

All doors in flight.
Terrestrial air
navigation test
and measurement
solutions.



Overview



Civil aviation and military operations depend on accurate distance, location and direction measuring systems for public safety and military mission success. Failures of these systems may place lives at immediate risk. Terrestrial air navigation systems such as landing systems or en-route navigation systems require unique test and measurement capabilities. With demonstrated experience in this field, Rohde&Schwarz provides test solutions to cover every need from design, development and production to operational maintenance.

Suitable solutions

Terrestrial navigation systems are subject to regular inspection and maintenance in the field. For these measurements, Rohde&Schwarz offers complete laboratory quality measurement solutions in portable, lightweight, weather-protected, battery-powered form factors.

- Ground and flight inspection of terrestrial navigation signals with lightweight instruments that offer a high degree of accuracy and fast measurement speeds
- Spectrum and signal analysis in development, production and maintenance
- Signal generation and simulation for accurate and repeatable test signals needed for receiver test and calibration
- Power measurement using standalone sensors that can be operated with a laptop and require only simple test setups yet deliver highly accurate measurement results
- Easy-to-use handheld cable and antenna analysis for setup and maintenance of antenna sites

Test and measurement equipment is the key to the proper functioning of navigational aid (navaid) systems.



Instrument landing system / marker beacon

The instrument landing system (ILS) provides aircraft pilots with landing approach data relative to the ideal landing course. Marker beacon (MB) receivers decode audio data and provide signaling output to identify one of three marker beacons installed near the runway.

Rohde & Schwarz ILS/MB solutions include:

- Field measurements at airports, e.g. runway measurements (R&S®EVS300 ILS/VOR analyzer)
- Conducted measurements on installations (R&S®EVS300 ILS/VOR analyzer), R&S®RTO/RTE/RTM oscilloscopes)
- Flight inspection (R&S®EVS300 ILS/VOR analyzer)
- Vector voltmeter measurements for ILS antennas (R&S®FSH handheld spectrum analyzer, R&S®ZVH handheld cable and antenna analyzer)
- Lab measurements and calibration for ILS/MB sources, e.g. ramp testers (R&S®FSMR measuring receiver)
- Signal generation for receiver tests, e.g. on-board equipment (R&S®SMA100A, R&S®SMBV100A signal generators)

Application example:

measurement of ILS glideslope signals
with trailer-mounted telescopic mast
(30 m) and R&S®EVS300



VHF omnidirectional radio range / Doppler VOR

VHF omnidirectional radio range (VOR) – conventional VOR (CVOR) and Doppler VOR (DVOR) – operate at VHF frequencies of 108 MHz to 118 MHz to provide aircraft with a bearing to the ground station location.

Rohde & Schwarz VOR solutions include:

- Ground measurements and monitoring (R&S®EVS300 ILS/VOR analyzer)
- Flight inspection, e.g. orbit measurements (R&S®EVS300 ILS/VOR analyzer)
- Antenna and cable measurements (R&S®FSH handheld spectrum analyzer, R&S®ZVH handheld cable and antenna analyzer)
- Lab measurements and calibration for VOR sources, e.g. ramp testers (R&S®FSMR measuring receiver)
- Signal generation for receiver tests (R&S®SMA100A, R&S®SMBV100A signal generators)

Application example:

measurement of AM distortion during installation and integration of a new DVOR station



Ground based augmentation system

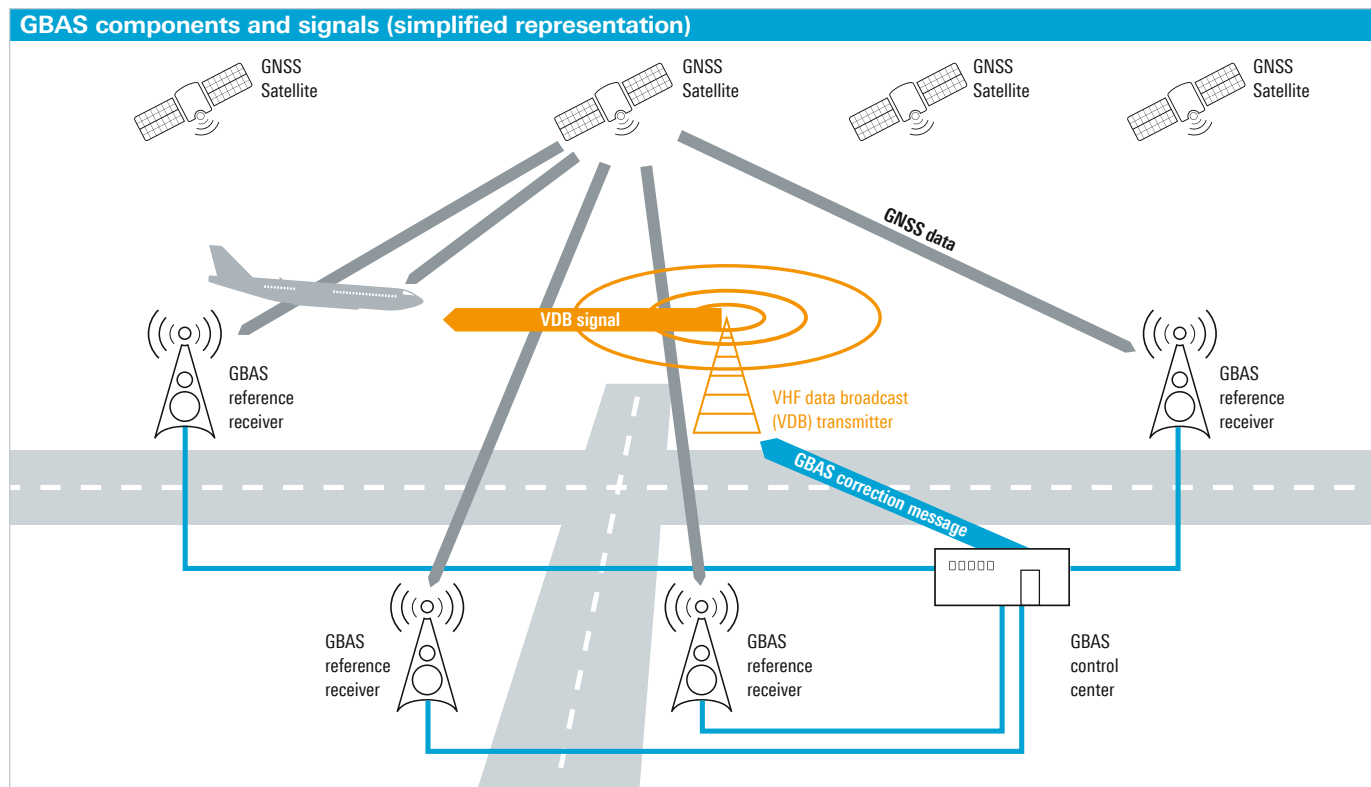
The ground based augmentation system (GBAS) is a landing system that transmits GPS corrections via a VHF data link (VDL) to approaching planes. The ground equipment consists of reference GNSS receivers at exactly defined positions around the airport, a GBAS ground station and a VHF data broadcast transmitter.

Rohde & Schwarz GBAS solutions include:

- Ground measurements/monitoring at airports (R&S®EVS300 ILS/VOR analyzer)
- Flight inspection, e.g. coverage measurements (R&S®EVS300 ILS/VOR analyzer)
- Signal generation for receiver tests, e.g. multi-mode receivers (R&S®SMBV100A signal generator)

Application example:

24/7 measurement of GBAS level and monitoring of pseudo-range correction values on GBAS stations



Distance measuring equipment

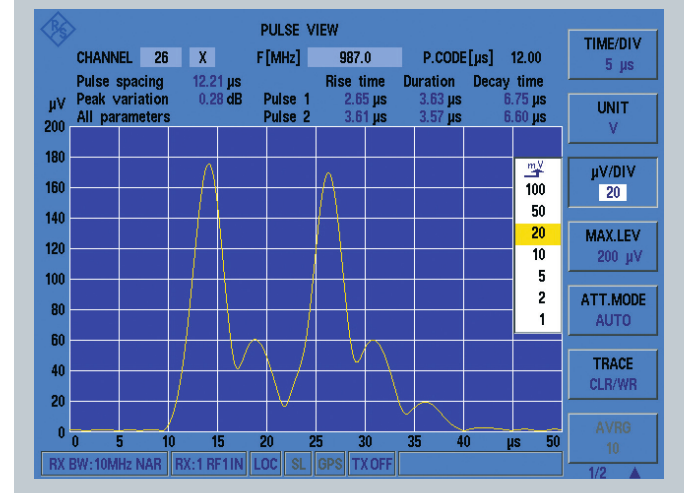
Distance measuring equipment (DME) is a transponder-based radio navigation technology used to determine the slant range of an aircraft (DME interrogator) to a ground station (DME transponder).

Rohde & Schwarz DME solutions include:

- Conducted and radiated measurements on the ground, e.g. main delay measurement (R&S®EDS300 DME/pulse analyzer)
- Flight inspection, e.g. simultaneous measurements of ten DMEs (R&S®EDS300 DME/pulse analyzer)
- Signal generation for interrogator/receiver tests (R&S®SMA100A, R&S®SMBV100A signal generators and R&S®NRP-Z81 power sensor)
- Verification of DME transponders in test laboratories (R&S®SMA100A, R&S®SMBV100A signal generators and R&S®NRP-Z81 power sensor, R&S®RTO/RTE/RTM oscilloscopes)

Application example:

measurement of DME pulses in multipath environment with the R&S®EDS300 pulse shape analysis option (R&S®EDS-K2)



TACAN

TACAN is the military version of DME. In addition to the distance information, it provides the user with the bearing to the ground or shipborne station. The method used for distance measurement is identical to DME, allowing TACAN to be used for civilian planes (e.g. for RNAV).

Rohde & Schwarz TACAN solutions include:

- Conducted and radiated measurements on the ground (R&S®EDS300 DME/pulse analyzer)
- Power measurements (R&S®NRP power sensors)
- Flight inspection, e.g. orbit measurements (R&S®EDS300 DME/pulse analyzer)
- TACAN time domain analysis (R&S®EDS300 DME/pulse analyzer, R&S®RTO/RTE/RTM oscilloscopes)

Application example:






azimuth, peak power and distance measurements during orbital flight around a TACAN ground station



Terrestrial air navigation – application overview:

	ILS	VOR	MB	GBAS	DME	TACAN	Antenna measurement
R&S®EVS300 ILS / VOR analyzer	●	●	●	●			
R&S®EDS300 DME / pulse analyzer					●	●	
R&S®FSMR measuring receiver	●	●	●				
R&S®FSH handheld spectrum analyzer							●
R&S®ZVH handheld cable and antenna analyzer							●
R&S®SMA100A signal generator	●	●	●		●		
R&S®SMBV100A signal generator	●	●	●	●	●		
R&S®NRP-Z81 power sensor					●	●	
R&S®RTO/RTE/RTM oscilloscopes					●	●	

Rohde & Schwarz analyzers, cable and antenna testers and generators for nav aids:

	<p>R&S®EV300 ILS/VOR analyzer</p>	<p>Portable, battery-powered level and modulation analyzer designed especially for starting up, checking and maintaining ILS, VOR, MB and GBAS systems.</p>
	<p>R&S®EDS300 DME/pulse analyzer</p>	<p>Level and modulation analyzer for installing and maintaining pulsed terrestrial navigation services (DME, TACAN).</p>
	<p>R&S®FSMR measuring receiver</p>	<p>The R&S®FS-K15 measurement demodulator adds the analysis of VOR and ILS signals to the comprehensive functionality offered by the R&S®FSMR measuring receiver.</p>
	<p>R&S®FSH handheld spectrum analyzer</p>	<p>Rugged handheld spectrum analyzer up to 20 GHz designed for use in field and service. Special option for vector voltmeter measurements (R&S®FSH-K45).</p>
	<p>R&S®ZVH handheld cable and antenna analyzer</p>	<p>Rugged, handy cable and antenna analyzer up to 3.6 or 8 GHz designed for use in installation and service. Special option for vector voltmeter measurements (R&S®ZVH-K45).</p>
	<p>R&S®RTO/RTE/RTM oscilloscope</p>	<p>Time domain measurements and pulse shape analysis (DME, TACAN), Trigger and decode on serial bus systems.</p>
	<p>R&S®SMA100A signal generator</p>	<p>Signal generator for all common types of analog modulation (AM, FM, ϕM, PM) as well as for special types of modulation (ILS, VOR, MB and DME).</p>
	<p>R&S®SMBV100A signal generator</p>	<p>Vector signal generator with navaid options for ILS, VOR, MB, DME and GBAS.</p>
	<p>R&S®NRP-Z81 power sensor</p>	<p>Wideband power sensor for time domain analysis and automatic pulse analysis for DME applications as well as for universal use.</p>

Further documentation available

Brochures and data sheets:

Find more information on www.rohde-schwarz.com (e.g. search for "EVS300") or take a look at the "Solutions/ Aerospace & Defense/ Avionics & Navigation" section

Application notes:

- ▮ Test of DME/TACAN transponders
- ▮ Aeronautical radio navigation measurement solutions
- ▮ Verify your avionics navigation equipment

Service and support

Service that adds value

- | Worldwide
- | Local and personalized
- | Customized and flexible
- | Uncompromising quality
- | Long-term dependability

With a dedicated, global service network and 24-hour availability, Rohde&Schwarz offers its customers comprehensive support worldwide. Support offerings range from detailed consultation before, during and after purchase to application support, calibration services, product upgrades, seminars and customized training courses. We attach great value to the technical expertise of our local sales engineers, who answer customer questions personally and in detail.

Rohde&Schwarz products are used in demanding applications where reliability is as important as accuracy. High equipment availability is vital in production for ensuring continuous, profitable operation. Our services are designed to maintain both high availability and high accuracy over the long term in order to protect our customers' investments. Services include globally accessible, high-end calibration routines to allow on-site calibration as well as product maintenance in the form of updates or upgrades. Most of our equipment is platform-based to allow adaptation to changed requirements and new technologies, even after years of use.

Our service offerings flexibly meet specific user requirements. On request we develop service strategies in close cooperation with our customers to optimally cater to their needs. Sustained customer benefit is paramount to us.





About Rohde & Schwarz

The Rohde & Schwarz electronics group is a leading supplier of solutions in the fields of test and measurement, broadcast and media, secure communications, cybersecurity, and radiomonitoring and radiolocation. Founded more than 80 years ago, this independent global company has an extensive sales network and is present in more than 70 countries. The company is headquartered in Munich, Germany.

Rohde & Schwarz GmbH & Co. KG

www.rohde-schwarz.com

Regional contact

- ▮ Europe, Africa, Middle East | +49 89 4129 12345
customersupport@rohde-schwarz.com
- ▮ North America | 1 888 TEST RSA (1 888 837 87 72)
customer.support@rsa.rohde-schwarz.com
- ▮ Latin America | +1 410 910 79 88
customersupport.la@rohde-schwarz.com
- ▮ Asia Pacific | +65 65 13 04 88
customersupport.asia@rohde-schwarz.com
- ▮ China | +86 800 810 82 28 | +86 400 650 58 96
customersupport.china@rohde-schwarz.com