Full

TEST REPORT

No. I18D00191-SRD05

For

Client : Shanghai Sunmi Technology Co.,Ltd.

Production : POS System

Model Name : L1320/L1322

Brand Name : SUNMI

FCC ID : 2AH25T2MINI

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.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

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Revision Version

Report Number	Revision	Date	Memo
I18D00191-SRD05	00	2018-12-25	Initial 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:	2018-09-18
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	L1320/L1322
FCC ID	2AH25T2MINI
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℃
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
N02	L1320	/	V1.03	MST2MINI_EQ000_2EE0.123BBE2.9530762_180824_100_V01_T15	2018-09-07
N01	L1322	/	V1.03	MST2MINI_EQ000_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 L1320/L1322, supporting GPRS/EDGE/WCDMA/CDMA/LTE/BT/WLAN/BLE/NFC, manufactured by Shanghai Sunmi Technology Co.,Ltd., which is a variant product for testing.

Note: The project has two prototypes, L1320 and L1322. In this report, we didn't test, all test cases please refer to the report No: I18D00189-SRD05, which was prepared by East China Institute of Telecommunications.

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 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2017/10/01
FCC Part 22	PUBLIC MOBILE SERVICES	2017/10/01
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2017/10/01

5. SUMMARY OF TEST RESULTS

Item	Test items	Clause in FCC rules	Clause in IC rules RSS-Gen and RSS- 130	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

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

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	123123	R&S	2018-05-11	1 Year
3	DC Power Supply	ZUP60-14	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 ℃, Max. = 35 ℃
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 ℃, Max. = 35 ℃
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 ℃, Max. = 35 ℃
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%	±0.88db
EBW and VBW	30MHz-3600MHz	95%	±0.031MHz
Transmitter Spurious Emission-Conducted	9KHz-10000MHz	95%	±4.56db
Transmitter Spurious Emission-Conducted	10000 MHz -40000MHz	95%	±5.34db
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	±5.66db
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	±4.98db
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	±5.06db
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	±5.20db
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 CFR47 (FCC) part 2.1046 and part 22.913.
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 CDMA2000 Cellular Test Condition:

RBW	VBW	Sweep time	Span

1MHz	1MHz	300ms	10MHz

A.1.2.7 Measurement results:

CDMA2000 Cellular BC0		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 777/848.31	24.94	24.88
Low 384/836.52	25.03	24.90
High 1013/824.7	25.06	24.98

Conclusion: PASS

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

Method of test measurements please refer to CFR47 (FCC) part 2.1046 and part 22.913.

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⩾signal's occupied bandwidth.
   3) Set the number of counts to a value that stabilizes the measured CCDF cure;
   4) Sweep time ⩾ 1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

A.2.3 Test results:

CDMA2000 Cellular BC0			
Channel	384	777	1013
Frequency (MHz)	836.52	848.31	824.7
PAPR(dB)	8.43	8.43	8.65

Conclusion: PASS

ANNEX A.3. Occupied Bandwidth

Method of test please refer to CFR 47 (FCC) part 2.1049 and part 22 subpart .

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 CDMA2000 Cellular, CDMA2000 PCS.

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 >= 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:

CDMA2000 Cellular BC0		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Mid 777	848.31	1.284
Low 384	836.52	1.279
High 1013	824.7	1.284

Conclusion: PASS

CDMA2000 Cellular

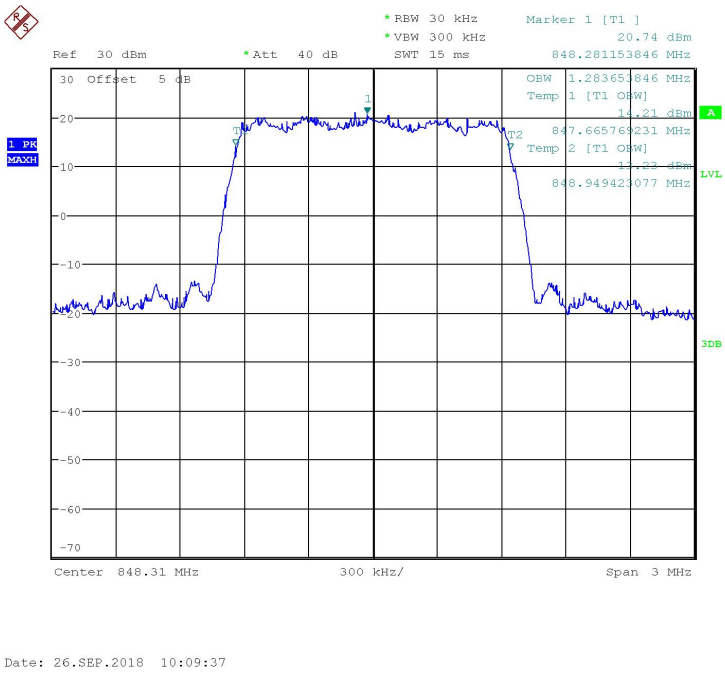

Fig.1 **Channel 777-Occupied Bandwidth (99%)**

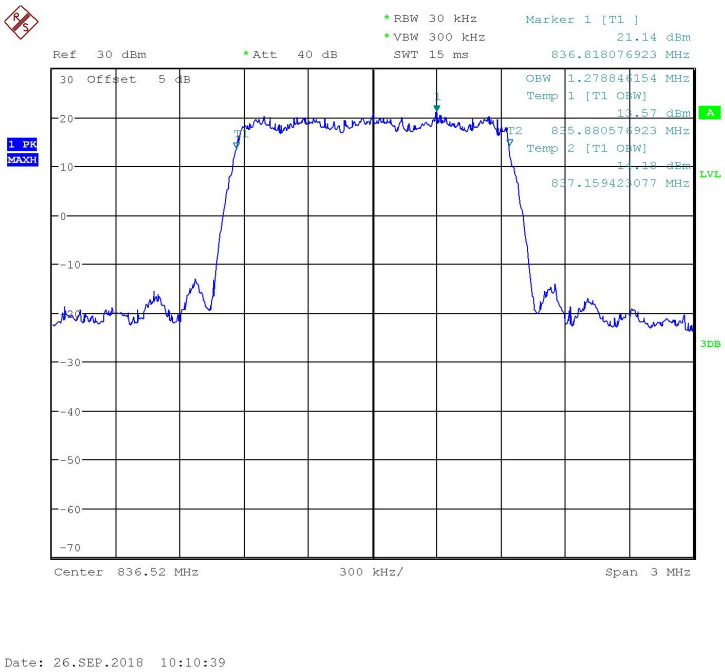

Fig.2 **Channel 384-Occupied Bandwidth (99%)**

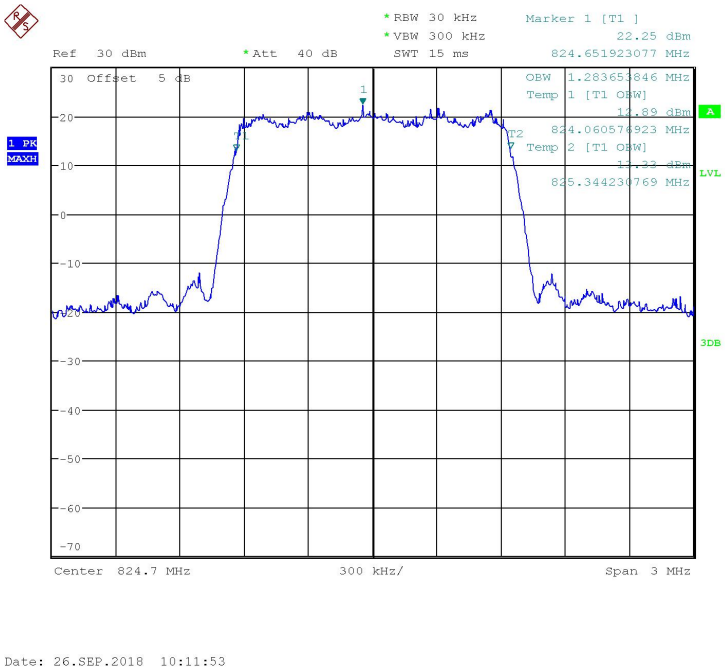

Fig.3 **Channel 1013-Occupied Bandwidth (99%)**

Conclusion: PASS

ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to CFR 47 (FCC) part 2.1049 and part 22 subpart.

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 CDMA2000 Cellular, CDMA2000 PCS.

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 CDMA: signal analyzer setting as: RBW=20KHz;VBW=200KHz;Span=3MHz.

A.4.4 Test results:

CDMA2000 Cellular BC0		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(MHz)
Mid 777	848.31	1.442
Low 384	836.52	1.442
High 1013	824.7	1.442

Conclusion: PASS

CDMA2000 Cellular

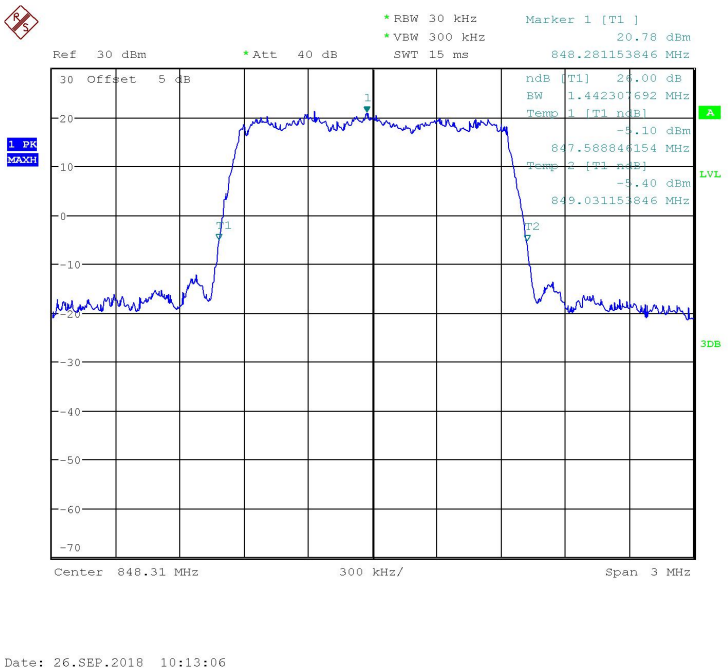

Fig.4 **Channel 777- Emission Bandwidth (-26dBc BW)**

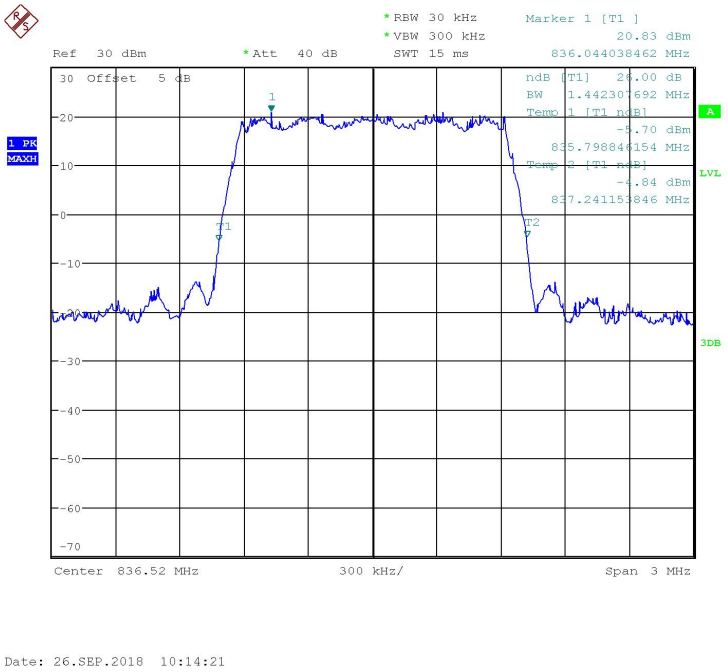

Fig.5 **Channel 384- Emission Bandwidth (-26dBc BW)**

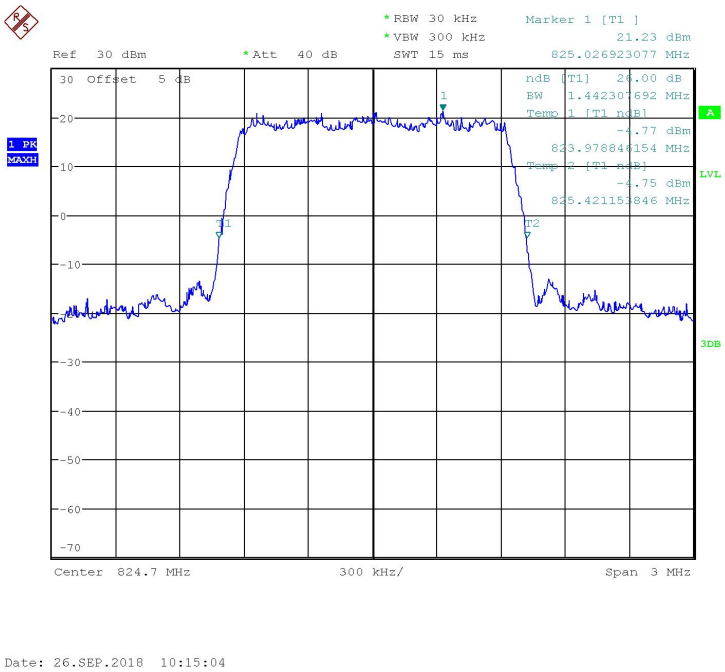

Fig.6 **Channel 1013- Emission Bandwidth (-26dBc BW)**

ANNEX A.5. Band Edge at antenna terminals

Method of test measurements please refer to CFR 47 (FCC) part 2.1051 and part 22.917.

A.5.1 Limit:

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than 43+10log (Mean power in watts) dBc below the mean power output outside a license's frequency block(-13dBm).

A.5.2 Test procedure:

1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
4. The limit line is derived from 43+10log(P) Db below the transmitter power P(Watts)

=P(W)-[43+10log(P)](Db)
=[30+10log(P)](dBm)-[43+10log(P)](Db)
=-13dBm

CDMA2000 Cellular BC0

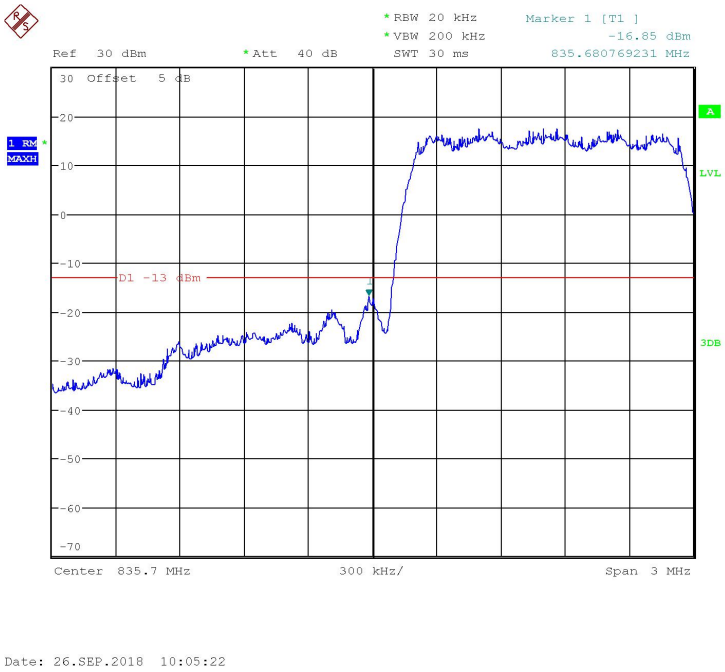

Fig.7 **Channel 384- LOW BAND EDGE BLOCK**

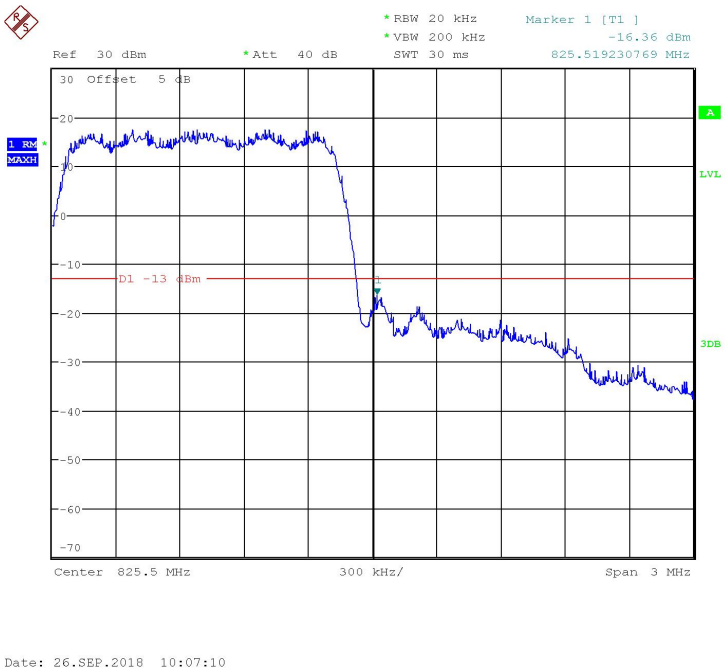

Fig.8 **Channel 1013- HIGH BAND EDGE BLOCK**

ANNEX A.6. FREQUENCY STABILITY

Method of test measurements please refer to CFR47 (FCC) part 2.1055 and part 22.355.

A.5.1.Method of Measurement and test procedures

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of GSM850, PCS1900, WCDMA BANDII and WCDMA BANDV, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.5.2. Measurement Limit

A.5.2.1. For Hand carried battery powered equipment

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.35VDC, with a nominal voltage of 3.8VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages was varied from 85% to 115%.

A.5.2.2. For equipment powered by primary supply voltage

According to the JTC standard the CDMA frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

A.5.3 Test results

CDMA2000 Cellular BC0 Mid Channel/fc(MHz) 384/836.52

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
24	-30	1.3	84
24	-20	-1.4	84
24	-10	-0.9	84
24	0	-1.8	84
24	10	2.4	84
24	20	-1.1	84
24	30	-2.0	84
24	40	1.6	84
24	50	-1.3	84

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
23	25	-1.5	84
24	25	1.3	84
25	25	1.2	84

ANNEX A.7. CONDUCTED SPURIOUS EMISSION

A.7.1. GSM Measurement Method and test procedures

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
The trace mode is set to MaxHold to get the highest signal at each frequency;
Wait 25 seconds;Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

CDMA2000 Cellular Transmitter

Channel	Frequency(MHz)
384	836.52
777	848.31
1013	824.7

A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A7.1.2. Measurement result

Spurious emission limit -13dBm.

Note: peak above the limit line is the carrier frequency.

A7.1.2.1. CDMA2000 Cellular BC0

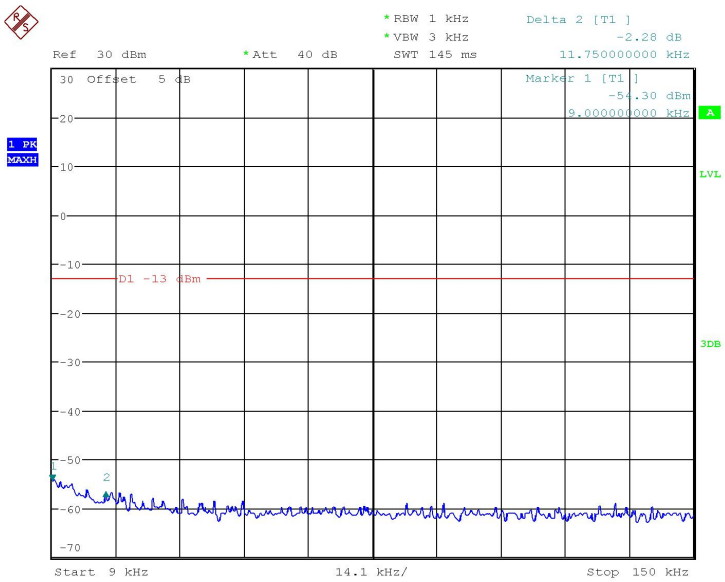

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Fig.9 **Channel 384: 9KHz~150KHz**

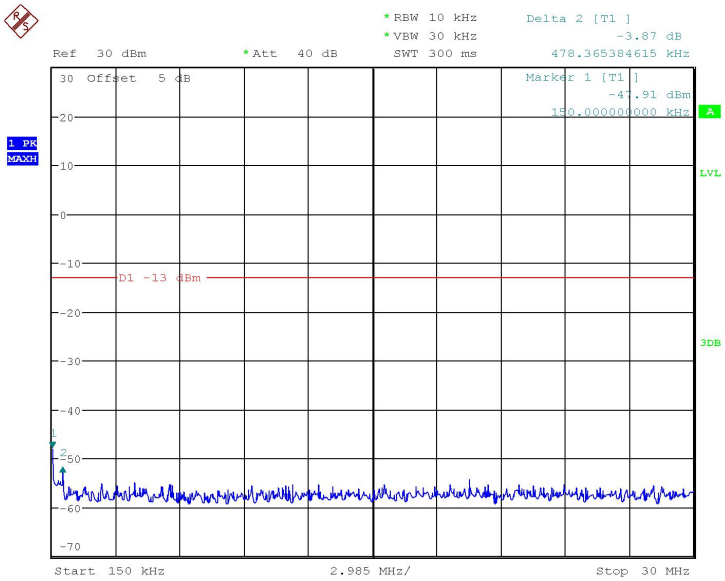

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Fig.10 **Channel 384: 150KHz~30MHz**

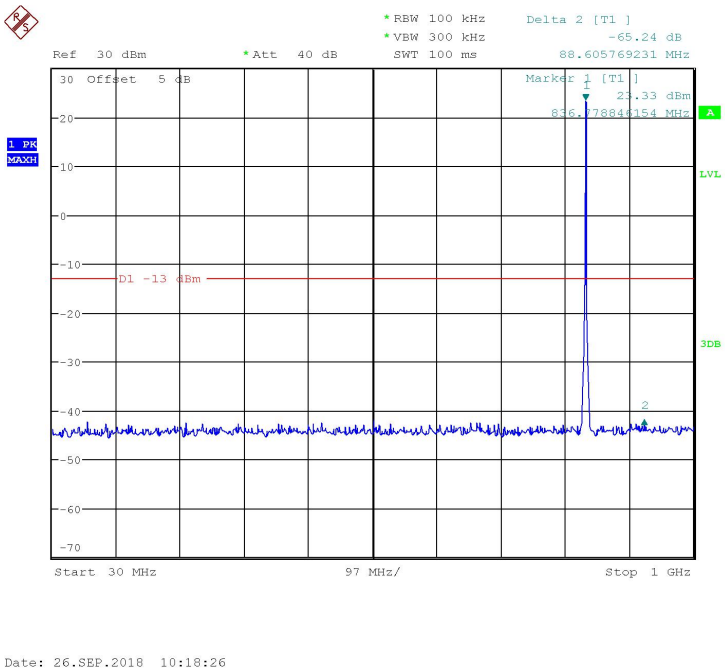


Fig.11 **Channel 384: 30MHz~1GHz**

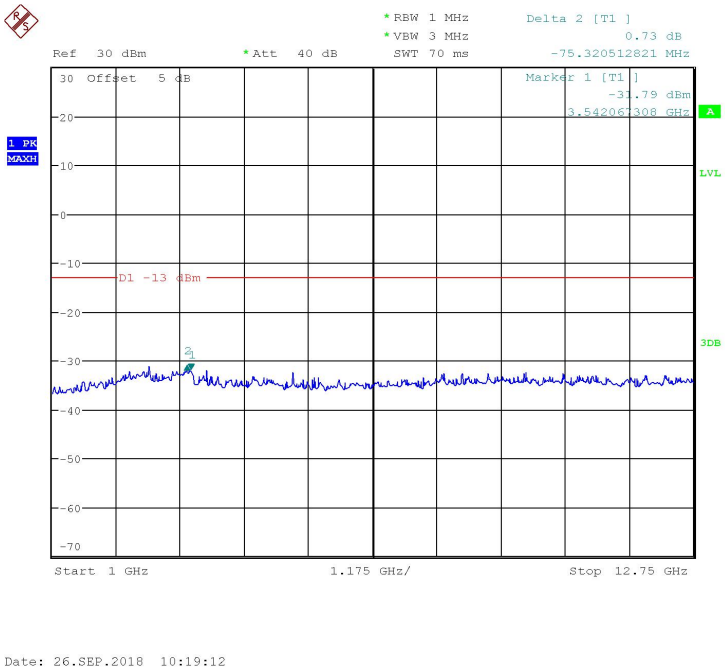
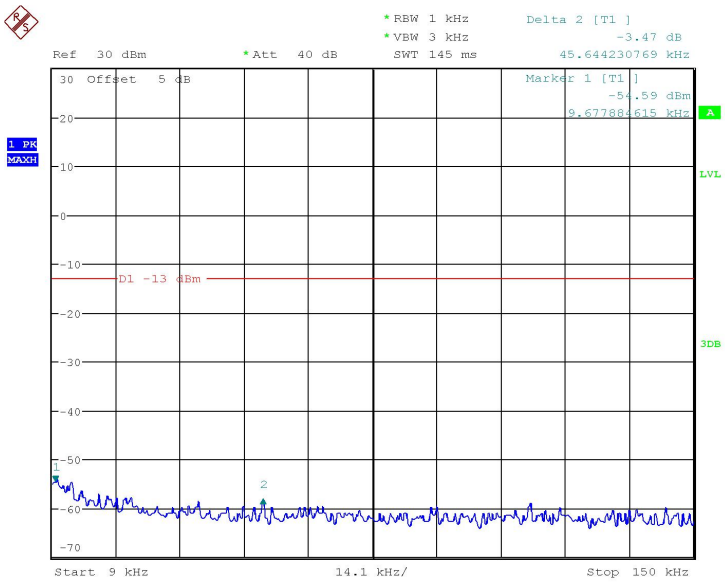
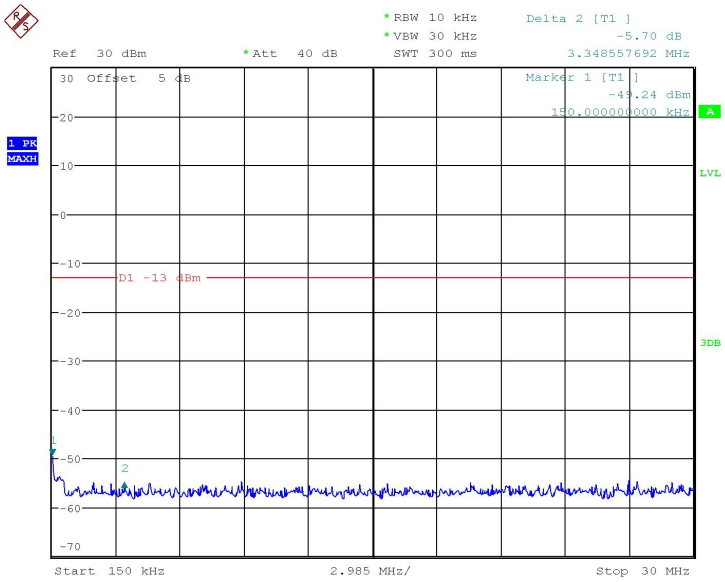


Fig.12 **Channel 384: 1GHz~12.75GHz**



Date: 26.SEP.2018 10:20:01

Fig.13 **Channel 777: 9KHz~150KHz**



Date: 26.SEP.2018 10:21:13

Fig.14 **Channel 777: 150KHz~30MHz**

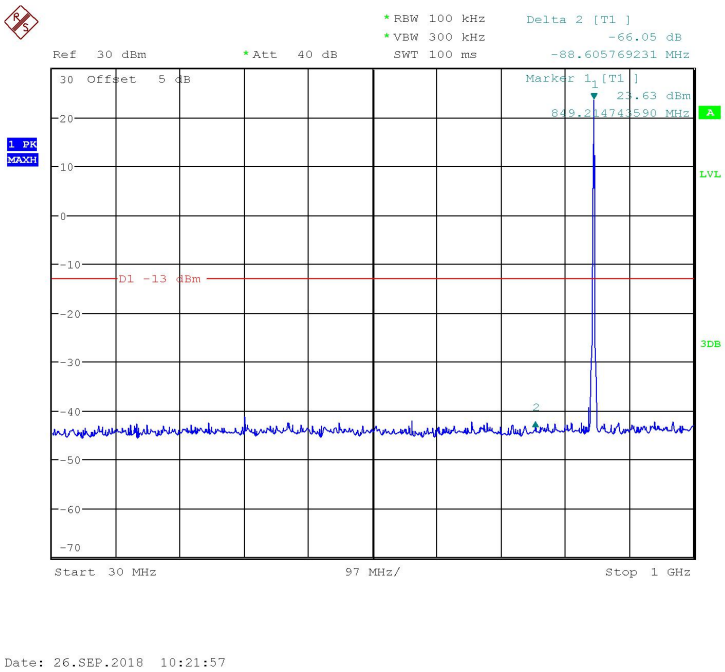


Fig.15 **Channel 777: 30MHz~1GHz**

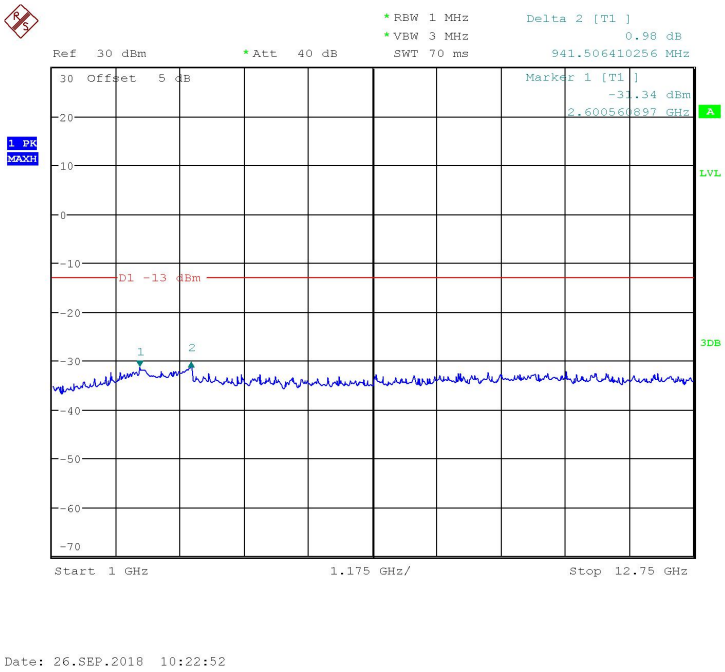


Fig.16 **Channel 777: 1GHz~12.75GHz**

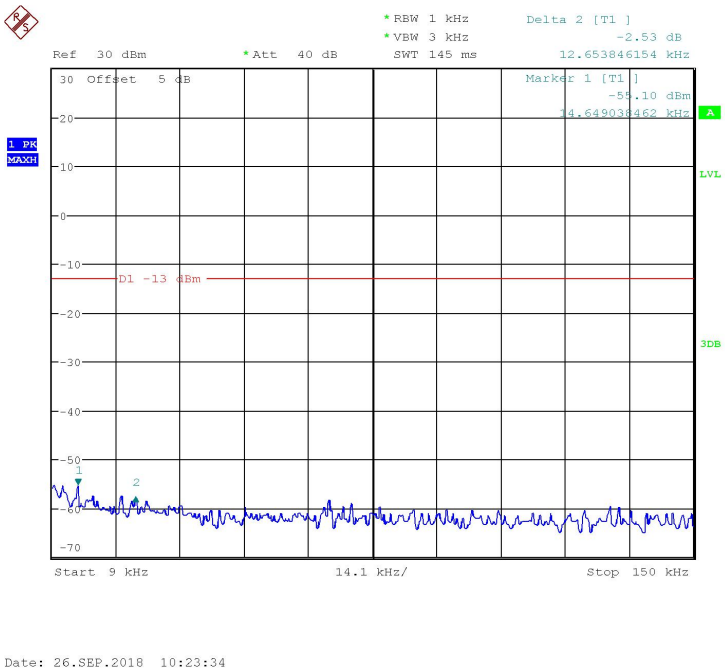


Fig.17 **Channel 1013: 9KHz~150KHz**

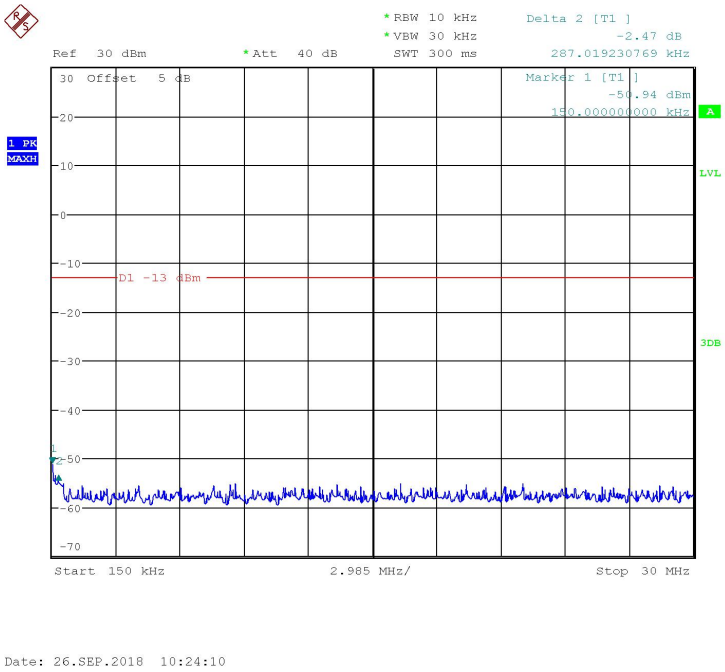


Fig.18 **Channel 1013: 150KHz~30MHz**

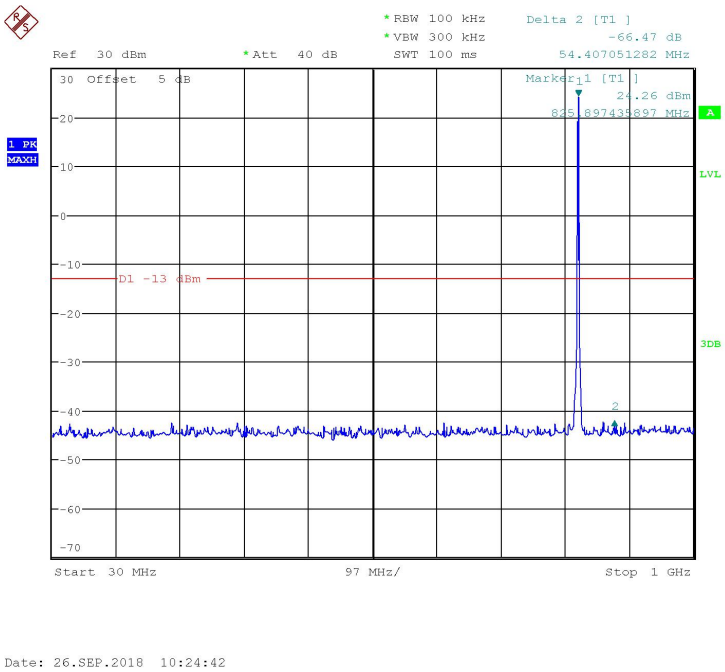


Fig.19 **Channel 1013: 30MHz~1GHz**

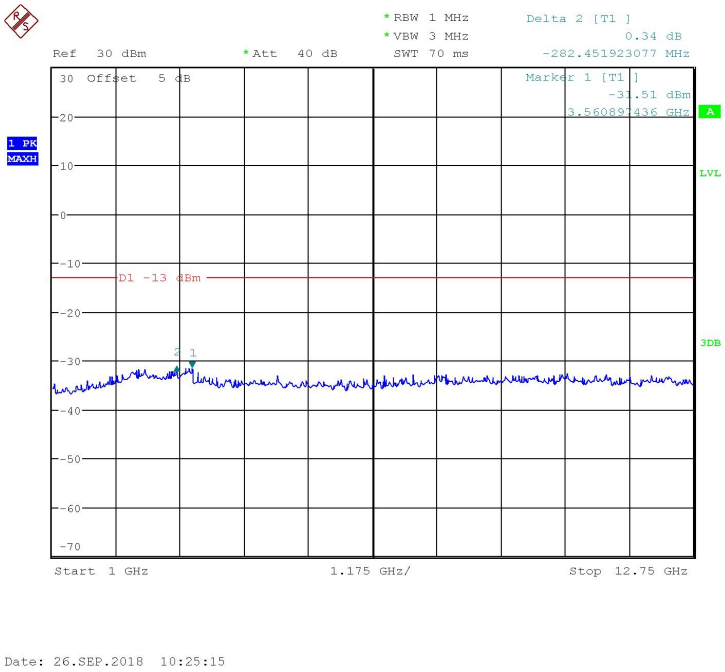


Fig.20 **Channel 1013: 1GHz~12.75GHz**

Conclusion: PASS

ANNEX B. Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

************End Of Report************