



2360

Radio Test Report

Cambridge Communication Systems Ltd

Metnet 1200

G28US000000

47 CFR Part 101C Effective Date 1st October 2016

↳ 47 CFR Part 2J Effective Date 1st October 2016

TNB: Licensed Non-Broadcast Station Transmitter

Test Date: 4th September 2017 to 18th September 2017

Report Number: 09-9926-1-17 Issue 02

Supersedes report: 09-9926-1-17 Issue 01

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Certificate of Test 9926-1

The equipment noted below has been fully tested by R.N. Electronics Limited and, where appropriate, conforms to the relevant subpart of 47CFR part 101C. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

Equipment:	Metnet 1200
Model Number:	G28US000000
Unique Serial Number:	004274
Applicant:	Cambridge Communication Systems Ltd Victory House, Chivers Way, Histon Cambridge, CB24 9ZR
Proposed FCC ID:	2ACV4-M1200-003

Full measurement results are
detailed in Report Number:

09-9926-1-17 Issue 02

Test Standards:

47 CFR Part 101C Effective Date 1st October 2016
↳ 47 CFR part 2J Effective Date 1st October 2016
TNB: Licensed Non-Broadcast Station Transmitter

NOTE:

Certain tests were not performed based upon manufacturer's declarations. Certain other requirements are subject to manufacturer declaration only and have not been tested/verified. For details refer to section 3 of this report. EUT also operates in frequency bands covered under FCC 47 CFR part 30; please see RN report 09-9926-2-17 for tests pertaining to these bands of operation.

DEVIATIONS:

No deviations were applied.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Federal Regulations, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Date Of Test: 4th September 2017 to 18th September 2017

Test Engineer:



2360

Approved By:
Radio Approvals Manager

Customer Representative:

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2 Equipment under test (EUT)

2.1 Equipment specification

Applicant	Cambridge Communication Systems Ltd Victory House Chivers Way Histon Cambridge CB24 9ZR	
Manufacturer of EUT	Cambridge Communication Systems Ltd	
Full Name of EUT	Metnet 1200	
Model Number of EUT	G28US000000	
Serial Number of EUT	004274	
Date Received	1st September 2017	
Date of Test:	4th September 2017 to 18th September 2017	
Purpose of Test	To demonstrate design compliance to the relevant rules of Chapter 47 of the Code of Federal Regulations.	
Date Report Issued	3rd July 2018	
Main Function	28 GHz small cell wireless backhaul.	
Information Specification	Height Width Depth Weight Voltage Current	185 mm 202 mm 202 mm 4.2 kg 90-265 V AC 0.6 A

2.2 Configurations for testing

General Parameters	
EUT Normal use position	Mounted on a lamp post
Choice of model(s) for type tests	Production samples
Antenna details	Integral. Also external dish antenna option available (high gain node)
Antenna port	WR34 waveguide
Baseband Data port (yes/no)?	No
Highest Signal generated in EUT	29.5 GHz
Lowest Signal generated in EUT	25 MHz
Hardware Version	Metnet 1200 V2 (FCC)
Software Version	Metnet_node_peckham_version-14-1-0-c15
Firmware Version	Not declared
Type of Equipment	Dual channel microwave transceiver
Technology Type	Proprietary STDMA multipoint dual channel transceiver
Geo-location (yes/no)	Yes
TX Parameters	
Alignment range – transmitter	27.5-29.25 GHz
EUT Declared Modulation Parameters	QPSK, 16QAM, 64QAM, 256QAM
EUT Declared Power level	Single TX QPSK=24 dBm, 16QAM=22 dBm, 64QAM=18.5 dBm, 256QAM=18.5 dBm. Dual TX QPSK=15.5 dBm, 16QAM=15.5 dBm, 64QAM=15.5 dBm, 256QAM=15.5 dBm.
EUT Declared Signal Bandwidths	50 MHz, 100 MHz, 112 MHz
EUT Declared Channel Spacing's	50 MHz, 100 MHz, 112 MHz
EUT Declared Duty Cycle	Not declared
Unmodulated carrier available?	Yes
Declared frequency stability	+/- 2.5 ppm over 20 years
Fixed Link Parameters	
Station Type	Nodes are peers that can take on different roles-regard as relay station although node can act as all three
EqC-PET	T
EqC-SET	not HC
EqC-EMO	6
EqC-ChS	112 MHz, 100 MHz, 50 MHz
EMO/ChS System Type	Multi-rate, multi-format
Gross Bit Rate	7.14 (800 Mbps per 112 MHz channel)
ATPC used	Yes
ATPC Power Range	30 dB
ATPC Tolerance	+/- 1 dBm
Activation Threshold	Not declared

Activation/Deactivation Description	ATPC2 is only used to reduce (but never increase) the actual transmit power for individual data links in two circumstances: (1) if the predicted RSSI is above -54 dBm, in order to avoid receiver compression and consequent reduction in SNR. The predicted RSSI is based on link attenuation measurements made continuously by the nodes. (2) large networks of nodes are divided into autonomous partitions, on a geographical basis, ideally with high isolation between them. Transmit power may be reduced on particular links to ensure that any interference imposed on adjacent partitions is at an acceptable level. Again this is automatically determined from the network wide attenuation measurements.
RTPC used	Type 2
RTPC Power Range	16 dB
RTPC Step Size	1 dB
RFC used	Not supported
RFC Frequency Range	Not supported
RFC Frequency Tolerances	Not supported
Frequency Error Long Term (ageing)	+/- 2.5 ppm/20 years
Frequency Error Long Term (years)	+/-4.6 ppm
TX Frequency Shutdown on loss Synchronisation	TX is disabled if the radio is not locked
Adaptive/Dynamic Modulation Used	The system continually monitors link quality and changes modulation setting for a link based assessment of FEC iterations and link SNR
TX Burst Timings	Variable

2.3 Functional description

The product is a 28 GHz self-organising transceiver capable of sustaining simultaneous links with peer nodes to provide wireless backhaul for access equipment such as cellular base stations. The product is designed to be mounted on street furniture such as lampposts to support dense deployments of small cell base stations.

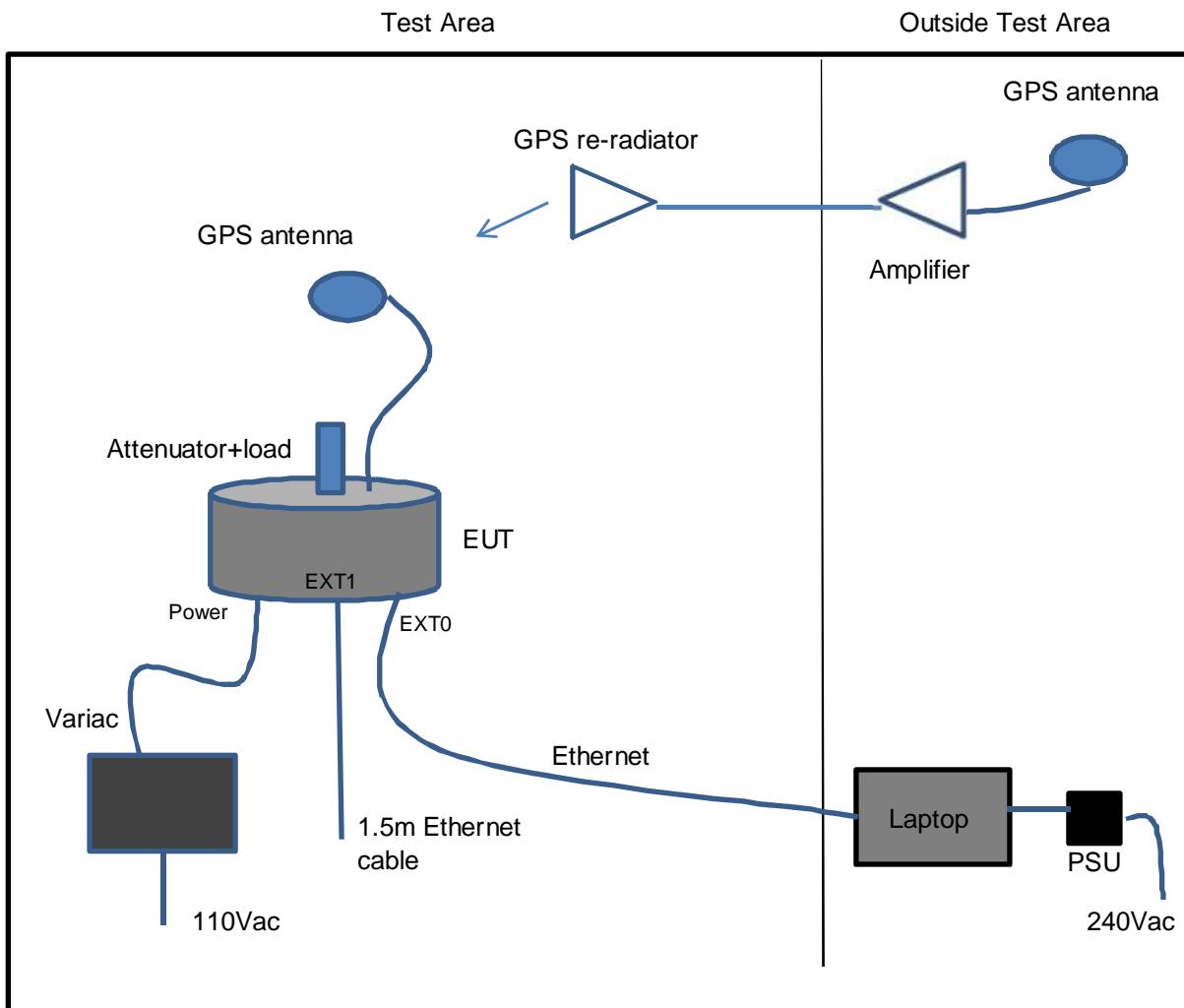
2.4 Modes of operation

Mode Reference	Description	Used for testing
TX1	27604.5 MHz, 50 MHz BW, QPSK, 24 dBm	No
TX2	27604.5 MHz, 50 MHz BW, 16QAM, 22 dBm	No
TX3	27604.5 MHz, 50 MHz BW, 64QAM, 18.5 dBm	No
TX4	27604.5 MHz, 50 MHz BW, 256QAM, 18.5 dBm	No
TX5	27604.5 MHz, 100 MHz BW, QPSK, 24 dBm	No
TX6	27604.5 MHz, 100 MHz BW, 16QAM, 22 dBm	No
TX7	27604.5 MHz, 100 MHz BW, 64QAM, 18.5 dBm	No
TX8	27604.5 MHz, 100 MHz BW, 256QAM, 18.5 dBm	No
TX9	27604.5 MHz, 112 MHz BW, QPSK, 24 dBm	No
TX10	27604.5 MHz, 112 MHz BW, 16QAM, 22 dBm	No
TX11	27604.5 MHz, 112 MHz BW, 64QAM, 18.5 dBm	No
TX12	27604.5 MHz, 112 MHz BW, 256QAM, 18.5 dBm	No
TX13	28248.5 MHz, 50 MHz BW, QPSK, 24 dBm	No
TX14	28248.5 MHz, 50 MHz BW, 16QAM, 22 dBm	No
TX15	28248.5 MHz, 50 MHz BW, 64QAM, 18.5 dBm	No
TX16	28248.5 MHz, 50 MHz BW, 256QAM, 18.5 dBm	No
TX17	28248.5 MHz, 100 MHz BW, QPSK, 24 dBm	No
TX18	28248.5 MHz, 100 MHz BW, 16QAM, 22 dBm	No
TX19	28248.5 MHz, 100 MHz BW, 64QAM, 18.5 dBm	No
TX20	28248.5 MHz, 100 MHz BW, 256QAM, 18.5 dBm	No
TX21	28248.5 MHz, 112 MHz BW, QPSK, 24 dBm	No
TX22	28248.5 MHz, 112 MHz BW, 16QAM, 22 dBm	No
TX23	28248.5 MHz, 112 MHz BW, 64QAM, 18.5 dBm	No
TX24	28248.5 MHz, 112 MHz BW, 256QAM, 18.5 dBm	No
TX25	29175 MHz, 50 MHz BW, QPSK, 24 dBm	Yes
TX26	29175 MHz, 50 MHz BW, 16QAM, 22 dBm	Yes
TX27	29175 MHz, 50 MHz BW, 64QAM, 18.5 dBm	Yes
TX28	29175 MHz, 50 MHz BW, 256QAM, 18.5 dBm	Yes
TX29	29175 MHz, 100 MHz BW, QPSK, 24 dBm	Yes
TX30	29175 MHz, 100 MHz BW, 16QAM, 22 dBm	Yes
TX31	29175 MHz, 100 MHz BW, 64QAM, 18.5 dBm	Yes
TX32	29175 MHz, 100 MHz BW, 256QAM, 18.5 dBm	Yes
TX33	29175 MHz, 112 MHz BW, QPSK, 24 dBm	Yes
TX34	29175 MHz, 112 MHz BW, 16QAM, 22 dBm	Yes
TX35	29175 MHz, 112 MHz BW, 64QAM, 18.5 dBm	Yes
TX36	29175 MHz, 112 MHz BW, 256QAM, 18.5 dBm	Yes
TX37	27604.5 MHz (with 28248.5 MHz), 50 MHz BW, QPSK, 15.5 dBm	No
TX38	27604.5 MHz (with 28248.5 MHz), 50 MHz BW, 16QAM, 15.5 dBm	No
TX39	27604.5 MHz (with 28248.5 MHz), 50 MHz BW, 64QAM, 15.5 dBm	No
TX40	27604.5 MHz (with 28248.5 MHz), 50 MHz BW, 256QAM, 15.5 dBm	No
TX41	27604.5 MHz (with 28248.5 MHz), 100 MHz BW, QPSK, 15.5 dBm	No
TX42	27604.5 MHz (with 28248.5 MHz), 100 MHz BW, 16QAM, 15.5 dBm	No
TX43	27604.5 MHz (with 28248.5 MHz), 100 MHz BW, 64QAM, 15.5 dBm	No
TX44	27604.5 MHz (with 28248.5 MHz), 100 MHz BW, 256QAM, 15.5 dBm	No
TX45	27604.5 MHz (with 28248.5 MHz), 112 MHz BW, QPSK, 15.5 dBm	No

TX46	27604.5 MHz (with 28248.5 MHz), 112 MHz BW, 16QAM, 15.5 dBm	No
TX47	27604.5 MHz (with 28248.5 MHz), 112 MHz BW, 64QAM, 15.5 dBm	No
TX48	27604.5 MHz (with 28248.5 MHz), 112 MHz BW, 256QAM, 15.5 dBm	No
TX49	27604.5 MHz (with 29175 MHz), 50 MHz BW, QPSK, 15.5 dBm	Yes
TX50	27604.5 MHz (with 29175 MHz), 50 MHz BW, 16QAM, 15.5 dBm	Yes
TX51	27604.5 MHz (with 29175 MHz), 50 MHz BW, 64QAM, 15.5 dBm	Yes
TX52	27604.5 MHz (with 29175 MHz), 50 MHz BW, 256QAM, 15.5 dBm	Yes
TX53	27604.5 MHz (with 29175 MHz), 100 MHz BW, QPSK, 15.5 dBm	Yes
TX54	27604.5 MHz (with 29175 MHz), 100 MHz BW, 16QAM, 15.5 dBm	Yes
TX55	27604.5 MHz (with 29175 MHz), 100 MHz BW, 64QAM, 15.5 dBm	Yes
TX56	27604.5 MHz (with 29175 MHz), 100 MHz BW, 256QAM, 15.5 dBm	Yes
TX57	27604.5 MHz (with 29175 MHz), 112 MHz BW, QPSK, 15.5 dBm	Yes
TX58	27604.5 MHz (with 29175 MHz), 112 MHz BW, 16QAM, 15.5 dBm	Yes
TX59	27604.5 MHz (with 29175 MHz), 112 MHz BW, 64QAM, 15.5 dBm	Yes
TX60	27604.5 MHz (with 29175 MHz), 112 MHz BW, 256QAM, 15.5 dBm	Yes
TX61	28248.5 MHz (with 29175 MHz), 50 MHz BW, QPSK, 15.5 dBm	Yes
TX62	28248.5 MHz (with 29175 MHz), 50 MHz BW, 16QAM, 15.5 dBm	Yes
TX63	28248.5 MHz (with 29175 MHz), 50 MHz BW, 64QAM, 15.5 dBm	Yes
TX64	28248.5 MHz (with 29175 MHz), 50 MHz BW, 256QAM, 15.5 dBm	Yes
TX65	28248.5 MHz (with 29175 MHz), 100 MHz BW, QPSK, 15.5 dBm	Yes
TX66	28248.5 MHz (with 29175 MHz), 100 MHz BW, 16QAM, 15.5 dBm	Yes
TX67	28248.5 MHz (with 29175 MHz), 100 MHz BW, 64QAM, 15.5 dBm	Yes
TX68	28248.5 MHz (with 29175 MHz), 100 MHz BW, 256QAM, 15.5 dBm	Yes
TX69	28248.5 MHz (with 29175 MHz), 112 MHz BW, QPSK, 15.5 dBm	Yes
TX70	28248.5 MHz (with 29175 MHz), 112 MHz BW, 16QAM, 15.5 dBm	Yes
TX71	28248.5 MHz (with 29175 MHz), 112 MHz BW, 64QAM, 15.5 dBm	Yes
TX72	28248.5 MHz (with 29175 MHz), 112 MHz BW, 256QAM, 15.5 dBm	Yes
TX73	27604.5 and 28248.5MHz, CW tone, 10 dBm	No
TX74	28248.5 and 29175 MHz, CW tone, 10 dBm	Yes

Note: Modes/channels not tested above are covered under FCC 47 CFR part 30, please see RN report 09-9926-2-17 for tests pertaining to these bands of operation.

2.5 Emissions configuration



The unit was powered from AC mains. All conducted test were performed at the waveguide port. For radiated tests a transition with an attenuator plus load were fitted to the waveguide port. The unit also required a GPS lock in order for it to operate. To obtain a GPS signal for the unit an amplified GPS signal was connected to an internal GPS re-radiator antenna located in close proximity to the EUT. Special GUI software was provided by CCS Ltd to access and set up the EUT channel frequency, power level and modulation schemes. The EUT can operate on a single channel or on two channels simultaneously. The unit operates in the 27.5 – 28.35 GHz band and the 29.1 – 29.25 GHz band. However, the EUT does not offer dual channel operation in the 29GHz band on its own (both TX channels cannot operate in the 29GHz band). The transmit mode was 100% continuous with modulation and the power settings for each channel and modulation scheme were as stated below: -

Low Channel (27604.5 MHz)

Mid Channel (28248.5 MHz)

High Channel (29175.0 MHz)

Single channel operation power levels: -

QPSK=24 dBm, 16QAM=22 dBm, 64QAM=18.5 dBm, 256QAM=18.5 dBm

Dual channel operation power levels: -

QPSK=15.5 dBm, 16QAM=15.5 dBm, 64QAM=15.5 dBm, 256QAM=15.5 dBm

Tests were performed in both single TX channel modes and dual TX channel modes where appropriate in order to check for any intermodulation products during tests.

2.5.1 Signal leads

Port Name	Cable Type	Connected
Power	3 core 0.75mm	Yes
EXT0	Bulgin PX0410, CAT5E/6	Yes
EXT1	Bulgin PX0410, CAT5E/6	Yes

3 Summary of test results

The Metnet 1200, G28US000000 was tested for compliance to the following standard(s) :

47 CFR Part 101C Effective Date 1st October 2016
↳ 47 CFR part 2J Effective Date 1st October 2016

Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard or the essential requirements of the directive, particularly under different conditions to those during testing. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Title	References	Results
Transmitter Tests		
1. Spurious emissions at antenna terminals	47CFR part 2J Part 2.1051, 47CFR part 101C Part 101.111	PASSED ¹
2. RF Power Output	47CFR part 2J Part 2.1046, 47CFR part 101C Part 101.113	PASSED
3. Frequency stability	47CFR part 2J Part 2.1055, 47CFR part 101C Part 101.107	PASSED
4. Occupied bandwidth	47CFR part 2J Part 2.1049, 47CFR part 101C Part 101.109	PASSED
5. Field strength of spurious radiations	47CFR part 2J Part 2.1053, 47CFR part 101C Part 101.111	PASSED
6. Band edge / spectrum mask additional emissions limitations	47CFR part 2J Part 2.1051, 47CFR part 101C Part 101.113	PASSED
7. Modulation characteristics	47CFR part 2J Part 2.1047, 47CFR part 101C Part 101.113	PASSED

¹ Spectrum investigated started at a frequency of 17 GHz due to the EUT's WR34 waveguide port low frequency cut off being 17.3 GHz. Please see section 7 calculations / explanations for further justification.

4 Specifications

The tests were performed and operated in accordance with R.N. Electronics Ltd procedures and the relevant standards listed below.

4.1 Relevant standards

Ref.	Standard Number	Version	Description
4.1.1	47CFR part 101C	2016	Part 101 – Fixed Microwave Services
4.1.2	47CFR part 2J	2016	Part 2 – Frequency Allocations and radio treaty matters; General rules and regulations
4.1.3	KDB 971168 D01 v02r02	2014	Measurement Guidance for Certification of Licensed Digital Transmitters
4.1.4	ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4.1.5	ITU-R SM.329-12	2012	Unwanted emissions in the spurious domain
4.1.6	TIA-603-E	2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards, Telecommunications Industry Association, June 2010

4.2 Deviations

No deviations have been applied.

4.3 Tests at extremes of temperature & voltage

The following test conditions were used to simulate testing at nominal or extremes.

Temperature Test Conditions		Voltage Test Conditions	
T nominal	20 °C	V nominal	110V AC
T minimum	-30 °C	V minimum	93.5V AC
T maximum	50 °C	V maximum	126.5V AC

Extremes of voltage are based on nominal +/-15%.

Extremes of temperature are based upon specification requirement.

The ambient test conditions of humidity and pressure in the laboratory were as specified in each specific test section within this report.

4.4 Test fixtures

In order to measure RF parameters at temperature extremes, the EUT was tested in a temperature controlled chamber as follows:

The equipment internal RF port was used for testing.

5 Tests, methods and results

5.1 Spurious emissions at antenna terminals

5.1.1 Test methods

Test Requirements: 47CFR part 2J Part 2.1051 [Reference 4.1.2 of this report],
47CFR part 101C Part 101.111 [Reference 4.1.1 of this report]
Test Method: KDB 971168 D01 v02r02 [Reference 4.1.3 of this report],
ITU-R SM.329-12 [Reference 4.1.5 of this report]
Limits: 47CFR part 101C Part 101.111 [Reference 4.1.1 of this report]

5.1.2 Configuration of EUT

The EUT was operated on a test bench. Measurements were made at the waveguide port. All test modes specified in section 2.4 were initially checked; QPSK modulation scheme using 50MHz bandwidth settings were found to be worst case for emissions and, therefore, the EUT was operated in TX25 to TX36 and TX49 to TX72 modes for this test.

5.1.3 Test procedure

Tests were made in accordance with the Test Method noted above, using the measuring equipment listed in the 'Test Equipment' Section. A complete scan of emissions from 17 GHz up to 100GHz was made, to identify any signals within 20dB of the limits. The 17GHz start frequency was used as the EUT's WR34 waveguide ports lowest cut-off frequency is stated as 17.3GHz Any identified spurious signals were measured in the required bandwidths using an RMS detector. Emissions limitations of part 101C for conducted spectrum mask requirements are included within section 5.6 of this report.

The EUT was tested in Site A.

5.1.4 Test equipment

E296-4, E296-5, E296-6, E329, E381, E455, E498, E520, E555, E602, E750, E755

See Section 9 for more details

5.1.5 Test results

Temperature of test environment	22°C
Humidity of test environment	52%
Pressure of test environment	101kPa

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Plots

9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm, 17-33 GHz
9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm, 33-40 GHz
9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm, 40-60 GHz
9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm, 60-75 GHz
9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm, 75-100 GHz

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Plots

9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 17-33 GHz
9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 33-40 GHz
9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 40-60 GHz
9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 60-75 GHz
9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 75-100 GHz

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Plots

9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 17-33 GHz
9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 33-40 GHz
9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 40-60 GHz
9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 60-75 GHz
9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm, 75-100 GHz

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Plots

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Plots

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No	spurious detected within 20 dB of limit	

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)
No spurious detected within 20 dB of limit		

The plots referred to in the above table may be found in section 6.

Note: For additional emissions limitations at the band edge/spectrum mask, plots for all combinations of modulation schemes, channel bandwidths and Low and high channel frequencies have been shown in modulation characteristics section.

Results for additional frequency bands of operation in single/dual channel modes are covered under RN Report 09-9926-2-17.

LIMITS:

Part 101.111, -13dBm

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
± 2.8 dB up to 26.5 GHz. 26.5 – 60 GHz ±3.6dB, 60 – 100 GHz ±4.1dB.

5.2 RF Power Output

5.2.1 Test methods

Test Requirements:	47CFR part 2J Part 2.1046 [Reference 4.1.2 of this report], 47CFR part 101C Part 101.113 [Reference 4.1.1 of this report]
Test Method:	KDB 971168 D01 v02r02 [Reference 4.1.3 of this report], TIA-603-E [Reference 4.1.6 of this report]
Limits:	47CFR part 101C Part 101.113 [Reference 4.1.1 of this report]

5.2.2 Configuration of EUT

The EUT was measured on a bench using a power meter connected to the external waveguide port. The EUT was operated in TX25 to TX36 and TX49 to TX72 modes for this test covering all bandwidths, modulation schemes and channel settings.

5.2.3 Test procedure

Tests were made in accordance with the Test Method noted above using the measuring equipment listed in the 'Test Equipment' Section. Power meter reading stated is maximum power observed using an average power head. EIRP density is calculated from wideband power meter reading per EUT bandwidth according to the following:

$$\text{EIRP density per MHz} = \text{Total power} - 10\log(\text{BW}/\text{BW}_{\text{NEW}}).$$

Measurements were made on a test bench in site A.

5.2.4 Test equipment

E291-2, E498, E700

See Section 9 for more details

5.2.5 Test results

Temperature of test environment	20°C
Humidity of test environment	66%
Pressure of test environment	100kPa

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Test conditions		Carrier Power (dBm)
High channel		
Temp Ambient	Volts Nominal	23.10
Maximum TX Power observed (dBm)		23.10

Variation in TX power observed to Limit (dB)	-0.9 / -0.9
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EIRP per MHz (50MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
6.11	+43	49.11	19.11

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.20	15.20
Maximum TX Power observed (dBm)		15.20	15.20
Variation in TX power observed to Limit (dB)		-0.3 / -0.3	-0.3 / -0.3

EIRP per MHz (50MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-1.79	+43	41.21	11.21
High channel	-1.79	+43	41.21	11.21

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Test conditions		Carrier Power (dBm)	
		Mid channel 4	
Temp Ambient	Volts Nominal	23.00	
Maximum TX Power observed (dBm)		23.00	
Variation in TX power observed to Limit (dB)		-1 / -1	

EIRP per MHz (100MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
3	+43	46	16

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.10	15.10
Maximum TX Power observed (dBm)		15.10	15.10
Variation in TX power observed to Limit (dB)		-0.4 / -0.4	-0.4 / -0.4

EIRP per MHz (100MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)

Mid channel 4	-4.9	+43	38.1	8.1
High channel	-4.9	+43	38.1	8.1

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	23.00
Maximum TX Power observed (dBm)		23.00

Variation in TX power observed to Limit (dB)	-1 / -1
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EIRP per MHz (112MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
2.51	+43	45.51	15.51

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.00	15.00
Maximum TX Power observed (dBm)		15.00	15.00

Variation in TX power observed to Limit (dB)	-0.5 / -0.5	-0.5 / -0.5
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EIRP per MHz (112MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-5	+43	38	8
High channel	-5	+43	38	8

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	21.10
Maximum TX Power observed (dBm)		21.10

Variation in TX power observed to Limit (dB)	-0.9 / -0.9
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EIRP per MHz (50MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
4.11	+43	47.11	17.11

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.20	15.20
Maximum TX Power observed (dBm)		15.20	15.20
Variation in TX power observed to Limit (dB)		-0.3 / -0.3	-0.3 / -0.3

EIRP per MHz (50MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-1.79	+43	41.21	11.21
High channel	-1.79	+43	41.21	11.21

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	21.00
Maximum TX Power observed (dBm)		21.00

Variation in TX power observed to Limit (dB)	-1 / -1
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EIRP per MHz (100MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
1	+43	44	14

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.00	15.00
Maximum TX Power observed (dBm)		15.00	15.00

Variation in TX power observed to Limit (dB)	-0.5 / -0.5	-0.5 / -0.5
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EIRP per MHz (100MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-5	+43	38	8
High channel	-5	+43	38	8

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	21.10
Maximum TX Power observed (dBm)		21.10
Variation in TX power observed to Limit (dB)		-0.9 / -0.9

EIRP per MHz (112MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
0.61	+43	43.61	13.61

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.00	14.90
Maximum TX Power observed (dBm)		15.00	14.90
Variation in TX power observed to Limit (dB)		-0.5 / -0.5	-0.6 / -0.6

EIRP per MHz (112MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-5.49	+43	37.51	7.51
High channel	-5.59	+43	37.41	7.41

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	18.10
Maximum TX Power observed (dBm)		18.10
Variation in TX power observed to Limit (dB)		-0.4 / -0.4

EIRP per MHz (50MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
1.11	+43	44.11	14.11

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.30	15.40
Maximum TX Power observed (dBm)		15.30	15.40

Variation in TX power observed to Limit (dB)	-0.2 / -0.2	-0.1 / -0.1
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EIRP per MHz (50MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-1.69	+43	41.3	11.3
High channel	-1.59	+43	41.4	11.4

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	18.00
Maximum TX Power observed (dBm)		18.00

Variation in TX power observed to Limit (dB)	-0.5 / -0.5
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EIRP per MHz (100MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
-2	+43	41	11

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.20	15.20
Maximum TX Power observed (dBm)		15.20	15.20

Variation in TX power observed to Limit (dB)	-0.3 / -0.3	-0.3 / -0.3
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EIRP per MHz (100MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-4.8	+43	38.2	8.2
High channel	-4.8	+43	38.2	8.2

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	18.00
Maximum TX Power observed (dBm)		18.00

Variation in TX power observed to Limit (dB)	-0.5 / -0.5
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EIRP per MHz (112MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
-2.49	+43	40.51	10.51

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
Temp Ambient	Volts Nominal	15.20	15.10
Maximum TX Power observed (dBm)		15.20	15.10

Variation in TX power observed to Limit (dB)	-0.3 / -0.3	-0.4 / -0.4
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EIRP per MHz (112MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-5.29	+43	37.71	7.71
High channel	-5.39	+43	37.61	7.61

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	18.20
Maximum TX Power observed (dBm)		18.20

Variation in TX power observed to Limit (dB)	-0.3 / -0.3
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EIRP per MHz (50MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
1.21	+43	44.21	14.21

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions	Carrier Power (dBm)	Carrier Power (dBm)
	Mid channel 4	High channel
Temp Ambient	15.40	15.40
Maximum TX Power observed (dBm)	15.40	15.40

Variation in TX power observed to Limit (dB)	-0.1 / -0.1	-0.1 / -0.1
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EIRP per MHz (50MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-1.59	+43	41.41	7.71
High channel	-1.59	+43	41.41	7.61

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

Test conditions	Carrier Power (dBm)
	Mid channel 4
Temp Ambient	18.00
Maximum TX Power observed (dBm)	18.00

Variation in TX power observed to Limit (dB)	-0.5 / -0.5
--	-------------

EIRP per MHz (100MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
-2	+43	41	11

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions	Carrier Power (dBm)	Carrier Power (dBm)
	Mid channel 4	High channel
Temp Ambient	15.30	15.30
Maximum TX Power observed (dBm)	15.30	15.30

Variation in TX power observed to Limit (dB)	-0.2 / -0.2	-0.2 / -0.2
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EIRP per MHz (100MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-4.7	+43	38.3	8.3
High channel	-4.7	+43	38.3	8.3

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

Test conditions		Carrier Power (dBm)
		Mid channel 4
Temp Ambient	Volts Nominal	18.10
Maximum TX Power observed (dBm)		18.10

Variation in TX power observed to Limit (dB)	-0.4 / -0.4
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EIRP per MHz (112MHz channel Bandwidth)

Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
-2.39	+43	40.61	10.61

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Test conditions		Carrier Power (dBm)	Carrier Power (dBm)
		Mid channel 4	High channel
Temp Ambient	Volts Nominal	15.20	15.20
Maximum TX Power observed (dBm)		15.20	15.20

Variation in TX power observed to Limit (dB)	-0.3 / -0.3	-0.3 / -0.3
--	-------------	-------------

EIRP per MHz (112MHz channel Bandwidth)

	Power per MHz (dBm)	Max Ant Gain dBi	EIRP per MHz (dBm)	EIRP per MHz (dBW)
Mid channel 4	-5.29	+43	37.71	7.71
High channel	-5.29	+43	37.71	7.71

Results for additional frequency bands of operation in single/dual channel modes are covered under RN Report 09-9926-2-17.

LIMITS:

Part 101.113, +55dBW.

Part 101.113(c)(1) *Transmitter power limitations*. Point-to-point stations in the 29.1-29.25 GHz band for the LMDS backbone between LMDS hubs shall be limited to a maximum allowable e.i.r.p. density per carrier of 23 dBW/MHz in any one megahertz in clear air, and may exceed this limit by employment of adaptive power control in cases where link propagation attenuation exceeds the clear air value due to precipitation and only to the extent that the link is impaired.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
 $\pm 1.0 \text{ dB}$

5.3 Frequency stability

5.3.1 Test methods

Test Requirements: 47CFR part 2J Part 2.1055 [Reference 4.1.2 of this report],
47CFR part 101C Part 101.107 [Reference 4.1.1 of this report]
Test Method: KDB 971168 D01 v02r02 [Reference 4.1.3 of this report],
TIA-603-E [Reference 4.1.6 of this report]
Limits: 47CFR part 101C Part 101.107 [Reference 4.1.1 of this report]

5.3.2 Configuration of EUT

The EUT was placed in a temperature controlled chamber. The EUT emissions were observed by means of connection to the waveguide port. The EUT was operated in TX73 and TX74 modes for this test.

5.3.3 Test procedure

Tests were made in accordance with the Test Method noted above, using the measuring equipment listed in the 'Test Equipment' Section. Temperature stability was achieved at each test level before taking measurements. The measurement was performed on a CW signal with a 10 MHz tone offset, which was accounted for in the measurement results. Frequency error is referenced to the channel frequency.

Tests were performed using Test Site A.

5.3.4 Test equipment

E498, E555, E615, E755, L264, TMS38, TMS57

See Section 9 for more details

5.3.5 Test results

Temperature of test environment	20°C
Humidity of test environment	63%
Pressure of test environment	102kPa

Band	29.1-29.25 GHz Single Channel
Power Level	10 dBm
Channel Spacing	50 MHz
Mod Scheme	CW tone
Mid channel	29175 MHz

Test conditions		Frequency Error (MHz) Mid channel
-30°C	Volts Nominal (110)	29175.000906
-20°C	Volts Nominal (110)	29175.000708
-10°C	Volts Nominal (110)	29175.000365
0°C	Volts Nominal (110)	29175.000234
10°C	Volts Nominal (110)	29175.000207
20°C	Volts Minimum (93.5)	29175.000939
	Volts Nominal (110)	29175.000834
	Volts Maximum (126.5)	29175.000530
30°C	Volts Nominal (110)	29175.000397
40°C	Volts Nominal (110)	29175.000888
50°C	Volts Nominal (110)	29175.000159
Max Frequency Error per chan (Hz)		+939
Max Frequency Error observed (MHz)		0.000939

Maximum variation observed was 0.000003219 %

LIMITS:

Part 101.107, +/-0.001%

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:

<± 0.7 ppm

5.4 Occupied bandwidth

5.4.1 Test methods

Test Requirements: 47CFR part 2J Part 2.1049 [Reference 4.1.2 of this report],
47CFR part 101C Part 101.109 [Reference 4.1.1 of this report]
Test Method: KDB 971168 D01 v02r02 [Reference 4.1.3 of this report],
TIA-603-E [Reference 4.1.6 of this report]
Limits: 47CFR part 101C Part 101.109 [Reference 4.1.1 of this report]

5.4.2 Configuration of EUT

The EUT was tested on a bench. The EUT was tested whilst connected to the AC power for maximised emissions. The EUT was operated in all modes listed in section 2.4. The EUT was operated in TX25 - TX36 and TX49 to TX72 modes.

5.4.3 Test procedure

Tests were performed using Test Site A. Tests were made in accordance with the Test Method noted above using the measuring equipment noted in the 'Test Equipment' Section. A 2 MHz RBW, 3x VBW, auto sweep time and max hold settings were used for the 99% bandwidth. The EUT was set to each bandwidth/mod scheme in turn (see section 2.4) and 99% bandwidth recorded.

5.4.4 Test equipment

E433, E498, E755

See Section 9 for more details

5.4.5 Test results

Temperature of test environment	18°C
Humidity of test environment	56%
Pressure of test environment	101kPa

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	29175 MHz

High channel	
99 % Bandwidth (MHz) Nominal Temp & Volts	47.475
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
99 % Bandwidth (MHz) Nominal Temp & Volts	47.302	47.208
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz (+27.6045), 50 MHz BW, QPSK, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 50 MHz BW, QPSK, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel 4	29175 MHz

Mid channel 4	
99 % Bandwidth (MHz) Nominal Temp & Volts	93.234
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 100 MHz BW, QPSK, 24 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Mid channel 4	High channel
99 % Bandwidth (MHz) Nominal Temp & Volts	93.424
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz (+27.6045), 100 MHz BW, QPSK, 15.5 dBm
	9926-1 29.175 GHz (+28.2485), 100 MHz BW, QPSK, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel 4	29175 MHz

Mid channel 4	
99 % Bandwidth (MHz) Nominal Temp & Volts	104.6
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 112 MHz BW, QPSK, 24 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
99 % Bandwidth (MHz) Nominal Temp & Volts	104.27	104.39
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz (+27.6045), 112 MHz BW, QPSK, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 112 MHz BW, QPSK, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

	Mid channel 4
99 % Bandwidth (MHz) Nominal Temp & Volts	47.349
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 50 MHz BW, 16QAM, 22 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
99 % Bandwidth (MHz) Nominal Temp & Volts	47.321	47.219
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz (+27.6045), 50 MHz BW, 16QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 50 MHz BW, 16QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

	Mid channel 4
99 % Bandwidth (MHz) Nominal Temp & Volts	93.577
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 100 MHz BW, 16QAM, 22 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	93.367	93.093
	9926-1 29.175 GHz (+27.6045), 100 MHz BW, 16QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 100 MHz BW, 16QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

Mid channel 4	
99 % Bandwidth (MHz) Nominal Temp & Volts	104.38
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 112 MHz BW, 16QAM, 22 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
	104.38	104.59
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz (+27.6045), 112 MHz BW, 16QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 112 MHz BW, 16QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

Mid channel 4	
99 % Bandwidth (MHz) Nominal Temp & Volts	47.216
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz, 50 MHz BW, 64QAM, 18.5 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
99 % Bandwidth (MHz) Nominal Temp & Volts	47.102	47.253
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	9926-1 29.175 GHz (+27.6045), 50 MHz BW, 64QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 50 MHz BW, 64QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

Mid channel 4	
99 % Bandwidth (MHz) Nominal Temp & Volts	93.385
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	
	9926-1 29.175 GHz, 100 MHz BW, 64QAM, 18.5 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Mid channel 4	High channel
93.255	93.318
9926-1 29.175 GHz (+27.6045), 100 MHz BW, 64QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 100 MHz BW, 64QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

Mid channel 4
104.67
9926-1 29.175 GHz, 112 MHz BW, 64QAM, 18.5 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Mid channel 4	High channel
104.39	104.28
9926-1 29.175 GHz (+27.6045), 112 MHz BW, 64QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 112 MHz BW, 64QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

Mid channel 4	
99 % Bandwidth (MHz) Nominal Temp & Volts	47.289
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	
9926-1 29.175 GHz, 50 MHz BW, 256QAM, 18.5 dBm	

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Mid channel 4	High channel
47.083	47.134
9926-1 29.175 GHz (+27.6045), 50 MHz BW, 256QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 50 MHz BW, 256QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

Mid channel 4
93.445
9926-1 29.175 GHz, 100 MHz BW, 256QAM, 18.5 dBm

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

Mid channel 4	High channel
93.484	93.141
9926-1 29.175 GHz (+27.6045), 100 MHz BW, 256QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 100 MHz BW, 256QAM, 15.5 dBm

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

99 % Bandwidth (MHz) Nominal Temp & Volts	Mid channel 4
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	104.46
9926-1 29.175 GHz, 112 MHz BW, 256QAM, 18.5 dBm	

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

99 % Bandwidth (MHz) Nominal Temp & Volts	Mid channel 4	High channel
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts	104.4	104.53
	9926-1 29.175 GHz (+27.6045), 112 MHz BW, 256QAM, 15.5 dBm	9926-1 29.175 GHz (+28.2485), 112 MHz BW, 256QAM, 15.5 dBm

Results for additional frequency bands of operation in single/dual channel modes are covered under RN Report 09-9926-2-17.

Analyser plots for the 99% bandwidth can be found in Section 6 of this report.

LIMITS:

Part 101.109: 150 MHz (band 29.1 – 29.25 GHz)

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
 $\pm 1.9\%$

5.5 Field strength of spurious radiations

5.5.1 Test methods

Test Requirements:	47CFR part 2J Part 2.1053 [Reference 4.1.2 of this report], 47CFR part 101C Part 101.111 [Reference 4.1.1 of this report]
Test Method:	KDB 971168 D01 v02r02 [Reference 4.1.3 of this report], TIA-603-E [Reference 4.1.6 of this report]
Limits:	47CFR part 101C Part 101.111 [Reference 4.1.1 of this report]

5.5.2 Configuration of EUT

The EUT was tested in an ALSE and ambient conditions were monitored. The EUT was examined in its declared normal use position. All test modes specified in section 2.4 were initially checked. The EUT was operated in TX25 - TX36 and TX49 to TX72 modes for this test.

5.5.3 Test procedure

Tests were made in accordance with the Test Method noted above, using the measuring equipment listed in the 'Test Equipment' Section. Peak field strength from the EUT was maximised by rotating it 360 degrees. An RMS detector was used for final measurements.

25MHz - 1GHz.

The measuring antenna was scanned 1 - 4m in both Horizontal and Vertical polarisations. Substitution method was performed using tuned dipoles / a calibrated bi-conical antenna. Measurement distance of 3metres was used.

1GHz – 100GHz.

The measuring antenna was used in both Horizontal and Vertical polarisations. Substitution method was performed using standard gain horn antennas. Measurement distances used were: 1 – 6 GHz at 3metres, 6 – 18 GHz at 1.2metres, 18 – 75 GHz at 0.3metres, & 75 – 100 GHz at 0.1metres

The EUT was tested in Site B and Site M.

5.5.4 Test equipment

E268, E289, E296-4, E296-5, E296-6, E329, E330, E331, E404, E411, E412, E414, E428, E433, E454, E455, E498, E503, E520, E570, E579, E580, E602, E704, E716, E718, E743, E755, LPE364, TMS78, TMS79, TMS814

See Section 9 for more details

5.5.5 Test results

Temperature of test environment	23°C
Humidity of test environment	64%
Pressure of test environment	101kPa

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
26671	-25	-12	Horizontal	Upright

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
26671	-24.4	-11.4	Horizontal	Upright

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
26671	-24.4	-11.4	Horizontal	Upright

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
High channel	29175 MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

Setup Table

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
High channel	28248.5 (with 29175 on) MHz

Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Difference to Limit (dB)	Antenna Polarisation	EUT Polarisation
No spurious detected within 20 dB of limit				

LIMITS:

Part 101.111, -13dBm

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
30MHz - 1GHz \pm 3.9 dB, 1 – 18 GHz \pm 3.5dB, 18 – 26.5 GHz \pm 3.9dB, 26.5 – 60 GHz \pm 3.9dB, 60 – 100 GHz \pm 4.4dB.

5.6 Band edge / spectrum mask additional emissions limitations

5.6.1 Test methods

Test Requirements:	47CFR part 2J Part 2.1051 [Reference 4.1.2 of this report], 47CFR part 101C Part 101.113 [Reference 4.1.1 of this report]
Test Method:	KDB 971168 D01 v02r02 [Reference 4.1.3 of this report], TIA-603-E [Reference 4.1.6 of this report]
Limits:	47CFR part 101C Part 101.111 [Reference 4.1.1 of this report]

5.6.2 Configuration of EUT

The EUT was operated on a test bench. Measurements were made at the waveguide port. The EUT was operated in TX25 - TX36 and TX49 to TX72 modes for this test.

5.6.3 Test procedure

Tests were made in accordance with the Test Method noted above, using the measuring equipment listed in the 'Test Equipment' Section. A 1 MHz RBW, 3x VBW, auto sweep time and max hold settings were used to show the band edge. All modulation schemes / rates in combination with channel bandwidths and all channel frequency combinations were assessed and plotted. (See section 2.4 for modes details).

The EUT was tested in Site A.

5.6.4 Test equipment

E433, E498, E755

See Section 9 for more details

5.6.5 Test results

Temperature of test environment	20°C
Humidity of test environment	56%
Pressure of test environment	101kPa

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	24 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, QPSK, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	24 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, QPSK, 24 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 100 MHz BW, QPSK, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 100 MHz BW, QPSK, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	24 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, QPSK, 24 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 112 MHz BW, QPSK, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 112 MHz BW, QPSK, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	22 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, 16QAM, 22 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, 16QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, 16QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	22 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, 16QAM, 22 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 100 MHz BW, 16QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 100 MHz BW, 16QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	22 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, 16QAM, 22 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 112 MHz BW, 16QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 112 MHz BW, 16QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, 64QAM, 18.5 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, 64QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, 64QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, 64QAM, 18.5 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 100 MHz BW, 64QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 100 MHz BW, 64QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, 64QAM, 18.5 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 112 MHz BW, 64QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 112 MHz BW, 64QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, 256QAM, 18.5 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 50 MHz BW, 256QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 50 MHz BW, 256QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, 256QAM, 18.5 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 100 MHz BW, 256QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 100 MHz BW, 256QAM, 15.5 dBm mask

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
High channel	29175 MHz

	High channel
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, 256QAM, 18.5 dBm mask

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel	27604.5 (with 29175 on) MHz
High channel	28248.5 (with 29175 on) MHz

	Mid channel	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 27.6045 GHz+29.175 GHz, 112 MHz BW, 256QAM, 15.5 dBm mask	9926-1 28.2485 GHz+29.175 GHz, 112 MHz BW, 256QAM, 15.5 dBm mask

Results for additional frequency bands of operation in single/dual channel modes are covered under RN Report 09-9926-2-17

Analyser plots for the bandwidth masks can be found in Section 6 of this report.

LIMITS:

Part 101.111, mask calculation to (a)(2)(ii).

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:

<± 4.1 dB

5.7 Modulation characteristics

5.7.1 Test methods

Test Requirements:	47CFR part 2J Part 2.1047 [Reference 4.1.2 of this report], 47CFR part 101C Part 101.113 [Reference 4.1.1 of this report]
Test Method:	KDB 971168 D01 v02r02 [Reference 4.1.3 of this report], TIA-603-E [Reference 4.1.6 of this report]
Limits:	47CFR part 101C Part 101.109 [Reference 4.1.1 of this report]

5.7.2 Configuration of EUT

The EUT was operated on a test bench. Measurements were made at the waveguide port. All test modes specified in section 2.4 were tested. The EUT was operated in TX25 - TX36 and TX49 to TX72 modes for this test.

5.7.3 Test procedure

Tests were made in accordance with the Test Method noted above, using the measuring equipment listed in the 'Test Equipment' Section. A 2MHz RBW, 3x VBW, auto sweep time and max hold settings were used to show the modulation characteristics. All modulation schemes / rates in combination with channel bandwidths and channel frequency combinations were assessed and plotted. (See section 2.4 for modes details).

The EUT was tested in Site A.

5.7.4 Test equipment

E433, E498, E755

See Section 9 for more details

5.7.5 Test results

Temperature of test environment	20°C
Humidity of test environment	56%
Pressure of test environment	101kPa

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	24 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, QPSK, 24 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5dBm
Channel Spacing	50 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 50 MHz BW, QPSK, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 50 MHz BW, QPSK, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	24 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, QPSK, 24 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 100 MHz BW, QPSK, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 100 MHz BW, QPSK, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	24 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	24 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, QPSK, 24 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	QPSK
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dbm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 112 MHz BW, QPSK, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 112 MHz BW, QPSK, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	22 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, 16QAM, 22 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 50 MHz BW, 16QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 50 MHz BW, 16QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	22 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, 16QAM, 22 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 100 MHz BW, 16QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 100 MHz BW, 16QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	22 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	22 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, 16QAM, 22 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	16QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 112 MHz BW, 16QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 112 MHz BW, 16QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, 64QAM, 18.5 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 50 MHz BW, 64QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 50 MHz BW, 64QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, 64QAM, 18.5 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 100 MHz BW, 64QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 100 MHz BW, 64QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	18.5 dbm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, 64QAM, 18.5 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	64QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 112 MHz BW, 64QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 112 MHz BW, 64QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 50 MHz BW, 256QAM, 18.5 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	50 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 50 MHz BW, 256QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 50 MHz BW, 256QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 100 MHz BW, 256QAM, 18.5 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	100 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 100 MHz BW, 256QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 100 MHz BW, 256QAM, 15.5 dBm mod

Band	27.5-29.25 GHz Single Channel
Power Level	18.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel 4	29175 MHz

	Mid channel 4
Nominal, Maximised RF Output / field strength	18.5 dBm
Nominal plot reference	9926-1 29.175 GHz, 112 MHz BW, 256QAM, 18.5 dBm mod

Band	27.5-29.25 GHz Dual Channel
Power Level	15.5 dBm
Channel Spacing	112 MHz
Mod Scheme	256QAM
Mid channel 4	29175 (with 27604.5 on) MHz
High channel	29175 (with 28248.5 on) MHz

	Mid channel 4	High channel
Nominal, Maximised RF Output / field strength	15.5 dBm	
Nominal plot reference	9926-1 29.175 GHz (+27.6045), 112 MHz BW, 256QAM, 15.5 dBm mod	9926-1 29.175 GHz (+28.2485), 112 MHz BW, 256QAM, 15.5 dBm mod

Results for additional frequency bands of operation in single/dual channel modes are covered under RN Report 09-9926-2-17

Analyser plots showing the modulation characteristics can be found in Section 6 of this report.

LIMITS:

Part 101.109: 150 MHz (band 29.1 – 29.25 GHz)

These results show that the EUT has PASSED this test.

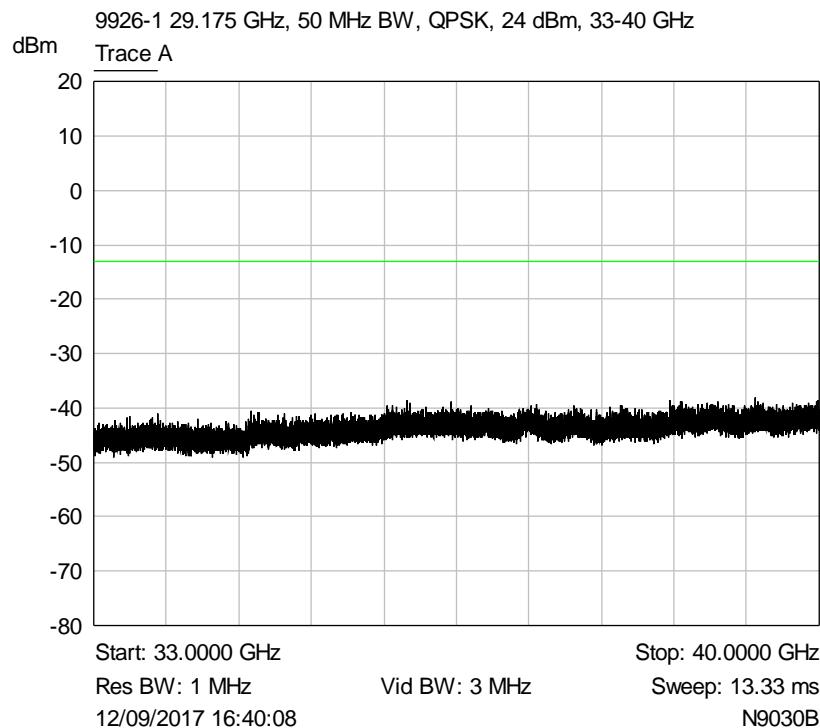
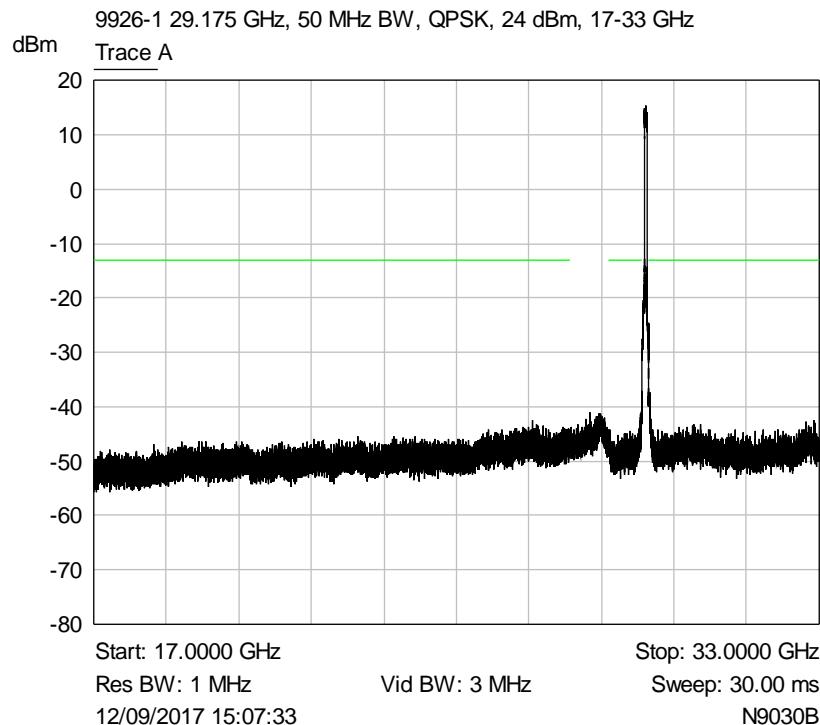
The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:

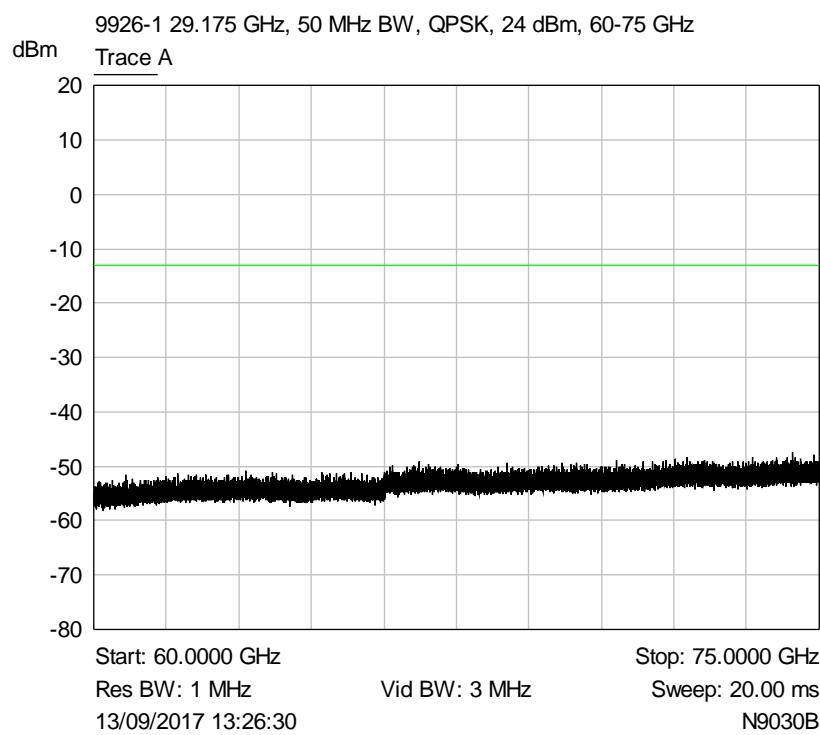
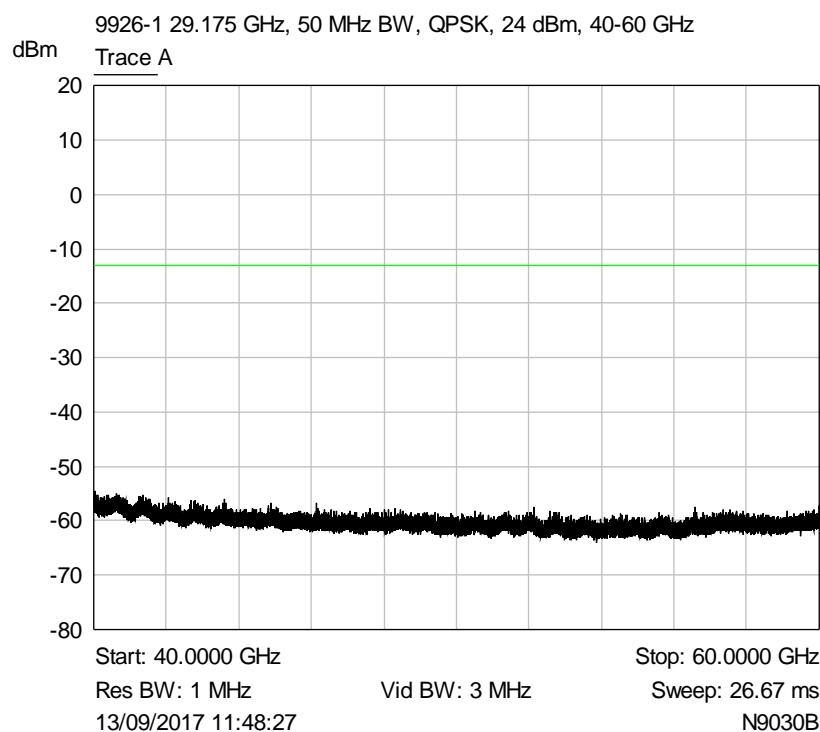
Bandwidth <± 1.9 %

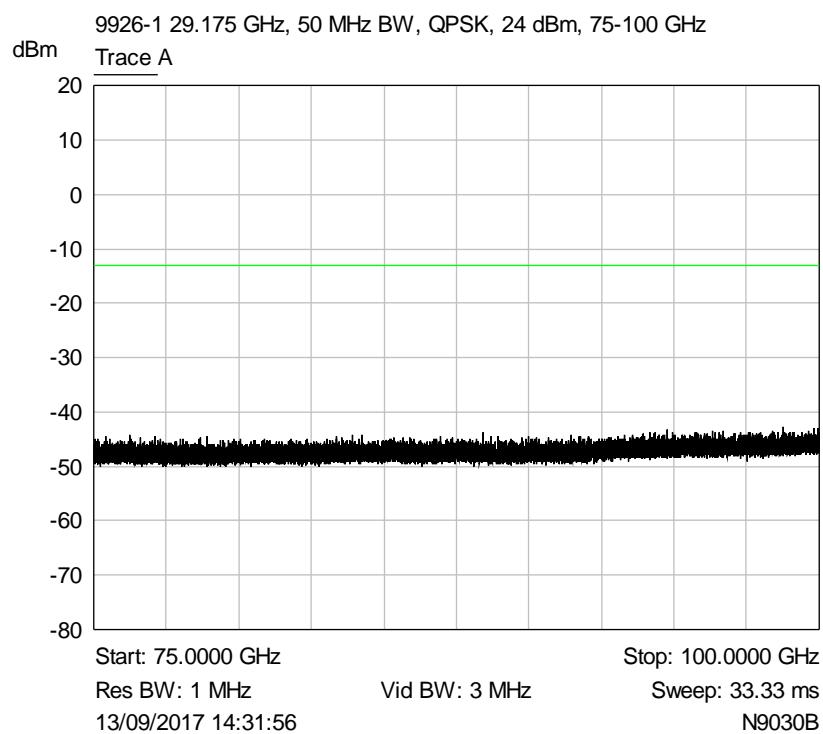
6 Plots/Graphical results

6.1 Spurious emissions at antenna terminals

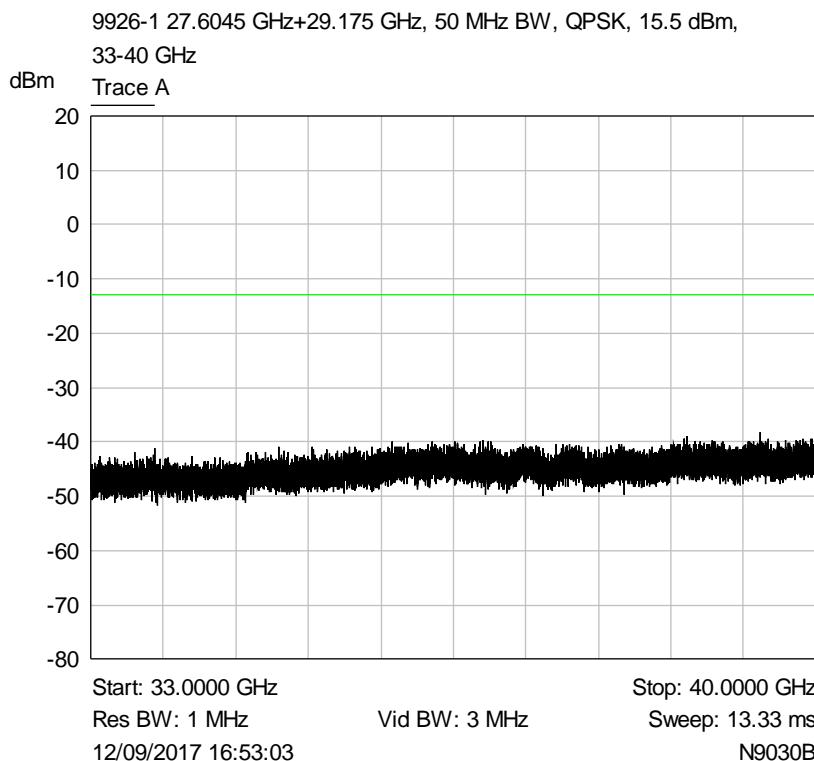
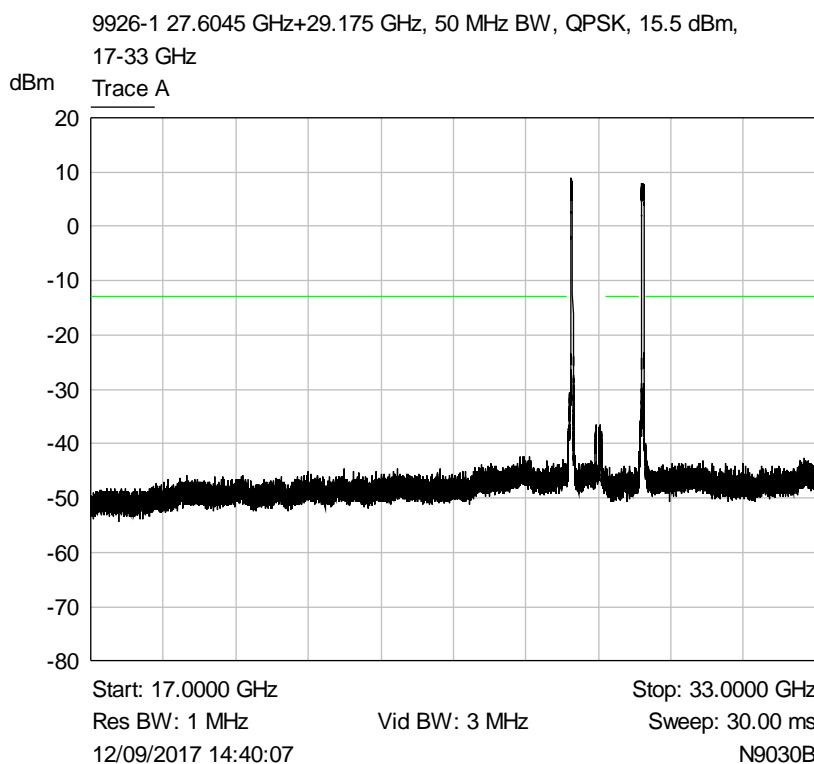
RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 MHz

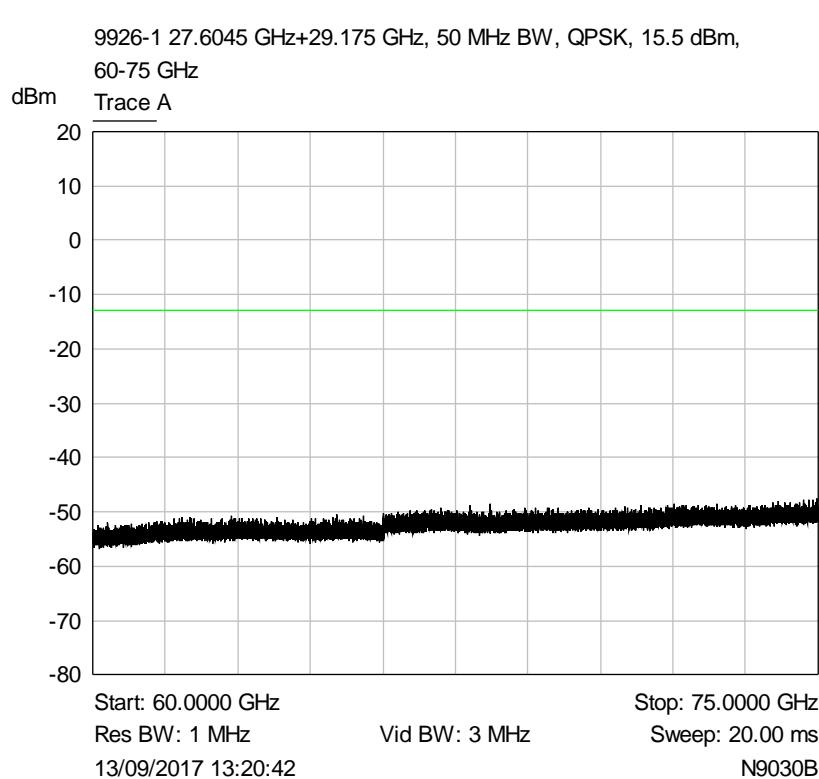
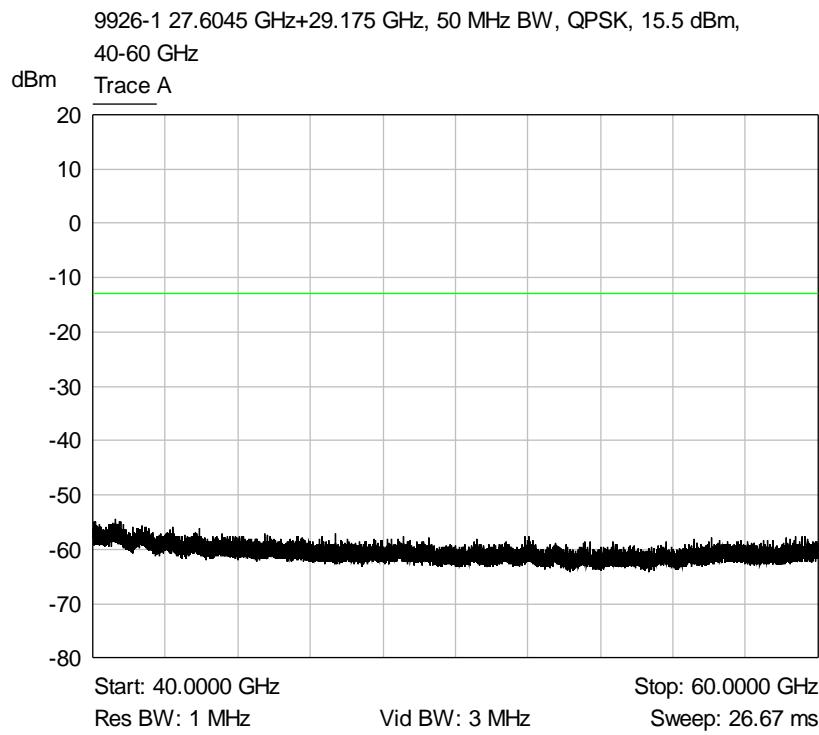


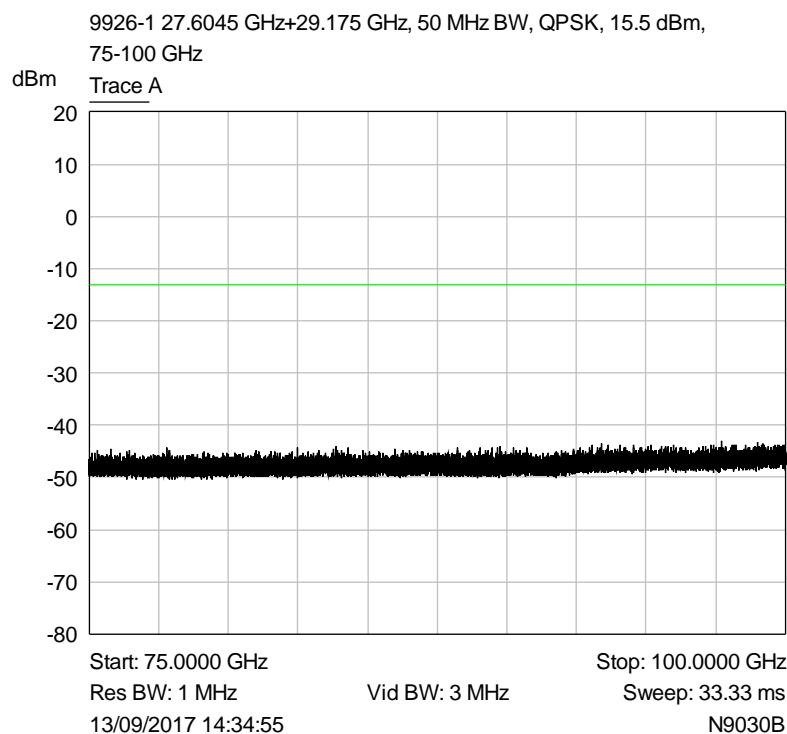




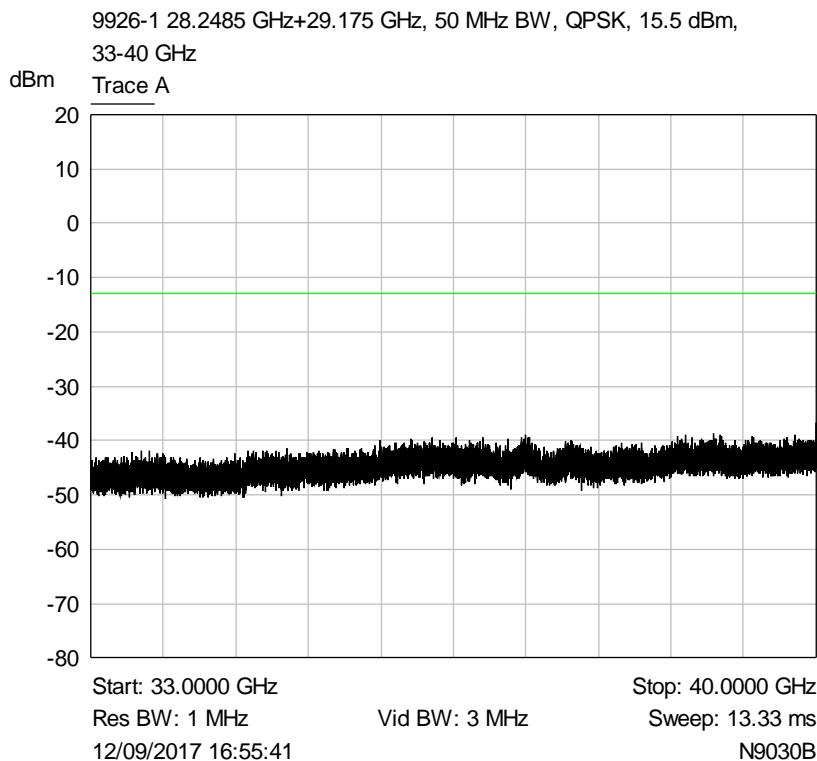
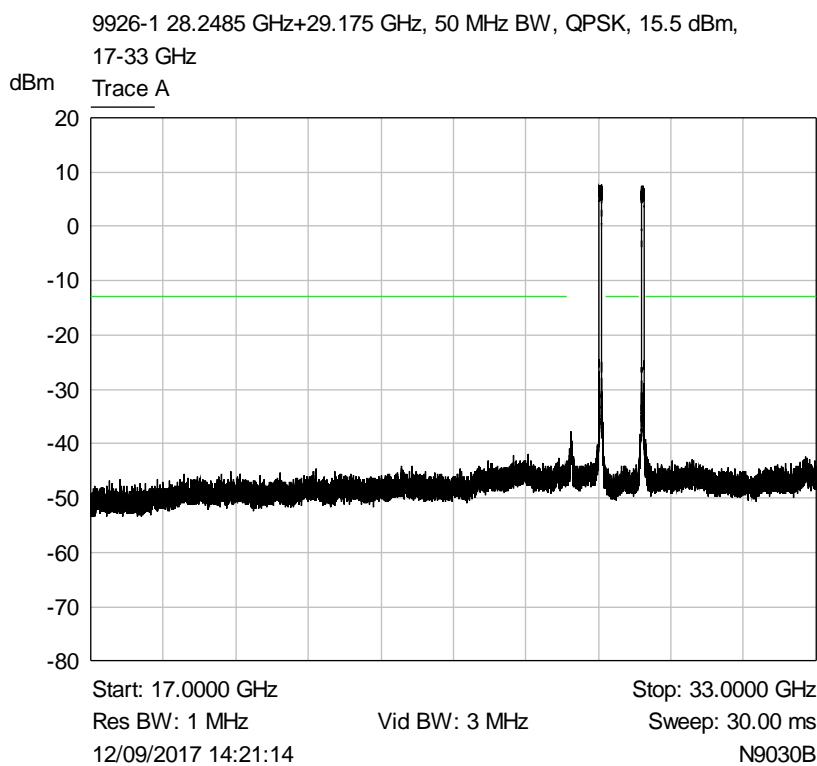
RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 27604.5 (with 29175 on) MHz

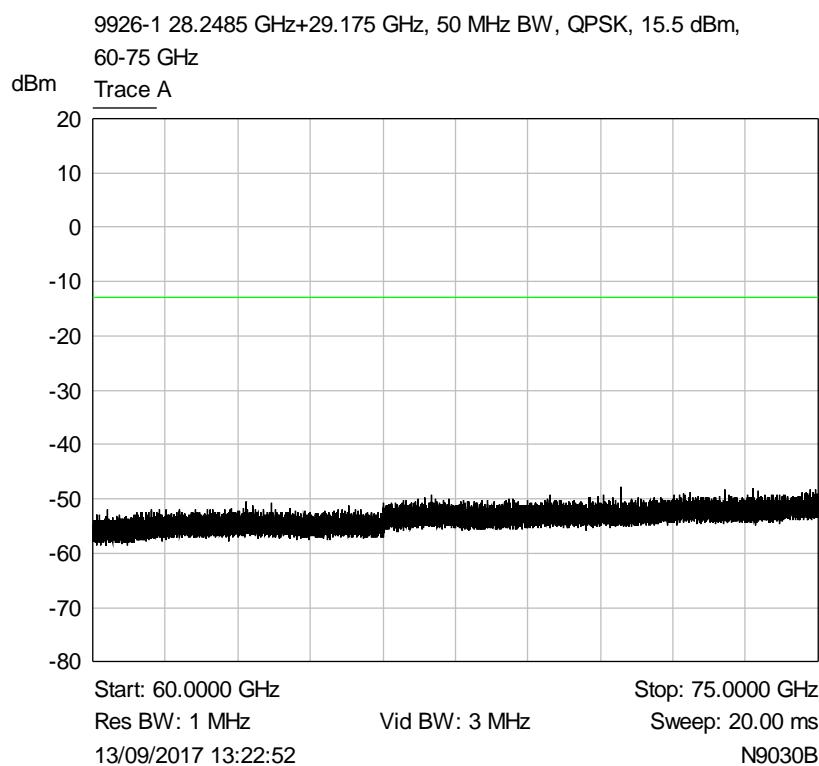
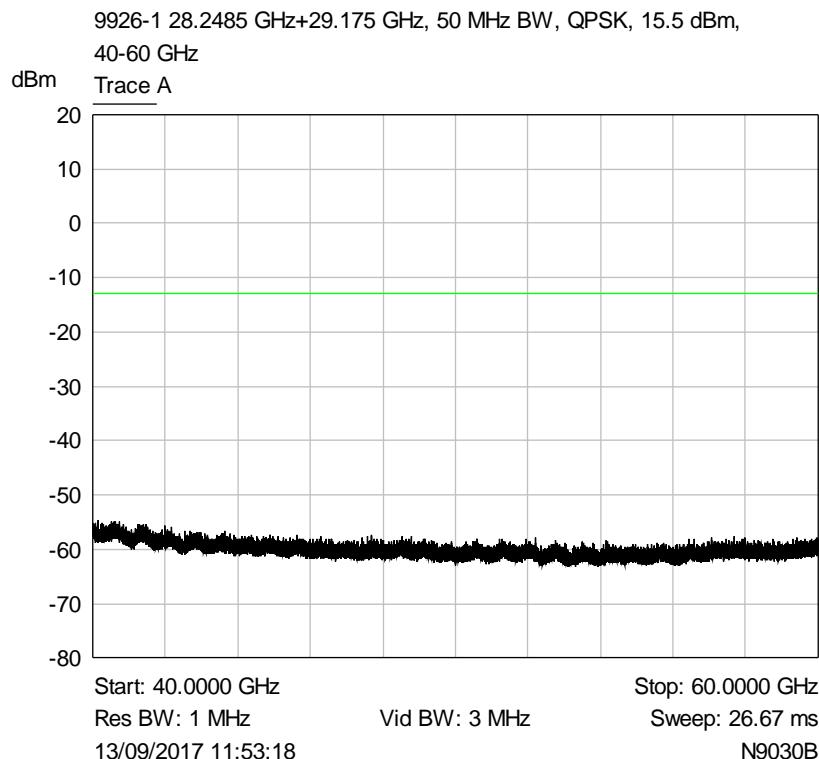


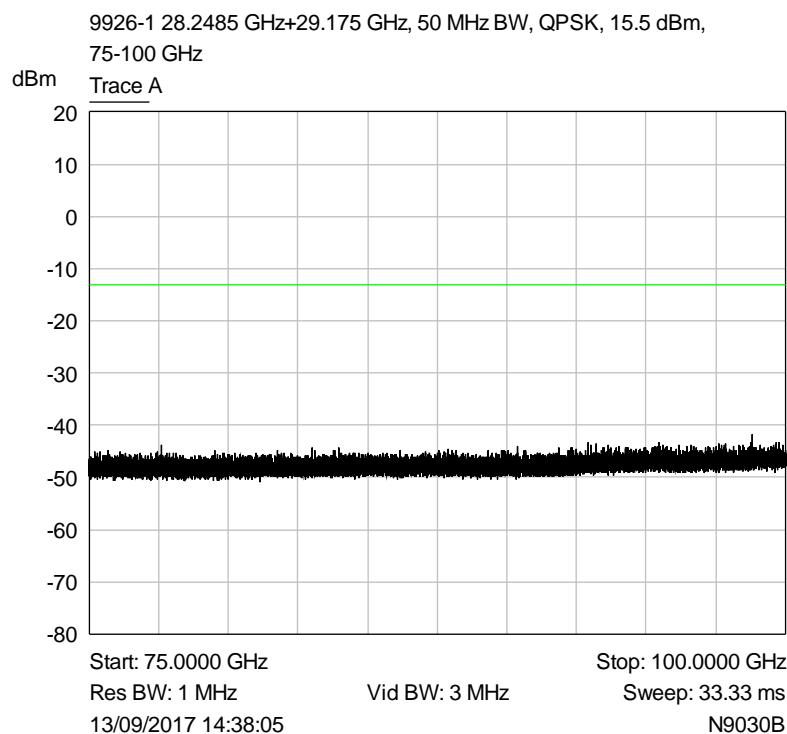




RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 28248.5 (with 29175 on) MHz







6.2 Occupied bandwidth

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 (with 282484.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 MHz

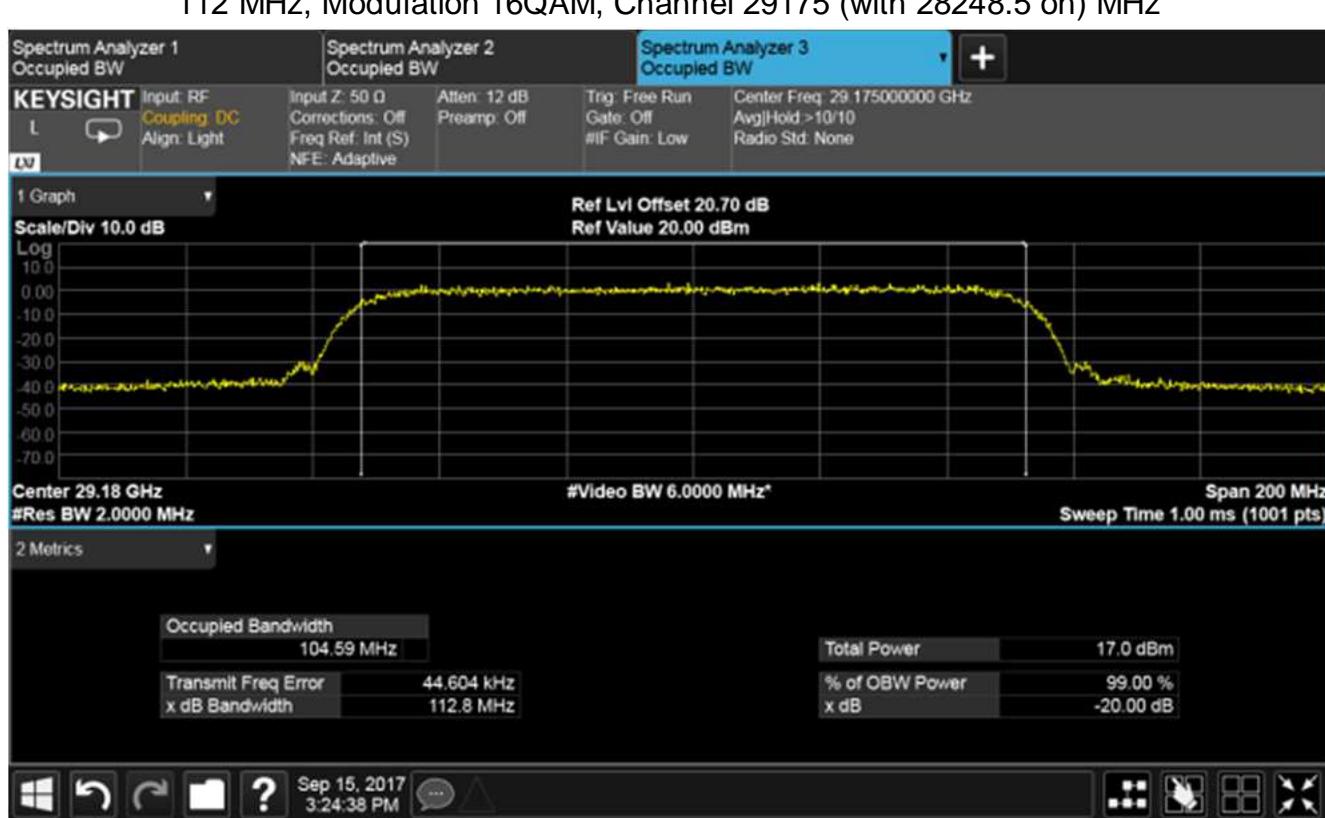


Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 (with 27604.5 on) MHz



RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 (with 28248.5 on) MHz



RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 MHz



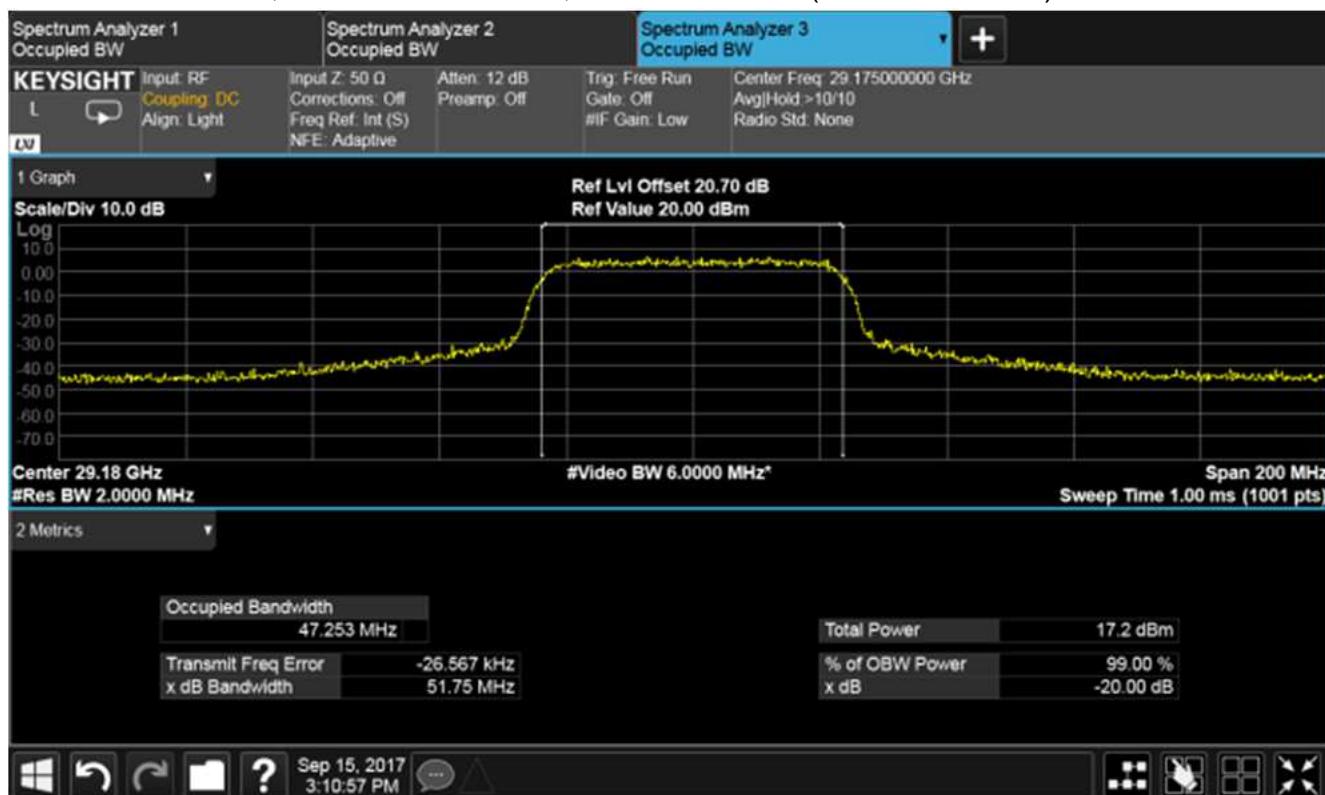
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 (with 27604.5 on) MHz



RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 MHz



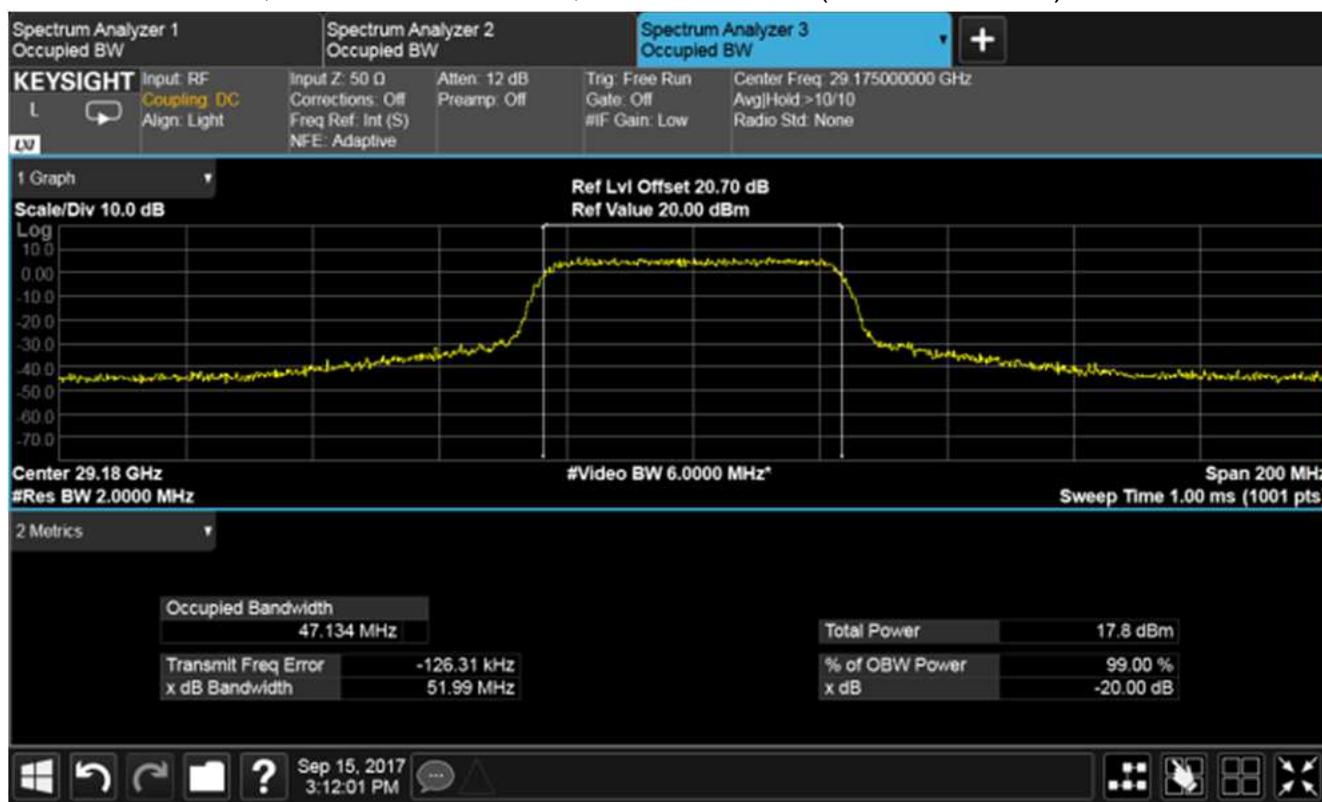
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 MHz



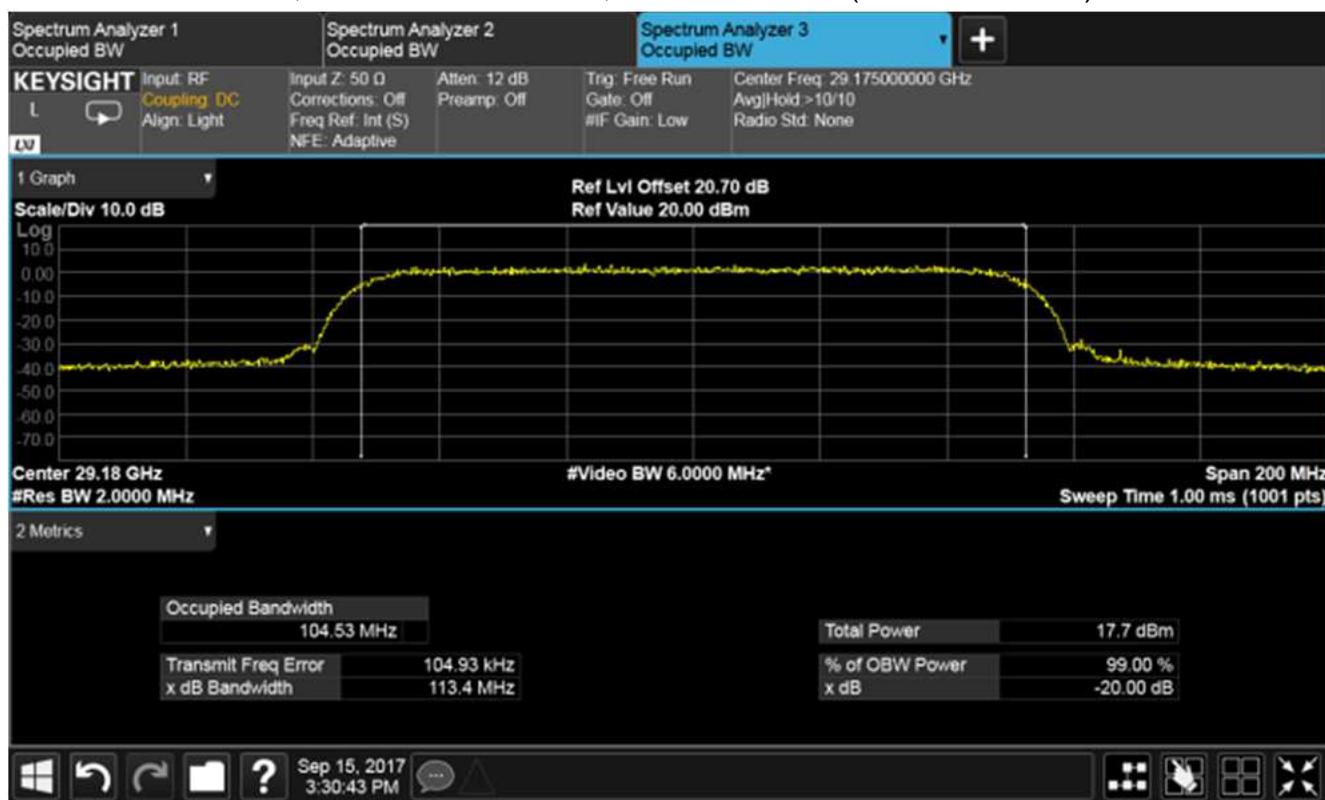
Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 (with 27604.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

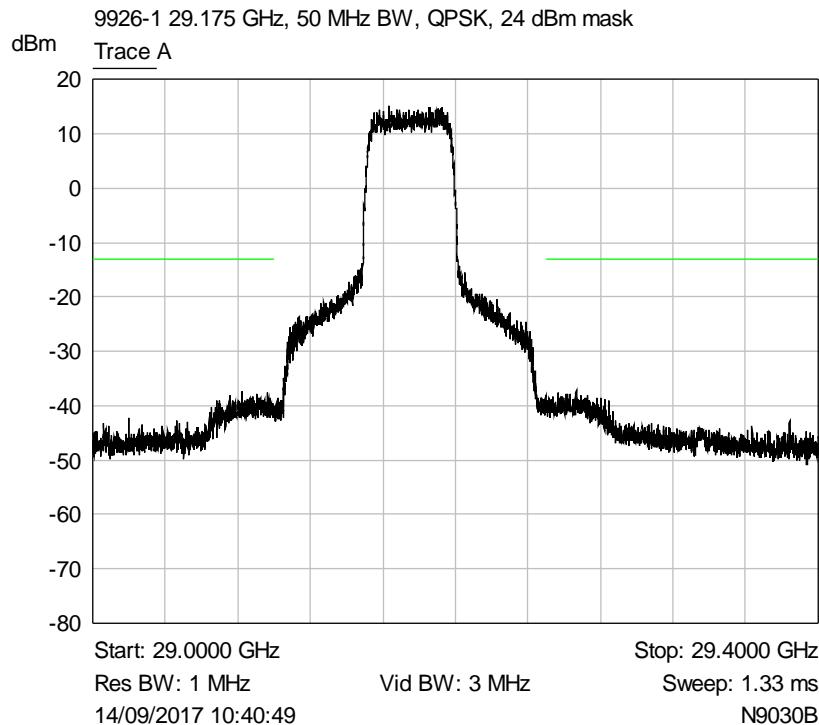
RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 (with 28248.5 on) MHz



Plot for 99 % Bandwidth (MHz) Nominal Temp & Volts

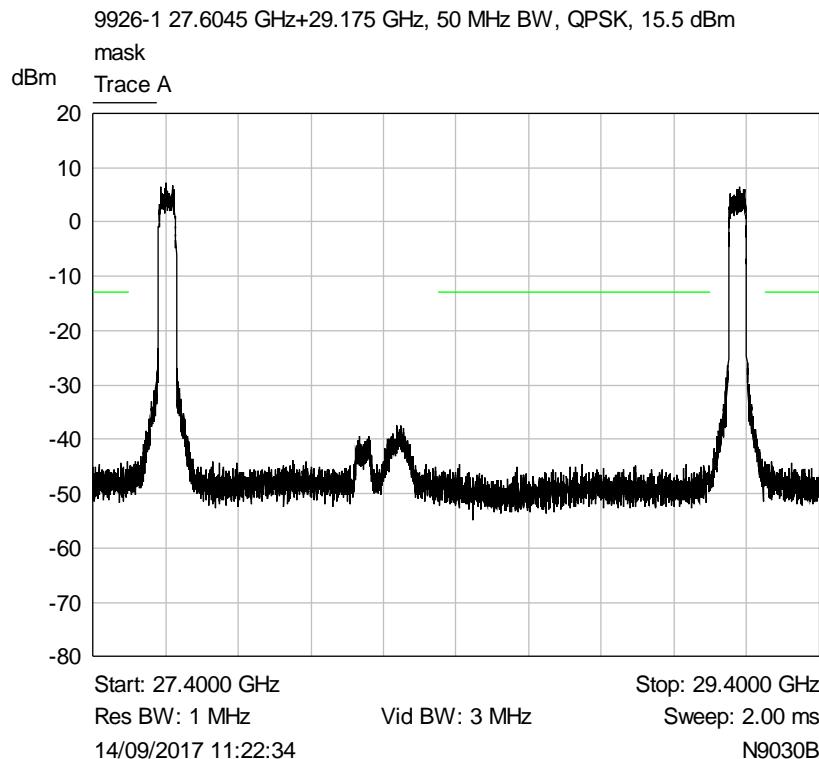
6.3 Band edge / spectrum mask additional emissions limitations

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 MHz



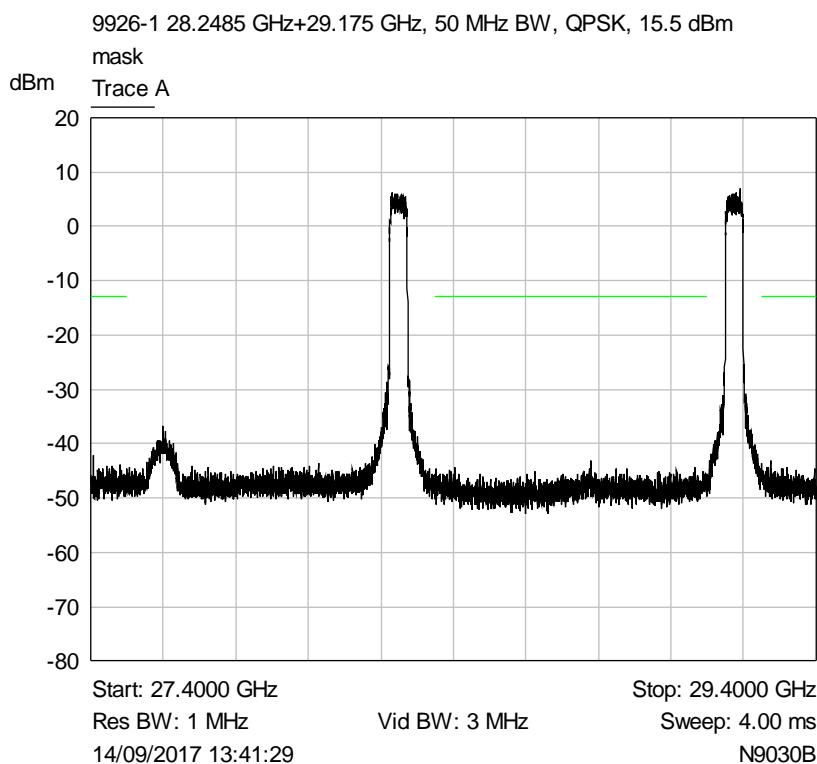
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 27604.5 (with 29175 on) MHz



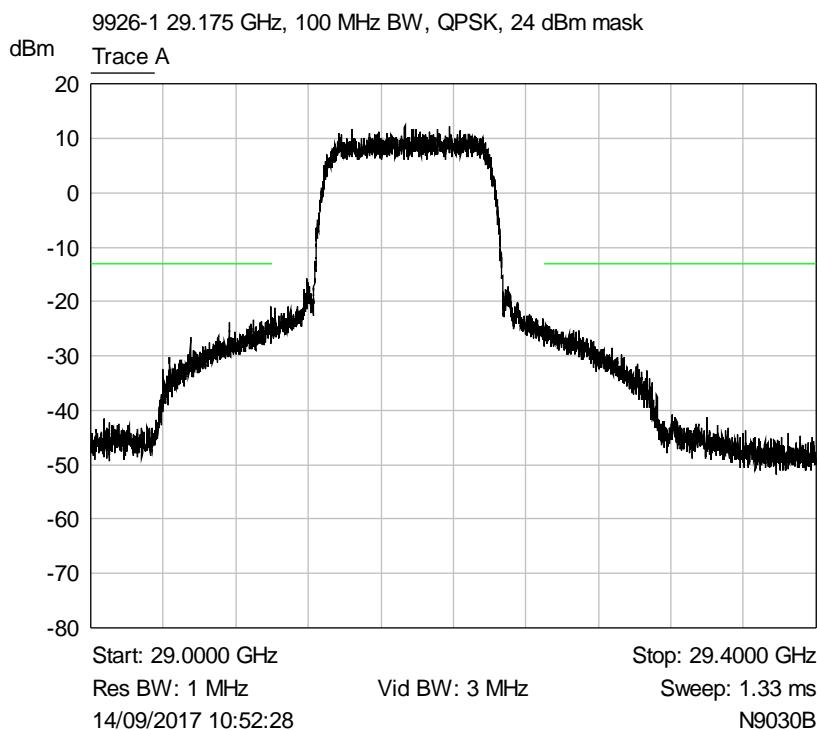
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 28248.5 (with 29175 on) MHz



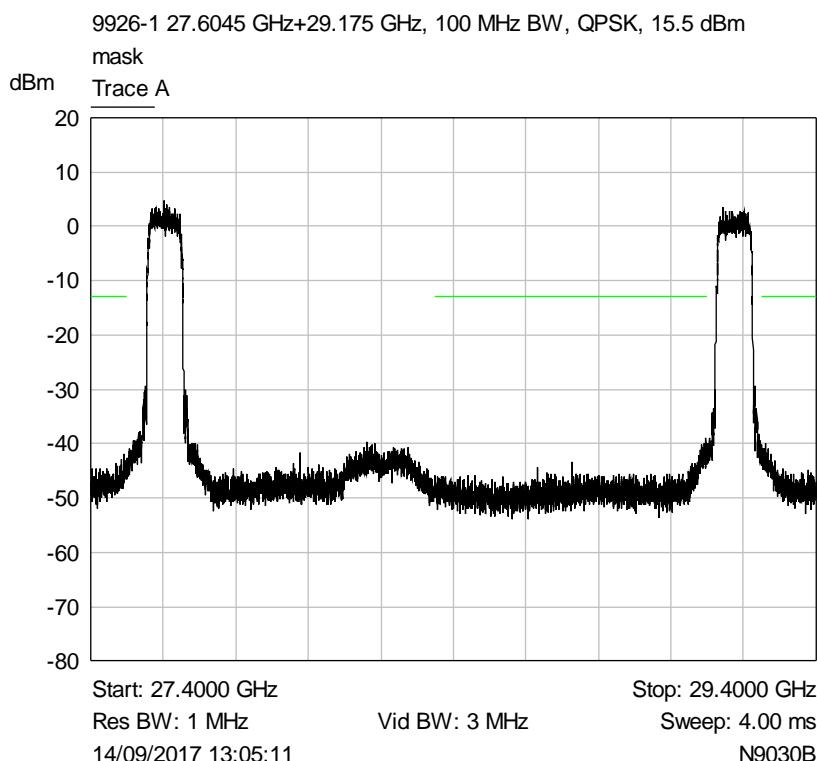
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 MHz



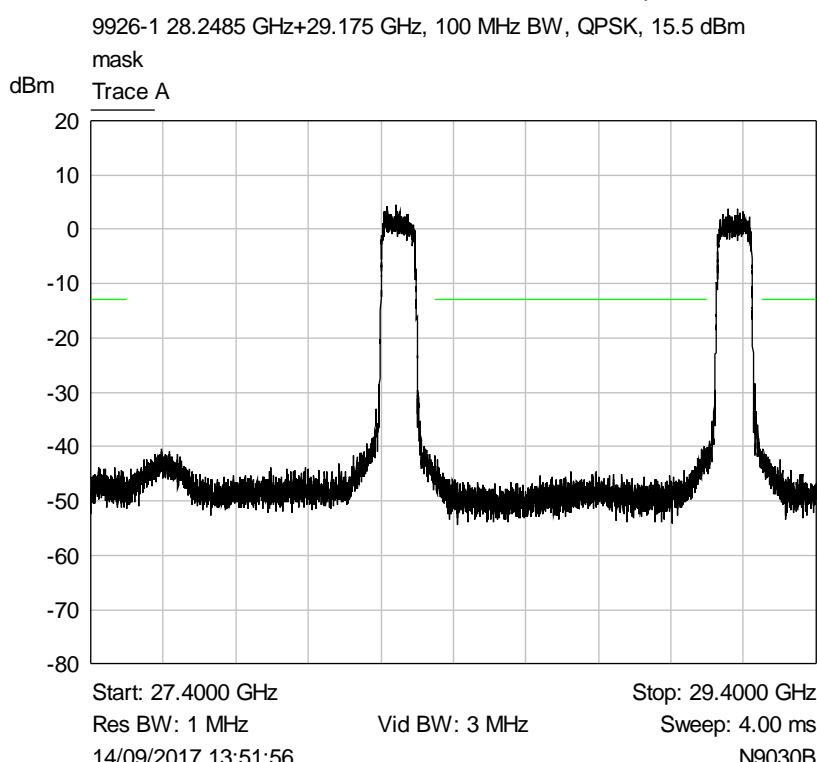
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 27604.5 (with 29175 on) MHz



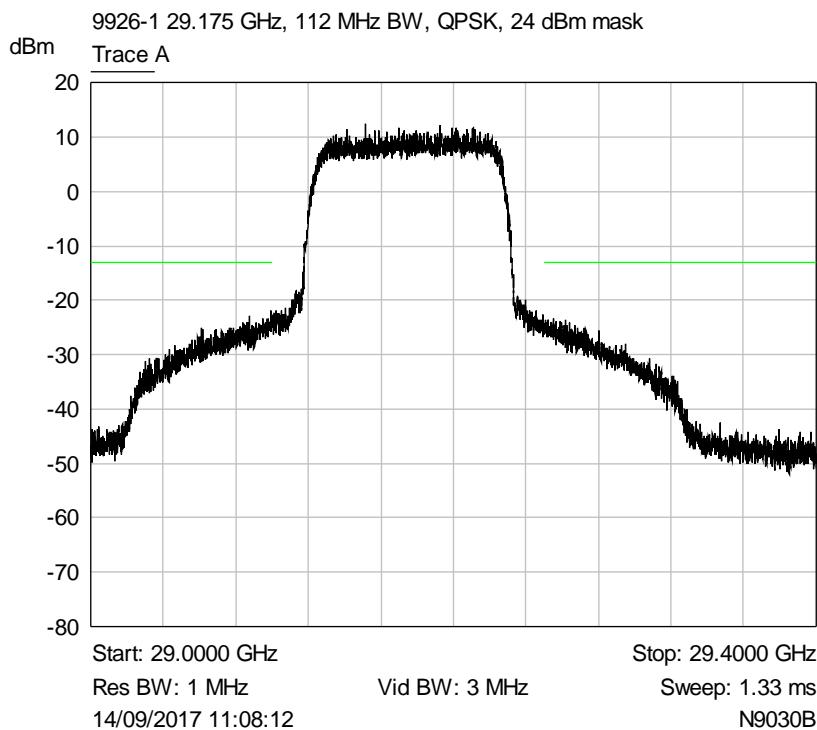
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 28248.5 (with 29175 on) MHz



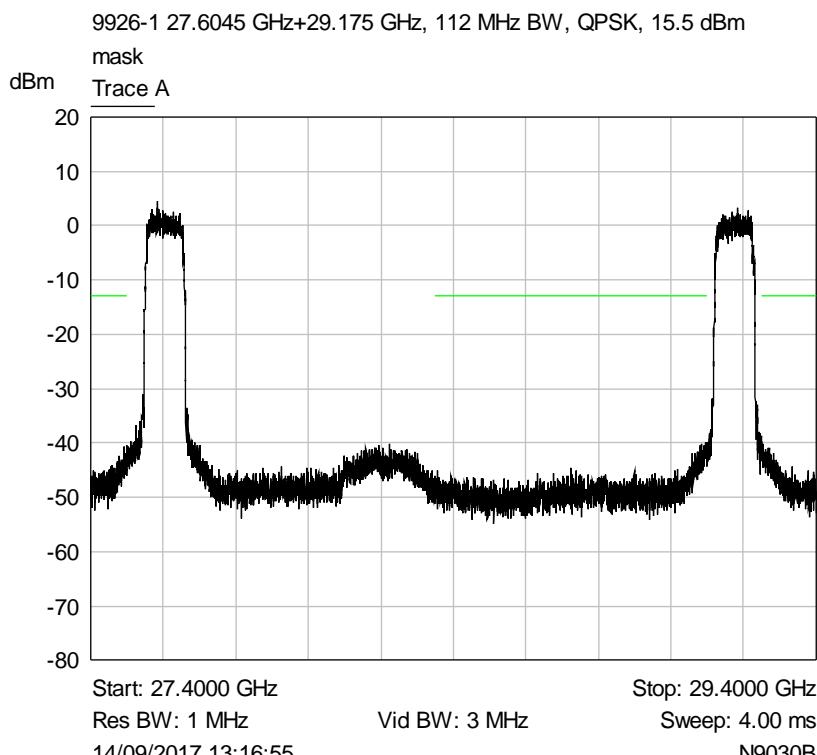
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 MHz



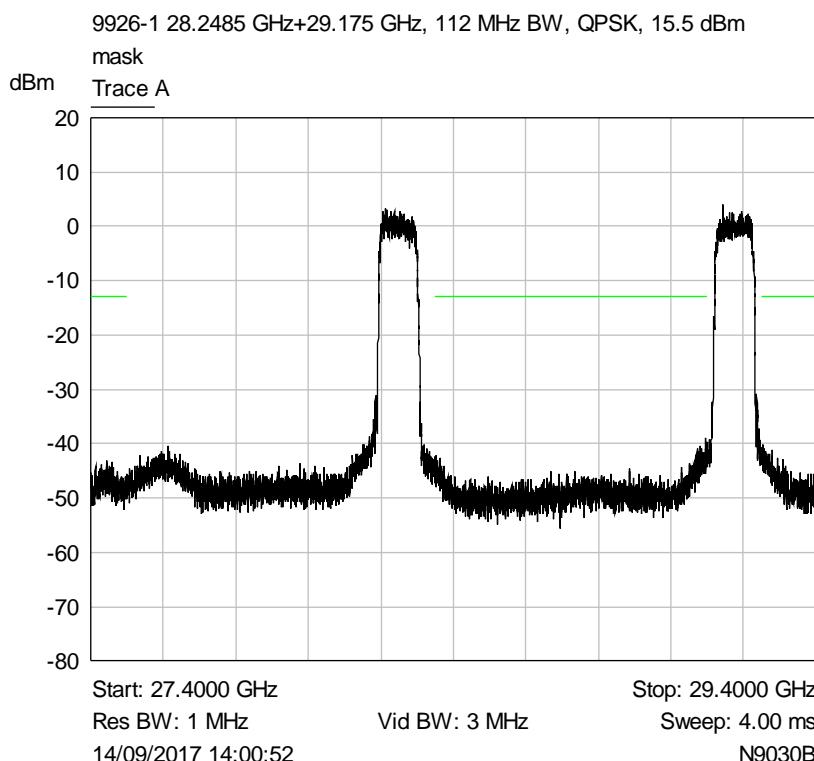
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 27604.5 (with 29175 on) MHz



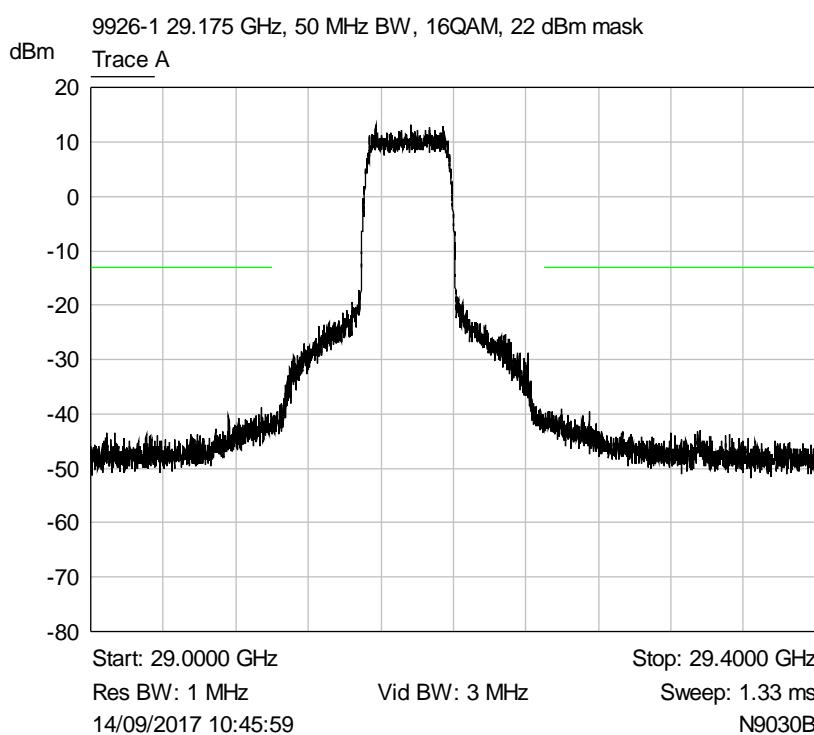
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 28248.5 (with 29175 on) MHz



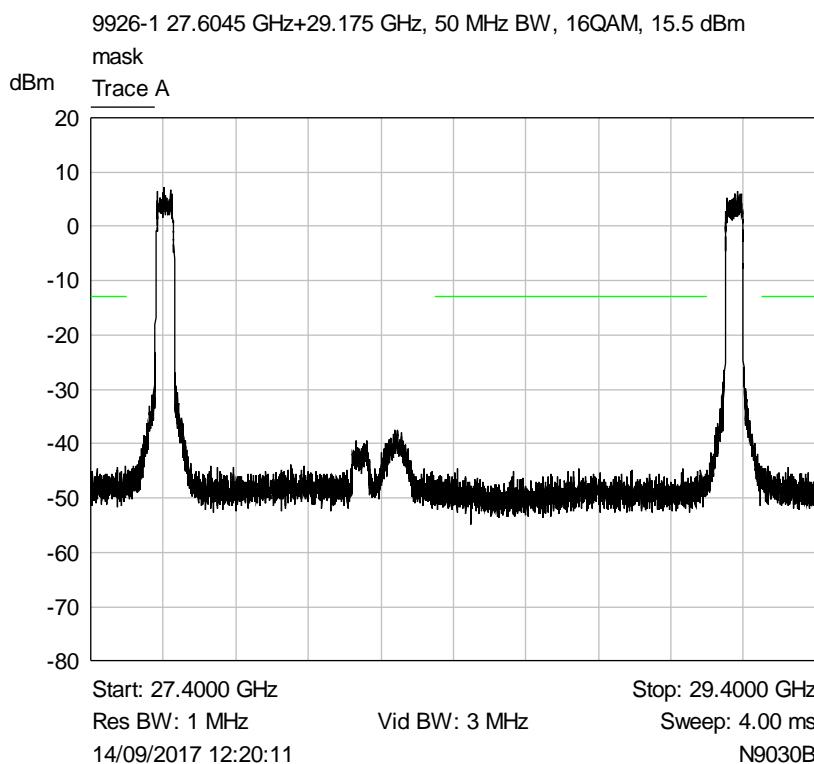
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 MHz



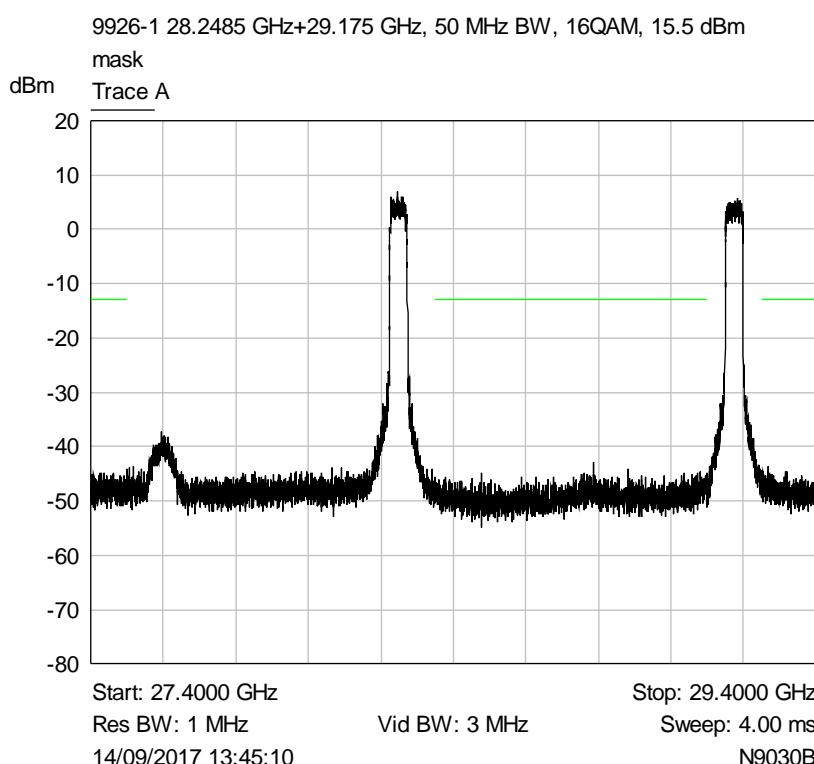
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 27604.5 (with 29175 on) MHz



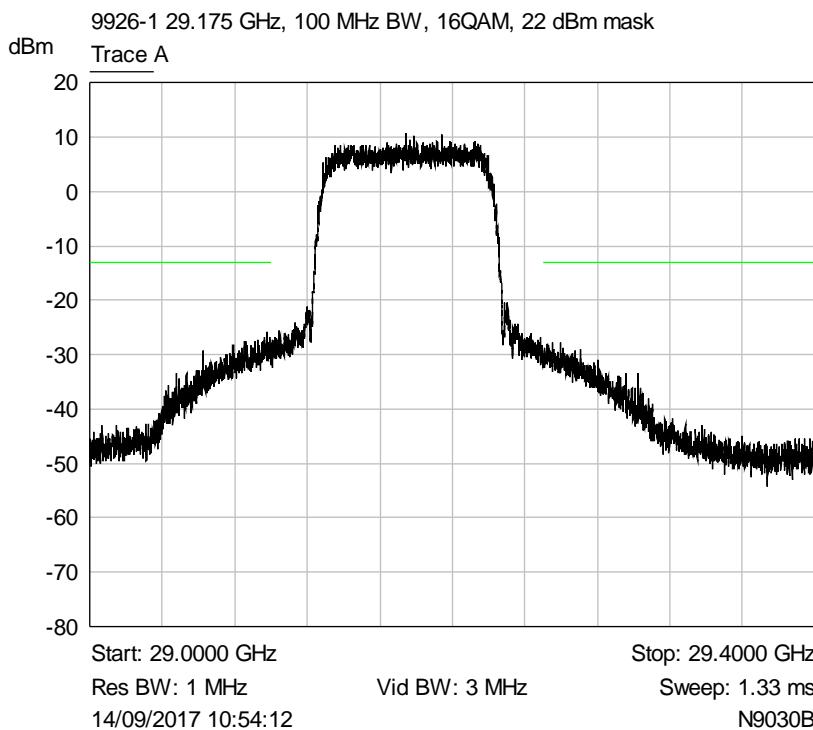
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 28248.5 (with 29175 on) MHz



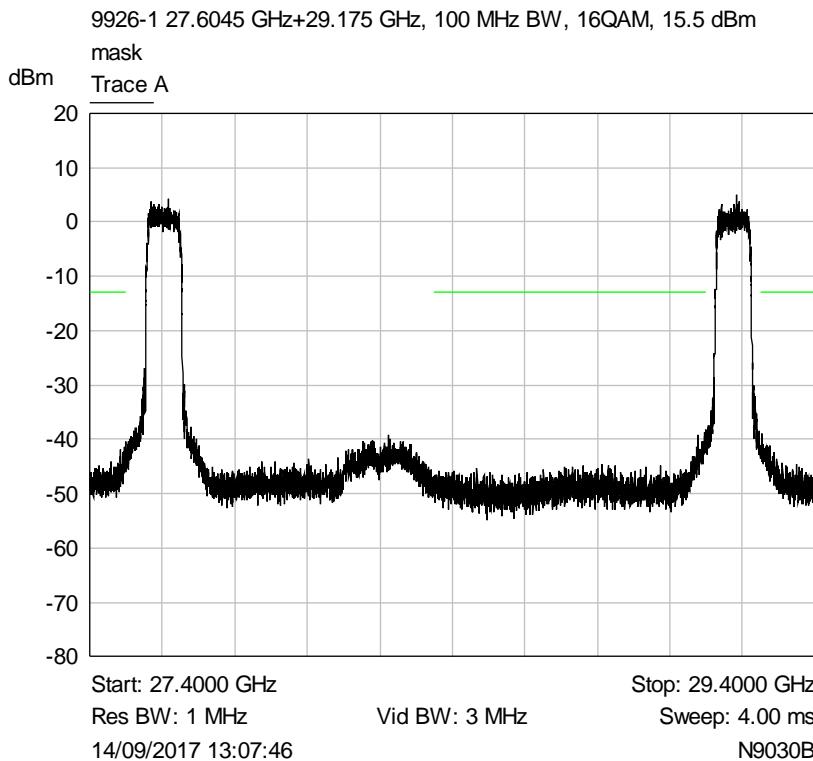
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 MHz



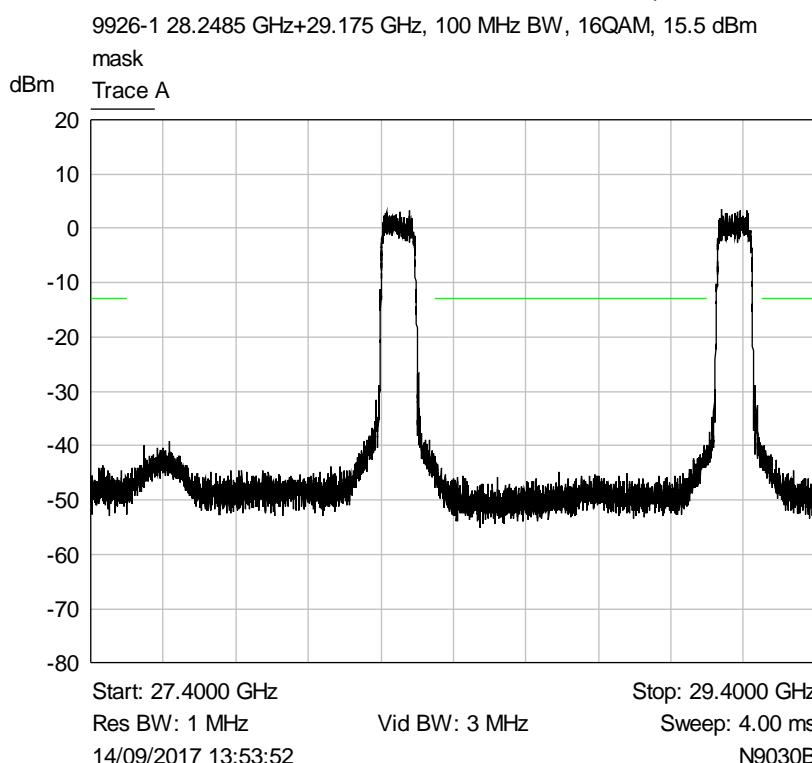
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 27604.5 (with 29175 on) MHz



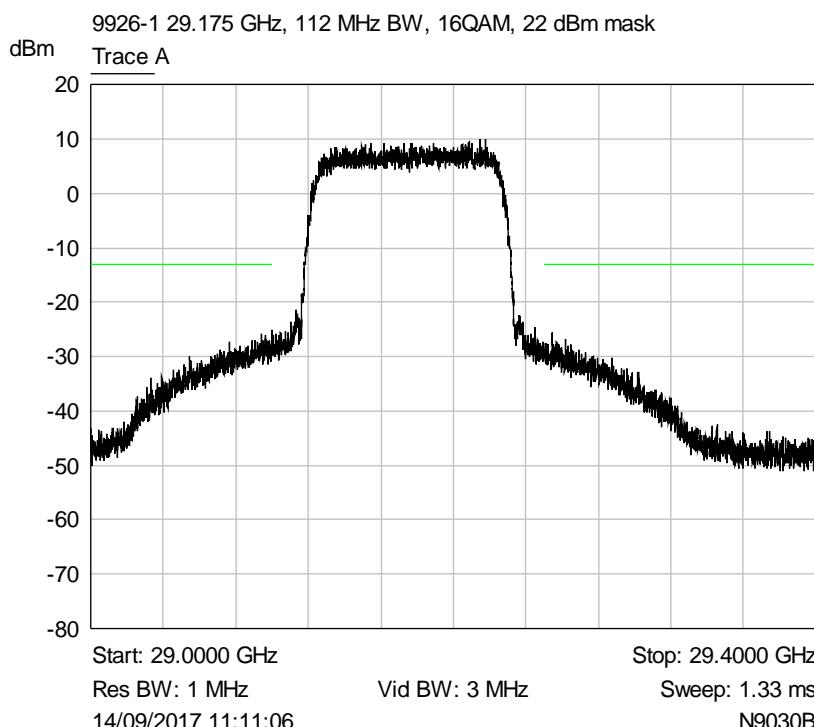
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 28248.5 (with 29175 on) MHz



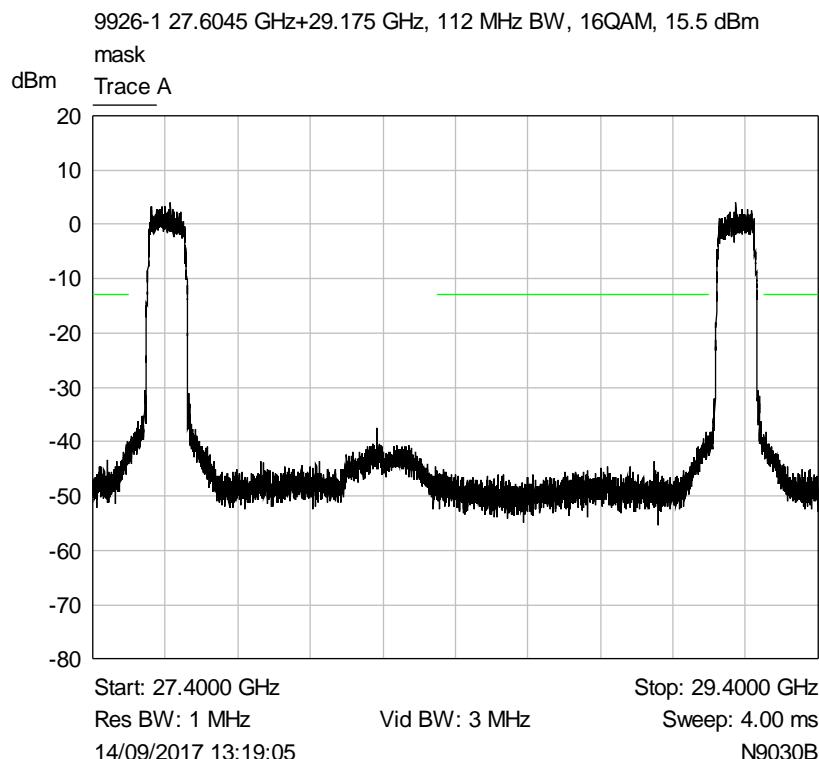
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 MHz



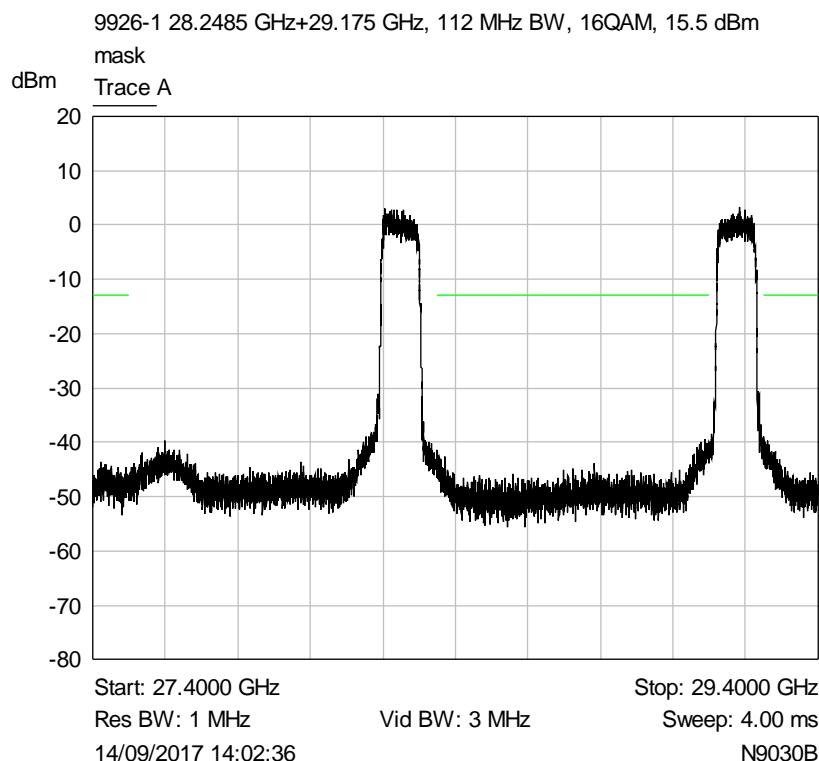
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 27604.5 (with 29175 on) MHz



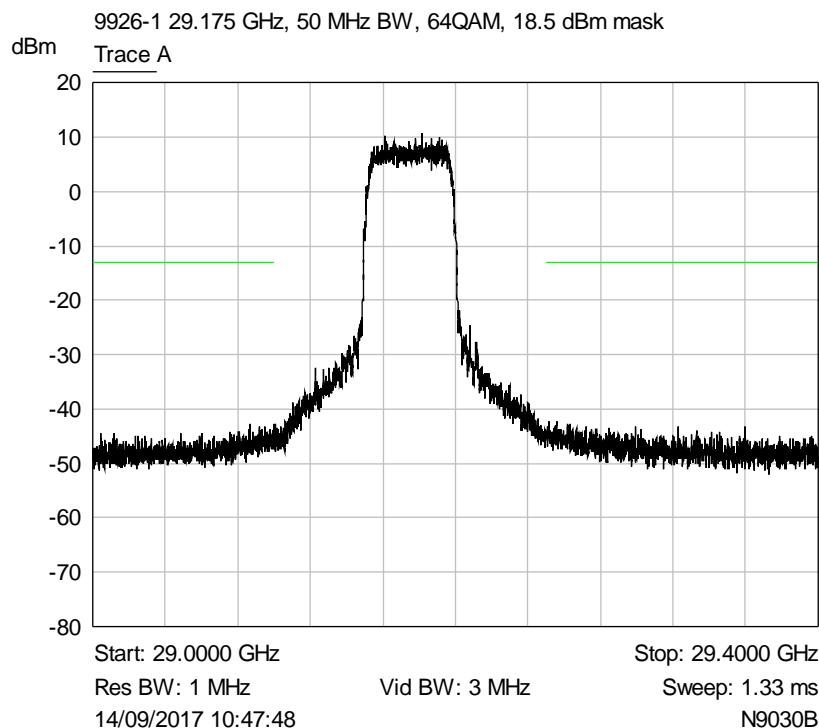
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 28248.5 (with 29175 on) MHz



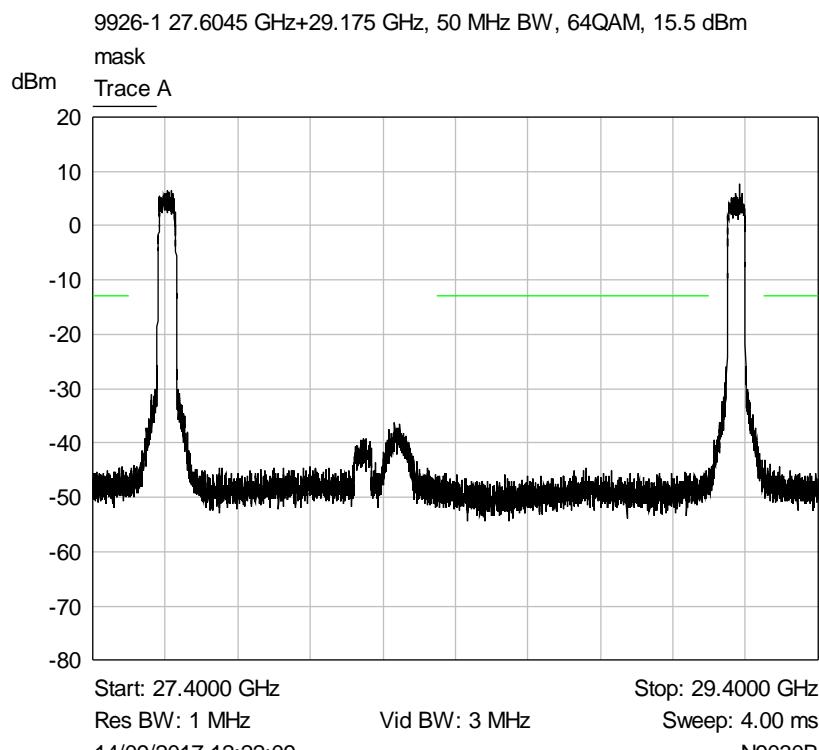
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 MHz



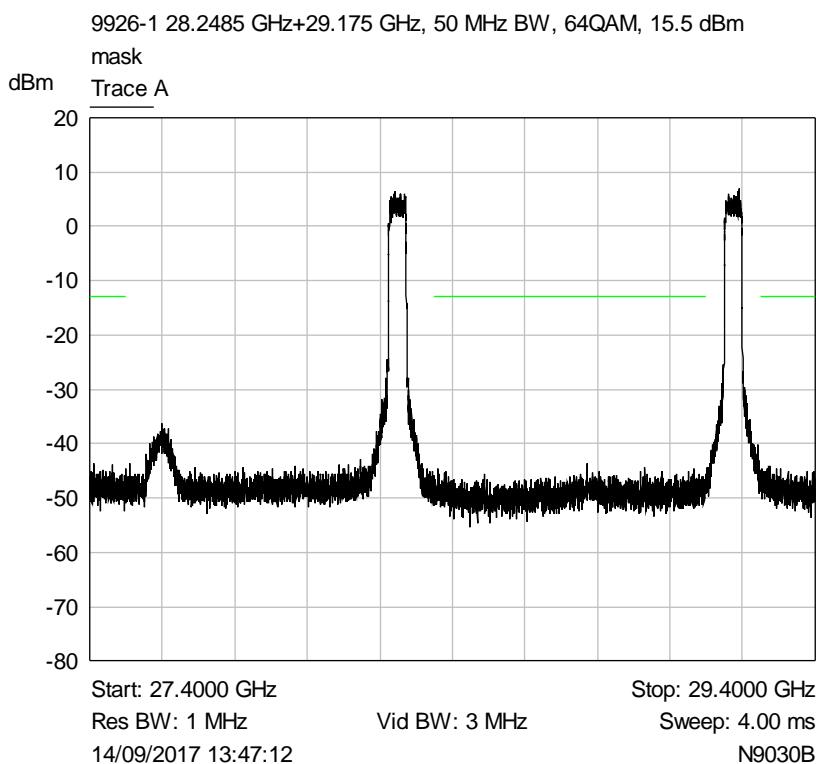
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 27604.5 (with 29175 on) MHz



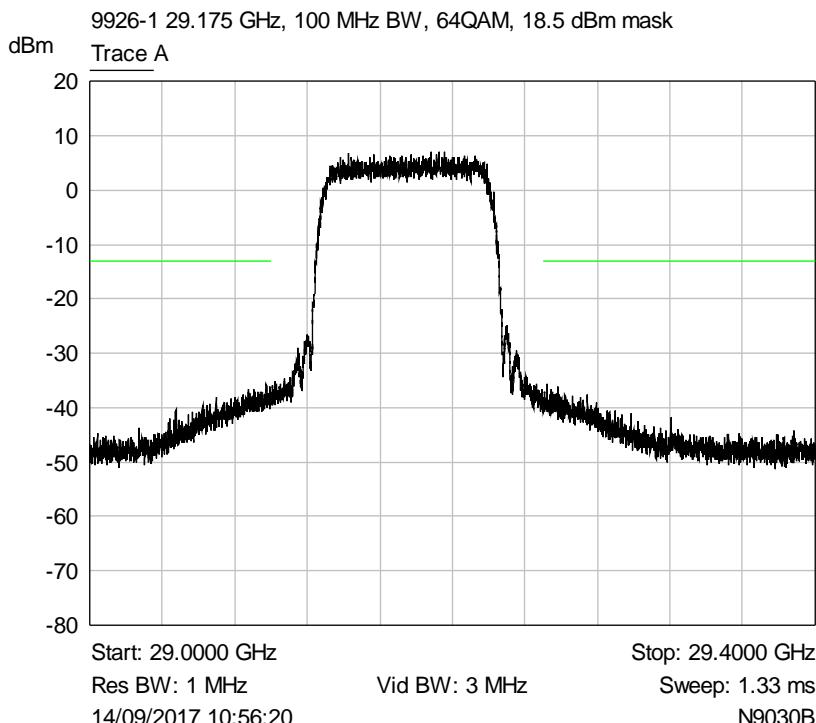
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 28248.5 (with 29175 on) MHz



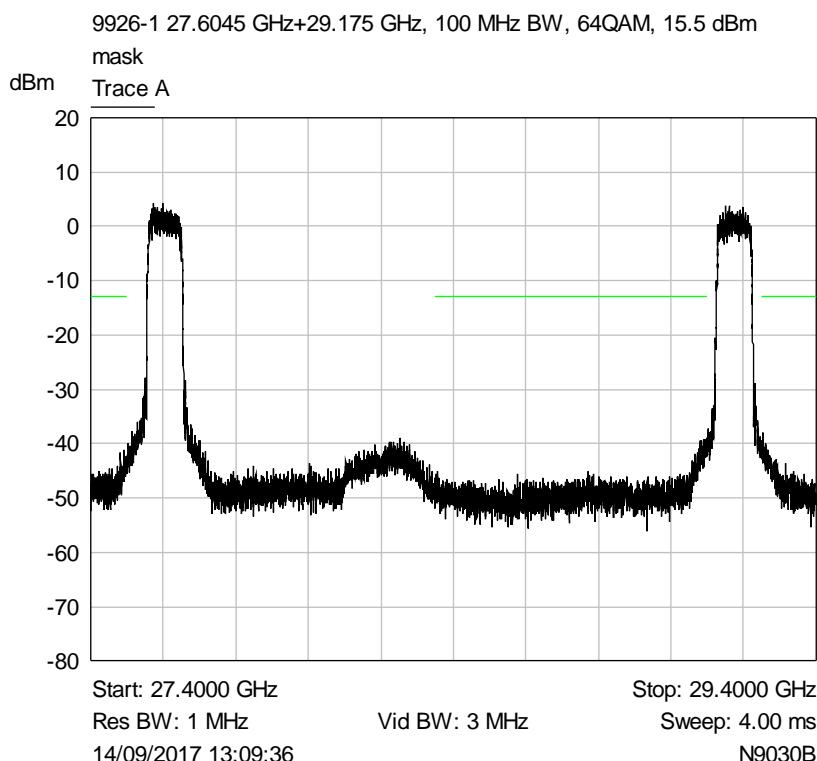
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 MHz



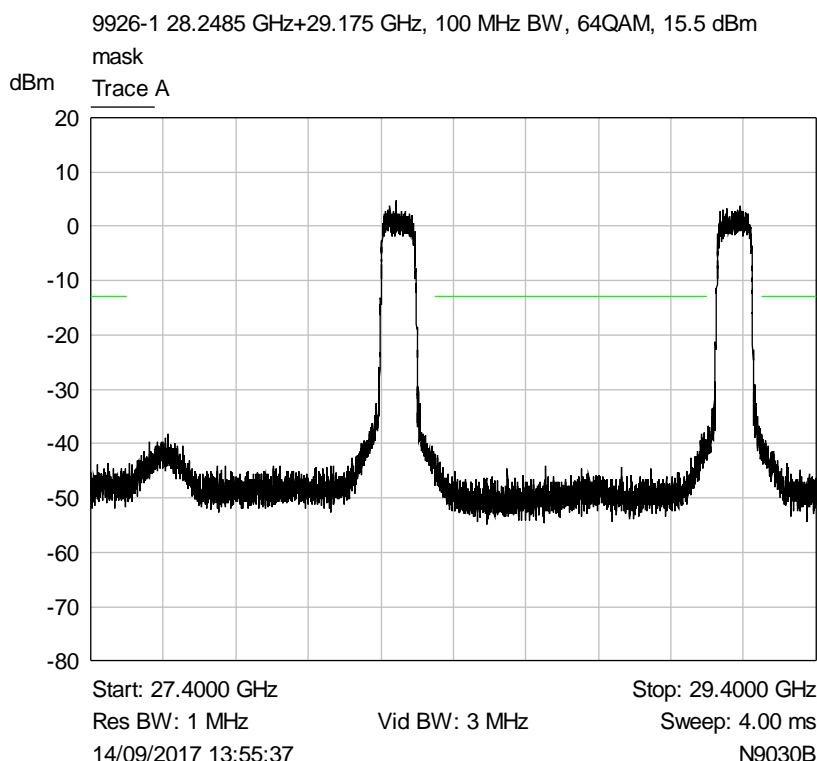
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 27604.5 (with 29175 on) MHz



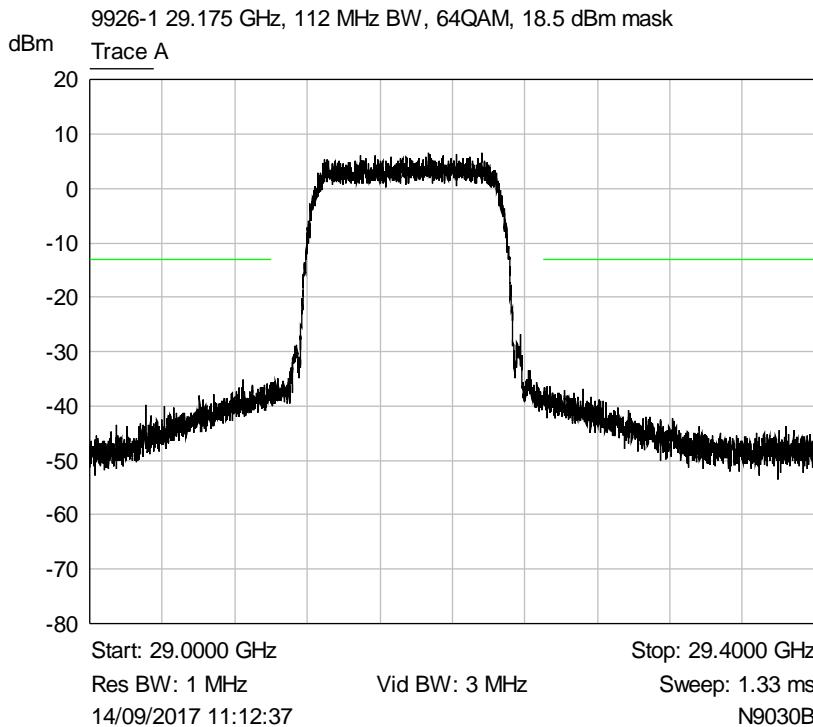
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 28248.5 (with 29175 on) MHz



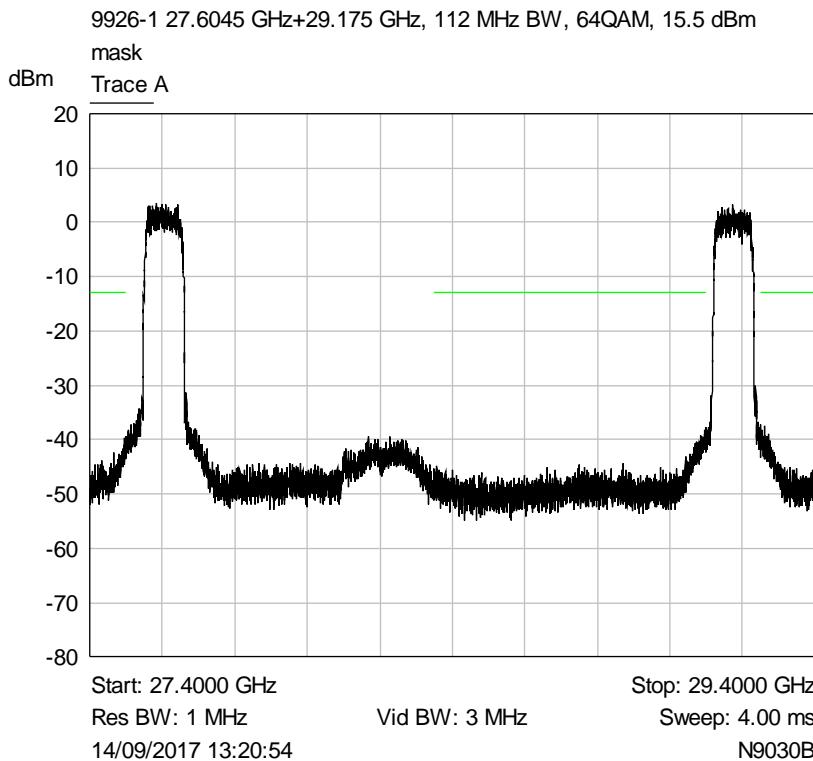
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 MHz



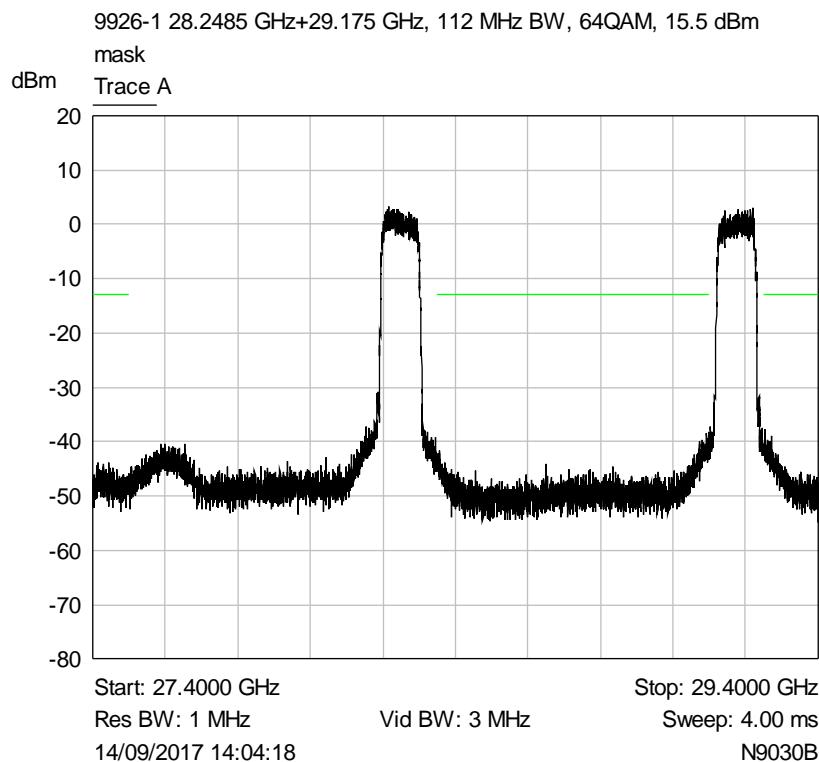
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 27604.5 (with 29175 on) MHz



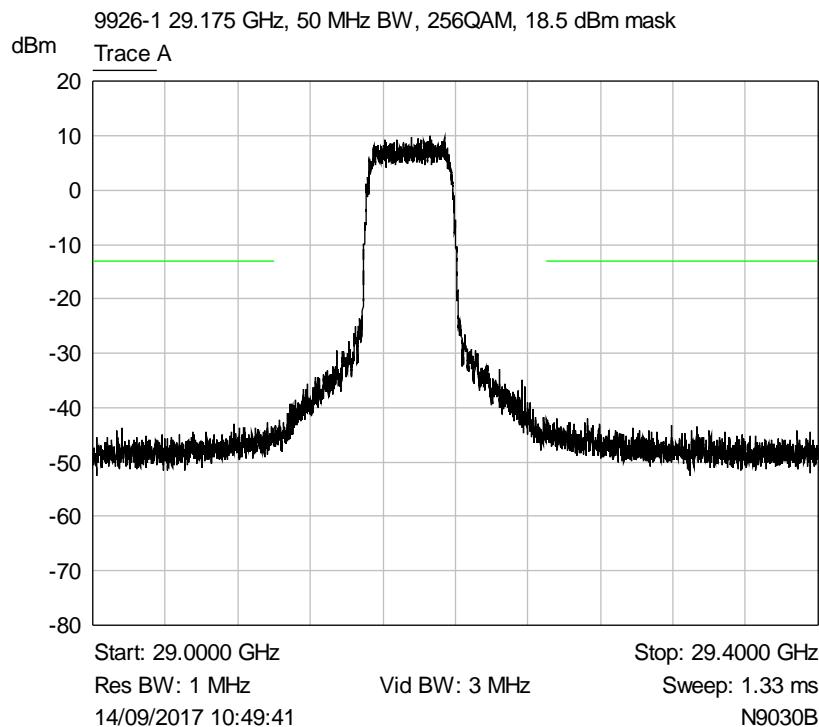
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 28248.5 (with 29175 on) MHz

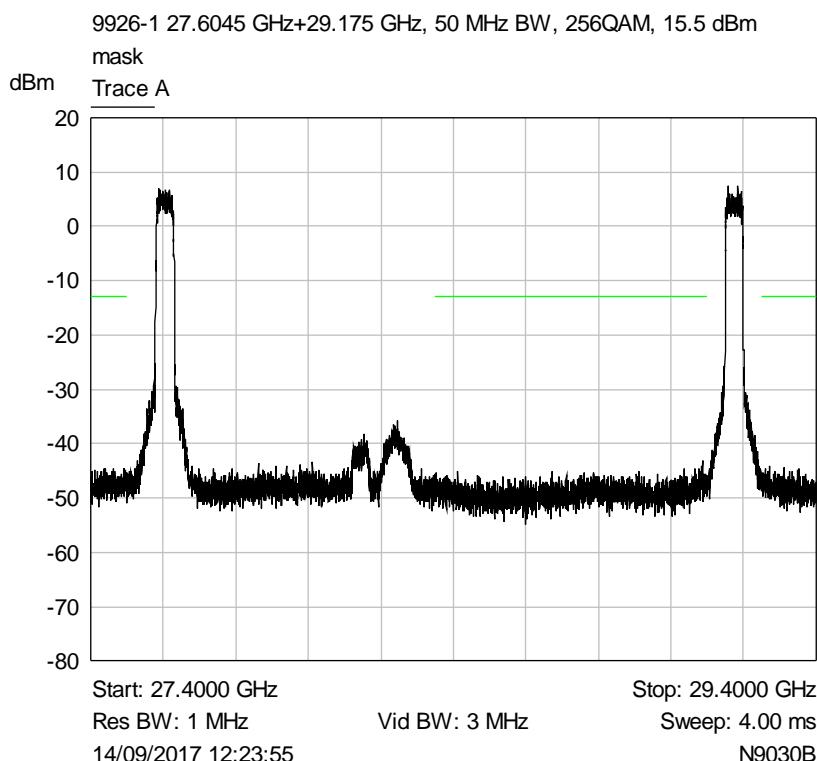


Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 MHz

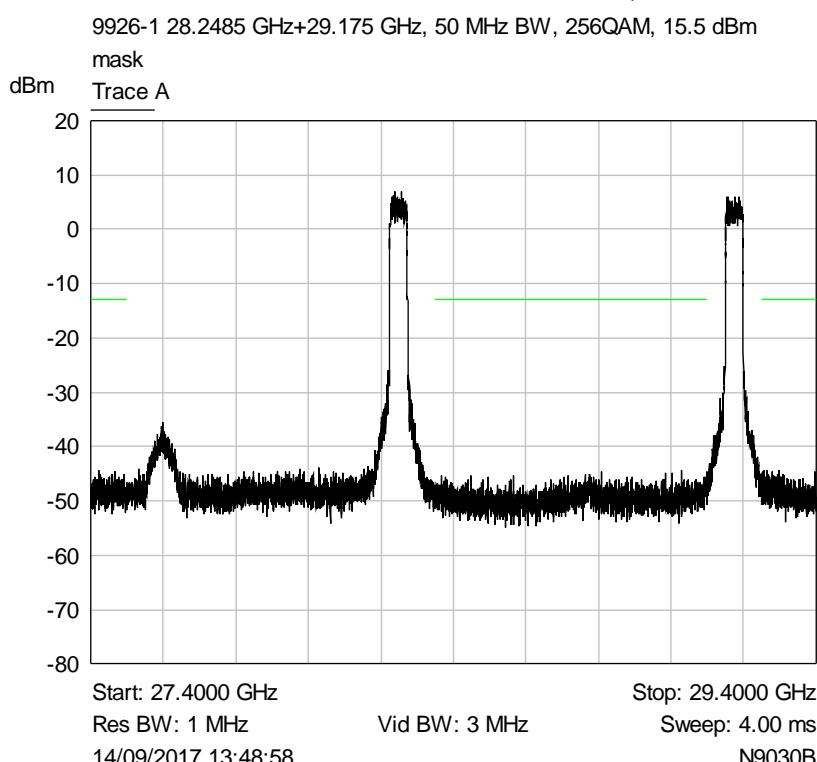


RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 27604.5 (with 29175 on) MHz



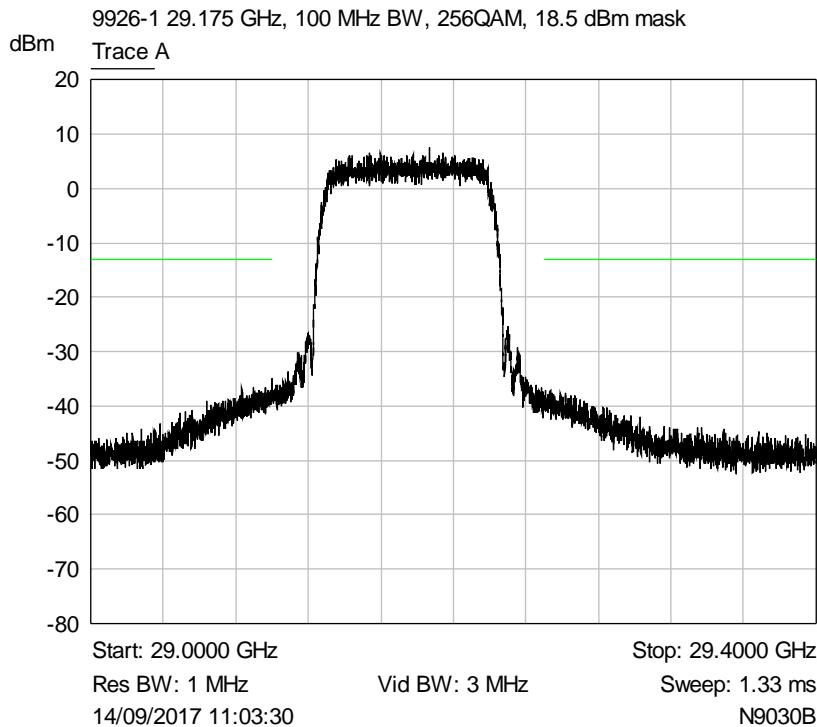
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 28248.5 (with 29175 on) MHz



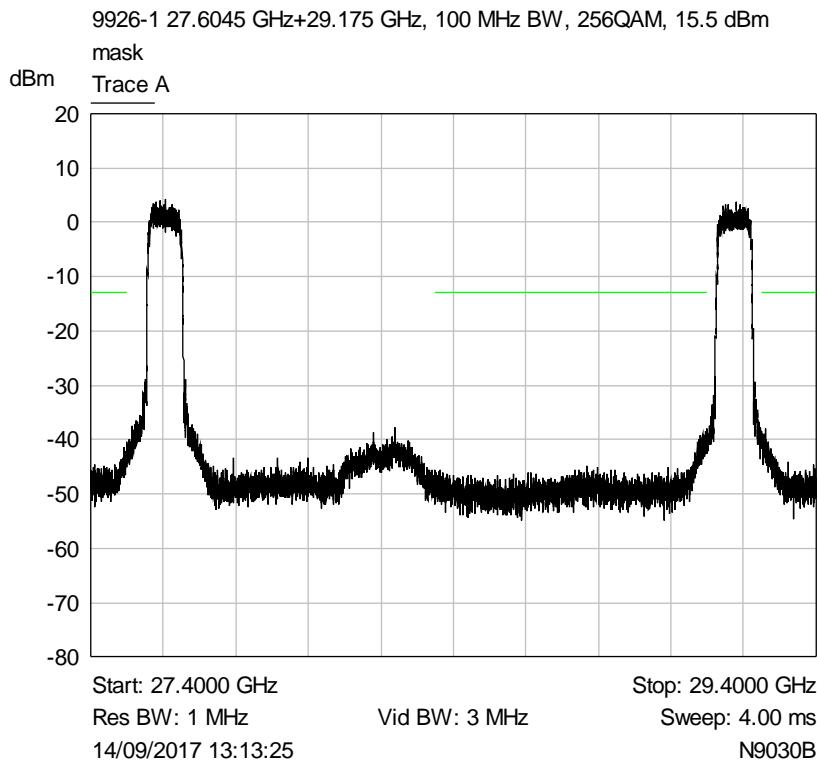
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 MHz



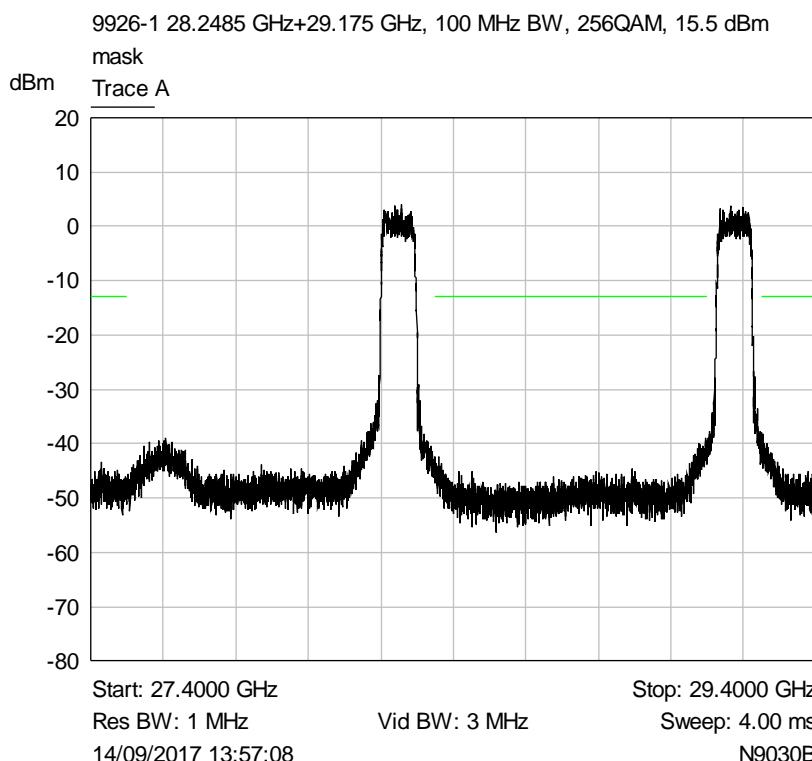
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 27604.5 (with 29175 on) MHz



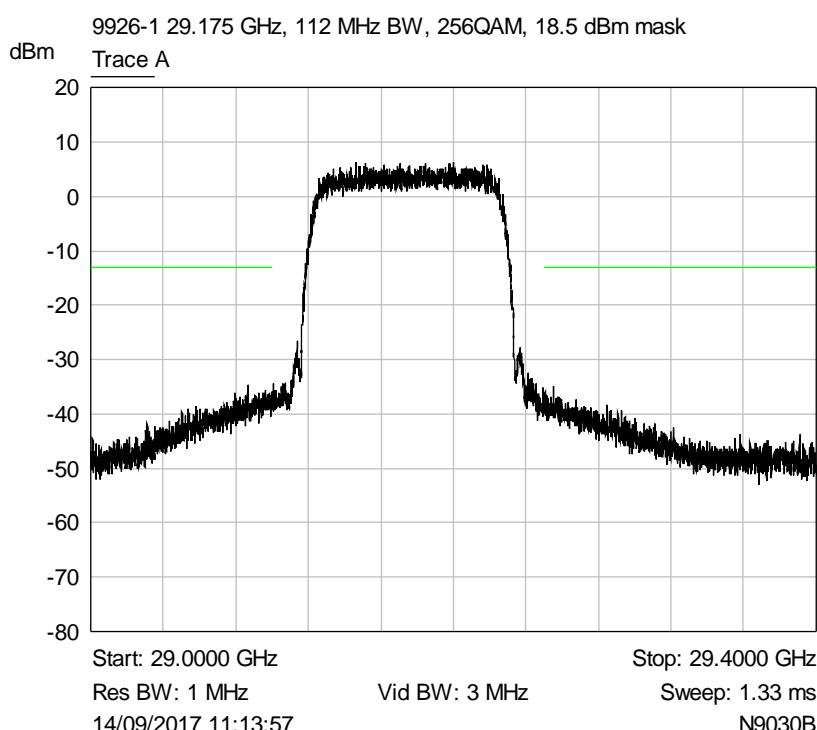
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 28248.5 (with 29175 on) MHz



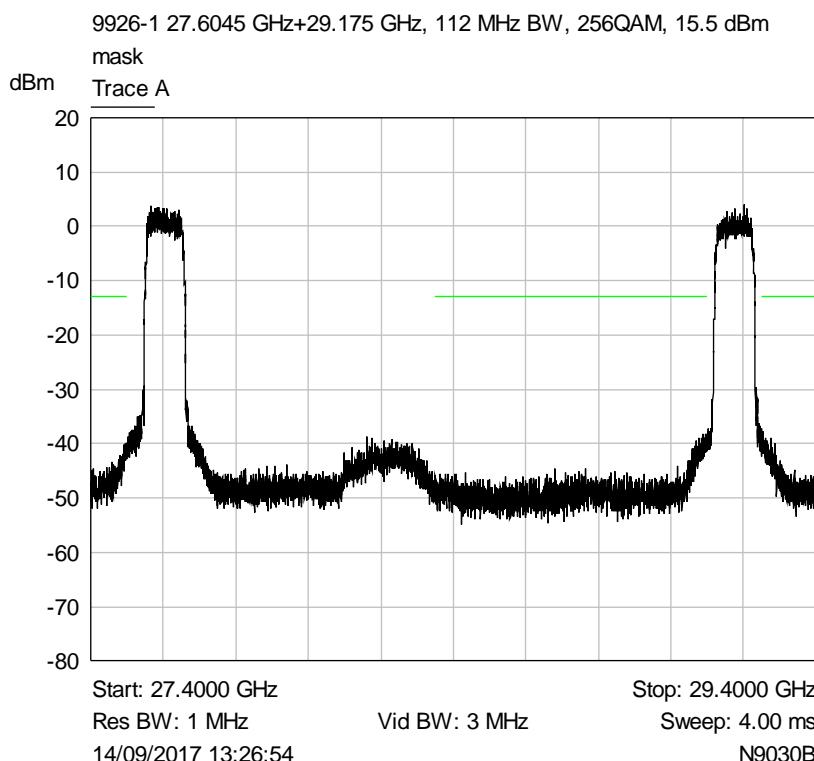
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 MHz



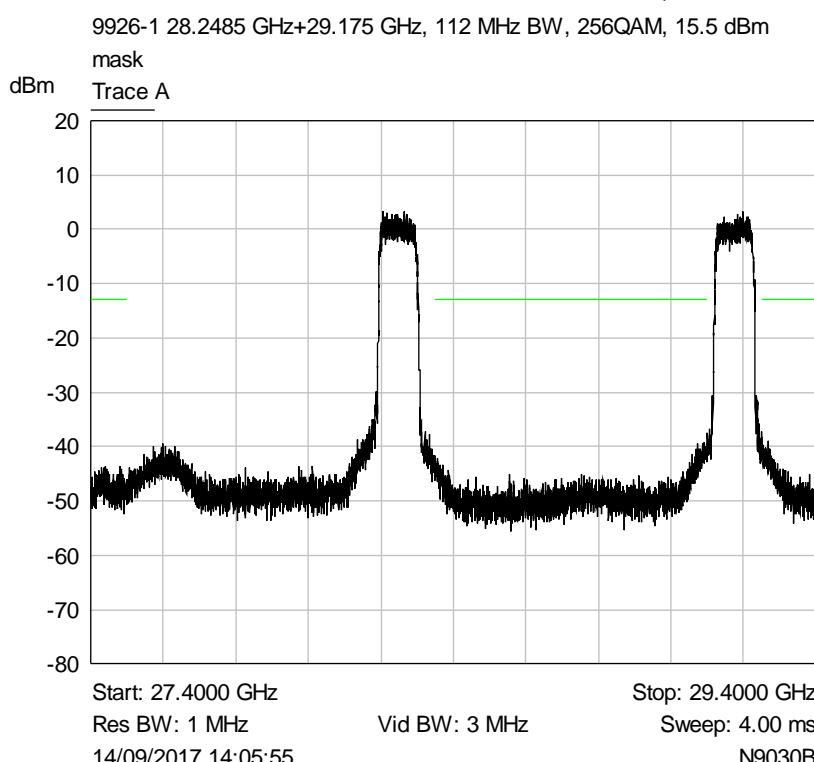
Nominal Temperature, Nominal Voltage

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 27604.5 (with 29175 on) MHz



Nominal Temperature, Nominal Voltage

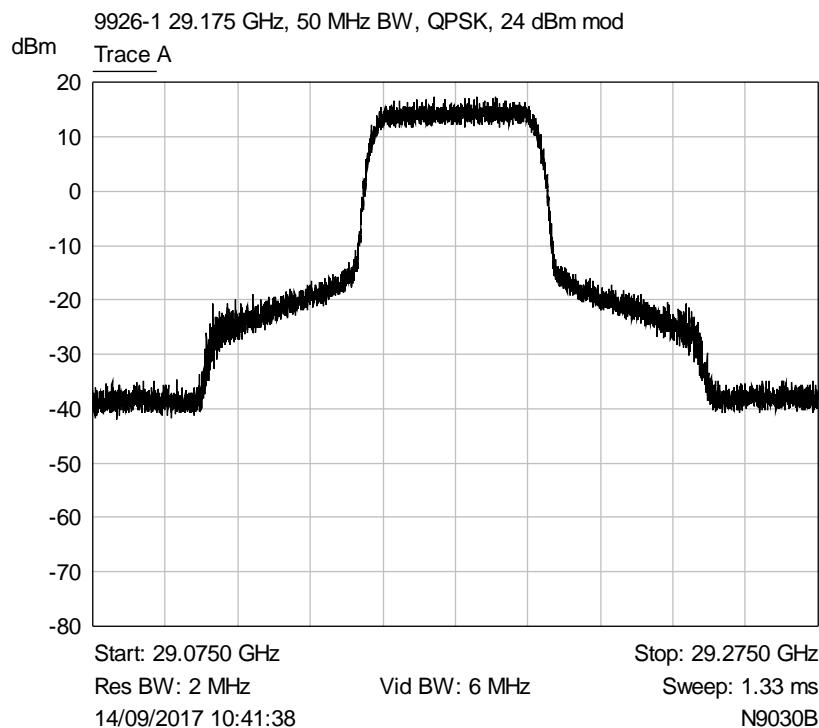
RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 28248.5 (with 29175 on) MHz



Nominal Temperature, Nominal Voltage

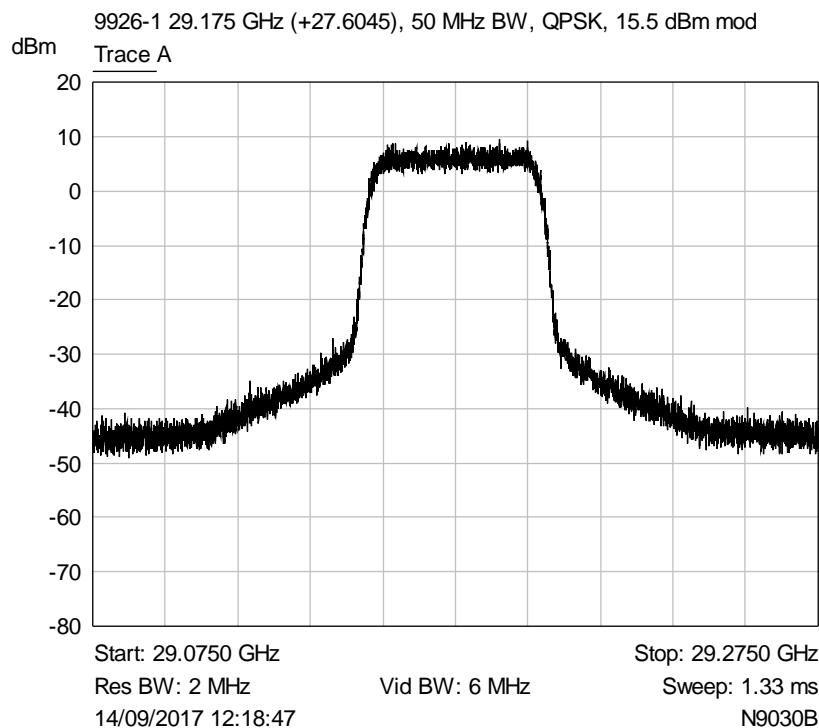
6.4 Modulation characteristics

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 MHz



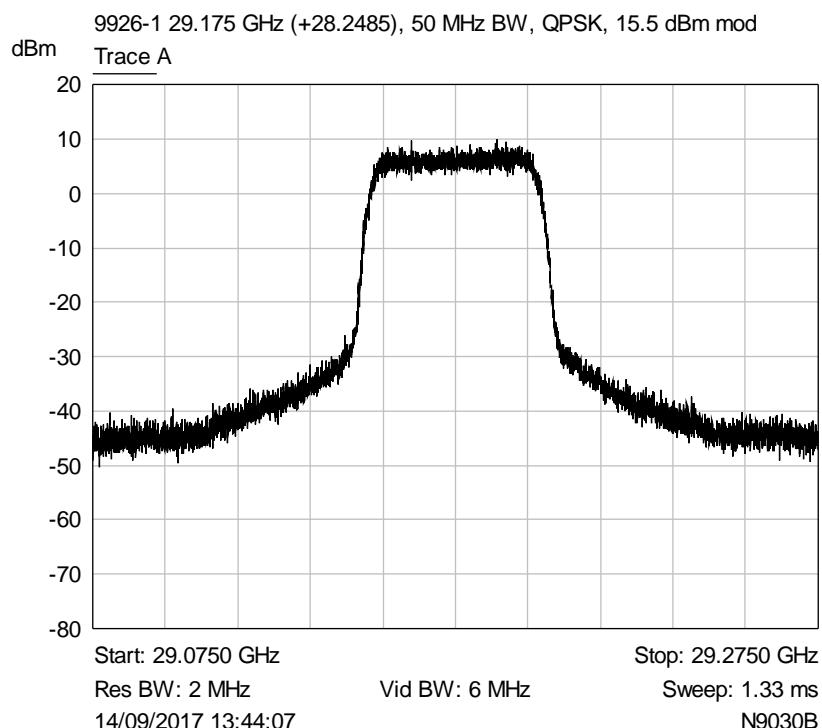
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 (with 27604.5 on) MHz



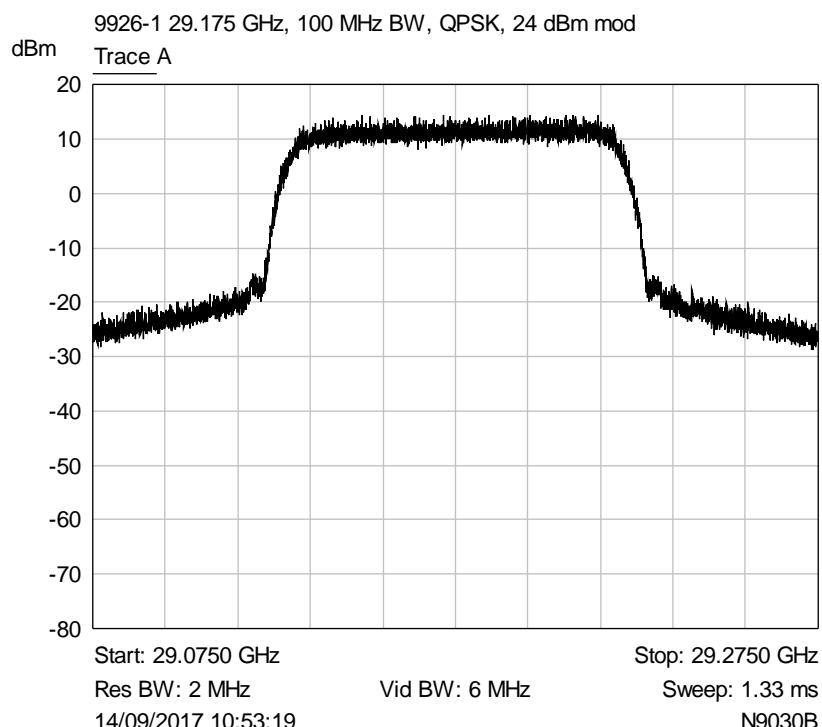
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation QPSK, Channel 29175 (with 28248.5 on) MHz



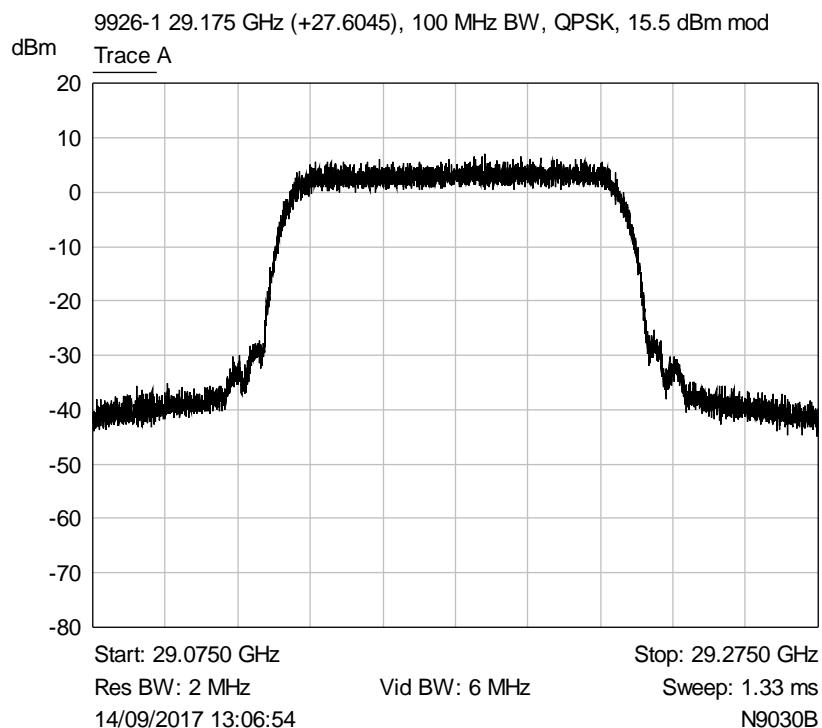
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 MHz



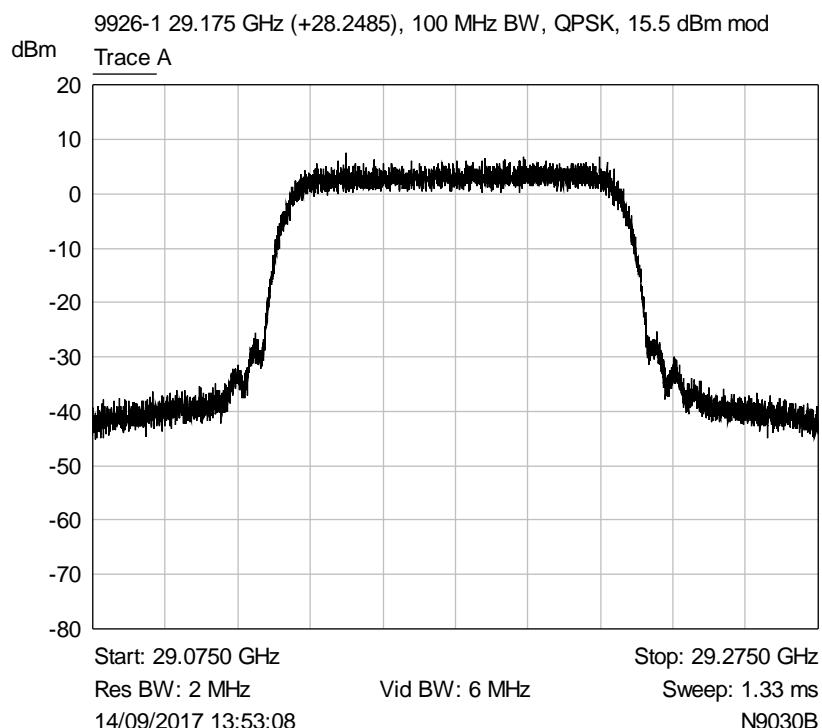
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 (with 27604.5 on) MHz



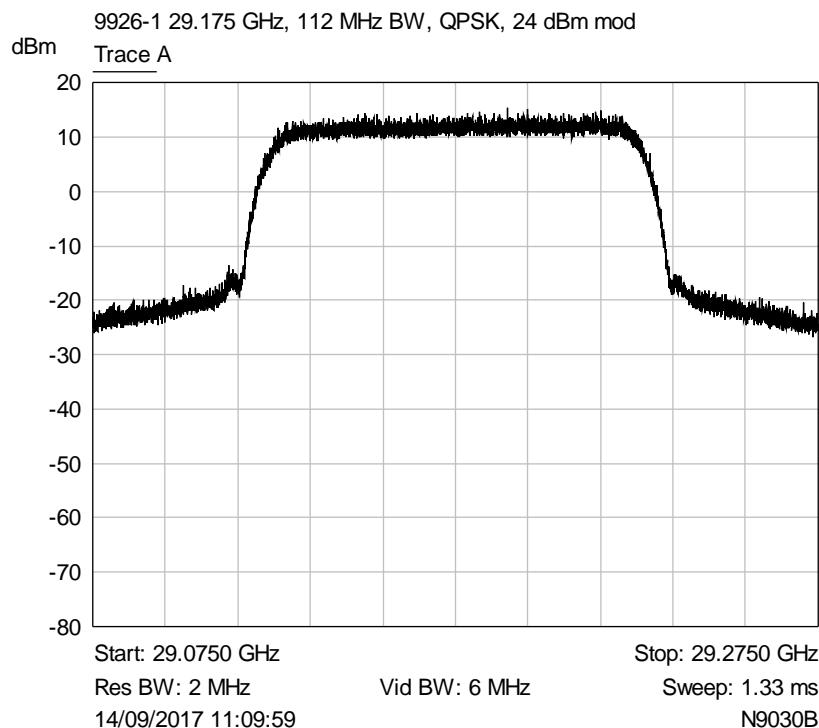
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation QPSK, Channel 29175 (with 28248.5 on) MHz



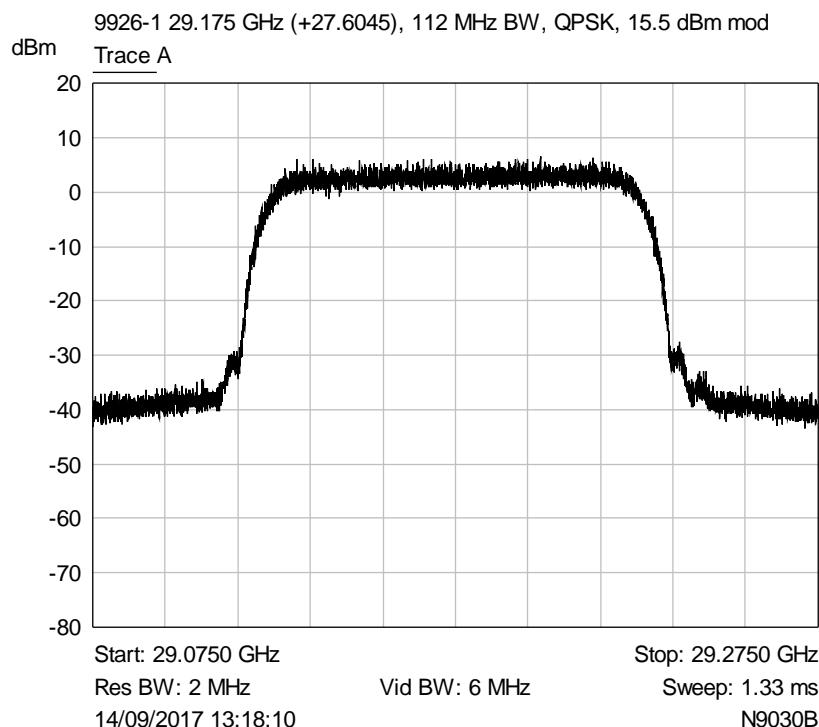
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 24 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 MHz



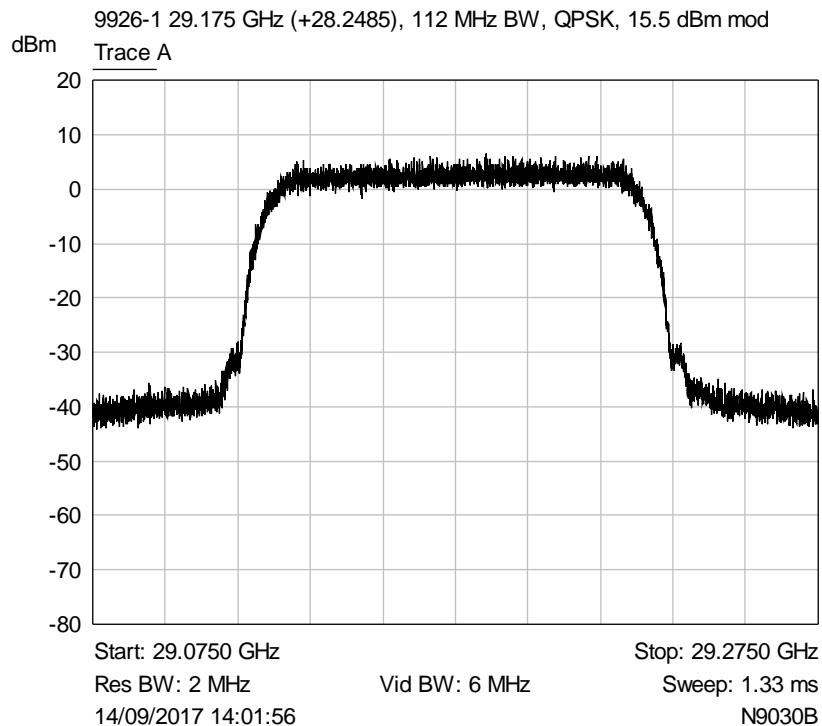
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 (with 27604.5 on) MHz



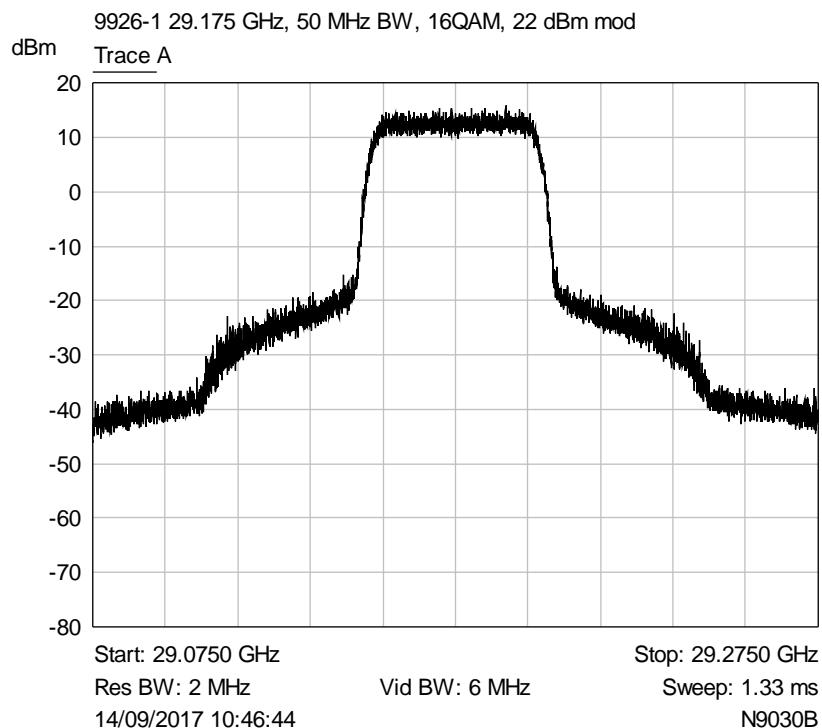
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation QPSK, Channel 29175 (with 28248.5 on) MHz



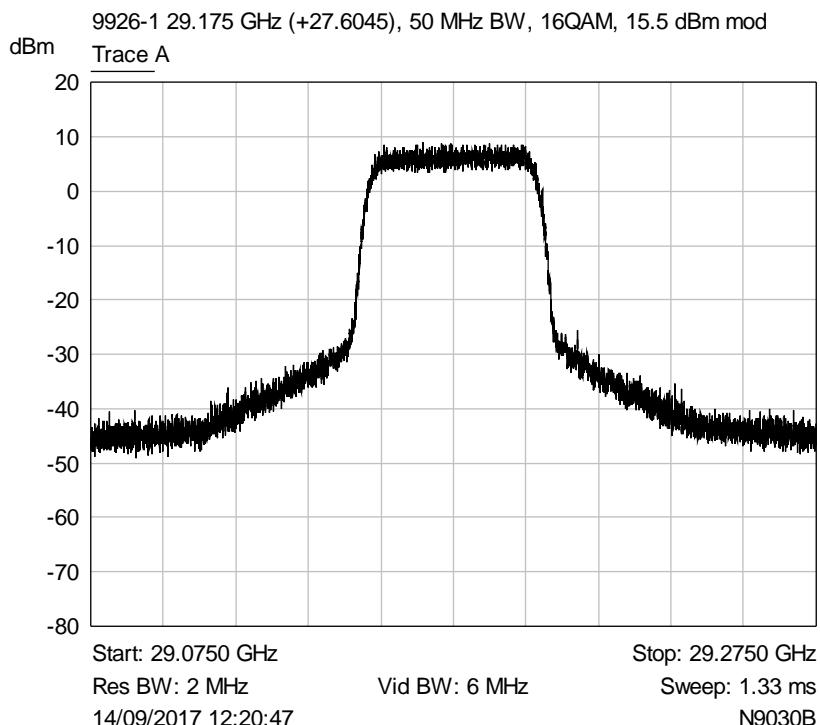
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 MHz



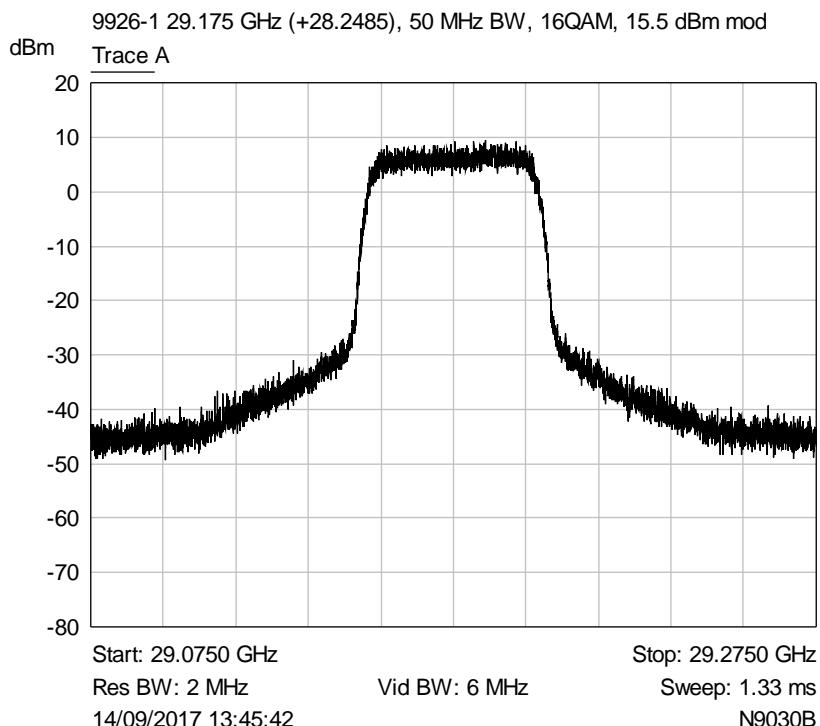
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 (with 27604.5 on) MHz



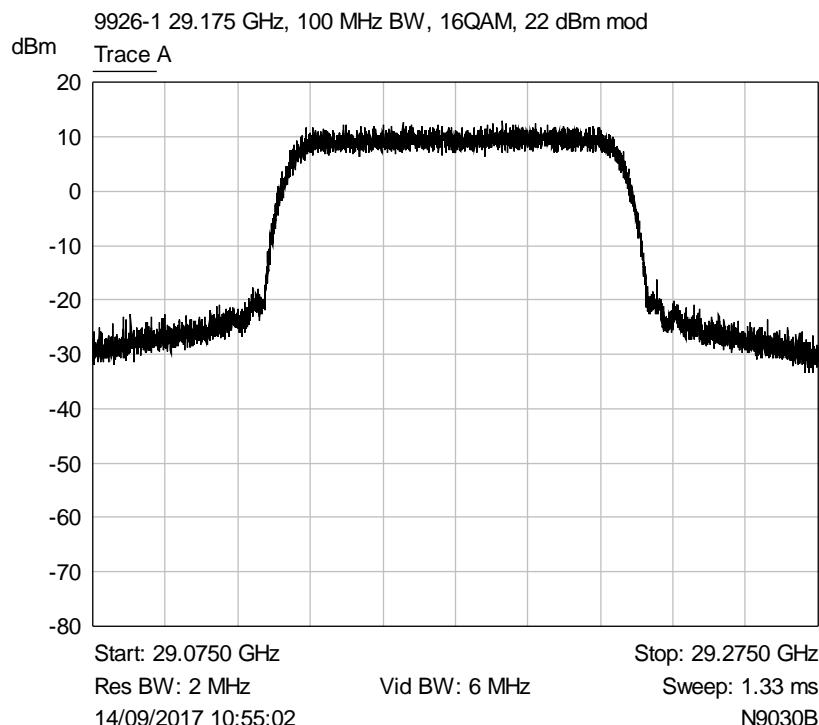
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 16QAM, Channel 29175 (with 28248.5 on) MHz



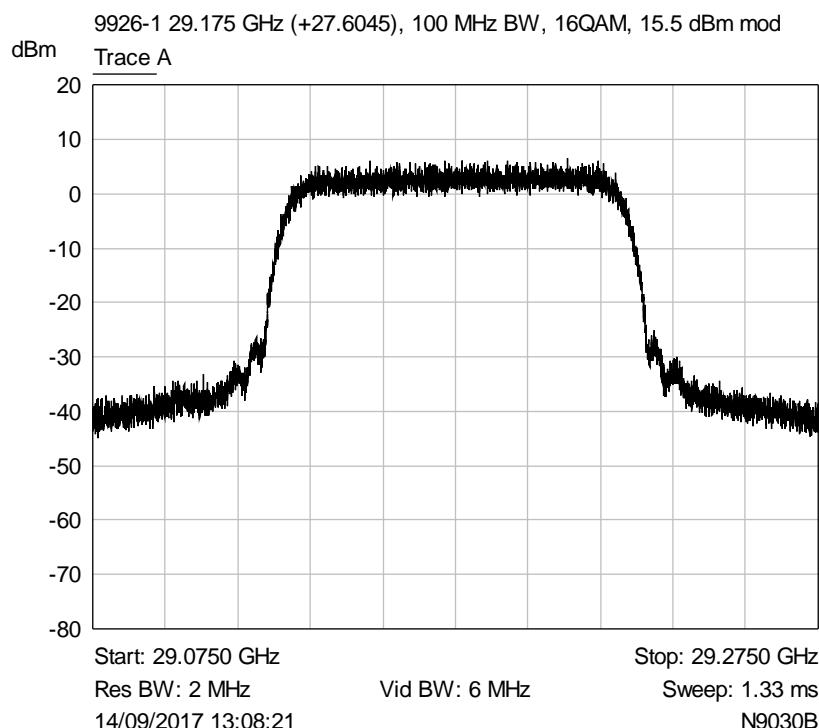
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 MHz



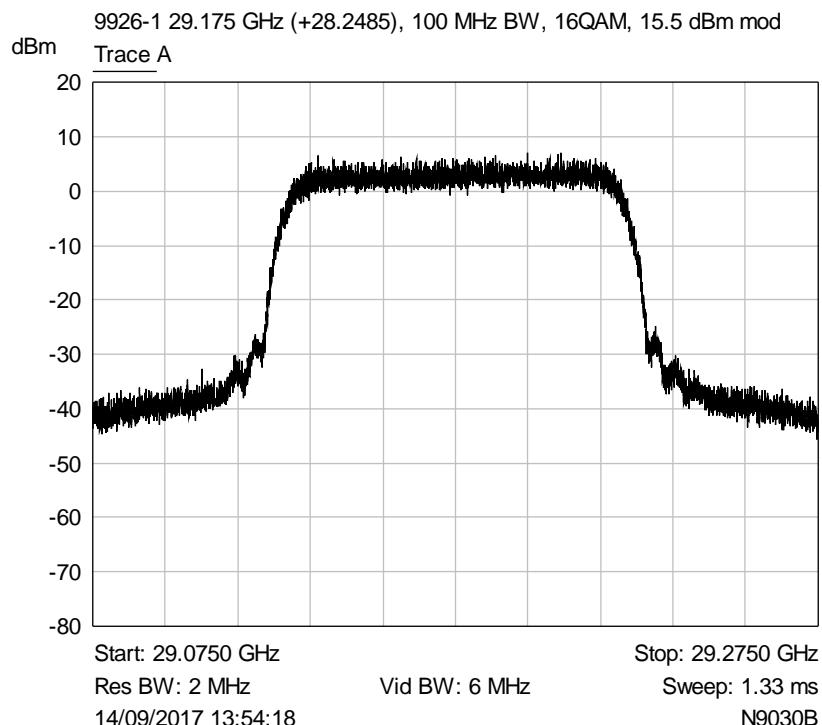
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 (with 27604.5 on) MHz



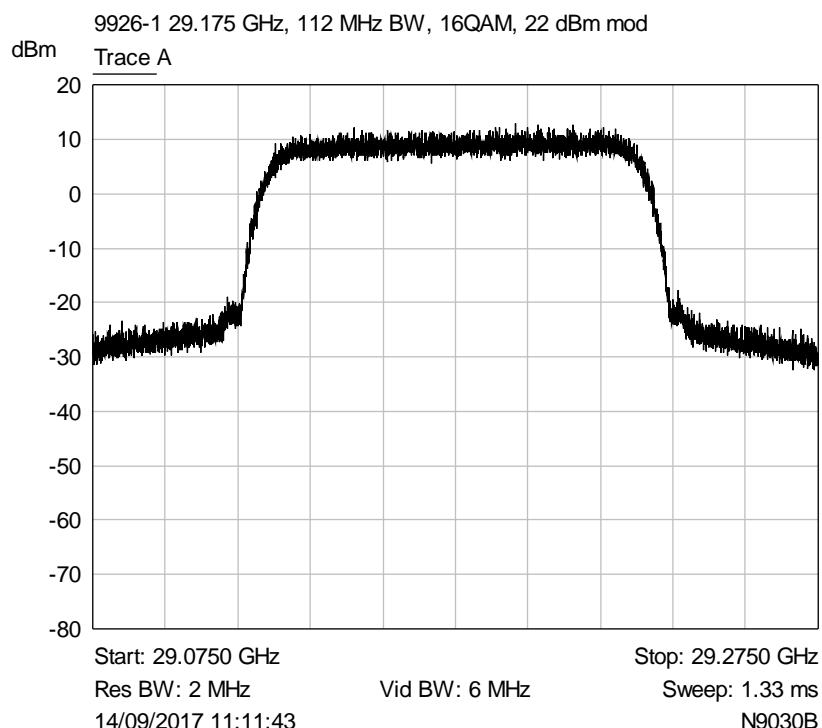
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 16QAM, Channel 29175 (with 28248.5 on) MHz



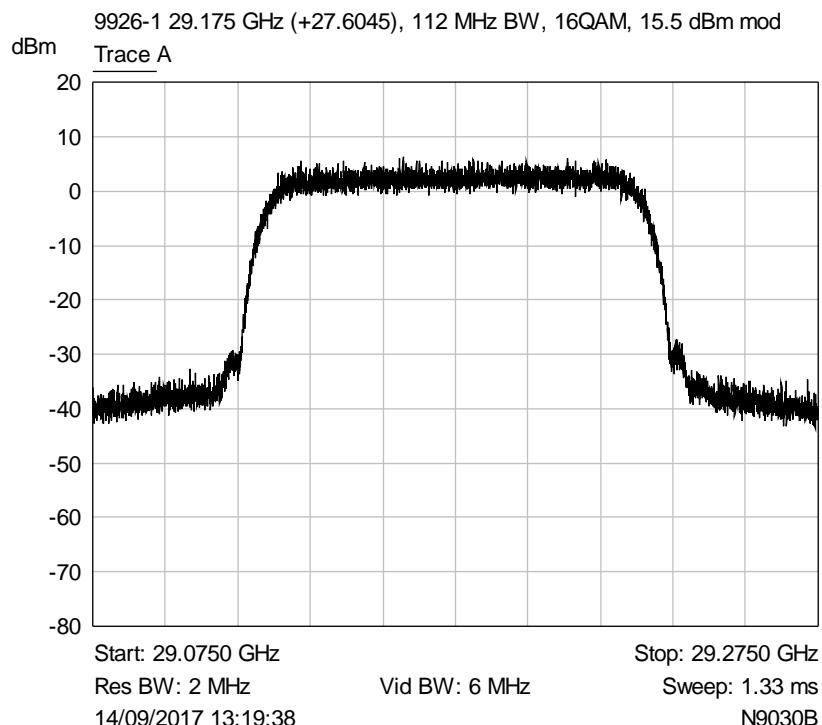
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 22 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 MHz



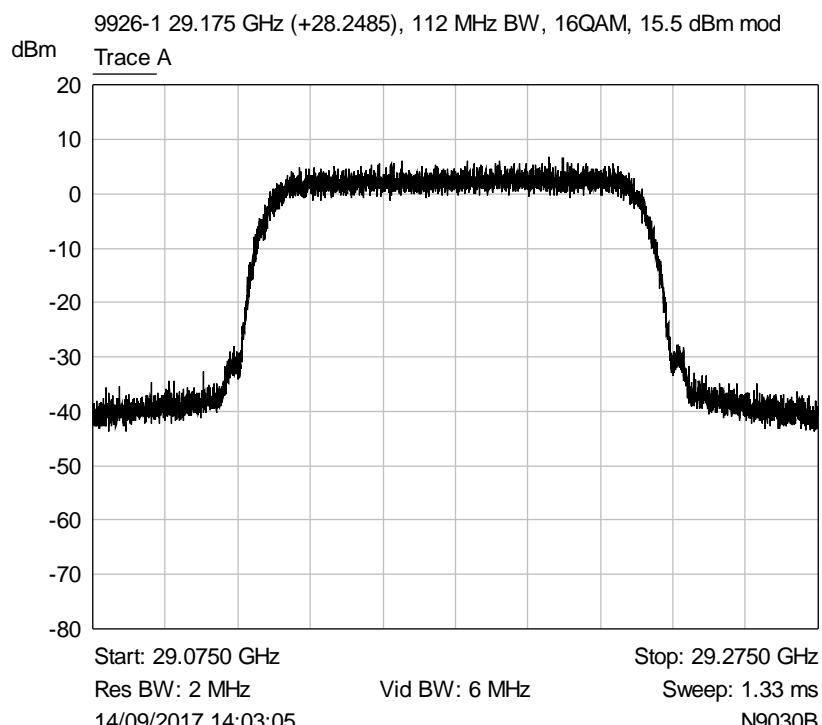
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 (with 27604.5 on) MHz



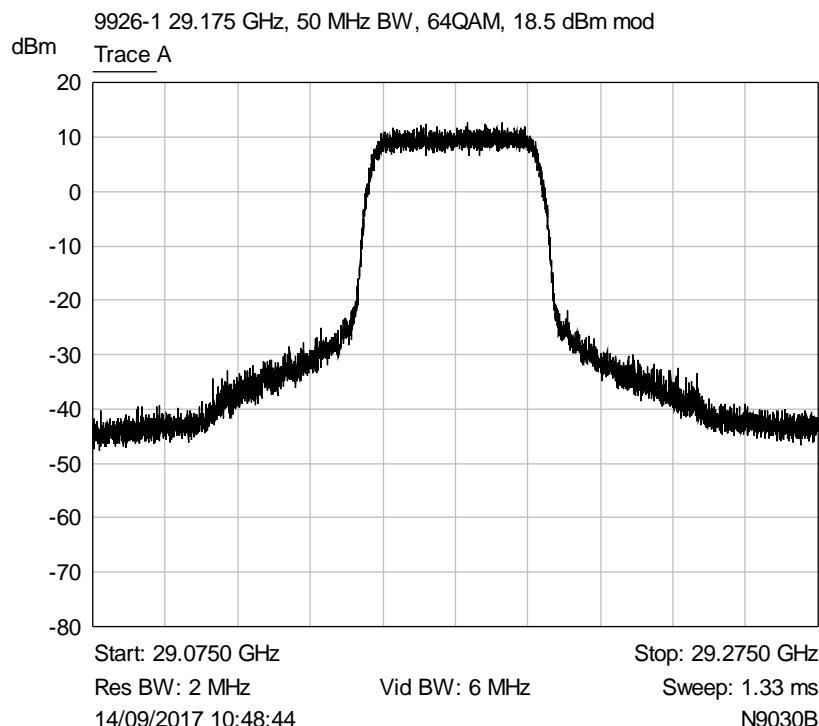
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 16QAM, Channel 29175 (with 28248.5 on) MHz



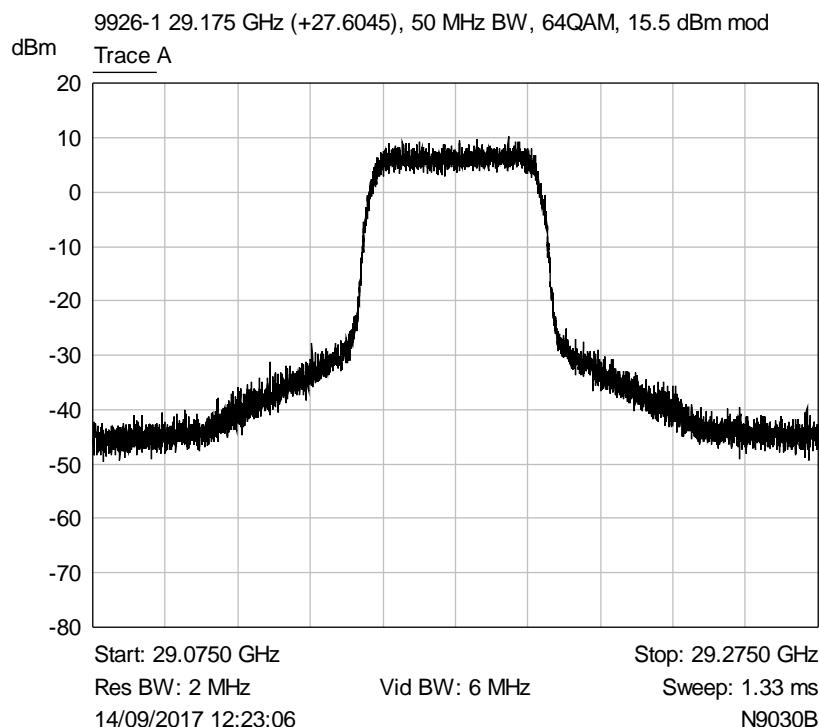
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 MHz



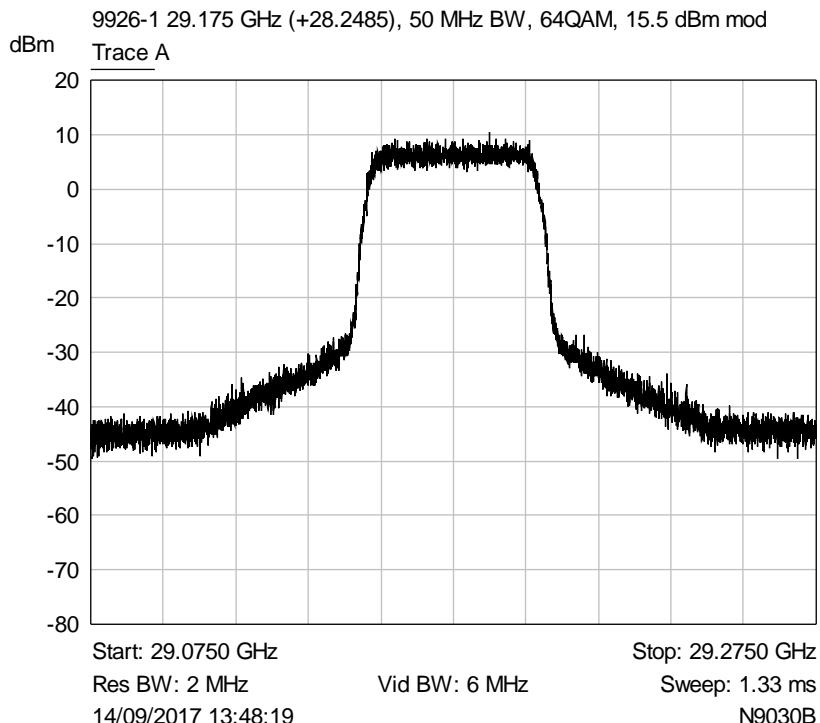
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 (with 27604.5 on) MHz



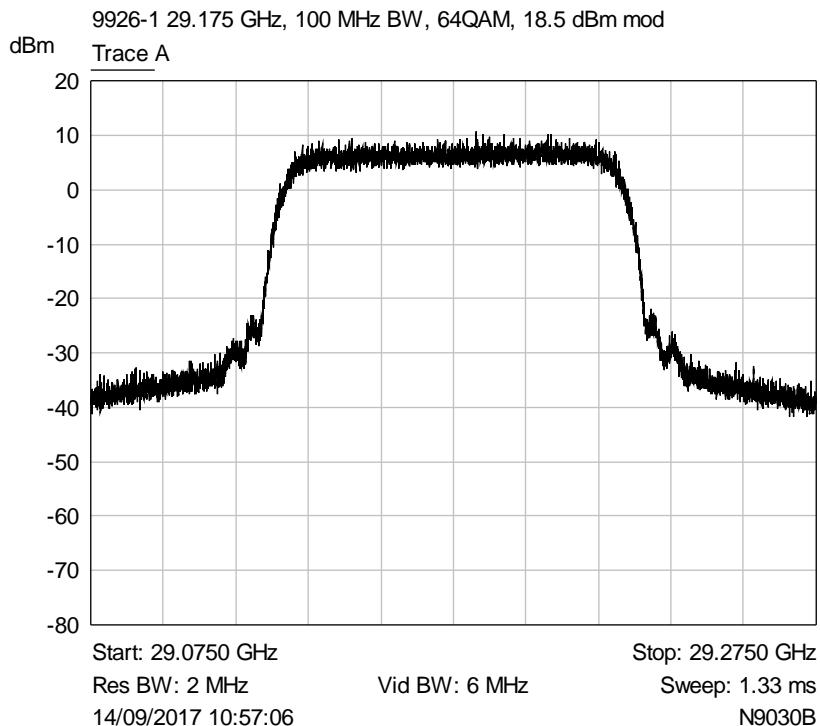
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 64QAM, Channel 29175 (with 28248.5 on) MHz



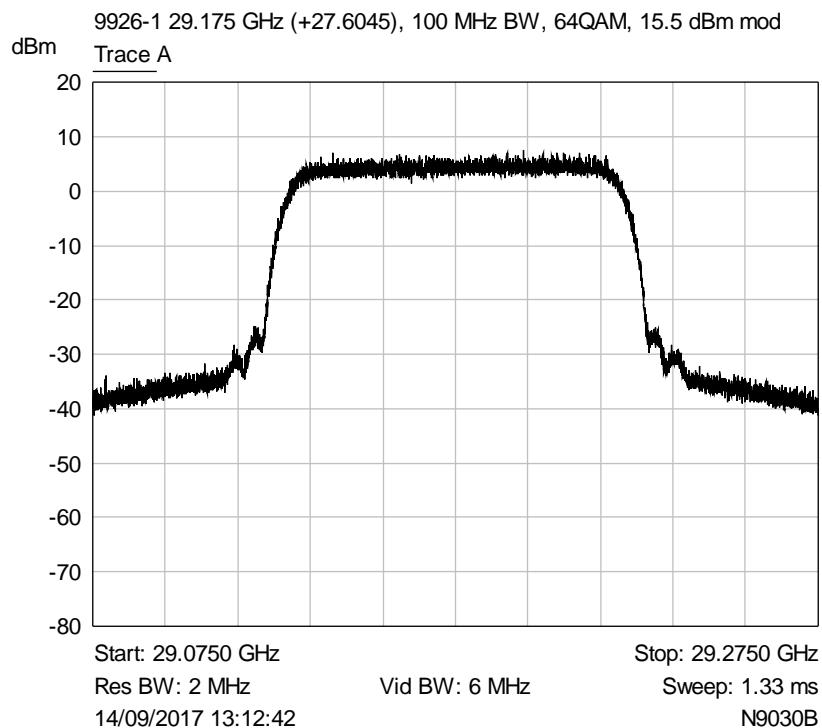
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 MHz



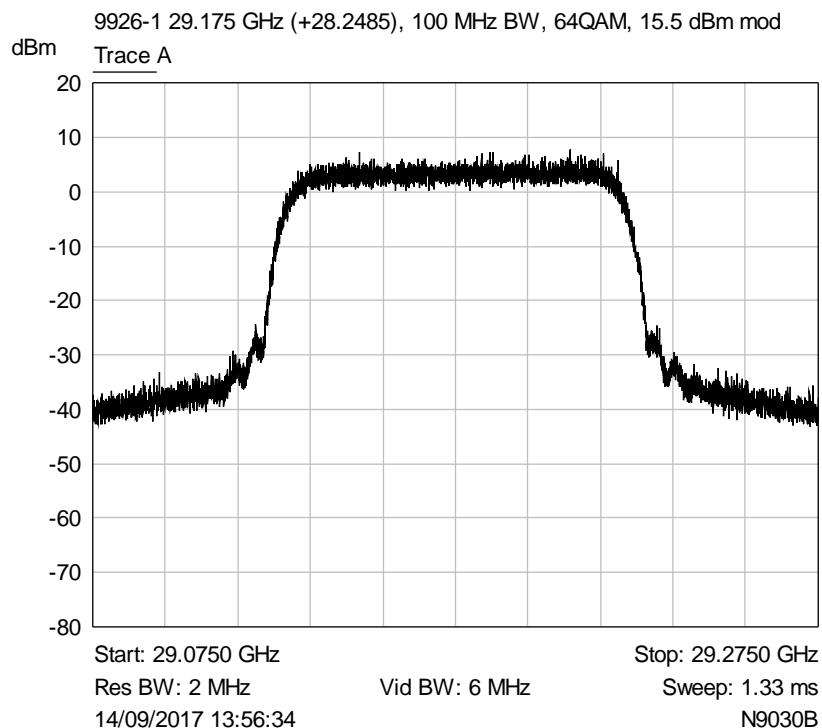
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 (with 27604.5 on) MHz



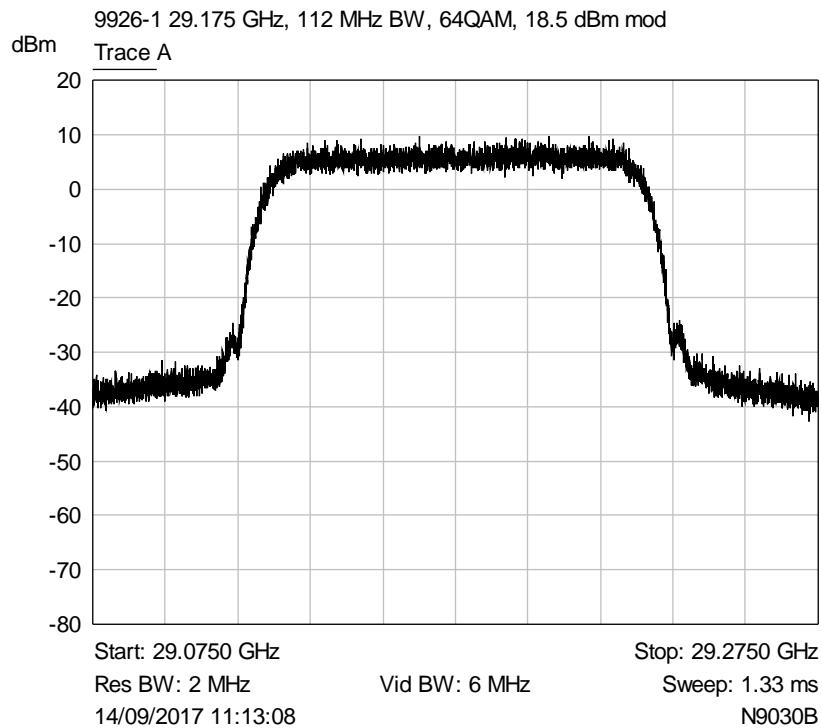
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 64QAM, Channel 29175 (with 28248.5 on) MHz



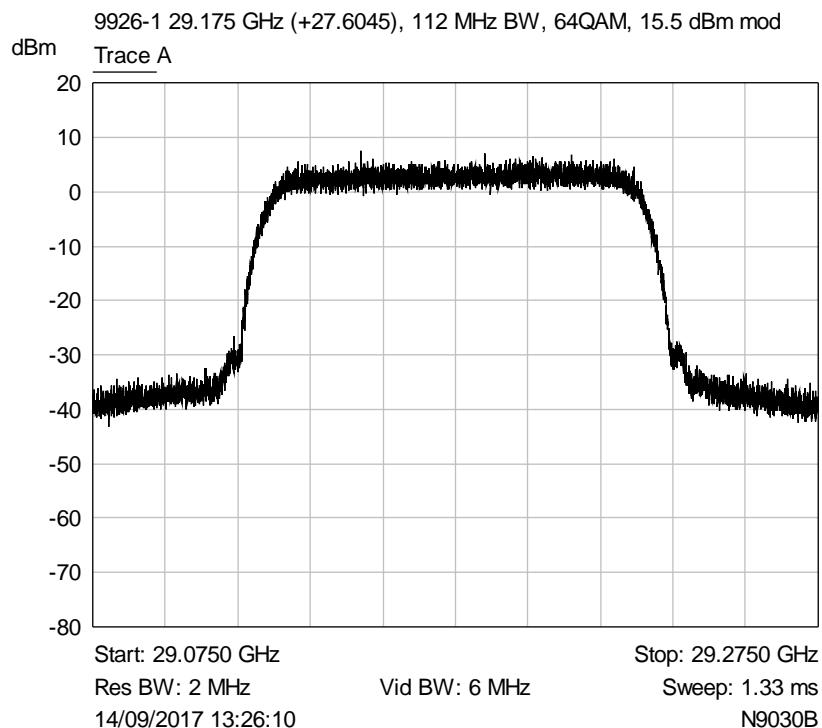
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 MHz



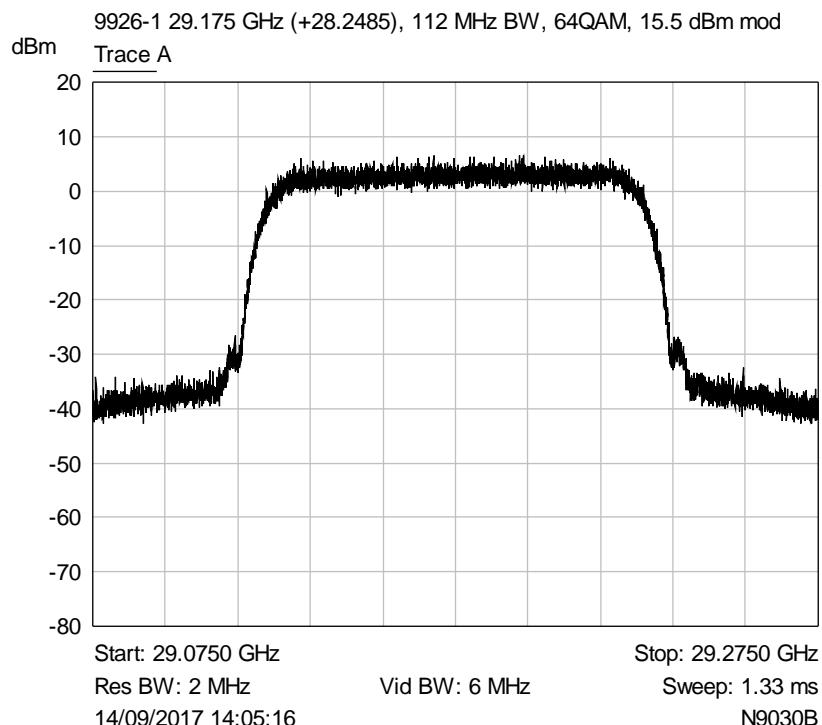
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 (with 27604.5 on) MHz



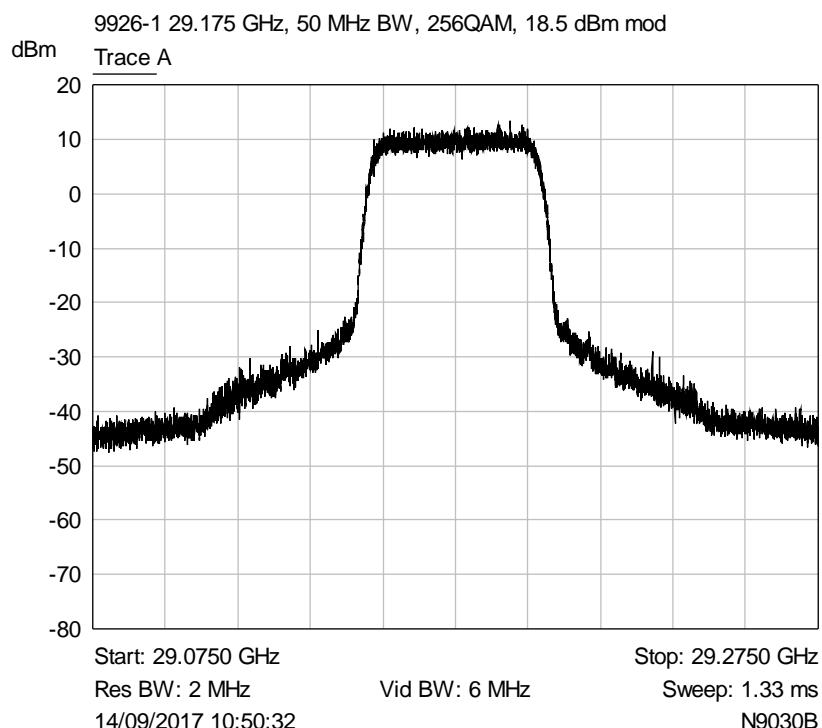
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 64QAM, Channel 29175 (with 28248.5 on) MHz



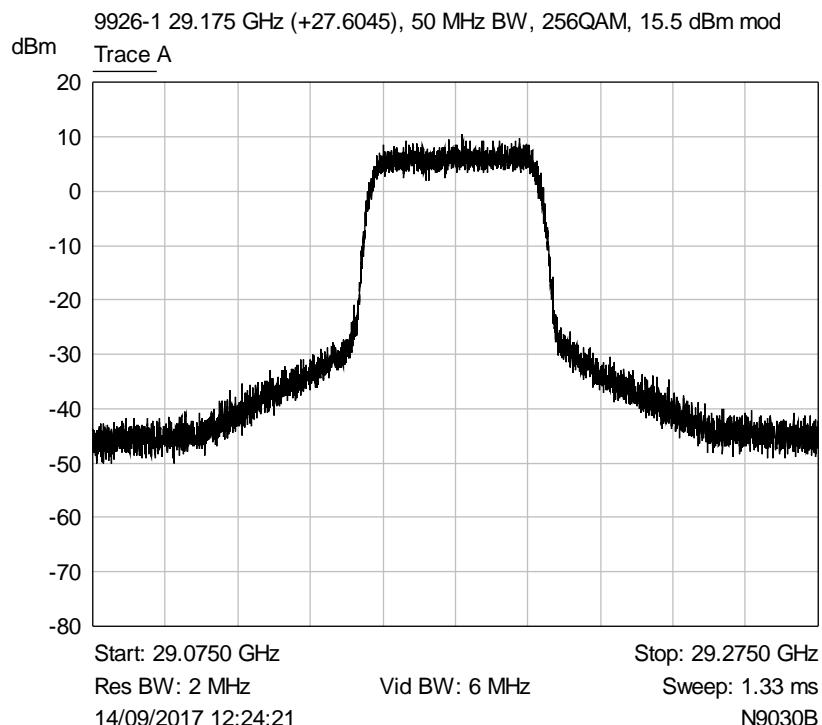
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 MHz



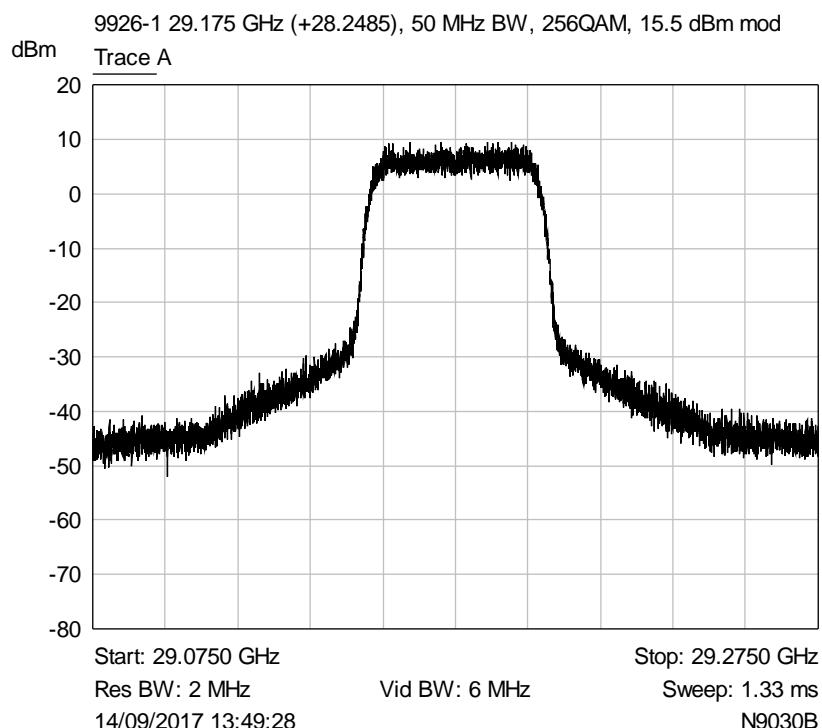
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 (with 27604.5 on) MHz



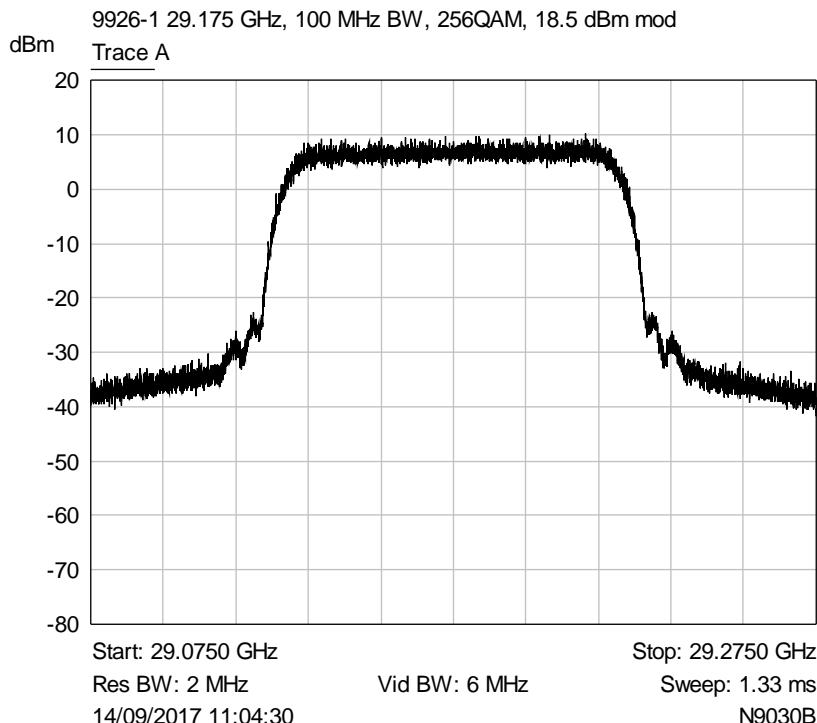
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 50 MHz, Modulation 256QAM, Channel 29175 (with 28248.5 on) MHz



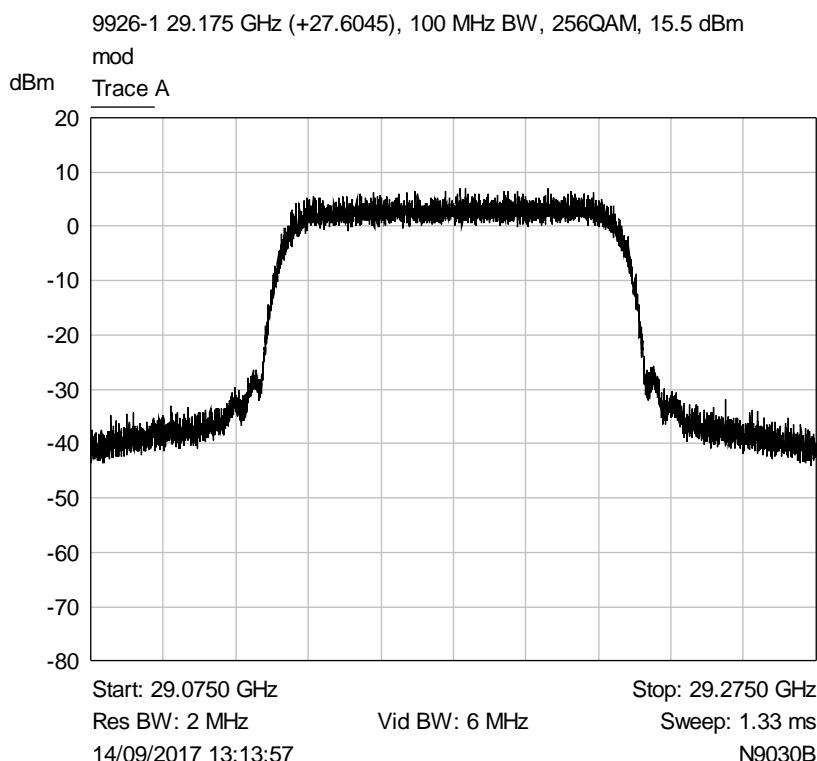
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 MHz



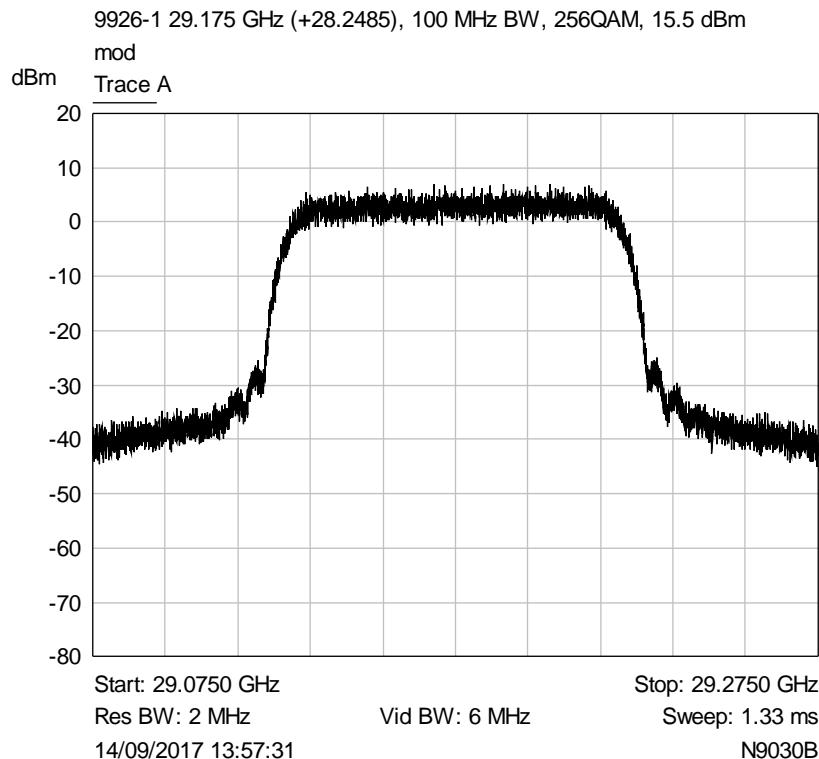
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 (with 27604.5 on) MHz



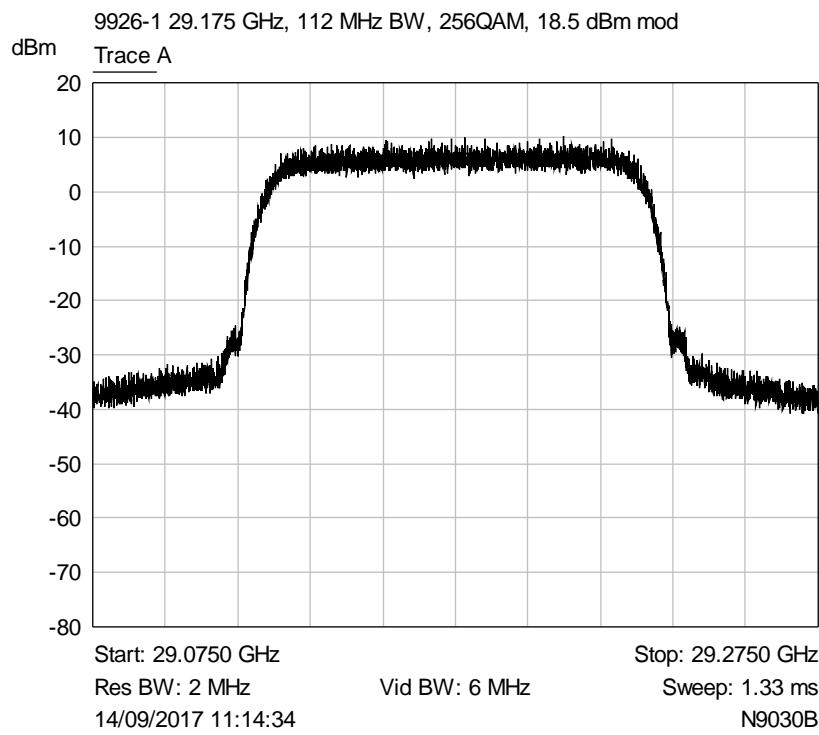
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 100 MHz, Modulation 256QAM, Channel 29175 (with 28248.5 on) MHz



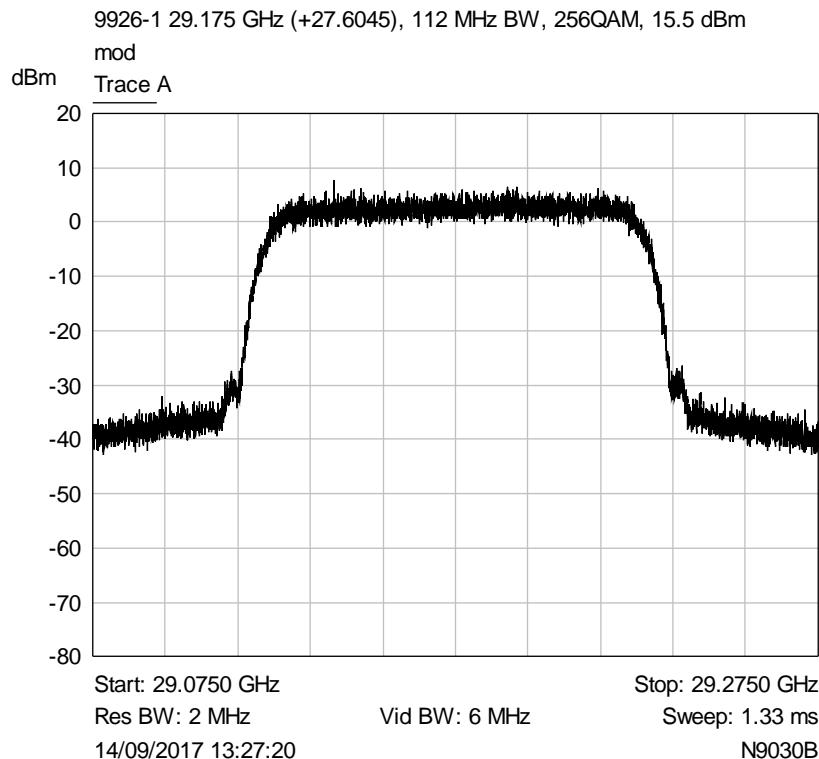
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Single Channel, Power 18.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 MHz



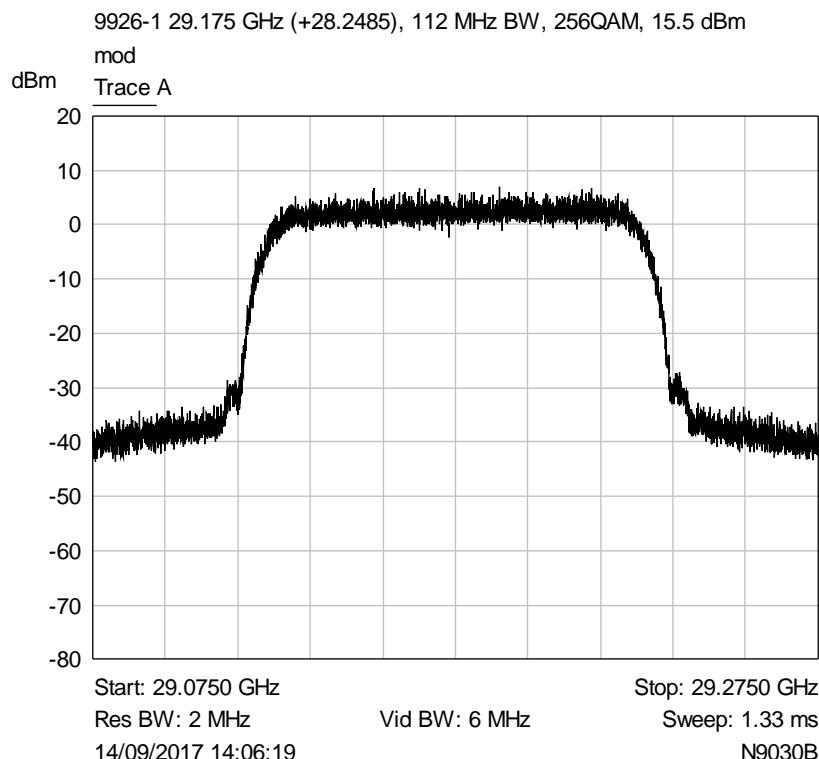
Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 (with 27604.5 on) MHz



Nominal, Maximised RF Output / field strength

RF Parameters: Band 27.5-29.25 GHz Dual Channel, Power 15.5 dBm, Channel Spacing 112 MHz, Modulation 256QAM, Channel 29175 (with 28248.5 on) MHz



Nominal, Maximised RF Output / field strength

7 Explanatory Notes

7.1 Explanation of waveguide cut-off frequency

Rationale for lowest conducted emissions test frequency for EUT's using Waveguide RF ports:

In order to determine lowest frequency cut-off of a waveguide the following must be known:

Broadwall (largest) Dimension in mm of waveguide (for purposes of this equation = A)

Speed of light (29.979 cm/ns) (for purposes of this equation = B)

The wavelength (λ) upper frequency cut-off distance in cm (= 2 x A).

Waveguide used by the EUT within this test report is WR34 which has a Broadwall (largest) dimension of = 8.636mm.

Thus:

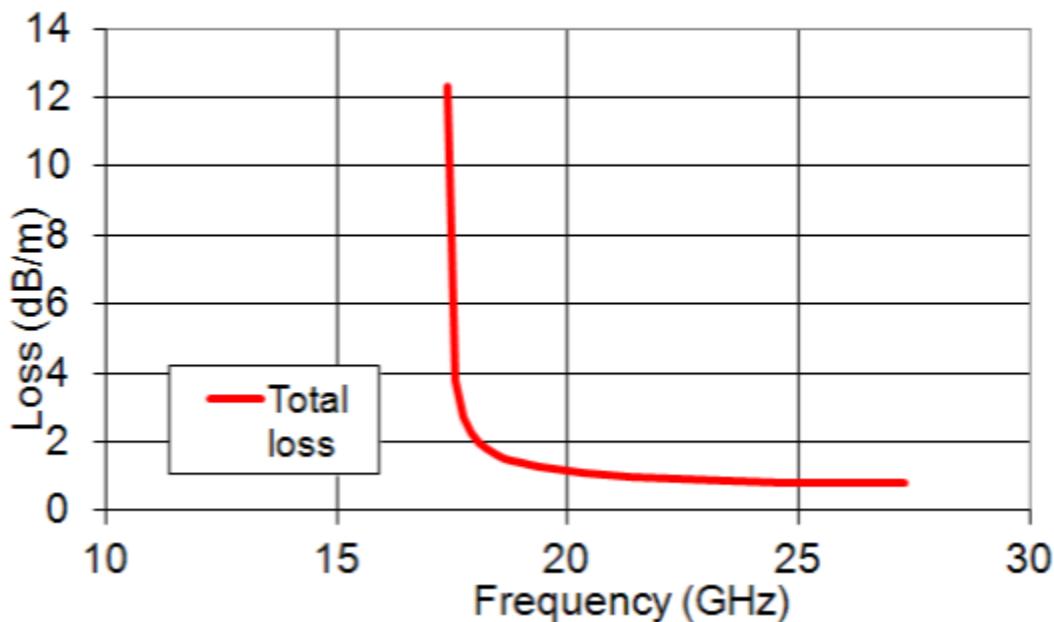
The wavelength (λ) upper frequency cut-off distance in cm is $2 \times 0.8636 = 1.7272\text{cm}$

The following equation may then be used to calculate the lowest cut off frequency of the waveguide:

$$f_{\text{lowercutoff}} = (B / 2A)$$

$$f_{\text{lowercutoff}} = 29.979 / 1.7272 = 17.35699398 \text{ GHz.}$$

waveguide loss WR34 example



8 Photographs

8.1 EUT Front View



8.2 EUT Reverse Angle



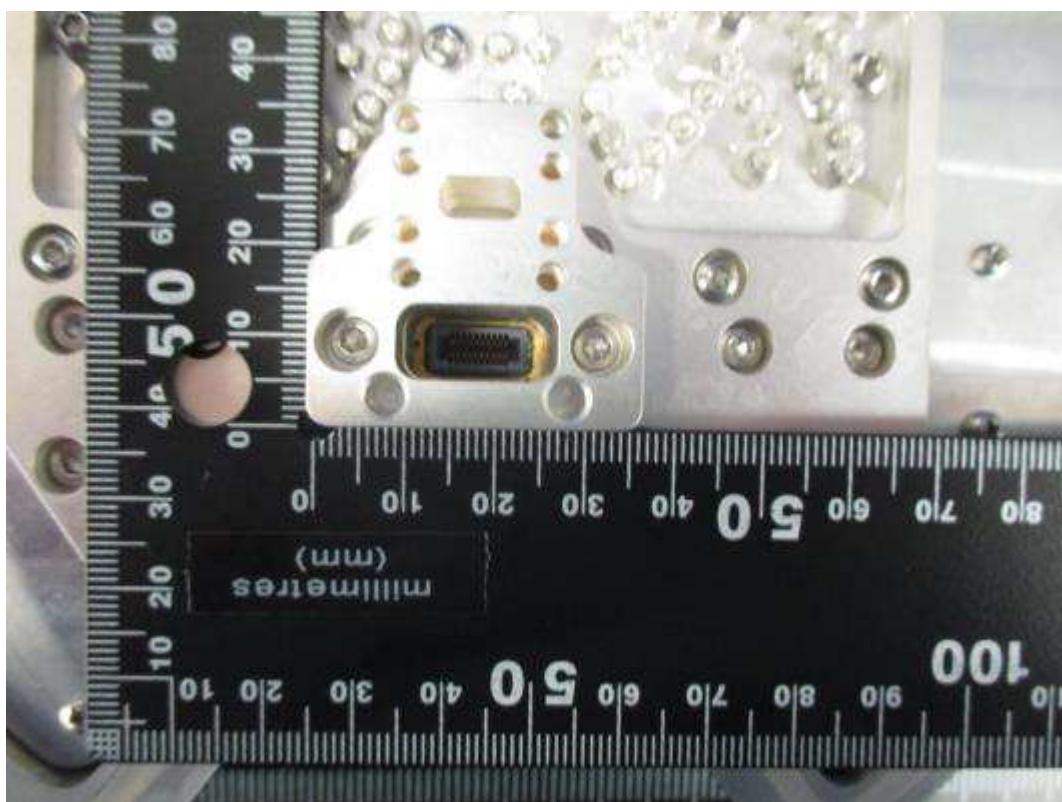
8.3 EUT Left side View



8.4 EUT Right side View



8.5 EUT Antenna Port



8.6 EUT Display & Controls



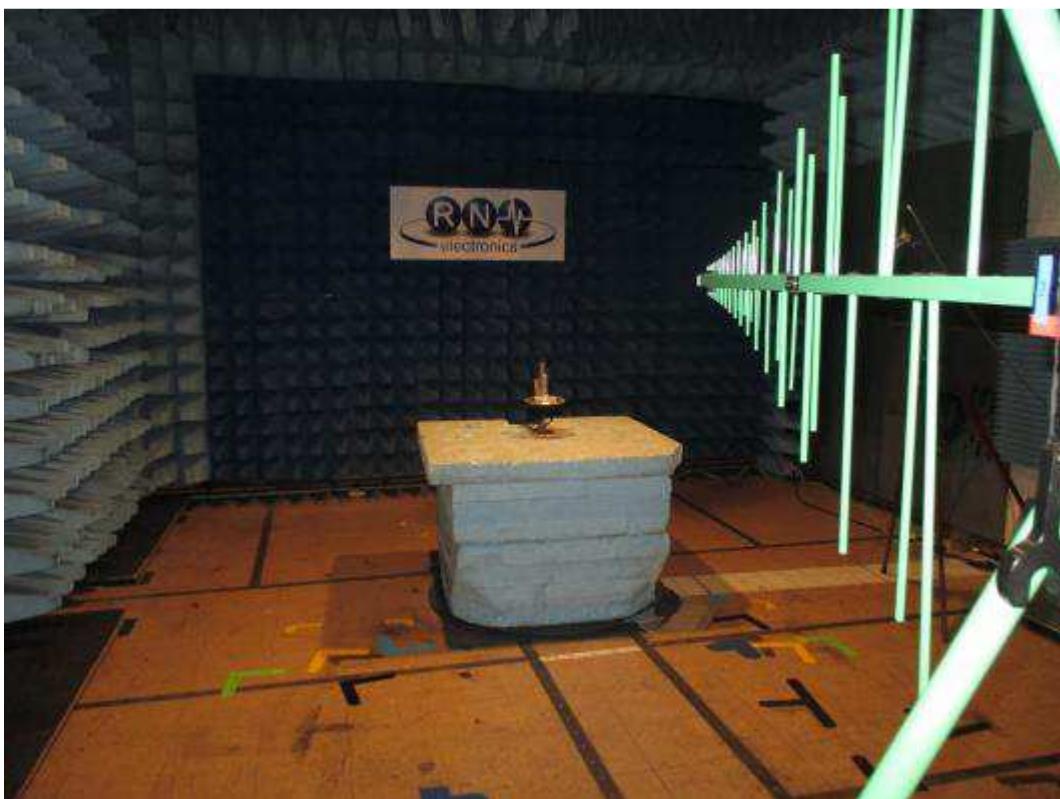
8.7 EUT Internal photos

Due to the complexity of the unit, internal photos were not taken by RN Electronics Ltd.

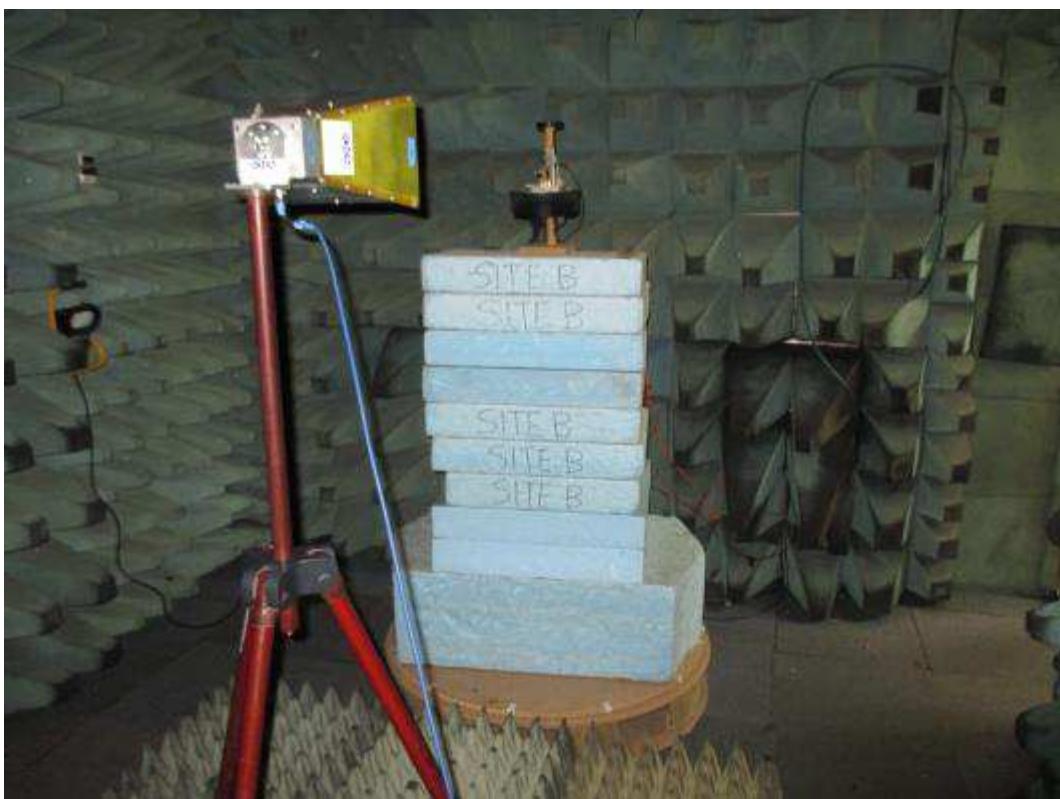
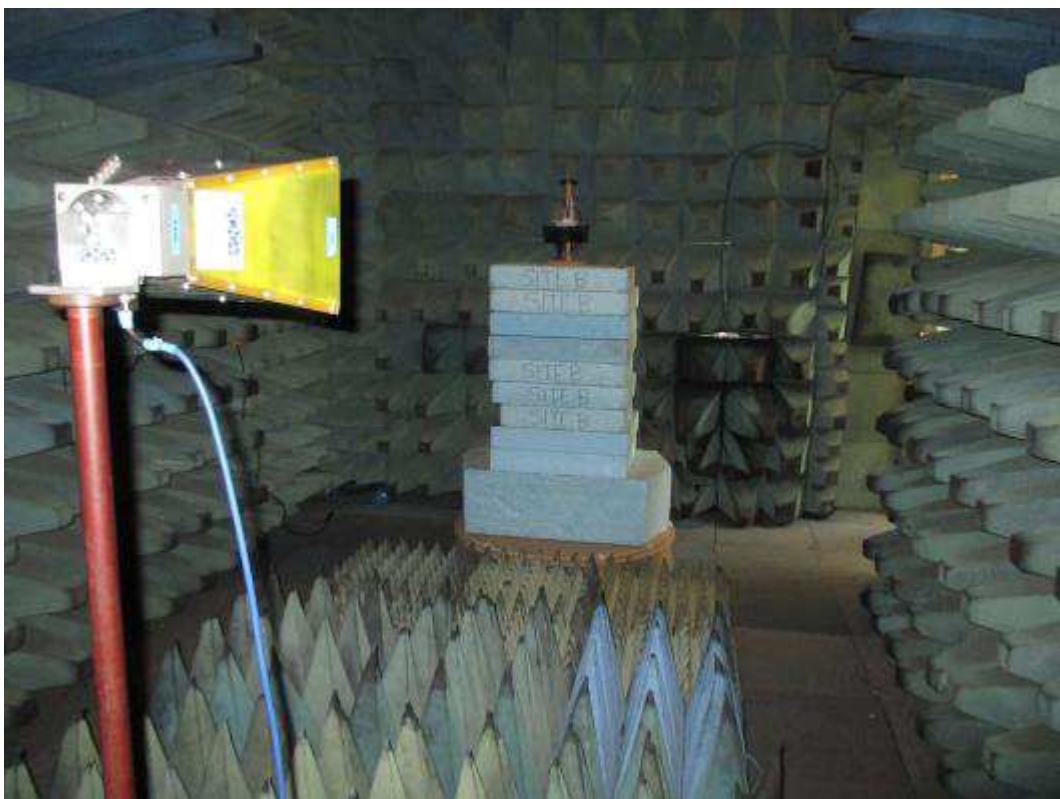
8.8 EUT ID Label

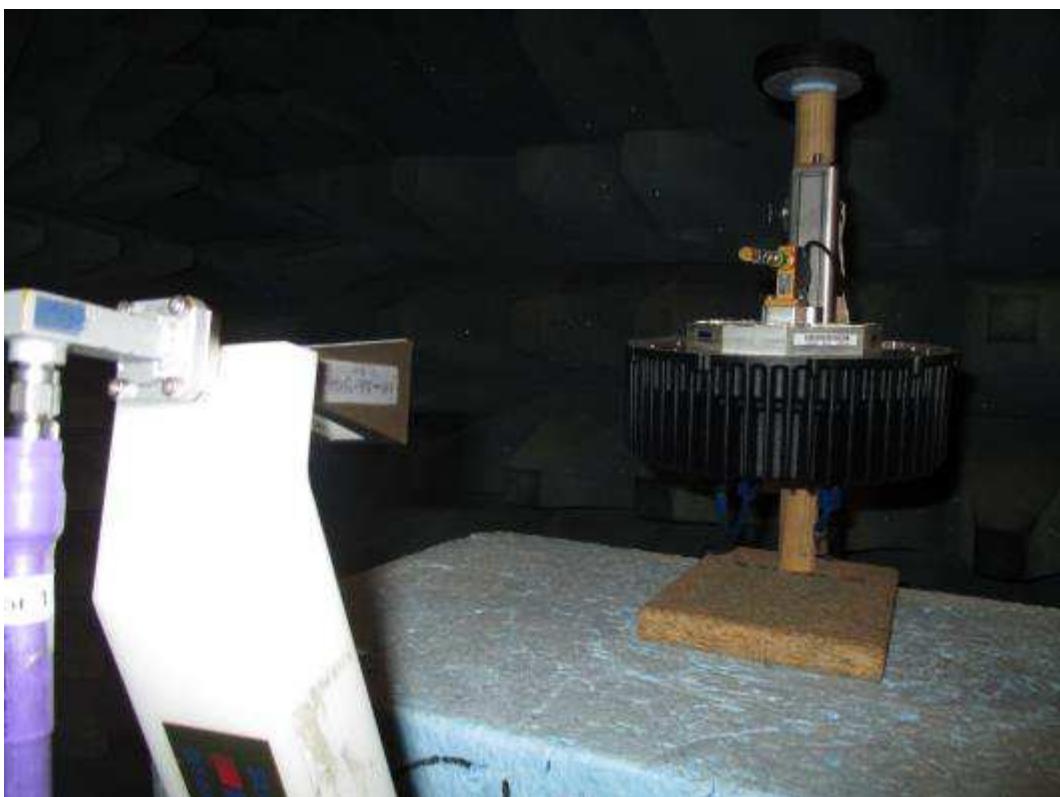
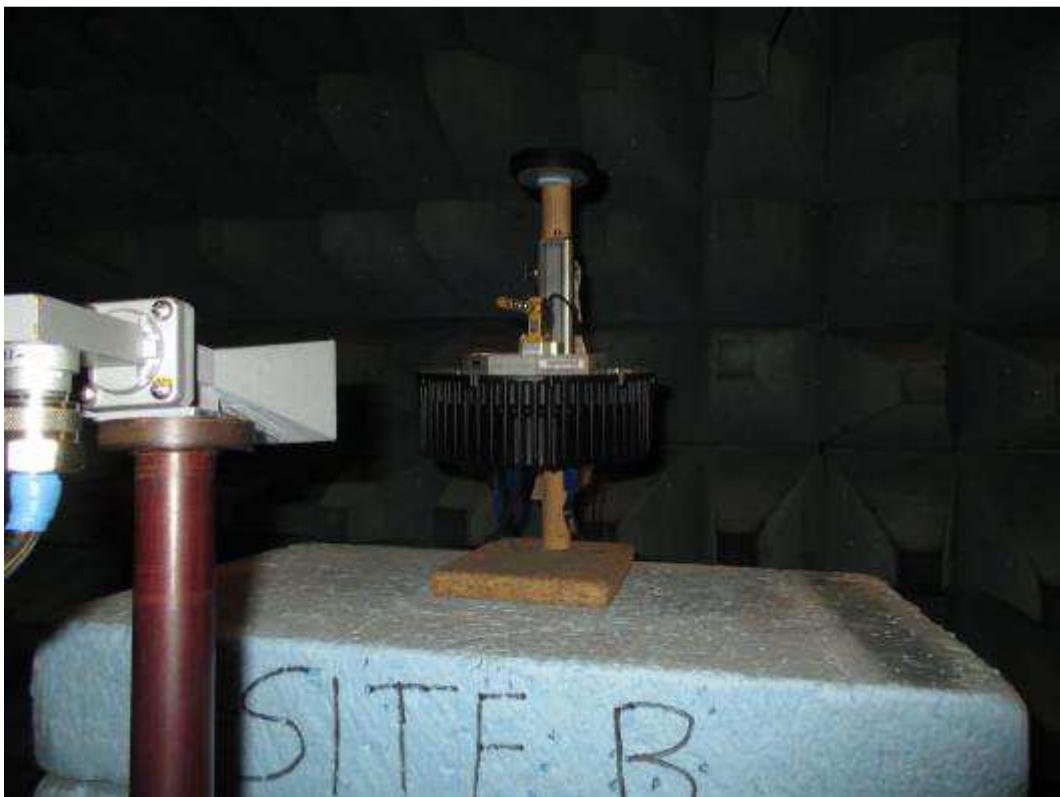


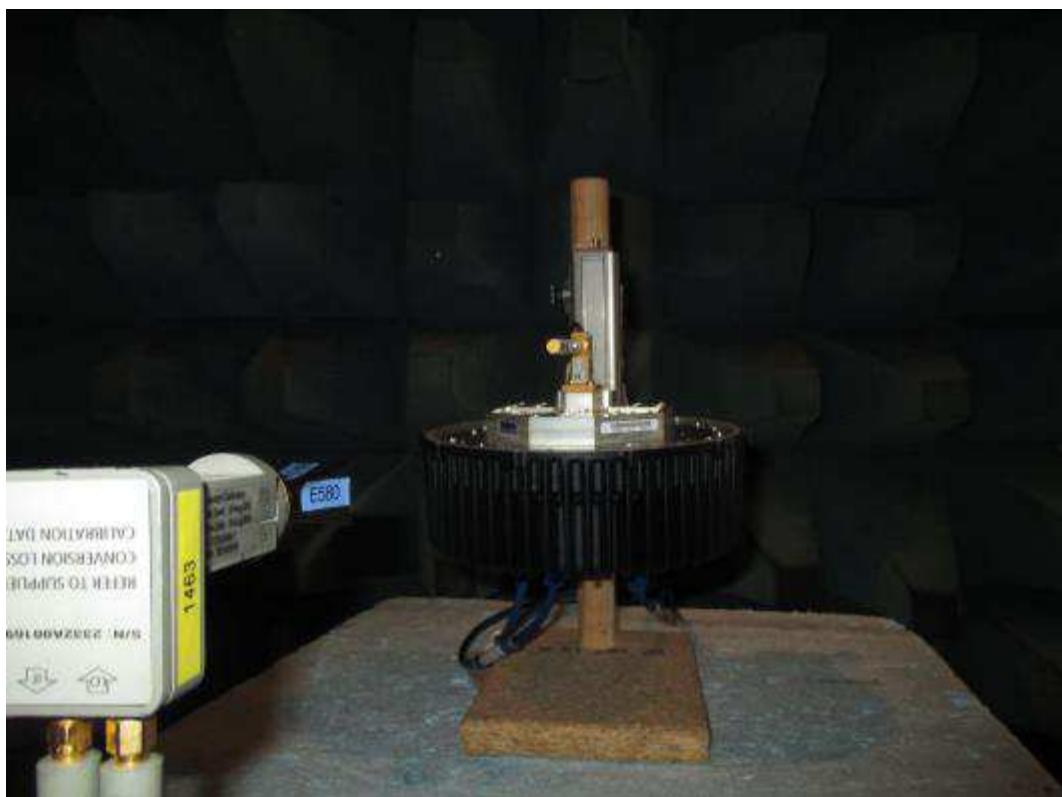
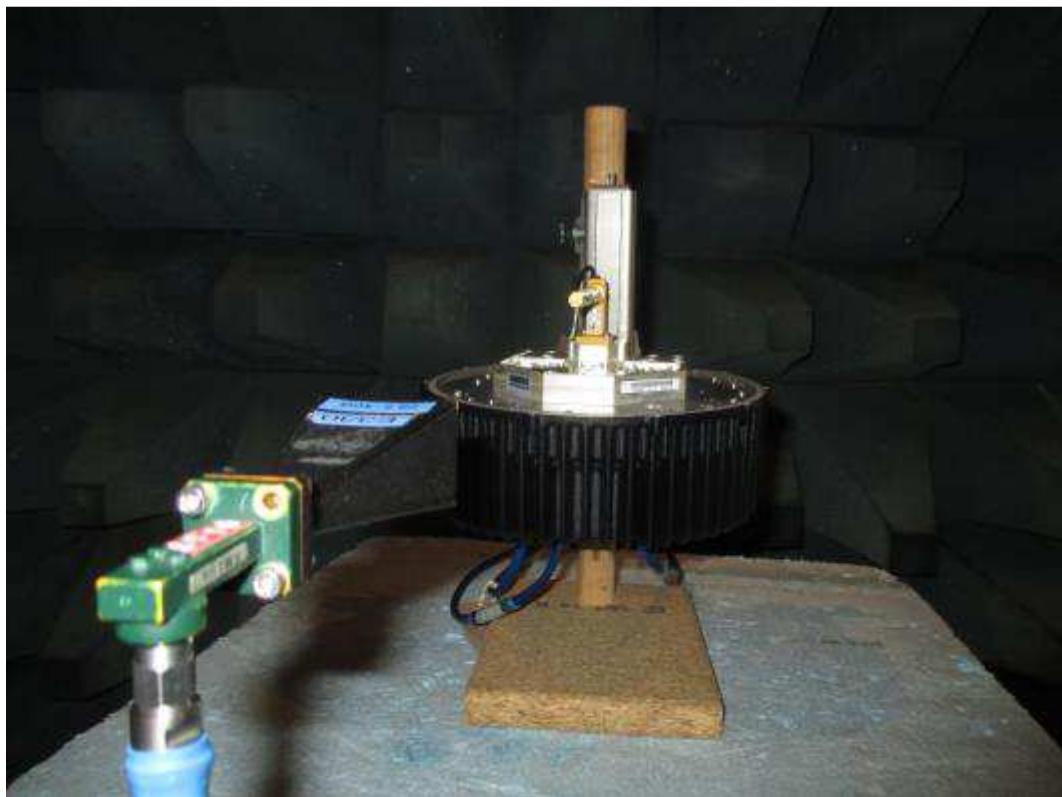
8.9 30-1000MHz Spurious emissions test set-up

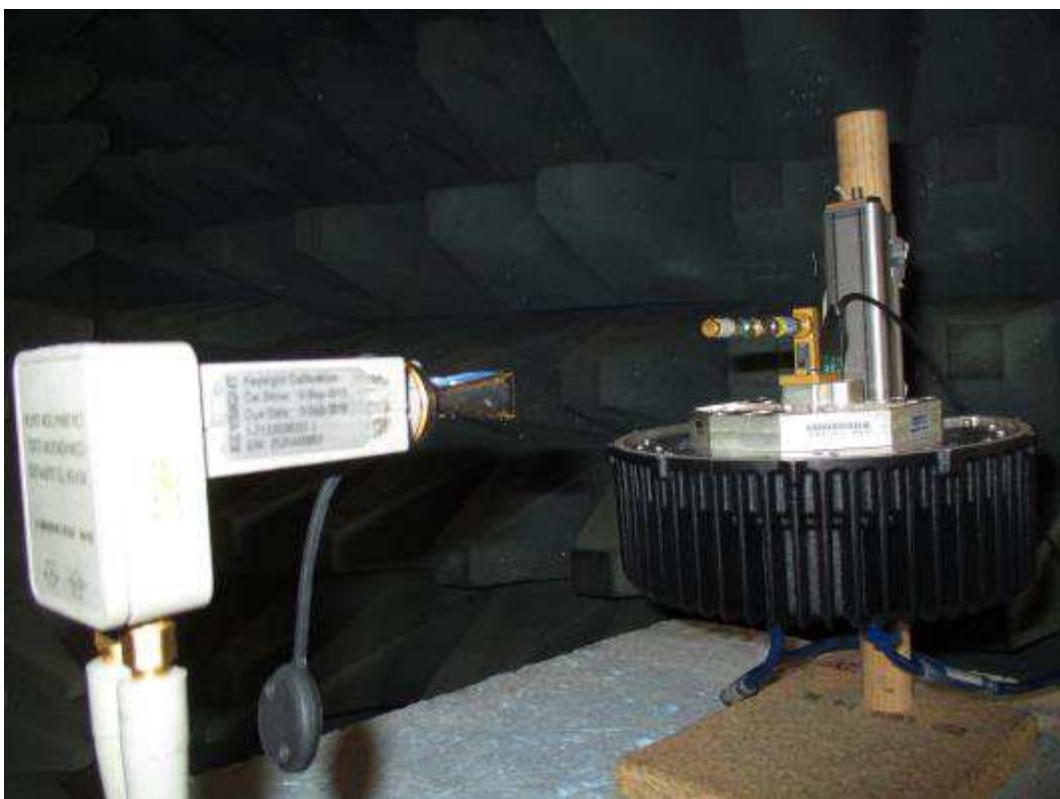
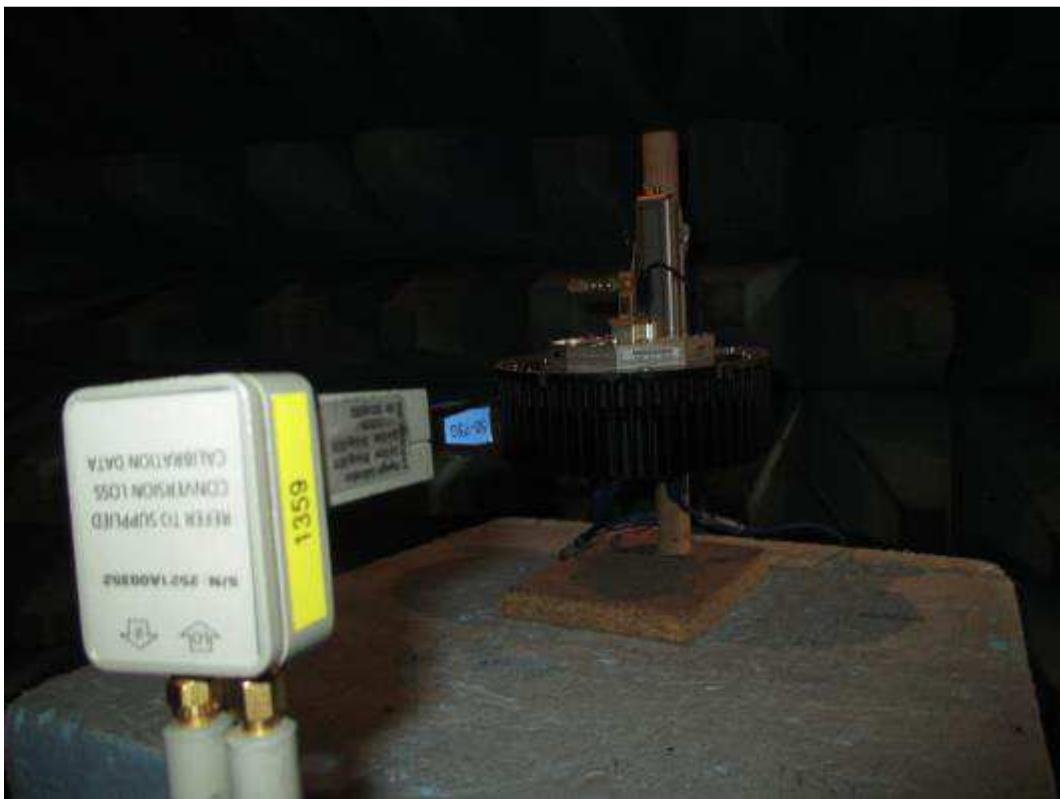


8.10 Above 1GHz Spurious emissions test set-up









8.11 Radiated emission diagram

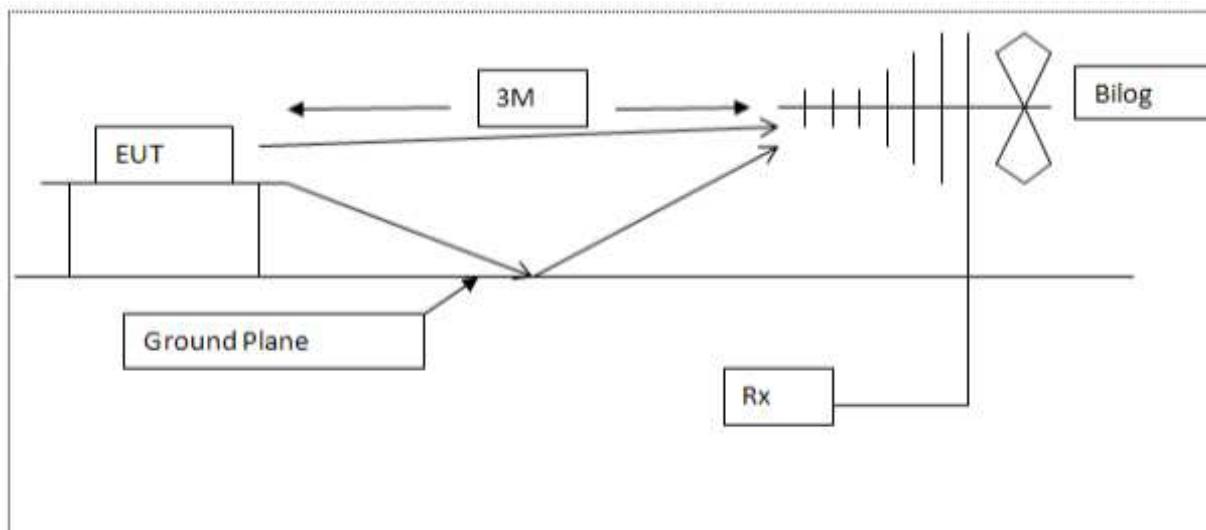


Diagram of the radiated emissions test setup 30 - 1000 MHz

9 Test equipment calibration list

The following is a list of the test equipment used by R.N. Electronics Ltd to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

RN No.	Model No.	Description	Manufacturer	Calibration date	Cal period
E268	BHA 9118	Horn Antenna 1-18 GHz	Schaffner	03-Apr-2017	12 months
E289	8449B	22-40GHz opt H40 Block Down Converter	Hewlett Packard	23-Feb-2017	12 months
E291-2	6960B	RF Power Meter	Marconi Instruments	22-Mar-2016	24 months
E296-4	11970U	Harmonic Mixer 40-60 GHz	Hewlett Packard	*04-Dec-2017	24 months
E296-5	11970V	Harmonic Mixer 50-75 GHz	Hewlett Packard	*29-Nov-2017	24 months
E296-6	11970W	Harmonic Mixer 75-110 GHz	Hewlett Packard	*08-Dec-2017	24 months
E329	8349B	Microwave Amplifier 2-20 GHz	Hewlett Packard	21-Nov-2016	12 months
E330	2224-20	Flann Horn 26.5-40 GHz	FMI	25-Apr-2017	12 months
E331	22093-KF20	Flann Horn 26.5-40 GHz	FMI	25-Apr-2017	12 months
E381	6669A	Signal Generator 10 MHz - 40 GHz	Wiltron	24-Feb-2017	12 months
E404	2024-20	Standard Gain Horn 17.6-26.7GHz	FMI	02-May-2017	12 months
E411	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	11-Jul-2017	12 months
E412	E4440A	PSA 3 Hz - 26.5 GHz	Agilent Technologies	10-Jul-2017	24 months
E414	6820.17.A	Attenuator 20dB 12.4GHz 50Ω	Huber & Suhner	21-Mar-2017	12 months
E428	HF906	Horn Antenna 1-18 GHz	Rohde & Schwarz	03-Apr-2017	12 months
E433	MG3693A	Signal Generator 30GHz	Anritsu	23-Jun-2016	24 months
E454	18240-20	Std Gain Horn Antenna 11.9 - 18.0 GHz	FMI Ltd	25-Jul-2017	12 months
E455	85100V	Wave Source Module 50 - 75 GHz	Hewlett Packard	19-Sep-2015	24 months
E498	4768-20	Attenuator 20dB 40GHz	Narda	*06-Dec-2017	12 months
E503	2524-20	50-75 GHz Horn Antenna	FMI	25-Apr-2017	12 months
E520	MD4A	Duplexor	Pacific Millimeter Products	23-May-2017	12 months
E555	CMV 5E-1	5A Variac	Carroll & Meynell Ltd	N/A	N/A
E570	K050120400F	110V 60 Hz Power Supply	Harmer & Simmons	19-Jan-2017	12 months
E579	27240	Standard Gain Horn 75GHz - 110GHz	FMI Ltd	25-Apr-2017	12 months
E580	24240	Standard Gain Horn 40GHz - 60GHz	FMI Ltd	25-Apr-2017	12 months
E602	MG3692A	Signal Generator 10MHz - 20GHz	Anritsu	30-Jan-2017	24 months
E615	4768-10	Attenuator 10dB 40GHz	Narda	07-Oct-2016	12 months
E700	6914	Power Sensor 10MHz - 40GHz	IFR	07-Oct-2016	12 months
E704	E4422B	Signal Generator 0.25-4000MHz	Agilent Technologies	25-Apr-2017	12 months
E716		Horn Std gain 40-60GHz	-	25-Jul-2017	12 months
E718		Horn Std gain 75-110GHz	-	25-Jul-2017	12 months
E743	RR2017 4/2dB	Attenuator 4/2dB 30-1000MHz	RN Electronics	15-Feb-2017	12 months
E750	6672B	Signal Generator 40-60GHz	Wiltron	*06-Dec-2017	12 months
E755	N9030B	3Hz to 50GHz PXA	Keysight	08-May-2017	12 months
L264	DT75	Digital Thermometer	Instrotech Ltd	02-Dec-2015	24 months
LPE364	CBL6112A	Antenna BiLog 30MHz - 2GHz	Chase Electronics Ltd	22-Jan-2016	24 months
TMS38	VMT04/140	Environmental Oven	Heraeus Votsch	N/A	N/A
TMS57	2534	Digital Multimeter	Philips	08-Mar-2017	24 months
TMS78	3160-08	Std Gain Horn Antenna 12.4-18 GHz	ETS Systems	25-Jul-2017	12 months
TMS79	3160-09	Std Gain Horn Antenna 18-26.5 GHz	ETS Systems	25-Jul-2017	12 months
TMS814	MP627A	Doublet Antenna 200-1700 MHz	Anritsu Electric Co Ltd	25-Apr-2017	12 months

* Equipment was in calibration dates for tests and has since been re-calibrated.

10 Auxiliary and peripheral equipment

10.1 Customer supplied equipment

Item No.	Model No.	Description	Manufacturer	Serial No.
1	Aspire E15	Laptop and PSU	Acer	-
2	-	GPS antenna	-	-

10.2 RN Electronics supplied equipment

RN No.	Model No.	Description	Manufacturer	Serial No
E341	WBH218	Broadband Horn Antenna 1.5 - 18 GHz	Q-par	2532
E442	RN-AFT-2063	Pre-Amplifier 1-2 GHz	RN Electronics Ltd	-
E612	GPS-QBW-20N	GPS Antenna	ANDREW	-

11 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

11.1 Modifications before test

No modifications were made before test by RN Electronics Ltd.

11.2 Modifications during test

No modifications were made during test by RN Electronics Ltd.

12 Description of test sites

- Site A Radio / Calibration Laboratory and anechoic chamber
- Site B Semi-anechoic chamber
FCC Registration No. 293246
IC Registration No. 5612A-4
- Site B1 Control Room for Site B
- Site C Transient Laboratory
- Site D Screened Room (Conducted Immunity)
- Site E Screened Room (Control Room for Site D)
- Site F Screened Room (Conducted Emissions)
- Site G Screened Room (Control Room for Site H)
- Site H 3m Semi-anechoic chamber (indoor OATS)
FCC Registration No. 293246
IC Registration No. 5612A-2
- Site J Screened Room
- Site K Screened Room (Control Room for Site M)
- Site M 3m Semi-anechoic chamber (indoor OATS)
FCC Registration No. 293246
IC Registration No. 5612A-3
- Site Q Fully-anechoic chamber
- Site OATS 3m and 10m Open Area Test Site
FCC Registration No. 293246
IC Registration No. 5612A-1
- Site R Screened Room (Conducted Immunity)
- Site S Safety Laboratory
- Site T Transient Laboratory

13 Abbreviations and units

%	Percent	LBT	Listen Before Talk
$\mu\text{A}/\text{m}$	microAmps per metre	LO	Local Oscillator
μV	microVolts	mA	milliAmps
μW	microWatts	max	maximum
AC	Alternating Current	kPa	Kilopascal
ALSE	Absorber Lined Screened Enclosure	Mbit/s	MegaBits per second
AM	Amplitude Modulation	MHz	MegaHertz
Amb	Ambient	mic	Microphone
ATPC	Automatic Transmit Power Control	min	minimum
BER	Bit Error Rate	mm	milliMetres
$^{\circ}\text{C}$	Degrees Celsius	ms	milliSeconds
C/I	Carrier / Interferer	mW	milliWatts
CEPT	European Conference of Postal and Telecommunications Administrations	NA	Not Applicable
COFDM	Coherent OFDM	nom	Nominal
CS	Channel Spacing	nW	nanoWatt
CW	Continuous Wave	OATS	Open Area Test Site
dB	deciBels	OFDM	Orthogonal Frequency Division Multiplexing
$\text{dB}\mu\text{A}/\text{m}$	deciBels relative to 1 $\mu\text{A}/\text{m}$	ppm	Parts per million
$\text{dB}\mu\text{V}$	deciBels relative to 1 μV	PRBS	Pseudo Random Bit Sequence
dBc	deciBels relative to Carrier	QAM	Quadrature Amplitude Modulation
dBm	deciBels relative to 1mW	QPSK	Quadrature Phase Shift Keying
DC	Direct Current	R&TTE	Radio and Telecommunication Terminal Equipment
DTA	Digital Transmission Analyser	Ref	Reference
EIRP	Equivalent Isotropic Radiated Power	RF	Radio Frequency
ERP	Effective Radiated Power	RFC	Remote Frequency Control
EU	European Union	RSL	Received Signal Level
EUT	Equipment Under Test	RTP	Room Temperature and Pressure
FM	Frequency Modulation	RTPC	Remote Transmit Power Control
FSK	Frequency Shift Keying	Rx	Receiver
g	Grams	s	Seconds
GHz	GigaHertz	SINAD	Signal to Noise And Distortion
Hz	Hertz	Tx	Transmitter
IF	Intermediate Frequency	V	Volts
kHz	kiloHertz		