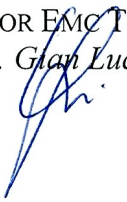




ELECTROMAGNETIC COMPATIBILITY
ELECTRICAL SAFETY
LASER SPECTROSCOPY
ENVIRONMENTAL PHYSICS

G.S.D. S.r.l.
Certified in accordance with
UNI EN ISO 9001:2008
by
TÜV Rheinland Italia S.r.l.
Certificate N. 39 00 1850509

G.S.D. Srl PISA - Italy	Test Report n. 16767-FCC	Rev. 02
Manufacturer	MOTION S.P.A.	
Address	Via Biondini 27 47121 Forlì (FC) Italy	
Frequency Range / RF Power Rating	2402 - 2482 MHz / 0.0001 WEIRP	
Bandwidths	1.8 MHz	
Modulations	GFSK	
Emission designators	1M80F1D	
Test Family Name	PTR6100M -- nRF24L01+	
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 IC Listed: Registration Number: 9353A	
Location and Date of Issue	Pisa, 2016 December 12	
G.S.D. s.r.l. Via Marmiceto, 8 56121 OSPEDALETTO - PISA Tel. 050.984254 - Fax 050.984262 P. IVA 01343950505 SENIOR EMC TEST MANAGER <i>Dr. Gian Luca Genovesi</i>  QUALITY MANAGER <i>Dr. David Pelliccia</i> 		

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Report Revision History

Revision details

<i>Date</i>	<i>Page No.(s)</i>	<i>Details</i>
2016 November 09	29	Rev. 00 Initial issue
2016 December 01	29	Rev. 01 Second issue
2016 December 12	29	Rev. 02-Draft00 Third draft issue

1. MANUFACTURER AND EUT IDENTIFICATION¹	
Manufacturer	MOTION S.P.A..
Address	Via Biondini 27 47121 Forlì (FC) Italy
Test Family Name	PTR6100M -- nRF24L01+
Date of reception	2016 May 09
Sampling	Laboratory sample for certification
Test Item Description	2.4GHz 2Mbps Super MiNi Embedded Transceiver Module
Nominal Input Voltage	1.9 - 3.6 Vdc
FCC ID	2AJ5S0001
IC ID	22061-0001

¹A detailed documentation is preserved in the internal fascicle.

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2. REFERENCE STANDARDS

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

<i>TEST</i>	<i>STANDARD</i>
Emissions: Conducted and Radiated – Section 15.207 and 15.209 RSS-Gen Issue 4 November 2014 §8.9	FCC Rules and 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
§15.249 Operation within the band 2400.00 – 2483.00 MHz ICES RSS-210 Annex B — Devices Operating in Frequency Bands for any Application B.10 Bands 902-928 MHz, 2400-2483.5 MHz and 5725-5875 MHz	FCC Rules and 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 ICES RSS-210 Issue 9 August 2016 Licence-Exempt Radio Apparatus: Category I Equipment
Antenna Requirement: §15.203	FCC Rules and Regulations, Title 47 Part 15 – Sub part C

3. RESULT, CONDITION, MEASUREMENT UNCERTAINTY

Summary of Test Results

<i>TEST</i>	<i>RESULT</i>
<i>Emissions: radiated Section 15.209</i>	<i>Pass</i>
<i>Field Strength Emissions – Emissions outside the bands Section 15.249 (a)(c)(d)(e)</i>	<i>Pass</i>

Measurement uncertainty

<i>TEST</i>	<i>EXPANDED UNCERTAINTY</i>
Conducted Emission – 50Ω/50μH (150 kHz – 30 MHz)	± 3.5 dB
Radiated Emission – (Semianechoic Room) (30 MHz – 18 GHz)	± 4.7 dB

Climatic Conditions

<i>PARAMETER</i>	<i>VALUE</i>
Temperature	(293 ± 3) K
Relative humidity	(50 ± 5) %

Extensions

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

Device uses frequency in the 2.402 to 2.482 GHz range:

First Channel Frequency: 2.402 GHz.

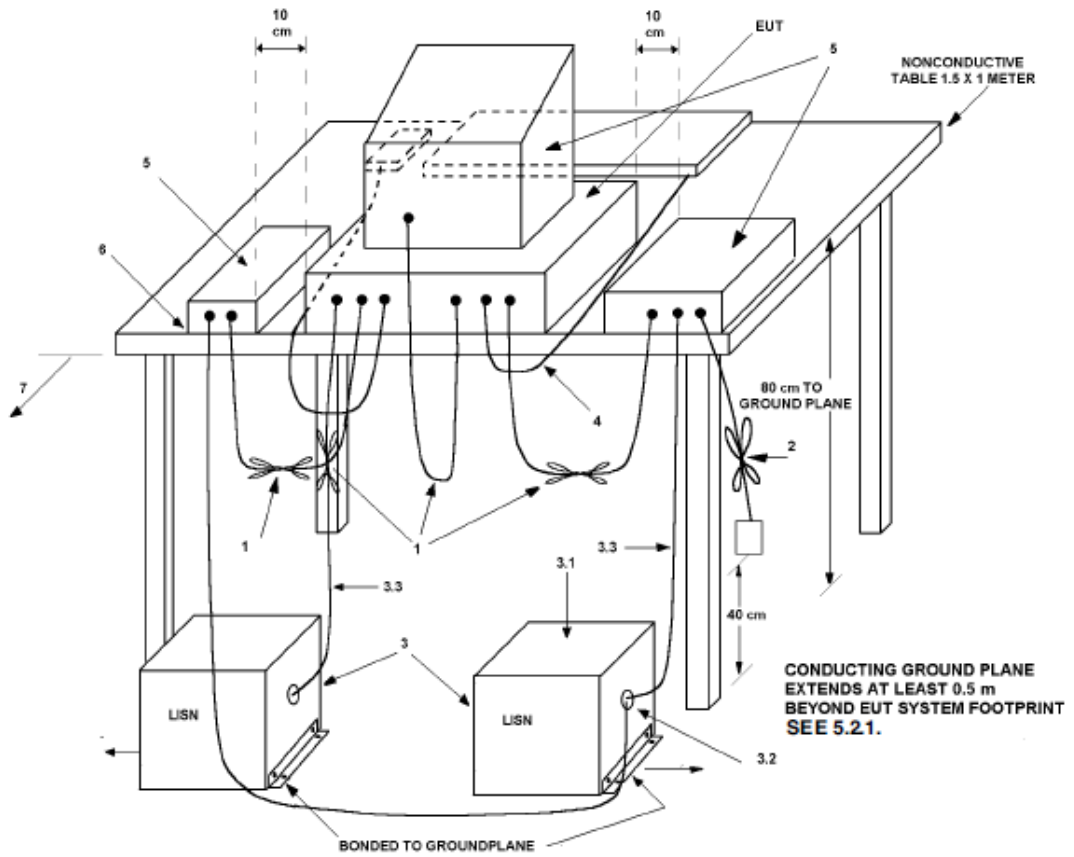
Last Channel Frequency: 2.482 GHz.

Power was set to maximum value.

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Conducted and Radiated EUT Test Set-up example (ANSI C63.10 2013)

4. RADIATED EMISSIONS -FIELD STRENGTH EMISSIONS – EMISSIONS RADIATED OUTSIDE THE BAND

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

§ 15.209 Limits

FREQUENCY RANGE (MHz)	<i>Field Strenght</i> <i>QUASI-PEAK LIMITS</i> <i>[dB (μV/m)]</i>
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 performed at 3 meters. Limit relaxed with a 40dB decade factor.

The Field strength of emissions form intentional radiators operated in the 2400.00 – 2483.50 MHz band shall comply with the following:

Fundamental Frequency (MHz)	Field Strenght of Fundamental (mV/m)	Field Strenght of harmonics (μV/m)
2400 – 2483.5	50	500

Field strength are specified at a distance of 3 meters

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2017
Anechoic Chamber	Comtest	CSA01	01/2017
Bilog Antenna	Schaffner	CBL6112B	01/2017
Horn Antenna	EMCO	3115	01/2017
Horn Antenna	Alpha Industries	61932500	01/2017
Loop Antenna	ETS	6512	01/2017
Controller	Deisel	HD100	01/2017
Turn Table	Deisel	MA240	01/2017
LISN	GSD	NTW06	01/2017

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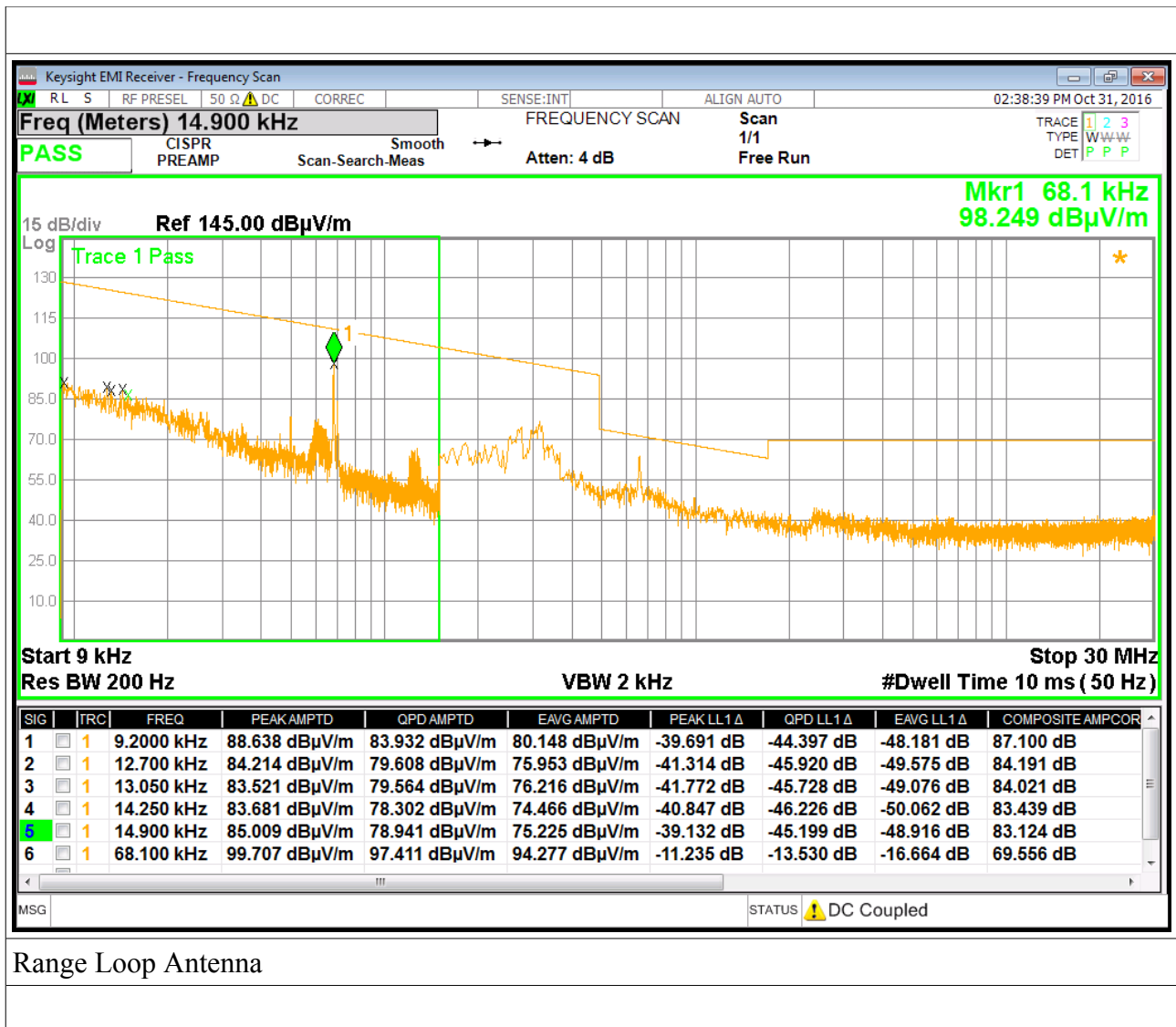
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Cable	Shuner	Sucoflex104EA 5363	01/2017
Cable	Shuner	Sucoflex104EA 5375	01/2017
<u>Test procedure:</u> RE22R02			
<u>Notes</u>			
Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument 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 counter-clockwise. Antenna height respect to the mass plane is conventionally individuated with: MA=XXX where XXX indicates the height (always positive and greater than 100) expressed in cm. Antenna horizontal polarisation is indicated by POL=H. Antenna vertical polarisation is indicated by POL=V. EUT was tested in the three orthogonal planes.			
<u>Results and conclusions</u>			
In all the operative conditions, equipment complied with the standard limits. Graphics in following figures show the most significant registrations of the performed measurements.			
As indicated in §15.215 of Part 15C, unwanted emissions outside the frequency band are attenuated to the emission limit §15.209 and 20 dB BW is inside the 2400-2483.5 permitted band of operation.			

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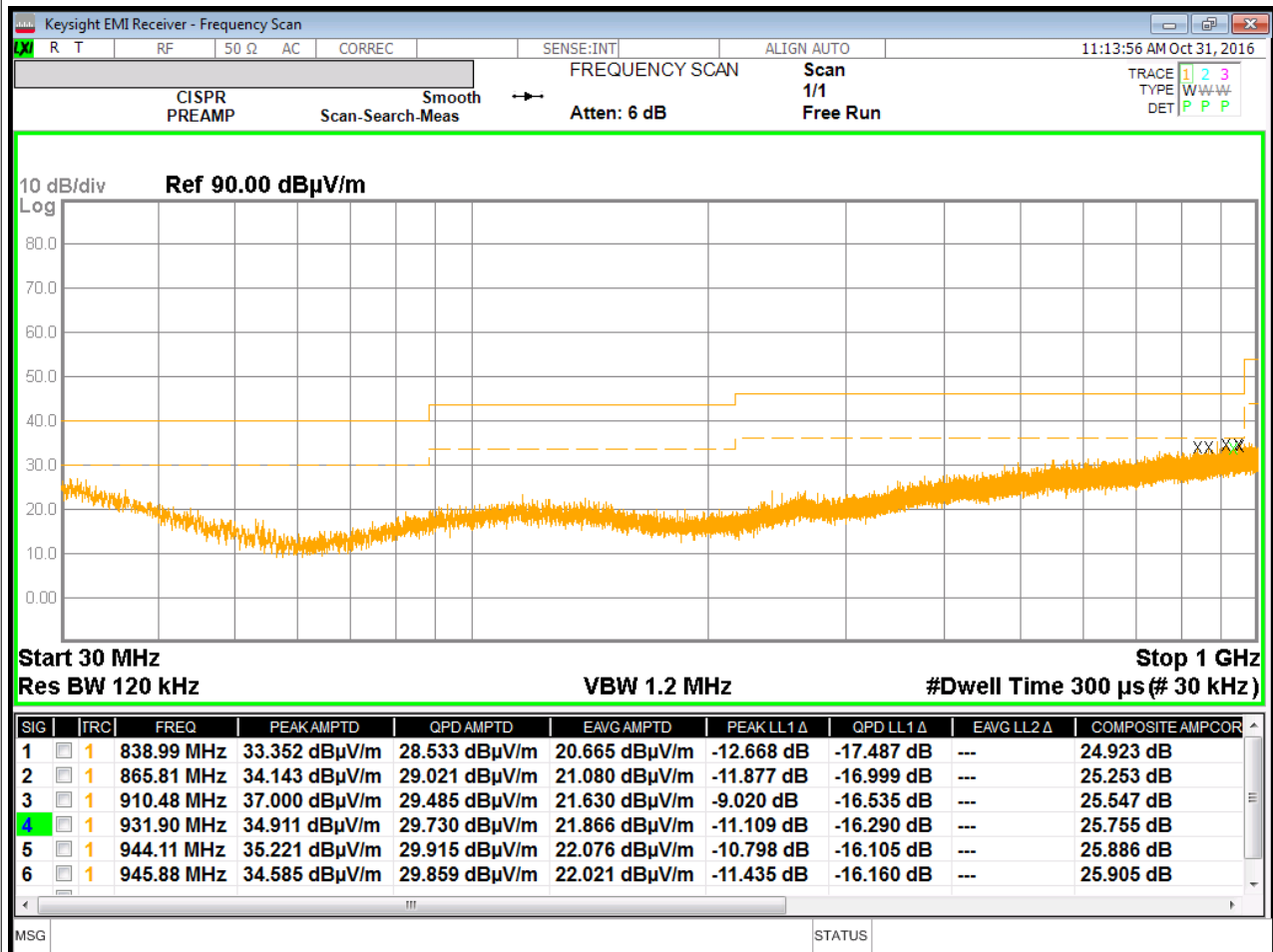
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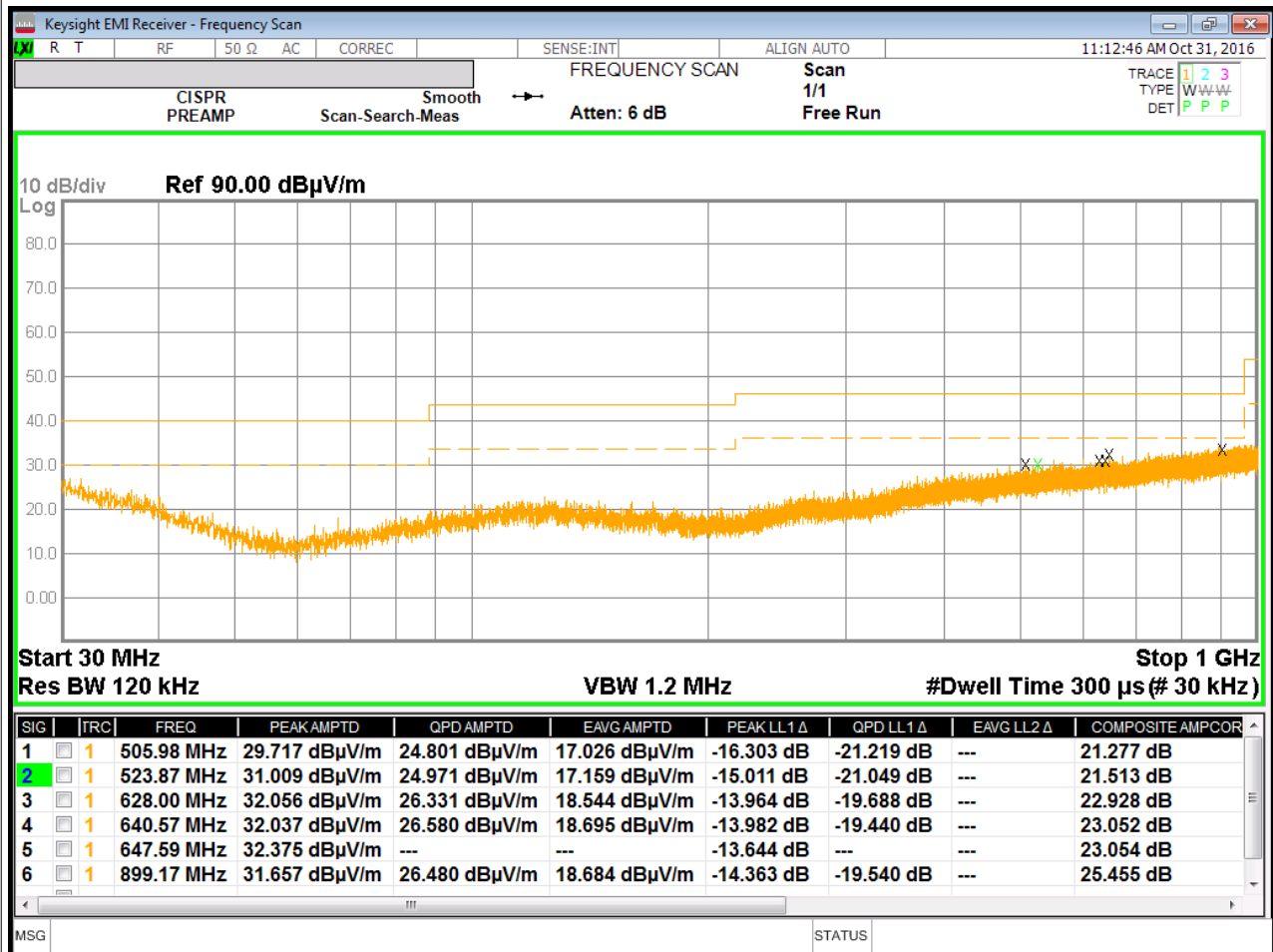
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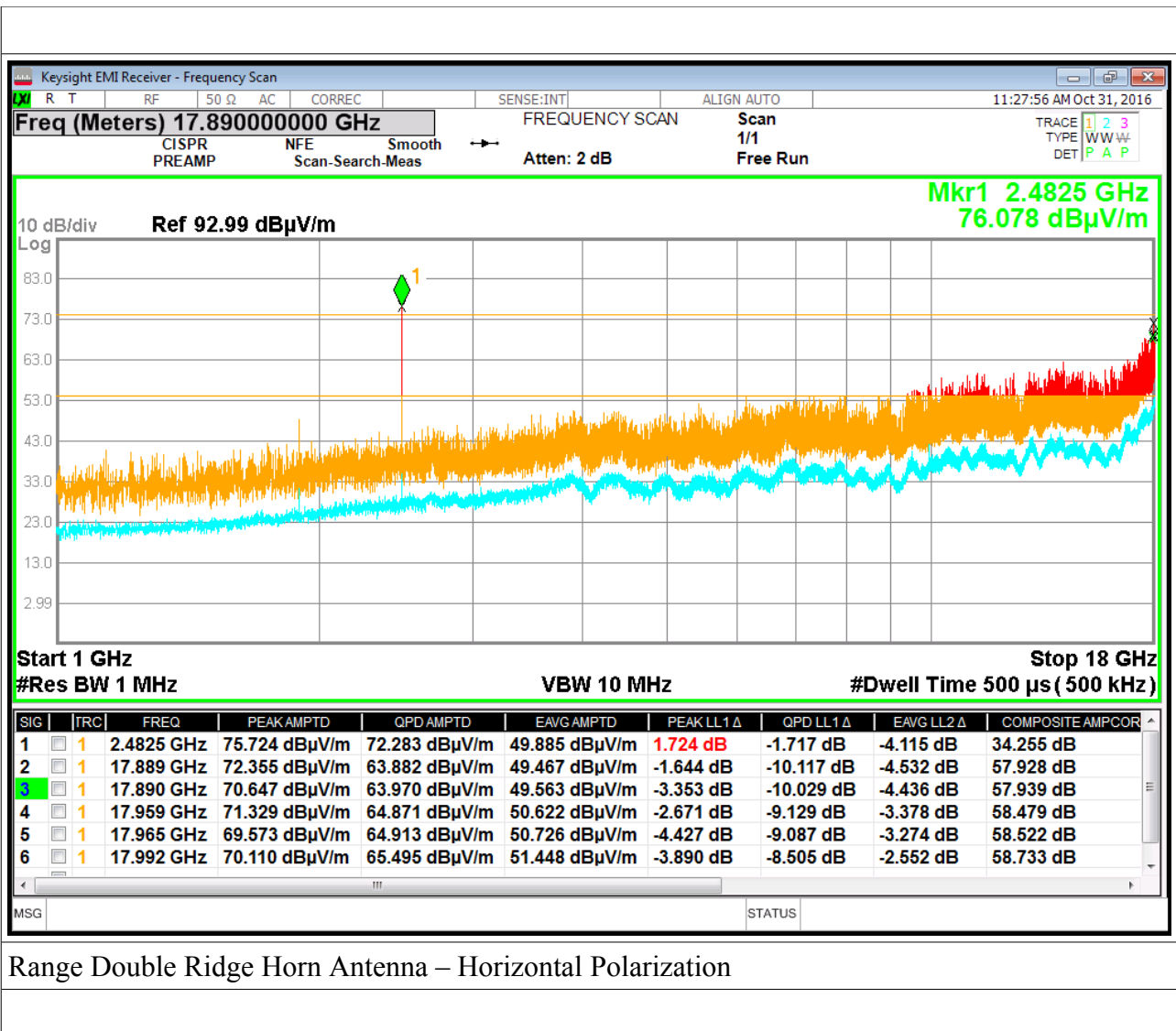
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Range Biconical Antenna – Horizontal Polarization



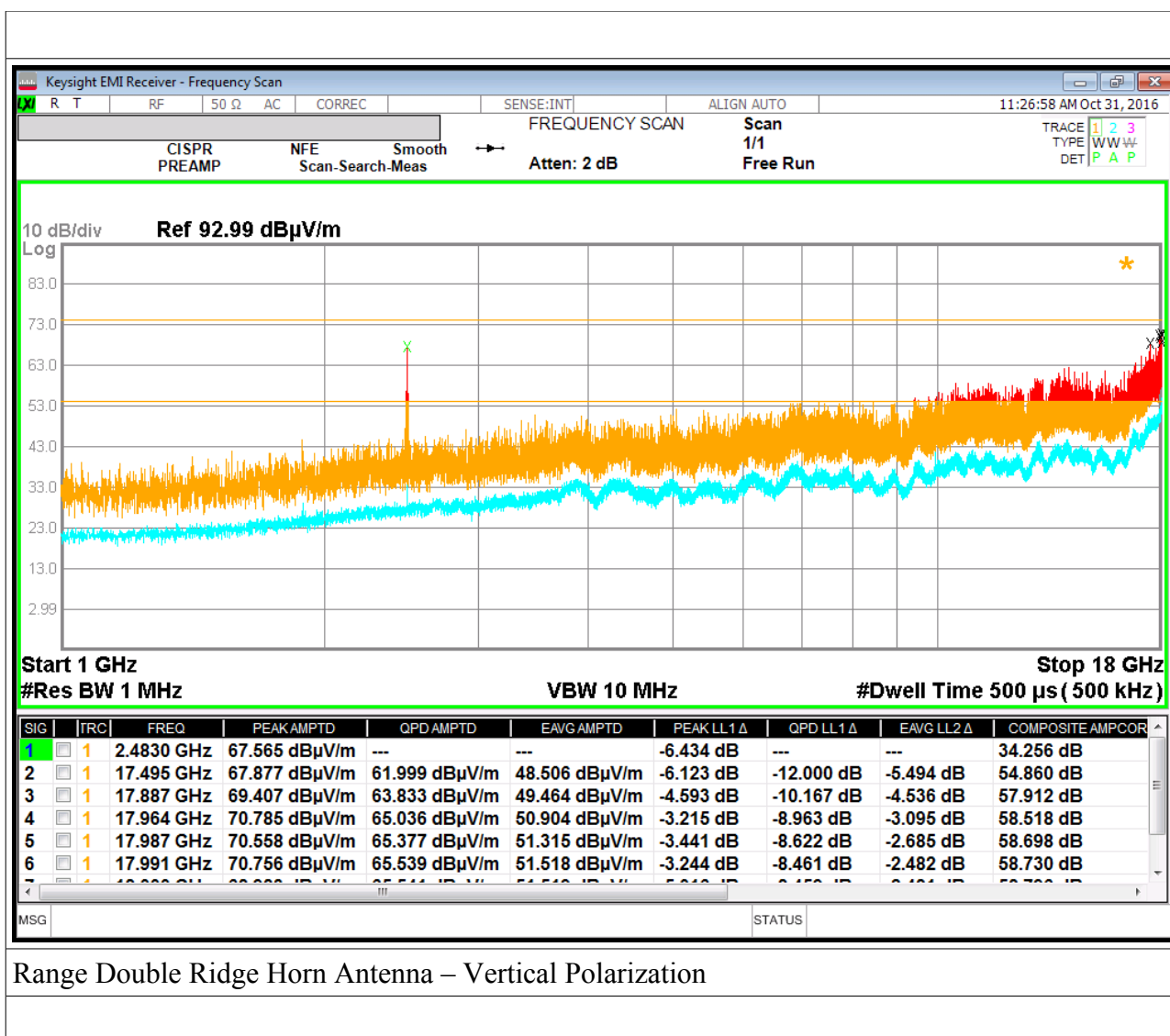
Range Biconical Antenna – Vertical Polarization



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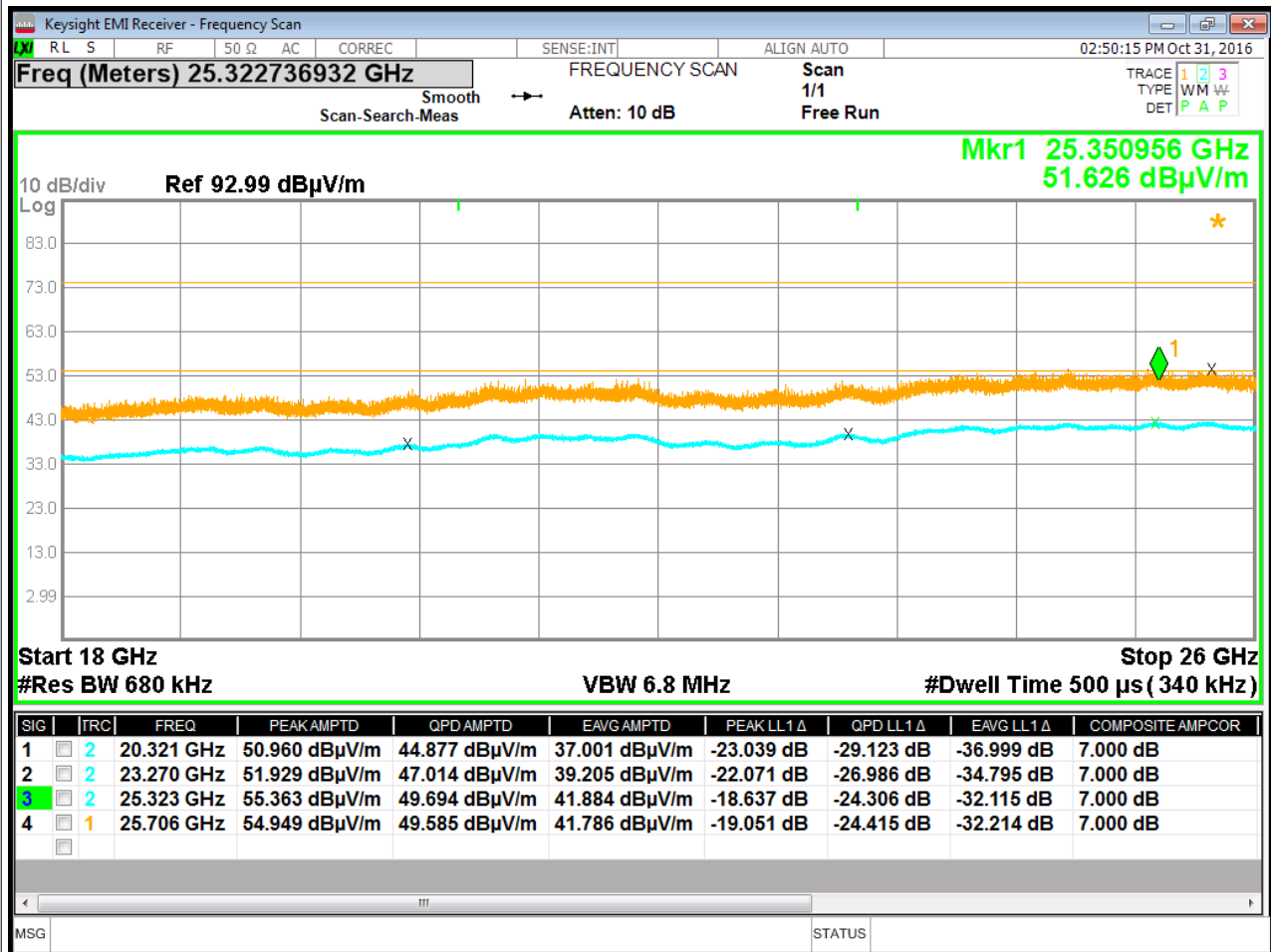
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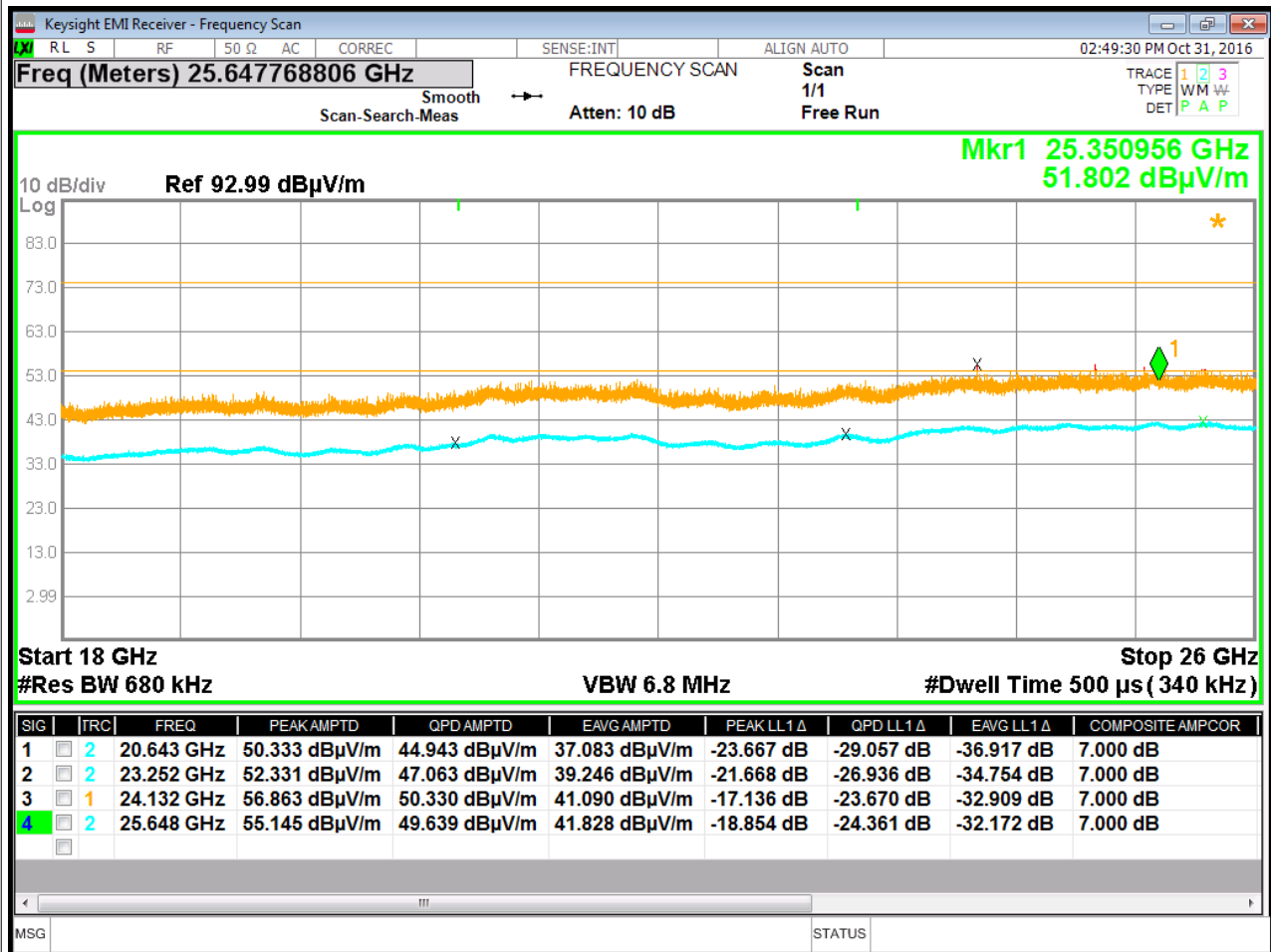
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Range Horn Antenna – Horizontal Polarization

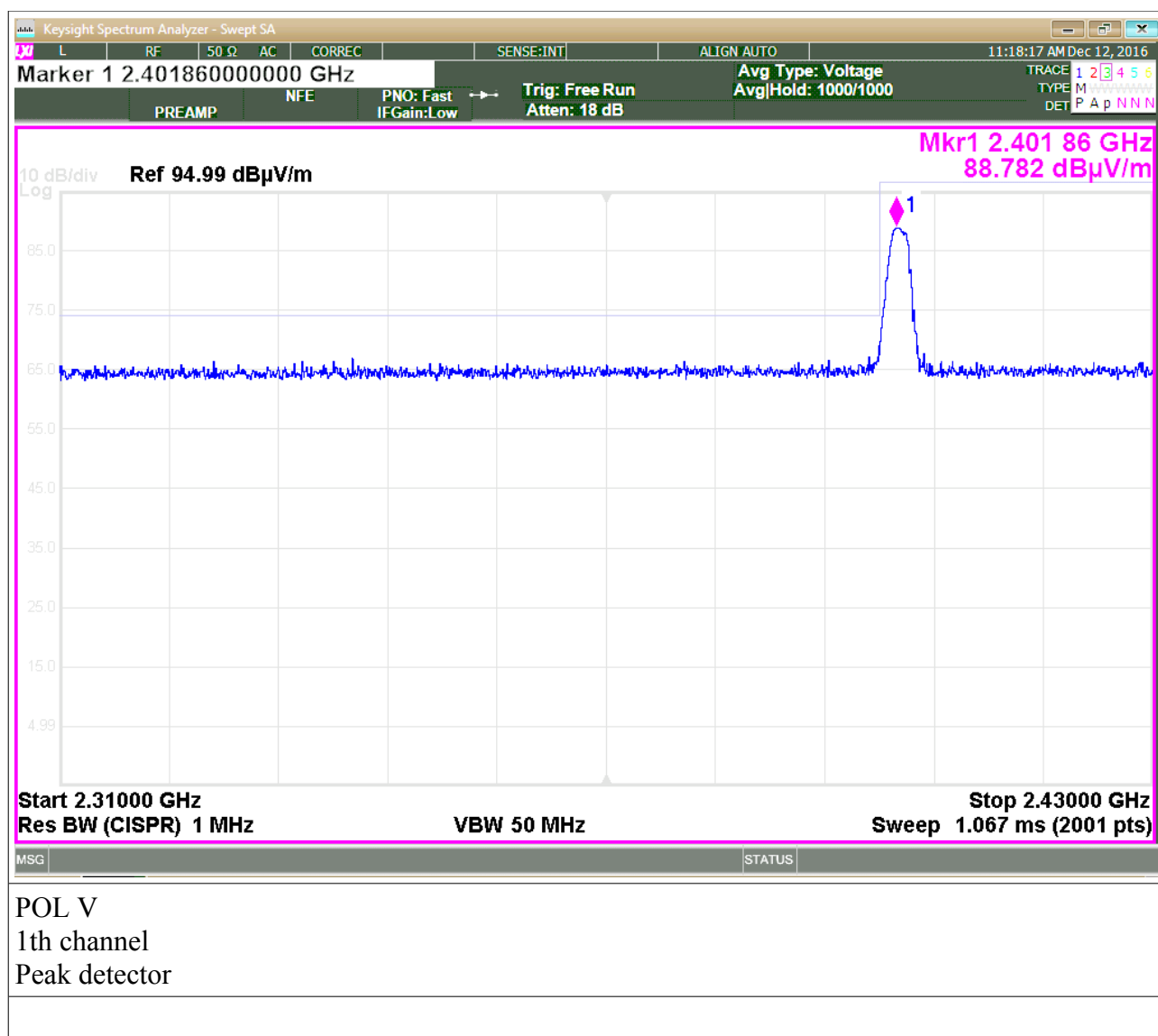


Range Horn Antenna – Vertical Polarization

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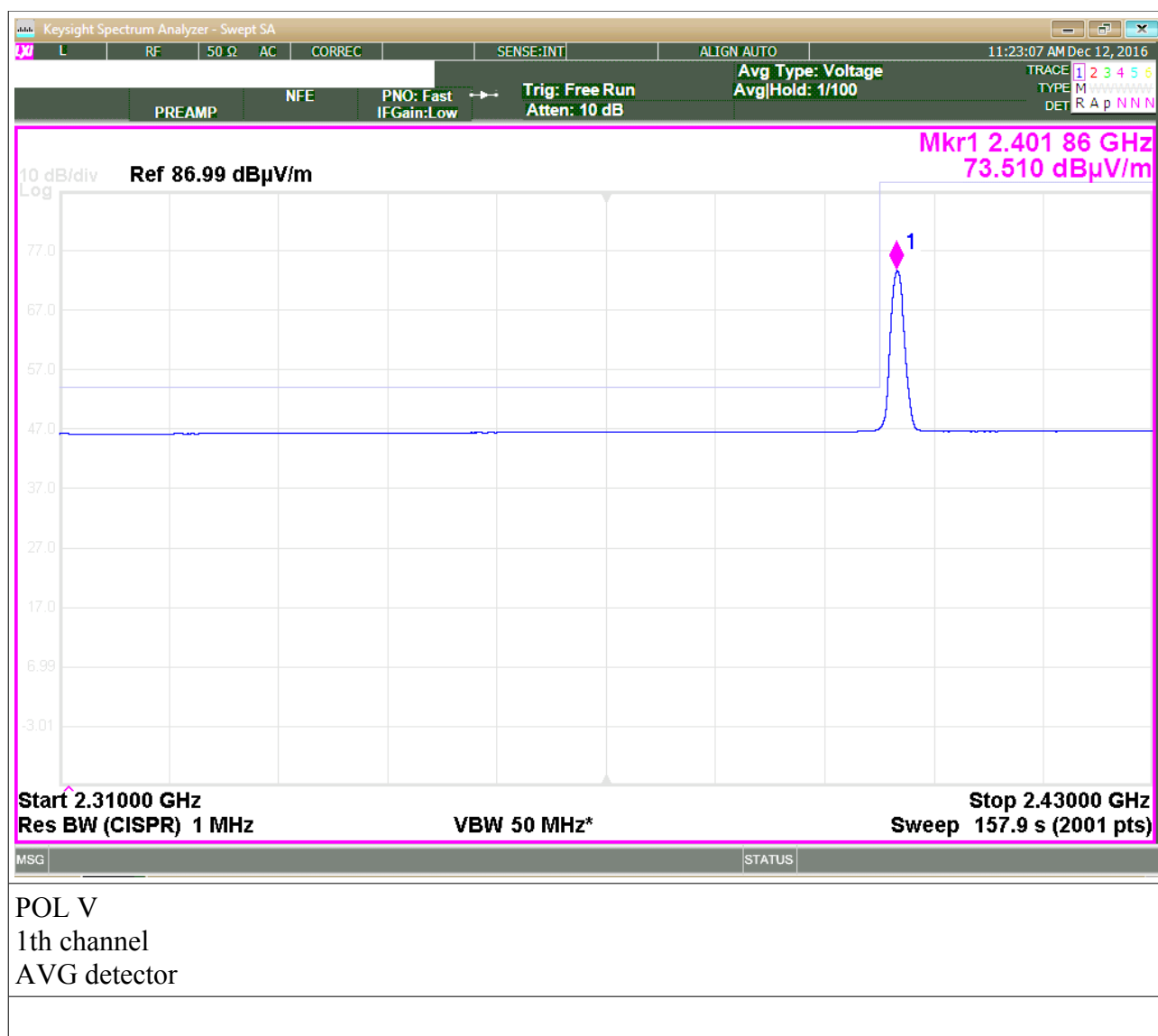
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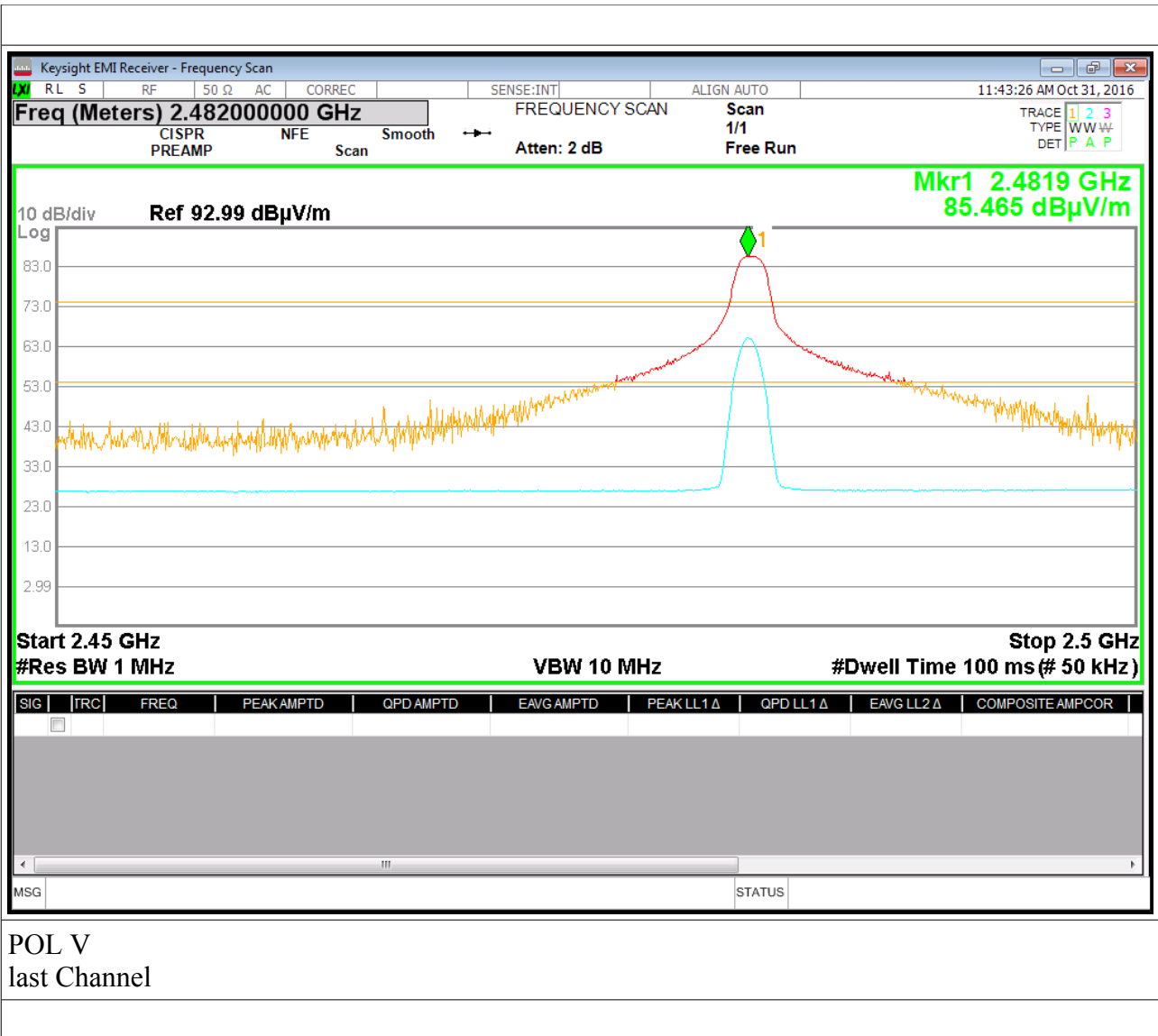


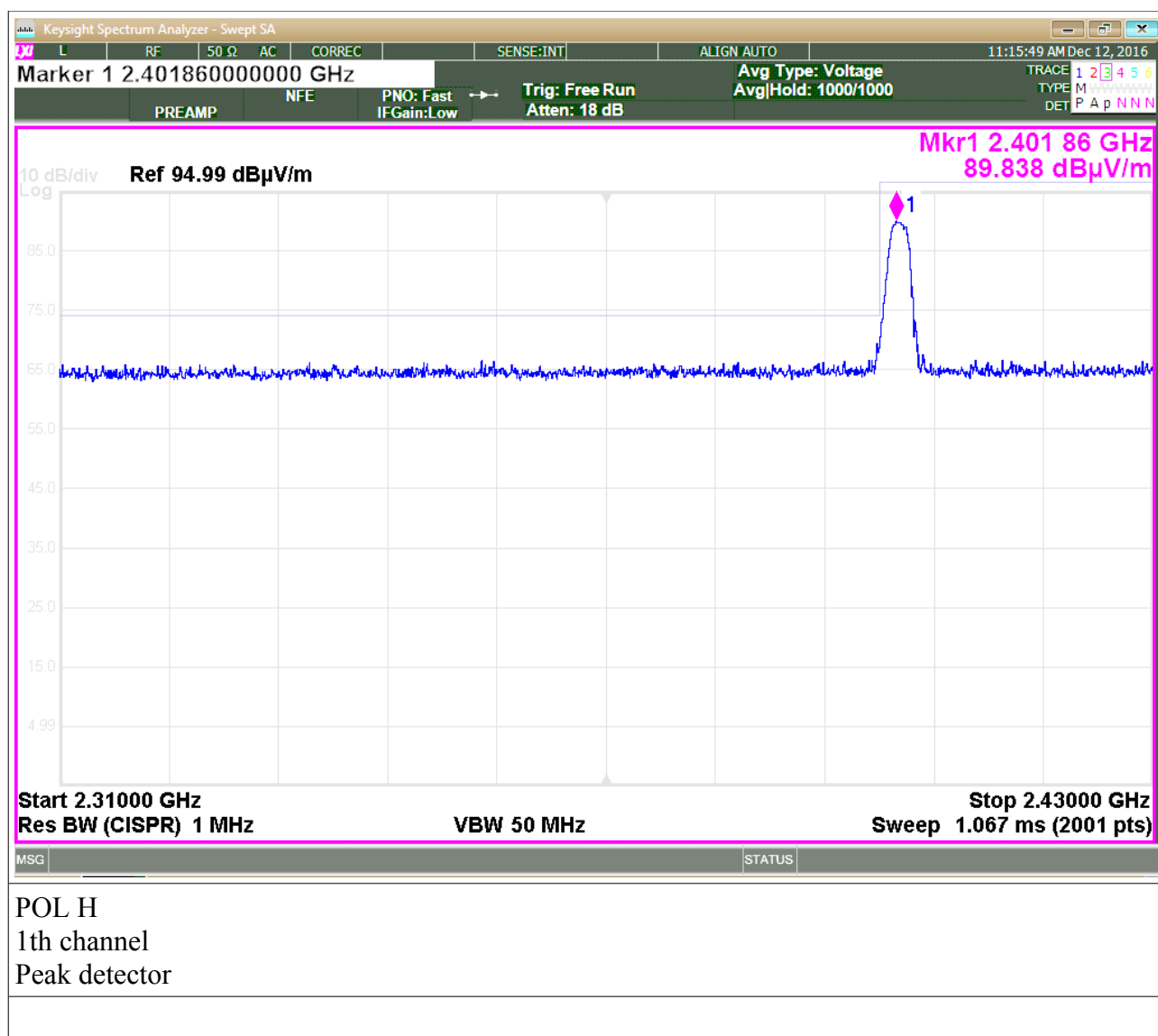
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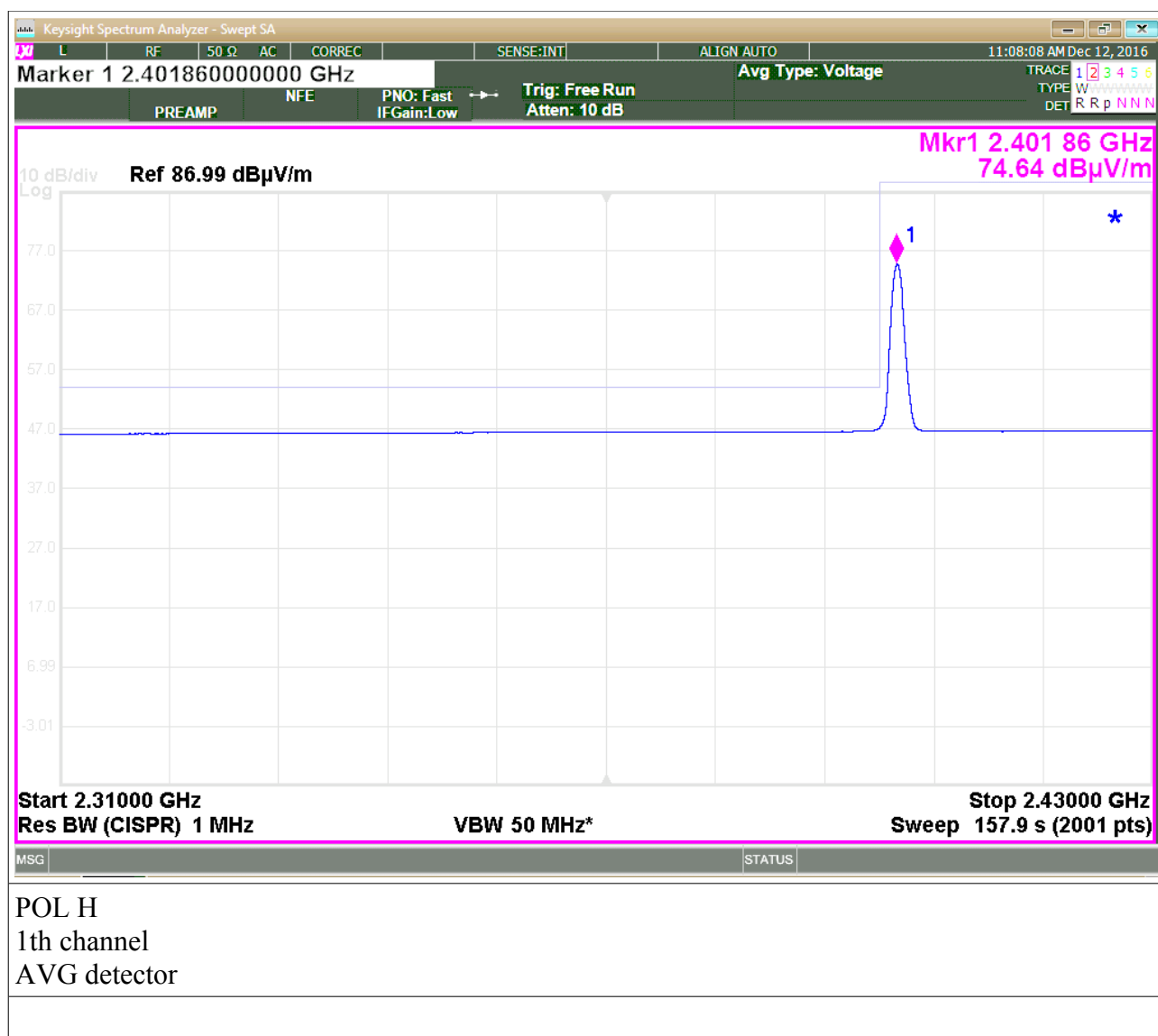




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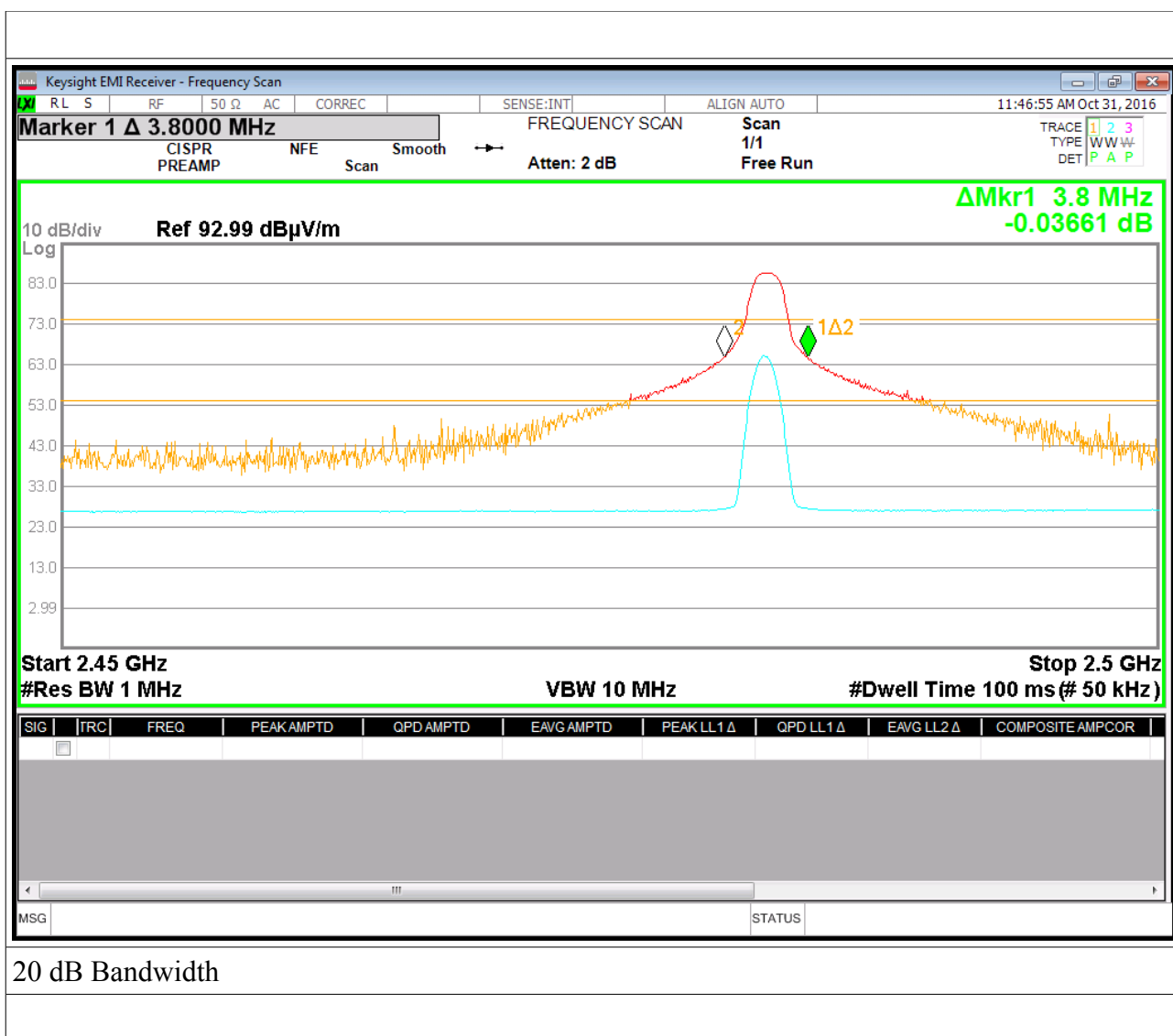
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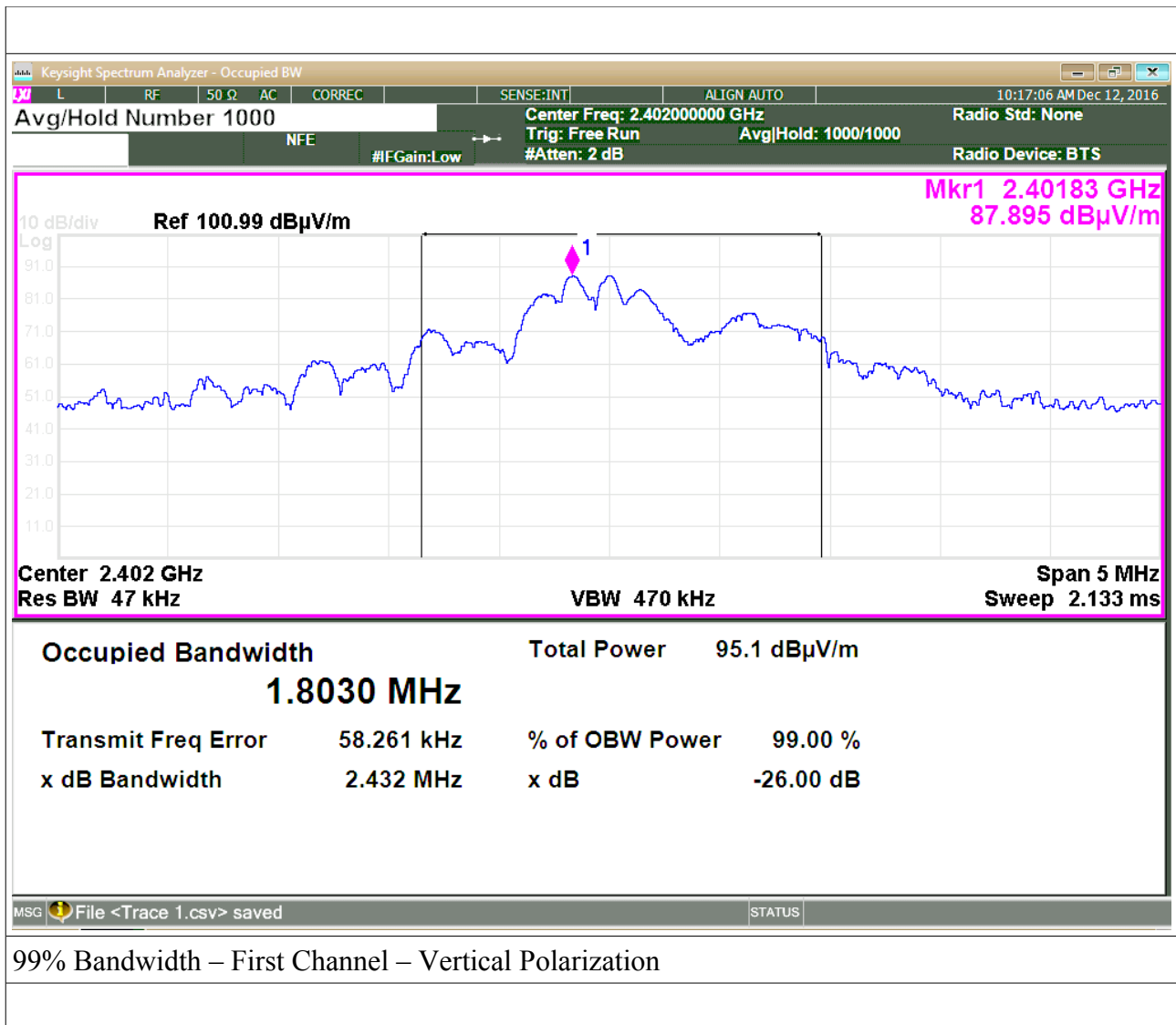
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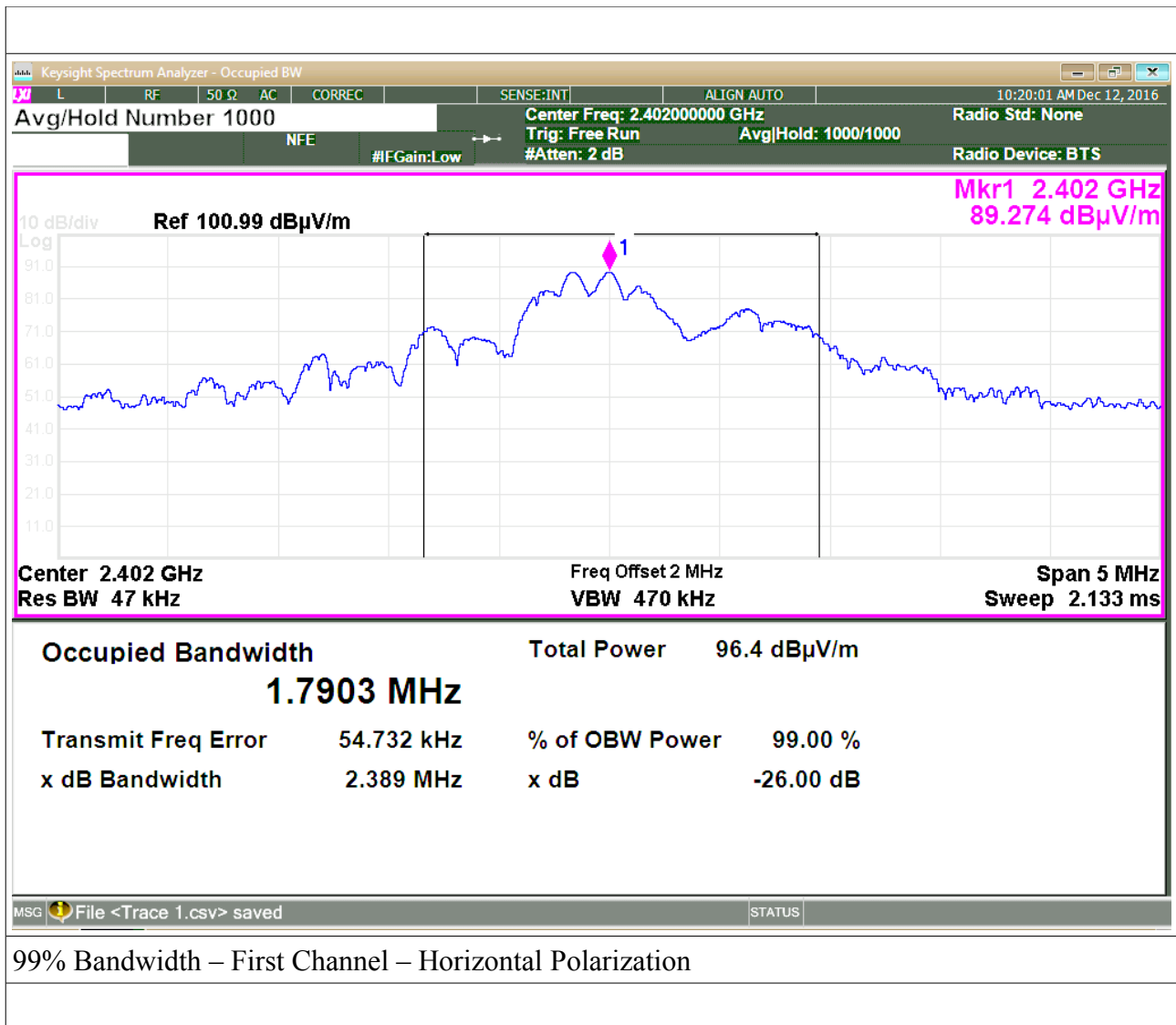


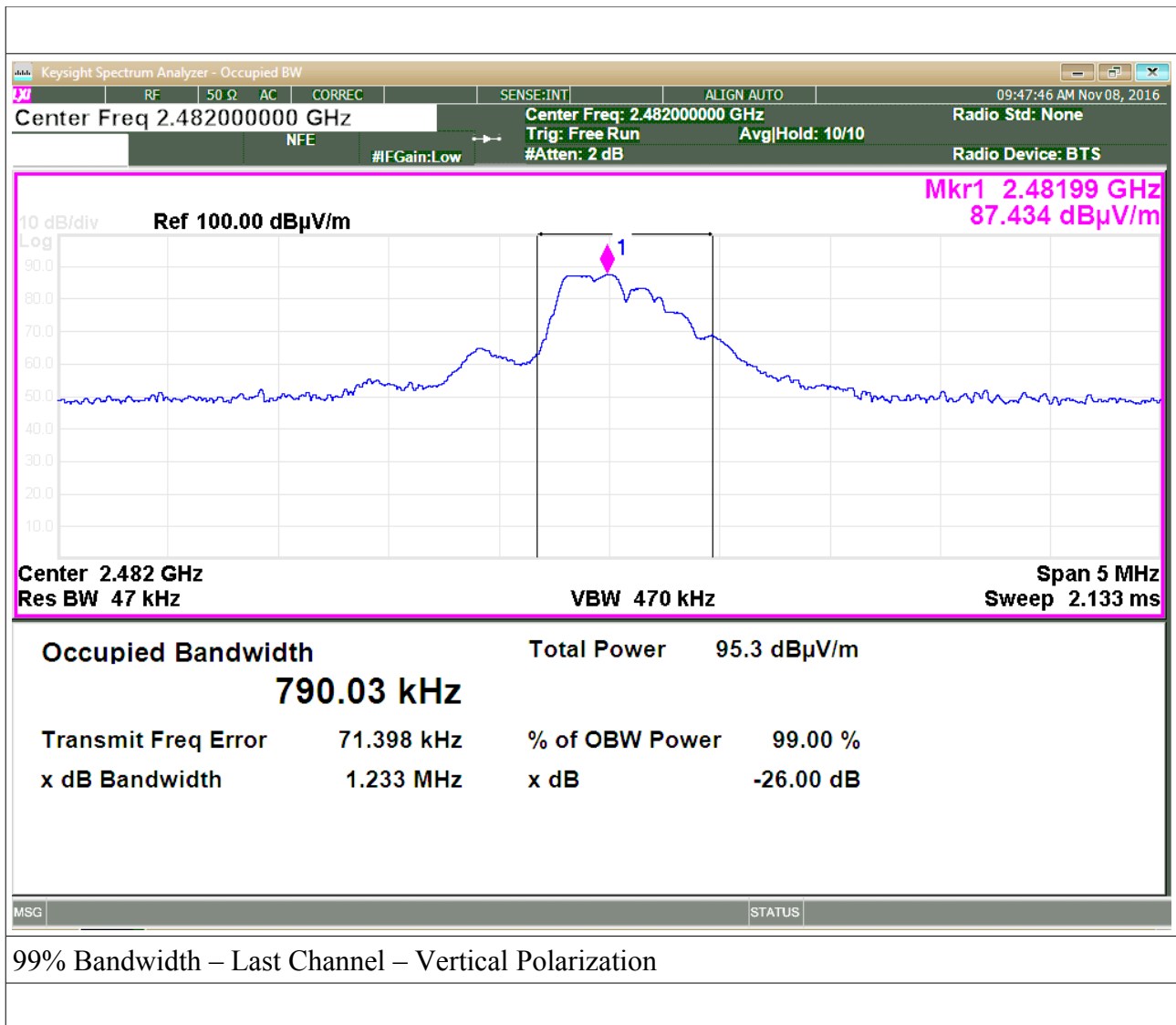
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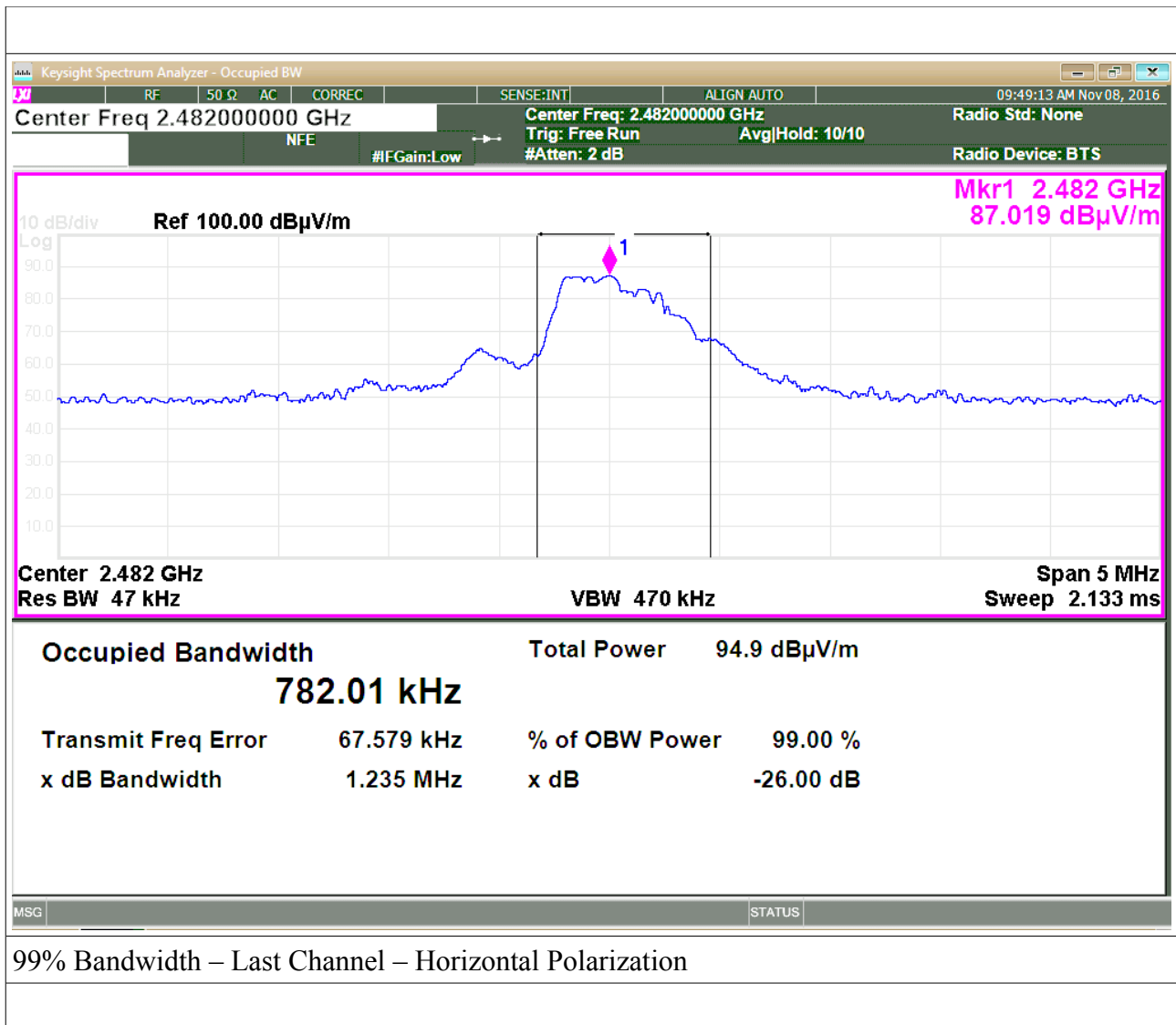




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5. PHOTO



Fig. 5.1

*Radiate Emissions Test Set-up
9 kHz – 30 MHz frequency range*

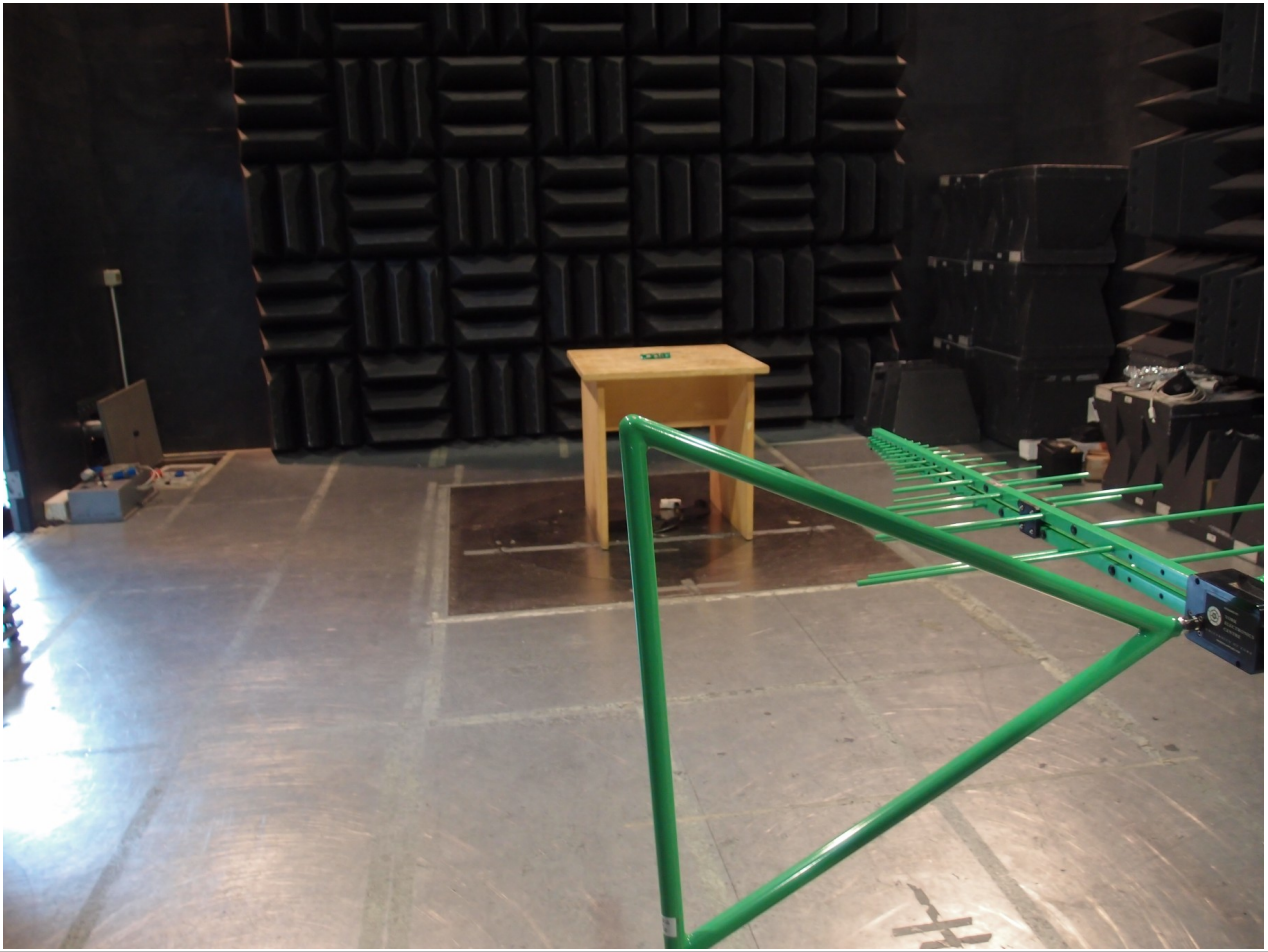


Fig. 5.2

*Radiated Emissions Test Set-up
Range: 30 – 1000 MHz*

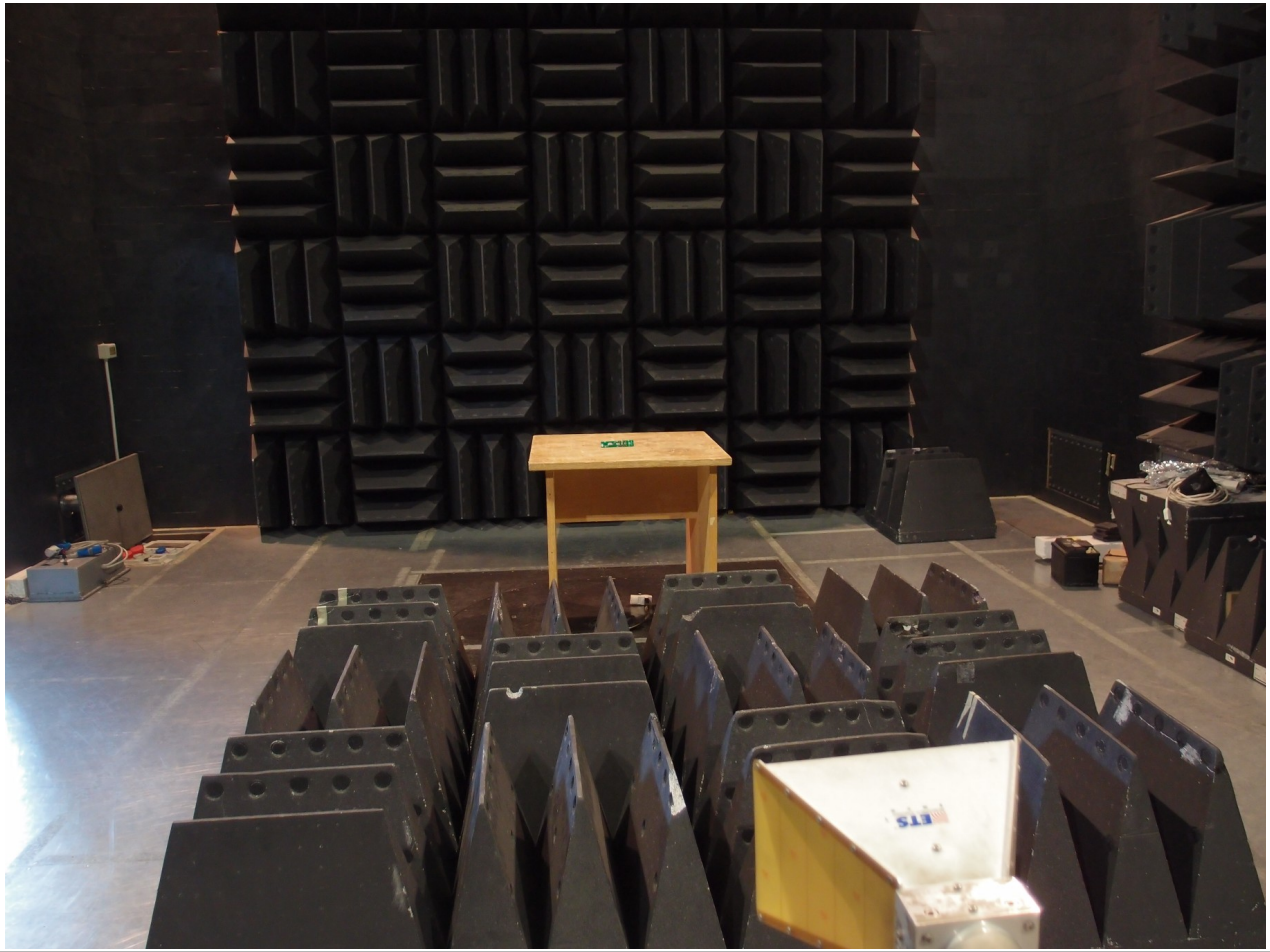


Fig. 5.3

*Radiated Emissions Test Set-up
Range: 1 – 18 GHz*



Fig. 5.4

*Radiated Emissions Test Set-up
Range: 18 – 26 GHz*

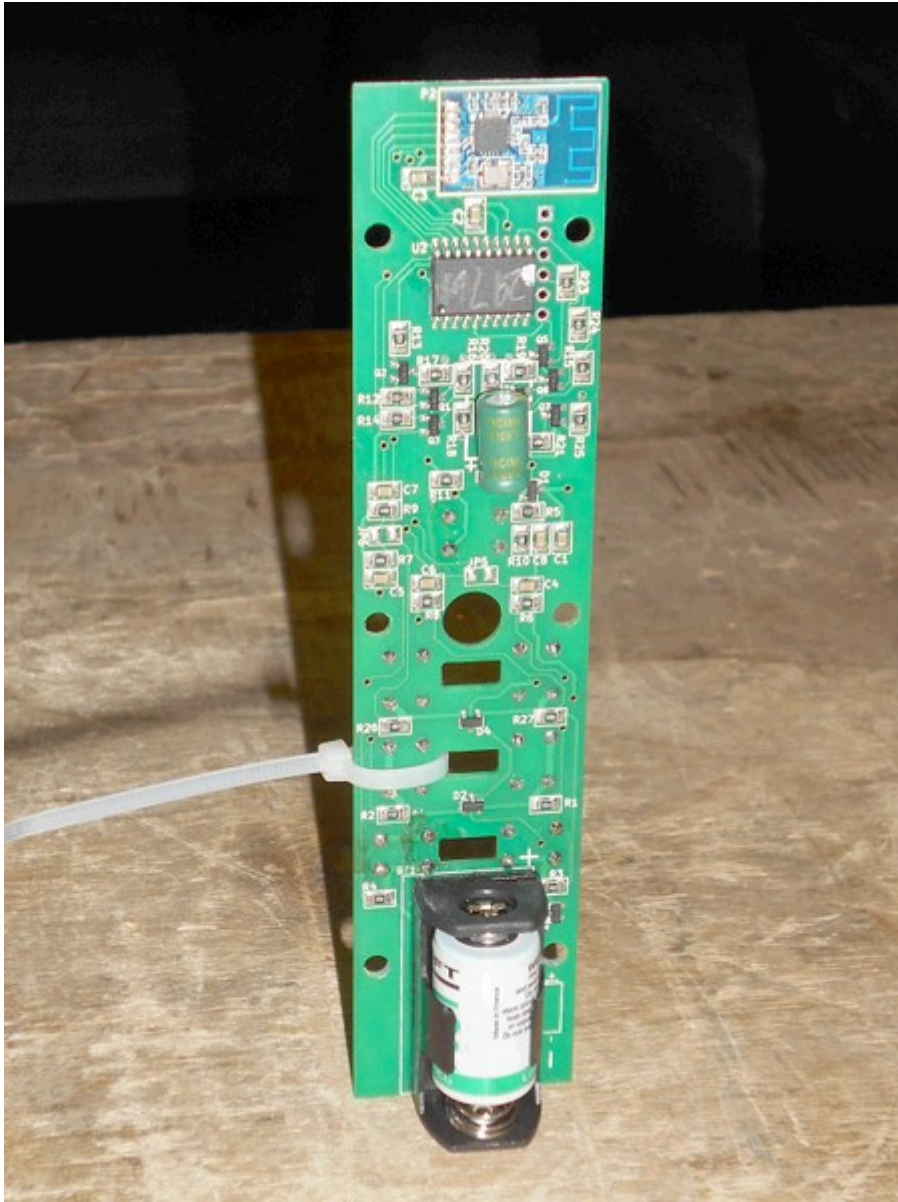


Fig. 5.5

Radiated Emissions Test Set-up
EUT component side

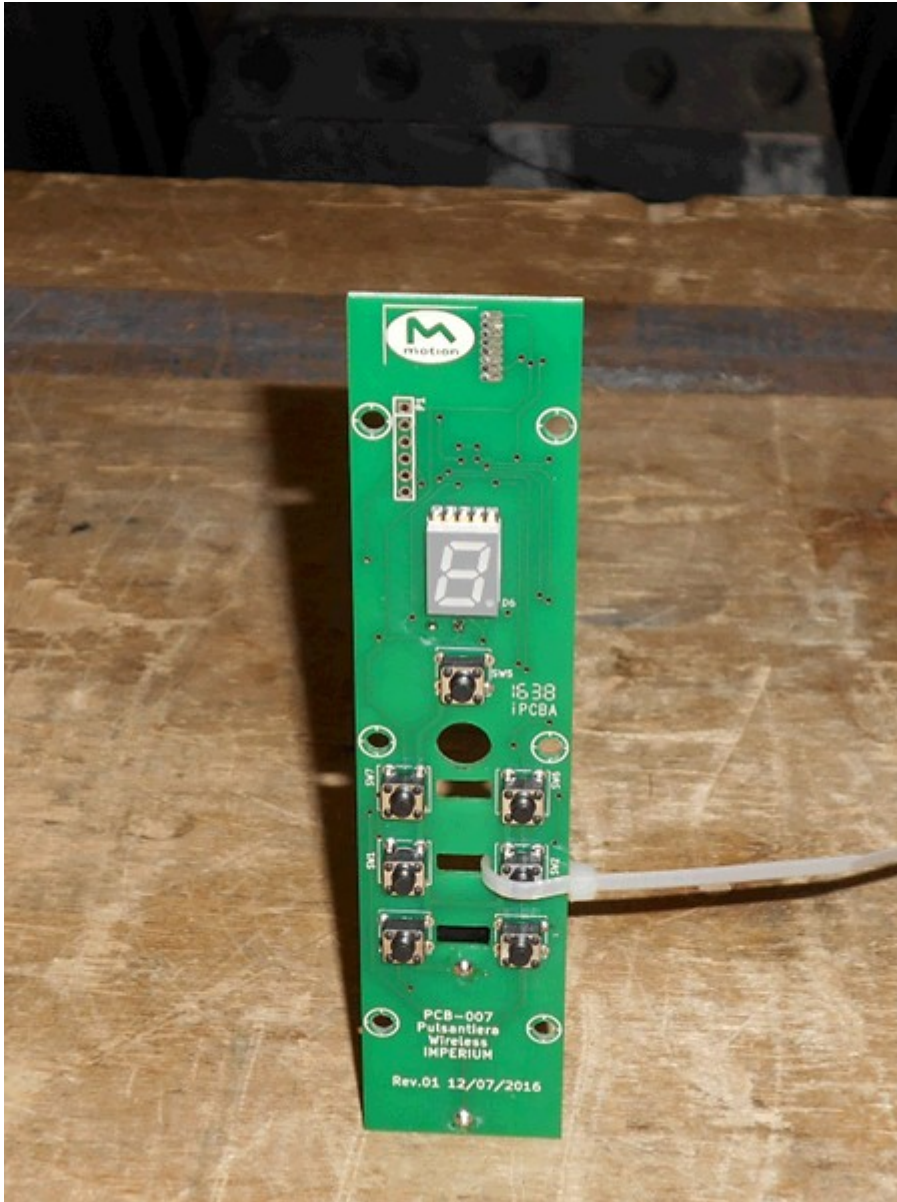


Fig. 5.6

*Radiated Emissions Test Set-up
EUT display side*