SITECH NORTHEAST

Tech Tip Thursday

Construction Surveying • **Earthworks** • Siteworks Machine Guidance • Roadworks • Groundworks • Marine Construction • Connected Site • Augmented Reality • Office Software

GNSS interference localization with built-in spectrum analyzer

The document delves into a practical case study demonstrating the application of a spectrum analyzer to identify a third-party device that was causing interference with GNSS (Global Navigation Satellite System) signals. It provides a detailed examination of the process, from the initial detection of the disturbance to the precise pinpointing of the rogue device. This example highlights the crucial role of spectrum analysis in troubleshooting and mitigating electromagnetic interference in sensitive satellite navigation systems.

[Tech Tip Thursday CCFS 2026-#1]

The problem: A machine gone "blind"

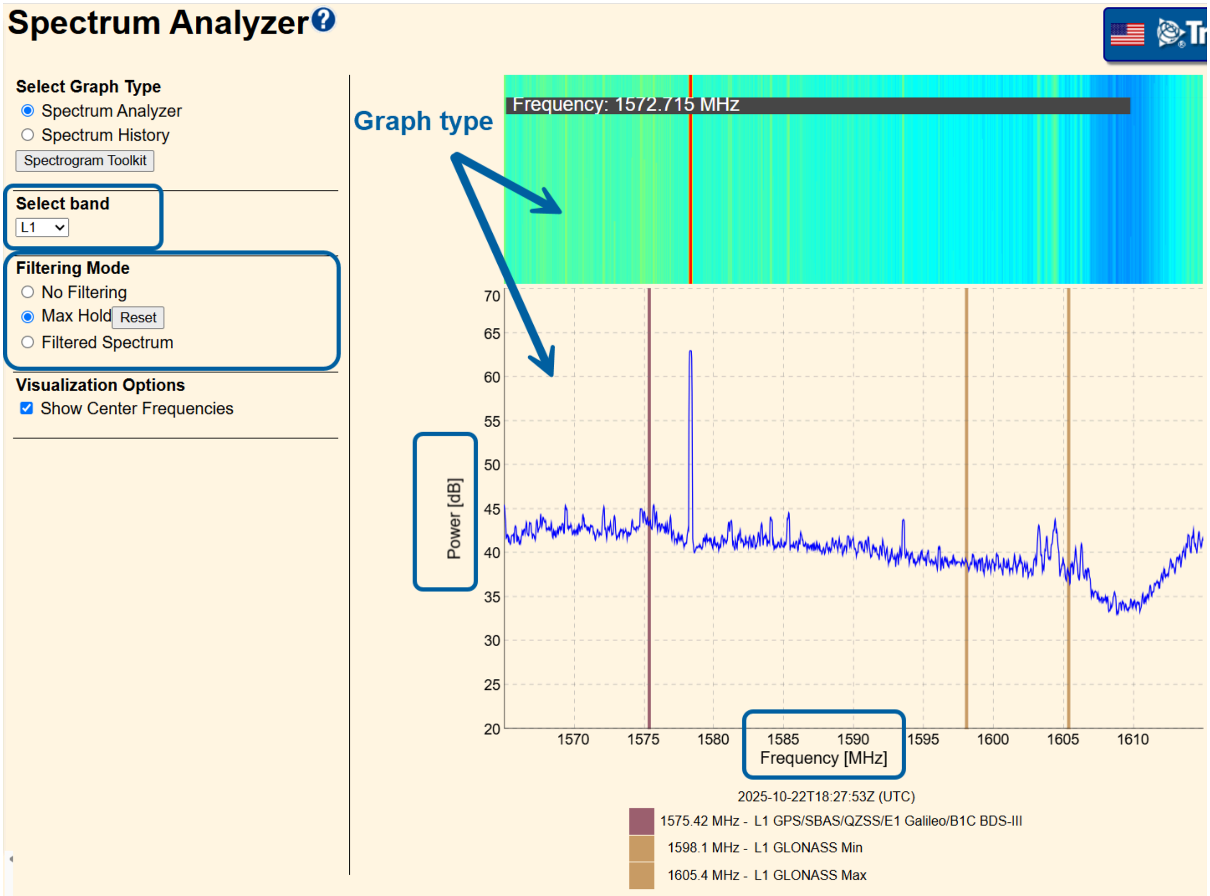
The incident occurred on an active construction site, where the operator of a Komatsu D51PX dozer equipped with Earthworks and dual MS976 GNSS receivers suddenly reported that the system, which normally maintained a robust lock on 30 or more satellites, was now only tracking 20. This significant drop in satellite count resulted in a loss of the RTK "Fixed" solution.

The diagnostic tool: Receiver spectrum analyzer

After a long troubleshooting of guessing and swapping components, the field engineer used the R780’s built-in Spectrum Analyzer function. This tool is accessible via the receiver's web interface or directly on a controller like the Trimble TSC5. It provides a real-time graph of the radio frequency (RF) environment, allowing the technician to "see" invisible interference.

The following features were critical in diagnosing the problem:

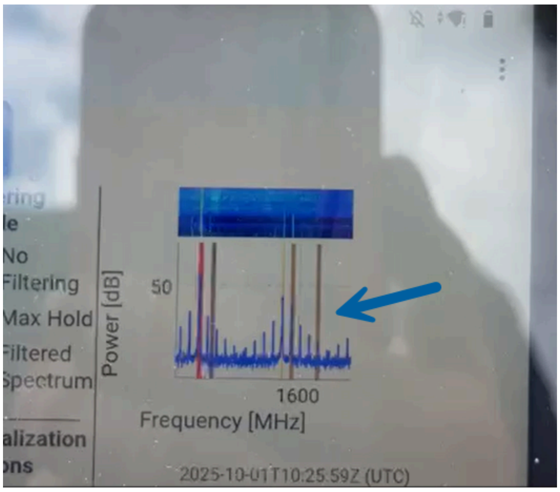
Feature	Description	How it helped find the issue
Select graph type	Allows choosing between different views of the spectral data, such as Spectrum Analyzer (live), Spectrum History, and Spectrogram Toolkit.	Viewing the Spectrum Analyzer (real-time plot of power vs. frequency) was essential for an immediate view of the interference spike and its magnitude.
Select band (L1, L2, etc.)	Allows the user to select the specific GNSS frequency band to analyze (e.g., L1 or L2).	By focusing on the L1 band (around 1575.42 MHz), the user confirmed the interference was directly impacting the primary GNSS frequency, which directly correlated with the degraded performance.
Filtering mode	Controls how the spectral data is processed, with options like No Filtering, Max Hold, and Filtered Spectrum.	Max Hold was selected to capture the maximum power level of the interference over time. This is crucial for identifying intermittent signals that might otherwise be missed.
Visualization options	Includes a checkbox to Show Center Frequencies.	This feature displays vertical lines indicating the expected center frequencies of various GNSS signals. This was vital for quickly confirming the spike was landing directly on the protected L1 frequency.
Power (dB) Scale	The vertical axis of the graph displays the measured signal strength in decibels (dB).	The sudden and distinct spike in power (over 45 dB) clearly highlighted the presence of a strong, unnatural signal (the jamming) far above the normal noise floor.
Frequency (MHz) Scale	The vertical axis of the graph displays the measured signal strength in decibels (dB).	This confirmed the interference was operating within the protected GNSS bands, specifically centered around the 1575.42 MHz L1 frequency.



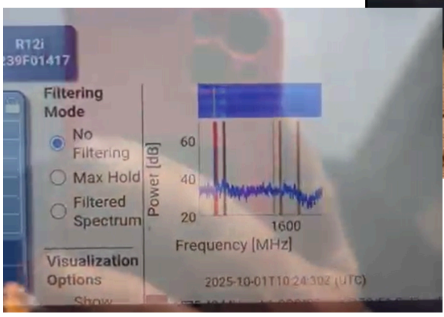
The investigation: The "hunt"

These tools were specifically used by the technician to turn an invisible RF problem into a simple "hot and cold" search.

Observation 1: A high-power spike was immediately visible on the spectrum analyzer when the field engineer was near the dozer. The interference was clearly affecting the L1 band.



20 meters away the issue is gone



Observation 2: The field engineer walked approximately 20 meters away from the machine. As he did, he observed the spectrum on the TSC5 return to a normal, flat signal, and the interference spike completely disappeared

Conclusion:

This test definitively confirmed the interference was not from a site-wide external source, but was emanating from the dozer itself. The technician also briefly disconnected the Trimble system's radio to rule it out as the source, with no change to the interference

Localization and resolution

Now certain the source was inside the cab, a physical inspection began. The technician quickly located a small, non-Trimble GPS antenna mounted on the console. This antenna was traced to a third-party vehicle security and location system.

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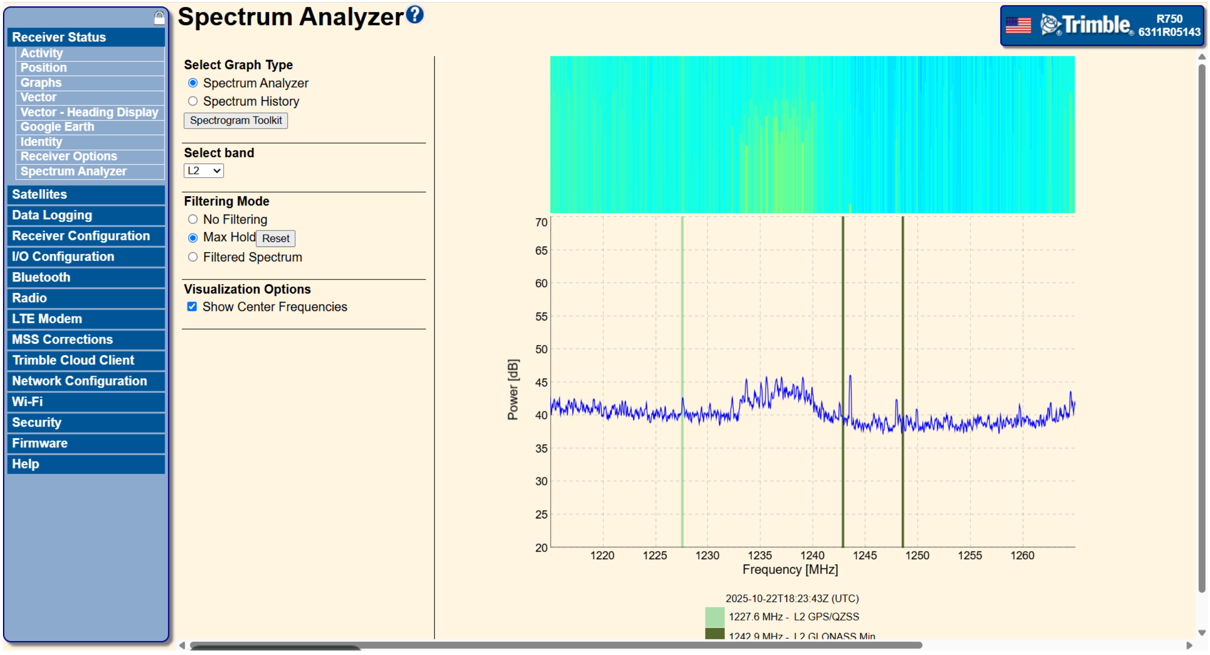
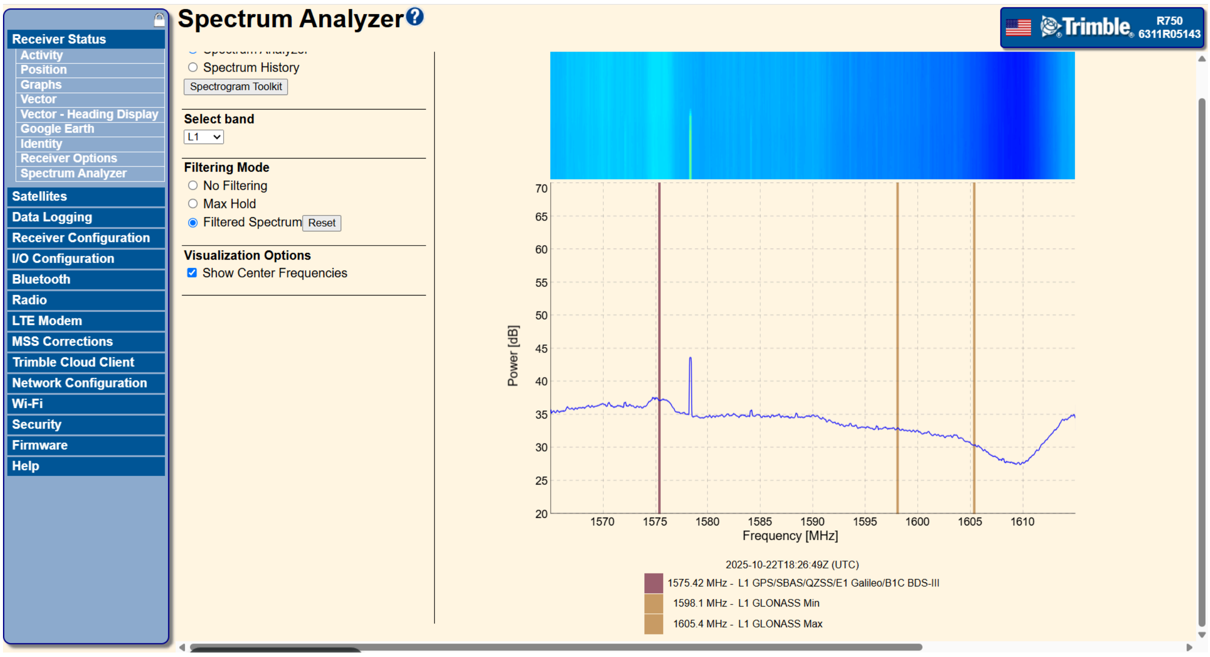
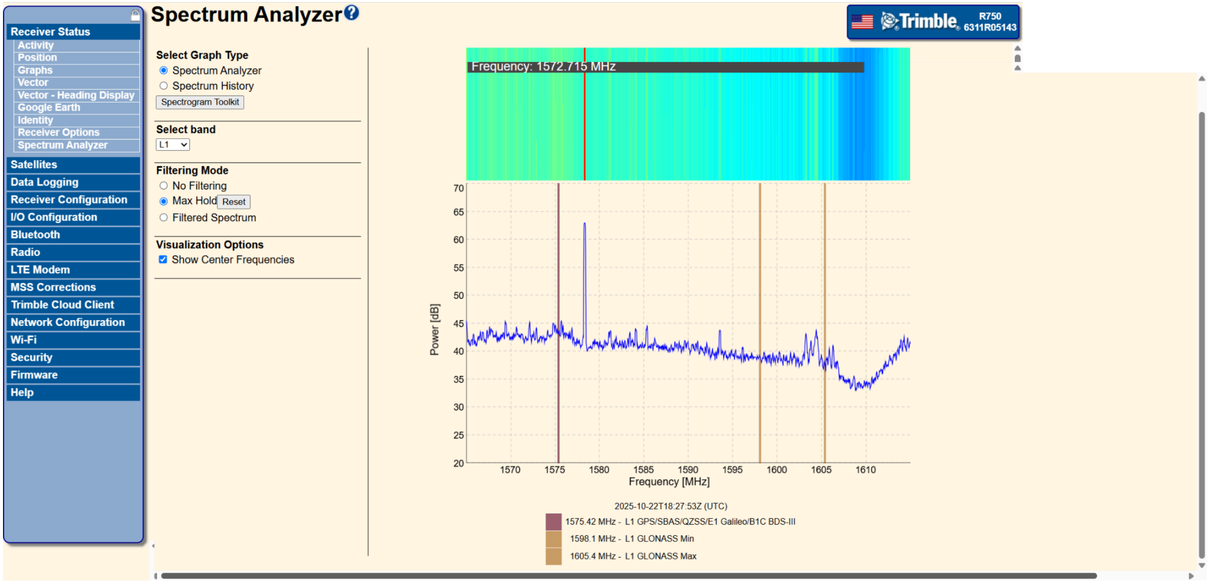
This third-party device's antenna had failed. Instead of passively receiving signals, it was malfunctioning and actively transmitting powerful RF noise. This "loud" signal was "deafening" the highly sensitive GNSS receiver, which is designed to listen for extremely faint signals from satellites in orbit.
The resolution was simple: the defective COBRA ITALIA unit was disconnected. As soon as it was powered down, the spikes on the spectrum analyzer vanished. The GNSS receiver's satellite count immediately returned to a healthy 30+, the RTK "Fixed" solution was re-established, and the dozer was fully operational.

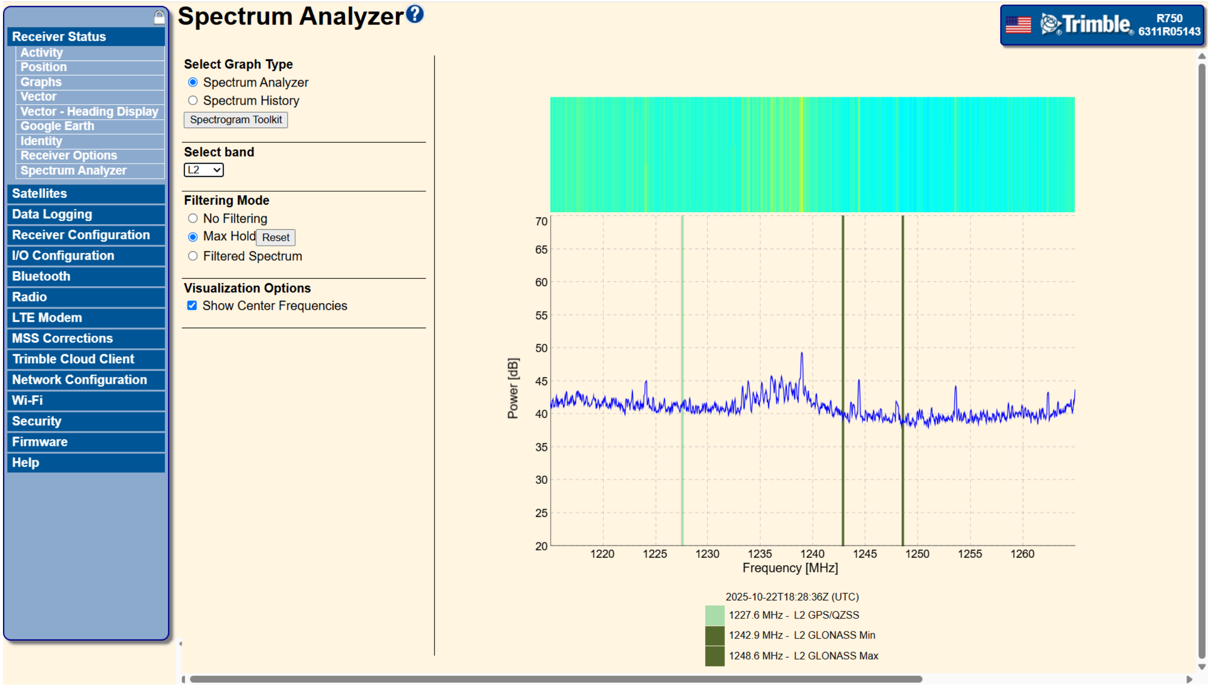
Other examples of interference might look like and not limited to:







Spectrum Analyzer
Trimble R750 6311R05143
Receiver Status
Activity
Position
Graphs
Vector
Vector - Heading Display
Google Earth
Identity
Receiver Options
Spectrum Analyzer
Satellites
Data Logging
Receiver Configuration
I/O Configuration
Bluetooth
Radio
LTE Modem
MSS Corrections
Trimble Cloud Client
Network Configuration
Wi-Fi
Security
Firmware
Help
Select Graph Type
Spectrum Analyzer
Spectrum History
Spectrogram Toolkit
Select band
L1
Filtering Mode
No Filtering
Max Hold Reset
Filtered Spectrum
Visualization Options
Show Center Frequencies
Frequency: 1572.715 MHz
Power [dB]
Frequency [MHz]
2025-10-22T18:27:53Z (UTC)
1575.42 MHz - L1 GPS/SBAS/QZSS/E1 Galileo/B1C BDS-III
1598.1 MHz - L1 GLONASS Min
1605.4 MHz - L1 GLONASS Max



Spectrum Analyzer
Trimble R750 6311R05143
Receiver Status
Activity
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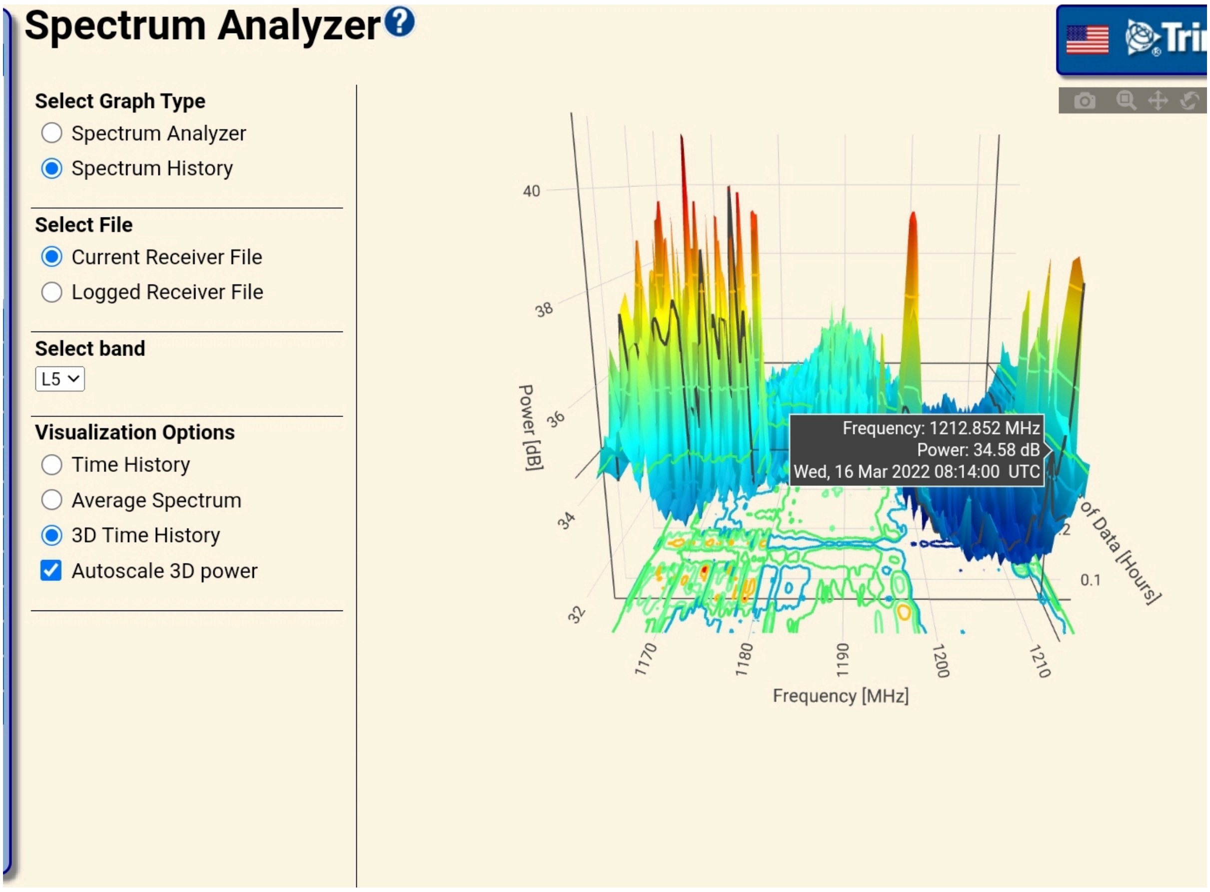
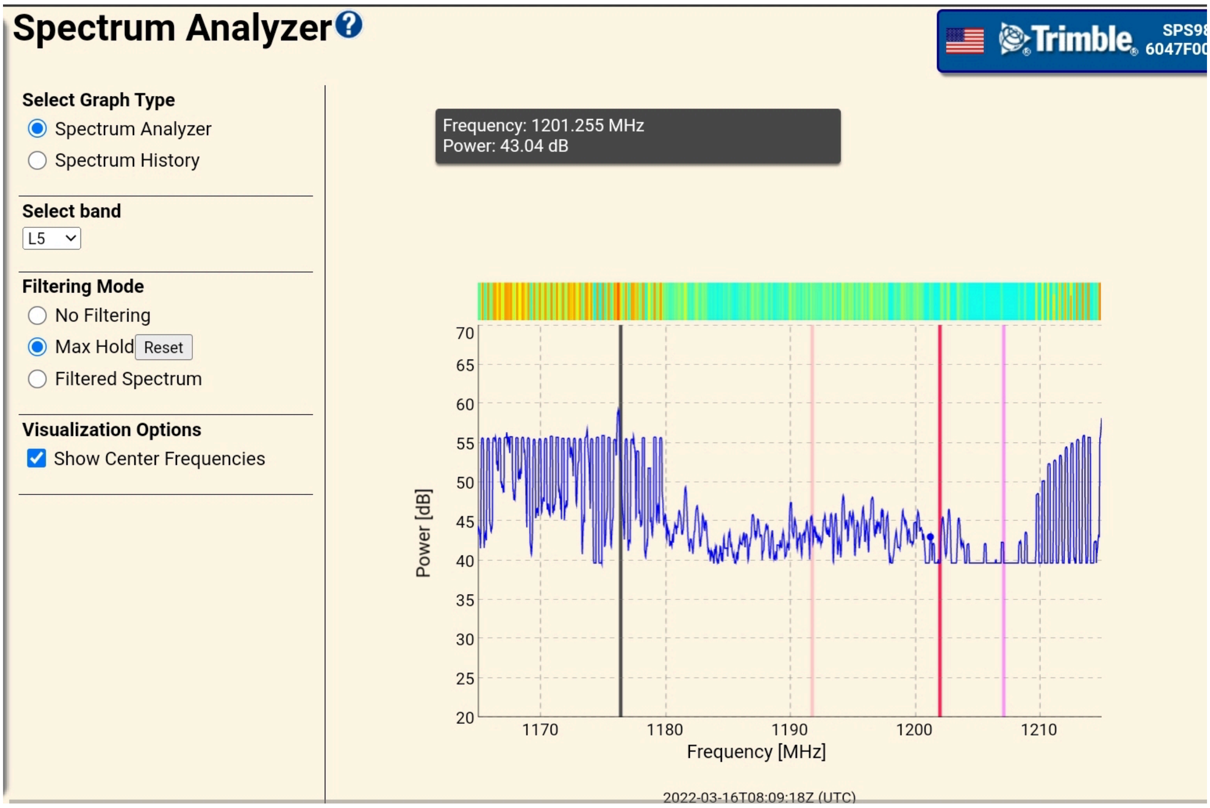
Receiver Configuration
I/O Configuration
Bluetooth
Radio
LTE Modem
MSS Corrections
Trimble Cloud Client
Network Configuration
Wi-Fi
Security
Firmware
Help
Select Graph Type
Spectrum Analyzer
Spectrum History
Spectrogram Toolkit
Select band
L2
Filtering Mode
No Filtering
Max Hold Reset
Filtered Spectrum
Visualization Options
Show Center Frequencies
Power [dB]
Frequency [MHz]
2025-10-22T18:28:36Z (UTC)
1227.6 MHz - L2 GPS/QZSS
1242.9 MHz - L2 GLONASS Min
1248.6 MHz - L2 GLONASS Max


Spectrum Analyzer
Select Graph Type
Spectrum Analyzer
Spectrum History
Select File
Current Receiver File
Logged Receiver File
Select band
L5
Visualization Options
Time History
Average Spectrum
3D Time History
Autoscale 3D power
Power [dB]
40
38
36
34
32
Frequency: 1212.852 MHz
Power: 34.58 dB
Wed, 16 Mar 2022 08:14:00 UTC
of Data [Hours]
0.1
1170
1180
1190
1200
1210
Frequency [MHz]


Spectrum Analyzer
Trimble
Select Graph Type
Spectrum Analyzer
Spectrum History
Select band
L5
Filtering Mode
No Filtering
Max Hold
Reset
Filtered Spectrum
Visualization Options
Show Center Frequencies
Frequency: 1201.255 MHz
Power: 43.04 dB
Power [dB]
70
65
60
55
50
45
40
35
30
25
20
1170
1180
1190
1200
1210
Frequency [MHz]
2022-03-16T08:09:18Z (UTC)