

Webinar

# TESTING MILCOM RADIOS WITH THE CMA 180 RADIO TEST SET

Albert Ramirez Perez, Market Segment Manager Aerospace & Defense  
Markus Hendeli, Product Manager CMA180

**ROHDE & SCHWARZ**

Make ideas real



# TESTING MILCOM RADIOS WITH CMA180

## ▶ MILCOM INTRO

## ▶ CMA180

- General
- APCO testing
- Record and Playback
- Automation, CMARun



# WHAT IS MILCOM TEST ABOUT?

Testing Tactical Communications for and by armed forces

Testing Secure Communications: police, fire, homeland and private security

Land mobile radios, Soldier radios vehicular and onboard radios

Pt-Pt and Pt-Multi Point Terrestrial communications for wideband datalinks

VSAT and SATCOM Terminals used by armed forces and homeland security

Mainly driven by HF and V/UHF analogue radio maintenance testing.

SDR performance and also the digital designs and its components

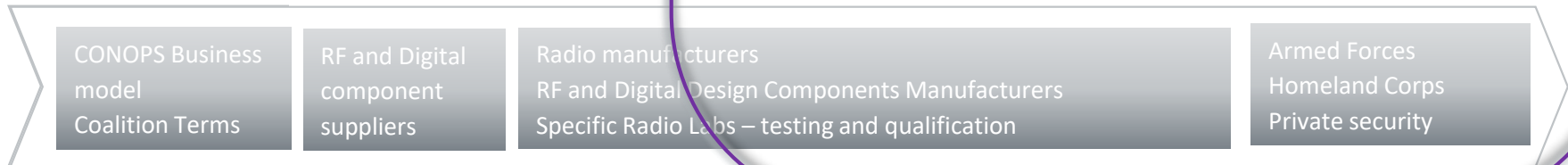
New radios require digital communications APCO, 5G, IoMT in tac radios

Cellular network monitoring and analysis for counter IED applications

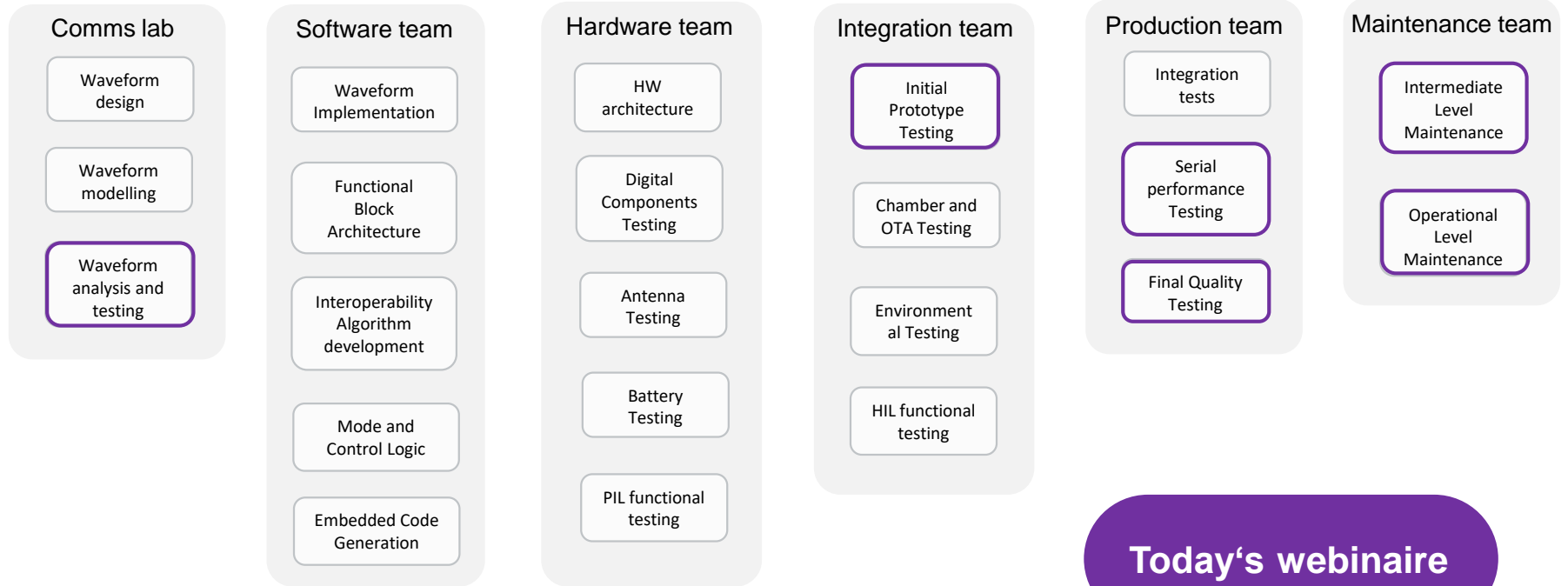


# MILCOM VALUE CHAIN

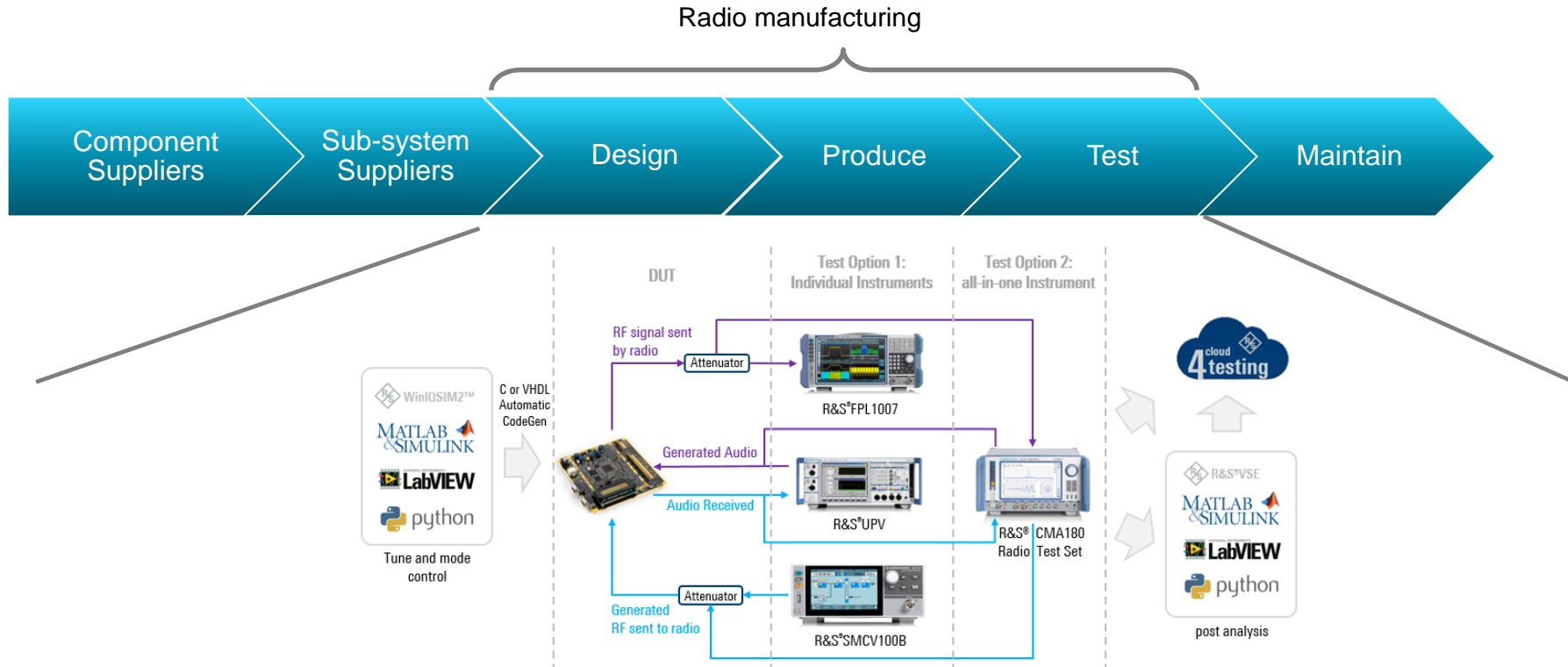
Today's webinaire



# MAIN ACTIVITIES IN MANUFACTURERS

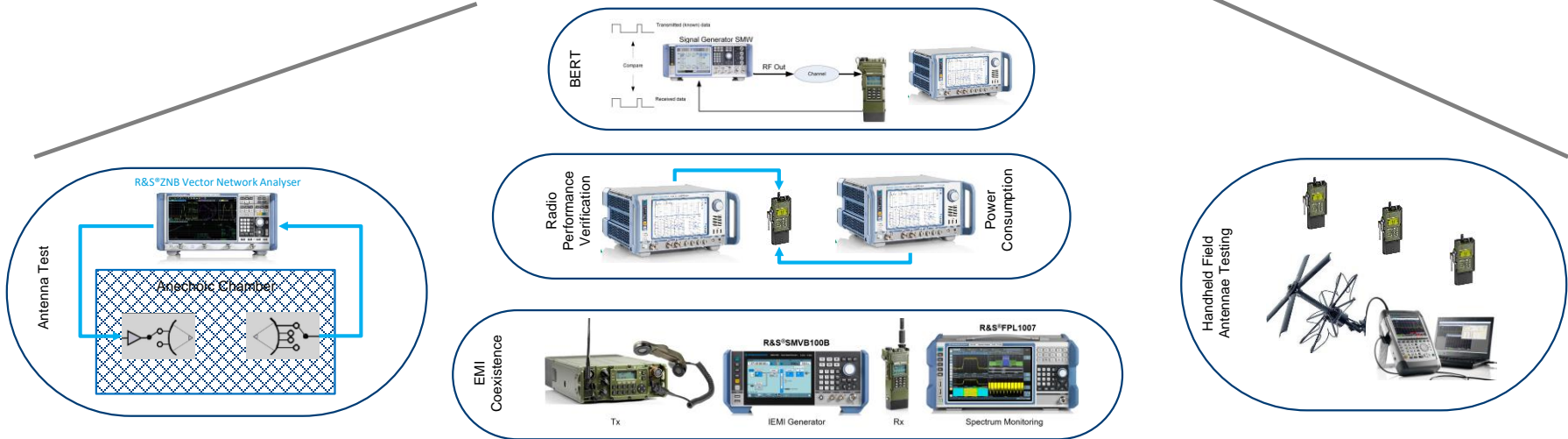
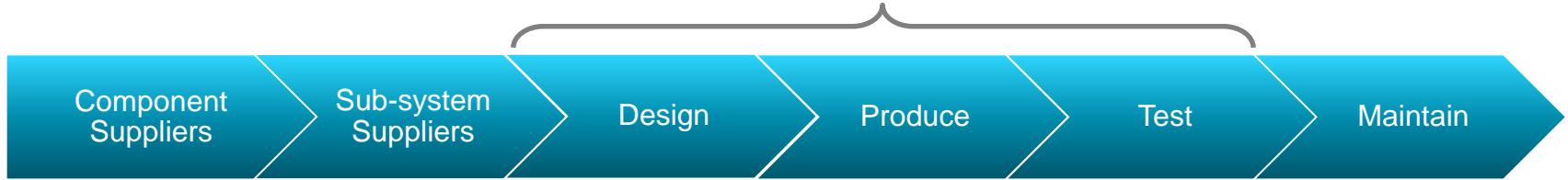


# MAIN TEST CASES IN MANUFACTURERS



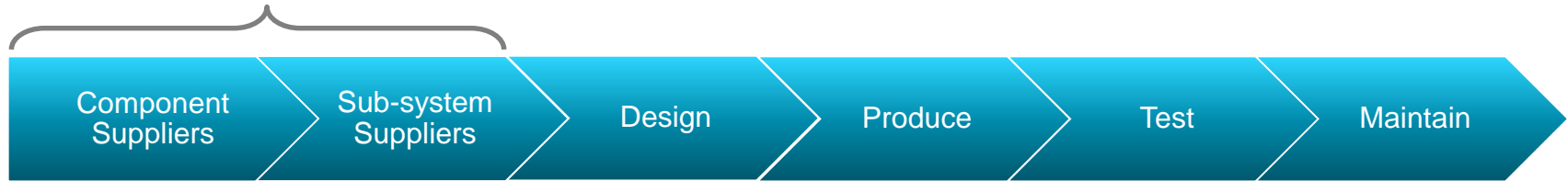
# MAIN TEST CASES IN MANUFACTURERS

Radio manufacturing

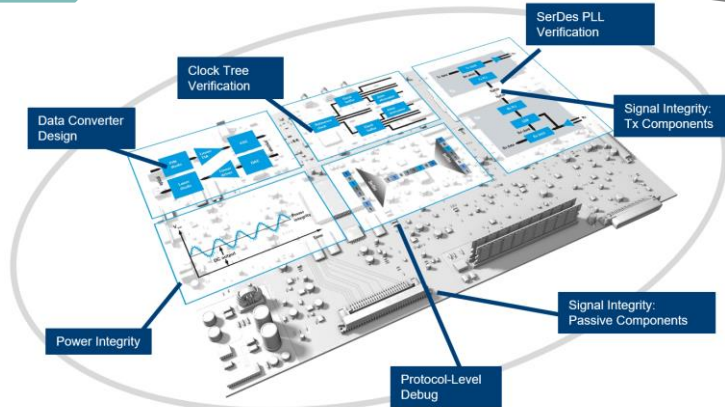


# MAIN TEST CASES IN MANUFACTURERS' SUPPLIERS

RF and Digital Design component manufacturing



Digital component suppliers  
Mixed RF components suppliers  
Digital Design engineers for debugging  
Digital Design labs for test and verification





# TECHNOLOGY TRENDS – MILCOM TEST

## Evolution of already used technologies

- New multi-coalition secure waveforms: SCA-SDR, HDR-WF, ESSOR, JPEO-JTRS
- Next Generation Digital Tactical Radio frequency up to 8GHz and 100MHz BW
- Microwave Data Links up to 85 GHz with 500MHz - 5GHz BW
- OTA and commercial coexistence for Wi-Fi, Bluetooth and 4G
- Digital Design in reduced weight, size and power.




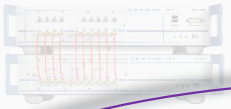



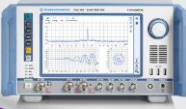
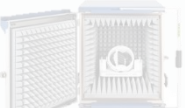





## Emerging new technologies:

- Rapid deployable 5G Secure Networks
- Internet of Military Things, connecting all warfare assets
- Vehicular short range secure Wireless replacing system wires.
- Conformable light weight antennas, MIMO radios, and AESA antennas

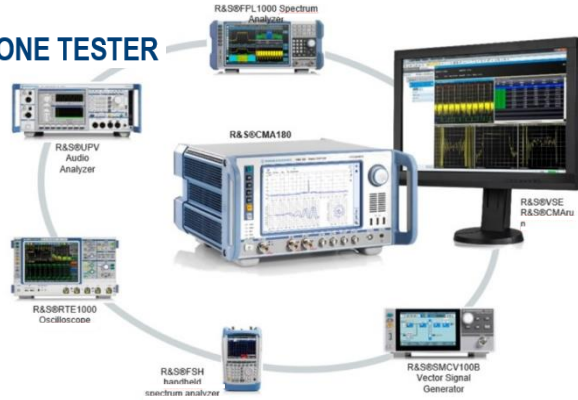


# R&S MILCOM TESTING SOLUTIONS PORTFOLIO

	Signal Generators		Power Sensors
	Signal and Spectrum Analyzers		Switch Matrix
	IQ Acquisition Recording and Replay		<b>Digital Radio Testers</b>
	Vector Network Analyzers		<b>Analogue Radio Testers</b>
	Antenna Test OTA Chambers		Broadband Power Amplifiers
	Real Time Oscilloscopes		Automatic Test Sequencers and other Analysis Software

# A RADIO TEST SET FOR MILCOM

## ALL-IN-ONE TESTER



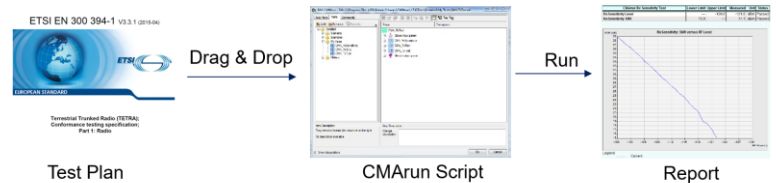
## AVIONICS GENERATOR



## VOIP TEST SETUP



## CMARUN – TEST AUTOMATION



# TESTING MILCOM RADIOS WITH CMA180

## ▶ MILCOM INTRO

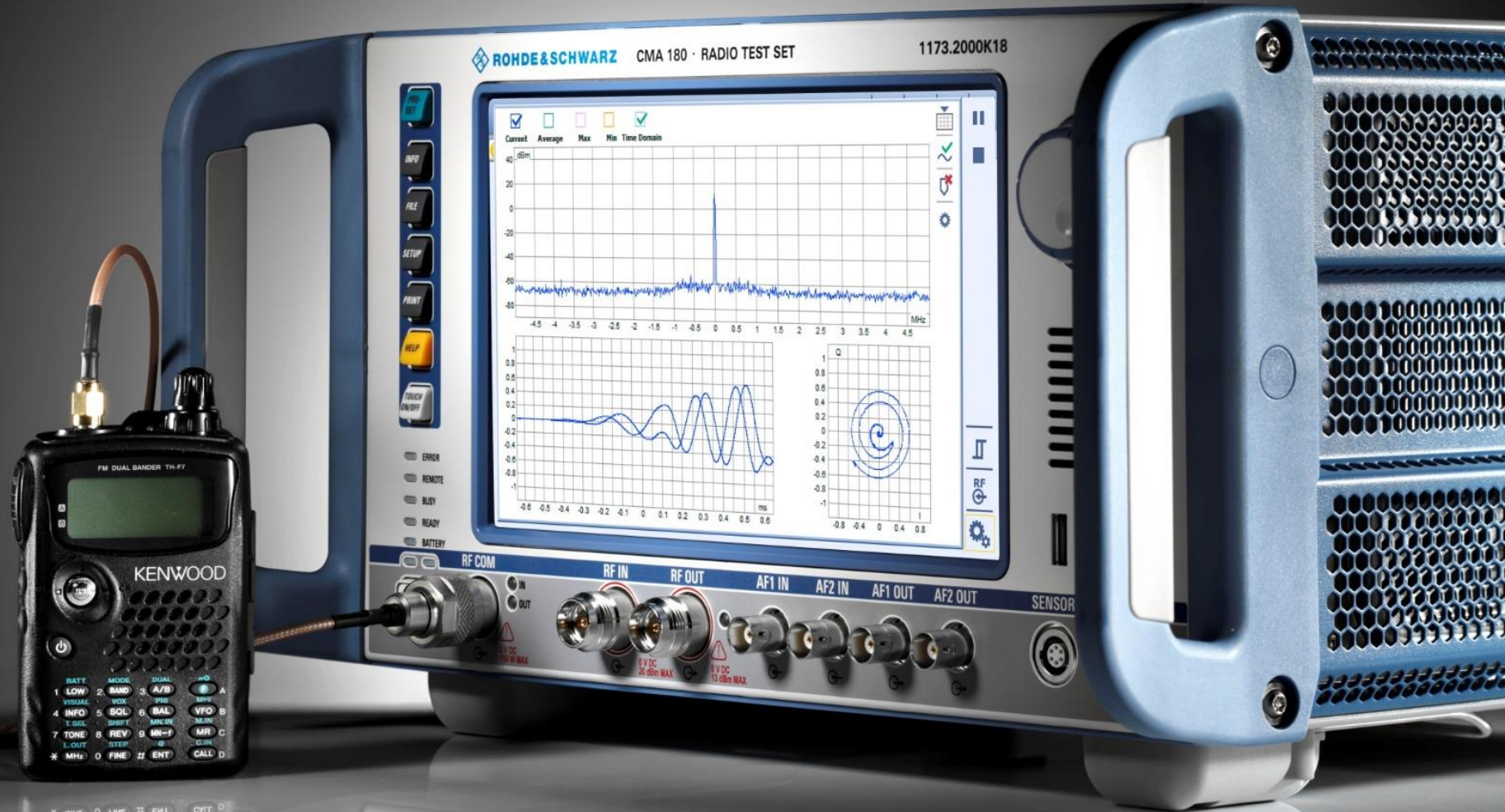
## ▶ CMA180

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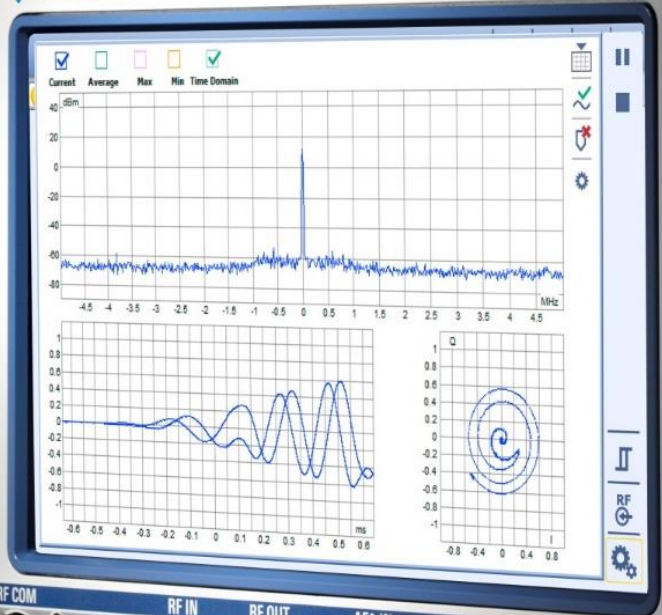


# UNIVERSAL RADIO TEST SET



ROHDE & SCHWARZ CMA 180 · RADIO TEST SET

1173.2000K18



- INFO
- FILE
- SETUP
- PRINT
- HELP
- POWER ON/OFF

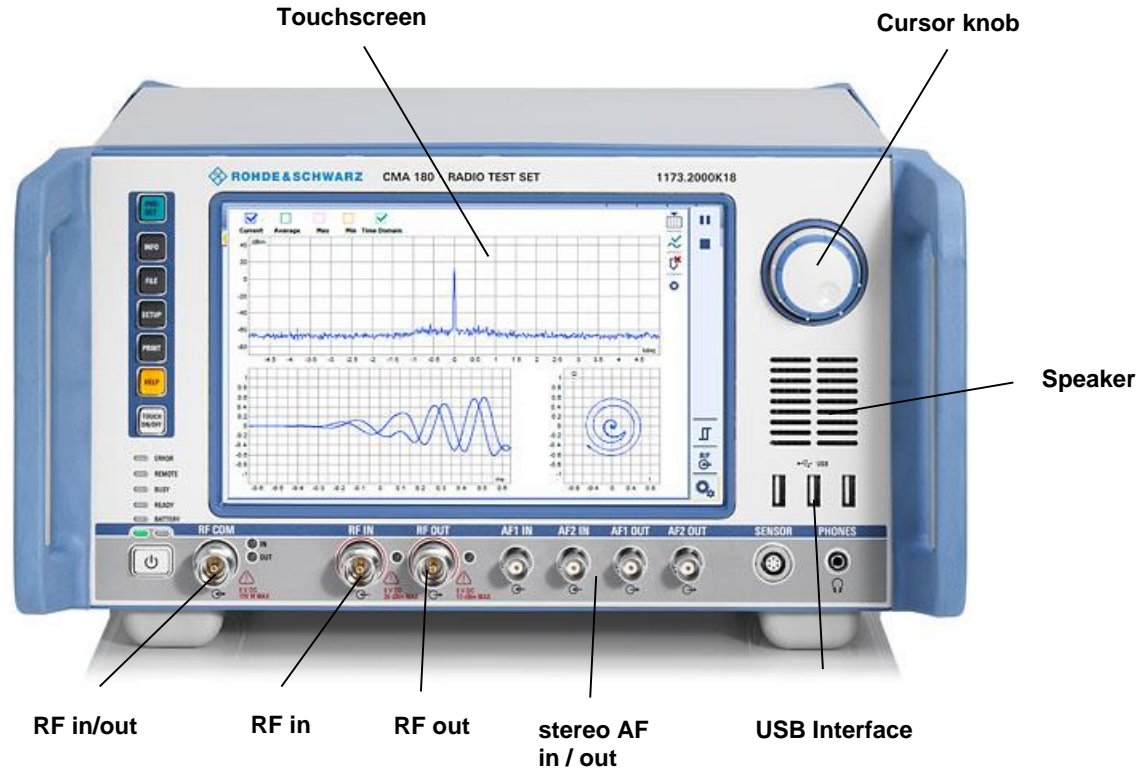
- ERROR
- REMOTE
- BUSY
- READY
- BATTERY

RF COM RF IN RF OUT AF1 IN AF2 IN AF1 OUT AF2 OUT SENSOR

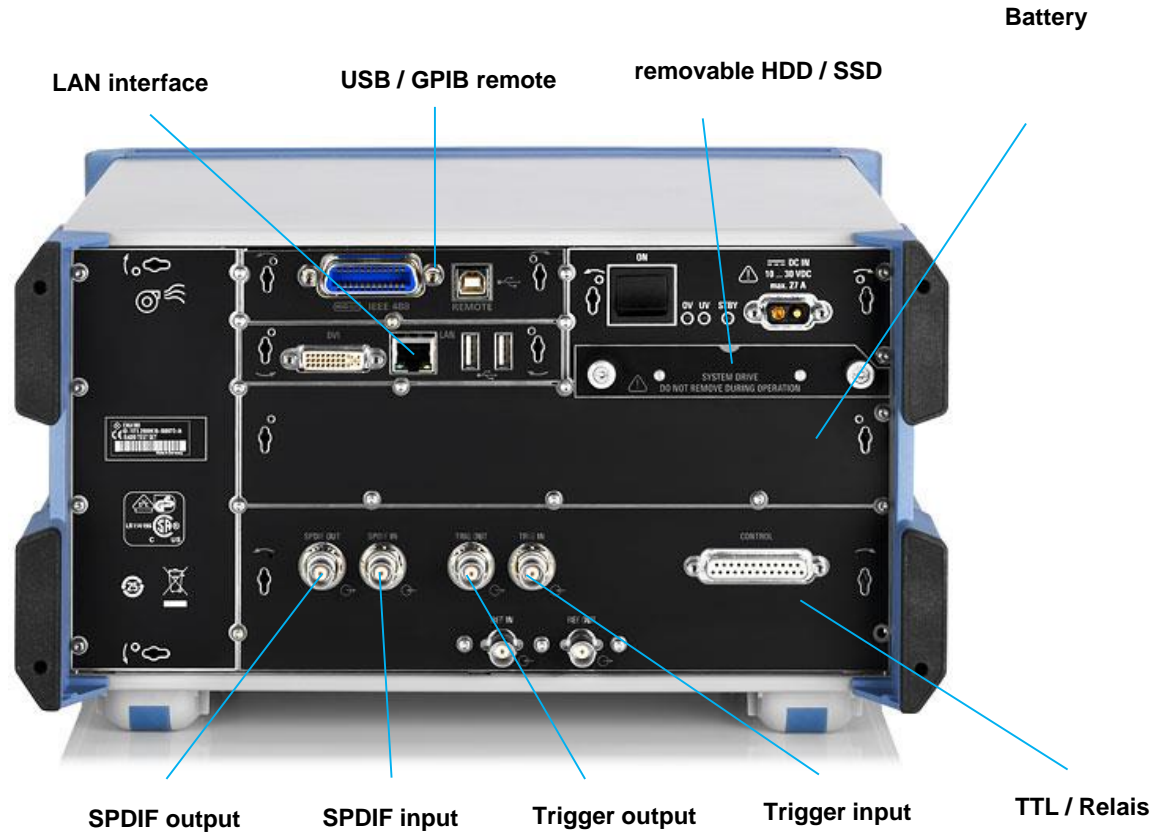
KENWOOD  
FM DUAL BANDSTER TH-F7  
BATT MODE DUAL  
1 LOW BAND 2 A/B  
4 INFO 5 BAND VOX 6 A/B  
7 TONE 8 REV 9 MR  
\* MHE 0 FINE # ENT CALL

\* PWR 0 LME II EPL CYT

# DISCOVERING THE INSTRUMENT FRONT

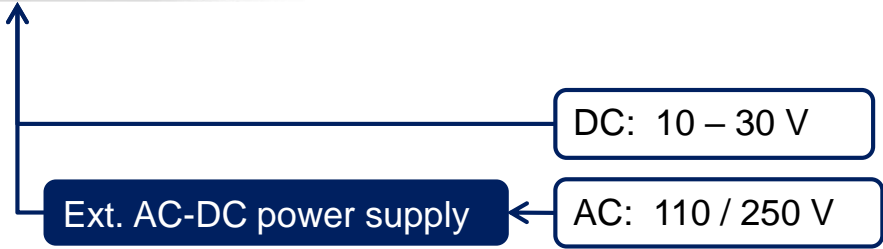
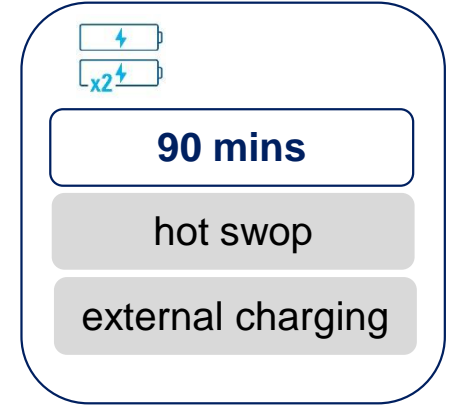
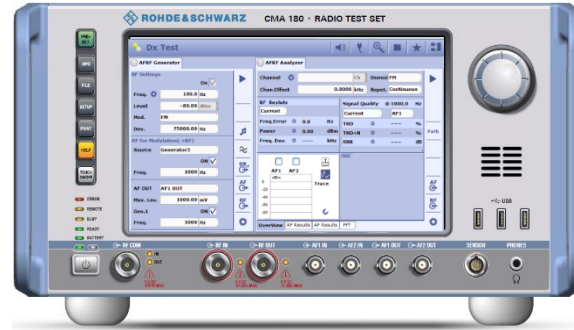


# DISCOVERING THE INSTRUMENT REAR



# PORTABILITY

- ▶ Mount in vehicle and operate on vehicle power
- ▶ Take to remote transceiver station and operate on battery
- ▶ Take to aircraft, ship, or vehicle and operate on battery
- ▶ Operate on AC power at benchtop





# RECEIVER TEST - RF GENERATORS

## Analog Generators

AM, FM, PM,  
SSB

internal / external  
Modulation

internal interferer

## ARB Generator

proprietary  
Signals  
TETRA, LTE

20 MHz  
bandwidth

graphical tools  
for creation

## Digital Generator

DMR, NXDN, P25,  
dPMR, POCSAG,  
ZIGBEE

configurable  
signal content

different test  
pattern

Frequency range: 100kHz to 3 GHz

Bandwidth: 20 Mhz

# RECEIVER TEST - AF ANALYZERS

## Signal Quality

SINAD, SNR,  
THD,...

HP, LP,  
Weighting Filter

from dem. signal  
from AFin  
from VOIP

## Spectrum

21 kHz FFT

from dem. signal  
from AFin  
from VOIP

## Scope

1  $\mu$ s/div - 1 s/div

from dem. signal  
from AFin  
from VOIP

# TRANSMITTER TEST - RF ANALYZERS

## Sweeping Spectrum

Full / Zero Span  
Tracking  
VSWR

100 Hz  
Resolution BW

Markers  
Triggers

## Digital Analyzer

RF and  
Demodulation

RF Parameters

Vector Signal  
Analyzer

## Modulation Analyzer

Modulation and  
Demodulation

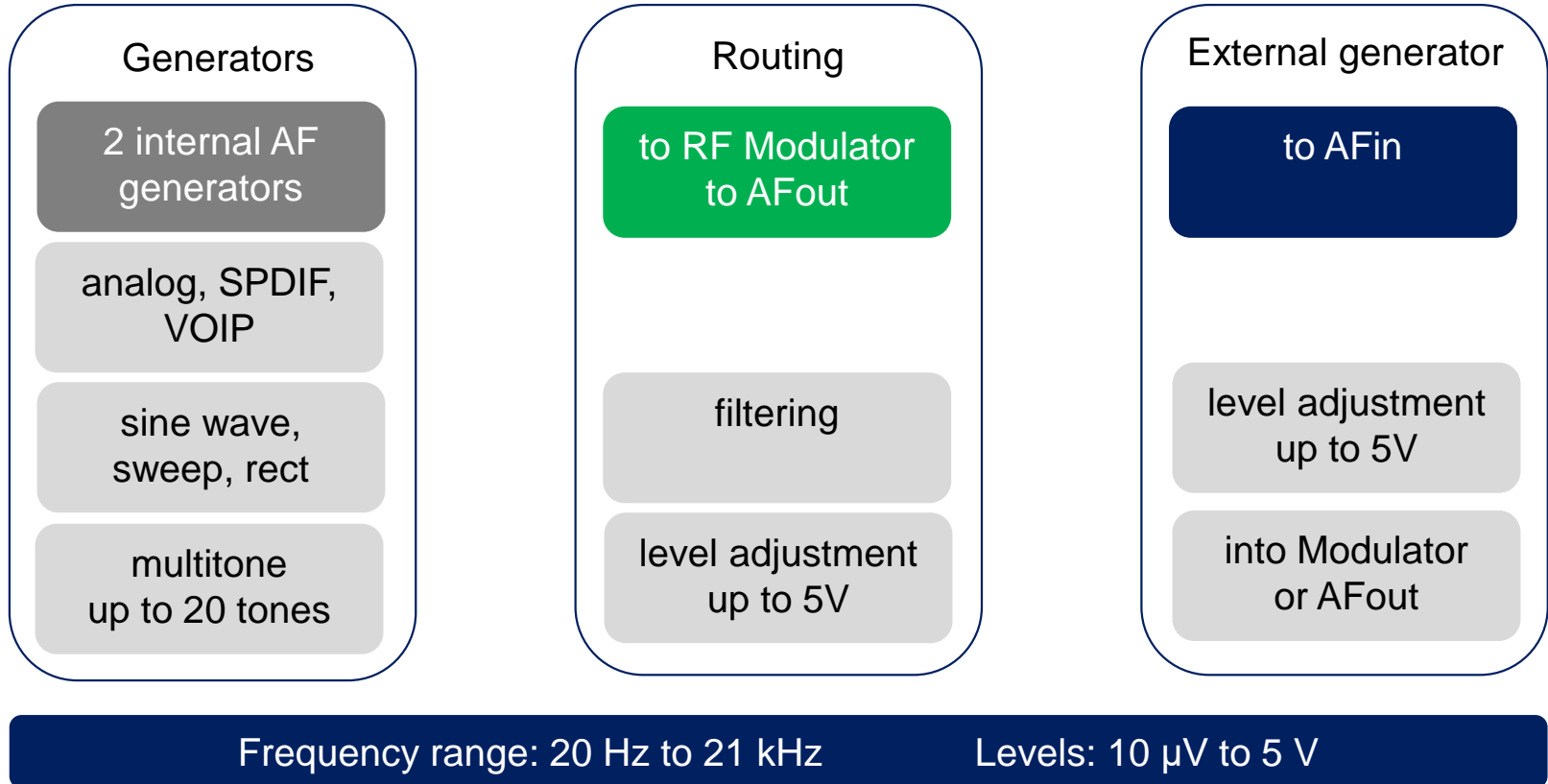
RF Mod.  
Parameters

Demod. Signal  
Qual.

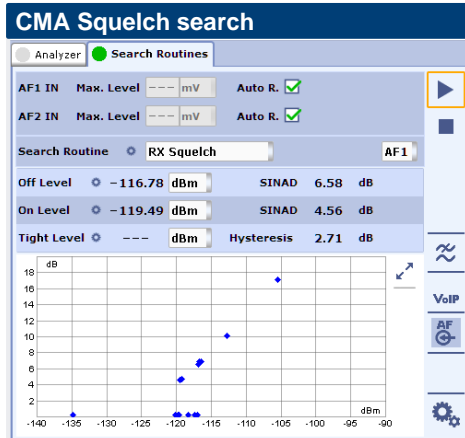
Frequency range: 100kHz to 3 GHz

Bandwidth: 20 MHz

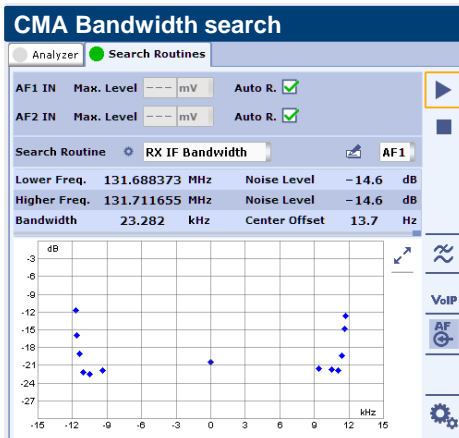
# TRANSMITTER TEST - AF GENERATORS



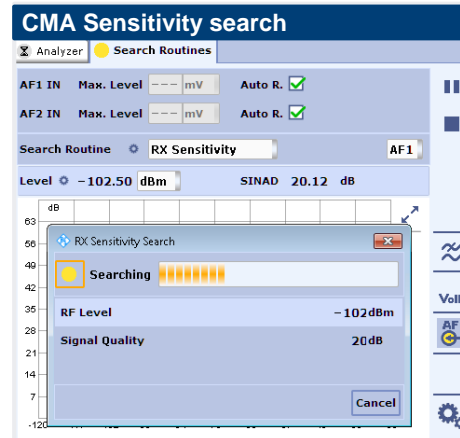
# SEARCH ROUTINES



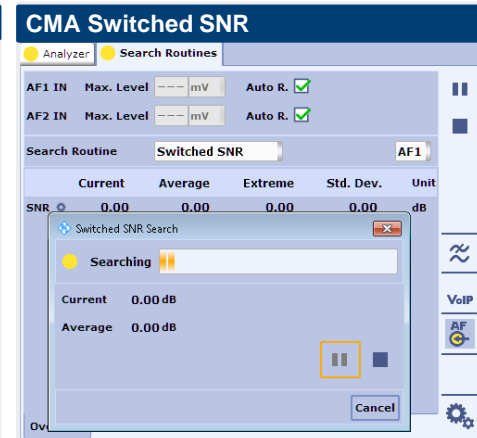
**Squelch search**  
finds the on and off levels of the squelch as well as the hysteresis



**Bandwidth search**  
searches the 6 dB drop-offs in the receive filter

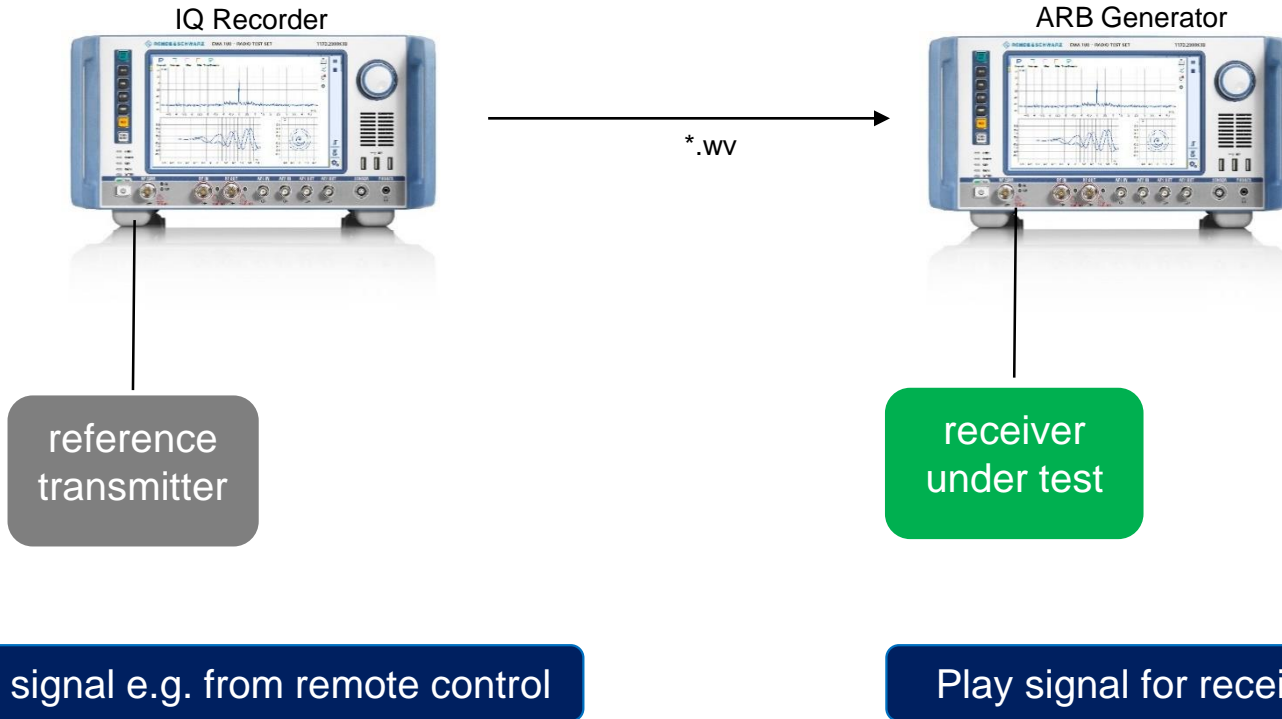


**Sensitivity search**  
reduces the RF level until a specified SNR / SINAD is reached



**Switched SNR**  
Classic routine where modulation is switched on and off and SNR is calculated from both measurements

# RECORD & PLAYBACK

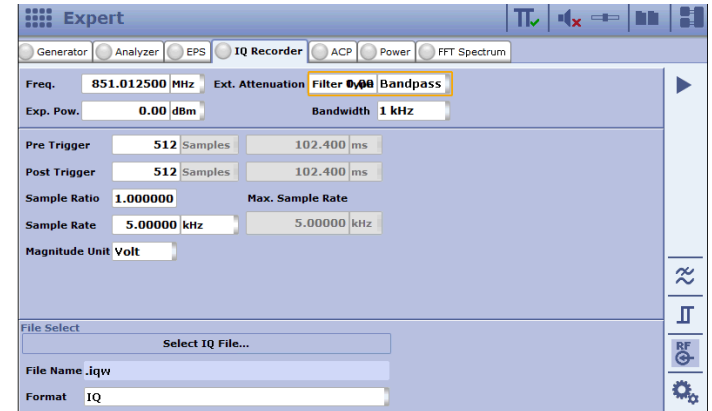


# RECORD & PLAYBACK

Min. Sample rate 500 Hz

Up to 64 MSamples

Technology	Channel	Duration
NXDN	6.25	~58 min
DMR / APCO	12.5 kHz	~14 min
LTE	10 MHz	~ 4 s



.iqw or .wv file formats  
for use in VSE or ARB Generator

# LMR RECEIVER TESTING

## P25, DMR, DPMR, NXDN, POCSAG, ZIGBEE

- ▶ Multiple Standards
- ▶ Adjustable Signal Parameters
- ▶ Different Test Patterns
- ▶ Adjustable RF Parameters

The image displays three screenshots of the LMR Receiver Testing software interface, illustrating the configuration options for different standards and test patterns.

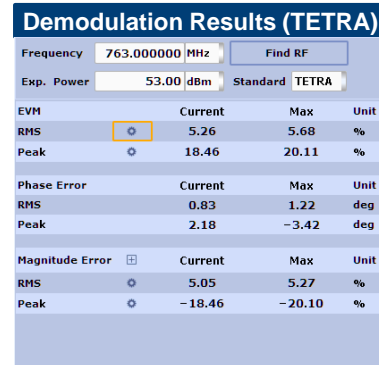
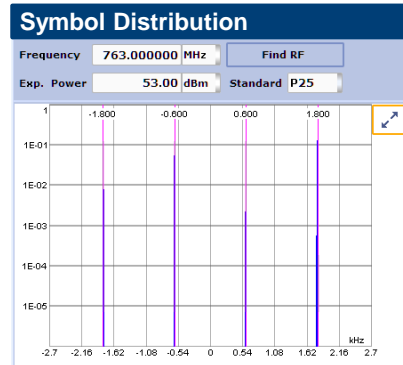
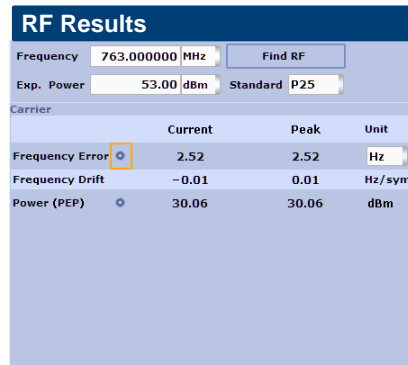
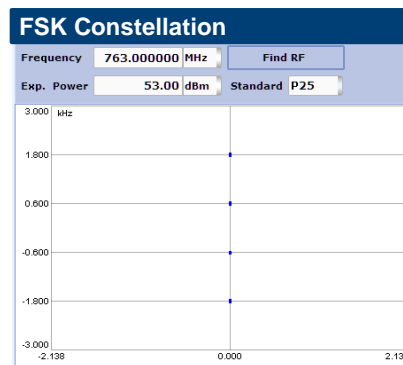
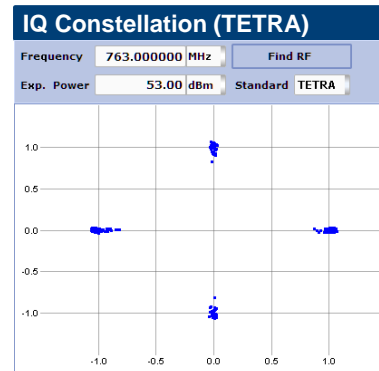
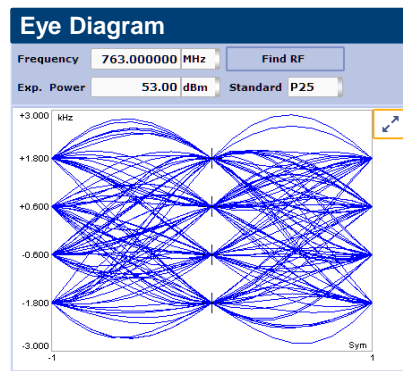
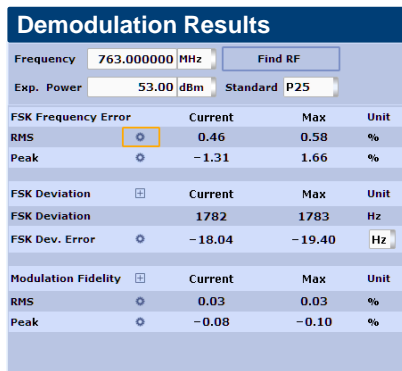
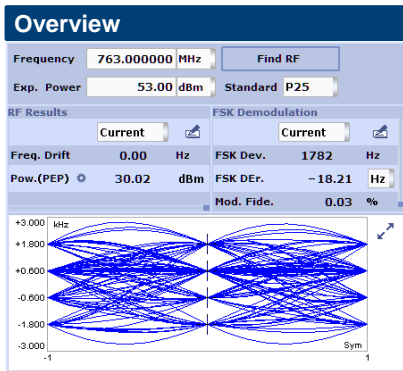
**Standards Panel:** Shows the 'Generator' tab with RF Settings (ON), Freq. (763.000000 MHz), Level (-12.00 dBm), and Source (P25). The Mode dropdown menu is open, showing options: RF ARB, DMR, NXDN, POCSAG, P25 (selected), User Defined, and ZigBee. Other fields include NAC (293hex), Talk Group ID (0001hex), Source ID (000001hex), and Emergency (unchecked).

**Test Pattern Panel:** Shows the 'Generator' tab with RF Settings (ON), Freq. (763.000000 MHz), Level (-12.00 dBm), and Source (P25). The Mode is Phase1: C4FM, and Deviation is 1.800 kHz. The Data (->RF) dropdown menu is open, showing options: Pattern (1011 selected), Silence, Interference, Busy, Idle, Calibration, and Cancel. Other fields include Symbol Rate, NAC (293hex), Talk Group ID, Source ID, and Emergency (unchecked).

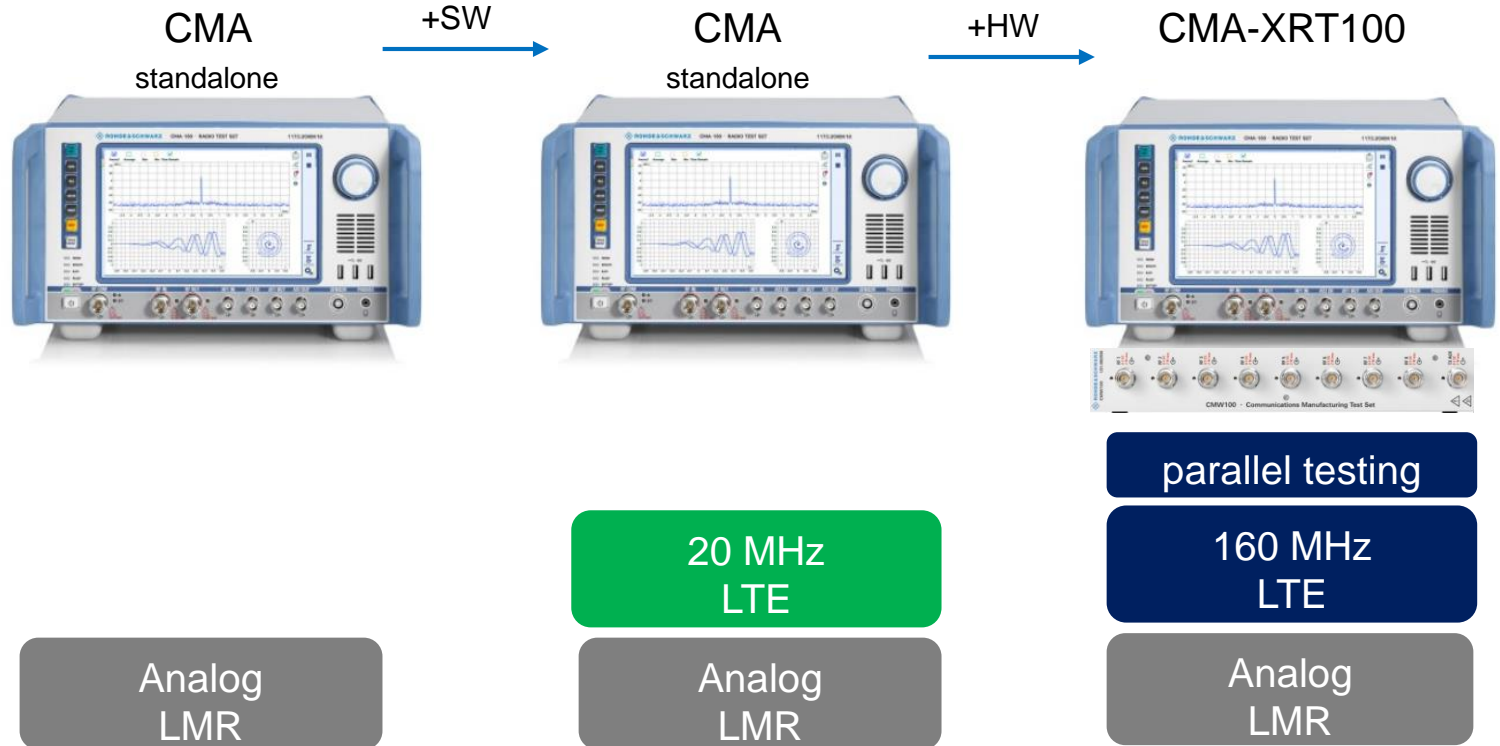
**Signal Parameters Panel:** Shows the 'Generator' tab with RF Settings (ON), Freq. (763.000000 MHz), Level (-12.00 dBm), and Source (P25). The Mode is Phase1: C4FM, and Deviation is 1.800 kHz. The Data (->RF) dropdown menu is open, showing options: Pattern (1011 selected), Symbol Rate (4800 Sym/s), NAC (293hex), Talk Group ID (0001hex), Source ID (000001hex), and Emergency (unchecked).



# LMR TRANSMITTER TEST P25, DMR, DPMR, NXDN, TETRA



# COMING SOON ... CMA-XRT100



# CMA-XRT100

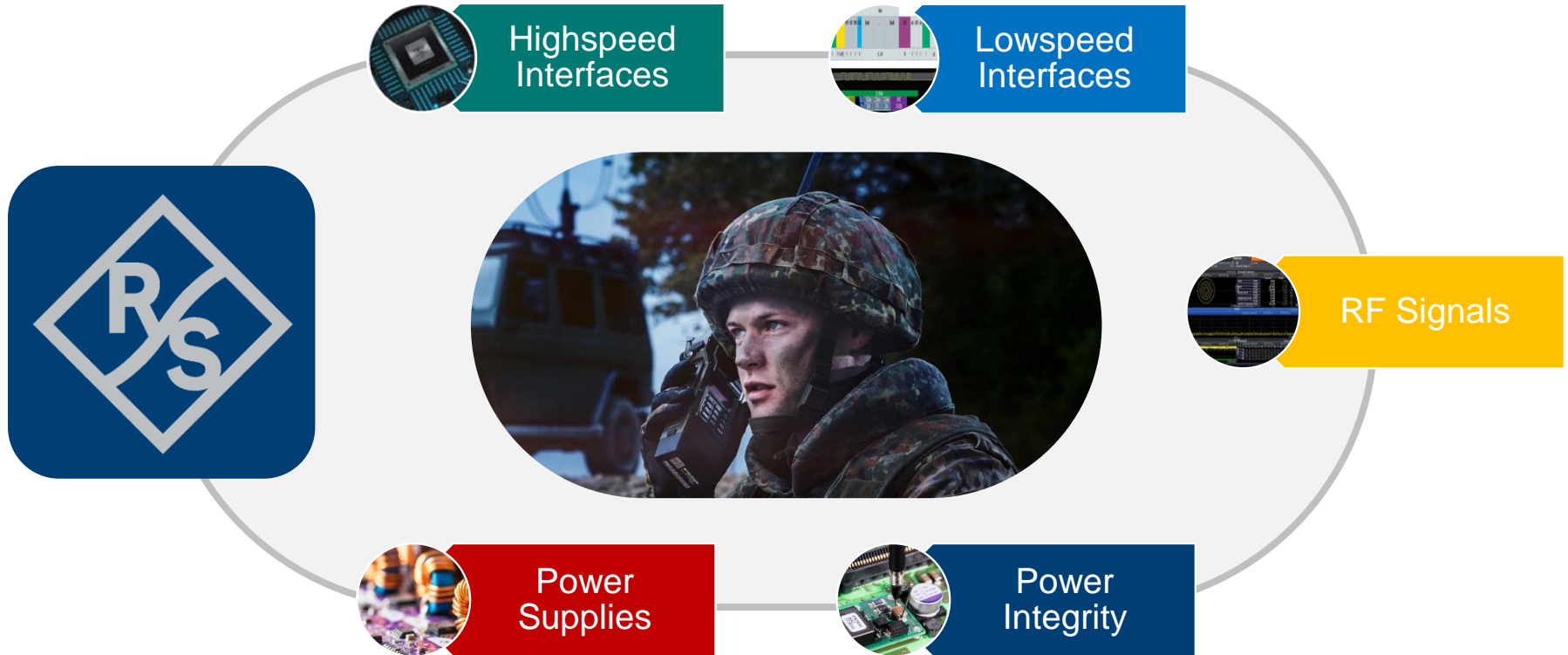


# SUMMARY

R&S addresses T&M needs for RF, highspeed digital and power design.

# TESTING MILCOM RADIOS WITH THE CMA 180 RADIO TEST SET

R&S a reliable partner – providing overall T&M solutions



**THANK YOU FOR YOUR ATTENTION!**