

Annex 1: Measurement diagrams to TEST REPORT No.: 18-1-0002601T02

According to:
FCC Regulations
Part 15.247

for

Agilion GmbH

WIRELESS TAG EPAPER 4 WIRELESS TAG EPAPER 4 PULSE | PHASE

FCC-ID: SCF6032702

Laboratory Accreditation and Listings		
 Deutsche Akkreditierungsstelle D-PL-12047-01-01 Accredited EMC-Test Laboratory	 Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	 Voluntary Controls for Electromagnetic Emissions Reg. No.: R-20013, C-20009, T-20006, G-20013
 	 Authorized Test Lab Lab Code: 20011130-00	 FEDERAL COMMUNICATIONS COMMISSION USA • MRA US-EU 0003
accredited according to DIN EN ISO/IEC 17025		
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Laboratory Accreditation and Listings		

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1. Radiated field strength measurements accord. §15.209&15.205

1.1. Magnetic field measurements $f < 30\text{MHz}$

1.1.1. Channel 11

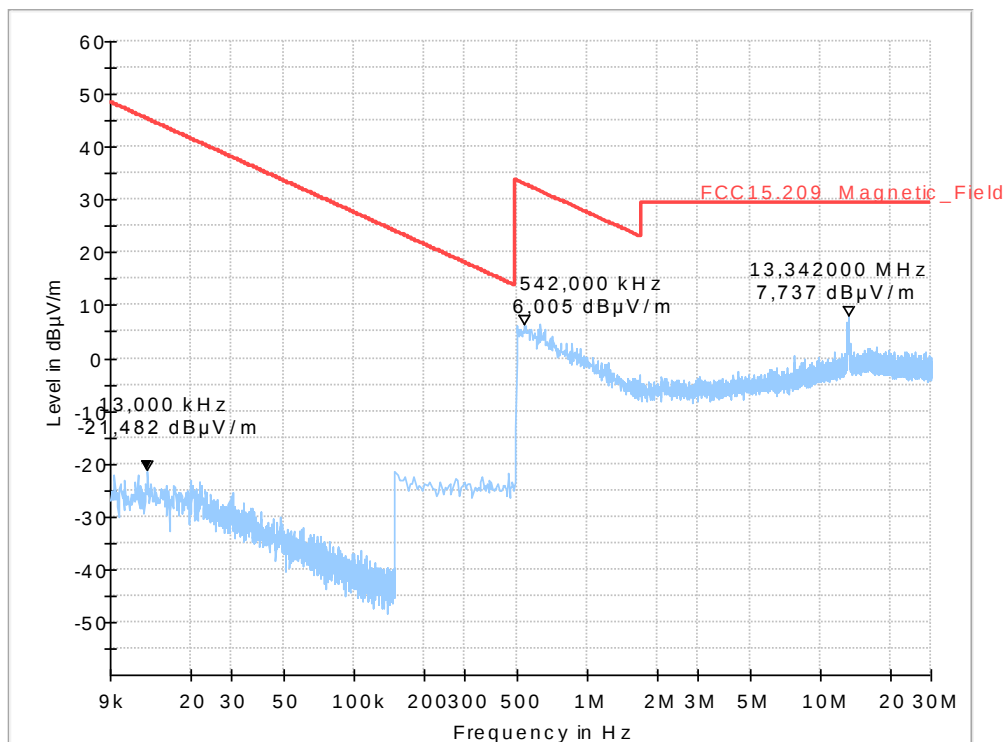


Diagram 1: Channel 11 (2.05_MgF_Ch11_PWR0_laying)

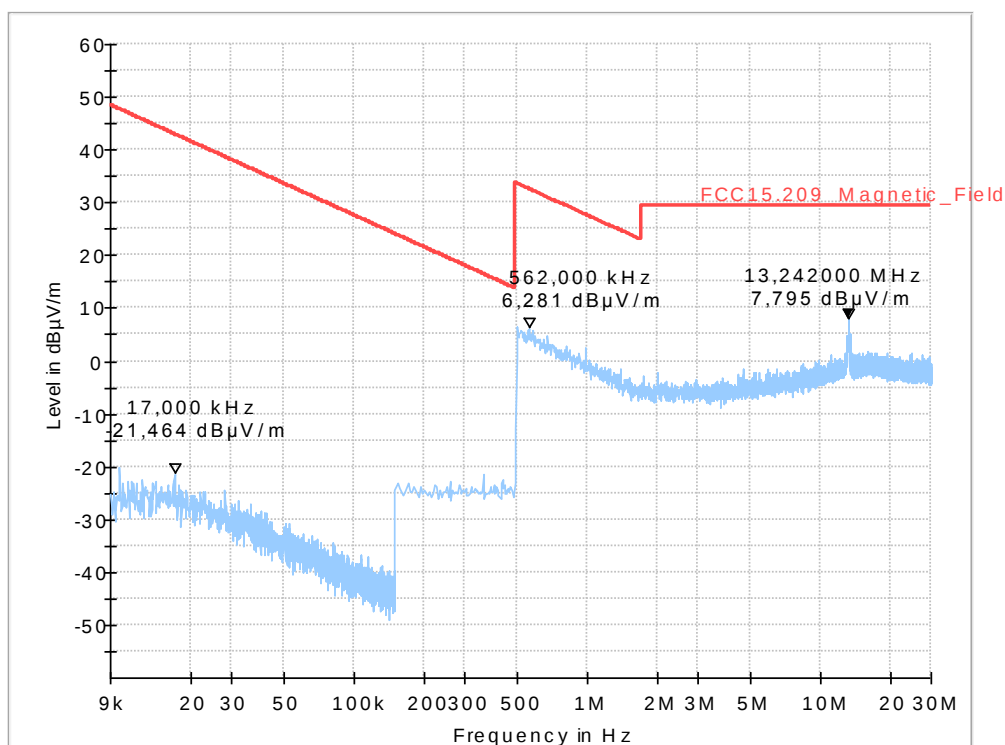


Diagram 2: Channel 11 (2.06_MgF_Ch11_PWR0_standing)

1.1.2. Channel 18

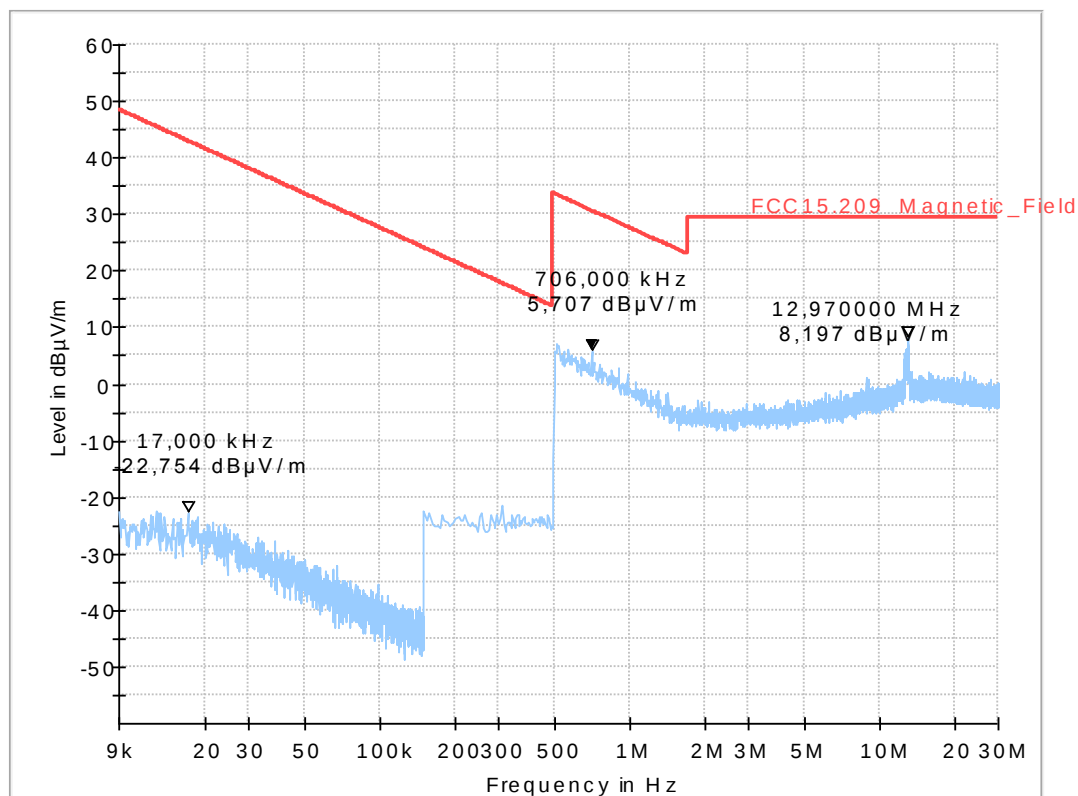


Diagram 3: Channel 18 (2.07_MgF_Ch18_PWR0_standing)

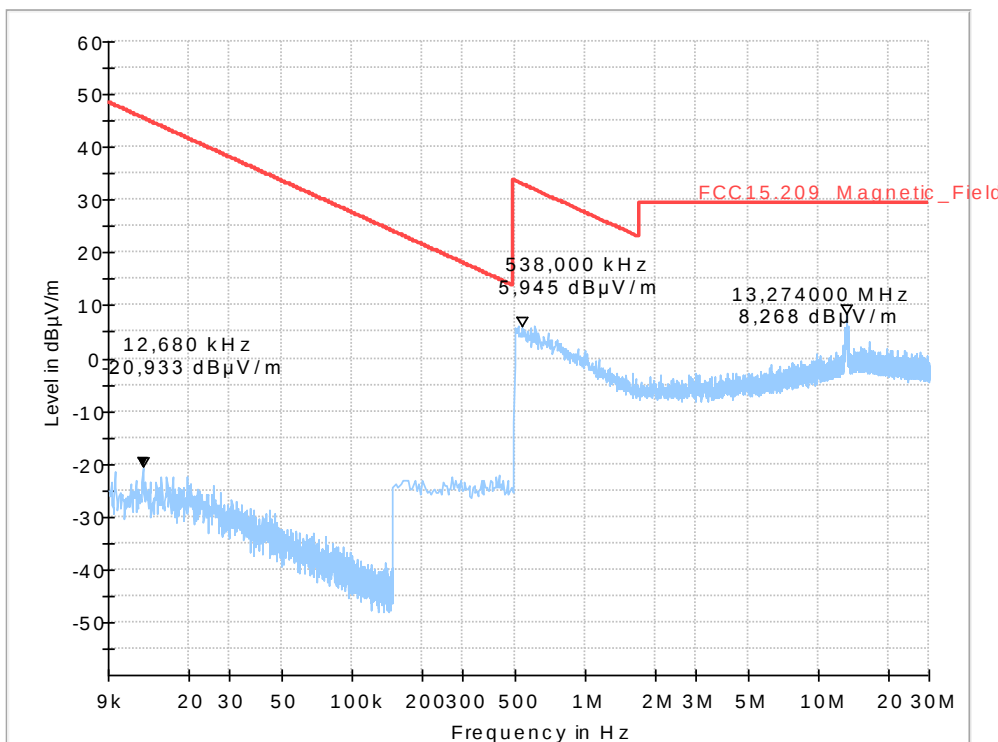


Diagram 4: Channel 18 (2.08_MgF_Ch18_PWR0_laying)

1.1.3. Channel 26

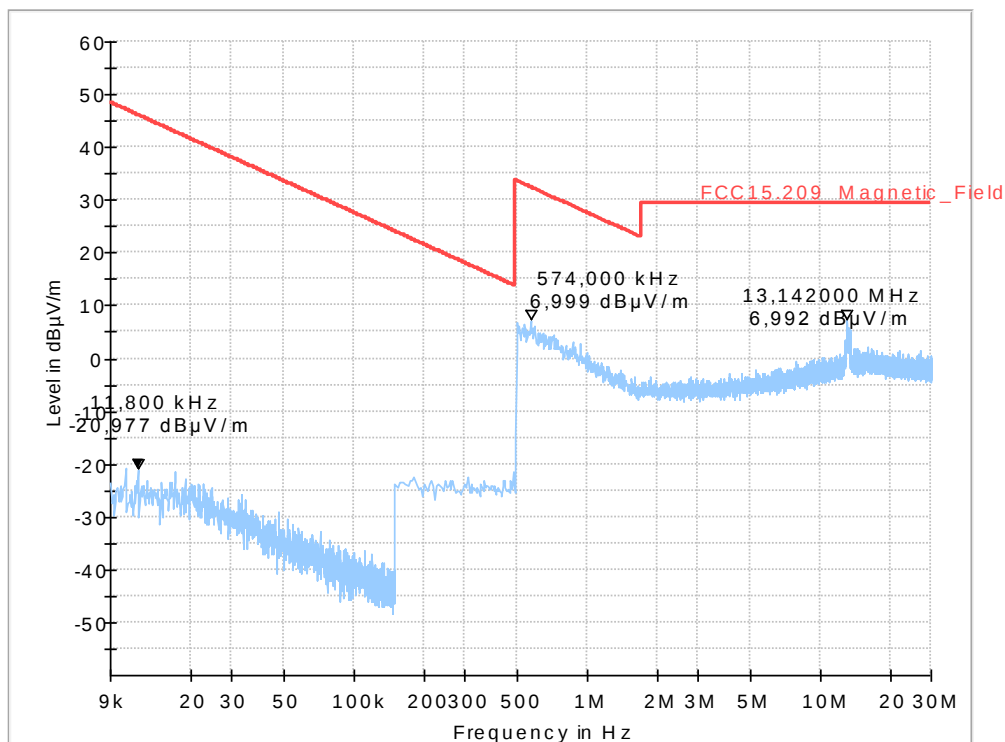


Diagram 5: Channel 26 (2.09_MgF_Ch26_laying)

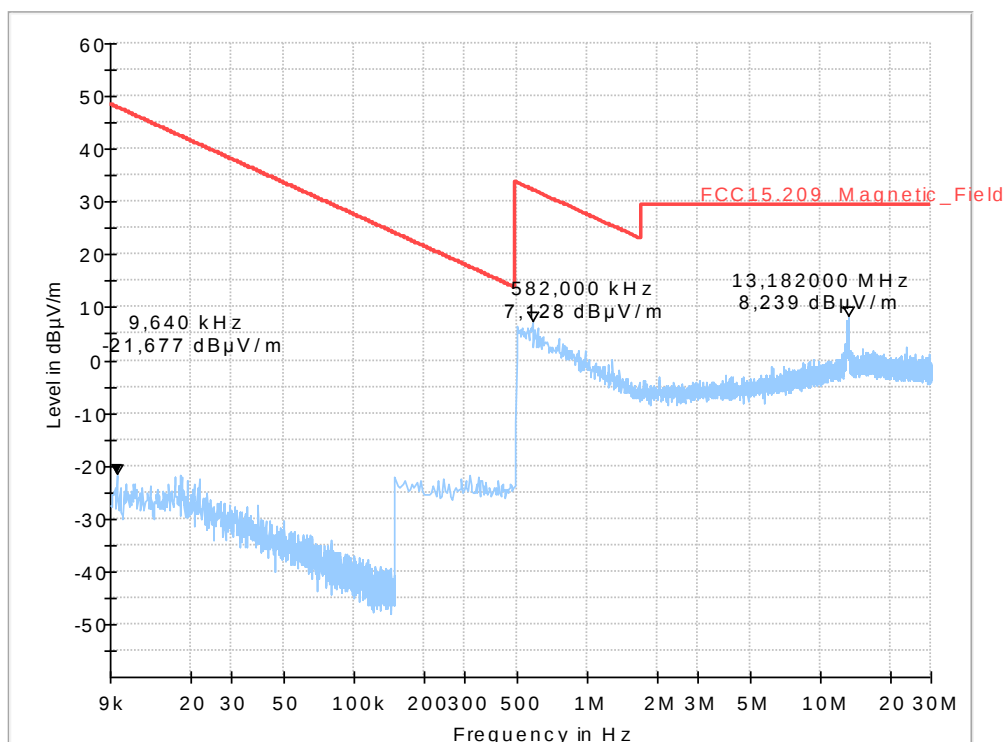


Diagram 6: Channel 26 (2.10_MgF_Ch26_standing)

1.2. Field strength measurements 30MHz <f <1GHz

1.2.1. Channel 11

Full Spectrum

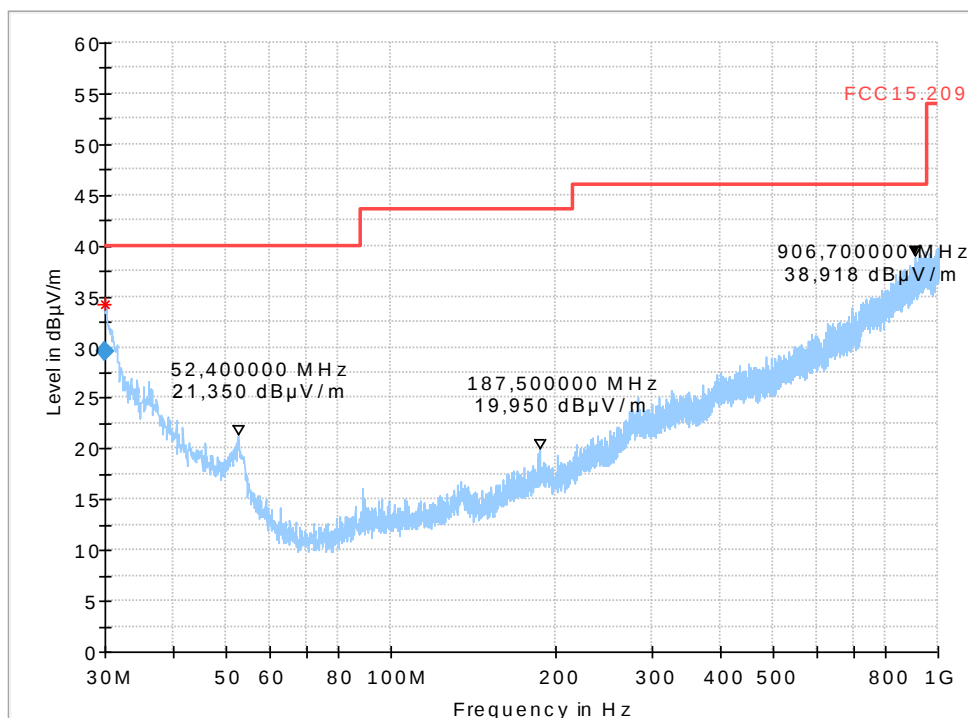


Diagram 7: Channel 11 (3.03_Ch11_PWR0_laying)

Full Spectrum

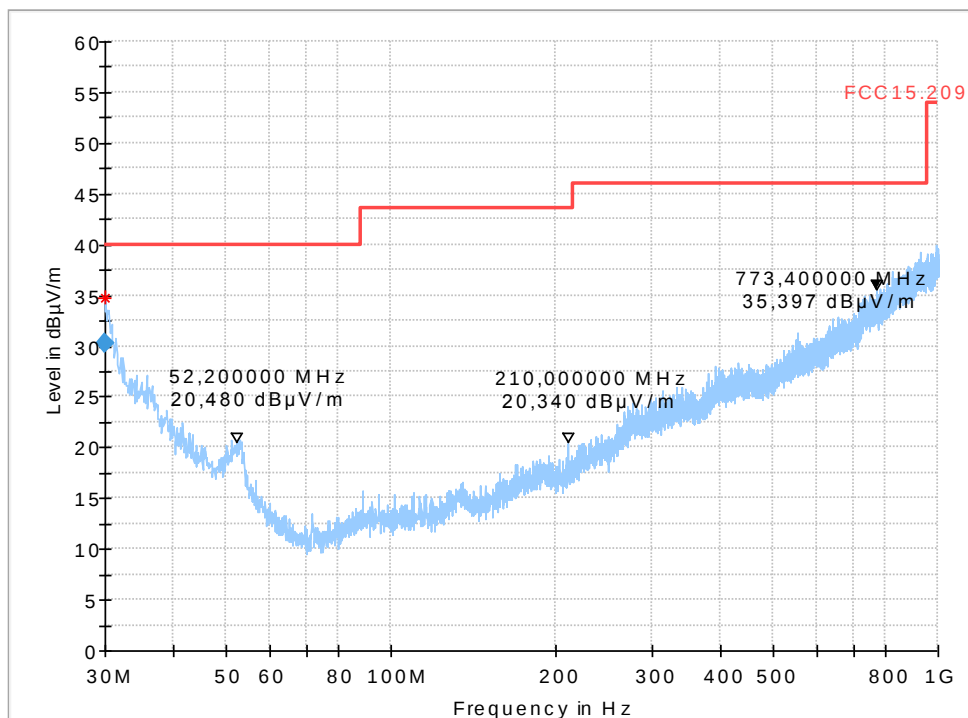


Diagram 8: Channel 11 (3.06_Ch11_PWR0_standing)

1.2.2. Channel 18

Full Spectrum

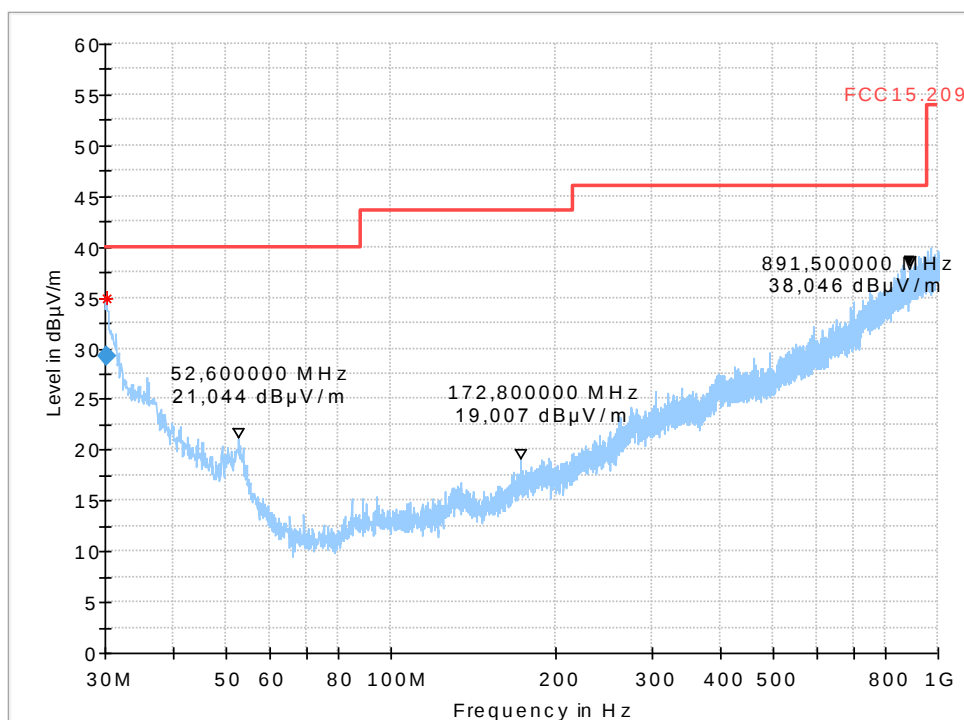


Diagram 9: Channel 18 (3.02_Ch18_PWR0_laying)

Full Spectrum

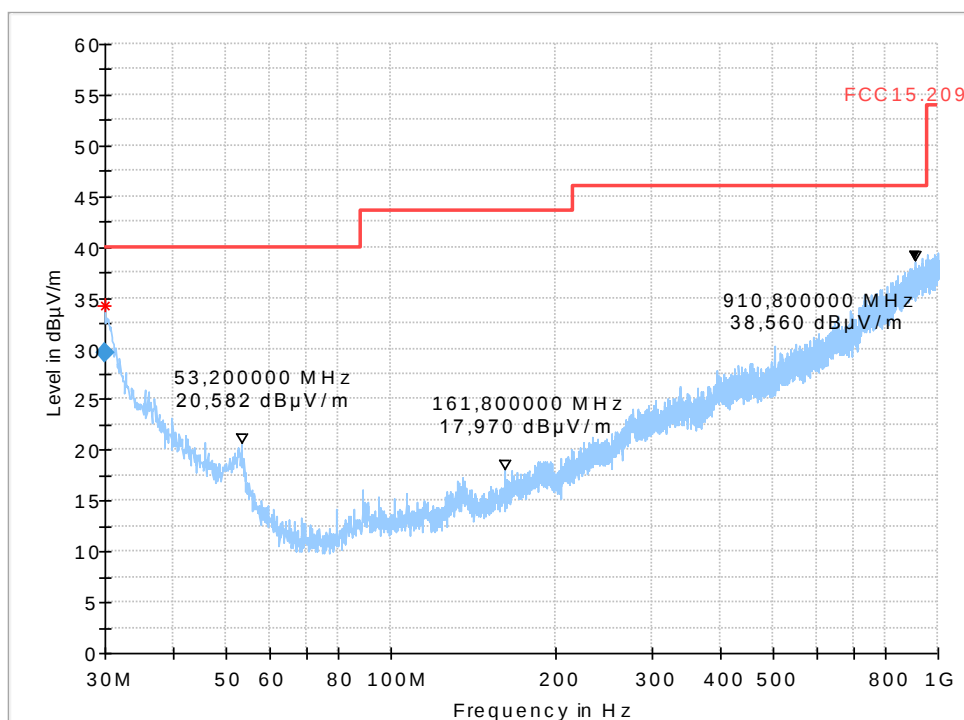


Diagram 10: Channel 18 (3.05_Ch18_PWR0_standing)

1.2.3. Channel 26

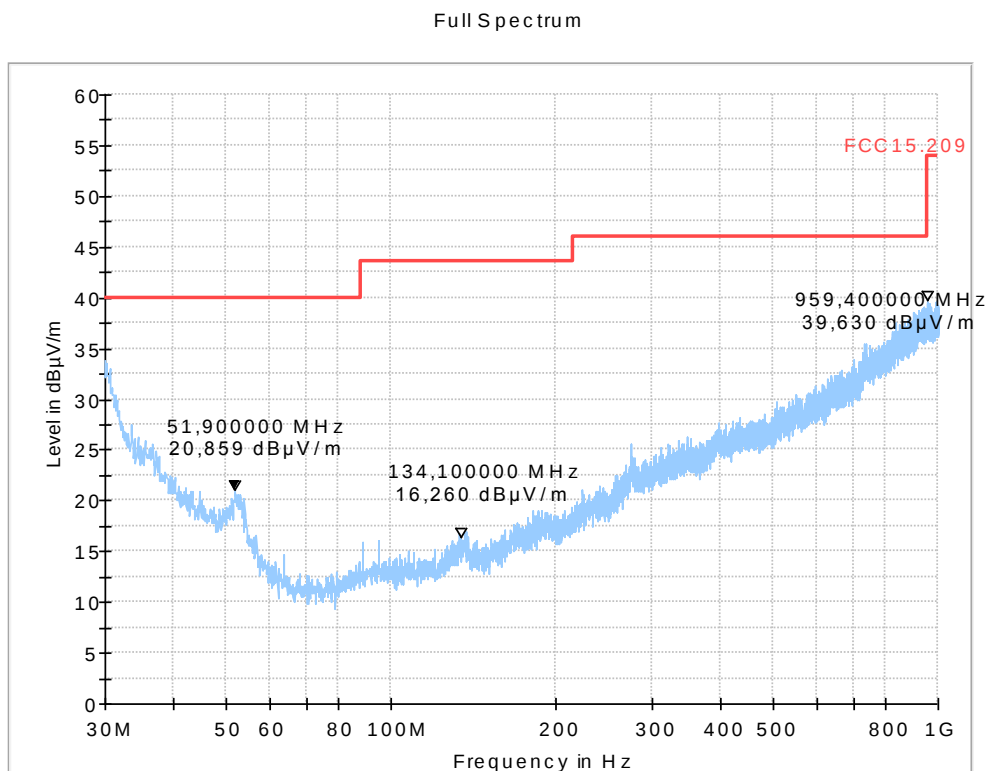


Diagram 11: Channel 26 (3.01_Ch26_laying)

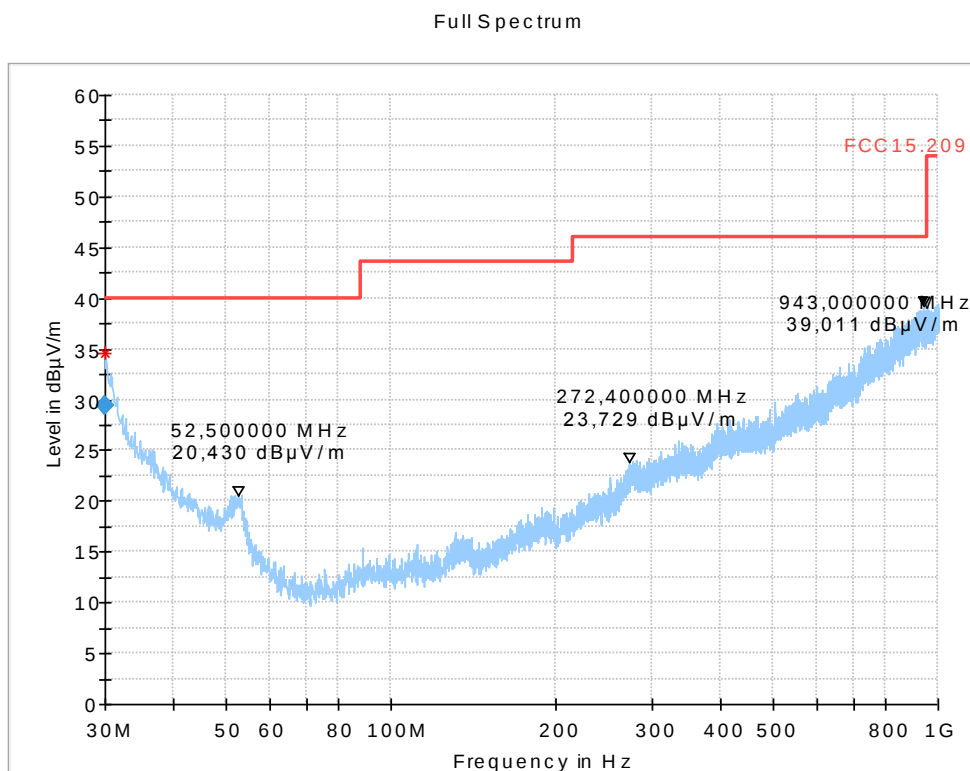


Diagram 12: Channel 26 (3.04_Ch26_standing)

1.3. Field strength measurements f < 18GHz

1.3.1. Channel 11

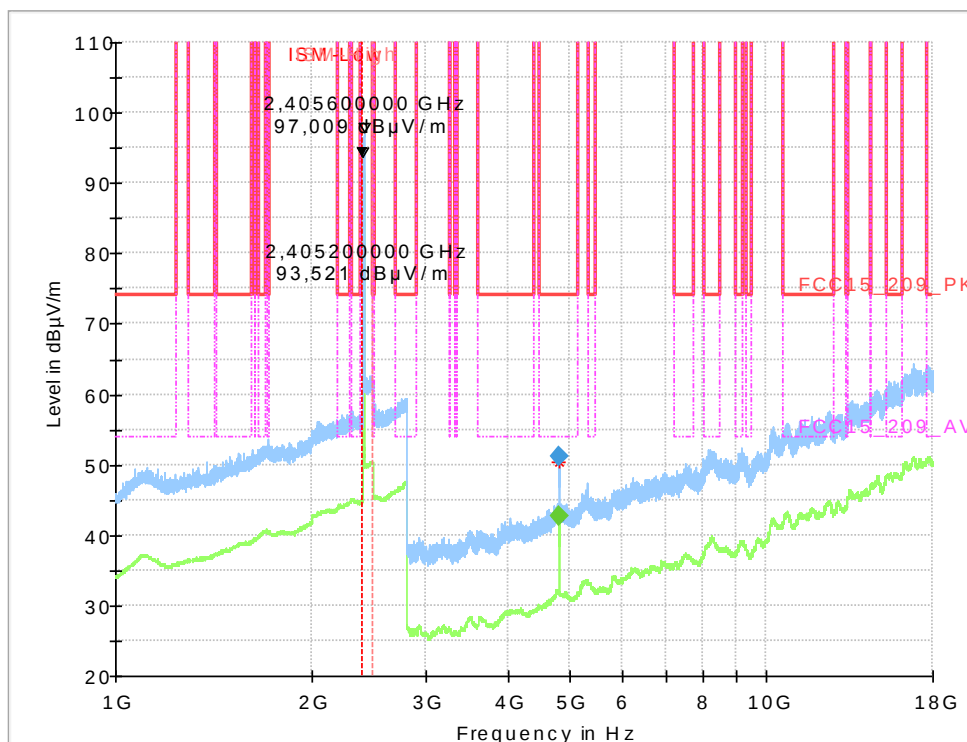


Diagram 13: Channel 11 (4.04_Ch11_PWR0)

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
4811.080000	---	42.64	54.00	11.36	100.0	1000.000	155.0	H	89.0	0.0
4811.080000	51.13	---	74.00	22.87	100.0	1000.000	155.0	H	89.0	0.0

1.3.2. Channel 18

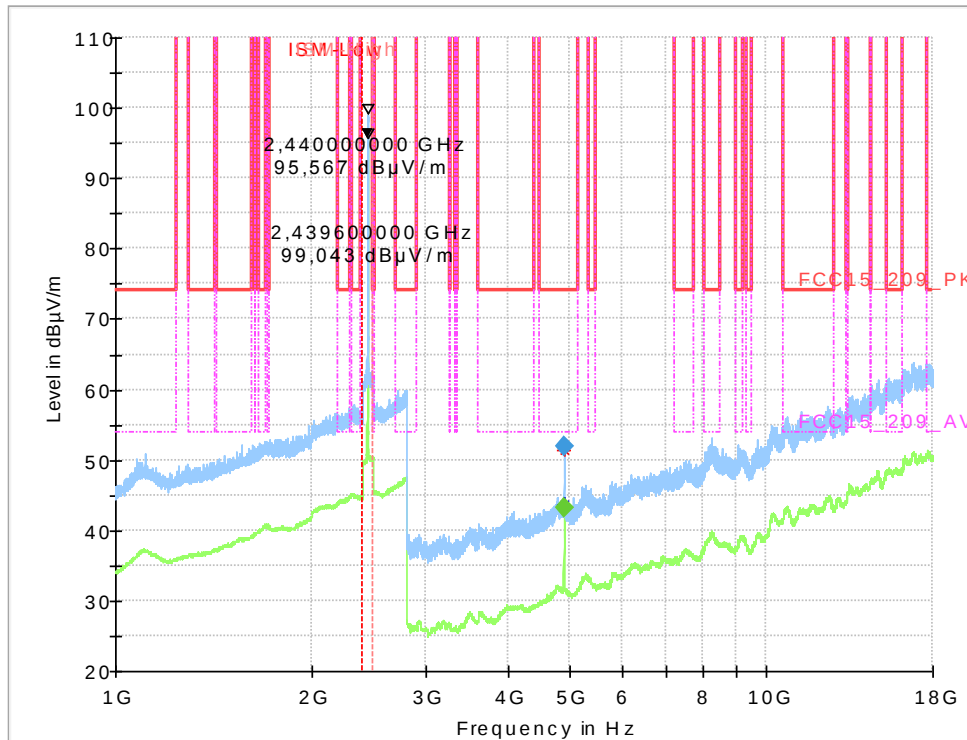


Diagram 14: Channel 18 (4.05_Ch18_PWR0)

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
4879.080000	---	43.22	54.00	10.78	100.0	1000.000	155.0	V	269.0	90.0
4879.080000	51.84	---	74.00	22.16	100.0	1000.000	155.0	V	270.0	90.0

1.3.3. Channel 26

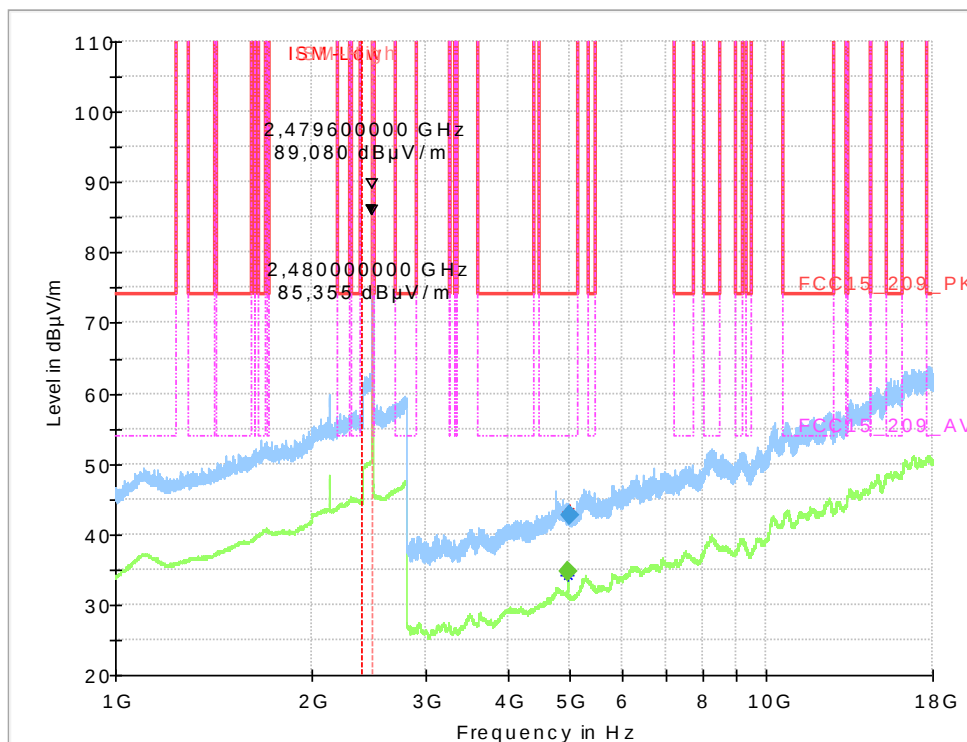


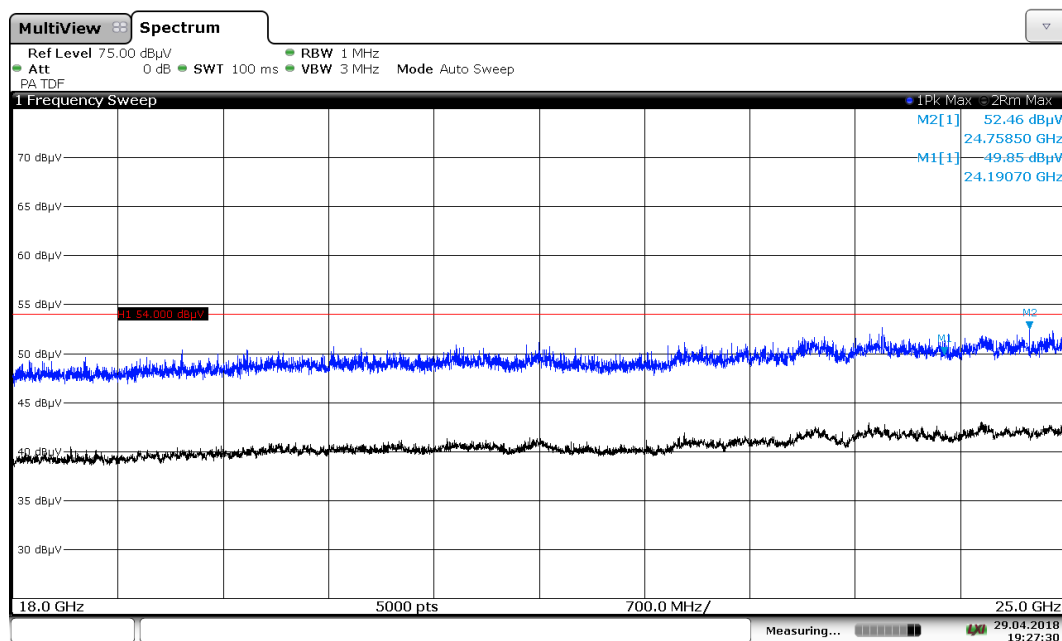
Diagram 15: Channel 26 (4.06_Ch26)

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
4961.080000	---	34.80	54.00	19.20	100.0	1000.000	155.0	V	87.0	90.0
4973.680000	42.60	---	74.00	31.40	100.0	1000.000	155.0	V	128.0	0.0

1.4. Field strength measurements above 18GHz

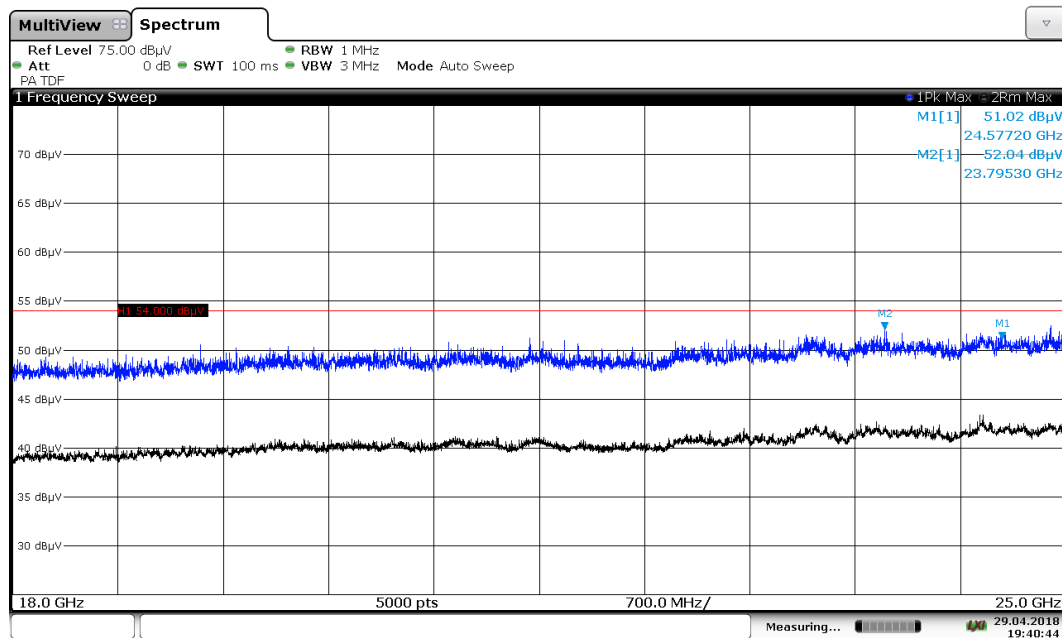
1.4.1. Channel 11



19:27:31 29.04.2018

Diagram 16: Ch11

1.4.2. Channel 18



19:40:45 29.04.2018

Diagram 17: Ch18

1.4.3. Channel 26

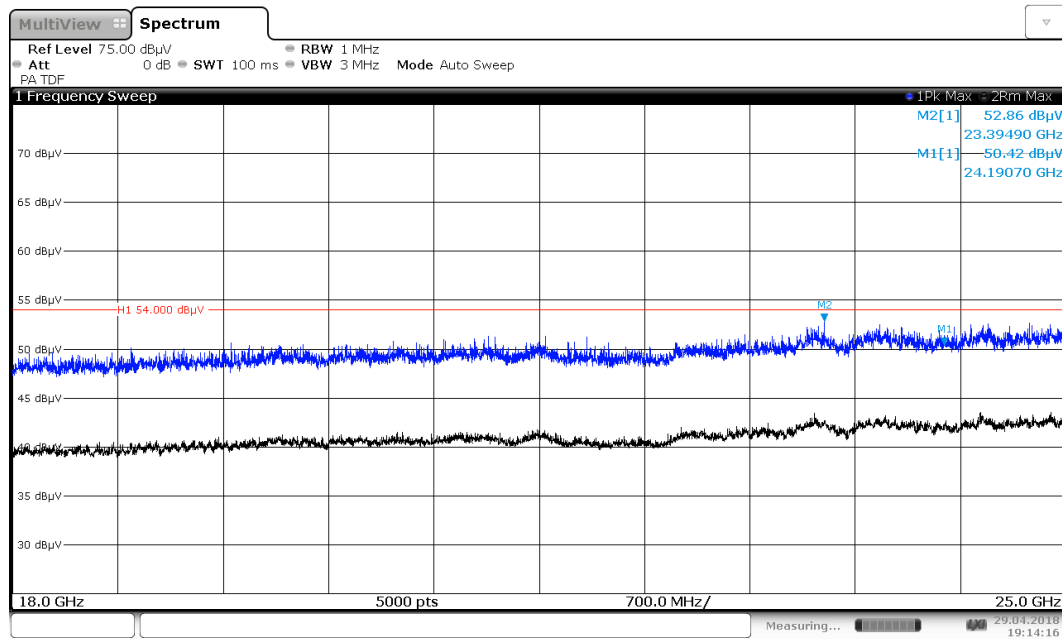


Diagram 18: Ch26

2. Band-edge measurements

2.1. Channel 11 (left band edge)

2.1.1. Conducted 20dBc

Result

DUT Frequency (MHz)	Result
2405.000000	PASS

Inband Peak

Frequency (MHz)	Level (dBm)
2405.108235	0.5

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.950000	-42.7	23.1	-19.5	PASS
2399.850000	-43.5	23.9	-19.5	PASS
2399.900000	-43.8	24.3	-19.5	PASS
2399.800000	-44.1	24.6	-19.5	PASS
2399.150000	-44.7	25.1	-19.5	PASS
2398.950000	-44.7	25.1	-19.5	PASS
2399.200000	-44.8	25.3	-19.5	PASS
2399.000000	-44.8	25.3	-19.5	PASS
2399.100000	-44.9	25.3	-19.5	PASS
2398.900000	-45.1	25.6	-19.5	PASS
2399.050000	-45.7	26.1	-19.5	PASS
2399.250000	-45.9	26.3	-19.5	PASS
2398.200000	-46.2	26.7	-19.5	PASS
2397.950000	-46.2	26.7	-19.5	PASS
2399.300000	-46.2	26.7	-19.5	PASS

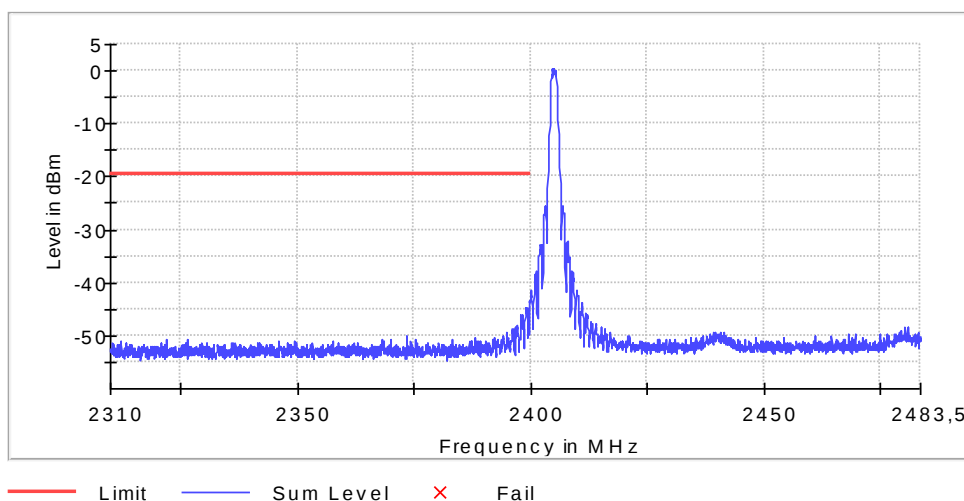


Diagram 19: Channel 11 – Band –Edge low (Ch11=2405MHz)

2.1.2. Radiated

20dBc criterium -> pass (limit is red-line)

2.2. Channel 26 (right band edge)

2.2.1. Conducted 20dBc

Result

DUT Frequency (MHz)	Result
2480.000000	PASS

Inband Peak

Frequency (MHz)	Level (dBm)
2479.963529	-8.6

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.923077	-46.8	18.2	-28.6	PASS
2483.975962	-47.0	18.4	-28.6	PASS
2483.870192	-47.0	18.4	-28.6	PASS
2484.081731	-47.0	18.5	-28.6	PASS
2484.134615	-47.0	18.5	-28.6	PASS
2484.028846	-47.3	18.8	-28.6	PASS
2483.817308	-47.6	19.1	-28.6	PASS
2483.764423	-47.9	19.3	-28.6	PASS
2484.240385	-48.3	19.8	-28.6	PASS
2484.187500	-49.0	20.5	-28.6	PASS
2483.711538	-49.2	20.6	-28.6	PASS
2484.927885	-49.4	20.8	-28.6	PASS
2484.875000	-49.6	21.1	-28.6	PASS
2484.980769	-49.9	21.3	-28.6	PASS
2484.293269	-50.1	21.5	-28.6	PASS

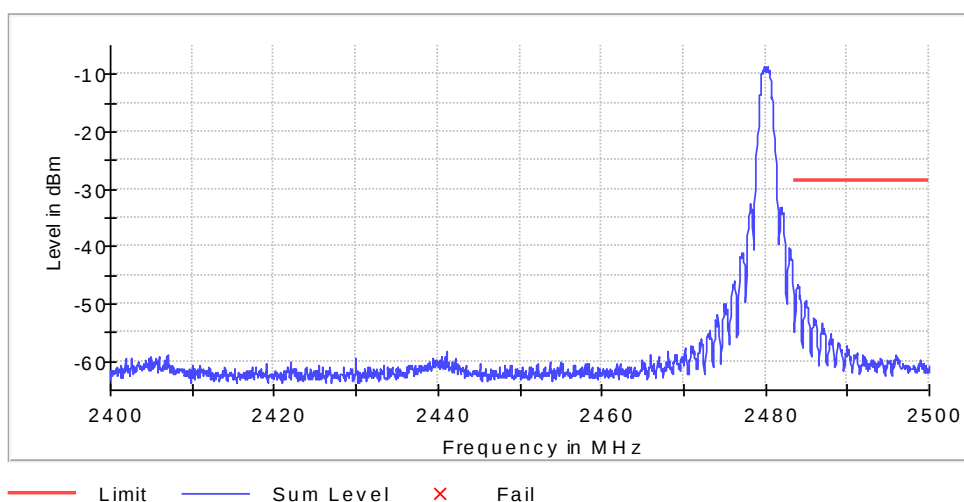


Diagram 20: Channel 26 – Band –Edge high (Ch26=2480MHz)

2.2.2. Radiated accord. §15.209 & 15.205

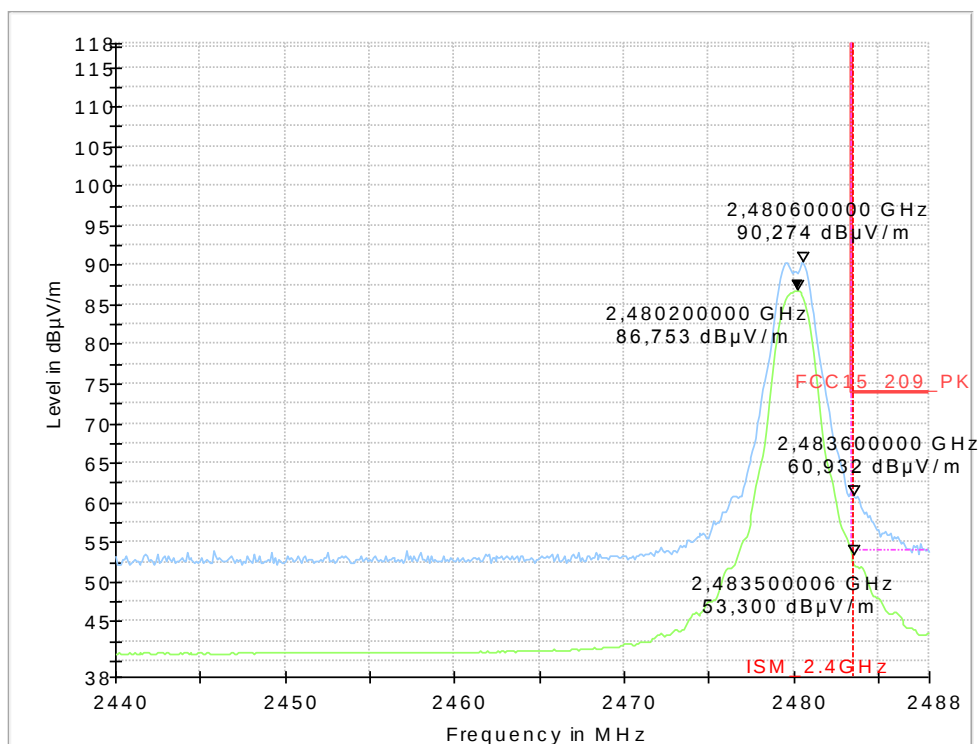


Diagram 21: Antenna 1 (test performed with power level = -11)

➔ pass

3. Conducted RF-measurements on antenna port

3.1. Duty-Cycle of EUT

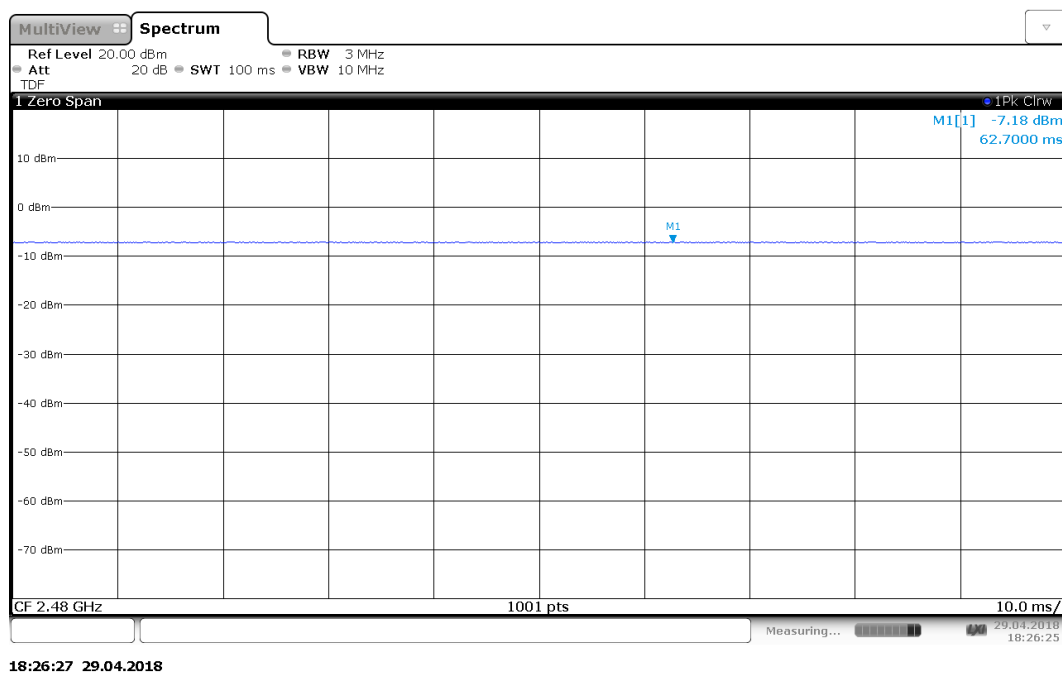


Diagram 22: check of duty-cycle on channel 26 (100ms period)

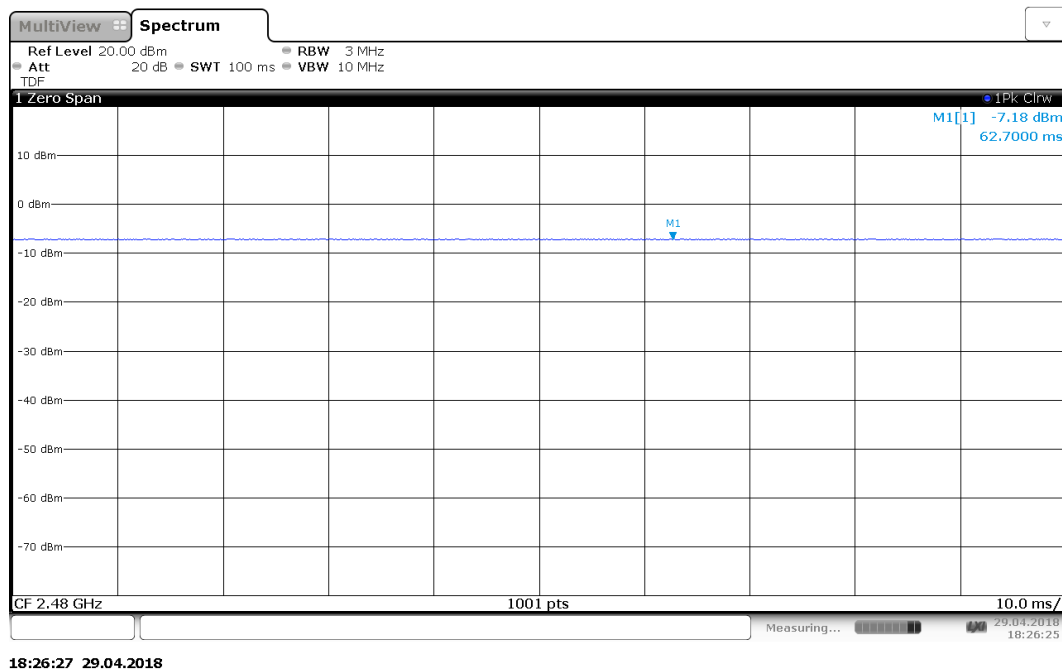
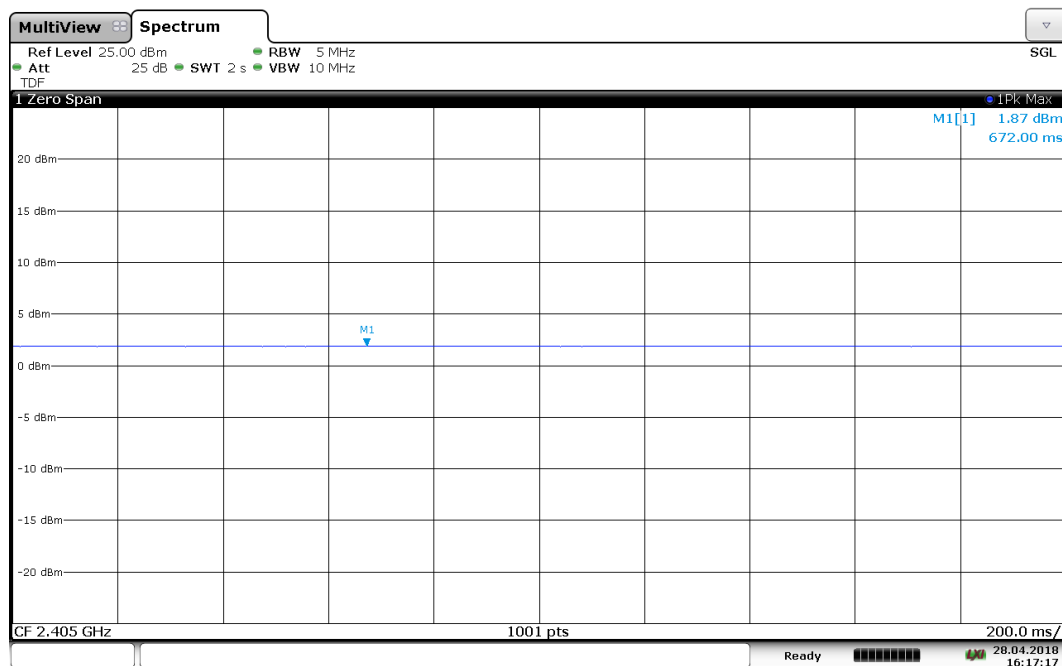


Diagram 23: check of duty-cycle on channel 26 (long 10s period)

3.2. Conducted RF-power (Peak)

3.2.1. Channel 11

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2405.000000	1.87	30.0	PASS



16:17:17 28.04.2018

Diagram 24: Channel 11

3.2.2. Channel 18

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2440.000000	1.8	30.0	PASS

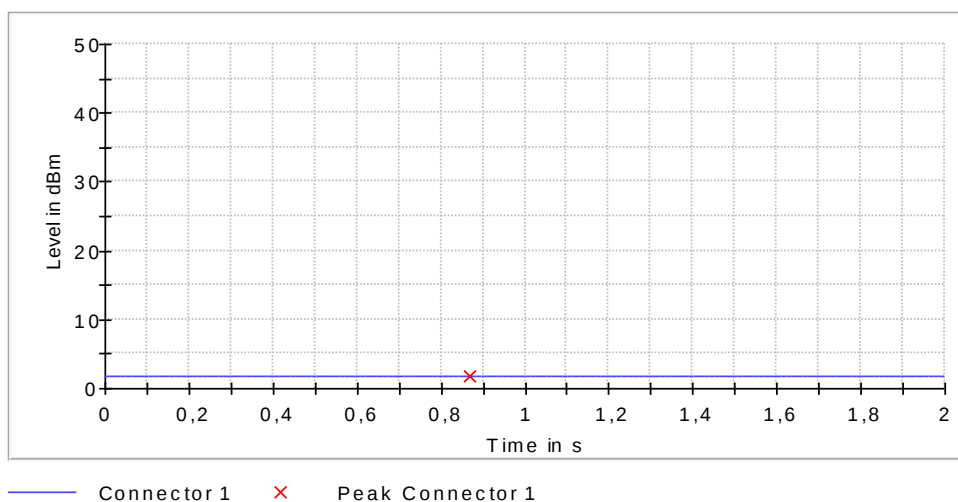


Diagram 25: Channel 18

3.2.3. Channel 26

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2480.000000	-6.9	30.0	PASS

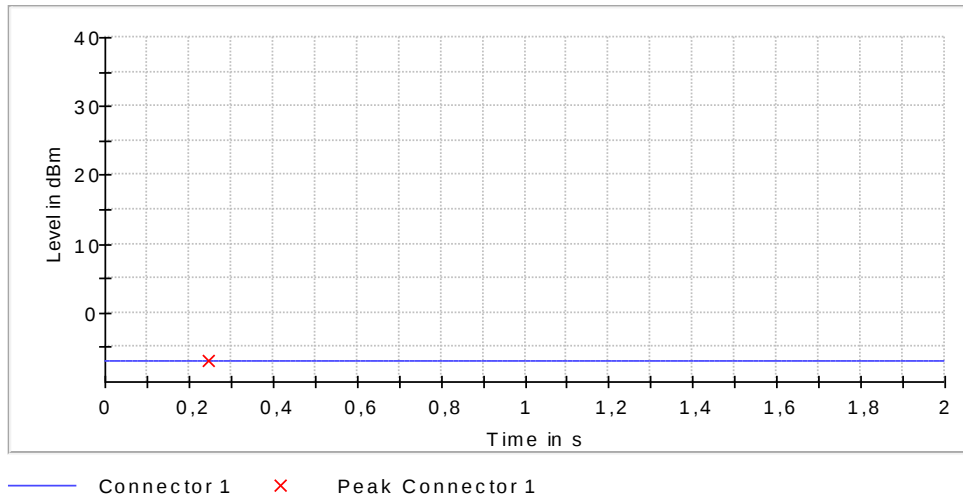


Diagram 26: Channel 26

3.3. 6-dB Bandwidth

3.3.1. 6-dB Bandwidth Ch11

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)
2405.000000	1.558442	0.500000	---	2404.220779	2405.779221	0.4

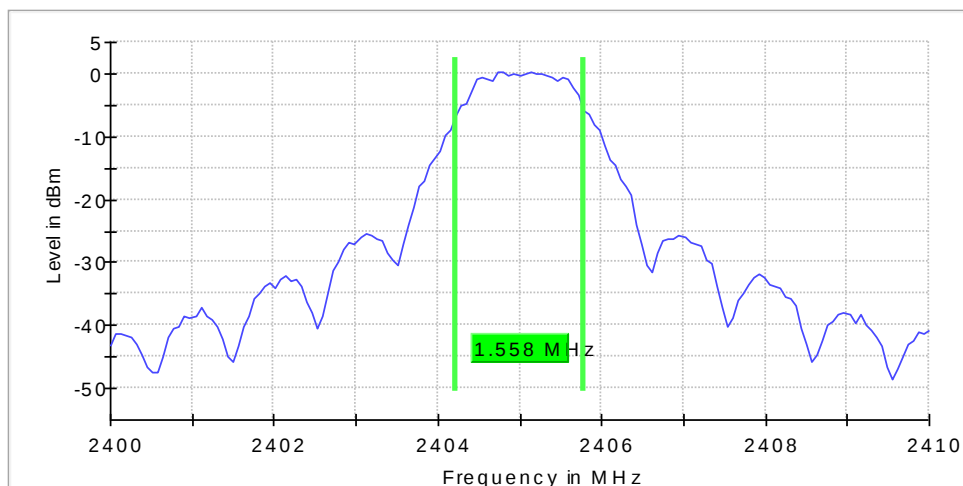


Diagram 27: Channel 11

3.3.2. 6-dB Bandwidth Ch18

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)
2440.000000	1.623377	0.500000	---	2439.220779	2440.84156	0.4

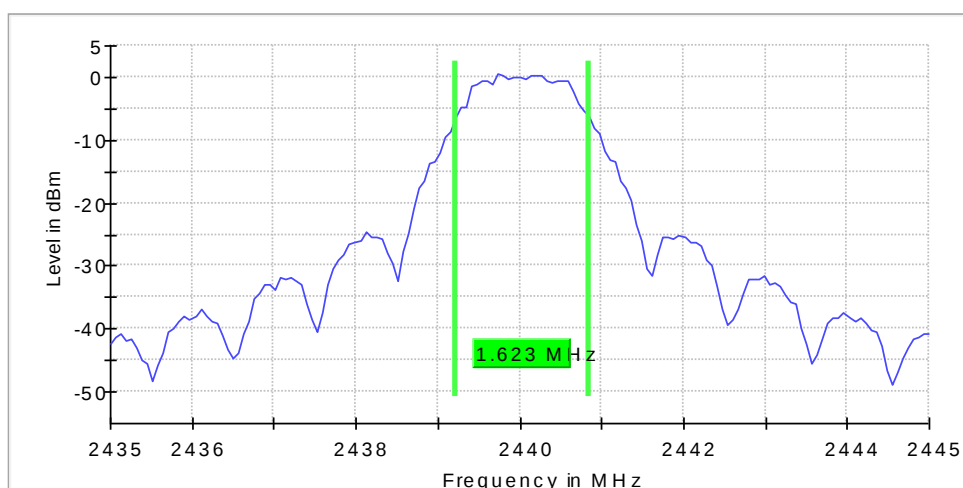


Diagram 28: Channel 18

3.3.3. 6-dB Bandwidth Ch26

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)
2480.000000	1.623377	0.500000	---	2479.220779	2480.844156	-8.4

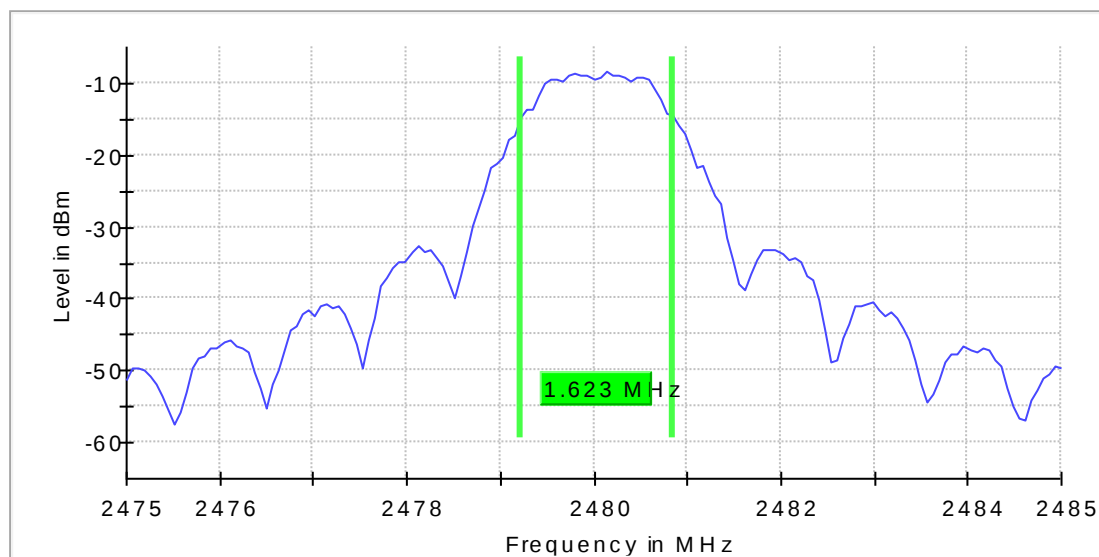
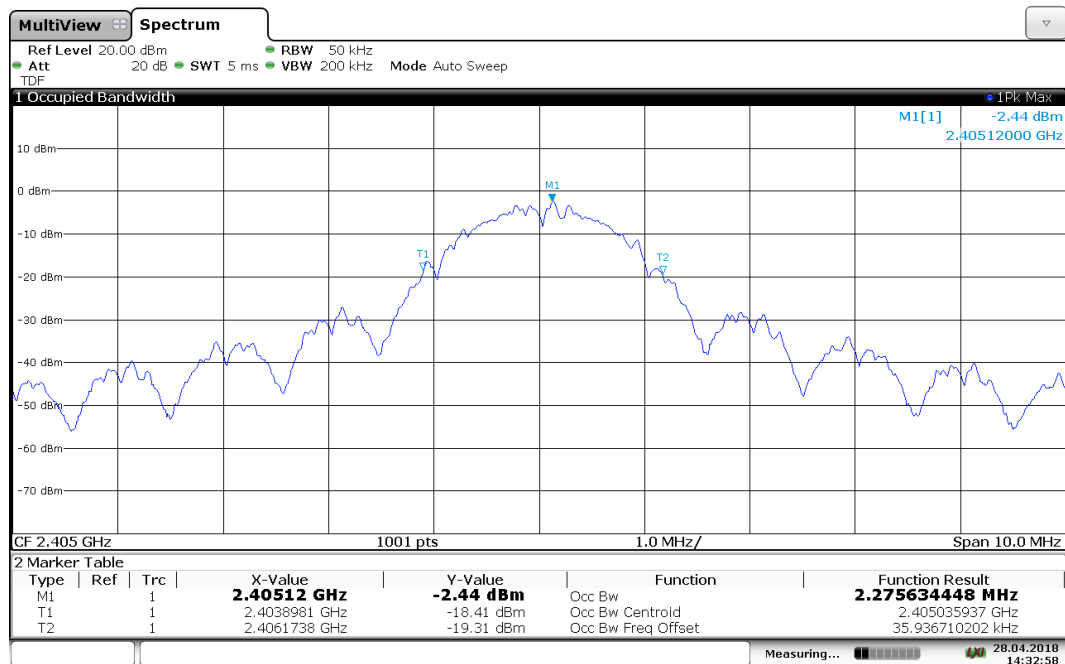


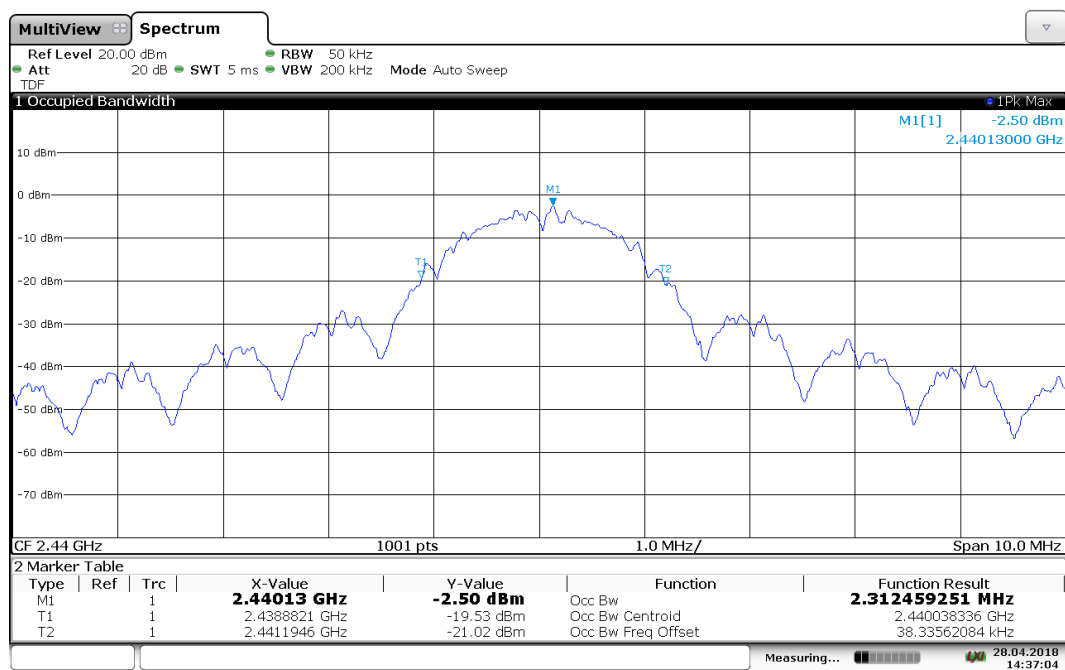
Diagram 29: Channel 26

3.4. 99% Occupied Bandwidth



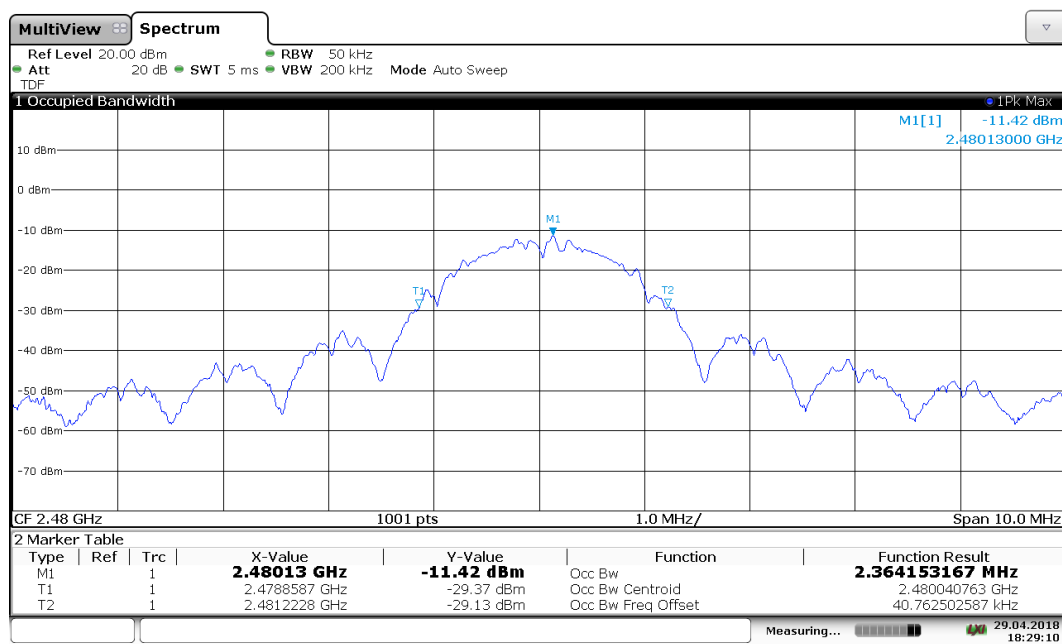
14:32:58 28.04.2018

Diagram 30: OBW 99% - channel 11



14:37:04 28.04.2018

Diagram 31: OBW 99% - channel 18



18:29:10 29.04.2018

Diagram 32: OBW 99% - channel 26

3.5. Power Spectral Density

3.5.1. Channel 11

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2405.000000	2405.100000	-20.199	8.0	PASS

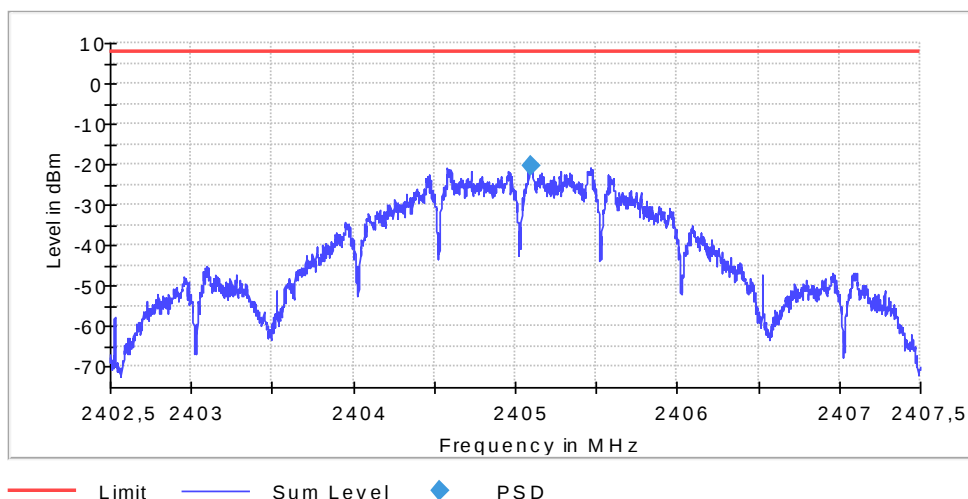


Diagram 33: Power Spectrum density (channel 11)

3.5.2. Channel 18

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2440.000000	2440.106061	-20.311	8.0	PASS

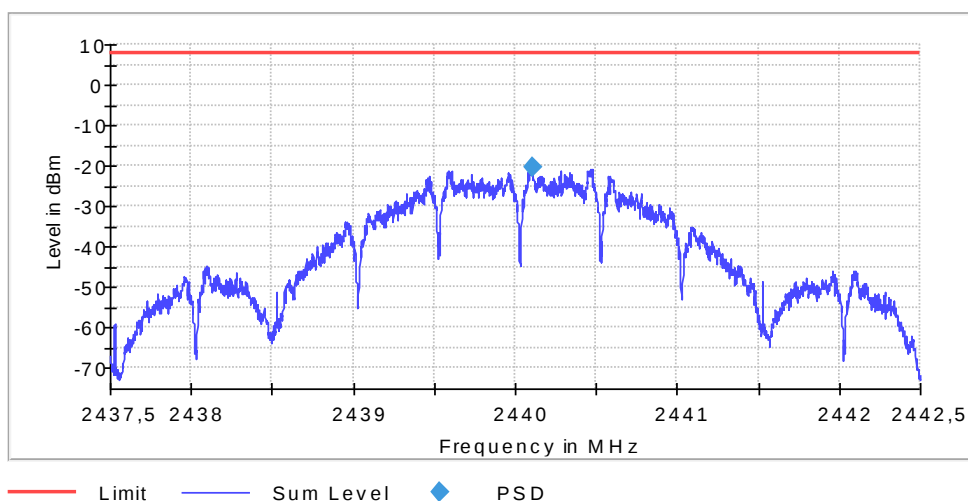


Diagram 34: Power Spectrum density (channel 18)

3.5.3. Channel 26

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	2480.112121	-29.424	8.0	PASS

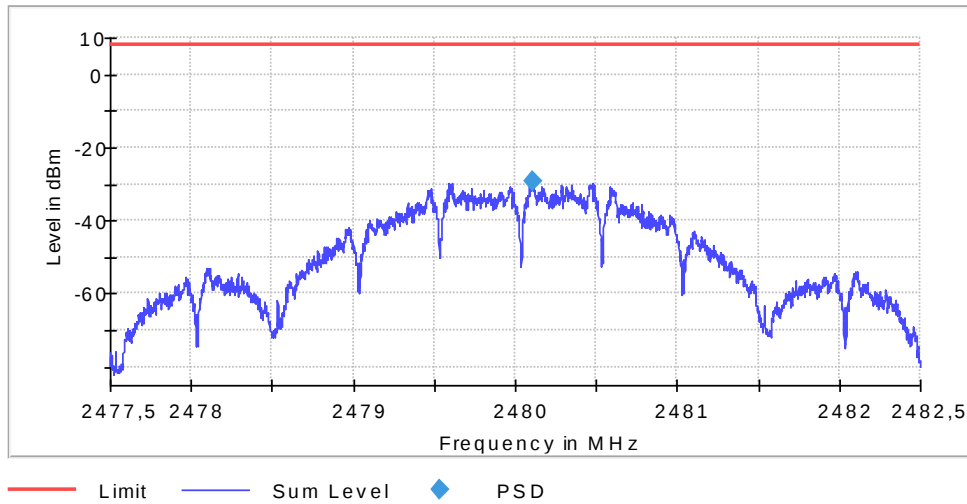


Diagram 35: Power Spectrum density (channel 26)

3.6. 20dBc Emissions (conducted)

3.6.1. Channel 11

Spurious

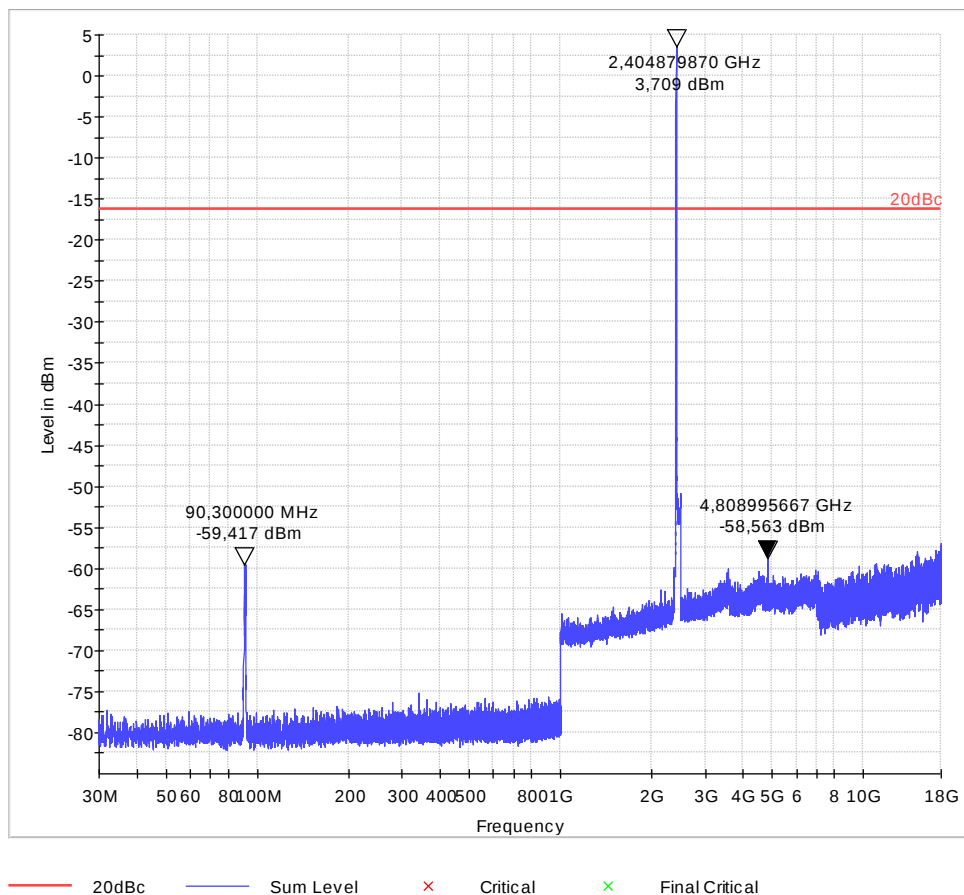


Diagram 36: 20dBc emissions on channel 11

3.6.2. Channel 18

Spurious

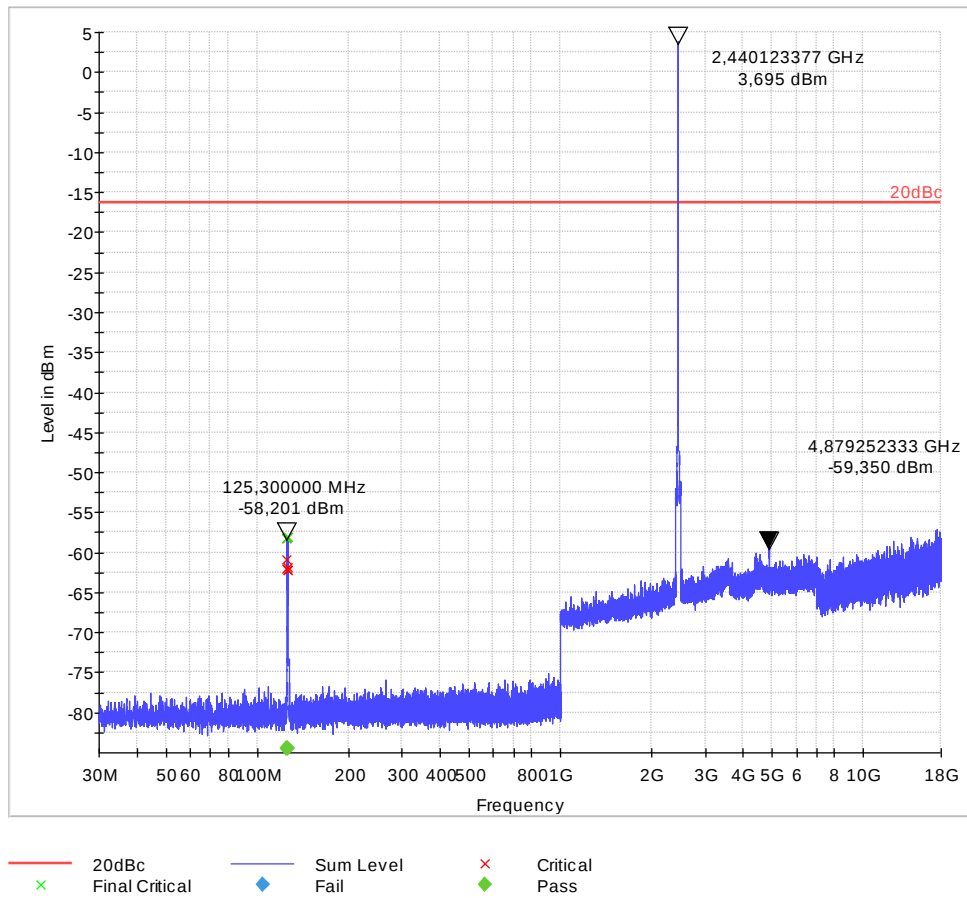


Diagram 37: 20dBc emissions on channel 18

3.6.3. Channel 26

Spurious

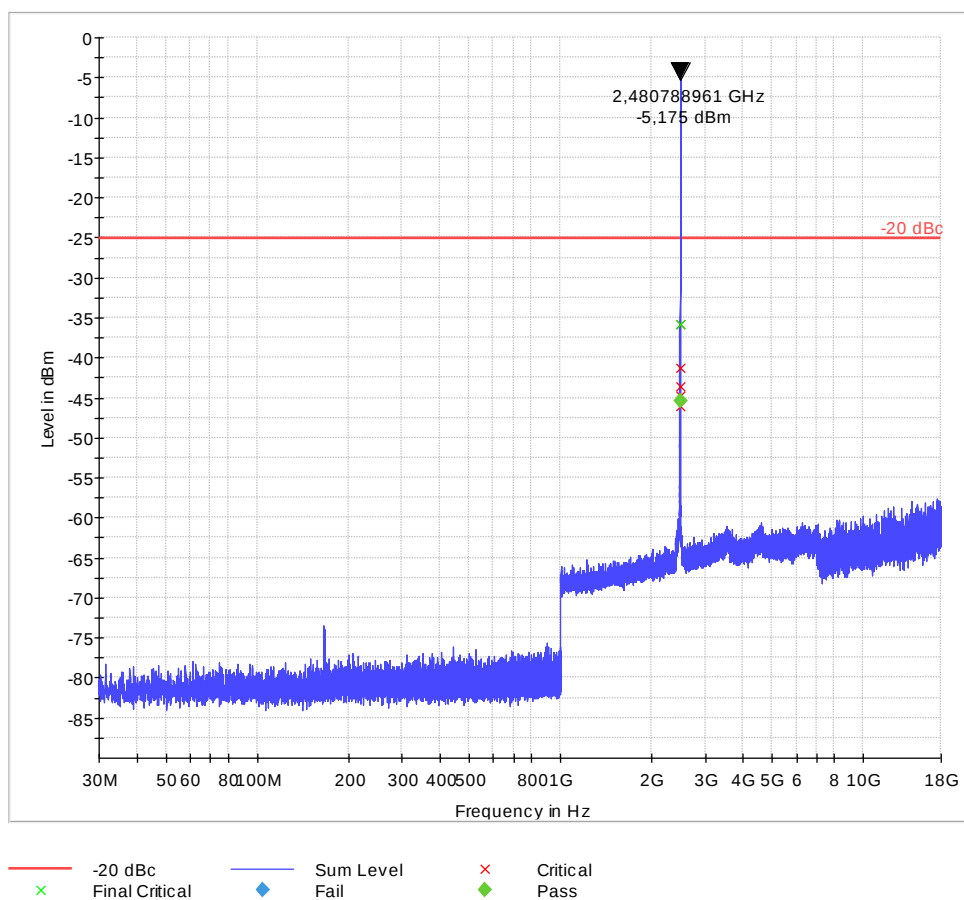


Diagram 38: 20dBc emissions on channel 26 -> Pass