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:	Handheld XRF Analyzer
Type/ Model:	XMDS2770
Manufacturer:	Oxford Instruments Analytical Oy Tarvonsalmenkatu 17 P.O. Box 85 FI-02631 ESPOO FINLAND
Customer:	Oxford Instruments Analytical Oy Tarvonsalmenkatu 17 P.O. Box 85 FI-02631 ESPOO FINLAND
FCC Rule Part:	15.247: 2012
IC Rule Part:	RSS-210, Issue 8, 2010 RSS-GEN Issue 3, 2010
KDB:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (April 9, 2013)

Customer has made modifications for the certified unit. The unit has different antennas .Only partial tests have been performed for C2PC. This report contains the tests made with WiFi.

Date:	November 15, 2013	Date:	November 18, 2013
Issued by:	Rauno Repo Testing Engineer	Checked by:	Jari Merikari Technical Manager

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Equipment Under Test (EUT)

Handheld XRF Analyzer	
Type/ Model:	XMDS2770
Serial Number:	Marked as “SATU”

The EUT contains CE-marked and FCC/IC certified Wi2Wi – WiFi 802.11 b/g and Bluetooth 2.0 + EDR module (ZYH-W2CBW003) with new integral antennas. The EUT has an USB port for PC data transmission and integrated GPS receiver. It is handheld and powered from internal battery which can be recharged with an external AC/DC charger.

Classification of the device

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

Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing

Ratings and declarations

Operating Frequency Range (OFR):	2412 – 2462 MHz
Channels:	11
Channel separation:	5 MHz
Channel bandwidth:	20 MHz (802.11b-standard) 22 MHz (802.11g-standard)
Conducted power:	+15.70 dBm
Transmission technique:	DSSS/OFDM
Modulation:	CCK/OFDM
Antenna gain:	4.0 dBi

Power Supply

Internal battery. Tests were performed with charger connected with 120 VAC/ 60 Hz.

Disclaimer

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.247(b)(3) / RSS-210 8.4	Maximum Conducted Output Power	PASS
§15.209 / RSS-GEN 7.2.3.2	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

The power of all modes and data rates were measured with a power meter (low, mid and high channel) and the signal giving the highest power was selected for the measurements (802.11 g-mode with 6 Mbps data rate).

Following channels were used during the tests:

Channel	Frequency/ MHz
LOW	2412
MID	2437
HIGH	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

Maximum Conducted Output Power Measurement

Standard:	ANSI C63.10	(2009)
Tested by:	RRE	
Date:	7.11.2013	
Temperature:	22 °C	
Humidity:	22 % RH	

FCC Rule: 15.247 (b) (3)

For systems using digital modulation in the 2400-2483.5 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

Output power was measured with a power meter. The EUT was using “14” parameter for the power setting.

Data rate [Mbps]	Conducted power [dBm]			Limit [dBm]	Result
	Low channel	Mid channel	High channel		
1	12.87	14.55	15.28	30	PASS
2	13.14	14.30	15.44	30	PASS
5.5	12.16	13.75	14.48	30	PASS
6	13.53	14.57	15.70	30	PASS
11	12.92	14.29	14.94	30	PASS
54	12.91	14.59	15.23	30	PASS

The output power in the grant ZYH-W2CBW003 was 0.03342 W (= 15.24 dBm). The deviation with measured maximum value is 0.46 dB.

Transmitter Radiated Emissions 30 – 26 500 MHz and Band Edge

Standard:	ANSI C63.10	(2009)
Tested by:	RRE	
Date:	13. – 14.11.2013	
Temperature:	23 °C	
Humidity:	15 – 23 % 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 are done with 6 Mbps data rate.

Test results

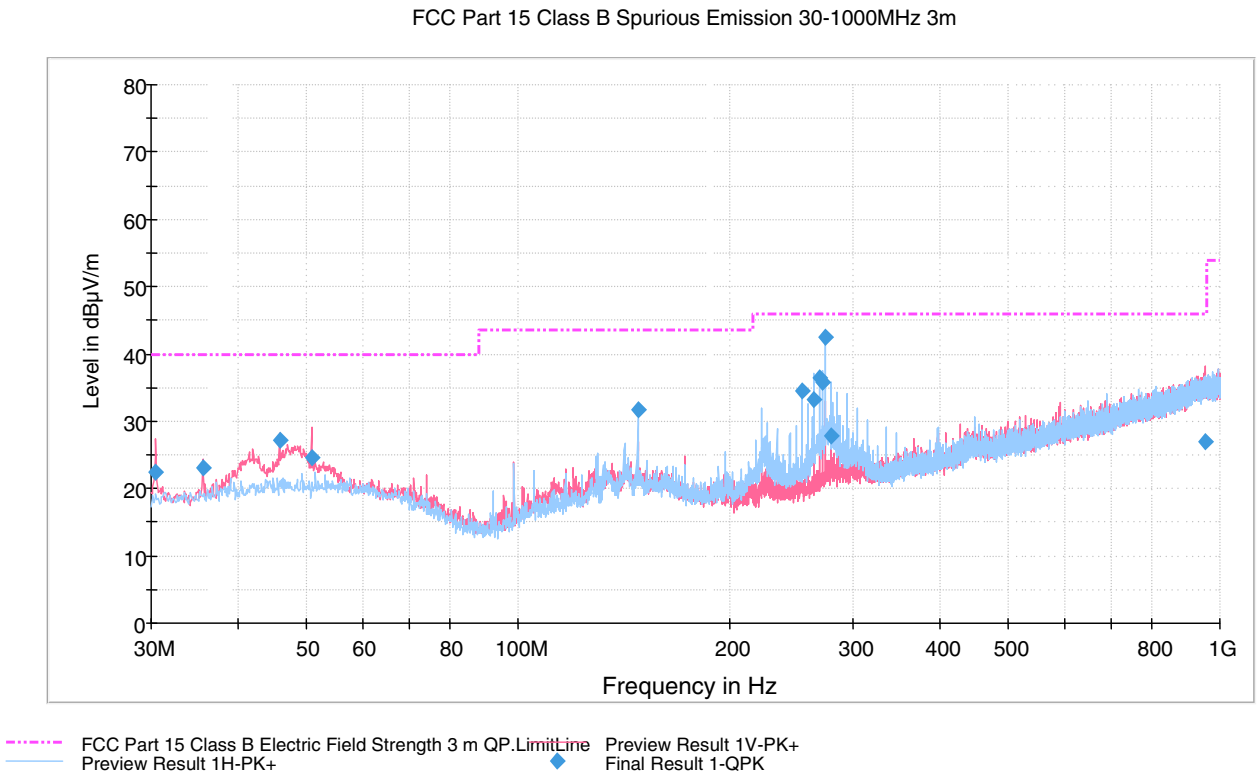

Figure 1. Measured curves with peak-detector (low channel).

Table 1. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.500000	22.5	1000.0	120.000	100.0	V	89.0	14.1	17.5	40.0	
35.569000	23.0	1000.0	120.000	110.0	V	159.0	14.5	17.0	40.0	
45.734000	27.2	1000.0	120.000	100.0	V	229.0	15.2	12.8	40.0	
50.818000	24.5	1000.0	120.000	100.0	V	211.0	15.2	15.5	40.0	
148.106000	31.7	1000.0	120.000	191.0	H	258.0	14.8	11.8	43.5	
254.130000	34.5	1000.0	120.000	109.0	H	105.0	14.1	11.5	46.0	
264.335000	33.3	1000.0	120.000	100.0	H	289.0	14.6	12.7	46.0	
269.356000	36.5	1000.0	120.000	110.0	H	289.0	14.8	9.5	46.0	
271.510000	35.8	1000.0	120.000	100.0	H	298.0	15.0	10.2	46.0	
274.440000	42.5	1000.0	120.000	116.0	H	300.0	15.2	3.5	46.0	
279.424000	27.8	1000.0	120.000	100.0	H	287.0	15.3	18.2	46.0	
953.462000	27.0	1000.0	120.000	332.0	V	47.0	28.3	19.0	46.0	

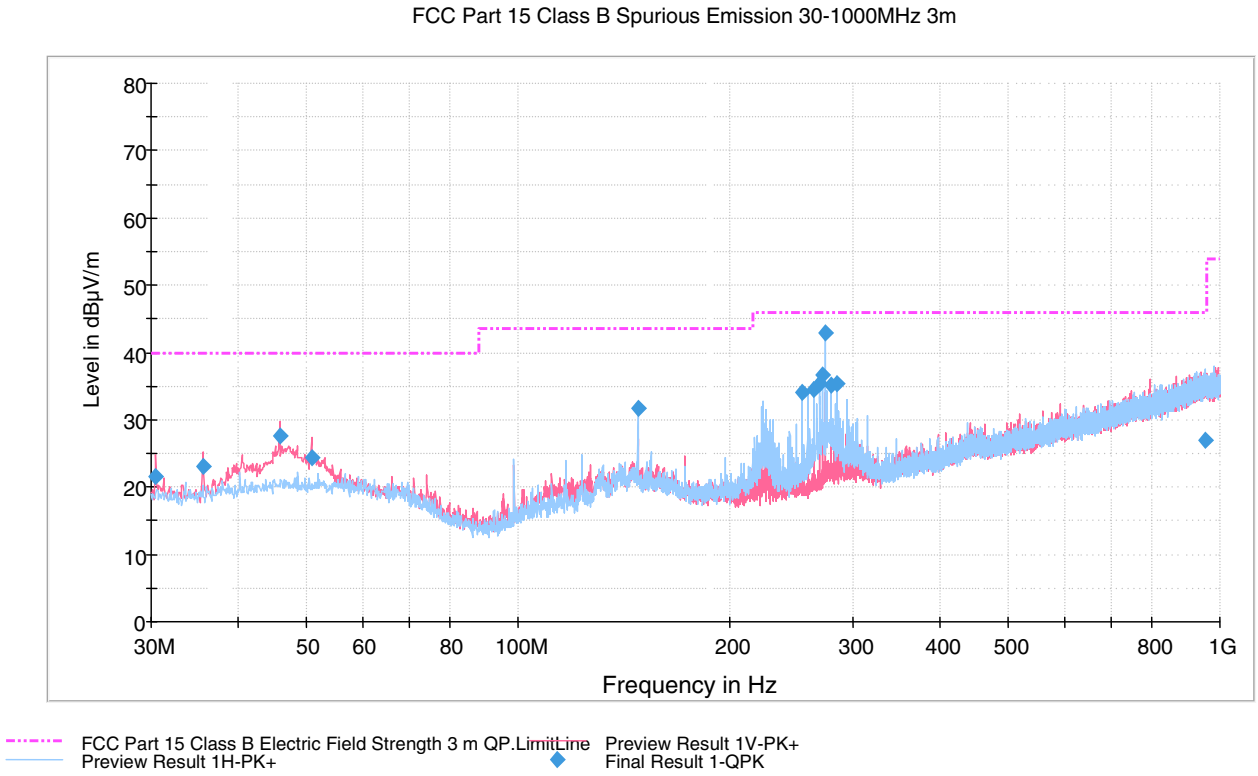

Figure 2. Measured curve with peak-detector (middle channel).

Table 2. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.480000	21.5	1000.0	120.000	100.0	V	81.0	14.1	18.5	40.0	
35.589000	23.1	1000.0	120.000	100.0	V	185.0	14.5	16.9	40.0	
45.734000	27.6	1000.0	120.000	100.0	V	217.0	15.2	12.4	40.0	
50.818000	24.4	1000.0	120.000	100.0	V	205.0	15.2	15.6	40.0	
148.109000	31.7	1000.0	120.000	200.0	H	235.0	14.8	11.8	43.5	
254.127000	34.2	1000.0	120.000	109.0	H	109.0	14.1	11.8	46.0	
264.275000	34.5	1000.0	120.000	100.0	H	302.0	14.6	11.5	46.0	
269.336000	35.3	1000.0	120.000	110.0	H	304.0	14.8	10.7	46.0	
271.530000	36.6	1000.0	120.000	100.0	H	292.0	15.0	9.4	46.0	
274.460000	42.9	1000.0	120.000	110.0	H	292.0	15.2	3.1	46.0	
279.521000	35.1	1000.0	120.000	100.0	H	292.0	15.3	10.9	46.0	
284.585000	35.4	1000.0	120.000	100.0	H	300.0	15.4	10.6	46.0	
952.816000	26.9	1000.0	120.000	361.0	H	185.0	28.3	19.1	46.0	

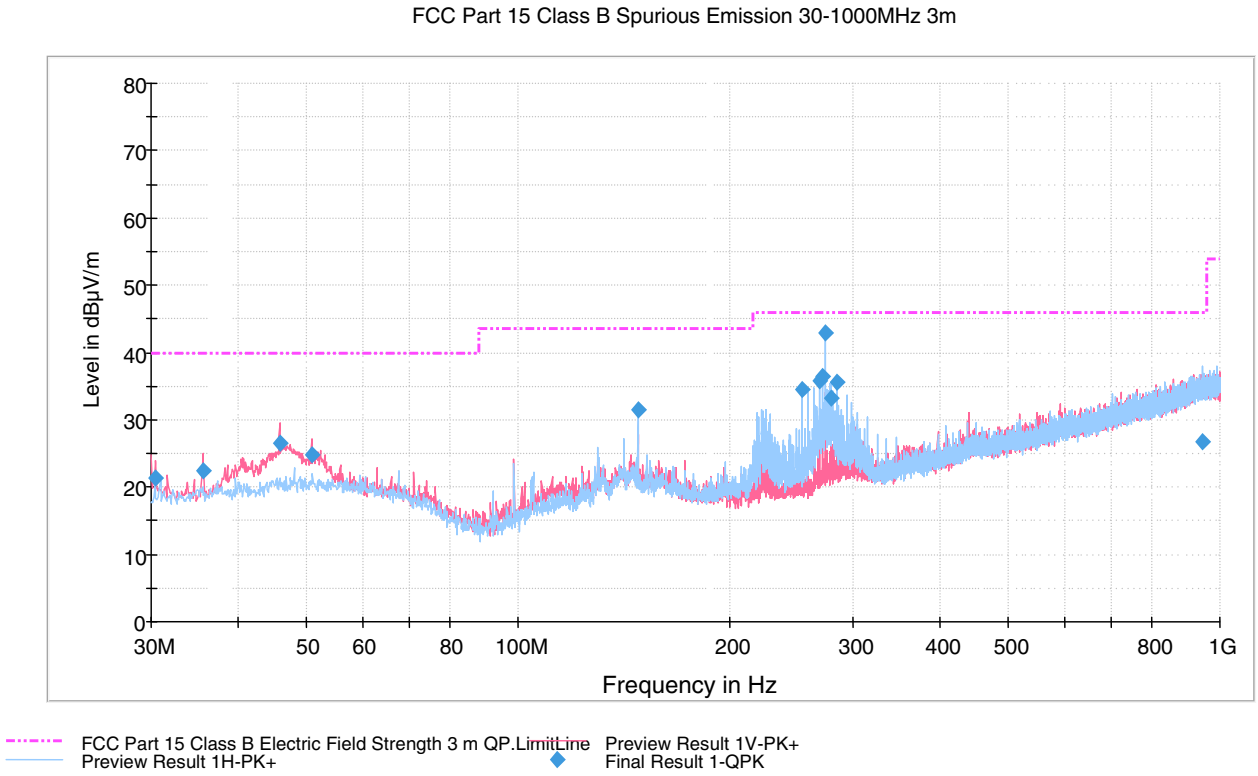

Figure 3. Measured curve with peak-detector (high channel).

Table 3. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.500000	21.4	1000.0	120.000	100.0	V	39.0	14.1	18.6	40.0	
35.586000	22.5	1000.0	120.000	127.0	V	55.0	14.5	17.5	40.0	
45.754000	26.5	1000.0	120.000	100.0	V	61.0	15.2	13.5	40.0	
50.818000	24.7	1000.0	120.000	100.0	V	222.0	15.2	15.3	40.0	
148.126000	31.5	1000.0	120.000	200.0	H	260.0	14.8	12.0	43.5	
254.110000	34.4	1000.0	120.000	100.0	H	103.0	14.1	11.6	46.0	
269.396000	35.7	1000.0	120.000	100.0	H	292.0	14.8	10.3	46.0	
271.570000	36.3	1000.0	120.000	100.0	H	291.0	15.0	9.7	46.0	
274.460000	43.0	1000.0	120.000	100.0	H	298.0	15.2	3.0	46.0	
279.524000	33.3	1000.0	120.000	100.0	H	108.0	15.3	12.7	46.0	
284.585000	35.6	1000.0	120.000	100.0	H	287.0	15.4	10.4	46.0	
945.805000	26.7	1000.0	120.000	186.0	H	207.0	28.1	19.3	46.0	

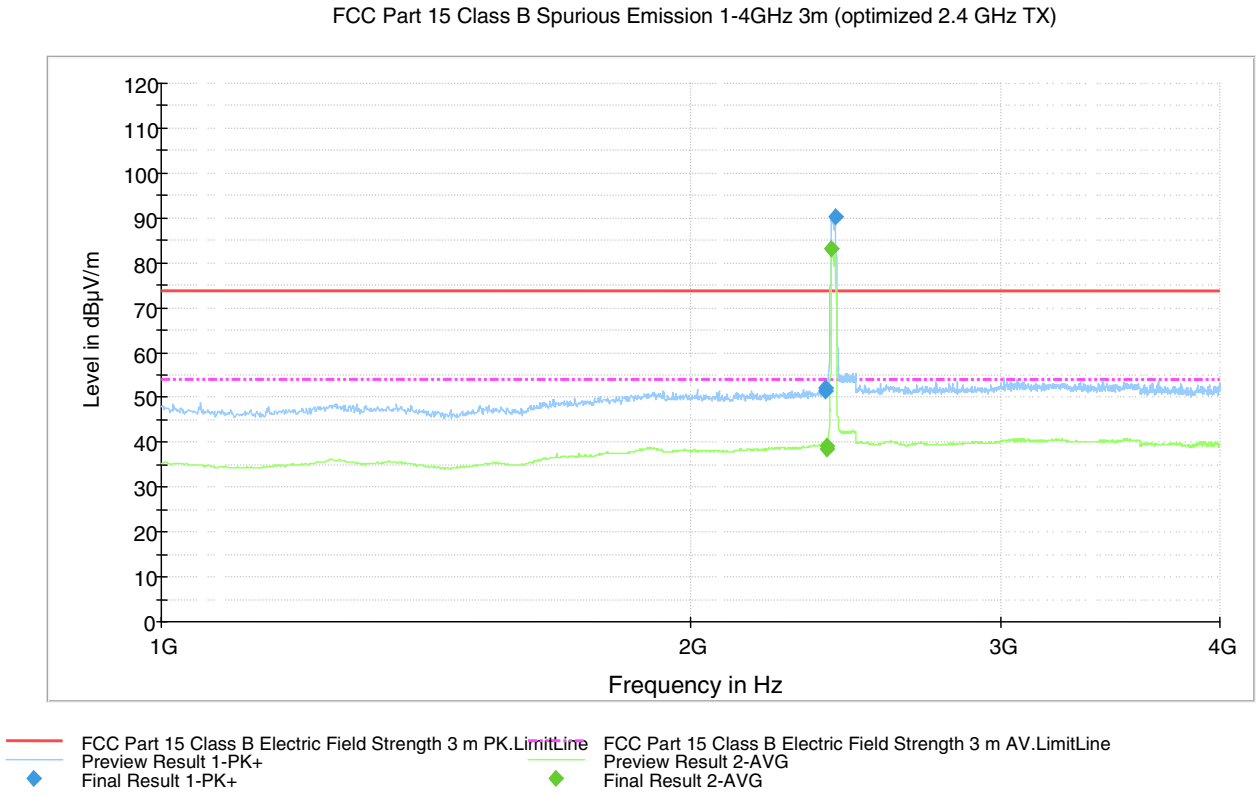

Figure 4. Measured curve with peak- and average detector (low channel).

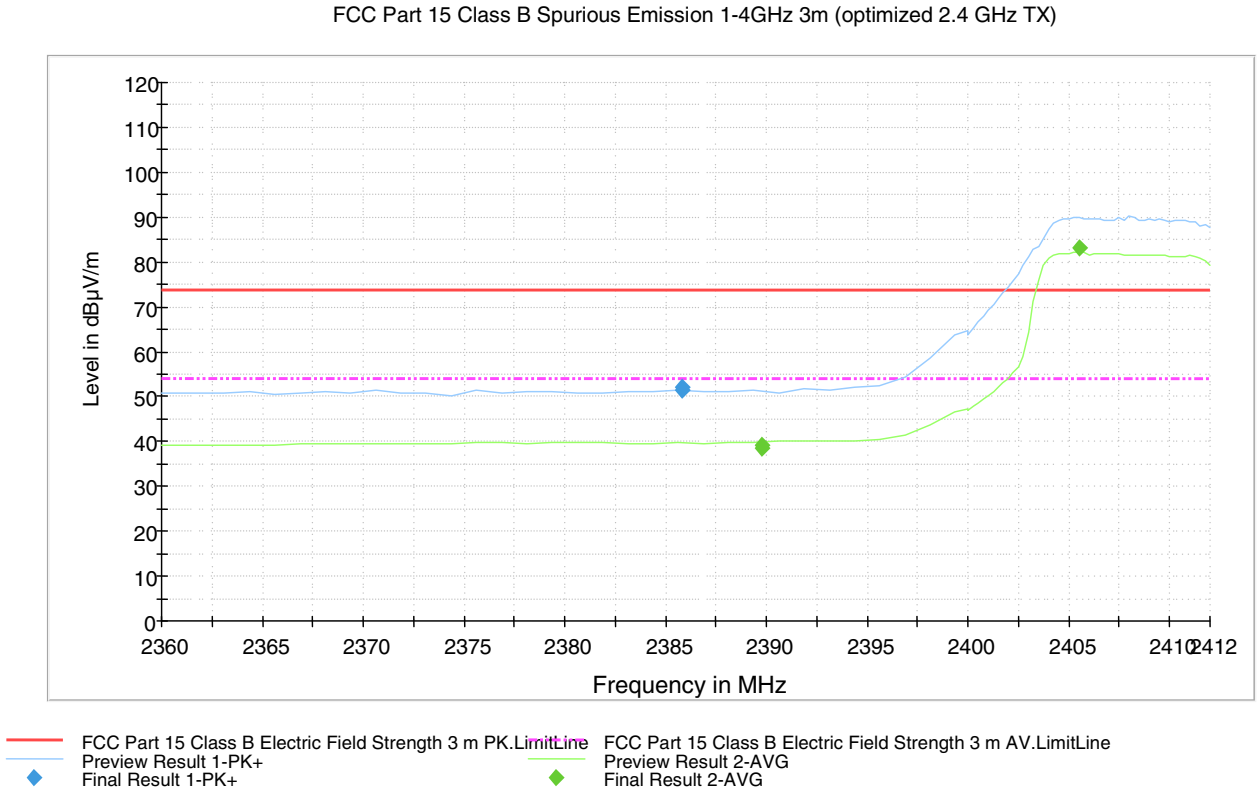

Figure 5. Low channel band edge

Final measurements from the worst frequencies

Table 4. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2385.800000	51.3	1000.0	1000.000	304.0	V	16.0	14.3	22.6	73.9	
2385.800000	52.0	1000.0	1000.000	171.0	H	4.0	14.3	21.9	73.9	
2418.750000	90.2	1000.0	1000.000	197.0	H	11.0	14.4	-	-	carrier

Table 5. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2389.800000	38.4	1000.0	1000.000	235.0	V	25.0	14.4	15.5	53.9	
2389.800000	39.1	1000.0	1000.000	203.0	H	5.0	14.4	14.8	53.9	
2405.500000	83.3	1000.0	1000.000	203.0	H	5.0	14.5	-	-	carrier

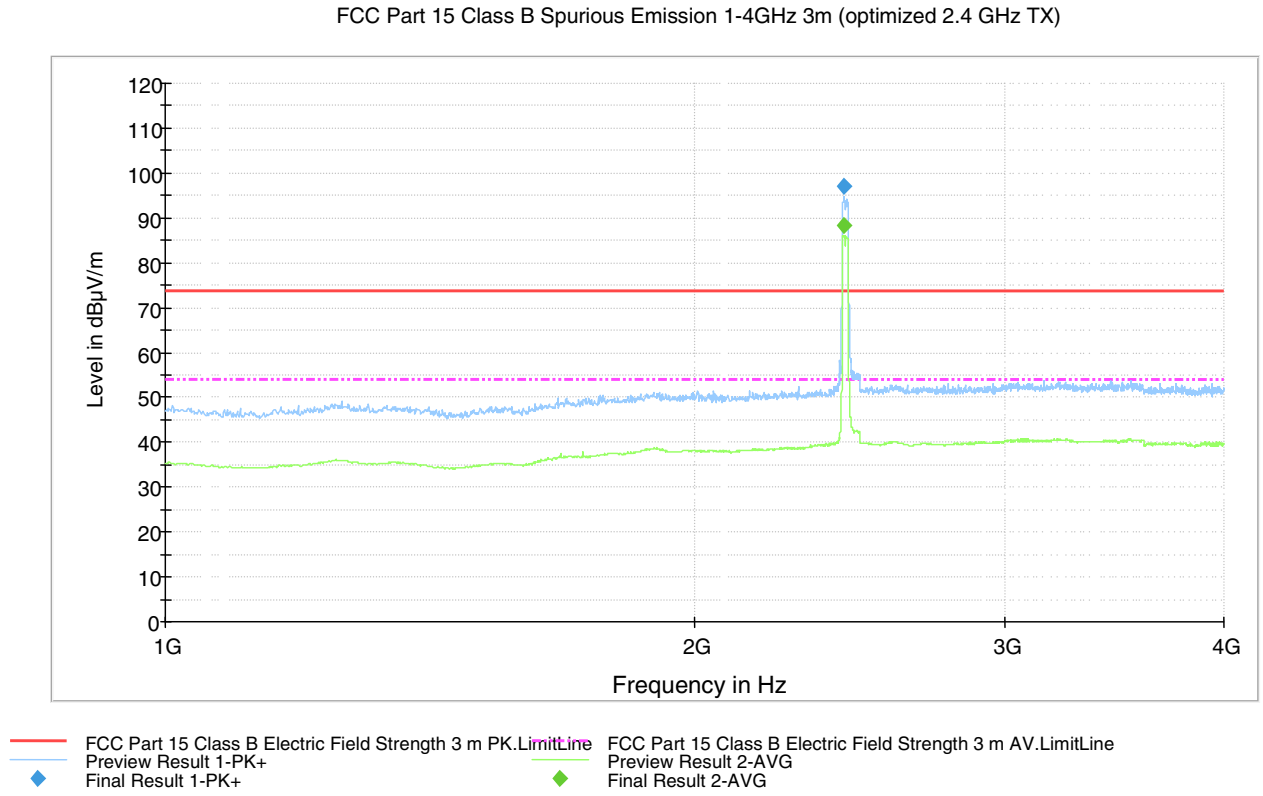

Figure 6. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

Table 6. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(m	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2430.450000	96.9	1000.0	1000.000	232.0	H	4.0	14.4	-	-	

Table 7. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(m	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2430.250000	88.2	1000.0	1000.000	202.0	H	4.0	14.4	-	-	

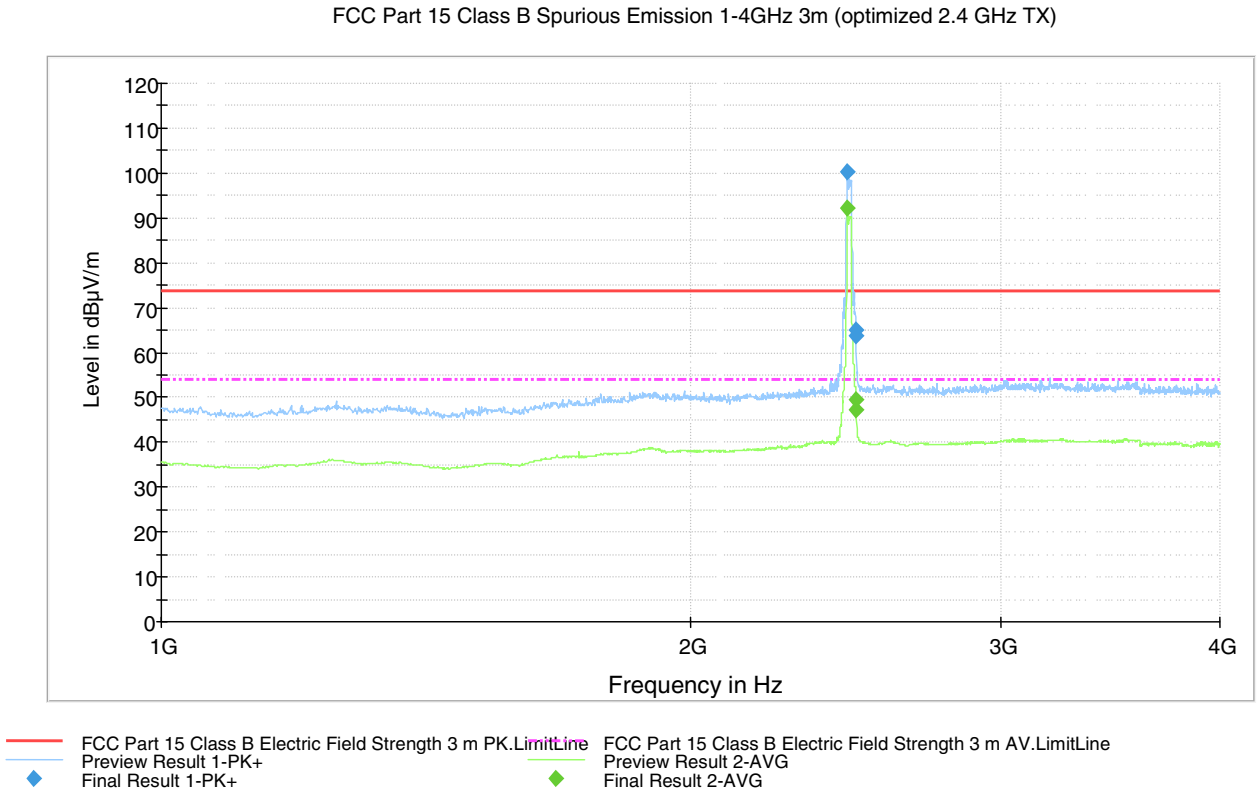

Figure 7. Measured curve with peak- and average detector (high channel).

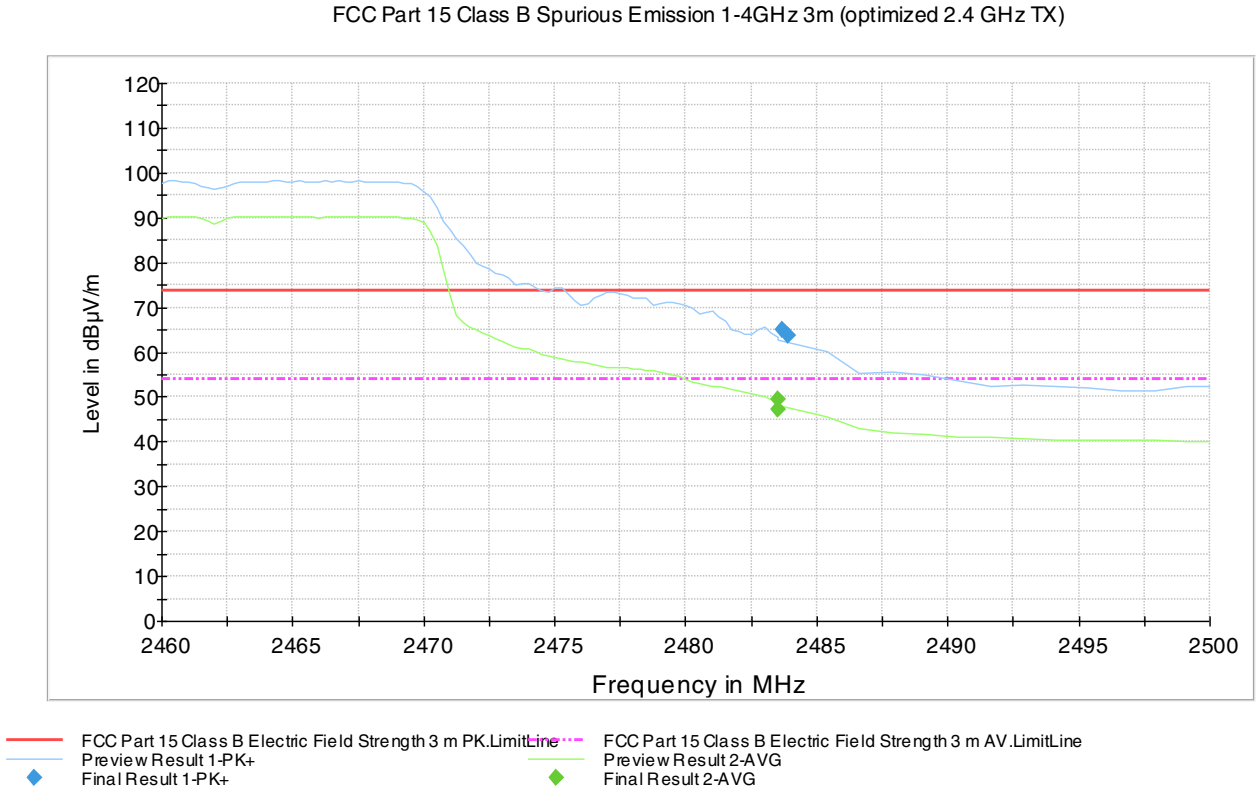

Figure 8. High channel band edge

Final measurements from the worst frequencies

Table 8. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2455.500000	100.4	1000.0	1000.000	224.0	H	313.0	14.4	-	-	carrier
2483.700000	65.1	1000.0	1000.000	138.0	H	320.0	14.8	8.8	73.9	
2483.900000	63.8	1000.0	1000.000	130.0	V	314.0	14.8	10.1	73.9	

Table 9. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2455.300000	92.3	1000.0	1000.000	227.0	H	313.0	14.4	-	-	carrier
2483.500000	47.4	1000.0	1000.000	159.0	V	310.0	14.8	6.5	53.9	
2483.500000	49.3	1000.0	1000.000	138.0	H	326.0	14.8	4.6	53.9	

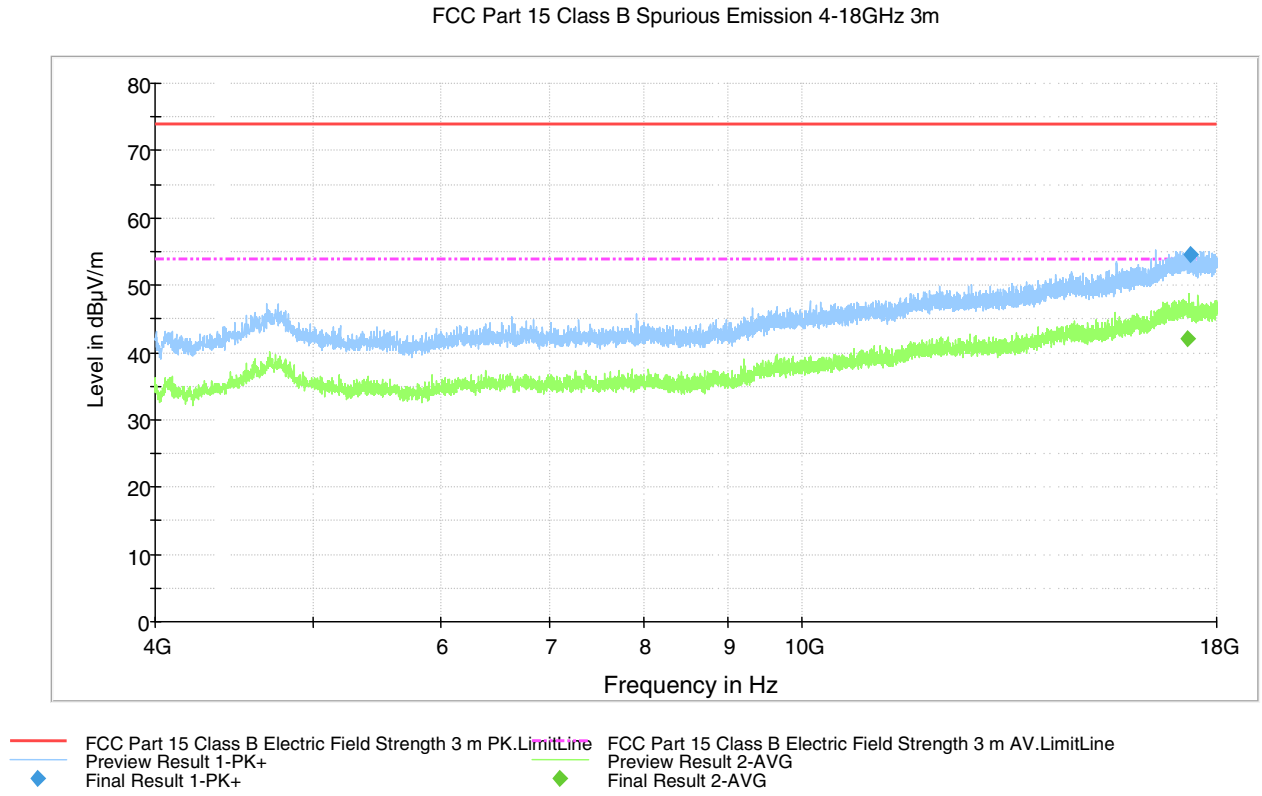

Figure 9. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

Table 10. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17330.000000	54.6	1000.0	1000.000	178.0	V	99.0	28.2	19.3	73.9	

Table 11. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17292.200000	42.0	1000.0	1000.000	105.0	V	110.0	28.2	11.9	53.9	

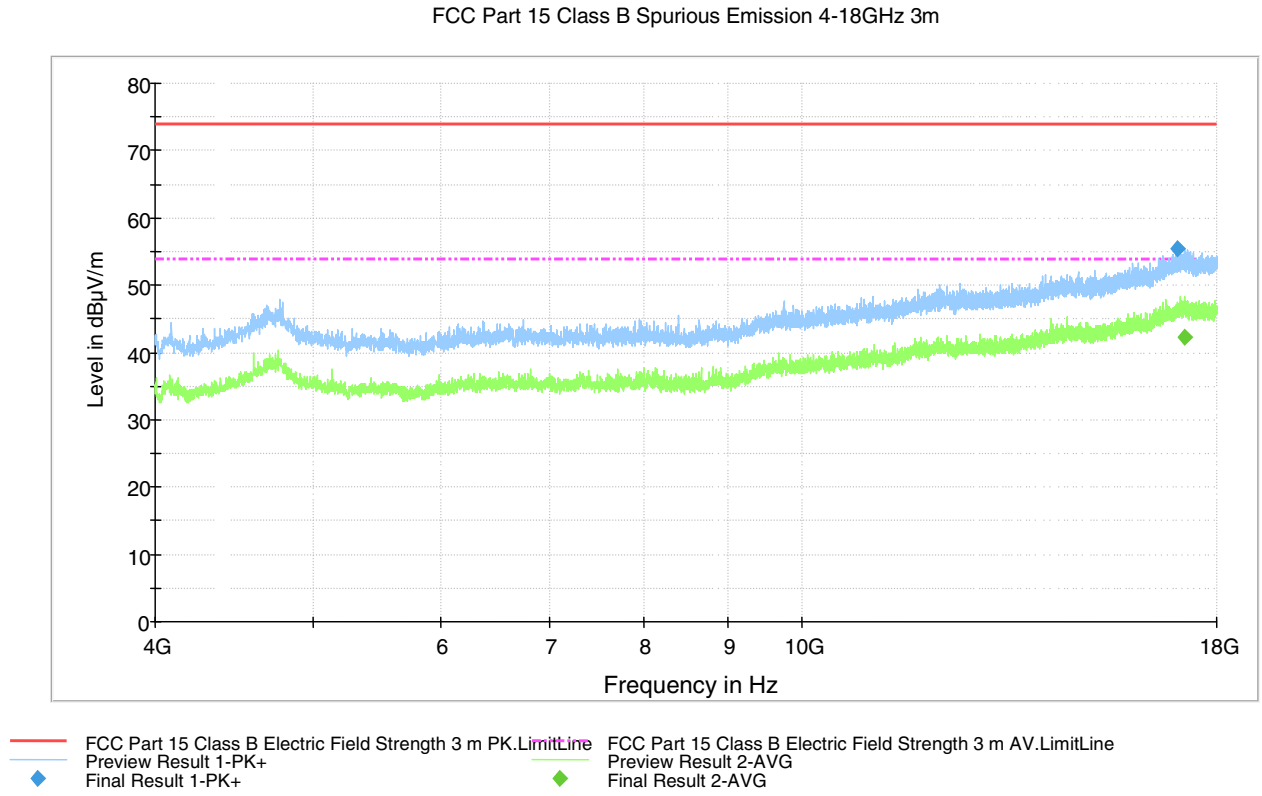

Figure 10. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

Table 12. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17021.200000	55.4	1000.0	1000.000	154.0	V	140.0	28.1	18.5	73.9	

Table 13. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
17199.400000	42.2	1000.0	1000.000	100.0	H	87.0	28.3	11.7	53.9	

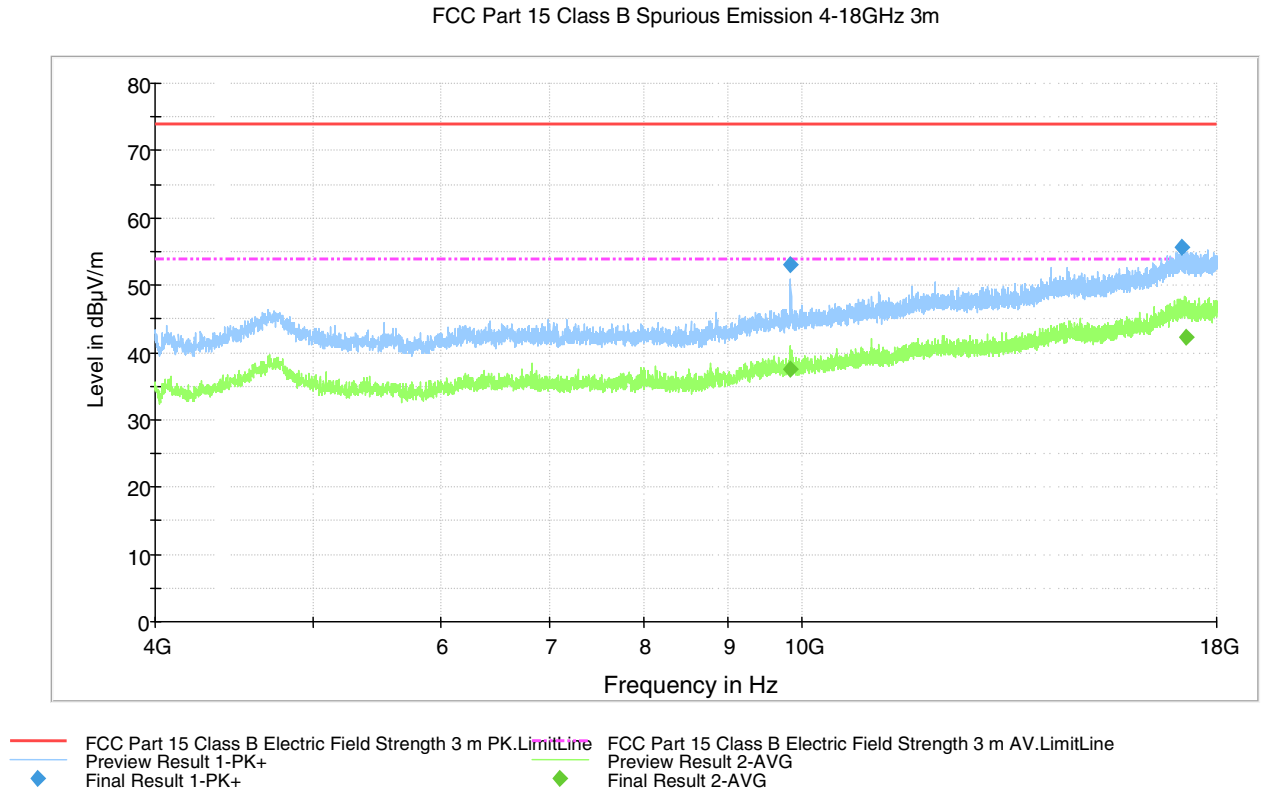

Figure 11. Measured curve with peak- and average detector (high channel).

Final measurements from the worst frequencies

Table 14. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
9842.000000	53.0	1000.0	1000.000	122.0	V	318.0	16.8	20.9	73.9	
17117.400000	55.7	1000.0	1000.000	277.0	H	330.0	28.2	18.2	73.9	

Table 15. Final Average results.

Frequency (MHz)	Average (dBµV/m)	Meas. Time 15x(ms)	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
9843.600000	37.4	1000.0	1000.000	100.0	V	335.0	16.8	16.5	53.9	
17222.400000	42.2	1000.0	1000.000	100.0	H	300.0	28.3	11.7	53.9	

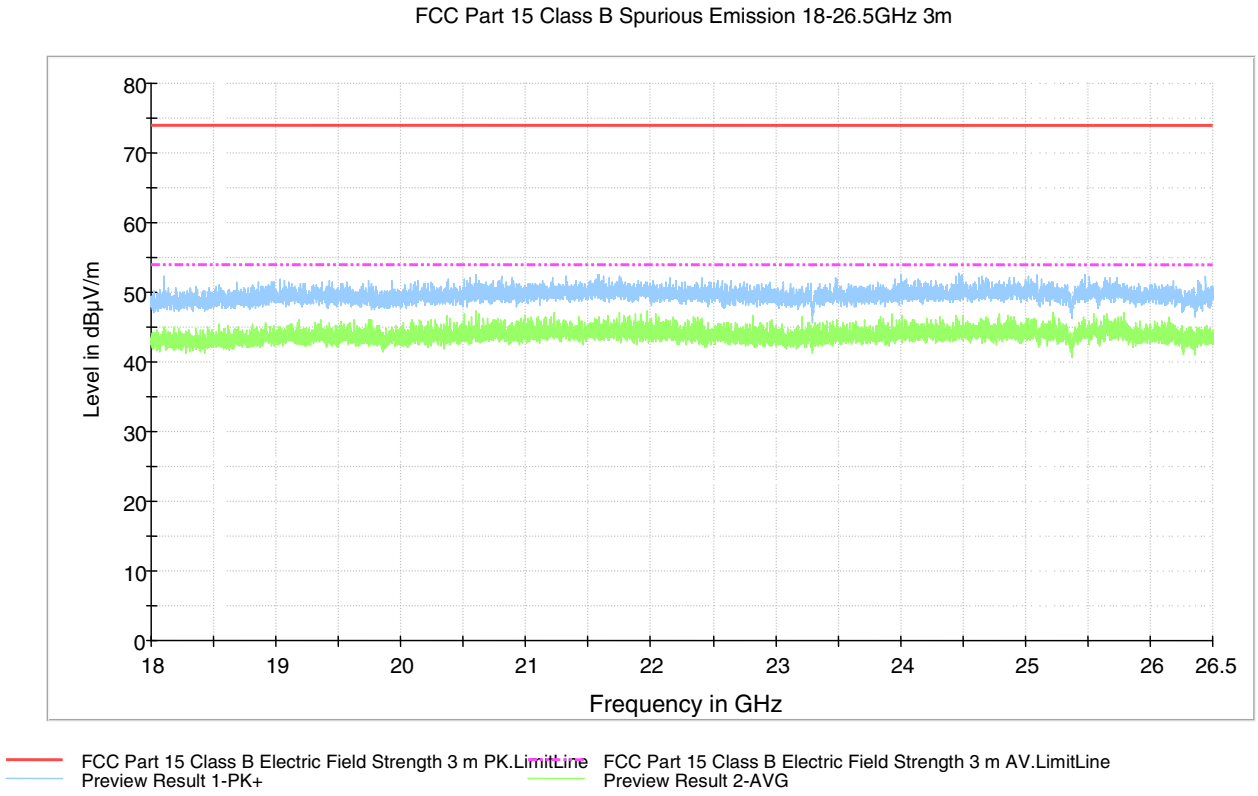

Figure 12. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

Due to the low emission level no final measurements were made.

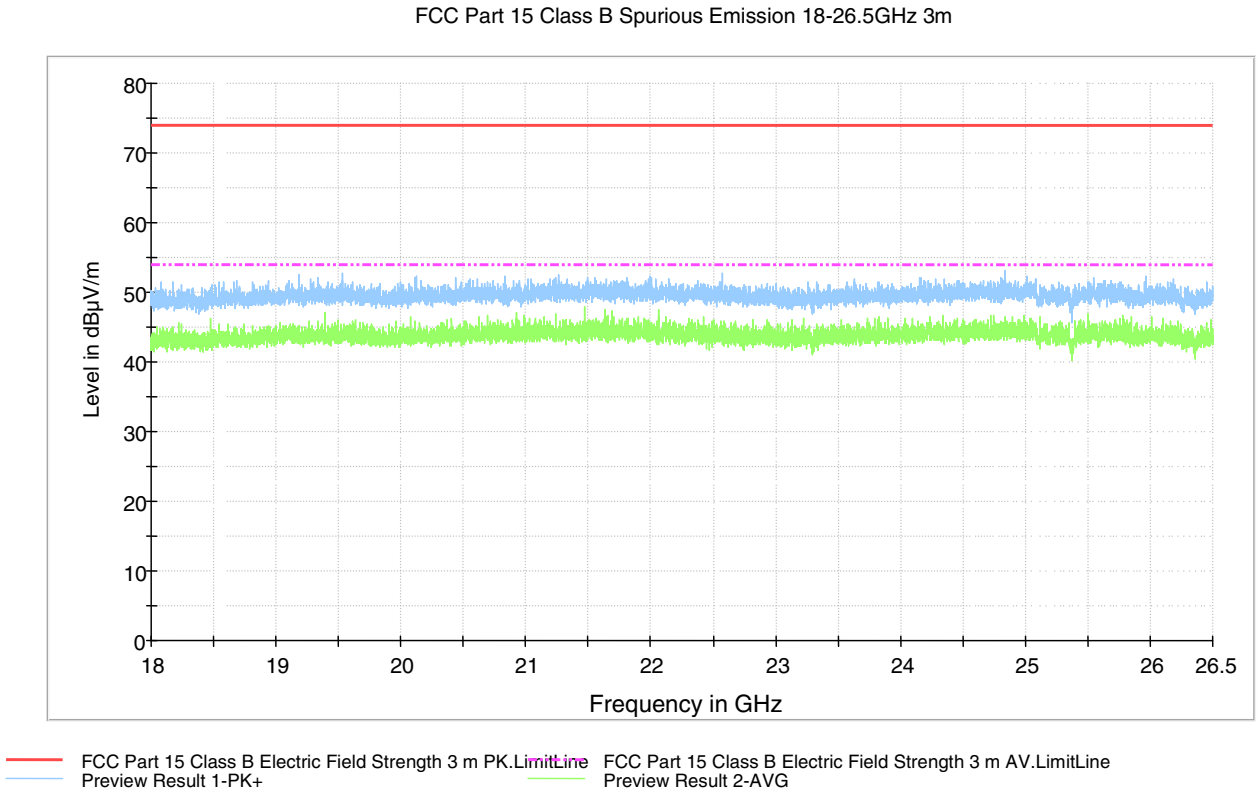

Figure 13. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

Due to the low emission level no final measurements were made.

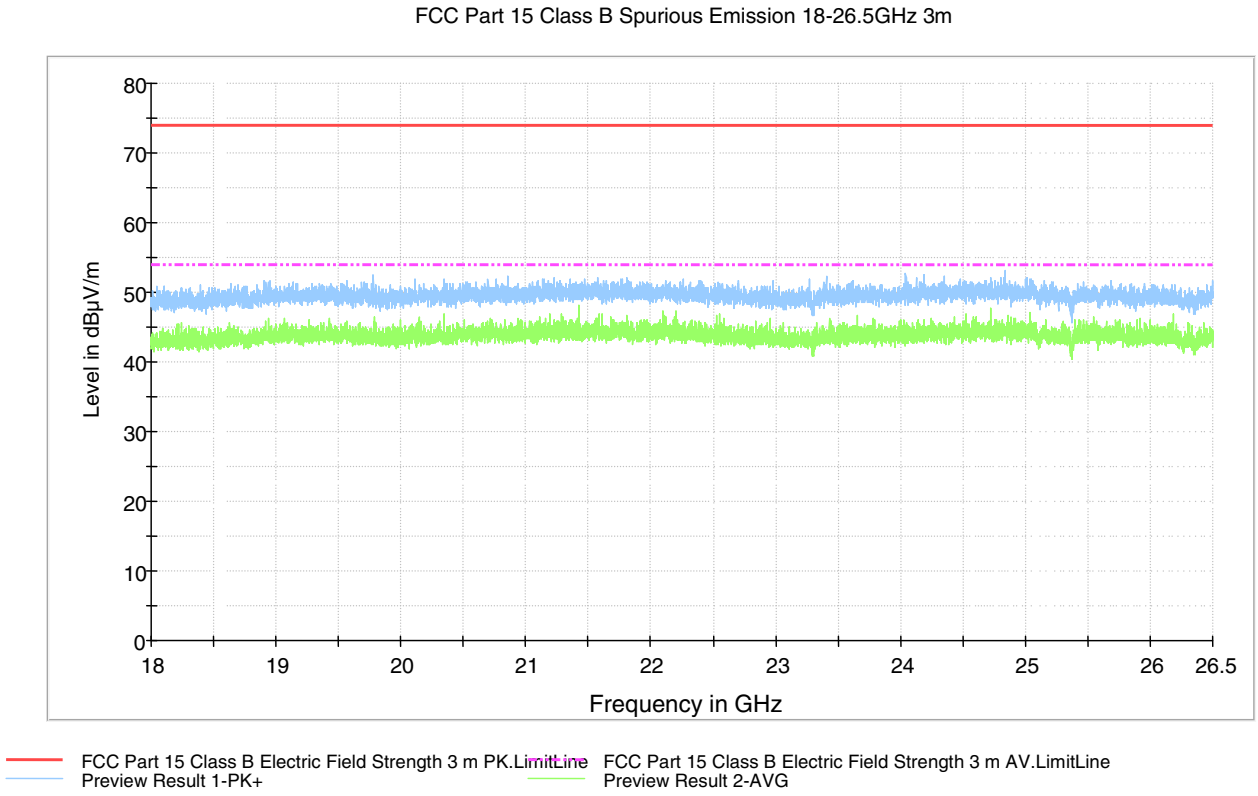

Figure 14. Measured curve with peak- and average detector (high channel).

Final measurements from the worst frequencies

Due to the low emission level no final measurements were made.

LIST OF TEST EQUIPMENT

Manufacturer	Type	Serial no	Inv. no
ROHDE & SCHWARZ			
Signal Analyzer	FSV40	101068	9093
EMI Test receiver	ESU 26	100185	8453
Test software	EMC32	-	-
BOONTON			
RF power meter	4300	87105ED	5029
Power sensor	51075	34999	8266
DAVIS			
Weather station	Vantage Pro	-	5297
EMCO			
Antenna (1 - 18 GHz)	3117	29617	7293
ETS-LINDGREN			
Antenna (18 GHz – 26 GHz)	3160-09	28535	7294
SCHWARZBECK			
Antenna (30 MHz - 1 GHz)	VULB 9168	9168-503	8911
HEWLETT- PACKARD			
Microwave amplifier	83017A	-	5226
HUBER-SUHNER			
Attenuator 10dB	6810.17B	-	-
DEISEL			
Antenna mast	MA 240	240/455	7896
Turntable	DS 430	-	-
WAINWRIGHT			
High Pass Filter	WHKX	10	8267

All used measurement equipment was calibrated (if required).