SK TECH CO., LTD.

Certificate of Compliance

Test Report No.:	**SKTTRT-090810-009**		
Applicant:	**SEWON TELETECH, INC.**		
Applicant Address:	881 Gwanyang2, Dongan, Anyang, Gyeonggi, South Korea		
Manufacturer:	**SEWON TELETECH, INC.**		
Manufacturer Address:	881 Gwanyang2, Dongan, Anyang, Gyeonggi, South Korea		
Device Under Test:	**Slim RU**		
FCC ID:	**WGUSTS848HMDAO**	**Model Name:**	**STS800-48HM-D-AO SYSTEM**
Brand/Trade Name:	**-**		
Receipt No.:	SKTEU09-0739	**Date of receipt:**	July 23, 2009
Date of Issue:	August 10, 2009		
Location of Testing:	**SK TECH CO., LTD.** #820-2, Wolmoon-ri, Wabu-up, Namyangju-si, Kyunggi-do, 472-905 South Korea		
Test Procedure:	**TIA-603-C (December 2004), ANSI C63.4**		
Test Specification:	**FCC Part 22H**		
FCC Equipment Class:	**AMP-Amplifier**		
Test Result:	The above-mentioned device has been tested and passed.		

Tested & Reported by: *Jungtae, Kim*

2009. 08. 10

Signature *Date*

Approved by: *Jongsoo, Yoon*

2009. 08. 10

Signature *Date*

Other Aspects:	**-**
Abbreviations:	**· OK, Pass = passed · Fail = failed · N/A = not applicable**

>> CONTENTS <<

1. GENERAL

These tests were performed using the test procedure outlined in TIA-603-C and ANSI C63.4, 2003, and in accordance with the limits set forth in FCC Part 22 and Part 2. The EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards.

We attest to the accuracy of data. All measurements reported herein were performed by SK TECH CO., LTD. and were made under Chief Engineer's supervision.
We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. TEST SITE

SK TECH CO., LTD.

2.1 Location

#820-2, Wolmoon-ri, Wabu-up, Namyangju-si, Kyunggi-do, 472-905 South Korea
(FCC Registered Test Site Number: 90752)

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.
This laboratory is recognized as a Conformity Assessment Body (CAB) for CAB's Designation Number: KR0007 by FCC, is accredited by NVLAP for NVLAP Lab. Code: 200220-0.

2.2 List of Test and Measurement Instruments

No.	Description	Manufacturer	Model No.	Serial No.	Calibrated until	Used
1	Spectrum Analyzer	Agilent	E4405B	US40520856	2010.07	
2	EMC Spectrum Analyzer	Agilent	E7405A	US40240203	2010.03	☒
3	EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2010.02	☒
4	EMI Test Receiver	Rohde&Schwarz	ESHS10	862970/019	2010.07	
5	Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	836679/018	2010.07	
6	Pre-amplifier	HP	8447F	3113A05153	2010.07	☒
7	Pre-amplifier	MITEQ	AFS44	1116321	2010.07	☒
8	Pre-amplifier	MITEQ	AFS44	1116322	2010.03	
9	Power Meter	Agilent	E4417A	MY45100426	2010.07	
10	Power Meter	Agilent	E4418B	US39402176	2010.07	☒
11	Power Sensor	Agilent	E9327A	MY44420696	2010.07	
12	Power Sensor	Agilent	8482A	MY41094094	2010.07	☒
13	Attenuator (10dB)	HP	8491B	38067	2010.07	
14	Attenuator (20dB)	Weinschel	44	AH6967	2010.07	☒
15	Attenuator (30dB)	Weinschel	58-30-34	MU777	2010.07	☒
16	Attenuator (30dB)	Weinschel	58-30-34	MU778	2010.07	☒
17	High Pass Filter	Wainwright	WHKX3.0/18G	8	2010.07	☒
18	VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	2009.12	☒
19	UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	2009.12	☒
20	Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	2009.11	
21	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	230	2009.07	
22	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	189	2009.09	☒
23	Horn Antenna	AH Systems	SAS-200/571	304	N/A	
24	Horn Antenna	EMCO	3115	00040723	2010.03	☒
25	Horn Antenna	EMCO	3115	00056768	2009.11	☒
26	Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170318	2010.08	☒
27	Vector Signal Generator	Agilent	E4438C	MY42080359	2010.07	☒
28	Vector Signal Generator	Agilent	E4438C	MY45092702	2010.02	☒
29	Vector Signal Generator	Agilent	E4438C	MY47272386	2010.07	☒
30	PSG analog signal generator	Agilent	E8257D-520	MY45141255	2010.07	☒
31	DC Power Supply	HP	6622A	3448A032223	2009.11	
32	DC Power Supply	HP	6268B	2542A-07856	2010.07	
33	Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2010.07	☒

2.3 Test Date

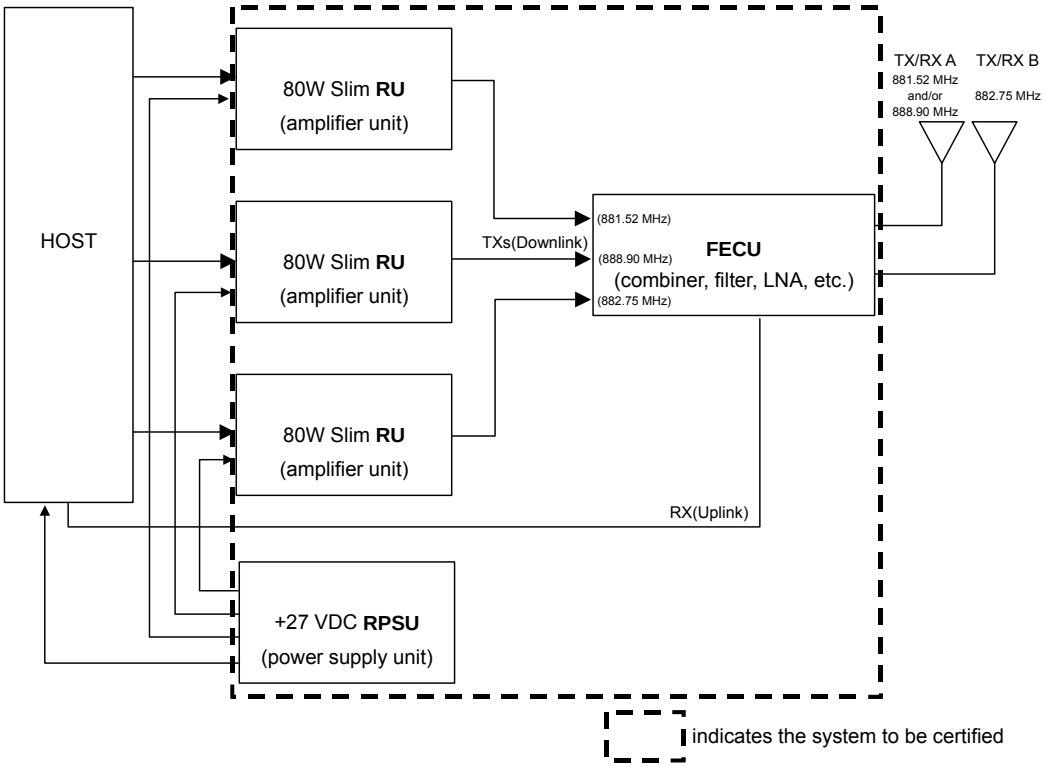
Date of Test: July 28, 2009 ~ August 5, 2009

2.4 Test Environment

See each test item's description.

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The EUT is a rack mounted CDMA power amplifier system with multiple amplifier modules. This power amplifier system is used in BTS (Base station Transceiver Subsystem) in the downlink spectrum of 850 Cellular bands.



System configuration:

1) RU, FECU, and RPSU are always marketed and used (installed) together.
2) Maximum three RU can be connected to one FECU for the service as 3 FA. The addition or deletion of RU only changes the output power.
3) Two RU are combined and connected to one common antenna (A ANT), and One RU is connected to another antenna (B ANT). The amplifier modules (RU) are electrically identical.
4) The rack was tested with the maximum number of RU installed (3FA).

3.1 Rating and Physical Characteristics

Power source		+27 VDC	
Frequency Range		Fixed frequency (3 FA) for Downlink (869 ~ 894 MHz) service CH384 (881.52 MHz), CH630 (888.90 MHz), and CH425 (882.75 MHz)	
Modulation		CDMA	
Total Rated Output Power		Maximum power per carrier: 60 W The total rated RF power: 180 W for multiple-carrier operation TX/RX A ANT port: 120 W (2 FA: CH384 and CH630 are combined) TX/RX B ANT port: 60 W (1 FA: CH425)	
Frequency Translation		☒ F1 - F1	☐ F1 - F2 / ☐ NA
		☐ Software	☐ Duplexer Change / ☐ Full Band Coverage
Components	RU	Model Number: STS800-48HM-D-AO Output power: 1FA, 80Watts average Max. (+49 dBm) RF Gain: 59 ± 1.0 dB @ frequency range, +27V, -20 °C ~ +65 °C Input Power: -10 dBm for 80W @ Normal Dimension: 482.6 (W) × 450 (D) × 132.6 (H), 19" Rack Max 3U	
	FECU	Model Number: STS800-FECU TX Insertion loss: 1.5 dB Max. TX Passband Ripple: 0.2 dB Max. (FA to FA) RX Gain: 24.0 ± 0.7 dB@ Normal Temperature Dimension: 482.6 (W) × 450 (D) × 88 (H), 19" Rack Max 2U	
	RPSU	Model Number: STS-RPSU-27-60W Dimension: 482.6 (W) × 450 (D) × 88 (H), 19" Rack Max 2U	
External Ports	RU	RF TX OUT	(N Female) DL signal output connected to TX IN at FECU
		RF TX IN	(SMA Female) DL signal source from Transceiver Block in BTS
		TX TP	(SMA Female) Coupling Test point (DL TX)
		MASTER	(RJ45, RS485) Signal port from/to BTS
		SLAVE (× 2)	(RJ45, RS485) Signal port from/to 2nd RU, 3rd RU
		TEST	(RJ45, RS232) Debug/Test port
		RPSU ALM	(RJ45) RPSU status monitoring port from ALARM at RPSU
		LNA PWR/ALM	(RJ45) 12 VDC output and control signal to FECU
		27 VDC IN	(D-SUB 3W3) 27 VDC input terminal from RPSU
	FECU	TX/RX_A ANT	(N Female) DL transmitter Ant. / UL receiver Ant. port (CH 384/630)
		TX/RX_B ANT	(N Female) DL transmitter Ant. / UL receiver Ant. port (CH 425)
		TX IN (× 3)	(N Female) DL signal source from the each RU
		RX_A/B OUT (× 6)	(SMA Female) UP signal to Transceiver Block in BTS
		TX_A/B TP (× 2)	(SMA Female) Coupling Test point (DL TX)
		RX_A/B TP (× 2)	(SMA Female) Coupling Test point (UP RX)
		LNA PWR/ALM	(RJ45) 12 VDC input and control signal from RU
	RPSU	27 VDC IN	(D-SUB 3W3) 27 VDC input terminal
		AW96 POWER	(D-SUB 3W3) 27 VDC output connected to Host (BTS, AW96)
		RU POWER (× 3)	(D-SUB 3W3) 27 VDC output connected to RU
		ALARM	(RS232) Alarm signal to RPSU ALM at RU

3.2 Equipment Modifications

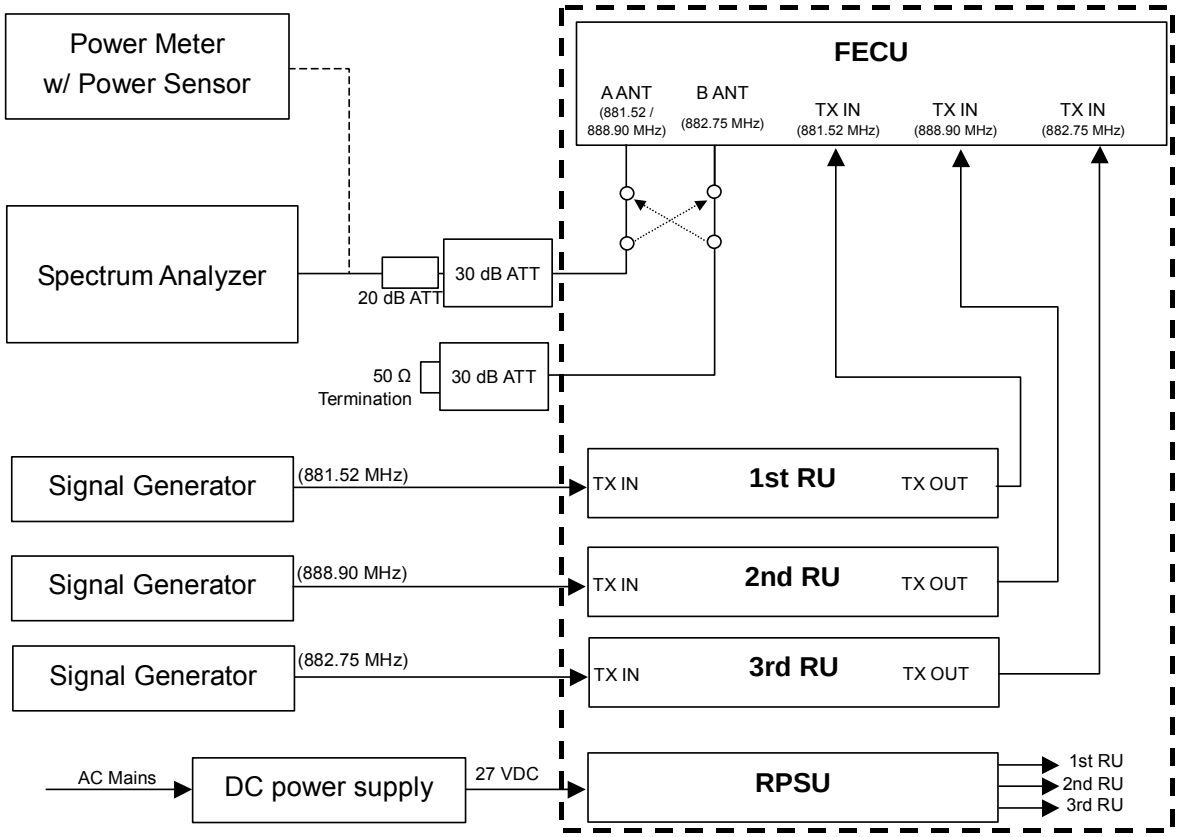
None

3.3 Submitted Documents

Block diagram / Schematic diagram / Tune up procedure / Part List / Instruction manual

4. MEASUREMENT CONDITIONS

4.1 Description of test configuration



[System Block Diagram of Test Configuration]

4.2 List of Peripherals

Equipment Type	Manufacturer	Model	S/N
DC power supply	-	PRM-100	-
Cooler (fan) for 30 dB attenuators	SEWON TELETECH, INC.	-	-

4.3 Type of Used Cables

#	START		END		CABLE	
	NAME	I/O PORT	NAME	I/O PORT	LENGTH (m)	SHIELDED
1	Signal Generator (× 3)	RF OUT	RU (× 3)	TX IN	3	RF cable × 3
2	RU (× 3)	TX OUT	FECU	TX IN (× 3)	3	RF cable × 3
3	FECU	TX/RX A/B	30 dB ATT (× 2)	RF IN	3	RF cable × 2
4	FECU	LNA PWR/ALM	1st RU (master)	LNA PWR/ALM	2	No
5	1st RU (master)	SLAVE1	2nd RU (slave1)	SLAVE1	2	No
6	1st RU (master)	SLAVE2	3rd RU (slave2)	SLAVE2	2	No
7	RPSU	ALARM	1st RU (master)	RPSU ALM	2	No
8	RPSU	RU POWER (× 3)	RU (× 3)	27 VDC IN	1.5	No
9	RPSU	27 VDC IN	DC power supply	DC OUT	3	No

4.4 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = *k*Uc (*k* = 2)
Conducted RF power	± 0.57 dB	± 1.14 dB
Radiated disturbance	± 2.30 dB	± 4.60 dB

5. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	CFR 47 Section	Report Section	Test Result
RF Power Output	2.1046	5.1	PASS
Modulation Characteristics	2.1047	N/A	N/A*
Occupied Bandwidth	2.1049	5.2	PASS
Spurious Emissions at Antenna Terminals	2.1051; 22.917	5.3	PASS
Field Strength of Spurious Radiation	2.1053; 22.917	5.4	PASS
Frequency Stability	2.1055; 22.917	N/A	N/A**

* The EUT does not support the ability to modulate voice.

** The EUT does not contain frequency translation.

5.1 RF POWER OUTPUT

5.1.1 Regulation

According to §2.1046(a), 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 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

According to §2.1046(b), for single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in 2.1046(b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

According to §2.1046(c), for measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

According to § 22.913 Effective radiated power limits, the effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

According to § 22.913 (a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

5.1.2 Test Procedure

RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations.

5.1.3 Test Results: PASS

Table 1: Measured values of the RF Power Output

Antenna port tested	Frequency (MHz)	Signal input port (TX IN)	Input Power (dBm)	Modulated Power Output (W)
A ANT	881.52	1st RU	-9.30	60.05
A ANT	888.90	2nd RU	-9.33	60.09
B ANT	882.75	3rd RU	-9.57	60.04
A ANT	881.52 & 888.90	1st RU & 2nd RU	-9.30 & -9.33	120.20
(A ANT) + (B ANT)**	(881.52 & 888.90) + (882.75)	(1st RU & 2nd RU) + (3rd RU)	(-9.30 & -9.33) + (-9.57)	180.24

*** The RF power output at both of A ANT and B ANT port was calculated as the summation of the RF power output at each port.*

NOTE: The amplifier modules (RU) are electrically identical. The addition or deletion of amplifier only changes the output power. Maximum power per carrier is 60 W. The total rated RF power is 180 W for multiple-carrier operation in case of the maximum number of amplifiers installed (3FA).

5.2 OCCUPIED BANDWIDTH

5.2.1 Regulation

According to §2.1049, the occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of part 2.1049 (a) through (i) as applicable.

5.2.2 Test Procedure

The modulation characteristics of signal generator's carrier was measured first at a maximum RF level declared by the applicant. The signal generator was then connected to either the Uplink or Downlink input at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

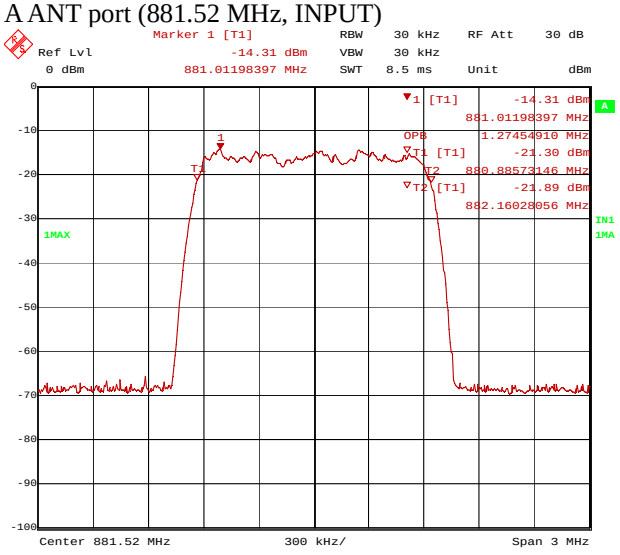
5.2.3 Test Results: PASS

Table 2: Measured values of the Occupied Bandwidth

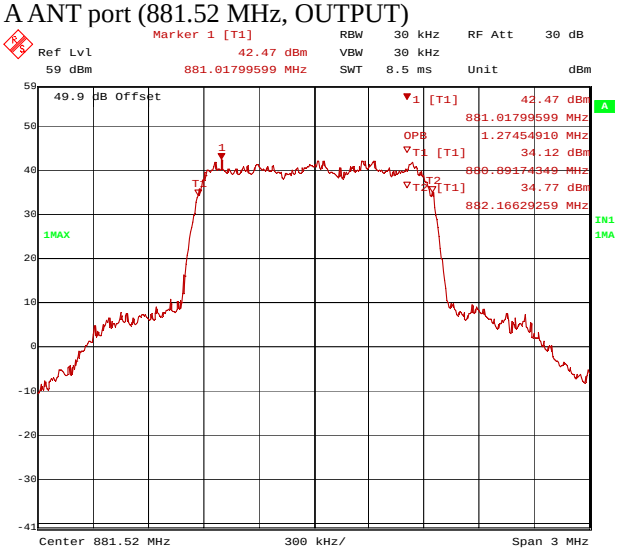
Antenna port tested	Frequency (MHz)	Signal input port (TX IN)	Occupied Bandwidth (MHz)	
			INPUT	OUTPUT
A ANT	881.52	1st RU	1.27	1.27
A ANT	888.90	2nd RU	1.27	1.27
B ANT	882.75	3rd RU	1.27	1.26

Figure 2: Plot of the Occupied Bandwidth

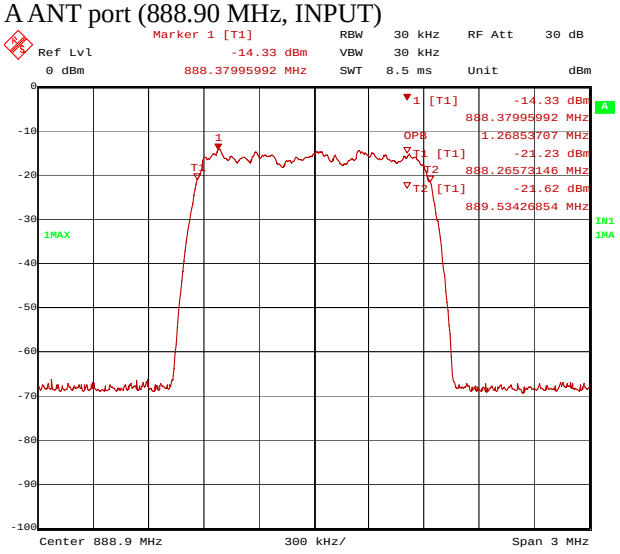
A ANT port (881.52 MHz, INPUT)



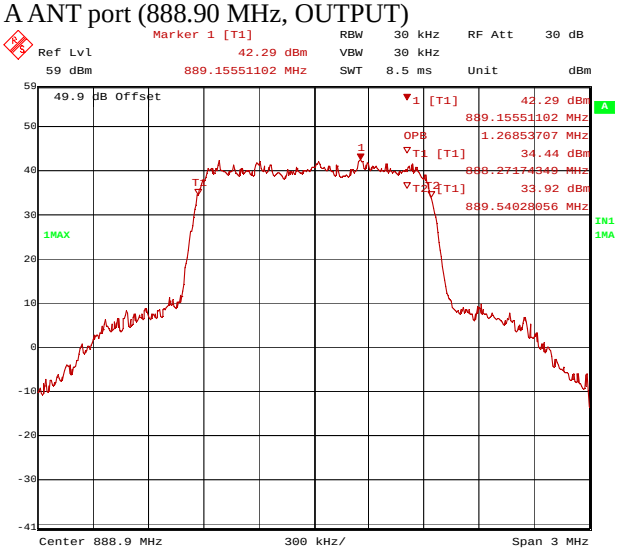
A ANT port (881.52 MHz, OUTPUT)



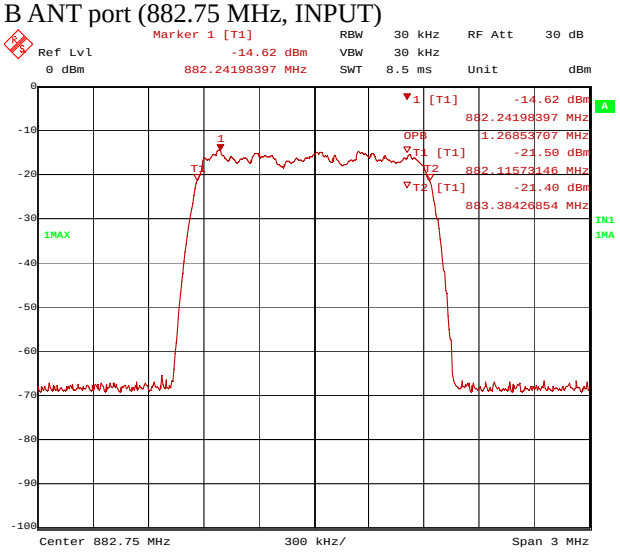
A ANT port (888.90 MHz, INPUT)



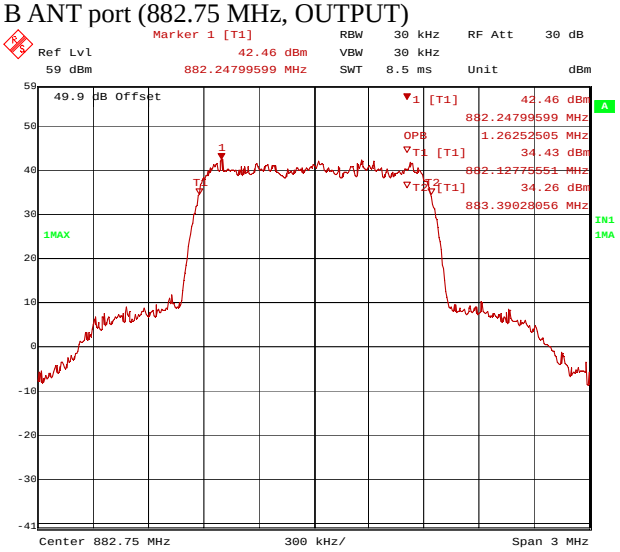
A ANT port (888.90 MHz, OUTPUT)



B ANT port (882.75 MHz, INPUT)



B ANT port (882.75 MHz, OUTPUT)



5.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

5.3.1 Regulation

According to §2.1051, measurement required: Spurious emissions at antenna terminals, 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 permissible value need not be specified.

According to §22.917 Emission limitations for cellular Equipment, The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

According to §22.917 (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+10log(P) dB.

5.3.2 Test Procedure

A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as declared by the applicant. A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum analyzer was set to 100 kHz RBW. The spectrum was investigated from 30 MHz to the 10th harmonic of the carrier.

The inter-modulation measurements were performed in a similar manner as described above. The spectrum analyzer was set to 100 kHz. Two modulated carriers were injected into the EUT.
The two channels near each other should be separated by at least one operating channel width.
One carrier was set at the band edge of either the Uplink or Downlink band and the other was separated by at least one operating channel width. The in band spurious emissions were investigated.

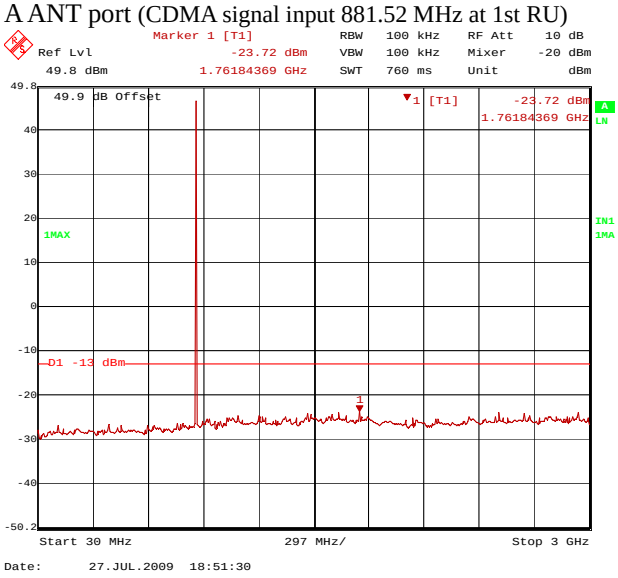
Out of Band Rejection was measured by injecting the swept CW signal into the EUT.
With the aid of a signal generator and spectrum analyzer, measure the 6 dB bandwidth of the amplifier (i.e. at the point where the gain has fallen by 6 dB). Measure the gain-versus-frequency response of the amplifier from the midband frequency f0 of the passband up to at least f0 ±250% of the 6 dB bandwidth. *[Remark: RF input level was set to approximately -30 dBm because the EUT is designed to be shutdown, when RF input level, which produces the maximum RF output power, is applied at the vicinity of pass bands]*

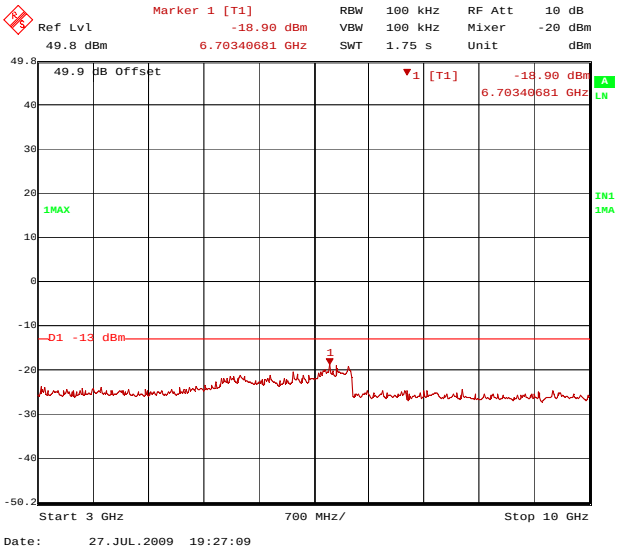
5.3.3 Test Results: PASS

The EUT complies with the requirements of this section.

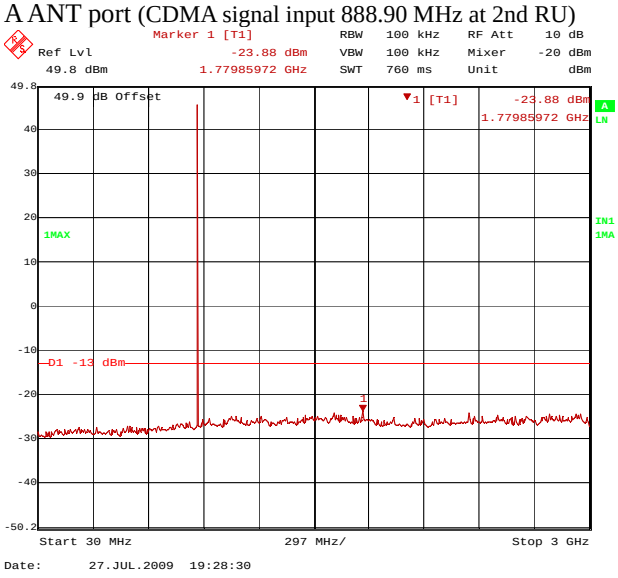
Figure 2: Plot of the Spurious Emissions at Antenna Terminals

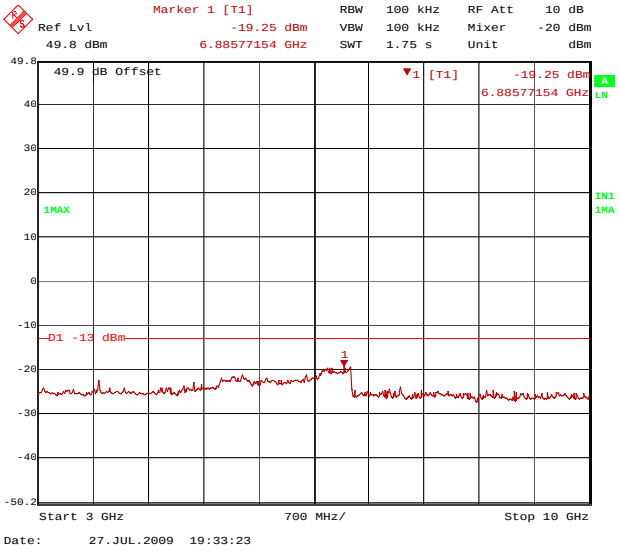
A ANT port (CDMA signal input 881.52 MHz at 1st RU)



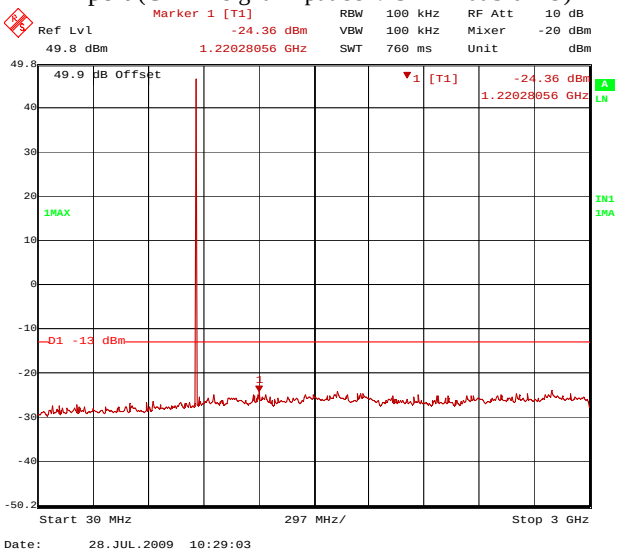


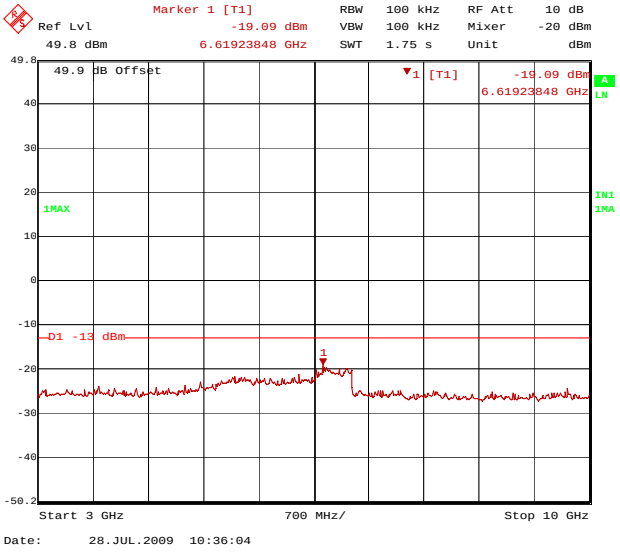
A ANT port (CDMA signal input 888.90 MHz at 2nd RU)



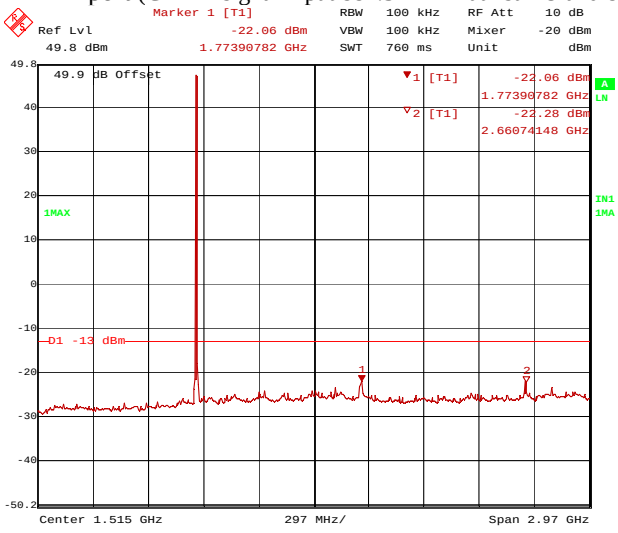


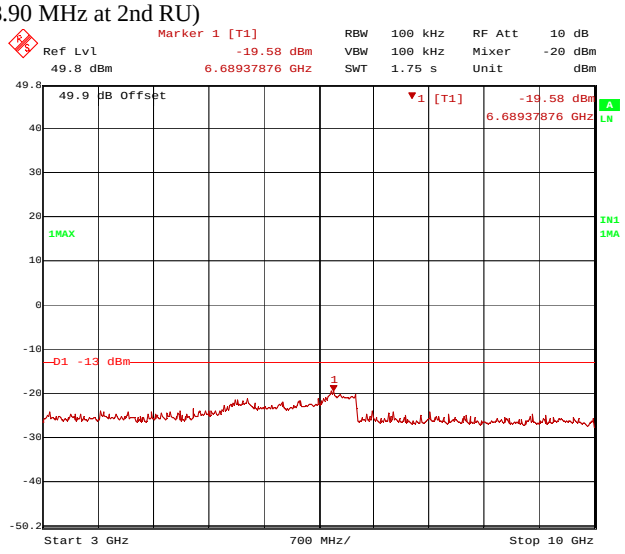
B ANT port (CDMA signal input 882.75 MHz at 3rd RU)



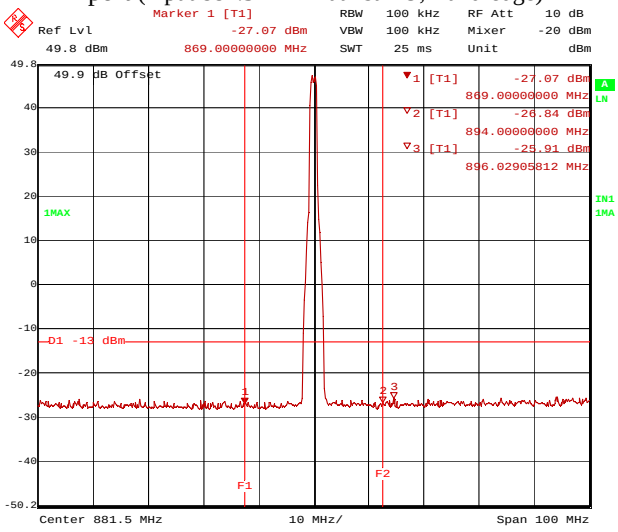


A ANT port (CDMA signal input 881.52 MHz at 1st RU and 888.90 MHz at 2nd RU)

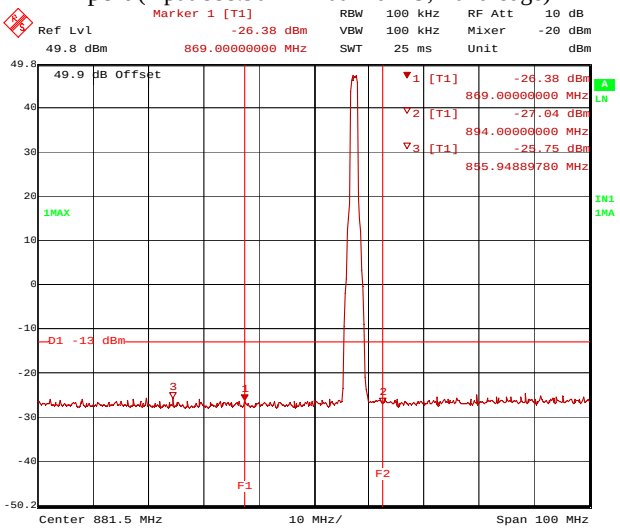




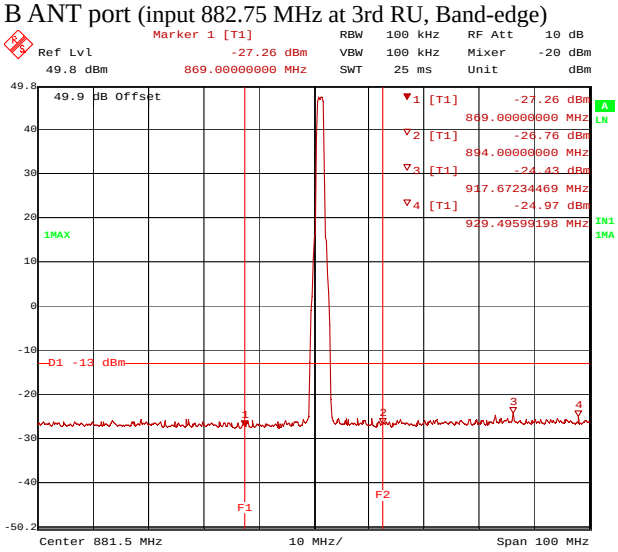
A ANT port (input 881.52 MHz at 1st RU, Band-edge)



A ANT port (input 888.90 MHz at 2nd RU, Band-edge)



B ANT port (input 882.75 MHz at 3rd RU, Band-edge)



A ANT port (881.52 MHz at 1st RU and 888.90 MHz at 3rd RU)

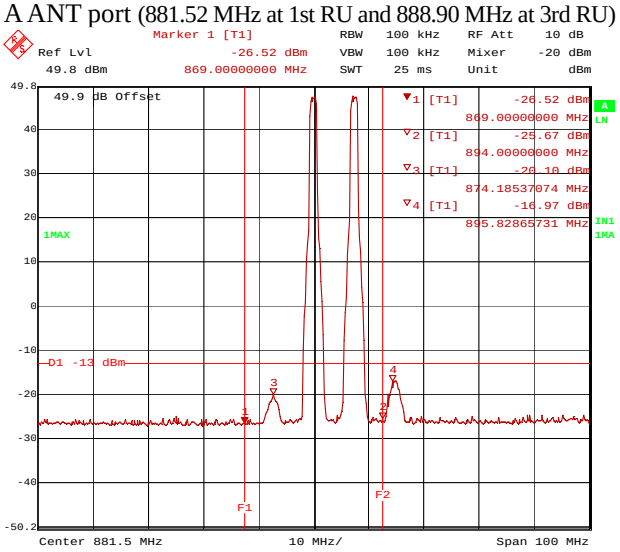
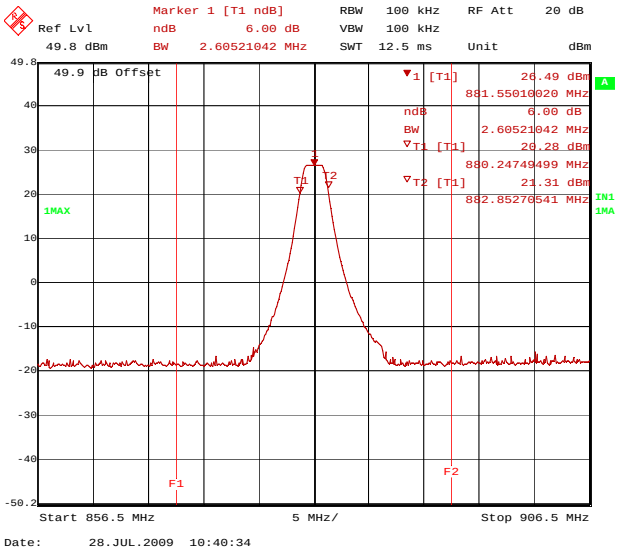


Figure 3: Plot of the Out of Band Rejection

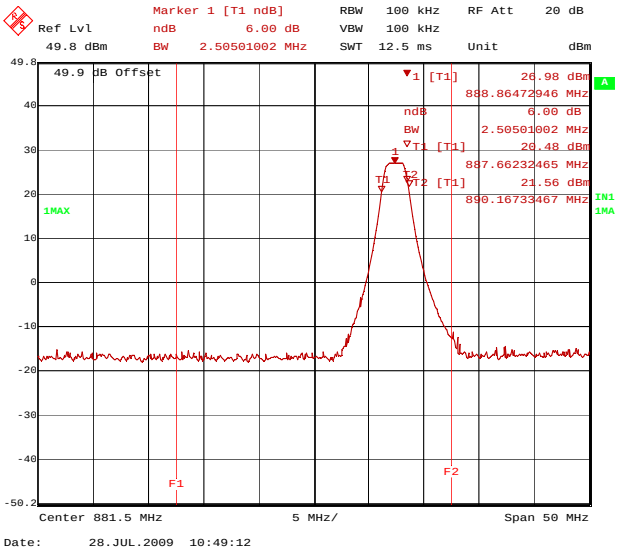
A ANT port (CH384/630)

INPUT: swept (in-band & out-band) CW signal at the 1st RU.
Output port of the 1st RU was connected to TX IN (CH384) 881.52 MHz port of FECU.



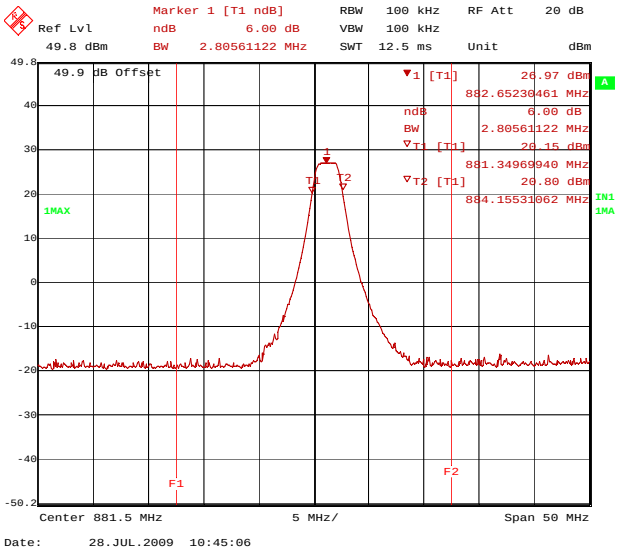
A ANT port (CH384/630)

INPUT: swept (in-band & out-band) CW signal at the 2nd RU.
Output port of the 2nd RU was connected to TX IN (CH630) 888.9 MHz port of FECU.



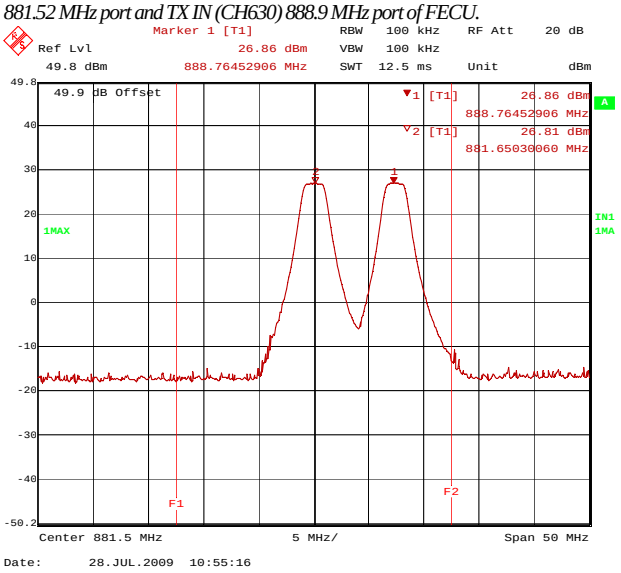
B ANT port (CH425)

INPUT: swept (in-band & out-band) CW signal at the 3rd RU.
Output port of the 3rd RU was connected to TX IN (CH425) 882.75 MHz port of FECU.



A ANT port (CH384/630)

INPUT: swept (in-band & out-band) CW signals at the 1st RU and 3rd RU.
Output ports of the 1st RU and 3rd were respectively connected to TX IN (CH384) 881.52 MHz port and TX IN (CH630) 888.9 MHz port of FECU.



5.4 FIELD STRENGTH OF SPURIOUS RADIATION

5.4.1 Regulation

According to §2.1053(a), measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

According to §2.1053(b), the measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
(2) All equipment operating on frequencies higher than 25MHz.
(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
(4) Other types of equipment as required, when deemed necessary by the commission.

According to §22.917 Emission limitations for cellular Equipment, The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

According to §22.917 (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+10log(P) dB.

5.4.2 Test Procedure

The measurements were made in accordance with the procedures of TIA-603-C.

1. The EUT was set at a distance of 3 m from the receiving antenna.
2. The EUT RF ports were terminated to 50 ohm load.
3. The EUT was set to transmit at the low, middle and high channels of the transmitter frequency range at its maximum power level.
4. The EUT was rotated about 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission.
5. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated.
6. The maximum ERP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value.

7. These steps were carried out with the receiving antenna in both vertical and horizontal polarization.
8. Harmonic emissions up to the 10th of harmonics were investigated.

5.4.3 Test Results: **PASS**

Table 3: Measured values of the spurious emissions (Radiated)

Frequency (MHz)	RBW (kHz)	Pol. (V/H)	Reading (dBm)	Substitution Antenna Gain (dBd)	Power into Substitution Antenna (dBm)	ERP (dBm)	Limit (dBm)	Margin [dB]

No emissions were detected at a level greater than 20 dB below the Limit.

ERP (dBm) = Power into Substitution Antenna (dBm) + Substitution Antenna Gain (dBd)

Margin (dB) = Limit (dBm) - ERP (dBm)