TRE-3

The state-of-the-art in GNSS technology...

And this is why:

- **Three** ultra wide-band (**100 MHz**) fast sampling and processing, programmable digital filters and superior dynamic range. After **12-bit** digital conversion, **nine** separate digital filters are perfectly shaped for each of the nine GPS L1/Galileo E1, GPS L2, GPS L5/ Galileo E5A, GLONASS L1, GLONASS L2, Galileo E5B/BeiDou B2/GLONASS L3, Galileo altBoc, Galileo E6/BeiDouB3/QZSS **LEX**, and BeiDou B1 bands.

- Each band consists of a combination of a digital Cascaded Integrator-Comb (**CIC**) filter and a digital Finite Impulse Response (**FIR**) filter (up to **60-th** order) where signal selection is performed.

- Two types of digital in-band anti-jamming filters (automatic **80-th** order and "user selectable" **256-th** order).

- We assign multiple channels to acquire and track each satellite signal. For example we can assign **20** channels to acquire the GPS L1 signal, each spaced one millisecond apart. We also assign up to **5 channels** to track each signal, each with different filter parameters and tracking strategies. This supports acquiring and tracking **weaker** signals in difficult conditions, especially under trees and canopy. People wonder why we need **864** channels! We put them to good use. Others use one channel per satellite signal. Several patents are pending (Patents and Pendings).

- **80 dB** out-of-band interference rejections: high dynamic range of wide RF bands and highly rectangular digital filters make the receiver much more resistant to out-of-band **jamming**.

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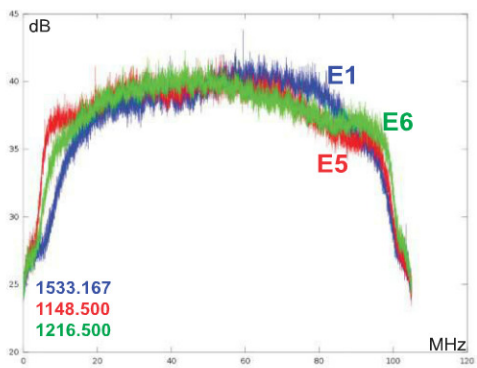
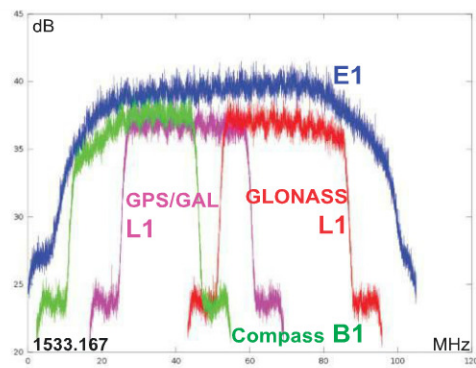


Noise spectrum of three wide RF bands (seen from DSP) with 3 level signal quantization



Noise spectrums of GNSS Bands which were cut from E1 wide RF band by corresponding digital filter

- **High-speed** high-dynamic automatic gain control (AGC) to respond to interferences and signal variations.

- Programmable filter **width** (by commands).

- Highly stable digital filters (band characteristics do **not change** with age, input voltages, or temperature).

- Improved **GLONASS** inter-channel bias performance (due to our flat digital filter shape).

- Excellent new **multipath** rejection technique, the best ever.

- 60-MHZ-wide Galileo **altBoc** band unleashes the full benefit of this signal. Its excellent multipath resistance is improved even further with our new multipath reduction technique.

- **864** GNSS channels allow tracking all current and future satellite signals.

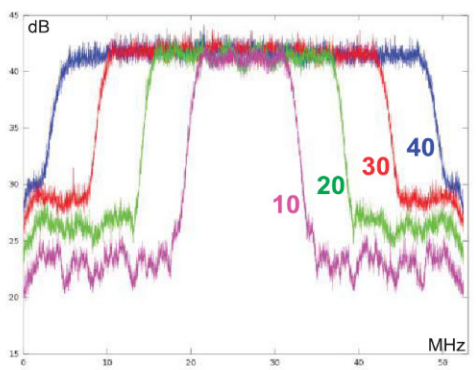
- Three wide band RF sections allow monitoring **spectrums** and interferences in three 100-MHz-wide bands.

- TRE-3 is the only receiver in the market that can track AND DECODE the QZSS **LEX signal messages**.

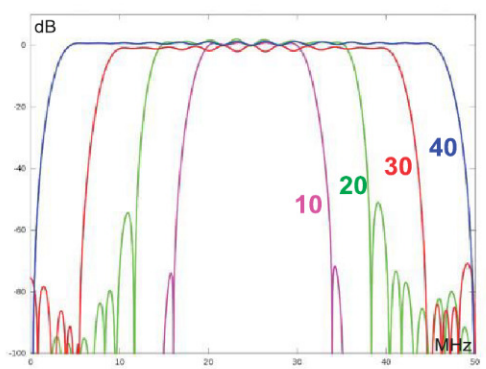
- Excellent features for **time transfer** applications: In time sources where the zero crossing of the input frequency defines the exact moment of the time second, we monitor **zero crossings** and accurately define the moment of the time second. External time interval measurement unit is not required to measure zero crossing and 1-PPS offset.

- Embedded **calibrator** measures phase and code delays of each of these nine bands in timing applications. External calibration is not required.

TRE-3 is form, pin-out, and command compatible with the TRE-G3T. It uses **8-Watts** of power, compared to 4-Watts of the TRE-G3T.



Noise spectrums of GPS L1/Galileo E1 band with different digital filter band width (set by command)



Amplitude response of combination of digital CIC and FIR filters, computed on Matlab. Real out-band attenuation