



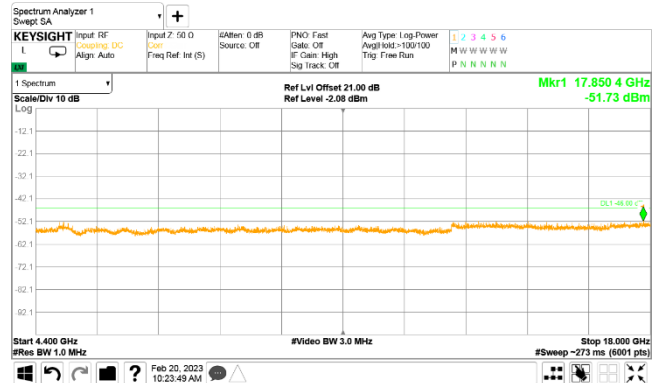
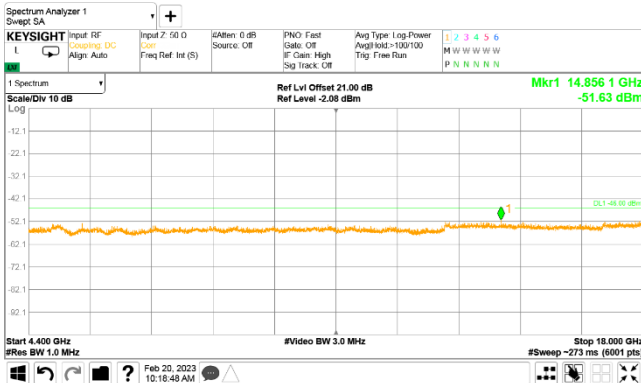
HERMON LABORATORIES

Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.47 Spurious emission measurements in 4400 - 18000 MHz range at mid carrier frequency

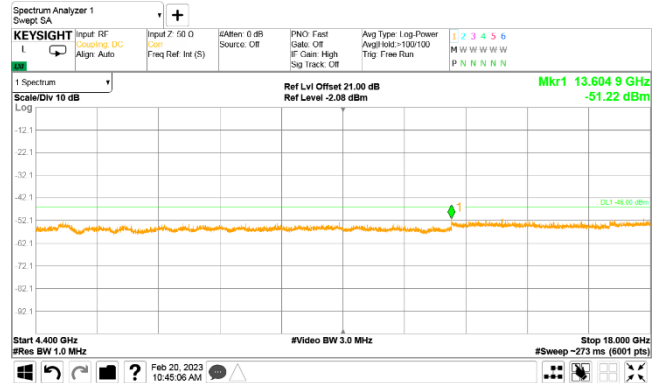
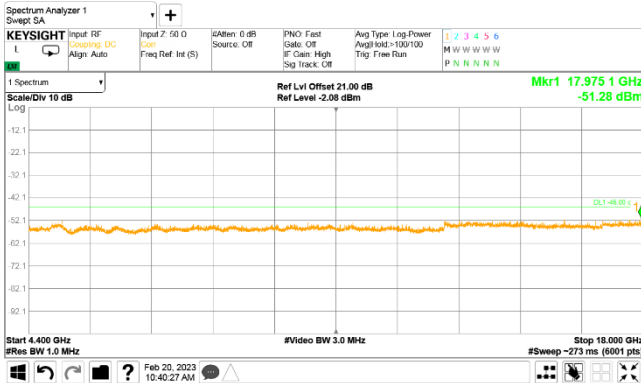
MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1

QPSK
20 MHz
ANTENNA CHAIN: #2



ANTENNA CHAIN: #3

ANTENNA CHAIN: #4



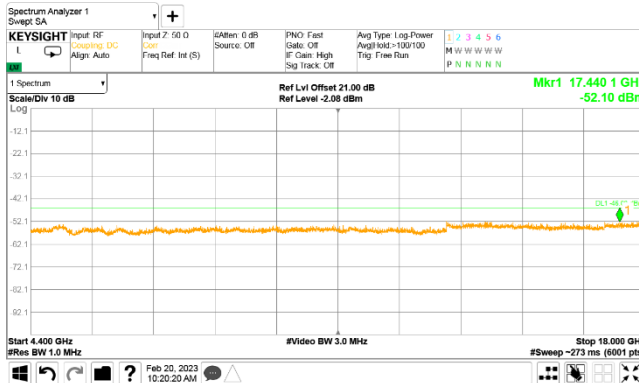


HERMON LABORATORIES

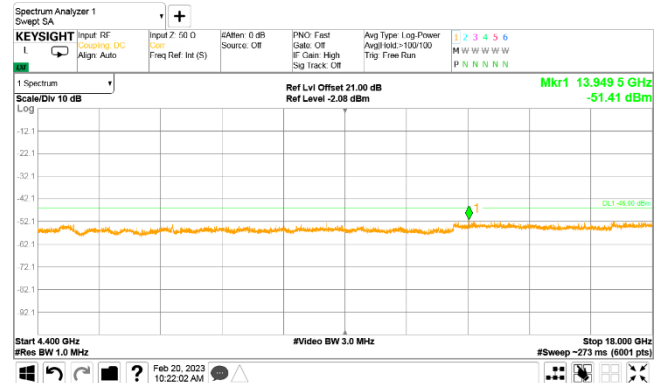
Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.48 Spurious emission measurements in 4400 - 18000 MHz range at high carrier frequency

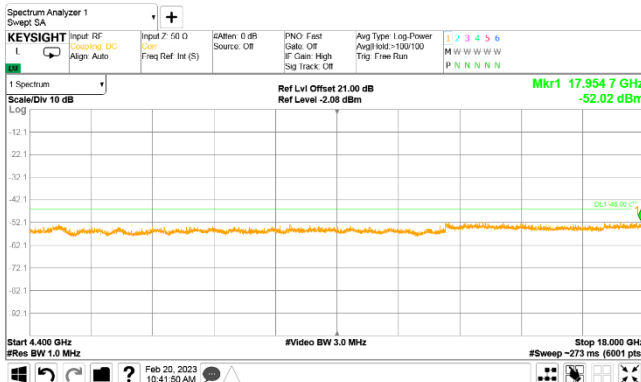
MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1



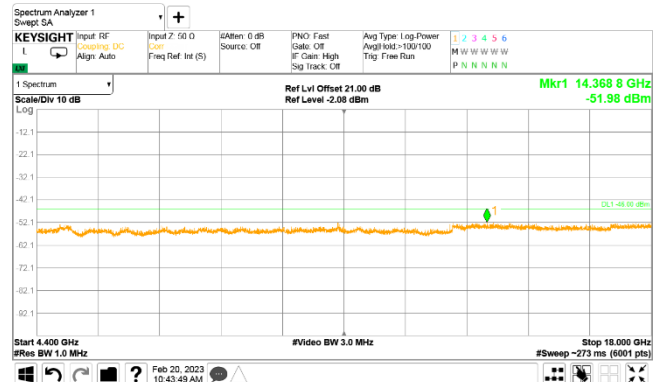
QPSK
20 MHz
ANTENNA CHAIN: #2



ANTENNA CHAIN: #3



ANTENNA CHAIN: #4



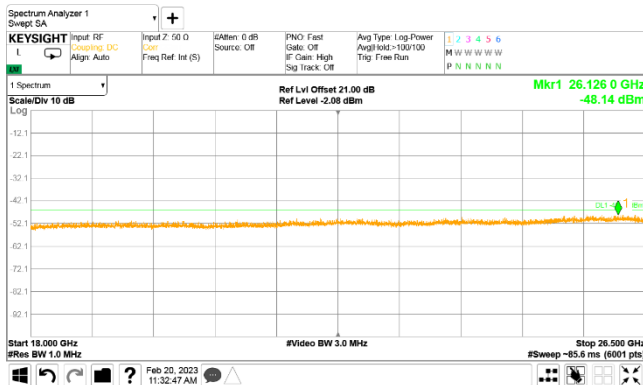


HERMON LABORATORIES

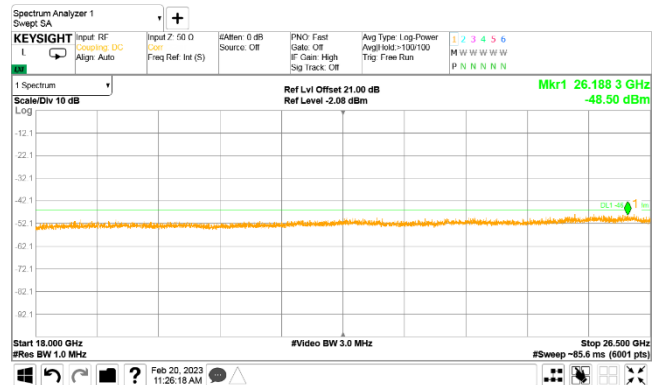
Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.49 Spurious emission measurements in 18000 - 26500 MHz range at low carrier frequency

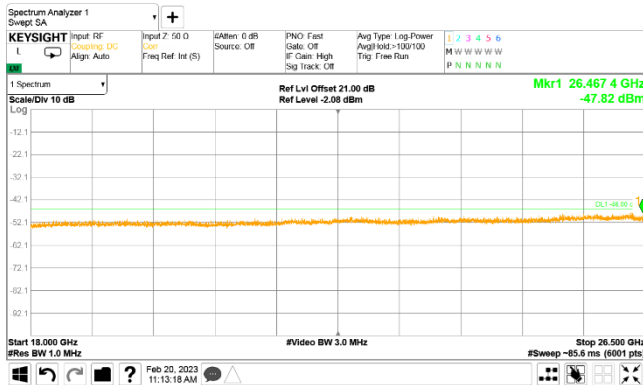
MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1



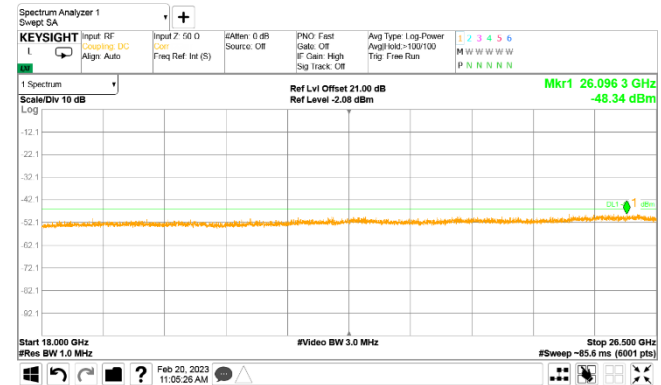
QPSK
20 MHz
ANTENNA CHAIN: #2



ANTENNA CHAIN: #3



ANTENNA CHAIN: #4



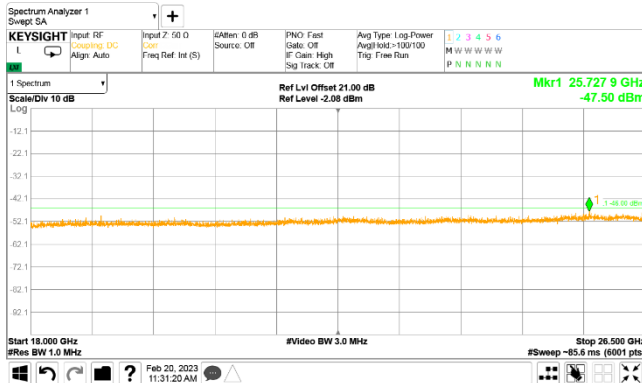


HERMON LABORATORIES

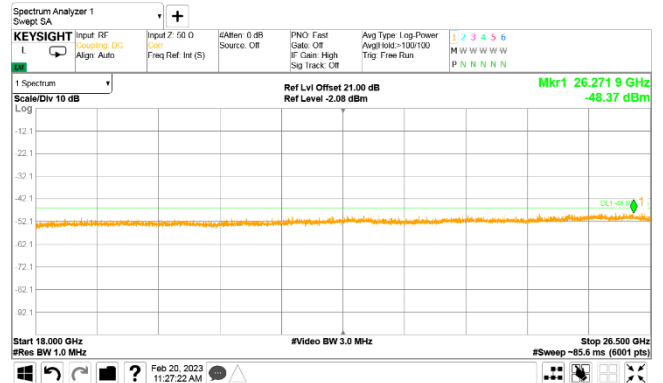
Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.50 Spurious emission measurements in 18000 - 26500 MHz range at mid carrier frequency

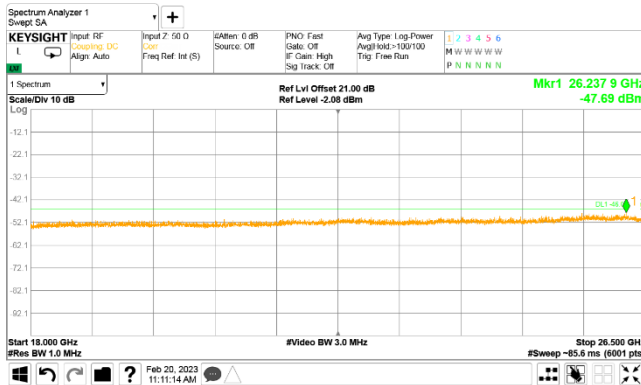
MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1



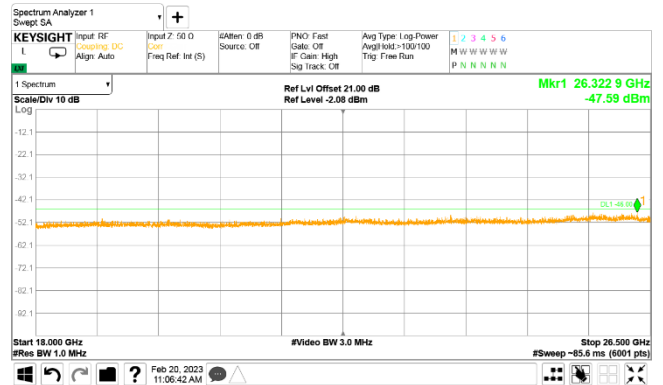
QPSK
20 MHz
ANTENNA CHAIN: #2



ANTENNA CHAIN: #3



ANTENNA CHAIN: #4



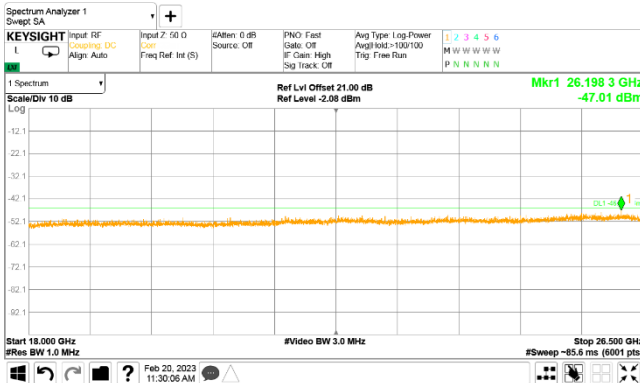


HERMON LABORATORIES

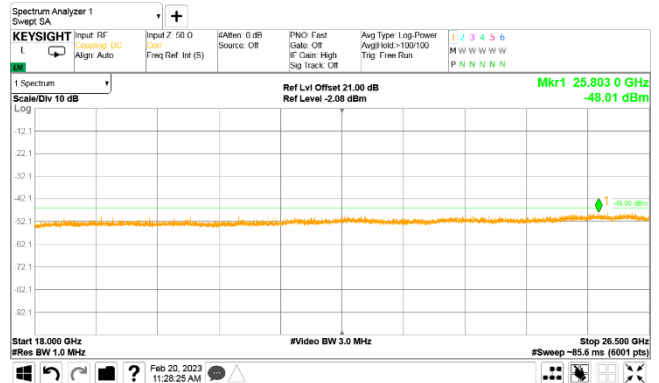
Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.51 Spurious emission measurements in 18000 - 26500 MHz range at high carrier frequency

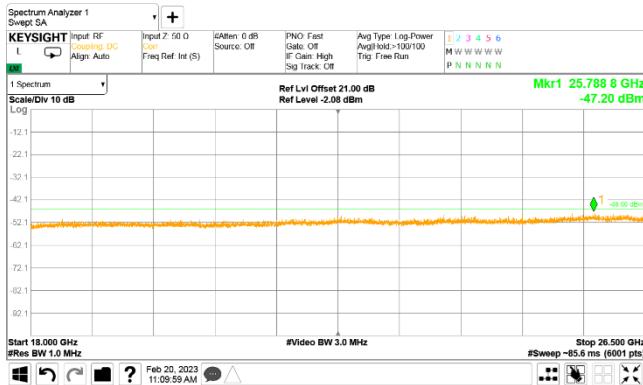
MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1



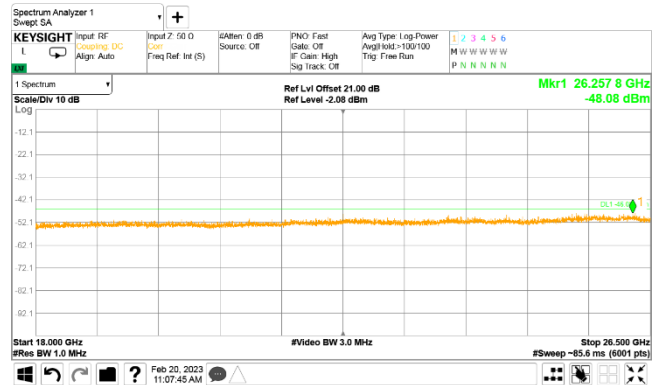
QPSK
20 MHz
ANTENNA CHAIN: #2



ANTENNA CHAIN: #3



ANTENNA CHAIN: #4





HERMON LABORATORIES

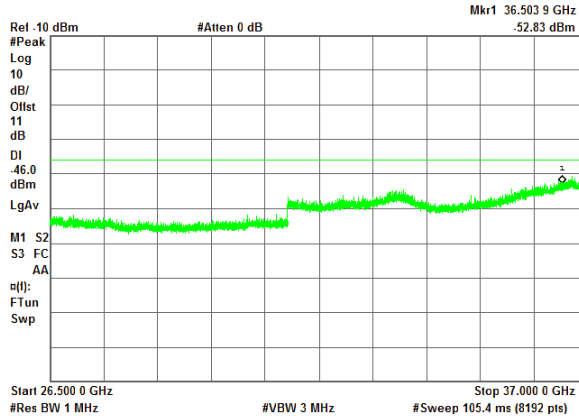
Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.52 Spurious emission measurements in 26500 - 37000 MHz range at low carrier frequency

MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1

* Agilent 11:56:57 Feb 20, 2023

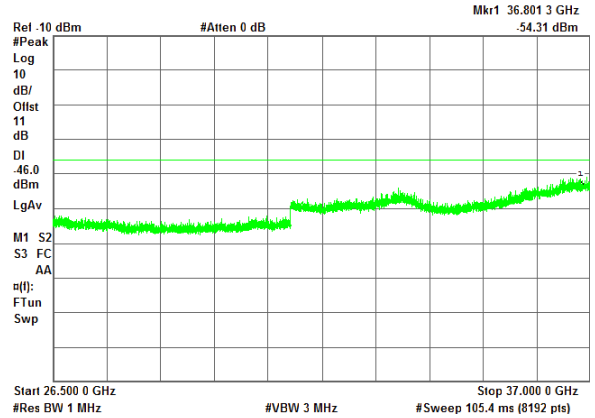
R T



QPSK
20 MHz
ANTENNA CHAIN: #2

* Agilent 12:02:12 Feb 20, 2023

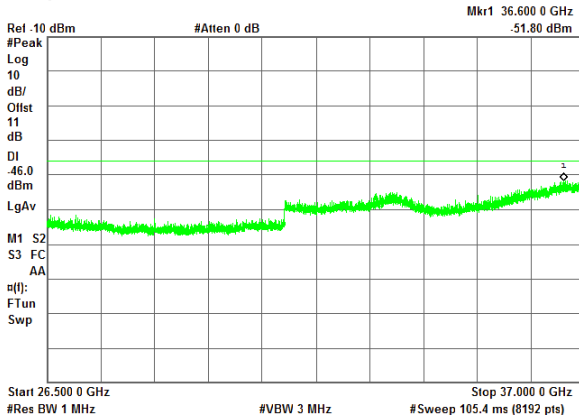
R T



ANTENNA CHAIN: #3

* Agilent 12:10:10 Feb 20, 2023

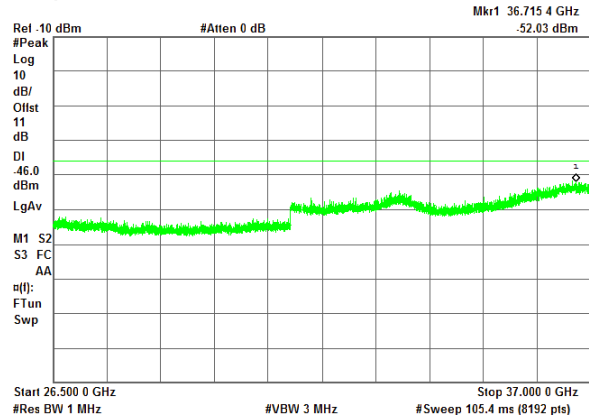
R T



ANTENNA CHAIN: #4

* Agilent 12:16:21 Feb 20, 2023

R T





HERMON LABORATORIES

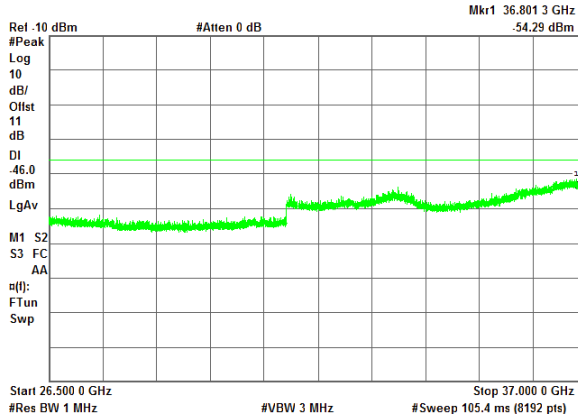
Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.53 Spurious emission measurements in 26500 - 37000 MHz range at mid carrier frequency

MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1

Agilent 11:58:11 Feb 20, 2023

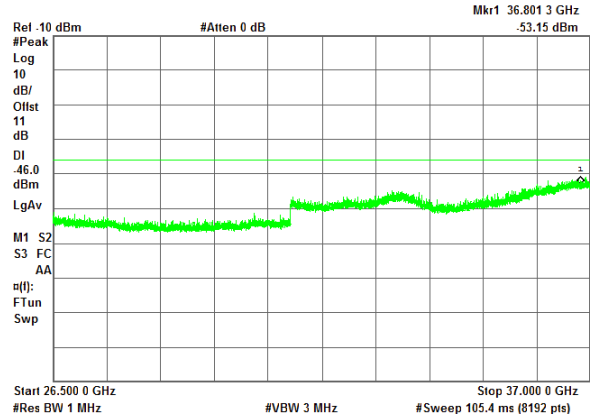
R T



QPSK
20 MHz
ANTENNA CHAIN: #2

Agilent 12:01:29 Feb 20, 2023

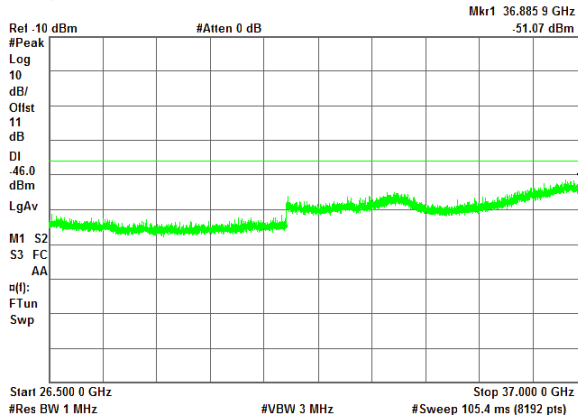
R T



ANTENNA CHAIN: #3

Agilent 12:10:55 Feb 20, 2023

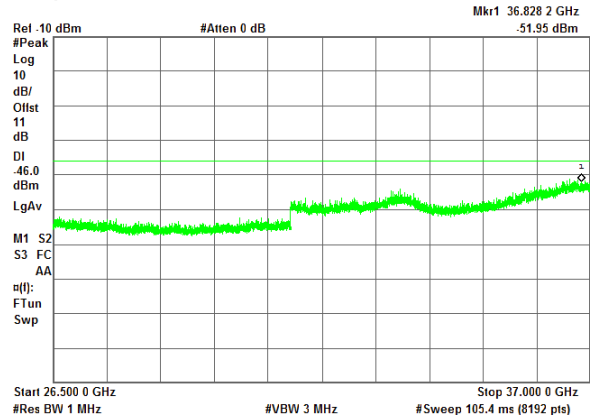
R T



ANTENNA CHAIN: #4

Agilent 12:17:05 Feb 20, 2023

R T





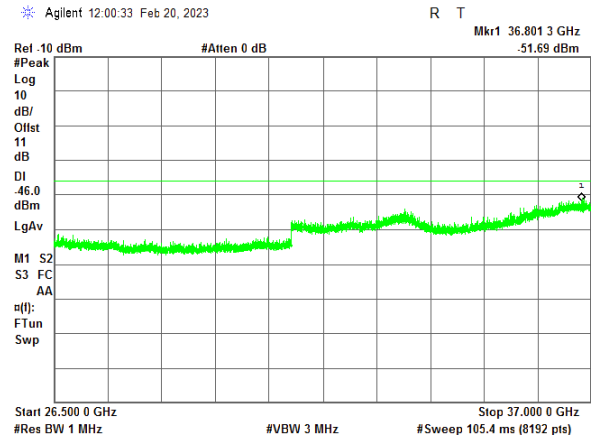
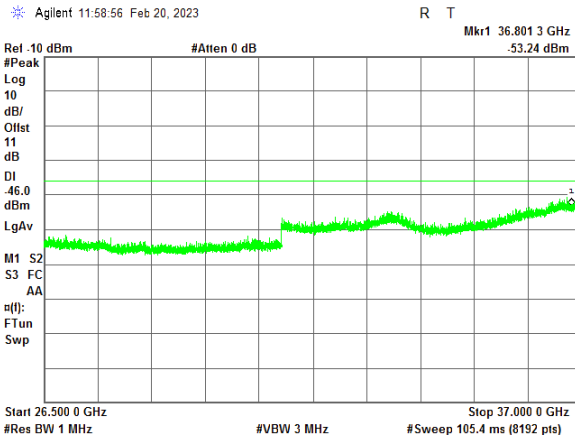
HERMON LABORATORIES

Test specification: Section 96.41(e)(3), Conducted spurious emissions			
Test procedure: Section 96.41(e)(3)			
Test mode: Compliance		Verdict: PASS	
Date(s): 24-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.6.54 Spurious emission measurements in 26500 - 37000 MHz range at high carrier frequency

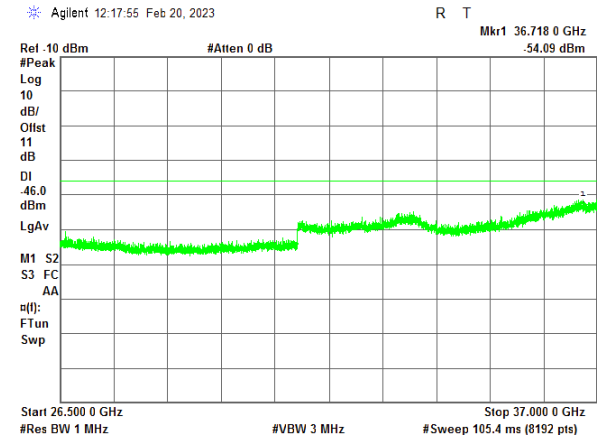
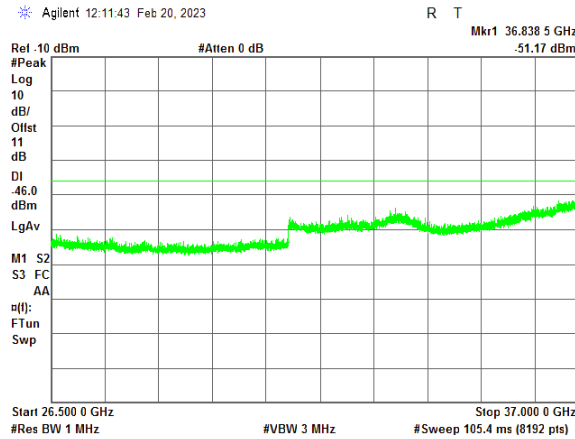
MODULATION:
CHANNEL SPACING:
ANTENNA CHAIN: #1

QPSK
20 MHz
ANTENNA CHAIN: #2



ANTENNA CHAIN: #3

ANTENNA CHAIN: #4





Test specification: Section 2.1055, Frequency stability			
Test procedure: 47 CFR, Section 2.1055			
Test mode: Compliance		Verdict: PASS	
Date(s): 21-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

7.7 Frequency stability test

7.7.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.7.1.

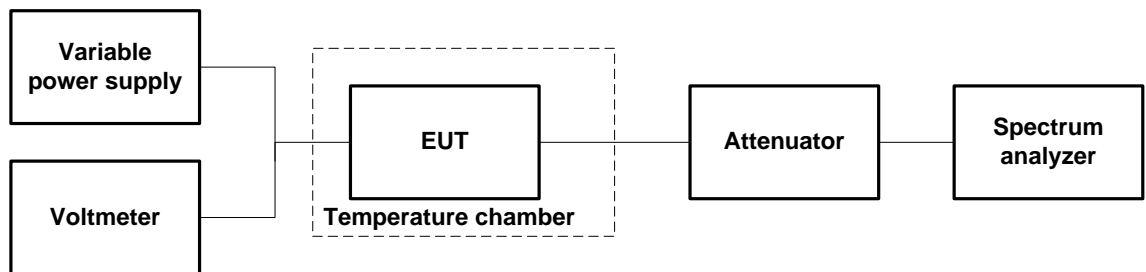
Table 7.7.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
3555.0	NA	NA
3625.0		NA
3695.0		NA

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.
- 7.7.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.7.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.7.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.7.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.
- 7.7.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.7.2.

Figure 7.7.1 Frequency stability test setup





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Test specification: Section 2.1055, Frequency stability			
Test procedure: 47 CFR, Section 2.1055			
Test mode: Compliance		Verdict: PASS	
Date(s): 21-Feb-23			
Temperature: 21 °C	Relative Humidity: 54 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Table 7.7.2 Frequency stability test results

OPERATING FREQUENCY: 3550-3700 MHz
 NOMINAL POWER VOLTAGE: 110 VAC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Counter
 RESOLUTION BANDWIDTH: 100 Hz
 VIDEO BANDWIDTH: 1 kHz
 MODULATION: Unmodulated

T, °C	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Verdict
		Start up	1 st min	2 nd min	3 rd min	4 th min	5 th min	10 th min	Positive	Negative	
-30	nominal	3.554999992	3.554999993	3.554999992	3.554999995	3.554999994	3.554999998	3.554999994	30	-30	Comply
-20	nominal	3.554999997	NA	NA	NA	NA	NA	3.554999995	20	0	Comply
-10	nominal	3.554999998	NA	NA	NA	NA	NA	3.554999998	30	0	Comply
0	nominal	3.554999997	3.554999994	3.554999992	3.554999996	3.554999997	3.554999995	3.554999996	20	-10	Comply
10	nominal	3.554999997	NA	NA	NA	NA	NA	3.554999994	20	-10	Comply
20	+15%	3.554999996	NA	NA	NA	NA	NA	3.554999992	10	-30	Comply
20	nominal	3.554999993	NA	NA	NA	NA	NA	*3.554999995	0	0	Comply
20	-15%	3.554999993	NA	NA	NA	NA	NA	3.554999994	0	-20	Comply
30	nominal	3.554999996	3.554999992	3.554999996	3.554999992	3.554999993	3.554999995	3.554999995	10	-30	Comply
40	nominal	3.554999996	NA	NA	NA	NA	NA	3.554999993	10	-20	Comply
50	nominal	3.554999994	NA	NA	NA	NA	NA	3.554999995	0	-10	Comply
Mid frequency 3625 MHz											
-30	nominal	3.624999999	3.624999992	3.624999994	3.624999997	3.624999992	3.624999998	3.624999993	20	-40	Comply
-20	nominal	3.624999993	NA	NA	NA	NA	NA	3.624999994	0	-40	Comply
-10	nominal	3.624999992	NA	NA	NA	NA	NA	3.624999996	0	-50	Comply
0	nominal	3.624999995	3.624999997	3.624999993	3.624999992	3.624999993	3.624999994	3.624999997	0	-40	Comply
10	nominal	3.624999993	NA	NA	NA	NA	NA	3.624999998	10	-40	Comply
20	+15%	3.624999998	NA	NA	NA	NA	NA	3.624999991	10	-60	Comply
20	nominal	3.624999999	NA	NA	NA	NA	NA	*3.624999997	0	0	Comply
20	-15%	3.624999997	NA	NA	NA	NA	NA	3.624999994	0	-30	Comply
30	nominal	3.624999996	3.624999995	3.624999998	3.624999996	3.624999994	3.624999997	3.624999996	0	-20	Comply
40	nominal	3.624999991	NA	NA	NA	NA	NA	3.624999998	10	-60	Comply
50	nominal	3.624999995	NA	NA	NA	NA	NA	3.624999990	0	-70	Comply
High frequency 3695 MHz											
-30	nominal	3.694999992	3.694999990	3.694999994	3.694999991	3.694999992	3.694999994	3.694999995	0	-30	Comply
-20	nominal	3.694999998	NA	NA	NA	NA	NA	3.694999993	0	-50	Comply
-10	nominal	3.694999994	NA	NA	NA	NA	NA	3.694999994	0	-40	Comply
0	nominal	3.694999998	3.694999997	3.694999994	3.694999993	3.694999992	3.694999992	3.694999991	0	-70	Comply
10	nominal	3.694999991	NA	NA	NA	NA	NA	3.694999991	0	-70	Comply
20	+15%	3.694999998	NA	NA	NA	NA	NA	3.694999999	10	0	Comply
20	nominal	3.694999997	NA	NA	NA	NA	NA	*3.694999998	0	0	Comply
20	-15%	3.694999997	NA	NA	NA	NA	NA	3.694999999	10	-10	Comply
30	nominal	3.694999992	3.694999993	3.694999994	3.694999993	3.694999996	3.694999997	3.694999996	0	-20	Comply
40	nominal	3.694999995	NA	NA	NA	NA	NA	3.694999991	0	-70	Comply
50	nominal	3.694999991	NA	NA	NA	NA	NA	3.694999992	0	-60	Comply

* - Reference frequency

Reference numbers of test equipment used

HL 3286	HL 3901	HL 5376	HL3521	HL2358			
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Full description is given in Appendix A.

**8 APPENDIX A Test equipment and ancillaries used for tests**

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal/ Check	Due Cal/ Check
0446	Antenna, Loop, Active, 10 (9) kHz - 30 MHz	EMCO	6502	2857	28-Feb-22	28-Feb-23
2016	Attenuator, Manual Step, 0-9/1 dB, 0-8 GHz, 2 W	Midwest Microwave	1072	1315	11-Apr-22	11-Apr-23
2358	Power Supply, 2 X 0-36VDC / 5A, 5VDC / 5A	Horizon Electronics	DHR3655 D	767469	30-May-22	30-May-23
3286	Temperature Chamber, (-50 to +170) °C	Thermotron	EL-8-CH-1-1-CO2	21-9048	12-Dec-22	12-Dec-23
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY45101057	08-Jun-22	08-Jul-23
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY45240586	08-Jun-22	08-Jul-23
3358	Low Pass Filter, 50 Ohm, DC to 3800 MHz	Mini-Circuits	VLF-3800+	NA	15-Jun-21	15-Jun-23
3521	Multimeter	Fluke	115	94771103	06-Jul-22	06-Jul-23
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1225/2A	07-Apr-22	07-Apr-23
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	07-Apr-22	07-Apr-23
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	11-Oct-22	11-Oct-23
4366	Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female	Tiger Micro-Electronics Institute	TGD-A1101-10	01e-JSDE805-007	29-May-22	29-May-24
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	19-Jan-23	19-Jan-24
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	07-Mar-22	07-Mar-23
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	24-Mar-22	24-Mar-25
5376	EXA Signal Analyzer, 10 Hz - 32 GHz	Keysight Technologies	N9010B	MY57470404	27-Dec-22	27-Dec-23
5642	Cable, 50 Ohm, DC to 18 GHz, 1.8 m, SMA/SMA	Mini Circuits	CBL-6FT-SMSM+	NA	21-Jul-22	21-Jul-23
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	08-Dec-22	08-Dec-23
6143	RF-cable, 40.0 GHz, 2.0m, 2.92mm/2.92mm	Mechanc	CFT360A P4060S	NA	12-Feb-23	12-Aug-23
7585	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103130	19-May-22	19-May-23



9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Unintentional radiator tests	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB
Vertical polarization	Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.



10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for relevant parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; Recognized by Innovation, Science and Economic Development Canada for wireless and terminal testing (ISED), ISED #2186A, CAB identifier is IL1001; Certified by VCCI, Japan (the registration numbers are R-10808 for OATS, R-1082 for anechoic chamber, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 for conducted emissions at telecommunication ports).

The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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11 APPENDIX D Specification references

FCC 47CFR part 96: 2020	Citizens Broadband Radio Service
FCC 47CFR part 1: 2020	Practice and procedure
FCC 47CFR part 2: 2020	Frequency allocations and radio treaty matters; general rules and regulations



12 APPENDIX E Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
dB Ω	decibel referred to one Ohm
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

END OF DOCUMENT