



243 Jubug-Ri, Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 449-822  
 Tel: +82-31-323-6008 Fax: +82-31-323-6010  
<http://www.ltalab.com>



Dates of Tests: July 26~ August 12, 2010  
 Test Report S/N: LR500191008D  
 Test Site : LTA CO., LTD.

FCC ID

**YM4OTAVQ100**

APPLICANT

**ARTECH Co., Ltd.**

## TEST REPORT

### FCC Part 27 Certification

<b>Classification</b>	:	Licensed Non-Broadcast Station Transmitter
<b>Manufacturing Description</b>	:	Quad-band Over the Air Repeater
<b>Manufacturer</b>	:	ARTECH Co., Ltd.
<b>Model name</b>	:	AROTA-VQ100
<b>Test Device Serial No.:</b>	:	Identification
<b>FCC Rule Part(s)</b>	:	§27, §2
<b>Rated RF Output Power(DL/UL)</b>	:	0.5W (27dBm)
<b>Type Of Modulation and Designators:</b>	:	LTE(F9W)
<b>Data of issue</b>	:	August 12, 2010

This test report is issued under the authority of:

Kyung-Taek LEE, Technical Manager

The test was supervised by:

Hyun-Chae You, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.

NVLAP LAB Code.: 200723-0

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## 1. General information's

### **1-1 Test Performed**

Company name : LTA Co., Ltd.  
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822  
 Web site : <http://www.ltalab.com>  
 E-mail : [chahn@ltalab.com](mailto:chahn@ltalab.com)  
 Telephone : +82-31-323-6008  
 Facsimile : +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

### **1-2 Accredited agencies**

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2010-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2011-06-20	EMC accredited Lab.
FCC	U.S.A	610755	2011-04-22	FCC filing
VCCI	JAPAN	R2133, C2307	2011-06-21	VCCI registration
IC	CANADA	IC5799	2012-05-14	IC filing

## 2. Information's about test item

### 2-1 Client

Company name : ARTECH Co., Ltd.  
 Address : 246 Kongdan-dong, Gumi-si, Kyungbuk area, Korea  
 Telephone : +82-54-461-0920  
 Facsimile : +82-54-461-0919

### 2-2 Equipment Under Test (EUT)

Classification	:	Licensed Non-Broadcast Station Transmitter
Trade name	:	Quad-band Over the Air Repeater
Model name	:	AROTA-VQ100
Serial number	:	Identification
Date of receipt	:	July 262010
EUT condition	:	Pre-production, not damaged
	:	Block A : 728.5~733.5MHz
Downlink		Block B : 734.5~739.5MHz
		Block C : 746~756MHz
		Block A : 698.5~703.5MHz
Uplink		Block B : 704.5~709.5MHz
		Block C : 777~787MHz
Gain range	:	63~ 93dB
Emission Designators	:	F9W
Power Input	:	120Vac

### 2.5 Mode of Operation

The EUT was powered by 120VAC. The EUT was configured for maximum gain, 93dB. Repeater simulators were used to provide the input signals to the EUT. Tests were performed with LTE modulations. The input power was the maximum declared by the manufacturer.

### 3. Test Report

#### 3.1 Summary of tests

Parameter	Status
<b>Transmitter Requirements</b>	
RF Power Output	C
Occupied Bandwidth, Input/Output Comparison	C
Spurious Emissions at antenna terminal	C
Field Strength of Spurious Radiation	C
Frequency Stability	N/A <sup>3</sup>

Note 1: C=Complies    NC=Not Complies    NT=Not Tested    NA=Not Applicable

Note 2: The data in this test report are to be tested to the ANSI/TIA-603-C-2004 standard

Note 3: The device does not translate the frequency of the input signal.

### **3.2 Results Of Tests**

#### **3.2.1 RF Power Output**

##### **1. Test Procedure**

The EUT RF output was connected to Powermeter. The EUT was setup to transmit continuously with maximum power. Powermeter was setup to measure power. Measurements were performed at three frequencies (low, middle, and high channels) with all modulations.

##### **2. Test Results**

<b>Direction</b>	<b>Block</b>	<b>Power output (dBm)</b>	<b>Power Output (W)</b>
DL	A	27.5	0.56
	B	27.5	0.56
	C	27.9	0.61
UL	A	27.3	0.53
	B	27.4	0.55
	C	27.8	0.60

### **3.2.2 Occupied Bandwidth, Input/Output Comparison**

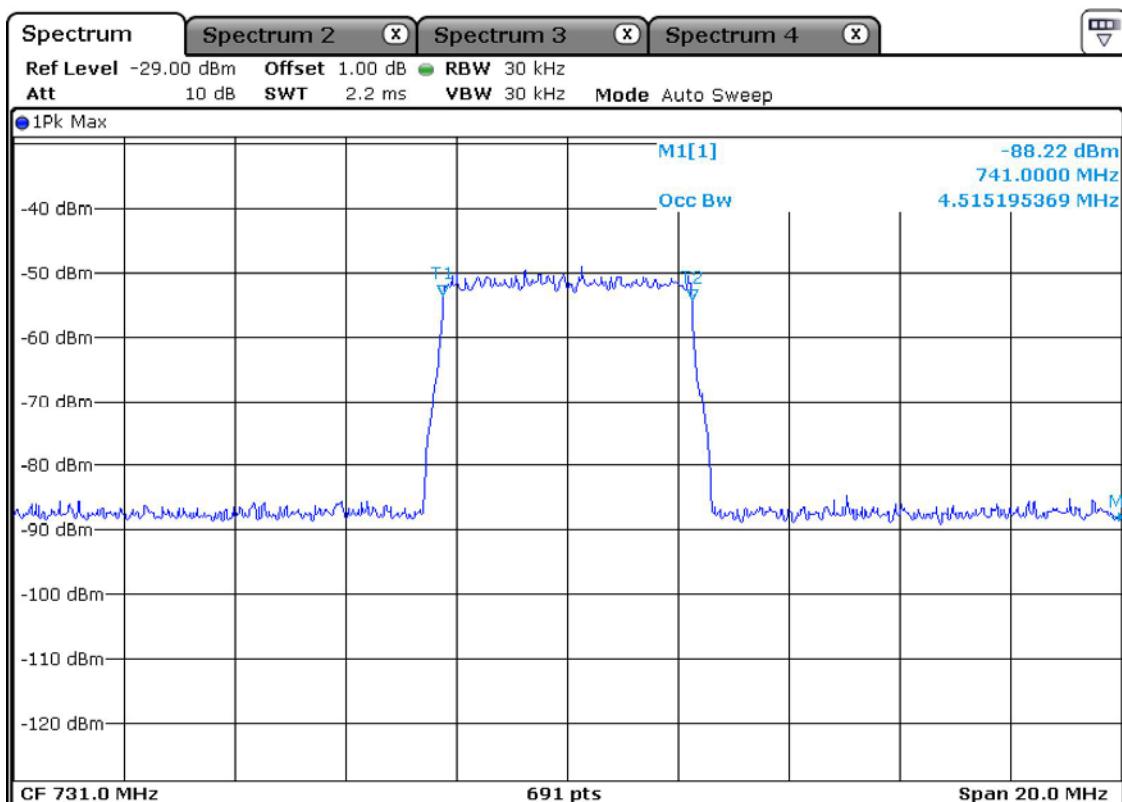
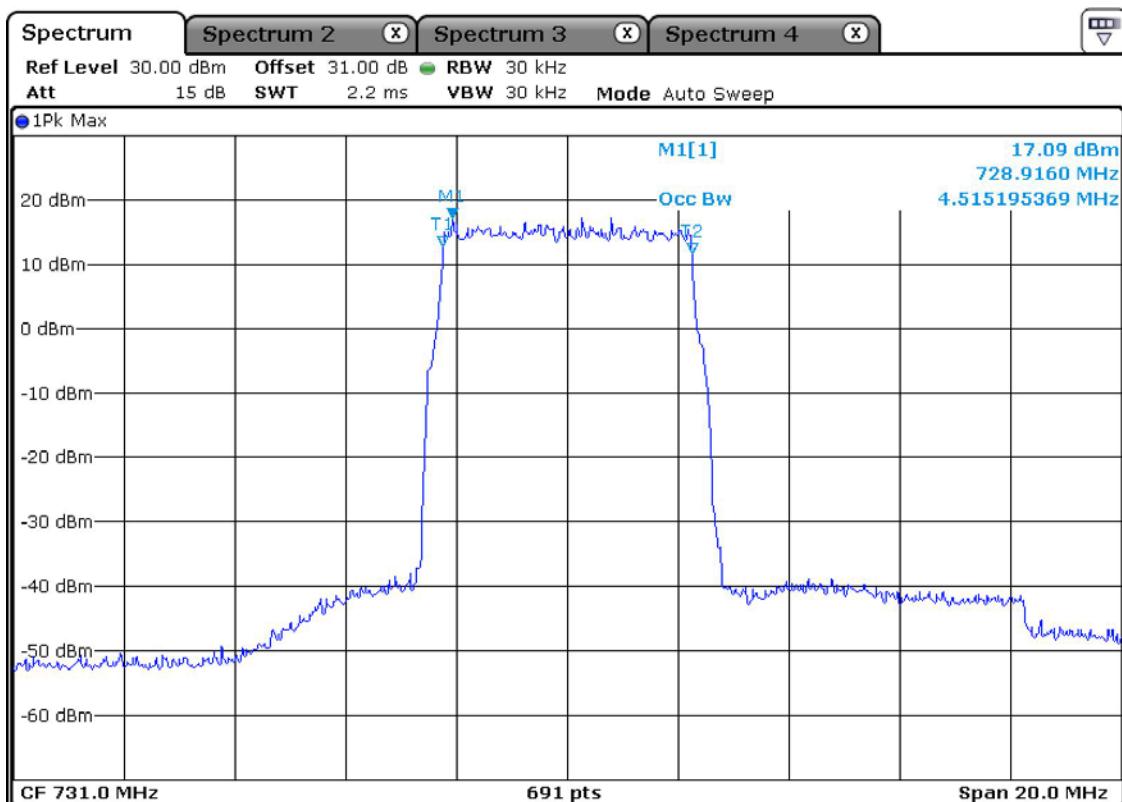
#### **1. Test Procedure**

The EUT RF ports were connected to Spectrum analyzer. The EUT was setup to transmit maximum power. The spectrum analyzer was setup to measure the Occupied Bandwidth (defined as the 99% Power Bandwidth). The Occupied Bandwidth was measured at the input and output ports of the EUT at the middle channels for each type of modulation

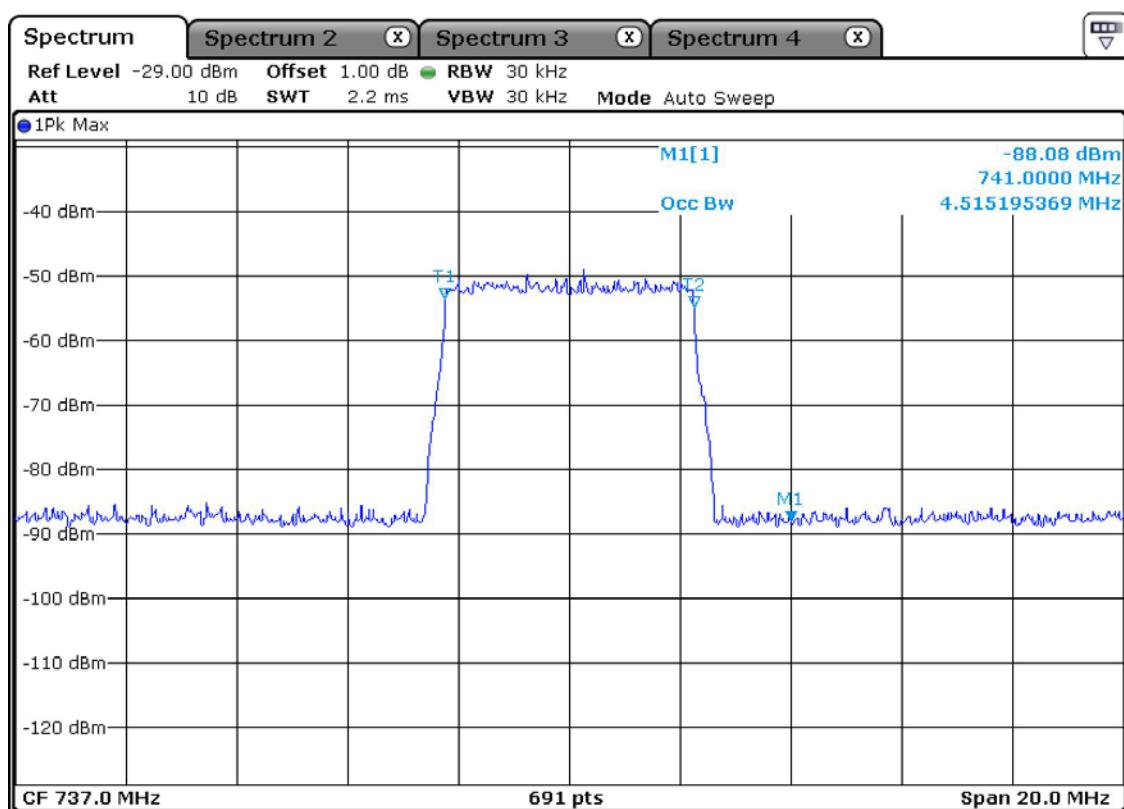
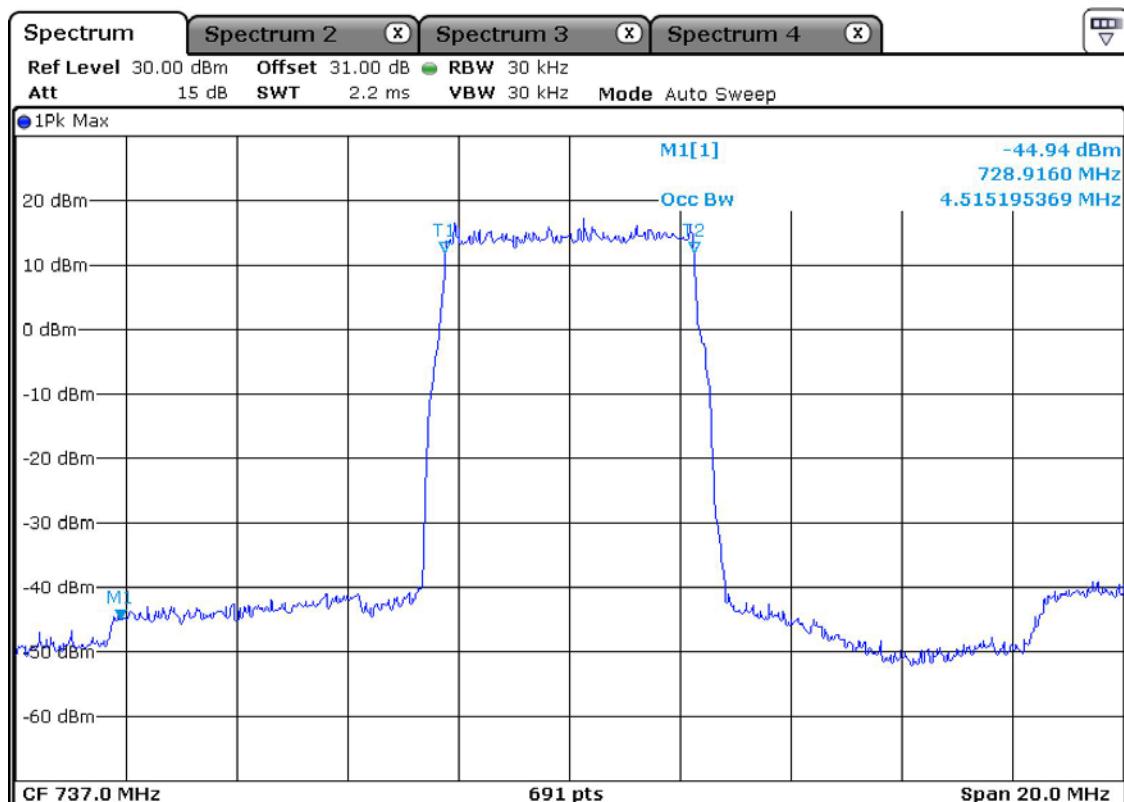
#### **2. Test Results : Complies**

Refer to the following Graphs.

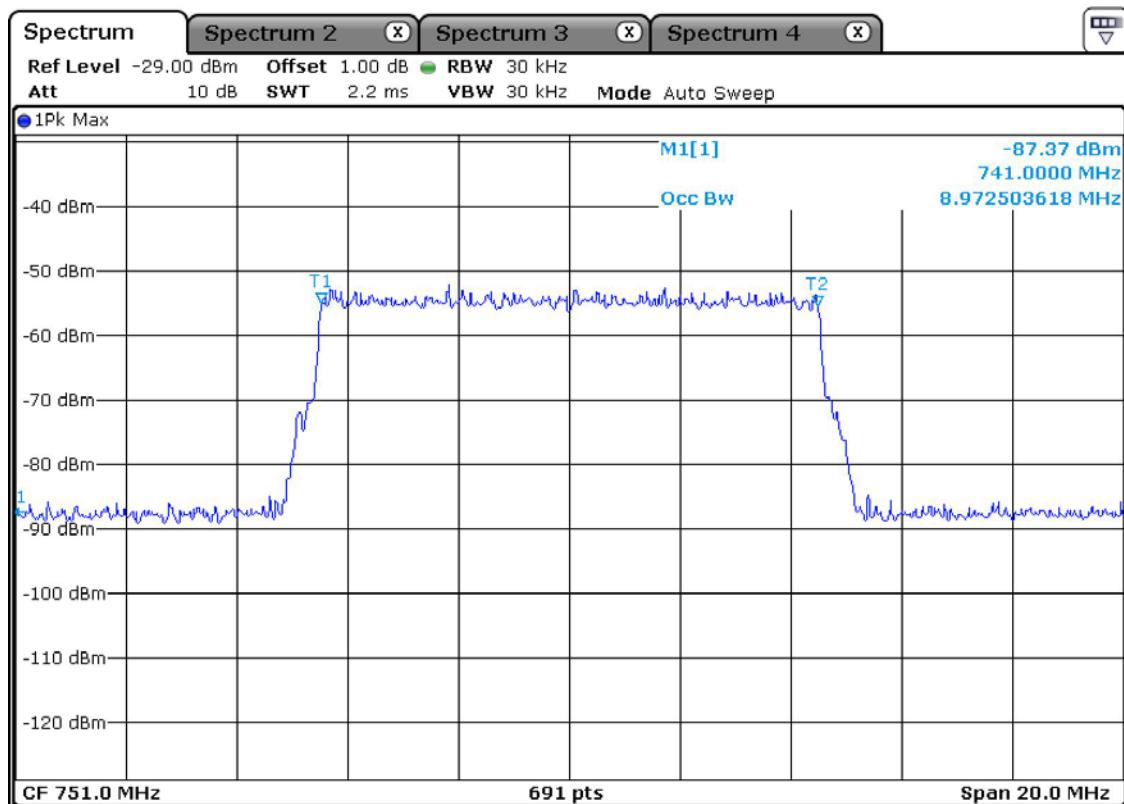
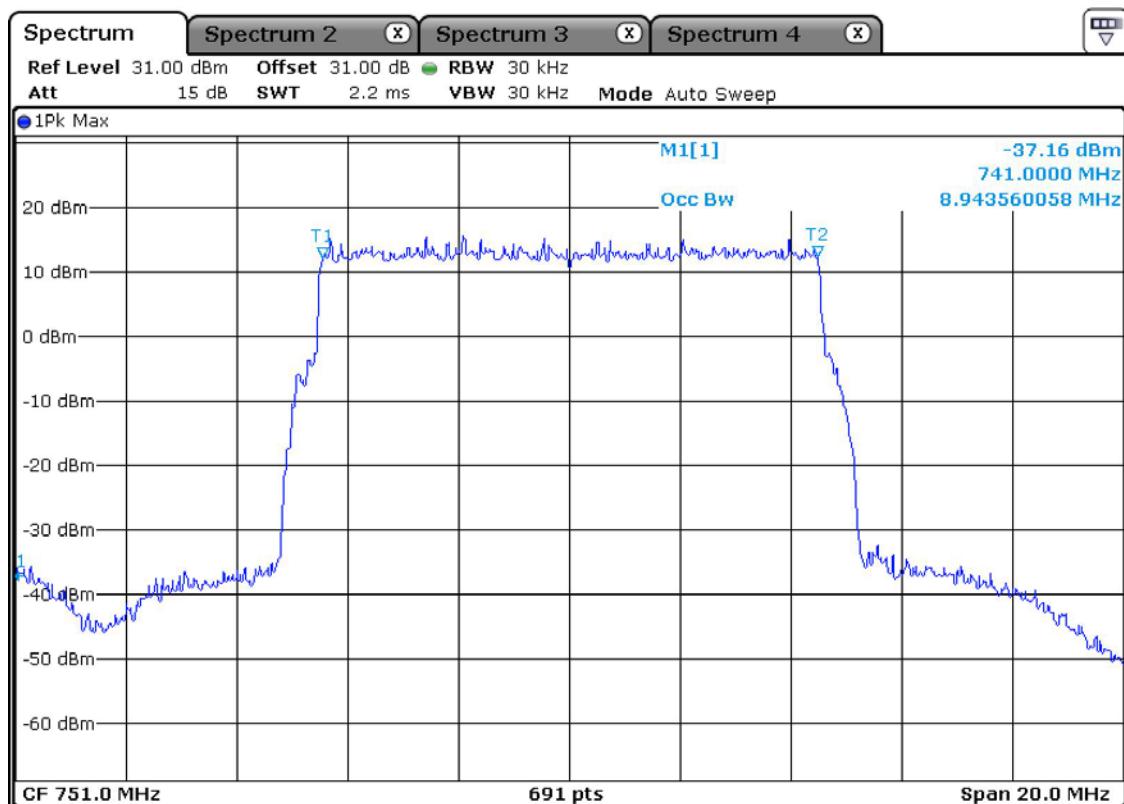
## Input/Output Bandwidth Comparison – Block A\_DL



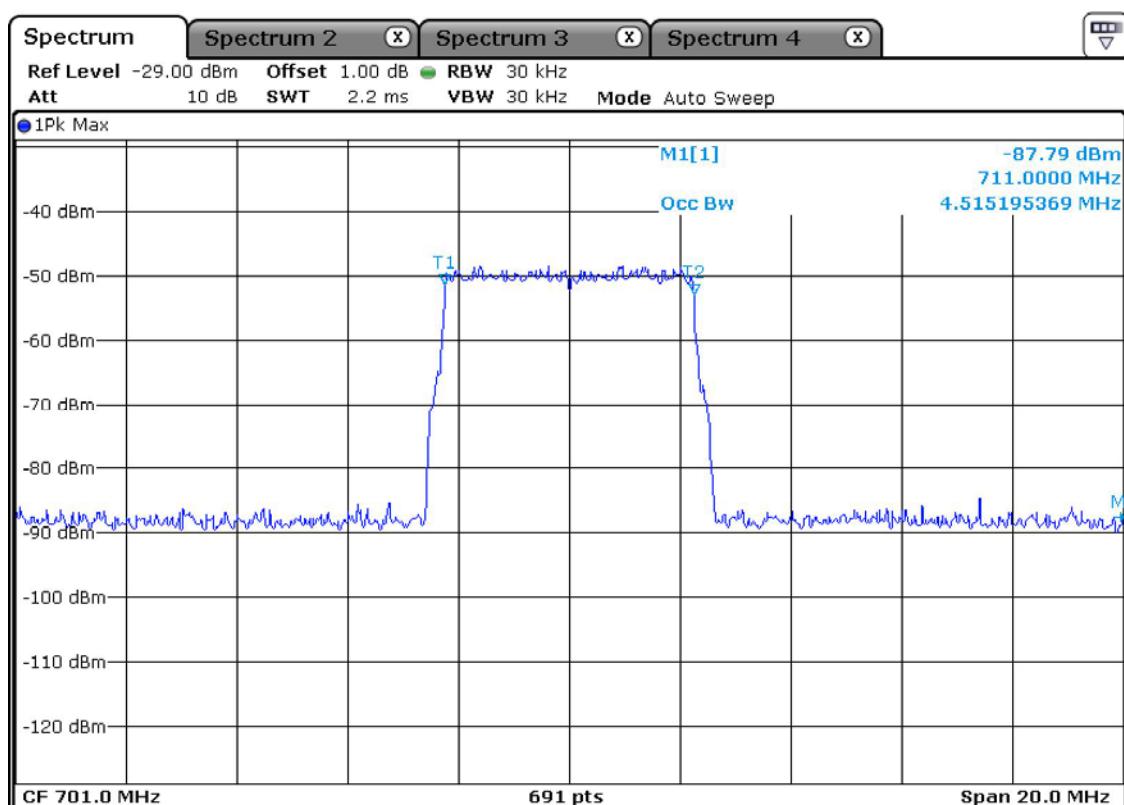
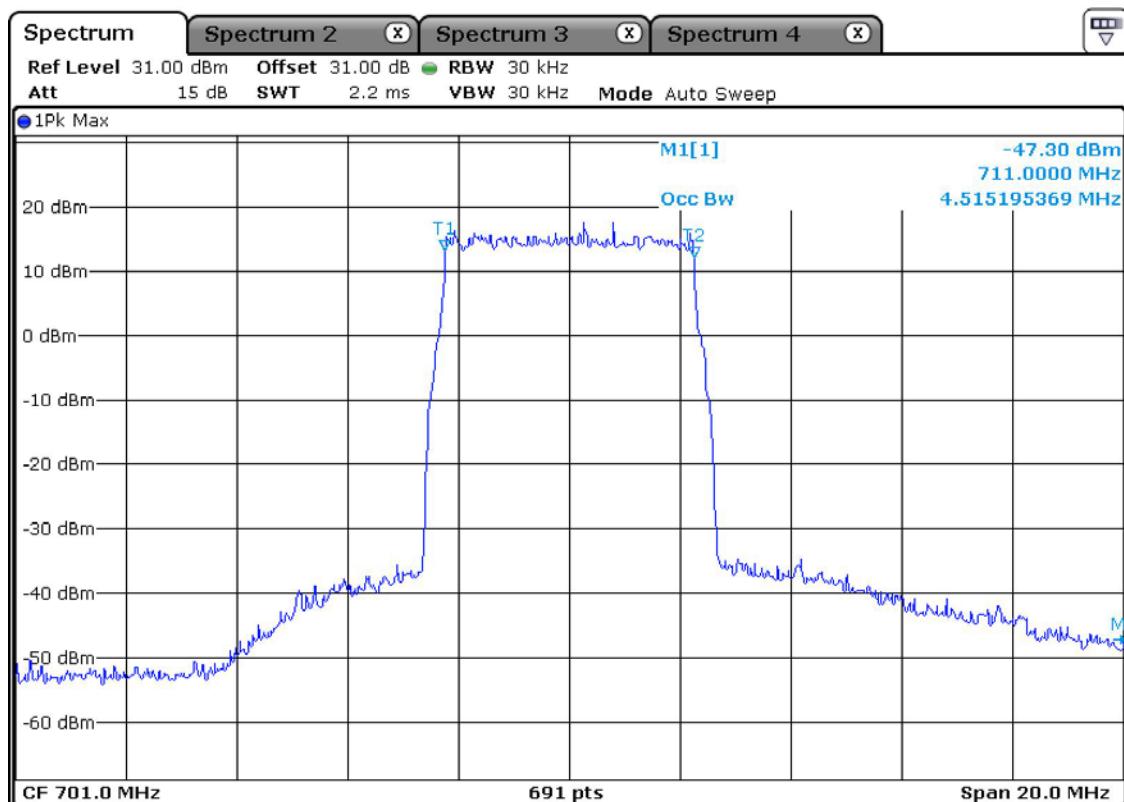
### Input/Output Bandwidth Comparison – Block B\_DL



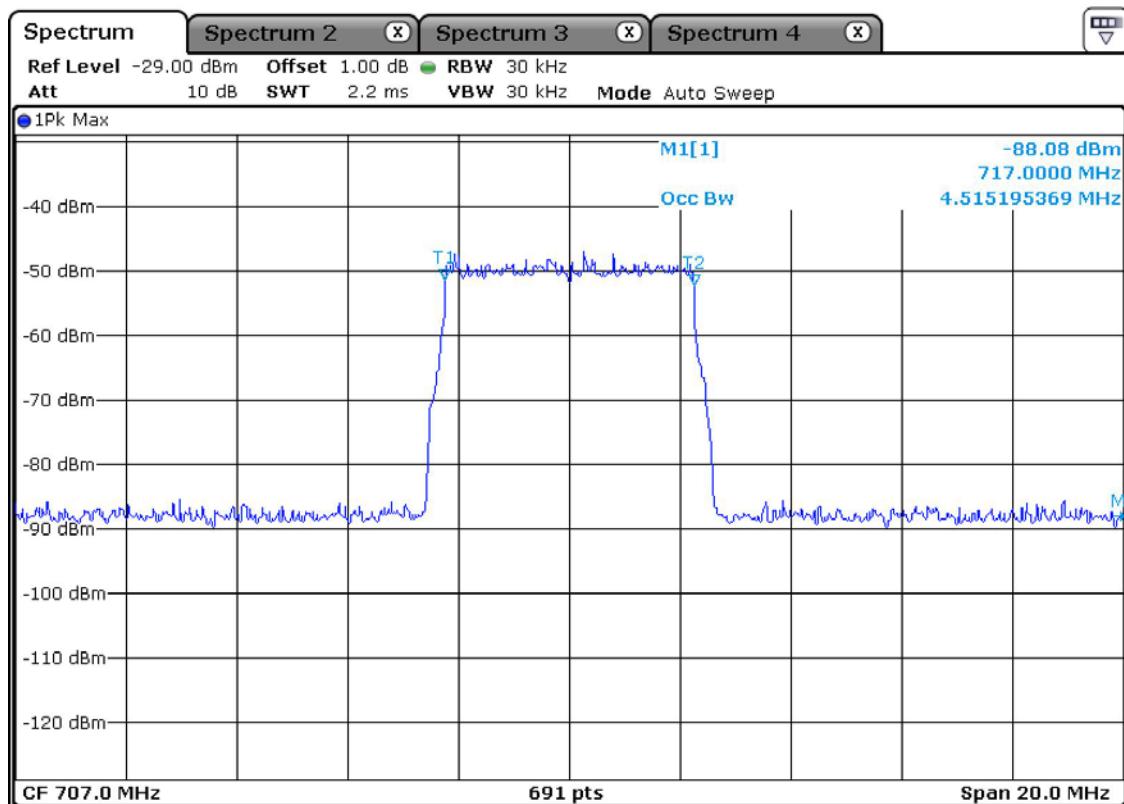
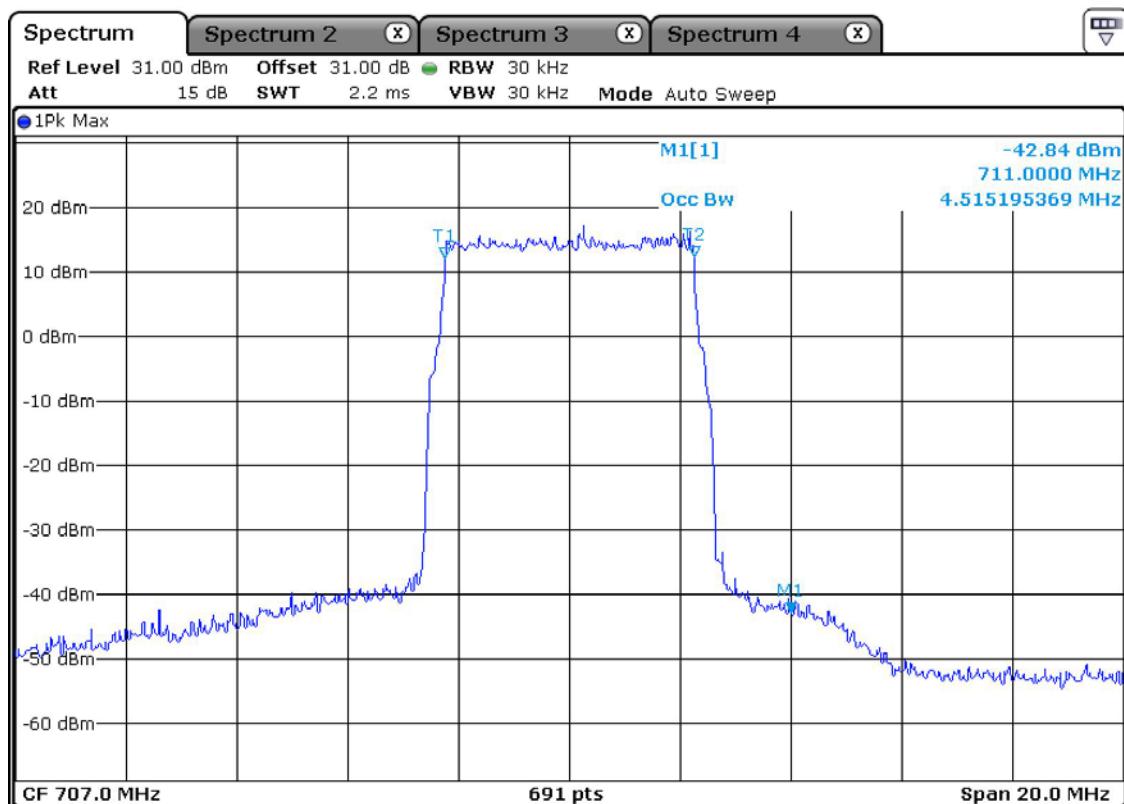
### Input/Output Bandwidth Comparison – Block C\_DL



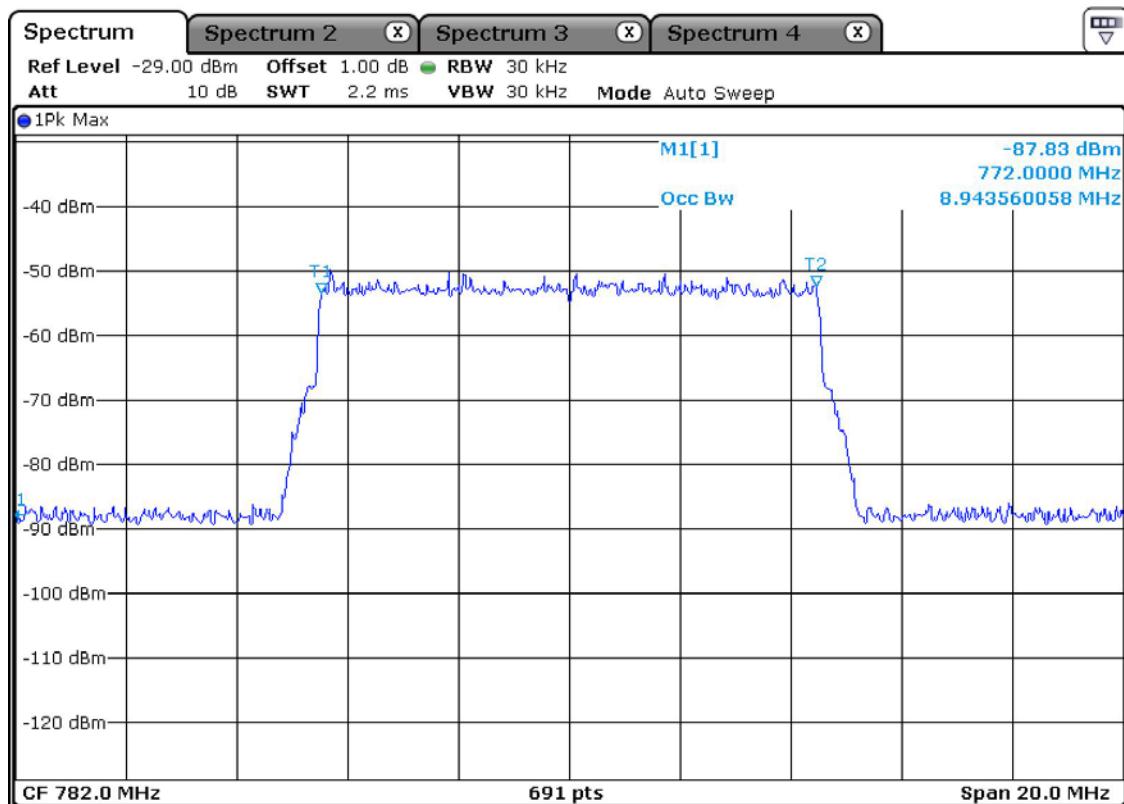
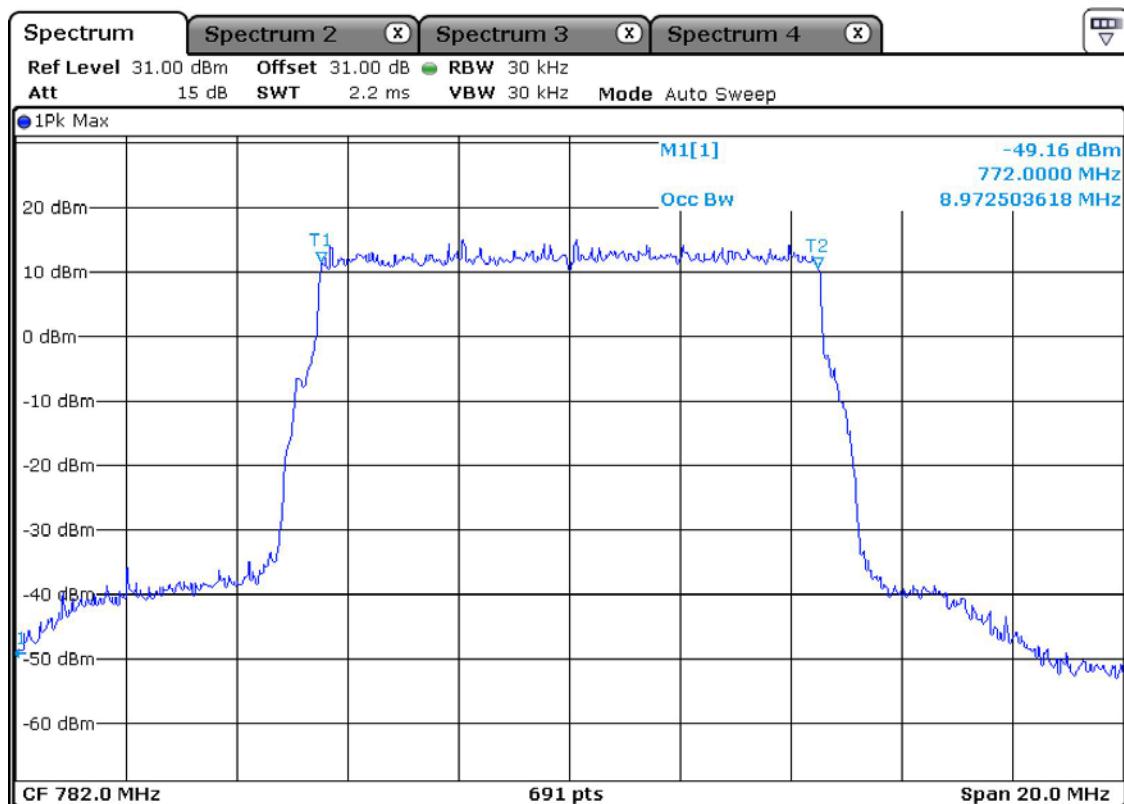
### Input/Output Bandwidth Comparison – Block A\_UL



### Input/Output Bandwidth Comparison – Block B\_UL



### Input/Output Bandwidth Comparison – Block C\_UL



### 3.2.3 Spurious Emissions at antenna terminal

#### 1. Requirement

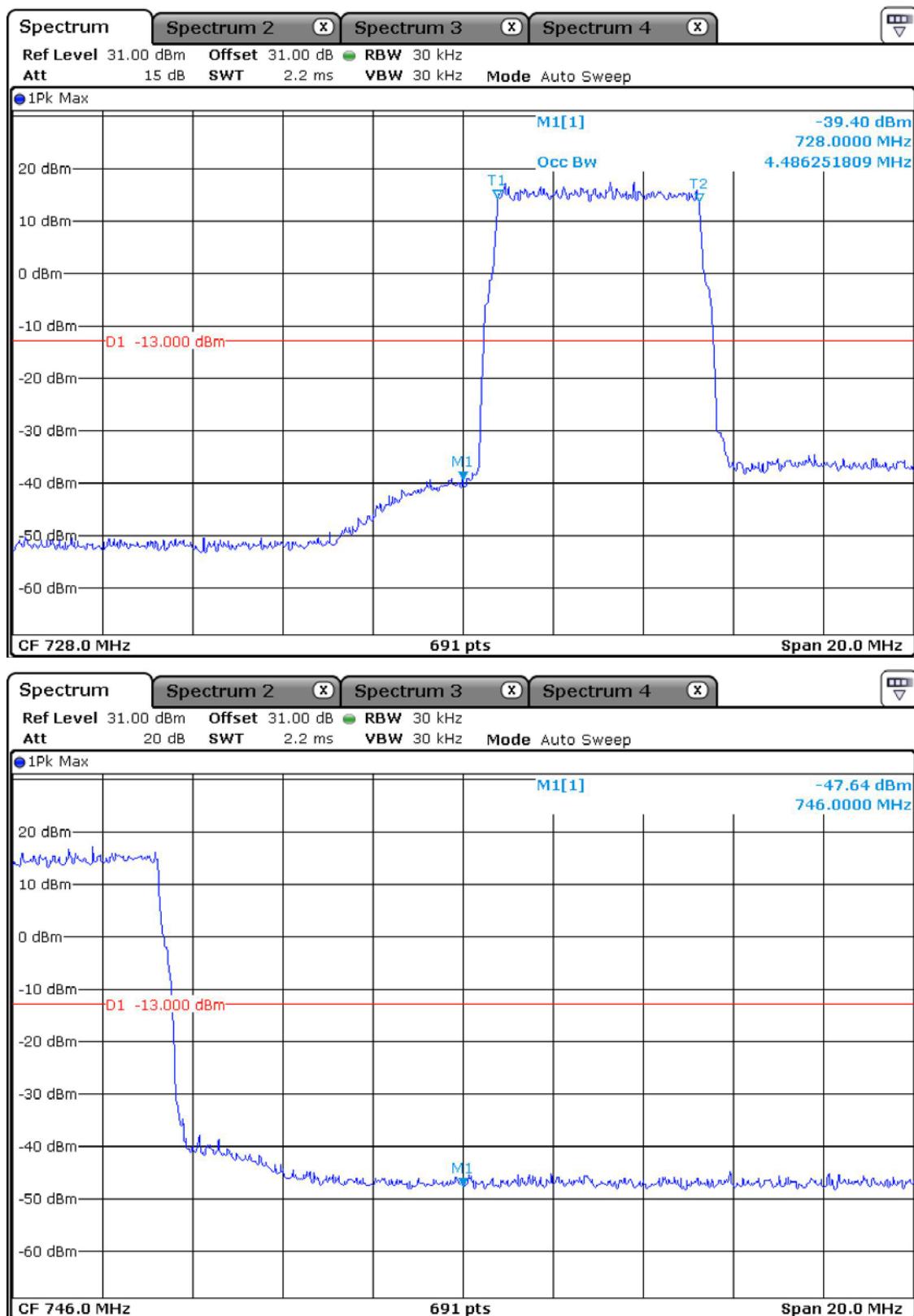
For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside of the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On any frequency outside of the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;
- (2) On any frequency outside of the 776-787 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;
- (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $76 + 10 \log (P)$  in a 6.25 KHz band segment for base and fixed stations;
- (5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based upon the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 30 kHz may be employed.

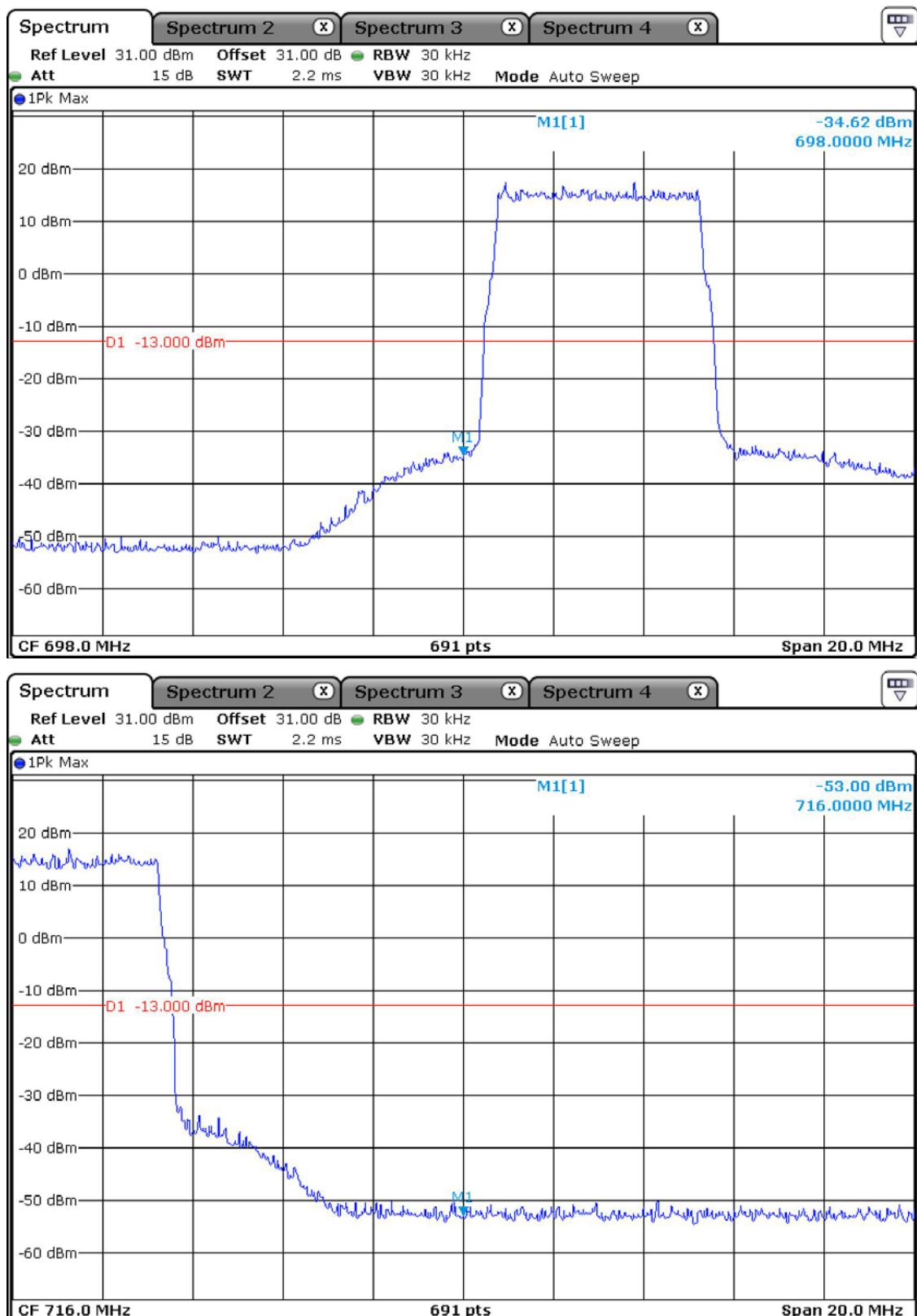
#### 2. Test Results : Complies

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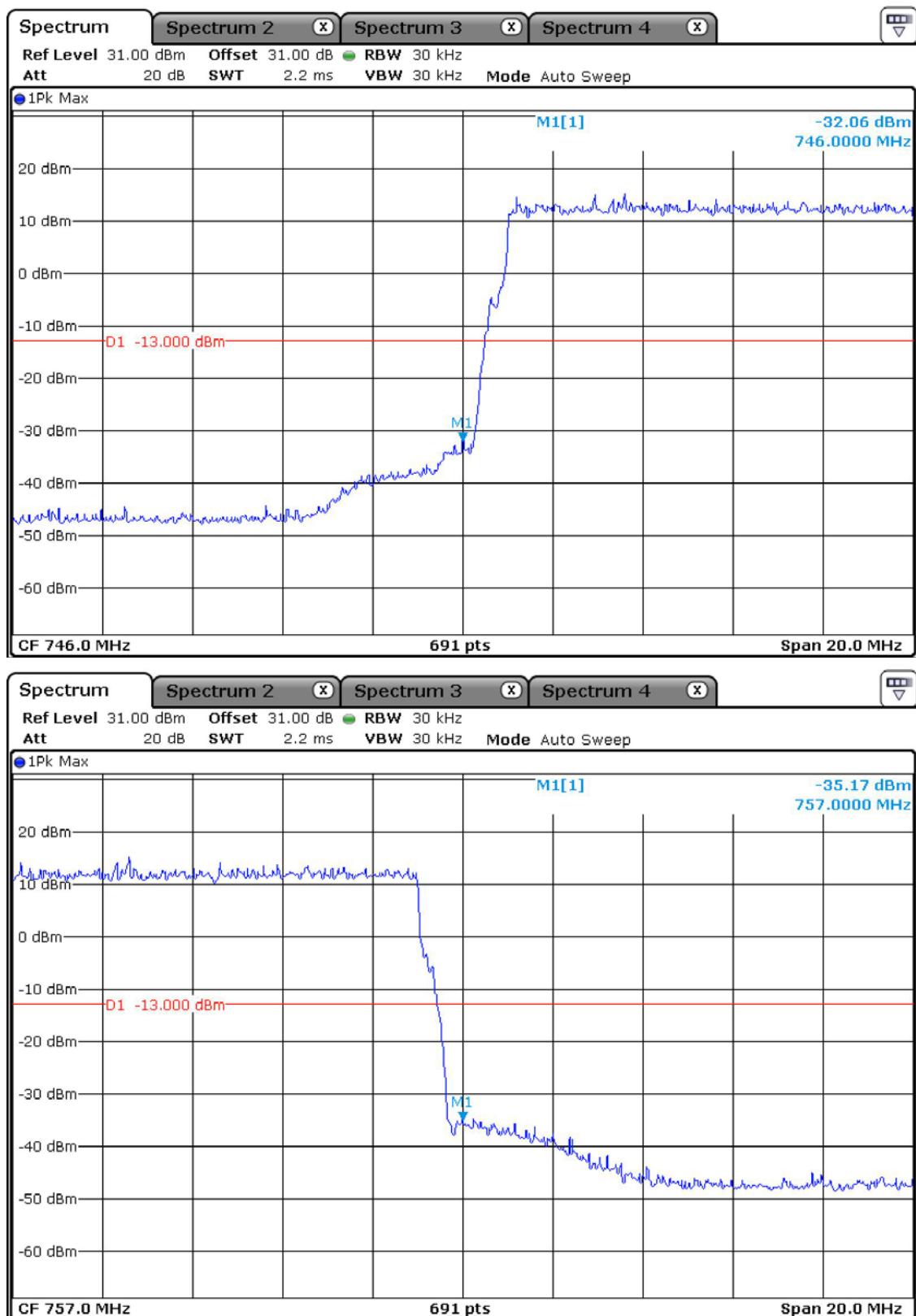
## Antenna Terminal Spurious Emissions, Bandedge, Block AB\_DL



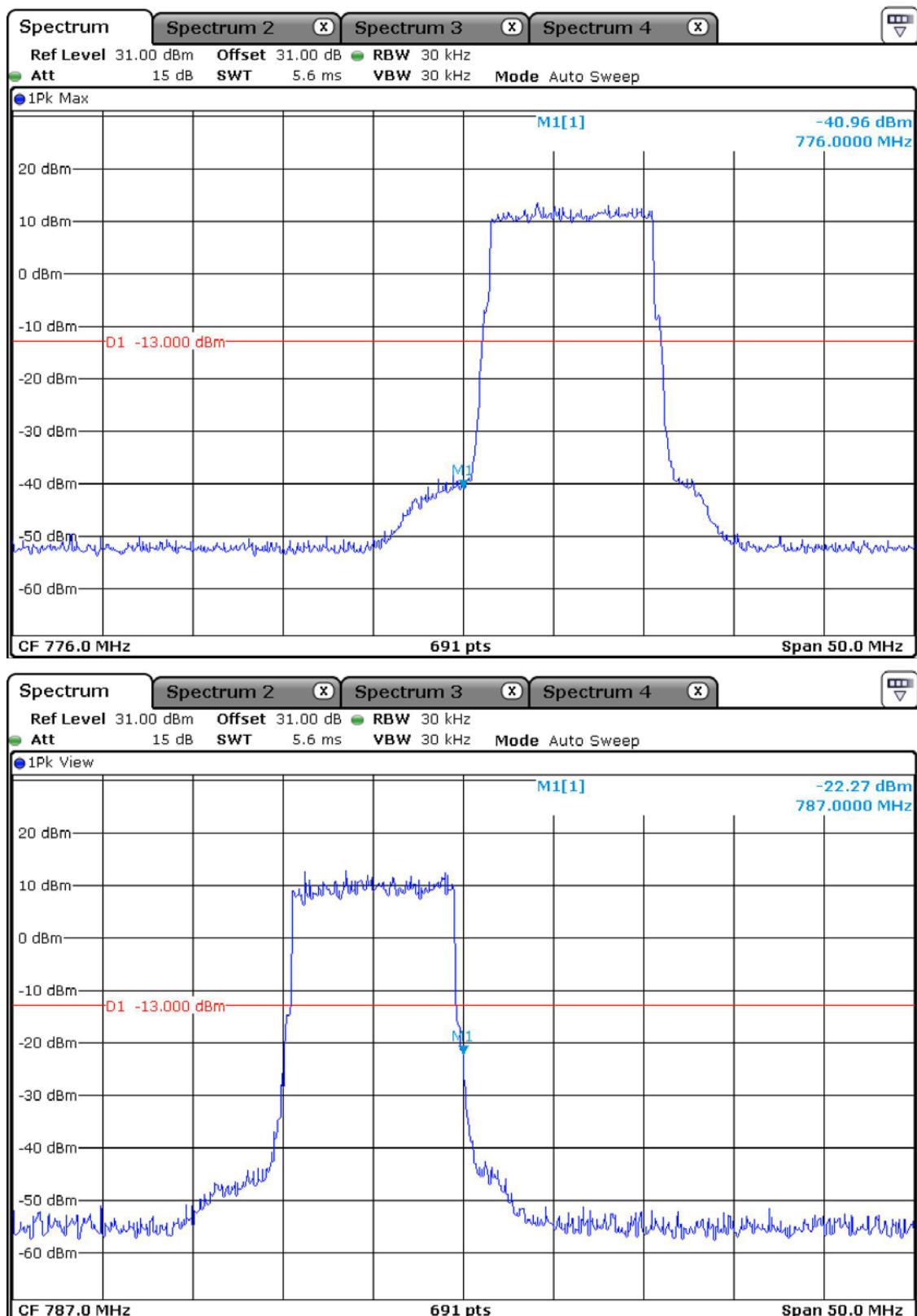
### Antenna Terminal Spurious Emissions, Bandedge, Block AB\_UL



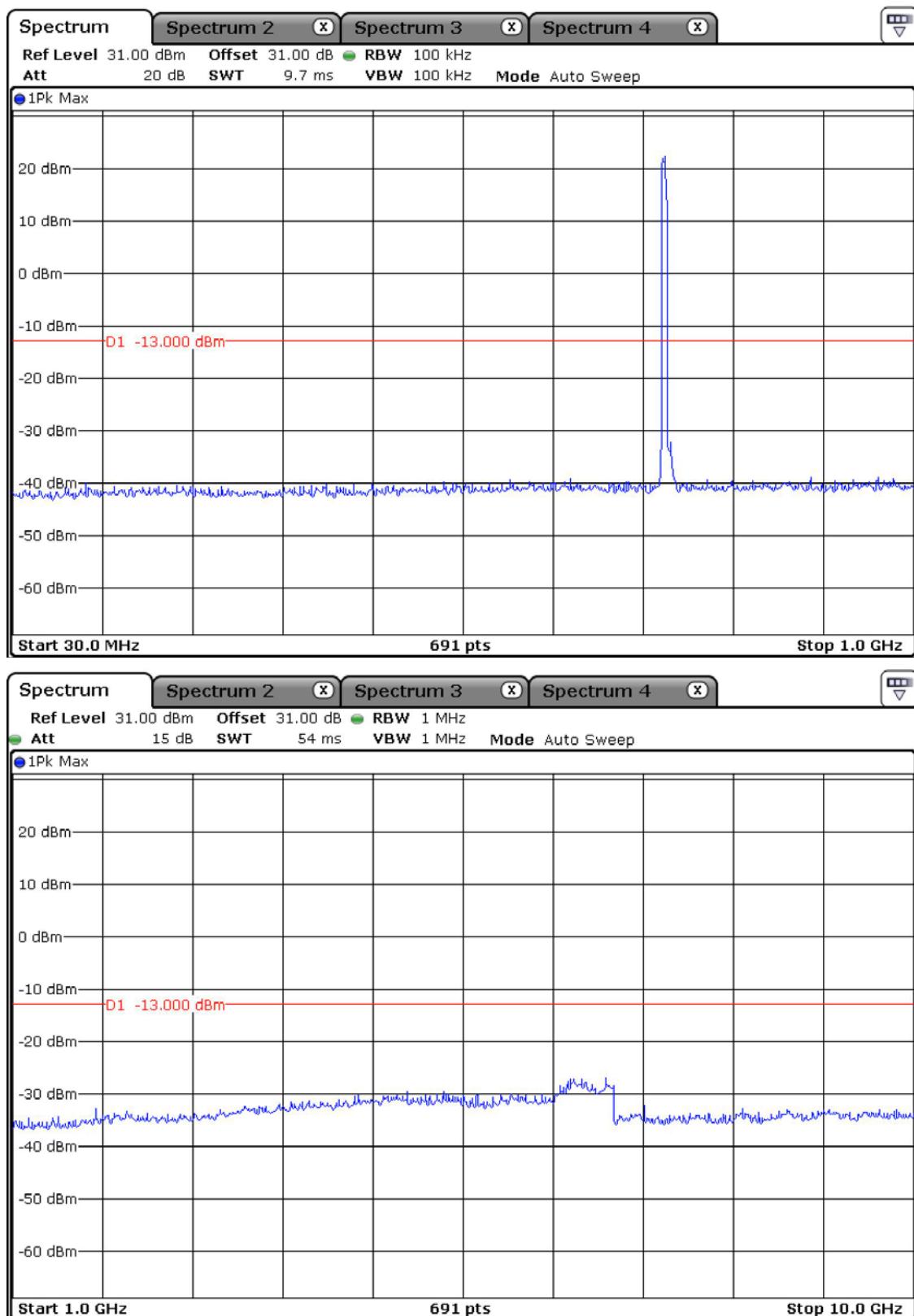
## Antenna Terminal Spurious Emissions, Bandedge, Block C\_DL



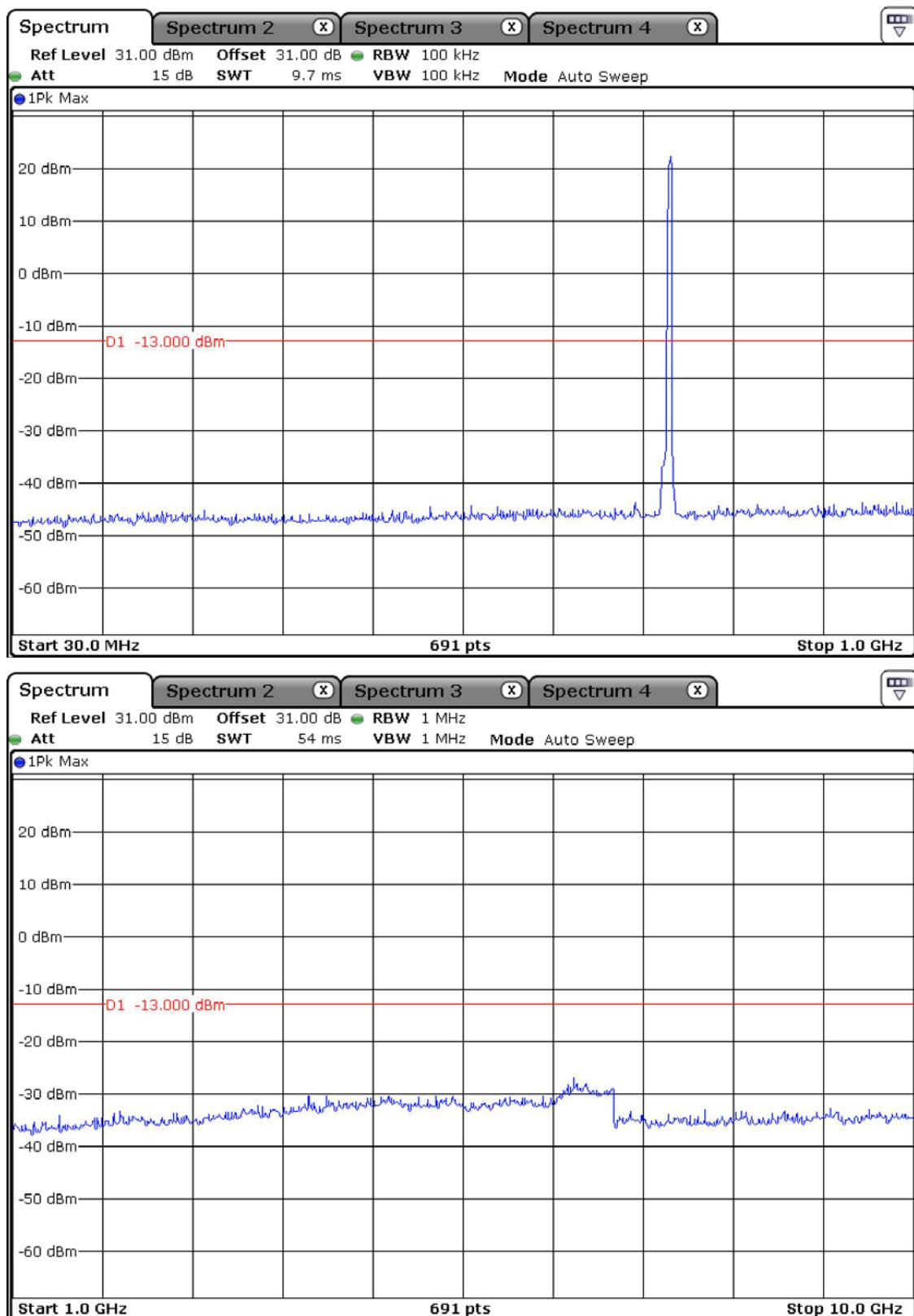
## Antenna Terminal Spurious Emissions, Bandedge, Block C\_UL



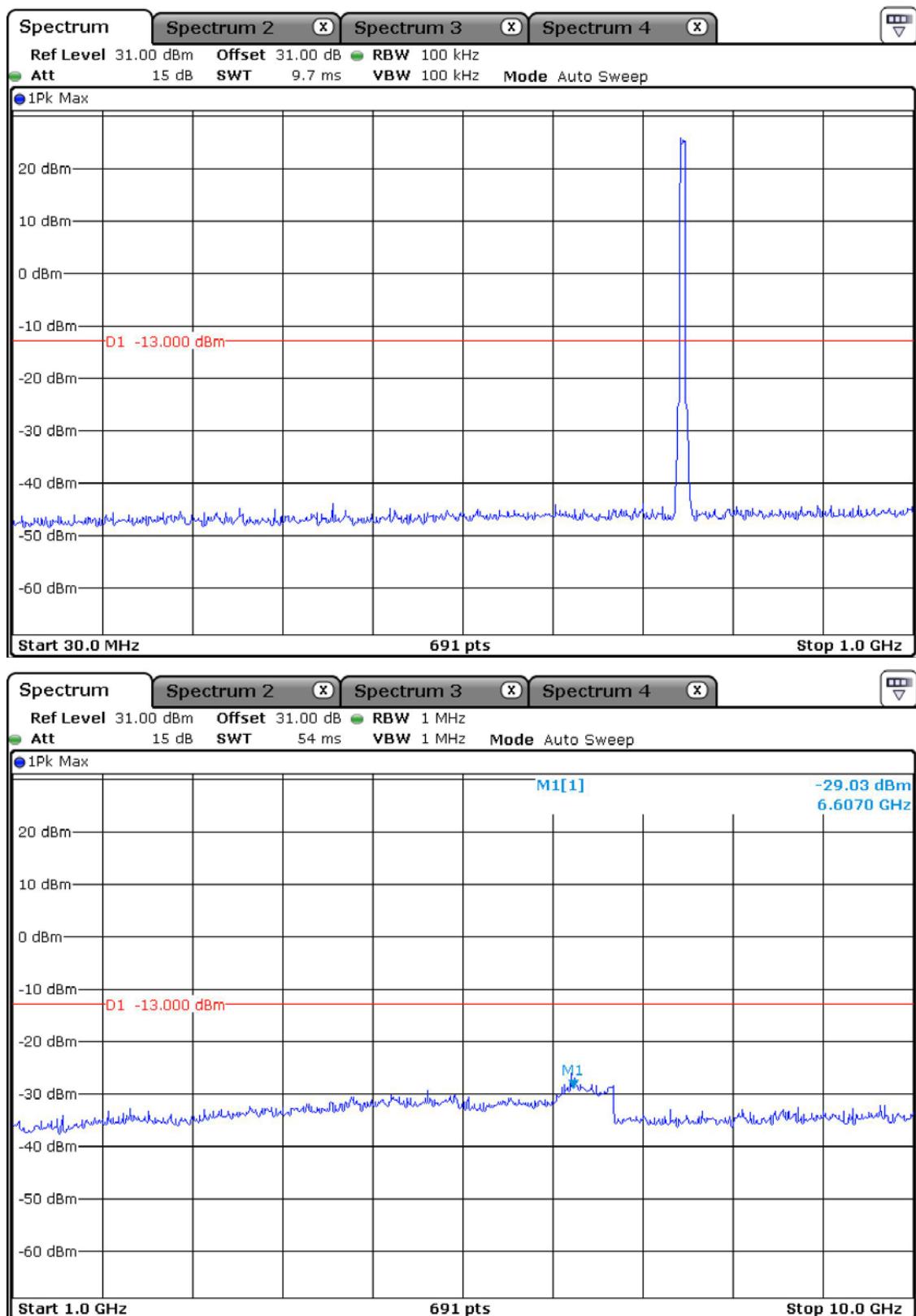
### Antenna Terminal Spurious Emissions, Spurious, Block A\_DL



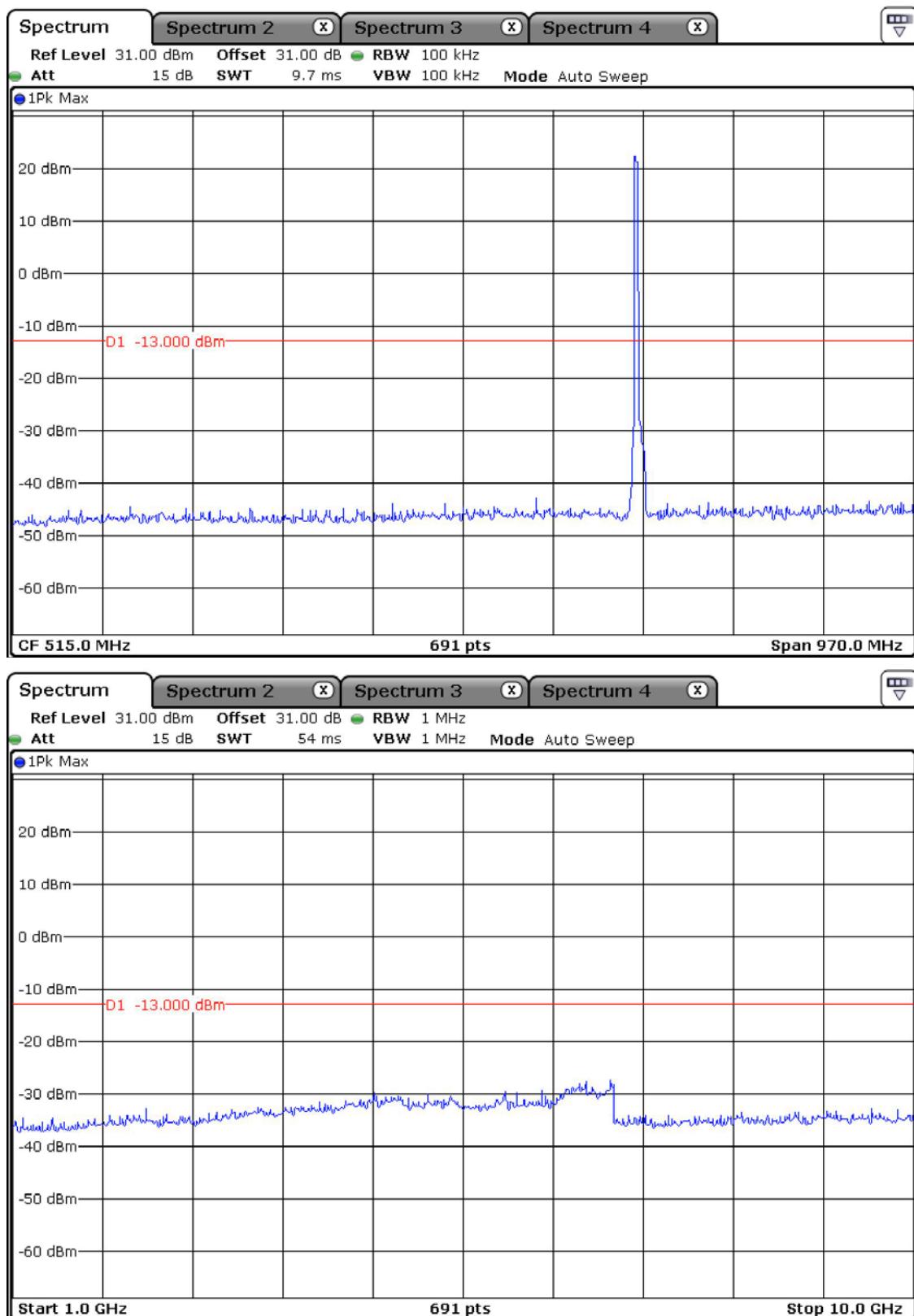
### Antenna Terminal Spurious Emissions, Spurious, Block B\_DL



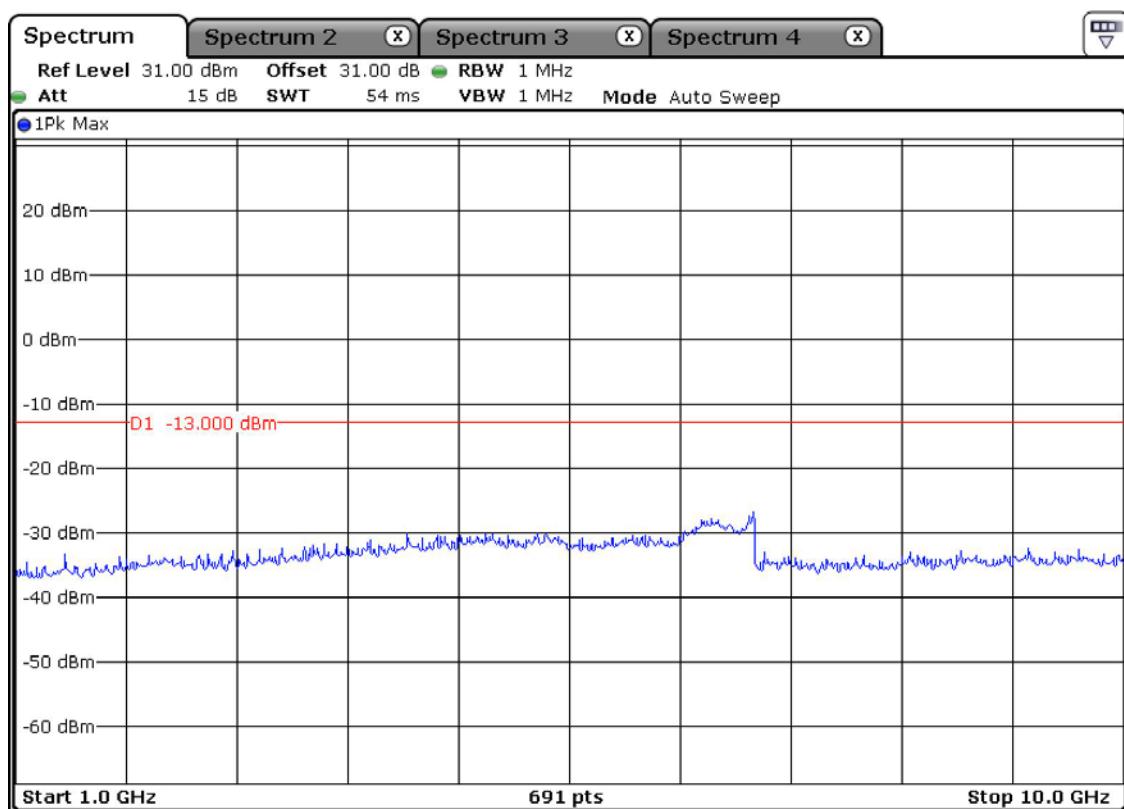
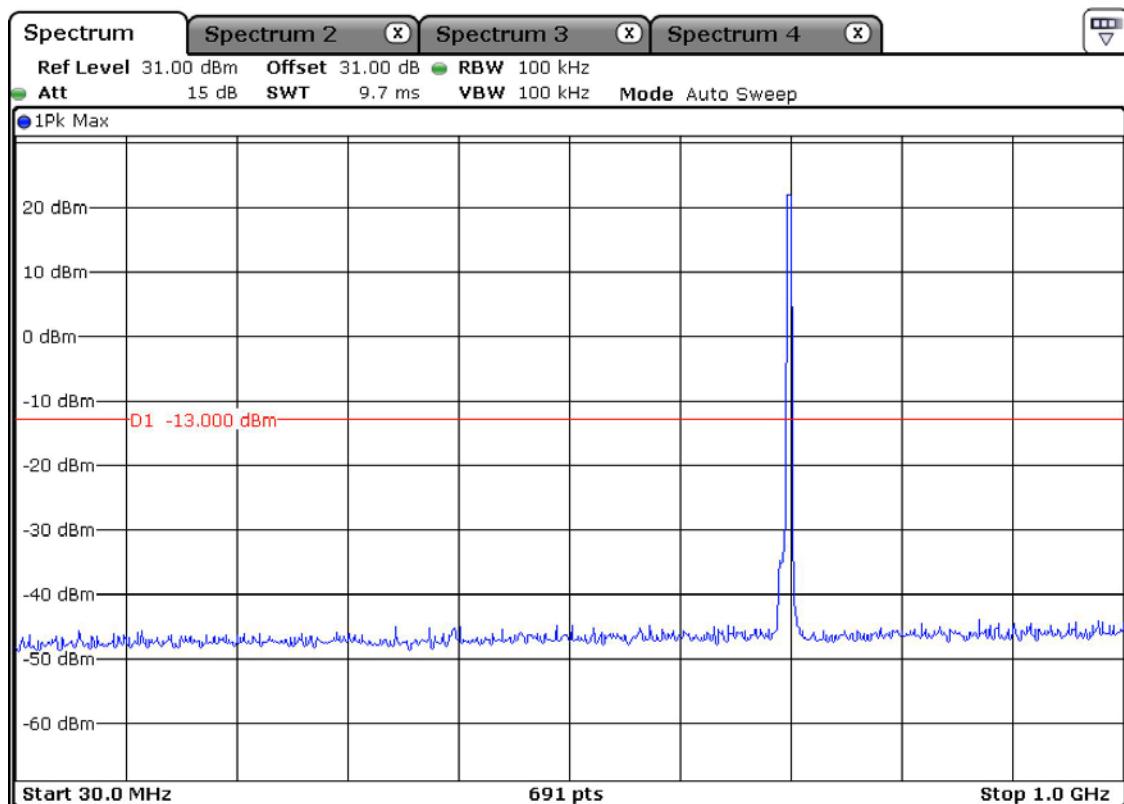
### Antenna Terminal Spurious Emissions, Spurious, Block C\_DL



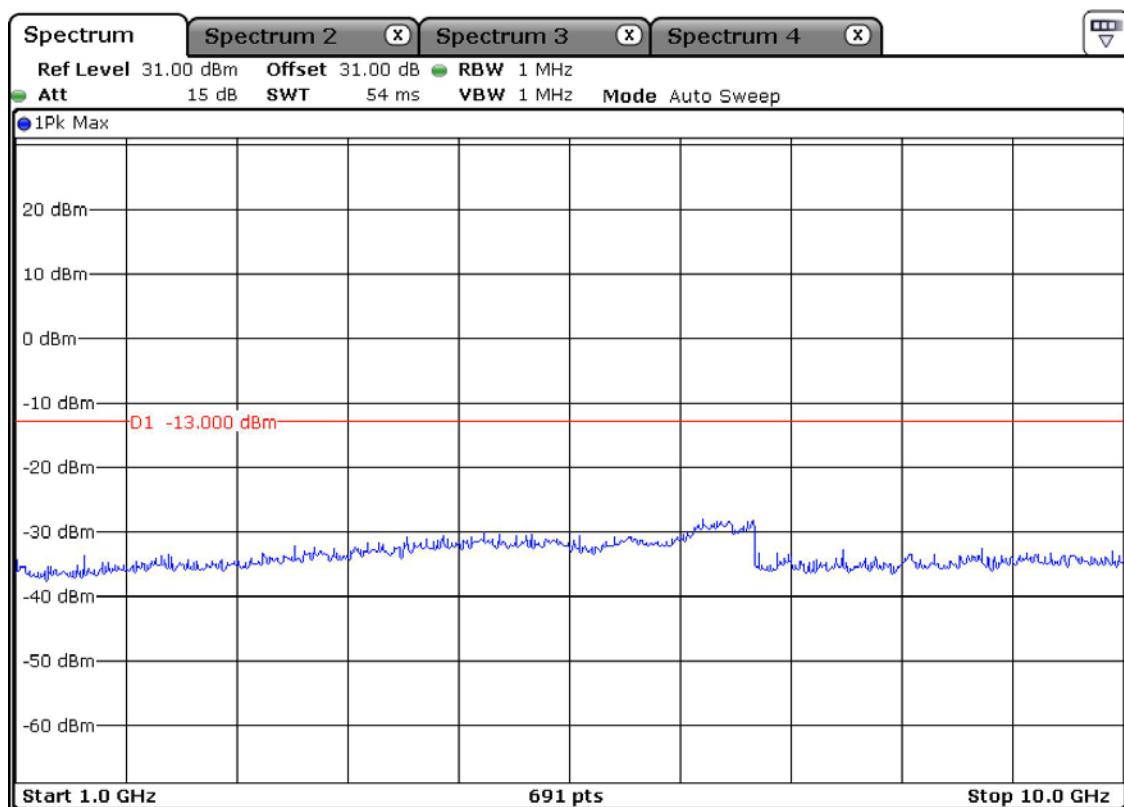
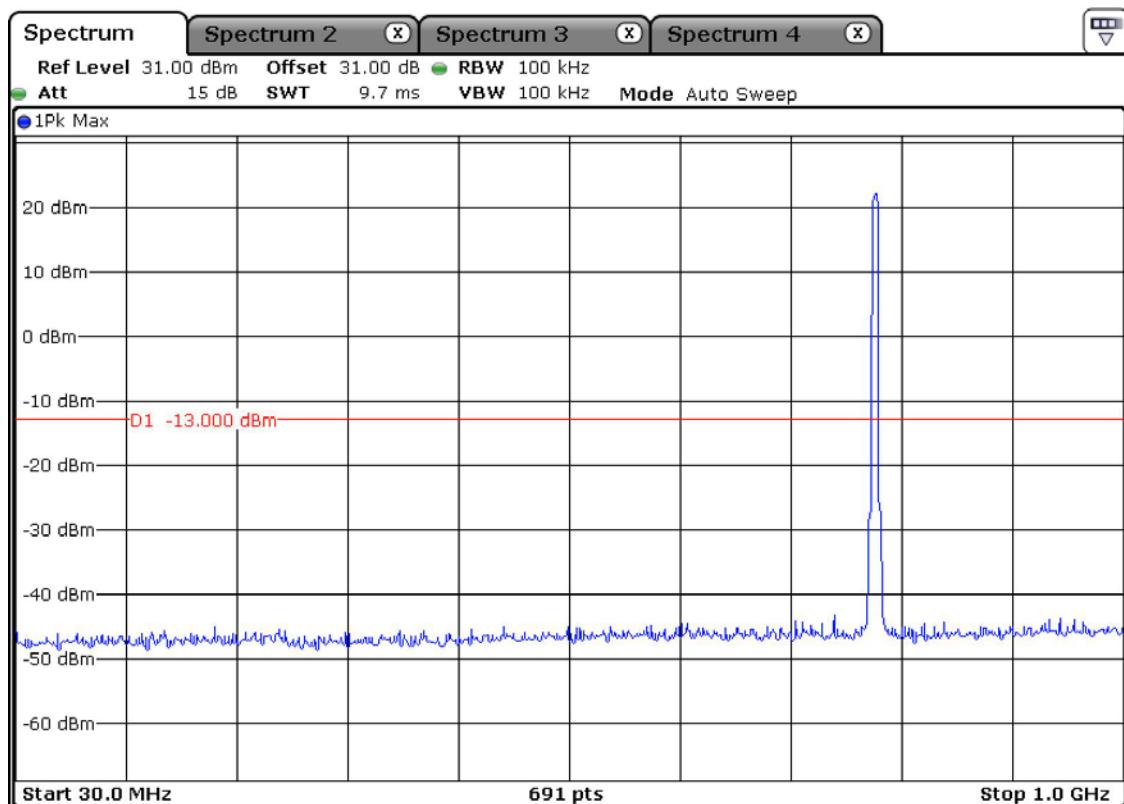
### Antenna Terminal Spurious Emissions, Spurious, Block A\_UL

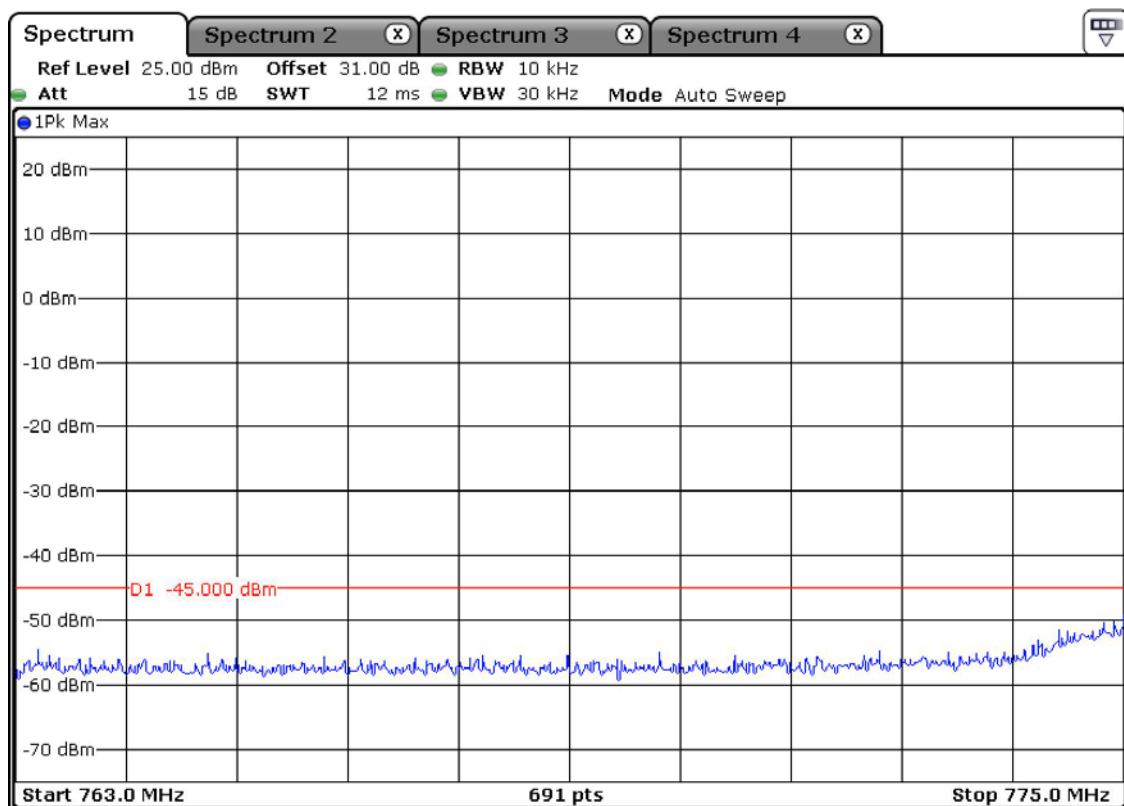


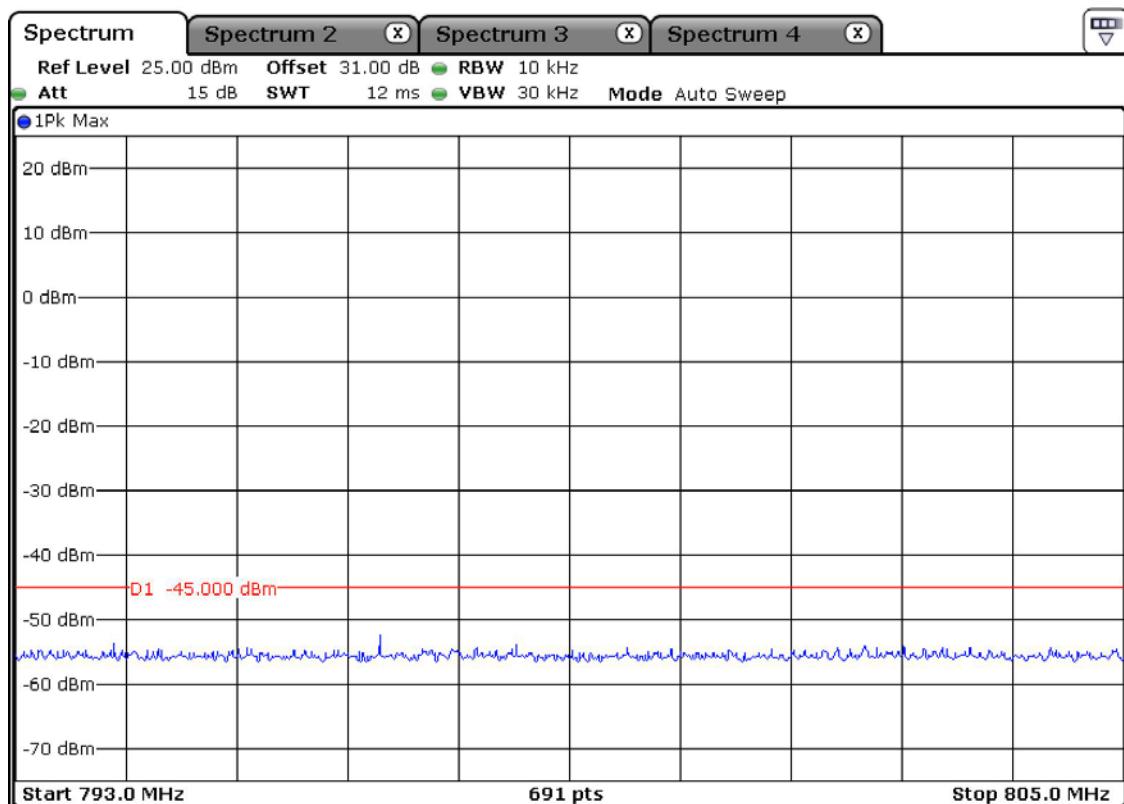
### Antenna Terminal Spurious Emissions, Spurious, Block B\_UL



### Antenna Terminal Spurious Emissions, Spurious, Block C\_UL

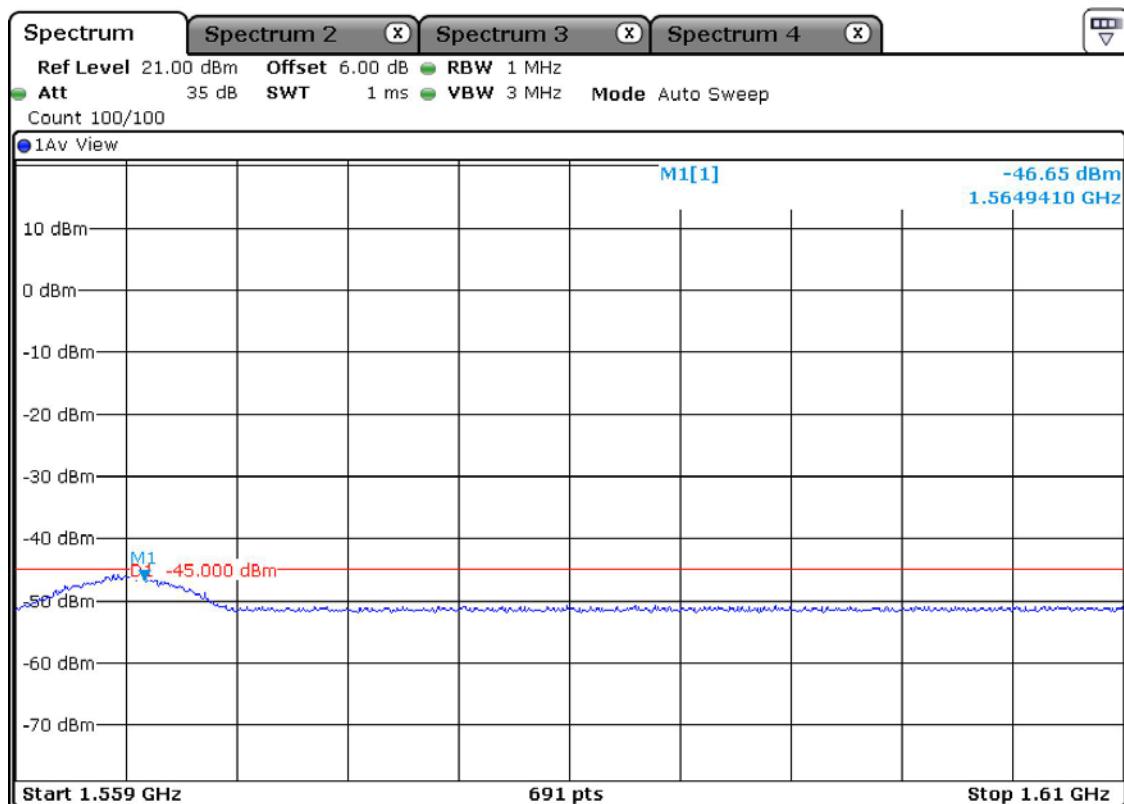


**Antenna Terminal Spurious Emissions, 763-775MHz**

**Antenna Terminal Spurious Emissions, 793-805MHz**

## Antenna Terminal Spurious Emissions, additional requirement 27.53(f)

1559-1610MHz



### 3.2.4 Field Strength of Spurious Emissions 27.53 (c)

#### 1. Requirement

For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside of the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On any frequency outside of the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;
- (2) On any frequency outside of the 776-787 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

#### 2. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

#### 3. Test Results : Complies

Refer to the following Graphs.

Note : The plots are worst case in Block A

Radiated Emission, <1GHz

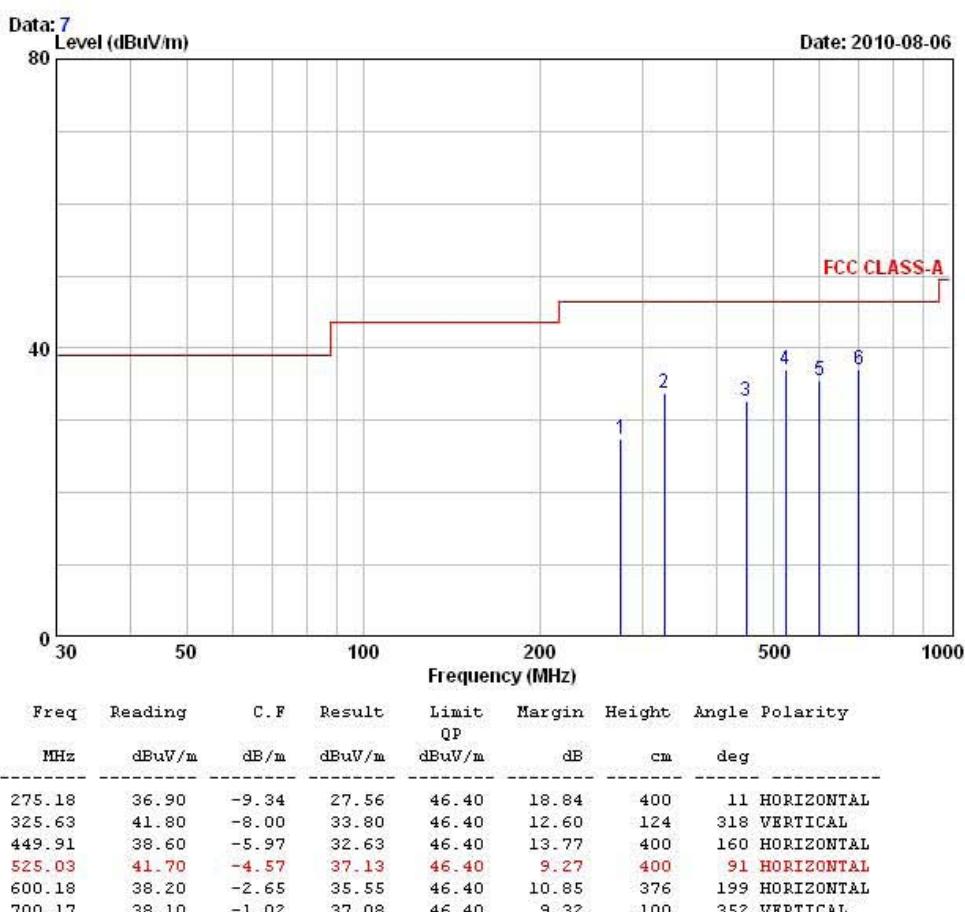
243 Jubug-ri, yangji-Myeon, Youngin-si,  
Gyeonggi-do 449-822 Korea  
Tel:+82-31-3236008,9  
Fax:+82-31-3236010

EUT/Model No.: AROTA-VQ100

TEST MODE: LTE Downlink mode

Temp Humi : 35 / 48

Tested by: PARK H W



Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



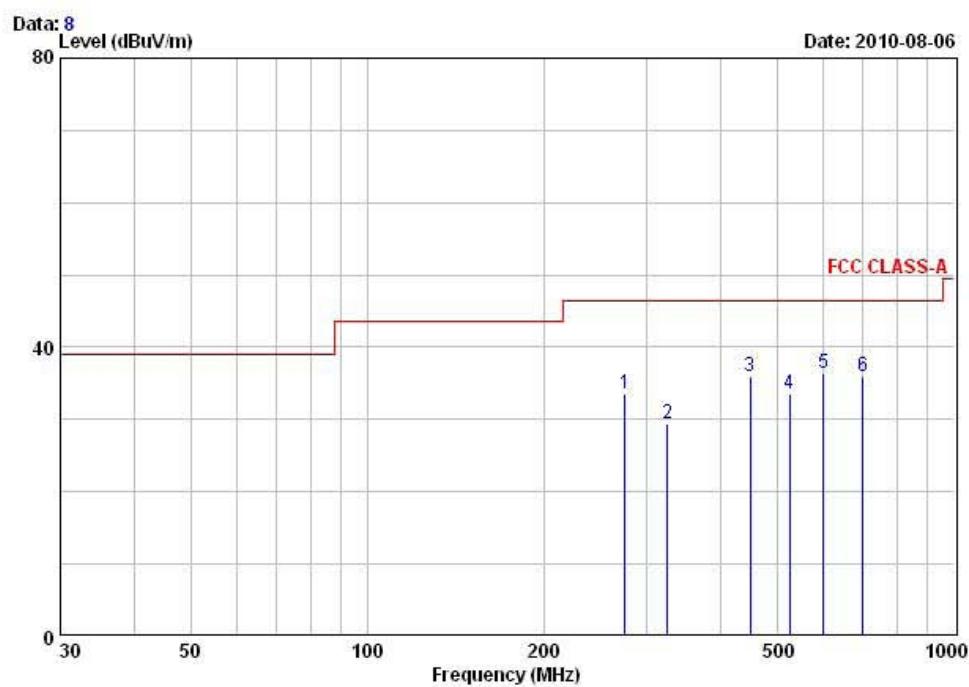
243 Jbug-ri, yangji-Myeon, Youngin-si,  
Gyeonggi-do 449-822 Korea  
Tel :+82-31-3236008,9  
Fax:+82-31-3236010

EUT/Model No.: AROTA-VQ100

TEST MODE: LTE Uplink mode

Temp Humi : 35 / 48

Tested by: PARK H W



Freq MHz	Reading dBuV/m	C.F dB/m	Result dBuV/m	Limit QP		Margin dB	Height cm	Angle deg	Polarity
				dBuV/m	dB				
1 275.36	42.80	-9.34	33.46	46.40	12.94	400	193	193	HORIZONTAL
2 325.16	37.40	-8.01	29.39	46.40	17.01	391	267	267	HORIZONTAL
3 450.00	41.90	-5.96	35.94	46.40	10.46	126	38	38	VERTICAL
4 525.01	38.20	-4.58	33.62	46.40	12.78	400	161	161	HORIZONTAL
5 600.12	39.00	-2.65	36.35	46.40	10.05	102	235	235	VERTICAL
6 700.08	37.00	-1.02	35.98	46.40	10.42	340	68	68	HORIZONTAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Radiated Emission, >1GHz

**There were no emissions detected above the noise floor, which was at least 20 dB below the specification limit**

Frequency [MHz]	Reading [dBuV/m]	Pol.	Correction Factor		EIRP [dBm]		Limit [dBm]	Margin [dB]
			Antenna	Cable	S/G Reading	Result		
No other emissions were detected at a level greater than 20dB below limit								

### **3.2.5 Frequency Stability**

#### **1. Requirement**

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized band of operation.

Note: The EUT does not translate the input frequency and therefore this testing was not performed.

### **3.3 CONCLUSION**

The data collected shows that the ARTECH Co., Ltd. Quad-band Over the Air Repeater FCC ID: **YM4OTAVQ100** complies with all the requirements of Parts 27 of the FCC Rules.

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## APPENDIX 1

### **TEST EQUIPMENT USED FOR TESTS**

	Description	Model No.	Serial No.	Manufacturer	Next Cal. Date
1	Spectrum Analyzer	FSV-30	100757	R&S	Feb-11
2	Spectrum Analyzer	8563E	3425A02505	HP	Mar-11
3	Spectrum Analyzer	8594E	3710A04074	HP	Oct-10
4	VECTOR SIGNAL GENERATOR	SMBV100A	255081	R&S	May-11
5	Signal Generator	83711B	US34490456	HP	Mar-11
6	Attenuator (3dB)	8491A	37822	HP	Oct-10
7	Attenuator (10dB)	8491A	63196	HP	Oct-10
8	Attenuator (30dB)	8498A	1801A06689	HP	Oct-10
9	EMI Test Receiver	ESVD	843748/001	R&S	Mar-11
10	Horn Antenna(18 ~ 40GHz)	SAS-574	154	Schwarzbeck	Nov-10
11	Horn Antenna(18 ~ 40GHz)	SAS-574	155	Schwarzbeck	Nov-10
12	RF Amplifier	8447D	2949A02670	HP	Oct-10
13	RF Amplifier	8449B	3008A02126	HP	Mar-11
14	Test Receiver	ESHS10	828404/009	R&S	Mar-11
15	TRILOG Antenna	VULB 9160	9160-3212	SCHWARZBECK	Apr-11
16	Log.-Per. Antenna	VULP 9118	9118 A 401	SCHWARZBECK	Apr-11
17	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	Apr-11
18	Horn Antenna	3115	00055005	ETS LINDGREN	Mar-11
19	Horn Antenna	BBHA 9120D	9120D122	SCHWARZBECK	Dec-11
20	Dipole Antenna	VHA9103	2116	SCHWARZBECK	Nov-10
21	Dipole Antenna	VHA9103	2117	SCHWARZBECK	Nov-10
22	Dipole Antenna	VHA9105	2261	SCHWARZBECK	Nov-10
23	Dipole Antenna	VHA9105	2262	SCHWARZBECK	Nov-10
24	Hygro-Thermograph	THB-36	0041557-01	ISUZU	Mar-11
25	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-
26	RF Switch	MP59B	6200414971	ANRITSU	-
27	Power Divider	11636A	6243	HP	Oct-10
28	DC Power Supply	6622A	3448A03079	HP	Oct-10
29	Frequency Counter	5342A	2826A12411	HP	Mar-11
30	Power Meter	EPM-441A	GB32481702	HP	Mar-11
31	Power Sensor	8481A	2702A64048	HP	Mar-11
32	Audio Analyzer	8903B	3729A18901	HP	Oct-10
33	Modulation Analyzer	8901B	3749A05878	HP	Oct-10
34	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	Jin Young Tech	Oct-10
36	Stop Watch	HS-3	601Q09R	CASIO	Mar-11
37	LISN	ENV216	100408	R&S	Oct-10
38	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	May-12