



Code Carrier Wipeoff

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Sinusoid Formulas

$$\sin(\omega_1 t)\cos(\omega_2 t) = \frac{1}{2}\{\sin[(\omega_1 - \omega_2)t] + \sin[(\omega_1 + \omega_2)t]\}$$

$$\sin(\omega_1 t)\sin(\omega_2 t) = \frac{1}{2}\{\cos[(\omega_1 - \omega_2)t] - \cos[(\omega_1 + \omega_2)t]\}$$

$$\cos(\omega_1 t)\cos(\omega_2 t) = \frac{1}{2}\{\cos[(\omega_1 - \omega_2)t] + \cos[(\omega_1 + \omega_2)t]\}$$

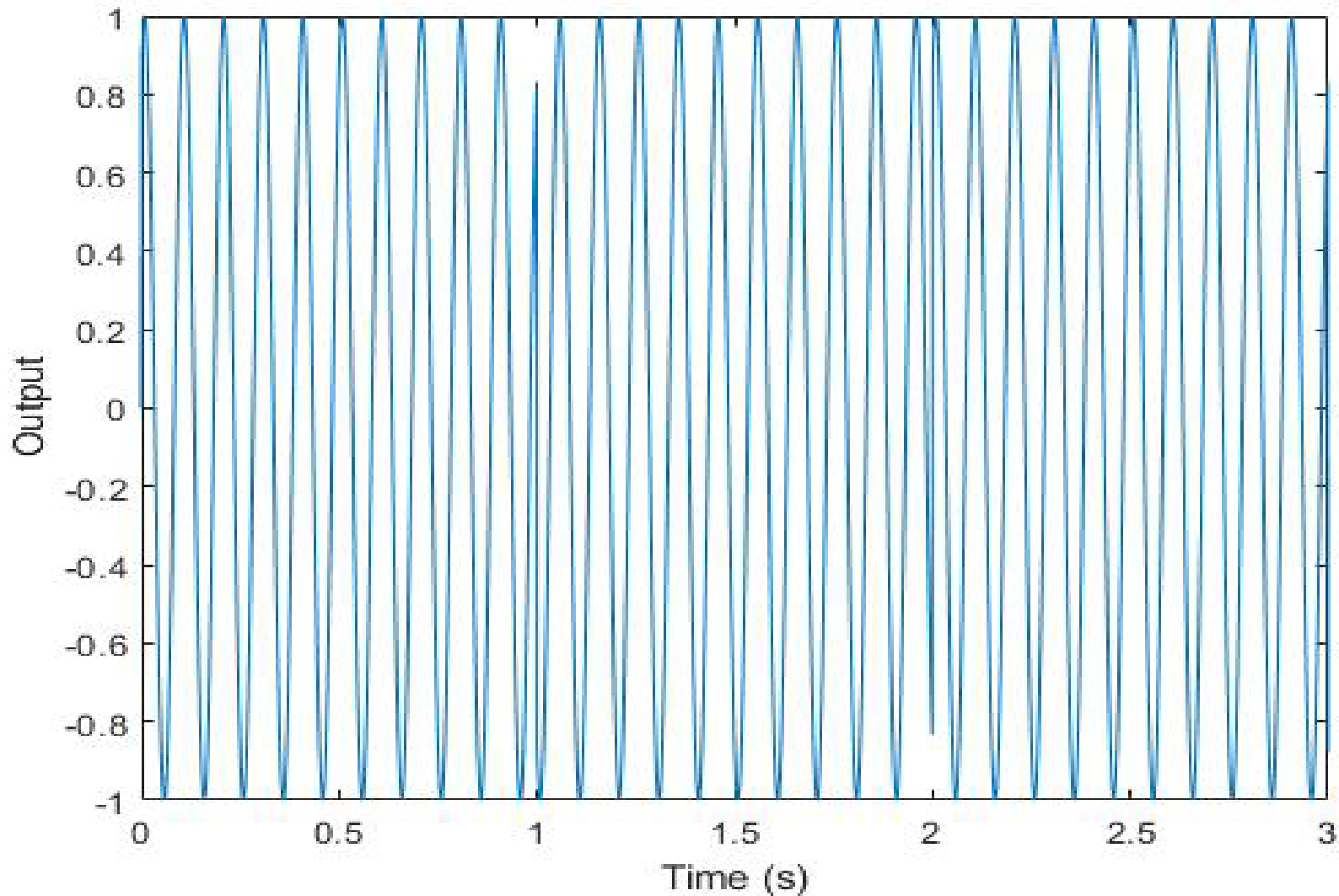
$$\sin(\omega_1 t + \theta)\cos(\omega_2 t) = \frac{1}{2}\{\sin[(\omega_1 - \omega_2)t + \theta] + \sin[(\omega_1 + \omega_2)t + \theta]\}$$

$$\sin(\omega_1 t + \theta)\sin(\omega_2 t) = \frac{1}{2}\{\cos[(\omega_1 - \omega_2)t + \theta] - \cos[(\omega_1 + \omega_2)t + \theta]\}$$

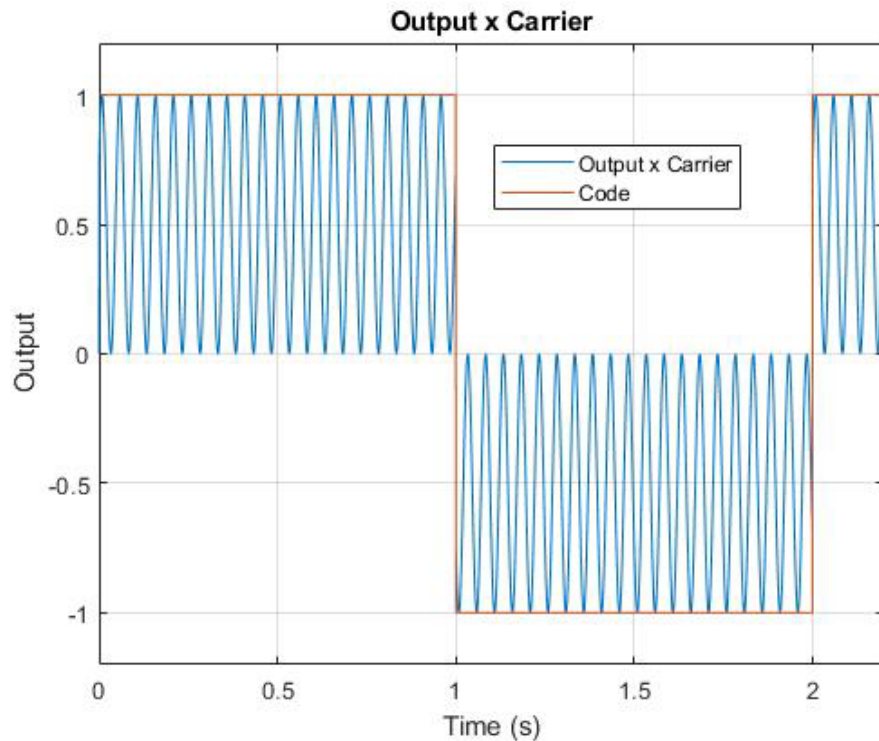
$$\cos(\omega_1 t + \theta)\cos(\omega_2 t) = \frac{1}{2}\{\cos[(\omega_1 - \omega_2)t + \theta] + \cos[(\omega_1 + \omega_2)t + \theta]\}$$

Signal: Code $\times \sin\left[10(2\pi)t + \frac{\pi}{3}\right]$

- Code bit (“chip”) flip every 1 second

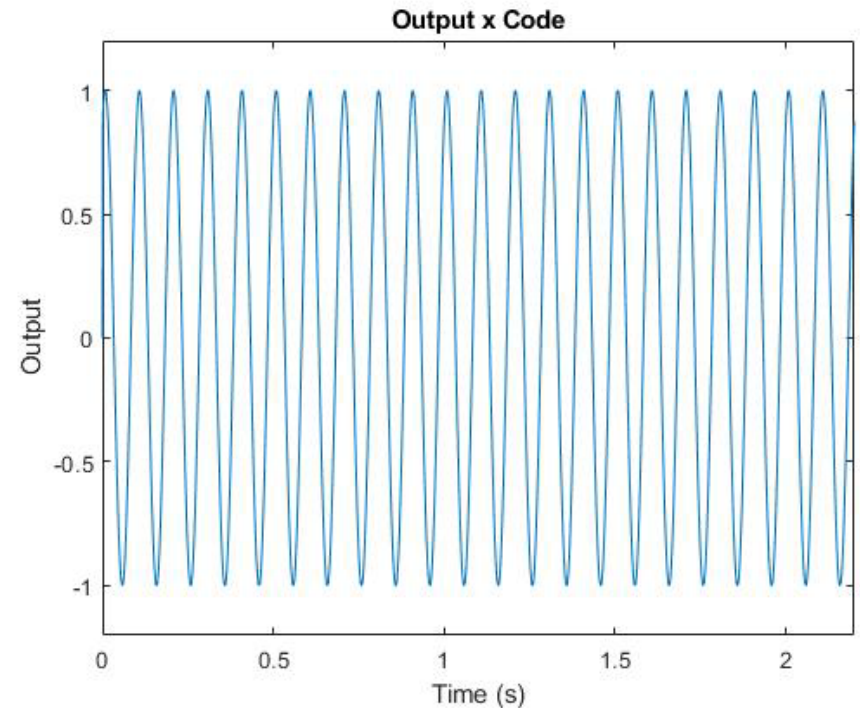


Output x Carrier vs Output x Code



Output x True Carrier Results:

- 20 Hz sinusoid
- Mean = $0.5 * \text{Code}$

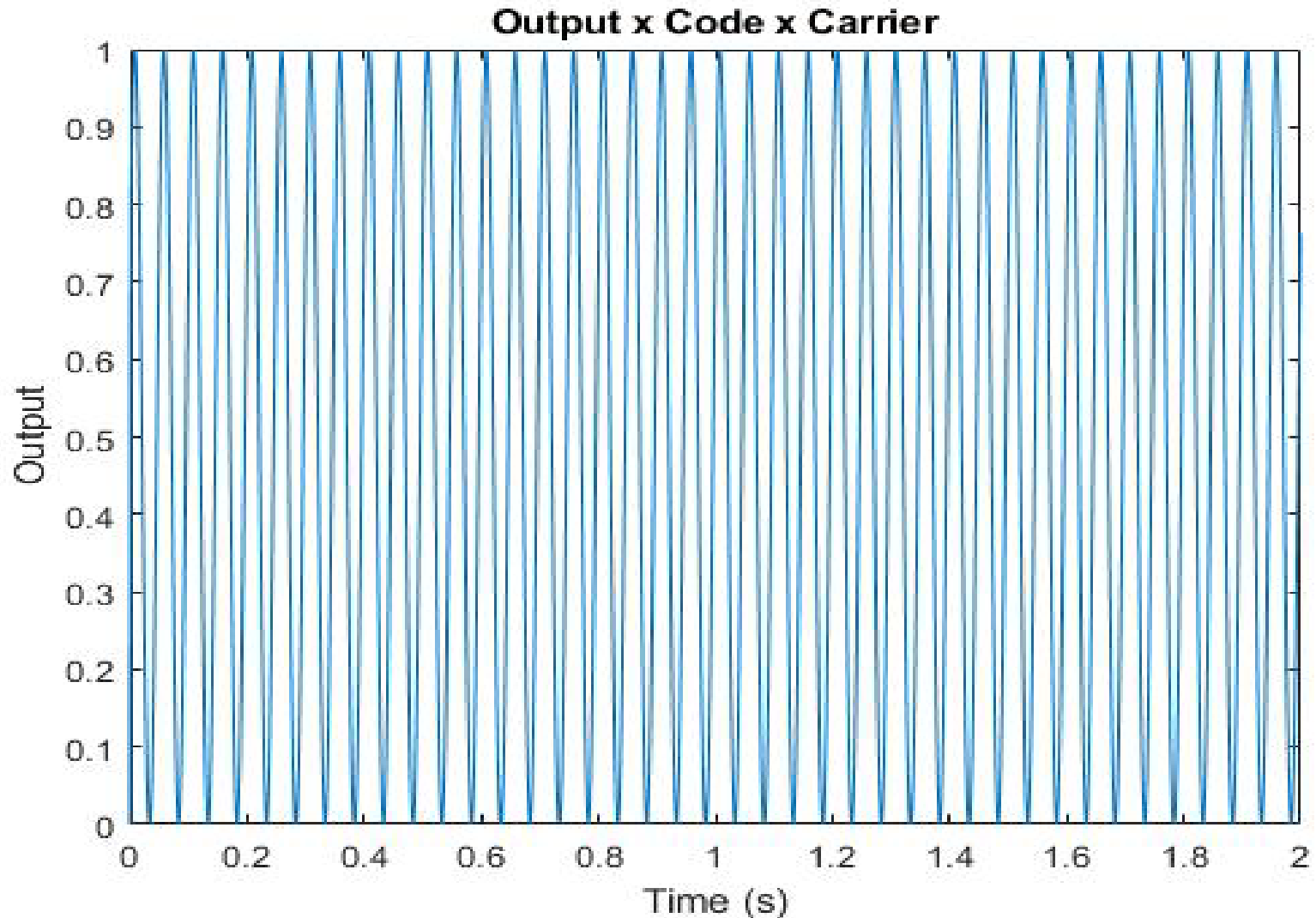


Output x True Code Results:

- 10 Hz sinusoid

Output x Code x Perfect Carrier

- Result is 20 Hz sinusoid



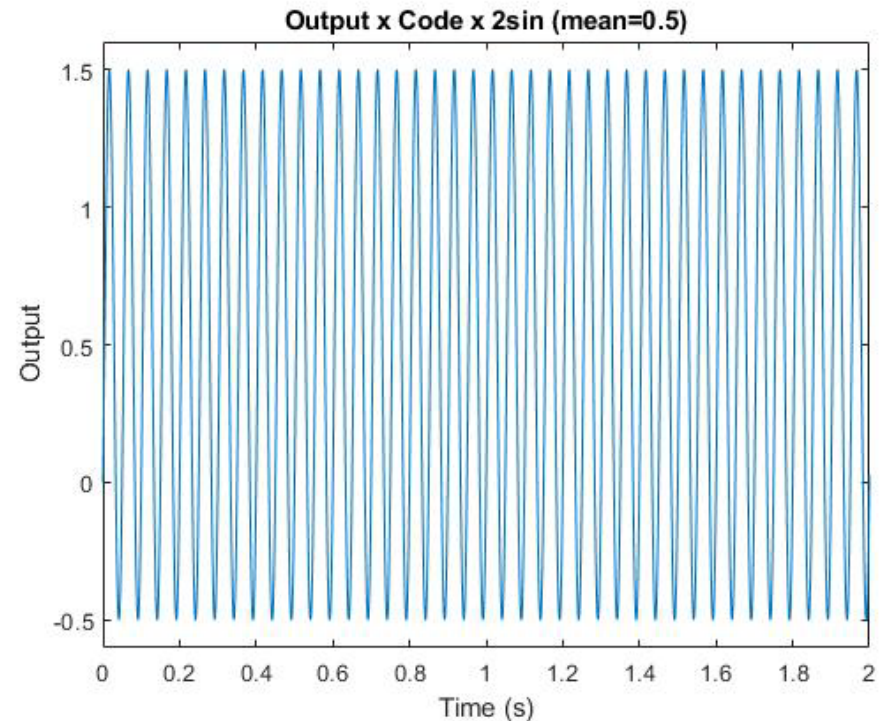
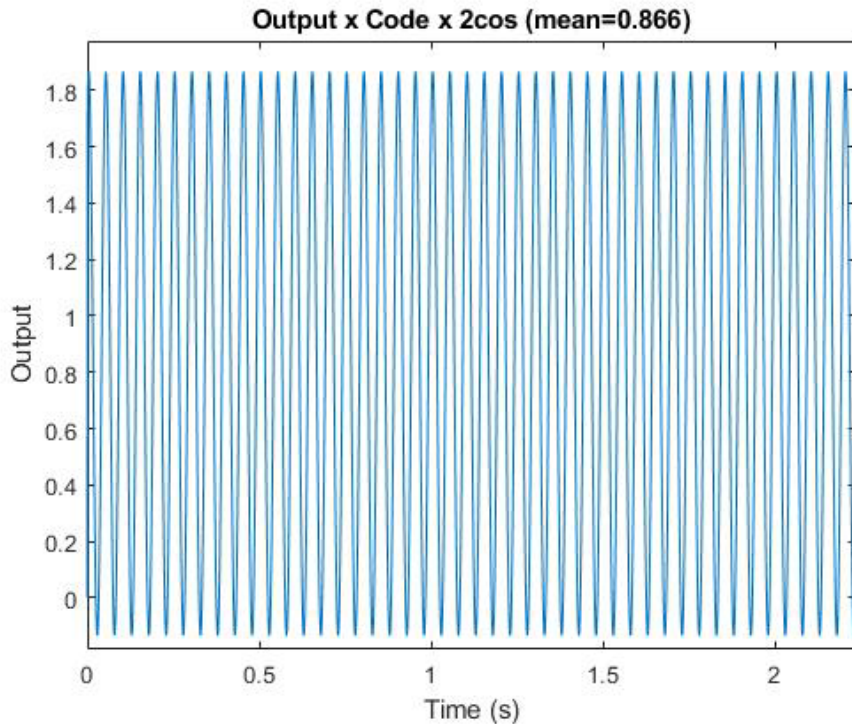
In-Phase & Quadrature ($x \sin[10(2\pi)t + \frac{\pi}{3}]$)

$$Q = 2\cos[10(2\pi)t]$$

$$I = 2\sin[10(2\pi)t]$$

$$\sqrt{(0.866)^2 + (0.5)^2} = 1$$

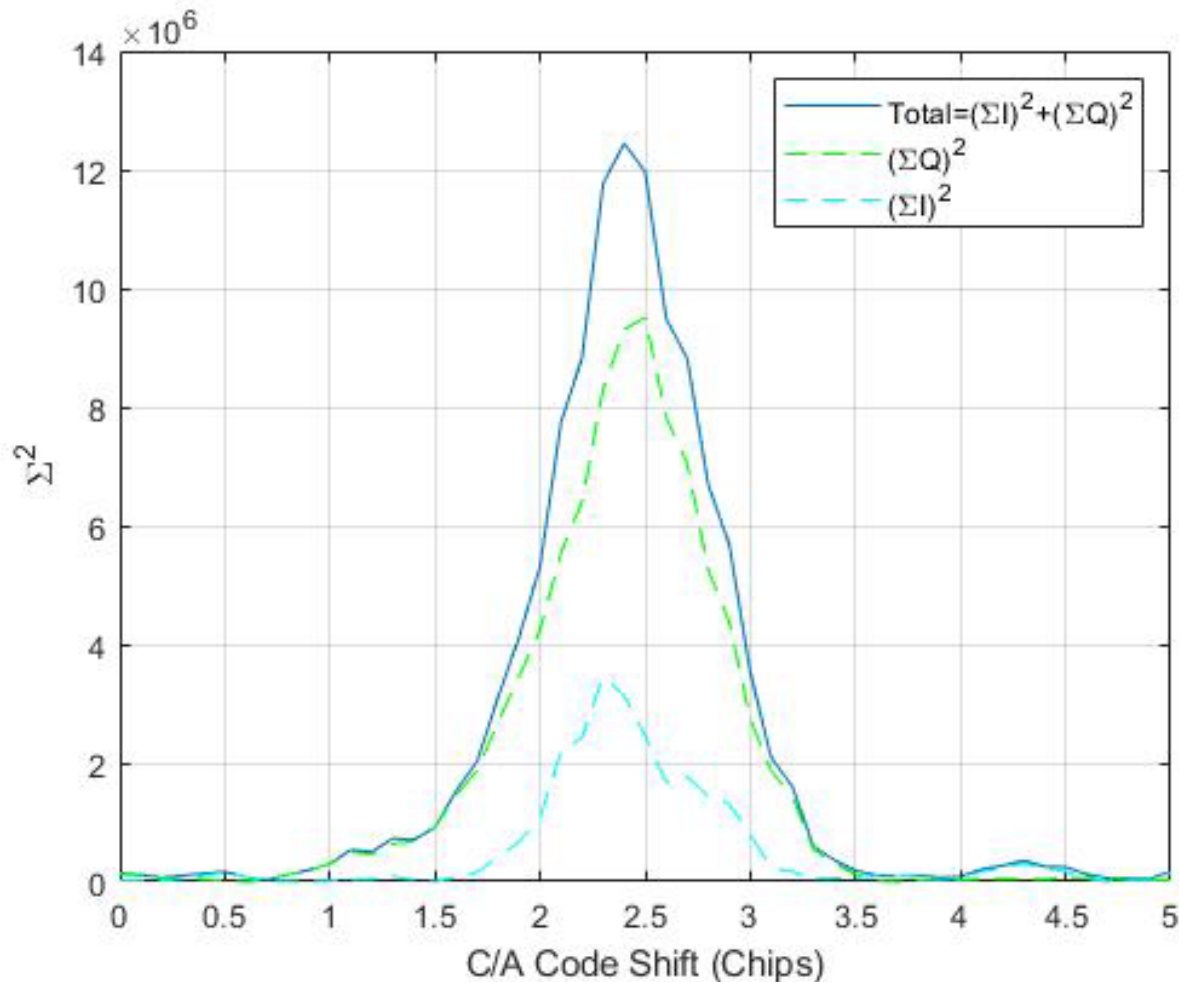
$$\tan^{-1}\left(\frac{0.866}{0.5}\right) = \frac{\pi}{3}$$



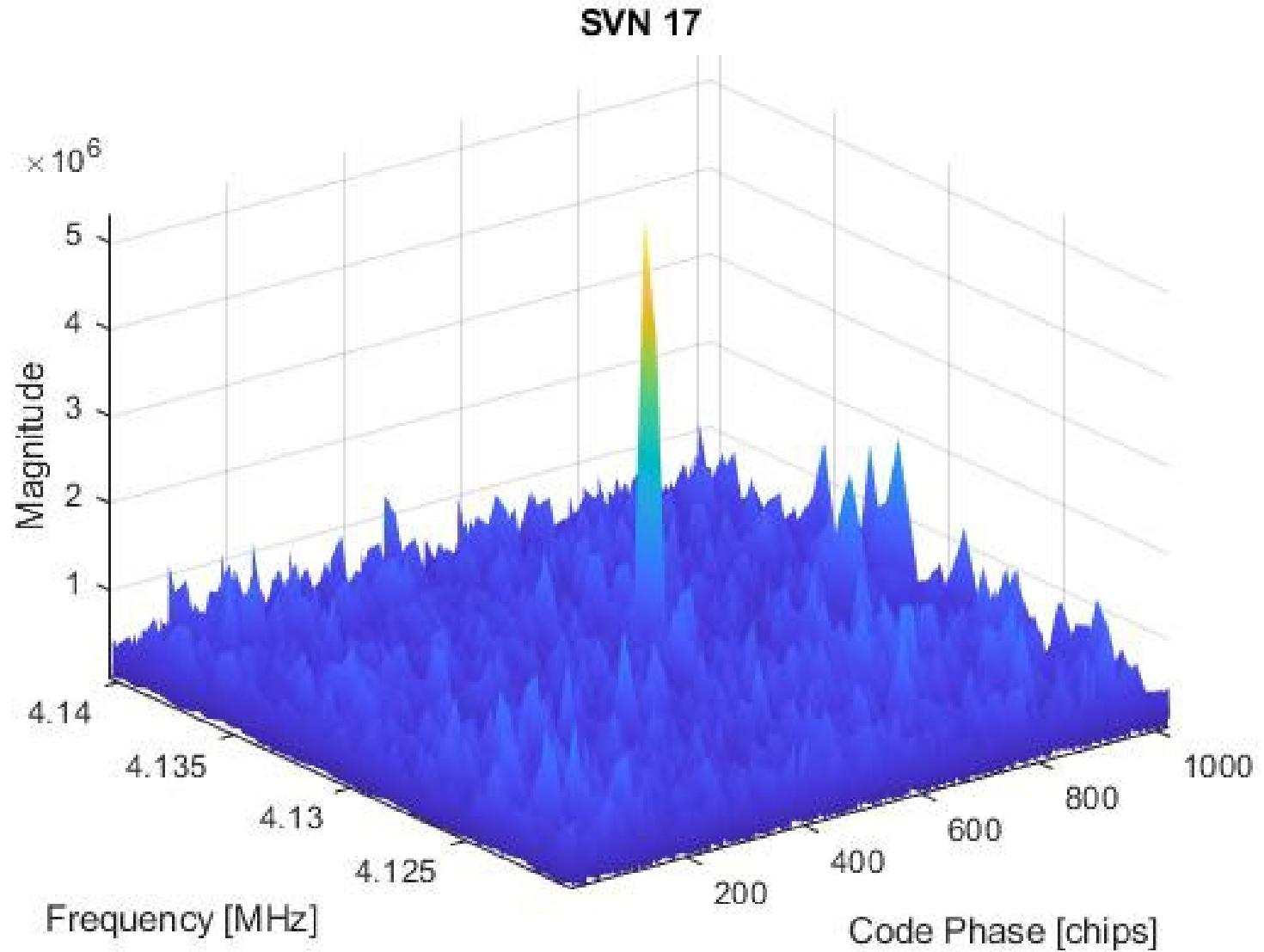
Real Data (w/Carrier Wiped Off)

$$Q = \text{Data} \times \sin(2\pi f t)$$

$$I = \text{Data} \times \cos(2\pi f t)$$



Serial Search Results



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