



Full

TEST REPORT

No. I18D00189-SRD04

For

Client : Shanghai Sunmi Technology Co.,Ltd.

Production : POS System

Model Name : L1321/L1323

Brand Name : SUNMI

FCC ID : 2AH25T2MININFC

Hardware Version: V1.03

Software Version: MST2MINI_EQ000_2EE0.123BBE2.9530762_

180824_100_V01_T15

Issued date: 2018-12-25

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of ECIT Shanghai.

The standards accredited by A2LA except ANSI/TIA-603-E and KDB 971168 D01.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

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Revision Version

Report Number	Revision	Date	Memo
I18D00189-SRD04	00	2018-12-13	Initial creation of test report
I18D00189-SRD04	01	2018-12-24	Second creation of test report
I18D00189-SRD04	02	2018-12-25	Third creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301
FCC registration No	958356

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-30/+50℃
Relative Humidity:	20-75%

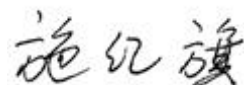
1.3. Project data

Project Leader:	Zhou Yan
Testing Start Date:	2018-09-25
Testing End Date:	2018-10-19

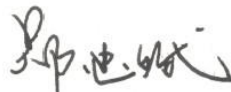
1.4. Signature



Yang Dejun
(Prepared this test report)



Shi Hongqi
(Reviewed this test report)



Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name: Shanghai Sunmi Technology Co.,Ltd.
Address: Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai,
China
Telephone: 8618721763396
Postcode: 200433

2.2. Manufacturer Information

Company Name: Shanghai Sunmi Technology Co.,Ltd.
Address: Room 505, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai,
China
Telephone: 8618721763396
Postcode: 200433

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	POS System
Model name	L1321/L1323
FCC ID	2AH25T2MININFC
GSM Frequency Band	GSM 850/GSM 1900
UMTS Frequency Band	Band 2/5
CDMA Frequency Band	BC 0
LTE Frequency Band	Band 38/41
Additional Communication Function	BT/BLE/2.4G WLAN b/g/n20/n40/NFC
Extreme Temperature	-30/+50°C
Nominal Voltage	24V
Extreme High Voltage	25V
Extreme Low Voltage	23V

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	Model Name	SN or IMEI	HW Version	SW Version	Date of receipt
N10	L1321	/	V1.03	MST2MINI_EQ00 0_2EE0.123BBE2 .9530762_180824 _100_V01_T15	2018-09-07
N08	L1321	/	V1.03	MST2MINI_EQ00 0_2EE0.123BBE2 .9530762_180824 _100_V01_T15	2018-09-07
N01	L1323	/	V1.03	MST2MINI_EQ00 0_2EE0.123BBE2 .9530762_180824 _100_V01_T15	2018-09-07

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	RF cable	---

*AE ID: is used to identify the test sample in the lab internally.

3.4. Statements

The L1321/L1323, supporting GPRS/EDGE/WCDMA/CDMA/LTE/BT/WLAN/BLE/NFC, manufactured by Shanghai Sunmi Technology Co.,Ltd., which is a new product for testing.

Note: The project has two prototypes, L1321 and L1323. The L1321 we tested all the test items. The other one we only tested worse case of RSE.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2017/10/01
FCC Part 22	PUBLIC MOBILE SERVICES	2017/10/01
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2017/10/01
ANSI-TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03

5. SUMMARY OF TEST RESULTS

Item	Test items	FCC rules	IC rules	result
1	Output Power	2.1046/22.913(a)/24.23	/	Pass
2	Peak-to-Average	24.232(d)	/	Pass
3	99%Occupied	2.1049(h)(i)/ 22.917(b)	/	Pass
4	-26dB Emission	22.917(b)/§24.238(b)	/	Pass
5	Band Edge at antenna terminals	22.917(a)/24.238(a)	/	Pass
6	Frequency stability	2.1055/24.235	/	Pass
7	Conducted Spurious mission	2.1053/22.917(a)/24.23	/	Pass
8	Emission Limit	2.1051/22.917/24.238/	/	Pass

6. Test Equipment Utilized

Climate chamber

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Climate chamber	SH-641	92012011	ESPEC	2017-12-25	2 Year

Radiated emission test system

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	2018-05-11	1 Year
2	EMI Test Receiver	ESU40	100307	R&S	2018-05-11	1 Year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 Year
4	Double-ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
5	2-Line V-Network	ENV216	101380	R&S	2018-05-11	1 Year
6	Substitution Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
7	RF Signal Generator	SMF100A	102314	R&S	2018-05-11	1 Year
8	Substitution Antenna	VUBA9117	9117-266	Schwarzbeck	2017-11-18	3 Year
9	Amplifier	SCU08	10146	R&S	2018-05-11	1 Year

Conducted test system

No.	Name	Type	SN	Manufacture	Calibration date	Cal.interval
1	Spectrum Analyzer	FSQ26	101096	R&S	2018-05-11	1 Year
2	Universal Radio Communicat	CMU200	123124	R&S	2018-05-11	1 Year
3	DC Power Supply	ZUP60-1 4	LOC-220Z006 -0007	TDL-Lambda	2018-05-11	1 Year

7. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

8. Test Environment

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents. The detailed measurement uncertainty to see the column, k=2

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Maximum Peak Output Power	30MHz-3600MHz	95%	$\pm 0.88\text{db}$
EBW and VBW	30MHz-3600MHz	95%	$\pm 0.031\text{MHz}$
Transmitter Spurious Emission-Conducted	9KHz-10000MHz	95%	$\pm 4.56\text{db}$
Transmitter Spurious Emission-Conducted	10000 MHz -40000MHz	95%	$\pm 5.34\text{db}$
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	$\pm 5.66\text{db}$
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	$\pm 4.98\text{db}$
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	$\pm 5.06\text{db}$
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	$\pm 5.20\text{db}$
Frequency stability	1MHz-16GHz	95%	10KHz

ANNEX A. MEASUREMENT RESULTS

ANNEX A.1. OUTPUT POWER

A.1.1. Summary

During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio. Communication tester (CMU-200) to ensure max power transmission and proper modulation. This result contains peak output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

A.1.2. Conducted

A.1.2.1. Method of Measurements

Method of measurements please refer to KDB971168 D01 v03 clause 5.

The EUT was set up for the max output power with pseudo random data modulation.

The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak).

These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0MHz and 1909.8MHz for PCS1900 band; 824.2MHz, 836.6MHz and 848.8MHz for GSM850 band. (bottom, middle and top of operational frequency range).

These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0MHz and 1907.6MHz for WCDMA Band II; 826.4MHz, 836.6MHz and 846.6MHz for WCDMA Band V. (bottom, middle and top of operational frequency range).

A.1.2.2 Test procedures:

1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

A.1.2.3 Limit:

22.913(a) Mobile stations are limited to 7watts.

24.232(c) Mobile and portable stations are limited to 2 watts.

A.1.2.4 Test Procedure:

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

A.1.2.5 GSM Test Condition:

RBW	VBW	Sweep time	Span
3MHz	10MHz	Auto	50MHz

A.1.2.6 WCDMA Test Condition:

RBW	VBW	Sweep time	Span
10MHz	30MHz	Auto	50MHz

A.1.2.7 Measurement results:

GPRS 850 (GMSK 1 Slot)		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 189/836.4	33.39	32.92
Low 128/824.2	33.43	33.01
High 251/848.8	33.52	33.13
EDGE 850 (8PSK 1 Slot)		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 189/836.4	29.81	26.43
Low 128/824.2	29.79	26.52
High 251/848.8	29.9	26.65

GPRS 1900 (GMSK 1 Slot)		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 661/1880	30.02	29.6
Low 512/1850.2	30.04	29.65
High 810/1909.8	29.75	29.43
EDGE 1900 (8PSK 1 Slot)		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 661/1880	28.93	25.54
Low 512/1850.2	28.82	25.41
High 810/1909.8	28.84	25.44

WCDMA II

Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 9400 /1880	25.65	22.82
Low 9262/1852.4	25.87	22.70
High 9538/1907.6	25.80	22.78
WCDMA BAND V		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 4183/836.6	27.08	23.65
Low 4132/826.4	27.20	23.73
High 4233/846.6	26.87	23.42

Conclusion: PASS

ANNEX A.2. Peak-to-Average Power Ratio

Method of test measurements please refer to KDB971168 D01 v03 clause 5.7.

A.2.1 PAPR Limit

The peak-to-average power ratio (PAPR) of the transmission may not exceed 13dB

A.2.2 Test procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2.
 - 1) Select the spectrum analyzer CCDF function.
 - 2) Set $RBW \geq$ signal's occupied bandwidth.
 - 3) Set the number of counts to a value that stabilizes the measured CCDF curve;
 - 4) Sweep time \geq 1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

A.2.3 Test results:

GPRS850			
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
PAPR(dB)	10.32	10.39	7.96
EDGE850			
Channel	128	189	251

Frequency (MHz)	824.2	836.4	848.8
PAPR(dB)	10.34	10.39	7.54

GPRS1900			
Channel	512	661	810
Frequency (MHz)	1850.2	1880	1909.8
PAPR(dB)	10.38	10.31	8.32
EDGE1900			
Channel	512	661	810
Frequency (MHz)	1850.2	1880	1909.8
PAPR(dB)	10.35	10.34	8.41

WCDMA Band II			
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880	1907.6
PAPR(dB)	5.77	5.45	5.77
WCDMA Band V			
Channel	4132	4183	4233
Frequency (MHz)	826.4	836.4	846.6
PAPR(dB)	4.17	4.13	4.78

Conclusion: PASS

ANNEX A.3. Occupied Bandwidth

Method of test please refer to KDB971168 D01 v03 clause 4.0.

A.3.1. Occupied Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM850, PCS1900, WCDMA BANDII and WCDMA BANDV.

A.3.2 Test Procedure:

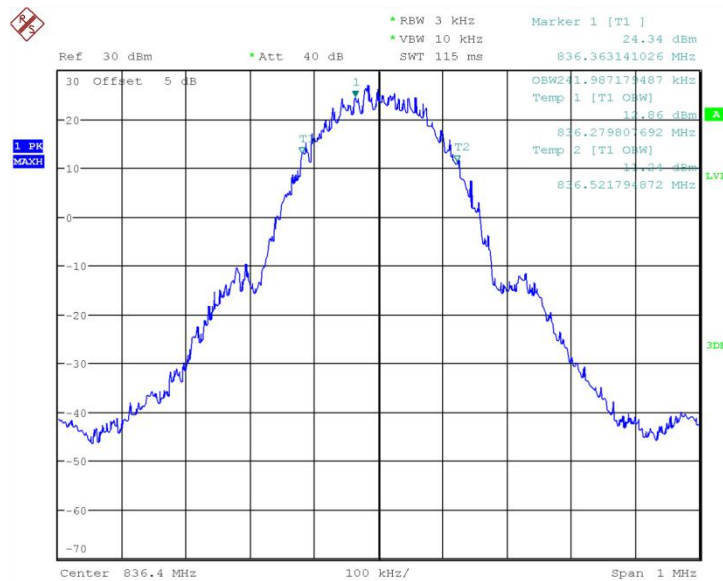
1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW \geq 3 times RBW,.
3. 99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.3.3 Test result:

GPRS850		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(kHz)
Mid 189	836.4	245.192
Low 128	824.2	243.59
High 251	848.8	243.59
EDGE850		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(kHz)
Mid 189	836.4	243.59
Low 128	824.2	240.385
High 251	848.8	245.192

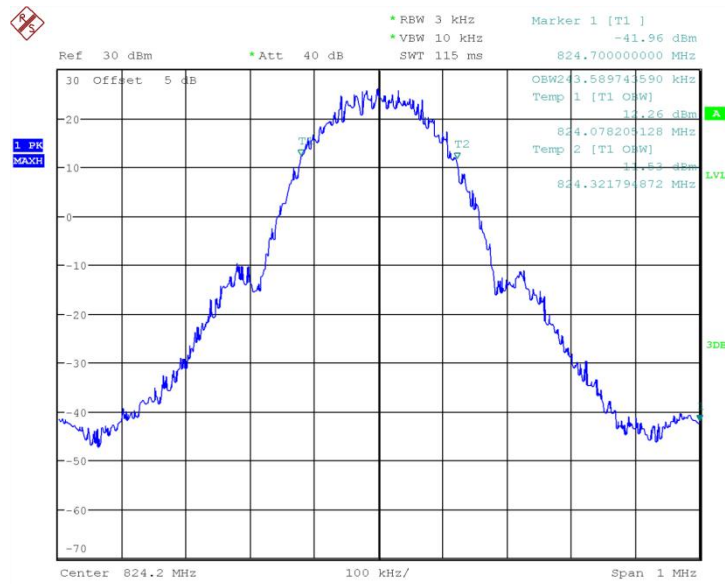
Conclusion: PASS

GPRS 850



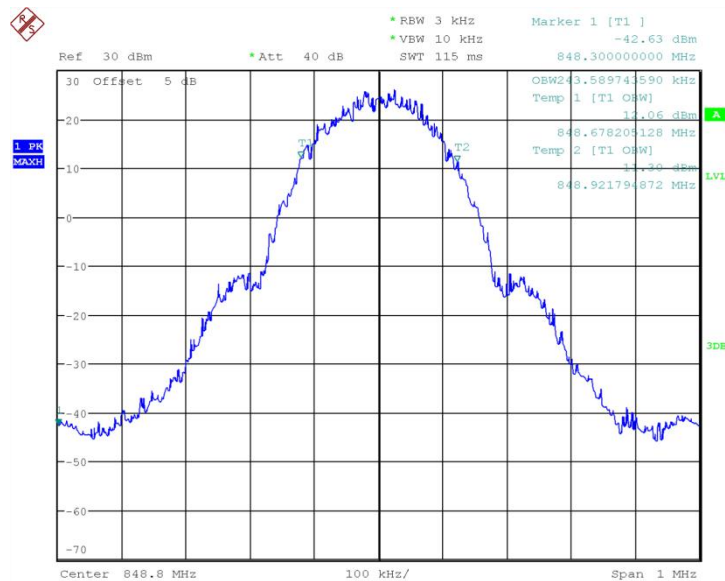
Date: 25.SEP.2018 04:03:09

Fig.1 Channel 189-Occupied Bandwidth (99%)



Date: 25.SEP.2018 04:03:56

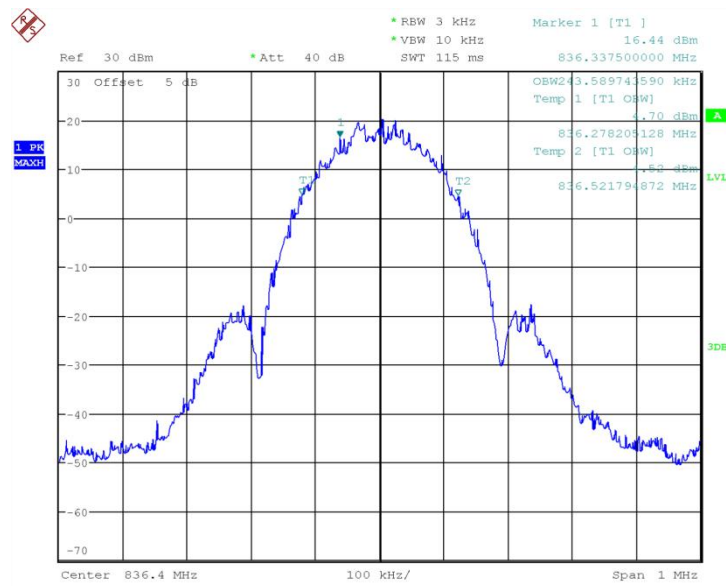
Fig.2 Channel 128-Occupied Bandwidth (99%)



Date: 25.SEP.2018 04:04:43

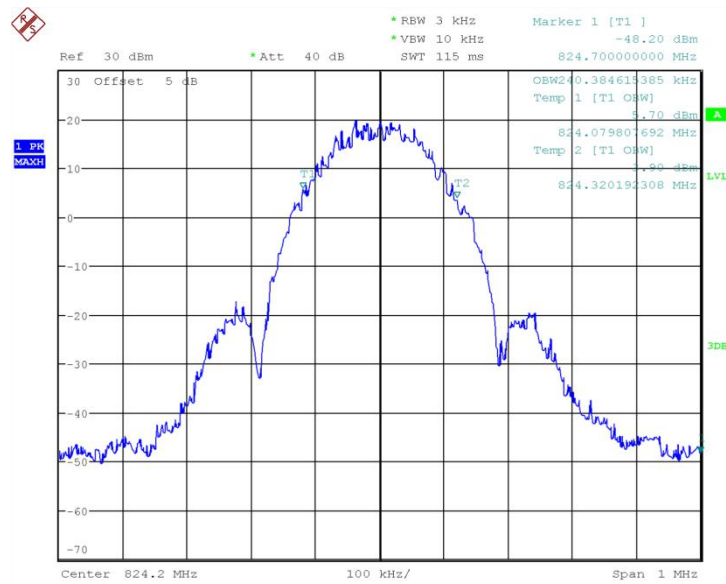
Fig.3 Channel 251-Occupied Bandwidth (99%)

EDGE 850



Date: 25.SEP.2018 04:07:38

Fig.4 Channel 189-Occupied Bandwidth (99%)



Date: 25.SEP.2018 04:08:25

Fig.5 Channel 128-Occupied Bandwidth (99%)

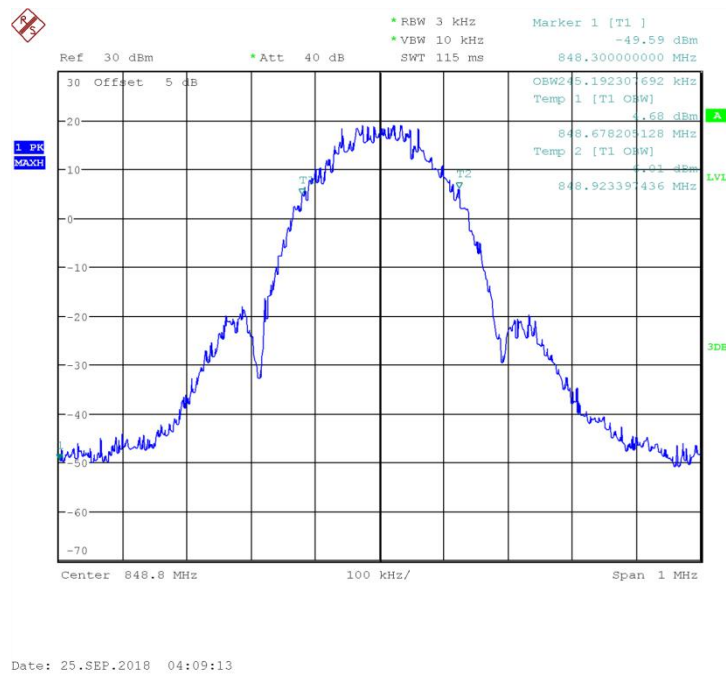
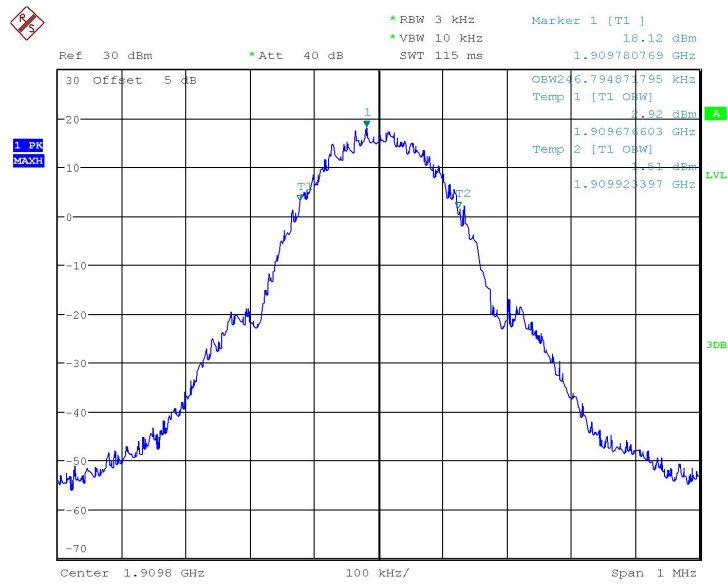


Fig.6 Channel 251-Occupied Bandwidth (99%)

GPRS1900		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(kHz)
Mid 661	1880	246.795
Low 512	1850.2	245.192
High 810	1909.8	246.795
EDGE1900		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(kHz)
Mid 661	1880	243.59
Low 512	1850.2	243.59
High 810	1909.8	246.795

Conclusion: PASS

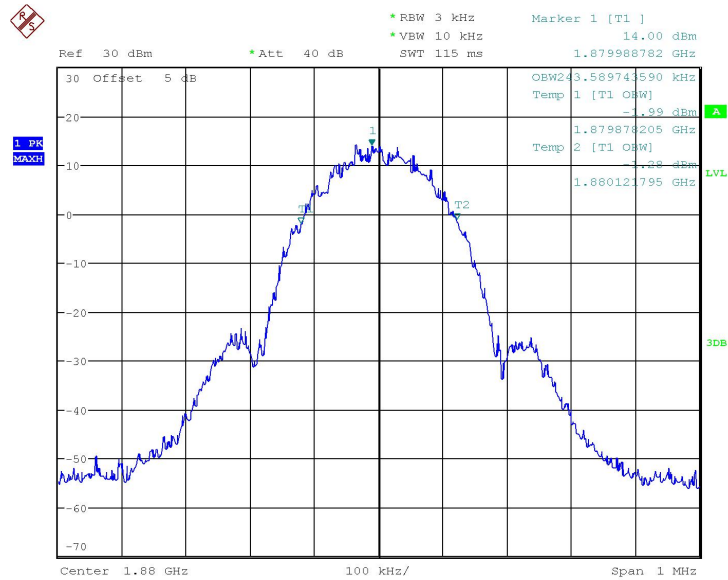
GPRS 1900



Date: 26.SEP.2018 08:30:43

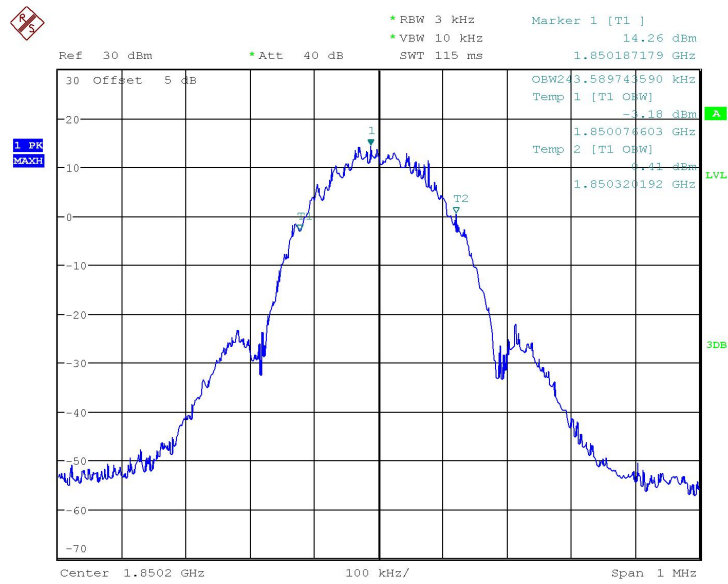
Fig.9 Channel 810-Occupied Bandwidth

EDGE 1900



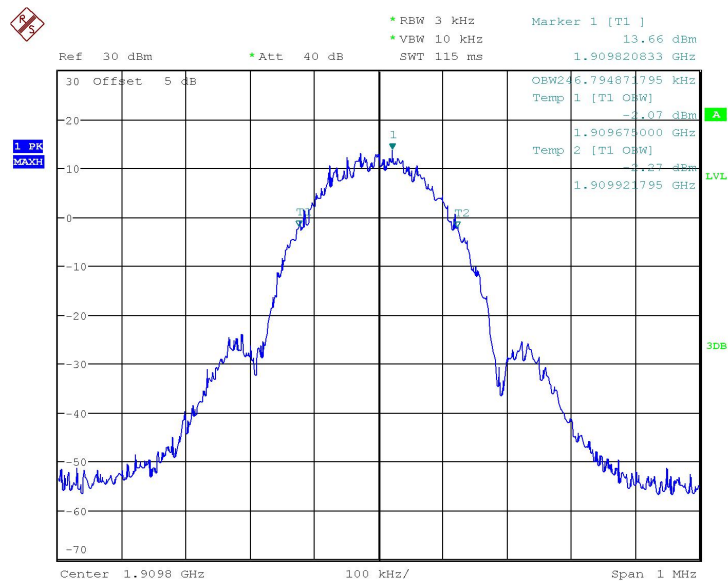
Date: 26.SEP.2018 08:38:35

Fig.10 Channel 661-Occupied Bandwidth



Date: 26.SEP.2018 08:40:10

Fig.11 Channel 512-Occupied Bandwidth



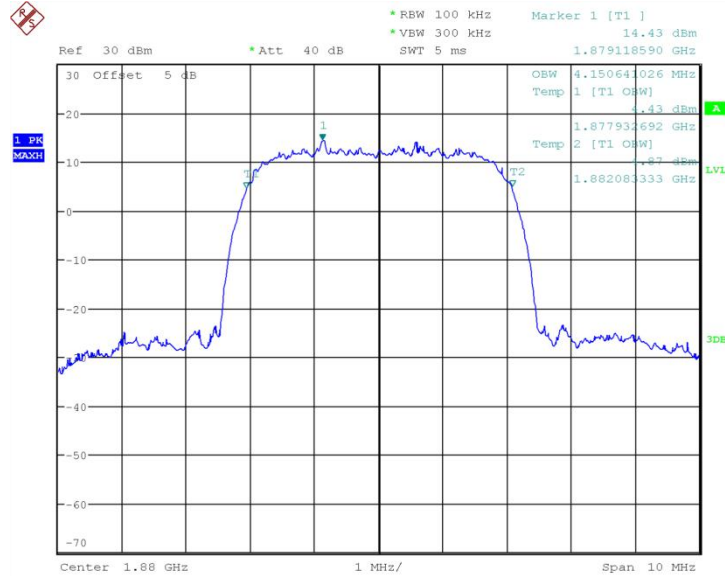
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Fig.12 Channel 810-Occupied Bandwidth

WCDMA BAND II		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 9400	1880	4.151
Low 9262	1852.4	4.151

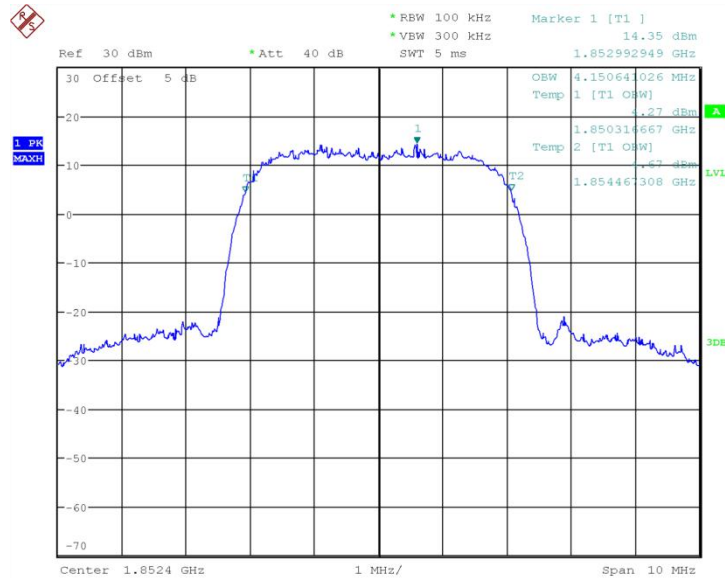
High 9538	1907.6	4.151
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Conclusion: PASS
WCDMA BAND II



Date: 25.SEP.2018 05:38:03

Fig.13 Channel 9400-Occupied Bandwidth



Date: 25.SEP.2018 05:39:05

Fig.14 Channel 9262-Occupied Bandwidth

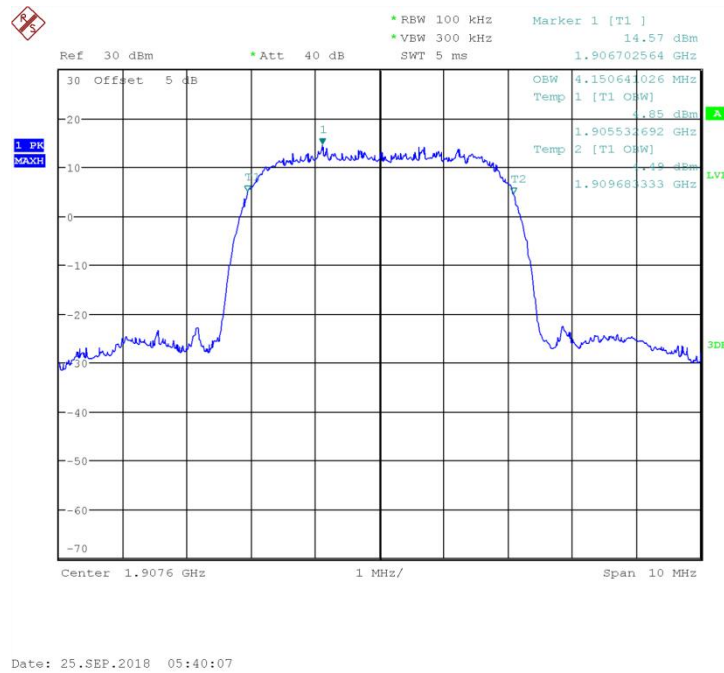
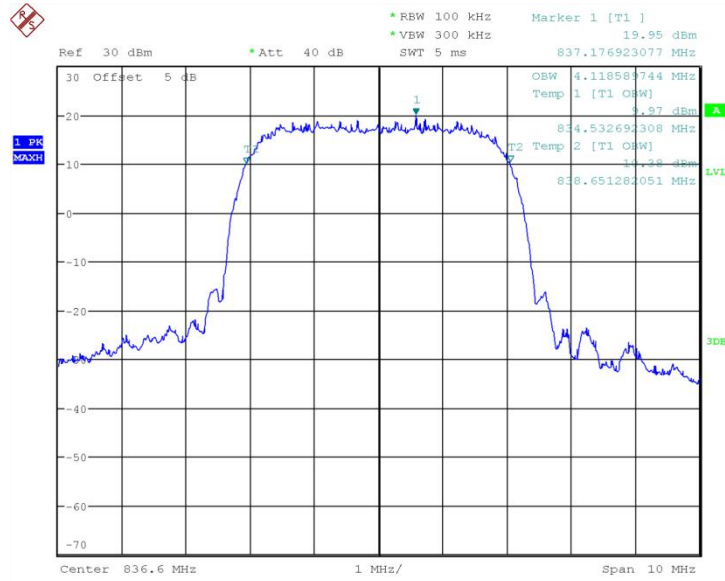


Fig.15 Channel 9538-Occupied Bandwidth

WCDMA BAND V		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 4183	836.6	4.135
Low 4132	826.4	4.119
High 4233	846.6	4.119

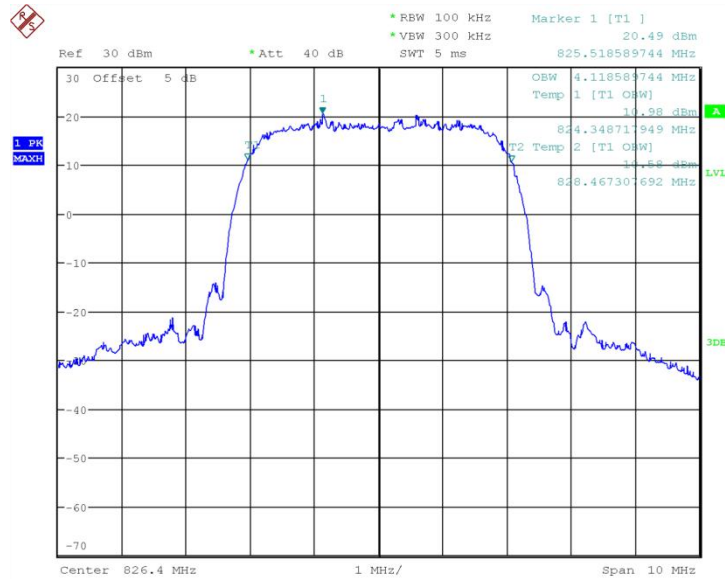
Conclusion: PASS

WCDMA BAND V



Date: 25.SEP.2018 05:41:19

Fig.16 Channel 4183-Occupied Bandwidth



Date: 25.SEP.2018 05:42:23

Fig.17 Channel 4132-Occupied Bandwidth

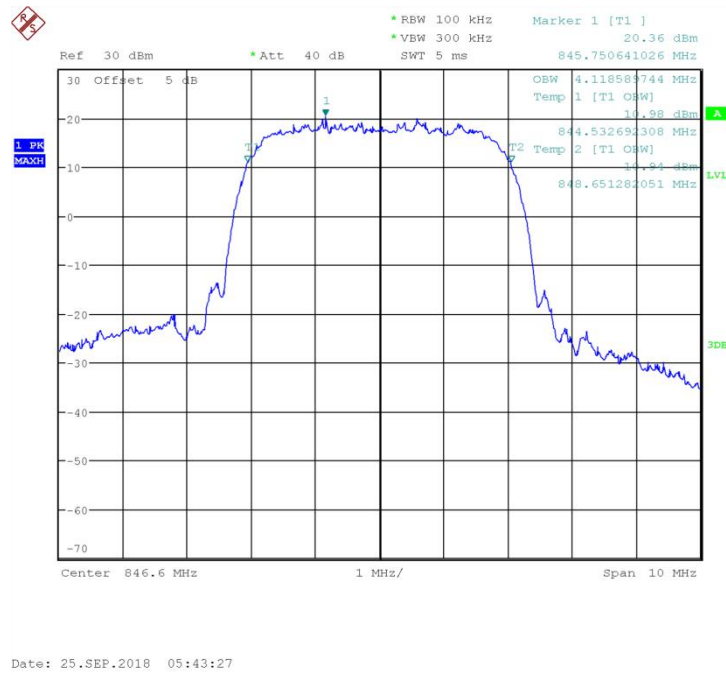


Fig.18 Channel 4233-Occupied Bandwidth

ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to KDB971168 D01 v03 clause 4.0.

A.4.1. -26dB Emission Bandwidth

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of GSM850, PCS1900, WCDMA BANDII and WCDMA BANDV.

A.4.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.4.3 Measurement methods:

For GSM: signal analyzer setting as: RBW=3KHz;VBW=10KHz;Span=1MHz.

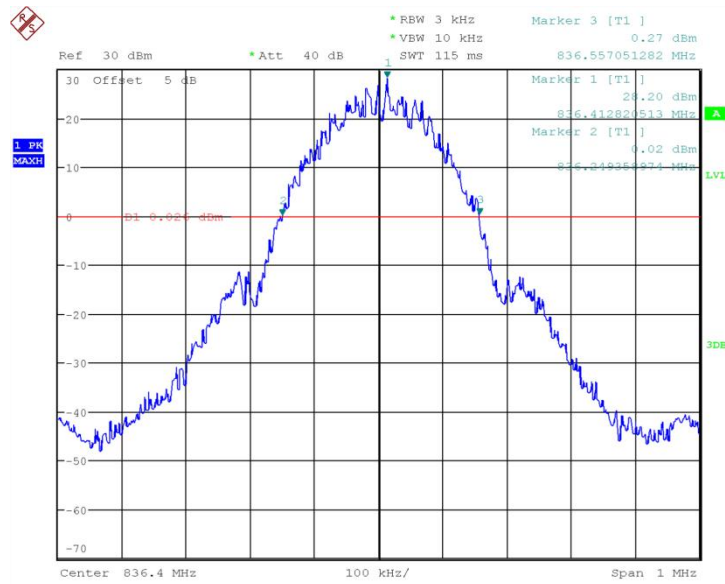
For WCDMA: signal analyzer setting as: RBW=50KHz;VBW=200KHz;Span=10MHz.

A.4.4 Test results:

GPRS 850		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(kHz)
Mid 189	836.4	307.692
Low 128	824.2	312.5
High 251	848.8	307.692
EDGE 850		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(kHz)
Mid 189	836.4	309.295
Low 128	824.2	310.897
High 251	848.8	306.09

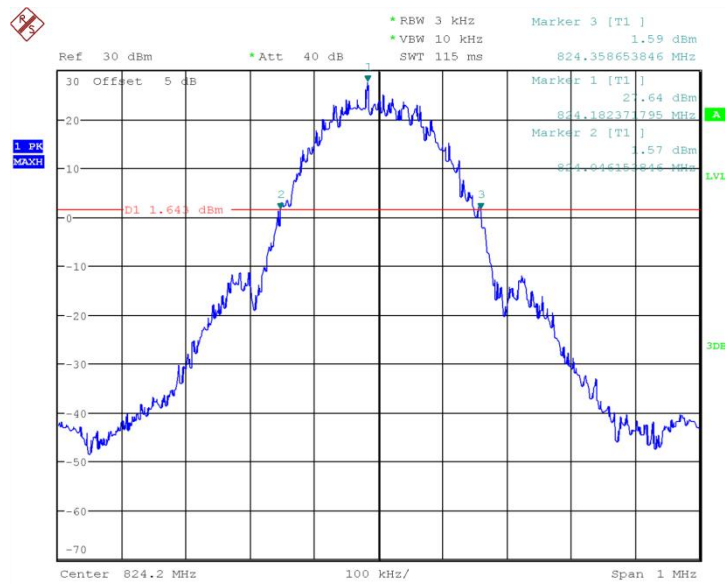
Conclusion: PASS

GPRS 850



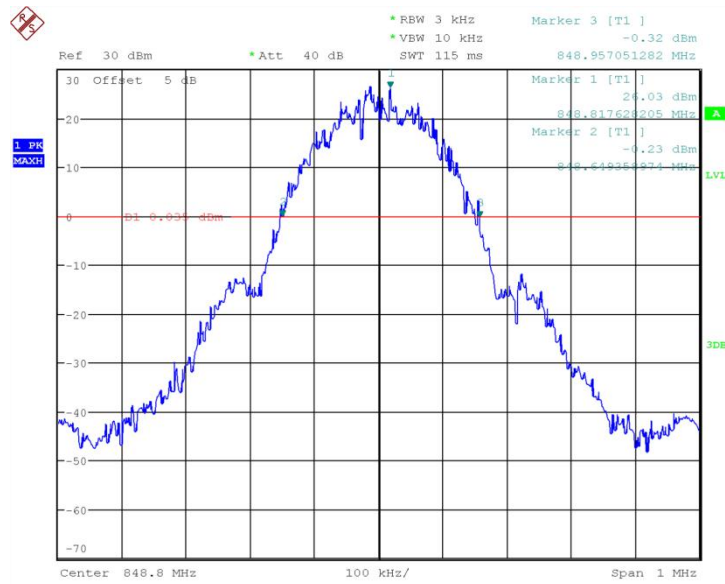
Date: 25.SEP.2018 04:26:23

Fig.19 Channel 189- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:26:52

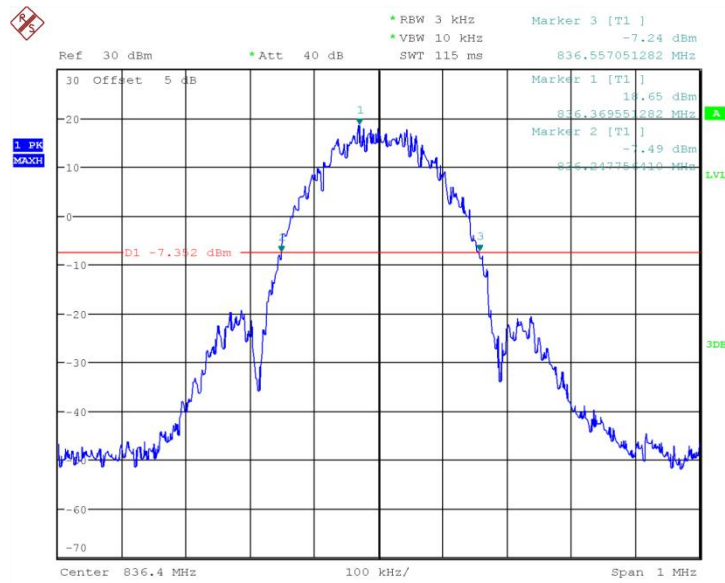
Fig.20 Channel 128- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:27:21

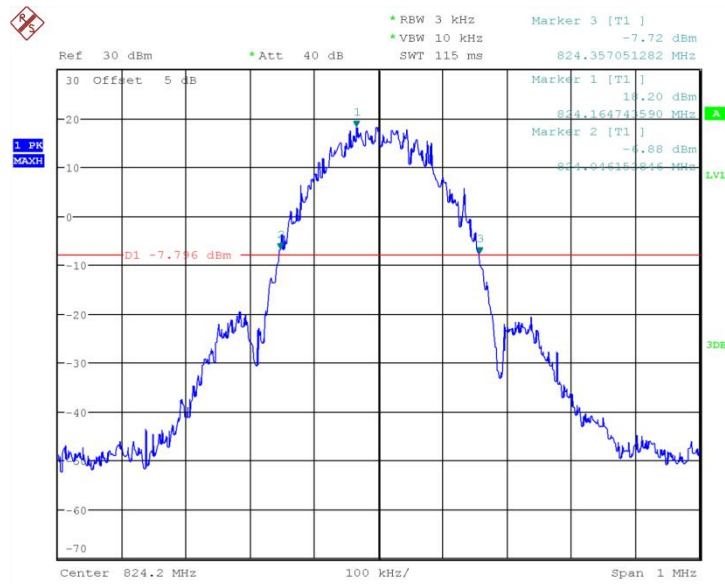
Fig.21 Channel 251- Emission Bandwidth (-26dBc BW)

EDGE 850



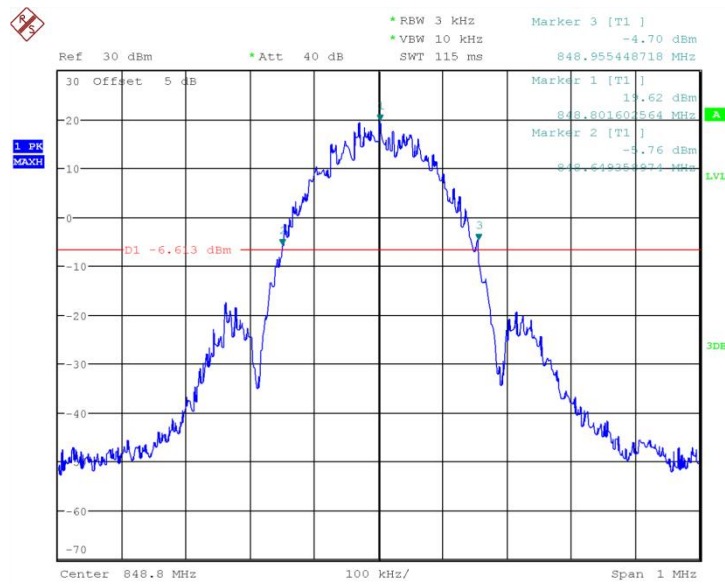
Date: 25.SEP.2018 04:30:17

Fig.22 Channel 189- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:30:46

Fig.23 Channel 128- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:31:15

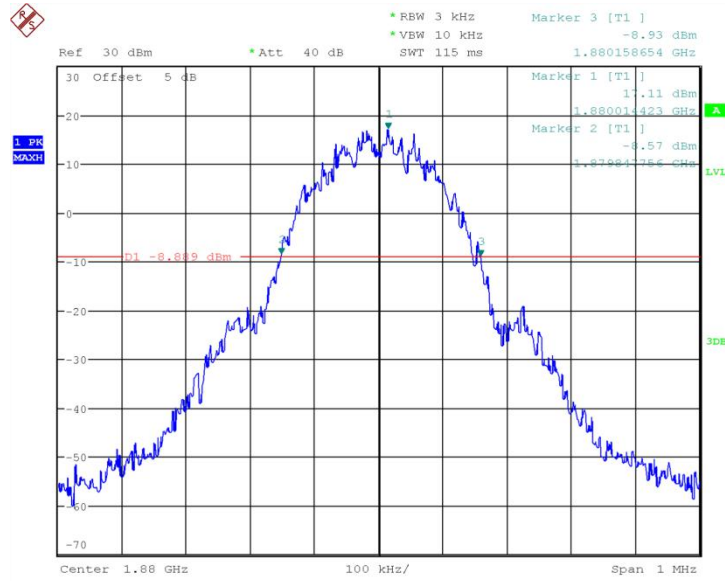
Fig.24 Channel 251- Emission Bandwidth (-26dBc BW)

GPRS1900		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(kHz)
Mid 661	1880	310.897
Low 512	1850.2	312.5

High 810	1909.8	318.91
EDGE1900		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(kHz)
Mid 661	1880	306.09
Low 512	1850.2	302.885
High 810	1909.8	309.295

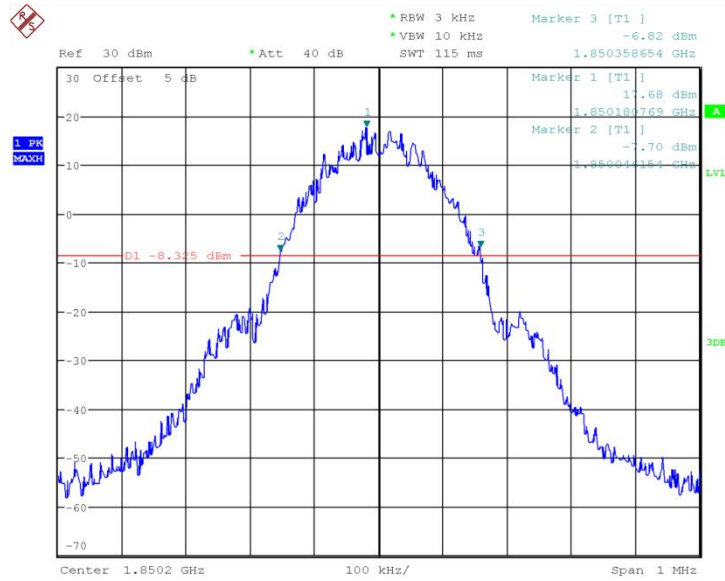
Conclusion: PASS

GPRS 1900



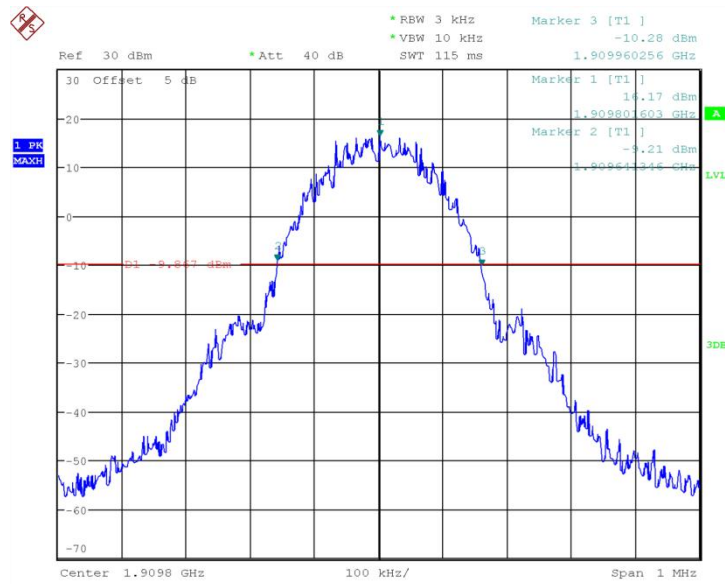
Date: 25.SEP.2018 04:37:51

Fig.25 Channel 661- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:38:19

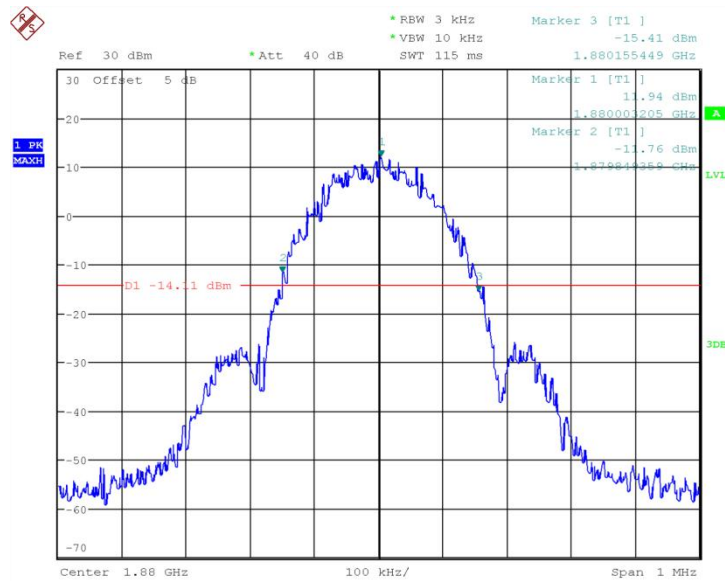
Fig.26 Channel 512- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:38:47

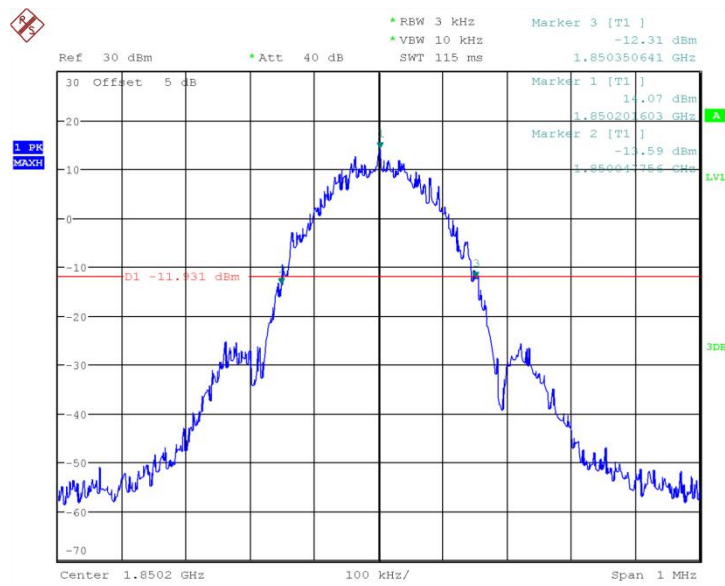
Fig.27 Channel 810- Emission Bandwidth (-26dBc BW)

EDGE 1900



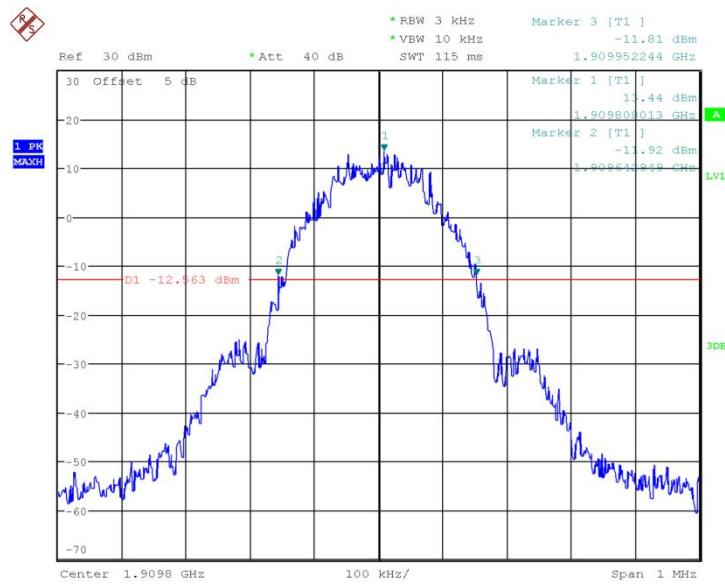
Date: 25.SEP.2018 04:40:57

Fig.28 Channel 661- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:41:25

Fig.29 Channel512- Emission Bandwidth (-26dBc BW)



Date: 25.SEP.2018 04:41:53

Fig.30 Channel 810- Emission Bandwidth (-26dBc BW)

WCDMA BAND II		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(MHz)
Mid 9400	1880	4.728

Low 9262	1852.4	4.744
High 9538	1907.6	4.728

Conclusion: PASS

WCDMA BAND II

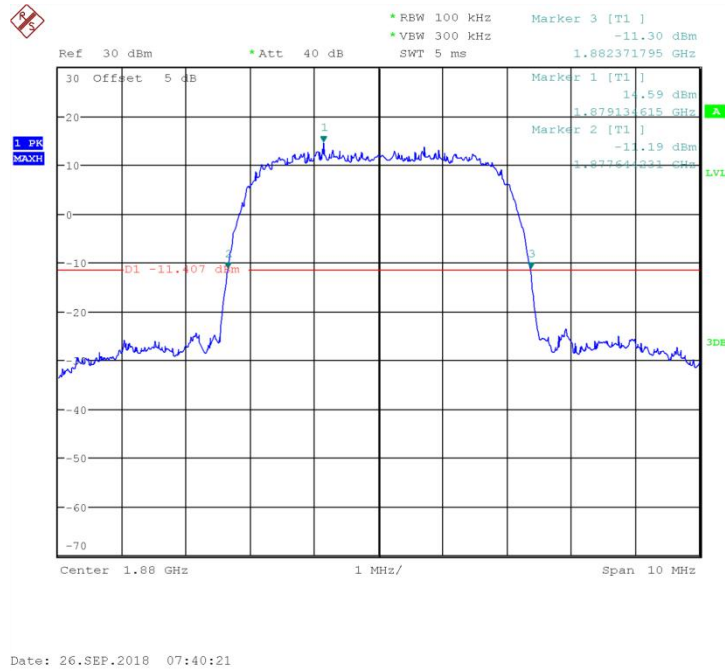


Fig.31 Channel 9400- Emission Bandwidth (-26dBc BW)

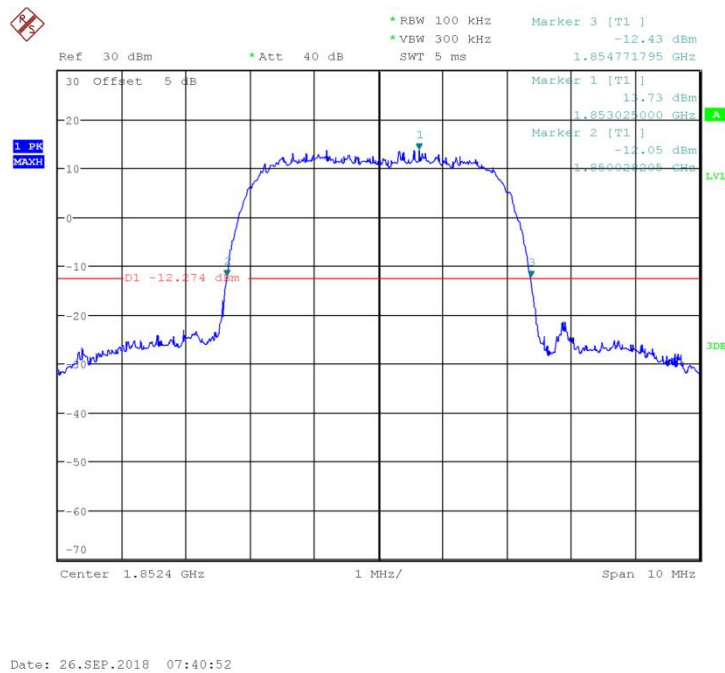
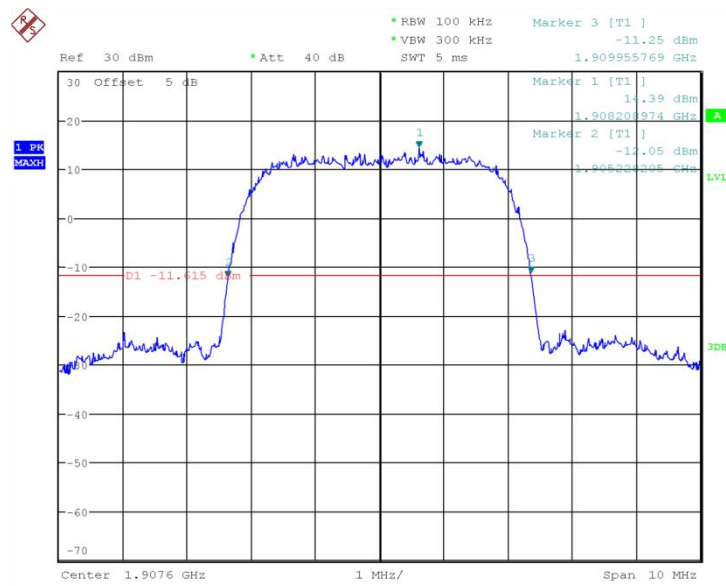


Fig.32 Channel 9262- Emission Bandwidth (-26dBc BW)



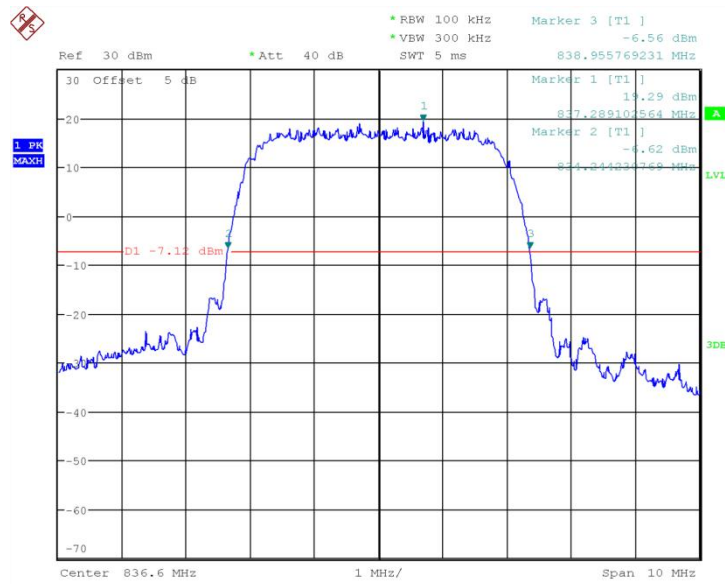
Date: 26.SEP.2018 07:41:23

Fig.33 Channel 9538- Emission Bandwidth (-26dBc BW)

WCDMA BAND V		
Test channel	Frequency (MHz)	-26dBc Emission Bandwidth(MHz)
Mid 4183	836.6	4.712
Low 4132	826.4	4.712
High 4233	846.6	4.696

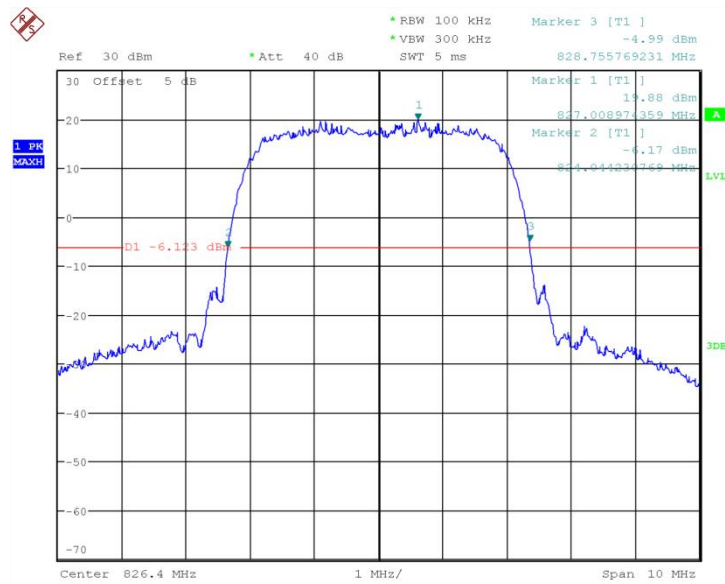
Conclusion: PASS

WCDMA BAND V



Date: 26.SEP.2018 07:42:02

Fig.34 Channel 4183- Emission Bandwidth (-26dBc BW)



Date: 26.SEP.2018 07:42:34

Fig.35 Channel 4132- Emission Bandwidth (-26dBc BW)