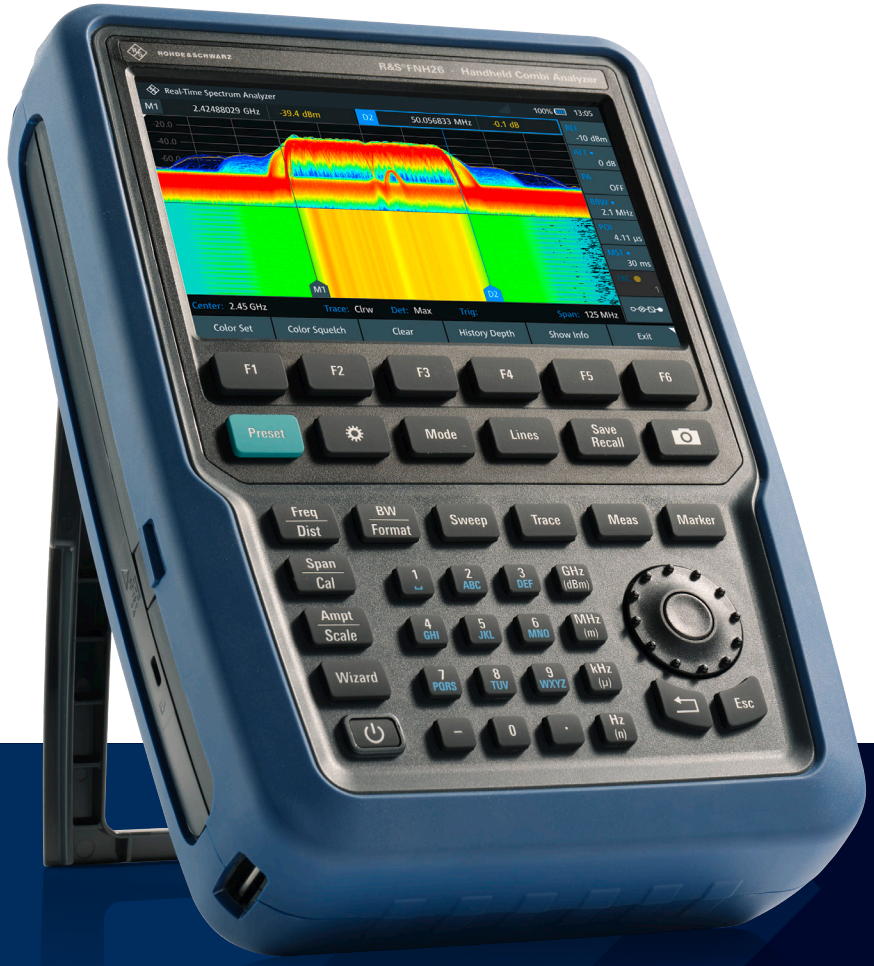
# R&S®FNH
# HANDHELD COMBINATION ANALYZER

## Complex RF measurements with one instrument




Product Brochure
Version 02.00

海洋儀器
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# AT A GLANCE

The versatile field instrument consolidates multiple tools into a single platform with a range of models tailored to demanding high-frequency requirements. The instruments integrate a standard spectrum analyzer (with optional real-time capabilities), a cable and antenna tester, a full 2-port vector network analyzer (VNA) and an power meter for RF and optical signals. The system also supports interference analysis, power meter support and more.

### The ultimate field companion for RF testing

No need to carry multiple instruments or sacrifice power. The R&S®FNH handheld combination analyzer is a versatile, all-in-one solution engineered to streamline field operations by combining essential tools in a single, portable platform.

Tailor your device to your mission. The high-performance spectrum analyzer (SA) can be customized with a cable and antenna tester (CAT), vector network analyzer (VNA) or real-time spectrum analyzer (RTSA). Whether analyzing high-frequency signal sources or conducting comprehensive audits of antennas, cables and filters, the R&S®FNH fits your workflow.

The RTSA can detect intermititent interference with ease and an intuitive wizard simplifies repetitive test scenarios and automates professional documentation to increase productivity.

### The R&S®FNH handheld combination analyzer includes:

- Spectrum analyzer (standard)
- Real-time spectrum analysis (option)
- Cable and antenna tester (option)
- Full 2-port vector network analyzer (option)
- Power meter for both RF signals and optical signals (option with accessory)
- Interference analyzer (option)
- Tracking generator (TG) and independent CW source (option)
- Vector voltmeter (option)




R&S®FNH handheld combination analyzer

# KEY FACTS

- **Spectrum analyzer (standard) and real-time spectrum analyzer (option)**
  - Frequency range: 5 kHz to 32 GHz
  - Real-time bandwidth: up to 125 MHz
  - Displayed average noise level (DANL) with preamplifier-ON –164 dBm
  - Phase noise: –110 dBc (1 Hz) at 1 GHz carrier frequency and 10 kHz offset
- **Cable and antenna tester (CAT) and vector network analyzer (VNA)**
  - Frequency range: 30 kHz to 26.5 GHz
  - Full 2-port S-parameter measurements ($S_{11}$, $S_{21}$, $S_{12}$ and $S_{22}$)
  - Maximum dynamic range: 120 dB
  - Output power range: –50 dBm to +6 dBm
  - Measurement speed: < 200 µs per point
  - Low trace noise: 0.0005 dB/0.0028°
- **Fully upgradeable with key codes**
  - Flexible software key code options
  - Zero down time for upgrade
  - Field-upgradeable, no re-calibration needed

# BENEFITS


**True combi analyzer**
- The ultimate convergence of RF field tools
- Extended performance
- Advanced interference hunting and signal strength mapping
- page 4

**Solid RF performance**
- Unrivaled sensitivity: spectrum analysis
- Total visibility: real-time spectrum analysis (RTSA)
- Precision at speed: CAT/VNA
- page 6

**Smart and intuitive features**
- Intuitive control at your fingertips
- Precision made simple: the measurement wizard
- One tool, endless applications
- Efficiency via the quick configuration dashboard
- page 7

**Excellent in the field**
- Uncompromising reliability
- Military-grade endurance
- Innovative field flexibility
- page 8

**Excellent in the laboratory, production and education**
- SCPI compatibility and software integration
- Remote access for academic use
- page 9

**Low cost of ownership**
- Maximize your existing investment
- Scale your capabilities with zero downtime
- Future-proof frequency paths:
- Measurement application options
- page 10

**Ergonomic design**
- Designed for field excellence
- page 10

**Operating elements**
- page 11

# TRUE COMBI ANALYZER

## The ultimate convergence of RF field tools

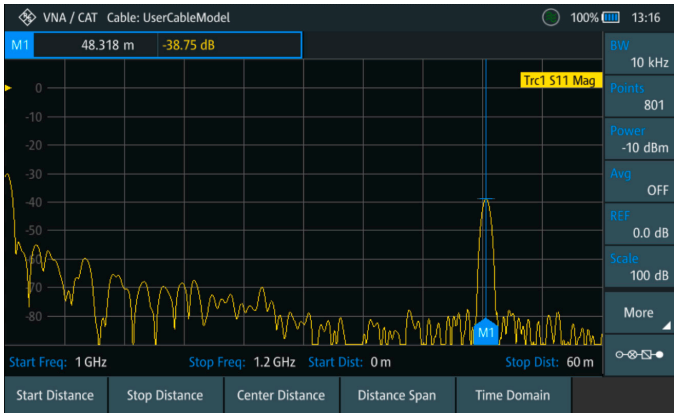
The R&S®FNH handheld combination analyzer is a spectrum analyzer, real-time spectrum analyzer, vector network analyzer, power meter, cable and antenna tester all in one portable platform.

The combination lowers costs and simplifies field operations with much quicker installation, maintenance and troubleshooting. The instrument is ideal for high-stakes applications, such as public safety communications and military network deployments.

## Extended performance

The R&S®FNH is built for longevity in the field. The small form factor is paired with an optimized power system for up to 4 hours of continuous operation in SA and CAT/VNA modes and 3.5 hours in RTSA mode, ensuring reliability during critical measurements.

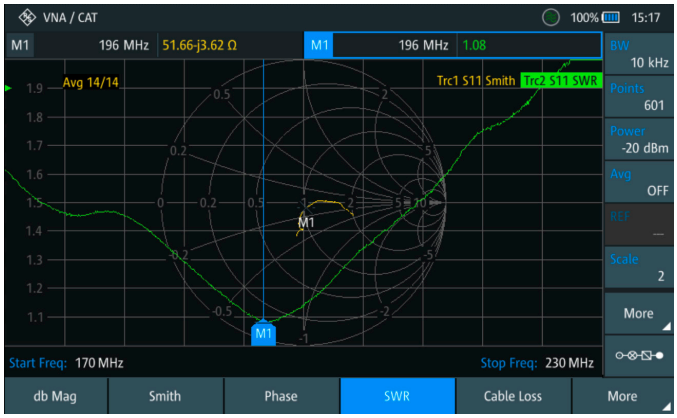
Distance to fault measurement on an RF cable in CAT mode



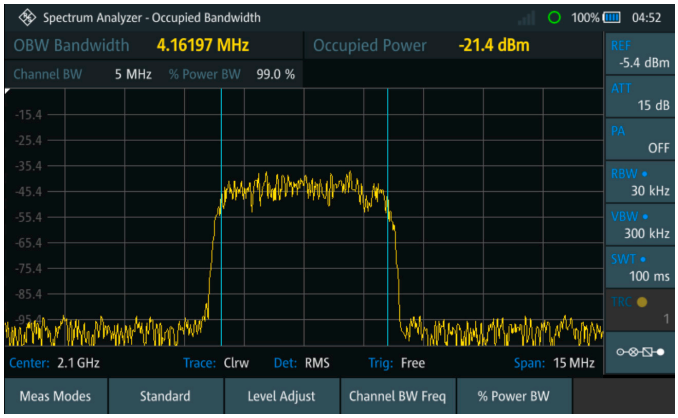

The R&S®FNH as channel power meter




SWR and Smith chart of 1-port DUT in VNA mode




Occupied bandwidth measurement in standard spectrum analyzer mode



## Advanced interference hunting and signal strength mapping

Transform your handheld combi analyzer into a powerful location-aware solution for interference hunting, signal localization, and coverage mapping. The R&S®FNH-K15 and R&S®FNH-K16 options provide intuitive visualization tools that combine RF measurements with geographical and indoor mapping capabilities.

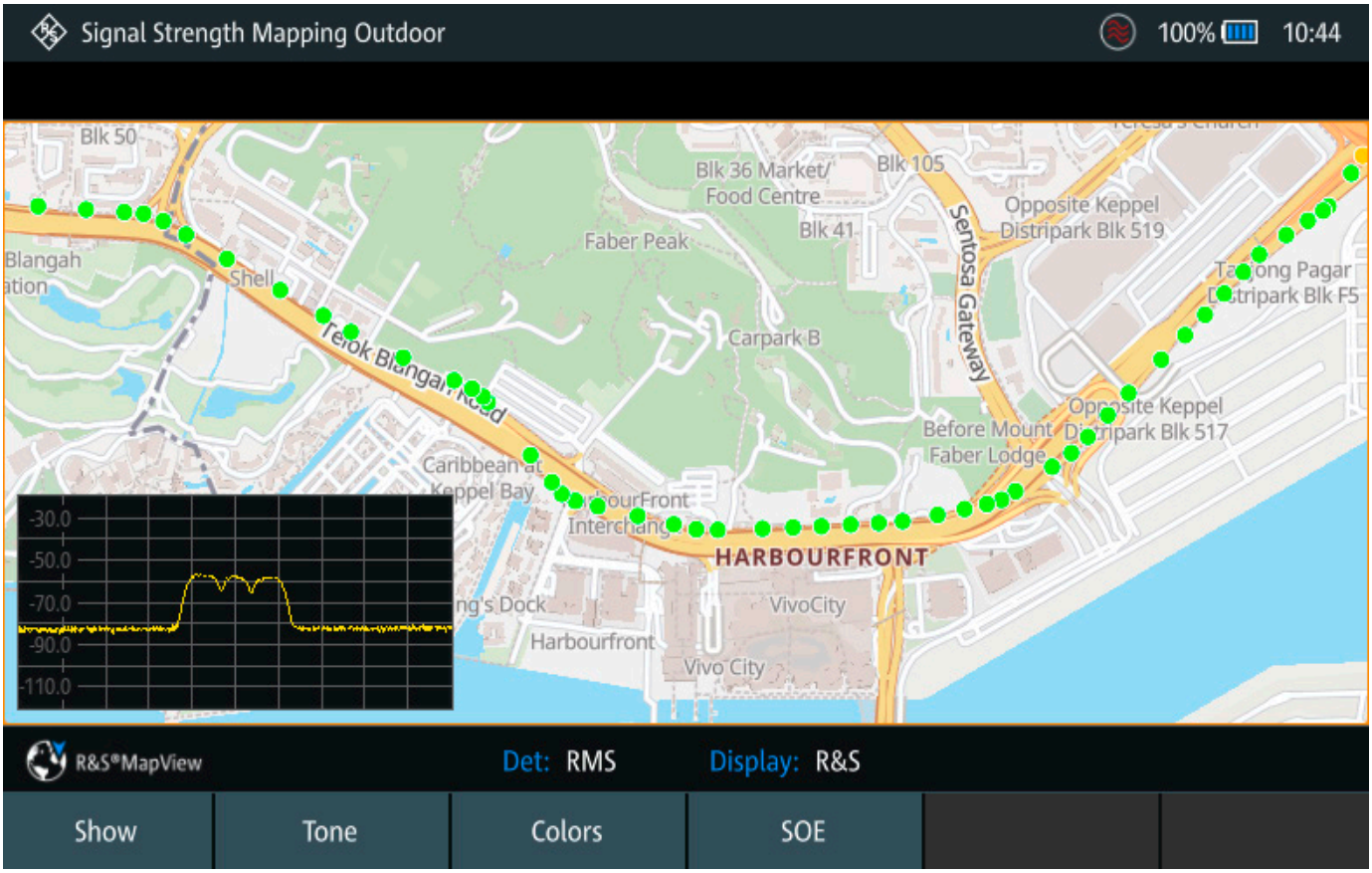
Interference hunting, locate interference sources faster and characterize signals with confidence using option R&S®FNH-K15 which includes:

- **Spectrogram in SA and RTSA mode**
  Visualize signal activity and interference over time, making it easier to identify intermittent and time-dependent signals
- **Triangulation in SA mode**
  Determine the direction of an interfering source using directional measurements for efficient source localization
- **Polar display in SA Mode**
  Clearly visualize signal bearings and directional information when used with a directional antenna to help pinpoint emitter locations
- **On-map spectrum trace**
  View spectrum traces directly on the map for immediate signal characterization at the measurement location

Signal strength mapping with option R&S®FNH-K16 enables turn RF measurements into an intuitive visual coverage map:

- **Signal strength mapping in SA mode**
  Display signal strength measurements directly over indoor or geographical maps, providing a clear view of RF coverage and signal distribution
- **On-map spectrum trace**
  Combine signal-strength mapping with spectrum trace information for detailed characterization of signals at specific locations

With the R&S®FNH-K16 Signal strength mapping option, every measurement point is recorded on a map. The level and the spectrum for each measurement point can be retrieved again at any time later.



# SOLID RF PERFORMANCE

### Unrivaled sensitivity: spectrum analysis

R&S®FNH can detect down to the theoretical thermal noise floor with a displayed average noise level (DANL) of –164 dBm (1 Hz) for sensitivity that far exceeds typical handhelds. When paired with a 14 dBm third order intercept (TOI), the instrument can isolate low-level spurious emissions even in the presence of powerful signals. The R&S®FNH is an indispensable tool for precision interference hunting, distributed antenna system (DAS) troubleshooting and rigorous spectrum monitoring.

### Total visibility: real-time spectrum analysis (RTSA)

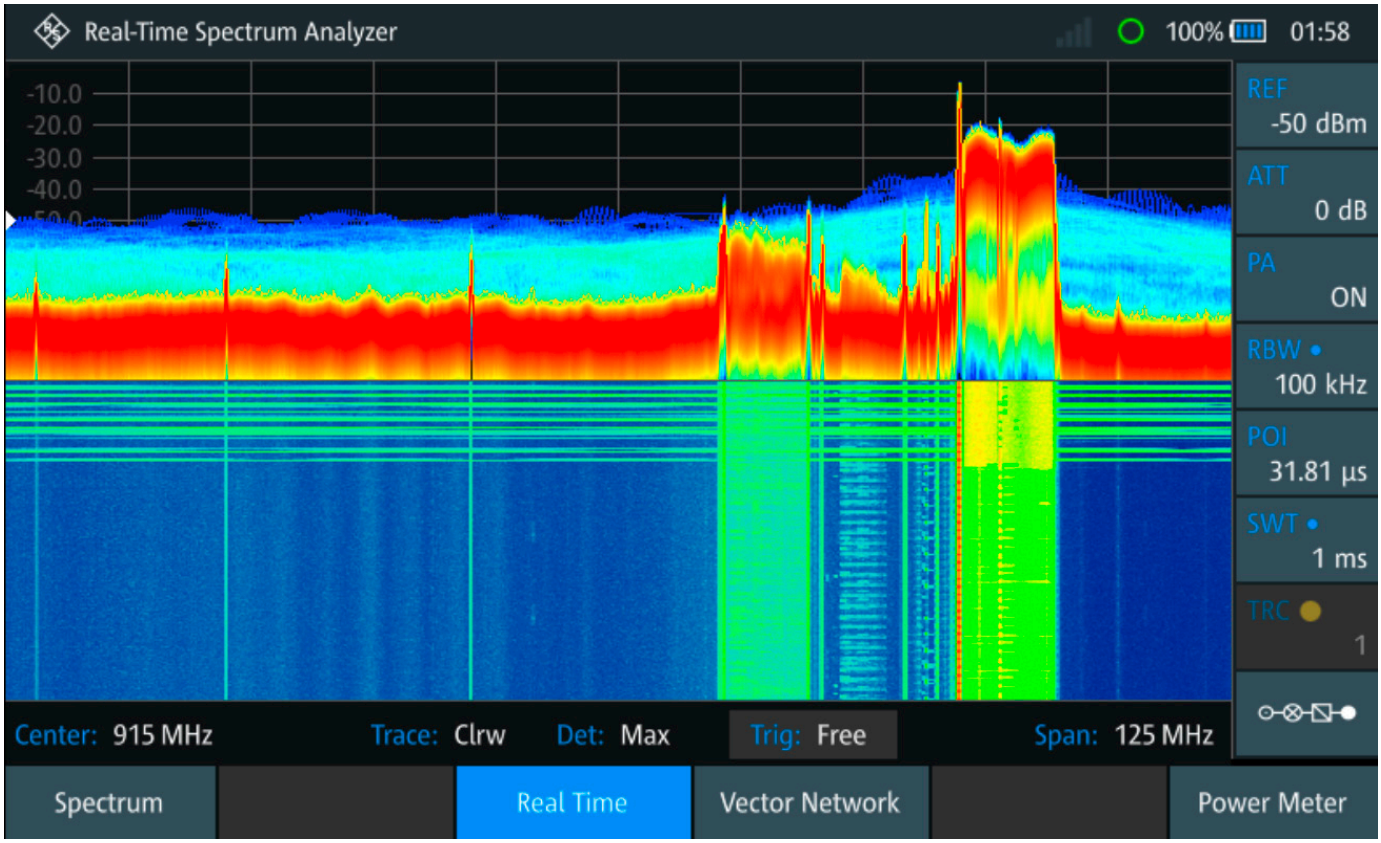
Capture the invisible. The R&S®FNH has 125 MHz of real-time bandwidth and provides a gapless view of entire channel blocks for LTE-Advanced, 5G NR and Wi-Fi 6/6E. Swept-tuned analyzers can leave blind spots however, with a 310 000 FFT/s rate means 100 % time coverage. Confidently detect radar pulses, hopping signals and transient bursts that other instruments miss with a probability of intercept (POI) of 3.6 µs.

### Precision at speed: CAT/VNA

Experience laboratory-grade accuracy in the field. The R&S®FNH surpasses most field VNAs with a massive 110 dB dynamic range and can help characterize high cable loss and RF components that would normally fall below the measurement floor. A full 1001-point sweep is completed in under 200 ms with sweep speeds of <200 µs per point to minimize tower time and maximize deployment efficiency.

Wi-Fi® is a registered trademark of Wi-Fi Alliance®.

The R&S®FNH features an optional real-time spectrum analysis mode with up to 125 MHz real-time bandwidth and a POI of 3.6 µs.



# SMART AND INTUITIVE FEATURES

### Intuitive control at your fingertips

The R&S®FNH has a bright 7" multi-touch display designed for the requirements of field work. Whether you are operating in a clean laboratory or wearing gloves on a job site, the intuitive interface gives you seamless control. Navigate with ease using natural gestures: double-tap to set markers, use an "X" gesture to clear the screen or simply pinch and spread to adjust the zoom.

### Precision made simple: the measurement wizard

Eliminate human error and standardize results with the integrated measurement wizard. Users are guided through complex tasks and technicians with minimal training can carry out professional-grade test campaigns. Once a measurement is complete, the instrument automatically generates a detailed report for absolute consistency across multiple sites and systems.

### One tool, endless applications

The R&S®FNH is versatile enough for applications ranging from aerospace and defense to broadcasting and spectrum regulation. The spectrum analyzer mode can qualify communications or radar signals and isolate unwanted emissions. Switch to VNA or CAT mode to certify the integrity of connectors, cables, antennas and filters.

### Efficiency via the quick configuration dashboard

Stop digging through menus. The quick configuration dashboard provides a single overview of all your relevant settings. You can configure an entire session from one screen basic spectrum setups to complex VNA measurements – saving time and eliminating manual configuration errors.

Keep your device in view at all times with the R&S®MobileView feature. Inside the rain holster, the device is protected to IP65 standards.



# EXCELLENT IN THE FIELD

### Uncompromising reliability

The R&S®FNH is both portable and ruggedized for the harshest climates on earth. Every detail is engineered for survival including a glare-free display, backlit keypad and superior thermal stability. The capacitive touchscreen remains fully responsive even when wearing gloves, making sure your workflow never stops, regardless of the weather.

### Military-grade endurance

Designed for tower climbs and long-term surveys, the R&S®FNH has an ergonomic form to  minimizes fatigue during extended use. An IP65 rating and optional rain holster keep it shielded against the elements. The device is in line with MIL-PRF-28800F class 2 and MIL-STD-810H and meets the most stringent US military standards for shock, vibration, humidity and temperature. Where commercial-grade instruments fail, the R&S®FNH thrives.

### Innovative field flexibility

Adapt to any scenario with smart connectivity. The R&S®FNH can be operated directly from its carrying bag with the Wi-Fi mirror feature. Mirroring the display to a smartphone attached to a directional antenna gives you true hands-free operation, letting you monitor signals in real-time while maintaining full mobility.

The R&S®FNH is a robust measuring instrument that can be used for a wide range of measurement tasks, even under difficult weather conditions.



# EXCELLENT IN THE LABORATORY, PRODUCTION AND EDUCATION

### SCPI compatibility and software integration

Full SCPI compatibility means the R&S®FNH can interface effortlessly with industry-standard automation software. Existing test routines can be transferred across platforms with minimal rework, reducing deployment time and engineering overhead.

### Remote access for academic use

The R&S®FNH is an exceptional teaching tool in academic environments. R&S®InstrumentView software lets students interact with a live RF instrument via remote access for a collaborative and flexible learning experience without direct physical access to the hardware.

Due to its compact footprint, the R&S®FNH is also highly versatile for use in the laboratory.



# LOW COST OF OWNERSHIP

### Maximize your existing investment

Transitioning to the R&S®FNH is seamless and cost-effective. The R&S®FNH is designed to work with a wide array of accessories from the R&S®FSH, R&S®ZVH, R&S®ZPH, and R&S®FPH families for maximum value and backward compatibility. Compatible accessories include: adapters, connectors, attenuators, power meters, antennas, calibration kits and GPS receivers.

### Scale your capabilities with zero downtime

The R&S®FNH comes as a high-performance spectrum analyzer, a powerful foundation that can be expanded to meet your evolving requirements. A series of flexible software keycodes let you instantly unlock higher frequency ranges

### Future-proof frequency paths:

- R&S®FNH6: Start at 6 GHz upgrade to 8 GHz (SA/RTSA and VNA)
- R&S®FNH13: Start at 13.6 GHz upgrade to 20 GHz (SA/RTSA and VNA) [1)]
- R&S®FNH26: Start at 26.5 GHz upgrade to 32 GHz (SA/RTSA only)

### Measurement application options

Beyond frequency upgrades, a wide range of measurement applications can be unlocked with keycodes, such as VNA, CAT, RTSA, extended analysis bandwidth, I/Q capture or a tracking generator. The spectrum analysis mode can be enhanced with pre-amplifier or measurement application options for interference hunting, signal strength mapping, pulse measurements and electromagnetic fields (EMF). The VNA/CAT mode can be enhanced with power range extensions, vector voltmeter, DC bias  and time domain analysis.

[1)] For optimal performance at 20 GHz, the R&S®FNH13 can be ordered with the 3.5 mm connector option at the time of purchase.

# ERGONOMIC DESIGN



### Designed for field excellence

Operation is easy, thanks to an intuitive layout with large, tactile keypads and precision rotary controls, which can be used with gloves. Whether working in the depths of a dark facility or under the glare of the midday sun, the backlit keypad and anti-reflective display ensure crystal-clear visibility. Compact, lightweight and rugged, the R&S®FNH is built for the most challenging locations with unwavering performance in any environment.

# OPERATING ELEMENTS



# SPECIFICATIONS IN BRIEF

| Specifications in brief (typ.) | | |
|---|---|---|
| **Spectrum analyzer/RTSA mode** | | |
| Frequency range | | |
| R&S®FNH6 | | 5 kHz to 6 GHz |
| | | 5 kHz to 8 GHz (option) |
| R&S®FNH13 | | 5 kHz to 13.6 GHz |
| | | 5 kHz to 20 GHz (option) |
| R&S®FNH26 | | 5 kHz to 26.5 GHz |
| | | 5 kHz to 32 GHz (option) |
| Aging per year | | $\pm 3 \times 10^{-6}$ |
| **Bandwidth** | | |
| Resolution bandwidth (–3 dB) | | 1 Hz to 10 MHz in 1/3 sequence |
| **Real-time bandwidth (R&S®FNH-K1R option)** | | |
| Bandwidth (span) | standard | 20 MHz |
| | with option | max. 125 MHz |
| FFT rate | | 310000 FFT/s |
| Probability of intercept (POI) | minimum signal duration for 100% POI with full amplitude accuracy | 3.6 µs |
| **Displayed average noise level (DANL)** | | |
| RF preamplifier off | 1 GHz | –151 dBm (1 Hz) |
| | 3 GHz | –147 dBm (1 Hz) |
| | 10 GHz | –143 dBm (1 Hz) |
| | 18 GHz | –142 dBm (1 Hz) |
| | 26.5 GHz | –140 dBm (1 Hz) |
| | 32 GHz | –135 dBm (1 Hz) |
| RF preamplifier on | 1 GHz | –164 dBm (1 Hz) |
| | 3 GHz | –162 dBm (1 Hz) |
| | 10 GHz | –163 dBm (1 Hz) |
| | 18 GHz | –160 dBm (1 Hz) |
| | 26.5 GHz | –156 dBm (1 Hz) |
| | 32 GHz | –152 dBm (1 Hz) |
| **Phase noise** | carrier frequency = 1 GHz, carrier offset = 10 kHz | < –110 dBc (1 Hz) |
| **Vector network analysis/cable and antenna testing mode** | | |
| Frequency range | R&S®FNH6 | 30 kHz to 6 GHz |
| | | 30 kHz to 8 GHz (option) |
| | R&S®FNH13 | 30 kHz to 13.6 GHz |
| | | 30 kHz to 20 GHz (option) |
| | R&S®FNH26 | 30 kHz to 26.5 GHz |
| Individual measurements | | reflection ($S_{11}$, $S_{22}$) |
| | | transmission ($S_{21}$, $S_{12}$) |
| | | one-port cable loss |
| | | distance-to-fault |
| Maximum port output power | 30 kHz to 26.5GHz | 0 dBm to –10 dB (std.) |
| | | +6 dBm to –50 dB (option) |
| Maximum dynamic range | | 120 dB |
| Trace noise magnitude (dB RMS) | 1 GHz | 0.0032 dB |
| Trace noise phase (deg. RMS) | 1 GHz | 0.02° |

| General data | | |
|---|---|---|
| Display | | |
| Size | capacitive touch screen | 7" TFT color display |
| Resolution | | WVGA, 800 × 480 pixel |
| Battery operating time | spectrum and VNA mode | approx. 4 hours (meas.) |
| Environmental conditions | | |
| Operating temperature range | | –10 °C to +55 °C |
| Dimensions | W × H × D | 202 mm × 294 mm × 78 mm<br>(8.0 in × 11.6 in × 3 in) |
| Weight | | 3.7 kg (8.157 lb) |


Service at Rohde&Schwarz

# YOU'RE IN GREAT HANDS

| | SERVICE PLANS | ON DEMAND |
|---|---|---|
| Calibration | Up to five years [1] | Pay per calibration |
| Warranty and repair | Up to five years [1] | Standard price repair |

[1] For extended periods, contact your Rohde & Schwarz sales office.

## Instrument management made easy

The R&S®InstrumentManager makes it easy to register and manage your instruments. It lets you schedule calibration dates and book services.

Find out more about our service portfolio:

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