

## GPS Class Data Overview

The GPS data was taken on Tuesday, 3/16/2023 from approximately 12:50-1:20 pm in Auburn, AL. The data consists of 2 Novatel receivers as well as IF data from one static antenna (located at **422596.629, -5362864.287, 3415493.797** in ECEF) and data from two Novatel receivers from two separate antennas mounted to a vehicle and IF data from one of those antennas. The data collection utilized antennas splitter to feed data from one antenna into the multiple receivers.

### Static Antenna:

RCVR\_S1: This is data taken from a Novatel PwrPak7 receiver with measurements recorded once per second (1 Hz) from a static antenna (Antenna 0).

RCVR\_S2: This is data taken from a Novatel PwrPak7 receiver with measurements recorded once per second (1 Hz) from a static antenna (Antenna 0)

IFEN\_data: This is IF data recorded form the static antenna (Antenna 0)

### Mobile Antenna:

RCVR\_D1: This is data taken from a Novatel ProPak-V3 receiver with measurements recorded once every second (1 Hz) from an antenna (Antenna 1) mounted on a vehicle

RCVR\_D2: This is data taken from a Novatel ProPak-V3 receiver with measurements recorded once every second (1 Hz) from an antenna (Antenna 2) mounted on a vehicle

Nordnav\_data: This is IF data recorded from an antenna (Antenna 1) mounted on a vehicle.

The data set includes the following information:

1. Receiver Type: Static or dynamic
  - a. GPS time
    - i. Week number since GPS time
    - ii. Time of week in seconds
  - b. Measurements: L1, L2, L2C, L5 for all GPS PRNs
    - i. Pseudorange in meters
    - ii. Carrier Phase
      1. Static Data: in cycles (watch the signs)
      2. Dynamic Data: in meters
    - iii. Doppler in Hz
    - iv. Carrier to Noise ratio

Note that L2 measurements on all receivers is codeless tracking of the encrypted L2 signal. L2C is the civilian L2 signal that provides a true L2 code tracking (i.e provides a true pseudorange).

## GPS Data Format

The GPS receiver data is contained in structures. The structures include raw (*uncorrected*) receiver measurement observables (such as pseudorange, carrier phase, doppler, C/No) as well as the GPS ephemeris data. The structures contain matrices of data indexed by the time and satellite. For example:

```
RCVR_S1.measurements.L1.psr(time_sample,SV)
```

Contains the Nth sample L1 pseudorange for the SVth satellite. The GPS seconds associated with this Nth sample is contained in:

```
RCVR_S1.GPS_time.seconds(time_sample)
```

However, The ephemeris data is “grouped” in a structure by satellite PRN. For example:

```
RCVR_S1.ephemeris(3).a_f0
```

Contains the clock correction term a\_f0 for the SV #3. This allows you to pass all the ephemerides for SV #3 together as “RCVR0\_data.ephem(3)” which will contain all of the ephemerides for SV #3. For example:

```
gps_sv_ephem=RCVR_S1.ephemeris(3)
```

will now have:

```
gps_sv_ephem.a_f0, gps_sv_ephem.a_f1, etc. for SV #3.
```

## Receiver Specifications:

### 1. Static Novatel

- a. Model: PwrPak7 OEM
- b. Frequency: L1 CA, L2 (Codeless Tracking), L2C, L5 (and L1C on 1 SV)
- c. Driver Interface: Novatel Official ROS Driver
  - i. ROS Driver: [http://wiki.ros.org/novatel\\_oem7\\_driver](http://wiki.ros.org/novatel_oem7_driver)
  - ii. Binary Novatel Parser: <https://novatel.com/products/firmware-options-pc-software/novatel-convert>

### 2. Dynamic Novatel (Two Antennas)

- a. Frequency: L1 CA, L2 Codeless
- b. Driver Interface: Novatel Official ROS Driver
- c. Antenna Specifications
  - i. Two antennas placed in line on the middle front and middle back of the MKZ roof rack. Spaced approximately 50 inches apart vertically.

