High Efficiency Adaptable Telemetry Transmitter

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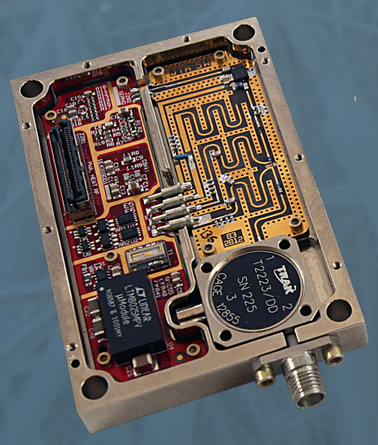
Casey Giron, Chris Kershaw, Donald Dowdle, Gregg Wouters, Olek Pawlowski
Design Engineering: Brian Cass, Gary Boccoleri, Lourdes Aguilar, Todd Vela
Sandia National Laboratories, Livermore, CA 94550 USA

Stockpile Stewardship at Sandia California

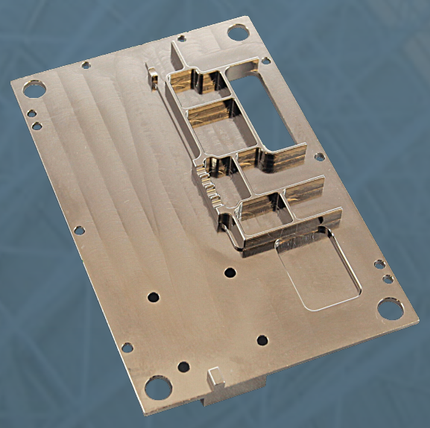
A critical aspect of Sandia stockpile stewardship is to gather and analyze weapon flight data. The primary responsibility of Sandia California's Telemetry Systems Engineering department is to develop instrumentation to support DoD and DOE Joint Test Assembly (JTA) flight tests. Weapons from the stockpile are retrofitted with telemetry systems that measure signals from various components. The signals are formatted and transmitted in real time to ground stations for processing and evaluation. The data is collected to assess the quality and reliability of the stockpile.

The transmitter is a vital component of a telemetry system and Sandia California's Telemetry Systems Engineering has worked to provide a small and high efficiency transmitter to work across multiple stockpile platforms - the High Efficiency Adaptable Telemetry Transmitter (HEATT). The HEATT's size, power consumption, and programable modulation allow it to meet the needs of legacy and future JTA programs. Usage of a single adaptable transmitter by multiple weapons systems will reduce vendor qualification costs and specific program hardware developments costs.



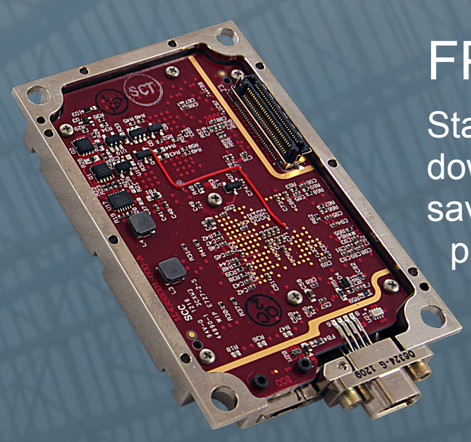
RF Amplification

A multi-stage amplifier board converts a 1 mW RF signal to 5 W, 10 W, or 15 W depending on the amplifier version selected.



RF Shielding

A middle plate isolates the noise from the two main boards from each other. Walls on the plate and housing along with via fences create noise isolated compartments.



FPGA Control

Start-up and shut-down sequencing save power and prevent damage to RF components.

RF Signal Generation

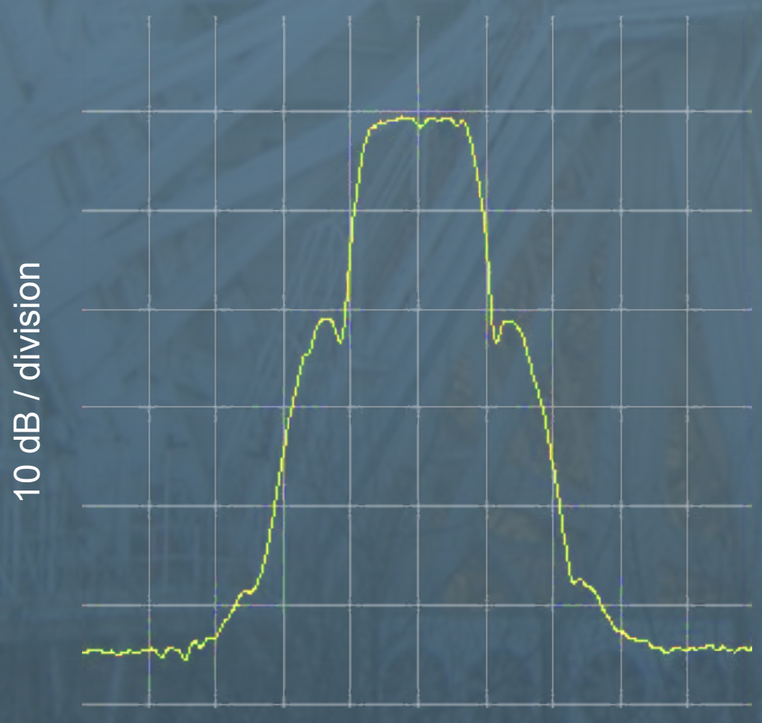
The RF signal is generated next to the amplifier chain in an RF shielded compartment to provide the cleanest signal possible. Power regulators specific to the selected amplifier board provide the required power from another shielded section.

Mechanical Housing

The mechanical housing protects the transmitter during high shock and vibration during missile flights, bomb drops, and transportation. The housing also transfers a significant amount of heat away from the circuit boards and RF amplifiers.

Baseband Signal Generation

Legacy and Micro Modular TM Bus telemetry inputs are processed in the FPGA and a PCM/FM or SOQPSK modulation is output for legacy or future flight tests. The design is radiation tolerant and recovers quickly from high shock events.



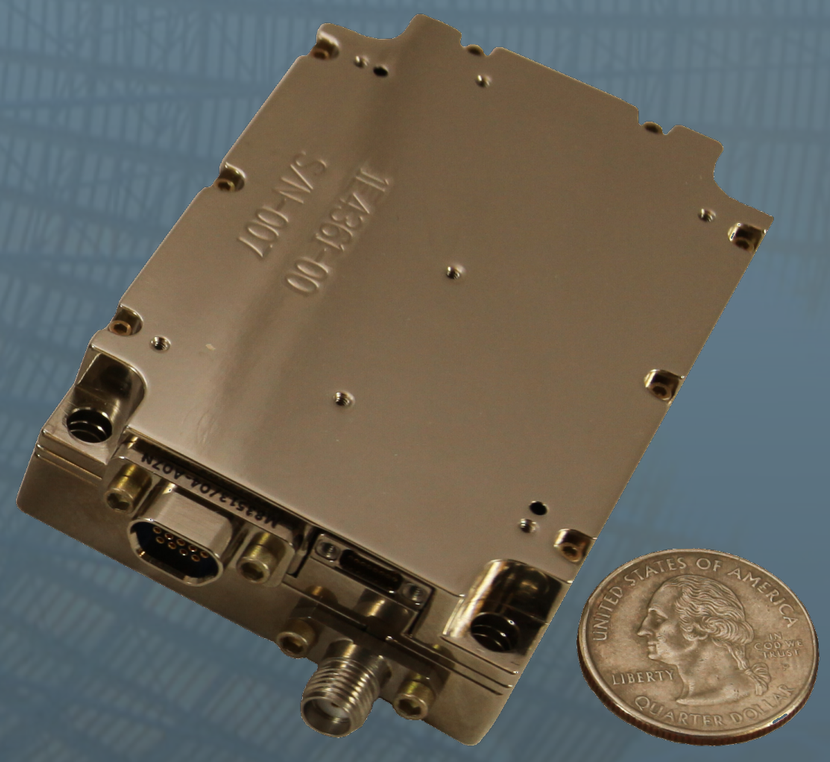
Focus on Customer's Needs

The HEATT's mechanical housing is based on the current JTA systems specifications.
Size: 2 in x 2.9 in x 0.8 in

HEATT uses temperature sensors to maintain stable output power over temperature.
Range: -40 ºC to +80 ºC.

The high efficiency amplifier board is designed to be swappable allowing selectable output powers of 5 to 15 W.

Legacy applications use PCM/FM modulation (output spectrum shown left). HEATT can accommodate an SOQPSK modulation by reprogramming the FPGA firmware.



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