Test Report

FINAS
Finnish Accreditation Service
T004 (EN ISO/IEC 17025)

INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C and INDUSTRY CANADA REQUIREMENTS

Equipment Under Test:	Nordic ID Medea
Model:	815-1A
Manufacturer / Customer:	Nordic ID Oy Myllyojankatu 2A 24100 Salo Finland
FCC Rule Part:	15.247: 2014
IC Rule Part:	RSS-210, Issue 8, 2010 RSS-GEN Issue 4, 2014
KDB:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (June 5, 2014)

Date:	February 27, 2015	Date:	February 27, 2015
Issued by:	Niko Kotsalo Testing Engineer	Checked by:	Rauno Repo Testing Engineer

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Equipment Under Test (EUT)

Nordic ID Medea with 802.11 a/b/g/n + BT 2.1 + EDR module	
Brand:	Nordic ID
Model No:	815-1A
Type:	HTG00017
FCC ID (RFID radio module):	SCCNUR05WL2
IC ID (RFID radio module):	5137A-NUR05WL2
FCC ID (WLAN a/b/g/n + Bluetooth 2.1 module):	TWG-SDCSSD40NBT
IC ID (WLAN a/b/g/n + Bluetooth 2.1 module):	6616A-SDCSSD40NBT

Description of the EUT

The EUT is a battery operated portable computer with RFID radio (FCC ID: SCCNUR05WL2) and barcode reader. Nordic ID medea also includes (FCC ID: TWG-SDCSSD40NBT) 802.11 a/b/g/n WLAN and Bluetooth v2.1 + EDR module This report includes only the 2.4 GHz WLAN b/g/n test results.

Classification of the device

Fixed device	☐
Mobile Device (Human body distance > 20cm)	☐
Portable Device (Human body distance < 20cm)	☒

Ratings and declarations

Operating Frequency Range (OFR):	2412 – 2462 MHz
Channels:	11
Channel separation:	5 MHz
Channel bandwidth:	20 MHz
Conducted power:	13.39 dBm (b-mode)
Transmission technique:	DSSS
Modulation:	CCK, OFDM, BPSK,
Transmission rate 802.11 n, 20MHz BW:	MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7
Transmission rate 802.11 b/g:	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps
Antenna gain:	3 dBi

Power Supply

Battery / AC operated	7.2 VDC / 100-240 VAC, 50-60 Hz

Disclaimer

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.209 / RSS-GEN 8.9	Unintentional Radiated Emissions	**PASS**

EUT Test Conditions during Testing

The EUT was configured into the wanted channel and was in continuous transmit mode during all the tests

Preliminary tests were performed in different data rates and mopdulation methods to find the worst case emissions. The following modes were selected for the final tests:

Mode 802.11b: 1Mbps
Mode 802.11n: 20 MHz BW, MCS0

The radiated spurious emissions tests were performed with the EUT being in three different orthogonal positions: X, Y, Z.

Following channels were used during the tests:

Channel	Channel #	Frequency/ MHz
LOW	1	2412
MID	6	2437
HIGH	11	2462

Test Facility

☐ Testing Location / address: FCC registration number: **90598**	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
☒ Testing Location / address: FCC registration number: **178986** Industry Canada registration number: **8708A-2**	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND

Transmitter Radiated Emissions 30 – 26 500 MHz and Band Edge

Standard:	ANSI C63.10	(2009)
Tested by:	NKO/PKA	
Date:	16.02 - 26.02.2015	
Temperature:	21 – 23 °C	
Humidity:	21 – 31 % RH	
Measurement uncertainty:	± 4.51 dB	Level of confidence 95 % (k = 2)

FCC Rule: 15.247(d), 15.209(a)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a)**.**

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).

The QuasiPeak value is the measured value corrected with the correction factor.

Measurements were done with 1Mbps data rate and MCS0 data rate.

Test results 802.11b 1Mbps

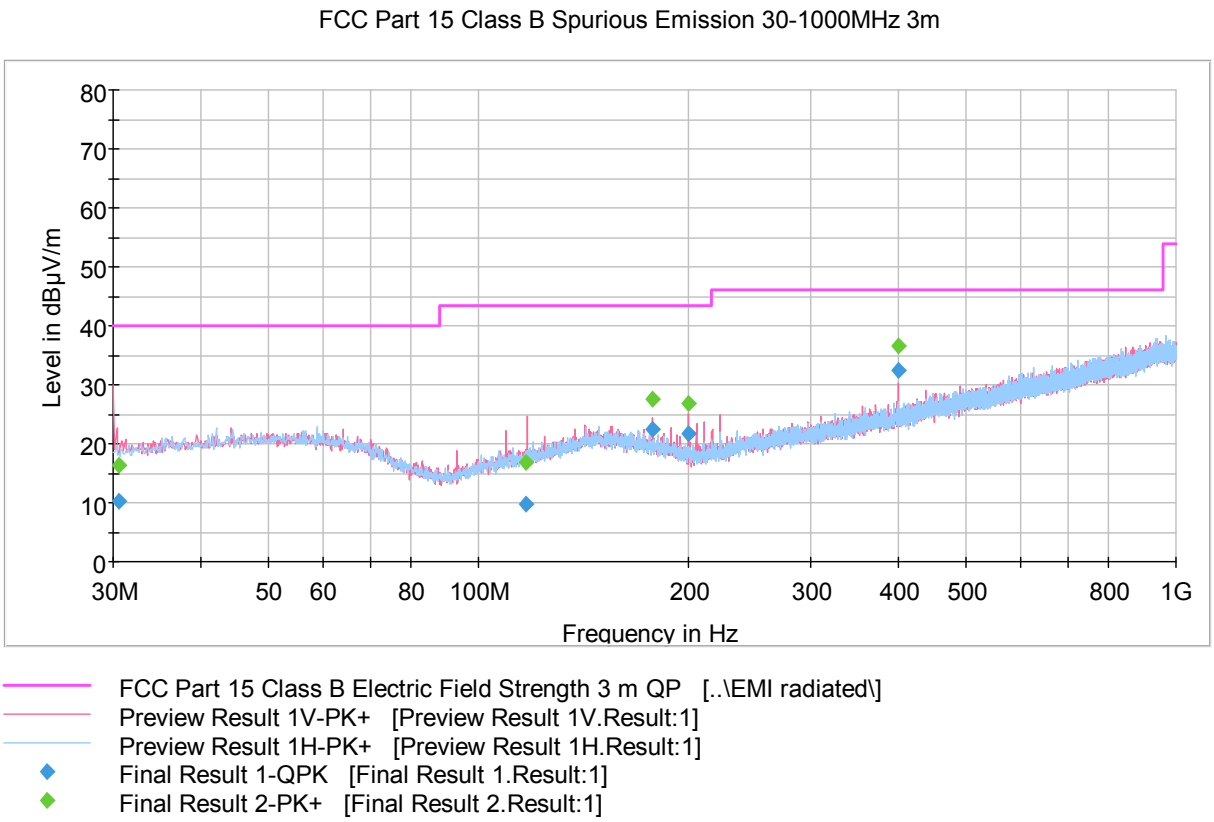


Figure 1. Measured curves with peak-detector (low channel).

Table 1. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.520000	10.2	1000.0	120.000	393.0	V	190.0	14.1	29.8	40.0	
117.254000	9.7	1000.0	120.000	100.0	V	156.0	11.6	33.8	43.5	
177.928000	22.5	1000.0	120.000	100.0	V	243.0	14.1	21.0	43.5	
199.984000	21.6	1000.0	120.000	100.0	V	260.0	12.5	21.9	43.5	
399.998000	32.5	1000.0	120.000	139.0	V	187.0	18.4	13.5	46.0	

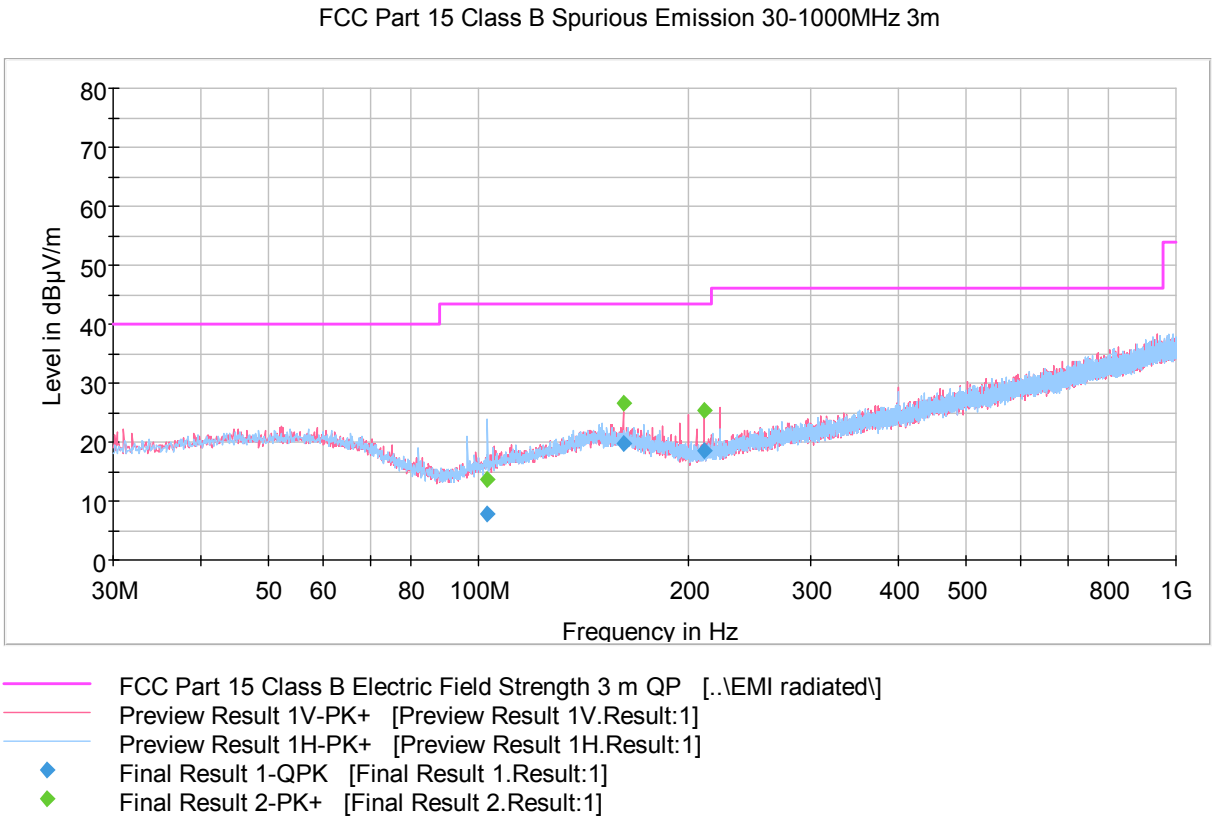


Figure 2. Measured curve with peak-detector (middle channel).

Table 2. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
103.035000	7.8	1000.0	120.000	315.0	H	150.0	10.5	35.7	43.5	
161.378000	19.8	1000.0	120.000	100.0	V	246.0	14.9	23.7	43.5	
210.982000	18.6	1000.0	120.000	100.0	V	329.0	12.4	24.9	43.5	

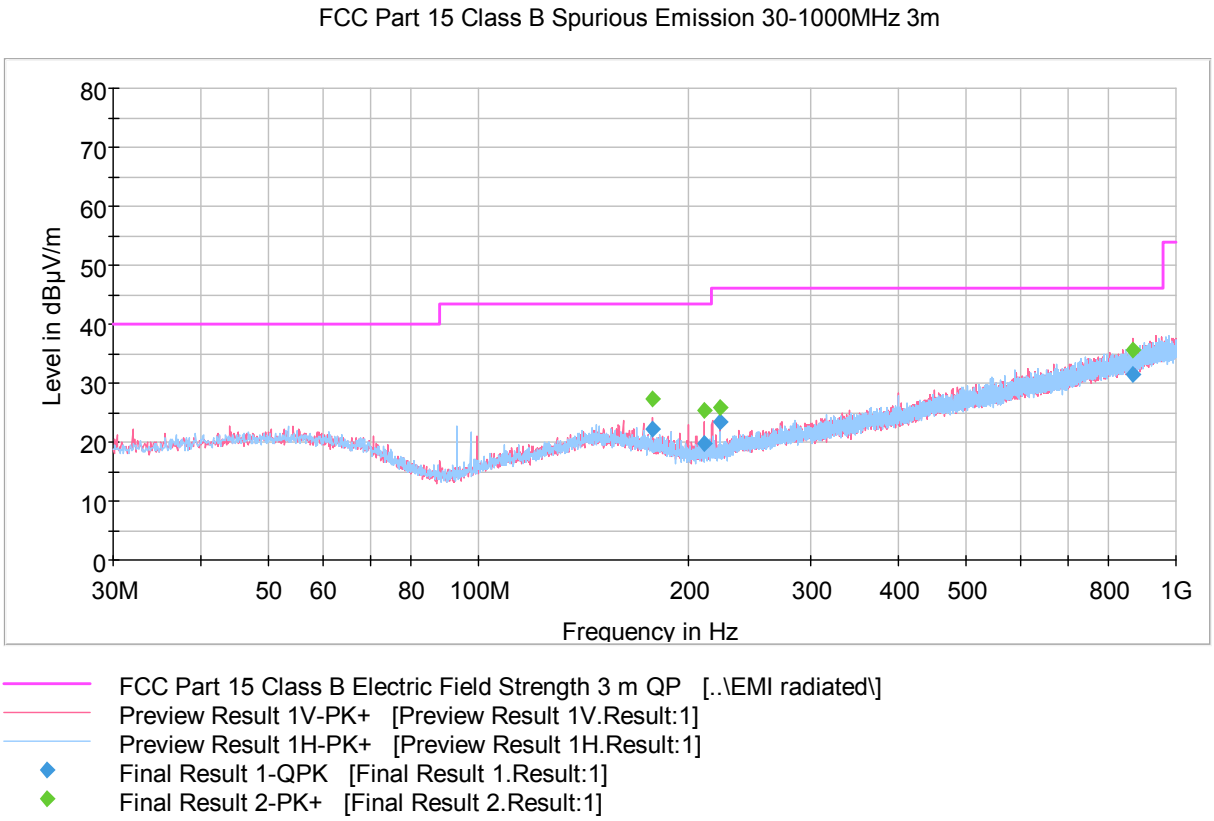
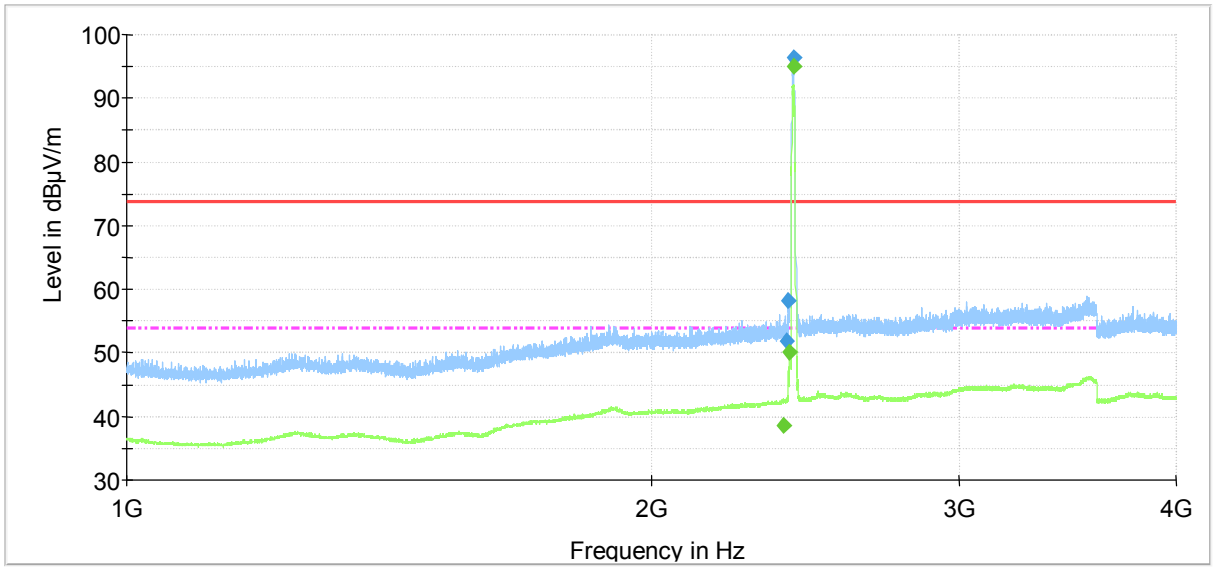


Figure 3. Measured curve with peak-detector (high channel).

Table 3. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
177.945000	22.2	1000.0	120.000	100.0	V	255.0	14.1	21.3	43.5	
211.022000	19.7	1000.0	120.000	100.0	V	224.0	12.4	23.8	43.5	
222.060000	23.3	1000.0	120.000	100.0	V	63.0	12.5	22.7	46.0	
866.874000	31.5	1000.0	120.000	395.0	V	255.0	26.8	14.5	46.0	

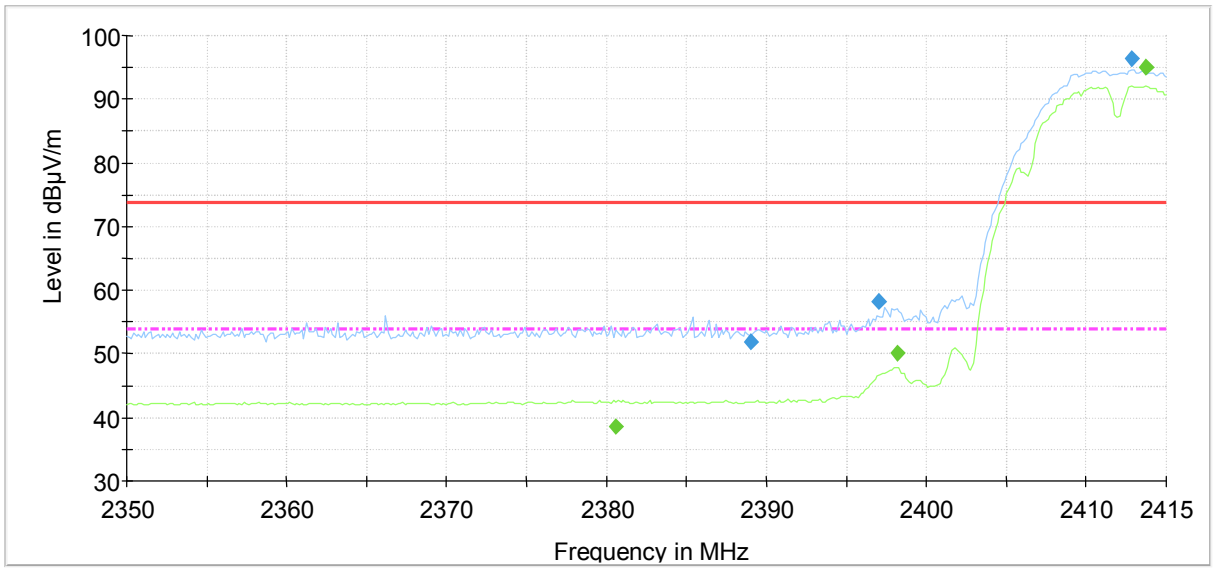
FCC Part 15 Class B Spurious Emission 1-4 GHz 3m



FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
Preview Result 1-PK+ [Preview Result 1.Result:1]
Preview Result 2-AVG [Preview Result 2.Result:2]
Final Result 1-PK+ [Final Result 1.Result:1]
Final Result 2-AVG [Final Result 2.Result:1]

Figure 4. Measured curve with peak- and average detector (low channel).

FCC Part 15 Class B Spurious Emission 1-4 GHz 3m



FCC Part 15 Class B Electric Field Strength 3 m PK [..\EMI radiated\]
FCC Part 15 Class B Electric Field Strength 3 m AV [..\EMI radiated\]
Preview Result 1-PK+ [Preview Result 1.Result:1]
Preview Result 2-AVG [Preview Result 2.Result:2]
Final Result 1-PK+ [Final Result 1.Result:1]
Final Result 2-AVG [Final Result 2.Result:1]

Figure 5. Low channel band edge.

Final measurements from the worst frequencies

Table 4. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.000000	52.0	1000.0	1000.000	202.0	H	1.0	13.9	21.9	73.9	
2397.000000	58.3	1000.0	1000.000	180.0	H	-5.0	13.9	15.6	73.9	
2412.850000	96.3	1000.0	1000.000	175.0	H	40.0	13.9	-22.4	73.9	Carrier

Table 5. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2380.600000	38.5	1000.0	1000.000	178.0	H	30.0	13.8	15.4	53.9	
2398.200000	50.1	1000.0	1000.000	210.0	H	47.0	14.0	3.8	53.9	
2413.750000	94.9	1000.0	1000.000	218.0	H	47.0	13.9	-41.0	53.9	Carrier

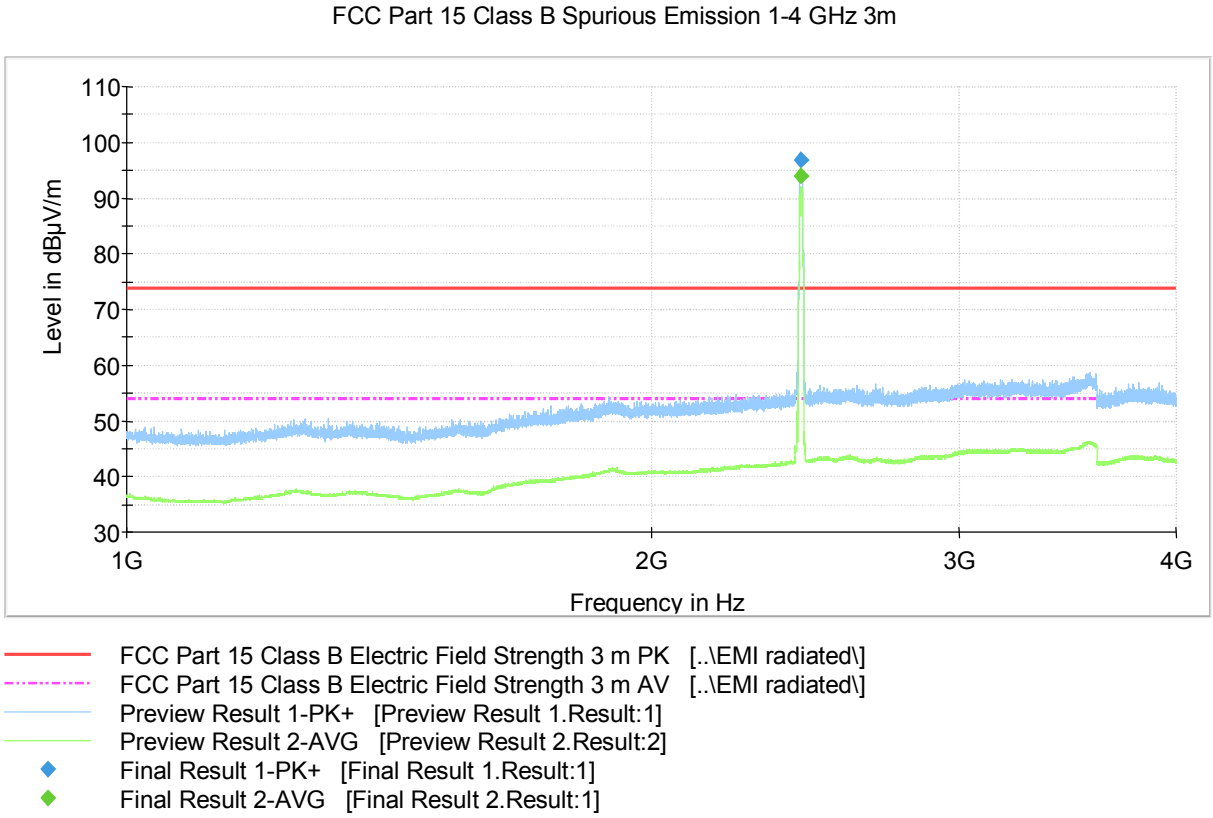


Figure 6. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

Table 6. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2437.900000	96.9	1000.0	1000.000	213.0	H	40.0	13.9	-23.0	73.9	Carrier

Table 7. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2438.800000	93.9	1000.0	1000.000	210.0	H	41.0	13.9	-40.0	53.9	Carrier

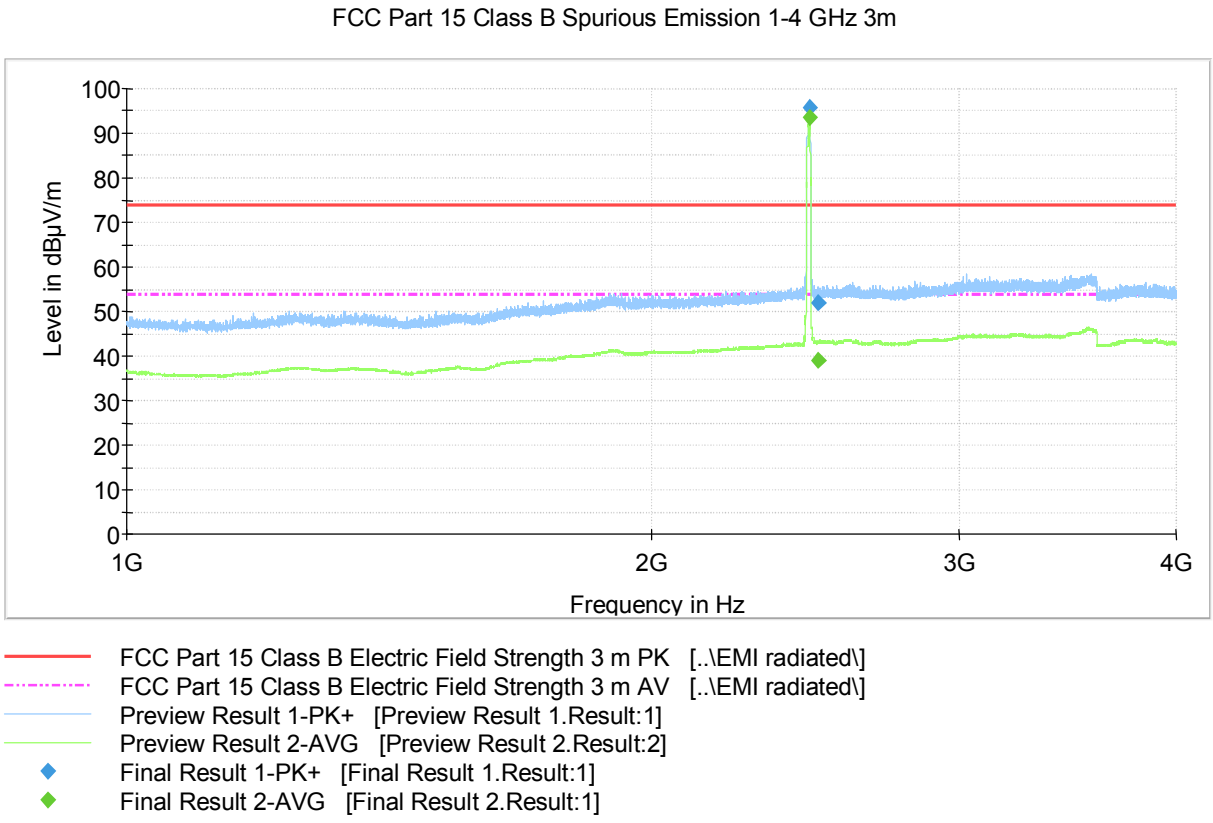


Figure 7. Measured curve with peak- and average detector (high channel).

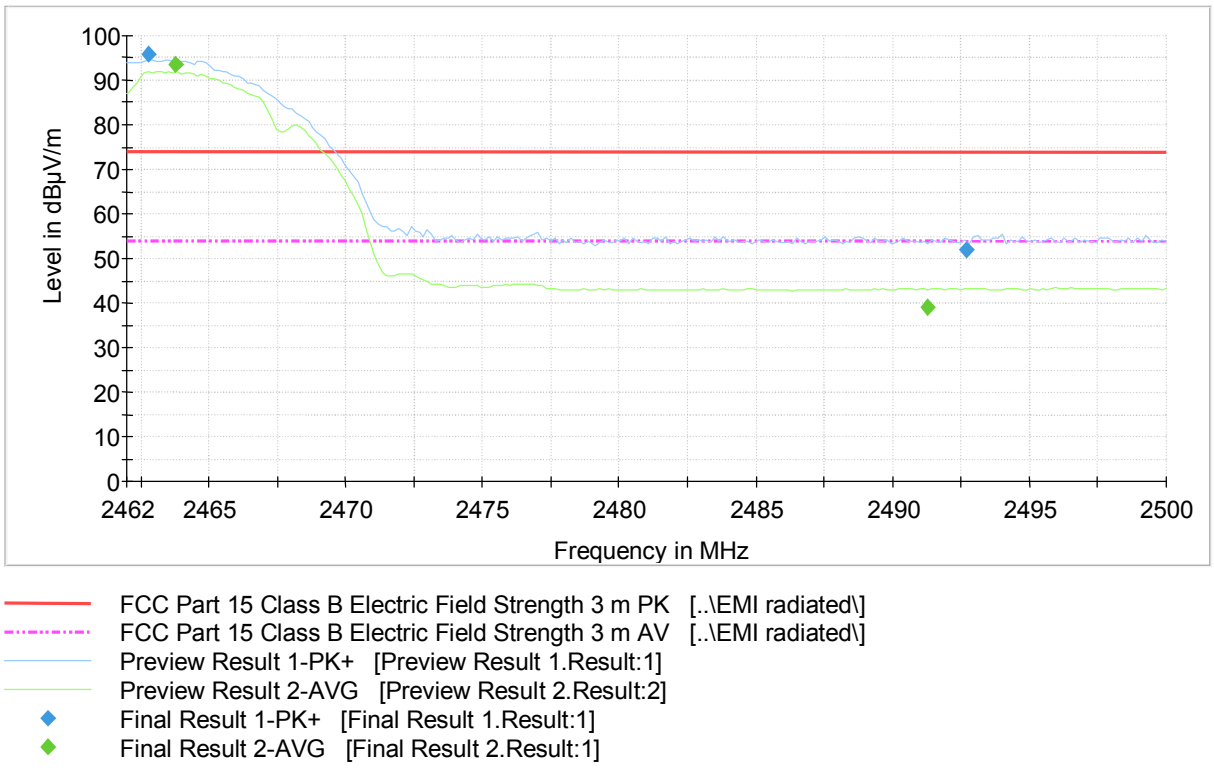


Figure 8. High channel band edge.

Final measurements from the worst frequencies

Table 8. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2462.800000	95.9	1000.0	1000.000	210.0	H	46.0	14.0	-22.0	73.9	Carrier
2492.700000	52.1	1000.0	1000.000	235.0	H	10.0	14.4	21.8	73.9	

Table 9. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2463.800000	93.6	1000.0	1000.000	212.0	H	48.0	14.0	-39.7	53.9	Carrier
2491.300000	39.1	1000.0	1000.000	203.0	H	63.0	14.4	14.8	53.9	

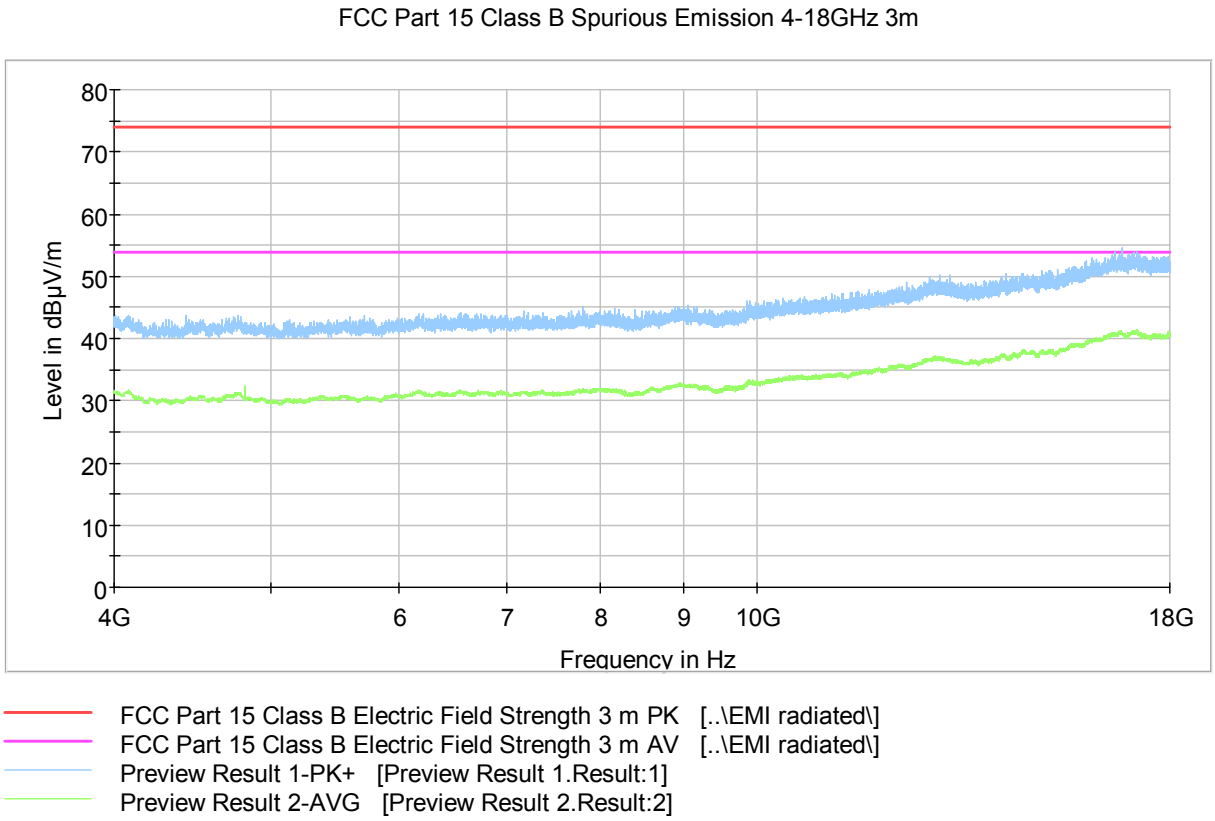


Figure 9. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

No final measurements were made duo to the low emission level.

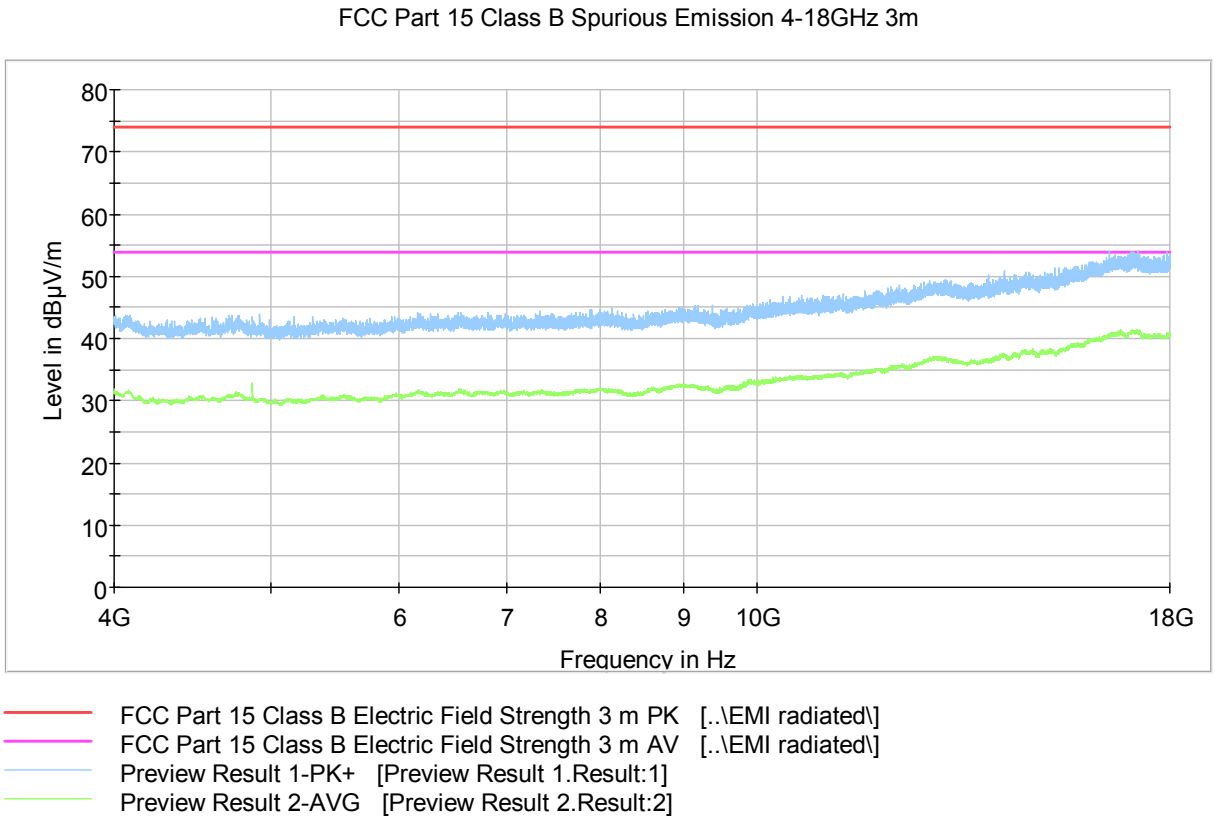


Figure 10. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

No final measurements were made due to the low emission level.

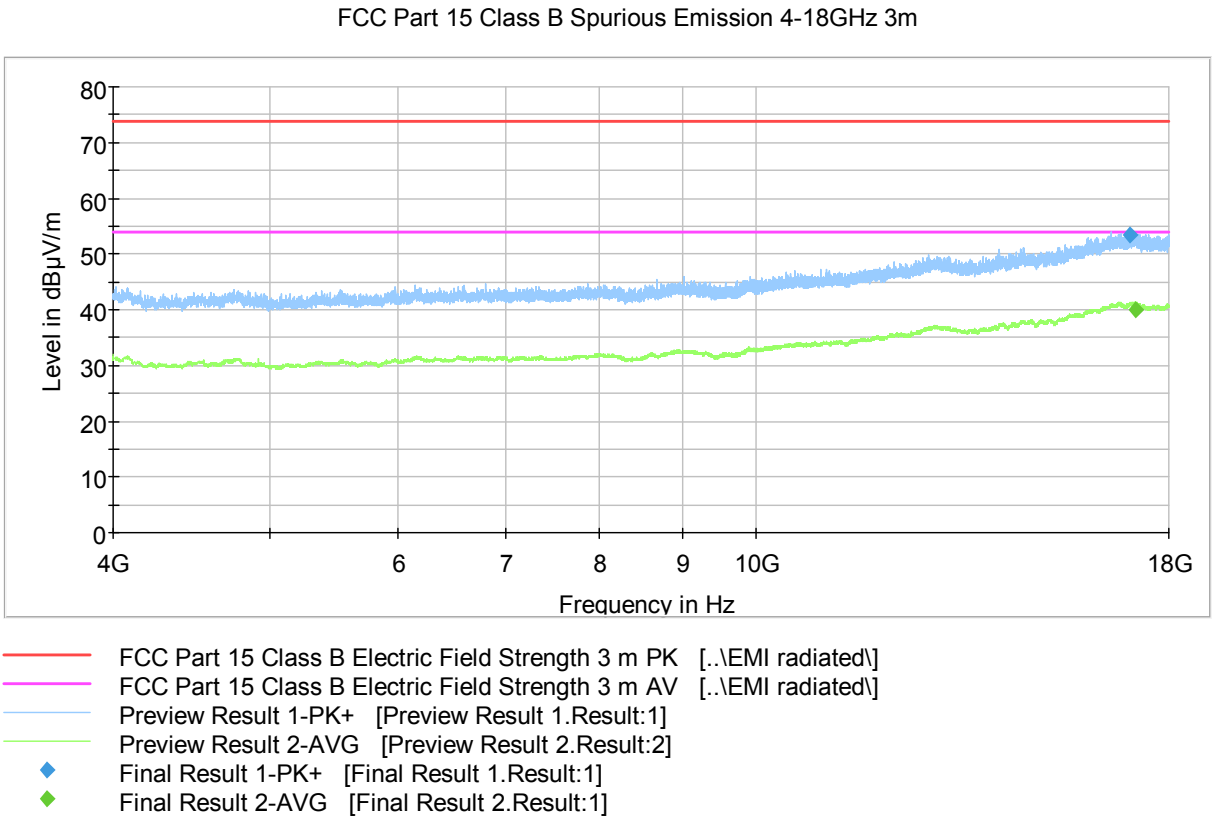


Figure 11. Measured curve with peak- and average detector (high channel).

Final measurements from the worst frequencies

Table 10. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17045.200000	53.5	1000.0	1000.000	221.0	V	0.0	25.7	20.4	73.9	

Table 11. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17170.100000	40.1	1000.0	1000.000	105.0	V	286.0	25.8	13.8	53.9	

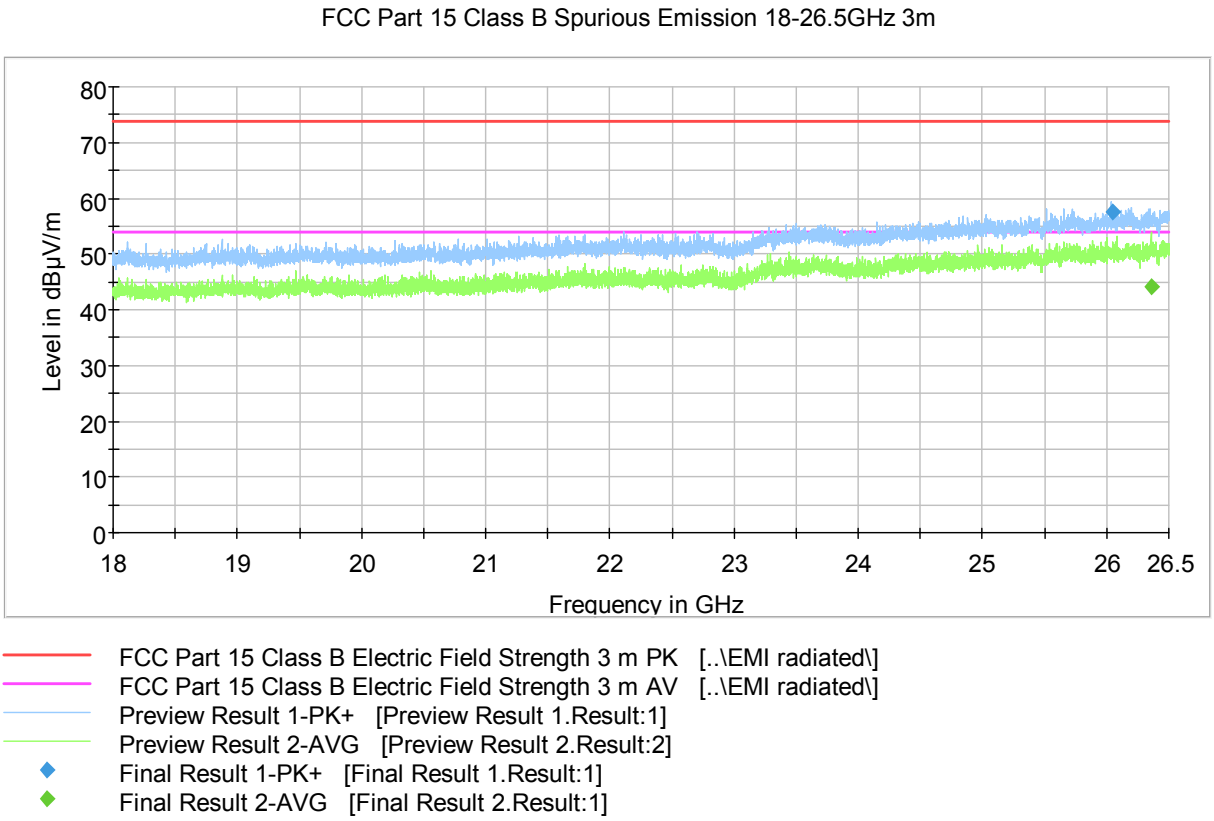


Figure 12. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

Table 12. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
26042.600000	57.5	1000.0	1000.000	362.0	H	217.0	34.8	16.4	73.9	

Table 13. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
26360.100000	44.2	1000.0	1000.000	317.0	V	355.0	35.6	9.7	53.9	

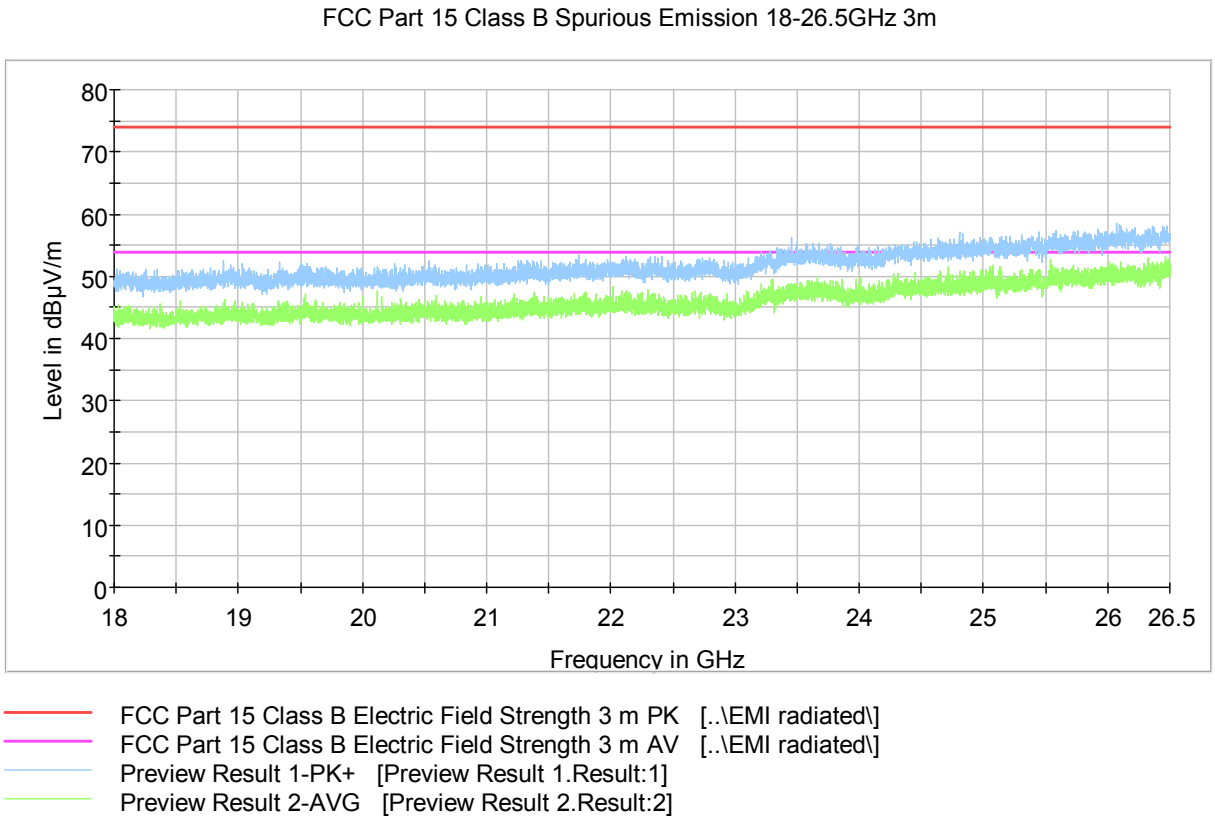


Figure 13. Measured curve with peak- and average detector (middle channel).

No final measurements were made due to the low emission level.

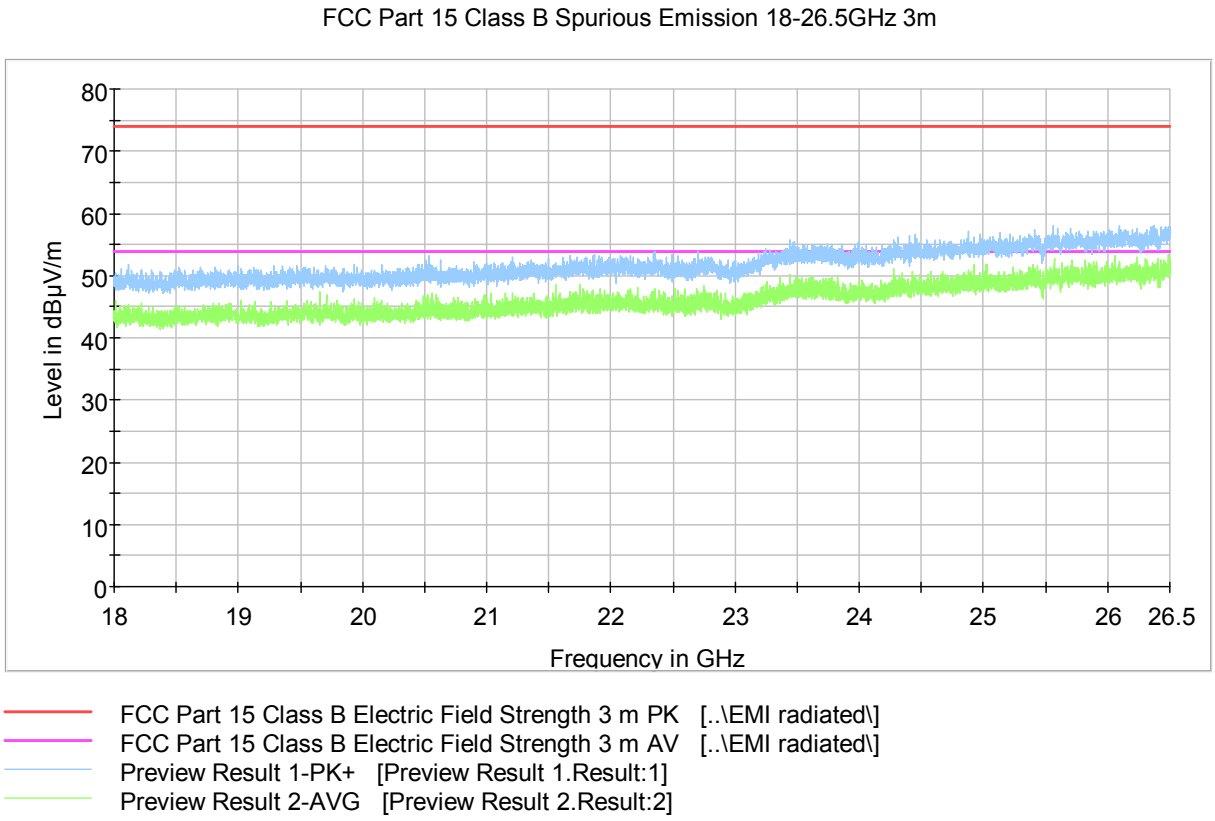


Figure 14. Measured curve with peak- and average detector (high channel).

No final measurements were made due to the low emission level.

Test results 802.11n MCS0

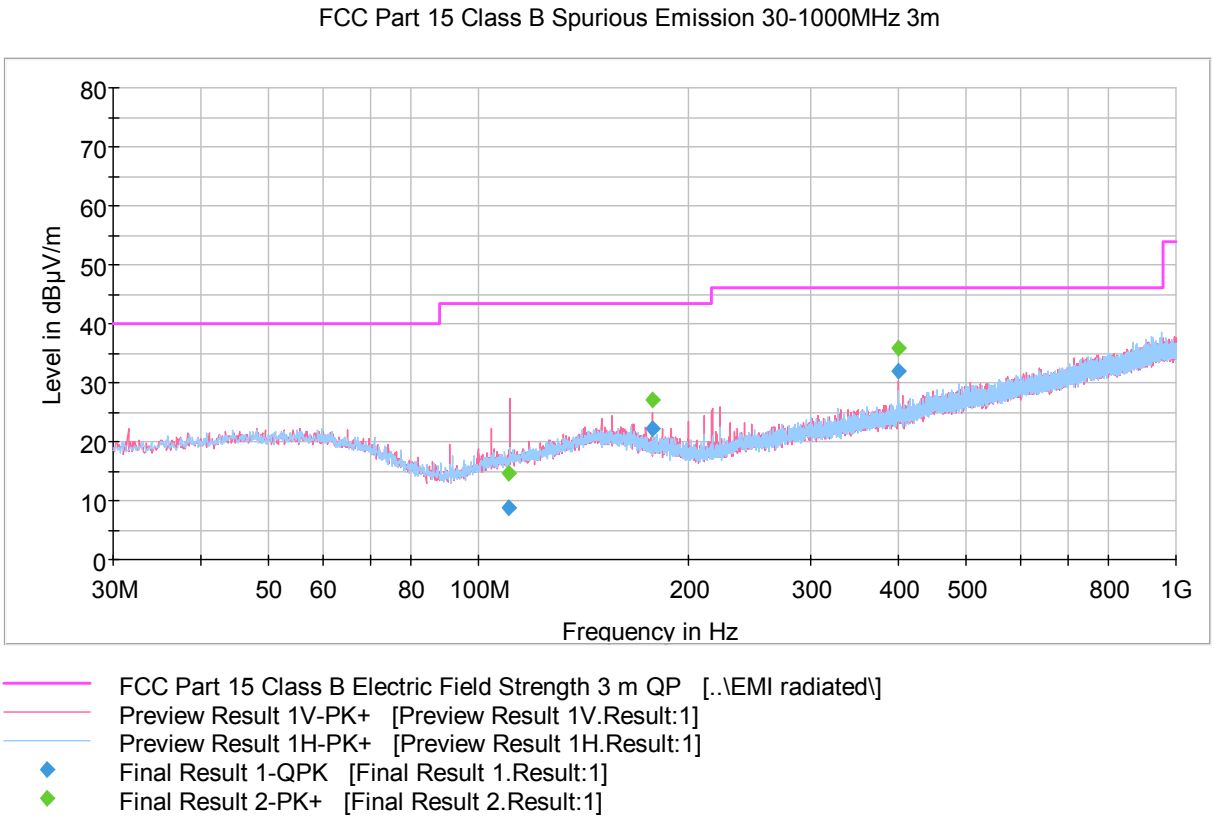


Figure 15. Measured curves with peak-detector (low channel).

Table 14. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
110.395000	8.7	1000.0	120.000	100.0	V	63.0	11.2	34.8	43.5	
177.945000	22.1	1000.0	120.000	100.0	V	249.0	14.1	21.4	43.5	
399.978000	31.8	1000.0	120.000	139.0	V	224.0	18.4	14.2	46.0	

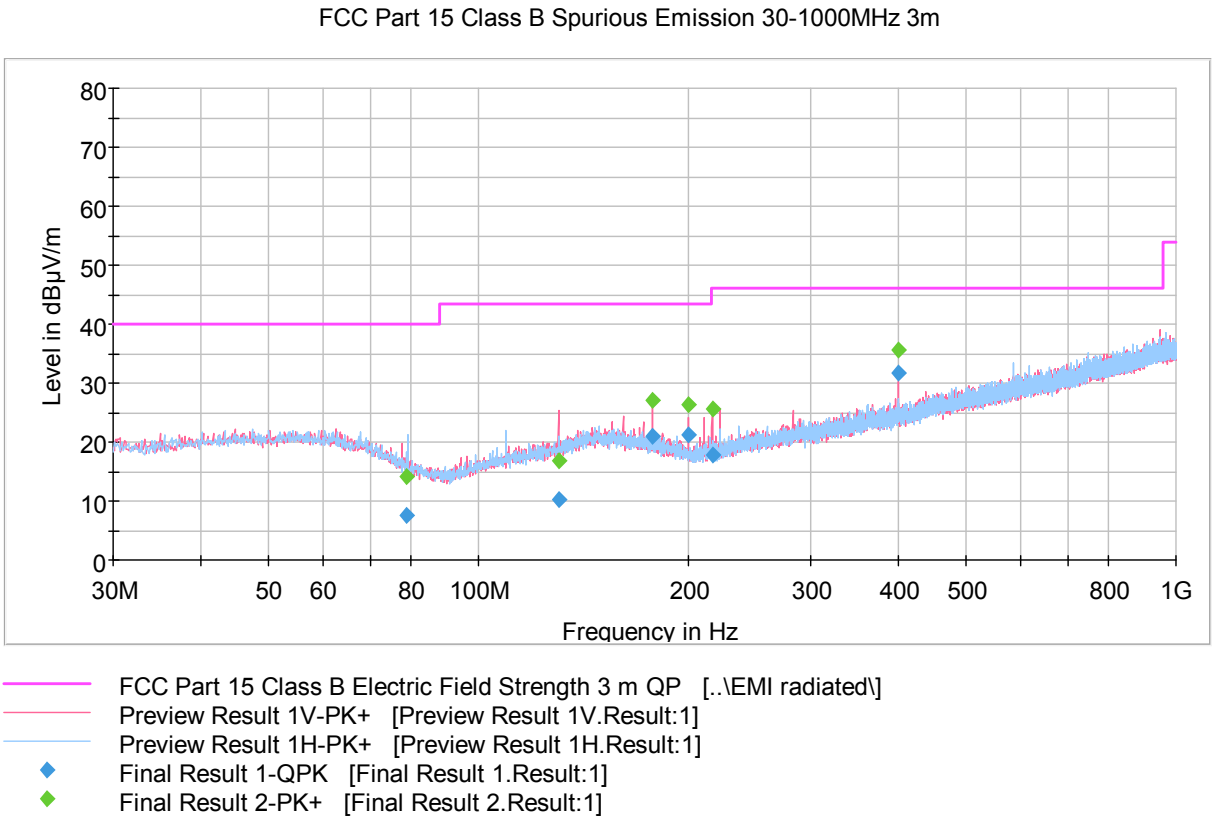


Figure 16. Measured curve with peak-detector (middle channel).

Table 15. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
79.013000	7.4	1000.0	120.000	293.0	H	13.0	10.5	32.6	40.0	
130.338000	10.4	1000.0	120.000	316.0	V	152.0	12.9	33.1	43.5	
177.965000	21.0	1000.0	120.000	100.0	V	254.0	14.1	22.5	43.5	
199.984000	21.3	1000.0	120.000	100.0	V	236.0	12.5	22.2	43.5	
216.611000	17.9	1000.0	120.000	100.0	V	243.0	12.5	28.1	46.0	
399.998000	31.7	1000.0	120.000	138.0	V	223.0	18.4	14.3	46.0	

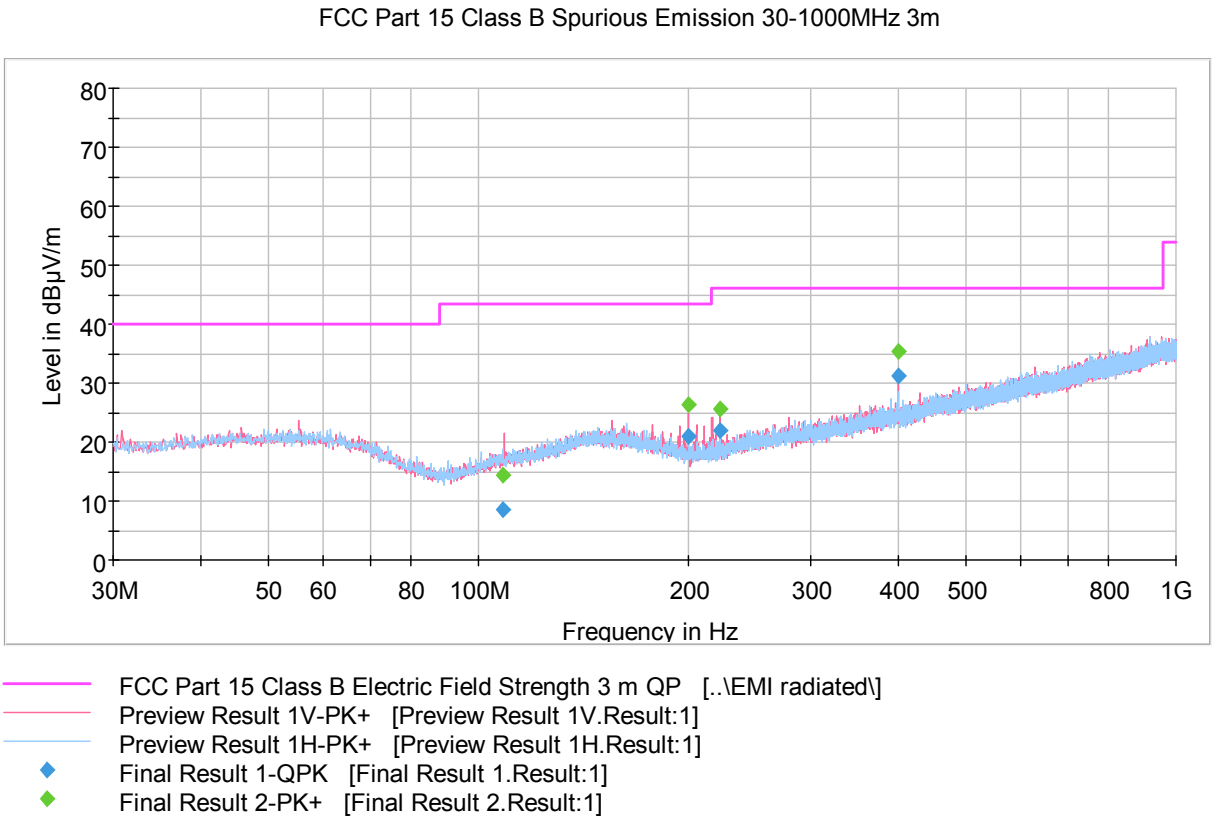


Figure 17. Measured curve with peak-detector (high channel).

Table 16. Final measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
108.755000	8.5	1000.0	120.000	123.0	V	161.0	11.1	35.0	43.5	
200.004000	21.1	1000.0	120.000	100.0	V	217.0	12.5	22.4	43.5	
222.100000	21.9	1000.0	120.000	121.0	V	63.0	12.5	24.1	46.0	
399.995000	31.2	1000.0	120.000	122.0	V	225.0	18.4	14.8	46.0	

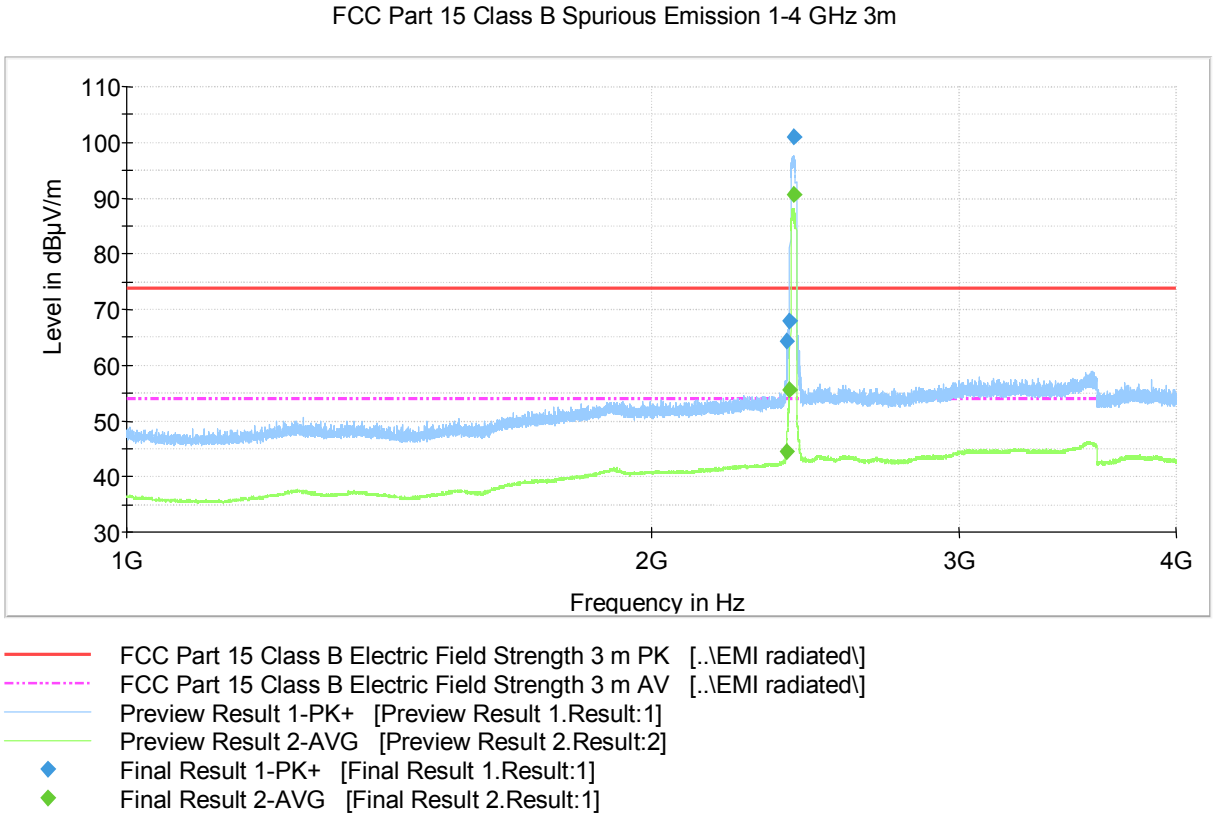


Figure 18. Measured curve with peak- and average detector (low channel).

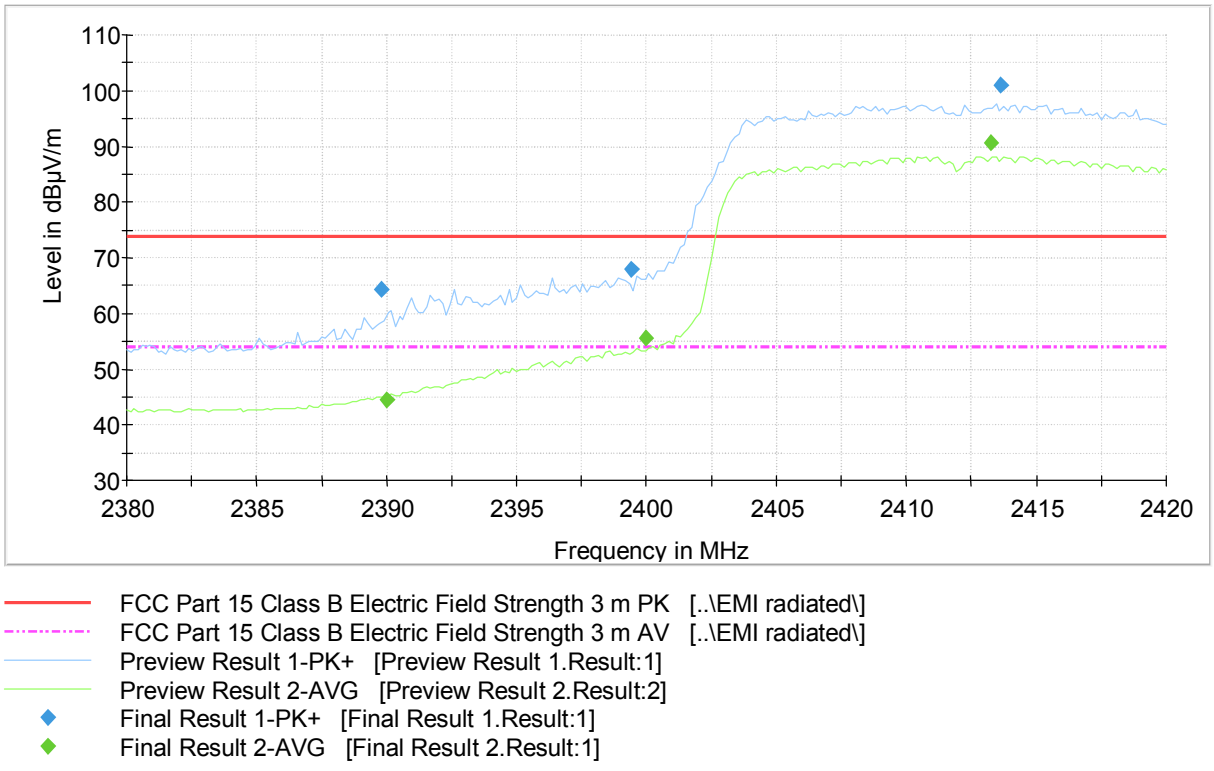


Figure 19. Low channel band edge.

Final measurements from the worst frequencies

Table 17. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.800000	64.4	1000.0	1000.000	209.0	H	30.0	13.9	9.5	73.9	
2399.400000	68.1	1000.0	1000.000	100.0	H	30.0	14.0	5.8	73.9	
2413.650000	100.9	1000.0	1000.000	210.0	H	30.0	13.9	-27.0	73.9	

Table 18. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2390.000000	44.5	1000.0	1000.000	210.0	H	30.0	13.9	9.4	53.9	
2400.000000	55.5	1000.0	1000.000	400.0	H	40.0	14.0	-1.6	53.9	
2413.250000	90.7	1000.0	1000.000	211.0	H	-4.0	13.9	-36.8	53.9	

Note 2: The measurement result at band edge is not on a restricted frequency and it complies with the 20 dB limit described in FCC Rule 15.247(d).

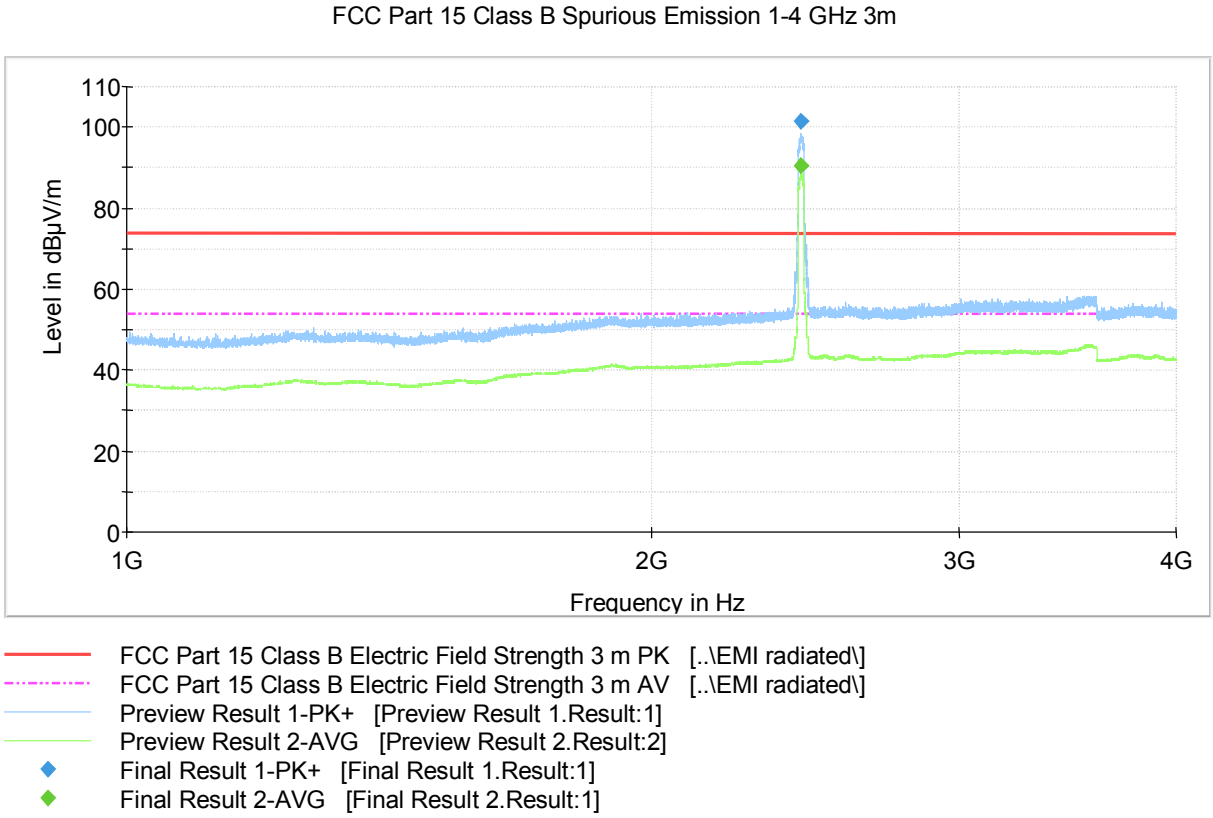


Figure 20. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

Table 19. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2438.400000	101.3	1000.0	1000.000	202.0	H	-4.0	13.9	-27.4	73.9	Carrier

Table 20. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2438.050000	90.5	1000.0	1000.000	211.0	H	46.0	13.9	-36.6	53.9	Carrier

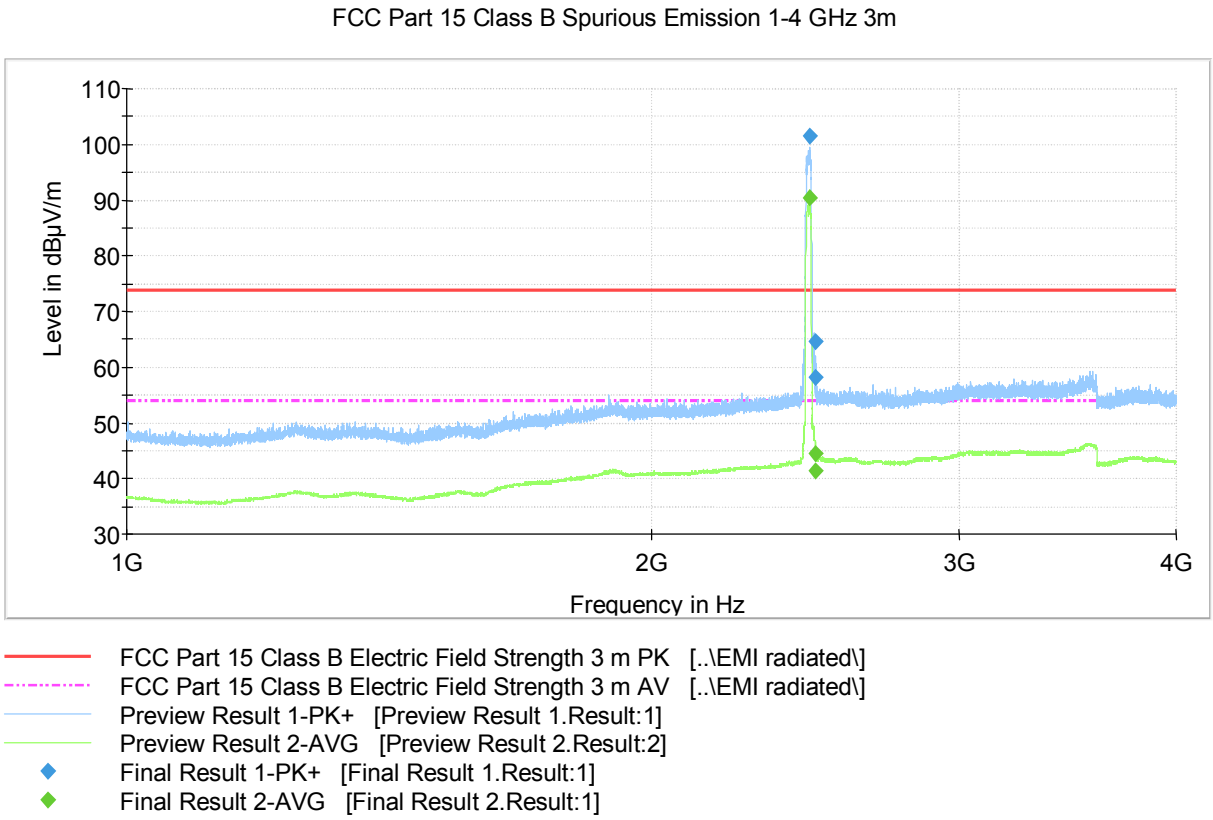


Figure 21. Measured curve with peak- and average detector (high channel).

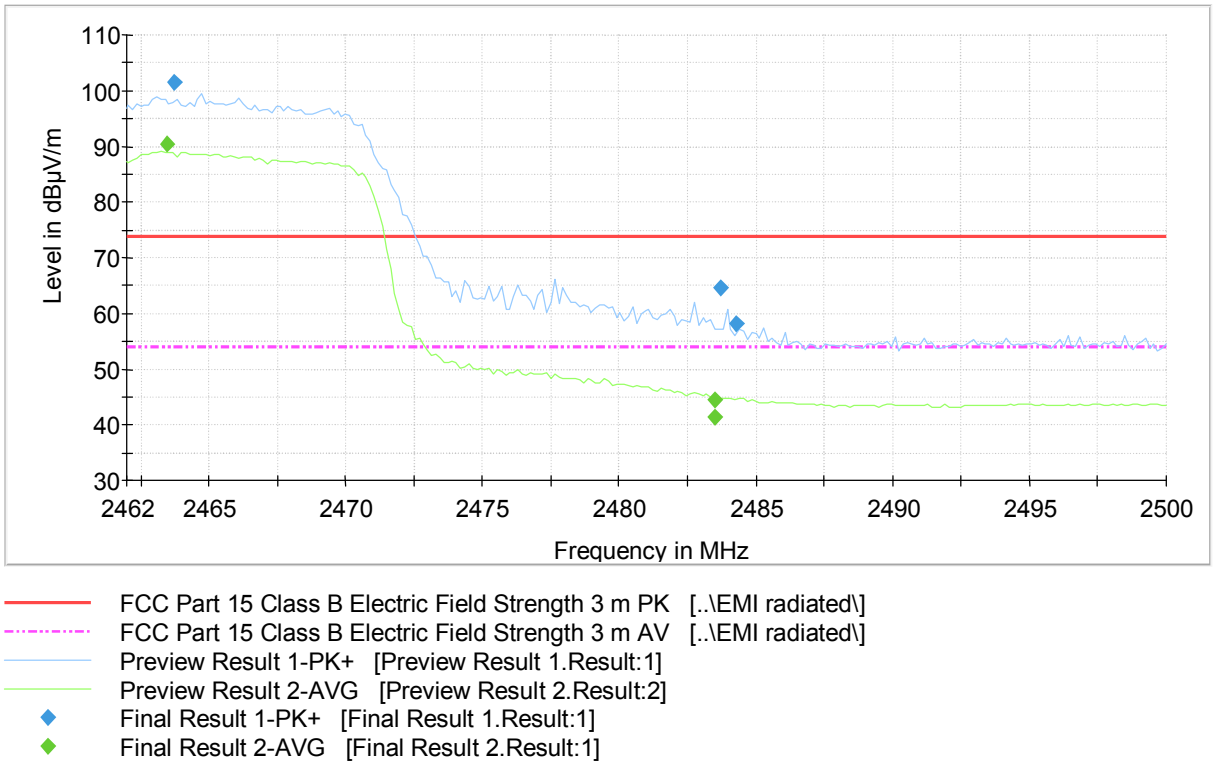


Figure 22. High channel band edge.

Final measurements from the worst frequencies

Table 21. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2463.750000	101.5	1000.0	1000.000	204.0	H	48.0	14.0	-27.6	73.9	Carrier
2483.700000	64.6	1000.0	1000.000	204.0	H	59.0	14.3	9.3	73.9	
2484.300000	58.2	1000.0	1000.000	178.0	V	59.0	14.3	15.7	73.9	

Table 22. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2463.450000	90.5	1000.0	1000.000	209.0	H	48.0	14.0	-36.6	53.9	Carrier
2483.500000	44.5	1000.0	1000.000	204.0	H	59.0	14.3	9.4	53.9	
2483.500000	41.4	1000.0	1000.000	212.0	V	59.0	14.3	12.5	53.9	

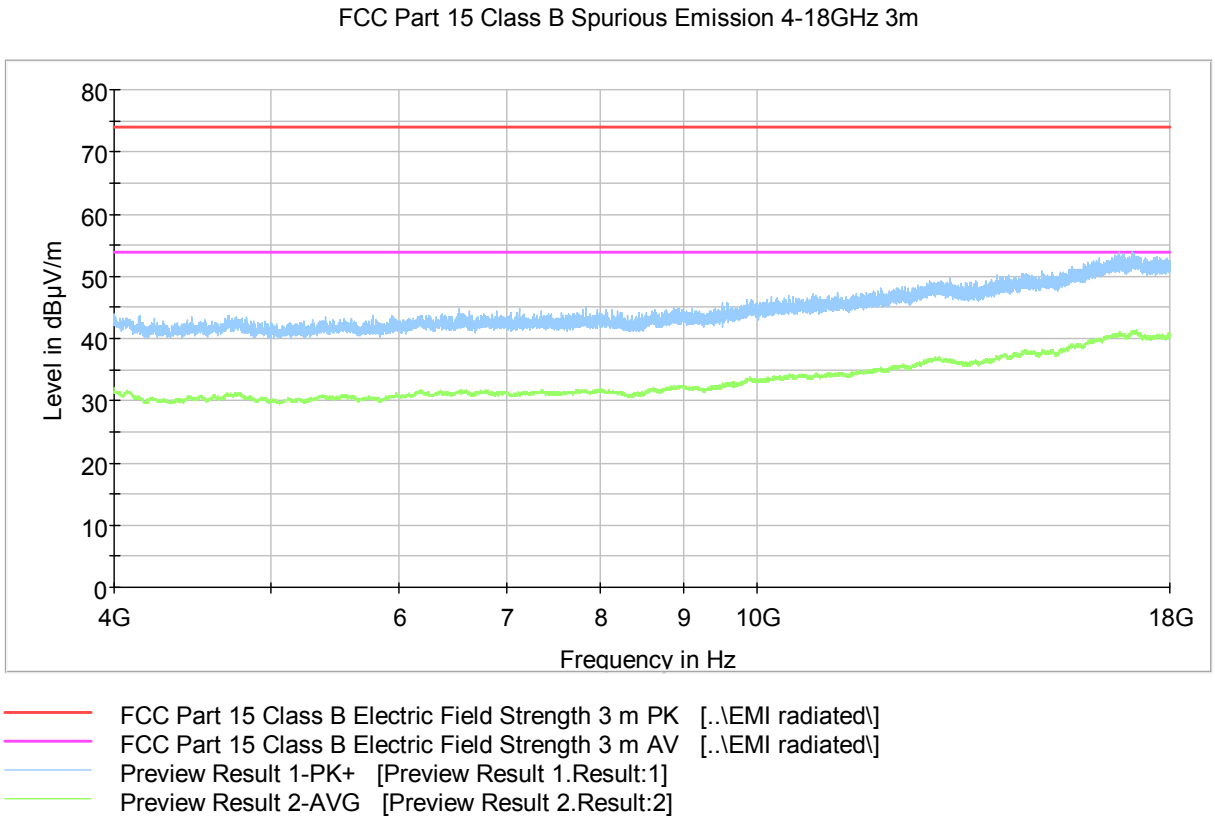


Figure 23. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

No final measurements were made duo to the low emission level.

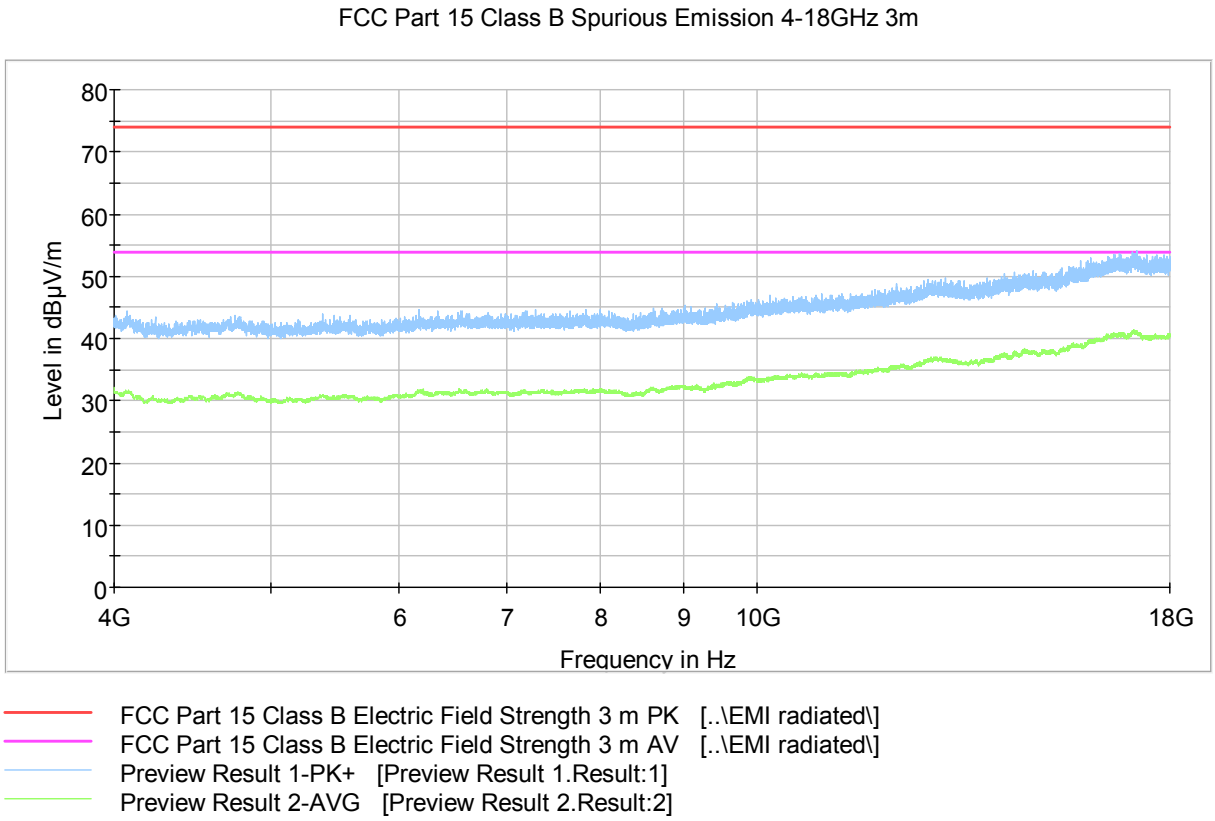


Figure 24. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

No final measurements were made due to the low emission level.

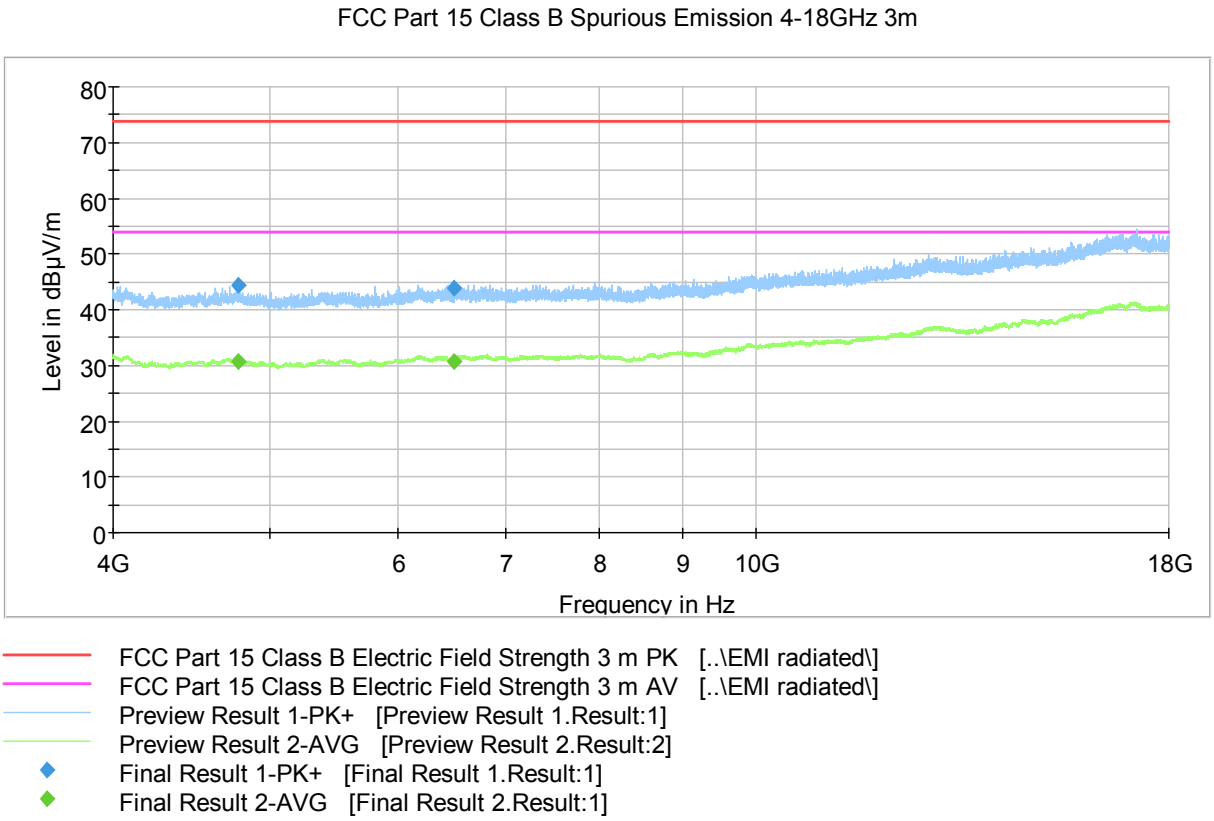


Figure 25. Measured curve with peak- and average detector (high channel).

Final measurements from the worst frequencies

Table 23. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4782.500000	44.4	1000.0	1000.000	186.0	H	222.0	10.0	29.5	73.9	
6502.700000	43.9	1000.0	1000.000	361.0	V	164.0	11.8	30.0	73.9	

Table 24. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
4782.500000	30.7	1000.0	1000.000	186.0	H	222.0	10.0	23.2	53.9	
6502.700000	30.7	1000.0	1000.000	361.0	V	164.0	11.8	23.2	53.9	

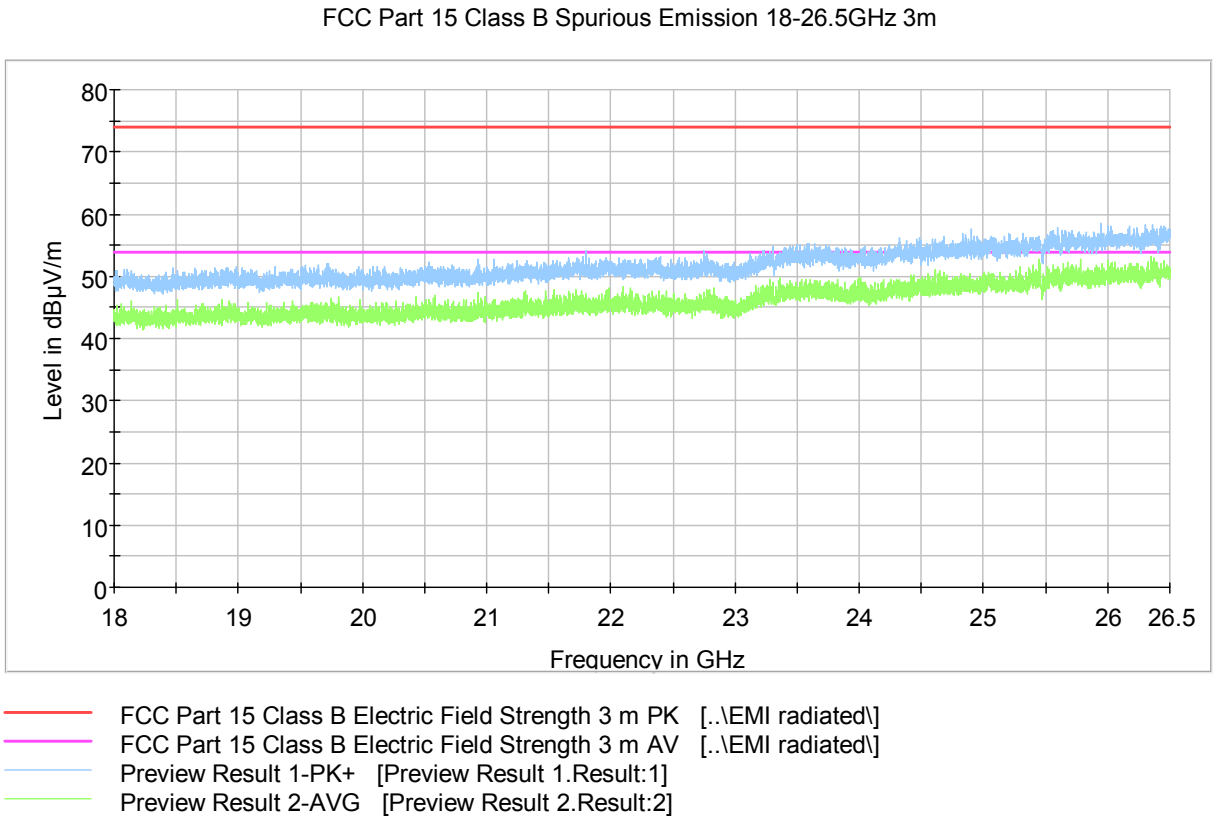


Figure 26. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

No final measurements were made due to the low emission level.

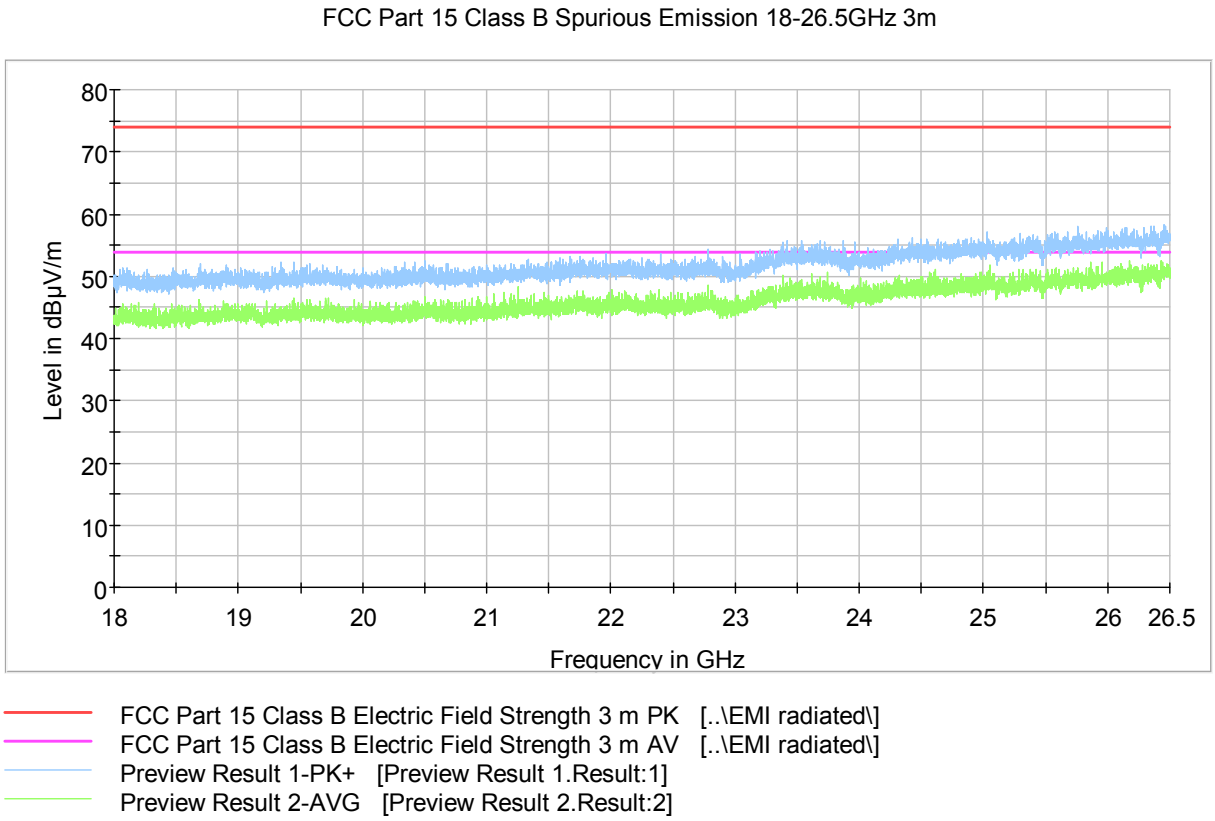


Figure 27. Measured curve with peak- and average detector (middle channel).

No final measurements were made due to the low emission level.

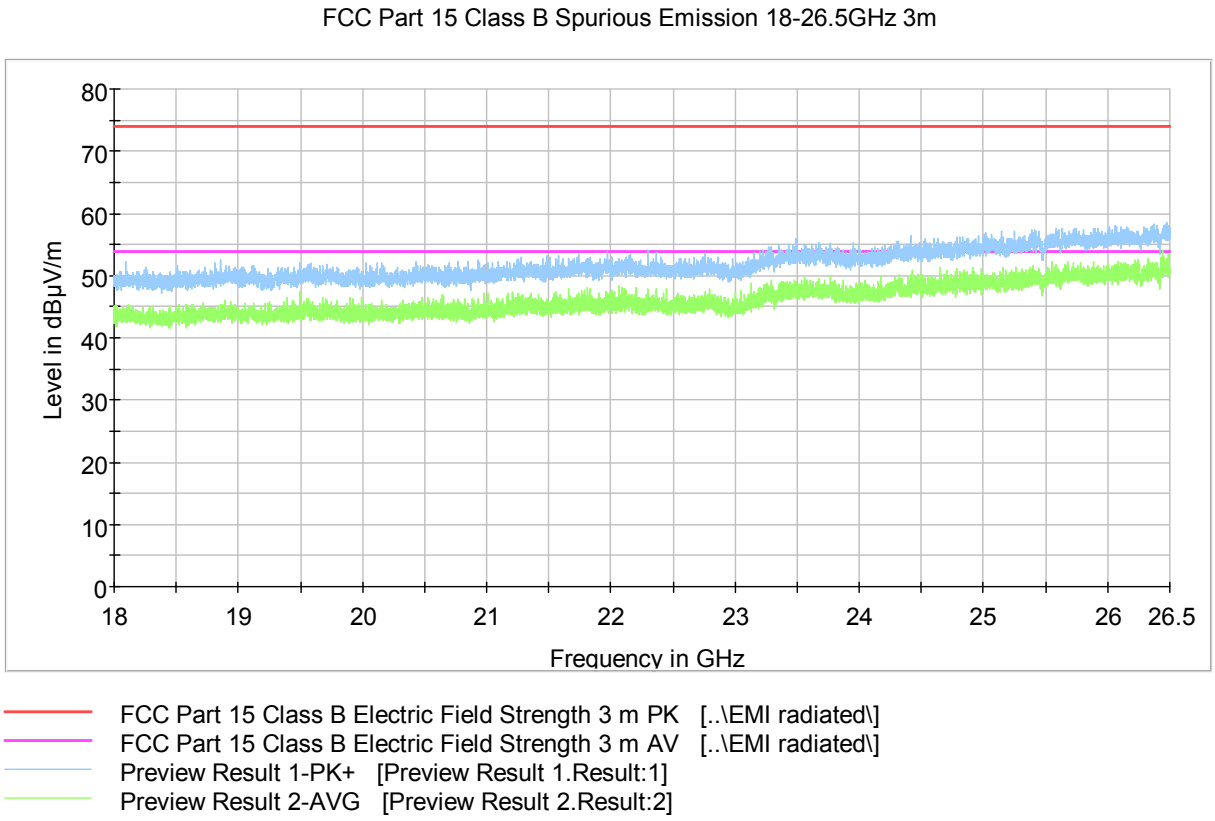


Figure 28. Measured curve with peak- and average detector (high channel).

No final measurements were made due to the low emission level.

TEST EQUIPMENT

Equipment	Manufacturer	Type	Serial no	Inv.no
TEST RECEIVER	ROHDE & SCHWARZ	ESU 26	100185	8453
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	-
ANTENNA (30-1000 MHz)	SCHWARZBECK	VULB 9168	8168-503	8911
ANTENNA MAST	DEISEL	MA240	240/455	5017
TURNTABLE	DEISEL	DS420	-	5015
CONTROLLER	COMTEST	HD100	100/457	5018
ANTENNA (1-18 GHz)	EMCO	3117	29617	7293
PREAMPLIFIER (0.5-26GHz)	HP	83017A	3950M00102	5226
ATTENUATOR 10 dB	HUBER & SUHNER	6810.17B	-	-
HIGH PASS FILTER	WAINWRIGHT	WHKX	10	8267
ANTENNA (18-26.5 GHz)	EMCO	3160- 09	030232-022	7294

All used measurement equipment was calibrated (if required).