

Conformance Test User Meeting 2026

RF, RRM, PCT CONFORMANCE TEST SOLUTIONS

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Product Management Mobile Conformance and
Operator Testing

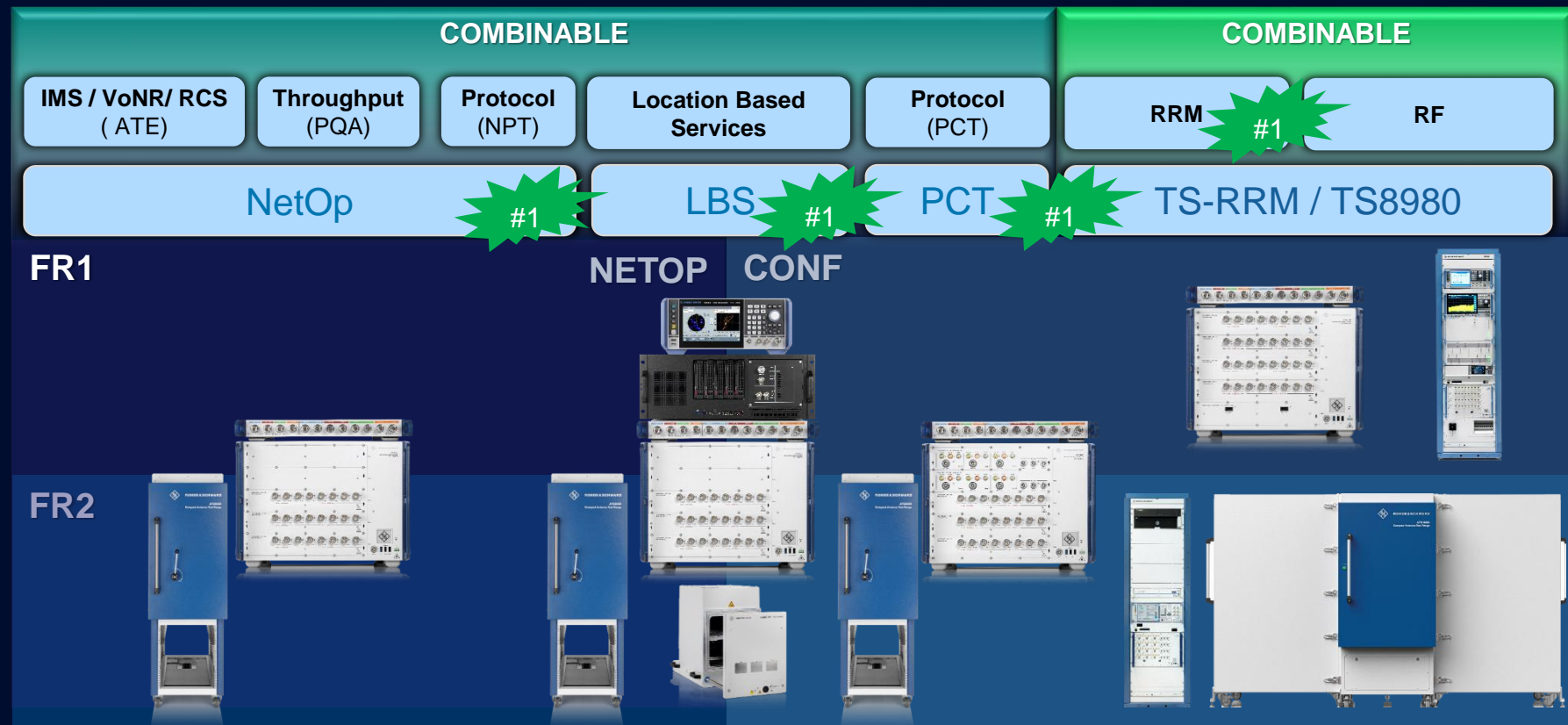
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R&S 5G FR1/FR2 TEST SOLUTIONS OVERVIEW



R&S IN THE NEWS

GCF announces certification of Broadband Mission Critical Services

11 Jun 2024

Collaboration with TCCA supports next generation of MCS products and services

JUNE 11th, 2024

The [Global Certification Forum \(GCF\)](#) today announced that it is adding 3GPP-based Mission Critical Services (MCS) to its certification programme, also referred to as MCX.

MCS and critical communications provide essential voice and data connectivity to first responders, public safety, transportation sectors, and more. The next generation of MCS, also referred to as Broadband MCS, are being deployed on LTE cellular networks and evolving towards 5G, thus providing the services required for emergency response.

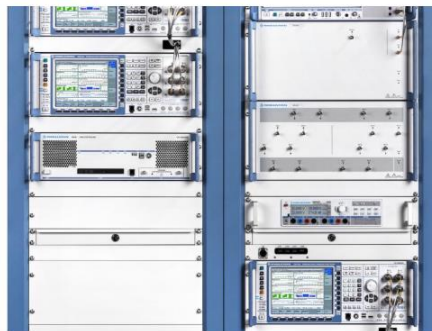
Lars Nielsen, CEO at GCF, said: "This new MCS certification follows a multi-year collaboration between GCF and the members of both organisations at [Mission Critical Services Work Stream](#). For the first time, MCS products can demonstrate conformance of different MCS clients and servers based on global standards maintained by the GCF.

Kevin Graham, CEO at [TCCA](#), said: "Following several years of work from members of TCCA and GCF, we now have an agreement, at industry level, on how to prove compliance of mission critical services to the market – based on global standards with the highest quality requirements."

Munich / 22-May-2024

Rohde & Schwarz first to achieve TPAC for NTN NB-IoT RF and RRM conformance test cases

At the recent Conformance Agreement Group (CAG) meeting #78 of the Global Certification Forum (GCF), Rohde & Schwarz verified NTN NB-IoT test cases for radio frequency (RF) and radio resource management (RRM), successfully meeting all test platform approval criteria (TPAC). The R&S TS-RRM and R&S TS8980 test platforms were approved for every type of NTN NB-IoT test (RF, Demod and RRM), making Rohde & Schwarz the only company to have activated both NTN NB-IoT radio frequency (RF) and radio resource management (RRM) work items (WI) in the GCF.



The R&S TS8980 meets test platform approval criteria (TPAC) by GCF for NTN NB-IoT RF and RRM conformance test cases. (Image: Rohde & Schwarz)

Rohde & Schwarz Achieves GCF Approval for 5G FR2 RRM



Rashmi · February 18, 2025

Less than a minute



Rohde & Schwarz is the first company to obtain Global Certification Forum (GCF) test approval for validating the radio resource management (RRM) performance of advanced 5G New Radio (NR) devices. This approval specifically applies to devices operating in 5G NR standalone (SA) mode within FR2 and capable of managing multiple angles of arrival. It enables device manufacturers to certify their products for global compatibility with mobile networks

and operate in 5G SA with a real 5G core network



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MWC 2025



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AGENDA

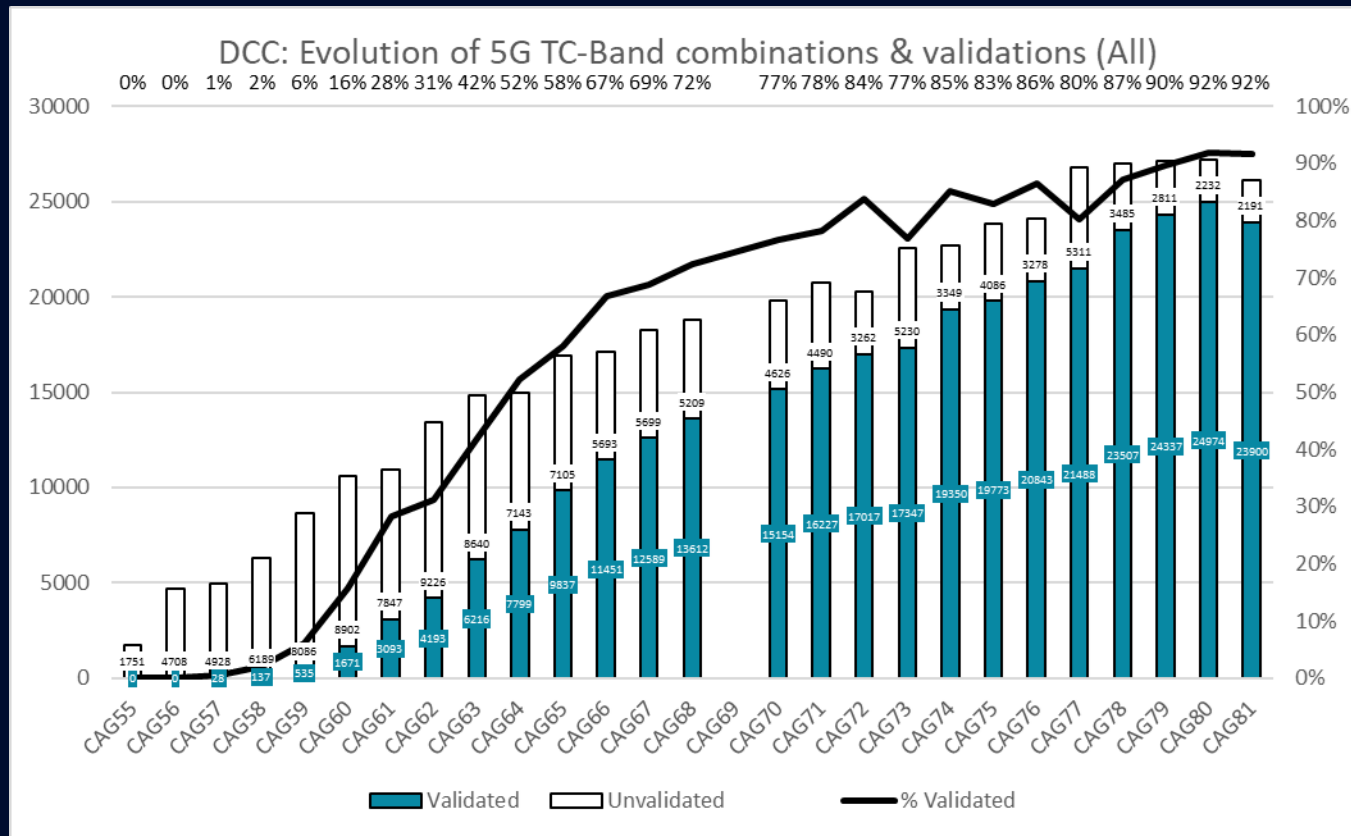
- ▶ Certification Updates
- ▶ Update on NTN
- ▶ Update on FR1 RF / RRM
- ▶ Update on FR2 RF / RRM
- ▶ Update on FR1 / FR2 PCT

Conformance Test User Meeting 2025

CERTIFICATION UPDATES

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VALIDATION PROGRESS: 5G TOTAL



ACTIVATED 5G WIs

Work Item	Work Item Description	Work Item Group	Type Of Test	Test Platforms
WI-500-EN-DC_8A_n77A	5G RF Transmitter and Receiver Conformance Test Band EN-DC_8A_n77A	5G EN-DC_8A_n77A	RF TX-RX	168, 207, 250, 298
WI-501-NR_n258	RRM Conformance Test	5G NR	RRM	296
WI-510-2CC_CA_DL_n1A-n5A	NR 2CC Carrier Aggregation CA_DL_n1A-n5A	5G WIG independent Work Items	Protocol	168, 251, 292
WI-510-2CC_CA_DL_n1A-n5A	NR 2CC Carrier Aggregation CA_DL_n1A-n5A	5G WIG independent Work Items	RF	168, 250, 298
WI-510-2CC_CA_DL_n1A-n5A	NR 2CC Carrier Aggregation CA_DL_n1A-n5A	5G WIG independent Work Items	RRM	168, 207, 250, 296
WI-510-3CC_CA_DL_n28A-n41C	UE conformance tests for NR Inter-band Carrier Aggregation Configurations	5G WIG independent Work Items	RF	168, 250
WI-510-3CC_CA_DL_n41A-n79C	UE conformance tests for NR Inter-band Carrier Aggregation Configurations	5G WIG independent Work Items	RF	168, 250
WI-512-3CC_EN-DC_1A-19A_n79A	WI-512 for 5G EN-DC CA	5G WIG independent Work Items	RF TX-RX	168, 250
WI-512-3CC_EN-DC_3A-21A_n78A	WI-512 for 5G EN-DC CA	5G WIG independent Work Items	RF TX-RX	168, 207, 250
WI-512-3CC_EN-DC_3A-21A_n79A	WI-512 for 5G EN-DC CA	5G WIG independent Work Items	RF TX-RX	168, 207, 250

R&S only
R&S and others
Not on R&S

10 5G WIs / ToT combinations

5 out of 10 on R&S TP

- 1 / 1 Protocol
- 1 / 2 RRM (1 exclusively!)
- 3 / 7 RF

Meeting Document: **CAG-25-025r1**



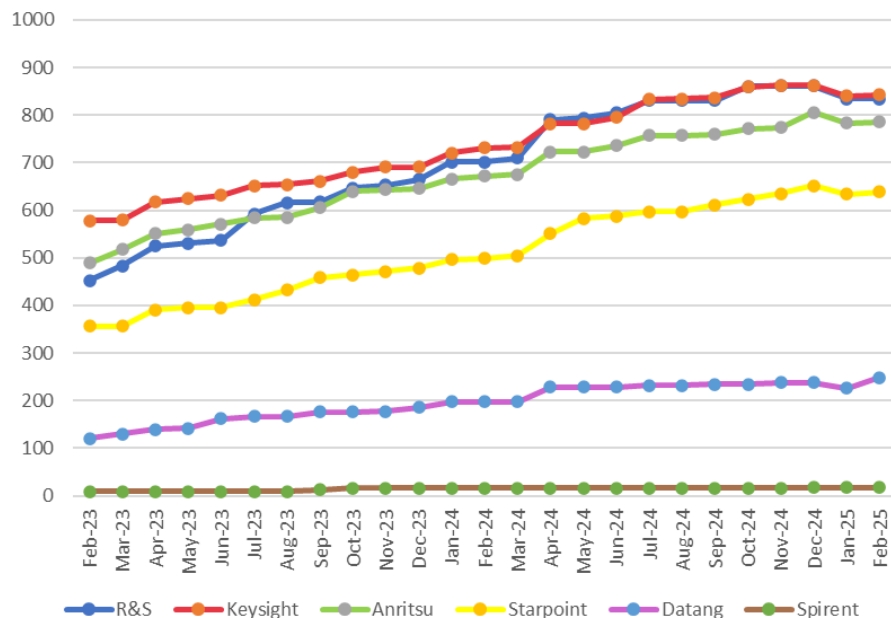
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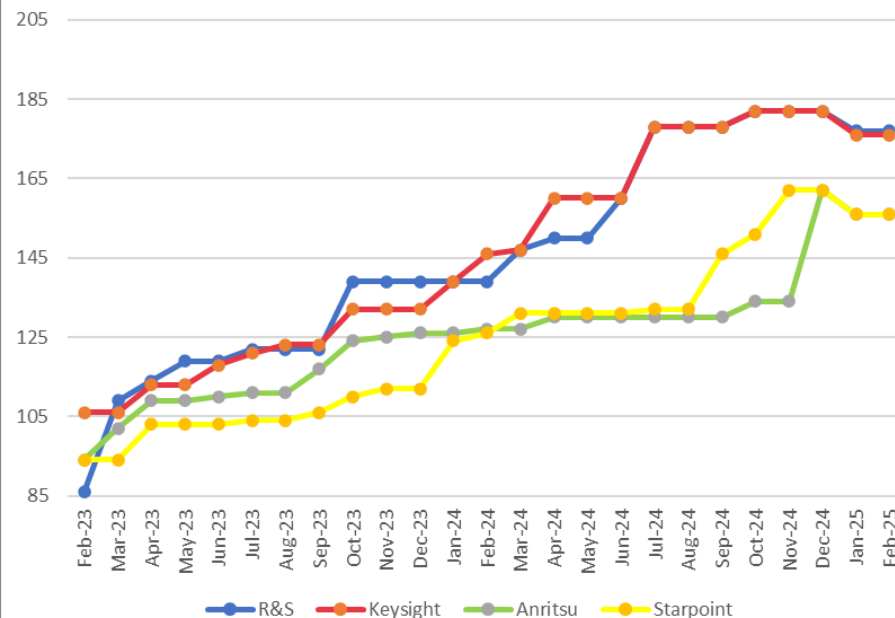
TPAC ANALYSIS OF ALL 5G WORK ITEMS (2/3)

Based on CC 3.96.0 as of 4 March 2025

TPAC: 5G Total

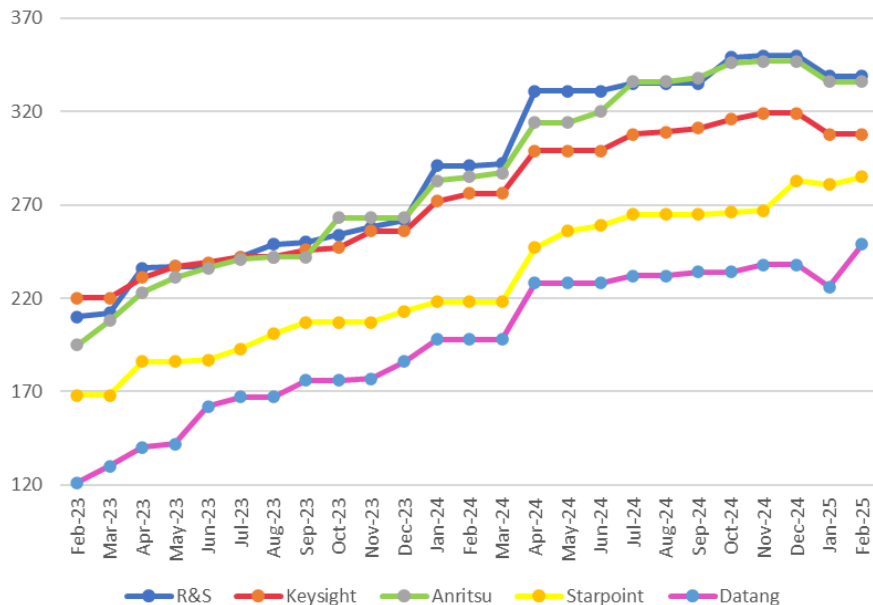


TPAC: 5G RRM

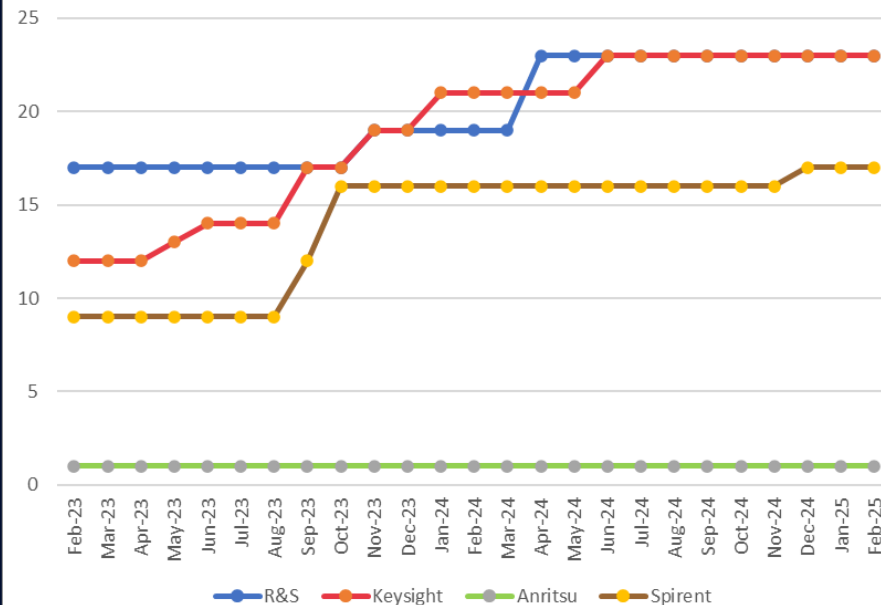


TPAC ANALYSIS OF ALL 5G WORK ITEMS (3/3)

TPAC: 5G Protocol



TPAC: 5G Positioning



SG #101: KEY USE CASES IN 2025/26



GCF Key Use Cases in 2025/26 - Priority A

- ▶ Evolution of 5G advanced (3GPP R18+)
- ▶ **MCX** Services (Rel15+ MC-PTT, MC-Data&Video)
 - Onboarding of MCX operators and manufacturers
 - Enable full certification scheme
- ▶ **NB-NTN**
 - Support of GEO & LEO
 - Membership growth
- ▶ **IoT Cybersecurity** Certification
 - Partnership with IMC
- ▶ **IoT eSIM** (SG.31)
 - Finalize specifications and test solutions

GCF Key Use Cases in 2025/26 - Priority B

- ▶ Technology Mature Areas
 - **Redcap, FWA, Consumer eSIM (SG.21), 400/450MHz bands, FR2**
- ▶ Early Technologies
 - **NR-NTN (Broadband)**
 - **5G NR V2X**
 - **IIoT**
- ▶ Under Investigation
 - Smartphone security
 - MCX server side certification
 - Private Networks
 - Environmental performance of smartphones

SG #102: NEW WORK ITEM PROPOSALS (WIP)

Doc identifier	Title
S-25-037	Work Item Proposal for Rel-19 Alignment of eCall over IMS with CEN
S-25-035	Work Item Proposal for Rel-17 NR NTN
S-25-036	Work Item Proposal for Rel-18 NR Demod Evolution (Link Adaptation)
S-25-034	Work Item Proposal for Rel-16 DL 256QAM for NR FR2

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NON-TERRESTRIAL NETWORKS (NTN)

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NON-TERRESTRIAL NETWORKS

NB-IoT for NTN

Expand to global reach for IoT use cases across land, sea, and air



Diverse set of use cases across all verticals e.g.

- Higher resolution of data points in asset tracking and logistics
- Ubiquitous drone connectivity
- Boat position information
- Wearables connectivity
- Operates for both GEO and LEO altitudes, but predominantly GEO
- 8% of IoT market is addressable by NTN-IoT
- Mainly S/L bands

5G NR for NTN

Extended coverage that complements terrestrial networks



Direct link to smartphones for mission critical and low data services e.g.

- Disaster recovery
- Emergency services
- Financial services – payments
- Predominantly operates at LEO altitude
- 3G like speeds for smartphones <6GHz
- Fixed broadband services on VSATs >10GHz

NB-IOT FOR NTN ON CMW500

NB-IoT for NTN

Expand to global reach for IoT use cases
across land, sea, and air



Diverse set of use cases across all verticals e.g.

- Higher resolution of data points in asset tracking and logistics
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	V3	V2	Rohde & Schwarz GmbH & Co. KG
WI-257	39	17	62
WI-295	10	2	18
WI-333	16	14	16
WI-336	27	84	112
<u>Grand Total</u>	<u>92</u>	<u>117</u>	<u>208</u>

NB-IOT FOR NTN

#1

Rohde & Schwarz Drives Roll-Out of NTN NB-IoT Technology with New GCF-Certified Conformance Test Cases

Mountain View, CA/Munich / 21-Feb-2024
Skylo achieves successful phase 1 validation of NTN test plan with Rohde & Schwarz
Rohde & Schwarz has reached a major milestone: its NTN Netop test solutions have been accepted as part of Skylo's NTN Certification Program.

► CMW-IOT Setup CMW500 (SW upgrade)

- ✓ PCT
- ✓ RF Inband
- ✓ RRM
- ✓ Skylo test plan
 - NPT
 - PQA

► TS8980FTA-3 (SW upgrade)

- ✓ RF IB + OOB
- ✓ RRM

Easy SW upgrade from existing CMW500 or TS8980 to NB-IoT NTN



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5G NTN-NR ON CMX500

- **First PCT test cases verified**
- **GCF**
 - Plan to introduce WI-555 in SG#102 (March 2025)
 - First validations expected in CAG#83 (July 2025)
- **PVG**
 - PVG#107 started work on RFT-555

TP 292



TP 296/298



5G NTN-NR

Extended coverage that complements terrestrial networks



Direct link to smartphones for mission critical and low data services e.g.

- Disaster recovery
- Emergency services
- Financial services – payments
- Predominantly operates at LEO altitude
- 3G like speeds for smartphones <6GHz
- Fixed broadband services on VSATs >10GHz

R&S LEADERSHIP IN NTN NETOP

▶ LTE D2D – TMO Starlink



▶ NB-NTN - VzW



▶ NB-NTN – Skylo



→ See Carrier Acceptance Testing presentation

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FR1 RF/RRM

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3GPP CONFORMANCE 5G FR1 RF / RRM

**Smallest footprint
In the market!**



S-4A Coverage vs. FTA-3A

- TX/RX ~70-80%
- PX 100%
- RRM 100%

TS8980S-4A (TP²⁹⁸)
TS-RRM-NR (TP²⁹⁶)

TS8980FTA-3A (TP²⁹⁸/TP²⁹⁶)
TS8980PRE-3A



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TS8980S-4A

- ▶ One-Box-Test solution, cost-optimized (CAPEX & OPEX)
- ▶ RF Inband (Tx & Rx)
3GPP 38.521-1 & 3
- ▶ RF Demod
(Px: performance)
3GPP 38.521-4
- ▶ RRM 3GPP 38.533
- ▶ Netop
- ▶ All 3gpp bands & CA/MIMO
band combinations
supported

CMX500 OBT FR1 SPECIALIST



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TS8980FTA-3A

5G FR1 RF / RRM

Smooth upgrade
path from LTE

GCF / PTCRB TP 96 / 98 for 2G / 3G / 4G

+ TP 296 / 298 for 5G

① SMW 6/20 GHz
(with 500 MHz BW)

✓ FSW26 GHz

✓ SSCU3

✓ CMWC

✓ Rubidium refer.

✓ CMW500

① New cooling concept

① New CMX



Conformance Test User Meeting 2025

FR2 RF/RRM

3GPP CONFORMANCE + NETOP + CTIA 5G FR2 RF / RRM

T-Mobile



TS8980FTA-M1 / PRE-M1

RF in-band
RRM 1AOA



ATS1800C

RF in-band + out-of-band
RRM 1AOA



ATS1800C
(with automatic feed switcher)

RF in-band + out-of-band
RRM 1AOA + 2AOA



ATS1800M
(with automatic feed switcher)



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3GPP CONFORMANCE VALIDATION ROADMAP

5G FR2 RF / RRM

RF

- WI500
 - **100%** of what is validatable
- WI502 (Demod / Reporting)
 - 100% (July) of validatable
- WI512 (UL CA)
 - **100%** (in July) of validatable

RRM 100% ✓

NetOp:

- **ATT 100%** ✓
- **TMO 100%** ✓
- **VzW 100%** ✓

CTIA: 100% ✓

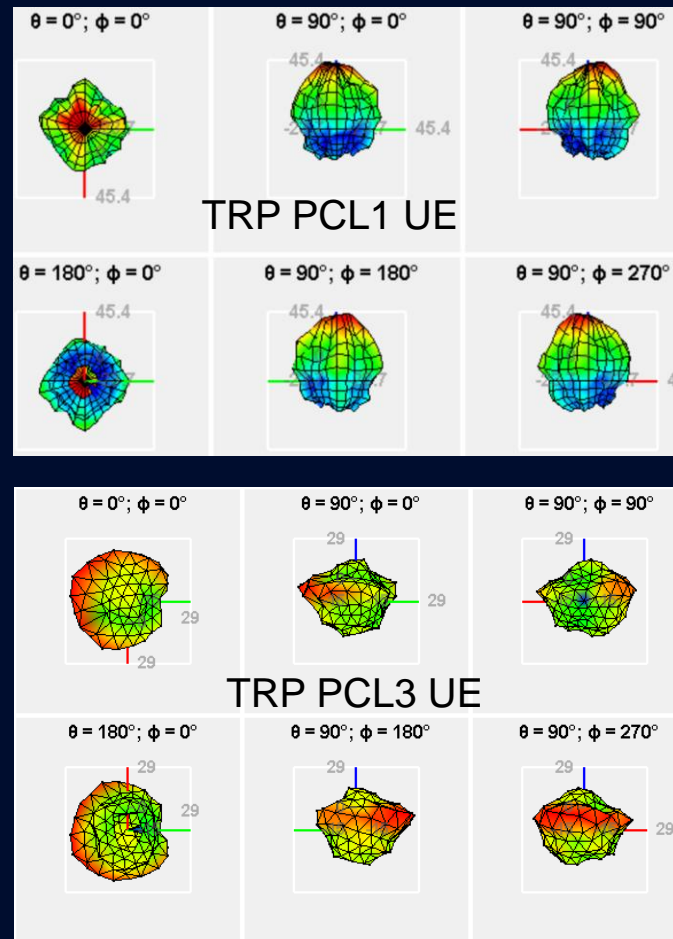
RED: IB and OOB ✓



FEATURE OVERVIEW

Compact, high dynamic, scalable, IB, OOB, ETC, mAoA RRM

- Test plans: 3GPP, CTIA, ATT, VzW, TMO, RED
- All 3GPP TX, RX, Demod TC
- 8CC in DL / 4CC in UL
- UL MIMO Rel.15 and 16
- CBW 50MHz, 100MHz, 200MHz
- Power Class 1, 2, 3, 4, 5, 6
- All types of Grids (Step-Step, Charged Particle; Weighting: Clenshaw-Curtis)
- All UE alignments supported
- Resume functionality
- Stability, recovering mechanism, ETC, ...



R&S CMX500 (TP 292) VALIDATION STATUS

- ▶ **GCF (CAG#78) and PTCRB (PVG#104)**
 - Total **595** individual EN-DC and NR PCT test cases validated
 - Currently **1049** TC validated at PTCRB
 - **> 13500** band combinations in GCF,
 - **>10600** band combinations in PTCRB
- **R&S PCT is leading in GCF TC validation individual and band specific TC count**
- **R&S PCT is leading in PTCRB TC validation individual and band specific TC count**



TP 292



R&S CMX500 (TP 292) VALIDATION STATUS: REDCAP (BAND SPECIFIC)



R&S is leading in PCT RedCap
GCF and PTCRB validation count

Also available on OBT light



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UPGRADE PATH FROM NR FR1 TO FR2

FR1 configuration + **IF boards** + **Remote Radio Head** + **chamber**



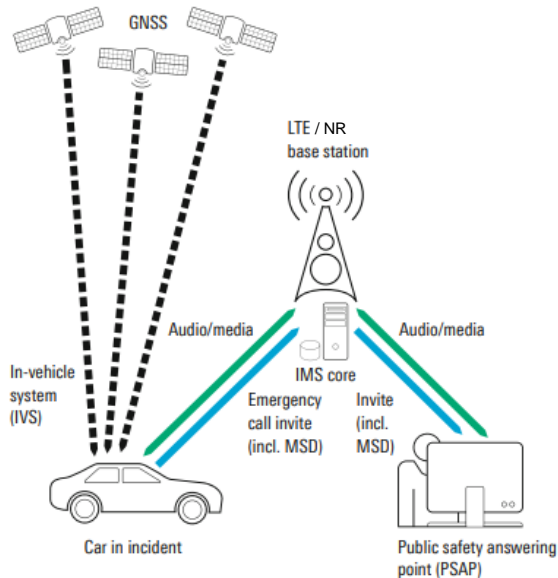


NGeCall

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NGECALL IMPORTANT SPECIFICATIONS

NGeCall system



Important NG eCall PS standards are defined in:

Core Standards:

- CEN / EN 16072 Pan-European eCall operating requirements
- CEN / EN 15722 Intelligent transport systems - ESafety - ECall minimum set of data
- CEN / TS 17184 eCall high level application requirements (HLAP) using IMS packet switched networks

Test Specifications:

- CEN / TS 17240 – eCall end-to-end conformance tests for IMS packet-switched systems

ECALL PROTOCOL CONFORMANCE

► **LTE:** 3GPP 34.229-1. , GCF WI-298

► Solution:

- **GCF test platform 92**
- **CMW500** Mobile Radio Tester Hardware
- **Contest PC**
- **CMW-KK512, LTE IMS eCall**
 - LTE only TCs



ECALL PROTOCOL CONFORMANCE

► **NR:** 3GPP 34.229-5, 38.523-1, GCF WI-537

► Solution:

- **GCF test platform 292**
- **CMX500** Mobile Radio Tester Hardware
- **Contest PC**
- **PCT5-KC , NR IMS eCall**
 - NR and NR-LTE TCs



CONTENT OF PCT5-KC OPTION, GCF WI-537

Test Specification	Test Case	Configuration	Title	Validated
3GPP TS 34.229-5	11.1.NR5GC	NR	eCall over IMS / Manual initiation / Normal registration / Emergency registration / Success / 200 OK with ACK / 5GS	Yes
3GPP TS 34.229-5	11.2.NR5GC	NR	eCall over IMS / Automatic initiation / Normal registration / Emergency registration / Success / 200 OK with ACK / 5GS	Yes
3GPP TS 34.229-5	11.4.NR5GC	NR	eCall over IMS / Manual initiation / MSD transfer and 200 OK with ACK / SIP INFO request for MSD Update / Success / 5GS	Yes
3GPP TS 38.523-1	11.5.1.NR5GC	NR-LTE	eCall Only mode / T3444 / eCall inactivity procedure / Removal of eCall only restriction after an eCall over IMS / 5GS to EPS	No
3GPP TS 38.523-1	11.5.12.NR5GC	NR-LTE	eCall Only mode / 5GS supports IMS voice over PS session / 5GS supports emergency service / eCall over IMS is not supported / eCall over EPS	Yes
3GPP TS 38.523-1	11.5.2.NR5GC	NR-LTE	eCall Only mode / T3445 / eCall inactivity procedure / Removal of eCall only restriction after a call to URI for test service / 5GS to EPS	No
3GPP TS 38.523-1	11.5.3.NR5GC	NR-LTE	eCall Only mode / 5GS supports IMS voice over PS session / 5GS does not support emergency service / eCall over EPS / eCall using eCall using CS domain / eCall failure if EPS and CS domain are not available	No
3GPP TS 38.523-1	11.5.4.NR5GC	NR-LTE	eCall Only mode / 5GS supports IMS voice over PS session / 5GS supports emergency service / eCall over IMS is supported / RACH failure in NR cell / eCall over EPS	No
3GPP TS 38.523-1	11.5.5.NR5GC	NR	eCall Only mode / Limited service state / Call to URI for test service should not be attempted / eCall over IMS should be attempted / 5GS	Yes
3GPP TS 34.229-5	11.5.NR5GC	NR	eCall over IMS / Automatic initiation / MSD transfer and 200 OK with ACK / SIP INFO request for MSD Update / Success / 5GS	Yes
3GPP TS 34.229-5	11.6.NR5GC	NR	eCall over IMS / Automatic initiation / MSD transfer and 200 OK with ACK / SIP INFO request for unsupported MSD / UE indicates unsuccessful in SIP INFO / 5GS	Yes
3GPP TS 38.523-1	8.1.4.1.10.NR5GC	NR	eCall Only mode / Intra NR handover / Success / Inter-frequency	Yes



MISSION CRITICAL SERVICES

MISSION CRITICAL SERVICES (MCS)

Mission Critical Services (Mission Critical Push-To-Talk - MCPTT, Mission Critical Data - MCData and Mission Critical Video - MCVideo, collectively known as MC or MCX services) have all been standardised in 3GPP

Benefit of 3GPP standardization:

MC Services benefit from the use of multicast bearers in LTE due to the standardisation of eMBMS and Group Communication System Enablers (GCSE). Additionally, D2D Proximity Based Services (ProSe) was enhanced to support public safety use.

MISSION CRITICAL (MCX) NETWORKS

Mission Critical

Fire brigade



Ambulance



Police



Ensure
public
safety



- ▶ Narrowband networks (P25, TETRA) cannot serve broadband as needed
- ▶ Moving towards 4G/5G cellular networks
- ▶ 3GPP has defined a standard architecture for MCX services

Reliable MCX networks are critical for first responders to save lives! → Testing is essential

3GPP MCX DEVICE REQUIREMENTS AND SERVICES



- ▶ MC-PTT
- ▶ MC-Data
- ▶ MC-Video
- ▶ Ruggedized
- ▶ Frequency Bands (FR1/FR2)
- ▶ NTN
- ▶ PTT Hard Key
- ▶ High Power UE Class (31dBm)
- ▶ Robust Battery and Re-charge Cycles
- ▶ QoS Bearer with Mission Critical QCI/5QIs
- ▶ 3GPP Conformance (GCF MCX)
- ▶ ...



INTEROPERABLE SOLUTIONS REQUIRE CERTIFICATION

GCF announces certification of Broadband Mission Critical Services

11 Jun 2024

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And yes, we did it:

We validated 36TC for WI-288 on CAG#78bis

- The WI is activated
- TP292 R&S is the only validated platform
- TCs available with PCT4-KC option on CMX500



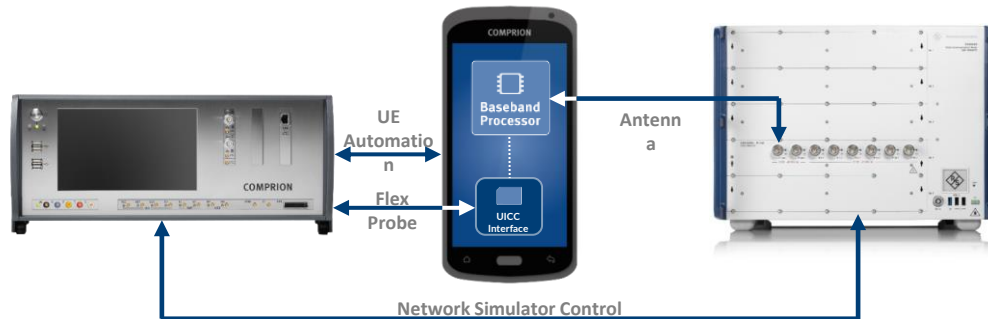
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5G USIM/USAT

SOLUTION WITH COMPRION: SIMFONY CMX500 (*)

COMPRION UT³:
UICC simulation
and user interaction
automation



R&S CMX500
OBT Lite

- 5G USIM/USAT test case packages for all GCF Work Items / PTCRB RFTs
- Validated test case package for Verizon Wireless for its VZW 5G NR SA Supplemental UICC Test Plan
- COMPRION's Device Test Center (DTC) as powerful E2E test management platform
- Test platform GCF & PTCRB approved (TP227)
- Cost-efficient variant available for pre-conformance
- Also 2, 3, 4G, NB-IoT, CAT M1 test case packages available on R&S CMW500

(*) More details can be provided in a separate document – please just request.

Thank you very much

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