

# GNSS/GPS ANTI-SPOOF/ANTI-JAM SOLUTIONS

Dielectric Filters, Diplexers, and Patch Antenna



CTS has industry-leading ceramic filters and diplexers serving numerous markets including high-precision and high-reliability Geolocation (GNSS/GPS) solutions for industrial, agricultural, transportation, aviation, and military applications. Recent application designs have begun to add anti-spoof/anti-jamming capabilities; often this requires multiple receiver paths with unique filter features. CTS technologies provide essential customized performance to meet these needs.



Customization needs vary by customer, but may include narrower passbands, enhanced stopband rejection, lower IL, tightly controlled group delay, group delay variation, or phase matching. In addition to these, CTS can also provide diplexers which separate L1 vs L2 vs L5 as necessary, which can then be cascaded with specialized bandpass filters.

## MONOBLOCK ADVANTAGES OVER COAXIAL RESONATORS

Some applications may use legacy filters based on discrete dielectric ceramic coaxial resonators. There is never an instance where discrete coaxial resonator filters offer any advantages. CTS's ceramic monoblock products can be customized and are affordable even in modest quantities. CTS Ceramic monoblock products are smaller, lower loss, higher performance, more reliable & durable, and more stable over temperature and other stressful environmental conditions.

## CUSTOM FABRICATION OF CERAMIC PATCH ANTENNAS

Commodity ceramic patch antennas are solely optimized for low-cost. Often there is a need for better performance. There are a variety of customizations which may be required by application. These include smaller sizes, unique form-factors, unique dielectric constant, lower loss, better efficiency, more stable center frequency over temperature, custom passband response, tuning-free designs, multi-element structures, or a combination of these attributes. CTS offers support for these attributes and is the best choice for custom-fabricated proprietary ceramic patch antennas manufactured to your mechanical designs.



Customers have achieved system solutions replacing single antenna-element GPS receivers with multi-element arrays in the same sized radome.

## APPLICATIONS

CTS solutions allow customers to specify their own system requirements and performance priorities. CTS supports either global solutions with no export license (EAR-99) or ITAR compliant solutions designed and manufactured in the USA.

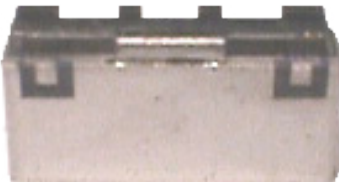
- GNSS Satellite Constellations: GPS (USA), QZSS (Japan), Beidou (China), Galileo (EU), Glonass (Russia), IRNSS (India)
  1. Bandpass filters: Specific desired sub-bands such as L1, L2, L5, or combinations of these bands.
  2. Diplexers (or triplexers) supporting frequency division from a shared antenna.

**PARAMETER OPTIMIZATION:**

- Narrow passbands for extra high selectivity for specific protocols and GNSS constellations, or wide passbands to support diverse protocols and multi-constellation support.
- Options for strong rejection of neighboring co-site spectrum interference such as from InMarSat, Iridium, etc.
- Options for tight tolerance on: Group Delay and/or Group Delay Variation, or Phase control
- Extra-low insertion loss



GNSS Diplexers	
Physical Size	16 - 63 mm length
Insertion Loss	<1.0 dB to < 2.0 dB max
High-band Freq	1574-1577MHz (narrow) to 1524-1625MHz (wide)
Low-band Freq	1217-1238MHz (narrow) to 1160-1304MHz (wide)
Band Rejection	>40dB to > 80dB min



GNSS Bandpass Filters	
Physical Size	8 - 56 mm length
Insertion Loss	<1.0 dB to < 4.6 dB max
High-band Freq	1574-1577MHz (narrow) to 1524-1625MHz (wide)
Low-band Freq	1217-1238MHz (narrow) to 1160-1304MHz (wide)
Band Rejection	>40dB to > 80dB min
Fc Group Delay	as little as +/- 3.0 ns
Group Delay Ripple	as little as < 7 ns

**ABOUT CTS**

CTS Corporation is a leading developer and manufacturer of high-performance dielectric ceramic Radio Frequency Filters and Diplexers as well as precision-fabrication of custom ceramic antenna for a wide range of applications, including aero, defense, industrial, and communications markets. Available in a variety of material compositions, these dielectric materials can be produced in various geometries in a comprehensive range of dimensions and in high volumes to support end-product specifications.

CTS offers a market leading level of possibilities for product customization of filters solutions. With production facilities in North America and Asia, CTS' global footprint is uniquely positioned to produce large volumes and provide quality and reliable products to customers worldwide.

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