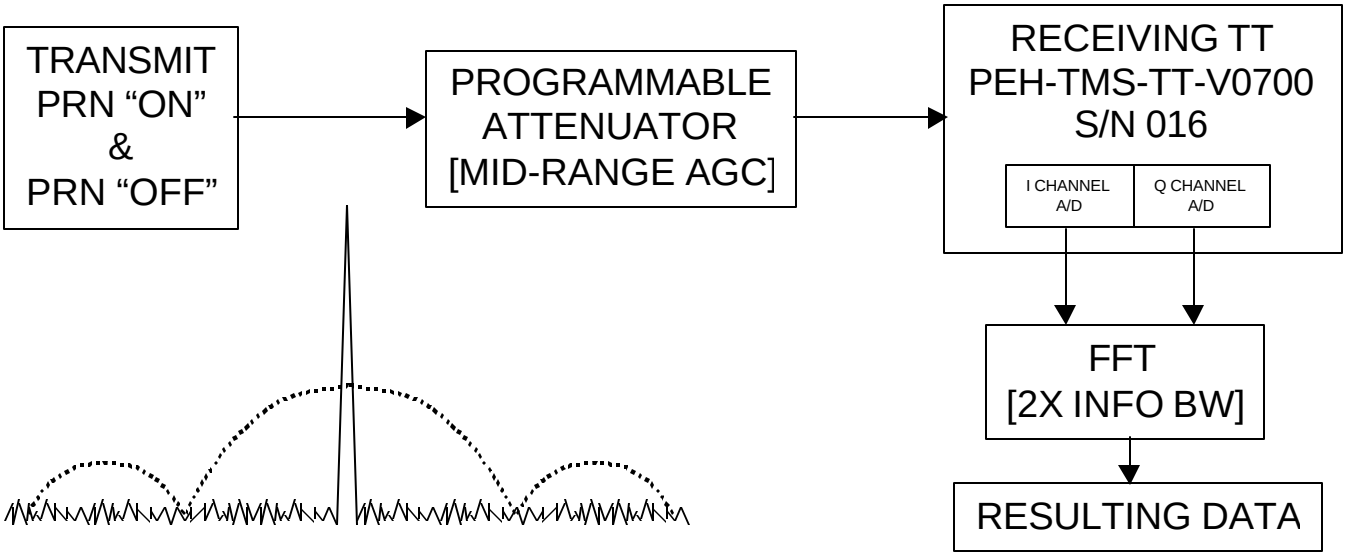
FCC PROCESSING GAIN TESTING

TOWER TRANSCEIVER PEH-TMS-TT-V0700

COMPANY CONFIDENTIAL

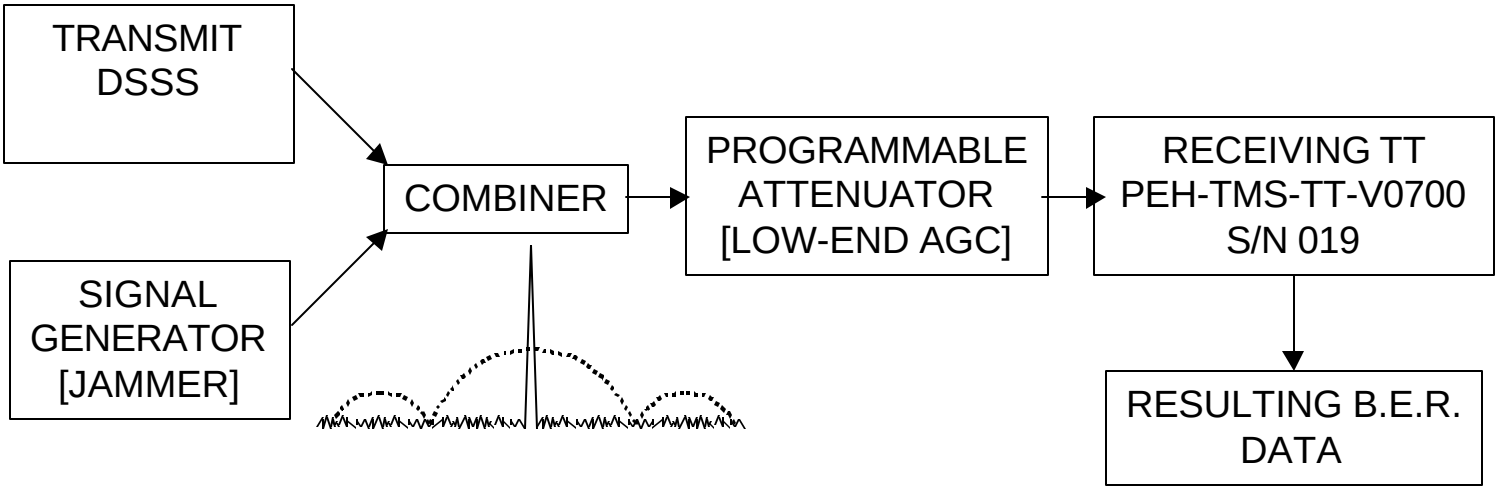
1 METHOD 1



Since our system is a direct sequence system, the processing gain of the receiver in the Tower Transceiver [PEH-TMS-TT-V0700] was measured per FCC Rule Part 15 Section 15.247 (e). Data was first taken using method (1), where the (S/N)o was first measured with the PRN code turned off, and then (S/N)o measured with the PRN code turned on. The ratio of these two signal-to-noise ratios was then taken to demonstrate the resultant processing gain. The 2X Information bandwidth (BW) data is tabulated and charted in the ADDENDUM. The pertinent data is listed below:

measurement	Value (dB)	Comment
So peak	-5.1	CW input at mid-range AGC
No peak	-50.2	Not including harmonics of chip rate 10 MHz
(S/N)o peak	45.1	Result @ A/D stages
So	-17.6	Peak in Information BW (within 10 MHz)
No	-50.1	Noise out to 20 MHz, not including harmonics
(S/N)o	32.5	Result @ A/D stages
Cp	+12.6	(45.1 dB – 32.5 dB)

2 METHOD 2



The processing gain of the receiver in the Tower Transceiver [PEH-TMS-TT-V0700] was also measured per FCC Rule Part 15 Section 15.247 (e) method (2). A CW jamming margin technique is employed by combining a signal generator (as the jammer) with the output of a DSSS system transmitter to be fed into a receiving Tower Transceiver. The jammer level is set to be 10 to 15 dB above the spread level of the DSSS transmitter (in 1 dB steps), and the resultant Bit Error Rate (BER) is recorded out of the correlator of the Tower Transceiver. Less then 20% of the frequencies within the system BW are discarded, and the remaining points are to be at or below the chosen BER.

Frequency steps of 50 kHZ across 2440 MHz to 2460 MHz BW were generated by the jammer for a total of 400 points tested. The measurements were done near the noise floor of the Trakus system, where BER's are worst case. (The noise floor for the Trakus system is –87 dBm). The Tower Transceiver for the Trakus system was designed to have BER's no greater than 5%, or 5,000 errors per 100,000 bits sent at this signal level. 100,000 bits were received along with each jammed frequency by the TT for this test, and bit errors out of the correlator were accumulated and stored in a data output file for each 50 kHz increment in the system BW. These results are tabulated and plotted in the ADDENDUM. The pertinent data is listed below:

Jammer to signal (J/S)	Average BER	% frequency points that were greater than chosen BER within system BW
+10 dB	2578.6	10.8 <20%
+11 dB	2529.3	9.5 <20%
+12 dB	3516.9	15.3 <20%
+13 dB	5465.4	26.8 >20%
+14 dB	8806.4	34.0 >20%
+15 dB	13557.2	39.0 >20%

The resultant processing gain obtained by method (2) is chosen from the above data, where the jammer level that is greatest relative to the DSSS signal but does not exceed the recommended BER is chosen. The jammer to signal ratio (J/S) is then used in the following equation for processing gain: $Cp = (S/N)o + (J/S) + Ls$, where Ls is misc system losses. The Cp for this method is therefore at least 12 dB, which closely correlates with method (1) results stated above.