**SatGen v3** software adds sophisticated signal generation capability to the **LabSat** range of GNSS Simulators. By defining the time, place and trajectory of your desired simulation, **SatGen** will generate an RF file which can be replayed by a **LabSat** into any GNSS enabled device.

SatGen v3 is available in three variants – **L1 Band**, **Real-Time** or **Wideband**. All versions allow users to tightly define the Time, Position and Trajectory of the simulation, as well as almanacs, dynamics, elevation masks and signal to noise ratios. **SatGen** will then create a binary file containing simulated signals from all of the satellites in view in the chosen almanac. This binary file is then transferred to the **LabSat** via SD card, USB Stick, Hard disk or Ethernet, depending on the model. We can supply almanacs with all future signals included to complete the constellations.
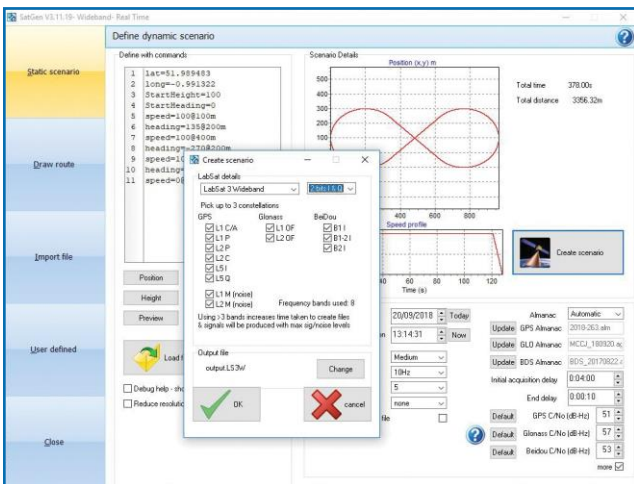
L1 Band

SatGen v3 L1 Band can generate GPS L1C/A, Galileo E1, GLONASS L1OF and BeiDou B1I signals.

Wideband

**SatGen v3 Wideband** can create 13 different signals across a very wide bandwidth. GPS signals simulated are L1, L2C, L5 and L2M (noise only). Galileo E1, E5a, E5b & E6. GLONASS signals are L1 OF and L2 OF. BeiDou signals are B1I, B2I & B3I. Note that I and Q signals are be separately generated and can be individually selected. A scenario containing all 13 available signals can be replayed on **LabSat 3 Wideband**.

GPS	Galileo	GLONASS	BeiDou
L1, L1P	E1	L1 OF	B1I
L2C, L2P	E5a, E5b	L2 OF	B2I
L5	E6		B3I
L1M, L2M (noise only)			

Real-Time (RT)

SatGen v3 Real-Time connects via USB to a **LabSat RT** and streams RF data in real-time starting at a user defined time or synchronised with the current UTC time. Synchronisation to UTC is typically accurate to within 2ms, enabling a quick changeover between live sky and replay without having to cold start the device. During real-time operation, individual satellites can be enabled/disabled and their signal to noise ratios adjusted. The latency of the system is typically less than 400ms.

The **LabSat RT** hardware is capable of simulating up to two constellations from the following: GPS L1C/A, Galileo E1, GLONASS L1OF, & BeiDou B1I.

SatGen v3 Real-Time

Datasheet
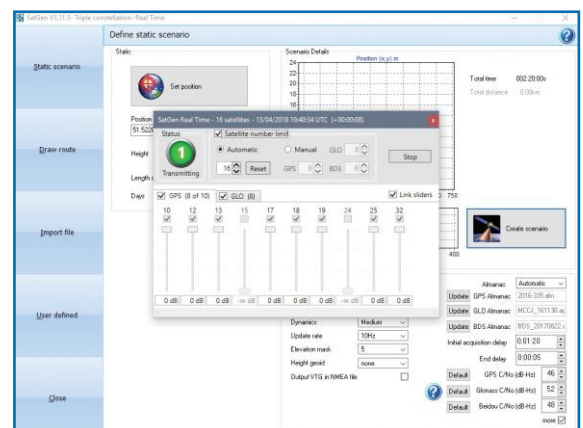
Performance

When **SatGen** is generating an RF output file, it utilises multiple cores and is heavily processor intensive. An Intel i5 based PC will typically take 1 minute to generate 1 minute of output (single GPS only) and an Intel i7 with 8 cores takes 30s per 1 minute of output.

If you are regularly generating a wideband scenario with multiple signals and multiple bits, this will take considerably longer, and we recommend a dual processor Xeon server with a large number of cores.

SatGen v3 variants

SatGen v3 software is a single installable application. Depending on the variant purchased, a USB dongle will be supplied, which will configure the software with the appropriate functionality.

Description	Order Code	Output Capability	Constellation Available
SatGen v3 L1 band Single constellation	RLLSSGSW03-1	Any single constellation scenario file of the three constellation's available	GPS L1 Galileo E1 GLONASS L1 Beidou B1
SatGen v3 L1 band Dual constellation	RLLSSGSW03-2	Any single or dual constellation scenario file of the three constellation's available	GPS L1 Galileo E1 GLONASS L1 Beidou B1
SatGen v3 L1 band Triple constellation	RLLSSGSW03-3	Any single, dual or triple constellation scenario file of the three constellation's available	GPS L1 Galileo E1 GLONASS L1 Beidou B1
SatGen v3 Real-Time	Contact your local LabSat distributor	Enables the Real-Time functionality within SatGen v3 allowing a live signal stream to a LabSat RT unit	GPS L1 Galileo E1 GLONASS L1 Beidou B1
SatGen v3 Wideband	RLLSGSW03-W	Generates scenario data for all Labsat hardware subject to capabilities of the device. All listed signals simultaneously when used with Labsat 3 Wideband hardware.	GPS L1 C/A GPS L1 P & L2 P GPS L2 C GPS L5 GPS L1 M & L2 M Galileo E1, E5a, E5b, E6 GLONASS L1 OF & L2OF BEIDOU B1I, B2I & B3I

SatGen v3 Wideband Signal Description

Signals can be generally split into two categories: **narrowband** and **wideband**.

Narrowband signals have a modulation (chipping code) frequency of no more than a few megahertz, e.g. GPS L1C/A (1.023MHz), GLONASS L1OF (0.511MHz), BeiDou B1I (2.046MHz).

Wideband signals use a modulation (chipping code) frequency of 10 or more megahertz, e.g. GPS L1P (10.23MHz), GPS L5 (10.23MHz).

When **SatGen v3 Wideband** simulates signals transmitted on no more than 3 frequencies the following conditions will apply:

- Each frequency band is transmitted on a different **LabSat 3 Wideband** output channel.
- For narrowband signals the 10.5 MHz sampling rate and 10 MHz bandwidth is used.
- For wideband signals a 24, 30 or 32 MHz bandwidth is used depending on the actual signals used. If a single wideband signal is present, all output channels are forced to use a high sampling rate.

When **SatGen v3 Wideband** simulates signals transmitted on more than 3 frequencies:

- The signals transmitted on frequencies which are close to each other are grouped together to form very wide output channels.

The following groups are examples of the grouping that can be used:

L1 with GPS L1C/A, GPS L1P, GPS L1M, GLONASS L1OF, BeiDou B1I and BeiDou B1-2I

L2 with GPS L2C, GPS L2P, GPS L2M, GLONASS L2OF and BeiDou B2I

L5 with GPS L5I and GPS L5Q

To maximise performance, **SatGen v3** software will automatically select the correct centre frequency and bandwidth depending upon the signal required. The actual parameters used within the scenario can easily be checked by looking at the .ini file produced alongside the .LS3W scenario file on the PC.

Quantisation selection for SatGen v3 Wideband

LabSat 3 Wideband supports generation of scenario data with 1, 2 and 3-bit quantisation. Depending on the **Labsat** hardware that data is generated for, quantisation may be automatically reduced to ensure that data bandwidth is not exceeded. For example, when selecting all available signals for use with **Labsat 3 Wideband** hardware, quantisation is limited to 2-bit.

Technical Specifications

Constellation all variants	GPS/Galileo/GLONASS/BeiDou
Data format	IF, I, Q, I&Q
Quantisation	1 bit, 2-bit, 3-bit
File format	.bin / .ls2 / .ls3 / .LS3W
File Size/ Duration	Unlimited/ 7 days
One hour scenario data size	LabSat: 7 GB LabSat 2 & RT: 14.4 GB LabSat 3: 14.4 GB LabSat 3 Wideband: 169 GB
Almanac file format	.ALM / .AGL
NMEA Input File Format	$GGA
Operating System	Win 7 64-bit, Win 8 64-bit, Win 10 64-bit

Minimum recommended PC requirements

SatGen v3 Single, Dual & Triple constellation	Single constellation: Min 4GB RAM Dual and Triple constellation: Min 8GBRAM
Real-Time	Single constellation: up to 16 satellites. 4-core Intel i7 3.8 GHz Turbo frequency Dual constellation: up to 28 satellites. 8-core Intel i7 Extreme 3.5GHz Turbo frequency 10-core Intel Xeon 2.8GHz Nominal frequency
SatGen v3 Wideband	Minimum RAM specification: 16GB 4-core Intel i7 3.8 GHz Turbo frequency

Note: Intel i7 processors are suitable for occasional use. For extended real-time use Intel Xeon processors are strongly recommended.