

Initial Efforts in Augmenting a Missile Telemetry Unit to Operate in C-Band

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ABSTRACT

Currently most of the missile telemetry systems operate in the lower S-Band frequency range (2200-2290 MHz). Due to Federal Government plans to repurpose this frequency spectrum to commercial entities, missile telemetry systems will have to migrate to operate in the lower C-Band range (4400-4940 MHz) as well. This move in the operational frequency requires the upgrading of not only the Range ground receiving equipment, but the airborne transmitting units as well. This paper will detail the efforts required to augment a missile telemetry unit from operating in S-Band to C-Band.

KEY WORDS

Missile Telemetry, Augmentation, and C-Band.

BACKGROUND

Under the National Broadband Initiative (NBI), the lower C-Band Frequency Range (4400-4940 MHz) has become available for use in airborne telemetry applications. This paper will discuss the initial efforts in augmenting the telemetry applications currently residing in S-Band (2200-2300 MHz) into lower C-Band. It will begin with a description of the required equipment, initial test setup and conclude with future test plans.

REQUIRED EQUIPMENT

In order to conduct this initial test to determine if a C-Band telemetry system can operate at a government test range, the following components / equipment will be required. On the transmitting side, a conformal wraparound antenna from a missile platform; a power supply; and a transmitter will be needed. For the receiving portion, a mobile dish antenna; receiver; demodulator; and bit error rate (BER) tester will be used.

Transmitting Portion-

Antenna- The C-Band antenna development effort is detailed in another ITC publication "Design and Development of a Thin Conformal C-Band Telemetry Antenna for a Small Diameter Missile". The initial design goal is to match all of the physical (axial length,

thickness and location of connectors), electrical (gain and polarization), and environmental (vibration and temperature) requirements of an existing missile S-Band telemetry (TM) antenna. Below are the electrical requirements:

Frequency Bandwidth:	4400-4940 MHz
Gain:	-7 dBiL
Polarization:	Linear.

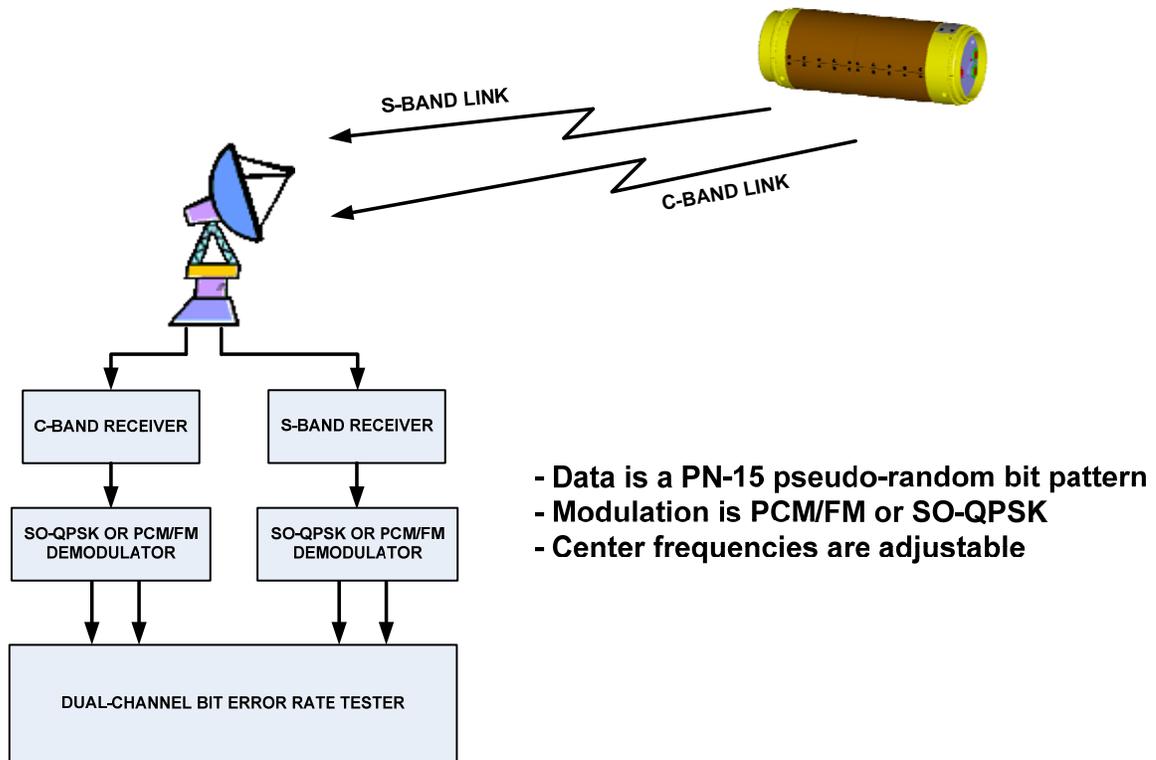
Transmitter /Power Supply- A commercial off the shelf (COTS) power supply will be used to provide the +28V to power the transmitter. The transmitter will be capable of providing five (5) watts and operate using the ARTM Tier 0 (PCM/FM- Pulse Coded Modulation/Frequency Modulation) or Tier 1 modulation scheme (SOQPSK- Shaped Offset Quadrature Phase Shift Keying). It also requires the capability of a 15-Bit Pseudo Data Generator (RN- Randomizer Output). Currently there are three vendors who have provided transmitters which meet this requirement and are being evaluated by the C-Band Working Group (CBWG).

Receiving Portion-

A mobile eight foot (8') Dish Antenna and Telemetry Receiver will be required. This setup is available and can be borrowed for the use of this test. In addition, a SO-QPSK Demodulator will be needed to provide clock and data to a Bit Error Rate (BER) Tester.

INITIAL TEST PLAN

Using the components / equipment listed in the previous sections, an Over-the-Air Test will be conducted. First, frequency clearance must be obtained since the C-Band Transmitter will be radiating into free space. After mounting the conformal wraparound antenna onto a missile mockup body, the power supply and transmitter will be connected. For this initial test, a 15 Bit Pseudo-random Noise Sequence will be transmitted. The mobile eight foot C-Band Dish Antenna will receive the signal. It will travel through the C-Band Receiver, SO-QPSK Demodulator, and finally to the BER Tester. The data will be compared to the performance of a similar system operating at S-Band. These tests will be used to verify both systems are operating properly. The data may not be truly representative of actual flight conditions due to the multipath signals due to the fact the mockup will be so close to the ground.



FUTURE TEST PLANS

After the initial test has been proven successful, a simplified telemetry (TM) section (modified to operate in the lower C-Band frequency range) will be integrated into a missile body and used for the transmitting portion of the test. It will be flown on a F/A-18 jet as a Captive Carry asset. All of the equipment in the receiving portion of the previous test will be maintained. The performance at C-Band will be compared with S-Band. The plan is to perform the Flight Testing over the Land and Sea Range to access the differences.

SUMMARY

Initial efforts are underway to augment telemetry applications to operate in the C-Band frequency range. Funding is currently being pursued with the C-Band Working Group (CBWG) to support the development and testing efforts detailed in this paper. Once these efforts are proven successful, the missile platforms will have more than one alternative in the application of missile instrumentation.