Testing and Certification

TEST REPORT

FCC Test for IT109A017B Certification

APPLICANT

Innertron

REPORT NO.

HCT-RF-2608-FC008-R1

DATE OF ISSUE

September 4, 2026

Tested by

Kyung Soo Kang (signature)

Technical Manager

Jong Seok Lee (signature)

HCT Co., Ltd.

CEO BongJai Huh

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TEST REPORT

REPORT NO.
HCT-RF-2608-FC008-R1

DATE OF ISSUE
September 4, 2026

Applicant	**Innertron** 301, Harmony-ro, Yeonsu-gu, Incheon, Republic of Korea
Product Name	UHF 380-512MHZ 32-CH BASE CONFIG BDA
Model Name	IT109A017B
FCC ID	2BCYP-IT109A017B
Date of Test	June 29, 2026 ~ August 21, 2026
Location of Test	■ Permanent Testing Lab □ On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)
Test Standard Used	CFR 47 Part 2, Part 90
Test Results	PASS

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REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 21, 2026	Initial Release
1	September 4, 2026	Revised the Applicant Information.

Notice

Content
Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance. The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

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1. GENERAL INFORMATION

1.1. APPLICANT INFORMATION

Company Name	Innertron
Company Address	301, Harmony-ro, Yeonsu-gu, Incheon, Republic of Korea

1.2. PRODUCT INFORMATION

EUT Type	UHF 380-512MHZ 32-CH BASE CONFIG BDA
EUT Serial Number	26IT08A10000
Power Supply	100-240 VAC, 24 VDC(Battery)
Frequency Range	

Band Name	Uplink / Downlink (MHz)
UHF	406.1 ~ 420
	421 ~ 430
	450 ~ 512

Tx Output Power

Band Name	Uplink	Downlink
UHF	27 dBm	37 dBm

Antenna Gain
(#Total Gain)

Peak Antenna Gain:

Band Name	Uplink	Downlink
UHF (406.1 ~ 420 MHz)	10.85 dBd	0.85 dBd
UHF (421 ~ 430 MHz)	9.85 dBd	
UHF (450 ~ 512 MHz)		

#Total Gain = Peak Antenna Gain + Cable Loss
(Cable Loss = Uplink: -1.87 dB / Downlink: -1.87 dB)

Band Name	Uplink	Downlink
UHF (406.1 ~ 420 MHz)	8.98 dBd	-1.02 dBd
UHF (421 ~ 430 MHz)	7.98 dBd	
UHF (450 ~ 512 MHz)		

1.3. TEST INFORMATION

FCC Rule Parts	CFR 47 Part 2, Part 90
Measurement Standards	KDB 935210 D05 v01r04, KDB 971168 D01 v03r01, ANSI C63.26-2015
Test Location	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea

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2. FACILITIES AND ACCREDITATIONS

2.1. FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea. This test facility has completed the evaluation in compliance with the standards and evaluation period required for chamber validity verification. ANSI C63.25.2-2024 + ANSI C63.4-2014 + C63.4a-2017 and ANSI C63.25.1-2018.
Detailed description of test facility was submitted to the Commission and accepted dated February 26, 2026(Registration Number: KR0032).

2.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

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3. TEST SPECIFICATIONS

3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR 47 Part 2, Part 90.

Description	Reference	Results
AGC threshold	KDB 935210 D05 v01r04 4.2	Compliant
Out-of-band rejection	KDB 935210 D05 v01r04 4.3	Compliant
Occupied Bandwidth	§2.1049 §90.209, §90.219(e)(4)(ii)	Compliant
Input-versus-output signal comparison	§90.210, §90.219(e)(4)(iii)	Compliant
Input/output power and amplifier/booster gain	§2.1046, §90.219(e)(1)	Compliant
Noise figure	§90.219(e)(2)	Compliant
Out-of-band/out-of-block emissions and spurious emissions	§2.1051, §90.219(e)(3)	Compliant
Spurious emissions radiated	§2.1053	Compliant
Frequency Stability	§2.1055 §90.213	Compliant

Note: The decision rule applies ‘simple acceptance’

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3.2. ADDITIONAL DESCRIPTIONS ABOUT TEST

- Except for the following cases, EUT was tested under normal operating conditions.
  : Out-of-band rejection test requires maximum gain condition without AGC.

- The highest antenna gain among the antennas used was applied for testing.

- The test was generally based on the method of KDB 935210 D05 v01r04 and only followed ANSI C63.26-2015 if there was no test method in KDB standard.

- The EUT was tested using test signals required by the test procedures, configured based on the manufacturer's specifications.

Band Name	Frequency	Tested Signal	
		Uplink	Downlink
UHF	406.1 ~ 420	P25 Phase1 (C4FM) P25 Phase2 (H-CPM) FM (6.25 kHz, 12.5 kHz, 25 kHz) CW	P25 Phase1 (C4FM, CQPSK) P25 Phase2 (H-DQPSK) FM (6.25 kHz, 12.5 kHz, 25 kHz) CW
	421 ~ 430		
	450 ~ 512		

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The tests results included actual loss value for attenuator and cable combination as shown in the table below.

: Input Path

Correction factor table			
Frequency (MHz)	Factor (dB)	Frequency (MHz)	Factor (dB)
600	0.283	800	0.402
650	0.336	850	0.286
700	0.333	900	0.256
750	0.388	950	0.394

: Output Path

Correction factor table			
Frequency (MHz)	Factor (dB)	Frequency (MHz)	Factor (dB)
0.009	30.246	2 000	32.332
10	29.259	2 100	32.400
30	29.460	2 200	32.266
50	29.591	2 300	31.978
100	29.496	2 400	32.033
200	30.061	2 500	31.964
300	29.960	2 600	31.925
400	30.222	2 700	31.861
500	30.592	2 800	32.327
600	30.337	2 900	32.410
700	30.531	3 000	32.748
800	30.579	4 000	33.005
900	30.963	5 000	32.950
1 000	31.090	6 000	33.056
1 100	31.336	7 000	33.543
1 200	31.846	8 000	34.023
1 300	34.493	9 000	34.324
1 400	32.238	10 000	35.259
1 500	31.578	-	-
1 600	31.672	-	-
1 700	31.828	-	-
1 800	32.144	-	-
1 900	32.095	-	-

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3.3. MEASUREMENTUNCERTAINTY

Parameter		Expanded Uncertainty
Radiated Disturbance	9 kHz ~ 30 MHz	4.54 dB
	30 MHz ~ 1 GHz	5.74 dB
	1 GHz ~ 18 GHz	5.80 dB
	18 GHz ~ 40 GHz	5.86 dB

Coverage factor *k* = 2, Confidence levels of 95 %

3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature	+15 ℃ to +35 ℃
Relative humidity	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

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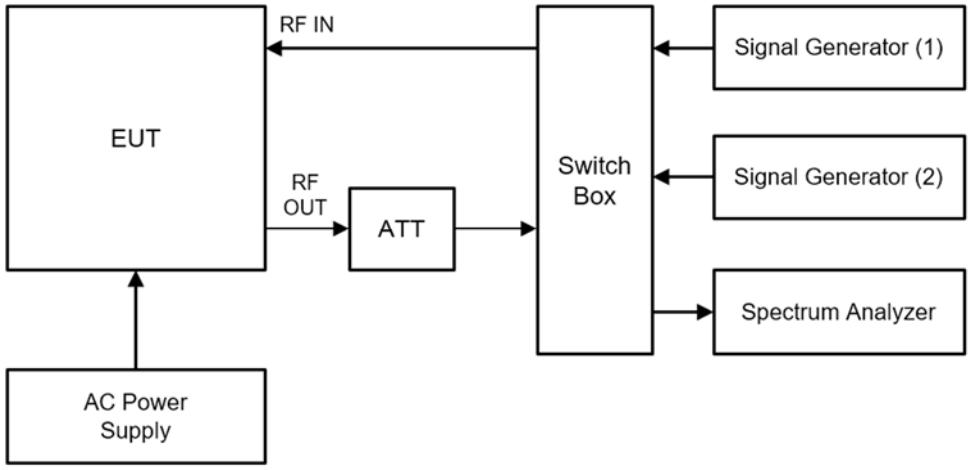
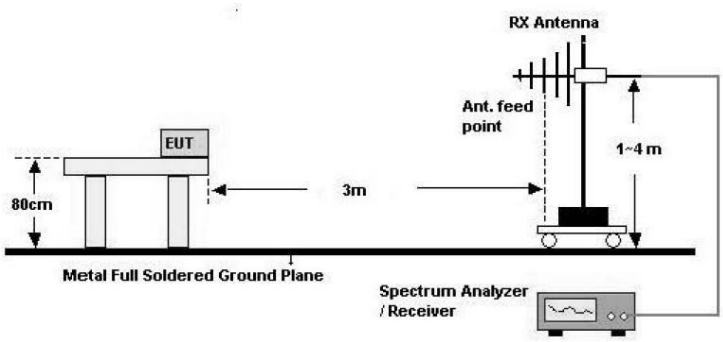
3.5. TEST DIAGRAMS

Conducted Test

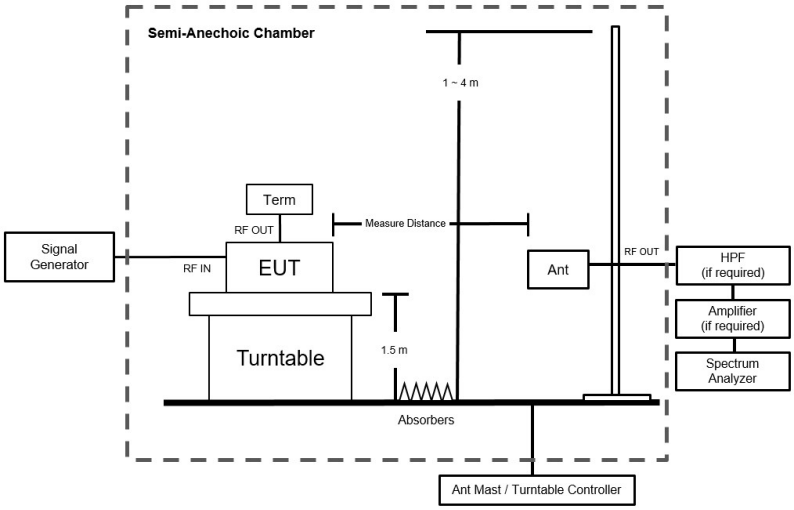


Radiated Test

30 MHz ~ 1 GHz



Above 1 GHz



Note: Measure distance for Above 1 GHz is 3 m.

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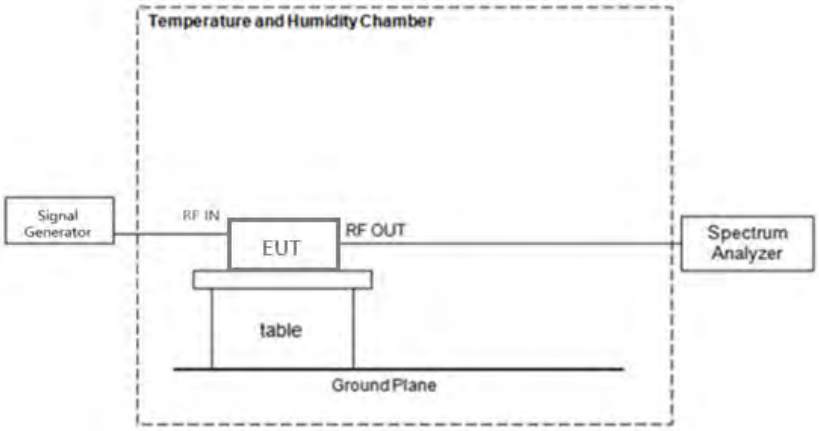
Frequency Stability



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4. TEST EQUIPMENTS

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
MXA Signal Analyzer	N9020A	Agilent	MY51110063	04/01/2027	Annual
# MXG Vector Signal Generator	N5182A	Agilent	MY50140312	01/07/2027	Annual
SIGNAL GENERATOR	SMBV100B	ROHDE&SCHWARZ	101177	02/11/2027	Annual
30 dB Attenuator	WA93-30-33	Weinschel Associates	0113	11/05/2026	Annual
AC Power Supply	PCR2000MA	KIKUSUI	ZL002530	12/17/2026	Annual
DC Power Supply	PWR800L	KIKUSUI	LJ003448	05/12/2027	Annual
Switch	S46-SV11	KEITHLEY	1088025	N/A	N/A
50Ω Termination	908A	H.P.	N/A	N/A	N/A
Temperature and Humidity Chamber	NY-THR18750	NANGYEAL	NY-200912201A	12/16/2026	Annual
Amp & Filter Bank Switch Controller	FBSM-01B	TNM system	TM20090002	N/A	N/A
Controller (Antenna Mast&Turn Table)	CO3000	Innco systems	CO3000/ 1251/48920320/P	N/A	N/A
Antenna Mast	MA4640	Innco systems	S4AM	07/30/2027	Annual
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	06/23/2027	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/28/2026	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-937	02/07/2027	Biennial
RF Switching System	FBSR-04C (LNA)	TNM system	S4L4	03/04/2027	Annual
RF Switching System	FBSR-04C (Thru)	TNM system	S4L6	03/04/2027	Annual
High Pass Filter	WHKX10-900-1000-15000-40SS	WAINWRIGHT INSTRUMENTS	16	07/02/2027	Annual

Multiple pieces of equipment were used depending on the test configuration; however, only one is listed for simplicity.

Note: All test equipment was within its valid calibration period at the time of testing.

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5. TEST RESULT

5.1. AGC THRESHOLD

Test Requirement:

KDB 935210 D05 v01r04

Testing at and above the AGC threshold is required.

Test Procedures:

Measurements were in accordance with the test methods section 4.2 of KDB 935210 D05 v01r04.

Testing at and above the AGC threshold will be required. The AGC threshold shall be determined by applying the procedure of 3.2, but with the signal generator configured to produce a test signal defined in Table 1, a CW input signal, or a digitally modulated signal, consistent with the discussion about signal types in 4.1.

Measurement were in accordance with the test methods in subclause 7.2.3.1 of ANSI C63.26.

a) Connect a signal generator to the input of the EUT.
b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation.
c) The signal generator must be set for CW operation.
d) While monitoring the output of the EUT, increase the input level until a 1 dB increase in the input signal no longer causes a 1 dB increase in the output signal.
e) This is the AGC threshold level of the EUT.

Note: Although subclause 7.2.3.1 c) of ANSI C63.26 specifies CW operation, the signal generator was configured to produce a digitally modulated signal in accordance with section 4.2 of KDB 935210 D05 v01r04, consistent with the signal types described in section 4.1.

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Test Results:

Test Band	Link	Test Signal	Center Frequency (MHz)	AGC Threshold Level (dBm)	Output Level (dBm)
UHF (406.1 ~ 420)	Uplink	P25 Phase 1 (C4FM)	413.05	-58	26.71
		P25 Phase 2 (H-CPM)	413.05	-58	26.86
		CW	413.05	-58	26.61
	Downlink	P25 Phase 1 (C4FM)	413.05	-48	36.79
		P25 Phase 1 (CQPSK)	413.05	-48	36.76
		P25 Phase 2 (H-DQPSK)	413.05	-48	36.78
		CW	413.05	-48	36.57
UHF (421 ~ 430)	Uplink	P25 Phase 1 (C4FM)	425.50	-58	26.84
		P25 Phase 2 (H-CPM)	425.50	-58	26.95
		CW	425.50	-58	26.65
	Downlink	P25 Phase 1 (C4FM)	425.50	-48	36.60
		P25 Phase 1 (CQPSK)	425.50	-48	36.90
		P25 Phase 2 (H-DQPSK)	425.50	-48	36.90
		CW	425.50	-48	36.75
UHF (450 ~ 512)	Uplink	P25 Phase 1 (C4FM)	481.00	-58	26.60
		P25 Phase 2 (H-CPM)	481.00	-58	26.82
		CW	481.00	-58	26.91
	Downlink	P25 Phase 1 (C4FM)	481.00	-48	37.27
		P25 Phase 1 (CQPSK)	481.00	-48	37.03
		P25 Phase 2 (H-DQPSK)	481.00	-48	37.11
		CW	481.00	-48	37.40

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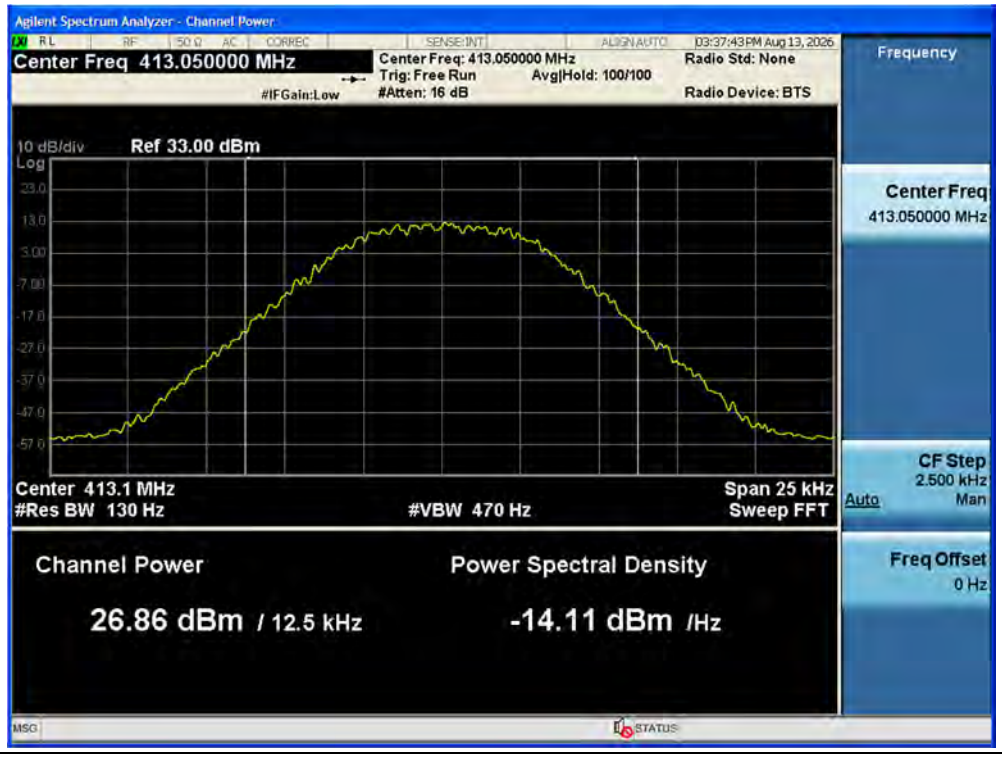
Plot data of AGC Threshold

AGC Threshold / UHF(406.1 ~ 420) / Uplink / P25 Phase1 (C4FM)

AGC Threshold / UHF(406.1 ~ 420) / Uplink / P25 Phase2 (H-CPM)



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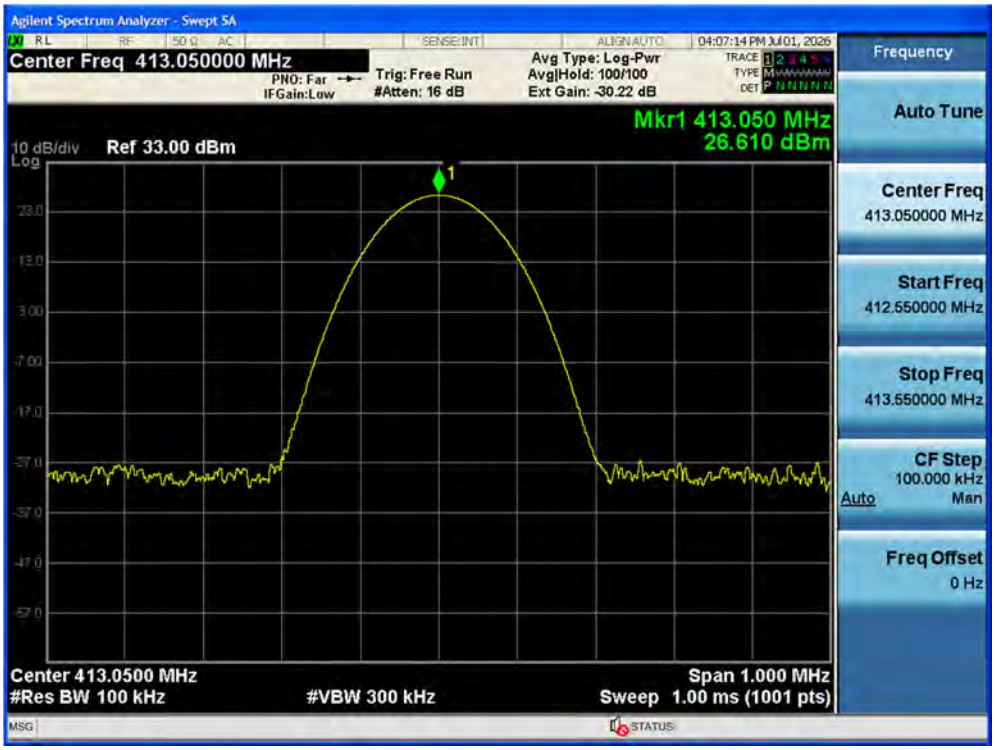
AGC Threshold / UHF(406.1 ~ 420) / Uplink / CW



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AGC Threshold / UHF(421 ~ 430) / Uplink / P25 Phase1 (C4FM)

AGC Threshold / UHF(421 ~ 430) / Uplink / P25 Phase2 (H-CPM)

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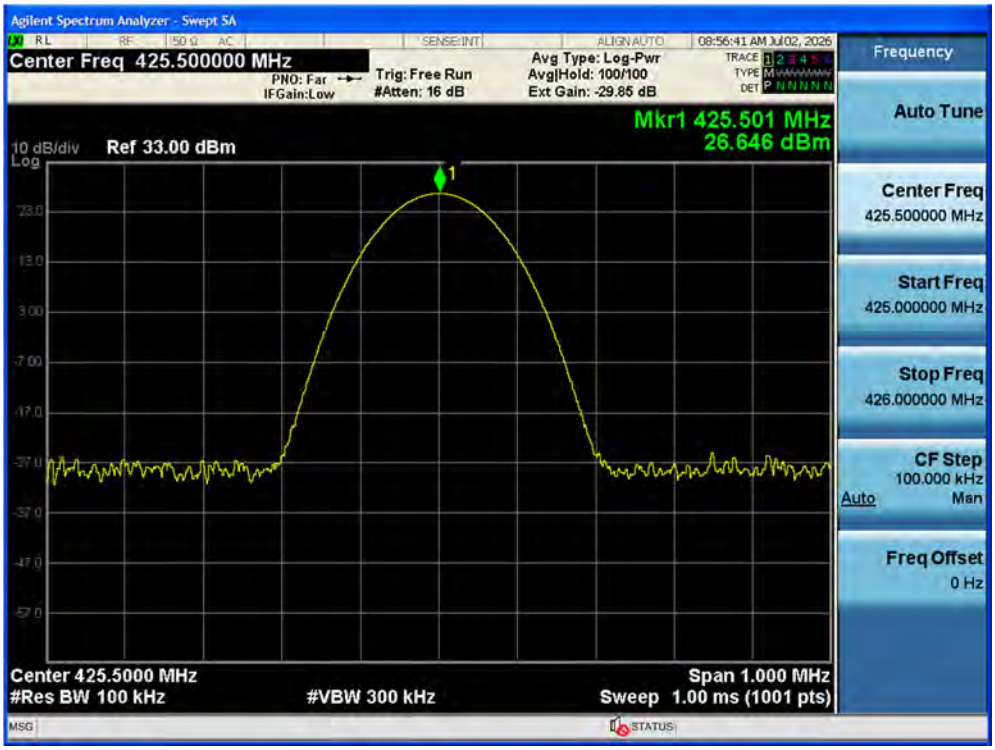
AGC Threshold / UHF(421 ~ 430) / Uplink / CW



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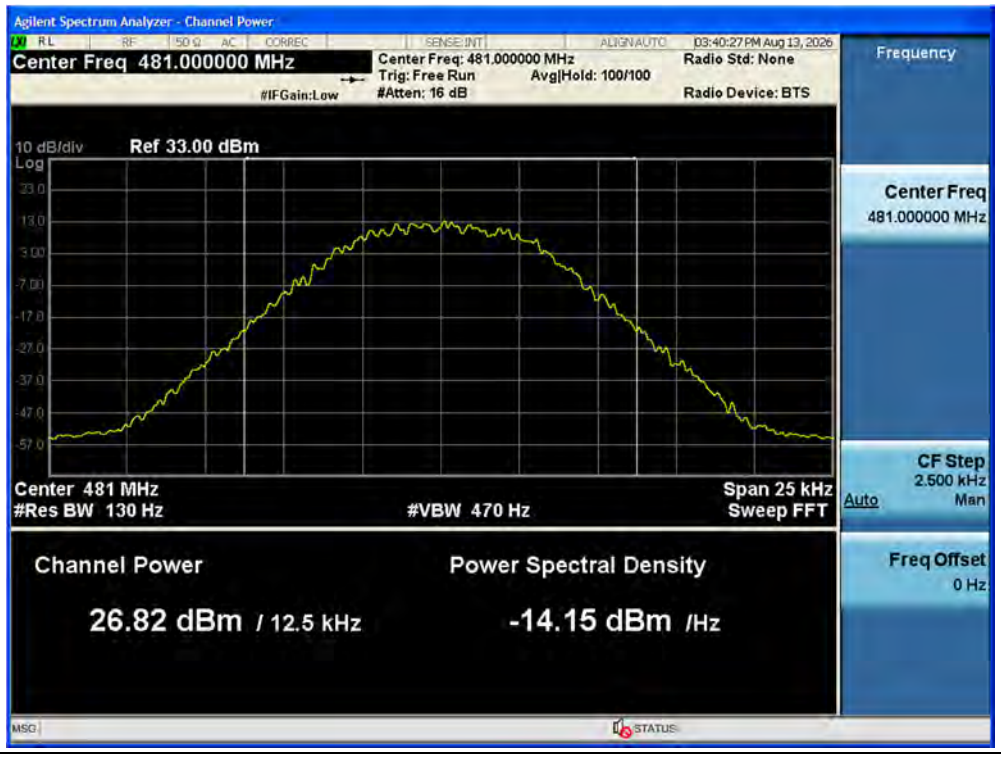
AGC Threshold / UHF(450 ~ 512) / Uplink / P25 Phase1 (C4FM)

AGC Threshold / UHF(450 ~ 512) / Uplink / P25 Phase2 (H-CPM)



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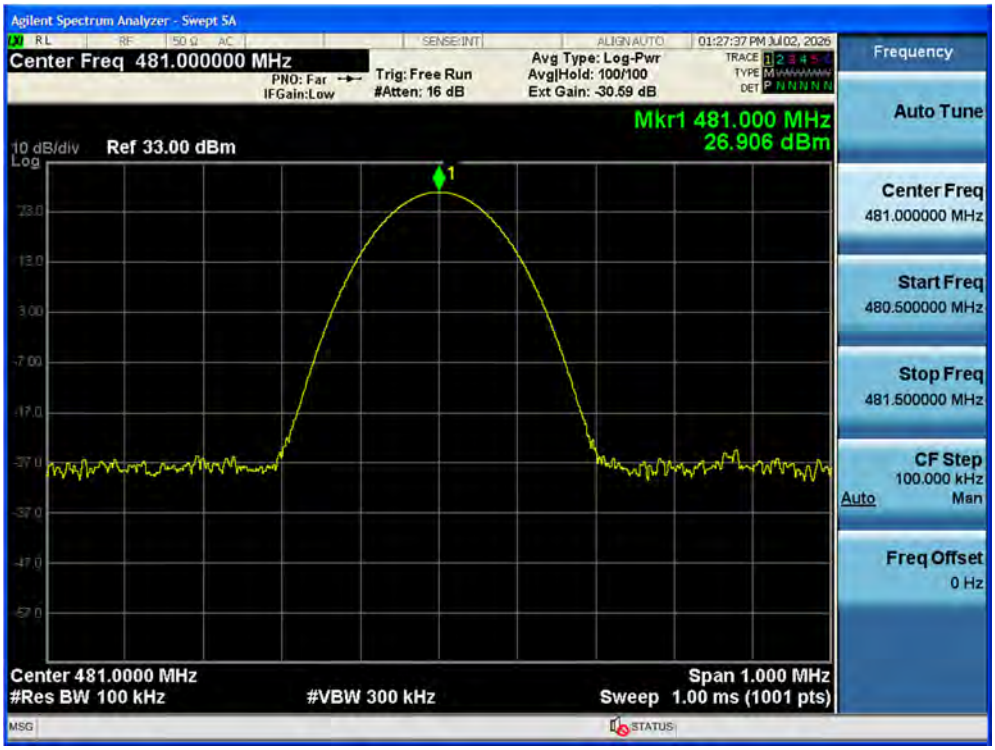
AGC Threshold / UHF(450 ~ 512) / Uplink / CW



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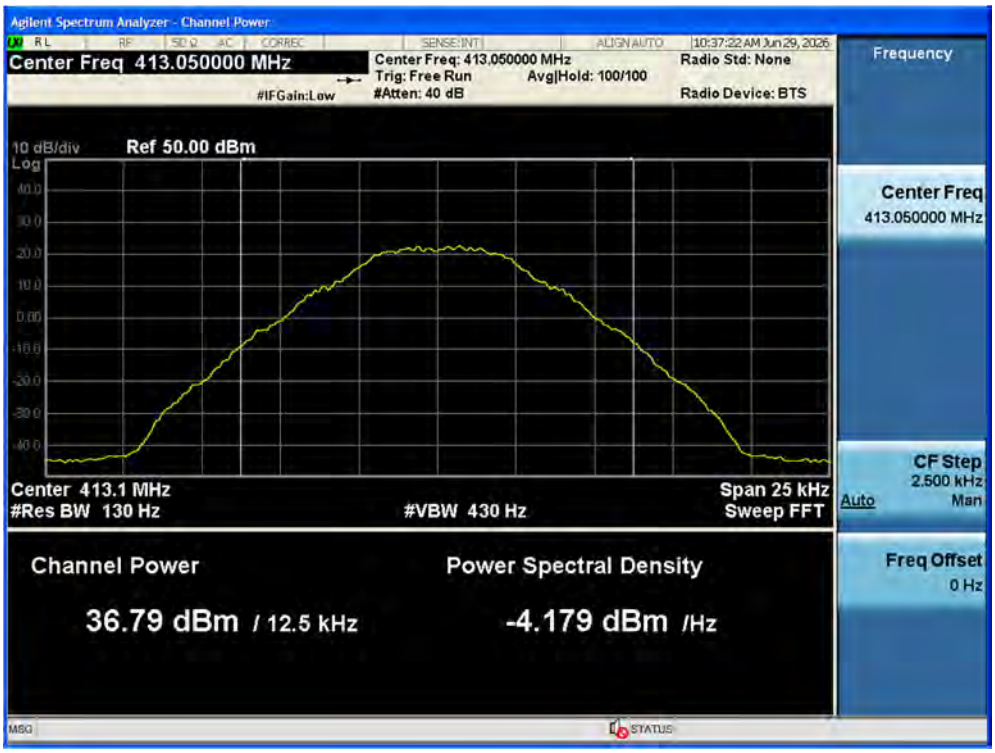
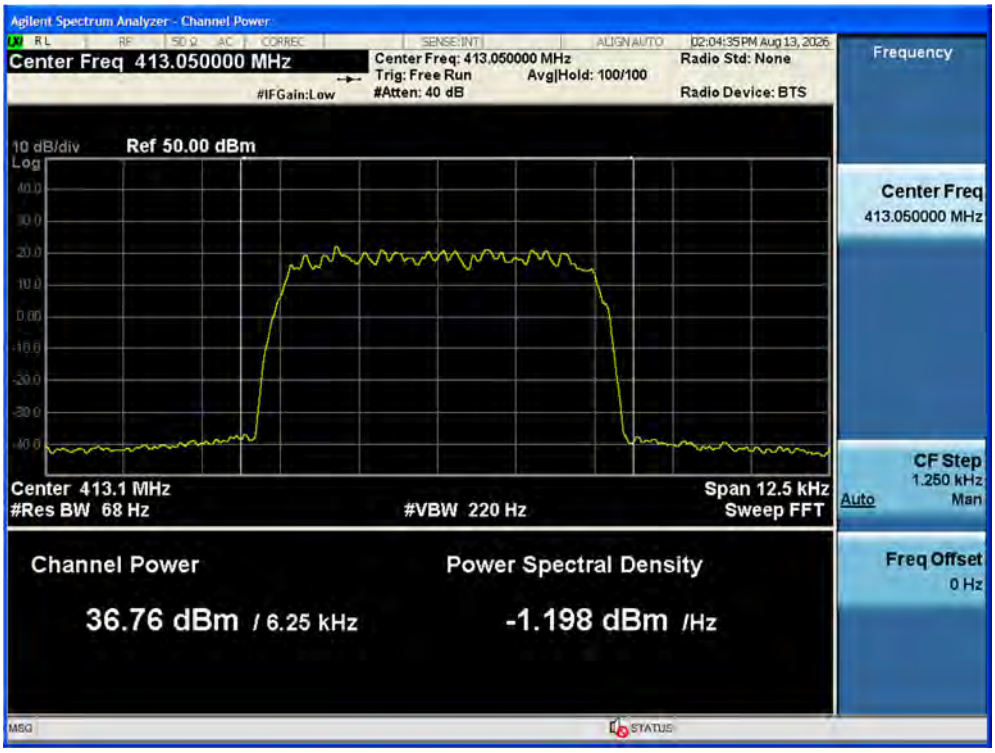
AGC Threshold / UHF(406.1 ~ 420) / Downlink / P25 Phase1 (C4FM)



AGC Threshold / UHF(406.1 ~ 420) / Downlink / P25 Phase1 (CQPSK)



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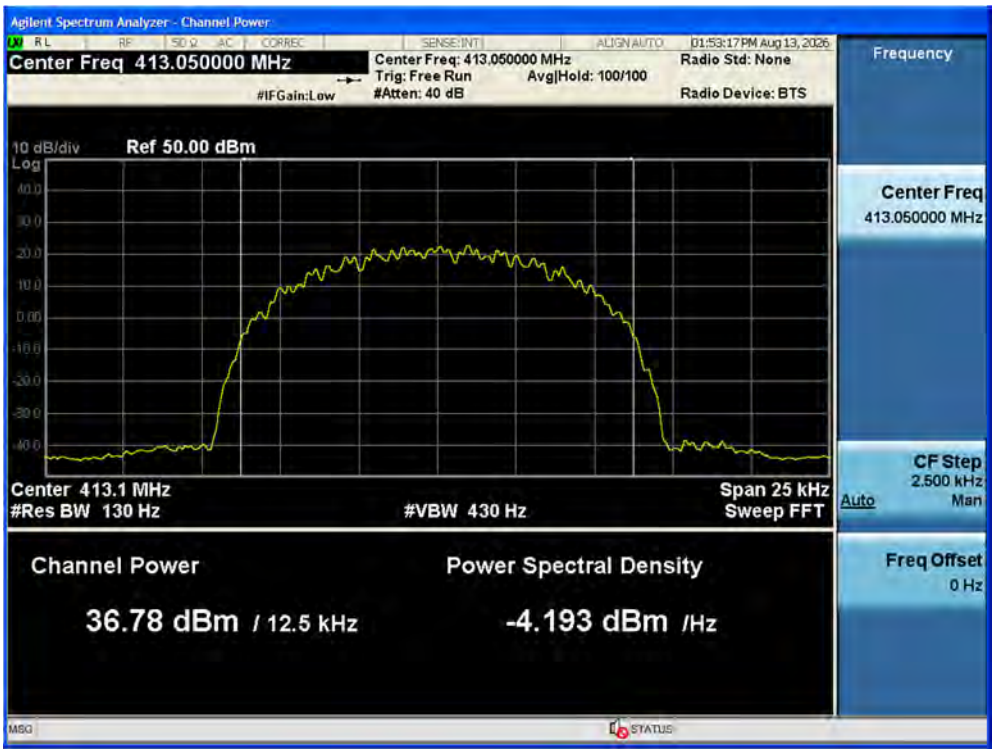
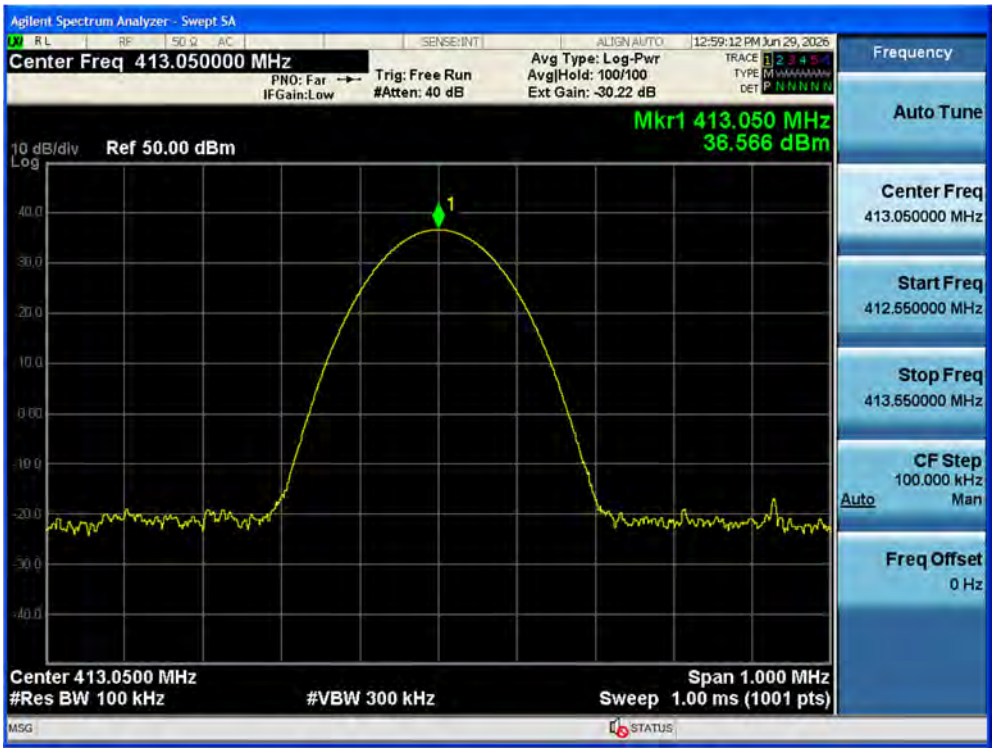
AGC Threshold / UHF(406.1 ~ 420) / Downlink / P25 Phase2 (H-DQPSK)



AGC Threshold / UHF(406.1 ~ 420) / Downlink / CW



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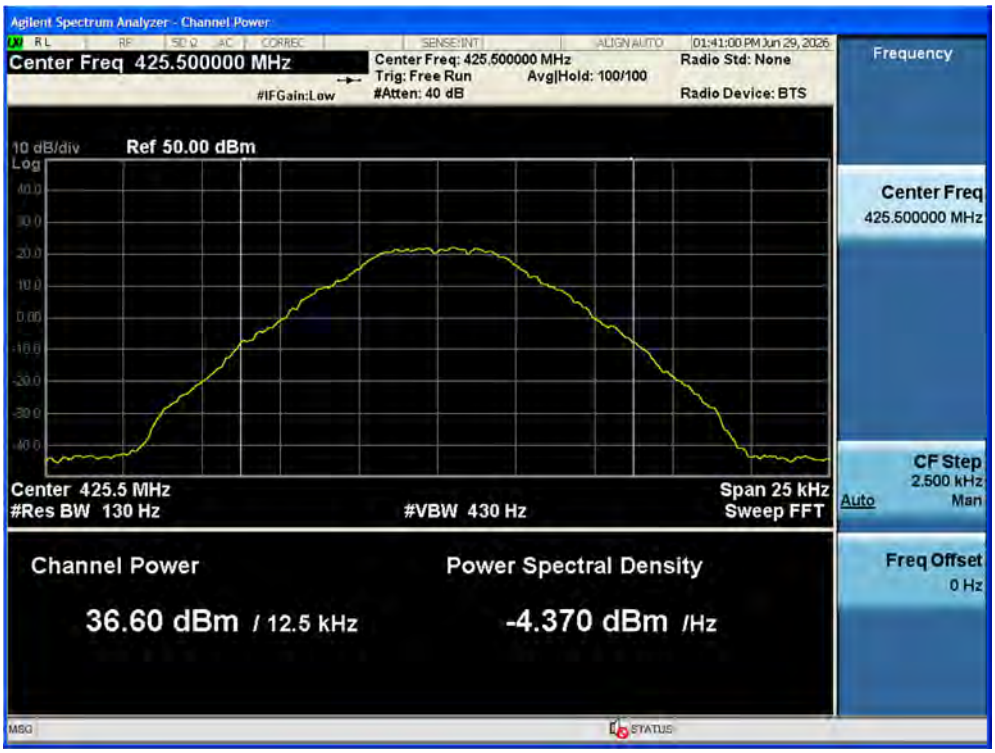
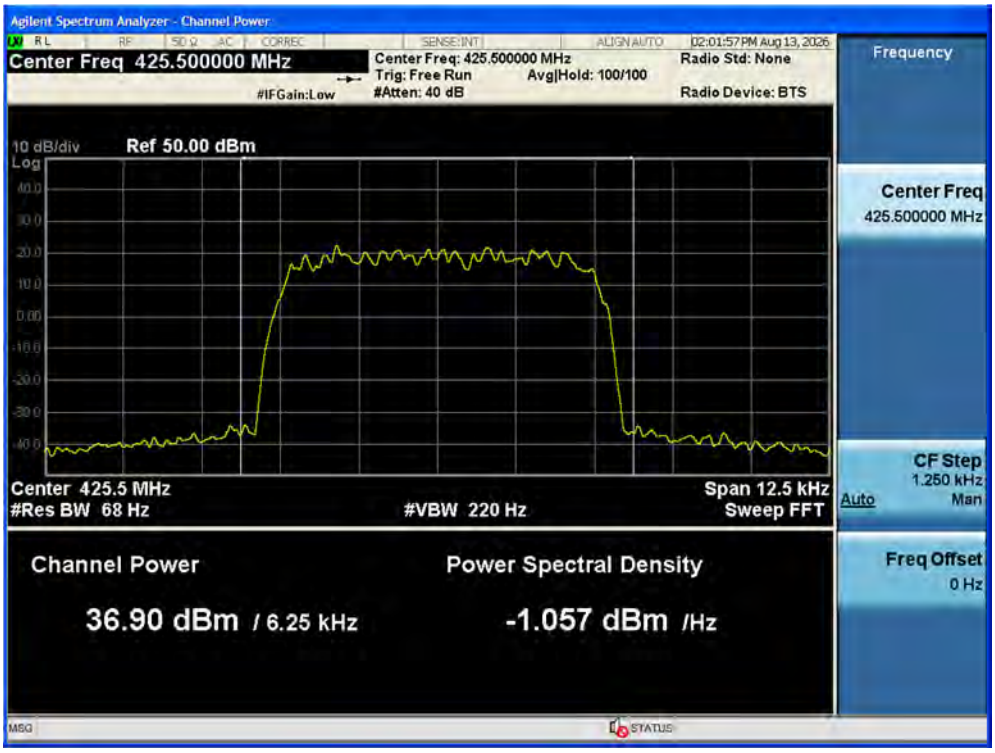
AGC Threshold / UHF(421 ~ 430) / Downlink / P25 Phase1 (C4FM)



AGC Threshold / UHF(421 ~ 430) / Downlink / P25 Phase1 (CQPSK)



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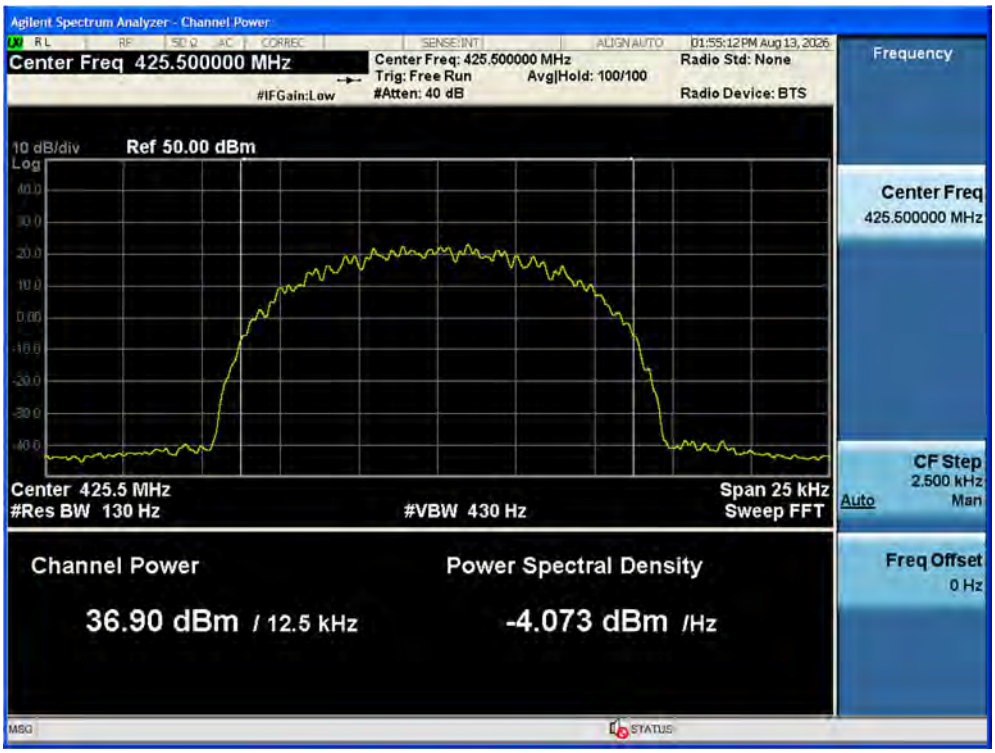
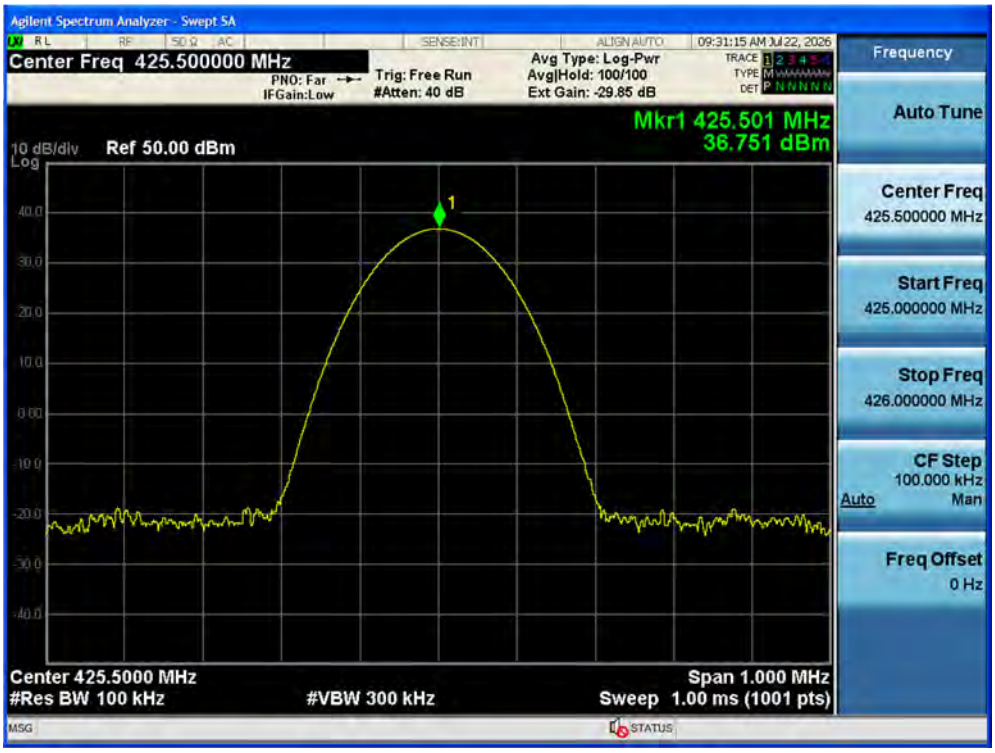
AGC Threshold / UHF(421 ~ 430) / Downlink / P25 Phase2 (H-DQPSK)



AGC Threshold / UHF(421 ~ 430) / Downlink / CW



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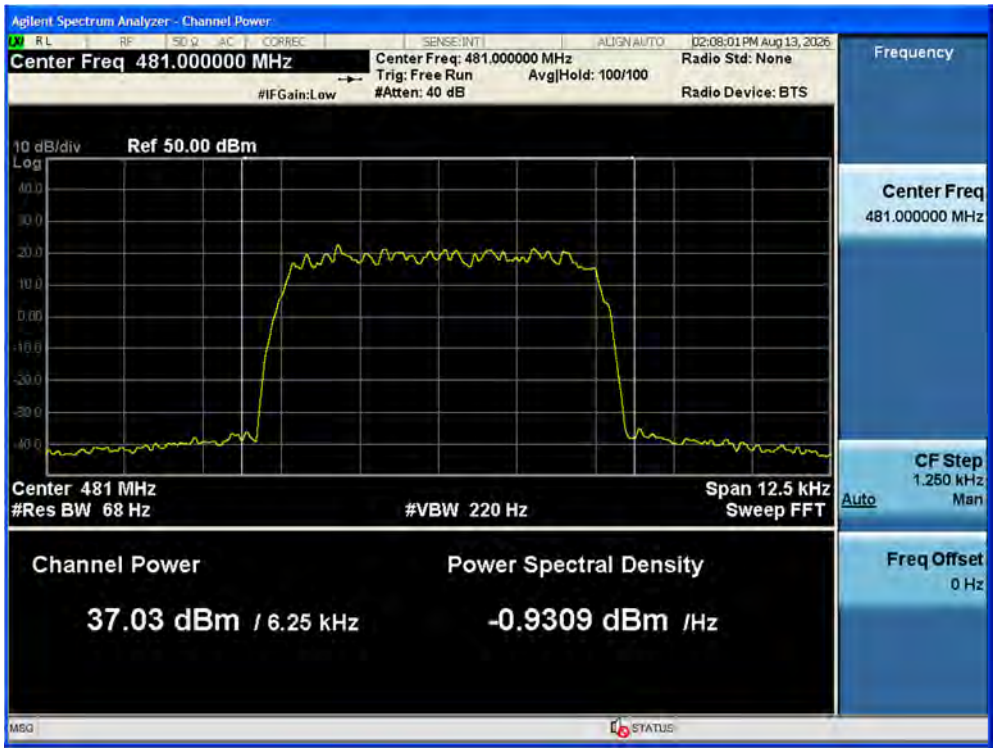
AGC Threshold / UHF(450 ~ 512) / Downlink / P25 Phase1 (C4FM)

AGC Threshold / UHF(450 ~ 512) / Downlink / P25 Phase1 (CQPSK)



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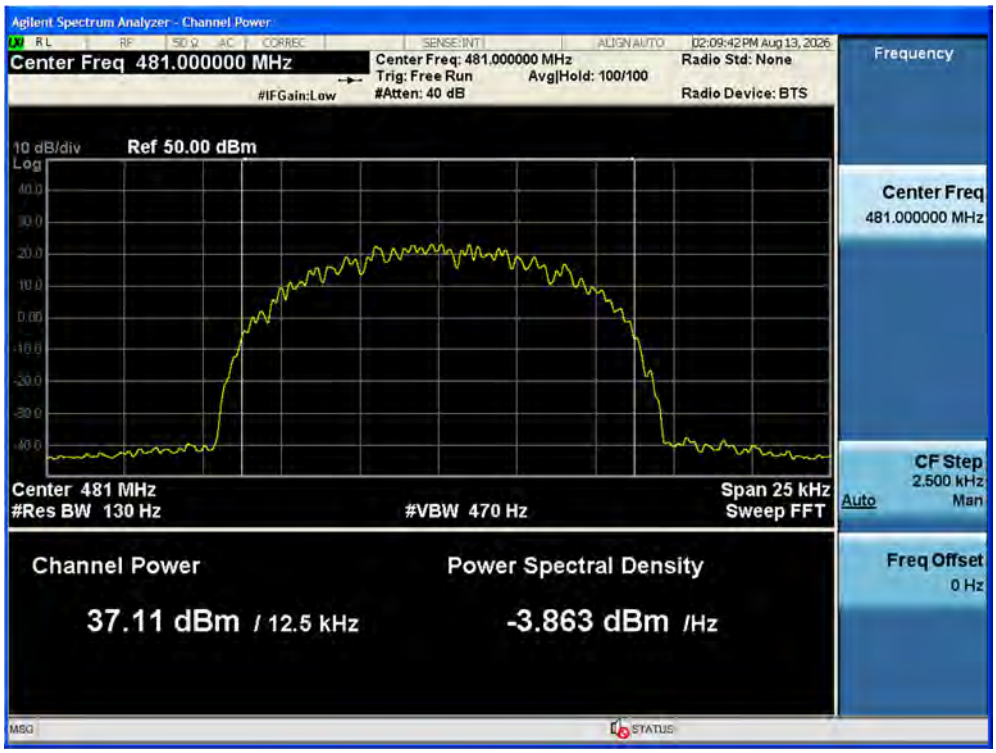
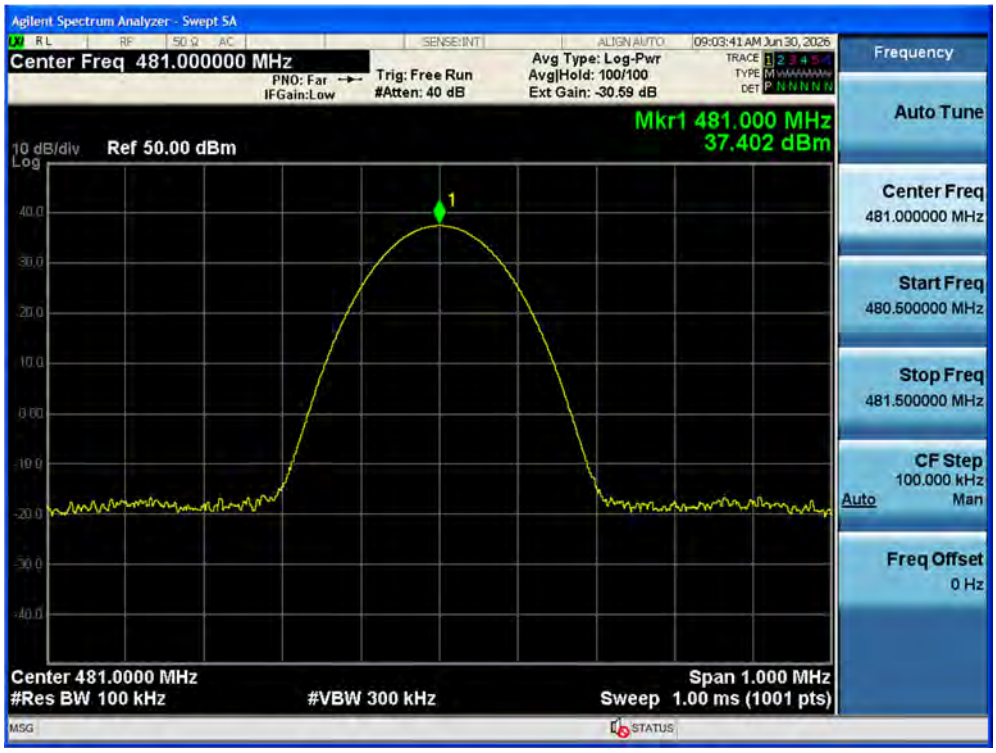
AGC Threshold / UHF(450 ~ 512) / Downlink / P25 Phase2 (H-DQPSK)



AGC Threshold / UHF(450 ~ 512) / Downlink / CW



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5.2. OUT-OF-BAND REJECTION

Test Requirement:

KDB 935210 D05 v01r04

Out-of-band rejection required.

Test Procedures:

Measurements were in accordance with the test methods section 4.3 of KDB 935210 D05 v01r04.

A signal booster shall reject amplification of other signals outside of its passband. Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
   1) Frequency range = ± 250 % of the manufacturer's specified pass band.
   2) The CW amplitude shall be 3 dB below the AGC threshold (see 4.2), and shall not activate the AGC threshold throughout the test.
   3) Dwell time = approximately 10 ms.
   4) Frequency step = 50 kHz.
c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
d) Set the RBW of the spectrum analyzer to between 1 % and 5 % of the manufacturer's rated passband, and VBW = 3 × RBW.
e) Set the detector to Peak and the trace to Max-Hold.
f) After the trace is completely filled, place a marker at the peak amplitude, which is designated as f_0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the level has fallen by 20 dB).
g) Capture the frequency response plot for inclusion in the test report.

Note: The manufacturer's specified pass band is defined as follows

UHF: 380 ~ 512 MHz

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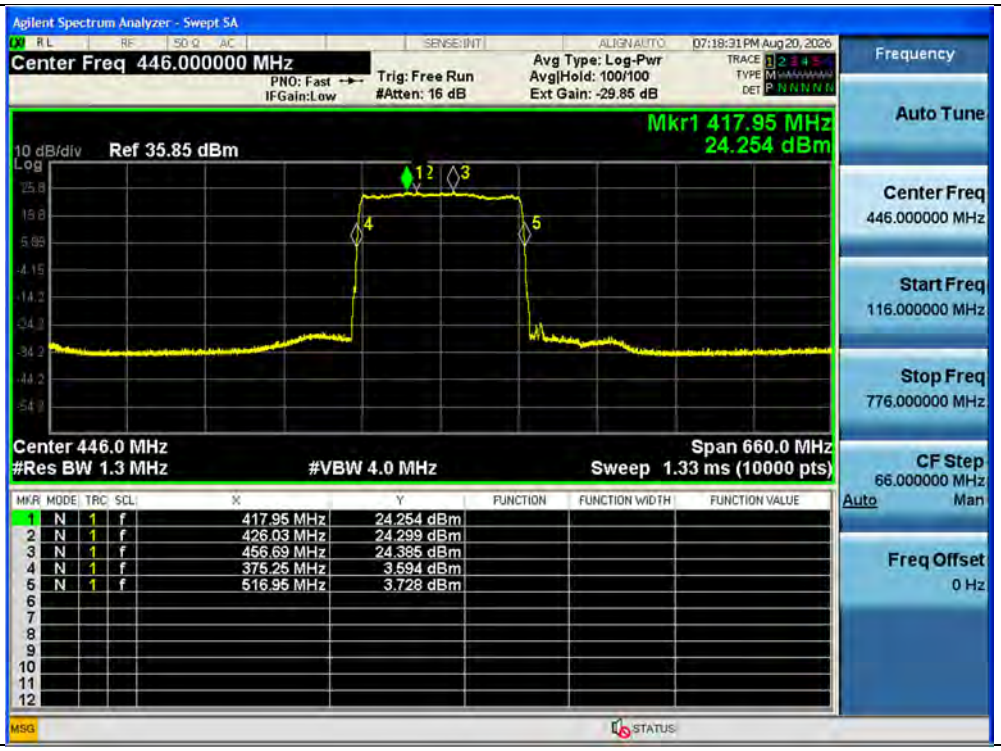
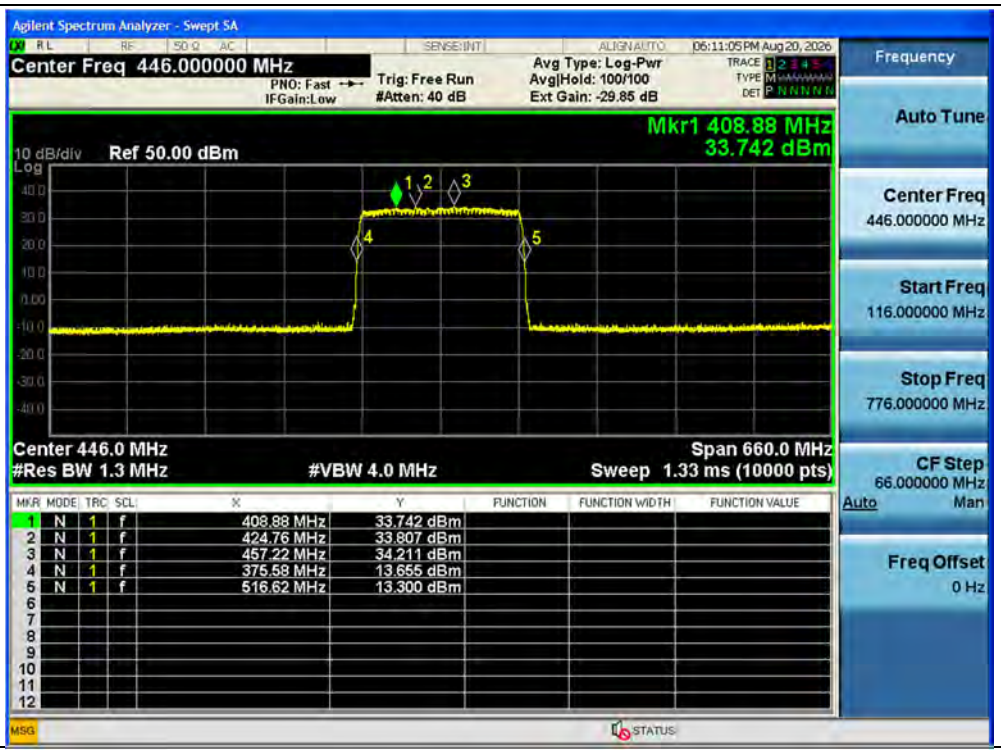
Test Results:

UHF (406.1 ~ 512 MHz) / Uplink



UHF (406.1 ~ 512 MHz) / Downlink



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5.3. OCCUPIED BANDWIDTH

Test Requirement:

§2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

§90.209 Bandwidth limitations.

Table 1 to § 90.209(b)(5) - Standard Channel Spacing/Bandwidth

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Below 25		
25-50	20	20
72-76	20	20
150-174	7.5	20/11.25/6
216-220	6.25	20/11.25/6
220-222	5	4
406-512	6.25	20/11.25/6
806-809/851-854#	12.5	20
809-817/854-862	12.5	20/11.25
817-824/862-869	25	20
896-901/935-940	12.5	13.6
902-928		
929-930	25	20
1427-1432	12.5	12.5
2450-2483.5		
Above 2500		

§90.219 Use of signal boosters.

(e) Device Specifications. In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(4) A signal booster must be designed such that all signals that it retransmits meet the following requirements:

(ii) There is no change in the occupied bandwidth of the retransmitted signals.

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Test Procedures:

Measurements were in accordance with the test methods section 5.4.4 of ANSI C63.26-2015.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.

NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) Set the detection mode to peak, and the trace mode to max-hold.

e) Omit

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

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Test Results:

Tabular data of Input Occupied Bandwidth

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (kHz)	26 dB OBW (kHz)
UHF (406.1 ~ 420)	Uplink	P25 Phase1 (C4FM)	413.05	8.337	11.42
		P25 Phase2 (H-CPM)	413.05	8.141	10.80
		FM 6.25 kHz	413.05	4.051	4.90
		FM 12.5 kHz	413.05	11.296	12.96
		FM 25 kHz	413.05	16.418	18.73
	Downlink	P25 Phase1 (C4FM)	413.05	8.525	11.33
		P25 Phase1 (CQPSK)	413.05	4.855	5.41
		P25 Phase2 (H-DQPSK)	413.05	9.790	12.08
		FM 6.25 kHz	413.05	4.050	4.90
		FM 12.5 kHz	413.05	11.293	12.96
		FM 25 kHz	413.05	16.414	18.72
UHF (421 ~ 430)	Uplink	P25 Phase1 (C4FM)	425.50	8.211	11.07
		P25 Phase2 (H-CPM)	425.50	8.142	10.79
		FM 6.25 kHz	425.50	4.051	4.90
		FM 12.5 kHz	425.50	11.296	12.96
		FM 25 kHz	425.50	16.416	18.73
	Downlink	P25 Phase1 (C4FM)	425.50	8.274	11.69
		P25 Phase1 (CQPSK)	425.50	4.866	5.40
		P25 Phase2 (H-DQPSK)	425.50	9.796	12.07
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.292	12.96
		FM 25 kHz	425.50	16.412	18.71
UHF (450 ~ 512)	Uplink	P25 Phase1 (C4FM)	481.00	8.236	10.73
		P25 Phase2 (H-CPM)	481.00	8.136	10.79
		FM 6.25 kHz	481.00	4.051	4.90
		FM 12.5 kHz	481.00	11.297	12.96
		FM 25 kHz	481.00	16.419	18.72
	Downlink	P25 Phase1 (C4FM)	481.00	8.415	11.36
		P25 Phase1 (CQPSK)	481.00	4.875	5.40
		P25 Phase2 (H-DQPSK)	481.00	9.796	12.12
		FM 6.25 kHz	481.00	4.050	4.90
		FM 12.5 kHz	481.00	11.293	12.96
		FM 25 kHz	481.00	16.411	18.71

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Tabular data of Output Occupied Bandwidth

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (kHz)	26 dB OBW (kHz)
UHF (406.1 ~ 420)	Uplink	P25 Phase1 (C4FM)	413.05	8.605	11.52
		P25 Phase2 (H-CPM)	413.05	8.153	10.74
		FM 6.25 kHz	413.05	4.050	4.90
		FM 12.5 kHz	413.05	11.292	12.96
		FM 25 kHz	413.05	16.412	18.71
	Downlink	P25 Phase1 (C4FM)	413.05	8.292	11.32
		P25 Phase1 (CQPSK)	413.05	4.854	5.40
		P25 Phase2 (H-DQPSK)	413.05	9.788	12.14
		FM 6.25 kHz	413.05	4.050	4.90
		FM 12.5 kHz	413.05	11.292	12.96
		FM 25 kHz	413.05	16.412	18.71
UHF (421 ~ 430)	Uplink	P25 Phase1 (C4FM)	425.50	8.362	11.05
		P25 Phase2 (H-CPM)	425.50	8.150	10.78
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.292	12.95
		FM 25 kHz	425.50	16.409	18.71
	Downlink	P25 Phase1 (C4FM)	425.50	8.319	11.71
		P25 Phase1 (CQPSK)	425.50	4.853	5.40
		P25 Phase2 (H-DQPSK)	425.50	9.785	12.11
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.292	12.96
		FM 25 kHz	425.50	16.409	18.70
UHF (450 ~ 512)	Uplink	P25 Phase1 (C4FM)	481.00	8.498	10.73
		P25 Phase2 (H-CPM)	481.00	8.145	10.78
		FM 6.25 kHz	481.00	4.051	4.90
		FM 12.5 kHz	481.00	11.293	12.96
		FM 25 kHz	481.00	16.412	18.71
	Downlink	P25 Phase1 (C4FM)	481.00	8.179	11.31
		P25 Phase1 (CQPSK)	481.00	4.868	5.40
		P25 Phase2 (H-DQPSK)	481.00	9.793	12.06
		FM 6.25 kHz	481.00	4.050	4.90
		FM 12.5 kHz	481.00	11.292	12.96
		FM 25 kHz	481.00	16.409	18.71

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Tabular data of Input Occupied Bandwidth at 3 dB above the AGC threshold

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (kHz)	26 dB OBW (kHz)
UHF (406.1 ~ 420)	Uplink	P25 Phase1 (C4FM)	413.05	8.362	11.35
		P25 Phase2 (H-CPM)	413.05	8.138	10.80
		FM 6.25 kHz	413.05	4.051	4.90
		FM 12.5 kHz	413.05	11.294	12.96
		FM 25 kHz	413.05	16.415	18.71
	Downlink	P25 Phase1 (C4FM)	413.05	8.129	10.87
		P25 Phase1 (CQPSK)	413.05	4.869	5.40
		P25 Phase2 (H-DQPSK)	413.05	9.793	12.12
		FM 6.25 kHz	413.05	4.050	4.90
		FM 12.5 kHz	413.05	11.293	12.96
		FM 25 kHz	413.05	16.414	18.71
UHF (421 ~ 430)	Uplink	P25 Phase1 (C4FM)	425.50	8.423	11.32
		P25 Phase2 (H-CPM)	425.50	8.134	10.78
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.294	12.96
		FM 25 kHz	425.50	16.413	18.72
	Downlink	P25 Phase1 (C4FM)	425.50	8.480	11.16
		P25 Phase1 (CQPSK)	425.50	4.867	5.40
		P25 Phase2 (H-DQPSK)	425.50	9.791	12.12
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.292	12.96
		FM 25 kHz	425.50	16.411	18.71
UHF (450 ~ 512)	Uplink	P25 Phase1 (C4FM)	481.00	8.492	11.46
		P25 Phase2 (H-CPM)	481.00	8.119	10.79
		FM 6.25 kHz	481.00	4.051	4.90
		FM 12.5 kHz	481.00	11.295	12.96
		FM 25 kHz	481.00	16.416	18.72
	Downlink	P25 Phase1 (C4FM)	481.00	8.266	11.16
		P25 Phase1 (CQPSK)	481.00	4.862	5.41
		P25 Phase2 (H-DQPSK)	481.00	9.796	12.06
		FM 6.25 kHz	481.00	4.050	4.90
		FM 12.5 kHz	481.00	11.293	12.96
		FM 25 kHz	481.00	16.409	18.70

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Tabular data of Output Occupied Bandwidth at 3 dB above the AGC threshold

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (kHz)	26 dB OBW (kHz)
UHF (406.1 ~ 420)	Uplink	P25 Phase1 (C4FM)	413.05	8.123	11.42
		P25 Phase2 (H-CPM)	413.05	8.104	10.74
		FM 6.25 kHz	413.05	4.050	4.90
		FM 12.5 kHz	413.05	11.292	12.96
		FM 25 kHz	413.05	16.412	18.71
	Downlink	P25 Phase1 (C4FM)	413.05	8.210	10.83
		P25 Phase1 (CQPSK)	413.05	4.863	5.40
		P25 Phase2 (H-DQPSK)	413.05	9.796	12.20
		FM 6.25 kHz	413.05	4.050	4.90
		FM 12.5 kHz	413.05	11.293	12.96
		FM 25 kHz	413.05	16.412	18.71
UHF (421 ~ 430)	Uplink	P25 Phase1 (C4FM)	425.50	8.242	11.25
		P25 Phase2 (H-CPM)	425.50	8.132	10.78
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.292	12.95
		FM 25 kHz	425.50	16.409	18.71
	Downlink	P25 Phase1 (C4FM)	425.50	8.287	11.06
		P25 Phase1 (CQPSK)	425.50	4.883	5.39
		P25 Phase2 (H-DQPSK)	425.50	9.804	12.11
		FM 6.25 kHz	425.50	4.050	4.90
		FM 12.5 kHz	425.50	11.292	12.96
		FM 25 kHz	425.50	16.409	18.70
UHF (450 ~ 512)	Uplink	P25 Phase1 (C4FM)	481.00	8.372	11.44
		P25 Phase2 (H-CPM)	481.00	8.140	10.79
		FM 6.25 kHz	481.00	4.051	4.90
		FM 12.5 kHz	481.00	11.293	12.96
		FM 25 kHz	481.00	16.411	18.71
	Downlink	P25 Phase1 (C4FM)	481.00	8.560	11.21
		P25 Phase1 (CQPSK)	481.00	4.886	5.39
		P25 Phase2 (H-DQPSK)	481.00	9.785	12.16
		FM 6.25 kHz	481.00	4.050	4.90
		FM 12.5 kHz	481.00	11.292	12.96
		FM 25 kHz	481.00	16.409	18.71

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Measured Occupied Bandwidth Comparison

Test Band	Link	Signal	Variant of Input and output Occupied Bandwidth (%)	Variant of Input and 3 dB above the AGC threshold output Occupied Bandwidth (%)
UHF (406.1 ~ 420)	Uplink	P25 Phase1 (C4FM)	0.84	0.63
		P25 Phase2 (H-CPM)	-0.60	-0.49
		FM 6.25 kHz	0.00	0.00
		FM 12.5 kHz	-0.02	-0.02
		FM 25 kHz	-0.13	-0.03
	Downlink	P25 Phase1 (C4FM)	-0.09	-0.37
		P25 Phase1 (CQPSK)	-0.13	-0.07
		P25 Phase2 (H-DQPSK)	0.51	0.63
		FM 6.25 kHz	0.00	-0.02
		FM 12.5 kHz	0.00	0.00
		FM 25 kHz	-0.05	0.00
UHF (421 ~ 430)	Uplink	P25 Phase1 (C4FM)	-0.18	-0.62
		P25 Phase2 (H-CPM)	-0.10	-0.06
		FM 6.25 kHz	0.00	0.00
		FM 12.5 kHz	-0.08	-0.08
		FM 25 kHz	-0.11	-0.05
	Downlink	P25 Phase1 (C4FM)	0.17	-0.90
		P25 Phase1 (CQPSK)	0.06	-0.26
		P25 Phase2 (H-DQPSK)	0.39	-0.02
		FM 6.25 kHz	0.00	0.00
		FM 12.5 kHz	-0.01	-0.01
		FM 25 kHz	-0.03	-0.07
UHF (450 ~ 512)	Uplink	P25 Phase1 (C4FM)	0.07	-0.21
		P25 Phase2 (H-CPM)	-0.11	-0.06
		FM 6.25 kHz	-0.02	-0.02
		FM 12.5 kHz	-0.01	-0.02
		FM 25 kHz	-0.07	-0.06
	Downlink	P25 Phase1 (C4FM)	-0.44	0.45
		P25 Phase1 (CQPSK)	-0.04	-0.30
		P25 Phase2 (H-DQPSK)	-0.50	0.83
		FM 6.25 kHz	0.00	0.00
		FM 12.5 kHz	-0.01	-0.01
		FM 25 kHz	-0.01	0.01

Change in input-output OBW is less than ±5 %.

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Plot data of Occupied Bandwidth

Input / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM)

Output/ UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM)

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Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM)

Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM)

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Input / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)

Output / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)

Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)

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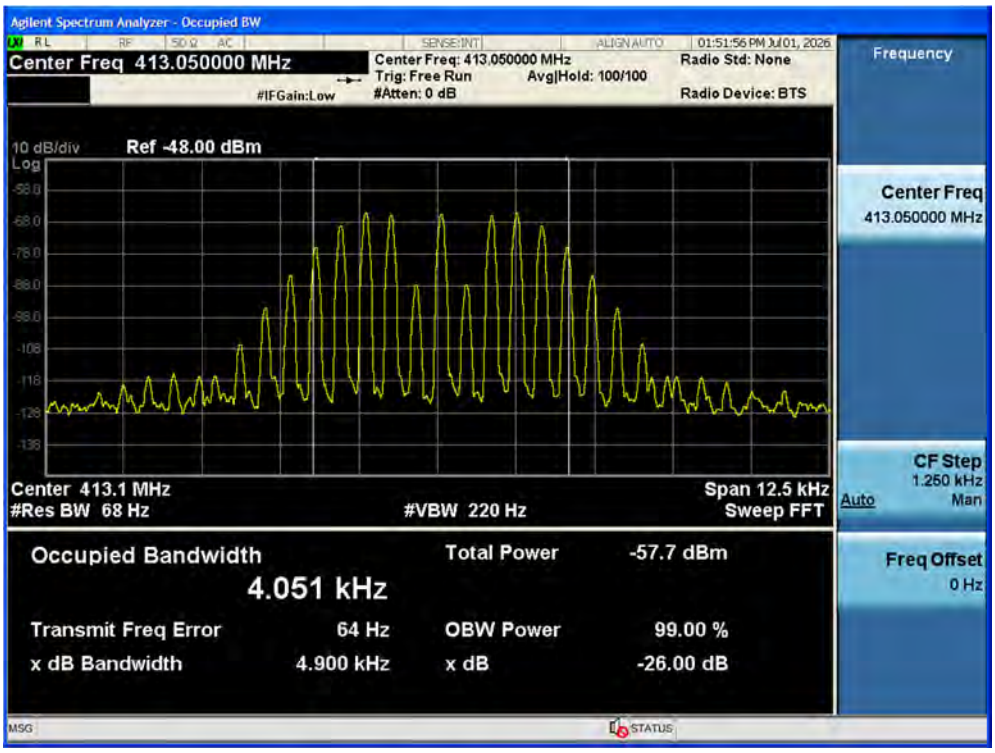
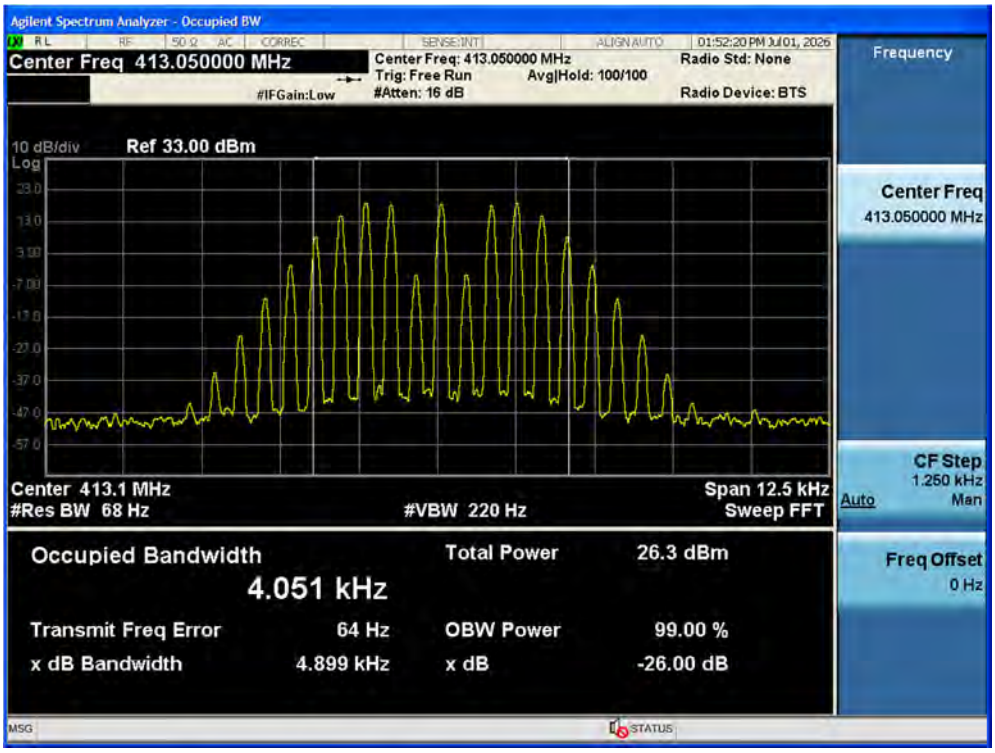
Input / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz)



Output / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz)



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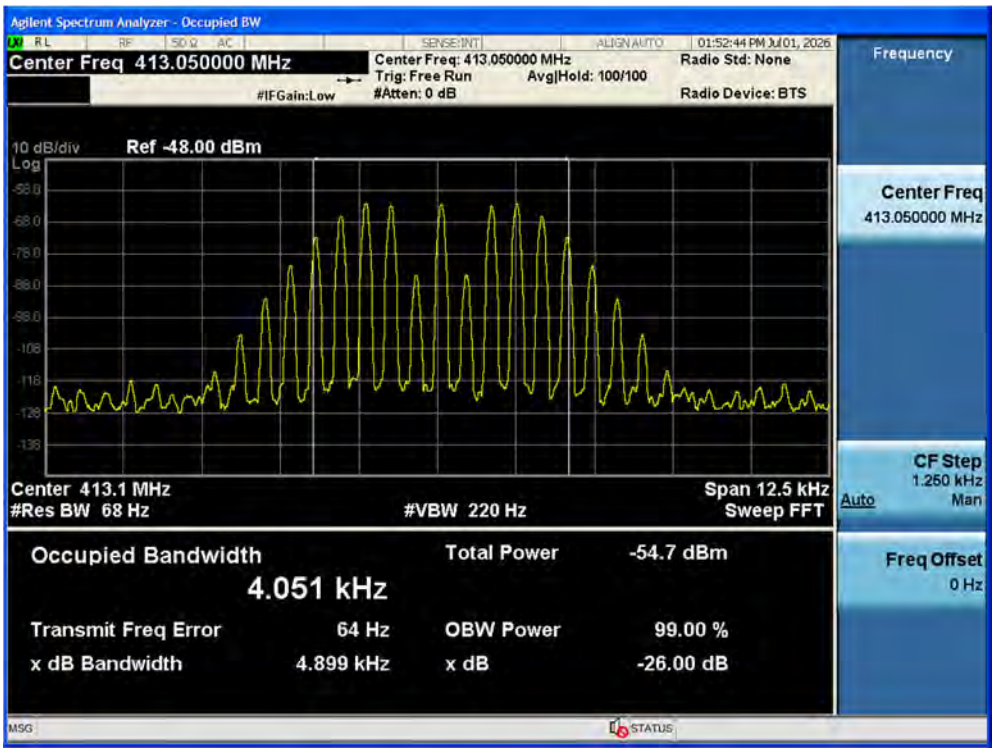
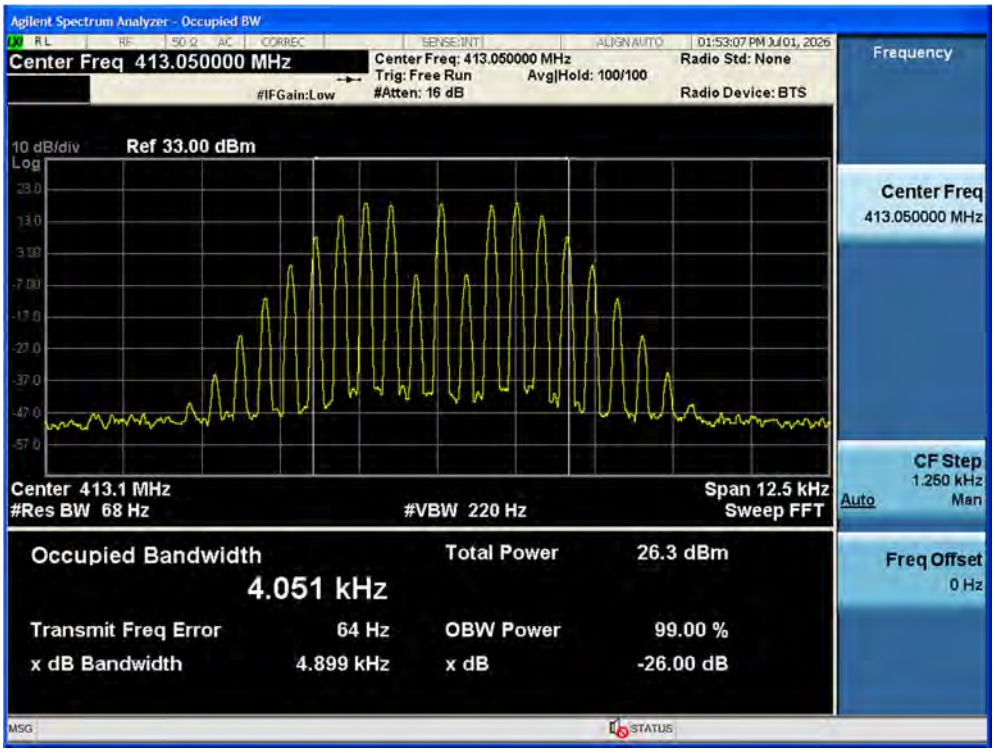
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz)



Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz)



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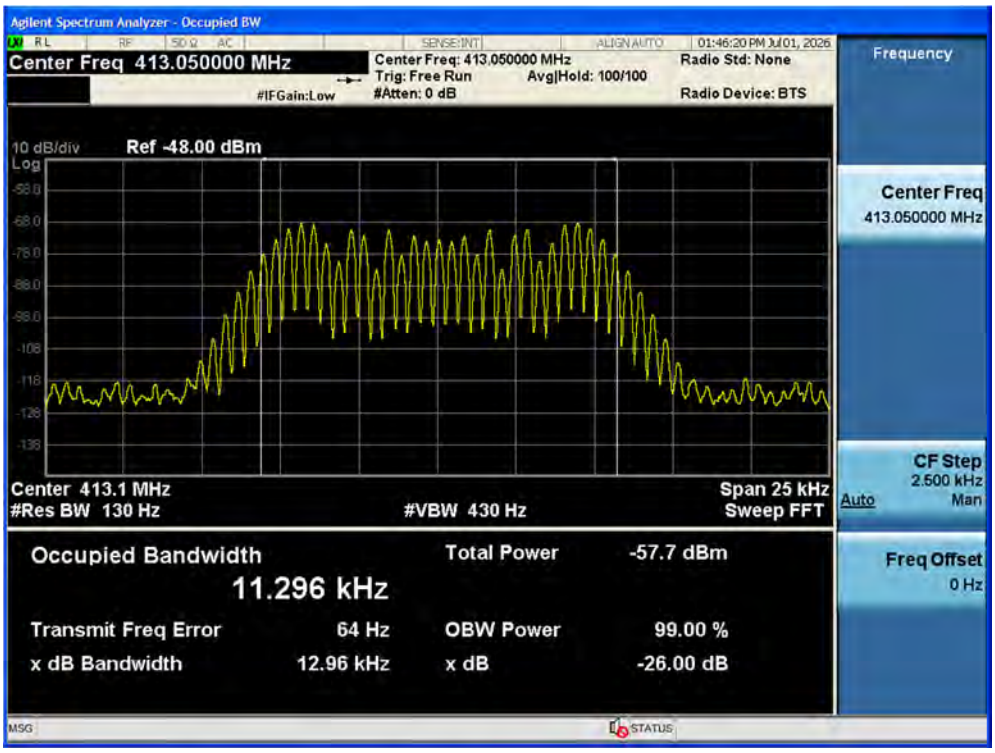
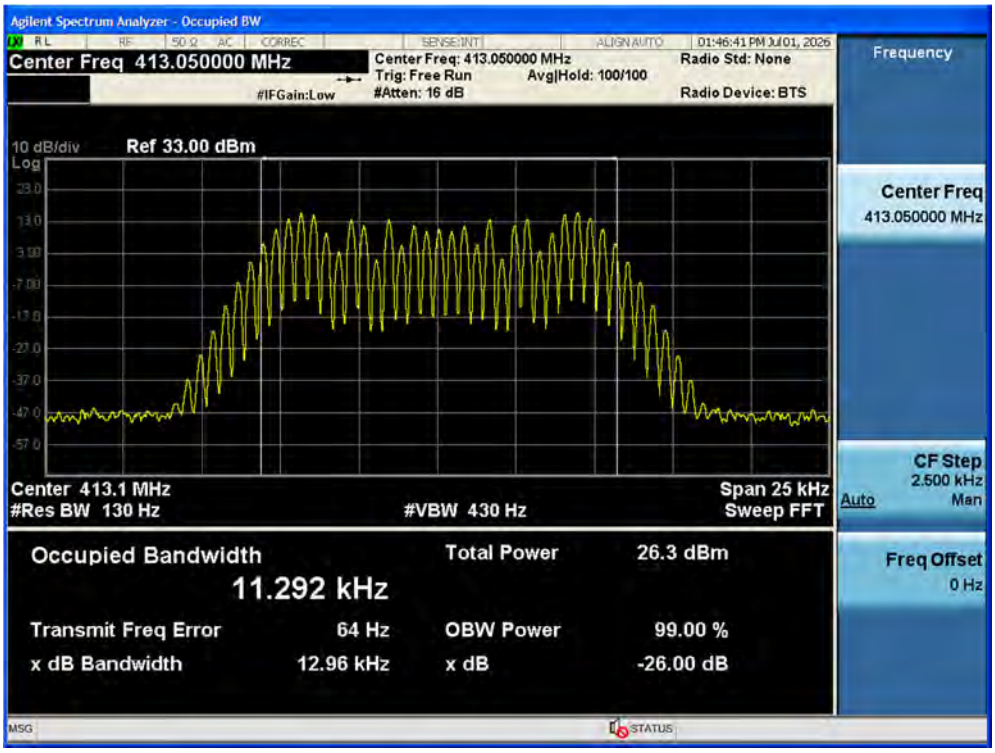
Input / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz)



Output / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz)



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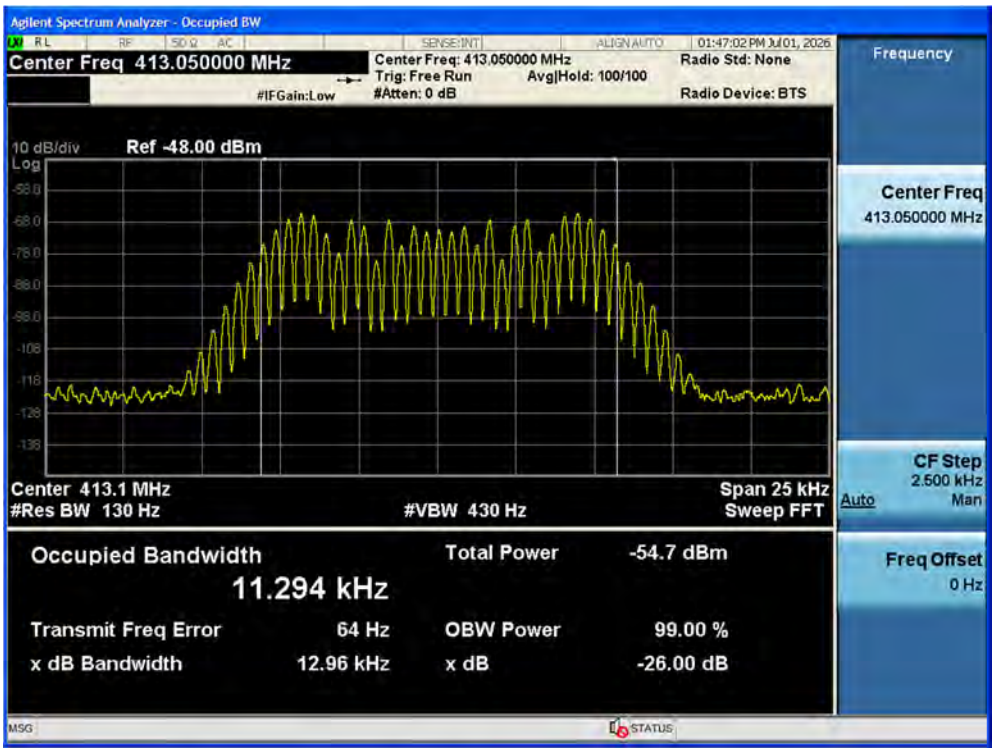
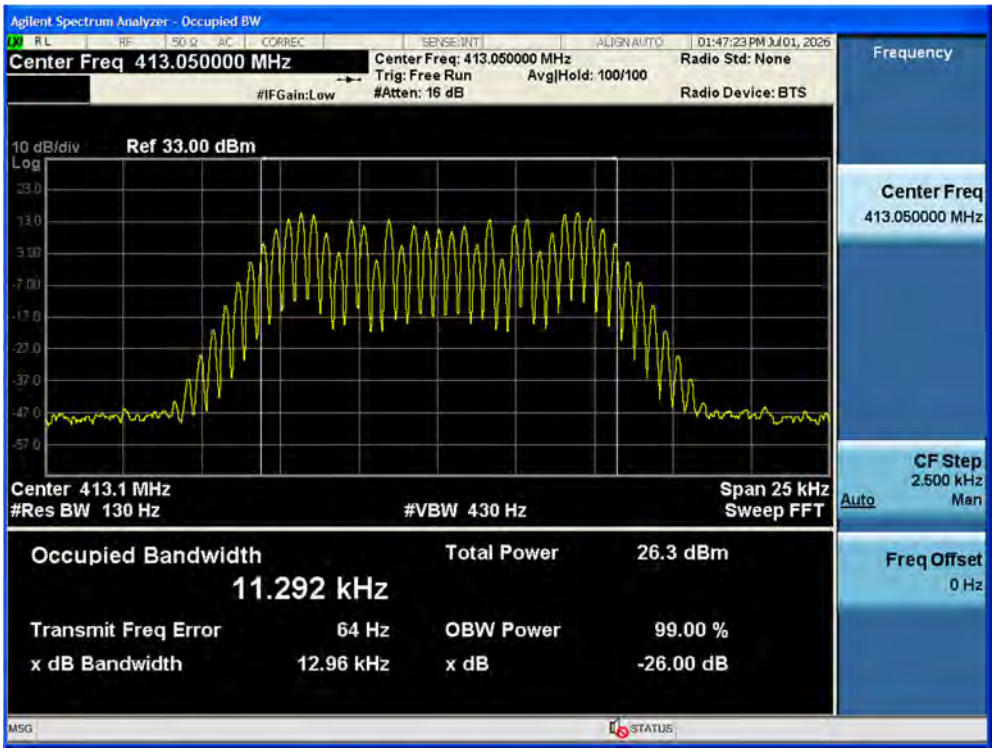
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz)

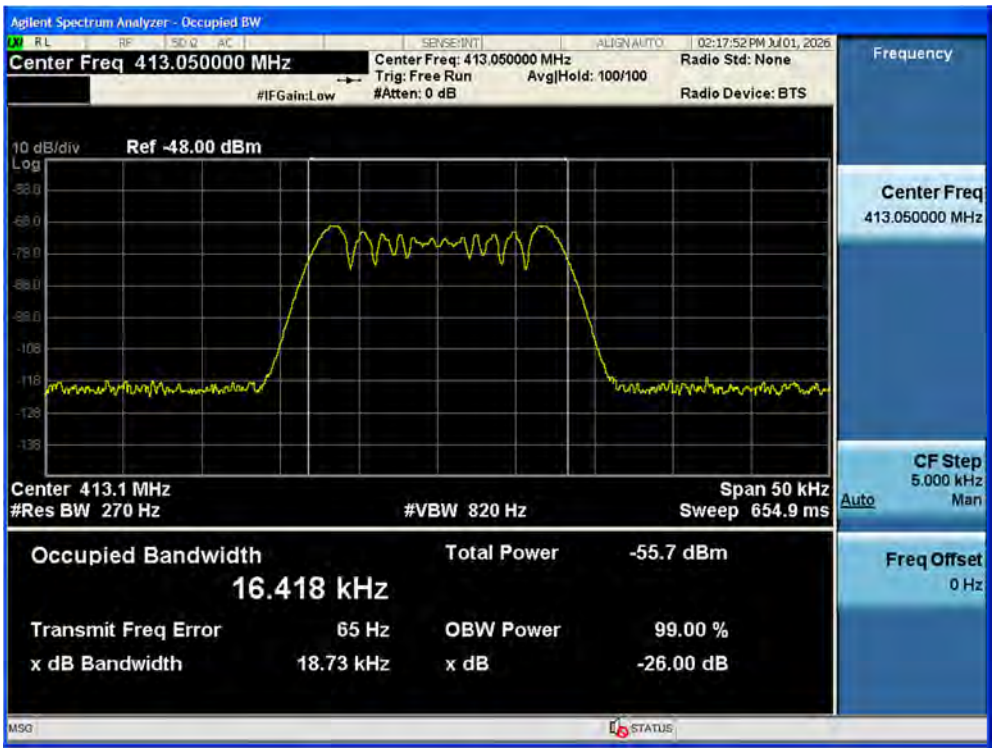


Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz)

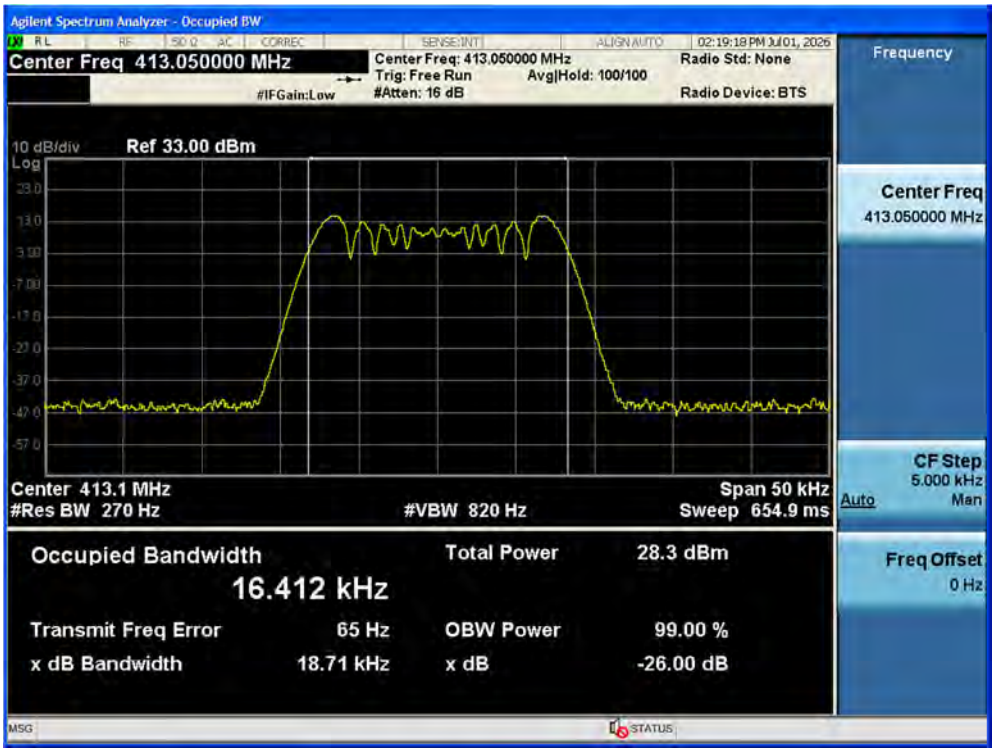


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (406.1 ~ 420) / Uplink / FM (25 kHz)

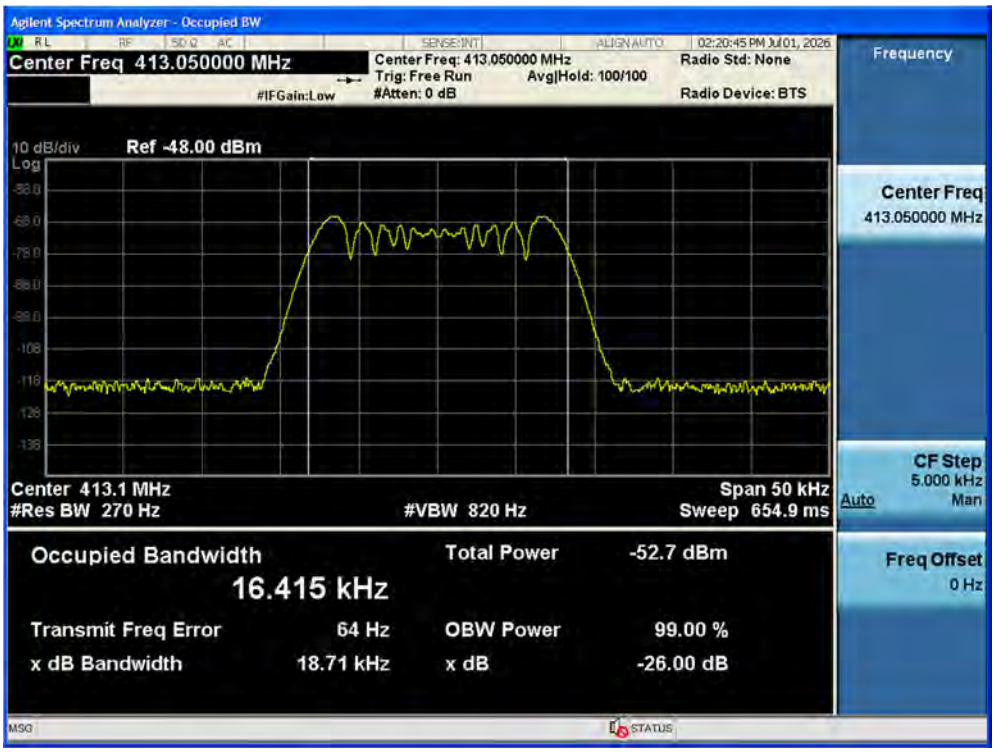


Output / UHF (406.1 ~ 420) / Uplink / FM (25 kHz)

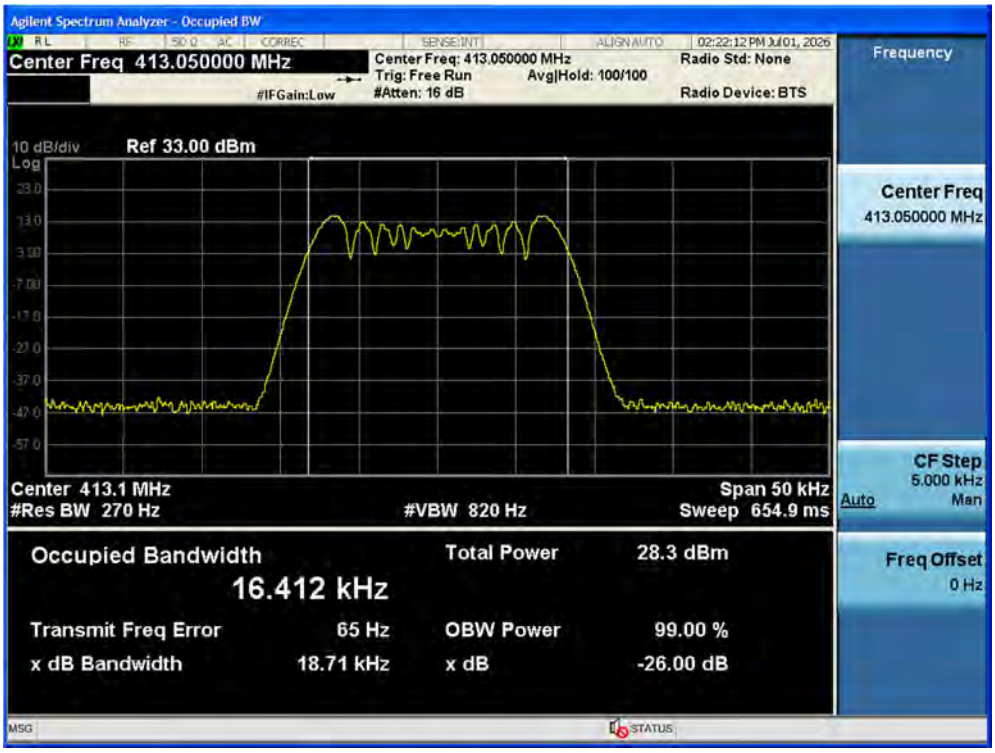


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (25 kHz)



Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (25 kHz)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM)

Output / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM)

Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM)

Output / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM)

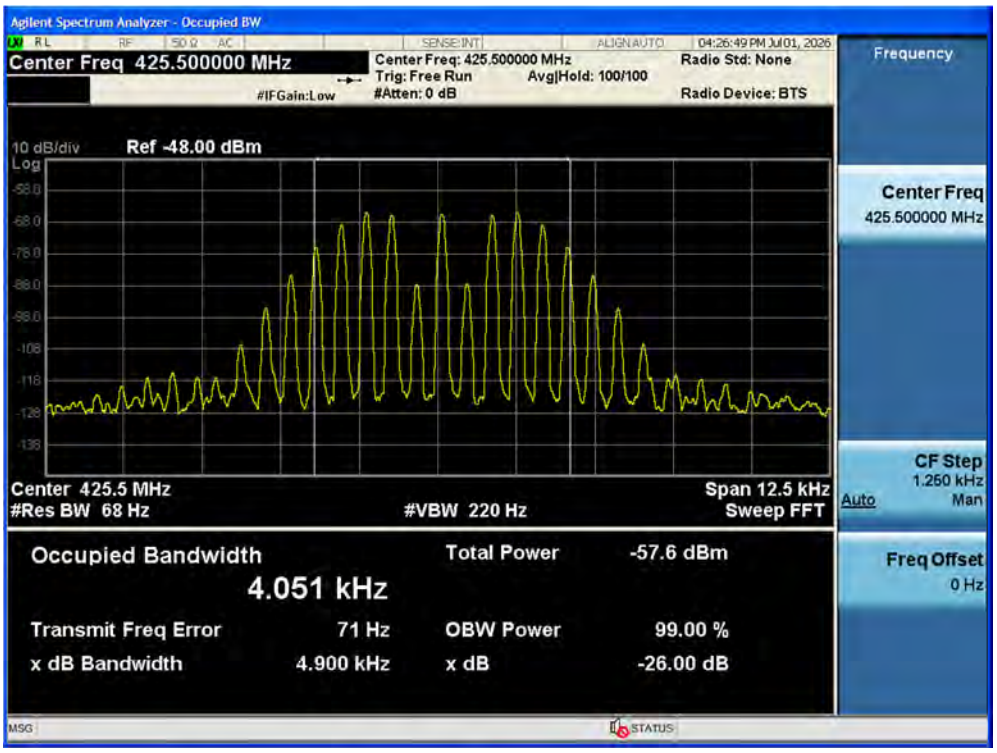
The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM)

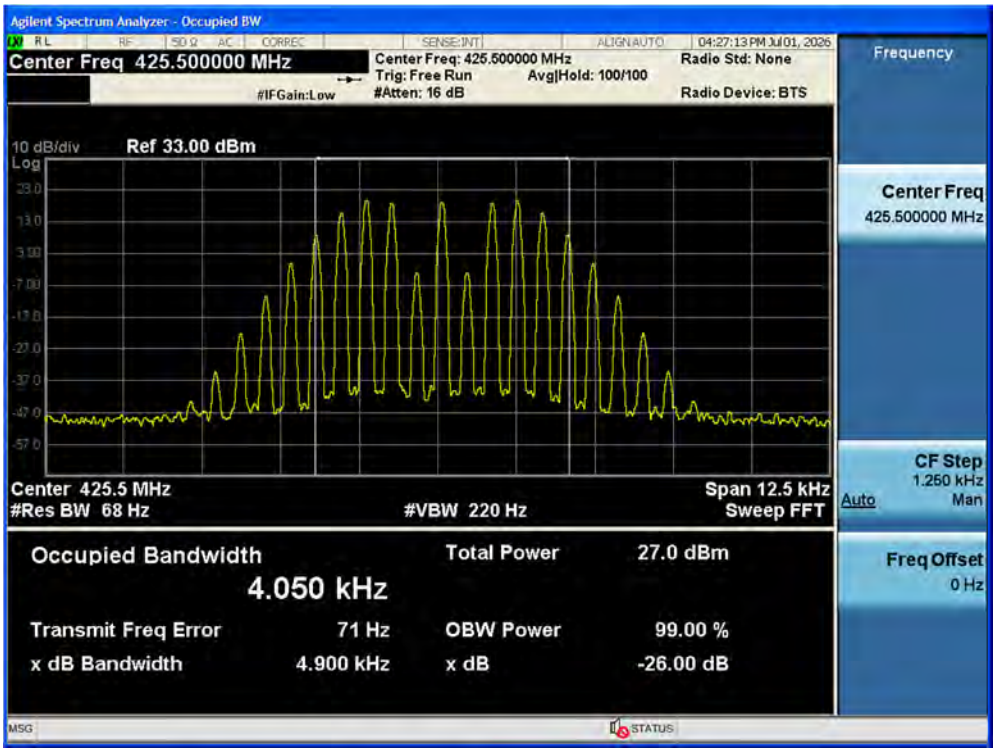
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Uplink / FM (6.25 kHz)

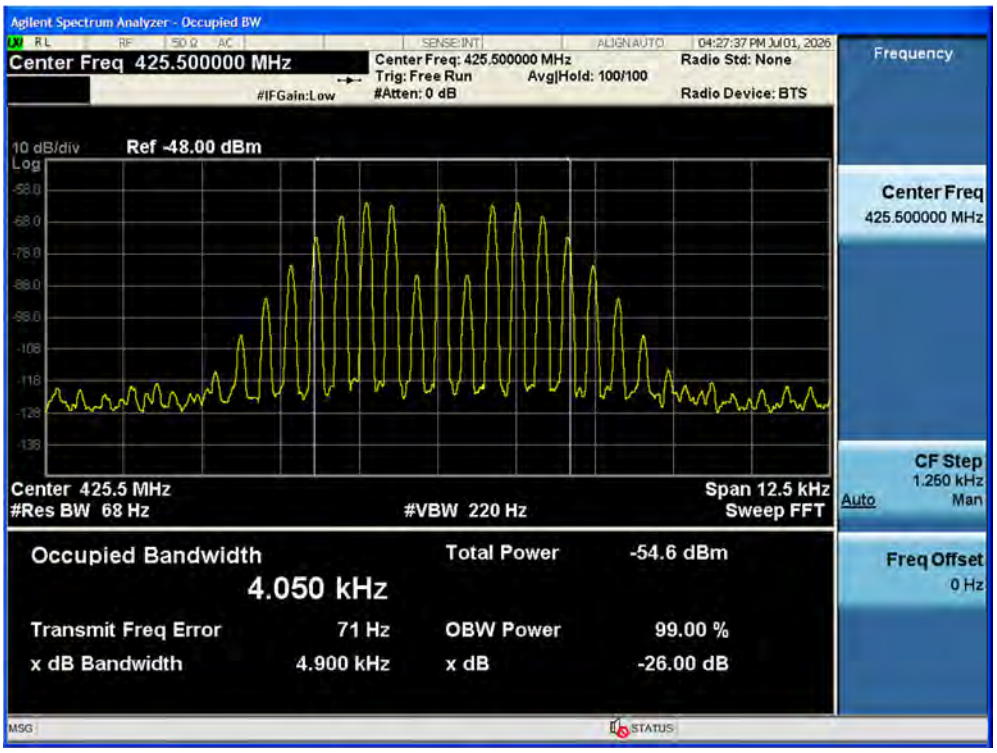


Output / UHF (421 ~ 430) / Uplink / FM (6.25 kHz)

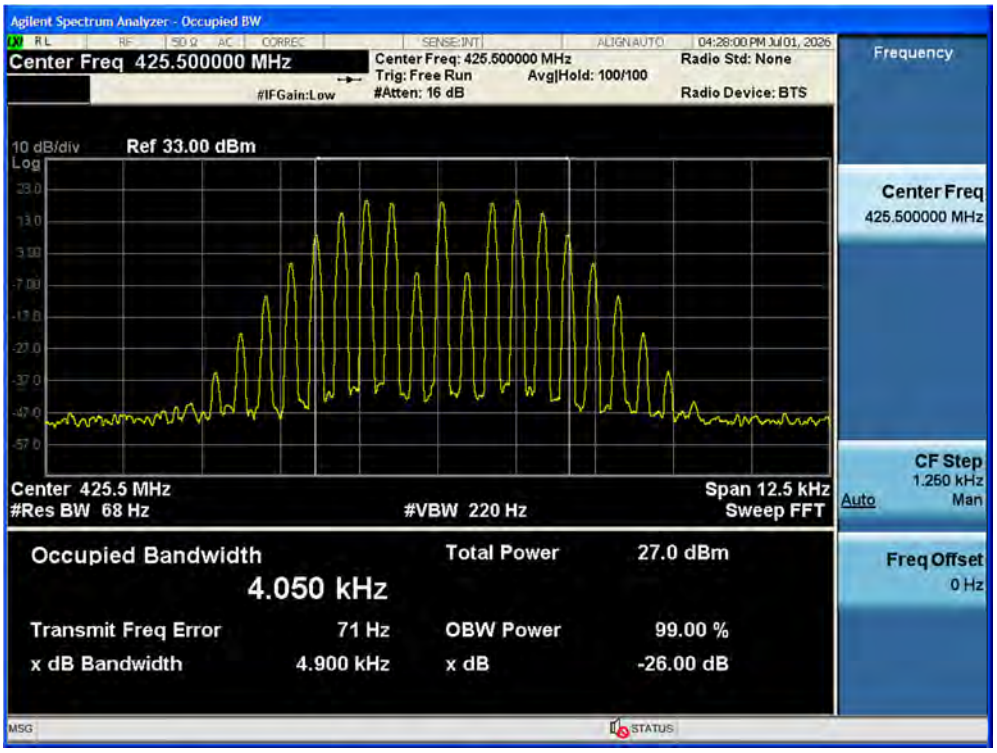


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (6.25 kHz)

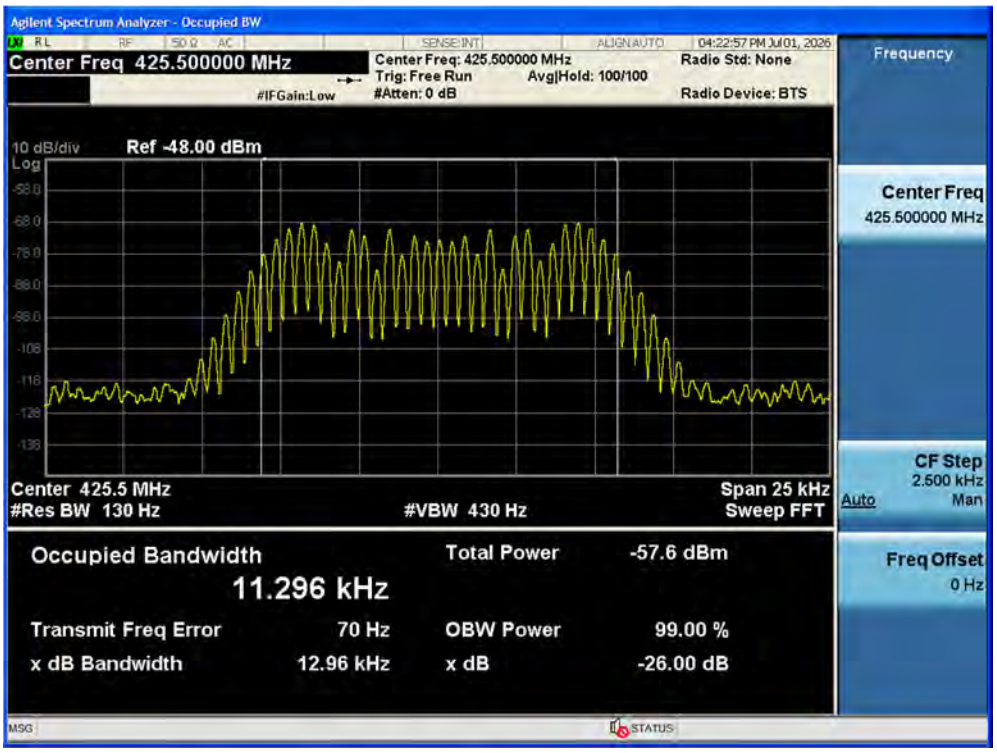


Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (6.25 kHz)

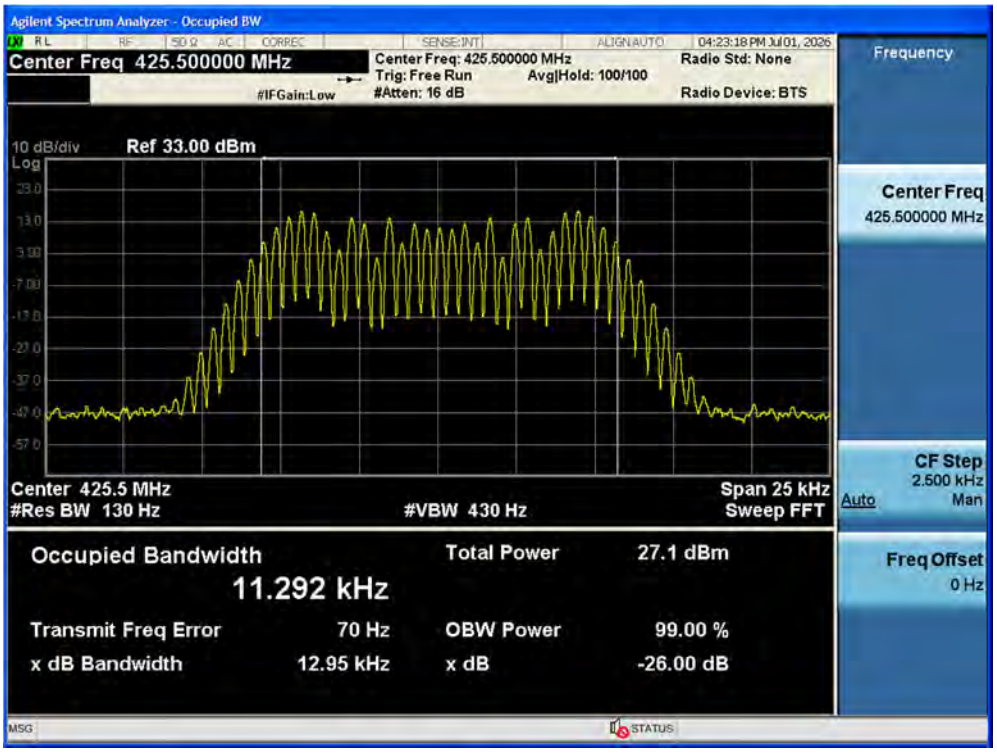


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Uplink / FM (12.5 kHz)

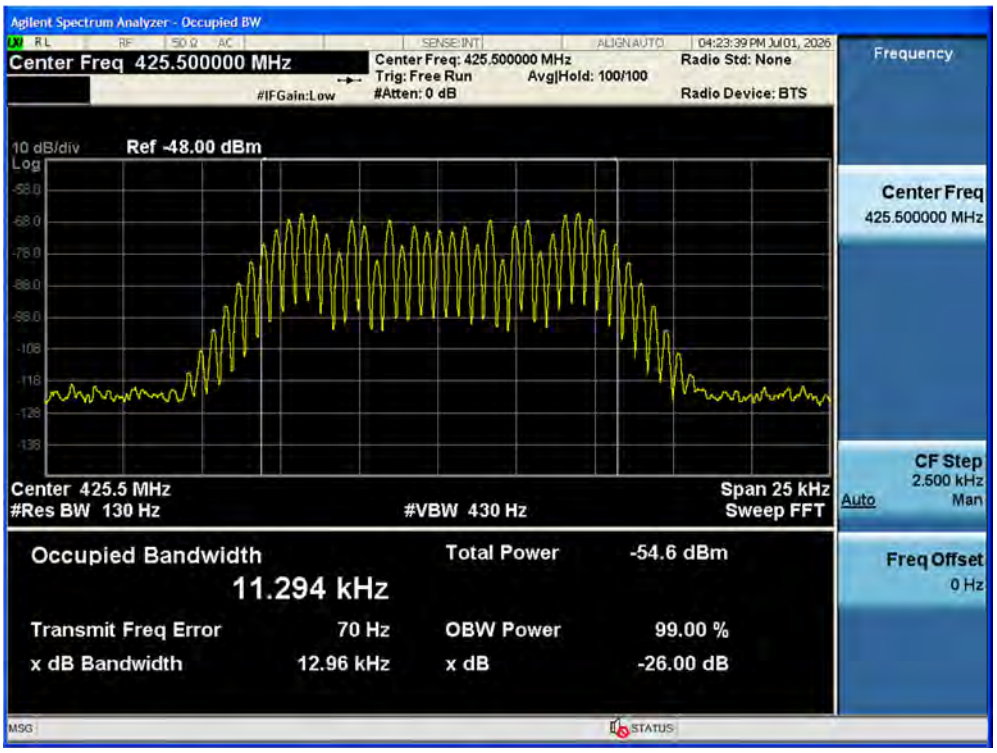


Output / UHF (421 ~ 430) / Uplink / FM (12.5 kHz)

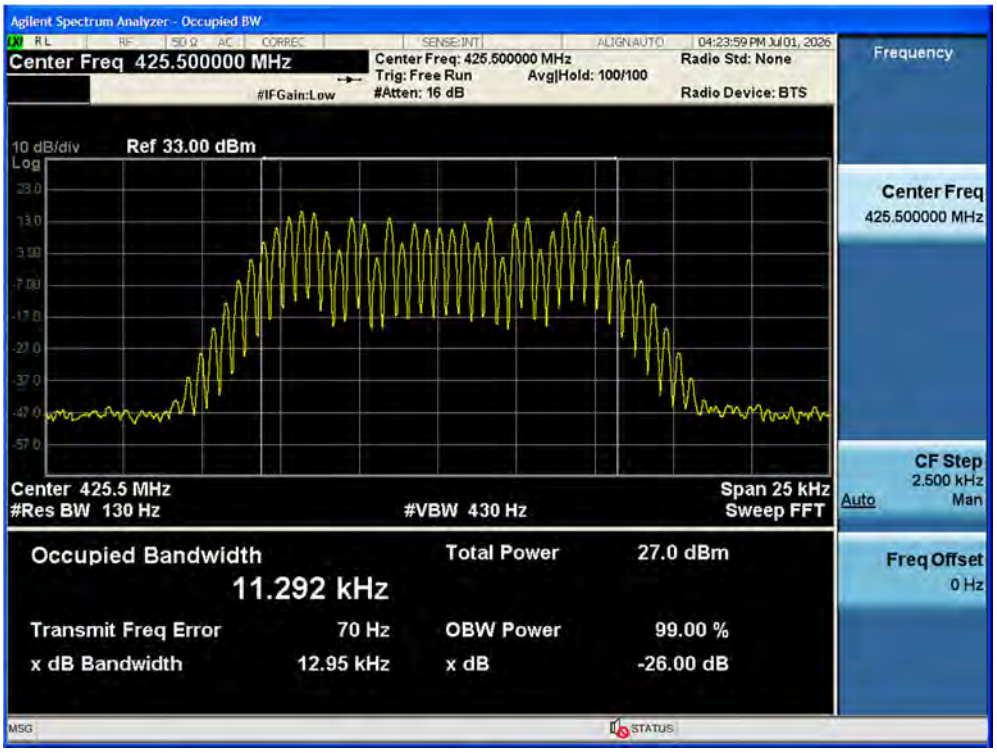


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (12.5 kHz)

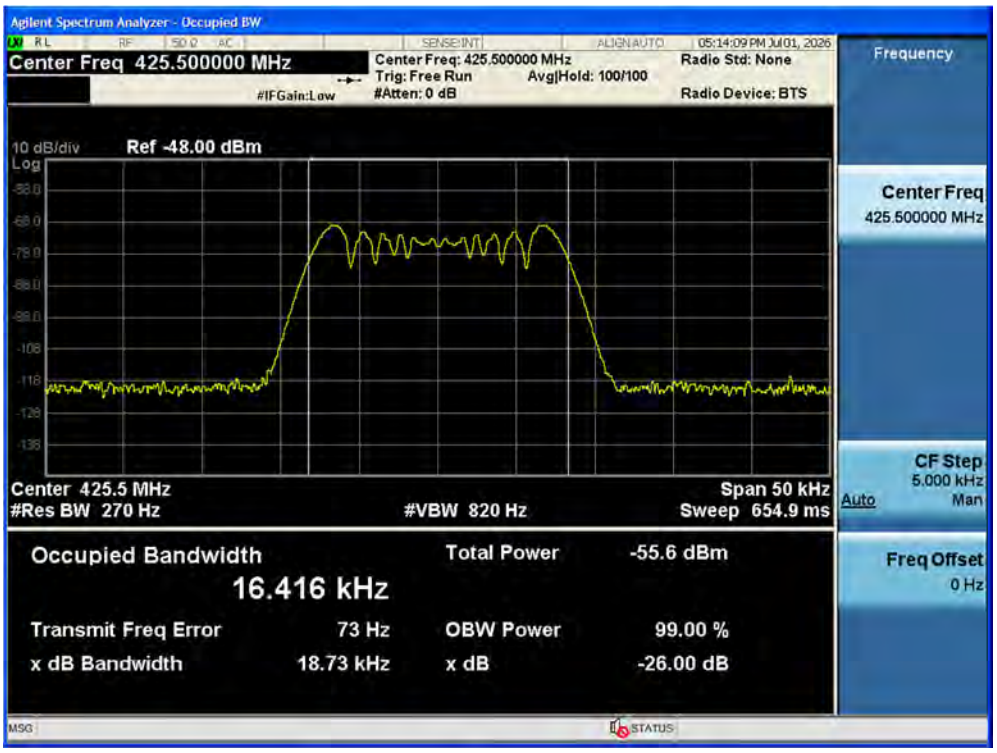


Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (12.5 kHz)

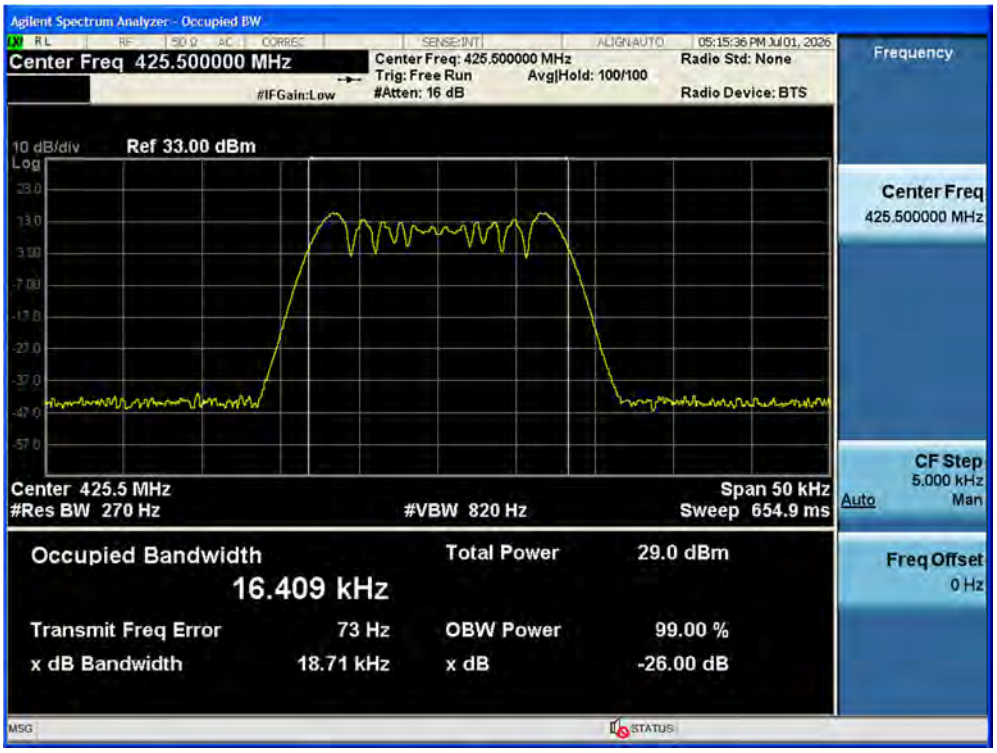


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Uplink / FM (25 kHz)

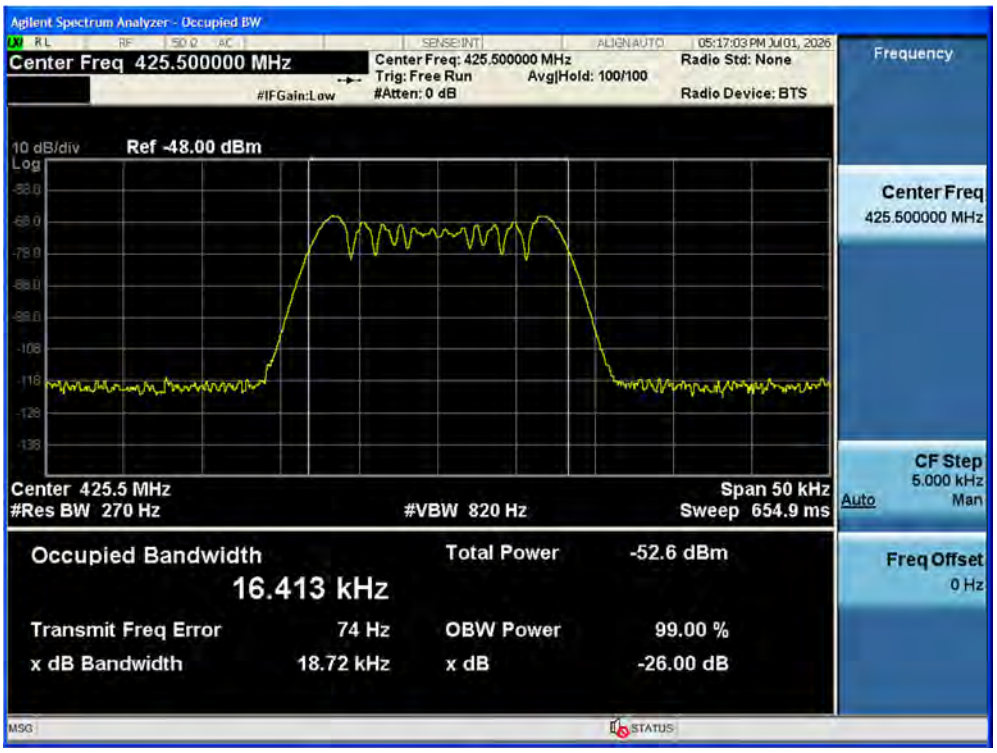


Output / UHF (421 ~ 430) / Uplink / FM (25 kHz)

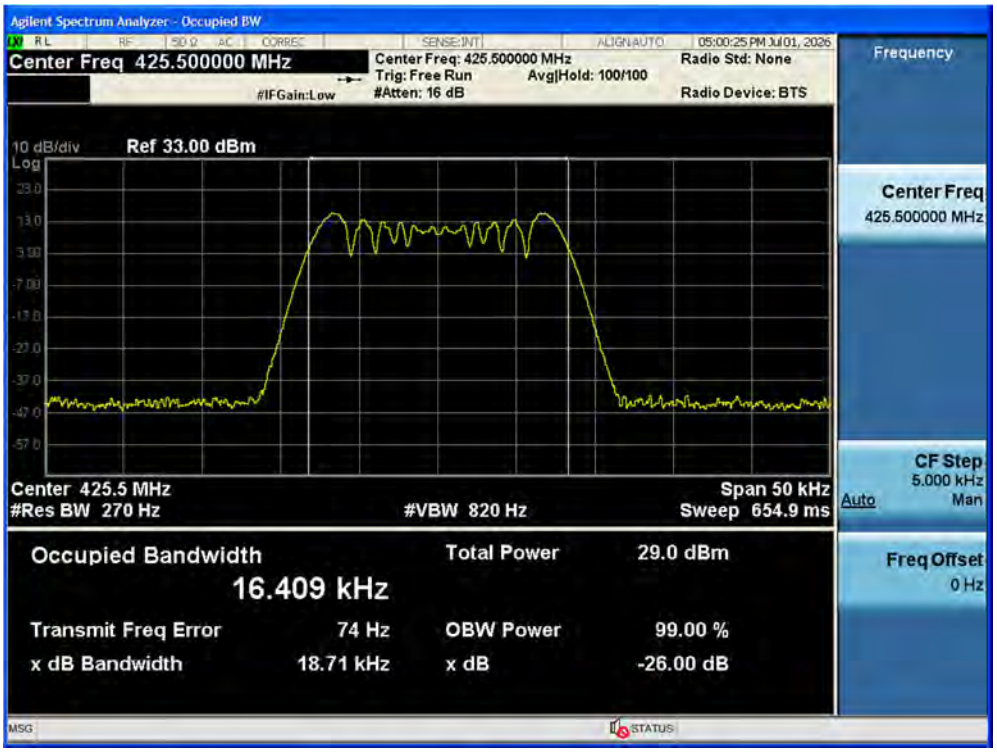


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (25 kHz)



Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (25 kHz)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM)

Output / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM)

Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Uplink / P25 Phase 2 (H-CPM)

Output / UHF (450 ~ 512) / Uplink / P25 Phase 2 (H-CPM)

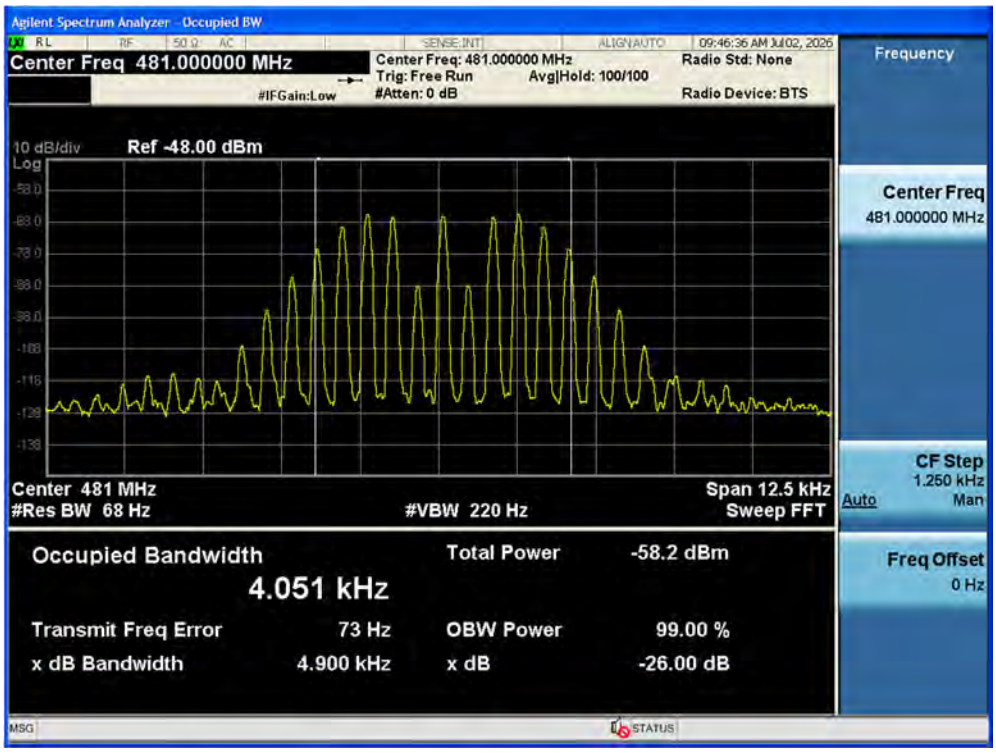
The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / P25 Phase 2 (H-CPM)

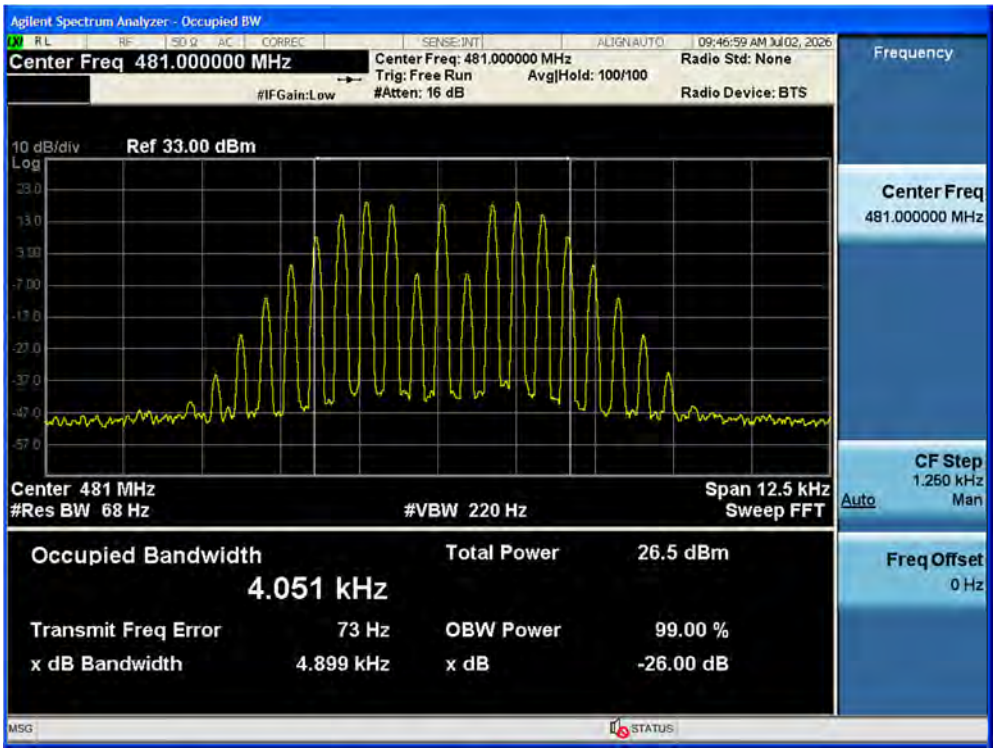
Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / P25 Phase 2 (H-CPM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Uplink / FM (6.25 kHz)

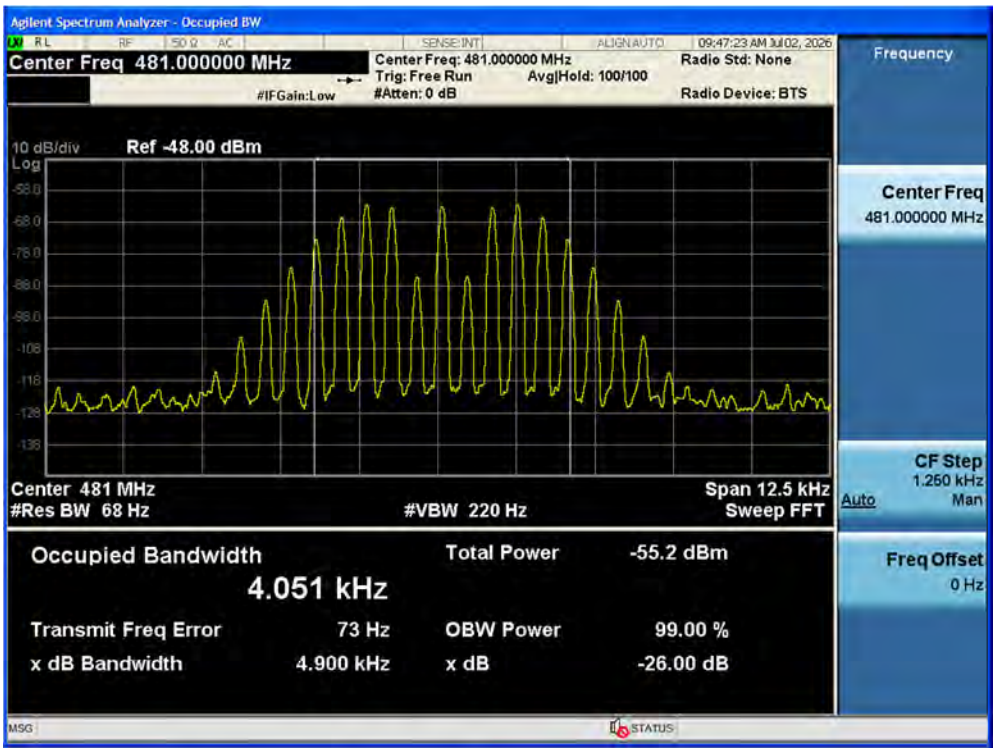


Output / UHF (450 ~ 512) / Uplink / FM (6.25 kHz)

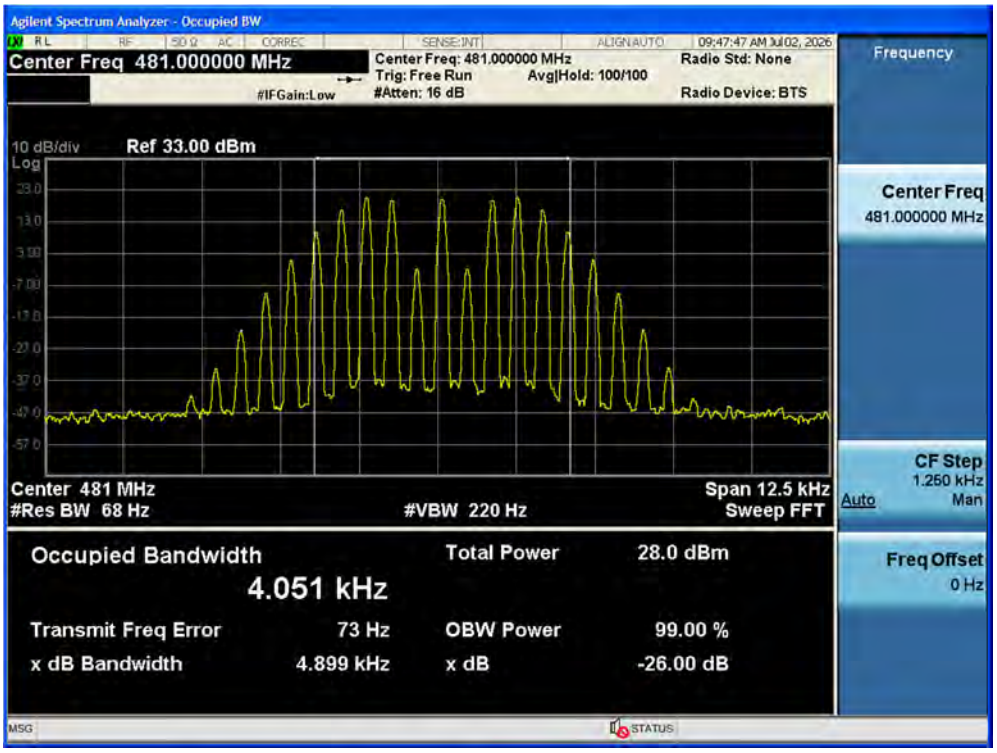


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (6.25 kHz)

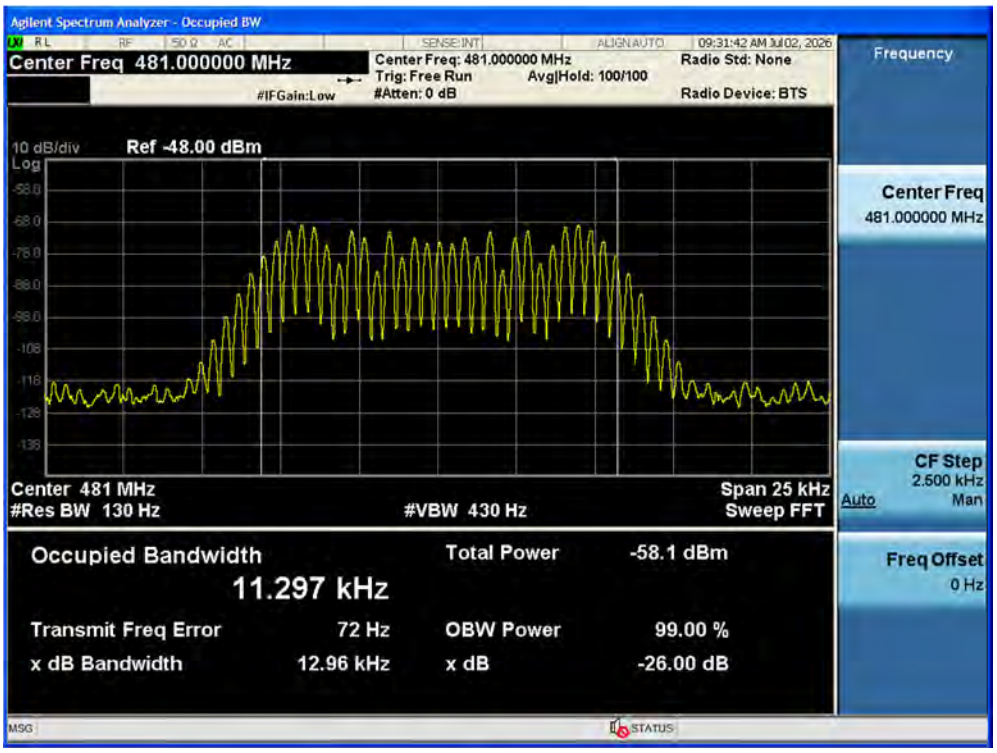


Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (6.25 kHz)

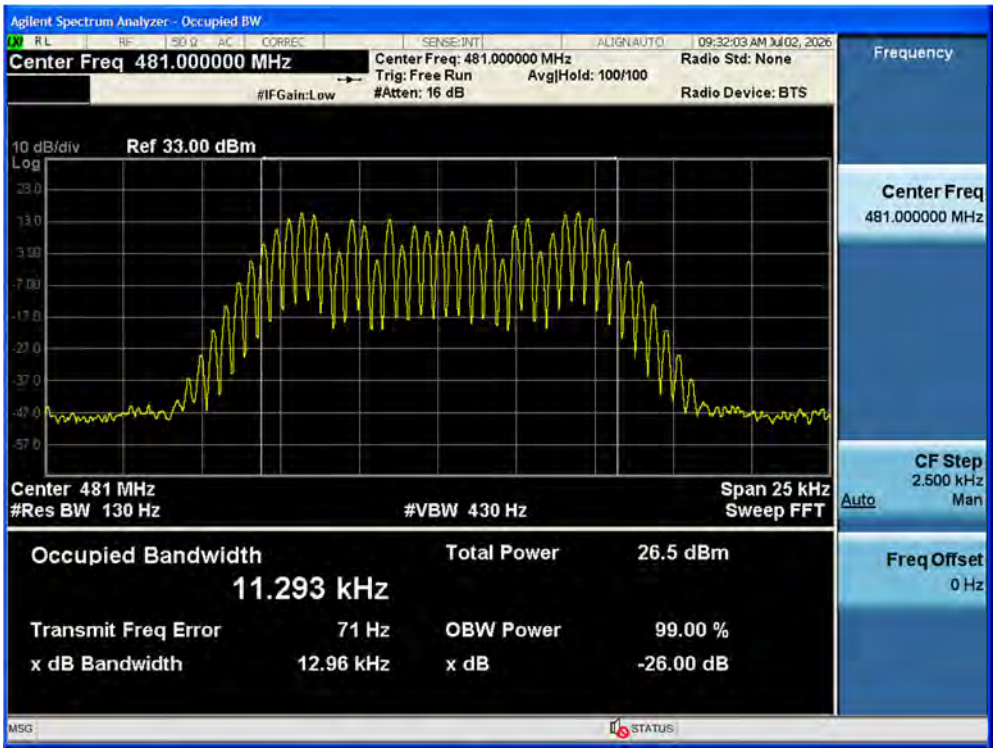


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Uplink / FM (12.5 kHz)

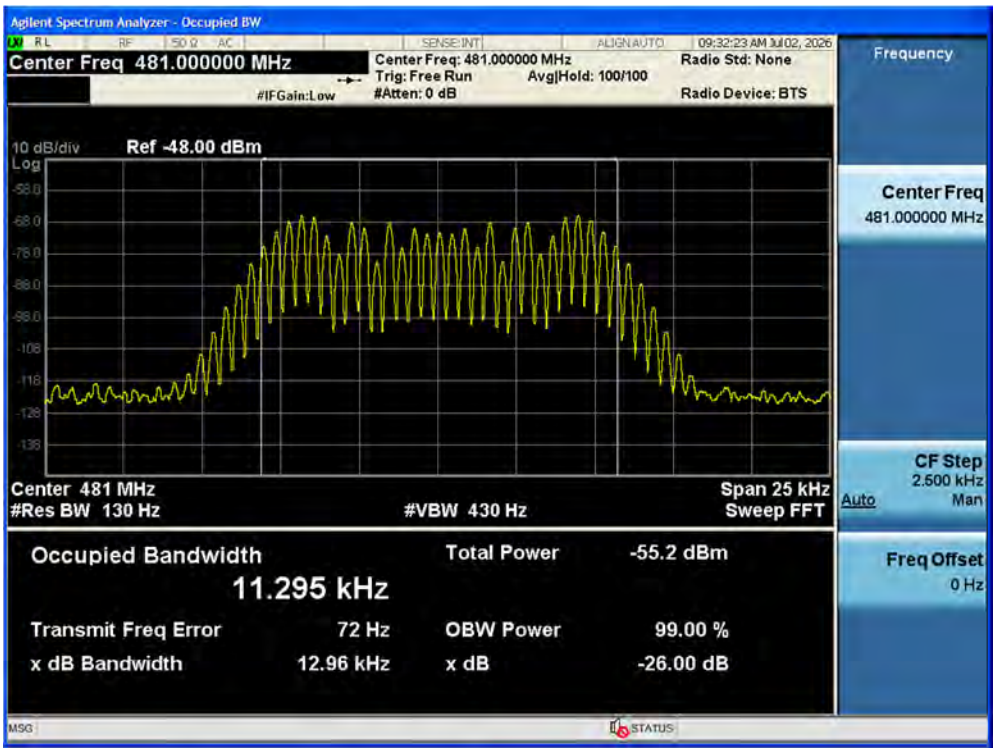


Output / UHF (450 ~ 512) / Uplink / FM (12.5 kHz)

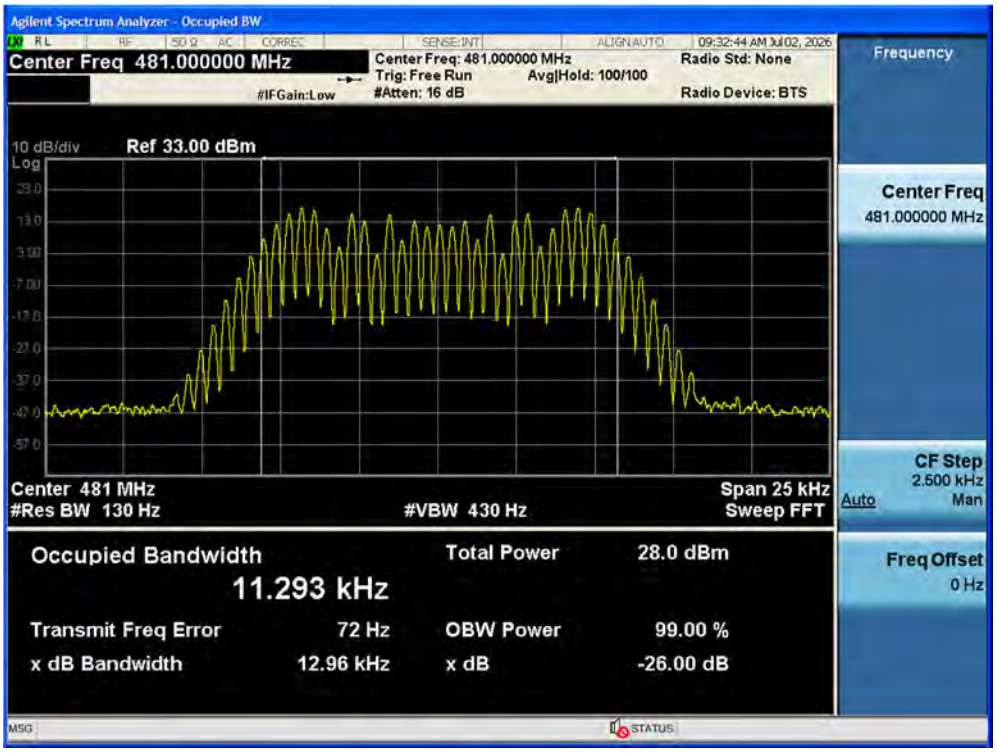


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (12.5 kHz)

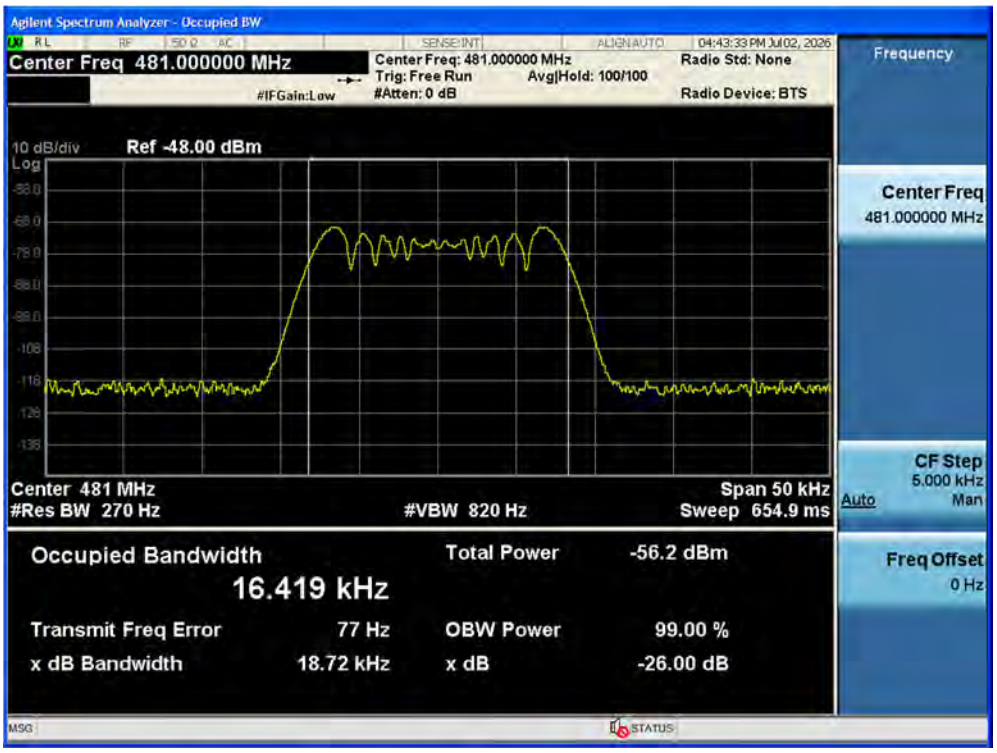


Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (12.5 kHz)

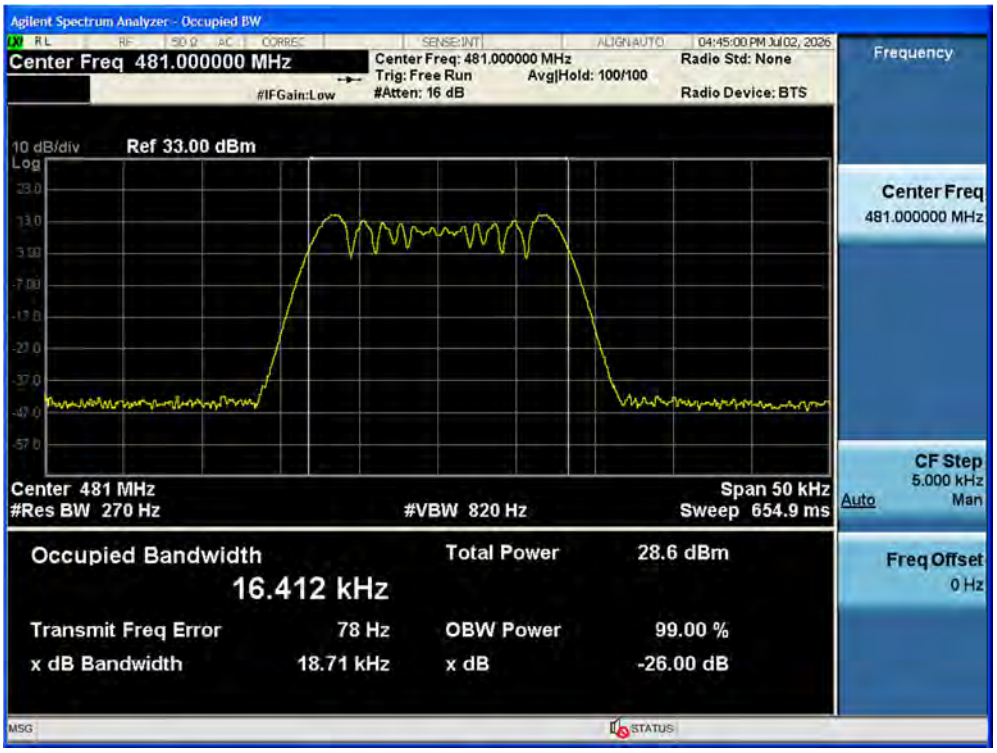


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Uplink / FM (25 kHz)

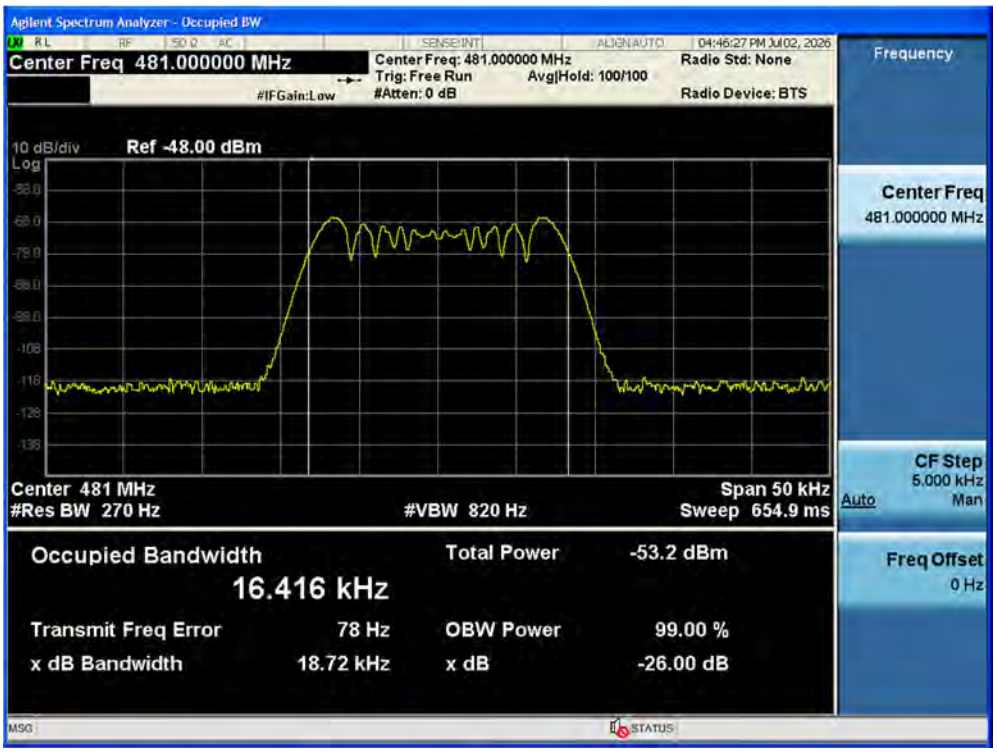


Output / UHF (450 ~ 512) / Uplink / FM (25 kHz)

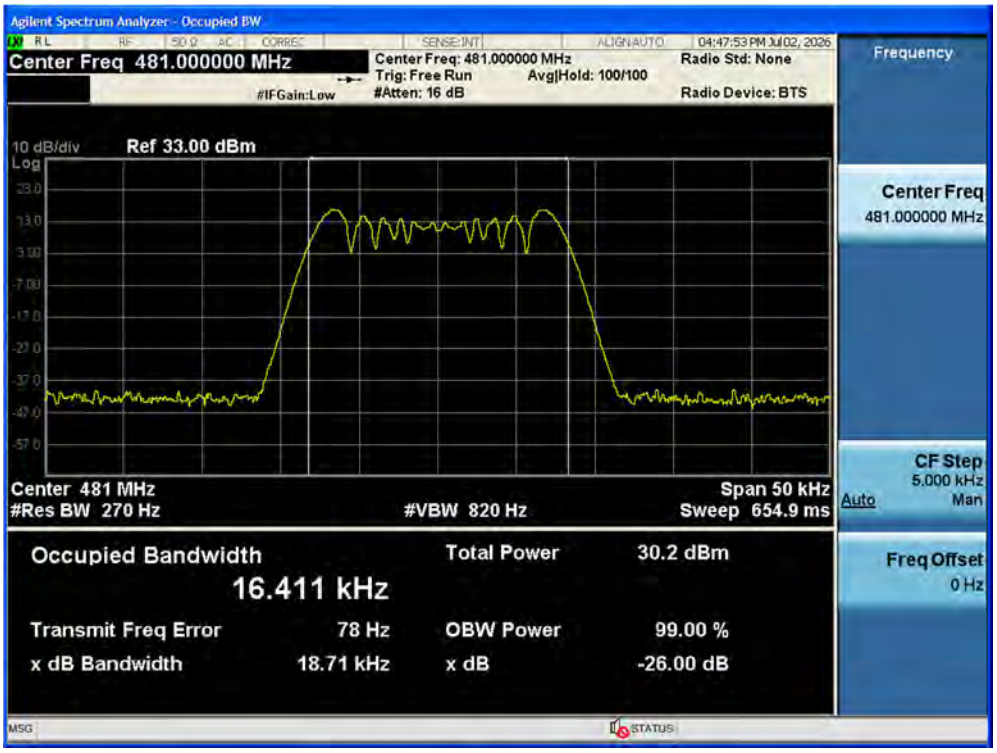


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (25 kHz)



Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (25 kHz)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

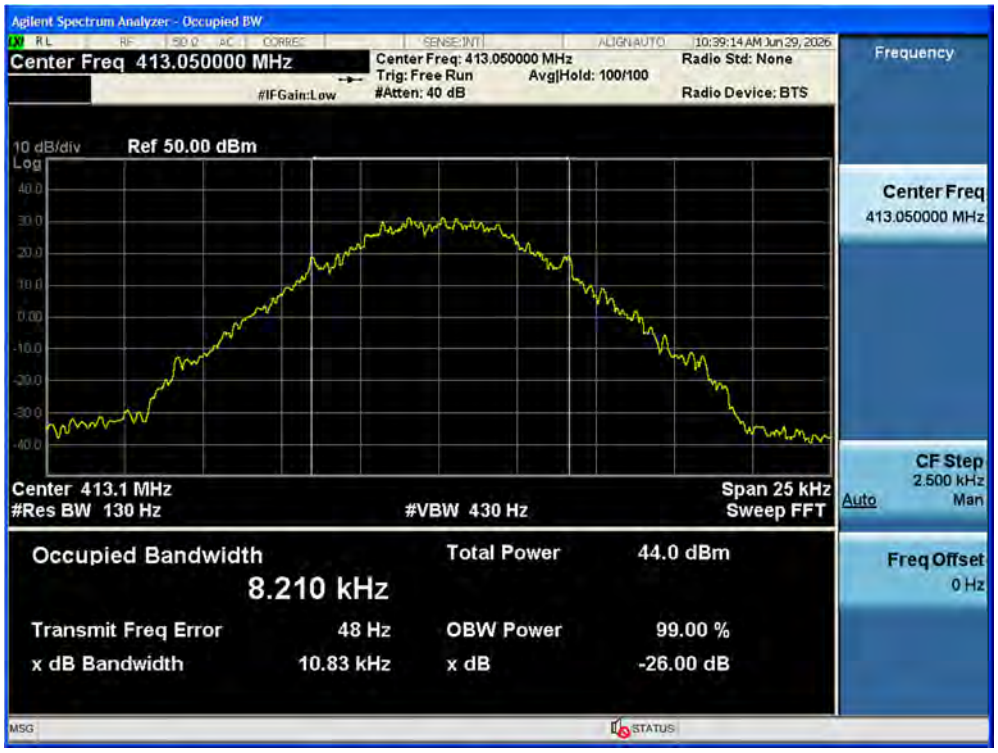
Input / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM)

Output/ UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

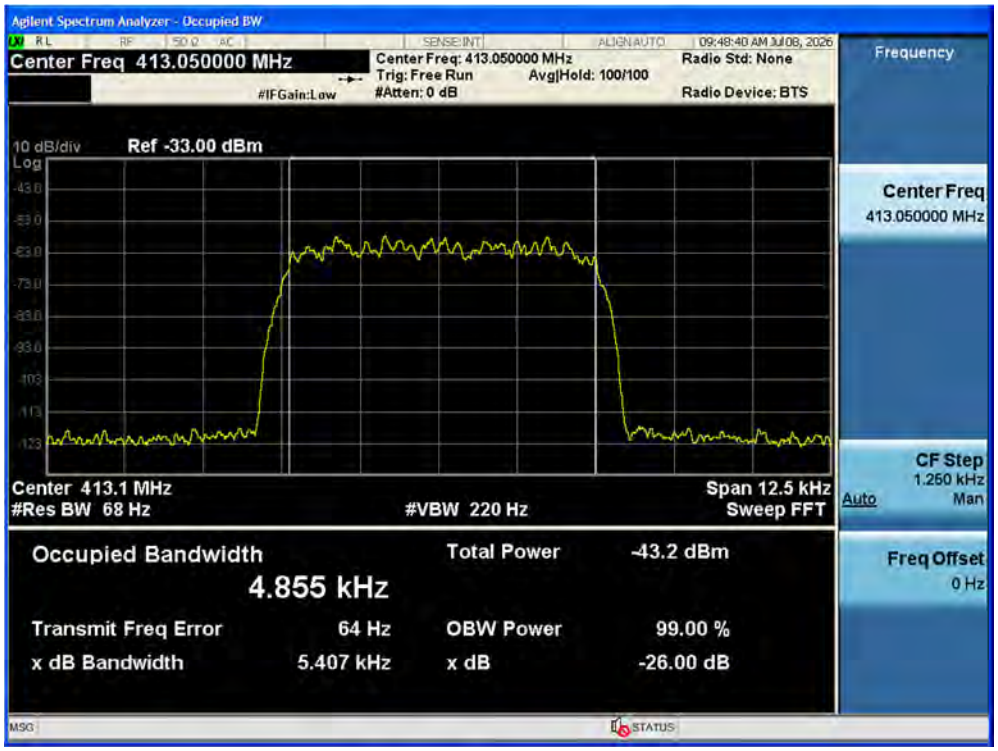
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM)

Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM)

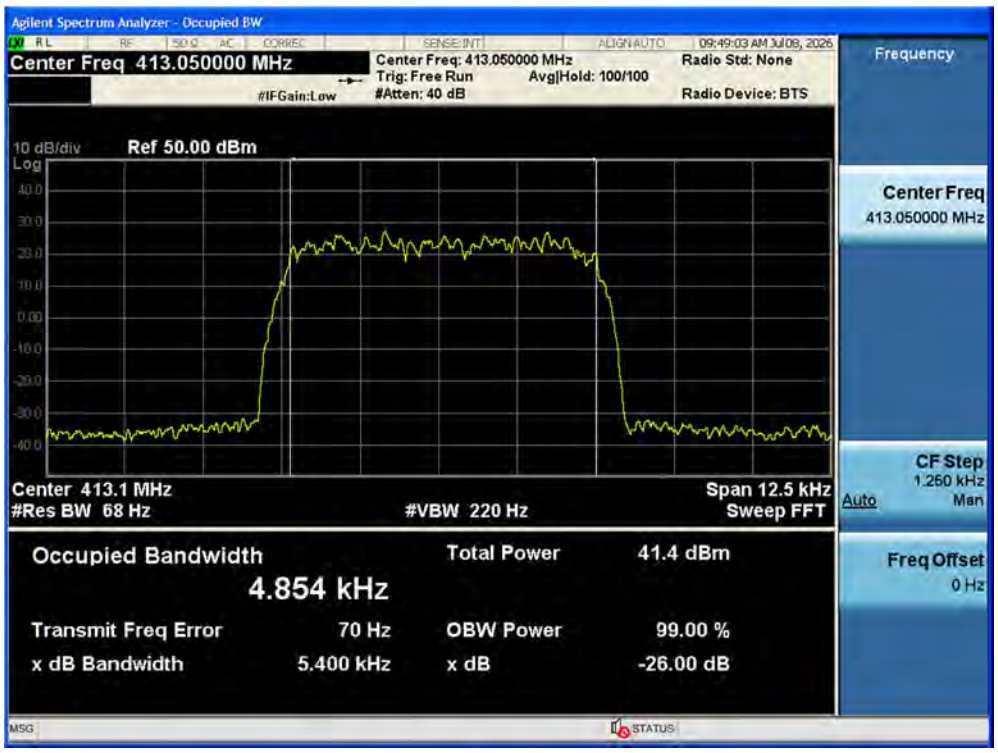


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK)

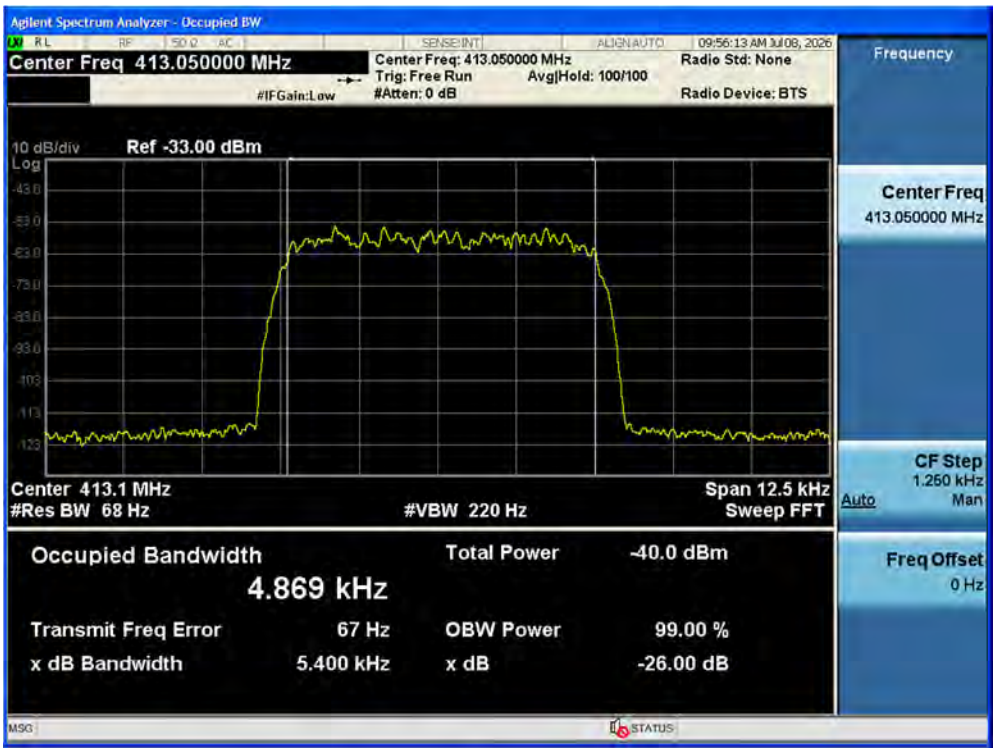


Output/ UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK)

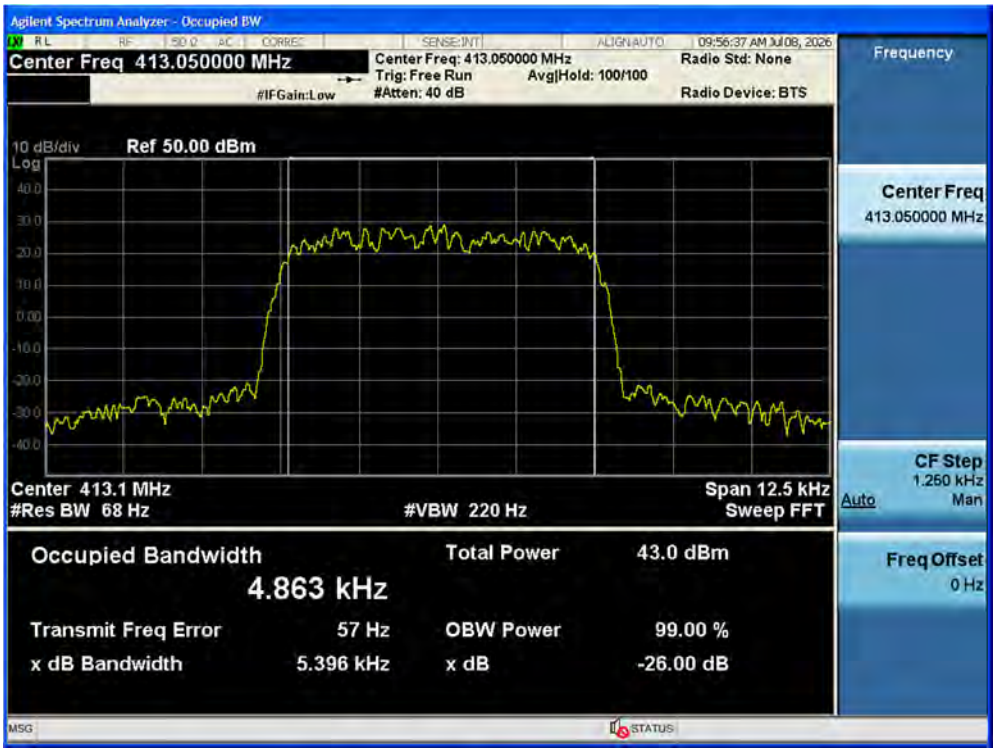


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK)



Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK)

Output / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK)

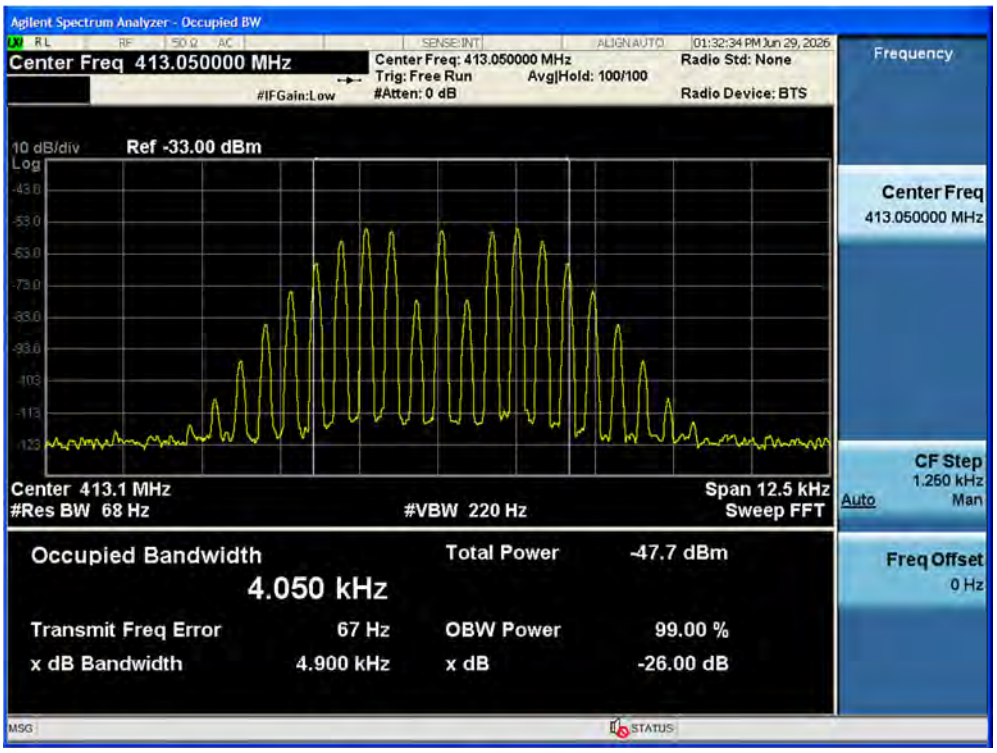
The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK)

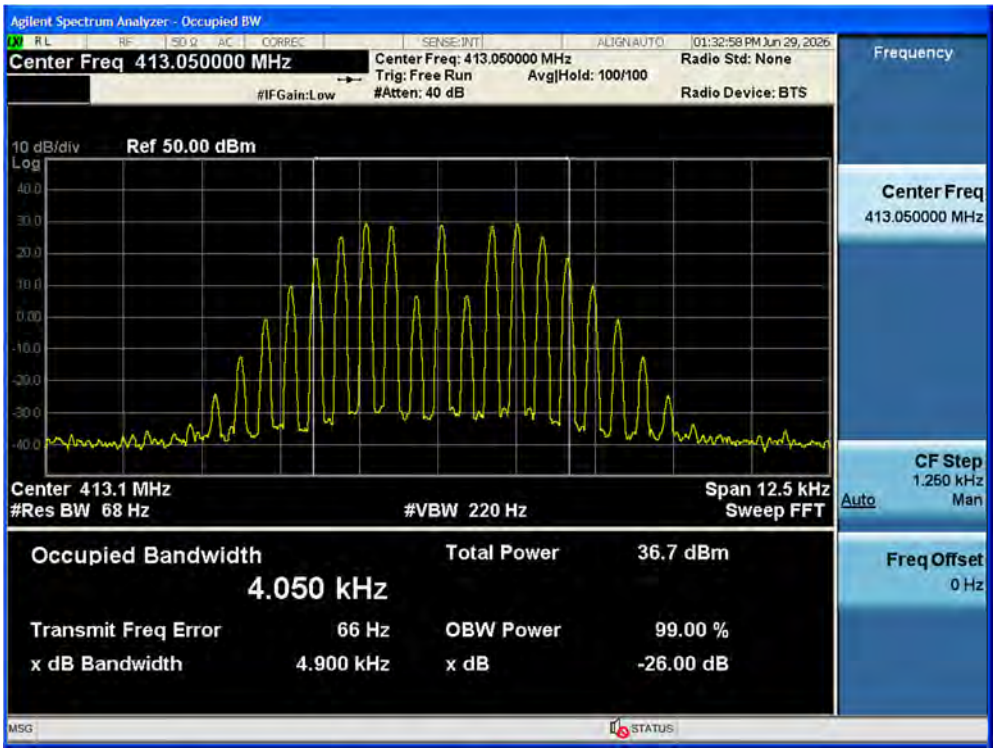
Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz)

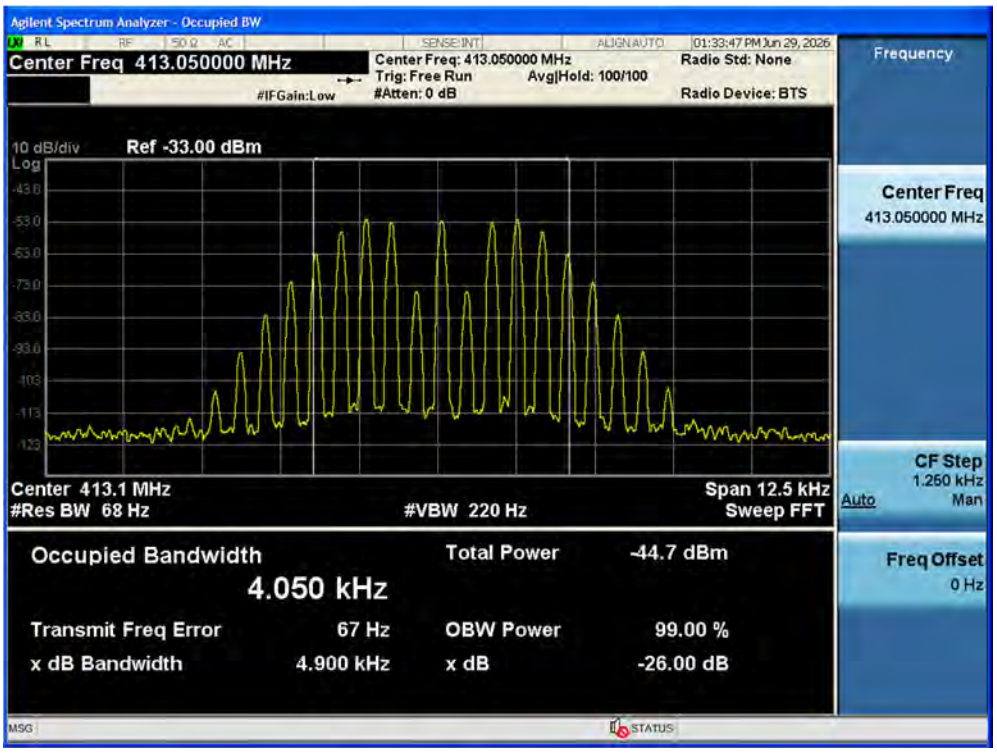


Output / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz)

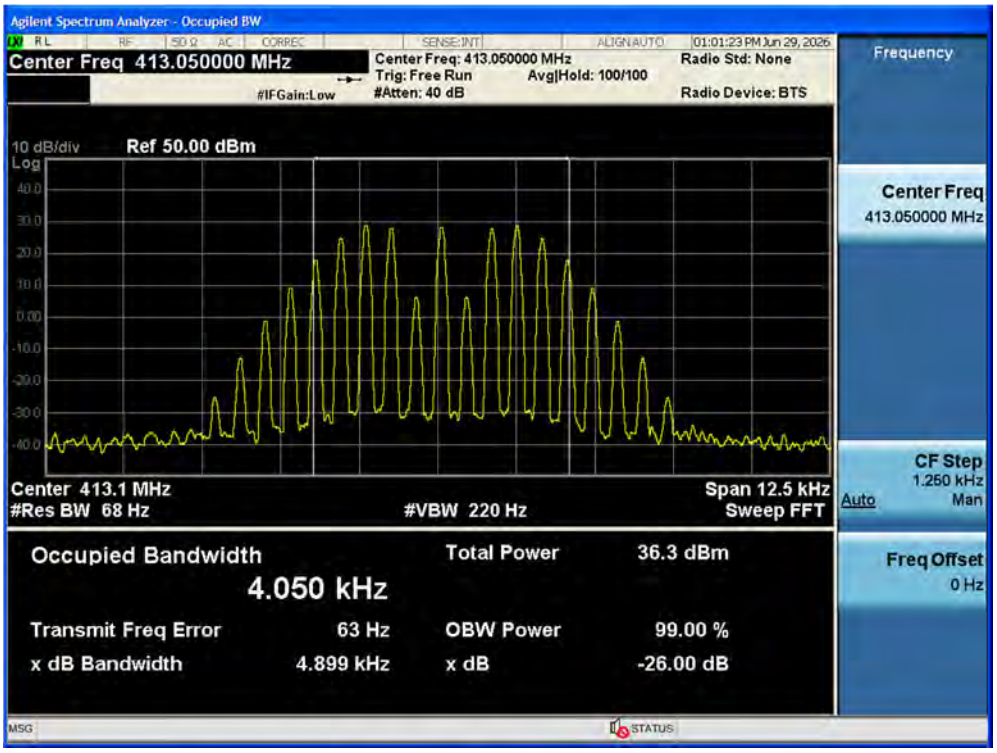


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz)

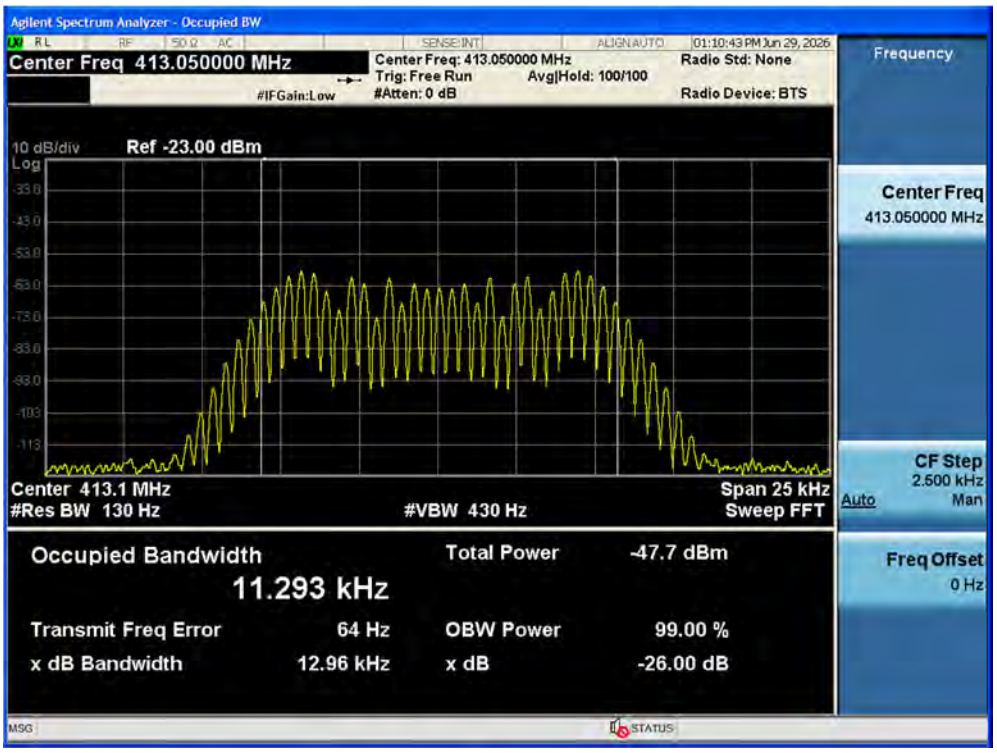


Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz)

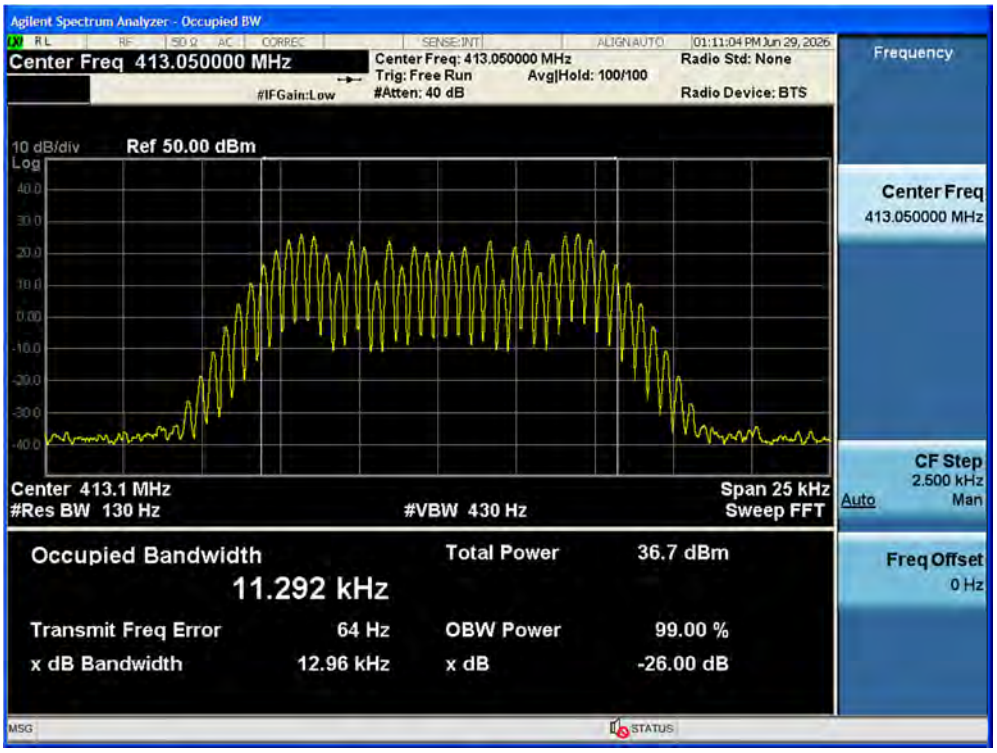


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz)

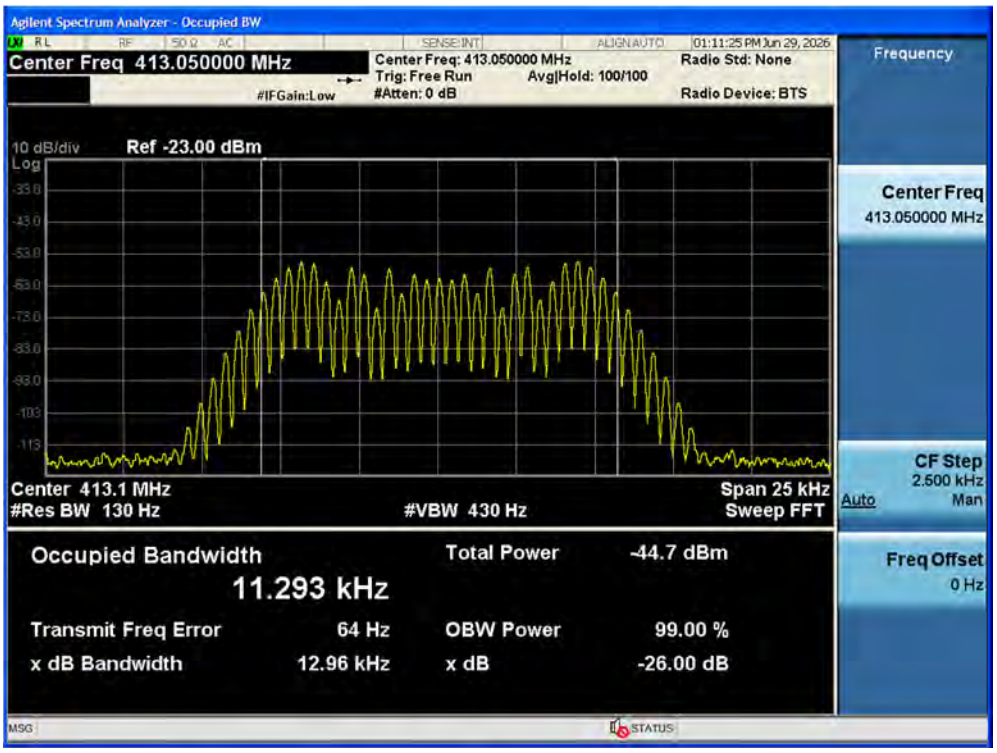


Output / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz)

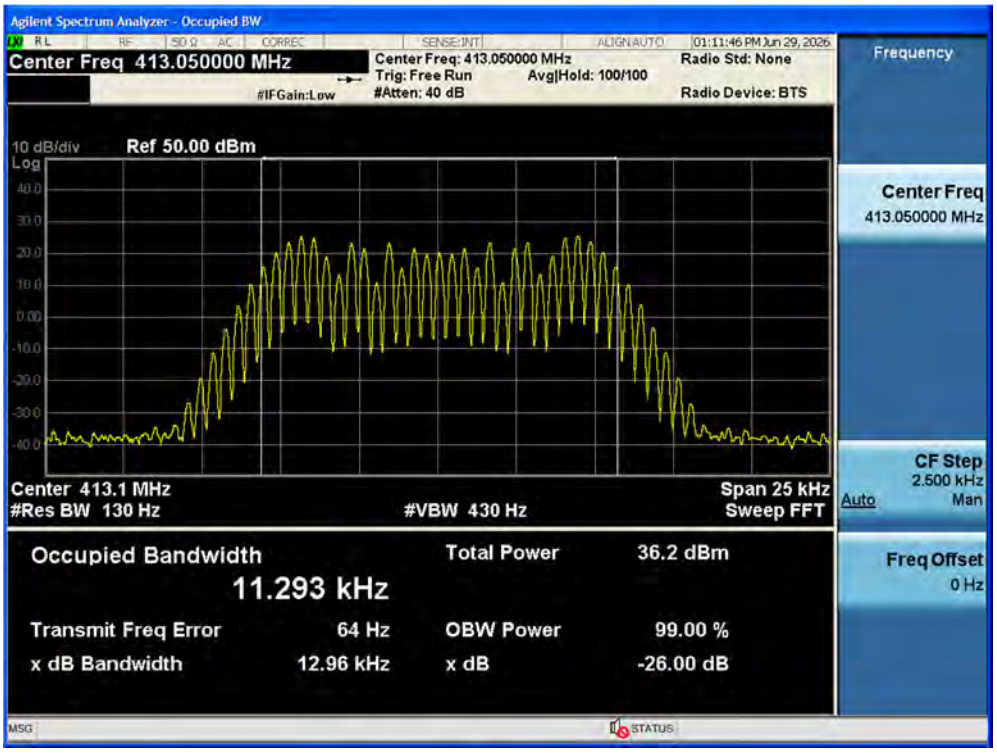


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz)

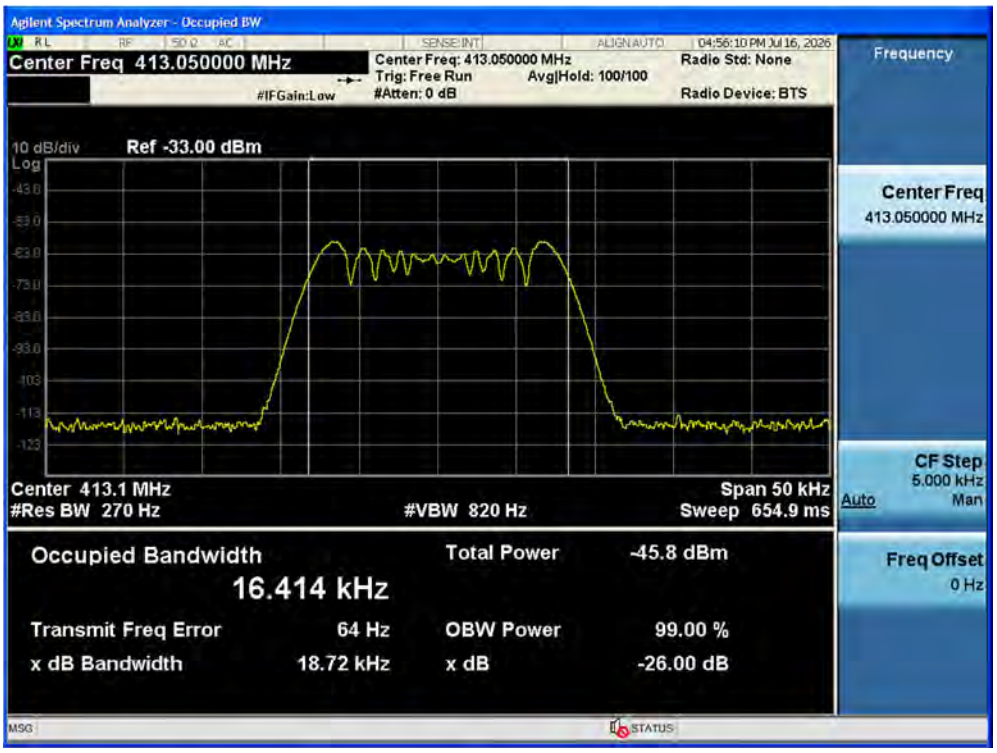


Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz)

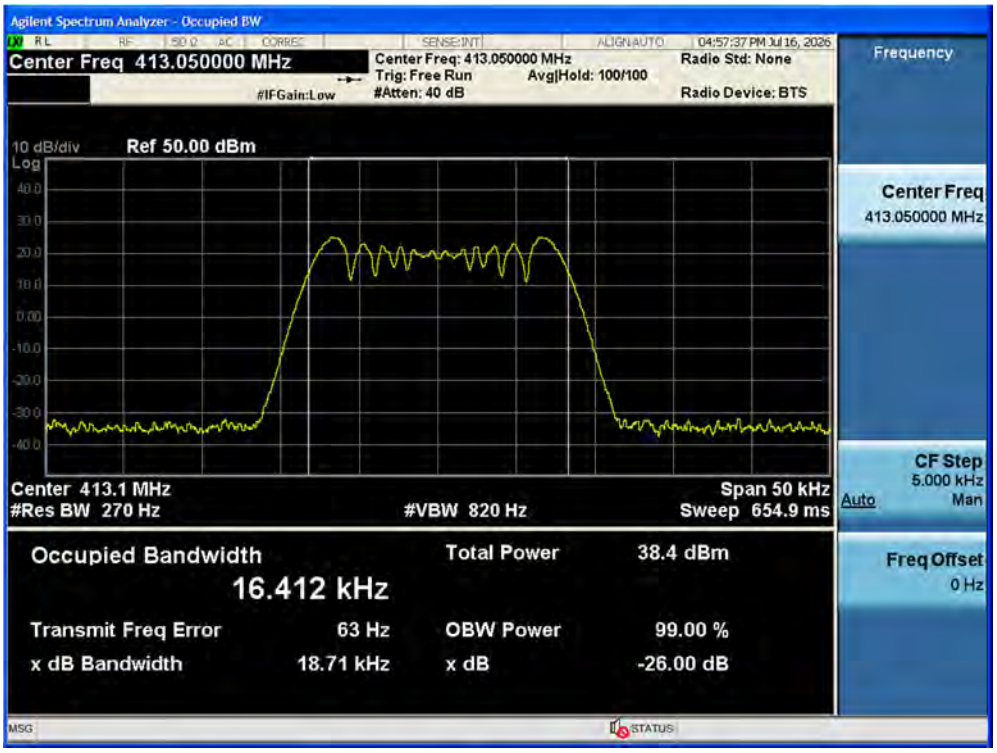


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (406.1 ~ 420) / Downlink / FM (25 kHz)

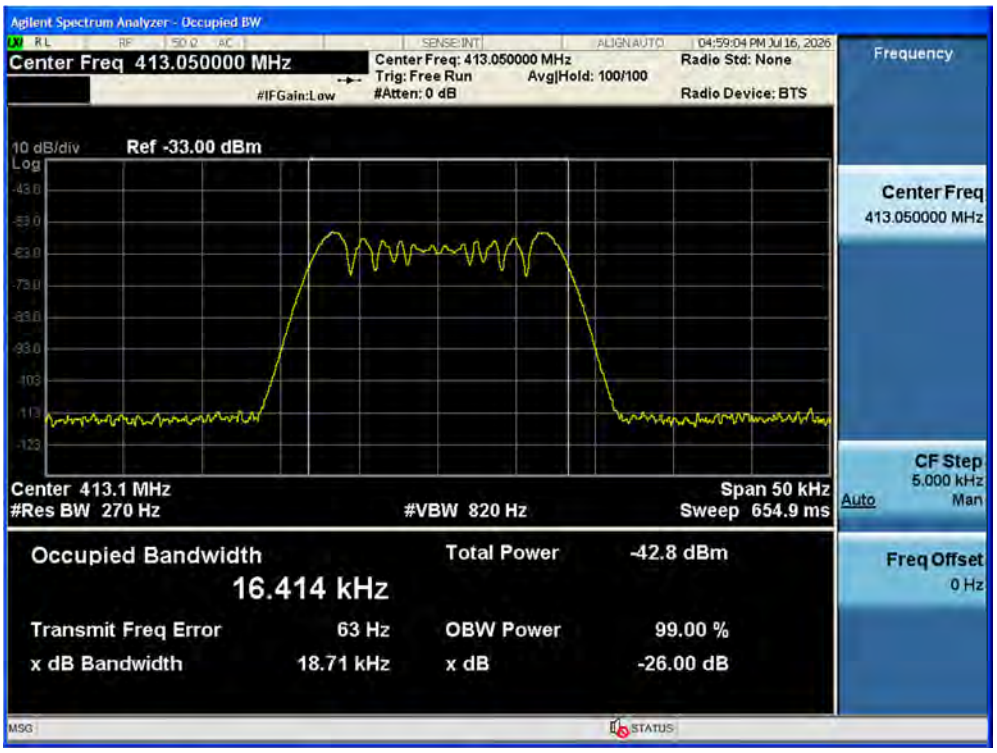


Output / UHF (406.1 ~ 420) / Downlink / FM (25 kHz)

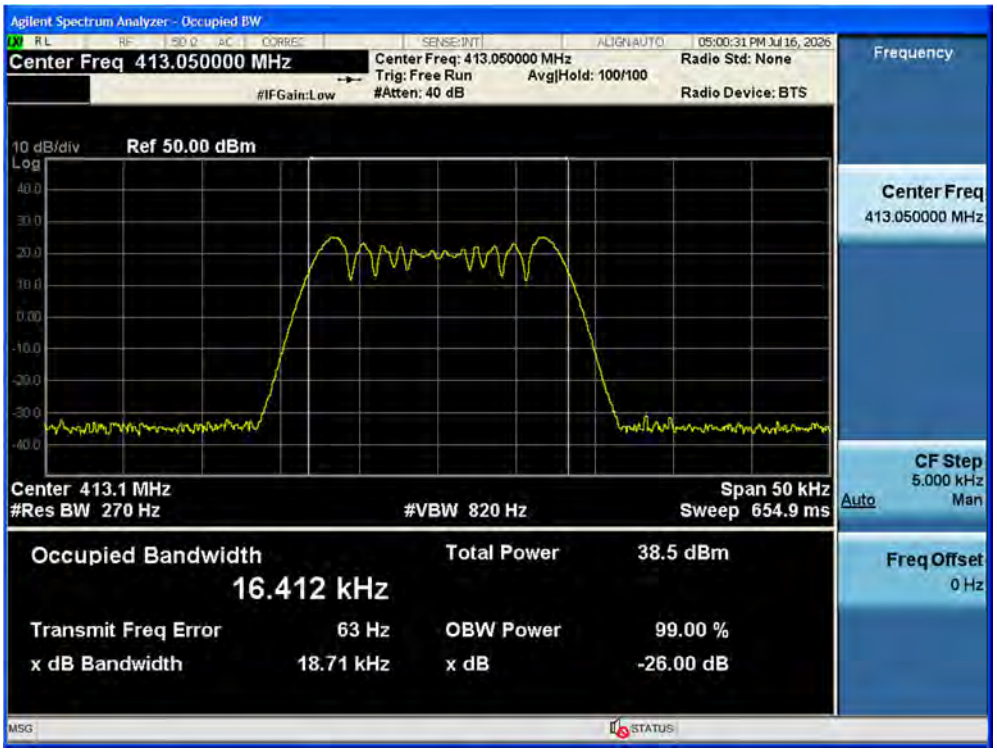


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (25 kHz)



Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (25 kHz)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Downlink / P25 Phase 1 (C4FM)

Output / UHF (421 ~ 430) / Downlink / P25 Phase 1 (C4FM)

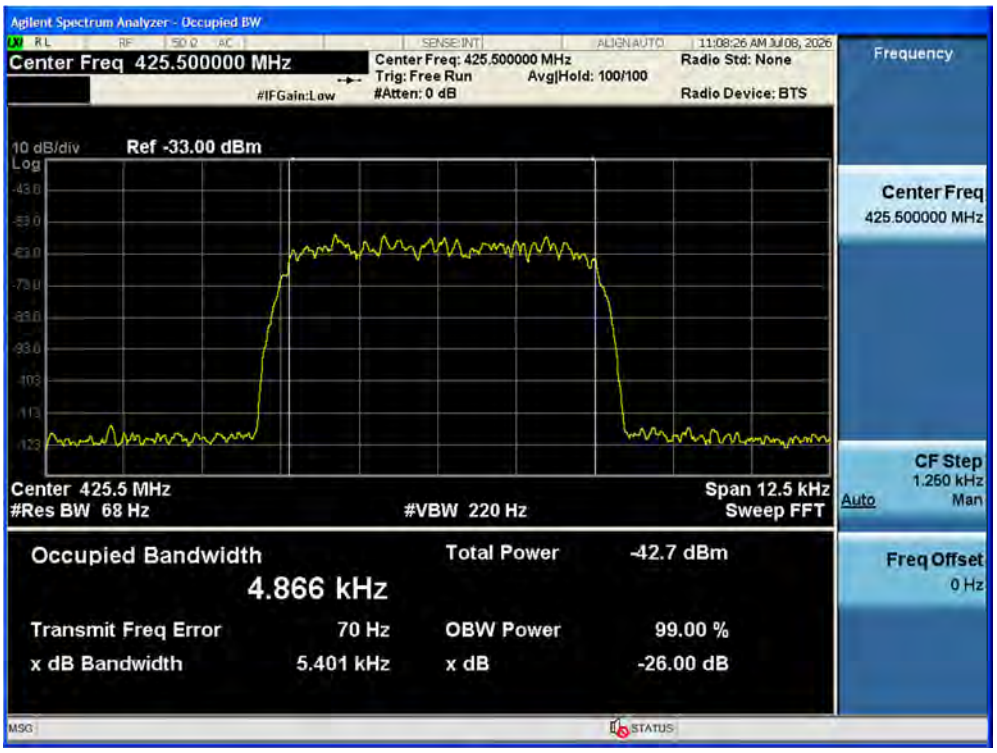
The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / P25 Phase 1 (C4FM)

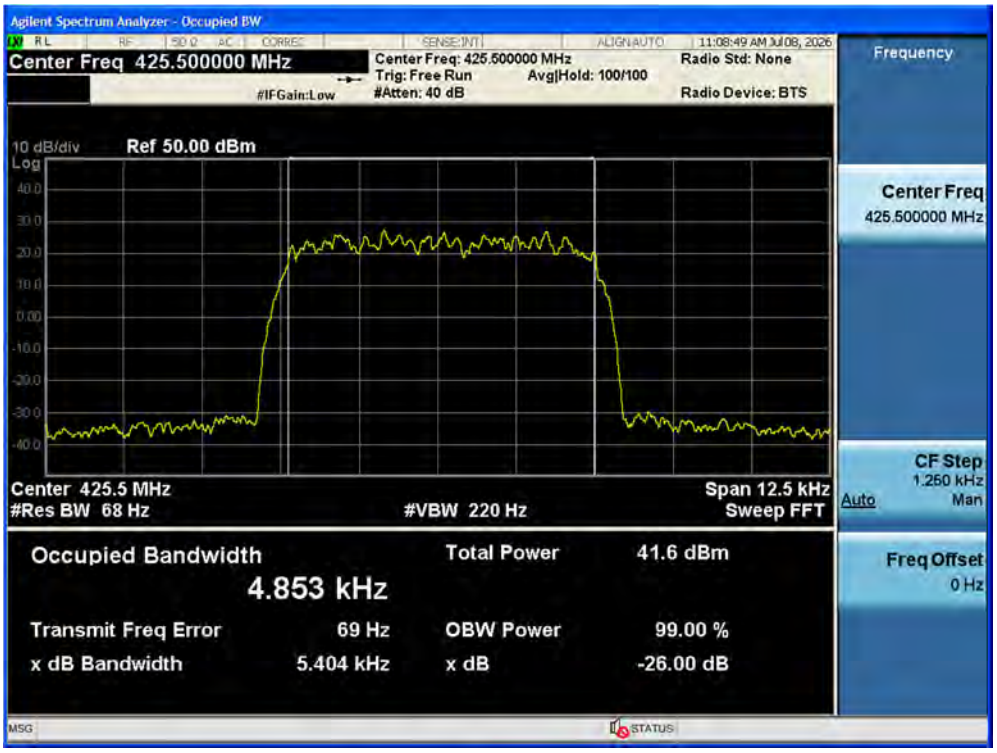
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Downlink / P25 Phase 1 (CQPSK)

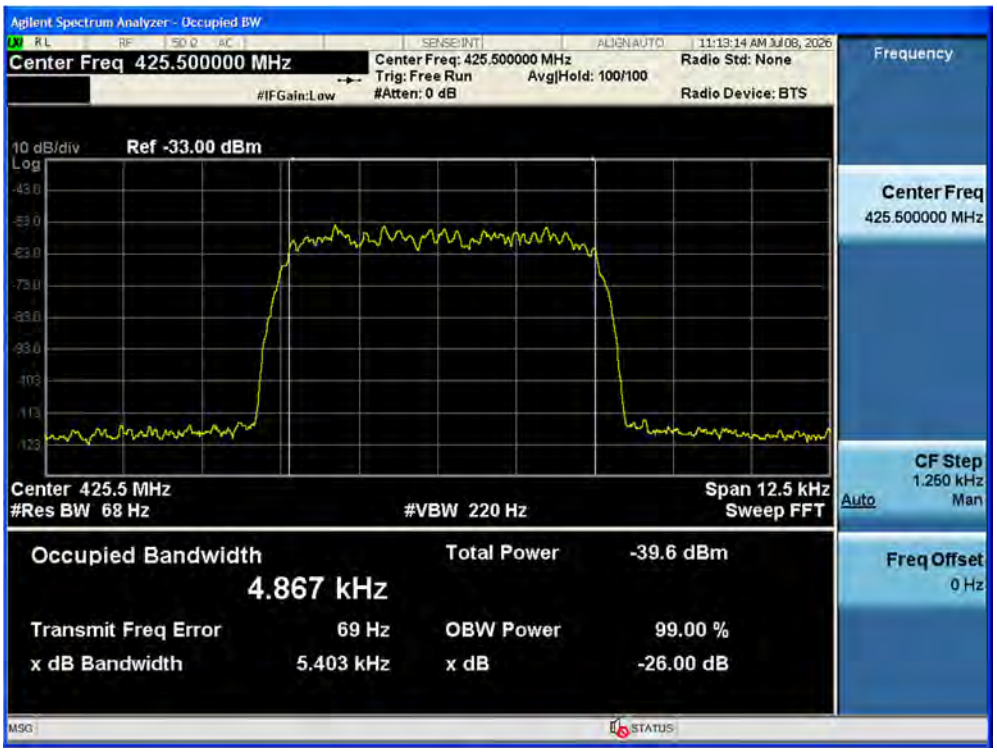


Output / UHF (421 ~ 430) / Downlink / P25 Phase 1 (CQPSK)

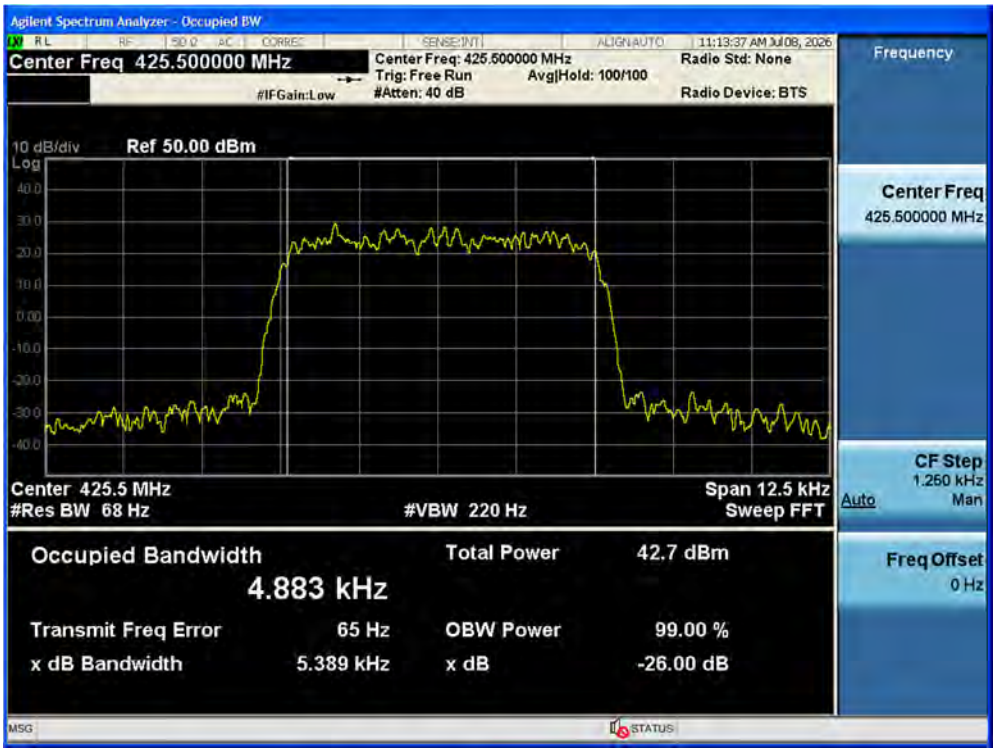


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / P25 Phase 1 (CQPSK)



Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / P25 Phase 1 (CQPSK)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Downlink / P25 Phase 2 (H-DQPSK)

Output / UHF (421 ~ 430) / Downlink / P25 Phase 2 (H-DQPSK)

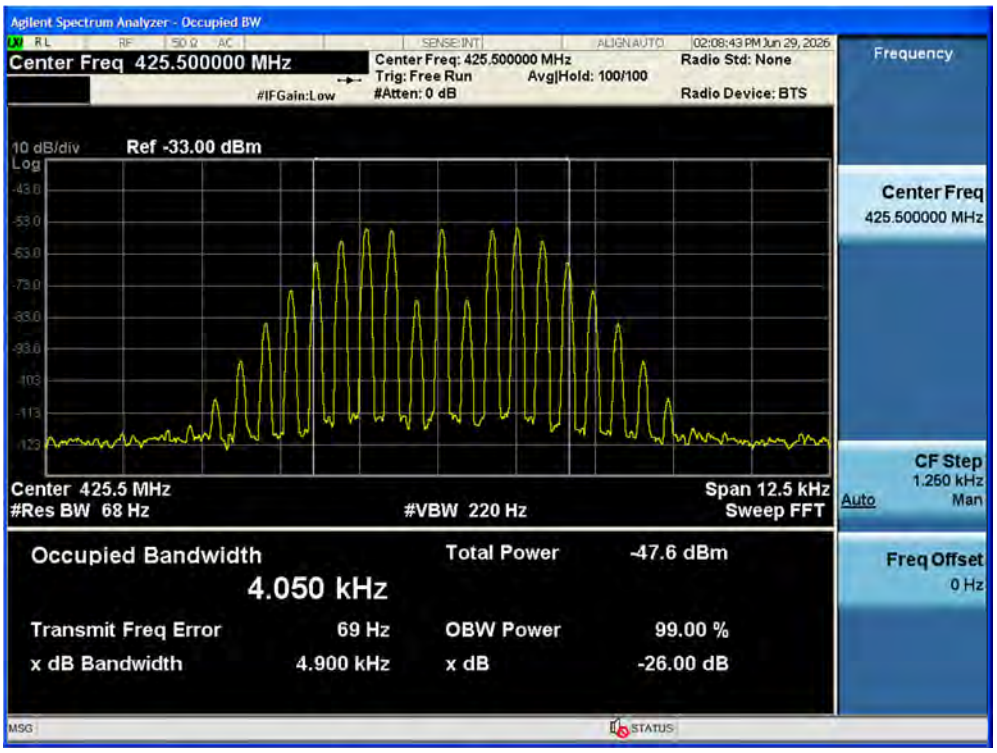
The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / P25 Phase 2 (H-DQPSK)

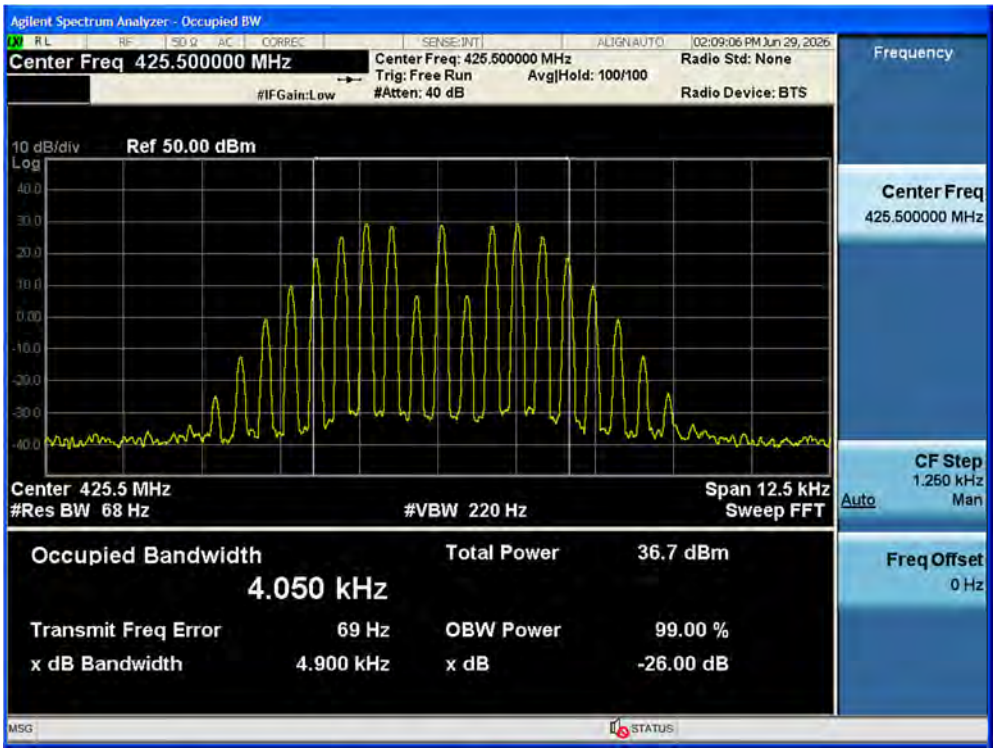
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / P25 Phase 2 (H-DQPSK)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Downlink / FM (6.25 kHz)

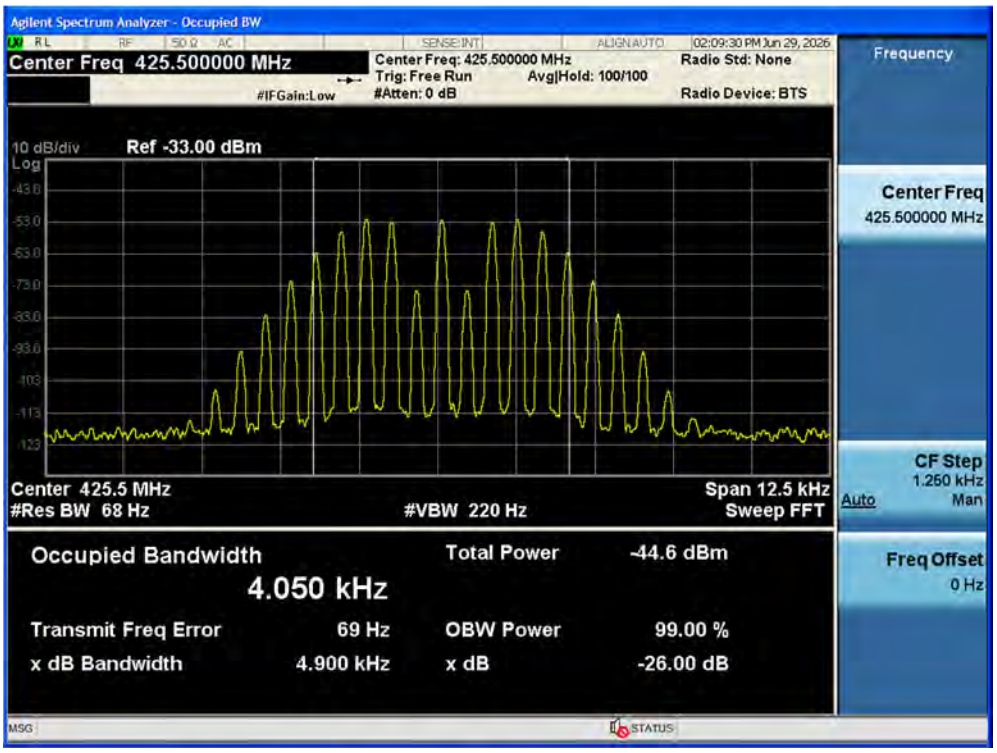


Output / UHF (421 ~ 430) / Downlink / FM (6.25 kHz)

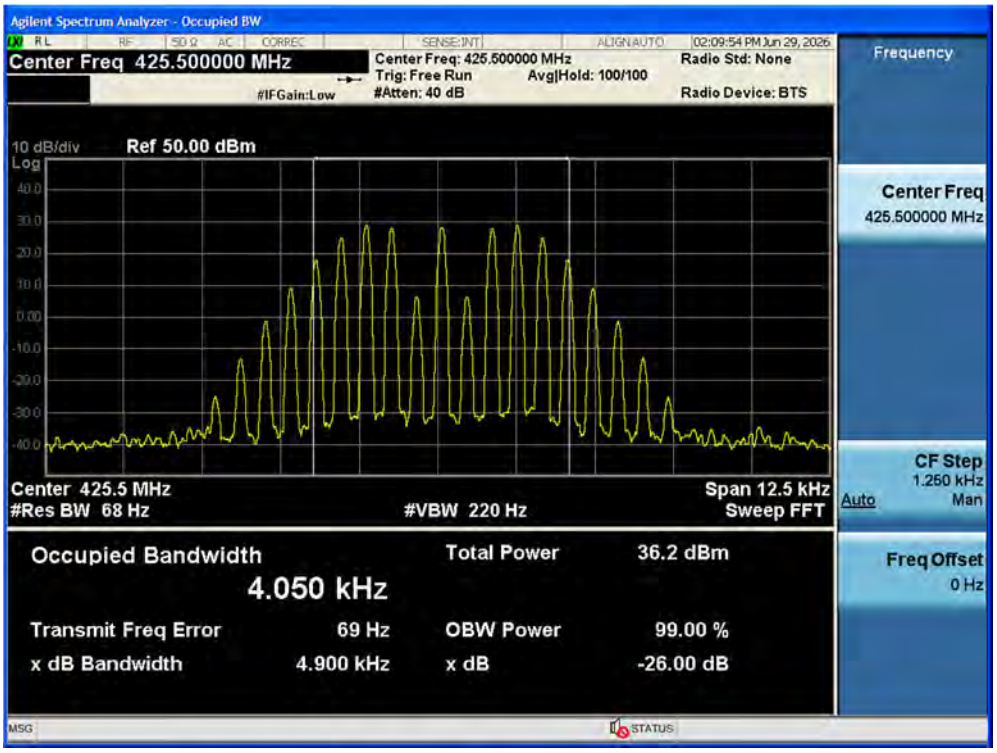


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (6.25 kHz)

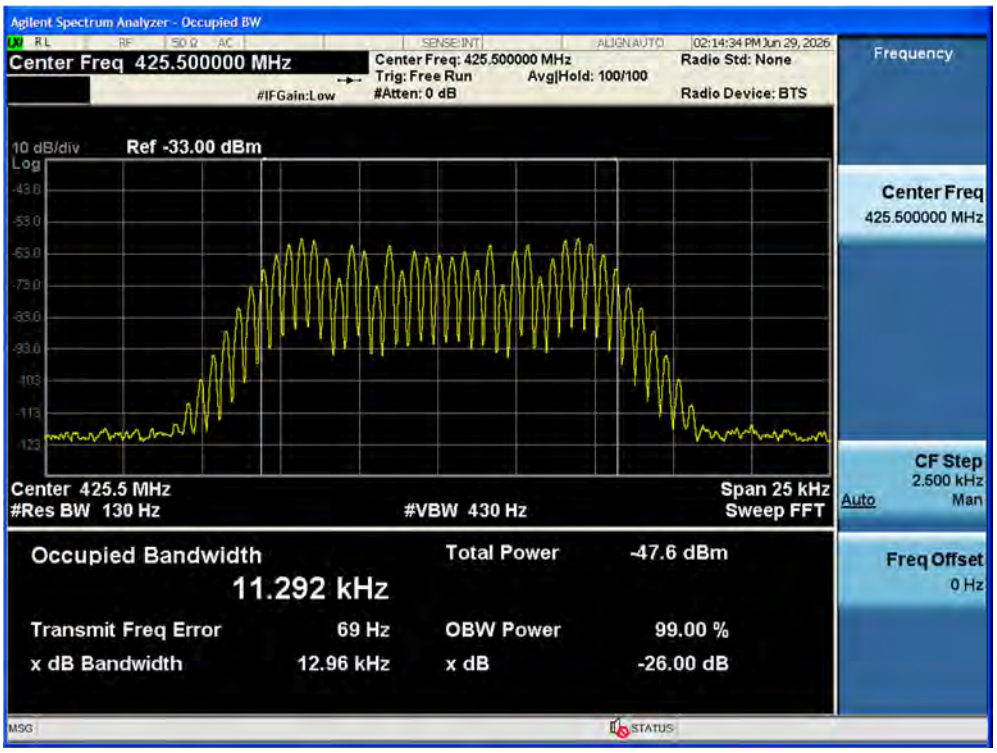


Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (6.25 kHz)

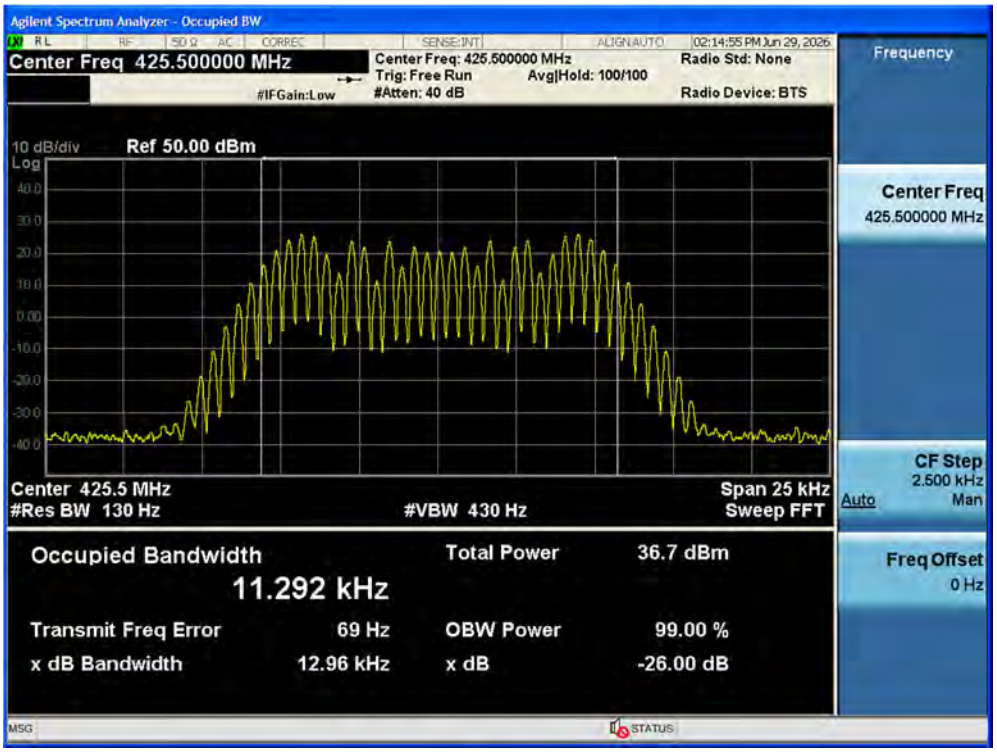


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Downlink / FM (12.5 kHz)

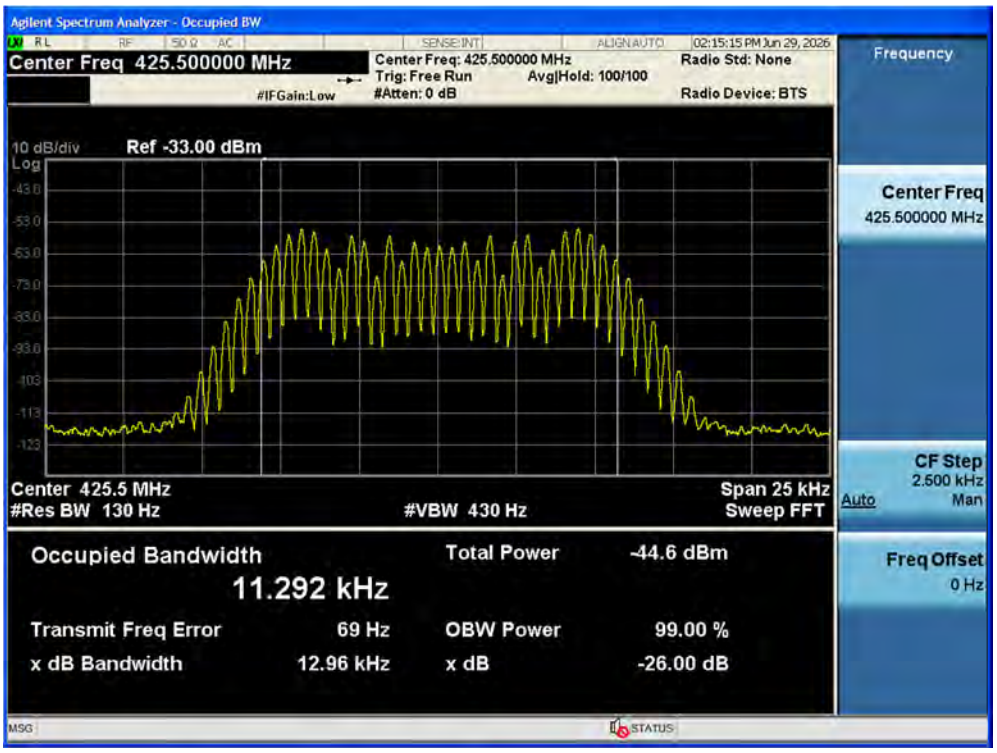


Output / UHF (421 ~ 430) / Downlink / FM (12.5 kHz)

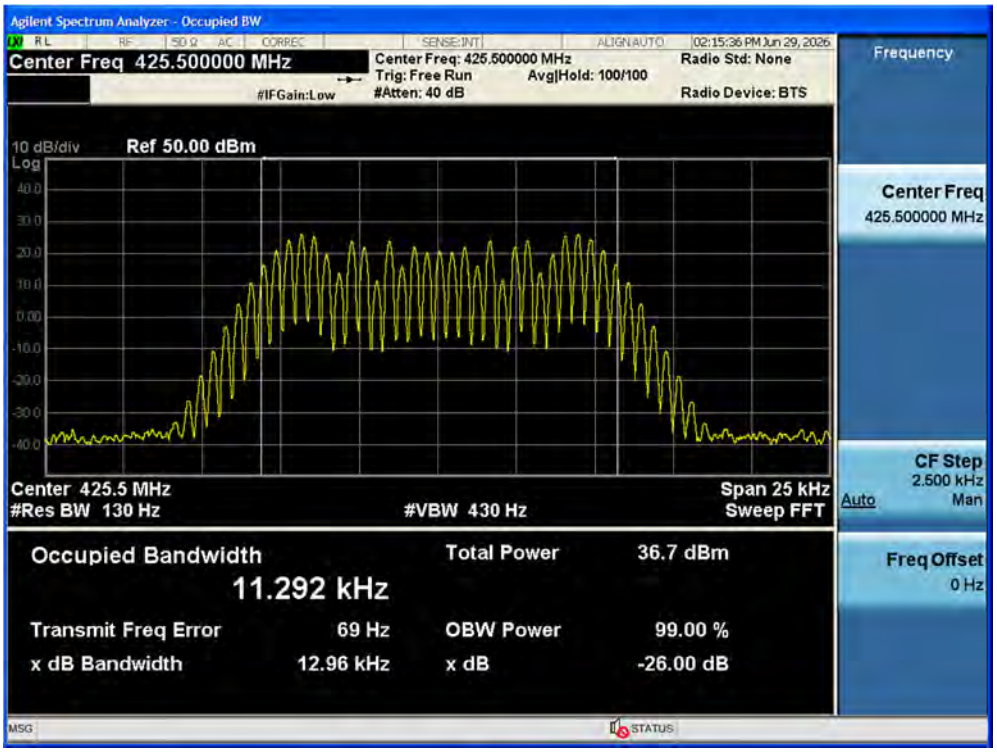


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (12.5 kHz)

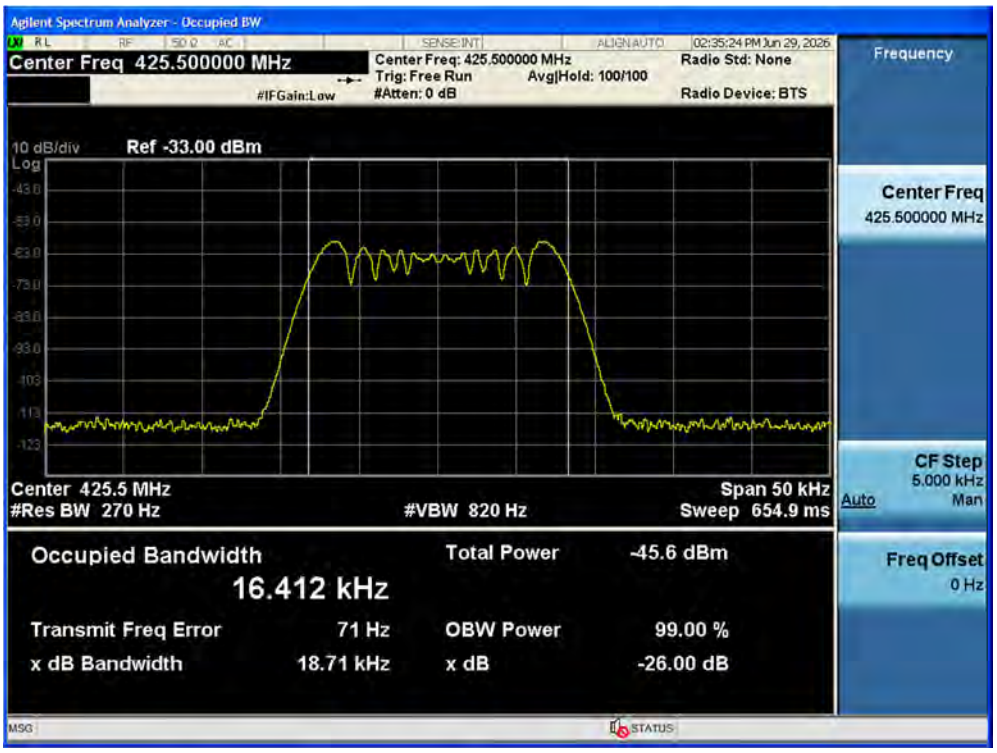


Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (12.5 kHz)

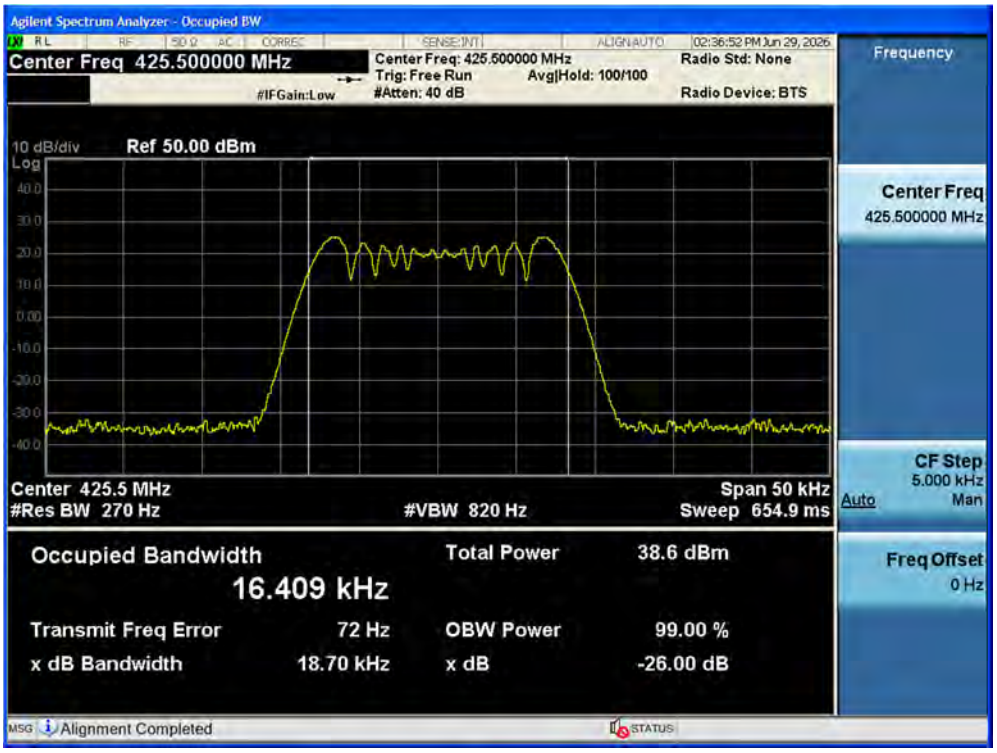


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (421 ~ 430) / Downlink / FM (25 kHz)

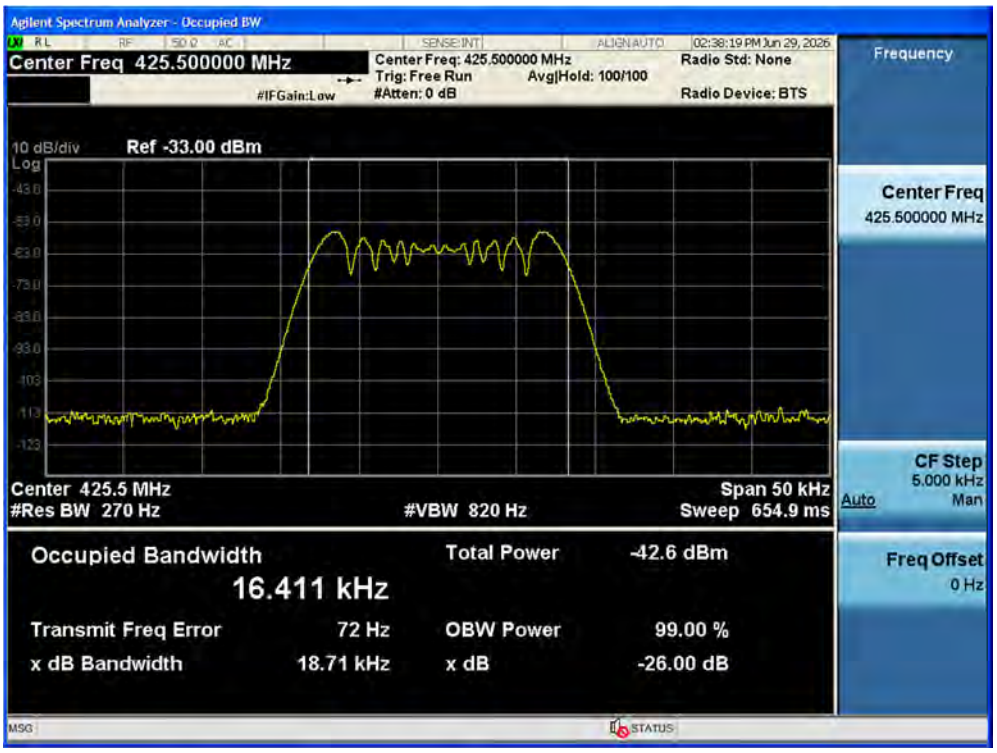


Output / UHF (421 ~ 430) / Downlink / FM (25 kHz)

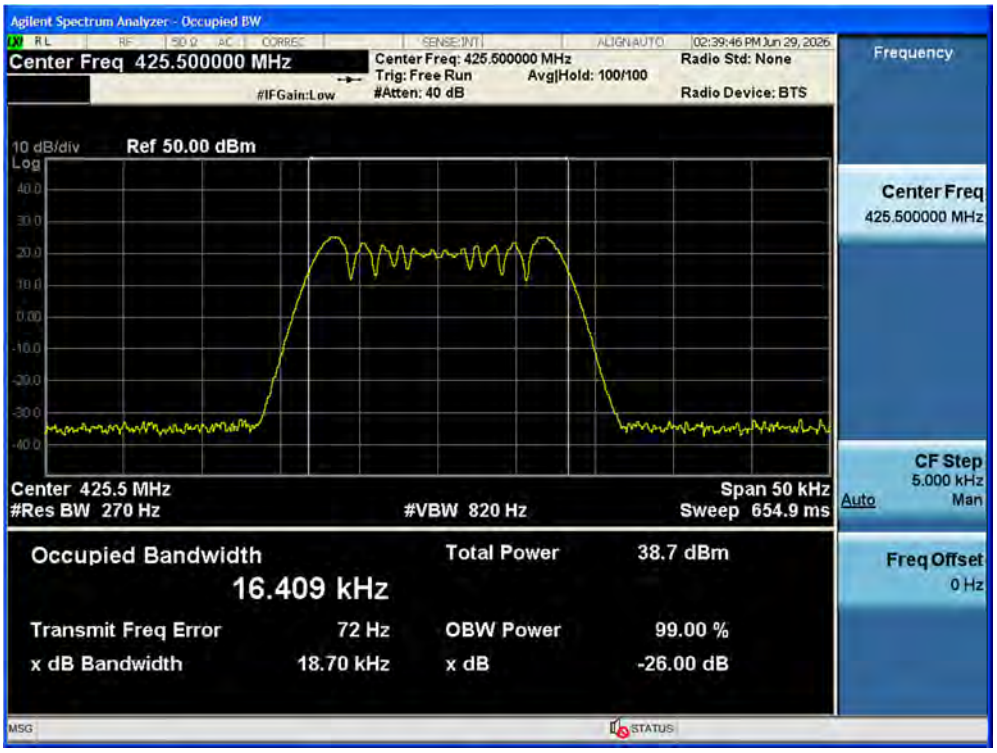


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (25 kHz)



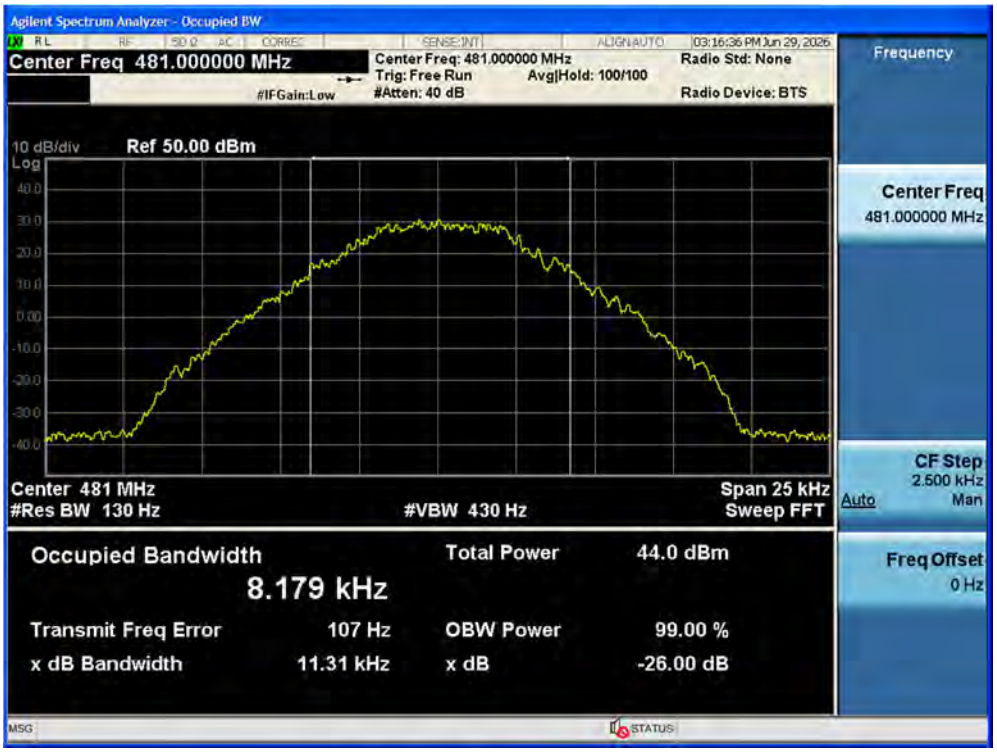
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (25 kHz)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Downlink / P25 Phase 1 (C4FM)

Output / UHF (450 ~ 512) / Downlink / P25 Phase 1 (C4FM)



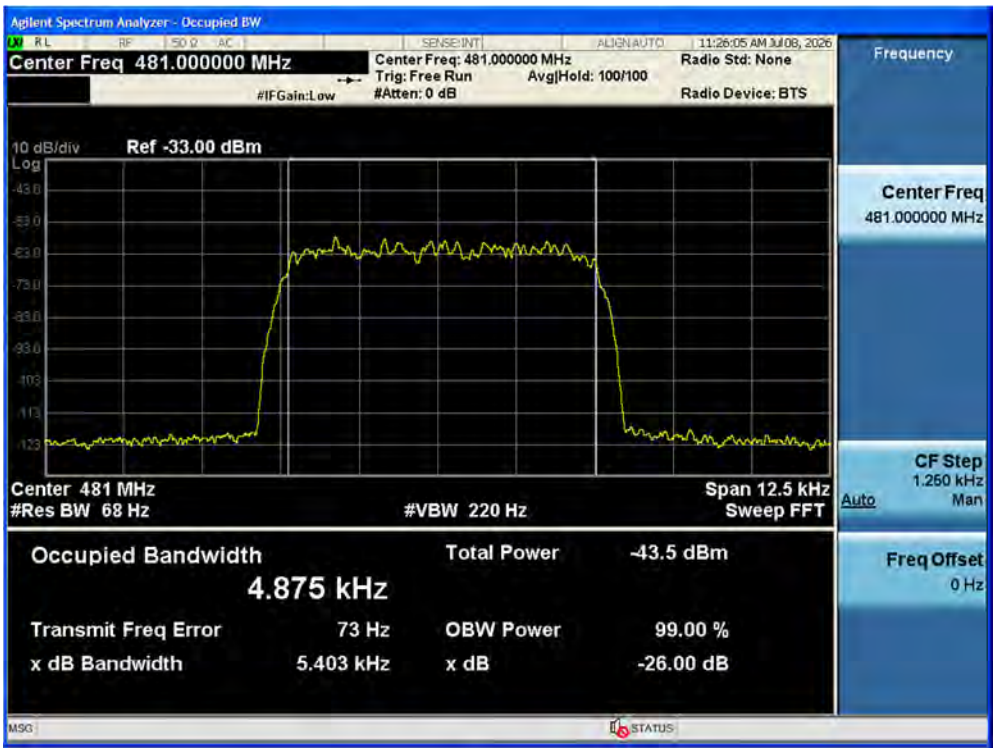
The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 1 (C4FM)

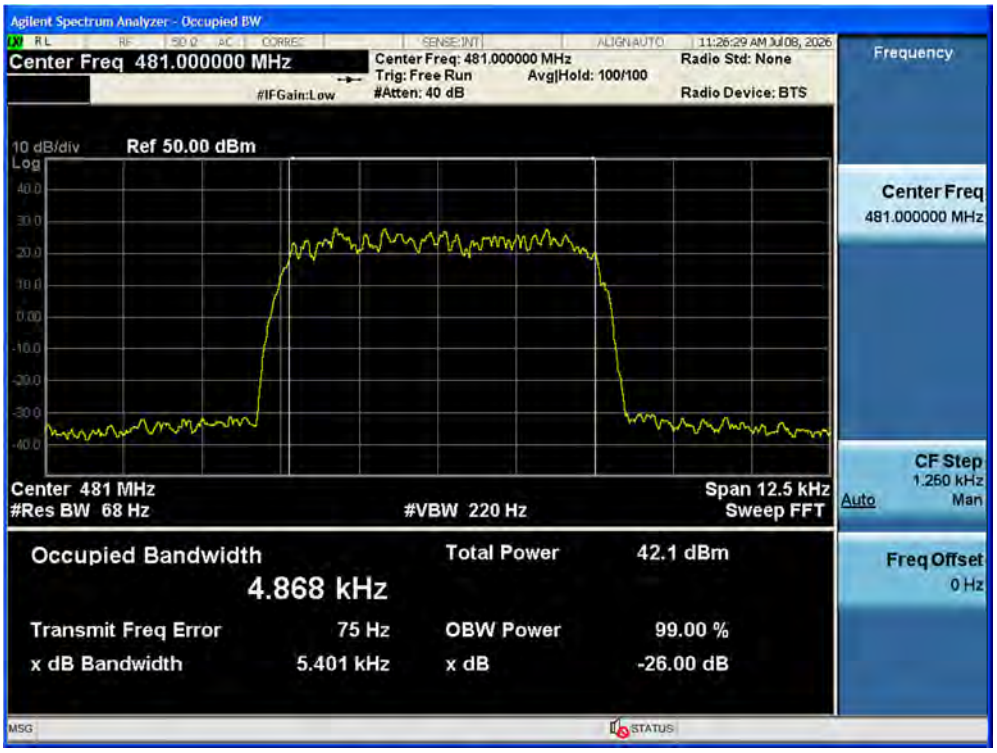
Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 1 (C4FM)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Downlink / P25 Phase 1 (CQPSK)

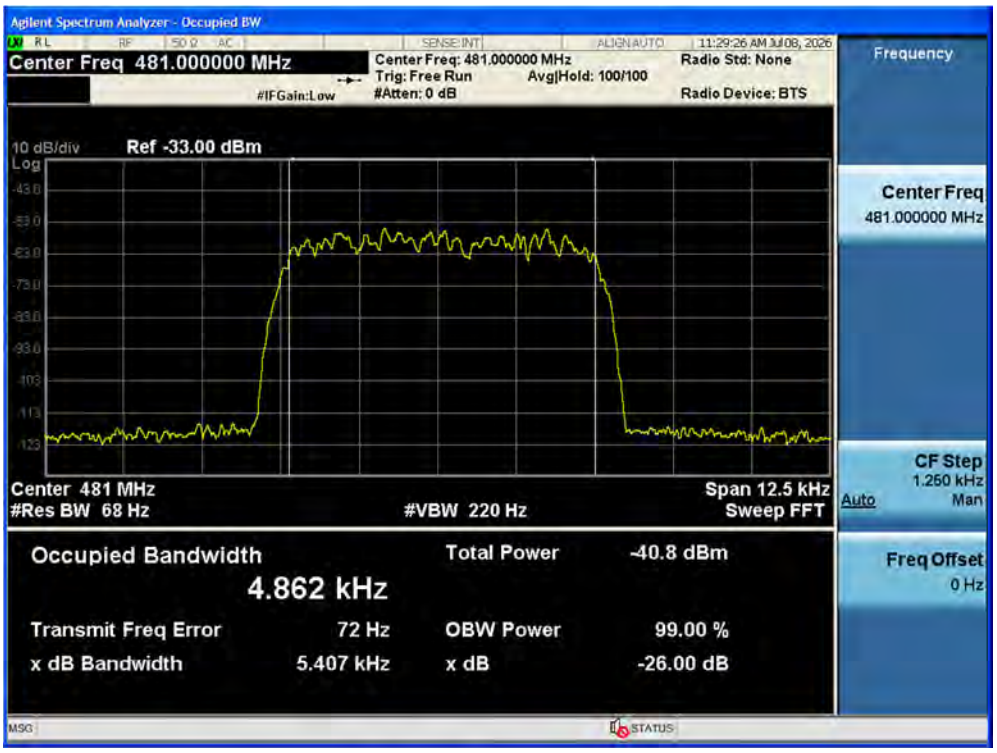


Output / UHF (450 ~ 512) / Downlink / P25 Phase 1 (CQPSK)

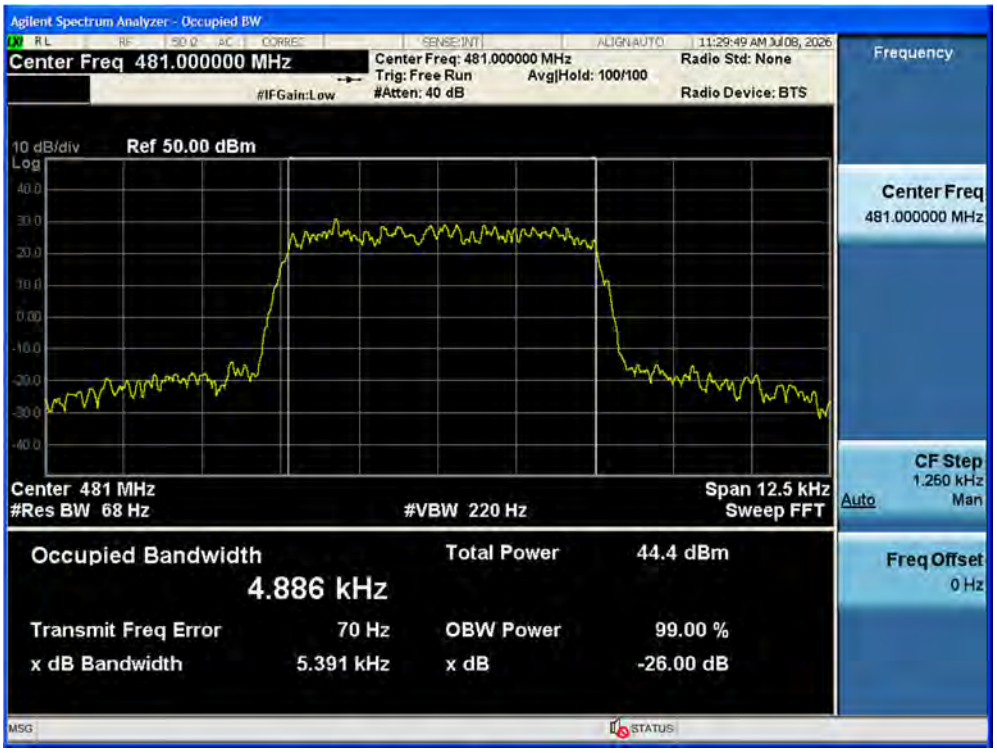


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 1 (CQPSK)



Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 1 (CQPSK)



The report shall not be (partly) reproduced except in full without approval of the laboratory.

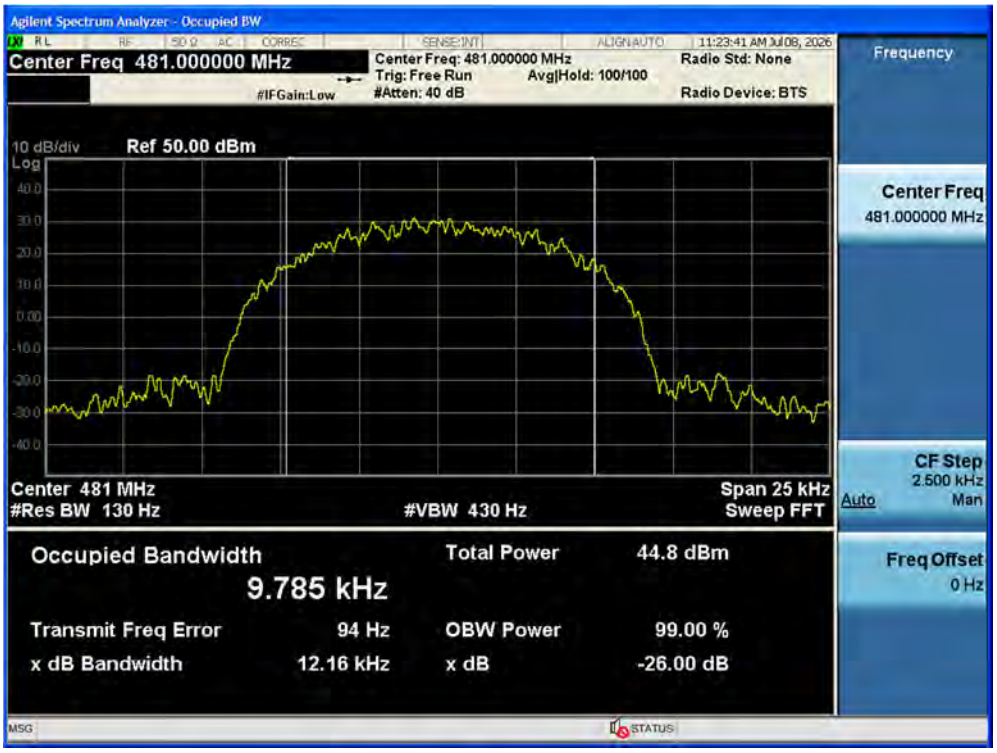
Input / UHF (450 ~ 512) / Downlink / P25 Phase 2 (H-DQPSK)

Output / UHF (450 ~ 512) / Downlink / P25 Phase 2 (H-DQPSK)

The report shall not be (partly) reproduced except in full without approval of the laboratory.

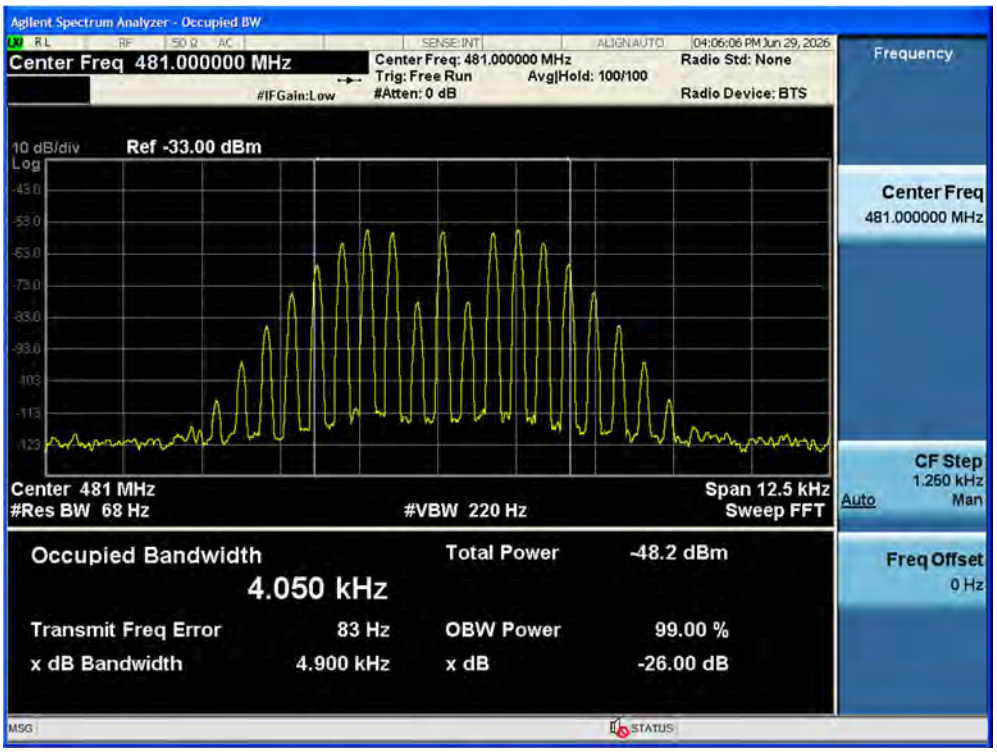
Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 2 (H-DQPSK)

Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 2 (H-DQPSK)

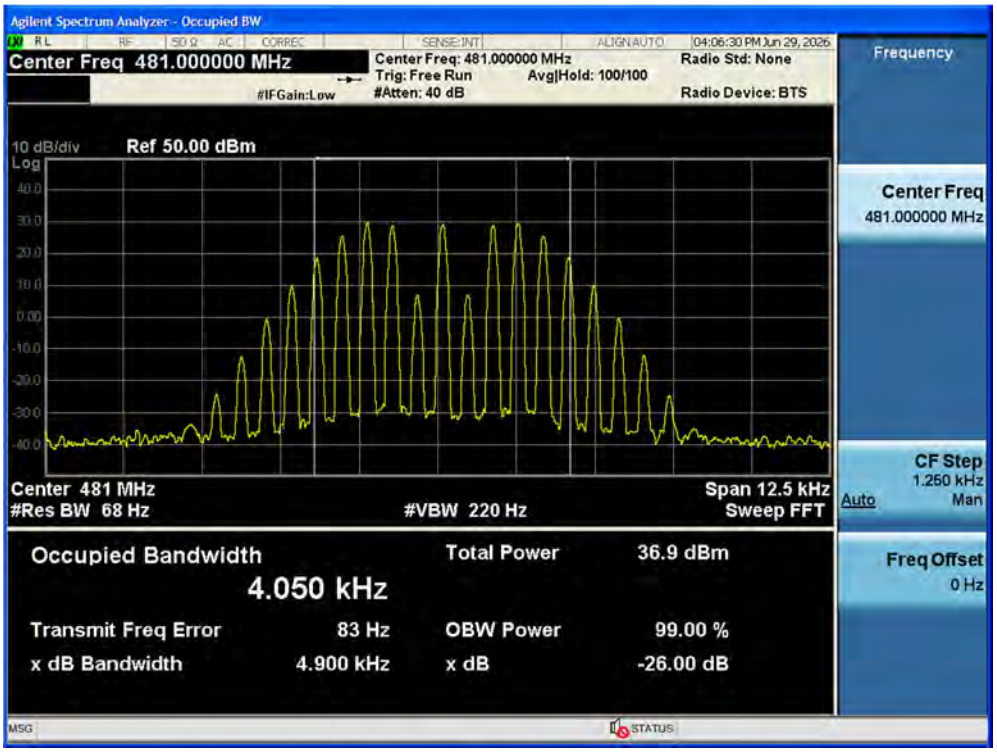


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Downlink / FM (6.25 kHz)

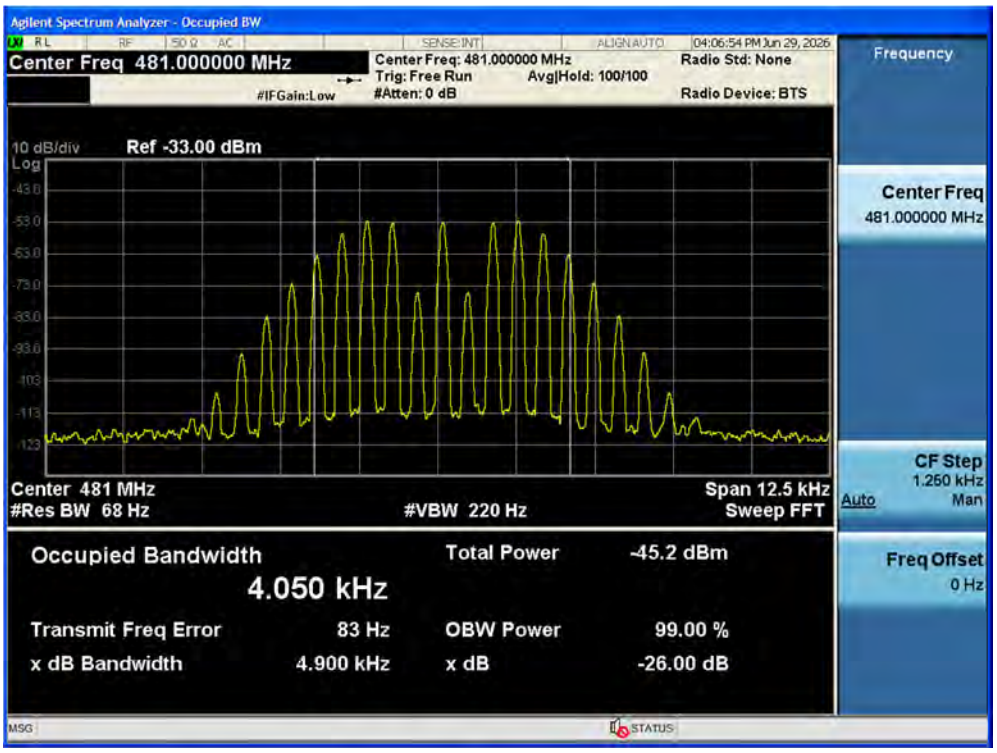


Output / UHF (450 ~ 512) / Downlink / FM (6.25 kHz)

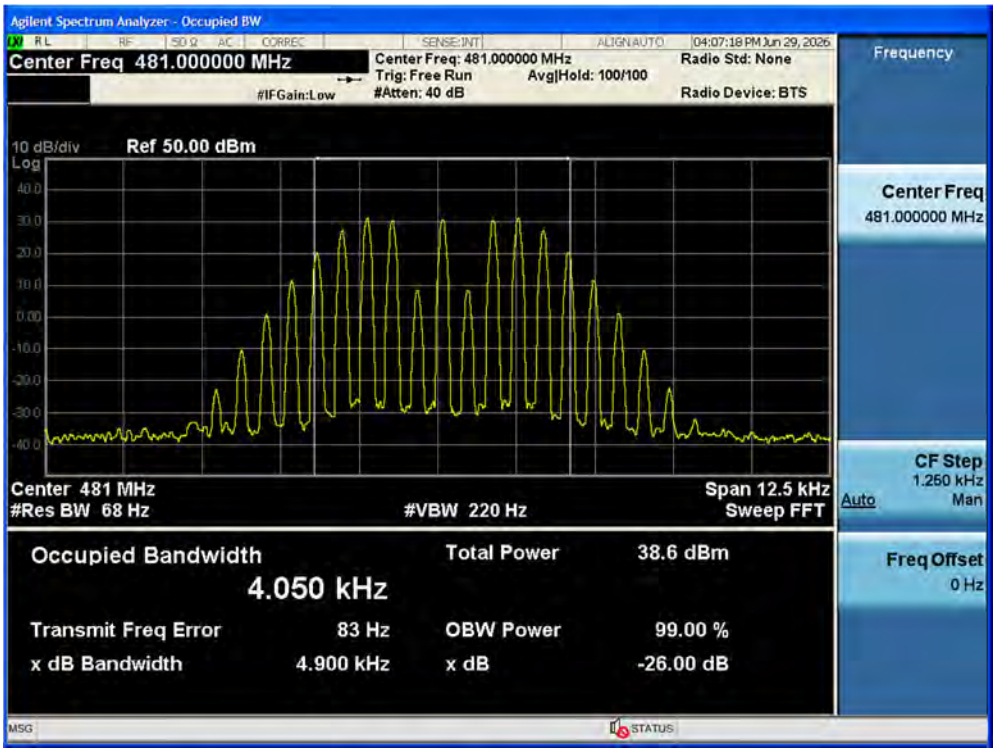


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (6.25 kHz)

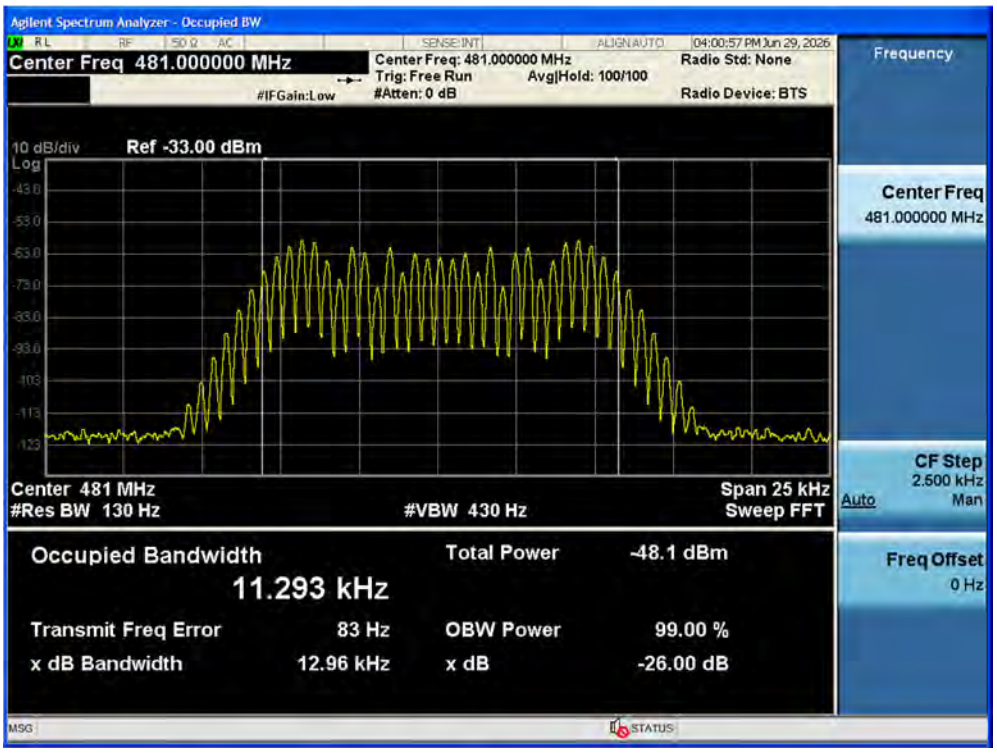


Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (6.25 kHz)

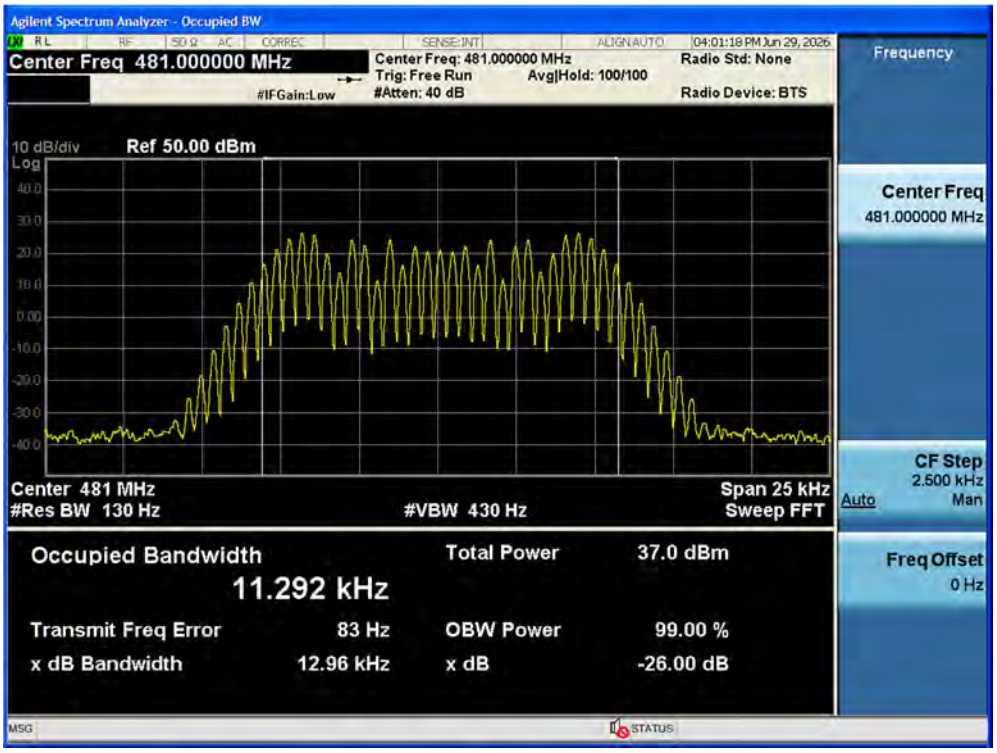


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Downlink / FM (12.5 kHz)

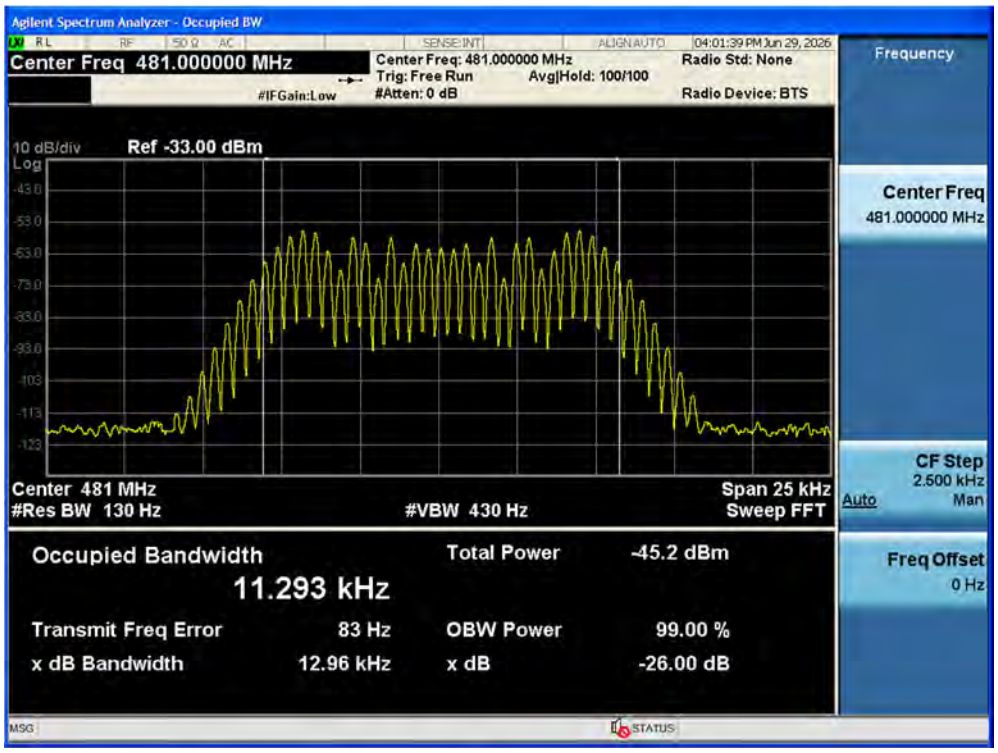


Output / UHF (450 ~ 512) / Downlink / FM (12.5 kHz)

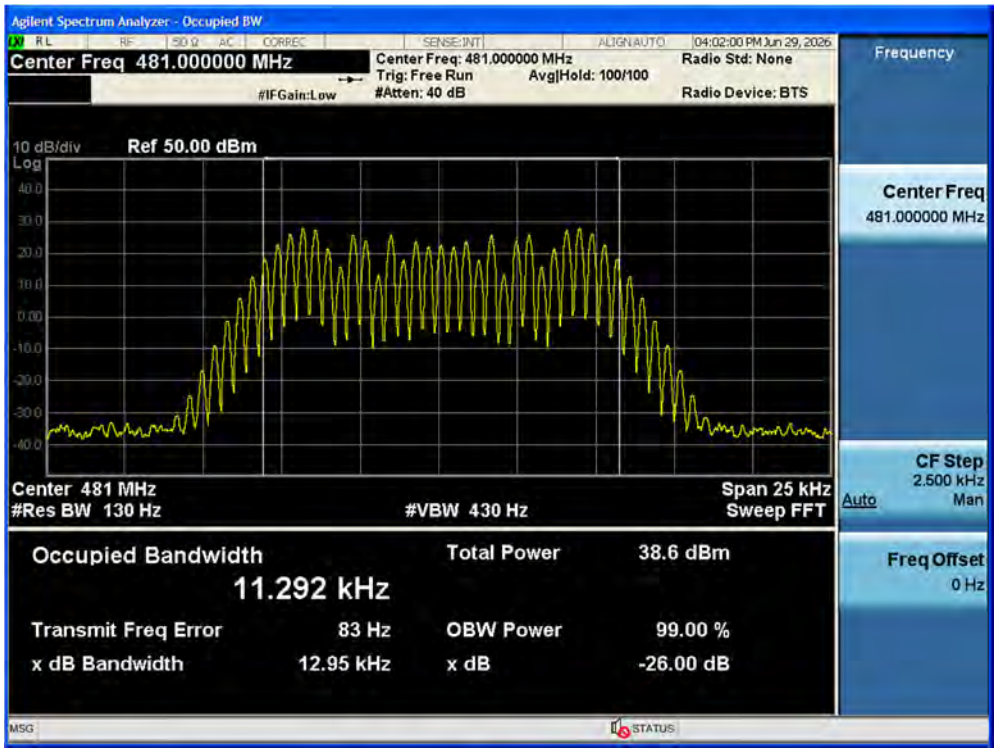


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (12.5 kHz)

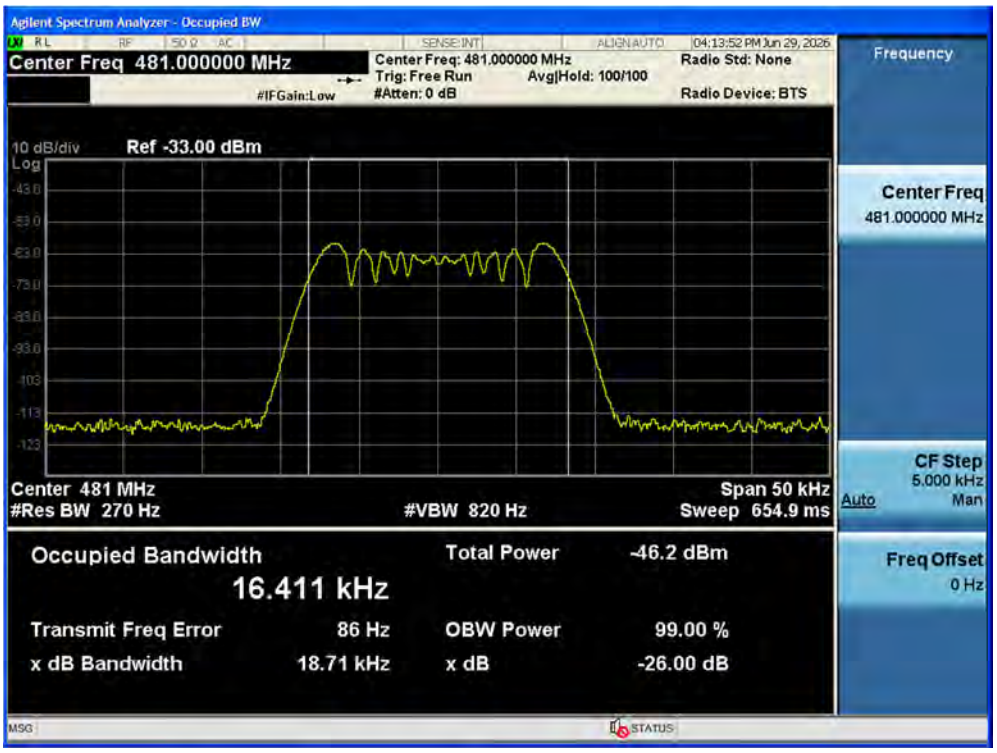


Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (12.5 kHz)

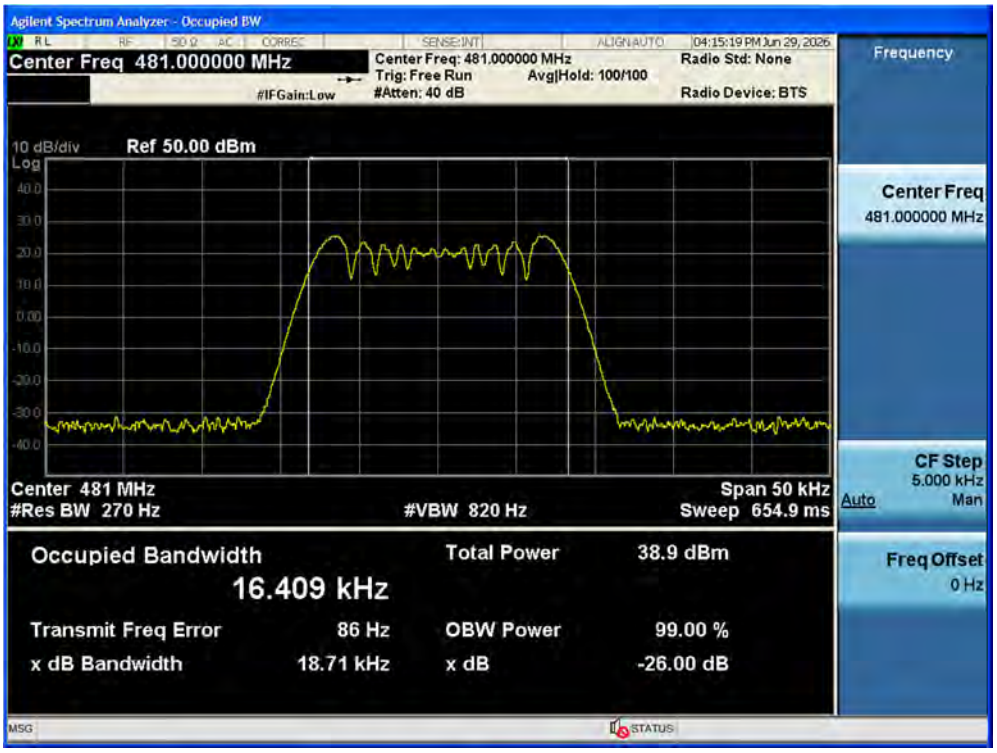


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input / UHF (450 ~ 512) / Downlink / FM (25 kHz)

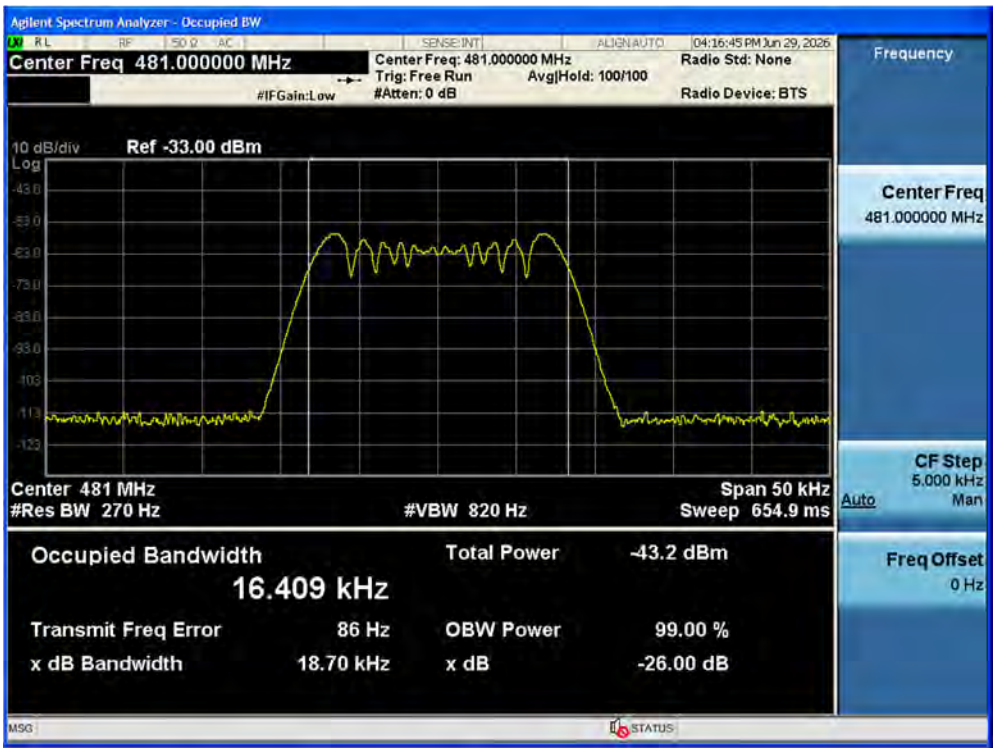


Output / UHF (450 ~ 512) / Downlink / FM (25 kHz)

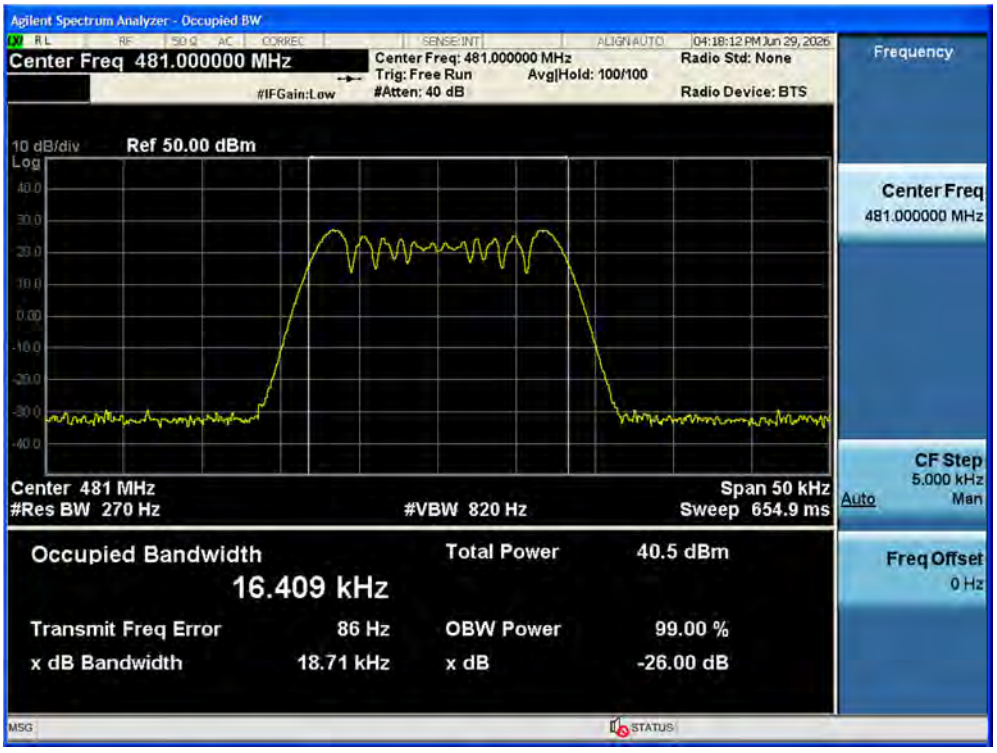


The report shall not be (partly) reproduced except in full without approval of the laboratory.

Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (25 kHz)



Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (25 kHz)



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5.4. INPUT-VERSUS-OUTPUT SIGNAL COMPARISON

Test Requirement:

§90.210 Emission masks.

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating under this part.

Applicable Emission Masks

Frequency band (MHz)	**Mask for equipment with audio low pass filter**	**Mask for equipment without audio low pass filter**
Below 25	A or B	A or C
25-50	B	C
72-76	B	C
150-174	B, D, or E	C, D or E
150 paging only	B	C
220-222	F	F
421-512 [2 5]	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854	B	H
809-824/854-869	B, D	D, G.
896-901/935-940	I	J
902-928	K	K
929 ~ 930	B	G
4940-4990 MHz	L or M	L or M
5850-5925		
All other bands	B	C

[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

[5] Equipment designed to operate on 25 kilohertz bandwidth channels must meet the requirements of either Emission Mask B or G, whichever is applicable, while equipment designed to operate on 12.5 kilohertz bandwidth channels must meet the requirements of Emission Mask D. Equipment designed to operate on 25 kilohertz bandwidth channels may alternatively meet the Adjacent Channel Power limits of § 90.221.

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(c) **Emission Mask C.** For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (fd/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (fd2/11) dB or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(4) In the 1427-1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400-1427 MHz band:

(i) For stations of point-to-point systems in the fixed service: −45 dBW/27 MHz.

(ii) For stations in the mobile service: −60 dBW/27 MHz.

(d) **Emission Mask D—12.5 kHz channel bandwidth equipment.** For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd−2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

(e) **Emission Mask E—6.25 kHz or less channel bandwidth equipment.** For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 kHz removed from f_0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(f_d−3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission

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of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

§ 90.219 Use of signal boosters.

(e) Device Specifications. In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(4) A signal booster must be designed such that all signals that it retransmits meet the following requirements:

(iii) The retransmitted signals continue to meet the unwanted emissions limits of §90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin).

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Test Procedures:

Measurements were in accordance with the test methods section 4.4 of KDB 935210 D05 v01r03.

a) Connect a signal generator to the input of the EUT.

b) Configure the signal generator to transmit the appropriate test signal associated with the public safety emission designation.

c) Configure the signal level to be just below the AGC threshold.

d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

e) Set the spectrum analyzer center frequency to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between 2 times to 5 times the EBW (or OBW).

f) The nominal RBW shall be 300 Hz for 16K0F3E, and 100 Hz for all other emissions types.

g) Set the reference level of the spectrum analyzer to accommodate the maximum input amplitude level, i.e., the level at f_0 per Out-of-band rejection test.

h) Set spectrum analyzer detection mode to peak, and trace mode to max hold.

i) Allow the trace to fully stabilize.

j) Confirm that the signal is contained within the appropriate emissions mask.

k) Use the marker function to determine the maximum emission level and record the associated frequency.

l) Capture the emissions mask plot for inclusion in the test report (output signal spectra).

m) Measure the EUT input signal power (signal generator output signal) directly from the signal generator using power measurement guidance provided in KDB Publication 971168 [R8] (input signal spectra).

n) Compare the spectral plot of the output signal (determined in step k), to the input signal (determined in step l) to affirm they are similar (in passband and rolloff characteristic features and relative spectral locations).

o) Repeat steps d) to n) with the input signal amplitude set 3 dB above the AGC threshold.

p) Repeat steps b) to o) for all authorized operational bands and emissions types (see applicable regulatory specifications, e.g., Section 90.210).

q) Include all accumulated spectral plots depicting EUT input signal and EUT output signal in the test report, and note any observed dissimilarities.

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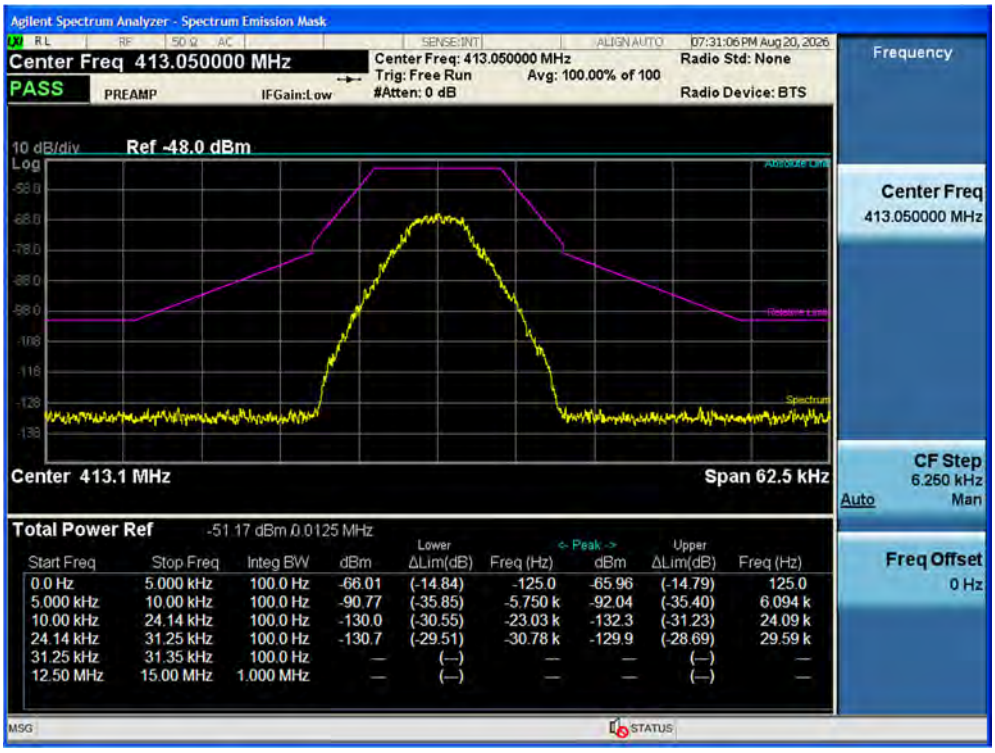
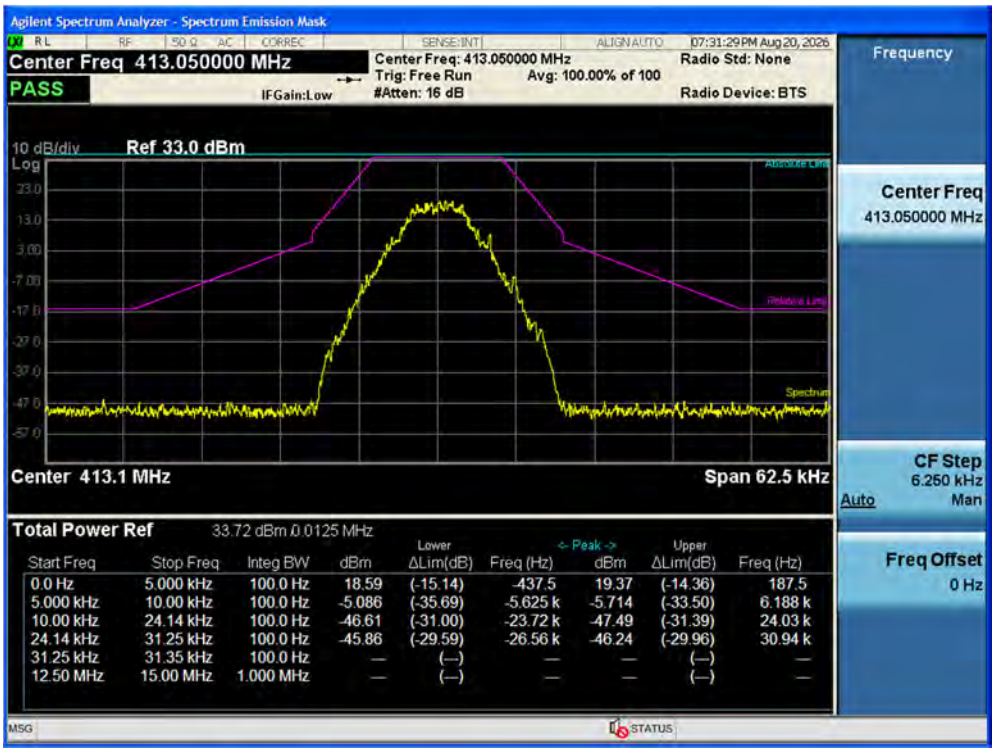
Plot data of Emission mask

Input / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM) / Mask C



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	5.000 kHz	100.0 Hz	-66.01	(-14.84)	-125.0	-65.96	(-14.79)	125.0
5.000 kHz	10.00 kHz	100.0 Hz	-90.77	(-35.85)	-5.750 k	-92.04	(-35.40)	6.094 k
10.00 kHz	24.14 kHz	100.0 Hz	-130.0	(-30.55)	-23.03 k	-132.3	(-31.23)	24.09 k
24.14 kHz	31.25 kHz	100.0 Hz	-130.7	(-29.51)	-30.78 k	-129.9	(-28.69)	29.59 k
31.25 kHz	31.35 kHz	100.0 Hz	—	(—)	—	—	(—)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(—)	—	—	(—)	—

Output / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM) / Mask C



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	5.000 kHz	100.0 Hz	18.59	(-15.14)	-437.5	19.37	(-14.36)	187.5
5.000 kHz	10.00 kHz	100.0 Hz	-5.086	(-35.69)	-5.625 k	-5.714	(-33.50)	6.188 k
10.00 kHz	24.14 kHz	100.0 Hz	-46.61	(-31.00)	-23.72 k	-47.49	(-31.39)	24.03 k
24.14 kHz	31.25 kHz	100.0 Hz	-45.86	(-29.59)	-26.56 k	-46.24	(-29.96)	30.94 k
31.25 kHz	31.35 kHz	100.0 Hz	—	(—)	—	—	(—)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(—)	—	—	(—)	—

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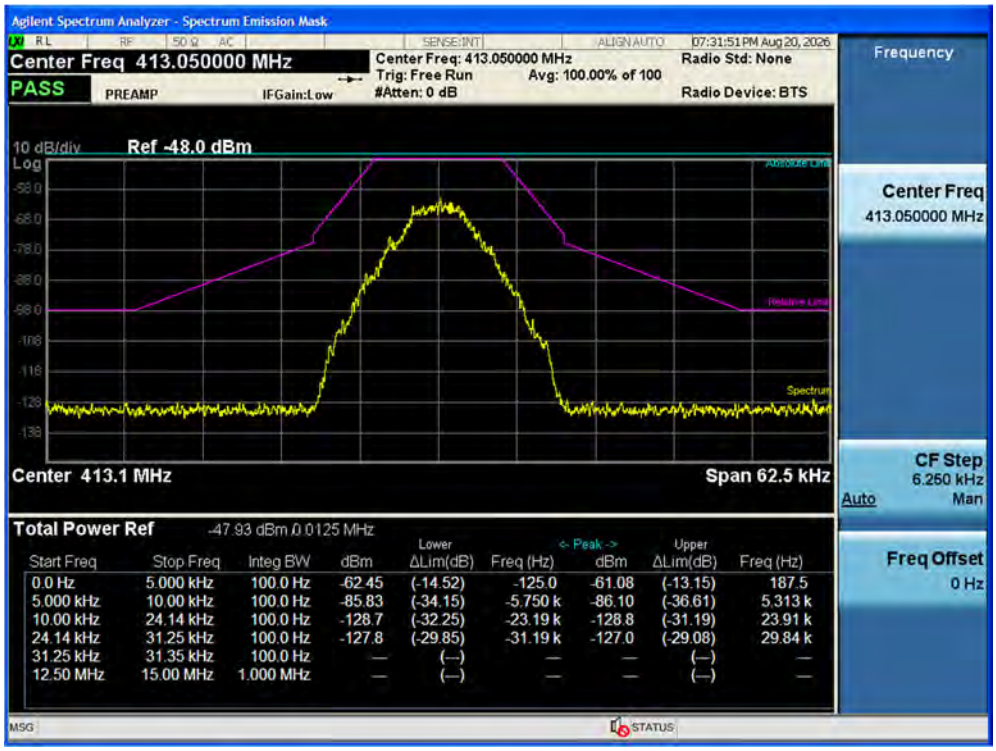
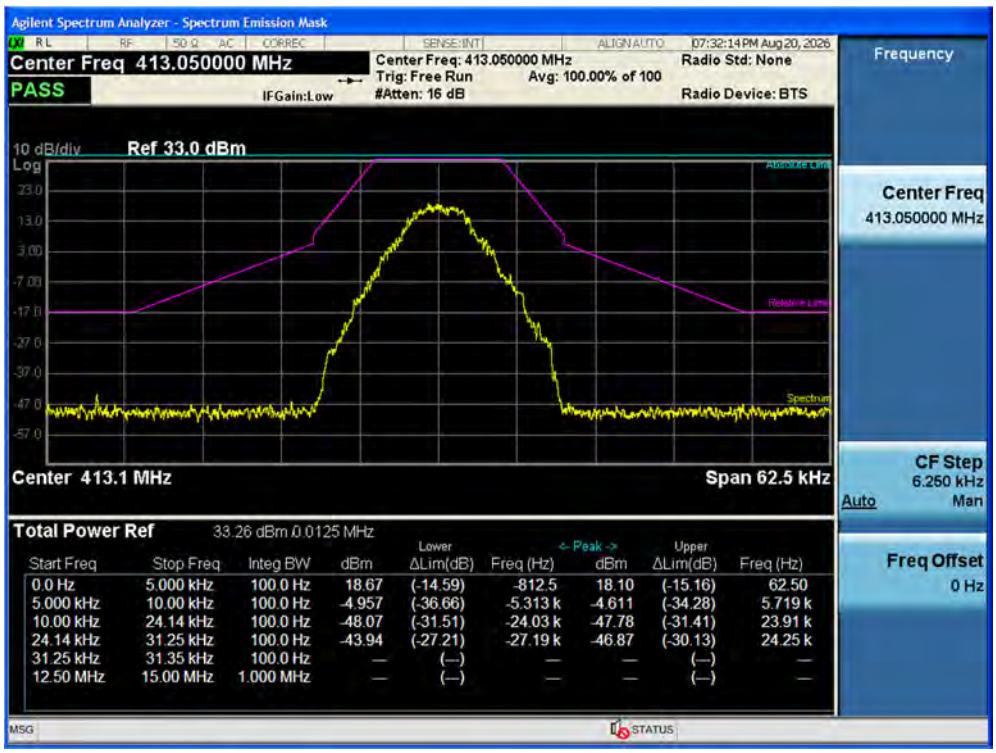
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM) / Mask C



Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 1 (C4FM) / Mask C



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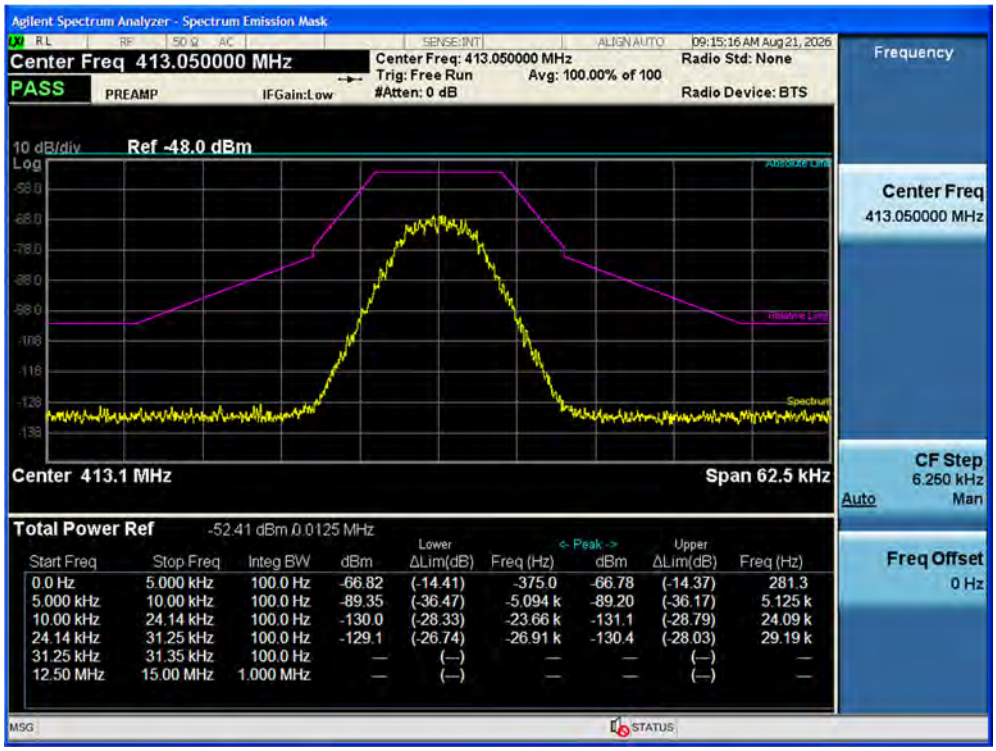
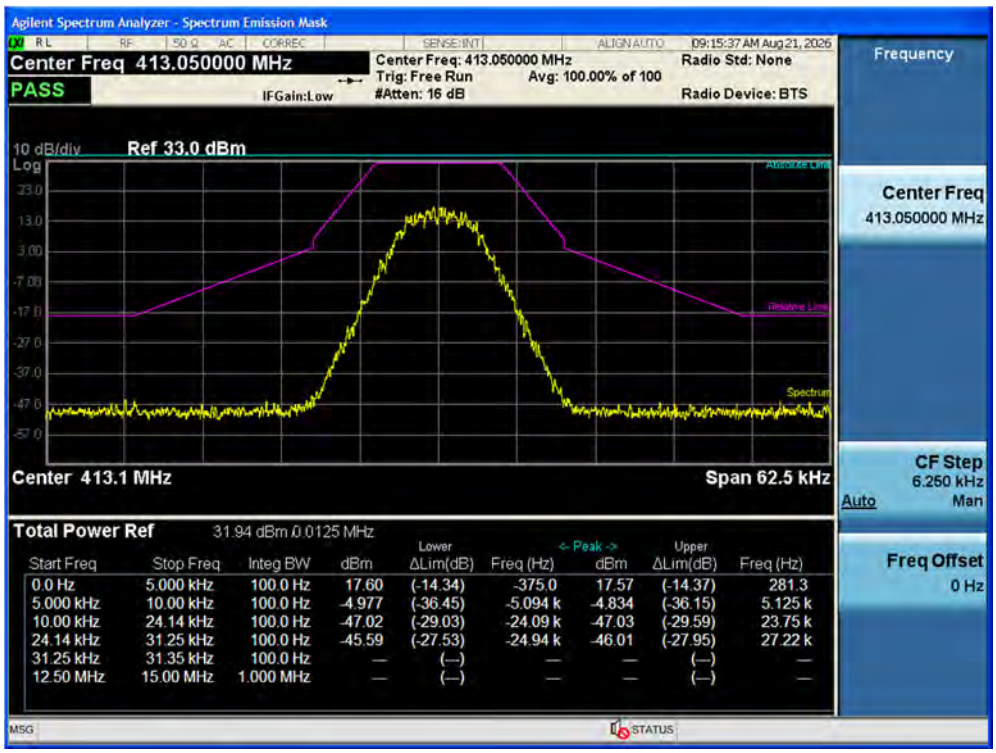
Input / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)/ Mask C



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	5.000 kHz	100.0 Hz	-66.82	(-14.41)	-375.0	-66.78	(-14.37)	281.3
5.000 kHz	10.00 kHz	100.0 Hz	-89.35	(-36.47)	-5.094 k	-89.20	(-36.17)	5.125 k
10.00 kHz	24.14 kHz	100.0 Hz	-130.0	(-28.33)	-23.66 k	-131.1	(-28.79)	24.09 k
24.14 kHz	31.25 kHz	100.0 Hz	-129.1	(-26.74)	-26.91 k	-130.4	(-28.03)	29.19 k
31.25 kHz	31.35 kHz	100.0 Hz	—	(---)	—	—	(---)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(---)	—	—	(---)	—

Output / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)/ Mask C



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	5.000 kHz	100.0 Hz	17.60	(-14.34)	-375.0	17.57	(-14.37)	281.3
5.000 kHz	10.00 kHz	100.0 Hz	-4.977	(-36.45)	-5.094 k	-4.834	(-36.15)	5.125 k
10.00 kHz	24.14 kHz	100.0 Hz	-47.02	(-29.03)	-24.09 k	-47.03	(-29.59)	23.75 k
24.14 kHz	31.25 kHz	100.0 Hz	-45.59	(-27.53)	-24.94 k	-46.01	(-27.95)	27.22 k
31.25 kHz	31.35 kHz	100.0 Hz	—	(---)	—	—	(---)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(---)	—	—	(---)	—

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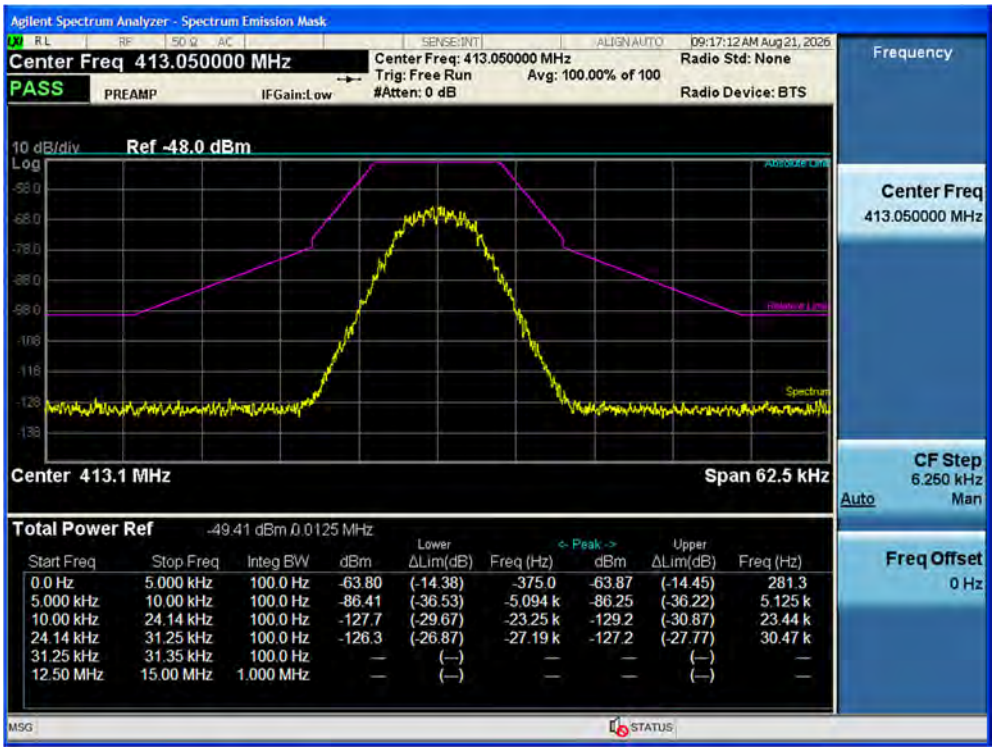
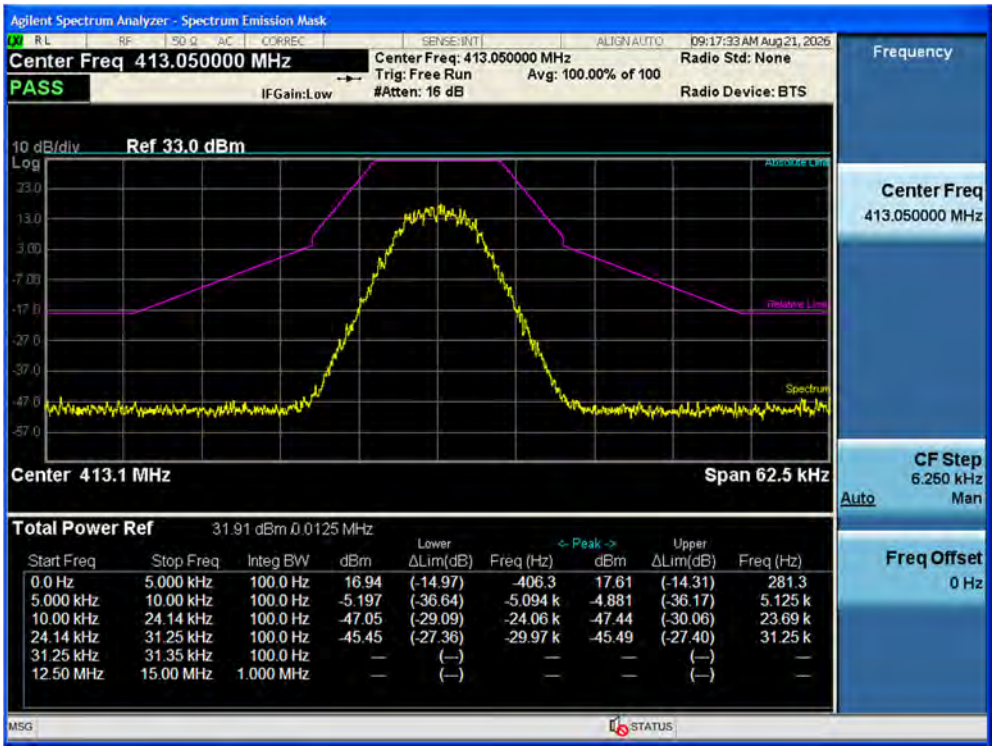
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)/ Mask C



Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / P25 Phase 2 (H-CPM)/ Mask C



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