



# IDENTIFICATION OF TARGET SIGNALS IN RADIO FREQUENCY PULSED ENVIRONMENTS

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# TECHNOLOGY DESCRIPTION

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- **What is it?**
    - Test Set that detects PSK Modulation and measures RF Amplitude
    - PSK is a digital modulation scheme that conveys data by modulating the phase of a carrier signal
    - Wireless LAN, RFID and Satellite Communications are some of the technologies that utilize PSK modulation
  - **How was it designed?**
    - PCB; Protel™
    - FPGA; Altera™
    - Firmware; Quartus II™
    - Windows™ Software; LabView™
  - **What makes it special?**
    - Detects PSK Modulation in Time Domain

# TECHNOLOGY DESCRIPTION

- **Why did we make it?**
  - **PSK Detector originally prototyped for a specific Navy EMI Solution**
  - **Later rolled into a Test Set used for Navy EMI Characterizations**
  
- **What are its limitations?**
  - **PSK Detector has only been tested on BPSK, QPSK, OQPSK, 8PSK modulation types**

# TECHNOLOGY DESCRIPTION

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- **What are the main components?**
    - RF Detector
      - CVR type, sometimes referred to as a DLVA
    - FPGA/Firmware
    - Windows™ Software
  - **What are its main capabilities?**
    - Detects PSK Modulation in Time Domain
    - Images PSKDETECT vs. (AZ, EL)
    - Measures RF Amplitude in Time Domain
    - Images RF Amplitude vs. (AZ, EL)



- **How does it work?**
  1. **Software moves Source Transmit Antenna to (AZ, EL) point**
  2. **Source Transmit Antenna radiates RF modulated with PSK**
  3. **Victim Receive Antennas capture RF modulated with PSK**
  4. **CVRs take video envelope of received RF**
  5. **Software/Control Circuitry commands Detection Circuitry to take readings**

- **How does it work?**

- 6. Detection Circuitry:**

- Detects presence or lack of presence of PSK;  
Outputs digital 1 or 0, respectively
    - Averages video level to determine RF Amplitude;  
Outputs digital amplitude word

- 7. Control Circuitry/Software stores PSK and Amplitude data into file**

- 8. Software post-processes file into:**

- Images of PSKDETECT vs. (AZ, EL) per Receiver
    - Images of RF Amplitude vs. (AZ, EL) per Receiver



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- **Who would use it?**
    - **EMC/EMI Testers**
    - **Radiation Hazard Testers**
  - **Why would they want it?**
    - **To characterize PSK signal amplitude levels around an area of interest**
      - **Characterization of a known PSK source**
      - **Detection and location of an unknown PSK source**
    - **Electronic architecture is more compact and cost effective than using multiple Spectrum Analyzers (i.e. Frequency Domain operations)**

- **How would it be used?**
  - **PSK Detector**
  - **EMC/EMI Characterizations (e.g. SATCOM, Cell Towers)**
  - **PSK Radiation Detector**
  - **Radiation Characterizations (e.g. HERO, HERF, HERP)**
  - **Alarm for critical Wireless LAN or RFID Systems**

# ACRONYMS (BACK-UP)



**8PSK: 8 Phase-Shift Keying**  
**AZ: Azimuth**  
**BPSK: Binary Phase-Shift Keying**  
**CVR: Crystal Video Receiver**  
**DIO: Digital Input/Output**  
**DLVA: Detector Log Video Amplifier**  
**EL: Elevation**  
**EMC: Electromagnetic Compatibility**  
**EMI: Electromagnetic Interference**  
**FPGA: Field-Programmable Gate Array**  
**HERF: Hazard of Electromagnetic Radiation to Fuel**  
**HERO: Hazard of Electromagnetic Radiation to Ordnance**  
**HERP: Hazard of Electromagnetic Radiation to Personnel**  
**LAN: Local Area Network**  
**PCB: Printed Circuit Board**  
**OQPSK: Offset Quadrature Phase-Shift Keying**  
**PSK: Phase-Shift Keying**  
**PSKDETECT: Binary output from PSK Detector**  
**QPSK: Quadrature Phase-Shift Keying**  
**RF: Radio Frequency**  
**RFID: Radio Frequency Identification**  
**SATCOM: Satellite Communications**