



RF - TEST REPORT

- FCC Part 15.407, RSS-247 -

Model Name : LIQ-200 DUO

Product Description : Network tester with WLAN

Applicant : Fluke Corporation

Address : 6920 Seaway Blvd
EVERETT, WA 89203, USA

Manufacturer : Fluke Corporation

Address : 6920 Seaway Blvd
EVERETT, WA 89203, USA

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : 80178981-07 Rev_0

31. July 2024

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00

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ATTACHMENT A as separate supplement

1 TEST STANDARDS

The tests were performed **partly** according to following standards:

FCC Rules and Regulations (July 2024)

Part 15, Subpart E, Section 15.407	Operation within the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.85 GHz
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ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
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KDB 789033 D02 v02r01	Guidelines for compliance testing of UNII-Devices Part 15, Subpart E, December 14, 2017.
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ISED Canada Rules and Regulations

RSS-Gen, Issue 5 + Amendment 1 + 2	General Requirements for Compliance of Radio Apparatus
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RSS-247, Issue 3	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
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ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
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2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according to his/her instructions.

2.3 General remarks

This report covers the emissions of the radio module Ezurio Sona IF573 in combination with the host device.

Performed tests:

- AC power line conducted emissions
- Maximum output power, conducted
- Undesirable emissions, radiated

2.4 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.5 Equipment category

WLAN - client

2.6 Short description of the equipment under test (EUT)

The EUT is a tool for troubleshooting networks. It is equipped with a WiFi 6E module Ezurio Sona IF573 and uses WLAN 2.4 GHz, 5 GHz and 6 GHz.

Number of tested samples	:	1
Serial number	:	24110552
Firmware number	:	1.2 Build 0

2.7 Variants of the EUT

There are no variants.

2.8 Operation frequency and channel plan

The operating frequency is 5150 MHz to 5250 MHz, 5250 MHz to 5350 MHz, 5470 MHz to 5725 MHz and 5725 MHz to 5850 MHz.

Channel plan 802.11g, n HT20, ac VT20, ax HE20:

Channel	Frequency (MHz)
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320

100	5500
104	5520
108	5540
112	5560
116	5580
120*	5600
124*	5620
128*	5640
132	5660
136	5680
140	5700
144	5720

149	5745
153	5765
157	5785
161	5805
165	5825

Channel plan 802.11n HT40, ac VT40, ax HE40:

Channel	Frequency (MHz)
38	5190
46	5230
54	5270
62	5310

102	5510
110	5550
118*	5590
126*	5630
134	5670
142	5710

151	5755
159	5795

Channel plan 802.11ac VT80, ax HE80:

Channel	Frequency (MHz)
42	5210
58	5290
106	5530
122*	5610
155	5775

Note: *marked channels are only available for use in US

2.9 Transmit operating modes

- 802.11g	54, 48, 36, 24, 18, 12, 9, 6 Mbps	(Mbps = megabits per second)
- 802.11n	HT20, MCS 0 – 7	
- 802.11n	HT40, MCS 0 – 7	
- 802.11ac	VT20, MCS 0 – 8	
- 802.11ac	VT40, MCS 0 – 8	
- 802.11ac	VT80, MCS 0 – 8	
- 802.11ax	HE20, MCS 0 – 11	
- 802.11ax	HE40, MCS 0 – 11	
- 802.11ax	HE80, MCS 0 – 11	

2.10 Antenna

The following antenna shall be used with the EUT:

Number	Characteristic	Name	Connector	Frequency band (GHz)	Gain (dBi)
1	omnidirectional	Ezurio FlexMIMO 6E	MHF4 (2x)	2.400 - 2.500 4.900 - 5.925 5.925 - 7.125	2.2 3.8 3.3

2.11 Power supply system utilised

Power supply voltage	: 3.6 V/DC (battery pack)
Power supply voltage alternative	: 5.0 V/DC (USB-C)

2.12 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- none	Model: -
-	Model: -

2.13 Determination of worst-case conditions for final measurement

Preliminary tests are performed in all three orthogonal axes of the EUT to locate at which position and at what setting of the EUT produces the maximum of the emissions.

For the final test the following channels and test modes are selected:

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate	BW
802.11ax HE20	36 to 165	36, 64, 100, 116, 140, 149, 165	P_{def}	OFDM	BPSK	MCS-0	20 MHz
802.11ax HE40	38 to 159	38, 62, 102, 134, 151, 159	P_{def}	OFDM	BPSK	MCS-0	40 MHz
802.11ax HE80	42 to 155	42, 58, 106, 122, 155	P_{def}	OFDM	BPSK	MCS-0	80 MHz

2.13.1 Test jig

No test jig is used.

2.13.2 Test software

A regulatory test tool software LWB provided by the customer is used to set the EUT into RX and TX modulated continuous mode. It allows to set channels, bandwidth, modulation type and FCC(/CA) or ETSI power setting.

3 TEST RESULT SUMMARY

UNII device using the operating bands 5150 MHz – 5250 MHz, 5250 MHz – 5350 MHz, 5470 MHz – 5725 MHz and 5725 MHz – 5850 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 8.8	AC power line conducted emission	passed
15.407(a)	RSS-247, 6.2	EBW, OBW	Not tested
15.407(a)	RSS-247, 6.2	Output power	passed
15.407(a)	RSS-247, 6.2	PSD	Not tested
15.407(b)	RSS-247, 6.2	Undesirable emission	passed
15.209 15.205(a)	RSS-Gen, 8.9 RSS-Gen, 8.10	Emission in restricted bands	passed
15.407(g)	RSS-Gen, 6.11	Transmitter frequency stability	Not tested
15.407(h)(1)	RSS-247, 6.2.	TPC	Not tested
15.203	-	Antenna requirement	passed

Notes: Not tested: module integration measurements, thus only radiated measurements are performed

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80178981-07	0	31 July 2024	Initial test report

The test report with the highest revision number replaces the previous test reports.

3.2 Final assessment

The equipment under test fulfils the requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 17 April 2024

Testing concluded on : 24 April 2024

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Christopher Thaller
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15 - 35 °C

Humidity: 30 - 60 %

Atmospheric pressure: 86 - 106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 30000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Output power ERP, radiated	1000 MHz to 7000 MHz	95%	± 2.71 dB
Field strength of the fundamental	1000 MHz to 7000 MHz	95%	± 2.71 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Spurious Emissions, conducted	9 kHz to 10000 MHz	95%	± 2.15 dB
Spurious Emissions, conducted	10000 MHz to 40000 MHz	95%	± 3.47 dB
Spurious Emissions, radiated	9 kHz to 30 MHz	95%	± 3.53 dB
Spurious Emissions, radiated	30 MHz to 1000 MHz	95%	± 4.44 dB
Spurious Emissions, radiated	1000 MHz to 30000 MHz	95%	± 2.34 dB
Spurious Emissions, radiated	30000 MHz to 40000 MHz	95%	± 5.13 dB

4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

4.5 Measurement protocol for FCC and ISED

4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

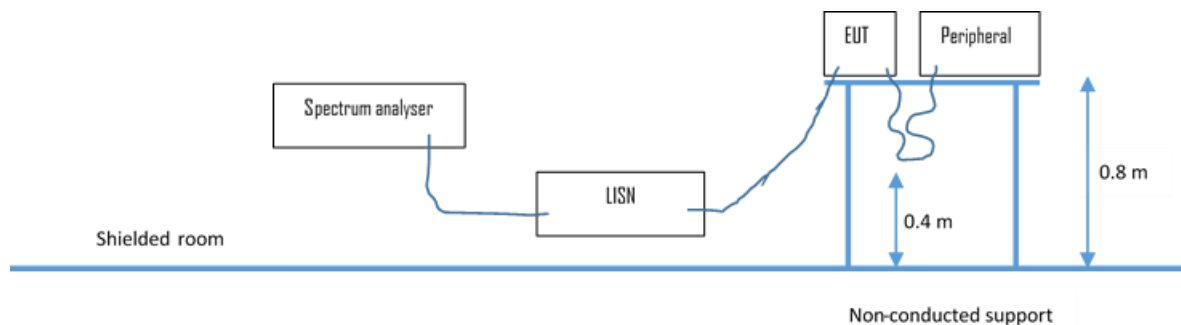
4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in $\text{dB}\mu\text{V}$, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between $\text{dB}\mu\text{V}$ and μV , the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

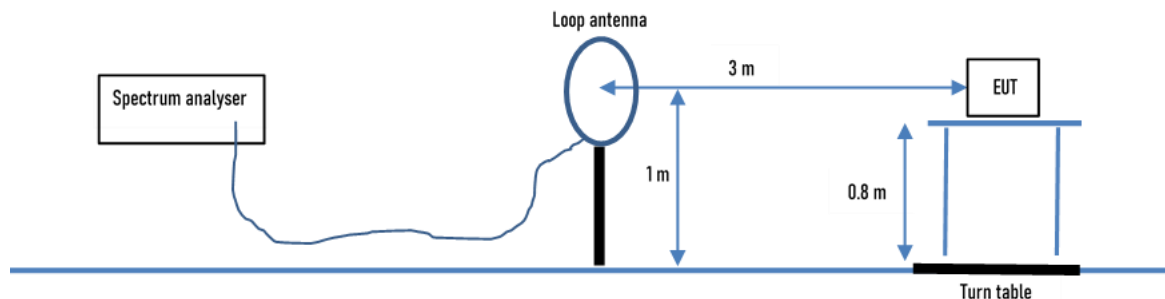
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with $50 \Omega / 50 \mu\text{H}$ (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.5.3.2 Radiated emission

4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

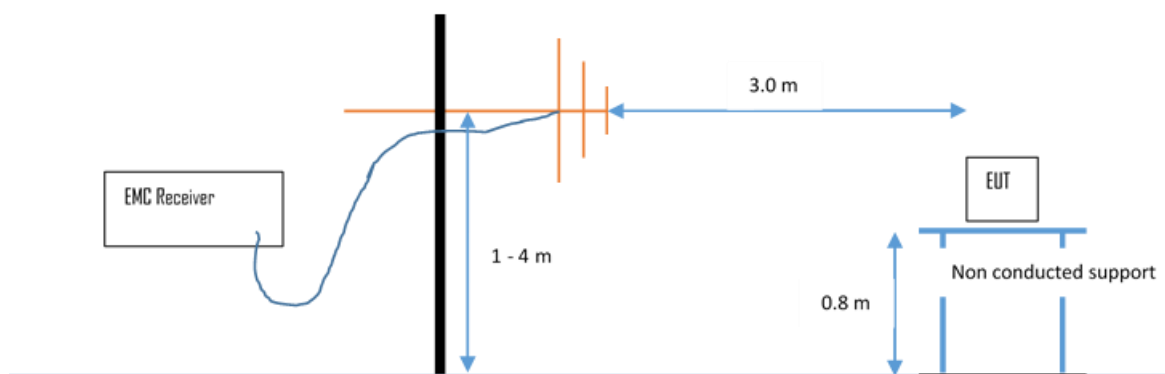
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBμV/m is calculated by taking the reading from the EMI receiver (Level dBμV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

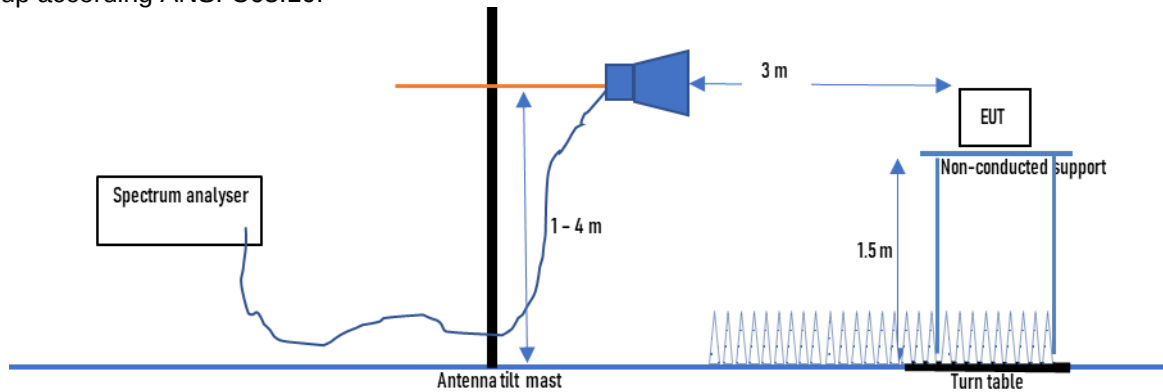
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level (dBμV/m)	-	Limit (dBμV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

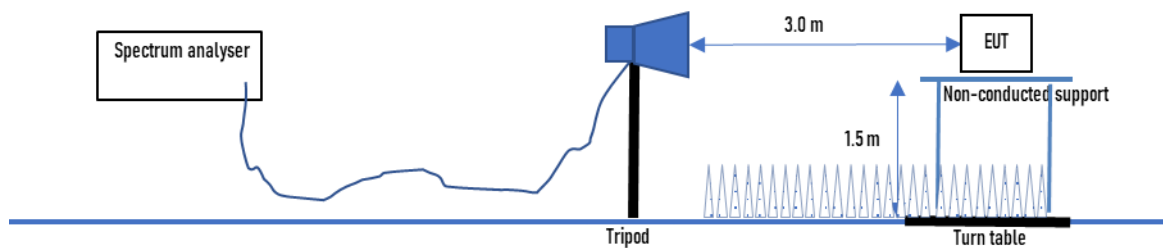
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the centre, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.5.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the centre, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit is adopted.

5 TEST CONDITIONS AND RESULTS

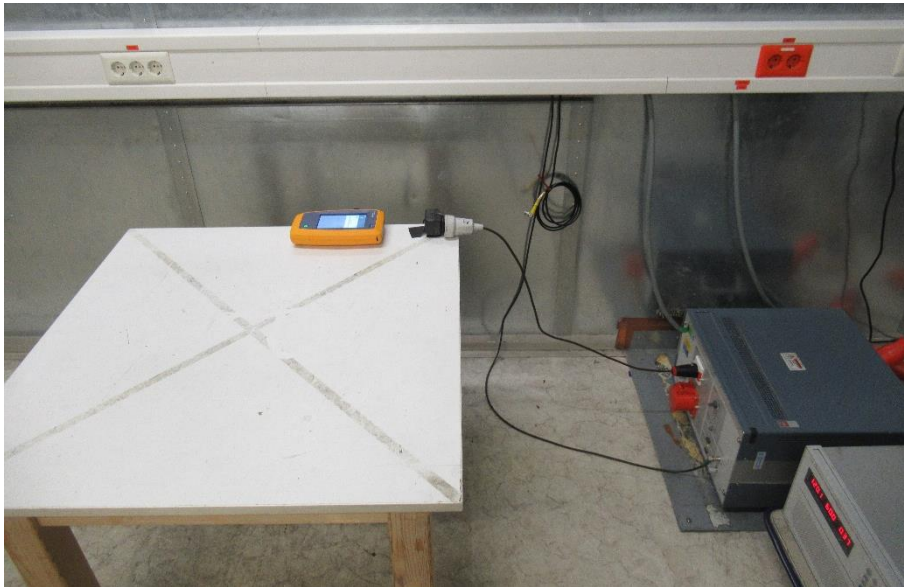
5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

According to RSS-Gen 8.8:

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μ H / 50 Ω line impedance stabilization network.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 19.7 dB at 0.164 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Limit according to RSS-Gen 8.8:

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

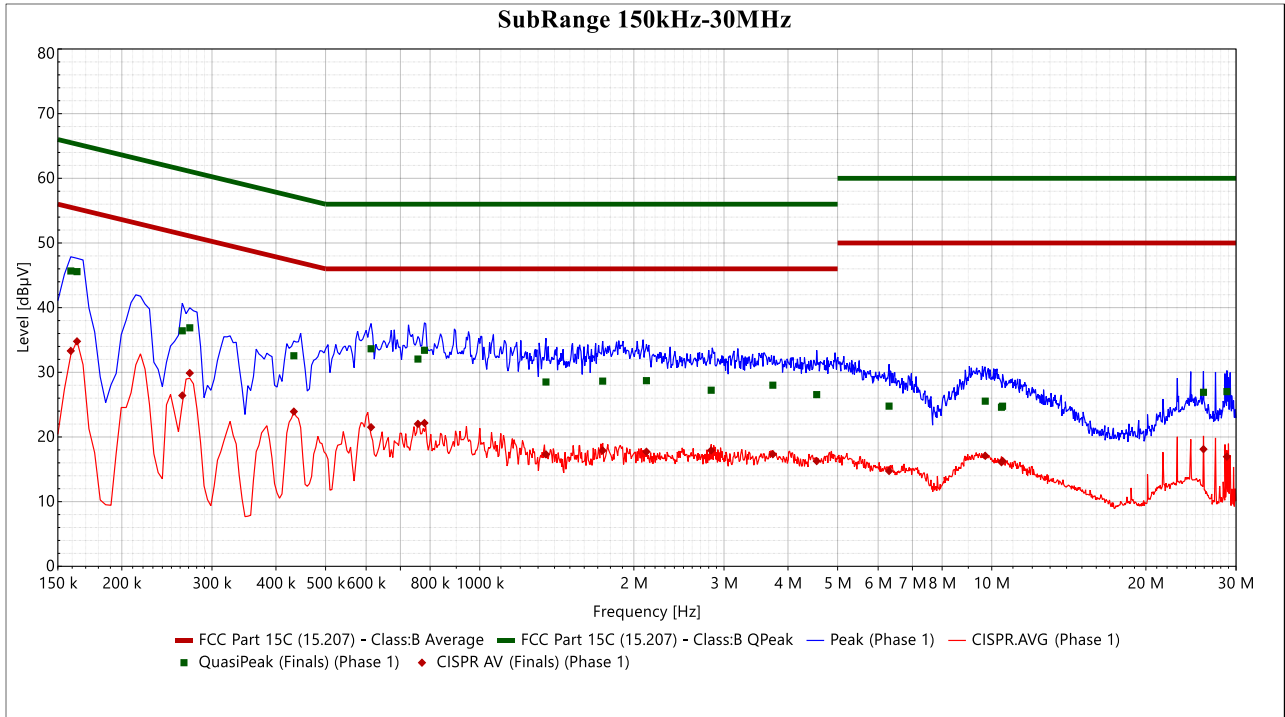
The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols.

5.1.6 Test protocol

Test point L1
Operation mode: TX

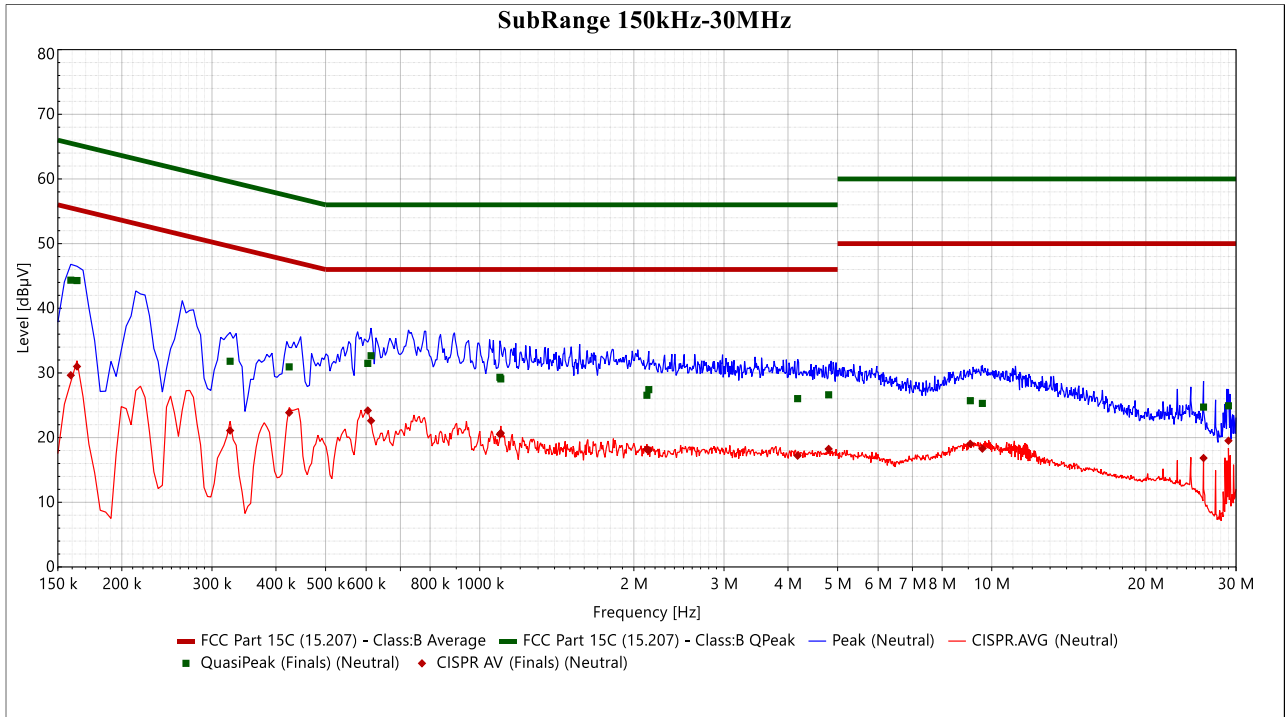
Result: passed



Frequency (Hz)	QuasiPeak (dBμV)	QP Margin	QP Limit (dBμV)	CISPR AV (dBμV)	CISPR AV Margin	AV Limit (dBμV)	Line	Correction (dB)
159 k	45.675	-19.841	65.516	33.314	-22.202	55.516	Phase 1	10.076
163.5 k	45.565	-19.719	65.284	34.787	-20.498	55.284	Phase 1	10.077
262.5 k	36.42	-24.932	61.352	26.408	-24.944	51.352	Phase 1	10.1
271.5 k	36.883	-24.188	61.072	29.883	-21.189	51.072	Phase 1	10.102
433.5 k	32.558	-24.628	57.185	23.929	-23.257	47.185	Phase 1	10.147
613.5 k	33.644	-22.356	56	21.514	-24.486	46	Phase 1	10.162
757.5 k	32.052	-23.948	56	22.023	-23.977	46	Phase 1	10.182
780 k	33.412	-22.588	56	22.164	-23.836	46	Phase 1	10.185
1.347 M	28.496	-27.504	56	17.306	-28.694	46	Phase 1	10.256
1.7385 M	28.636	-27.364	56	17.912	-28.088	46	Phase 1	10.274
2.1165 M	28.709	-27.291	56	17.724	-28.276	46	Phase 1	10.277
2.832 M	27.227	-28.773	56	17.925	-28.075	46	Phase 1	10.324
3.7365 M	28.009	-27.991	56	17.33	-28.67	46	Phase 1	10.358
4.551 M	26.552	-29.448	56	16.271	-29.729	46	Phase 1	10.413
6.3015 M	24.766	-35.234	60	14.736	-35.264	50	Phase 1	10.552
9.7125 M	25.535	-34.465	60	17.086	-32.914	50	Phase 1	10.645
10.446 M	24.598	-35.402	60	16.098	-33.902	50	Phase 1	10.693
10.5 M	24.762	-35.238	60	16.295	-33.705	50	Phase 1	10.699
25.9125 M	26.906	-33.094	60	18.112	-31.888	50	Phase 1	11.469
28.7925 M	27.024	-32.976	60	16.949	-33.051	50	Phase 1	11.467

Test point: N
Operation mode: TX

Result: passed



Frequency (Hz)	QuasiPeak (dBµV)	QP Margin	QP Limit (dBµV)	CISPR AV (dBµV)	CISPR AV Margin	AV Limit (dBµV)	Line	Correction (dB)
159 k	44.351	-21.165	65.516	29.638	-25.878	55.516	Neutral	10.107
163.5 k	44.29	-20.994	65.284	30.997	-24.287	55.284	Neutral	10.108
325.5 k	31.812	-27.753	59.565	21.085	-28.48	49.565	Neutral	10.157
424.5 k	30.943	-26.417	57.36	23.856	-23.504	47.36	Neutral	10.172
604.5 k	31.477	-24.523	56	24.186	-21.814	46	Neutral	10.187
613.5 k	32.66	-23.34	56	22.61	-23.39	46	Neutral	10.188
1.095 M	29.333	-26.667	56	20.506	-25.494	46	Neutral	10.237
1.0995 M	29.082	-26.918	56	20.699	-25.301	46	Neutral	10.237
2.121 M	26.545	-29.455	56	18.187	-27.813	46	Neutral	10.309
2.139 M	27.421	-28.579	56	18.08	-27.92	46	Neutral	10.311
4.1775 M	26.027	-29.973	56	17.198	-28.802	46	Neutral	10.42
4.803 M	26.62	-29.38	56	18.249	-27.751	46	Neutral	10.437
9.0825 M	25.706	-34.294	60	19.033	-30.967	50	Neutral	10.638
9.5865 M	25.291	-34.709	60	18.29	-31.71	50	Neutral	10.642
25.9215 M	24.718	-35.282	60	16.844	-33.156	50	Neutral	11.109
28.9905 M	24.919	-35.081	60	19.518	-30.482	50	Neutral	11.023

5.2 Maximum output power, radiated

For test instruments and accessories used see section 6 Part **CPR 3**.

5.2.1 Description of the test location

Test location: Anechoic chamber 1

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):

The maximum conducted output power over the frequency band of operation shall not exceed the effective values. If transmitting antennas of directional gain are greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-247 6.2:

The output power and e.i.r.p. of the equipment wanted emission shall be measured in terms of average value.

5.2.4 Description of Measurement

The output power is measured radiated using a spectrum analyser. The EUT has a constant duty cycle and may be smaller than 98% therefore the procedure according the KDB 789033 D02; item E d) Method SA-2 Alternative is followed. The EUT is set while measuring in TX continuous mode with a maximum duty cycle. The output power is integrated across the channel bandwidth.

Spectrum analyser settings:

RBW: 1 MHz, VBW: 3 MHz,
Power mode: max hold;

Detector: RMS (power averaging),
Band power function: OBW, Span: >OBW

5.2.5 Test result

Test results radiated according to FCC §15.407(a)						
Modulation	Channel	Frequency	Measured fieldstrength	Calculated EIRP	Conducted Tx-Power Limit	Margin
		MHz	dB(μV/m)	dBm	dBm	dB
ax HE20, MCS-0	CH36	5180	107.8	12.6	24	-11.4
	CH64	5320	106.8	11.6	24	-12.4
	CH100	5500	106.5	11.3	24	-12.7
	CH116	5500	108.2	13.0	24	-11.1
	CH140	5700	100.0	4.8	24	-19.2
	CH149	5745	106.8	11.6	30	-18.4
	CH165	5825	105.6	10.4	30	-19.6
ax HE40, MCS-0	CH38	5190	102.7	7.5	24	-16.5
	CH62	5310	101.0	5.8	24	-18.2
	CH102	5510	99.0	3.8	24	-20.2
	CH134	5670	104.9	9.6	24	-14.4
	CH151	5755	105.3	10.1	30	-19.9
	CH159	5795	104.1	8.9	30	-21.1
ax HE80, MCS-0	CH42	5210	104.0	8.8	24	-15.2
	CH58	5290	100.7	5.5	24	-18.6
	CH106	5530	100.3	5.1	24	-18.9
	CH122	5610	105.8	10.6	30	-19.4
	CH155	5775	106.0	10.8	30	-19.2

Peak power limit according to FCC Part 15E, Section 15.407(a):

Frequency	Radiated Power Limit	Conducted Power Limit
GHz	dBm	dBm
5.150 – 5.250	30	24
5.250 – 5.350	30	11 + 10*log(EBW) or 24
5.470 – 5.725	30	11 + 10*log(EBW) or 24
5.725 – 5.850	36	30

Whichever is the lesser applies.

Test results radiated according to RSS-247 6.2						
Modulation	Channel	Frequency	Measured fieldstrength	Calculated EIRP	Conducted Tx-Power Limit	Margin
		MHz	dB(μV/m)	dBm	dBm	dB
ax HE20, MCS-0	CH36	5180	107.8	12.6	23	-10.4
	CH64	5320	106.8	11.6	24	-12.4
	CH100	5500	106.5	11.3	24	-12.7
	CH116	5500	108.2	13.0	24	-11.1
	CH140	5700	100.0	4.8	24	-19.2
	CH149	5745	106.8	11.6	30	-18.4
	CH165	5825	105.6	10.4	30	-19.6
ax HE40, MCS-0	CH38	5190	102.7	7.5	23	-15.5
	CH62	5310	101.0	5.8	24	-18.2
	CH102	5510	99.0	3.8	24	-20.2
	CH134	5670	104.9	9.6	24	-14.4
	CH151	5755	105.3	10.1	30	-19.9
	CH159	5795	104.1	8.9	30	-21.1
ax HE80, MCS-0	CH42	5210	104.0	8.8	23	-14.2
	CH58	5290	100.7	5.5	24	-18.6
	CH106	5530	100.3	5.1	24	-18.9
	CH155	5775	106.0	10.8	30	-19.2

Peak power limit according to RSS-247 6.2:

Frequency	Radiated Power Limit	Conducted Power Limit
GHz	dBm	dBm
5.150 – 5.250	11 + 10*log(OBW) or 23	11 + 10*log(OBW) or 23
5.250 – 5.350	17 + 10*log(OBW) or 30	11 + 10*log(OBW) or 24
5.470 – 5.600	17 + 10*log(OBW) or 30	11 + 10*log(OBW) or 24
5.650 – 5.725	17 + 10*log(OBW) or 30	11 + 10*log(OBW) or 24
5.725 – 5.850	36	30

Whichever is the lesser applies.

The requirements are **FULFILLED**.

Remarks: Note: Conducted limits are consulted despite radiated measurement, for antenna gain please refer to section 2.10.

5.3 Undesirable emission, radiated

For test instruments and accessories used see section 6 Part **SER 1, SER 2 and SER 3.**

5.3.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1
Test distance: 3 m

5.3.2 Photo documentation of the test set-up

9 kHz - 30 MHz:



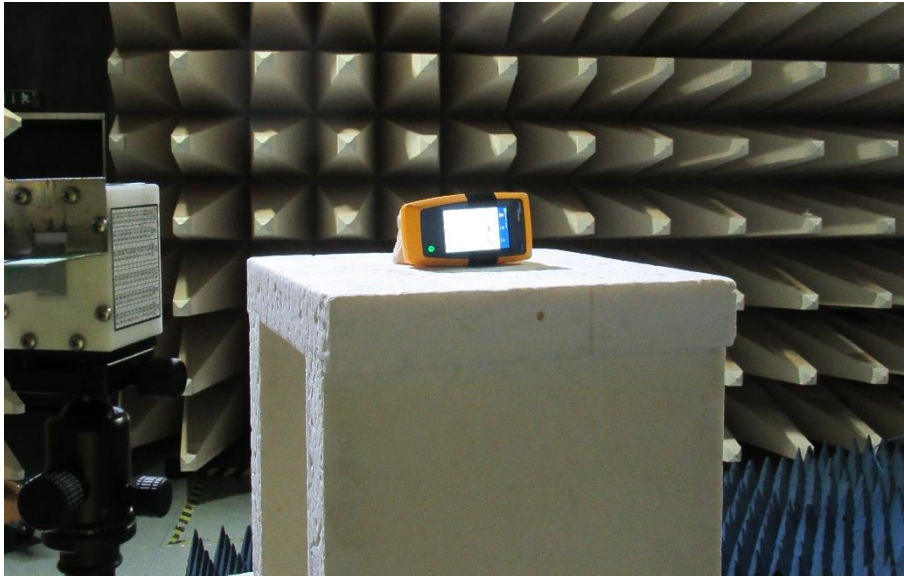
30 MHz - 1 GHz:



1 GHz - 18 GHz:



18 GHz - 40 GHz:



5.3.3 Applicable standard

According to FCC Part 15E, Section 15.407(b):

Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the appropriate limits.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

According to RSS-6.2:

The power and e.i.r.p. of the equipment unwanted emission shall be measured in peak value. However, the equipment is required to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands which are listed in the same standard.

5.3.4 Description of Measurement

Unwanted emission is measured with the setup set out in ANSI C63.10, item 12.7. The plots show the general limit average 54 dBμV/m and the peak limit for out of band emission -27 dBm/MHz (68.3 dBμV/m). This way we are able to verify the undesirable limit and the general limit within the restricted bands in one plot.

If the emission level of the EUT in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported. Up from 8 GHz a HP filter is used. A conversion EIRP to Field strength is done with the formula which applies at 3 m measurement distance only.

$$\frac{EIRP}{dBm} = \frac{FS}{dB(\frac{\mu V}{m})} + 95.2$$

Test receiver settings for SER1, SER2:

9kHz-150kHz	RBW: 200 Hz	Detector: Quasi peak*	Meas. Time: 1 s,
150kHz-30MHz	RBW: 9 kHz	Detector: Quasi peak*	Meas. Time: 1 s,
30MHz-1GHz	RBW: 120 MHz	Detector: Quasi peak	Meas. Time: 1 s,
*AV Detector in the ranges 9-90kHz and 110-490kHz			

Spectrum analyser settings for SER3:

1GHz-40GHz	RBW: 1 MHz	Detector: Max. peak	Trace: Max. hold	Sweep: Auto
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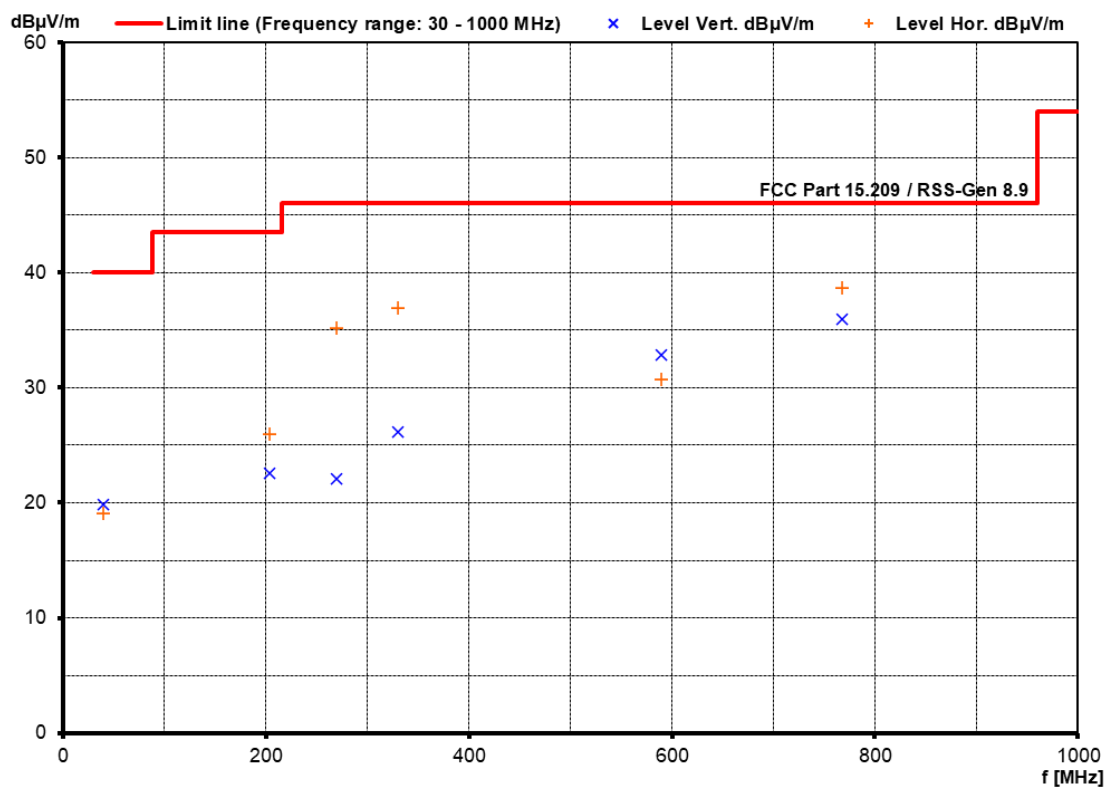
5.3.5 Test result

f < 30 MHz:

During the measurements no emissions from the EUT could be detected in the frequency range 9 kHz to 30 MHz

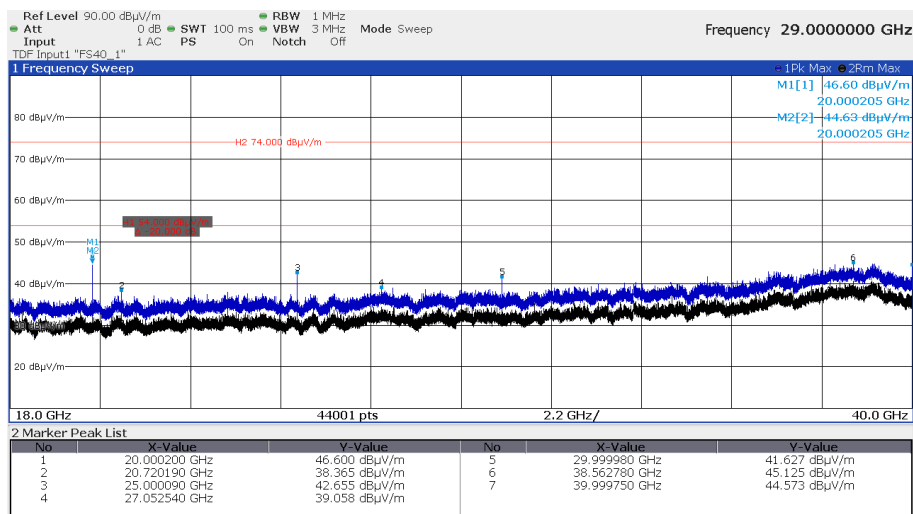
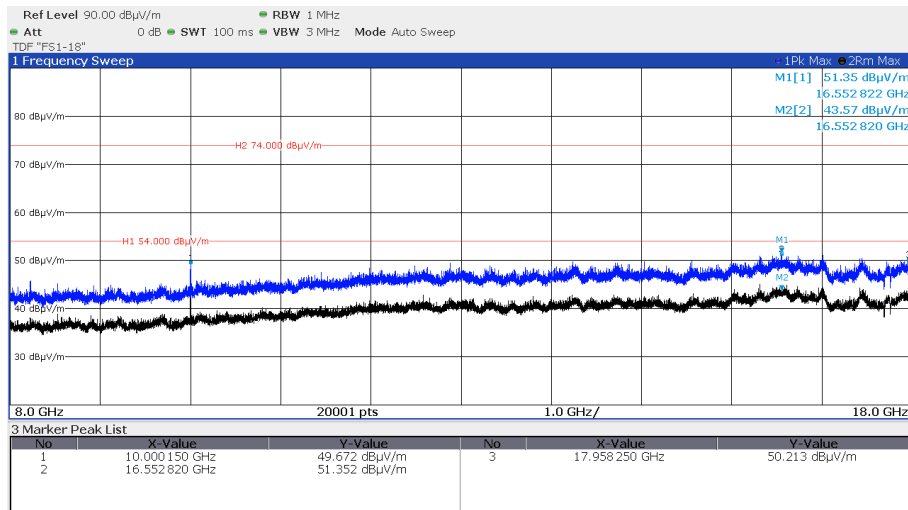
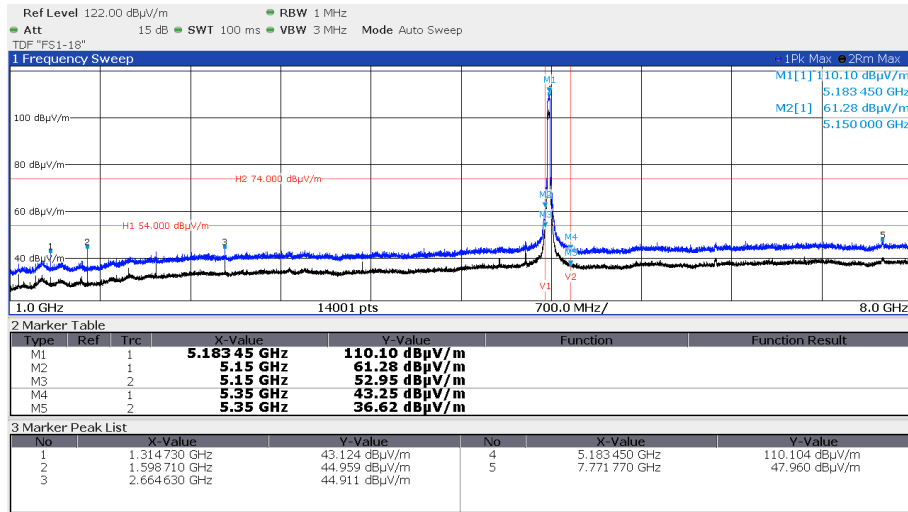
30 MHz < f < 1000 MHz:

Frequency (MHz)	Reading Vert. (dBμV)	Reading Hor. (dBμV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBμV/m)	Level Hor. (dBμV/m)	Limit (dBμV/m)	Dlimit (dB)
40.00	3.1	1.1	16.8	18.0	19.9	19.1	40.0	-20.1
203.70	5.4	9.3	17.1	16.7	22.5	26.0	43.5	-17.5
270.00	2.7	15.6	19.4	19.5	22.1	35.1	46.0	-10.9
330.00	5.0	15.3	21.1	21.6	26.1	36.9	46.0	-9.1
589.00	4.8	2.4	28.0	28.3	32.8	30.7	46.0	-13.2
768.00	4.9	7.3	31.0	31.4	35.9	38.7	46.0	-7.3

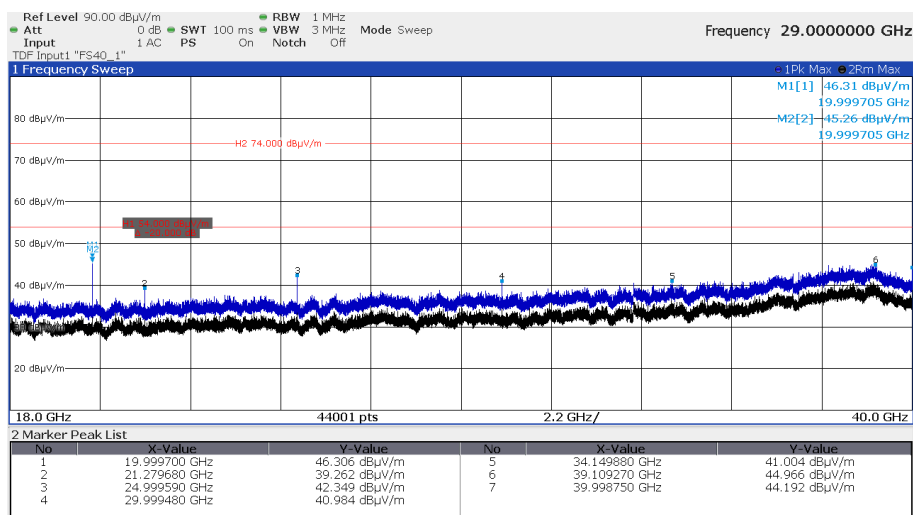
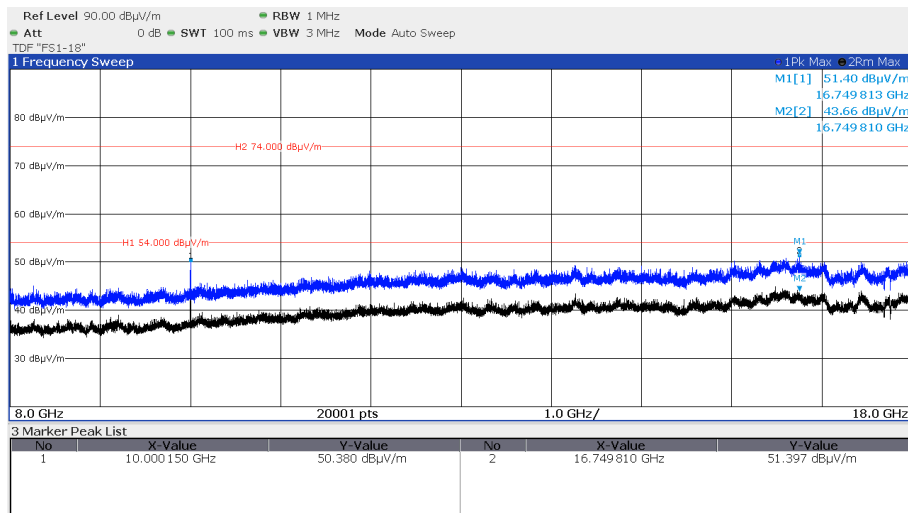
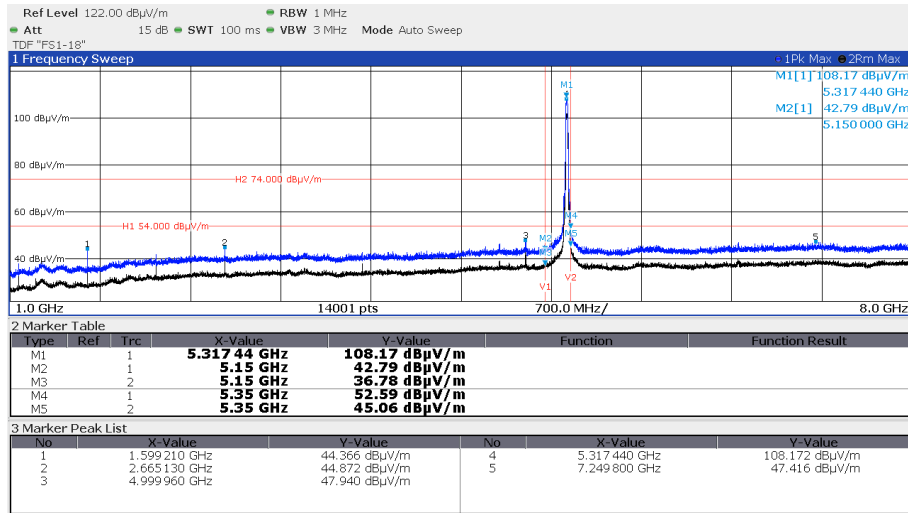


f > 1000 MHz:

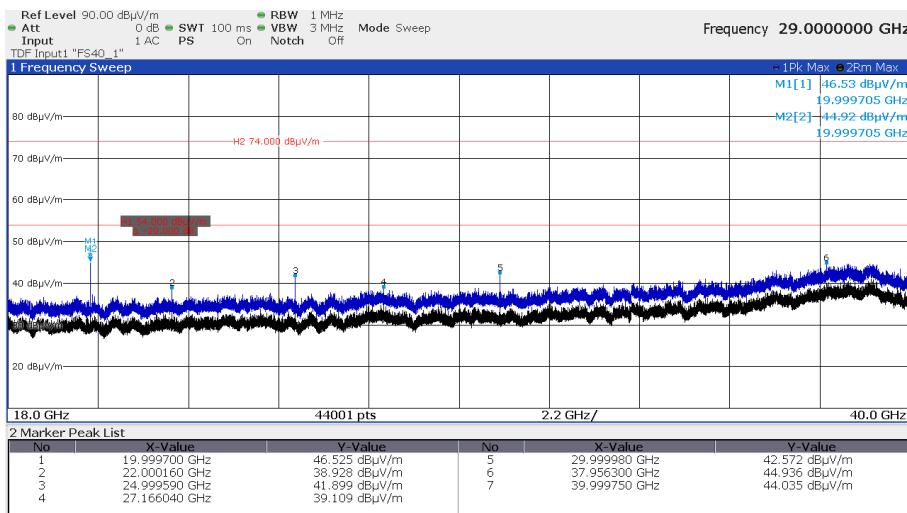
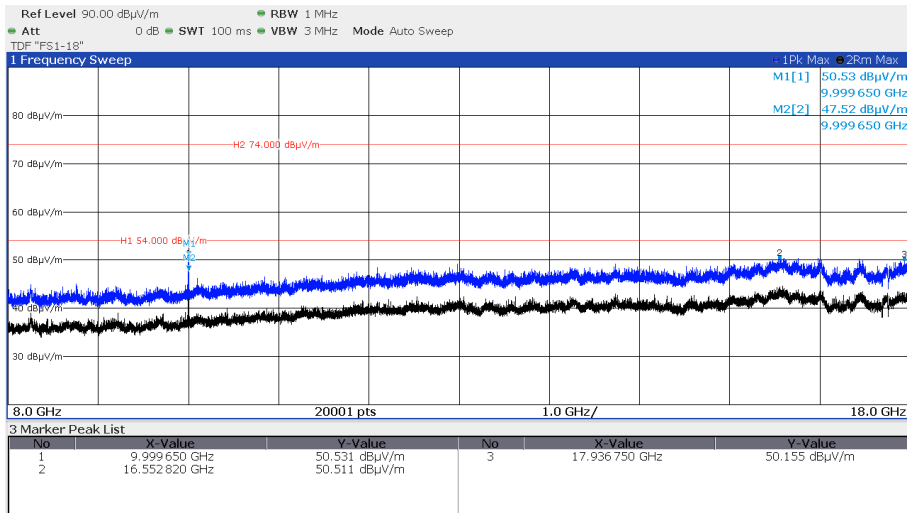
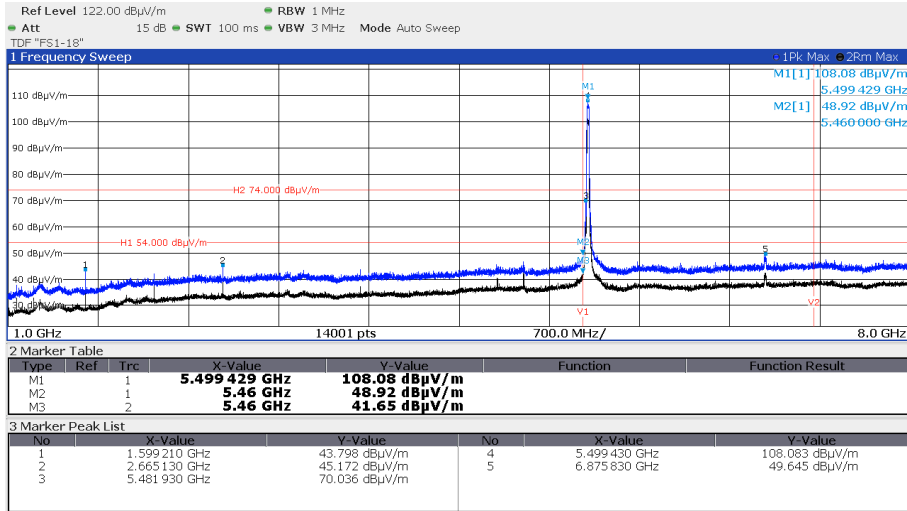
802.11ax, HE20, MCS-0, CH36:



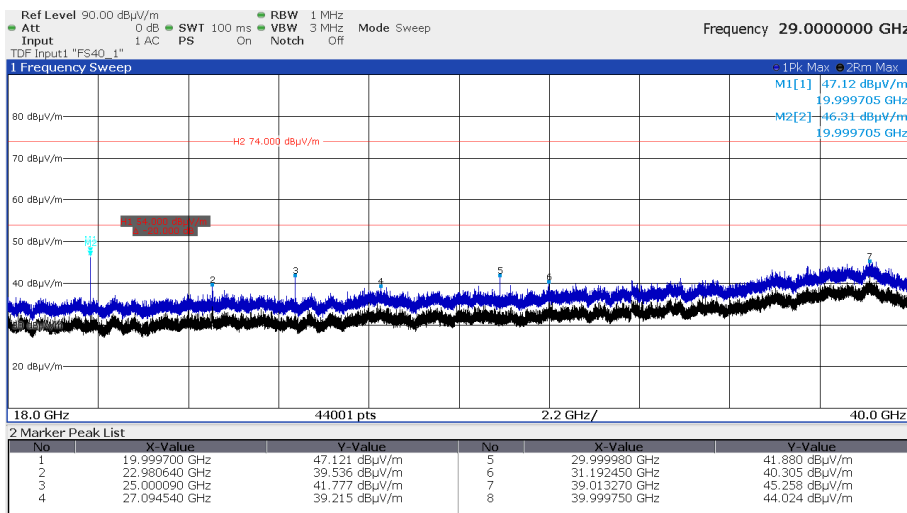
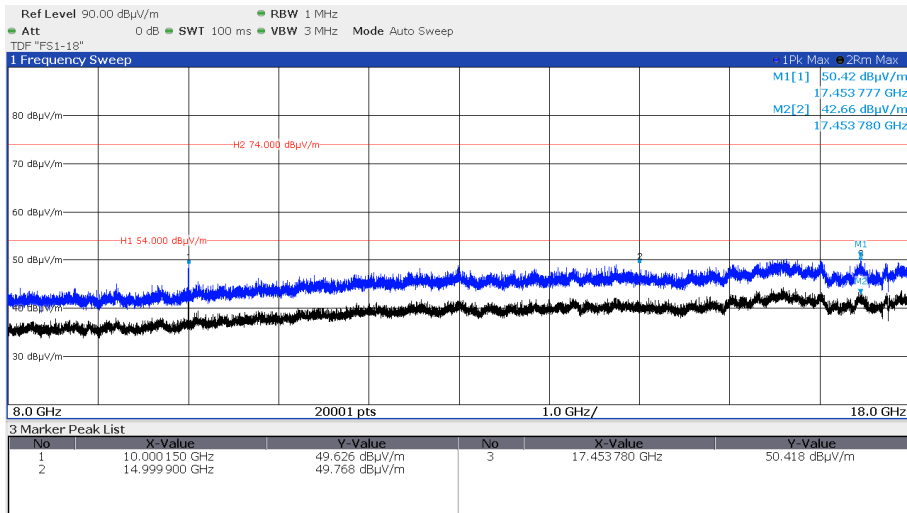
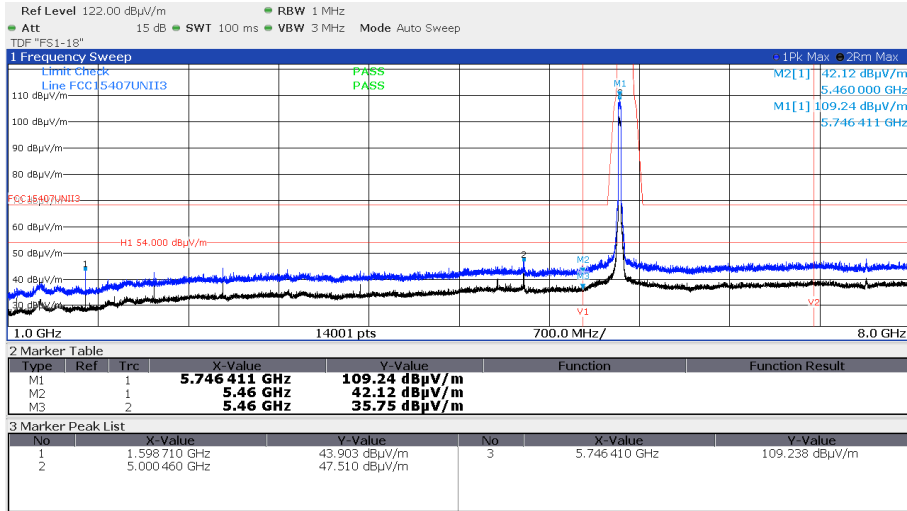
802.11ax, HE20, MCS-0, CH64:



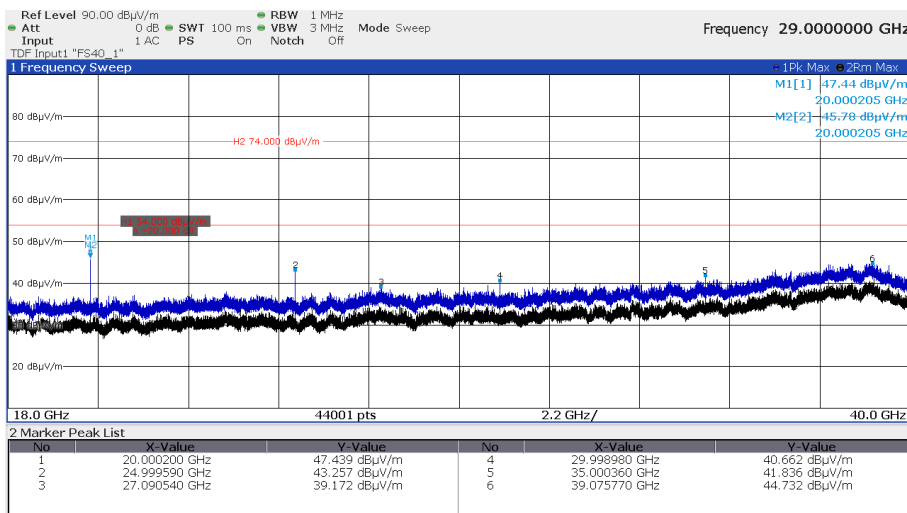
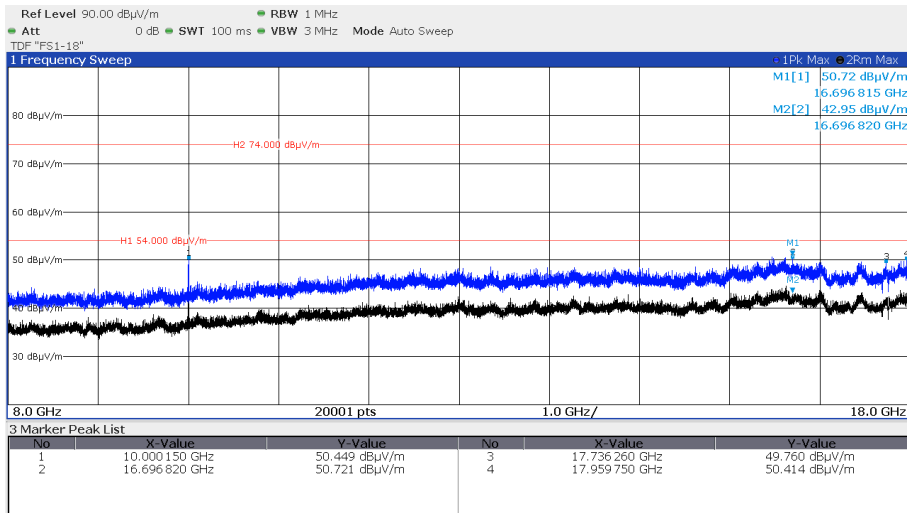
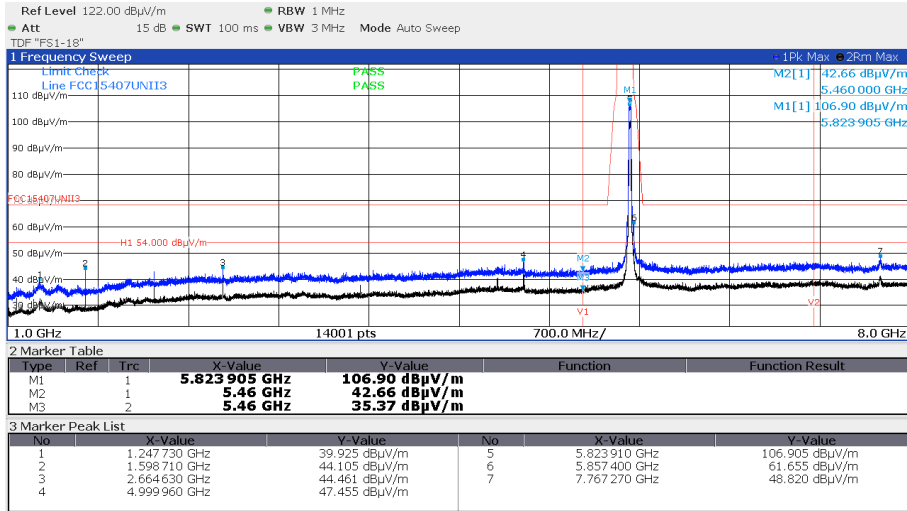
802.11ax, HE20, MCS-0, CH100:



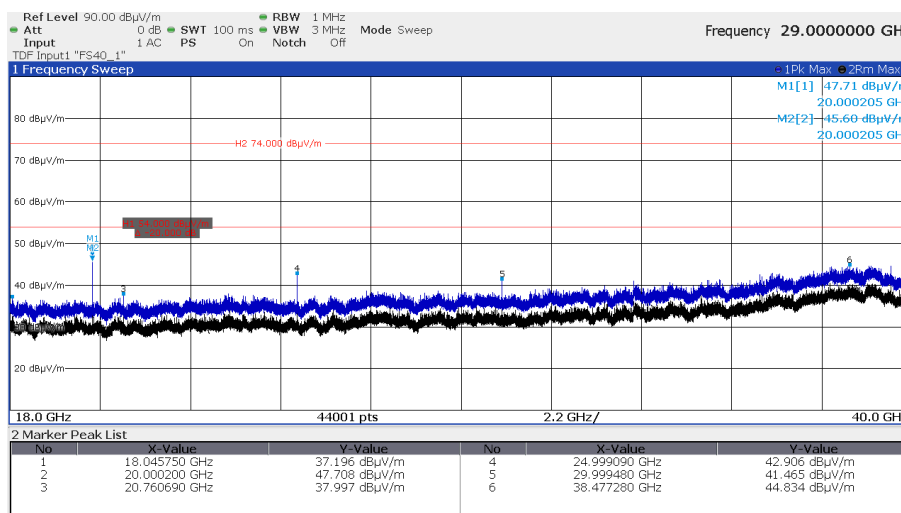
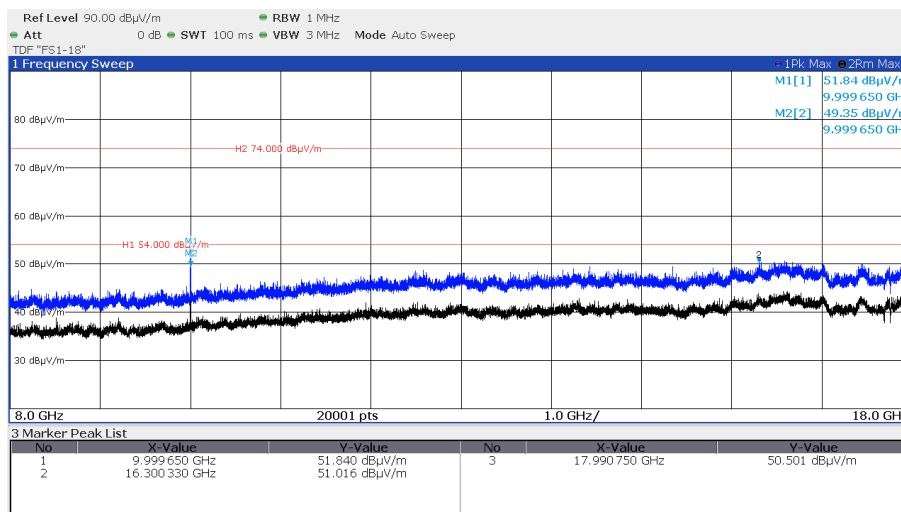
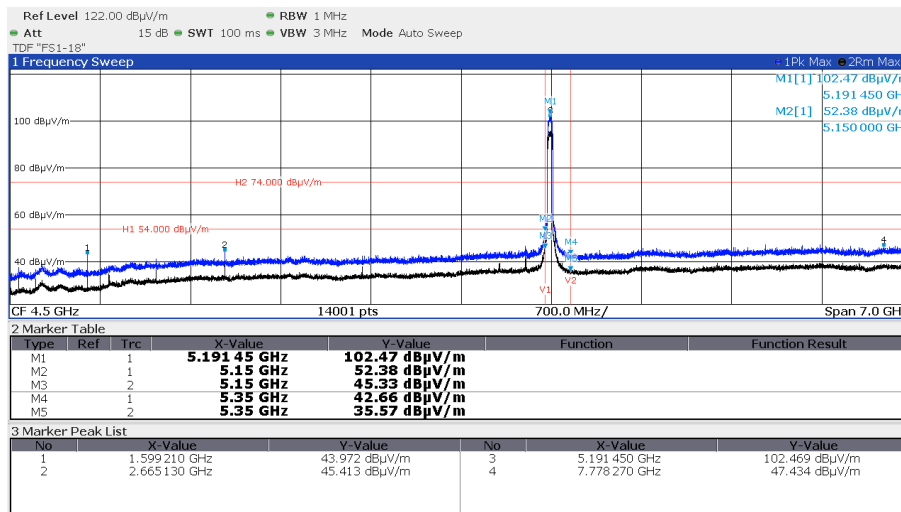
802.11ax, HE20, MCS-0, CH149:



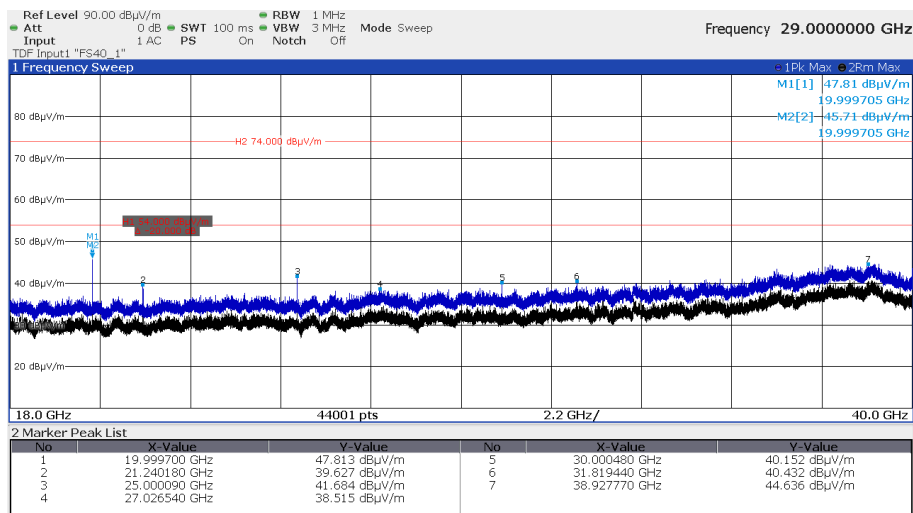
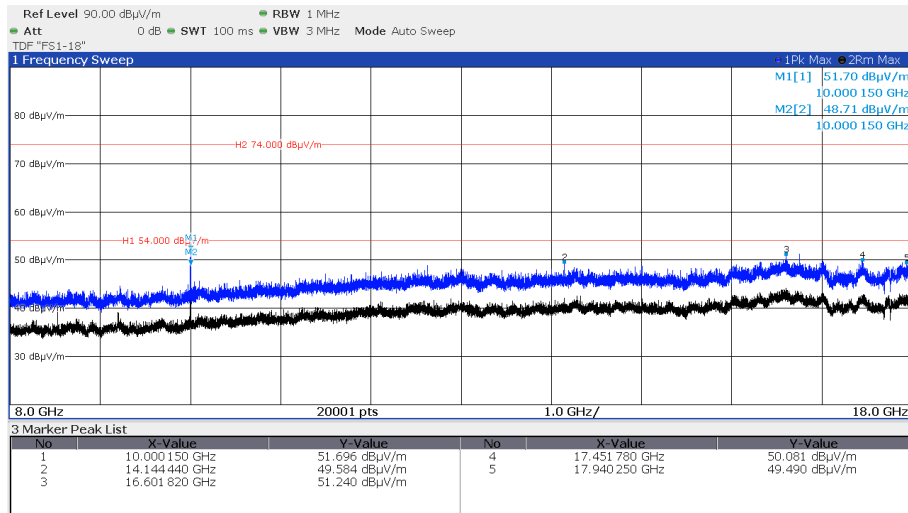
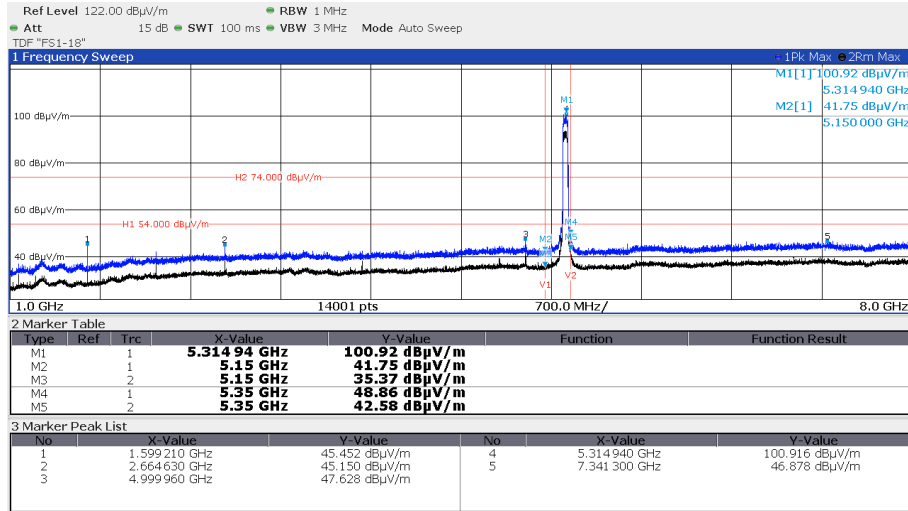
802.11ax, HE20, MCS-0, CH165:



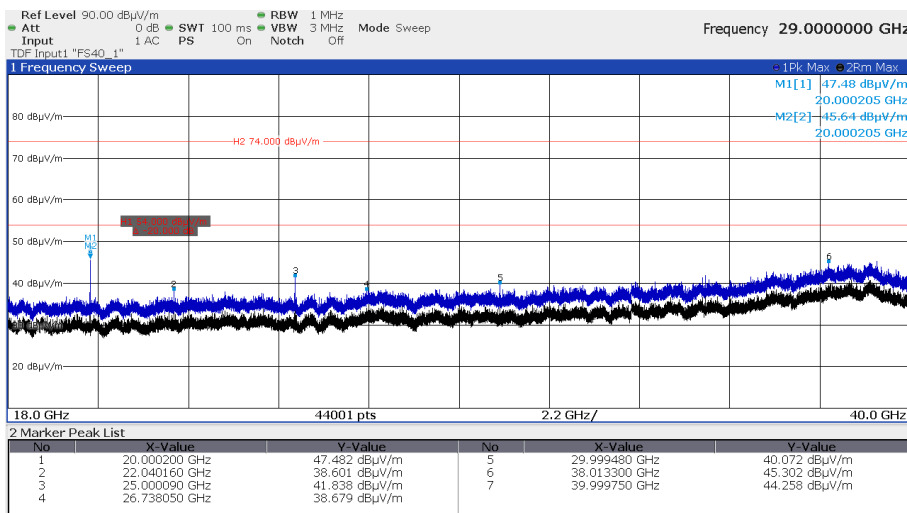
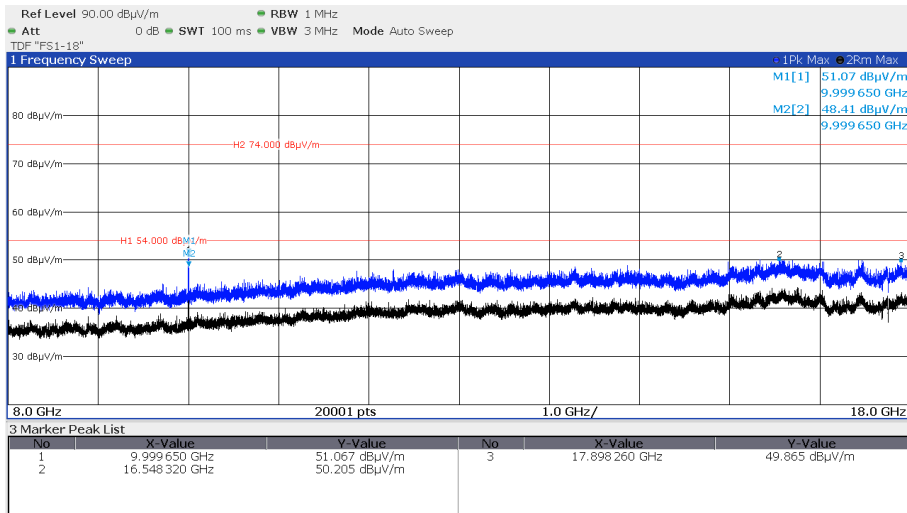
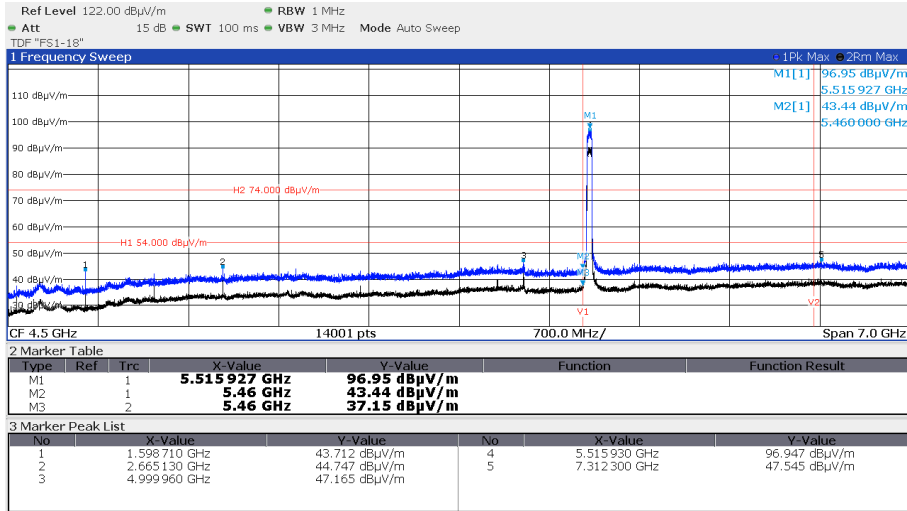
802.11ax, HE40, MCS-0, CH38:



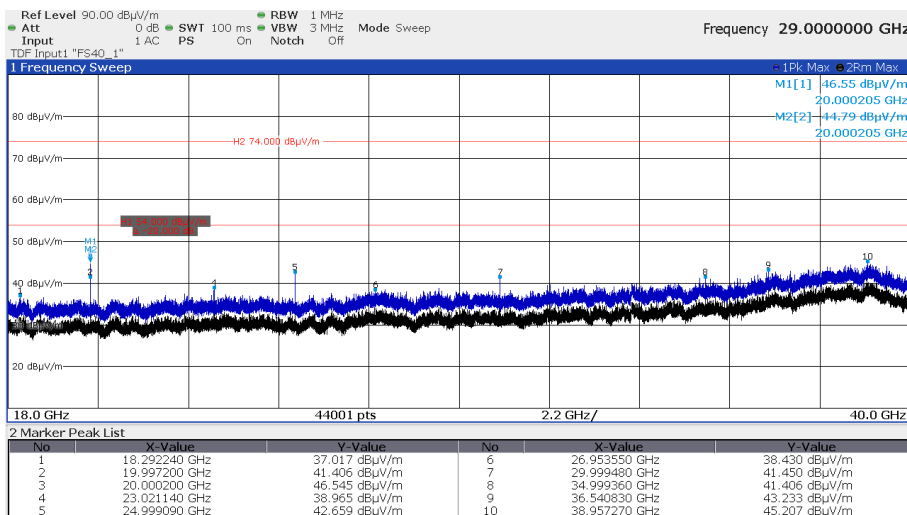
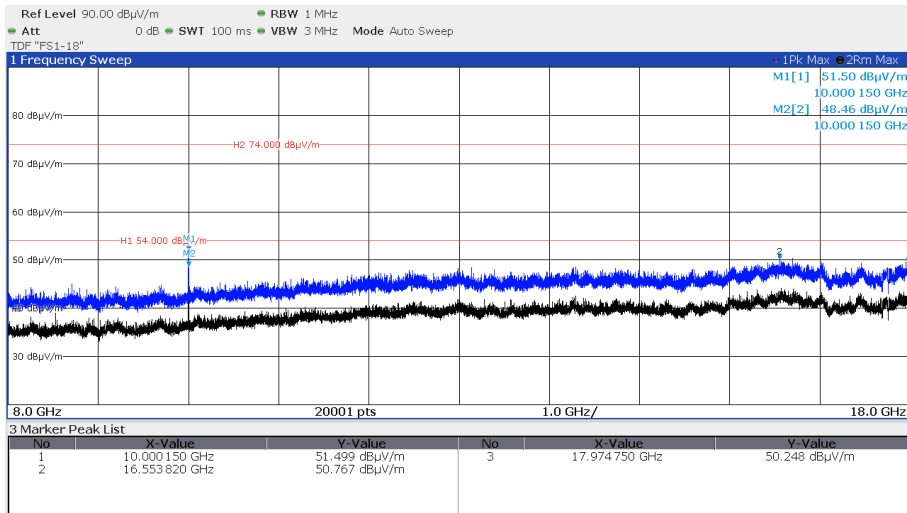
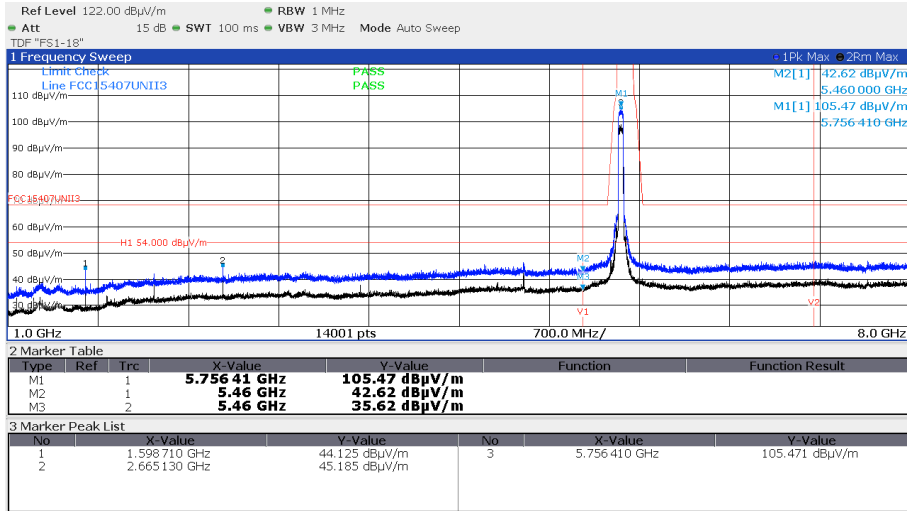
802.11ax, HE40, MCS-0, CH62:



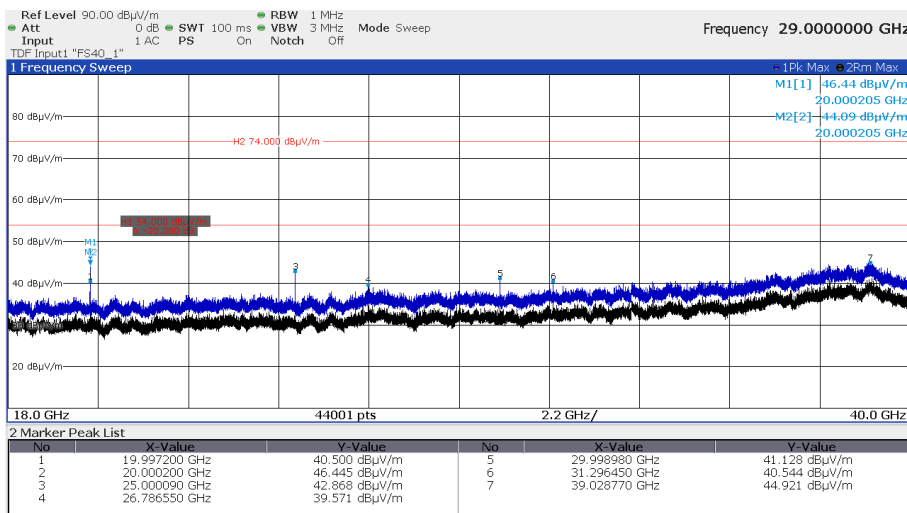
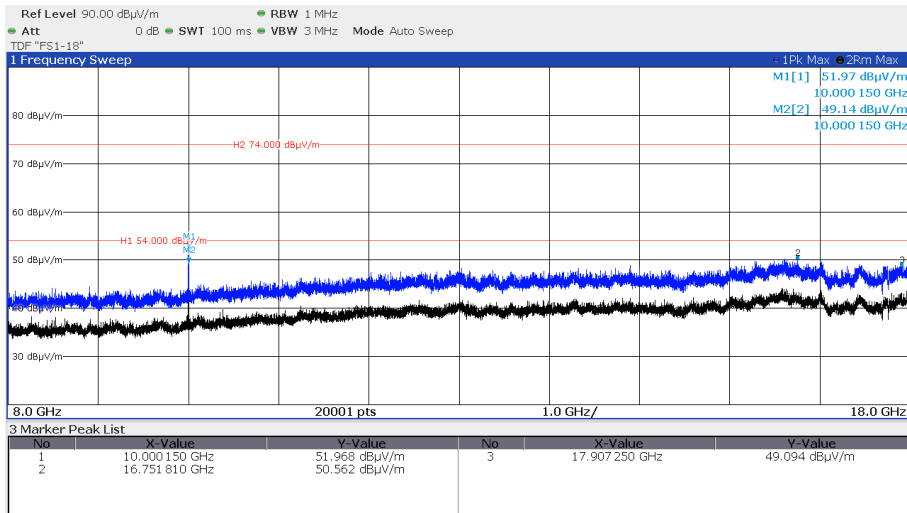
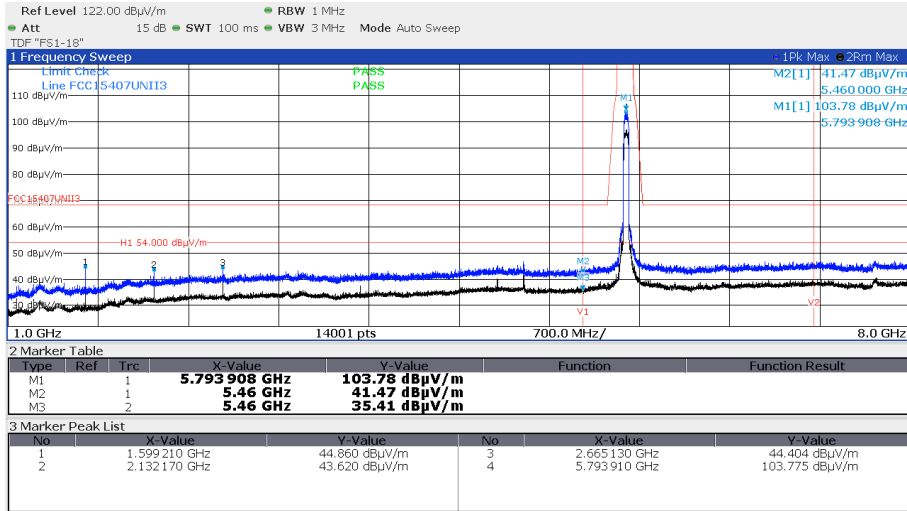
802.11ax, HE40, MCS-0, CH102:



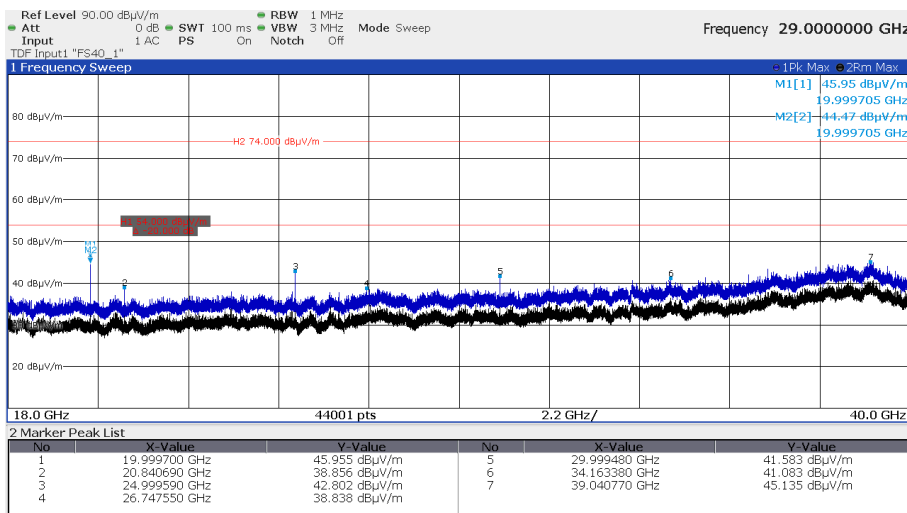
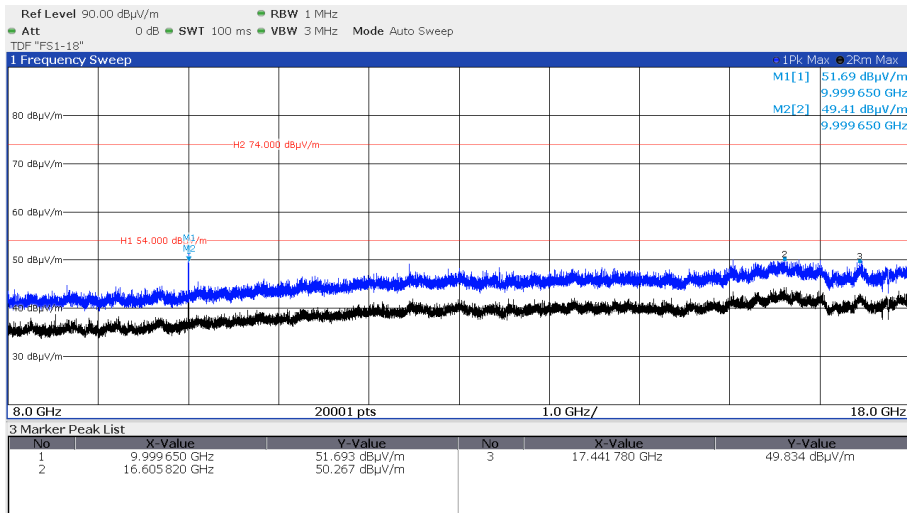
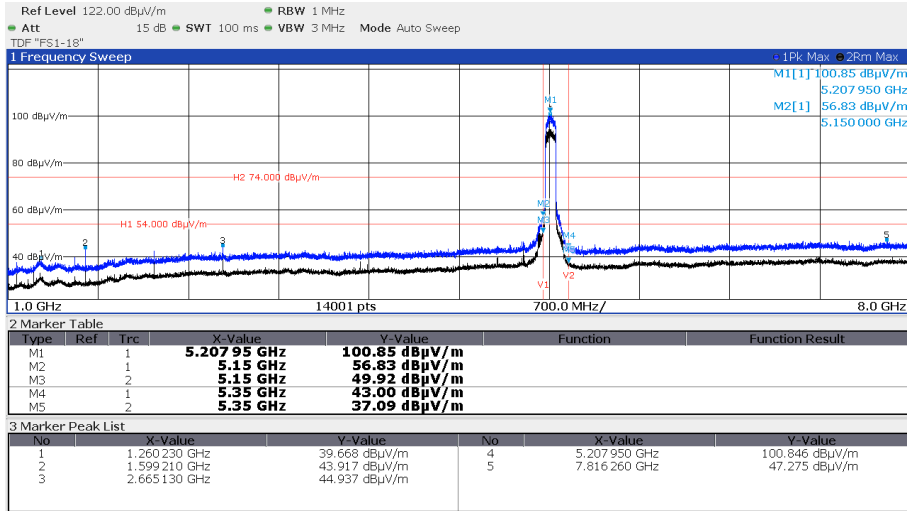
802.11ax, HE40, MCS-0, CH151:



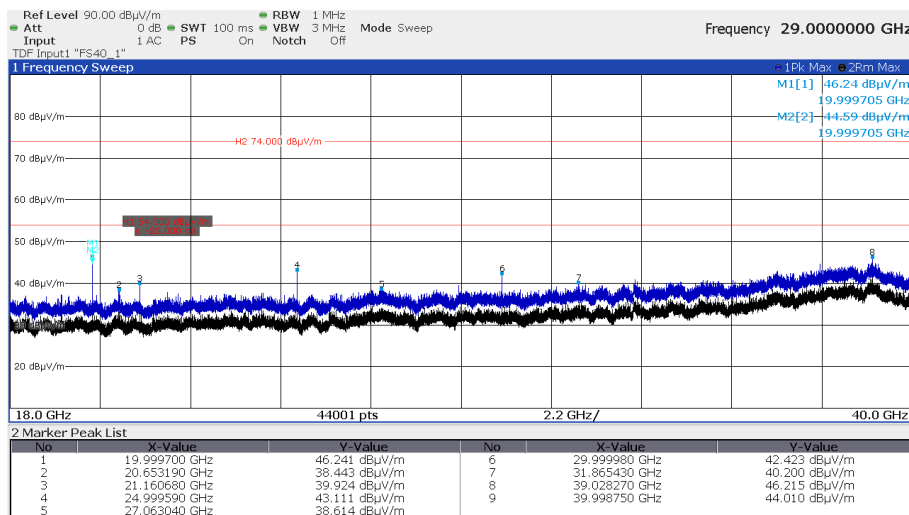
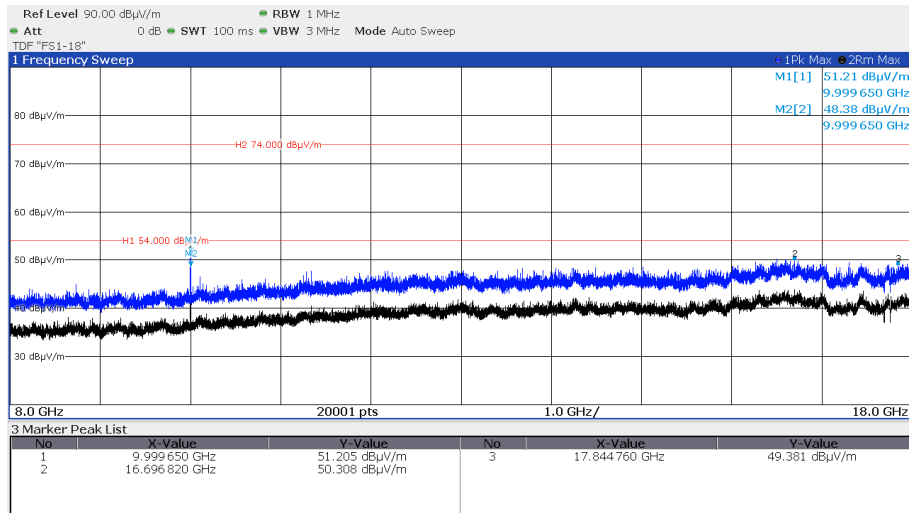
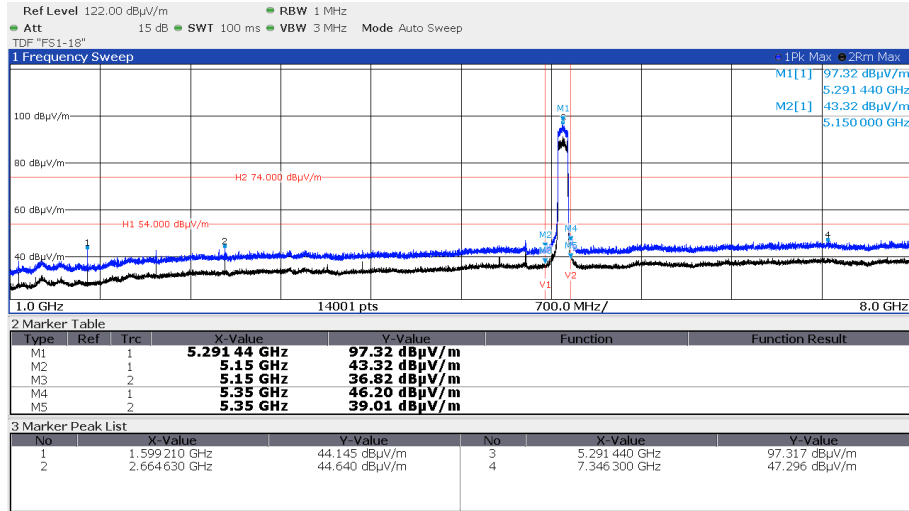
802.11ax, HE40, MCS-0, CH159:



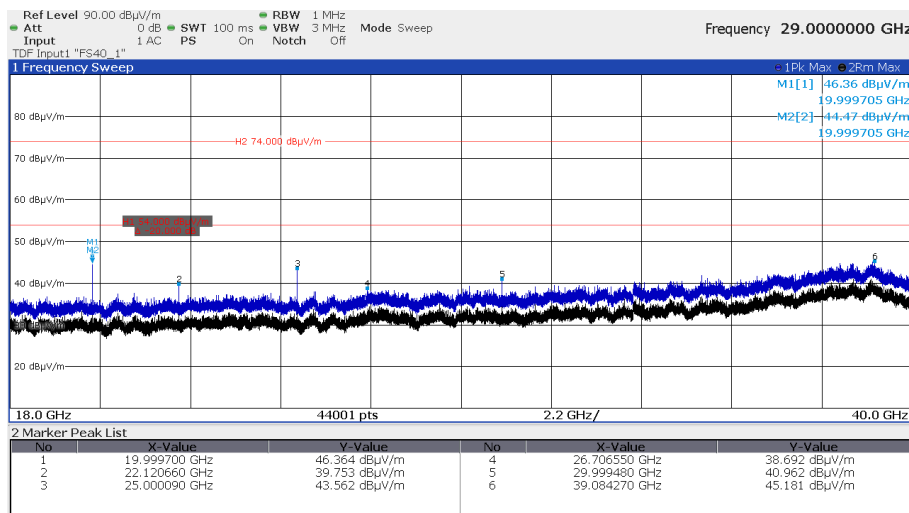
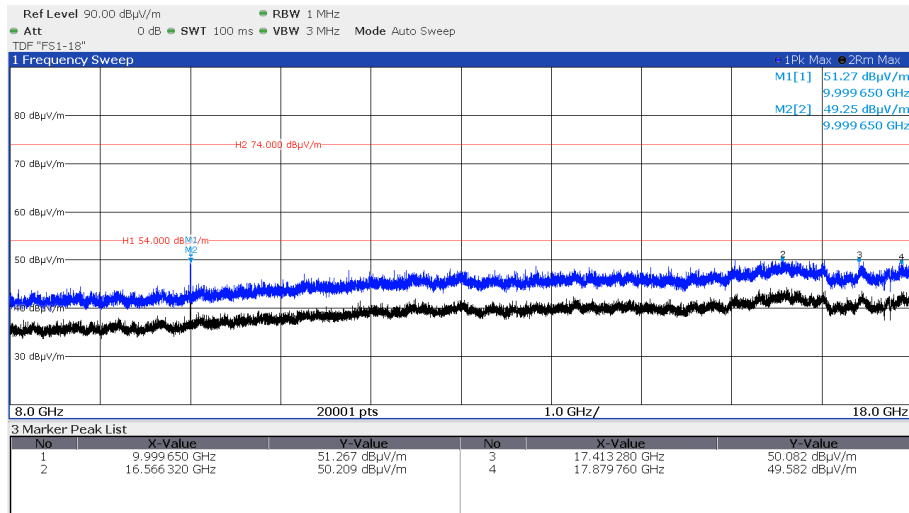
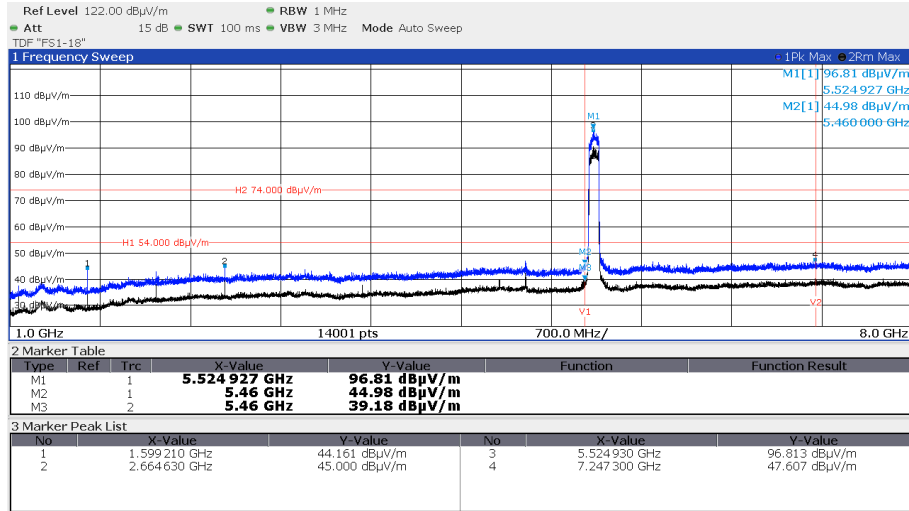
802.11ax, HE80, MCS-0, CH42:



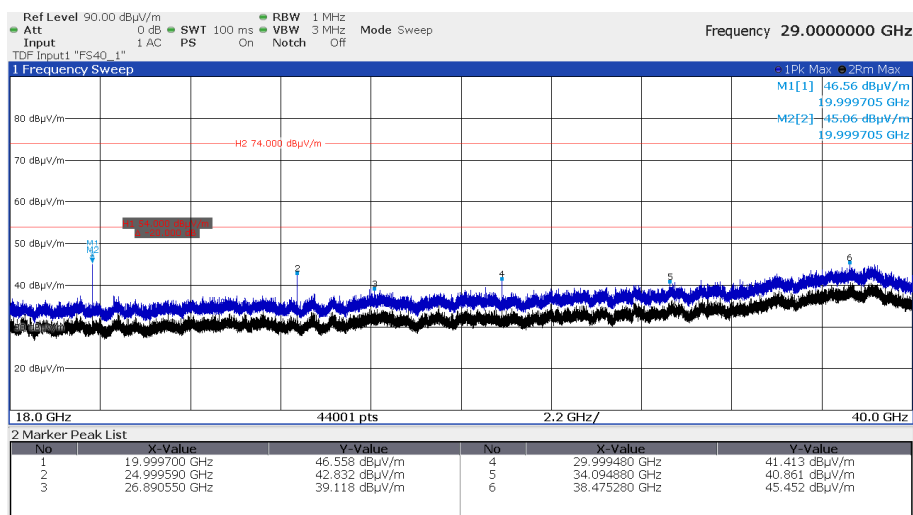
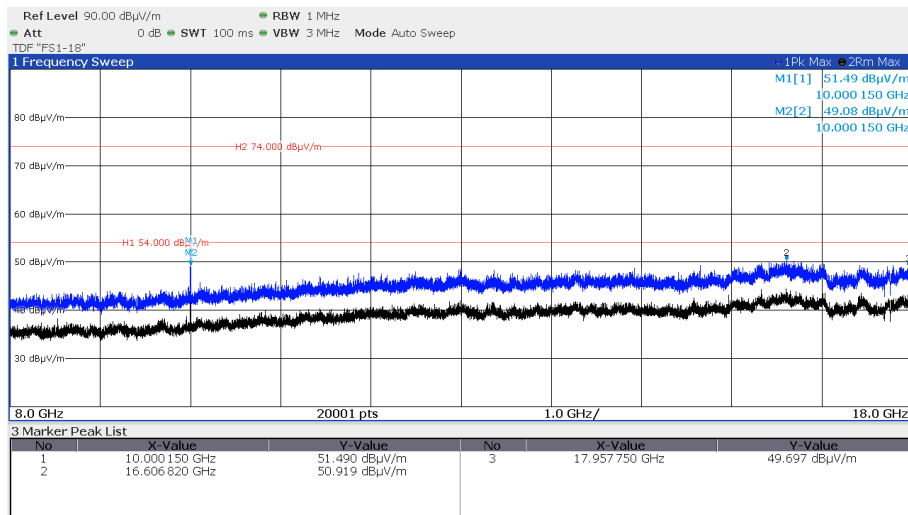
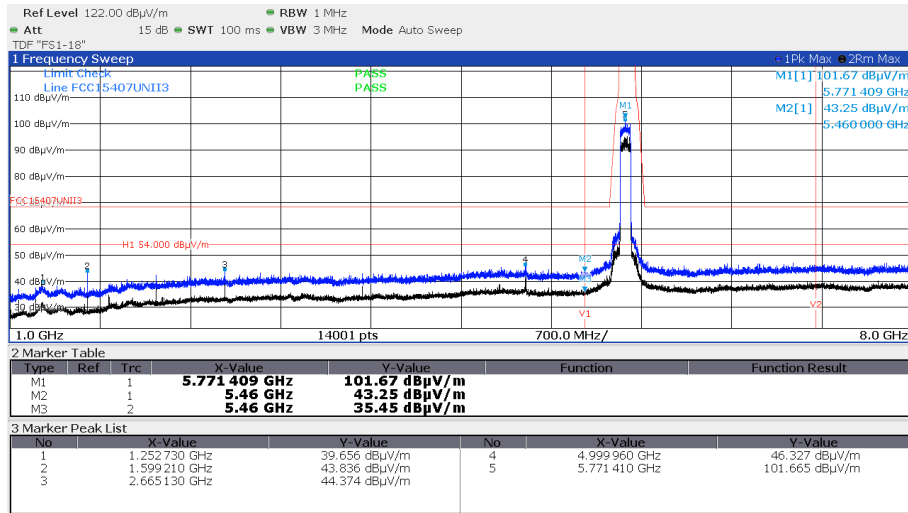
802.11ax, HE80, MCS-0, CH58:



802.11ax, HE80, MCS-0, CH106:



802.11ax, HE80, MCS-0, CH155:



Note: Detail band edge high. Trace 2 (black) shows AV limit is met.

Note: Marker M2 (trace 2) shows AV limit is met.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Limit according to FCC Part 15E, Section 15.407(b):

Operating Frequency range (MHz)	Frequency ranges from band edge (MHz)	Undesirable emission limit, EIRP (dBm / MHz)	Undesirable emission limit, EIRP (dBμV/m / MHz)
5150 - 5250	-	-27.0	68.3
5250 - 5350	-	-27.0	68.3
5470 - 5725	-	-27.0	68.3
5725 - 5850	± 5	27.0 decreasing linearly to 15.6	122.2 decreasing linearly to 110.8
	± 5 - ± 25	15.6 decreasing linearly to 10.0	110.8 decreasing linearly to 105.2
	± 25 - ± 75	10.0 decreasing linearly to -27.0	105.2 decreasing linearly to 68.3
	± 75	-27.0	68.3

Limit according to RSS-247 6.2:

Operating Frequency range (MHz)	Frequency ranges from band edge (MHz)	Undesirable emission limit, EIRP (dBm / MHz)	Undesirable emission limit, EIRP (dBμV/m / MHz)
5150 - 5250	-	-27.0	68.3
5250 - 5350	-	-27.0	68.3
5470 - 5600	-	-27.0	68.3
5650 - 5725	-	-27.0	68.3
5725 - 5850	± 5	27.0 decreasing linearly to 15.6	122.2 decreasing linearly to 110.8
	± 5 - ± 25	15.6 decreasing linearly to 10.0	110.8 decreasing linearly to 105.2
	± 25 - ± 75	10.0 decreasing linearly to -27.0	105.2 decreasing linearly to 68.3
	± 75	-27.0	68.3

Radiated limits according to FCC Part 15, Section 15.209 for spurious emissions which fall in restricted bands:

Frequency (MHz)	15.209 Limits (μV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 - 1.705	24000/f(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Radiated limits according to RSS-Gen, 8.9 for spurious emissions which fall in restricted bands:

Frequency (MHz)	RSS-Gen Limits (μA/m)	Measurement distance (m)
0.009 - -0.49	63.7/f(kHz)	300
0.49 - 1.705	63.7/f(kHz)	30
1.705 - 30.0	0.08	30

Frequency (MHz)	RSS-Gen Limits (μV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Restricted bands of operation FCC Part 15C, Section 15.205:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

Restricted frequency bands RSS-Gen, Table 6:

MHz	MHz	MHz	GHz
0.090 - 0.110	12.57675 - 12.57725	399.9 - 410	7.250 - 7.750
0.495 - 0.505	13.36 - 13.41	608 - 614	8.025 – 8.500
2.1735 - 2.1905	16.42 - 16.423	960 - 1427	9.0 - 9.2
3.020 - 3.026	16.69475 - 16.69525	1435 - 1626.5	9.3 - 9.5
4.125 - 4.128	16.80425 - 16.80475	1645.5 - 1646.5	10.6 - 12.7
4.17725 - 4.17775	25.5 - 25.67	1660 - 1710	13.25 - 13.4
4.20725 - 4.20775	37.5 - 38.25	1718.8 - 1722.2	14.47 - 14.5
5.677 - 5.683	73 - 74.6	2200 - 2300	15.35 - 16.2
6.215 - 6.218	74.8 - 75.2	2310 - 2390	17.7 - 21.4
6.26775 - 6.26825	108 – 138	2483.5 - 2500	22.01 - 23.12
6.31175 - 6.31225	149.9 - 150.05	2655 - 2900	23.6 - 24.0
8.291 - 8.294	156.52475 - 156.52525	3260 – 3267	31.2 - 31.8
8.362 - 8.366	156.7 - 156.9	3332 - 3339	36.43 - 36.5
8.37625 - 8.38675	162.0125 - 167.17	3345.8 - 3358	Above 38.6
8.41425 - 8.41475	167.72 - 173.2	3500 - 4400	
12.29 - 12.293	240 – 285	4500 - 5150	
12.51975 - 12.52025	322 - 335.4	5350 - 5460	

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to 40 GHz. Only the worst case of the plots are listed.

5.4 Antenna application

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT uses the listed antenna(s).

The supplied antenna meets the requirements of part 15.203.

The requirements are **FULFILLED**.

Remarks:

None

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 2023.0.8.0	01-02/68-13-001				
	ESCI	02-02/03-15-001	03/07/2024	03/07/2023		
	ESH 2 - Z 5	02-02/20-05-004	13/10/2025	13/10/2022	19/03/2025	19/03/2024
	N-4000-BNC	02-02/50-05-138				
	ESH 3 - Z 2	02-02/50-05-155	09/11/2025	09/11/2022	06/08/2024	06/02/2024
CPR 3	FSW43	02-02/11-21-001	22/05/2024	22/05/2023		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-20-007	15/11/2024	15/11/2023		
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
SER 1	ESR 7	02-02/03-17-001	01/08/2024	01/08/2023		
	HFH 2 - Z 2	02-02/24-05-020	01/06/2025	01/06/2022	05/09/2024	05/09/2023
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	VULB 9168	01-02/24-20-001	12/02/2025	12/02/2024		
	ESVS 30	02-02/03-05-006	27/07/2024	27/07/2023		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
	50F-003 N 3 dB	02-02/50-21-010				
SER 3	FSW43	02-02/11-21-001	22/05/2024	22/05/2023		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	LNA-40-18004000-33-5P	02-02/17-20-002				
	BBHA 9170	02-02/24-05-013	21/03/2026	21/03/2023	22/01/2025	22/01/2024
	3117	02-02/24-20-007	15/11/2024	15/11/2023		
	WHK 3.0/18G-10EF	02-02/50-05-180				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	KMS116-GL140SE-KMS116-	02-02/50-20-026				

- End of test report -