

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
LINCOLN LABORATORY**

11 July 2019

**TO:** FCC  
**FROM:** John Meklenburg  
**SUBJECT:** FCC 442 Exhibit Submission

MIT Lincoln Laboratory (MIT LL) is a Federally Funded Research and Development Center (FFRDC) under contract with the United States Air Force to conduct advanced research related to national security missions. MIT LL frequently conducts field experiments like the one outlined in this application both locally and at remote sites.

USG Contract Agency: US Air Force  
Contract Number: FA8702-15-D-0001  
POC: Pino D'Orazio / 781-225-5206

**Purpose of Experiment**

MIT Lincoln Laboratory will be conducting a series of outdoor experiments in support of the LOCIT (Laser Optimized Coherence in Transmission) program. The purpose of these experiments is to coordinate optical and RF range measurements to ultimately enable coherent transmissions from disjoint RF emitters.

**Experimental Setup / Geometry**

Two transmitters will be located on the roof of Hanscom Air Force Base Building 1715. One receiver will be located on the MIT Lincoln Laboratory main campus, in a laboratory on the top floor of Building C. The two transmitter antennas will be steered towards the receiver, at an azimuth heading of approximately 110 degrees and an elevation angle of approximately 0 degrees (horizontal).



**FOR LABORATORY USE ONLY**

## Hardware

The experiment will include the following hardware related to the RF transmissions:

- Ettus x310 radio with UBX-160 RF daughterboards (x2) [transmitters]
- Ettus B210 radio (x1) [receiver]
- Data Alliance A24 2.4 GHz Antenna (x3) [antenna used for both transmitters and receivers]
  - o 24 dBi of gain
  - o 8 degree azimuth beamwidth
  - o 4 degree elevation beamwidth

## Emissions

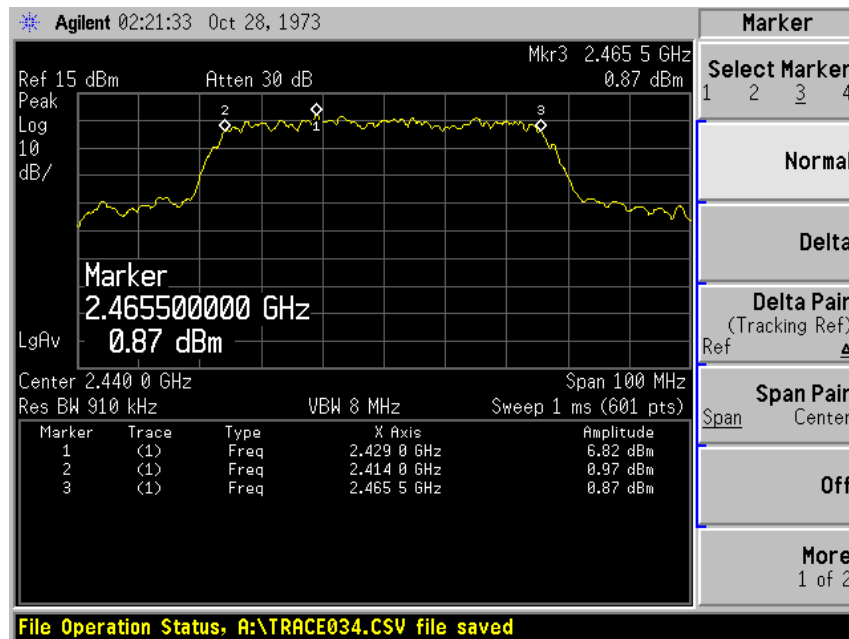
The transmitters utilize a direct sequence spread spectrum waveform and will emit a sequence of QPSK-modulated pulses.

The signal has the following characteristics:

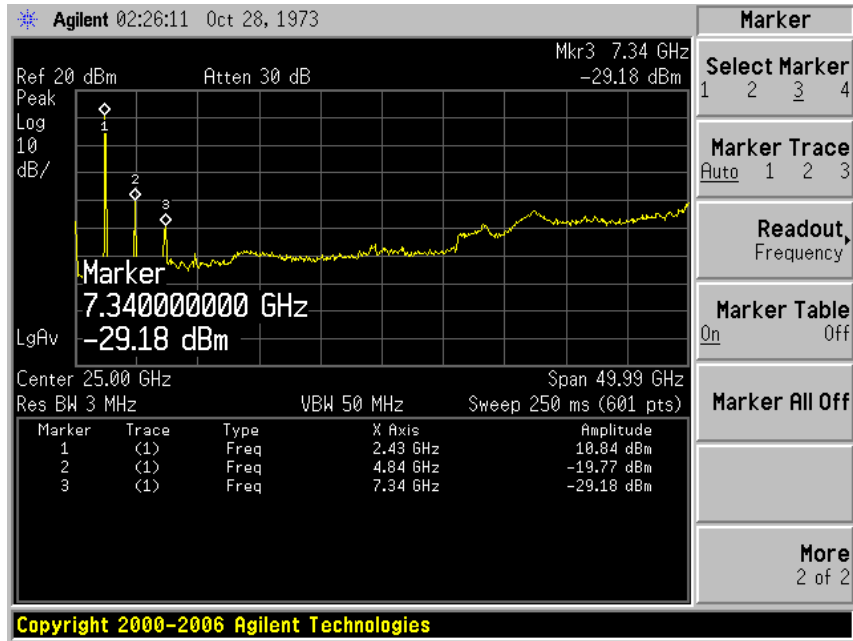
Pulse width:	12 microseconds
Pulse repetition rate:	13.89 kHz
Bandwidth:	50 MHz
Transmit Power:	6 dBm
ERP:	30 dBm (including antenna gain)

Several measurements have been made on this signal and are shown below:

- Center frequency and 6 dB bandwidth



- Harmonics out to 50 GHz (#1 is transmit signal, #2 and 3 are harmonics)



- Transmit power

