SGS

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 Analyser
Model:	XMDS2770
Manufacturer:	Oxford Instruments
	Oxford Instruments Analytical Oy Tarvonsalmenkatu 17 P.O Box 85 FI-02631 Espoo
Customer:	FINLAND
	Oxford Instruments Analytical Oy Tarvonsalmenkatu 17 P.O Box 85 FI-02631 Espoo 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 4, 2015	Date:	February 4, 2015
Issued by:	Niko Kotsalo Testing Engineer	Checked by:	Janne Nyman Compliance Specialist

Table of Contents

Equipment Under Test (EUT)

Handheld XRF Analyser with a 802.11 b/g WLAN and Bluetooth v2.0 + EDR module	
Brand:	Oxford Instruments
Model:	XMDS2770
FCC ID (radio module):	Z64-WL18SBMOD

Description of the EUT

The EUT is a battery or AC-operated handheld XRF Analyser that includes a Texas Instruments (FCC ID: Z64-WL18SBMOD) WL18SBMOD 802.11 b/g WLAN and Bluetooth v2.0 + EDR module. This report includes only the WLAN test results. The results for the Bluetooth tests are located in the SGS Fimko test report with the reference number 278706-1.

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
Conducted power:	17.93 dBm
Transmission technique:	DSSS
Modulation:	CCK, OFDM
Transmission rate:	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps
Antenna gain:	3.99 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
§15.247(b)(3) / RSS-210 8.4	Average Conducted Output Power	PASS
§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

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 54 Mbps data rate). 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	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

Average Conducted Output Power Measurement

Standard:	ANSI C63.10	(2009)
Tested by:	NKO	
Date:	12.01.2015	
Temperature:	22.6 °C	
Humidity:	31 % 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 *average 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 “13” parameter for the power setting.

802.11b

Data rate [Mbps]	Conducted power [dBm]			Limit [dBm]	Result
	Low channel	Mid channel	High channel		
1	11.32	11.47	11.79	30	PASS
2	11.89	12.06	11.85	30	PASS
5.5	13.42	13.52	13.57	30	PASS
11	15.59	15.56	15.44	30	PASS

802.11g

Data rate [Mbps]	Conducted power [dBm]			Limit [dBm]	Result
	Low channel	Mid channel	High channel		
6	16.55	16.76	16.56	30	PASS
9	16.46	16.54	16.55	30	PASS
12	17.60	17.90	17.11	30	PASS
18	17.43	17.44	17.37	30	PASS
24	17.59	17.91	17.77	30	PASS
36	17.69	17.93	17.81	30	PASS
48	17.64	17.81	17.73	30	PASS
54	17.76	17.93	17.86	30	PASS

Transmitter Radiated Emissions 30 – 26 500 MHz and Band Edge

Standard:	ANSI C63.10	(2009)
Tested by:	NKO	
Date:	12.01 - 14.01.2015	
Temperature:	22.0 – 22.6 °C	
Humidity:	18 – 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 are done with 54 Mbps data rate.

Test results

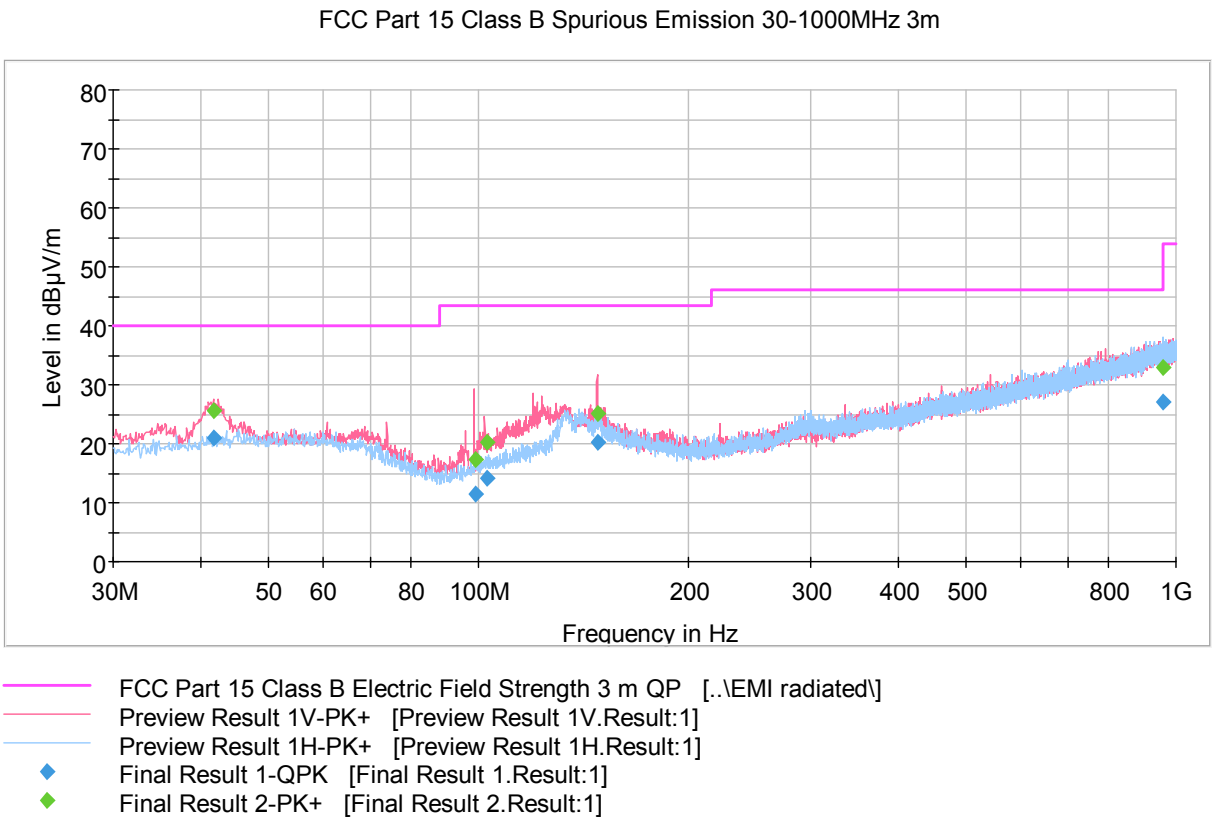

Figure 1. Measured curves with peak-detector (low channel).

Table 1. Final measurements from the worst frequencies.

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
41.817000	21.1	1000.0	120.000	122.0	V	181.0	14.9	18.9	40.0	
99.293000	11.4	1000.0	120.000	100.0	V	139.0	9.9	32.1	43.5	
102.805000	14.3	1000.0	120.000	100.0	V	189.0	10.4	29.2	43.5	
148.646000	20.3	1000.0	120.000	100.0	V	102.0	14.8	23.2	43.5	
956.601000	27.2	1000.0	120.000	281.0	H	68.0	28.2	18.8	46.0	

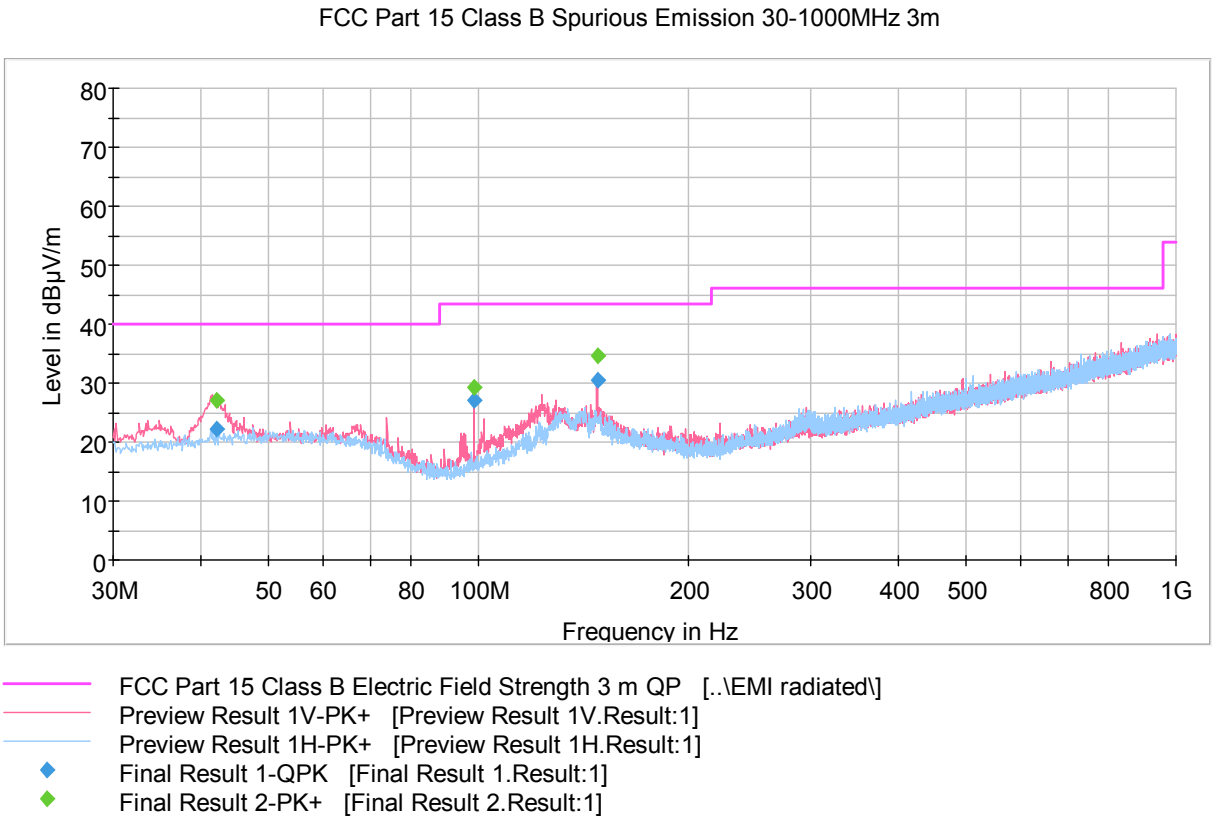

Figure 2. Measured curve with peak-detector (middle channel).

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
42.200000	22.3	1000.0	120.000	100.0	V	52.0	14.9	17.7	40.0	
98.750000	27.0	1000.0	120.000	100.0	V	150.0	9.8	16.5	43.5	
148.110000	30.5	1000.0	120.000	116.0	V	120.0	14.8	13.0	43.5	

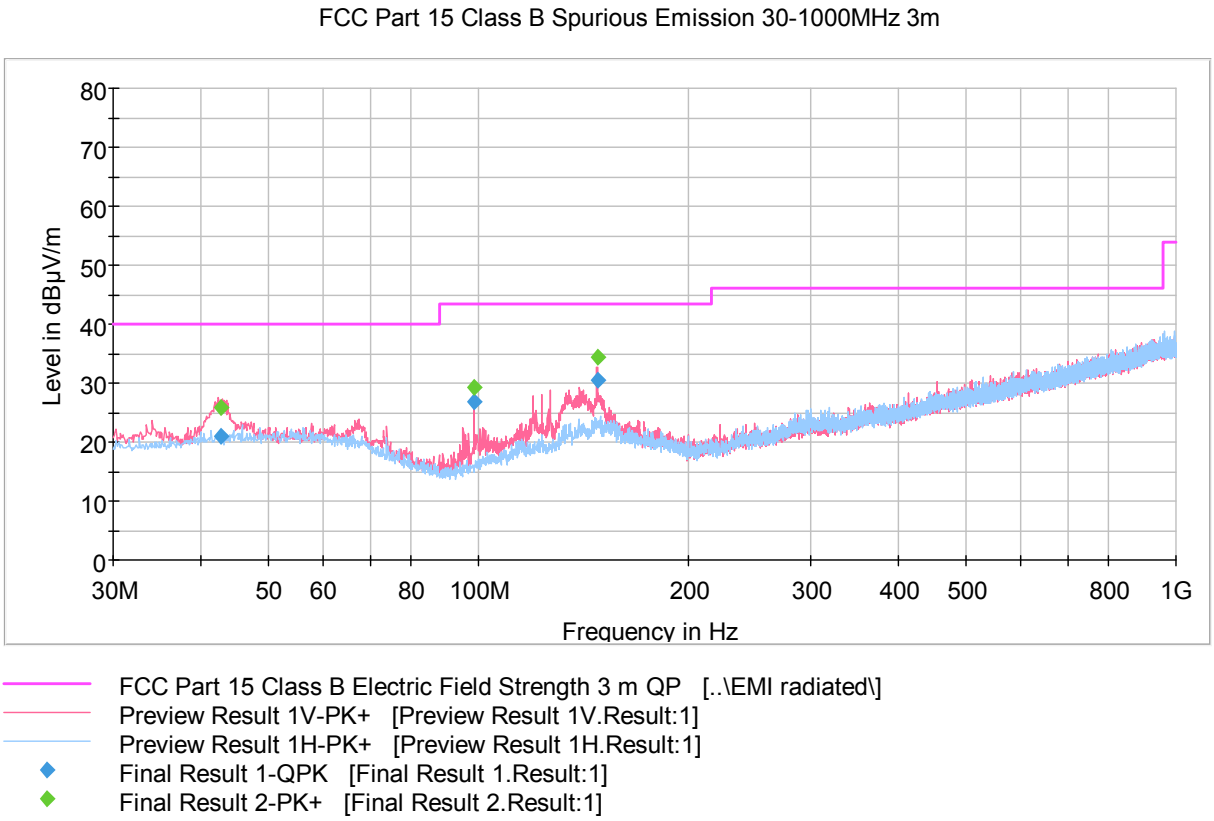

Figure 3. Measured curve with peak-detector (high channel).

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
42.733000	20.9	1000.0	120.000	100.0	V	93.0	15.0	19.1	40.0	
98.750000	26.9	1000.0	120.000	100.0	V	170.0	9.8	16.6	43.5	
148.111000	30.5	1000.0	120.000	100.0	V	120.0	14.8	13.0	43.5	

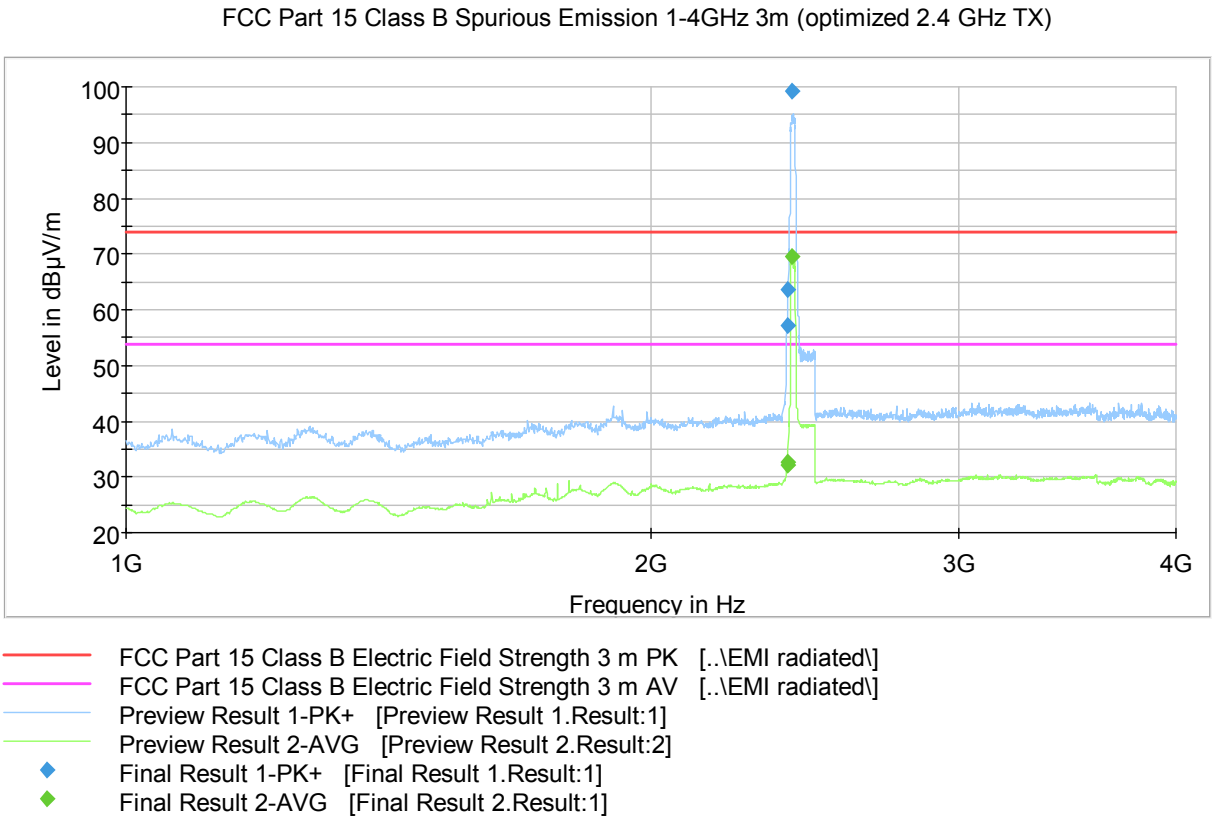

Figure 4. Measured curve with peak- and average detector (low channel).

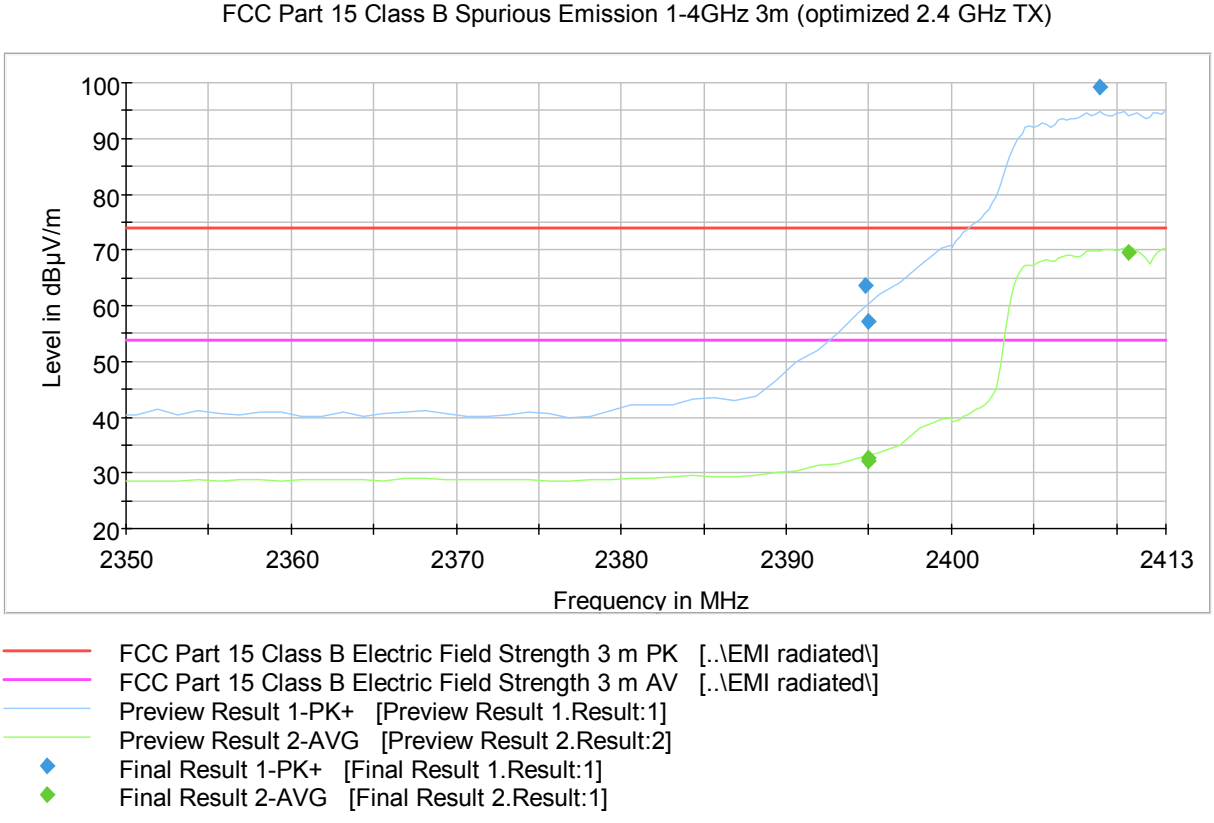

Figure 5. Low channel band edge

Final measurements from the worst frequencies

Table 4. Final Max Peak results.

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
2394.800000	63.5	1000.0	1000.000	114.0	H	7.0	3.9	10.4	73.9	
2395.000000	57.1	1000.0	1000.000	114.0	V	236.0	3.9	16.8	73.9	
2408.950000	99.1	1000.0	1000.000	113.0	H	9.0	3.9	-25.2	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
2395.000000	32.2	1000.0	1000.000	204.0	V	3.0	3.9	21.7	53.9	
2395.000000	32.8	1000.0	1000.000	196.0	H	4.0	3.9	21.1	53.9	
2410.750000	69.6	1000.0	1000.000	181.0	H	163.0	3.9	-15.7	53.9	Carrier

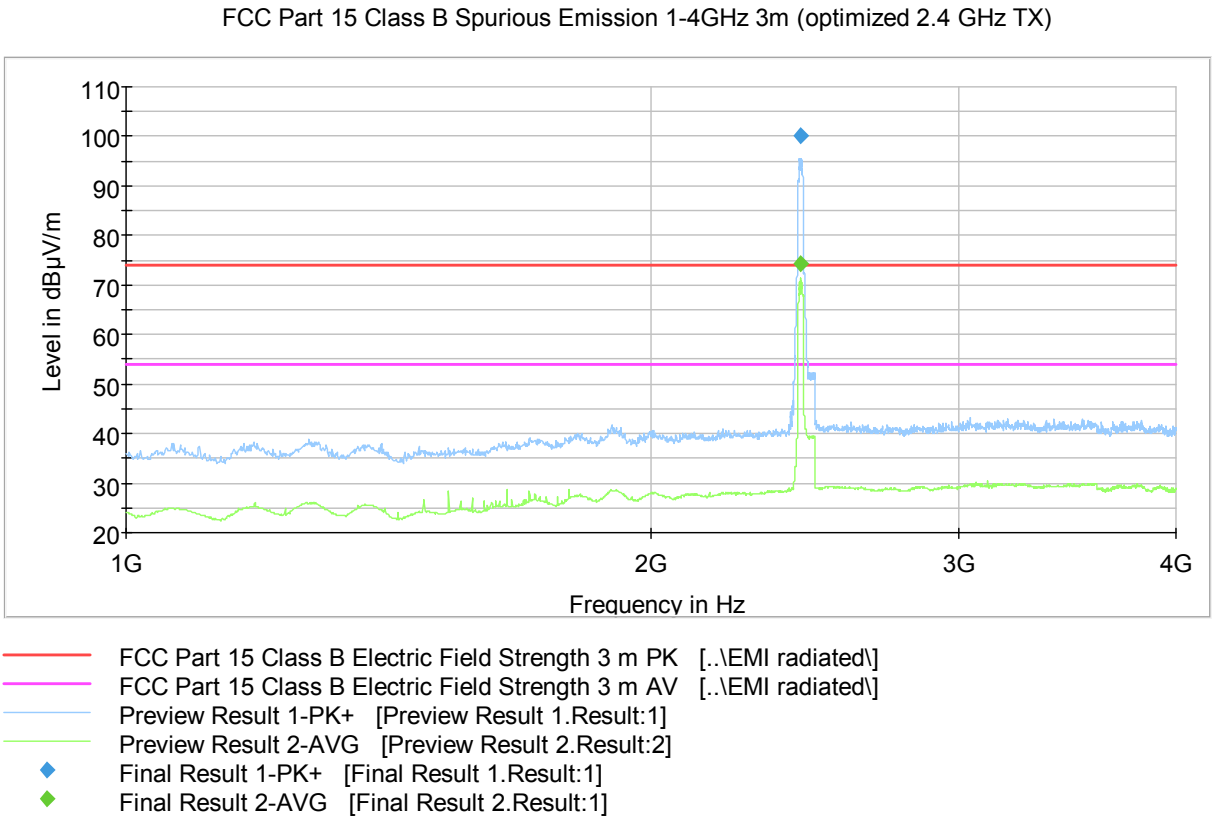

Figure 6. Measured curve with peak- and average detector (middle channel).

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
2438.050000	100.3	1000.0	1000.000	218.0	H	321.0	3.9	-26.4	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
2438.150000	74.4	1000.0	1000.000	223.0	H	319.0	3.9	-20.5	53.9	Carrier

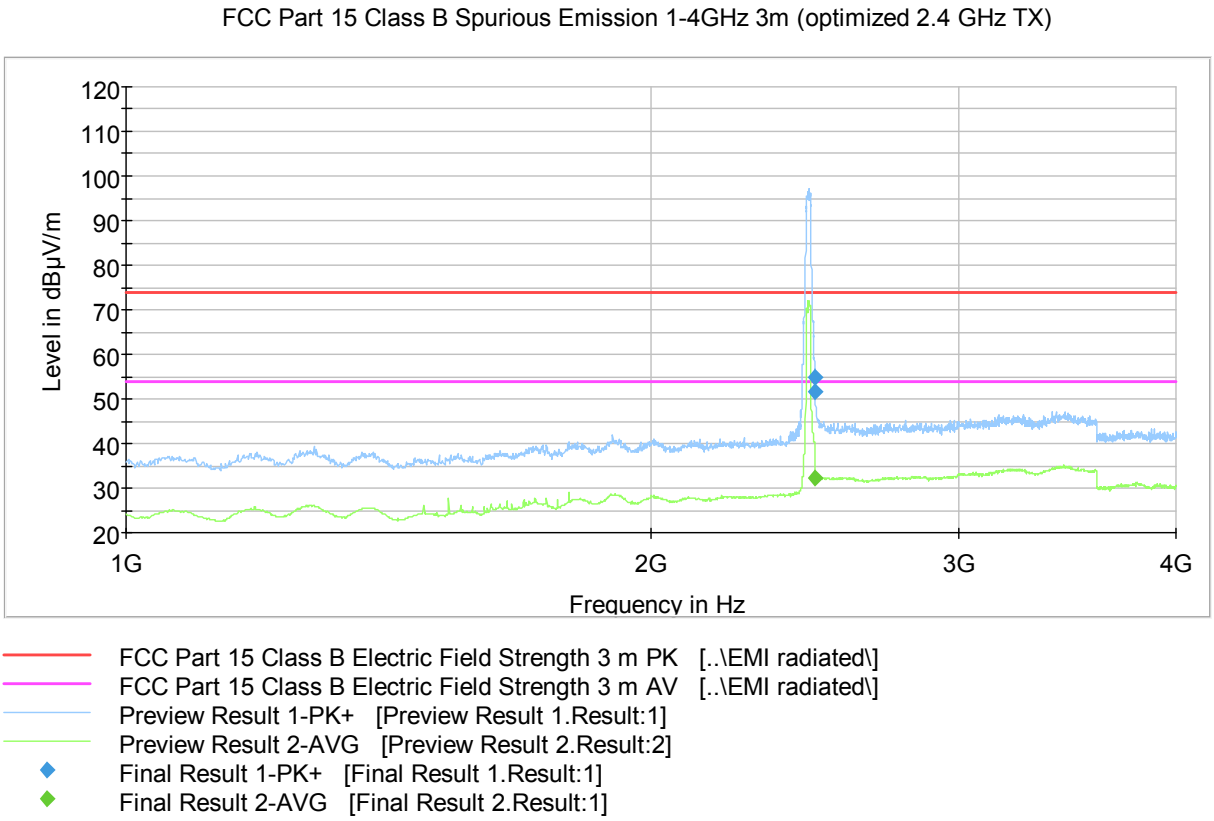

Figure 7. Measured curve with peak- and average detector (high channel).

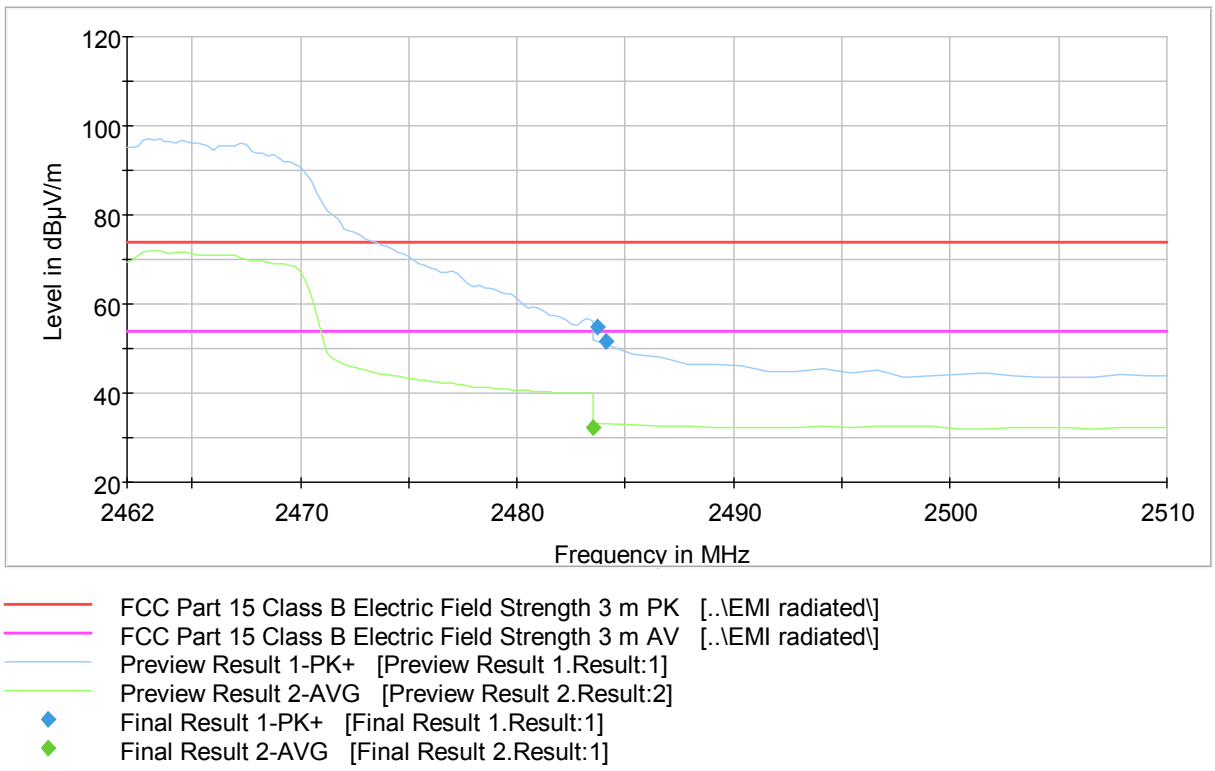

Figure 8. High channel band edge

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
2483.700000	54.9	1000.0	1000.000	229.0	H	234.0	4.2	19.0	73.9	
2484.100000	51.6	1000.0	1000.000	181.0	V	4.0	4.2	22.3	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
2483.500000	32.1	1000.0	1000.000	219.0	H	324.0	4.2	21.8	53.9	

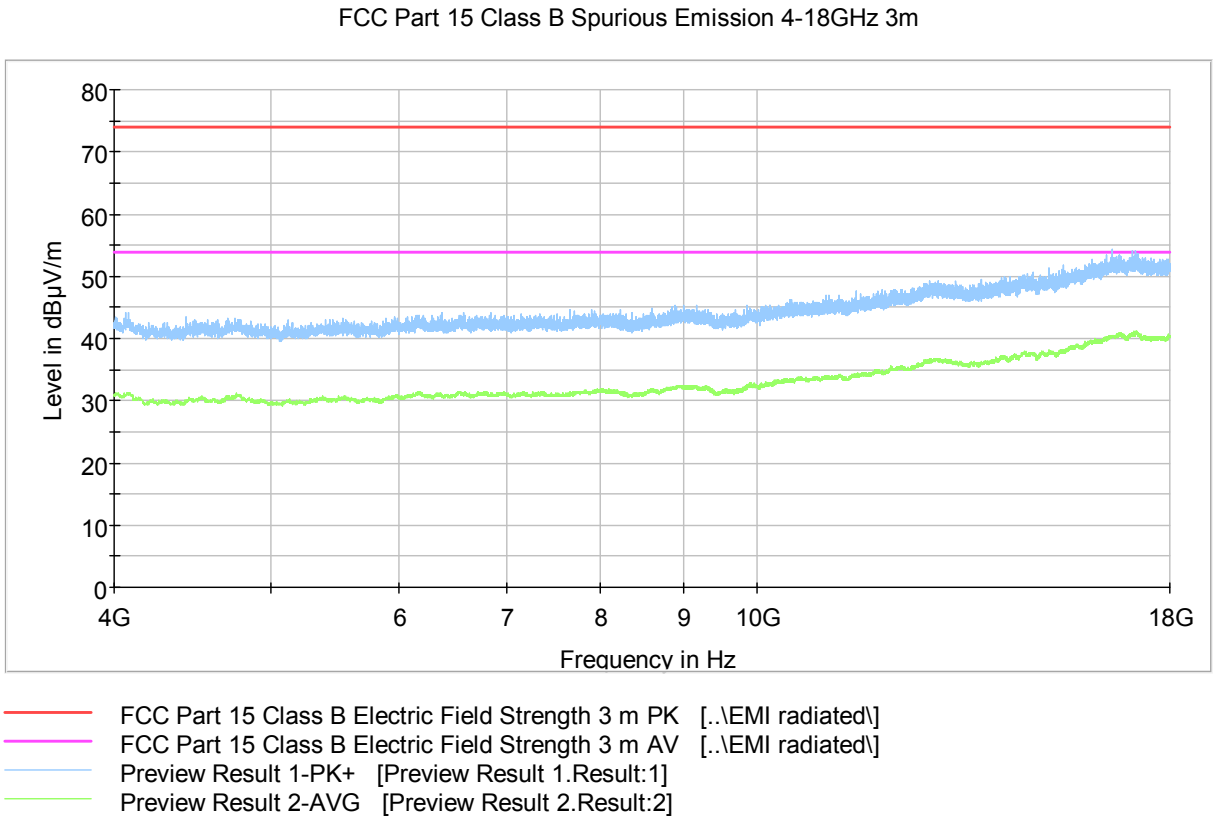

Figure 9. Measured curve with peak- and average detector (low channel).

Final measurements from the worst frequencies

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

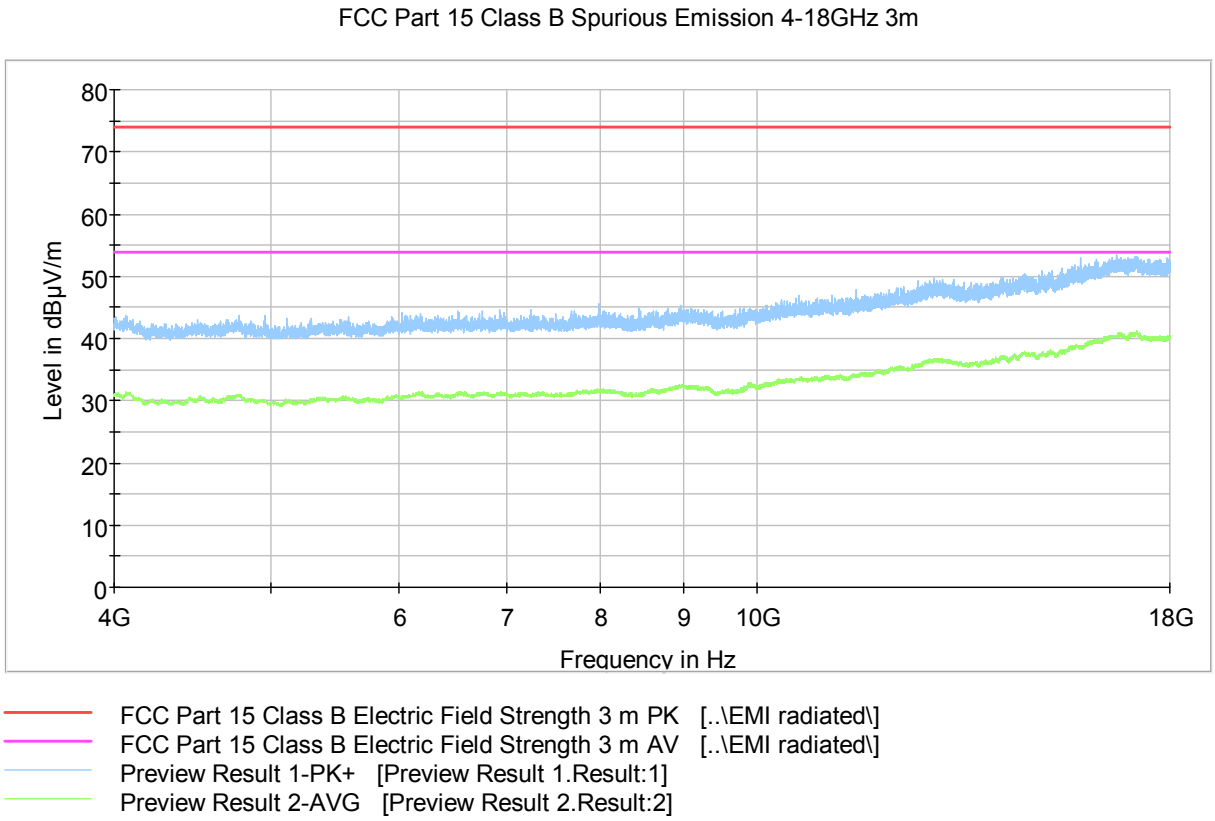

Figure 10. Measured curve with peak- and average detector (middle channel).

Final measurements from the worst frequencies

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

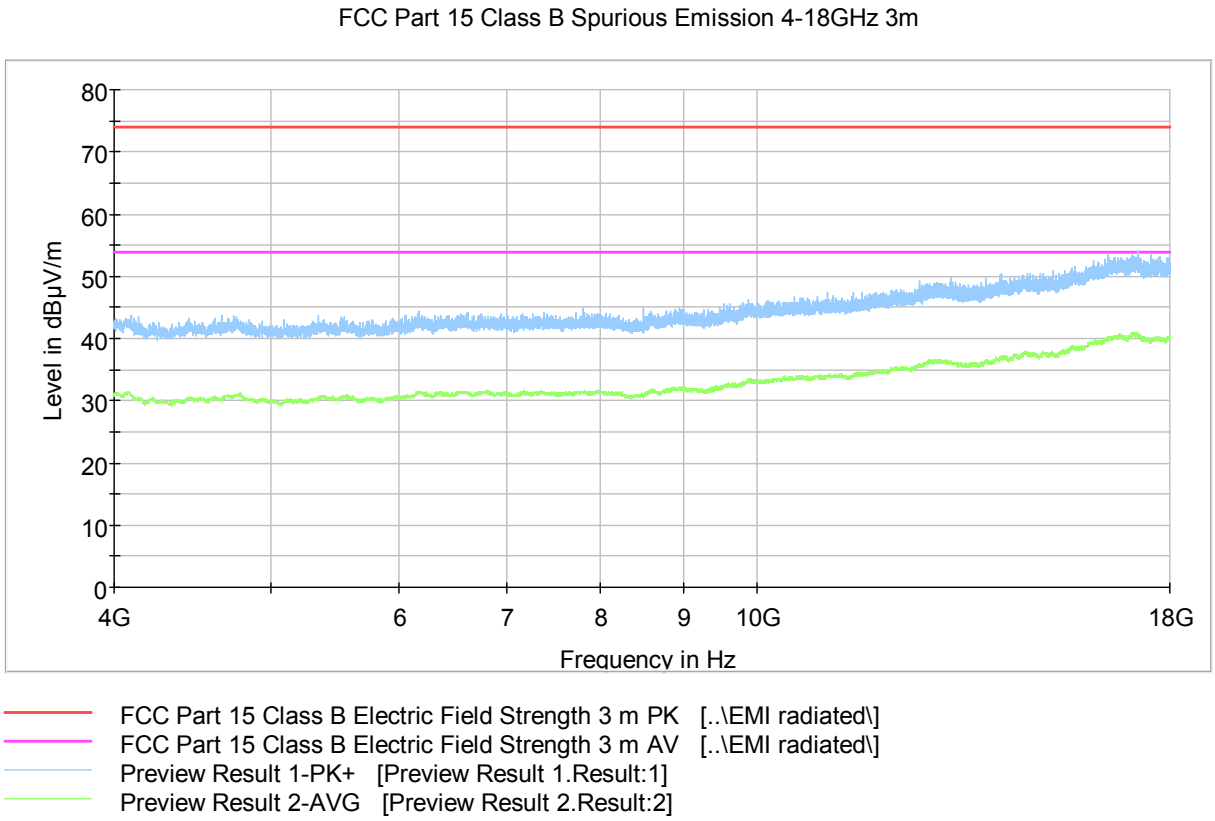

Figure 11. Measured curve with peak- and average detector (high channel).

Final measurements from the worst frequencies

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

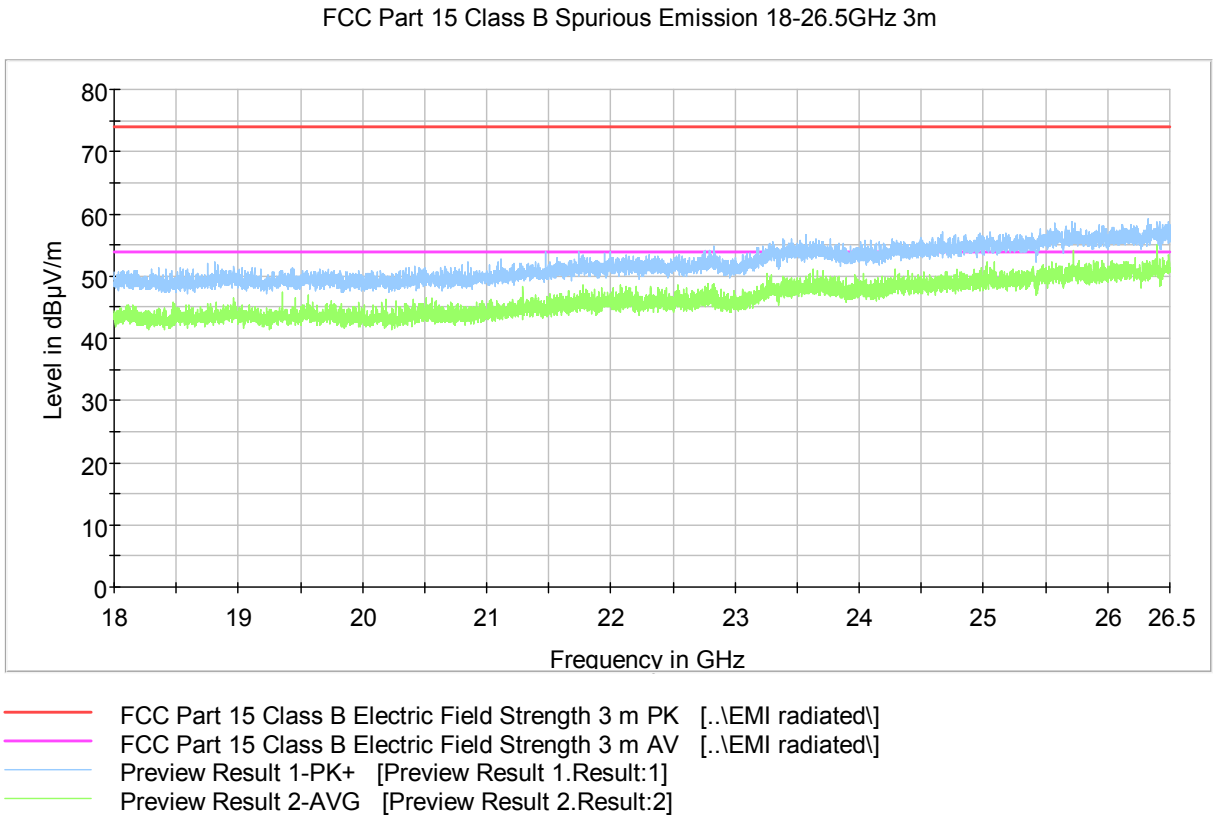

Figure 12. Measured curve with peak- and average detector (low channel).

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

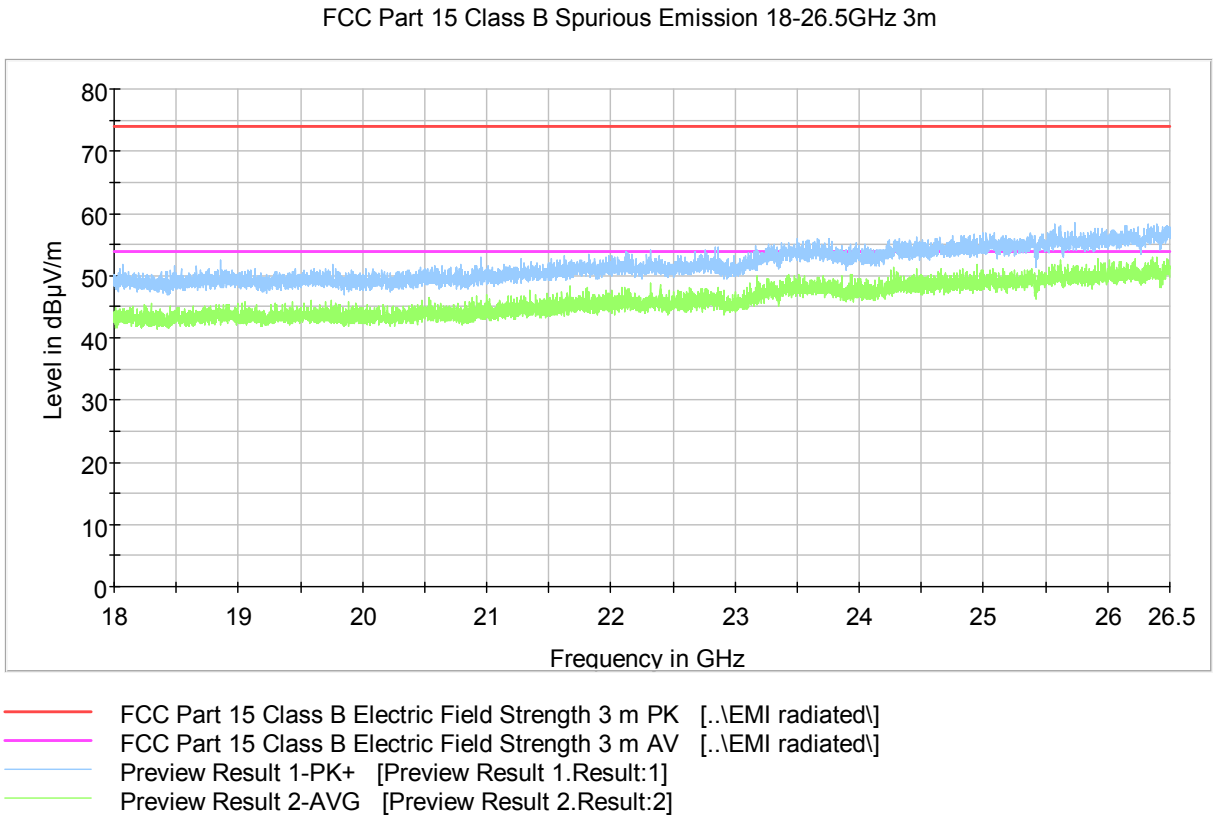

Figure 13. Measured curve with peak- and average detector (middle channel).

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

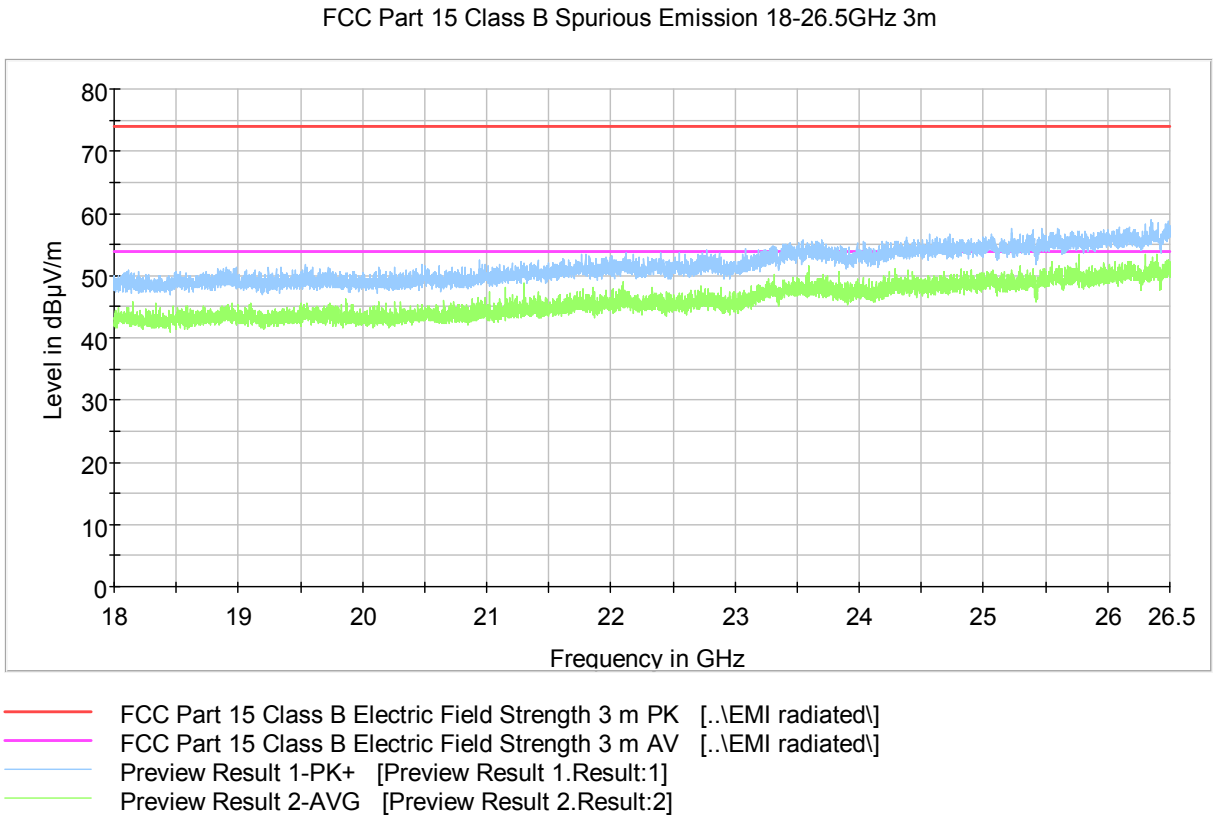

Figure 14. Measured curve with peak- and average detector (high channel).

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

TEST EQUIPMENT

Manufacturer	Type	Serial no	Inv. no
ROHDE & SCHWARZ			
Signal Analyzer	FSV40	101068	9093
EMI Test receiver	ESU 26	100185	8453
Test software	EMC32	-	-
Average Power Sensor	NRP-Z91	100267	9878
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).