

# GNSS

## Global Navigation Satellite System for the R&S SMBV100A

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**ROHDE & SCHWARZ**

# Global Navigation Satellite System (GNSS)

**General term for a system that provides satellite navigation to users worldwide**

## I **GPS (Global Positioning System)**

- I Originally designed and funded by US DOD as a military navigation system. The removal of selective availability in 2000 has enabled GPS to be used in many applications and led to the explosion of commercial GPS applications that we are seeing today. 32 satellites available today.

## I **Galileo**

- I Built by the European Union. Civil focus. Designed to be inter-operable with GPS. Combined GPS/Galileo improve satellite availability and integrity. First satellites launched, planned to be operational in 2013/2014.

## I **Glonass**

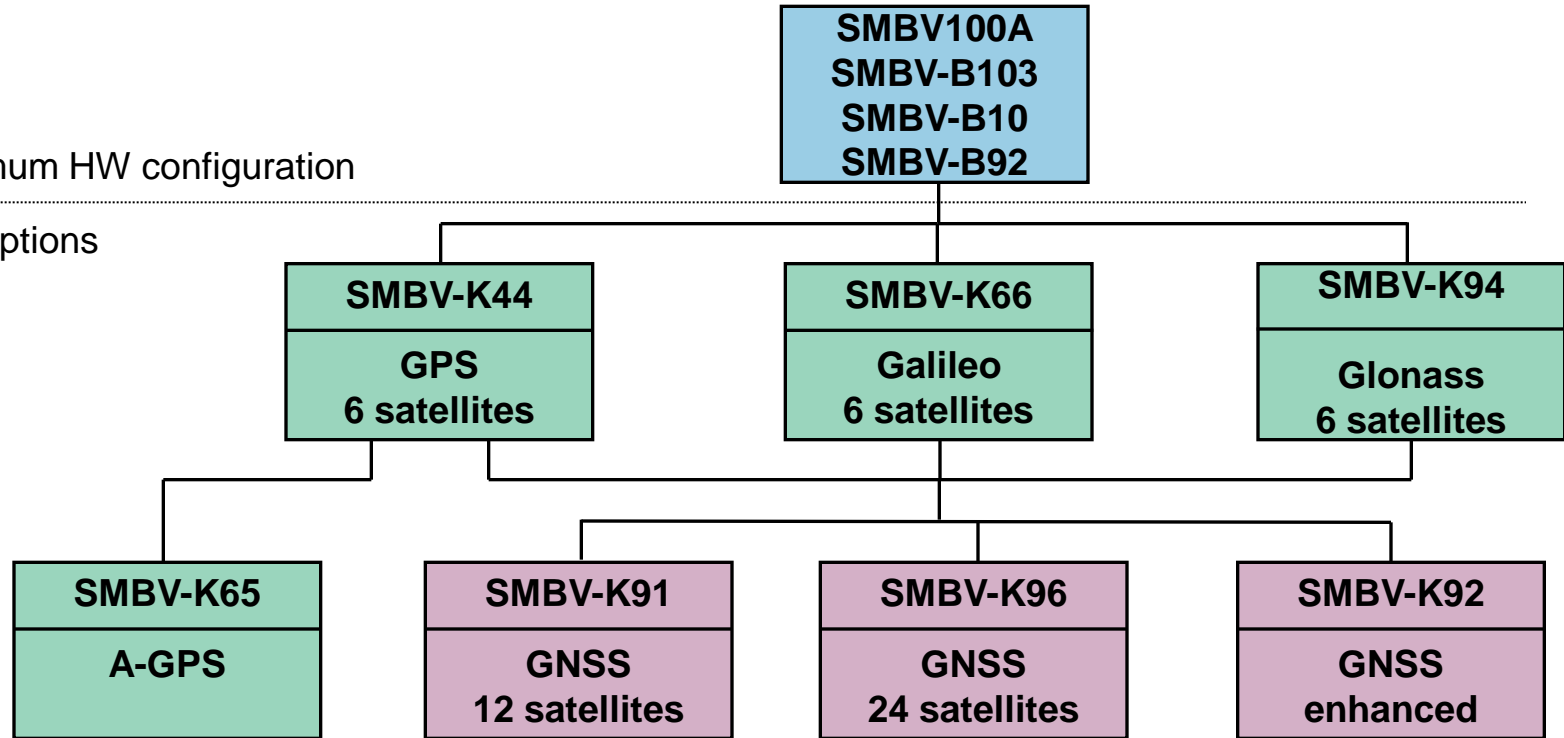
- I Operated by the Russian government. Initially developed for use by the Soviet military for navigation and ballistic missile targeting. Planned to be fully operational by end of 2010 with 24 satellites.




# GNSS Options for the SMBV100A


Minimum HW configuration

SW options



 Hardware

 GNSS standard dependent SW options; Glonass to be released within 2011

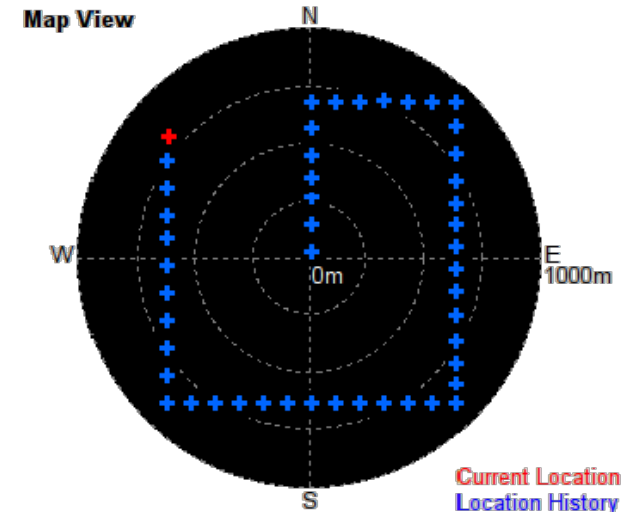
 GNSS standard independent SW options

# Moving Scenarios

## SMBV-K92

- | **Moving scenarios simulate the motion of a receiver along a user-defined trajectory**
- | **Supported waypoint formats**
  - | Comma separated waypoints
  - | Movement script
  - | Import of NMEA files
- | **Minimum duration of 12 hours before waypoint repetition and up to 4 days if SMBV-B55 is installed**

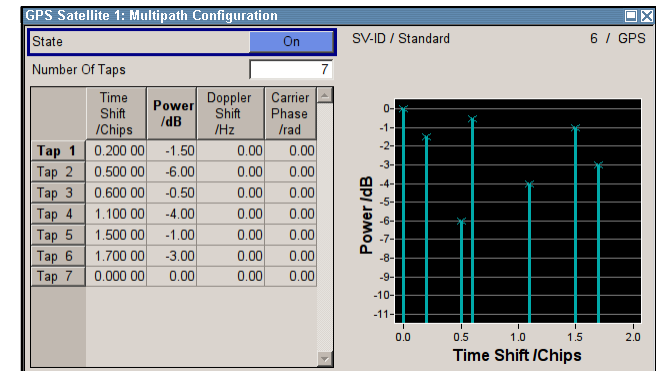
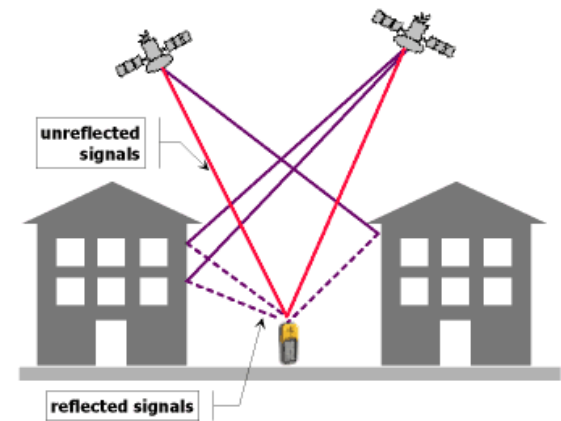
Localization Data	
Geographic Location	Waypoints
Select Waypoint File...	Melbourne.txt
Read Out Mode	One Way
Position Format	Cyclic
Altitude	Round Trip
	One Way
Latitude	37 ° 48 ' 59.987 " South
Longitude	144 ° 57 ' 59.970 " East



# Multipath

## SMBV-K92

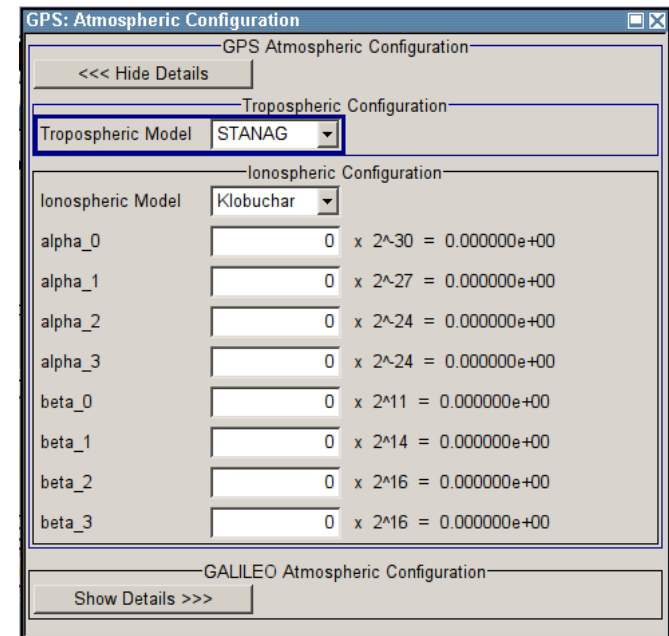
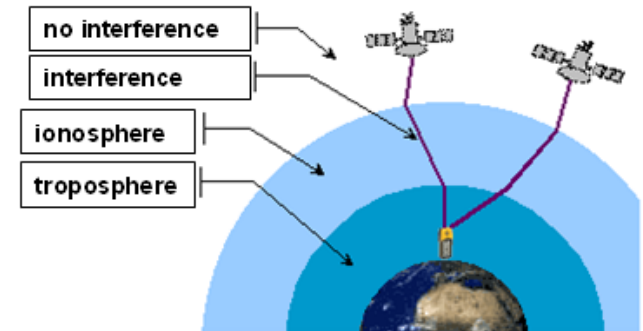
- | **Multipath propagation occurs when the signal reaches the receiving antenna by two or more different paths.**
- | **It is caused by reflection and diffraction of the original signal from buildings, mountains, trees...**
- | **Multipath conditions can result in degraded location accuracy, degraded TTFF or degraded reacquisition time of the receiver.**
- | **The SMBV100A supports the definition of multipath scenarios for each satellite.**
- | **Channel budget:**
  - | 16 channels for GPS
  - | 12 channels for Galileo
  - | 12 to 16 for hybrid constellations
- | **For each tap additional time shift, power, Doppler shift and carrier phase can be defined.**



# Atmospheric Modeling

SMBV-K92

- | In outer space signals propagate with speed of light but in ionosphere and troposphere they propagate with lower speed.
- | These atmospheric conditions can cause additional errors in time of arrival and signal strength. Typically these errors lead to degraded location accuracy.
- | The SMBV100A supports various ionospheric and tropospheric models



# Strengths of our solution at a glance

- **GPS L1/L2 and Galileo E1 supported including hybrid constellations**
- **Simulation of realistic constellations with up to 12 satellites in real-time (no pre-calculated waveforms)**
- **Flexible scenario generation including moving scenarios (import of NMEA waypoints), multipath, dynamic power control and atmospheric modeling without the need of additional software tools**
- **Unlimited simulation time due to automatic on-the-fly exchange of satellites**
- **User mode for full flexibility to select the satellites and to define the navigation data (import of RINEX files)**
- **Support of pre-defined as well as user-defined A-GPS test scenarios including generation of assistance data**
- **The flexible option concept enables the user to adapt his solution to his needs (6 or 12 satellites, GPS and/or Galileo, with or without enhanced functionality...). Upgrade is easily possible via software key code**
- **Support of digital communication standards (GSM, WCDMA, HSPA+, LTE, WiMAX, WLAN...) and radio standards (DAB, XM radio, HD radio, Sirius, FM stereo) in the same instrument.**



Thank you for your attention