# Raytheon Request for Modification

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Call Sign: WG2XVY
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**Modification:**
Continued development of the prototype radar requires the testing of more waveforms, i.e. pulsed linear Frequency Modulated (FM Chirp) and Phase-Coded waveforms over the same frequency range 5.4 – 5.5 GHz.

In addition, experiments are planned that are intended to demonstrate the operability of the radar with varying types of targets. The targets will be presented to the radar via a Synthetic Target Generator. It is essential that radar performance be demonstrated in a real-time radar environment, which allows for the analysis of over-the-air effects that are not easily modeled in simulation.

Synthetic Target Generators (STGs) will be used to present the radar with targets with varying characteristics. The STGs will receive signals transmitted by the radar and will process them to add simulated targets to the return signal.

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**Additional equipment used in the radar development:**

**Synthetic Target Generator 1**

| | |
|---|---|
| Manufacturer: | Raytheon |
| Model: | STGMF1 |
| Number of units: | One |
| Experimental (Y/N): | Yes |

**Synthetic Target Generator 2**

| | |
|---|---|
| Manufacturer: | MIT Lincoln Laboratory |
| Model: | Doppleganger |
| Number of units: | One |
| Experimental (Y/N): | Yes |

**STG Characteristics:**
RF output at the transmitter terminals: 1 Watt
Effective radiated power from the antenna: 500 Watts Peak
Frequency Tolerance: Less than 0.001 %

**Additional Waveforms:**
The additional waveforms will be utilized by the prototype radar and STGs:

- Linear FM-Pulsed with a 25 MHz chirp and programmable pulse width from 6.3μsec to 123μsec, 29.762 kHz max rep rate (10% duty factor maximum at any pulse duration/rep rate combination)
- Phase Coded waveforms will be transmitted at a constant frequency with a programmable pulse width and programmable number of chips per pulse. The pulse width is programmable from 6.3μsec to 123μsec. The pulse will be divided into equal length "chips" with 15-2023 chips/pulse. The maximum chip pulse width is 0.4 μsec.

Table 1 below shows the characteristics of the additional waveforms. Necessary bandwidths were calculated using the formulas in Annex J of the NTIA Manual.

Table 1. Parameters for Additional Waveforms

| Waveform | Transmitter | Az Scan Coverage (deg) | El Scan Coverage (deg) | Az BW (deg) | El BW (deg) | Pulse Width (µs) | Pulse Rise/Fall Time (µs) | Max Duty Cycle (%) | Transmitter Output, Peak | ERP, Peak | Max FM Chirp BW (MHz) | Necessary BW (MHz) | Emission Designator |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Linear FM Chirp | radar | 108 | 0-90 | 3.8 | 2.8 | 6.3-123.0 | 0.1 | 10 | 75 kW | 72.5 MW | 25 | 52.3 | 52M3Q1N |
| Linear FM Chirp | STG | Fixed | Fixed | 5.4 | 5.4 | 6.3-123.0 | 0.1 | 10 | 1 W | 500 W | 25 | 52.3 | 52M3Q1N |
| Phase Coded Pulse | radar | 108 | 0-90 | 3.8 | 2.8 | 6.3-123.0 | 0.1 | 10 | 75 kW | 72.5 MW | NA | 9.0 | 9M0M1N |
| Phase Coded Pulse | STG | Fixed | Fixed | 5.4 | 5.4 | 6.3-123.0 | 0.1 | 10 | 1 W | 500 W | NA | 9.0 | 9M0M1N |