TELTRIUM

Introduction to: SACC-400S

Coherent Signal Combining for Distributed Communications Architectures



SACC-400S is designed around a flexible GPU- and FPGA-based processing architecture that supports scalable, high-performance signal processing and mission-specific implementation. The system independently acquires, synchronizes, and aligns four received copies of a common framed signal, then coherently combines the corrected I/Q samples into one enhanced output for the end receiver. The result is a flexible foundation for distributed receive arrays, clustered relay platforms, resilient beyond-visual-line-of-sight operations, and ground systems using multiple smaller commercial antennas.

Independent Channel Processing

- Accepts four independently received copies of a common framed signal through a configurable direct-RF, IF, or digital I/Q front end.
- The ZCU216 development platform supports direct RF sampling up to 6 GHz at the integrated RF-ADC

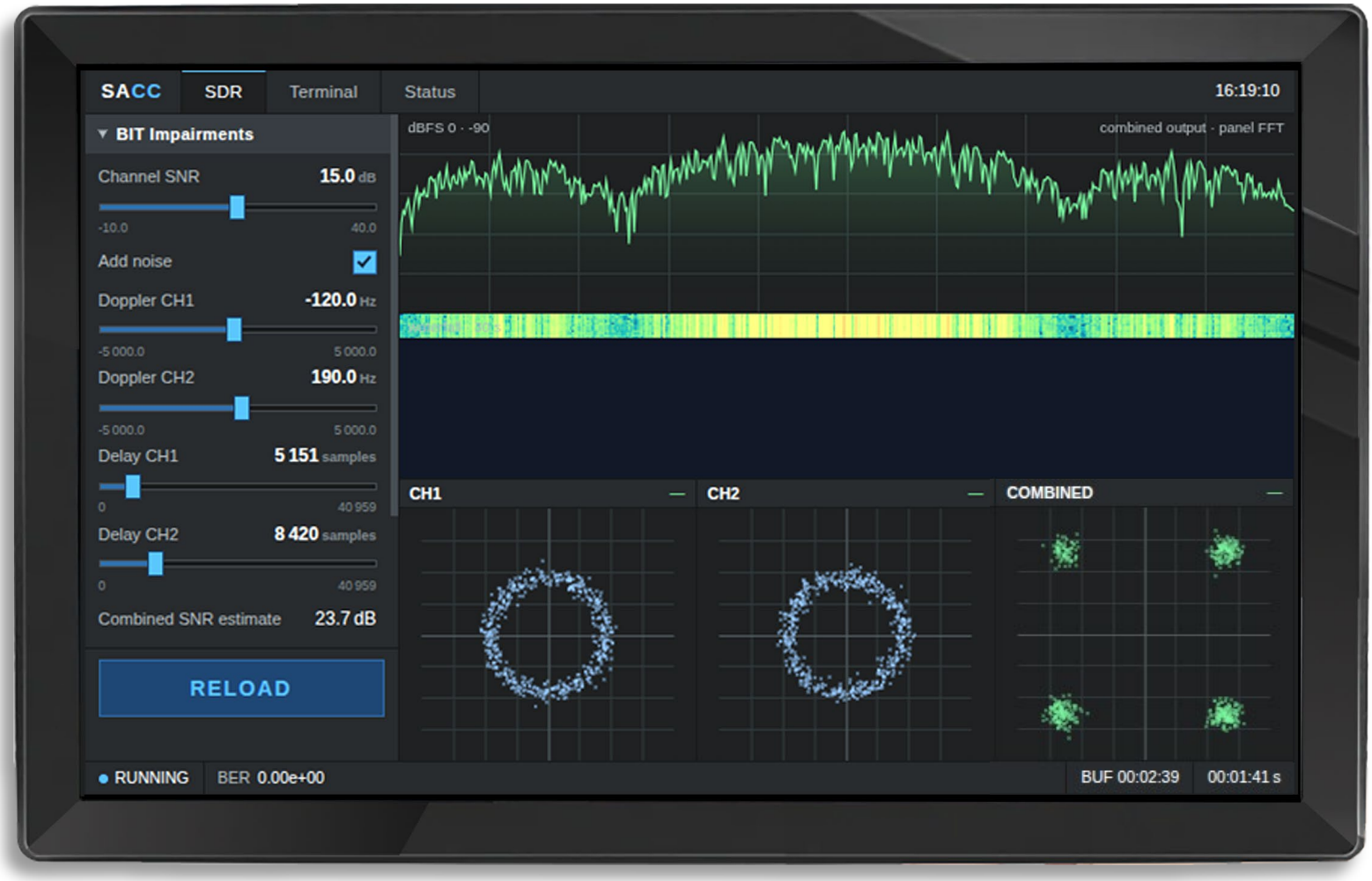
Time, Frequency, and Phase Alignment

- Per-channel carrier acquisition reduces residual frequency uncertainty before tracking.
- Synchronization-marker correlation supports frame detection, carrier tracking, and relative timing measurement.
- Buffered delay alignment compensates differential signal arrival time before coherent combination.

Sample-Level Coherent Combining

- Corrected baseband I/Q samples are coherently summed on a sample-by-sample basis to create one enhanced array output.
- The combined output is delivered to the selected downstream receiver or modem for conventional demodulation and decoding.

SACC-400S Display

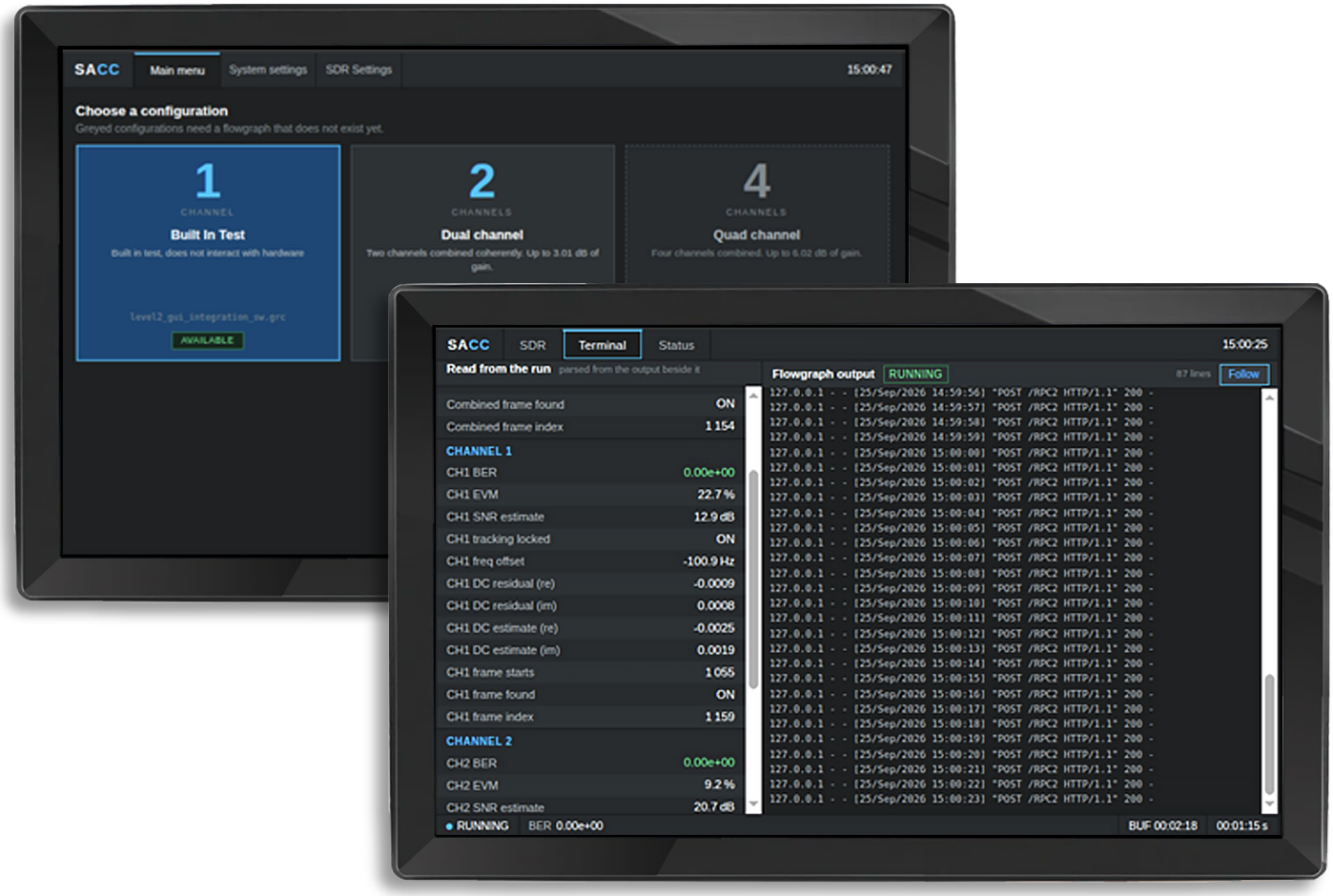


Technical Specifications

SACC-400S delivers the processing speed, signal flexibility, and performance required for advanced distributed communications. Key technical specifications include:

- Four independently processed SACC receive channels
- Flexible GPU- and FPGA-based processing architecture
- 14-bit RF-ADCs operating to 2.5 GSPS
- 14-bit RF-DACs operating to 9.85 GSPS
- Direct RF sampling up to 6 GHz
- Multi modulation-coding support
- 600+ MS/s at four samples per symbol
- FFT acquisition, ASM synchronization, carrier tracking, frame alignment, and differential-delay compensation
- Combined SNR target within 0.5 dB of theory; ~6 dB improvement with four inputs
- Configurable digital I/Q, digital-IF, or analog-IF output

SACC-400S Interface



What Can SACC-400S Enable?

Replace a Large Monolithic Satellite with a Coordinated Smallsat

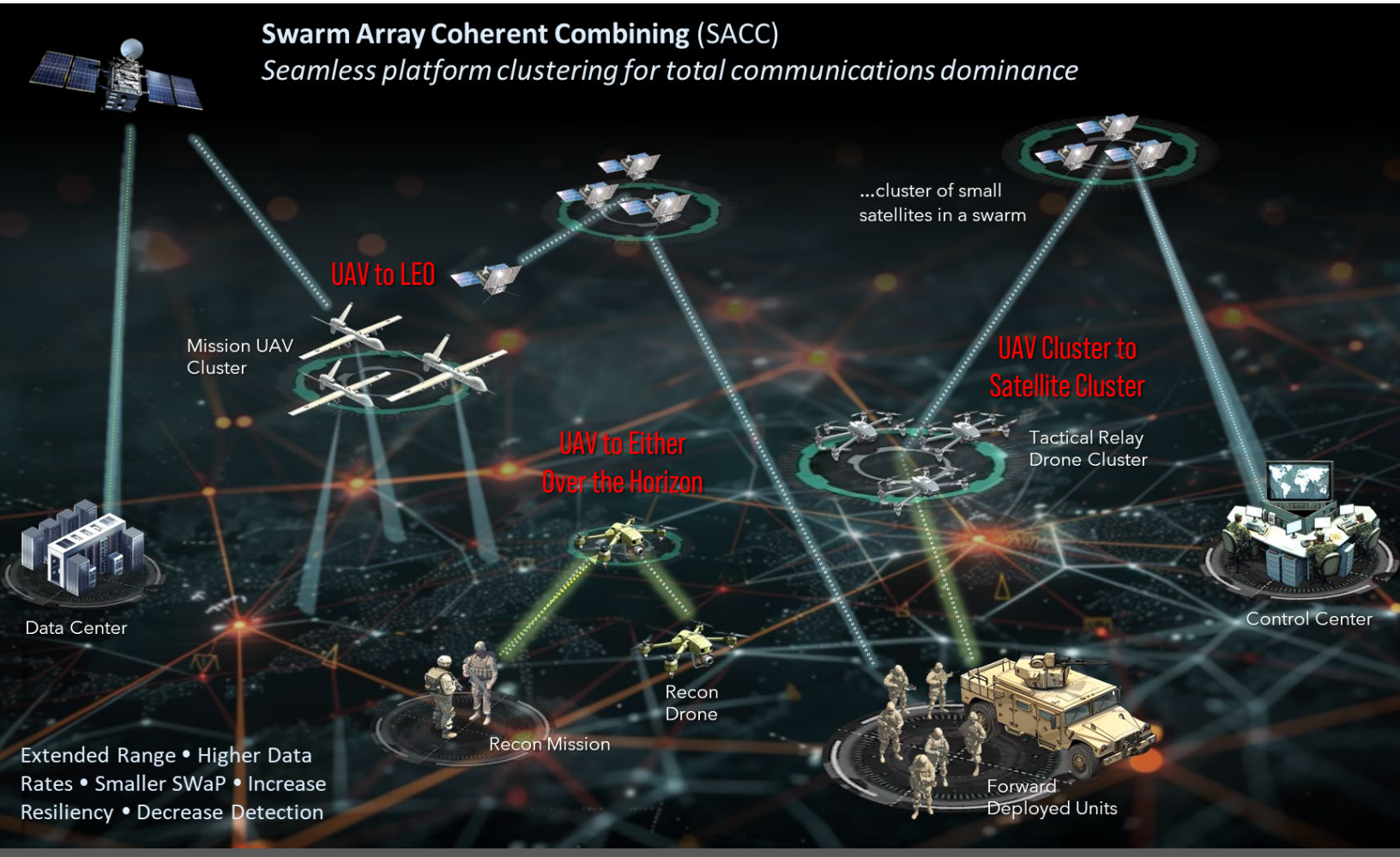
- **Distribute communications capability across multiple coordinated smallsats.** SACC coherently combines signals from independent spacecraft, allowing the cluster to work together as a unified, high-performance communications system.

Enable Resilient Beyond-Visual-Line-of-Sight Relaying

- **Maintain reliable communications through distributed relay paths and coordinated receiving platforms.** SACC aligns and combines multiple observations of the same signal, improving link margin and enabling resilient relay architectures, even when an individual path or platform becomes unavailable.

Replace Large Custom Ground Antennas with Smaller COTS Apertures

- **Achieve high-performance reception with smaller, commercially available antennas.** SACC precisely aligns frequency, phase, timing, and delay across multiple receive paths, coherently combining their signals into a coordinated array with enhanced aggregate performance.



Key SACC-400S Take Away

SACC-400S moves complex channel synchronization and coherent combining into the ground processor. Four independent signal paths are precisely aligned for frequency, phase, timing, and delay before sample-level combination—delivering approximately 6 dB of array gain with four equal-quality inputs while providing a single combined signal for conventional downstream processing.

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