NCAT Report 07-01

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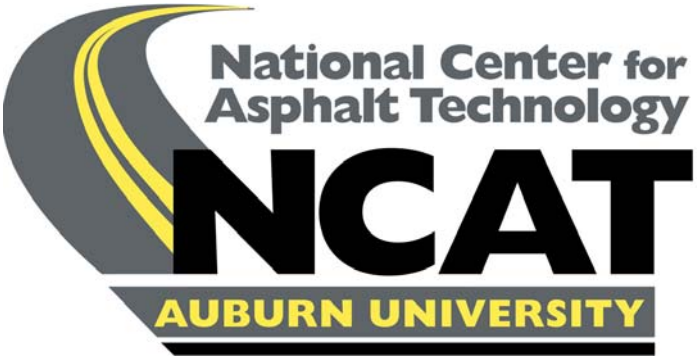

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LIST OF SYMBOLS

AASHTO : American Association of State Highway and Transportation Officials
ANOVA : Analysis Of Variance
ASTM : American Society for Testing and Materials
CTM : Circular Texture Meter
CPX : Close Proximity Trailer (NCAT Noise Trailer)
dB(A) : A-Weighted Decibel
FHWA : Federal Highway Administration
GDYR : Goodyear Aquatread Tire
ISO : International Organization for Standardization
MPH : Mile Per Hour
NCAT : National Center for Asphalt Technology
OGFC : Open Graded Friction Course
SMA : Stone Matrix Asphalt
SPL : Sound Pressure Level
UNIR : Uniroyal Tigerpaw Tire
ULIP : Ultra Light Inertial Profiler

ABSTRACT

The NCAT test track comprises a range of different mixtures types with varying surface textures. The macrotextures of the surface mixtures on the track were measured following the suspension of trafficking operations (as part of the Phase 2 experiment) using the ASTM sand patch and circular texture meter (CTM) methods as well as with the new ultra-light inertial profiler (ULIP). An excellent correlation was found between the macrotexture measurements of the NCAT sections using these three devices. The ULIP has an advantage over the sand patch and CTM methods in that the macrotexture of a stretch of road can be measured instead of spot measurements. This allows the definition of texture wavelength spectra that can be used to calculate the ISO texture wavelength parameters L_4 and L_{63}. These parameters are reportedly related to noise levels generated at the pavement-tire interface. Past studies at NCAT have indicated that noise at the pavement-tire interface is not overly influenced by surface macrotexture or mixture gradation parameters such as fineness modulus. A statistical analysis of variance was done to relate noise levels measured on the different sections at the NCAT track with texture parameters measured with the ULIP and mixture gradation properties. Once again, no definitive relationship between sound pressure as measured at the pavement-tire interface and the material factors was observed. This conclusion suggests that pavement-tire noise cannot only be defined in terms of mixture gradation and surface texture properties, particularly if the surface mixture has been exposed to trafficking as was the case at the track. The focus of the report is on the evaluation of the ULIP to measure the macrotexture properties of surface layers. The device proved to be an effective and efficient tool for this purpose. Possible anomalies using the ULIP device were identified but these would need to be confirmed, possibly by repeating selected tests with an alternative surface profiler.

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INTRODUCTION

Pavement surface macrotexture is defined as the deviation of a pavement surface from a true planar surface, within the texture wavelength ranges of 0.5 – 50 mm [1]. It is a function of aggregate size and mixture gradation of the surface layer and influences factors such as water drainage, noise at the pavement-tire interface, friction, rolling resistance and tire wear. The so-called "sand patch" method has been used to provide a single measurement describing surface texture. In this method a given volume of uniformly graded sand or glass spherical beads is spread on the surface to form a circular patch, the diameter (*D*) of which is measured. By dividing the volume (*V*) of material spread out by the area covered, the average depth of the sand or glass beads patch is calculated as a mean texture depth (MTD) as follows:

$$MTD = \frac{4 \cdot V}{\pi \cdot D^2} \tag{1}$$

This method has been standardized in ASTM E965 [2]. Surface macrotexture can also be measured using the circular texture meter (CTM) standardized in ASTM E2157 [3]. The CTM uses a laser to measure the surface profile of a circle 284 mm (11.2 in) in diameter. The profile is divided into eight segments of 111.5 mm (4.4 in). The average mean profile depth (MPD) is determined for each of the segments of the circle and the reported MPD is the average of all eight segment depths. Prowell and Hanson [4] evaluated the CTM for measuring surface texture of pavements. They concluded that the CTM produces results comparable with the sand patch test and provided a more realistic measure of macrotexture for porous surfaces. The sand patch method gives erroneously high measures of surface texture when used to test porous surfaces given that the sand or glass beads flow into the voids interconnected with the surface texture. Prowell and Hanson indicate that macrotexture results from the CTM are more variable than those from the sand patch test but less technical skill is required to operate the CTM and testing with the CTM can also be done more rapidly.

The ultra-light inertial profiler (ULIP) is a laser based device for measuring surface profiles for the evaluation of surface texture or roughness. It consists of a SEGWAY™ Human Transporter onto which a sensor box is mounted connected to a laptop computer for data acquisition and analysis as shown in Figure 1. The sensor box is equipped with triggers, a laser and accelerometers. An advantage of the ULIP for measuring surface macrotexture over the CTM and sand patch methods is that a longitudinal stretch of pavement can be evaluated. This allows a better assessment of texture variability across the tested section compared to spot measurements with the CTM and sand patch methods.

Figure 1. ULIP Testing at the NCAT Test Track

This report expands on results of macrotexture measurements done on sections at the NCAT test track. The focus is on comparing measurements with the ULIP with those using the CTM and sand patch methods. The scope of the study was extended to also investigate the possibility of deriving texture wavelength properties for the NCAT test track sections from the ULIP measurements. This would allow a better characterization of surface texture properties and possibly noise potential.

Sandberg and Ejsmont [1] point out that macrotexture measurements, such as mean texture depth (MTD) obtained by applying the sand patch method and mean profile depth (MPD) from the CTM are not sufficiently well correlated with noise levels. This finding was supported by noise testing reported by Hanson et al. [5] done at the NCAT test track. They concluded that there appears to be a relationship between noise and the aggregate particle size and gradation used in a HMA wearing course but that it is not totally explained by either fineness modulus or surface texture.

Macrotexture measures are mainly intended to represent wet frictional characteristics of road surfaces. Two special measures derived from the texture spectrum can possibly be used to describe noise-relevant characteristics of road surfaces. These are L_4 and L_{63} as shown in Figure 2, the texture profile levels for the one-third octave band having center wavelengths of 4 and 63 mm respectively.

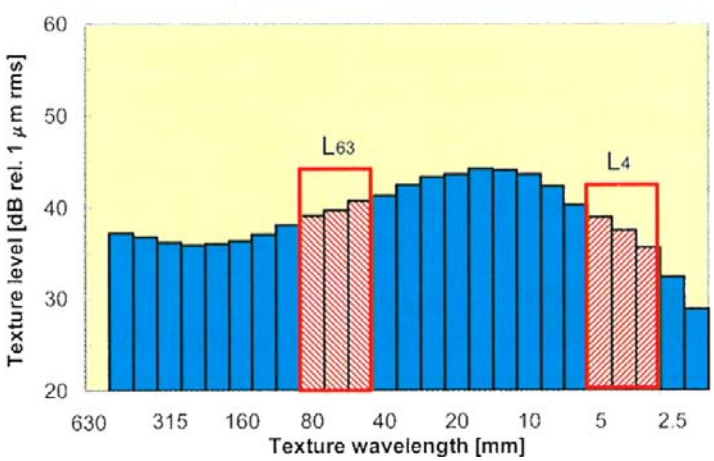

Figure 2. Example of texture spectrum after Sandberg and Ejsmont [1]

The concept of a texture spectrum is explained in ISO 13473-2 [6]. This is the spectrum obtained when a surface profile curve has been analyzed by filtering techniques to determine the magnitude of its spectral components at different wavelengths or spatial frequencies. Wavelength is a concept commonly used and accepted in signal-processing vocabularies. The profile can be considered as a stationary, random function of the distance along the surface. By means of a Fourier analysis, such a function can be mathematically represented as an infinite series of sinusoidal components of various frequencies, each having a given amplitude and initial phase. For typical and continuous surface profiles, a profile analyzed by its Fourier components contains a continuous distribution of wavelengths. Texture wavelength is the inverse of the spatial frequency, with unit m^{-1} or cycles/m.

The authors developed a procedure to determine texture spectra from the ULIP measurements. During this process an interesting phenomenon was observed. Each of the sections evaluated produced a characteristic peak in the texture spectra that has not been documented or reported previously. Discussions with experts in the field indicated that this could possibly be an artifact of the ULIP. Analysis where done by two separate parties to investigate this possibility. These analyses are included in the report. The macrotexture characteristics of sections at the NCAT test track are also related to sound pressure measurements at the pavement-tire interface collected on each of the sections using the NCAT close-proximity (CPX) noise trailer.

NCAT TEST TRACK

The NCAT test track was originally built in 2000 and consists of 46 different sections on a 1.7 mile oval track [7]. These sections were trafficked with 10 million equivalent standard axle loads (mESALs) over a two year period. Following this initial testing, 22 of the original sections were rehabilitated in 2003. Of these, 8 sections were used for a structural experiment by removing the existing pavement all the way down to uniform subgrade materials (approximately 30 inches) and rebuilding the pavement structure with varying thicknesses and materials. The remaining 14 new sections were shallow mill and inlay sections. Following reconstruction an addititional 10 mESALs were applied to the track sections. During the Phase 2 study, sections N1 and N2 failed and were eventually replaced together with section E9 with warm mix asphalt having a Superpave gradation. Sections E2 and E3 were overlain with a resin epoxy containing calcined bauxite chippings to improve the frictional resistance of the surface. At the time of the noise and macrotexture testing, the surface layer of section W3 had been scratched to improve friction. Testing was done directly on the scratched surface. Table 1 gives a breakdown of the different hot-mix asphalt (HMA) surface mixtures on the sections tested at the NCAT test track as part of this study, together with approximate traffic over the section at the time of testing in terms of million equivalent standard axle loads (mESALS). Table 2 shows the gradations of the surface mixtures for the different sections.

Table 1. NCAT test track section surface mixtures

Section	Date[1]	mESALS[2]	Mix	Aggregate
N1	2006	0.5	Superpave	Grn/Lms/Snd
N2	2006	0.5	Superpave	Grn/Lms/Snd
N3	2003	10	Superpave	Grn/Lms/Snd
N4	2003	10	Superpave	Grn/Lms/Snd
N5	2003	10	Superpave	Grn/Lms/Snd
N6	2003	10	Superpave	Grn/Lms/Snd
N7	2003	10	SMA	Granite
N8	2003	10	SMA	Granite
N9	2003	10	SMA	Limestone
N10	2003	10	SMA	Lms/Chert
N11	2000	20	Superpave	Granite
N12	2000	20	SMA	Granite
N13	2003	10	SMA	Granite
W1	2000	20	SMA	Granite
W2	2003	10	SMA	Porph/Lms
W3	This section was scratched.			
W4	2000	20	OGFC	Granite
W5	2000	20	OGFC	Granite
W6	2003	10	Superpave	Lms/Grv/Snd
W7	2000	20	Novachip	Granite
W8	2003	10	OGFC	Granite
W9	2003	10	Superpave	Granite
W10	2000	20	?	Qtz Gravel
S1	2003	10	SMA	Granite
S2	2000	20	Superpave	Gravel
S3	2000	20	Superpave	LMS / Gravel
S4	2003	10	OGFC	Limestone
S5	2003	10	Superpave	Grv/Lms/Snd
S6	2000	20	Superpave	LMS / RAP
S7	2000	20	Superpave	LMS / RAP
S8	2000	20	Superpave	Marble Schist
S9	2000	20	Superpave	Granite
S10	2000	20	Superpave	Granite
S11	2000	20	Superpave	Marble Schist
S12	2000	20	Superpave	Limestone
S13	2000	20	Superpave	Granite
E1	2003	10	SMA	Limestone
E2	These sections were overlain with a			
E3	calcined bauxite friction surface.			
E4	2000	20	Superpave	Granite
E5	2000	20	Superpave	Granite
E6	2000	20	Superpave	Granite
E7	2000	20	Superpave	Granite
E8	2000	20	Superpave	Granite
E9	2000	20	Superpave	Granite

[1] Year of construction
[2] Approximate ESALS at time of texture measurements

Table 2. Section mixture gradations

Section / Sieve	Percentage passing the noted sieve									
	19	12.5	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075
N1	100	100	100	81	63	51	38	20	12	7
N2	100	100	100	80	63	51	38	21	12	6.6
N3	100	100	100	80	63	51	38	21	12	6.6
N4	100	100	100	81	61	49	37	21	12	6.7
N5	100	100	100	81	61	49	37	21	12	6.7
N6	100	100	100	81	62	50	37	21	12	6.8
N7	100	100	100	49	24	20	17	14	12	9.2
N8	100	100	100	49	24	20	17	14	12	9.2
N9	100	97	83	37	17	13	12	11	10	8.6
N10	100	95	87	30	21	17	15	14	13	11.5
N11	100	97	80	52	37	30	24	18	11	7.2
N12	100	96	73	32	23	21	19	17	14	11.8
N13	100	95	71	32	21	18	16	15	14	12.1
W1	100	95	68	28	20	18	16	14	12	9.7
W2	100	88	54	22	17	14	13	12	11	9.7
W3	Scratched surface.									
W4	100	95	66	23	14	13	12	11	10	8.6
W5	100	95	67	22	15	12	11	11	10	8.5
W6	100	100	100	98	75	50	35	22	15	11.3
W7	100	96	69	22	17	14	12	12	12	10.9
W8	100	100	96	40	25	19	15	13	10	7.5
W9	100	100	98	83	61	43	32	23	15	7.5
W10	100	96	81	51	33	22	16	12	9	6.5
S1	99	92	74	33	25	24	22	19	16	13
S2	100	100	96	67	41	29	22	15	10	8.4
S3	100	100	100	70	43	29	21	15	11	8.9
S4	100	95	78	19	5	3	3	2	2	1.6
S5	100	96	87	66	43	30	21	10	7	5.5
S6	100	95	87	74	53	41	33	24	12	5.9
S7	100	96	88	71	34	25	20	16	10	6.2
S8	100	100	93	58	38	25	19	15	12	7.8
S9	100	93	82	53	36	27	20	14	9	5.7
S10	100	95	88	69	52	38	27	19	11	6.6
S11	100	100	92	62	47	30	22	17	13	7.5
S12	100	97	82	63	46	32	23	16	10	7
S13	100	93	80	68	50	37	27	19	11	6.6
E1	100	91	69	35	23	17	14	12	11	10
E2	Friction surface.									
E3										
E4	100	95	75	42	29	23	18	13	8	4.6
E5	100	98	83	54	40	30	24	16	9	5.1
E6	100	96	81	52	37	28	22	15	8	4.3
E7	100	97	83	53	38	29	22	16	9	5.2
E8	100	98	86	66	51	38	28	18	10	5.2
E9	100	100	100	81	63	51	38	20	12	7

MACROTEXTURE MEASUREMENTS

Macrotexture measurements were done on each of the NCAT test track sections using the sand patch method, the circular texture meter and the ultra-light inertial profiler. Photos of the surface texture of each section tested are shown in Appendices A (close-ups) and B. A measurement scale has been superimposed on the photos in Appendix A. The smaller black and white bars on this scale are 10 mm in length and the larger bars are 1 inch in length.

It is important to note that the measurements as reported were taken after termination of the Phase 2 trucking operations at the track. Macrotexture testing was done in the right hand wheelpath of the trafficked lanes. Two points to note:

1. The measurements do not represent the surface textures of the sections after construction.
2. The traffic volume applied to the sections varied depending on whether these were left in place or rehabilitated following the Phase 1 study at the track.

The sand patch and CTM measurements were done at 5 random locations within each section. These measurements where done at the same locations in the right hand wheelpath. The CTM measurements were done first so as not to be influenced by the glass beads used in the sand patch method that fill the surface voids.

Sand patch method

Appendix C contains the results of sand patch measurements for the different sections at the NCAT test track. The measurements are diameters at four equally spaced locations around the patch circumference in accordance with ASTM E965 [2]. The sample volume used for the tests was 112.25 ml. Mean texture depth (MTD) is calculated using Equation 1. Measurements where taken at five random locations along each section. The means and standard deviations of the calculated macrotextures in terms of mean texture depth (MTD) are shown in Figure 103 through Figure 106 in Appendix E for the sections on the north-, east-, south-, and west-bound sections.

Circular texture meter (CTM) method

Table 6 and Table 7 in Appendix D contain the CTM measurements for the test track sections. Measurements were taken parallel and perpendicular to the direction of travel of traffic on the track. Analysis of the individual segments can be performed to examine the profile parallel to the direction of travel (segments A and E) and perpendicular to the direction of travel (segments C and G). This information could be useful in the study of surfaces that have texture with significant directional characteristics. Computer software supplied with the CTM can process the data to report either the Mean Profile Depth (MPD) or the Root Mean Square (RMS) for each circular segment. The means and standard deviations of the calculated macrotextures in terms of mean profile depth (MPD) are shown in Figure 107 through Figure 110 in Appendix E for the sections on the north-, east-, south-, and west-bound sections.

Ultra-light inertial profiler (ULIP) method

ULIP macrotexture measurements were done by running the device at a constant speed (12 mph) in the right hand wheelpath throughout the sections. Section markers were placed to exclude measurements within the first and last 25 ft of each section. NCAT sections are typically 200 ft in length. At least three measurements were done in both the direction of traffic travel and opposite to the direction of traffic travel.

The ULIP device is equipped with analysis software that outputs ASTM mean profile depth (MPD) in 0.5 meter data windows. These data are too numerous to report but are summarized for each of the sections tested. Figure 3 shows that the measurements taken in and against the direction of trafficking at the track compare well. This indicates that the trafficked sections did not exhibit directional textures. An exception is section W3, which was a scratched surface that visually showed directional orientation.

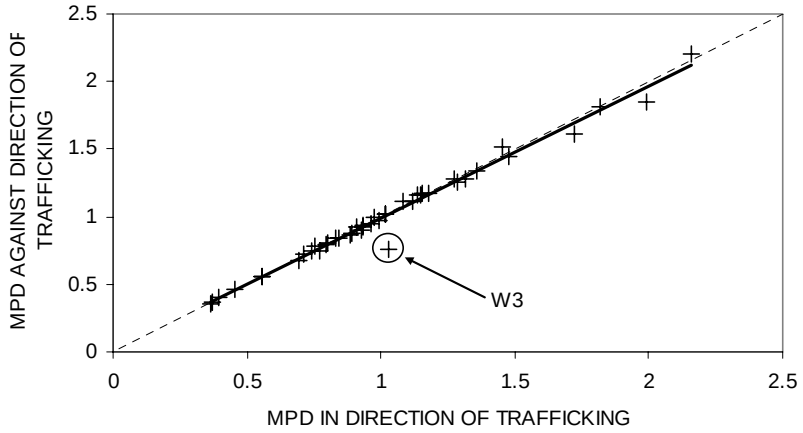

Figure 3. Comparison of macrotexture measurements in and against direction of trafficking

The means and standard deviations of the ULIP calculated macrotextures in terms of mean profile depth (MPD) are shown in Figure 111 through Figure 114 in Appendix E for the sections on the north-, east-, south-, and west-bound sections respectively. The macrotexture results are discussed in more detail later in the report.

SOUND PRESSURE MEASUREMENTS

Sound pressure measurements of the NCAT track sections were taken using the NCAT close proximity (CPX) trailer at a speed of 45 mph. Results of this testing are reported in Appendix F. Figure 119 through Figure 163 in Appendix F show A-weighted sound pressure levels (SPL) at the third octave band frequencies for the different sections. Sound measurements in the field are collected using an OR25, OROS[3] analyzer with GRAS[4] ½ inch microphones. The OROS NVGATE software is used to analyze in the

[3] http://www.oros.com/en/
[4] http://www.gras.us

sound data. Repeated sound measurements (at least 3 runs) were done on each section. Testing was done with two different tires, the Goodyear Aquatread (GDYR) and Uniroyal Tigerpaw (UNIR).

A critical review of the sound pressure data indicates variations between the respective noise test runs on particularly the north-tangent sections as is shown in Appendix F. The sound pressure levels for the first run are higher than subsequent runs. As a result, higher than anticipated standard deviations are evident on these sections. The reason for the differences between test runs is believed to be related to progressive heating of the test tire used for the noise measurements. This emphasizes the importance of ensuring that the test tire is sufficiently heated and at a stable temperature before commencing with the noise measurements. It is standard practice as part of the NCAT noise measurement protocol to drive three laps around the track before starting with the noise measurements. The data suggests that the number of laps before testing be increased. To address this problem in the future it is recommended that the test tires be heated by driving the trailer for 20 minutes prior to testing.

The figures in Appendix F show the mean sound pressure levels calculated for the three runs on each section with the different tires. As discussed, given unusually high variations in sound pressure levels measured on the first run on the north-tangent sections (particularly for the Aquatread tire) it was decided to remove these runs from the analysis. The sound pressure level figures for the north-tangent sections tested with the Aquatread tire are therefore the average levels of runs 2 and 3.

Figure 164 through Figure 167 in Appendix F summarize the sound pressure measurements on the north-, east, south- and west-bound sections respectively. Mean and standard deviation of the A-weighted global sound pressure levels (SPL) calculated by logarithmic addition of the sound levels between the third octave band frequencies of 316 and 3981 Hz are shown.

SYNTHESIS

Macrotexture

The sand patch and circular texture meter (CTM) allow spot measurements of surface texture. Figure 4 shows the relationship between the macrotexture measurements of sections at the test track determined by applying the sand patch and CTM methods. This graph was obtained by averaging the readings of the 5 sand patch measurements on each section and comparing this to the average of the 5 CTM measurements. One outlier was removed from the dataset before relating the sand patch and CTM measurements. This was the macrotexture readings on section S5, a Superpave mixture. The sand patch measurements on this section were highly variable as shown in Figure 105.

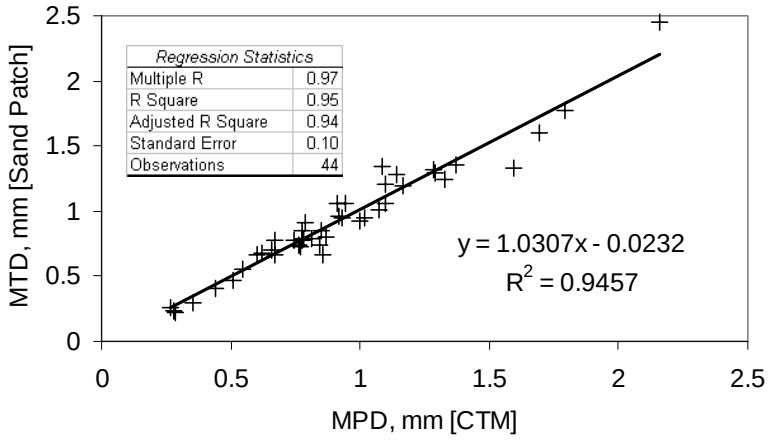

Figure 4. Relationship between CTM and sand patch macrotexture measurements

Figure 4 includes data from the open graded friction course (OGFC) mixtures. Sand patch macrotextures on these mixtures are usually questionable given that the glass beads used in this test can drain into the voids of these mixtures resulting in an overestimation of the actual surface texture. The data as reported suggest that the surface voids of the OGFC mixtures on the track are clogged and this appears to be the case from the photos in Appendices A and B for sections W4, W5 and W8.

Figure 5 shows an excellent correlation between mean profile depth measured with the CTM and ULIP devices. The ULIP macrotextures are on average about 0.2 mm lower than corresponding CTM values.

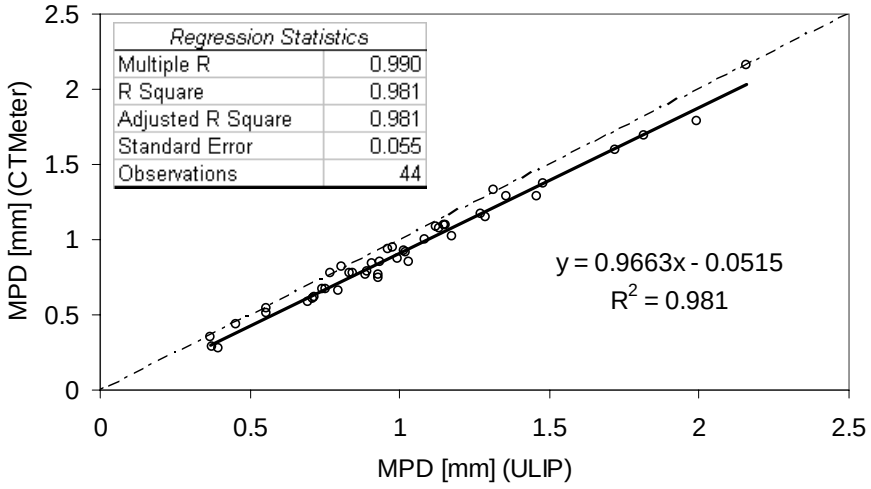

Figure 5. Relationship between ULIP and CTM macrotexture measurements

Figure 115 through Figure 118 in Appendix E summarize the macrotexture measurements on the track. The figures show mean profile depths (MPD) for the circular texture meter (CTM) and ULIP as well as mean texture depths (MTD) from the sand

patch (SP) tests. As suggested by the correlations graphed previously, these results compare well with the exception of the measurements on section S5.

In addition to outputting summarized mean profile depth measurements every 0.5 m, the software developer for the ULIP device at the FHWA (Jim Mekemson) was requested to provide the actual surface profile data from which MPD is calculated. This required an adjustment and patch of the ULIP software. The ULIP data is laser based sampled at a frequency of 10,000 Hz. The step between raw profile measurements is limited by the thickness of the laser beam i.e. 0.5 mm. An example of surface profile data spanning the length of a section (W4 in this case) is shown in Figure 6.

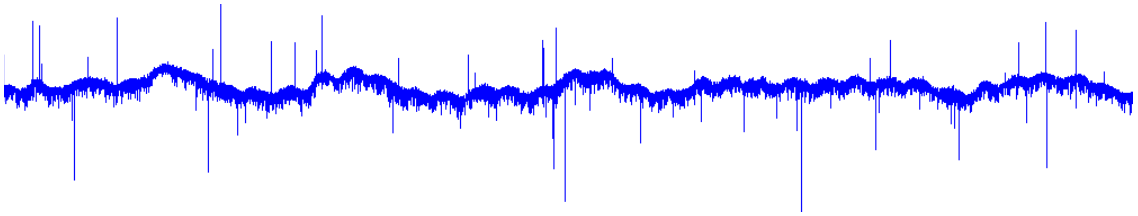

Figure 6. ULIP surface profile for section W4 (unfiltered)

The figure shows that the profile data is riddled with spikes or outliers. It must be pointed out that this is not a typical ULIP profile. Roughly half of the sections on which profile data were collected with the ULIP contained these spikes. Interestingly, on some sections, the profiles measured in the direction of traffic travel would have spikes while those measured opposite to the direction of travel would have none and vice versa. It is postulated that these spikes are dropouts. A dropout is an invalid reading of the surface profile as a result of surface photometric properties or shadowing of light in deep surface troughs. This is particularly the case for measurements on porous surfaces. Given that these invalid readings can skew the data set, they should be considered as outliers and removed. The circular texture meter (CTM) measurements are also laser-based and also prone to dropouts but the CTM software removes these automatically and indicates the percentage of dropouts (DROP) measured as shown in Table 6 and Table 7.

Statistically, potential outliers in a data set can be determined by calculating the first quartile (q1), third quartile (q3), and inter-quartile range (iqr=q3-q1). Observations that lie outside of q1-(1.5*iqr) and q3+(1.5*iqr) are flagged as potential outliers and anything outside of q1-(3*iqr) and q3+(3*iqr) as problematic outliers. Alternatively, all observations that lie beyond 3 standard deviations from the sample mean could be considered as outliers. This is an iterative procedure i.e. after outliers are initially removed the data set should be reexamined. The ULIP macrotexture data was processed by removing outliers as described above. Figure 7 shows the same profile after removal of the spikes.

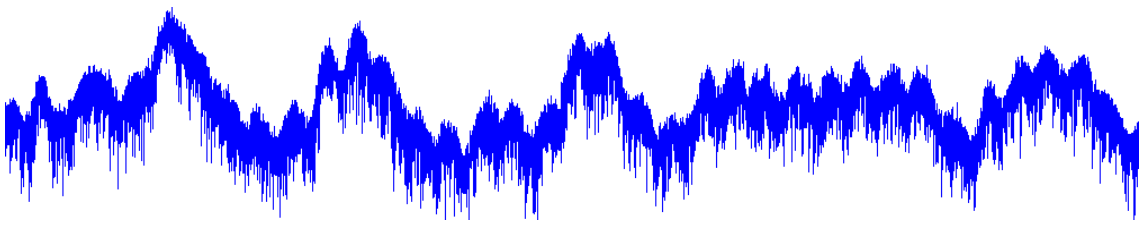

Figure 7. ULIP surface profile for section W4 (filtered)

A consequence of these spikes in the profile data is that the ULIP macrotexture measurements of mean profile depth (MPD) must be examined for outliers and these removed if necessary. This was done for the data reported in Figure 5 above.

Figure 8 shows the relationship between macrotexture (MTD) measured with the ULIP and Uniroyal tire sound pressure levels (SPL) on the NCAT test track sections. It was this anticipated weak relationship that prompted the study of the ULIP data to extract perhaps more meaningful texture parameters that may be related to noise at the pavement-tire interface.

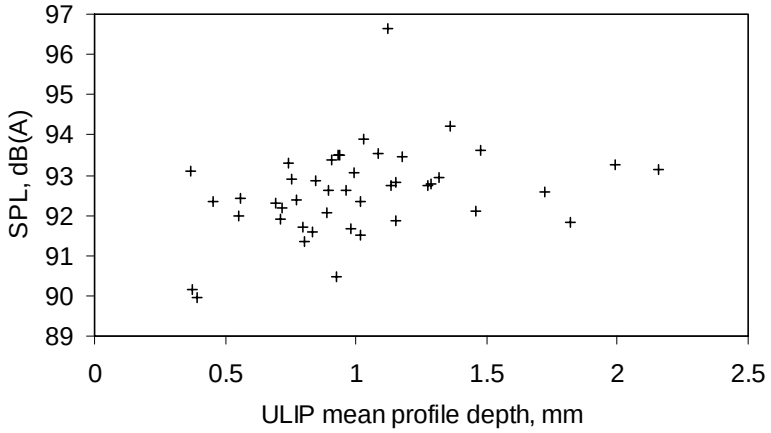

Figure 8. Relationship between ULIP macrotexture and sound pressure level

Texture wavelength

Figure 9 shows a plot of the surface profile measured using the ULIP on section N1. Only a partial plot of the total measurement taken is shown to illustrate some characteristics of the ULIP measurements. The inset shown on the figure is a zoom-in on the profile at an arbitrary point. The figure shows how the surface elevation drops about 20 mm (0.8 in) over the first 6 m (20 ft) and then increases by about 20 mm at a distance of 14 m. This is the expected longitudinal change in slope along the road.

The ULIP surface profile is characterized by a waviness pattern overlain on the surface profile itself. This waviness appears to have a clearly defined wavelength that repeats every 1.5 m or so in this case. Initially it was proposed that this waviness is a result of the rocking motion imposed by the Segway Human Transporter during ULIP measurements. This is a feature of the Segway to maintain dynamic stabilization[5]. Mark Swanlund (personal communication) pointed out, however, that the waviness is more likely related to the tires of the Segway. The diameter of the Segway tire is 0.48 m (19 in) and the circumference is therefore π x 0.48 = 1.5 meters, which matches the wavelength of the waviness pattern. Given that this wavelength is considerably larger than the macrotexture wavelengths considered, it should not influence the results of macrotexture

[5] http://www.segway.com/personal-transporter/how_it_works.html

measurements. It should be emphasized, however, that this waviness may impact roughness measurements with the ULIP unless compensated for.

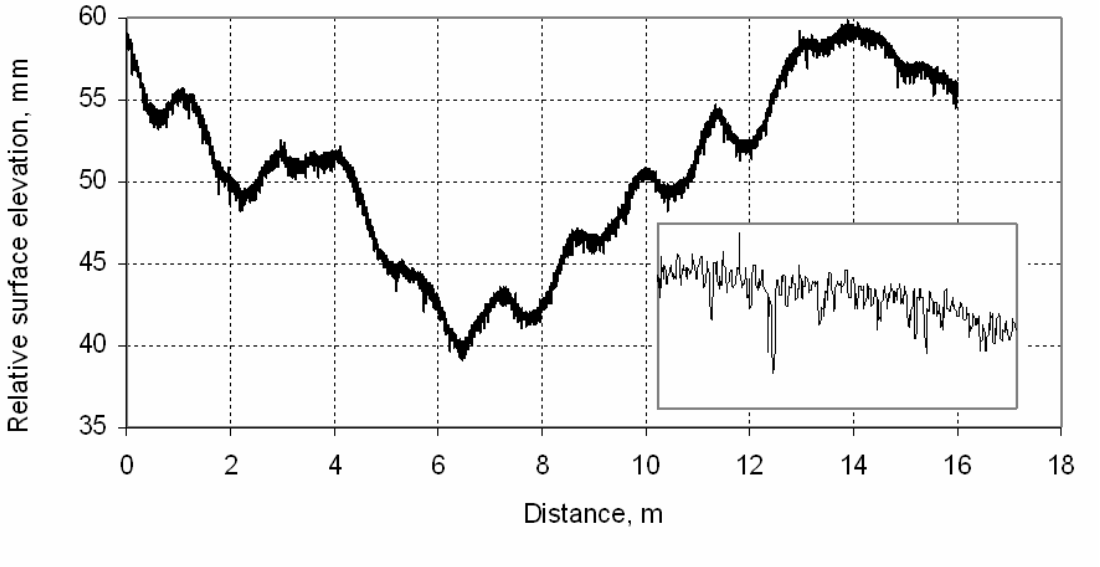

Figure 9. Partial ULIP Surface profile of section N1

The inset in the figure shows the level of detail that the ULIP can measure on the surface profile. It is at this level that macrotexture calculations are done. To investigate this further a Fourier analysis of the profile data was performed. Figure 10 shows a plot of the Fourier transform with the spatial frequency (cycles/mm) converted to wavelength (mm). This is plotted to point out two important features. The first is the peak in the spectra data at about 1.4 m. This is the waviness feature described previously due to the Segway tires. A second peak in the data with a wavelength of about 6.4 mm is also clearly defined.

Peaks in spectra data indicate characteristic wavelengths present in the original profile. From Figure 15 it can be seen that the surface on section N1 was relatively smooth. No clear “wavelength” features can be seen, although protrusions of the aggregates on the surface are perceivable. Interestingly, the maximum aggregate size of the mixture used on section N1 was somewhere between 9.5 and 4.75 mm as shown in Table 2. Thus the characteristic peak indicating a wavelength of about 6.4 mm in the spectra could be related to the protrusions of these aggregates on the surface. This is hypothesized as the authors can think of no other reason that would explain this phenomenon, other than it being an artifact. An artifact in signal analysis is an anomaly in the measurement caused by external influences not related to the object being measured. In other words, a consistent error or bias in the measurement device independent of the measured profile. An investigation done by Dr. Nicolas Gagarin based on ULIP profiles measured at NCAT concluded that there were no artifacts in the ULIP data as measured. Appendix H contains the report provided by Dr. Gagarin. Limited analysis on section N1 data was also done by Dr. Parisa Shokouhi of the University of Texas at El Paso. She also concluded that the peaks in the ULIP data were not artifacts. These peaks were found in all of the sections measured and varied in wavelength as is shown later in the report. To

further investigate this apparent anomaly in the ULIP data it is recommended that selected surface profiles measured using an alternative surface profiler be used.

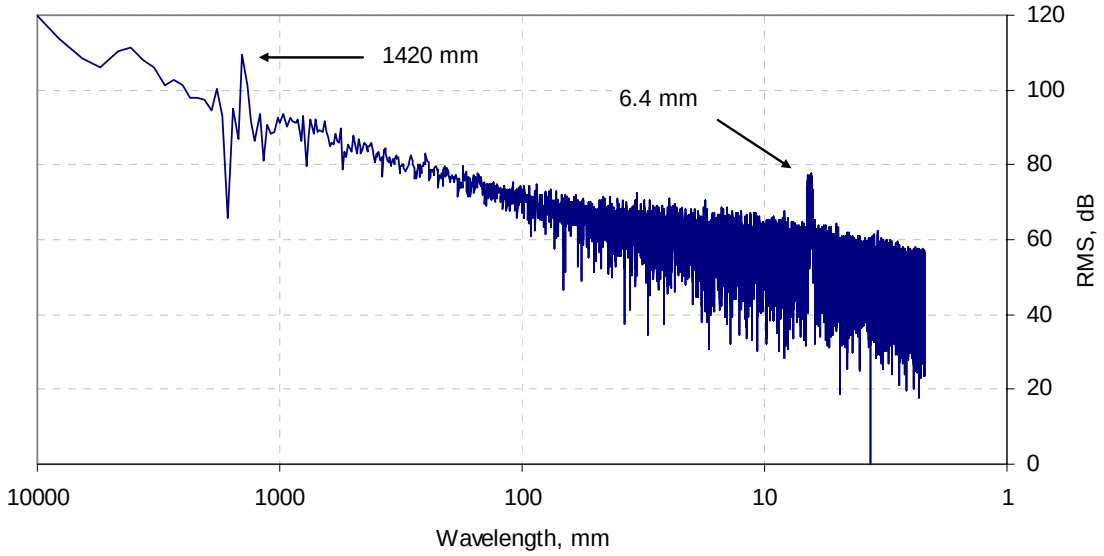

Figure 10. Fourier transform of ULIP measurements on section N1

Texture wavelength spectra were developed from the ULIP surface profile data collected on the sections. Microsoft Windows software was programmed to determine these directly from the profiles and to also calculated the ISO texture wavelength parameters L_4 and L_{63}. This process involves a Fourier transform of the profile data. The resulting wavelengths are then summed logarithmically at the ISO standard [6] third octave band wavelengths. Figure 168 through Figure 211 in Appendix G show the texture wavelength spectra determined for the different track sections for ULIP measurements in the direction of traffic travel. Also shown is the variation associated with at least three ULIP measurements per section. Outliers or spikes in the ULIP data were removed before analyzing the texture wavelength spectra. The characteristic peaks in the wavelength data can be seen on some of the sections, typically in the wavelength region of 2 – 4 mm. The flatter these spectra the smoother the road surface and the more pronounced spectra are associated with rougher surfaces.

Figure 212 through Figure 215 in Appendix G show the ISO parameter L_4 (mean and standard deviation) calculated for the north-, east-, south- and west-bound sections respectively from the texture wavelength spectra. Shown in the figures are values determined from ULIP data measured with and against traffic flow. Sandberg and Ejsmont [1] indicate that the higher the L_4 value, the lower the noise and vice versa. A survey and comparison of the noise data measured on the respective sections indicates that this is not necessarily the case for the track data as indicated in Figure 11. This figure was charted using the sound pressure data for the Uniroyal tire.

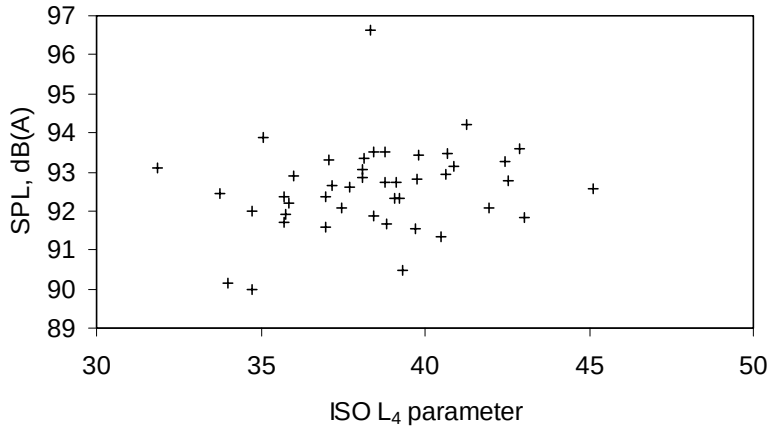

Figure 11. Relationship between L_4 and sound pressure levels at the NCAT track

Figure 216 through Figure 219 in Appendix G show the ISO parameter L_{63} (mean and standard deviation) calculated for the north-, east-, south- and west-bound sections respectively from the texture wavelength spectra. Shown in the figures are values determined from ULIP data measured with and against traffic flow. Sandberg and Ejsmont [1] indicate that the lower the L_{63} value, the lower the noise and vice versa. A survey and comparison of the noise data measured on the respective sections indicates that this is not necessarily the case for the track data as indicated in Figure 12. This figure was charted using the sound pressure data for the Uniroyal tire.

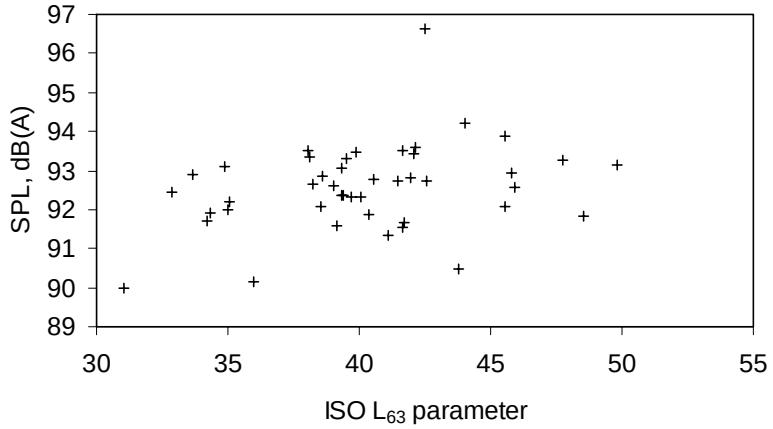

Figure 12. Relationship between L_{63} and sound pressure levels at the NCAT track

Figure 220 through Figure 223 in Appendix G show the characteristic wavelengths or peaks found in the wavelength spectra data for the respective sections. Figure 13 relates these peaks with the Uniroyal tire noise levels measured on the track sections. Once again no clear trend can be seen.

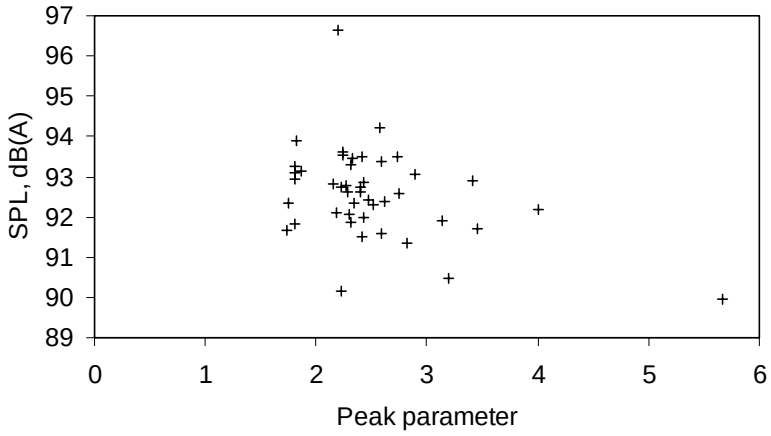

Figure 13. Relationship between characteristic peak and sound pressure levels

Analysis of variance

Statistical multiple regression and analysis of variance (ANOVA) were done to determine which if any of the mixture gradation and texture factors measured as part of the study relate to the noise levels measured on the NCAT test track sections. It was found that none of the gradation factors including fineness modulus significantly influenced the noise levels. The macrotexture factors evaluated included ULIP mean profile depth (MPD) and the texture wavelength parameters L_4, L_{63} as well as the characteristic peak in the wavelength spectra (CP). Interactions between these factors were also included in the analysis. The factors and interactions were related to the mean sound pressure levels measured with both the Uniroyal Tigerpaw and Goodyear Aquatread tires. One data point (W10) was identified as overly influential and was removed from the data set for analysis. Table 3 shows the results of the ANOVA and the prediction model coefficients are shown in Table 4. No single factor or interaction was identified as having a significant influence on the sound levels indicating that relationships between the predictor variables or factors appear to be masking individual effects. Although the model was found to be significant, the overall model fit (adjusted R2) is just slightly higher than 0.5 indicating that the macrotexture parameters evaluated do not fully explain the noise levels measured on the NCAT sections. Figure 14 shows the ANOVA model predicted A-weighted sound pressure levels.

Table 3. ANOVA Results

Source	Type III SS	Mean Square	F Value	Pr > F
CP	0.07771871	0.07771871	0.16	0.6944
L4	0.16670976	0.16670976	0.34	0.5655
L63	1.08904023	1.08904023	2.20	0.1476
MPD	0.03262305	0.03262305	0.07	0.7989
CP*L4	0.00896019	0.00896019	0.02	0.8938
CP*L63	1.48454733	1.48454733	3.00	0.0928
CP*MPD	1.82739325	1.82739325	3.70	0.0635
L4*L63	0.43132207	0.43132207	0.87	0.3573
L4*MPD	0.05124206	0.05124206	0.10	0.7496
L63*MPD	0.03452379	0.03452379	0.07	0.7933

Table 4. ANOVA Model

Term	Estimate	Std. Err.	T	Pr > |T|
Intercept	49.82	45.31	1.099	0.2798
L63	1.545	1.041	1.484	0.1476
CP	2.574	6.491	0.396	0.6944
L4	0.871	1.500	0.581	0.5655
MPD	-3.538	13.77	-0.257	0.7989
L63*CP	-0.166	0.0960	-1.733	0.0928
L63*L4	-0.031	0.0329	-0.934	0.3573
L63*MPD	0.0779	0.295	0.264	0.7933
CP*L4	0.0302	0.224	0.135	0.8938
CP*MPD	3.176	1.652	1.923	0.0635
L4*MPD	-0.087	0.270	-0.322	0.7496
The predicted model is DBA = 49.82 + 1.545*L63 + 2.574*CP + 0.871*L4 -3.538*MPD -0.166*L63*CP -0.031*L63*L4 + 0.0779*L63*MPD + 0.0302*CP*L4 + 3.176*CP*MPD -0.087*L4*MPD				

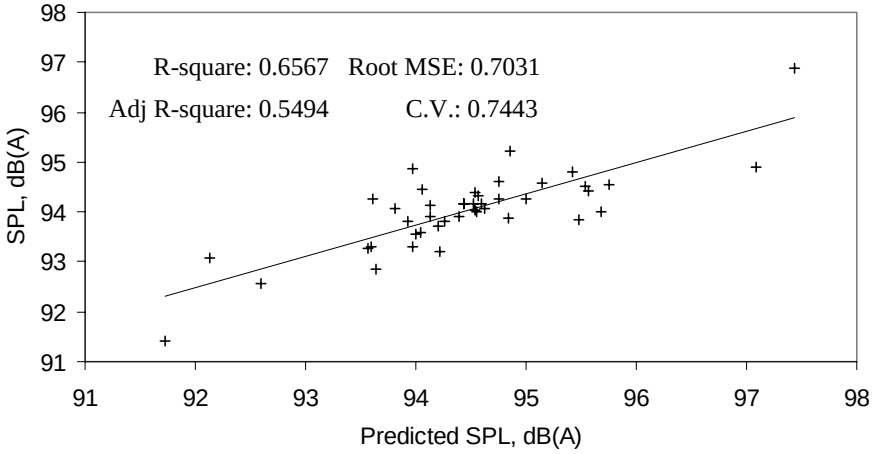

Figure 14. Predicted sound pressure levels based on ANOVA model

General Comments on ULIP Operation

The ULIP can be used to measure pavement roughness, although in this study is was used to investigate surface macrotexture. The advantages of the system are that it is lightweight and easily transported to the project site. A single person is required for operation. It also has low initial and operating costs. After several months of operation and testing at NCAT, the following key features of the ULIP are recognized:

- Sections of most interest can be tested and evaluated directly, in our case the right-hand wheel path of the outside lane at the NCAT test track.
- Testing can be done on straights and gentle curves.
- It is fairly easy to duplicate runs on the same line of travel.
- Highly portable, but still requires traffic control on public roads.
- Enables us to test relatively long test sections. With extra batteries, and warm weather, you can test about 5 miles of test section per day - depending on the length of the section and the distance between the sections.

The ULIP requires a skilled driver/operator. It is very challenging to avoid pitching when testing at full speed (about 12 mph). The ULIP has limitations on the slopes of roads that it can test. Steeply banked curves, such as those at the NCAT test track, may be too steep to test. Also, it is harder to duplicate the same path of travel on curved sections. Only one or two test runs on each test section are required to "dial in" the pitch of the laser. This must be done because of the variations in grades and slopes. The rider's center of gravity also changes as the slope or grade changes. It can be physically demanding to test for lengthy periods at a time – one is always standing and effort is required to maintain speed and pitch.

CONCLUSIONS AND RECOMMENDATIONS

This document reports on macrotexture testing of the HMA sections at the NCAT test track as part of FHWA Work Plan AU4-C1. Macrotexture measurements were done on the sections using the sand patch and circular texture meter (CTM) and with the ultra-light inertial profiler (ULIP). Sound pressure measurements were done at speeds of 45 mph using the NCAT close proximity (CPX) trailer and two different test tires. All testing was done following trucking operations as part of the NCAT Phase 2 study at the track. The traffic volume of the sections prior to noise and texture testing varied depending on reconstruction and rehabilitation efforts at the track. A consequence of this is that the material and roughness characteristics of the section mixtures were not "as-constructed". The density of the sections would likely have increased, the open graded friction courses were possibly clogged, aggregate degradation is a possibility, surface macrotexture may have decreased and the roughness of the sections would have increased with trafficking. This is mentioned to emphasize the complexity of relating surface macrotexture and noise measurements at the track, which was the underlying focus of the study.

An excellent correlation was found between the three measures of surface macrotexture determined using the sand patch, CTM and ULIP devices respectively. It was, however, necessary to remove outliers (spikes) from the ULIP macrotexture data to improve this correlation. The ULIP device has an advantage over the sand patch and CTM methods in that the macrotexture along the length of a section of roadway can be evaluated instead of repeated spot measurements. This allows a better evaluation of the variation in macrotexture along the roadway. It also allows the development of texture wavelength spectra that can be used to determine the ISO texture parameters L_4 and L_{63}.

Software was developed as part of the study for producing texture wavelength spectra and for calculating the ISO parameters from the ULIP data. A charactersitic peak was identified in the Fourier transformed profile data of all of the sections tested. These peaks varied in wavelength and intensity for the different sections and were included in the ANOVA analysis done as part of the study to relate noise and macrotexture parameters. Analyzes indicated that the peaks identified in the ULIP data are not artifacts of the device as originally suggested. Other macrotexture parameters investigated as part of the ANOVA included mean profile depth, and the ISO parameters L_4 and L_{63}. Interactions between these parameters were also included in the analysis. The ANOVA indicated that no single texture factor significantly influenced the noise levels measured on the NCAT

track sections. It can be deduced from the analysis that relationships between the macrotexture variables appear to be masking individual effects. The ANOVA model developed indicates that the texture parameters and interactions between these did significantly influence the noise results. A poor correlation was found, however, indicating that the noise levels measured on the sections were influenced by factors other than just macrotexture.

A waviness pattern having a wavelength of about 1.5 m resulting from the tires of the Segway was identified and should be compensated for when using the ULIP for roughness measurements.

Continued use of the ULIP for macrotexture evaluations is recommended. The device was found to be both efficient in terms of speed and portability and effective provided that outliers are removed from the macrotexture data. It is proposed that the software used to evaluate the ULIP surface profile data for the development of texture wavelength spectra be further developed to accelerate processing time – it is time consuming to manually remove outliers from the data prior to processing. It is recommended that anomalies apparent in the ULIP data be further investigated by measuring selected surface profiles (previously measured using the ULIP) with an alternative surface profiler.

Given possible high variability in sound pressure measurements between test runs, warming of the test tires prior to noise measurements is required to ensure repeatability between test runs. It is recommended that the current noise test protocol be changed to ensure that noise measurements between successive runs are repeatable. A minimum of 20 minutes is recommended to warm-up tires prior to testing.

ACKNOWLEDGEMENTS

The authors thank the Federal Highway Administration (FHWA) for sponsoring this project. The authors thank Mark Swanlund and Jim Mekemson (FHWA) and Nicolas Gagarin (Starodub, Inc.) for administrative, software and hardware support. Dr. Gagarin is also thanked for the analysis of the ULIP data for artifacts. The authors thank Ulf Sandberg (Swedish National Road and Transport Research Institute,VTI) for reviewing some of the ULIP profiles and for providing feedback on these. The authors thank Parisa Shokouhi (University of Texas at El Paso) for evaluating ULIP profiles for artifacts. The authors thank the NCAT service center and test track personnel for assistance in gathering and processing texture and noise data. Finally the authors acknowledge the contributions of Doug Hanson (AMEC) and Don Watson (NCAT) as part of the project.

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[6] ISO 13473-2, "Characterization of pavement texture by use of surface profiles – Part 2: Terminology and basic requirements related to pavement texture profile analysis", International Organization for Standardization (ISO), Geneva, Switzerland, 1997.

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APPENDIX A: NCAT TEST TRACK TEXTURE PHOTOS (CLOSE-UP)

Figure 15. Surface Texture: N1 (close-up)

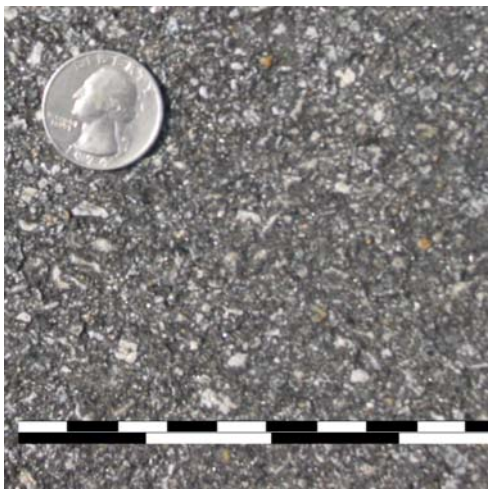


Figure 16. Surface Texture: N2 (close-up)

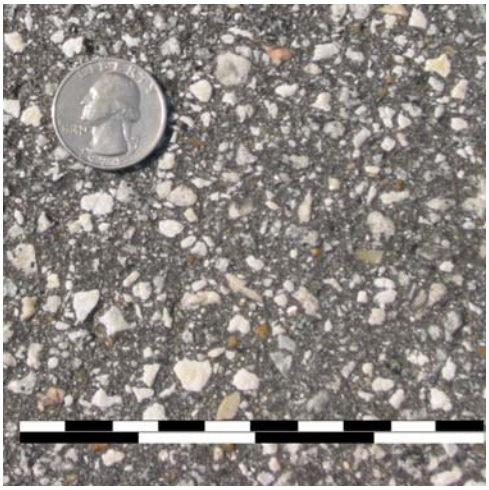


Figure 17. Surface Texture: N3 (close-up)

Figure 18. Surface Texture: N4 (close-up)

Figure 19. Surface Texture: N5 (close-up)

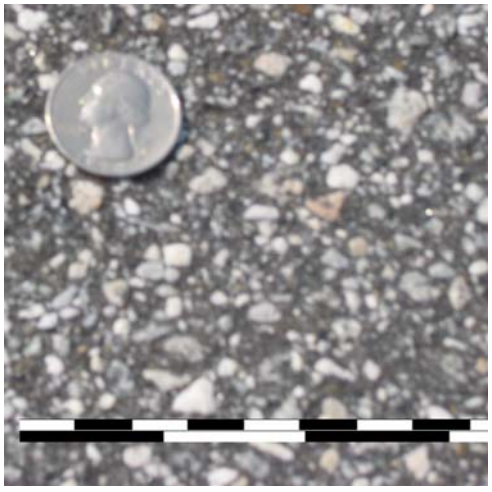


Figure 20. Surface Texture: N6 (close-up)

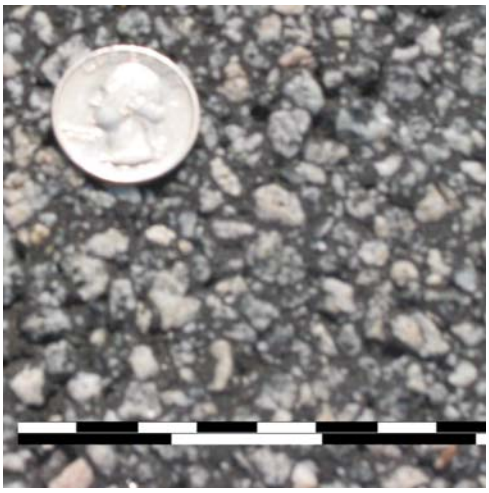


Figure 21. Surface Texture: N7 (close-up)

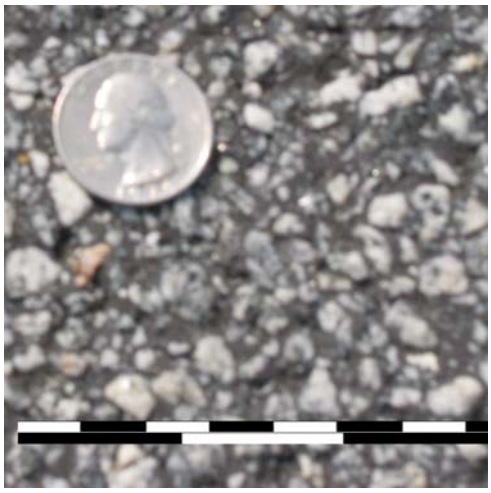


Figure 22. Surface Texture: N8 (close-up)

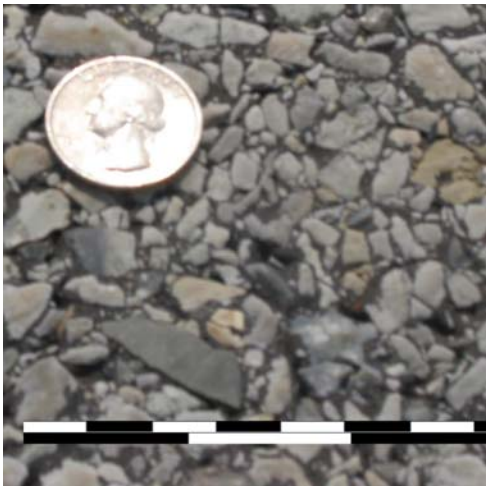


Figure 23. Surface Texture: N9 (close-up)

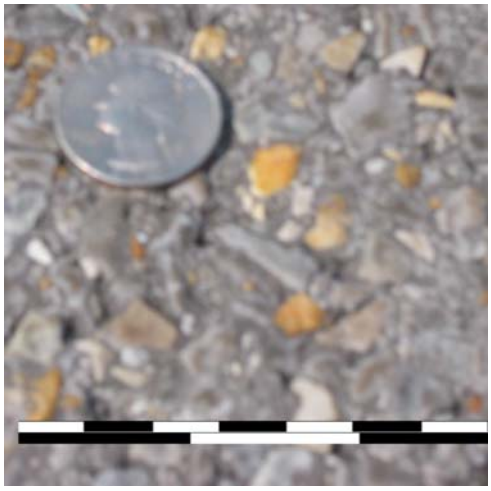


Figure 24. Surface Texture: N10 (close-up)

Figure 25. Surface Texture: N11 (close-up)

Figure 26. Surface Texture: N12 (close-up)

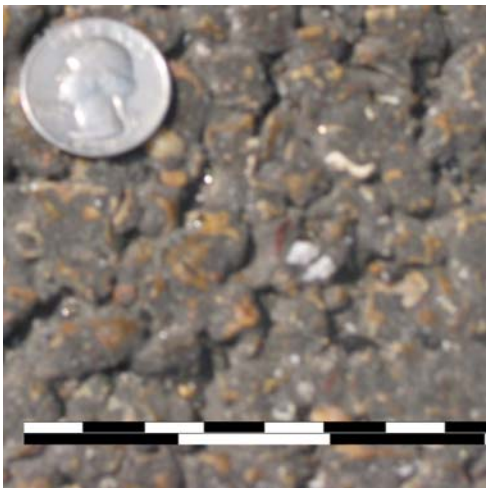


Figure 27. Surface Texture: N13 (close-up)

Figure 28. Surface Texture: W1 (close-up)

Figure 29. Surface Texture: W2 (close-up)

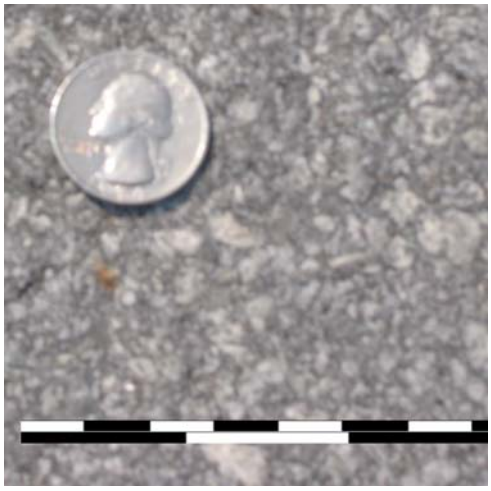


Figure 30. Surface Texture: W3 (close-up)

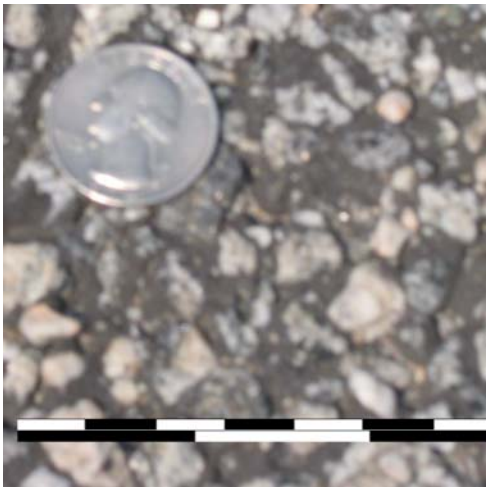


Figure 31. Surface Texture: W4 (close-up)

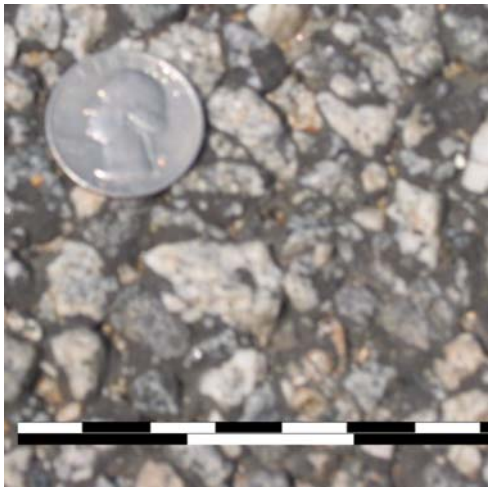


Figure 32. Surface Texture: W5 (close-up)

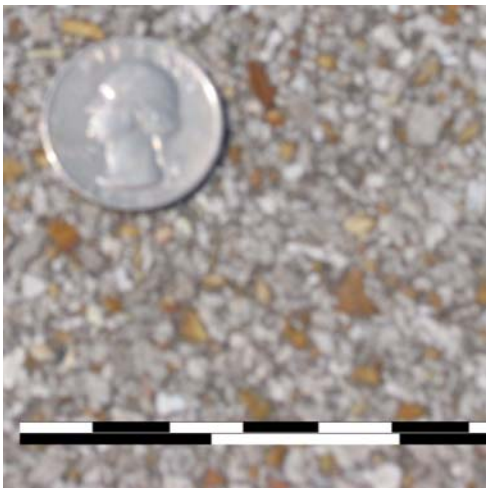


Figure 33. Surface Texture: W6 (close-up)

Figure 34. Surface Texture: W7 (close-up)

Figure 35. Surface Texture: W8 (close-up)

Figure 36. Surface Texture: W9 (close-up)

Figure 37. Surface Texture: S1 (close-up)

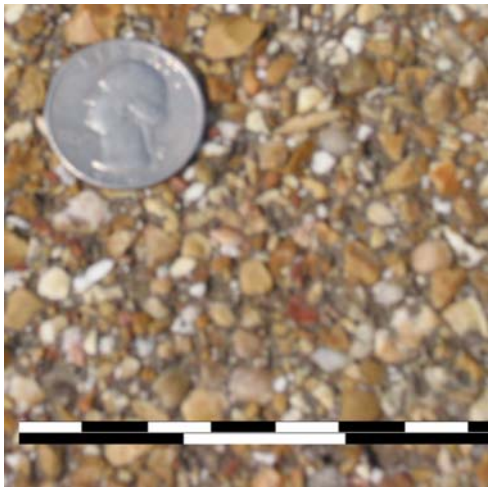


Figure 38. Surface Texture: S2 (close-up)

Figure 39. Surface Texture: S3 (close-up)

Figure 40. Surface Texture: S4 (close-up)

Figure 41. Surface Texture: S5 (close-up)

Figure 42. Surface Texture: S6 (close-up)

Figure 43. Surface Texture: S7 (close-up)

Figure 44. Surface Texture: S8 (close-up)

Figure 45. Surface Texture: S9 (close-up)

Figure 46. Surface Texture: S10 (close-up)

Figure 47. Surface Texture: S11 (close-up)

Figure 48. Surface Texture: S12 (close-up)

Figure 49. Surface Texture: S13 (close-up)

Figure 50. Surface Texture: E1 (close-up)

Figure 51. Surface Texture: E2 (close-up)

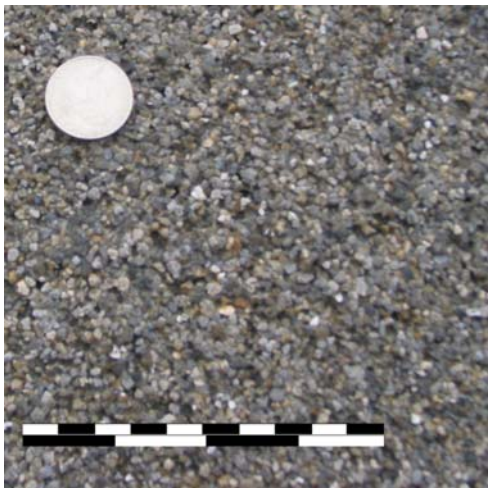


Figure 52. Surface Texture: E3 (close-up)

Figure 53. Surface Texture: E4 (close-up)

Figure 54. Surface Texture: E5 (close-up)

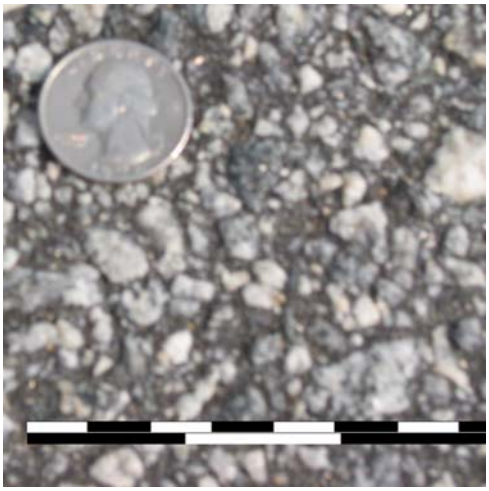


Figure 55. Surface Texture: E6 (close-up)

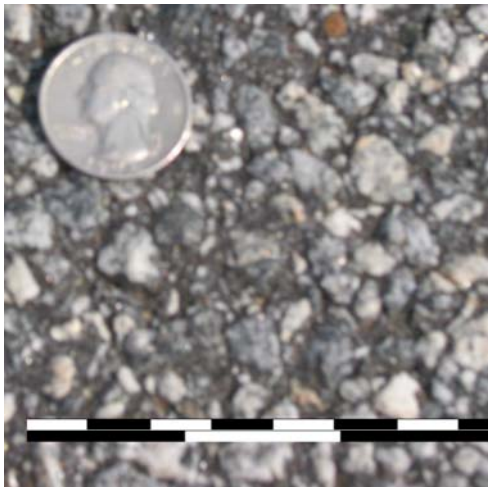


Figure 56. Surface Texture: E7 (close-up)

Figure 57. Surface Texture: E8 (close-up)

Figure 58. Surface Texture: E9 (close-up)

APPENDIX B: NCAT TEST TRACK TEXTURE PHOTOS (FAR)

Figure 59. Surface Texture: N1 and N2

Figure 60. Surface Texture: N3

Figure 61. Surface Texture: N4

Figure 62. Surface Texture: N5

Figure 63. Surface Texture: N6

Figure 64. Surface Texture: N7

Figure 65. Surface Texture: N8

Figure 66. Surface Texture: N9

Figure 67. Surface Texture: N10

Figure 68. Surface Texture: N11

Figure 69. Surface Texture: N12

Figure 70. Surface Texture: N13

Figure 71. Surface Texture: W1

Figure 72. Surface Texture: W2

Figure 73. Surface Texture: W3

Figure 74. Surface Texture: W4

Figure 75. Surface Texture: W5

Figure 76. Surface Texture: W6

Figure 77. Surface Texture: W7

Figure 78. Surface Texture: W8

Figure 79. Surface Texture: W9

Figure 80. Surface Texture: W10

Figure 81. Surface Texture: S1

Figure 82. Surface Texture: S2

Figure 83. Surface Texture: S3

Figure 84. Surface Texture: S4

Figure 85. Surface Texture: S5

Figure 86. Surface Texture: S6

Figure 87. Surface Texture: S7

Figure 88. Surface Texture: S8

Figure 89. Surface Texture: S9

Figure 90. Surface Texture: S10

Figure 91. Surface Texture: S11

Figure 92. Surface Texture: S12

Figure 93. Surface Texture: S13

Figure 94. Surface Texture: E1

Figure 95. Surface Texture: E2

Figure 96. Surface Texture: E3

Figure 97. Surface Texture: E4

Figure 98. Surface Texture: E5

Figure 99. Surface Texture: E6

Figure 100. Surface Texture: E7

Figure 101. Surface Texture: E8

Figure 102. Surface Texture: E9

APPENDIX C: SAND PATCH MEASUREMENTS

Table 5. Sandpatch Test Results (Diameters)

Sec	Pos	Measurement				Avg	Sec	Rnd	Measurement				Avg
N1	50	28.00	27.00	25.50	27.50	27.00	S1	33	13.25	13.50	13.00	13.00	13.19
	90	23.50	22.50	23.00	24.00	23.25		90	12.00	13.00	13.25	13.00	12.81
	123	23.00	24.00	26.00	23.00	24.00		104	14.75	15.00	15.00	15.00	14.94
	141	24.50	24.00	25.25	24.00	24.44		148	13.00	13.00	13.25	13.50	13.19
	160	26.00	27.00	28.00	27.00	27.00		156	14.00	14.00	14.00	13.50	13.88
N2	29	24.50	23.00	24.00	23.50	23.75	S2	45	13.00	13.50	13.75	13.00	13.31
	51	23.00	22.00	24.00	23.00	23.00		70	13.75	14.00	14.00	14.00	13.94
	107	23.50	24.00	24.50	24.00	24.00		106	12.00	13.00	13.00	13.25	12.81
	132	24.00	24.00	25.00	24.00	24.25		132	14.00	14.50	14.00	14.25	14.19
	160	23.00	22.50	23.50	23.00	23.00		161	13.00	13.50	13.00	13.00	13.13
N3	59	15.00	14.50	15.00	15.00	14.88	S3	75	12.75	13.00	13.50	12.75	13.00
	79	14.00	14.50	15.00	15.00	14.63		96	13.25	13.00	13.00	12.50	12.94
	117	14.00	14.00	14.50	14.00	14.13		102	13.00	13.00	12.75	13.00	12.94
	126	14.00	14.50	14.50	15.00	14.50		134	12.50	12.50	12.75	12.00	12.44
	151	15.00	14.50	15.00	14.75	14.81		153	13.50	14.00	14.00	14.00	13.88
N4	46	14.50	15.00	15.50	14.50	14.88	S4	74	13.00	13.50	13.25	13.00	13.19
	61	14.00	14.00	14.00	14.75	14.19		76	8.50	8.25	8.25	8.50	8.38
	100	14.50	14.50	14.00	14.50	14.38		113	12.50	12.75	13.00	12.00	12.56
	144	15.50	15.50	15.75	15.00	15.44		127	8.75	8.75	8.50	8.25	8.56
	160	14.25	15.00	14.25	14.25	14.44		172	12.00	12.50	12.00	12.75	12.31
N5	45	14.00	14.00	14.00	14.50	14.13	S5	35	15.50	15.50	14.75	14.50	15.06
	76	14.00	14.50	15.00	14.50	14.50		55	7.00	7.00	7.25	6.75	7.00
	124	14.50	14.00	15.00	15.00	14.63		124	14.50	15.00	15.00	15.25	14.94
	146	13.50	13.50	14.00	14.25	13.81		145	8.00	8.50	8.25	9.00	8.44

Sec	Pos	Measurement				Avg	Sec	Rnd	Measurement				Avg
	161	15.50	13.75	14.50	13.00	14.19		167	16.00	16.50	16.75	17.25	16.63
N6	42	14.25	14.25	15.00	15.00	14.63	S6	45	15.00	15.00	14.75	14.75	14.88
	60	14.50	14.75	13.00	13.75	14.00		66	17.50	17.50	17.00	16.75	17.19
	77	14.50	14.50	15.00	15.00	14.75		76	15.00	15.00	14.75	14.50	14.81
	131	15.00	15.50	15.00	15.25	15.19		132	17.00	16.50	16.50	16.75	16.69
	165	15.00	15.00	15.00	15.00	15.00		171	17.00	17.75	17.25	17.50	17.38
N7	36	16.00	16.00	17.00	16.50	16.38	S7	26	17.00	17.00	17.50	17.50	17.25
	67	12.75	12.50	12.50	13.00	12.69		54	18.00	17.50	17.25	18.00	17.69
	82	13.00	13.50	14.00	13.00	13.38		88	17.25	17.50	17.75	18.00	17.63
	116	12.75	12.50	13.00	13.50	12.94		118	18.00	17.50	16.75	17.00	17.31
	174	15.00	15.00	15.00	15.00	15.00		174	18.00	17.50	17.75	18.00	17.81
N8	25	13.75	14.00	13.50	13.50	13.69	S8	42	12.00	13.00	12.50	12.75	12.56
	49	13.50	13.00	14.00	13.50	13.50		68	12.75	12.75	12.50	12.50	12.63
	138	14.50	14.50	13.75	14.50	14.31		88	12.00	13.00	12.00	12.50	12.38
	168	14.00	13.00	13.50	13.00	13.38		121	11.50	11.75	12.00	11.75	11.75
	188	14.50	14.50	14.00	15.00	14.50		137	11.50	12.00	12.00	11.75	11.81
N9	42	13.50	13.50	14.00	14.00	13.75	S9	39	11.25	11.25	11.50	11.00	11.25
	53	14.00	14.00	13.25	14.00	13.81		59	12.00	12.00	11.50	11.75	11.81
	90	12.00	12.00	12.50	12.00	12.13		81	12.00	11.50	11.50	11.75	11.69
	102	14.00	14.00	14.25	14.50	14.19		105	11.75	11.50	11.50	11.50	11.56
	125	15.00	14.50	14.50	14.50	14.63		130	12.00	11.75	11.75	12.00	11.88
N10	71	14.00	14.25	14.25	14.50	14.25	S10	61	12.00	11.75	11.50	11.25	11.63
	79	13.50	14.00	13.50	13.25	13.56		77	14.00	14.00	13.75	13.75	13.88
	101	14.00	14.25	14.00	13.25	13.88		105	11.50	11.75	11.50	11.50	11.56
	143	12.00	12.50	12.75	13.00	12.56		148	14.00	13.50	13.50	14.00	13.75
	159	13.00	13.00	13.50	14.00	13.38		168	12.50	12.50	12.25	12.75	12.50
N11	52	10.00	9.50	10.00	11.00	10.13	S11	62	12.25	12.50	12.75	12.50	12.50

Sec	Pos	Measurement				Avg	Sec	Rnd	Measurement				Avg
	82	12.00	12.00	12.50	12.75	12.31		99	12.00	11.75	11.50	11.25	11.63
	118	11.00	11.00	10.75	10.50	10.81		122	12.25	12.50	12.50	12.50	12.44
	132	11.75	11.75	12.00	11.75	11.81		146	12.50	12.00	12.25	12.25	12.25
	174	10.00	10.25	10.25	9.75	10.06		168	12.50	12.50	12.25	12.75	12.50
	57	9.50	10.00	10.50	10.50	10.13		52	12.00	12.50	12.25	12.75	12.38
	96	9.00	9.50	10.00	10.50	9.75		94	13.25	13.00	12.75	12.50	12.88
N12	108	10.25	10.50	10.50	10.50	10.44	S12	102	12.75	12.50	12.75	13.00	12.75
	134	12.00	11.00	12.00	10.00	11.25		142	14.25	14.00	13.75	13.75	13.94
	154	10.50	10.75	11.00	11.00	10.81		161	13.00	13.00	13.00	13.25	13.06
	34	11.00	10.50	11.00	11.00	10.88		33	13.25	13.50	13.50	13.75	13.50
	74	11.75	12.00	12.25	12.00	12.00		71	13.75	13.75	13.50	13.75	13.69
N13	89	9.50	10.00	9.75	11.00	10.06	S13	91	13.75	14.00	13.50	13.25	13.63
	135	11.50	11.50	11.00	11.75	11.44		139	13.00	13.00	13.75	13.50	13.31
	168	10.50	11.00	10.50	9.50	10.38		169	13.75	14.00	14.00	14.00	13.94
	46	11.00	10.50	10.50	11.00	10.75		47	11.50	11.00	11.25	11.25	11.25
	92	9.00	9.00	9.50	10.00	9.38		88	12.25	12.00	12.25	12.25	12.19
W1	102	10.25	10.25	10.50	10.00	10.25	E1	100	11.75	11.75	11.25	11.50	11.56
	142	10.00	10.50	11.00	11.00	10.63		145	10.75	11.00	11.00	10.75	10.88
	168	12.00	12.50	12.00	12.25	12.19		166	12.25	12.00	12.50	12.75	12.38
	38	10.00	10.50	9.50	9.00	9.75		48	10.50	10.50	10.75	11.00	10.69
	68	11.25	11.50	11.50	11.75	11.50		53	10.75	10.50	10.75	11.00	10.75
W2	120	10.50	10.00	9.00	9.50	9.75	E2	109	10.75	10.75	10.75	10.75	10.75
	142	12.25	12.50	12.00	12.25	12.25		132	10.50	10.50	10.25	10.25	10.38
	154	9.00	9.00	10.00	9.00	9.25		167	10.50	10.50	10.50	10.00	10.38
	72	13.50	14.00	15.00	15.00	14.38		62	10.75	10.50	10.50	10.50	10.56
	91	14.00	13.50	15.00	14.50	14.25		77	9.75	10.50	10.25	10.00	10.13
W3	123	15.00	15.00	15.25	15.25	15.13	E3	123	10.00	10.50	10.75	10.25	10.38
	130	14.25	14.50	15.00	15.00	14.69		134	10.00	9.50	9.75	10.25	9.88
	161	15.00	14.75	15.00	15.00	14.94		171	10.75	10.25	10.50	10.50	10.50

Sec	Pos	Measurement				Avg	Sec	Rnd	Measurement				Avg
W4	68	8.50	7.50	8.00	8.50	8.13	E4	67	12.50	12.50	12.75	13.00	12.69
	89	9.75	9.50	8.75	8.50	9.13		85	12.75	12.50	12.50	12.75	12.63
	105	9.00	9.50	9.00	10.00	9.38		101	12.50	12.50	12.75	13.00	12.69
	133	9.25	9.25	9.25	9.00	9.19		140	12.00	11.75	11.50	11.50	11.69
	167	9.00	9.00	9.50	9.50	9.25		154	11.75	12.00	12.25	11.75	11.94
W5	40	9.75	9.50	9.25	10.00	9.63	E5	35	12.50	12.50	12.25	12.00	12.31
	63	8.00	8.75	8.75	8.50	8.50		68	12.25	12.50	12.75	13.00	12.63
	118	9.50	9.75	10.00	9.50	9.69		114	12.00	12.25	12.00	12.50	12.19
	141	10.00	9.50	10.00	10.00	9.88		144	12.50	12.50	12.75	13.00	12.69
	151	9.50	9.75	10.00	10.00	9.81		161	12.25	12.75	12.50	12.75	12.56
W6	41	18.00	19.00	19.50	18.00	18.63	E6	34	13.00	13.50	13.50	13.00	13.25
	65	18.00	19.00	18.50	18.75	18.56		60	13.50	13.00	13.00	13.75	13.31
	82	19.00	19.50	18.75	19.50	19.19		88	13.25	13.00	13.50	13.50	13.31
	150	17.50	18.00	18.50	19.25	18.31		148	13.00	13.00	13.25	13.00	13.06
	172	20.00	18.00	18.50	19.50	19.00		155	13.50	13.75	14.00	14.25	13.88
W7	28	10.50	11.00	11.50	10.50	10.88	E7	26	12.00	12.00	12.00	11.75	11.94
	63	10.50	10.00	10.75	11.00	10.56		65	12.00	11.50	11.50	12.00	11.75
	79	10.75	11.00	11.00	10.50	10.81		76	12.00	11.50	11.50	11.50	11.63
	110	10.00	10.50	10.25	10.50	10.31		105	12.25	12.00	11.75	12.00	12.00
	173	11.00	11.00	11.25	11.50	11.19		160	12.00	12.00	12.50	12.00	12.13
W8	36	11.00	10.75	10.75	11.25	10.94	E8	33	13.50	14.00	14.00	14.25	13.94
	62	12.00	12.00	12.50	13.00	12.38		70	14.00	14.00	14.25	14.00	14.06
	76	11.00	11.25	11.00	10.75	11.00		81	13.50	13.75	14.00	13.75	13.75
	102	11.50	12.00	12.00	12.50	12.00		124	14.00	14.00	13.75	14.25	14.00
	128	11.75	12.00	11.50	12.00	11.81		140	14.25	14.00	14.50	13.75	14.13
W9	50	19.50	20.00	20.50	20.75	20.19	E9	36	25.75	25.50	25.00	25.00	25.31
	70	20.00	20.00	21.00	21.50	20.63		58	26.00	26.50	26.50	27.00	26.50
	84	22.50	23.00	23.00	23.50	23.00		80	26.25	26.00	26.00	26.50	26.19
	101	23.50	23.00	23.75	23.75	23.50		124	25.00	25.50	25.50	24.75	25.19

Sec	Pos	Measurement				Avg	Sec	Rnd	Measurement				Avg
	146	24.00	24.00	23.00	23.00	23.50		130	25.00	24.75	24.00	25.00	24.69
W10	13	7.00	7.75	7.25	7.00	7.25							
	34	8.50	9.00	9.00	8.00	8.63							
	55	6.50	6.25	7.00	7.00	6.69							
	65	8.25	8.50	8.50	8.75	8.50							
	82	7.50	7.50	7.50	8.00	7.63							

APPENDIX D: CIRCULAR TEXTURE METER MEASUREMENTS

Table 6. CTM measurements perpendicular to direction of travel

Sec	Pos	Measurement								MPD	DROP	RMS
N1	50	0.19	0.17	0.27	0.18	0.30	0.25	0.33	0.25	0.24	0	0.16
	90	0.21	0.27	0.25	0.24	0.27	0.27	0.28	0.33	0.27	0	0.15
	123	0.23	0.28	0.27	0.30	0.29	0.24	0.29	0.35	0.30	1	0.19
	141	0.22	0.25	0.25	0.35	0.21	0.29	0.33	0.19	0.26	0	0.15
	160	0.26	0.31	0.34	0.40	0.34	0.35	0.34	0.33	0.33	0	0.21
N2	29	0.23	0.26	0.29	0.28	0.36	0.21	0.23	0.21	0.26	0	0.23
	51	0.25	0.35	0.28	0.21	0.24	0.23	0.25	0.22	0.25	0	0.15
	107	0.30	0.23	0.26	0.27	0.28	0.25	0.23	0.28	0.26	0	0.15
	132	0.29	0.35	0.29	0.28	0.30	0.24	0.29	0.23	0.28	1	0.19
	160	0.30	0.26	0.63	0.28	0.28	0.26	0.21	0.23	0.31	0	0.49
N3	59	0.55	0.52	0.66	0.71	0.59	0.58	0.68	0.60	0.61	1	0.24
	79	0.53	0.63	0.68	0.48	0.65	0.66	0.72	0.68	0.63	1	0.25
	117	0.61	0.74	0.67	0.63	0.80	0.43	0.51	0.72	0.64	1	0.24
	126	0.46	0.58	0.73	0.61	0.59	0.72	0.69	0.63	0.63	1	0.24
	151	0.47	0.53	0.68	0.65	0.64	0.55	0.56	0.57	0.58	1	0.24
N4	46	0.56	0.54	0.78	0.70	0.57	0.62	0.65	0.61	0.63	1	0.27
	61	0.69	0.63	0.61	0.63	0.69	0.63	0.72	0.54	0.64	1	0.25
	100	0.60	0.57	0.72	0.80	0.64	0.79	0.78	0.53	0.68	1	0.29
	144	0.74	0.66	0.64	0.75	0.64	0.65	0.74	0.77	0.70	1	0.26
	160	0.78	0.76	0.80	0.66	0.72	0.65	0.57	0.56	0.69	1	0.28
N5	45	0.63	0.48	0.51	0.64	0.62	0.84	0.72	0.66	0.64	1	0.26
	76	0.63	0.59	0.63	0.76	0.69	0.50	0.78	0.75	0.67	0	0.28
	124	0.63	0.72	0.82	0.63	0.66	0.61	0.74	0.53	0.67	1	0.28
	146	0.67	0.61	0.98	0.67	0.59	0.63	0.69	0.62	0.68	1	0.33
	161	0.59	0.63	0.54	0.56	0.68	0.56	0.54	0.92	0.63	1	0.28
N6	42	0.48	0.78	0.74	0.60	0.58	0.67	0.61	0.62	0.64	1	0.24
	60	0.59	0.62	0.57	0.73	0.62	0.59	0.51	0.74	0.62	1	0.25
	77	0.54	0.60	0.65	0.68	0.54	0.59	0.53	0.46	0.57	2	0.24
	131	0.72	0.56	0.71	0.62	0.67	0.65	0.60	0.53	0.63	1	0.29
	165	0.66	0.48	0.65	0.50	0.49	0.43	0.67	0.59	0.56	1	0.22
N7	36	0.60	0.70	0.82	0.73	0.71	0.70	1.06	0.83	0.77	2	0.47
	67	0.91	0.92	0.91	0.84	0.74	0.98	0.93	0.87	0.89	2	0.57
	82	1.02	1.01	0.72	0.73	0.68	0.89	0.74	0.85	0.83	2	0.49
	116	0.68	0.90	0.73	1.01	0.85	1.04	0.85	0.88	0.87	2	0.73
	174	1.11	0.87	0.66	0.87	1.17	0.78	0.77	0.85	0.89	2	0.52
N8	25	0.74	0.76	0.92	0.85	0.68	0.59	1.02	0.89	0.81	2	0.50
	49	0.89	0.89	0.72	0.97	0.87	0.84	0.62	0.93	0.84	3	0.61
	138	0.83	0.77	0.62	0.62	0.57	0.93	0.62	0.76	0.72	2	0.41
	168	0.69	0.87	0.63	0.66	0.61	0.77	0.73	0.82	0.72	1	0.37
	188	0.73	0.90	0.82	0.61	0.55	0.68	0.79	0.74	0.73	1	0.43
N9	42	0.79	0.72	0.84	0.74	0.80	0.91	0.75	0.69	0.78	1	0.57
	53	0.48	0.53	0.63	0.79	0.97	0.85	0.74	0.83	0.73	1	0.48
	90	0.70	0.77	0.69	0.75	0.78	0.96	0.74	0.75	0.77	0	0.42
	102	0.53	0.59	0.75	0.53	0.52	0.62	0.82	0.58	0.62	0	0.39
	125	0.35	0.61	0.34	0.49	0.47	0.56	0.46	0.34	0.45	0	0.18
N10	71	0.78	0.47	0.56	0.62	0.75	0.84	1.01	0.80	0.73	0	0.37
	79	0.43	0.60	0.71	0.70	0.59	0.54	0.69	0.67	0.62	0	0.31
	101	0.71	0.86	0.94	0.80	0.96	0.76	0.78	0.76	0.82	0	0.38

Sec	Pos	Measurement								MPD	DROP	RMS
	143	1.04	0.90	0.70	0.69	0.75	1.06	0.93	0.79	0.86	0	0.45
	159	1.08	0.92	0.71	0.69	0.74	1.07	0.92	0.81	0.87	0	0.46
	52	0.80	1.02	1.40	1.06	1.09	0.88	1.07	1.33	1.08	2	0.63
	82	1.46	1.02	1.07	1.02	1.38	1.22	0.94	0.96	1.13	1	0.64
N11	118	1.20	1.27	1.14	1.16	1.33	1.23	1.37	1.09	1.22	3	0.65
	132	0.89	0.93	0.91	0.96	1.07	0.88	1.37	0.83	0.98	2	0.57
	174	1.76	1.36	1.52	1.65	1.11	1.26	1.51	1.32	1.44	3	0.81
	57	1.28	0.82	1.35	1.45	1.37	1.21	1.89	1.25	1.33	4	0.89
	96	1.55	1.17	1.43	1.09	1.45	1.60	1.36	1.17	1.35	3	0.91
N12	108	1.56	1.47	1.12	1.15	1.47	1.65	1.16	1.58	1.40	4	0.99
	134	1.25	0.89	0.87	1.09	1.32	1.00	1.16	1.32	1.11	3	0.72
	154	1.50	1.00	1.22	1.44	1.29	0.93	1.22	1.39	1.25	5	0.92
	34	0.99	1.05	1.17	1.18	0.97	1.08	1.21	0.77	1.05	1	0.65
	74	1.04	1.29	0.99	0.84	1.51	1.36	1.14	0.78	1.12	2	0.67
N13	89	1.10	0.76	1.26	1.12	1.42	0.97	1.35	0.88	1.11	3	0.63
	135	1.41	1.02	1.46	1.18	0.80	1.23	1.22	1.03	1.17	3	0.81
	168	0.88	0.73	0.92	1.12	1.26	1.10	1.05	0.84	0.99	3	0.71
	46	1.30	1.34	1.35	1.32	1.26	1.59	1.43	1.53	1.39	3	0.89
	92	1.24	1.27	1.50	1.53	1.30	1.20	1.23	1.30	1.32	3	0.90
W1	102	1.48	1.21	1.30	1.31	1.05	1.48	2.14	1.81	1.47	3	0.90
	142	1.24	1.57	1.32	1.01	1.27	1.33	0.78	1.09	1.20	3	0.63
	168	1.36	0.94	0.83	0.87	1.37	1.21	1.03	1.03	1.08	2	0.81
	38	0.95	0.60	1.32	1.14	1.11	1.11	0.95	0.66	0.98	0	0.48
	68	0.72	1.25	1.13	0.91	1.01	1.11	0.83	1.26	1.03	0	0.56
W2	120	1.10	1.44	1.40	1.16	1.60	1.57	0.84	0.99	1.26	1	0.71
	142	1.12	0.98	1.16	1.39	1.92	0.85	0.95	1.27	1.21	1	0.70
	154	0.87	0.96	1.15	0.88	0.99	1.05	0.79	0.82	0.94	0	0.52
	72	0.77	0.56	0.61	0.91	1.62	0.95	0.82	0.75	0.87	0	0.63
	91	0.70	0.55	0.52	0.91	1.68	1.35	0.82	0.55	0.89	1	0.55
W3	123	0.55	0.58	1.31	0.89	0.87	0.89	0.83	0.57	0.81	0	0.57
	130	0.48	0.53	0.48	1.05	1.07	1.23	1.24	0.78	0.86	0	0.57
	161	0.85	0.74	0.48	1.18	1.41	0.83	0.50	0.87	0.86	0	0.55
	68	1.52	1.53	1.76	1.54	2.49	1.95	1.25	1.89	1.74	3	1.22
	89	2.07	1.89	1.73	2.14	2.17	2.56	1.74	1.57	1.98	5	1.43
W4	105	2.04	1.65	2.48	1.43	2.12	1.62	2.00	1.62	1.87	4	1.31
	133	1.48	2.02	1.84	1.79	2.00	1.85	2.28	1.66	1.87	6	1.50
	167	0.88	1.94	1.46	1.60	1.83	1.63	1.61	1.47	1.55	4	1.04
	40	1.12	1.70	2.01	1.17	1.48	1.89	1.38	2.21	1.62	4	1.18
	63	2.28	1.77	1.41	1.69	1.91	1.68	1.62	2.07	1.80	3	1.44
W5	118	2.06	1.70	1.42	1.17	2.21	1.60	1.91	2.00	1.76	5	1.04
	141	1.73	1.33	1.29	2.01	1.29	1.19	2.03	1.07	1.49	3	1.04
	151	1.93	1.13	1.21	1.99	2.29	2.32	1.61	1.52	1.75	4	1.03
	41	0.61	0.46	0.47	0.39	0.35	0.42	0.50	0.47	0.46	0	0.20
	65	0.41	0.40	0.37	0.43	0.35	0.44	0.47	0.44	0.41	0	0.22
W6	82	0.49	0.44	0.53	0.49	0.41	0.38	0.51	0.43	0.46	0	0.22
	150	0.38	0.45	0.35	0.63	0.32	0.84	0.40	0.53	0.49	0	0.27
	172	0.39	0.37	0.36	0.36	0.39	0.38	0.38	0.45	0.39	0	0.20
	28	1.15	1.15	1.39	1.33	1.55	1.22	1.15	1.32	1.28	1	0.77
	63	1.26	1.07	1.33	1.59	1.83	1.28	1.17	0.98	1.31	1	0.82
W7	79	1.23	1.51	1.27	1.49	1.53	1.06	1.51	1.17	1.35	1	0.84
	110	1.40	1.29	1.81	1.51	2.18	1.93	1.67	1.15	1.62	2	1.13
	173	1.09	0.93	1.13	0.96	1.63	1.24	0.95	0.57	1.06	1	0.63
W8	36	1.27	1.05	0.89	0.73	0.78	1.14	0.93	1.19	1.00	1	0.64

Sec	Pos	Measurement								MPD	DROP	RMS
	62	0.70	0.91	0.87	1.02	0.67	1.04	1.00	0.93	0.89	1	0.52
	76	0.79	1.16	1.19	1.14	1.10	0.81	1.05	1.01	1.03	1	0.65
	102	0.95	0.72	1.05	0.77	1.12	1.19	1.15	0.83	0.97	1	0.91
	128	0.69	0.88	0.89	0.80	0.85	0.85	0.80	0.89	0.83	0	0.46
	50	0.36	0.36	0.48	0.49	0.31	0.37	0.31	0.36	0.38	0	0.15
	70	0.46	0.27	0.46	0.40	0.33	0.27	0.31	0.31	0.35	0	0.15
W9	84	0.46	0.25	0.48	0.39	0.33	0.28	0.36	0.31	0.36	0	0.15
	101	0.29	0.36	0.30	0.47	0.27	0.26	0.32	0.25	0.32	0	0.15
	146	0.26	0.26	0.39	0.20	0.30	0.20	0.52	0.60	0.34	0	0.13
	13	1.34	1.43	1.64	2.56	2.63	2.46	2.82	1.83	2.09	2	1.53
	34	2.36	2.41	2.62	1.91	1.38	1.31	3.09	2.04	2.14	4	1.32
W10	55	2.39	1.82	2.42	2.76	1.90	2.20	2.06	1.60	2.14	3	1.46
	65	2.61	1.70	2.45	2.15	2.09	1.64	2.26	2.44	2.17	4	1.51
	82	1.57	2.32	2.50	1.97	2.22	2.78	2.27	2.70	2.29	3	1.44
	33	0.79	1.06	1.12	0.72	0.75	0.90	0.71	0.90	0.87	0	0.63
	90	0.79	0.57	0.90	1.03	0.68	0.62	0.83	0.88	0.79	2	0.44
S1	104	0.55	0.62	0.83	0.61	0.58	0.50	0.87	0.63	0.65	2	0.39
	148	0.67	0.77	0.87	0.70	0.82	0.71	0.61	0.70	0.73	1	0.40
	156	0.72	0.88	0.86	0.54	0.64	0.72	0.65	0.76	0.72	2	0.44
	45	1.06	0.88	0.84	0.93	1.34	0.68	0.90	0.68	0.91	2	0.68
	70	0.62	0.62	0.95	0.77	0.85	0.77	0.96	1.06	0.83	1	0.59
S2	106	0.75	0.78	0.65	0.82	0.77	0.73	0.50	0.70	0.71	1	0.46
	132	1.00	1.41	0.53	0.79	0.59	0.81	0.82	0.81	0.85	1	0.49
	161	0.67	0.53	0.75	0.58	0.89	0.74	0.87	0.97	0.75	2	0.51
	75	0.74	0.91	0.87	0.78	0.96	0.94	0.75	0.69	0.83	1	0.49
	96	1.15	0.80	1.03	0.96	0.90	0.89	0.82	1.06	0.95	2	0.59
S3	102	1.00	0.72	0.88	0.74	0.97	0.78	0.73	0.81	0.83	1	0.52
	134	0.59	0.70	0.99	0.91	0.76	0.83	0.87	0.78	0.80	1	0.54
	153	0.79	0.80	0.92	0.73	0.74	0.80	0.87	0.92	0.82	0	0.52
	74	1.61	1.28	2.00	1.94	2.17	1.45	1.98	1.79	1.78	4	1.13
	76	1.15	1.47	1.36	1.97	1.76	1.48	1.40	1.12	1.46	5	1.08
S4	113	1.54	1.35	2.04	1.70	1.76	1.76	1.32	1.13	1.58	3	0.97
	127	1.35	1.75	1.10	1.94	1.48	1.73	1.49	1.85	1.59	2	0.97
	172	1.08	1.17	1.39	1.65	1.54	2.37	1.48	2.05	1.59	4	1.35
	35	0.71	0.50	0.54	0.45	0.55	0.75	0.43	0.81	0.59	0	0.29
	55	0.60	0.60	0.51	0.71	0.58	0.47	0.50	0.58	0.57	1	0.29
S5	124	0.50	0.49	0.52	0.68	0.77	0.70	0.52	0.50	0.59	1	0.28
	145	0.42	0.45	0.62	0.60	0.58	0.53	0.41	0.49	0.51	1	0.26
	167	0.67	0.55	0.77	0.67	0.56	0.72	0.65	0.68	0.66	0	0.31
	45	0.69	0.51	0.76	0.43	0.45	0.46	0.65	0.46	0.55	0	0.25
	66	0.46	0.45	0.81	0.63	0.47	0.45	0.71	0.31	0.54	0	0.23
S6	76	0.69	0.52	0.60	0.50	0.57	0.46	0.48	0.67	0.56	0	0.26
	132	0.46	0.65	0.76	0.48	0.51	0.49	0.76	0.72	0.60	0	0.27
	171	0.48	0.46	0.37	0.51	0.46	0.54	0.39	0.52	0.47	0	0.20
	26	0.57	0.42	0.37	0.41	0.61	0.68	0.54	0.39	0.50	1	0.26
	54	0.57	0.57	0.47	0.64	0.54	0.54	0.69	0.43	0.56	1	0.27
S7	88	0.46	0.51	0.42	0.39	0.50	0.79	0.42	0.38	0.48	1	0.21
	118	0.42	0.59	0.56	0.41	0.43	0.49	0.52	0.56	0.50	1	0.25
	174	0.52	0.51	0.49	0.49	0.54	0.50	0.56	0.47	0.51	0	0.25
S8	42	0.77	0.90	0.95	0.95	0.96	0.92	0.87	1.13	0.93	1	0.49
	68	0.85	0.95	1.08	1.07	1.07	0.81	1.09	0.86	0.97	1	0.54
	88	0.99	0.89	0.98	0.82	0.94	0.95	0.94	1.06	0.95	1	0.51
	121	0.86	0.96	0.72	0.98	0.91	1.04	0.65	0.78	0.86	1	0.49

Sec	Pos	Measurement								MPD	DROP	RMS
	137	0.67	0.88	0.74	0.87	1.09	0.94	1.05	0.79	0.88	1	0.47
S9	39	1.43	0.88	1.00	1.30	1.04	1.27	0.98	0.93	1.10	3	0.60
	59	0.92	1.18	0.87	1.10	1.20	1.15	0.97	1.03	1.05	4	0.59
	81	1.28	0.94	1.08	1.33	0.76	1.12	1.43	1.16	1.14	4	0.74
	105	0.90	1.07	1.35	1.05	1.06	1.12	1.26	1.31	1.14	4	0.54
	130	1.31	1.03	1.21	1.24	1.05	0.93	1.06	1.28	1.14	1	0.83
S10	61	0.76	1.10	1.34	0.85	0.85	0.79	0.64	0.79	0.89	1	0.60
	77	0.69	0.92	0.60	0.72	0.62	0.91	0.81	1.00	0.78	3	0.31
	105	0.66	0.60	0.77	0.73	0.67	0.82	0.82	0.93	0.75	1	0.55
	148	0.90	0.75	0.72	0.64	0.82	1.04	0.73	0.83	0.80	2	0.36
	168	0.68	0.68	1.09	0.79	0.80	0.61	0.59	0.78	0.75	1	0.36
S11	62	0.85	1.00	0.80	1.06	1.27	1.18	0.87	0.95	1.00	0	0.43
	99	0.89	0.86	0.82	0.75	1.07	1.00	1.09	0.74	0.90	0	0.43
	122	0.67	0.99	0.95	1.14	1.08	1.36	1.04	0.68	0.99	0	0.45
	146	0.95	0.83	0.71	1.01	1.15	0.88	0.92	1.00	0.93	1	0.42
	168	0.93	0.91	0.83	0.90	0.89	0.94	0.67	0.84	0.86	0	0.43
S12	52	0.64	0.82	0.79	1.09	0.55	0.75	0.84	1.06	0.82	0	0.50
	94	0.68	0.71	0.96	0.76	0.84	0.88	0.75	0.65	0.78	0	0.40
	102	0.57	0.73	0.80	1.12	1.42	0.68	0.75	0.84	0.86	1	0.53
	142	0.74	0.72	0.74	0.71	0.62	0.69	0.62	0.94	0.72	0	0.39
	161	0.75	0.91	0.67	0.61	0.63	0.78	0.56	0.87	0.72	0	0.37
S13	33	0.93	0.80	0.78	0.80	0.91	0.72	0.83	0.80	0.82	1	0.43
	71	0.53	0.79	0.82	0.80	0.66	0.86	0.90	0.71	0.76	0	0.44
	91	0.72	0.66	0.72	0.71	0.79	1.06	0.76	0.76	0.77	0	0.42
	139	0.84	0.77	0.92	0.81	0.82	0.71	0.71	0.84	0.80	0	0.43
	169	0.57	0.77	0.67	0.68	0.64	0.93	0.57	0.79	0.70	0	0.39
E1	47	0.83	0.81	0.95	1.11	1.08	0.92	0.72	0.80	0.90	1	0.60
	88	0.69	0.81	1.03	0.96	1.17	1.22	0.92	0.84	0.96	1	0.60
	100	0.96	0.64	0.88	0.73	1.18	1.06	0.65	0.90	0.88	2	0.58
	145	0.73	1.08	0.84	0.94	0.92	0.95	0.86	0.60	0.87	1	0.55
	166	0.87	0.78	0.95	1.03	0.85	1.12	1.31	0.79	0.96	0	0.60
E2	48	1.17	1.03	1.01	0.97	1.19	1.12	1.18	1.08	1.09	1	0.56
	53	1.12	1.17	1.27	1.43	1.05	1.39	0.75	1.02	1.15	1	0.53
	109	1.52	0.83	1.30	1.27	1.12	1.03	1.38	1.12	1.20	2	0.56
	132	1.00	1.47	1.02	1.24	1.44	1.07	1.01	0.93	1.15	1	0.54
	167	1.06	0.89	1.34	1.20	1.16	1.09	1.15	1.02	1.11	1	0.55
E3	62	0.90	0.85	1.61	1.38	1.53	1.56	1.78	0.87	1.31	1	0.92
	77	1.12	1.38	1.50	1.28	1.44	2.01	1.41	1.06	1.40	5	0.75
	123	1.11	1.54	1.13	1.95	1.49	1.26	1.09	1.67	1.41	2	0.71
	134	1.92	1.22	1.45	1.55	2.04	1.69	1.67	1.37	1.61	1	0.72
	171	1.06	1.04	1.26	0.84	1.35	1.34	1.05	1.03	1.12	1	0.59
E4	67	0.85	0.83	1.33	1.08	1.00	1.11	0.79	0.94	0.99	3	0.56
	85	0.85	1.06	1.08	1.18	1.04	0.82	1.03	0.64	0.96	3	0.75
	101	1.09	0.94	0.83	1.03	0.94	1.02	0.87	0.96	0.96	3	0.49
	140	0.80	0.79	1.10	0.90	0.92	1.07	1.20	1.55	1.04	6	0.70
	154	1.23	1.75	1.25	1.09	1.06	0.92	0.98	0.88	1.15	4	0.88
E5	35	1.15	1.06	1.00	0.95	0.84	0.83	0.91	0.66	0.93	3	0.78
	68	1.08	0.92	1.04	0.97	1.06	1.12	0.93	1.02	1.02	2	0.55
	114	0.87	1.15	0.89	1.07	0.99	1.05	0.91	0.92	0.98	3	0.48
	144	0.75	1.09	1.13	0.94	0.96	0.94	1.11	1.20	1.02	4	0.50
	161	0.81	0.95	0.84	0.94	1.12	0.73	1.19	1.17	0.97	3	0.59
E6	34	0.79	1.05	0.75	0.83	1.13	0.92	0.91	0.82	0.90	1	0.64
	60	0.77	0.94	0.76	1.08	0.79	1.00	1.01	0.92	0.91	2	0.79

Sec	Pos	Measurement								MPD	DROP	RMS
	88	0.75	0.95	0.97	0.80	0.93	0.83	0.78	1.24	0.91	2	0.47
	148	0.92	0.88	1.07	0.70	0.69	0.82	0.86	0.98	0.87	2	0.42
	155	0.69	0.61	0.74	0.81	1.24	0.65	0.73	1.09	0.82	2	0.84
	26	1.25	1.06	0.98	1.00	0.91	1.03	1.01	0.89	1.02	3	0.53
	65	1.37	1.25	1.18	1.19	1.18	1.04	1.29	1.11	1.20	3	0.98
E7	76	1.13	1.03	0.91	1.05	0.99	1.20	1.28	1.21	1.10	3	0.61
	105	1.24	1.28	1.11	1.01	1.08	0.85	1.10	1.17	1.11	2	0.63
	160	0.94	0.79	0.99	1.10	1.02	0.92	0.92	0.97	0.96	3	0.53
	33	0.63	0.61	0.90	0.90	0.67	0.80	0.69	0.80	0.75	2	0.33
	70	0.93	0.89	0.87	0.77	0.66	0.76	0.98	0.82	0.84	4	0.36
E8	81	0.70	0.64	0.61	0.81	0.58	0.72	0.74	0.63	0.68	2	0.31
	124	0.85	0.70	0.85	0.66	0.72	0.76	0.81	0.80	0.77	3	0.32
	140	1.14	0.59	0.92	0.78	0.79	0.61	0.51	0.73	0.76	2	0.33
	36	0.31	0.32	0.31	0.54	0.23	0.26	0.31	0.30	0.32	0	0.19
	58	0.28	0.21	0.25	0.34	0.30	0.32	0.25	0.21	0.27	0	0.16
E9	80	0.37	0.36	0.24	0.25	0.42	0.20	0.25	0.30	0.30	0	0.16
	124	0.46	0.26	0.31	0.35	0.21	0.23	0.18	0.25	0.28	0	0.17
	130	0.32	0.28	0.19	0.18	0.30	0.24	0.36	0.23	0.26	0	0.15

Table 7. CTM measurements parallel to direction of travel

Sec	Pos	Measurement								MPD	DROP	RMS
	50	0.17	0.23	0.25	0.24	0.33	0.27	0.29	0.24	0.25	0	0.16
	90	0.21	0.29	0.22	0.24	0.26	0.27	0.24	0.30	0.25	0	0.15
N1	123	0.27	0.32	0.26	0.28	0.31	0.26	0.33	0.38	0.30	1	0.19
	141	0.26	0.19	0.21	0.33	0.24	0.27	0.33	0.18	0.25	0	0.15
	160	0.31	0.30	0.34	0.39	0.33	0.35	0.32	0.34	0.34	1	0.21
	29	0.26	0.27	0.31	0.26	0.29	0.19	0.27	0.23	0.26	0	0.16
	51	0.28	0.34	0.26	0.21	0.23	0.24	0.26	0.26	0.26	0	0.16
N2	107	0.31	0.26	0.24	0.22	0.28	0.30	0.26	0.25	0.27	0	0.16
	132	0.28	0.34	0.27	0.29	0.31	0.25	0.31	0.19	0.28	1	0.18
	160	0.24	0.26	0.31	0.25	0.28	0.23	0.21	0.24	0.25	0	0.18
	59	0.59	0.51	0.80	0.72	0.62	0.58	0.69	0.59	0.64	1	0.47
	79	0.65	0.63	0.65	0.48	0.64	0.59	0.70	0.66	0.63	1	0.24
N3	117	0.59	0.68	0.71	0.67	0.79	0.46	0.53	0.72	0.64	1	0.24
	126	0.58	0.57	0.72	0.64	0.62	0.74	0.69	0.62	0.65	0	0.24
	151	0.49	0.56	0.64	0.64	0.67	0.51	0.58	0.50	0.57	1	0.24
	46	0.56	0.54	0.80	0.65	0.55	0.70	0.63	0.65	0.64	1	0.26
	61	0.71	0.67	0.59	0.63	0.69	0.57	0.72	0.51	0.64	1	0.25
N4	100	0.62	0.59	0.72	0.79	0.66	0.75	0.81	0.56	0.69	0	0.29
	144	0.74	0.68	0.66	0.74	0.62	0.73	0.75	0.81	0.72	0	0.26
	160	0.76	0.77	0.80	0.65	0.70	0.67	0.56	0.57	0.69	1	0.27
	45	0.63	0.48	0.51	0.64	0.63	0.82	0.65	0.67	0.63	1	0.26
	76	0.72	0.60	0.62	0.81	0.67	0.52	0.76	0.76	0.68	1	0.29
N5	124	0.66	0.69	0.80	0.64	0.66	0.61	0.74	0.55	0.67	1	0.28
	146	0.64	0.60	0.93	0.69	0.66	0.63	0.71	0.59	0.68	1	0.29
	161	0.60	0.62	0.58	0.58	0.66	0.53	0.55	0.93	0.63	1	0.27
	42	0.44	0.76	0.72	0.44	0.56	0.69	0.59	0.61	0.60	1	0.24
	60	0.63	0.66	0.57	0.73	0.62	0.59	0.51	0.74	0.63	0	0.25
N6	77	0.52	0.58	0.61	0.63	0.54	0.62	0.54	0.43	0.56	1	0.24
	131	0.72	0.51	0.75	0.71	0.71	0.64	0.62	0.52	0.65	1	0.25
	165	0.71	0.48	0.63	0.50	0.33	0.44	0.84	0.59	0.57	1	0.41
N7	36	0.60	0.75	0.77	0.75	0.64	0.69	1.06	0.83	0.76	1	0.47

Sec	Pos	Measurement								MPD	DROP	RMS
	67	0.94	0.89	0.83	0.79	0.75	0.94	0.90	0.89	0.87	2	0.56
	82	1.02	1.01	0.84	0.75	0.67	0.95	0.71	0.84	0.85	1	0.48
	116	0.68	0.91	0.72	1.02	0.89	0.76	0.85	0.84	0.83	2	0.49
	174	1.12	0.85	0.62	0.91	1.05	0.85	0.76	0.87	0.88	2	0.53
	25	0.69	0.77	0.93	0.88	0.71	0.60	0.96	0.83	0.80	2	0.49
	49	1.00	0.88	0.68	0.80	0.84	0.87	0.62	0.90	0.82	2	0.63
N8	138	0.82	0.79	0.62	0.62	0.58	0.89	0.62	0.78	0.72	2	0.41
	168	0.69	0.87	0.64	0.63	0.60	0.80	0.76	0.81	0.73	1	0.43
	188	0.76	0.91	0.82	0.60	0.54	0.69	0.82	0.76	0.74	1	0.43
	42	0.77	0.73	0.73	0.73	0.79	0.92	0.76	0.70	0.77	1	0.51
	53	0.48	0.54	0.63	0.79	1.22	0.84	0.75	0.85	0.76	1	0.71
N9	90	0.66	0.77	0.65	0.77	0.91	0.96	0.75	0.76	0.78	1	0.58
	102	0.53	0.58	0.76	0.54	0.52	0.64	0.84	0.58	0.62	0	0.39
	125	0.35	0.58	0.35	0.47	0.47	0.56	0.44	0.32	0.44	0	0.18
	71	0.78	0.45	0.56	0.60	0.75	0.79	1.02	0.78	0.72	0	0.36
	79	0.42	0.57	0.71	0.70	0.59	0.55	0.70	0.67	0.61	0	0.31
N10	101	0.73	0.86	0.96	0.79	0.96	0.78	0.80	0.77	0.83	0	0.38
	143	1.07	0.93	0.70	0.69	0.74	1.08	0.93	0.83	0.87	0	0.46
	159	1.05	0.91	0.70	0.70	0.74	1.06	0.92	0.84	0.87	0	0.46
	52	0.73	1.01	1.44	1.04	1.13	0.88	0.96	1.26	1.06	3	0.63
	82	1.43	1.00	1.04	0.98	1.39	1.20	0.95	0.96	1.12	2	0.64
N11	118	1.20	1.30	1.16	1.15	1.35	1.13	1.37	1.03	1.21	3	0.65
	132	0.93	0.96	0.90	0.95	1.05	0.89	1.36	0.91	0.99	3	0.57
	174	1.75	1.34	1.49	1.65	1.09	1.26	1.53	1.33	1.43	3	0.81
	57	1.25	0.78	1.33	1.42	1.35	1.23	1.82	1.35	1.32	3	0.85
	96	1.57	1.17	1.48	1.19	1.42	1.63	1.37	1.15	1.37	3	0.92
N12	108	1.54	1.49	1.13	1.15	1.44	1.71	1.22	1.42	1.39	4	0.98
	134	1.22	0.87	0.88	1.08	1.34	1.03	0.99	1.38	1.10	2	0.74
	154	1.49	0.99	1.18	1.38	1.29	0.93	1.10	1.40	1.22	5	0.81
	34	1.01	1.07	1.17	1.17	0.98	1.10	1.31	0.85	1.08	1	0.86
	74	1.00	1.27	1.02	0.81	1.48	1.36	1.16	0.76	1.11	1	0.67
N13	89	1.13	0.77	1.27	1.00	1.40	0.95	1.38	1.35	1.16	2	0.90
	135	1.38	1.30	1.45	1.13	0.82	1.22	1.17	1.20	1.21	3	1.17
	168	0.89	0.90	0.91	1.13	1.30	1.11	1.06	0.80	1.01	2	0.97
	46	1.34	1.33	1.38	1.30	1.21	1.48	1.36	1.47	1.36	2	0.88
	92	1.25	1.29	1.47	1.49	1.32	1.20	1.26	1.31	1.32	3	0.89
W1	102	1.53	1.21	1.28	1.32	1.13	1.49	2.15	1.78	1.49	3	0.91
	142	1.34	1.64	1.27	0.97	1.28	1.34	0.81	1.07	1.22	3	0.63
	168	1.42	0.88	0.85	0.86	1.23	1.24	1.03	1.01	1.07	2	0.78
	38	0.96	0.61	1.31	1.09	1.10	1.17	0.95	0.66	0.98	0	0.49
	68	0.73	1.25	1.09	0.94	1.01	1.11	0.82	1.27	1.03	0	0.56
W2	120	1.10	1.44	1.40	1.17	1.57	1.59	0.88	1.00	1.27	1	0.71
	142	1.15	0.99	1.16	1.38	1.87	0.82	0.92	1.29	1.20	1	0.70
	154	0.93	0.93	1.14	0.90	0.99	1.06	0.78	0.83	0.95	0	0.65
	72	0.76	0.61	0.58	0.90	1.63	0.99	0.80	0.74	0.88	0	0.64
	91	0.70	0.56	0.50	0.93	1.64	1.34	0.89	0.55	0.89	1	0.55
W3	123	0.57	0.53	1.32	0.87	0.82	0.90	0.81	0.60	0.80	0	0.56
	130	0.47	0.55	0.47	1.06	1.07	1.22	1.25	0.78	0.86	0	0.57
	161	0.81	0.76	0.47	1.17	1.35	0.82	0.50	0.87	0.84	0	0.55
W4	68	1.47	1.54	1.77	1.46	2.49	1.85	1.25	1.91	1.72	4	1.22
	89	1.96	1.54	1.73	2.10	2.17	2.11	1.73	1.62	1.87	4	1.24
	105	2.39	1.71	2.41	1.45	2.12	1.66	1.88	1.61	1.90	3	1.15
	133	1.52	1.77	1.60	1.76	2.00	1.88	2.35	1.63	1.81	5	1.18

Sec	Pos	Measurement								MPD	DROP	RMS
	167	0.90	2.02	1.47	1.70	1.83	1.67	1.59	1.54	1.59	3	1.05
W5	40	1.18	1.69	1.97	1.24	1.50	1.84	1.35	2.17	1.62	4	1.17
	63	2.33	1.77	1.12	1.65	1.90	1.70	1.69	2.11	1.78	4	1.28
	118	2.03	1.69	1.41	1.13	2.20	1.66	1.84	1.98	1.74	4	1.03
	141	1.75	1.35	1.32	2.00	1.52	1.23	2.06	1.38	1.58	3	1.46
	151	1.90	1.12	1.19	2.04	2.15	2.81	1.54	1.52	1.78	4	1.19
W6	41	0.63	0.42	0.44	0.40	0.35	0.46	0.51	0.45	0.46	0	0.20
	65	0.43	0.44	0.35	0.39	0.36	0.45	0.42	0.43	0.41	0	0.22
	82	0.44	0.46	0.52	0.49	0.38	0.38	0.52	0.43	0.45	0	0.22
	150	0.39	0.45	0.33	0.68	0.34	0.86	0.43	0.53	0.50	0	0.27
	172	0.42	0.37	0.34	0.37	0.37	0.39	0.39	0.46	0.39	0	0.20
W7	28	1.13	1.14	1.37	1.26	1.57	1.21	1.15	1.31	1.27	1	0.76
	63	1.29	1.09	1.32	1.56	1.85	1.27	1.19	0.98	1.32	1	0.82
	79	1.19	1.50	1.23	1.51	1.54	1.05	1.49	1.16	1.33	1	0.84
	110	1.40	1.29	1.83	1.72	2.18	1.98	1.67	1.14	1.65	2	1.27
	173	1.10	0.92	1.13	0.97	1.66	1.21	0.94	0.59	1.07	1	0.63
W8	36	1.21	1.06	0.91	0.73	0.72	1.16	0.92	1.17	0.99	1	0.59
	62	0.74	0.92	0.90	1.02	0.66	1.03	0.95	0.92	0.89	1	0.52
	76	0.78	1.15	1.19	1.13	1.07	0.81	1.05	1.05	1.03	1	0.65
	102	1.00	0.75	1.10	0.79	0.88	1.33	1.11	0.85	0.98	1	0.89
	128	0.65	0.86	0.88	0.82	0.85	0.86	0.81	0.89	0.83	0	0.45
W9	50	0.37	0.34	0.48	0.51	0.32	0.38	0.32	0.36	0.39	0	0.15
	70	0.46	0.25	0.48	0.39	0.33	0.28	0.36	0.31	0.36	0	0.15
	84	0.46	0.25	0.48	0.39	0.33	0.28	0.36	0.31	0.36	0	0.15
	101	0.33	0.36	0.30	0.48	0.28	0.28	0.31	0.25	0.32	0	0.15
	146	0.25	0.32	0.44	0.20	0.28	0.16	0.52	0.61	0.35	0	0.13
W10	13	1.30	1.45	1.70	2.46	2.41	2.46	2.62	1.57	2.00	3	1.23
	34	2.32	2.36	2.59	1.86	1.29	1.31	3.14	2.02	2.11	5	1.31
	55	2.39	1.81	2.47	2.81	1.82	2.24	2.06	1.55	2.14	3	1.47
	65	2.56	1.67	2.40	2.28	2.08	2.25	2.15	2.39	2.22	4	1.52
	82	1.59	2.30	2.44	2.03	2.40	2.79	2.34	2.57	2.31	3	1.43
S1	33	0.77	0.84	0.91	0.73	0.75	0.91	0.70	0.89	0.81	0	0.42
	90	0.84	0.54	0.89	0.99	0.73	0.60	0.80	0.86	0.78	2	0.44
	104	0.54	0.67	0.77	0.68	0.68	0.55	0.86	0.63	0.67	2	0.40
	148	0.69	0.75	0.82	0.65	0.80	0.70	0.61	0.66	0.71	2	0.40
	156	0.80	0.90	0.88	0.52	0.69	0.67	0.61	0.81	0.74	1	0.45
S2	45	1.09	0.89	0.82	0.95	1.36	0.64	0.91	0.73	0.92	1	0.68
	70	0.64	0.64	0.94	0.92	0.84	0.77	1.00	1.08	0.85	1	0.59
	106	0.72	0.78	0.64	0.82	0.76	0.72	0.51	0.72	0.71	1	0.47
	132	0.96	1.41	0.54	0.96	0.59	0.80	0.86	0.77	0.86	1	0.59
	161	0.63	0.59	0.76	0.60	0.91	0.80	0.84	0.98	0.76	1	0.51
S3	75	0.71	0.94	0.82	0.79	1.00	0.94	0.77	0.70	0.83	1	0.49
	96	1.16	0.76	1.05	0.94	0.92	0.83	0.84	1.06	0.95	2	0.60
	102	0.95	0.76	1.06	0.74	0.98	0.76	0.71	0.81	0.85	1	0.62
	134	0.56	0.72	0.99	0.89	0.77	0.86	0.83	0.76	0.80	1	0.53
	153	0.78	0.84	0.92	0.73	0.75	0.79	0.80	0.92	0.82	1	0.52
S4	74	1.60	1.31	1.99	1.95	2.18	1.44	1.92	1.82	1.78	4	1.12
	76	1.29	1.47	1.29	1.85	1.80	1.52	1.36	1.12	1.46	4	1.02
	113	1.55	1.39	1.96	1.75	1.69	1.76	1.42	1.06	1.13	3	0.96
	127	1.39	1.79	1.13	1.89	1.44	1.70	1.49	1.82	1.58	2	1.03
	172	1.08	1.10	1.41	1.63	1.50	2.05	1.77	1.86	1.55	4	1.10
S5	35	0.70	0.50	0.55	0.44	0.55	0.70	0.44	0.85	0.59	0	0.29
	55	0.61	0.62	0.50	0.68	0.57	0.52	0.44	0.60	0.57	1	0.29

Sec	Pos	Measurement								MPD	DROP	RMS
	124	0.50	0.50	0.50	0.65	0.79	0.68	0.48	0.48	0.57	0	0.28
	145	0.46	0.43	0.55	0.60	0.62	0.56	0.42	0.46	0.51	1	0.26
	167	0.68	0.52	0.66	0.65	0.57	0.66	0.66	0.71	0.64	1	0.69
	45	0.70	0.53	0.74	0.39	0.46	0.52	0.63	0.47	0.56	0	0.25
	66	0.48	0.46	0.83	0.61	0.48	0.43	0.71	0.32	0.54	0	0.23
S6	76	0.68	0.50	0.60	0.51	0.57	0.46	0.48	0.67	0.56	0	0.26
	132	0.45	0.63	0.75	0.45	0.55	0.49	0.77	0.71	0.60	1	0.26
	171	0.50	0.43	0.37	0.51	0.46	0.55	0.39	0.51	0.47	0	0.20
	26	0.58	0.39	0.38	0.41	0.60	0.70	0.51	0.40	0.50	0	0.26
	54	0.52	0.57	0.49	0.64	0.57	0.55	0.69	0.44	0.56	1	0.27
S7	88	0.44	0.50	0.43	0.38	0.49	0.75	0.44	0.40	0.48	1	0.22
	118	0.44	0.59	0.58	0.41	0.44	0.47	0.53	0.54	0.50	1	0.25
	174	0.51	0.50	0.50	0.50	0.53	0.49	0.56	0.44	0.50	0	0.25
	42	0.72	0.91	0.94	0.94	0.95	0.90	0.88	1.12	0.92	1	0.50
	68	0.88	0.96	1.06	1.06	1.06	0.81	1.12	0.83	0.97	1	0.54
S8	88	1.31	0.90	1.00	0.83	0.92	0.97	0.92	1.06	0.99	1	0.71
	121	0.91	0.96	0.73	0.97	0.91	1.05	0.62	0.71	0.86	1	0.48
	137	0.69	0.88	0.75	0.86	1.06	0.95	1.06	0.79	0.88	1	0.47
	39	1.38	0.90	1.01	1.34	1.01	1.27	0.98	0.96	1.11	2	0.60
	59	0.87	1.23	0.88	1.04	1.19	1.15	0.95	1.05	1.05	3	0.59
S9	81	1.35	0.99	1.09	1.28	0.74	1.14	1.19	1.13	1.11	3	0.58
	105	0.84	1.00	1.36	1.01	1.04	1.14	1.27	1.34	1.13	3	0.54
	130	1.44	0.10	1.20	1.03	1.07	0.89	1.06	1.24	1.00	1	0.69
	61	0.75	1.12	0.85	0.84	0.85	0.78	0.64	0.78	0.83	2	0.37
	77	0.68	0.90	0.65	0.76	0.62	0.85	0.77	0.99	0.78	2	0.32
S10	105	0.69	0.55	0.75	0.67	0.68	0.59	0.81	0.95	0.71	1	0.31
	148	0.89	0.72	0.71	0.66	0.85	1.00	0.68	0.85	0.80	2	0.36
	168	1.20	0.66	1.08	0.82	0.77	0.61	0.60	0.81	0.82	1	0.61
	62	0.88	0.97	0.81	1.04	1.27	1.17	0.86	0.93	0.99	0	0.43
	99	0.91	0.85	0.83	0.73	1.06	0.96	1.10	0.73	0.90	0	0.43
S11	122	0.68	0.99	0.94	1.14	1.07	1.38	1.06	0.66	0.99	0	0.45
	146	0.95	0.80	0.71	1.01	1.08	0.89	0.91	1.00	0.92	1	0.43
	168	0.91	0.92	0.78	0.91	0.91	0.93	0.58	0.90	0.86	1	0.43
	52	0.64	0.83	0.79	1.10	0.53	0.76	0.83	1.07	0.82	0	0.50
	94	0.69	0.70	0.97	0.76	0.84	0.88	0.77	0.65	0.78	0	0.39
S12	102	0.58	0.72	0.81	1.10	1.15	0.69	0.75	0.85	0.83	1	0.53
	142	0.73	0.70	0.75	0.71	0.63	0.68	0.63	0.95	0.72	0	0.38
	161	0.78	0.89	0.65	0.60	0.63	0.78	0.59	0.87	0.72	0	0.37
	33	0.93	0.80	0.80	0.77	0.89	0.72	0.91	0.80	0.83	0	0.44
	71	0.53	0.77	0.82	0.83	0.66	0.84	0.94	0.72	0.76	0	0.44
S13	91	0.73	0.69	0.74	0.69	0.78	1.04	0.78	0.74	0.77	0	0.42
	139	0.85	0.78	0.92	0.82	0.81	0.74	0.73	0.84	0.81	0	0.43
	169	0.60	0.79	0.70	0.67	0.66	0.90	0.53	0.76	0.70	0	0.39
	47	0.85	0.84	0.91	1.10	1.08	0.98	0.70	0.78	0.91	1	0.61
	88	0.68	0.84	1.06	0.97	1.10	1.18	0.94	0.89	0.96	1	0.61
E1	100	0.97	0.68	0.88	0.73	1.19	1.10	0.67	0.92	0.89	2	0.59
	145	0.77	1.09	0.83	0.93	0.91	0.92	0.87	0.61	0.87	1	0.55
	166	0.88	0.77	0.93	1.05	0.85	1.10	1.27	0.78	0.95	1	0.59
	48	1.14	1.07	0.99	1.03	1.21	1.31	1.22	0.94	1.11	1	0.56
	53	1.16	1.20	1.30	1.39	1.07	1.31	0.73	1.09	1.16	2	0.53
E2	109	1.47	0.83	1.25	1.30	1.24	1.11	1.39	1.13	1.22	2	0.56
	132	0.96	1.56	1.01	1.20	1.24	1.16	0.99	0.94	1.13	1	0.53
	167	1.05	0.95	1.41	1.23	1.19	1.07	1.10	1.01	1.13	1	0.55

Sec	Pos	Measurement								MPD	DROP	RMS
E3	62	0.94	0.89	1.53	1.43	1.40	1.58	1.81	0.88	1.31	1	0.65
	77	1.15	1.35	1.48	1.29	1.48	1.99	1.37	1.05	1.40	4	0.71
	123	1.10	1.47	1.13	2.01	1.57	1.29	1.02	1.63	1.40	1	0.71
	134	1.89	1.21	1.45	1.55	2.05	1.67	1.69	1.34	1.61	1	0.72
	171	1.01	1.06	1.25	0.84	1.44	1.38	1.02	1.09	1.14	1	0.63
E4	67	0.86	0.78	1.30	1.16	1.01	1.16	0.79	0.92	1.00	3	0.57
	85	0.87	0.87	1.10	1.17	0.99	0.82	0.92	0.64	0.92	2	0.52
	101	1.06	0.88	0.82	0.89	1.04	1.02	0.91	0.96	0.95	4	0.59
	140	0.82	0.78	0.93	0.87	1.17	1.07	1.20	1.53	1.05	8	0.91
	154	1.76	1.45	1.25	1.13	0.99	1.00	0.96	0.87	1.18	4	0.64
E5	35	1.17	1.12	0.84	0.97	0.84	0.83	0.94	0.65	0.92	3	0.49
	68	1.05	0.88	1.30	1.03	1.12	1.16	0.86	0.95	1.04	2	0.84
	114	0.78	1.13	0.90	1.09	1.00	1.11	1.97	0.96	1.12	4	0.48
	144	0.80	1.13	1.13	0.95	0.98	0.92	1.07	1.22	1.03	2	0.52
	161	0.81	0.81	0.83	0.98	1.13	0.71	1.19	1.14	0.95	2	0.54
E6	34	0.82	1.02	0.91	0.81	1.19	0.90	0.56	0.85	0.88	1	0.55
	60	0.81	0.95	0.75	1.09	0.83	0.76	0.94	0.92	0.88	4	0.51
	88	0.78	0.86	0.94	0.80	0.93	0.81	0.79	1.23	0.89	2	0.48
	148	0.98	0.85	1.00	0.70	0.67	0.80	0.85	0.94	0.85	2	0.42
	155	0.73	0.62	0.74	0.81	0.81	0.82	0.74	0.91	0.77	4	0.55
E7	26	1.25	1.04	1.01	1.01	0.92	1.02	1.01	0.89	1.02	4	0.53
	65	1.28	1.23	1.17	1.16	0.93	1.08	1.29	1.14	1.16	5	0.74
	76	1.12	1.23	0.93	1.06	0.99	1.23	1.28	1.19	1.13	4	0.70
	105	1.33	1.22	1.10	0.93	1.10	0.88	1.14	1.19	1.11	2	0.73
	160	0.98	0.76	0.96	1.13	1.03	0.92	0.92	0.97	0.96	3	0.52
E8	33	0.65	0.62	0.95	0.96	0.65	0.79	0.68	0.91	0.78	2	0.51
	70	0.90	0.94	0.87	0.78	0.63	0.75	0.97	0.82	0.83	3	0.36
	81	0.70	0.58	0.88	0.71	0.60	0.72	0.76	0.68	0.70	2	0.45
	124	0.83	0.77	0.96	0.66	0.66	0.76	0.82	0.80	0.78	2	0.50
	140	1.11	0.55	0.88	0.80	0.80	0.84	0.51	0.77	0.78	2	0.33
E9	36	0.34	0.20	0.35	0.56	0.23	0.25	0.31	0.31	0.32	0	0.19
	58	0.26	0.21	0.25	0.35	0.32	0.33	0.26	0.22	0.28	0	0.16
	80	0.35	0.36	0.23	0.26	0.39	0.19	0.29	0.32	0.30	0	0.16
	124	0.49	0.32	0.29	0.35	0.19	0.23	0.16	0.24	0.28	0	0.17
	130	0.34	0.30	0.19	0.18	0.27	0.21	0.36	0.23	0.26	0	0.15

APPENDIX E: COMPARISON OF CTM, ULIP AND SAND PATCH MEASUREMENTS

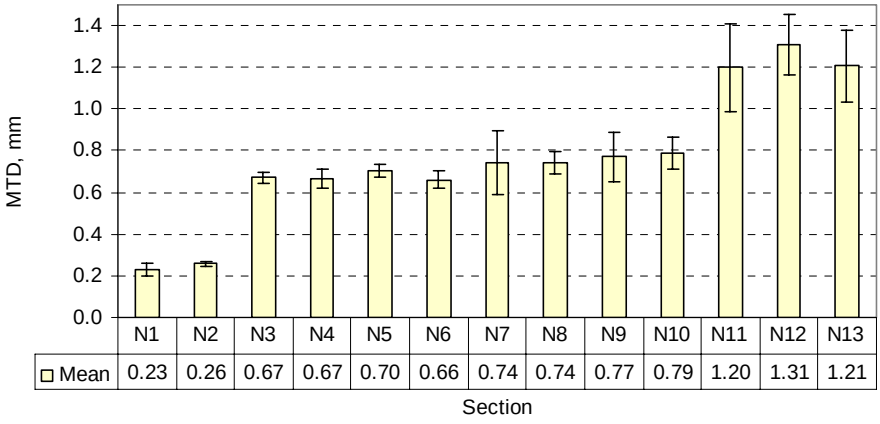


Figure 103. Sand patch macrotextures of north-bound sections

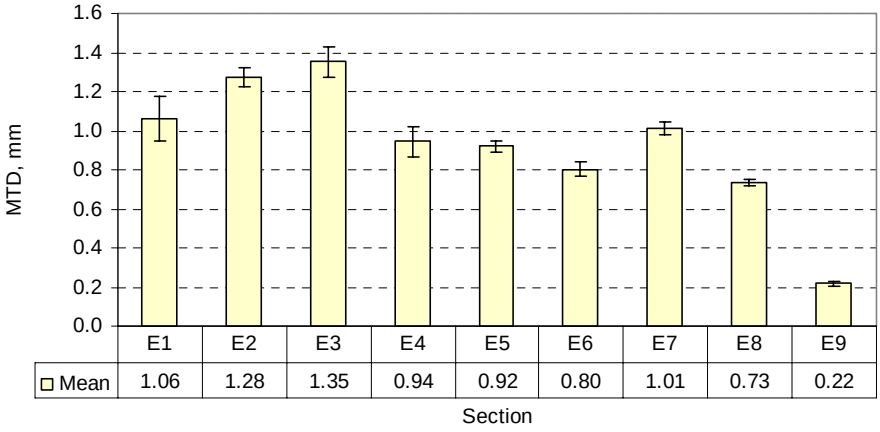


Figure 104. Sand patch macrotextures of east-bound sections

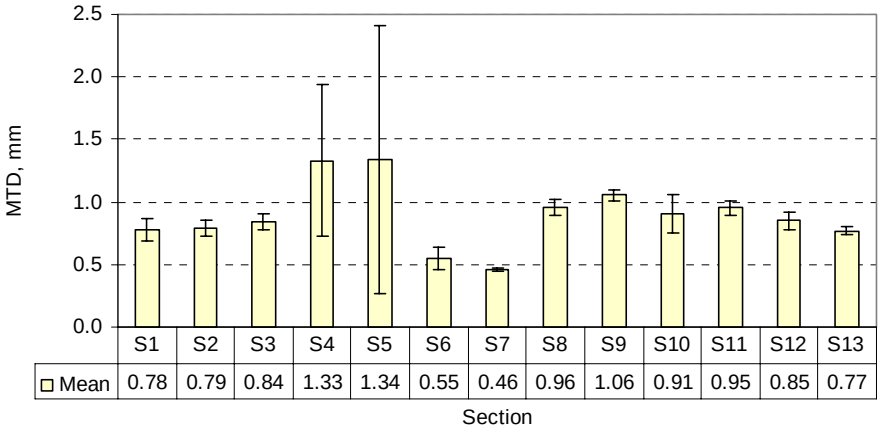


Figure 105. Sand patch macrotextures of south-bound sections

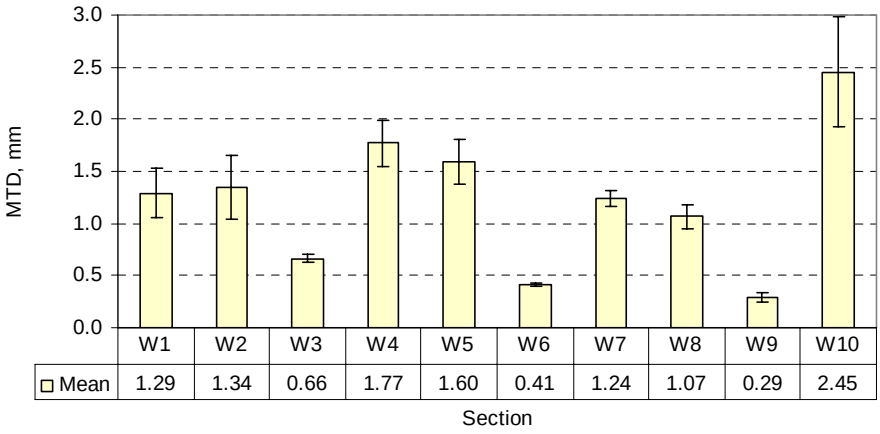


Figure 106. Sand patch macrotextures of west-bound sections

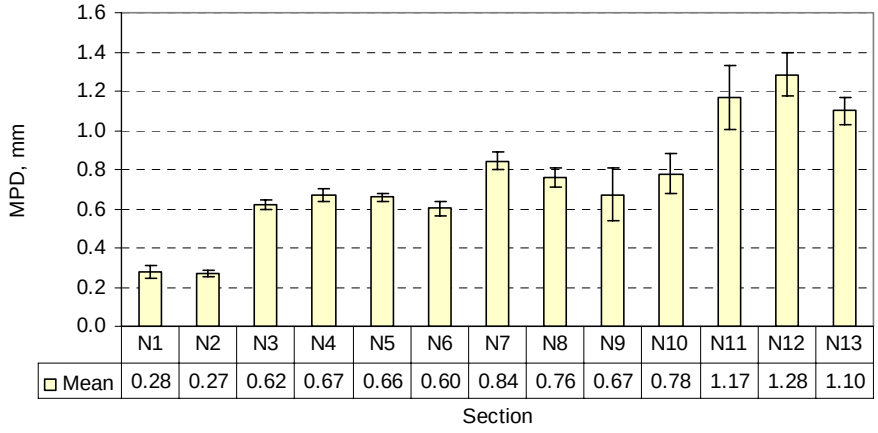


Figure 107. CTM macrotextures of north-bound sections

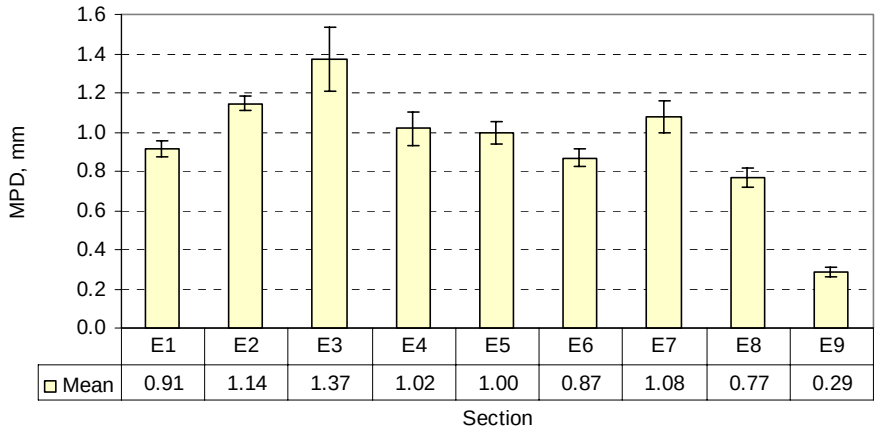


Figure 108. CTM macrotextures of east-bound sections

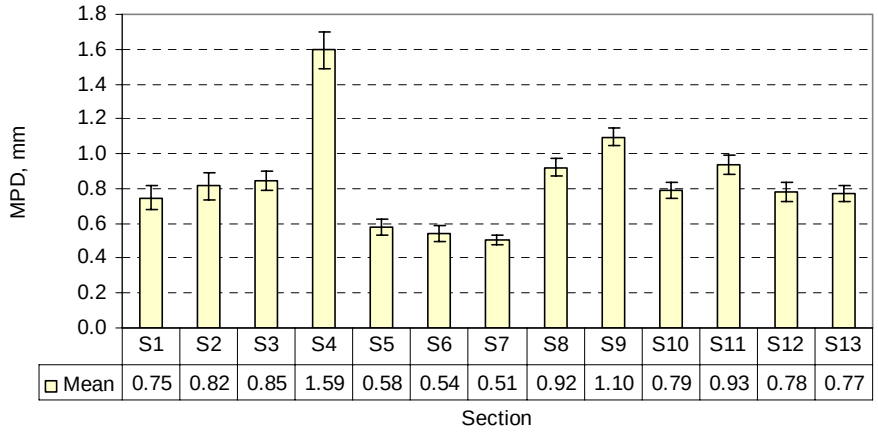


Figure 109. CTM macrotextures of south-bound sections

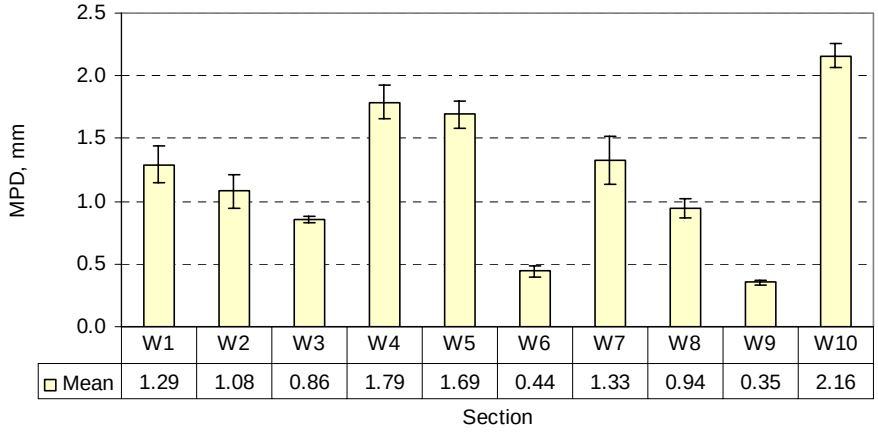


Figure 110. CTM macrotextures of west-bound sections

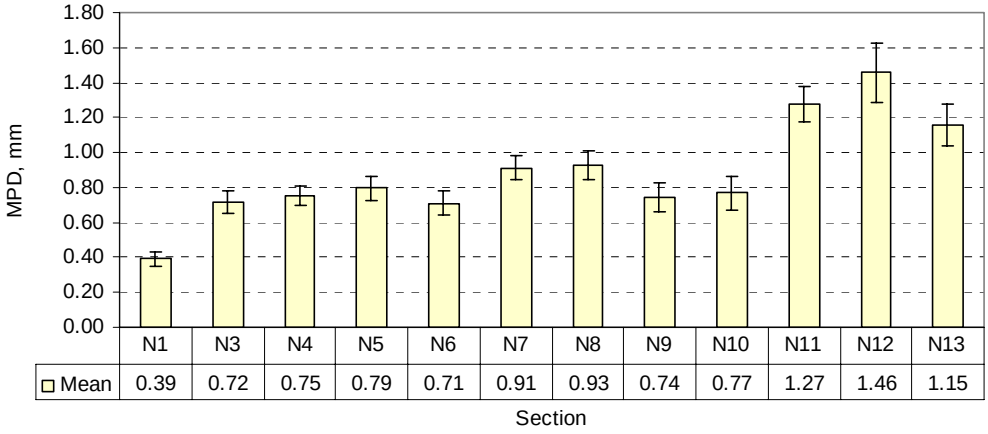


Figure 111. ULIP macrotextures on north-bound sections

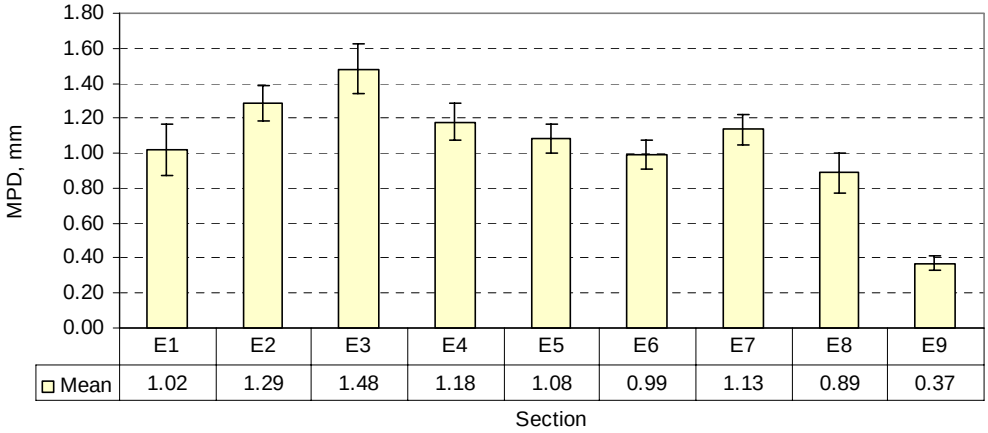


Figure 112. ULIP macrotextures on east-bound sections

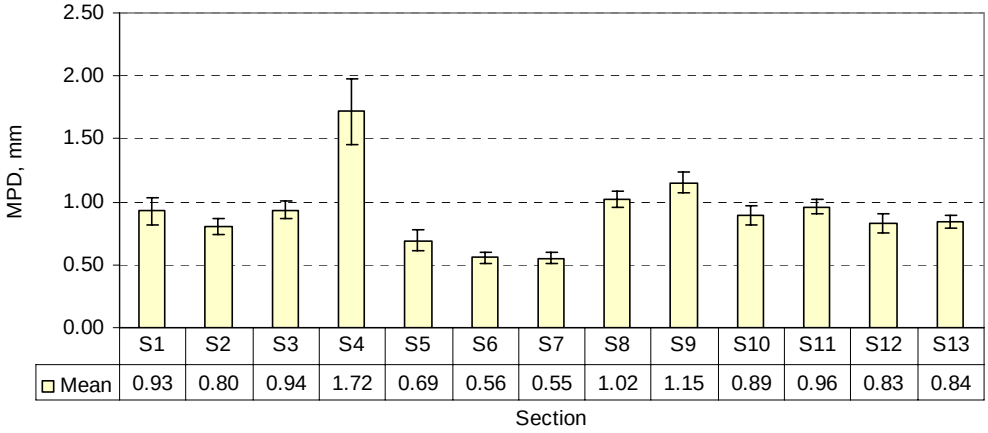


Figure 113. ULIP macrotextures on south-bound sections

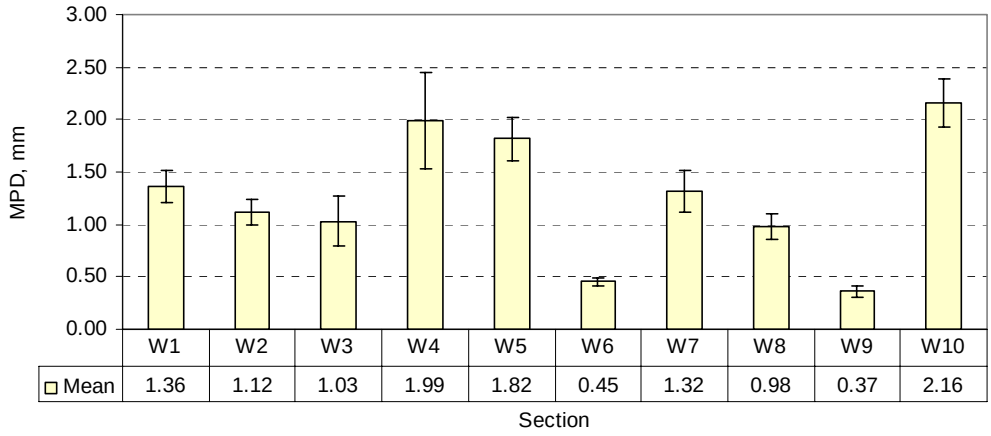


Figure 114. ULIP macrotextures on west-bound sections

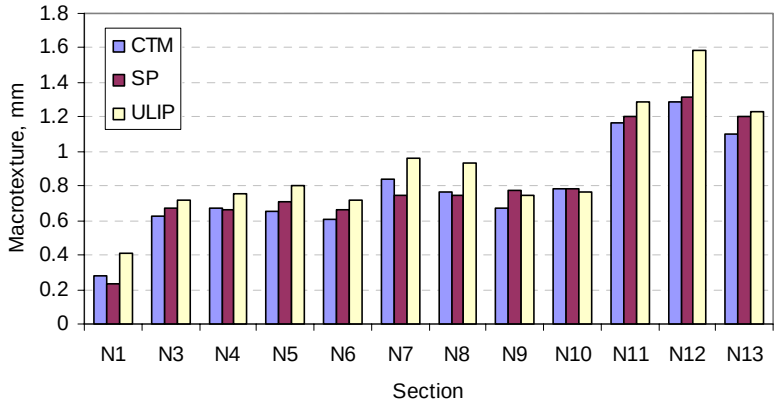


Figure 115. Summary of mean macrotexture measurements on north-bound sections

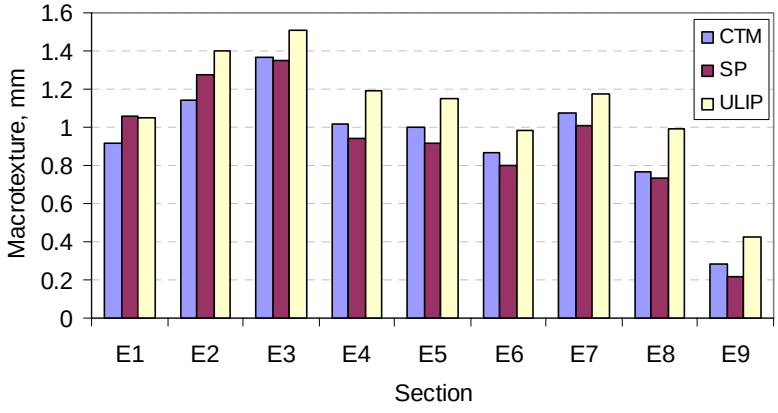


Figure 116. Summary of mean macrotexture measurements on east-bound sections

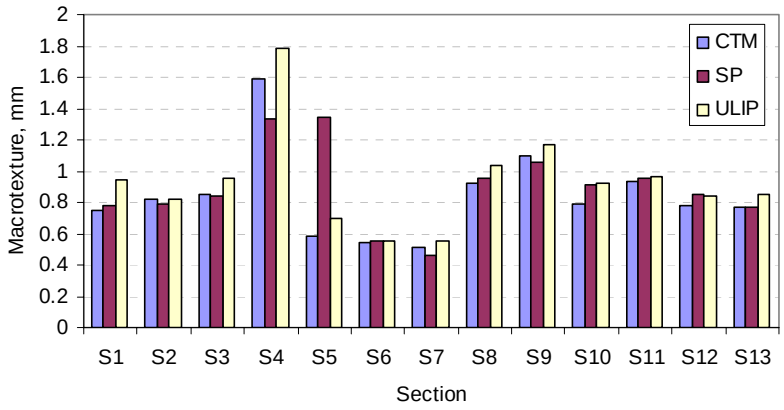


Figure 117. Summary of mean macrotexture measurements on south-bound sections

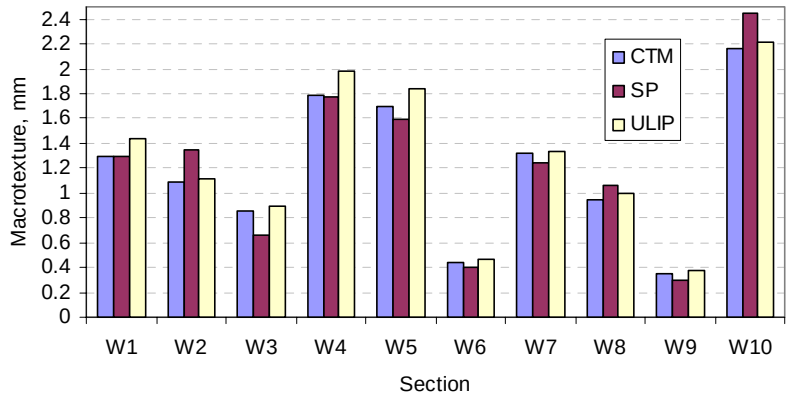


Figure 118. Summary of mean macrotexture measurements on west-bound sections

APPENDIX F: CPX SOUND PRESSURE MEASUREMENTS

Table 8. Section N1 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.35	81.70	73.55	68.38	72.31	67.35
398	89.16	86.75	73.61	71.31	72.10	70.15
501	87.92	86.46	78.02	75.00	75.63	73.84
631	86.18	84.69	79.85	79.46	79.52	78.89
794	84.26	85.39	80.78	80.04	81.70	79.75
1000	89.85	89.91	84.90	85.63	86.43	86.42
1259	86.85	89.48	85.12	87.65	85.56	88.30
1585	86.25	86.78	83.24	83.67	84.36	85.08
1995	80.79	82.00	78.04	80.02	79.65	81.08
2512	79.28	81.15	75.38	78.05	76.71	78.55
3162	77.26	78.39	71.52	74.06	72.68	74.63
3981	74.09	75.08	69.17	70.99	70.41	71.91

Table 9. Section N1 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	71.48	67.83	70.42	66.96	70.27	67.29
398	70.13	67.14	68.66	67.10	68.69	66.63
501	73.41	69.77	71.83	69.49	72.33	69.12
631	76.33	75.52	74.35	73.78	74.72	73.73
794	78.12	80.26	77.51	78.61	77.85	78.81
1000	80.81	83.22	80.24	81.25	80.89	81.59
1259	84.51	84.39	84.23	83.57	84.18	83.95
1585	85.45	84.51	85.20	84.32	85.32	84.51
1995	78.60	78.51	78.24	78.56	78.15	78.77
2512	77.12	77.03	76.35	77.14	76.34	77.29
3162	73.69	74.85	73.39	74.41	73.32	74.80
3981	68.68	71.14	68.28	70.69	68.00	71.04

Table 10. Section N2 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.66	82.62	71.63	66.75	71.63	67.44
398	89.59	87.17	71.75	68.82	71.14	69.21
501	87.61	85.78	75.89	72.67	74.35	72.65
631	86.36	84.86	79.64	78.88	79.54	78.44
794	84.80	85.56	80.93	79.64	80.92	79.30
1000	90.54	90.46	84.79	85.66	85.81	85.95
1259	86.95	89.32	85.32	88.40	85.72	88.46
1585	86.26	87.60	83.59	84.05	83.98	84.33
1995	80.63	82.04	78.98	80.31	79.13	80.54
2512	78.99	80.75	76.04	78.29	76.46	78.21
3162	77.07	78.09	72.24	74.33	72.41	74.31
3981	74.47	75.27	69.91	71.67	70.00	71.43

Table 11. Section N2 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	74.54	70.48	75.52	71.67	74.78	70.59
398	72.15	70.01	74.79	72.67	73.12	71.07
501	76.79	72.74	76.77	73.08	76.51	72.80
631	78.86	77.04	79.69	77.69	79.13	77.19
794	80.45	82.99	81.31	83.48	81.65	83.40
1000	83.03	86.70	83.44	86.97	83.51	86.93
1259	85.30	86.47	85.89	86.88	85.73	86.71
1585	85.05	84.84	85.72	85.43	85.55	85.36
1995	79.45	79.38	80.02	80.03	79.86	80.19
2512	78.23	77.79	78.66	78.68	78.32	78.88
3162	75.22	76.19	75.39	76.13	75.12	76.03
3981	70.31	72.20	69.91	71.78	69.77	71.88

Table 12. Section N3 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.62	82.83	76.97	71.06	76.07	71.06
398	89.56	87.48	76.81	73.96	77.03	73.64
501	88.74	87.38	80.44	76.61	80.10	76.39
631	87.18	85.49	82.94	79.44	82.69	79.34
794	87.35	87.23	86.40	83.46	85.85	82.86
1000	93.56	93.31	92.27	92.05	91.83	91.65
1259	87.87	90.98	87.48	90.81	87.54	90.64
1585	86.29	88.57	85.30	87.83	84.97	87.40
1995	81.98	83.16	80.69	82.00	80.75	81.95
2512	80.42	81.47	78.48	79.82	78.64	79.73
3162	78.73	79.54	74.94	76.65	74.94	76.33
3981	75.95	76.84	72.81	73.90	72.79	73.60

Table 13. Section N3 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.48	86.38	79.96	85.78	77.21	80.97
398	74.05	75.57	74.34	75.63	72.62	72.25
501	77.16	73.41	77.41	73.12	76.44	72.67
631	79.60	77.54	79.53	77.71	79.16	76.83
794	80.44	82.47	80.98	83.16	81.05	82.42
1000	83.31	86.45	83.51	86.98	83.20	86.21
1259	84.75	85.90	85.25	86.47	85.35	86.22
1585	84.49	84.20	84.92	84.78	85.08	84.81
1995	79.10	78.85	79.42	79.54	79.57	79.83
2512	77.60	77.44	78.01	78.19	78.14	78.72
3162	74.72	75.32	75.10	75.80	74.96	76.02
3981	69.39	71.48	70.18	71.72	69.25	71.62

Table 14. Section N4 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.76	83.25	76.41	70.68	77.10	79.44
398	89.56	87.48	76.30	73.52	76.50	74.19
501	89.05	87.50	79.76	76.29	79.98	76.59
631	86.92	85.23	82.01	79.69	82.72	79.53
794	87.54	87.07	85.90	83.02	86.11	82.84
1000	93.36	93.16	91.49	91.21	91.52	91.27
1259	88.26	91.20	87.08	90.15	87.52	90.35
1585	85.92	88.38	84.80	87.47	84.79	87.00
1995	81.61	82.46	80.50	81.91	80.59	81.61
2512	80.37	81.37	78.62	79.68	78.66	79.68
3162	78.51	79.50	75.00	76.24	74.79	76.19
3981	76.01	76.83	72.48	73.63	72.70	73.62

Table 15. Section N4 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	84.69	86.06	84.84	87.40	73.81	69.56
398	79.05	86.12	80.18	88.11	72.63	70.26
501	77.53	76.69	77.93	78.09	76.33	72.88
631	79.83	78.02	80.02	78.15	79.04	77.31
794	80.82	83.06	81.21	82.82	81.06	82.69
1000	83.30	86.99	84.19	87.10	83.56	86.33
1259	85.70	86.67	85.53	86.64	85.05	86.18
1585	84.80	84.57	85.09	84.96	84.62	84.87
1995	79.53	79.26	79.64	79.76	79.46	79.66
2512	78.09	77.82	78.01	78.38	77.94	78.21
3162	74.85	75.60	74.94	75.88	74.56	75.69
3981	69.98	71.61	70.05	71.88	69.68	71.81

Table 16. Section N5 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.88	82.48	78.20	71.69	76.86	71.18
398	88.33	86.21	77.97	74.66	77.63	74.44
501	88.90	87.14	80.77	77.04	80.87	76.92
631	87.15	85.85	82.84	79.86	83.32	79.81
794	87.26	86.74	86.25	83.28	86.19	83.31
1000	92.87	92.83	91.79	91.89	92.08	92.11
1259	88.05	91.14	87.45	90.42	87.57	90.36
1585	85.32	88.07	84.75	86.99	84.75	87.43
1995	80.74	82.08	80.45	81.60	80.58	81.64
2512	79.98	81.23	78.54	79.64	78.50	79.37
3162	77.71	79.11	74.78	76.07	74.68	75.98
3981	75.85	76.25	72.76	73.67	72.75	73.60

Table 17. Section N5 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	73.73	69.19	73.12	69.13	71.87	68.44
398	71.87	69.53	72.70	70.26	71.53	69.33
501	76.11	72.92	76.16	72.98	75.05	71.27
631	79.16	77.44	79.44	77.79	77.90	76.41
794	80.90	83.07	80.93	83.19	80.45	81.84
1000	82.83	86.14	83.23	86.40	82.44	85.43
1259	85.62	86.31	85.70	86.36	85.33	85.92
1585	84.93	84.89	85.73	85.48	85.21	85.18
1995	79.18	79.32	79.96	80.11	79.37	79.54
2512	77.83	77.58	78.22	78.53	77.36	77.99
3162	74.65	75.46	75.04	76.07	74.23	75.50
3981	69.64	71.77	69.94	72.13	69.34	71.68

Table 18. Section N6 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.03	83.29	76.10	70.89	75.73	70.68
398	89.61	87.47	76.80	73.89	76.12	73.45
501	87.89	86.05	80.34	76.67	79.99	76.72
631	87.64	85.25	83.12	79.43	82.77	79.71
794	87.33	87.27	86.05	83.43	86.07	82.94
1000	94.10	93.86	92.20	92.01	91.91	91.85
1259	89.23	91.07	87.44	90.51	87.30	90.55
1585	86.46	88.49	85.17	87.46	85.08	87.83
1995	81.76	82.84	80.93	81.94	80.86	82.02
2512	80.20	81.78	78.67	79.64	78.60	79.65
3162	79.25	79.74	75.08	76.31	74.68	76.13
3981	76.44	77.12	72.98	73.96	72.84	73.61

Table 19. Section N6 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.44	89.60	74.07	70.32	74.51	74.47
398	77.15	86.09	73.08	70.77	73.46	74.74
501	77.22	74.19	76.69	73.47	75.93	72.75
631	79.59	77.87	79.28	78.09	78.28	77.19
794	80.31	82.10	80.35	82.22	80.02	82.10
1000	83.68	86.03	83.67	86.01	83.66	86.07
1259	84.77	85.69	84.83	85.64	84.73	85.64
1585	84.14	83.94	84.07	84.08	84.13	83.59
1995	79.26	78.96	78.97	79.05	78.99	79.05
2512	77.57	77.67	77.16	77.90	77.13	77.89
3162	74.52	75.16	74.23	75.04	74.35	75.08
3981	69.59	70.92	69.11	70.79	68.99	70.42

Table 20. Section N7 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.33	83.80	76.38	71.36	76.48	72.47
398	89.77	87.71	76.61	74.05	77.29	73.98
501	87.59	85.14	80.08	76.44	80.57	76.96
631	86.09	84.62	82.48	79.55	82.83	80.02
794	86.71	86.86	85.82	83.24	85.71	83.65
1000	92.93	92.84	90.51	90.70	90.75	90.69
1259	88.62	90.98	87.07	89.74	87.08	90.08
1585	85.35	87.60	84.43	86.61	84.44	86.69
1995	81.25	82.14	79.86	80.98	80.01	81.14
2512	80.45	81.42	78.42	78.95	78.32	78.96
3162	79.15	79.39	74.53	75.46	74.47	75.49
3981	76.24	76.47	72.17	73.15	71.94	72.71

Table 21. Section N7 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.86	88.96	80.83	75.27	82.86	85.93
398	76.68	85.45	77.73	74.97	79.02	83.02
501	77.20	73.98	81.39	79.57	80.65	78.32
631	79.53	77.80	83.35	83.31	82.40	82.40
794	80.31	82.21	82.46	85.19	82.42	85.38
1000	83.68	85.93	85.52	87.61	85.28	87.46
1259	84.65	85.71	86.07	86.95	86.23	87.61
1585	83.90	83.84	84.73	84.51	85.21	85.57
1995	79.06	78.94	80.09	80.06	80.63	80.84
2512	77.38	77.55	78.50	78.74	79.59	79.41
3162	74.45	75.11	75.48	76.23	76.80	77.33
3981	69.55	70.89	71.64	72.37	73.53	74.44

Table 22. Section N8 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	84.86	85.69	82.55	77.86	85.18	87.77
398	90.03	88.02	83.65	79.54	84.19	83.80
501	88.60	86.32	86.40	82.76	86.45	83.97
631	88.28	86.41	87.70	85.85	87.37	86.12
794	88.47	89.06	88.09	88.06	87.35	87.69
1000	93.74	94.17	92.03	92.52	91.93	92.44
1259	89.51	91.52	88.64	91.32	88.26	91.12
1585	86.44	88.44	85.54	88.02	85.48	88.00
1995	82.63	82.84	81.86	83.14	81.41	82.28
2512	81.39	82.10	79.98	80.25	80.01	79.94
3162	79.47	79.95	78.28	77.79	76.42	76.94
3981	77.48	77.48	77.41	76.09	74.65	74.48

Table 23. Section N8 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	74.96	72.97	73.96	71.15	75.68	71.93
398	74.04	72.13	74.50	71.77	74.65	72.01
501	78.18	74.52	77.79	74.07	78.24	74.59
631	80.87	79.11	80.75	78.67	80.86	79.02
794	82.54	84.79	82.07	84.15	82.61	84.55
1000	84.48	87.97	84.89	87.92	85.16	88.16
1259	87.23	88.02	87.06	88.11	87.25	88.13
1585	86.75	86.58	86.76	86.65	86.92	86.64
1995	81.29	81.25	81.27	81.42	81.45	81.85
2512	79.73	79.84	80.11	80.09	79.94	80.41
3162	76.62	77.61	76.77	77.74	76.94	77.89
3981	71.81	73.84	71.51	73.61	71.57	73.74

Table 24. Section N9 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.89	83.78	77.19	71.78	75.93	71.75
398	89.71	87.54	77.91	75.04	78.39	76.14
501	87.97	85.69	82.30	78.91	81.76	78.28
631	87.48	85.24	84.58	80.90	84.01	80.85
794	88.63	87.57	87.42	84.79	87.46	84.93
1000	94.16	94.05	93.12	92.88	93.38	92.89
1259	89.39	91.86	88.78	91.92	88.94	91.65
1585	87.70	89.87	87.00	89.52	86.91	89.58
1995	83.26	84.23	82.72	83.81	82.75	83.68
2512	81.50	82.82	80.21	81.65	80.56	81.26
3162	79.43	80.20	76.97	78.28	76.65	78.15
3981	77.13	77.87	74.56	76.13	74.55	75.76

Table 25. Section N9 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	73.94	70.88	73.93	70.10	74.47	71.10
398	74.72	72.16	73.17	71.14	74.38	72.30
501	78.18	74.44	77.72	73.17	78.36	74.48
631	81.39	79.05	80.85	78.78	80.80	78.84
794	82.35	84.64	81.73	83.88	82.81	84.32
1000	85.17	88.30	84.64	87.50	85.26	88.35
1259	87.09	88.00	86.17	87.15	86.80	87.93
1585	86.45	85.99	86.04	86.03	86.75	86.64
1995	81.26	81.02	81.41	81.56	81.74	81.88
2512	79.52	79.63	79.32	79.99	79.65	80.32
3162	76.65	77.55	76.33	77.18	76.92	77.83
3981	71.95	73.36	71.29	72.99	71.68	73.42

Table 26. Section N10 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.19	84.08	76.72	72.01	76.21	71.59
398	90.03	87.43	77.89	74.75	78.13	75.08
501	87.98	85.81	80.90	77.87	81.16	77.81
631	87.45	85.11	83.89	80.52	84.16	80.10
794	88.74	87.45	87.13	84.88	87.49	84.66
1000	94.70	94.45	93.34	92.87	93.21	93.10
1259	89.48	91.99	88.89	91.52	88.77	91.65
1585	86.97	89.50	86.54	89.13	86.28	88.90
1995	83.30	84.10	82.37	83.19	82.33	83.00
2512	81.88	82.38	80.39	80.87	80.52	81.02
3162	79.79	80.39	76.71	77.88	76.52	77.75
3981	77.52	77.87	74.52	75.70	74.54	75.48

Table 27. Section N10 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.70	72.84	77.57	72.58	77.85	73.37
398	76.25	73.57	76.51	73.55	76.53	74.11
501	80.24	76.71	80.02	76.63	80.23	77.01
631	82.60	80.61	82.13	80.42	82.20	80.59
794	82.93	84.78	82.89	84.63	82.97	84.65
1000	84.80	87.87	85.27	87.87	85.26	88.00
1259	84.74	86.07	84.59	85.88	84.45	86.15
1585	83.06	82.77	83.39	83.52	83.26	83.55
1995	78.80	78.84	78.70	79.14	78.97	79.35
2512	76.64	77.51	76.90	77.94	76.84	78.07
3162	74.00	74.38	74.09	74.52	74.36	74.73
3981	69.30	70.11	69.00	70.15	69.13	70.01

Table 28. Section N11 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.91	84.27	78.06	73.66	78.51	72.70
398	89.91	87.86	79.84	77.04	79.74	76.64
501	88.56	86.06	83.82	79.23	83.52	79.32
631	88.12	85.44	85.04	81.53	85.07	81.20
794	88.90	88.05	87.90	85.98	87.90	85.68
1000	93.57	93.56	92.24	92.42	92.58	92.56
1259	88.31	91.18	87.20	90.32	87.52	90.75
1585	85.29	87.63	84.14	86.54	83.98	86.33
1995	81.50	82.25	79.76	80.75	79.92	80.80
2512	80.85	81.30	78.49	78.89	78.84	79.07
3162	79.00	79.40	74.64	75.47	74.42	74.88
3981	76.16	76.25	71.83	72.62	71.47	72.02

Table 29. Section N11 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.72	72.62	76.98	75.96	82.36	88.59
398	75.38	73.24	76.59	75.50	78.99	85.75
501	79.35	75.45	79.39	75.79	79.48	76.37
631	81.37	79.88	81.88	80.04	81.73	79.91
794	82.66	84.25	82.68	84.55	82.85	84.73
1000	84.67	88.14	85.06	88.02	85.30	88.12
1259	84.66	86.14	85.04	86.32	85.08	86.36
1585	83.30	83.11	83.48	83.48	83.54	83.72
1995	78.90	79.26	79.15	79.58	79.28	79.80
2512	76.97	77.75	76.92	78.03	76.98	78.24
3162	74.36	74.72	74.33	74.73	74.51	74.92
3981	69.34	70.53	69.38	70.31	69.23	70.40

Table 30. Section N12 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.83	84.82	78.75	73.48	78.31	73.18
398	90.14	88.13	79.94	76.63	79.69	77.26
501	87.99	85.86	83.79	79.70	83.71	79.21
631	88.11	85.55	85.43	82.12	84.95	81.95
794	89.04	88.39	88.25	86.40	87.58	86.38
1000	93.54	93.80	92.09	92.42	91.23	91.86
1259	88.63	91.17	87.30	90.24	86.76	89.73
1585	85.46	87.29	83.98	86.22	83.51	85.64
1995	81.60	82.51	79.68	80.78	79.48	80.67
2512	80.83	81.29	78.40	78.88	78.00	78.71
3162	78.83	78.97	74.51	75.12	73.89	74.63
3981	75.28	75.72	71.41	72.21	71.04	71.55

Table 31. Section N12 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	74.94	71.18	75.76	71.34	75.47	71.26
398	74.92	72.26	74.80	72.25	74.94	72.08
501	79.07	75.71	78.68	75.22	79.38	75.90
631	81.80	80.28	81.54	80.02	81.63	79.78
794	82.14	84.69	82.25	84.65	82.11	84.52
1000	84.50	87.69	84.48	87.72	84.38	87.42
1259	84.96	86.25	84.88	86.45	84.80	86.07
1585	83.19	83.04	83.62	83.62	83.45	83.59
1995	78.87	78.80	78.98	79.02	78.90	79.26
2512	76.80	77.44	76.81	77.46	76.41	77.48
3162	73.91	74.19	73.91	74.40	73.93	74.44
3981	69.13	69.92	69.07	69.87	68.94	69.82

Table 32. Section N13 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	84.02	84.86	77.17	72.32	77.09	72.70
398	89.93	87.98	78.30	75.91	78.56	76.29
501	87.53	85.23	82.14	78.53	82.33	78.97
631	87.62	85.52	84.70	81.23	84.96	81.72
794	88.57	88.07	87.72	85.56	87.31	85.76
1000	93.16	93.49	92.00	92.18	91.39	91.65
1259	88.41	90.94	87.59	90.73	87.27	90.29
1585	85.90	87.63	84.44	86.92	84.22	86.54
1995	81.46	82.39	80.04	81.24	79.69	81.21
2512	80.46	81.36	78.64	79.27	78.15	79.32
3162	79.22	79.44	74.79	75.74	74.16	75.18
3981	76.00	76.22	72.05	72.65	71.53	72.10

Table 33. Section N13 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.54	73.00	76.65	72.46	76.70	72.90
398	75.98	73.90	75.86	73.68	75.56	73.10
501	80.53	76.61	79.60	75.67	79.75	76.13
631	82.22	80.31	81.47	80.01	82.01	79.98
794	83.27	85.10	82.83	84.70	83.16	84.47
1000	85.36	89.08	85.28	88.35	85.01	88.38
1259	85.81	87.17	85.24	86.60	85.40	86.80
1585	84.45	84.04	84.23	84.27	84.21	84.17
1995	79.93	79.81	79.96	80.00	79.86	80.22
2512	77.79	78.58	77.80	78.50	77.57	78.86
3162	74.87	75.30	74.53	75.18	74.77	75.24
3981	69.94	70.74	69.38	70.37	69.30	70.37

Table 34. Section E1 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.06	79.54	77.95	73.00	77.31	73.15
398	84.02	82.01	79.32	76.34	79.02	76.48
501	85.56	82.11	83.47	79.52	83.09	78.89
631	86.33	83.25	84.99	81.74	85.36	82.01
794	88.80	87.00	87.97	86.17	88.42	86.30
1000	92.67	92.83	91.68	92.11	92.56	92.78
1259	88.23	91.26	87.69	90.78	87.90	91.12
1585	85.81	88.55	85.07	87.49	85.57	88.05
1995	81.61	83.09	80.87	82.47	81.13	82.82
2512	79.68	81.29	78.52	80.83	79.24	81.04
3162	76.54	78.04	74.77	77.14	75.32	77.22
3981	73.64	75.61	72.36	74.66	72.61	74.59

Table 35. Section E1 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	75.31	71.65	75.14	71.74	76.23	71.98
398	75.18	72.29	75.20	72.09	75.45	72.74
501	78.04	74.12	77.89	74.05	78.48	74.13
631	80.02	78.56	80.09	78.47	80.42	78.57
794	80.82	83.14	80.66	83.26	80.74	83.20
1000	83.83	86.33	83.79	86.59	83.93	86.63
1259	84.18	85.47	84.03	85.61	84.47	85.93
1585	82.73	82.94	82.68	83.21	83.31	83.54
1995	79.38	79.04	79.48	79.25	79.77	79.47
2512	77.96	78.78	77.83	78.78	78.48	79.31
3162	75.73	76.56	75.64	76.47	75.91	76.76
3981	70.94	73.09	70.41	73.07	70.60	73.29

Table 36. Section E2 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.11	79.47	79.27	72.46	79.15	72.48
398	84.08	81.43	79.34	76.29	79.67	75.92
501	86.57	84.18	82.41	79.22	82.12	78.22
631	87.06	84.63	83.85	80.88	83.47	80.68
794	86.84	85.24	86.30	84.01	86.16	83.75
1000	91.28	91.57	90.58	90.61	90.83	90.75
1259	87.76	89.25	86.61	88.29	86.38	88.23
1585	84.41	85.61	83.50	84.73	83.27	84.60
1995	80.59	81.36	79.26	80.98	79.29	80.78
2512	79.14	80.60	77.66	79.46	77.79	79.07
3162	76.45	78.06	73.59	75.88	73.38	75.62
3981	74.47	75.58	71.04	73.40	70.89	72.96

Table 37. Section E2 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.22	74.54	78.86	74.41	79.64	74.70
398	77.94	74.82	77.48	74.22	77.69	75.31
501	79.57	76.11	79.49	75.92	80.34	76.96
631	81.67	79.82	81.30	80.10	82.07	80.91
794	81.40	84.42	80.98	84.69	82.06	84.93
1000	84.66	87.72	84.52	87.57	85.41	88.35
1259	85.30	86.68	85.27	86.78	85.97	87.24
1585	83.29	83.67	83.42	83.91	84.18	84.25
1995	80.27	79.83	80.47	80.12	81.11	80.73
2512	78.58	79.49	78.82	80.00	79.20	80.54
3162	76.51	77.45	76.47	77.83	77.30	78.55
3981	72.41	74.95	72.52	75.31	73.24	75.89

Table 38. Section E3 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.72	77.23	81.73	75.71	80.70	73.74
398	83.83	80.81	82.27	78.27	81.46	77.33
501	88.94	87.85	83.83	81.44	83.29	80.96
631	87.71	85.76	84.58	81.67	84.22	81.49
794	87.24	85.88	86.87	85.08	86.80	84.42
1000	91.53	92.24	91.20	91.85	90.96	91.65
1259	88.18	90.07	88.15	89.46	87.78	89.23
1585	84.56	85.76	84.29	85.25	84.18	84.94
1995	80.79	81.66	80.52	81.76	80.28	81.44
2512	78.86	80.53	77.98	80.17	78.05	79.65
3162	76.17	78.00	74.03	76.59	73.49	76.37
3981	74.13	75.84	72.68	74.90	72.31	74.37

Table 39. Section E3 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.17	72.81	77.19	73.44	76.33	73.00
398	77.09	74.14	77.36	74.29	77.13	74.13
501	80.06	76.29	80.31	76.76	79.90	75.84
631	82.10	80.73	82.38	80.82	82.30	80.47
794	82.95	85.98	82.95	86.23	83.38	86.18
1000	86.52	89.20	86.31	89.34	86.32	89.49
1259	86.84	88.01	86.77	87.77	86.51	87.84
1585	85.08	84.63	84.80	84.50	84.94	84.58
1995	80.60	80.16	80.42	80.20	80.28	80.61
2512	78.47	78.36	78.26	78.51	78.03	78.89
3162	75.25	75.91	75.52	75.97	75.35	76.18
3981	71.88	72.78	71.97	72.47	71.69	72.46

Table 40. Section E4 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.57	78.86	79.90	73.94	79.57	72.87
398	84.58	82.32	80.81	77.51	80.46	77.61
501	88.36	87.18	84.12	80.76	83.78	80.25
631	87.66	85.61	85.88	82.59	85.50	82.71
794	88.66	86.90	88.85	86.57	88.83	86.80
1000	93.37	93.95	93.54	93.95	93.44	93.61
1259	90.02	92.02	89.67	92.28	89.74	91.76
1585	86.20	88.08	85.72	87.92	85.61	87.48
1995	82.04	82.03	81.21	81.72	81.29	81.55
2512	79.53	79.97	79.12	78.52	79.10	79.01
3162	77.24	77.53	75.23	75.42	75.28	75.52
3981	75.57	75.28	73.97	73.49	73.66	73.22

Table 41. Section E4 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.06	72.83	76.80	72.99	76.85	72.93
398	76.84	74.21	76.16	73.86	76.71	73.95
501	79.93	76.41	79.65	76.14	79.36	76.06
631	82.34	80.68	82.10	80.45	82.82	81.15
794	82.91	86.13	83.07	85.75	83.01	86.06
1000	86.23	89.07	86.08	88.86	86.22	89.37
1259	86.61	87.75	86.59	87.65	86.60	87.84
1585	84.63	84.01	84.98	84.51	84.76	84.43
1995	80.05	79.38	80.35	80.31	80.23	80.13
2512	78.15	77.99	78.52	78.71	78.19	78.40
3162	74.97	75.63	75.09	75.95	75.20	75.82
3981	71.90	72.56	71.64	72.41	71.66	72.40

Table 42. Section E5 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.11	79.61	79.70	74.22	79.30	73.33
398	87.60	84.73	80.37	77.30	80.36	77.37
501	87.97	85.99	83.10	80.75	82.98	80.55
631	87.46	85.08	85.84	82.71	85.45	82.91
794	88.69	86.88	88.33	86.17	88.18	86.43
1000	93.16	93.82	93.24	93.71	93.19	93.95
1259	90.33	92.01	89.73	91.94	89.58	91.79
1585	86.06	87.81	85.52	87.16	85.70	87.49
1995	81.59	81.72	80.90	81.16	80.90	81.20
2512	79.72	79.77	78.37	78.32	78.61	78.63
3162	77.21	77.40	74.50	75.41	74.70	75.30
3981	75.23	74.92	74.01	73.42	73.85	73.36

Table 43. Section E5 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.13	73.19	77.21	73.23	76.64	72.57
398	76.60	74.02	76.58	73.84	77.42	73.57
501	79.90	75.96	80.37	76.69	79.97	76.31
631	82.66	80.85	82.59	81.16	82.15	80.80
794	82.67	85.77	83.08	86.10	82.41	85.89
1000	86.01	89.26	86.58	89.39	85.87	89.03
1259	86.66	88.14	86.78	88.05	86.41	87.86
1585	84.99	84.22	85.07	84.54	84.88	84.61
1995	80.15	79.84	80.42	80.12	80.16	80.17
2512	78.03	78.28	78.35	78.76	78.10	78.52
3162	75.03	75.60	75.17	75.93	74.86	75.82
3981	71.54	72.43	71.83	72.49	71.50	72.37

Table 44. Section E6 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.83	74.99	79.14	72.77	79.42	73.45
398	82.57	80.10	80.86	77.45	80.67	77.86
501	84.50	82.52	83.62	81.08	83.59	80.87
631	86.11	83.04	85.72	82.51	85.68	82.71
794	88.46	86.20	88.30	85.62	88.48	86.24
1000	93.06	93.48	93.20	93.55	93.08	93.71
1259	89.83	91.75	89.64	91.53	89.60	91.75
1585	85.66	87.64	85.53	87.71	85.65	87.41
1995	80.71	81.34	80.79	81.31	81.04	81.40
2512	78.79	78.59	78.48	78.23	78.70	78.37
3162	75.38	76.01	74.61	75.22	74.68	75.35
3981	74.44	74.08	74.06	73.36	73.99	73.49

Table 45. Section E6 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.58	72.57	77.42	72.79	76.98	73.51
398	76.50	73.55	76.44	73.35	76.98	74.65
501	79.91	75.89	79.91	76.14	79.60	75.46
631	82.63	80.66	82.22	80.51	81.86	80.88
794	82.83	85.55	82.85	85.77	82.57	86.10
1000	85.46	88.60	85.90	88.78	85.45	88.57
1259	85.82	87.28	85.95	87.00	86.27	87.40
1585	83.97	83.45	84.13	83.97	84.58	84.03
1995	79.75	79.65	80.11	80.00	79.81	80.15
2512	77.35	77.83	77.60	78.35	77.68	78.72
3162	74.61	75.27	74.75	75.46	74.60	75.59
3981	71.13	71.60	71.35	71.86	71.21	71.93

Table 46. Section E7 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	78.97	73.57	79.43	73.42	80.99	74.18
398	80.50	77.13	81.26	77.75	81.24	78.32
501	83.58	81.26	83.67	80.63	85.03	82.08
631	85.33	82.40	85.82	82.49	87.16	83.80
794	88.29	86.17	88.51	86.21	88.40	87.06
1000	92.56	93.26	92.76	93.24	92.11	92.93
1259	89.18	91.22	89.09	91.02	89.16	90.05
1585	84.66	86.49	84.83	86.48	84.91	85.93
1995	80.10	80.50	80.31	80.63	80.56	81.12
2512	78.29	78.05	78.68	78.17	78.58	78.43
3162	74.65	75.04	74.56	74.97	74.32	75.06
3981	73.18	73.01	73.25	73.02	73.01	73.01

Table 47. Section E7 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	74.61	70.40	75.00	71.44	74.01	70.36
398	74.66	72.13	75.31	72.66	73.91	71.16
501	77.93	74.99	79.09	74.87	77.79	73.97
631	81.14	79.93	81.92	79.81	80.09	78.97
794	81.40	85.35	81.66	85.23	81.55	84.90
1000	85.33	87.63	85.33	87.88	84.49	87.21
1259	86.27	87.29	86.59	87.69	86.04	87.27
1585	84.76	84.60	84.82	84.72	85.29	85.95
1995	79.22	78.82	79.52	79.58	79.44	79.87
2512	78.07	77.65	77.91	78.17	77.98	78.87
3162	74.41	75.25	74.42	75.41	74.62	75.81
3981	71.12	72.66	70.97	72.32	71.14	72.77

Table 48. Section E8 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.72	72.20	77.73	72.46	78.01	72.10
398	79.91	76.63	79.37	76.51	79.60	76.21
501	82.90	80.59	82.82	80.00	82.33	80.12
631	85.61	82.47	85.19	81.77	85.34	82.12
794	87.74	85.39	87.71	84.93	88.13	85.53
1000	92.77	93.22	92.66	93.16	92.94	93.34
1259	89.35	91.65	88.54	91.16	89.27	91.59
1585	85.42	87.56	85.29	87.32	85.88	87.47
1995	80.66	81.06	80.40	80.92	80.91	81.15
2512	78.43	78.17	78.04	77.97	78.34	78.36
3162	74.71	75.13	74.31	74.78	74.18	75.10
3981	73.80	73.12	73.72	72.99	73.82	73.23

Table 49. Section E8 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	67.96	65.44	70.89	66.71	69.45	65.37
398	67.74	66.11	68.43	66.90	68.21	66.74
501	71.35	68.69	71.39	68.84	71.31	68.06
631	74.63	73.90	75.43	74.16	74.92	74.04
794	78.60	81.08	79.06	81.88	79.06	81.23
1000	80.84	82.58	81.21	83.18	80.57	82.47
1259	85.62	86.15	86.06	87.14	85.37	86.31
1585	87.27	88.10	87.22	88.86	86.95	88.33
1995	80.40	81.08	80.65	81.91	80.38	81.59
2512	79.36	80.67	79.62	81.19	79.38	80.84
3162	75.36	76.93	75.55	77.52	75.80	77.42
3981	70.35	73.05	70.66	73.52	70.21	73.46

Table 50. Section E9 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	72.65	67.71	72.18	67.83	72.71	67.67
398	72.67	70.16	72.44	70.27	72.37	70.57
501	76.16	73.47	76.18	73.74	76.12	74.06
631	80.88	79.35	81.00	79.25	80.75	79.34
794	83.39	80.64	83.17	80.03	83.08	80.28
1000	88.57	89.25	88.20	88.81	88.22	89.16
1259	87.69	90.19	87.49	89.93	87.77	90.20
1585	86.27	86.58	86.18	86.18	86.22	86.32
1995	81.76	82.61	81.62	82.60	81.71	82.78
2512	78.17	79.64	77.96	79.80	77.96	79.76
3162	73.68	75.70	73.42	75.79	73.71	75.74
3981	71.82	73.06	71.82	73.29	71.88	73.31

Table 51. Section E9 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	68.63	64.78	68.87	64.55	68.87	64.55
398	66.75	65.42	66.50	64.69	66.50	64.69
501	70.07	67.69	70.08	67.77	70.08	67.77
631	73.70	73.33	73.45	72.89	73.45	72.89
794	77.57	78.12	77.65	78.21	77.65	78.21
1000	79.25	80.00	79.25	79.67	79.25	79.67
1259	84.37	84.20	84.31	84.08	84.31	84.08
1585	86.22	85.75	86.25	85.61	86.25	85.61
1995	78.89	79.58	78.85	79.63	78.85	79.63
2512	77.39	78.47	77.20	78.35	77.20	78.35
3162	74.04	75.52	74.14	75.52	74.14	75.52
3981	68.51	71.68	68.39	71.49	68.39	71.49

Table 52. Section S1 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.38	80.54	76.59	71.71	76.75	72.27
398	83.53	81.83	78.13	74.72	77.96	75.06
501	84.17	81.27	81.33	77.49	81.57	77.58
631	85.58	82.51	84.05	80.37	83.57	80.40
794	87.86	86.49	87.35	85.02	86.81	84.28
1000	93.04	93.05	92.67	92.65	92.81	92.72
1259	88.55	91.31	88.07	91.09	88.14	91.17
1585	86.04	88.40	85.13	87.73	85.35	87.94
1995	81.52	82.95	80.95	82.45	81.23	82.49
2512	80.12	81.10	79.21	80.30	79.35	80.38
3162	77.21	78.30	74.95	76.55	75.03	76.24
3981	76.22	75.87	72.84	73.49	72.68	73.17

Table 53. Section S1 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	73.41	68.61	78.68	83.01	76.89	77.52
398	71.45	68.54	73.60	79.76	72.12	71.32
501	74.57	71.49	75.03	72.49	75.06	72.43
631	77.01	76.55	77.43	76.27	77.95	77.17
794	78.64	80.38	78.86	80.89	79.36	80.99
1000	81.86	83.57	82.86	84.40	82.27	83.56
1259	84.30	84.40	84.40	84.68	83.93	84.37
1585	83.51	82.87	83.64	83.53	83.71	83.21
1995	78.48	78.02	78.69	78.62	78.44	78.31
2512	76.71	76.66	76.78	77.16	76.43	77.30
3162	73.55	73.86	73.91	74.51	73.47	74.22
3981	68.66	69.84	68.94	70.21	68.49	69.86

Table 54. Section S2 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.49	79.19	75.04	70.25	74.90	70.36
398	81.46	79.96	75.56	72.64	75.18	73.07
501	81.79	79.87	79.50	75.90	78.77	75.83
631	82.09	80.09	81.34	79.15	81.05	79.02
794	84.24	82.41	83.84	81.41	83.91	82.07
1000	88.95	89.48	88.45	88.72	88.64	88.90
1259	86.48	89.88	86.06	89.20	86.34	89.52
1585	83.98	86.06	83.76	85.53	83.74	85.63
1995	79.26	80.28	78.58	79.92	78.87	80.30
2512	77.97	78.44	77.27	78.03	77.65	78.15
3162	74.82	75.37	73.61	74.24	73.62	74.36
3981	72.96	73.19	70.86	71.56	71.15	72.05

Table 55. Section S2 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.61	86.73	76.49	72.60	75.60	71.46
398	77.68	83.53	75.01	72.95	75.98	73.23
501	78.60	76.08	76.84	73.91	80.28	76.42
631	81.37	81.31	79.08	79.18	82.00	81.75
794	80.62	83.97	79.40	82.32	79.70	83.39
1000	84.22	85.89	83.21	84.67	83.81	85.12
1259	84.35	84.92	84.18	84.69	83.64	84.17
1585	82.85	82.13	82.97	82.44	82.55	82.01
1995	77.66	77.14	77.58	77.64	77.09	77.14
2512	75.88	75.75	75.93	76.25	75.28	75.97
3162	73.25	73.16	73.01	73.43	72.76	73.36
3981	68.64	69.44	68.27	69.32	68.11	69.20

Table 56. Section S3 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.99	79.92	75.29	70.64	74.09	69.48
398	80.35	79.13	76.65	73.63	75.69	72.65
501	82.16	79.10	80.32	76.53	79.64	76.56
631	83.59	80.81	82.53	79.89	81.87	79.91
794	84.57	83.53	84.52	83.47	83.77	82.89
1000	88.98	89.15	88.63	88.96	87.87	88.02
1259	86.23	89.16	85.93	89.13	85.84	88.48
1585	83.89	85.55	83.47	85.36	83.21	85.20
1995	78.66	80.10	78.35	79.68	78.30	79.89
2512	77.62	78.38	76.96	77.75	76.92	77.63
3162	74.44	74.95	73.37	74.00	72.89	73.63
3981	72.18	72.50	70.70	71.63	70.39	71.10

Table 57. Section S3 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.55	75.75	79.94	75.71	79.45	75.42
398	80.67	76.66	79.37	76.93	78.84	76.56
501	85.36	81.55	84.85	81.28	85.02	81.27
631	87.39	87.50	87.43	87.78	86.81	86.91
794	84.30	88.84	84.38	88.67	83.94	88.49
1000	86.46	88.10	85.57	87.71	85.32	87.56
1259	81.08	83.83	80.97	83.48	81.36	83.58
1585	79.81	79.34	77.79	78.00	79.83	79.62
1995	75.51	74.68	74.21	73.25	75.28	74.92
2512	74.23	74.61	74.26	73.76	74.46	74.60
3162	72.66	73.46	72.18	72.85	72.28	72.46
3981	71.10	73.49	69.61	71.42	69.53	71.81

Table 58. Section S4 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.45	80.47	82.62	76.22	82.70	76.29
398	86.14	82.83	84.63	80.06	83.79	80.32
501	89.91	85.66	89.18	85.17	88.77	84.87
631	92.08	90.50	91.58	90.45	91.30	90.20
794	88.36	90.56	89.21	91.14	87.86	90.39
1000	89.68	89.80	89.57	90.20	89.25	89.59
1259	81.24	85.72	82.04	86.80	80.61	85.58
1585	76.33	77.92	75.05	78.58	74.58	76.86
1995	75.31	75.49	73.75	74.28	73.69	74.54
2512	75.59	76.12	74.82	74.66	74.09	74.62
3162	72.39	73.38	71.19	71.51	70.28	71.07
3981	69.35	69.94	67.90	68.60	67.14	67.84

Table 59. Section S4 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	75.26	70.88	75.53	71.28	79.41	75.47
398	73.96	72.09	73.24	71.96	79.41	77.16
501	79.00	74.50	78.20	73.96	85.44	81.77
631	82.04	79.69	80.98	79.04	87.31	87.36
794	81.25	83.29	80.94	83.43	84.15	89.05
1000	83.66	85.82	83.56	85.69	85.73	87.90
1259	86.13	86.61	86.21	86.92	78.19	82.31
1585	85.29	85.12	85.71	85.64	73.86	74.88
1995	79.35	79.32	79.60	80.03	72.18	71.02
2512	77.79	77.72	77.59	78.21	72.57	72.18
3162	74.94	75.75	75.01	75.94	70.68	70.00
3981	70.46	73.71	70.10	71.83	66.44	66.64

Table 60. Section S5 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.12	78.62	76.97	72.23	75.59	71.16
398	82.82	81.01	78.59	75.83	77.09	74.11
501	83.02	80.45	82.49	78.15	80.90	76.60
631	83.68	81.21	84.92	81.81	83.25	80.47
794	86.02	83.95	86.30	84.12	84.84	83.46
1000	90.93	90.75	91.06	90.56	89.32	89.49
1259	86.88	89.78	86.69	89.78	85.96	88.89
1585	85.05	87.60	84.97	87.45	84.06	86.10
1995	80.54	81.84	80.07	81.81	79.34	80.98
2512	78.08	78.86	77.66	79.88	77.00	78.38
3162	75.24	76.06	74.65	75.85	73.47	74.76
3981	73.00	73.58	72.83	73.57	71.27	72.12

Table 61. Section S5 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	71.53	68.24	72.57	68.32	72.64	68.82
398	70.86	69.11	71.51	69.15	71.68	69.65
501	74.40	71.47	74.84	71.62	74.72	71.94
631	77.74	76.26	78.00	76.58	77.75	76.58
794	80.23	82.35	81.11	82.20	80.87	82.33
1000	82.69	85.69	83.01	85.73	83.14	85.73
1259	86.04	86.93	85.59	86.75	86.27	87.15
1585	86.31	86.48	86.26	86.60	86.73	86.75
1995	81.05	81.15	81.13	81.21	81.24	81.58
2512	79.74	79.77	79.32	79.88	79.86	80.23
3162	76.15	77.10	76.36	77.06	76.64	77.77
3981	70.31	73.12	70.78	73.12	70.78	73.31

Table 62. Section S6 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.05	78.74	75.56	71.00	73.13	69.37
398	82.77	81.06	76.14	73.57	75.13	72.40
501	82.36	80.39	79.45	76.08	78.88	75.83
631	83.36	80.18	82.60	79.24	81.51	79.11
794	86.25	83.61	85.74	82.49	85.35	82.94
1000	92.18	91.59	92.12	91.67	91.64	90.81
1259	87.81	90.96	87.67	90.57	87.78	90.15
1585	86.83	89.30	86.64	88.75	86.17	88.76
1995	82.92	84.18	82.54	83.71	82.48	83.63
2512	80.06	81.84	79.72	81.26	79.66	81.22
3162	77.00	78.48	75.92	77.58	75.54	77.34
3981	74.70	75.89	74.19	75.24	73.19	74.53

Table 63. Section S6 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	72.70	69.01	71.45	68.50	74.22	69.45
398	71.89	69.53	71.49	69.46	73.33	70.17
501	75.26	72.58	75.27	71.96	76.29	73.19
631	78.58	76.90	77.80	76.38	78.69	77.28
794	80.84	82.70	80.45	82.42	81.06	82.21
1000	83.13	85.75	82.77	85.61	83.76	85.93
1259	86.58	87.30	86.04	87.15	85.94	86.99
1585	86.48	86.49	86.31	86.43	86.23	86.32
1995	81.39	81.41	81.20	81.32	81.43	81.47
2512	79.79	79.73	79.90	80.14	79.66	79.85
3162	76.45	77.29	76.40	77.51	76.43	77.08
3981	70.75	73.27	70.19	73.17	70.61	73.09

Table 64. Section S7 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.04	79.61	75.59	70.14	73.51	69.18
398	83.98	82.28	76.44	73.44	74.83	73.16
501	82.92	81.29	80.42	76.37	79.33	76.74
631	83.99	81.00	82.53	79.32	81.94	80.54
794	85.83	83.22	85.88	83.14	85.60	83.21
1000	91.31	91.34	92.18	91.73	91.25	90.67
1259	88.07	90.64	87.78	90.90	87.70	90.17
1585	86.32	88.44	87.00	88.87	86.34	88.85
1995	82.49	83.39	82.83	83.94	82.66	83.74
2512	79.96	81.22	79.96	81.46	79.74	81.51
3162	76.94	78.23	76.07	77.95	75.76	77.73
3981	74.61	75.91	74.10	75.45	73.38	74.94

Table 65. Section S7 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.86	72.39	76.81	72.70	77.29	72.79
398	75.32	72.64	75.91	73.68	75.71	73.02
501	79.00	75.95	79.68	76.53	79.56	76.41
631	81.36	80.66	81.83	80.93	81.89	80.62
794	81.36	83.76	81.61	84.32	82.06	84.05
1000	84.46	86.72	85.21	87.28	84.96	87.10
1259	84.75	85.63	84.98	86.13	85.30	86.09
1585	82.89	82.57	83.58	83.06	83.53	83.25
1995	78.77	77.87	78.65	78.42	78.78	78.76
2512	76.21	76.76	76.32	76.95	76.50	77.44
3162	73.56	73.45	74.09	74.06	73.70	74.14
3981	69.10	69.79	69.35	69.79	69.08	70.07

Table 66. Section S8 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.93	79.73	78.84	73.54	79.05	73.81
398	84.34	82.11	79.71	76.40	80.06	76.94
501	85.58	82.49	83.45	79.66	83.84	79.69
631	86.10	82.77	85.27	82.62	85.64	82.76
794	87.02	85.99	85.93	85.21	87.05	86.04
1000	90.72	91.22	89.67	90.19	90.43	91.02
1259	86.83	89.96	85.91	88.69	86.83	89.82
1585	84.24	86.03	82.93	84.49	83.98	85.92
1995	79.38	80.12	78.24	79.20	79.30	80.26
2512	78.10	78.68	76.81	77.38	78.05	78.31
3162	75.12	75.41	73.33	73.61	74.11	74.43
3981	72.26	72.69	70.56	70.78	71.57	71.76

Table 67. Section S8 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.00	72.06	76.53	72.15	75.53	71.53
398	75.21	72.70	75.28	72.52	74.91	72.27
501	78.94	75.01	79.20	74.85	78.46	74.59
631	81.16	78.98	81.57	79.50	81.02	79.31
794	82.43	83.75	82.44	83.80	82.64	83.56
1000	84.74	87.97	84.96	87.93	85.37	87.97
1259	85.01	86.50	85.15	86.73	85.08	86.46
1585	83.88	83.81	83.80	83.59	83.96	84.04
1995	79.68	79.56	79.79	79.74	79.71	79.93
2512	77.53	78.22	77.48	78.68	77.48	78.79
3162	74.62	75.11	74.74	75.01	74.80	75.49
3981	69.44	70.58	69.24	70.42	69.32	70.41

Table 68. Section S9 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.54	79.32	77.49	72.63	77.30	71.95
398	84.42	82.65	78.57	75.14	78.47	75.76
501	84.79	82.03	81.97	78.17	82.47	78.52
631	85.26	81.82	84.54	80.81	84.51	80.76
794	87.67	85.50	87.31	84.73	87.08	84.75
1000	92.24	92.26	91.96	91.90	91.98	92.03
1259	87.52	90.62	87.43	90.32	87.60	90.32
1585	84.66	87.09	84.11	86.53	84.64	86.79
1995	80.47	81.51	79.64	80.73	80.46	81.25
2512	79.39	79.53	78.25	78.99	78.88	79.13
3162	76.23	76.51	74.07	75.02	74.83	75.29
3981	73.04	73.38	71.41	71.96	71.94	72.42

Table 69. Section S9 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	75.24	71.56	75.25	70.74	75.14	70.84
398	74.25	71.93	73.31	71.23	73.39	70.99
501	77.87	74.03	77.68	74.10	77.36	74.31
631	80.41	78.84	79.54	77.57	79.72	78.13
794	81.87	83.29	81.29	82.23	81.25	82.47
1000	84.26	87.19	84.28	86.71	84.60	86.96
1259	85.00	86.24	84.86	86.07	85.04	86.16
1585	84.30	84.01	84.25	84.04	84.43	84.11
1995	80.00	80.02	79.80	79.84	79.71	79.60
2512	78.16	78.66	77.80	78.43	77.73	78.55
3162	75.26	75.75	74.87	75.65	74.95	75.48
3981	69.79	71.22	69.59	71.13	69.52	70.94

Table 70. Section S10 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.42	72.54	75.13	70.51	76.02	71.05
398	75.05	72.80	76.72	73.85	77.43	74.55
501	79.69	76.35	80.55	76.72	80.83	77.00
631	82.08	80.75	82.95	79.28	83.34	79.57
794	82.04	84.49	85.81	82.66	86.22	83.05
1000	84.88	87.84	92.15	91.86	92.34	91.68
1259	85.78	86.71	87.41	90.24	87.65	90.07
1585	84.20	83.87	84.15	86.88	84.42	87.25
1995	79.41	79.25	80.44	81.27	80.70	81.56
2512	77.14	77.72	78.70	79.16	78.73	79.08
3162	74.48	75.05	74.62	75.63	74.78	75.45
3981	69.43	70.78	72.31	72.85	72.46	72.79

Table 71. Section S10 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.42	72.54	76.74	72.83	77.29	72.51
398	75.05	72.80	75.74	73.07	75.89	73.27
501	79.69	76.35	79.60	76.11	79.80	76.45
631	82.08	80.75	82.17	80.35	81.82	80.28
794	82.04	84.49	82.64	84.71	82.97	85.16
1000	84.88	87.84	84.92	87.82	84.99	87.80
1259	85.78	86.71	85.80	87.19	85.58	86.54
1585	84.20	83.87	84.14	84.15	84.35	84.21
1995	79.41	79.25	79.60	79.43	79.87	80.27
2512	77.14	77.72	77.10	78.00	77.83	78.57
3162	74.48	75.05	74.46	74.77	74.94	75.40
3981	69.43	70.78	69.51	70.58	70.03	71.16

Table 72. Section S11 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	81.63	79.45	79.67	74.00	79.76	74.49
398	84.10	81.84	81.02	76.85	80.00	76.96
501	85.67	82.31	84.01	80.02	83.98	79.38
631	86.18	82.33	86.17	82.23	85.90	82.37
794	88.27	86.11	87.74	85.75	88.17	85.88
1000	92.34	92.58	92.23	92.31	92.48	92.35
1259	87.28	90.75	87.50	90.41	87.35	90.77
1585	84.45	86.98	84.39	86.64	84.48	86.83
1995	80.30	81.24	80.01	81.05	80.51	81.08
2512	78.73	79.55	78.39	79.06	78.61	78.87
3162	75.98	76.23	75.09	75.26	74.69	75.15
3981	72.85	73.76	72.34	72.69	72.35	72.65

Table 73. Section S11 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	75.93	71.38	75.30	70.68	75.01	70.99
398	74.42	72.03	73.85	71.13	74.09	71.66
501	78.78	74.93	77.49	73.51	78.35	74.57
631	81.08	79.64	80.50	79.09	80.90	79.48
794	82.51	84.08	82.06	84.04	82.45	83.84
1000	84.37	87.41	84.34	86.92	84.53	86.93
1259	86.09	87.48	85.86	87.14	85.63	86.97
1585	85.17	85.10	85.36	85.48	85.22	85.11
1995	80.41	80.46	80.70	80.59	80.56	80.59
2512	78.43	78.98	78.69	79.27	78.46	79.39
3162	75.90	76.56	75.64	76.44	75.31	76.43
3981	70.64	72.50	70.39	72.36	70.20	72.22

Table 74. Section S12 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.07	78.69	77.32	73.05	77.14	72.70
398	82.60	80.85	78.82	75.80	78.96	76.00
501	84.11	81.39	82.73	79.24	82.46	78.37
631	84.80	81.71	84.63	81.73	84.92	81.38
794	87.59	85.21	87.55	85.07	87.88	85.34
1000	92.81	92.72	92.15	92.09	92.50	92.60
1259	88.30	91.34	88.05	91.14	88.32	91.30
1585	85.71	88.52	85.72	88.27	85.89	88.84
1995	81.86	83.19	81.55	82.64	81.94	83.20
2512	80.09	81.46	79.59	80.41	79.86	80.96
3162	76.91	78.08	75.62	76.77	75.85	77.51
3981	74.29	75.30	73.01	74.23	73.51	74.68

Table 75. Section S12 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	74.74	70.35	74.43	70.03	75.36	70.32
398	72.69	70.96	72.48	70.58	74.28	71.01
501	76.85	73.97	76.31	72.68	77.30	74.44
631	79.37	78.11	78.69	77.16	79.99	78.48
794	80.75	82.81	80.37	81.93	81.38	83.15
1000	83.86	86.05	83.37	85.41	84.01	86.53
1259	85.34	86.09	84.81	86.00	85.21	86.23
1585	84.39	84.40	83.81	83.77	84.41	84.49
1995	79.50	79.54	79.51	79.24	79.75	79.99
2512	77.67	78.11	77.32	78.13	77.75	78.48
3162	74.70	75.80	74.44	75.67	74.63	75.97
3981	69.64	71.86	69.24	71.64	69.16	71.76

Table 76. Section S13 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	78.24	77.96	76.08	71.03	75.70	71.64
398	81.97	80.16	77.37	74.36	76.90	73.48
501	82.88	80.38	80.68	77.07	80.36	76.90
631	82.95	81.06	83.09	80.46	83.13	80.40
794	85.18	83.72	85.56	83.58	86.11	83.77
1000	90.04	89.81	90.45	90.32	90.85	90.42
1259	86.91	89.83	86.95	90.01	87.14	90.25
1585	84.33	86.95	84.15	87.04	84.73	87.18
1995	80.02	81.78	79.90	81.61	80.26	82.08
2512	78.60	79.82	78.34	79.65	78.74	80.09
3162	75.41	76.79	74.50	76.01	74.81	76.63
3981	72.49	74.01	71.72	73.31	72.09	73.51

Table 77. Section S13 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	76.56	72.72	76.16	71.62	76.62	72.17
398	75.83	73.22	75.06	72.37	76.17	73.67
501	80.05	76.28	79.36	75.54	79.85	76.05
631	82.41	81.33	81.48	80.41	82.31	81.11
794	83.31	85.25	82.27	84.76	82.43	85.29
1000	85.17	88.00	84.69	87.40	85.60	88.20
1259	85.90	87.38	85.57	86.83	85.95	87.02
1585	84.59	84.46	84.04	84.04	84.80	84.98
1995	79.90	79.86	79.71	79.86	80.34	80.52
2512	78.21	78.78	77.71	78.67	78.57	79.33
3162	75.22	76.33	74.49	75.99	75.72	76.85
3981	70.52	72.85	69.80	72.57	70.78	72.83

Table 78. Section W1 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.51	83.02	78.93	73.95	80.24	74.20
398	88.37	86.19	80.70	77.53	80.11	77.22
501	88.16	85.72	84.13	80.09	83.88	79.87
631	87.52	85.08	85.53	81.81	86.04	82.59
794	88.96	87.67	88.36	86.31	88.53	87.02
1000	93.16	93.42	92.89	93.21	92.73	93.27
1259	88.72	91.39	88.37	91.19	88.24	91.01
1585	86.23	88.12	85.33	87.26	85.03	86.93
1995	81.52	82.38	80.57	81.68	80.53	81.47
2512	80.39	81.17	79.20	79.39	79.01	79.08
3162	78.39	78.68	75.07	75.65	74.78	75.37
3981	75.10	75.10	72.20	72.65	71.89	72.44

Table 79. Section W1 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.64	74.36	77.64	74.17	77.99	74.32
398	77.37	75.92	76.68	74.67	77.64	75.00
501	81.25	77.51	80.24	77.04	80.75	77.42
631	84.19	82.56	82.86	81.74	83.46	82.27
794	83.98	87.45	83.31	86.77	83.99	87.31
1000	86.40	89.73	86.22	89.13	86.21	89.89
1259	87.93	89.08	86.96	88.01	87.33	88.34
1585	86.34	86.01	85.57	85.13	86.42	86.24
1995	80.07	80.24	79.72	79.95	80.26	80.69
2512	78.86	78.43	78.27	78.24	79.00	78.98
3162	75.60	75.96	75.20	75.76	75.53	76.29
3981	72.00	72.53	71.40	71.89	71.86	72.57

Table 80. Section W2 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.54	80.54	80.87	74.92	80.29	74.47
398	85.29	83.02	82.10	78.43	80.91	78.30
501	87.41	84.89	84.28	81.54	84.27	81.06
631	86.98	84.36	86.35	83.28	86.63	83.01
794	89.30	87.04	89.00	86.93	89.04	86.67
1000	93.25	93.92	93.19	93.50	93.33	93.62
1259	88.89	91.98	88.90	91.79	88.71	91.47
1585	86.07	88.12	85.53	87.93	85.72	87.98
1995	81.18	81.60	80.96	81.45	81.20	81.31
2512	79.76	80.00	78.96	78.69	79.15	78.76
3162	77.40	77.84	75.51	75.75	75.42	75.79
3981	75.16	75.20	74.04	73.85	74.09	73.84

Table 81. Section W2 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	78.81	76.71	79.21	75.65	78.88	75.94
398	79.67	77.94	79.75	77.10	79.94	77.62
501	82.96	79.02	82.89	78.93	82.96	78.90
631	85.69	84.44	85.62	84.24	85.75	84.20
794	85.13	89.76	85.09	89.65	85.34	90.14
1000	88.13	92.11	88.10	91.29	88.14	91.38
1259	90.60	92.00	90.53	91.39	90.44	91.50
1585	88.48	89.05	88.89	88.87	89.01	89.36
1995	81.31	81.39	81.20	81.80	81.50	82.07
2512	80.12	79.23	80.70	79.91	80.84	80.21
3162	75.92	76.30	76.17	76.80	76.06	76.90
3981	73.10	73.70	73.24	74.28	73.34	74.40

Table 82. Section W3 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.93	79.97	81.84	76.44	80.86	76.29
398	87.20	86.80	84.53	84.33	83.52	83.39
501	88.95	86.10	87.13	84.02	86.39	83.45
631	90.57	87.16	89.73	85.92	88.84	85.46
794	92.80	90.89	92.02	90.15	91.45	89.70
1000	97.70	98.99	96.48	97.70	95.53	96.78
1259	93.20	96.30	92.35	95.43	91.75	94.78
1585	89.59	92.08	89.76	92.19	89.58	91.57
1995	83.76	84.76	83.99	84.94	84.11	85.01
2512	80.33	80.72	80.25	80.48	80.20	80.63
3162	76.82	77.58	76.24	76.66	76.10	76.46
3981	76.21	75.47	76.17	75.08	76.30	75.13

Table 83. Section W3 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.04	75.55	79.60	75.25	79.46	75.84
398	79.59	76.92	79.46	76.75	79.42	76.77
501	82.73	79.43	83.32	79.55	82.59	79.59
631	85.34	83.82	85.57	84.23	84.88	83.69
794	84.50	87.50	85.05	87.66	84.30	87.41
1000	86.22	89.92	86.52	90.00	85.86	89.58
1259	85.18	87.10	85.65	87.21	85.42	86.88
1585	82.81	82.44	83.47	83.01	83.50	83.16
1995	78.66	78.69	78.92	79.34	78.72	79.38
2512	76.42	76.80	76.47	76.97	76.23	77.31
3162	73.73	74.03	74.05	74.21	73.82	74.21
3981	70.76	70.32	71.06	70.86	70.41	70.28

Table 84. Section W4 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.56	78.10	81.35	75.46	82.13	76.36
398	84.74	81.79	83.51	80.22	83.69	80.43
501	87.39	84.80	86.09	84.40	86.64	84.07
631	88.54	84.92	87.82	85.00	88.10	84.89
794	90.11	88.75	89.91	88.52	89.50	88.35
1000	93.57	94.60	92.51	94.28	92.28	93.57
1259	88.83	91.35	88.32	91.30	88.25	90.76
1585	84.36	85.81	83.81	85.39	84.02	85.17
1995	79.44	79.32	79.17	79.41	79.46	79.49
2512	78.52	78.12	77.94	77.48	77.93	77.39
3162	75.65	75.39	74.51	74.18	74.23	74.03
3981	73.72	72.99	72.55	72.03	72.39	71.64

Table 85. Section W4 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.14	75.42	79.41	76.04	78.68	75.26
398	78.88	76.00	79.51	77.15	78.56	76.31
501	82.13	78.94	82.48	79.54	82.46	78.85
631	84.29	83.25	85.02	84.01	84.20	83.48
794	83.59	86.88	84.29	86.90	83.30	86.90
1000	85.35	88.97	85.68	88.91	85.27	88.19
1259	85.10	86.47	85.34	86.79	84.67	85.85
1585	83.06	82.43	83.03	82.71	83.12	82.65
1995	78.30	78.06	78.68	78.87	78.01	78.53
2512	76.34	75.91	76.54	76.57	76.17	76.44
3162	73.79	73.71	73.95	74.09	73.60	73.76
3981	70.79	70.55	71.02	71.01	70.10	69.92

Table 86. Section W5 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.87	78.26	82.15	76.83	82.56	76.73
398	85.36	82.10	84.30	80.97	84.15	80.60
501	88.82	86.71	87.28	84.76	86.55	83.82
631	88.92	86.57	88.98	85.62	88.15	84.72
794	89.18	88.99	89.58	88.69	89.10	88.45
1000	92.26	93.48	92.16	93.28	91.46	92.99
1259	88.27	90.98	87.83	90.73	87.40	90.27
1585	84.72	85.70	83.38	84.21	83.27	84.35
1995	79.72	79.33	78.78	78.74	78.66	78.57
2512	78.08	77.49	77.54	76.86	77.41	76.62
3162	75.37	75.04	73.98	73.78	73.75	73.25
3981	73.85	73.12	72.46	71.73	71.84	71.05

Table 87. Section W5 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	73.01	69.00	70.41	67.31	71.35	68.21
398	72.12	70.13	69.43	67.91	70.78	69.16
501	74.41	71.95	72.93	70.07	73.55	71.20
631	77.97	77.71	76.66	76.50	77.36	76.88
794	80.41	83.39	80.24	83.02	80.62	83.53
1000	83.83	85.35	82.84	84.53	83.37	84.88
1259	86.27	86.48	86.09	86.30	86.05	86.39
1585	85.45	85.42	86.18	86.07	85.89	85.72
1995	79.45	79.26	79.46	79.35	79.75	79.48
2512	78.89	77.47	78.78	77.63	78.80	77.87
3162	74.95	75.23	74.91	75.38	74.75	75.78
3981	72.34	73.48	71.88	73.06	72.02	73.21

Table 88. Section W6 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	78.87	78.94	72.73	67.43	73.76	68.44
398	87.32	84.44	73.64	71.06	74.29	72.20
501	89.85	89.22	77.21	74.49	77.50	75.74
631	86.62	85.15	81.88	79.83	82.30	80.05
794	85.84	85.00	84.84	82.03	85.44	82.84
1000	90.19	90.96	88.62	89.58	89.82	90.55
1259	89.29	91.02	88.31	90.33	88.89	90.68
1585	88.17	88.97	86.34	87.29	87.14	88.16
1995	83.17	82.92	81.27	81.83	81.73	82.34
2512	79.86	79.99	78.19	78.36	78.49	78.57
3162	77.29	77.48	74.66	75.15	74.37	75.17
3981	76.92	76.60	74.40	73.85	74.72	74.06

Table 89. Section W6 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	77.80	74.06	77.53	74.14	76.94	73.42
398	77.93	75.47	77.89	75.74	76.44	73.77
501	81.85	78.60	82.12	78.43	79.69	76.71
631	83.40	83.35	83.57	82.93	81.89	81.17
794	81.93	86.33	82.16	86.19	82.10	84.96
1000	85.80	87.64	85.56	87.44	85.40	87.56
1259	84.55	85.25	84.21	85.18	85.09	86.03
1585	82.10	81.12	81.90	81.03	83.31	82.88
1995	77.37	76.67	77.21	76.81	78.28	78.19
2512	75.85	75.19	75.34	74.88	76.45	76.54
3162	73.33	73.16	73.06	72.90	73.60	74.08
3981	70.44	70.28	70.18	69.70	70.53	70.85

Table 90. Section W7 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	82.58	81.85	79.84	74.10	80.76	74.63
398	88.43	86.08	82.01	78.41	82.29	79.19
501	90.12	88.62	84.68	81.84	85.26	82.76
631	89.26	87.26	86.52	83.93	87.06	84.45
794	87.86	88.22	87.16	87.00	87.10	87.22
1000	91.65	92.01	90.47	91.32	90.39	91.09
1259	87.86	89.70	87.47	89.47	86.74	88.81
1585	84.55	85.01	82.63	84.17	82.10	83.30
1995	80.52	79.48	78.12	77.99	77.88	77.50
2512	78.02	78.13	76.85	75.99	76.35	75.45
3162	76.32	76.16	73.73	72.86	73.23	72.58
3981	74.91	74.41	72.51	71.56	71.94	70.82

Table 91. Section W7 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	74.80	71.31	75.41	71.99	75.64	72.19
398	74.97	73.00	75.95	73.69	74.82	73.53
501	78.21	75.28	79.02	76.00	78.39	76.17
631	80.84	80.13	81.25	80.28	80.77	80.18
794	82.12	85.17	82.02	85.22	82.07	85.39
1000	85.29	88.19	85.56	88.52	85.55	87.70
1259	86.54	87.32	86.63	87.56	86.23	87.18
1585	85.06	84.54	85.00	84.54	84.93	84.85
1995	79.66	79.53	79.61	79.57	79.73	79.50
2512	78.34	77.81	78.02	77.94	78.28	78.37
3162	74.72	75.28	74.79	75.41	74.87	75.52
3981	71.56	72.07	71.30	72.03	71.73	72.58

Table 92. Section W8 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	83.48	84.44	78.54	73.40	78.02	73.41
398	88.84	87.34	79.96	77.27	79.52	77.36
501	90.35	89.41	83.08	80.82	82.66	80.13
631	88.20	86.94	85.45	82.58	85.41	82.28
794	88.34	87.63	88.23	86.24	87.77	85.73
1000	93.31	93.86	92.32	92.96	92.39	92.69
1259	90.04	92.11	88.72	91.39	88.83	91.39
1585	87.89	88.93	85.20	87.28	85.27	87.28
1995	83.33	82.89	80.40	81.18	80.47	80.83
2512	80.33	80.71	78.33	78.35	78.61	78.43
3162	78.05	78.72	74.85	75.41	75.19	75.47
3981	76.89	76.90	74.42	73.70	74.21	73.54

Table 93. Section W8 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	73.66	68.71	75.41	70.25	74.37	71.21
398	72.30	70.38	73.09	70.94	74.30	71.94
501	75.88	72.46	77.21	74.51	77.95	74.86
631	77.40	76.17	78.97	78.84	79.35	78.51
794	80.19	82.28	80.65	83.00	81.40	83.57
1000	81.12	83.57	80.47	82.71	81.52	84.17
1259	84.91	85.64	84.13	84.91	84.44	85.20
1585	86.31	87.06	85.97	86.74	86.22	86.88
1995	79.77	80.51	80.06	80.48	80.02	80.79
2512	78.75	78.80	78.65	78.49	78.65	79.03
3162	74.88	75.60	74.57	75.73	74.57	75.87
3981	71.02	72.54	71.30	73.14	70.76	72.71

Table 94. Section W9 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.53	81.22	73.10	68.74	71.50	67.46
398	87.47	84.99	73.86	70.93	72.16	70.35
501	88.91	87.94	76.53	73.79	75.88	74.35
631	87.30	85.66	80.83	78.55	80.88	78.92
794	85.45	85.73	83.35	81.78	83.54	81.43
1000	90.55	90.82	87.88	88.29	88.73	88.77
1259	89.30	90.97	88.50	90.16	88.30	89.72
1585	88.45	89.21	86.31	87.13	86.13	87.12
1995	84.09	83.78	81.90	82.72	81.88	82.65
2512	79.88	80.97	77.92	78.89	77.82	78.58
3162	78.27	78.71	74.04	75.27	73.93	75.10
3981	77.65	77.10	73.86	73.53	74.34	73.59

Table 95. Section W9 A-Weighted SPL UNIR Tire in dB(A)

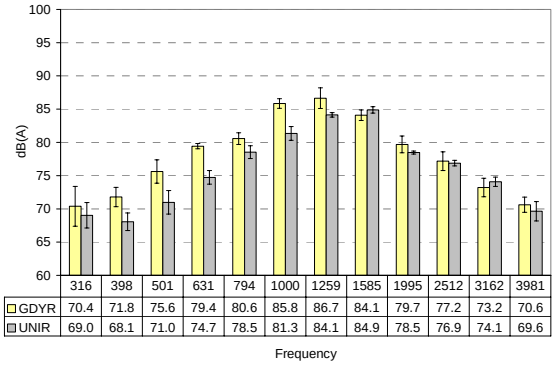
	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	80.16	75.89	80.66	76.38	78.54	75.03
398	78.78	75.50	79.07	76.55	77.94	75.58
501	82.06	78.96	82.36	78.60	81.38	77.24
631	83.47	82.26	83.95	82.53	83.16	81.90
794	83.02	85.58	83.38	85.62	83.02	85.39
1000	84.80	87.96	84.68	87.79	84.89	87.95
1259	85.12	86.38	85.35	86.57	85.56	86.70
1585	84.49	84.38	84.17	84.43	84.62	84.52
1995	79.65	79.74	79.77	79.84	79.92	80.05
2512	77.92	78.39	77.59	78.47	77.93	78.87
3162	74.88	75.45	74.87	75.29	74.98	75.98
3981	69.80	70.88	69.77	70.81	69.74	71.32

Table 96. Section W10 A-Weighted SPL GDYR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	85.75	81.45	85.10	78.53	85.93	80.20
398	88.08	85.05	86.28	82.30	86.70	83.30
501	90.60	86.54	88.80	84.64	88.61	84.67
631	91.73	88.45	89.26	85.92	89.48	86.15
794	90.61	90.44	90.09	89.41	89.33	89.48
1000	92.22	93.77	91.45	92.64	90.64	92.40
1259	86.55	89.89	85.32	89.14	85.19	88.14
1585	83.77	84.69	83.00	83.98	82.32	82.96
1995	80.64	81.26	79.12	80.35	78.43	79.72
2512	79.59	80.27	77.78	79.06	77.23	78.51
3162	76.77	77.39	74.10	74.56	73.74	74.25
3981	74.57	75.31	70.96	71.73	70.47	70.73

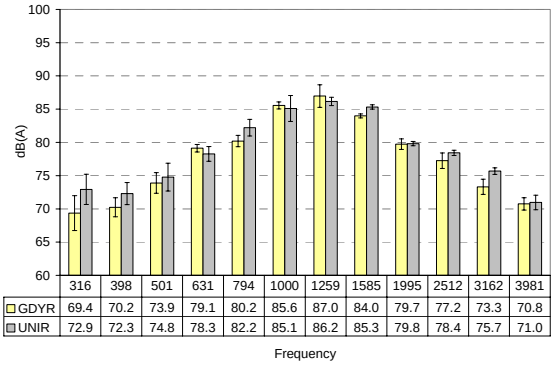
Table 97. Section W10 A-Weighted SPL UNIR Tire in dB(A)

	Run. 1		Run. 2		Run. 3	
Freq (Hz)	Ch. 1	Ch. 2	Ch. 1	Ch. 2	Ch. 1	Ch. 2
316	79.25	72.97	78.87	73.04	78.17	72.22
398	76.29	74.48	76.52	74.56	75.86	74.46
501	79.35	77.05	79.59	76.39	79.53	76.20
631	83.20	81.94	82.02	81.43	81.95	81.01
794	82.15	85.01	82.43	84.90	81.65	84.09
1000	85.68	87.59	85.89	87.59	85.85	86.97
1259	86.52	87.26	86.85	87.29	86.40	86.77
1585	85.05	84.97	85.87	85.86	85.18	85.21
1995	79.61	80.14	80.05	80.53	79.74	80.21
2512	78.57	79.24	78.44	79.44	77.79	79.13
3162	76.04	77.20	76.58	76.97	76.75	76.07
3981	72.30	72.34	72.08	72.46	73.03	73.06



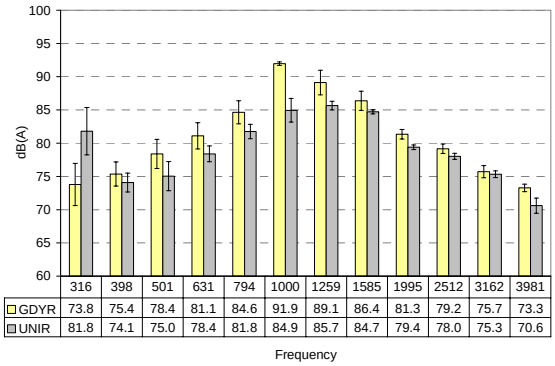
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	70.4	71.8	75.6	79.4	80.6	85.8	86.7	84.1	79.7	77.2	73.2	70.6
UNIR	69.0	68.1	71.0	74.7	78.5	81.3	84.1	84.9	78.5	76.9	74.1	69.6

Figure 119. SPL: N1



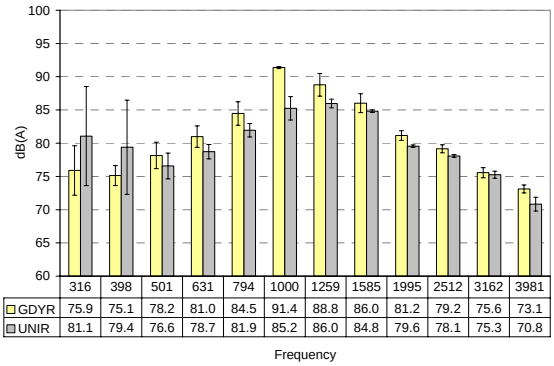
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	69.4	70.2	73.9	79.1	80.2	85.6	87.0	84.0	79.7	77.2	73.3	70.8
UNIR	72.9	72.3	74.8	78.3	82.2	85.1	86.2	85.3	79.8	78.4	75.7	71.0

Figure 120. SPL: N2



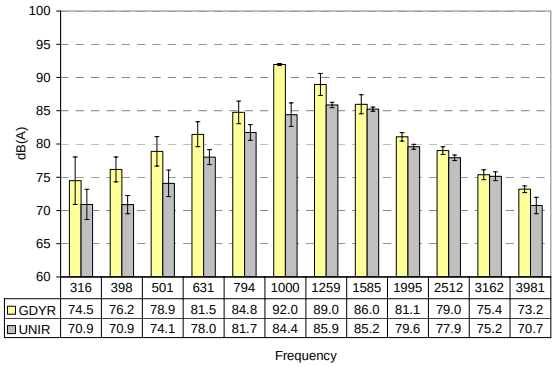
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	73.8	75.4	78.4	81.1	84.6	91.9	89.1	86.4	81.3	79.2	75.7	73.3
UNIR	81.8	74.1	75.0	78.4	81.8	84.9	85.7	84.7	79.4	78.0	75.3	70.6

Figure 121. SPL: N3



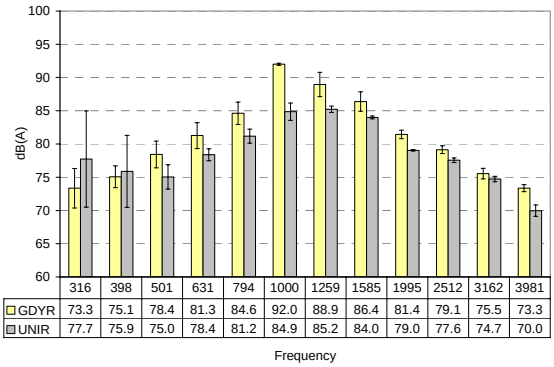
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	75.9	75.1	78.2	81.0	84.5	91.4	88.8	86.0	81.2	79.2	75.6	73.1
UNIR	81.1	79.4	76.6	78.7	81.9	85.2	86.0	84.8	79.6	78.1	75.3	70.8

Figure 122. SPL: N4



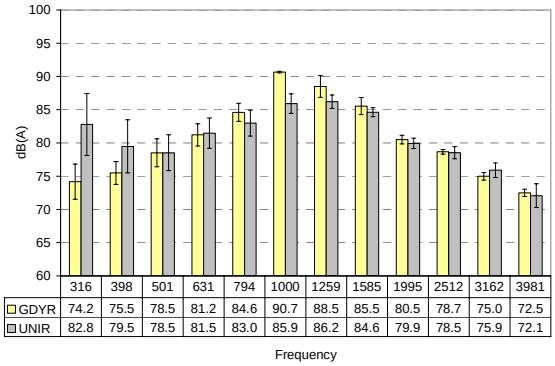
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	74.5	76.2	78.9	81.5	84.8	92.0	89.0	86.0	81.1	79.0	75.4	73.2
UNIR	70.9	70.9	74.1	78.0	81.7	84.4	85.9	85.2	79.6	77.9	75.2	70.7

Figure 123. SPL: N5



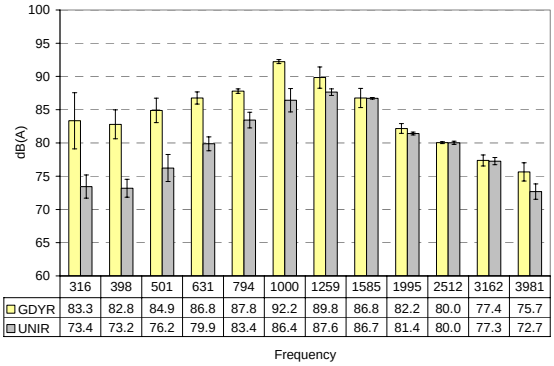
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	73.3	75.1	78.4	81.3	84.6	92.0	88.9	86.4	81.4	79.1	75.5	73.3
UNIR	77.7	75.9	75.0	78.4	81.2	84.9	85.2	84.0	79.0	77.6	74.7	70.0

Figure 124. SPL: N6



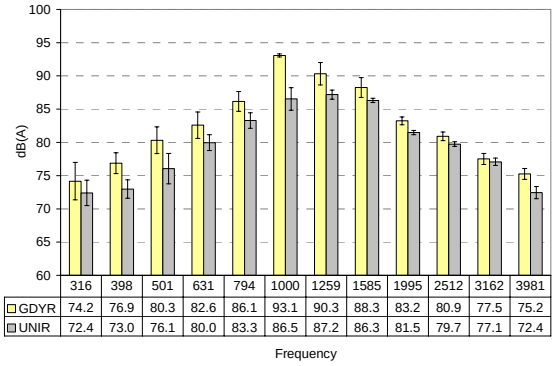
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	74.2	75.5	78.5	81.2	84.6	90.7	88.5	85.5	80.5	78.7	75.0	72.5
UNIR	82.8	79.5	78.5	81.5	83.0	85.9	86.2	84.6	79.9	78.5	75.9	72.1

Figure 125. SPL: N7



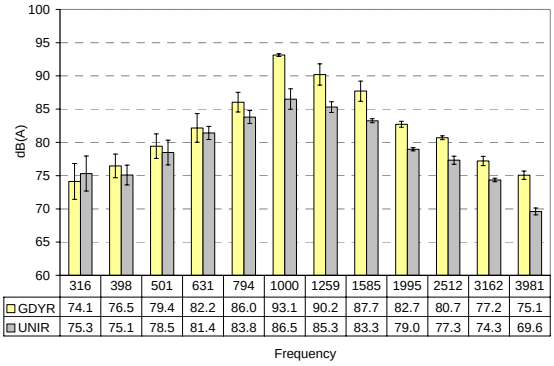
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	83.3	82.8	84.9	86.8	87.8	92.2	89.8	86.8	82.2	80.0	77.4	75.7
UNIR	73.4	73.2	76.2	79.9	83.4	86.4	87.6	86.7	81.4	80.0	77.3	72.7

Figure 126. SPL: N8



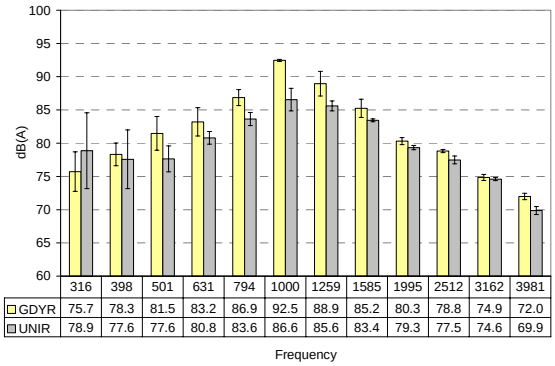
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	74.2	76.9	80.3	82.6	86.1	93.1	90.3	88.3	83.2	80.9	77.5	75.2
UNIR	72.4	73.0	76.1	80.0	83.3	86.5	87.2	86.3	81.5	79.7	77.1	72.4

Figure 127. SPL: N9



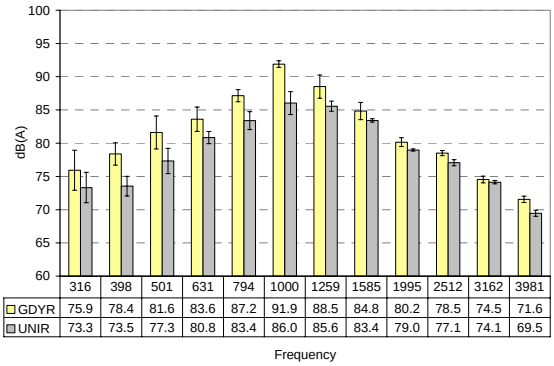
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	74.1	76.5	79.4	82.2	86.0	93.1	90.2	87.7	82.7	80.7	77.2	75.1
UNIR	75.3	75.1	78.5	81.4	83.8	86.5	85.3	83.3	79.0	77.3	74.3	69.6

Figure 128. SPL: N10



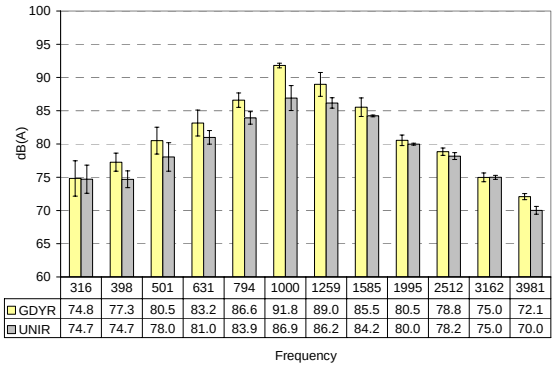
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	75.7	78.3	81.5	83.2	86.9	92.5	88.9	85.2	80.3	78.8	74.9	72.0
UNIR	78.9	77.6	77.6	80.8	83.6	86.6	85.6	83.4	79.3	77.5	74.6	69.9

Figure 129. SPL: N11



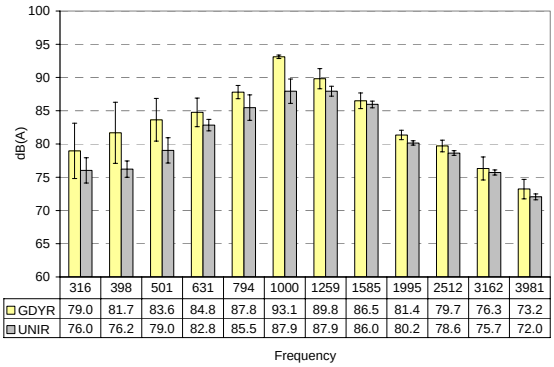
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	75.9	78.4	81.6	83.6	87.2	91.9	88.5	84.8	80.2	78.5	74.5	71.6
UNIR	73.3	73.5	77.3	80.8	83.4	86.0	85.6	83.4	79.0	77.1	74.1	69.5

Figure 130. SPL: N12



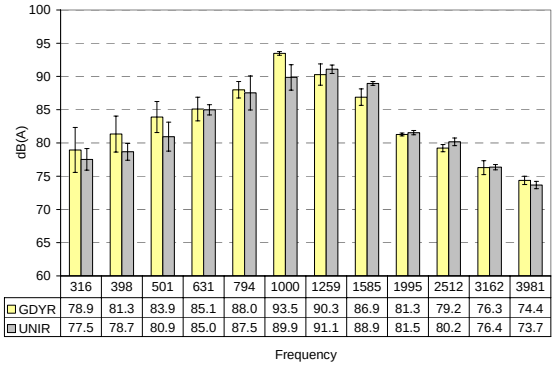
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	74.8	77.3	80.5	83.2	86.6	91.8	89.0	85.5	80.5	78.8	75.0	72.1
UNIR	74.7	74.7	78.0	81.0	83.9	86.9	86.2	84.2	80.0	78.2	75.0	70.0

Figure 131. SPL: N13



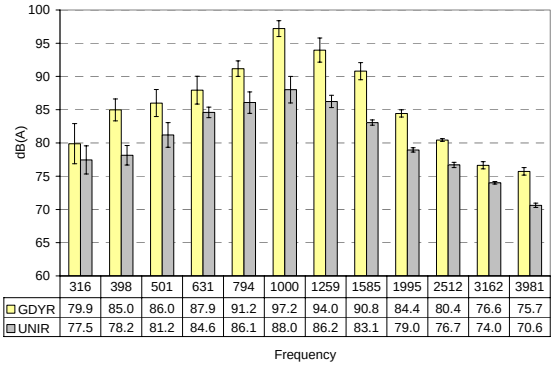
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	79.0	81.7	83.6	84.8	87.8	93.1	89.8	86.5	81.4	79.7	76.3	73.2
UNIR	76.0	76.2	79.0	82.8	85.5	87.9	87.9	86.0	80.2	78.6	75.7	72.0

Figure 132. SPL: W1



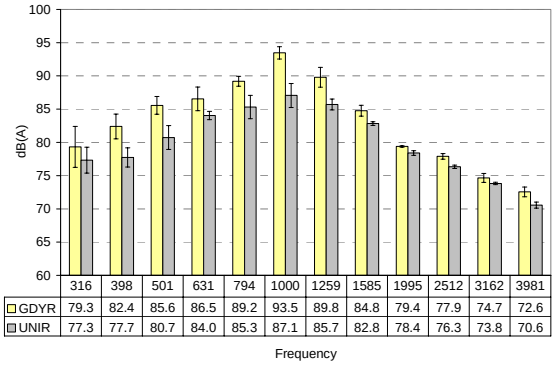
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	78.9	81.3	83.9	85.1	88.0	93.5	90.3	86.9	81.3	79.2	76.3	74.4
UNIR	77.5	78.7	80.9	85.0	87.5	89.9	91.1	88.9	81.5	80.2	76.4	73.7

Figure 133. SPL: W2



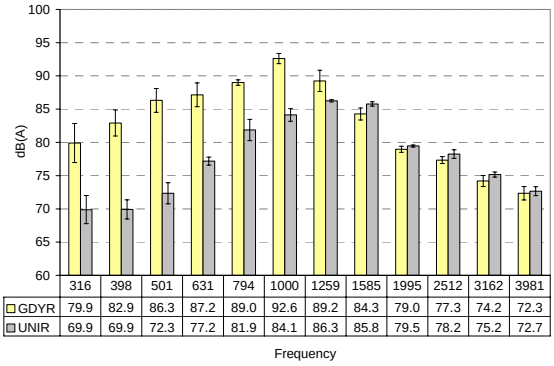
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	79.9	85.0	86.0	87.9	91.2	97.2	94.0	90.8	84.4	80.4	76.6	75.7
UNIR	77.5	78.2	81.2	84.6	86.1	88.0	86.2	83.1	79.0	76.7	74.0	70.6

Figure 134. SPL: W3



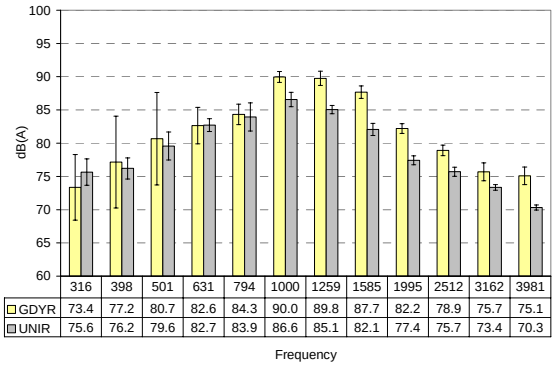
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	79.3	82.4	85.6	86.5	89.2	93.5	89.8	84.8	79.4	77.9	74.7	72.6
UNIR	77.3	77.7	80.7	84.0	85.3	87.1	85.7	82.8	78.4	76.3	73.8	70.6

Figure 135. SPL: W4



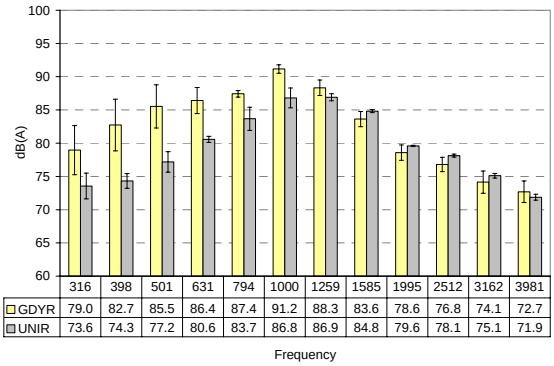
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	79.9	82.9	86.3	87.2	89.0	92.6	89.2	84.3	79.0	77.3	74.2	72.3
UNIR	69.9	69.9	72.3	77.2	81.9	84.1	86.3	85.8	79.5	78.2	75.2	72.7

Figure 136. SPL: W5



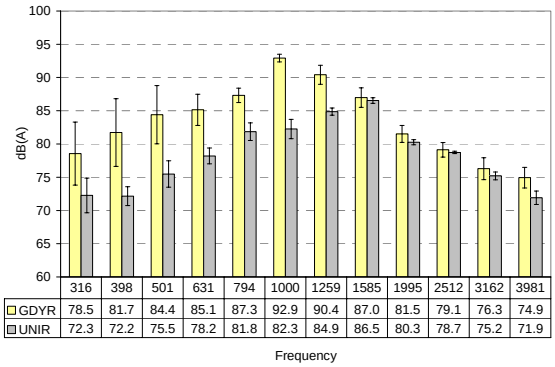
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	73.4	77.2	80.7	82.6	84.3	90.0	89.8	87.7	82.2	78.9	75.7	75.1
UNIR	75.6	76.2	79.6	82.7	83.9	86.6	85.1	82.1	77.4	75.7	73.4	70.3

Figure 137. SPL: W6



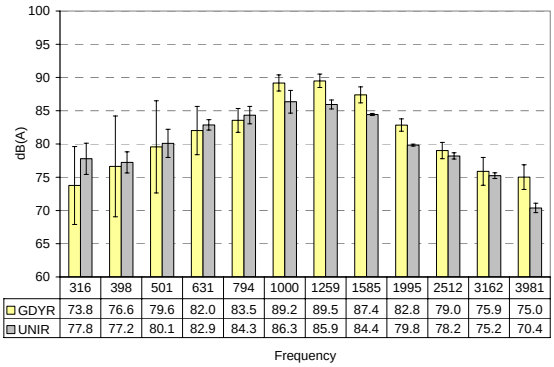
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	79.0	82.7	85.5	86.4	87.4	91.2	88.3	83.6	78.6	76.8	74.1	72.7
UNIR	73.6	74.3	77.2	80.6	83.7	86.8	86.9	84.8	79.6	78.1	75.1	71.9

Figure 138. SPL: W7



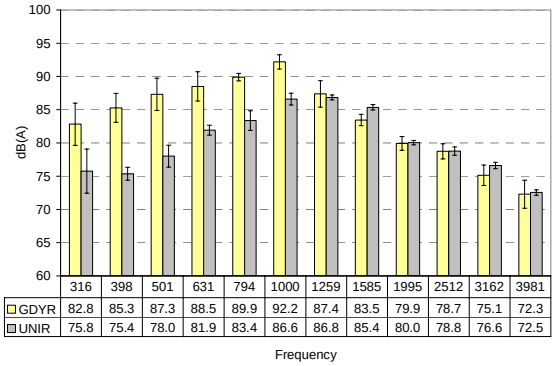
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	78.5	81.7	84.4	85.1	87.3	92.9	90.4	87.0	81.5	79.1	76.3	74.9
UNIR	72.3	72.2	75.5	78.2	81.8	82.3	84.9	86.5	80.3	78.7	75.2	71.9

Figure 139. SPL: W8



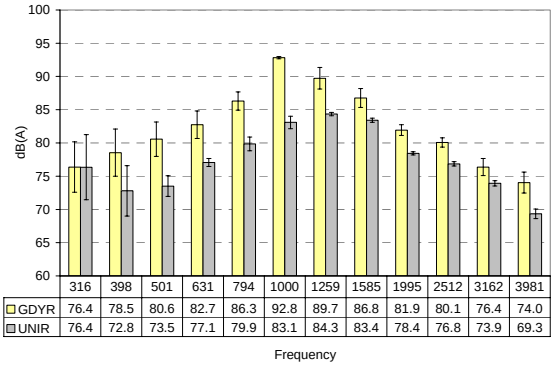
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	73.8	76.6	79.6	82.0	83.5	89.2	89.5	87.4	82.8	79.0	75.9	75.0
UNIR	77.8	77.2	80.1	82.9	84.3	86.3	85.9	84.4	79.8	78.2	75.2	70.4

Figure 140. SPL: W9



	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	82.8	85.3	87.3	88.5	89.9	92.2	87.4	83.5	79.9	78.7	75.1	72.3
UNIR	75.8	75.4	78.0	81.9	83.4	86.6	86.8	85.4	80.0	78.8	76.6	72.5

Figure 141. SPL: W10



	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	76.4	78.5	80.6	82.7	86.3	92.8	89.7	86.8	81.9	80.1	76.4	74.0
UNIR	76.4	72.8	73.5	77.1	79.9	83.1	84.3	83.4	78.4	76.8	73.9	69.3

Figure 142. SPL: S1

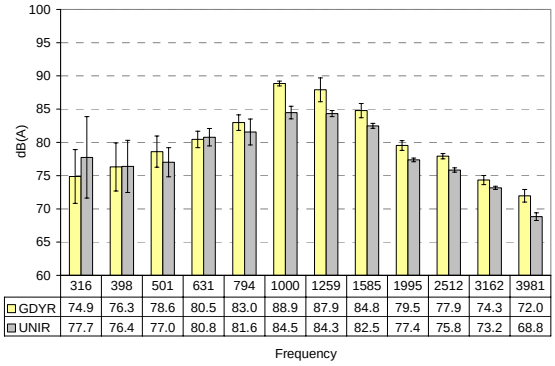


Figure 143. SPL: S2

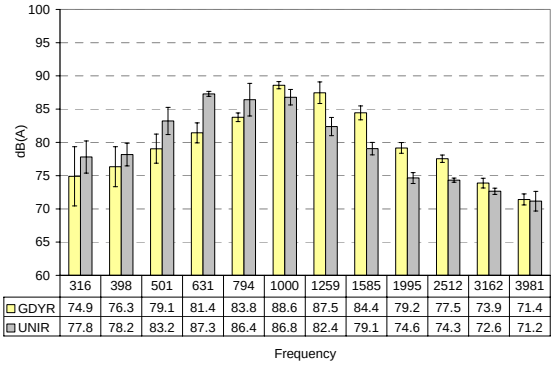


Figure 144. SPL: S3

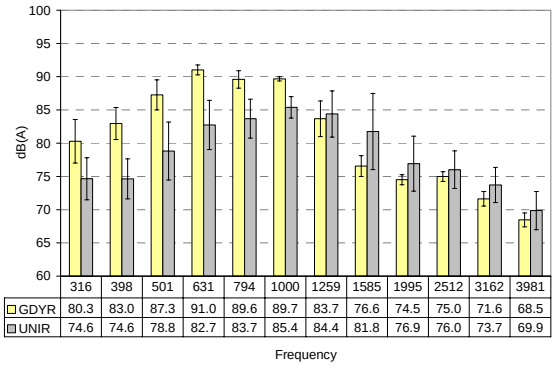


Figure 145. SPL: S4

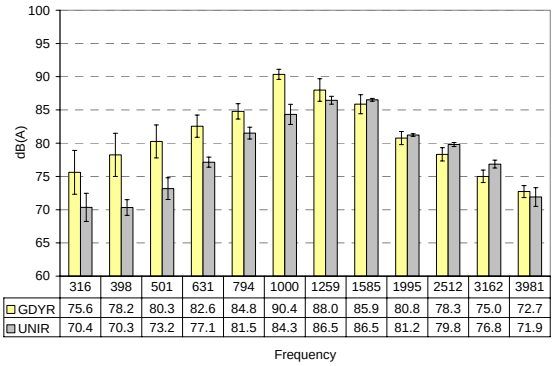


Figure 146. SPL: S5

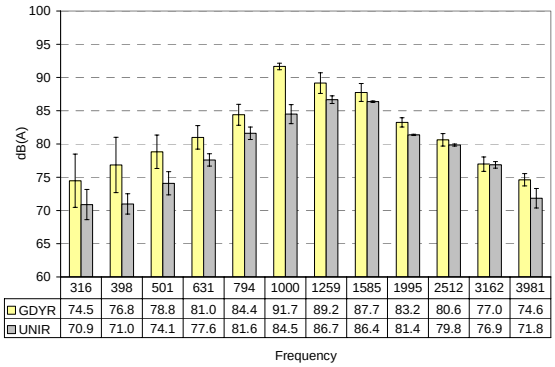


Figure 147. SPL: S6

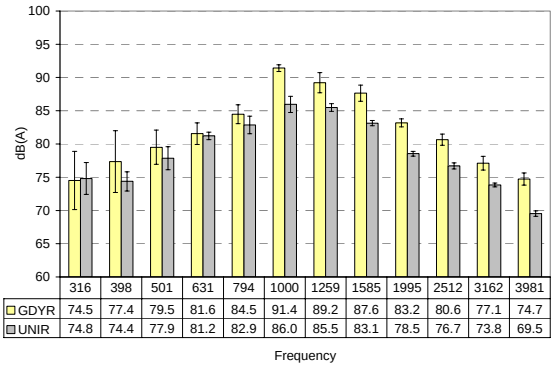


Figure 148. SPL: S7

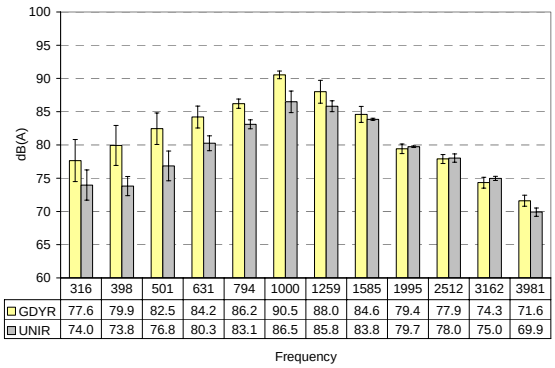


Figure 149. SPL: S8

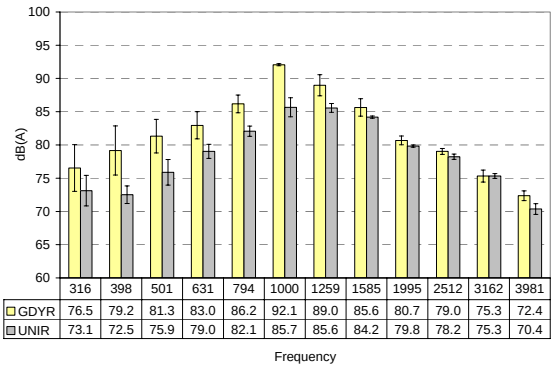
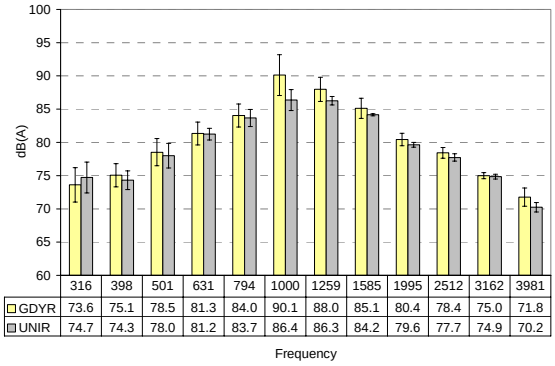
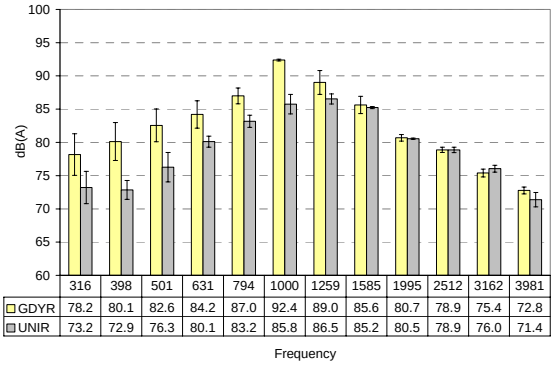


Figure 150. SPL: S9



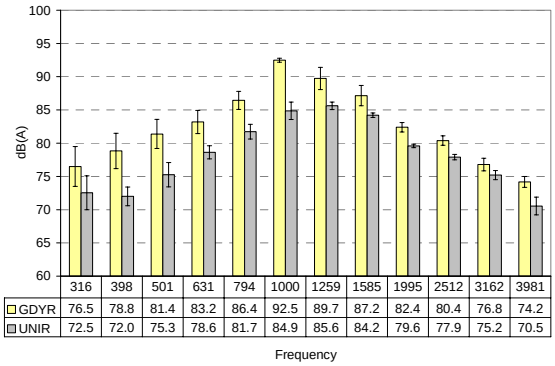
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	73.6	75.1	78.5	81.3	84.0	90.1	88.0	85.1	80.4	78.4	75.0	71.8
UNIR	74.7	74.3	78.0	81.2	83.7	86.4	86.3	84.2	79.6	77.7	74.9	70.2

Figure 151. SPL: S10



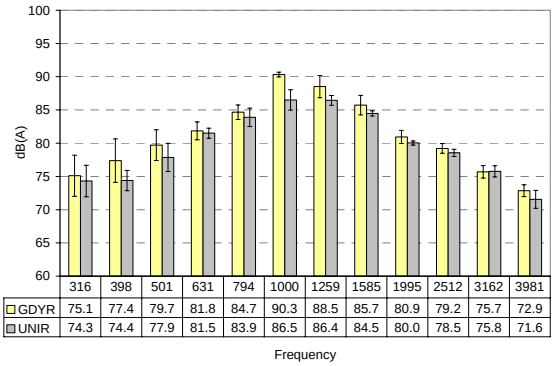
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	78.2	80.1	82.6	84.2	87.0	92.4	89.0	85.6	80.7	78.9	75.4	72.8
UNIR	73.2	72.9	76.3	80.1	83.2	85.8	86.5	85.2	80.5	78.9	76.0	71.4

Figure 152. SPL: S11



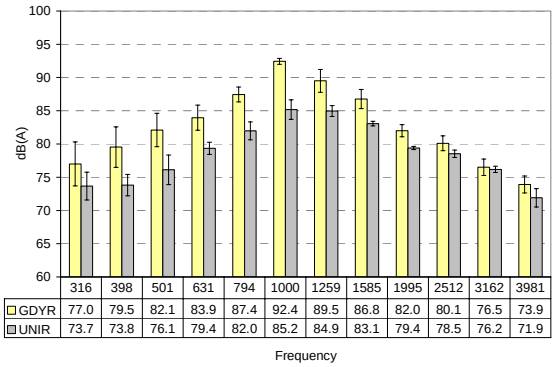
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	76.5	78.8	81.4	83.2	86.4	92.5	89.7	87.2	82.4	80.4	76.8	74.2
UNIR	72.5	72.0	75.3	78.6	81.7	84.9	85.6	84.2	79.6	77.9	75.2	70.5

Figure 153. SPL: S12



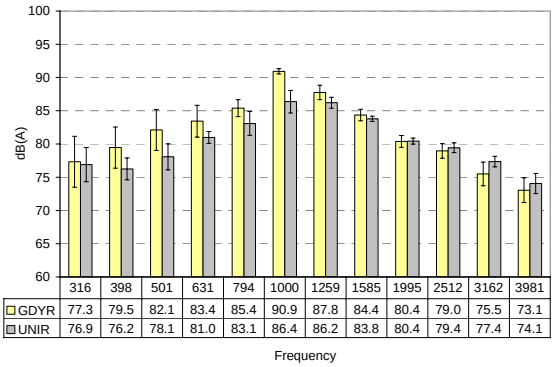
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	75.1	77.4	79.7	81.8	84.7	90.3	88.5	85.7	80.9	79.2	75.7	72.9
UNIR	74.3	74.4	77.9	81.5	83.9	86.5	86.4	84.5	80.0	78.5	75.8	71.6

Figure 154. SPL: S13



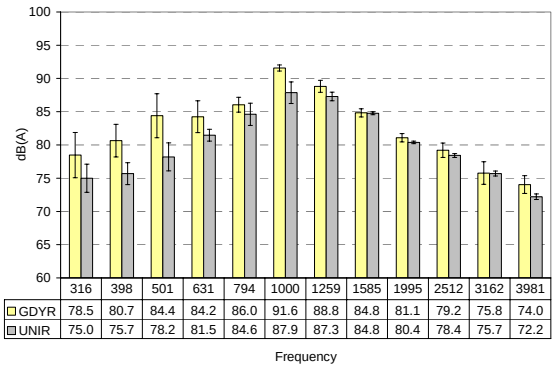
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	77.0	79.5	82.1	83.9	87.4	92.4	89.5	86.8	82.0	80.1	76.5	73.9
UNIR	73.7	73.8	76.1	79.4	82.0	85.2	84.9	83.1	79.4	78.5	76.2	71.9

Figure 155. SPL: E1



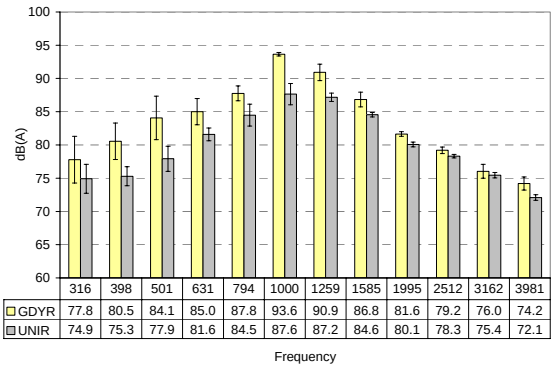
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	77.3	79.5	82.1	83.4	85.4	90.9	87.8	84.4	80.4	79.0	75.5	73.1
UNIR	76.9	76.2	78.1	81.0	83.1	86.4	86.2	83.8	80.4	79.4	77.4	74.1

Figure 156. SPL: E2



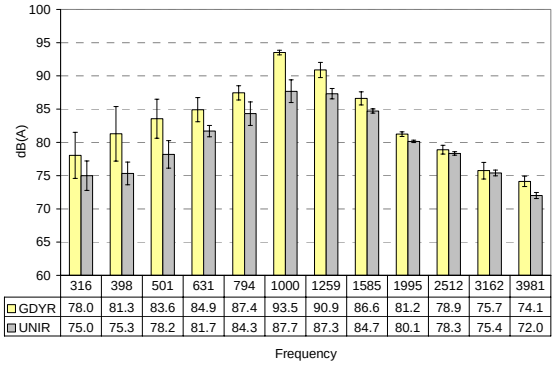
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	78.5	80.7	84.4	84.2	86.0	91.6	88.8	84.8	81.1	79.2	75.8	74.0
UNIR	75.0	75.7	78.2	81.5	84.6	87.9	87.3	84.8	80.4	78.4	75.7	72.2

Figure 157. SPL: E3



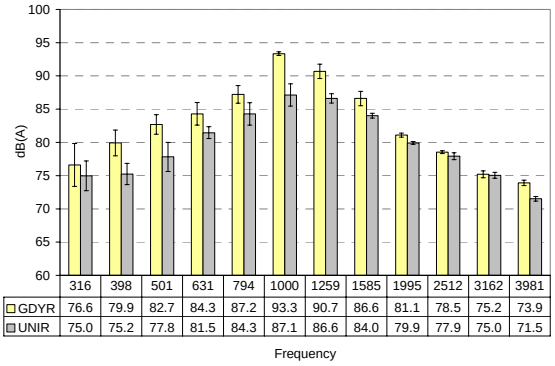
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	77.8	80.5	84.1	85.0	87.8	93.6	90.9	86.8	81.6	79.2	76.0	74.2
UNIR	74.9	75.3	77.9	81.6	84.5	87.6	87.2	84.6	80.1	78.3	75.4	72.1

Figure 158. SPL: E4



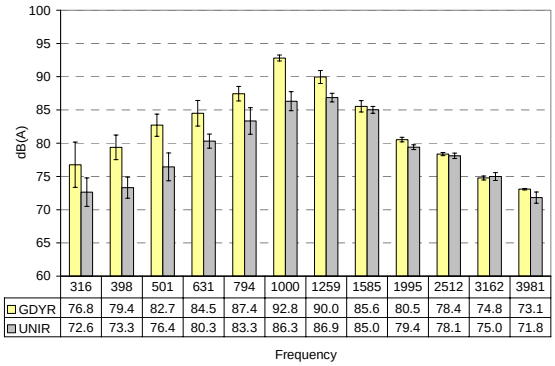
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	78.0	81.3	83.6	84.9	87.4	93.5	90.9	86.6	81.2	78.9	75.7	74.1
UNIR	75.0	75.3	78.2	81.7	84.3	87.7	87.3	84.7	80.1	78.3	75.4	72.0

Figure 159. SPL: E5



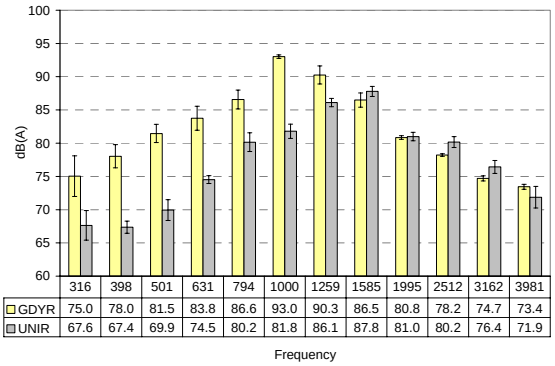
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	76.6	79.9	82.7	84.3	87.2	93.3	90.7	86.6	81.1	78.5	75.2	73.9
UNIR	75.0	75.2	77.8	81.5	84.3	87.1	86.6	84.0	79.9	77.9	75.0	71.5

Figure 160. SPL: E6



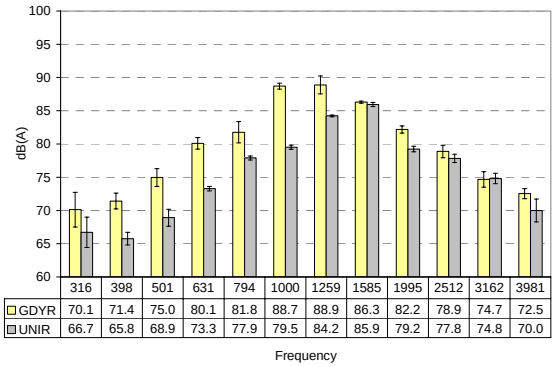
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	76.8	79.4	82.7	84.5	87.4	92.8	90.0	85.6	80.5	78.4	74.8	73.1
UNIR	72.6	73.3	76.4	80.3	83.3	86.3	86.9	85.0	79.4	78.1	75.0	71.8

Figure 161. SPL: E7



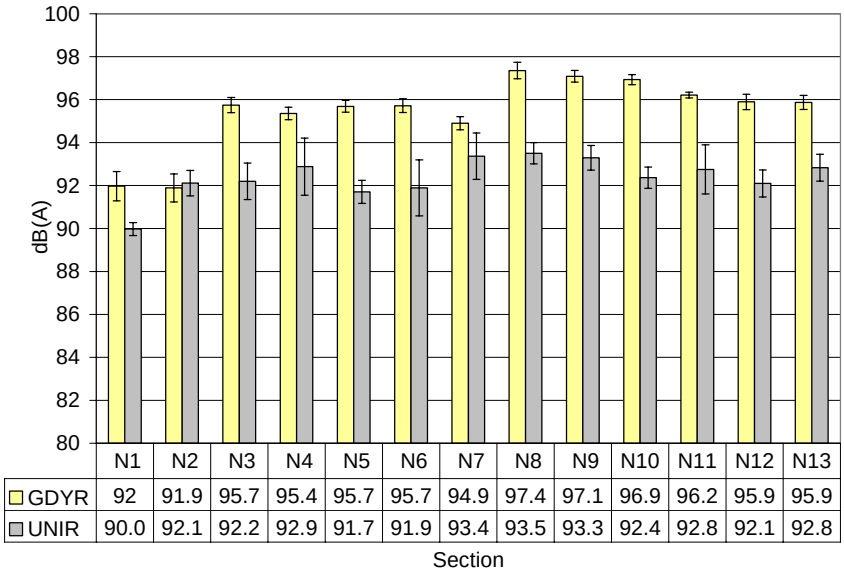
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	75.0	78.0	81.5	83.8	86.6	93.0	90.3	86.5	80.8	78.2	74.7	73.4
UNIR	67.6	67.4	69.9	74.5	80.2	81.8	86.1	87.8	81.0	80.2	76.4	71.9

Figure 162. SPL: E8



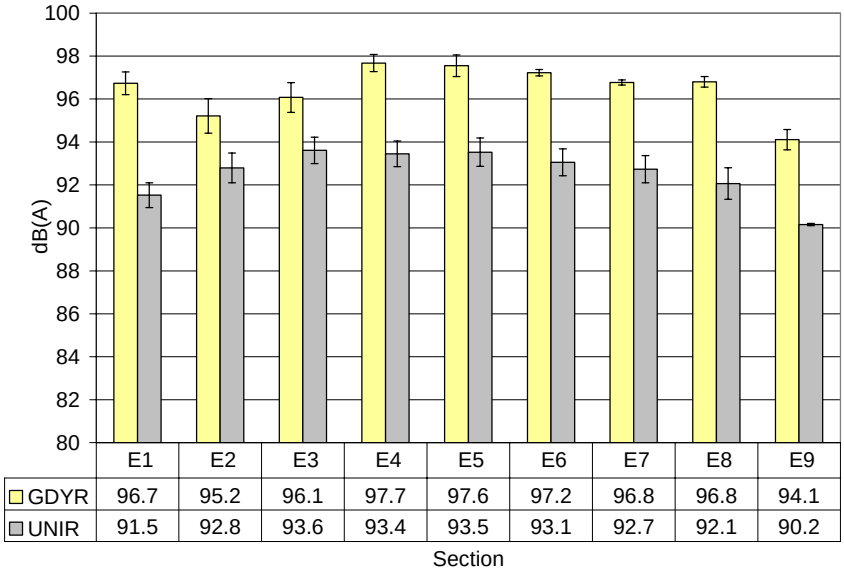
	316	398	501	631	794	1000	1259	1585	1995	2512	3162	3981
GDYR	70.1	71.4	75.0	80.1	81.8	88.7	88.9	86.3	82.2	78.9	74.7	72.5
UNIR	66.7	65.8	68.9	73.3	77.9	79.5	84.2	85.9	79.2	77.8	74.8	70.0

Figure 163. SPL: E9



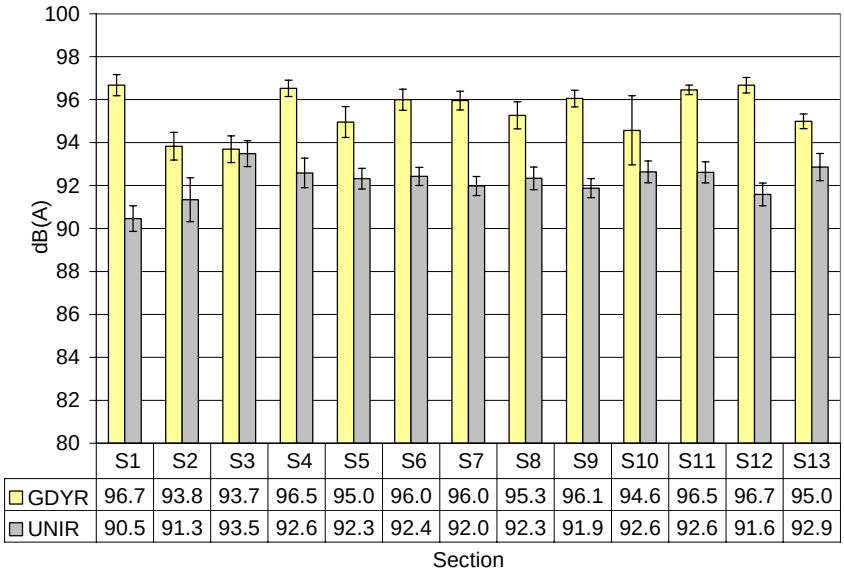
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13
GDYR	92	91.9	95.7	95.4	95.7	95.7	94.9	97.4	97.1	96.9	96.2	95.9	95.9
UNIR	90.0	92.1	92.2	92.9	91.7	91.9	93.4	93.5	93.3	92.4	92.8	92.1	92.8

Figure 164. Global SPL on the north-bound sections



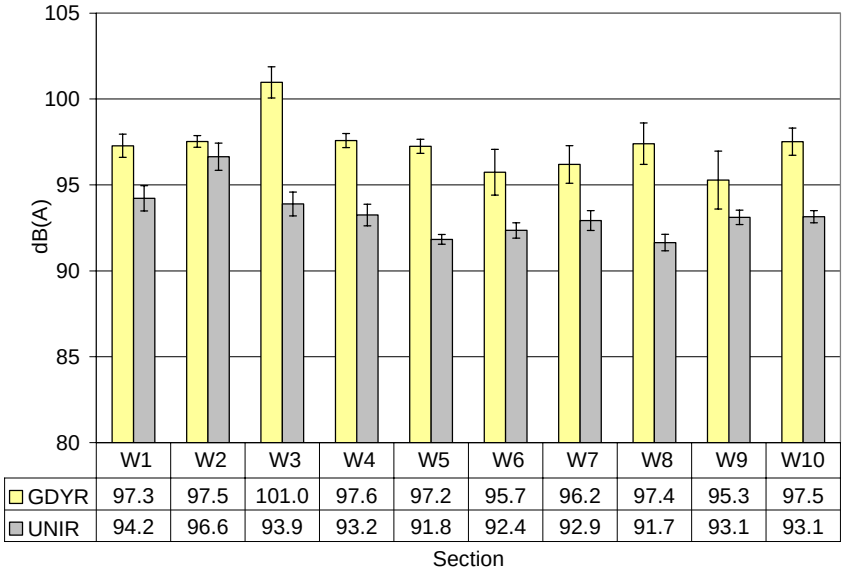
	E1	E2	E3	E4	E5	E6	E7	E8	E9
GDYR	96.7	95.2	96.1	97.7	97.6	97.2	96.8	96.8	94.1
UNIR	91.5	92.8	93.6	93.4	93.5	93.1	92.7	92.1	90.2

Figure 165. Global SPL on the east-bound sections



	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13
GDYR	96.7	93.8	93.7	96.5	95.0	96.0	96.0	95.3	96.1	94.6	96.5	96.7	95.0
UNIR	90.5	91.3	93.5	92.6	92.3	92.4	92.0	92.3	91.9	92.6	92.6	91.6	92.9

Figure 166. Global SPL on the south-bound sections



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
GDYR	97.3	97.5	101.0	97.6	97.2	95.7	96.2	97.4	95.3	97.5
UNIR	94.2	96.6	93.9	93.2	91.8	92.4	92.9	91.7	93.1	93.1

Figure 167. Global SPL on the west-bound sections

APPENDIX G: ULIP TEXTURE SPECTRA

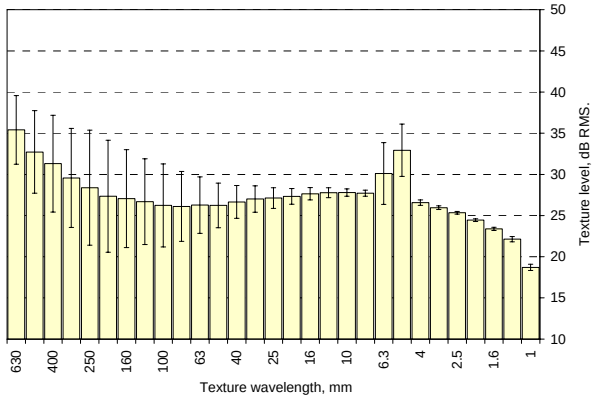


Figure 168. N1 texture spectrum

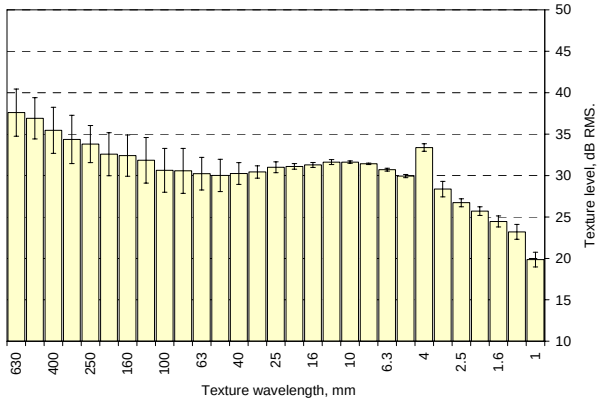


Figure 169. N3 texture spectrum

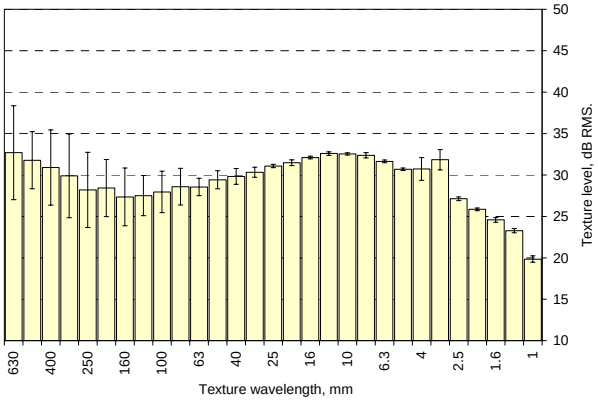


Figure 170. N4 texture spectrum

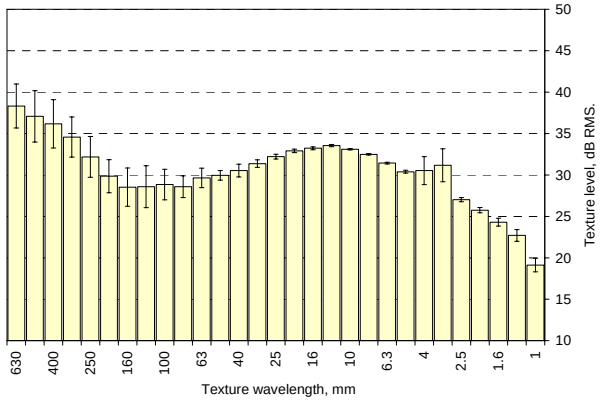


Figure 171. N5 texture spectrum

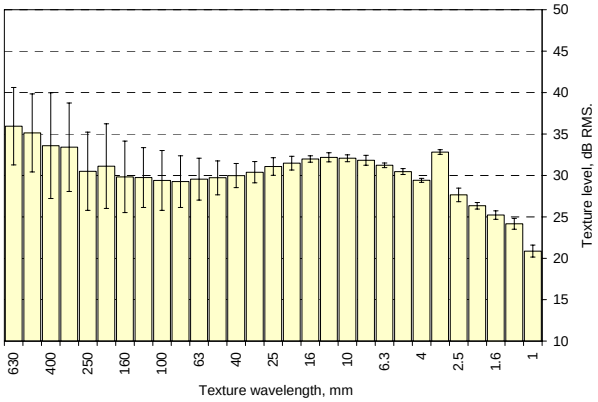


Figure 172. N6 texture spectrum

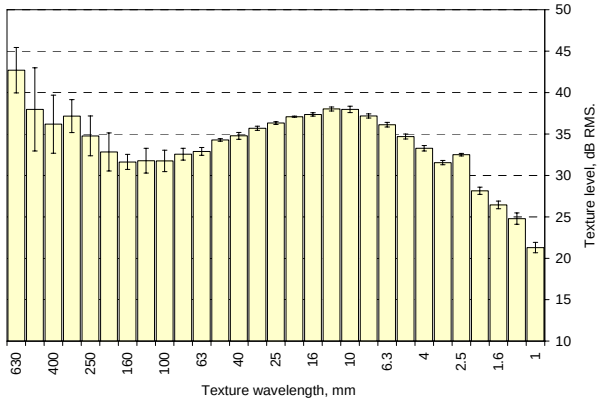


Figure 173. N7 texture spectrum

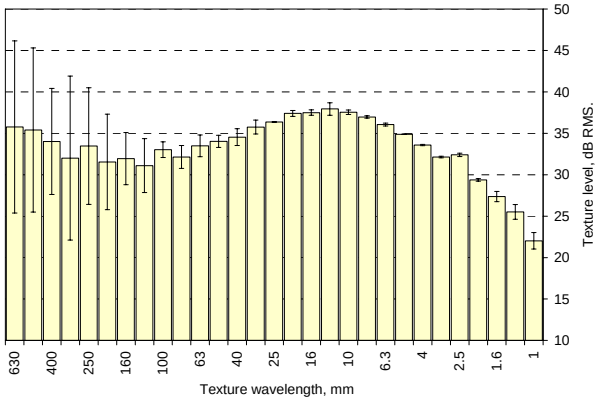


Figure 174. N8 texture spectrum

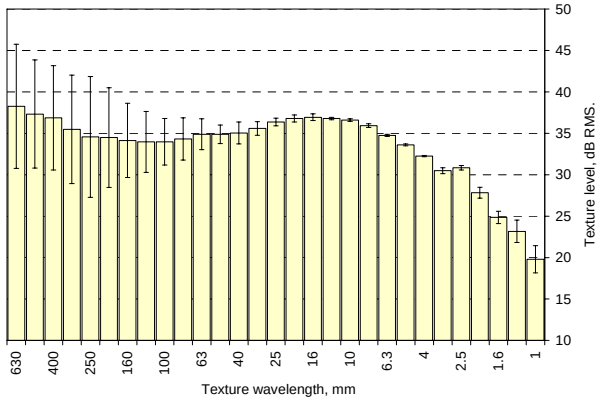


Figure 175. N9 texture spectrum

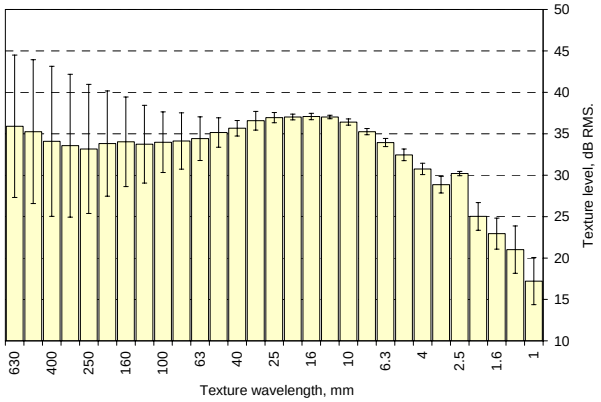


Figure 176. N10 texture spectrum

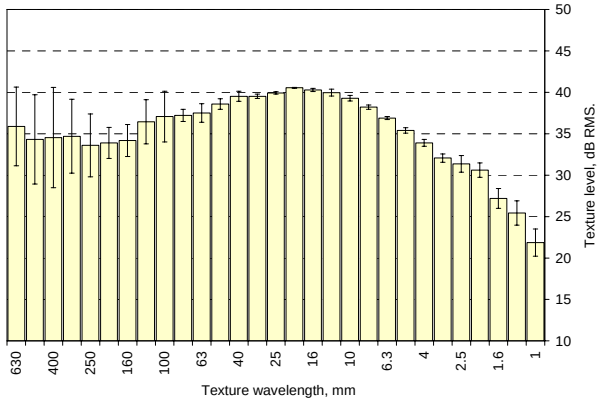


Figure 177. N11 texture spectrum

Figure 178. N12 texture spectrum

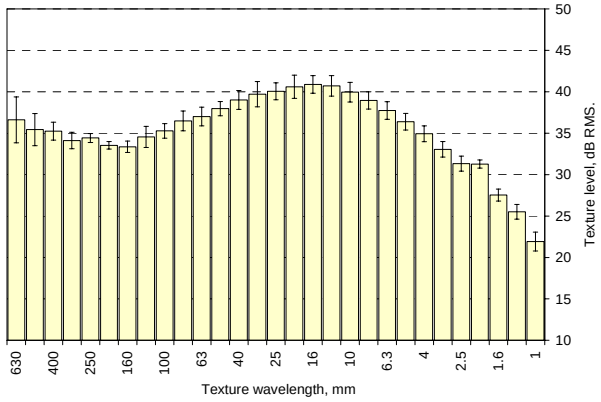


Figure 179. N13 texture spectrum

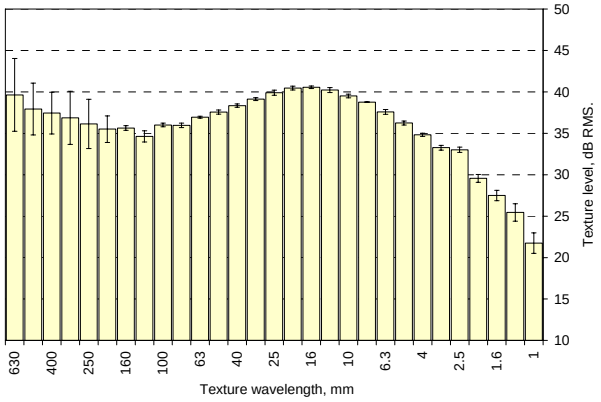


Figure 180. E1 texture spectrum

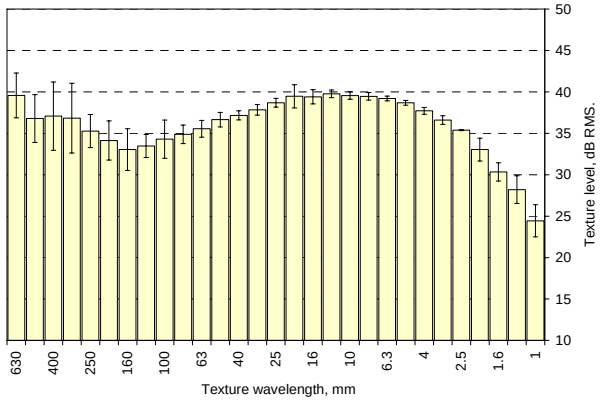


Figure 181. E2 texture spectrum

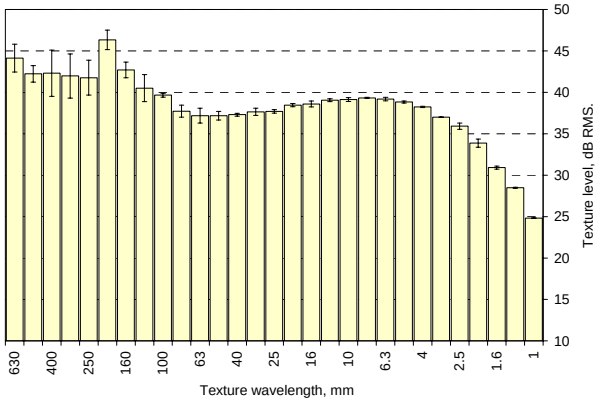


Figure 182. E3 texture spectrum

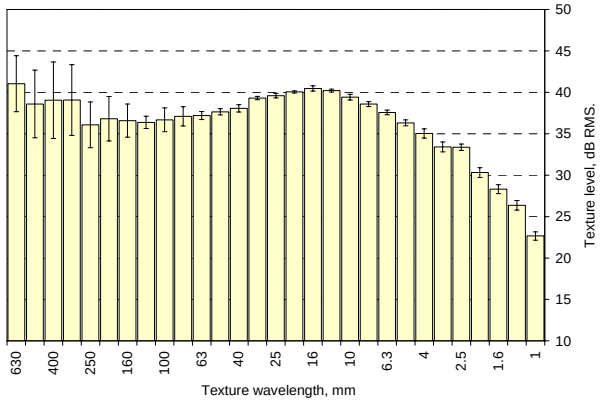


Figure 183. E4 texture spectrum

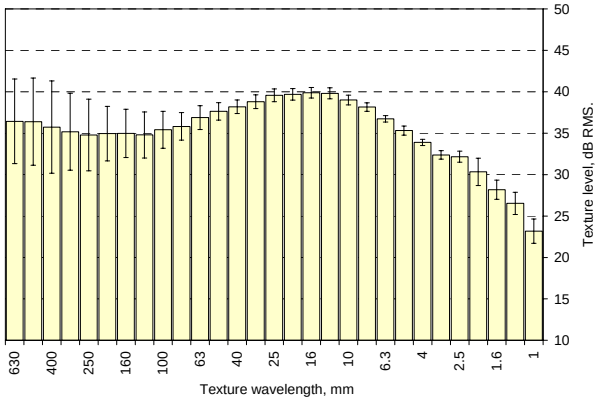


Figure 184. E5 texture spectrum

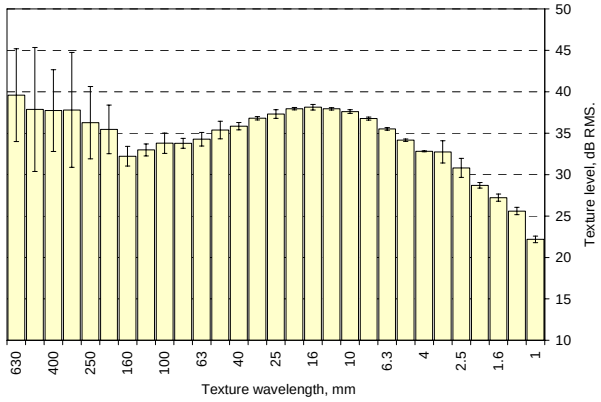


Figure 185. E6 texture spectrum

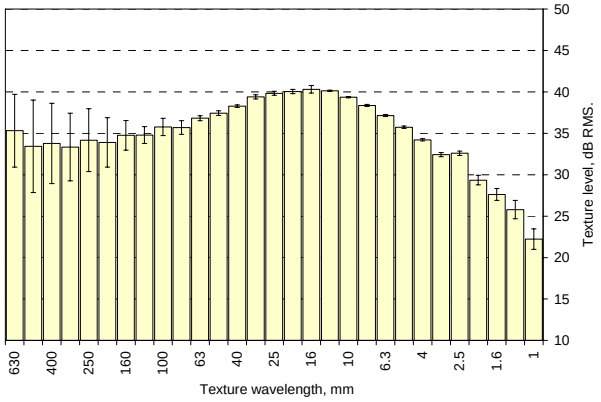


Figure 186. E7 texture spectrum

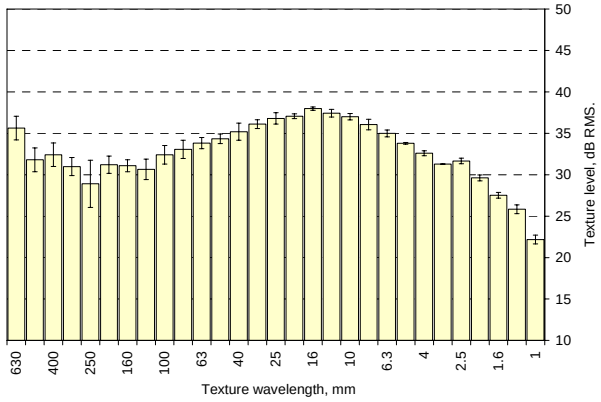


Figure 187. E8 texture spectrum

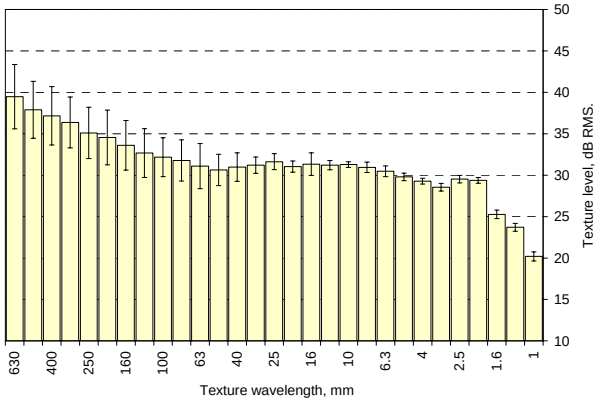


Figure 188. E9 texture spectrum

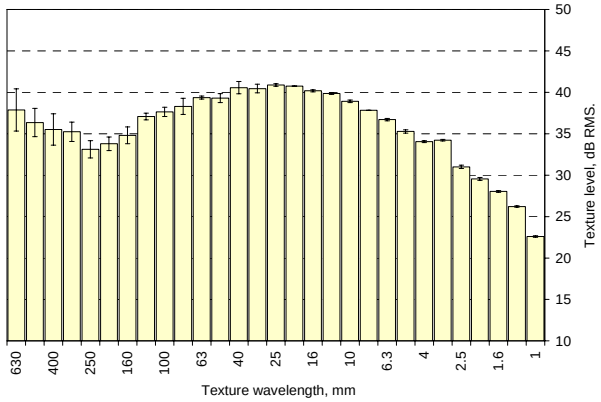


Figure 189. S1 texture spectrum

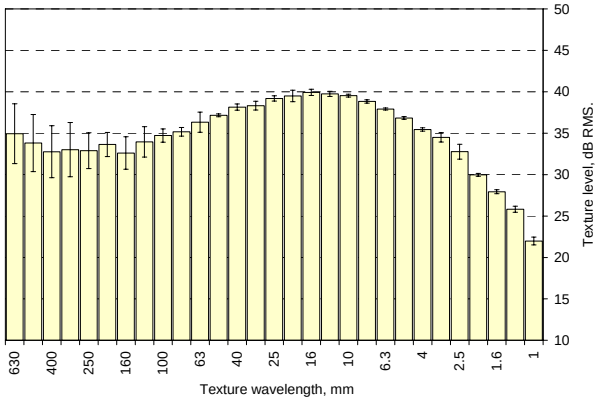


Figure 190. S2 texture spectrum

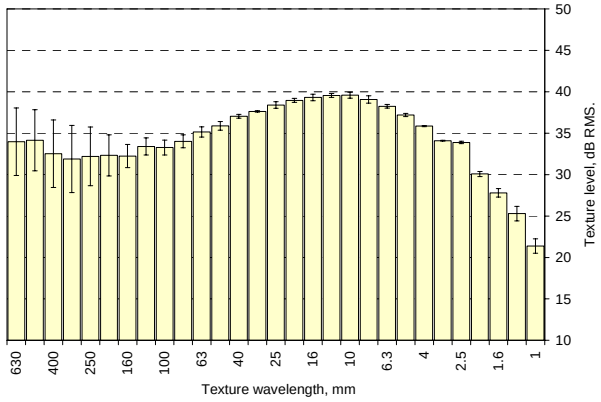


Figure 191. S3 texture spectrum

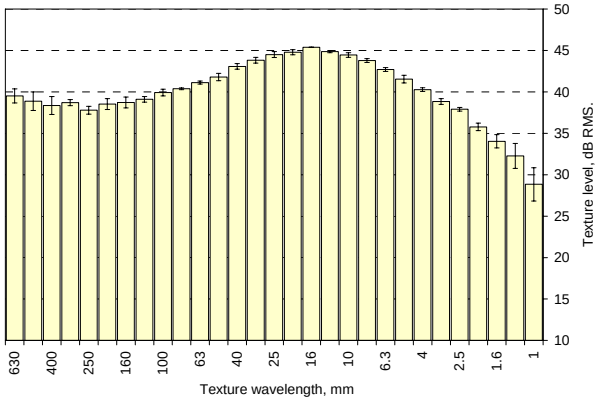


Figure 192. S4 texture spectrum

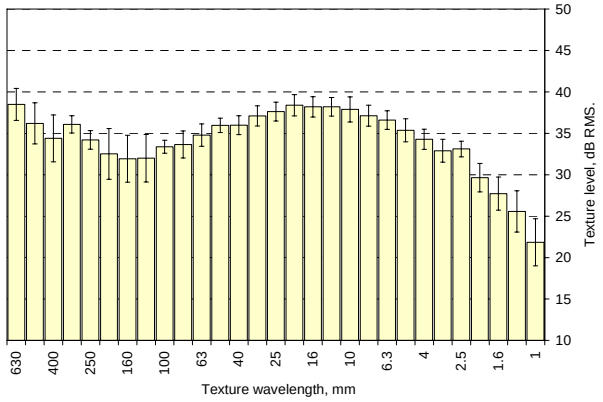


Figure 193. S5 texture spectrum

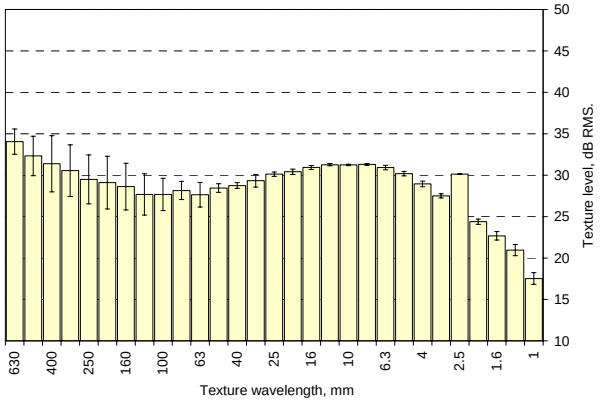


Figure 194. S6 texture spectrum

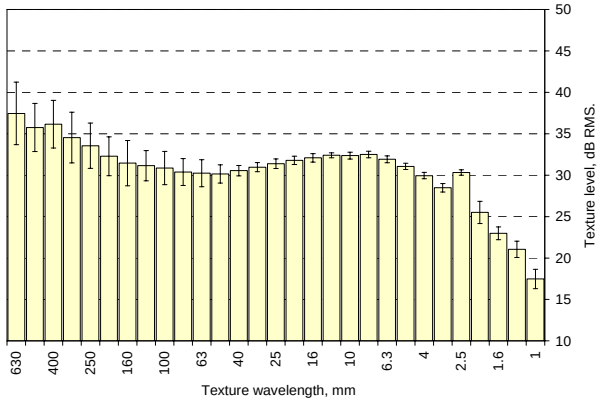


Figure 195. S7 texture spectrum

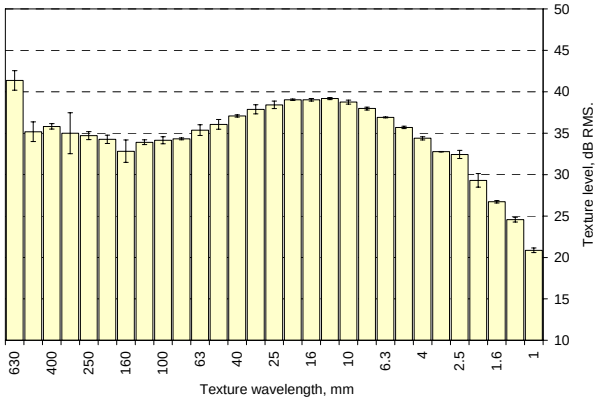


Figure 196. S8 texture spectrum

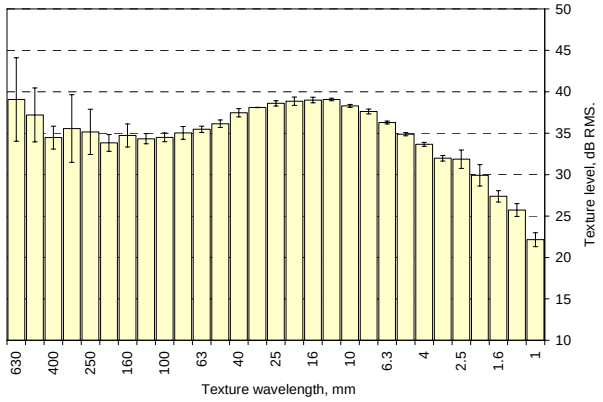


Figure 197. S9 texture spectrum

Figure 198. S10 texture spectrum

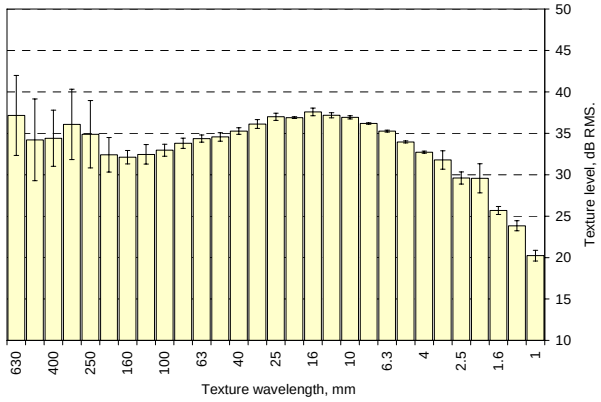


Figure 199. S11 texture spectrum

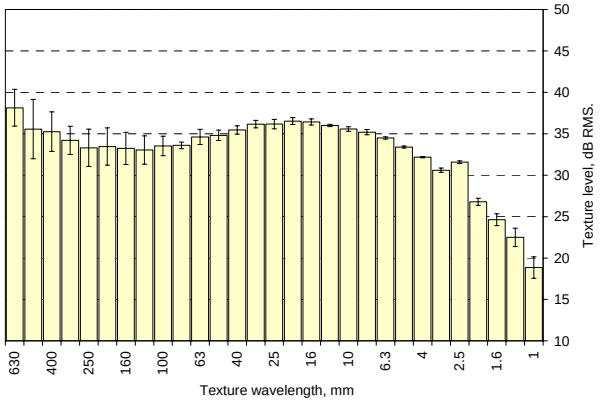


Figure 200. S12 texture spectrum

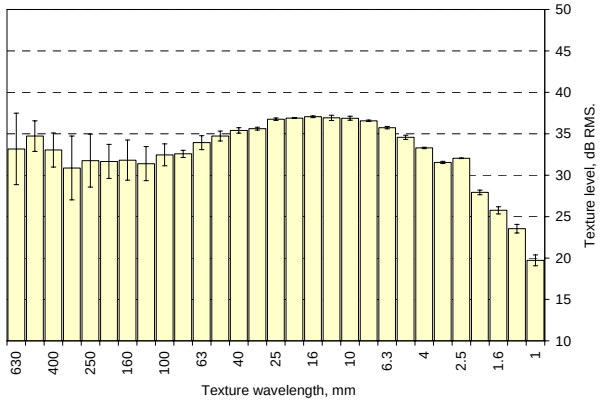


Figure 201. S13 texture spectrum

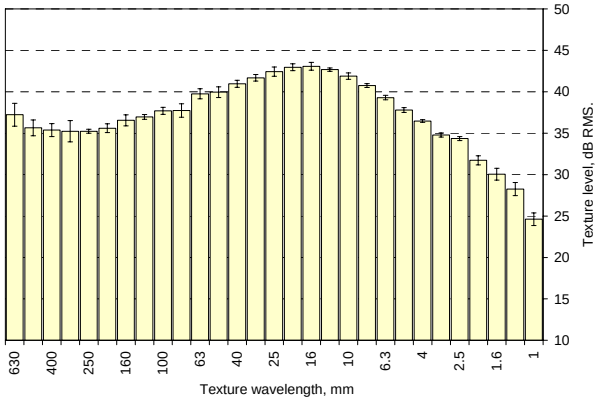


Figure 202. W1 texture spectrum

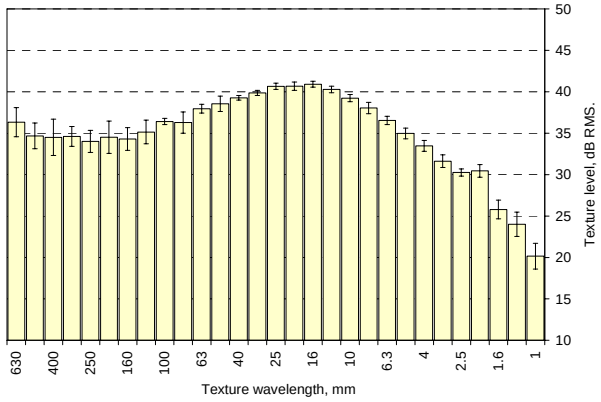


Figure 203. W2 texture spectrum

Figure 204. W3 texture spectrum

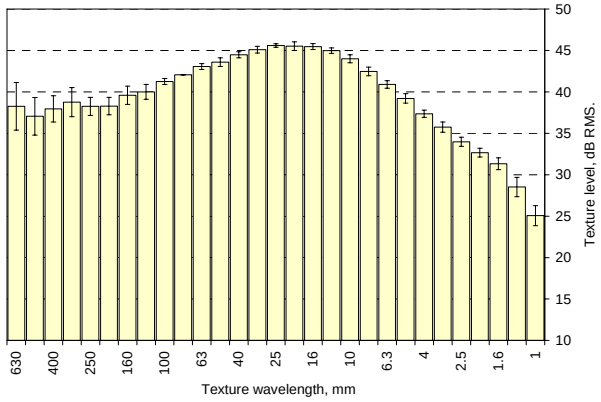


Figure 205. W4 texture spectrum

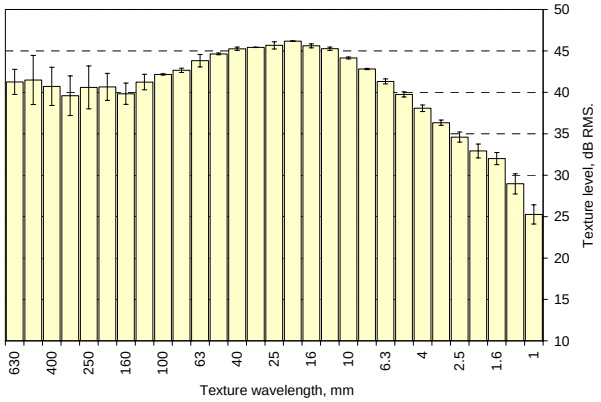


Figure 206. W5 texture spectrum

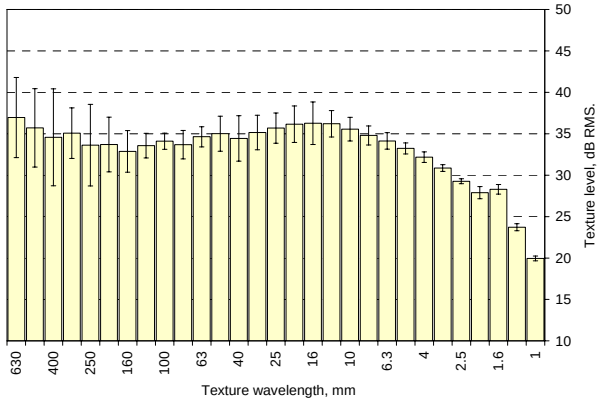


Figure 207. W6 texture spectrum

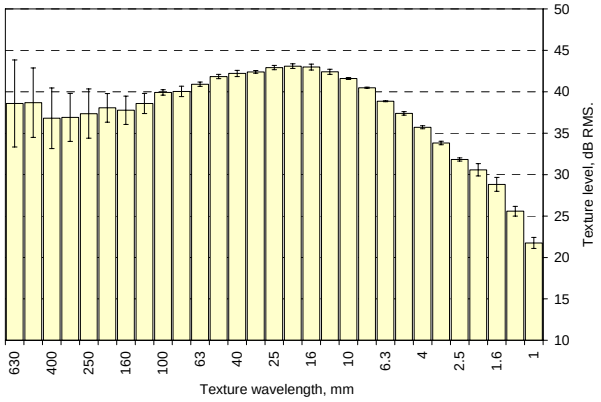


Figure 208. W7 texture spectrum

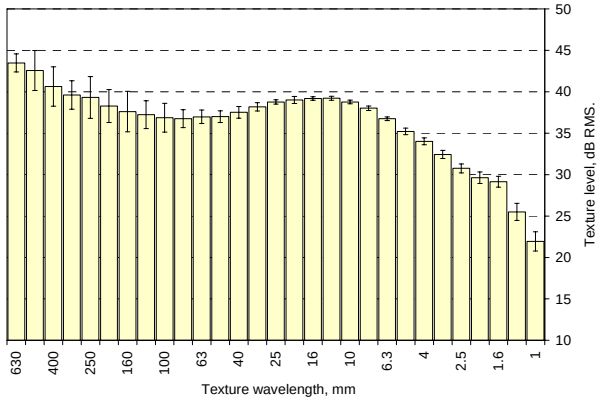


Figure 209. W8 texture spectrum

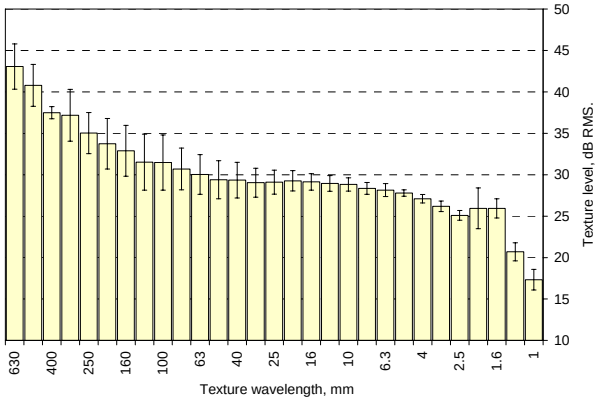


Figure 210. W9 texture spectrum

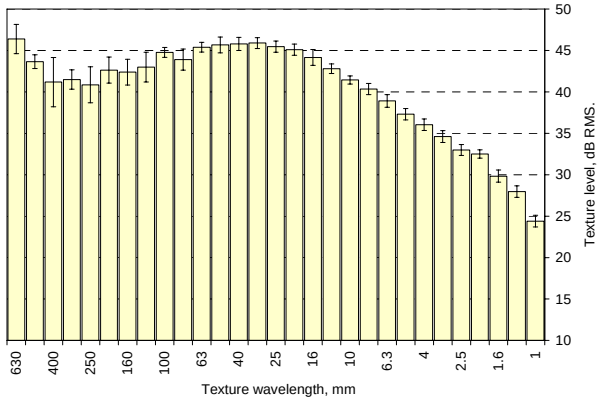


Figure 211. W10 texture spectrum

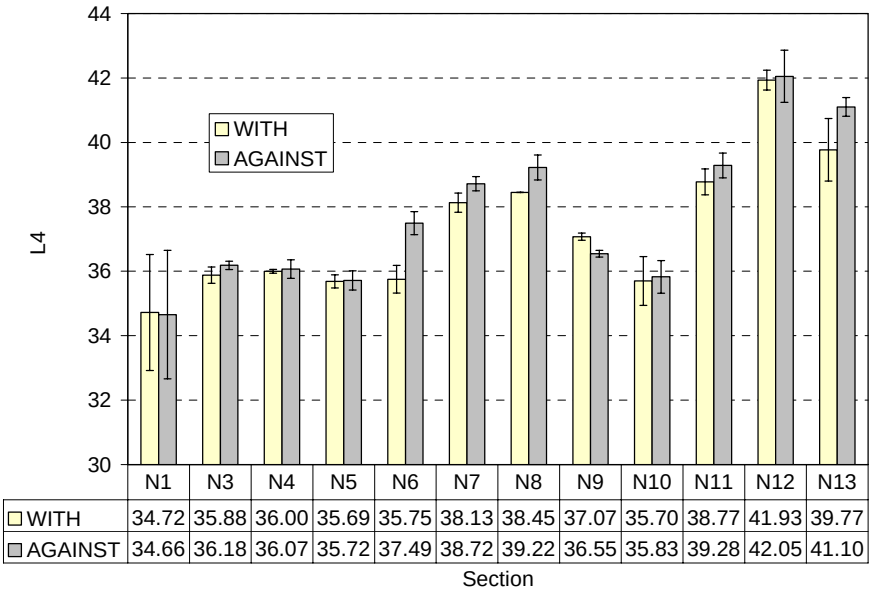
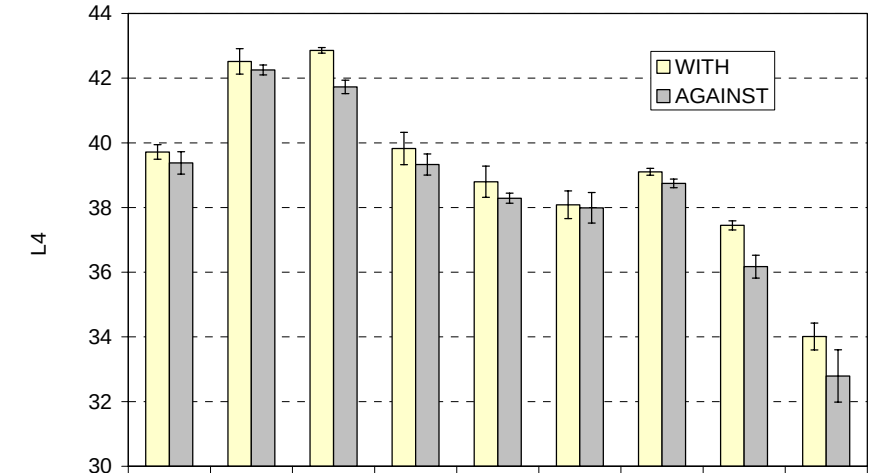


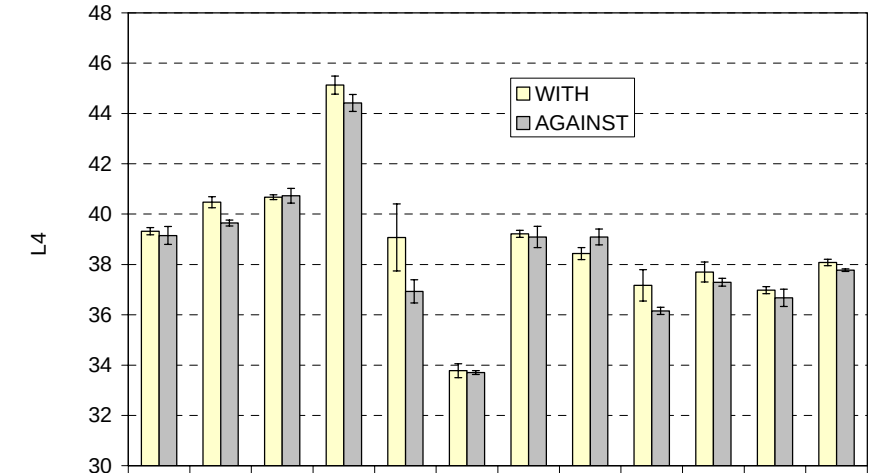
Figure 212. L_4 on the north-bound sections



	E1	E2	E3	E4	E5	E6	E7	E8	E9
WITH	39.72	42.52	42.86	39.83	38.80	38.08	39.10	37.45	34.01
AGAINST	39.38	42.25	41.73	39.33	38.29	37.99	38.75	36.17	32.79

Section

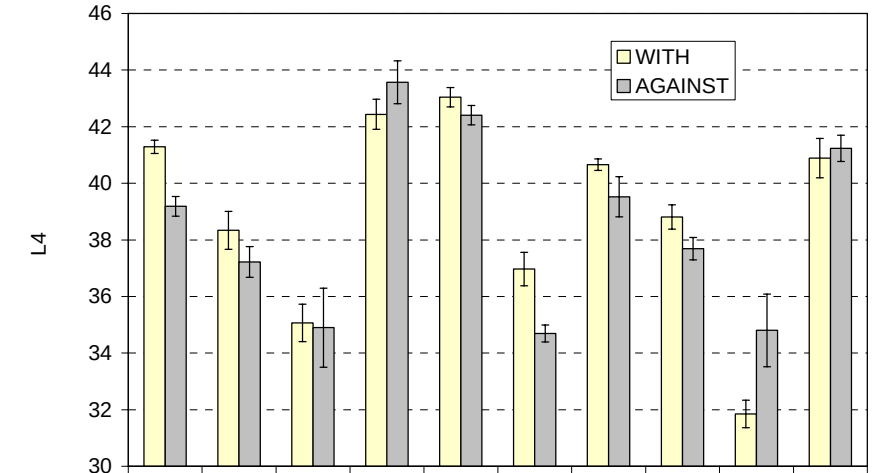
Figure 213. L_4 on the east-bound sections



	S1	S2	S3	S4	S5	S6	S8	S9	S10	S11	S12	S13
WITH	39.32	40.47	40.67	45.13	39.07	33.78	39.22	38.43	37.17	37.70	36.98	38.08
AGAINST	39.15	39.64	40.73	44.42	36.93	33.71	39.09	39.09	36.15	37.29	36.67	37.77

Section

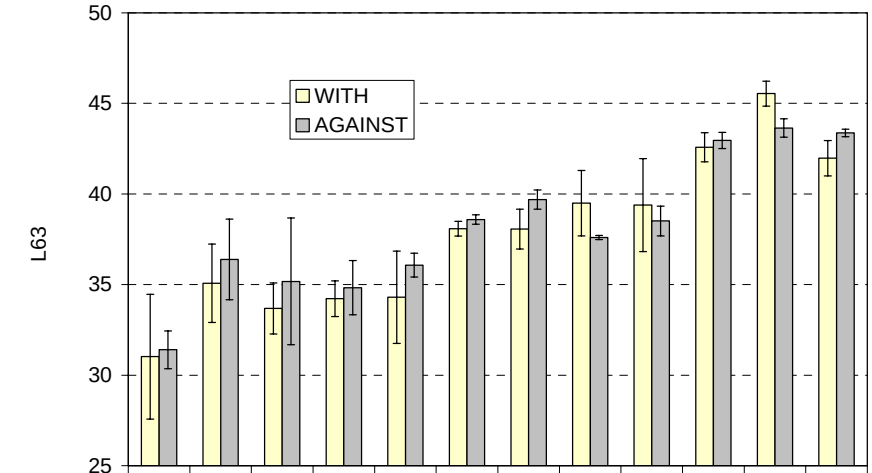
Figure 214. L_4 on the south-bound sections



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
WITH	41.29	38.34	35.06	42.44	43.04	36.97	40.66	38.81	31.85	40.89
AGAINST	39.18	37.22	34.90	43.57	42.41	34.69	39.52	37.69	34.80	41.23

Section

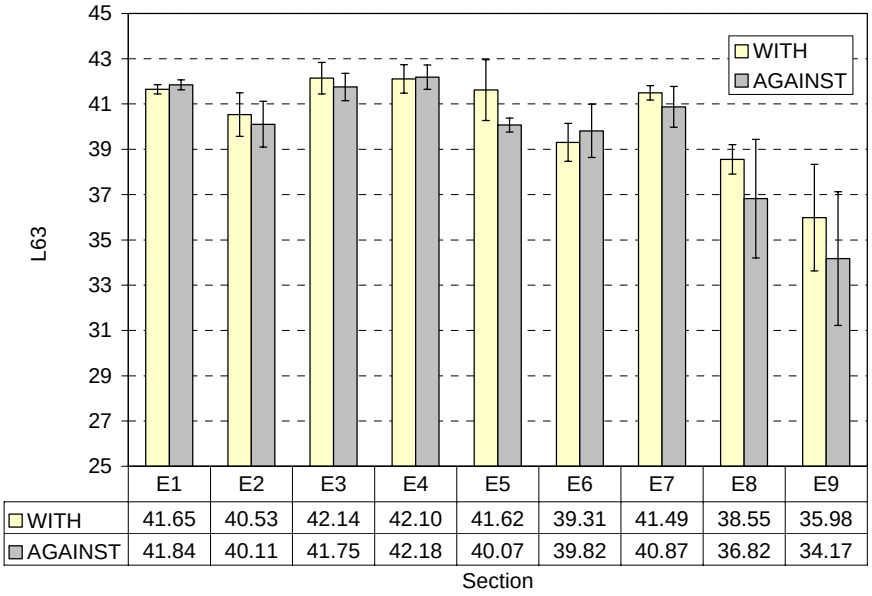
Figure 215. L_4 on the west-bound sections



	N1	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13
WITH	31.02	35.07	33.68	34.22	34.30	38.08	38.07	39.50	39.39	42.58	45.54	41.98
AGAINST	31.40	36.39	35.17	34.83	36.08	38.59	39.69	37.60	38.51	42.96	43.64	43.37

Section

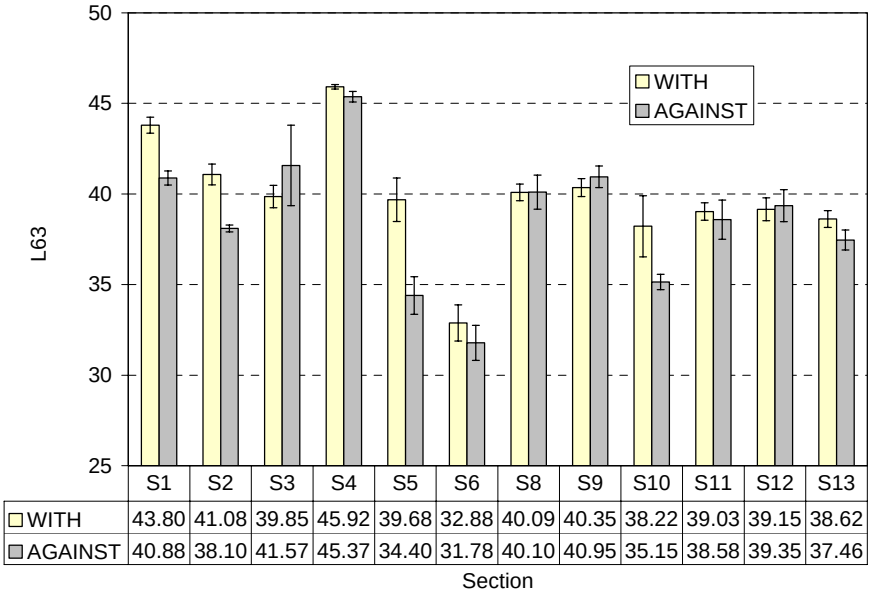
Figure 216. L_{63} on the north-bound sections



	E1	E2	E3	E4	E5	E6	E7	E8	E9
WITH	41.65	40.53	42.14	42.10	41.62	39.31	41.49	38.55	35.98
AGAINST	41.84	40.11	41.75	42.18	40.07	39.82	40.87	36.82	34.17

Section

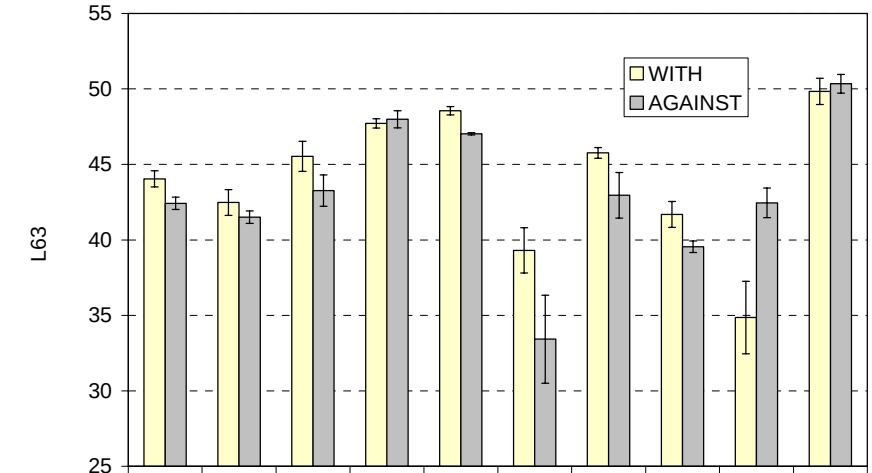
Figure 217. L_{63} on the east-bound sections



	S1	S2	S3	S4	S5	S6	S8	S9	S10	S11	S12	S13
WITH	43.80	41.08	39.85	45.92	39.68	32.88	40.09	40.35	38.22	39.03	39.15	38.62
AGAINST	40.88	38.10	41.57	45.37	34.40	31.78	40.10	40.95	35.15	38.58	39.35	37.46

Section

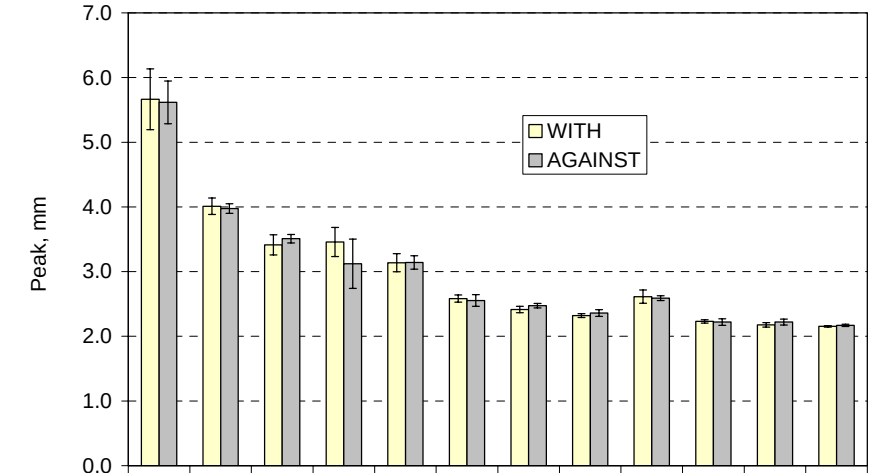
Figure 218. L_{63} on the south-bound sections



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
WITH	44.04	42.47	45.54	47.72	48.56	39.31	45.76	41.68	34.85	49.84
AGAINST	42.42	41.50	43.26	47.99	47.03	33.42	42.95	39.55	42.45	50.34

Section

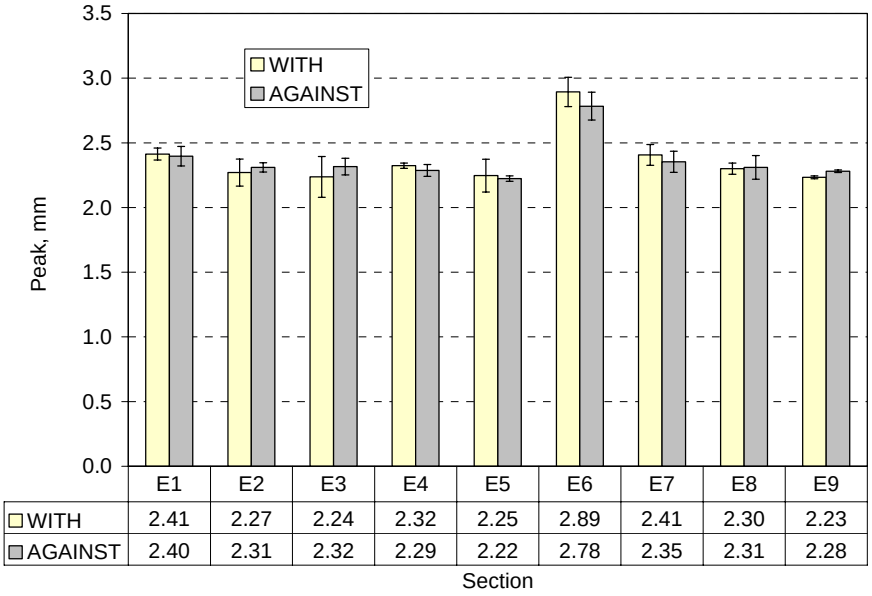
Figure 219. L_{63} on the west-bound sections



	N1	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13
WITH	5.66	4.01	3.41	3.46	3.14	2.58	2.42	2.32	2.61	2.23	2.18	2.15
AGAINST	5.62	3.97	3.51	3.12	3.14	2.55	2.47	2.36	2.59	2.22	2.22	2.17

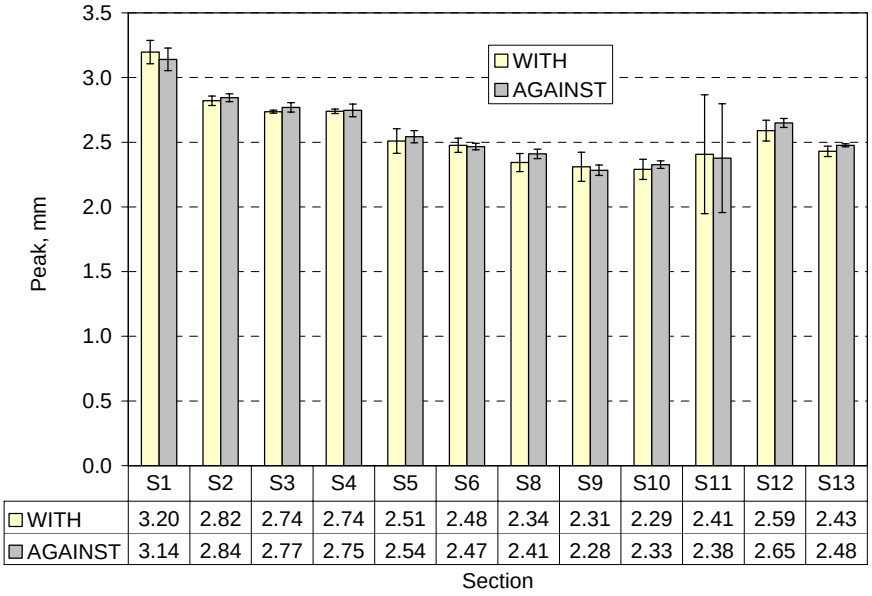
Section

Figure 220. Characteristic peak on the north-bound sections



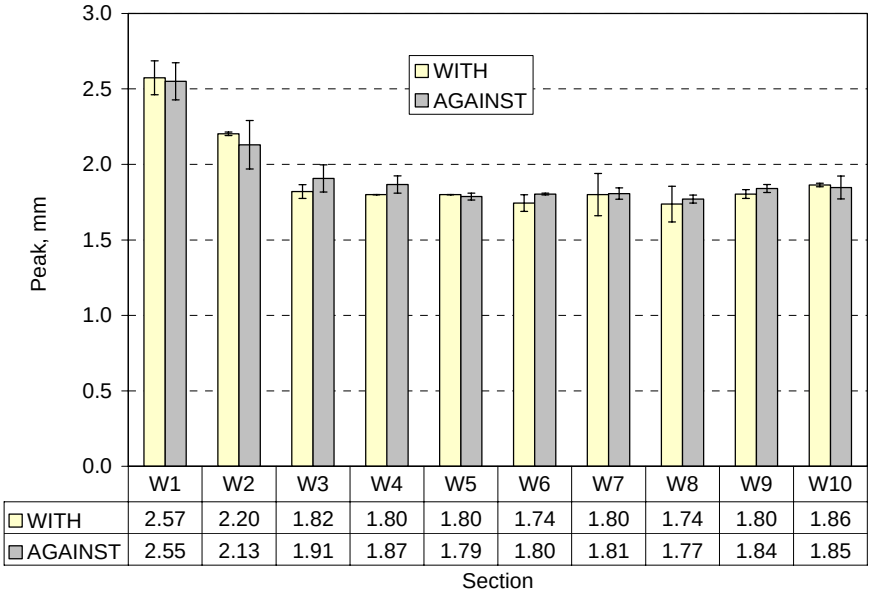
	E1	E2	E3	E4	E5	E6	E7	E8	E9
WITH	2.41	2.27	2.24	2.32	2.25	2.89	2.41	2.30	2.23
AGAINST	2.40	2.31	2.32	2.29	2.22	2.78	2.35	2.31	2.28

Figure 221. Characteristic peak on the east-bound sections



	S1	S2	S3	S4	S5	S6	S8	S9	S10	S11	S12	S13
WITH	3.20	2.82	2.74	2.74	2.51	2.48	2.34	2.31	2.29	2.41	2.59	2.43
AGAINST	3.14	2.84	2.77	2.75	2.54	2.47	2.41	2.28	2.33	2.38	2.65	2.48

Figure 222. Characteristic peak on the south-bound sections



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
WITH	2.57	2.20	1.82	1.80	1.80	1.74	1.80	1.74	1.80	1.86
AGAINST	2.55	2.13	1.91	1.87	1.79	1.80	1.81	1.77	1.84	1.85

Figure 223. Characteristic peak on the west-bound sections

APPENDIX H: ULIP ARTIFACT INVESTIGATION