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**NORTHROP GRUMMAN**

## Signal Measurement System (SMS)

**A**s electronic warfare (EW) threats have proliferated, the need for sophisticated defensive systems has increased. The ability to test these advanced systems under realistic conditions throughout their life cycle and to verify their performance is critical to mission success.

Northrop Grumman's Signal Measurement System (SMS) provides the capability to fully monitor test procedures and validate results, assuring the warfighter's optimal chances of surviving the mission. Survivability is also enhanced by an effective training program which is supported by the SMS post-test analysis of the training environment and the system under test's response.

The SMS provides real-time RF measurement and analysis of threat emitters and corresponding SUT Jammer responses for hardware-in-the-loop, installed system, and open-air range applications.

- Validates the test environment by capturing threat simulator signals and SUT (radar and/or ECM) response in real time, and allows
- post collection correlation of ECM with threat activity
- Monitors test progress to provide real-time indication of test correlation, failures, or anomalies
- Provides for post-test analysis of the threat signal and correlated SUT Jammer response, with scripted parametric measurement to allow ECM technique validation
- Operates in stand-alone mode or can be integrated with EW and CNI stimulators to enable shared use of databases and use of a common time base (GPS and IRIG-B)
- Versatility of application, readily configured for laboratory, anechoic chamber, and open air range operation — adds value by meeting test/evaluation needs throughout an EW program's life cycle
- Real-time and post-test analysis tools optimize the use of costly chamber and range time
- Re-programmability allows adaptation for new requirements while performing a test
- User configurable ECM technique analysis definitions
- Modularity permits easy upgrades and/or equipment swap-outs for addition of new features
- Non-invasive system application permits dynamic, high-fidelity measurement and analysis without affecting test results
- Selective programming enables user to trap specific radars and find specific events or emitters
- Integrated and automated features, such as scripted operation, reduce the need for operator interaction and oversight
- Measurements of two independent simultaneous frequency agile signals with optional 2nd high speed synthesizer
- Detailed report generation
- Intuitive and robust software applications along with COTS hardware offers the advantages of an NDI solution

The SMS provides for comprehensive ECM Technique evaluation and response verification with analysis tools and displays including a standard off-the-shelf suite as well as user customizable analysis definitions.

| ECM Technique Analysis Tools and Displays  |   |                               |
|--|---|-------------------------------|
| Range Gate Pull Off (RGPO)   | Coordinated RGPO                                    | Random Range Program (RANRAP) |
| Velocity Gate Pull Off (VGPO)  | Swept Square Wave                                   | Blinking                      |
| Noise<br>- Doppler - Spot<br>- Range Gated - Barrage<br>- CW - Swept<br>- Frequency - Cover Pulse<br>Locked (FL) | Intrapulse<br>- Frequency<br>- Amplitude<br>- Phase | Multiplexed False Targets     |
| Coordinated False Targets  | Swept RF  | Skirt Modulation              |
| Pseudo CW  | Dynamic Rate Reduction (DRR)                        | Offsets                       |
| Combined   | Multiple Doppler                                    | Custom                        |

| Measured Parameters |   |  |                            |
|---------------------|---|--|----------------------------|
| Parameter           | Measurement Range                           | Measurement Accuracy   | Measurement Resolution     |
| Frequency           | 0.5 to 2 GHz<br>2 to 18 GHz<br>32 to 38 GHz | 10 Hz, coherent signals<br>5 kHz quick-look,<br>PW dependent | 10 Hz<br>10 kHz quick-look |
| Bandwidth           | 0 to 500 MHz                                | 10% quick-look, 1 kHz minimum<br>300 Hz, coherent signals    | 1% of span                 |
| Pulse Width         | 100 ns to 65 ms                             | +/- 20 ns  | 5 ns                       |
| PRI                 | 1 us to 65 ms                               | 1 ns RMS<br>(250 pulses)                                     | 5 ns                       |
| Amplitude           | Dynamic Range                               | 2.5 dB, absolute<br>1.0 dB, relative                         | 0.05 dB                    |
| TOA                 | Data Collection                             | 50 ns  | 5 ns                       |

## SMS Features and Characteristics

### SUT and Threat Simulator Input Frequency Ranges

- 2 GHz to 18 GHz
- Standard options for frequency extensions including 0.5 to 2 GHz and 32 to 38 GHz

### Instantaneous Bandwidth

- 40 MHz and 80 MHz

### Dynamic Range with Performance Accuracy

- 50 dB in 40 MHz and 47 dB in 80 MHz

### DSP IF Filters

- 5 MHz, 10 MHz, and Custom

### Real-time Recording Rate

- 200 MSPS

### Recording Time

- Greater than 6 hours per channel, expandable

### High Speed Data Storage

- 8 Terabytes per Channel, Expandable

### Closely Coupled with CEESIM and AMES RF Simulators

- IRIG-B with GPS Synchronized

- Scripted Scenario Control for Correlation of SUT Response to Threat Emitter
- High Speed LO Control for Threat Emitter Tracking

### Tuning Speed

- < 1us over entire frequency range providing pulse-by-pulse frequency agility when tracking a CEESIM or an AMES emitter

### External Control

- Ethernet 10/100/1000 Base Tx
- Event Triggers

### Real-Time Results and Confirmation

- Quick Look Displays
- Pulse Amplitude
- PDW Zero Span
- Pulse Frequency
- Pulse Width
- Pulse-to-Pulse Delay (PRI)
- Spectrum Plot
- Spectrum Waterfall

### All Data Archived for Post Test Analysis

- Data storage computer with scalable storage capacity

### Time Standard Subsystem

- Provides for overall laboratory time standard with IRIG-B/GPS synchronization
- Rubidium Reference Clock

### Report Generator

- Detailed reports including pass/fail indications based on user specified criteria
- User customizable
- .pdf file format

### For more information, please contact:

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