ELECTRONICS & DEFENSE

BUILDING YOUR OWN GNSS SIMULATOR

Skydel's Power. Your Hardware.

PORTABLE

The Skydel Simulation Engine

Skydel is packed with a rich feature set – multi-constellation/multi-frequency signal generation, remote control from user-defined scripts, and integrated interference generation. Despite all these features, one of Skydel's greatest assets is its open, software-defined architecture. This GNSS simulation approach gives Skydel maximum scalability and flexibility, and provides users with the ability to develop and innovate while not limited by hardware design.

With a Skydel software license in hand, users can simply purchase the hardware they need, and start simulating.

GNSS Simulation Components

This document outlines the necessary hardware for assembling your own Skydel-powered GNSS simulator. Described below are the specifications required for the following hardware components:

- Laptop
- PCIe Extension System
- Operating System
- Cables
- Radio / Modulator / SDR
- Timing Source
- DC Block
- Attenuator

Portable Simulation Build

Building a GNSS simulator for portable testing and simulation does not require high-end hardware components. Users of this build might perform in-field receiver testing, and go/no-go testing.

Portable builds are targeting the following output specifications:

- 20 to 300 Signals
- 1 RF Output

In order to achieve this number of signals and RF output, Safran has produced this document to help guide users in the assembly of an effective GNSS simulator using readily available components.

Building your own GNSS simulator system can be enjoyable, but it requires technical expertise. We provide general guidance and recommendations, but accuracy isn't guaranteed. We hold no responsibility for any issues arising from this information or your build. If you wish to learn more about our turnkey systems, please see our GNSS products page.

RF Signals

Radio frequency (RF) outputs in Skydel-based systems are very flexible. Systems with multiple outputs can combine RF signals to a single output or be used individually with a receiver.

Each output can be configured with:

- Upper Band GNSS Signals
- Lower Band GNSS Signals
- Interference/Jamming signal

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Building Your Own System

When undertaking the task of building your own system, it may be difficult to procure some hardware components. It is possible to replace some of the components listed below with those of other manufacturers or slightly different models.

As with any hardware build, it is important to be aware of possible conflicts or incompatibilities between hardware components — especially with regard to the number of PCIe slots available, and the space certain cards can take on the motherboard.

Safran strongly recommends to align your build as closely as possible with the components listed below. It is possible to mix components from the Minimum and Recommended columns, unless stated otherwise.

Portable GNSS Simulator

The GNSS simulator components for an Portable simulation build are listed below with suggested models and/or specifications.

Component	Recommended Requirements	Notes
Laptop	Dell XPS 15	
Graphics	We strongly recommend a laptop with an Nvidia GPU, such as the following (or similar): • RTX 3050 (capable of generating 100 signals) • RTX 4070 (capable of generating 300 signals)	See our detailed GPU Guide for further guidance.
PCIe Expansion System	Sonnettech Echo Express SE III	
Software-Defined Radio (SDR)* NOTE: Skydel builds do not support mixed SDR models..	SDR is connected to a PCIe slot in the PCIe Expansion System (above) Quantity: 1 DekTec DTA-2116	

Using a PCIe Expansion System (left; Echo Express SE III), is a convenient way to add additional PCIe capabilities to a system or laptop.

*: These SDR cards are the preferred choice for Skydel-based builds.
Safran cannot guarantee the compatability, operation, or performance of SDR components not listed in tihs document.

Technical Specifications

Additional Items

Timing Source (Optional)

Quantity: 1
If opting for a timing card to use with a DekTec SDR, Safran suggest the following timing source component model.

- Safran CDM-5

This component is optional since the SDR includes a clock. A timing source can, however, improve the SDR's RF performance beyond what is required for Portable simulation.

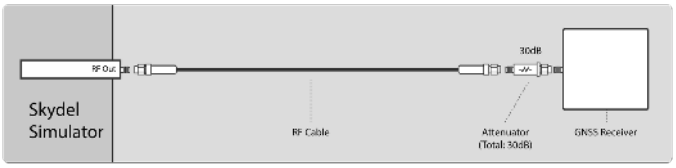
DC Blocks

Safran recommends a DC Block with 10Hz to 18GHz, 50ohm, <1dB insertion loss.
Example: CP01R-DCBK-5018 Mini-Circuits DC-Block, or similar.

Attenuators

- Safran recommends the following attenuators:
- Attenuator 10dB SMA
- Attenuator 20dB SMA
- Attenuator 30dB SMA

Example of a 10dB model



Connection using a DC Block and attenuator

Operating System

Skydel supports both Linux and Windows environments. We recommend the following versions:

- Preferred: Linux Ubuntu 22.04 LTS
- Windows 10 Home or Pro

NOTE: In order to extract the maximum performance form your Skydel build, we recommend the use of the Linux operating system.

Accessories

Users may need additional combinations of coaxial cables. The following or similar are recommended:

- 50 Ohms compatible LMR 195 type

Support

In order to receive Safran support, your system must use the components listed in this document. Simulators using hardware other than those listed, may not be covered by support.

Support from Safran for «Building Your Own SImulator» is offerred on a best-effort basis and includes up to 10 hours of support.

More Information

For additional information on hardware selection, accessories, and installation, the following resources are available:

- Skydel User Manual (Hardware Selection)
- Skydel User Manual (Hardware Components)
- Skydel Certification Courses
- Applicaton Note: Measuring a GNSS Signal & Gaussian Noise Power

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December 19, 2023