SPEDIS-TRX

Radar target and environment simulator

SPEDIS-TRX is a portable radar target simulator built on digital radio frequency memory (DRFM). It receives the radar's transmission and returns it with controlled delay, Doppler shift and attenuation, so the radar sees targets at the range and velocity defined in the scenario. Targets follow user-defined trajectories or real-time motion data from an external source. Deceptive ECM and noise jamming are added to the same scenario to evaluate detection and tracking under jamming. The system works in direct injection and radiation modes. The portable version is for workbench and range testing; versions for anechoic chamber, tower and other test site installations are also available, as is a version extended to 40 GHz.



Figure 1. SPEDIS-TRX scenario software with target and emitter parameters, flow parameters, simulation status panel and delay, velocity and range graphs

AT A GLANCE

FREQUENCY BAND
0.5–18 GHz (version up to 40 GHz available)

INSTANTANEOUS BANDWIDTH
1 GHz

DYNAMIC RANGE
80 dB block (40 dB instantaneous)

NUMBER OF TARGETS
5

RANGE SIMULATION
300 m – 1000 km

APPLICATIONS

- Radar development testing and verification
- Radar acceptance and qualification testing
- ECCM and anti-jamming performance evaluation
- Anechoic chamber and hardware-in-the-loop radar testing
- Range and tower testing of radar systems

Key Features

- Up to five moving targets
- Deceptive ECM and noise jamming
- Radar signal analysis
- Emitter simulation
- Modulation, antenna pattern and scan
- Portable and fixed installations

Capabilities

Up to five moving targets

Each target has its own range, velocity, acceleration and attenuation, defined as multiple motion intervals towards or away from the radar. Range runs from 300 m to 1000 km with 1 m resolution, and radial velocity up to 30,000 m/s. Scenarios are saved and reloaded, and an optional interface accepts external motion data at a 1 ms update rate for five platforms.

Deceptive ECM and noise jamming

Range and velocity gate pull-off (RGPO/VGPO, coordinated or uncoordinated), clutter, chaff and multiple false targets test the radar's tracking under deception. Barrage (50, 100, 200 MHz) and spot (1–20 MHz) noise jammers have their own motion parameters.

Radar signal analysis

The simulator monitors the incoming radar spectrum and measures frequency, amplitude and pulse repetition interval. Status graphs show spectrum, instantaneous frequency and amplitude, and pulse frequency, amplitude and period. Optional instantaneous frequency measurement (IFM) has an error below 1%.

Emitter simulation

Besides targets that repeat the radar's signal, the scenario contains independent emitters that transmit their own CW or pulsed signal at a set output power. PRI follows constant, wobbulation, random, stagger, dwell-and-switch or burst patterns; pulse width and carrier frequency have their own agility types.

Modulation, antenna pattern and scan

Intra-pulse modulation covers Frank, Zadoff, P1–P4 and Barker codes, BPSK and QPSK with custom symbol tables, custom phase patterns, AM and FM steps and FM chirp. Antenna patterns and circular, sector, raster, helical, conical and spiral scans are simulated, with a configurable path-loss model including free-space path loss.

Portable and fixed installations

The portable unit weighs less than 20 kg and connects to the radar by direct injection or radiates through antennas. Installations for anechoic chambers, test towers and other test sites use the same scenario software.

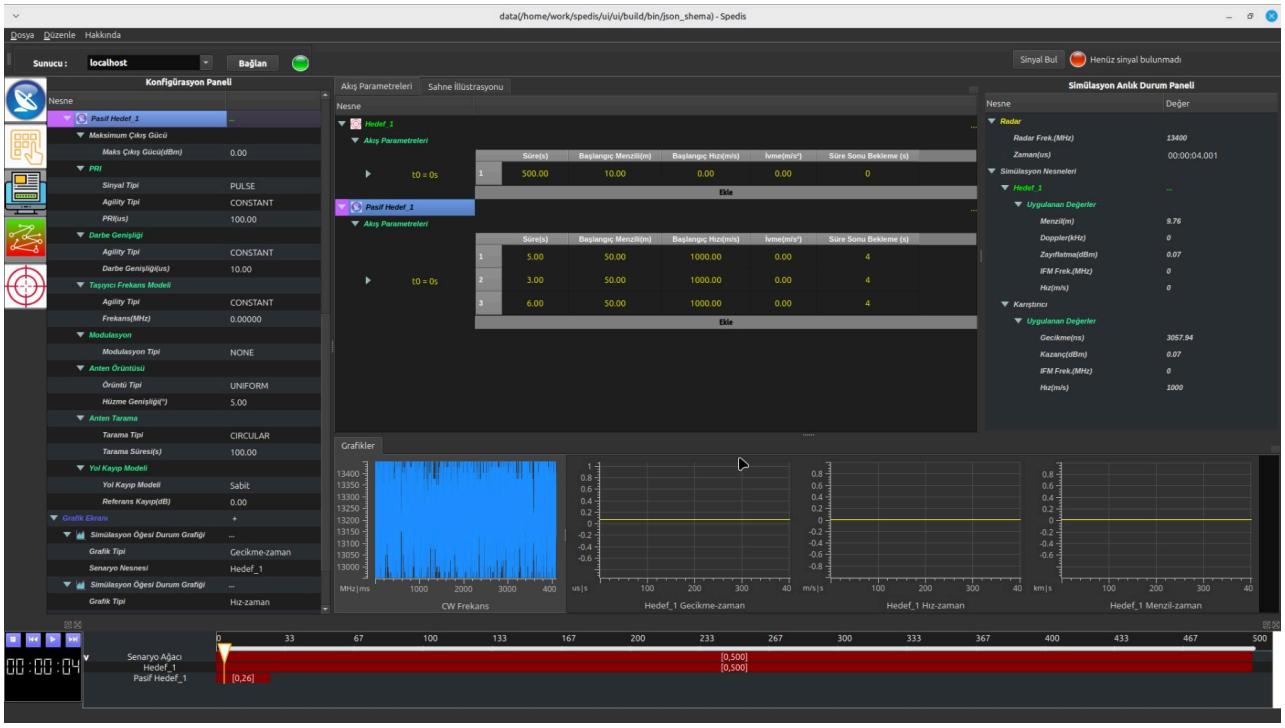


Figure 2. Scenario software: target and emitter parameters, flow parameters, live simulation status and delay, velocity and range graphs



Figure 3. Radar signal analysis: input spectrum with frequency–time and amplitude–time graphs and measured radar parameters

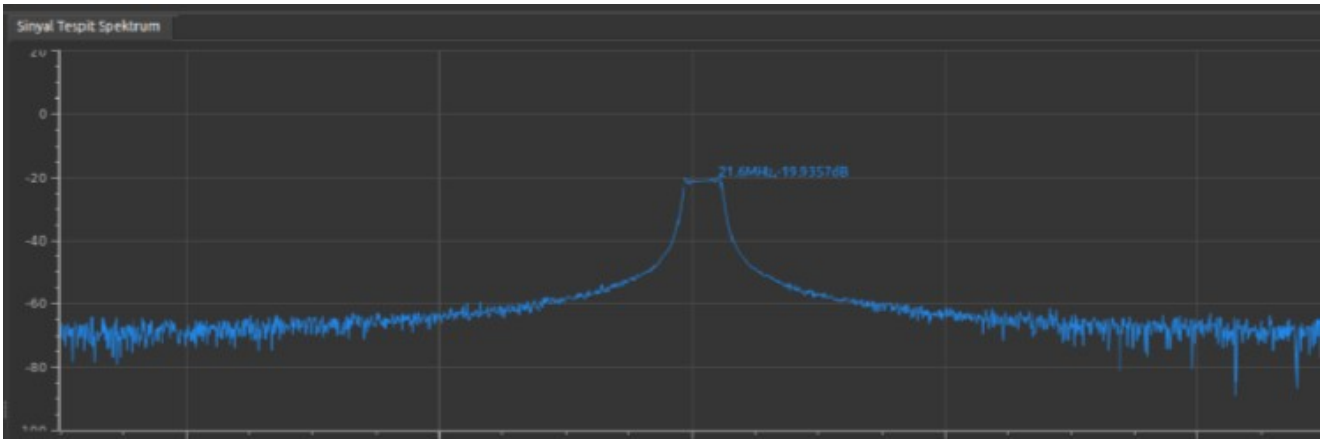


Figure 4. Spectrum of the detected radar signal

Specifications

General	
Frequency band	0.5–18 GHz (version up to 40 GHz available)
Instantaneous bandwidth	1 GHz
Dynamic range	80 dB block (40 dB instantaneous)
Number of targets	5
Range simulation	300 m – 1000 km
Range resolution	1 m
Radial velocity simulation	Up to 30,000 m/s
Doppler shift	±2 MHz
Doppler resolution	1 Hz (adjustable)
Detectable pulse width	50 ns – 1 ms

General	
Detectable PRI	1 µs – 100 ms
Deceptive ECM	RGPO/VGPO (coordinated/uncoordinated), clutter, chaff, multiple false targets
Noise jammer	Barrage 50/100/200 MHz; spot 1/2/5/10/20 MHz
IFM	Error < 1% (optional)
External motion interface	1 ms update for 5 platforms (optional)
Operating modes	Direct injection and radiation
Portable unit dimensions	524 × 372 × 226 mm
Weight	Less than 20 kg
Temperature	Operating 0 °C to 50 °C; storage −20 °C to 70 °C

Warranty

All hardware and software procured from Zeta is under warranty against manufacturing or design failures for 2 years. Customer-specific warranty terms may be arranged.

Disclaimer

Due to ongoing research and development, Zeta reserves the right to change product specifications without notice.

About Zeta

Zeta Defence develops electronic intelligence (ELINT) and communication intelligence (COMINT) equipment and radar / electronic warfare simulators. Its capabilities include RF transceiver system design, digital design and large-scale software development.

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