

KTL Test Report: 8R01001

Applicant: Allen Telecom Group
140 Vista Centre Drive
Forest, Virginia
24551

**Equipment Under Test:
(E.U.T.)** "Prism Plus Indoor" Repeater

FCC ID: BCR-DBE60-ABE

In Accordance With: **FCC Part 22, Subpart H**
Cellular Band Repeaters

Tested By: KTL Ottawa Inc.
3325 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By: _____
W. Waterhouse, RF Engineering Lab Manager

Date: _____

Total Number of Pages: 92

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

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EQUIPMENT: "Prism Plus Indoor" Repeater
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EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Section 1. Summary of Test Results

Manufacturer: Allen Telecom Group

Model No.: Prism Plus Indoor

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22, Subpart H.



New Submission



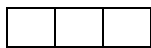
Production Unit



Class II Permissive Change



Pre-Production Unit



Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: _____
Kevin Carr, Technologist

TECHNICAL REVIEW: _____ DATE: _____
Tom Tidwell, Wireless Group Manager

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This report applies only to the items tested.

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	22.913(a)	500W ERP	Plot	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask C	Plot	Complies
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask D	Plot	Complies
Occupied Bandwidth (ST)	22.917(d)	Mask D	Plot	Complies
Occupied Bandwidth (Digital)	None	Input vs. Output	Plot	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Plot	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Chart	Complies
Frequency Stability	22.355	1.5 ppm	N/A	N/A

Footnotes For N/A's:

Test Conditions: Temperature: 23 °C
 Humidity: 29%

EQUIPMENT: "Prism Plus Indoor" Repeater
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Section 2. General Equipment Specification

Supply Voltage Input:	120 Vac, 60 Hz				
Frequency Range:	Downlink:	869 - 894 MHz			
	CDMA:	869.73 - 893.28 MHz			
Frequency Range:	Uplink:	824 - 849 MHz			
	CDMA:	824.73 - 848.28 MHz			
20 dB Bandwidth:	Uplink:	36.42 MHz			
	Downlink:	35.92 MHz			
Type of Modulation and Designator:	CDMA (F9W)	GSM (GXW)	TDMA (DXW)	CDPD (F9W)	AMPS (F8W, F1D)
	☒	☐	☒	☐	☒
AGC Threshold:	Not Applicable				
Output Impedance:	50 ohm				
Gain:	60 dB Nominal				
Max Input Power:	30 dBm Nominal				
RF Output (Rated):	Single:	30 dBm Nominal			
	Composite:	27 dBm per 2 Channel Nominal			
Frequency Translation:	F1-F1		F1-F2	N/A	
	☒		☐	☐	
Band Selection:	Software		Duplexer Change	Fullband Coverage	
	☐		☒	☒	

EQUIPMENT: "Prism Plus Indoor" Repeater
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Description of Modifications For Class II Permissive Change

NOT APPLICABLE

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Modifications Made During Testing

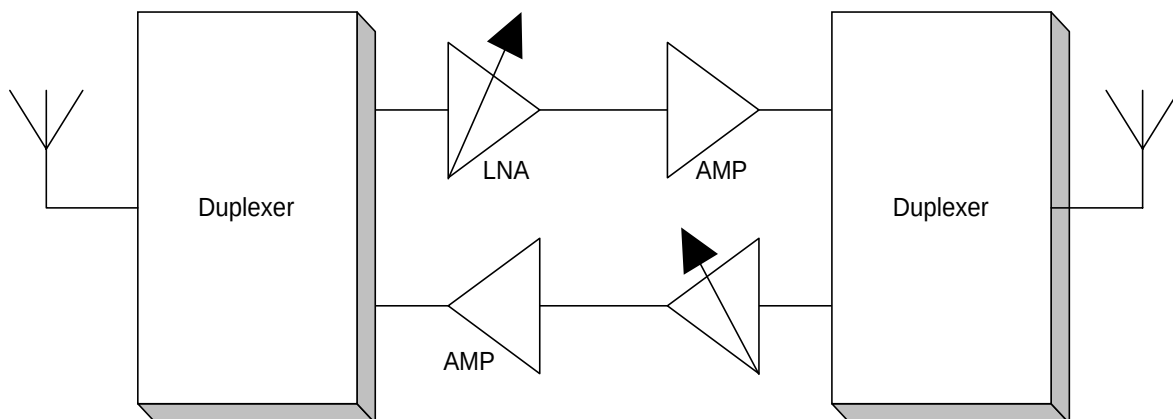
NOT APPLICABLE

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Theory of Operation

The Prism Plus is an RF booster that is used to extend cellular telephone and 800/900 MHz trunked / conversion coverage in weak signal areas a "dead spots". Prism Plus may be used to make coverage inside buildings more accessible to offices, police stations and emergency communications centers. Increasing cellular accessibility, the Prism Plus has a radius are of up to one mile.

System Diagram



EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Section 3. RF Power Output

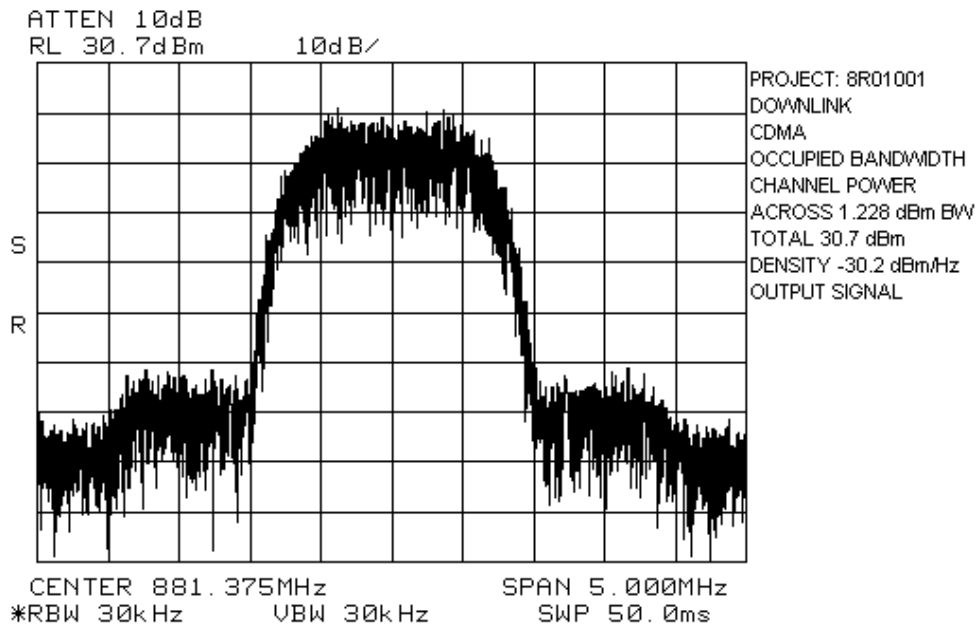
NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Kevin Carr	DATE: October 30, 1998

Test Results: Complies.

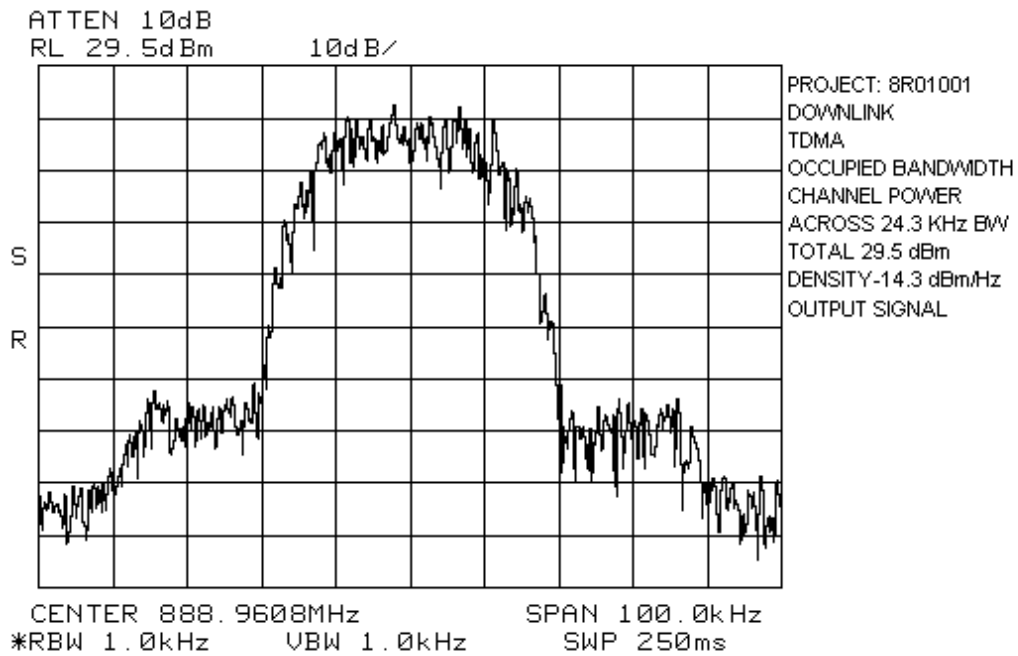
Measurement Data:

	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Uplink	AMPS	30.3	27.3 / 2 Channel
Downlink	AMPS	30.3	27.3 / 2 Channel
Uplink	CDMA	30.8	27.8 / 2 Channel
Downlink	CDMA	30.7	27.7 / 2 Channel
Uplink	TDMA	29.1	26.1 / 2 Channel
Downlink	TDMA	29.5	26.5 / 2 Channel

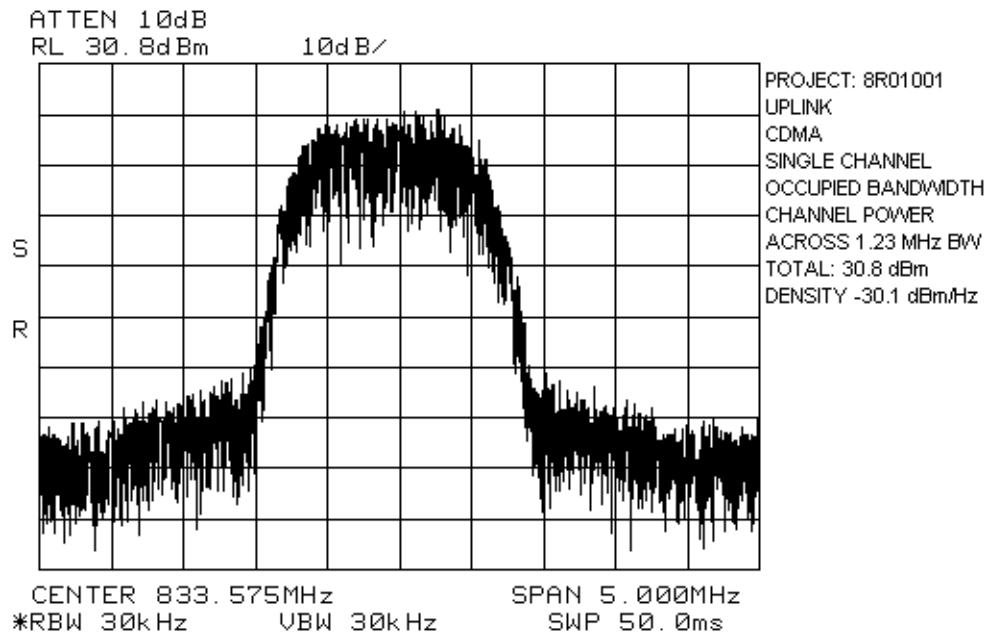
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FCC ID: BCR-DBE60-ABE



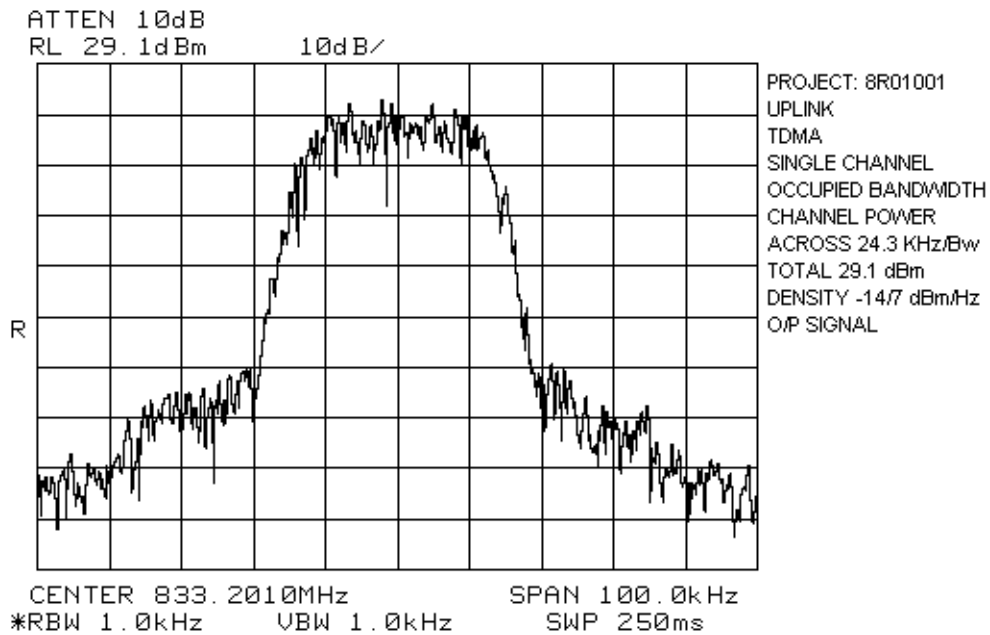
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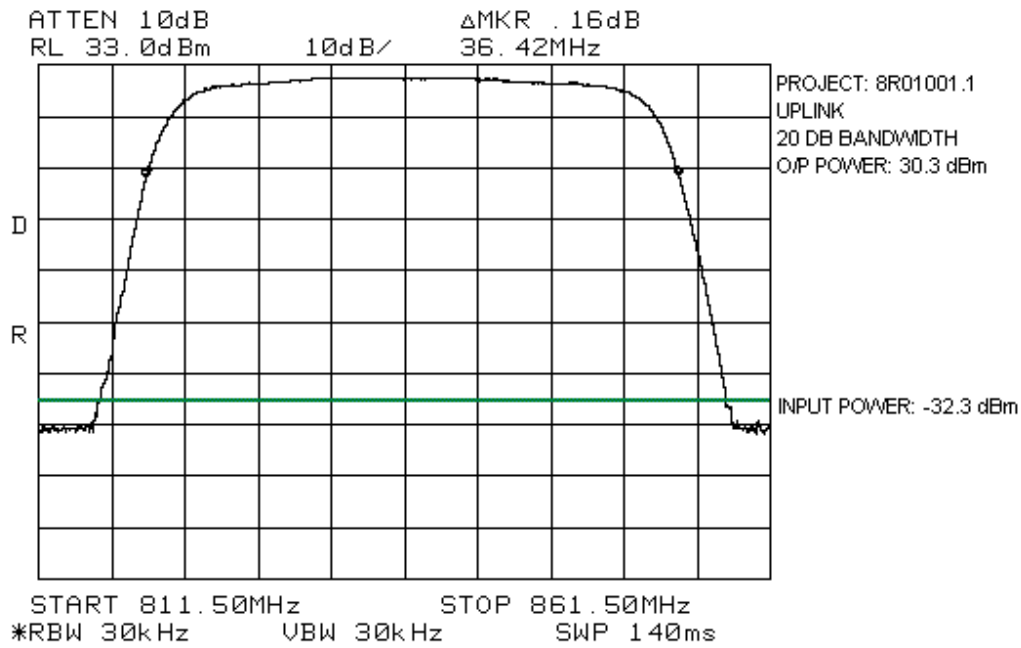
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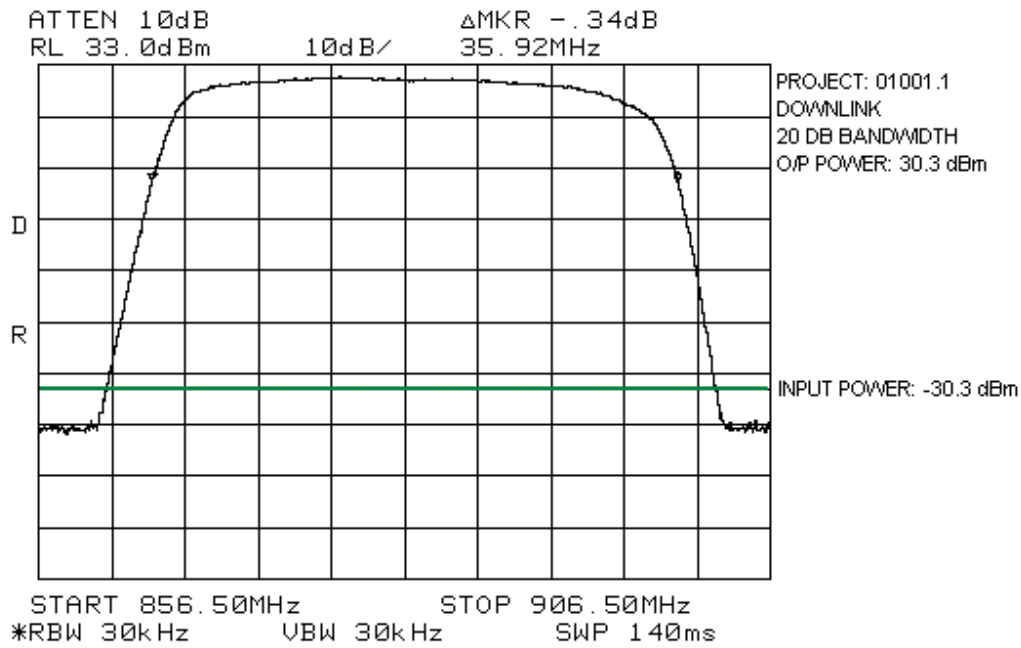
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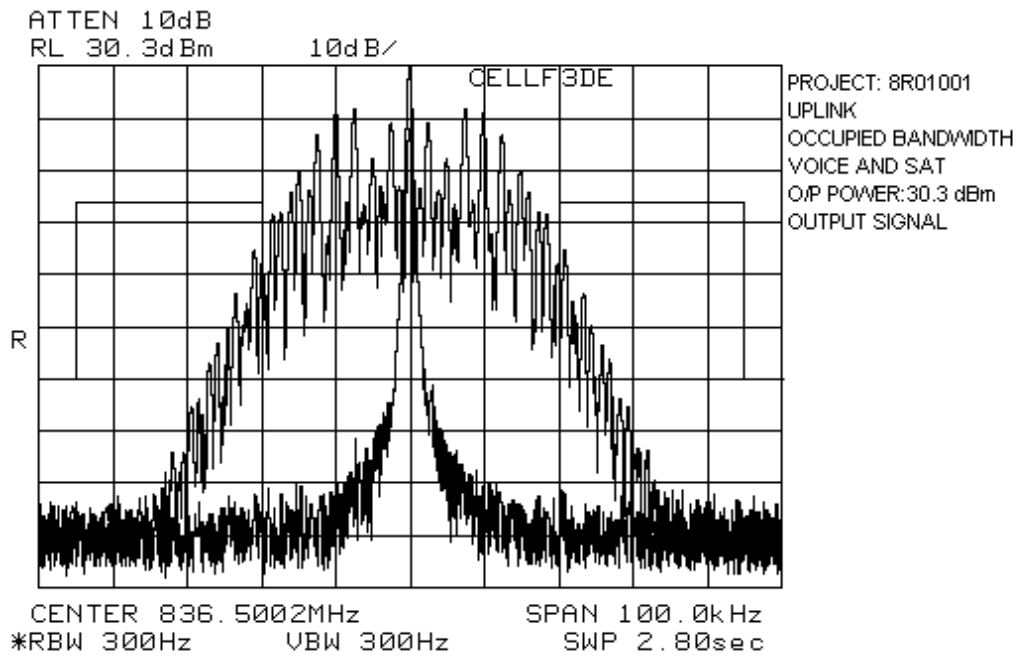
Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (Voice + SAT)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: October 30, 1998

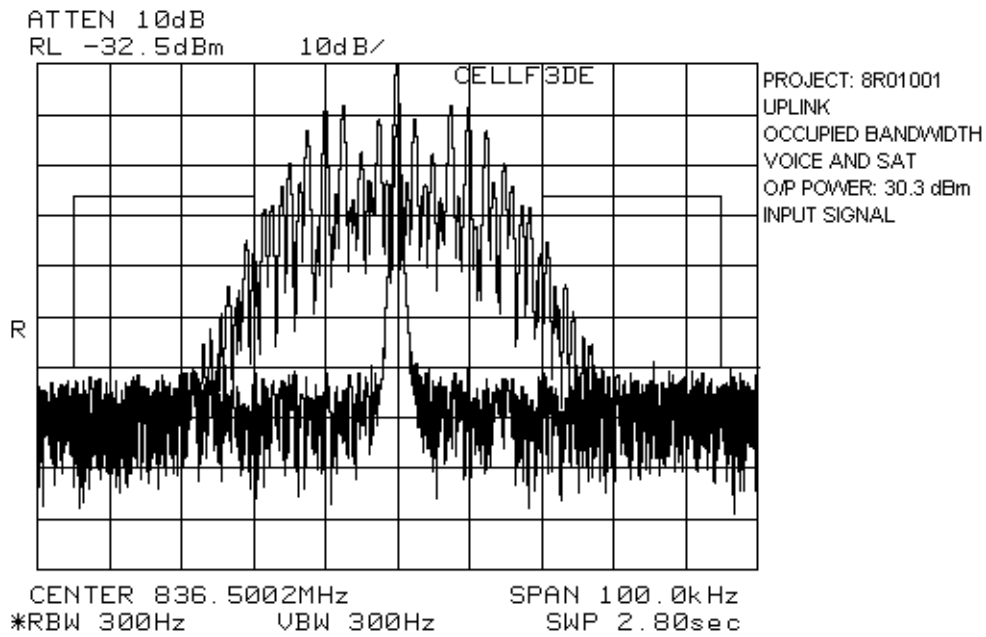
Test Results: Complies.

Test Data: See attached graph(s).

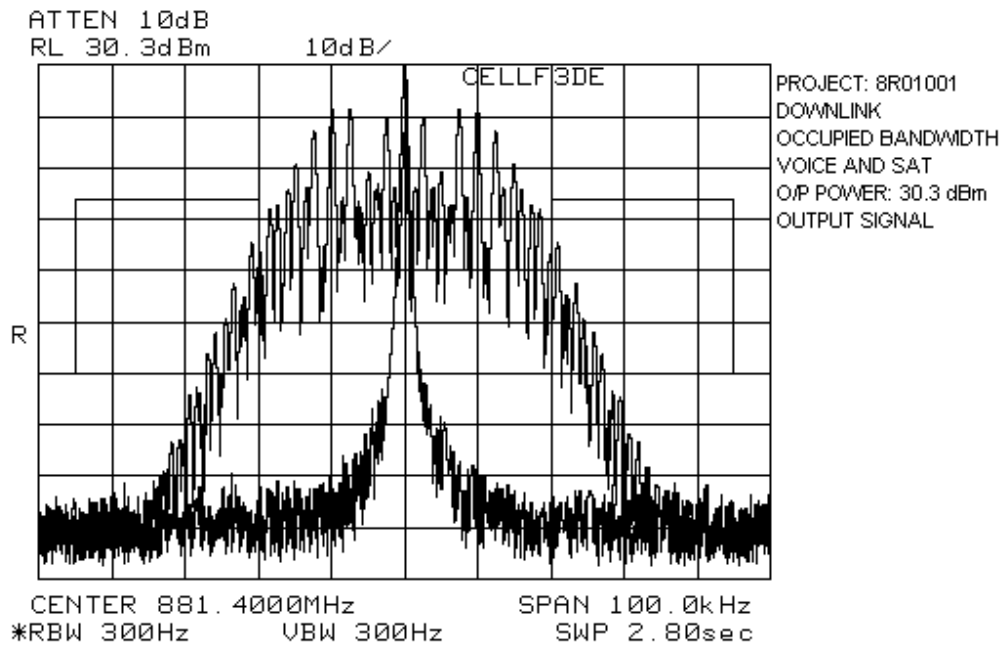
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FCC ID: BCR-DBE60-ABE



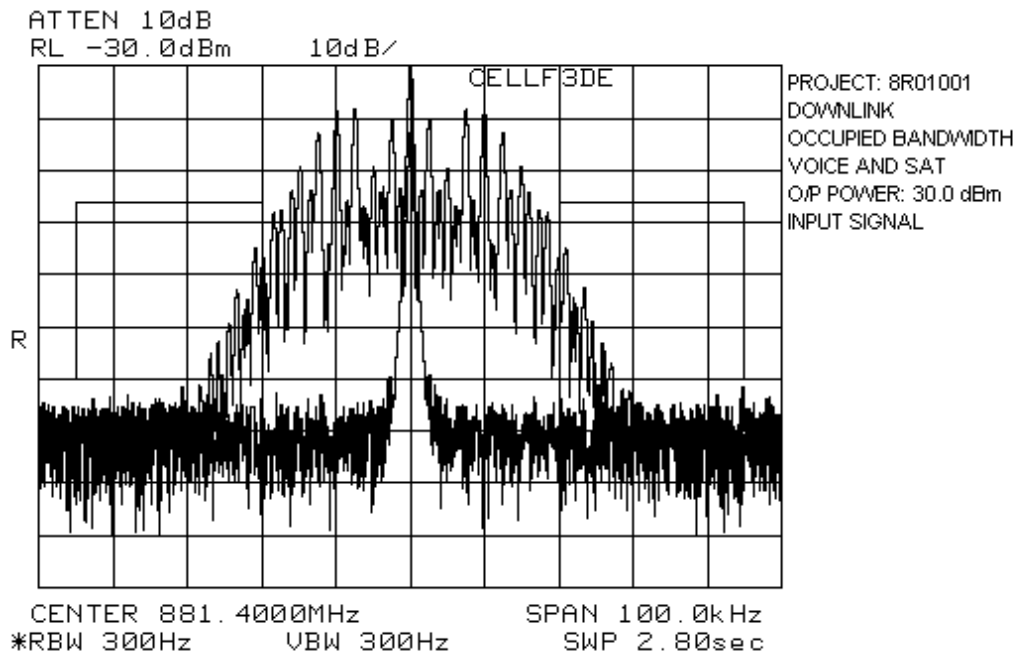
EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE



EQUIPMENT: "Prism Plus Indoor" Repeater
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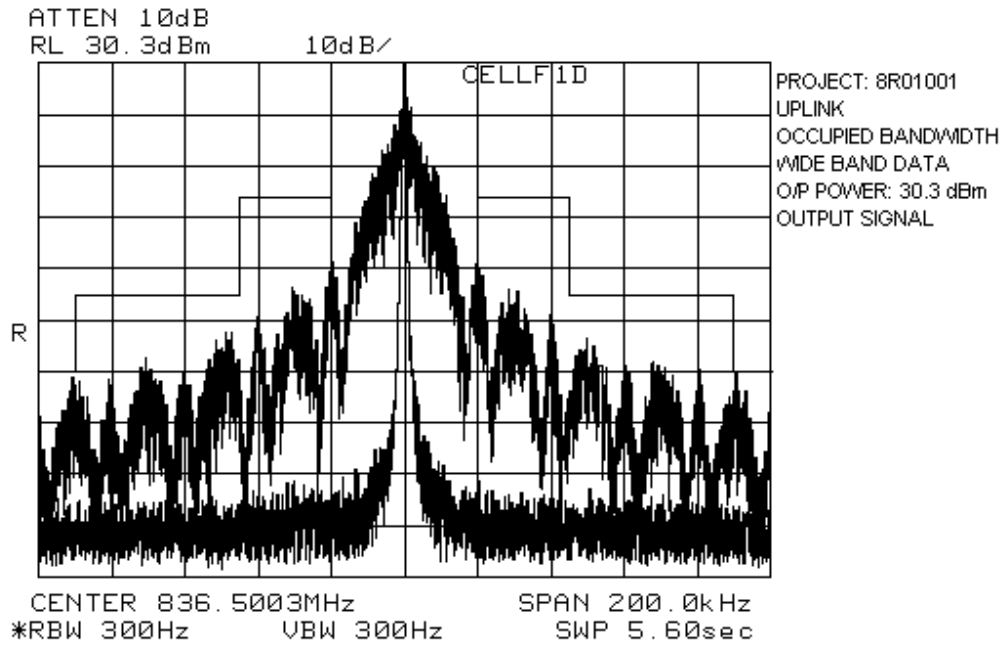
EQUIPMENT: "Prism Plus Indoor" Repeater
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NAME OF TEST: Occupied Bandwidth (WB Data)	PARA. NO.: 2.917 (d)
TESTED BY: Kevin Carr	DATE: October 30, 1998

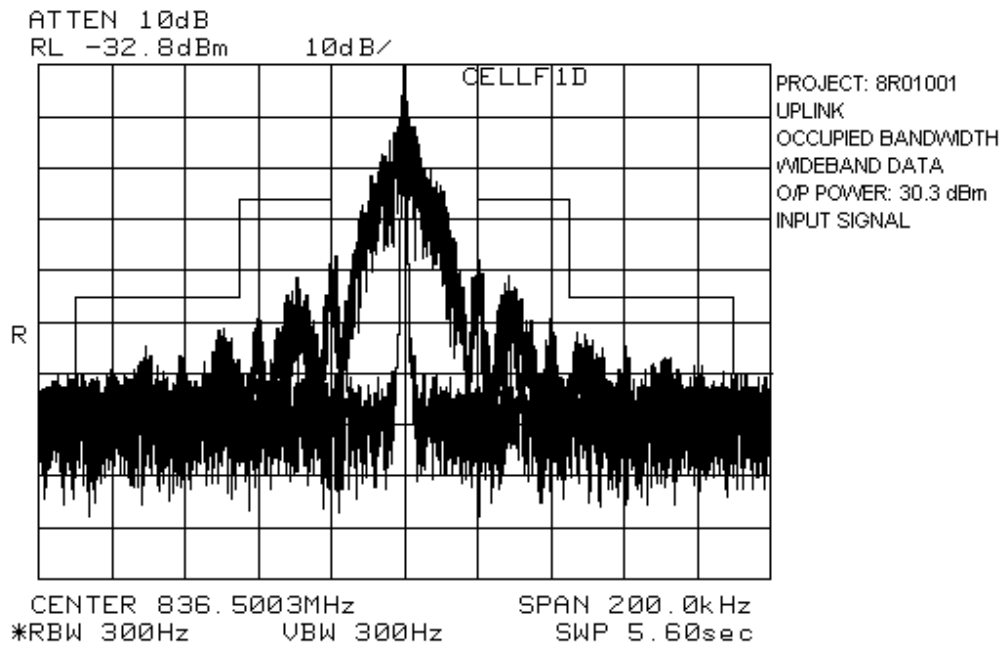
Test Results: Complies.

Test Data: See attached graph(s).

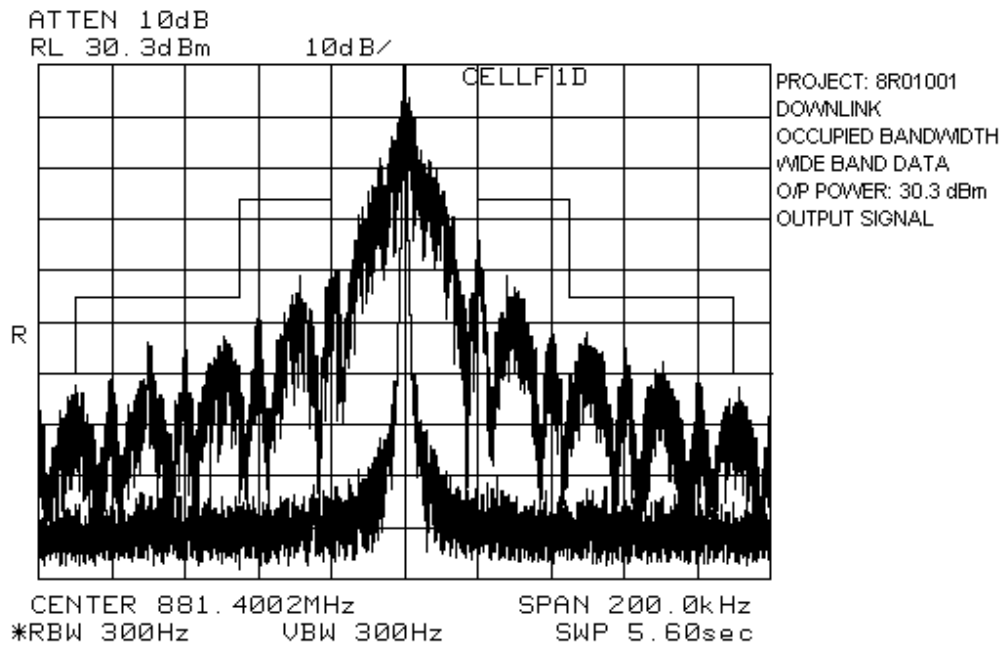
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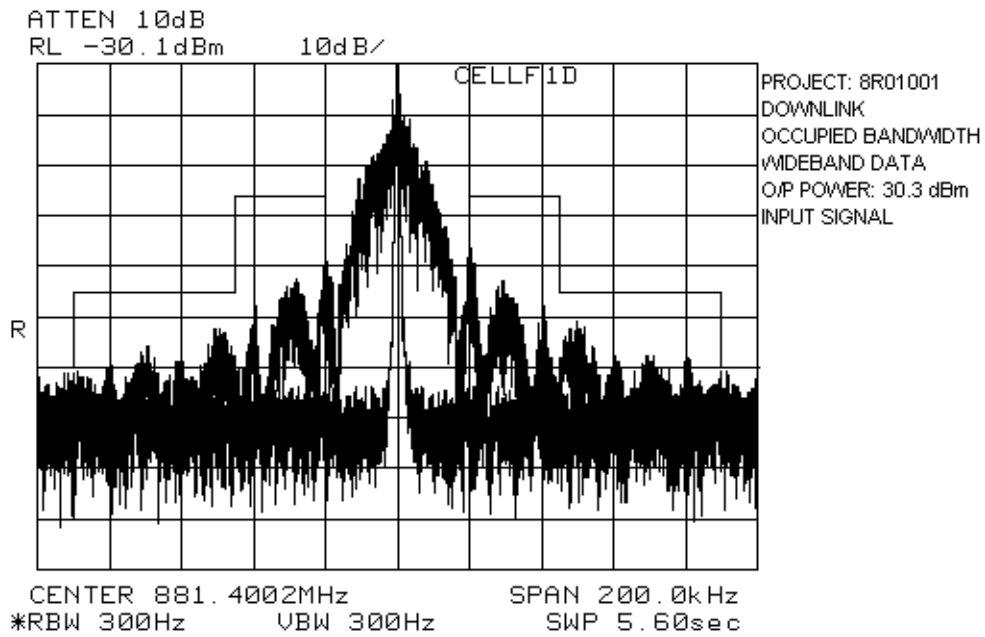
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EQUIPMENT: "Prism Plus Indoor" Repeater
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EQUIPMENT: "Prism Plus Indoor" Repeater
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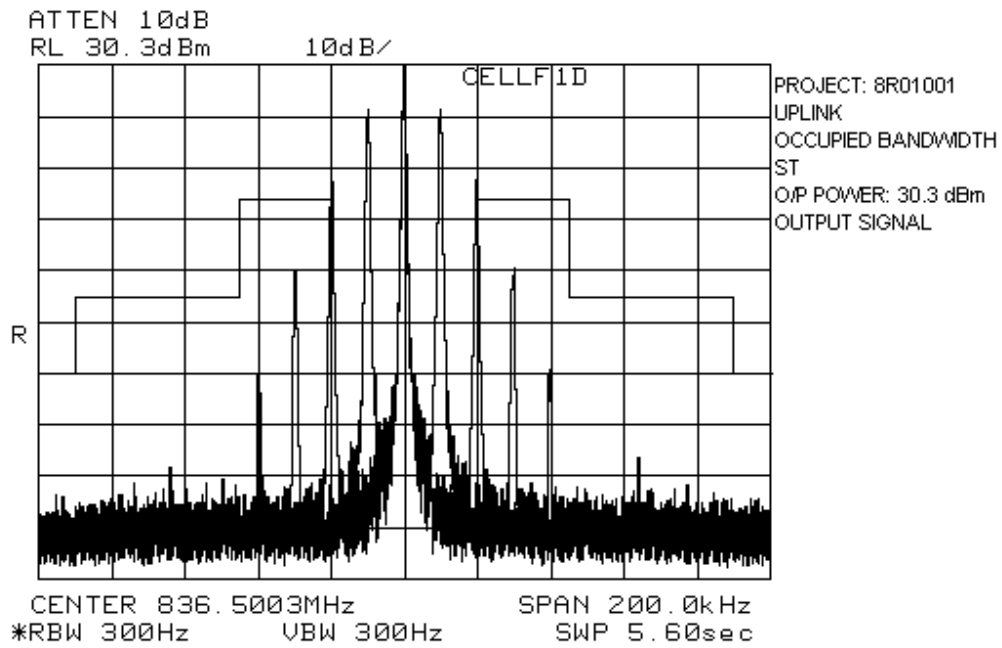
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FCC ID: BCR-DBE60-ABE

NAME OF TEST: Occupied Bandwidth (ST)	PARA. NO.: 2.917(d)
TESTED BY: Kevin Carr	DATE: October 30, 1998

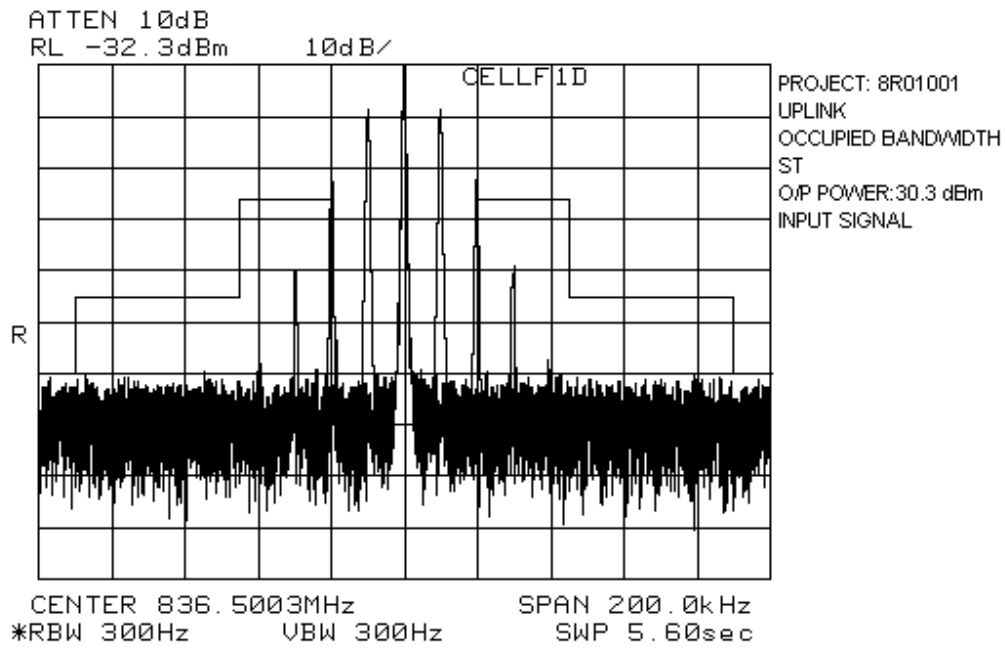
Test Results: Complies.

Test Data: See attached graph(s).

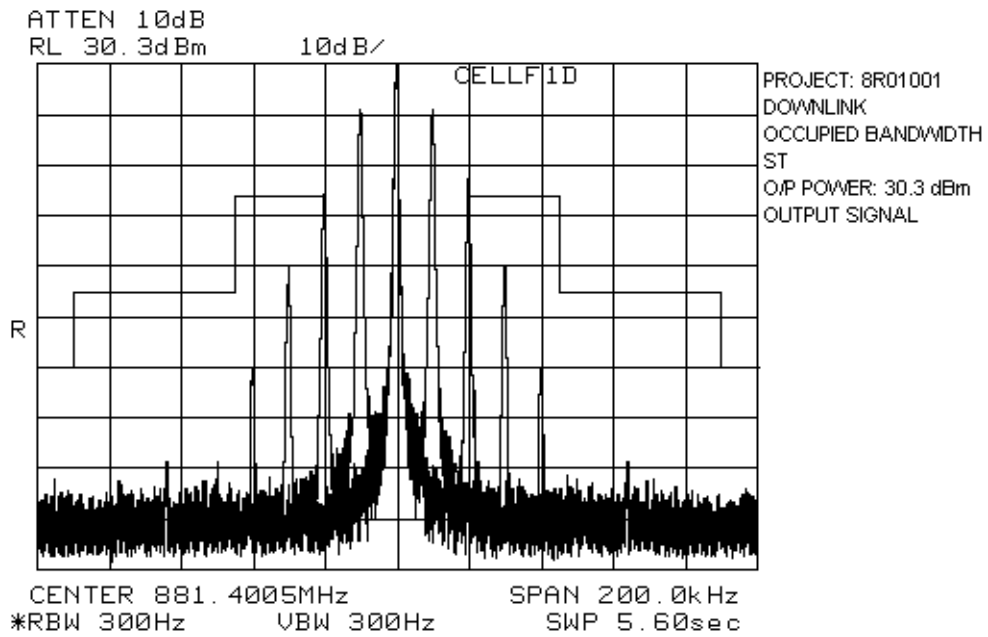
EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE



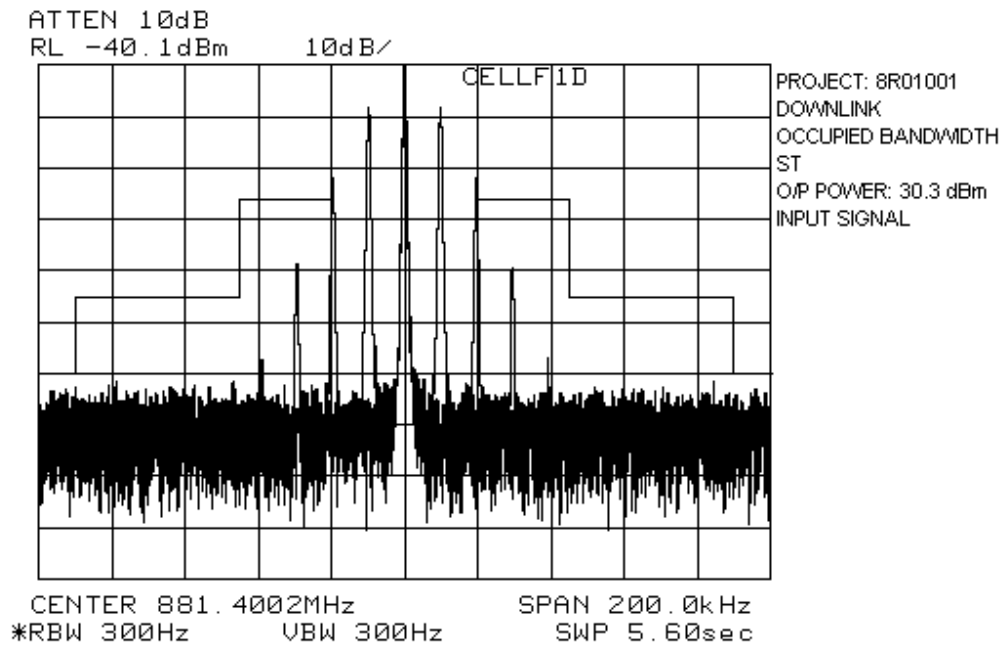
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FCC ID: BCR-DBE60-ABE



EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE



EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE



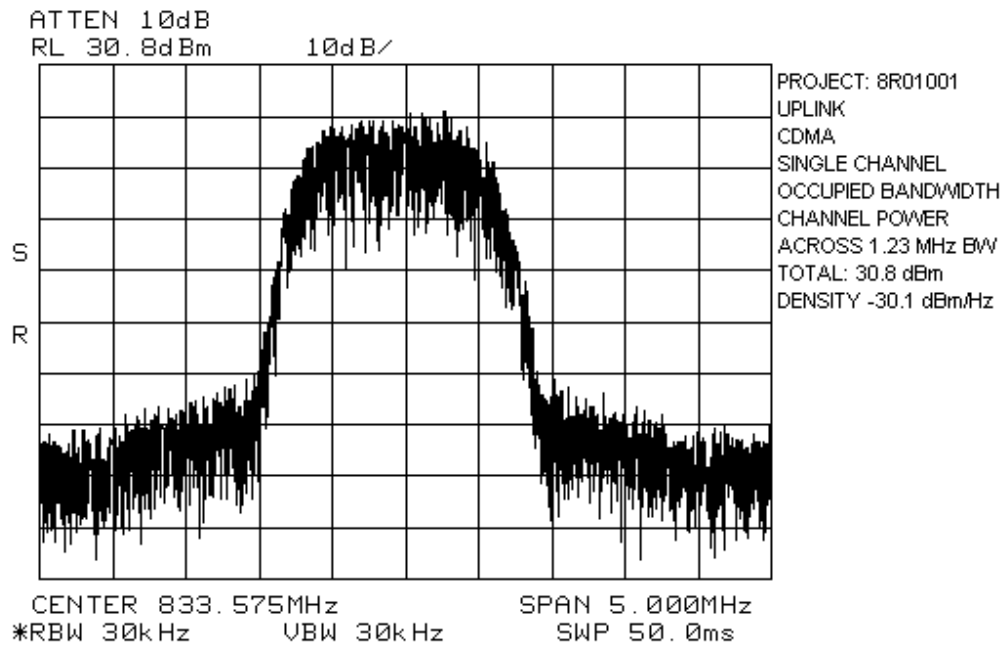
EQUIPMENT: "Prism Plus Indoor" Repeater
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NAME OF TEST: Occupied Bandwidth (Digital Mod.)	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: October 29, 1998

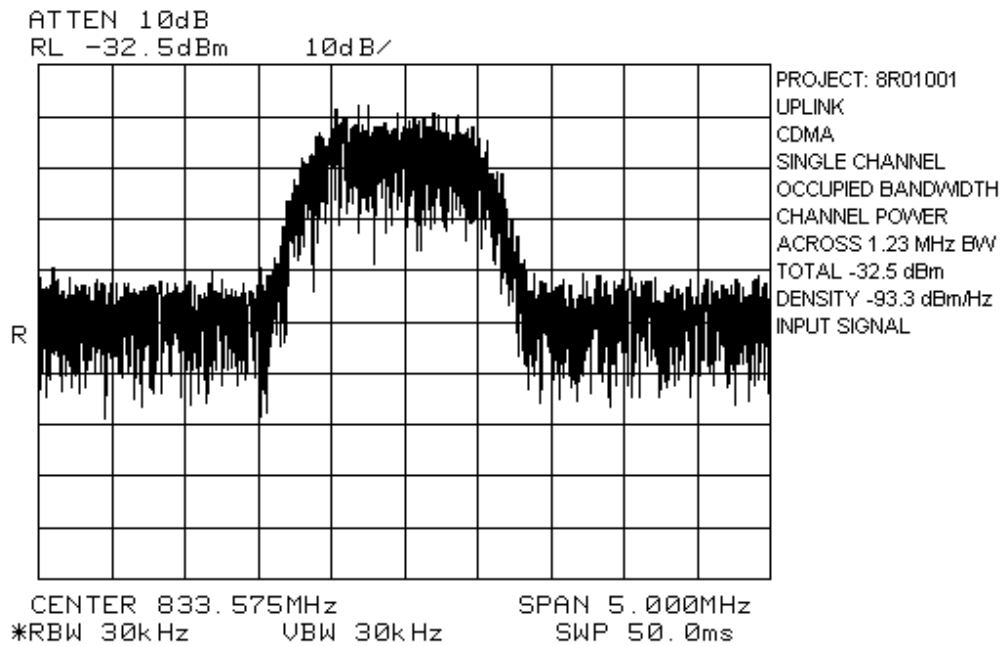
Test Results: Complies.

Test Data: See attached graph(s).

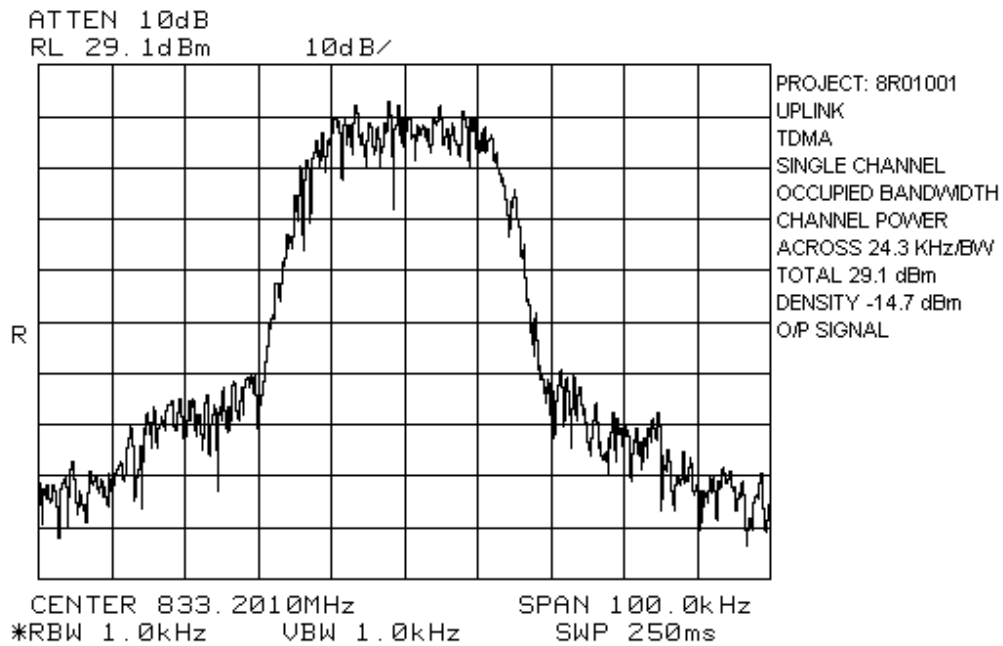
EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE



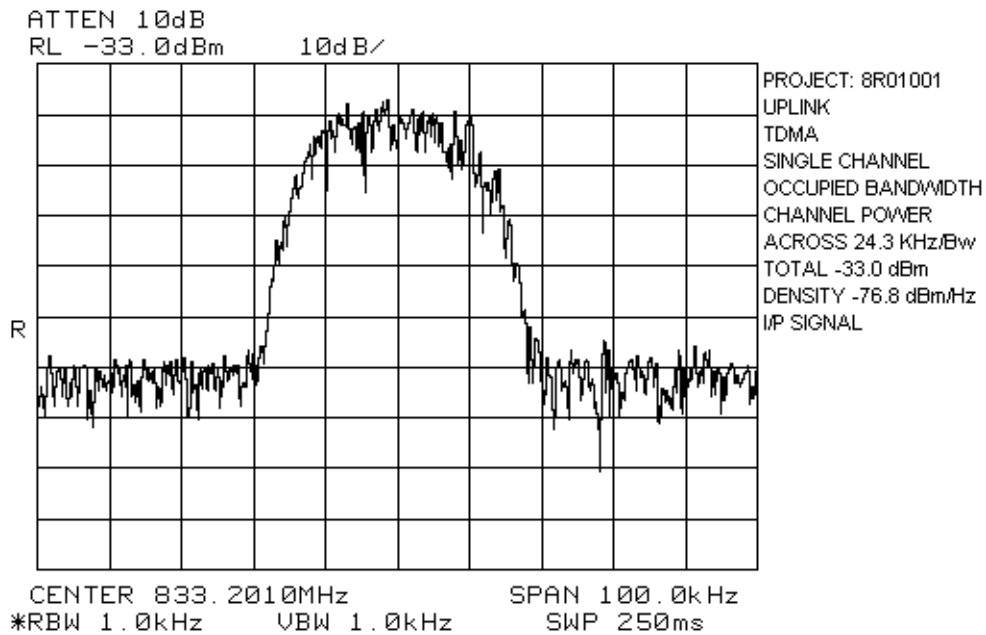
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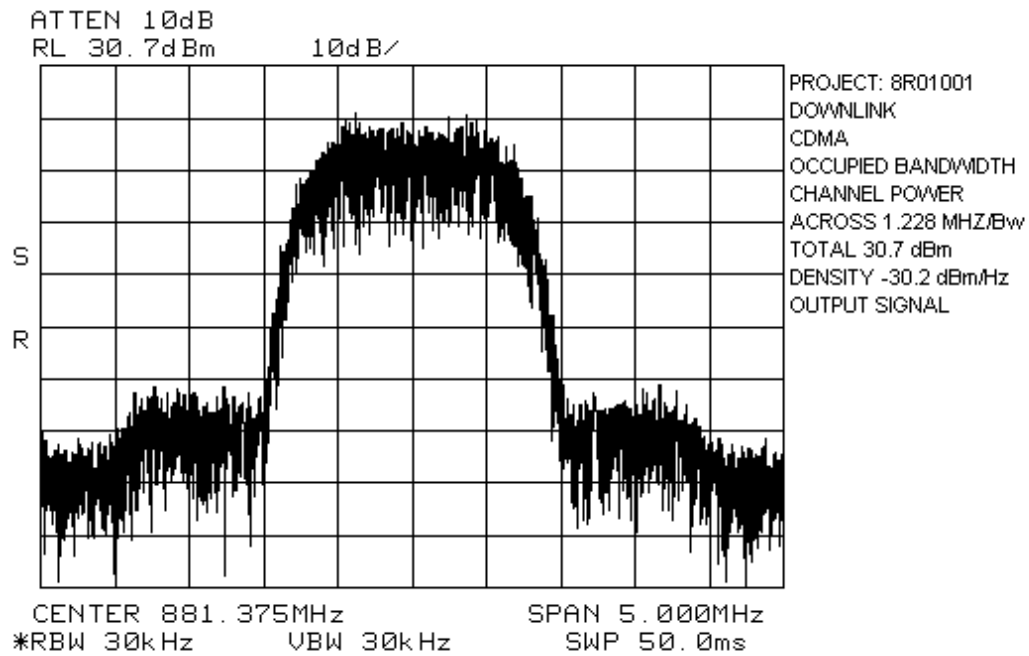
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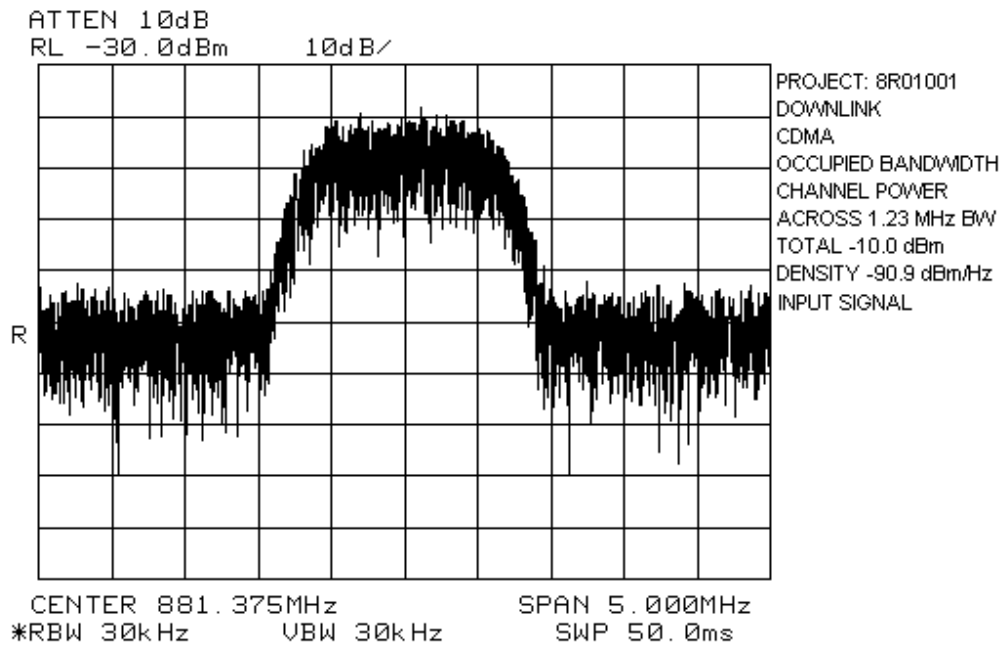
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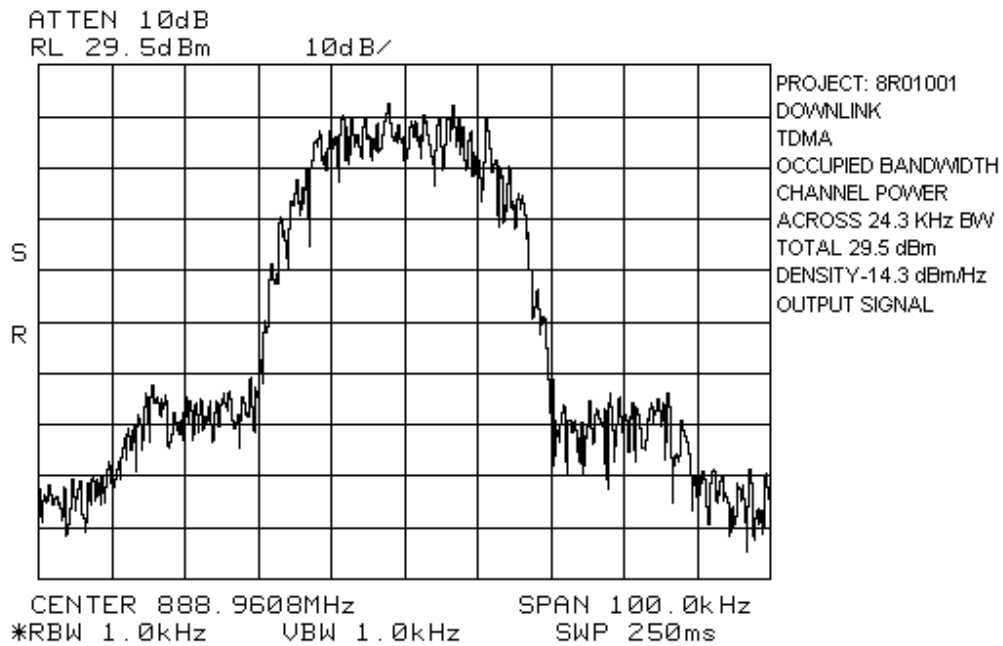
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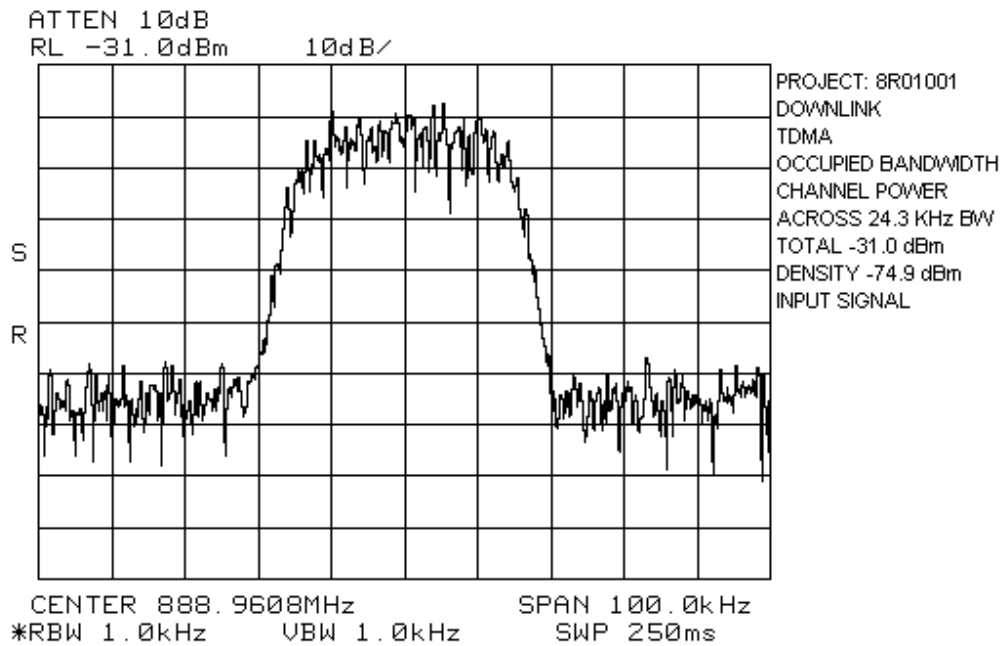
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EQUIPMENT: "Prism Plus Indoor" Repeater
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Section 5. Spurious Emissions at Antenna Terminals

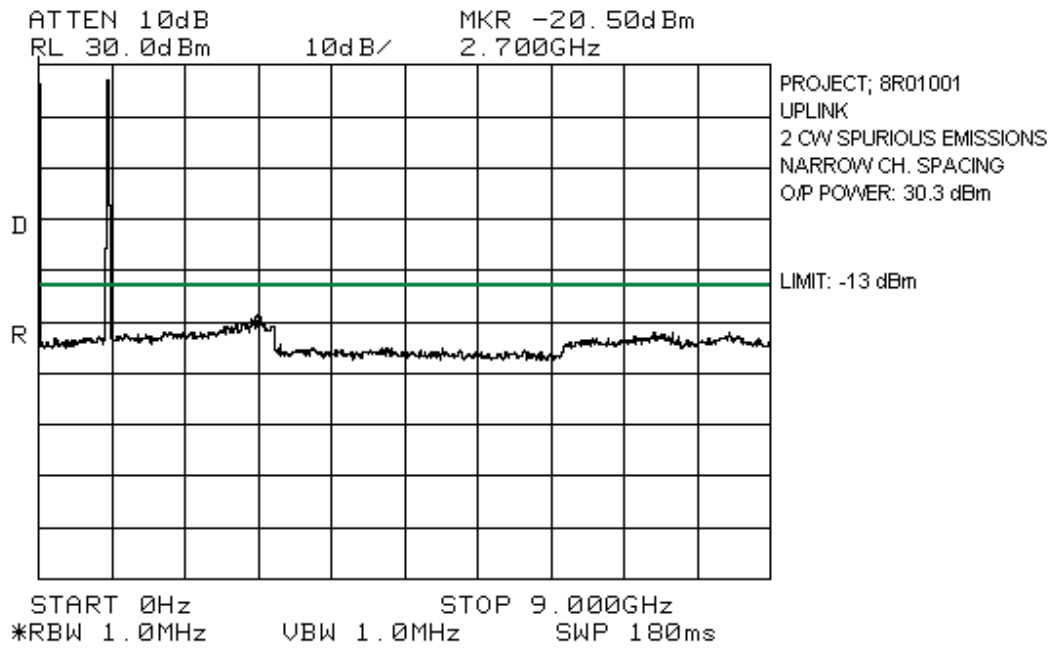
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: October 29, 1998

Test Results: Complies.

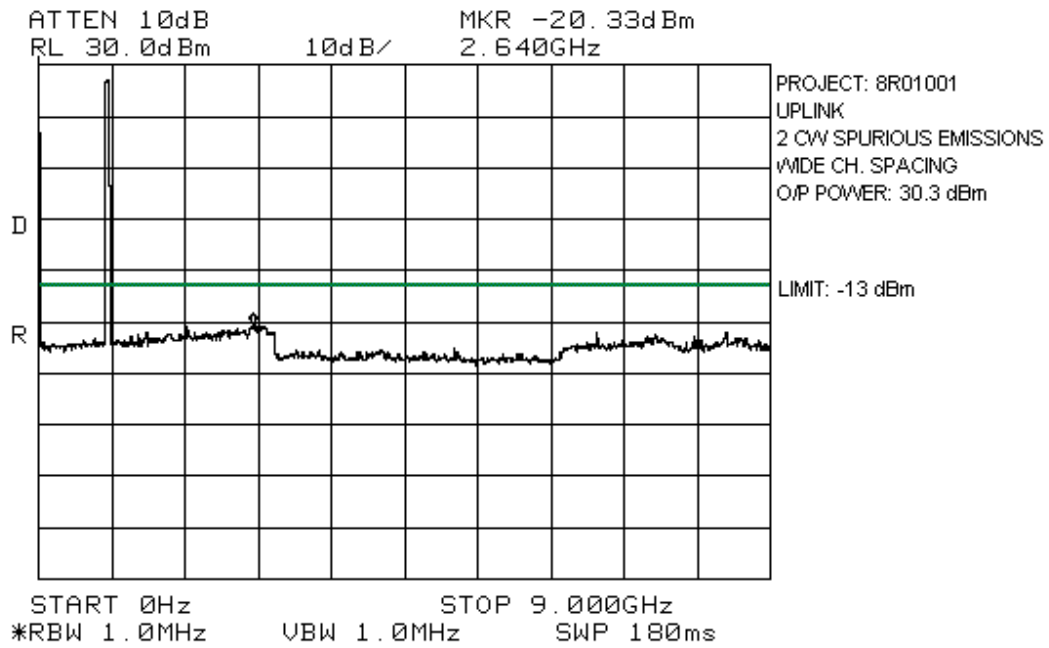
Test Data:

NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 10 GHz spurious (Uplink)	-20.17
0 to 10 GHz spurious (Downlink)	-19.83
2 - signal intermodulation (Uplink)	-13.0
2 - signal intermodulation (Downlink)	-13.0
Lower band edge spurious (Uplink)	-18.30
Lower band edge spurious (Downlink)	-14.50
Upper band edge spurious (Uplink)	-13.17
Upper band edge spurious (Downlink)	-13.50

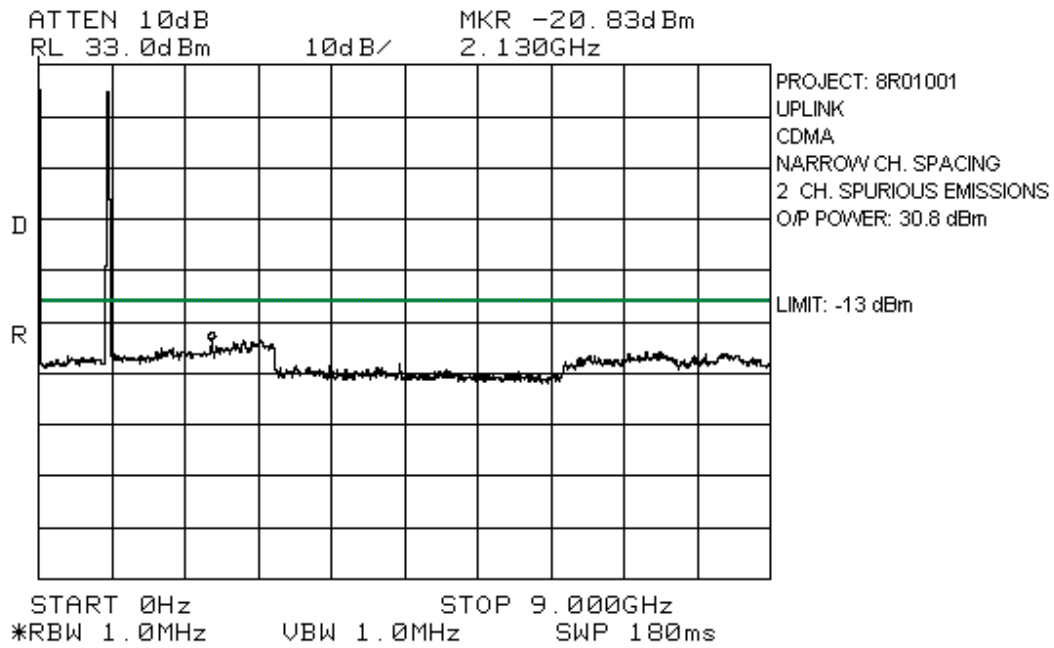
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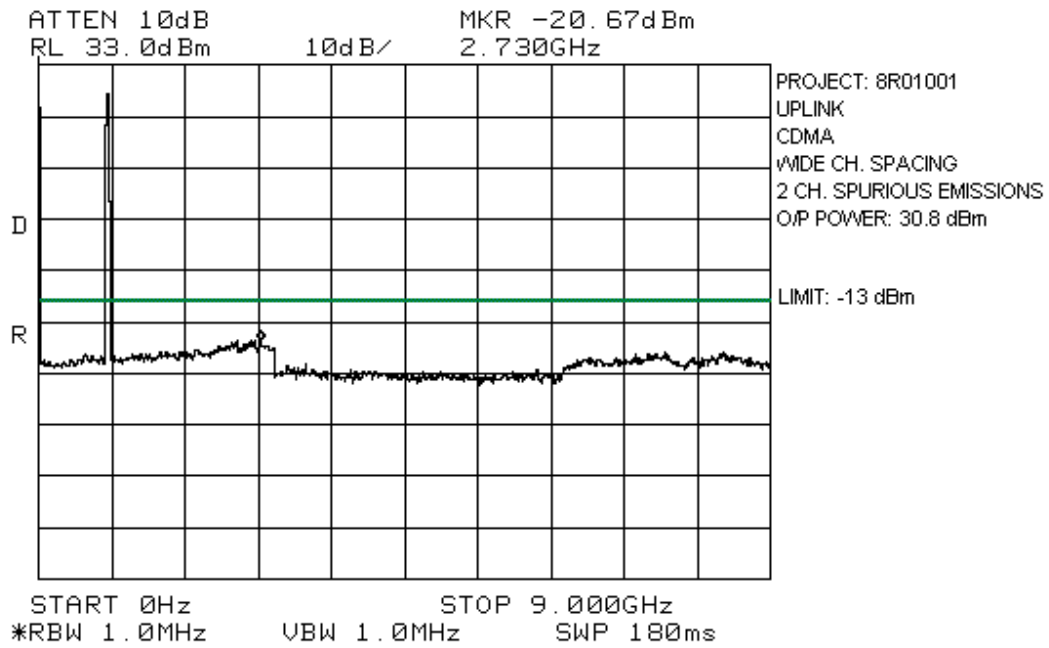
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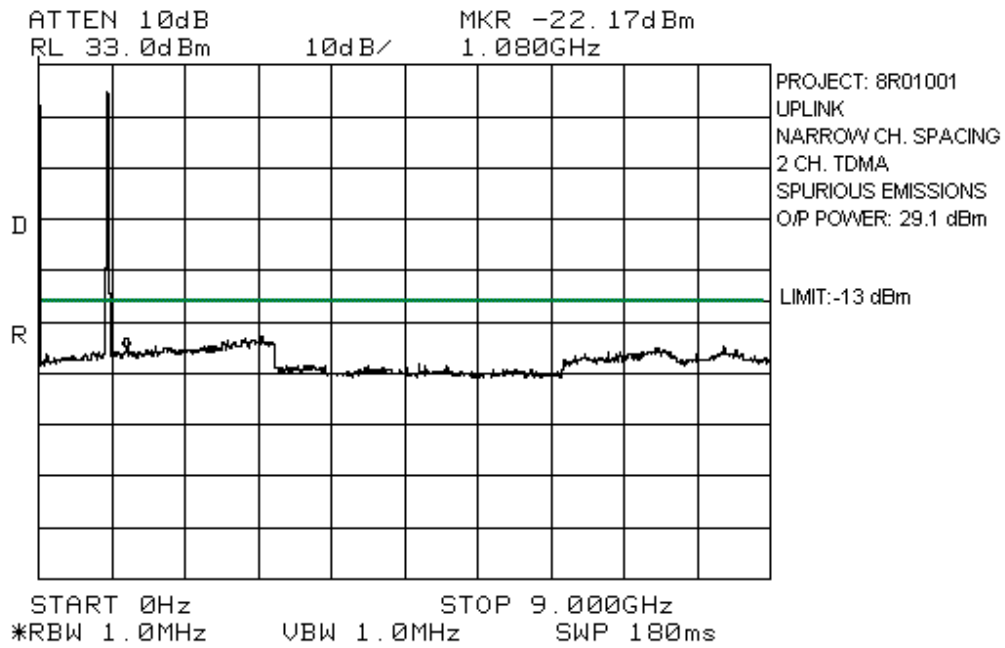
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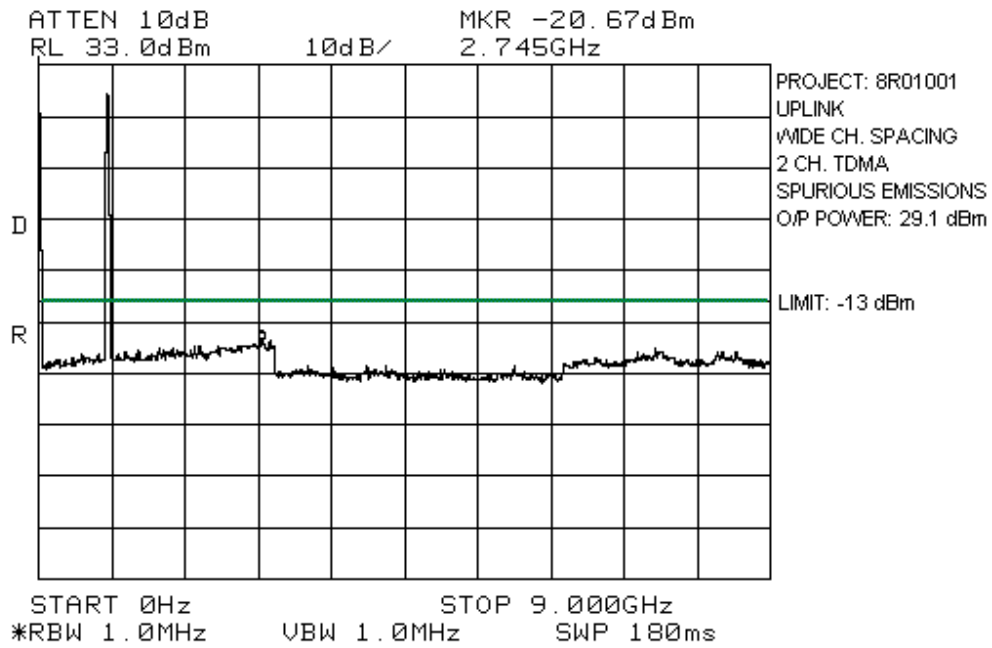
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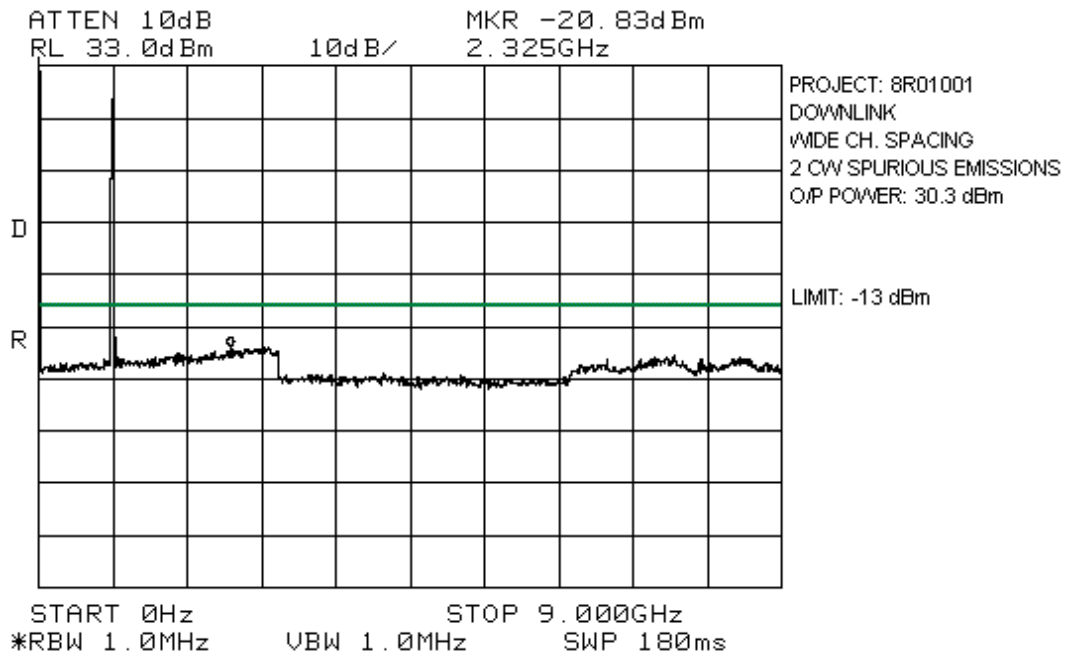
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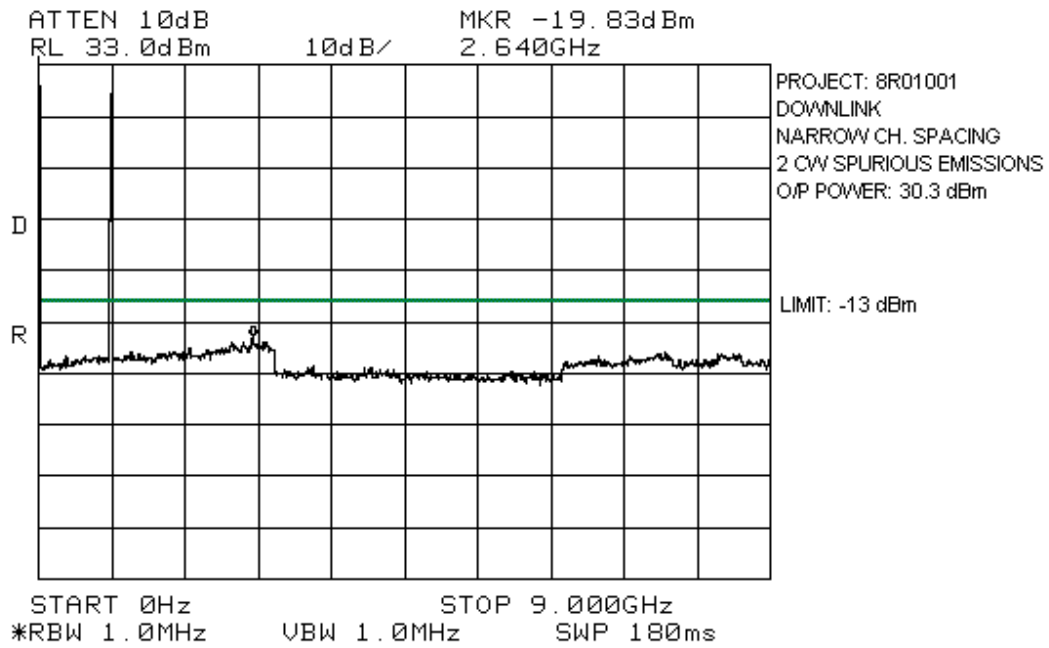
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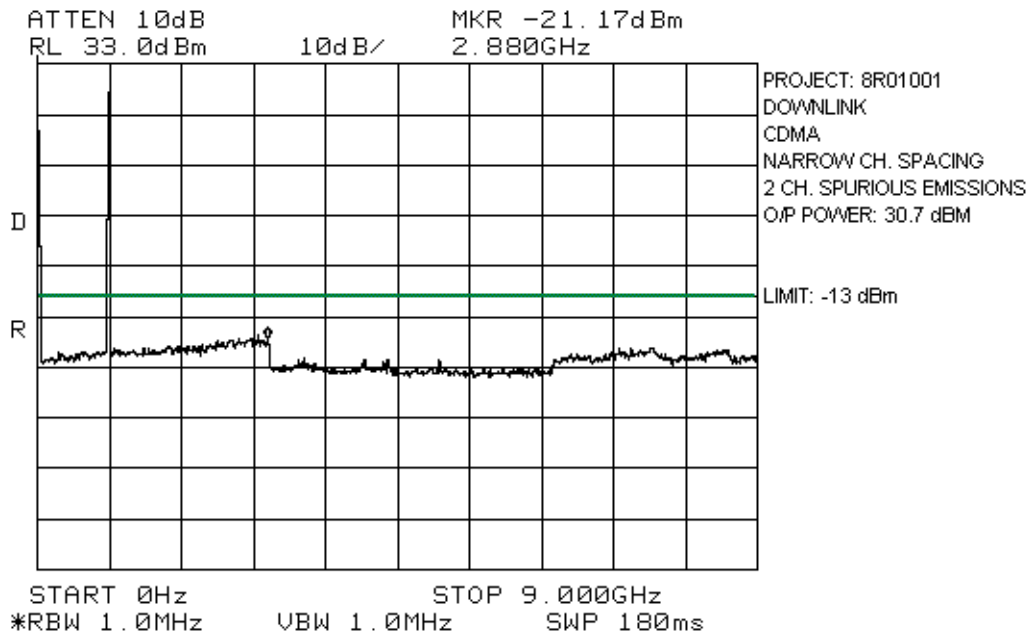
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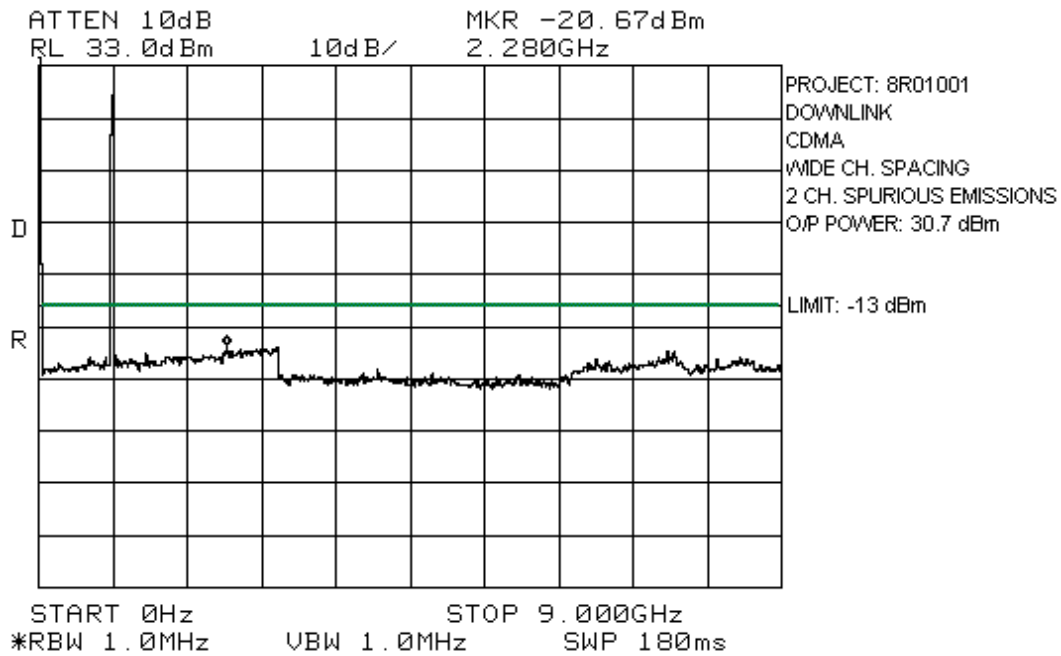
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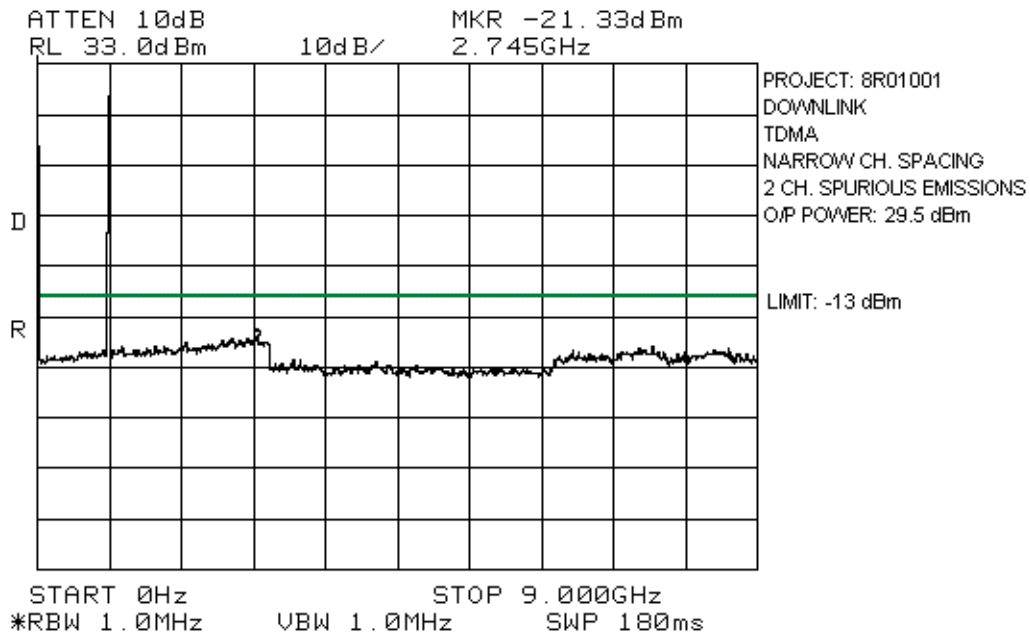
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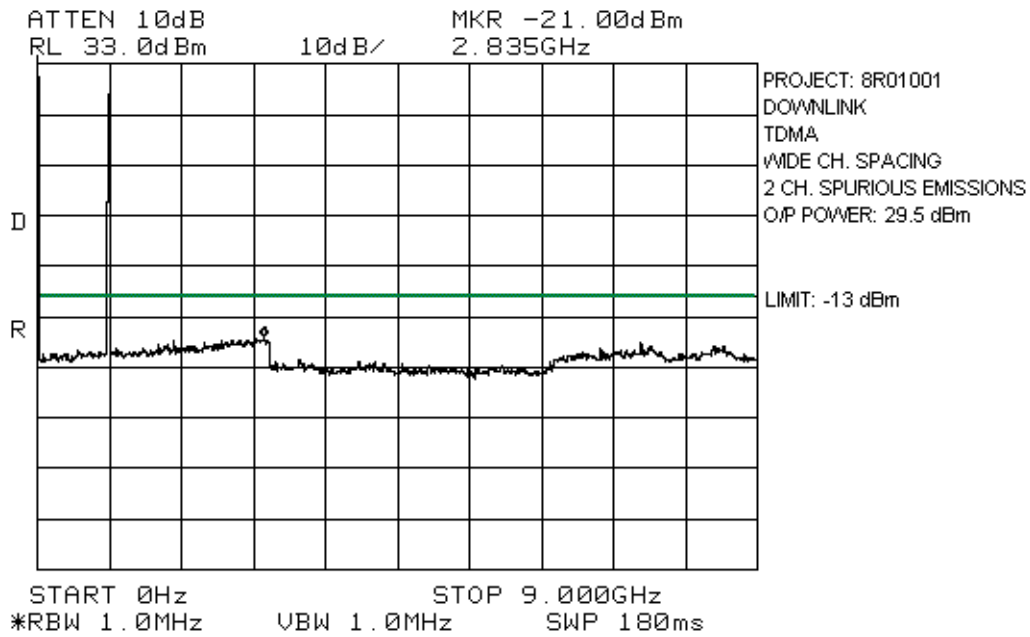
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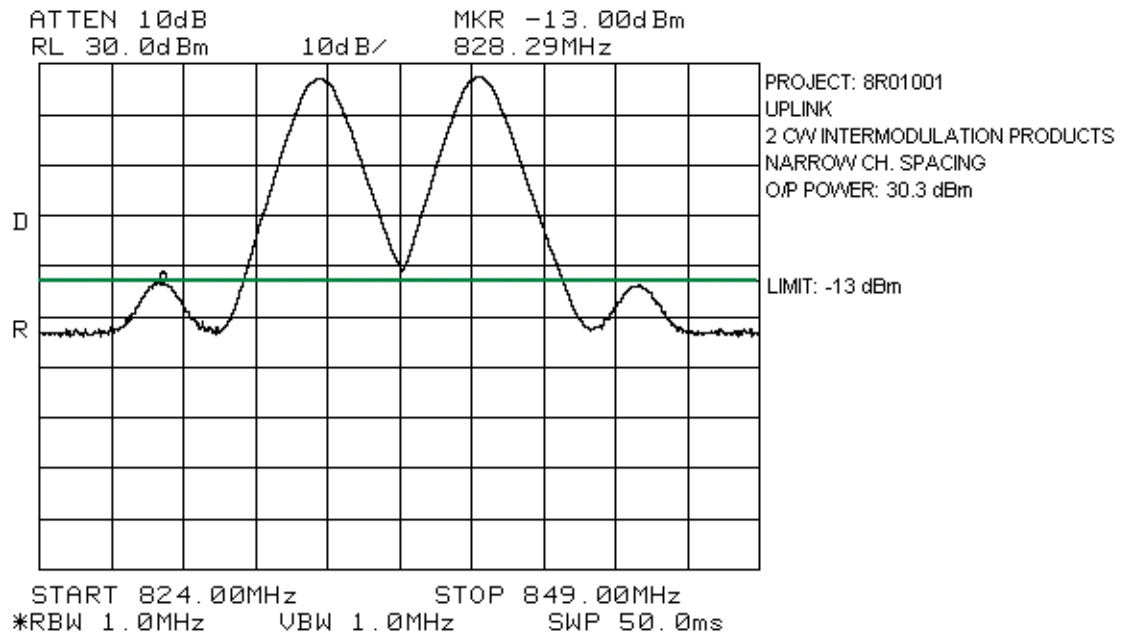
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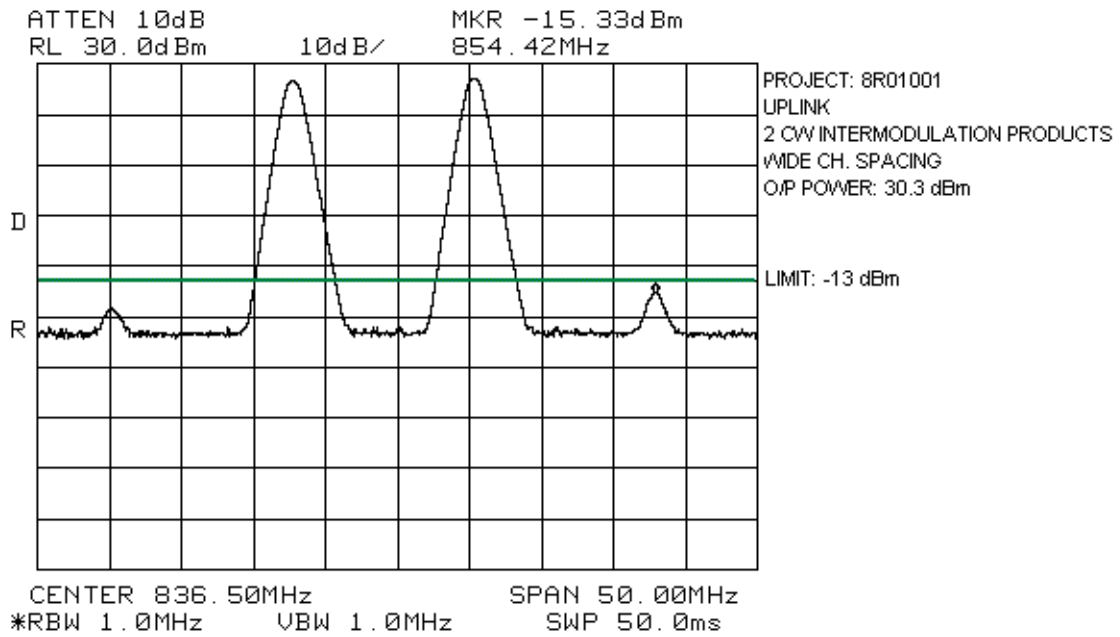
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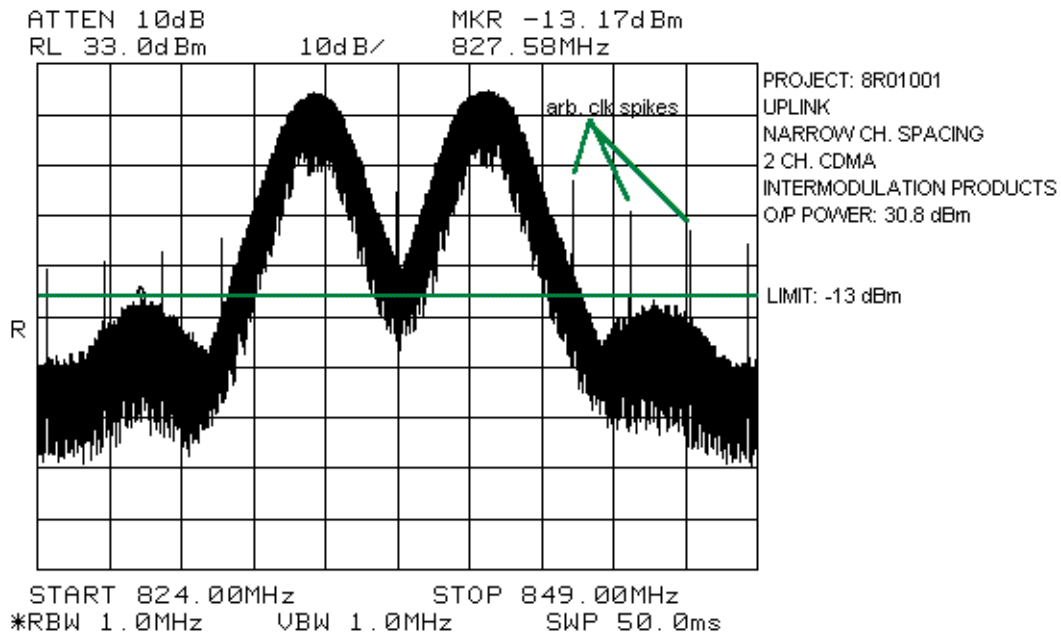
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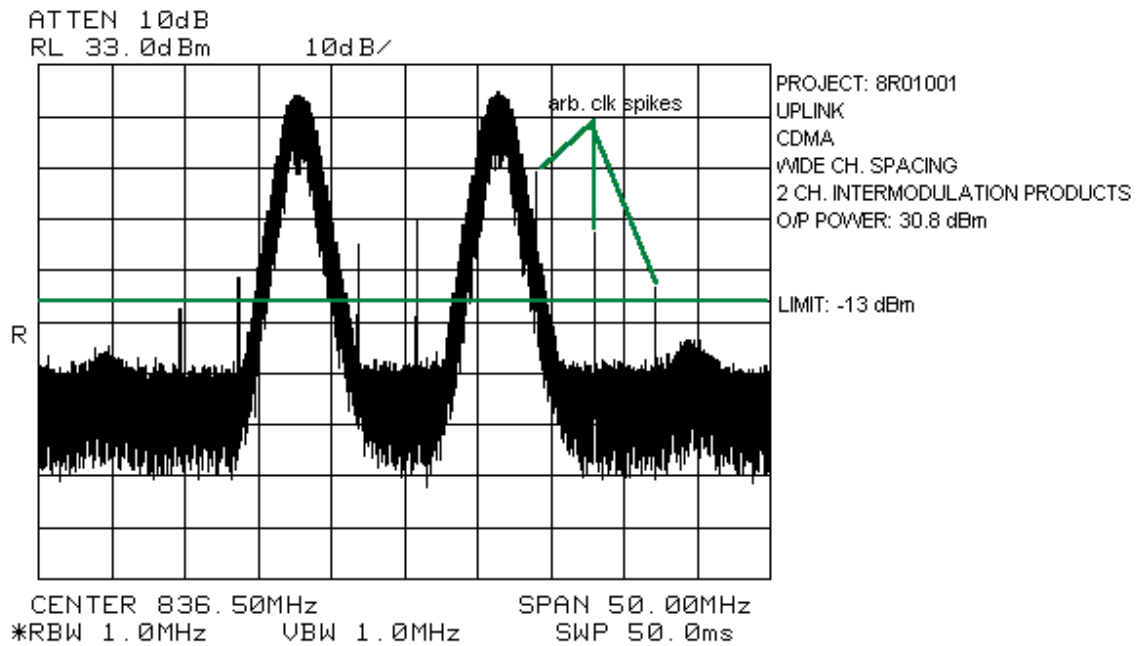
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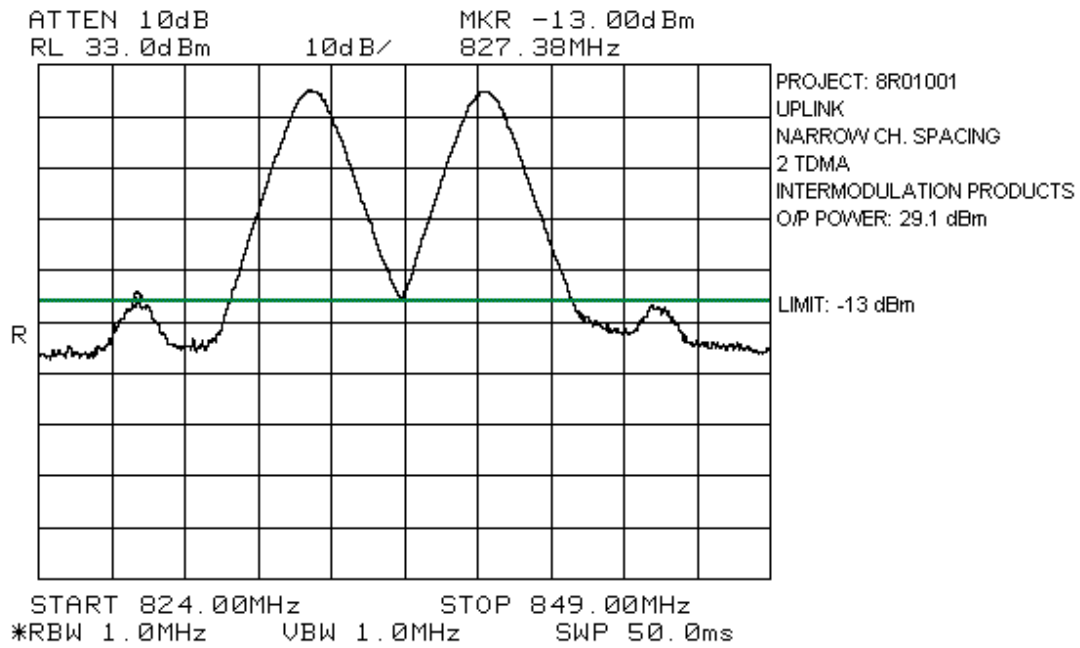
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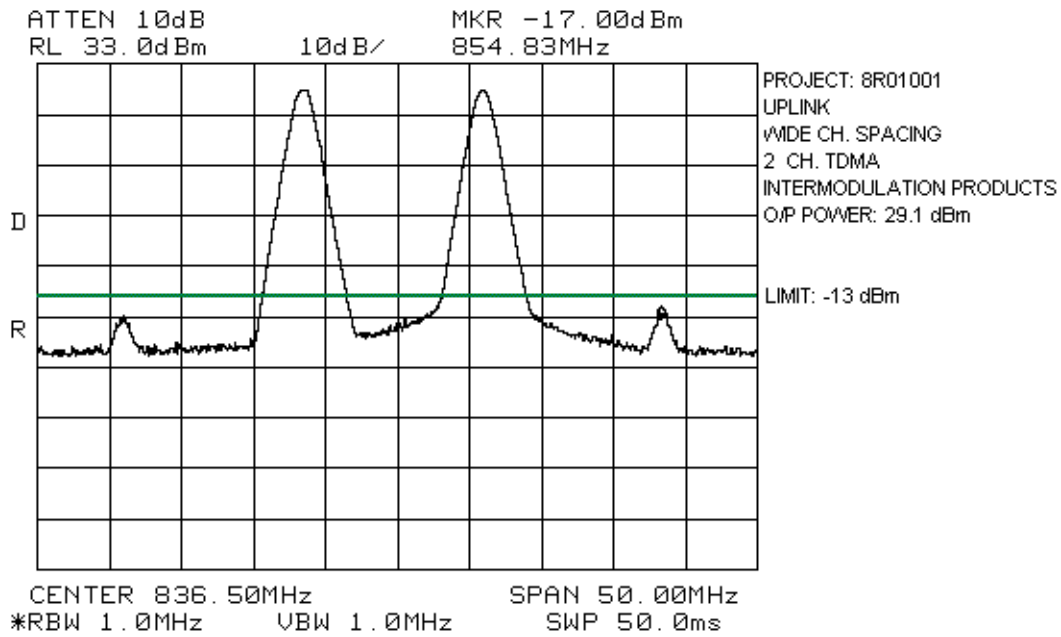
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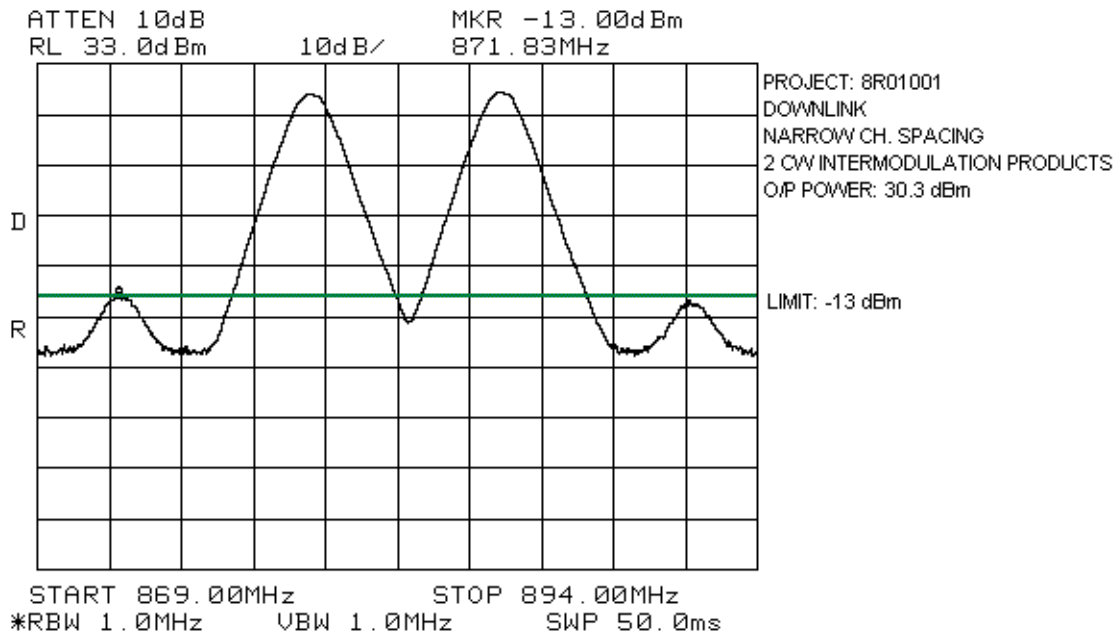
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FCC ID: BCR-DBE60-ABE



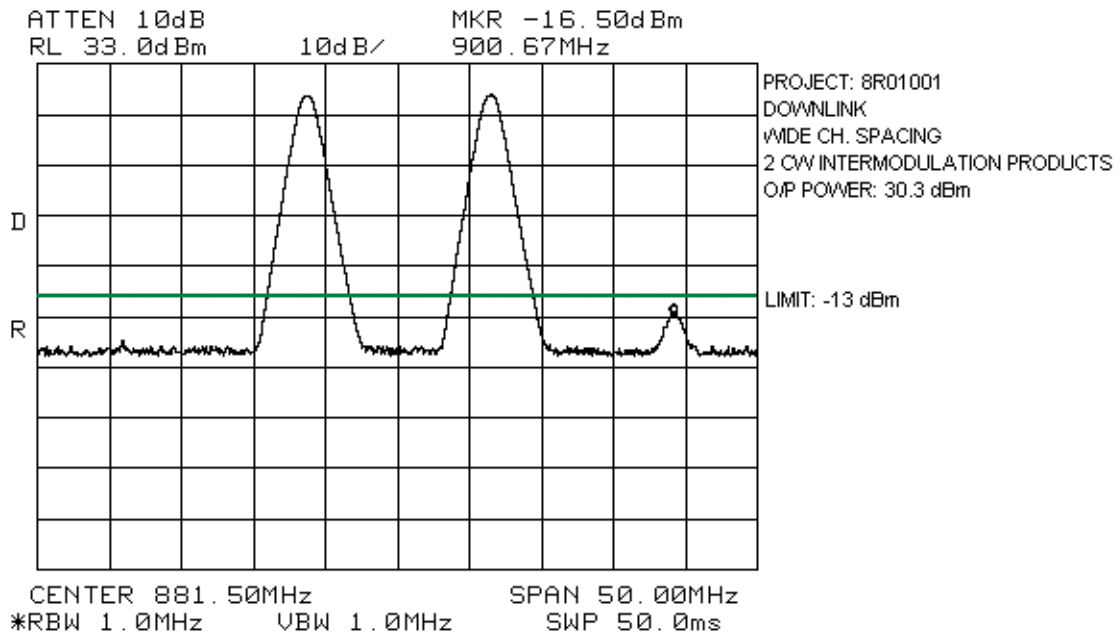
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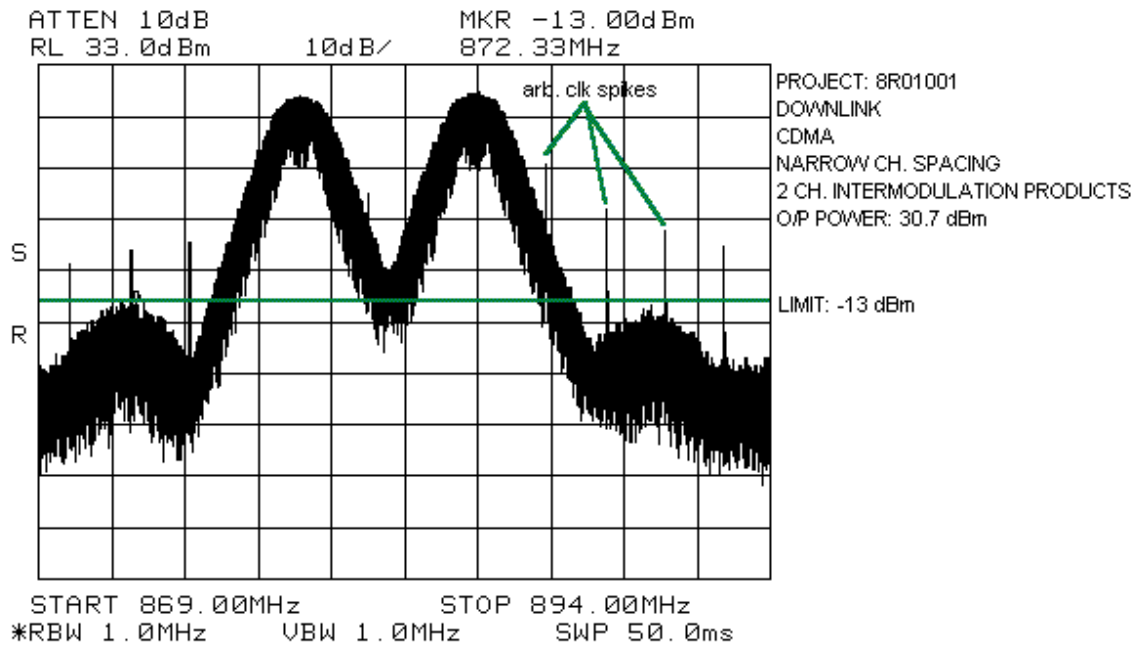
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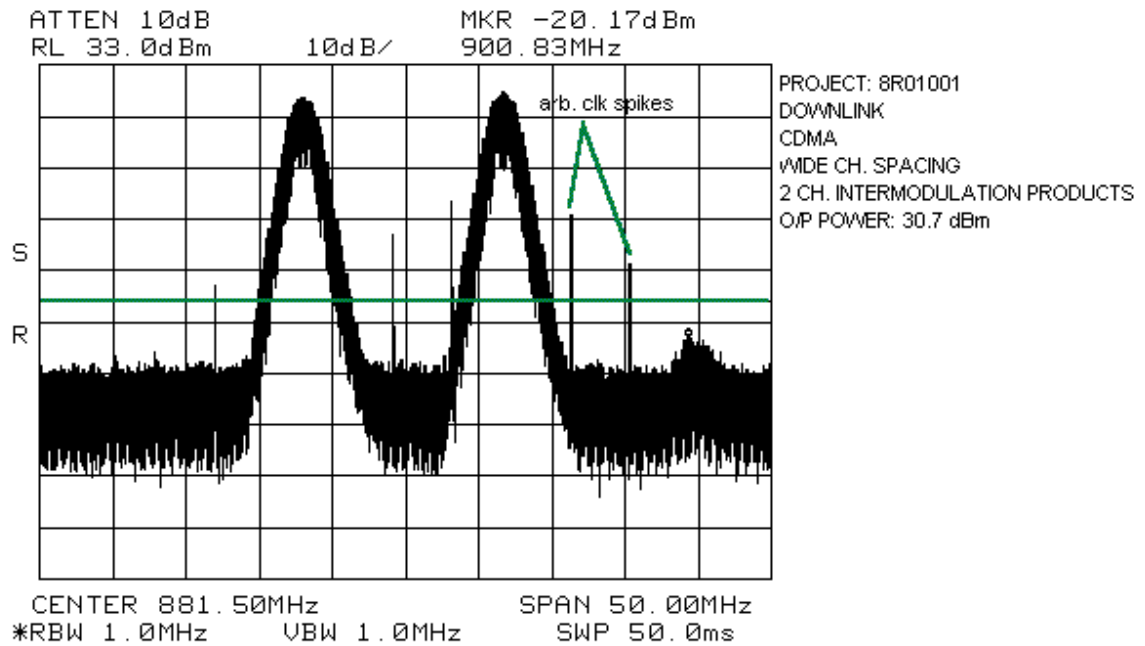
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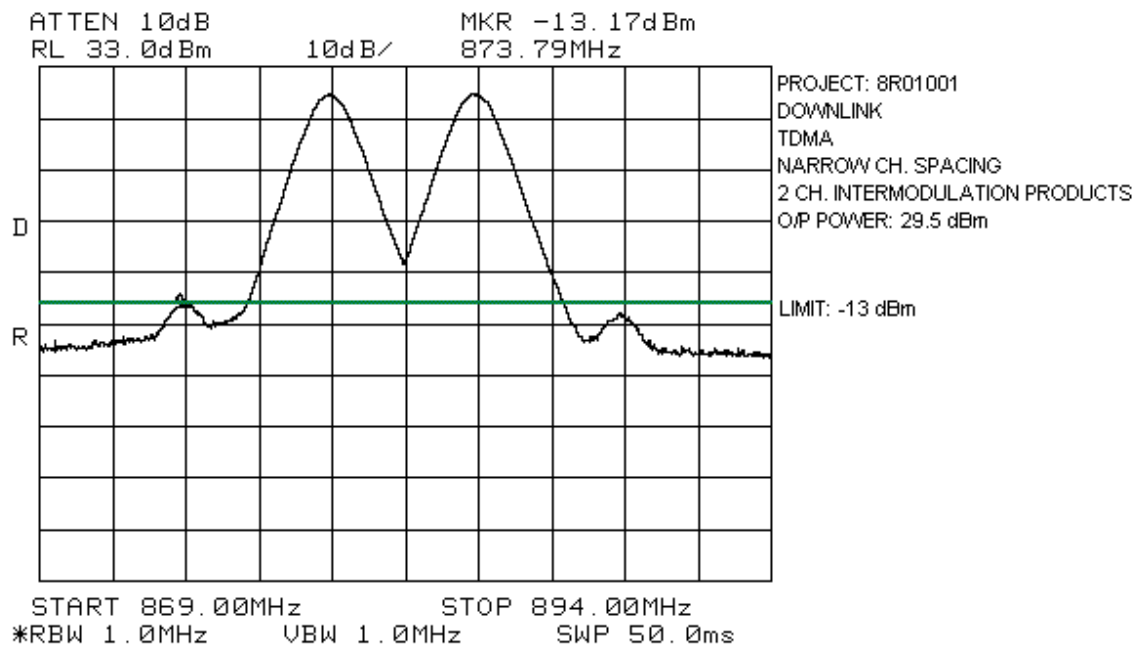
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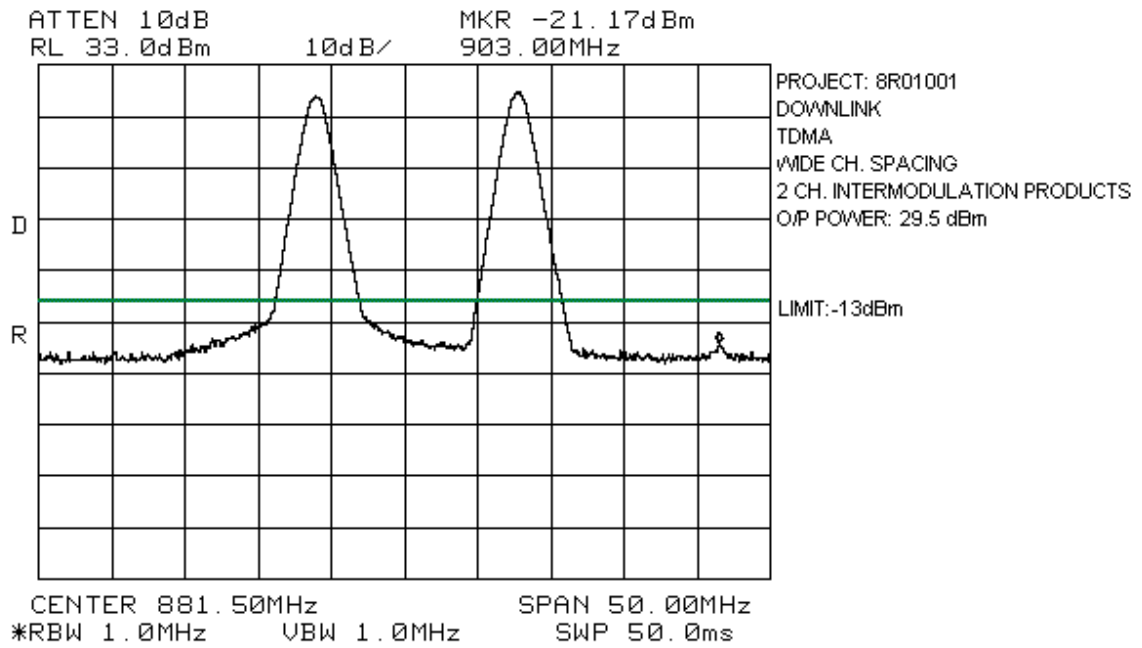
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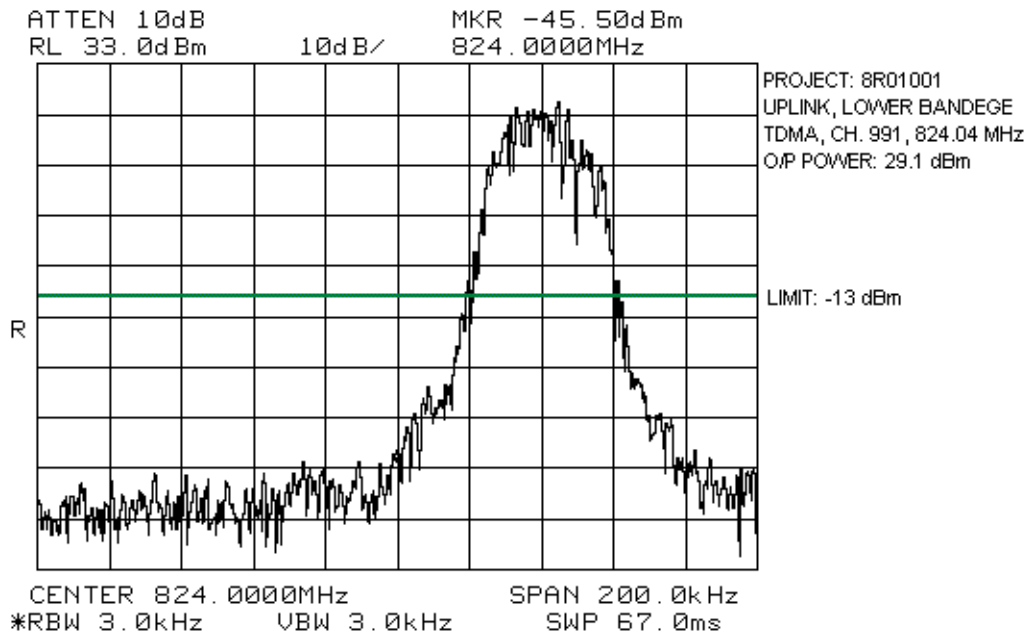
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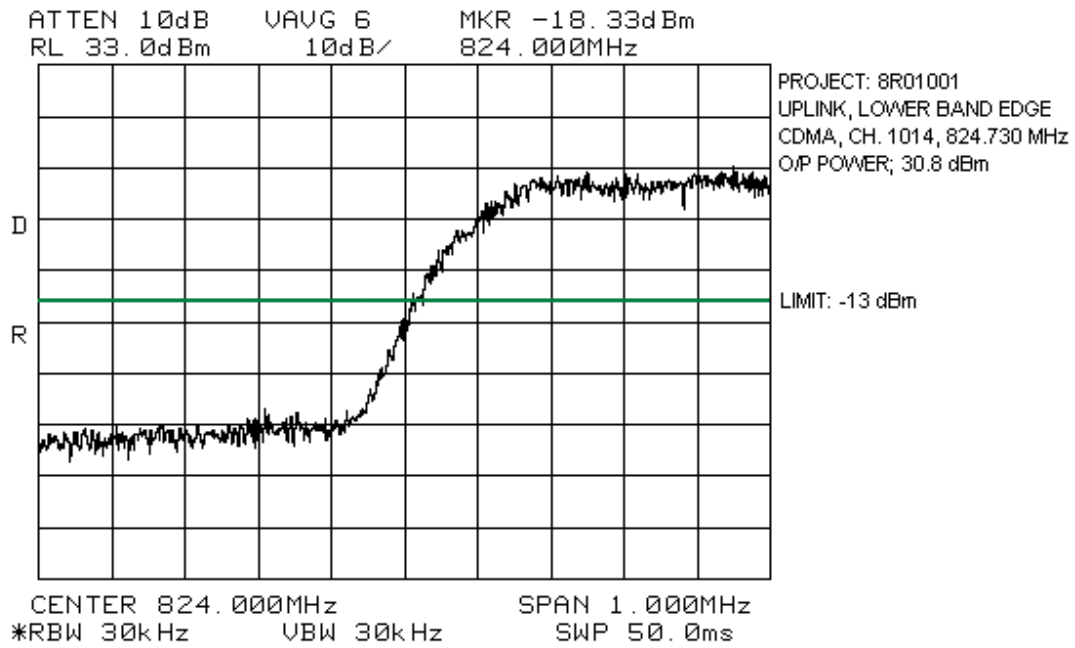
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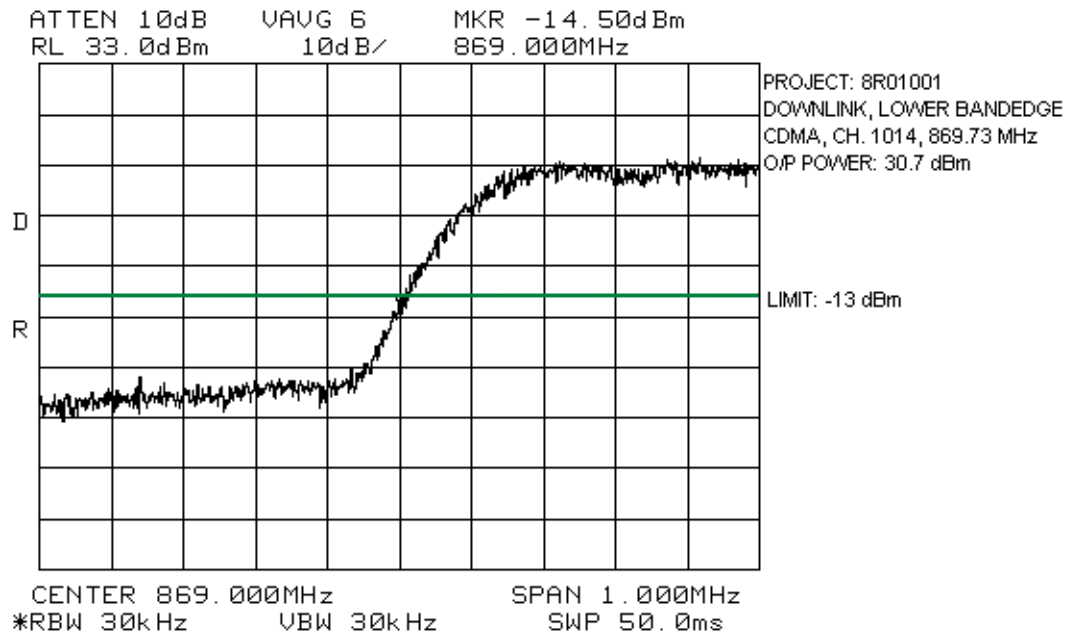
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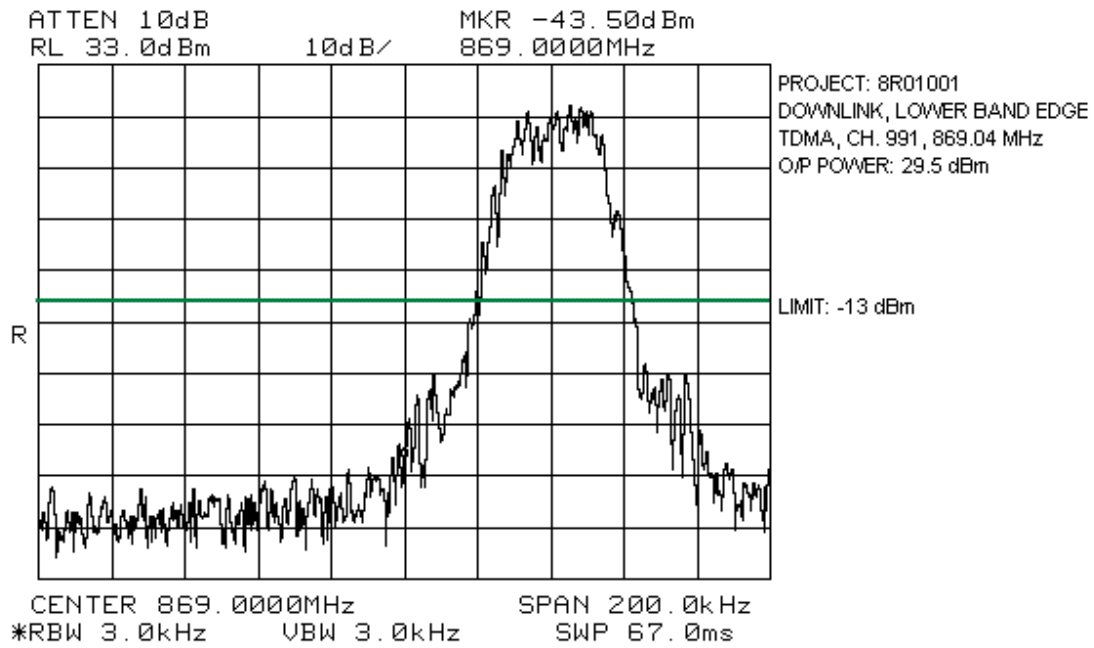
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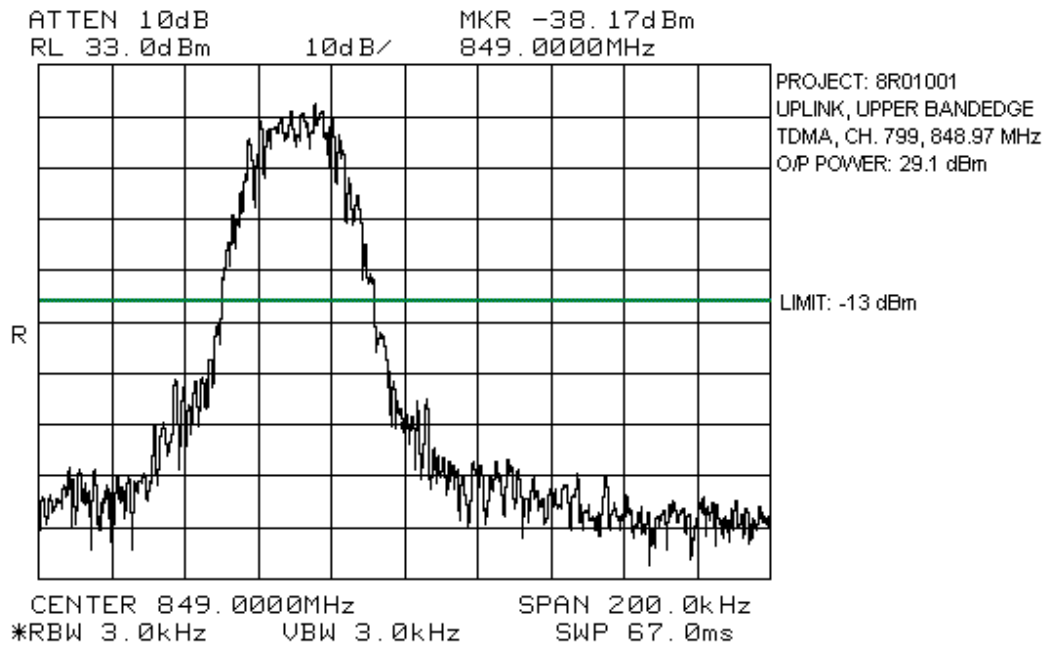
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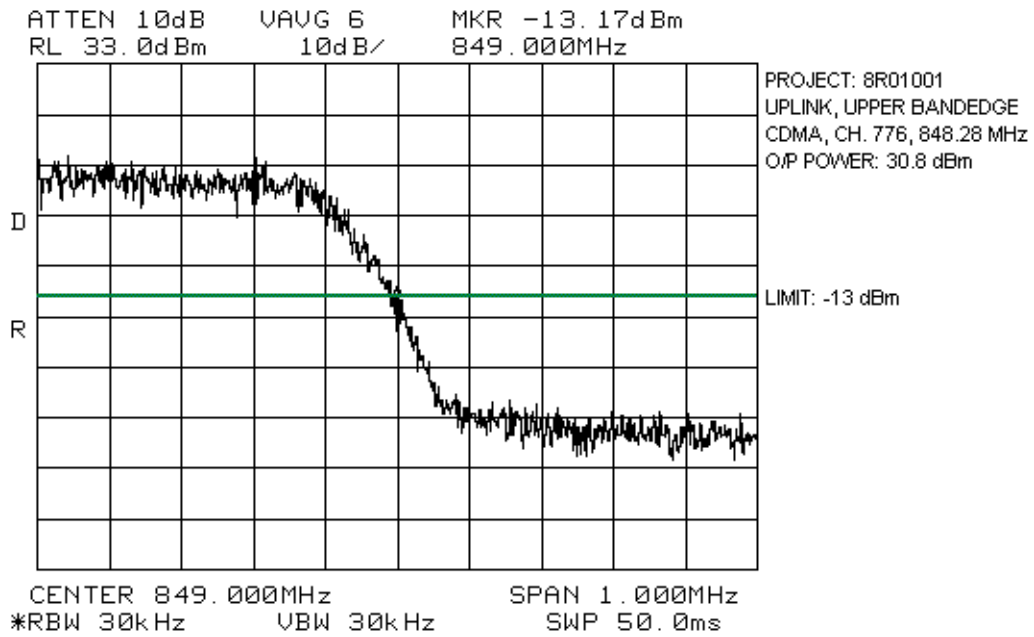
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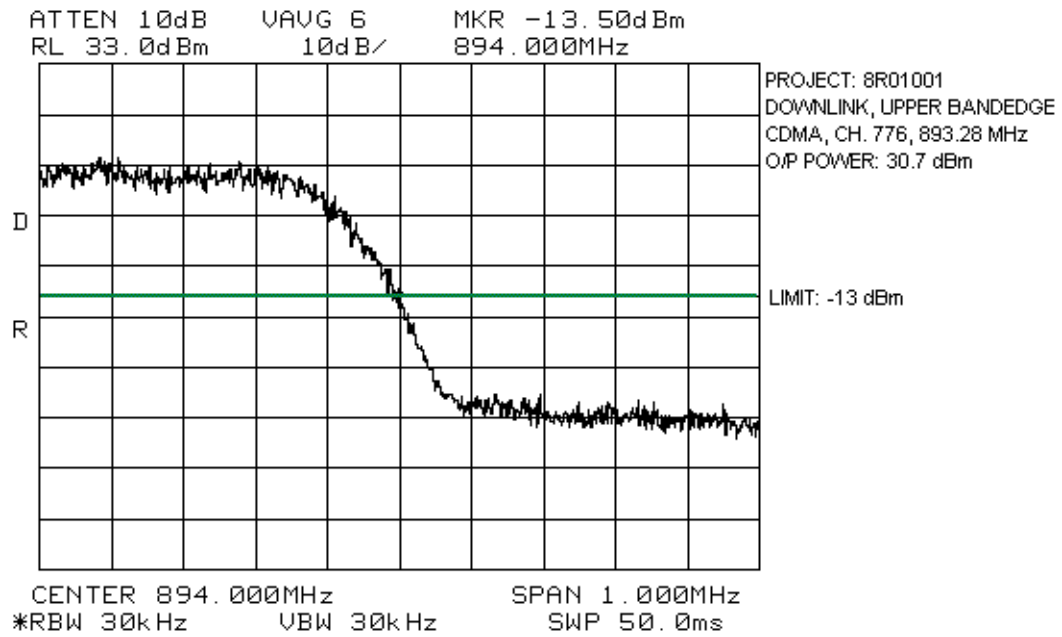
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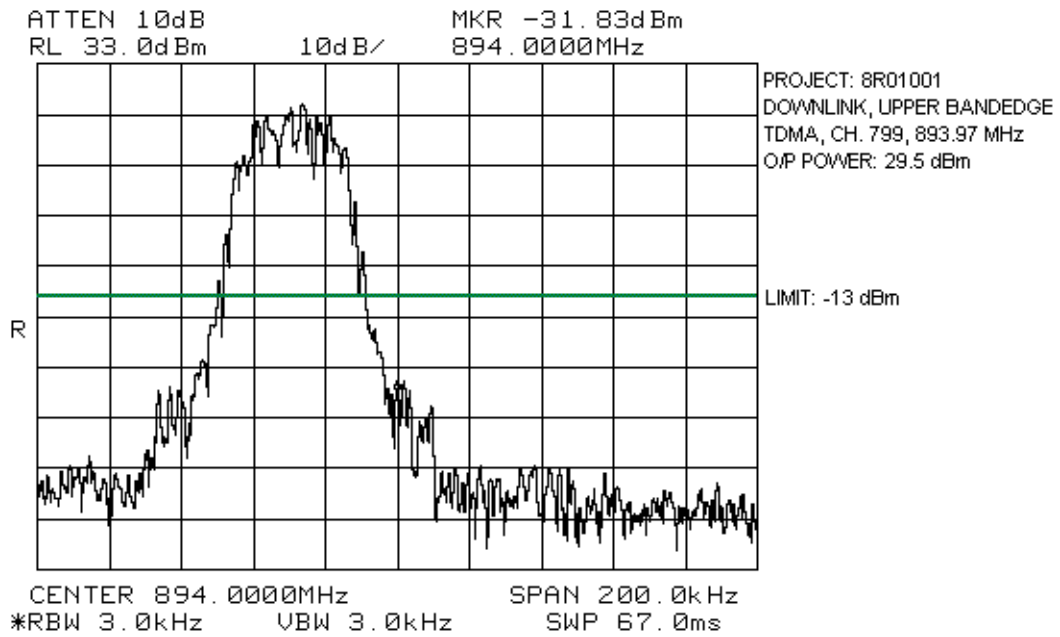
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FCC ID: BCR-DBE60-ABE



EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE



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FCC ID: BCR-DBE60-ABE



EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Section 6. Field Strength of Spurious

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: November 2, 1998

Test Results: Complies.
The maximum field strength is 2.6 dB μ V/m @ 3m.

Test Data: See attached tables.

Test Data - Radiated Emissions - Uplink

Page 75 of 79

Test Data - Radiated Emissions - Downlink

Page 76 of 79

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Photographs of Test Setup

FRONT VIEW

REAR VIEW

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 22.355
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Measurement Data: Standard Test Frequency: _____ MHz
 Standard Test Voltage: _____ Vdc

NOT APPLICABLE

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Section 8. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	May 20/99	
1 Year	Radio Test Set	Rohde & Schwarz	CMS 52	840.0009.52	July 23/98	July 23/99	
	Power Supply	Astron	VS-50M	8405071	NCR	NCR	
1 Year	Attenuator	Narda	765-20	9510	July 24/98	July 24/99	
1 Year	Attenuator	Narda	768-10	9704	July 24/98	July 24/99	
1 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA000420	July 23/98	July 23/99	
1 Year	Insertion Unit	Rohde & Schwarz	URV5-Z4	FA000905	July 23/98	July 23/99	
1 Year	Receiver	Rohde & Schwarz	ESVS-30	843710/002	Oct. 27/98	Oct. 27/99	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	Log Periodic Antenna	EMCO	LPA-25	1141	July 27/98	July 27/99	
	50 Ω Termination	Wiltron	26N50	605248	N/A	N/A	
	50 ohm Combiner Pad	Mini Circuits	ZA3PD-4	9740	Dec. 12/97	Dec. 12/98	
1 Year	Signal Generator	Rohde & Schwarz	SM1Q03	1084-8004-03	July 23/98	July 23/99	
1 Year	Arbitrary Waveform Gen.	Sony/Tektronix	AWG2021	J310495	NCR	NCR	
3 Year	RF Generator	Rohde & Schwarz	SME3	DE14439	June 29/96	June 29/99	

NA: Not Applicable
NCR: No Cal Required

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

ANNEX A
TEST METHODOLOGIES

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
--------------------------------------	-------------------------

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

Method Of Measurement:

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Occupied Bandwidth (Voice & SAT)	PARA. NO.: 2.989
---	-------------------------

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

- (i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least $117 \log(f_d/12)$

- (ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least $100 \log(f_d/11)$ dB or $43 + 10 \log(P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz
VBW: $\geq$ RBW
Span: 100 kHz
Sweep: Auto
Mask: CELLF3E

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer
AF1 frequency: 6 kHz
AF1 level: sufficient to produce 2 kHz deviation
AF2 frequency: 2.5 kHz
AF2 level: sufficient to produce 12 kHz deviation.

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Occupied Bandwidth (WB Data)	PARA. NO.: 2.989
---	-------------------------

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: $\geq$ RBW

Span: 200 kHz

Sweep: Auto

Mask: CELLF1D

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz, random bit sequence

AF1 level: sufficient to produce 8 kHz deviation

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Occupied Bandwidth (ST)	PARA. NO.: 2.989
--	-------------------------

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: $\geq$ RBW

Span: 200 kHz

Sweep: Auto

Mask: CELLF1D

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz tone

AF1 level: sufficient to produce 8 kHz deviation

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Occupied Bandwidth (Digital Modulation) PARA. NO.: 2.989
--

Minimum Standard: Not defined by FCC. Input vs. Output.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)

VBW: $\geq$ RBW

Span: As required

Sweep: Auto

Mask:

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Spurious Emission at Antenna Terminals	PARA. NO.: 2.991
---	-------------------------

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 30 kHz (AMPS). As required for digital modulations.

VBW: $\geq$ RBW

Start Frequency: 0 MHz

Stop Frequency: 10 GHz

Sweep: Auto

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.993
---	-------------------------

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

Calculation Of Field Strength Limit:

An example of attenuation requirement of $43 + 10 \log P$ is equivalent to -13 dBm (5×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions ≤ 1 GHz:

$G = 1.64$ (Dipole Gain)

$P = 10^{-5}$ Watts (Maximum spurious output power)

$R = 3\text{m}$ (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$E = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V / m} = 84.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

$G = 1$ (Isotropic Gain)

$P = 1 \times 10^{-5}$ Watts (Maximum spurious output power)

$R = 3\text{m}$ (Measurement Distance)

$$E = 84.4 - 20 \log \sqrt{1.64} = 82.3 \text{ dB}\mu\text{V / m@3m}$$

The spectrum is searched to 10 GHz.

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

NAME OF TEST: Frequency Stability**PARA. NO.: 2.995**

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

Table C-1

Method Of Measurement:Frequency Stability With Voltage Variation:

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation:

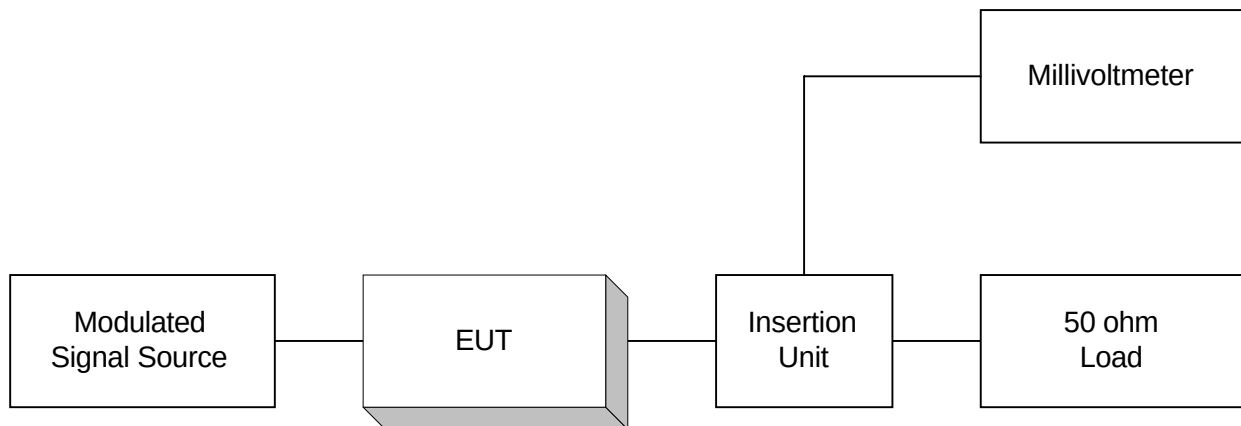
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

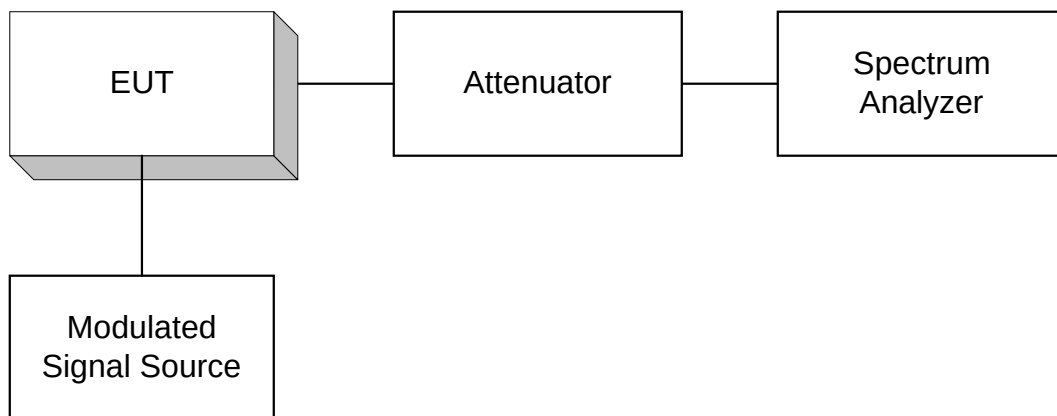
ANNEX B
TEST DIAGRAMS

EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Para. No. 2.985 - R.F. Power Output

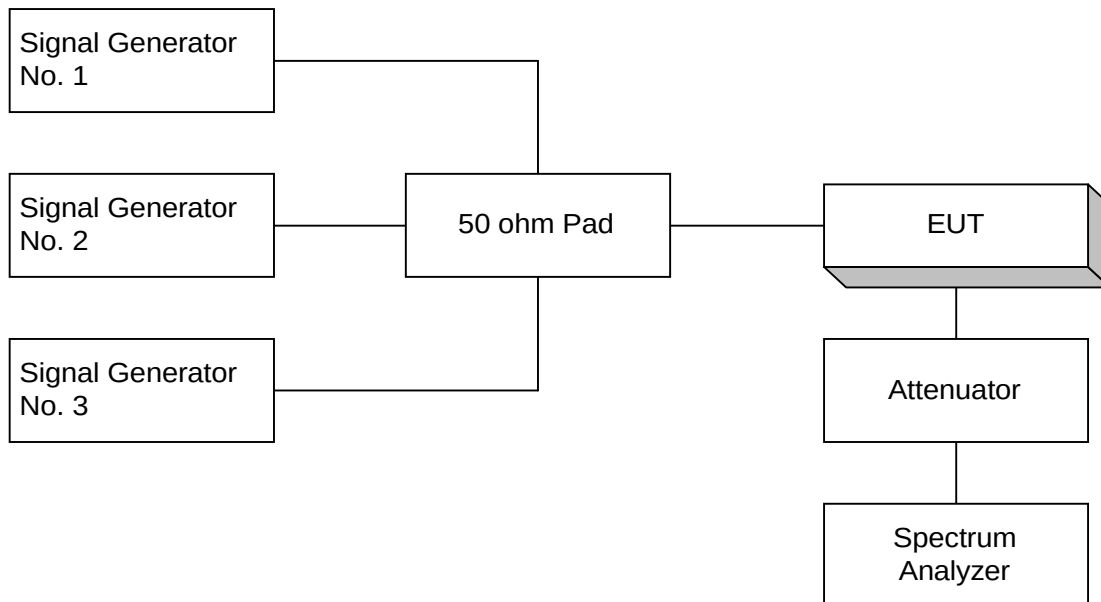
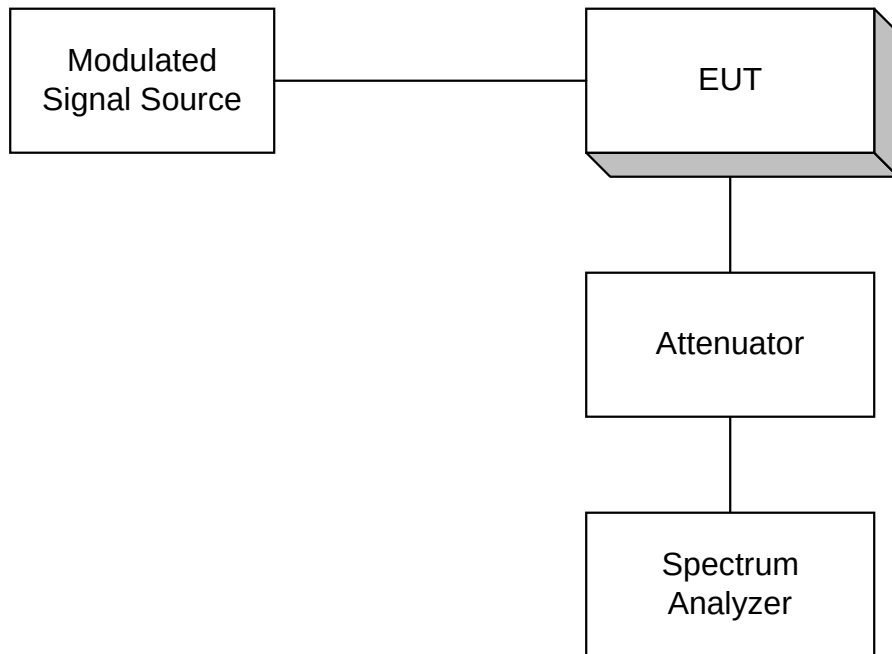


Para. No. 2.989 - Occupied Bandwidth



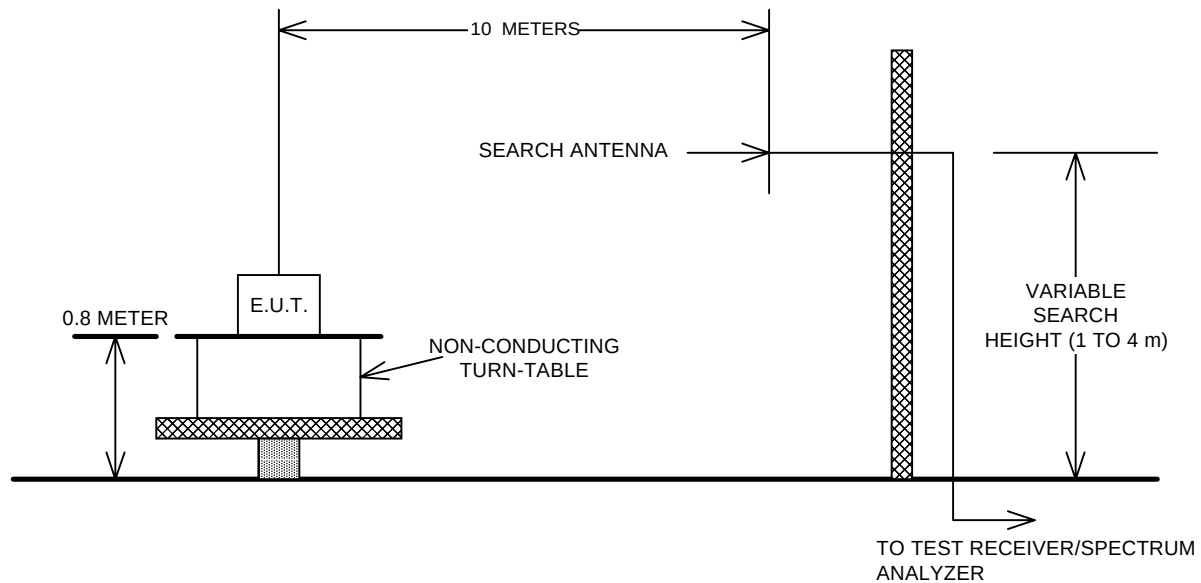
EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Para. No. 2.991 Spurious Emissions at Antenna Terminals



EQUIPMENT: "Prism Plus Indoor" Repeater
FCC ID: BCR-DBE60-ABE

Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

