

KTL Test Report:	9R01459
Applicant:	Communication Components Inc. 299 Forest Avenue Paramus, NJ 07652
Equipment Under Test: (E.U.T.)	PCS Bi-Directional Amplifier
FCC ID:	NT3BDA-1819-60
In Accordance With:	FCC Part 24, Subpart E Broadband PCS Repeaters
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	 R. Grant, RF Engineer
Date:	
Total Number of Pages:	149

Table of Contents

Section 1. Summary of Test Results

- General
- Summary of Test Data

Section 2. General Equipment Specification

- Specifications
- Description of Modifications for Class II Permissive Change
- Modifications Made During Testing
- Theory of Operation
- System Diagram

Section 3. RF Power Output

- Test Results
- Measurement Data
- Power Over Bandwidth Graphs

Section 4. Occupied Bandwidth

- Occupied Bandwidth (CDMA)
 - Test Results
 - CDMA Input and Output Graphs
- Occupied Bandwidth (GSM)
 - Test Results
 - GSM Input and Output Graphs
- Occupied Bandwidth (NADC)
 - Test Results
 - NADC Input and Output Graphs

Section 5. Spurious Emissions at Antenna Terminals

- Test Results
- Test Data
- Graphs

Section 6. Field Strength of Spurious

- Test Results
- Test Data
- Test Data - Radiated Emissions - Uplink
- Test Data - Radiated Emissions - Downlink
- Photographs of Test Setup
- Pre-Scan Data

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Table of Contents, continued

Section 7. Frequency Stability

Test Results
Measurement Data
Graphs

Section 8. Test Equipment List

Annex A - Test Methodologies

RF Power Output
Occupied Bandwidth (CDMA)
Occupied Bandwidth (GSM)
Occupied Bandwidth (NADC)
Spurious Emission at Antenna Terminals
Field Strength of Spurious
Frequency Stability

Annex B - Test Diagrams

R.F. Power Output
Occupied Bandwidth
Spurious Emissions at Antenna Terminals
Field Strength of Spurious
Frequency Stability

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Section 1. Summary of Test Results

Manufacturer: Communication Components Inc.

Model No.: BDA-1819-60

Serial No.: 2380

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 24, Subpart E.



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

KTL Ottawa Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. KTL Ottawa Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	24.232	100W	Plot	Complies
Occupied Bandwidth (CDMA)	24.238	Input/Output	Plot	Complies
Occupied Bandwidth (GSM)	24.238	Input/Output	Plot	Complies
Occupied Bandwidth (NADC)	24.238	Input/Output	Plot	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	-13.0 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Chart	Complies
Frequency Stability	24.235	N/A	N/A	N/A

Footnotes For N/A's:**Test Conditions:**

Indoor Temperature: 25 °C
 Humidity: 23 %

Outdoor Temperature: 20 °C
 Humidity: 23 %

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Section 2. General Equipment Specification**Supply Voltage Input:** 15 Vdc, via 120 VAC, 60 Hz to 15 Vdc Power Cube**Frequency Range:** **Downlink:** A/D Block: 1930 MHz to 1949.95 MHz
B Block: 1950 MHz to 1964.95 MHz**Frequency Range:** **Uplink:** A/D Block: 1850 MHz to 1869.95 MHz
B Block: 1870MHz to 1884.95 MHz**20 dB Bandwidth:****Type of Modulation and Designator:****CDMA
(F9W)****GSM
(GXW)****TDMA
(DXW)****AGC Threshold:** Not Applicable**Output Impedance:** 50 ohm**Gain:** 66.0 dB Nominal**Max Input Power:** -35.7 dBm

RF Output (Rated):	Uplink (dBm)	Downlink (dBm)
	Single:	Composite:
	20.0	20.0
	23.0	23.0

Frequency Translation:**F1-F1****F1-F2****N/A****Band Selection:****Software****Duplexer
Change****Fullband
Coverage**

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Description of Modifications For Class II Permissive Change

NOT APPLICABLE

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Modifications Made During Testing

NOT APPLICABLE

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Theory of Operation

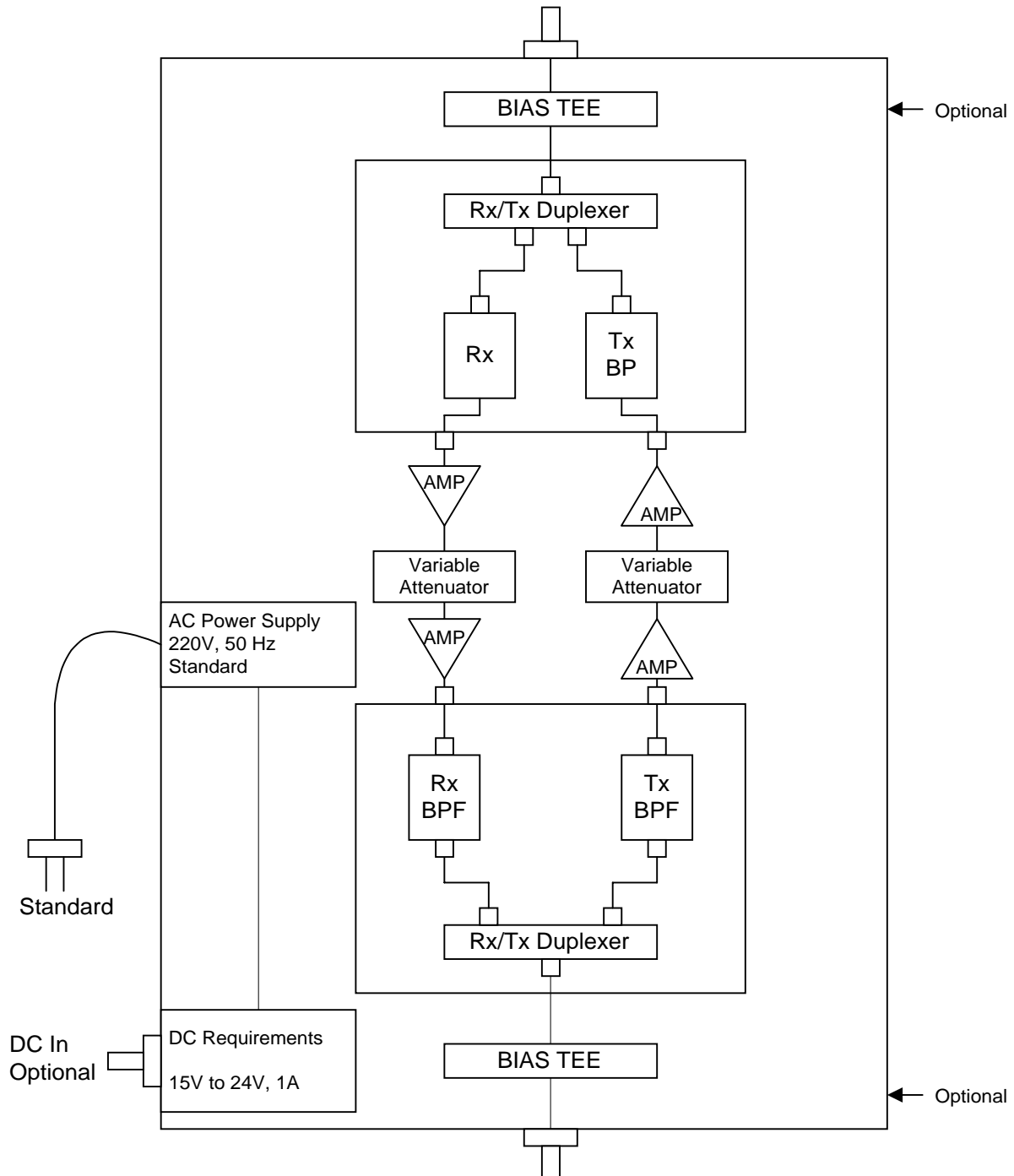
Communication Components Inc. Bi-Directional Amplifier (BDA) improves the sensitivity of base stations in indoor locations where there is a significant amount of cable loss in RF distribution systems as well as weak penetration of the signal from outside of the building.

The BDA was specifically designed for low system group delay to minimize Bit Error Rate (BER) of digital transmissions. The BDA block consists of a single compact unit with two RF Connectors. It is rugged and can be easily connected during cable installation. It has a moisture proof NEMA 4 enclosure suitable for indoor and outdoor installation with two low noise medium power amplifiers, intermodulation level control circuit, optional independently controlled up-link and down-link attenuators, duplexers and external AC power supply.

Optional package allows DC voltage to be supplied to the BDA by one of two ways: Via the external DC input connector or via the centre conductor of the RF coax cable.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

System Diagram



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

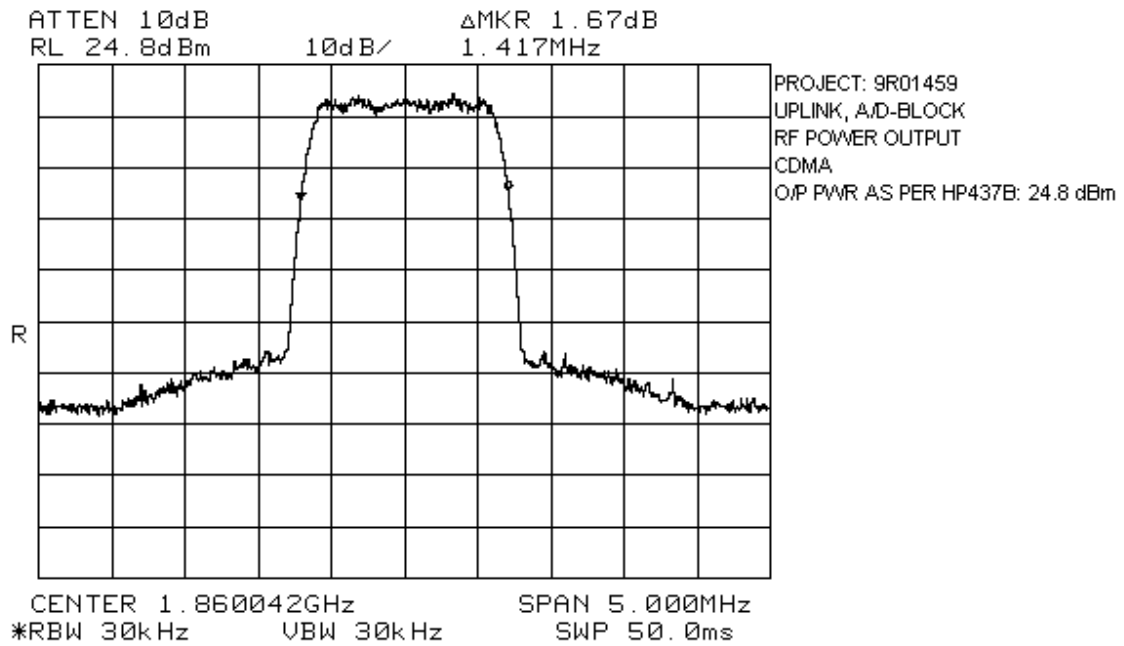
Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Kevin Carr	DATE: April 21, 1999

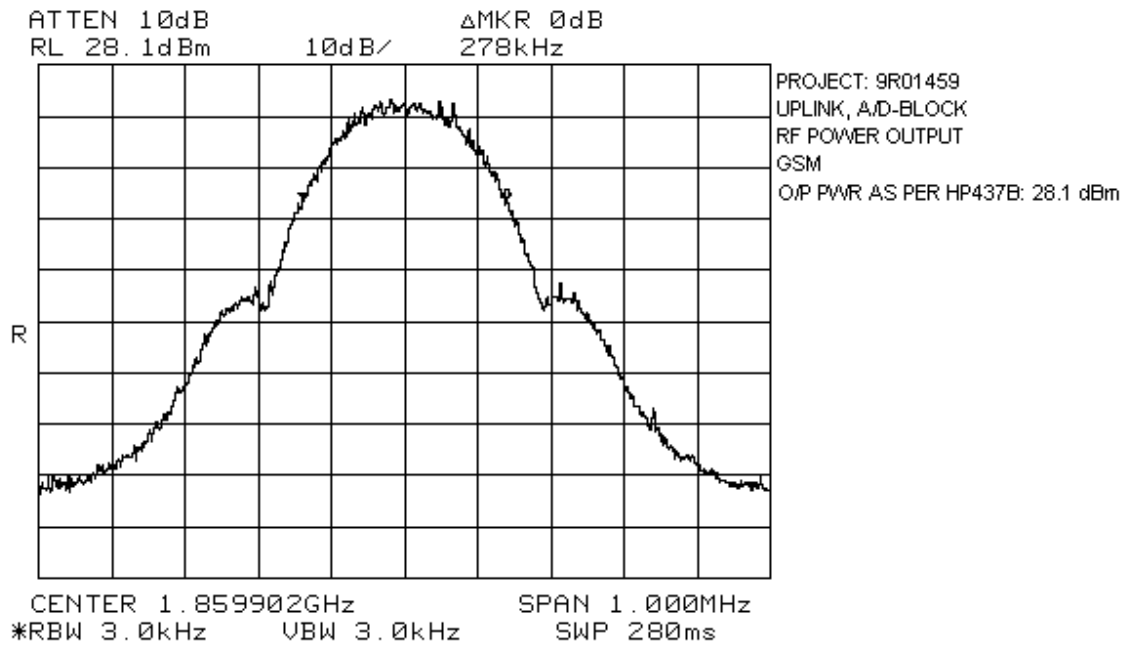
Test Results: Complies.**Measurement Data:**

	Modulation Type	Per Channel Output Power (dBm)	Composite Output Power (dBm)
Uplink	CDMA	21.8	24.8
Downlink	CDMA	20.0	23.0
Uplink	GSM	23.1	26.1
Downlink	GSM	23.1	26.1
Uplink	TDMA	22.4	25.4
Downlink	TDMA	22.3	25.3

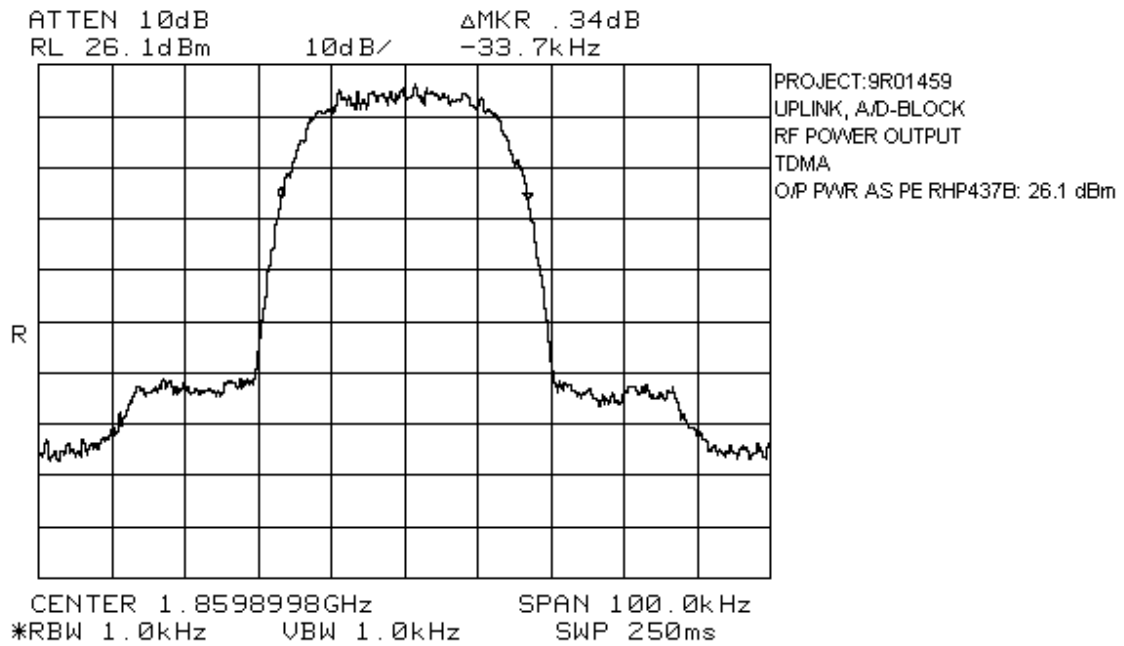
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



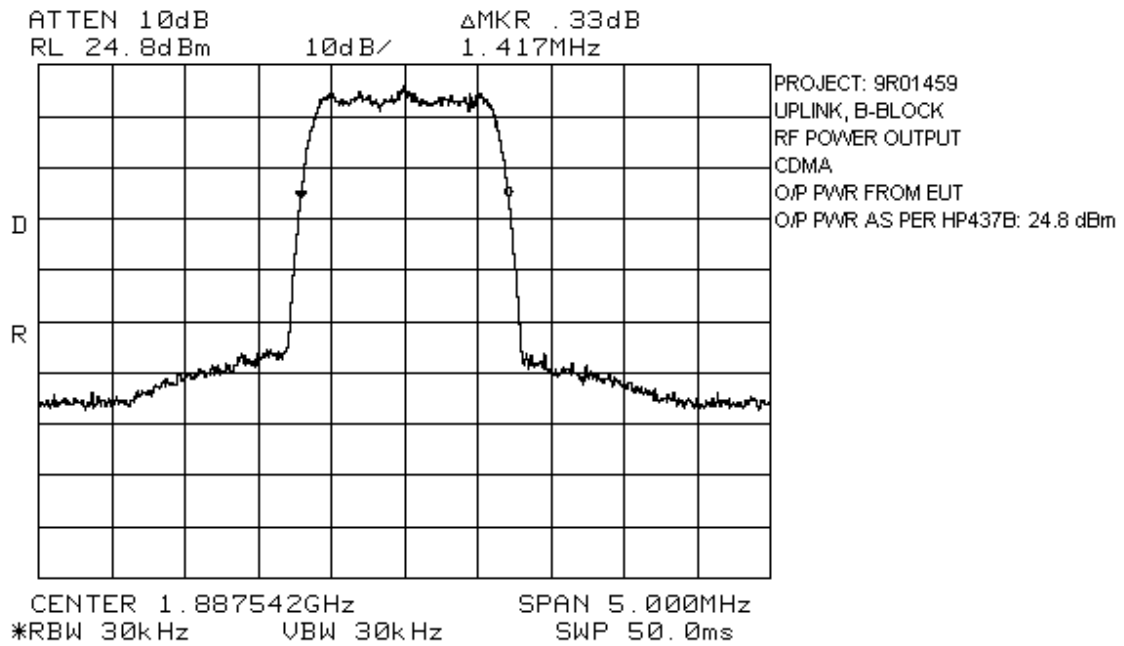
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



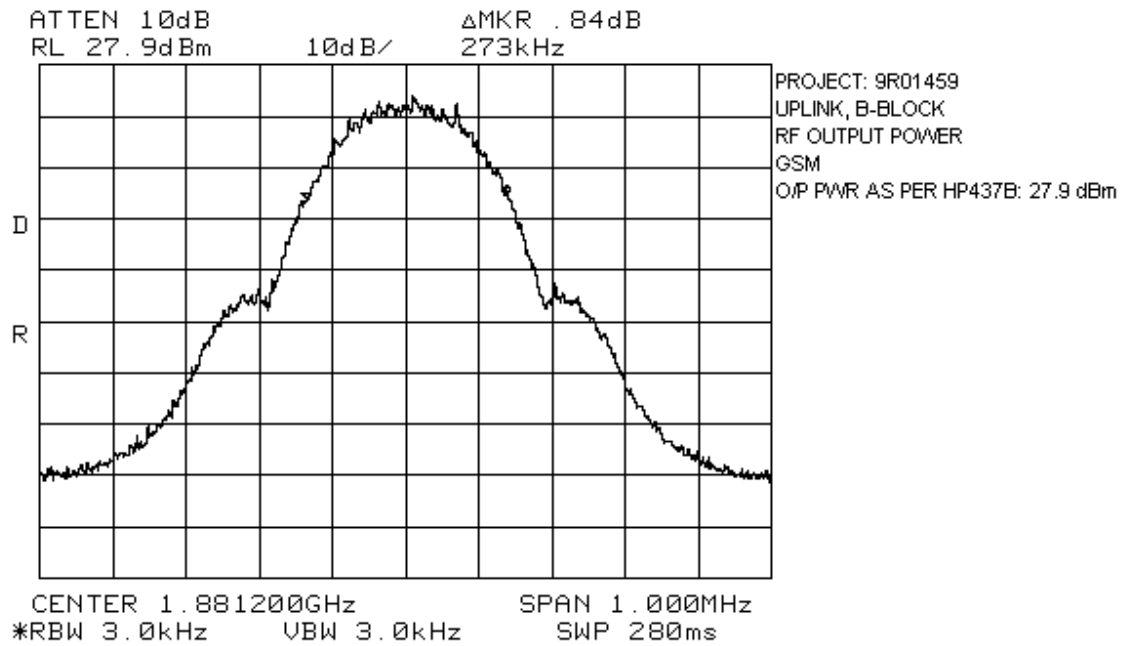
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



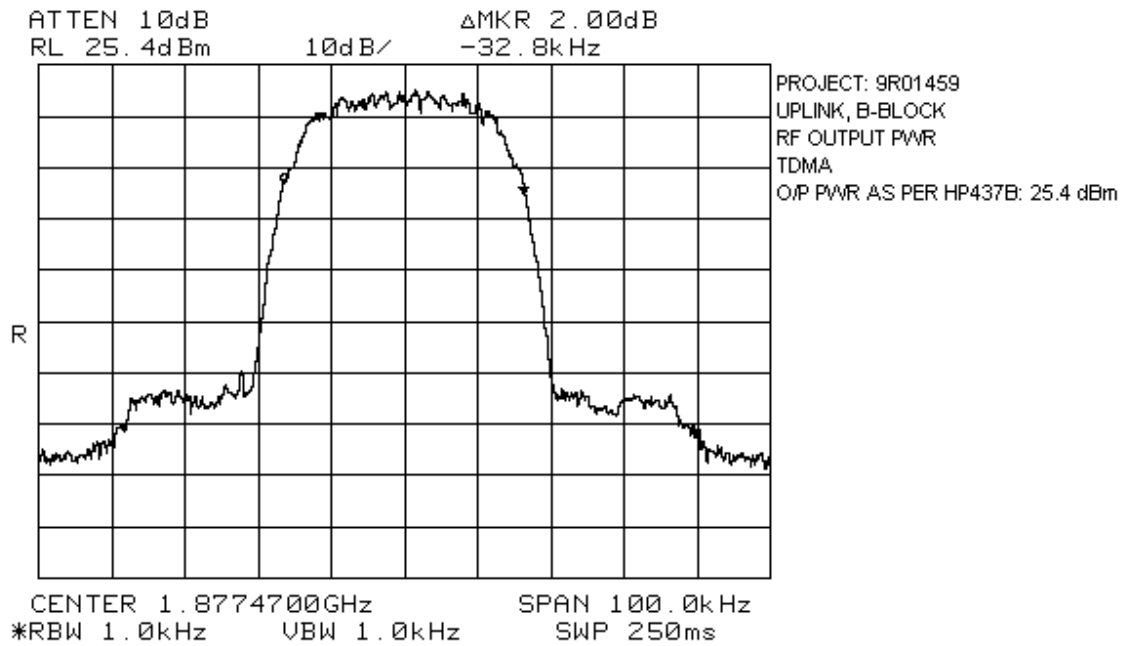
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



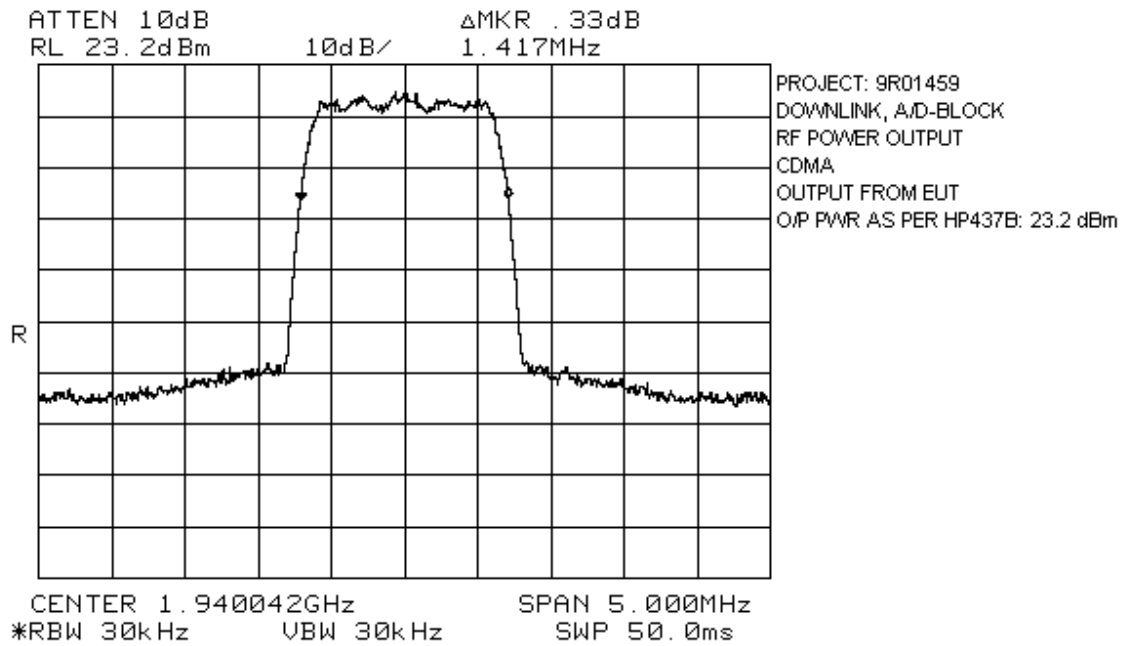
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



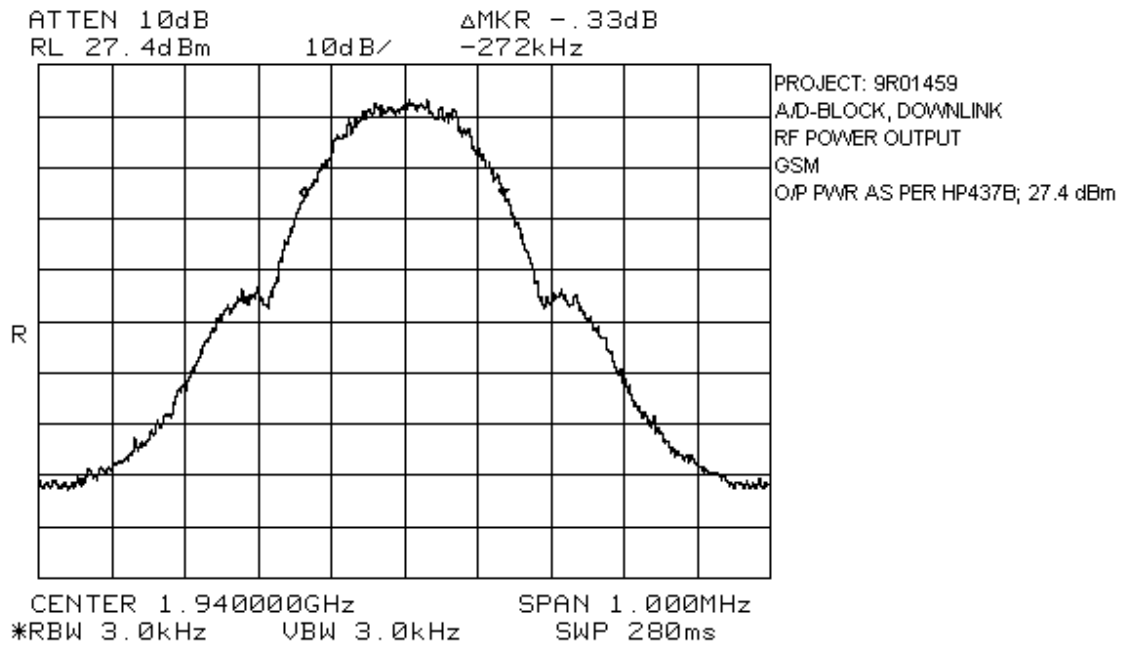
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



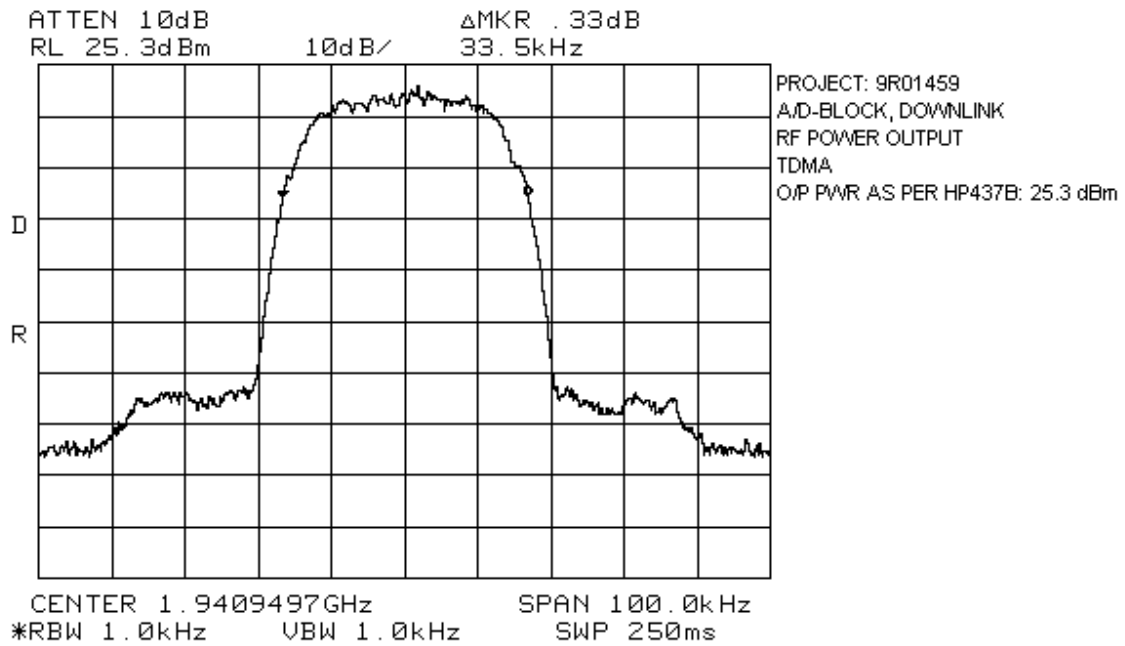
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



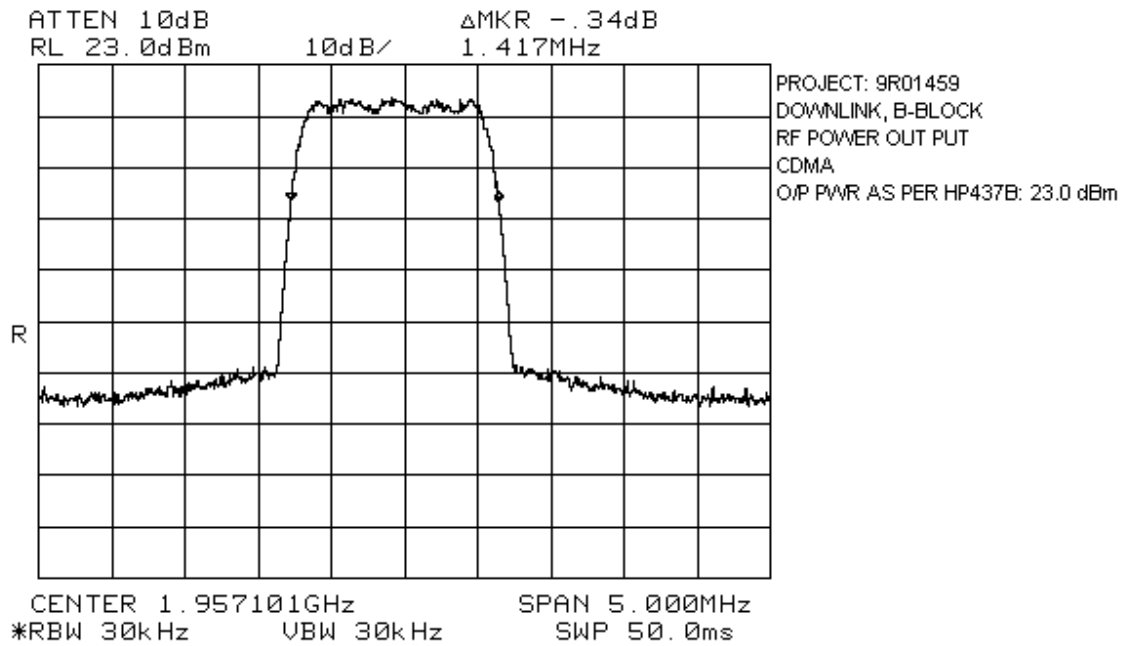
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



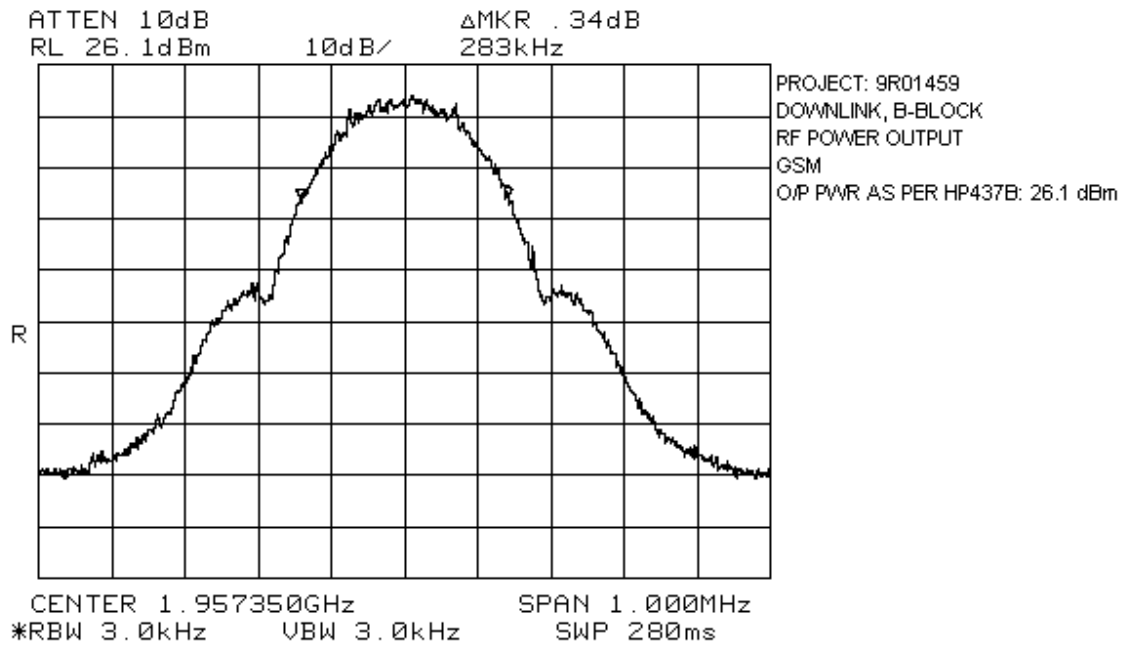
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



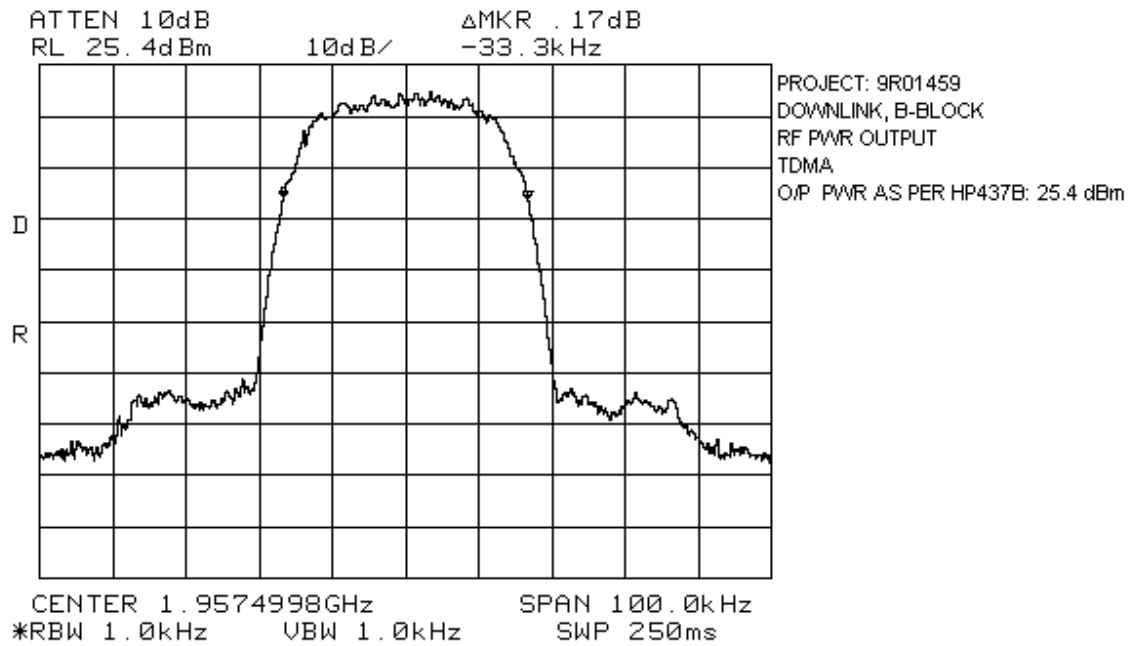
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

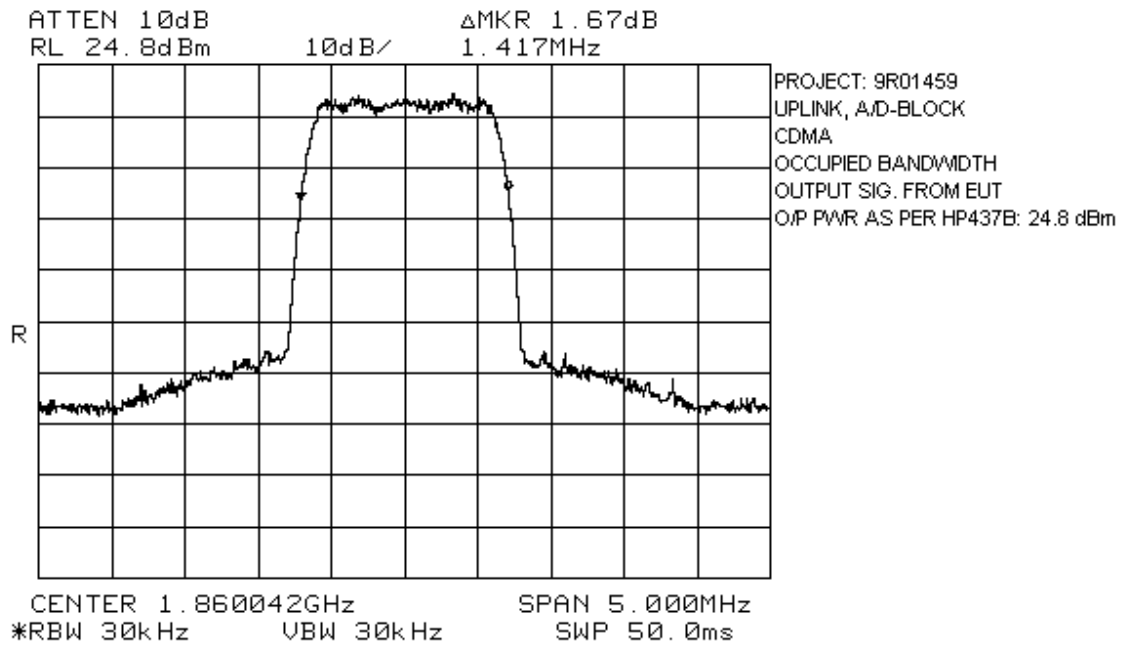
Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: April 21, 1999

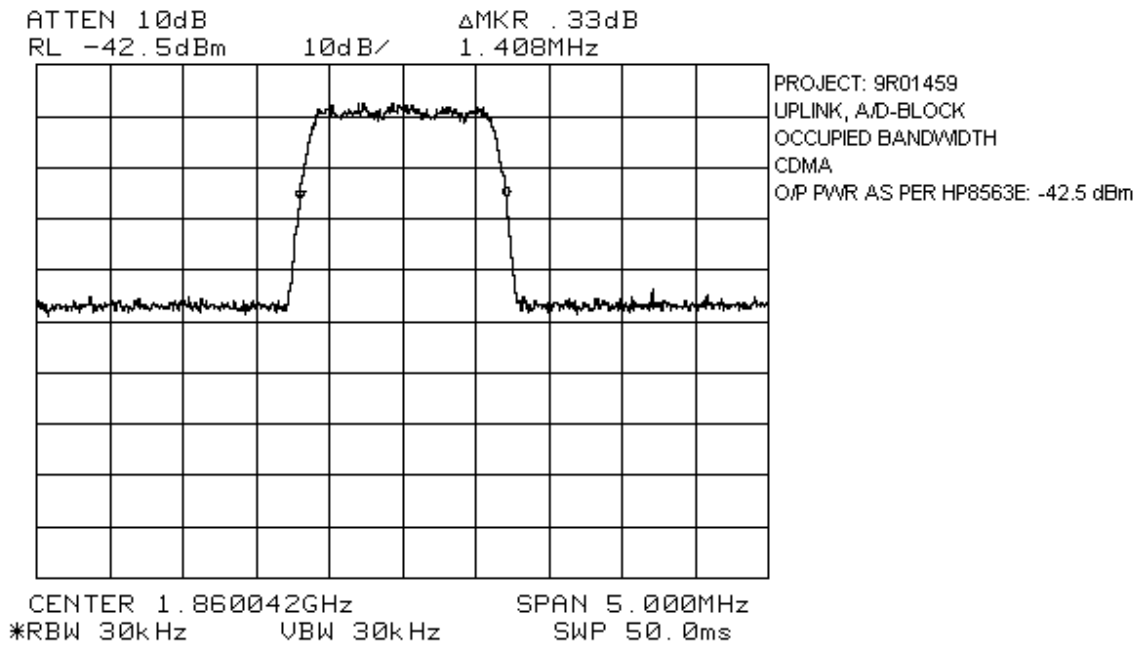
Test Results: Complies.

Test Data: See attached graph(s).

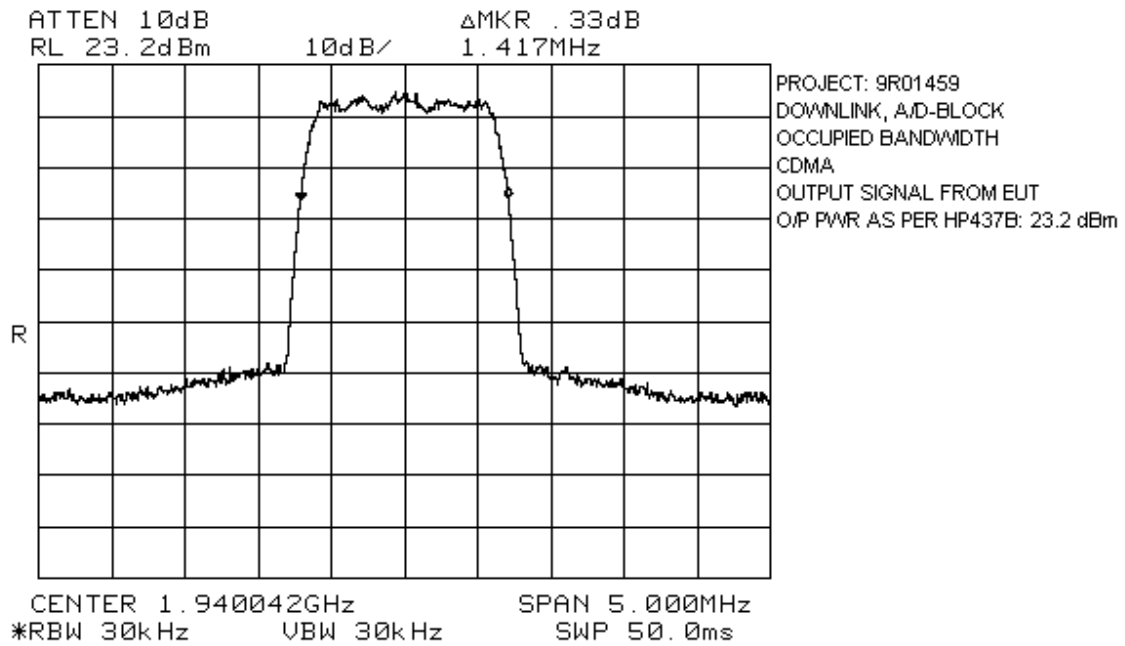
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



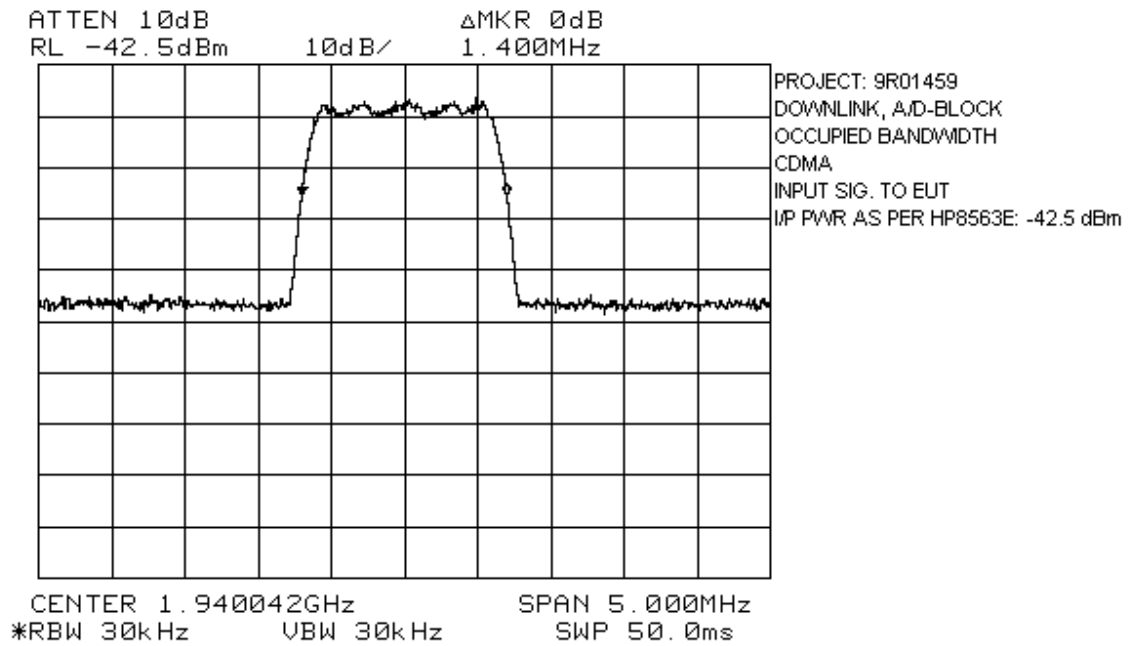
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



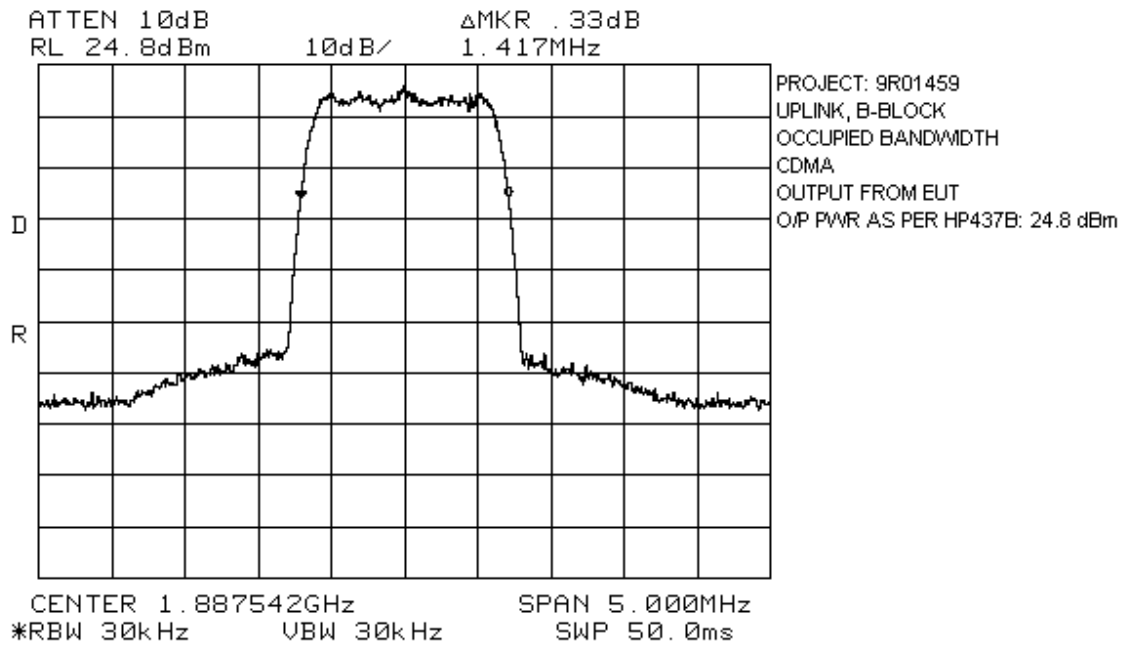
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



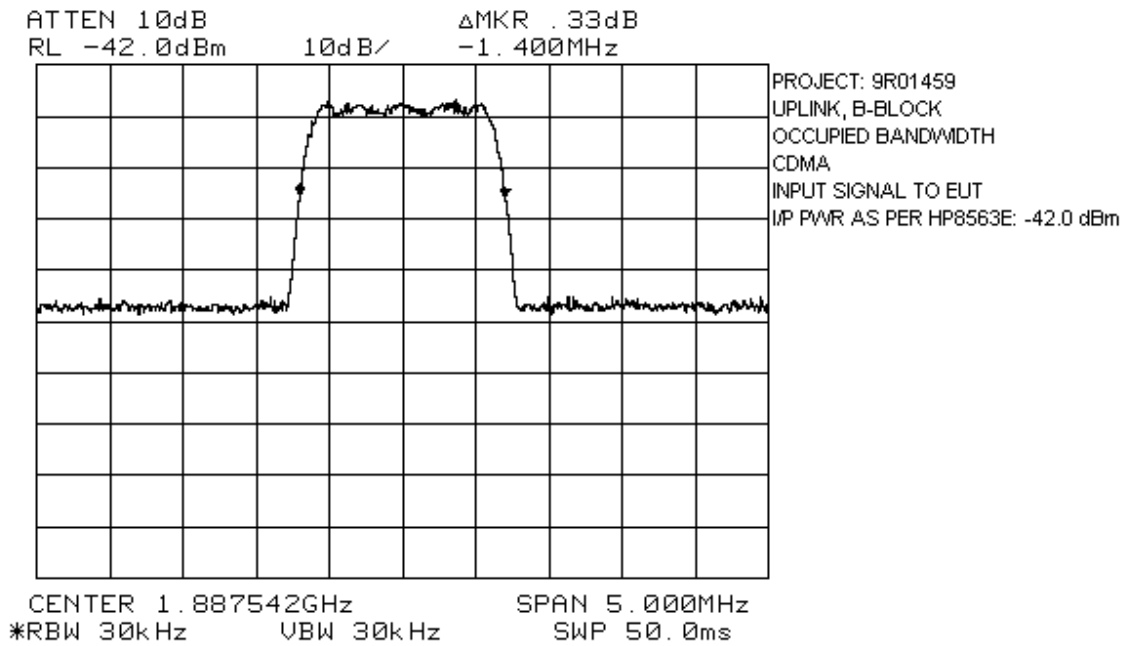
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



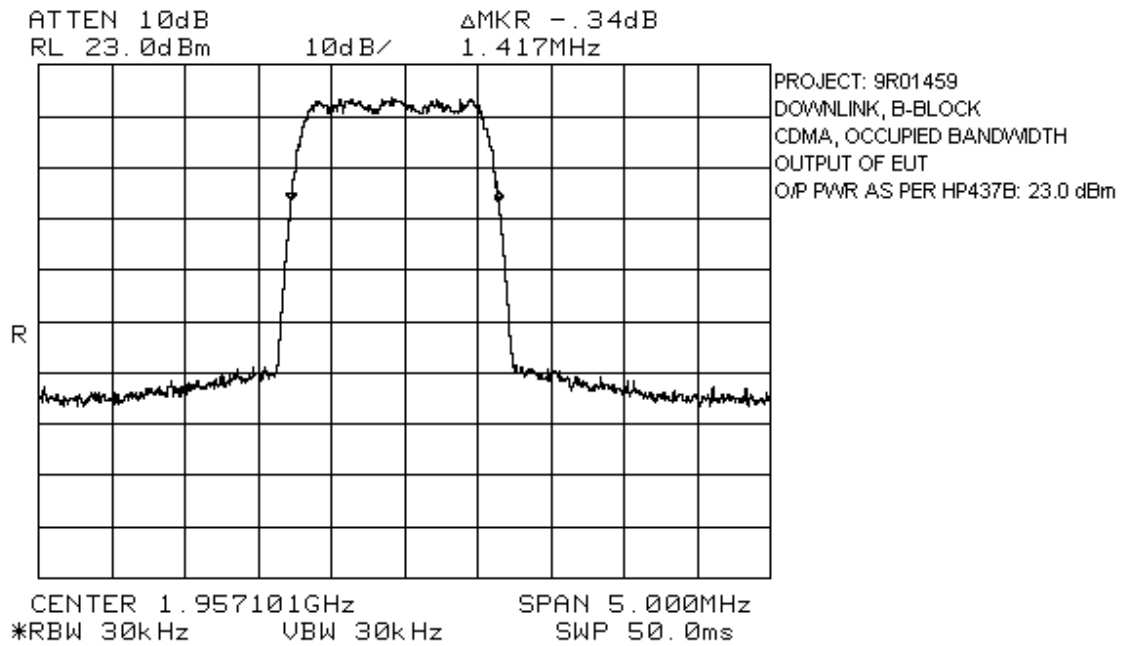
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



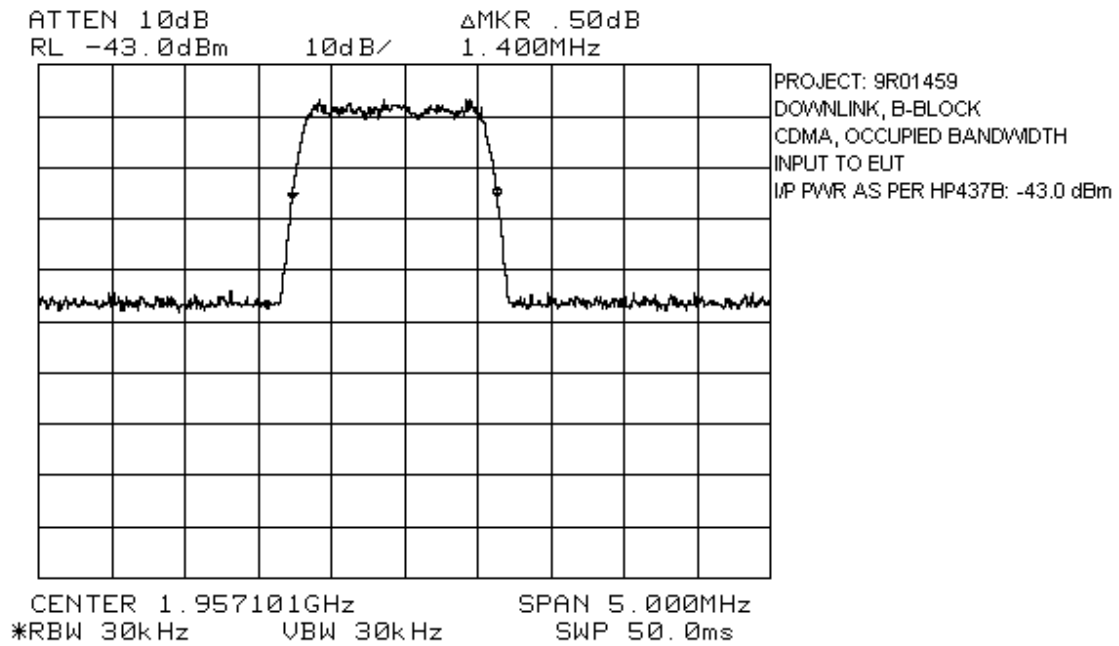
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



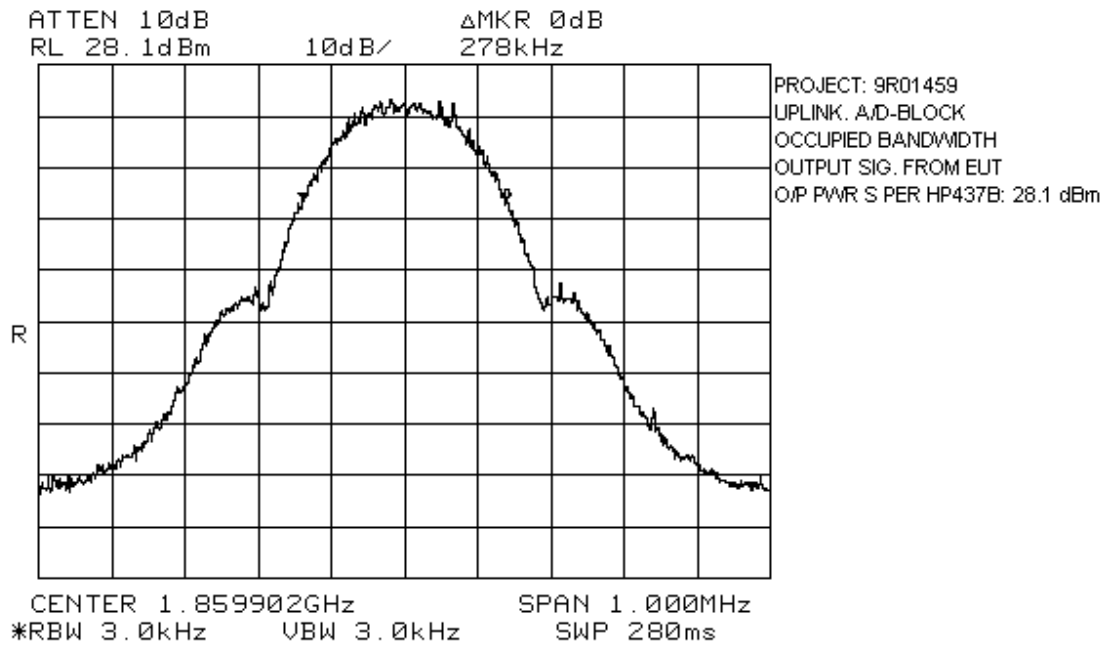
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

NAME OF TEST: Occupied Bandwidth (GSM)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: April 22, 1999

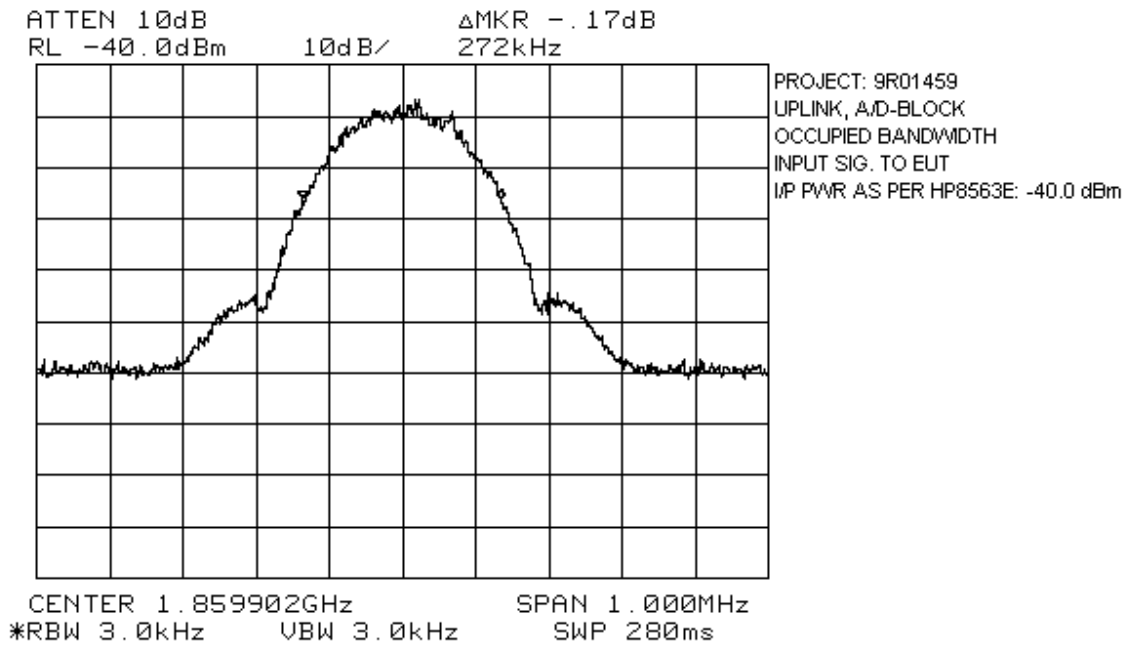
Test Results: Complies.

Test Data: See attached graph(s).

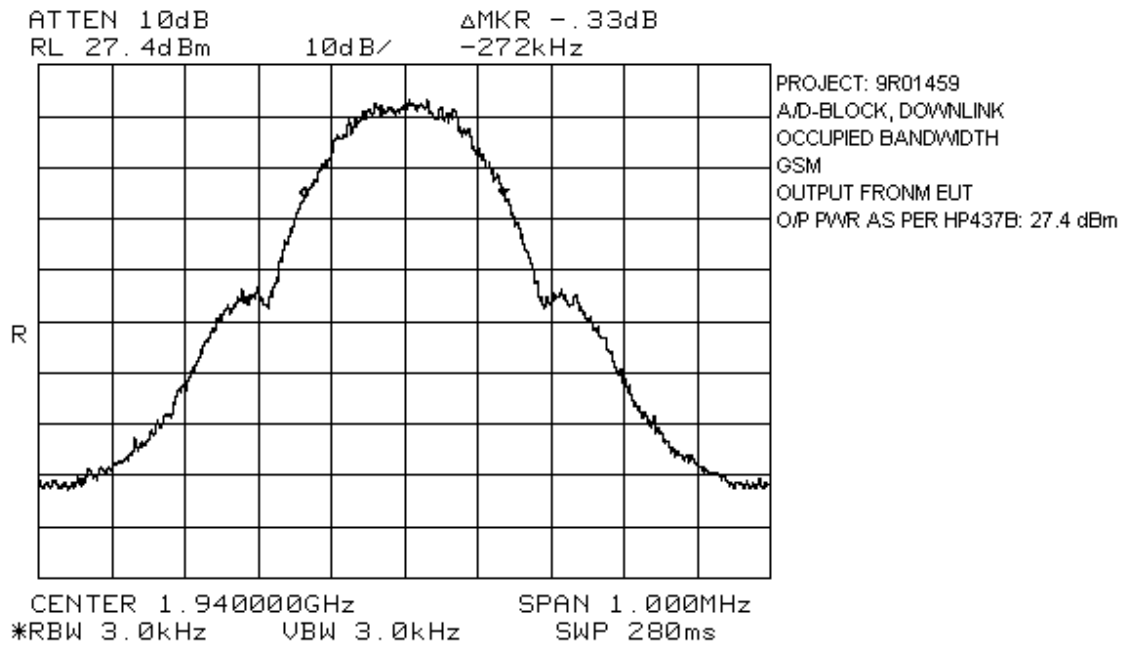
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



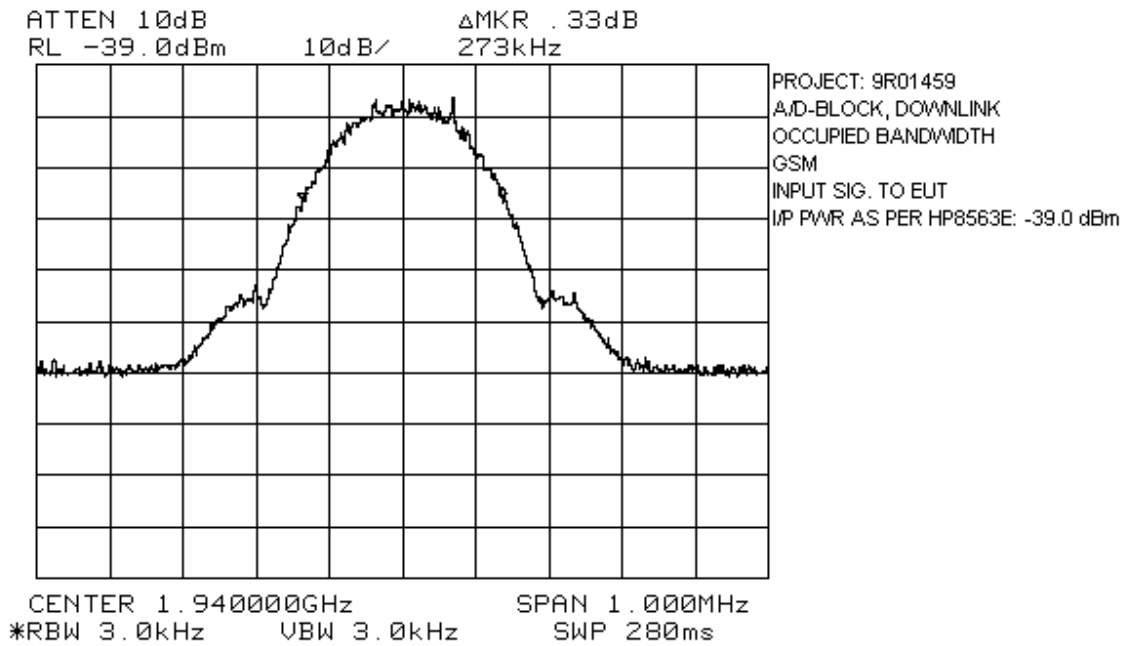
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



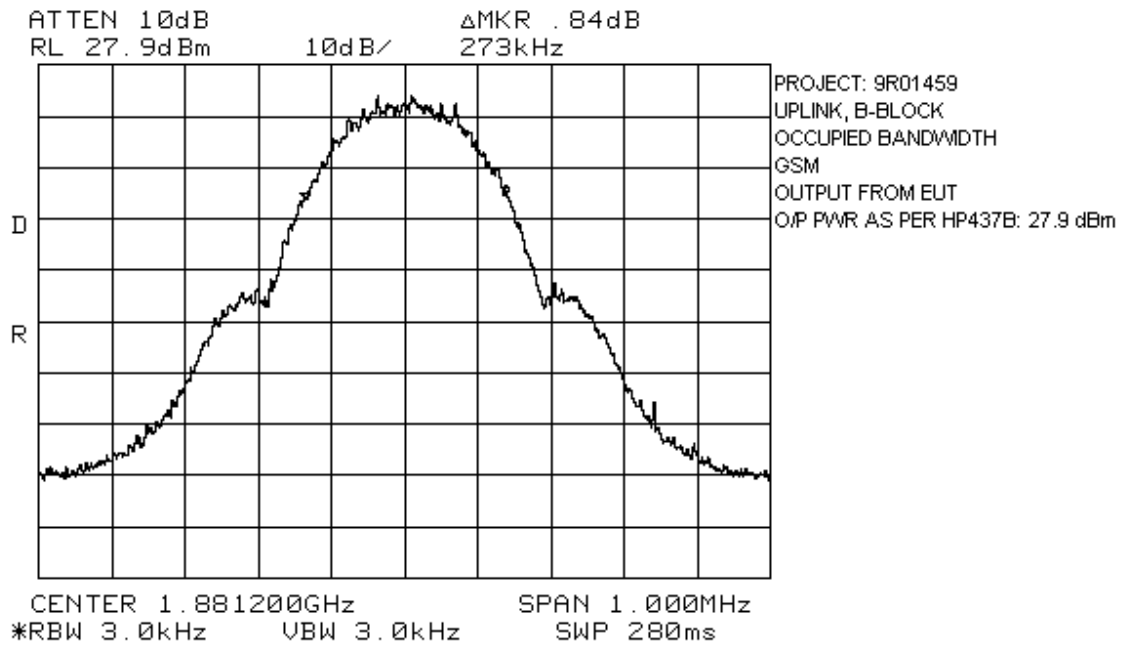
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



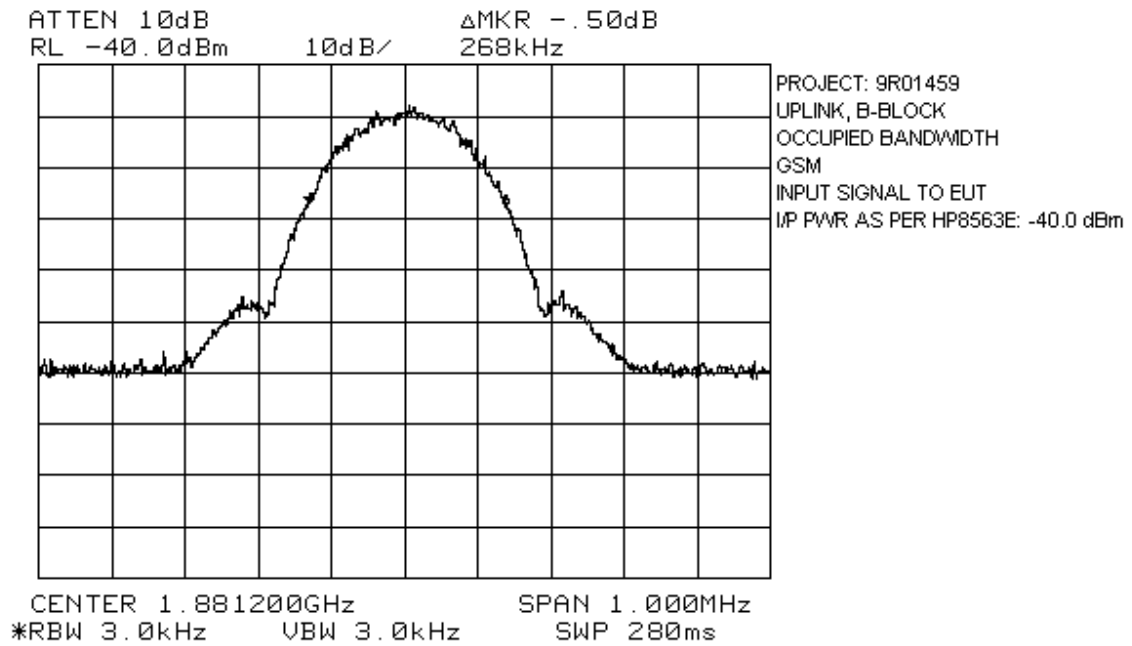
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



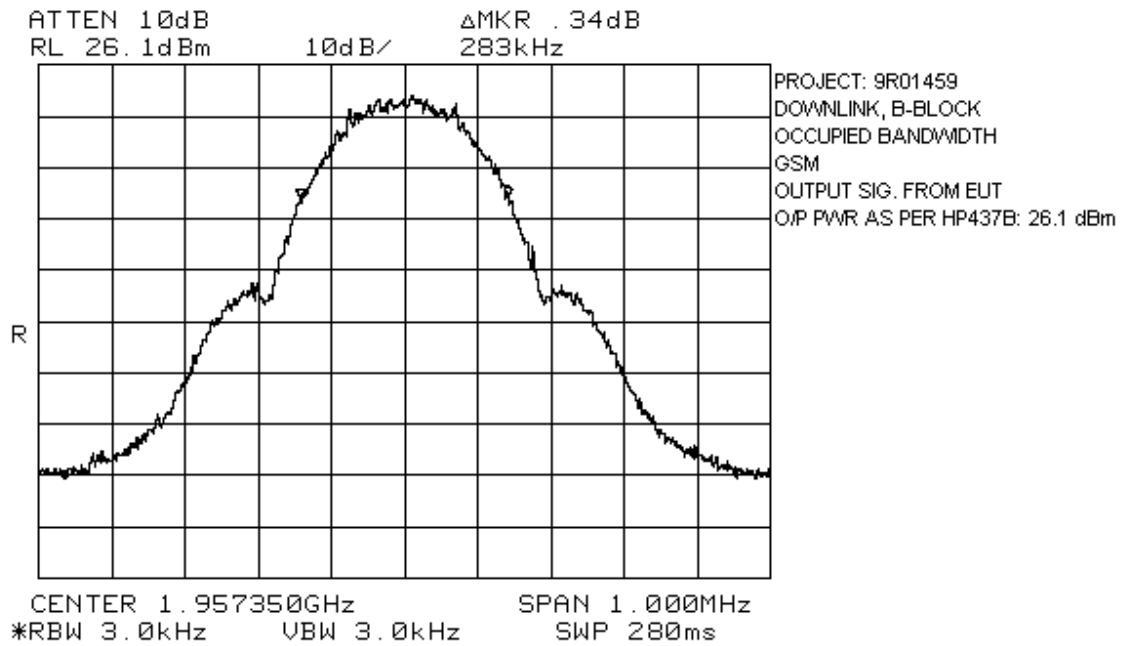
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



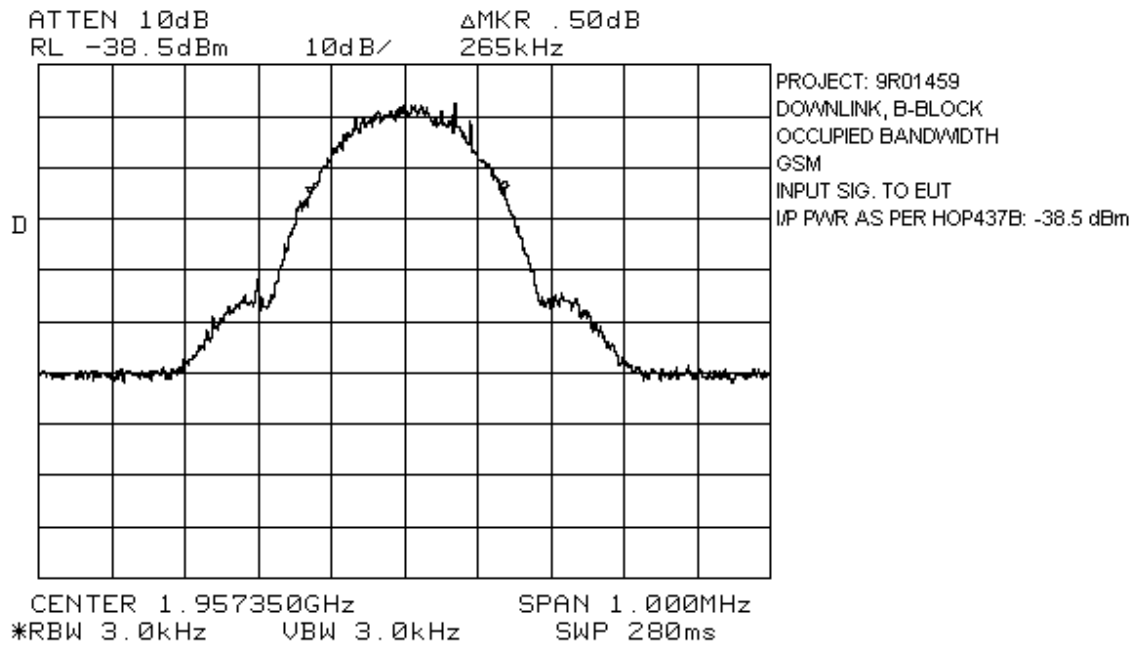
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



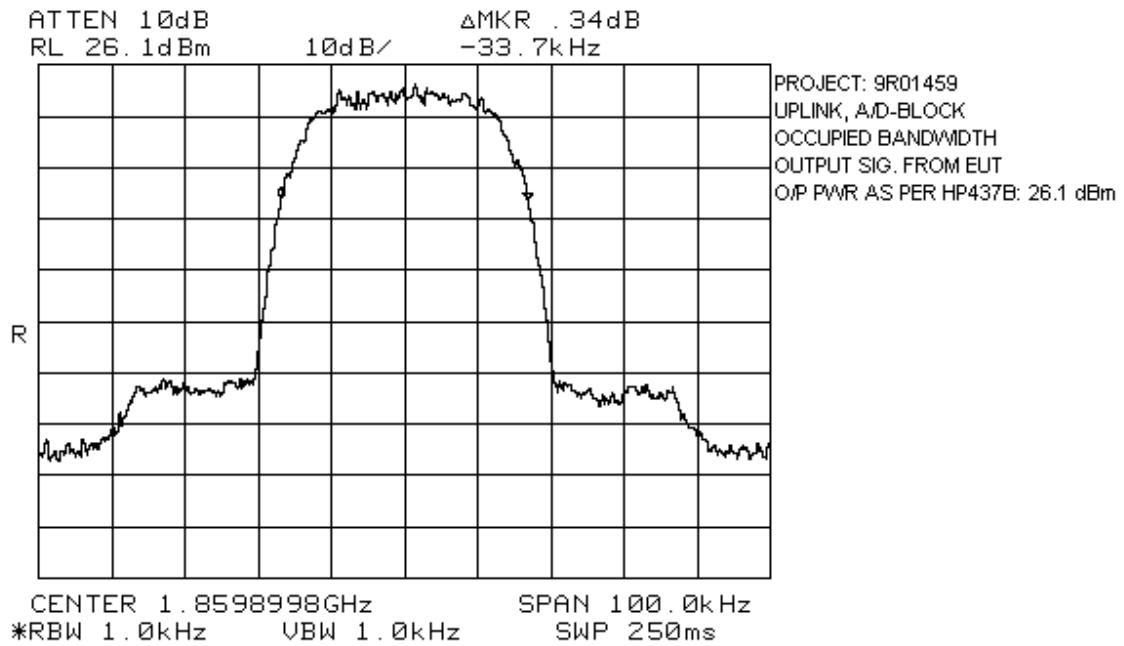
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

NAME OF TEST: Occupied Bandwidth (TDMA)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: April 22, 1999

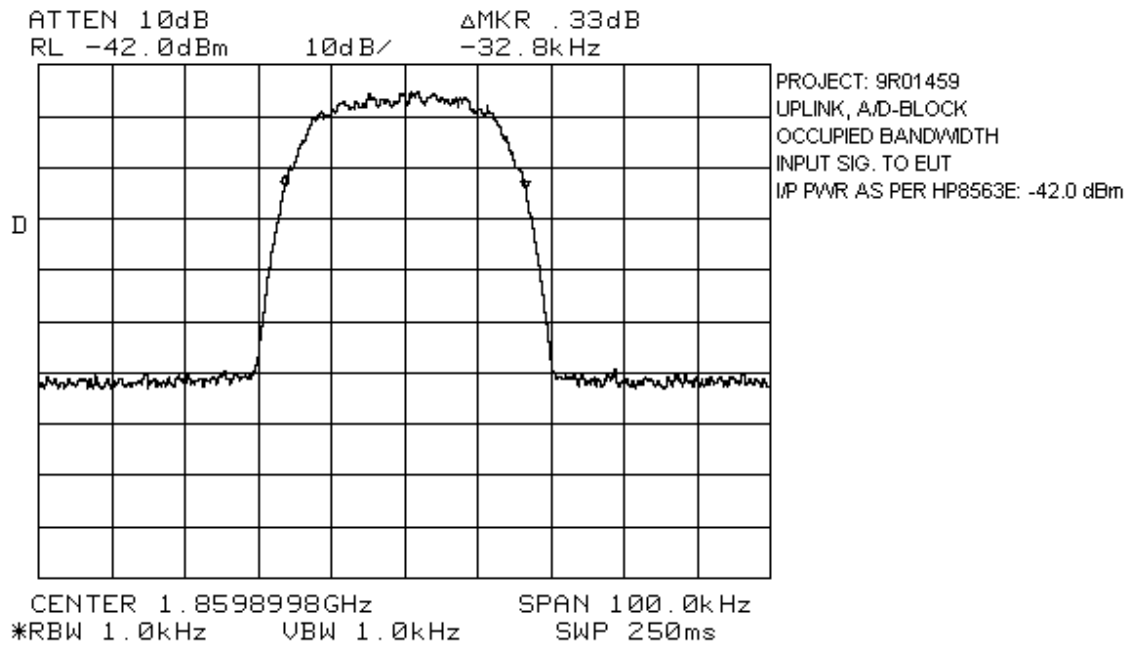
Test Results: Complies.

Test Data: See attached graph(s).

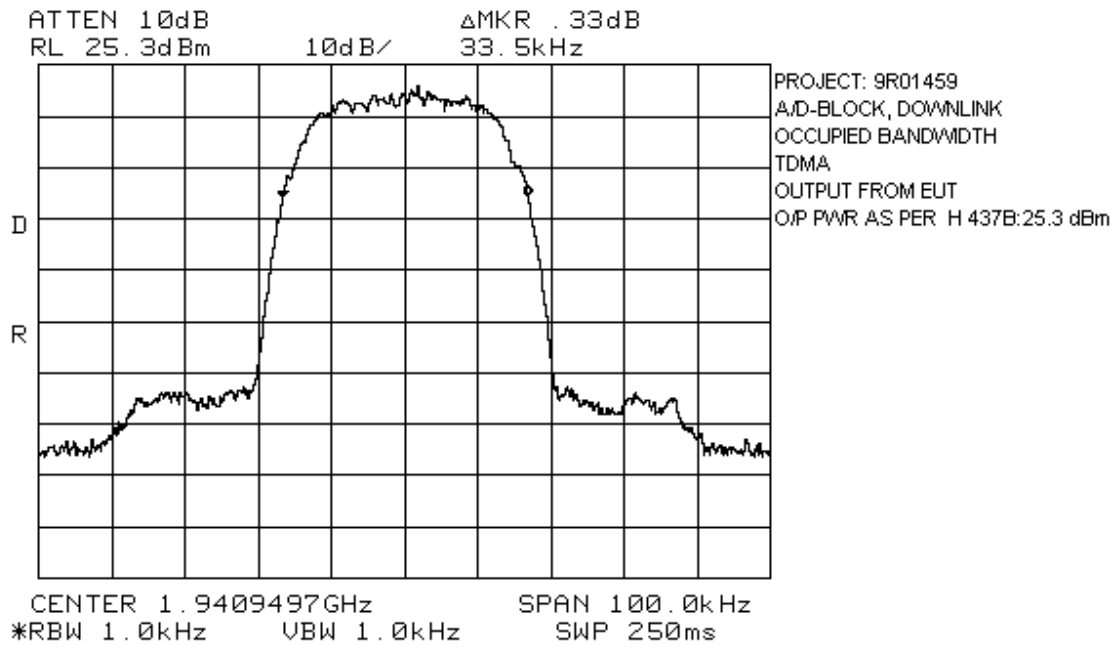
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



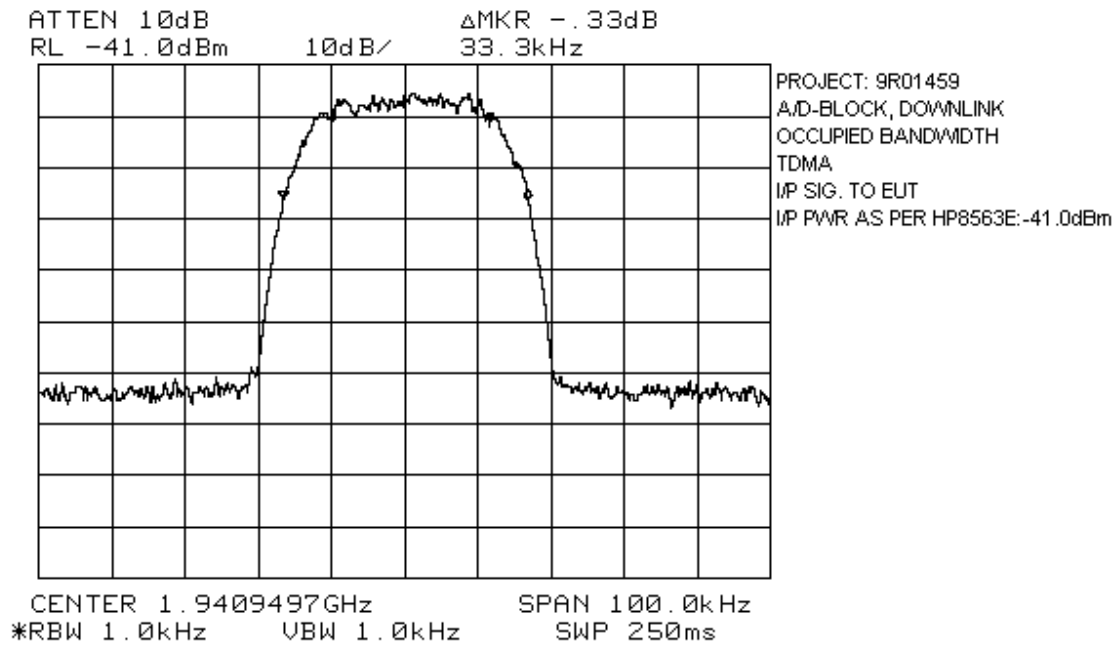
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



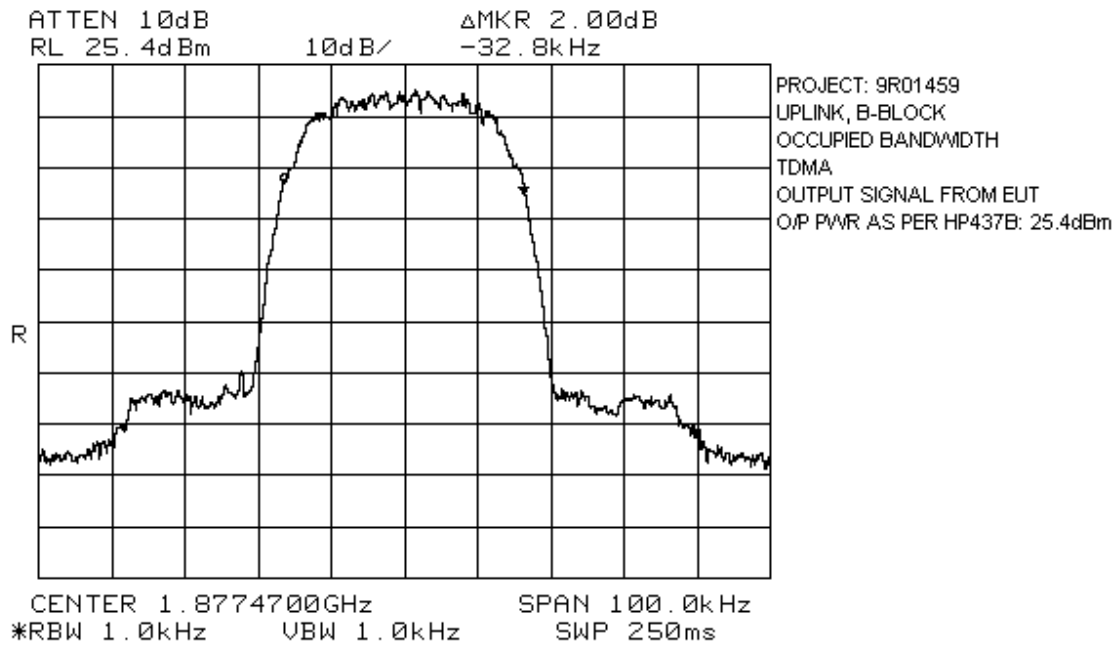
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



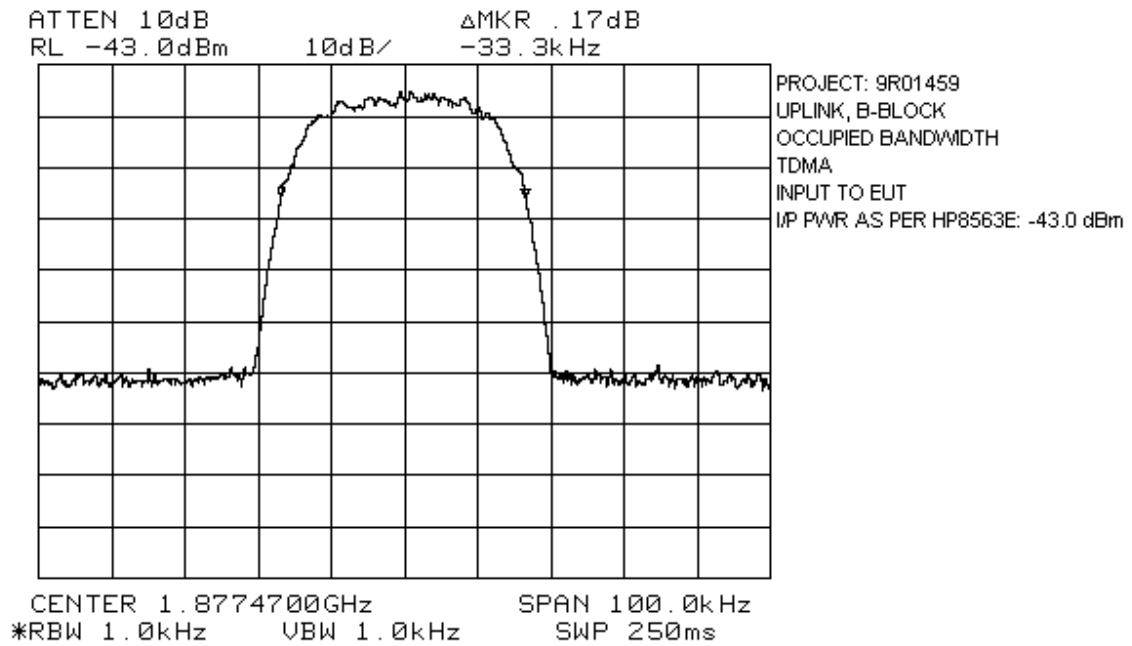
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



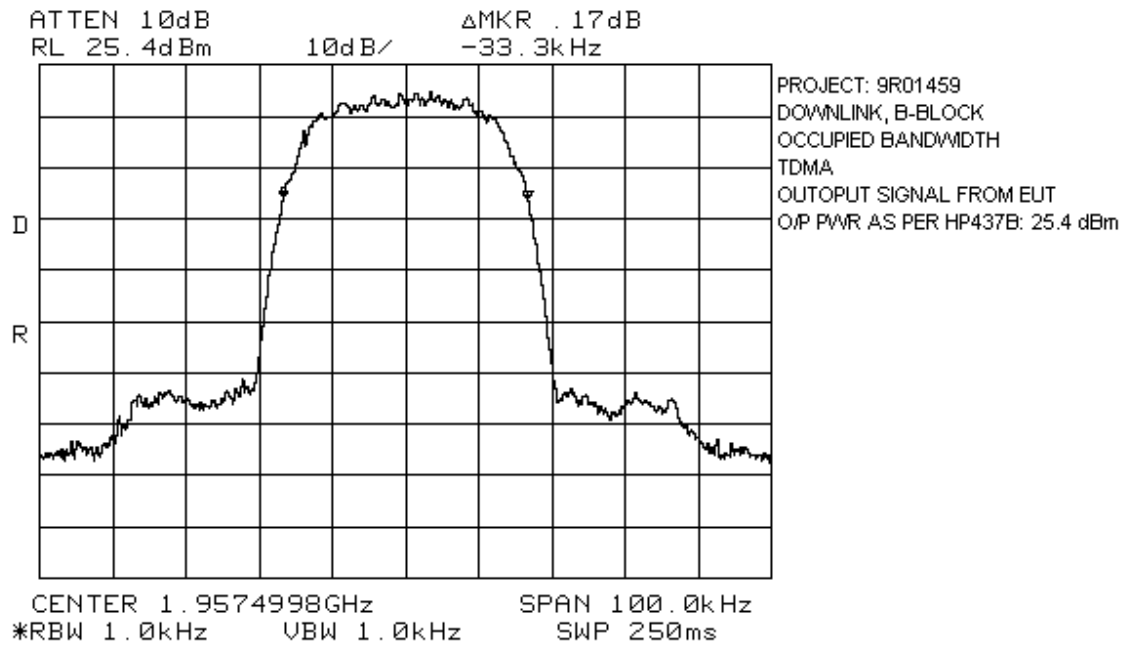
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



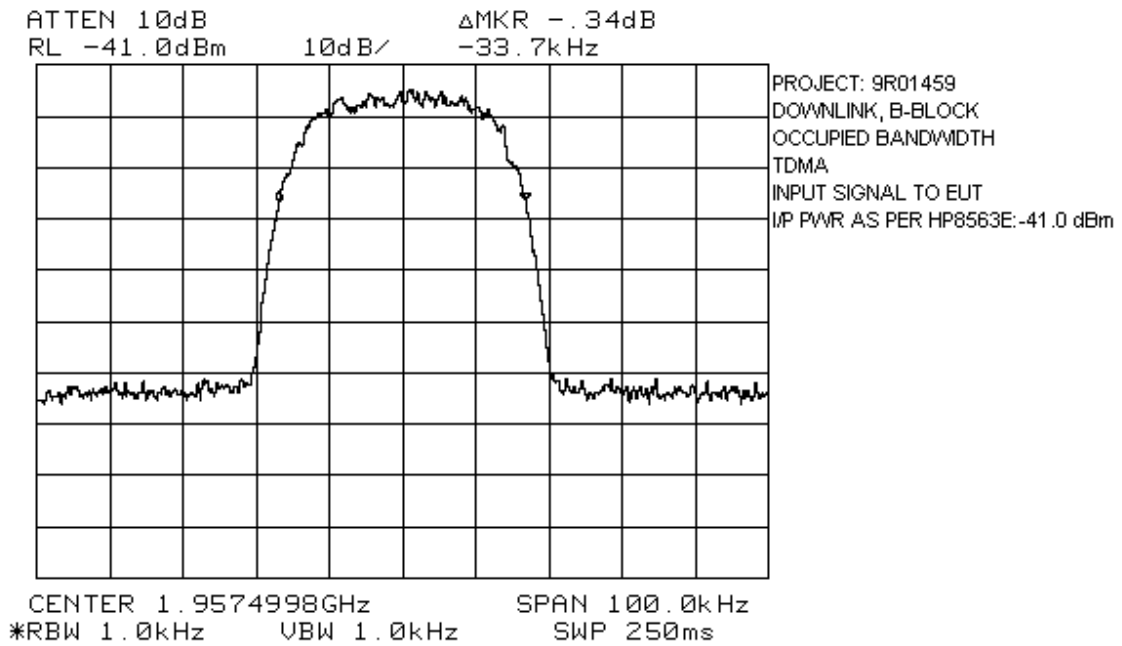
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals PARA. NO.: 2.917(e)

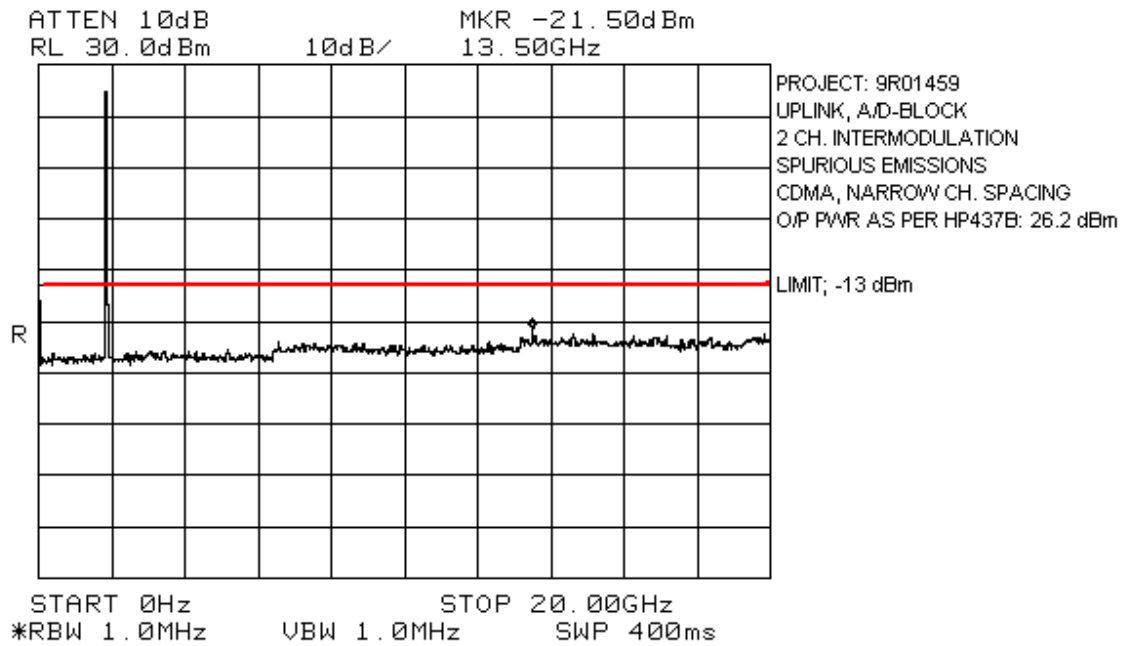
TESTED BY: Kevin Carr

DATE: April 22, 1999

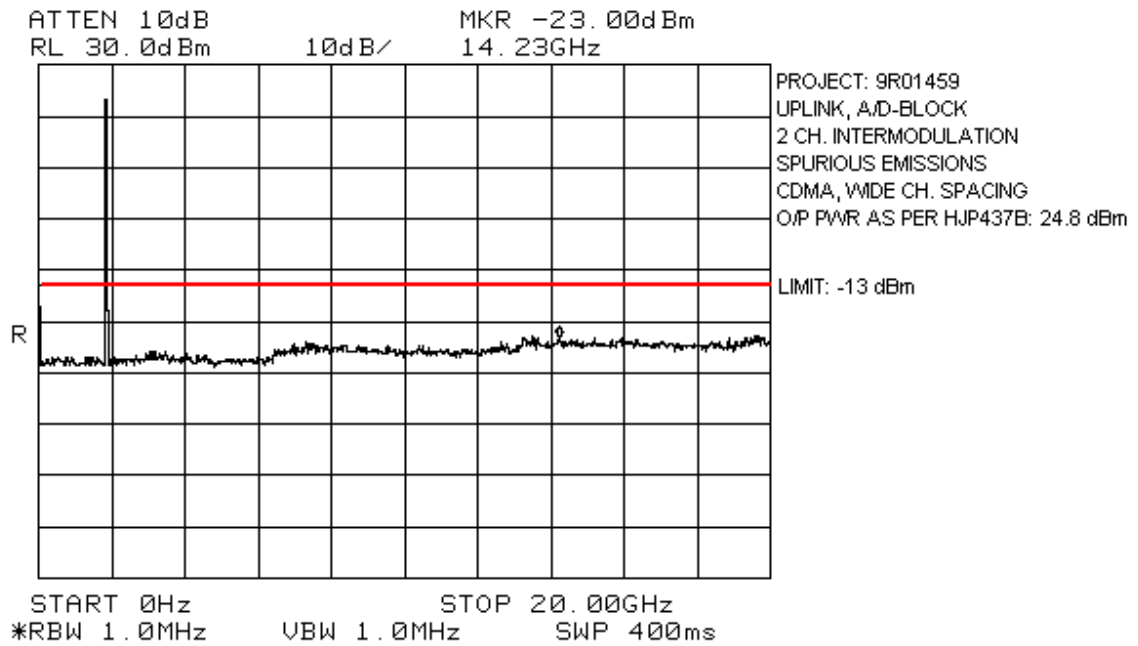
Test Results: Complies.**Test Data:**

NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 20 GHz spurious (Uplink)	-17.33
0 to 20 GHz spurious (Downlink)	-21.67
2 - signal intermodulation (Uplink)	-13.0
2 - signal intermodulation (Downlink)	-13.0
Lower band edge spurious (Uplink)	-15.57
Lower band edge spurious (Downlink)	-17.0
Upper band edge spurious (Uplink)	-16.73
Upper band edge spurious (Downlink)	-16.27

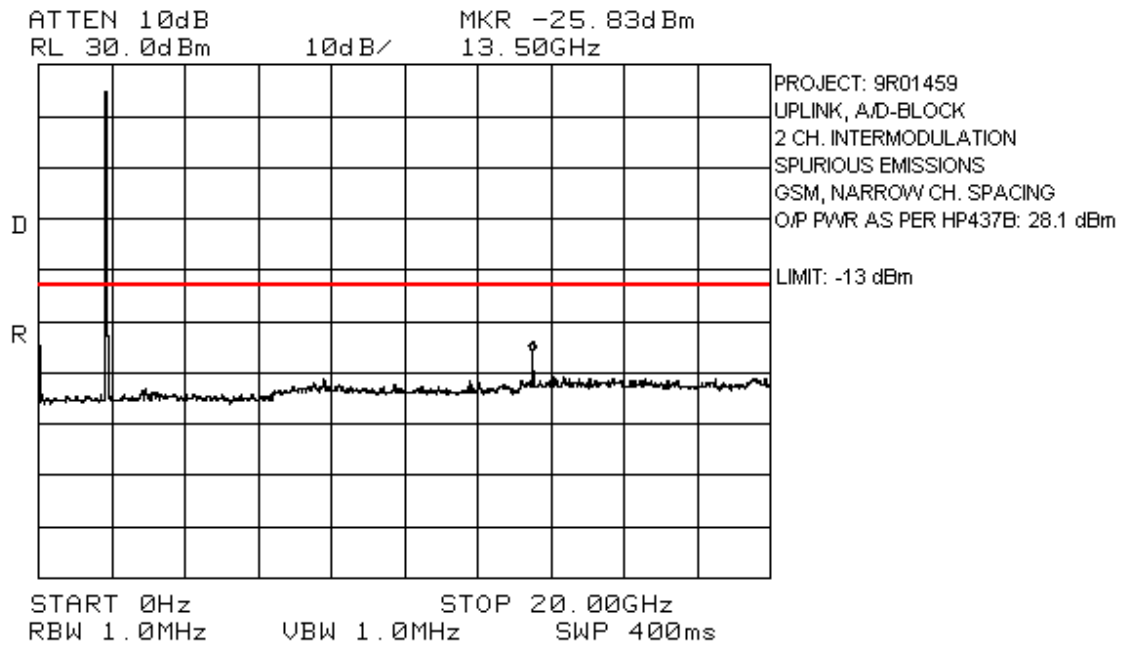
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



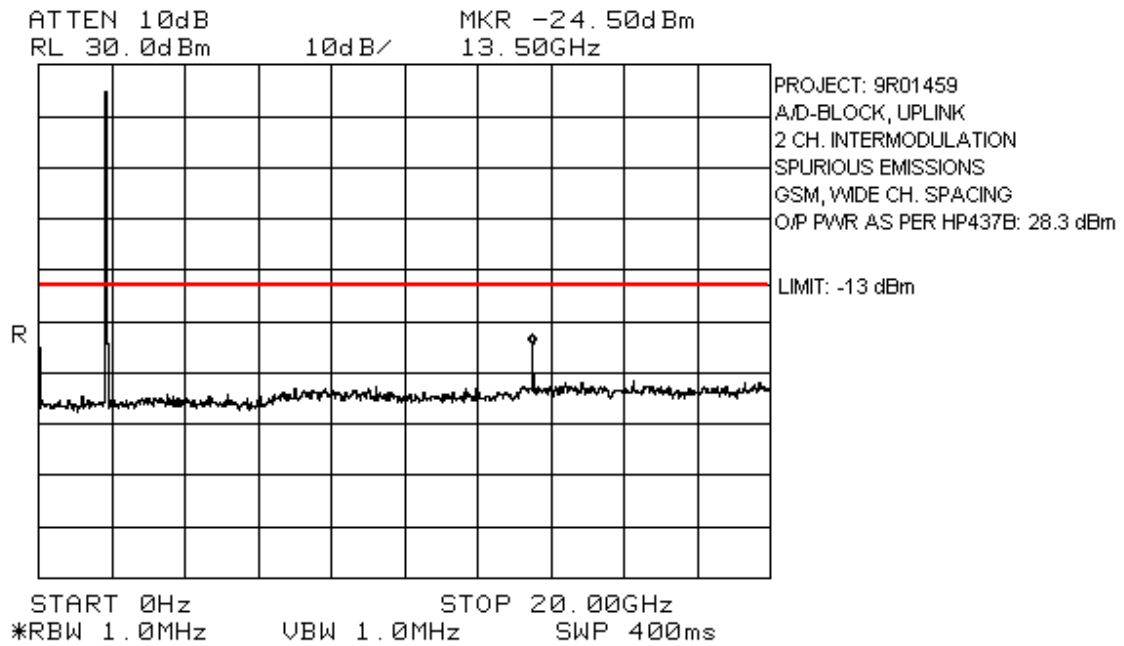
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



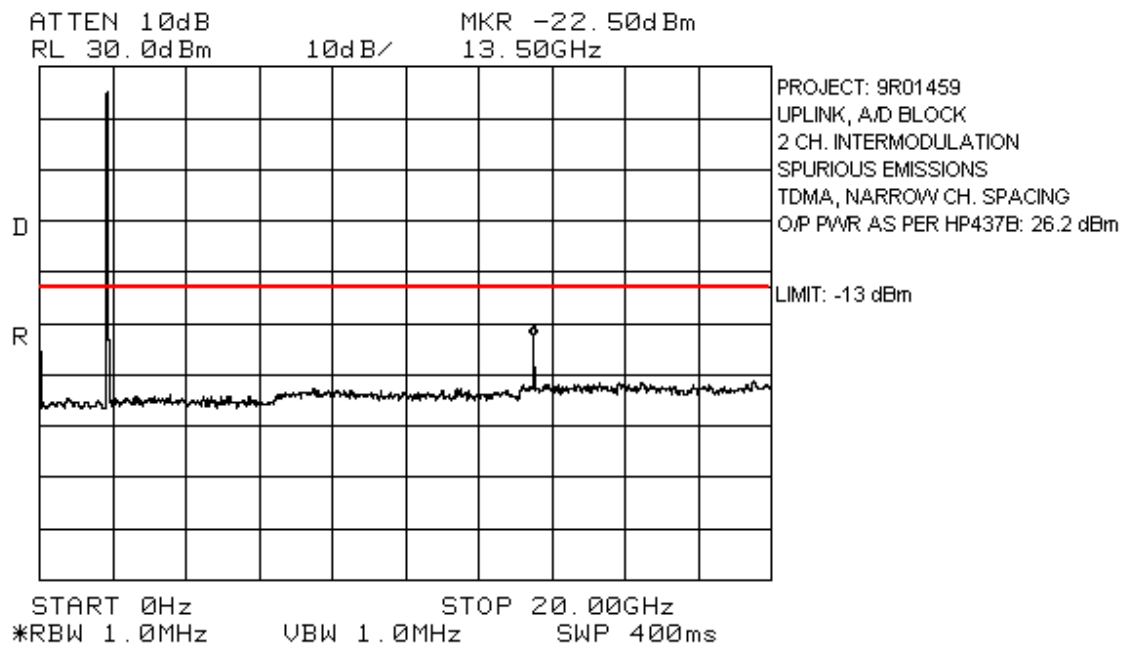
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



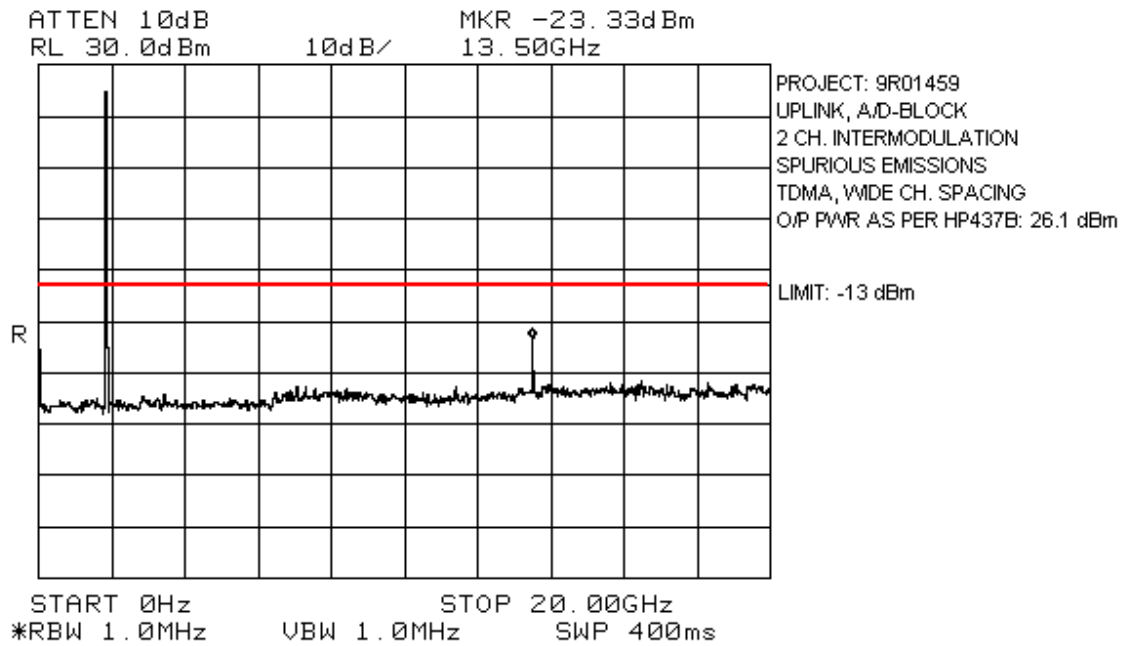
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



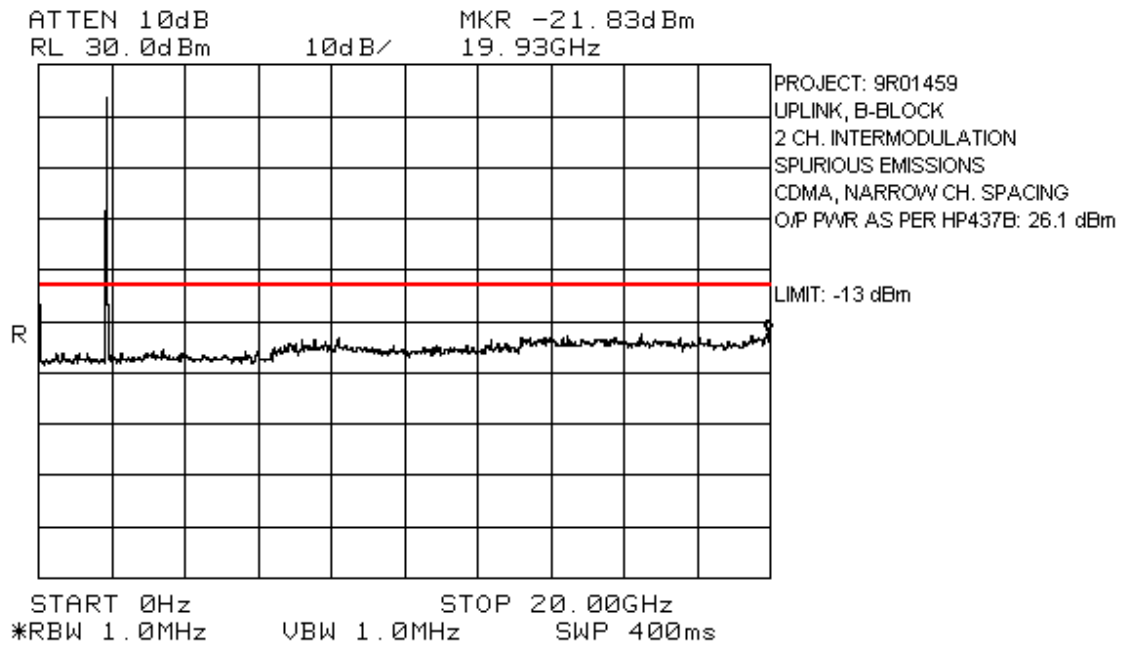
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



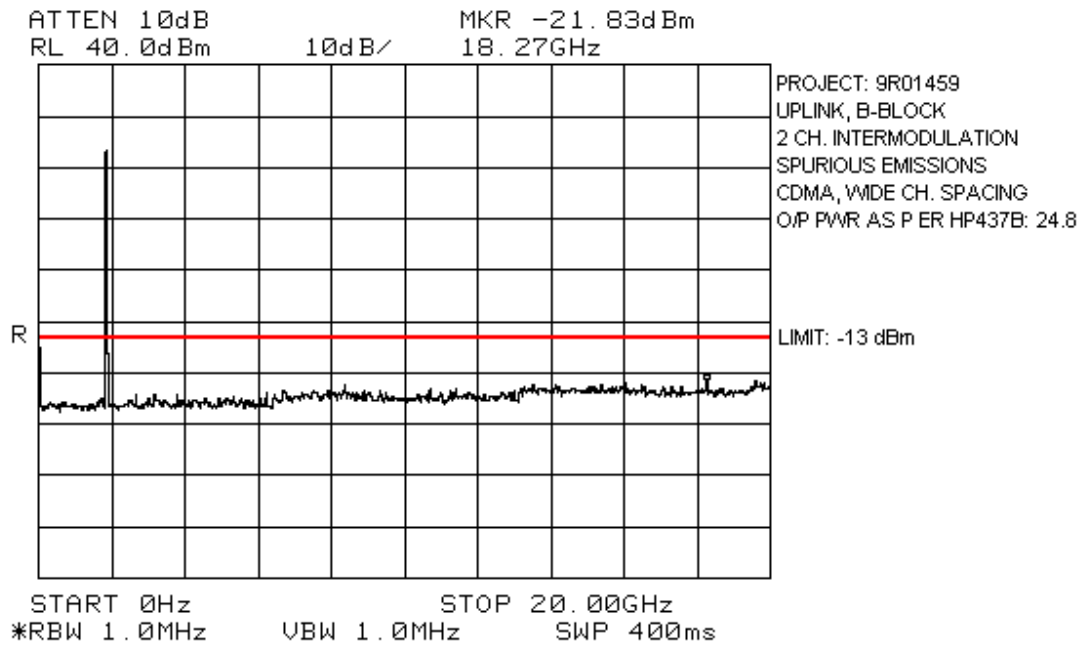
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



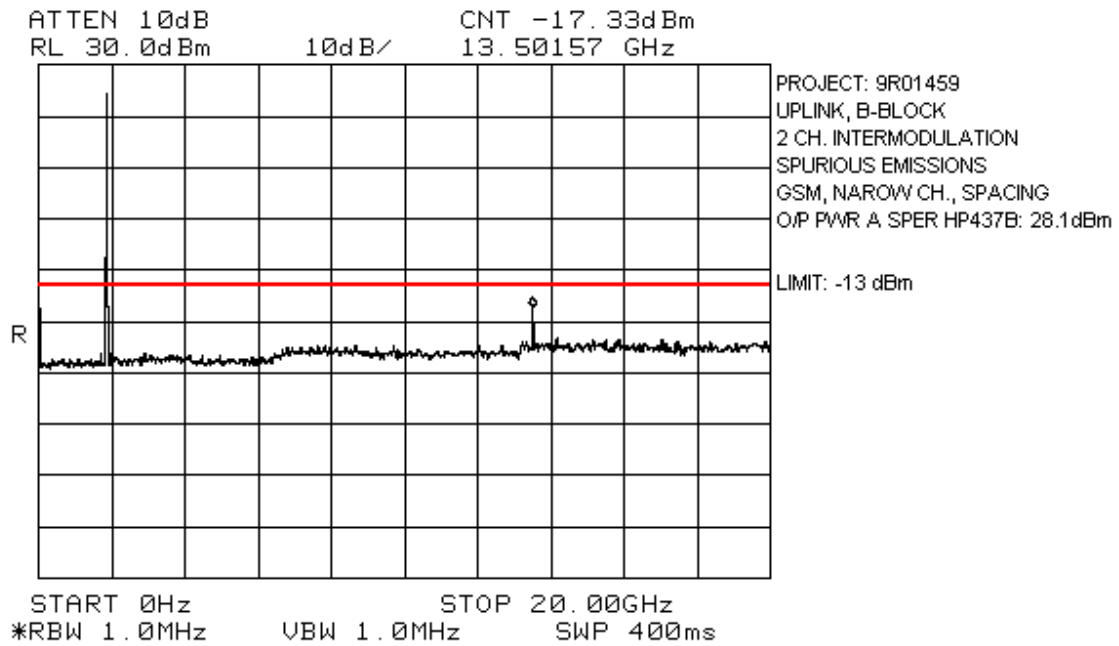
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



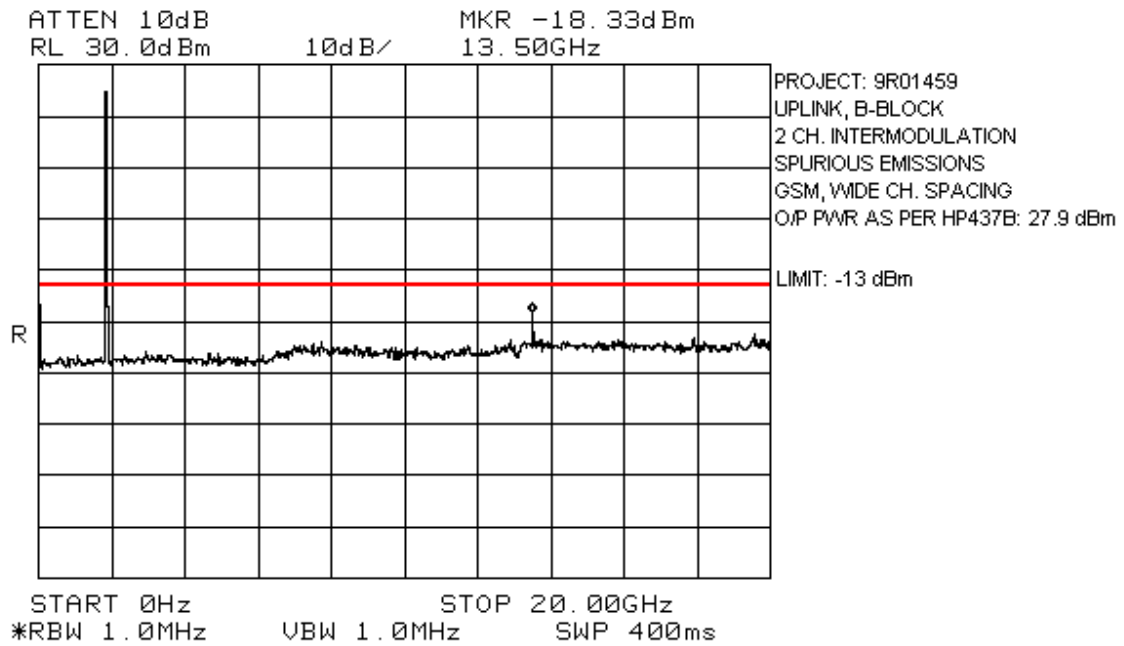
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



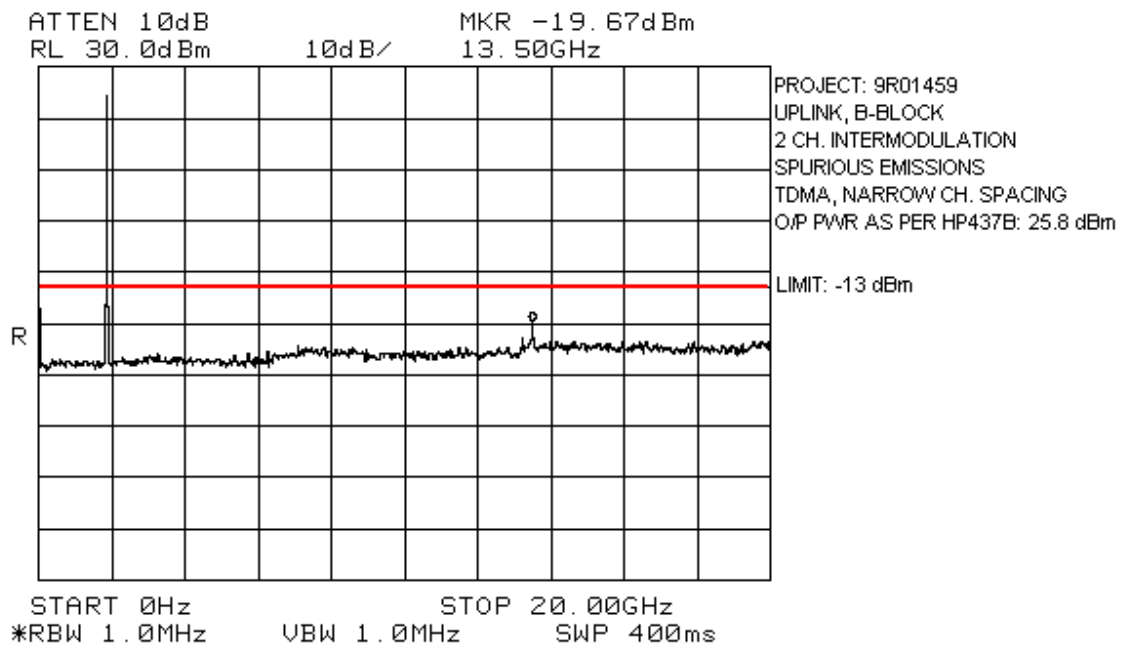
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



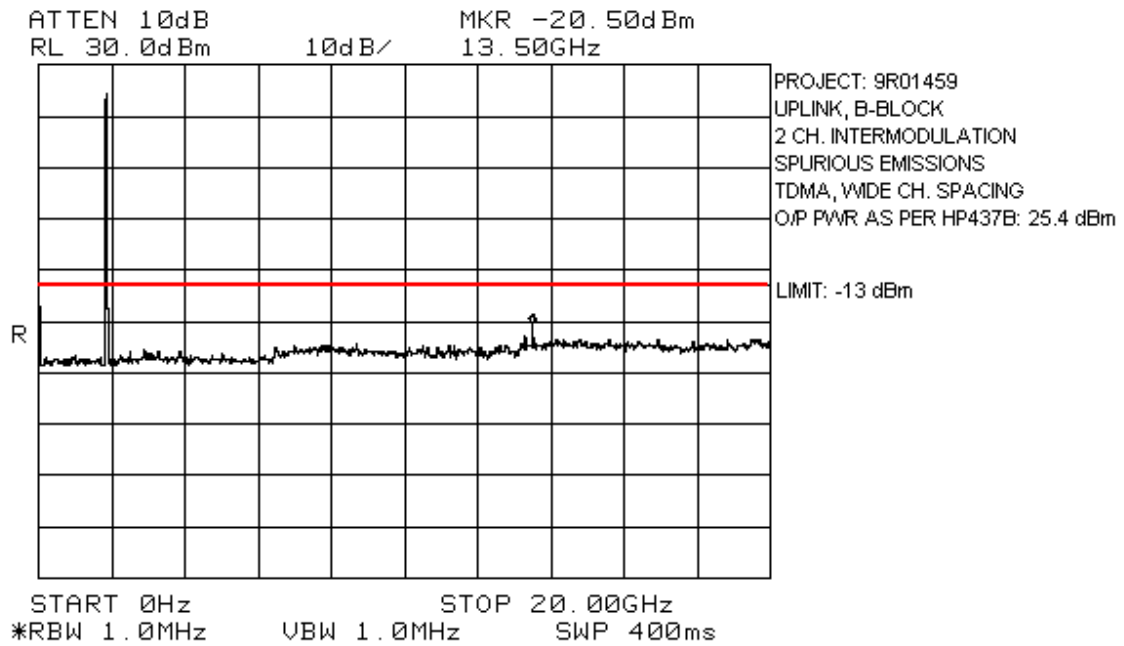
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



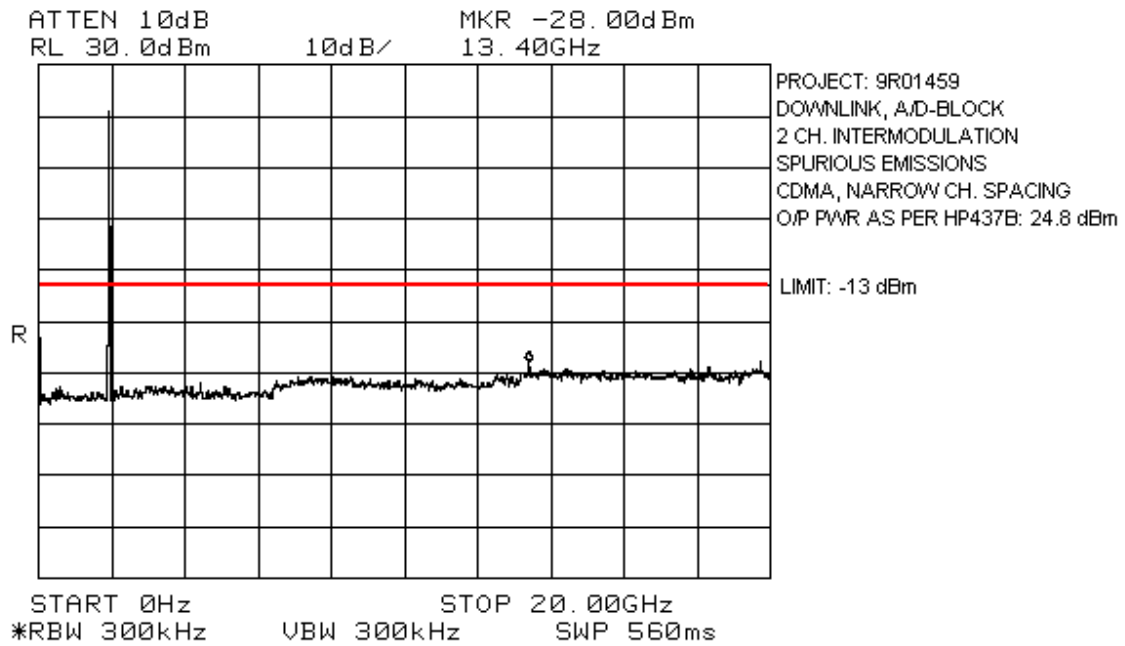
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



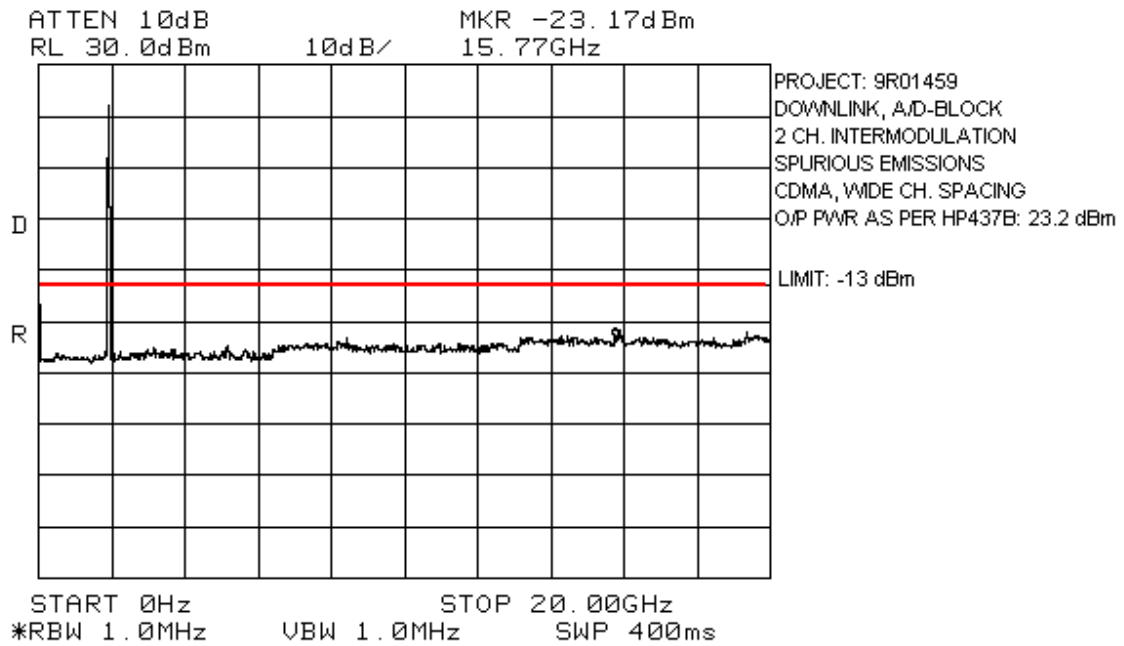
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



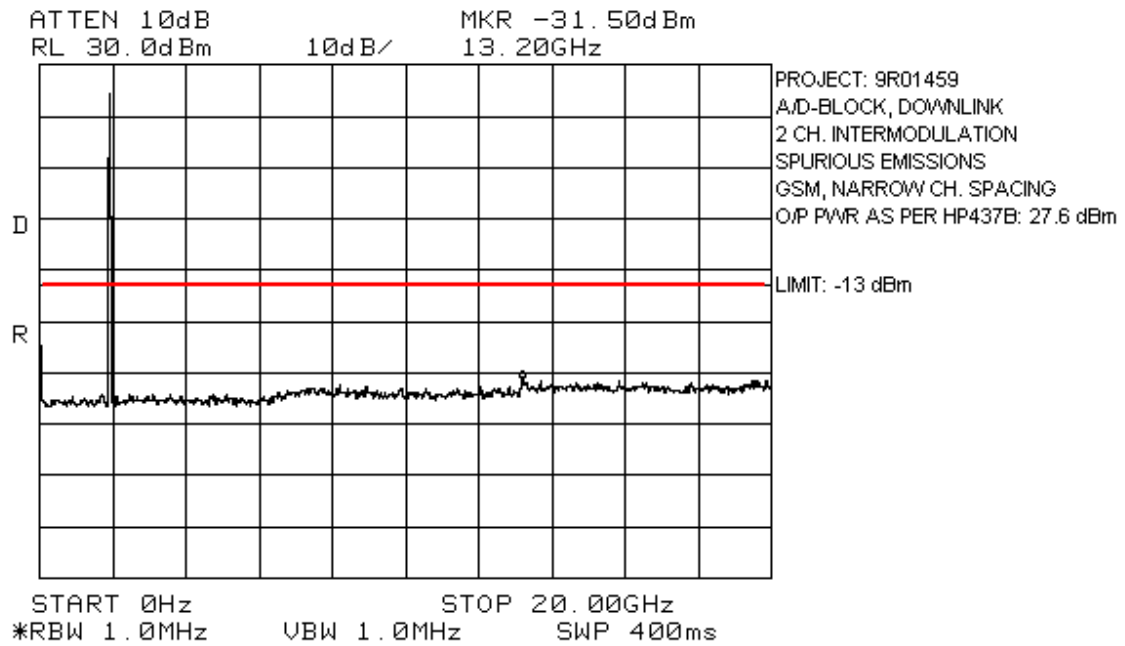
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



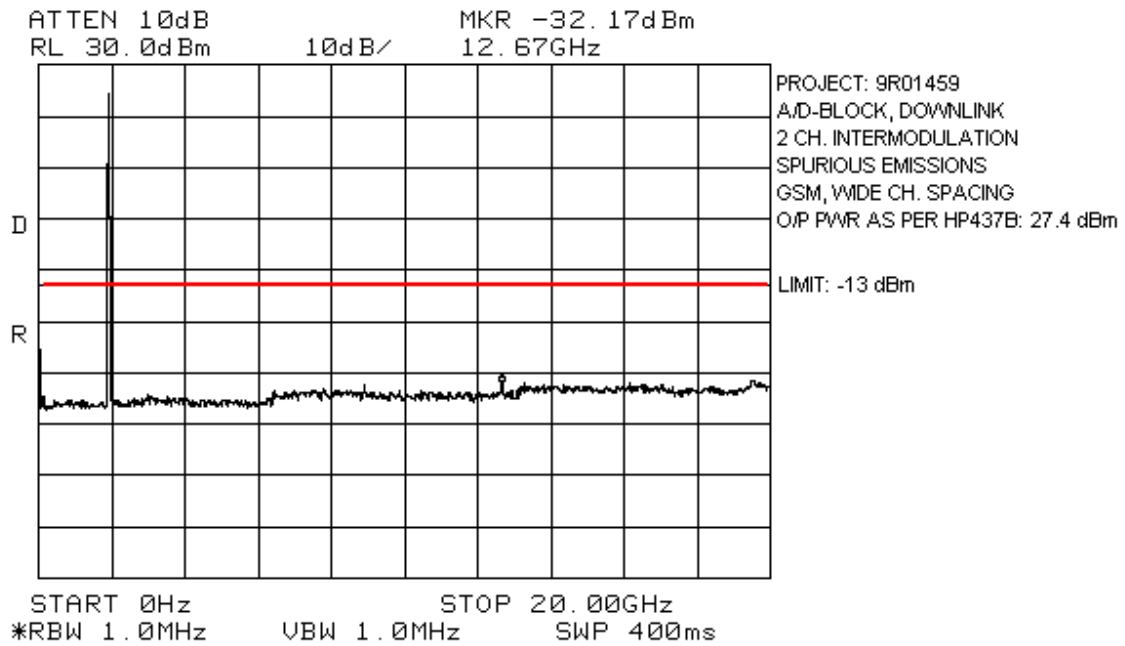
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



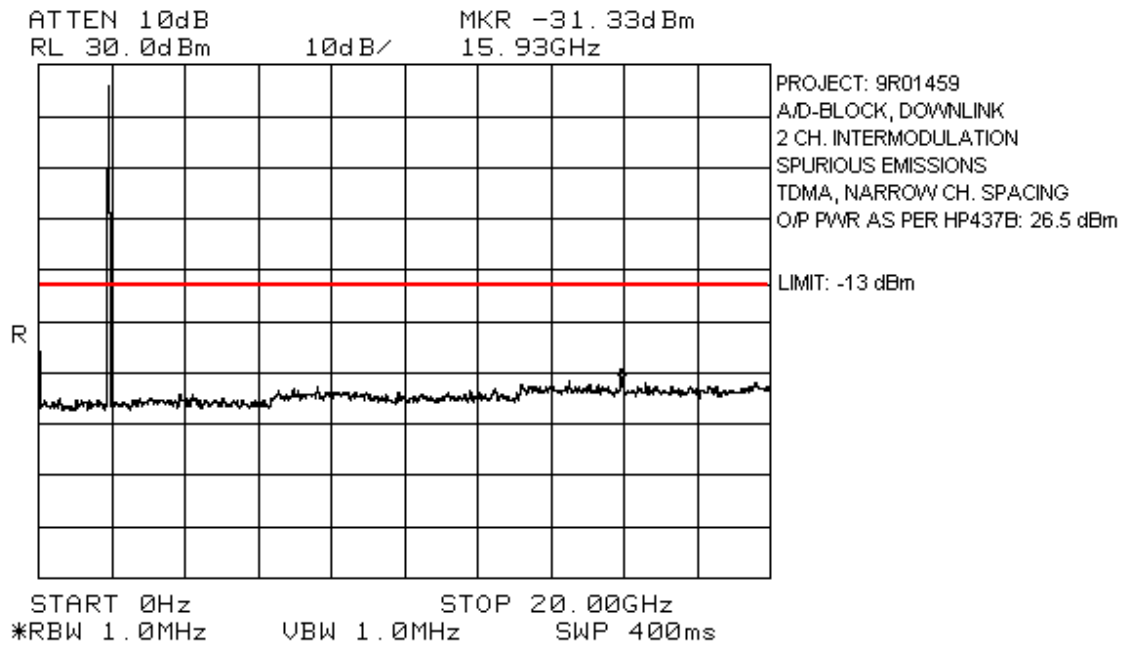
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



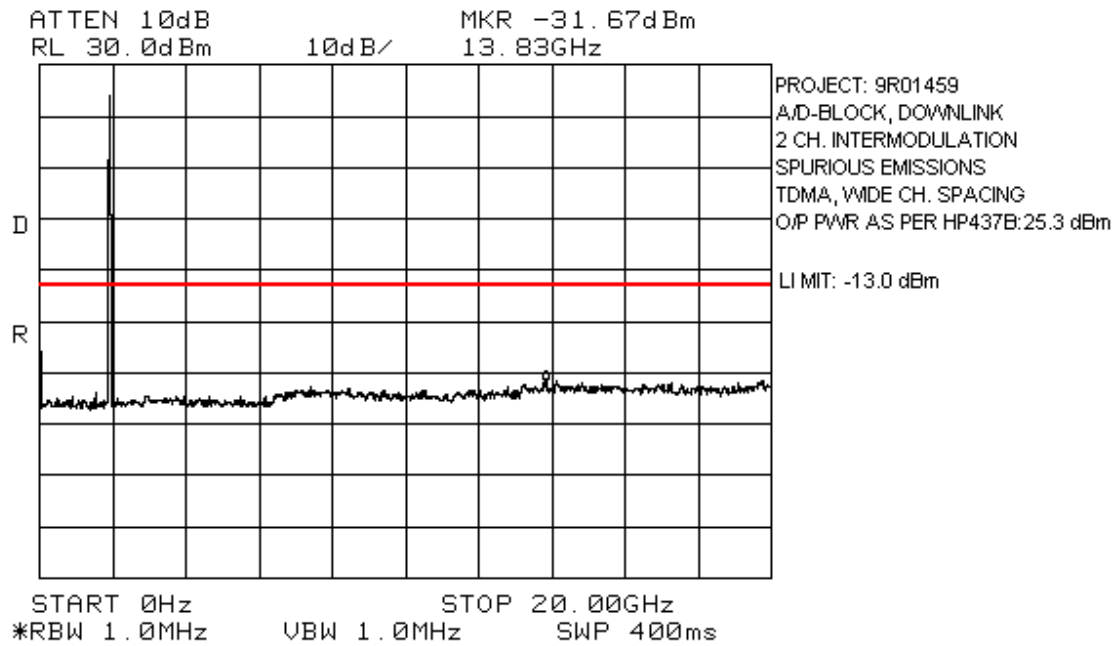
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



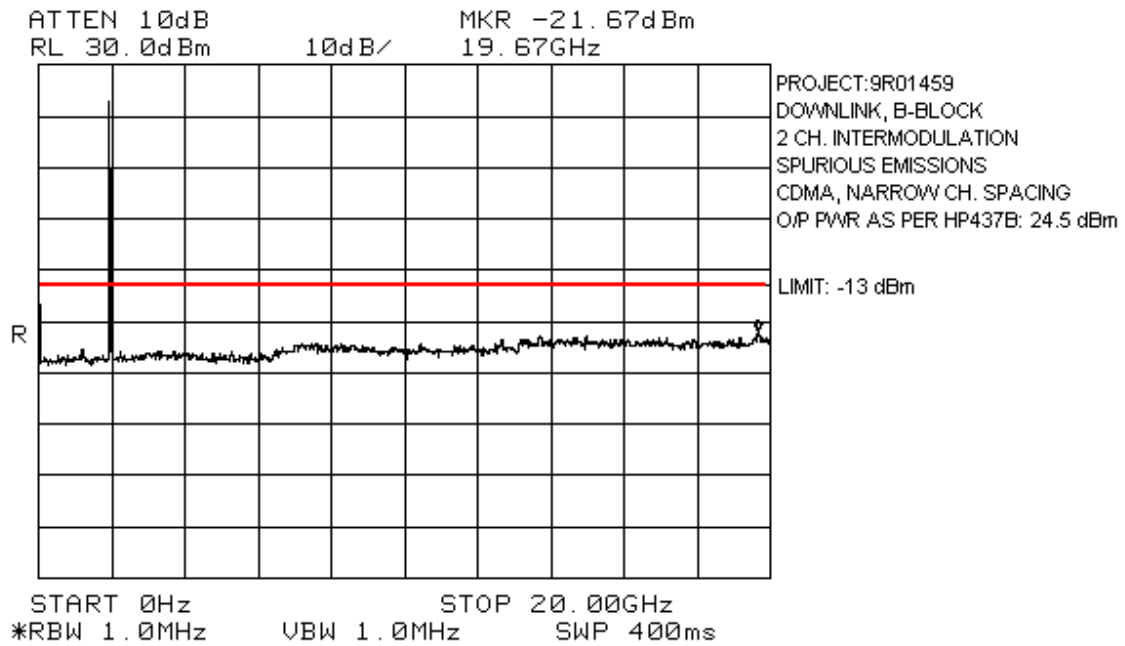
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



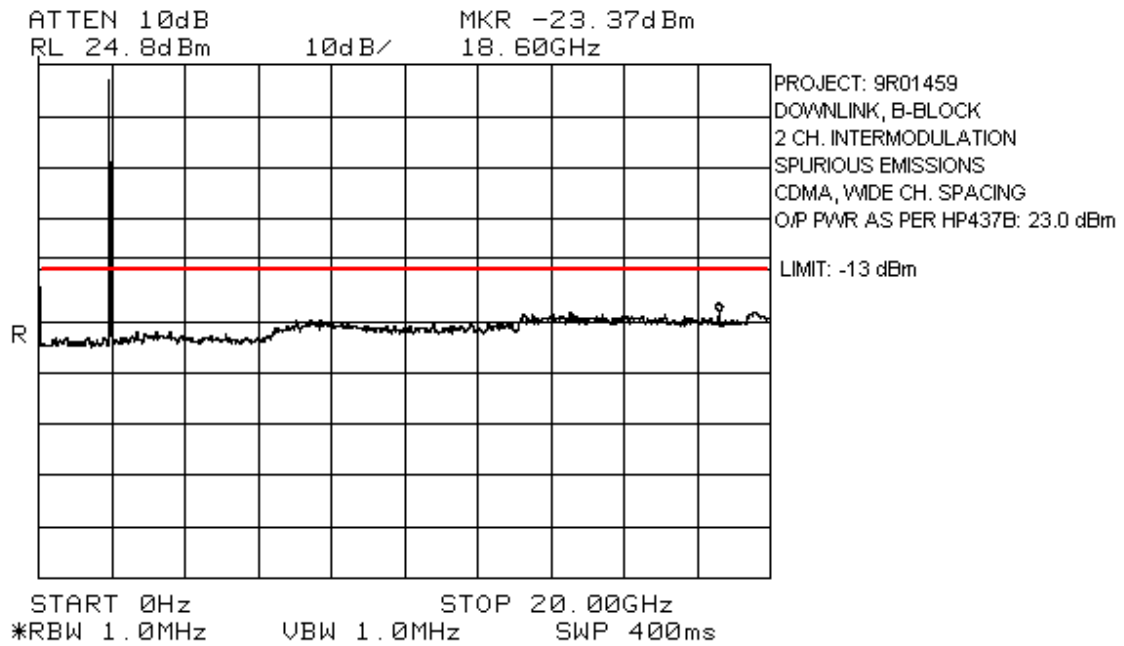
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



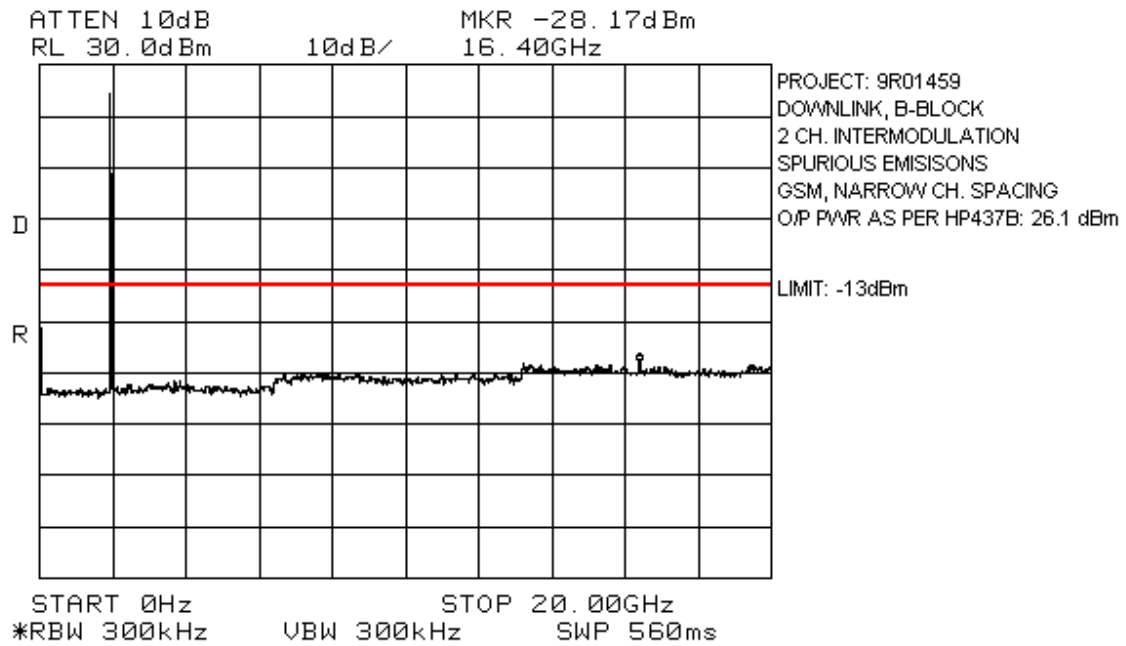
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



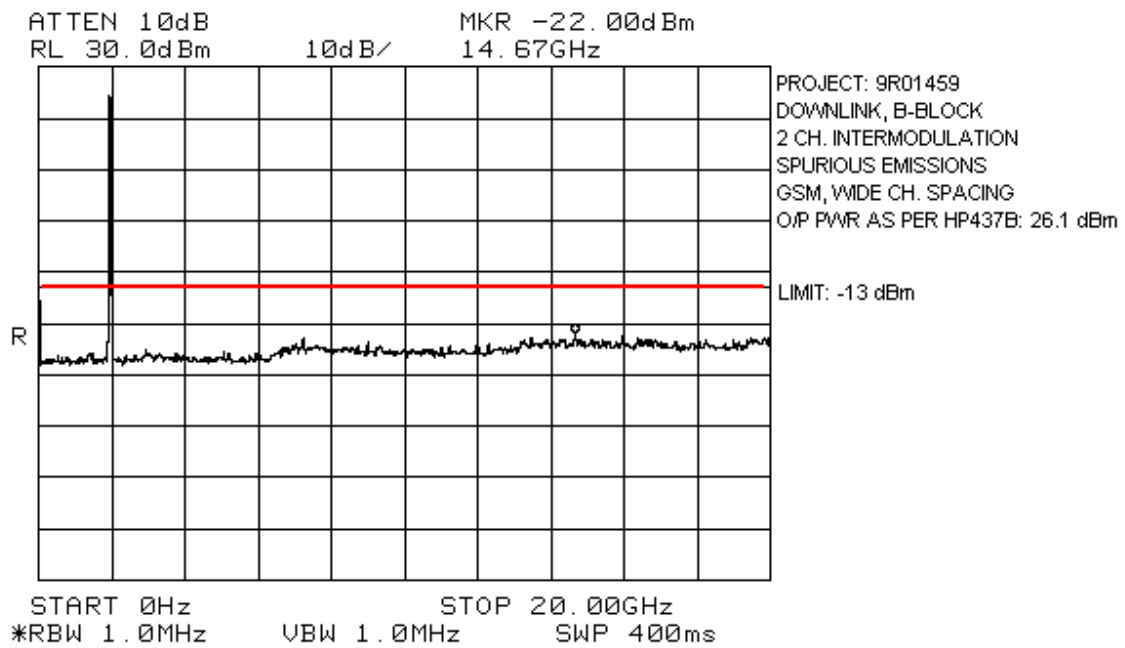
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



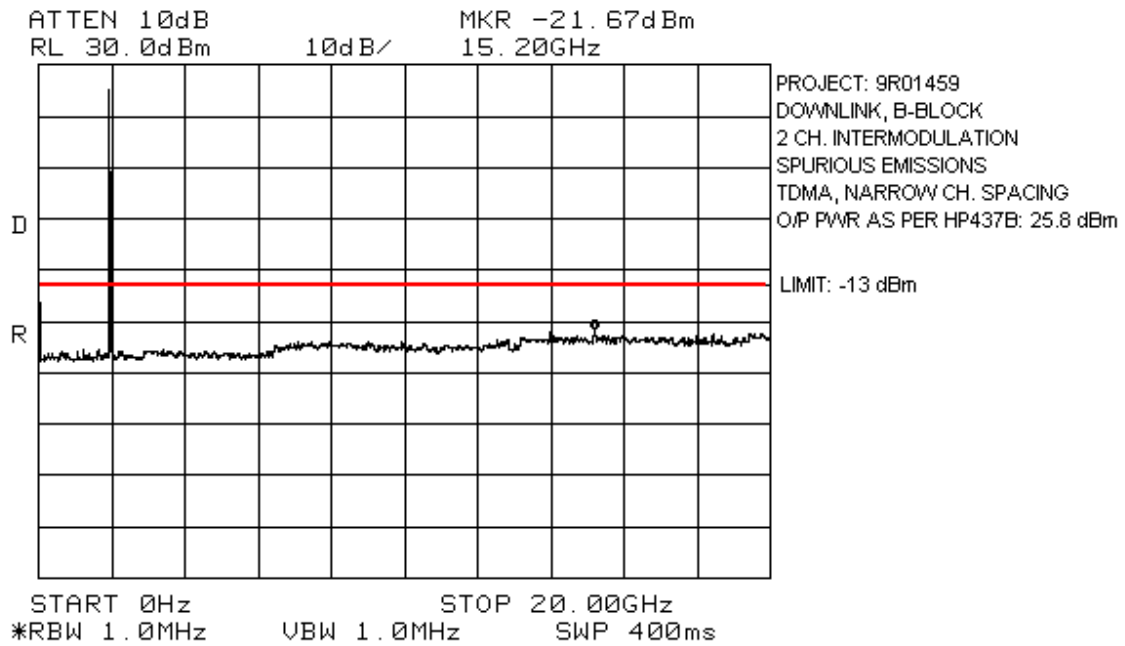
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



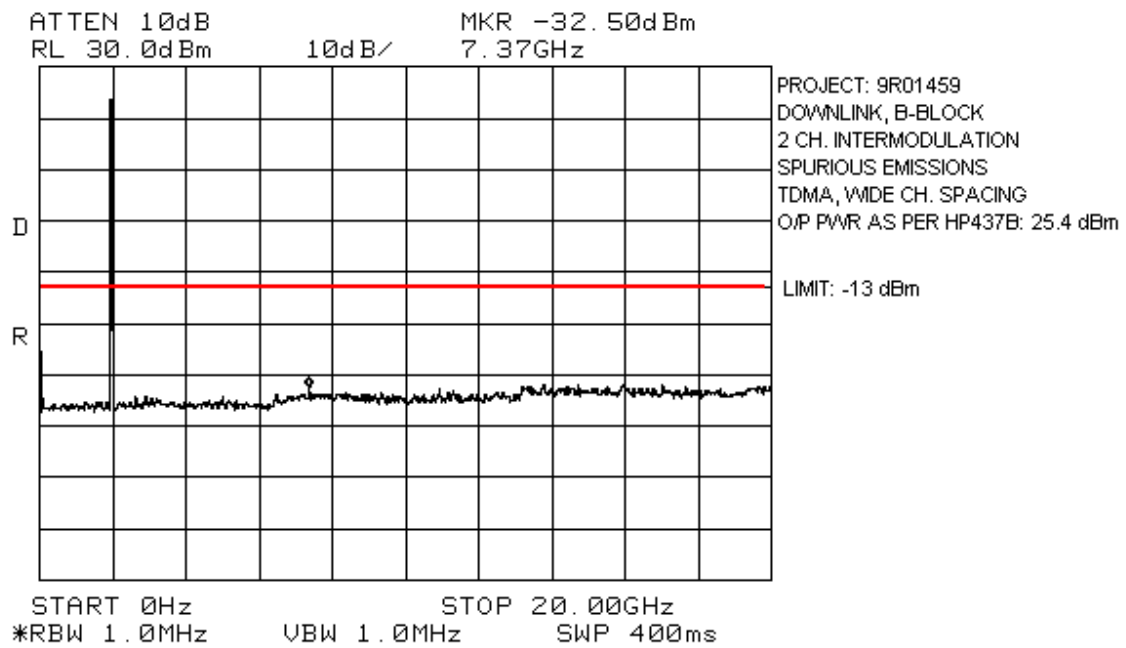
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



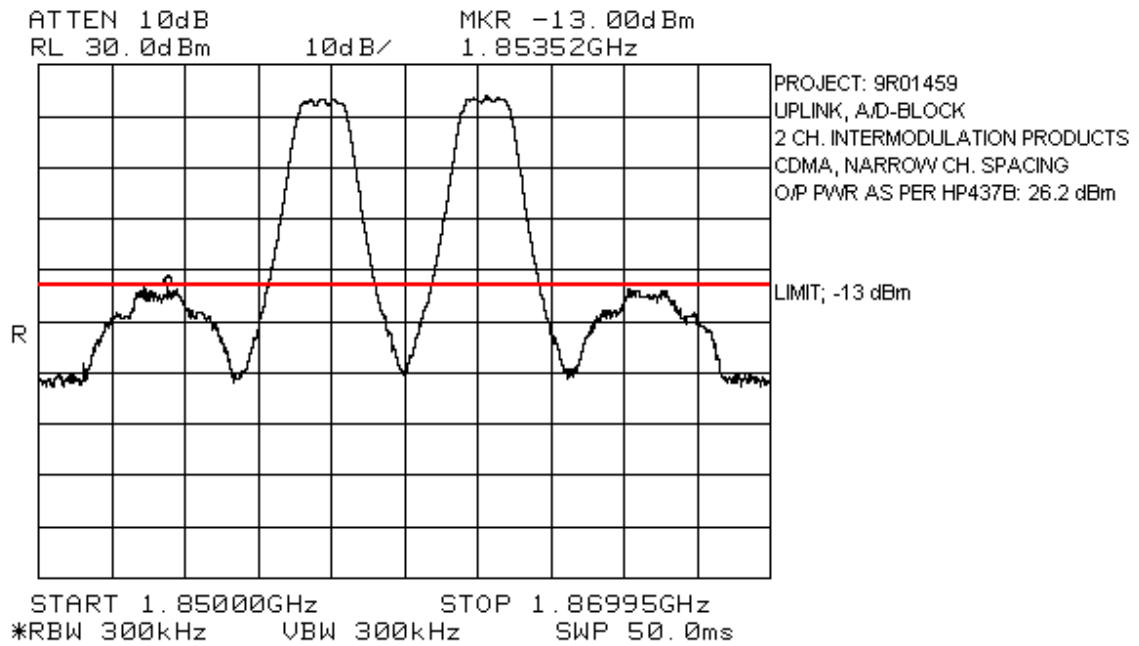
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



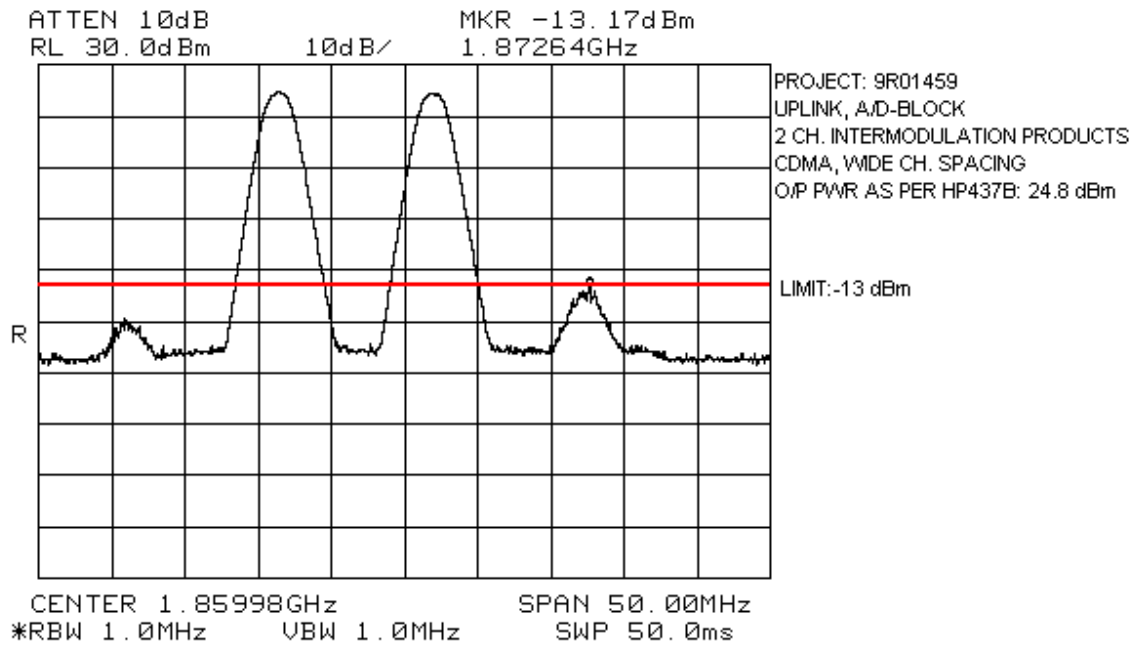
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



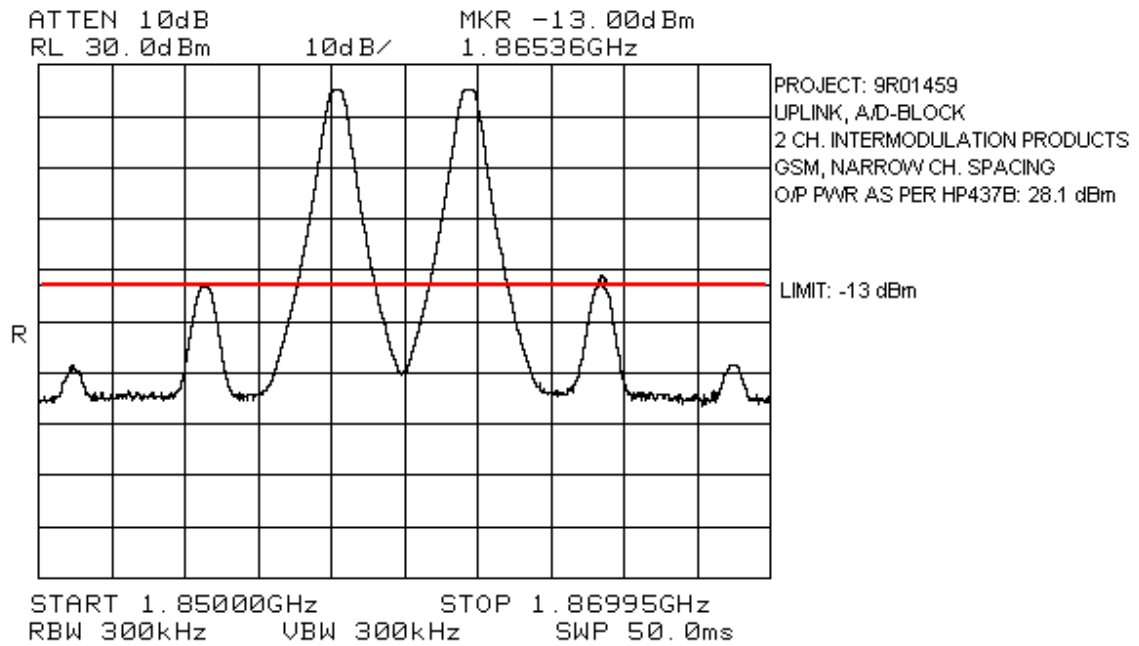
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



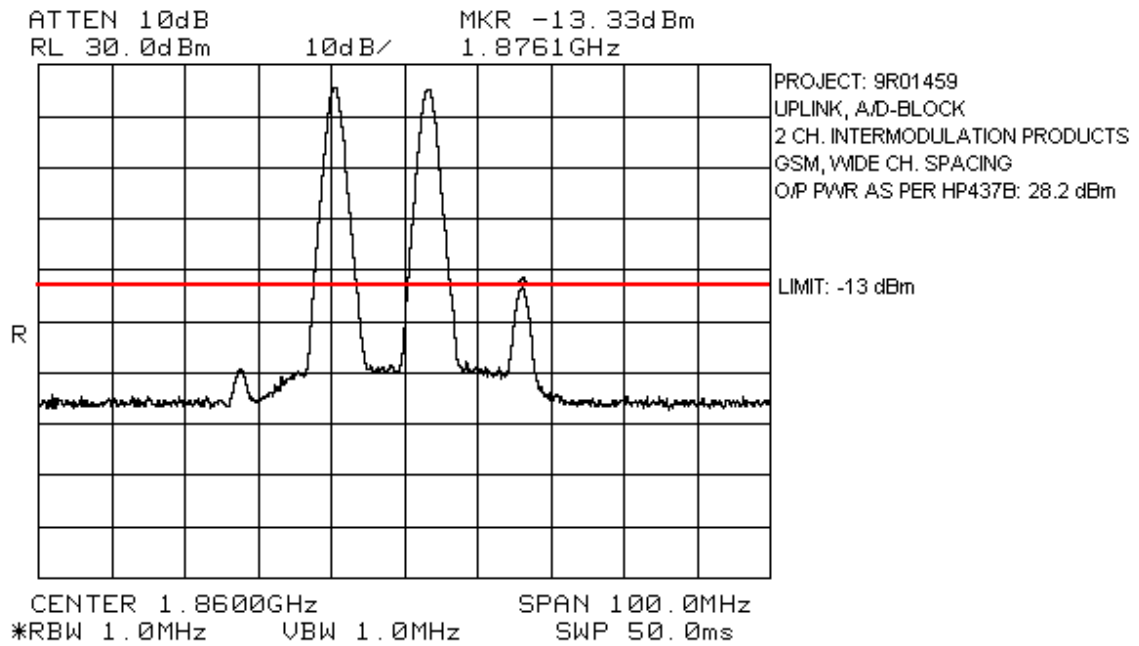
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



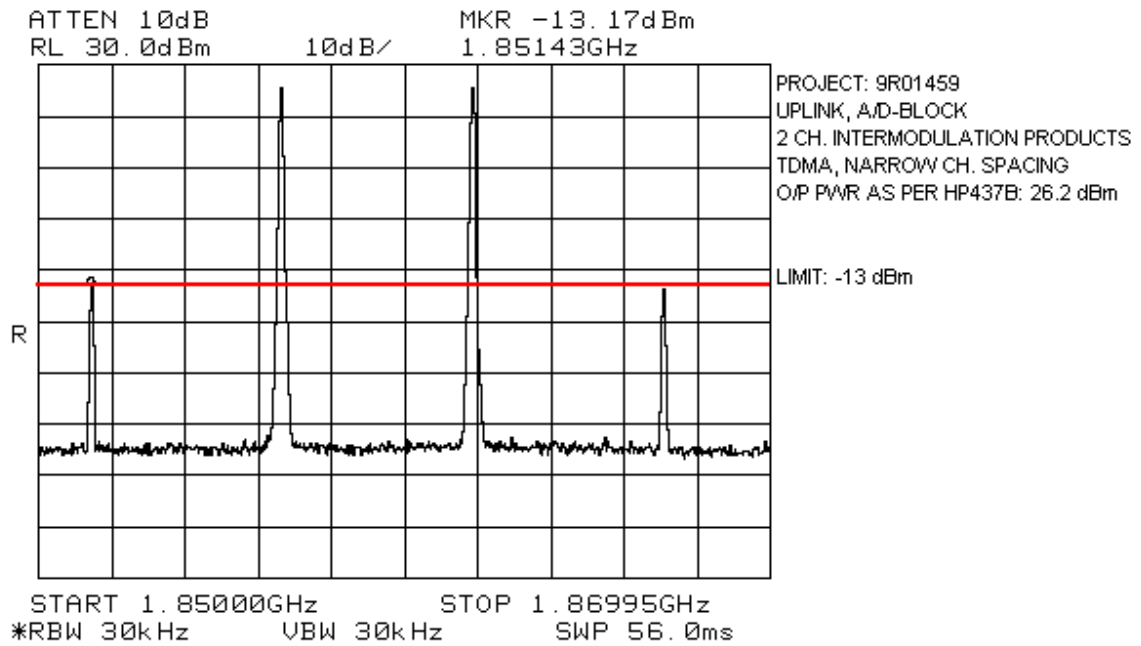
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



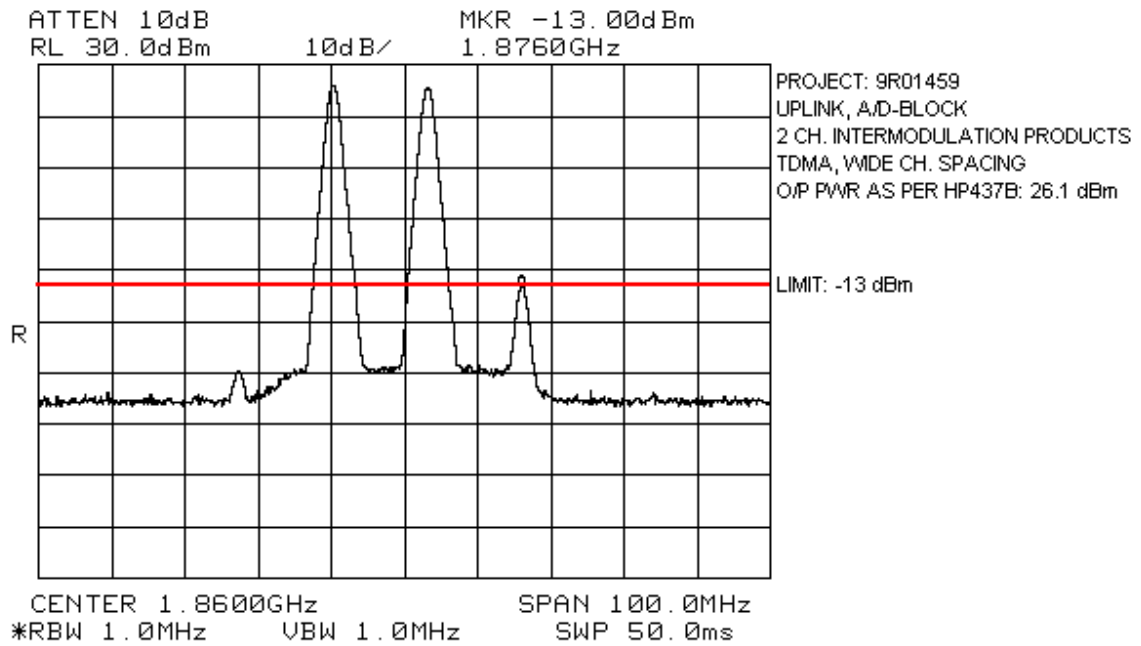
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



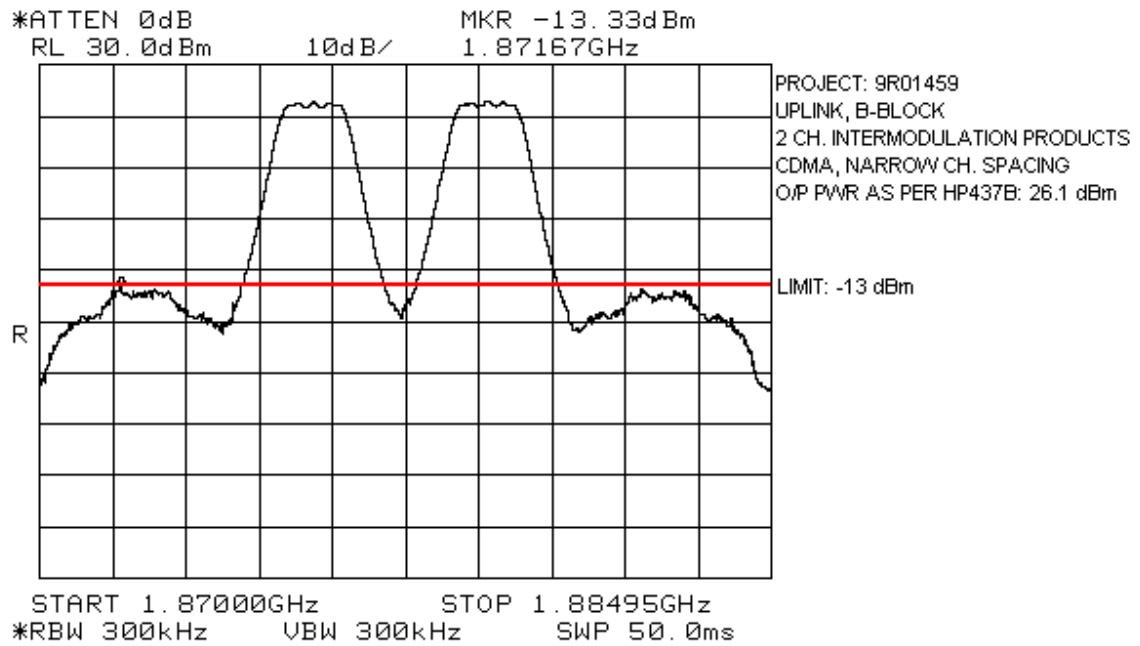
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



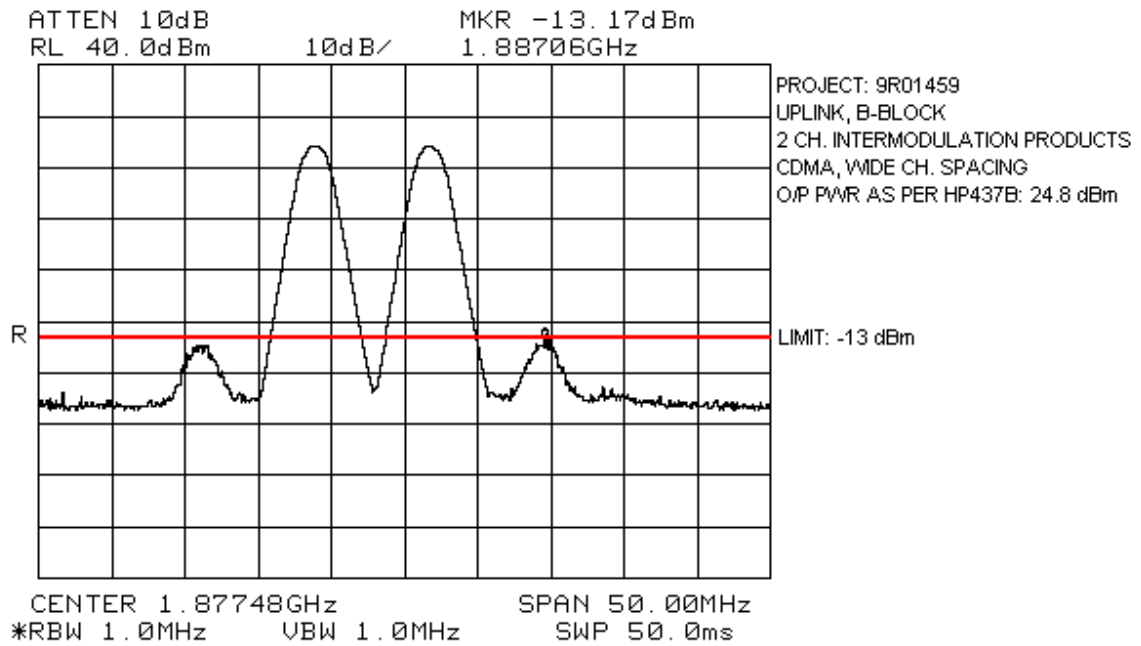
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



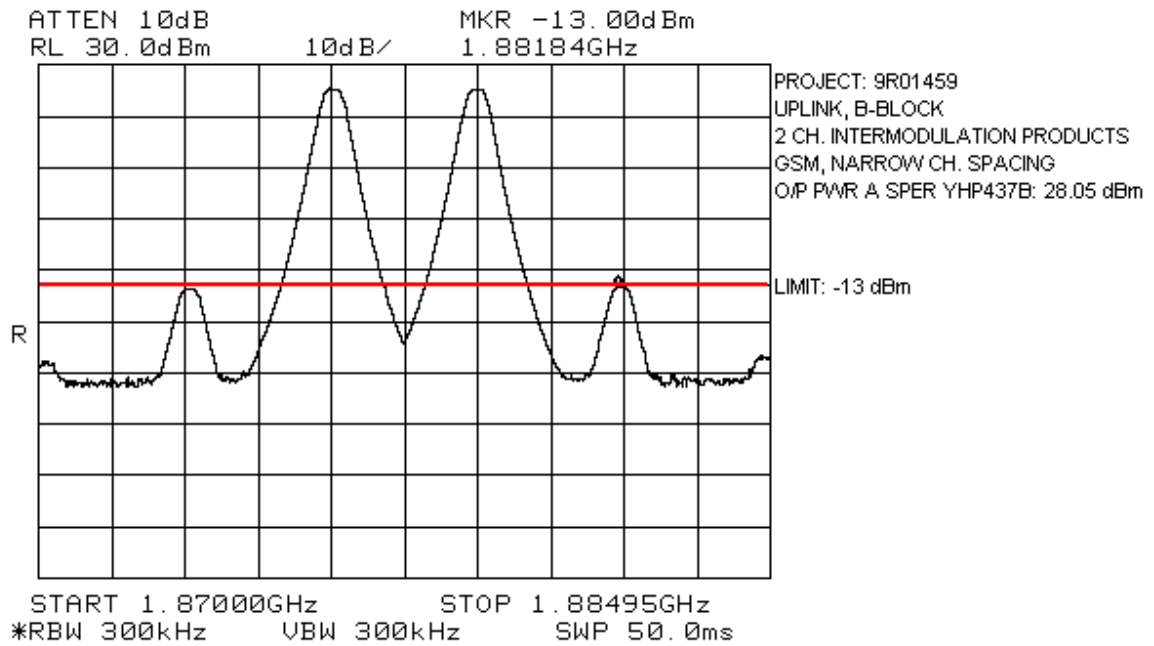
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



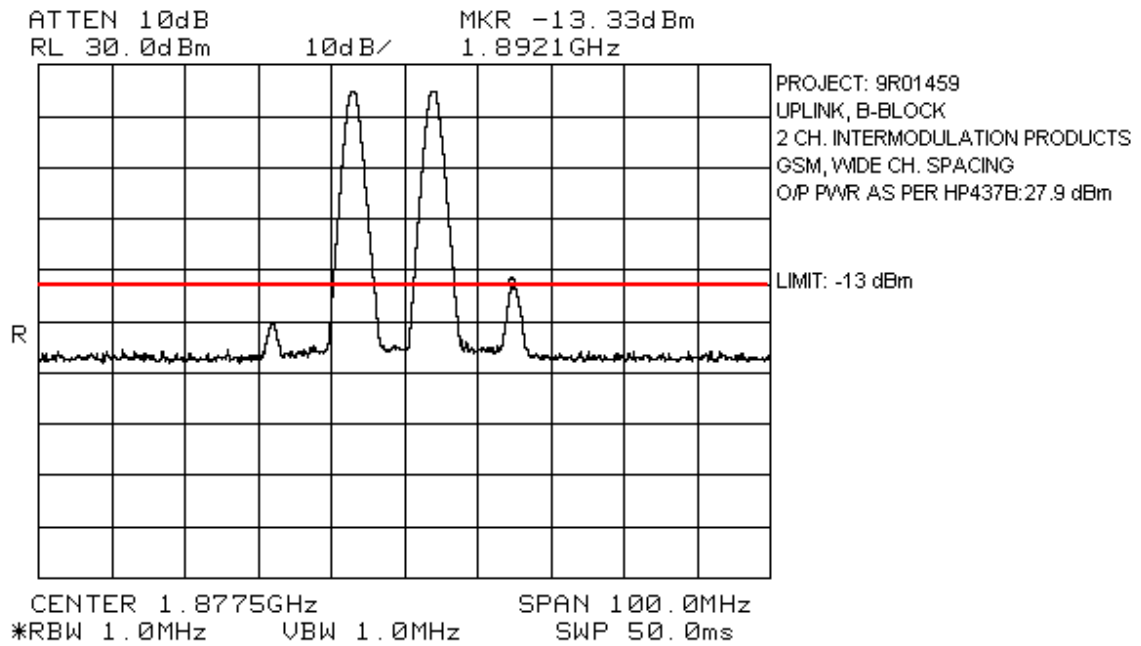
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



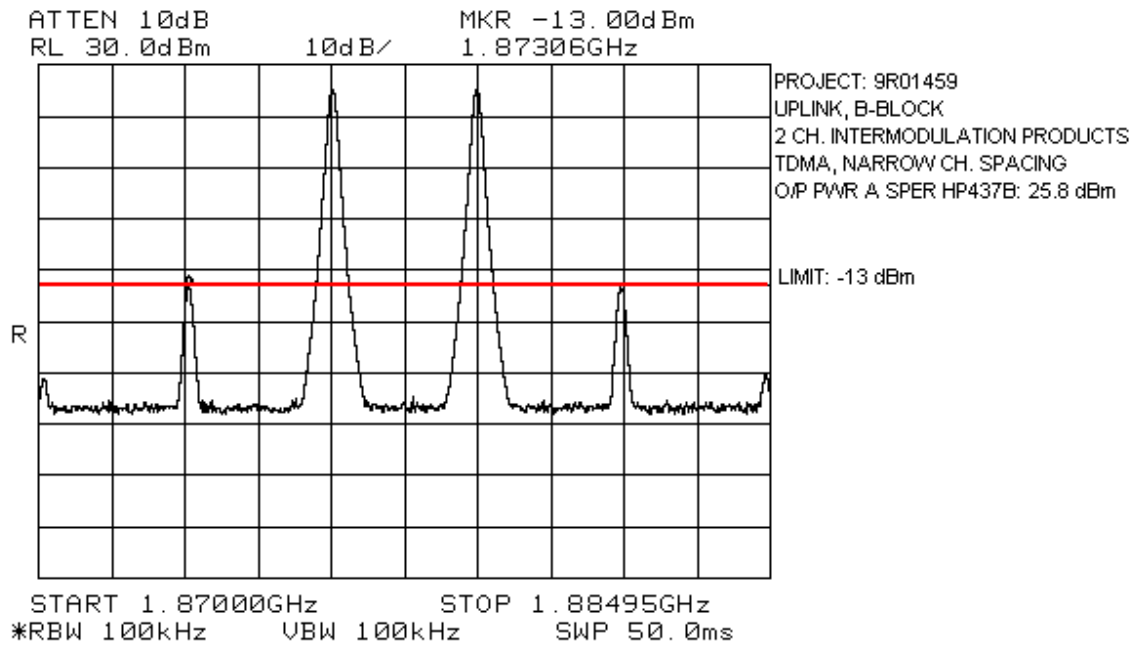
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



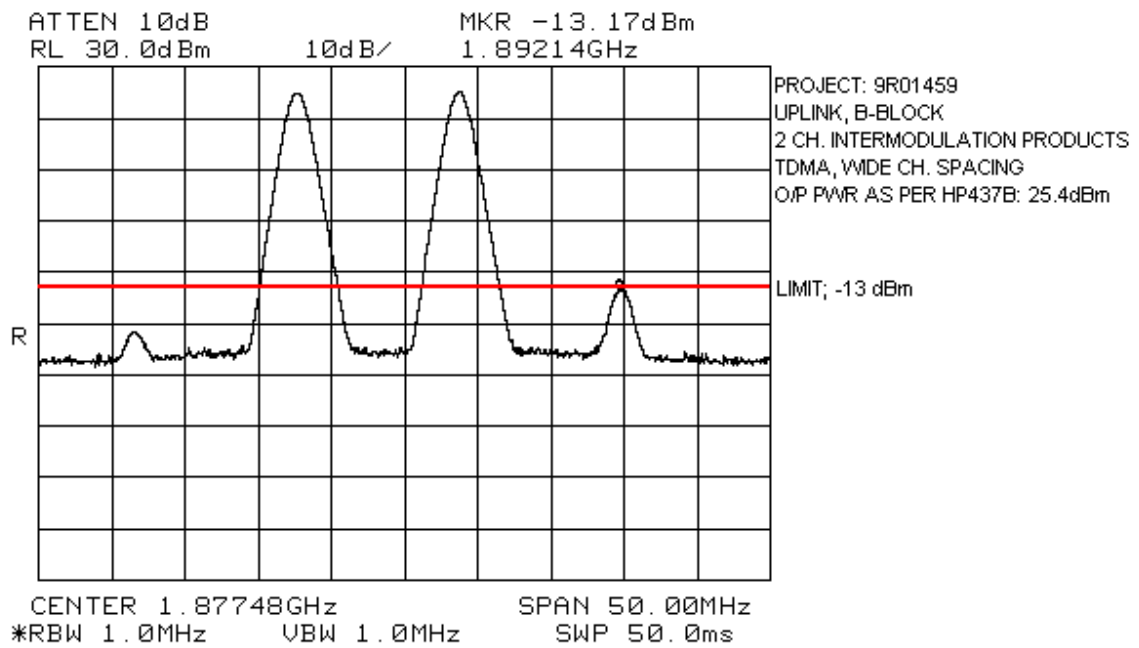
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



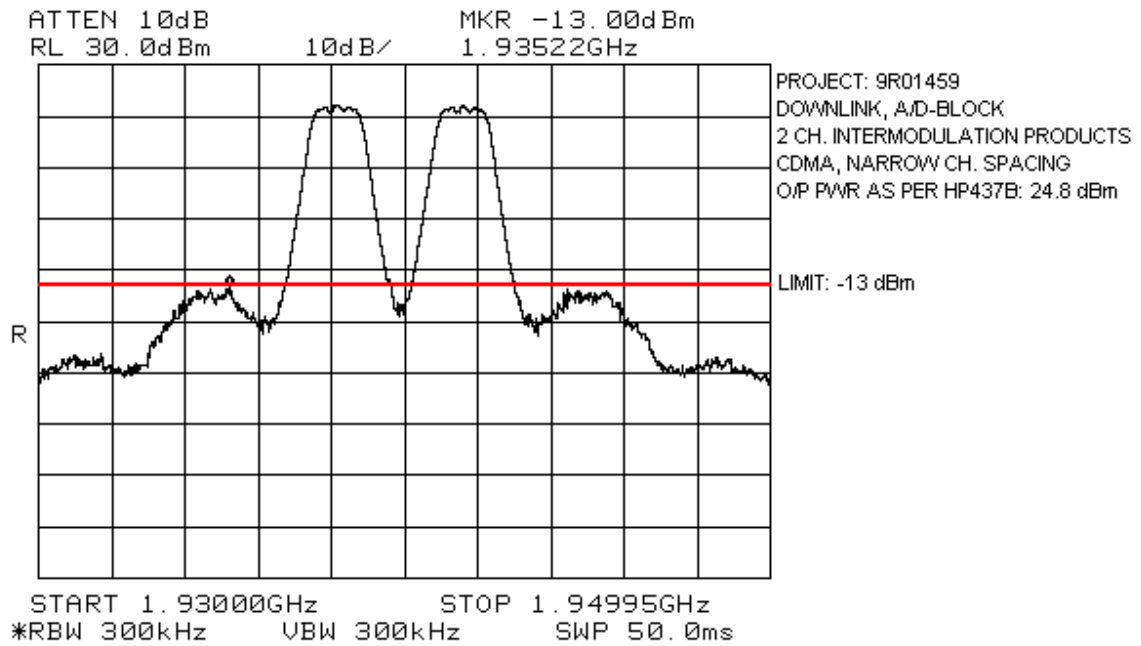
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



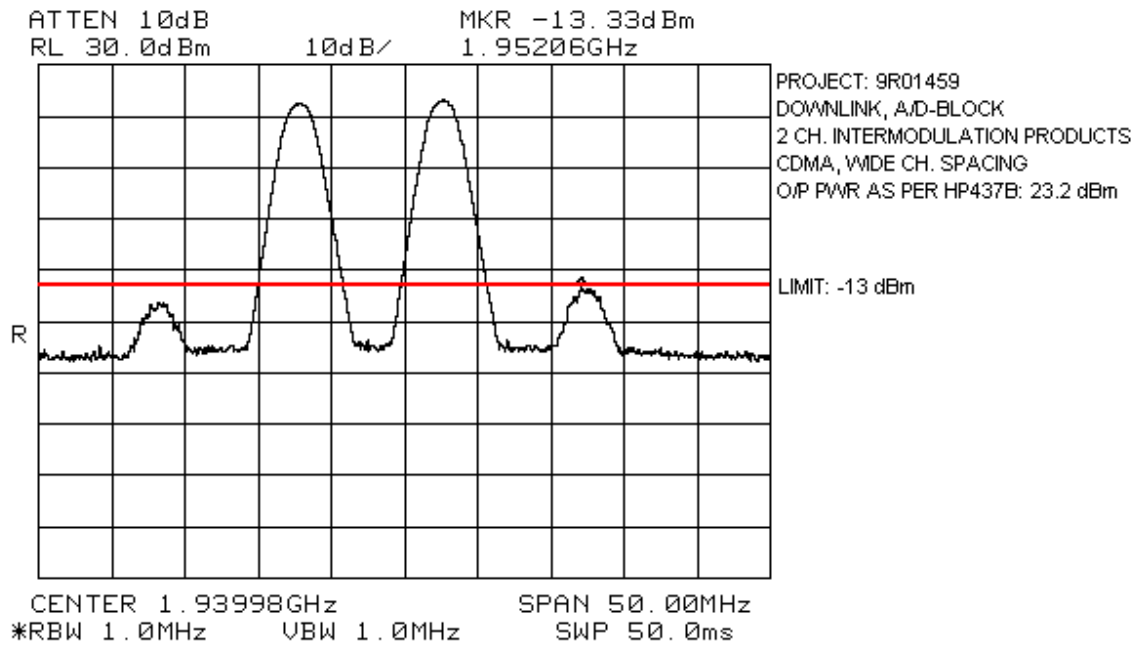
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



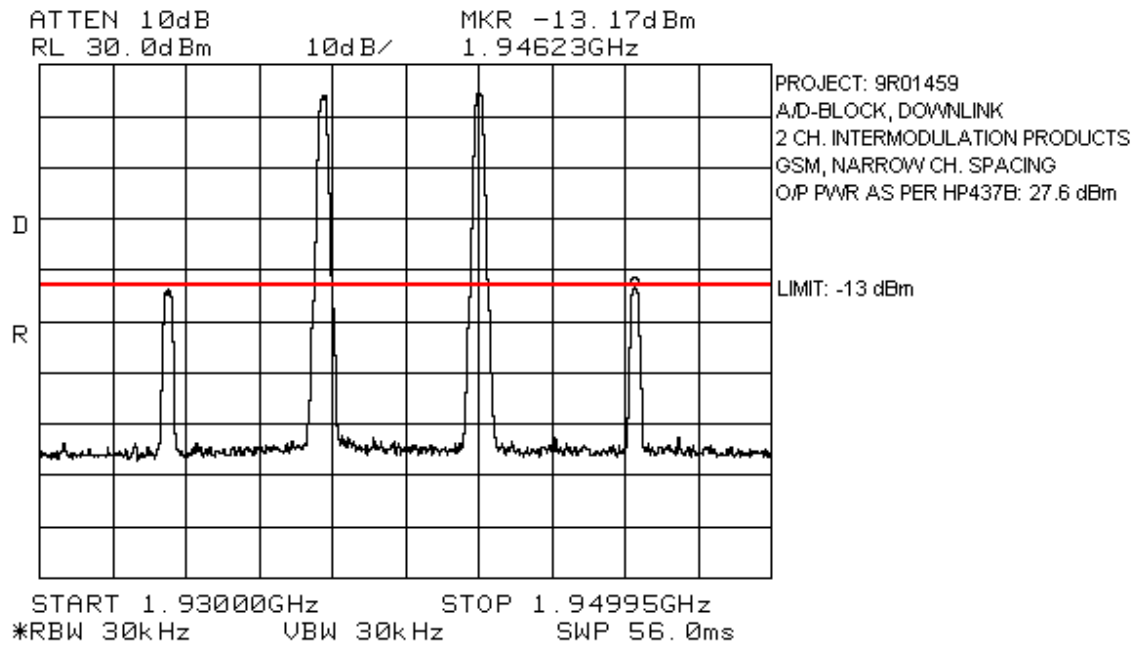
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



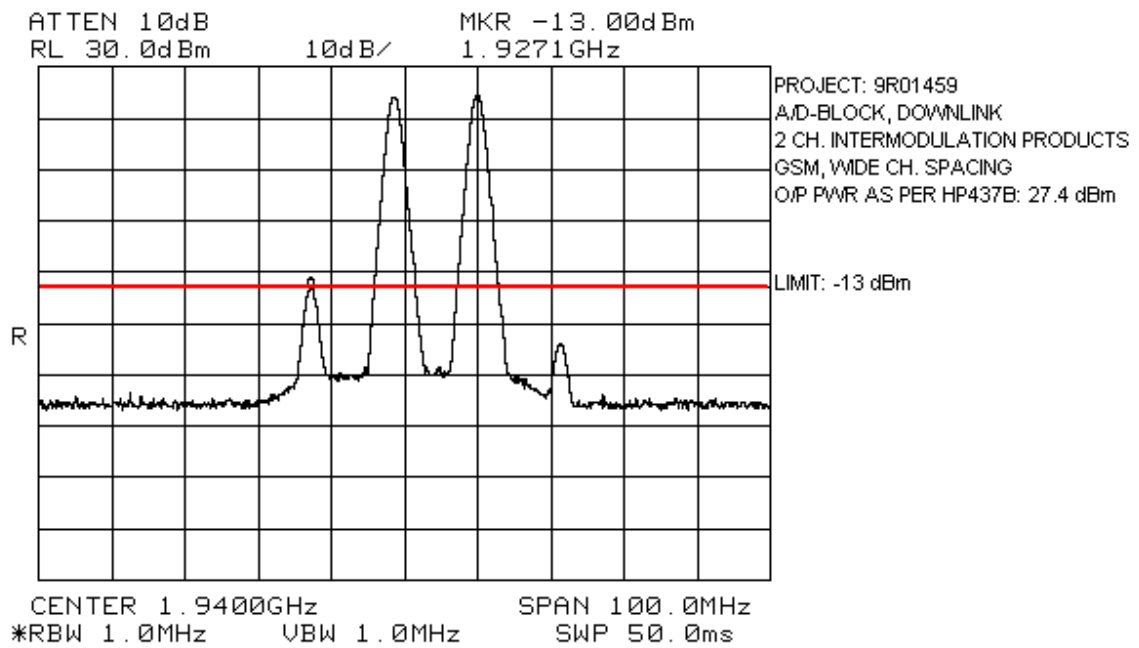
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



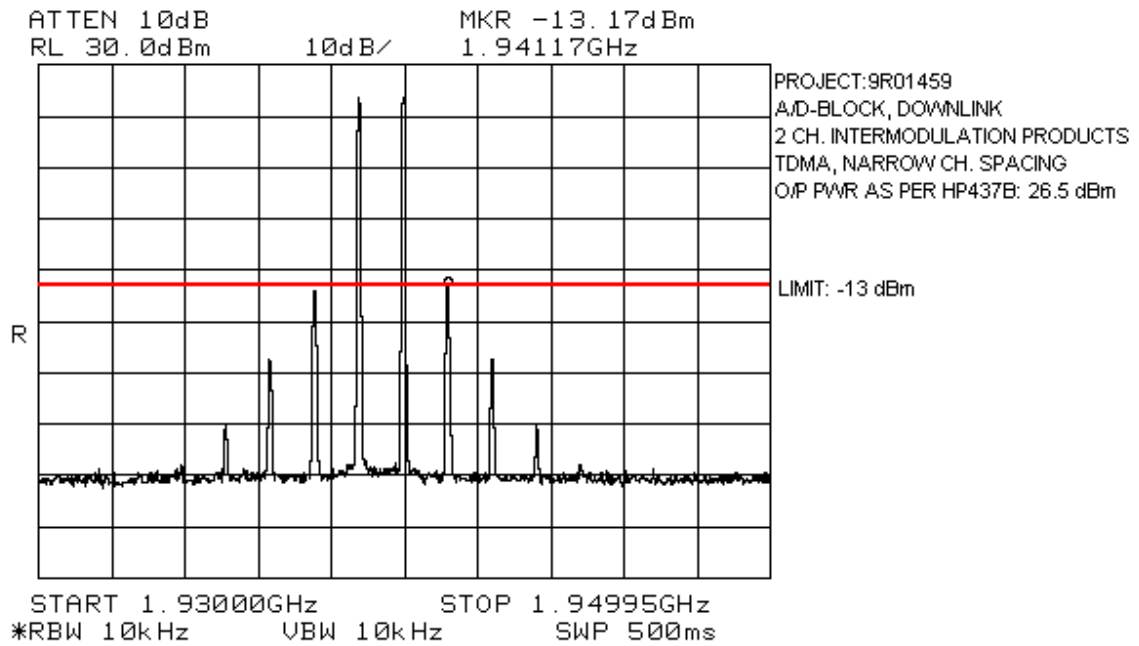
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



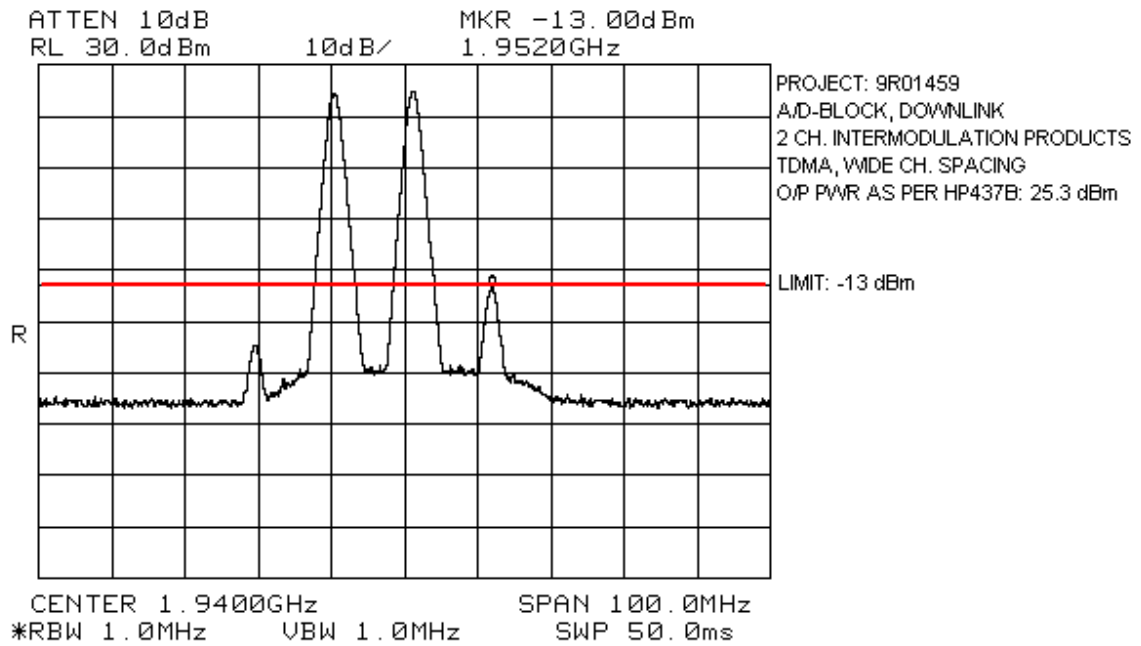
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



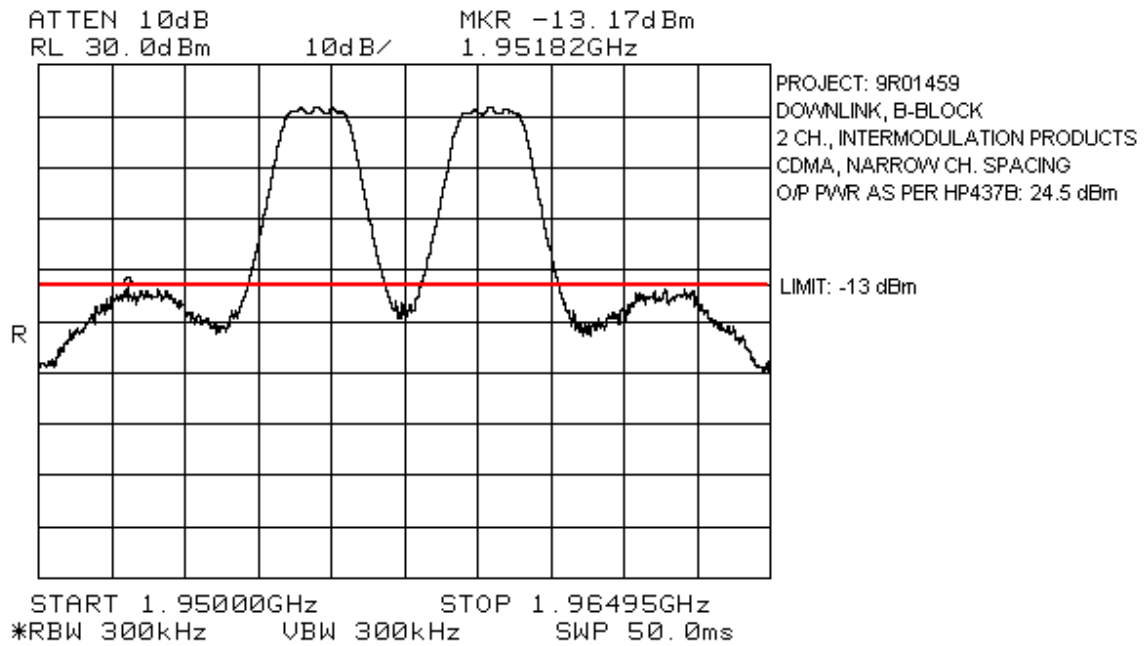
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



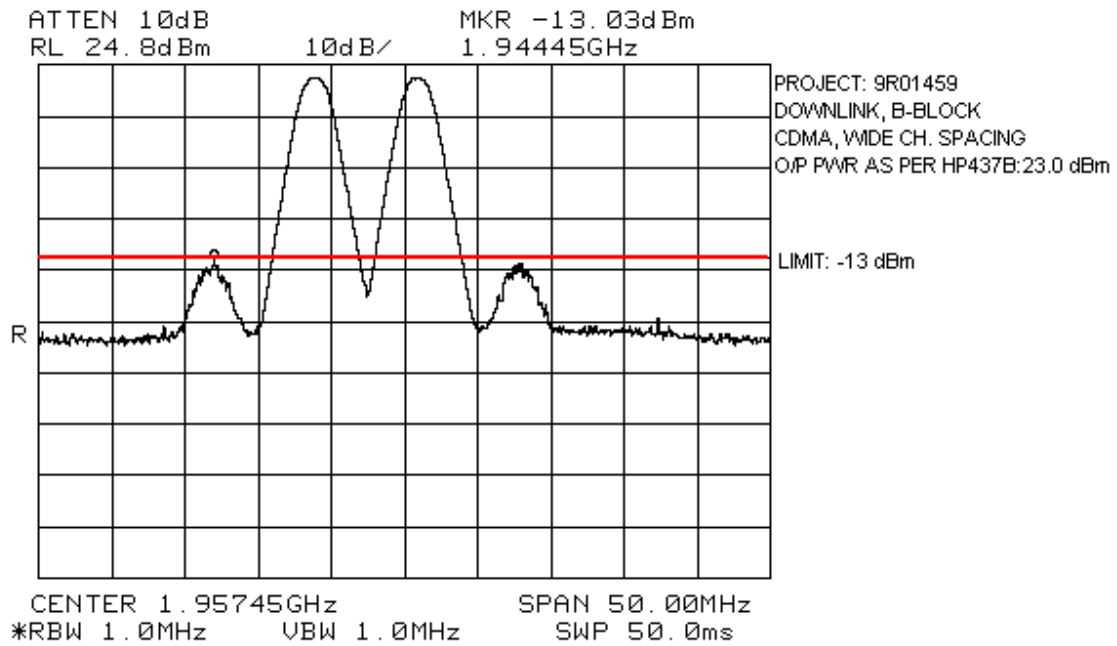
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



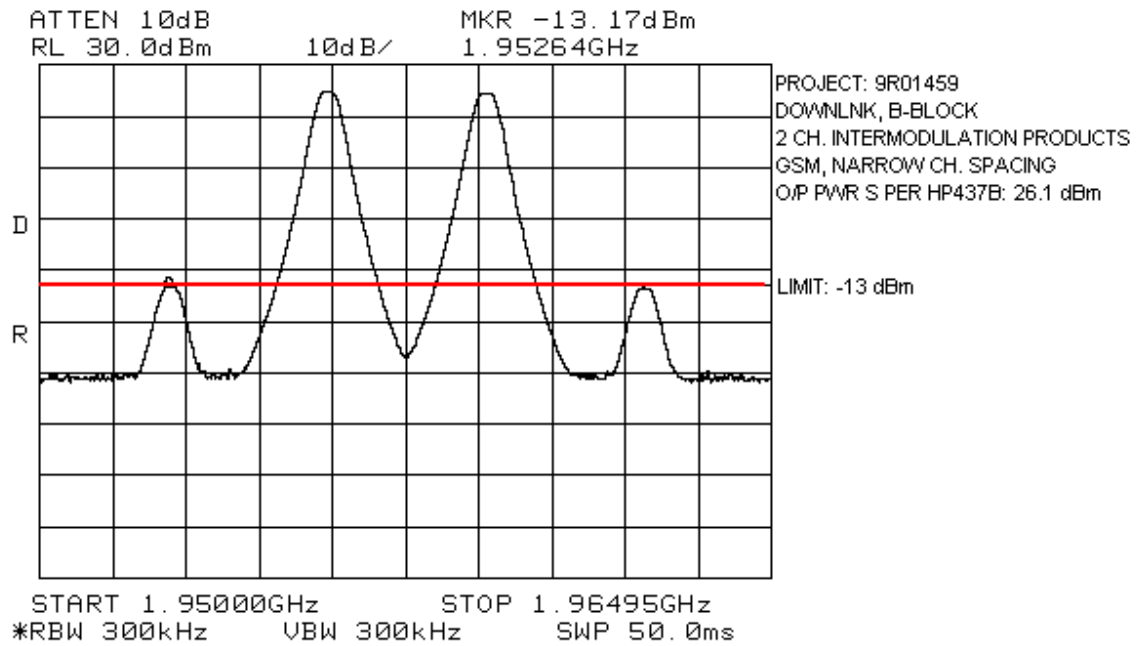
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



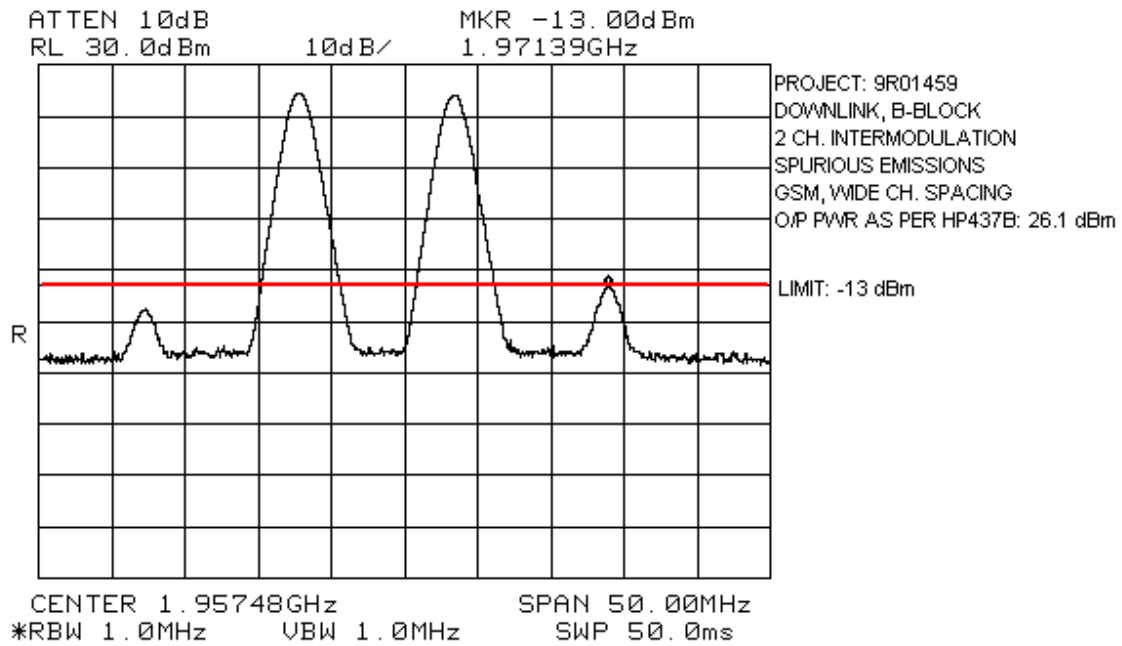
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



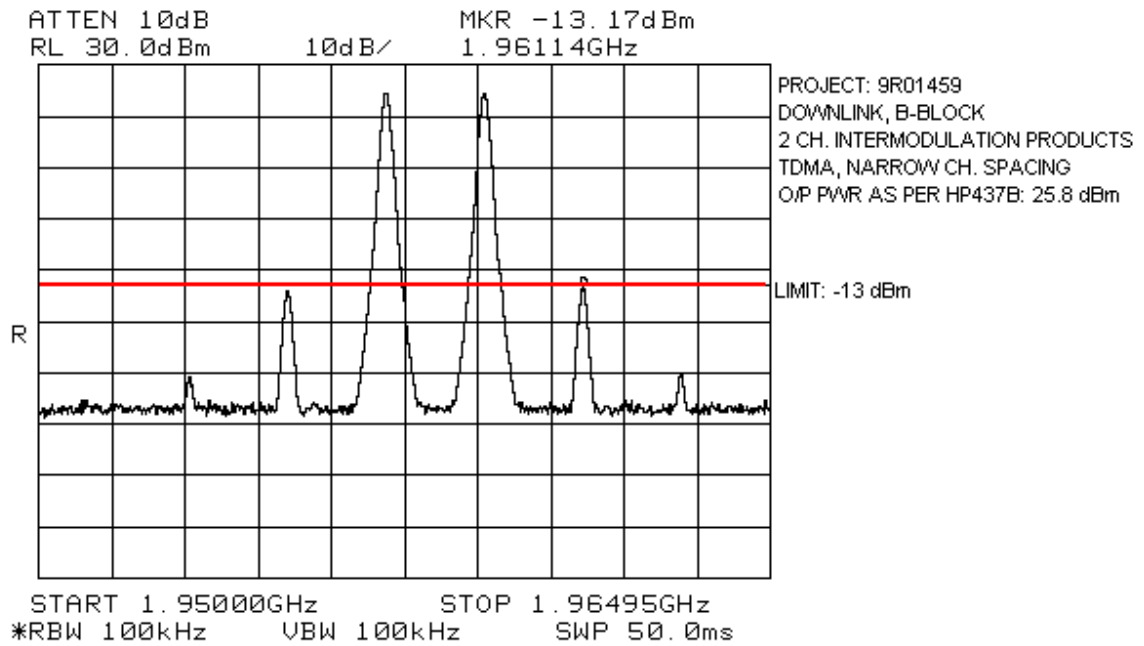
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



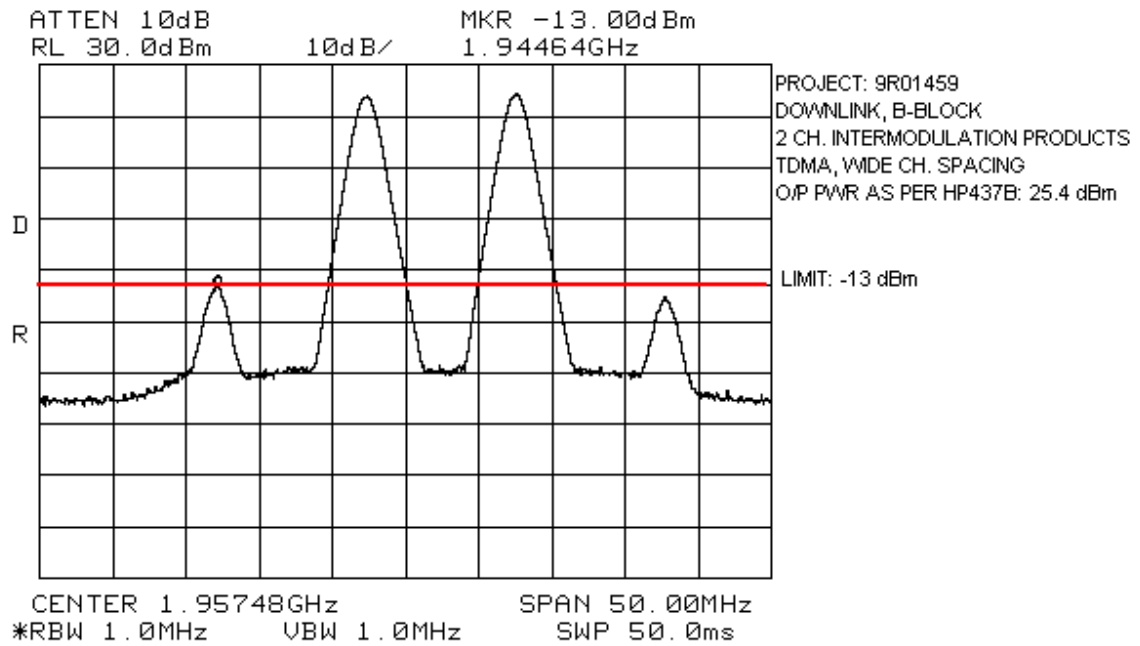
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



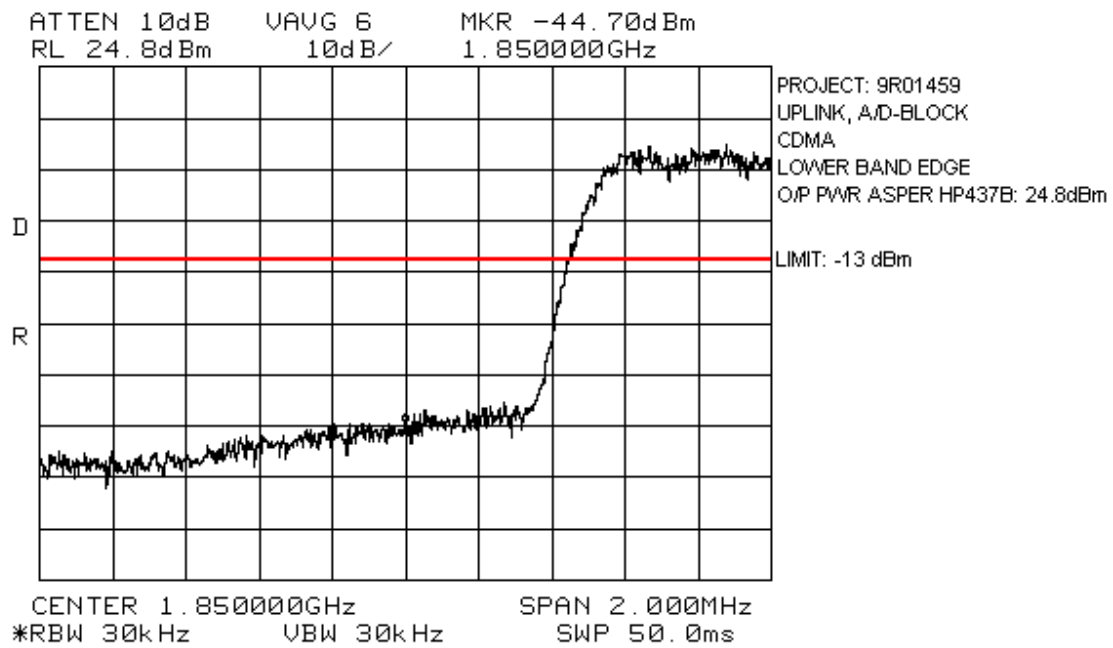
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



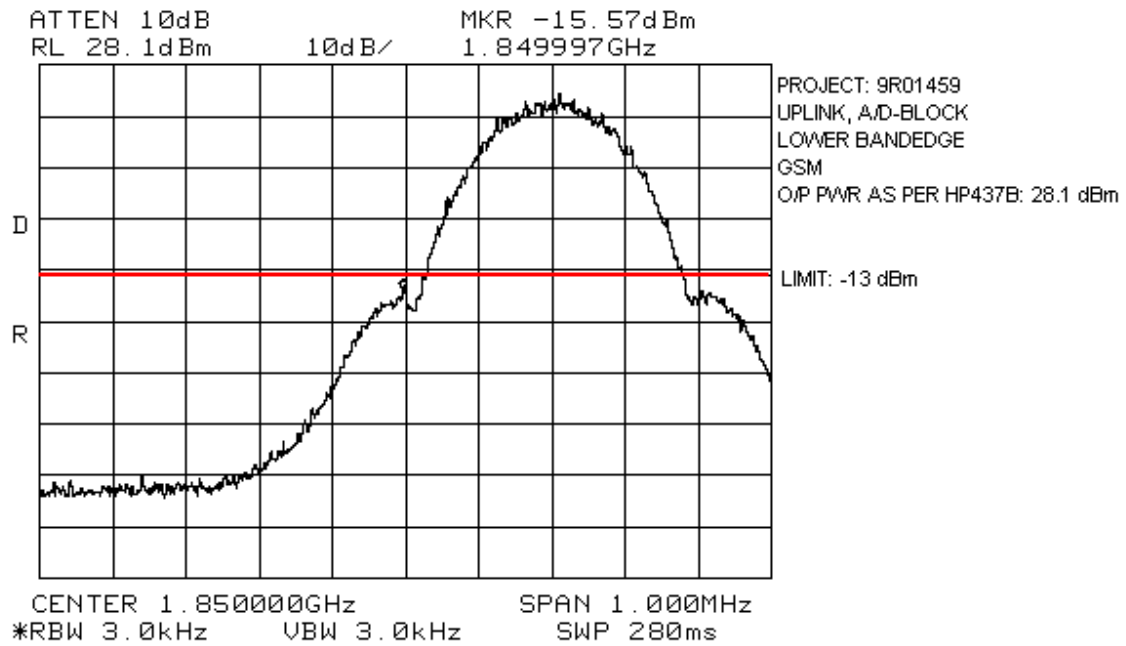
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



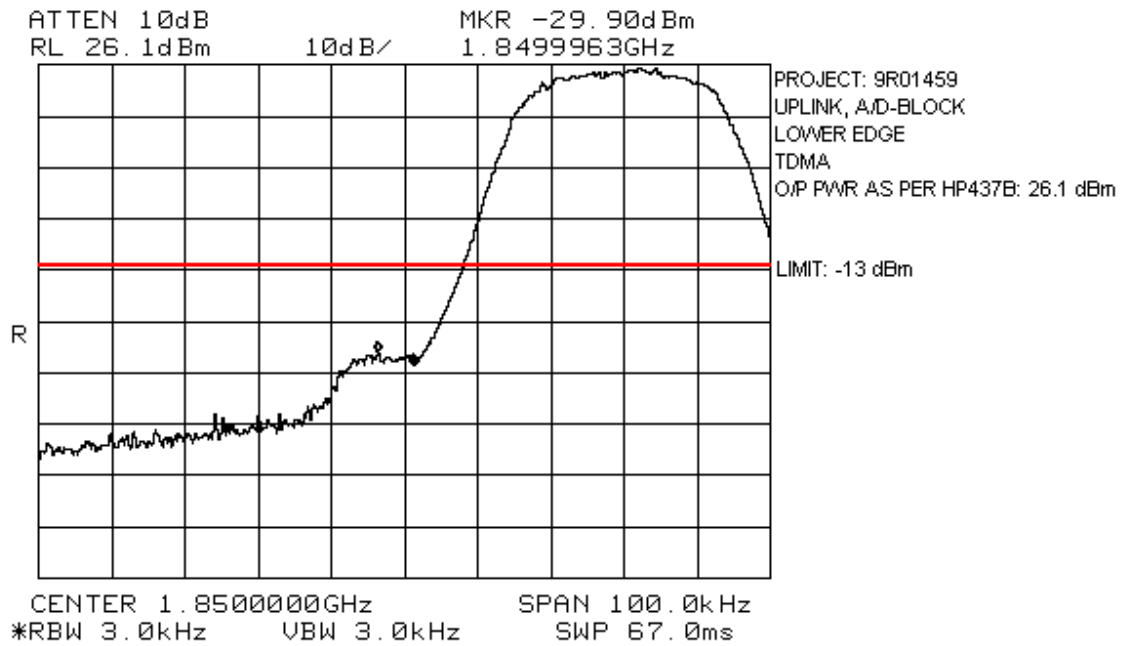
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



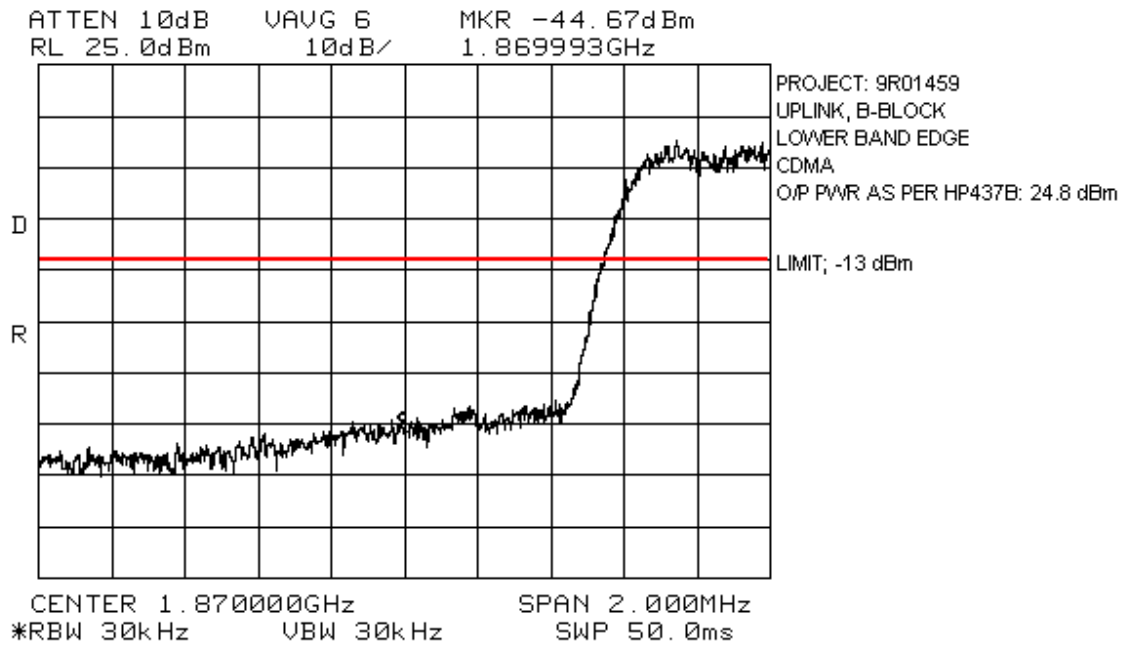
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



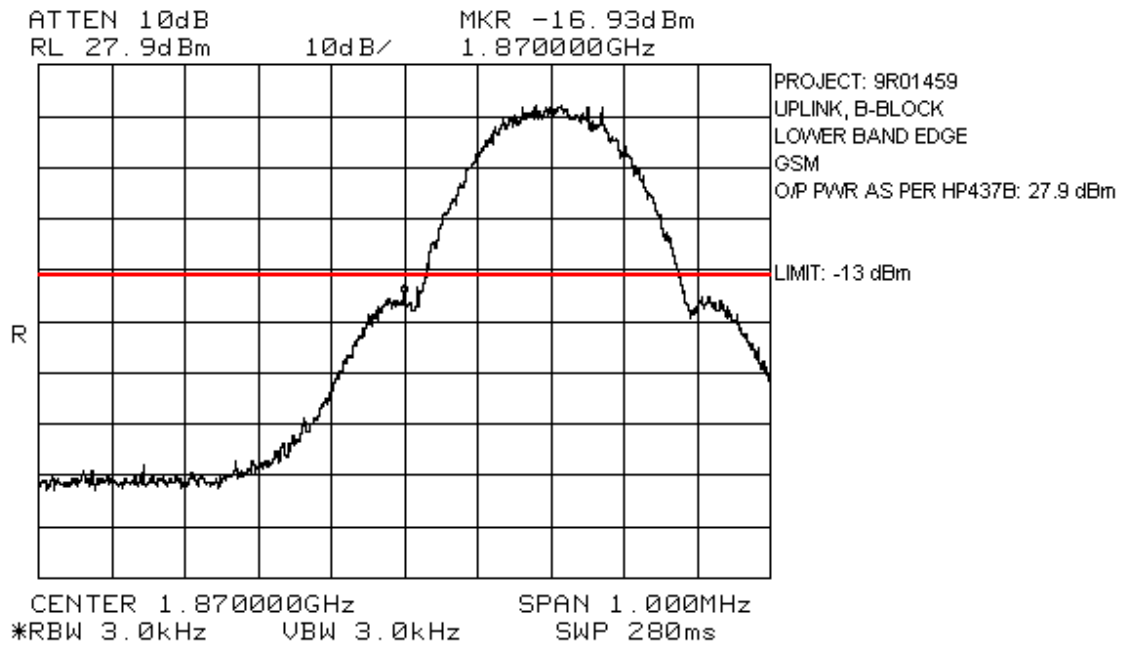
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



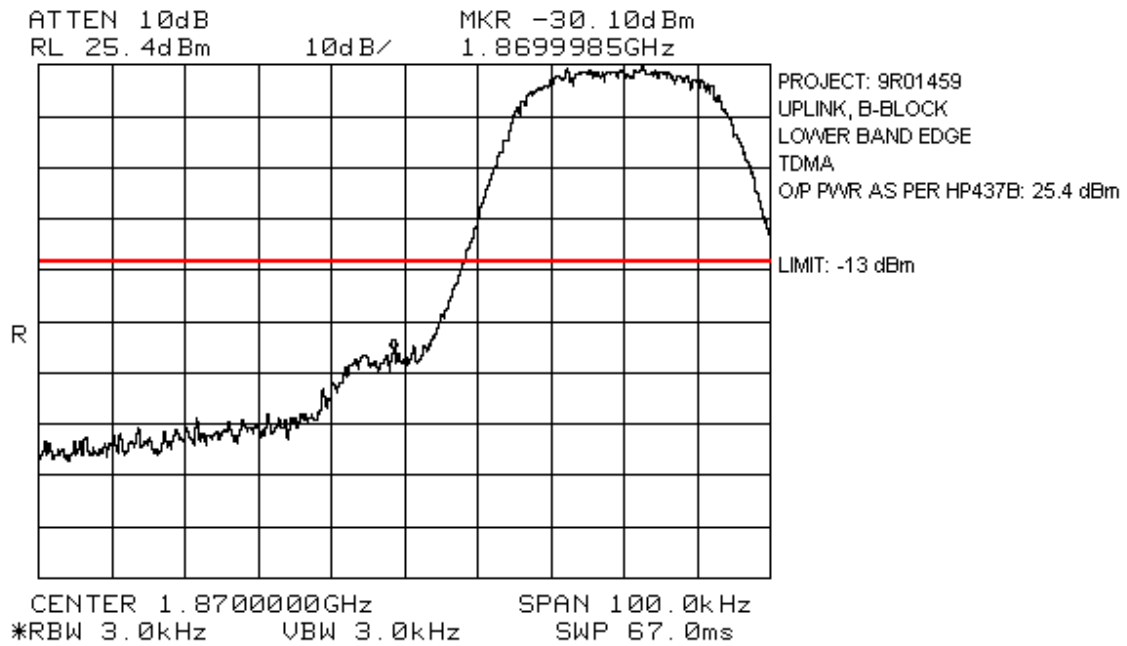
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



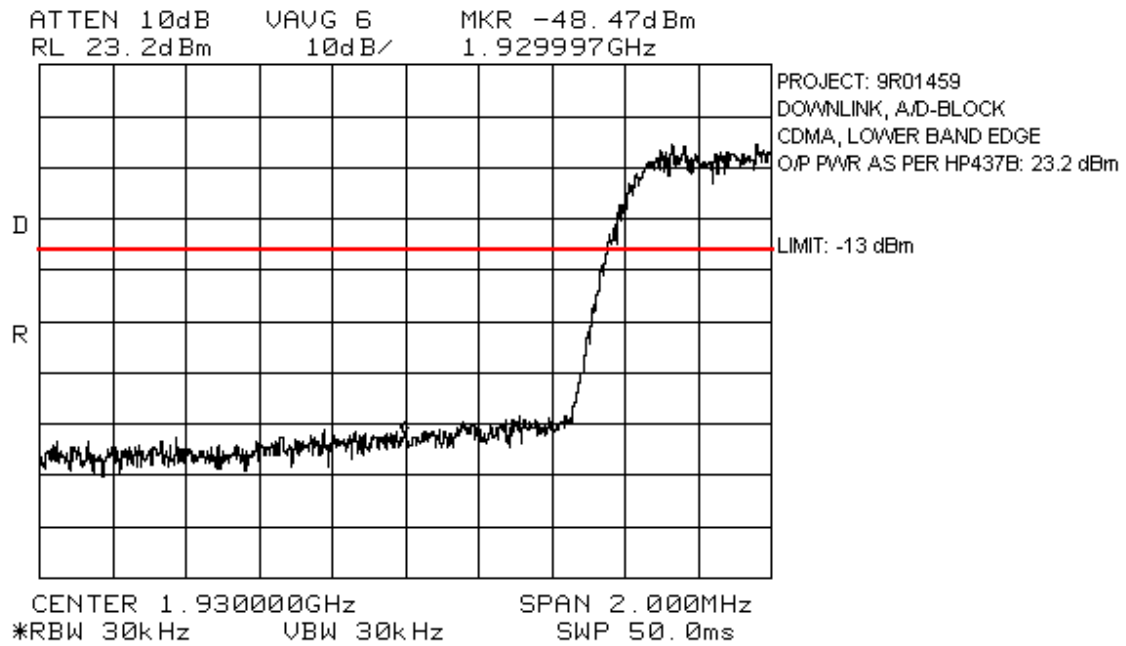
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



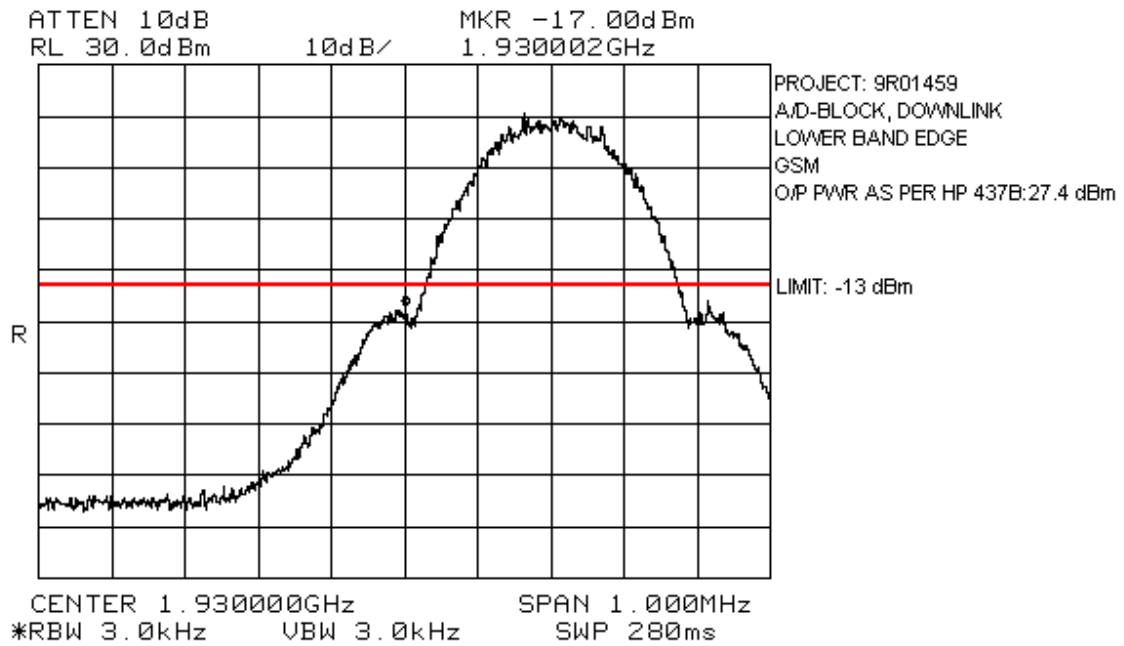
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



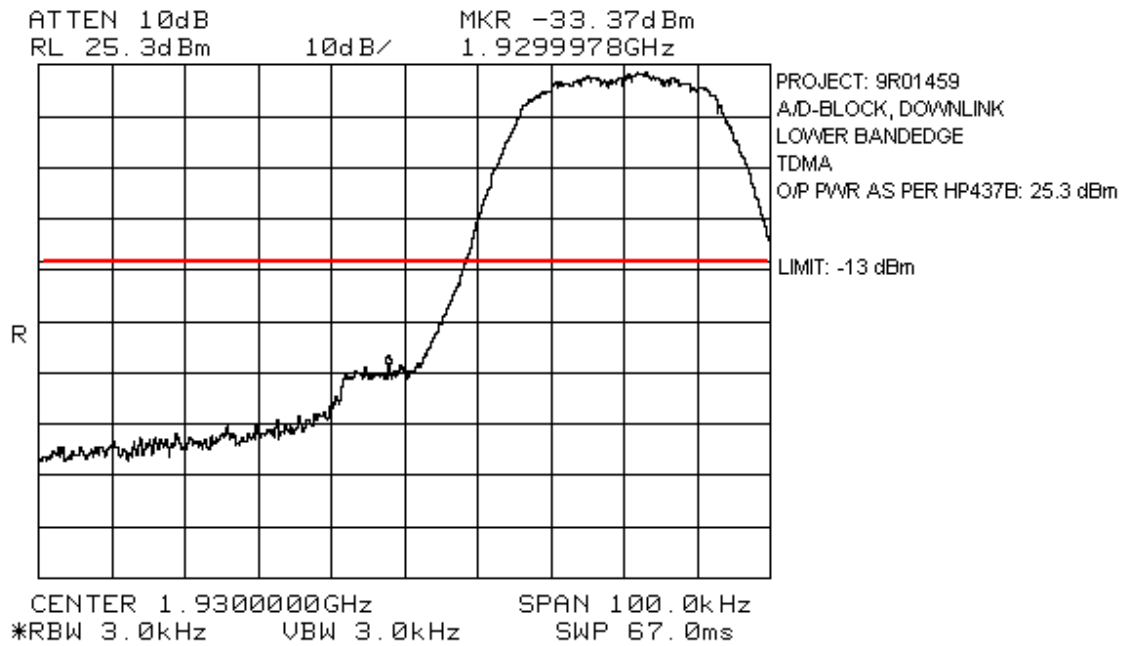
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



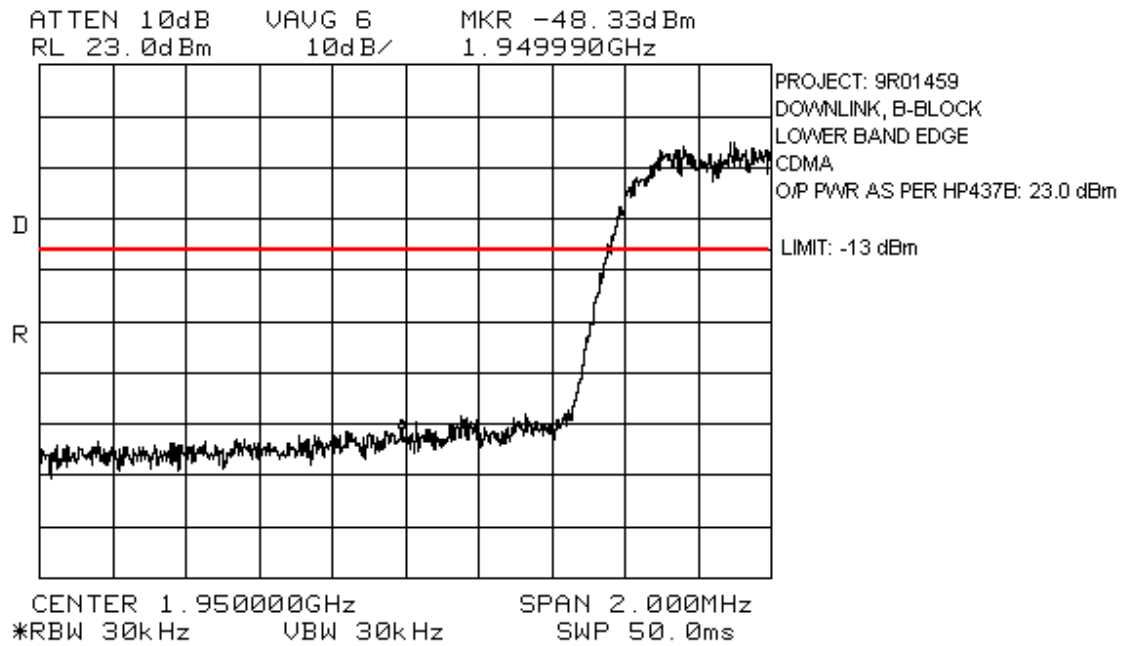
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



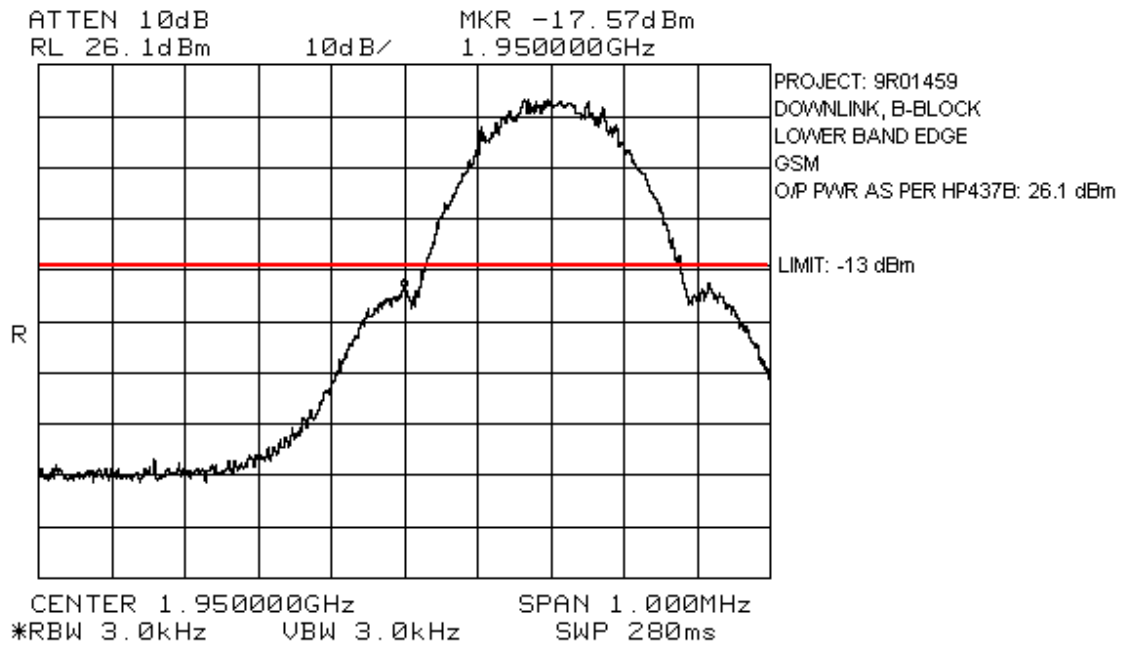
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



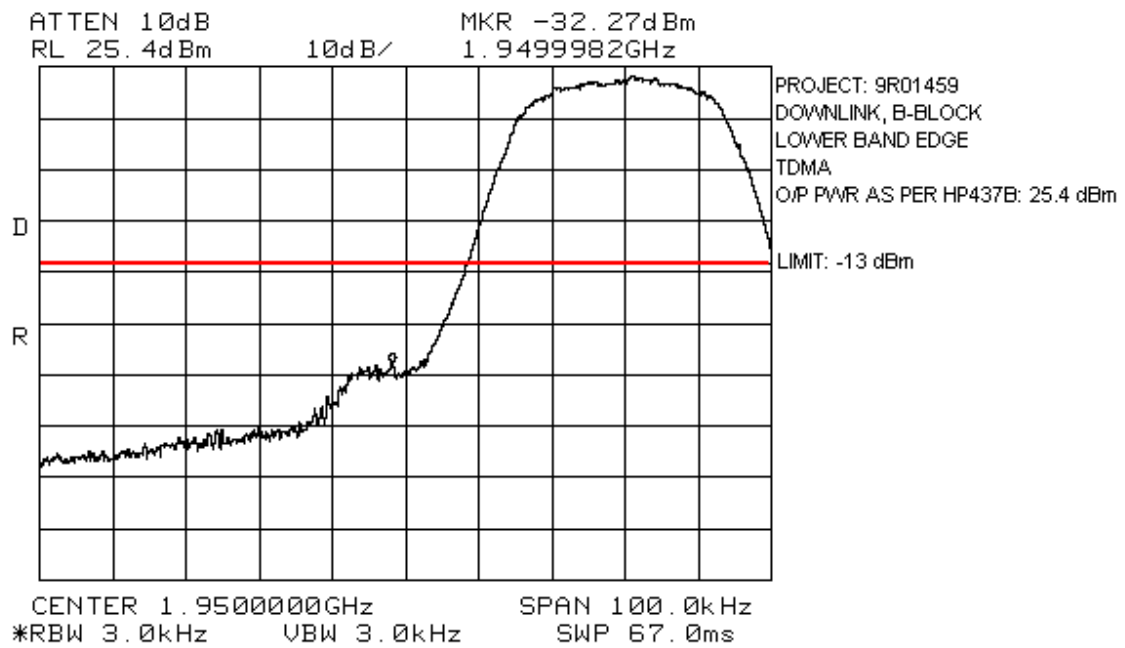
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



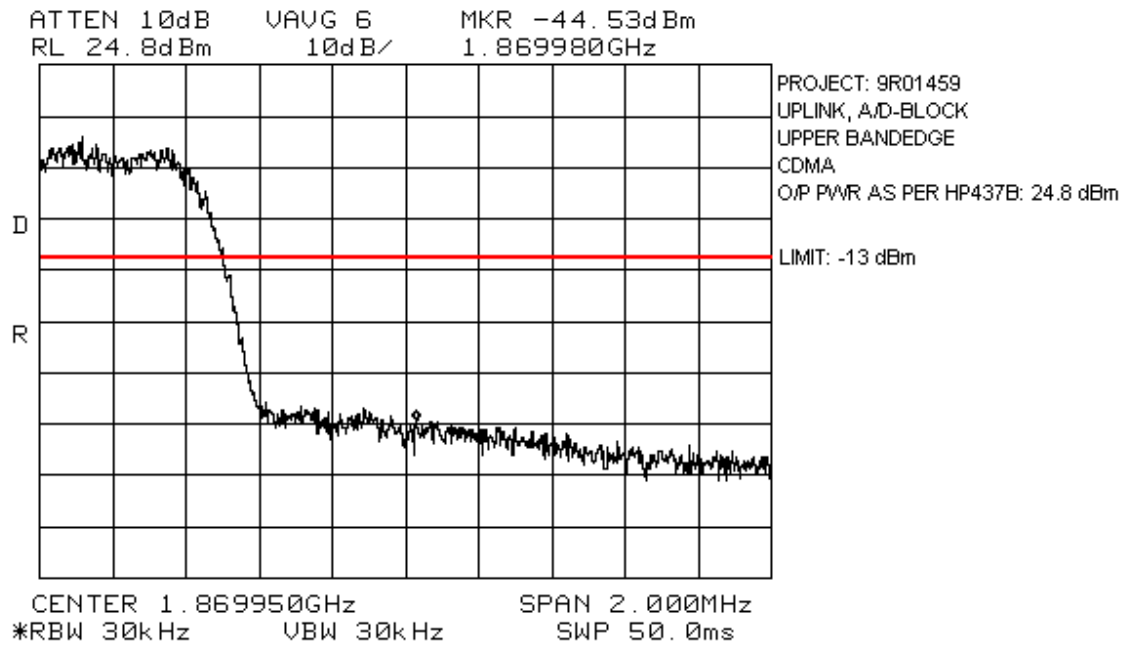
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



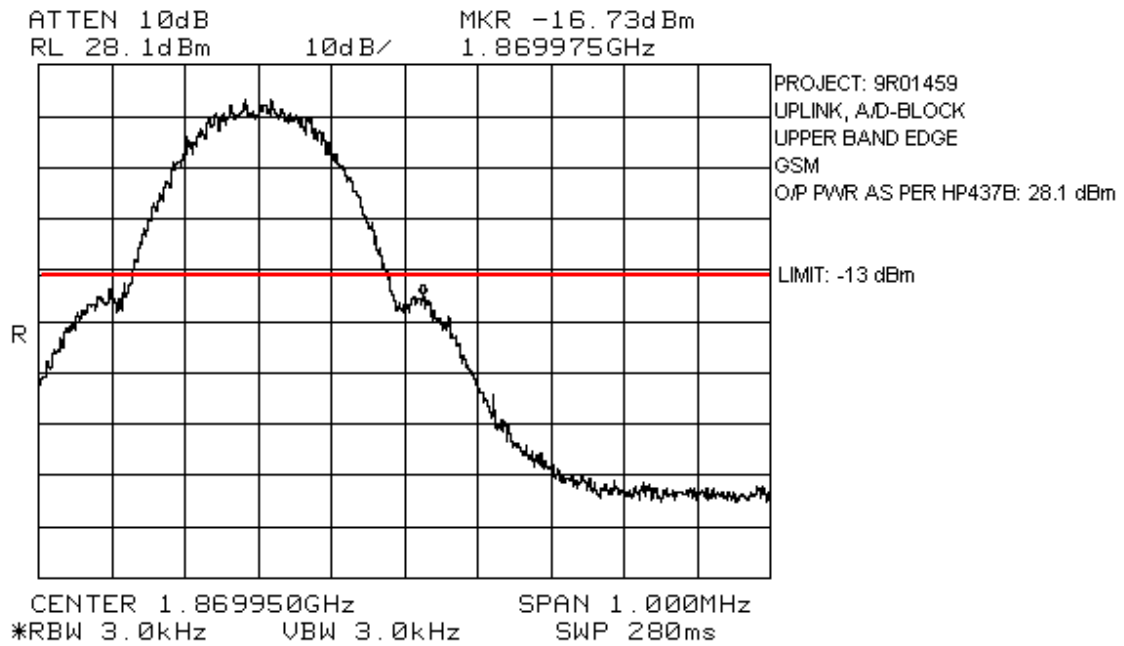
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



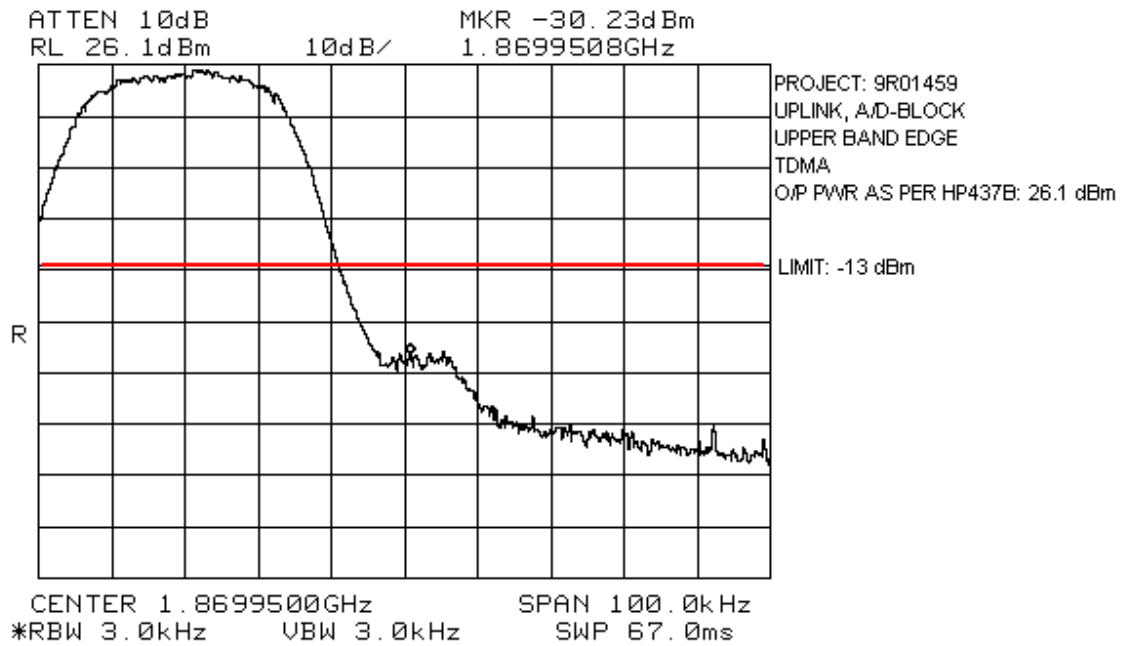
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



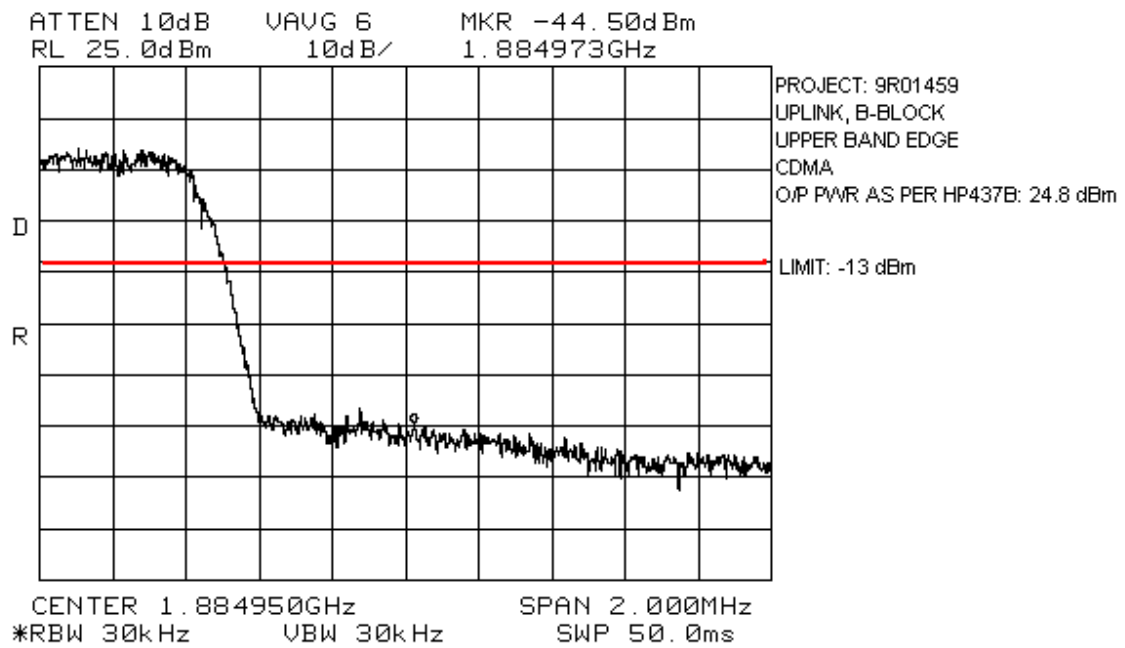
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



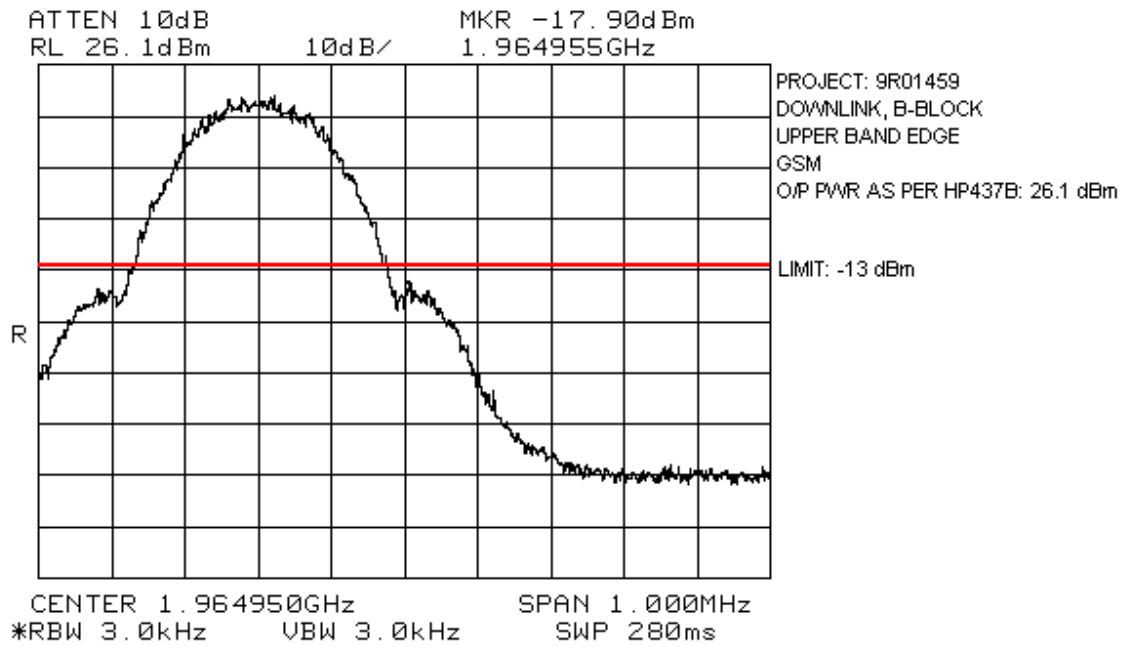
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



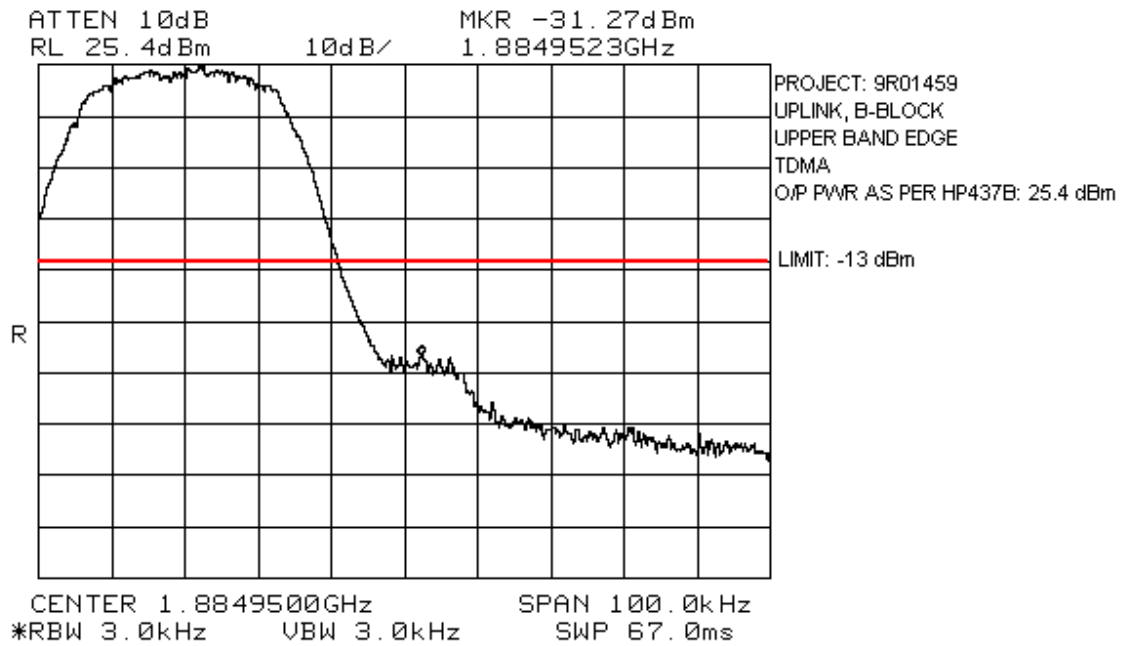
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



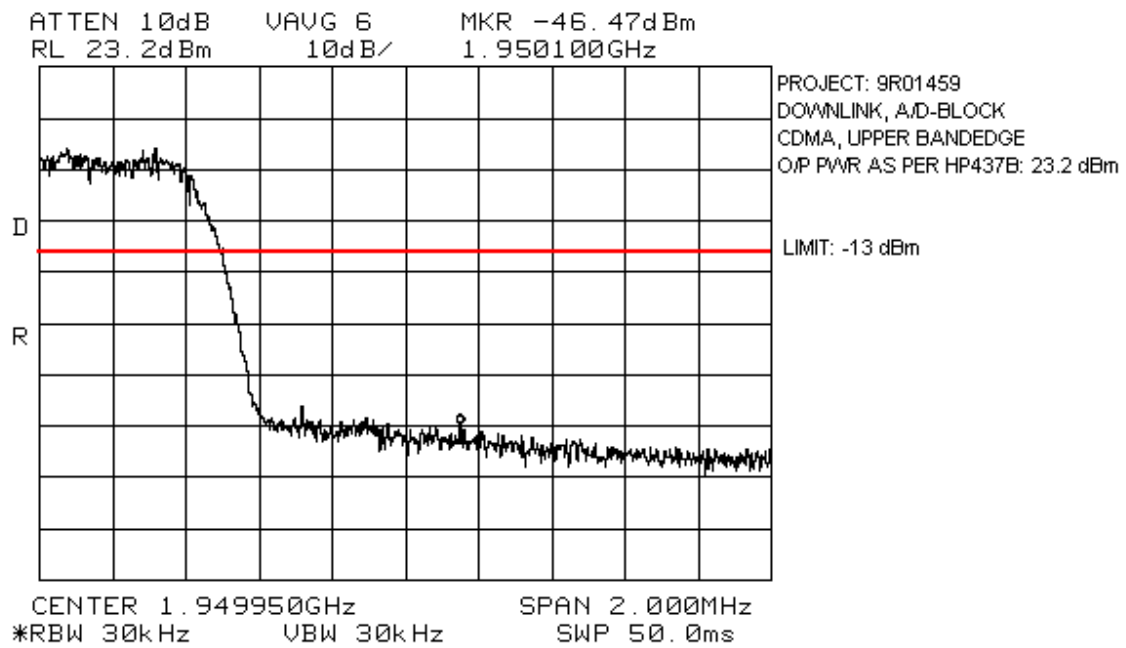
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



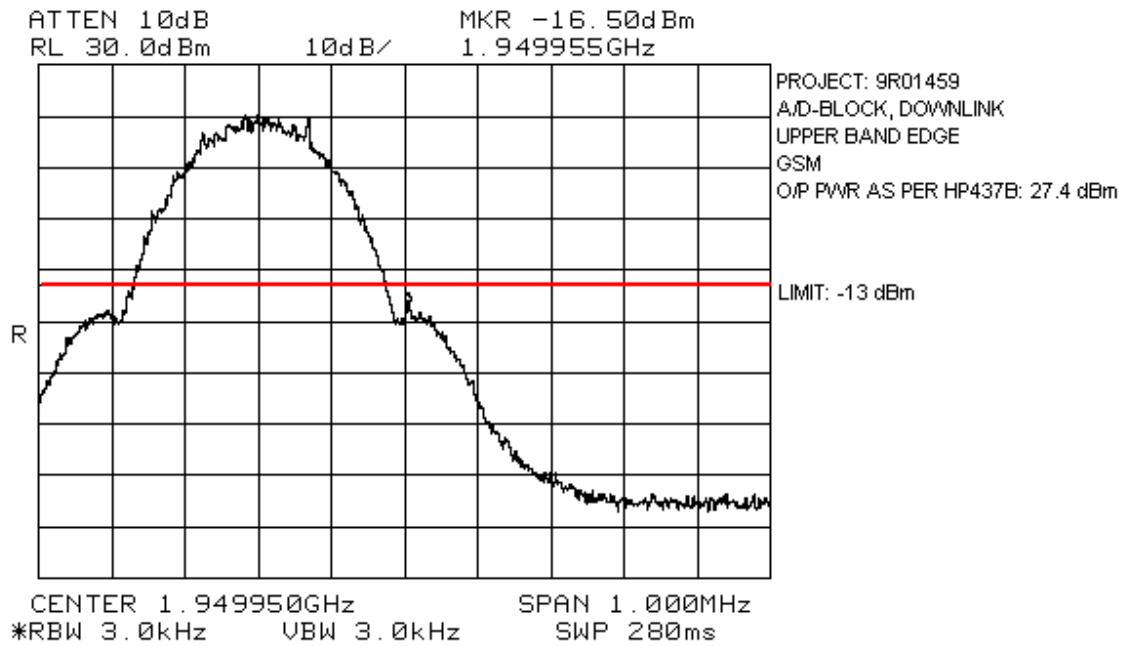
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



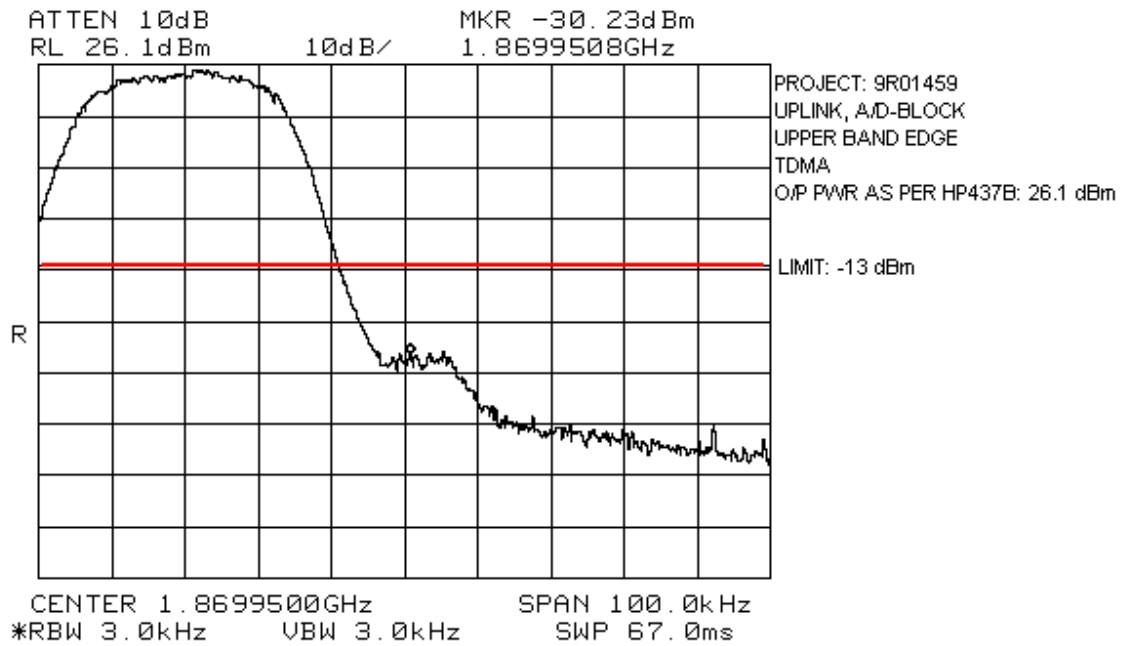
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



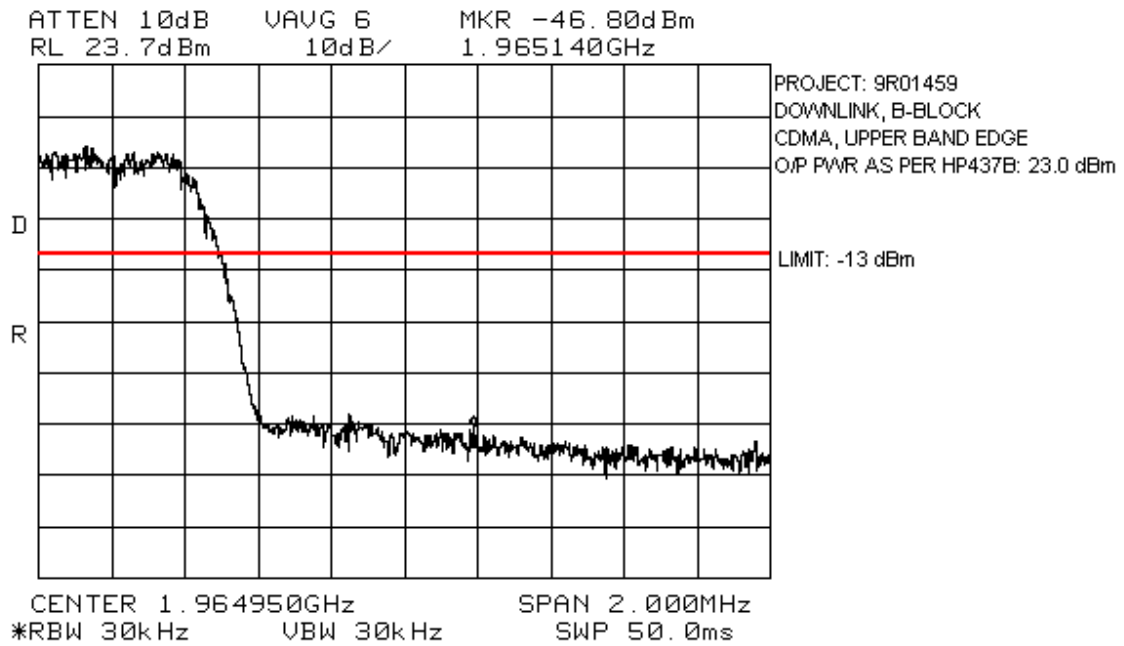
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



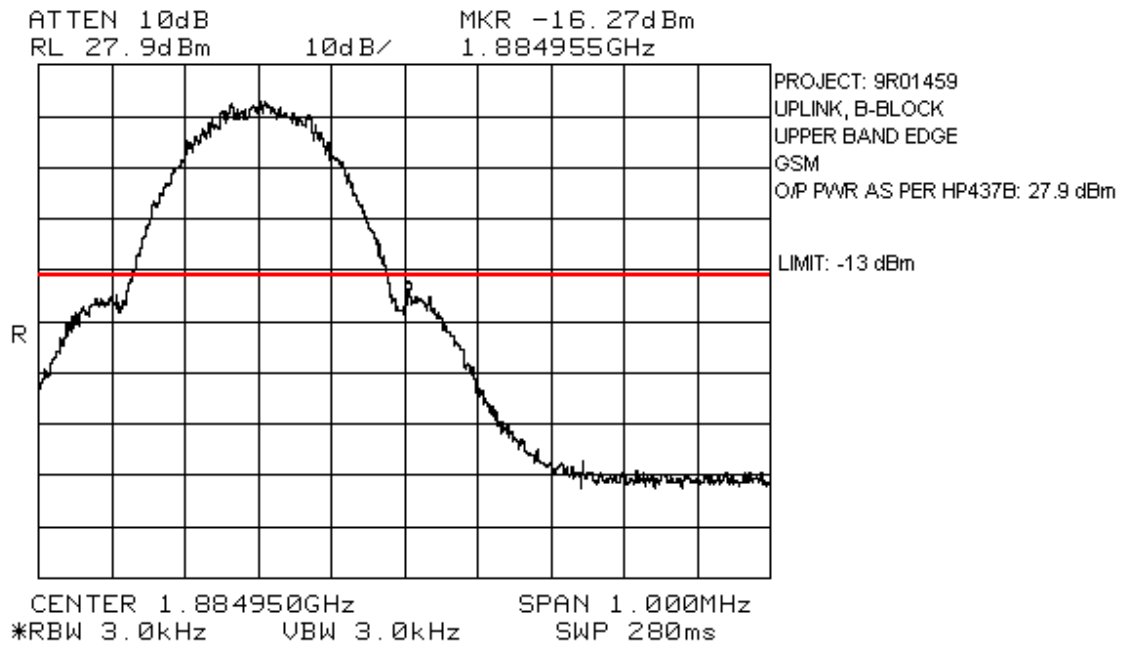
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



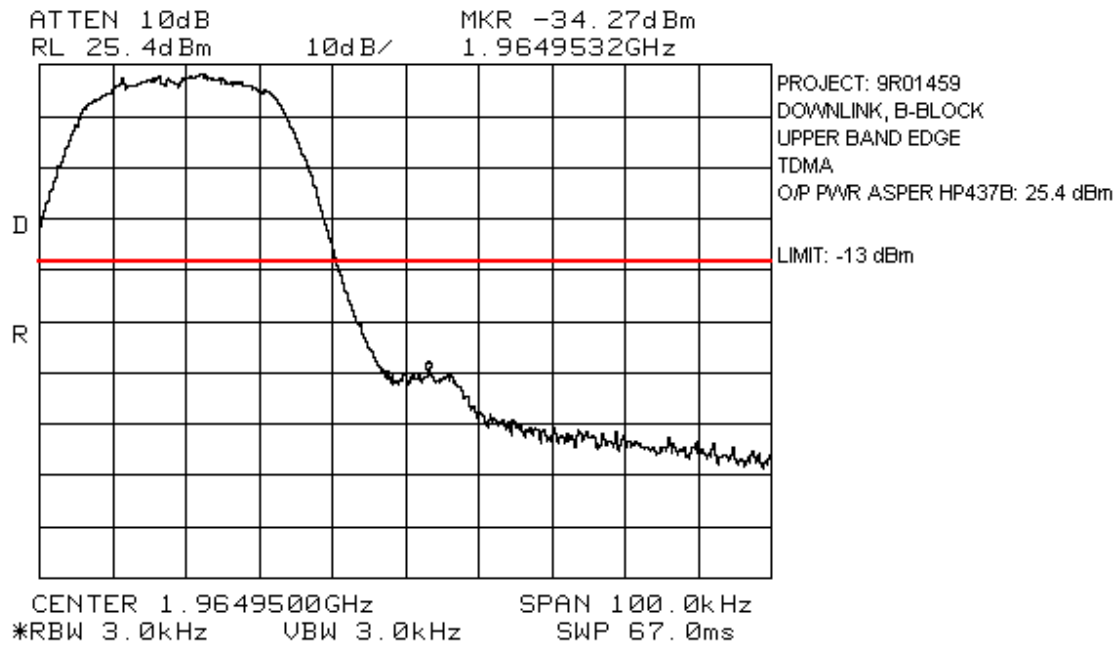
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Section 6. Field Strength of Spurious

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: April 28, 1999

Test Results:

Complies.

The maximum field strength is 32.0 dB μ V/m @ 3m @ 36.9 MHz
is 8.0 below specified limit.

Test Data:

See attached table.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Test Data - Radiated Emissions - Uplink

Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP HP8563B		RBW(1 MHz): 120 kHz/1 MHz		Detector: Q-Peak, CISPR & Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
3754.0	Hrn2	V			50.0	35.7	-42.4		43.3	82.3	39.0
3754.0	Hrn2	H			52.3	35.7	-42.4		45.6	82.3	36.7
5631.0	Hrn2	V			46.8	40.6	-42.9		44.5	82.3	37.8
5631.0	Hrn2	H			46.1	40.6	-42.9		43.8	82.3	38.5
7508.0	Hrn2	V			44.5	44.9	-41.9		47.5	82.3	34.8
7508.0	Hrn2	H			43.8	44.9	-41.9		46.8	82.3	35.5
Notes: The spectrum was search up to the 10 th harmonic of the fundamental frequency. B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole * Includes cable loss when amplifier is not used. ** Includes cable loss. () Denotes failing emission level. Note: The spectrum was searched to the 10 th harmonic. No further emissions were detected within 20 dB of the limit.											

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Test Data - Radiated Emissions - Downlink

Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP HP8563B		RBW(1 MHz): 120 kHz/1 MHz		Detector: Q-Peak, CISPR & Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
36.9	Hrn2	V			18.5	13.5			32.0	40.0	8.0
36.9	Hrn2	H			8.4	13.5			21.9	40.0	18.1
43.5	Hrn2	V			15.2	12.5			27.7	40.0	12.3
43.5	Hrn2	H			8.6	12.5			21.1	40.0	18.9
3914.0	Hrn2	V			53.5	36.0	-42.6		46.9	82.3	35.4
3914.0	Hrn2	H			44.7	36.0	-42.6		38.1	82.3	44.2
5871.0	Hrn2	V			45.5	41.8	-41.6		45.7	82.3	36.6
5871.0	Hrn2	H			44.8	41.8	-41.6		45.0	82.3	37.3
7828.0	Hrn2	V			41.0	45.6	-40.9		45.7	82.3	36.6
7828.0	Hrn2	H			41.3	45.6	-40.9		46.0	82.3	36.3
9785.0	Hrn2	V			35.8	51.6	-44.4		43.0	82.3	39.3
9785.0	Hrn2	H			36.0	51.6	-44.4		43.2	82.3	39.1

Notes:

The spectrum was search up to the 10th harmonic of the fundamental frequency.

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole

* Includes cable loss when amplifier is not used.

** Includes cable loss.

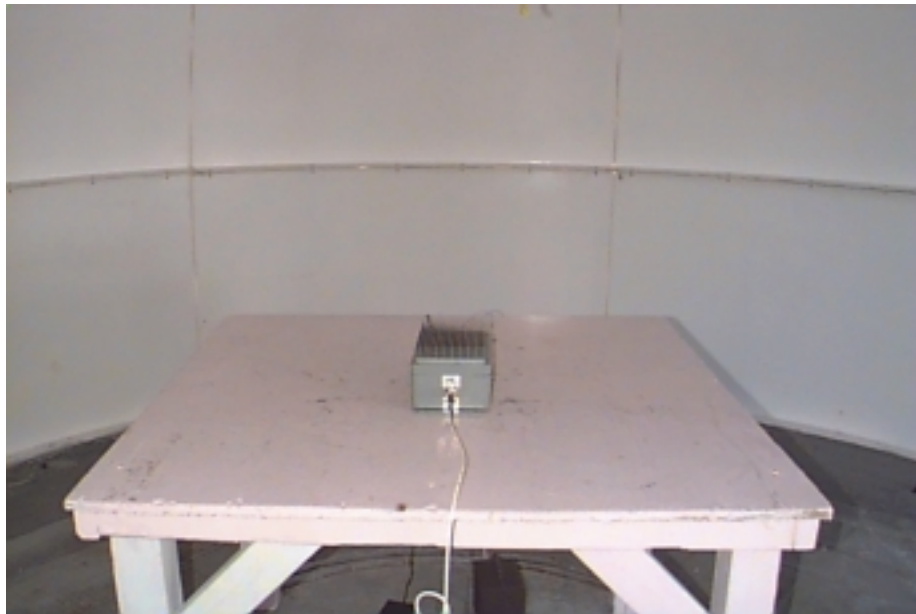
() Denotes failing emission level.

Note: The spectrum was searched to the 10th harmonic. No further emissions were detected within 20 dB of the limit.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Photographs of Test Setup

End View



Side View



KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Pre-Scan Data

INSERT PRESCAN GRAPHS

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Prescan Data: Uplink

Prescan Data

Project Number : 9r01459
Project Filename : 9R1459U.LST
Date : April 27, 1999
Start Frequency : 30 MHz
Stop Frequency : 1000 MHz
Display Line Value: 24 (30-300 MHz), 16 (300-1000MHz) dBuV

Vertical Prescan

Top Emissions below 300 MHz from the vertical prescan list:

Full Emission List below 300 MHz:

Top Emissions above 300 MHz from the vertical prescan list:

Full Emission List above 300 MHz:

Horizontal Prescan

Top Emissions below 300 MHz from the horizontal prescan list:

Full Emission List below 300 MHz:

Top Emissions above 300 MHz from the horizontal prescan list:

Full Emission List above 300 MHz:

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

KTL Ottawa

FCC PART 24, SUBPART E
BROADBAND PCS REPEATERS
PROJECT NO.: 9R01459

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Prescan Data: Downlink

Prescan Data

Project Number : 9r01459
Project Filename : 9R1459D.LST
Date : April 27, 1999
Start Frequency : 30 MHz
Stop Frequency : 1000 MHz
Display Line Value: 24 (30-300 MHz), 16 (300-1000MHz) dBuV

Vertical Prescan

Top Emissions below 300 MHz from the vertical prescan list:

Full Emission List below 300 MHz:

Top Emissions above 300 MHz from the vertical prescan list:

Full Emission List above 300 MHz:

Horizontal Prescan

Top Emissions below 300 MHz from the horizontal prescan list:

Full Emission List below 300 MHz:

Top Emissions above 300 MHz from the horizontal prescan list:

Full Emission List above 300 MHz:

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

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

NOT APPLICABLE

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Section 8. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	3585A	846057	Oct. 22/98	Oct. 22/99	
1 Year	Spectrum Analyzer-1	Hewlett Packard	8566B	2311A02238	Oct. 22/98	Oct. 22/99	
1 Year	Spectrum Analyzer Display-1	Hewlett Packard	8566B	2314A04759	Oct. 22/98	Oct. 22/99	
1 Year	Attenuator	Narda	768-20	9507	July 24/98	July 24/99	
1 Year	Attenuator	Narda	765-20	9510	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	Power Sensor	Rohde & Schwarz	URV5-Z5	FA000419	July 23/98	July 23/99	
1 Year	LISN	Rohde & Schwarz	ESH2-Z5	890485/017	July 23/98	July 23/99	
1 Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 31/98	Mar. 31/99	
	Biconilog Antenna	EMCO	3143	1038	NCR	NCR	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
	50 Ω Termination	Wilton	26N50	605248	N/A	N/A	
	50 ohm Combiner Pad	Mini Circuits	ZA3PD-4	9740	July 23/98	July 23/99	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	
1 Year	Signal Generator	Rohde & Schwarz	SM1Q03	1084-8004-03	July 23/98	July 23/99	
1 Year	Plotter	Hewlett Packard	7550A	FA001129	NCR	NCR	
3 Year	RF Generator	Rohde & Schwarz	SME3	DE14439	June 29/96	June 29/99	
2 Year	Spectrum Analyzer	Hewlett Packard	8563E	862205	Jan. 22/98	Jan. 22/00	

NA: Not Applicable
NCR: No Cal Required

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

ANNEX A
TEST METHODOLOGIES

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

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

Minimum Standard:

Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 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: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
---	-------------------------

Minimum Standard:

Para. No. 24.238(b). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB.

Method Of Measurement:

CDMA

Spectrum analyzer settings:

RBW: 30 kHz

VBW: \geq RBW

Span: 5 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

GSM

RBW: 3 kHz

VBW: \geq RBW

Span: 2 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

NADC

RBW: 1 kHz

VBW: \geq RBW

Span: 1 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

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

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: Disabled

NADC

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

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

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

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)

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

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

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

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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

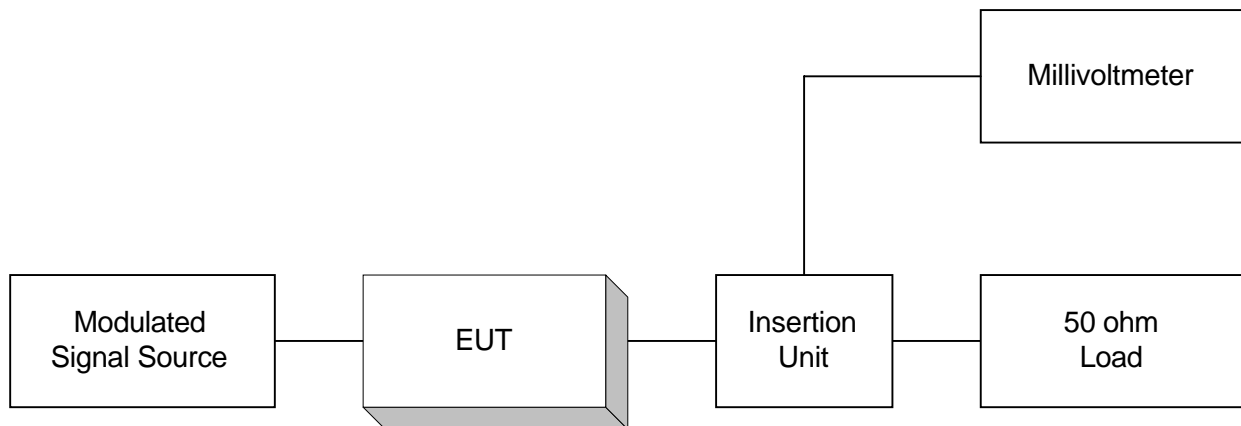
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

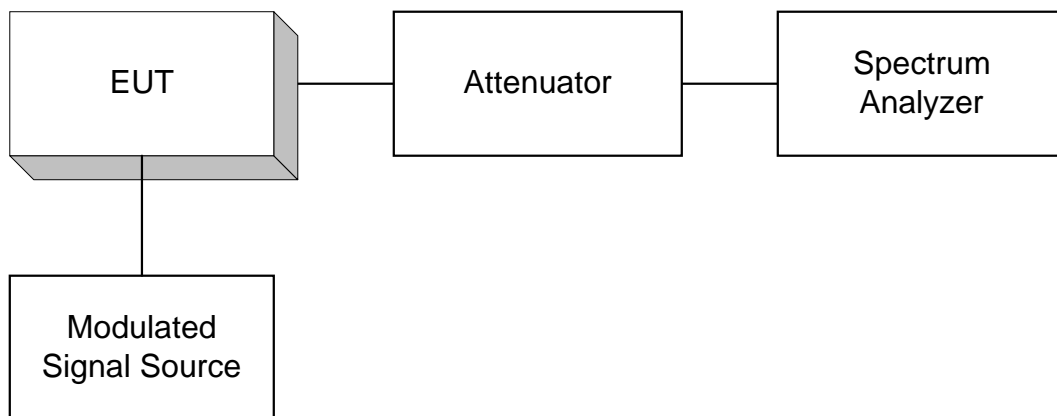
ANNEX B
TEST DIAGRAMS

EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

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

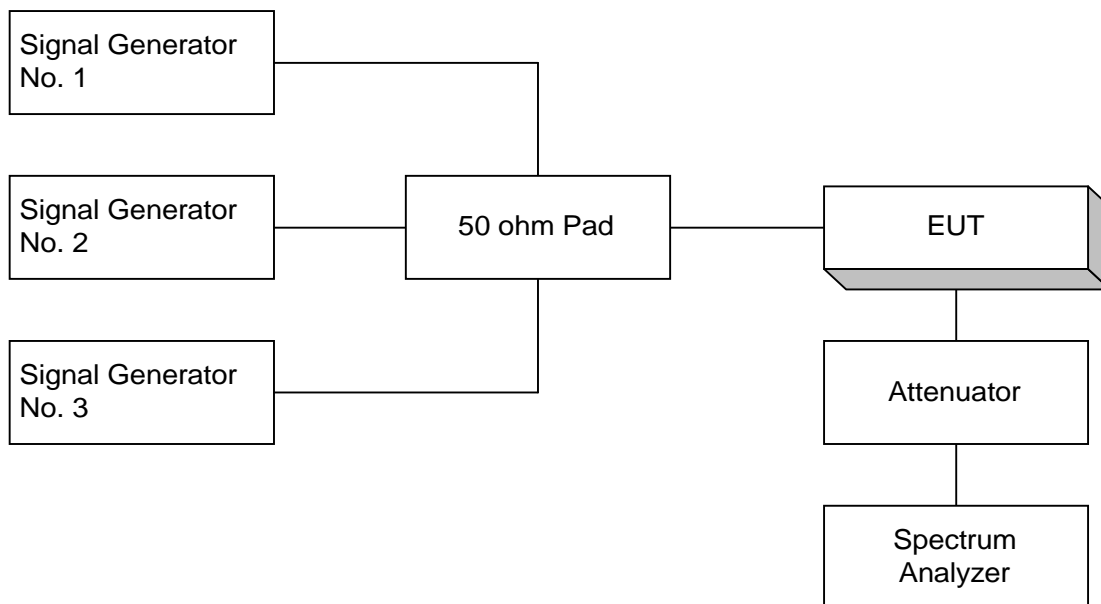
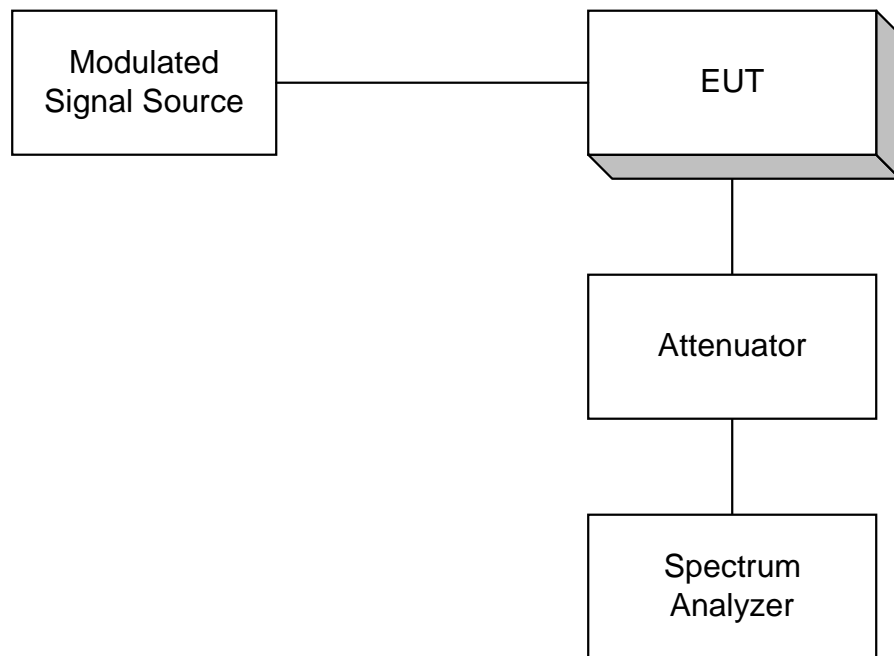


Para. No. 2.989 - Occupied Bandwidth



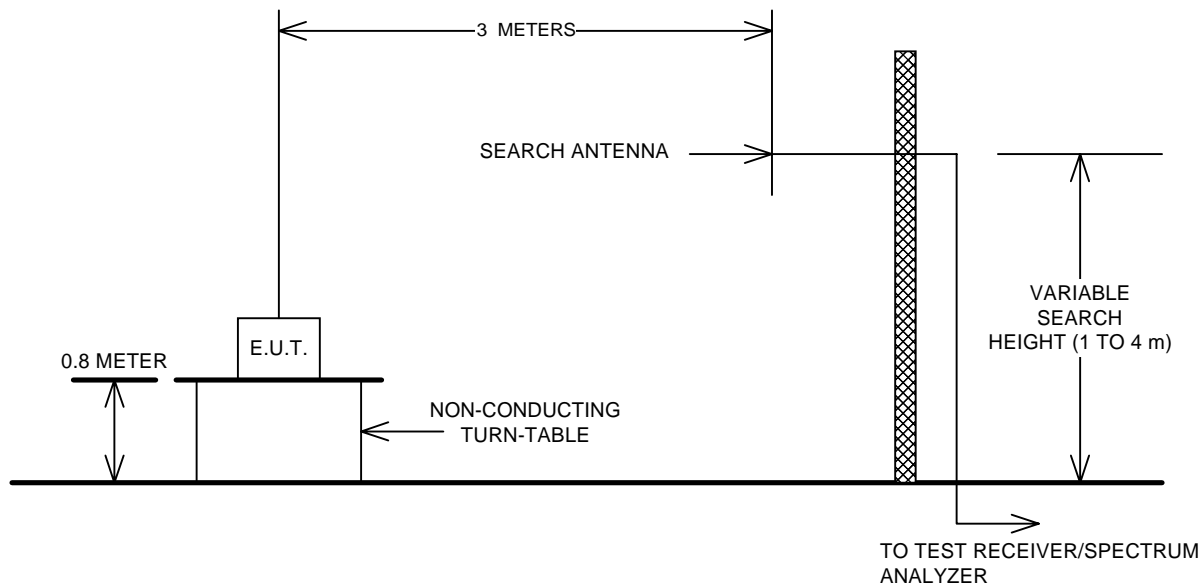
EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Para. No. 2.991 Spurious Emissions at Antenna Terminals



EQUIPMENT: PCS Bi-Directional Amplifier
FCC ID: NT3BDA-1819-60

Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

