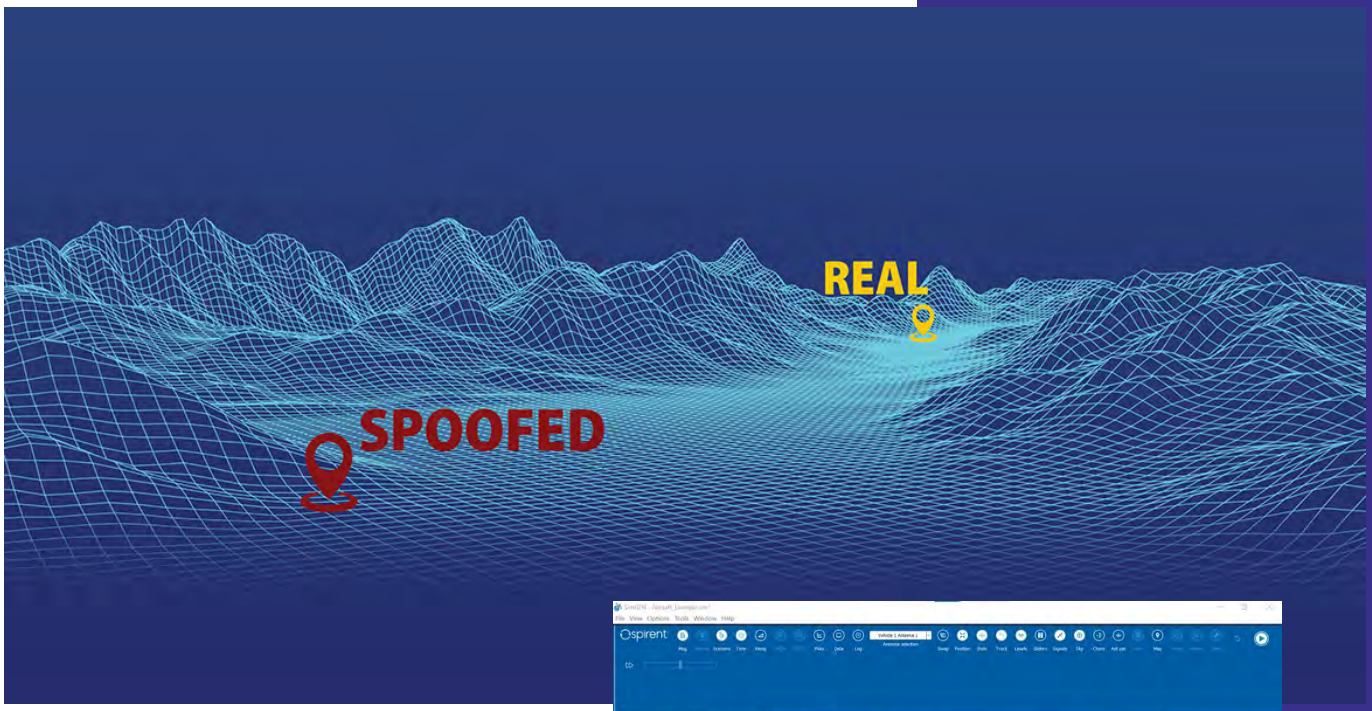
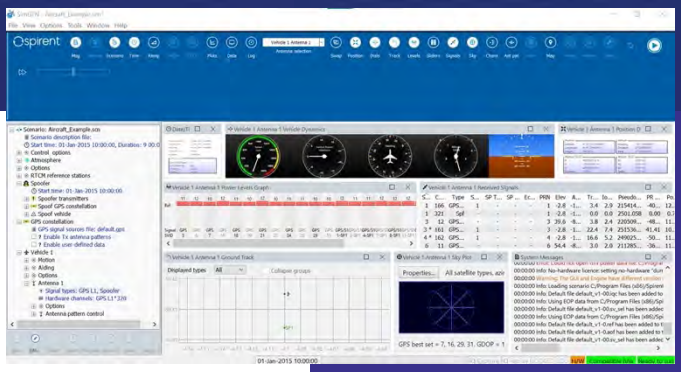
Spirent Federal Systems





Spoofing Feature

Spirent all-in-one spoofing solution for GSS9000 Constellation Simulator Series

Spirent Embedded Spoofing Feature

Introduction

The Spoofing feature for the GSS9000 comprises built-in and user-configurable capabilities to generate spoofing scenarios in SimGEN®, such as trajectory spoofing, navigation data spoofing and meaconing attacks. It can simulate up to **4** independent spoofers in a given scenario, allowing user definition of the following parameters, for each spoofer:

- Number of spoofer ground-based transmitters (up to 64), their location and trajectory
- Power level selection
- False vehicle position (spoofed position)
- Spoofing signal content selection, including navigation data and errors

The resulting spoofer RF signal will be automatically calculated by SimGEN® based on user scenario settings, with the correct spoofer signal arrival angle and spoofer signal content. Spoofing is supported on all GNSS constellations and frequencies, provided that the appropriate constellation feature licence keys are present on the GSS9000. Dedicated spoofing channels which are available only for spoofing can be provided.

Feature Overview

Spoofing is an established feature enhancement of SimGEN®. An active spoofing feature key will enable the new “Spoofer” type of signal in the Antenna Signal Types.

- Enable ‘Spoofer’ signal type, specifying the quantity of independent Spoofers required

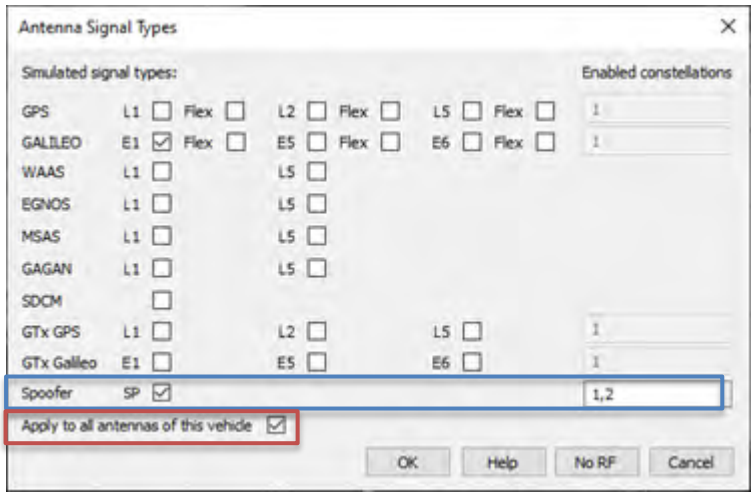


Figure 1: Antenna Signal Types with new "Spoofer" signal type

- A spoofer is an independent, self-contained set of transmitters, constellations and a vehicle within the main scenario. 1 Spoofer involves definition of the associated:
  a. Spoof GNSS constellation(s): defines the parameters of the satellites used to calculate the spoof signals of the spoof constellation.
  b. Spoof vehicle: defines the parameters of the receiver of the spoof signals. The location of the spoof vehicle’s antenna is the location the spoofer is trying to fool the real vehicle into thinking it is located at.
  a. Spoofer transmitters: ground-based transmitters whose spoofing signals represent the spoof (‘fake’) constellation(s) & vehicle. The Spoofer transmitters are the transmitters that broadcast the spoof signals. One or more spoofer transmitters are set up for a given spoofer. A single spoofer transmitter can generate a spoof constellation or multiple spoof signals.

Note: When using 2 RF output systems or CRPA (multi-antenna / element) scenario configuration, you must also ensure that the same antenna signal type selections are applied to all antennas.

For each Spoofer enabled, a new Spoofer group is added to the scenario tree, alongside the standard GNSS and Vehicle definitions. Figure 1 shows two (“Spoofer 1” & “Spoofer 2”) Spoofers enabled. For each Spoofer group, it is possible to define:

- The parameters of the spoofing signal source(s), or ground-based transmitters (Figure 2):
    a. Initial location; absolute or relative to vehicle
    b. Trajectory; static or moving using .umt files.
    c. Signal level; fixed or modelled.

- The parameters of the ‘Spoof constellation’; user-definition is identical to the equivalent, standard constellation file. The different spoof constellations are enabled in the Spoof vehicle Signal Antenna Type dialog, similar to how truth signals are enabled on the standard (real) vehicle.
- The ‘Spoof vehicle’ parameters; including its type, using one of SimGEN’s built-in vehicle models, and trajectory with user motion file or real-time remote motion input

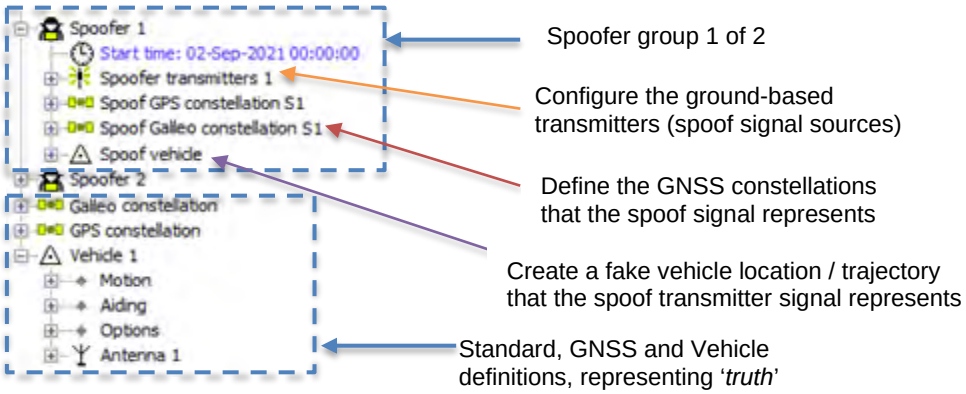


Figure 2: Scenario tree with two spoofers enabled

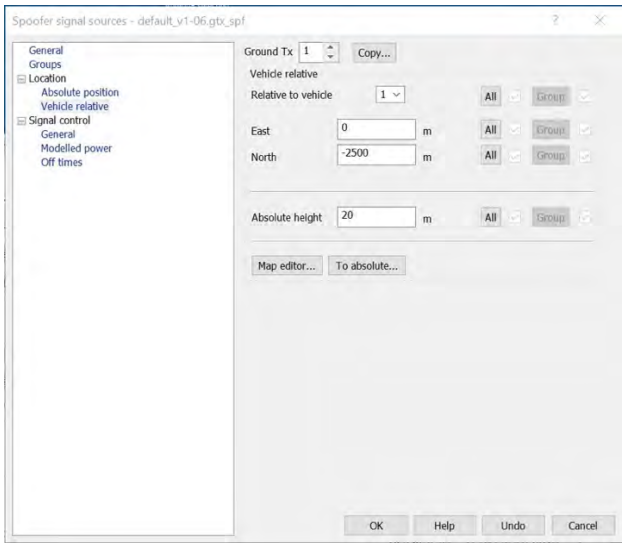


Figure 3: Spoofer signal sources parameters

Spirent Embedded Spoofing Feature

Figure 4: SimGEN Ground Track window

During runtime SimGEN® manages all the real-time signal characteristics, such as pseudorange, angle of arrival, power levels, based upon:

a. Initial user-definitions of the truth and spoof content
b. Relative changes between the target and spoof vehicle locations
c. Relative changes between the target vehicle and spoofer transmitter location

SVID	Type	PRN	Elev	Azim	Pseudorange
1	Spf	1	-85.5	46.9	983.056
3	GPS L1L2	3	9.3	-94.2	24777585.583
3	GPS/S1 L1	3	-85.5	46.9	24778758.750

Spoofer transmitter (SP1)
Truth satellite SVID3
Spoof satellite SVID3

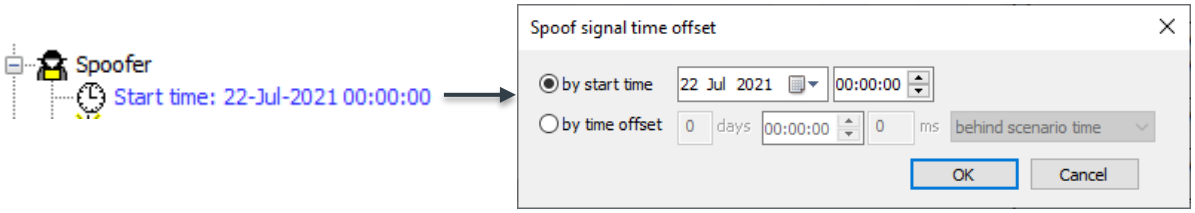
Spoof satellite El / Az matches the spoofer transmitter location relative to the target vehicle, i.e., not received from space

PR difference between SV signals is the Spoofer transmitter PR + delta between current target vehicle location and spoof vehicle location

Other options

The spoofer constellation can be given a unique scenario start time, either as a fixed time/date or as an offset from the normal (true) scenario start time.

a. by **start time** provides 1s resolution
b. by **time offset** provides 1ms resolution



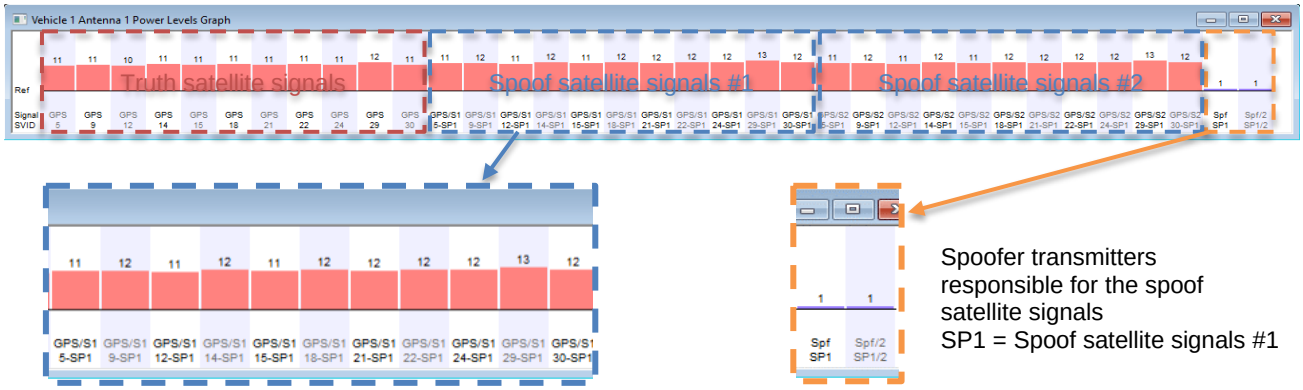
Channel Allocation

The target vehicle receives truth GNSS signals transmitted from the space-based GNSS satellites and spoof GNSS signals transmitted from the ground-based spoofer transmitters. The available signal generator channels (per RF output) are shared equally between:

- the enabled and visible truth GNSS signals and
- the enabled and visible spoofer transmitters.

For example, if each RF output supports 32 channels and the scenario involves 2 spoofers with a single transmitter each, then:

- The truth GNSS signals are allocated 11 channels
- Spoofer 1 is allocated 11 channels
- Spoofer 2 is allocated 10 channels



Spoofing-only channels are introduced with a new part number for ordering. Spoofing-only channels are channels that can only be assigned to spoofing signals during a scenario and can never be assigned to truth signals.
Standard channels (usual GNSS channels) can be assigned to either truth GNSS signals or spoofing signals, on a given spoofing scenario.

Moreover, the exact number of channels allocated to ‘real’ and ‘spoof’ channels on a given scenario is variable and depends on the following criteria:

- Number of real signal constellations
- Number of spoofers
- Number of ground transmitters in each spoofer
- Number of spoof constellations in each spoofer
- Number of standard and spoofing-only channels

Additionally, the user is able to reduce the maximum number or truth or “real” GNSS channels used on a given scenario, allowing more channels to be assigned to spoofing signals.

Detailed Specifications

Table 1 Embedded Spoofing feature specifications

Parameter	GSS9000
Spoofer vehicles	Up to 4
Spoofer transmitters (per spoofer)	Up to 64
Trajectory spoofing	Yes
Navigation data spoofing	Yes
Meaconing	Yes

For secure signal support with the spoofing feature, please contact your Spirent representative.

About Spirent Positioning Technology

Spirent enables innovation and development in the GNSS (global navigation satellite system) and additional PNT (positioning, navigation and timing) technologies that are increasingly influencing our lives.

Our clients promise superior performance to their customers. By providing comprehensive and tailored test solutions, Spirent assures that our clients fulfill that promise.

Why Spirent?

Across five decades Spirent has brought unrivaled power, control and precision to positioning, navigation and timing technology. Spirent is trusted by the leading developers across all segments to consult and deliver on innovative solutions, using the highest quality dedicated hardware and the most flexible and intuitive software on the market.

Spirent delivers

- Ground-breaking features proven to perform
- Flexible and customizable systems for future-proofed test capabilities
- World-leading innovation, redefining industry expectations
- First-to-market with new signals and ICDs
- Signals built from first principles — giving the reliable and precise truth data you need
- Unrivaled investment in customer-focused R&D
- A global customer support network with established experts

About Spirent Communications
Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks. We help bring clarity to increasingly complex technological and business challenges. Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled. For more information visit: www.spirent.com

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