

04/20/2026

Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda
Rua Hungria,
8th floor
São Paulo, Brazil
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Dear Nic Holmes,

Enclosed is the EMC Wireless test report for compliance testing of the Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda VL70LF as tested to the requirements of Item 19 of Article 38-2, Paragraph 1 of Japan Radio Law for Intentional Radiators.

Thank you for using the services of Eurofins MET Labs. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
EUROFINS MET LABS



Nancy LaBrecque
Documentation Department

Reference: WIRA136963-Japan-BLE – Rev 1

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Bluetooth Low Energy Test Report

for the

Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda
Model: VL70LF

Tested under
Rules for
2.4 GHz Wide-Band Low-Power
Communication System in
Item 19 of Article 38-2, Paragraph 1 of Japan Radio Law
For Intentional Radiators



Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab



Nancy LaBrecque
Documentation Department

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 Part 15.247 under normal use and maintenance.



Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	03/25/2026	Initial Issue.
1	04/20/2026	Reviewer Comments

List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB μ A	Decibels above one microamp
dB μ V	Decibels above one microvolt
dB μ A/m	Decibels above one microamp per meter
dB μ V/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μ H	microhenry
μ	microfarad
μ s	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda VL70LF, with the requirements of a 2.4 GHz Wide-Band Low-Power Data Communication System in Item 19 of Article 38-2, Paragraph 1 of Japan Radio Law. Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the VL70LF, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Item 19 of Article 38-2, Paragraph 1 of Japan Radio Law, in accordance with Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda purchase order number HID026847.

Description	Compliance	Remark
Frequency Error	Compliant	
Occupied Bandwidth	Compliant	
Spurious Emissions	Compliant	
Antenna Power	Compliant	
EIRP	Compliant	
Secondary Radiated Emissions (Spurious Emission of Receiver)	Compliant	
Function of Carrier Sense	Not Applicable	This items is not applicable to BLE transmitters
Absolute Gain of Tx Antenna	Not Applicable	This item is not applicable to transmitters with an EIRP below 12.14dBm/MHz
Half Power Beam Width	Not Applicable	This item is not applicable to transmitters with an EIRP below 12.14dBm/MHz
Interference Prevention Function	Compliant	

Table 1. Executive Summary

II. Equipment Configuration

A. Overview

Eurofins MET Labs was contracted by Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda to perform testing on the model VL70LF, under Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda's purchase order number HID026847.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda model VL70LF

The results obtained relate only to the item(s) tested.

Product Name:	HID Amico Facial Reader	
Model(s) Tested:	VL70LF	
Equipment Specifications:	Primary Power:	12VDC via AC / DC Power Adapter
	Type of Modulations:	GFSK
	Equipment Code:	DTS
	Peak RF Output Power:	3.64dBm
	EUT Frequency Ranges:	2402MHz – 2480MHz
	Antenna Gain ¹ :	3.47 dBi
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: -20 to 50° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Bryan Taylor	
Report Date(s):	04/20/2026	

Figure 1. EUT List

¹ The antenna gain information was provided by Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda and may affect compliance.

B. References

2.4 GHz Band Wide-Band Low-Power Data Communication System (Item 19 of Article 2 Paragraph 1)	Radio equipment for low-power data communications system radio station using a radio wave of 2,400 – 2,483.5 MHz
ANSI C63.10:2013	Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI/ISO/IEC 17025:2000	General Requirements for the Competence of Testing and Calibration Laboratories

Table 2. References

C. Test Site

All testing was performed at Eurofins MET Labs, Inc., 13501 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site).

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
Occupied Bandwidth Measurements	±4.52 Hz	2	95%
Conducted Power Measurements	±2.74 dB	2	95%
Power Spectral Density Measurements	±2.74 dB	2	95%
Conducted Spurious Emissions	±2.80 dB	2	95%
Conducted Emissions (Mains)	±2.97 dB	2	95%
Radiated Spurious Emissions (9kHz – 1GHz)	±2.95 dB	2	95%
Radiated Spurious Emissions (1GHz - 40GHz)	±3.54 dB	2	95%

Table 3. Uncertainty Calculations Summary

E. Description of Test Sample

The HID Amico Facial Recognition Reader, is an access control reader employing facial recognition technology, as well as RFID and Bluetooth technologies.

The VL70LF has an LF, HF and a BLE radio on board enables the use of traditional RFID access control as well as mobile access through cell phone BLE and the HID Mobile Access App.

The VL70LF allows a user that is enrolled to access a door through the means of facial recognition (by looking into the cameras on the screen) or presenting an RFID credential, in the form of a fob, card or mobile device.

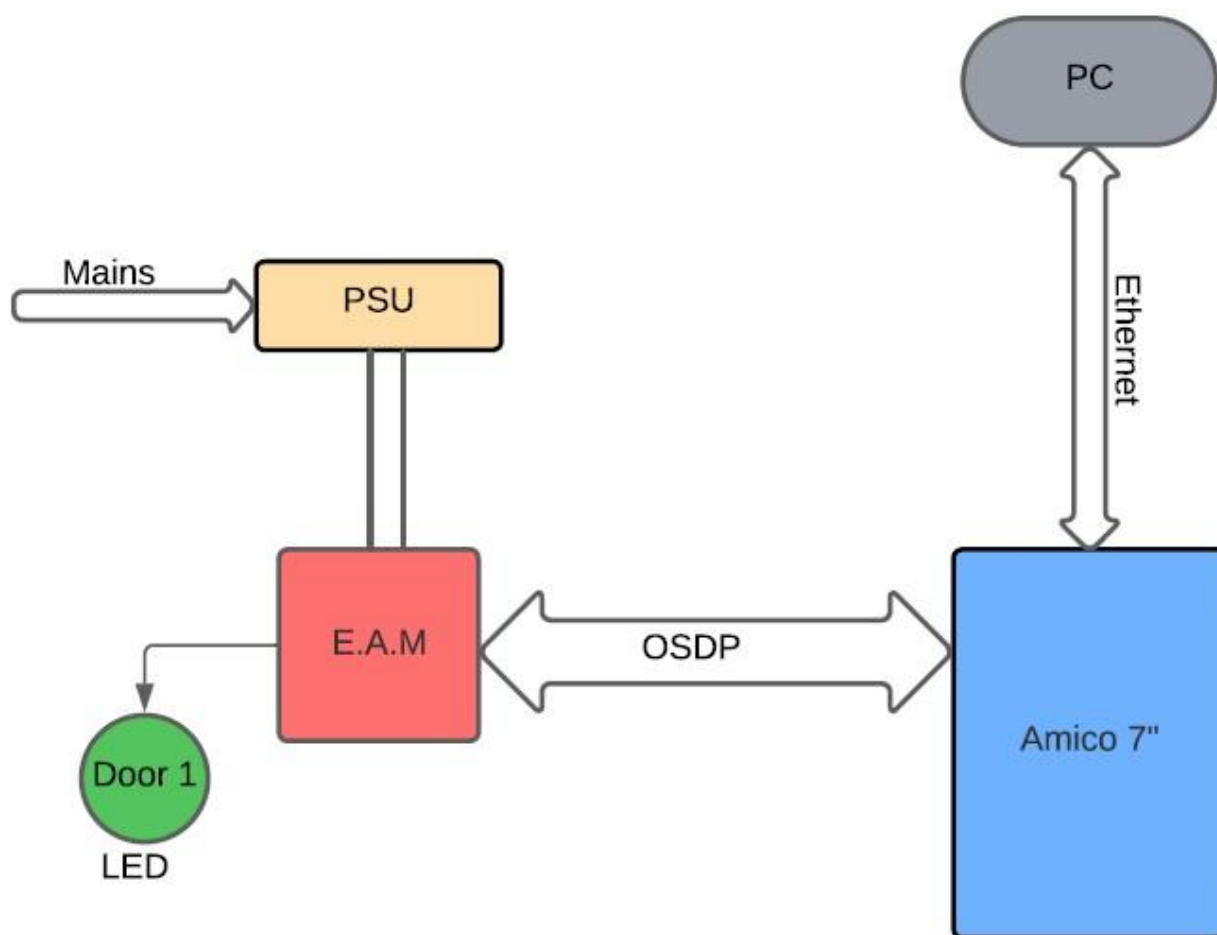


Figure 2. Block Diagram of Test Configuration

Antenna Type	Brand	Model	Peak Gain	Frequency Range	Connector
Wire Wound Coil	HID Global Corporation	LF (125kHz) Antenna	Unknown	125kHz	----
PCB Loop Antenna	HID Global Corporation	HF(13.56MHz) Antenna	Unknown	13.56MHz	----
Meandering Monopole	Jing Lai Electronics	SL910	3.47dBi	2.4GHz	IPEX-1

Table 4. Antenna Information

F. Equipment Configuration

A laptop was connected to the test sample and software commands were used to force the BLE radio to transmit on low, mid, or high channels and at 1Mbps or 2Mbps

G. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Name/Description	Manufacturer	Model Number	Serial Number	*Customer Supplied Calibration Data
Smart Phone	Motorola	Moto E7	ZF523HTNWX	N/A
Smart Phone	Samsung	Galaxy A03	R9XT501Z14J	N/A
Laptop	Asus	M509D	L5N0B6017297222	N/A
Power Supply	XP Power	VEC65US12	N/A	N/A

Figure 3. Support Equipment

H. Ports and Cabling Information

Name/Description	Manufacturer	Model Number	Serial Number	*Customer Supplied Calibration Data
Smart Phone	Motorola	Moto E7	ZF523HTNWX	N/A
Smart Phone	Samsung	Galaxy A03	R9XT501Z14J	N/A
Laptop	Asus	M509D	L5N0B6017297222	N/A

Figure 4. Ports and Cabling Information

A. Mode of Operation

A laptop was connected to the test sample and software commands were used to force the BLE radio to transmit on low, mid, or high channels and at 1Mbps or 2Mbps.

Transmit Band	Modulation	Channel Frequencies Tested	Test Tool Name	Test Tool Power Setting ²
2400 – 2483.5MHz	BLE (GFSK)	2402MHz / 2440MHz / 2480MHz	STM32CubeMonitor-RF Version 2.12.0	6

Figure 5. Test Channels Utilized

B. Method of Monitoring EUT Operation

A spectrum analyzer was used to confirm proper transmitter operation.

C. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

D. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Controlid Industria e Comercio de Hardware e Servicos De Tecnologia Ltda upon completion of testing.

² Note the power settings are relative levels and do not necessarily correspond to the actual measured output power.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

Frequency Error

Test Conditions:

- (1) Frequency counter may be replaced by spectrum analyzer's counter function.
- (2) Accuracy of frequency counter shall be more than 10 times as accurate as the specified limit.
- (3) Deduction of the attenuator shall be enough to sense at the input of the frequency counter for preventing missing carrier due to amplitude fluctuation of EUT.
- (4) Where EUT is not available to transmit carrier wave but only burst signal, pulse measurement function with gate-time which is more than the burst time shall be used. Other practical, reasonable method may also be used.

Operational Condition of the Equipment Under Test:

- (1) Set tested transmitting channel
- (2) Operation mode shall be un-modulated (CW), continuous. If impossible, operation mode shall adjust as a characteristic frequency spectrum can be identified, repeatable. (i.e. one of harmonics, sub-carrier)

Test Method:

- (1) Where un-modulated carrier can be made, frequency counter shall directly be used to measure the frequency error of EUT.
- (2) Where burst signal only be made, gate time of frequency counter shall be enough to keep adequate accuracy of the measurement; calculate the average value.
- (3) Where some characteristic spectrums are repeatable, frequency counter function of spectrum analyzer may be used.

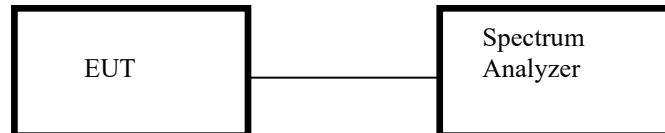


Figure 6. Frequency Error Test Configuration

Test Limit: Tolerance of frequency ($\times 10^{-6}$): ± 50 ppm

Test Engineer(s): Bryan Taylor

Test Date(s): 8/3/2025

Results: The EUT was compliant with the requirements of this section. The frequency error was less than the 50ppm limit. Testing was performed at nominal voltage as well as $\pm 10\%$ nominal voltage.

Voltage	Target Frequency (MHz)	Measured Frequency (MHz)	Frequency Deviation (MHz)	Limit (ppm)	Δ (ppm)
Vnom	2402	2402.05	0.05	50	24.97918
	2440	2440.03	0.03	50	8.196721
	2480	2480.03	0.03	50	12.09677
Vlow	2402	2402.04	0.04	50	20.81599
	2440	2440.05	0.05	50	20.4918
	2480	2480.06	0.06	50	28.22581
Vhigh	2402	2402.06	0.06	50	24.97918
	2440	2440.02	0.02	50	16.39344
	2480	2480.04	0.04	50	12.09677

Table 5. Frequency Error, Test Results (Power Supply)

Voltage	Target Frequency (MHz)	Measured Frequency (MHz)	Frequency Deviation (MHz)	Limit (ppm)	Δ (ppm)
Vnom	2402	2402.05	0.05	50	24.97918
	2440	2440.05	0.05	50	8.196721
	2480	2480.04	0.04	50	12.09677
Vlow	2402	2402.07	0.07	50	20.81599
	2440	2440.06	0.06	50	20.4918
	2480	2480.04	0.04	50	28.22581
Vhigh	2402	2402.05	0.05	50	24.97918
	2440	2440.04	0.04	50	16.39344
	2480	2480.05	0.05	50	12.09677

Table 6. Frequency Error, Test Results (PoE)

Electromagnetic Compatibility Criteria for Intentional Radiators

Occupied Bandwidth and Spread Spectrum Bandwidth

Test Condition:

- (1) Set the spectrum analyzer as follows:
 - Center frequency: Operational frequency;
 - Span: 2 to 3.5 times of the specified limit;
 - RBW: Less than 3% of the specified limit;
 - VBW: Equivalent to RBW;
 - Sweep time: Minimum time keeping measurement accuracy (In the case of burst waves, the time at which one burst or more is included per sample);
 - Quantity of sampling: More than 400 points;
 - Sweep mode: Continuous sweep;
 - Detecting mode: Max hold.
- (2) For OFDM (non-burst wave) the spectrum analyzer settings are updated as follows:
 - Average processing times: 10 or more;
 - Detecting mode: Sample.

Operational Condition of the Equipment Under Test:

One low, middle, and high channel were selected to perform this test. Where EUT transmits burst signal with OFDM technique, modulation shall be made as spreading spectrum width and sub-carriers are maximum as possible.

Test Method:

- (1) Spectrum analyzer shall be set up as (1) from the Test Condition above.
- (2) The sweep shall be repeated until there are no changes in the spectrum.
- (3) Convert the dB value into watts.
- (4) Amount of all measured data in Watts shall be recorded as “total power”.
- (5) From the lowest frequency, sum the stored data one by one until the summed amount is 0.5% (5% for FHSS transmitter) of “total power” and the frequency related to the data getting to 0.5% shall be recorded as “the lowest frequency.”
- (6) From the highest frequency, sum the stored data one by one until the summed amount is 0.5% (5% for FHSS transmitter) of “total power” and the frequency related to the data getting to 0.5% shall be recorded as “the highest frequency.”
- (7) Where spectrum analyzer has a function to automatically calculate the lowest and highest frequencies as above, it may be used instead.



Figure 7. Occupied Bandwidth and Spread Spectrum Bandwidth Test Configuration

Test Limit: Tolerance of occupied bandwidth:

FHSS: 83.5 MHz
FHSS + DSSS: 83.5 MHz
FHSS + OFDM: 83.5 MHz
OFDM: 38 MHz
DSSS: 26 MHz
Others: 26 MHz

Test Engineer(s): Bryan Taylor

Test Date(s): 8/3/2025

Test Results: The EUT was compliant with the requirements of this section.

Data Rate	Channel	Frequency (MHz)	99% Bandwidth (MHz)	Result
1Mbps	Low	2402	1.034	Pass
	Middle	2440	1.032	Pass
	High	2480	1.032	Pass
2Mbps	Low	2402	2.026	Pass
	Middle	2440	2.028	Pass
	High	2480	2.023	Pass

Table 7. Occupied Bandwidth, Test Results (Power Supply)

Data Rate	Channel	Frequency (MHz)	99% Bandwidth (MHz)	Result
1Mbps	Low	2402	1.027	Pass
	Middle	2440	1.027	Pass
	High	2480	1.033	Pass
2Mbps	Low	2402	2.024	Pass
	Middle	2440	2.032	Pass
	High	2480	2.010	Pass

Table 8. Occupied Bandwidth, Test Results (PoE)

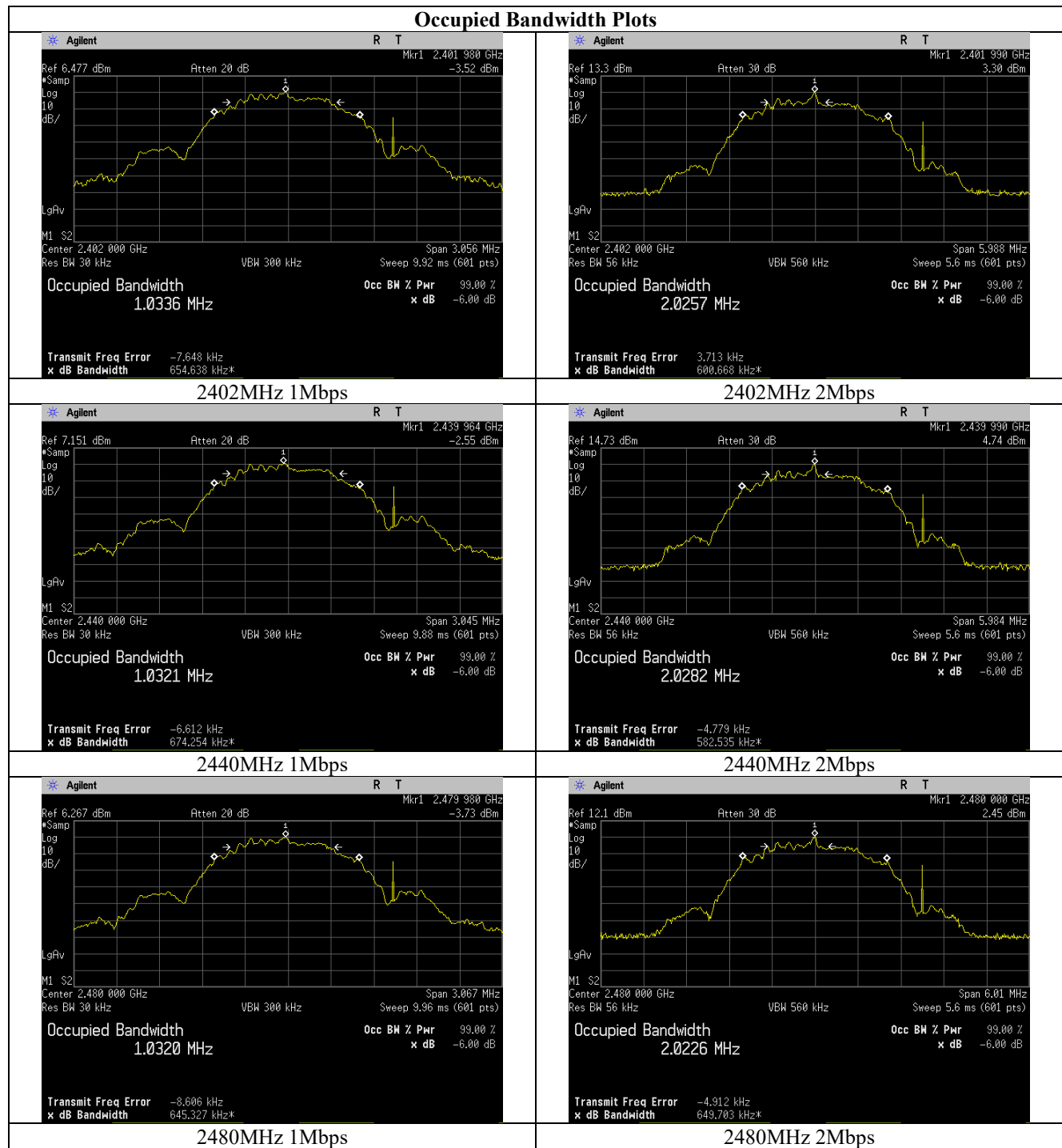


Figure 8. Occupied Bandwidth (Power Supply)

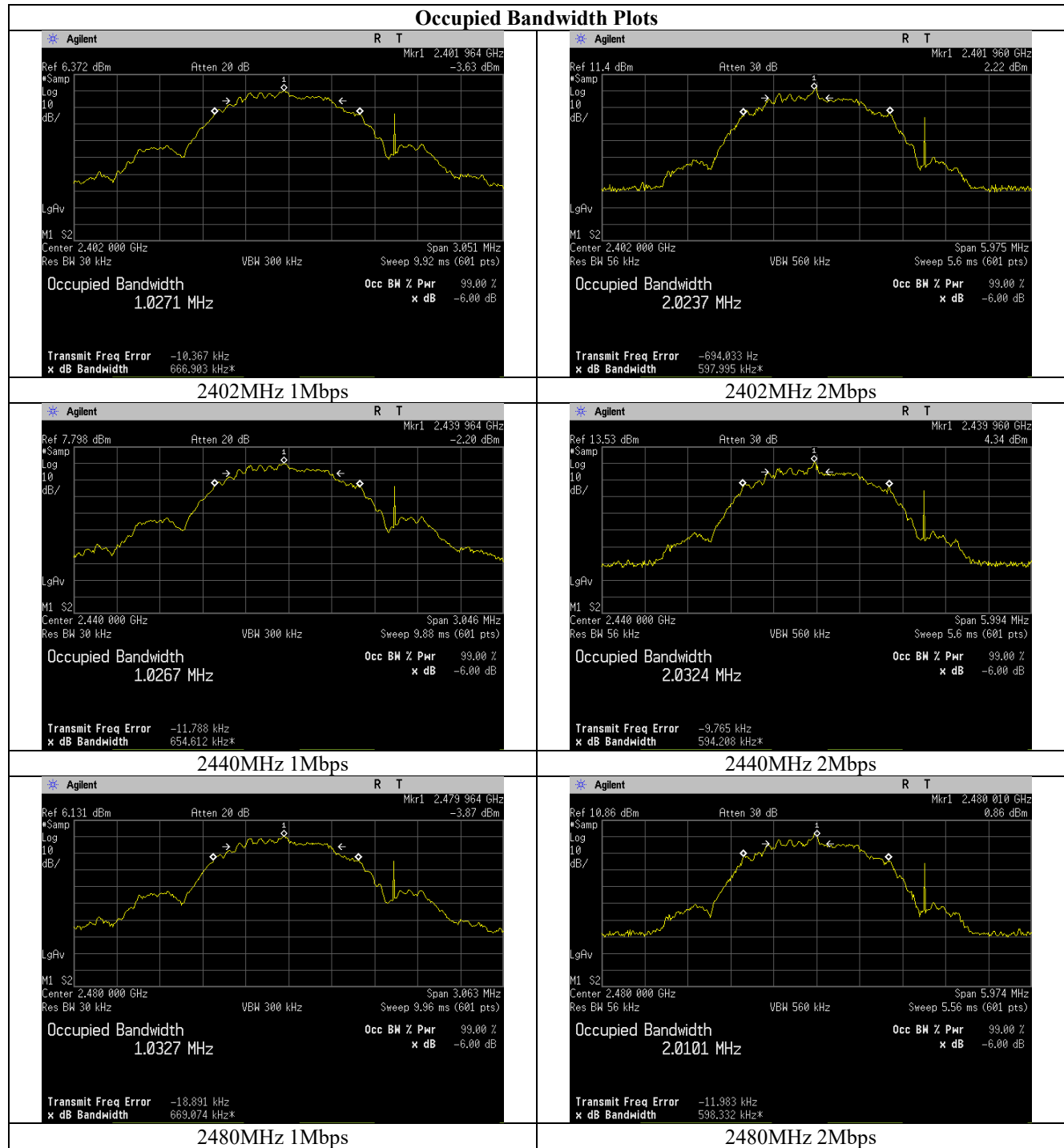


Figure 9. Occupied Bandwidth (PoE)

Electromagnetic Compatibility Criteria for Intentional Radiators

Spurious Emissions

Test Condition:

- (1) Searching spurious emissions, the spectrum analyzer shall setup as following;
 - Frequency range: Searching spurious emissions shall be done from 30 MHz to 5 times of fundamental frequency (i.e. 30 MHz – 12.5 GHz)
 - RBW: 1MHz;
 - VBW: Equivalent to RBW;
 - Scale of Y axis: 10dB/Div;
 - Input level: Maximum dynamic range;
 - Sweep time: Least time keeping measurement accuracy;
 - Quantity of sampling: More than 400 points;
 - Sweep mode: Single sweep (*);
 - Detecting mode: Positive peak hold;
 - * Where EUT employs DSSS technique and is burst transmitter, shortening measurement work any sweep time may be applied as long as the time is longer than one is conducted from the following formula; Least sweep time = $[\text{Span (MHz)} / \text{RBW (MHz)}] \times \text{Burst cycle(s)}$ due to cut the sweep time. However, detected signal may appear lower than real value by maximum 3dB and this possibility shall be taken into account.
- (2) Determining the level of the detected spurious emission the following settings of the spectrum analyzer shall be used;
 - Center frequency: A frequency of detected spurious emissions;
 - Span: 0Hz;
 - RBW: 1MHz;
 - VBW: Equivalent to RBW;
 - Scale of Y axis: 10dB / Div;
 - Input level: Around maximum dynamic range area where input mixer can keep its linear character;
 - Sweep time: Minimum time keeping measurement accuracy (In the case of burst waves, the time at which one burst or more is included per sample);
 - Quantity of sampling: More than 400 points;
 - Sweep mode: Single sweep;
 - Detecting mode: Sampling;

Operational Condition of the Equipment Under Test:

One low, middle, and high channel were selected to perform this test.

Test Method:

(1) Spectrum analyzer shall be set up as Test Condition Section (1) and significant spurious emissions shall be searched. If the level of the searched spurious emission is lower than the specified limit (Where *1 of 5.2 is applied, 3dB lower than the limit shall be referred.), the level shall be recorded as a final result.
 (2) If the level of the searched spurious emission is greater than the specified limit, RBW shall change like 100MHz, 10MHz, 1MHz and more narrow until determining the precise frequency. Determine the level of the detected spurious emission using the setting in Test Condition Section (2). Average value based on the sampled data shall be a final result. (Where burst signal is measured, averaging shall be applied to on-time of the burst signal.)



Figure 10. Spurious Emissions Test Configuration

Test Limit: Tolerance of unwanted emission density:

<u>Frequency Range</u>	<u>Limit (uW/MHz)</u>	<u>Limit (dBm/MHz)</u>
(1) 30 – 2387 MHz:	2.5 μ W/MHz	-26dBm/MHz
(2) 2387 – 2400 MHz:	25 μ W/MHz	-16dBm/MHz
(3) 2483.5 – 2496.5 MHz:	25 μ W/MHz	-16dBm/MHz
(4) 2496.5 MHz – 12.5 GHz:	2.5 μ W/MHz	-26dBm/MHz

Test Engineer(s): Bryan Taylor

Test Date(s): 8/4/2025

Test Results The EUT was compliant with the requirements of this section.

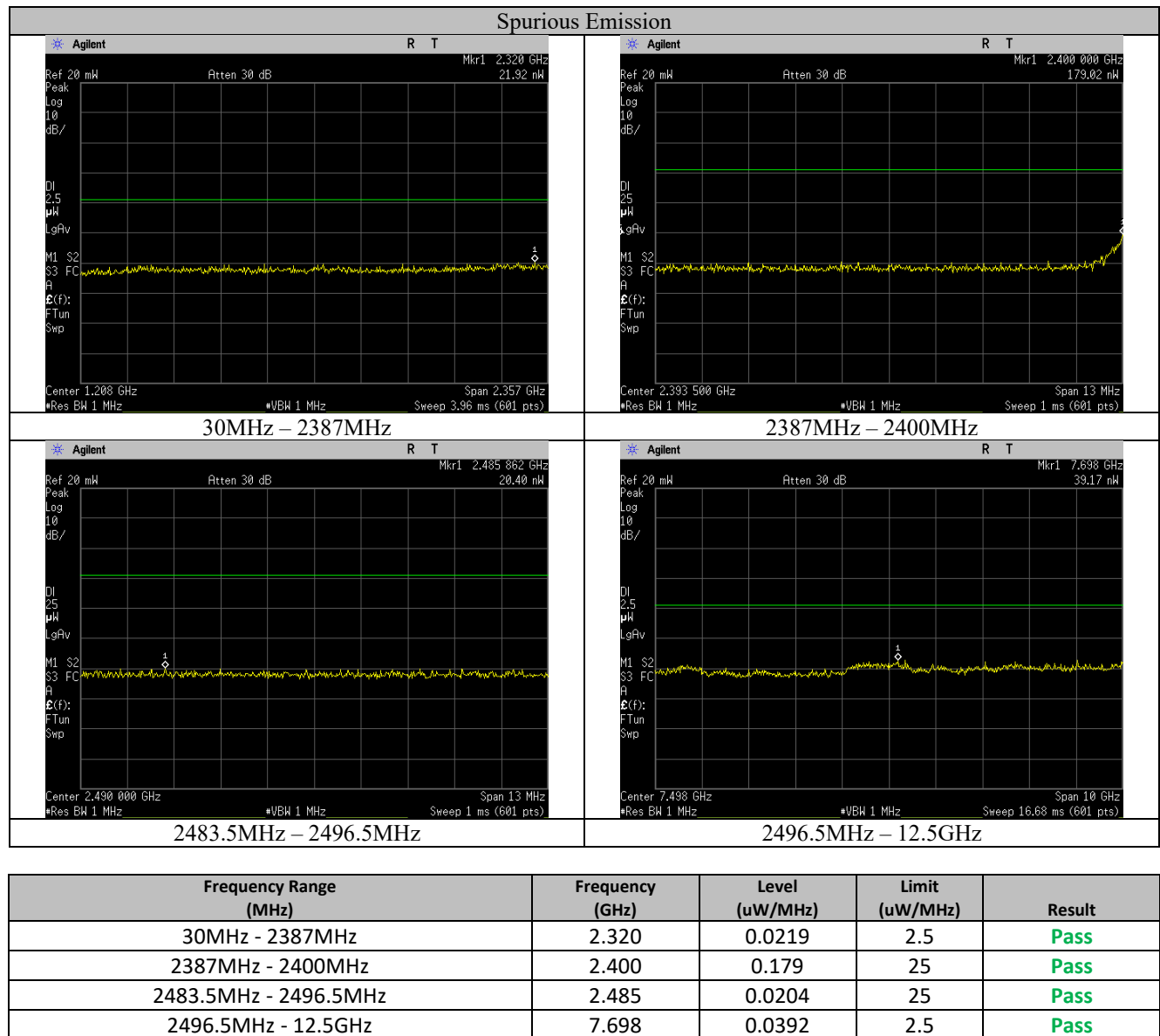


Figure 11. Spurious Emissions, Low Channel, 1MBps

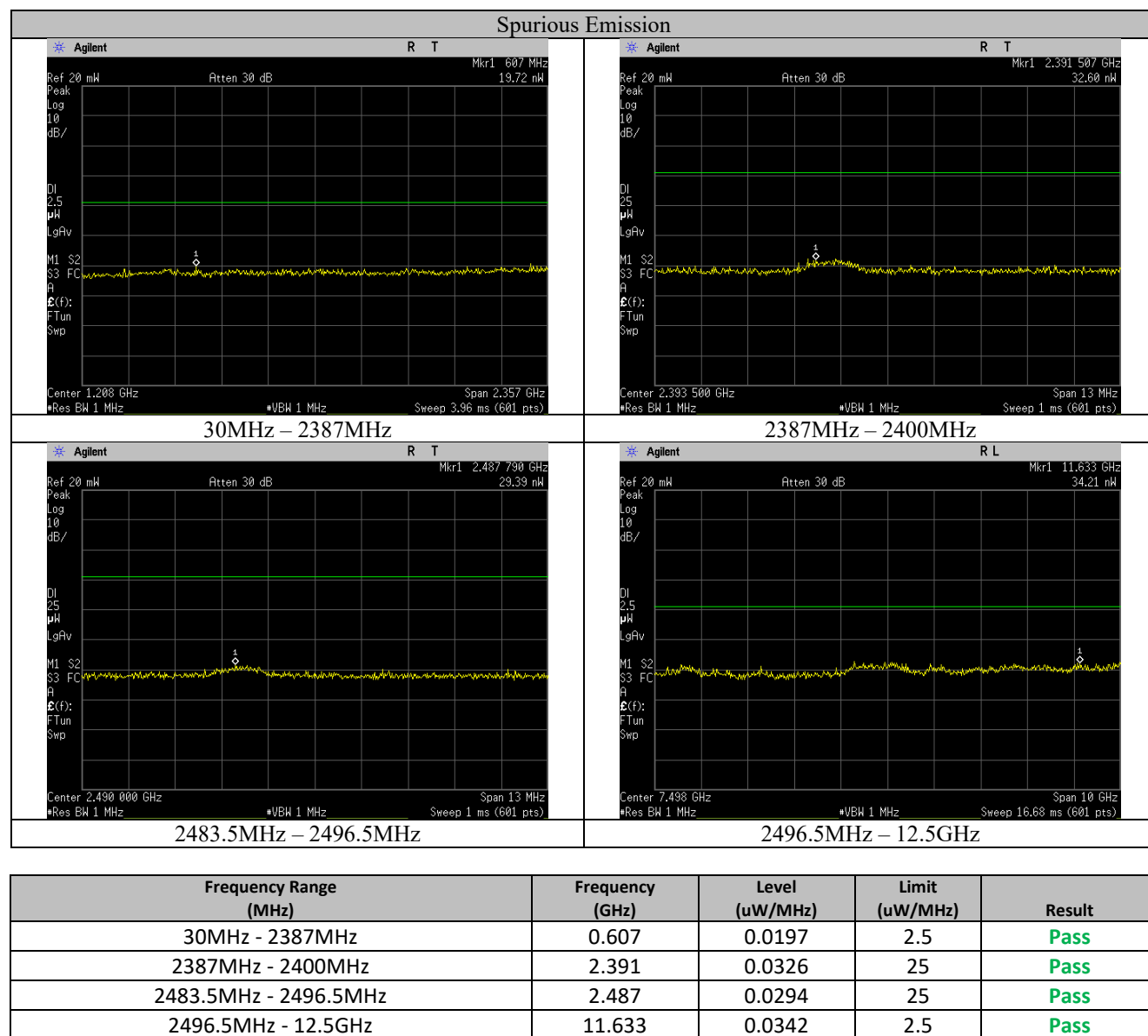


Figure 12. Spurious Emissions, Mid Channel, 1MBps

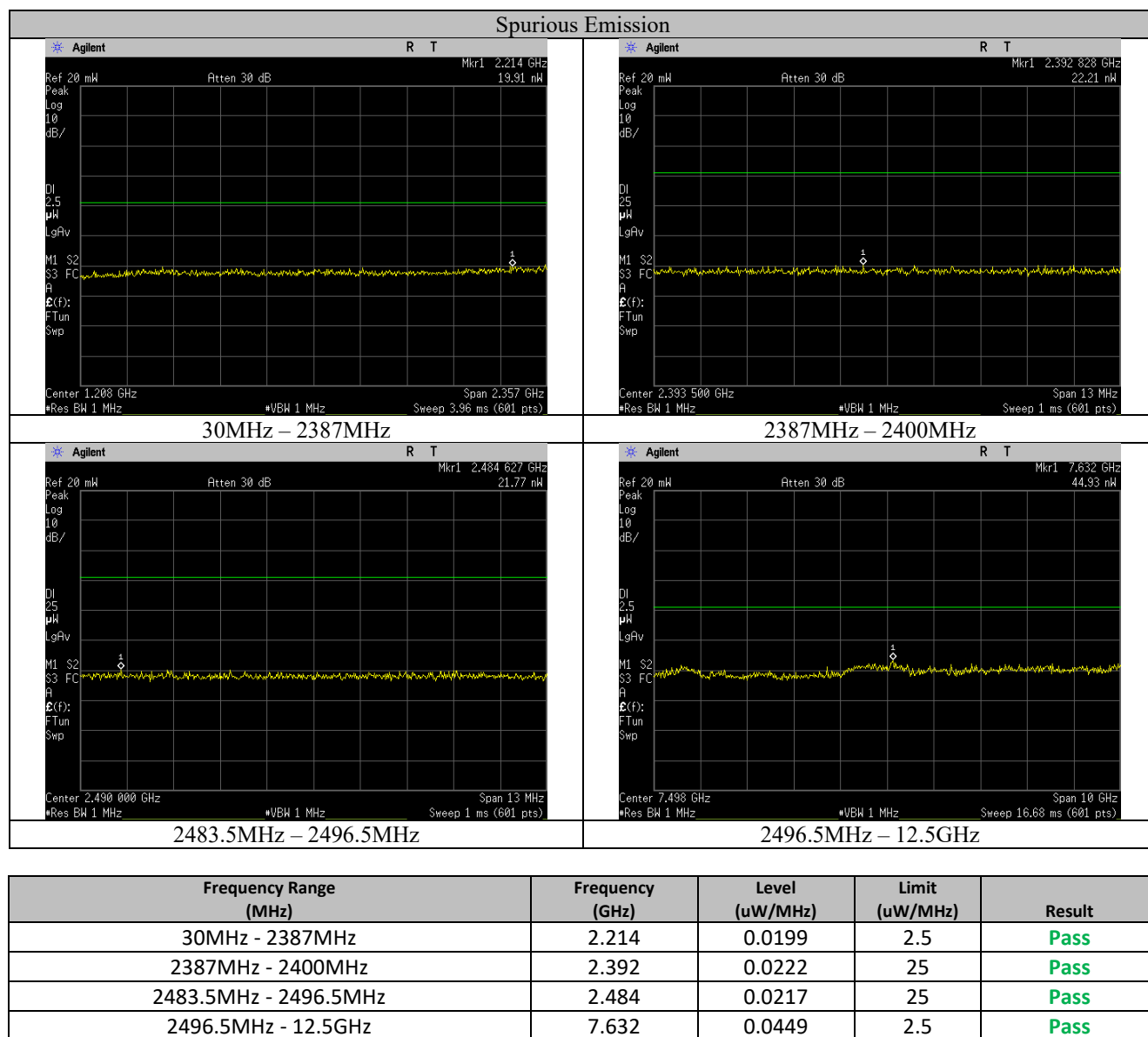


Figure 13. Spurious Emissions, High Channel, 1MBps

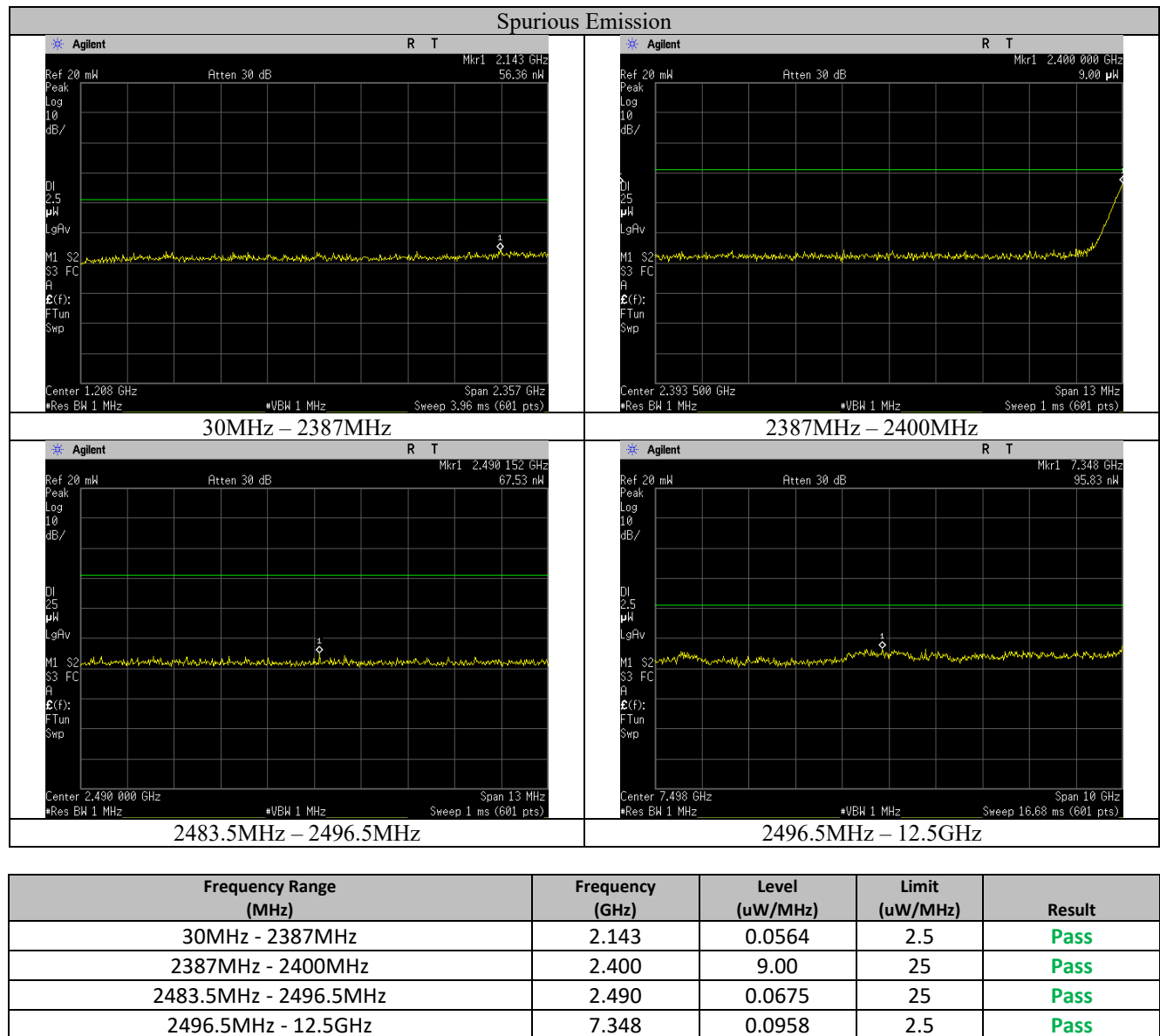


Figure 14. Spurious Emissions, Low Channel, 2Mbps

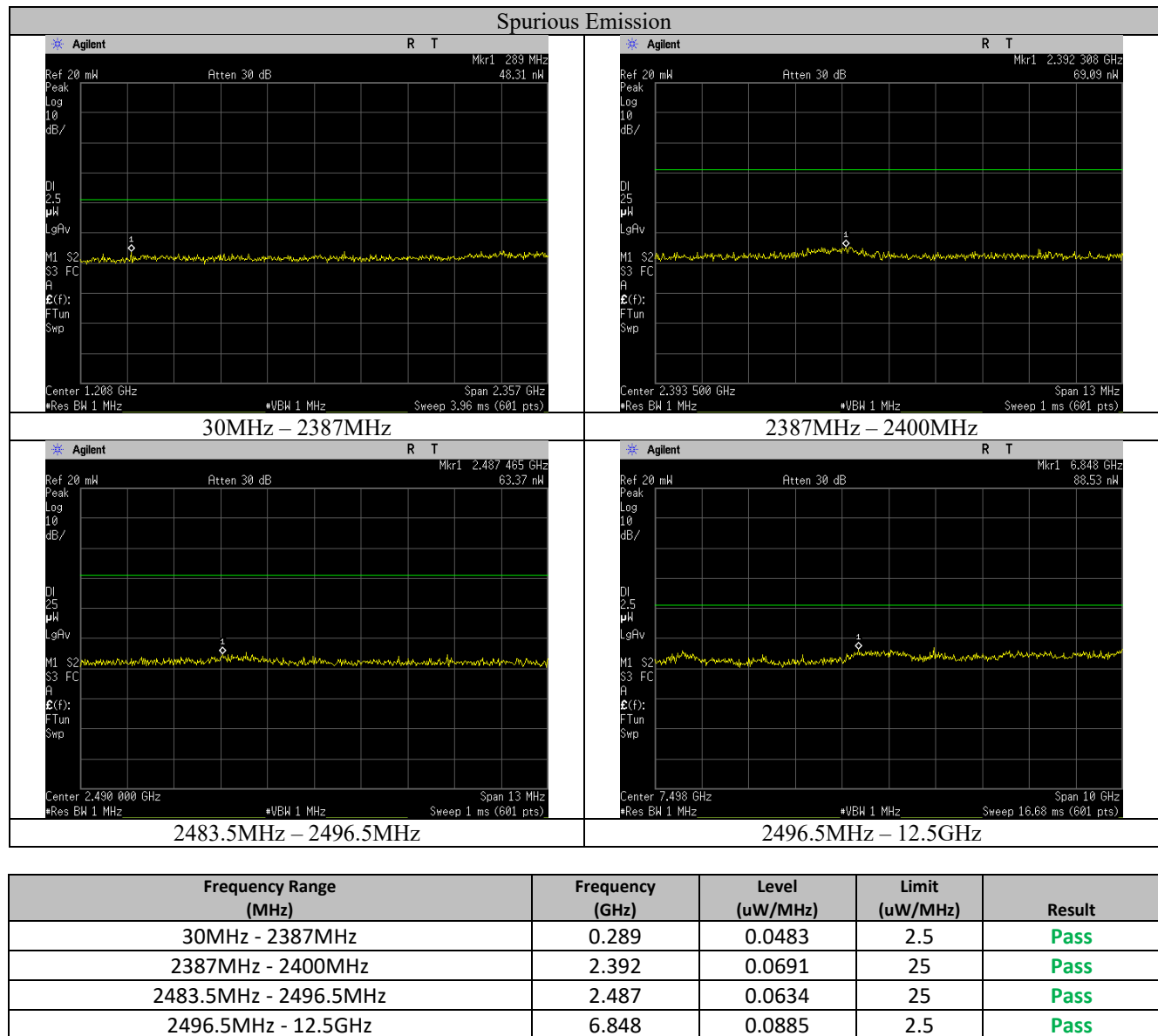


Figure 15. Spurious Emissions, Mid Channel, 2MBps

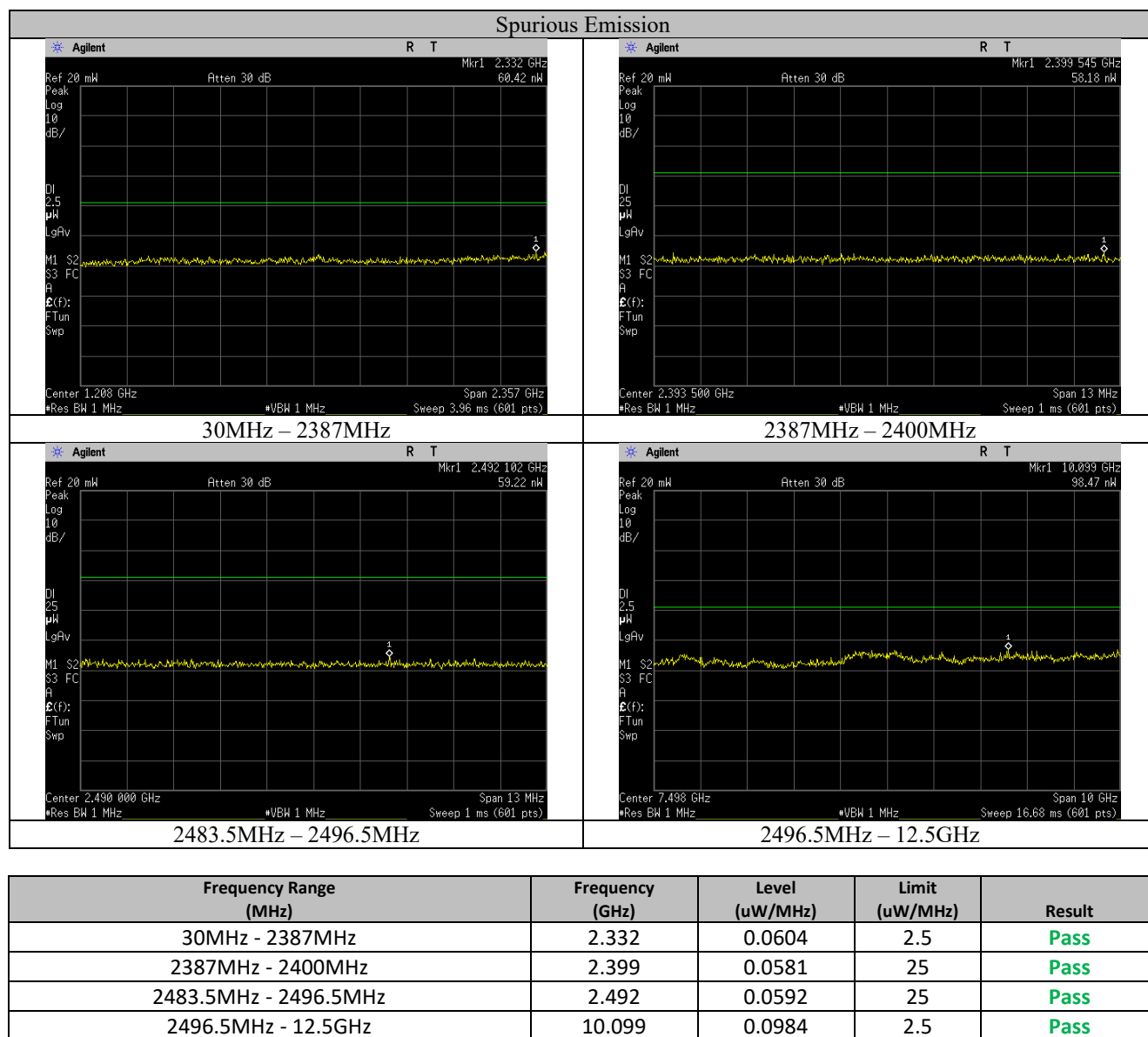


Figure 16. Spurious Emissions, High Channel, 2MBps

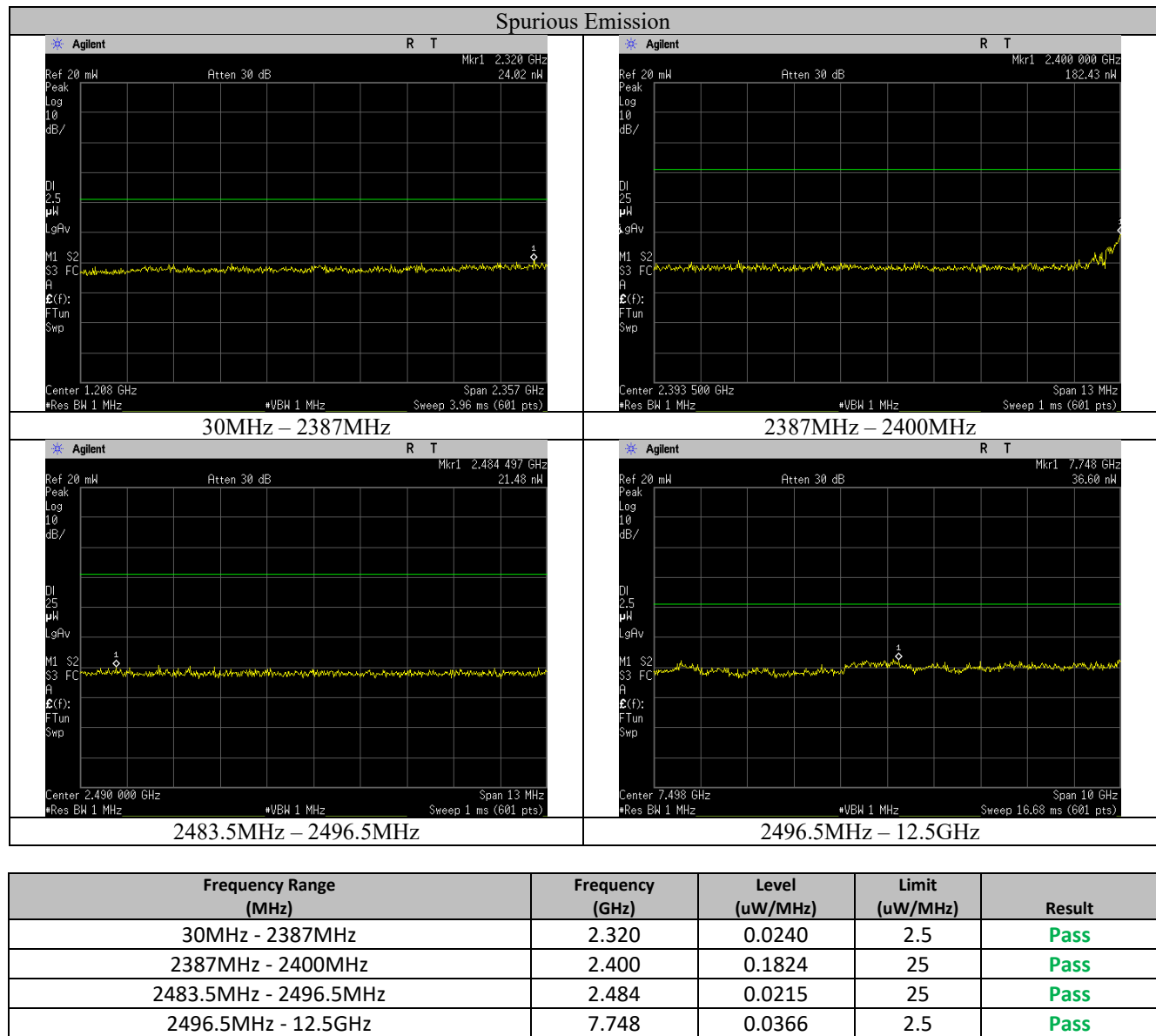


Figure 17. Spurious Emissions, Low Channel, 1MBps (PoE)

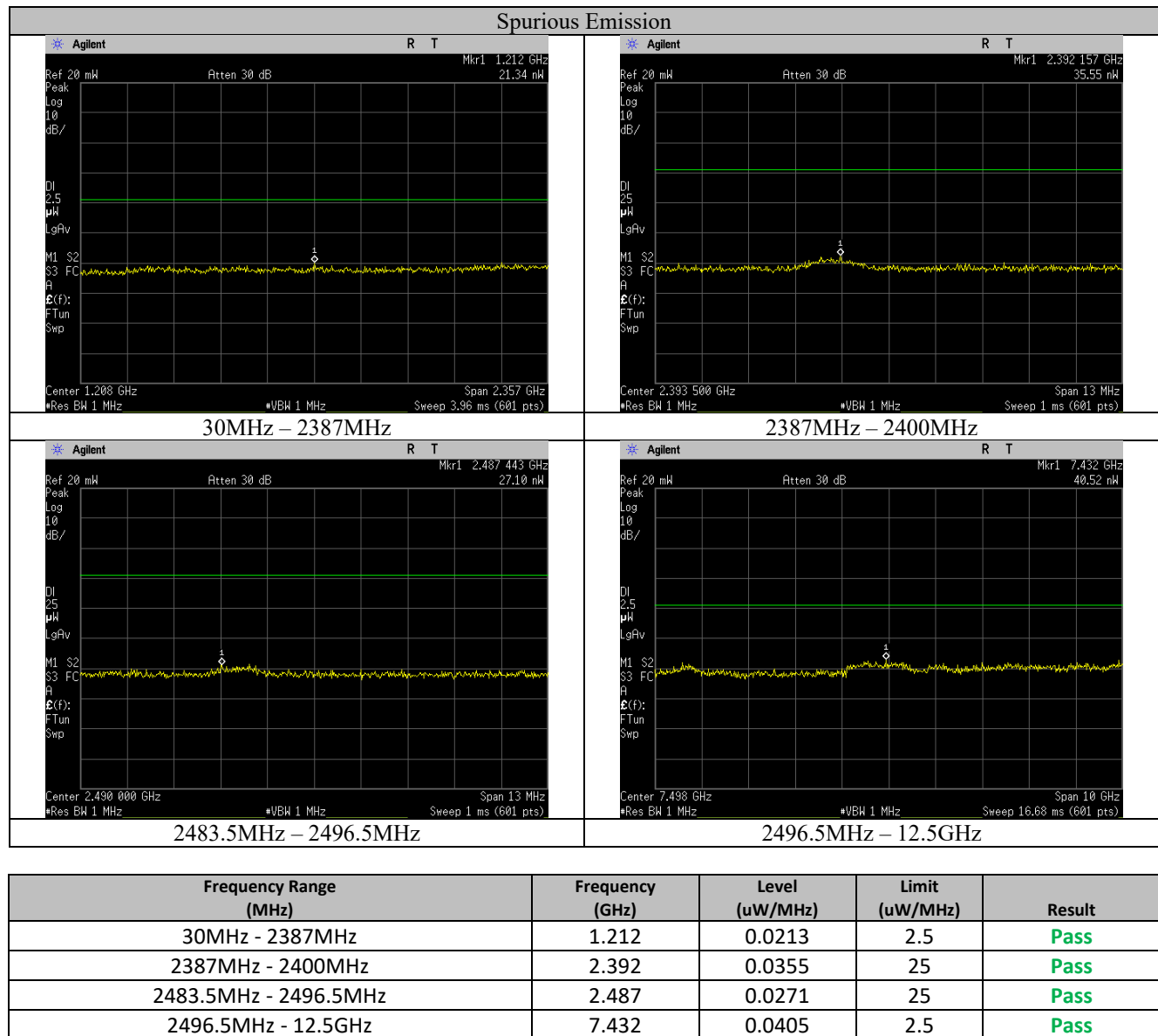


Figure 18. Spurious Emissions, Mid Channel, 1MBps (PoE)

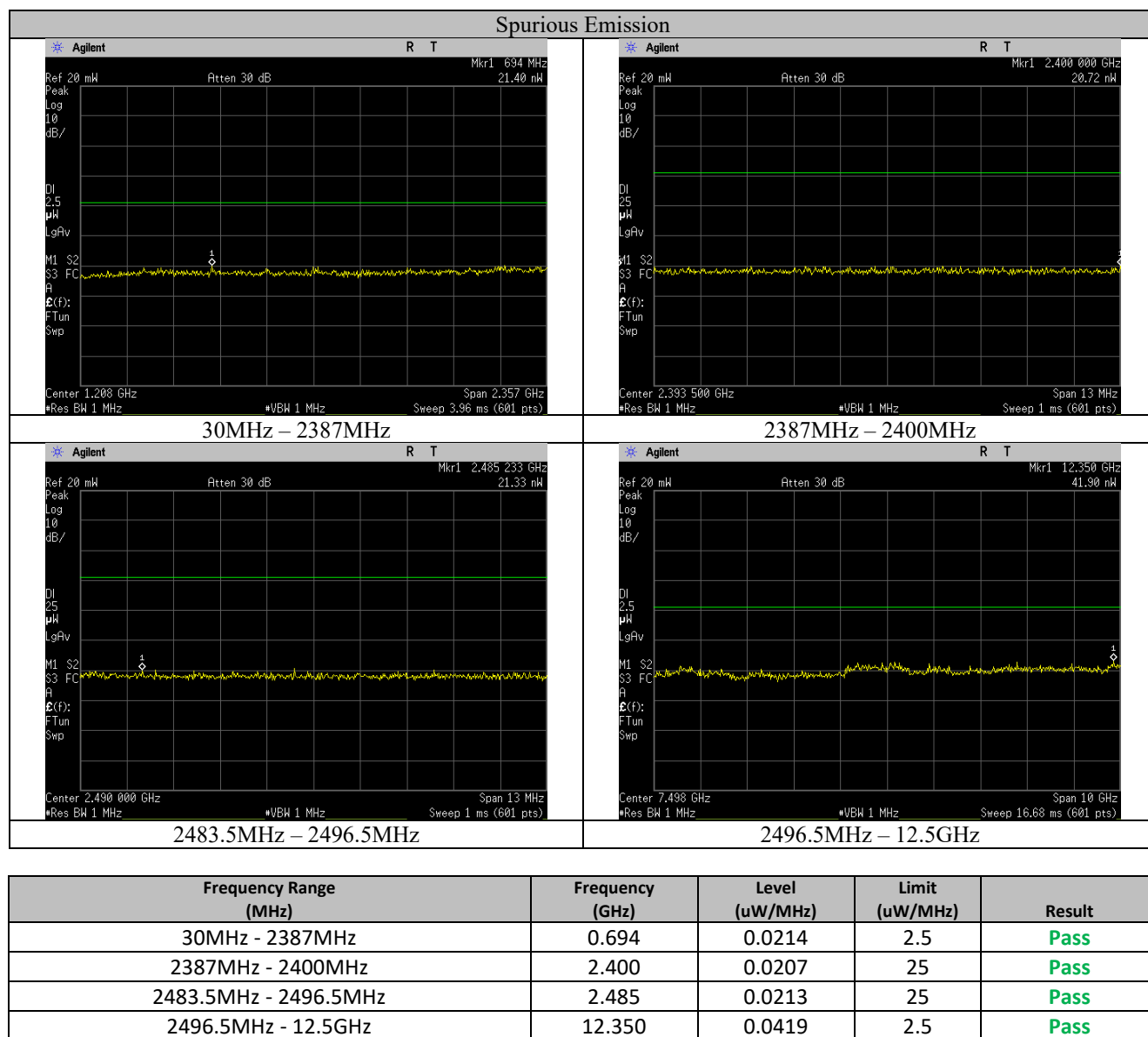


Figure 19. Spurious Emissions, High Channel, 1MBps (PoE)

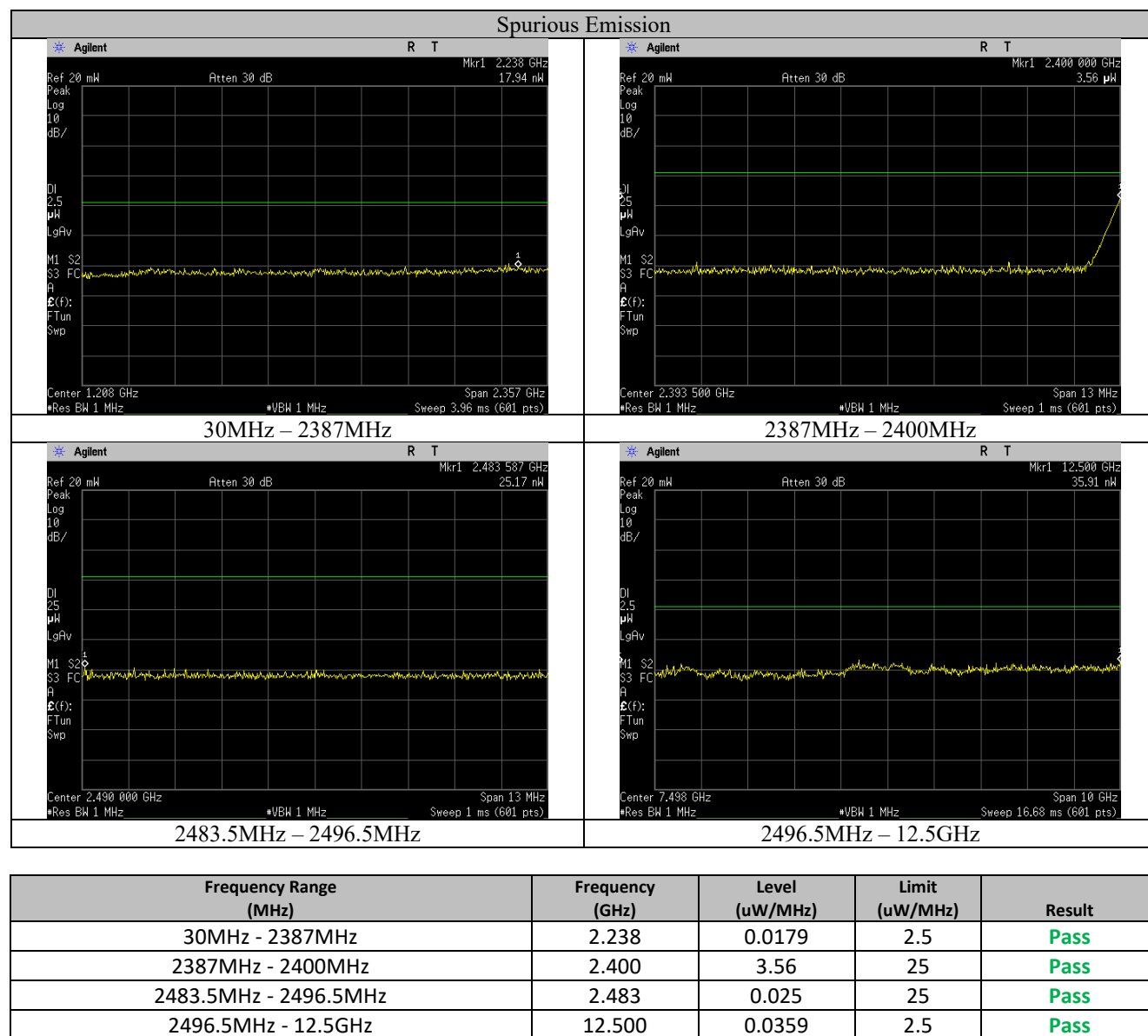


Figure 20. Spurious Emissions, Low Channel, 2MBps (PoE)

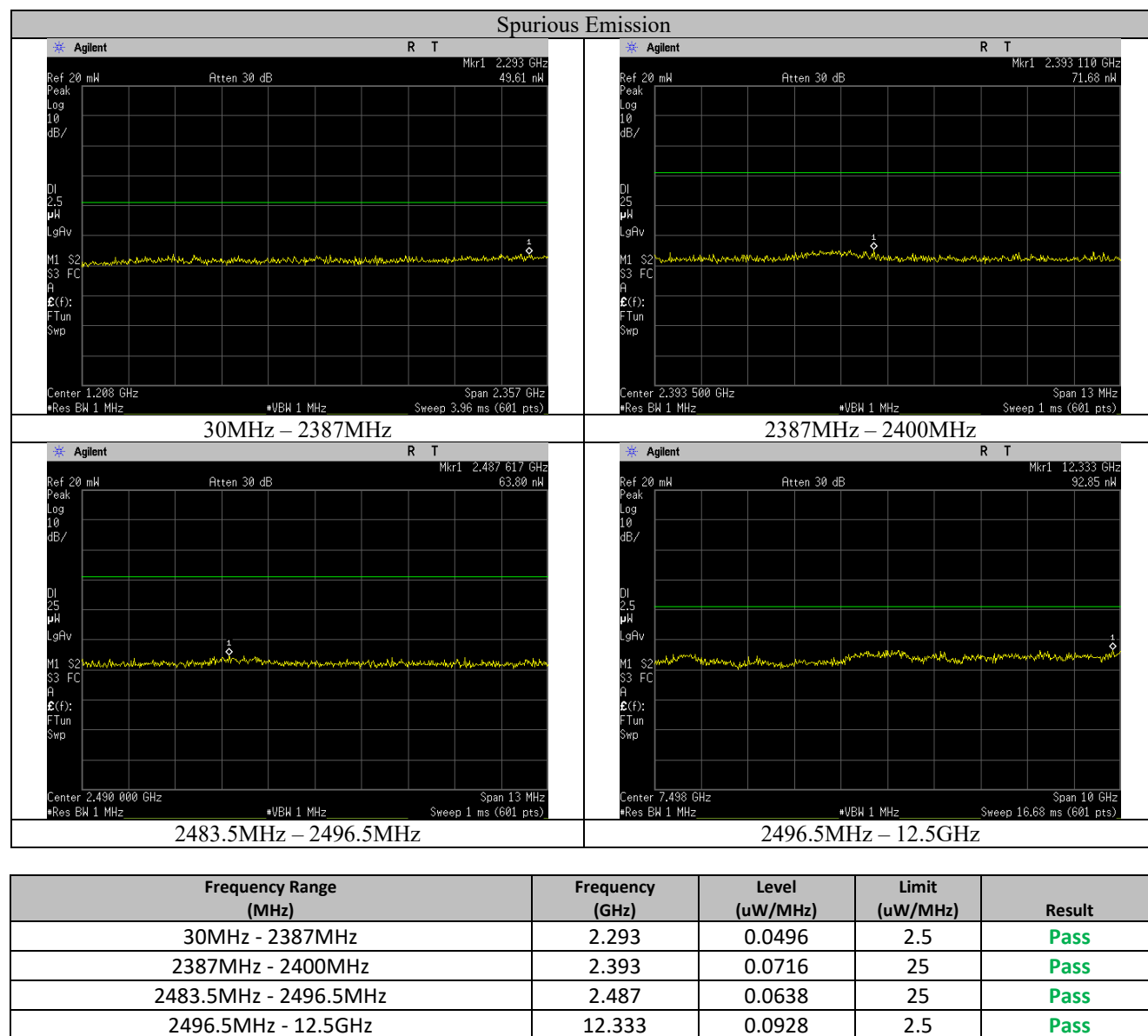


Figure 21. Spurious Emissions, Mid Channel, 2MBps (PoE)

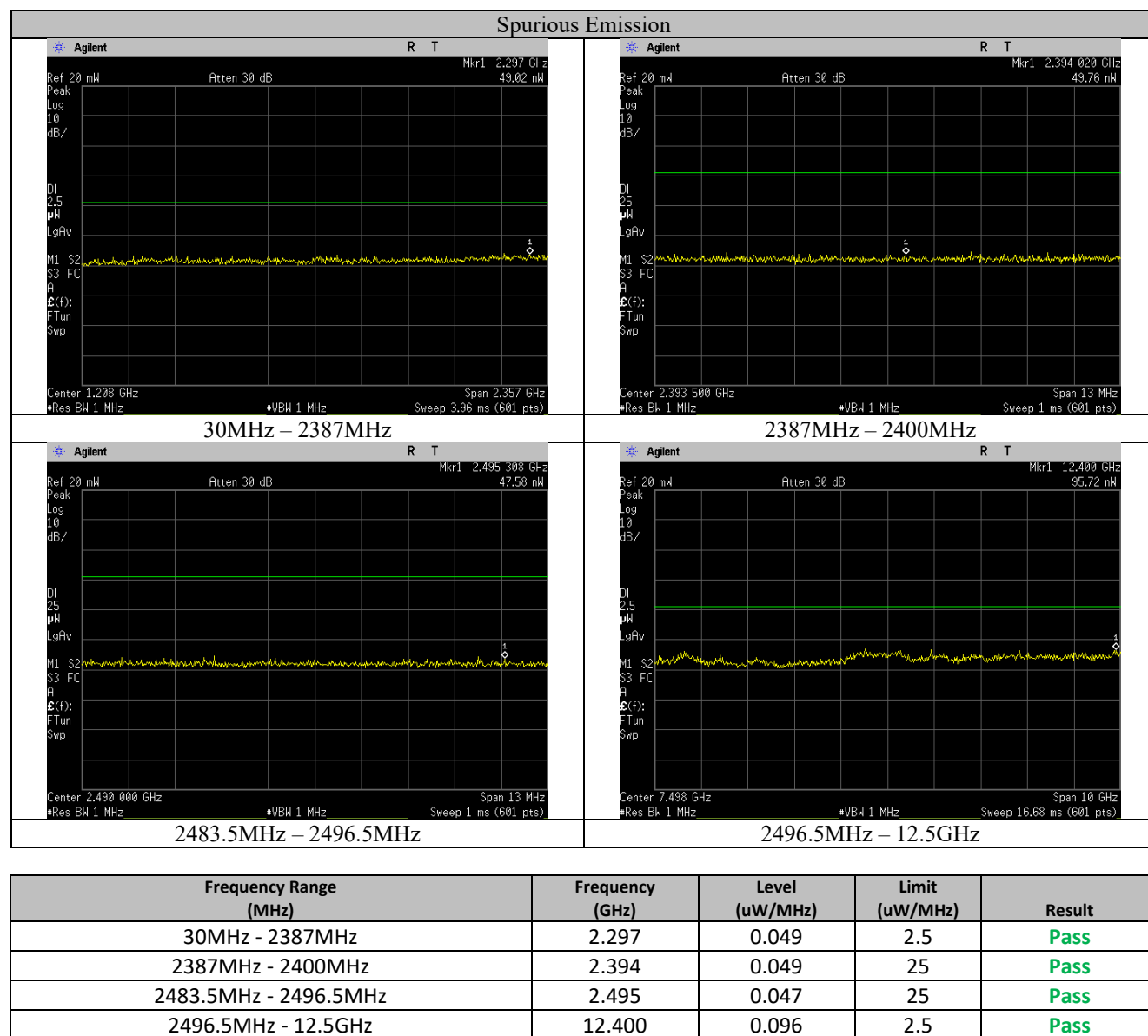


Figure 22. Spurious Emissions, High Channel, 2MBps (PoE)

Electromagnetic Compatibility Criteria for Intentional Radiators

Antenna Power, Tolerance, and EIRP

Test Condition:

- (1) Considering Equivalent Noise Bandwidth of IF filter of the spectrum analyzer, a specified correction factor provided by the manufacturer of the spectrum analyzer shall be added to the reading value. However, where spread spectrum bandwidth is lower than 1MHz, the factor shall be applied if only "Spread Spectrum Bandwidth (MHz) / Equivalent Noise Bandwidth (MHz)" is larger than 1.
- (2) Value of the attenuator shall be suitable to input dynamic range of the spectrum analyzer.
- (3) Searching maximum powered frequency, the spectrum analyzer shall setup as following;
 - Center frequency: Operational frequency specified by the applicant;
 - Frequency range: About 2 times as large as the occupied bandwidth measured
 - RBW: 1MHz;
 - VBW: About 3 times the RBW;
 - Sweep time: Minimum time keeping measurement accuracy (In the case of burst waves, the time at which one burst or more is included per sample);
 - Trigger: Free run;
 - Quantity of sampling: More than 400 points;
 - Sweep mode: Continuous sweep;
 - Detecting mode: Positive peak;
 - Trace mode: Max hold.
- (4) Determining the level of the detected spurious emission the following settings of the spectrum analyzer shall be used;
 - Center frequency: A frequency of detected maximum power (searched frequency)
 - Span: 0Hz;
 - RBW: 1MHz;
 - VBW: Equivalent to RBW;
 - Sweep mode: Continuous

Operational Condition of the Equipment Under Test:

- (1) Set the test frequency and set the continuous transmission state or continuous burst transmission state.
- (2) Those using spreading codes are set to test spreading codes and modulated by standard encoded test signals.
- (3) For OFDM, the burst transmission state is set and the number of subcarriers is the maximum. The modulation state is set such that the proportion of the time of the state with the smallest state is maximized. However, if the unit cannot be set with continuous burst transmission state or continuous, it can be done in the subsequent transmission state.

Test Method:

- (1) FHSS type (including combination with DSSS or OFDM);
 - A. If the frequency hopping interval in the frequency distribution of frequency hopping is equidistant at 1 MHz or less and the appearance probability at each hopping frequency is uniform and the occurrence probability at each hopping frequency is uniform, it is carried out by the following method:
 - Connect the power meter directly to the output attenuator (not the IF output of the spectrum analyzer) and measure the total power.
 - Divide the total power by the spread spectrum bandwidth and find an average power per 1 MHz.
 - The antenna power shall be as follows:
 - Value with continuous wave
 - Burst wave value and value calculated from the average power in the burst from the transmission time rate
 - B. From references submitted by the applicant rate of distribution of the hopping frequency shall be confirmed if it is uniform with flat channel separation less than 1MHz and rate of hopping emergence at each frequency is also uniform. If the rate of distribution is not uniform, set the spectrum analyzer as in Test Condition (4). Measure the antenna power.
- (2) OFDM or DSSS type;
 - The spectrum analyzer shall be setup as Test Condition (3).
 - Sweeping shall be repeated until spectrum appearance does not change. Then the frequency having maximum power per 1MHz shall be measured.
 - The spectrum analyzer shall be setup as Test Condition (4).
 - The power meter shall be connected to IF output of the spectrum analyzer.
 - The final value shall be determined as following;
 - Continuous signal: The reading of the power meter corrected by the specified factor defined in Test Condition (1)
 - Burst signal: The reading of the power meter corrected by the specified factor defined in Test Condition (1) and an average power of the burst term shall be calculated by the total power and the rate of transmitting time (Duty cycle).
 - Where transmitter employing OFDM technique and having one more modulation techniques of sub-carrier, the antenna power shall be determined in each modulation mode.
- (3) Other types;
 - The power meter shall directly connect to the attenuator and the total average power shall be measured.
 - The final value shall be determined as following;
 - Continuous signal: The reading of the power meter
 - Burst signal: The reading of the power meter, corrected with the rate of transmitting time (Duty cycle).

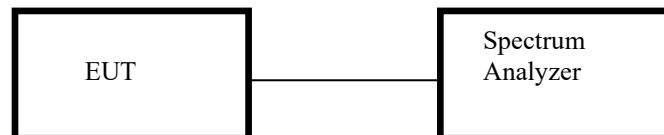


Figure 23. Antenna Power Test Configuration

The EIRP is calculated by $EIRP = \text{Antenna Power (dBm)} + \text{Antenna Gain (declared, dBi)}$

Test Limit: Antenna power designated value:

- (1) FHSS, FHSS+DSSS, FHSS+OFDM
 - a. 2427 – 2470.75 MHz: 3 mW/MHz
 - b. 2400 – 2483.5 MHz (except 2427 – 2470.75 MHz): 10 mW/MHz
- (2) DSSS: 10 mW/MHz
- (3) OFDM:
 - a. OBW < 26 MHz: 10 mW/MHz
 - b. 26 MHz < OBW < 38 MHz: 5 mW/MHz
- (4) Others: 10 mW

Tolerance +20%, -80%

The EIRP shall be less than 12.14dBm to 22.14dBm depending on Half Power Beamwidth

Test Engineer(s): Bryan Taylor

Test Date(s): 8/5/2025

Test Results: The EUT was compliant with the requirements of this section.

Mode	Freq (MHz)	Conducted Pwr (dBm)	Antenna Power Pwr (mW)	Limit (mW)	Margin	Rated Power (mW)	Power Deviation (%)
1MBps	2402	2.09	1.618825363	10	8.381174637	2	-19.05873187
1MBps	2440	3.39	2.183735328	10	7.816264672	2	9.18676638
1MBps	2480	1.46	1.397976915	10	8.602023085	2	-30.10115423
2MBps	2402	-0.59	0.872368549	10	9.127631451	2	-56.38157253
2MBps	2440	0.92	1.235947433	10	8.764052567	2	-38.20262833
2MBps	2480	-1.32	0.73790423	10	9.26209577	2	-63.10478849

Table 9. Antenna Power Output, Conducted Test Results (Power Supply)

Mode	Freq (MHz)	Conducted Pwr (dBm)	Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin
1MBps	2402	2.092	3.47	5.562	12.14	6.578
1MBps	2440	3.392	3.47	6.862	12.14	5.278
1MBps	2480	1.455	3.47	4.925	12.14	7.215
2MBps	2402	-0.593	3.47	2.877	12.14	9.263
2MBps	2440	0.92	3.47	4.39	12.14	7.75
2MBps	2480	-1.32	3.47	2.15	12.14	9.99

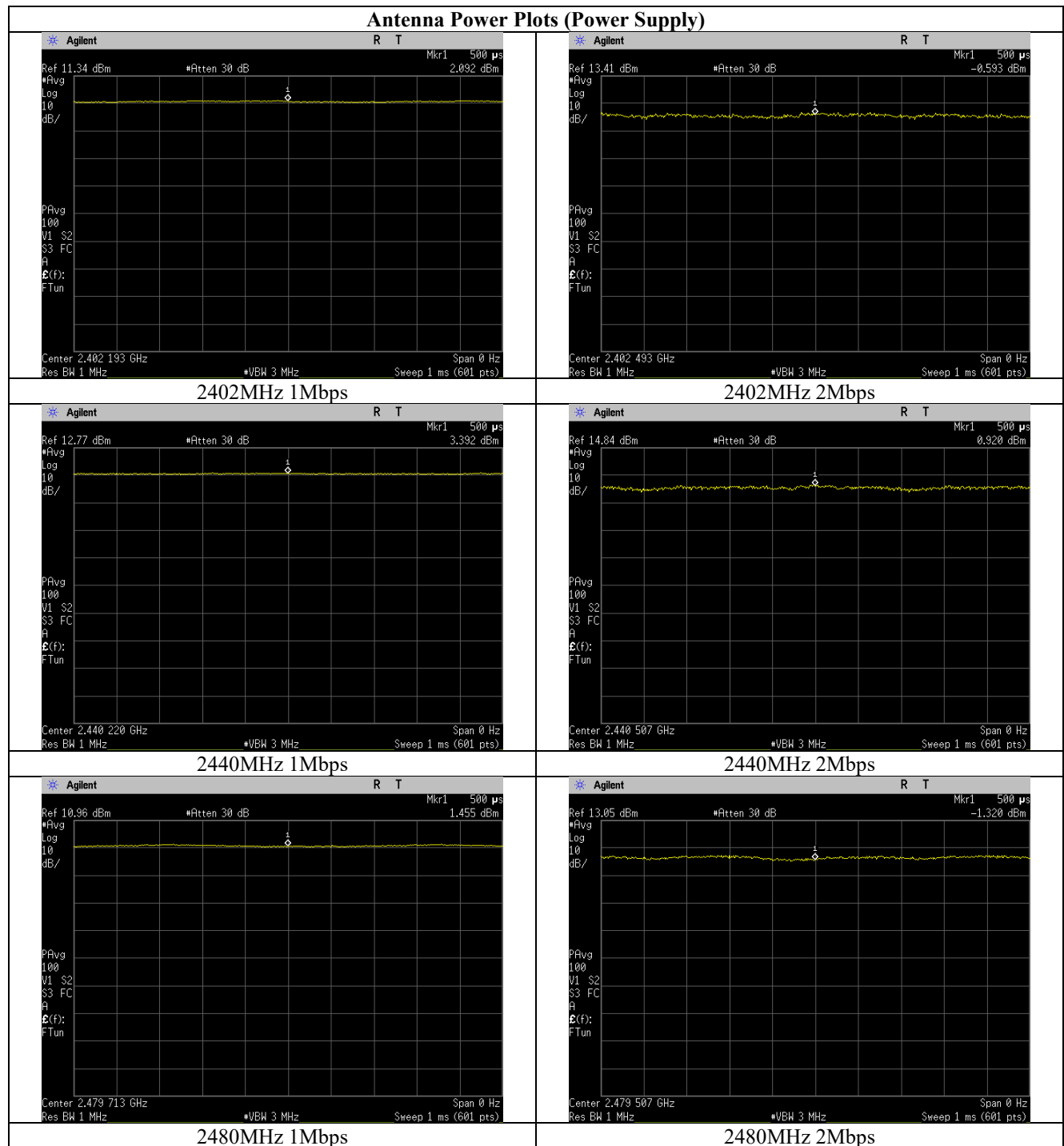
Table 10. Antenna Power Output, EIRP Test Results (Power Supply)

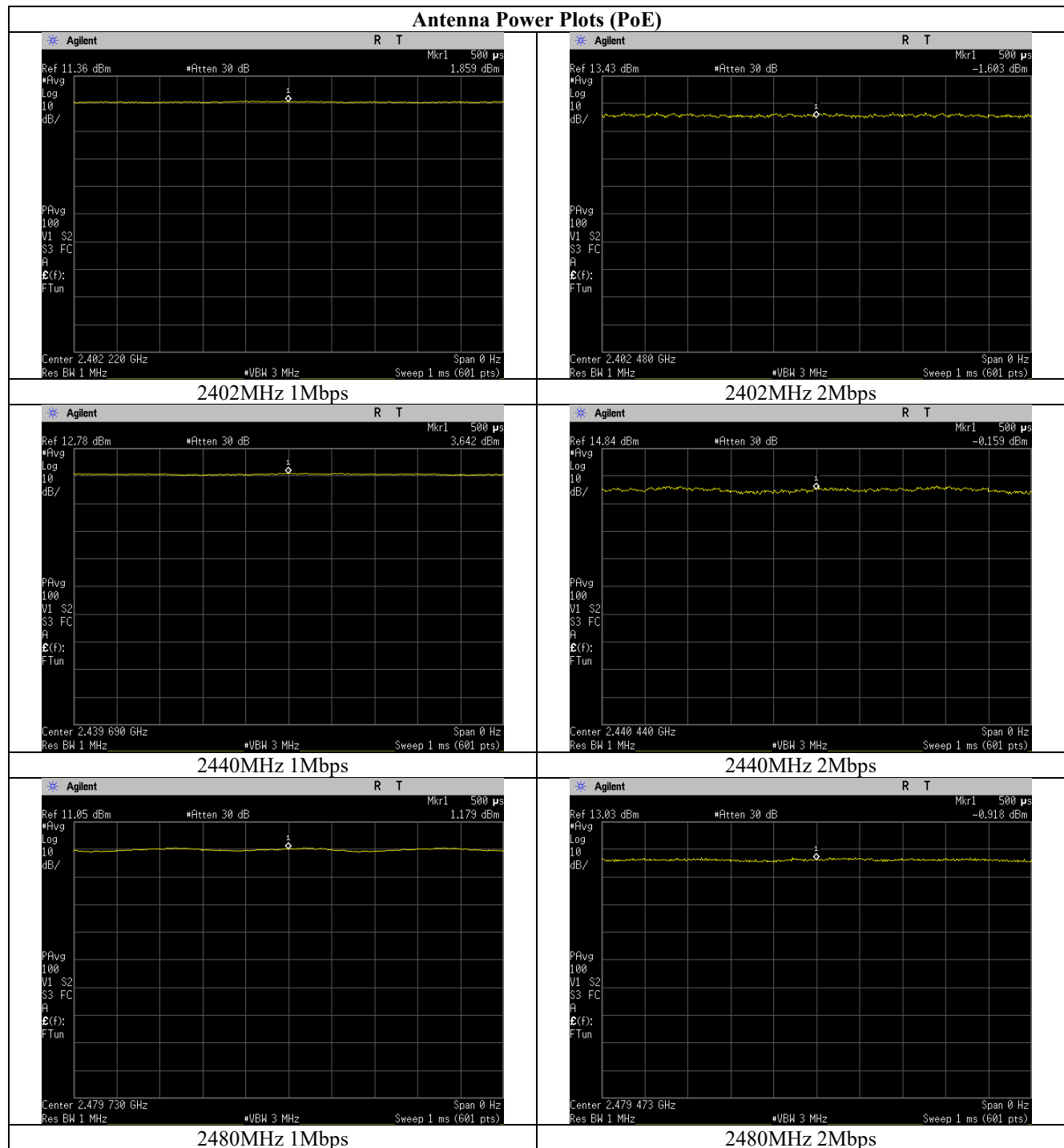
Mode	Freq (MHz)	Conducted Pwr (dBm)	Antenna Power Pwr (mW)	Limit (mW)	Margin	Rated Power (mW)	Power Deviation (%)
1MBps	2402	1.86	1.534263665	10	8.465736335	2	-23.28681676
1MBps	2440	3.64	2.313129781	10	7.686870219	2	15.65648903
1MBps	2480	1.18	1.311897789	10	8.688102211	2	-34.40511057
2MBps	2402	-1.60	0.691353236	10	9.308646764	2	-65.4323382
2MBps	2440	-0.16	0.964050979	10	9.035949021	2	-51.79745105
2MBps	2480	-0.92	0.809468587	10	9.190531413	2	-59.52657063

Table 11. Antenna Power Output, Conducted Test Results (PoE)

Mode	Freq (MHz)	Conducted Pwr (dBm)	Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin
1MBps	2402	1.859	3.47	5.329	12.14	6.811
1MBps	2440	3.642	3.47	7.112	12.14	5.028
1MBps	2480	1.179	3.47	4.649	12.14	7.491
2MBps	2402	-1.603	3.47	1.867	12.14	10.273
2MBps	2440	-0.159	3.47	3.311	12.14	8.829
2MBps	2480	-0.918	3.47	2.552	12.14	9.588

Table 12. Antenna Power Output, EIRP Test Results (PoE)





Electromagnetic Compatibility Criteria for Intentional Radiators

Secondary Emissions (Spurious Emission of Receiver)

Test Condition:

- (1) The attenuation value of the attenuator shall be low as possible due to very low level measurement.
- (2) The spectrum analyzer shall setup as following;
 - Frequency range: Searching spurious emissions shall be done from the low frequency as possible to more than 5 times of fundamental frequency (i.e. 12.5 GHz);
 - RBW: 100kHz (up to 1GHz), 1MHz (from 1GHz);
 - VBW: Equivalent to RBW;
 - Sweep time: Least time keeping measurement accuracy;
 - Scale of Y axis: 10dB/Div;
 - Quantity of sampling: More than 400 points;
 - Sweep mode: Single sweep;
 - Detecting mode: Positive peak hold
- (3) Determining the level of the detected spurious emission the following settings of the spectrum analyzer shall be used;
 - Center frequency: A frequency of detected spurious emissions;
 - Span: 0Hz;
 - RBW: 100kHz (up to 1GHz), 1MHz (from 1GHz);
 - VBW: Equivalent to RBW;
 - Sweep time: Least time keeping measurement accuracy;
 - Scale of Y axis: 10dB/Div;
 - Quantity of sampling: More than 400 points;
 - Sweep mode: Single sweep;
 - Detecting mode: Sample

Operational Condition of the Equipment Under Test:

EUT shall be in continuous receiving mode.

Test Method:

- (1) Spectrum analyzer shall be set up as Test Condition (1) and significant spurious emissions shall be searched.
- (2) If the level of the searched spurious emission is less than $1/10^{\text{th}}$ of the specified limit, (3dB lower than the limit shall be referred), the level shall be recorded as a final result.
- (3) If the level of the searched spurious emission exceeds $1/10^{\text{th}}$ of the specified limit, RBW shall change like 100MHz, 10MHz, 1MHz and more narrower until determining the precise frequency. Determine the level of the detected spurious emission using the setting in Section 2.3. Average value based on the sampled data shall be a final result.



Figure 24. Secondary Emissions (Spurious Emission of Receiver) Test Configuration

Test Limit: Limit of secondary radiated emissions:
(1) Below 1 GHz: 4 nW (-57dBm)
(2) 1 GHz or higher: 20 nW (-47dBm)

Test Engineer(s): Bryan Taylor

Test Date(s): 8/5/2025

Test Results: The EUT was compliant with the requirements of this section.

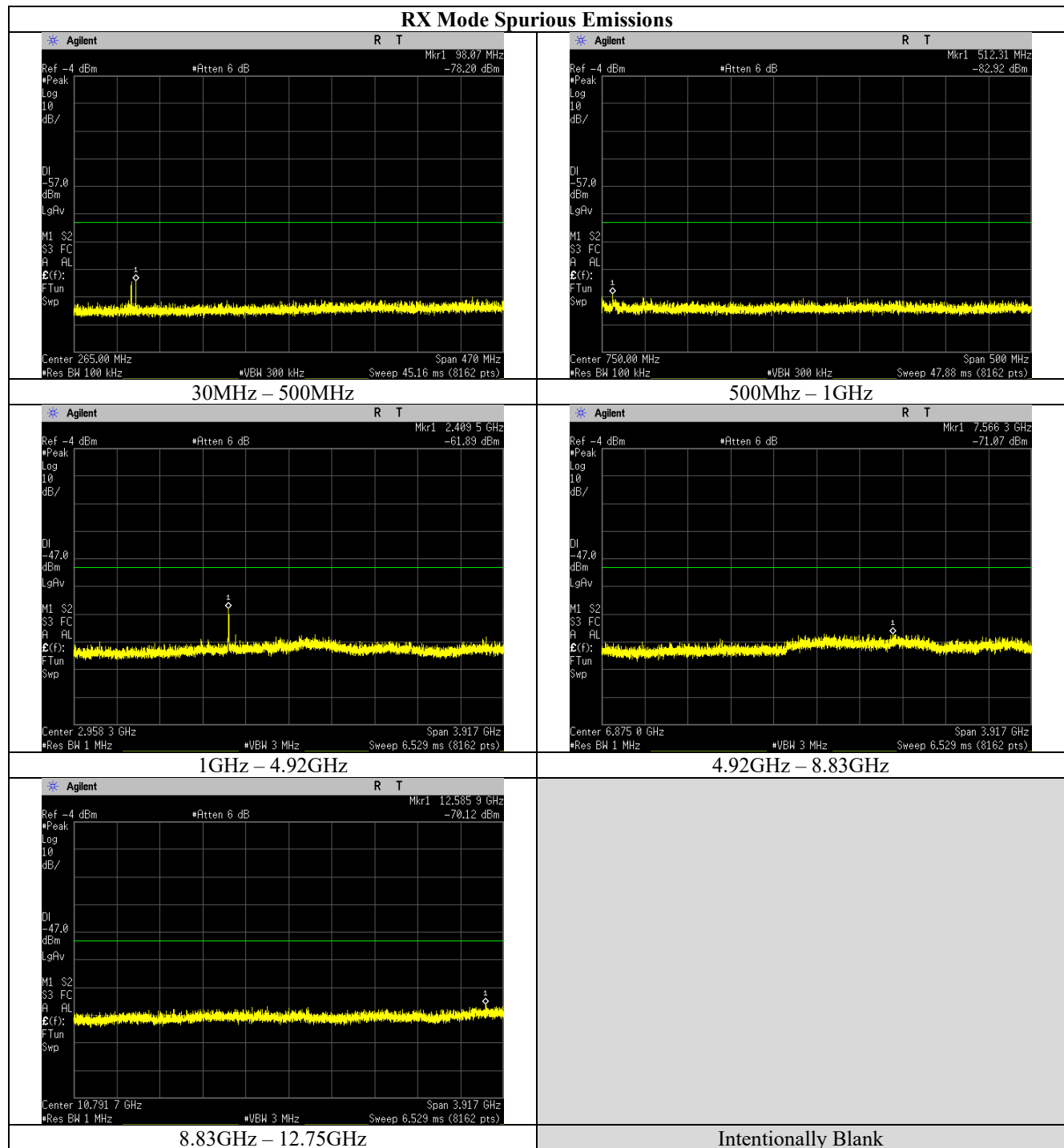


Figure 25. Receiver Spurious Emissions (Power Supply)

Frequency Range (MHz)	Frequency	Level (dBm)	Limit (dBm)	Result
30MHz - 500MHz	98.07MHz	-78.20	-57	Pass
500MHz - 1000MHz	512.31MHz	-82.92	-57	Pass
1000MHz - 4920MHz	2.409GHz	-61.89	-47	Pass
4920MHz – 8830MHz	7.566GHz	-71.07	-47	Pass
8830MHz – 12,750MHz	12.585GHz	-70.12	-47	Pass

Figure 26. Spurious Emissions, Receiver Mode (Power Supply)

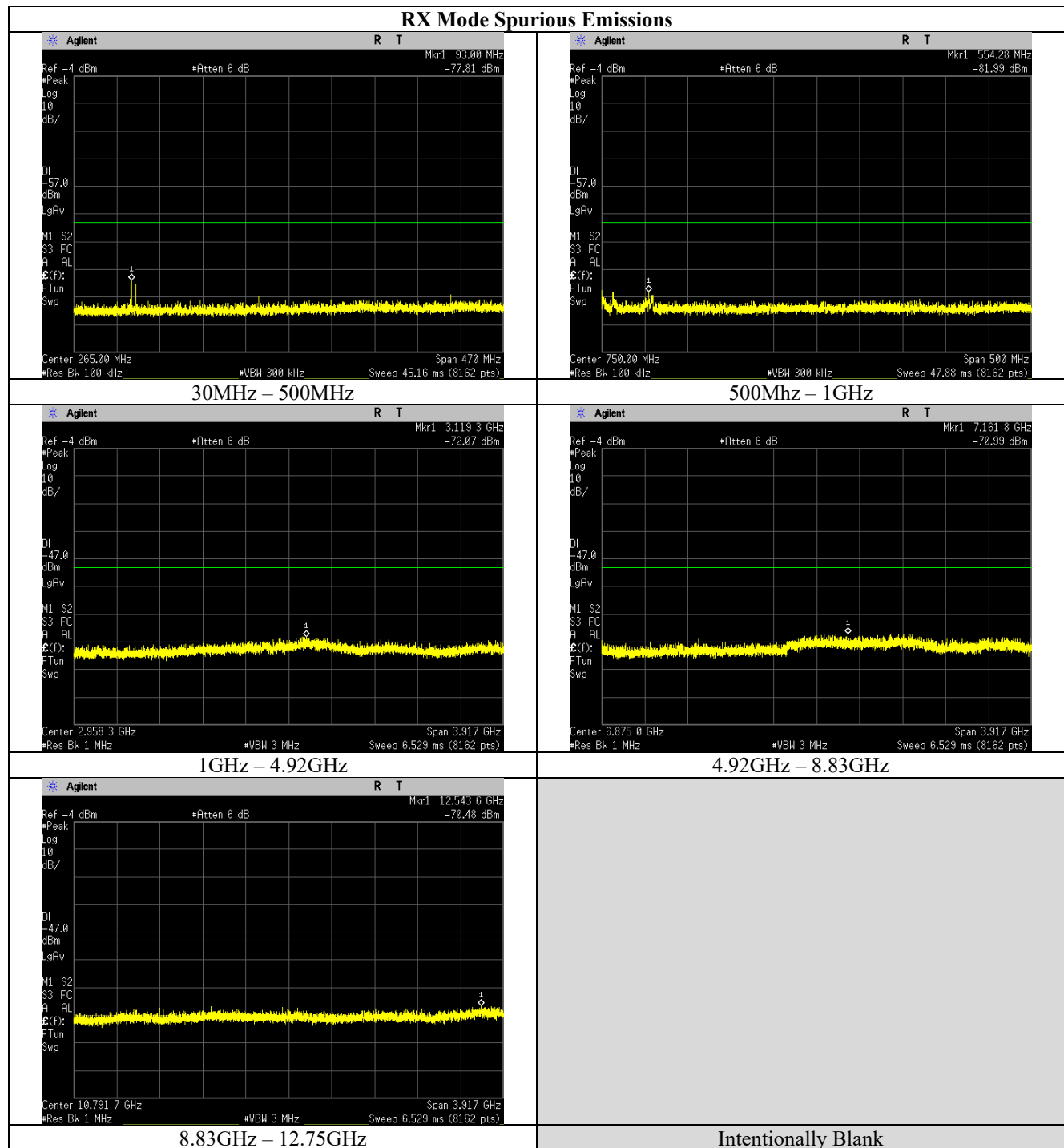


Figure 27. Receiver Spurious Emissions (PoE)

Frequency Range (MHz)	Frequency	Level (dBm)	Limit (dBm)	Result
30MHz - 500MHz	93.00MHz	-77.81	-57	Pass
500MHz - 1000MHz	554.28MHz	-81.99	-57	Pass
1000MHz - 4920MHz	3.119GHz	-72.07	-47	Pass
4920MHz – 8830MHz	7.161GHz	-70.99	-47	Pass
8830MHz – 12,750MHz	12.543GHz	-70.48	-47	Pass

Figure 28. Spurious Emissions, Receiver Mode (PoE)

Electromagnetic Compatibility Criteria for Intentional Radiators

Interference Prevention Function

Test Condition

- (1) The receiver shall be able to decode the identification signal and make it visible.
- (2) The transmitter shall be able to transmit the identification signal which can be identified by EUT in normal intended use.

Operational Condition of the Equipment Under Test

Normal intended use.

Test Method

- (1) If EUT automatically transmit identification signal;
 - Transmit the identification signal from EUT.
 - Confirm the signal is sent in appropriate manner at the receiver.
- (2) If EUT automatically receives identification signal;
 - Transmit the identification signal from the transmitter.
 - Confirm whether those make proper communication link.
 - Transmit a different signal.
 - Confirm whether EUT stops any transmitting or indicates that the received signal is not appropriate.



Figure 29. Function of Collision Avoidance Test Configuration

Test Engineer: Bryan Taylor

Test Date: 8/3/2025

Test Results: The EUT was compliant with the requirements of this section. The identification code transmitted by the test sample is shown in the photograph below.

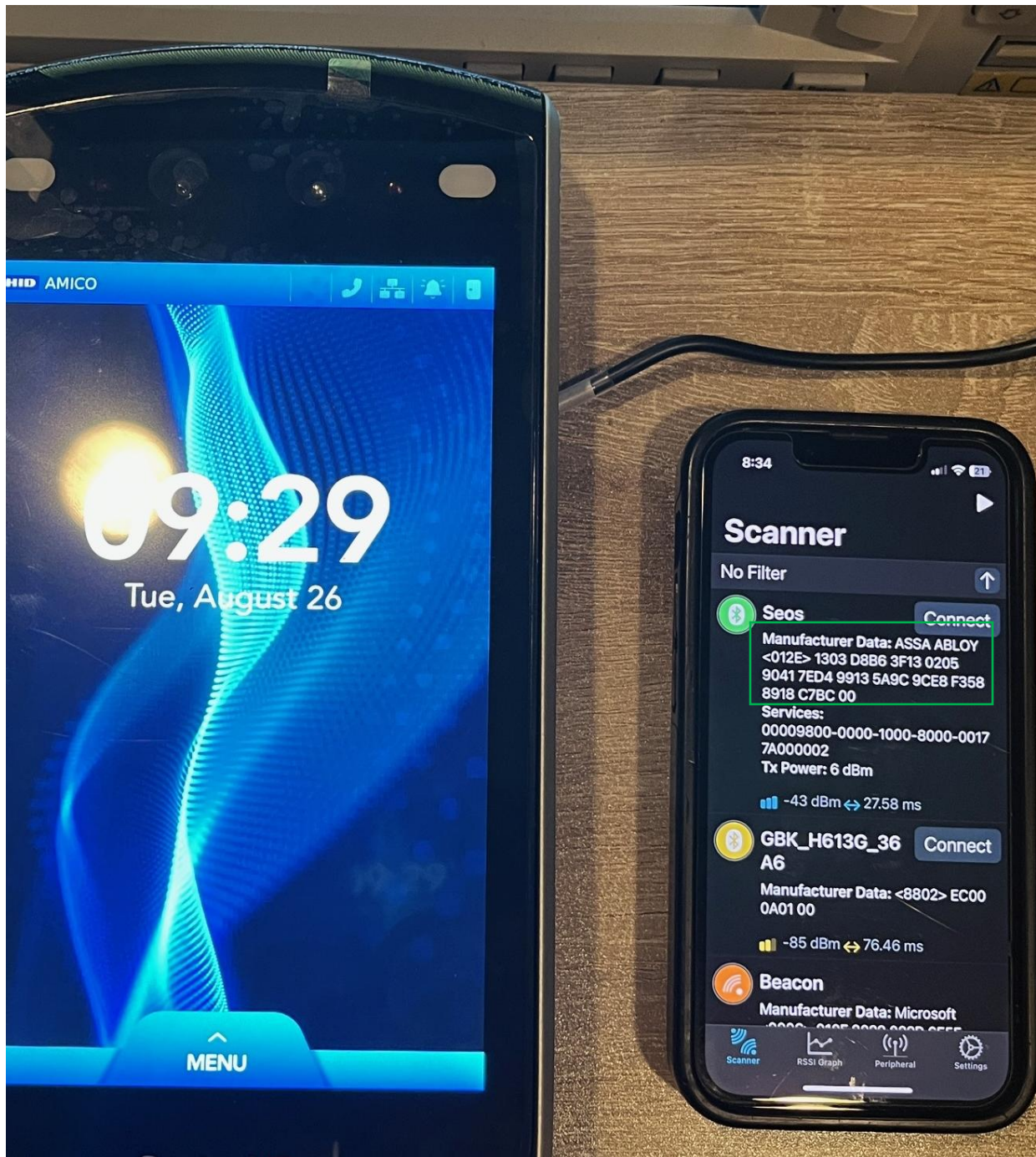


Figure 30. Interference Prevention Function

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Met Asset #	Equipment	Manufacturer	Model	Calibration Company	Last Cal Date	Cal Due Date
1A1234	Spectrum Analyzer	Rohde & Schwarz	FSV40	HCT Calibration	3/13/2025	3/13/2026
1A1250	EMI Test Receiver	Rohde & Schwarz	ESW44	HCT Calibration	3/28/2025	3/28/2026
1A1236	Signal Generator	Rohde & Schwarz	SMB100A	HCT Calibration	2/25/2025	2/25/2027
1A1263	Vector Signal Generator	Rohde & Schwarz	SMCV100B	HCT Calibration	1/2/2025	1/2/2027
1A1050	Bi-Log Antenna	Schaffner	CBL-6112D	Keysight Technologies	3/05/2024	3/05/2026
1A1183	Double Ridged Waveguide Antenna	ETS Lindgren	3117	Keysight Technologies	2/20/2024	2/20/2026
1A1225	Environmental Chamber	Espec	EXP-2H/New	Thermotron	5/16/2025	5/16/2026
1A1088	Pre-Amp	Rohde & Schwarz	TS-PR1	---	See Note	
1A1080	Multi-Device Controller	ETS-Emco	2090	---	See Note	
1A1180	Pre-Amp	Miteq	AMF-7D-01001800-22-10P	---	See Note	
1A1106	10m Semi-Anechoic Chamber	Lindgren	N/A	---	See Note	
1A1230	RF Rotary Attenuator	N/A	SA3700SMA	---	See Note	
None	RF Power Divider	Mni-Circuits	ZFSC-2-2500-S+	---	See Note	
None	RF Power Divider	Weinschel	1506A	---	See Note	
None	Directional Coupler	Narda	4226-20	---	See Note	

Figure 31. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

End of Report