RRUL 11 B13 – Remote Radio Unit 700MHz Radio Compliance
FCC CFR 47 Part 27 Test Report

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Approvals and Key Reviewers

Name	Function	Role	Status
David Bolzon	Regulatory Prime	Author / Ratifier	Approved

Revision History

Issue	Description of change	Changed by	Date
0.1	Draft	David Bolzon	31 May 2010
1.0	Approved	David Bolzon	18 May 2010

Reference Documents

1. FCC 47 CFR Part 27 “Wireless Communications Services”
2. FCC 47 CFR Part 15 “Unintentional Radiators”
3. ICES-003 “Digital Apparatus” EMC
4. 3GPP TS 36.104 V9.0.0 (2009-05) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (Release 9)
5. EN 50385:2002—Product Standard to Demonstrate the Compliance of Radio Base Stations and Fixed Terminal Stations for Wireless Telecommunication Systems with the Basic Restrictions or the Reference Levels Related to Human Exposure to Radio-Frequency Electromagnetic Fields (110 MHz–40 GHz)—General Public
6. 3GPP TS 36.113 V9.0.0(2009-05) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) and repeater Electro Magnetic Compatibility (EMC) (Release 9)
7. EN 55022, Limits and methods of measurement of radio disturbance characteristics of information technology equipment (CISPR22: 1997), 1998, European Committee for Electro-technical Standardization
8. 3GPP TS 36.141 V9.0.0 (2009-05): 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) ; Base Station (BS) conformance testing (Release 9).
9. SM.328: "Spectra and bandwidth of emissions".
10. CISPR 22: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
11. CISPR 16-1-1: "Specification for radio disturbance and immunity measuring apparatus and methods - Measuring apparatus".
12. ETSI TS 136 141 V8.2.0 (2009-04) LTE; Evolved Universal Radio Access (E-UTRA); Base Station (BS) conformance testing (3GPP TS 36.141 version 8.2.0 Release 8)
13. ETSI TS 136 104 V8.5.0 (2009-04) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA);Base Station (BS) radio transmission and reception (3GPP TS 36.104 version 8.5.0 Release 8)
14. ETSI TS 136 113 V8.1.0 (2009-01) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA);Base Station (BS) and repeater Electro Magnetic Compatibility (EMC) (3GPP TS 36.113 version 8.1.0 Release 8)
15. 3GPP TS 36.211 V8.7.0 (2009-05) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation (Release 8)
16. 3GPP TS 36.212 V8.7.0 (2009-05) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (Release 8)
17. 3GPP TS 36.213 V8.7.0 (2009-05) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 8)
18. 700MHz LTE Remote Radio Unit, System Design Specification (RRUL 11 B13)

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Acronyms

RRU	Remote Radio Unit
RRUL	Remote Radio Unit LTE
UDM	Universal Digital Module
DDM	Dual Duplexer Module
BTS	Base Station Transceiver
EUT	Equipment Under Test
LTE	Long Term Evolution
ACP	Adjacent Channel Power
CPRI	Common Public Radio Interface
NIST	National Institute of Standards and Technology
NRTL	National Recognized Testing Laboratory
NVLAP	National Voluntary Laboratory Accreditation Program
LAP	Laboratory Accreditation Programs
IC	Industry Canada
FCC	Federal Communication Commission
CFR	Code of Federal Regulations (US)
CAB	Conformity assessment body
EMC	Electromagnetic Compatibility
EMI	Electromagnetic interference
RTTE	Radio and Telecommunications Terminal Equipment
TTE	Telecommunications equipment
TCB	Telecom Certification Body
CCB	Canadian Certification Body
IECEE	International Electro-technical Committee for Conformity Testing to Standards for Electrical Equipment
NCB	National Certification Bodies
CBTL	CB Test Laboratory
ITL	Independent Test Laboratory
ITE	Information Technology Equipment

1 Results Summary

Applicant:	Ericsson Canada 3500 Carling Ave. Ottawa, On Canada K2H 8E9
Apparatus:	KRC 131 145/1 (RRUL 11 B13 700MHz Upper C)
Application:	Fixed Wireless Base Station Transceiver
FCC ID:	VZTAKRC131145-1
In Accordance With:	FCC CFR 47 Part 27 Miscellaneous Wireless Communications Services

This test report has been prepared for the purpose of demonstrating compliance with FCC CFR Title 47 Part 27. Conducted measurements have been performed in accordance with ANSI TIA-603-B-2002. Radiated tests have been conducted is accordance with ANSI C63.4-2003. Radiated emissions are assessed and measured at an accredited ITL in a 3 meter or 10 meter Semi-Anechoic chamber. Conducted Emissions have been assessed at Ericsson Carling facilities using calibrated equipment in accordance with Part 27 Requirements.

The assessment summary is as follows:

Apparatus Assessed:	KRC 131 145/1 (700MHz RRUL 11 B13 Remote Radio Unit)
Specification:	FCC CFR 47 Part 27 Miscellaneous Wireless Communications Services
Compliance Status:	Compliant
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

2 Introduction

This document supports the FCC test process and filing requirements for North American approvals. Measurements are conducted to satisfy and demonstrate compliance to the Essential parameters for Radio Compliance and Conformance to the following standards:

- FCC CFR 47 Part 27 Subpart C, Miscellaneous Wireless Communications Services.
- FCC CFR 47, Subpart 2, Subpart J, Equipment Authorization Procedures – Equipment Authorization.

The initial RRUL B13 deployment will support a 10MHz BW for Fixed Wireless Base Station (BTS) applications with a rated output of 30W (44.8dBm) in a 2 x 2 MIMO configuration. Frequency band for authorization will address the US 700MHz Band 13 (Upper C Block).

Hardware Description

The BTS equipment is comprised of the following:

1) KRC 131 145/1 RRUL 11 B13: LTE Remote Radio Unit [RRUL] **EUT**
2) CPRI Modem Emulator (RU-Master LPC 102 400/5 R1B S/N T01E684487)

RRU Details

Frequency: FCC 700MHz Band

Transmit / Downlink: 746 – 757MHz – Upper Block C: 751MHz

- Modulation: OFDMA, QPSK, 16QAM, 64QAM
- BW: 10 MHz
- MIMO, 2 x 2 (Spatial Multiplexing)
- Diversity, 2 Way Transmit
- Throughput: Up to 60 Mbps
- Power: 44.8dBm (30W)
- PAPR: 7dB

Duplex: FDD (31MHz)

Frequency Stability: +/-0.05ppm

Channel Raster: 100 kHz

Receive / Uplink: 776 - 787MHz – Upper Block C: 782MHz

- Modulation: SC-FDMA, QPSK, 16QAM
- BW: 10 MHz
- MIMO, 2 x 2, Multi-User
- Throughput: Up to 20Mbps
- Diversity, 2 and (4 Branch Receive)

RRU Physical Details:

PWR: -48V (typical) DC 350W (max), Size: 17” x 11.3” x 8.7” (H x W x D), Weight: 53lbs

3 Equipment Under Test

3.1 Product Identification

The Equipment Under Test (UUT) is identified for Fixed Base Station operation as follows:
Ericsson Remote Radio Unit RRUL 11 B13, 700MHz (Upper C Block) KRC 131 145/1

3.2 Technical Specifications of the EUT

Manufacturer:	Ericsson Canada
Operating Frequency:	TX: 751MHz RX: 782MHz
Emission Designator:	10M0 W7D
Modulation:	LTE OFDMA, QPSK, 16QAM, 64QAM (Two transmitters, 2 receivers per sector)
Antenna Data: (for reference only)	Andrew LNX-6513DS-T4M 12.7dBd, 14.8dBi (max) Beamwidth – Horizontal 65°

3.3 Technical Description

The Ericsson LTE RRU (RRUL) is a single sector Transceiver (2 transmitter, 2 receivers per radio / sector) operating in FDD mode which will be introduced as part of Ericsson's next generation BTS product line. The initial RRU product offering addresses the LTE air interface, while the RRU radio architecture will be 4G agnostic to support OFDM based air interfaces including the long term evolution of GSM/UMTS (LTE), 802.16e OFDMA standards with Multiple Inputs Multiple Outputs (MIMO) operation. Transmitter outputs (TX1, TX2) are isolated and non-correlated for external interface to customer furnished antenna.

The Radio design will address outdoor installations for pole and building/wall mount deployment. RRU electronics are housed in a weather protected environmental enclosure intended for co-location in proximity to the customer furnished antenna. The RRU has an integrated active duplexer for enhanced up link performance and antenna interface. Compliance and performance testing will include a band / spectrum dependent DDM (duplexer) integrated with the RRU product offering.

The RRU operates over the North American 700MHz band employing a band specific duplexer designed to limit operations to specific customer requirements. The RRUL 11 B13 product offering will operate over a Down Link (DL) transmit frequency band from 746MHz to 757MHz, at a channel bandwidth of 10MHz centered at 751MHz. LTE modulation formats OFDMA QPSK, 16QAM and 64QAM will be assessed at a rated output of 30W per transmitter.

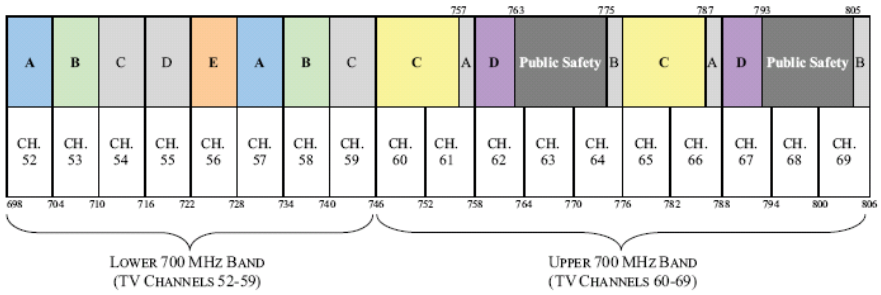
The recommended customer furnished antenna detail is as follows:
MFG: Andrew Antenna
Model: LNX-6513DS-T4M
Gain: 12.7dBd (14.8dBi)
Beam width: Horizontal 65°

The Ericsson RRU design consists of logical sections comprised of Digital, RF, Power Amplifiers, and a Power Supply and distribution housed in a single outdoor enclosure. Heat fins on the enclosure external surface provide convection cooling for thermal and environmental control. For protection against solar impact, a sun shield mounted on the unit provides additional thermal protection to limit direct solar exposure. The unit operates over an ambient temperature of -40°C to +55°C including sun loading.

The digital section provides processing resources to the RRU CPRI based optical link to the Modem and Soft Radio Core. This single sector Radio is targeted to support up to 20MHz base band data bandwidth. (Initial deployment will be limited to 10MHz) The digital section of the transceiver card provides the processing solution for the 4G Radio.

The PSU provides primary power conversion from a nominal input of -48VDC (350W) for the internal PCB circuit requirements. The PA board produces the RF output power for BTS transmission at a rated power up to 30W per transmitter port. The RRU consists of a Radio transceiver and integrated active Duplexer combination for applicable FCC compliance. All compliance measurements and ratings are referenced at the antenna ports / duplexer interface.

Revised 700 MHz Band Plan for Commercial Services



Block	Frequencies (MHz)	Bandwidth	Pairing	Area Type	Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	EA	176
B	704-710, 734-740	12 MHz	2 x 6 MHz	CMA	734
C	710-716, 740-746	12 MHz	2 x 6 MHz	CMA	734
D	716-722	6 MHz	unpaired	EAG	6
E	722-728	6 MHz	unpaired	EA	176
C	746-757, 776-787	22 MHz	2 x 11 MHz	REAG	12
A	757-758, 787-788	2 MHz	2 x 1 MHz	MEA	52
D	758-763, 788-793	10 MHz	2 x 5 MHz	Nationwide	1 *
B	775-776, 805-806	2 MHz	2 x 1 MHz	MEA	52

* Subject to conditions respecting a public/private partnership.

The blocks shaded above in gray (Lower 700 MHz Band C and D Blocks and Upper 700 MHz Band A and B Blocks) were auctioned prior to Auction 73.

Figure 3-1: FCC Revised 700MHz Frequency Band

Radio Standard is LTE, OFDMA TX, (SC-FDMA RX) configured for a 2x2 MIMO operating mode with an output rated power of 30W (44.8dBm) at the antenna port. Transmit outputs 1 and 2 are isolated, non-correlated outputs connected to two isolated customer furnished antenna and are measured/verified independently.

The TX Modulation schemes of QPSK, 16QAM, and 64QAM will be supported along with an operational bandwidth of 10MHz for product release in the 700MHz Upper C Block spectrum. QPSK, 16QAM, and 64 QAM will employ 3/4 CTC data rate coding. The RRU employs a CPRI (Common Public Radio Interface) for interoperability and standardization of the radio protocol interface. To demonstrate compliance, appropriate LTE waveforms will be utilized to generate the RF output, rated power and bandwidth requirements with respect to the modulation variables.

Table 3-1: Applicable FCC 700MHz Blocks

Block	*Bandwidth*	*Frequency*
C	**11MHz**	**746 - 757MHz** and 776 – 787MHz

Test Units:

Part 27: UUT KRC 131 145/1 RRUL 11 B13 700MHz, SN: CH50000356 CA05
CPRI Modem interface with LTE Test Vectors and traffic (RUMA LPC 102 400/5)
Part 15: UUT KRC 131 145/1 RRUL 11 B13 700MHz, SN: CH50000356 CA05
CPRI Modem interface with LTE Test Vectors and traffic (RUMA LPC 102 400/5)

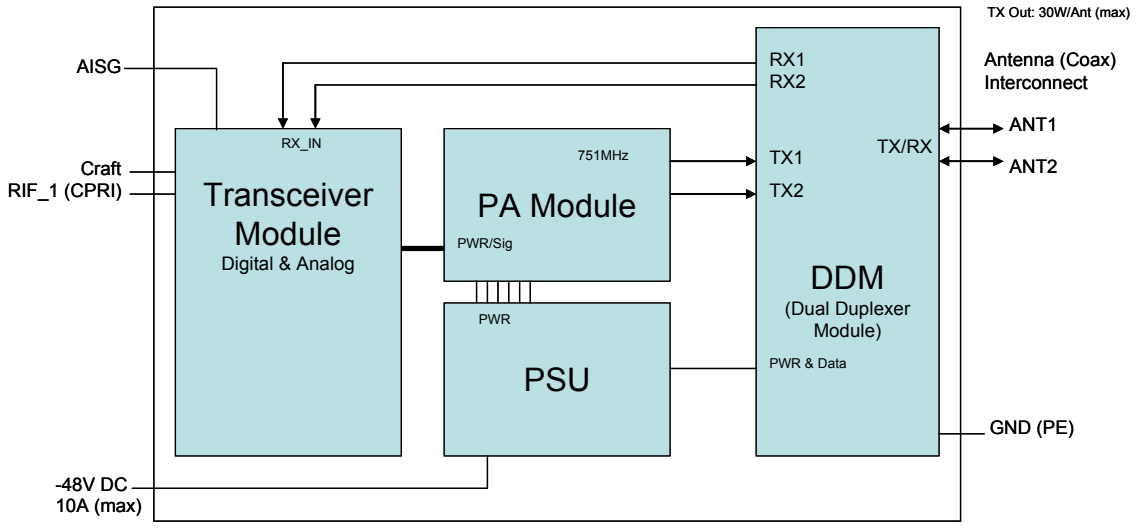


Figure 3-2: UUT – Block Diagram RRUL 700MHz

4 Test Conditions

4.1 Specifications

The apparatus has been assessed against the following specifications:
FCC CFR 47 Part 27 Miscellaneous Wireless Communications Services

4.2 Test Environment

All tests are performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

4.3 Test Equipment

Table 4-1: Conducted Emissions - List of Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal Due
Signal Analyzer	Agilent	MXA N9020A	1084944/MY48010211	15 Feb 2012
Signal Analyzer	Agilent	MXA N9020A	1081485/MY47380104	15 Feb 2012
Power Meter	HP	438A	L0544032	24 Nov 2010
Power Sensor	HP	8481A	US37290233	24 Nov 2010
Attenuator 30dB (Qty=2)	Narda	769-30	NA	NA
Attenuator 20dB (Qty=2)	Meca	650-20-1F4	NA	NA
Network Analyzer (Path Loss Calibration)	Agilent	N5230	MY45000798	16 Nov 2010
Climatic Chamber	Burnsco	RTC-37P-3-3	04-13	27 Oct 2010
Power Supply	Xantrex	XHR 60-18	62016	NCR
Digital Volt Meter	Fluke			

Table 4-2 Radiated Emissions - List of Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
10 m EMI Test Chamber				
Bilog Antenna	ARA	LPB 2520A	SSG012772	12/21/2010
Horn Antenna, Double ridged	EMCO	3115	SSG012298	02/19/2011
Active Loop Antenna (H Field)	EMCO	6502	SSG012080	12/01/2010
Active Monopole Antenna	EMCO	3301B	SSG012683	07/02/2010
Bilog Antenna	Chase CBL6111	LPB 2520A	SSG012564	10/06/2010
Double Ridged Horn	EMCO	3115	SSG012267	03/12/2011
Receiver/Spectrum Analyzer	Hewlett Packard	8566B	SSG012521	03/02/2011
Power Supply	Hewlett Packard	6216A	SSG013063	NR
Attenuator	Aeroflex/Weinschel	6070-10	SSG012140	10/29/2010
Spec. A, RF Pre-selector	Hewlett Packard	85685A	SSG012010	03/02/2011
Spectrum Analyzer Display	Hewlett Packard	85662A	SSG012433	03/02/2011
Quasi Peak Adaptor	Hewlett Packard	85650A	SSG012620	03/02/2011
RF Amplifier	Hewlett Packard	8447D	SSG013045	09/24/2010
Pre-Amplifier	BNR	LNA	SSG012360	01/15/2011
Signal Generator	Anritsu	69369A	SSG012138	09/28/2010
High Pass RF Filter	Microwave Circuits inc.	H1G013G1	SSG013705	04/20/2011
Radio Frequency Filter	FSY Microwave	DC9371	SSG013702	02/10/2011
High Pass Filter	Microwave Circuits inc.	H3G02G1	SSG012728	03/22/2011
Band Pass Filter	Hewlett Packard	8430A	SSG012120	02/10/2011
Coaxial Cable	HUBER + SUHNER	104 Sucoflex	SSG012409	01/27/2011
Coaxial Cable #23	HUBER + SUHNER	104 Sucoflex	SSG013019	08/17/2010
Coaxial Cable #8		104 Sucoflex	SSG012131	10/29/2010
Coaxial Cable #14	HUBER + SUHNER	104 Sucoflex	SSG012041	10/29/2010

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

5 Applicable Tests

This section contains the following:

FCC CFR 47 Part 27: Test Requirements

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: Not Applicable / Not Relevant.

Y Yes: Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested

The results compiled in this document are in accordance and representative of the operation of the apparatus as originally submitted.

5.1 FCC Part 27: Test Parameters

Table 5-1: Applicable Test Parameters / Results Summary

Clause	Test Method	Test description	Required	Result
27.50(c)	2.1046	RF Output Power	Y	Pass
------	2.1047	Modulation Characteristics	Y	Pass
------	2.1049	Occupied Bandwidth	Y	Pass
27.53(c)	2.1051	Band Edge Compliance	Y	Pass
27.53(c)	2.1051	Spurious Emissions at the Antenna Terminal	Y	Pass
27.53(c)	2.1053, 2.1057	Field Strength of Spurious Emissions	Y	Pass
27.54	2.1055	Frequency Stability	Y	Pass

6 Test Results

6.1 Effective Radiated Power and Antenna Height

Clause 27.50 Limits: FCC CFR Part 2.1046 Fixed Base Station

(b) The following power and antenna height limits apply to transmitters operating in the 746–763 MHz, 775–793 MHz and 805–806 MHz bands:

(4) Fixed and base stations transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.

(5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746–757 MHz, 758–763 MHz, 776–787 MHz, and 788–793 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

Table 3 to §27.50.—Permissible Power and Antenna Heights for Base and Fixed Stations in the 698–757 MHz, 758–763 MHz, 776–787 MHz and 788–793 MHz Bands Transmitting a Signal With an Emission Bandwidth Greater than 1 MHz

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

Table 4 to §27.50.—Permissible Power and Antenna Heights for Base and Fixed Stations in the 698–757 MHz, 758–763 MHz, 776–787 MHz and 788–793 MHz Bands Transmitting a Signal With an Emission Bandwidth Greater than 1 MHz

Antenna height (AAT) in meters (feet)	**Effective radiated power (ERP) per MHz (watts/MHz)**
Above 1372 (4500)	130
Above 1220 (4000) To 1372 (4500)	140
Above 1067 (3500) To 1220 (4000)	150
Above 915 (3000) To 1067 (3500)	200
Above 763 (2500) To 915 (3000)	280
Above 610 (2000) To 763 (2500)	400
Above 458 (1500) To 610 (2000)	700
Above 305 (1000) To 458 (1500)	1200
Up to 305 (1000)	2000

Test Set Up

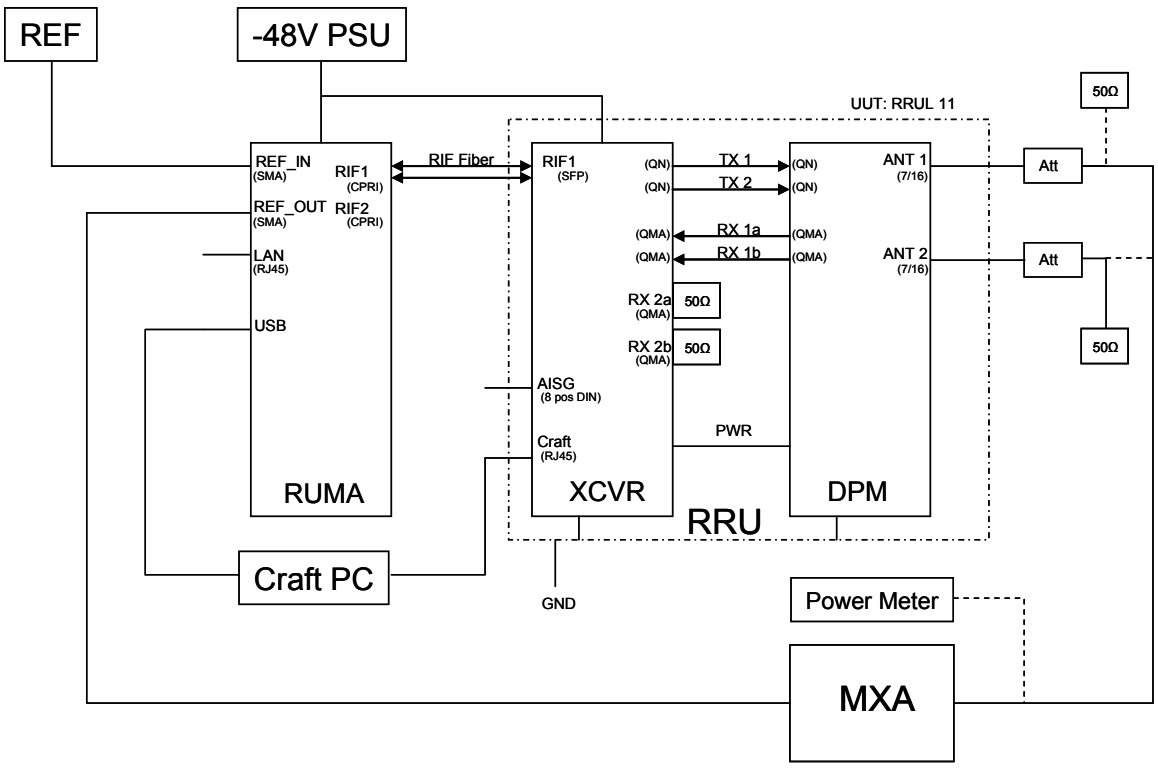


Figure 6-1 RRU Radio Compliance Set Up / Configuration

Test conditions:

All modulation (QPSK, 16QAM, and 64QAM) modes and different data rates are evaluated using representative waveforms of all modulation schemes. The test results shall include 10MHz bandwidth configurations for 751MHz as applicable.

Physical Channels

A downlink physical channel corresponds to a set of resource elements carrying information originating from higher layers and is the interface defined between 36.212 and 36.211 [15]. The following downlink physical channels are defined:

- Physical Downlink Shared Channel, PDSCH – QPSK, 16QAM, 64QAM
- Physical Broadcast Channel, PBCH - QPSK
- Physical Downlink Control Channel, PDCCH - QPSK
- Physical Control Format Indicator Channel, PCFICH - QPSK
- Physical Hybrid ARQ Indicator Channel, PHICH - BPSK

LTE standard defines BPSK as an ARQ Indicator Channel, thus being embedded into the LTE signal and does not contain traffic data. As BPSK is embedded in each modulation scheme, waveforms tested represent the worst case conditions.

Procedure:

Channel Power measurements for each output shall be conducted for the applicable bandwidths and modulation schemes for the Lower, Middle and Upper frequency offsets as applicable. The following tables are used to summarize recorded results in addition to applicable captured plots.

Table 6-1: Setting / Measurement Results – Channel Power

Setting		10MHz Channel Power Output (dBm)					
		QPSK		16 QAM		64 QAM	
		TX1	TX2	TX1	TX2	TX1	TX2
Frequency (CH 5230)	751MHz	44.75	44.77	44.70	44.75	44.72	44.83
RBW	1MHz						
VBW	3MHz						
CH BW	10MHz						
Span	50MHz						
Sweep	1ms						
Reference Level Offset	51.5dB						
Detector	RMS	Aggregate Power =10^(10*LOG(10^(TX1/10)+10^(TX2/10))/10)/1000					
Attenuation	10dB	59.85		59.37		60.06	

Antenna Height Limit: (see FCC Clause 27.50 tables 3 and 4 for antenna compliance reference heights)

Note: Antenna are customer furnished … G = 12.7dBd (max)

Aggregate Power: TX1 + TX2

PWR PdBm = 10log(10^ (TX1 dBm/10) + 10^ (TX2 dBm/10)) = 47.79dBm (10MHz)

PWR W (10MHz) = 10^(47.79/10)/1000 = 60.06W

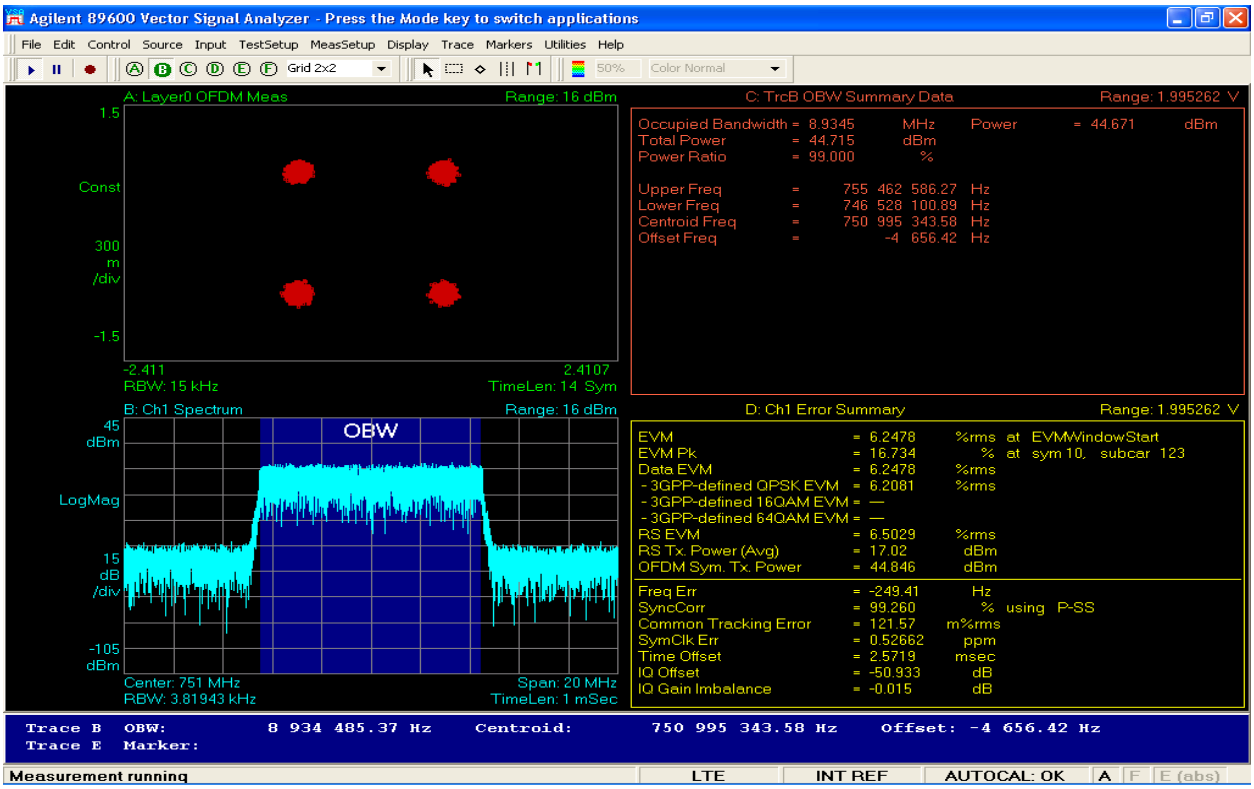


Figure 6-2 : 10MHz BW Modulation TX1_QPSK at 751.0MHz

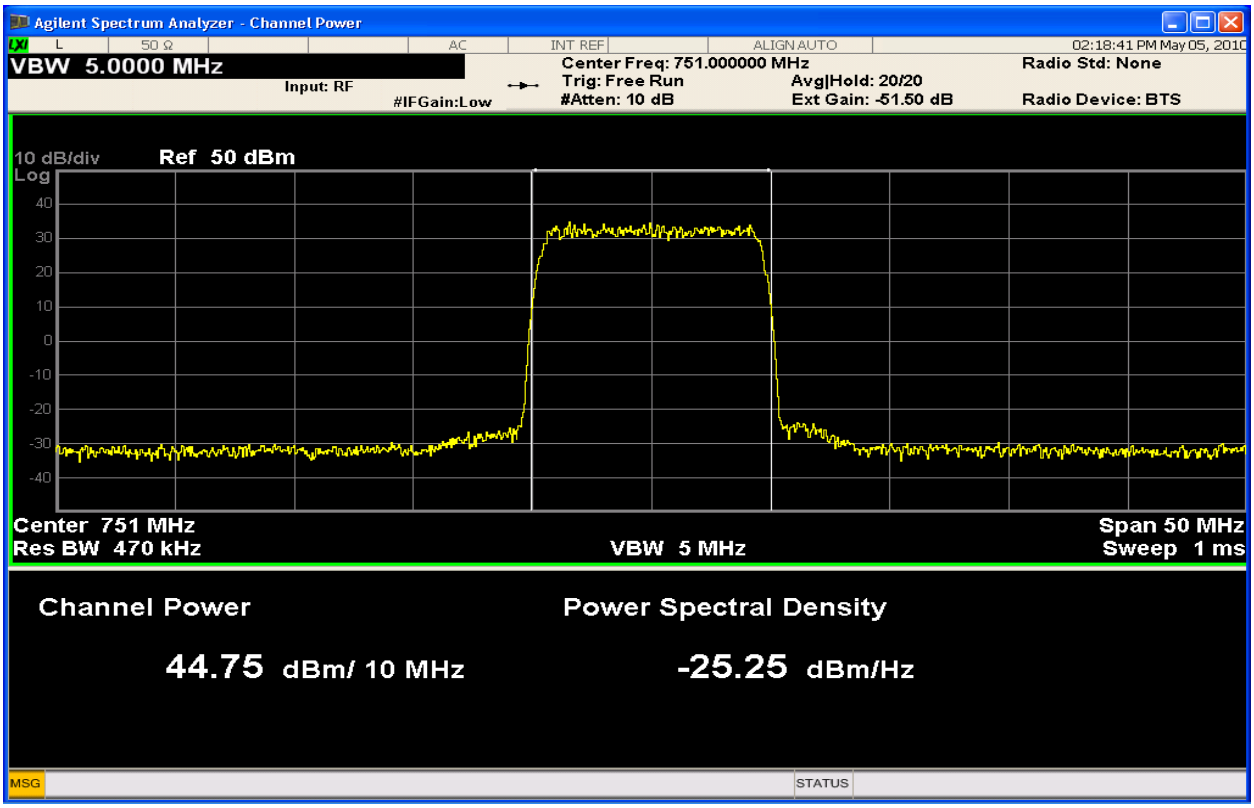


Figure 6-3 : 10MHz BW Channel Power TX1_QPSK at 751.0MHz

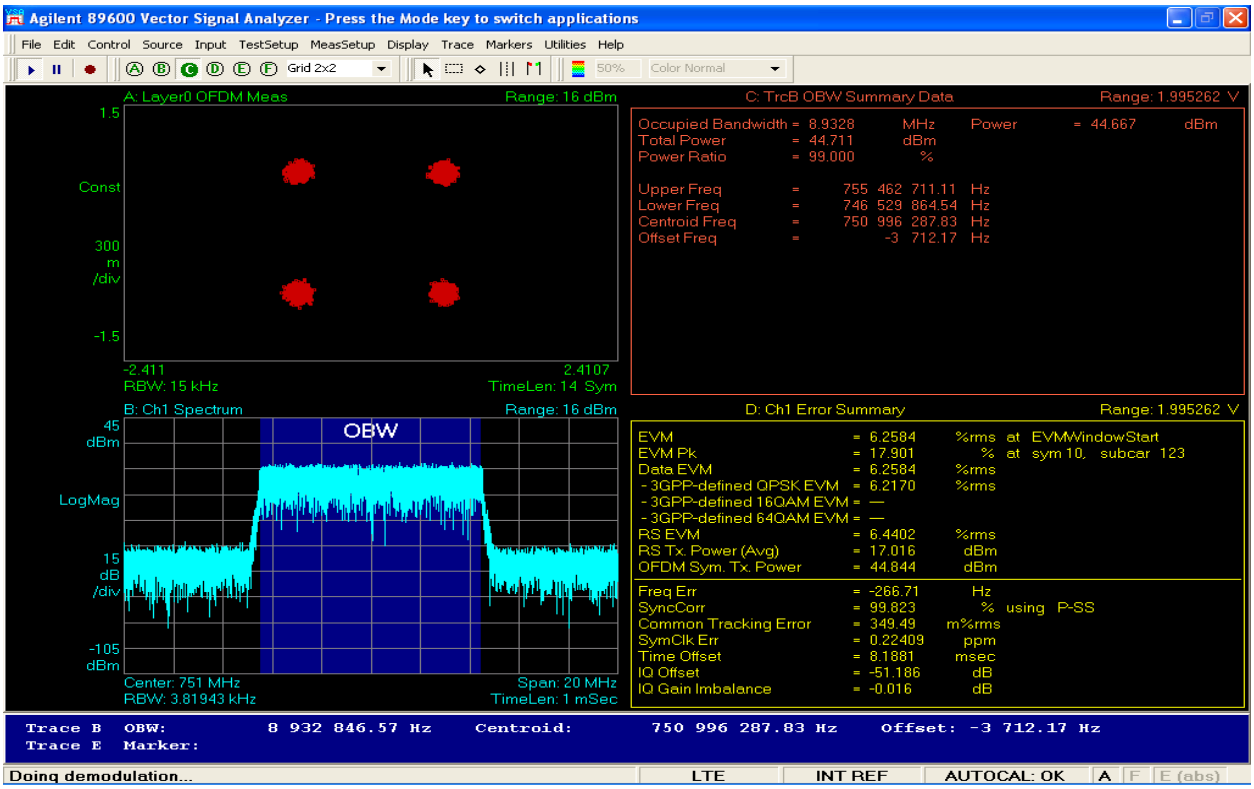


Figure 6-4 : 10MHz BW Modulation TX2_QPSK at 751.0MHz

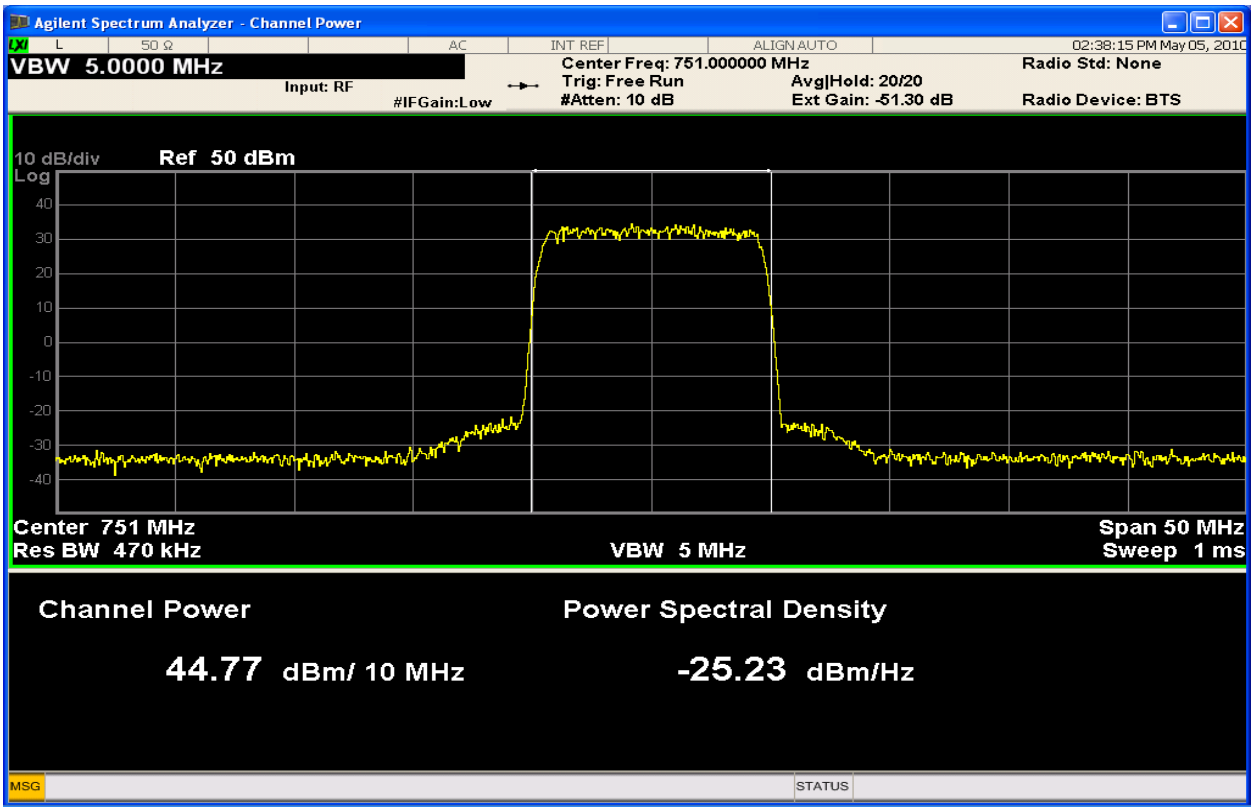


Figure 6-5 : 10MHz BW Channel Power TX2_QPSK at 751.0MHz

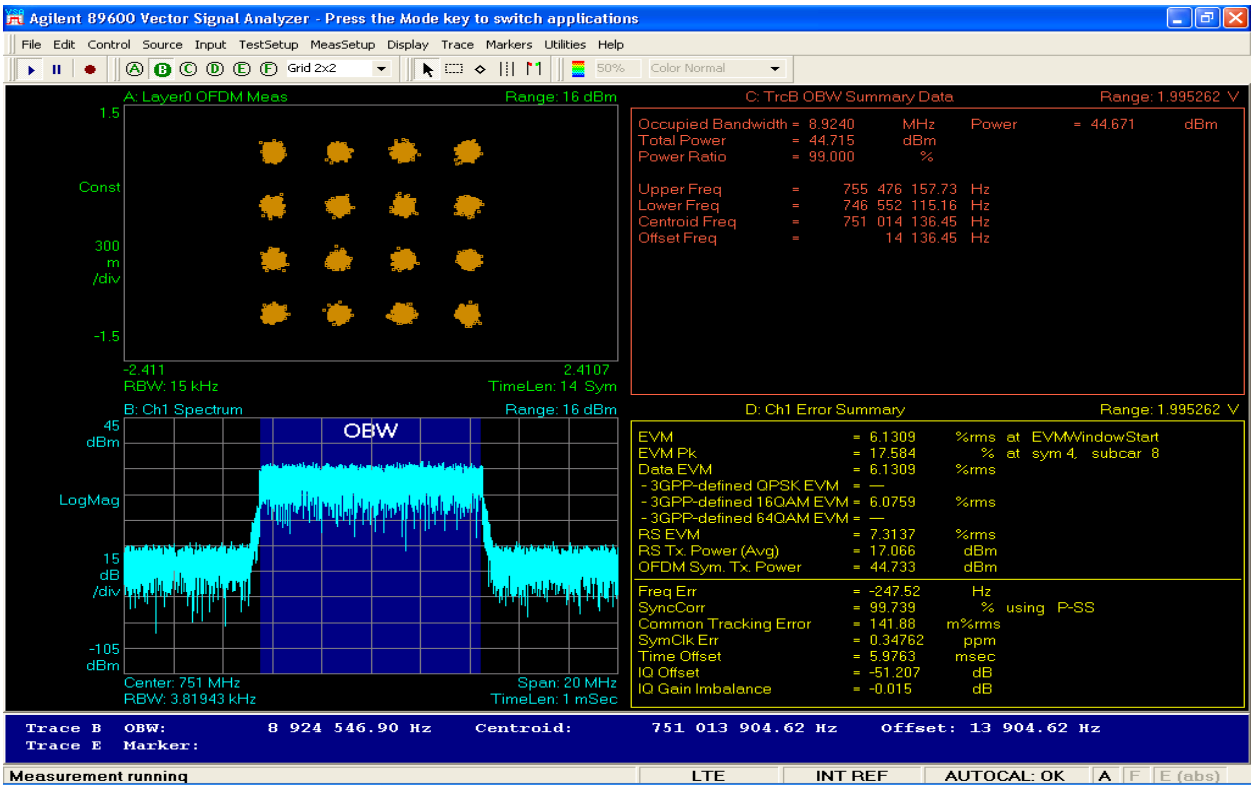


Figure 6-6 : 10MHz BW Modulation TX1_16QAM at 751.0MHz

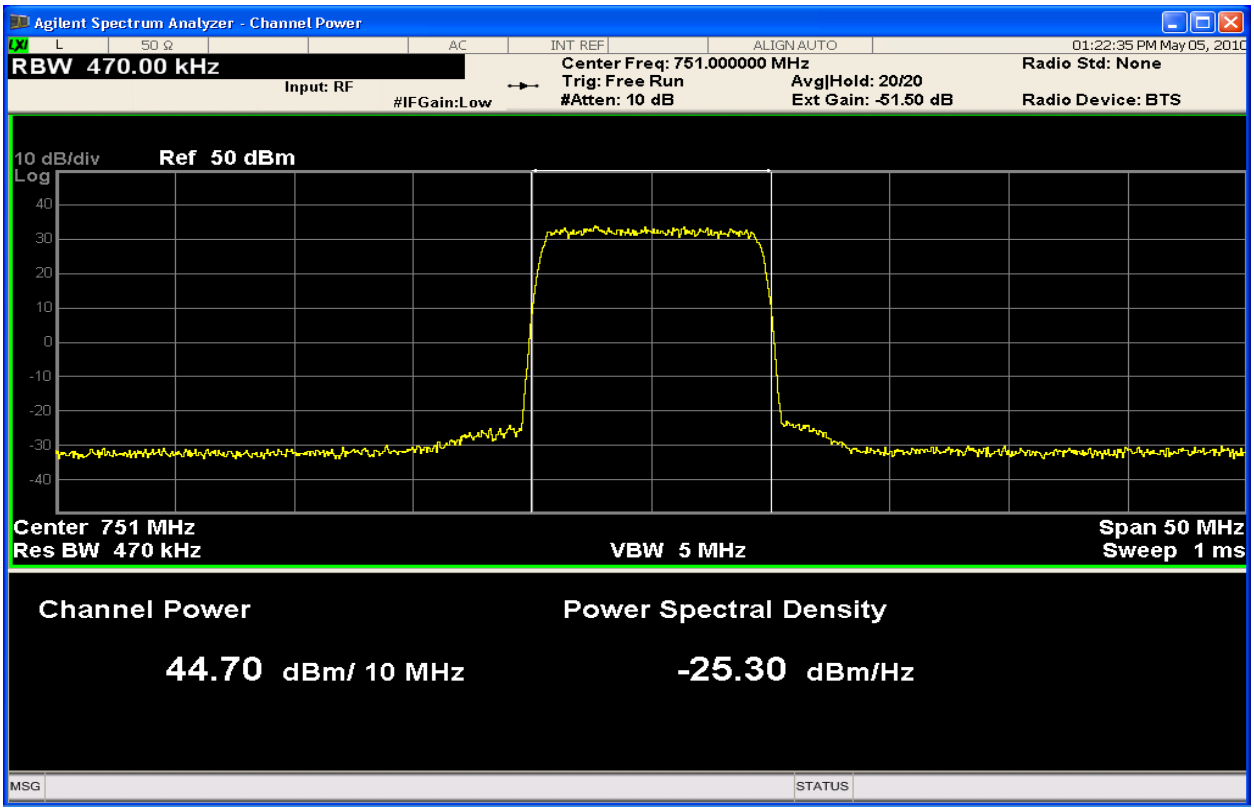


Figure 6-7 : 10MHz BW Channel Power TX1_16QAM at 751.0MHz

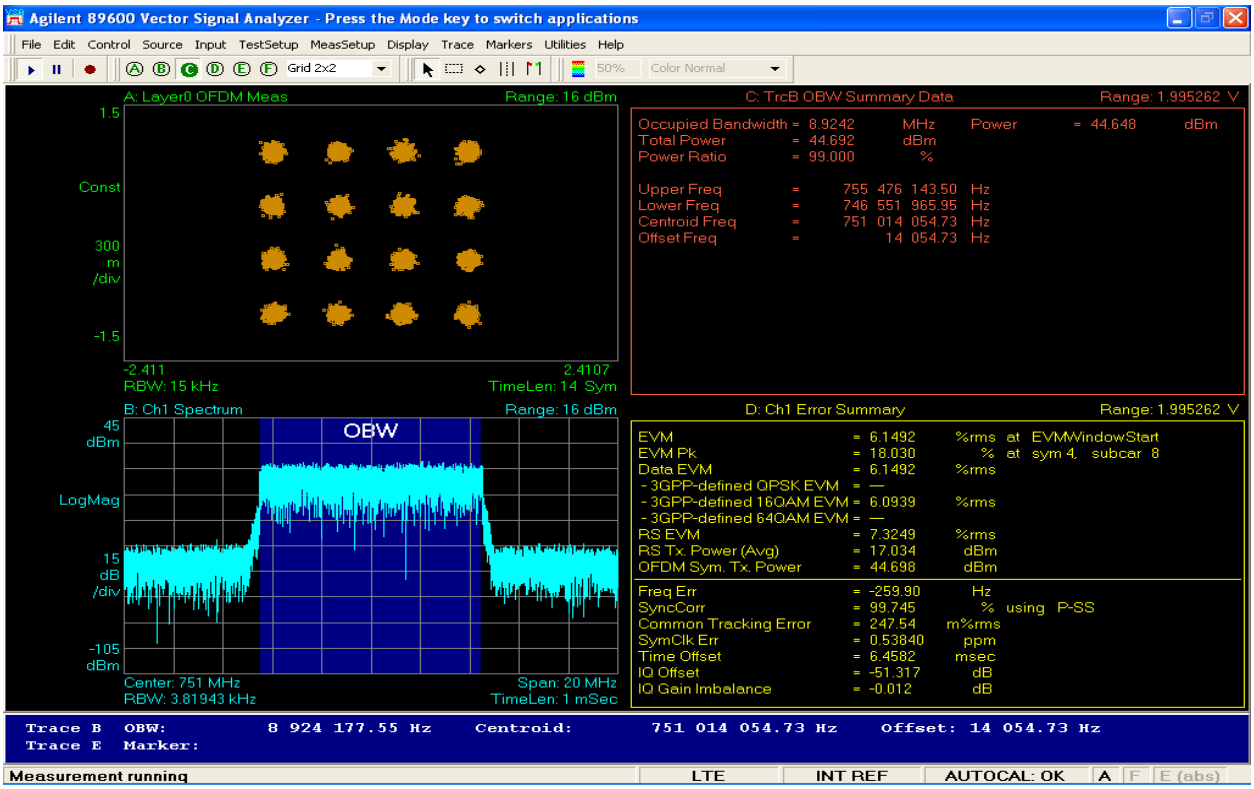


Figure 6-8 : 10MHz BW Modulation TX2_16QAM at 751.0MHz

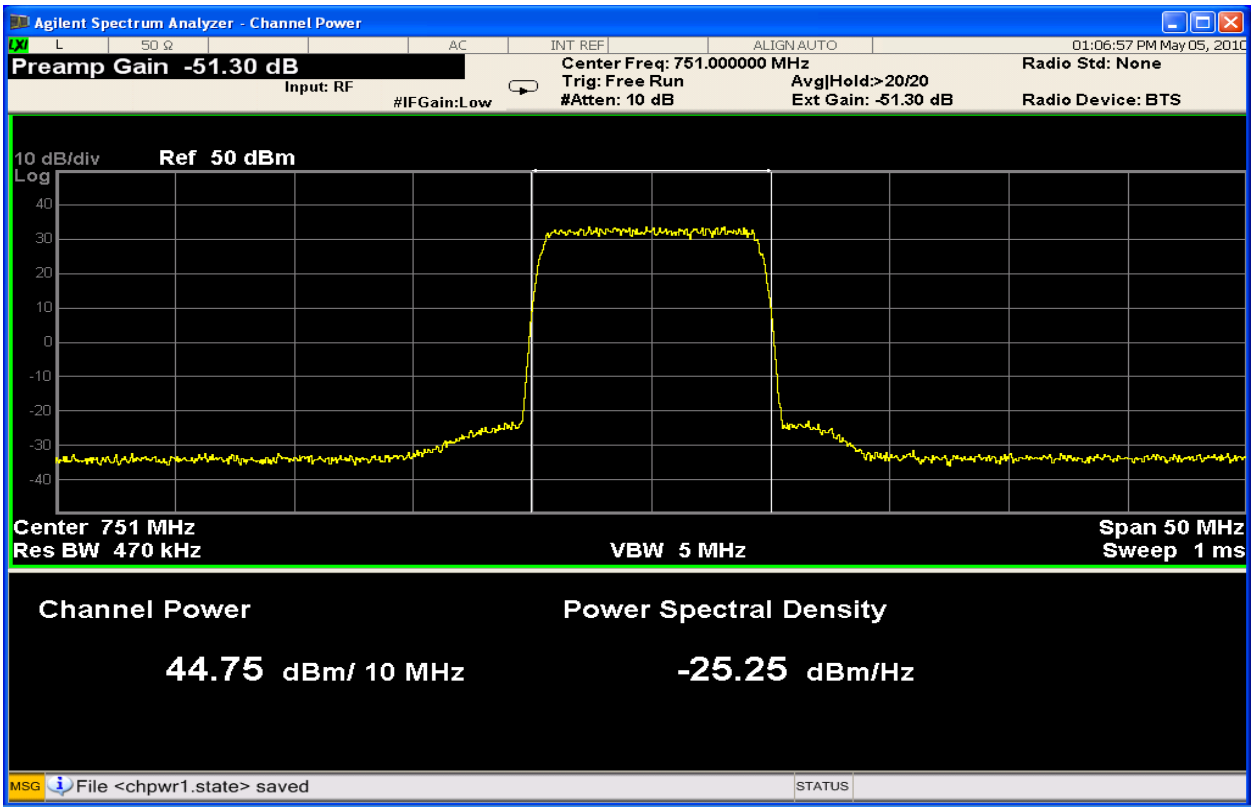


Figure 6-9 : 10MHz BW Channel Power TX2_16QAM at 751.0MHz

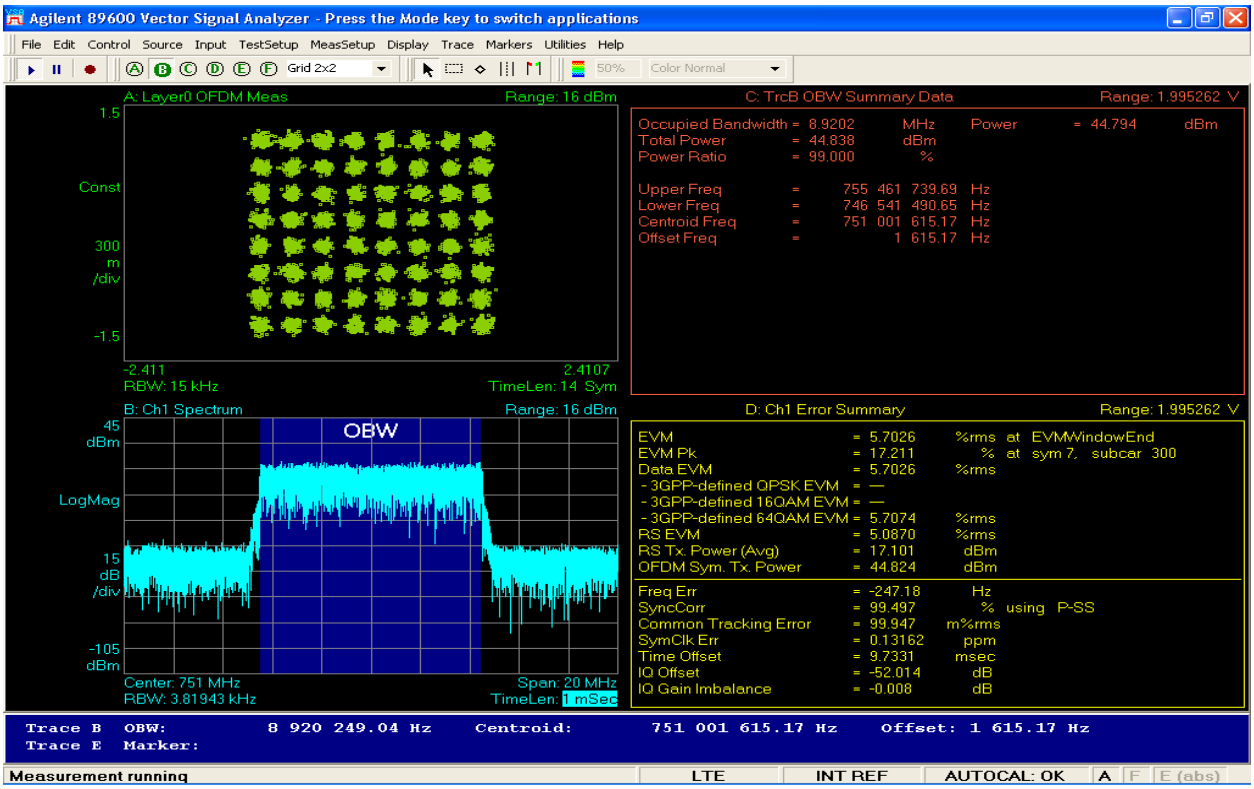


Figure 6-10 : 10MHz BW Modulation TX1_64QAM at 751.0MHz

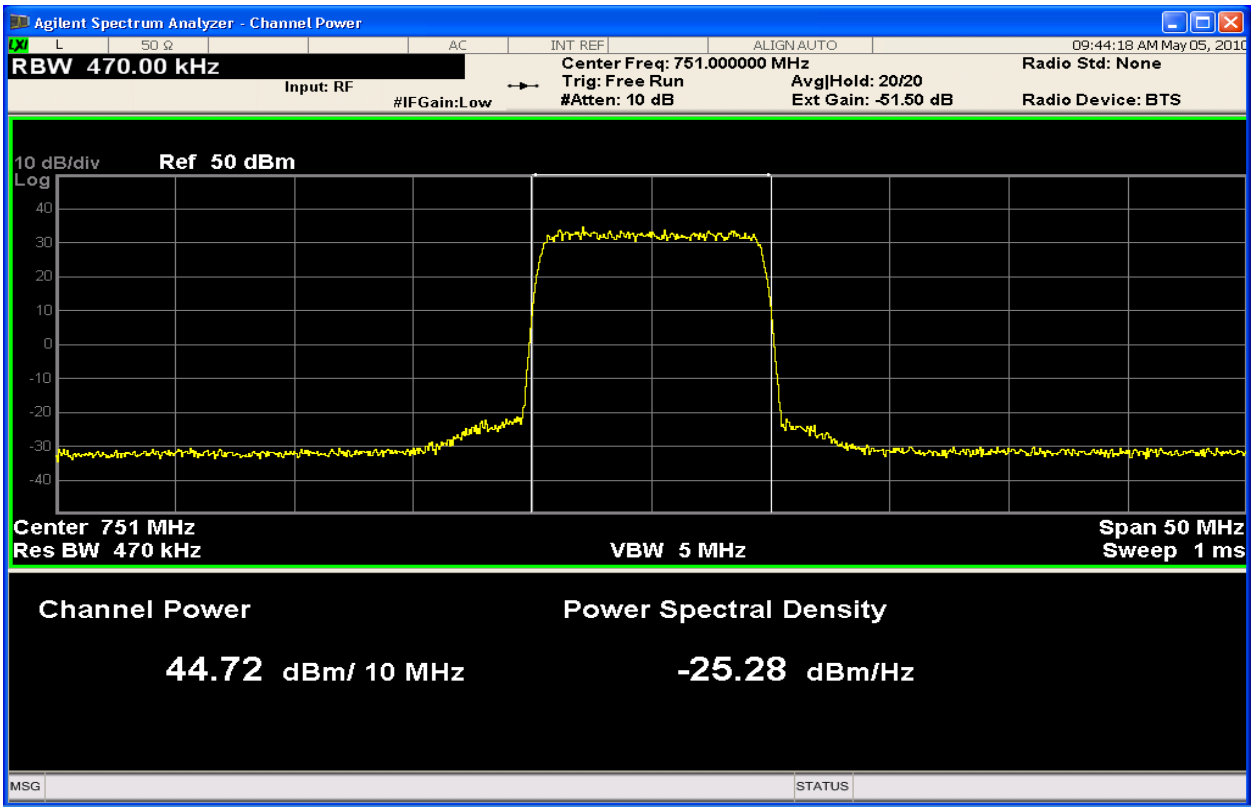


Figure 6-11 : 10MHz BW Channel Power TX1_64QAM at 751.0MHz

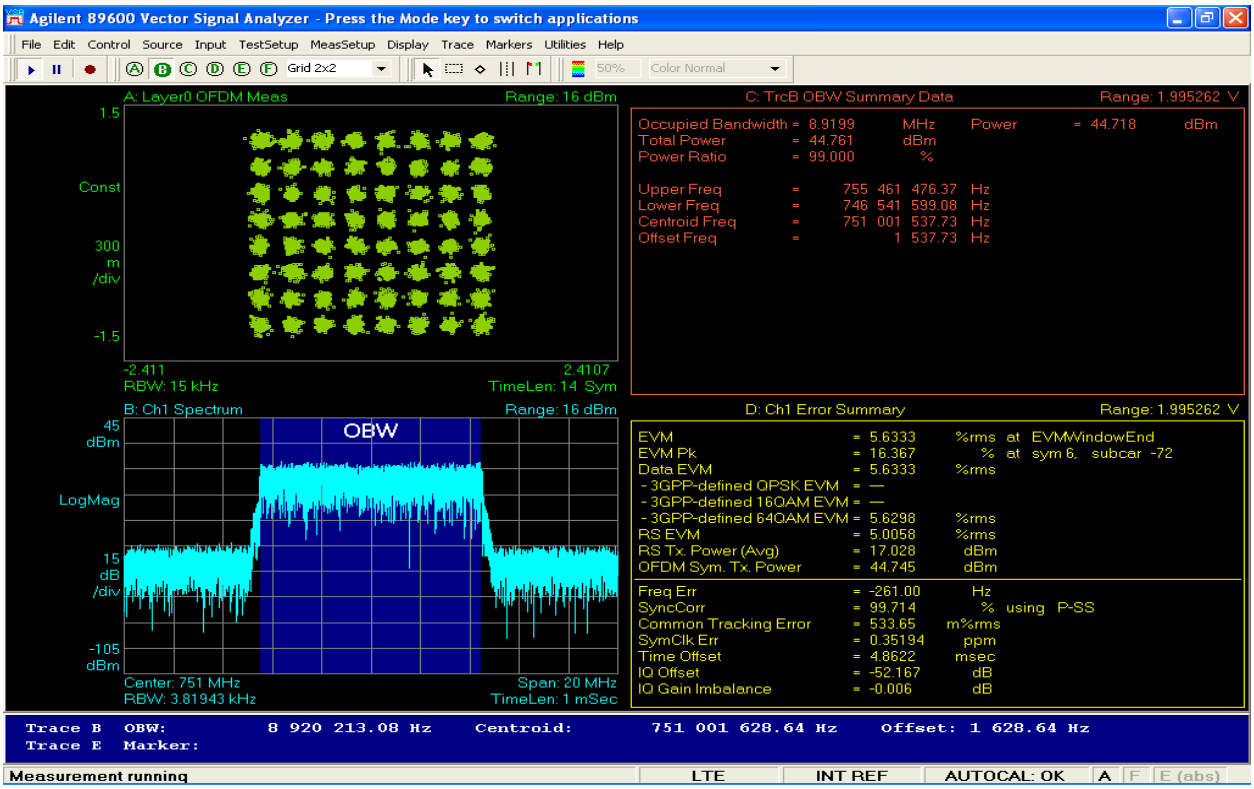


Figure 6-12 : 10MHz BW Modulation TX2_64QAM at 751.0MHz

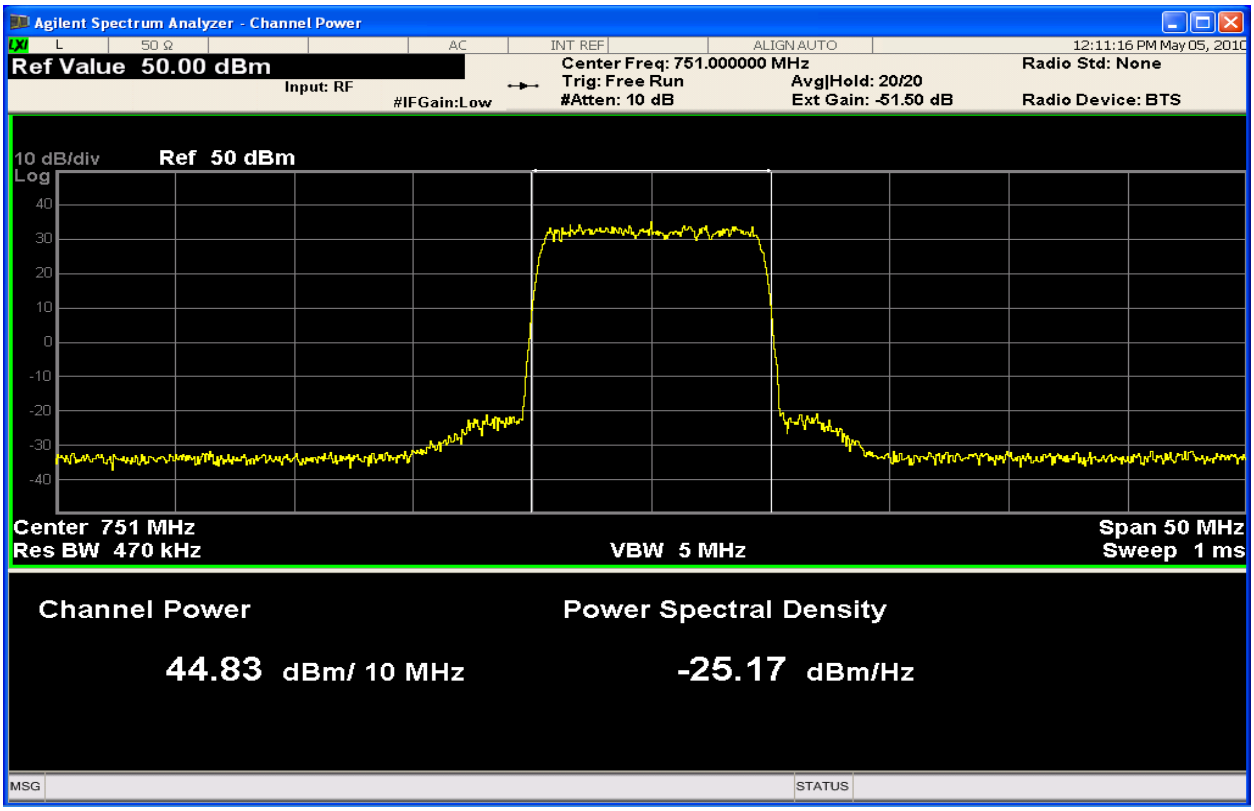


Figure 6-13 : 10MHz BW Channel Power TX2_64QAM at 751.0MHz

6.2 RF Safety (Reference 27.52)

Licensees and manufacturers are subject to the radio frequency radiation exposure requirements specified in sections 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate.

Technical information showing the basis for this statement must be submitted to the Commission upon request.

The following spread sheet shows an example of the required calculation for MPE (Maximum Permissible Exposure) for RF safety submissions. This calculation is required as a separate exhibit under the FCC submission.

RF Safety: Based on the rated output power and 14.8dB antenna gain, a minimum distance of 4.0 meters to the operating antenna must be maintained.

ERICSSON

Prediction of MPE limit at a given distance

Reference_1: Equation from page 51 of EN 50385: Basic standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication systems (110 MHz - 40 GHz)
Reference 2: Equation from page 18 of OET Bulletin 65, Edition 97-01: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields.

RRUL 11 B13: 700MHz (Upper C Block)

$$S \eta \frac{PG}{4\eta R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	44.80	(dBm)
Maximum peak output power at antenna input terminal:	30199.5172	(mW)
Antenna gain (typical):	14.8	(dBi)
Maximum antenna gain:	30.1995172	(numeric)
Prediction distance:	400	(cm)
Prediction frequency:	737	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.5	(mW/cm^2)
Power density at prediction frequency:	0.453597	(mW/cm^2)
Maximum allowable antenna gain:	15.22299851	(dBi)
Margin of Compliance:	0.42299851	

6.3 Occupied Bandwidth

Clause 27.50 2.1049

(a) *Occupied bandwidth.* 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. Occupied BW is the portion of the spectrum which contains 99% of the emitted energy (.5% of the remaining is above and .5% is below the occupied BW). The occupied bandwidth may not exceed the authorized bandwidth in the radio service rules. The occupied bandwidth test should be performed for each type of emission listed on the grant.

Procedure:

The following procedure and conditions shall apply for Occupied Bandwidth measurements. As applicable, Lower, Middle and Upper frequency offsets, modulation, and bandwidths shall be assessed and recorded along with the relevant captured plots.

Test Setup

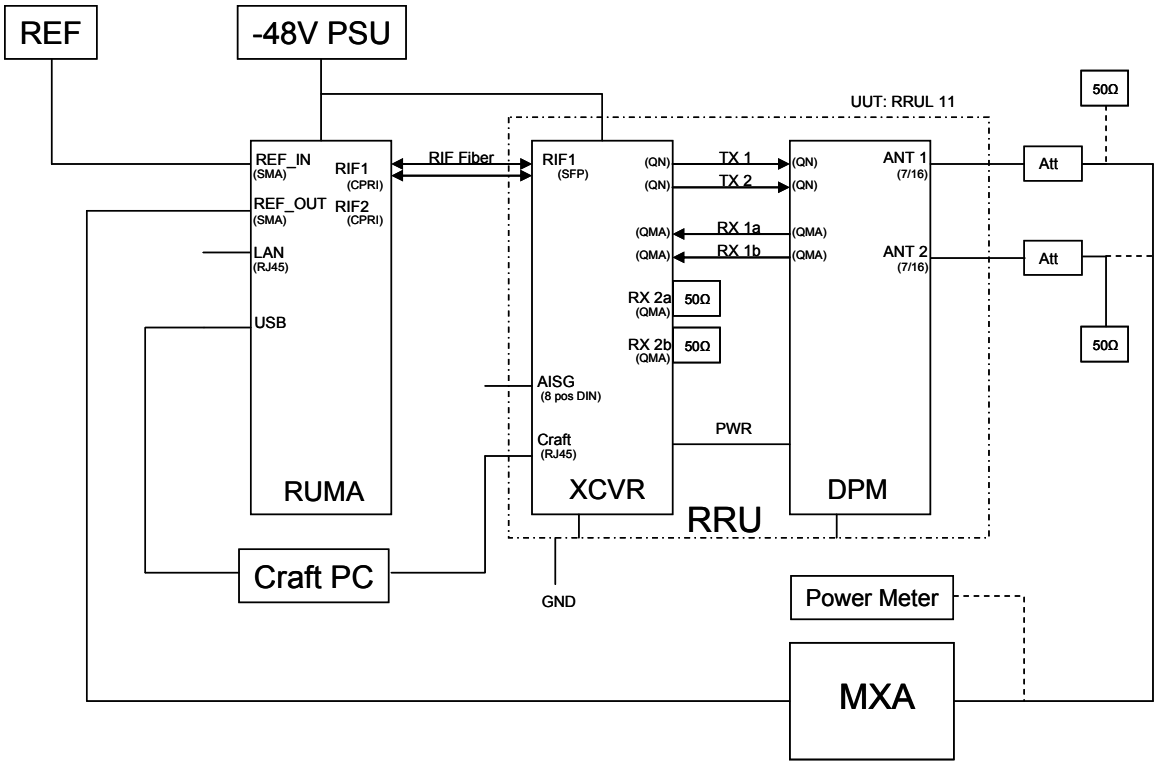


Figure 6-14 RRU Radio Compliance Set Up / Configuration

The following tables shall be used to summarize recorded results in addition to applicable captured plots.

Table 6-2: Setting / Measurement Results – Occupied Bandwidth

Setting		Occupied Bandwidth (MHz) (Note: BPSK embedded in each modulation scheme)					
		QPSK		16 QAM		64 QAM	
		TX1	TX2	TX1	TX2	TX1	TX2
Frequency (CH 5230)	751MHz	8.937	8.968	8.939	8.980	8.952	8.970
RBW	180kHz						
VBW	1.8MHz						
CH BW	10MHz						
Span	20MHz						
Sweep	1ms						
Reference Level Offset	51.0dB						
Detector	Peak						
Attenuation	10dB						

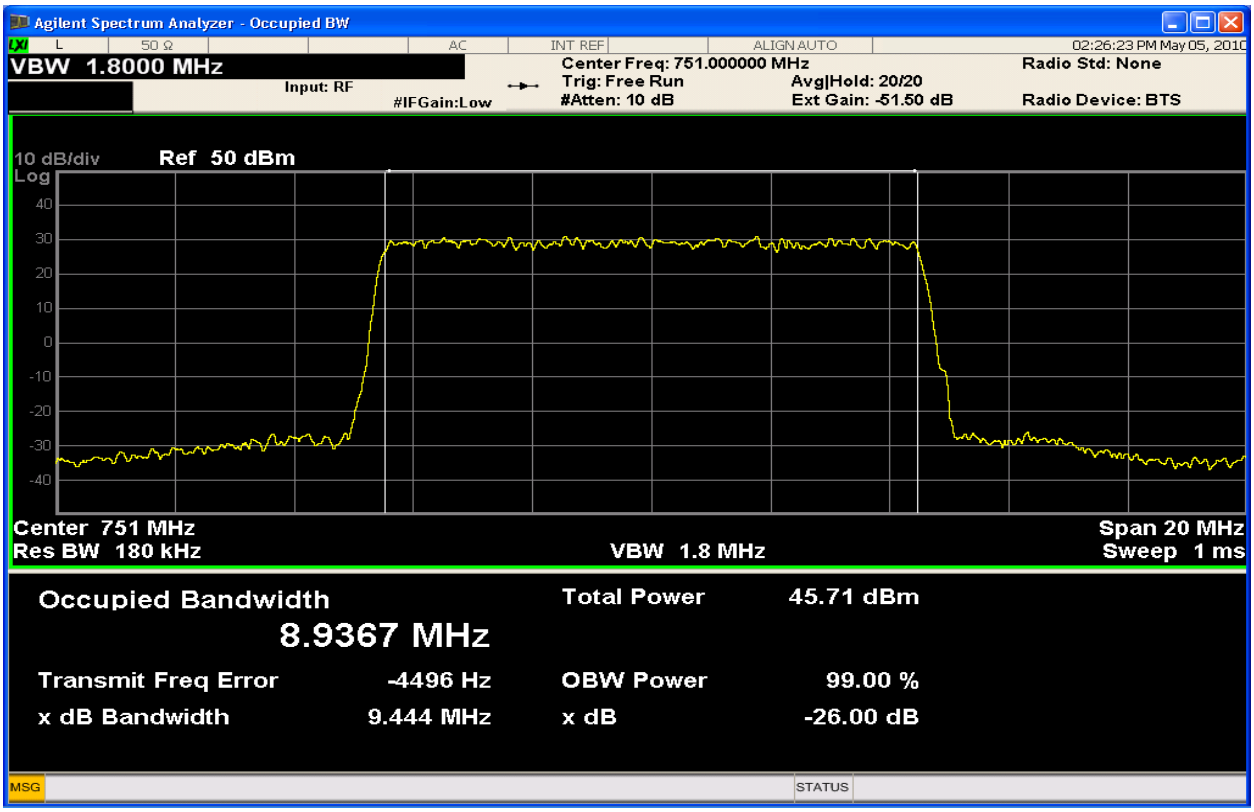


Figure 6-15: 10MHz Occupied Bandwidth TX1_QPSK at 751.0MHz

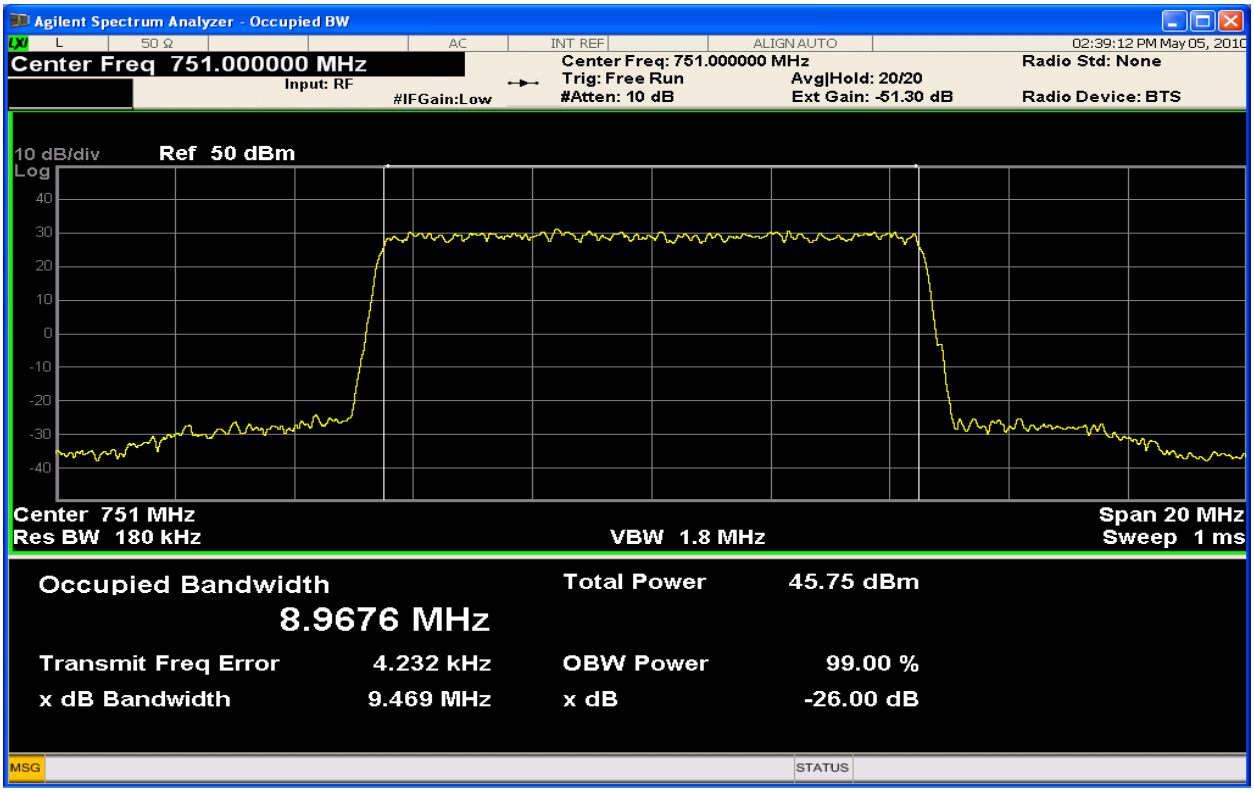


Figure 6-16: 10MHz Occupied Bandwidth TX2_QPSK at 751.0MHz

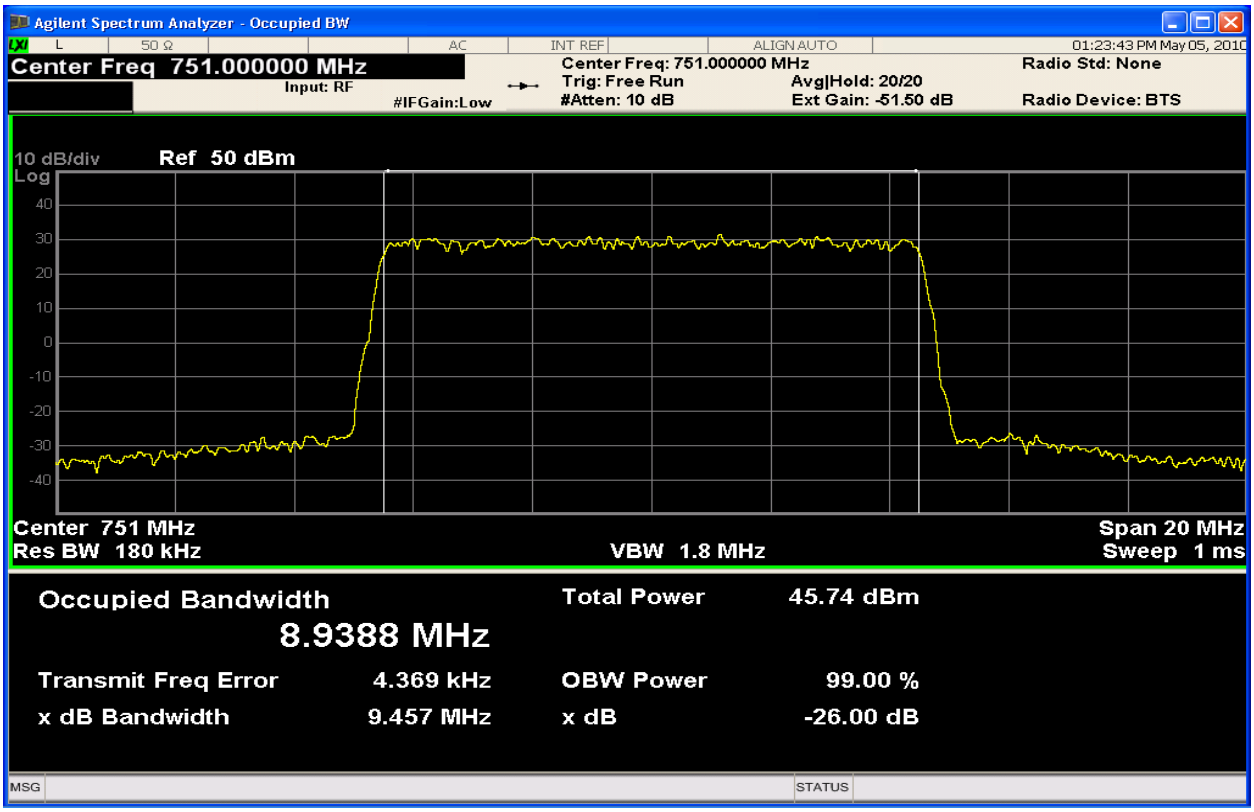


Figure 6-17: 10MHz Occupied Bandwidth TX1_16QAM at 751.0MHz

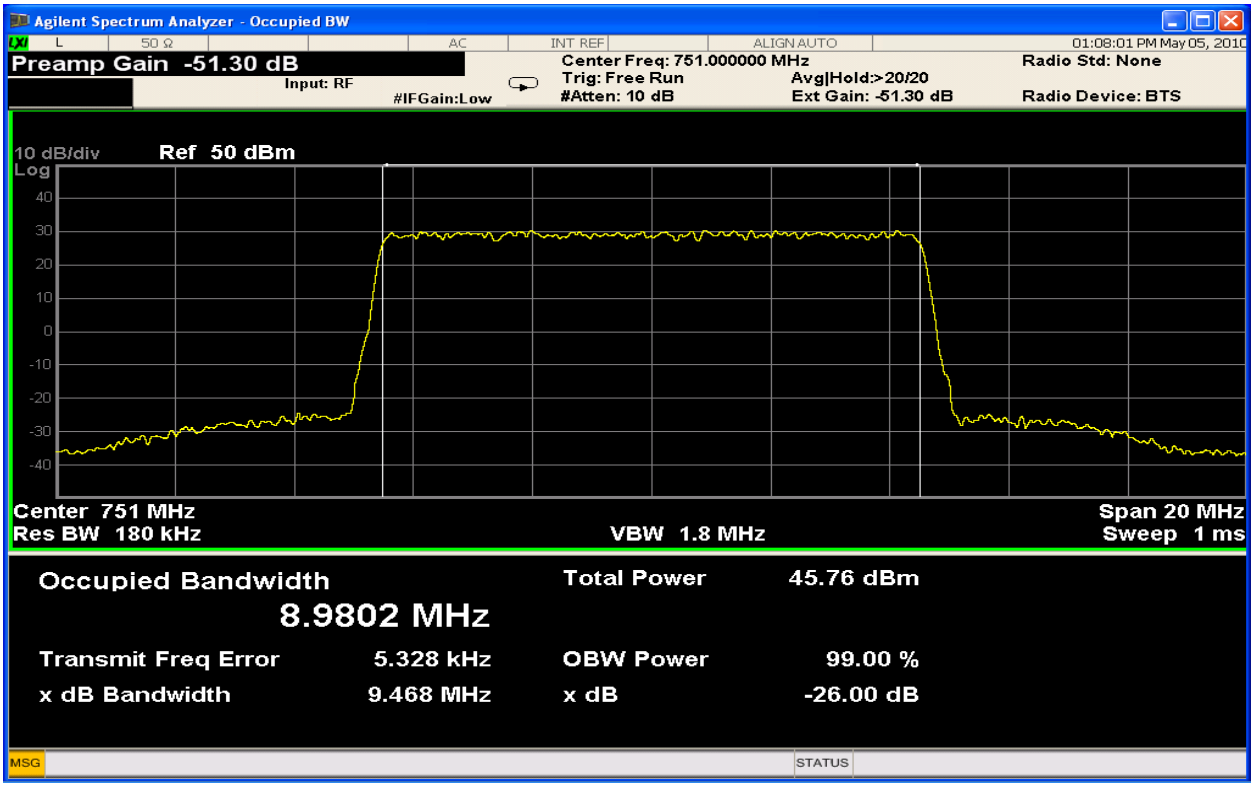


Figure 6-18: 10MHz Occupied Bandwidth TX2_16QAM at 751.0MHz

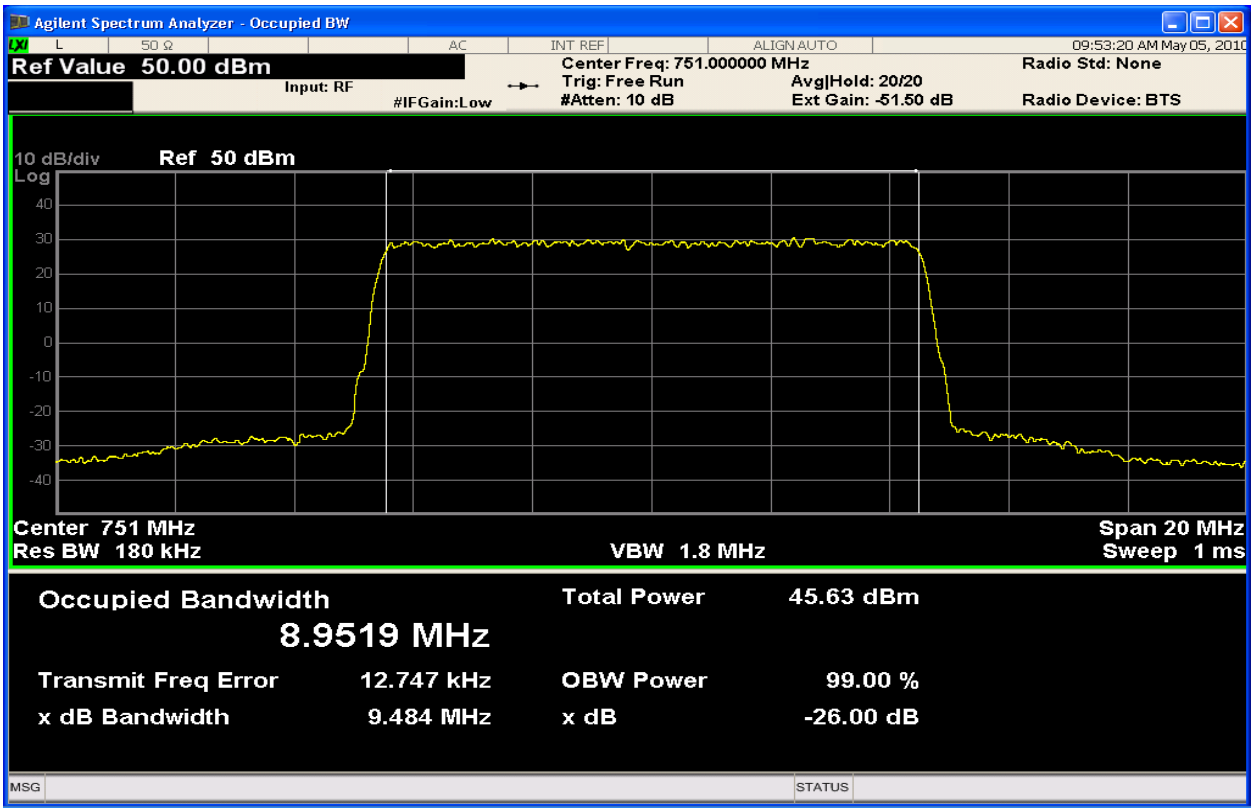


Figure 6-19: 10MHz Occupied Bandwidth TX1_64QAM at 751.0MHz

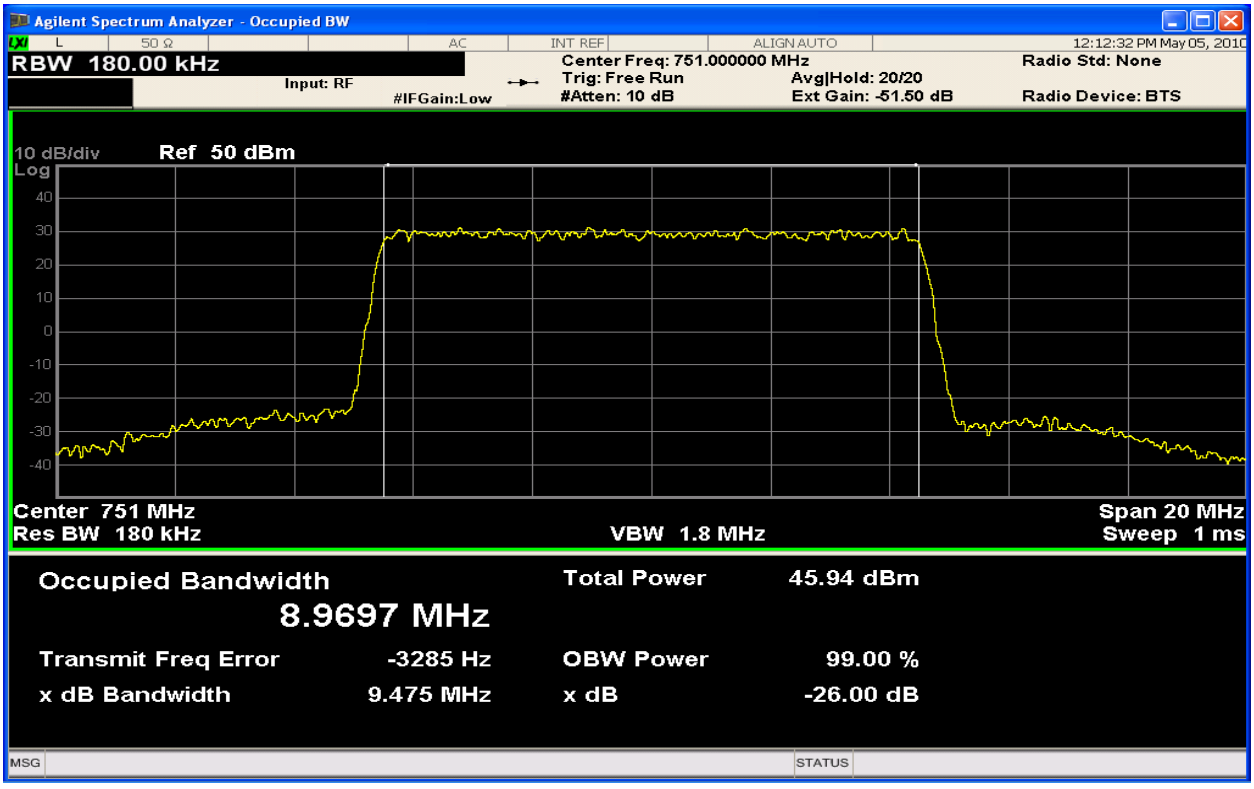


Figure 6-20: 10MHz Occupied Bandwidth TX2_64QAM at 751.0MHz

6.4 Spurious emissions at the antenna terminal

Clause 27.53(c)

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside 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 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;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB 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 on 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 at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Test Setup:

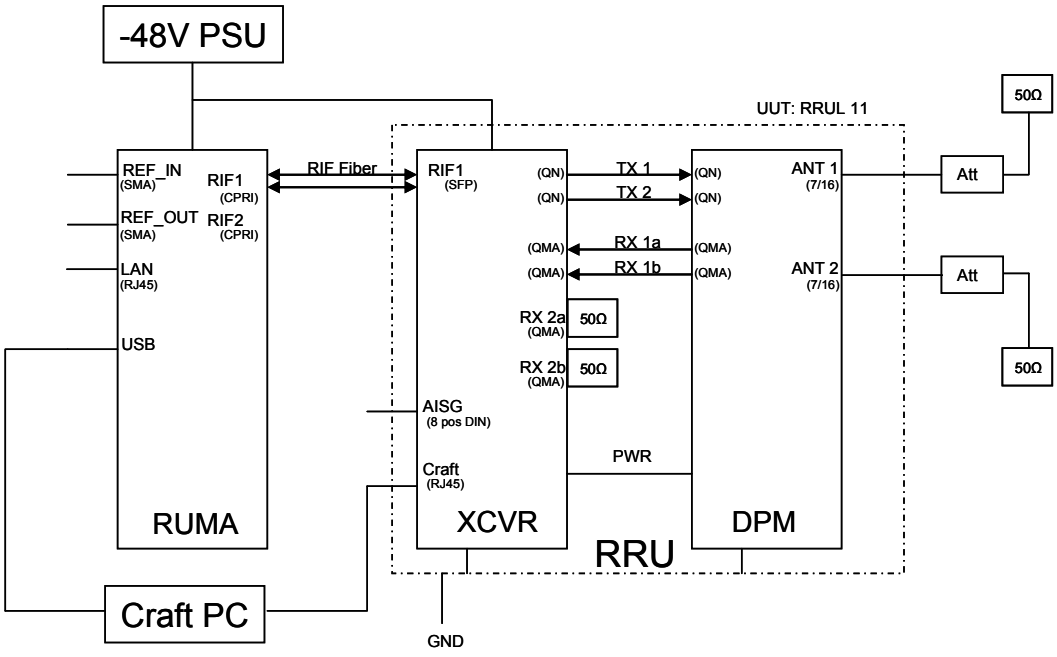


Figure 6-21 RRU Radio Compliance Set Up / Configuration

FCC Limit = PWR $_{(dBm)}$ – [43 + 10log(PWR $_{(W)}$)] = 44.8 – 43 + 10log(30) = -13dBm

Procedure:

The following procedure and conditions shall apply for Spurious Emission measurements. As applicable, lower and high side offsets from the channel shall be assessed with respect to all modulation, and bandwidths as well as all emissions up to 8.5GHz. Results shall be compiled and recorded along with the relevant captured plots.

Table 6-3: Setting / Measurement Results – Spurious Emissions Band Edge BW=10MHz

Setting		**Spurious Emissions (dBm) FCC Limit -13dBm**					
		QPSK		**16 QAM**		**64 QAM**	
Measurement ACP <2MHz		**TX1**	**TX2**	**TX1**	**TX2**	**TX1**	**TX2**
Frequency (CH 5230)	751MHz	**Lower Edge Emission (746MHz)**					
RBW	30kHz	-29.91	-29.63	-30.12	-28.84	-30.31	-29.56
VBW	30kHz	**Upper Edge Emission (756MHz)**					
CH BW	10MHz	-30.71	-30.52	-30.03	-29.25	-30.96	-30.68
Reference Level Offset	51.5dB	**Margin to FCC Limit (dB)**					
Detector	RMS	16.91	16.63	17.12	15.84	17.31	16.56
Attenuation	6dB	17.71	17.52	17.03	16.25	17.96	17.68

Table 6-4: Setting Remarks / Measurement Results – Spurious Emissions <1GHz

Setting		**Spurious Emissions (dBm) FCC Limit -13dBm**					
		QPSK		**16 QAM**		**64 QAM**	
Measurement < 1GHz		**TX1**	**TX2**	**TX1**	**TX2**	**TX1**	**TX2**
Frequency (CH 5230)	751MHz	-39.19	-40.84	-40.10	41.30	-40.45	-40.91
RBW	100kHz						
VBW	300kHz						
CH BW	10MHz						
Reference Level Offset	51.5dB						
Detector	RMS	**Margin to FCC Limit (dB)**					
Attenuation	6dB	26.19	27.84	27.10	28.30	27.45	27.91

Table 6-5: Setting Remarks / Measurement Results – Spurious Emissions > 1GHz

Setting Measurement > 1GHz		Spurious Emissions (dBm) FCC Limit -13dBm					
		QPSK		16 QAM		64 QAM	
		TX1	TX2	TX1	TX2	TX1	TX2
Frequency (CH 5230)	751MHz	-26.79	-27.01	-25.87	-27.64	-26.20	-27.35
RBW	1MHz						
VBW	3MHz						
CH BW	10MHz						
Reference Level Offset	51.5dB						
Detector	RMS	Margin to FCC Limit (dB)					
Attenuation	6dB	13.79	14.01	12.87	14.64	13.20	14.35

Table 6-6: Setting Remarks / Measurement Results – Spurious Emissions 763 – 775MHz

Setting Measurement 763-775MHz		Spurious Emissions (dBm) FCC Limit -46dBm/6.25kHz (-49.19dBm/3kHz)					
		QPSK		16 QAM		64 QAM	
		TX1	TX2	TX1	TX2	TX1	TX2
Frequency (CH 5230)	751MHz	-52.00	-54.96	-52.40	-55.17	-51.41	-55.17
RBW	3kHz						
VBW							
CH BW	10MHz						
Reference Level Offset	51.5dB						
Detector	RMS	Margin to FCC Limit (dB)					
Attenuation	0dB	2.81	5.77	3.21	5.98	2.22	5.98

Table 6-7: Setting Remarks / Measurement Results – Spurious Emissions 793 – 805MHz

Setting Measurement 793 - 805MHz		Spurious Emissions (dBm) FCC Limit -46dBm/6.25kHz (-49.19dBm/3kHz)					
		QPSK		16 QAM		64 QAM	
		TX1	TX2	TX1	TX2	TX1	TX2
Frequency (CH 5230)	751MHz	-53.28	-57.00	-53.50	-55.07	-53.39	-55.07
RBW	3kHz						
VBW							
CH BW	10MHz						
Reference Level Offset	51.5dB						
Detector	RMS	Margin to FCC Limit (dB)					
Attenuation	51.5dB	4.09	7.81	4.31	5.88	4.20	5.88

FCC Section 27.53(c)(3):

Based on a measurement resolution bandwidth of 6.25 kHz, all frequencies between 763 to 775 MHz and 793 to 805 MHz shall be attenuated at least 76 + 10log (P) dB

Limit = PWR(dBm) - (76+10log(P) = 44.8 – (76+10log(30)) = -46 dBm/6.25 kHz

Measurement BW = 3kHz (3kHz RBW Limit = -46 – 10log(6.25/3)) = -49.19dBm

Table 6-8: Setting Remarks / Measurement Results: Spurious Emissions 1559 – 1610MHz

Setting		**Spurious Emissions (dBm) FCC Limit -80dBW EIRP**					
		QPSK		**16 QAM**		**64 QAM**	
Measurement 1559 – 1610MHz		**TX1**	**TX2**	**TX1**	**TX2**	**TX1**	**TX2**
Frequency (CH 5230)	751MHz	-56.30	-56.55	-56.29	-56.52	-55.95	-56.52
RBW	3kHz						
VBW							
CH BW	10MHz						
Reference Level Offset	51.5dB						
Detector	RMS	**Margin to FCC Limit (dB)**					
Attenuation	0dB	7.11	7.36	7.10	7.33	6.76	7.33

Note: Emission values listed in the above table were below the SA noise floor.

MXA Noise Floor = -56dBm.

FCC Section 27.53(f) *For operations in the 746-763 MHz, 775-793 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.*

Antenna Gain = 14.8dBi

Limit = -80dBW + Antenna Gain = -65.2dBm

Margin = Limit – Measurement

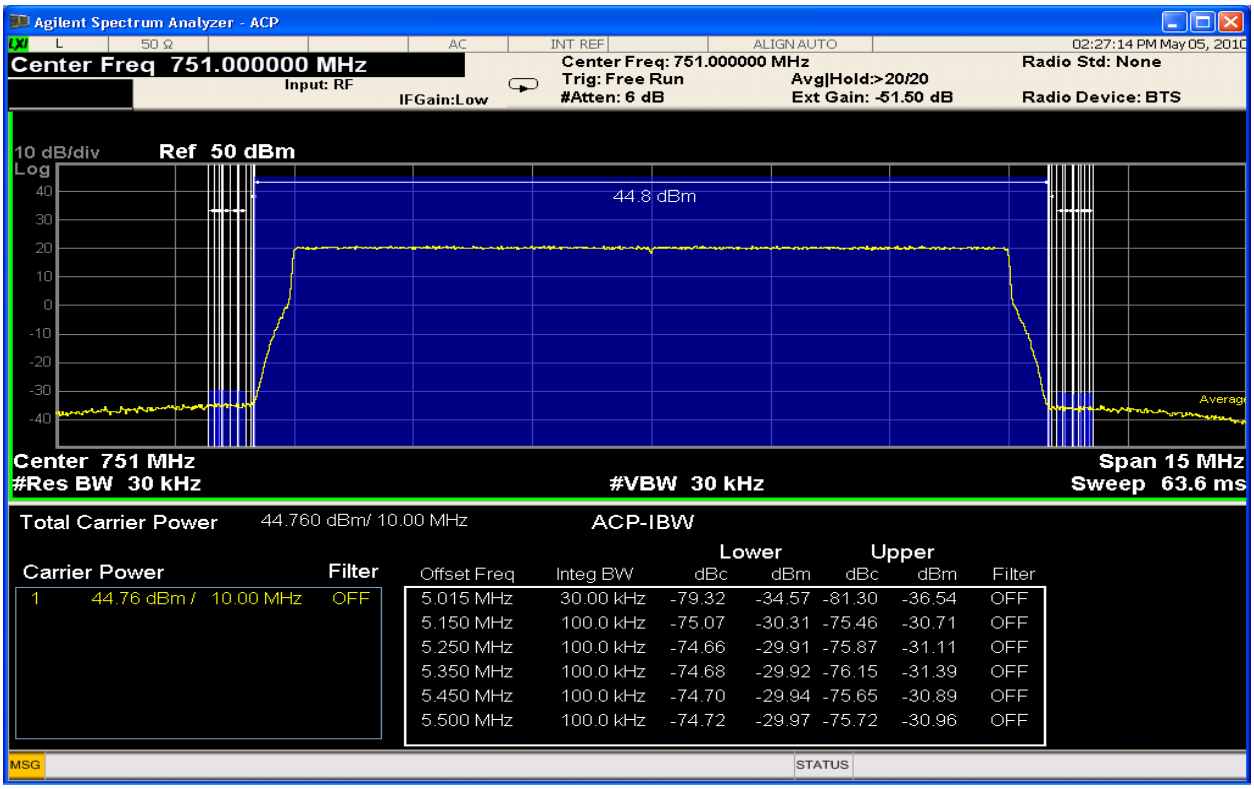


Figure 6-22: Spurious Emissions TX1_QPSK Band Edge (ACP 15kHz – 550kHz)

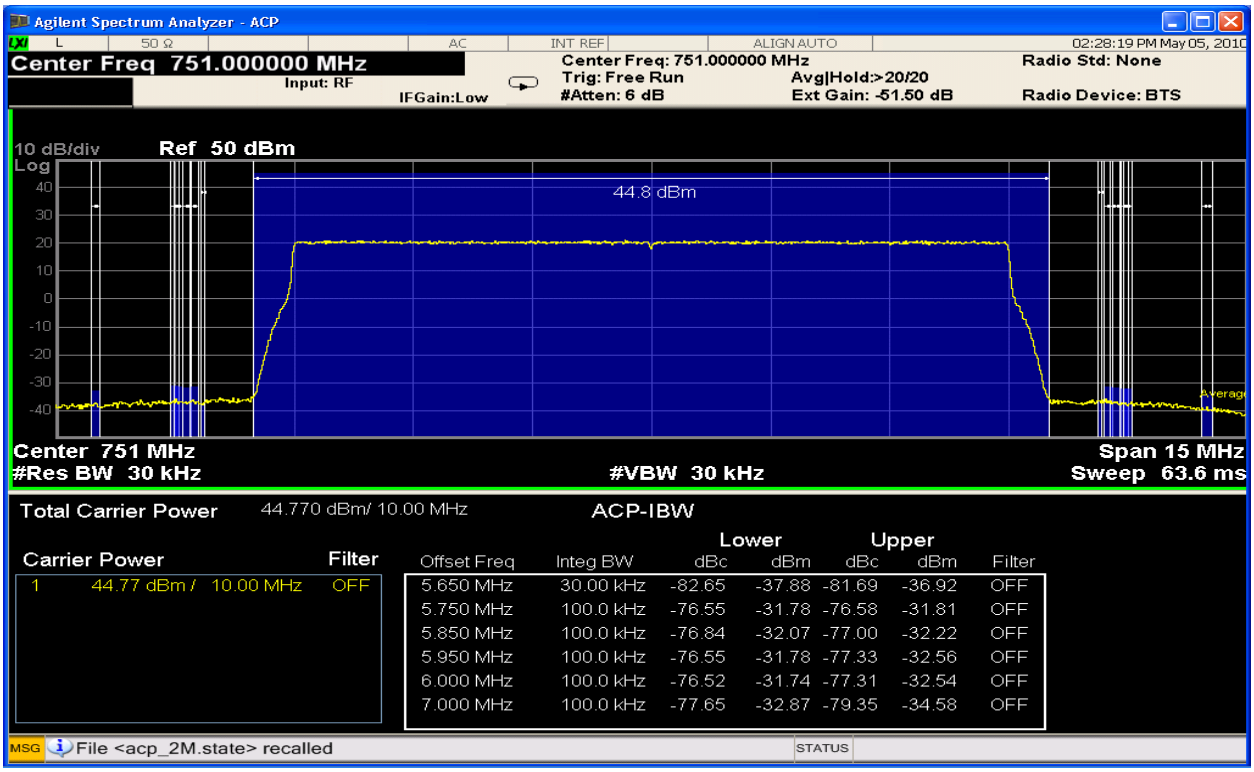


Figure 6-23: Spurious Emissions TX1_QPSK Band Edge (ACP 650kHz – 2MHz)

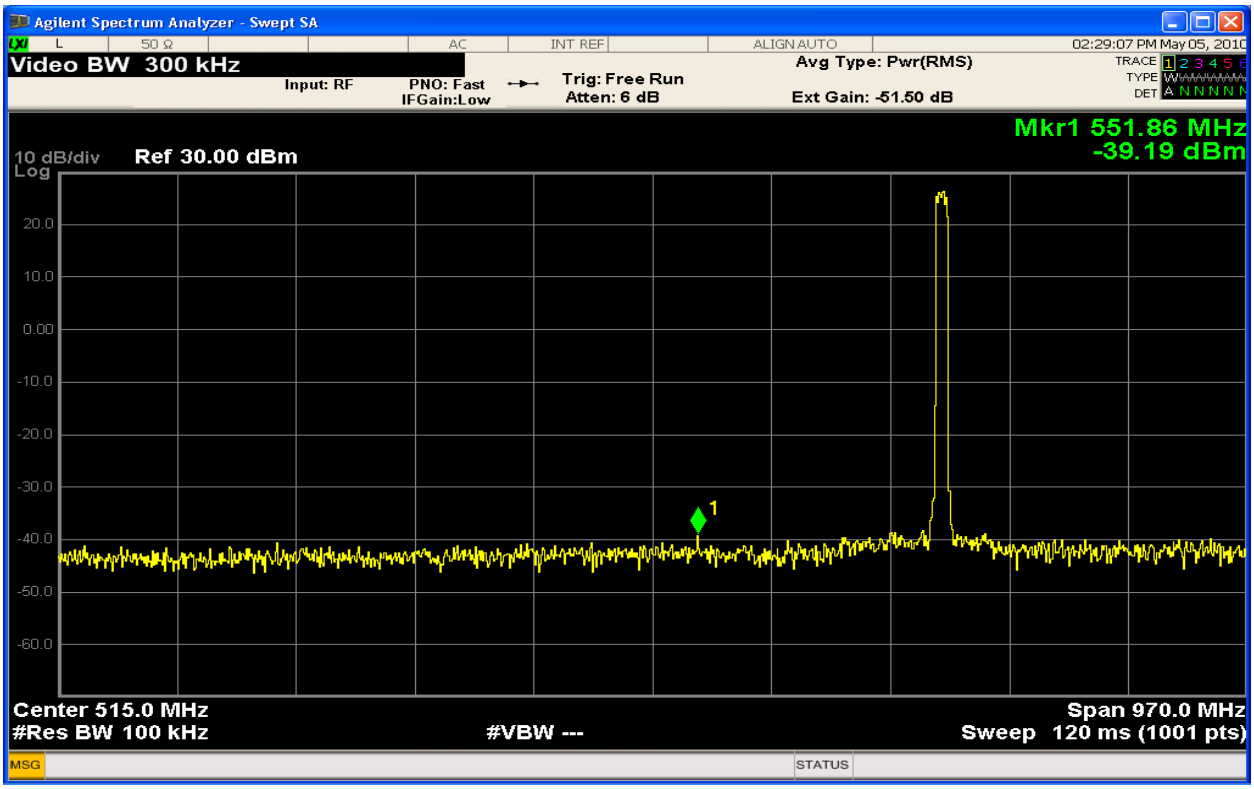


Figure 6-24: Spurious Emissions TX1_QPSK (30MHz – 1GHz)

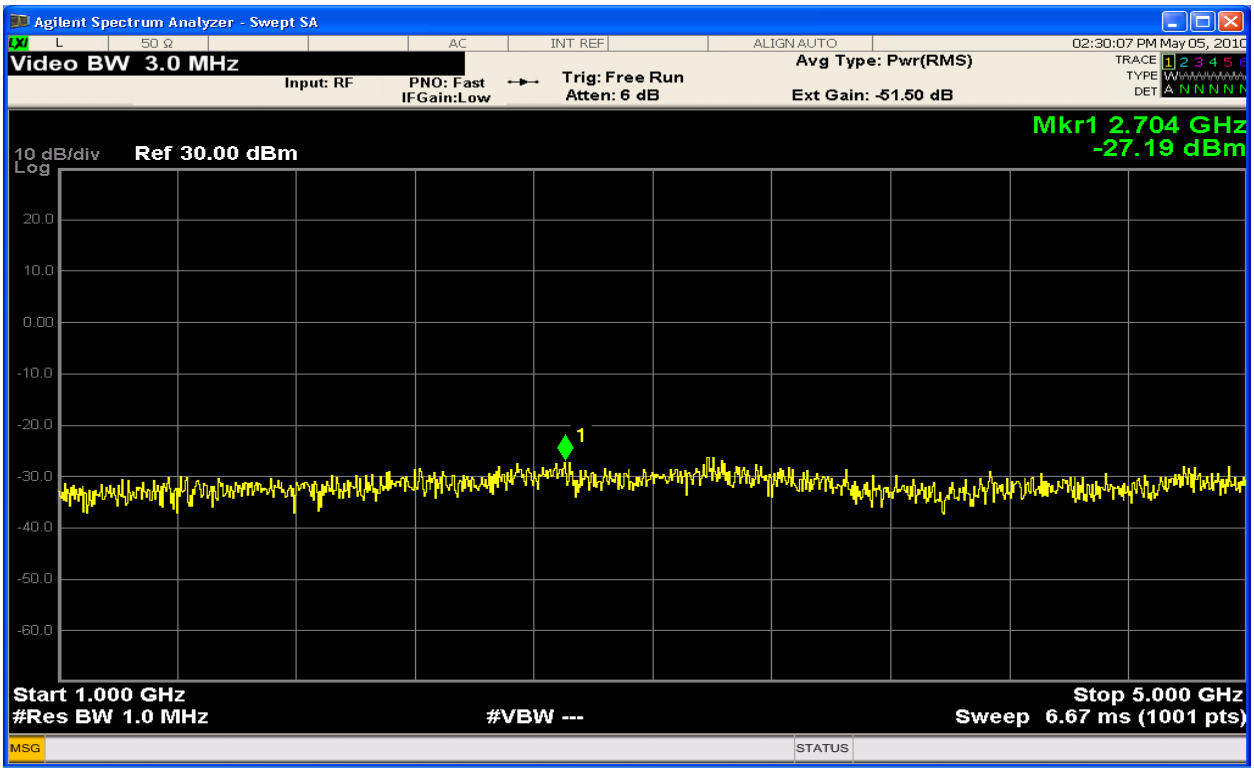


Figure 6-25: Spurious Emissions TX1_QPSK (1GHz-5GHz)

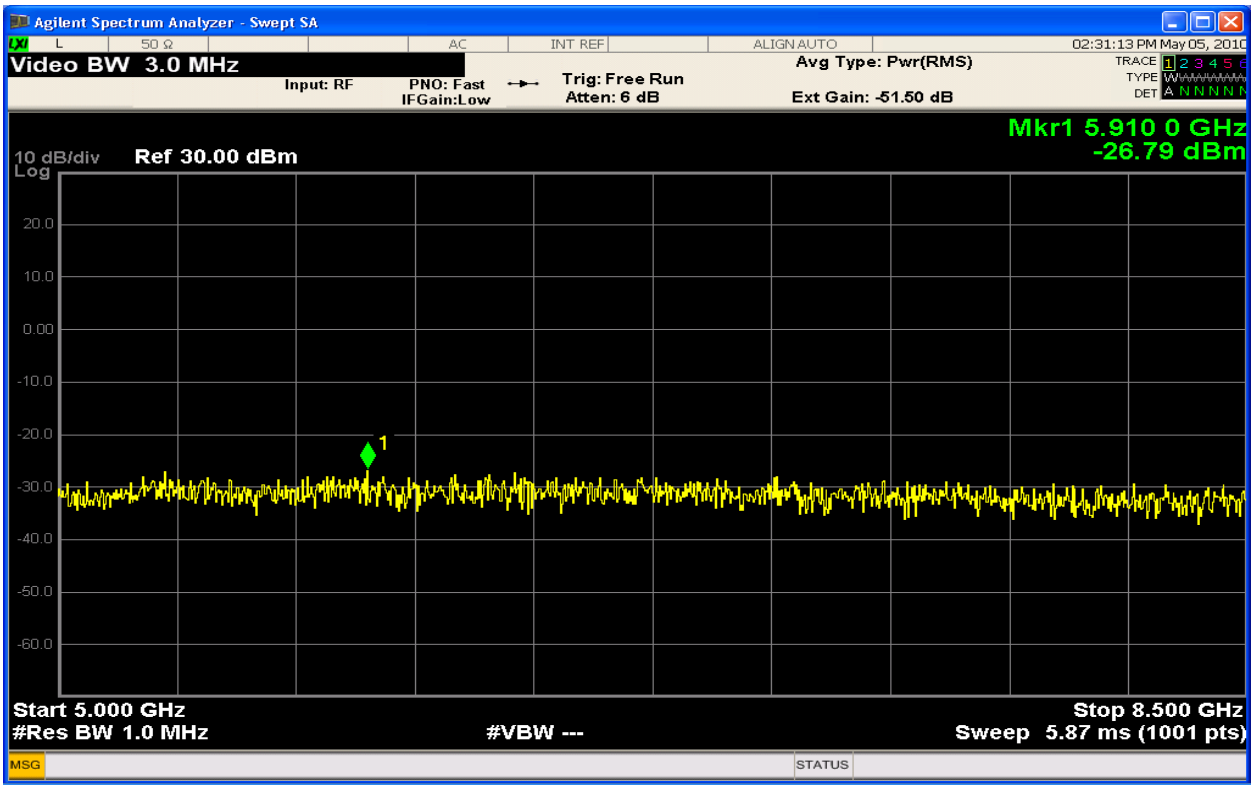


Figure 6-26: Spurious Emissions TX1_QPSK (5GHz-8.5GHz)

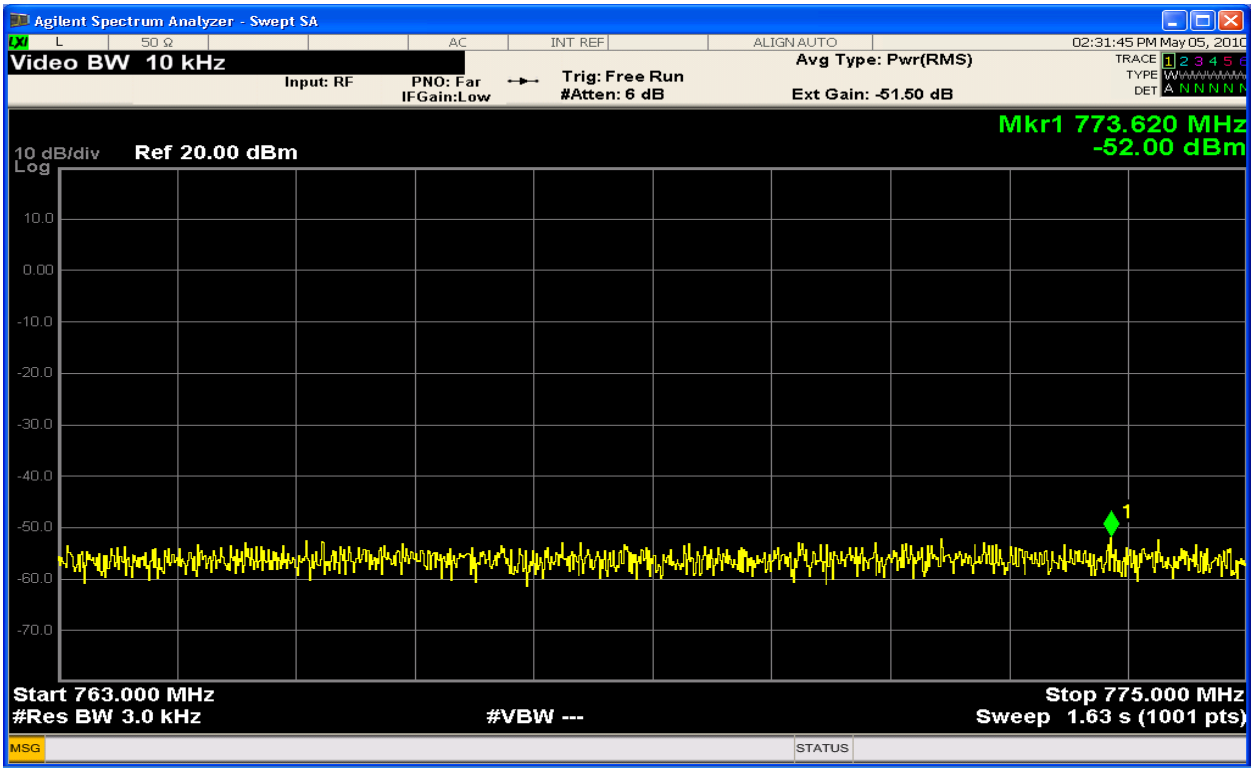


Figure 6-27: Spurious Emissions TX1_QPSK (763 – 775MHz)

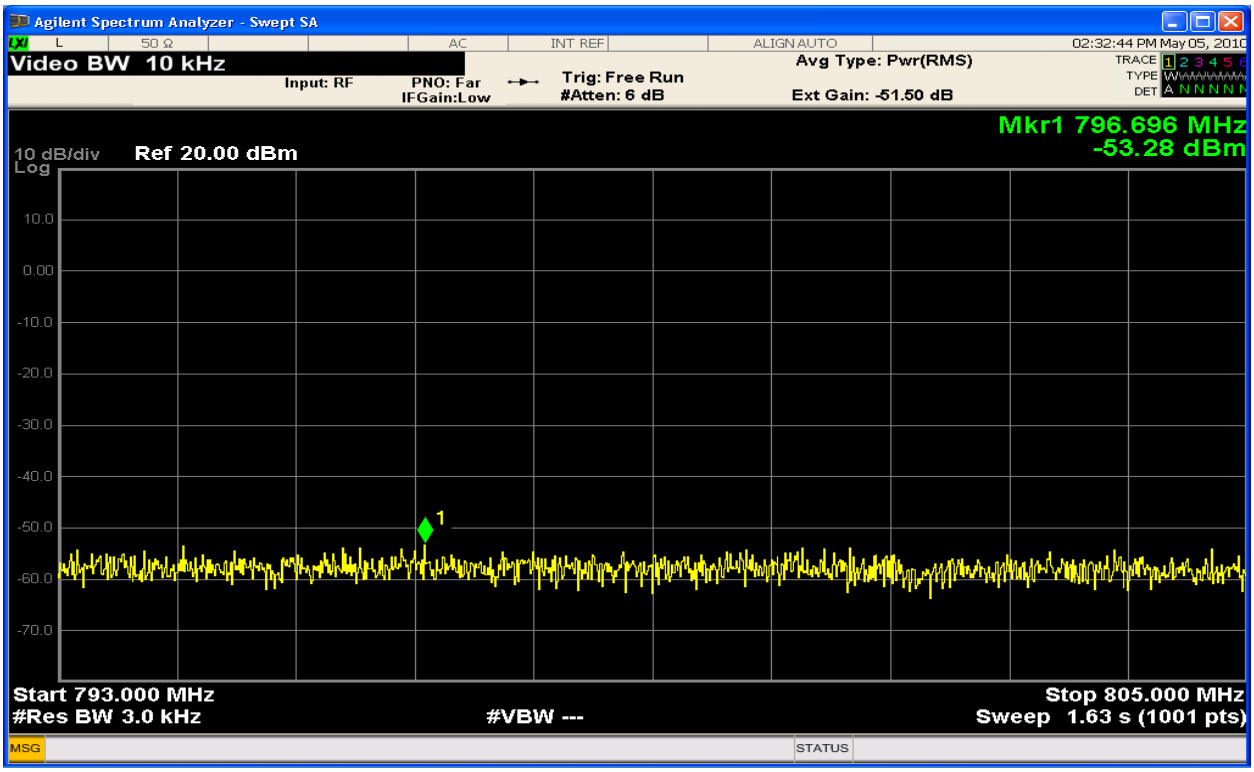


Figure 6-28: Spurious Emissions TX1_QPSK (793 – 805MHz)

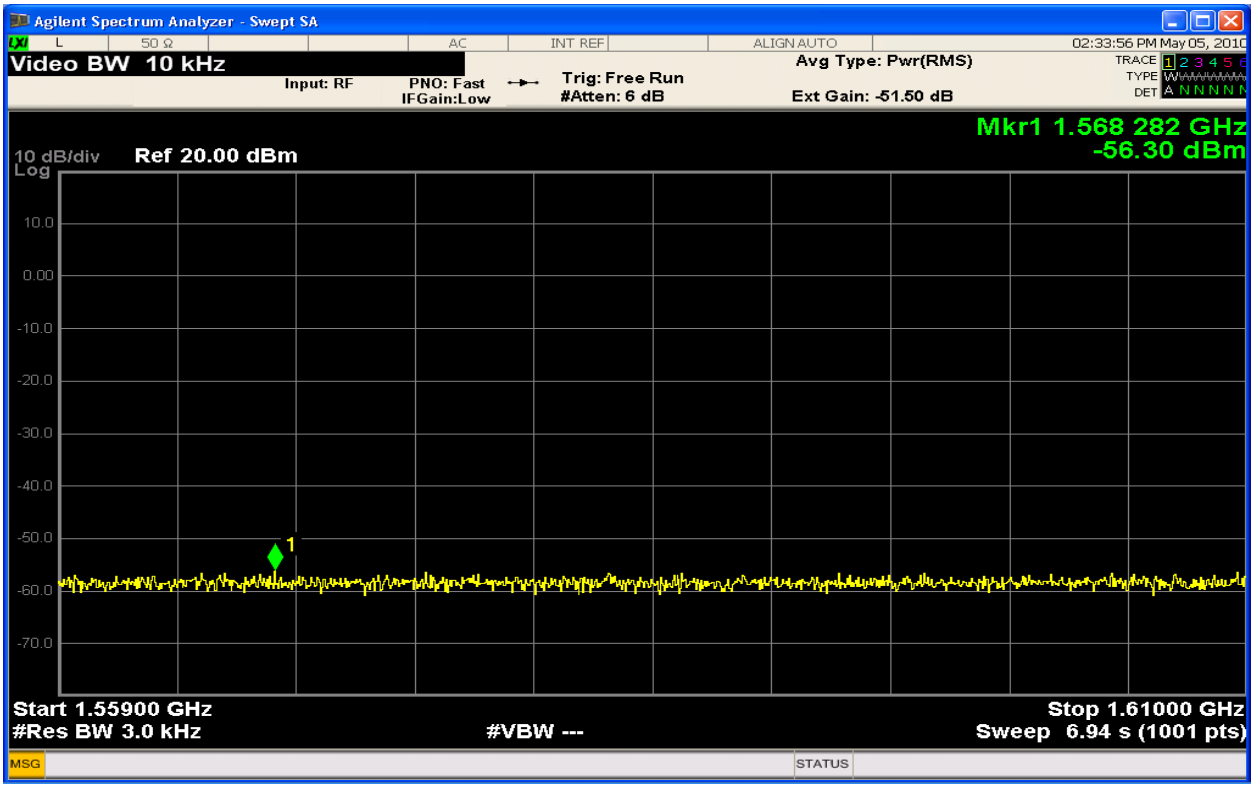


Figure 6-29: Spurious Emissions TX1_QPSK (1559 – 1610MHz)

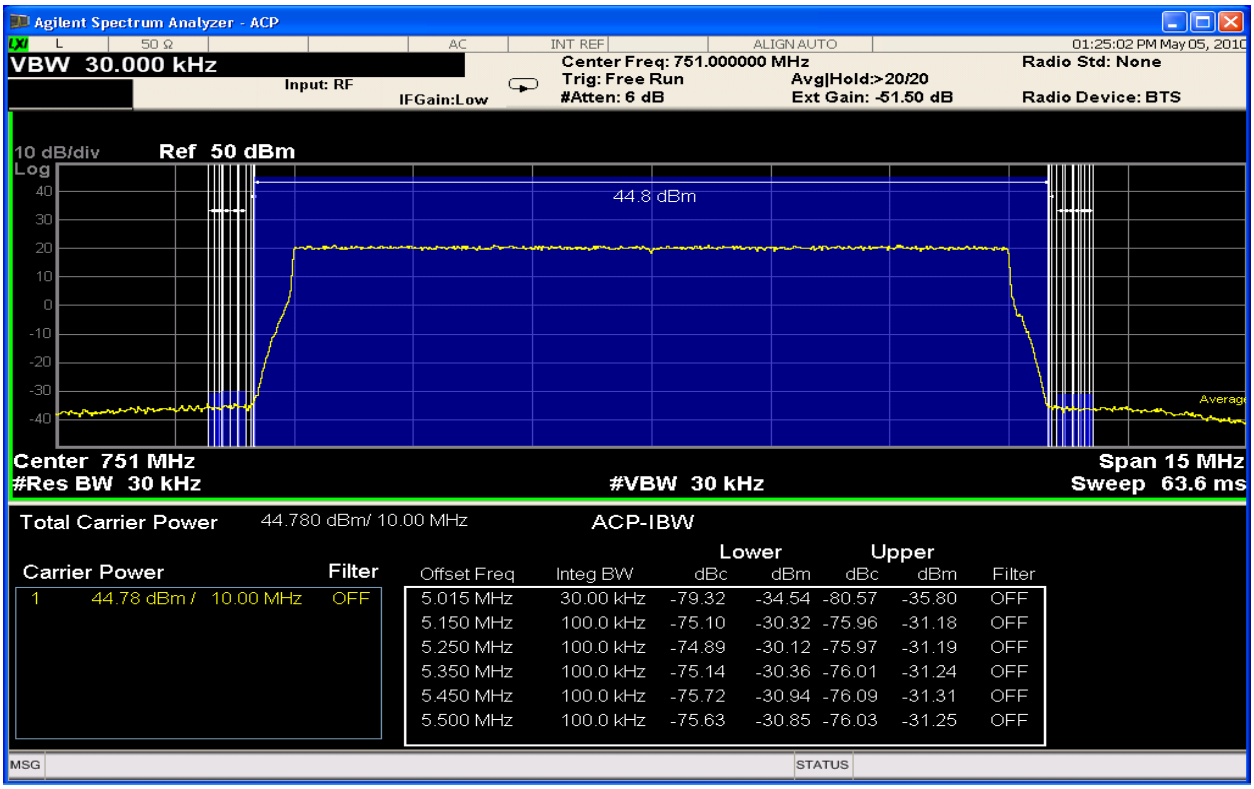


Figure 6-30: Spurious Emissions TX1_16 QAM Band Edge (ACP 15kHz – 550kHz)

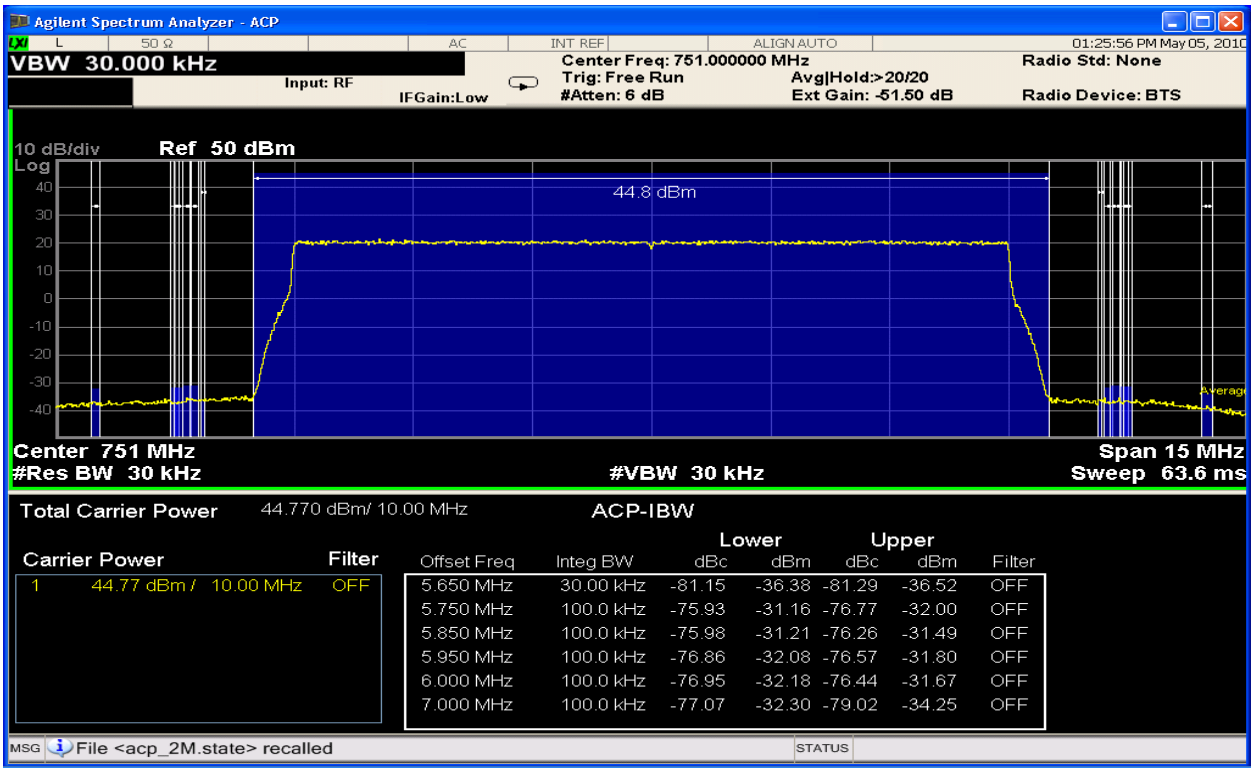


Figure 6-31: Spurious Emissions TX1_16 QAM Band Edge (ACP 650kHz – 2MHz)

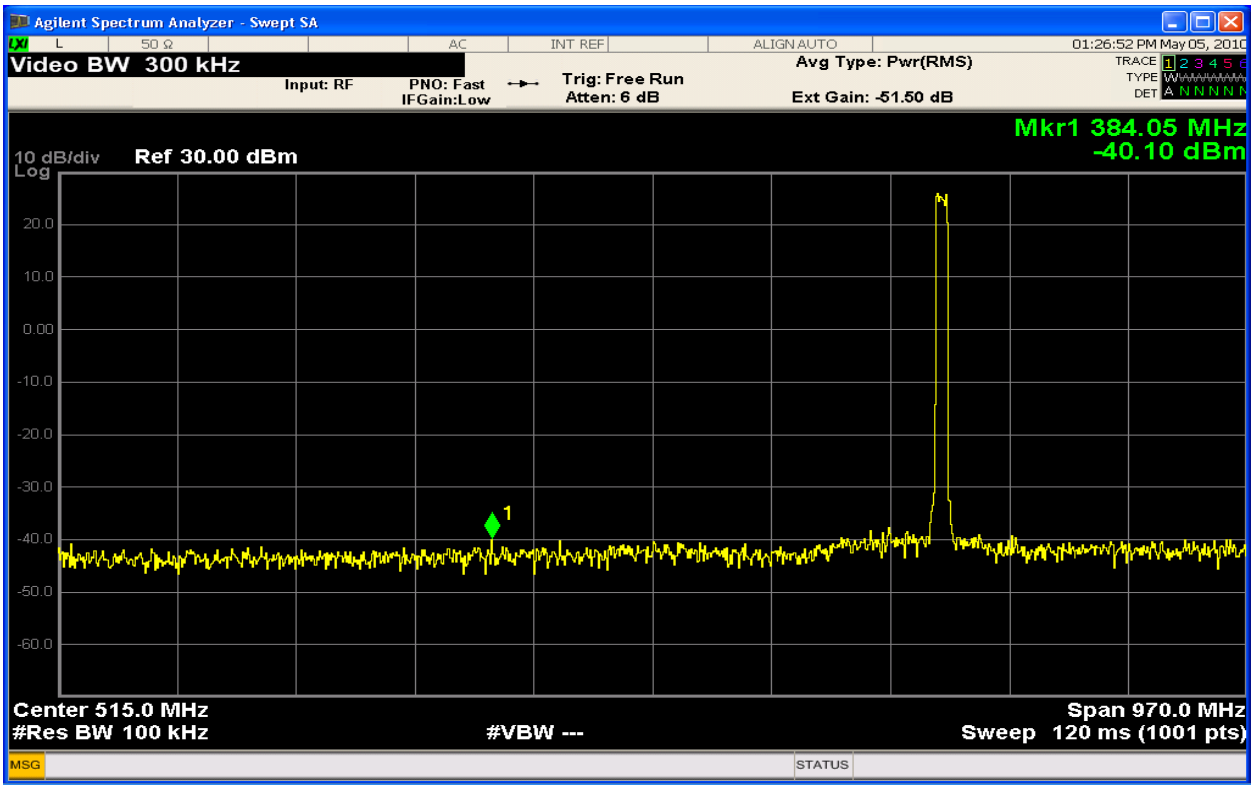


Figure 6-32: Spurious Emissions TX1_16 QAM (30MHz – 1GHz)

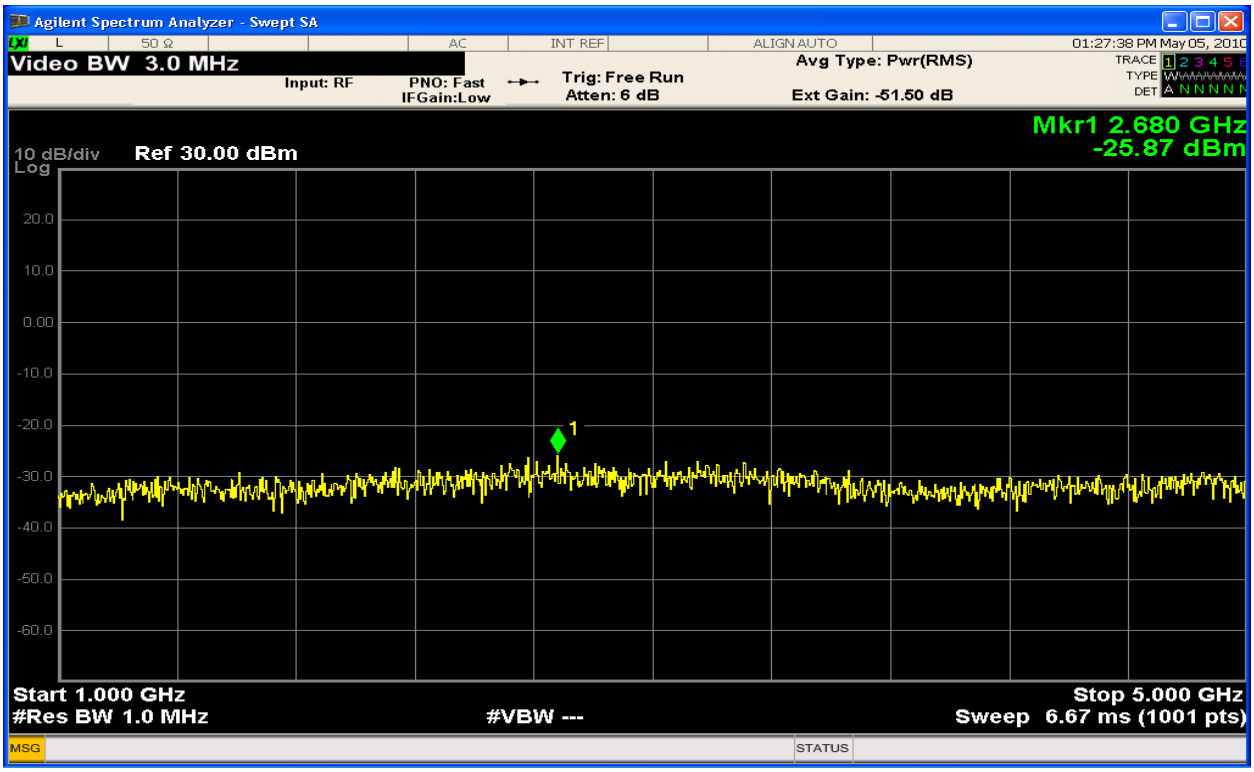


Figure 6-33: Spurious Emissions TX1_16 QAM (1GHz-5GHz)

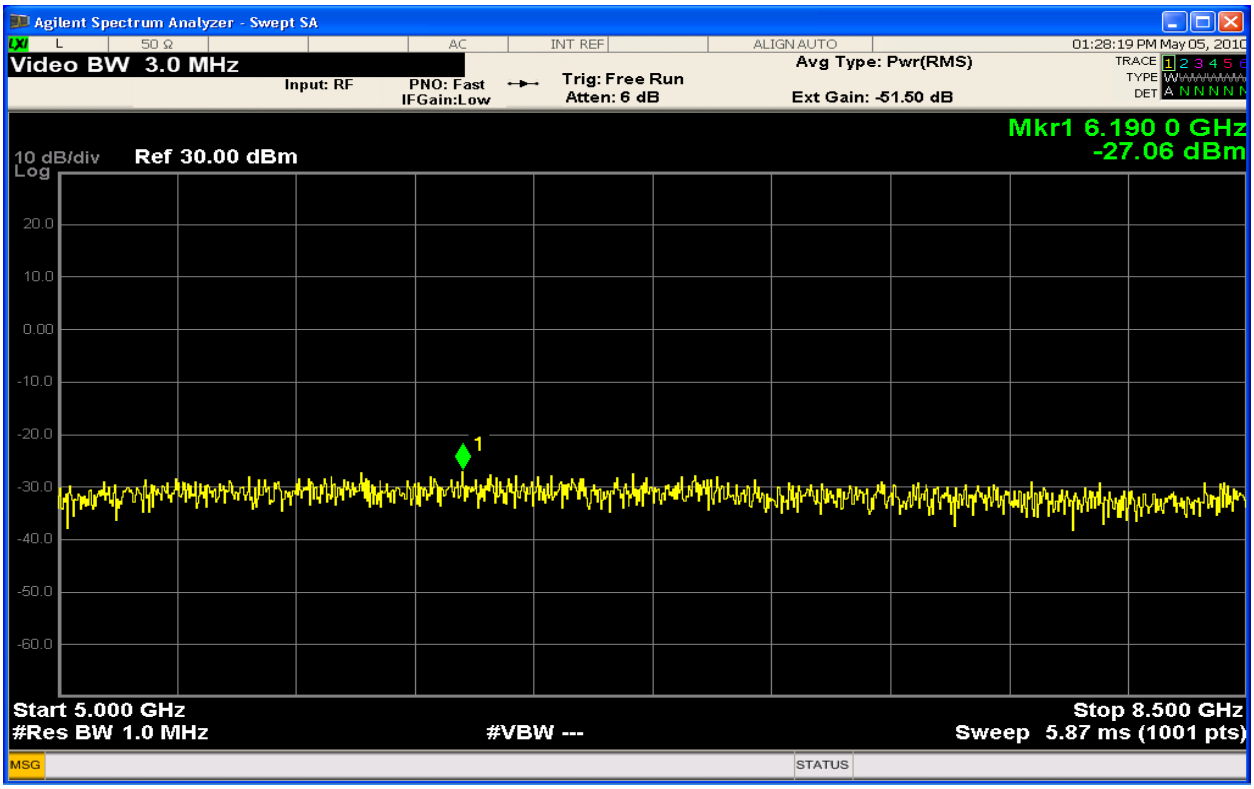


Figure 6-34: Spurious Emissions TX1_16 QAM (5GHz-8.5GHz)

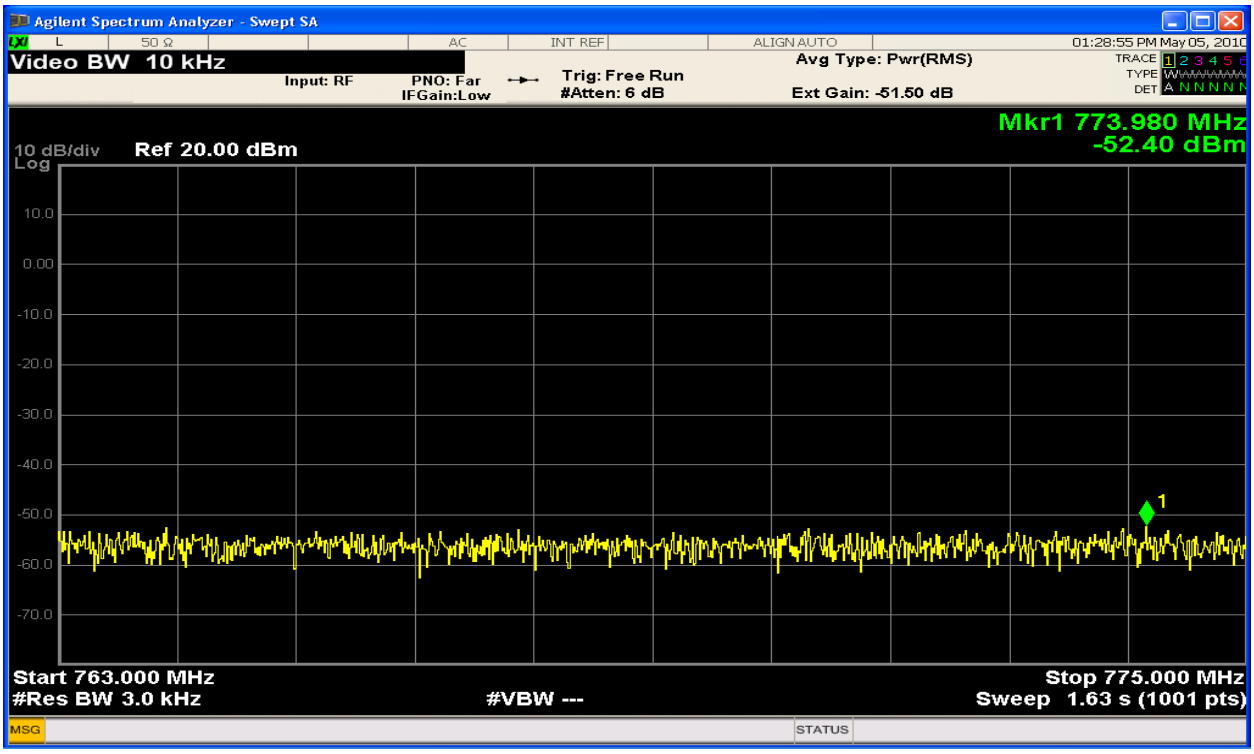


Figure 6-35: Spurious Emissions TX1_16 QAM (763 – 775MHz)

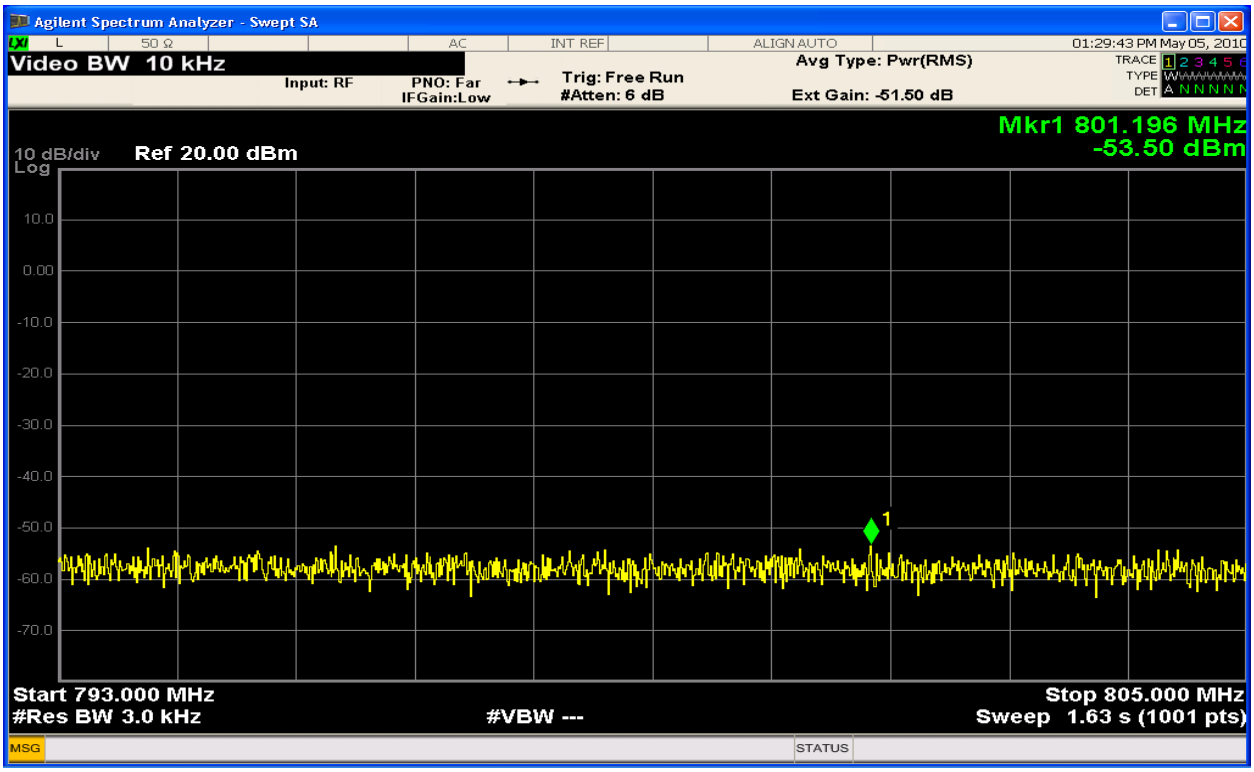


Figure 6-36: Spurious Emissions TX1_16 QAM (793 – 805MHz)

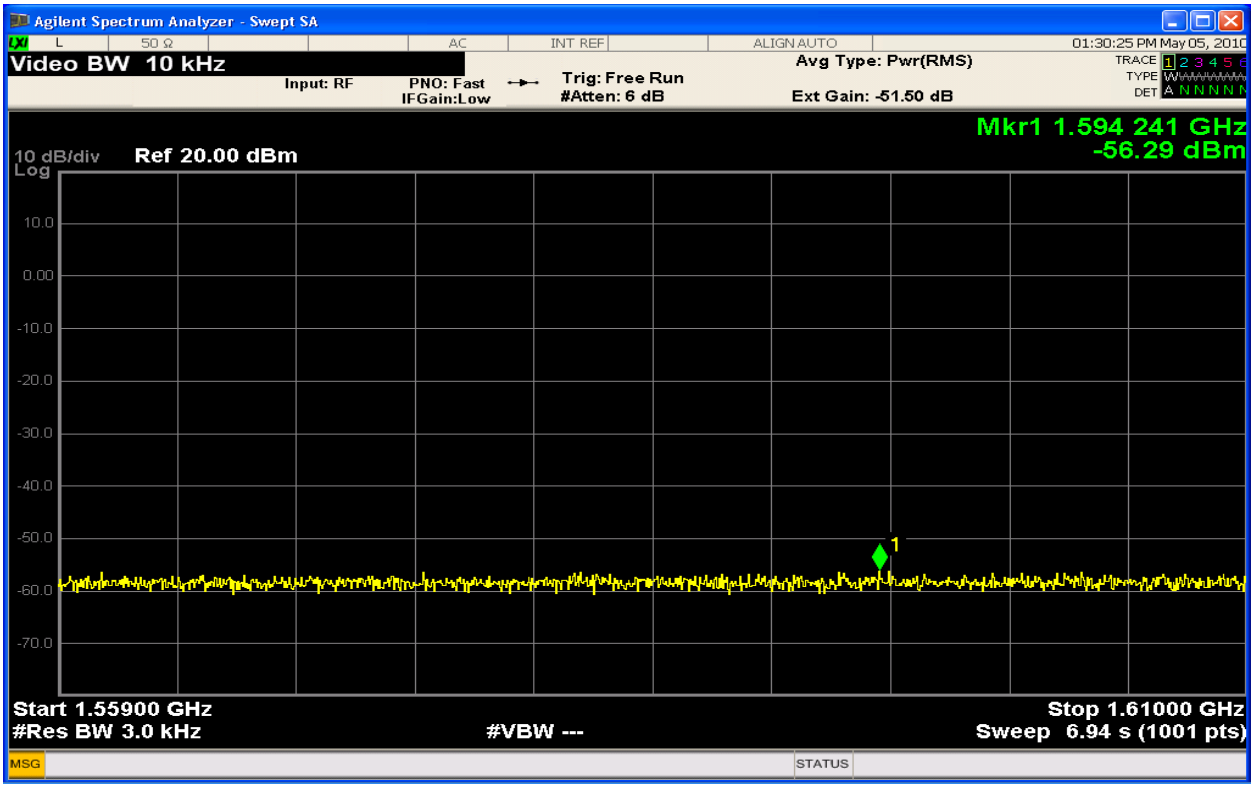


Figure 6-37: Spurious Emissions TX1_16 QAM (1559 – 1610MHz)

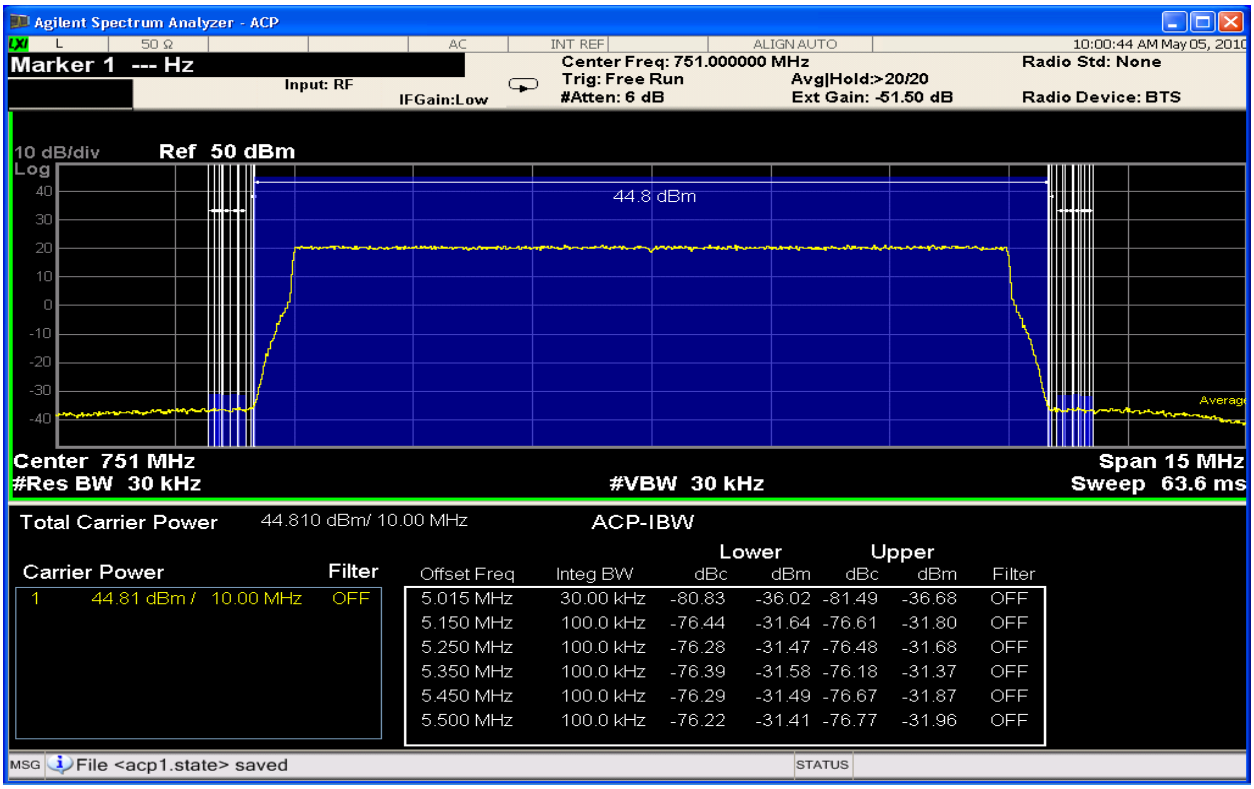


Figure 6-38: Spurious Emissions TX1_64 QAM Band Edge (ACP 15kHz – 550kHz)

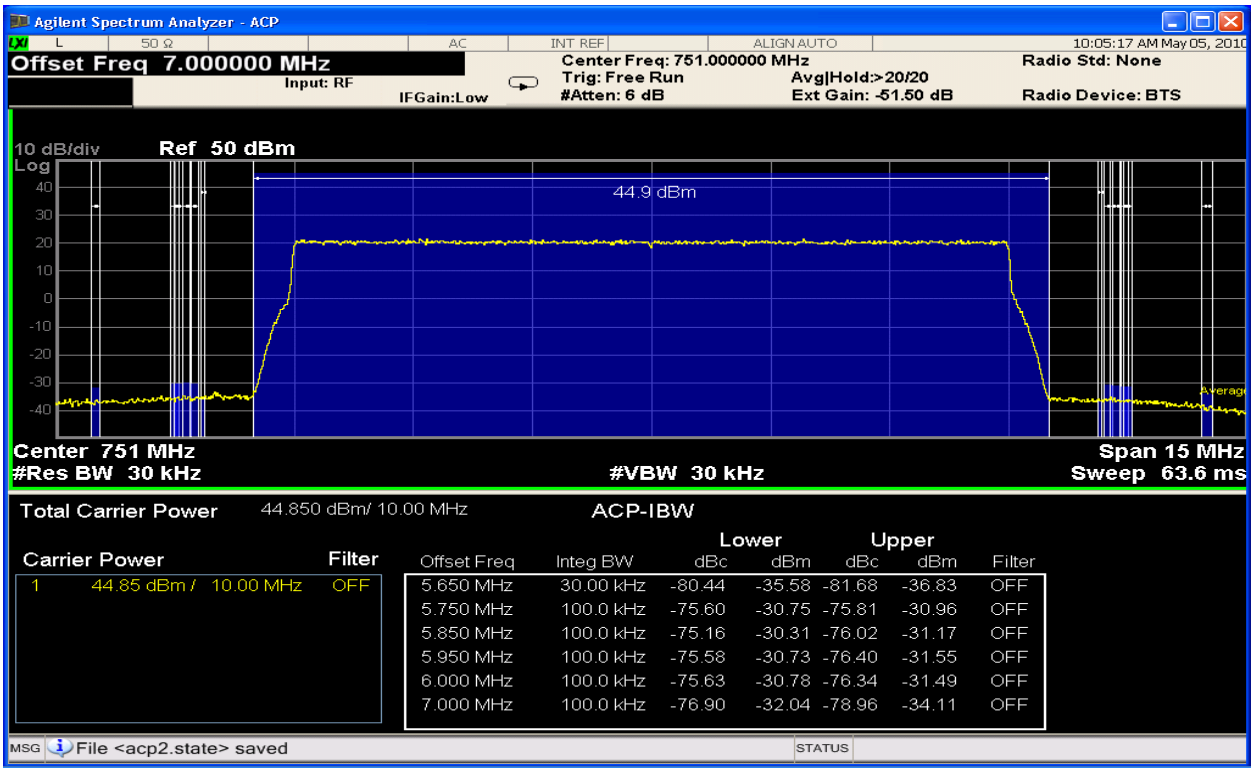


Figure 6-39: Spurious Emissions TX1_64 QAM Band Edge (ACP 650kHz – 2MHz)

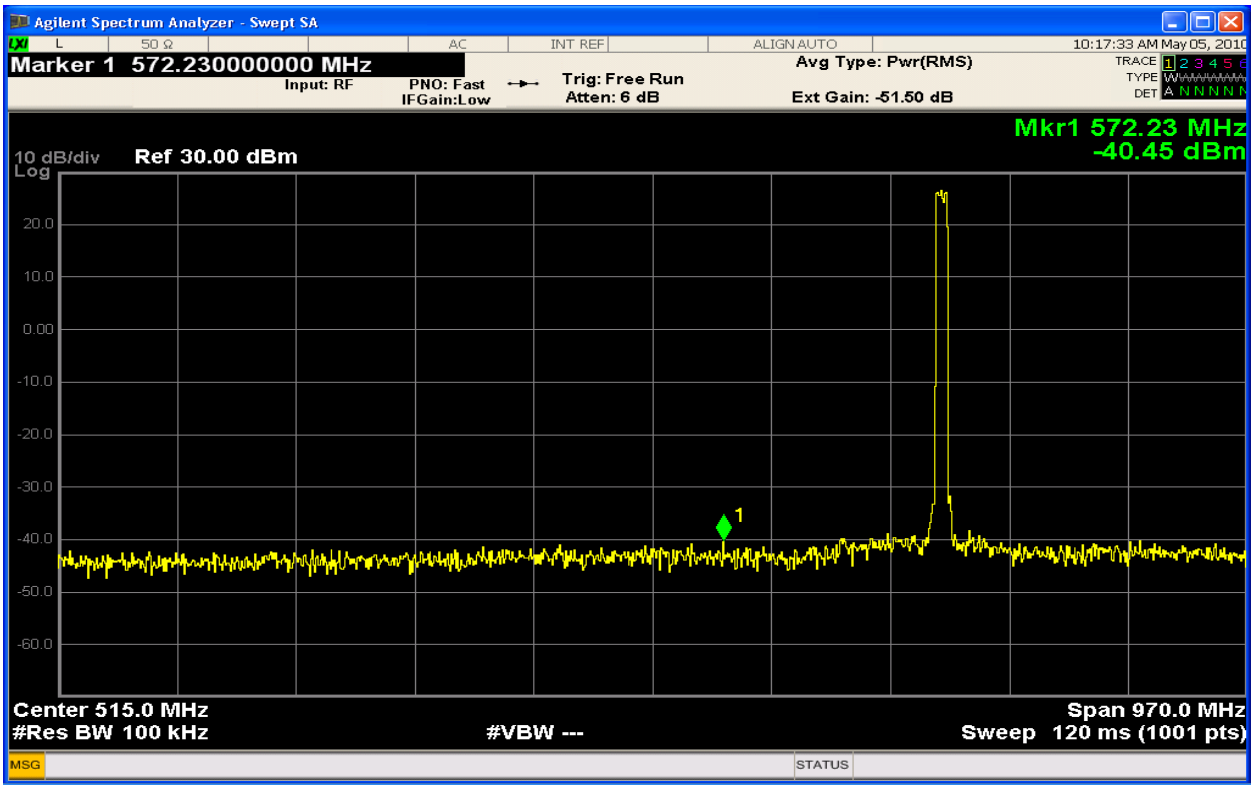


Figure 6-40: Spurious Emissions TX1_64 QAM (30MHz – 1GHz)

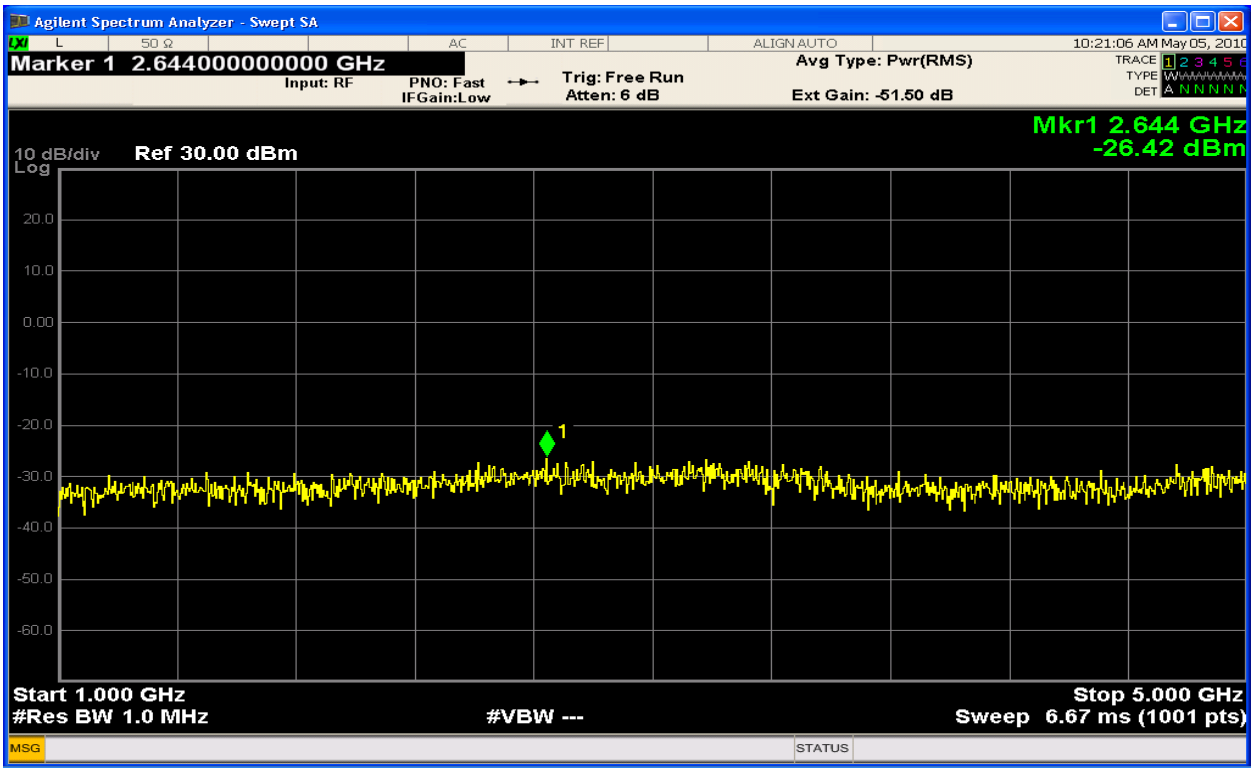


Figure 6-41: Spurious Emissions TX1_64 QAM (1GHz – 5GHz)

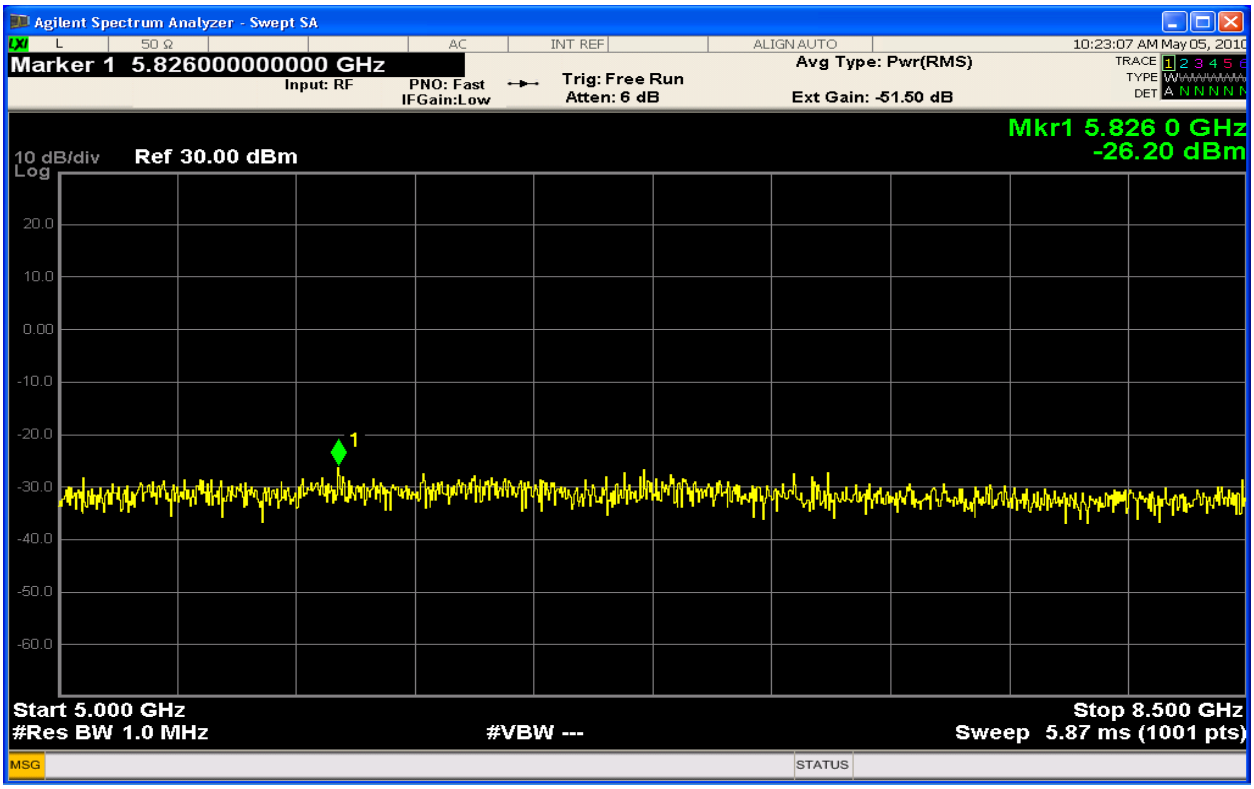


Figure 6-42: Spurious Emissions TX1_64 QAM (5GHz – 8.5GHz)

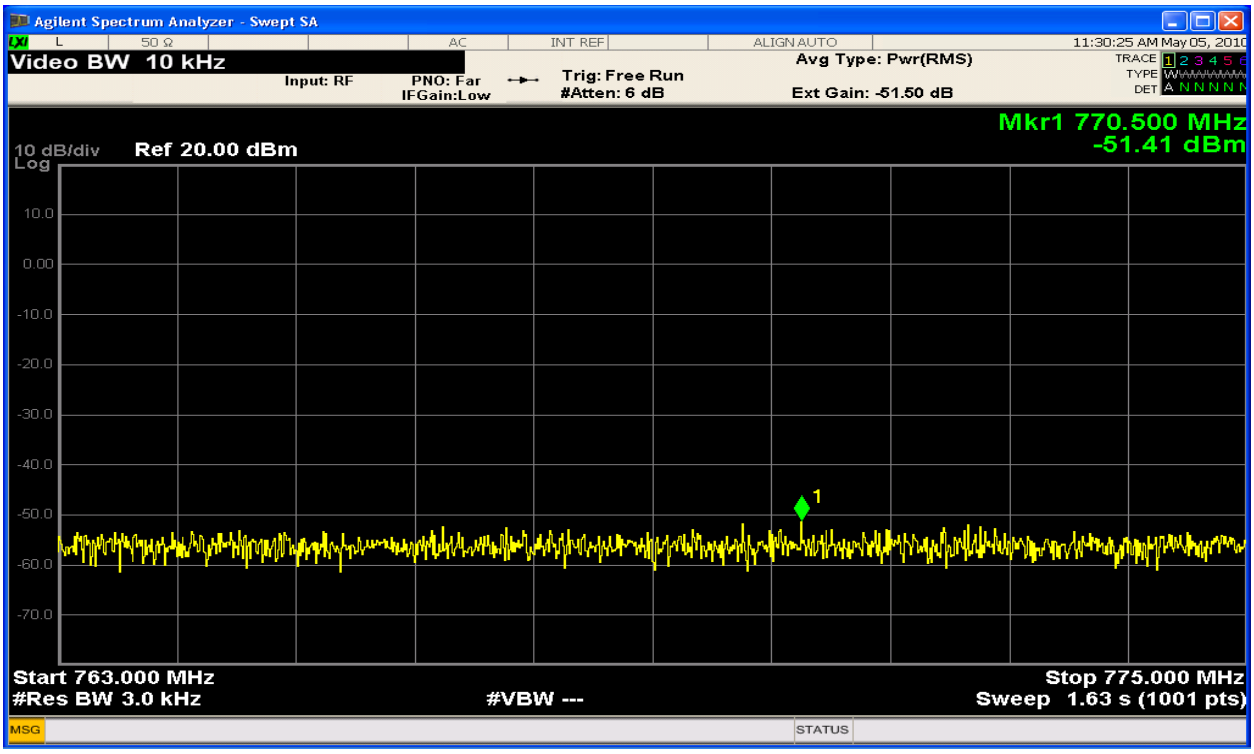


Figure 6-43: Spurious Emissions TX1_64 QAM (763 – 775MHz)

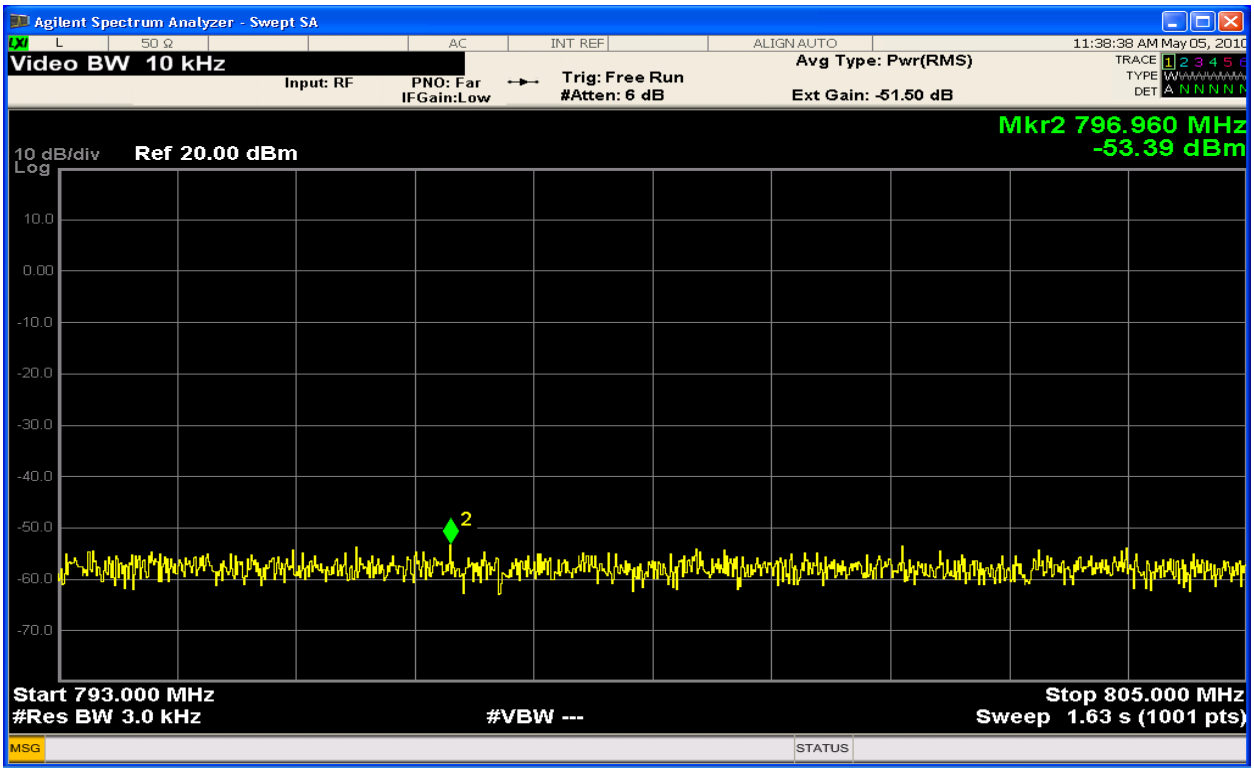


Figure 6-44: Spurious Emissions TX1_64 QAM (793 – 805MHz)

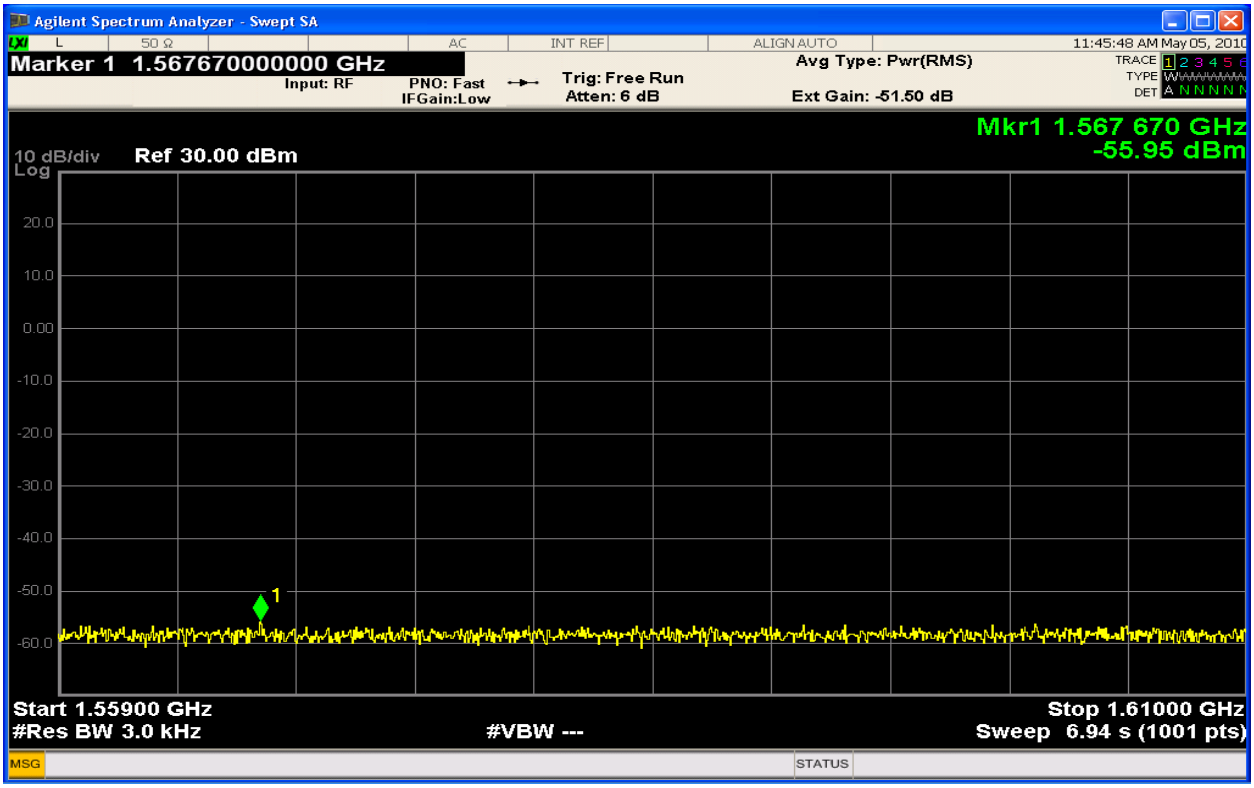


Figure 6-45: Spurious Emissions TX1_64 QAM (1559 – 1610MHz)

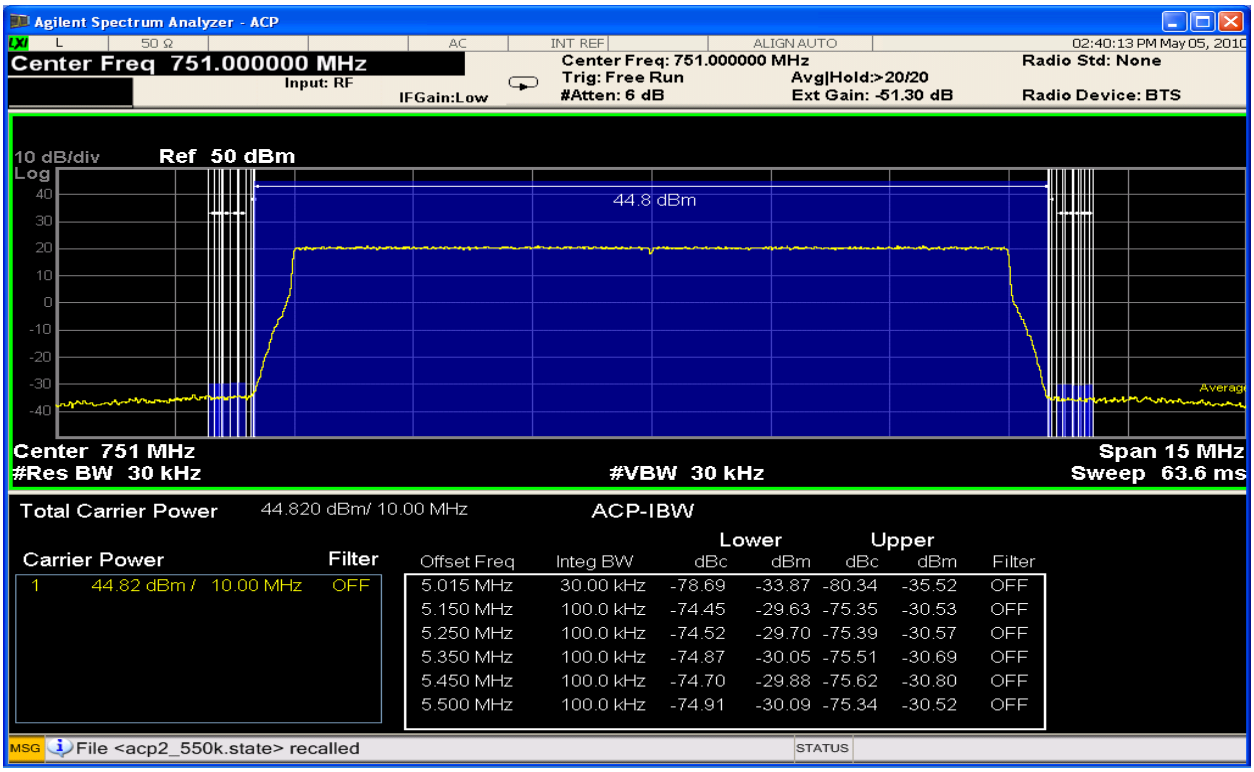


Figure 6-46: Spurious Emissions TX2_QPSK Band Edge (ACP 15kHz – 550kHz)

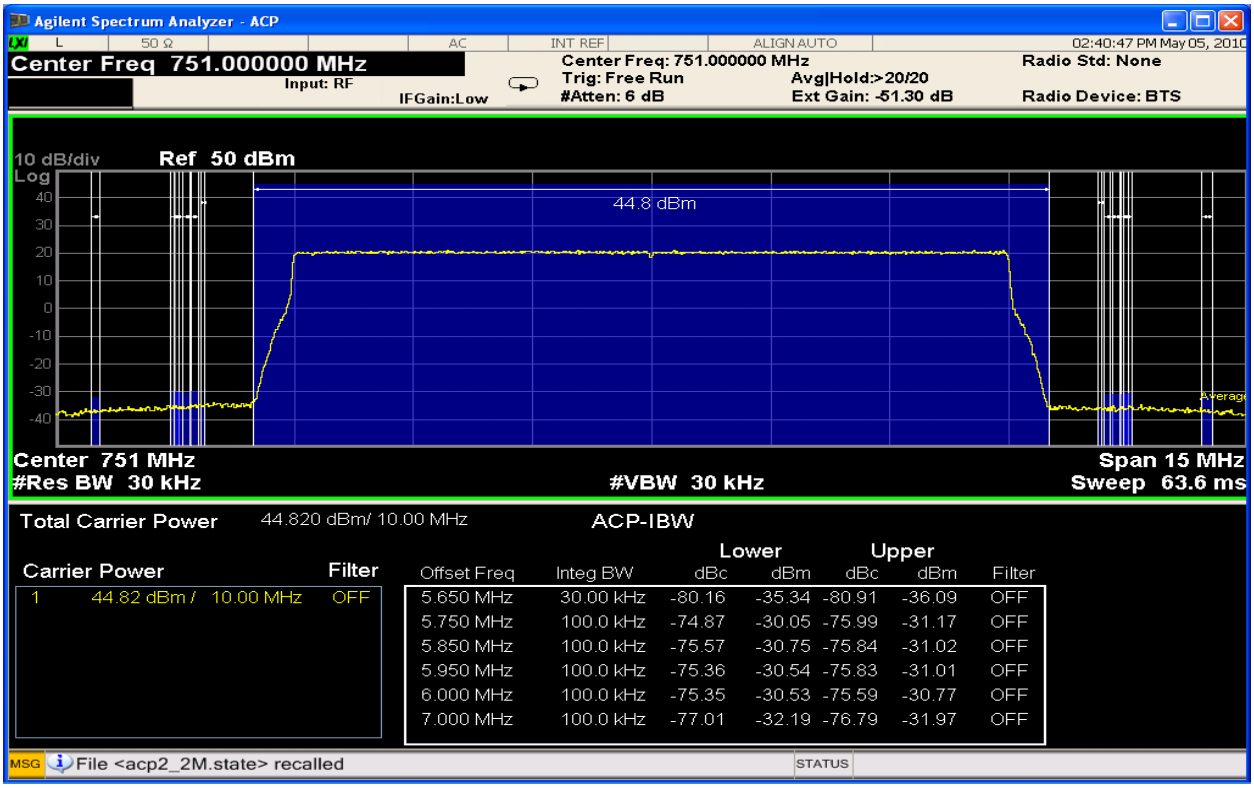


Figure 6-47: Spurious Emissions TX2_QPSK Band Edge (ACP 650kHz – 2MHz)

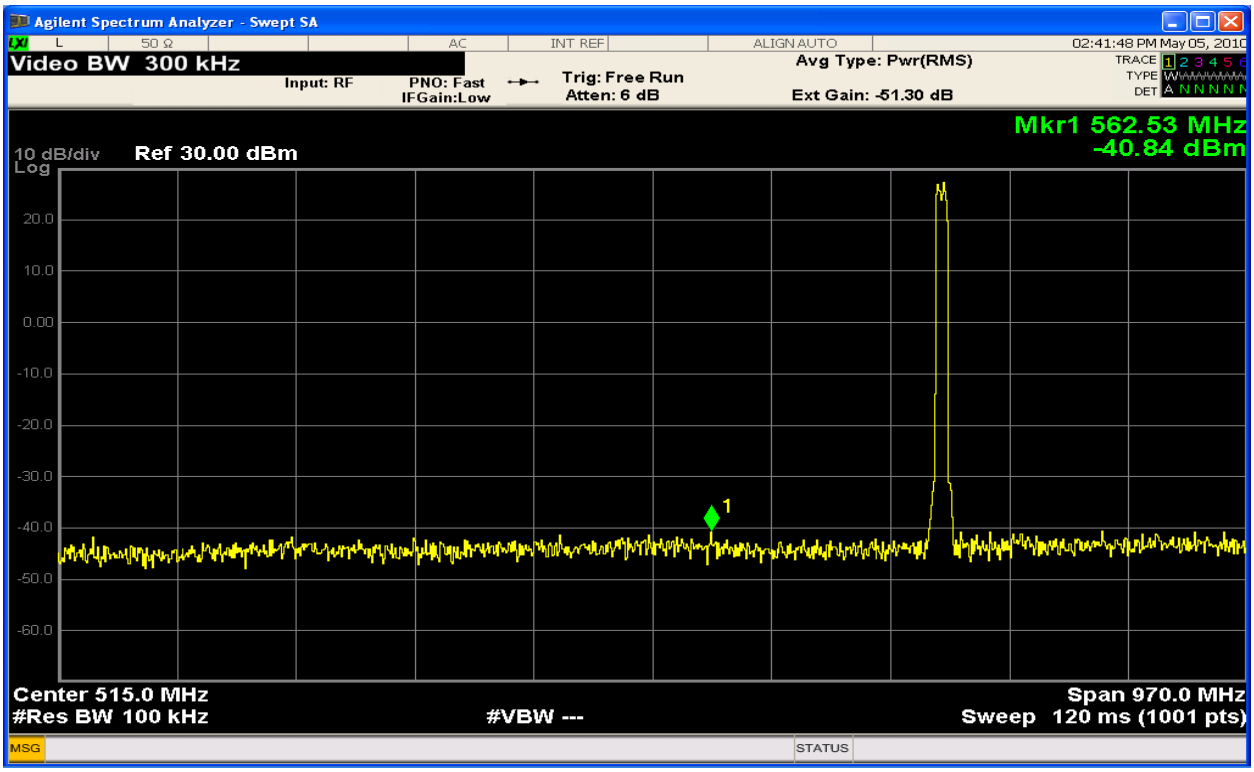


Figure 6-48: Spurious Emissions TX2_QPSK (30MHz – 1GHz)

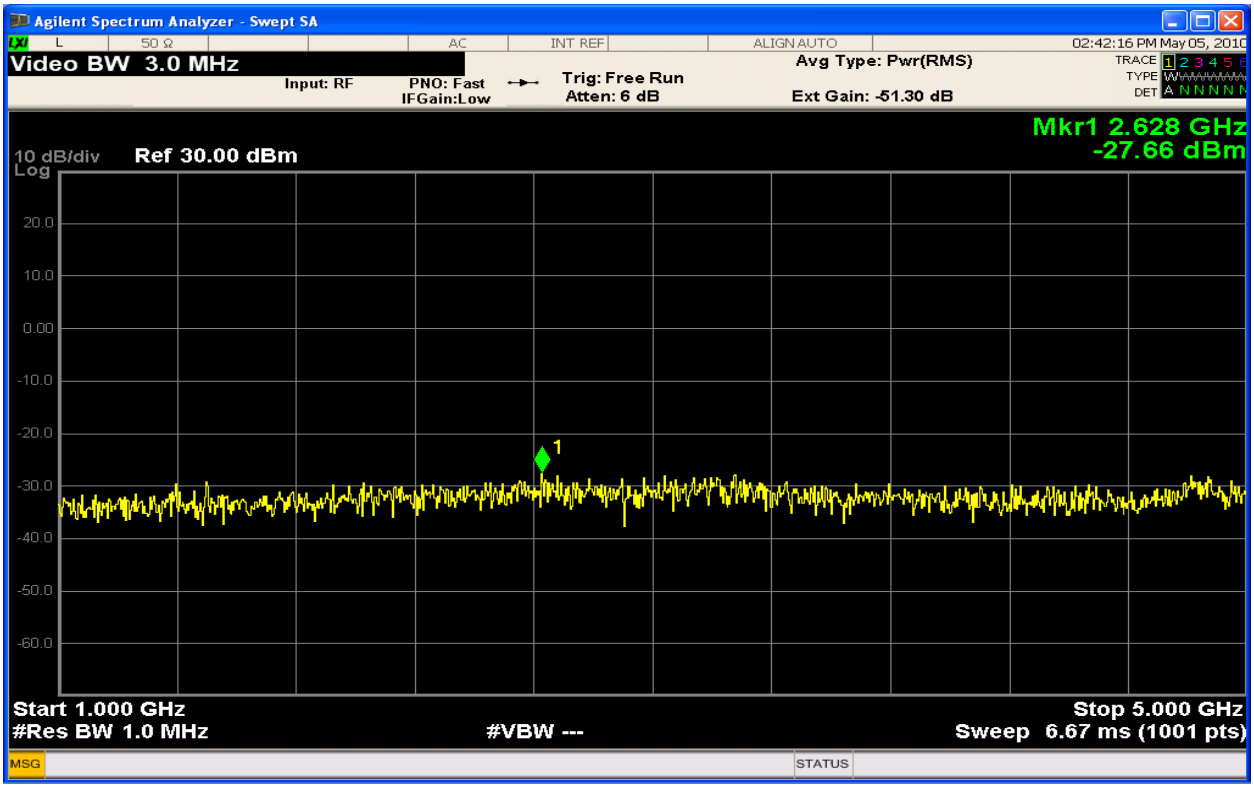


Figure 6-49: Spurious Emissions TX2_QPSK (1GHz-5GHz)

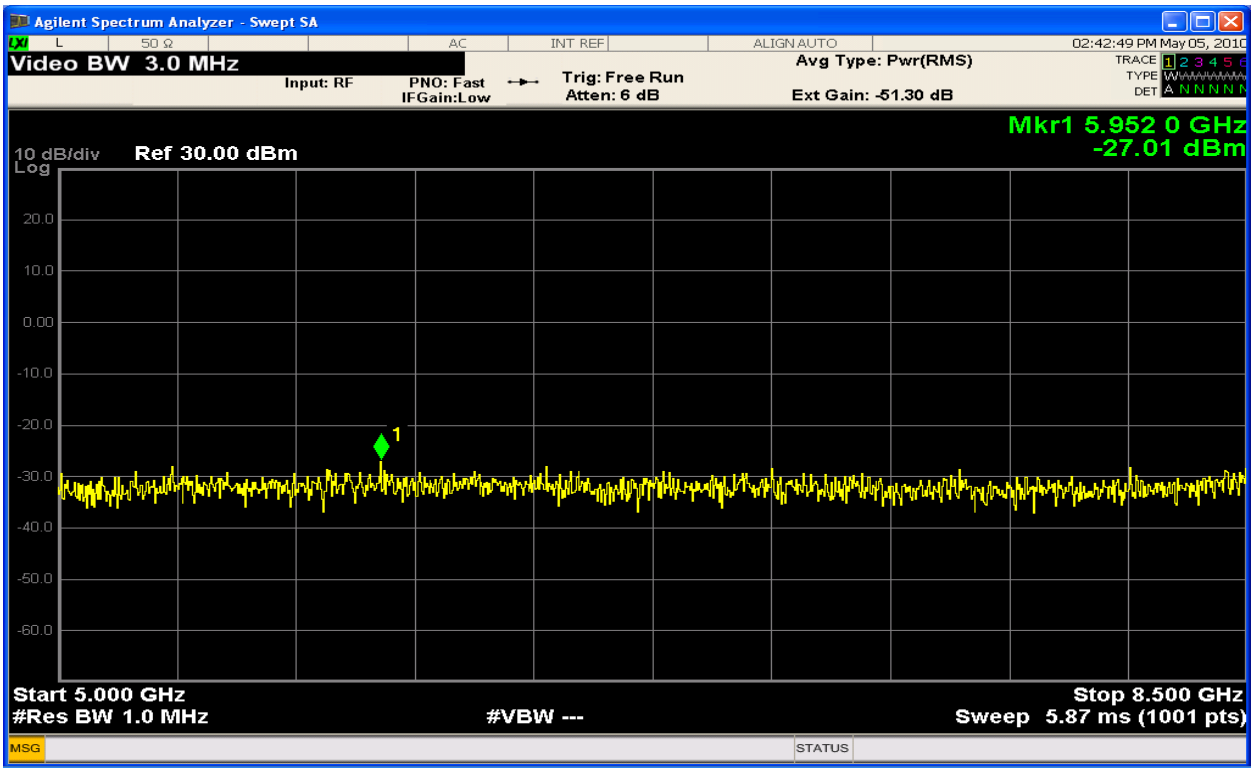


Figure 6-50: Spurious Emissions TX2_QPSK (5GHz-8.5GHz)

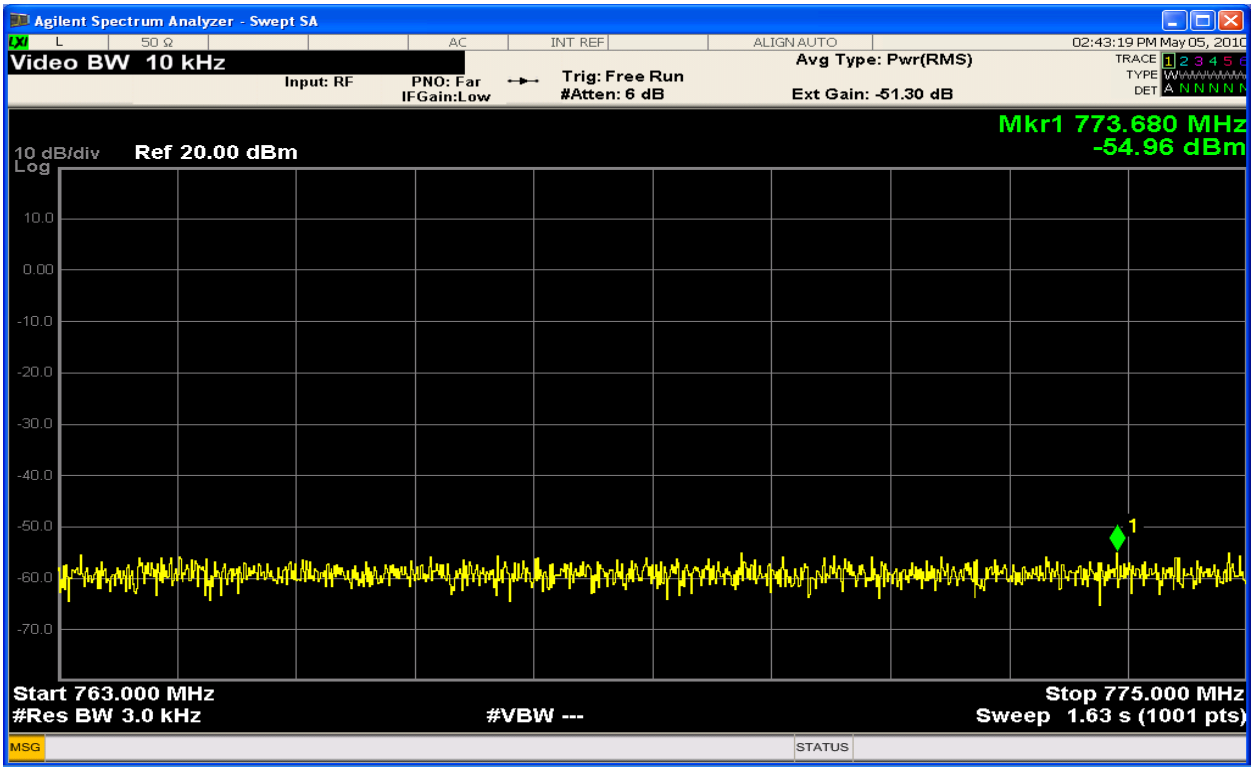


Figure 6-51: Spurious Emissions TX2_QPSK (763 – 775MHz)

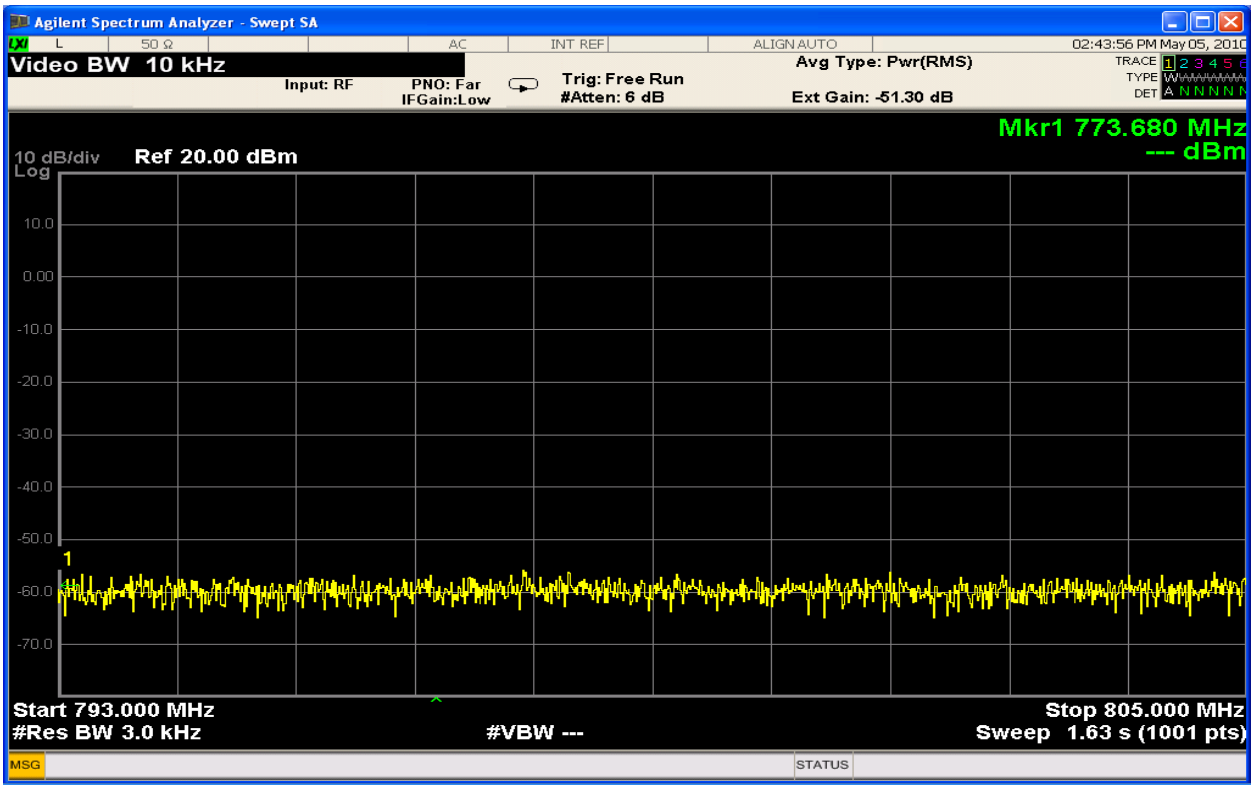


Figure 6-52: Spurious Emissions TX2_QPSK (793 – 805MHz)

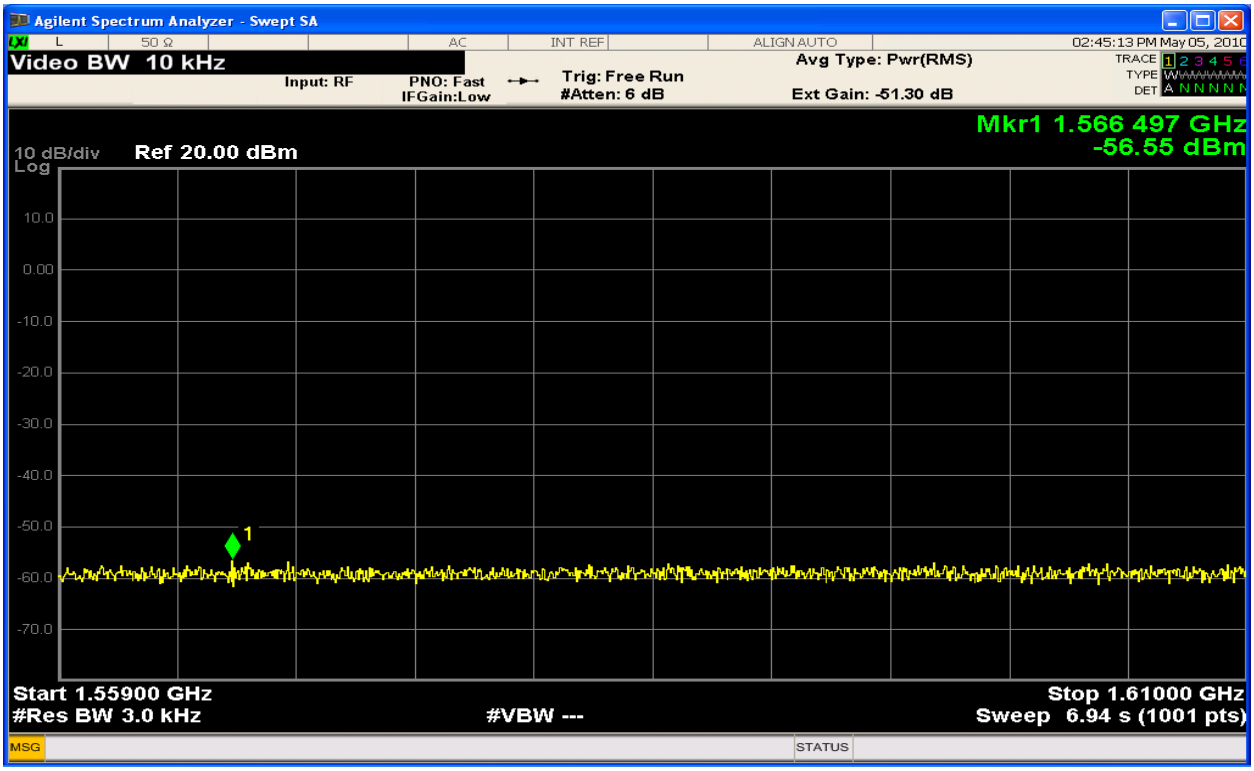


Figure 6-53: Spurious Emissions TX2_QPSK (1559 – 1610MHz)

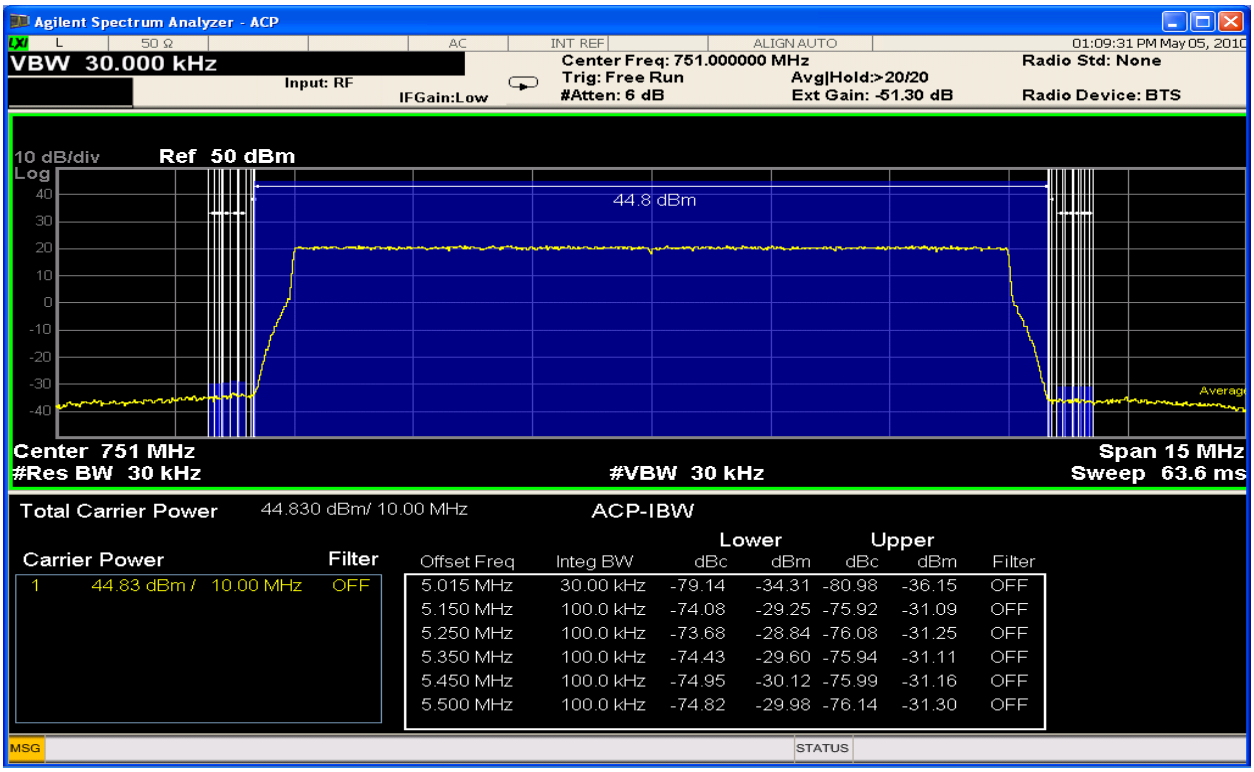


Figure 6-54: Spurious Emissions TX2_16 QAM Band Edge (ACP 15kHz – 550kHz)

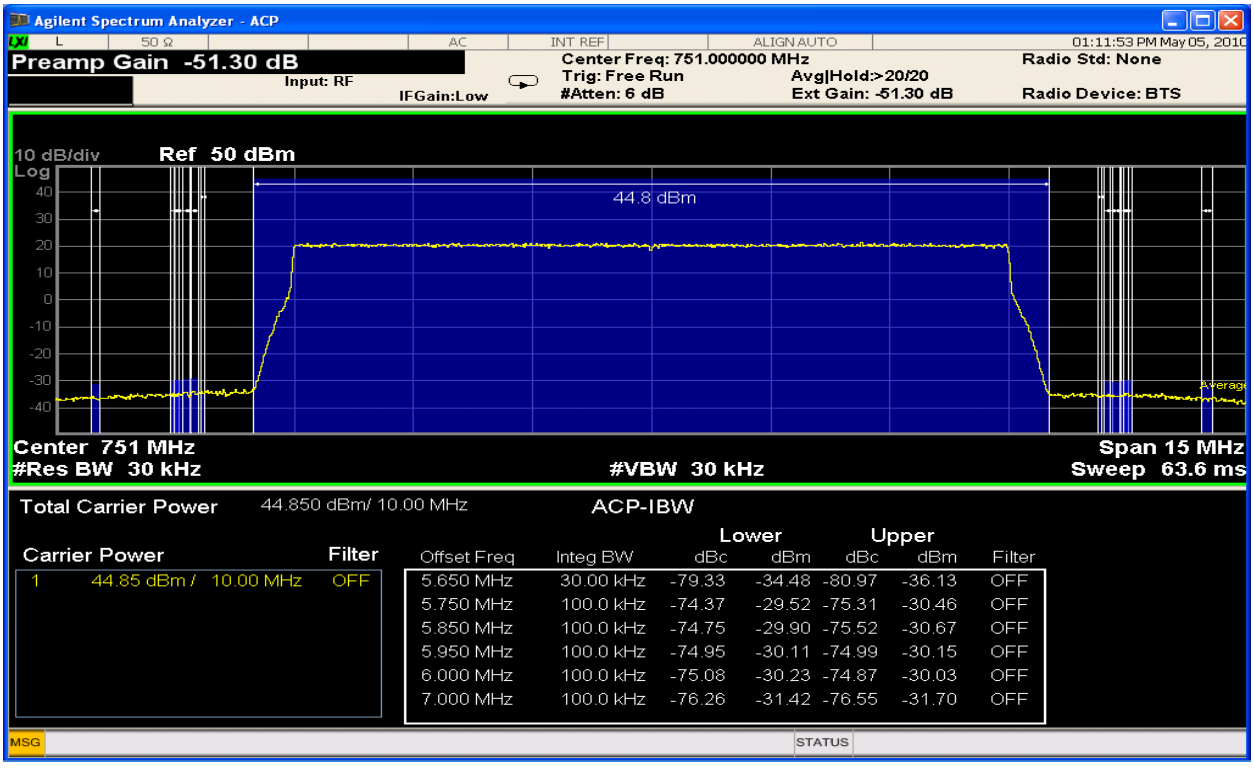


Figure 6-55: Spurious Emissions TX2_16 QAM Band Edge (ACP 650kHz – 2MHz)

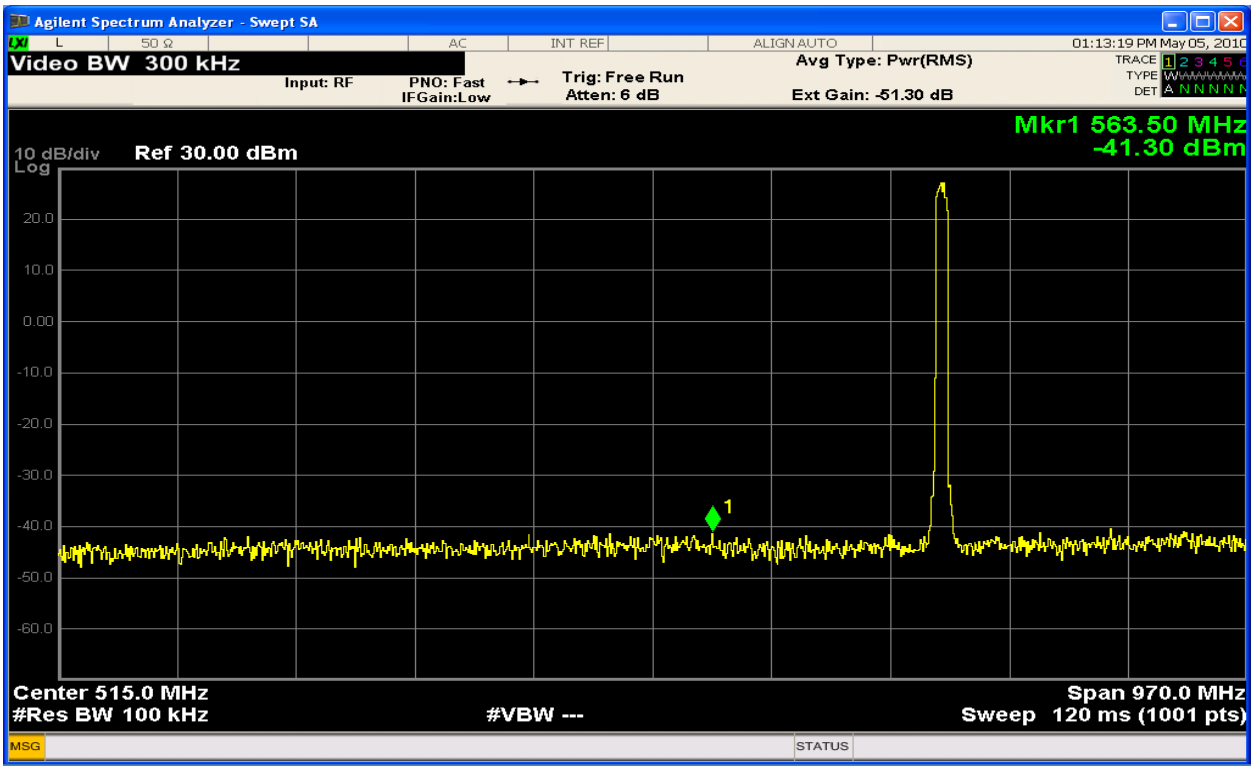


Figure 6-56: Spurious Emissions TX2_16 QAM (30MHz – 1GHz)

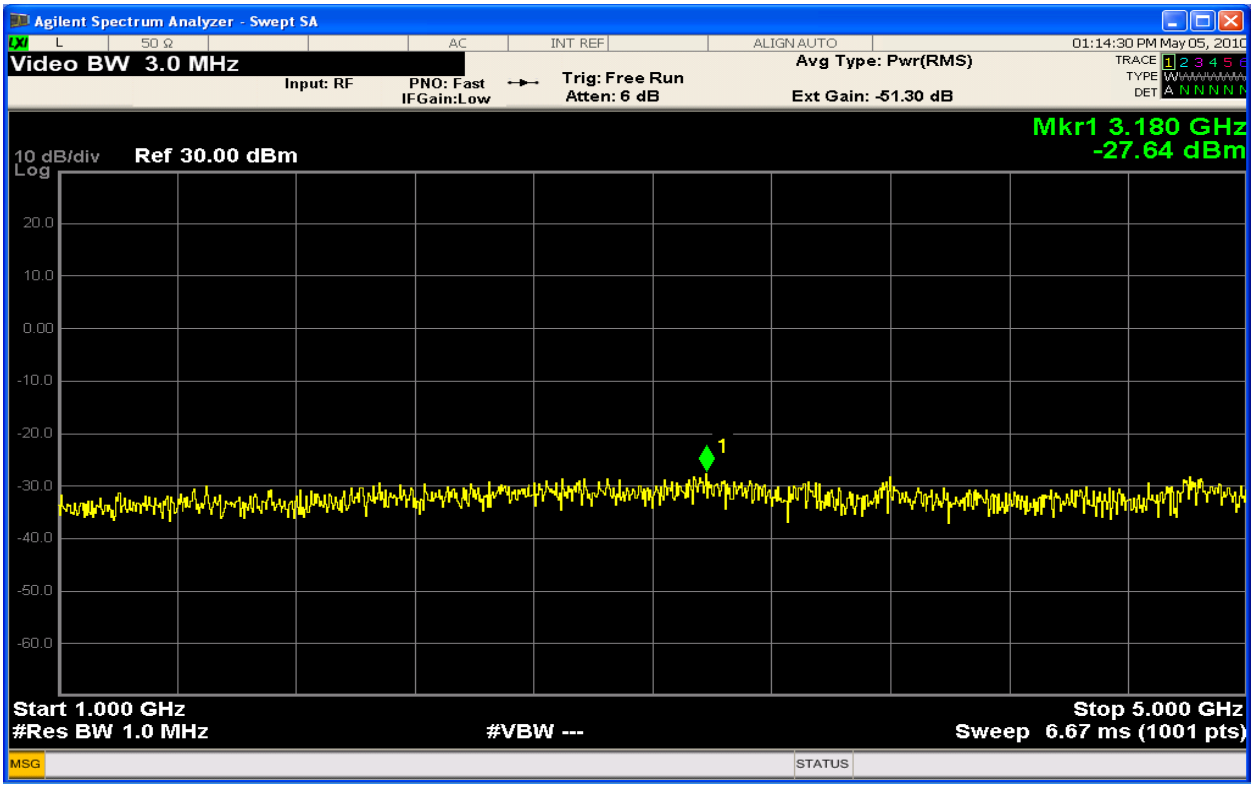


Figure 6-57: Spurious Emissions TX2_16 QAM (1GHz – 5GHz)

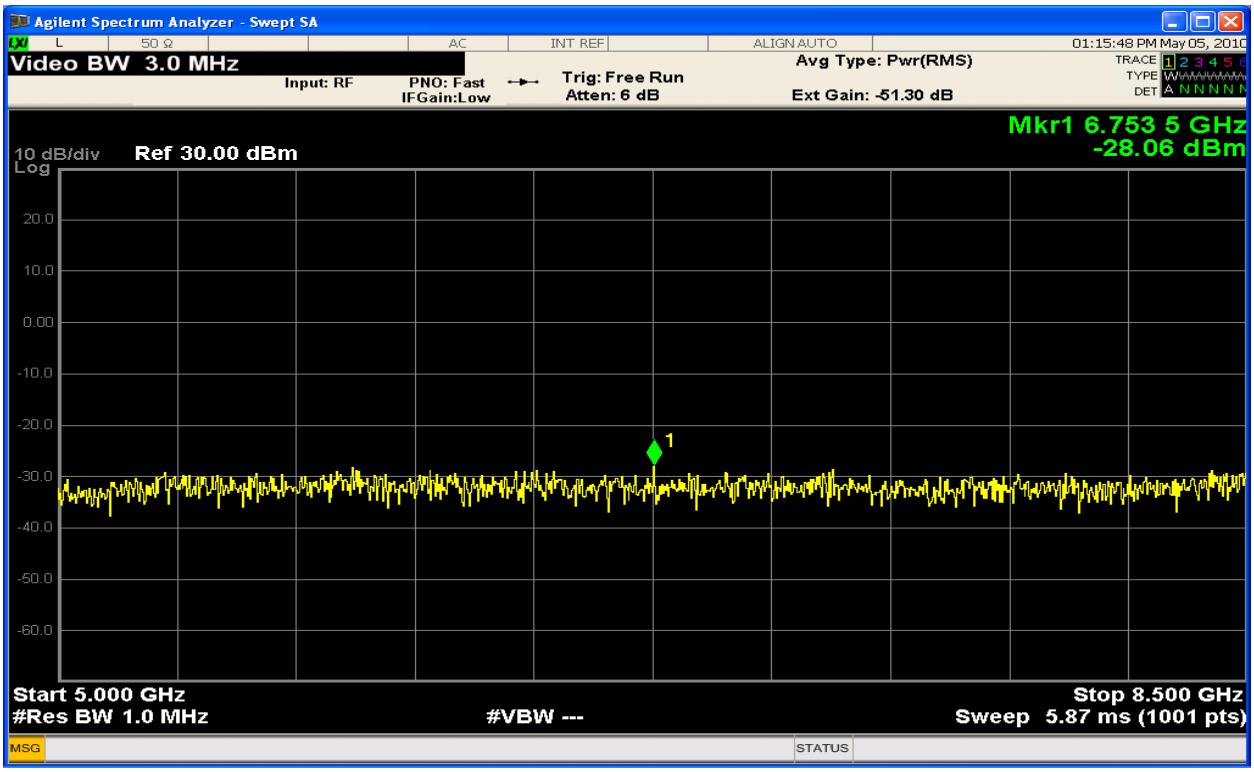


Figure 6-58: Spurious Emissions TX2_16 QAM (5GHz – 8.5GHz)

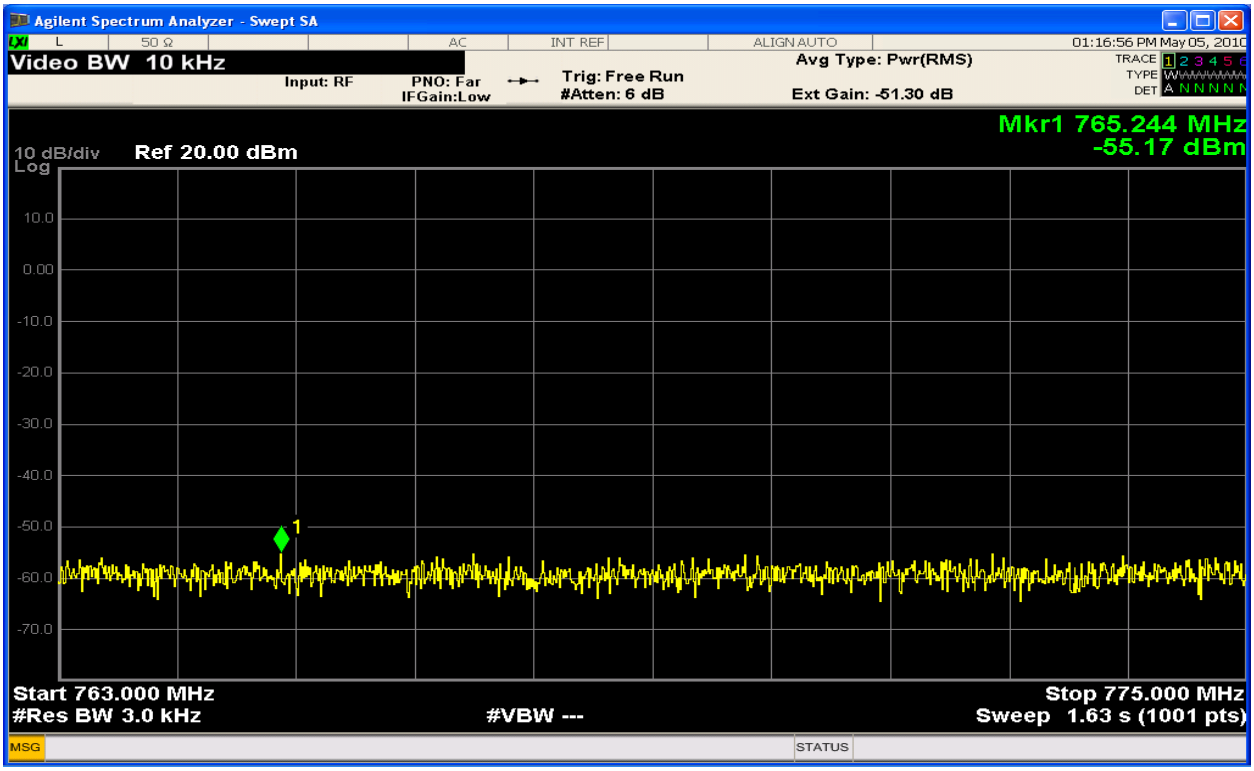


Figure 6-59: Spurious Emissions TX2_16 QAM (763 – 775MHz)

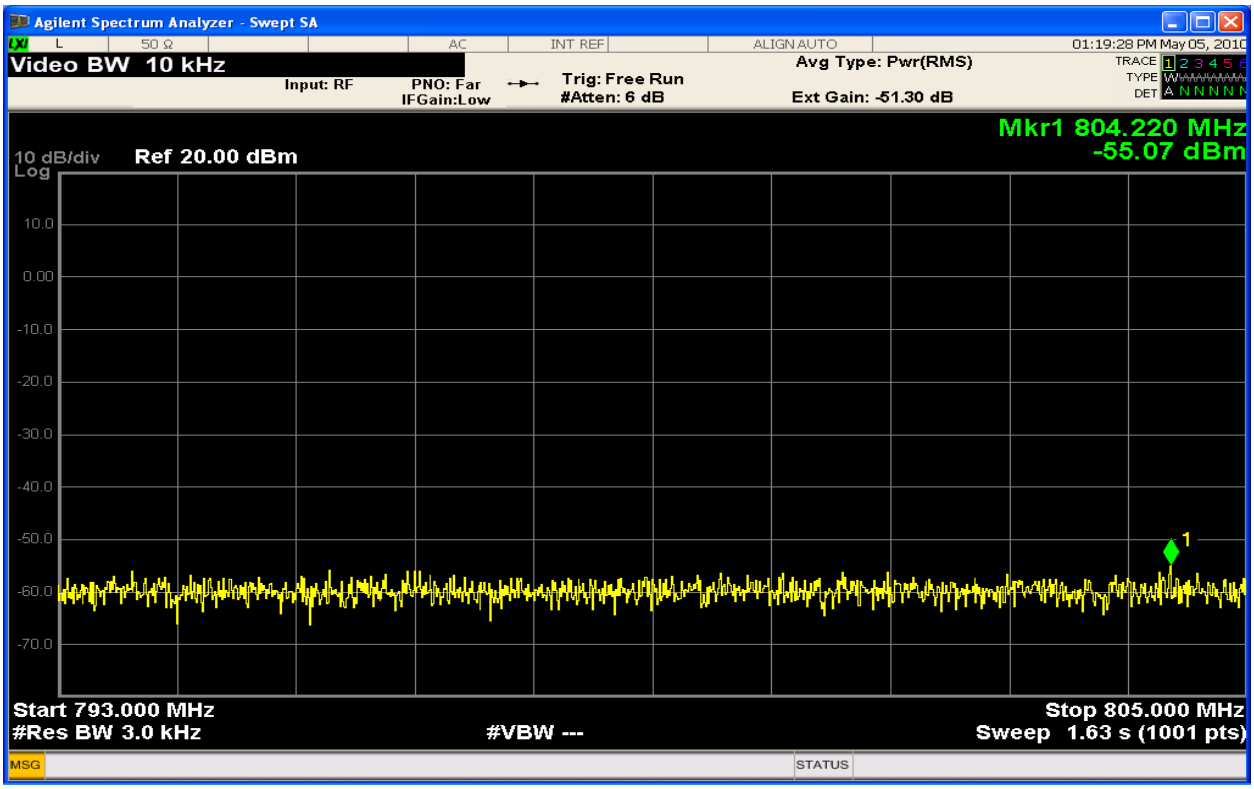


Figure 6-60: Spurious Emissions TX2_16 QAM (793 – 805MHz)

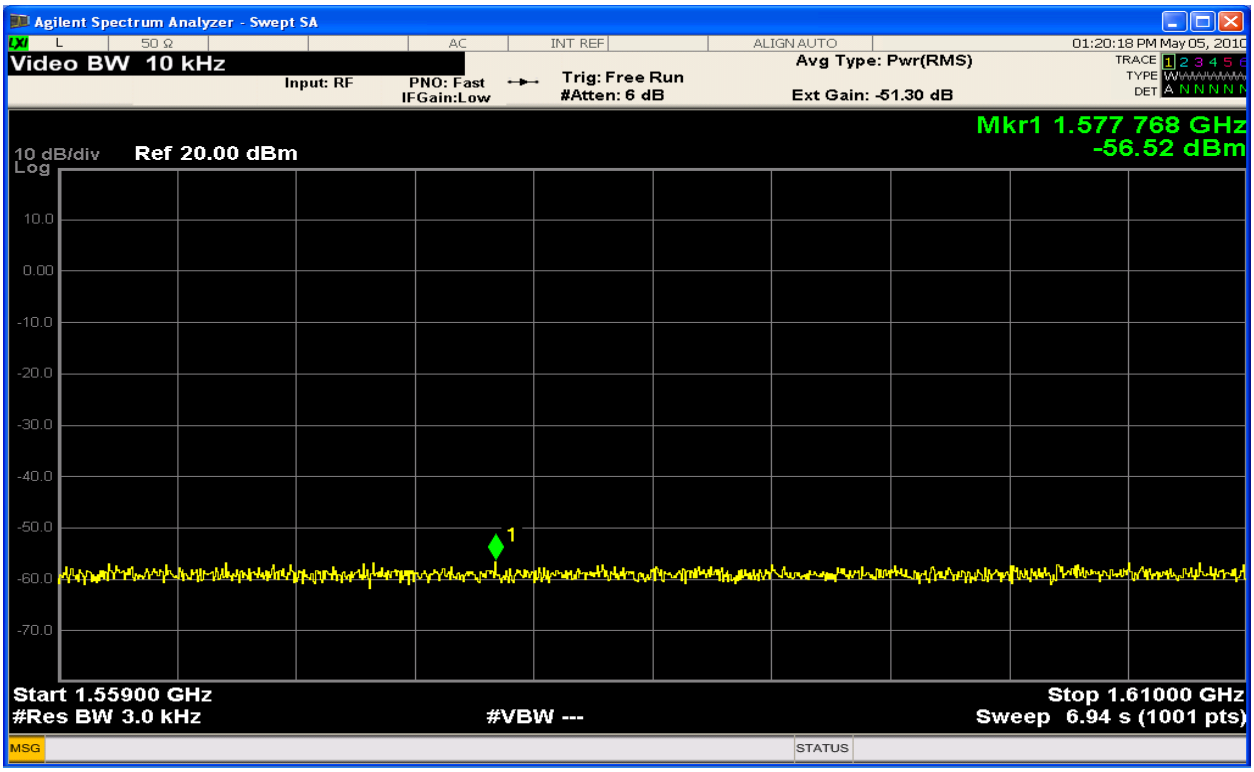


Figure 6-61: Spurious Emissions TX2_16 QAM (1559 – 1610MHz)

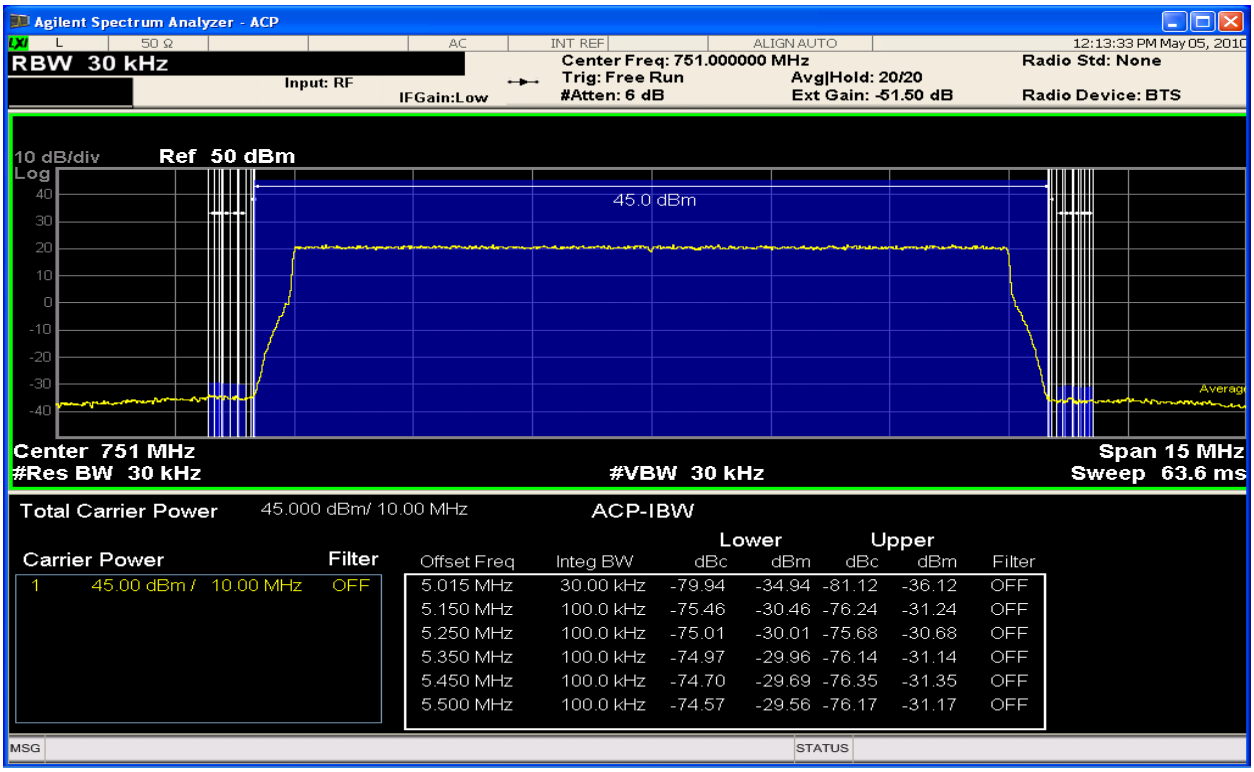


Figure 6-62: Spurious Emissions TX2_64 QAM Band Edge (ACP 15kHz – 550kHz)

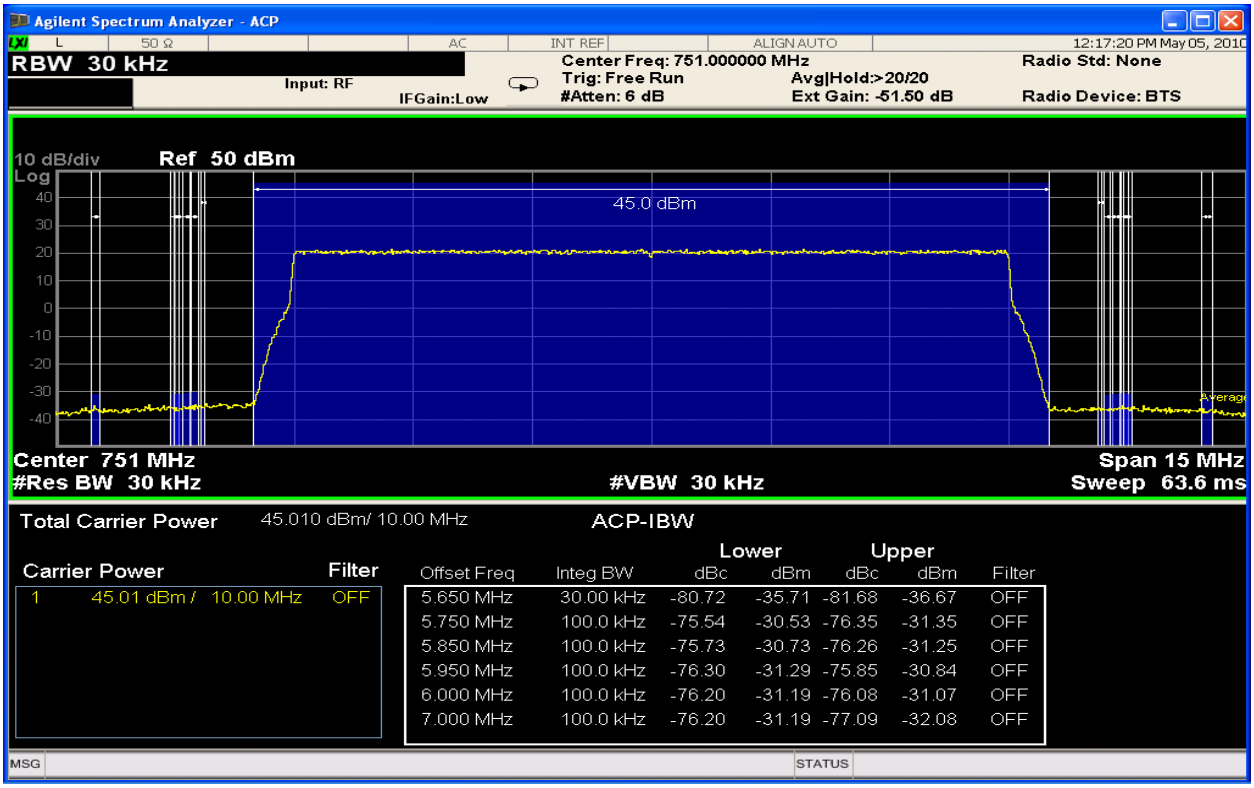


Figure 6-63: Spurious Emissions TX2_64 QAM Band Edge (ACP 650kHz – 2MHz)

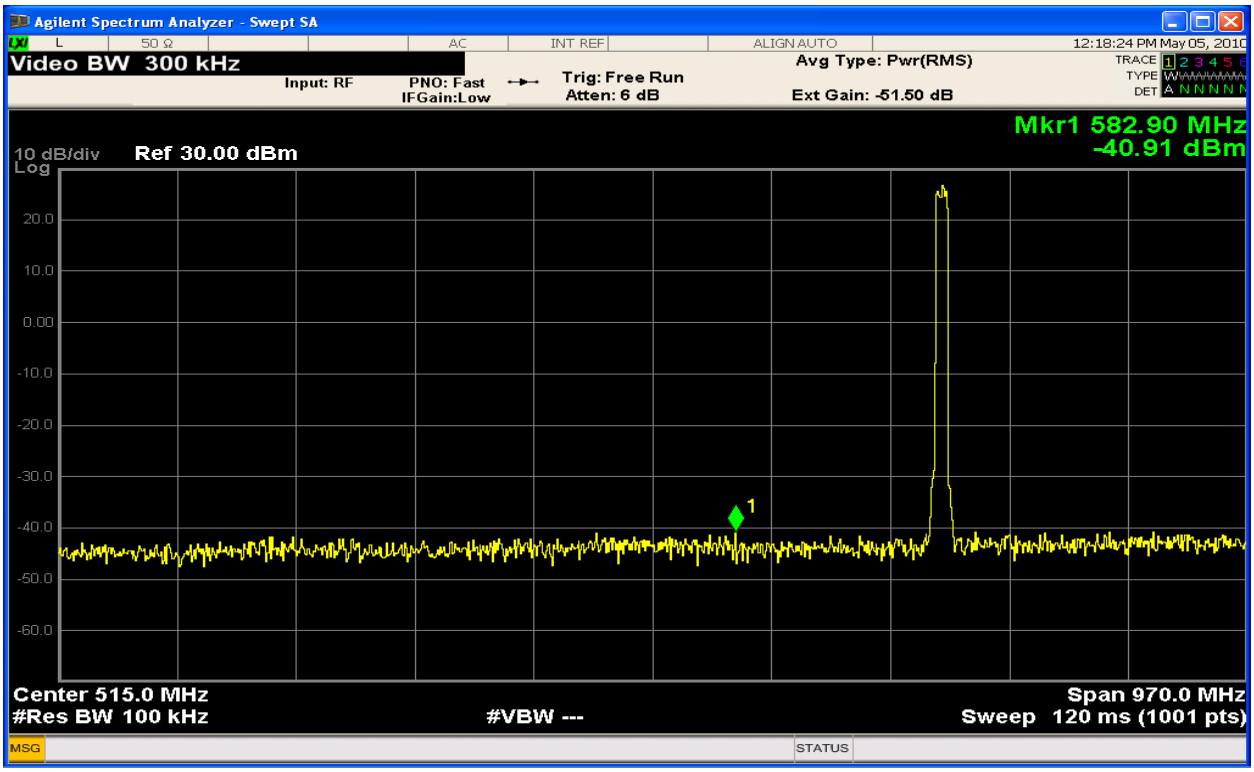


Figure 6-64: Spurious Emissions TX2_64 QAM (30MHz – 1GHz)

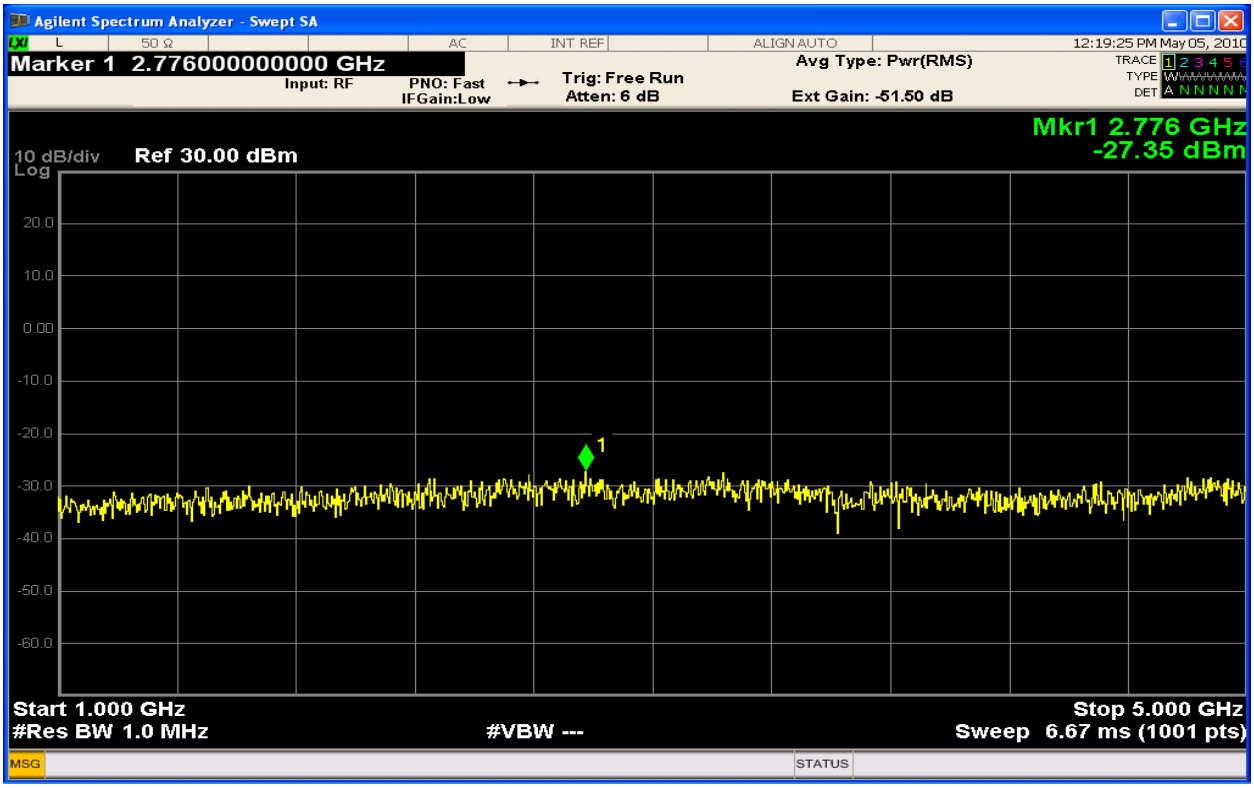


Figure 6-65: Spurious Emissions TX2_64 QAM (1GHz – 5GHz)

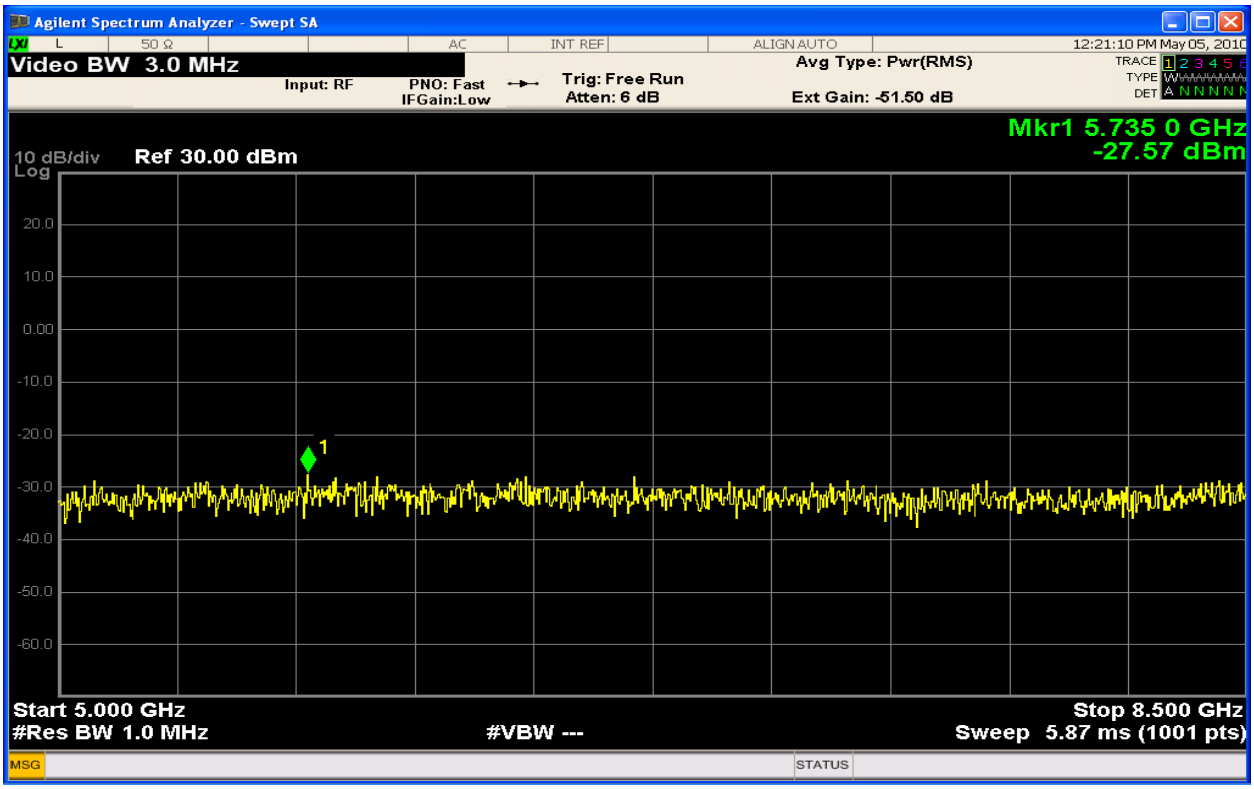


Figure 6-66: Spurious Emissions TX2_64 QAM (5GHz – 8.5GHz)

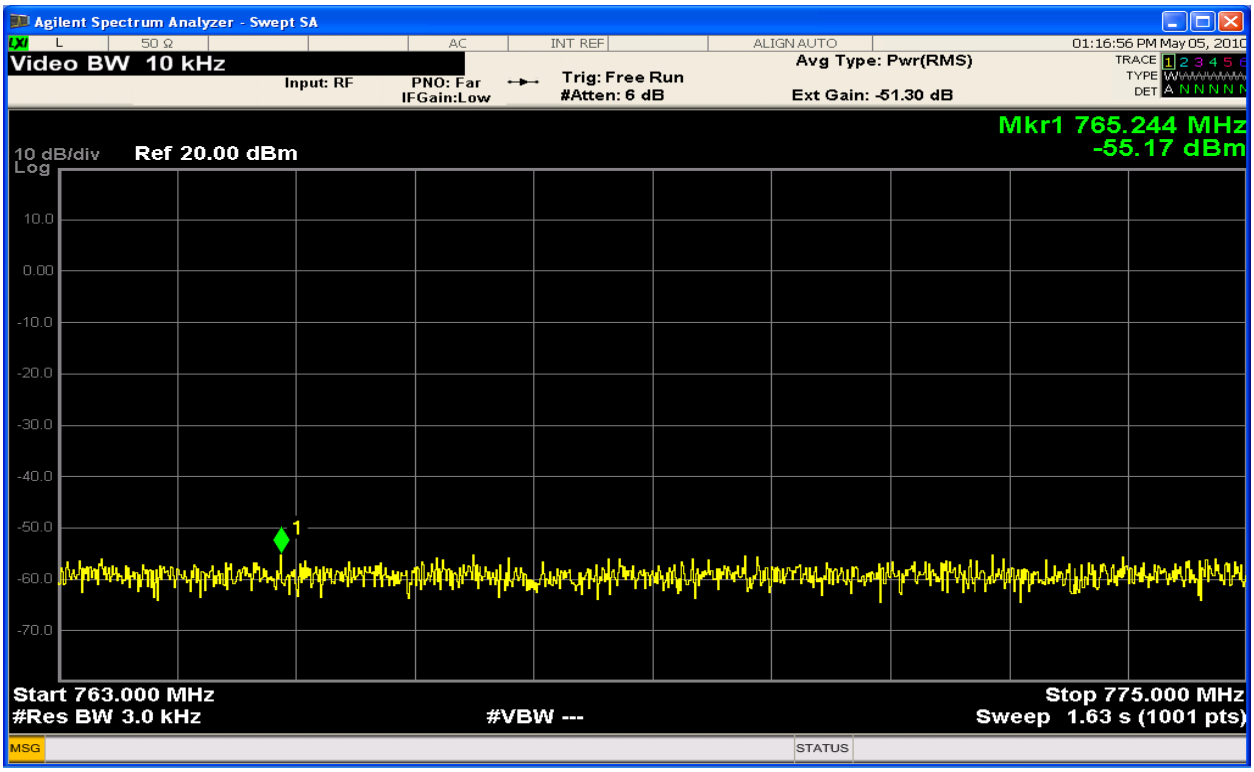


Figure 6-67: Spurious Emissions TX2_64 QAM (763 – 775MHz)

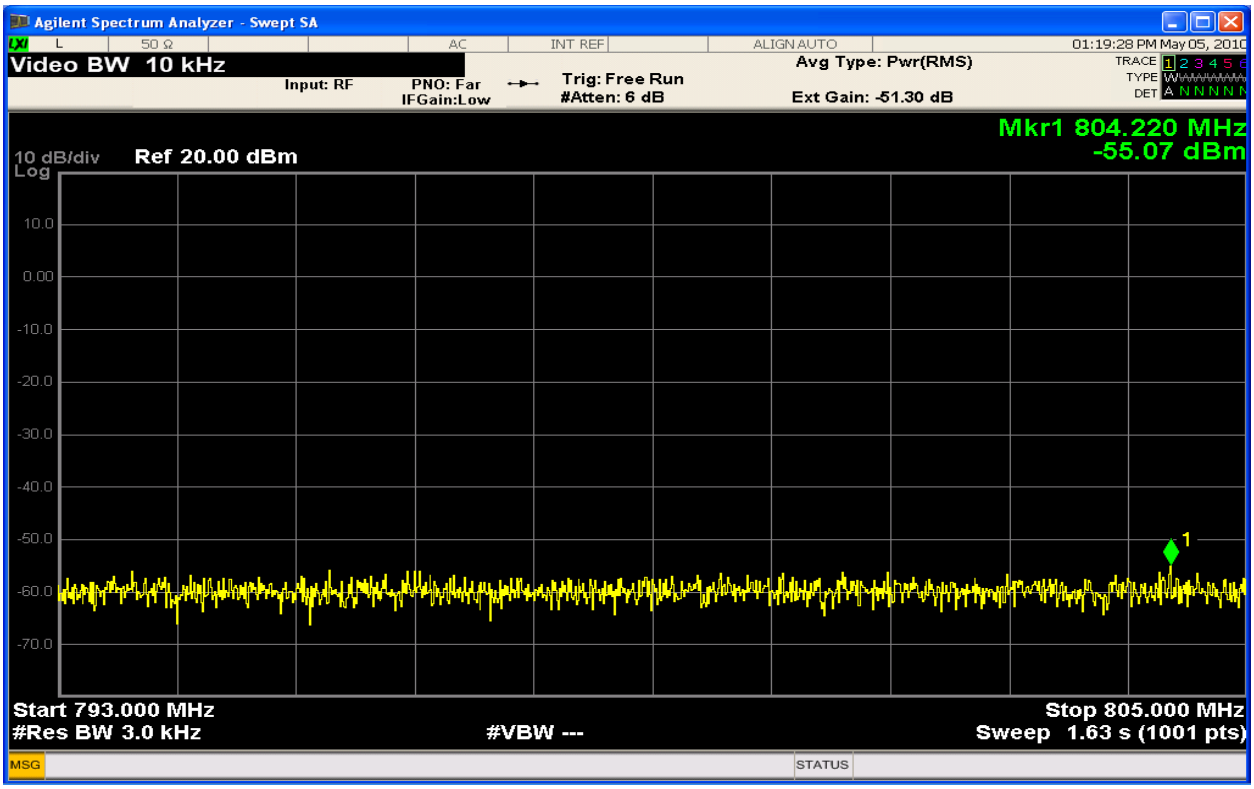


Figure 6-68: Spurious Emissions TX2_64 QAM (793 – 805MHz)

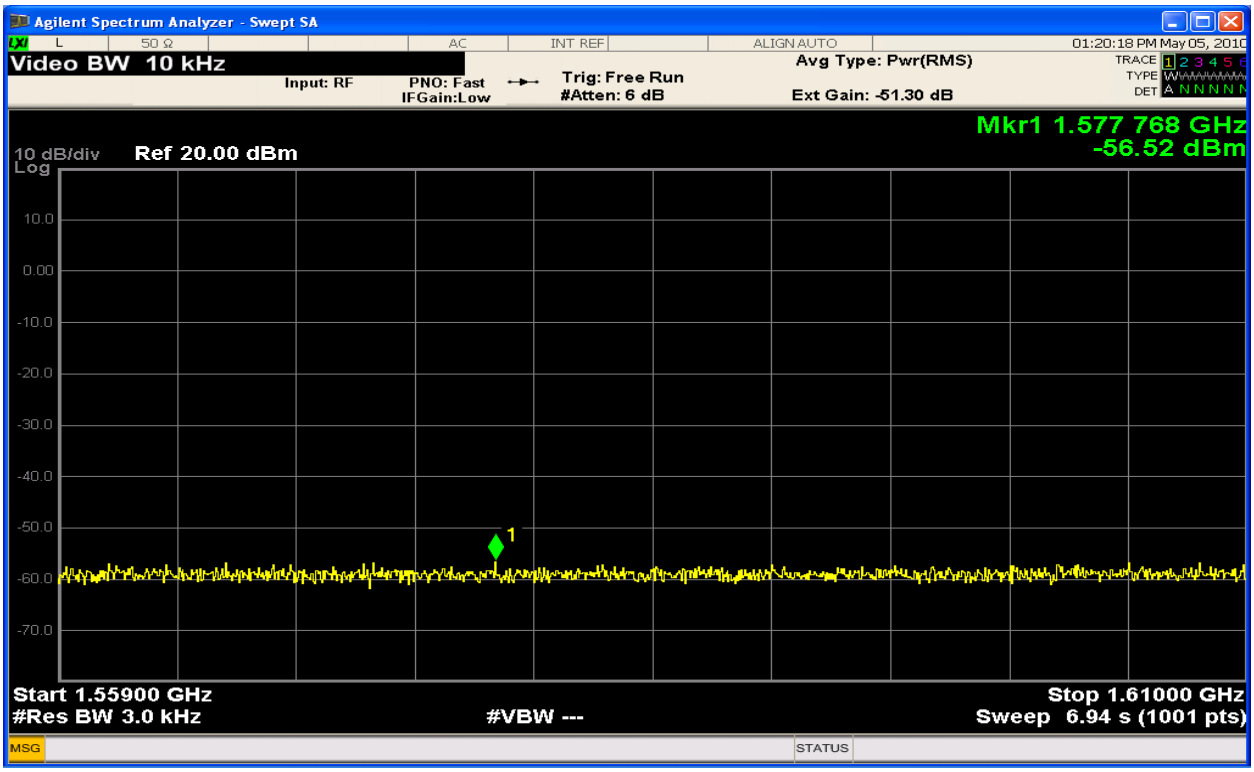


Figure 6-69: Spurious Emissions TX2_64 QAM (1559 – 1610MHz)

6.5 Field Strength of Spurious Radiation

Clause 27.53(c)

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside 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 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;

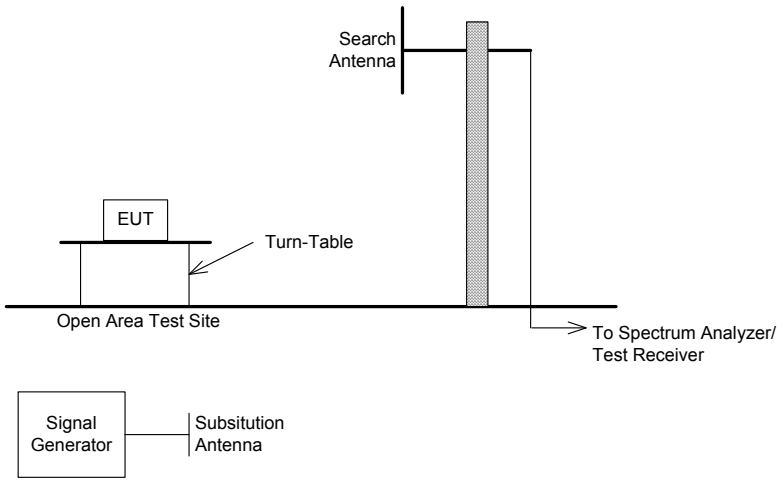
(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on 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 at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropic radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Test Setup:



Test Procedure

- The EUT was placed on a turntable inside the AFC (configured as in normal operation). The system and its cables were separated from the ground plane by an insulating support 10 mm in height. The system was grounded in accordance with its installation specifications. No additional grounding connections were connected.
- For tests between **30 MHz and 1 GHz** the receive antenna (bi-log/horn) was placed at 10 m away from the EUT. An initial scan was done to find emissions (frequencies) requiring detailed measurement. The pre-scan was done by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for antenna heights of 1 to 4 m, and for horizontal and vertical polarizations of the receiving antenna. The detector mode was quasi-peak (QP) with a 120 kHz bandwidth unless otherwise noted.
- For tests between **1 GHz and 10 GHz** the receive antenna (bi-log/horn) was placed at 10 m away from the EUT. An initial scan was done to find emissions (frequencies) requiring detailed measurement. The pre-scan was done by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for antenna heights of 1 to 4 m, and for horizontal and vertical polarizations of the receiving antenna. The detector mode was average (AVG) with a 1 MHz bandwidth unless otherwise noted.
- For tests between **10 GHz to 18 GHz** the receive horn antenna was placed at a 3 m distance from the EUT. An initial scan was done to find emissions (frequencies) requiring detail measurement. The pre-scan was done by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for antenna heights of 1 to 4 m, and for horizontal and vertical polarizations of the receiving antenna. These measurements were made with an average detector mode (AVG) with a 1 MHz bandwidth unless otherwise noted.
- For **all the above frequency ranges** optimization was done based on the pre-scan data. For each identified frequency, the EUT was rotated in azimuth over 360 degrees and the direction of maximum emission was noted. Antenna height was then varied from 1 to 4 m at this azimuth to obtain maximum emissions. The procedure was repeated for both horizontal and vertical polarizations (where applicable) of the search antenna. The maximum level measured was recorded. The spectrum analyzer was verified to make sure it was not saturating in the presence of the radio signal.
- The highest emissions were re-evaluated using the substitution method. This is accomplished by replacing the EUT by a calibrated antenna, cable and signal generator. This equipment is used to transmit a signal that will generate a RF meter reading level identical to the one were done with a bandwidth of 1 MHz.

Calculation of the Compliance Margin

The following example illustrates the manner in which the emissions levels are calculated in the "RE Test Results" **Error! Reference source not found.**.

The rows in these tables are defined as follows.

Meter Reading (dBuV) =	Voltage measured using the spectrum analyzer with quasi-peak adapter
Gain/Loss Factor (dB) =	Cumulative gain or loss of pre-amplifier and cables used in the measurement path (a negative value indicates gain)
Transducer Factor (dB) =	Antenna factor
Level (dBuV/m) =	Corrected value or field strength, that is, the parameter of interest that is compared to the limit
Margin (dB) =	Level with respect to the appropriate limit (a positive Margin indicates that the Level is below the limit and that the measurement is a PASS)

The values in the Level row are calculated as follows:

Level = Meter Reading + Gain/Loss Factor + Transducer Factor

The values in the Margin row are calculated as follows:
Margin = Limit – Level

The following example shows the manner in which the compliance margin is calculated for ERP:
ERP = Effective radiated power or equivalent radiated power

ERP = Signal generator level – Cable losses + Antenna gain – Half wave dipole gain
Margin = Limit – ERP

Limit = EUT Rated Power – Attenuation

Attenuation = (43 + 10 Log (Pwr))

Limit = 10 log (30Watt) – (43+ 10 Log(30W))

Limit = - 13 dBm

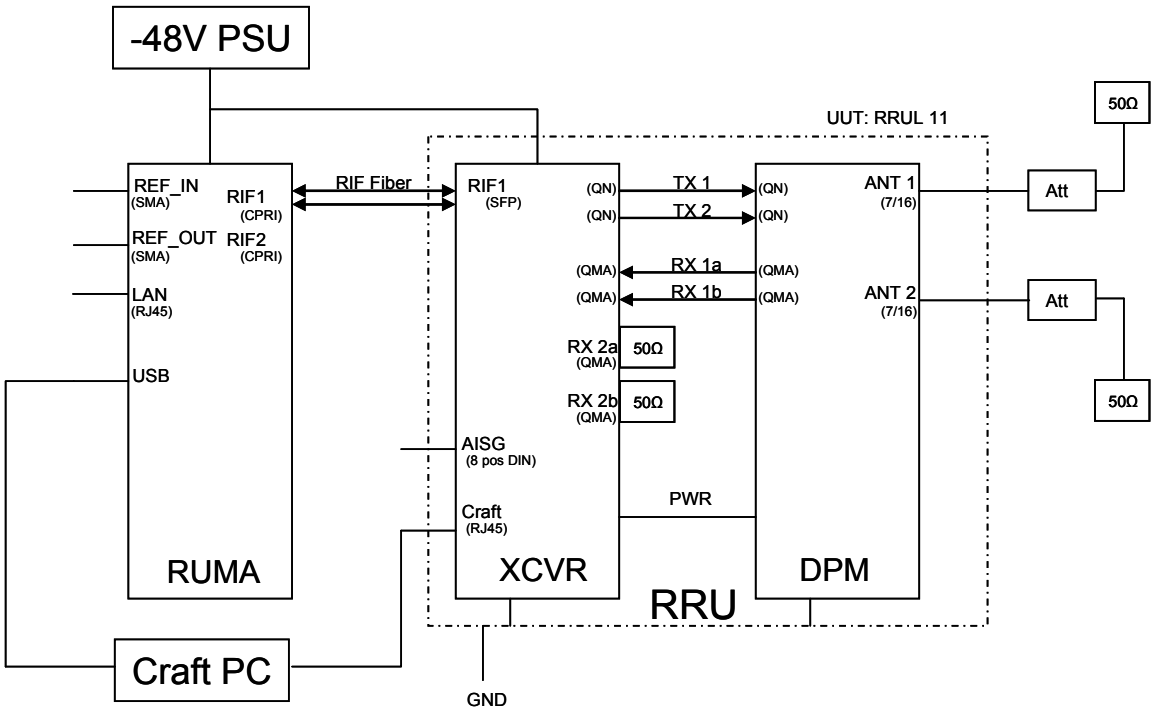


Figure 6-70 RRU EMC Set Up / Configuration

The following table was derived from measurements made in the Flextronics 10 Meter anechoic chamber.

Reference Flextronics EMC Test Report: K0001750-TR-RAD-02-C01

Table 6-9 Radiated Emissions

Frequency (MHz)	Field Strength (dBuV)	Signal Substitution (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	dBi to dBd Conversion	ERP (dBm)	Limit (dBm)	Margin (dB)
31.6962	33.0	-49.7	0.66	-18.5	2.15	-71.0	-13.0	58.0
79.4329	43.1	-65.5	1.03	0.36	2.15	-69.4	-13.0	55.4
236.2128	40.1	-68.3	1.77	6.55	2.15	-65.7	-13.0	52.7
2255.829	44.8	-60.7	5.56	9.50	2.15	-58.9	-13.0	45.9
6259.494	33.2	-57.3	9.87	11.31	2.15	-58.0	-13.0	45.0
Remarks: All other spurious have more margin								

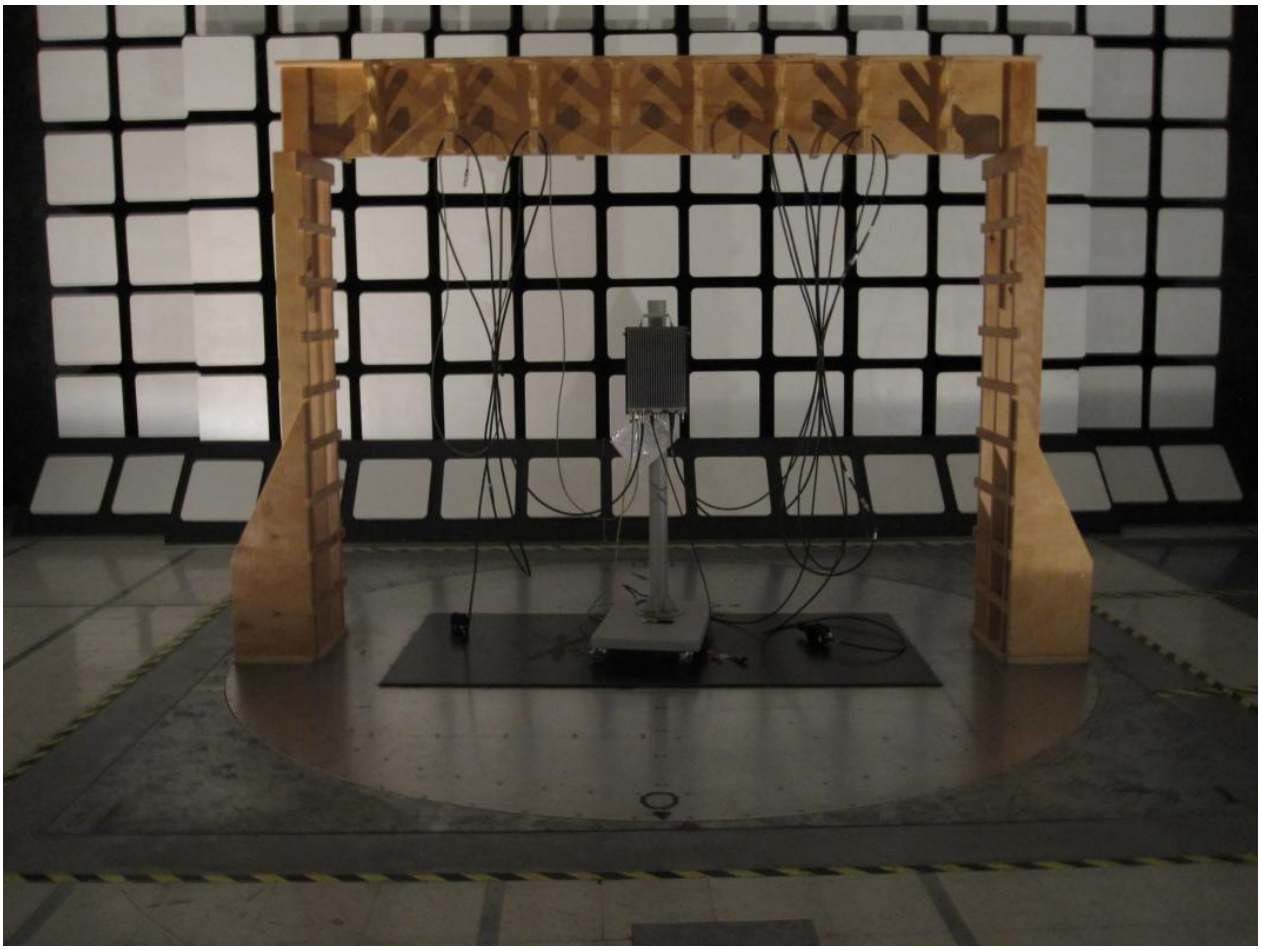


Figure 6-71 Radiated Emissions Set Up Photo's

6.6 Frequency Stability

Frequency Stability **Clause 27.54**

27.54 Frequency Stability. - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

FCC Clause 2.1055 Frequency Stability

2.1055 Measurements required: Frequency stability.

(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 paragraphs (a)(2) and (3) of this section

(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.

(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.

Test Setup

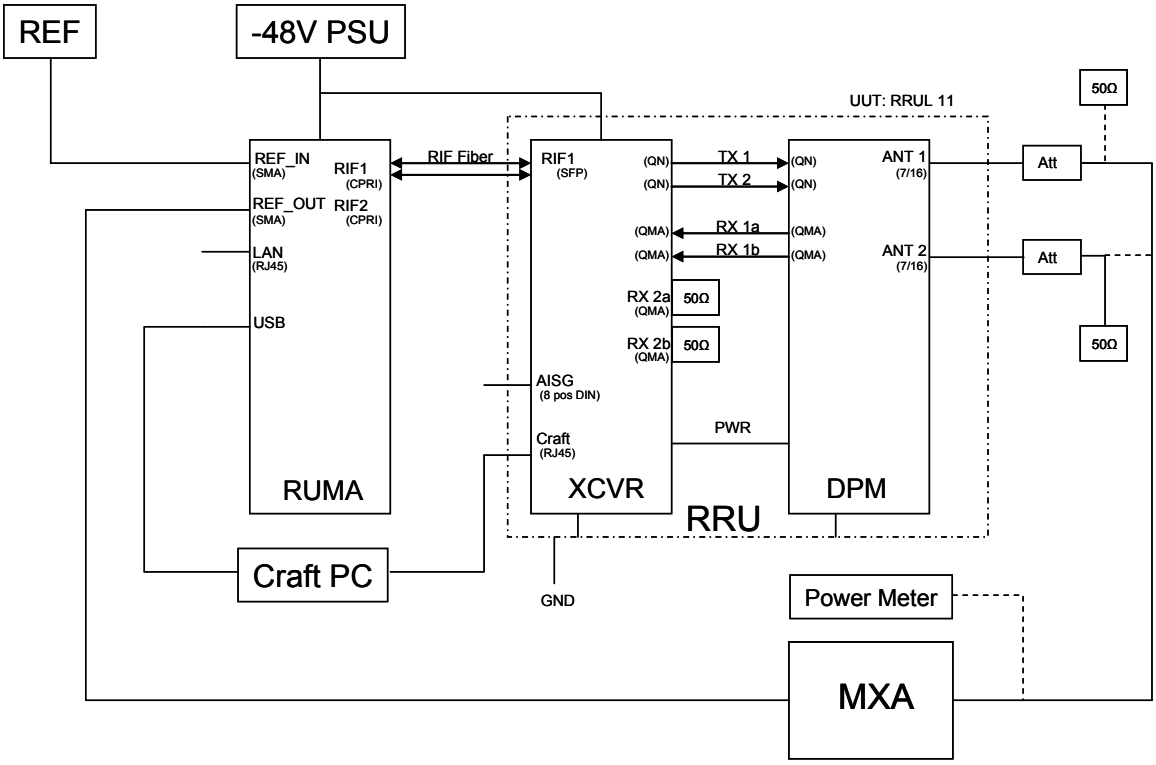


Figure 6-72 RRU Stability Set Up / Configuration

Test Conditions:

Extreme Temperature Condition: –30°C to 50°C
Extreme Voltage Conditions: ±15% of standard voltage condition.

Settings Remarks

1. The EUT would be operated and frequency offset / error monitored over the variables.
2. The EUT would be connected to a spectrum analyzer. The frequency stability would be determined by the frequency counter function of the spectrum analyzer.
3. Test would be conducted at the temperature range from –30°C to 50°C degree with 10°C intervals. Measurement would also be conducted with varying the primary supply voltage from 85% to 115% of the nominal value.
4. Tabulated results and plots are compiled and presented in this section.

Table 6-10: Frequency Stability vs. Temperature / Voltage Variation

Temperature (°C)	DC (V)	Frequency Error (Hz)	Time	Date
-30	40	3.521	08:30	20 May 2010
-30	48	-1.997	08:30	20 May 2010
-30	55	0.696	08:30	20 May 2010
-20	40	-0.312	09:30	20 May 2010
-20	48	-1.481	09:30	20 May 2010
-20	55	4.446	09:30	20 May 2010
-10	40	2.764	10:30	20 May 2010
-10	48	3.703	10:30	20 May 2010
-10	55	0.886	10:30	20 May 2010
0	40	-1.087	11:30	20 May 2010
0	48	0.684	11:30	20 May 2010
0	55	1.509	11:30	20 May 2010
+10	40	1.116	12:30	20 May 2010
+10	48	1.039	12:30	20 May 2010
+10	55	-0.754	12:30	20 May 2010
+20	40	2.210	13:30	20 May 2010
+20	48	0.315	13:30	20 May 2010
+20	55	0.480	13:30	20 May 2010
+30	40	0.552	14:00	20 May 2010
+30	48	2.018	14:00	20 May 2010
+30	55	1.290	14:00	20 May 2010
+40	40	-1.654	14:30	20 May 2010
+40	48	-2.018	14:30	20 May 2010
+40	55	-1.991	14:30	20 May 2010
+50	40	-2.300	15:00	20 May 2010
+50	48	-1.452	15:00	20 May 2010
+50	55	1.757	15:00	20 May 2010

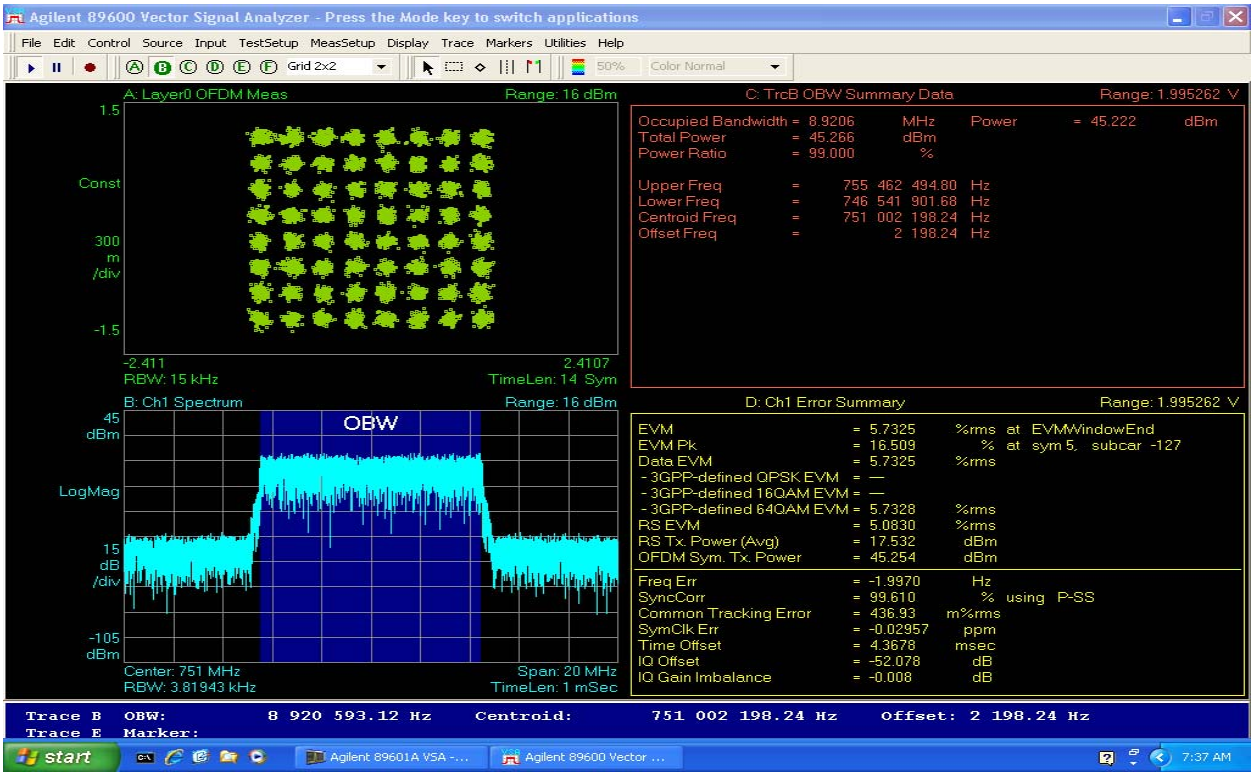


Figure 6-73: Stability -30°C

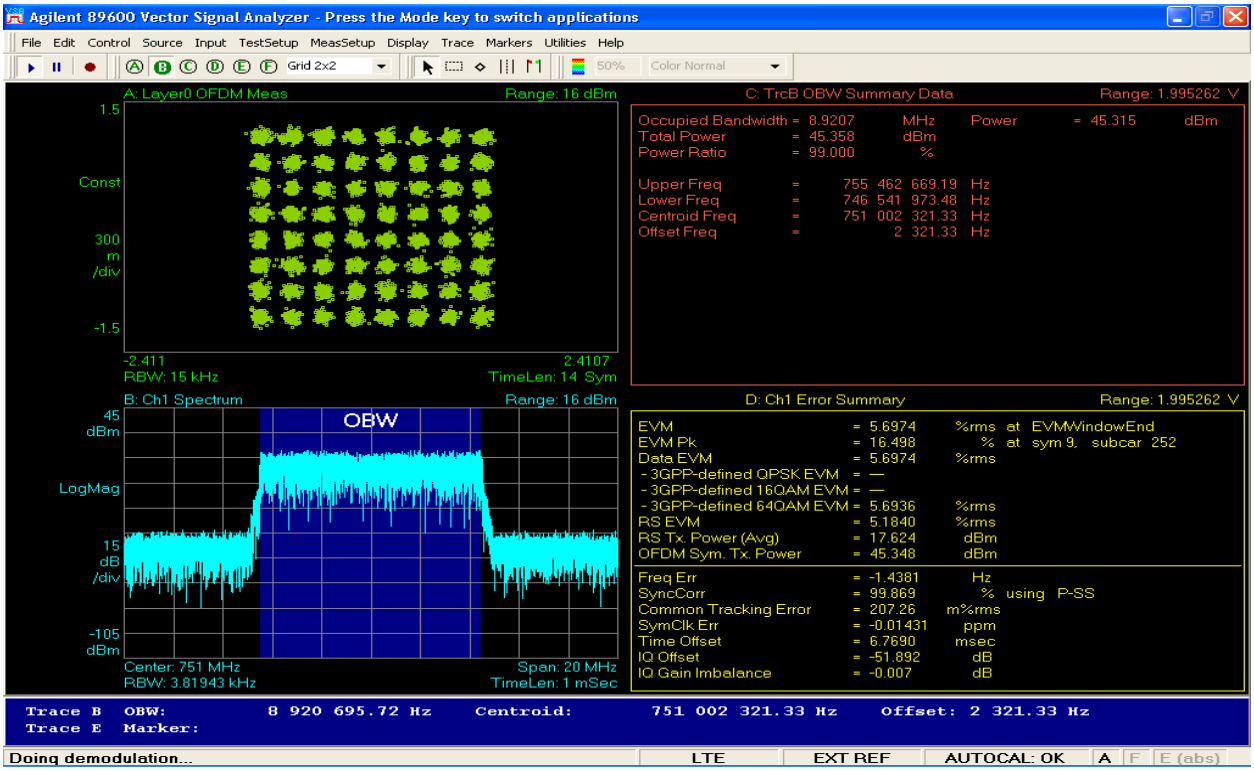


Figure 6-74: Stability -20°C

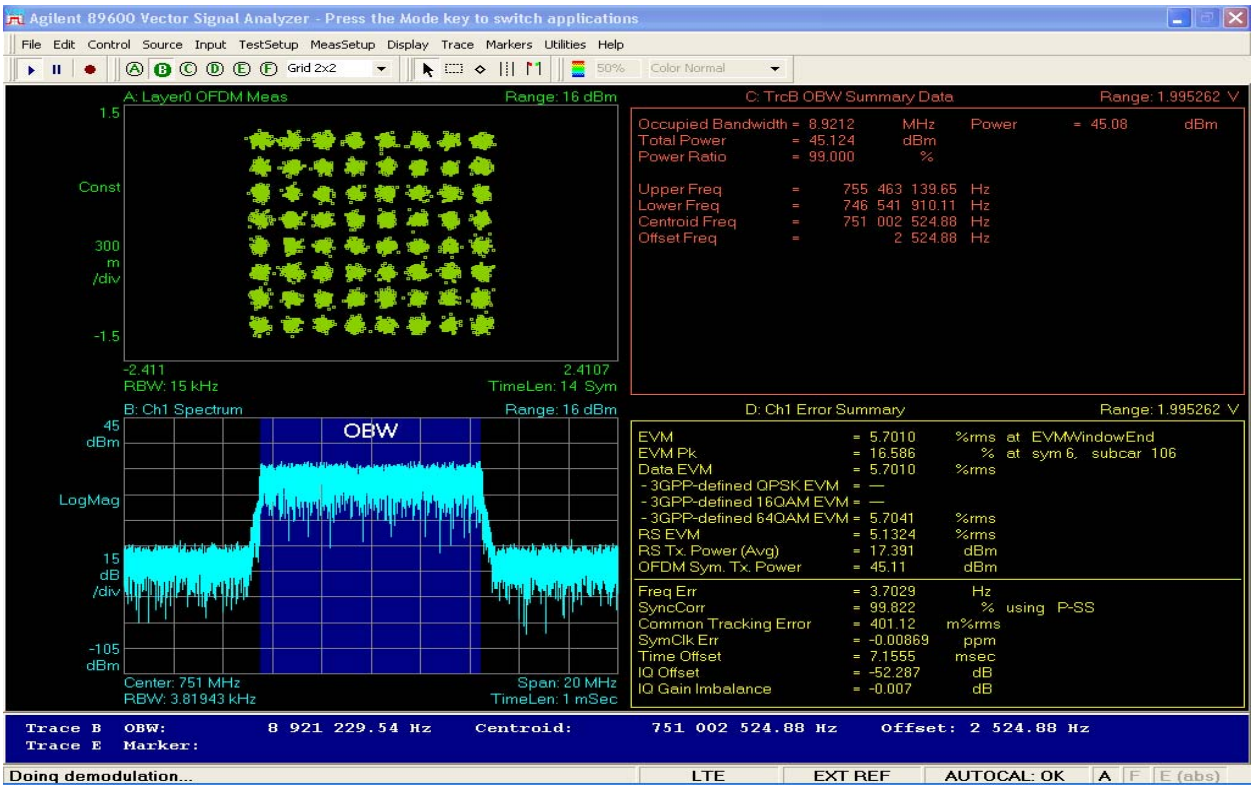


Figure 6-75: Stability -10°C

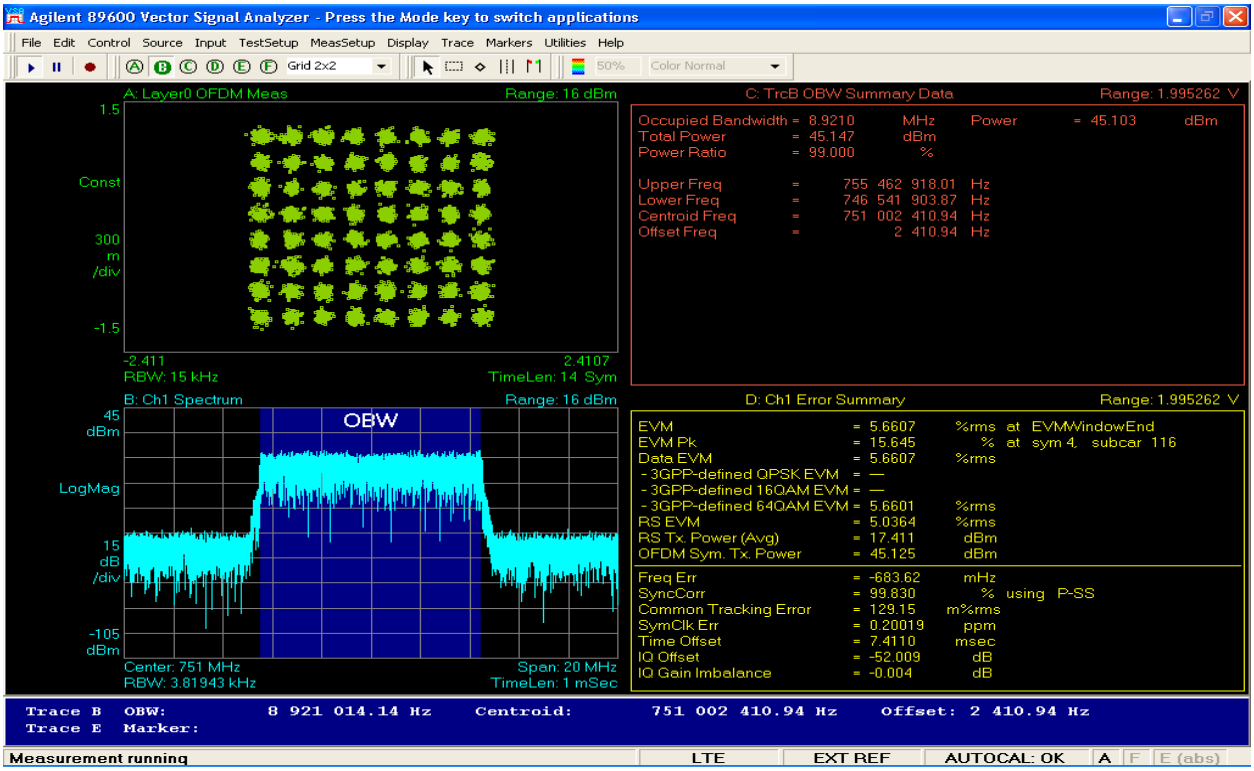


Figure 6-76: Stability 0°C

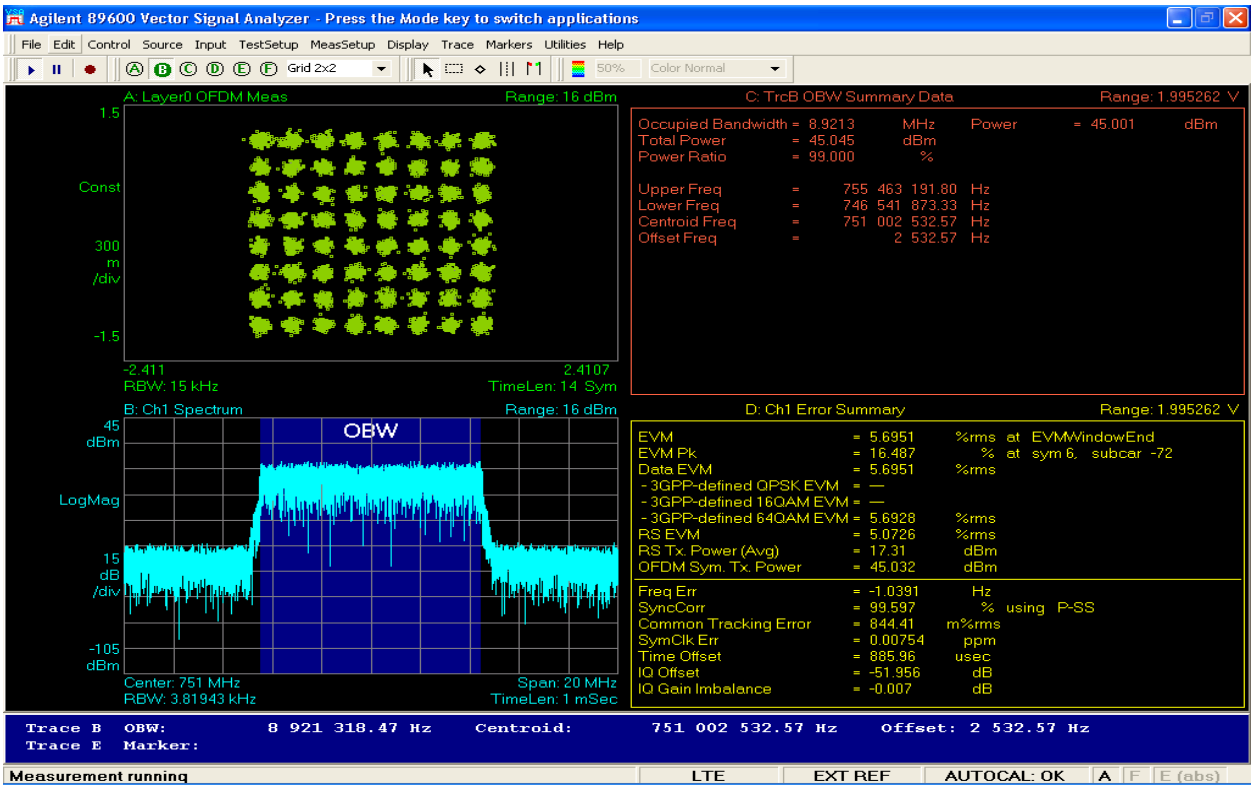


Figure 6-77: Stability 10°C

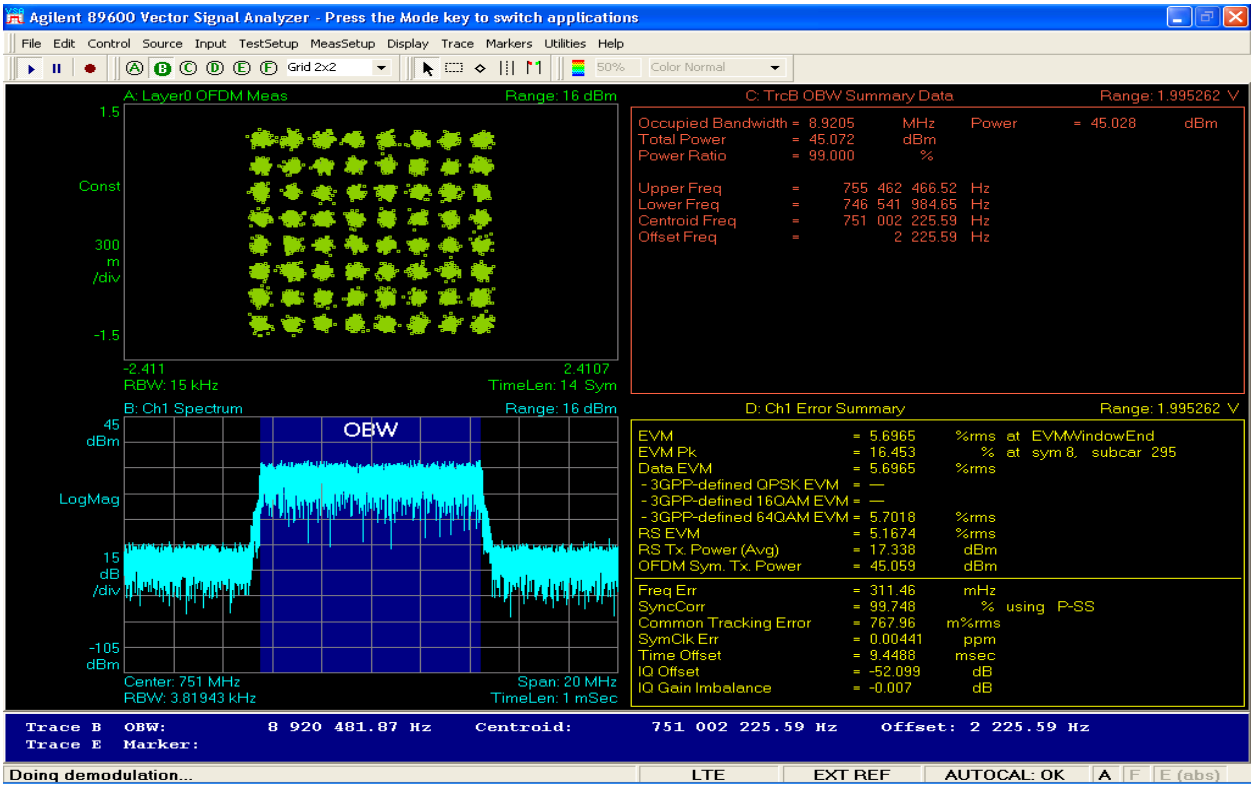


Figure 6-78: Stability 20°C

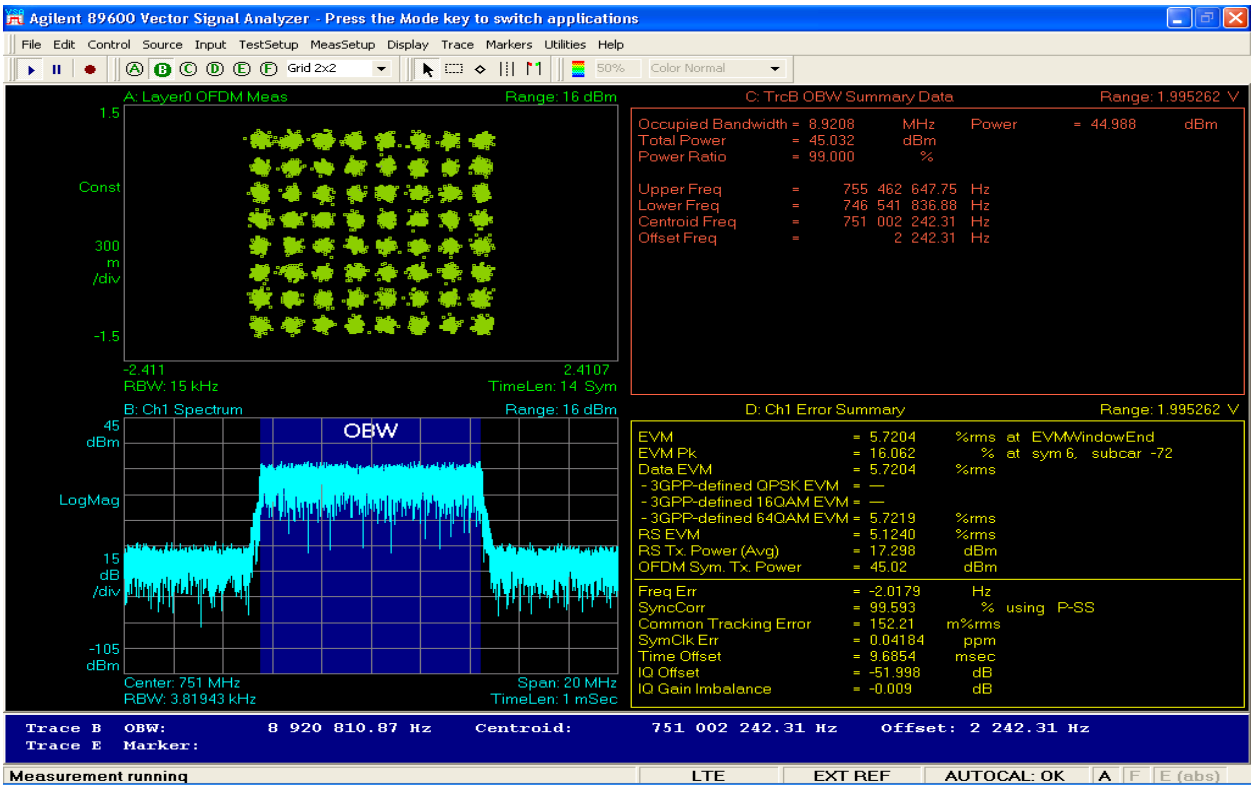


Figure 6-79: Stability 30°C

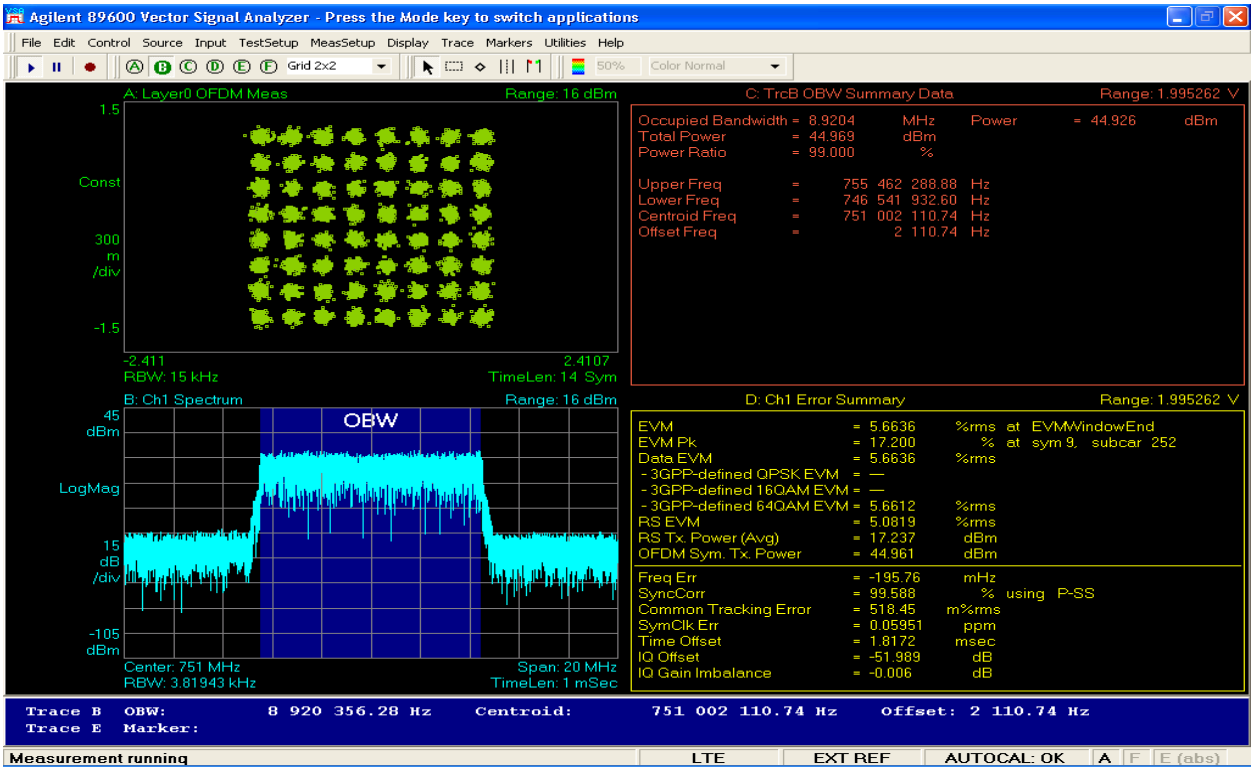


Figure 6-80: Stability 40°C

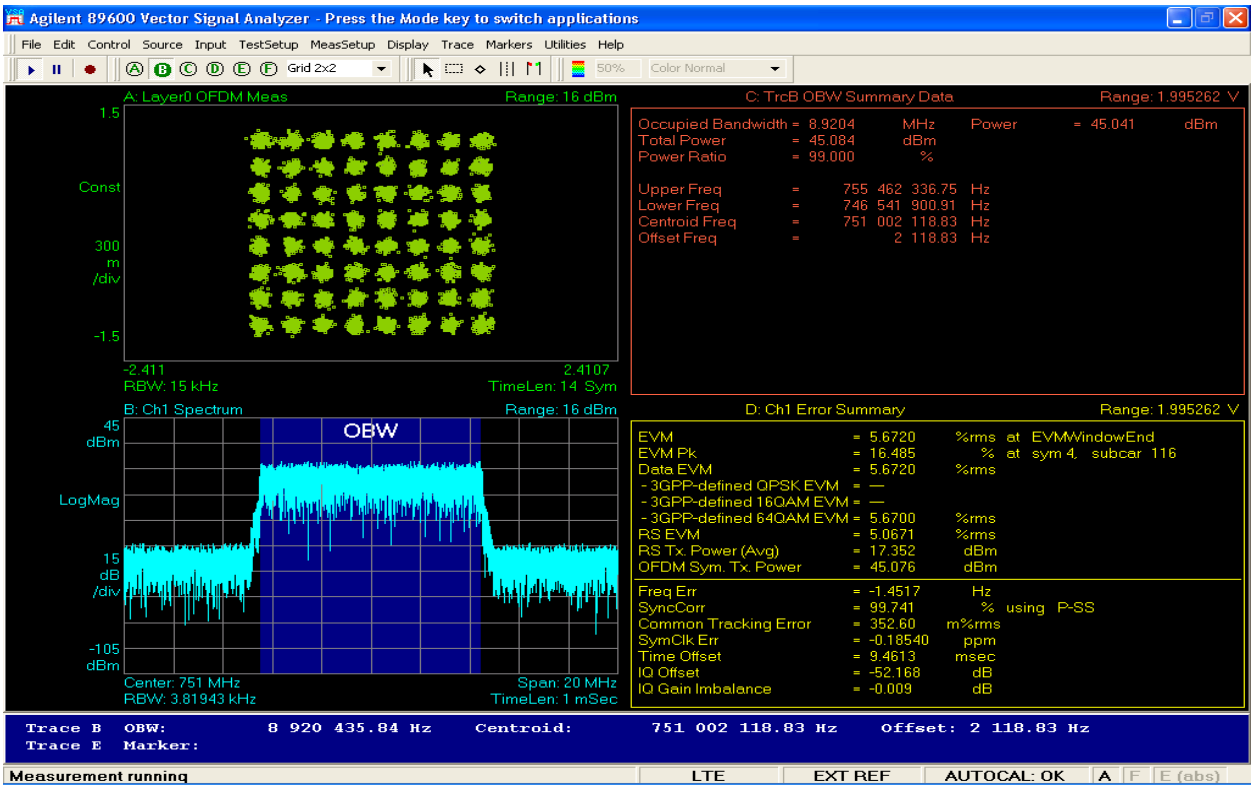


Figure 6-81: Stability 50°C

6.7 Submission Exhibits

2.1033 Submission Exhibits

- Schematics
- Bill of Materials
- Block Diagram
- User Manual
- Letter Head Technical Operation and Description
- Letter Head MPE Calculation
- Letter Head, Cover Letter, Confidentiality Request
- External Photo’s
- Internal Photo’s
- Tune up Procedure
- FCC Form 731
- Label Details (Format and location)
- Set-up Photo’s
- Test Report