



Radar Development and Testing on Government Contract

RE: Antenna Registration Q4: Directional Antenna Information, Exhibit

File Number: 0935-EX-CN-2018

Confirmation Number: EL775632

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Experiment Overview

Systems & Technology Research (STR) is leading efforts on the DARPA radar development project called "Radar Net." We are supporting a Phase 2 development effort.

This phase will involve performance testing of our system, requiring a larger footprint in both the Boston, MA area as well as the Ann Arbor, MI area, compared to those conducted under our existing STA (WI2XGL). A maximum of two aircraft will be outfitted with systems and simultaneously operating in the same region with identical radar equipment. Both systems will employ identically constructed phased array antennas.

Altitudes will still be constrained to $< 10,000$ ft, using the same antenna systems as previously used. However, an expanded instantaneous bandwidth (800 MHz) will be required to be tested, hence the expanded action frequency range between 8.1 and 8.9 GHz, as well as 9.2 and 10.2 GHz, are being requested in the Boston area.

This effort will be expected to begin in January, 2019, and extend for up to 24 months or contract end. The primary area of operation will be in the Boston, MA region, with occasional operations in the other areas.

For all computations we consider the highest desired bandwidth and ERP of the systems.

Antenna Parameters:

The antenna is an electronically steered directional rectangular antenna with a 3dB azimuth beamwidth of 2.4 degrees and a 3dB elevation beamwidth of 10 degrees using the full array. In certain configurations we may have a wider beam, but the ERP will be reduced as a result.

The antenna can radiate in either horizontal or vertical polarizations at any given time, but not simultaneously.

The antenna has an effective scan limit of 60 degrees off boresight.

Power Parameters:



The radar transmits with a 10.5% duty cycle with pulses no longer than 100 microseconds. The peak transmit power is 1135 Watts. With the 10.5% duty cycle, the average transmit power is 120 Watts. The maximum antenna transmit gain is 31.34 dB, or a factor of 1361. So the peak ERP is $1135 * 1361 = 1.55$ MW. The average ERP is $120 * 1360 = 163$ kW.

Operations / Flight Routes:

Flights are currently planned for the Boston, MA area primarily near Lawrence, MA (KWLM) but at times extending south to operations near Cape Cod CGAS (KFMH) and north to Portsmouth Intl (KPSM). These locations will be where a majority of the flight operations will occur, not continuously, but rather as discrete test events during the execution of the contract.

Additionally, other flight operations near and surrounding North Texas Regional Airport (KGYI), Ann Arbor, MI and Ypsilanti (KYIP) and Hunstville, AL will be conducted.

A nominal flight altitude of 8500 ft MSL is planned, but could vary from 4500 ft to 9,000 ft MSL depending on weather conditions and VMC minimum requirements.