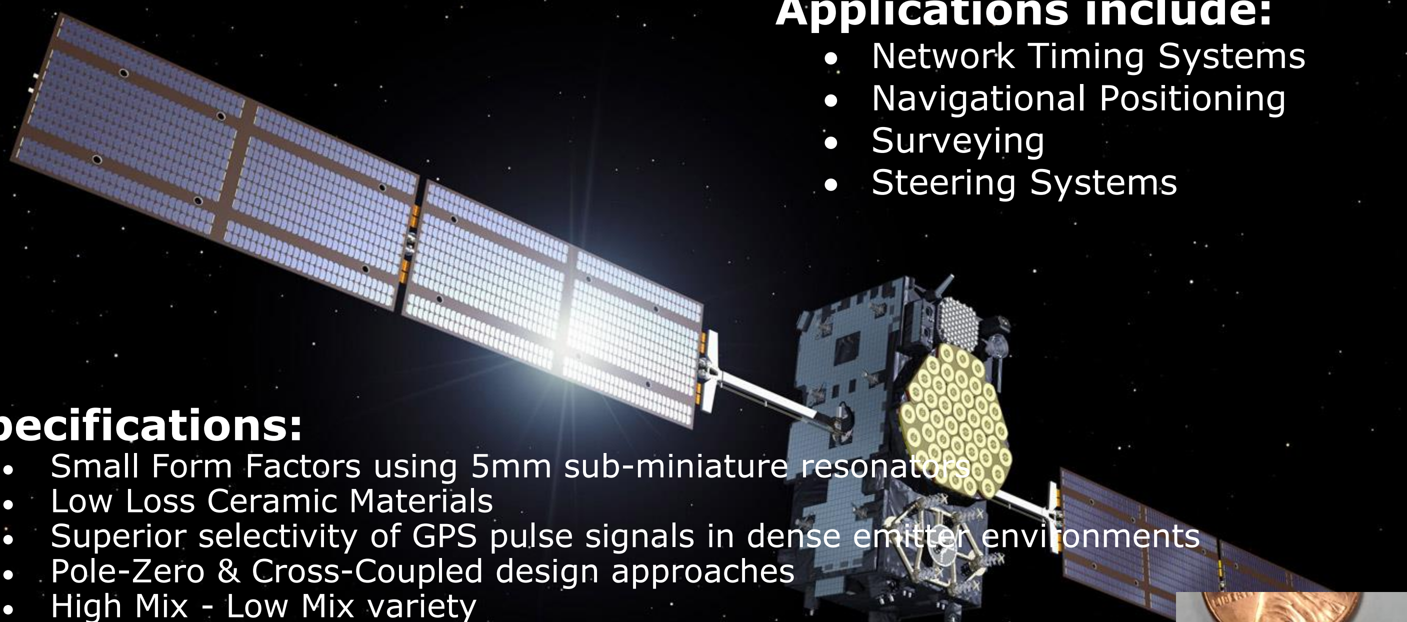
Custom-engineered

excellence.

VETERAN OWNED BUSINESS

GNSS HIGH PRECISION FILTER PRODUCTS



Applications include:

- Network Timing Systems
- Navigational Positioning
- Surveying
- Steering Systems

Specifications:

- Small Form Factors using 5mm sub-miniature resonators
- Low Loss Ceramic Materials
- Superior selectivity of GPS pulse signals in dense emitter environments
- Pole-Zero & Cross-Coupled design approaches
- High Mix - Low Mix variety
- SMT, Thru-hole & Connectorized Packaging
- High temperature stability
- Ruggedized designs suitable for Military & Space environments
- Highly repeatable for volume production

Expert Service. Fast Turnaround. Real Relationships.

ComNav is well known for our responsive, relationship-based customer service. Look to ComNav for the best engineering talent, cutting-edge design software and a refreshingly good-humored attitude toward resolving your most complex engineering challenges.

COMNAV ENGINEERING

430 Riverside St. | Phone +1 (207) 797-4588
Portland, ME 04103 | www.comnav-eng.com

Made in USA

THETA-J ASSOCIATES
MICROWAVE RESOURCE ENGINEERS

ComNav Dwg #	GNSS Platform(s)	Filter Style	SIZE (Length x Width x HT.)	NOTES
6DCR2E-1230/1560-L	GPS - Glonass - Galileo - OmniStar	SMT Diplexer	0.56 x 0.48 x 0.125	low loss - high isolation
4DCR4C-1227.6/1575.4/90-LX	GPS L1 & L2	SMT Diplexer	1.345 x 0.635 x 0.360	small size - high isolation
5BCR6C-1587.5/Z70-L	GPS & Glonass L1	SMT BP Filter		low loss with control over the Attenuation Zero
3BCR4C-1235/Z100-L	GPS & Glonass L2	SMT BP Filter		low loss with control over the Attenuation Zero
3BCR2E-1560/155-L	GPS L1	SMT BP Filter	0.500 x 0.32 x 0.125	small size - low loss - High Temp
4DCR2E-1227.6/1575.4/90-L	GPS L1 & L2	SMT Diplexer	0.440 x 0.400 x 0.126	small size - high isolation
3BCR2E-1567.5/110-L	GPS L1	SMT BP Filter	0.420 x 0.320 x 0.134	small size - low loss
3BCR3E-1587.5/100-L	GPS L1	SMT BP Filter	0.450 x 0.440 x 0.153	small size - low loss - High Temp
4DCR2E-1230/1570-L	GPS L1 & L2	SMT Diplexer	0.440 x 0.400 x 0.126	small size - high isolation
4DCR8C-1227.6/1575.4/90-LX	GPS L1 & L2	SMT Diplexer	1.345 x 0.635 x 0.360	High Power - high isolation
4DCR4C-1227.6/1575.4-L	GPS L1 & L2	SMT Diplexer	0.710 x 0.600 x 0.201	High Power - high isolation

Frequencies used by GPS

Band	Frequency (MHz)	Phase	Original usage	Modernized usage
L1	1575.42 (10.23×154)	In-phase (I)	Encrypted Precision P(Y) code	
		Quadrature- phase (Q)	Coarse-acquisition (C/A) code	C/A, L1 Civilian (L1C), and Military (M) code
L2	1227.60 (10.23×120)	In-phase (I)	Encrypted Precision P(Y) code	
		Quadrature-phase (Q)	Unmodulated carrier	L2 Civilian (L2C) code and Military (M) code
L3	1381.05 (10.23×135)		Used by Nuclear Detonation (NUDET) Detection System Payload (NDS); signals nuclear detonations/ high-energy infrared events. Used to enforce nuclear test ban treaties.	
L4	1379.913 (10.23×1214/9)		*(No transmission)*	Being studied for additional ionospheric correction
L5	1176.45 (10.23×115)	In-phase (I)	*(No transmission)*	Safety-of-Life (SoL) Data signal
		Quadrature-phase (Q)		Safety-of-Life (SoL) Pilot signal

All satellites broadcast at the same two frequencies, 1.57542 GHz (L1 signal) and 1.2276 GHz (L2 signal). The satellite network uses a CDMA spread-spectrum technique where the low-bitrate message data is encoded with a high-rate pseudo-random (PRN) sequence that is different for each satellite. The receiver must be aware of the PRN codes for each satellite to reconstruct the actual message data. The C/A code, for civilian use, transmits data at 1.023 million chips per second, whereas the P code, for U.S. military use, transmits at 10.23 million chips per second. The L1 carrier is modulated by both the C/A and P codes, while the L2 carrier is only modulated by the P code.[17] The P code can be encrypted as a so-called P(Y) code which is only available to military equipment with a proper decryption key. Both the C/A and P(Y) codes impart the precise time-of-day to the user.

Each composite signal (in-phase and quadrature phase) becomes:

$$S(t) = \sqrt{P_{\mathrm{I}}}X_{\mathrm{I}}(t)\cos(\omega t + \phi_0) \underbrace{- \sqrt{P_{\mathrm{Q}}}X_{\mathrm{Q}}(t)\sin(\omega t + \phi_0)}_{+\sqrt{P_{\mathrm{Q}}}X_{\mathrm{Q}}(t)\cos\left(\omega t + \phi_0 + \frac{\pi}{2}\right)},$$

where P_{I} and P_{Q} represent signal powers; $X_{\mathrm{I}}(t)$ and $X_{\mathrm{Q}}(t)$ represent codes with/without data $(=\pm 1)$.