R&S®DDF5GTS
High-Speed Scanning Direction Finder
Fast, accurate direction finding
R&S®DDF5GTS
High-Speed Scanning Direction Finder

At a glance

The R&S®DDF5GTS high-speed scanning direction finder offers outstanding realtime bandwidth and DF scan speed as well as high DF accuracy, sensitivity and immunity to reflections. Thanks to the integrated super-resolution DF method, the direction finder is ideal for complex signal scenarios.

The R&S®DDF5GTS can be operated with virtually all R&S®ADDx multichannel DF antennas. From the wide range of R&S®ADDx antennas, the right antenna(s) can be chosen for every application. The R&S®ADDx multichannel DF antennas have a large number of antenna elements and therefore offer a very wide aperture and exceptionally high performance. All antennas come with integrated lightning protection that does not impair DF accuracy.

For fast, automatic location of frequency agile signals, multiple R&S®DDF5GTS direction finders can be combined and operated in synchronized DF scan mode in conjunction with an optional, automatic preclassifier. The R&S®DDF5GTS complies with all ITU recommendations and can be extended with an option to include ITU-compliant measurement methods. With its optional DC power supply, the R&S®DDF5GTS is ideal for mobile applications.

Key facts
- Top DF scan speed thanks to three-channel architecture and outstanding realtime bandwidth
- High DF accuracy, sensitivity and immunity to reflections
- Integrated super-resolution DF method
- Compliance with all ITU recommendations; ITU-compliant measurements available as an option
- Easy integration into mobile platforms thanks to optional DC power supply
R&S®DDF5GTS
High-Speed Scanning Direction Finder

Benefits and key features

Direction finding of extremely fast frequency agile signals with high probability of intercept
- High DF scan speed thanks to 80 MHz realtime bandwidth
- Direction finding and location of frequency hopping transmitters with up to 2000 hops/s
- Direction finding and location of pulses with a duration of 10 µs
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Reliable DF results even in challenging environments
- Higher immunity to reflections due to DF antennas with a very large number of antenna elements
- Stable bearings even with a 50 percent share of reflections
▷ page 4

Super-resolution DF method
- Direction finding for co-channel signals
- Super-resolution DF method as standard
▷ page 5

Innovative DF antennas
- Active/passive switchover with just a mouse click
- Exceptionally high DF sensitivity
- Integrated, extendible lightning protection
- Easy replacement of DF antennas
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- High DF sensitivity due to large number of antenna elements
- Adjustable coherent signal integration in wideband DF mode and DF scan mode for enhanced DF sensitivity
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Accurate and reliable location of short-duration signals
- GPS-based synchronization of multiple R&S®DDF5GTS (time-synchronized DF scan mode)
- Optional preclassifier for detecting LPI signals and summarizing individual results into a condensed result
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Special and exceptionally powerful receive path for signal measurement
- Special and exceptionally powerful receive path
- Improved analog architecture of the receive path
- Especially powerful analog/digital converters
- Considerable advantages in the case of weak signals and dense signal scenarios
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Effective measurements in line with ITU recommendations
- Compliance with all ITU recommendations for direction finders and receivers
- Option for comprehensive, ITU-compliant measurement methods
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Receive mode with integrated antenna matrix
- Very fast panorama scan
- Integrated antenna matrix for connecting up to three VHF/UHF/SHF receiving antennas and up to three HF receiving antennas (option) in addition to the DF antenna
- Independent DDC channel
- Selection of the antenna element with maximum signal level
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Signal analysis in parallel with direction finding
- Output of I/Q data for parallel signal analysis with R&S®CA120
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Powerful hardware developed by Rohde & Schwarz
- In-house development and manufacture of all DF system components, including the DF antenna
- Signal processing at maximum speed based on powerful FPGAs
- Use of powerful Rohde & Schwarz ASICs
- High immunity to strong signals thanks to sophisticated preselection
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Rohde & Schwarz R&S®DDF5GTS High-Speed Scanning Direction Finder
Direction finding of extremely fast frequency agile signals with high probability of intercept

Reliable DF results even in challenging environments

The R&S®DDF5GTS is designed for high-speed monitoring of wide frequency ranges. Bearings of short bursts and fast, frequency agile transmitters operating at unknown frequencies are taken with high probability of intercept. This is mainly due to the use of three coherent receive channels and the exceptionally large 80 MHz realtime bandwidth. In many applications, this bandwidth makes it possible – without activating the DF scan mode – to take bearings of all signals in the 80 MHz range in parallel and with maximum probability of intercept. Frequency ranges exceeding 80 MHz are traversed in DF scan mode at very high speed, thanks to the fast synthesizer.

The R&S®DDF5GTS also delivers accurate bearings of state-of-the-art frequency hopping transmitters with up to 2000 hops/s and of repetitive pulses with a duration of only 10 µs.

Increase in measurement speed

With the R&S®DDFGTS-EMS option, the measurement speed of the R&S®DDF5GTS can be further increased to take the bearings of extremely short emissions, making it possible to reliably locate even one-time emissions with a duration of 300 µs.¹

¹ The R&S®DDFGTS-EMS option is subject to export control.

Multi-element DF antennas

Due to multipath propagation (especially in urban areas), not only the direct wave but also reflections arrive at the DF antenna. The R&S®ADDx multichannel DF antennas offer higher immunity to such reflections than most other commercially available DF antennas, since they feature an exceptionally large number of antenna elements. Virtually all Rohde & Schwarz DF antennas use nine antenna elements in the HF/VHF/UHF range, or eight in the UHF/SHF range, while commercially available DF antennas typically have fewer antenna elements. The R&S®ADDx antennas were designed to provide stable bearings even with a 50% share of reflections. If only five antenna elements are used, substantial DF errors can be expected in certain frequency ranges.¹

¹ For details, see R&S®ADDx multichannel DF antennas product brochure (PD 0758.1106.12).
Super-resolution DF method

Direction finding for co-channel signals
Conventional DF methods are based on the assumption that a specific frequency is occupied exclusively by a single transmitter. However, if additional transmitters are operating on the same frequency, direction finding may be impaired – a problem referred to as co-channel interference. In this case, the DF result depends on the ratio of the transmitter levels. If one of the transmitters is clearly stronger than the others, its bearing is displayed with a slight error. If the transmitters have similar levels, the DF result is usually incorrect. This applies equally to all conventional DF methods, including correlative interferometer, Doppler and Watson-Watt.

Co-channel interference is regularly seen in practice:
- In single-frequency networks such as those used in DAB/DVB, multiple transmitters broadcast the same signal on the same frequency from different sites. This is done to improve transmission quality.
- Defective electronic equipment may produce electromagnetic interference on a frequency that is also used by transmitters.
- Sometimes, specific transmitters are intentionally jammed. In this case, an interfering signal is sent on the same frequency.
- In the HF range, propagation conditions are continuously changing. Emissions may sometimes travel much farther than originally planned and therefore be received in areas where a different station transmits on the same frequency.

Maximum performance
Reliable estimation of the number of waves is an important prerequisite when using super-resolution DF methods in automated measurements. This estimation provides information about the number of the signals present on the same frequency. The super-resolution algorithm implemented in the R&S®DDF5GTS employs an improved method for estimating the number of waves. This method contributes significantly to the excellent performance of the R&S®DDF5GTS in super-resolution mode.

Super-resolution DF antennas
The super-resolution DF method requires DF antennas whose antenna elements can be combined into various subgroups. The R&S®ADDxxxSR multichannel DF antennas offer this capability. They can be used to cover frequency ranges between 300 kHz and 6 GHz and deliver high performance in super-resolution DF mode thanks to their exceptionally wide apertures.

Super-resolution technology
Users of the R&S®DDF5GTS can switch to super-resolution DF mode with a mouse click. This sophisticated signal processing technology is now available for the R&S®DDF5GTS. It enables the direction finder to resolve a wave field with multiple signals present on the same frequency. The number, angle of incidence, receive level and DF quality of the signals are precisely calculated and displayed. In super-resolution mode, the R&S®DDF5GTS can take the bearings of several different signals on the same frequency in parallel. The actually achievable performance depends, among other factors, on the receive frequency set on the DF system as well as on the angles of incidence and S/N ratios of the signals.
Active/passive switchover with just a mouse click
Up until now, users have had to decide what is more important to them: the higher sensitivity offered by active DF antennas or the higher immunity to strong signals provided by passive DF antennas.

The R&S®ADD011P, R&S®ADD011SR, R&S®ADD050SR, R&S®ADD153SR, R&S®ADD157 and R&S®ADD253 DF antennas for the first time make it possible to bypass the active electronic circuitry of the antenna elements. The user can switch the active elements to passive mode by a simple mouse click. These DF antennas offer the advantages of both the active and the passive mode.  

Exceptionally high DF sensitivity
The antenna elements of the R&S®ADD153SR, R&S®ADD253 and R&S®ADD157 DF antennas are equipped with PIN diodes in the frequency range from 20 MHz to 1.3 GHz (vertical polarization), allowing the electrically active structure to change very quickly. As a result, these elements are always optimally adapted to the receive frequency and offer exceptionally high sensitivity.  

Integrated, extendible lightning protection
All installed Rohde & Schwarz DF antennas that are at risk of being struck by lightning have effective, extendible lightning protection. This lightning protection concept was taken into account in development right from the start and does not impair DF accuracy.  

Easy replacement of DF antennas
Unlike other commercially available antennas, DF antennas from Rohde & Schwarz do not need to be individually calibrated. The precisely manufactured R&S®ADDx DF antennas behave exactly as predicted in theory. A Rohde & Schwarz DF antenna can be replaced with the same model without having to manage new calibration data and store it in the direction finder.  

For details, see R&S®ADDx multichannel DF antennas product brochure (PD 0758.1106.12).
Precise direction finding of weak signals

High DF sensitivity due to large number of antenna elements
Featuring an exceptionally large number of antenna elements, the R&S®ADDx multichannel DF antennas offer higher sensitivity for use with the R&S®DDF5GTS than DF antennas with identical diameter but fewer elements. A higher number of antenna elements means a higher number of spatial sampling points, resulting in higher system gain. 1)

Adjustable coherent signal integration in wideband DF mode and DF scan mode for enhanced DF sensitivity
The R&S®DDF5GTS performs parallel averaging of the voltages measured on the individual elements of a DF antenna relative to a reference element. This is done on a large number of frequency channels simultaneously, both in wideband DF mode and DF scan mode, the process being referred to as coherent signal integration. In a first step, all antenna voltages for all frequency channels measured are stored and, after the selected averaging time has been reached, the averaged voltage value is output for each channel. Next, bearings are calculated from the averaged antenna voltages. As the averaging time increases, the impact of noise decreases significantly, resulting in a corresponding increase in DF sensitivity.
Accurate and reliable location of short-duration signals

GPS-based synchronization of multiple R&S®DDFGTS (time-synchronized DF scan mode)
Thanks to its high realtime bandwidth and three-channel architecture, the R&S®DDFGTS provides outstanding DF scan speed and high probability of intercept for short-duration signals. To locate these signals, at least two direction finders must take the bearings of the same signal. The time-synchronous DF scan mode is an essential prerequisite in order to make sure that all direction finders in a radiolocation network take bearings on the same frequency at the same time.

Using the R&S®DDFGTS-TS option, the R&S®DDFGTS can be synchronized to the GPS pulse per second (PPS). This can be done with most conventional GPS modules with PPS. To obtain top time accuracy, however, it is recommended to use the optional, integrated R&S®DDF-IGT GPS module, eliminating the need for additional components.

Optional preclassifier for detecting LPI signals and summarizing individual results into a condensed result
Only a specific portion of the signals received by the DF antenna is of interest in practical applications. The R&S®DDFGTS-CL preclassifier option automatically separates specific LPI signals, such as frequency hopping, chirp and burst signals, from conventional signals. The individual DF results of an emission are automatically averaged and summarized to give a condensed result. This procedure enhances radiolocation accuracy and minimizes the amount of data to be transferred between the DF stations in a radiolocation network.

R&S®SCANLOC radiolocation network with two R&S®DDFGTS
Special and exceptionally powerful receive path for signal measurement

The number of radio services and transmitters is continuously growing, which results in an increasing cumulative load on the antenna input and the receiver input. Digital broadcasting services in particular, such as DVB-T and DAB with their high bandwidths, are changing antenna and receiver linearity requirements. The problem is intensified if the DF antenna is in the vicinity of strong transmitters – which can hardly be avoided in metropolitan areas.

If the number of strong signals becomes too high, intermodulation products may become visible in the spectrum. In the worst case, they would mask signals of interest and make direction finding impossible.

In many applications, it is good practice to reduce the realtime bandwidth in order to increase sensitivity, linearity and immunity to strong signals.

Special and exceptionally powerful receive path

When the user sets a realtime bandwidth of 20 MHz (or less), both receive channels of the R&S®DDF5GTS in the VHF/UHF/SHF range automatically switch over to an exceptionally powerful receive path. This second path has been optimized for precise signal measurement.

Improved analog architecture of the receive path

To minimize the detrimental influence of strong signals outside the receive bandwidth, these signals must be filtered out as far as possible already in the analog part of the RF frontend. This works best with narrow receive bandwidths. Filters can be used that take effect in the spectrum considerably earlier and thus filter more strongly. The R&S®DDF5GTS includes various filters that are selected depending on the set realtime bandwidth:

- Special filters in preselection optimized for the narrower realtime bandwidth
- Special IF filter with 20 MHz bandwidth

Especially powerful analog/digital converters

The performance of commercially available analog/digital converters is influenced by the receive bandwidth: the narrower the receive bandwidth, the better the performance. This is why the R&S®DDF5GTS features two different analog/digital converters that can be selected depending on the set realtime bandwidth. When a realtime bandwidth of 20 MHz (or less) has been set, a particularly high-resolution converter is used.

Considerable advantages in the case of weak signals and dense signal scenarios

The receive path with 20 MHz realtime bandwidth, which was specially developed for precise signal measurement, offers a number of advantages in both DF and receive mode:

- Significant reduction of the noise floor due to narrower bandwidth
- Less limitation (due to strong signals outside the receive bandwidth) of the dynamic range in the analog/digital converter thanks to narrower analog filters
- Significant improvement (typ. 18 dB) of the intermodulation-free dynamic range through the use of a special analog/digital converter

These measures lead to a much improved signal-to-noise ratio, especially with strong signals in the vicinity of the receive bandwidth. The second receive path is therefore particularly suitable for measuring weak signals and/or dense signal scenarios where many strong signals are present (typically in large cities).
Effective measurements in line with ITU recommendations

The R&S®DDF5GTS complies with all ITU recommendations for direction finders and receivers.

**Option for comprehensive, ITU-compliant measurement methods**

The R&S®DDF5GTS-IM option enables ITU-compliant measurements of signal parameters for AM, FM and PM modulated signals. The modulation index, occupied bandwidth and phase deviation can be determined, for example. The minimum, maximum and average values over a user-defined measurement period are displayed.

The R&S®DDF5GTS fulfills the following ITU hardware recommendations:

- ITU-R SM.1836 (measurements of IF filter edge steepness)
- ITU-R SM.1837 (IP3 measurements)
- ITU-R SM.1838 (noise figure measurements)
- ITU-R SM.1840 (sensitivity measurements)

1) Depending on the application, an external reference frequency with higher accuracy may be required, e.g. a GPS reference frequency.
Receive mode with integrated antenna matrix

Depending on the operating mode, the R&S®DDF5GTS can be used as a precise scanning direction finder or as a fast monitoring receiver.

**Very fast panorama scan**
As a monitoring receiver, the panorama scan function of the R&S®DDF5GTS allows extremely fast scanning to provide optimum support for signal search. The R&S®DDF5GTS offers very fast scan speeds in DF scan mode. In panorama scan mode, the scan speed is even higher since no switching of antenna elements is required. This makes the panorama scan ideal for detecting extremely short burst signals that would be lost in DF mode.

**Integrated antenna matrix**
In receive mode, special receiving antennas are often required for signal analysis. Depending on the operating mode, the DF antenna or the receiving antenna is used, which previously required an external antenna matrix. The R&S®DDF5GTS is the first direction finder with an integrated antenna matrix for connecting three VHF/UHF/SHF receiving antennas and three HF receiving antennas (instead of a HF DF antenna) in addition to the VHF/UHF/SHF DF antenna. For HF, the R&S®DDFGTS-HF HF frequency range extension option is required.

Once the system has been configured, the R&S®DDF5GTS automatically selects the appropriate antenna, based on the selected operating mode and frequency.

Mixed operation is also possible, for example:
- DF mode using a DF antenna in the VHF/UHF/SHF range for radiolocation ▷ switchover to receive mode using a receiving antenna in the HF range for radiomonitoring/signal analysis (R&S®DDFGTS-HF HF frequency range extension option) (see upper figure)
- DF mode using a DF antenna for radiolocation ▷ switchover to receive mode using ITU-compliant receiving antennas for radiomonitoring/signal analysis (see lower figure)

**Independent DDC channel**
During wideband DF operation, the R&S®DDF5GTS can be used to demodulate and listen to any given signal on any frequency within the realtime bandwidth.
Selection of the antenna element with maximum signal level

DF antennas usually consist of multiple antenna elements arranged in a circle. Due to reflections and spatial proximity of the antenna elements, the direct wave is superimposed at the reference antenna element. Depending on the receive frequency, this can cause nulls in the horizontal radiation pattern of the reference antenna element. DF antennas feature higher demodulation sensitivity in the reference direction, depending on the angle of incidence. DF sensitivity is not affected, since all antenna elements are used for direction finding.

The R&S®DDF5GTS allows the antenna element used for spectrum display and receive mode to be selected as required. Selecting the appropriate element increases the signal-to-noise ratio. As a result, especially weak signals can be detected and demodulated.

The best positioned antenna element can be found using the bearing, or by manually searching for the element with the strongest signal level.
Signal analysis in parallel with direction finding

Output of I/Q data for parallel signal analysis with R&S®CA120 1) Depending on the setting, the R&S®DDF5GTS can demodulate signals within the realtime bandwidth and output the I/Q data for signal analysis while in wideband DF mode. The signal can then be analyzed and classified using the R&S®CA120 multichannel signal analysis software.

1) Availability on request.
Powerful hardware developed by Rohde & Schwarz

In-house development and manufacture of all DF system components, including the DF antenna
All components of the DF system that is based on the R&S®DDF5GTS are developed and manufactured by Rohde & Schwarz, ensuring above-average performance and quick implementation of technical innovations. Particularly for DF antennas, recent years have seen major improvements, such as active/passive switchover developed and introduced by Rohde & Schwarz.

Rohde & Schwarz benefits from its many years of experience in the development and production of antennas, receivers and digital signal processing equipment.

Signal processing at maximum speed based on powerful FPGAs
The large number of powerful field programmable gate arrays (FPGA) implemented in the R&S®DDF5GTS delivers above-average signal processing speed. FPGAs are much more powerful than the digital signal processors (DSP) and PC processors that many competitor products use for signal processing.

Use of powerful Rohde & Schwarz ASICs
At specific points in the signal processing chain, all data must be processed simultaneously. The processing speed of the entire chain therefore essentially depends on the performance at these points. This is why Rohde & Schwarz uses its own application-specific integrated circuits (ASIC).

High immunity to strong signals thanks to sophisticated preselection
Apart from wanted signals, a spectrum usually also contains strong signals, such as those from TV and radio broadcast transmitters. In order not to impair DF results, these out-of-band signals must be sufficiently suppressed by preselection. The R&S®DDF5GTS is equipped with sophisticated preselectors developed by Rohde & Schwarz based on decades of experience. In contrast to most competitor products, the R&S®DDF5GTS has tracking and bandpass filters that can be selected depending on the set realtime bandwidth. This preselection capability goes far beyond ITU recommendations and leads to above-average immunity to strong signals.

Module with powerful FPGA for high-speed signal processing.

VHF/UHF/SHF preselection of the R&S®DDF5GTS with bandpass and tracking filters.
System configuration

DF antennas for the R&S®DDF5GTS
The R&S®DDF5GTS can be operated with virtually all R&S®ADDx multichannel DF antennas (see table).

R&S®ADD-LP extended lightning protection
All installed Rohde & Schwarz DF antennas that are at risk of being struck by lightning include a lightning rod as standard. This rod safely diverts lightning strikes and in most cases prevents damage to the DF antenna.

The higher a DF antenna is located, the higher the likelihood that lightning will not strike the rod but instead will laterally impact the DF antenna and cause significant damage. The R&S®ADD-LP extended lightning protection is recommended for installation heights of more than 20 m above ground (e.g. masts > 20 m, tall buildings, mountain-tops). The R&S®ADD-LP consists of two crossed lightning rods that in most cases prevent lateral impacts since the rods protrude beyond the DF antenna.

<table>
<thead>
<tr>
<th>DF antenna</th>
<th>Frequency range</th>
<th>Application</th>
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<tbody>
<tr>
<td>R&amp;S®ACD001 with R&amp;S®GX125 ¹</td>
<td>see product information</td>
<td>mobile, on ships</td>
</tr>
<tr>
<td>R&amp;S®ADD011SR</td>
<td>300 kHz to 30 MHz</td>
<td>stationary and transportable</td>
</tr>
<tr>
<td>R&amp;S®ADD011P</td>
<td>300 kHz to 30 MHz</td>
<td>mobile</td>
</tr>
<tr>
<td>R&amp;S®ADD119</td>
<td>300 kHz to 30 MHz</td>
<td>mobile</td>
</tr>
<tr>
<td>R&amp;S®ADD015</td>
<td>1 MHz to 30 MHz</td>
<td>mobile and stationary</td>
</tr>
<tr>
<td>R&amp;S®ADD216</td>
<td>300 kHz to 3 GHz</td>
<td>mobile</td>
</tr>
<tr>
<td>R&amp;S®ADD050SR</td>
<td>20 MHz to 450 MHz</td>
<td>stationary and transportable</td>
</tr>
<tr>
<td>R&amp;S®ADD153SR</td>
<td>20 MHz to 1.3 GHz (vertical polarization), 40 MHz to 1.3 GHz (horizontal polarization)</td>
<td>mobile and stationary</td>
</tr>
<tr>
<td>R&amp;S®ADD070</td>
<td>1.3 GHz to 3 GHz</td>
<td>stationary and transportable</td>
</tr>
<tr>
<td>R&amp;S®ADD253</td>
<td>20 MHz to 3 GHz</td>
<td>mobile and stationary</td>
</tr>
<tr>
<td>R&amp;S®ADD078SR</td>
<td>1.3 GHz to 6 GHz</td>
<td>mobile and stationary</td>
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<tr>
<td><strong>Discontinued antennas</strong></td>
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<tr>
<td>R&amp;S®ADD050</td>
<td>20 MHz to 200 MHz</td>
<td>stationary</td>
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<td>R&amp;S®ADD070M</td>
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<td>800 MHz to 2 GHz</td>
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<tr>
<td>R&amp;S®ADD153</td>
<td>20 MHz to 1.3 GHz</td>
<td>mobile and stationary</td>
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</tbody>
</table>

¹ Requires R&S®DDF5GTS model 25.
² Depending on the production version, a hardware modification may be required.
R&S®DDF-IGT internal GPS time synchronization

With the R&S®DDF-IGT internal GPS time synchronization option, the R&S®DDF5GTS can be synchronized in time to ensure that all direction finders within a radiolocation network measure on the same frequency at the same time.

The R&S®DDF-IGT option also serves as an internal GPS, e.g. to show the position of the R&S®DDF5GTS on a map.

R&S®RAMON and R&S®ARGUS software

The R&S®DDF5GTS can be operated from a standard PC using the R&S®DDF-CTL control software supplied with the R&S®DDF5GTS. R&S®DDF-CTL is part of the R&S®RAMON software family and can be used together with other, optional R&S®RAMON software modules to integrate the direction finder into complex radiomonitoring systems.

R&S®DDF1XZ, R&S®DDF5XZ, R&S®DDF7XZ, R&S®DDF3C-7 cable sets

To connect the DF antenna(s) to the R&S®DDF5GTS, different cable sets are available for different frequency ranges. The R&S®DDF1XZ is available for the HF range. The R&S®DDF5XZ (0.3 MHz to 1.3 GHz) and R&S®DDF7XZ (0.3 MHz to 3 GHz) are used in the VHF/UHF range. The R&S®DDF3C-7 (0.3 MHz to 6 GHz) is used in the VHF/UHF/SHF range. Each of these cable sets consists of four coaxial RF cables and one control cable. Special lengths are available on request.
R&S®DDF-CTL supports the fixed frequency mode (FFM), the wideband fixed frequency mode (WFFM) up to 80 MHz, and the scanning of frequency ranges wider than 80 MHz. Results can be displayed in various formats:

- Polar display with DF quality and level bargraph for a specific frequency
- Histogram for a specific frequency
- IF spectrum plus selectable DF result window (DF values versus frequency) and waterfall
- RF spectrum with DF result window and waterfall, plus selectable polar display and histogram

The R&S®DDF5GTS can be extended with R&S®RAMON options to add versatile functionality:

- Automatic signal detection and preclassification
- Remote control of one or more R&S®DDF5GTS over WAN networks with intelligent data reduction
- Configuration of radiolocation systems, with result display for single frequencies or frequency ranges on digital maps
- Configuration of DF and radiolocation servers for multi-user systems
- Extended storage capabilities and offline analysis of DF and radiolocation results

The R&S®DDF5GTS can also be used with R&S®ARGUS monitoring software packages for ITU-compliant measurements and evaluation. Combined with the R&S®DDF5GTS-IM option and suitable R&S®ARGUS options, it can simplify complex radiomonitoring tasks – even for inexperienced users.

R&S®DDF-CTL (R&S®RAMON): graphical display of scan mode, including spectrum, DF values versus frequency, waterfall and histogram.
## Specifications in brief

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<th>Specifications in brief</th>
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<tr>
<td>Frequency range in DF mode</td>
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<td>with R&amp;S®DDFGTS-HF option</td>
<td>300 kHz to 6 GHz</td>
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<td>Frequency range in receive mode</td>
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<td>with R&amp;S®DDFGTS-HF option</td>
<td>8 kHz to 6 GHz</td>
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<tr>
<td><strong>DF mode</strong></td>
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<td>DF method</td>
<td>standard</td>
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<td>with R&amp;S®DDFGTS-VM option</td>
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<td>Realtime bandwidth</td>
<td>VHF/UHF/SHF</td>
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<td>HF</td>
<td>20 MHz</td>
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<tr>
<td>Instrument DF accuracy</td>
<td>typ. 0.2° RMS</td>
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<tr>
<td>System DF accuracy</td>
<td>depends on DF antenna; here for example R&amp;S®ADD011SR (1x), R&amp;S®ADD050SR, R&amp;S®ADD153SR and R&amp;S®ADD078SR, in reflection-free environment, with lightning protection, in line with report ITU-R SM.2125 (limited to one modulation type) and recommendation ITU-R SM.854</td>
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<tr>
<td>300 kHz to 1300 MHz</td>
<td>typ. 0.5° RMS</td>
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<tr>
<td>1.3 GHz to 6 GHz</td>
<td>typ. 1° RMS</td>
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<tr>
<td><strong>DF sensitivity</strong></td>
<td>depends on DF antenna; for 2° RMS bearing fluctuation, 1 s integration time and 250 Hz (HF) or 600 Hz (VHF/UHF/SHF) DF bandwidth; here for example with R&amp;S®ADD011SR (1x), R&amp;S®ADD050SR, R&amp;S®ADD153SR and R&amp;S®ADD078SR, in line with report ITU-R SM.2125</td>
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<td>300 kHz to 1300 MHz</td>
<td>typ. 0.7 µV/m</td>
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<td>1.3 GHz to 6 GHz</td>
<td>typ. 3 µV/m to 20 µV/m</td>
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<td><strong>DF scan speed in VHF/UHF/SHF</strong></td>
<td>base unit</td>
</tr>
<tr>
<td>(25 kHz channel resolution, 100% channel occupancy, correlative interferometer method, wideband fixed frequency mode)</td>
<td></td>
</tr>
<tr>
<td><strong>DF scan speed in HF</strong></td>
<td>base unit</td>
</tr>
<tr>
<td>(1.25 kHz channel resolution, 100% channel occupancy, Watson-Watt method, wideband fixed frequency mode)</td>
<td></td>
</tr>
<tr>
<td>Minimum signal duration</td>
<td>for a single burst signal, in line with report ITU-R SM.2125</td>
</tr>
<tr>
<td><strong>Minimum burst duration</strong></td>
<td>base unit</td>
</tr>
<tr>
<td>with R&amp;S®DDFGTS-EMS option</td>
<td>0.25 ms</td>
</tr>
<tr>
<td>for multiple burst signals</td>
<td>10 µs</td>
</tr>
</tbody>
</table>

1) Measurement in reflection-free environment. The RMS error is calculated from the bearings of evenly distributed samples versus azimuth and frequency.

2) The R&S®DDFGTS-EMS option is subject to export control.

For R&S®DDF5GTS data sheet, see PD 3606.8137.22
For R&S®ADDx multichannel DF antennas data sheet, see PD 0758.1106.22
For R&S®ADDx multichannel DF antennas product brochure, see PD 0758.1106.12 and www.rohde-schwarz.com
# Ordering information

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type</th>
<th>Order No</th>
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<tbody>
<tr>
<td>High-Speed Scanning Direction Finder, AC power supply</td>
<td>R&amp;S®DDF5GTS</td>
<td>4073.9203.02</td>
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<tr>
<td>High-Speed Scanning Direction Finder, DC power supply</td>
<td>R&amp;S®DDF5GTS</td>
<td>4073.9203.12</td>
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### Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Order No</th>
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<tbody>
<tr>
<td>HF Frequency Range Extension</td>
<td>R&amp;S®DDFGTS-HF</td>
<td>4074.1270.02</td>
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<tr>
<td>Synchronization</td>
<td>R&amp;S®DDFGTS-TS</td>
<td>4074.0922.02</td>
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<td>Internal GPS Module, with GPS antenna</td>
<td>R&amp;S®DDF-IGT</td>
<td>4079.8009.04</td>
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<td>ITU Measurement Software</td>
<td>R&amp;S®DDFGTS-IM</td>
<td>4074.0822.02</td>
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<td>Documentation of Calibration Values</td>
<td>R&amp;S®DDFGTS-DCV</td>
<td>4074.1187.02</td>
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<td>Preclassification</td>
<td>R&amp;S®DDFGTS-CL</td>
<td>3025.2912.02</td>
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<td>Enhanced Measurement Speed, requires R&amp;S®DDFGTS-ID</td>
<td>R&amp;S®DDFGTS-EMS</td>
<td>4501.0604.02</td>
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<td>Enhanced Measurement Speed, requires R&amp;S®DDFGTS-ID</td>
<td>R&amp;S®DDFGTS-EMS</td>
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<td>EMS Identification</td>
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<td>DF Error Correction</td>
<td>R&amp;S®DDFGTS-COR</td>
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<td>DF Method Vectormatching</td>
<td>R&amp;S®DDFGTS-VM</td>
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### External accessories

DF antennas and accessories:
- see R&S®ADDx multichannel DF antennas product brochure, PD 0758.1106.12

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1) The R&S®DDF5GTS-EMS option is subject to export control.

Your local Rohde & Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde & Schwarz representative, visit
www.sales.rohde-schwarz.com
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Certified Environmental Management
ISO 14,001
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ISO 9,001

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