Rev 7/00

Naval Postgraduate School
Monterey, California

Radar Systems
EC-4610

Laboratory Instructions

Objective: The objective of the laboratory work is to investigate the characteristics and performance of several of the radar systems installed in the lab. Through hands-on measurements experience you will become familiar with the radar hardware and have the opportunity to compare system performance with theory.

General Information: Normally the lab is a 2-hour laboratory period. The Radar Laboratory (SP-543) is generally locked, but access can readily be obtained by calling x2345 and asking for Paul Buczynski.

Handouts & Technical Manuals: Labs handouts "How to Speak Radar" by Acker and "Test Methods and Practices" will be handed out during the introduction week. These are good basic handouts about Radar Systems and Radar Measurements. The technical manuals should be checked and studied at least a week prior before starting the radar measurements. Bring all of this material including your textbook to lab each week.

Laboratory Notebook: Keep a legible, dated laboratory notebook containing entries made at the time measurements are performed. It should contain notes, block diagrams of measurement setups etc. See you Professor about the details of your notebook and lab report, if required.

Measurements: The attached list, suggest measurements that can be made on the radar. Some of these may not readily be performed on certain radars for one reason or another. Do not feel that you must restrict yourself to the list, use your ingenuity to invent interesting experiments. Remember in each case the importance of Safety to Personnel and also of safety to the equipment.

At No Time Should You Work Alone On Any Equipment

Suggested Standard Radar Measurements

1. System Characteristics and Familiarization

2. Echo Box Ring Time, Observe TR Recovery Time, Plot Transmitter Spectrum if Desired.

3. Measure Transmitter R.F. Envelope (Pulse Width)

4. Measure Pulse Rep Rate with Counter (PRF) — Compute Duty Cycle

5. Measure Transmitter Average Power (Compute Peak Power)

6. A. Observe Transmitter/Modulator Waveform As Applicable — High Voltage Hazard
   B. Compute Magnetron Efficiency

7. A. Measure Minimum Discernible Signal (MDS) of Receiver
   B. Measure Minimum Range with Transmitter in Dummy Load

8. Determine Receiver Noise Bandwidth

9. A. Measure Receiver Noise Figure
   B. Determine the Effects of Receiver Tuning, (L.O., TR, ATR), Crystal Current (i.e. Local Oscillator Injection) and Crystal Condition of Noise Figure.

10. A. Transmitter Spectrum Analysis
    B. Transmitter Frequency Stability (Delta Time/Delta Temp/Delta H.V.)
    C. Effects of Load Impedance (Antenna/Dummy Load)
    D. AFC Capture and/or tracking Range

11. MTI Radar Cancellation Ratio and Sub-Clutter Visibility

12. Radar Cross Section Experiment
    AN/MPQ-64 – Marina Airport - CIRPAS

1. Begin with one of the following basic Pulse Radars:

AN/SPS-10B	(C-Band Pulse Search Radar)
AN/SPS-12C	(L-Band Pulsed Air Search Radar)
AN/SPS-64(V)9	(X-Band Search/Navigation Radar)
AN/SPS-67(V)1	(C-Band Pulsed Search Radar)
AN/PPS-6	(X-Band Anti-Personnel Radar with Non-Coherent MTI)

1. Move to an MTI or Pulse Compression Search Radar:

AN/SPS-40C	(UHF Pulse Compression Air search Radar)
AN/SPS-58A	(L-Band Pulsed Search, MTI Radar)
AN/SPS-65(V)1	(L-Band Pulsed Search, MTI Radar)

2. Finally we will finish by making RCS Measurements using the Tracking Radar. (Group Experiment, AN/MPQ-64 – Marina Airport