Conformance Test User Meeting 2023

LOCATION BASED SERVICES (LBS)

Ewald Zelmer

ROHDE&SCHWARZ

Make ideas real

Conformance Test User Meeting 2022

BREAKING NEWS

e112

Delegated Regulation (EU) 2019/320

TS8991

API-3rd parties

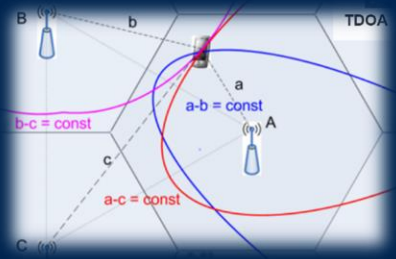
API-ETS

CTIA OTA LBS A-GNSS

PosSIB

UL-TDOA

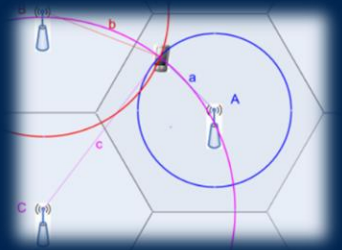
DL-TDOA

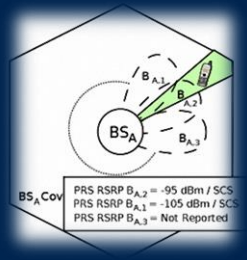


AoD

AoA

RTT





3GPP Release 16 Features

HARDWARE EVOLUTION

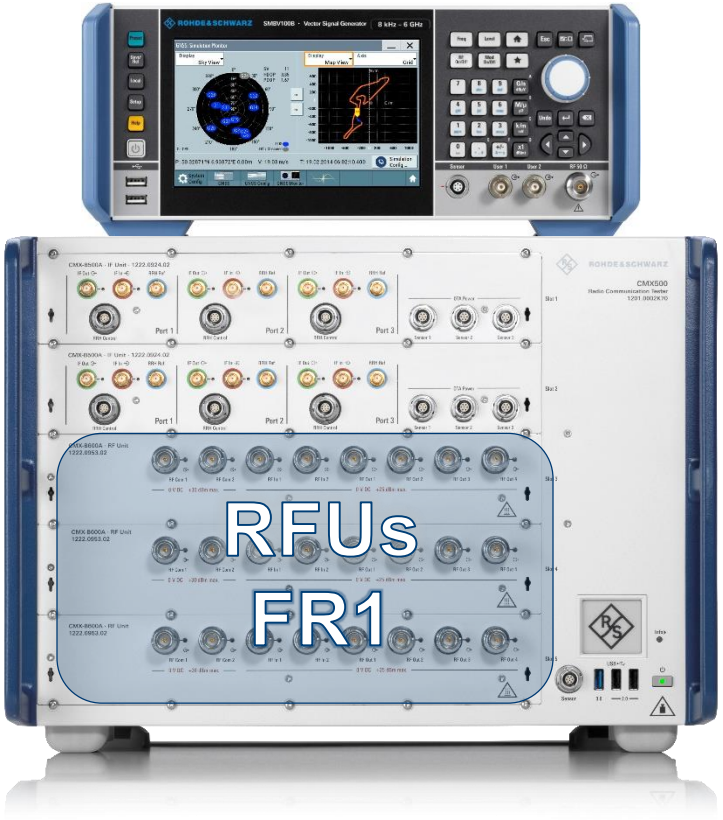
NEW LBS REL.16 HW UPGRADE

- CMX500 to CMX500 OBT
- Compact solution
- FRU inside CMX500
- CMW500 not required

Software upgrade

- Rel.16 stack extension
- LBS Server extension
- TC packages
- Multi-Cell Rel.16 Support
- Supporting all 5G NR TCs

Available now



FR2 TS-LBS-NR TURNKEY CONFORMANCE TEST SYSTEM

- Adding CMX IF boards
- Adding CMQ500 or ATS800R
- Adding RRH

FR2 extension

LBS SYSTEMS
API

TS8991

API-3rd parties

API-ETS

CTIA OTA LBS
A-GNSS

CTIA validation expected soon

CTIA OTA LBS

5G NR OTA GNSS TEST SOLUTIONS

R&S Turnkey solution

LBS system

+

WPTC CHAMBER

+

CONTEST SW

R&S TS 8991 system
R&S Chamber

- Turnkey solution
- R&S WPTC chamber
- R&S Contest SW

Solution for third parties

LBS system

+

LBS SYSTEMS API

+

External Chamber Provider

3rd Party SW

3rd Party Chamber solutions

- LBS OTA API enables easy of integration with 3rd party suppliers

e112

Delegated Regulation
(EU) 2019/320

LTE / 5G NR

emergency call Australia coming soon

effective from 17.03.2022

E112 DELEGATED REGULATION (EU) 2019/320

GUIDELINE DOCUMENT

DELEGATED REGULATION (EU) 2019/320

- **3 Test sections**
  - Section 5: “Galileo compliance” → Lab test
  - Section 6: “AML compliance” → Lab test
  - Section 7: “WLAN location compliance” → Field test

- **Lab Test regime:**
  - Over-the-air (a shielded box is allowed)
  - Dual-Frequency (E1+E5) Signal generator for GNSS
  - Network emulator (for AML and reset commands)
  - A-GNSS is optional

E112
RED REGULATION

- DELEGATED REGULATION (EU) 2019/320
- Effective from 17.03.2022
- Use of GALILEO & WLAN
- 3 Test Sections
  - GALILEO Sec. 5 (lab)
  - AML Sec. 6 (lab)
  - WLAN Sec. 7 (field)

- Optional GSM on CMW only
- LTE/5G NR on OBT

Section 5

- Using NMEA 0183 for evaluation
- 2 Tests for NMEA 0183 compliance and Galileo support
- 2 Tests for performance (Statistical evaluation)
- 1 Test for “Galileo Open Signal Navigation Message Authentication” (OSNMA readiness)

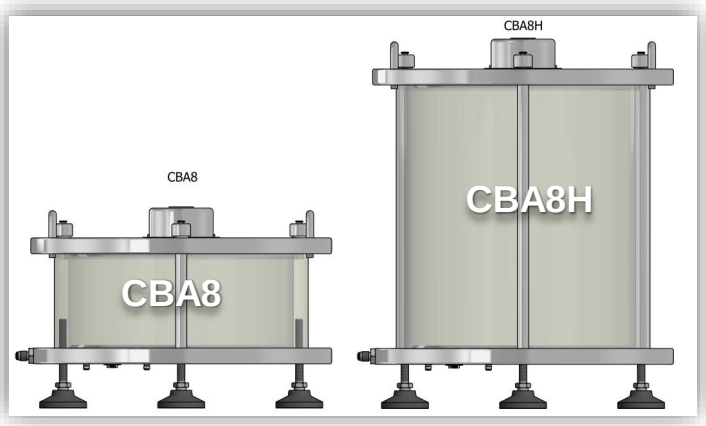
Section 6

- Guideline requires compliance to TS 103 625 V1.1.1 „AML“ specification
- TS 103 625 V 1.1.1 specifies SMS and HTTPS transmission
- No conformance tests in 103 625 → TS 103 825 (under construction by ETSI)
- 11-13 TCs final number depends on notified bodies
- R&S is participating in test development and created pre-standard test cases, which ensure compliance to AML protocol

BAROMETRIC CHAMBER TEST SOLUTION

BAROMETRIC PERFORMANCE TESTS ON LBS

- Barometric performance testing for z-axis
- FCC mandates 3m accuracy
- ELS based Z-axis reporting
- can be placed in temperature chamber
- NEW! Chamber in 2 sizes



leading

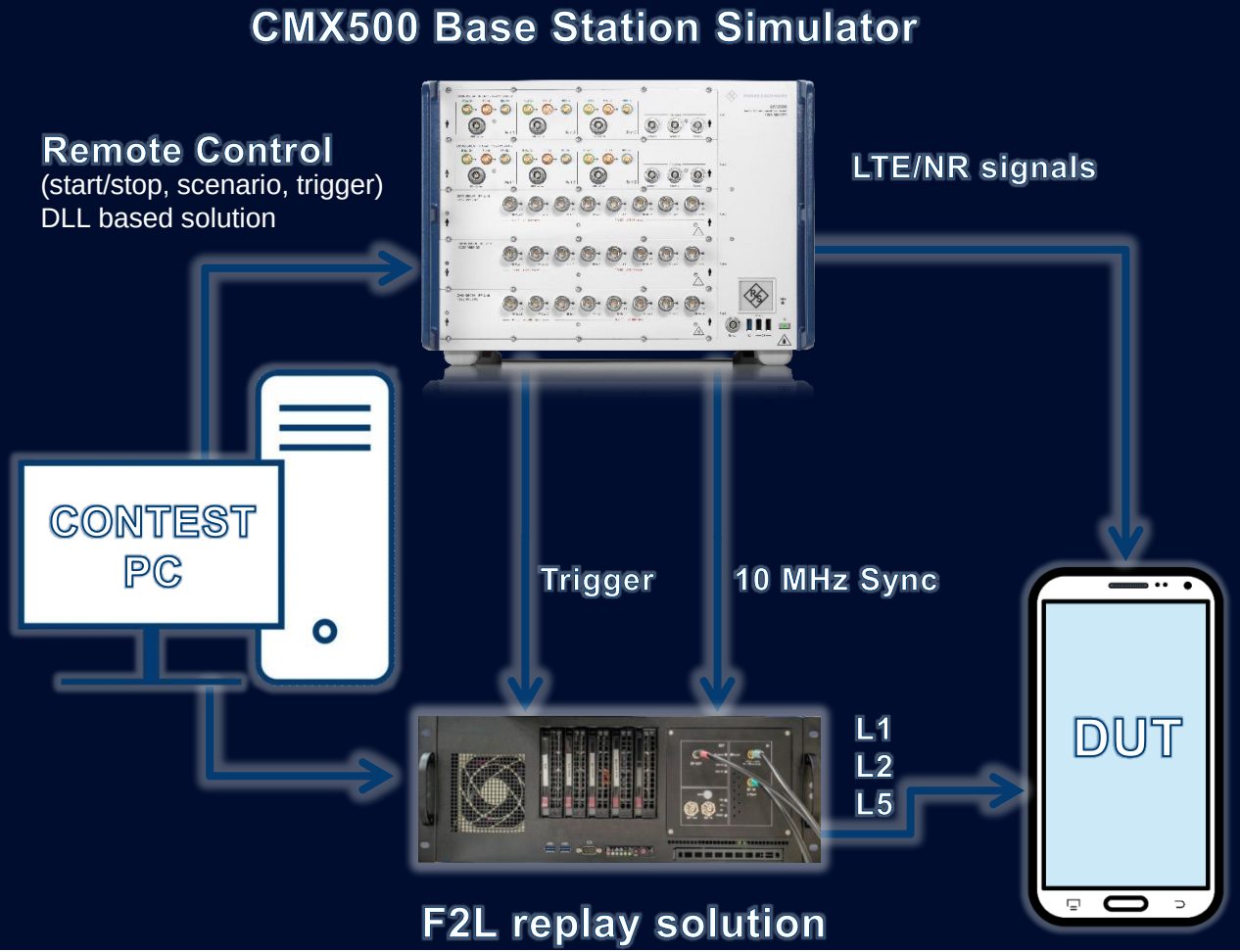
CBA8
Barometric Chamber

MPS46RS Air Data Test Set

5G NR F2L (FIELD TO LAB) TEST SOLUTION

NEW 5G NR F2L SOLUTION

- Support **all** US **NetOps**
- Supports **multi-frequency** (L1E1, L2, L5/E5) GNSS replay
- Replay's **open source GNSS IQ data** formats
- **Synchronized with CMX500** for assisted GNSS scenario
- **One replay box** including recordings on SSD and RF GNSS output



3GPP RELEASE 16 FEATURES

PosSIB

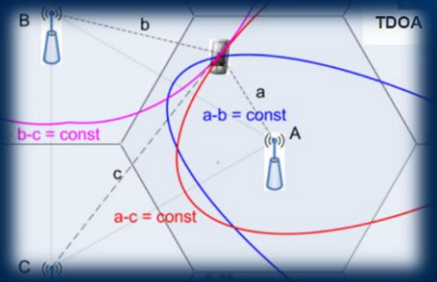
UL-TDOA

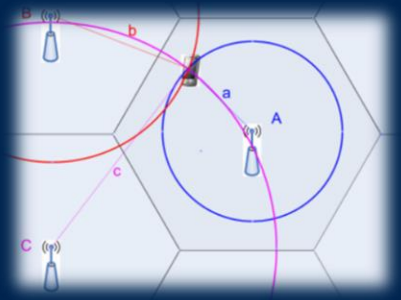
DL-TDOA

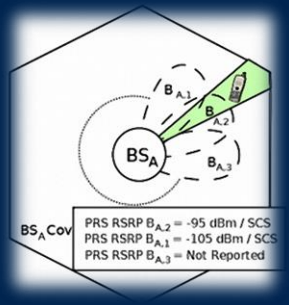
AoD

AoA

RTT





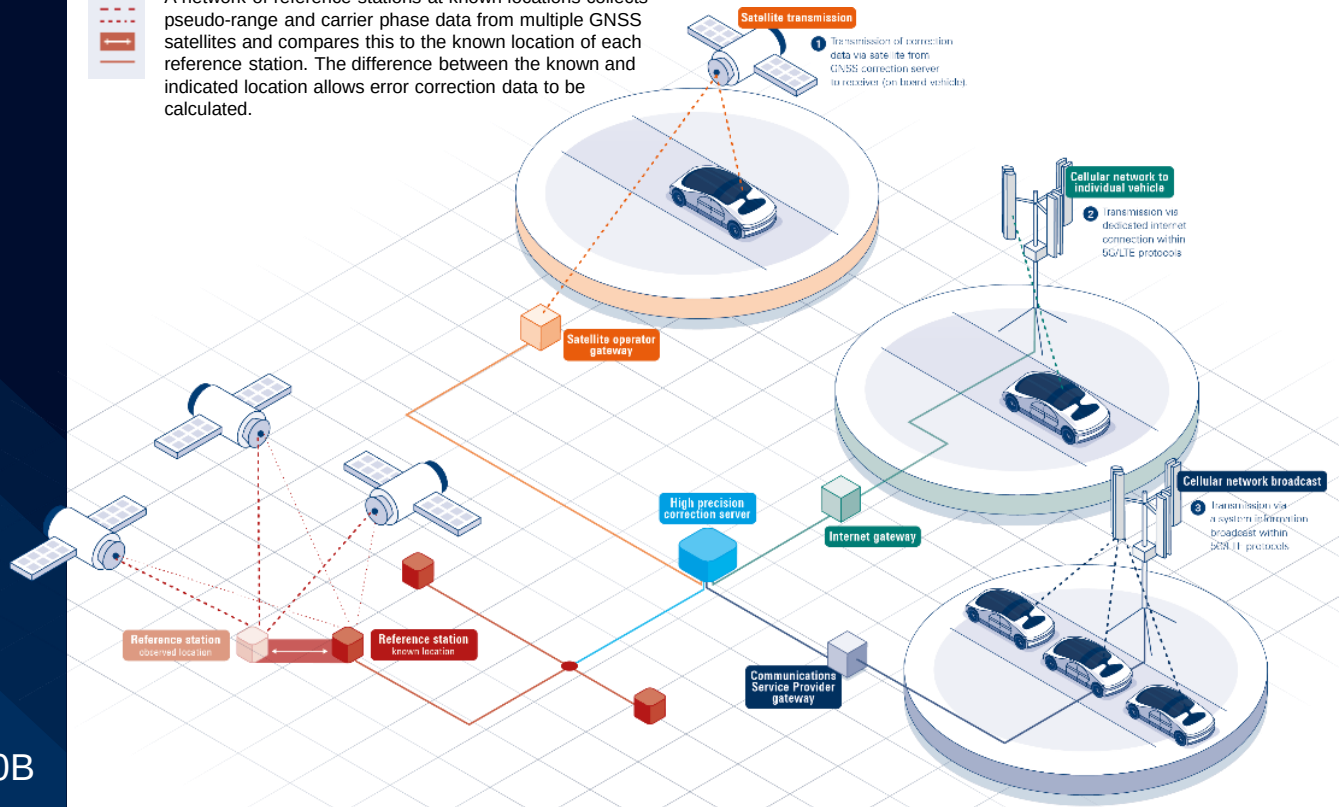


3GPP Release 16 Features

RTK/PPP POSSIB

- High Precision GNSS positions based on RTK/PPP over PosSIB
- 4 key technology pillars
  - High Precision,
  - Global availability,
  - Integrity
  - Continuity of service
- RTK available on SMBV100B
- PosSIB available on OBT

A network of reference stations at known locations collects pseudo-range and carrier phase data from multiple GNSS satellites and compares this to the known location of each reference station. The difference between the known and indicated location allows error correction data to be calculated.



A central high precision correction server processes the collected data and generates measurement corrections (RTK) and/or computes satellite orbit, and clock corrections (PPP)..

The correction data is transmitted from the high precision correction server to the user via three basic methods: Satellite transmission (1), cellular network to individual vehicle (2) and cellular network broadcast (3)..

CANDIDATE RAT BASED TECHNOLOGIES FOR REL.16 NR

DL technologies	• **DL-TDOA:** Downlink Time Difference of Arrival → Relevant for mobile testing • **DL-AoD:** Downlink Angle of Departure
UL technologies	• **UL-TDOA:** Uplink Time difference of Arrival • **UL AoA:** Uplink Angle of Arrival
Mixed UL/DL Technologies **Reference: TR 38.855**	• **RTT: Round Trip Time**, with multi cell support → Relevant for mobile testing • **eCID: Enhanced Cell ID** → Relevant for mobile testing

... leading in all area

TEST CASE COVERAGE

Full 5G LBS support available on CMX500 OBT configuration

Dish SA LBS E911 test plan validated

Verizon SA LBS E911 test plan validated

E112 over 5G conformance test plan available

T-Mobile and AT&T R16 ECID test plan validated

First verification for R16 NPRS signals completed

Official version for 5G OTA LBS systems API Completed

RTK/PPP support new released on SMBV100B

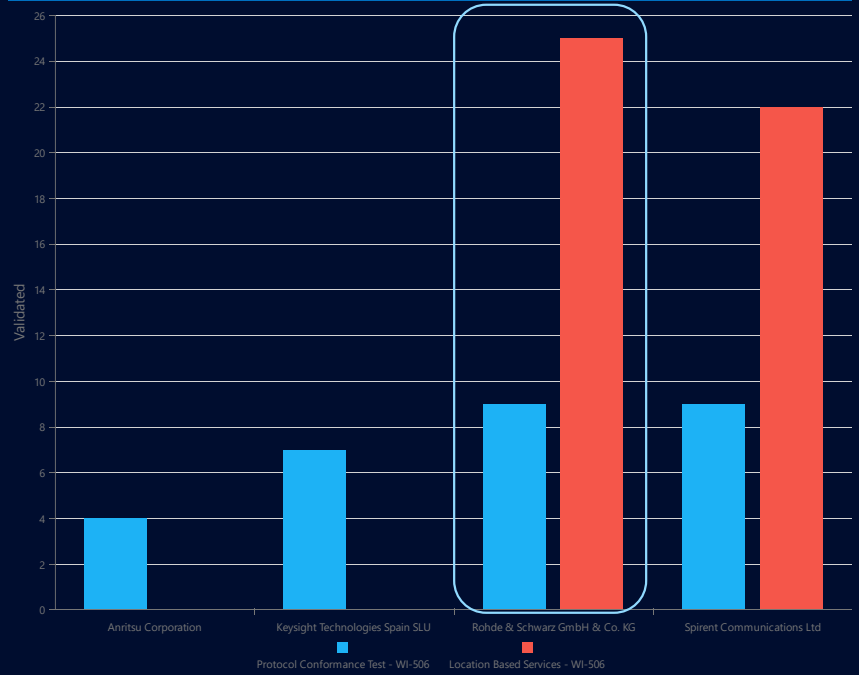
SMBV100A CANNOT be used with upgrade to GNSS 2020

LATEST LBS NEWS

5G VALIDATION STATUS FOR 5G (GCF AND PTCRB) BAND INDEPENDENT

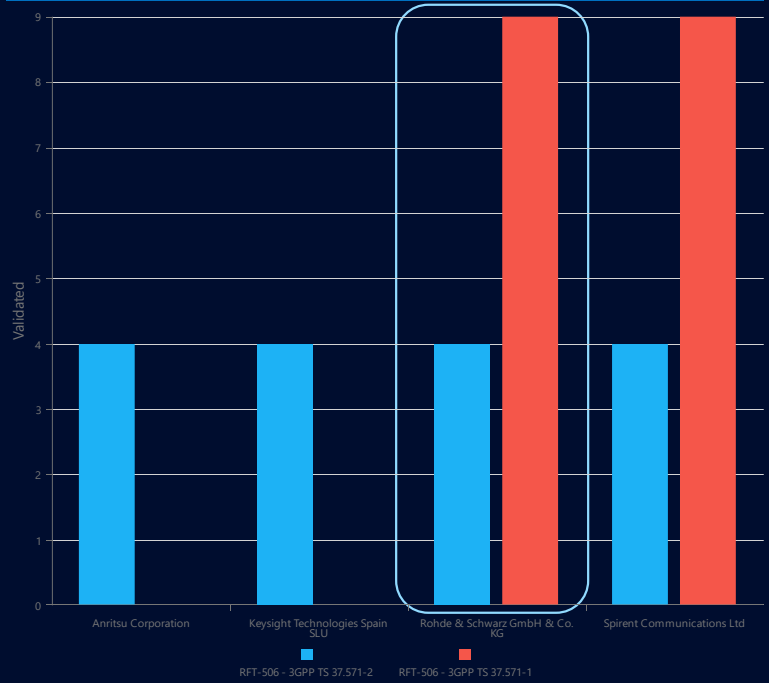
GCF

Competitor Analysis (Band Independent)



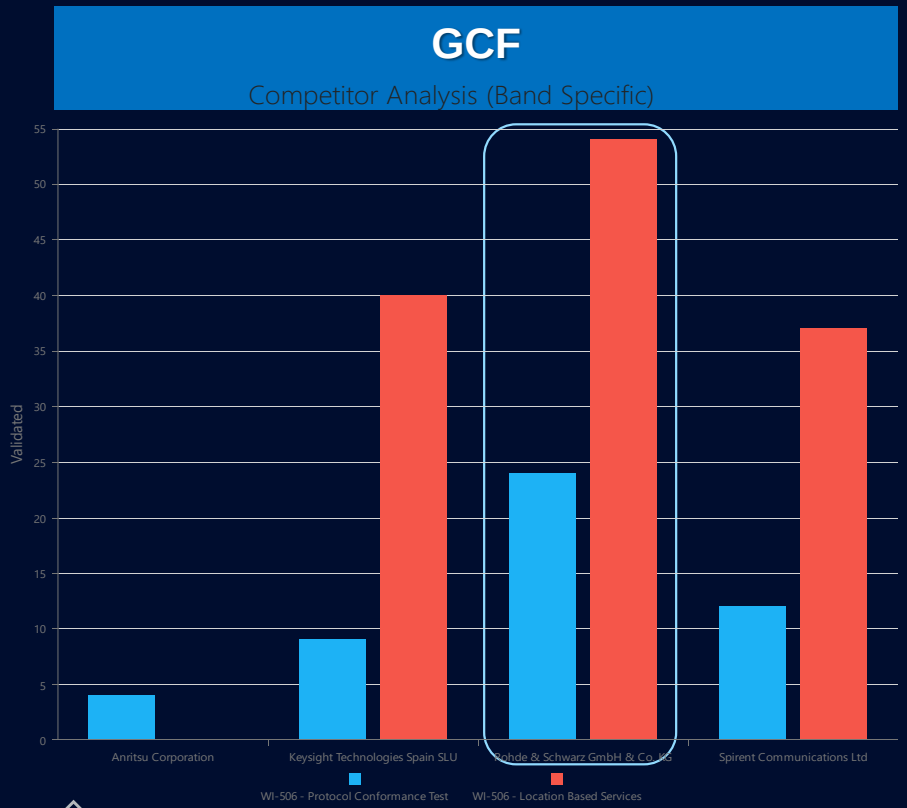
PTCRB

Competitor Analysis (Band Independent)

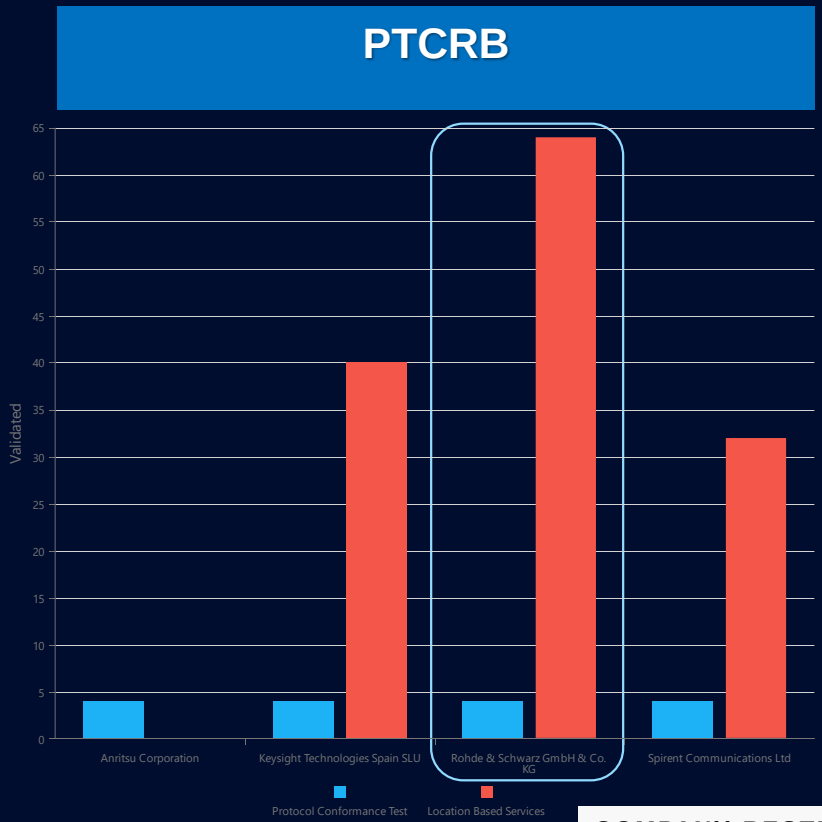


5G VALIDATION STATUS FOR 5G (GCF AND PTCRB) BAND SPECIFIC

GCF



PTCRB



Thank you for your attention!

"If you want to go fast, go alone.
If you want to go far, go together!"

African proverb