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SINCERT

G.S.D. Srl **PISA - Italy**	***Test Report n. FCC-15806***	Rev. 01

Manufacturer	**Reha Technology AG**
Address	Industriestrasse 78 4600 Olten Switzerland
Test Family Name	**Armotion**
Testing Laboratory Name	**G.S.D. S.r.l.**
Address	Via Marmiceto, 8 56121 Ospedaletto Pisa (PI) Italy
Tel/Fax	+39 050 984254 / +39 050 984262
P.IVA/VAT	01343950505
http – e-mail	www.gsd.it - info@gsd.it
	FCC Listed: Registration Number: 424037
Location and Date of Issue	Pisa, 2015 December 21

G.S.D. s.r.l.
Via Marmiceto, 8
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Tel. 050.984254 - Fax 050.984262
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SENIOR EMC TEST MANAGER
Dr. Gian Luca Genovesi

QUALITY MANAGER
Dr. David Pelliccia

INDEX

1. MANUFACTURER AND EUT IDENTIFICATION [1]

Manufacturer	**Reha Technology AG.**
Address	Industriestrasse 78 4600 Olten Switzerland
Test Family Name	**Armotion**
Date of reception	**2015 September 24**
Sampling	**Laboratory sample for certification**
Test Item Description	**Robotic Solution wiht Bluetooth Device**
Nominal Input Voltage	**11.1 Vdc**
FCC ID	**2AF6XRTAM1000**

[1] A detailed documentation is preserved in the internal fascicle.

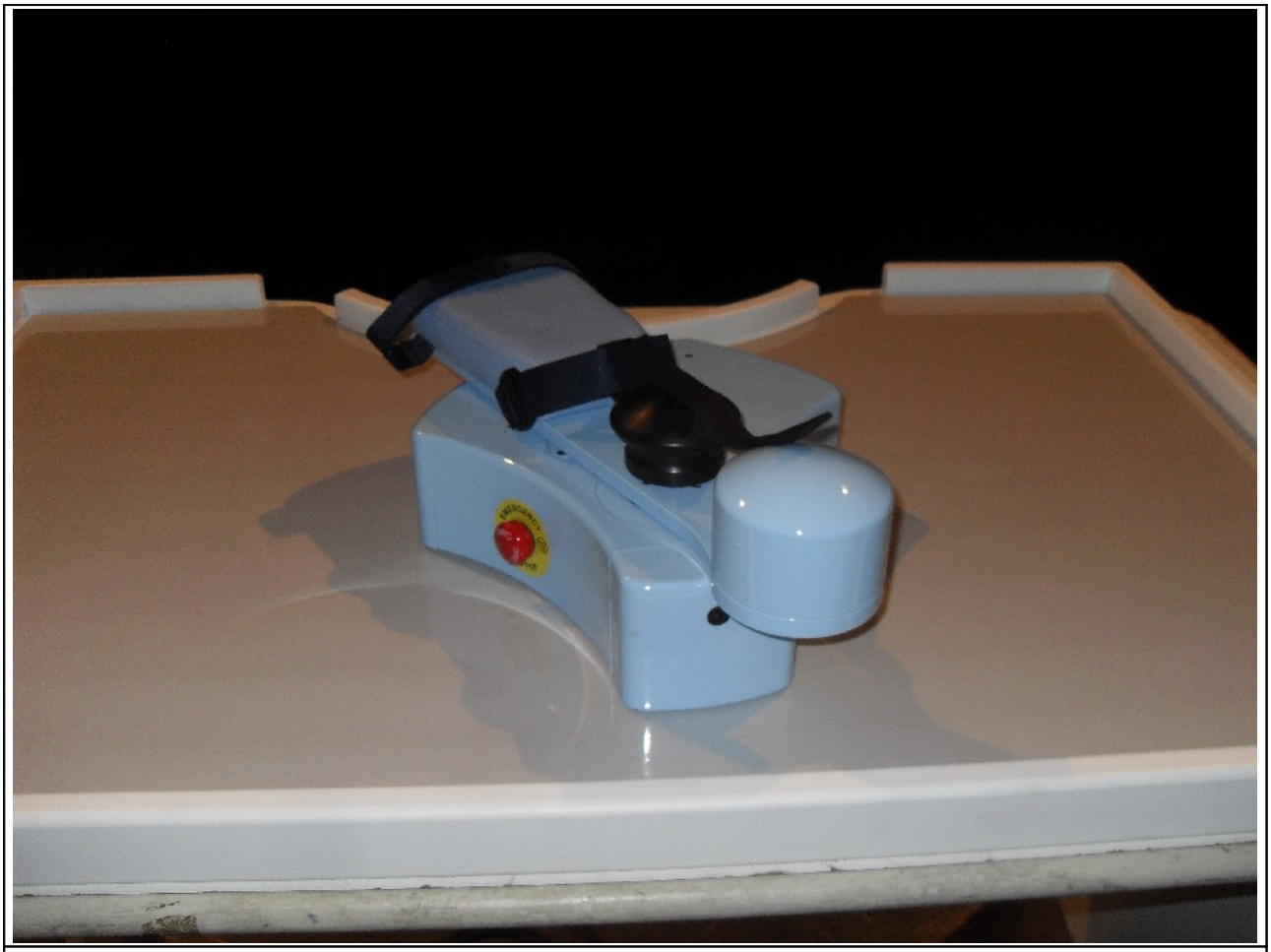


Fig. 1.1
Equipment Photo

2. REFERENCE STANDARDS

Tests and measurements are performed accordingly to the reference standards given in the table below:

TEST	*STANDARD*
Emissions: Conducted and Radiated – Section 15.207 and 15.209	FCC Rules ad Regulations, Title 47 Part 15 – Sub part C ANSI C63.4 2014 – American National Standard for Methods of Measuring of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz ANSI C63.10 2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Operation within the band 902-928 MHz: Alternative Test Procedures 15.247 (b) and (c) , and (a) Bandwidth and average time of occupancy, Band Edge 15.247 (d)	FCC Rules ad Regulations, Title 47 Part 15 – Sub part C DA 00-705 (30 March 2000) – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems ANSI C63.4 2014 – American National Standard for Methods of Measuring of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz ANSI C63.10 2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Antenna Requirement: §15.203	FCC Rules ad Regulations, Title 47 Part 15 – Sub part C

3. RESULT, CONDITION, MEASUREMENT UNCERTAINTY

Summary of Test Results

TEST	*RESULT*
Antenna Requirement: 15.203 (*)	*Pass*
Restricted Band: 15.205	*Pass*
Emissions: radiated *Section 15.209*	*Pass*
Bandwidth, Dwell Time and Numer of Hopping Frequencies *Section 15.247 (a)*	*Pass*
Operation within the band 2402-2483.5 MHz: *Section 15.247 (b) and (c)*	*Pass*
Band Edge *Section 15.247 (d)*	*Pass*

(*) Antenna is integrated in the device

Measurement uncertainty

TEST	*EXPANDED UNCERTAINTY*
Conducted Emission – 50Ω/50µH (150 kHz - 30 MHz)	± 3.5 dB
Radiated Emission – (Semianechoic Room) (30 MHz - 18 GHz)	± 4.7 dB
Radiated Emission – (Semianechoic Room) (18 GHz - 40 GHz)	± 5.1 dB

Climatic Conditions

PARAMETER	*VALUE*
Temperature	(293 ± 3) K
Relative humidity	(50 ± 5) %

General Conditions

Antenna conducted tests cannot be performed on this device, radiated tests to accordingly to DA 00-705 were performed.

Extensions

The results refer only to the sampled EUT and under the specified conditions.

4. RADIATED EMISSIONS

In the following table you can find the limits established by the reference standard:

FREQUENCY RANGE *(MHz)*	***Field Strenght*** *QUASI-PEAK LIMITS* *[dB (μV/m)]*
0.009 ÷ 0.490	48.15 ÷ 13.8 @ 300m
0.490 ÷ 1.705	33.8 ÷ 23 @ 30m
1.705 ÷ 30	29.5 @ 30m
30 ÷ 88	40
88 ÷ 216	43,5
216 ÷ 960	46
Above 960	54

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
MXE EMI Receiver	Agilent	N9038A	01/2016
Anechoic Chamber	Comtest	CSA01	01/2016
High Pass Filter	MiniCircuits	VHP-39	01/2016
Notch Filter	K&L	3N45-2442/T84	01/2016
Preamplifier	SHF	97AP	01/2016
Loop Antenna	ETS	6509	01/2016
Bilog Antenna	Schaffner	CBL6112B	01/2016
Horn Antenna	EMCO	3115	01/2016
Horn Antenna	Alpha Industries	61932500	01/2016
Controller	Deisel	HD100	01/2016
Turn Table	Deisel	MA240	01/2016
LISN	GSD	NTW06	01/2016

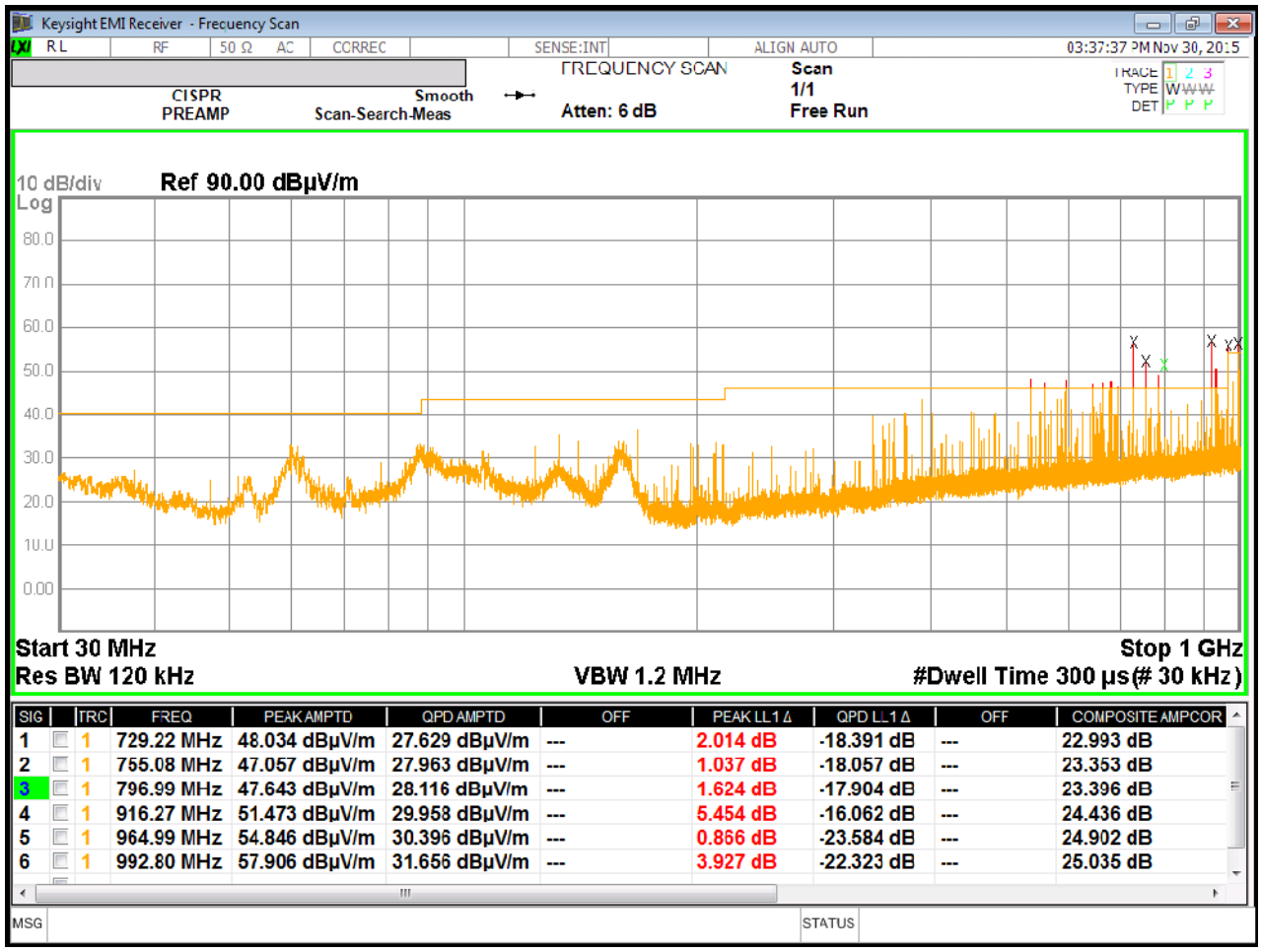
Test procedure: RE22R02

Notes

Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument to be tested shows the front part turned towards the antenna. Positive grades individuate clockwise rotations of TT when this one is observed from the top. For negative degrees, TT rotation is anticlockwise.
Antenna height respect to the mass plane is conventionally individuated with: MA=XXX where XXX indicates the height (always positive for e>100) expressed in cm.
Antenna horizontal polarization is indicated by POL=H. Antenna vertical polarization is indicated by POL=V. EUT was tested in the three orthogonal planes.

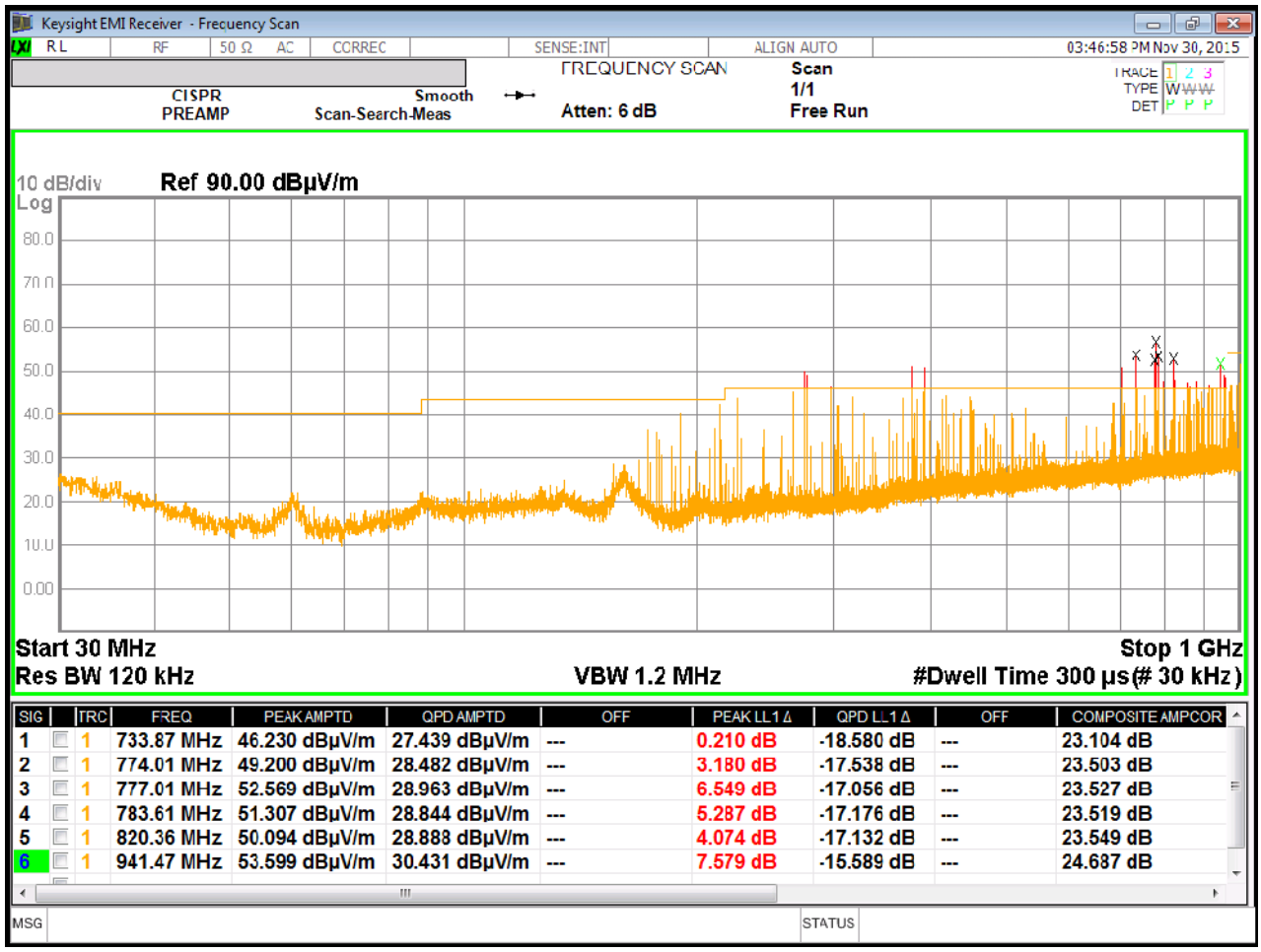
Results and conclusions

In all the operative conditions, equipment complied with the standard limits. Graphics in following figures show the most significant registrations of the performed measurements.



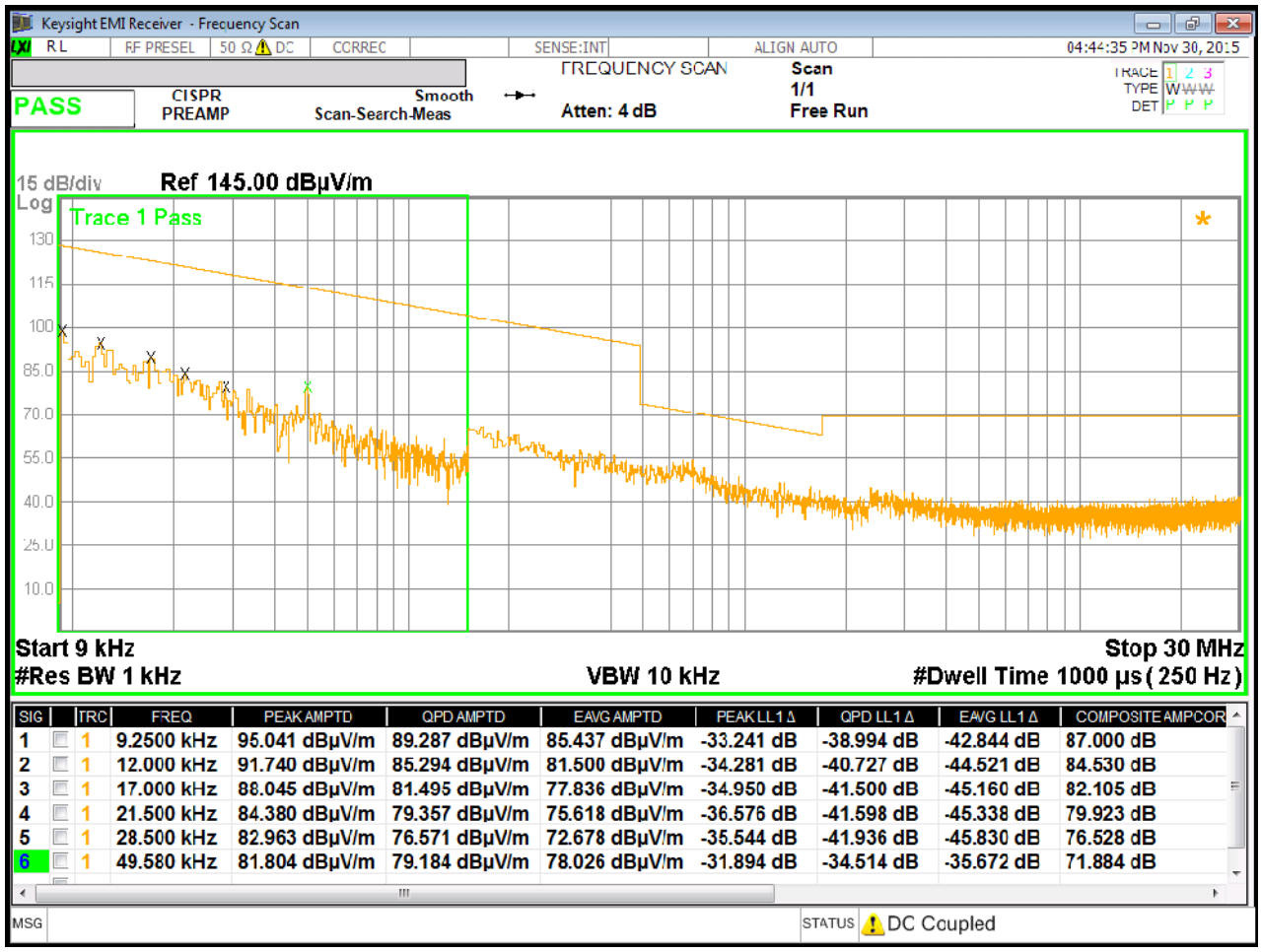
SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	OFF	PEAK LL1 Δ	QPD LL1 Δ	OFF	COMPOSITE AMPCOR
1	1	729.22 MHz	48.034 dBµV/m	27.629 dBµV/m	---	2.014 dB	-18.391 dB	---	22.993 dB
2	1	755.08 MHz	47.057 dBµV/m	27.963 dBµV/m	---	1.037 dB	-18.057 dB	---	23.353 dB
3	1	796.99 MHz	47.643 dBµV/m	28.116 dBµV/m	---	1.624 dB	-17.904 dB	---	23.396 dB
4	1	916.27 MHz	51.473 dBµV/m	29.958 dBµV/m	---	5.454 dB	-16.062 dB	---	24.436 dB
5	1	964.99 MHz	54.846 dBµV/m	30.396 dBµV/m	---	0.866 dB	-23.584 dB	---	24.902 dB
6	1	992.80 MHz	57.906 dBµV/m	31.656 dBµV/m	---	3.927 dB	-22.323 dB	---	25.035 dB

POL V: Prescan and Final measurement List



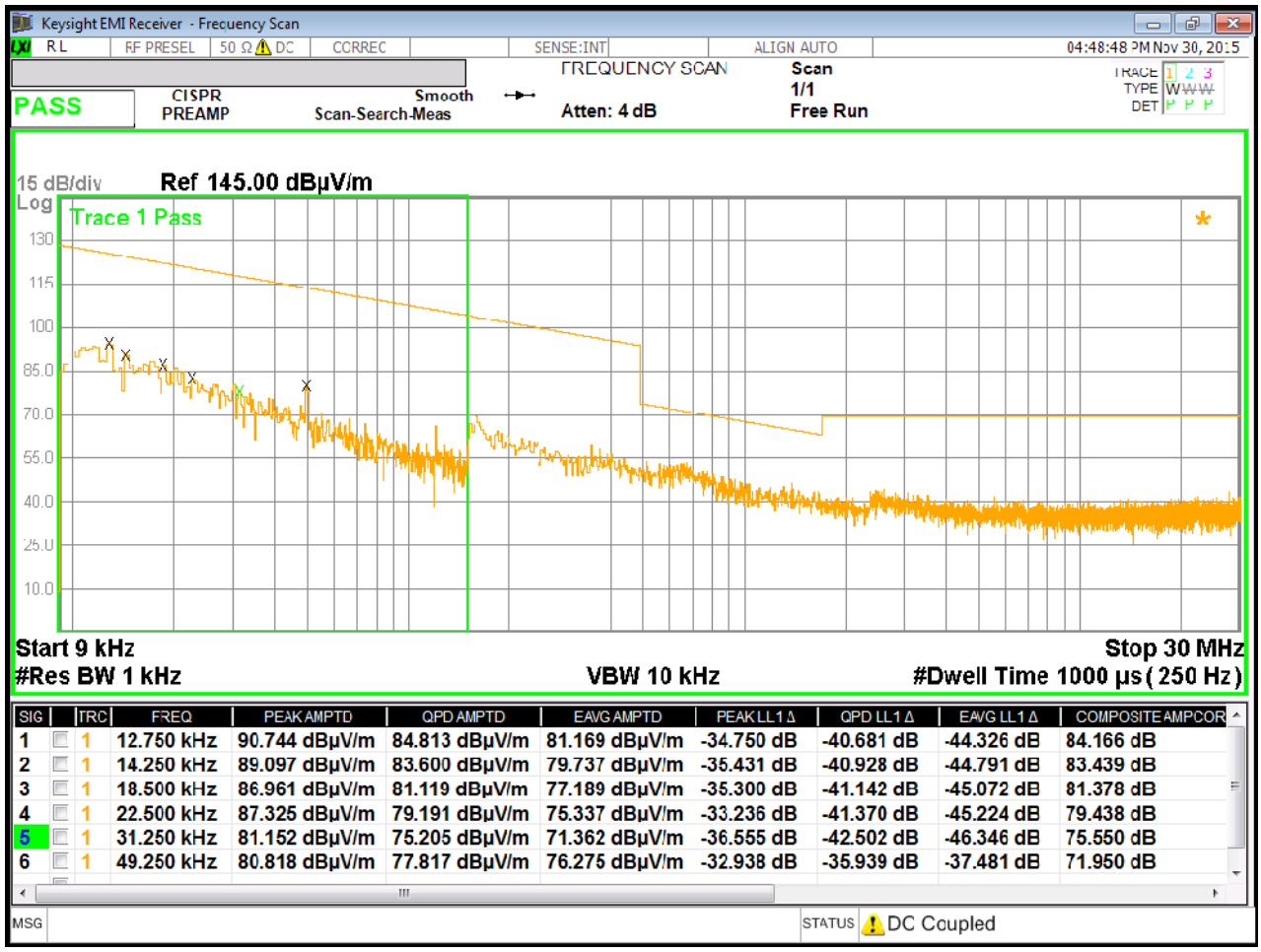
SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	OFF	PEAK LL1 Δ	QPD LL1 Δ	OFF	COMPOSITE AMPCOR
1	1	733.87 MHz	46.230 dBµV/m	27.439 dBµV/m	---	0.210 dB	-18.580 dB	---	23.104 dB
2	1	774.01 MHz	49.200 dBµV/m	28.482 dBµV/m	---	3.180 dB	-17.538 dB	---	23.503 dB
3	1	777.01 MHz	52.569 dBµV/m	28.963 dBµV/m	---	6.549 dB	-17.056 dB	---	23.527 dB
4	1	783.61 MHz	51.307 dBµV/m	28.844 dBµV/m	---	5.287 dB	-17.176 dB	---	23.519 dB
5	1	820.36 MHz	50.094 dBµV/m	28.883 dBµV/m	---	4.074 dB	-17.132 dB	---	23.549 dB
6	1	941.47 MHz	53.599 dBµV/m	30.431 dBµV/m	---	7.579 dB	-15.589 dB	---	24.687 dB

POL H: Prescan and Final measurement List



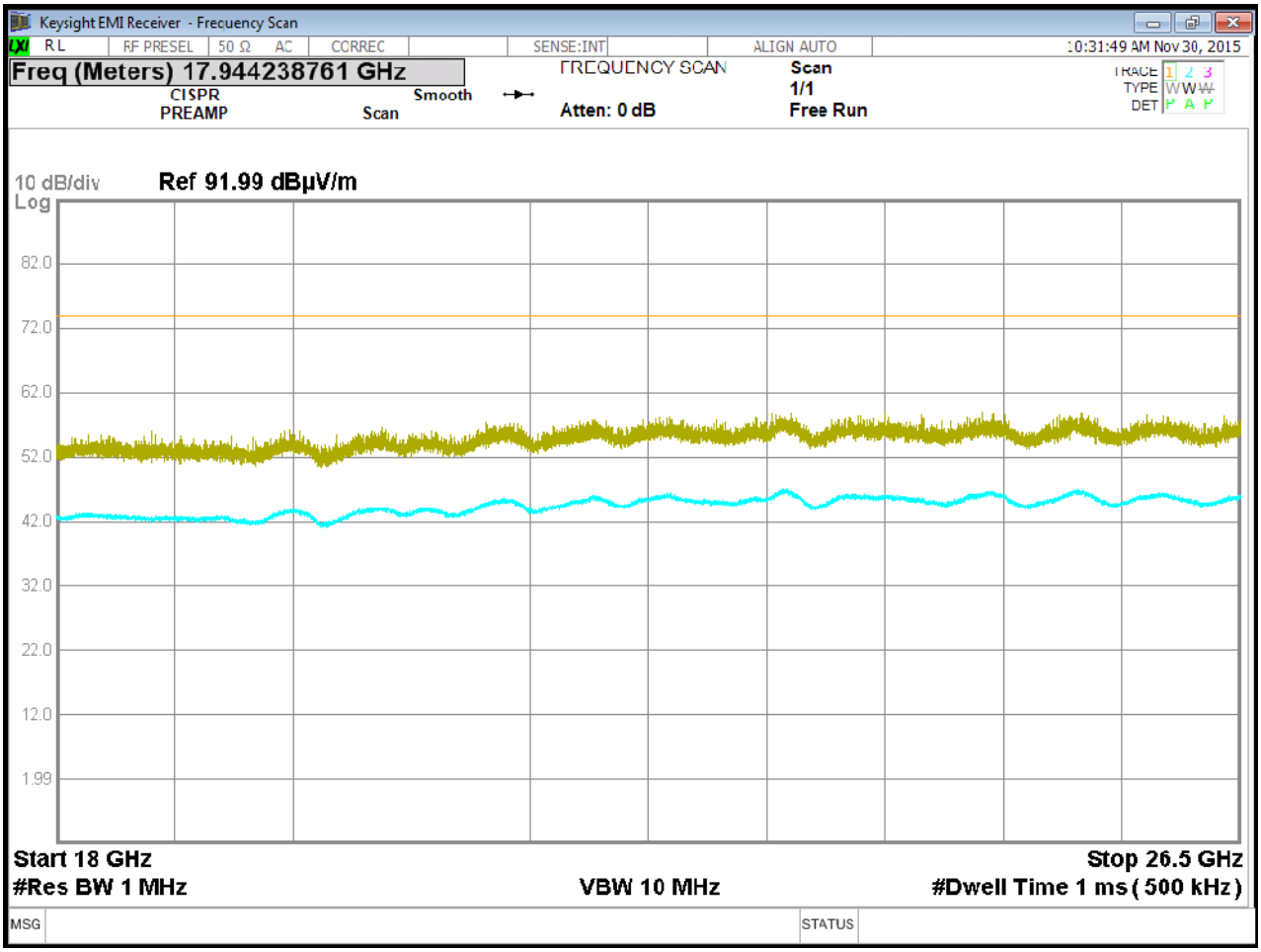
SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL1 Δ	COMPOSITE AMPCOR
1	1	9.2500 kHz	95.041 dBµV/m	89.287 dBµV/m	85.437 dBµV/m	-33.241 dB	-38.994 dB	-42.844 dB	87.000 dB
2	1	12.000 kHz	91.740 dBµV/m	85.294 dBµV/m	81.500 dBµV/m	-34.281 dB	-40.727 dB	-44.521 dB	84.530 dB
3	1	17.000 kHz	88.045 dBµV/m	81.495 dBµV/m	77.836 dBµV/m	-34.950 dB	-41.500 dB	-45.160 dB	82.105 dB
4	1	21.500 kHz	84.380 dBµV/m	79.357 dBµV/m	75.618 dBµV/m	-36.576 dB	-41.598 dB	-45.338 dB	79.923 dB
5	1	28.500 kHz	82.963 dBµV/m	76.571 dBµV/m	72.678 dBµV/m	-35.544 dB	-41.936 dB	-45.830 dB	76.528 dB
6	1	49.580 kHz	81.804 dBµV/m	79.184 dBµV/m	78.026 dBµV/m	-31.894 dB	-34.514 dB	-35.672 dB	71.884 dB

Horizontal Polarization

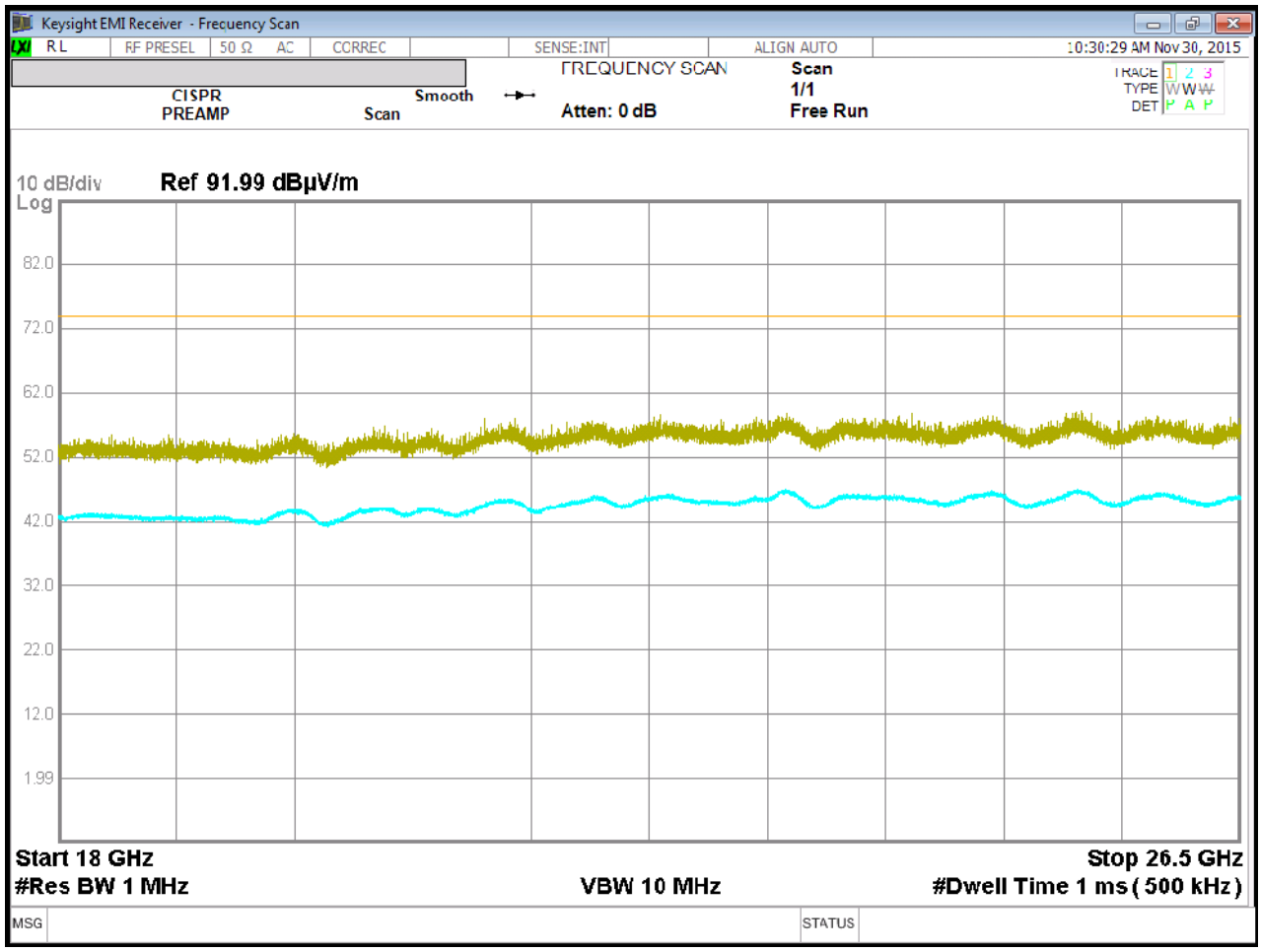


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL1 Δ	COMPOSITE AMPCOR
1	1	12.750 kHz	90.744 dBµV/m	84.813 dBµV/m	81.169 dBµV/m	-34.750 dB	-40.681 dB	-44.326 dB	84.166 dB
2	1	14.250 kHz	89.097 dBµV/m	83.600 dBµV/m	79.737 dBµV/m	-35.431 dB	-40.928 dB	-44.791 dB	83.439 dB
3	1	18.500 kHz	86.961 dBµV/m	81.119 dBµV/m	77.189 dBµV/m	-35.300 dB	-41.142 dB	-45.072 dB	81.378 dB
4	1	22.500 kHz	87.325 dBµV/m	79.191 dBµV/m	75.337 dBµV/m	-33.236 dB	-41.370 dB	-45.224 dB	79.438 dB
5	1	31.250 kHz	81.152 dBµV/m	75.205 dBµV/m	71.362 dBµV/m	-36.555 dB	-42.502 dB	-46.346 dB	75.550 dB
6	1	49.250 kHz	80.818 dBµV/m	77.817 dBµV/m	76.275 dBµV/m	-32.938 dB	-35.939 dB	-37.481 dB	71.950 dB

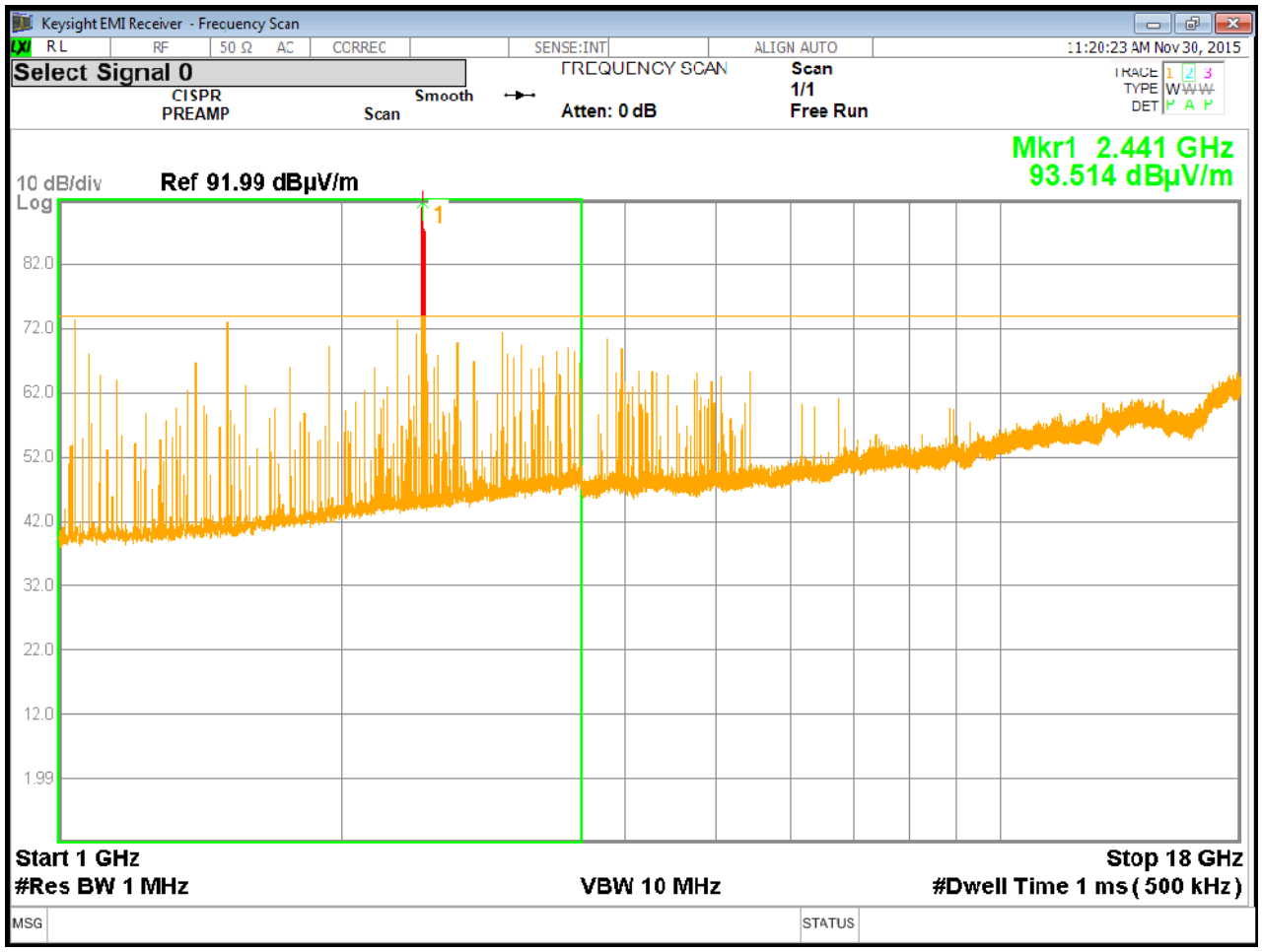
Parallel Polarization



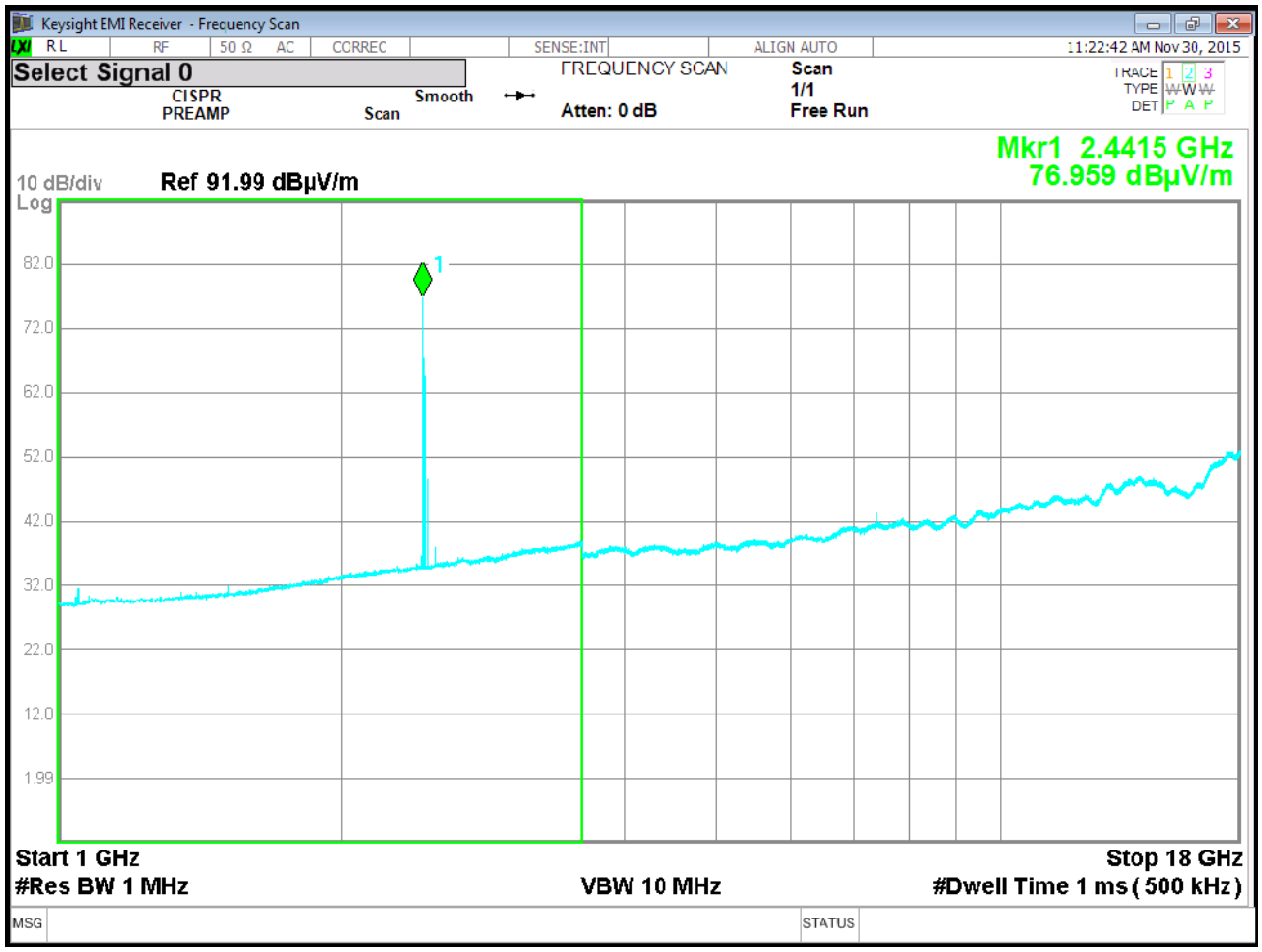
POL V
MA: 100 cm
TT: 0°
Antenna in front of EUT
3m measure distance
EUT working



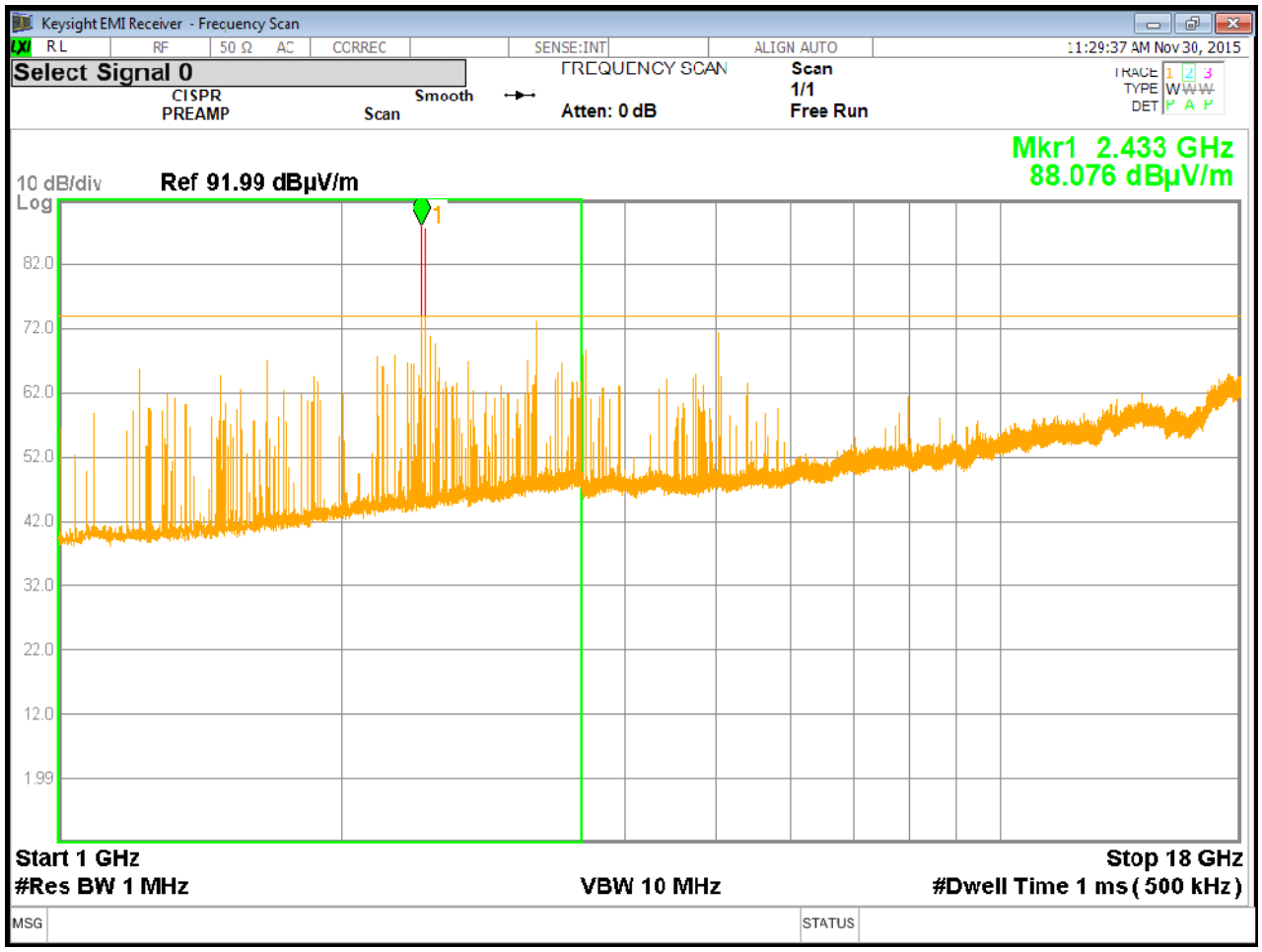
POL H
MA: 100 cm
TT: 0°
Antenna in front of EUT
3m measure distance
EUT working



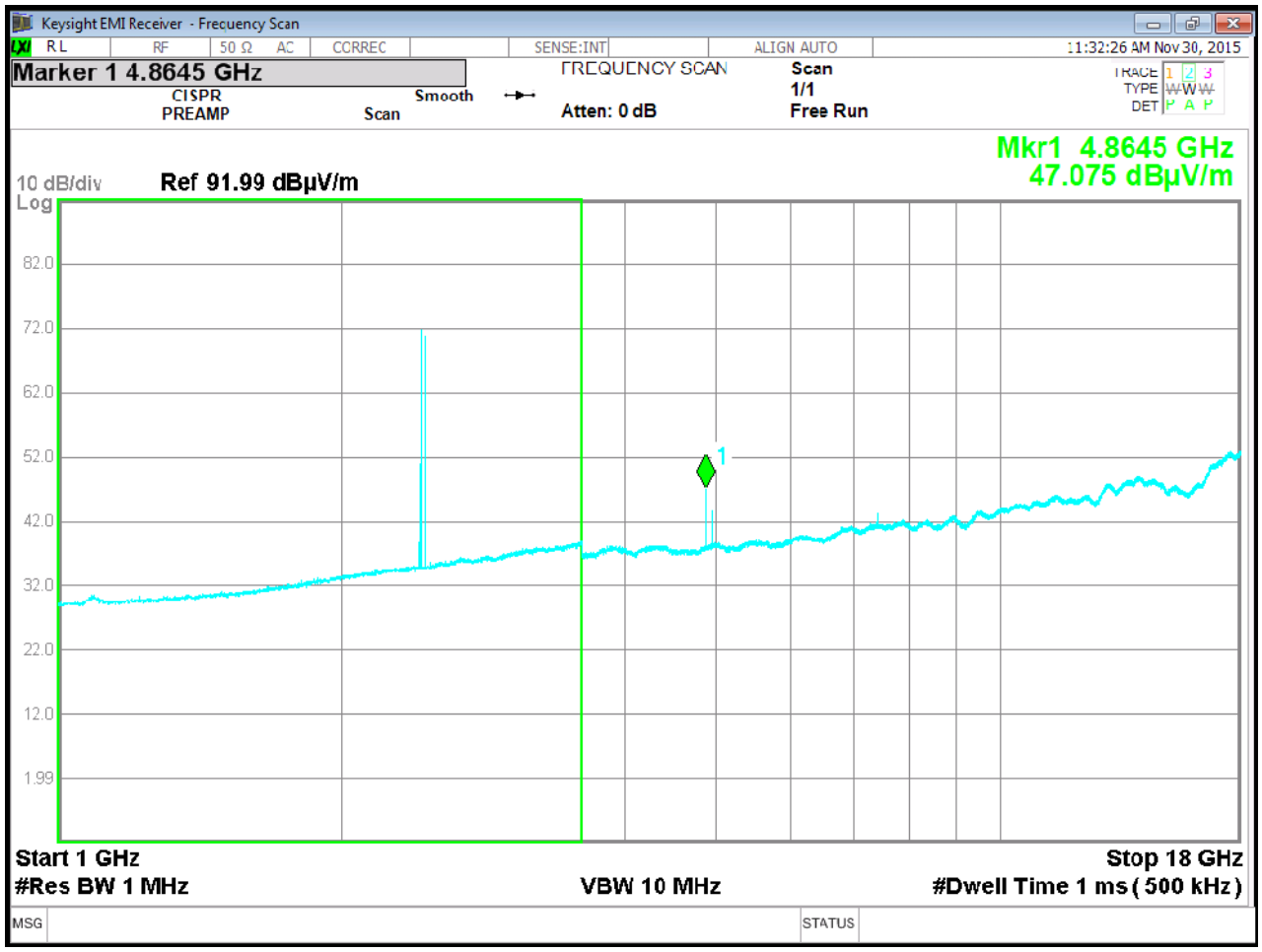
POL V



POL V



POL H



POL H

5. Operation within the band 2400 - 2483.5 MHz: Peak Output Power – Spurious RF Emission – Band Edge - Restricted Band of Operation – Trasmission Time

Accordingly to DA 00-705 (30 March 2000), radiated measurement were performed.

Peak Output Power

Peak power was calculated accordingly to the following equation:

$$P = (Ed)^2/30G$$

E = measured maximum fundamental field strength in V/m
G = numeric gain of the transmitting antenna with reference to an isotropic radiator.
d = distance in meters from which the field strength was measured.

P = power in watts

Equipment shall meet the limits below.

Frequency range (MHz)	RF power output Limit dBm
2400-2483.5	30.0

E = 90.4 dBµV/m (0.033 V/m)
G=-1 dBi (Numerical Gain = 0.794)
d = 3m

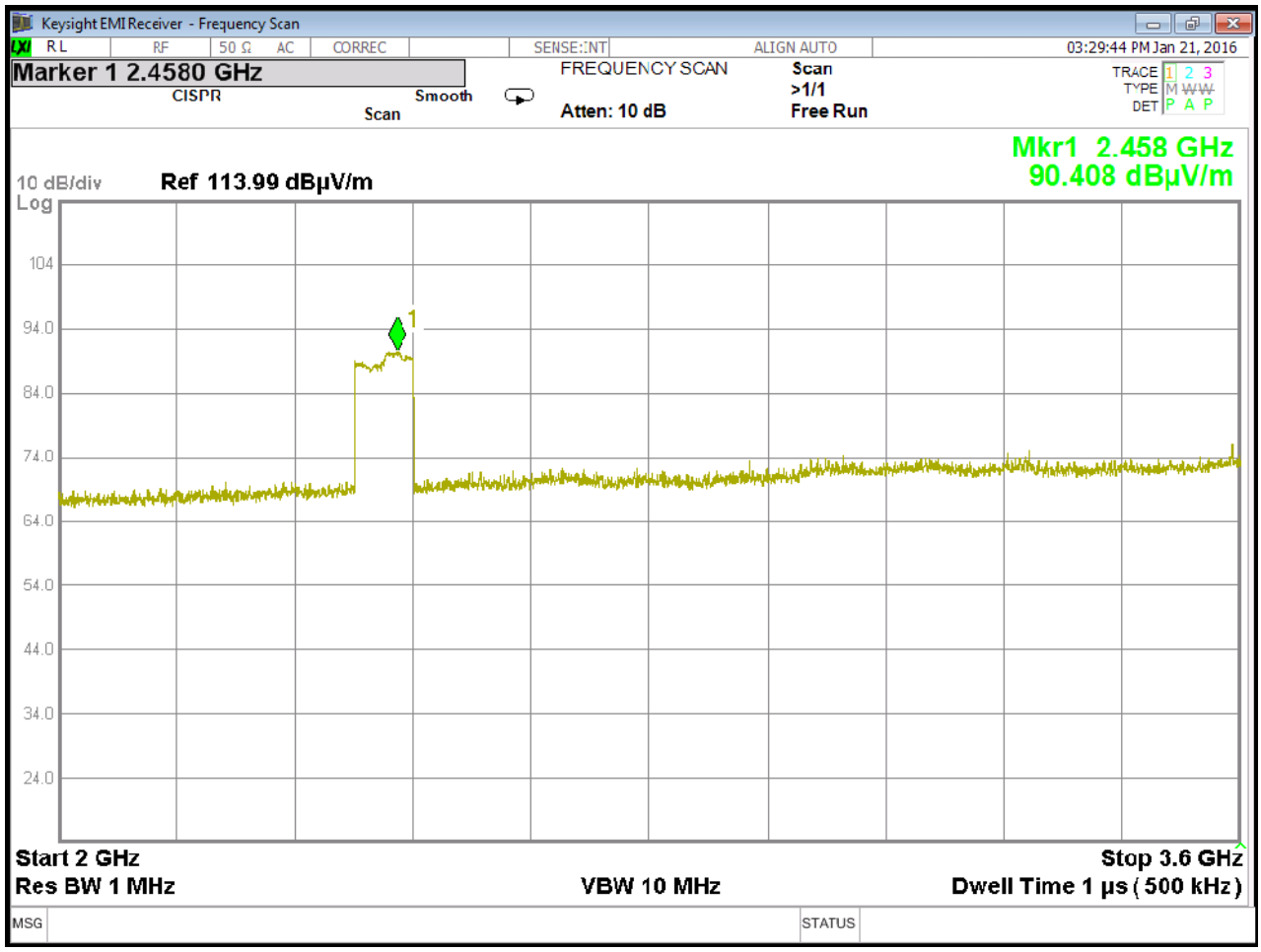
Maximum calculated peak power = -3.87 dBm (0.41 mW)

Additional Measurement [15.247 (a)(1)]

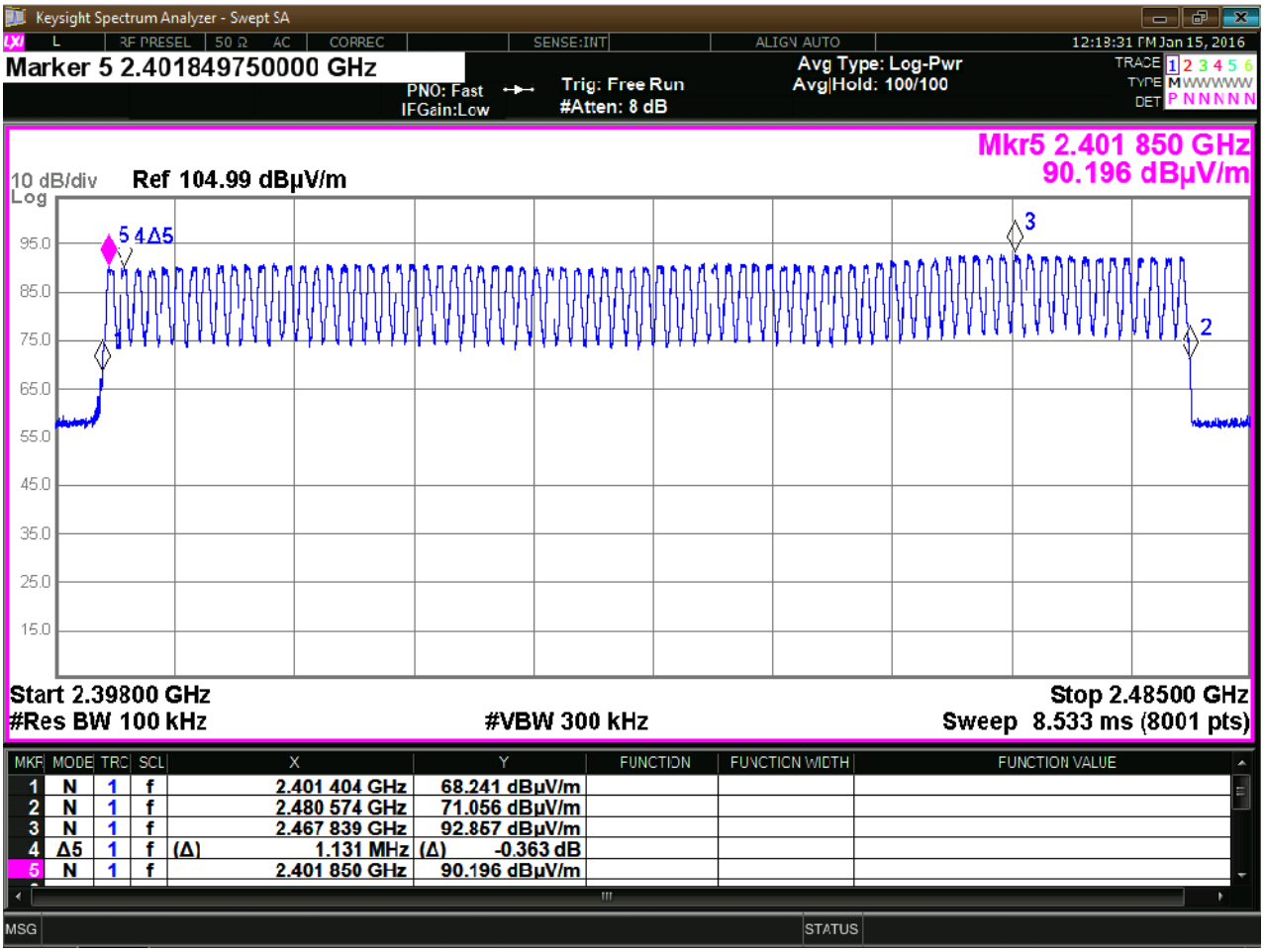
Channel spacing= 0.999 MHz

Number of hopping frequencies= 79

Frequencies are choosen from a pseudorandomly ordered list of hopping frequencies.



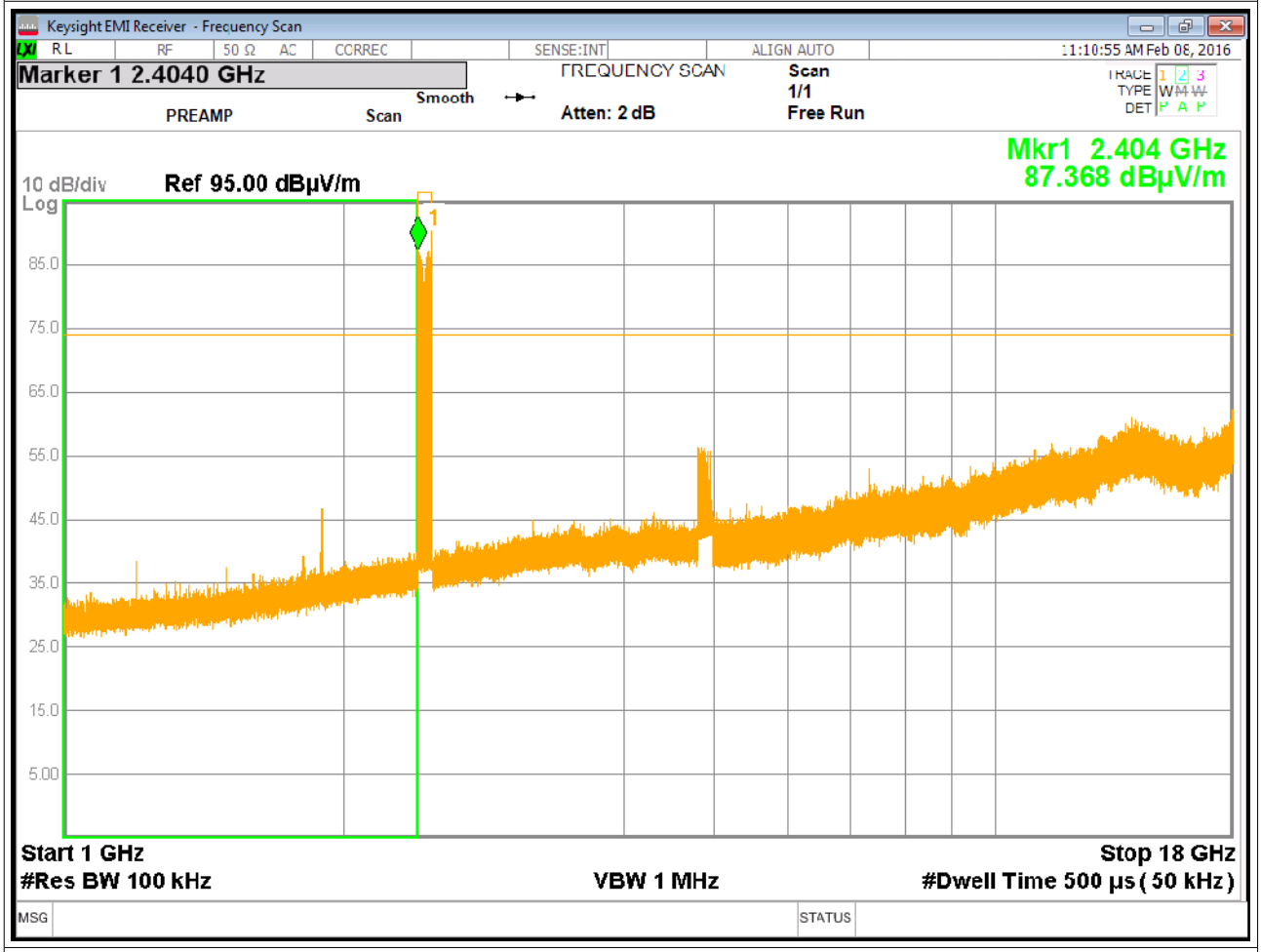
Peak Output Power



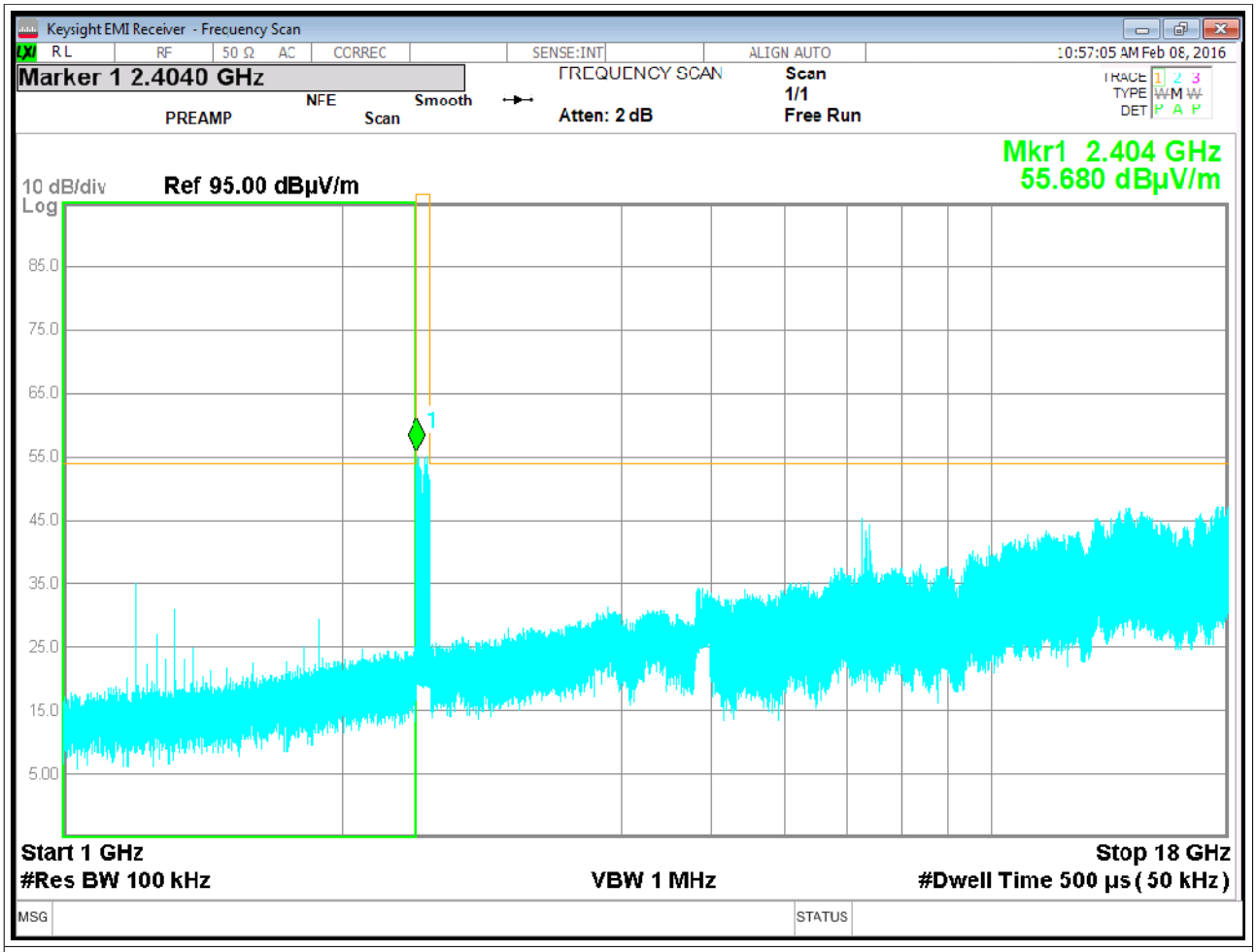
Number of hopping frequencies: 79

Channel Spacing

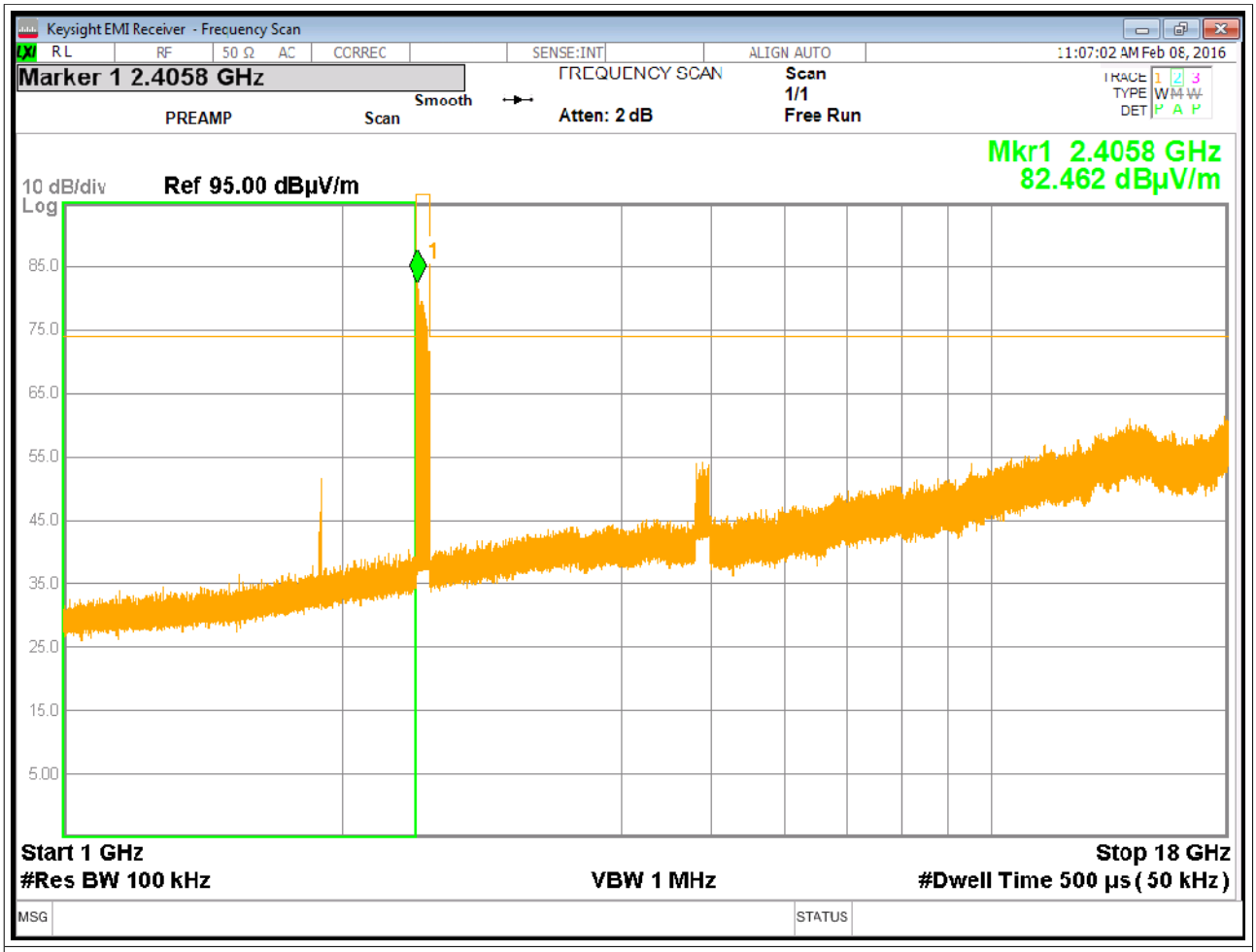
Spurious Emissions 15.247 (d)



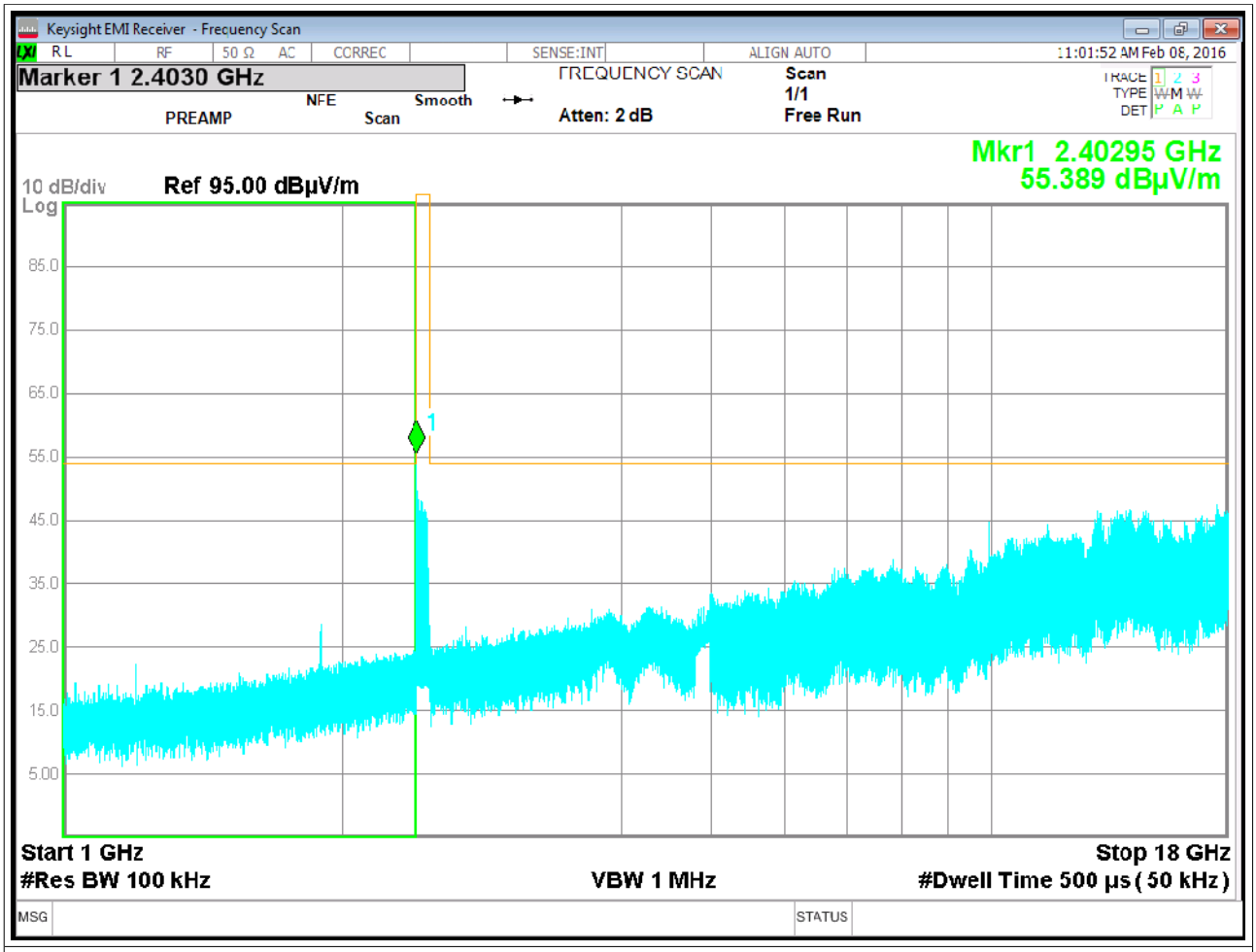
Spurious Emissions – Peak detector – Vertical Polarization



Spurious Emissions – Average detector – Vertical Polarization



Spurious Emissions – Peak detector – Horizontal Polarization



Spurious Emissions – Average detector – Horizontal Polarization

Spurious Emissions

Nr Harmonics	AV Level (dBµV/m)	AV Limits (dBµV/m)	Remark
2	--	54.0	
3	45.2	54.0	
4	--	54.0	
5	--	54.0	
6	--	54.0	
7	--	54.0	
8	--	54.0	
9	--	54.0	
10	--	54.0	

Note: Levels below 20 dB of limits are indicated with (--).

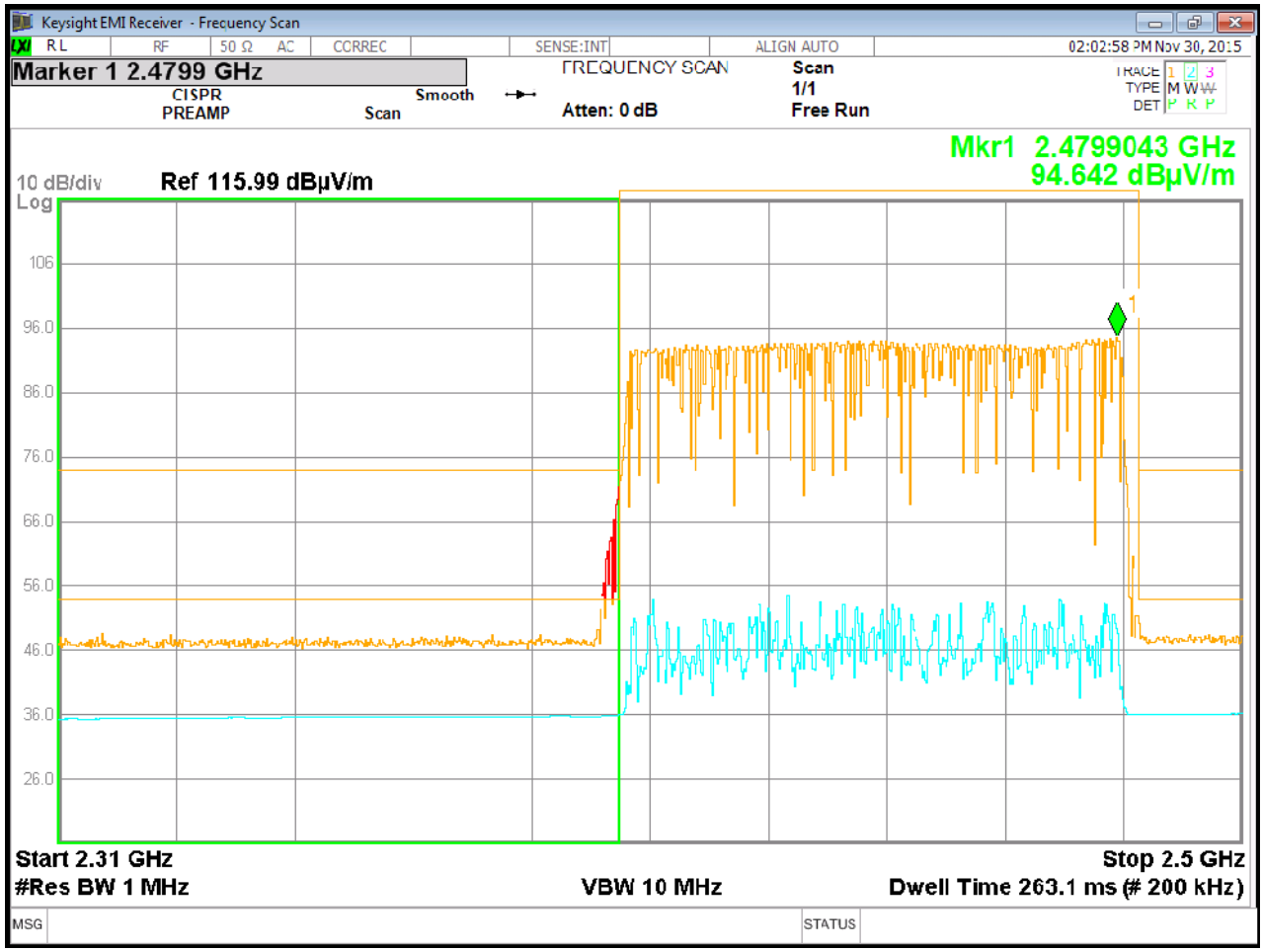
Nr Harmonics	Peak Level (dBµV/m)	AV Limits (dBµV/m)	Remark
2	57.8	74.0	
3	--	74.0	
4	--	74.0	
5	--	74.0	
6	--	74.0	
7	--	74.0	
8	--	74.0	
9	--	74.0	
10	--	74.0	

Note: Levels below 20 dB of limits are indicated with (--).

Band Edge and Restricted Band of Operation 15.247 (d)

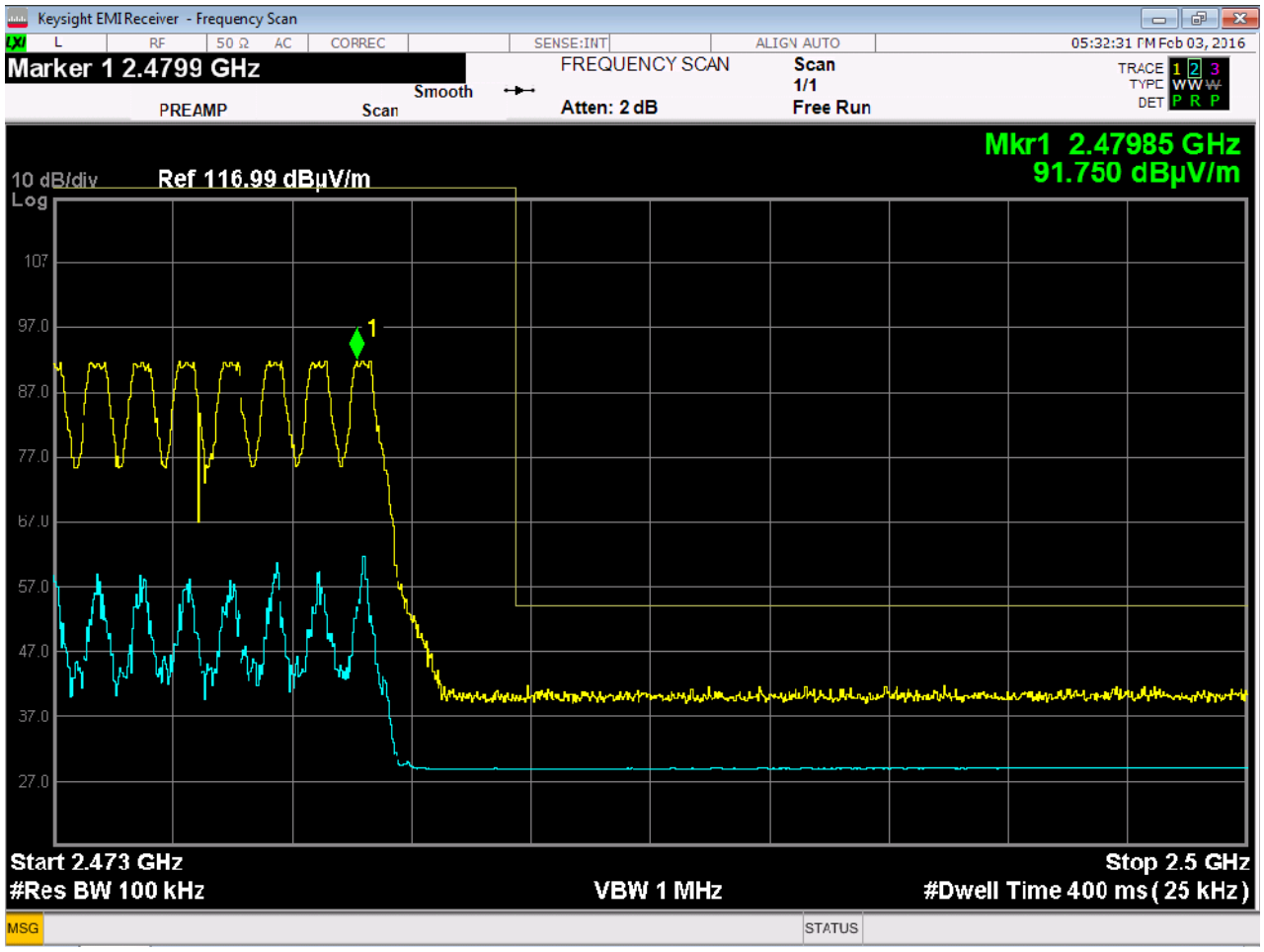
Emissions must be within the band 2400 – 2483.5 MHz.

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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

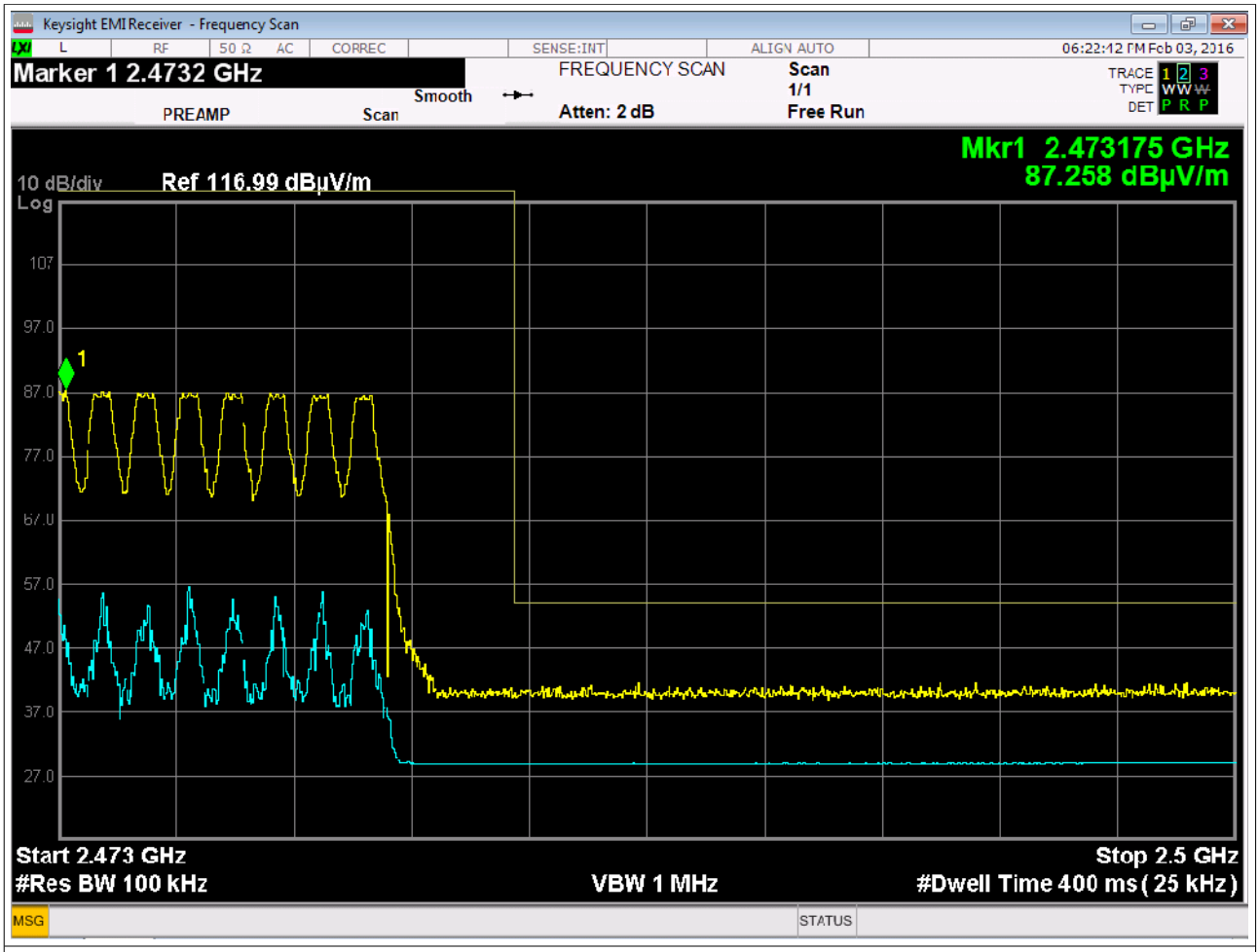


Band Edge and Restricted Band of Operation: 1 MHz BW

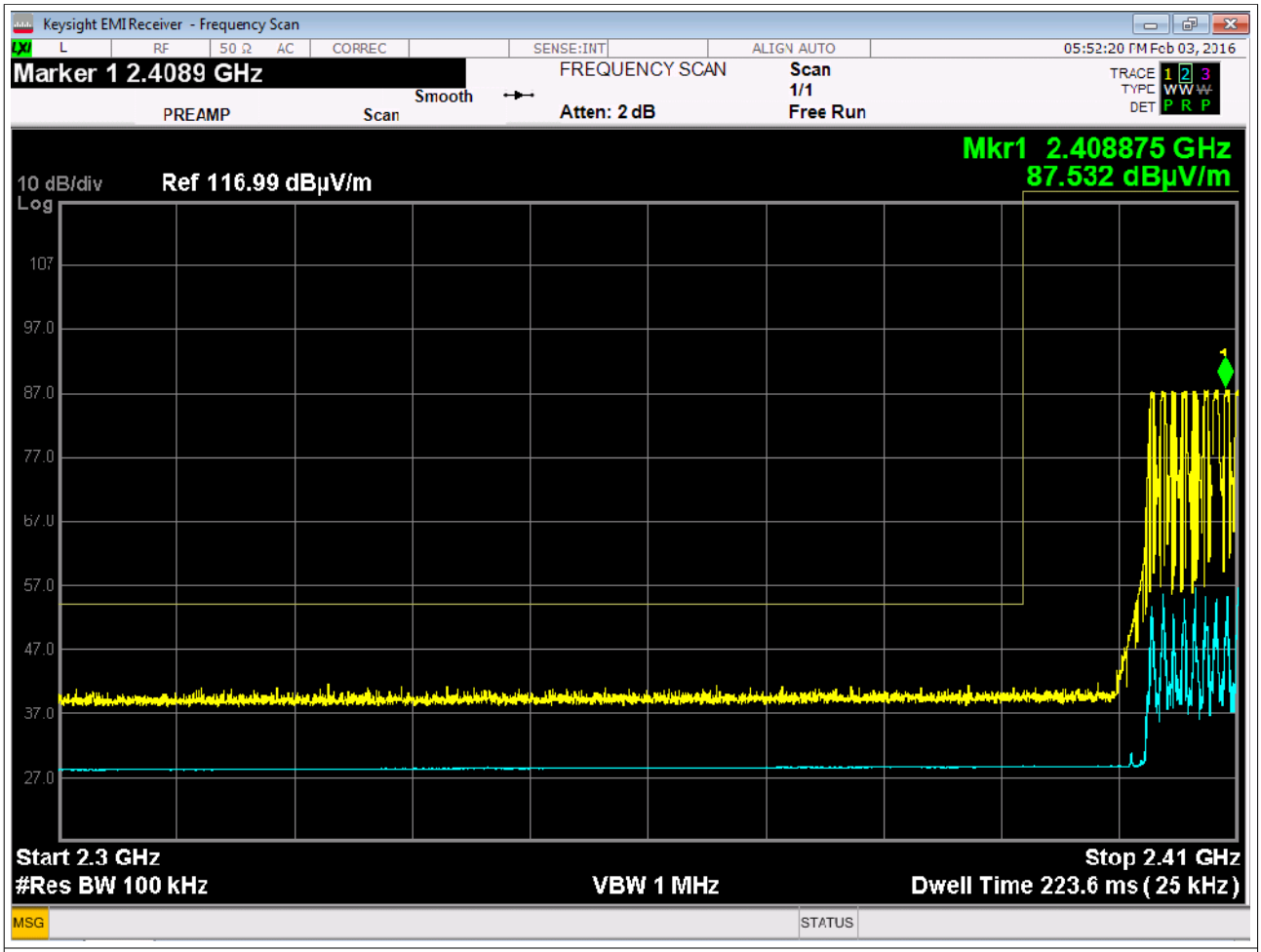
Limits specified in §15.209(a) are shown



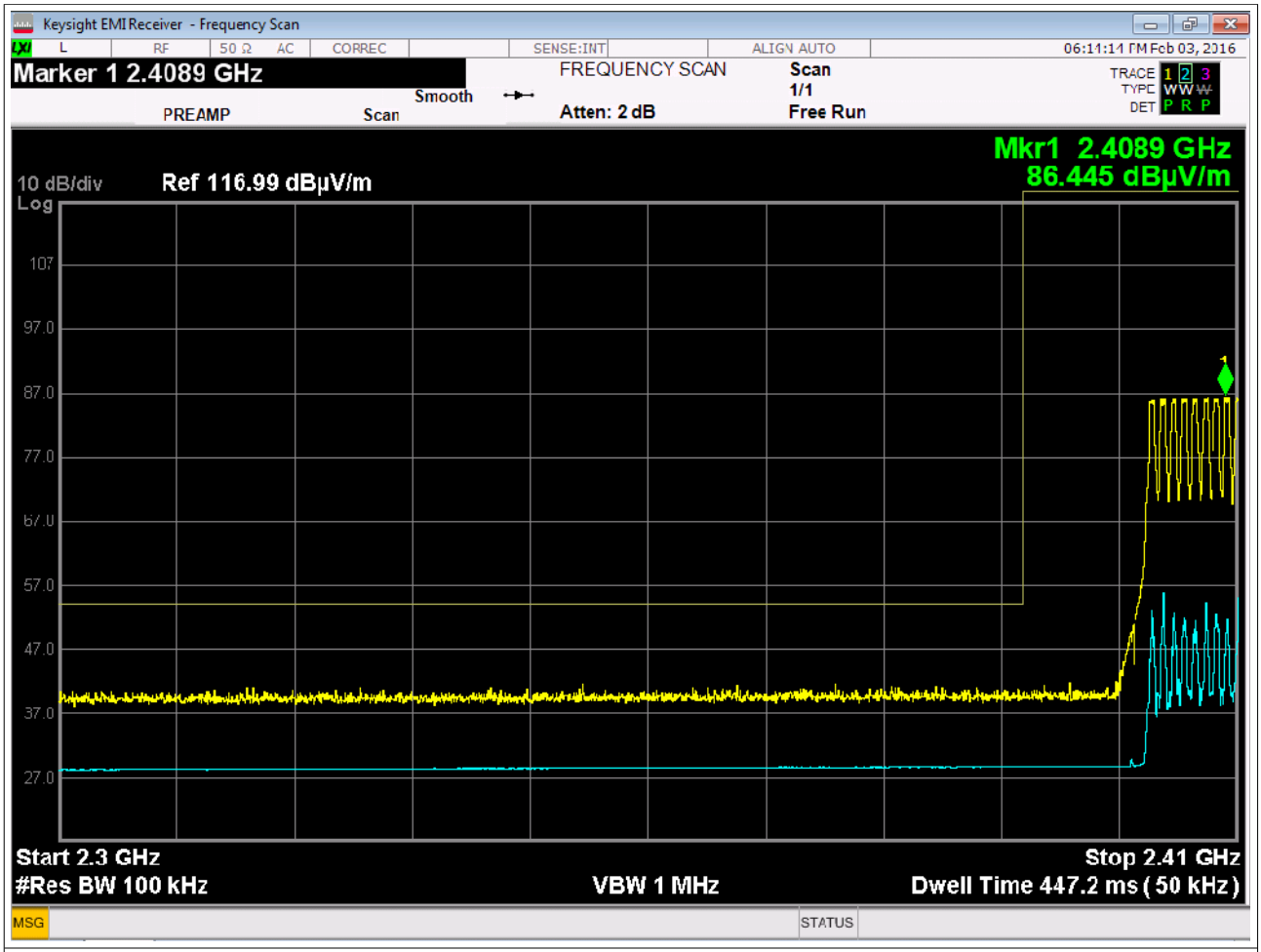
Band Edge and Restricted Band of Operation: 2483.5 – 2500 Band – Vertical Polarization



Band Edge and Restricted Band of Operation: 2483.5 – 2500 Band – Horizontal Polarization

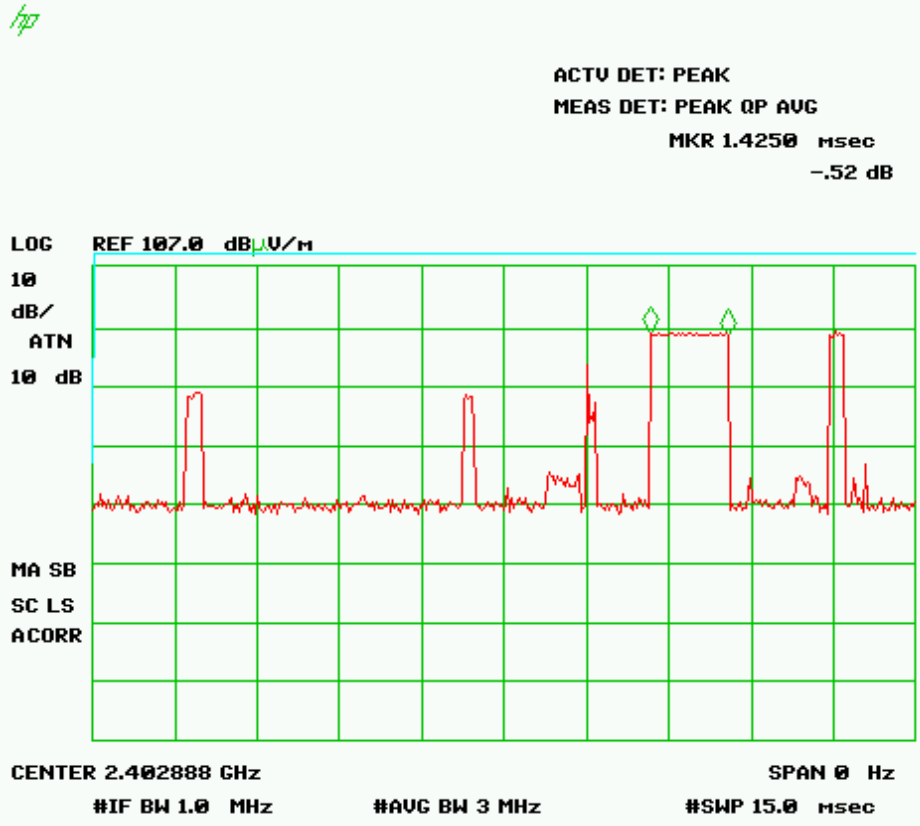


Band Edge: 2300– 2410 Band – Vertical Polarization



Band Edge: 2300– 2410 Band – Vertical Polarization

Transmission Time (15.247 (a)(1)



Length of Trasmission Time (msec) = 1.425 msec

Number of trasmission in a 31.6 sec = 200

Result: 0.285 sec
Limit: 0.4 sec

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
MXE EMI Receiver	Agilent	N9038A	01/2016
Anechoic Chamber	Comtest	CSA01	01/2016
High Pass Filter	MiniCircuits	VHP-39	01/2016
Notch Filter	K&L	3N45-2442/T84	01/2016
Preamplifier	SHF	97AP	01/2016
Loop Antenna	ETS	6509	01/2016
Bilog Antenna	Schaffner	CBL6112B	01/2016
Horn Antenna	EMCO	3115	01/2016
Horn Antenna	Alpha Industries	61932500	01/2016
Controller	Deisel	HD100	01/2016
Turn Table	Deisel	MA240	01/2016
LISN	GSD	NTW06	01/2016

Test procedure: CE22R01

6. PHOTO

Fig. 6.1

Radiated Emissions Test Set-up

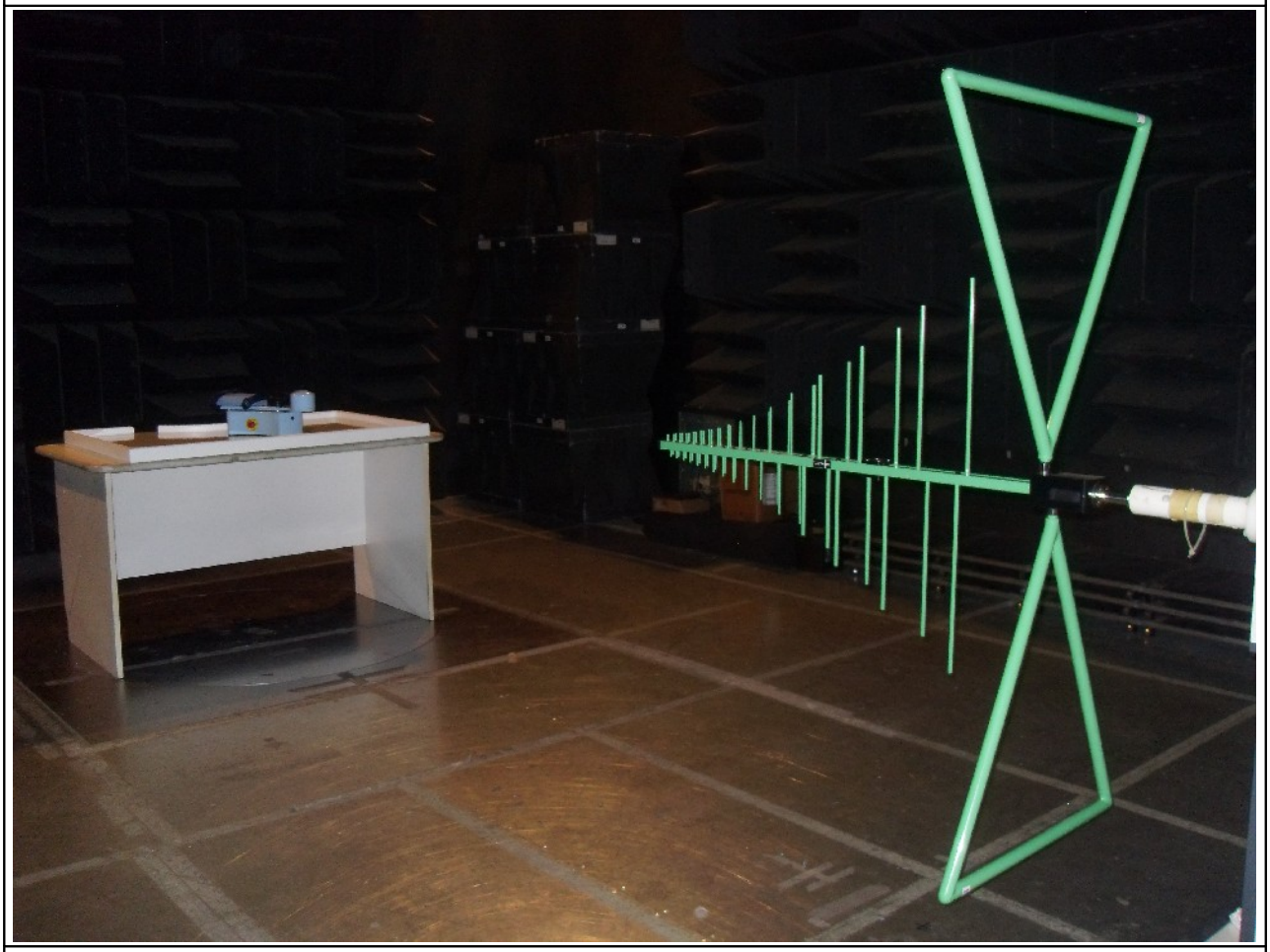


Fig. 6.2

Radiated Emissions Test Set-up

Fig. 6.3

Radiated Emissions Test Set-up