

FCC TEST REPORT FCC 47 CFR Part 22H ISED RSS-132, Issue 2 Cellular Telephones Operating in the Bands 824-849MHz and 869-894MHz FCC 47 CFR Part 24E ISED RSS-133, Issue 5 2GHz Personal Communication Services	
Report Reference No.	G0M-1812-7888-TFC224GS-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	  FCC Test Firm Designation Number: DE0008 IC Testing Laboratory site: 3470A-2
Applicant's name	Leica Geosystems AG
Address	Heinrich Wild Strasse 9435 Heerbrugg SWITZERLAND
Test specification:	
Standard	47 CFR Part 22H, 47 CFR Part 24E RSS-132, Issue 3: 2013-01, RSS-133, Issue 6: 2013-01
Test scope	partial Radio compliance test
Equipment under test (EUT):	
Product description	Field Controller Win EC7
Model No.	CS20 LTE Disto (US, CA)
Additional Model(s)	None
Brand Name(s)	Leica Geosystems
Hardware version	V1.0
Firmware / Software version	V4.97
	FCC-ID: RFD-CSNGG IC: 3177A-CSNGG
Test result	Passed

Possible test case verdicts:

- neither assessed nor tested : N/N
- required by standard but not appl. to test object : N/A
- required by standard but not tested : N/T
- not required by standard for the test object : N/R
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement : F (Fail)

Testing:

Test Lab Temperature : 20 – 23 °C

Test Lab Humidity : 32 – 38 %

Date of receipt of test item : 2019-01-15

Date (s) of performance of tests : 2019-01-15 - 2019-02-26

Compiled by : Burkhard Pudell

Tested by (+ signature)..... : Burkhard Pudell 

(Responsible for Test)

Approved by (+ signature) : Christian Weber 

(Head of Lab)

Date of issue : 2019-07-16

Total number of pages..... : 67

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

Test case reduction on radiated measurements only is based on the requirements for host integration for full modular approved transmitter modules (KDB 996369 D02) used by the EUT. The EUT uses a module with full modular approval according to FCC and IC rules. For details about the radio module see EUT description in section 1.

ADDITIONAL VARIANTS

Additional Variants (not tested and not evaluated variants)		
Not-tested Variant	Description	
1	Product Type Description	Field Controller Win EC7
	Model name	CS20 LTE (US, CA)
	Brand name	Geosystems
	Hardware Version	V1.00
	Software Version	V4.97
Comment: Those named additional variants above have not been tested. Those additional variants of the series have been declared by the manufacturer. The test report explicitly states that those variants were neither tested nor assessed nor evaluated.		

Version History

Version	Issue Date	Remarks	Revised by
01	2019-07-16	Initial Release	

REPORT INDEX

1	EQUIPMENT (TEST ITEM) DESCRIPTION	6
1.1	Photos – Equipment External	9
1.2	Photos – Equipment internal	11
1.3	Photos – Test setup	14
1.4	Supporting Equipment Used During Testing	15
1.5	Test Modes	15
1.6	Test Equipment Used During Testing	18
1.7	Sample emission level calculation	19
2	RESULT SUMMARY	20
3	TEST CONDITIONS AND RESULTS	21
3.1	Test Conditions and Results – Occupied Bandwidth	21
3.2	Test Conditions and Results – Effective radiated power / Equivalent isotropic radiated power	59
3.3	Test Conditions and Results – Transmitter radiated emissions	63
3.4	Test Conditions and Results – Receiver radiated emissions	66

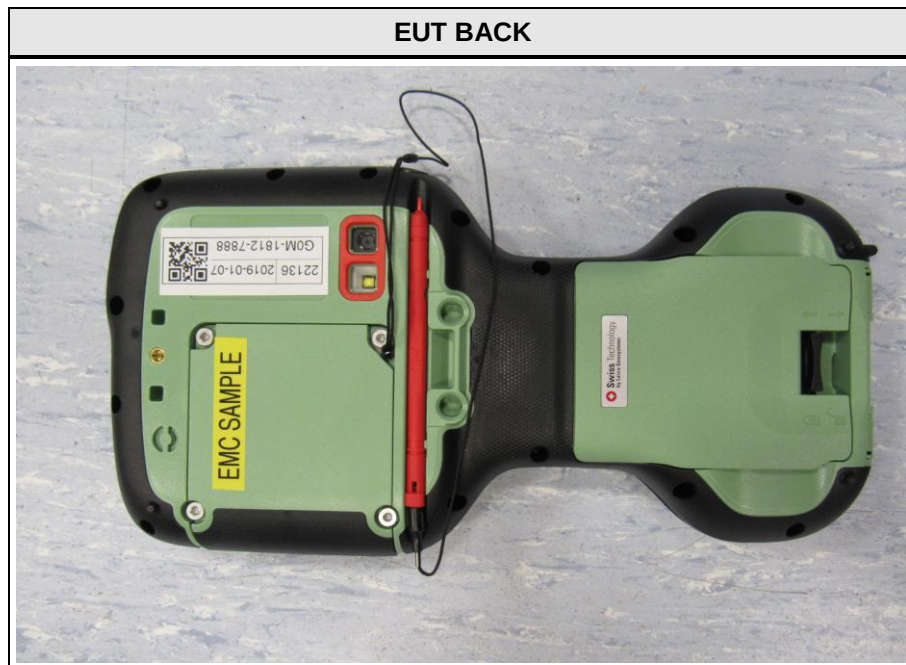
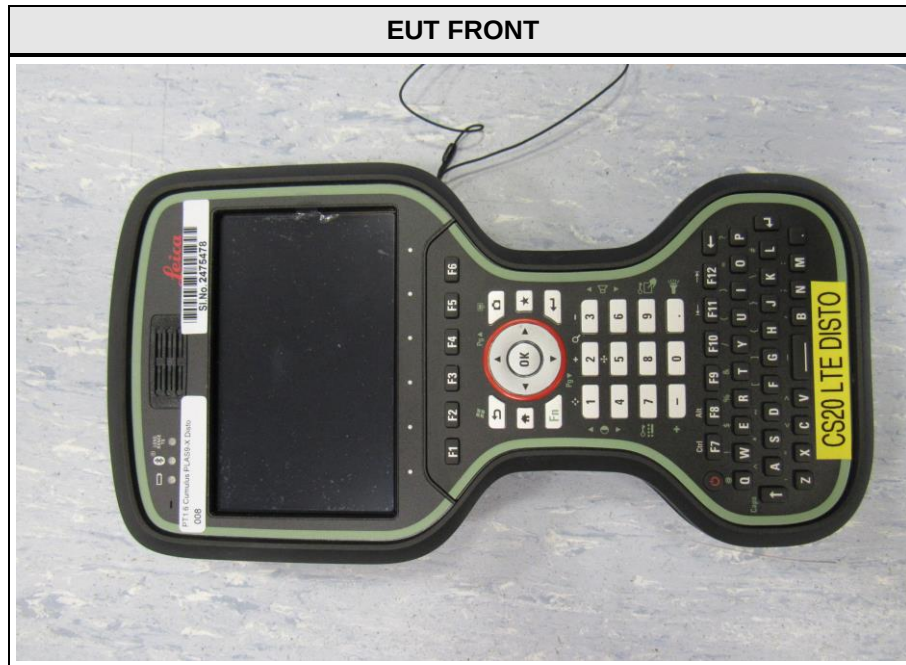
1 Equipment (Test item) Description

Description	Field Controller Win EC7		
Model	CS20 LTE Disto (US, CA)		
Additional Model(s)	None		
Brand Name(s)	Leica Geosystems		
Serial number	2475478		
Hardware version	V1.0		
Software / Firmware version	V4.97		
PMN	CS20 LTE Disto, CS20 LTE		
HVIN	CS20 LTE Disto, CS20 LTE		
FVIN	-/-		
HMN	-/-		
FCC-ID	RFD-CSNGG		
IC	3177A-CSNGG		
Equipment type	End product		
Equipment classification	Mobile Device (Human Body distance > 20 cm)		
Radio type	Transceiver		
Radio technology	2G / 3G FDD / 4G FDD		
Operating frequency range	GSM 850 : TX = 824 - 849 MHz, RX = 869 - 894 MHz GSM1900 : TX = 1850 - 1910 MHz, RX = 1930 - 1990 MHz		
Assigned frequency band	Cell. Service Block A & B : 824 - 849 MHz & 869 - 894 MHz Broadband PCS : 1850 - 1910 MHz & 1930 - 1990 MHz		
Main test frequencies GSM850	F _{LOW}	CH : 128 UL: 824.2 MHz	CH : 128 DL: 869.2 MHz
	F _{MID}	CH : 188 UL: 836.2 MHz	CH : 188 DL: 881.2 MHz
	F _{HIGH}	CH : 251 UL: 848.8 MHz	CH : 251 DL: 893.8 MHz
Main test frequencies WCDMA FDD V	F _{LOW}	CH : 4133 UL: 826.6 MHz	CH : 4358 DL: 871.6 MHz
	F _{MID}	CH : 4175 UL: 835.0 MHz	CH : 4400 DL: 880.0 MHz
	F _{HIGH}	CH : 4232 UL: 846.4 MHz	CH : 4457 DL: 891.4 MHz
Main test frequencies LTE FDD 5	F _{LOW}	CH : 20450 UL: 829.0 MHz	CH : 2450 DL: 874.0 MHz
	F _{MID}	CH : 20525 UL: 836.5 MHz	CH : 2525 DL: 881.5 MHz
	F _{HIGH}	CH : 20600 UL: 844.0 MHz	CH : 2600 DL: 889.0 MHz

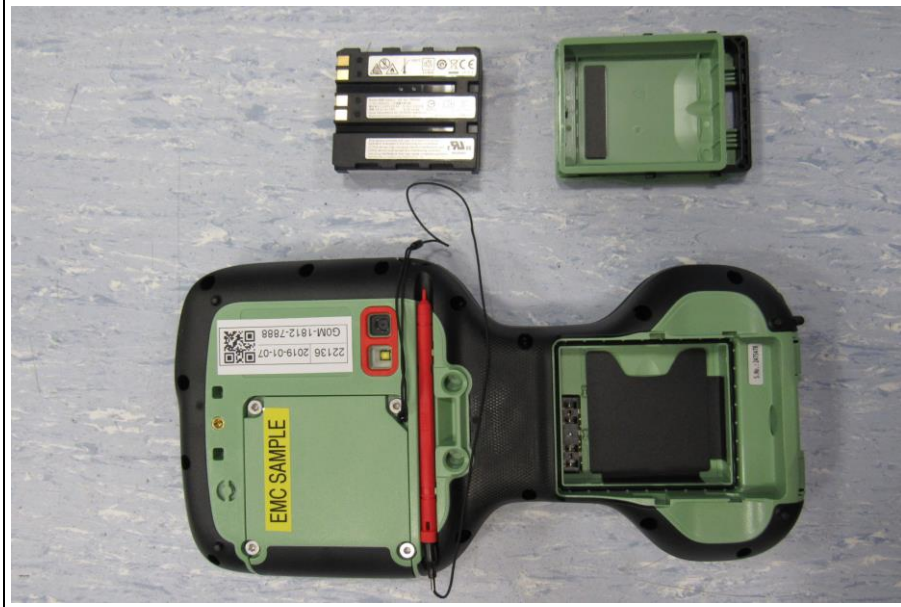
Main test frequencies GSM1900	F _{LOW}	CH : 512 UL: 1850.2 MHz	CH : 512 DL: 1930.2 MHz
	F _{MID}	CH : 661 UL: 1880.0 MHz	CH : 661 DL: 1960.0 MHz
	F _{HIGH}	CH : 810 UL: 1909.8 MHz	CH : 810 DL: 1989.8 MHz
Main test frequencies WCDMA FDD II	F _{LOW}	CH : 9263 UL: 1852.6 MHz	CH : 9663 DL: 1932.6 MHz
	F _{MID}	CH : 9400 UL: 1880.0 MHz	CH : 9800 DL: 1960.0 MHz
	F _{HIGH}	CH : 9537 UL: 1907.4 MHz	CH : 9937 DL: 1987.4 MHz
Main test frequencies LTE FDD 2	F _{LOW}	CH : 18650 UL: 1855.0 MHz	CH : 650 DL: 1935.0 MHz
	F _{MID}	CH : 18900 UL: 1880.0 MHz	CH : 900 DL: 1960.0 MHz
	F _{HIGH}	CH : 19150 UL: 1905.0 MHz	CH : 1150 DL: 1985.0 MHz
Supported transmission modes	GSM		GPRS, EGPRS
	WCDMA		RMC+HSPA
	LTE		RMC
Modulations	GSM		GMSK, 8-PSK
	WCDMA		QPSK, 16-QAM
	LTE		QPSK, 16-QAM
Number of antennas	2		
Radio module	Type	2G/3G/4G module	
	Model	PLAS9-X	
	Manufacturer	Gemalto	
	HW Version	4.2	
	SW Version	01.001	
	FCC-ID	QIPPLAS9-X	
	IC	7830A-PLAS9X	
Antenna A (TX + RX)	Type	integrated	
	Model	W3796	
	Manufacturer	Pulse Electronics	
	Gain	680- 980 MHz = <2 dBi 1700-2700 MHz = <5 dBi	
Antenna B (RX)	Type	integrated	
	Model	W3796	
	Manufacturer	Pulse Electronics	
	Gain	680- 980 MHz = <1 dBi 1700-2700 MHz = <3 dBi	

Manufacturer	Leica Geosystems AG Heinrich Wild Strasse 9435 Heerbrugg SWITZERLAND	
	V _{NOM}	11.1 VDC (Battery)
	V _{MIN}	7.5 VDC (Battery)
	V _{MAX}	12.6 VDC (Battery)
Power supply	Model	GEV276
	Vendor	Leica Geosystems
	Input	100 - 240 VAC
	Output	15 VDC
AC/DC-Adaptor		

1.1 Photos – Equipment External



EUT BACK OPEN

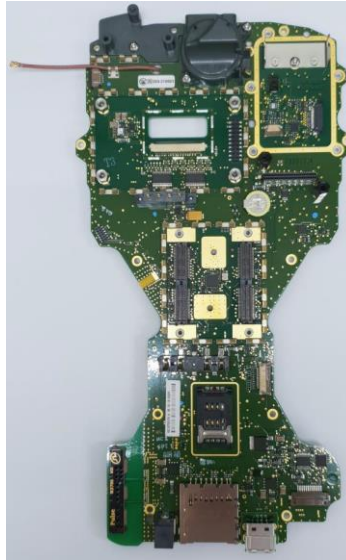


EUT BOTTOM INTERFACE



1.2 Photos – Equipment internal

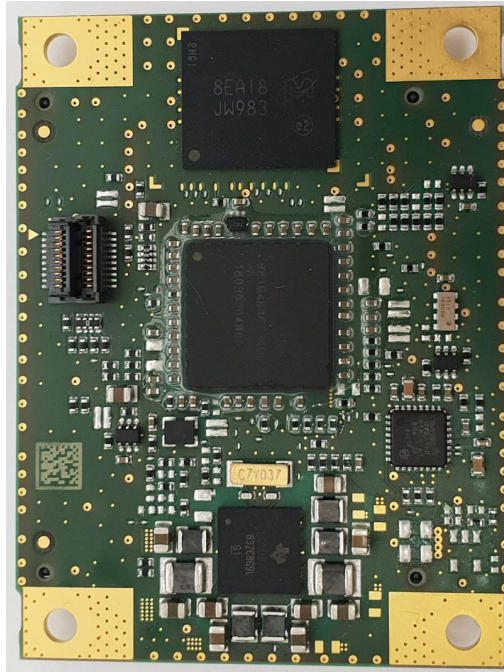
EUT - MAIN PCB TOP



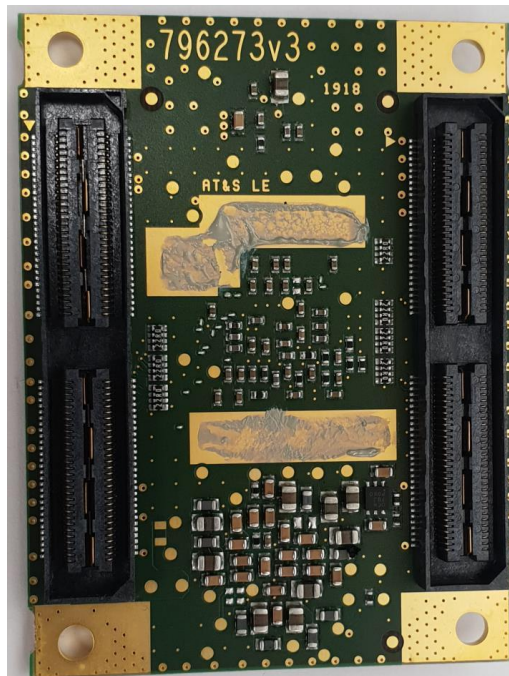
EUT - MAIN PCB BOTTOM



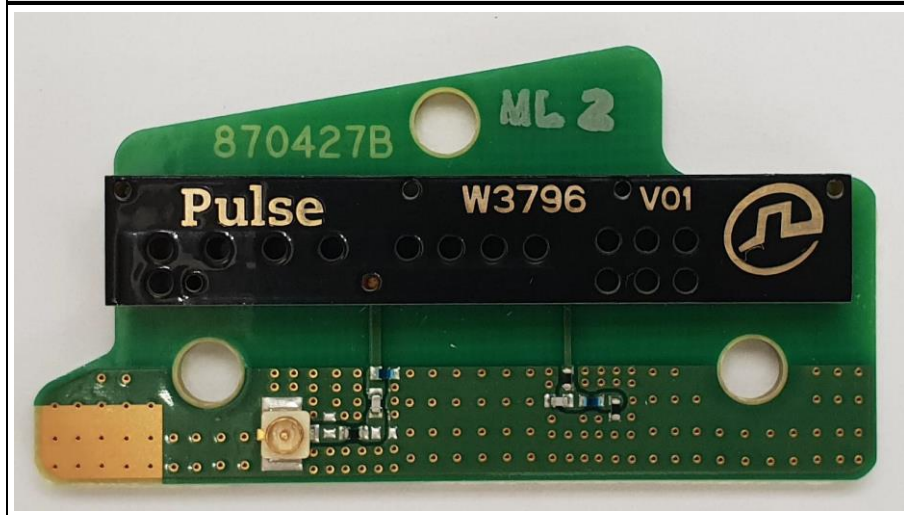
EUT - core module board top



EUT - core module board bottom



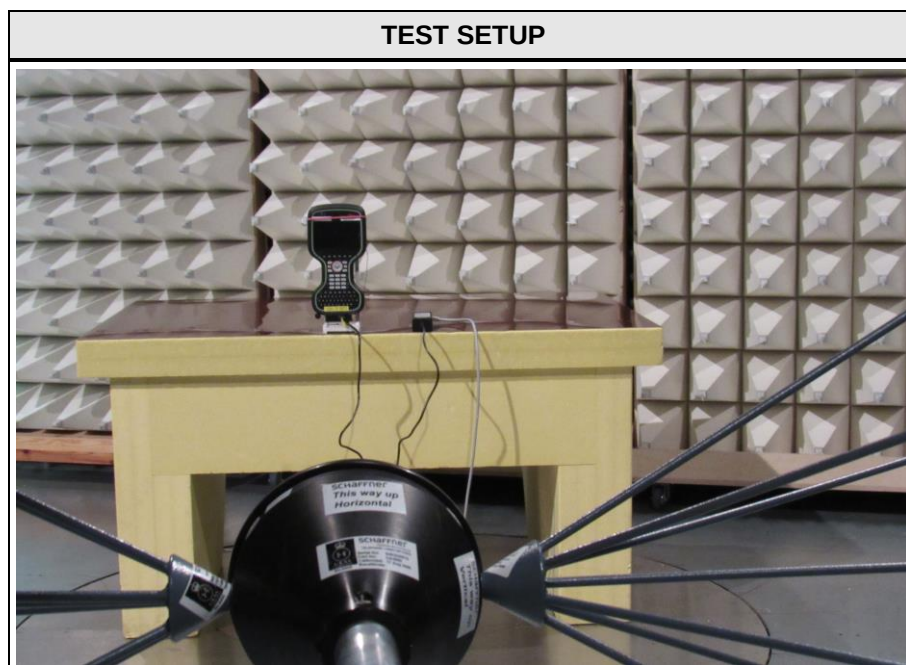
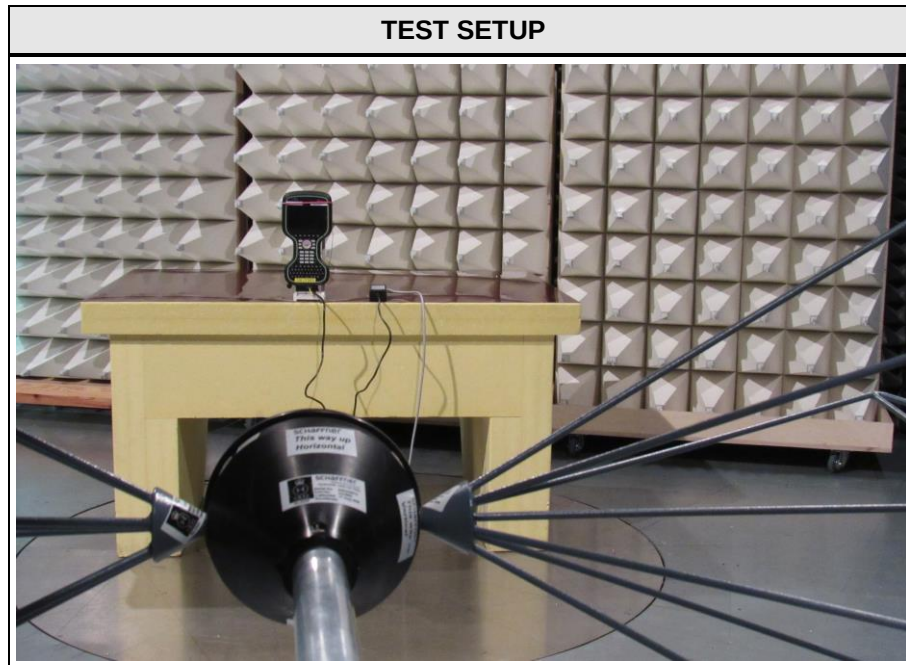
EUT - diversity antenna board top



EUT - diversity antenna board bottom



1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
SIM	Network	R&S	CMW500	Mobile -Tester
*Note: Use the following abbreviations: AE : Auxiliary/Associated Equipment, or SIM : Simulator (Not Subjected to Test) CABL : Connecting cables				

1.5 Test Modes

Mode #	Description	
GPRS - TX	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = packet switched Modulation = GMSK Slot configuration = 2 up / 1 down Power level = Maximum
EDGE - TX	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = packet switched Modulation = 8PSK Slot configuration = 2 up / 1 down Power level = Maximum
WCDMA - TX	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = RMC12.2kbps + HSPA Modulation = QPSK Power level = Maximum
LTE 5 - QPSK - PWR	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit (PWR=max) Connection = UL BW10MHz RB1 Modulation = QPSK Power level = Maximum

LTE 5 - QAM - PWR	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit (PWR=max) Connection = UL BW10MHz RB1 Modulation = 16-QAM Power level = Maximum
LTE 5 - QPSK10	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit BW=max Connection = UL BW10MHz RB50 Modulation = QPSK Power level = Maximum
LTE 5 - QAM10	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit BW=max Connection = UL BW10MHz RB50 Modulation = 16-QAM Power level = Maximum
LTE 2 - QPSK - PWR	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit (PWR=max) Connection = UL BW10MHz RB1 Modulation = QPSK Power level = Maximum
LTE 2 - QAM - PWR	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit (PWR=max) Connection = UL BW10MHz RB1 Modulation = 16-QAM Power level = Maximum
LTE 2 - QPSK20	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit BW=max Connection = UL BW20MHz RB100 Modulation = QPSK Power level = Maximum
LTE 2 - QAM20	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit BW=max Connection = UL BW20MHz RB100 Modulation = 16-QAM Power level = Maximum

LTE 2 - QPSK10	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = UL BW10MHz RB50 Modulation = QPSK Power level = Maximum
LTE 2 - QAM10	General conditions:	EUT powered by battery connected with AC/DC adapter. Active call to communication tester.
	Radio conditions:	Mode = transmit Connection = UL BW10MHz RB50 Modulation = 16-QAM Power level = Maximum
GSM - Idle	General conditions:	EUT powered by battery connected with AC/DC adapter.
	Radio conditions:	Mode = receive Channel = middle Connection = no (registered state) Modulation = GMSK
W-CDMA - RX	General conditions:	EUT powered by battery connected with AC/DC adapter.
	Radio conditions:	Mode = receive Channel = middle Connection = Cell-FACH mode Modulation = QPSK
LTE - RX	General conditions:	EUT powered by battery connected with AC/DC adapter.
	Radio conditions:	Mode = receive Channel = middle Connection = RMC Modulation = QPSK Configuration = UL BW10MHz RB0
Comments: LTE operational modes were taken from modular approval test reports. The transmission modes with the highest emission bandwidth and output power were determined acc. to KDB 634817 D01		

1.6 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	15.2.4

Occupied Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSIQ 26	EF00242	2018-07	2019-07

Radiated power					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Fully-anechoic chamber	Frankonia	AC 3	EF00199	-	-
Spectrum Analyzer	R&S	FSIQ 26	EF00242	2018-07	2019-07
LPD Antenna	R&S	HL 223	EF00187	2016-05	2019-05
Horn Antenna	R&S	BBHA 9120D	EF01153	2018-09	2019-09

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
MXE EMI Receiver	Keysight	N9038A-526/WXP	EF01070	2018-08	2019-08
Biconical Antenna	R&S	HK 116	EF00186	2018-03	2020-03
LPD Antenna	R&S	HL 223	EF00202	2016-04	2019-04
Horn Antenna	Schwarzbeck	BBHA9120	EF01153	2018-09	2019-09
Horn Antenna	Amplifier Research	ATH18G40	EF01152	2018-10	2019-10

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBμV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB)} = \text{Net field strength (dB}\mu\text{V/m)}$$

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBμV/m). The FCC limits are given in units of μV/m. The following formula is used to convert the units of μV/m to dBμV/m:

$$\text{Limit (dB}\mu\text{V/m)} = 20 \cdot \log (\mu\text{V/m})$$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

$$\begin{array}{rclclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{ dB} \end{array}$$

2 Result Summary

FCC 47 CFR Part 22H, 24E, ISED RSS-132, 133				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 6.6	Occupied Bandwidth	RSS-Gen 6.6 KDB 971168 ANSI C63.26-2015 5.4		Informational only
FCC § 24.235 FCC § 22.355 ISED RSS-132 § 4.3 ISED RSS-133 § 6.3	Frequency stability	FCC § 24.235 FCC § 22.355 ISED RSS-132 § 4.3 ISED RSS-133 § 6.3 KDB 971168 ANSI C63.26-2015 5.6	N/T	
FCC § 22.913(a)	Effective radiated power	ANSI/TIA-603-D KDB 971168	PASS	
FCC § 24.232(c) ISED RSS-132 § 4.4 ISED RSS-133 § 6.4	Equivalent isotropic radiated power	ANSI/TIA-603-D KDB 971168 ANSI C63.26-2015 5.2	PASS	
FCC § 24.232(d) ISED RSS-133 § 6.4	Peak to average ratio	KDB 971168	N/T	
FCC § 22.917(b) FCC § 24.238(b) ISED RSS-132 § 4.5 ISED RSS-133 § 6.5	Band-edge compliance	KDB 971168	N/T	
FCC § 22.917(a) FCC § 24.238(a) ISED RSS-132 § 4.5 ISED RSS-133 § 6.5	Conducted out-of-band emissions	KDB 971168 ANSI C63.26-2015 5.7	N/T	
FCC § 22.917(a) FCC § 24.238(a) ISED RSS-132 § 4.5 ISED RSS-133 § 6.5	Radiated out-of-band emissions	ANSI/TIA-603-D KDB 971168 ANSI C63.26-2015 5.5	PASS	
ISED RSS-132 § 4.6 ISED RSS-133 § 6.6 ISED RSS-Gen 7.1	Receiver radiated spurious emissions	ISED RSS-Gen 7.1 ANSI C63.4	PASS	
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to ISED RSS-Gen			
Test according to measurement reference	Reference Method		
	RSS-Gen 6.6 / KDB 971168 / ANSI C63.26-2015 5.4		
Test frequency range	Tested frequencies		
	F _{LOW} / F _{MID} / F _{HIGH}		
Limits			
None (Informational only)			
Test setup			
Spectrum Analyzer EUT			
Test procedure			
1. EUT set to test mode (Communication tester is used if needed) 2. Span set to at least twice the emission spectrum 3. Resolution bandwidth set to 1 % of span 4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function			
Test results – GSM850			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F _{LOW}	824.2	GPRS - TX	250.0
F _{MID}	836.2	GPRS - TX	248.0
F _{HIGH}	848.8	GPRS - TX	248.0
F _{LOW}	824.2	EDGE - TX	252.0
F _{MID}	836.2	EDGE - TX	258.0
F _{HIGH}	848.8	EDGE - TX	254.0
Test results – GSM1900			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F _{LOW}	1850.2	GPRS - TX	250.0
F _{MID}	1880.0	GPRS - TX	246.0
F _{HIGH}	1909.8	GPRS - TX	248.0
F _{LOW}	1850.2	EDGE - TX	254.0
F _{MID}	1880.0	EDGE - TX	254.0
F _{HIGH}	1909.8	EDGE - TX	252.0
Comments:			

Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

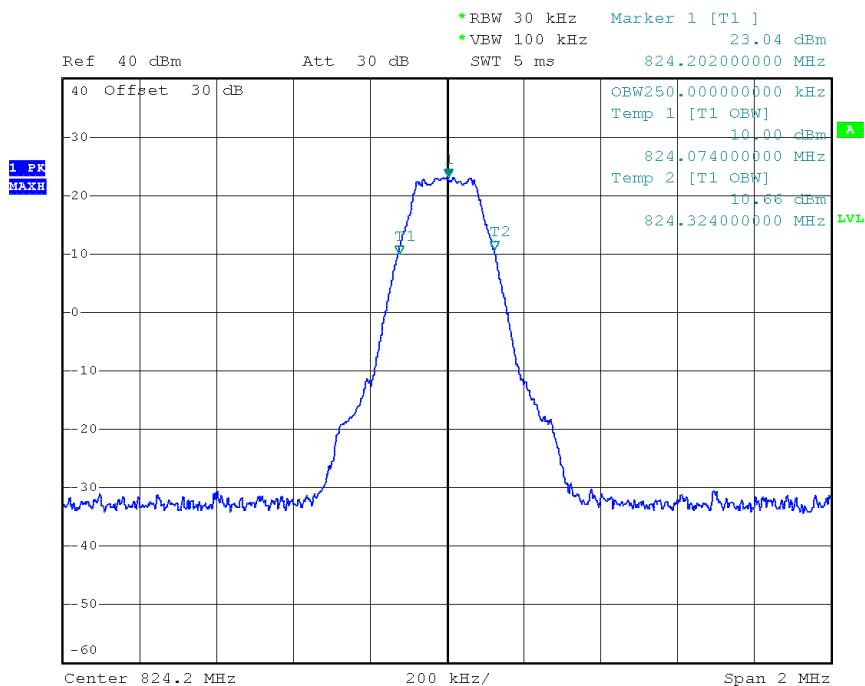
Test results – W-CDMA FDD V			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F _{LOW}	826.6	W-CDMA - TX	4140
F _{MID}	835.0	W-CDMA - TX	4190
F _{HIGH}	846.4	W-CDMA - TX	4150
Test results – W-CDMA FDD II			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F _{LOW}	1852.6	W-CDMA - TX	4170
F _{MID}	1880.0	W-CDMA - TX	4160
F _{HIGH}	1907.4	W-CDMA - TX	4190
Comments:			

Test results – LTE FDD 5			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F _{LOW}	829.0	LTE 5 - QPSK10	9060
F _{MID}	836.5	LTE 5 – QPSK10	9090
F _{HIGH}	844.0	LTE 5 – QPSK10	9090
F _{LOW}	829.0	LTE 5 - QAM10	9060
F _{MID}	836.5	LTE 5 - QAM10	9060
F _{HIGH}	844.0	LTE 5 - QAM10	9090
Test results – LTE FDD 2			
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [kHz]
F _{LOW}	1860.0	LTE 2 – QPSK20	17950
F _{MID}	1880.0	LTE 2 – QPSK20	17950
F _{HIGH}	1900.0	LTE 2 – QPSK20	17900
F _{LOW}	1860.0	LTE 2 – QAM20	18000
F _{MID}	1880.0	LTE 2 – QAM20	18000
F _{HIGH}	1900.0	LTE 2 – QAM20	17940
F _{LOW}	1855.0	LTE 2 – QPSK10	9090
F _{MID}	1880.0	LTE 2 – QPSK10	9090
F _{HIGH}	1905.0	LTE 2 – QPSK10	9060
F _{LOW}	1855.0	LTE 2 - QAM10	9090
F _{MID}	1880.0	LTE 2 - QAM10	9060
F _{HIGH}	1905.0	LTE 2 - QAM10	9060
Comments:			

Occupied Bandwidth – GPRS 850 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 824.2 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: GPRS 850_Channel 128
 Occupied Bandwidth [kHz]: 250.0

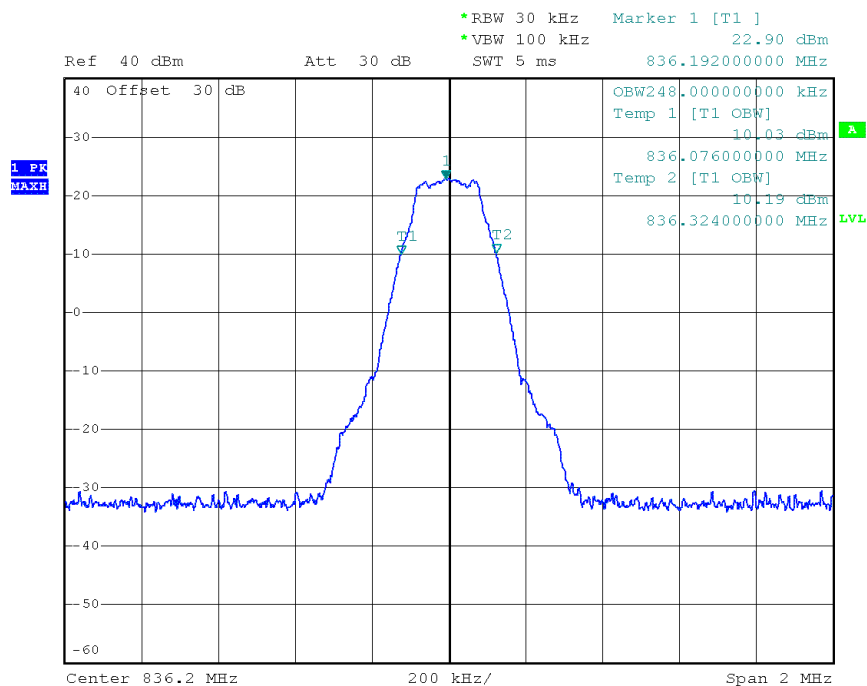


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Occupied Bandwidth – GPRS 850 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 836.2 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: GPRS 850_Channel 188
 Occupied Bandwidth [kHz]: 248.0

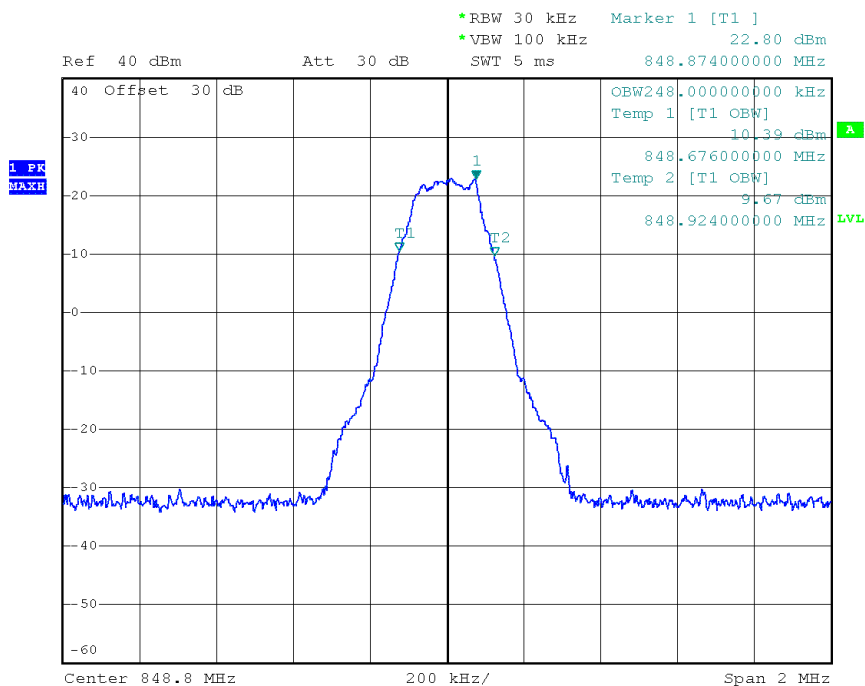


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Occupied Bandwidth – GPRS 850 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 848.8 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: GPRS 850_Channel 251
 Occupied Bandwidth [kHz]: 248.0

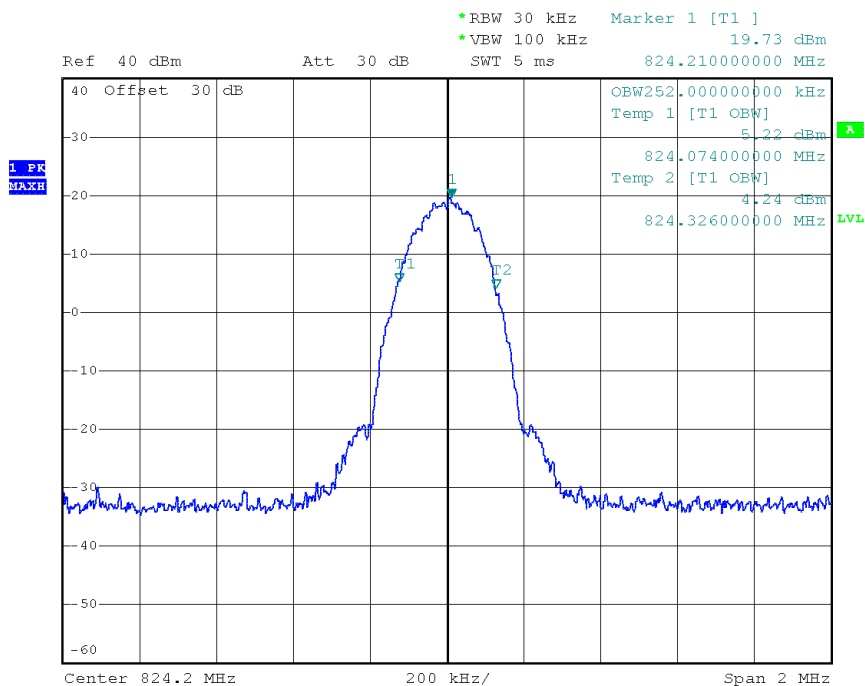


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Occupied Bandwidth – EDGE 850 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 824.2 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: EDGE 850_Channel 128
 Occupied Bandwidth [kHz]: 252.0

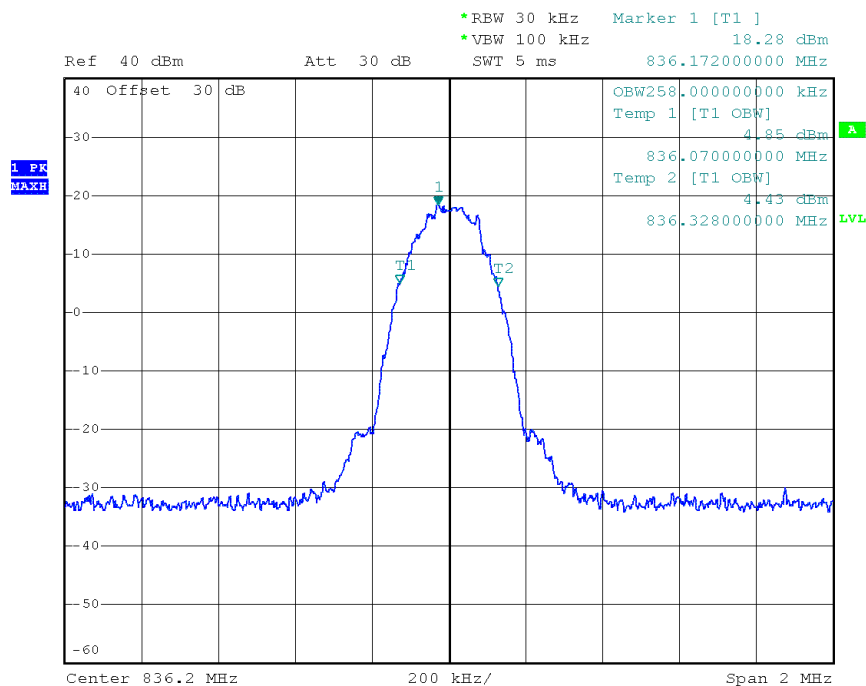


Date: 16.JAN.2019 11:17:36

Occupied Bandwidth – EDGE 850 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 836.2 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: EDGE 850_Channel 188
 Occupied Bandwidth [kHz]: 258.0

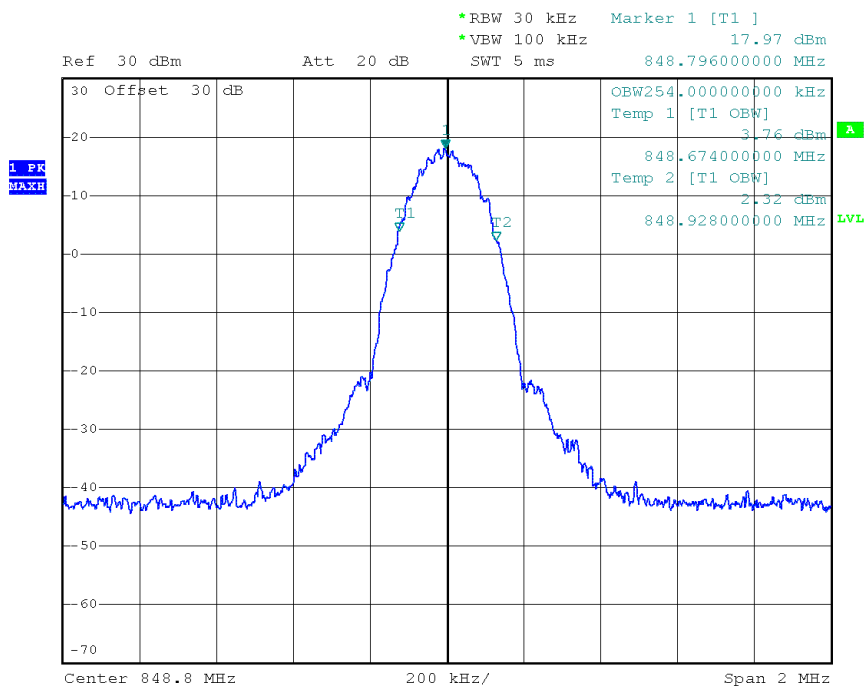


Date: 16.JAN.2019 11:10:02

Occupied Bandwidth – EDGE 850 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 848.8 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: EDGE 850_Channel 251
 Occupied Bandwidth [kHz]: 254.0

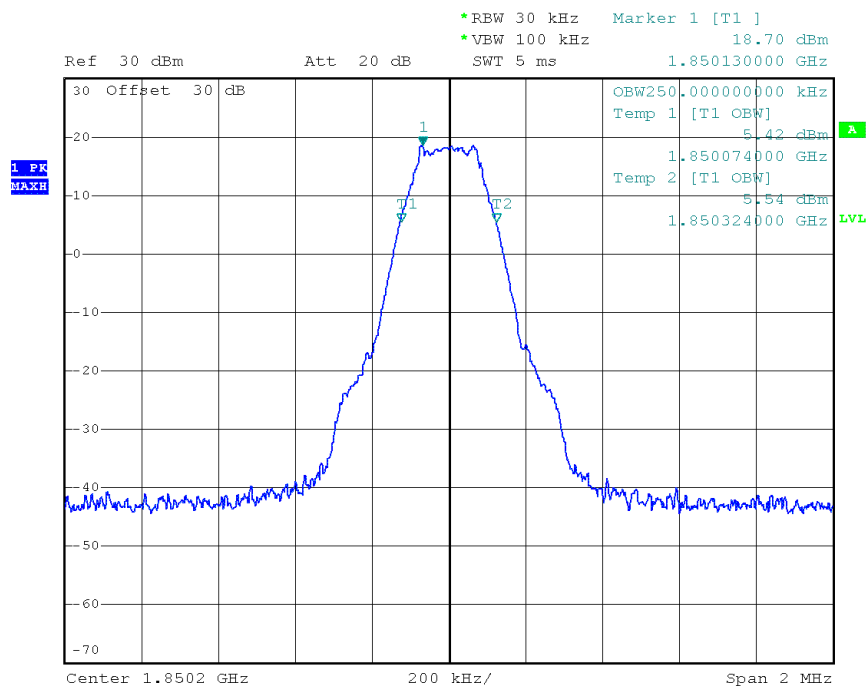


Date: 16.JAN.2019 11:21:00

Occupied Bandwidth – GPRS1900 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
Applicant: Leica Geosystems AG
Model Description: Field Controller Win EC7
Model: CS20 LTE Disto (US, CA)
Test Sample ID: 22136
Reference Standards: RSS-Gen
Reference Method: ANSI C63.26:2015, Section 5.4.4
Operating Frequency: 1850.2 MHz
Operating Conditions: Tnom/Vnom
Operator: Burkhard Pudell
Test Site: Eurofins Product Service GmbH
Test Date: 2019-01-16
Note: GPRS 1900_Channel 512
Occupied Bandwidth [kHz]: 250.0

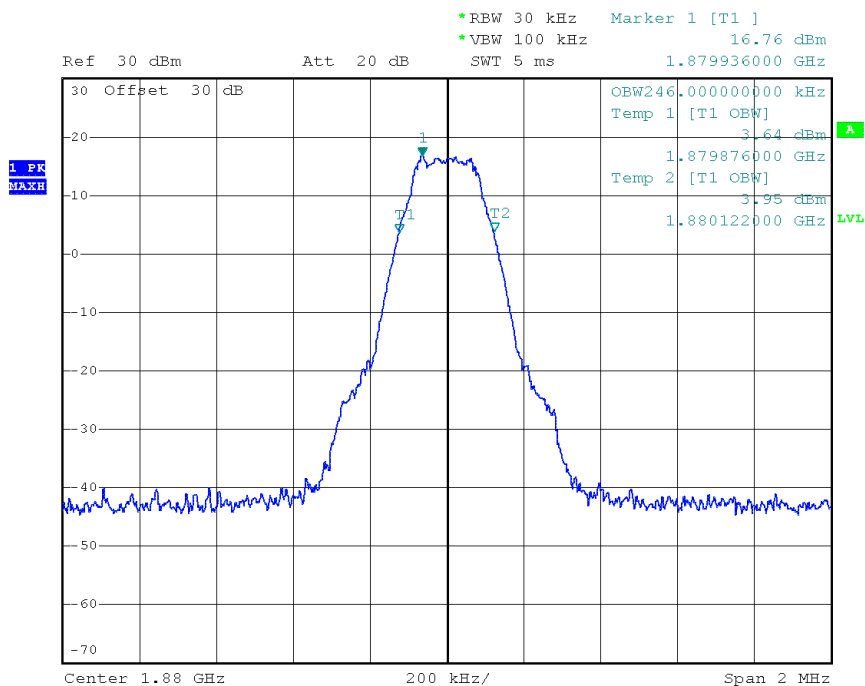


Date: 16.JAN.2019 13:56:48

Occupied Bandwidth – GPRS1900 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: GPRS 1900_Channel 661
 Occupied Bandwidth [kHz]: 246.0

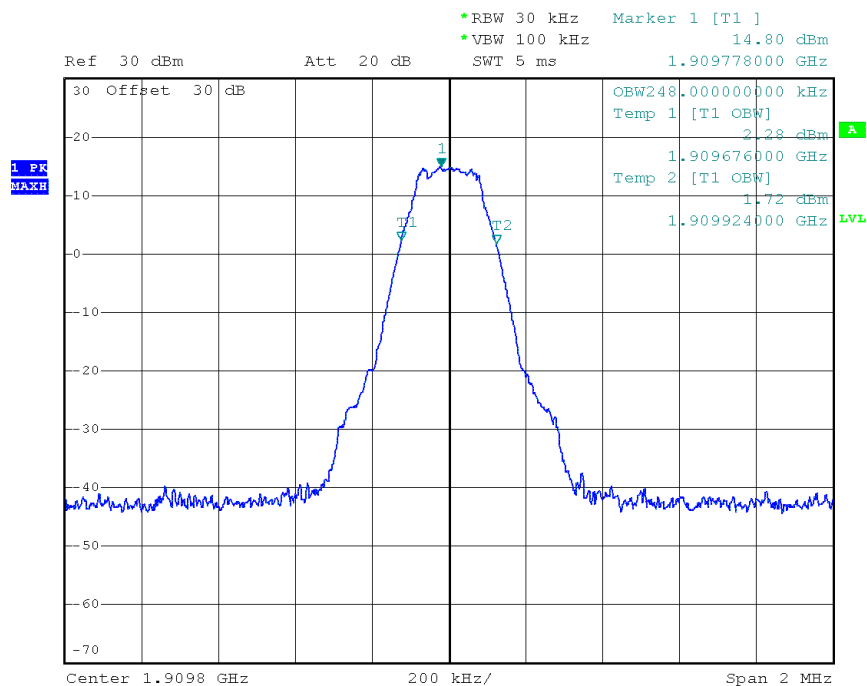


Date: 16.JAN.2019 13:50:45

Occupied Bandwidth – GPRS1900 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1909.8 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: GPRS 1900_Channel 810
 Occupied Bandwidth [kHz]: 248.0

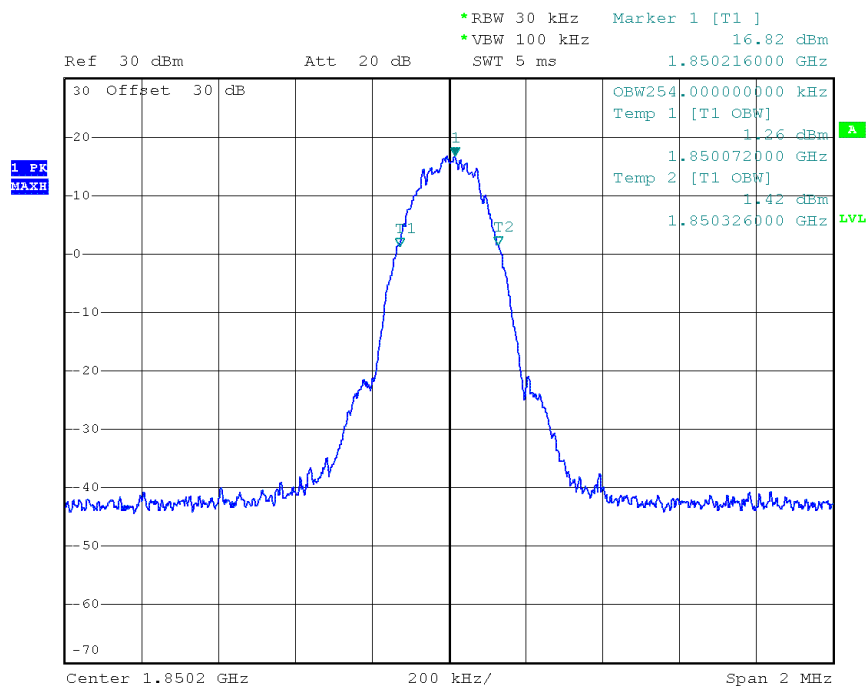


Date: 16.JAN.2019 13:53:21

Occupied Bandwidth – EDGE1900 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1850.2 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: EDGE 1900_Channel 512
 Occupied Bandwidth [kHz]: 254.0

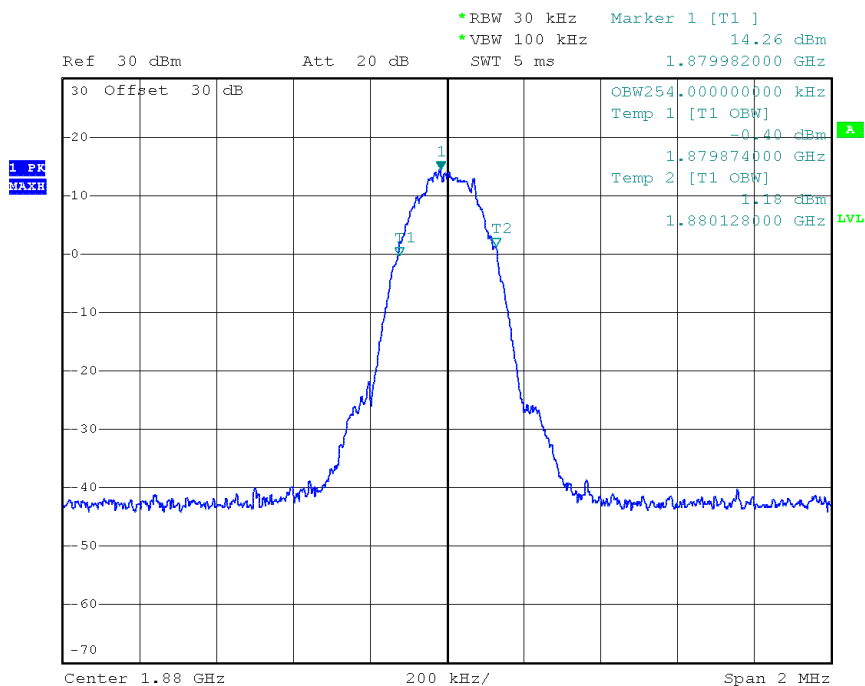


Date: 16.JAN.2019 14:16:47

Occupied Bandwidth – EDGE1900 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880.0 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: EDGE 1900_Channel 661
 Occupied Bandwidth [kHz]: 254.0

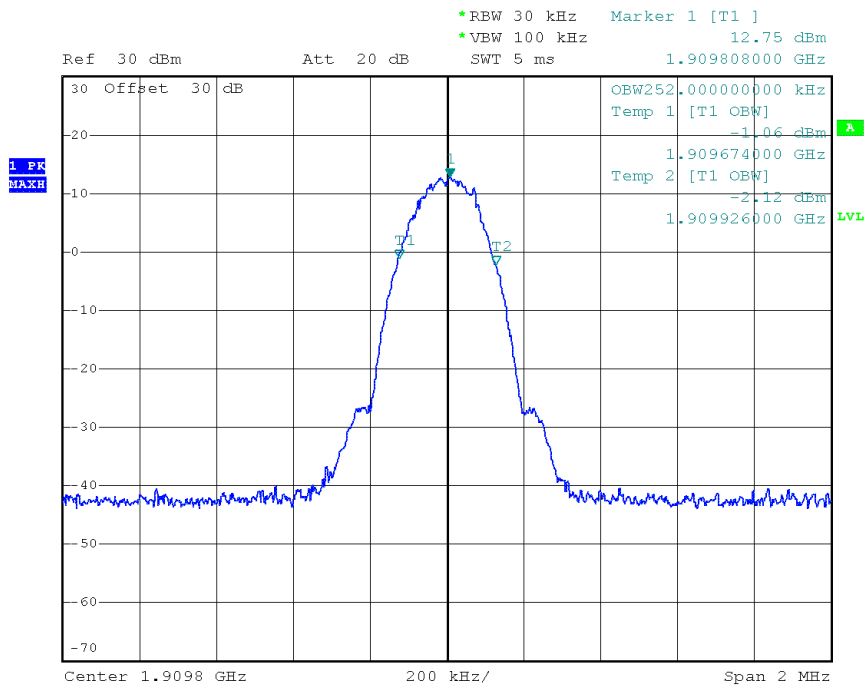


Date: 16.JAN.2019 14:19:31

Occupied Bandwidth – EDGE1900 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1909.8 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-16
 Note: EDGE 1900_Channel 810
 Occupied Bandwidth [kHz]: 252.0

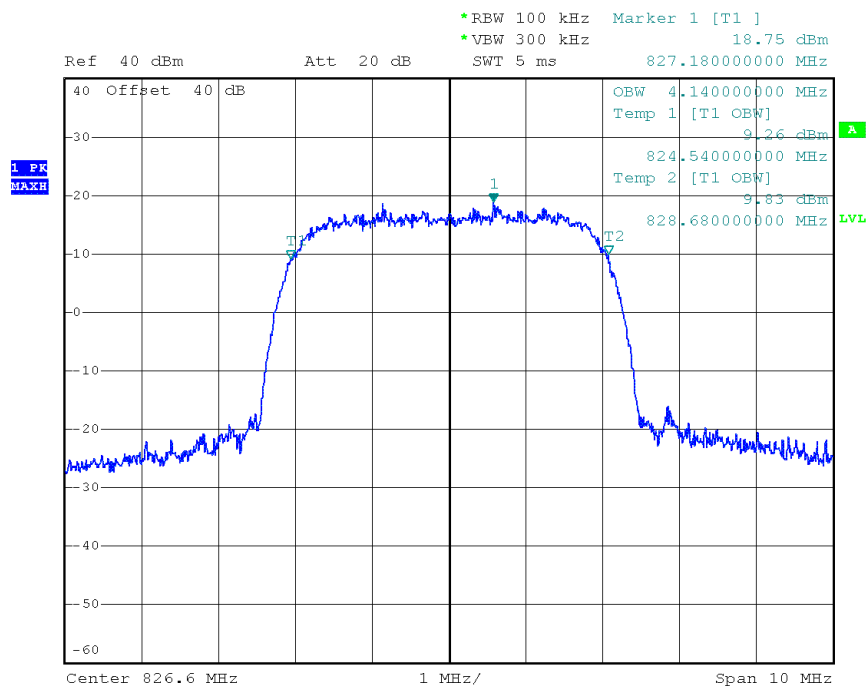


Date: 16.JAN.2019 14:13:08

Occupied Bandwidth – W-CDMA FDD V - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 826.6 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-02-01
 Note: UMTS FDD V_CH: 4133
 Occupied Bandwidth [kHz]: 4140.0

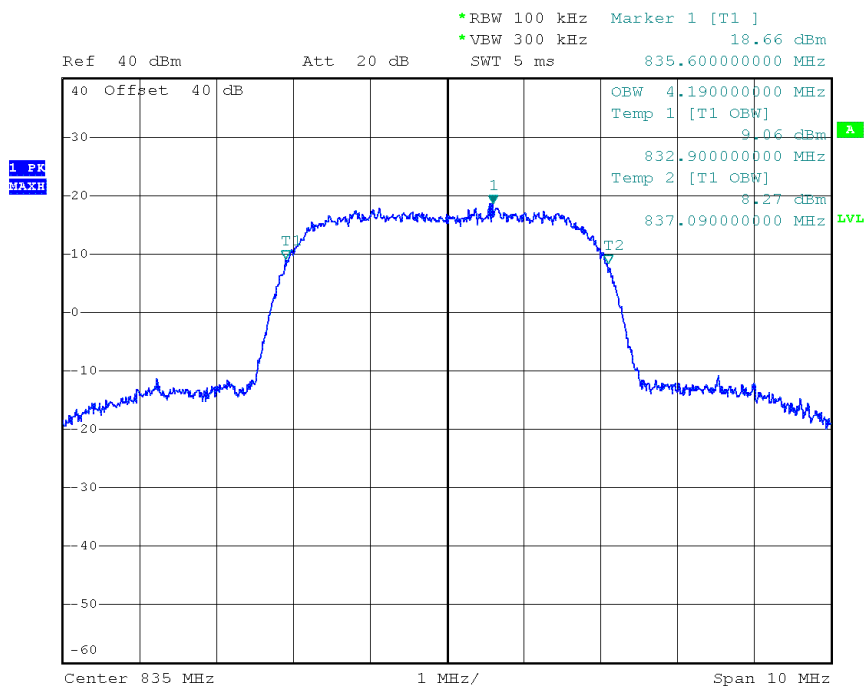


Date: 1.FEB.2019 09:08:36

Occupied Bandwidth – W-CDMA FDD V - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 835.0 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-02-01
 Note: UMTS FDD V_CH: 4175
 Occupied Bandwidth [kHz]: 4190.0

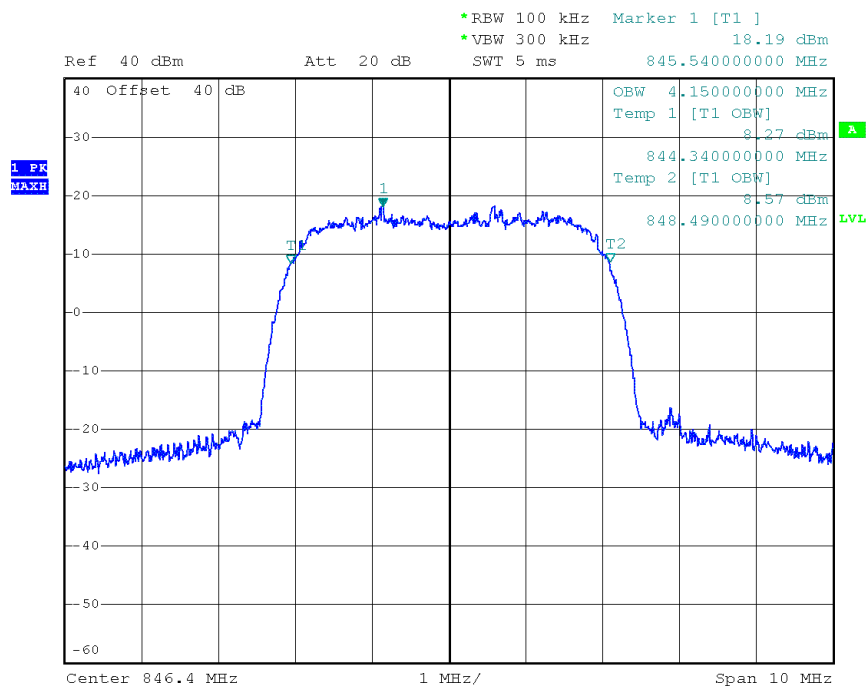


Date: 1.FEB.2019 09:05:43

Occupied Bandwidth – W-CDMA FDD V - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 846.4 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-02-01
 Note: UMTS FDD V_CH: 4232
 Occupied Bandwidth [kHz]: 4150.0

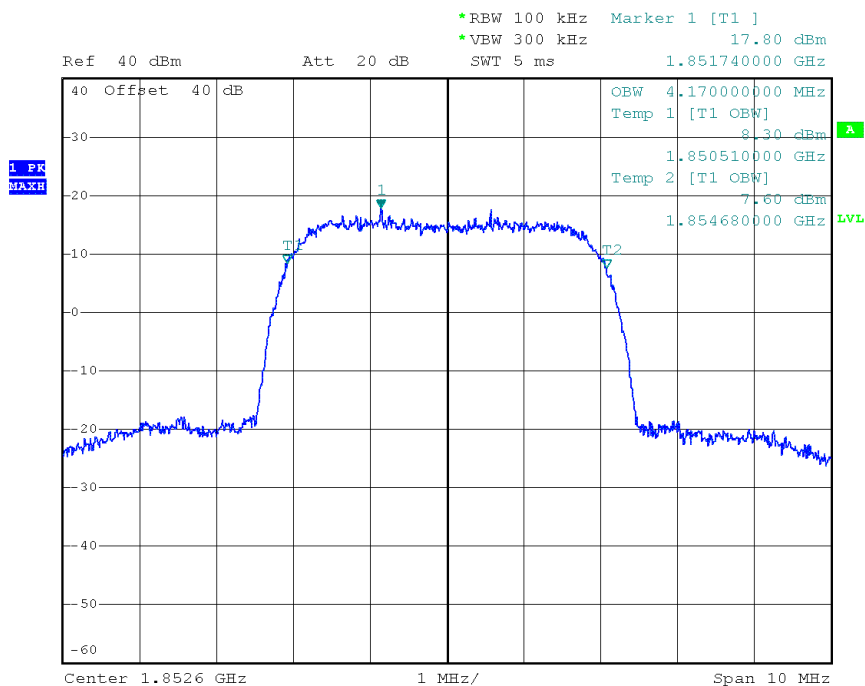


Date: 1.FEB.2019 08:59:11

Occupied Bandwidth – W-CDMA FDD II - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
Applicant: Leica Geosystems AG
Model Description: Field Controller Win EC7
Model: CS20 LTE Disto (US, CA)
Test Sample ID: 22136
Reference Standards: RSS-Gen
Reference Method: ANSI C63.26:2015, Section 5.4.4
Operating Frequency: 1852.6 MHz
Operating Conditions: Tnom/Vnom
Operator: Burkhard Pudell
Test Site: Eurofins Product Service GmbH
Test Date: 2019-01-30
Note: UMTS FDD II_CH: 9263
Occupied Bandwidth [kHz]: 4170.0

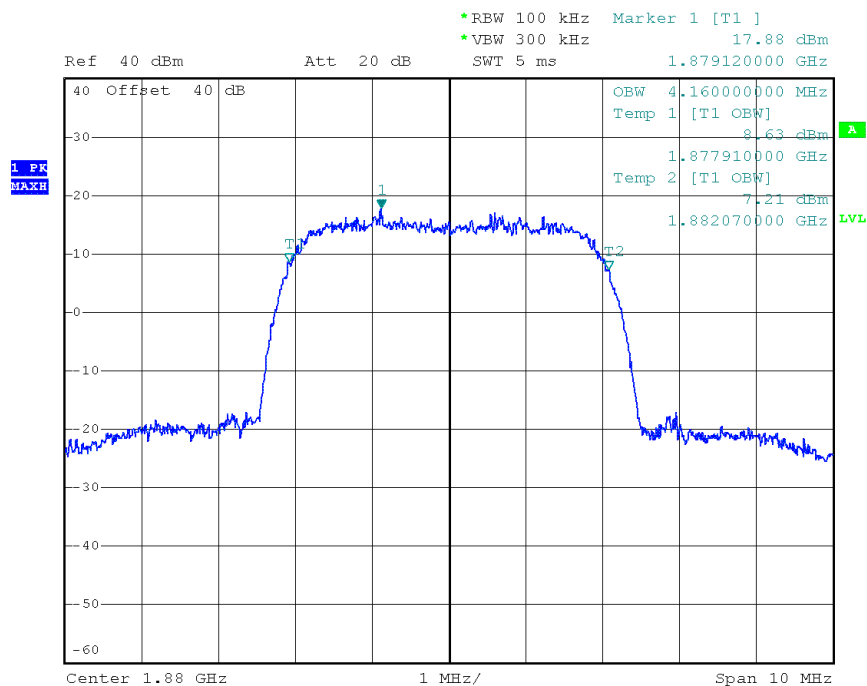


Date: 30.JAN.2019 09:31:03

Occupied Bandwidth – W-CDMA FDD II - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880.0 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-30
 Note: UMTS FDD II_CH: 9400
 Occupied Bandwidth [kHz]: 4160.0

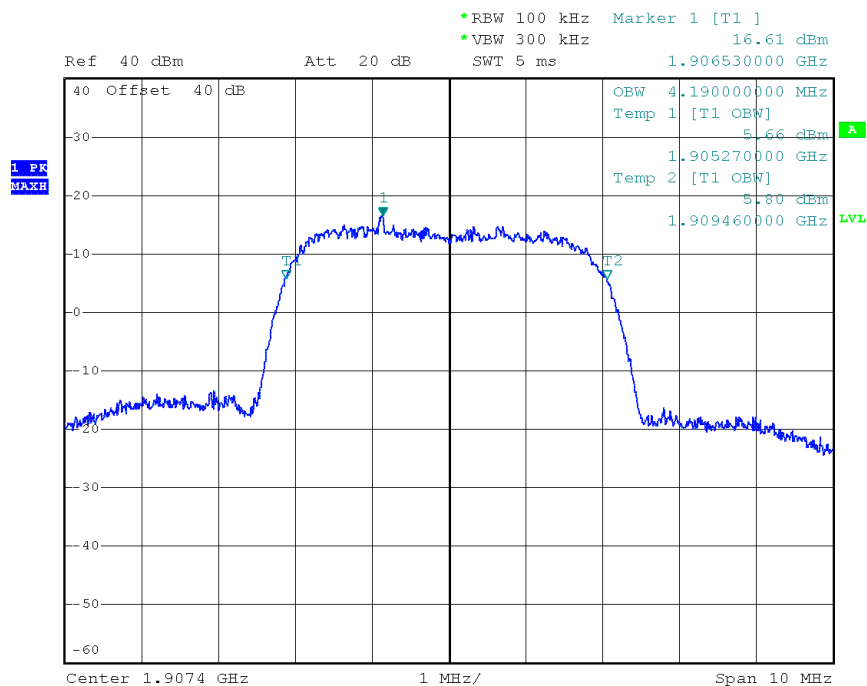


Date: 30.JAN.2019 09:27:50

Occupied Bandwidth – W-CDMA FDD II - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: 22136
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1907.4 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-30
 Note: UMTS FDD II_CH: 9537
 Occupied Bandwidth [kHz]: 4190.0

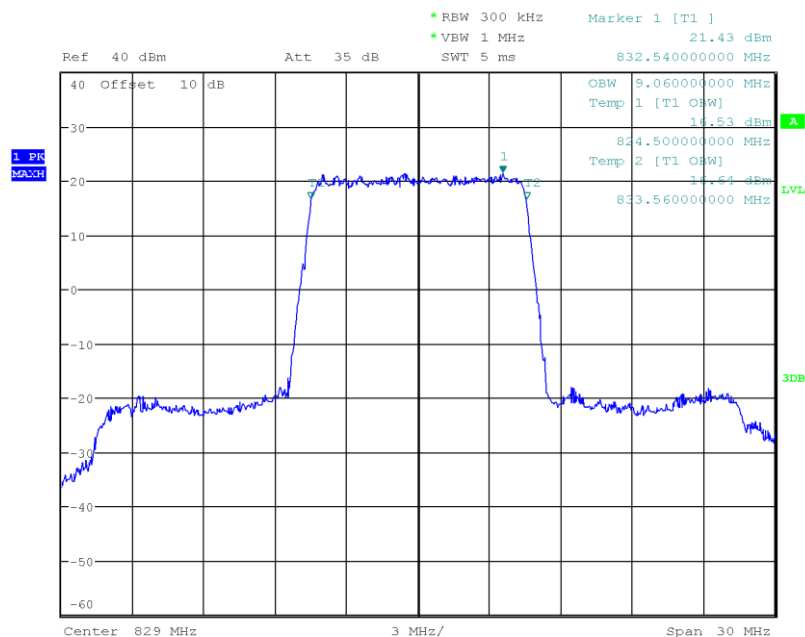


Date: 30.JAN.2019 09:23:15

Occupied Bandwidth – LTE FDD 5 QPSK10 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 829 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-27
 Note: LTE FDD 5_CH: 20450; QPSK; BW10; RB50
 Occupied Bandwidth [kHz]: 9060.0

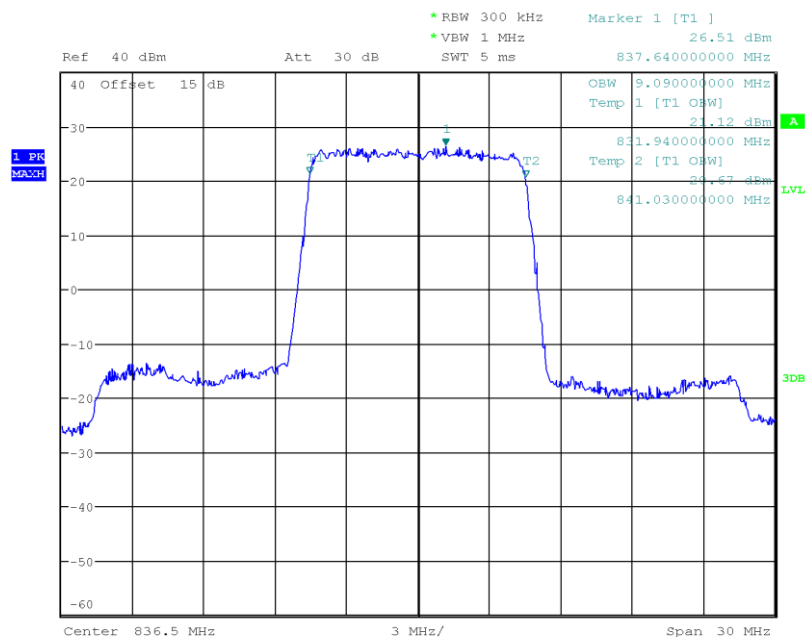


Date: 27.JUN.2019 03:10:46

Occupied Bandwidth – LTE FDD 5 QPSK10 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 836.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-27
 Note: LTE FDD 5_CH: 20525; QPSK; BW10; RB50
 Occupied Bandwidth [kHz]: 9090.0

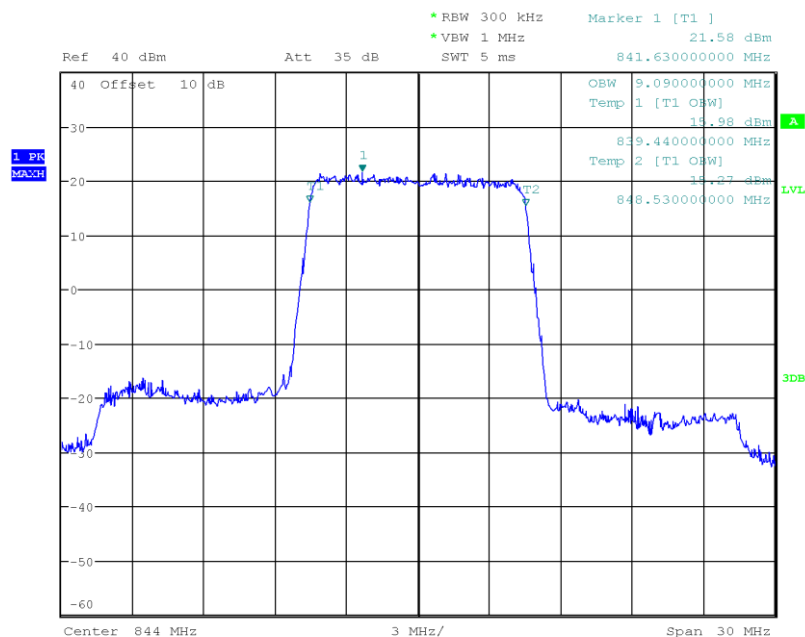


Date: 27.JUN.2019 02:35:46

Occupied Bandwidth – LTE FDD 5 QPSK10 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 844 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-27
 Note: LTE FDD 5_CH: 20600; QPSK; BW10; RB50
 Occupied Bandwidth [kHz]: 9090.0

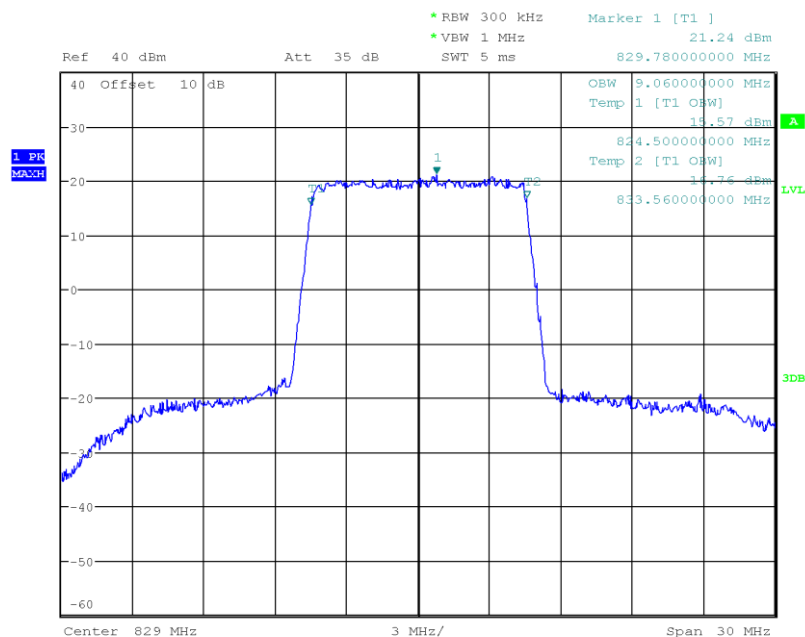


Date: 27.JUN.2019 03:08:25

Occupied Bandwidth – LTE FDD 5 QAM10 - F_{LOW}

Occupied Bandwidth

Project Number:	G0M-1812-7888
Applicant:	Leica Geosystems AG
Model Description:	Field Controller Win EC7
Model:	CS20 LTE Disto (US, CA)
Test Sample ID:	S/N.: 2476141
Reference Standards:	RSS-Gen
Reference Method:	ANSI C63.26:2015, Section 5.4.4
Operating Frequency:	829 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Burkhard Pudell
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-06-28
Note:	LTE FDD 5_CH: 20450; 16-QAM; BW10; RB50
Occupied Bandwidth [kHz]:	9060.0

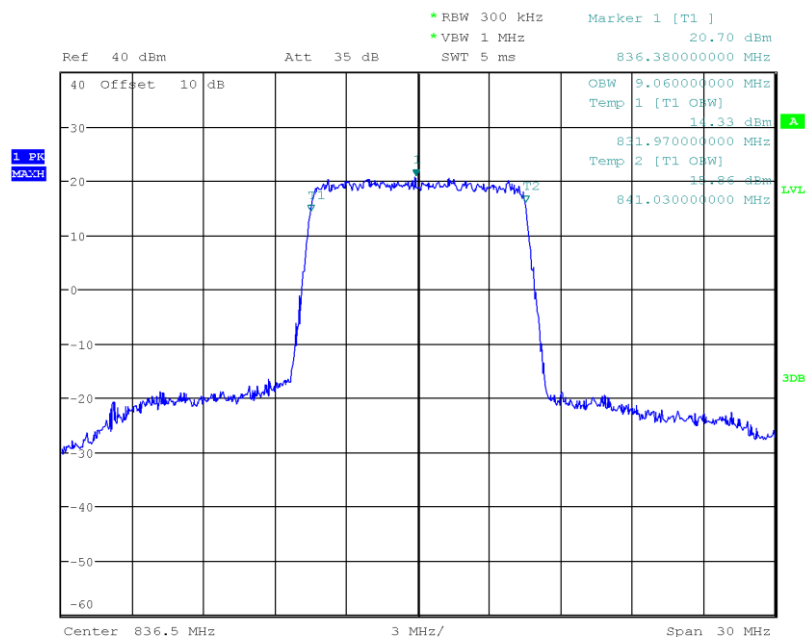


Date: 28.JUN.2019 09:35:00

Occupied Bandwidth – LTE FDD 5 QAM10 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 836.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-28
 Note: LTE FDD 5_CH: 20525; 16-QAM; BW10; RB50
 Occupied Bandwidth [kHz]: 9060.0

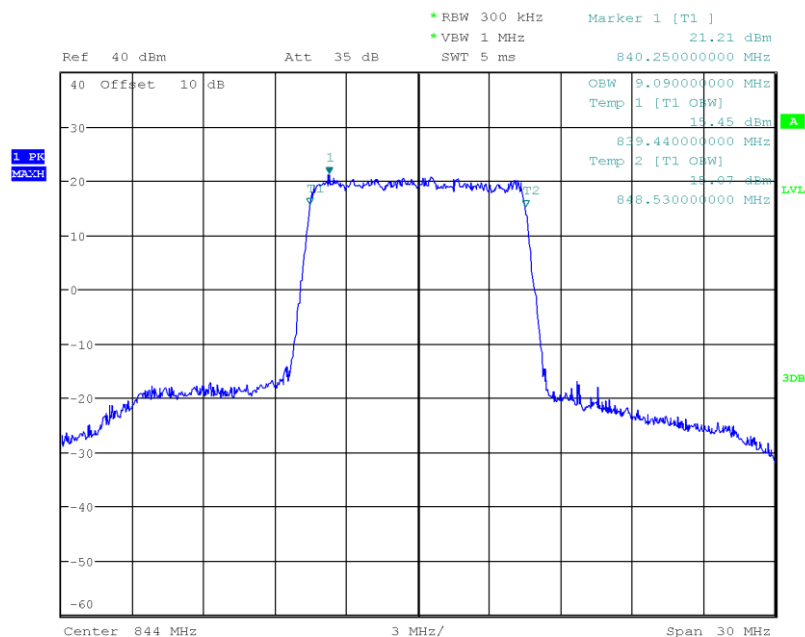


Date: 28.JUN.2019 09:37:15

Occupied Bandwidth – LTE FDD 5 QAM10 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 844 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-28
 Note: LTE FDD 5_CH: 20600; 16-QAM; BW10; RB50
 Occupied Bandwidth [kHz]: 9090.0

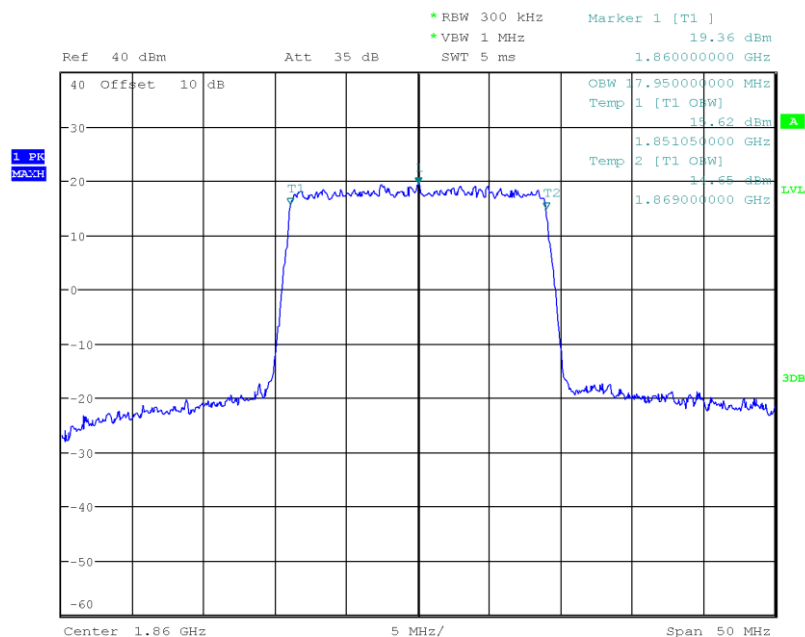


Date: 28.JUN.2019 09:39:07

Occupied Bandwidth – LTE FDD 2 QPSK20 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1860 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-27
 Note: LTE FDD 2_CH: 18700; QPSK; BW20; RB100
 Occupied Bandwidth [kHz]: 17950.0



Date: 27.JUN.2019 03:24:32

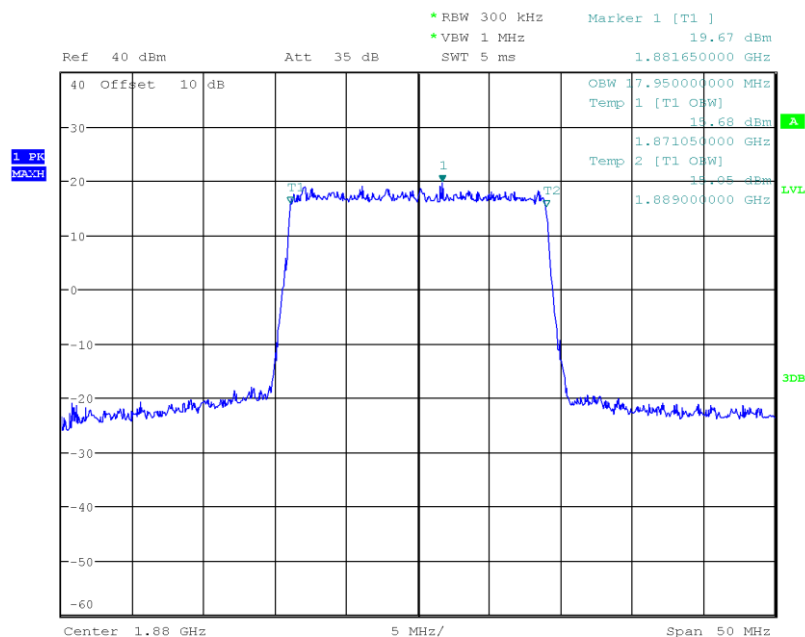
Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – LTE FDD 2 QPSK20 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-27
 Note: LTE FDD 2_CH: 18900; QPSK; BW20; RB100
 Occupied Bandwidth [kHz]: 17950.0

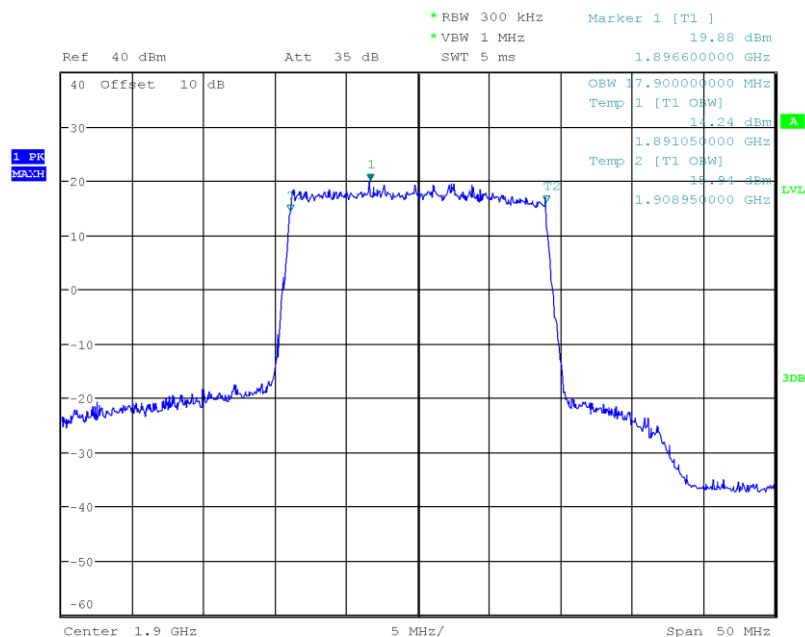


Date: 27.JUN.2019 03:16:07

Occupied Bandwidth – LTE FDD 2 QPSK20 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1900 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-27
 Note: LTE FDD 2_CH: 19100; QPSK; BW20; RB100
 Occupied Bandwidth [kHz]: 17900.0

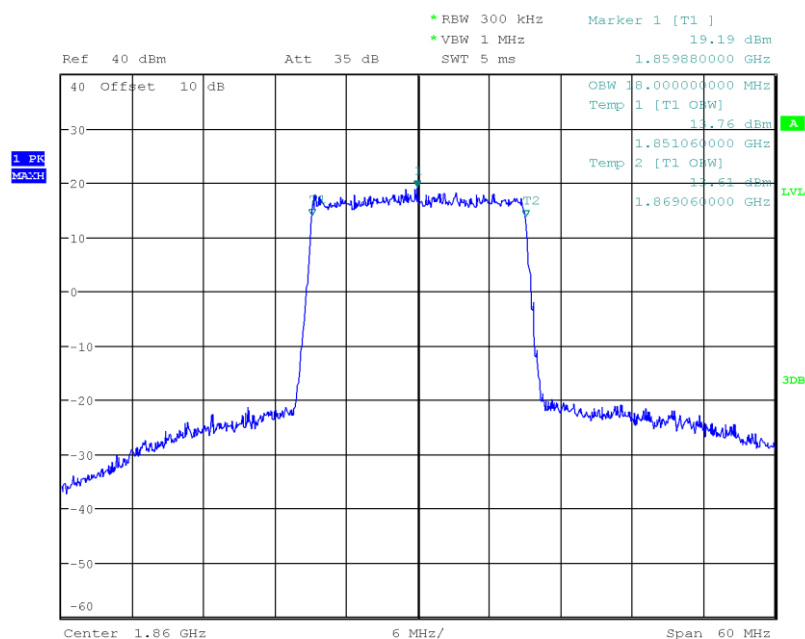


Date: 27.JUN.2019 03:19:53

Occupied Bandwidth – LTE FDD 2 QAM20 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1860 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-28
 Note: LTE FDD 2_CH: 18700; 16-QAM; BW20; RB100
 Occupied Bandwidth [kHz]: 18000.0

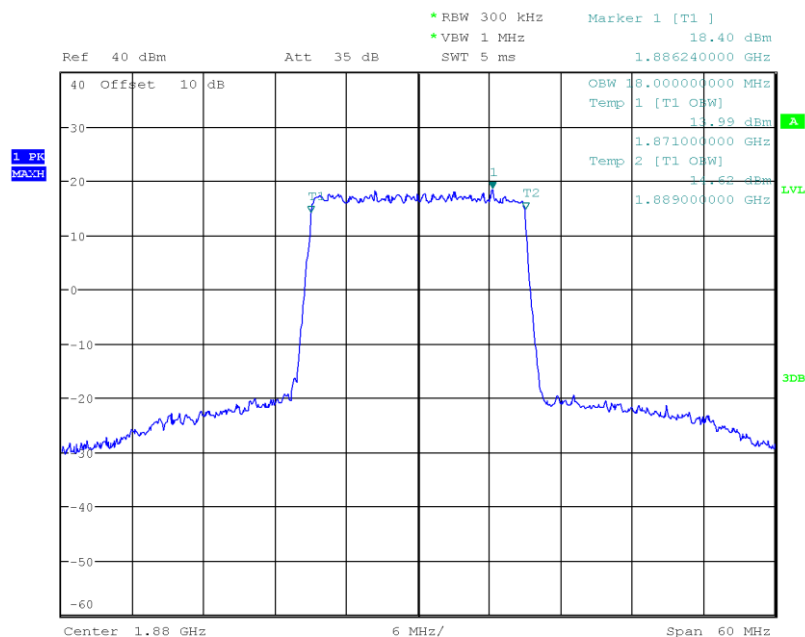


Date: 28.JUN.2019 09:14:59

Occupied Bandwidth – LTE FDD 2 QAM20 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-28
 Note: LTE FDD 2_CH: 18900; 16-QAM; BW20; RB100
 Occupied Bandwidth [kHz]: 18000.0

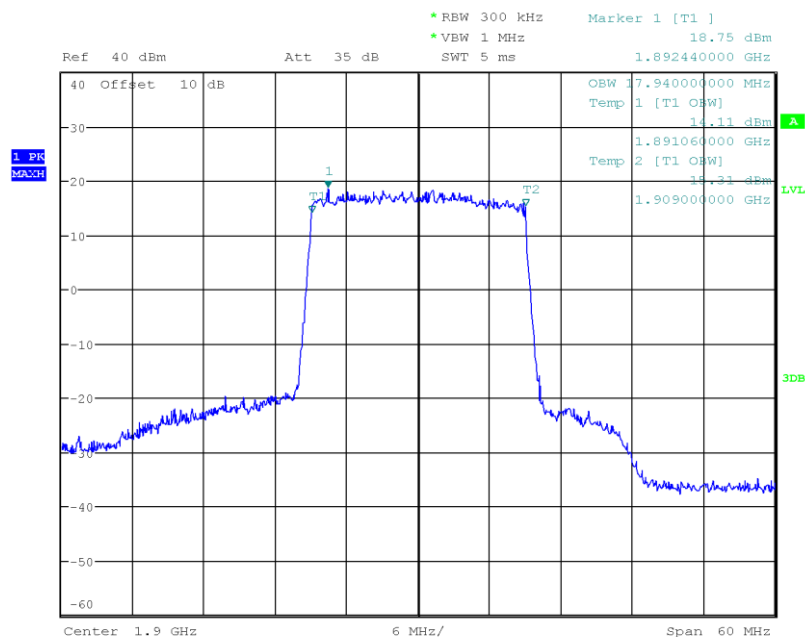


Date: 28.JUN.2019 09:11:31

Occupied Bandwidth – LTE FDD 2 QAM20 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1900 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-06-28
 Note: LTE FDD 2_CH: 19100; 16-QAM; BW20; RB100
 Occupied Bandwidth [kHz]: 17940.0

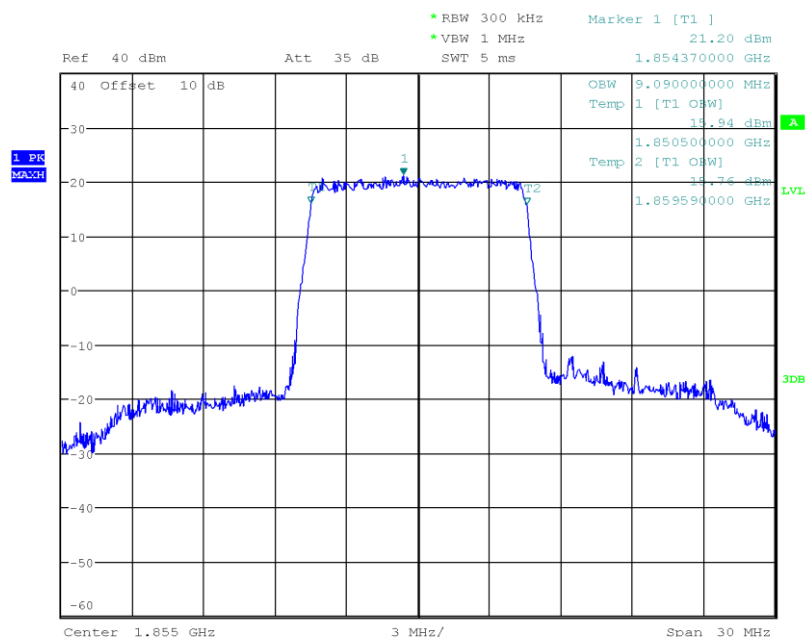


Date: 28.JUN.2019 09:17:48

Occupied Bandwidth – LTE FDD 2 QPSK10 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1855 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-07-02
 Note: LTE FDD 2_CH: 18650; QPSK; BW10; RB50
 Occupied Bandwidth [kHz]: 9090.0



Date: 2.JUL.2019 05:32:31

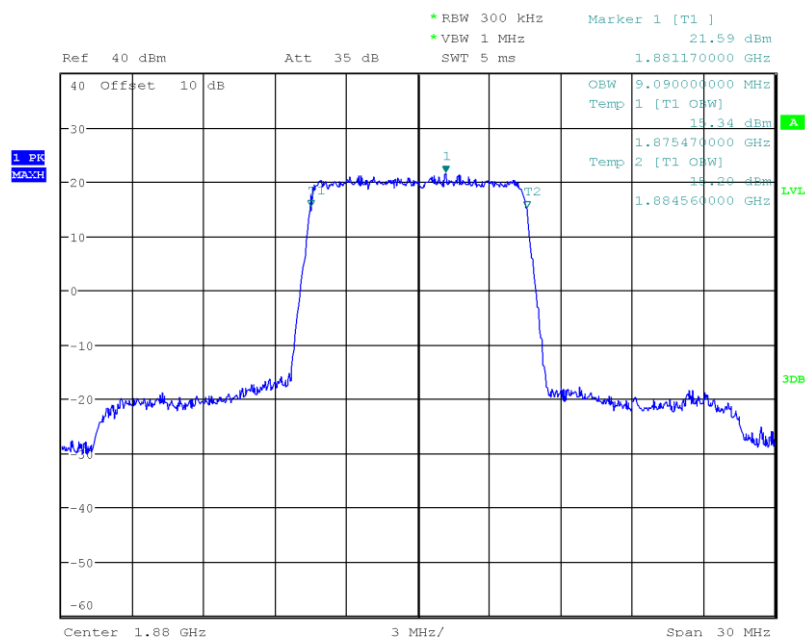
Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – LTE FDD 2 QPSK10 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-07-02
 Note: LTE FDD 2_CH: 18900; QPSK; BW10; RB50
 Occupied Bandwidth [kHz]: 9090.0

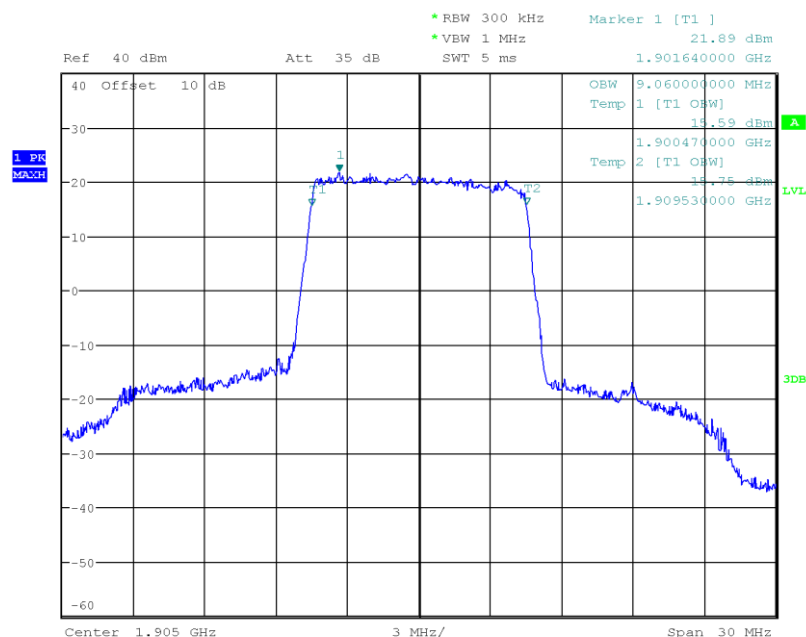


Date: 2.JUL.2019 05:18:55

Occupied Bandwidth – LTE FDD 2 QPSK10 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1905 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-07-02
 Note: LTE FDD 2_CH: 19150; QPSK; BW10; RB50
 Occupied Bandwidth [kHz]: 9060.0



Date: 2.JUL.2019 05:37:27

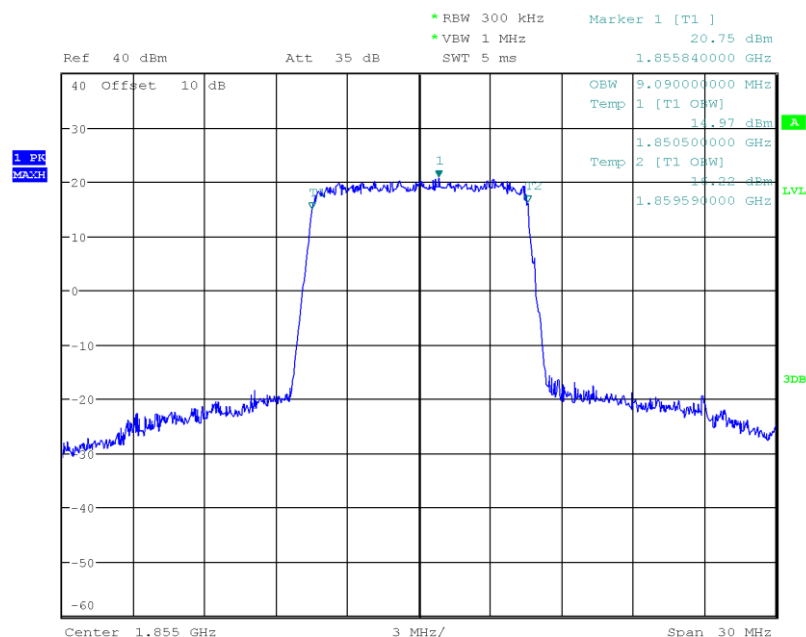
Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – LTE FDD 2 QAM10 - F_{Low}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1855 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-07-02
 Note: LTE FDD 2_CH: 18650; 16-QAM; BW10; RB50
 Occupied Bandwidth [kHz]: 9090.0



Date: 2.JUL.2019 05:29:21

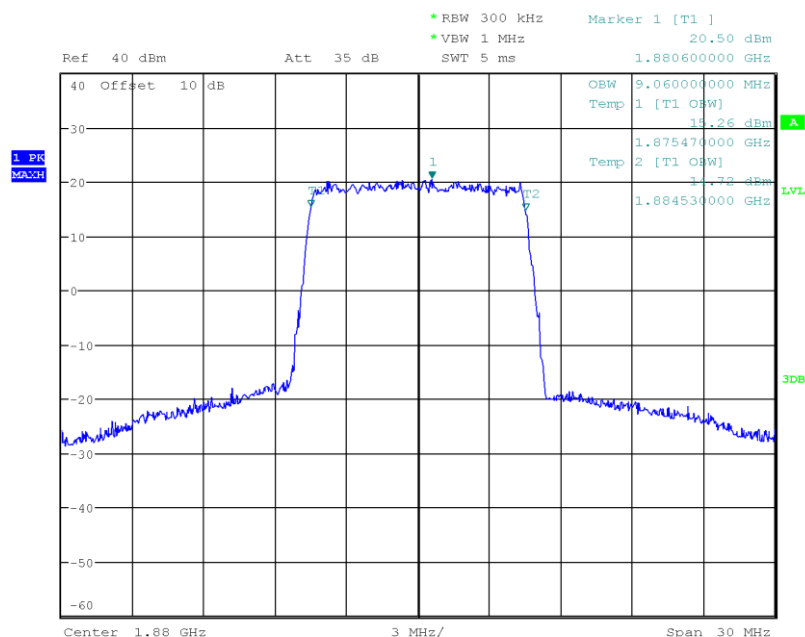
Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – LTE FDD 2 QAM10 - F_{MID}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1880 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-07-02
 Note: LTE FDD 2_CH: 18900; 16-QAM; BW10; RB50
 Occupied Bandwidth [kHz]: 9060.0



Date: 2.JUL.2019 05:22:44

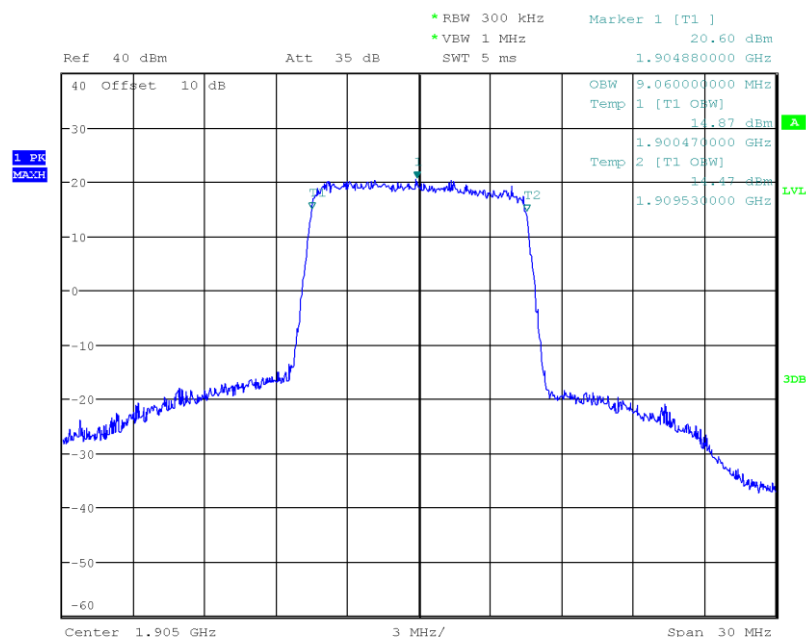
Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – LTE FDD 2 QAM10 - F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1812-7888
 Applicant: Leica Geosystems AG
 Model Description: Field Controller Win EC7
 Model: CS20 LTE Disto (US, CA)
 Test Sample ID: S/N.: 2476141
 Reference Standards: RSS-Gen
 Reference Method: ANSI C63.26:2015, Section 5.4.4
 Operating Frequency: 1905 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Burkhard Pudell
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-07-02
 Note: LTE FDD 2_CH: 19150; 16-QAM; BW10; RB50
 Occupied Bandwidth [kHz]: 9060.0

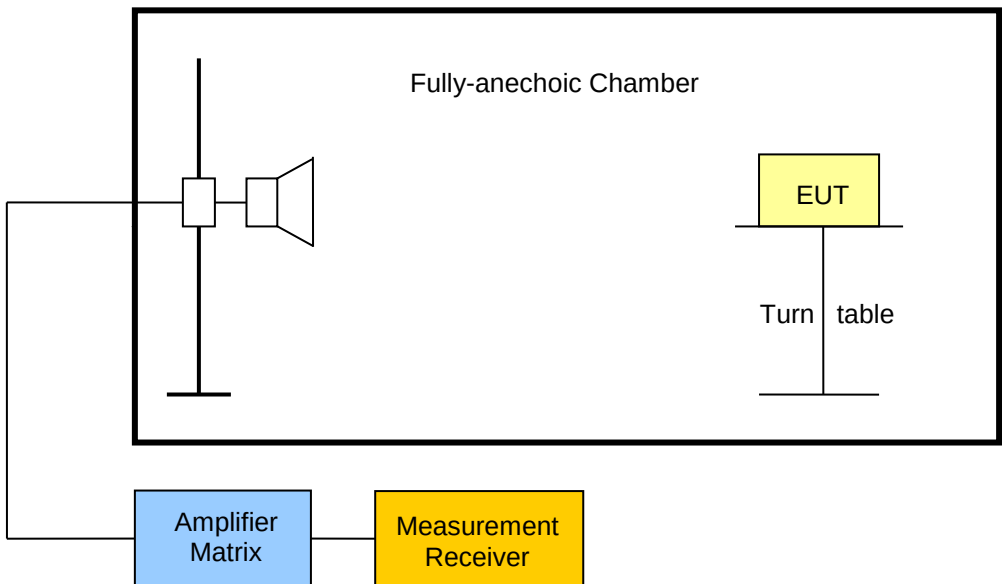


Date: 2.JUL.2019 05:40:32

Test Report No.: G0M-1812-7888-TFC224GS-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.2 Test Conditions and Results – Effective radiated power / Equivalent isotropic radiated power

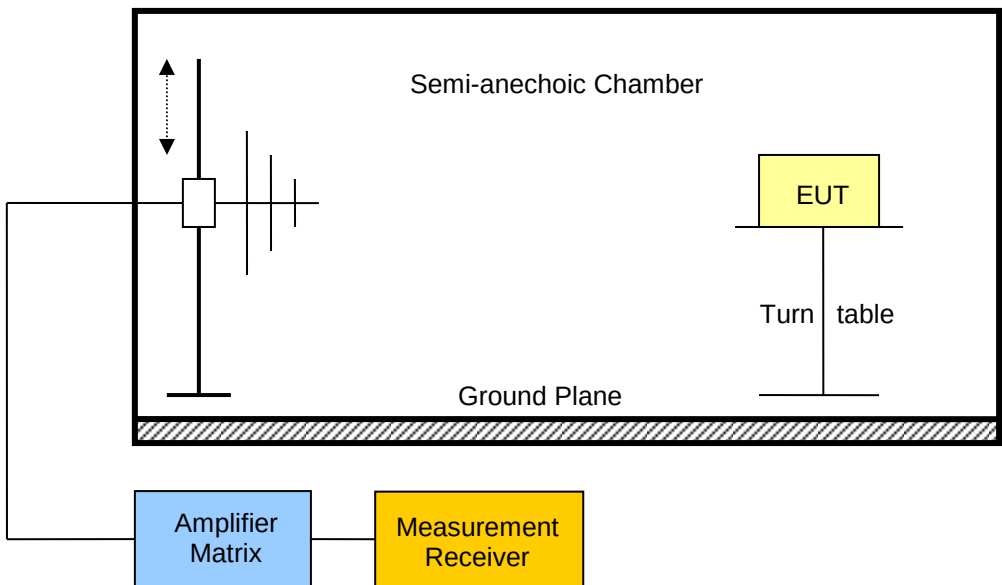
Radiated power acc. to FCC 22H / FCC 24E / ISED RSS-132 / ISED RSS-133			Verdict: PASS
EUT requirement rule parts and clause	Reference		
	FCC § 22.913(a) / FCC § 24.232(c) ISED RSS-132 § 4.4 / IC RSS-133 § 6.4		
Test according to measurement reference	Reference Method		
	FCC § 22.913(a) / FCC § 24.232(c) / ANSI/TIA-603-D ISED RSS-132 § 4.4 / ISED RSS-133 § 6.4 / ANSI C63.26-2015 5.2		
Test frequency range	Tested frequencies		
	F _{LOW} / F _{MID} / F _{HIGH}		
Limits			
Carrier Frequency range	Equipment type	Power limit	
824-849 MHz	Mobile transmitter	FCC : 7 Watts (38.45 dBm) e.r.p. ISED : 11.5 Watts (40.60 dBm) e.i.r.p.	
1850-1910 MHz	Mobile transmitter	FCC : 2 Watts (33 dBm) e.i.r.p. ISED : 2 Watts (33 dBm) e.i.r.p.	
Test setup			
			
Test procedure			
1. EUT set to test mode 2. The radiated power is measured with a measurement antenna in vertical polarization 3. To obtain maximum level the EUT is rotated 4. The EUT is replaced with a half-wave dipole and the power to the dipole is adjusted to obtain same radiated power measurement value			

Test results – GSM850 - E.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.r.p]	Limit [dBm e.r.p]	Margin [dB]	Result
F _{LOW}	824.2	GPRS - TX	hor	31.8	-38.45	-6.65	PASS
F _{MID}	836.2	GPRS - TX	hor	32.4	38.45	-6.05	PASS
F _{HIGH}	848.8	GPRS - TX	hor	33.2	38.45	-5.25	PASS
F _{LOW}	824.2	EDGE - TX	hor	29.0	38.45	-9.45	PASS
F _{MID}	836.2	EDGE - TX	hor	29.3	38.45	-9.15	PASS
F _{HIGH}	848.8	EDGE - TX	hor	29.5	38.45	-8.95	PASS
Test results – GSM850 - E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F _{LOW}	824.2	GPRS - TX	hor	33.95	40.6	-6.65	PASS
F _{MID}	836.2	GPRS - TX	hor	34.55	40.6	-6.05	PASS
F _{HIGH}	848.8	GPRS - TX	hor	35.35	40.6	-5.25	PASS
F _{LOW}	824.2	EDGE - TX	hor	31.15	40.6	-9.45	PASS
F _{MID}	836.2	EDGE - TX	hor	31.45	40.6	-9.15	PASS
F _{HIGH}	848.8	EDGE - TX	hor	31.65	40.6	-8.95	PASS
Test results – GSM1900 - E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F _{LOW}	1850.2	GPRS - TX	hor	32.1	33	-0.9	PASS
F _{MID}	1880.0	GPRS - TX	hor	29.9	33	-3.1	PASS
F _{HIGH}	1909.8	GPRS - TX	hor	28.1	33	-4.9	PASS
F _{LOW}	1850.2	EDGE - TX	hor	31.0	33	-2.0	PASS
F _{MID}	1880.0	EDGE - TX	hor	28.6	33	-4.4	PASS
F _{HIGH}	1909.8	EDGE - TX	hor	26.8	33	-6.2	PASS
Comments: For each channel and bandwidth only the polarization that gives the highest output power is reported							

Test results – W-CDMA FDD V - E.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.r.p]	Limit [dBm e.r.p]	Margin [dB]	Result
F _{LOW}	826.6	W-CDMA - TX	hor	23.9	38.45	-14.55	PASS
F _{MID}	835.0	W-CDMA - TX	hor	23.3	38.45	-15.15	PASS
F _{HIGH}	846.4	W-CDMA - TX	hor	23.7	38.45	-14.75	PASS
Test results – W-CDMA FDD V - E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F _{LOW}	826.6	W-CDMA - TX	hor	26.05	40.6	-14.55	PASS
F _{MID}	835.0	W-CDMA - TX	hor	25.45	40.6	-15.15	PASS
F _{HIGH}	846.4	W-CDMA - TX	hor	25.85	40.6	-14.75	PASS
Test results – W-CDMA FDD II - E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F _{LOW}	1852.6	W-CDMA - TX	hor	25.7	33	-7.3	PASS
F _{MID}	1880.0	W-CDMA - TX	hor	25.9	33	-7.1	PASS
F _{HIGH}	1907.4	W-CDMA - TX	hor	23.6	33	-9.4	PASS
Comments: For each channel and bandwidth only the polarization that gives the highest output power is reported							

Test results – LTE FDD 5 - E.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.r.p]	Limit [dBm e.r.p]	Margin [dB]	Result
F _{LOW}	829.0	LTE 5 - QPSK PWR	hor	26.7	38.45	-11.75	PASS
F _{MID}	836.5	LTE 5 - QPSK PWR	hor	27.3	38.45	-11.15	PASS
F _{HIGH}	844.0	LTE 5 - QPSK PWR	hor	27.8	38.45	-10.65	PASS
F _{LOW}	829.0	LTE 5 - QAM PWR	hor	24.5	38.45	-13.95	PASS
F _{MID}	836.5	LTE 5 - QAM PWR	hor	24.7	38.45	-13.75	PASS
F _{HIGH}	844.0	LTE 5 - QAM PWR	hor	25.5	38.45	-12.95	PASS
Test results – LTE FDD 5 - E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F _{LOW}	829.0	LTE 5 - QPSK PWR	hor	28.85	40.6	-11.75	PASS
F _{MID}	836.5	LTE 5 - QPSK PWR	hor	29.45	40.6	-11.15	PASS
F _{HIGH}	844.0	LTE 5 - QPSK PWR	hor	29.95	40.6	-10.65	PASS
F _{LOW}	829.0	LTE 5 - QAM PWR	hor	26.65	40.6	-13.95	PASS
F _{MID}	836.5	LTE 5 - QAM PWR	hor	26.85	40.6	-13.75	PASS
F _{HIGH}	844.0	LTE 5 - QAM PWR	hor	27.65	40.6	-12.95	PASS
Test results – LTE FDD 2 - E.I.R.P.							
Channel	Frequency [MHz]	Mode	Pol.	Power [dBm e.i.r.p]	Limit [dBm e.i.r.p]	Margin [dB]	Result
F _{LOW}	1855.0	LTE 2 - QPSK PWR	hor	29.3	33	-3.7	PASS
F _{MID}	1880.0	LTE 2 - QPSK PWR	hor	29.3	33	-3.7	PASS
F _{HIGH}	1905.0	LTE 2 - QPSK PWR	hor	26.0	33	-7.0	PASS
F _{LOW}	1855.0	LTE 2 - QAM PWR	hor	29.3	33	-3.7	PASS
F _{MID}	1880.0	LTE 2 - QAM PWR	hor	29.3	33	-3.7	PASS
F _{HIGH}	1905.0	LTE 2 - QAM PWR	hor	26.2	33	-6.8	PASS
Comments: For each channel and bandwidth only the polarization that gives the highest output power is reported							

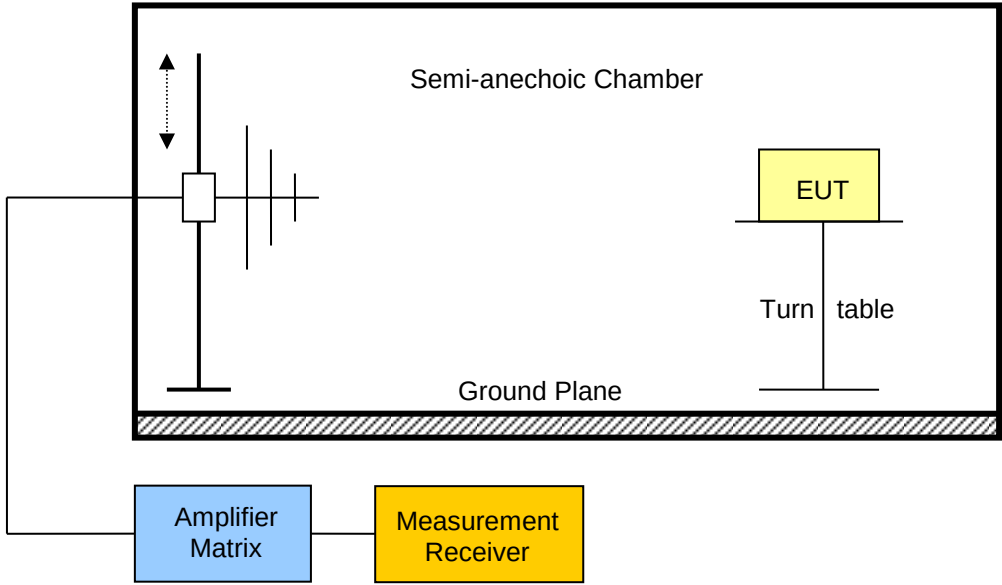
3.3 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated power acc. to FCC 22H / FCC 24E / ISED RSS-132 / ISED RSS-133		Verdict: PASS
Test according referenced standards	Reference Method	
	FCC § 22.917(a) / FCC § 24.238(a) ISED RSS-132 § 4.5 / ISED RSS-133 § 6.5	
Test according to measurement reference	Reference Method	
	ANSI/TIA-603-D / ANSI C63.26-2015 5.5	
Test frequency range	Tested frequencies	
	30 MHz – 10 th Harmonic	
Limits		
Carrier Frequency range	Limit	
824-849 MHz	Attenuation below transmitter power ≥ 43 + 10 · log ₁₀ (P) [dB] = -13 dBm	
1850-1910 MHz	Attenuation below transmitter power ≥ 43 + 10 · log ₁₀ (P) [dB] = -13 dBm	
Test setup		
		
Test procedure		
1. EUT set to test mode 2. Maximum emission level is measured by rotating the EUT and adjusting the antenna height for vertical polarization 3. The EUT is replaced by a substitution antenna and generator 4. The power level is set to obtain the same power reading 5. Measurement is repeated for horizontal polarization		

Test results – FCC 22H							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]
F _{LOW}	824.2	GPRS - TX	*)				
F _{MID}	836.2	GPRS - TX	*)				
F _{HIGH}	848.8	GPRS - TX	*)				
F _{LOW}	826.6	W-CDMA - TX	824.0	-27.5	hor	-13	-14.5
F _{MID}	835.0	W-CDMA - TX	*)				
F _{HIGH}	846.4	W-CDMA - TX	850.3	-26.1	hor	-13	-13.1
F _{LOW}	829.0	LTE 5 - QPSK PWR	*)				
F _{MID}	836.5	LTE 5 - QPSK PWR	*)				
F _{HIGH}	844.0	LTE 5 - QPSK PWR	851.0	-29.7	hor	-13	-16.7
F _{LOW}	829.0	LTE 5 - QAM PWR	*)				
F _{MID}	836.5	LTE 5 - QAM PWR	*)				
F _{HIGH}	844.0	LTE 5 - QAM PWR	*)				
Comments: *) No significant spurious emissions							

Test results – FCC 24E							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]
F _{LOW}	1850.2	GPRS - TX	1850	-21.9	ver	-13	-8.9
F _{LOW}	1850.2	GPRS - TX	1850	-20.5	hor	-13	-7.5
F _{MID}	1880.0	GPRS - TX	*)				
F _{HIGH}	1909.8	GPRS - TX	1910	-20.3	ver	-13	-7.3
F _{HIGH}	1909.8	GPRS - TX	1913	-18.3	hor	-13	-5.3
F _{LOW}	1852.6	W-CDMA - TX	1850	-26.8	ver	-13	-13.8
F _{LOW}	1852.6	W-CDMA - TX	1850	-22.9	hor	-13	-9.9
F _{MID}	1880.0	W-CDMA - TX	*)				
F _{HIGH}	1907.4	W-CDMA - TX	1910	-21.4	ver	-13	-8.4
F _{HIGH}	1907.4	W-CDMA - TX	1911	-20.8	hor	-13	-7.8
F _{LOW}	1855.0	LTE 2 - QPSK PWR	*)				
F _{MID}	1880.0	LTE 2 - QPSK PWR	*)				
F _{HIGH}	1905.0	LTE 2 - QPSK PWR	*)				
F _{LOW}	1855.0	LTE 2 - QAM PWR	*)				
F _{MID}	1880.0	LTE 2 - QAM PWR	*)				
F _{HIGH}	1905.0	LTE 2 - QAM PWR	*)				
Comments: *) No significant spurious emissions							

3.4 Test Conditions and Results – Receiver radiated emissions

Receiver radiated emissions acc. to ISED RSS-210				Verdict: PASS
Test according referenced standards	Reference Method			
	ISED RSS-132 5.6 / 133 6.6			
Test according to measurement reference	Reference Method			
	ANSI C63.4			
Test frequency range	Tested frequencies			
	30 MHz – 5 th Harmonic			
EUT test mode	Receive			
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]*
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
Test setup				
				

Test procedure							
1. EUT set to receive mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1MHz with peak/average detector is used above 1GHz 4. Markers are set to peak emission levels							
Test results – RSS-132							
Channel	Frequency [MHz]	Emission [MHz]	Emission Level [db μ V/m]	Emission Level [μ V/m]	Det.	Limit [μ V/m]	Margin [μ V/m]
F _{MID} 188	836.2	4952	44.70	170	pk	500	-330
F _{MID} 4400	880.0	34.08	30.57	34	pk	100	-66
F _{MID} 2525	881.5	7060	49.95	310	pk	500	-190
Comments: * Physical distance between EUT and measurement antenna. ** Emission level corresponds to ambient noise floor							

Test results – RSS-133							
Channel	Frequency [MHz]	Emission [MHz]	Emission Level [db μ V/m]	Emission Level [μ V/m]	Det.	Limit [μ V/m]	Margin [μ V/m]
F _{MID} 661	1880	3460	42.84	140	pk	500	-360
F _{MID} 9800	1960	7816	50.36	330	pk	500	-170
F _{MID} 900	1960	187.42	32.93	44	pk	150	-106
F _{MID} 900	1960	7120	49.99	320	pk	500	-180
Comments: * Physical distance between EUT and measurement antenna. ** Emission level corresponds to ambient noise floor							