# TS-LBS LOCATION BASED SERVICES

### LATEST NEWS AND FUTURE OUTLOOK

Ewald Zelmer Product Management Mobile Conformance and Operator Testing

#### **ROHDE&SCHWARZ**

Make ideas real



#### LBS NEWS LBS GENERAL OVERVIEW



A-GNSS Minimum Performance	LBS Protocol Conformance	Network Based Positioning OTDOA/eCID	Operator Acceptance Field2Lab	LBS Hybrid	5G NR	Indoor Positioning	LBS Development Features	A-GNSS OTA	RED EN 303 413 L1+L2/L5 e112
LTE A-GNSS	OMA SUPL2.0 TTCN3	LTE OTDOA eCID	Verizon AT&T	LTE A-GNSS Hybrid	5G NR FR1 SA/NSA	WLAN BT-LE	Margin Search PEM Mode User def Scenarios OTDOA/	Verizon LTE GPS Verizon 5G NR A-GNSS CTIA 4.0	Adjacent frequency band
WCDMA A-GNSS	LTE LPP C-Plane	Inter- band OTDOA	T-Mobile DoCoMo	LTE A-GNSS OTDOA	5G NR FR1 Rel.16	Barom.			Receiver spurious emissions
GSM A-GPS	WCDMA RRC C-Plane	CA OTDOA	Softbank	Position Calcul.	5G NR FR1 PosSIB	LPP R13	LBS	LTE A-GNSS CTIA	e112 LTE 5G-NR
3Const. GNSS	GSM RRLP C-Plane	NB-loT eMTC	Boost		5G NR FR2 SA/NSA	ToF/TOA	Testing GPS, GLONASS, BeiDou Galileo	SG-NR A-GNSS CTIA 5G-NR 3rd party API	



### HARDWARE UPGRADE PATH

### **R&S 5G FR1 TEST SOLUTIONS OVERVIEW**



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### **R&S 5G FR1/FR2 TEST SOLUTIONS OVERVIEW**



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### NEW LBS REL.16 HW UPGRADE

- CMX500 to CMX500 OBT
- RFU inside CMX500
- CMW500 not required

#### Software upgrade

- R15 no additional SW required
- Rel.16 stack extension
- LBS Server R16 extension
- ► Multi-Cell Rel.16 Support
- ► Supporting all 5G NR TCs

### RFUs FR1







#### FR2 TS-LBS-NR TURNKEY CONFORMANCE TEST SYSTEM

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



## **FR2** extension



### UPGRADE PATH PARALLEL TESTING

- ► split into 2 Setups:
  - 2x SMBV100B
  - -NR
  - Legacy
- CMX+CMW (setup1+2) is deprecated from mid 2024
- R16 onwards updates available on OBT only





### SPLIT TS-SB TO 5G AND LEGACY

- Reuse one SMBV100B
- TS-SB-CMX split to 5G system and Legacy system
- Either 2 different Contest PC can be used or 2 different contest installations
- 5G and legacy cannot be run in sequence due to single SMBV100B
- Minor re-cabeling may be needed



Sharing SMBV100B









TS8991 API-3rd parties API-ETS CTIA OTA LBS A-GNSS validated with CTIA 01.1 v6.0.x

OTA A-GNSS on TS8991

3<sup>rd</sup> party API with EMQuest from ETS

TS8991 & API CTIA validation and listed CTIA OTA LBS



### **5G NR OTA GNSS TEST SOLUTIONS**





#### TS8991: 5G NR FR1 OTA - WHAT HAS TO BE MEASURED?

#### ... again TRP and TIS

- TRP = Total Radiated Power is an spatially average of EIRP measurements ≈ Max output power but radiated
- TIS = Total Isotropic Sensitivity is an spatially average of EIS measurements ≈ Reference sensitivity but radiated

#### ... in a full 3D fashion

- Elevation
- Azimuth
- Two polarizations

... but because of the lower frequency range in a WPTC size chamber with a conical cut scan in a direct far field







## For OTA GNSS is just TIS required



#### OTA 5G NR GNSS FR1 ON TOP OF TS8991

# OTA 5G NR FR1 LBS upgrades on TS8991

- ► Reuse all TS8991 HW
- Reuse existing CONTEST SW
- adding SMBV100B
- adding LBS Framework
- adding TC Packages





R&S TS8991 system with R&S Chamber

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

#### **R&S Turnkey solution**





#### OTA 5G NR GNSS FR1 ON TOP OF 3<sup>RD</sup> PARTY OTA SOLUTION

OTA 5G NR FR1 GNSS upgrade on ETS OTA Solution

- Reuse all 3rd Party HW+SW
- Adding CMX as OBT
- Adding SMBV100B
- Adding LBS Framework
- Adding LBS API (Remote Control Software)



#### **TS-LBS-NR**



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Rohde & Schwarz

#### e112



GUIDELINES FOR COMPLIANCE WITH DELEGATED REGULATION

Delegated Regulation (EU) 2019/320



### E112 DELEGATED REGULATION (EU) 2019/320

### GUIDELINE DOCUMENT

#### DELEGATED REGULATION (EU) 2019/320

GUIDELINES FOR COMPLIANCE WITH DELEGATED REGULATION (EU) 2019/320

European Commission, April 2021

#### ► 3 Test sections

- Section 5: "Galileo compliance"
- Section 6: "AML compliance"
- 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



 $\rightarrow$  Lab test

 $\rightarrow$  Lab test

#### **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
- Chamber in 2 sizes





CBA8 Barometric Chamber





### BAROMETRIC PERFORMANCE CHAMBERS

#### ► Small chamber

- Mobiles
- Watches
- Variables

#### Large chamber

- Tablets
- iPads
- Small Notebooks



Name	CBA8	CBA8H
nterior (Diameter x Height) cm	24x10	24x27
Exterior (WxHxL) cm	32x21x32	32x38x32
SMA ports	2	4
JSB ports	1	1
DC input port (for USB Hub)	No	Yes
JSB Hub up to 10 ports (Optional)	No	Yes
Pressure change rate	914 meter/minute	700 meter/minute
Stabilization time	3 minutes	3 minutes



#### **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

#### **CMX500 Base Station Simulator**







#### 3GPP RELEASE 16 FEATURES

## 3GPP Release 16 Features

### RTK/PPP POSSIB AVAILABLE

- 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 CMX





#### SOFTWARE UPGRADES AND FUTURE OUTLOOK

CMX-Z25#2 for LBS specific F2L/GNSS/WLAN signal combination Full 5G LBS support available on CMX500 OBT configuration Boost (Dish) LBS E911 (VoNR, eCID) test plan validated Verizon LBS E911 test plan validated and Verizon OTA LBS test plan released E112 over 5G conformance test plan available Official version for 5G OTA LBS systems API integrated with ETS Lindgren OTA LBS validated for CTIA 01.1 v6.0.x for 5G A-GPS L5 and A-Galileo E1 Migration AMS32 LTE supported with CONTEST on TS8991

#### LATEST LBS NEWS

LTE Release				
Product	Current Version			
TS-LBS products	LBS V11.60 - Contest Base 19.16 (replaces all LBS V10.xx) (SUW support is now stopped)			
5G-NR Release				
Product	Current Version			
TS-LBS-NR products	LBS-NR (OBT) V18.70			

### LATEST RELEASE

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





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





# Thank you for your attention!

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