

FCC TEST REPORT

Test report No.: EMC- FCC- R0051
FCC ID: A3LSCS-2UYYYY
Classification: PCS Licensed Transmitter(PCB)
Model Name: SCS-2U01
Brand Name: Samsung
Applicant: Samsung Electronics Co., Ltd.
FCC Rule Part(s): FCC Part 22 Subpart H
Frequency Range: 869.70 MHz ~ 893.31 MHz
Test result: Complied

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: October 17, 2011 ~ October 28, 2011

Issued date: November 1, 2011

Tested by:

KIM, CHANG MIN

Approved by:

YOO, SUNG YOUNG

[Contents]

1. Client information	3
2. Laboratory information	4
3. Description of E.U.T.....	5
3.1 Basic description.....	5
3.2 General description	5
3.3 Test frequency.....	6
3.4 Test Voltage	6
3.5 Ancillary/peripheral equipment	6
4. Summary of test results.....	7
4.1 Standards & results	7
4.2 Uncertainty.....	7
4.3 Methodes and Prosedures	8
5. Test results	9
5.1 RF power output	9
5.2 Effective radiated power output CDMA.....	13
5.3 Spurious Emission	14
5.4 Frequency Stability	29
6. Test equipment used for test	32

Appendix 1 Test setup photos

Appendix 2 External photos of EUT

Appendix 3 Internal photos of EUT

Appendix 4 Block diagram

Appendix 5 Schematics

Appendix 6 Part list

Appendix 7 User manual

Appendix 8 Layout diagram

Appendix 9 Antenna Specification

1. Client information

Applicant: SAMSUNG Electronics Co.,Ltd
Address: 416, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Telephone number: +82-31-279-3509
Facsimile number:
Contact person: Duk-Hun Kim / thekern.kim@samsung.com

Manufacturer: SAMSUNG Electronics Co.,Ltd
Address: 416, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea

2. Laboratory information

Address

EMC Compliance Ltd.

480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-390, Korea

Telephone Number: 82 31 336 9919 Facsimile Number: 82 31 336 4767

Certificate

CBTL Testing Laboratory, KOLAS NO.: 231

FCC Filing No.: KR0040

VCCI Registration No.: C-1713, R-1606, T-258

SITE MAP



3. Description of E.U.T.

3.1 Basic description

Applicant :	Samsung Electronics Co., Ltd.
Address of Applicant:	416, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Manufacturer:	Samsung Electronics Co., Ltd.
Address of Manufacturer:	416, Maetan-3dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea
Type of equipment:	Verizon Wireless Network Extender
Basic Model:	SCS-2U01
Brand name:	Samsung
Serial number:	Proto Type

3.2 General description

Frequency Range (TX)	869.70 MHz ~ 893.31 MHz
Frequency Range (RX)	824.70 MHz ~ 848.31 MHz
Type of Modulation	OQPSK / 16QAM / 64QAM
Type of Antenna	Dipole Antenna
Antenna Gain	1.378 dBi
Transmit Power	14.06 dBm(1X) / 13.52 dBm (DO)
Power supply	DC 12 V , 1.5A from AC/DC adapter
Frequency Tolerance	2.5 ppm
Emission Designator	1M28F9W
Operator selection of Frequency	Software Controlled
Power output adjustment Capability	Software Controlled

3.3 Test frequency

	Frequency
Low frequency	869.70 MHz
Middle frequency	881.52 MHz
High frequency	893.31 MHz

3.4 Test Voltage

mode	Voltage
Normal voltage	AC 110 V

3.5 Ancillary/peripheral equipment

Type	Model / Part #	Serial number	Manufacturer
Gigabit Switch	3CGSU05A	AB/9U8QBV00085BA	3COM

4. Summary of test results

4.1 Standards & results

Rule Reference	Parameter	Report Section	Test Result
2.1046	RF power output	5.1	C
22.913	Effective radiated power output	5.2	C
2.1049	Occupied bandwidth	5.3	C
2.1051 / 22.917, 22.359	Spurious Emission	5.4	C
22.355	Frequency Stability	5.5	C
Note: C=complies NC= Not complies NT=Not tested NA=Not Applicable			

4.2 Uncertainty

Measurement Item	Combined Standard Uncertainty U _c	Expanded Uncertainty U = KU _c (K = 2)
Conducted RF power	± 1.106 dB	± 3.120 dB
Radiated disturbance	+2.280dB / - 2.278 dB	+4.560dB / - 4.556 dB
Conducted disturbance	+1.883 dB / - 1.676 dB	+3.766dB / - 3.352 dB

4.3 Methodes and Prosedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2

American National Standard for Instrumentation- Electromagnetic noise and field strength.

ANSI C63.4

American National Standard method of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electric equipment in the range of 9 kHz to 40 GHz.

ANSI C63.5

American National Standard for the Calibration of antenna used for radiated Emission measurement in Electromagnetic interference (EMI) Control.

ANSI C63.7

American National Standard Guide for Construction of open Area Test Sites for performing radiated emission Measurement.

CISPR 16-1

Specification For Radio Disturbance and Immunity Measuring Appatus and Method. Part 1 : radio Disturbance and Immunity Measuring Appatus.

5. Test results

5.1 RF power output

5.1.1 Regulation

FCC part 2.1046

For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune -up procedure to give the values of current and voltage on the circuit elements specified in 2.983(d)(5). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

FCC Limit (Part 22.913)

(a) The effective radiated power of base transmitters and cellular repeaters must not exceed 500 Watts.

5.1.2 Result

-Complied

The output power was measured under all R.C.s and S.O.s which are listed below measurement data.
The Worst case output power is reported with SO2 of RC1 for CDMA band.

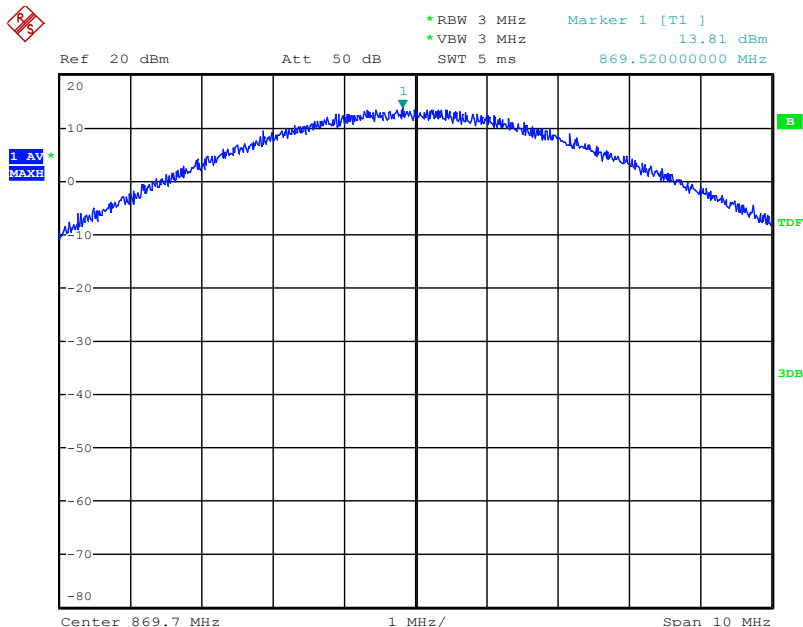
5.1.2.1 Test Result- 1X RTT

Channel No.	Frequency	1X RTT [dBm]	
		RC1	RC3
		SO2	SO9
1013	869.70	13.81	12.83
384	881.52	14.06	13.24
777	893.31	13.39	12.84

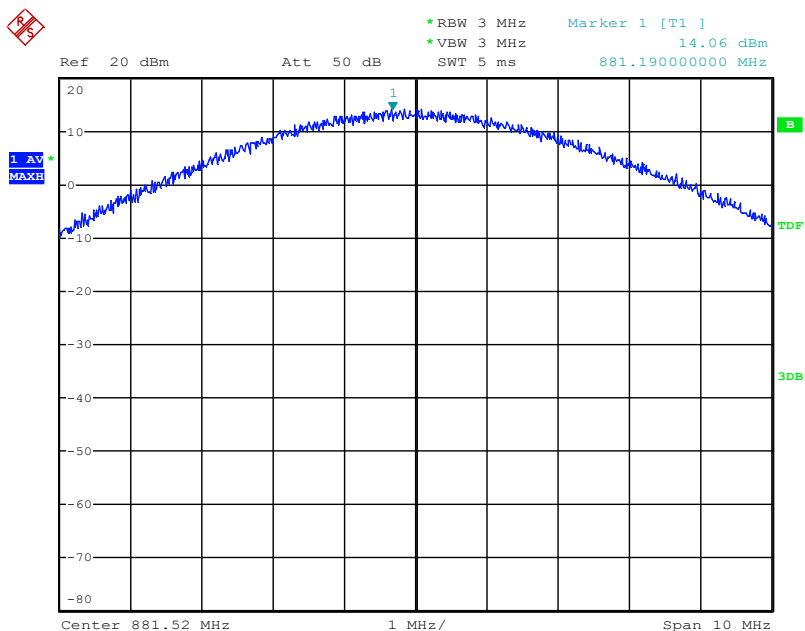
5.1.2.2 Test Result- DO RTT

Channel No.	Frequency	DO RTT [dBm]	
		RC1	RC3
		SO2	SO9
1013	869.70	12.22	11.99
384	881.52	13.52	13.05
777	893.31	12.94	12.44

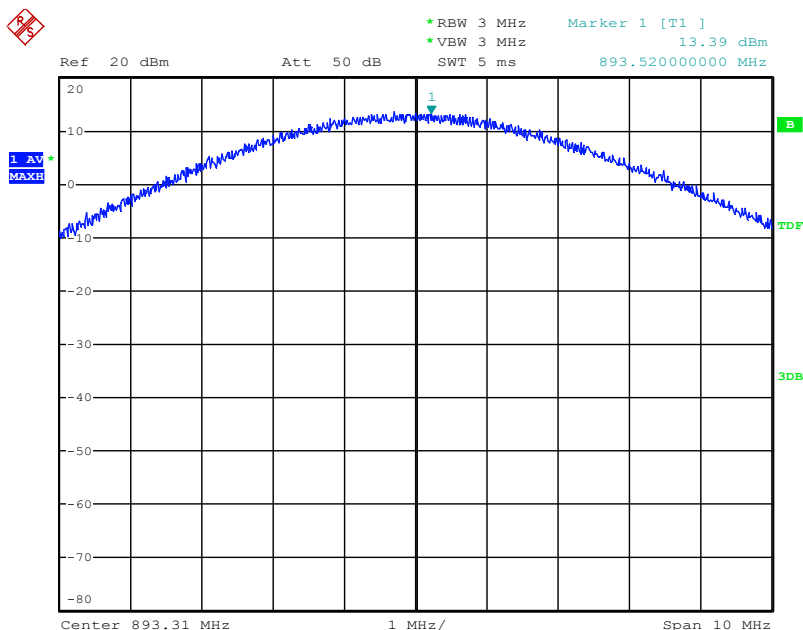
5.1.2.3 Test Result- 1X RTT TEST PLOT
- ch. 1013



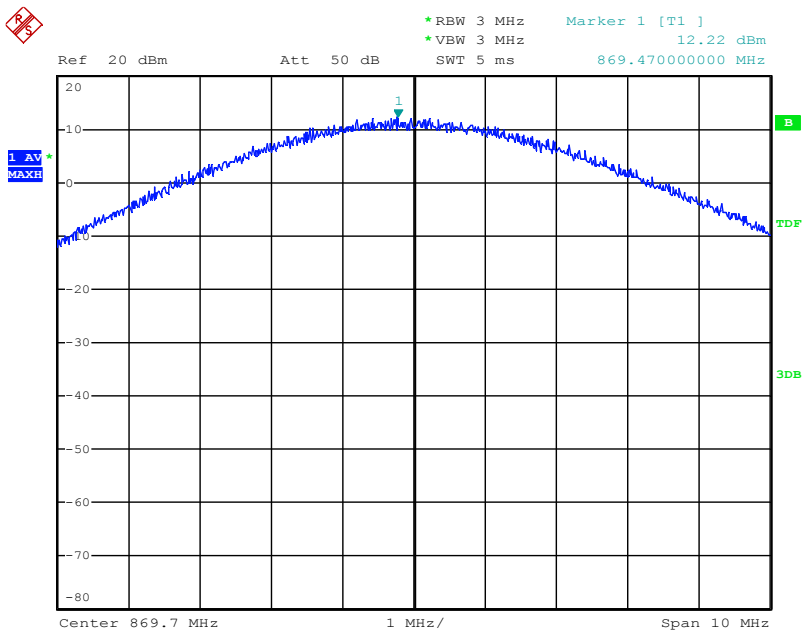
-ch. 384



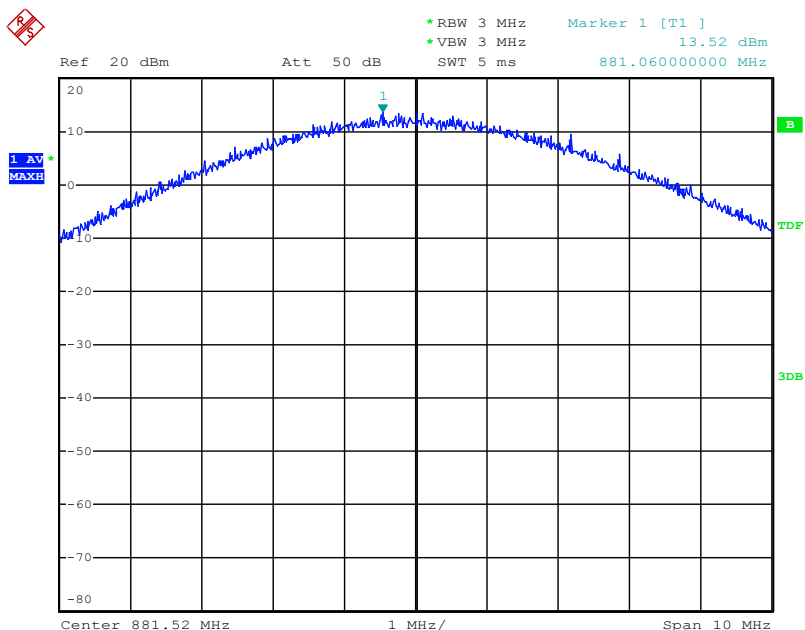
- ch. 777



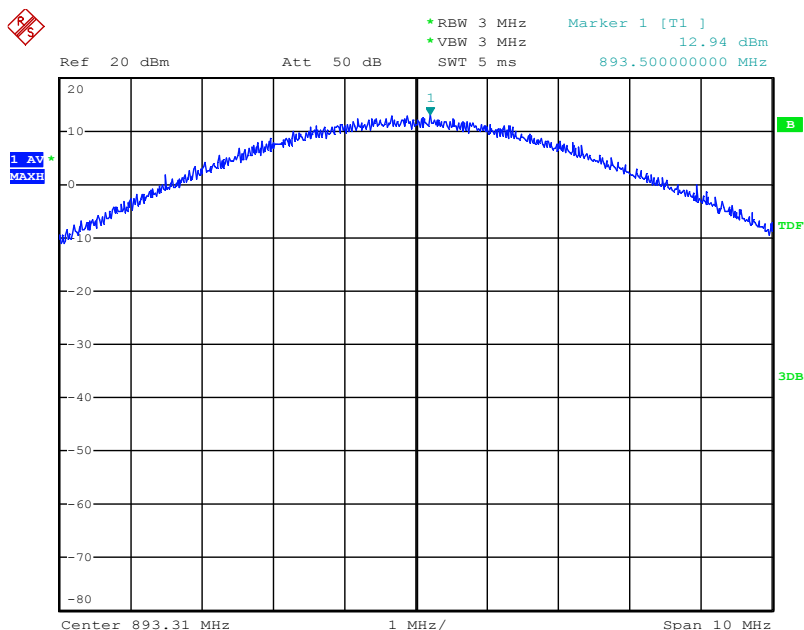
5.1.2.4 Test Result- DO RTT TEST PLOT
-ch. 1013



- ch. 384



-ch. 777



5.2 Effective radiated power output CDMA

5.2.1 Regulation

FCC Limit (Part 22.913)

(a) The effective radiated power of base transmitters and cellular repeaters must not exceed 500 Watts.

5.2.2 Test Result

-complied

1. Test Mode: All R.C.s and S.O.s / all Polarization
2. The worstcase is reported RC1/ SO2

5.2.2.1 Test Result- 1X RTT

Frequency [MHz]	Pol. [V/H]	Measured LEVEL [dBm]	ERP [dBm]	ERP [W]	Limit [W]
869.70	H	6.35	6.35	0.0043	500
869.70	V	8.01	8.01	0.0063	500
881.52	H	7.50	7.50	0.0056	500
881.52	V	8.90	8.90	0.0077	500
893.31	H	8.00	8.00	0.0063	500
893.31	V	8.60	8.60	0.0072	500

5.2.2.2 Test Result- DO RTT

Frequency [MHz]	Pol. [V/H]	Measured LEVEL [dBm]	ERP [dBm]	ERP [W]	Limit [W]
869.70	H	6.12	6.12	0.0040	500
869.70	V	7.99	7.99	0.0063	500
881.52	H	7.44	7.44	0.0055	500
881.52	V	8.85	8.85	0.0077	500
893.31	H	6.30	6.30	0.0043	500
893.31	V	8.70	8.70	0.0074	500

5.3 Spurious Emission

5.3.1 Regulation

FCC Part 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the per-missible value need not be specified.

FCC Part 2.1057 - Frequency Spectrum to be investigated

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 or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC Part 22.917 Limit

- (a) Out of band emissions. 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.
- (b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100kHz or greater. 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 fundamental emission of the transmitter may be employed. A narrow resolution bandwidth is permitted in all cases to improve measure accuracy provided the measured power is integrated over the full required measurement bandwidth. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

5.3.2 Test Result

-complied

5.3.2.1 Test Result- 1X RTT

Field Strength spurious radiation – Low channel

Frequency [MHz]:	869.70
Channel No.:	1013
Measured output power [dBm]:	13.81 dBm
Measured output power [W]:	0.02404W
Limit [dBc] = $43+10\log_{10}(W)$:	26.809

Worst case mode (SO2 of RC1) for Final test.

Frequency [MHz]	Pol. [V/H]	Maximum LEVEL [dBm]	Level [dBc]	Limit [dBc]
45.278	V	-58.17	-71.98	26.809
53.855	V	-53.45	-67.26	26.809
108.797	V	-57.89	-71.70	26.809
368.641	H	-57.44	-71.25	26.809
614.393	V	-50.93	-64.74	26.809
1474.450	V	-56.47	-70.28	26.809
1739.200	V	-48.42	-62.23	26.809
3773.160	V	-31.95	-45.76	26.809

Field Strength spurious radiation –Mid channel

Frequency [MHz]:	881.52
Channel No.:	384
Measured output power [dBm]:	14.06 dBm
Measured output power [W]:	0.02546W
Limit [dBc] = $43+10\log_{10}(W)$:	27.05

Worst case mode (SO2 of RC1) for Final test.

Frequency [MHz]	Pol. [V/H]	Maximum LEVEL [dBm]	Level [dBc]	Limit [dBc]
53.885	V	-54.05	-68.11	27.05
98.468	V	-62.61	-76.67	27.05
108.800	H	-64.89	-78.95	27.05
614.401	V	-50.83	-64.89	27.05
1474.400	V	-51.57	-65.63	27.05
1763.235	V	-37.72	-51.78	27.05
3773.105	V	-31.05	-45.11	27.05

Field Strength spurious radiation –High channel

Frequency [MHz]:	893.31
Channel No.:	777
Measured output power [dBm]:	13.39 dBm
Measured output power [W]:	0.02182W
Limit [dBc] = 43+10log ₁₀ (W):	26.39

Worst case mode (SO2 of RC1) for Final test.

Frequency [MHz]	Pol. [V/H]	Maximum LEVEL [dBm]	Level [dBc]	Limit [dBc]
53.854	V	-54.05	-67.44	26.39
98.439	V	-63.11	-76.50	26.39
614.425	V	-54.73	-68.12	26.39
1474.800	V	-50.37	-63.76	26.39
1786.920	V	-42.62	-56.01	26.39
3771.600	V	-32.85	-46.24	26.39

5.3.2.1 Test Result- DO RTT

Field Strength spurious radiation – Low channel

Frequency [MHz]:	869.70
Channel No.:	1013
Measured output power [dBm]:	12.22 dBm
Measured output power [W]:	0.01667W
Limit [dBc] = 43+10log ₁₀ (W):	25.22

Worst case mode (SO2 of RC1) for Final test.

Frequency [MHz]	Pol. [V/H]	Maximum LEVEL [dBm]	Level [dBc]	Limit [dBc]
53.549	V	-53.45	-65.67	25.22
108.804	H	-65.89	-78.11	25.22
614.395	V	-50.33	-62.55	25.22
2132.950	H	-44.62	-56.84	25.22
3298.815	H	-40.04	-52.26	25.22

- Field Strength spurious radiation – Mid channel

Frequency [MHz]:	881.52
Channel No.:	384
Measured output power [dBm]:	13.52 dBm
Measured output power [W]:	0.02249W
Limit [dBc] = $43+10\log_{10}(W)$:	26.52

-
- Worst case mode (SO2 of RC1) for Final test.
-

Frequency [MHz]	Pol. [V/H]	Maximum LEVEL [dBm]	Level [dBc]	Limit [dBc]
53.552	V	-53.45	-66.97	26.52
108.807	V	-61.09	-74.61	26.52
221.604	H	-77.43	-90.95	26.52
614.505	V	-50.73	-64.25	26.52
2133.150	H	-47.02	-60.54	26.52
3346.130	H	-38.64	-52.16	26.52

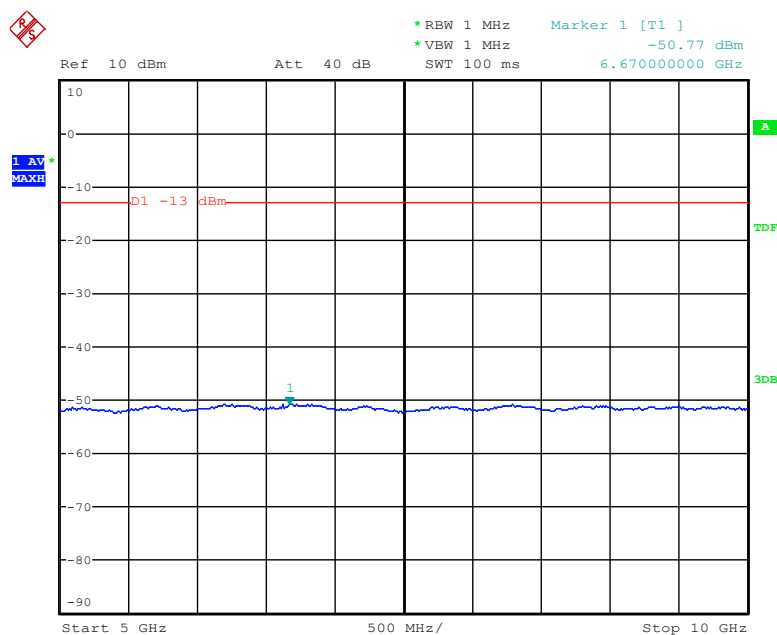
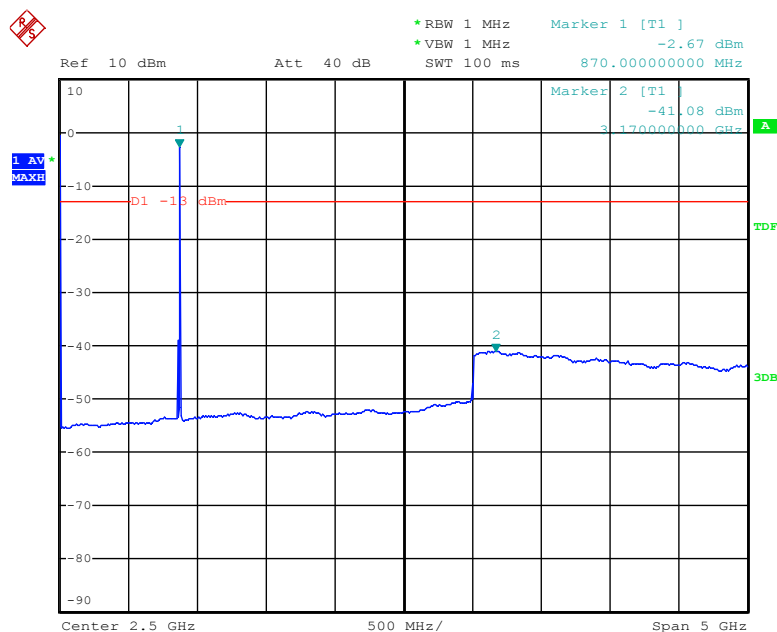
-
- Field Strength spurious radiation –High channel

Frequency [MHz]:	893.31
Channel No.:	777
Measured output power [dBm]:	12.94 dBm
Measured output power [W]:	0.01968W
Limit [dBc] = $43+10\log_{10}(W)$:	25.94

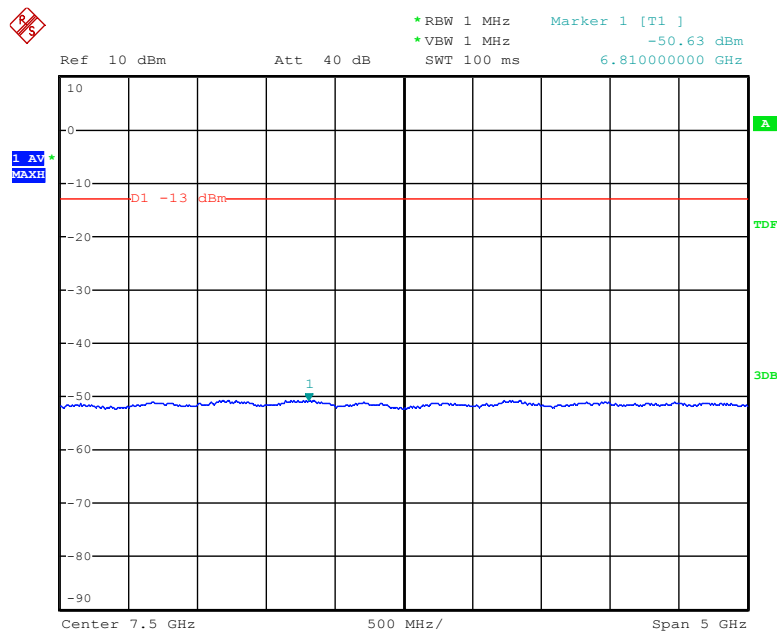
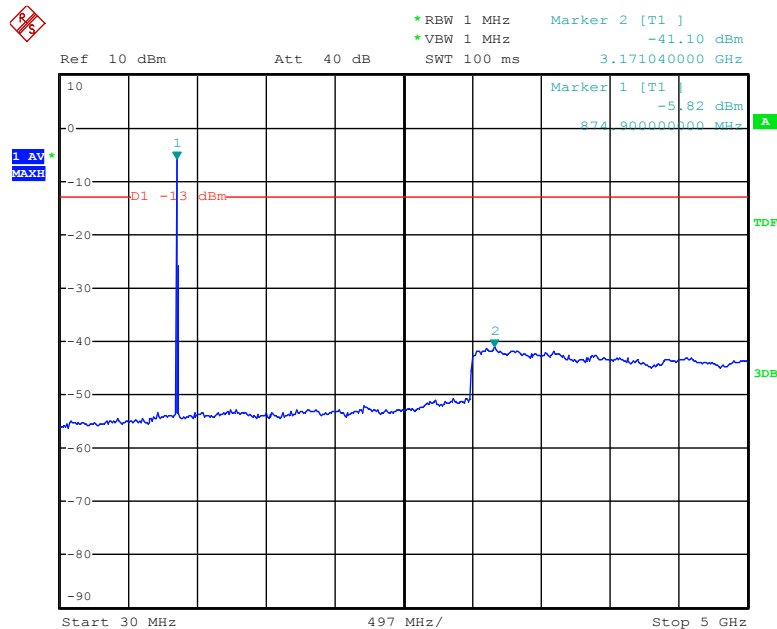
-
- Worst mode (SO2 of RC1) for Final test.
-

Frequency [MHz]	Pol. [V/H]	Maximum LEVEL [dBm]	Level [dBc]	Limit [dBc]
53.564	V	-53.35	-66.29	25.94
108.813	H	-66.89	-79.83	25.94
614.401	V	-50.23	-63.17	25.94
2132.945	H	-40.52	-53.46	25.94
2827.935	H	-47.54	-60.48	25.94
3393.365	H	-39.35	-52.29	25.94

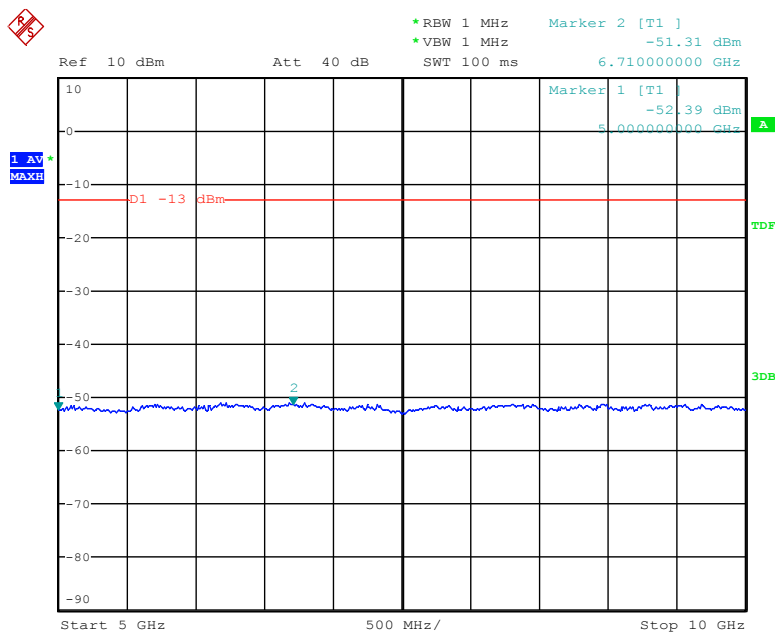
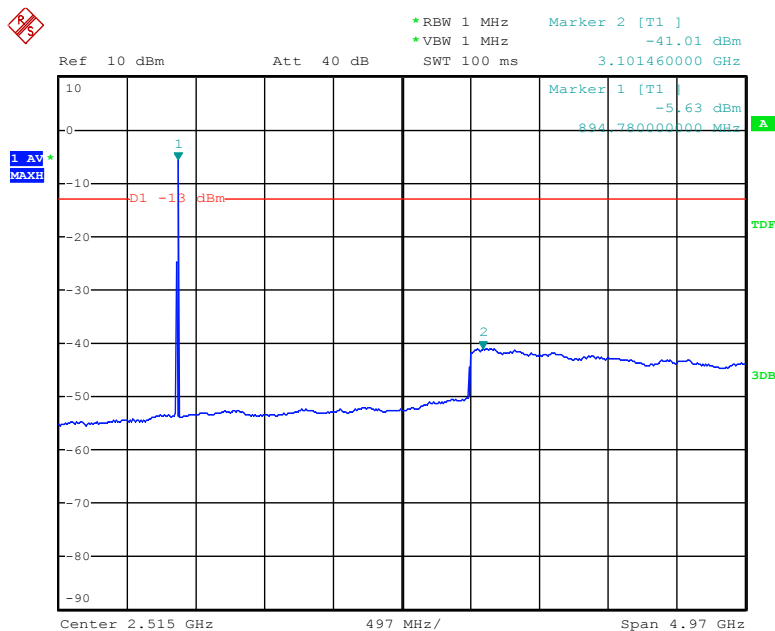
5.3.2.3 Conducted Spurious Test Result- 1X RTT - Conducted Spurious ch .1013



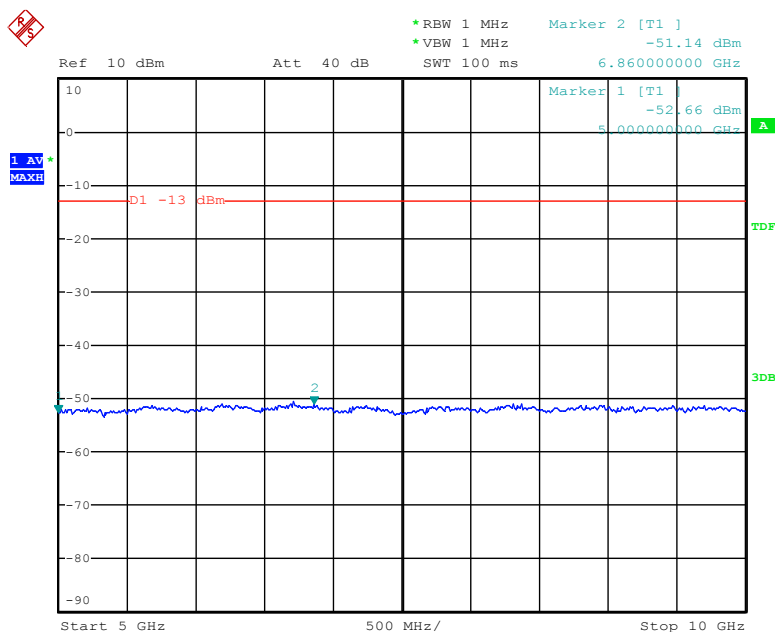
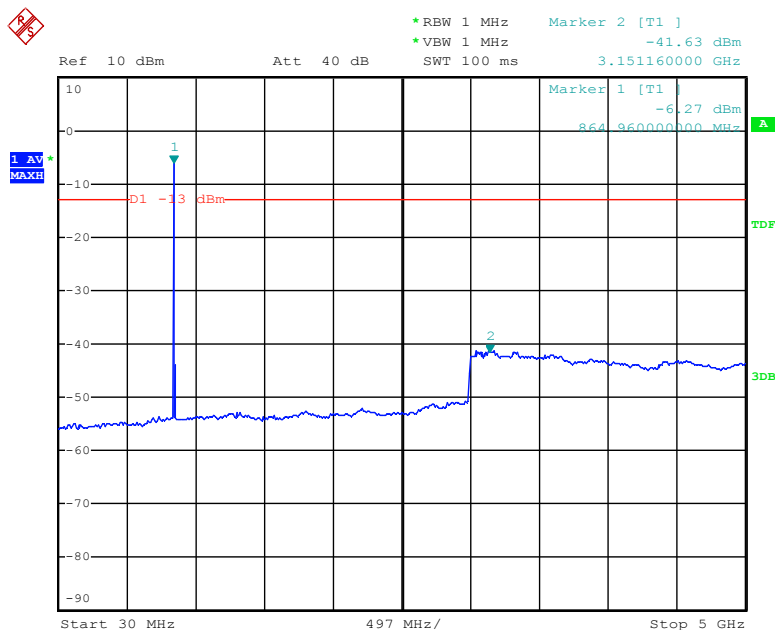
- Conducted Spurious ch .384



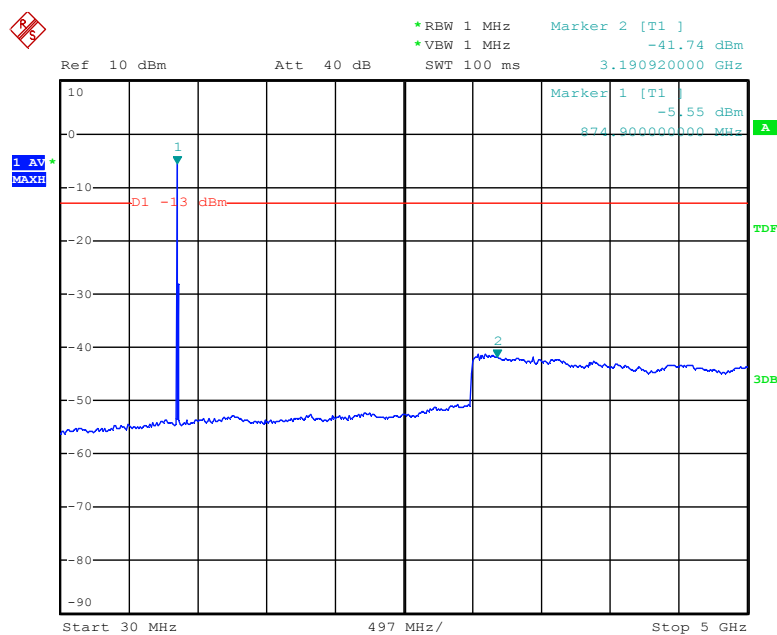
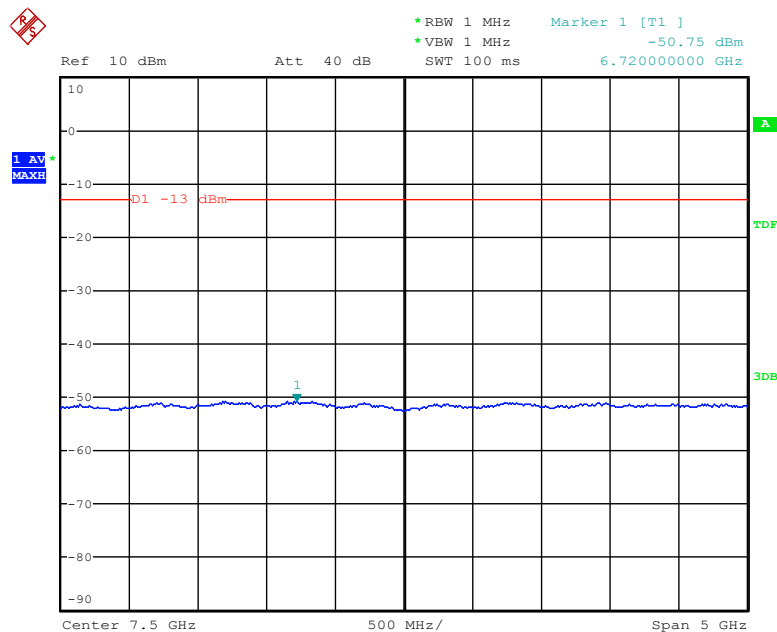
- Conducted Spurious ch .777



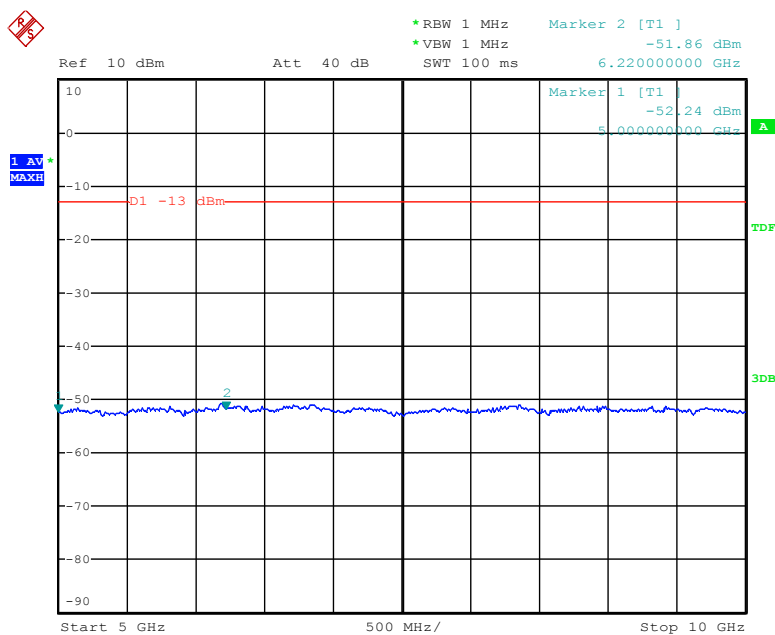
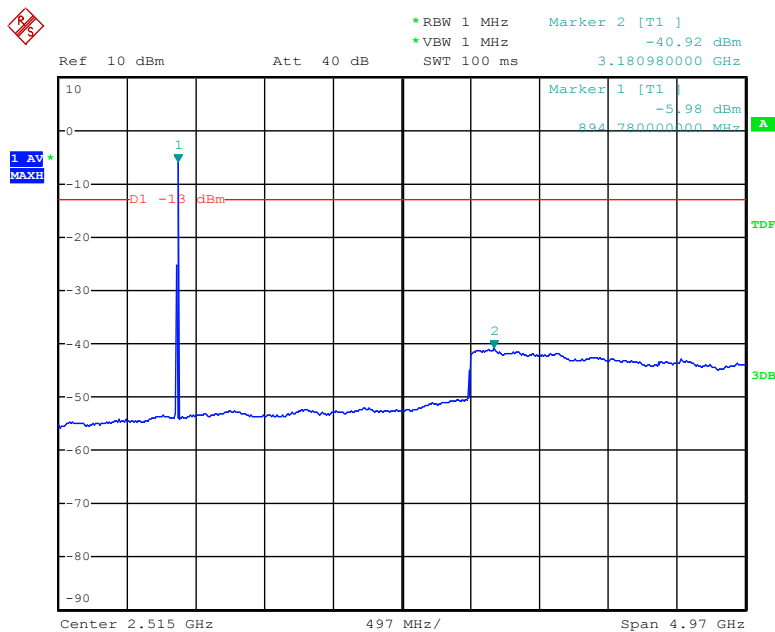
5.3.2.4 Conducted Spurious Test Result- DO RTT - Conducted Spurious ch .1013



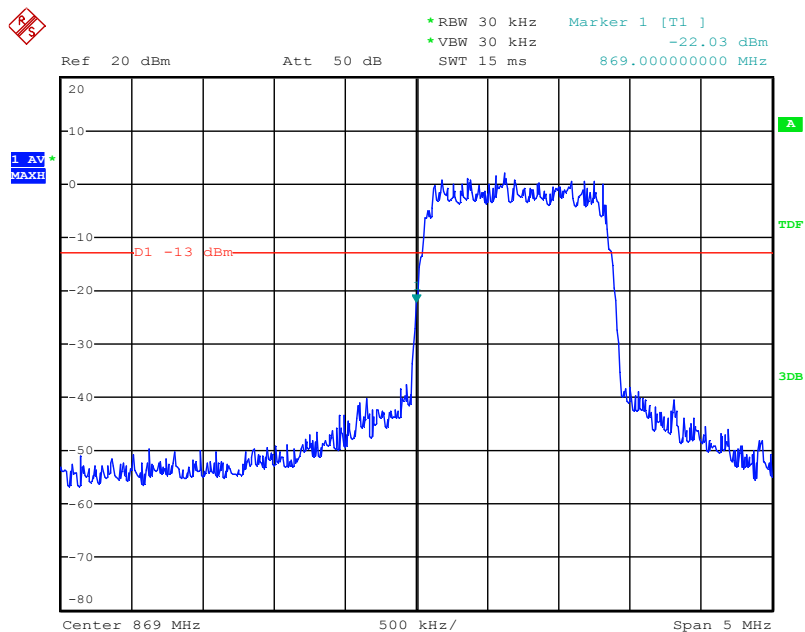
5.3.2.4 Conducted Spurious Test Result- DO RTT - Conducted Spurious ch .384



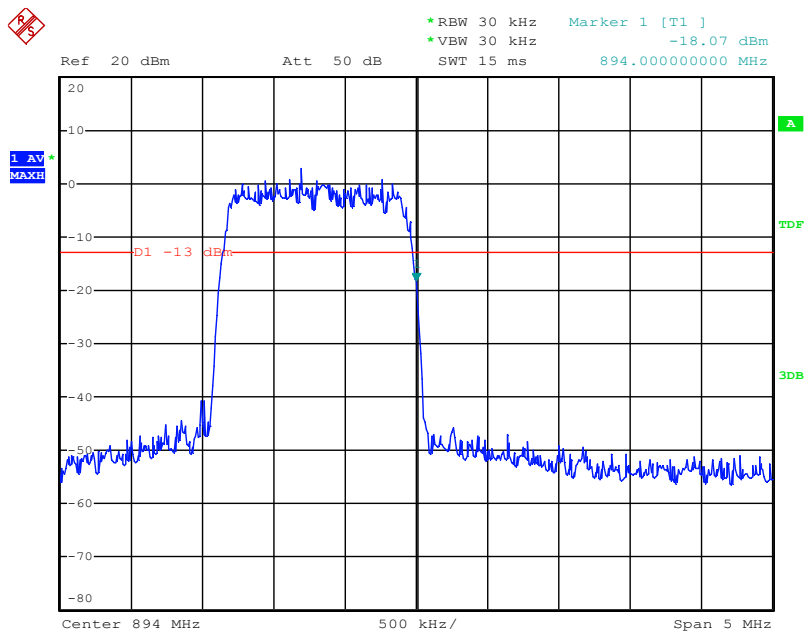
5.3.2.4 Conducted Spurious Test Result- DO RTT - Conducted Spurious ch .777



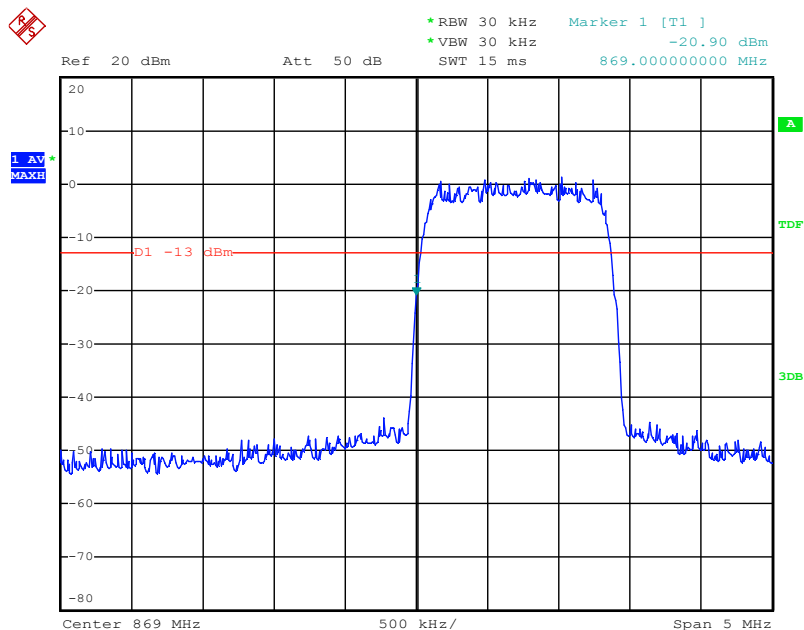
5.3.2.5 Bandedge Test Result- 1X RTT - Bandedge ch .1013



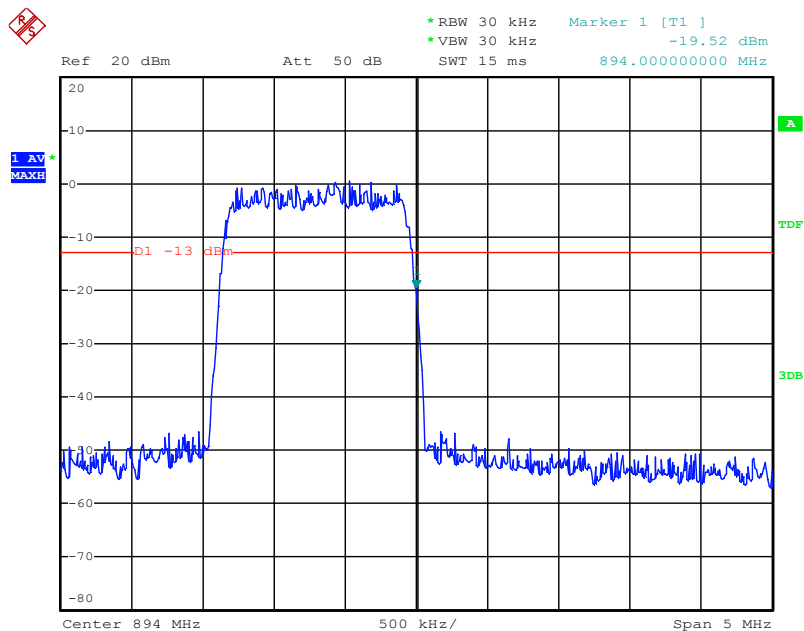
- Bandedge ch .777



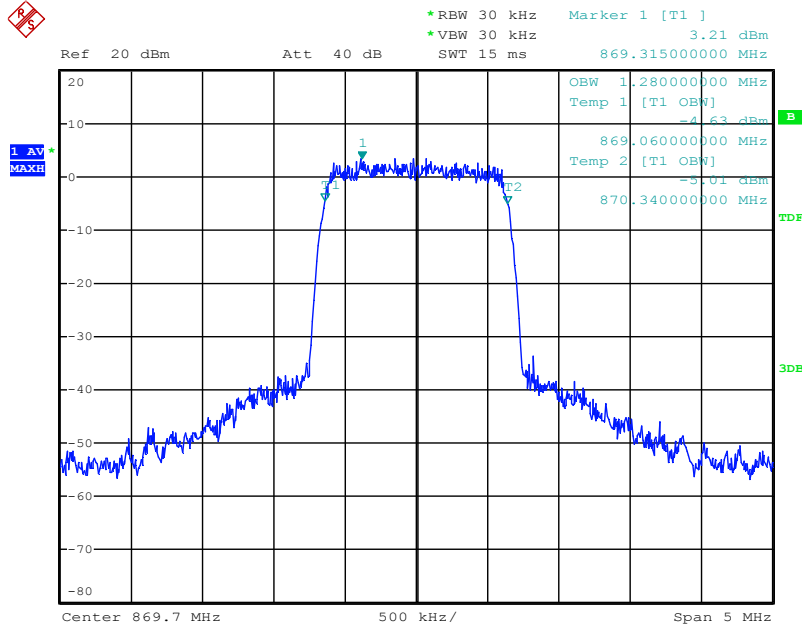
5.3.2.6 Bandedge Test Result- DO RTT - Bandedge ch .1013



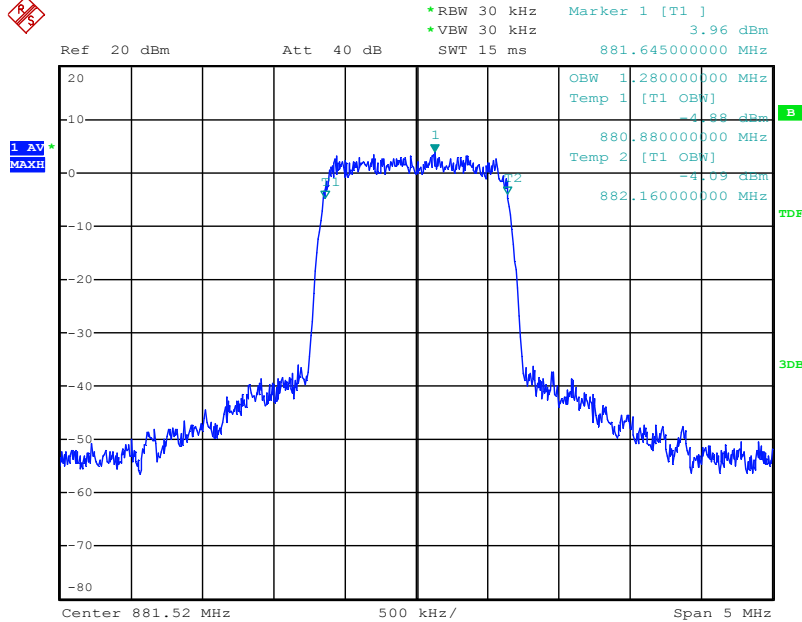
- Bandedge ch .777



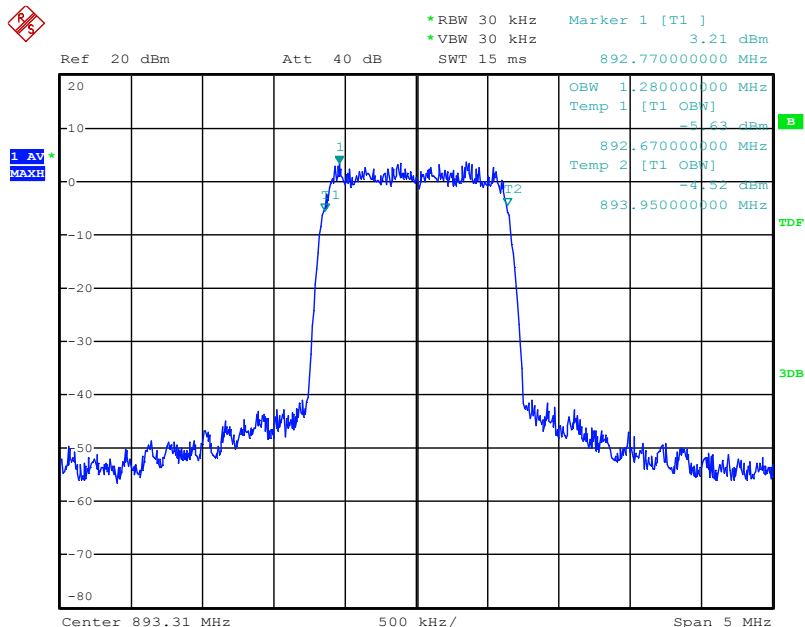
5.3.2.6 Occupied bandwidth Test Result- 1X RTT - OBW ch .1013



- OBW ch .384

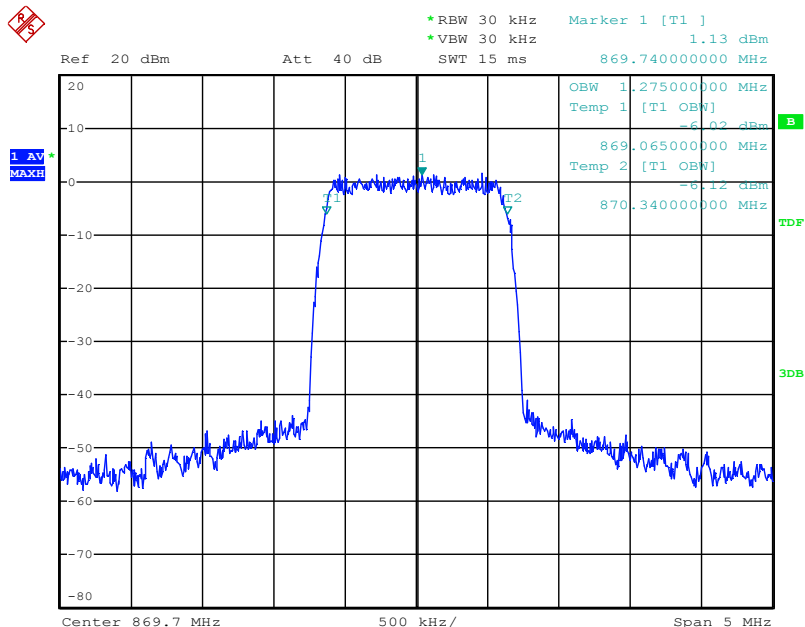


- OBW ch .777

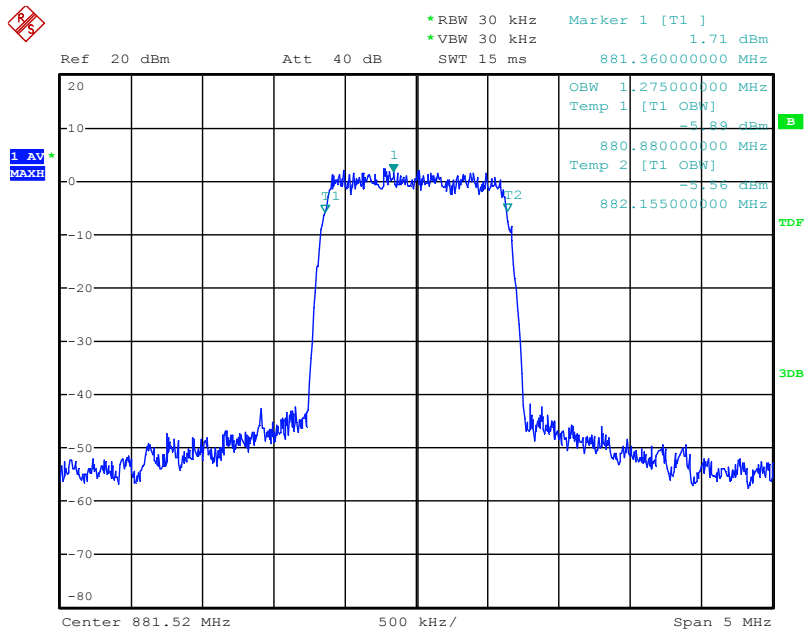


5.3.2.7 Occupied bandwidth Test Result- DO RTT

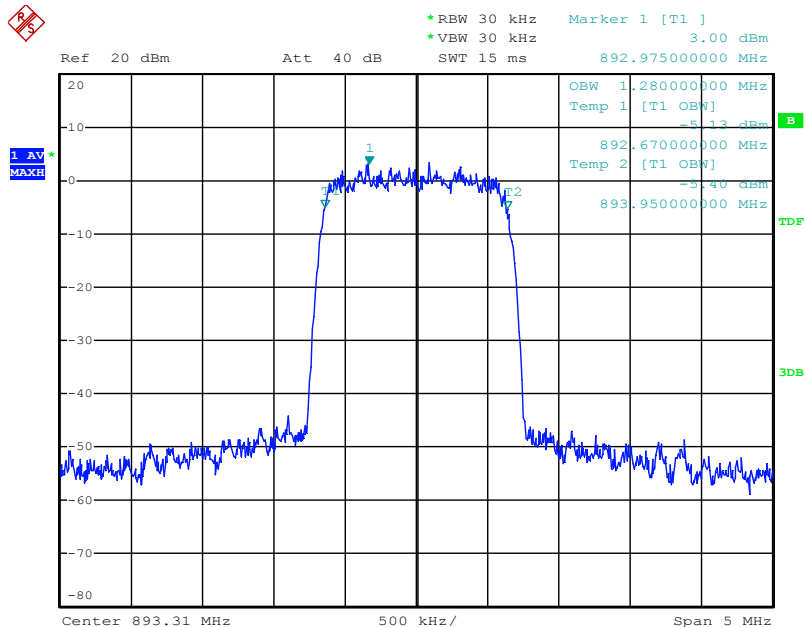
- OBW ch .1013



- OBW ch .384



- OBW ch .777



5.4 Frequency Stability

5.4.1 Regulation

FCC Part 2.1055

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30 to +50 centigrade for all equipment except that specified in subpara-graphs (2) and (3) of this paragraph.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown. (e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

FCC Part 22.355 Limit

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

5.4.2 Test Result

-complied

5.4.2.1 Test Result- 1X RTT

Frequency [MHz]:	881.52
Channel No.:	384
Test Mode:	1X RTT
Reference Voltage [VAC]	110
Limit [ppm]	2.5

Voltage(%)	Power(V)	Temp	Frequency	Deviation(%)	Deviation(ppm)	Limit(ppm)
100	110	25(REF)	881518888	0.000000	0.00	2.5
100		-30	881517807	-0.000123	-1.23	2.5
100		-20	881518123	-0.000087	-0.87	2.5
100		-10	881518318	-0.000065	-0.65	2.5
100		0	881518551	-0.000038	-0.38	2.5
100		10	881518693	-0.000022	-0.22	2.5
100		20	881518748	-0.000016	-0.16	2.5
100		25	881518887	0.000000	0.00	2.5
100		30	881518963	0.000009	0.09	2.5
100		40	881519163	0.000031	0.31	2.5
100		50	881519211	0.000037	0.37	2.5
100		60	881519382	0.000056	0.56	2.5
85	93.5	25	881518866	-0.000002	-0.02	2.5
115	126.5	25	881518875	-0.000001	-0.01	2.5

5.4.2.2 Test Result- DO RTT

Frequency [MHz]:	881.52
Channel No.:	384
Test Mode:	DO RTT
Reference Voltage [VAC]	110
Limit [ppm]	2.5

Voltage(%)	Power(V)	Temp	Frequency[Hz]	Deviation(%)	Deviation(ppm)	LimiT(ppm)
100	110	25(REF)	881518889	0.000000	0.00	2.5
100		-30	881517812	-0.000122	-1.22	2.5
100		-20	881518133	-0.000086	-0.86	2.5
100		-10	881518324	-0.000064	-0.64	2.5
100		0	881518554	-0.000038	-0.38	2.5
100		10	881518689	-0.000023	-0.23	2.5
100		20	881518752	-0.000015	-0.15	2.5
100		25	881518883	-0.000001	-0.01	2.5
100		30	881518970	0.000009	0.09	2.5
100		40	881519156	0.000030	0.30	2.5
100		50	881519218	0.000037	0.37	2.5
100		60	881519388	0.000057	0.57	2.5
85	93.5	25	881518865	-0.000003	-0.03	2.5
115	126.5	25	881518872	-0.000002	-0.02	2.5

6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
☐	Temp & humidity chamber	taekwang	TK-04	TK001	11.12.10
☒	Temp & humidity chamber	taekwang	TK-500	TK002	12.09.05
☐	Power Meter	Agilent	E4416A	GB41292365	12.10.26
☒	Frequency Counter	HP	53150A	US39250565	12.09.07
☒	Spectrum Analyzer	Agilent	E4407B	US39010142	12.10.26
☒	Spectrum Analyzer	R & S	FSP40	100209	12.10.26
☒	Signal Generator	HP	E4432B	GB39340611	12.10.26
☐	Modulation Analyzer	HP	8901B	3538A05527	12.10.26
☐	Audio Analyzer	HP	8903B	3729A19213	12.01.11
☒	AC Power Supply	KIKUSUI	PCR2000W	GB001619	12.10.25
☐	DC Power Supply	Tektronix	PS2520G	TW50517	12.02.18
☒	DC Power Supply	Tektronix	PS2521G	TW53135	12.10.25
☐	Dummy Load	BIRD	8141	7560	12.09.16
☐	Dummy Load	BIRD	8401-025	799	12.09.16
☒	EMI Test Receiver	R&S	ESCI	100001	12.07.11
☐	Attenuator	HP	8494A	2631A09825	12.10.26
☐	Attenuator	HP	8496A	3308A16640	12.10.26
☐	Attenuator	R&S	RBS1000	D67079	12.10.26
☐	Power sensor	Agilent	E9325A	US40420186	12.10.26
☐	LOOP Antenna	EMCO	EMCO6502	9205-2745	13.05.23
☒	BILOG Antenna	Schwarzbeck	VULB 9168	375	11.11.30
☒	BILOG Antenna	Schwarzbeck	VULB 9168	375	11.11.30
☒	HORN Antenna	ETS	3115	00062589	11.12.22
☒	HORN Antenna	ETS	31	00062589	11.12.22
☒	HORN Antenna	ETS	3116	00086632	11.12.17
☒	HORN Antenna	ETS	3116	00086632	11.12.17
☒	Signal Generator	HP	E4432B	GB39340611	12.10.26
☐	Power Divider	Weinschel	1580-1	NX375	12.10.26
☐	Power Divider	Weinschel	1580-1	NX380	12.09.14
☐	Power Divider	Weinschel	1594	671	12.09.14
☐	Test Receiver	R&S	ESHS30	844827/011	12.08.16
☐	LISN	R&S	ESH3-Z5	846125/024	12.08.04
☐	LISN	PMM	L3-32	0120J20305	-