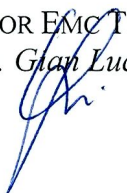


		CE MARKING <i>ELECTROMAGNETIC COMPATIBILITY ELECTRICAL SAFETY LASER SPECTROSCOPY ENVIRONMENTAL PHYSICS</i>	G.S.D. S.r.l. Certified in accordance with UNI EN ISO 9001:2008 by TÜV Rheinland Italia S.r.l. Certificate N. 39 00 1850509
G.S.D. S.r.l. PISA - Italy	Test Report n. 17170-FCC		Rev. 01
Manufacturer	Power-One Italy S.p.A.		
Address	Via San Giorgio, 642 52028 Terranuova Bracciolini (AR) Italy		
Test Item Name	V2P53		
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: July 05, 2017		
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>
2017 May 04	97	Rev. 00 First issue
2017 July 05	97	Rev. 01 Second issue

1. MANUFACTURER AND EUT IDENTIFICATION¹	
Manufacturer	Power-One Italy S.p.A..
Address	Via San Giorgio, 642 52028 Terranuova Bracciolini (AR) Italy
Test Item Name	V2P53
Date of reception	2015 November 12
Sampling	Laboratory sample for certification
Test Item Description	WiFi Device
Nominal Input Voltage	12Vdc
Frequency Range	2400-2483.5 MHz
Std 802.11	IEEE Std 802.11b, 802.11g and 802.11n
Modulation Technology	
Transfer Rate	802.11b: 11 / 5.5 / 2 / 1 Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n: 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5 Mbps
Antenna Connector /Types :	RSMA connector
Antenna Manufacturer	RF Antenna Technology Corp.
Antenna Model	EA-79F
Antenna Gain	2.95-3.32 dBi
FCC ID	X6W-V2P53

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>
Operation within the band 2400-2483,5 MHz: Test Procedures 15.247 (a)(2), (b)(3), (d), (e)	FCC Rules and Regulations, Title 47 Part 15 – Sub part C ANSI C63.4 – 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: 2014 KDB 558074 D01 DTS Meas Guidance v03r04 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 ANSI C63.10 - American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices: 2013
Maximum Permissible Exposure	OET Bulletin 65 Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields FCC Rules and Regulations, Title 47 Part 15

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3. RESULT, CONDITION, MEASUREMENT UNCERTAINTY, ANTENNA REQUIREMENTSSummary of Test Results

<i>TEST</i>	<i>RESULT</i>
6 dB bandwidth Section 15.247 (a) (2)	Pass
Peak Conducted Output Power: Section 15.247 (b) (3)	Pass
Band Edge Section 15.247 (d)	Pass
Power Spectral Density Section 15.247 (e)	Pass
Power Line Conducted Emissions Section 15.207	Pass
Radiated Emissions Section 15.209	Pass

Internal Procedures:

APR01: internal procedure for antenna port measurement Revision 01

CE22R01: internal procedure for power lead port measurement Revision 01

RE22R02: internal procedure for radiated emissions measurement Revision 02

Measurement uncertainty

<i>TEST</i>	<i>EXPANDED UNCERTAINTY</i>
Conducted Emission – 50Ω/50μH AMN (150 kHz - 30 MHz)	± 3.5 dB
Radiated Emission – (Semianechoic Room) (30 MHz - 40 GHz)	± 4.7 dB

Climatic Conditions

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

Power during the tests: 12 Vdc

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<u>Antenna Requirements:</u>
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.
<u>Results:</u>
The antennas used for this product are antenna with RPSMA, the maximum peak gain of the transmit antenna is only -1.87dBi.
<u>Extensions</u>
The results refer only to the sampled EUT and under the specified conditions.

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4. 6 dB BANDWIDTH

Peak Output Power

Equipment shall meet the limits below.

<i>FREQUENCY RANGE</i> (MHz)	Limit
2400 – 2483.5	The minimum 6 dB Bandwidth shall be at least 500 kHz

Results: 6dB Bandwidth > 500 kHz

802.11b Mode, 11 Mbs

<i>Channel</i>	<i>Frequency</i> (MHz)	<i>6 dB Bandwidth</i> (MHz)	<i>Minimum Limit</i> (MHz)	<i>Margin</i> (MHz)
Low	2412	7.74	0.5	7.24
Mid	2437	8.37	0.5	7.87
High	2462	7.67	0.5	7.17

802.11g Mode, 54 Mbs

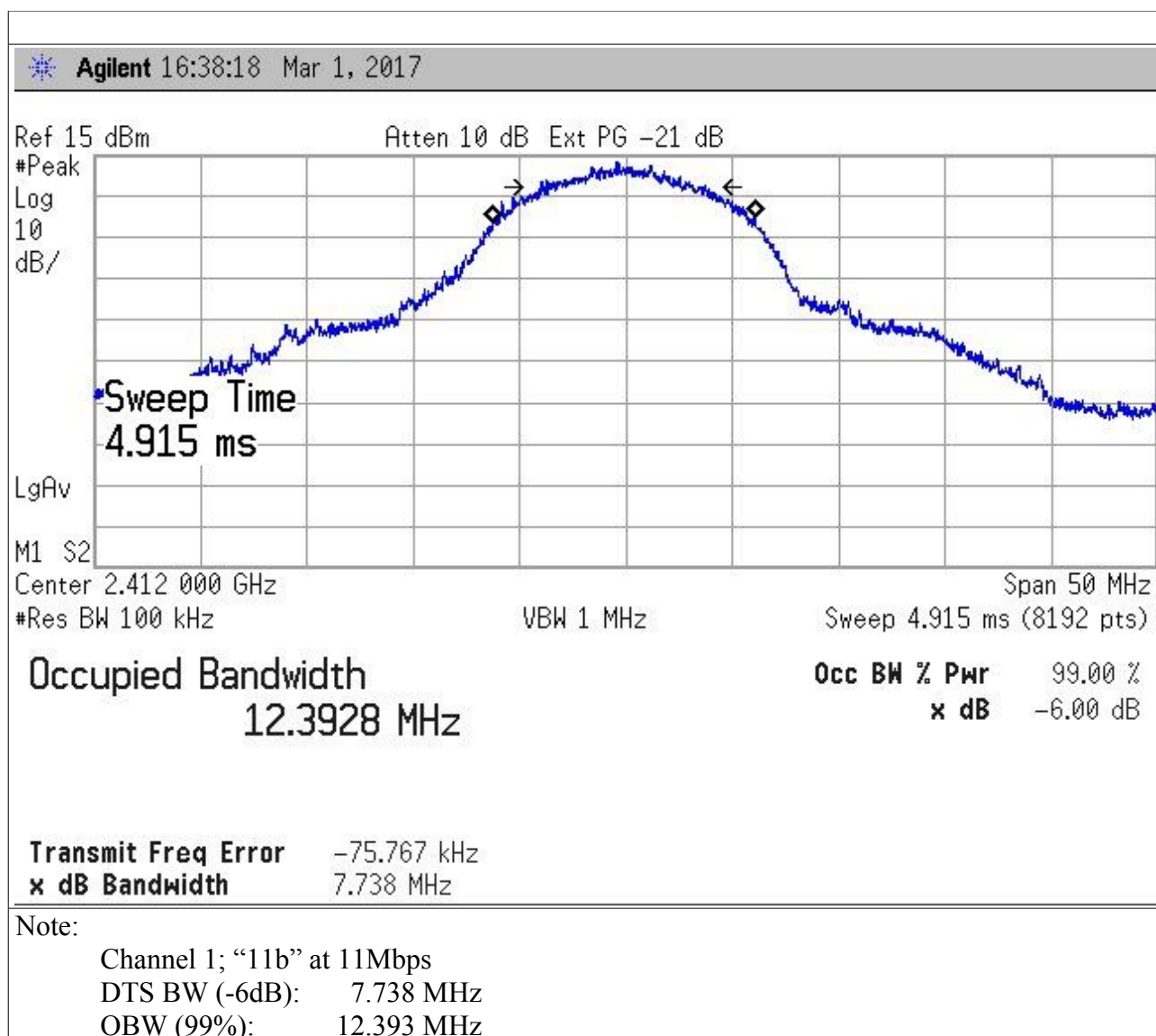
<i>Channel</i>	<i>Frequency</i> (MHz)	<i>6 dB Bandwidth</i> (MHz)	<i>Minimum Limit</i> (MHz)	<i>Margin</i> (MHz)
Low	2412	15.41	0.5	14.91
Mid	2437	15.33	0.5	14.83
High	2462	15.13	0.5	14.63

802.11n Mode, mcs7 (65 Mbs)

<i>Channel</i>	<i>Frequency</i> (MHz)	<i>6 dB Bandwidth</i> (MHz)	<i>Minimum Limit</i> (MHz)	<i>Margin</i> (MHz)
Low	2412	16.37	0.5	15.87
Mid	2437	16.25	0.5	15.75
High	2462	16.08	0.5	15.58

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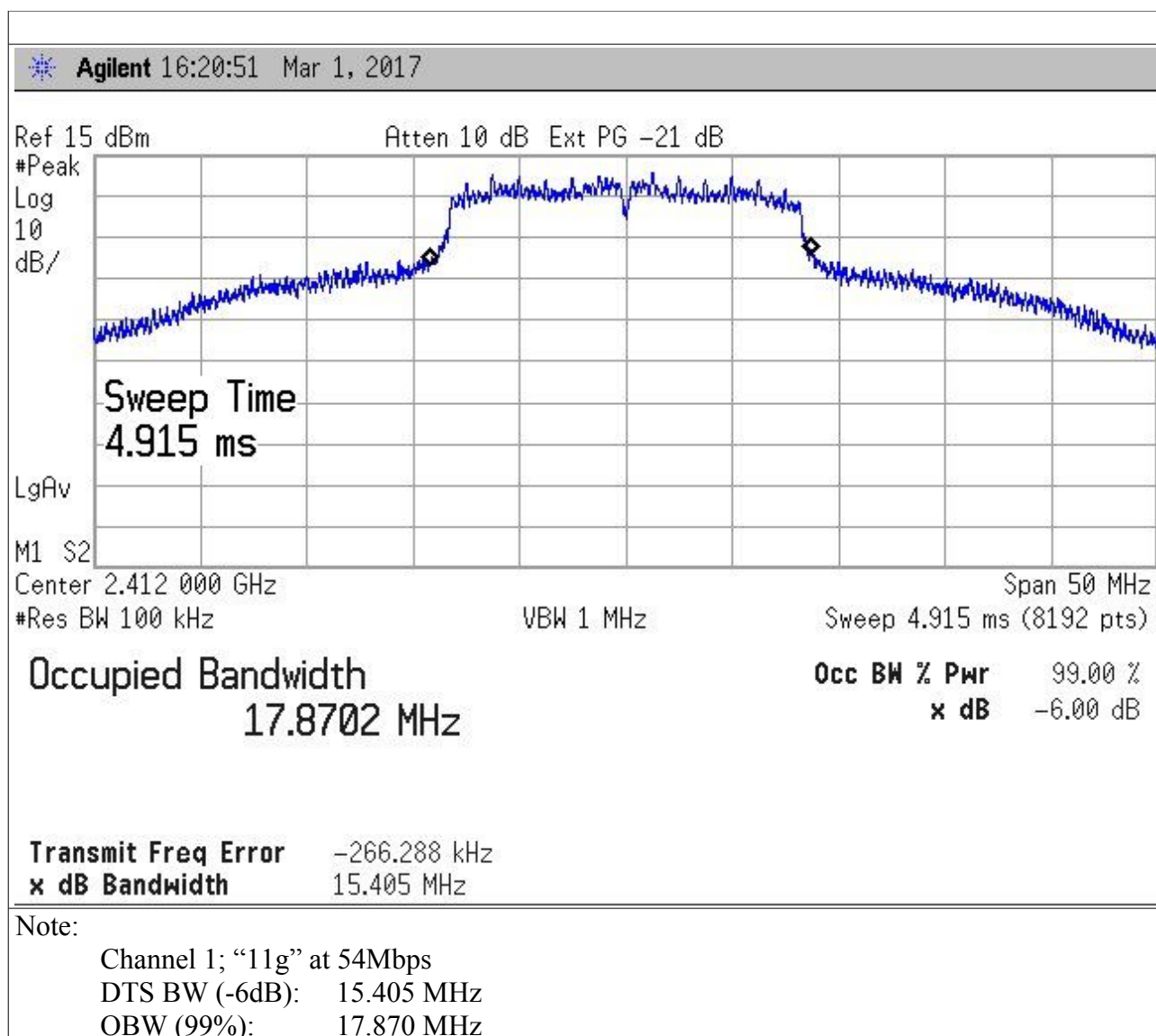
<u>Test Equipment</u>			
EQUIPMENT	MANUFACTURER	MODEL	CAL. DATE
EMI Receiver	Agilent	E4440A	01/2018
<u>Test procedure:</u> APR01			
Test performed on low, middle and high channels and in the b,g,n protocols at maximum and minimum data rate for each protocol.			
In the following graphs results are shown:			



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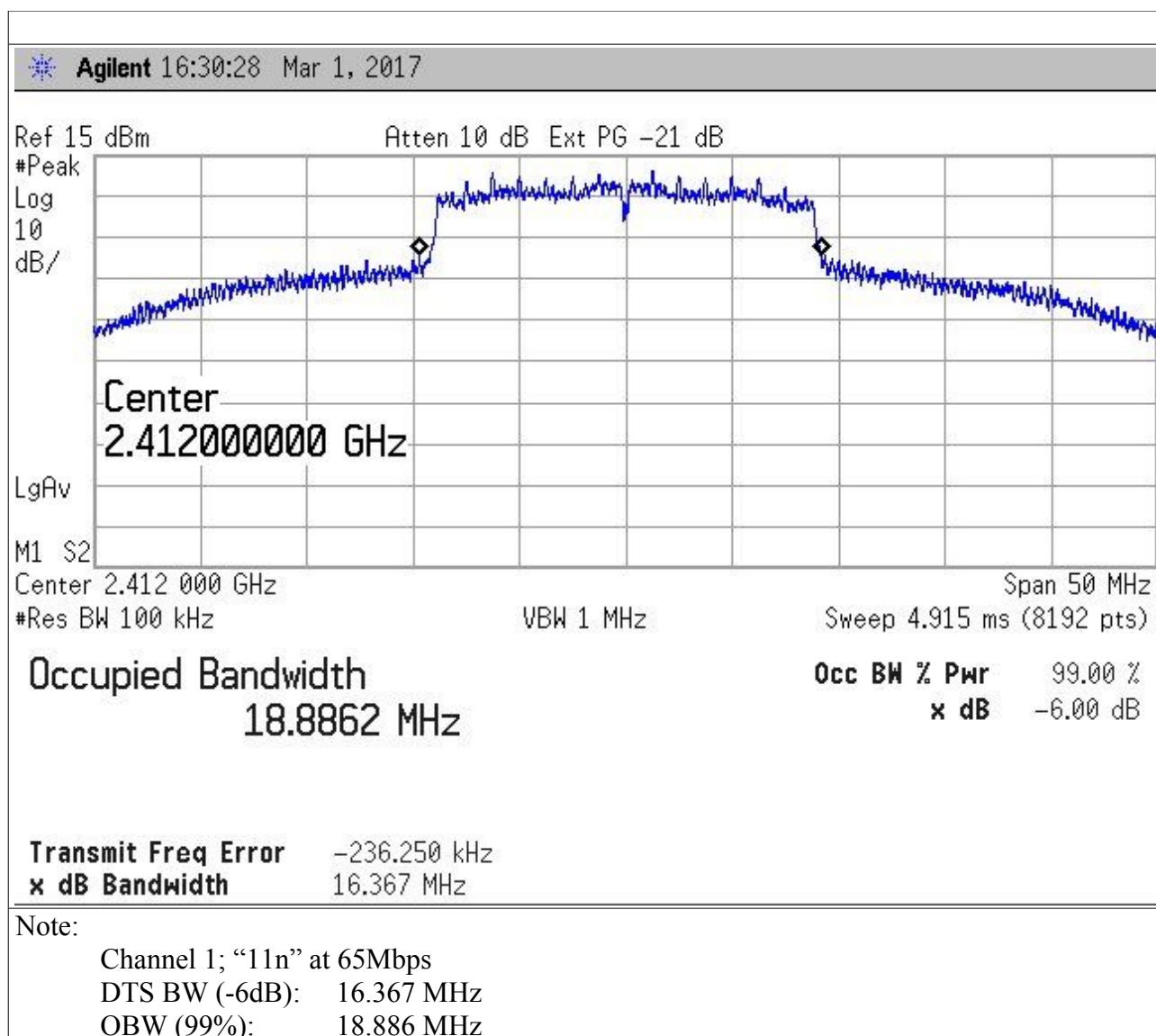
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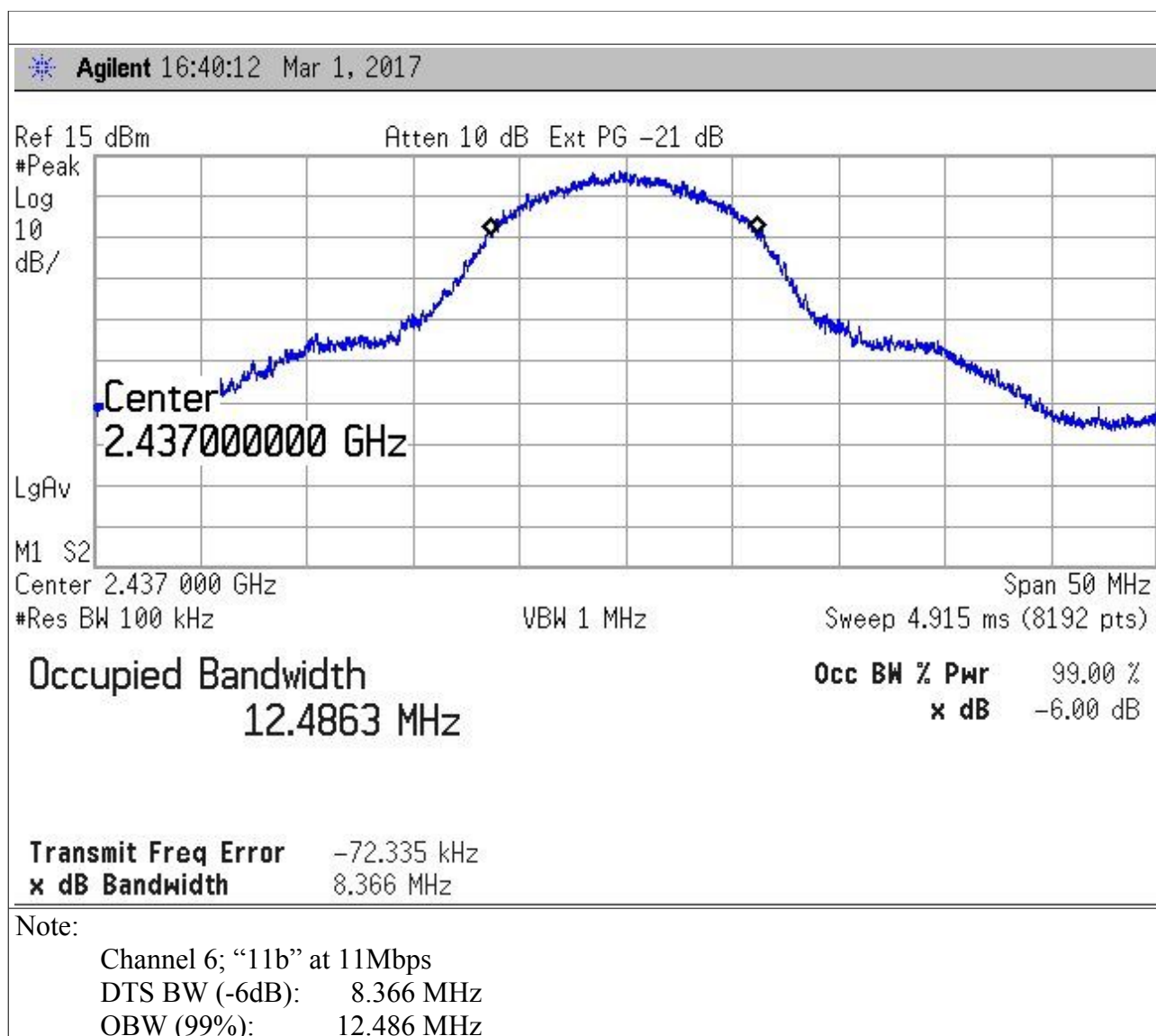
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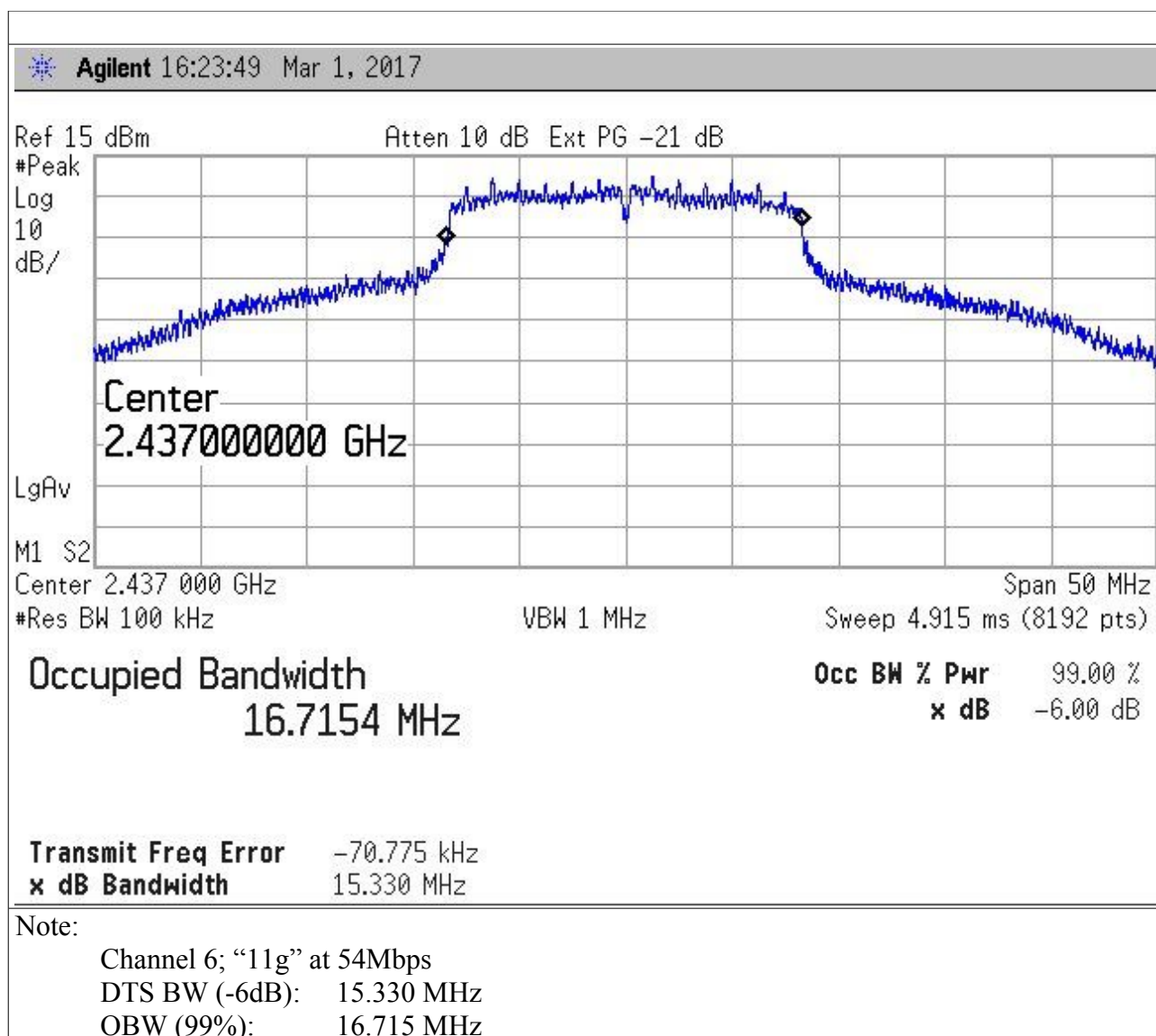
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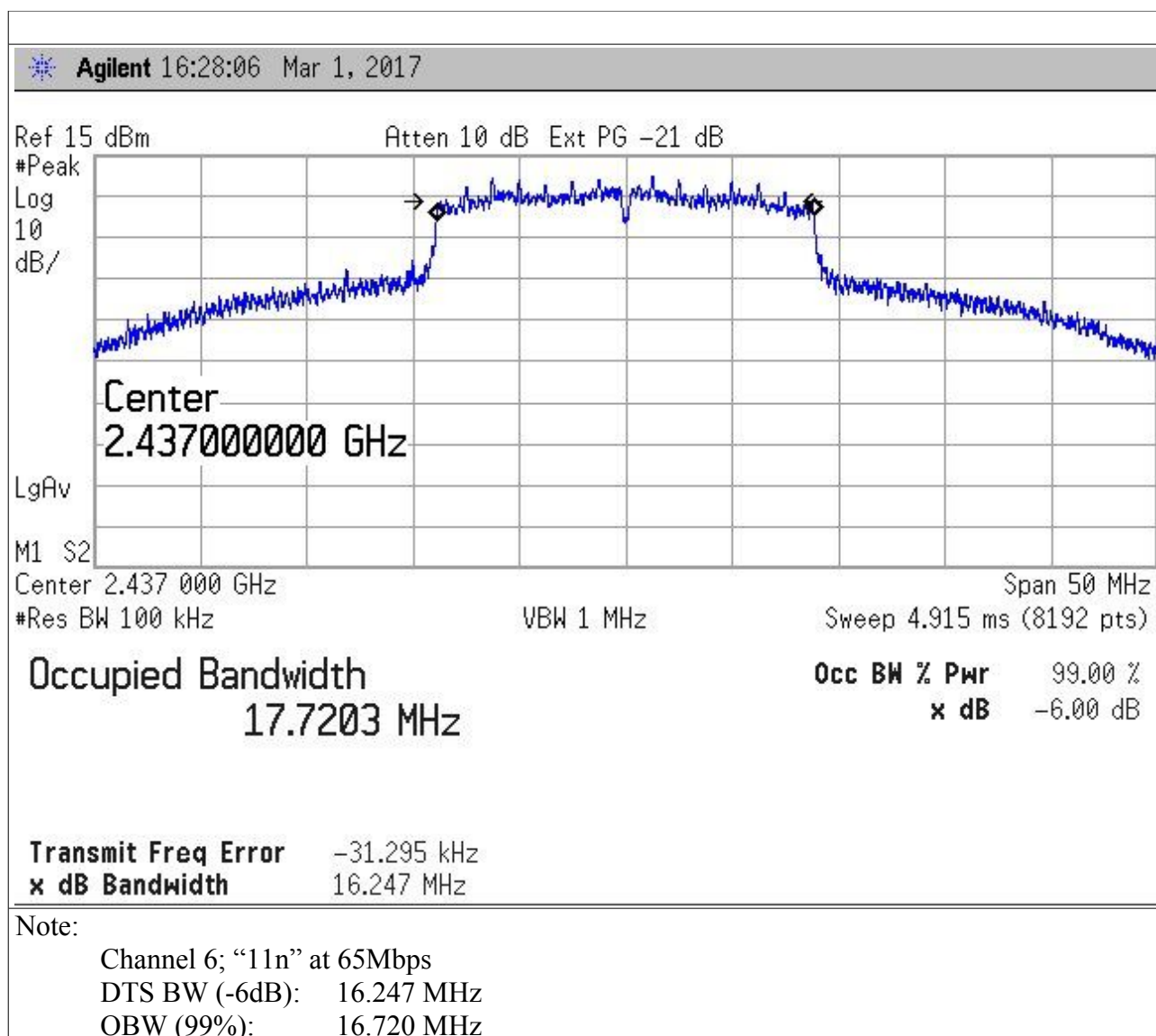
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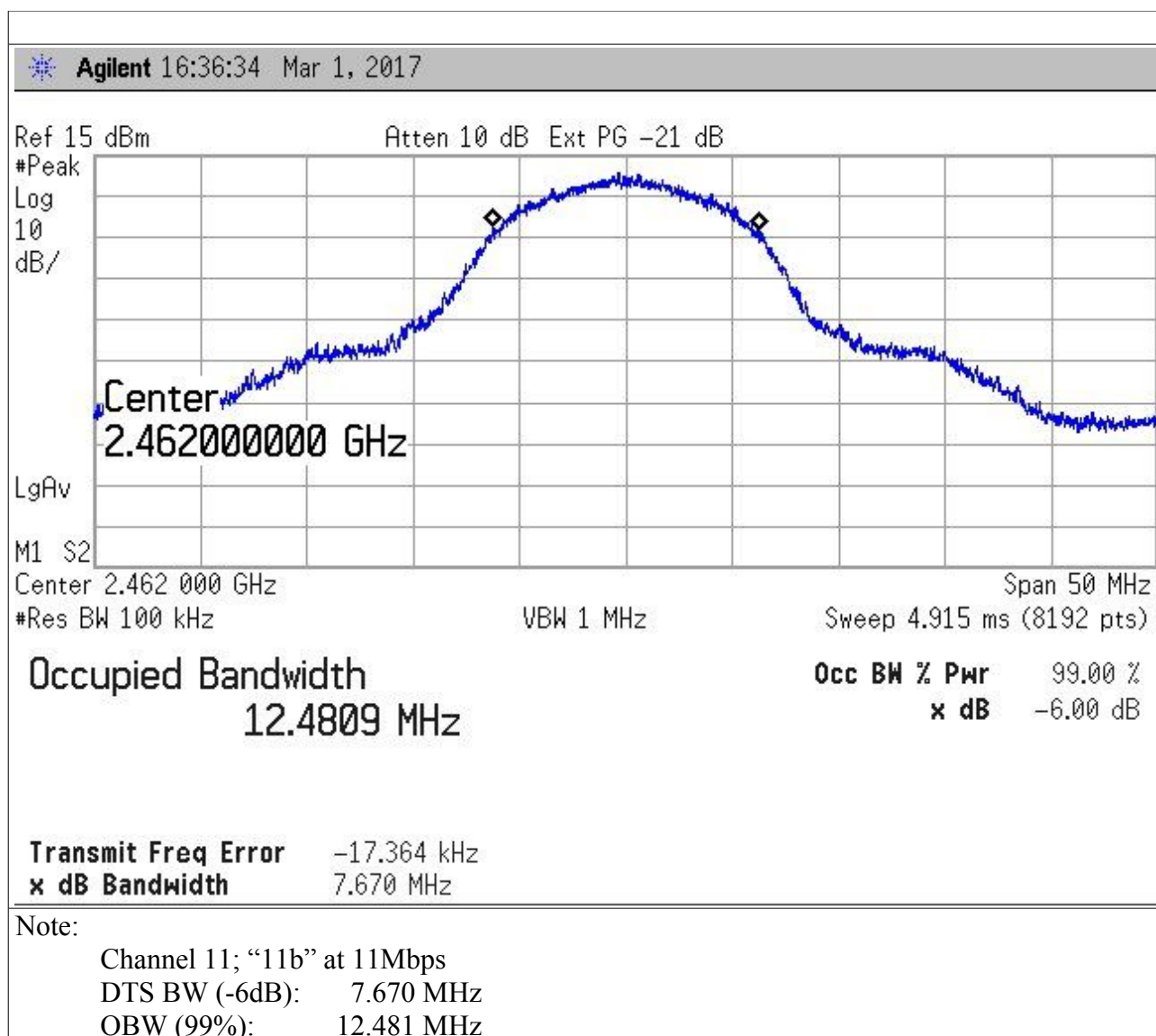
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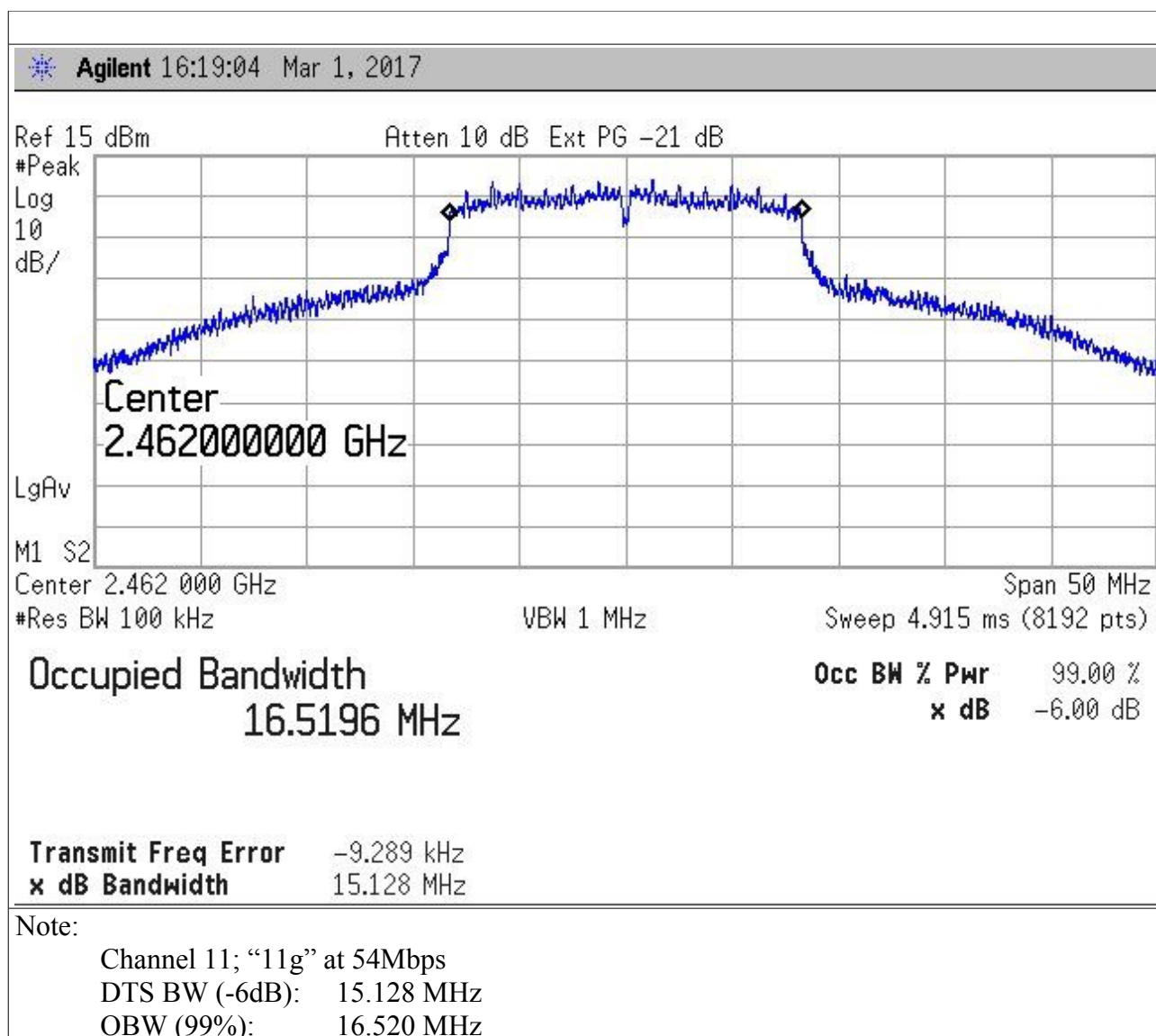
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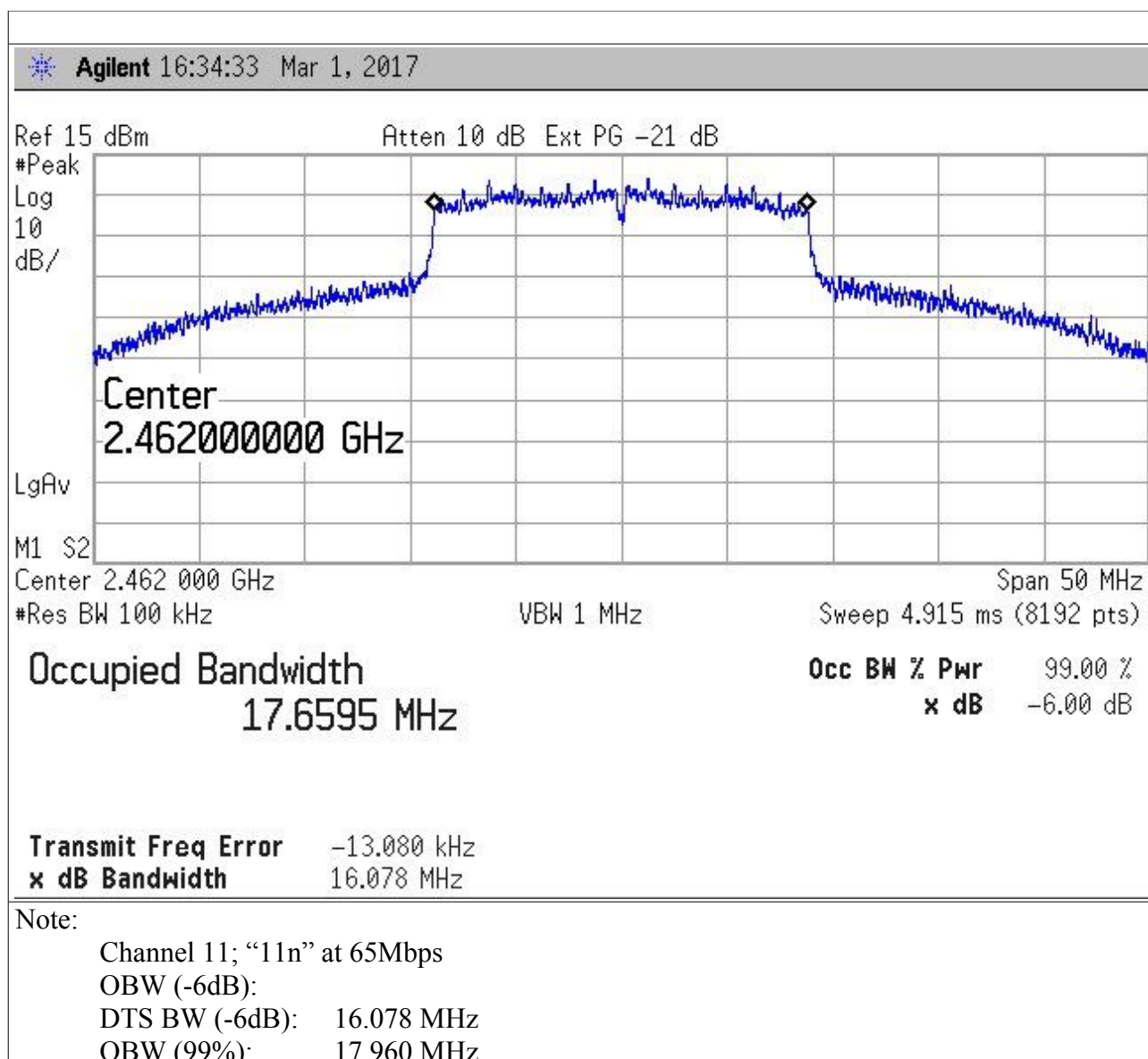
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5. MAXIMUM PEAK OUTPUT POWER

Equipment shall meet the limits below.

For systems using digital modulation in the 2400 – 2483.5 MHz: 1 Watt (+30 dBm).

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DATE
EMI Receiver	Agilent	E4440A	01/2018
Peak Power Meter	Agilent	U2021X	01/2018

Test procedure: APR01

The transmitter output is connected to a spectrum analyzer and the analyzer internal channel power integration is used to integrate the power over a bandwidth greater than or equal to the occupied bandwidth.

Test performed on low, middle and high channels and in the b, g and n protocols at maximum data rate for each protocol.

Results:

No non-compliance noted.

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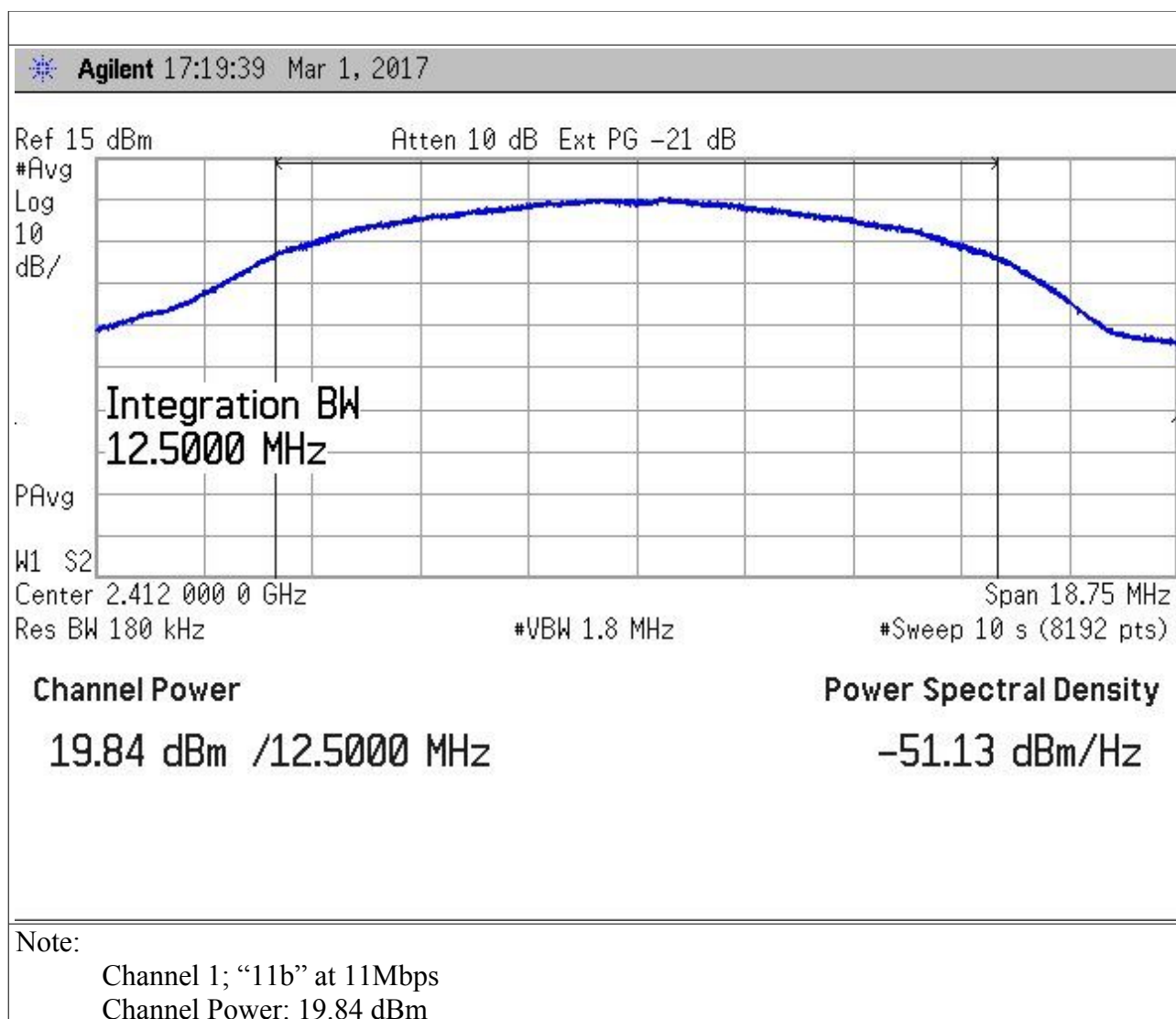
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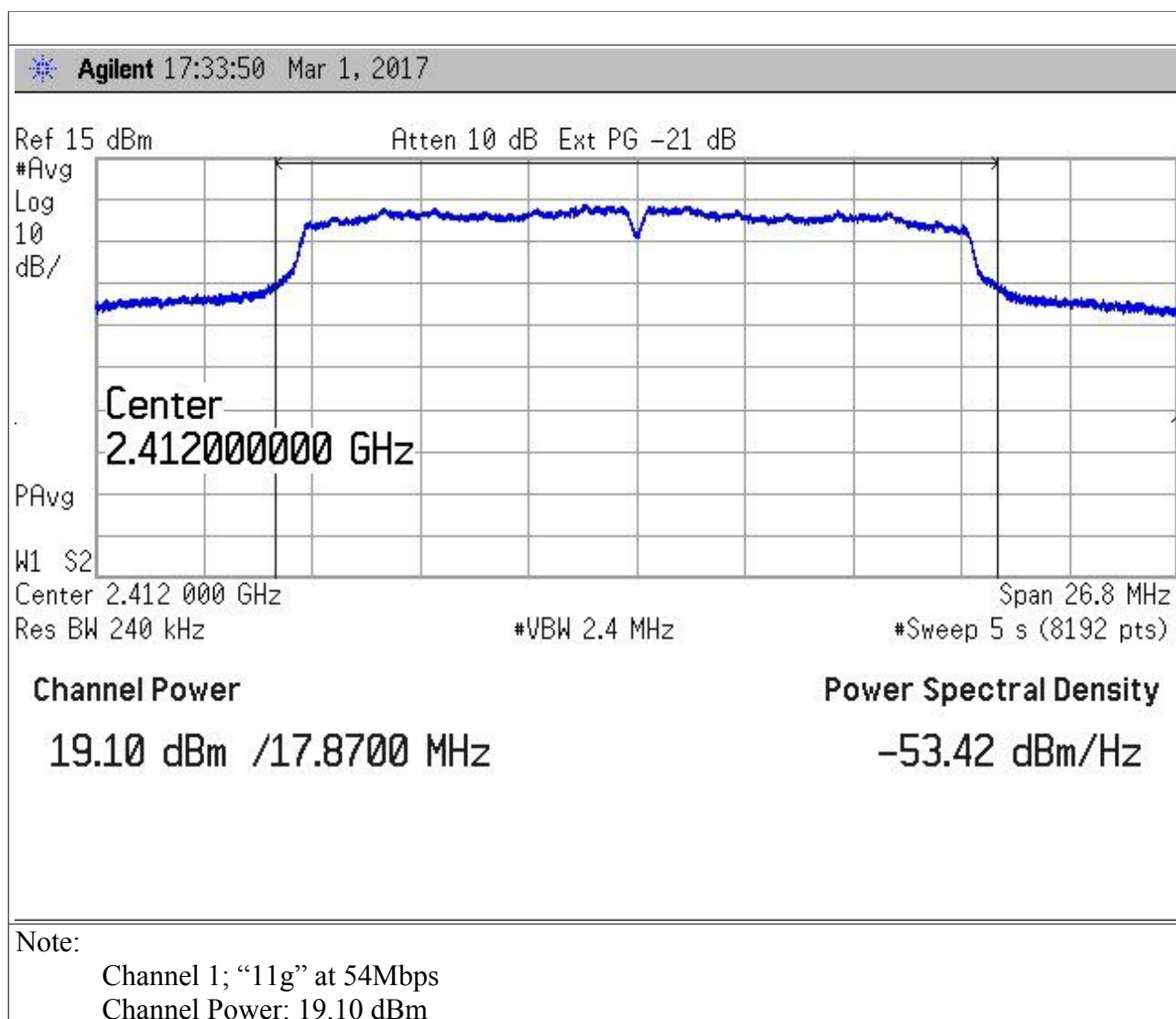
802.11b Mode, 11 Mbs				
<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Peak Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Margin (dB)</i>
Low	2412	19.84	30	-10.16
Mid	2437	18.48	30	-11.52
High	2462	18.32	30	-11.68
802.11g Mode, 54 Mbs				
<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Peak Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Margin (dB)</i>
Low	2412	19.1	30	-10.9
Mid	2437	18.04	30	-11.96
High	2462	16.88	30	-13.12
802.11n Mode, 65Mbs				
<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Peak Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Margin (dB)</i>
Low	2412	19.04	30	-10.96
Mid	2437	18.05	30	-11.95
High	2462	16.97	30	-13.03

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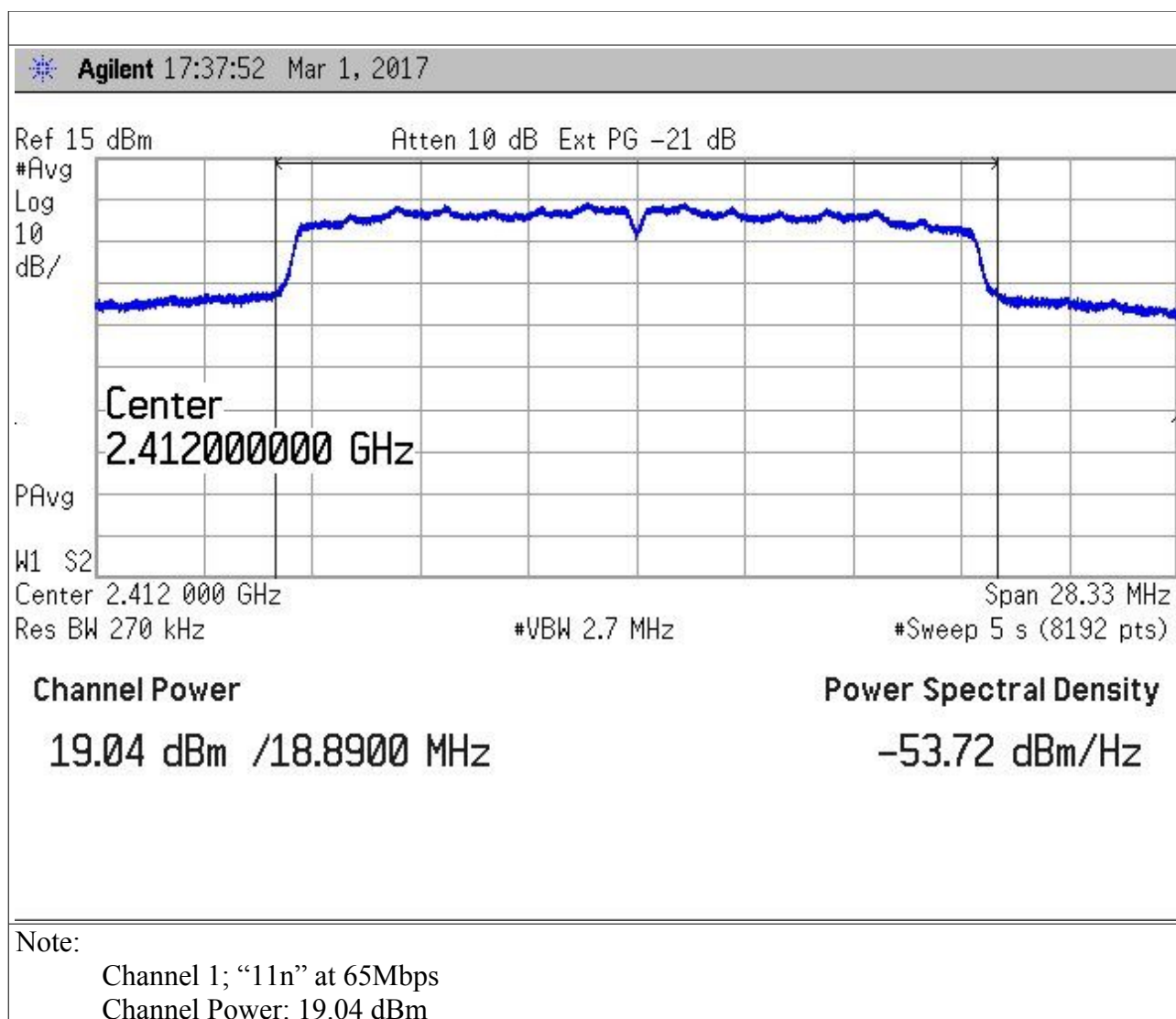


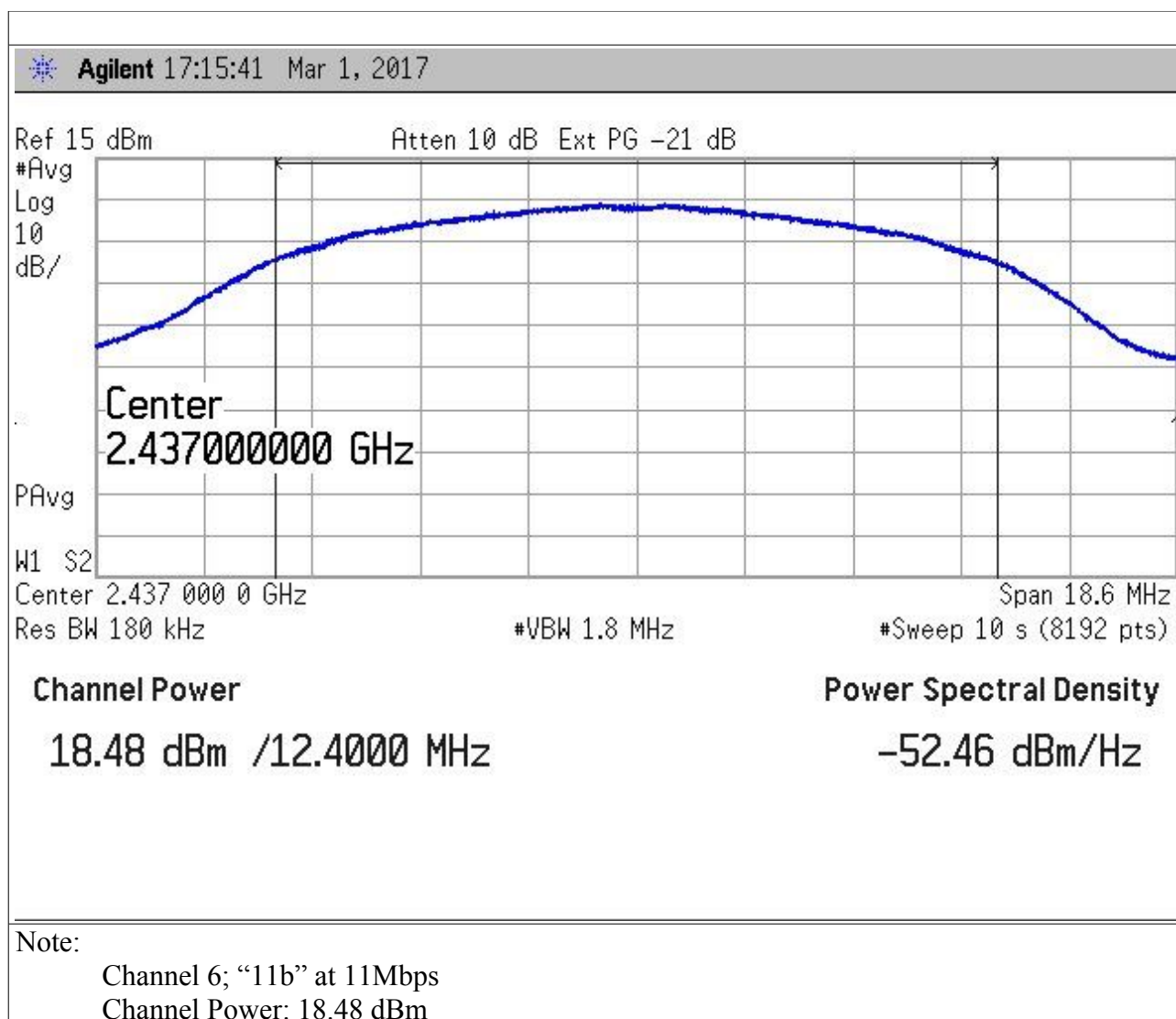


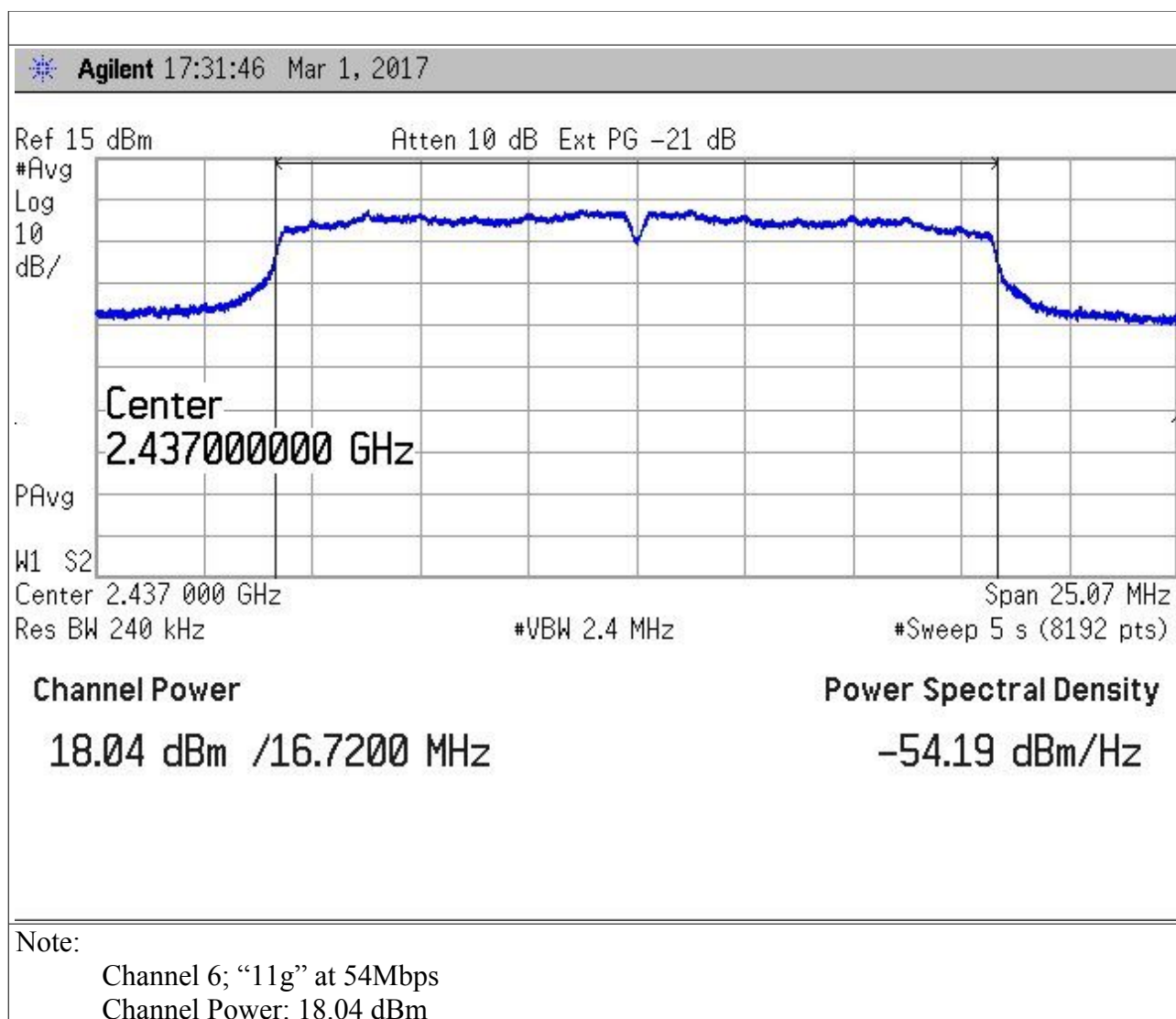
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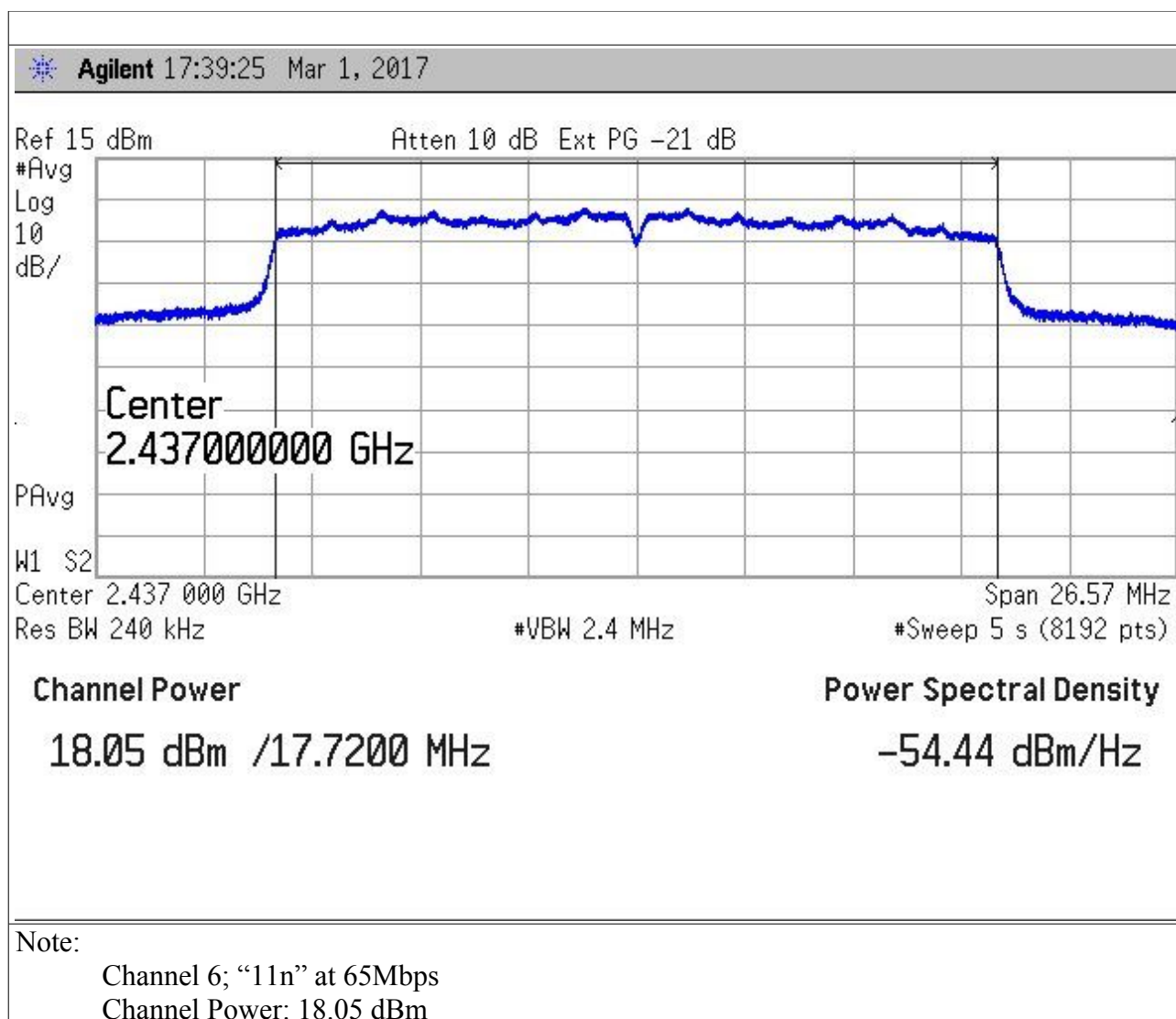




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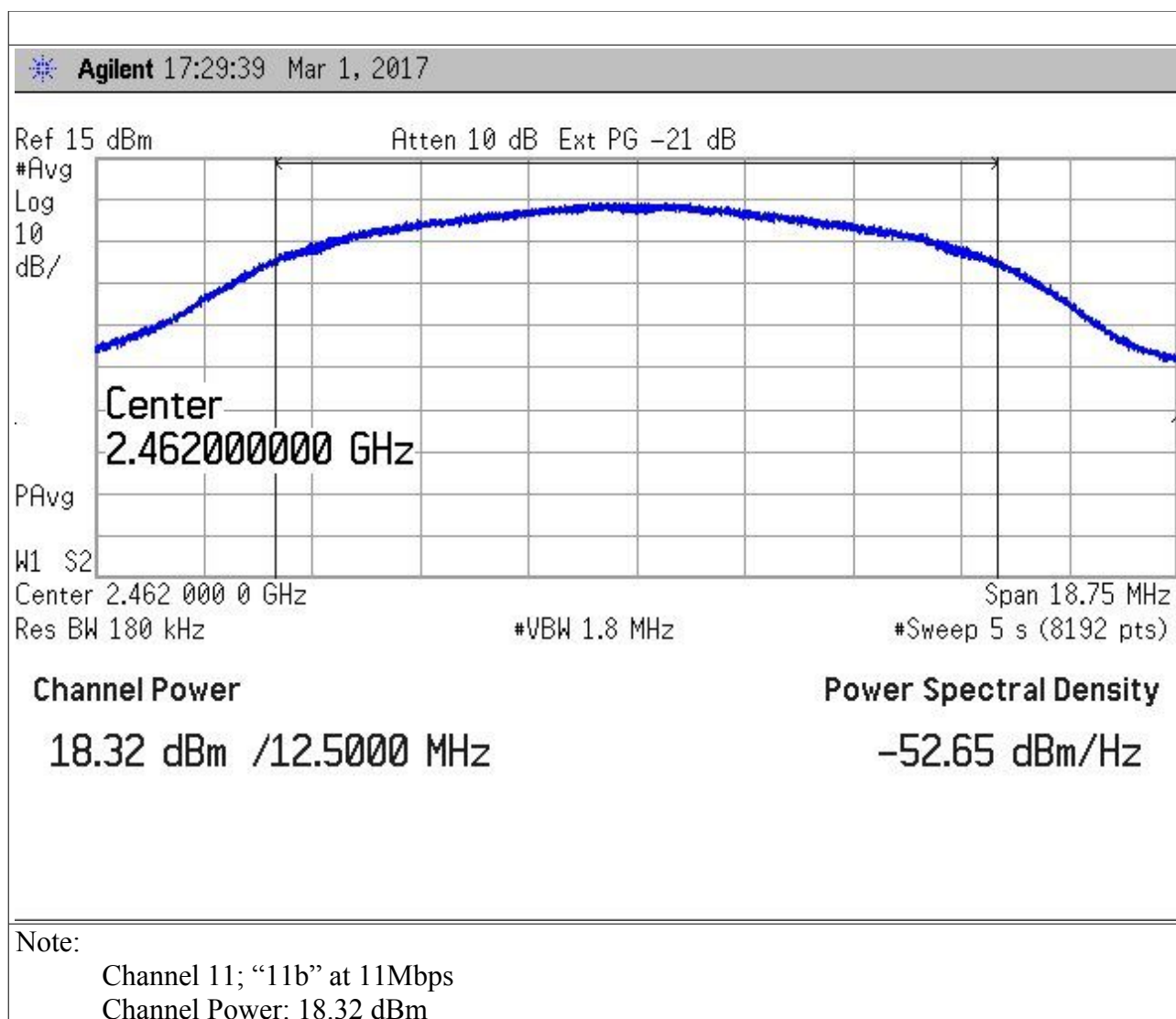
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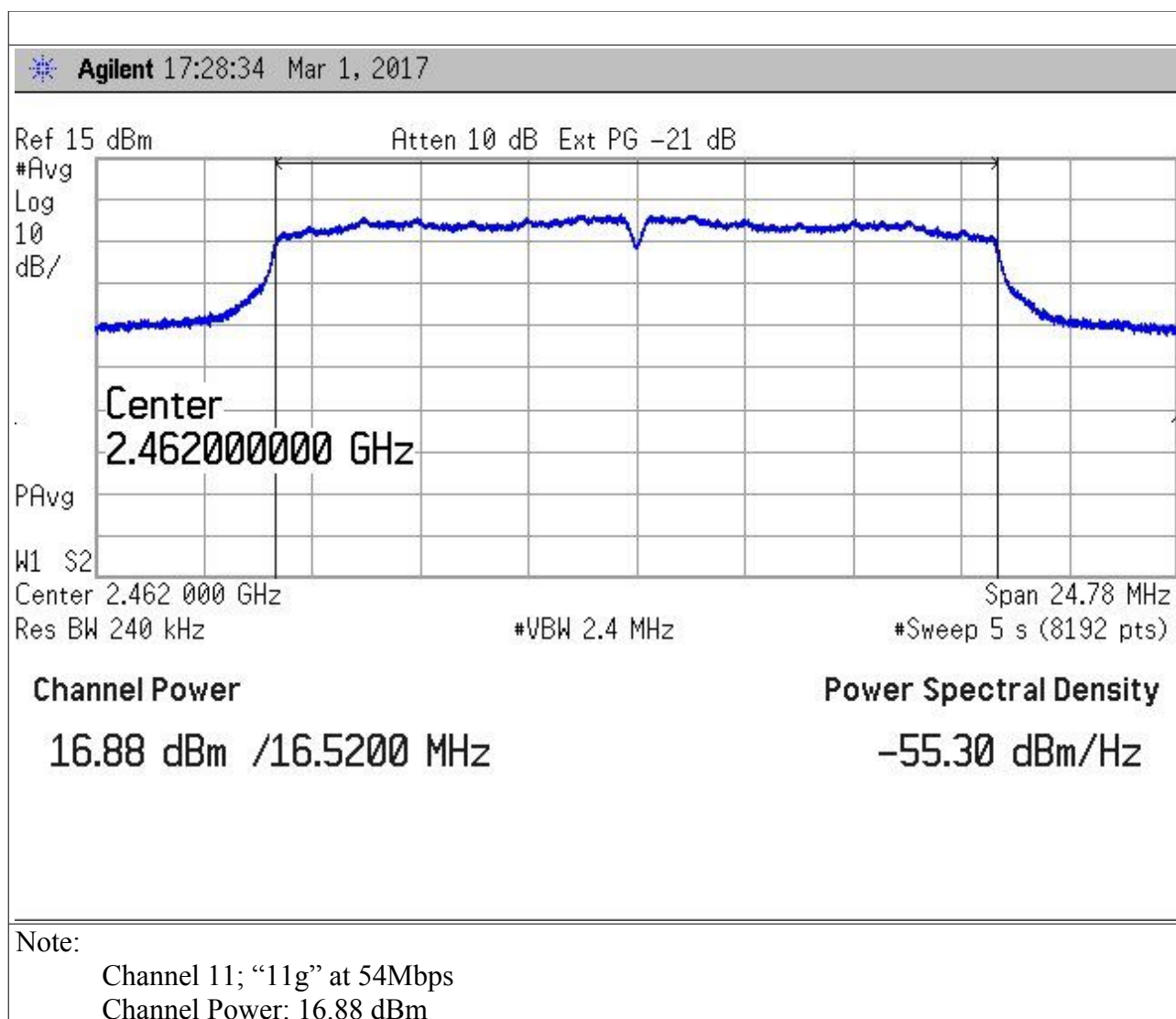


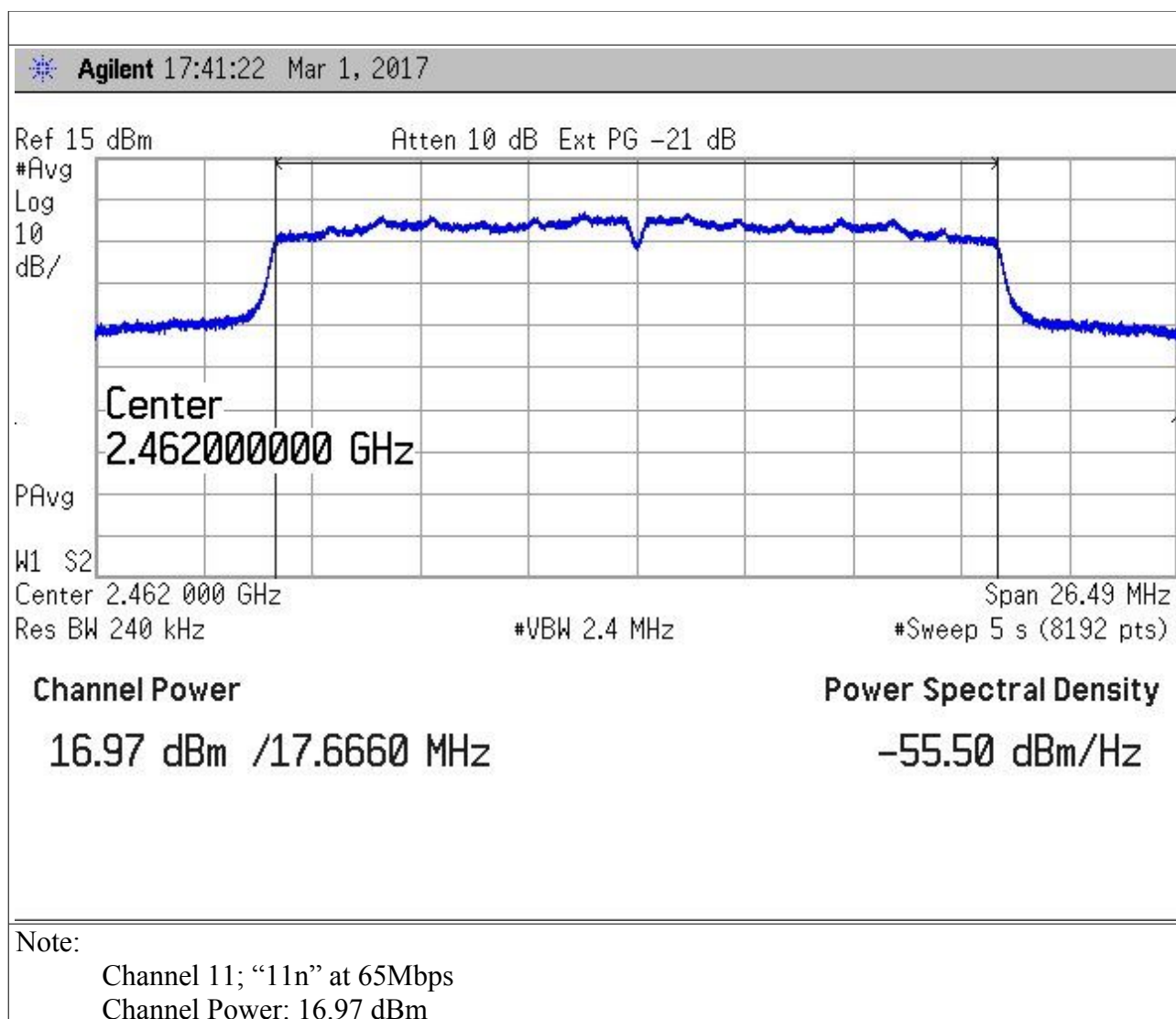
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6. BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS

Equipment shall meet the limits below .

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.

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DATE
EMI Receiver	Agilent	E4440A	01/2018

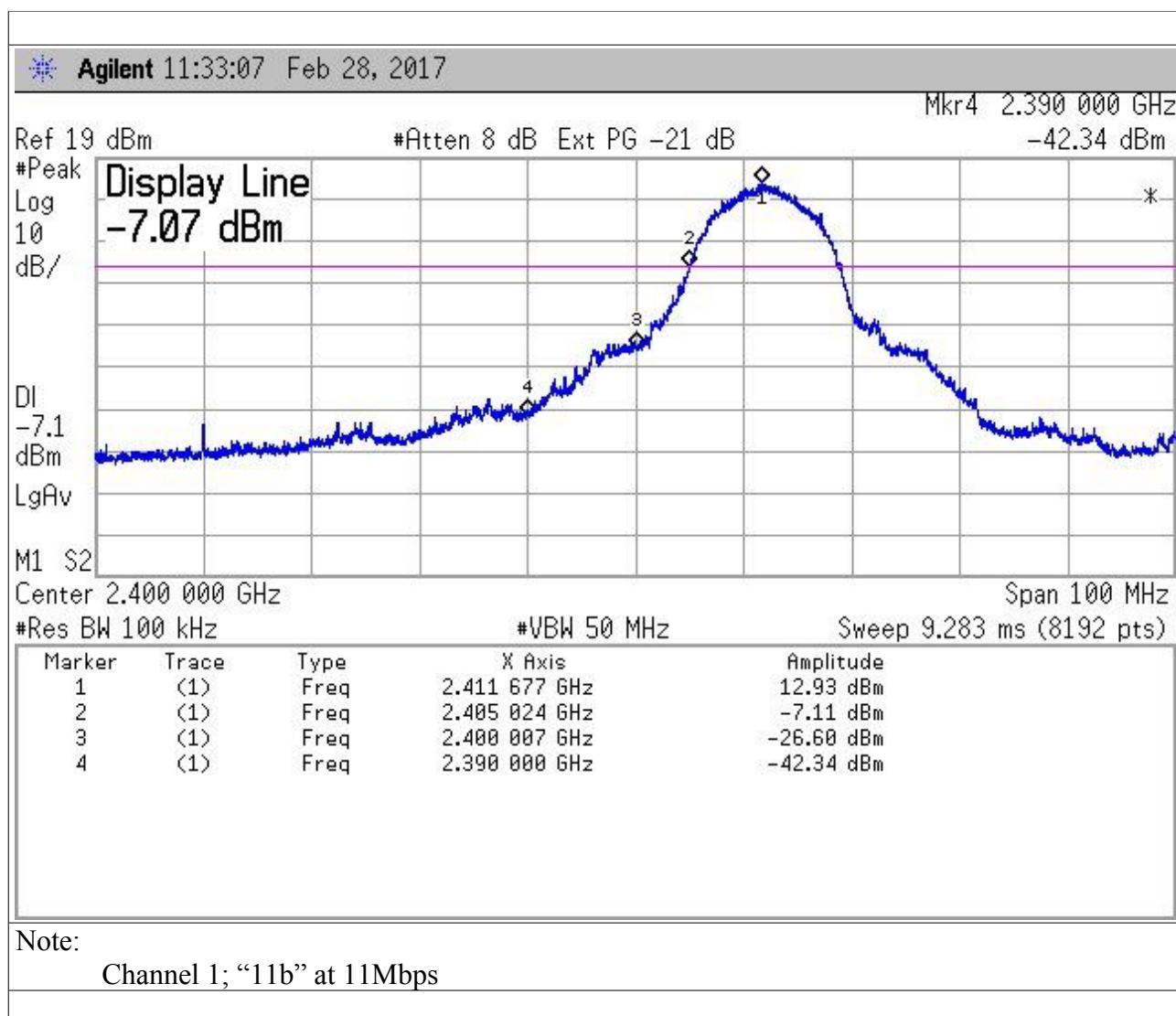
Test procedure: APR01

Test performed on low, middle and high channels and in the b,g,n protocols at maximum data rate for each protocol.

Results:

No non-compliance noted

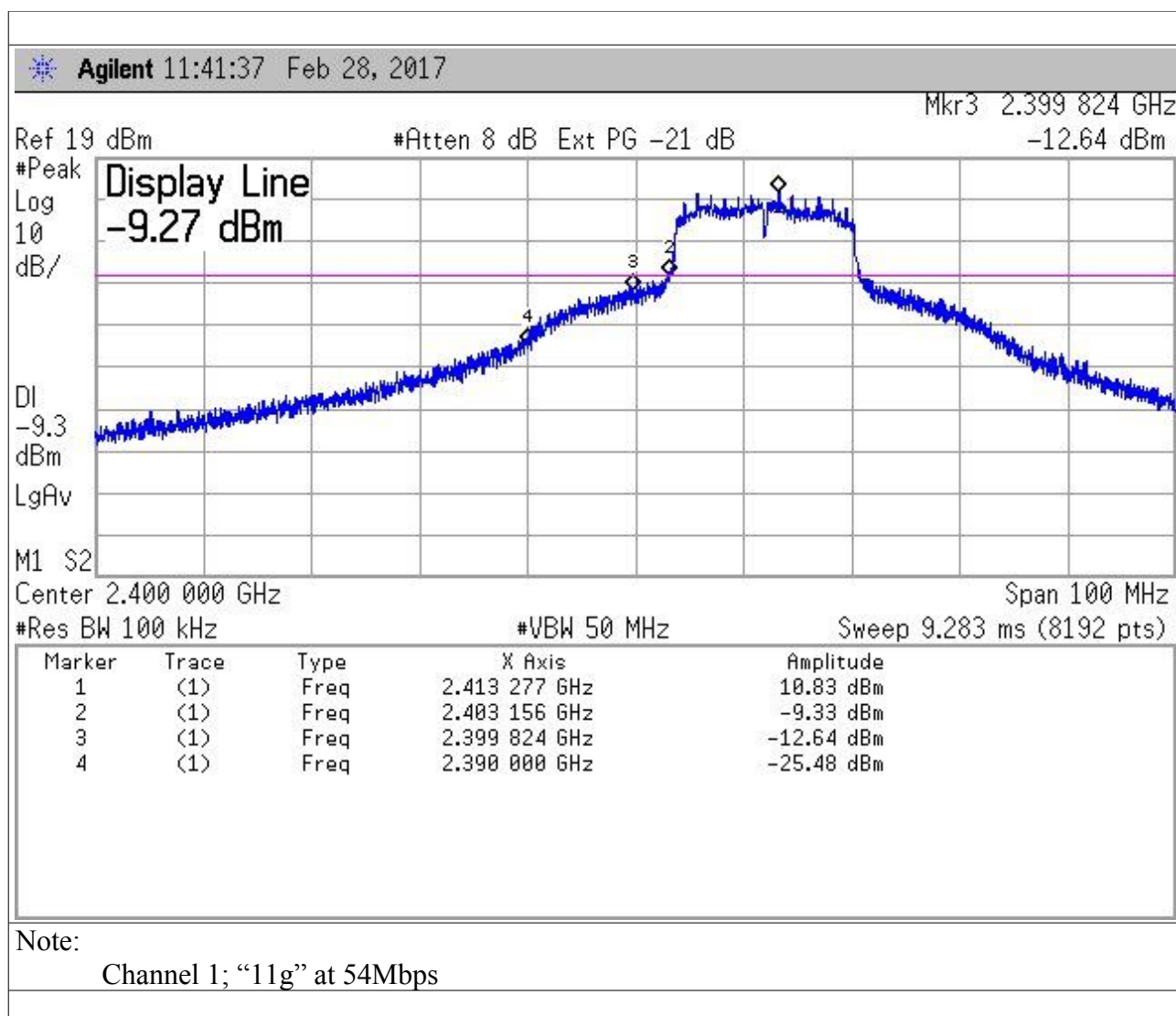
The following figures show the results.



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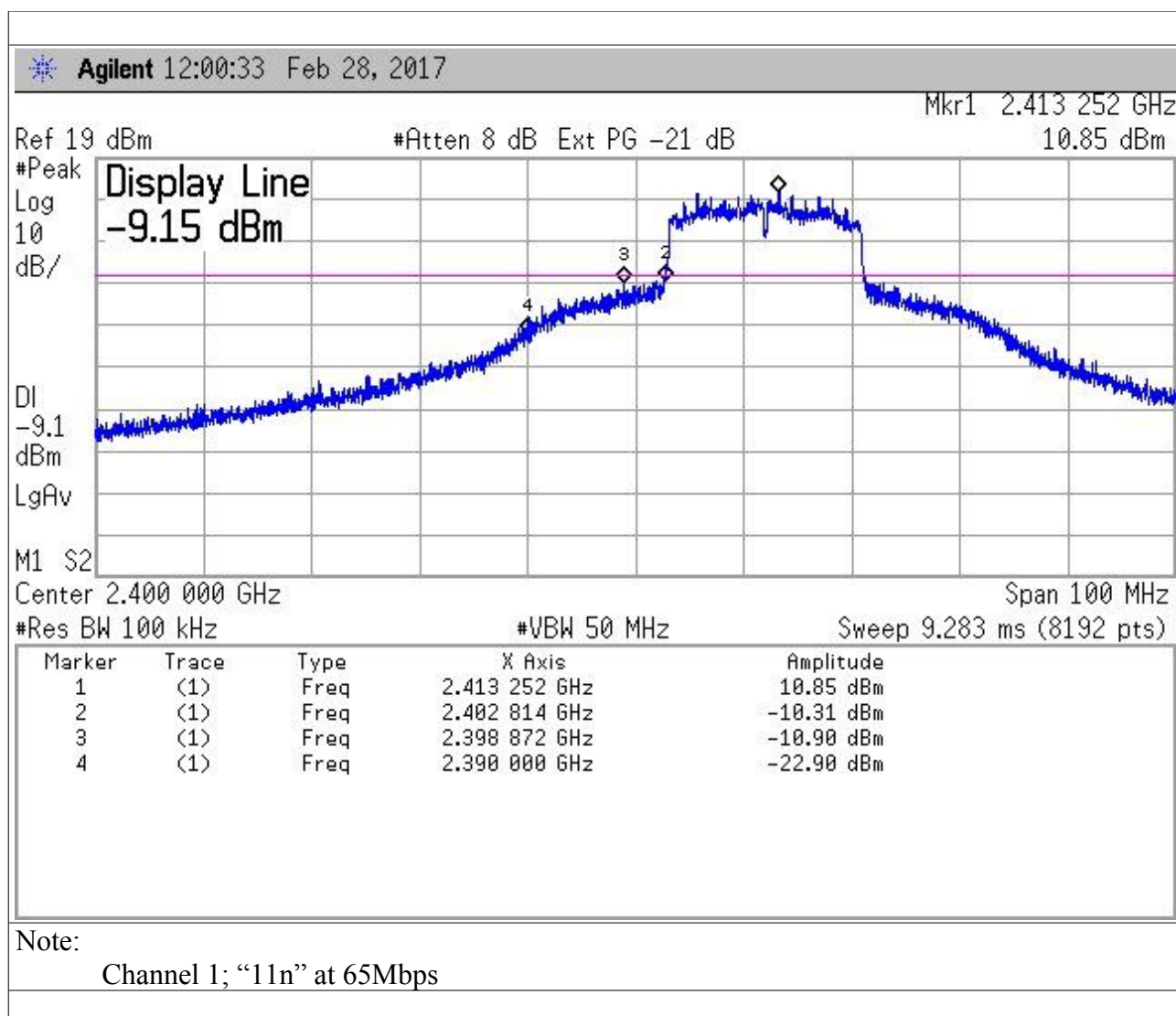
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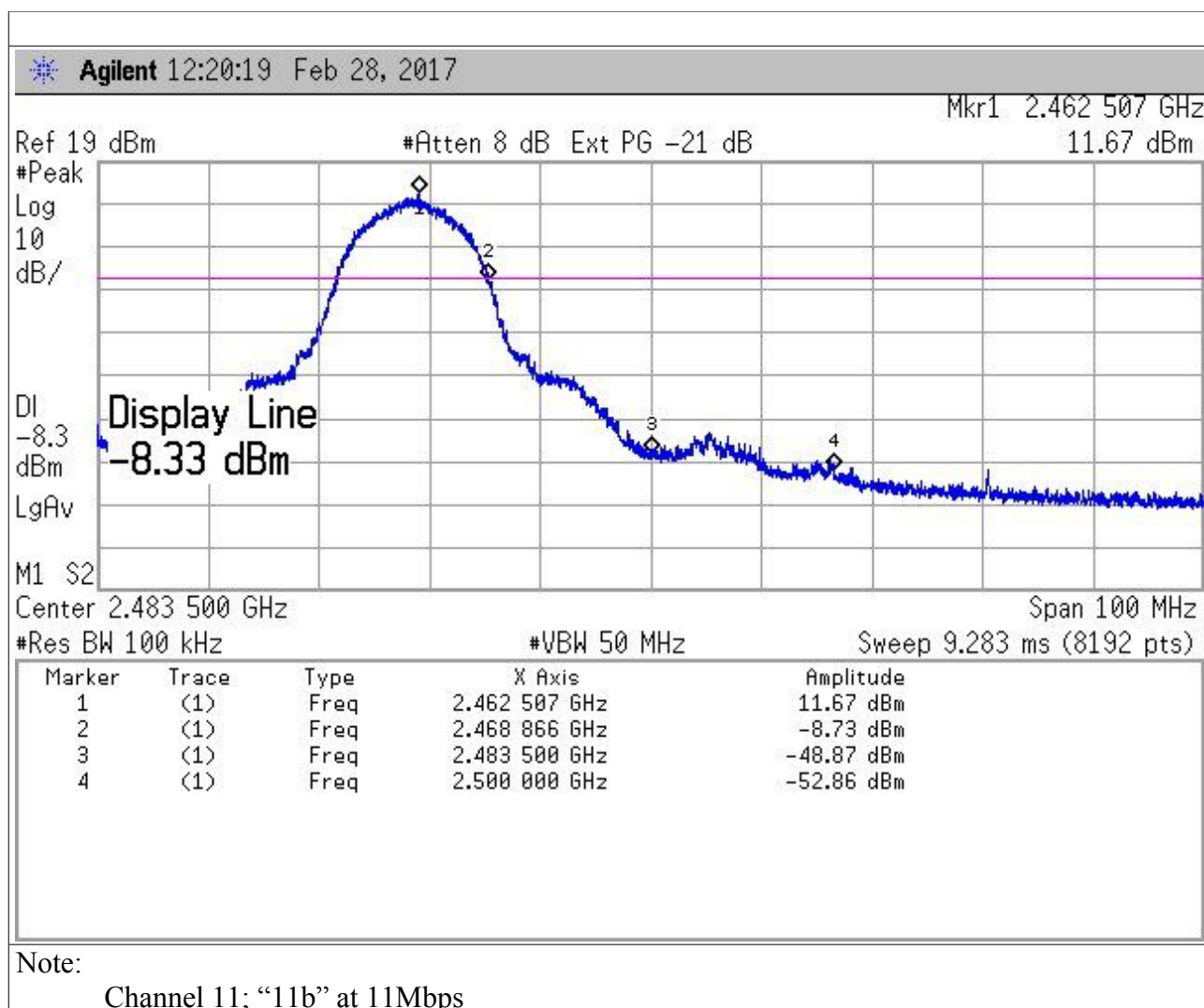
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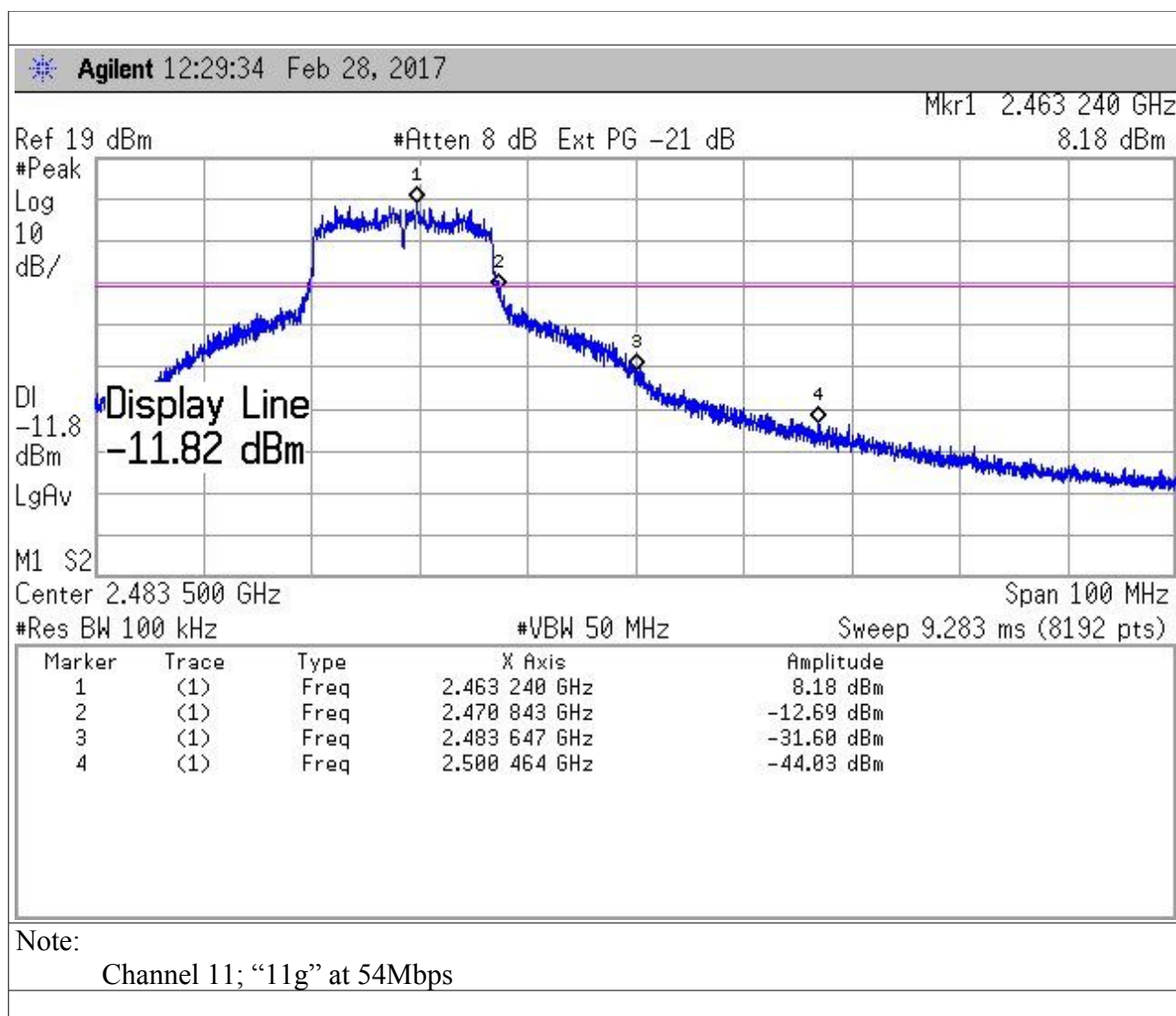


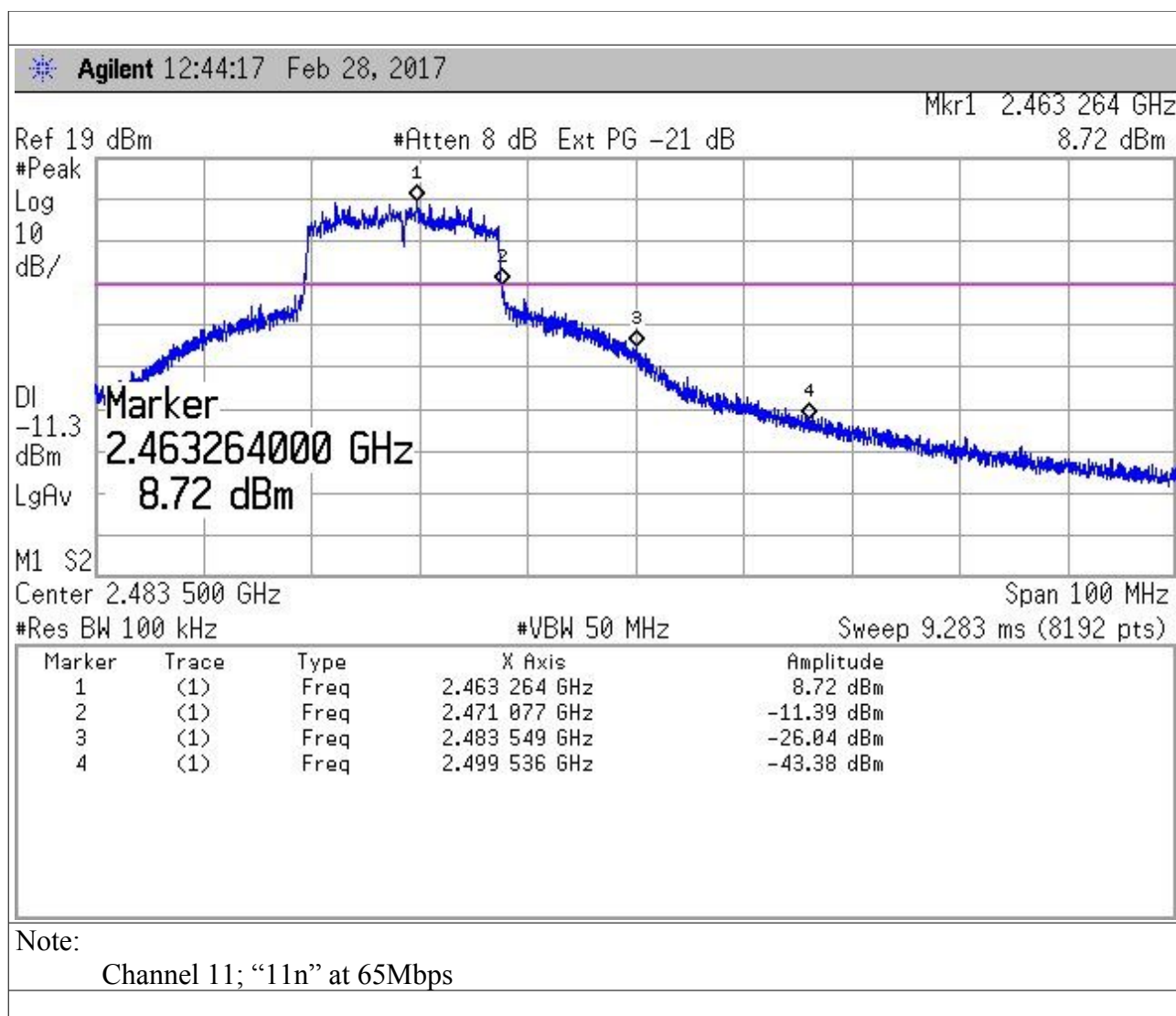
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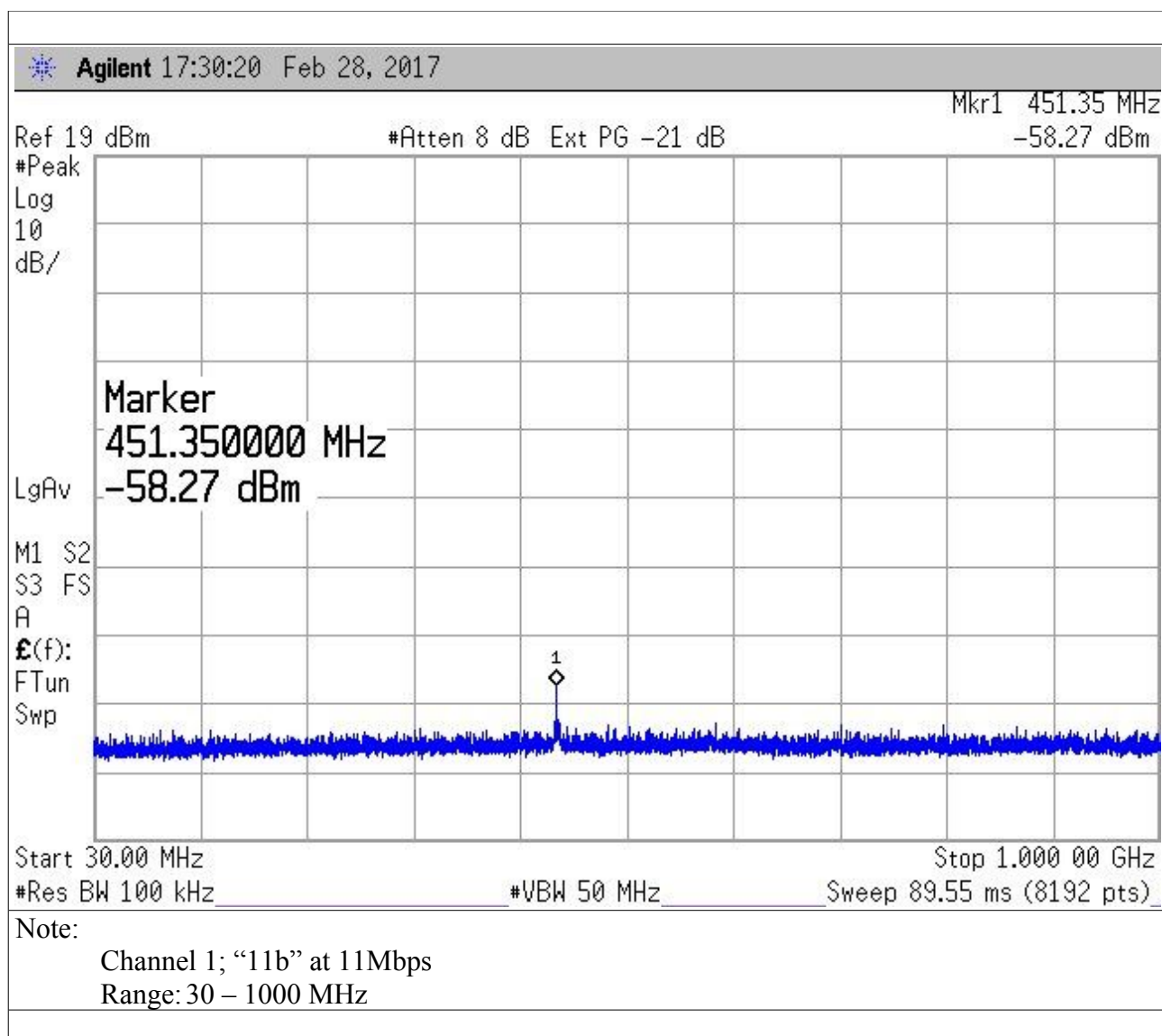




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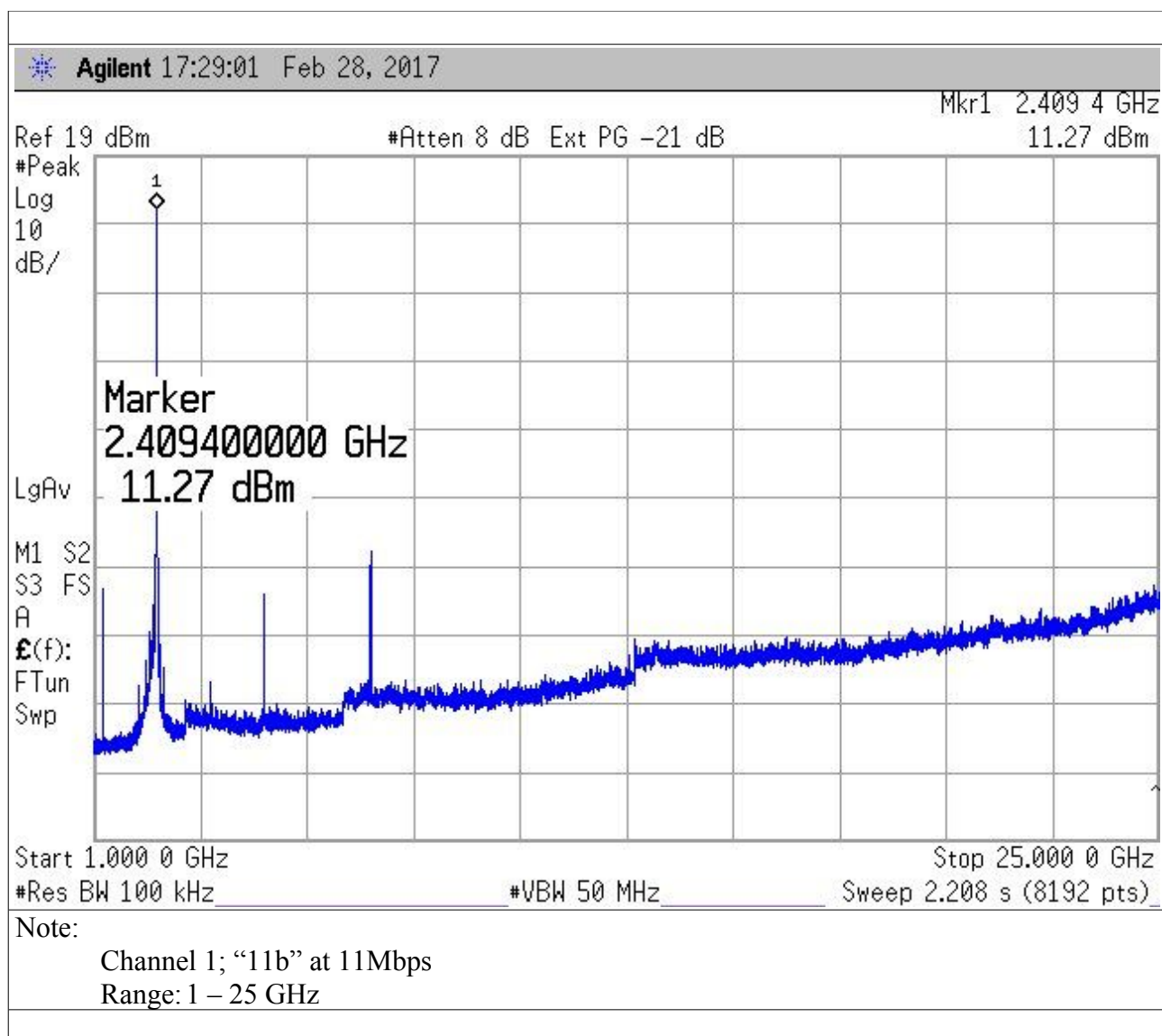
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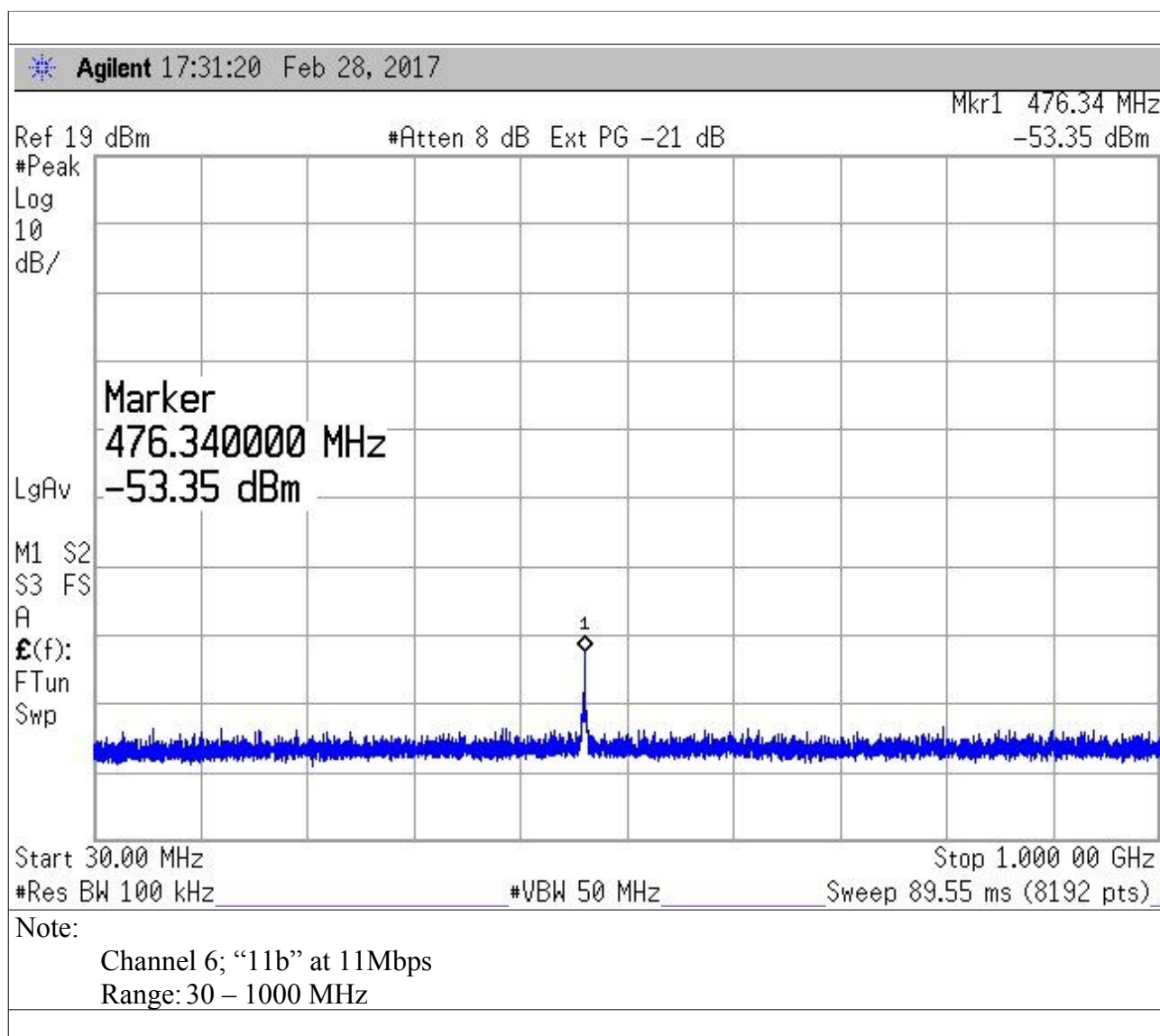
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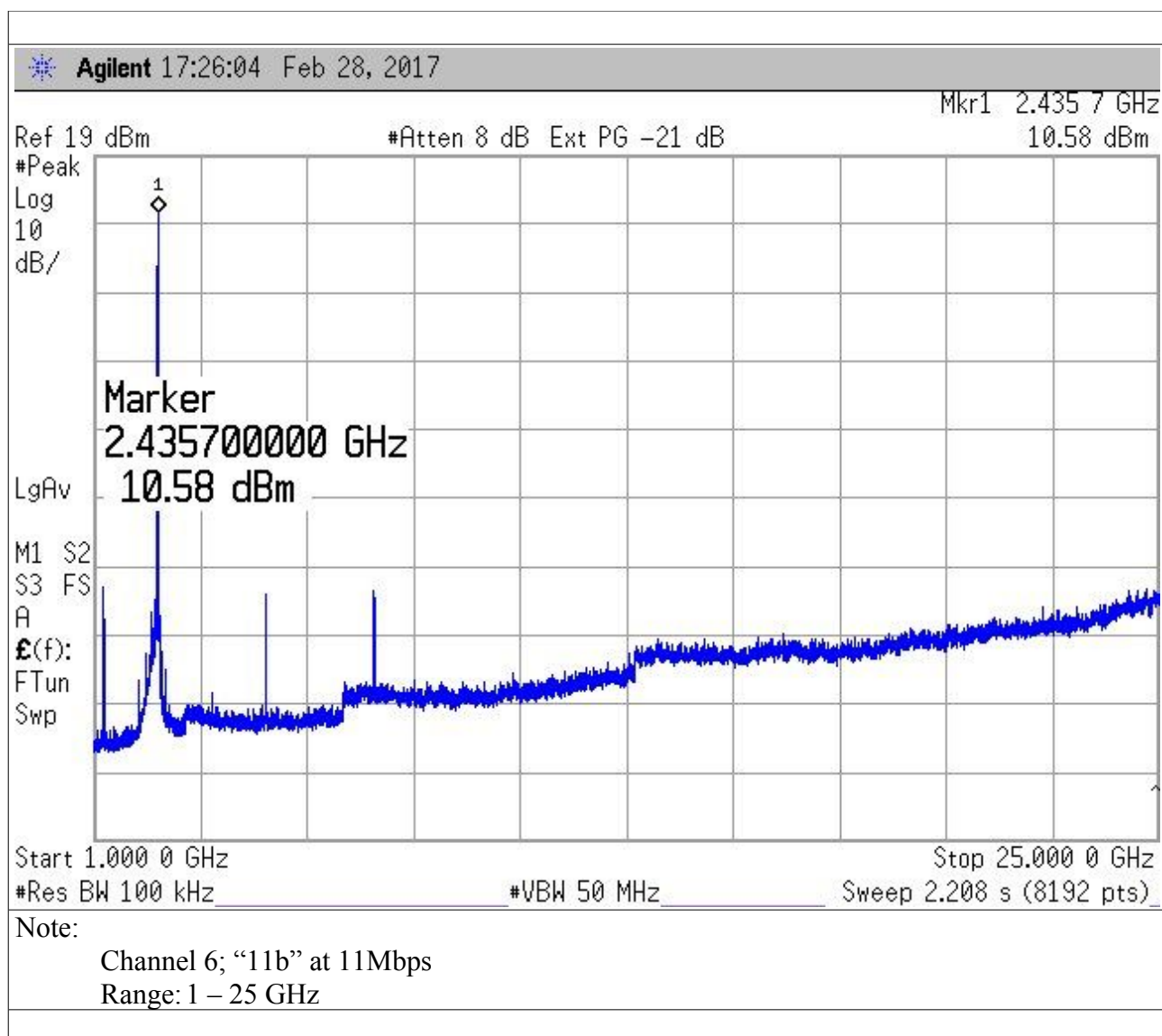
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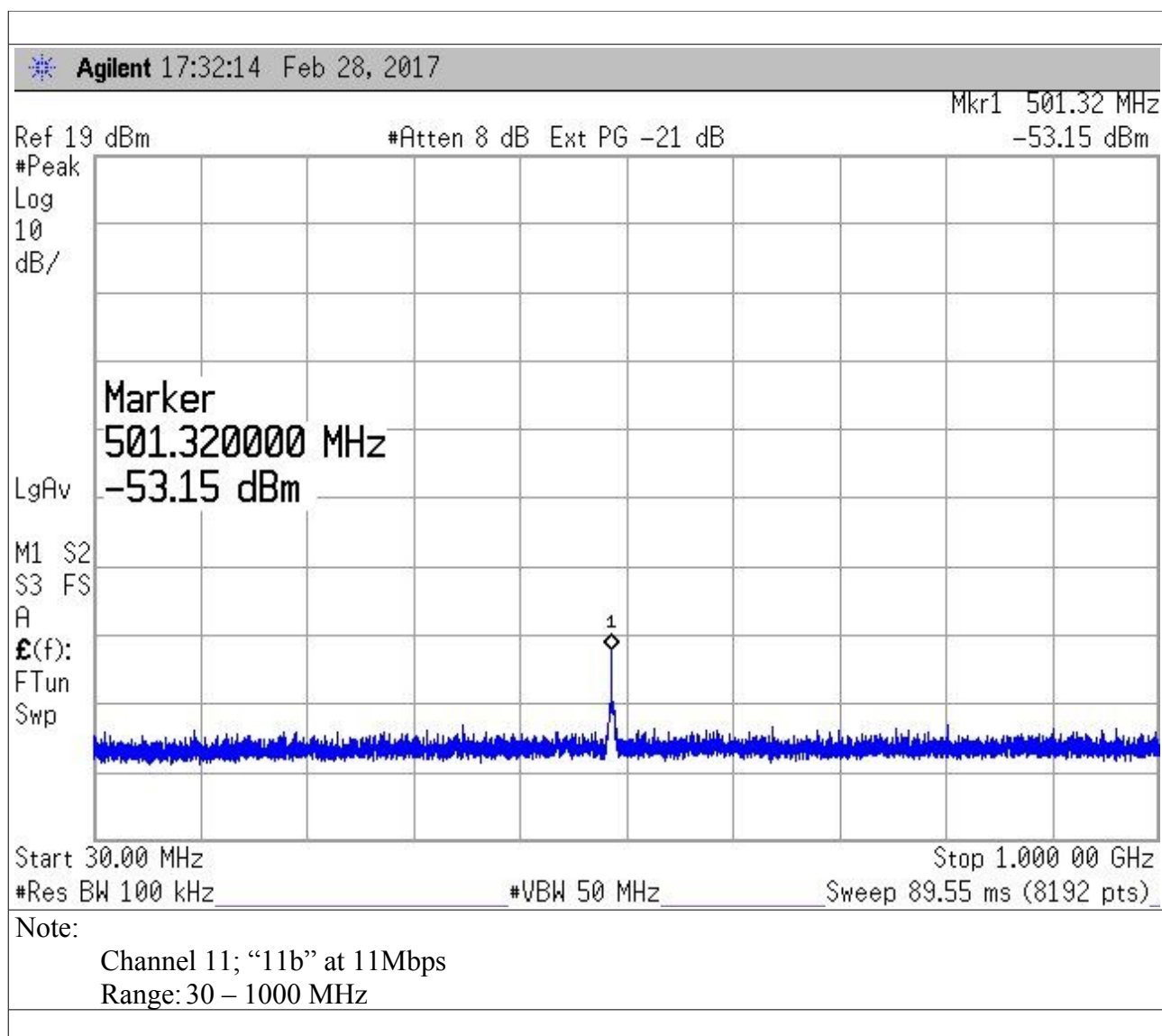
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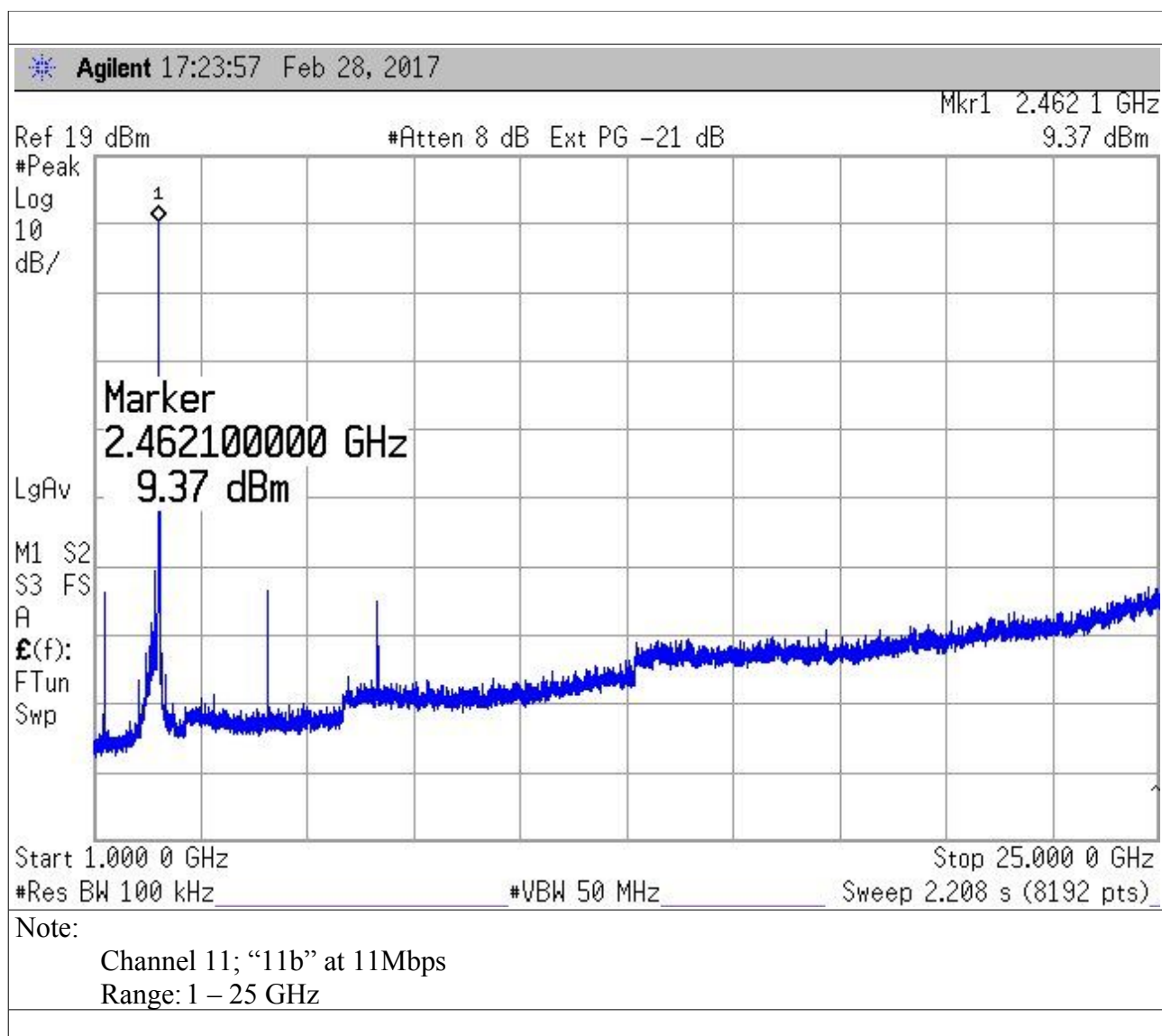
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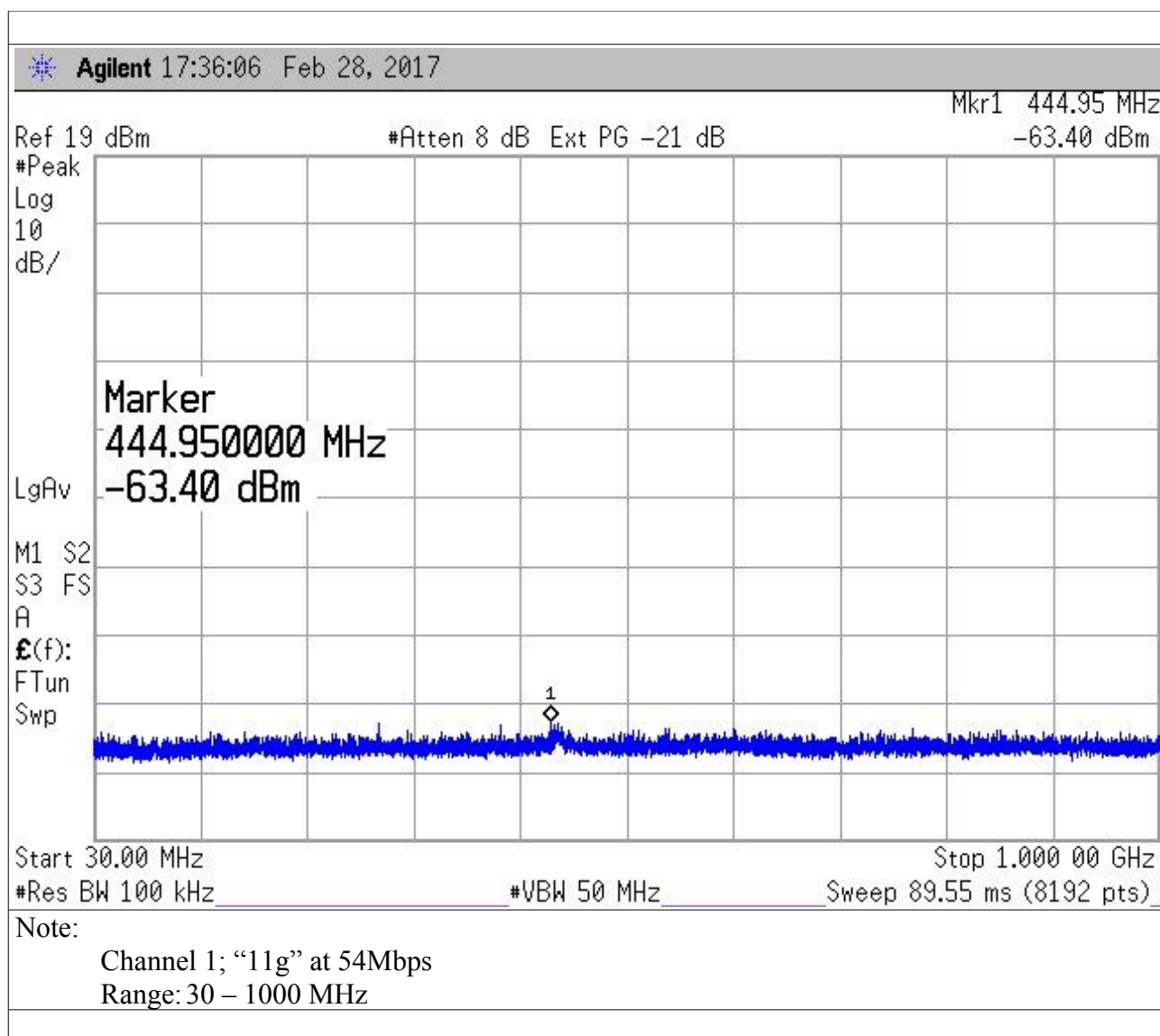


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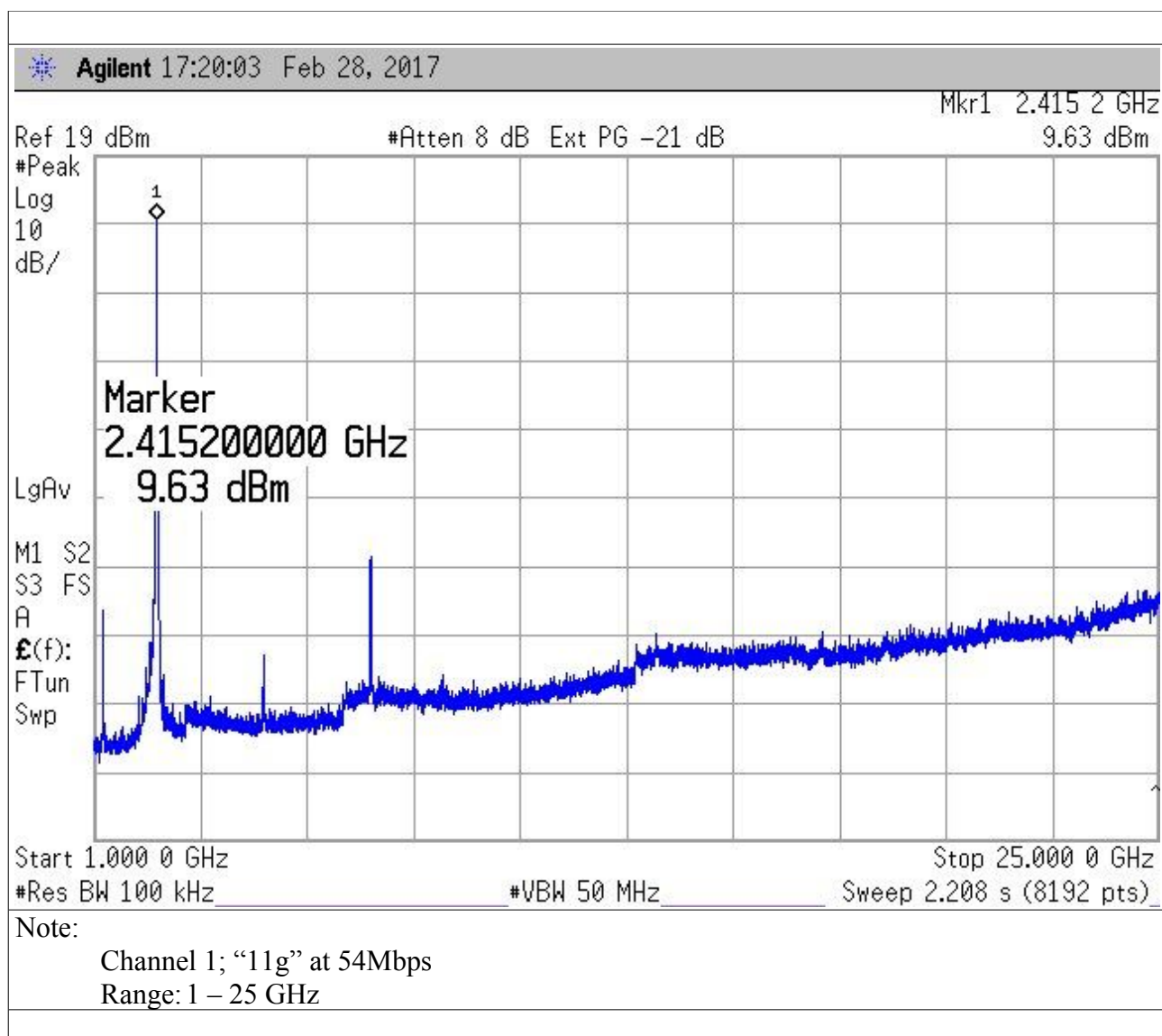




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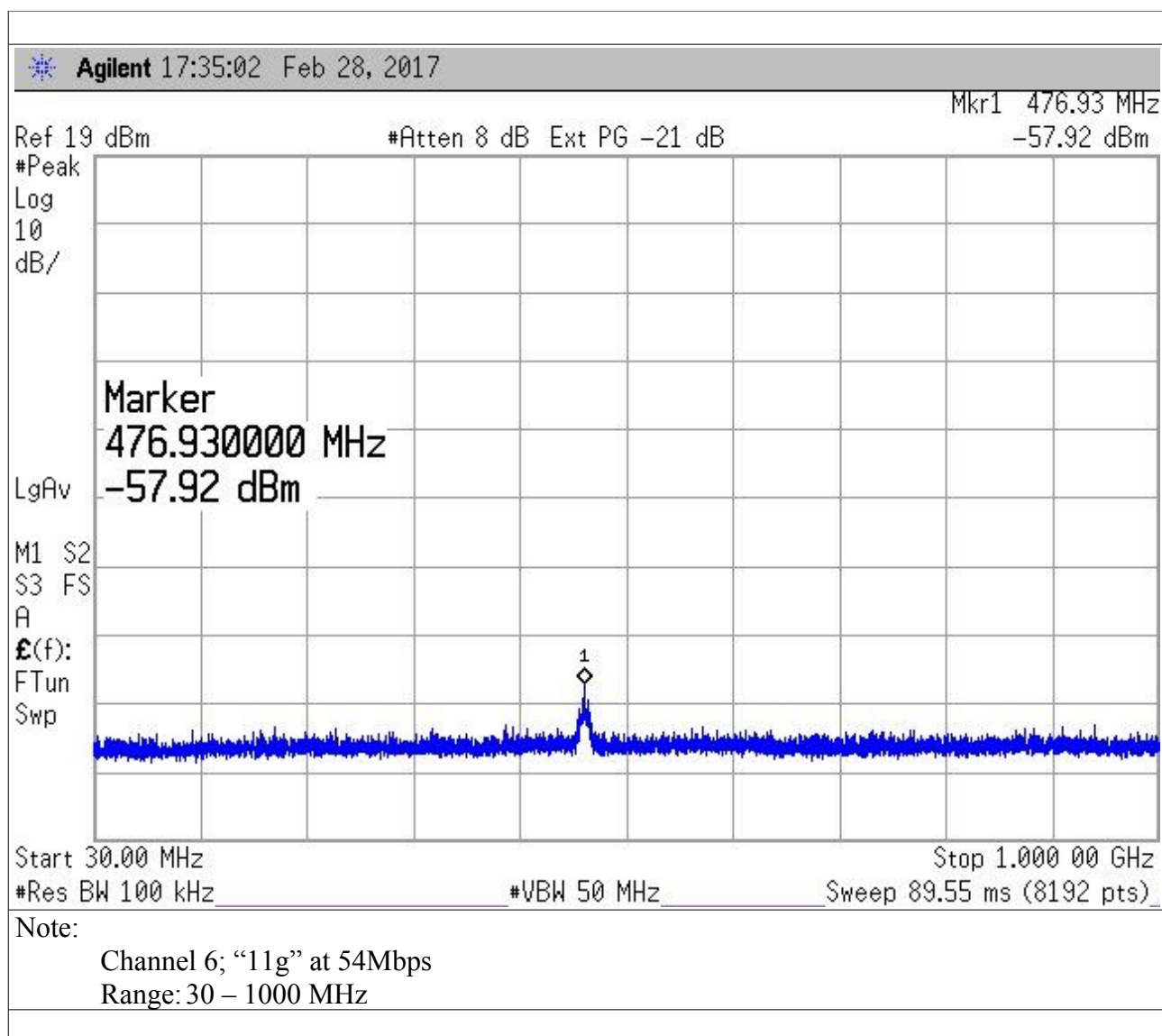
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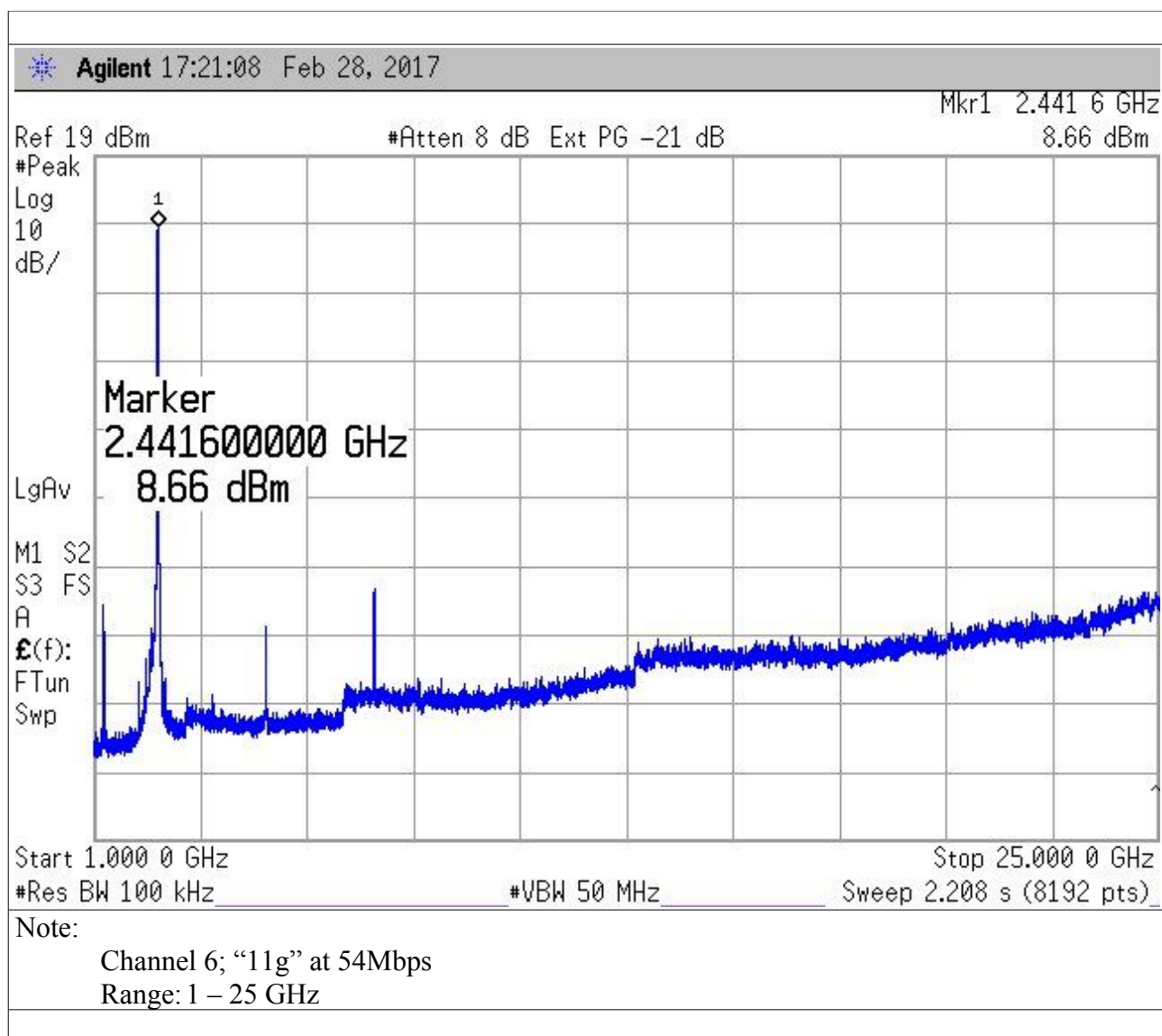
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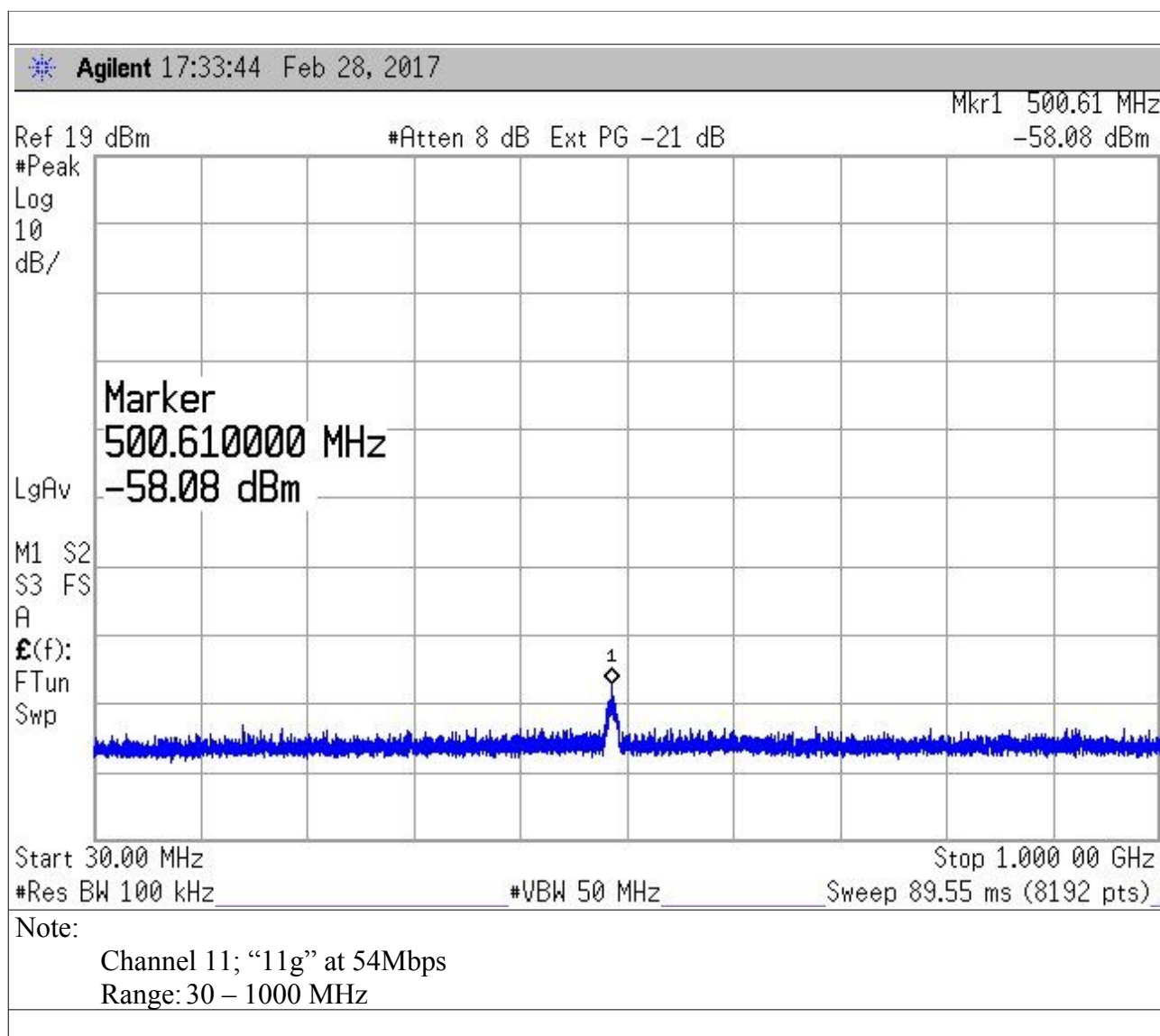
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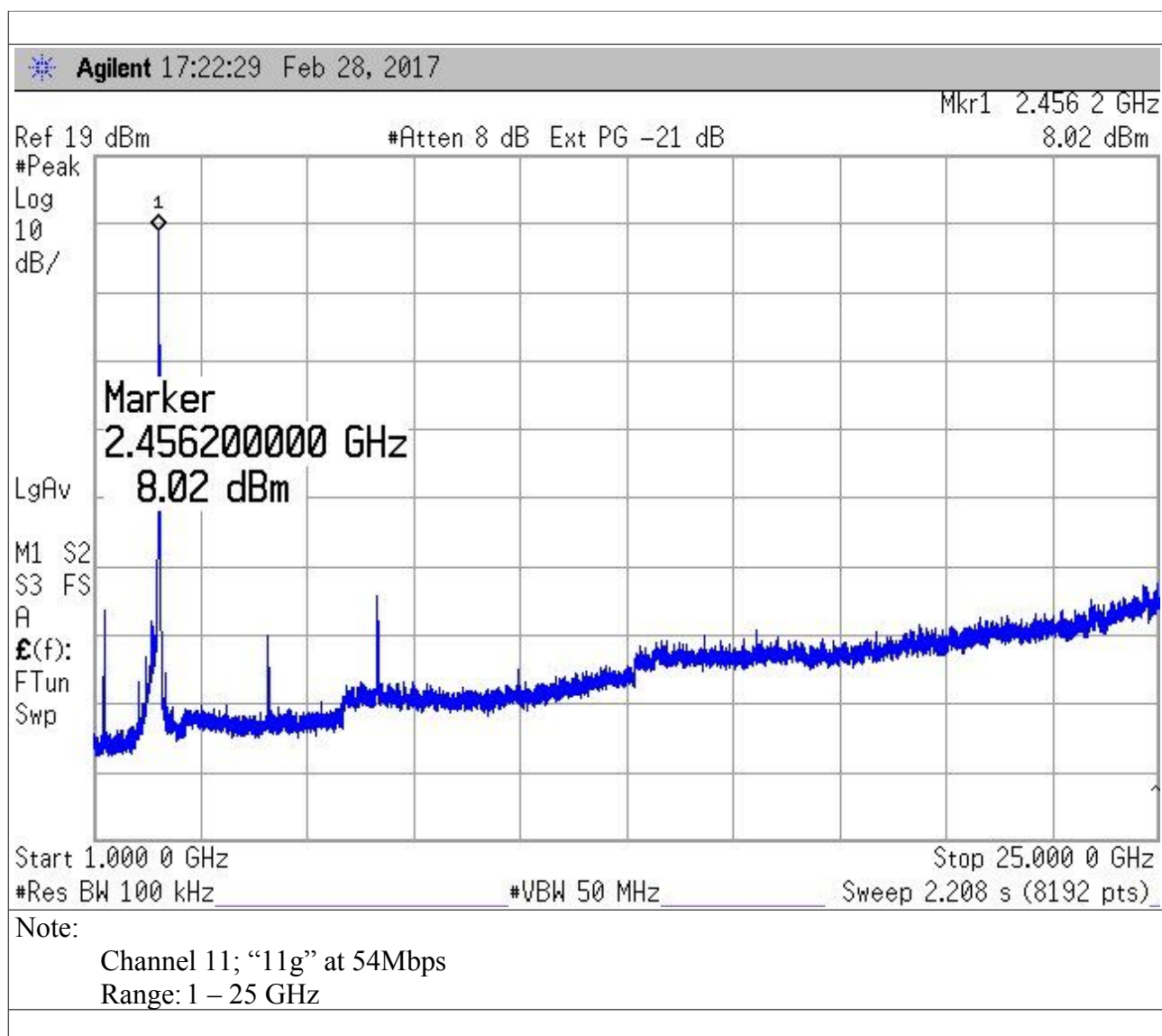
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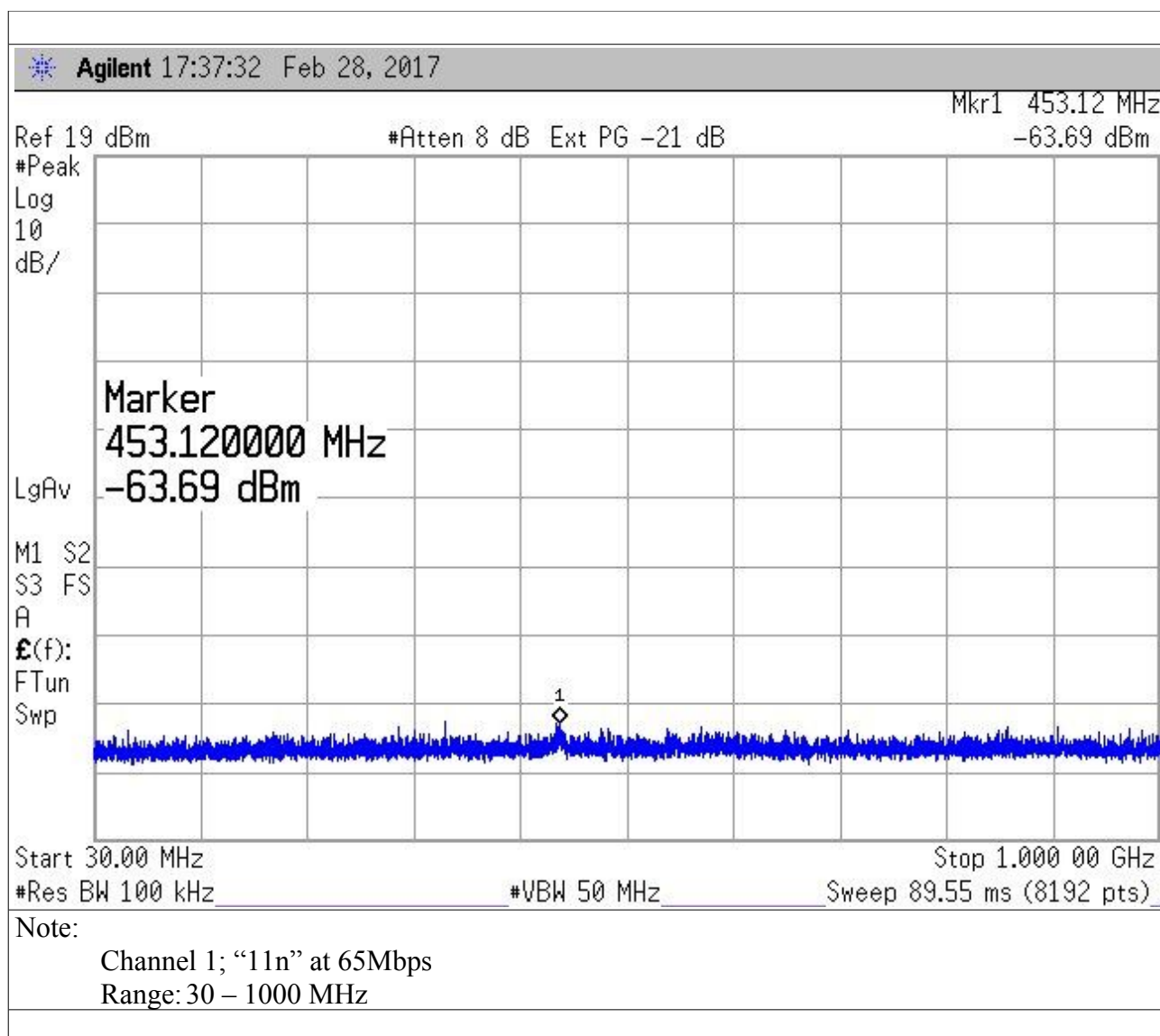
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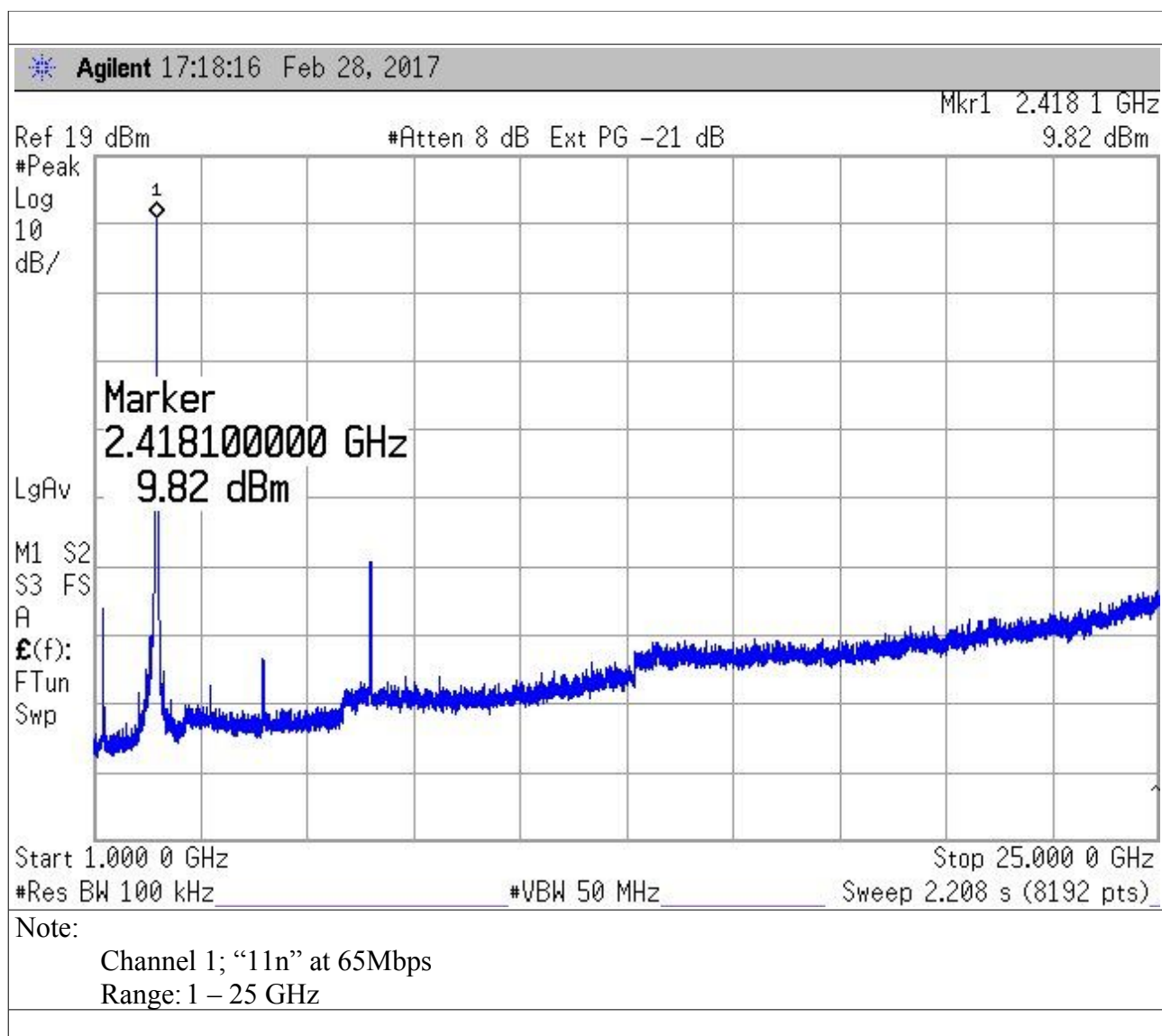
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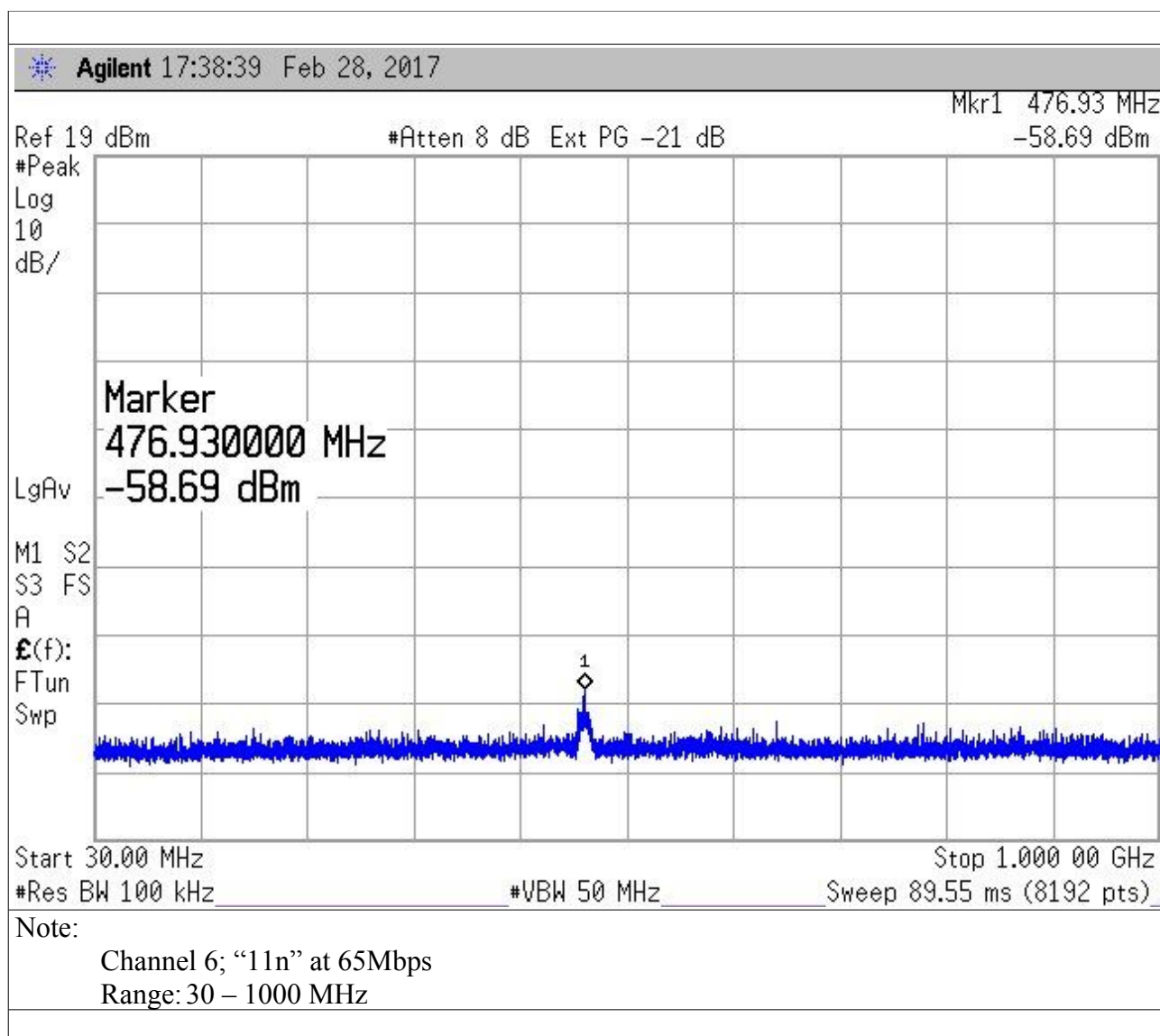
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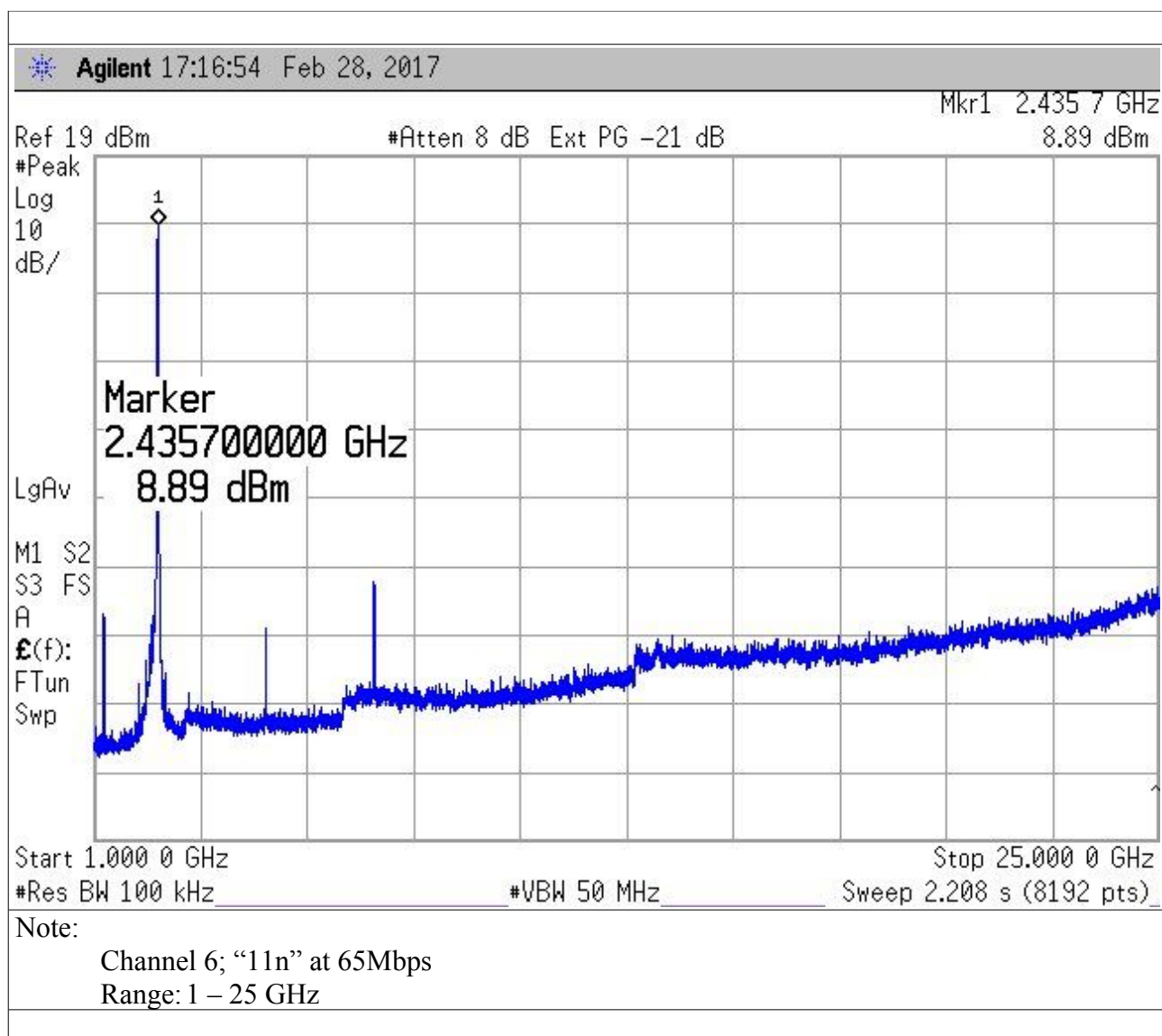
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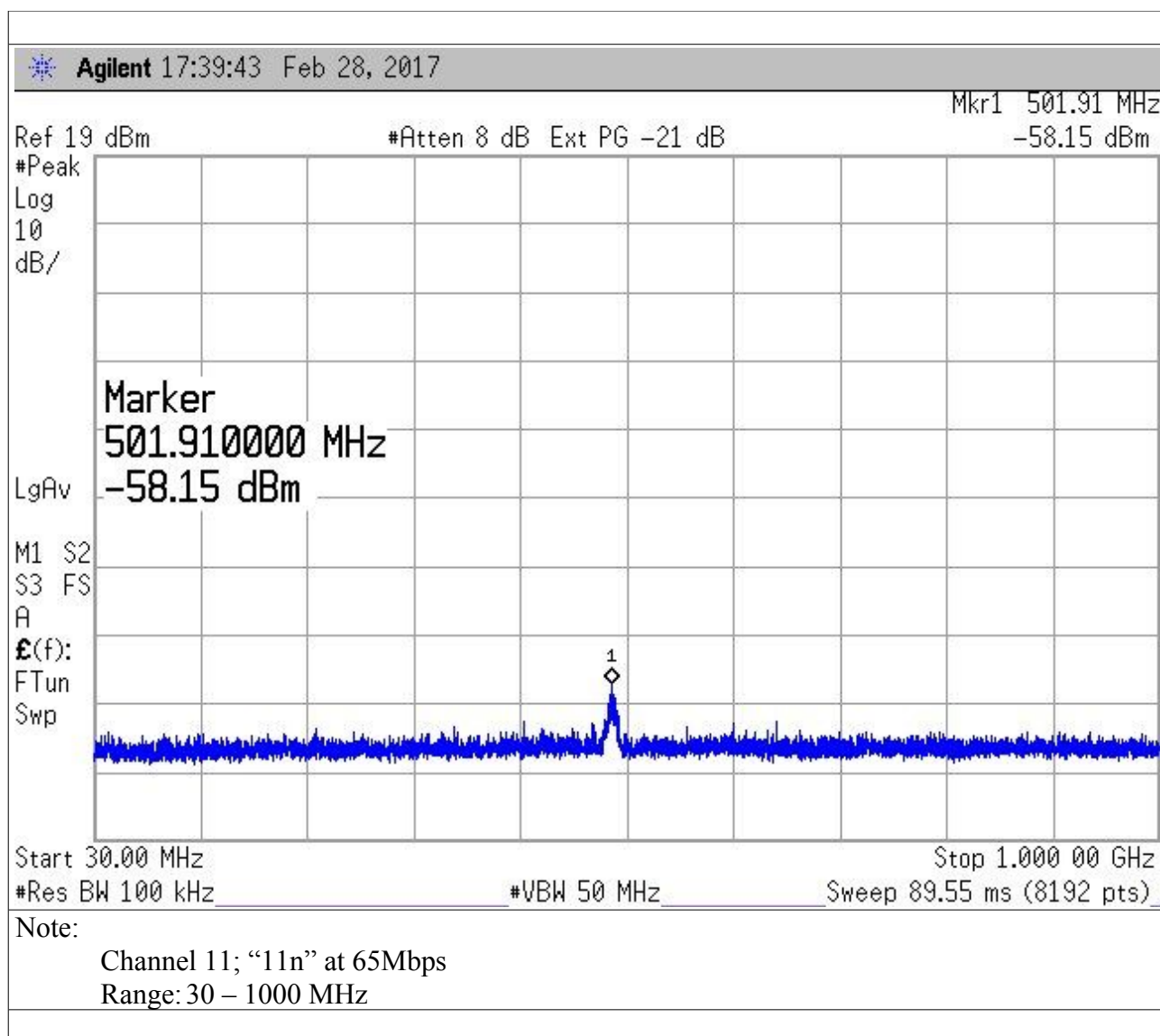
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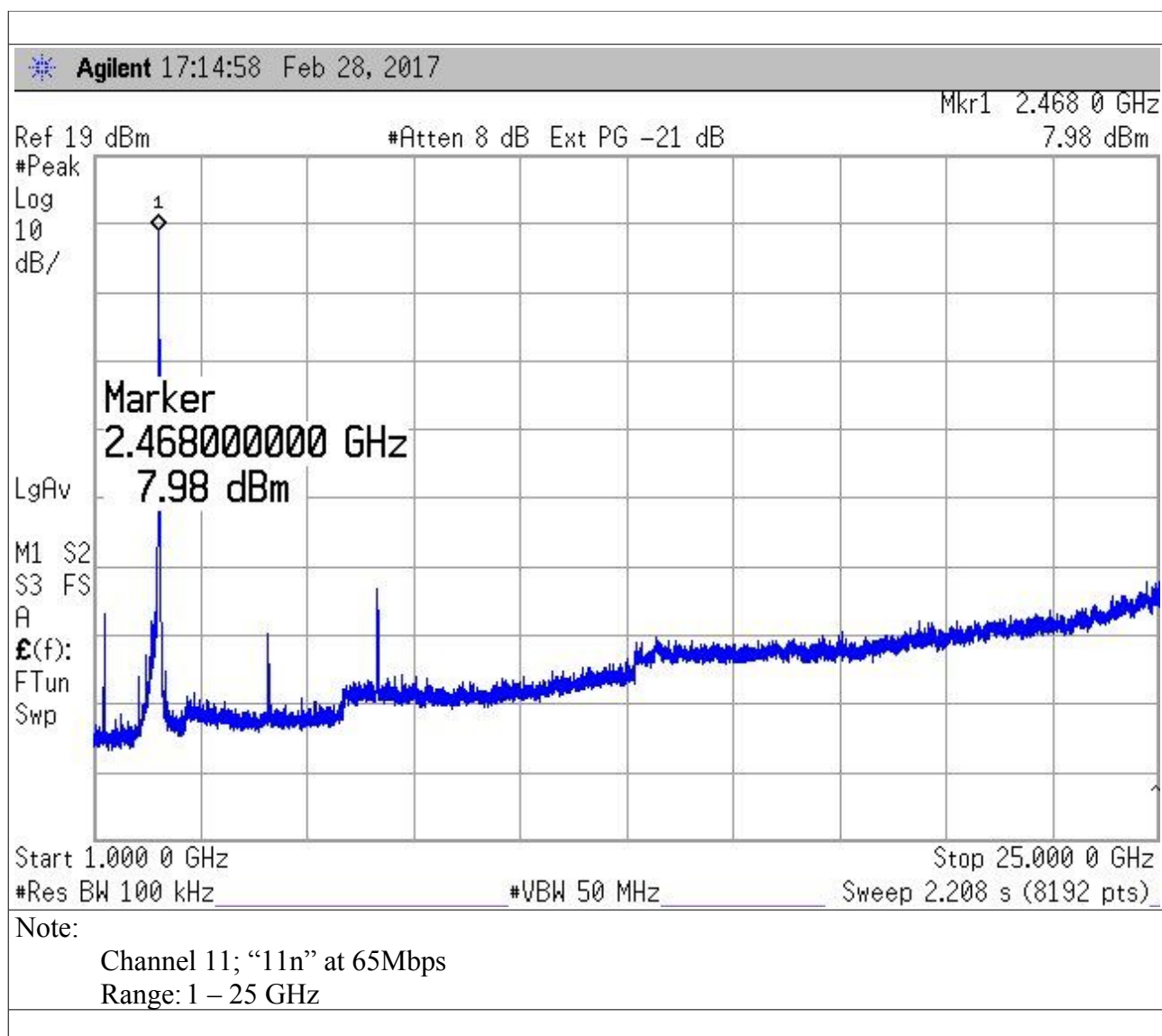
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7. PEAK POWER SPECTRAL DENSITY

Equipment shall meet the limits below .

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DATE
EMI Receiver	Agilent	E4440A	01/2018

Test procedure: APR01

Test performed on low, middle and high channels and in the b, g and n protocols at maximum data rate for each protocol.

Results:

No non-compliance noted

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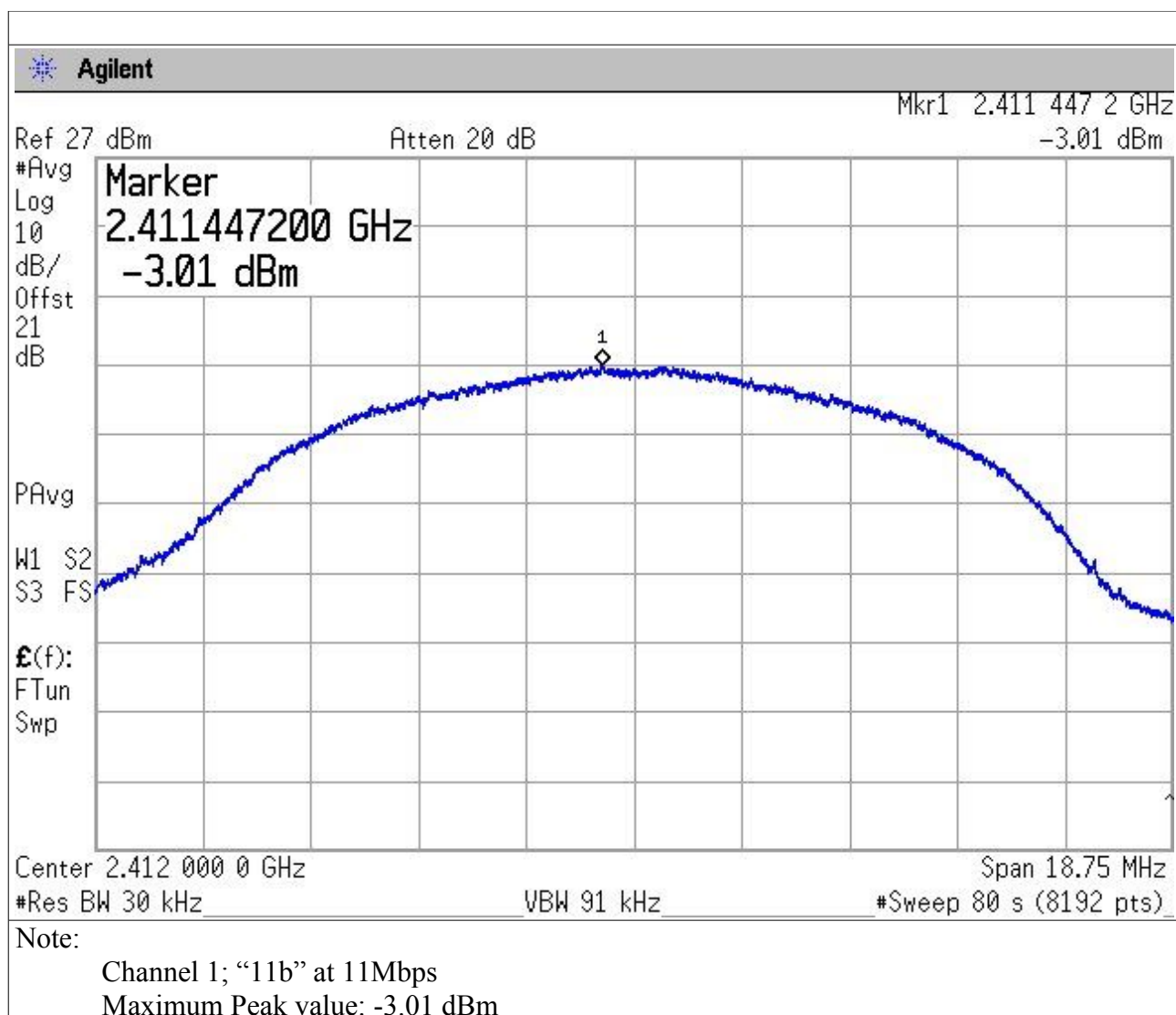
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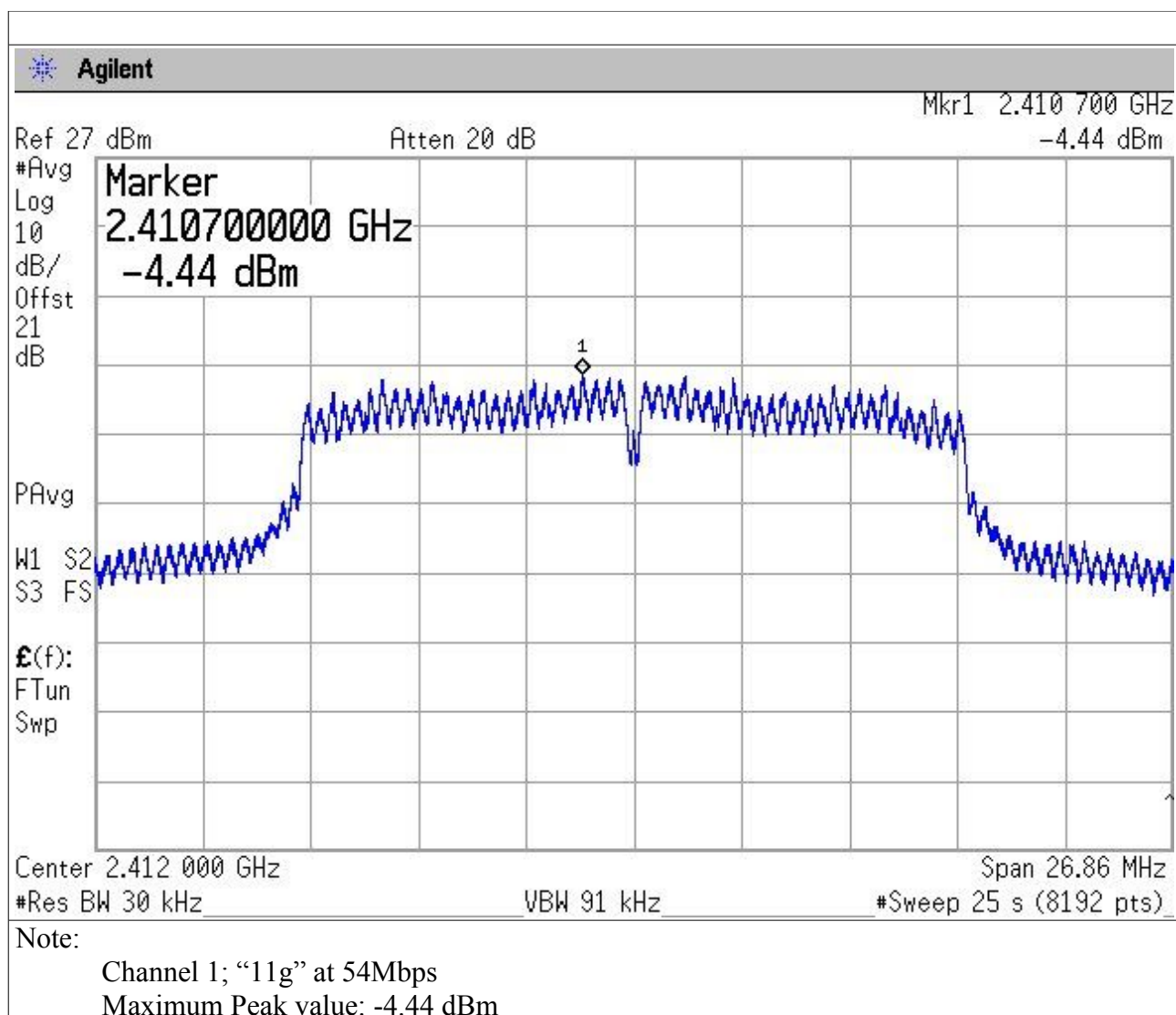
802.11b Mode, 11 Mbs (Duty Cycle: 90.3%; Total On/Off period: 956.7 μ s)						
Channel	Frequency (MHz)	Max Peak (dBm)	10 Log(1/DC) (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.01	0.45	-2.56	8	-10.56
Mid	2437	-4.44	0.45	-3.99	8	-11.99
High	2462	-3.72	0.45	-3.27	8	-11.27
802.11g Mode, 54 Mbs (Duty Cycle: 64.8%; Total On/Off period: 280.7 μ s)						
Channel	Frequency (MHz)	Max Peak (dBm)	10 Log(1/DC) (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.76	1.89	-1.87	8	-9.87
Mid	2437	-5.07	1.89	-3.18	8	-11.18
High	2462	-4.84	1.89	-2.95	8	-10.95
802.11n Mode, 65 Mbs (Duty Cycle: 63.1%; Total On/Off period: 268.9 μ s)						
Channel	Frequency (MHz)	Max Peak (dBm)	10 Log(1/DC) (dB)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.36	2	-2.36	8	-10.36
Mid	2437	-5.97	2	-3.97	8	-11.97
High	2462	-5.55	2	-3.55	8	-11.55
The following figures show the results.						

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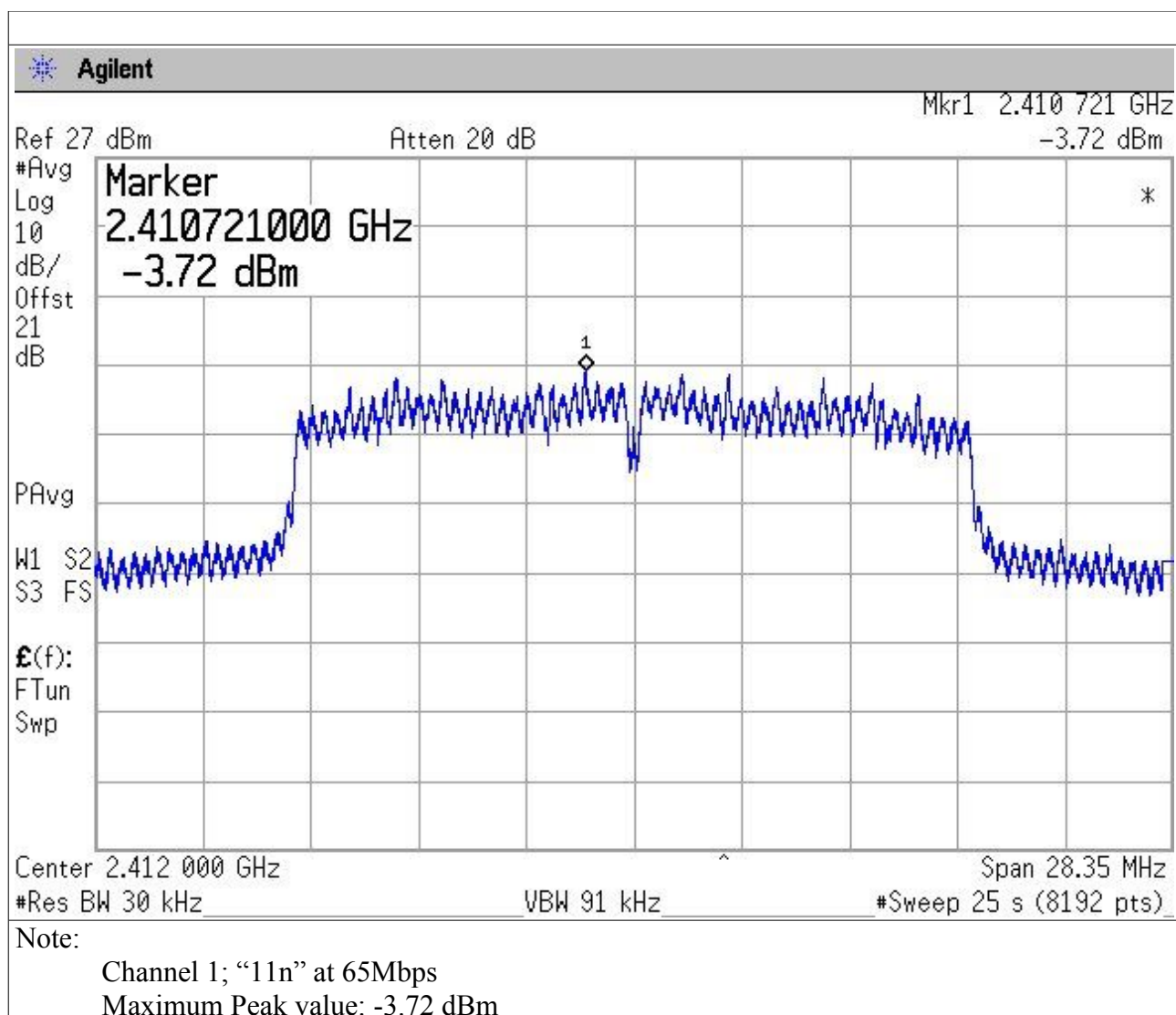


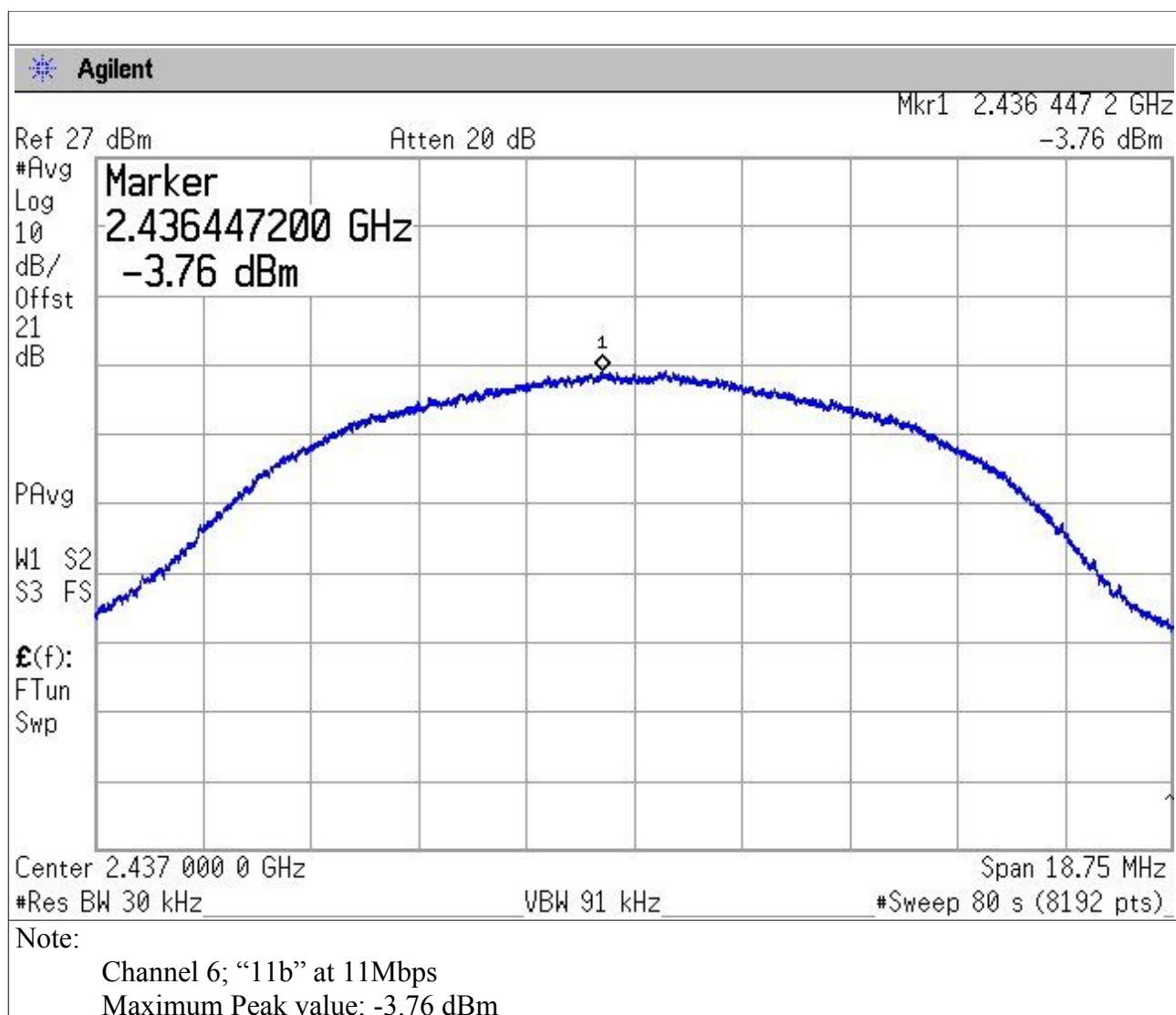


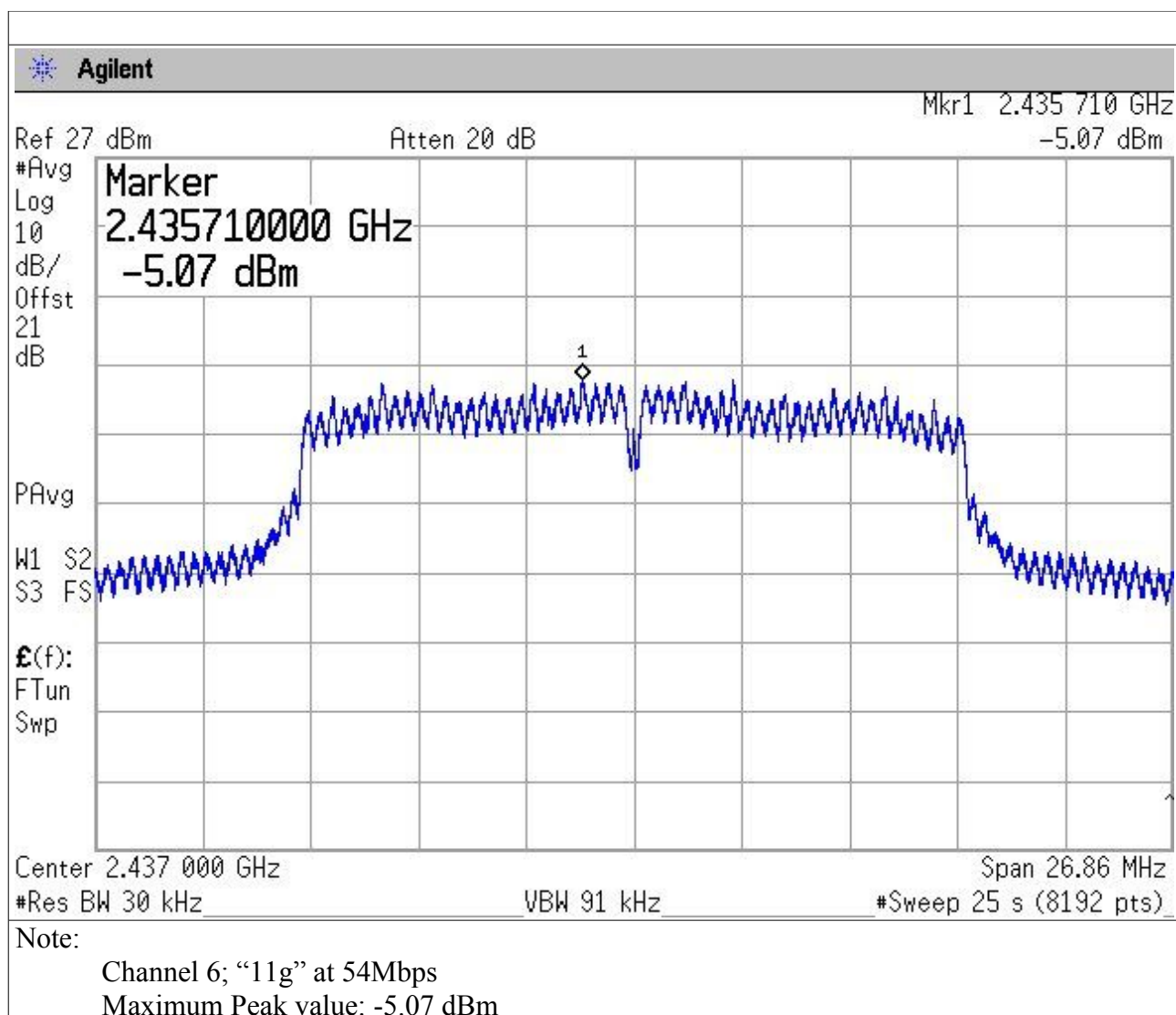
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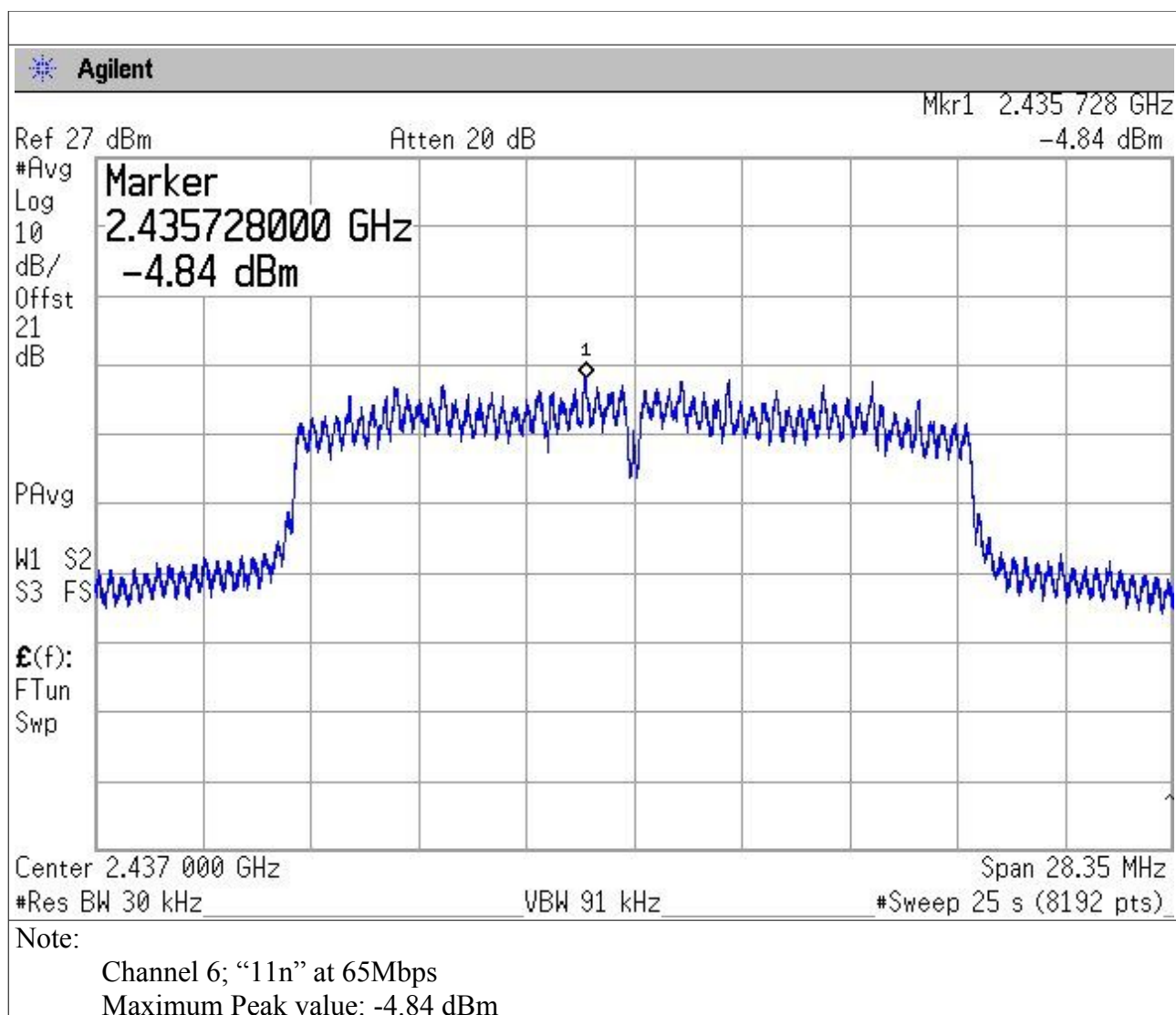




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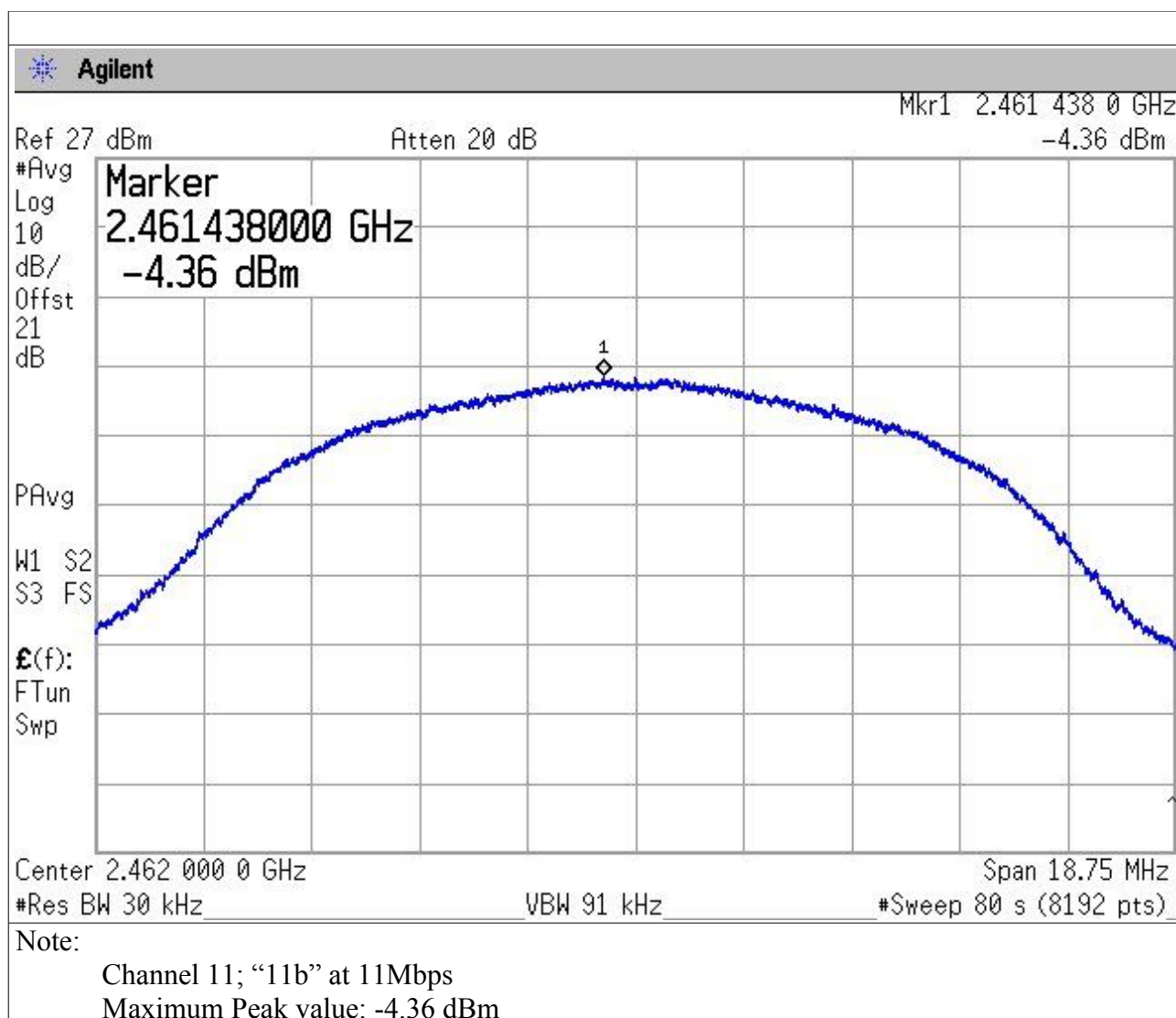
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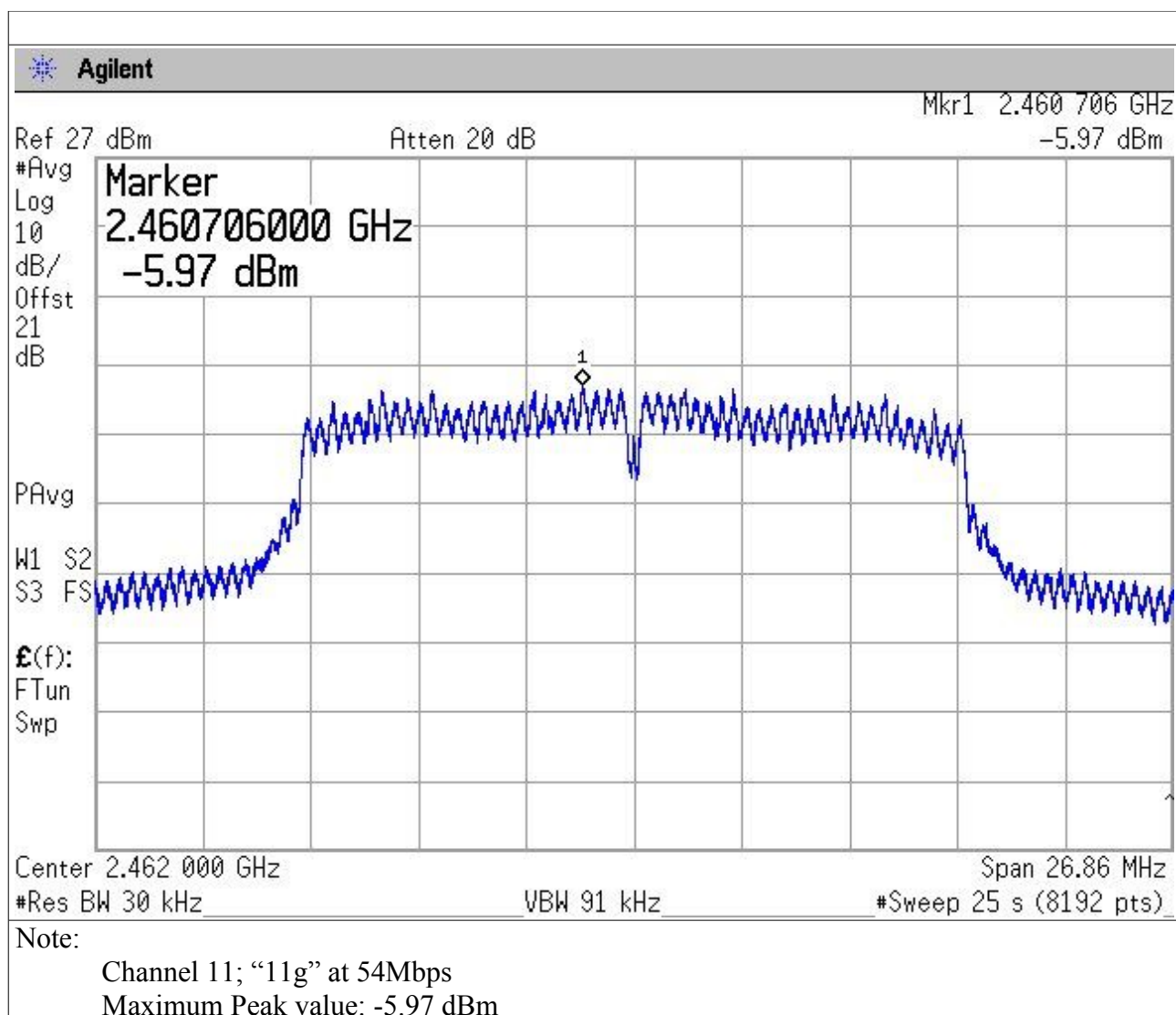


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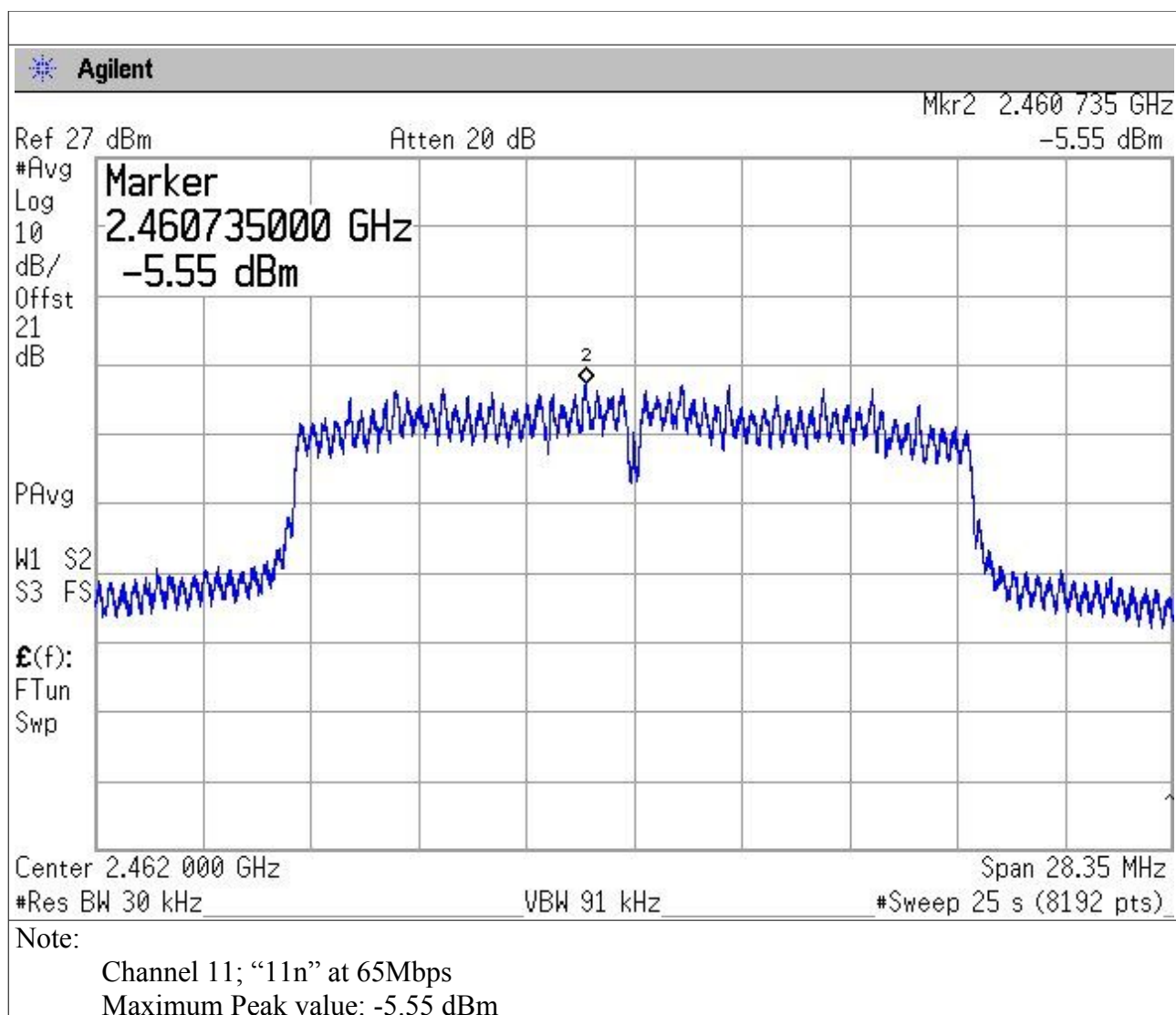




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8. RADIATED EMISSIONS

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

FCC

<i>DISTANCE (m)</i>	<i>FREQUENCY RANGE (MHz)</i>	<i>QUASI-PEAK LIMITS [dB (μV/m)]</i>	<i>PEAK LIMITS [dB (μV/m)]</i>	<i>AVERAGE LIMITS [dB (μV/m)]</i>
300	0.009 – 0.49	48.52 – 13.8	--	--
30	0.49 – 1.705	33.8 – 22.97	--	--
30	1.705 – 30	29.54	--	--
3	30 – 88	40	--	--
3	88 – 216	43.5	--	--
3	216 – 960	46	--	--
3	960 – 1000	54	--	--
3	Above 1000	--	74	54

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DATE
EMI Receiver	HP	HP8546A	01/2018
EMI Receiver Filter Section	HP	HP85460A	01/2018
EMI Receiver	Agilent	E4440A	01/2018
EMI Receiver Filter Section	Agilent	N9039A	01/2018
Anechoic Chamber	Comtest	CSA01	01/2018
Horn Antenna (1-18 GHz)	EMCO	3115	01/2018
Loop Antenna	EMCO	6512	01/2018
Horn Antenna (18-26.5 GHz)	Alpha Ind. Inc.	100655A	01/2018
Bilog Antenna	Schaffner	CBL6112B	01/2018
Controller	Deisel	HD100	01/2018
Turn Table	Deisel	MA240	01/2018

Test procedure: RE22R02

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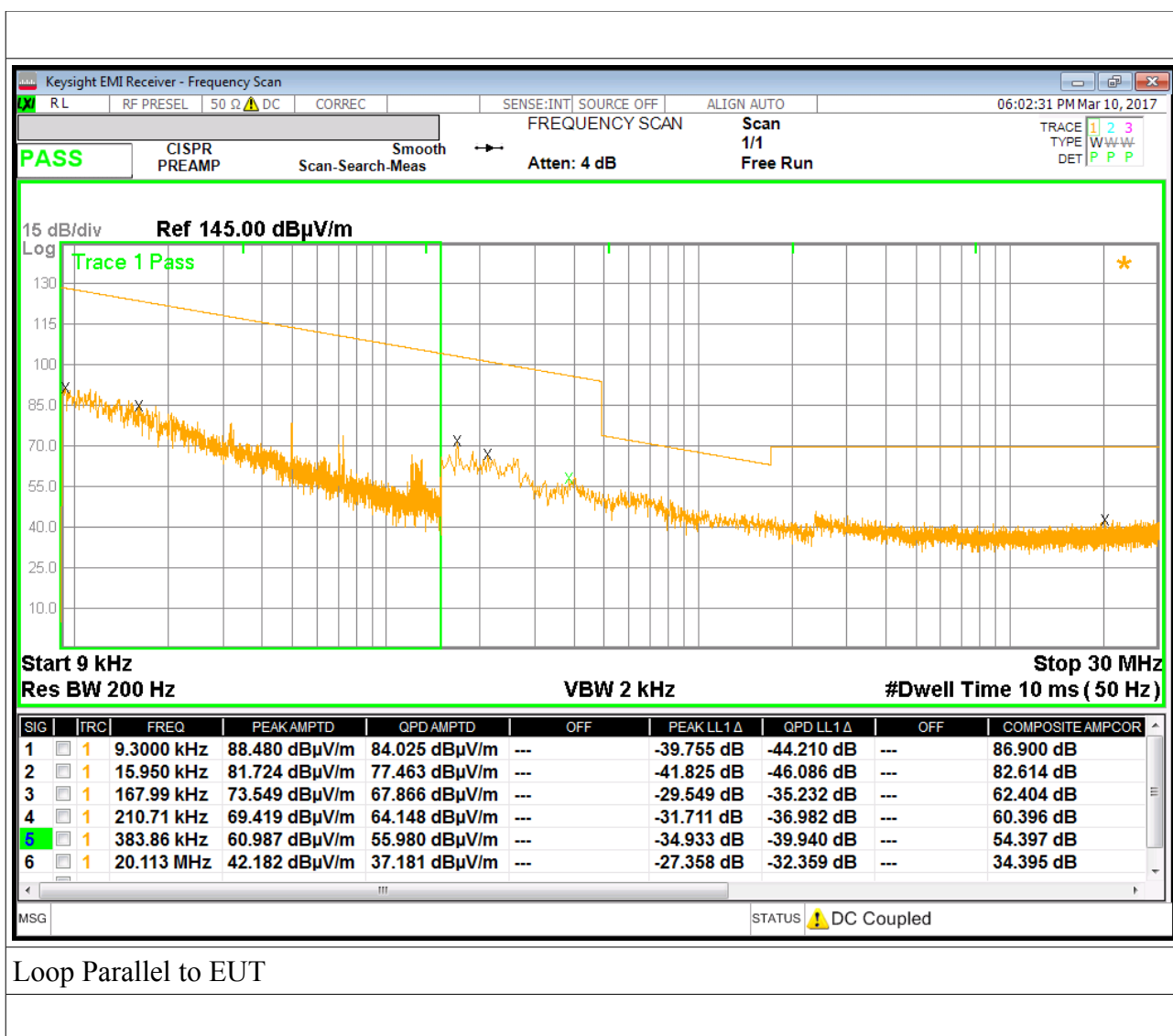
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<u>Notes</u>
Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument to be tested shows the front part turned towards the antenna. Positive grades individuate clockwise rotations of TT when this one is observed from the top. For negative degrees, TT rotation is 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 polarisation is indicated by POL=H.
Antenna vertical polarisation is indicated by POL=V.
Accordingly to reference standard, a limit relaxing factor equal to 20 dB for decade for measurements performed at 3 m has been used.
<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.

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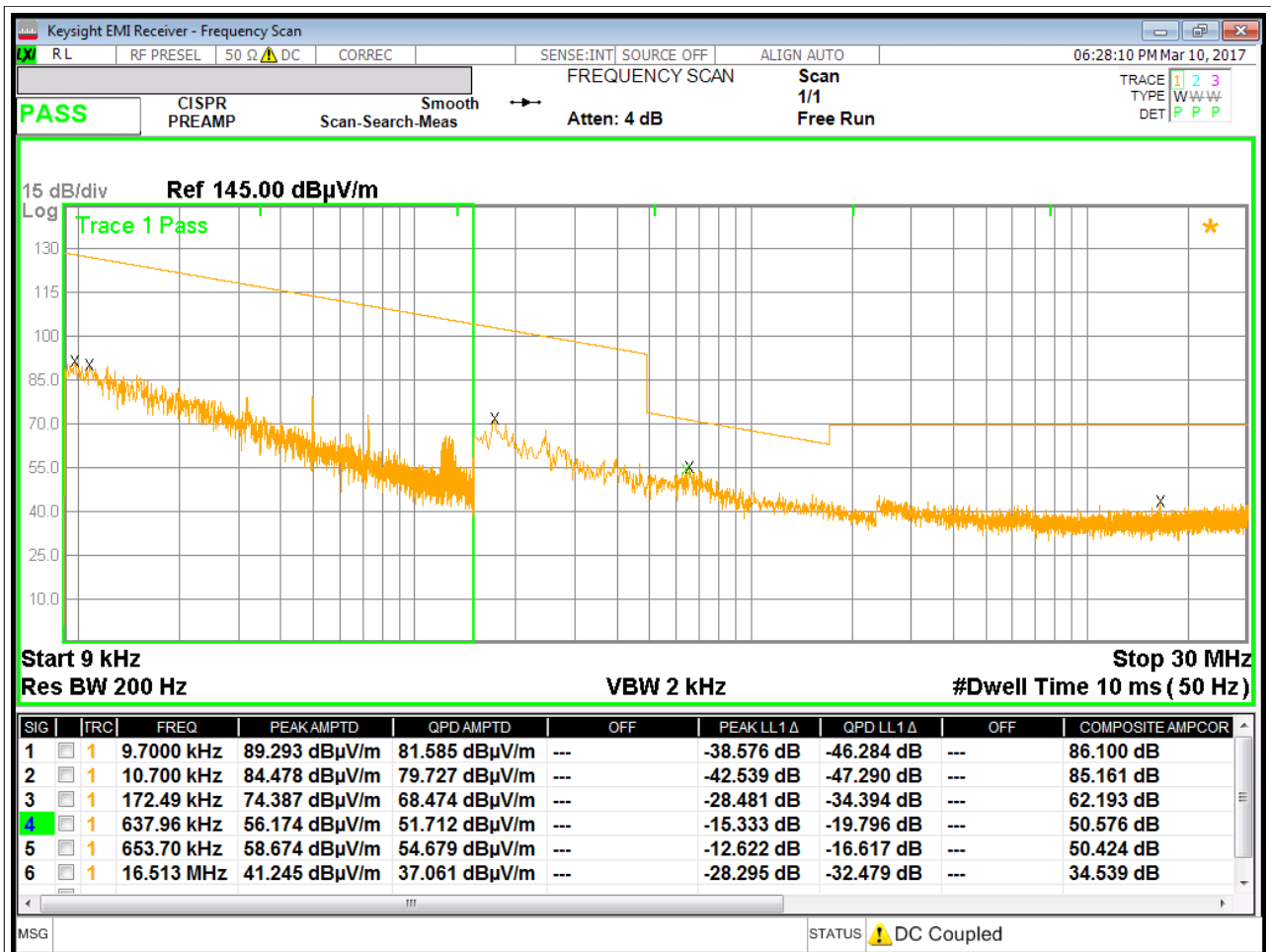
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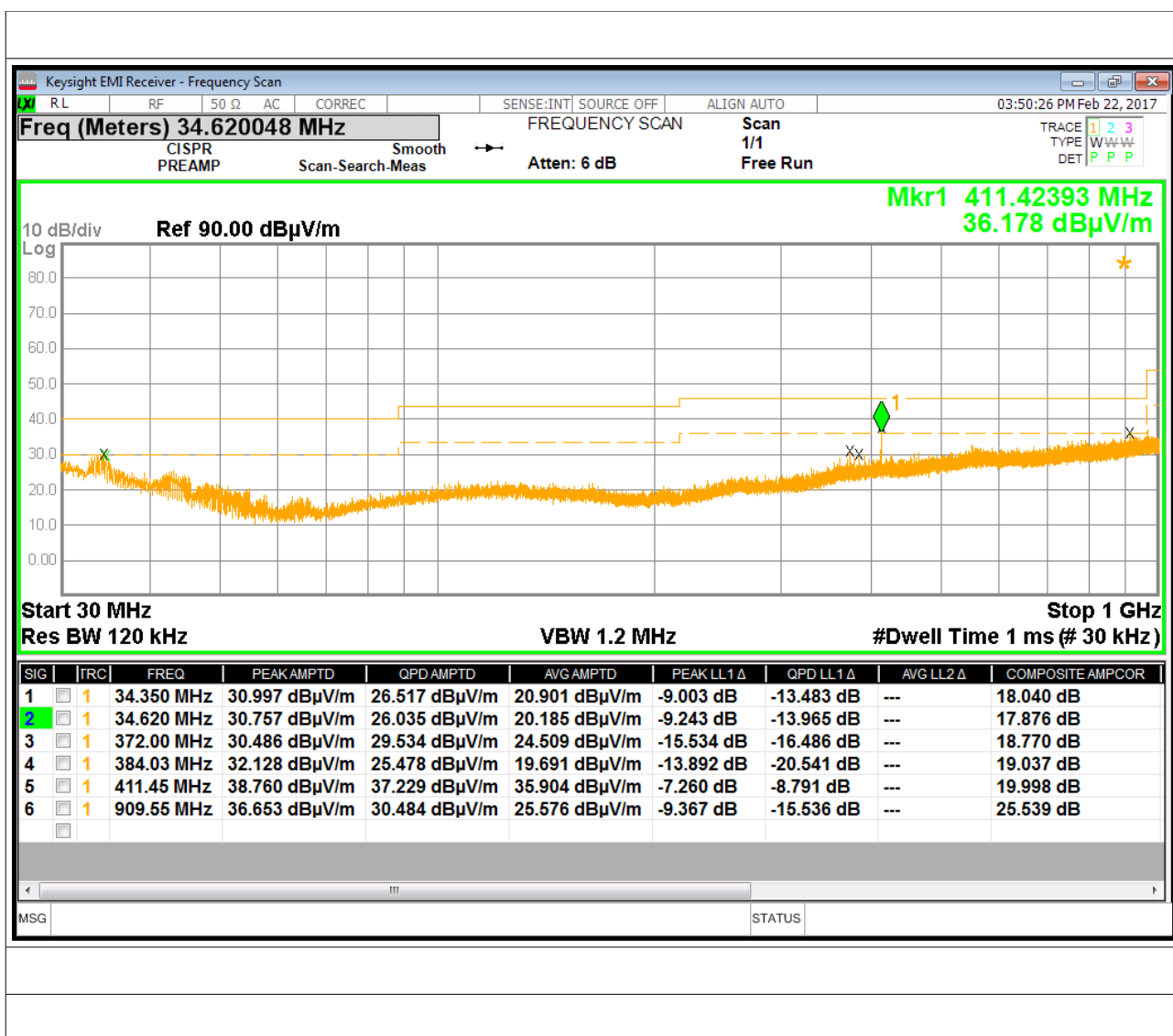


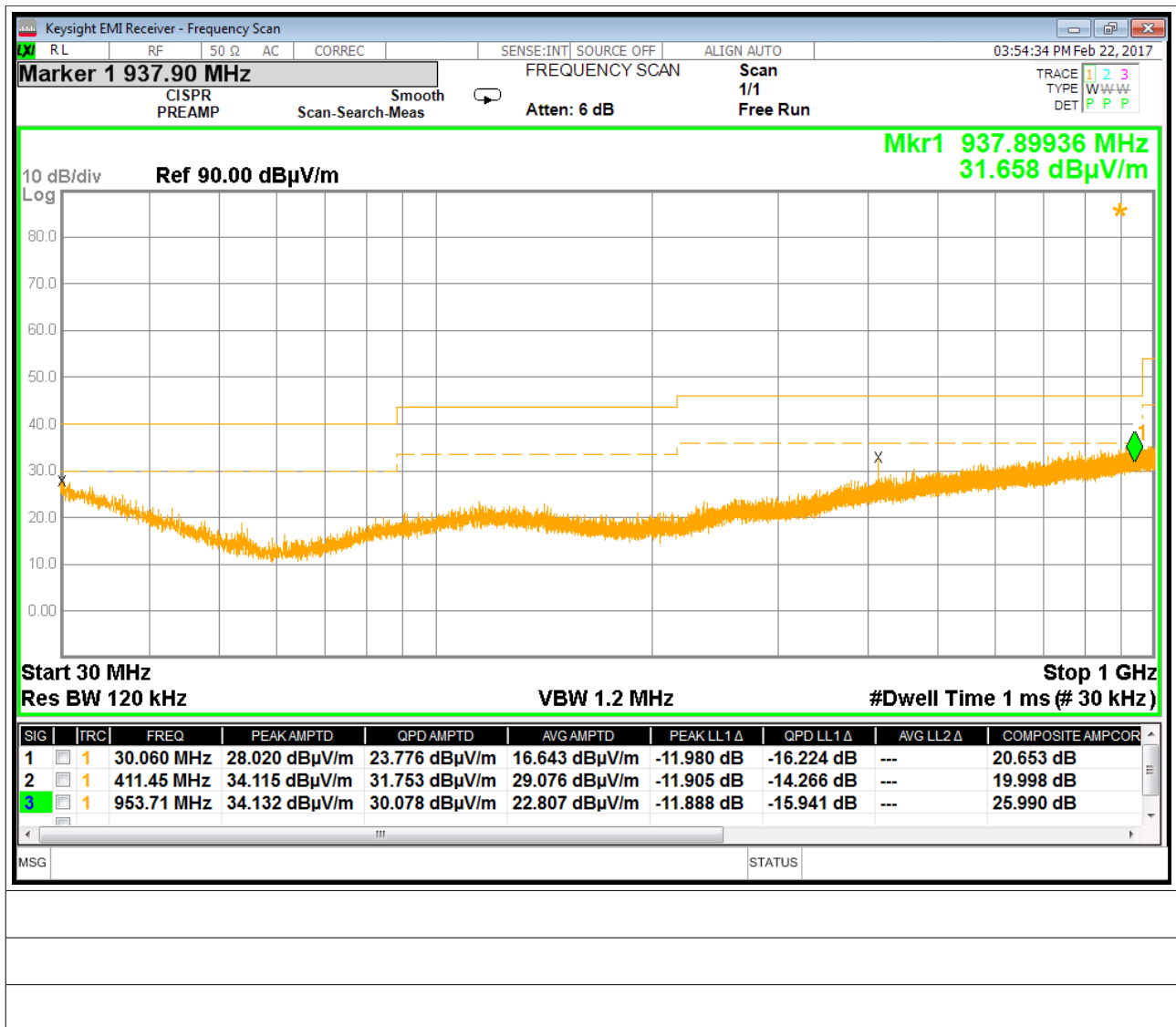
Loop Orthogonal to EUT

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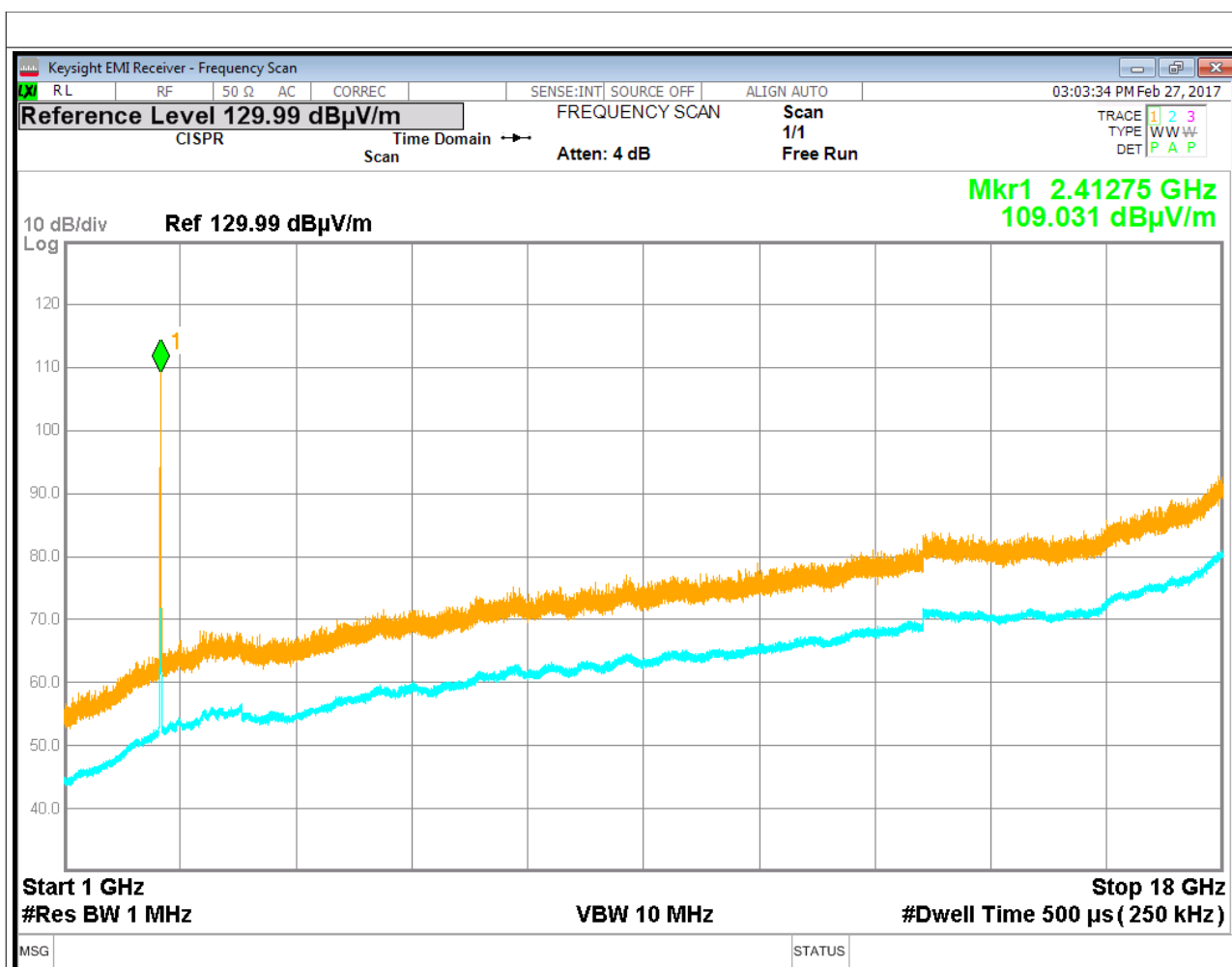




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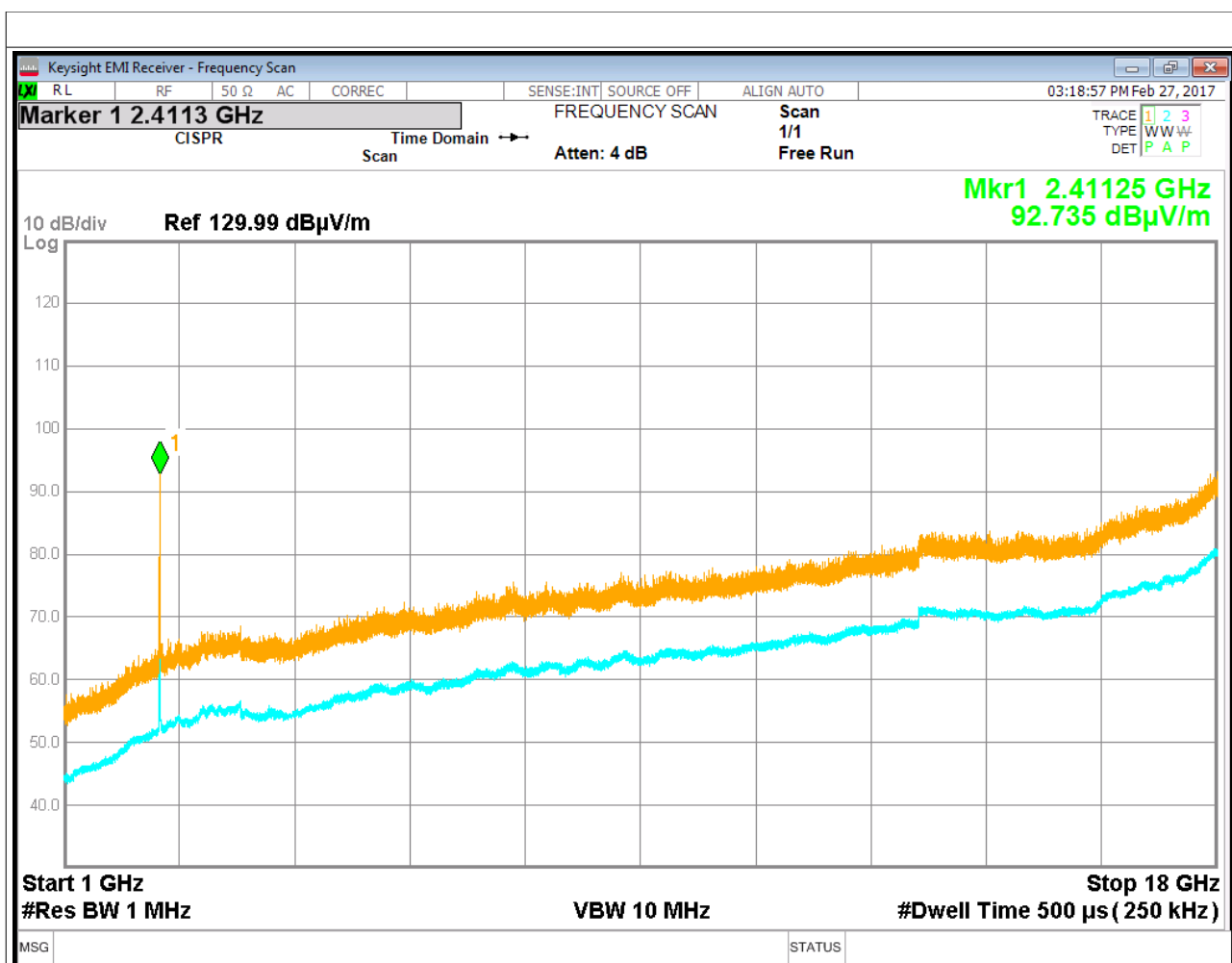
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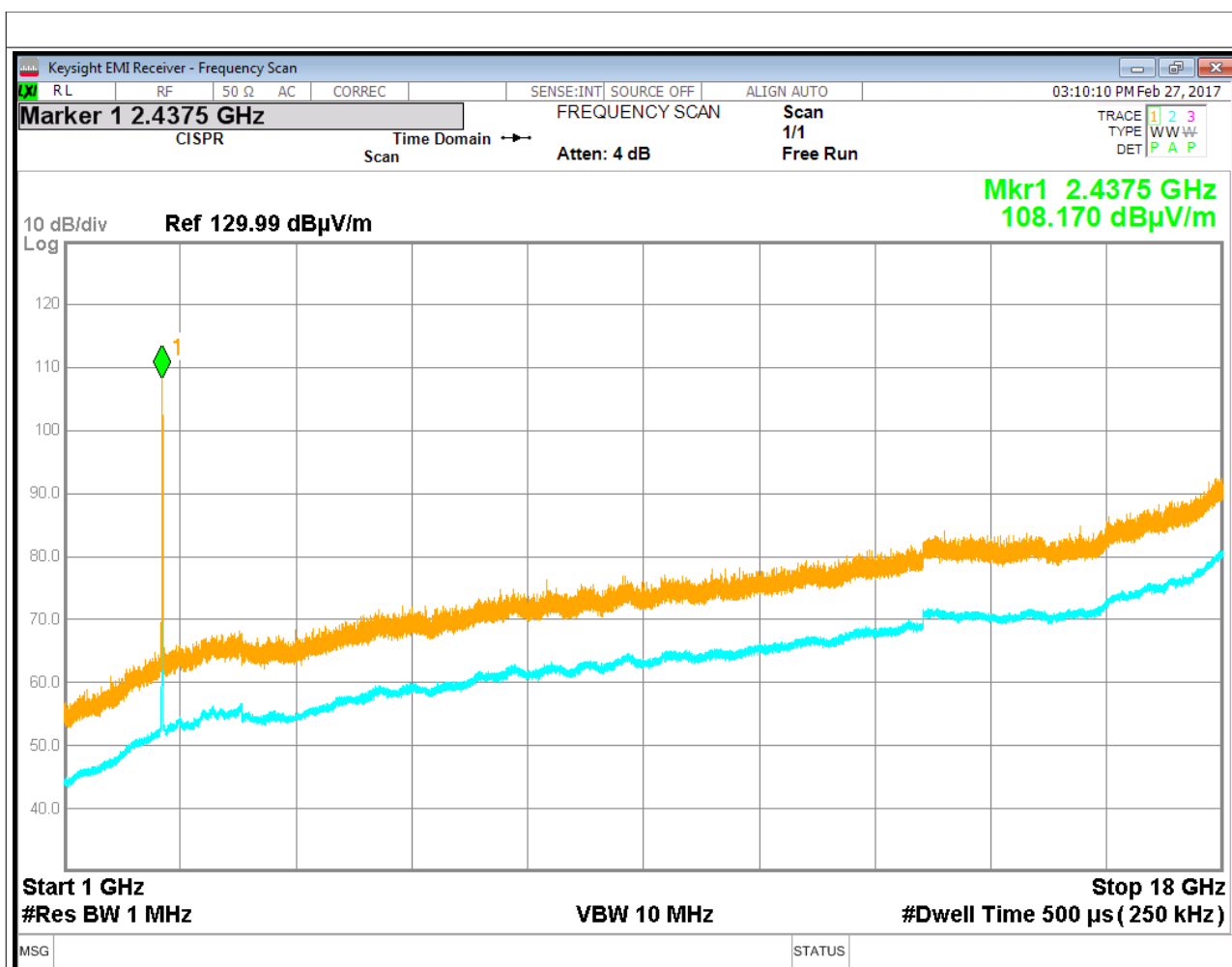
Note:

EUT
Pol. V
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 1
modulation type b
max speed (11 Mbps)



Note:

EUT
Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 1
modulation type b
max speed (11 Mbps)



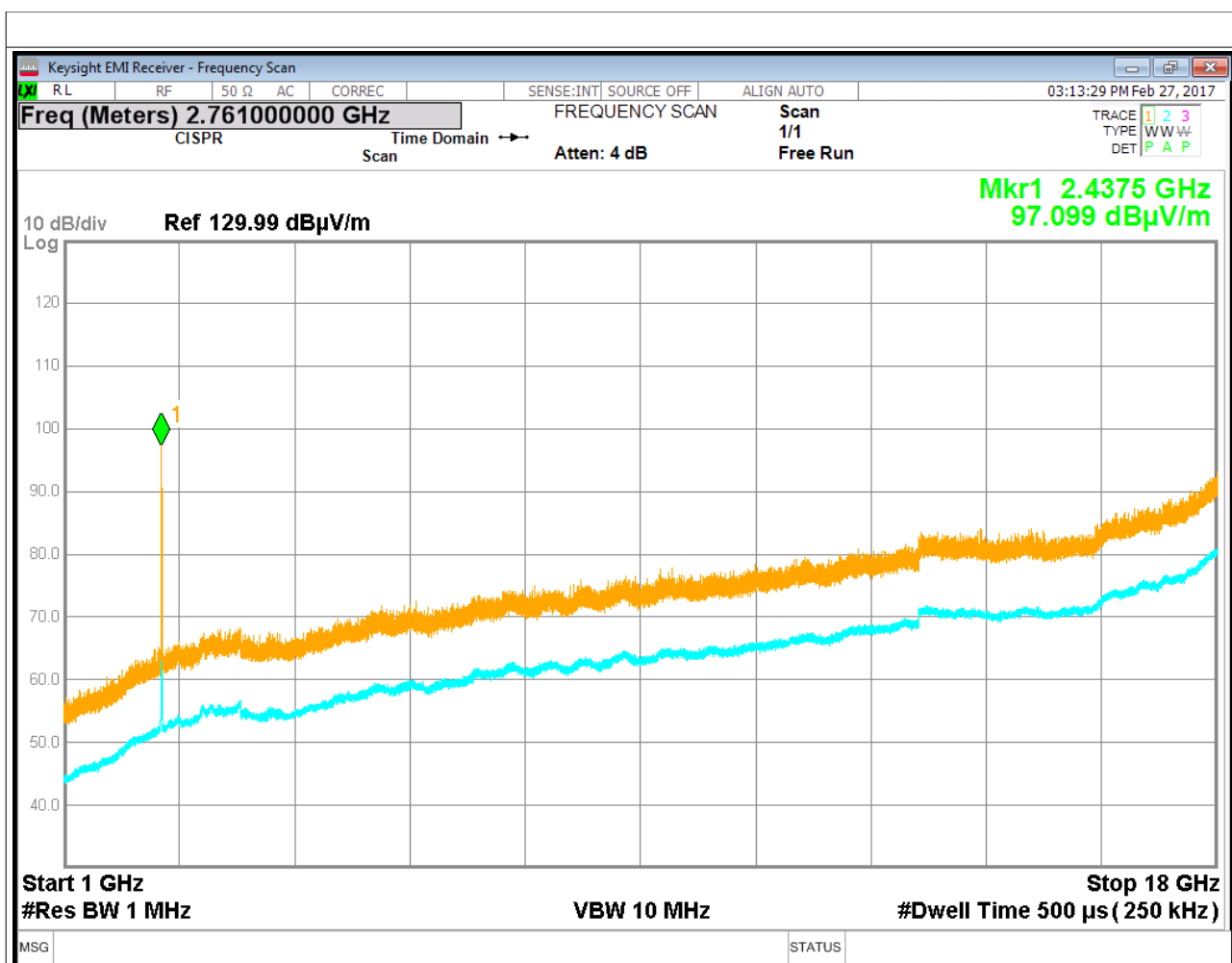
Note:

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Pol. V
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-
EUT mode: operative
Auxiliary apparatus: all ON
channel 6
modulation type b
max speed (11 Mbps)

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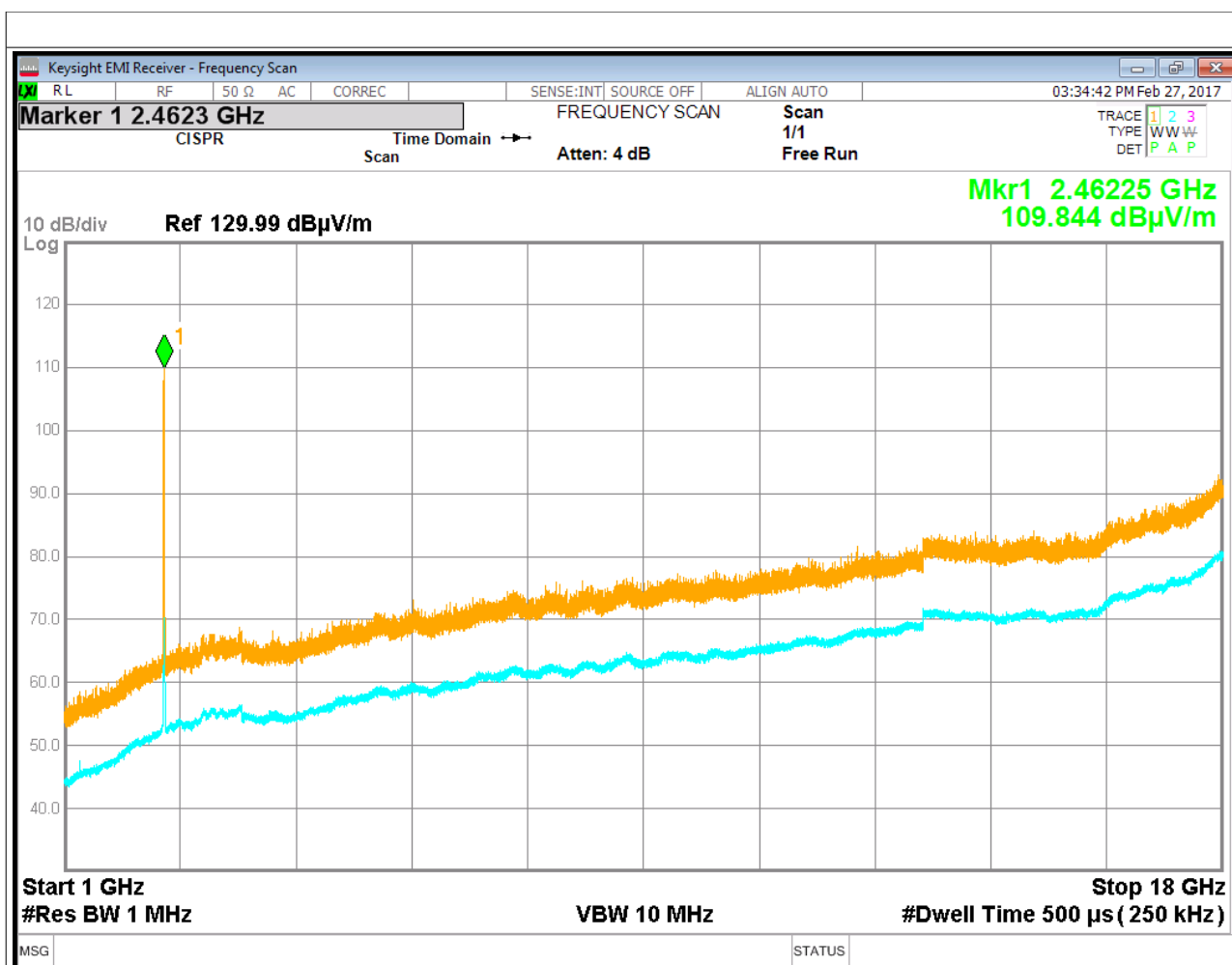
Note:

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Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 6
modulation type b
max speed (11 Mbps)

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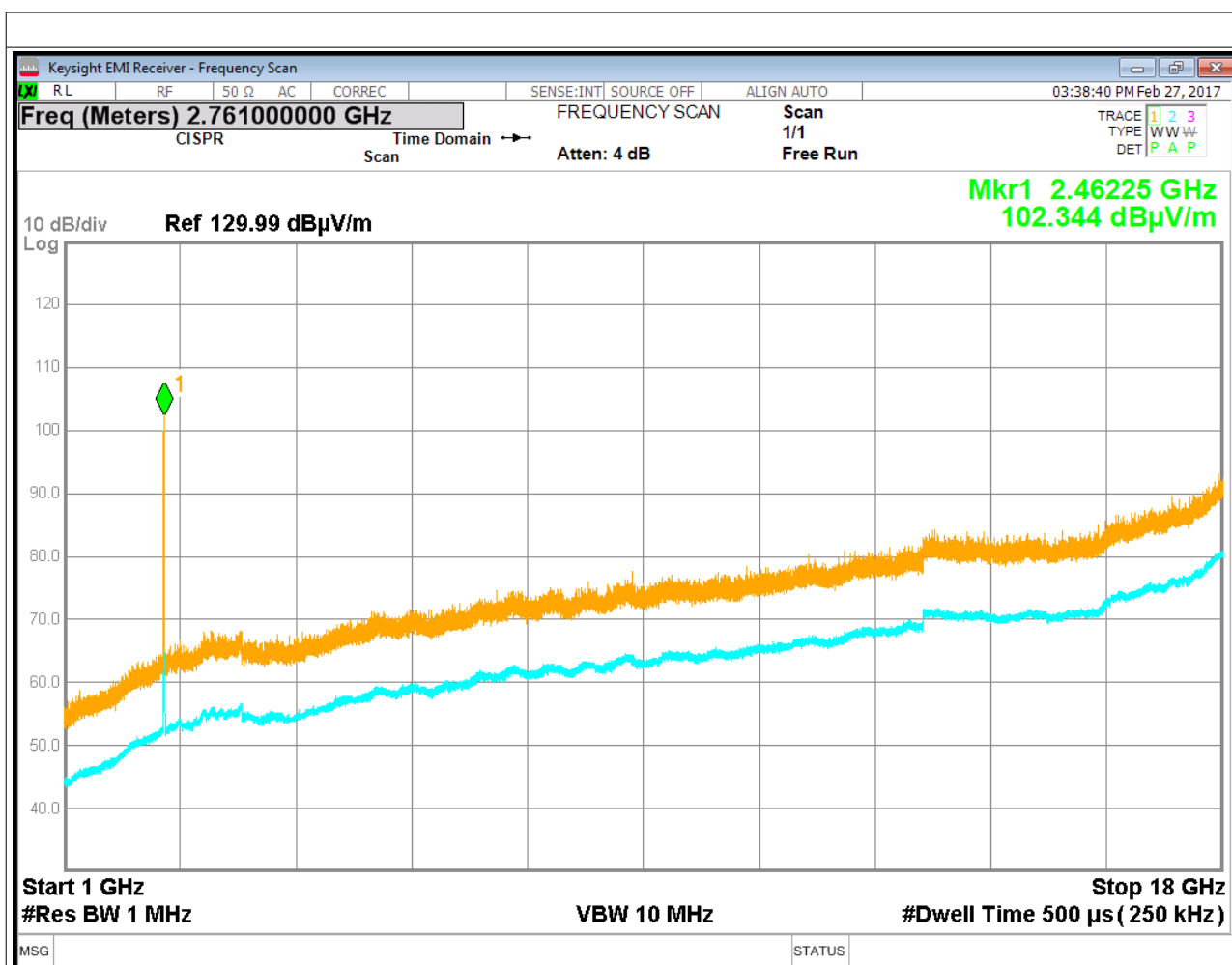
Note:

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Pol. V
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 11
modulation type b
max speed (11 Mbps)

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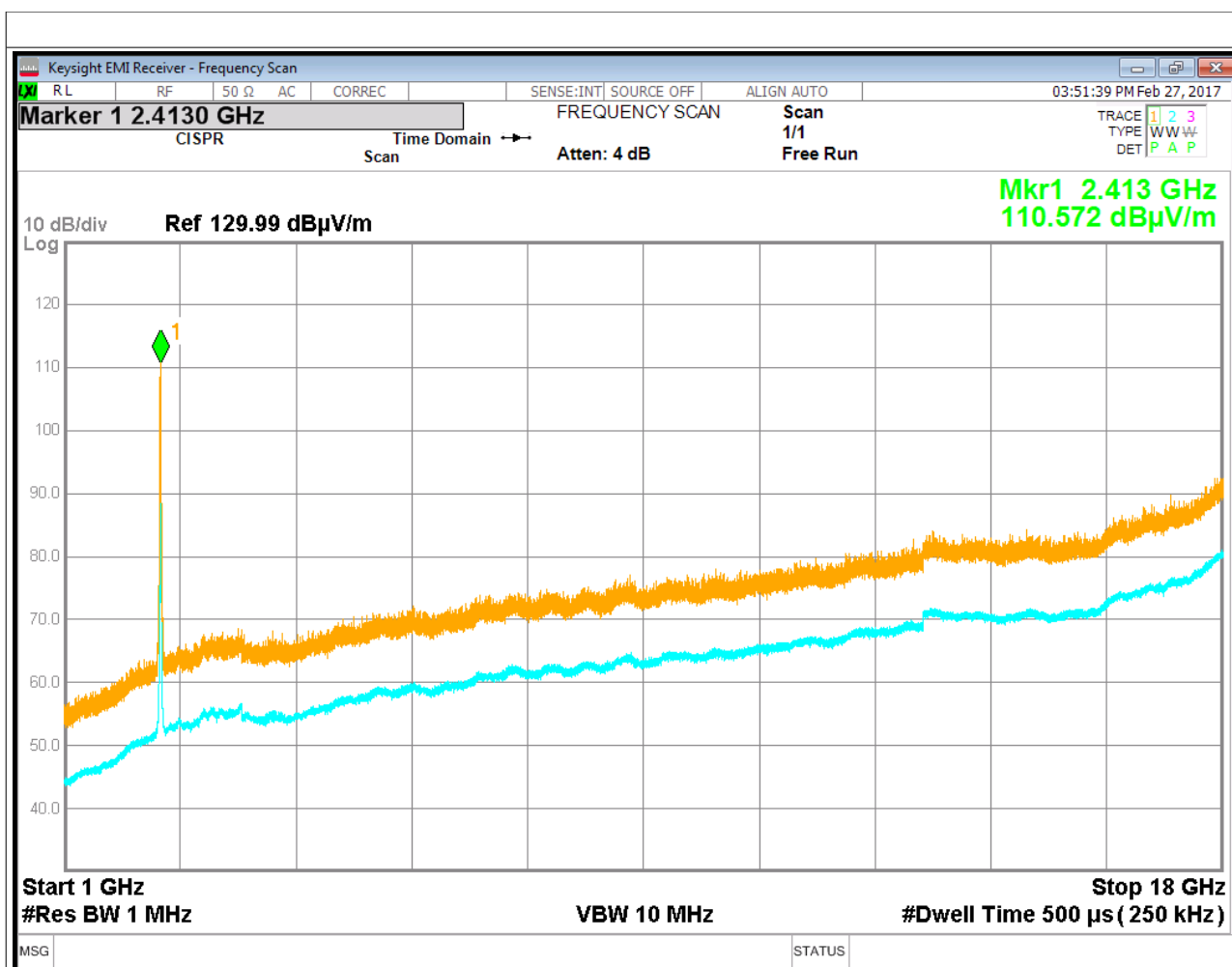
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Note:

EUT
Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 11
modulation type b
max speed (11 Mbps)



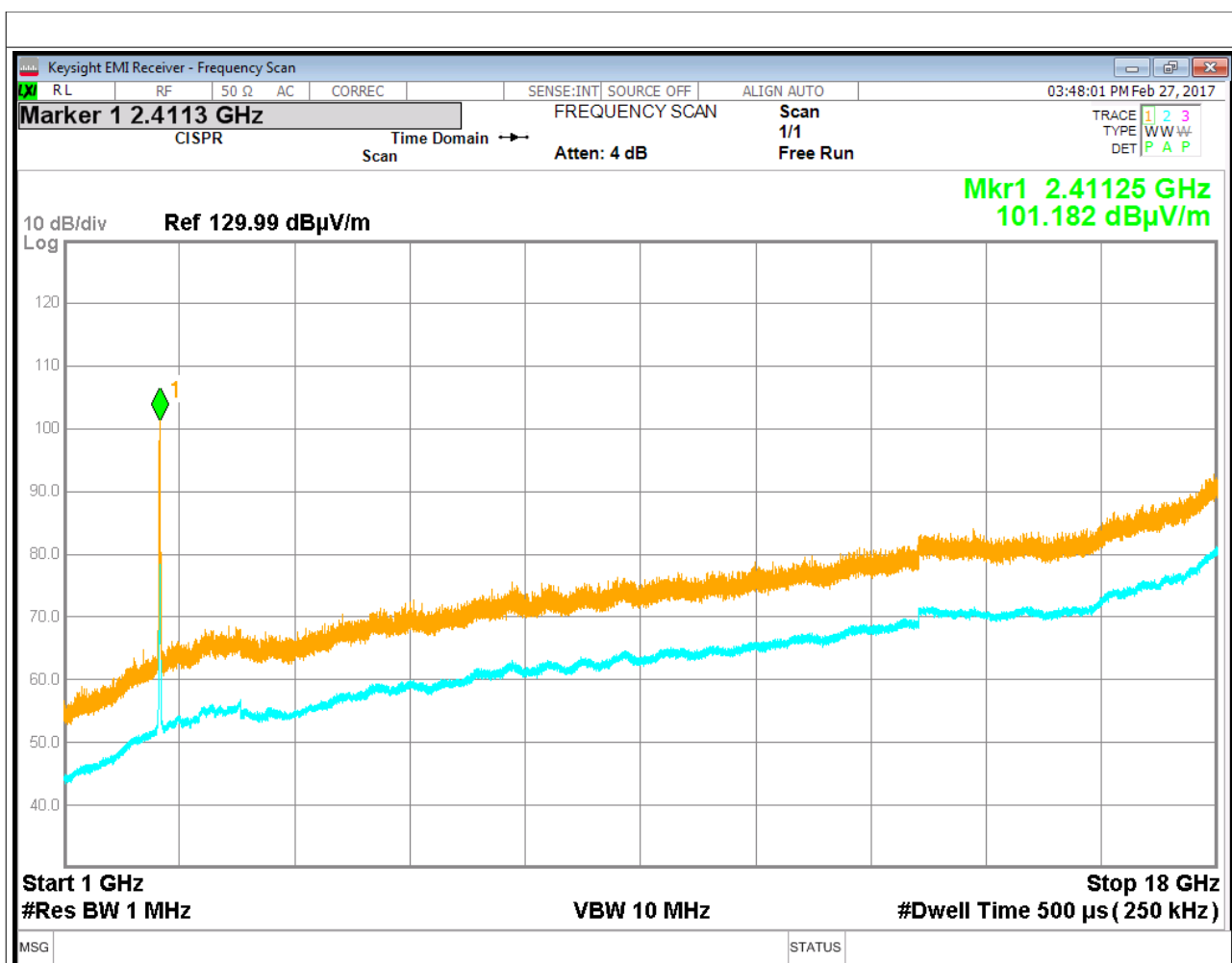
Note:

EUT
Pol. V
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 1
modulation type g
max speed (54 Mbps)

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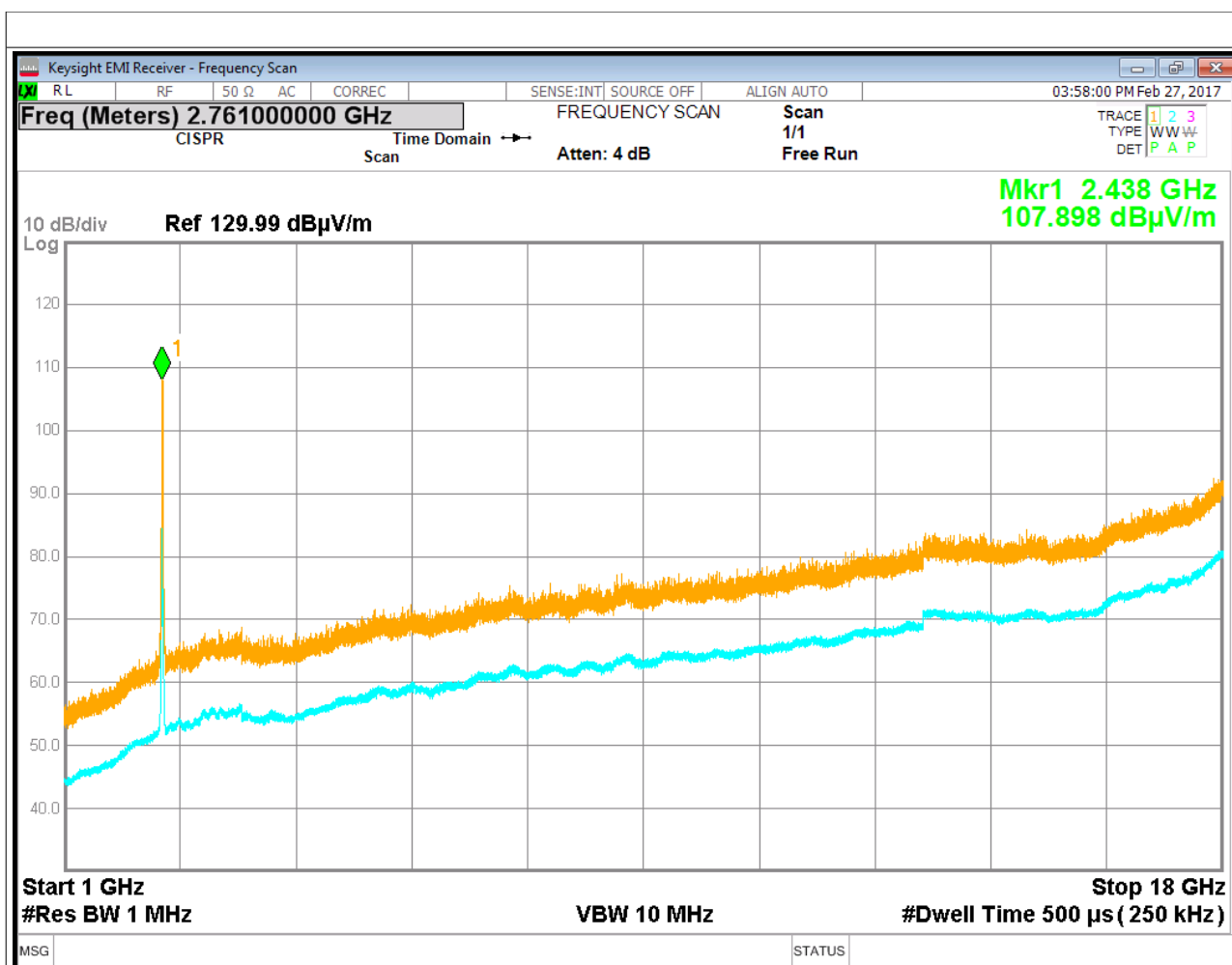
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Note:

EUT
Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 1
modulation type g
max speed (54 Mbps)



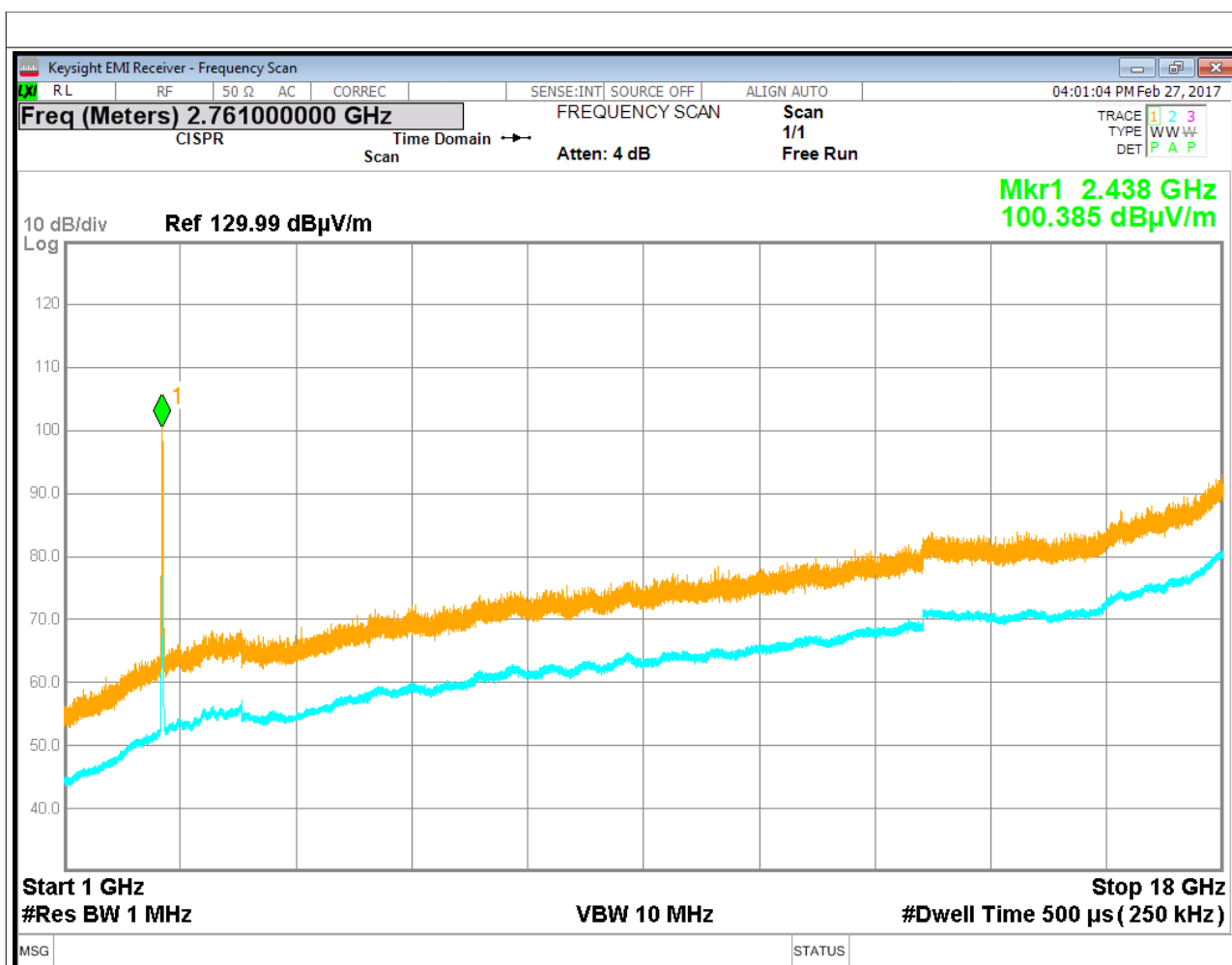
Note:

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Pol. V
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 6
modulation type g
max speed (54 Mbps)

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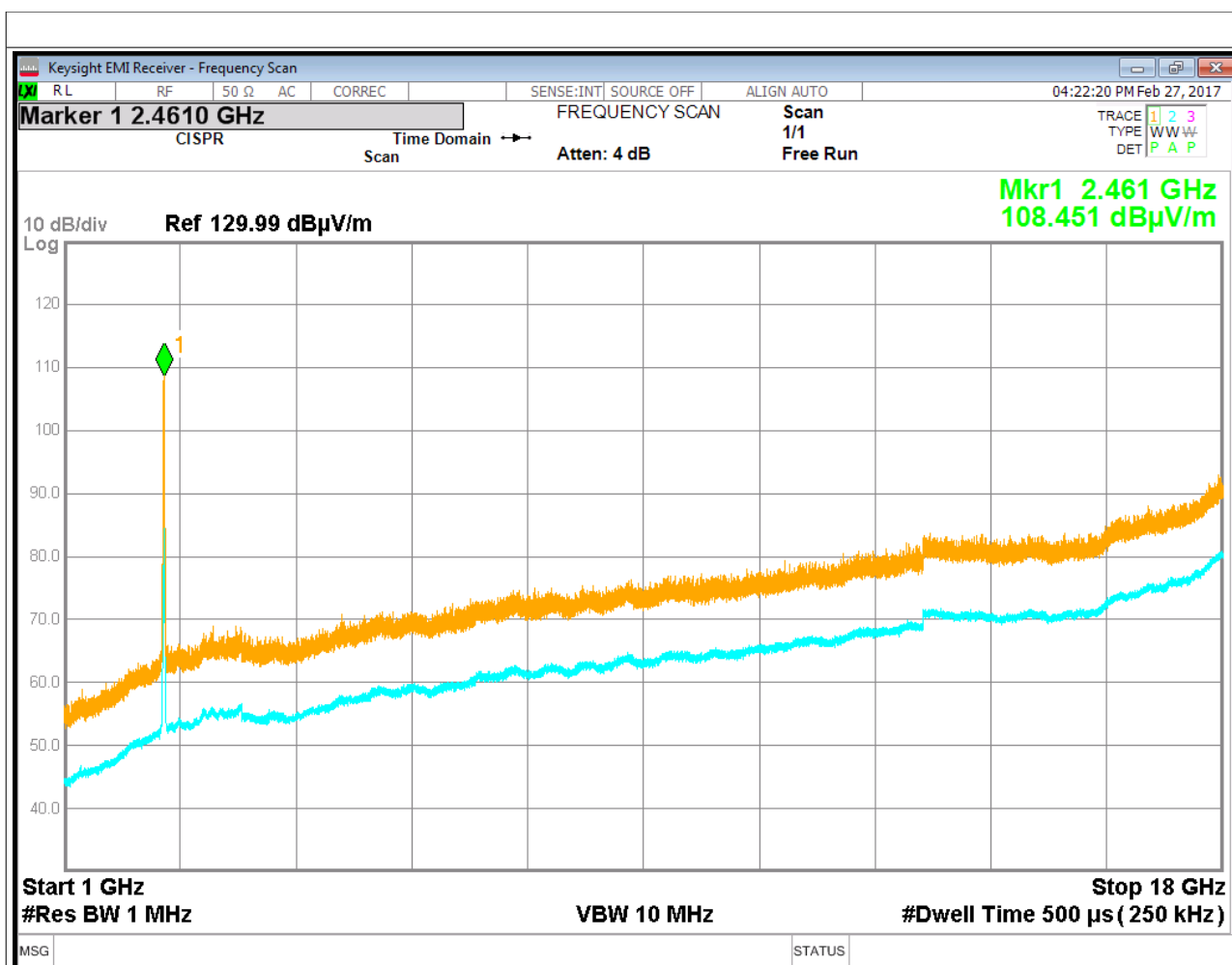
Note:

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-
EUT mode: operative
Auxiliary apparatus: all ON
channel 6
modulation type g
max speed (54 Mbps)

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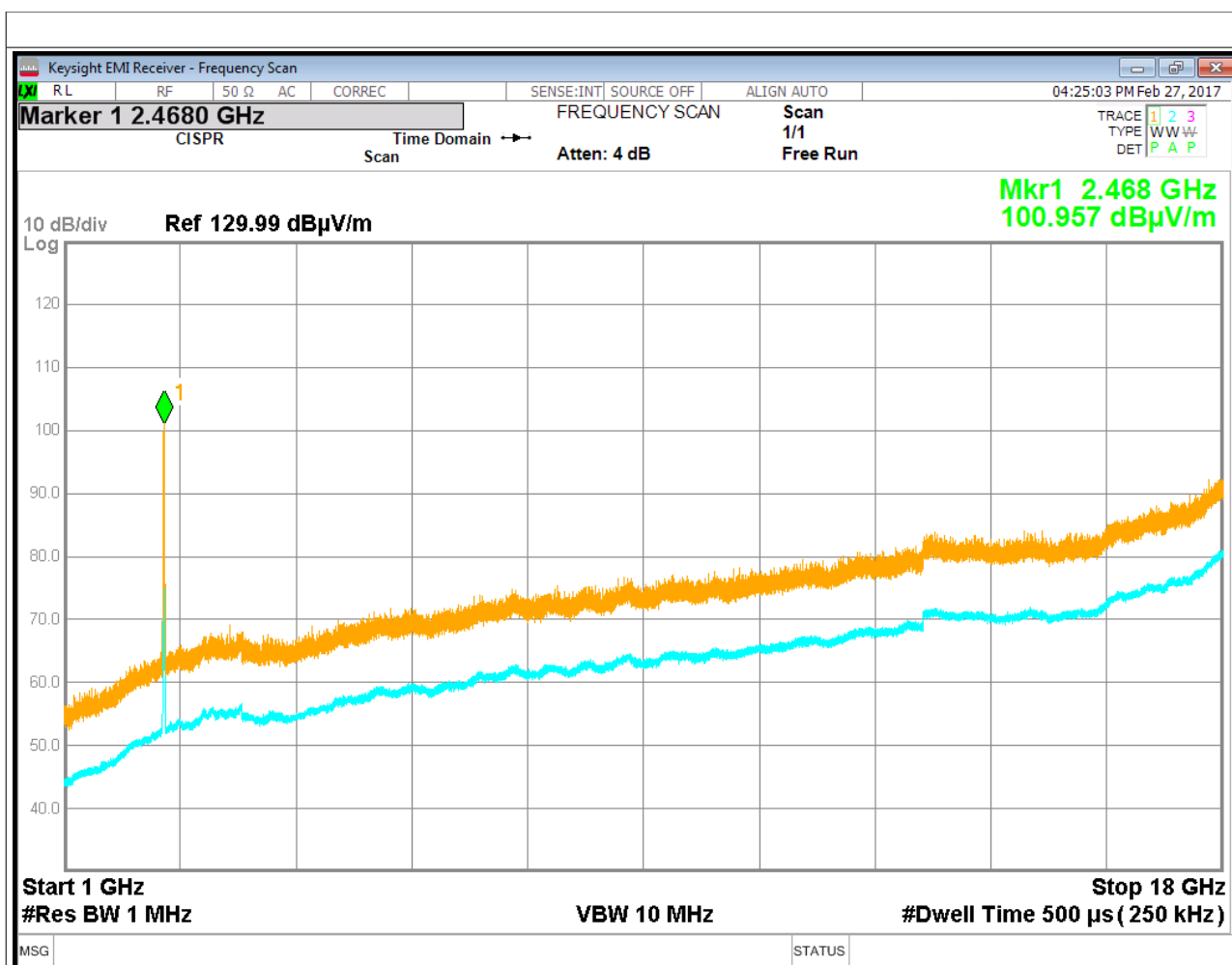
Note:

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-
EUT mode: operative
Auxiliary apparatus: all ON
channel 11
modulation type g
max speed (54 Mbps)

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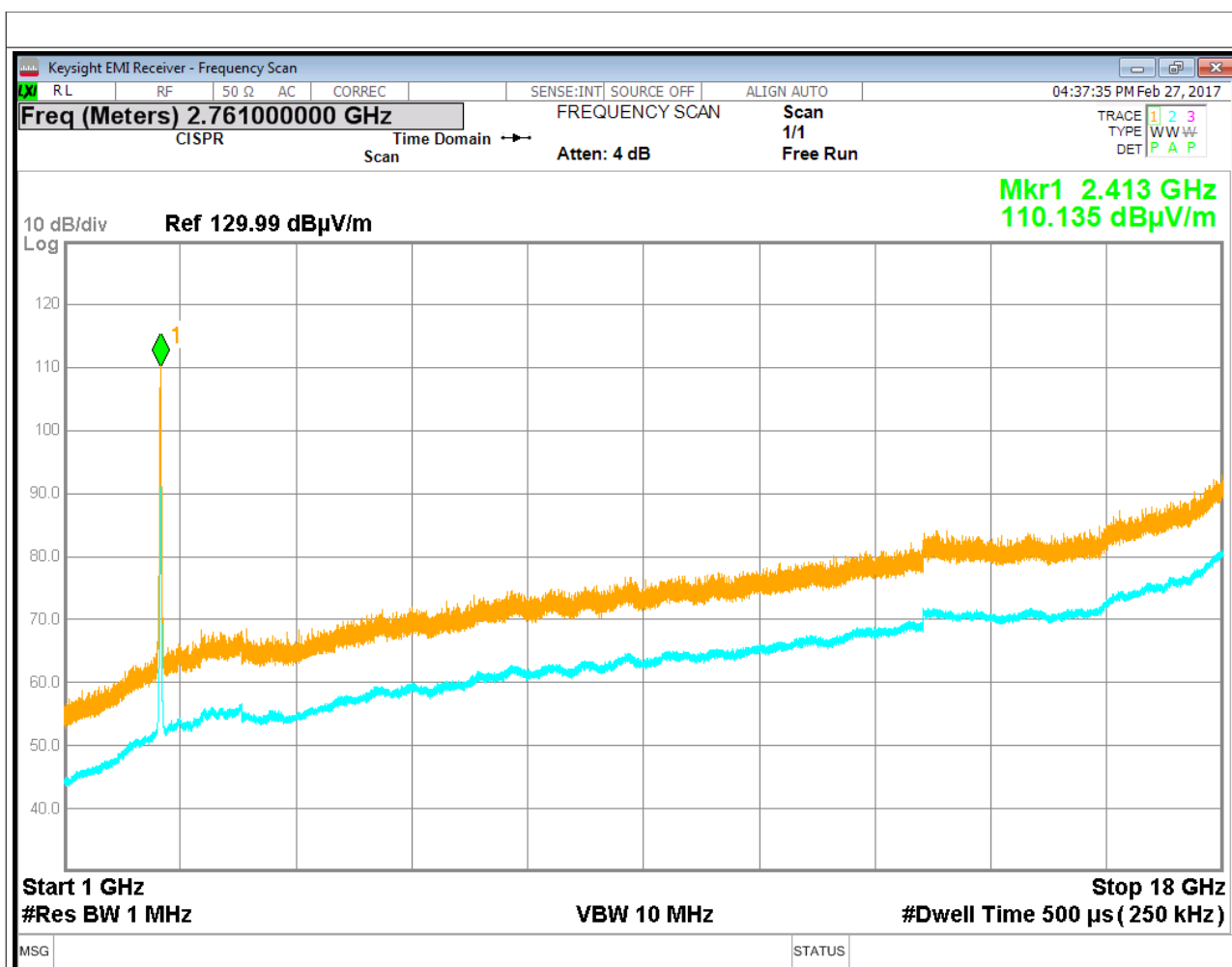
Note:

EUT
Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 11
modulation type g
max speed (54 Mbps)

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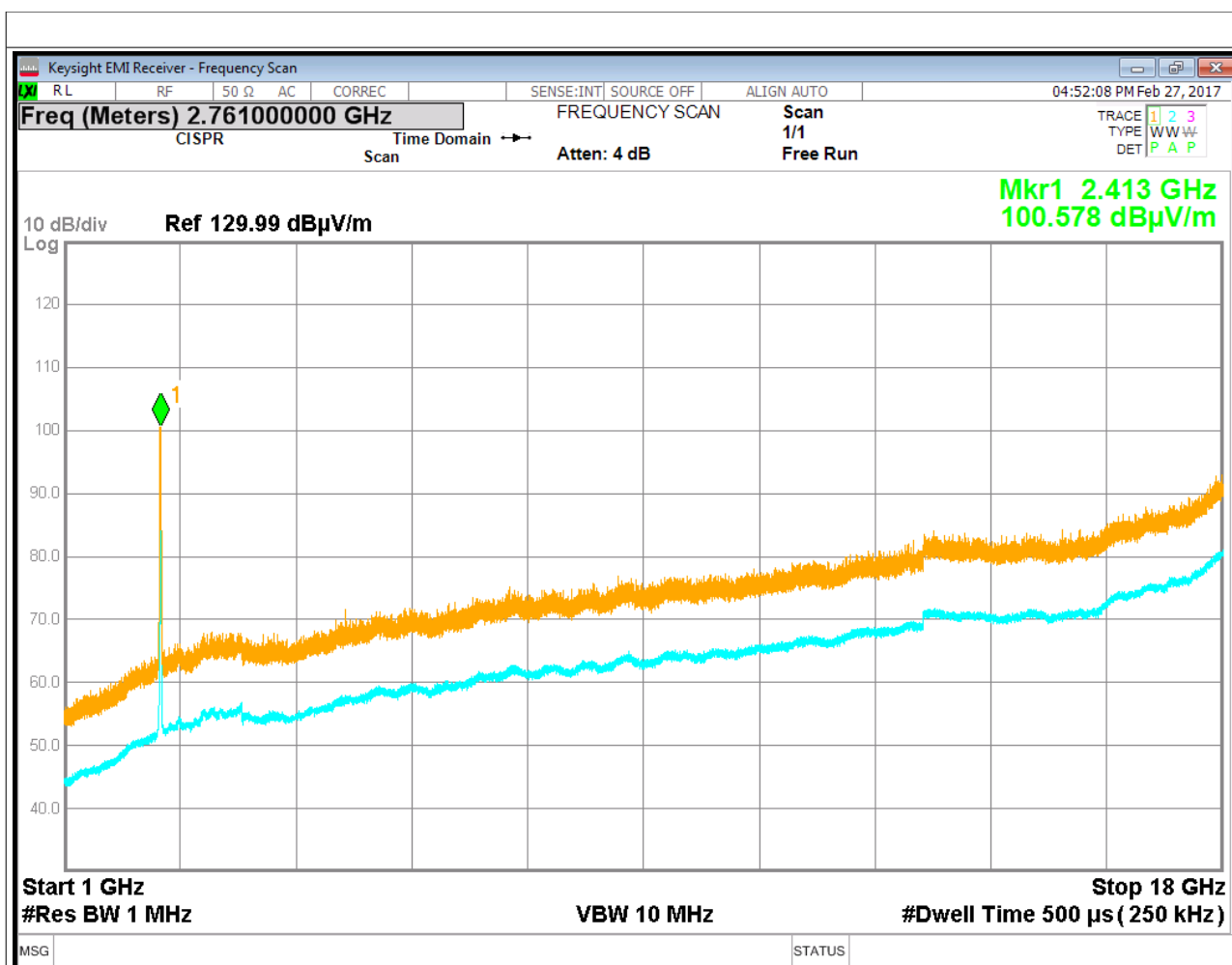
Note:

EUT
Pol. V
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 1
modulation type n
max speed (mcs7; 20MHz; 65 Mbps)

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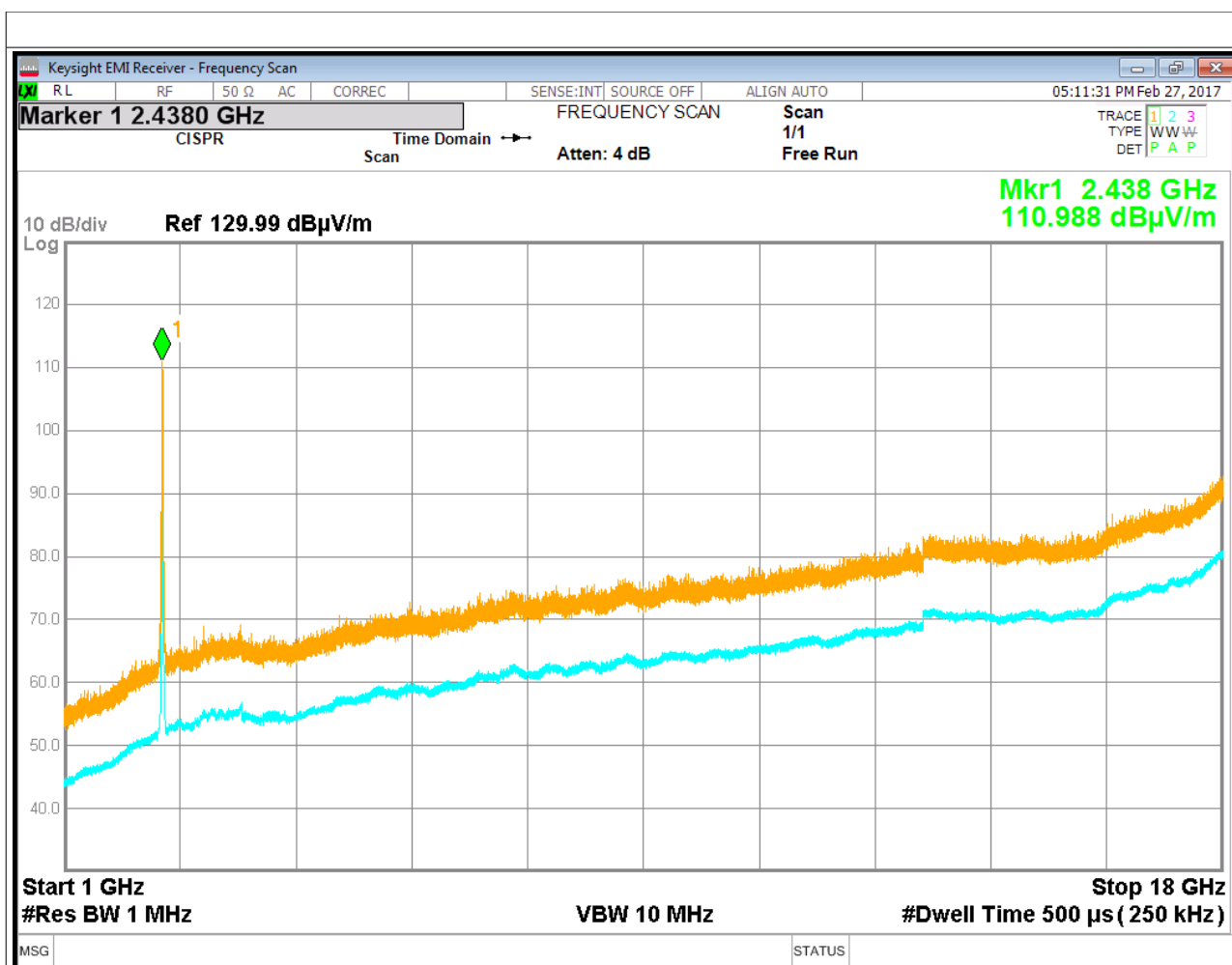
Note:

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Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 1
modulation type n
max speed (mcs7; 20MHz; 65 Mbps)

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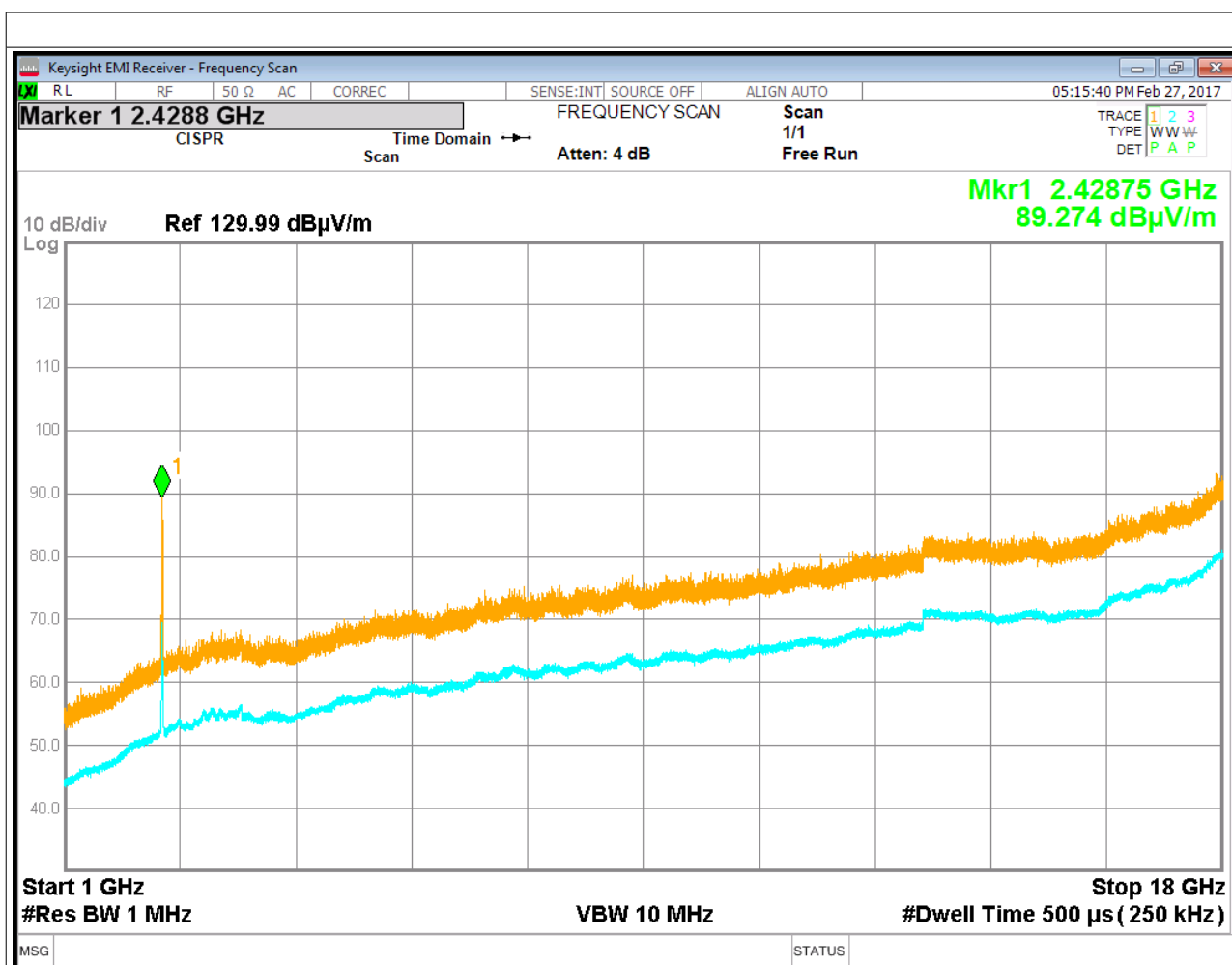
Note:

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EUT mode: operative
Auxiliary apparatus: all ON
channel 6
modulation type n
max speed (mcs7; 20MHz; 65 Mbps)

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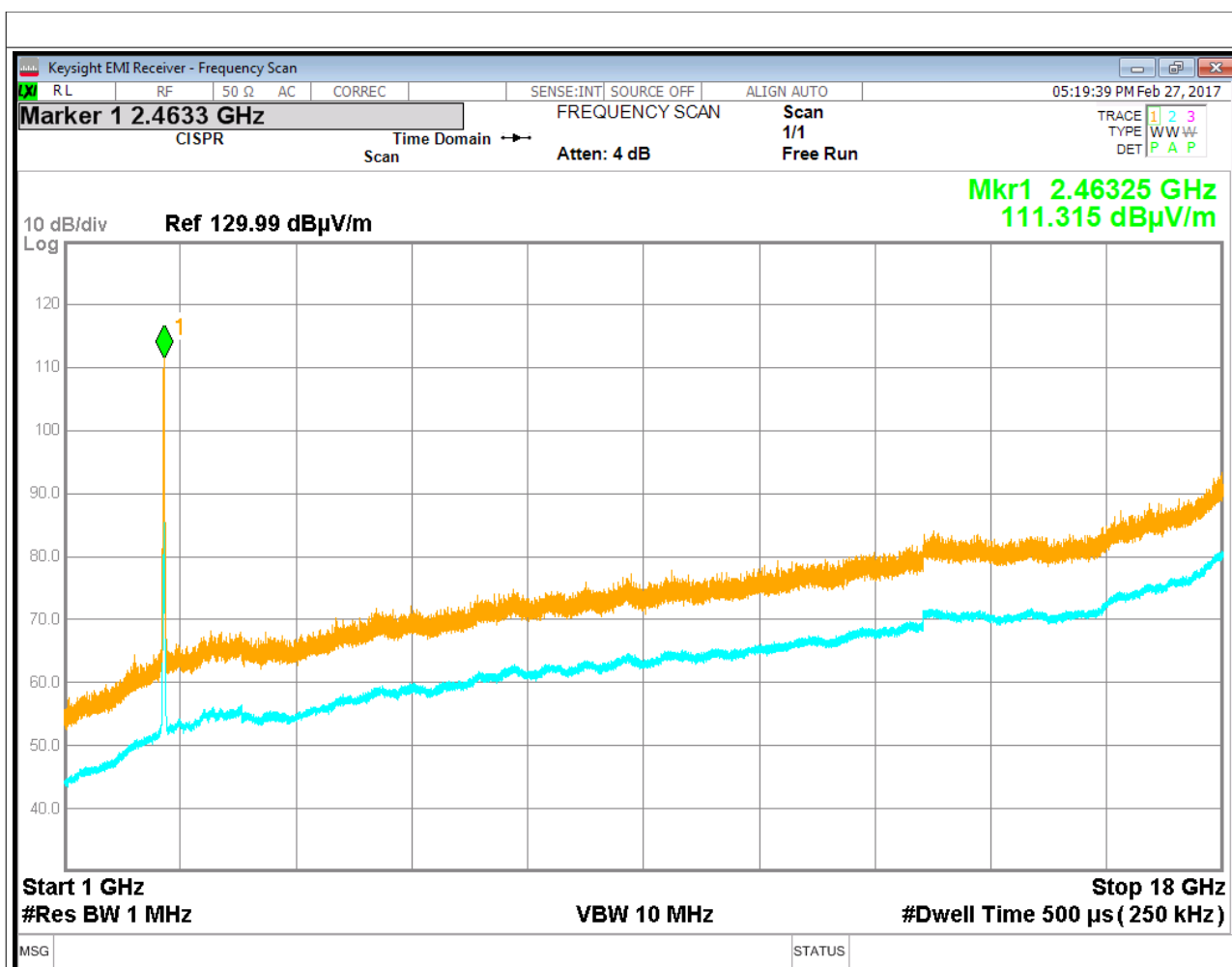
Note:

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Pol. H
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 6
modulation type n
max speed (mcs7; 20MHz; 65 Mbps)

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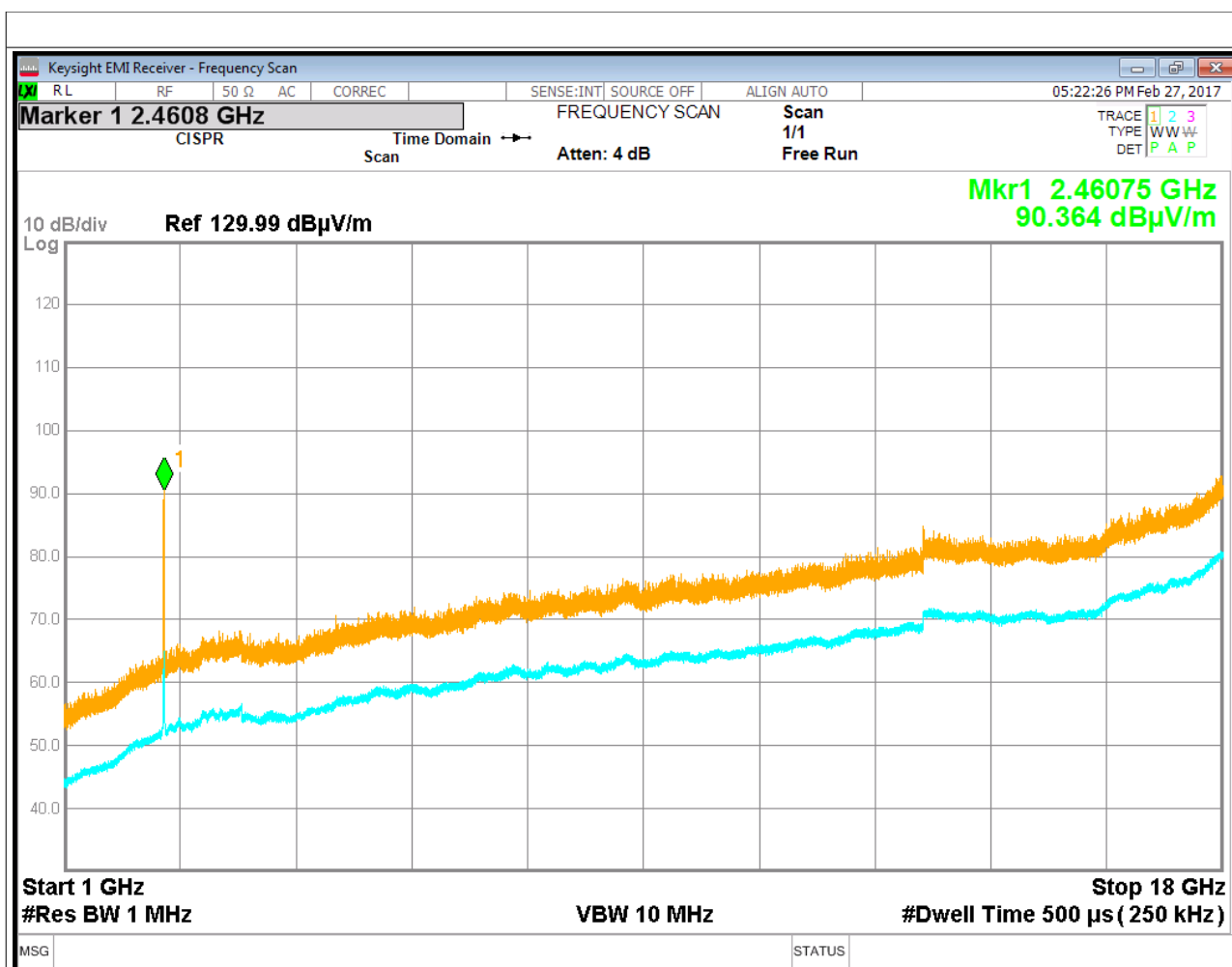
Note:

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Pol. V
-
-
EUT mode: operative
Auxiliary apparatus: all ON
channel 11
modulation type n
max speed (mcs7; 20MHz; 65 Mbps)

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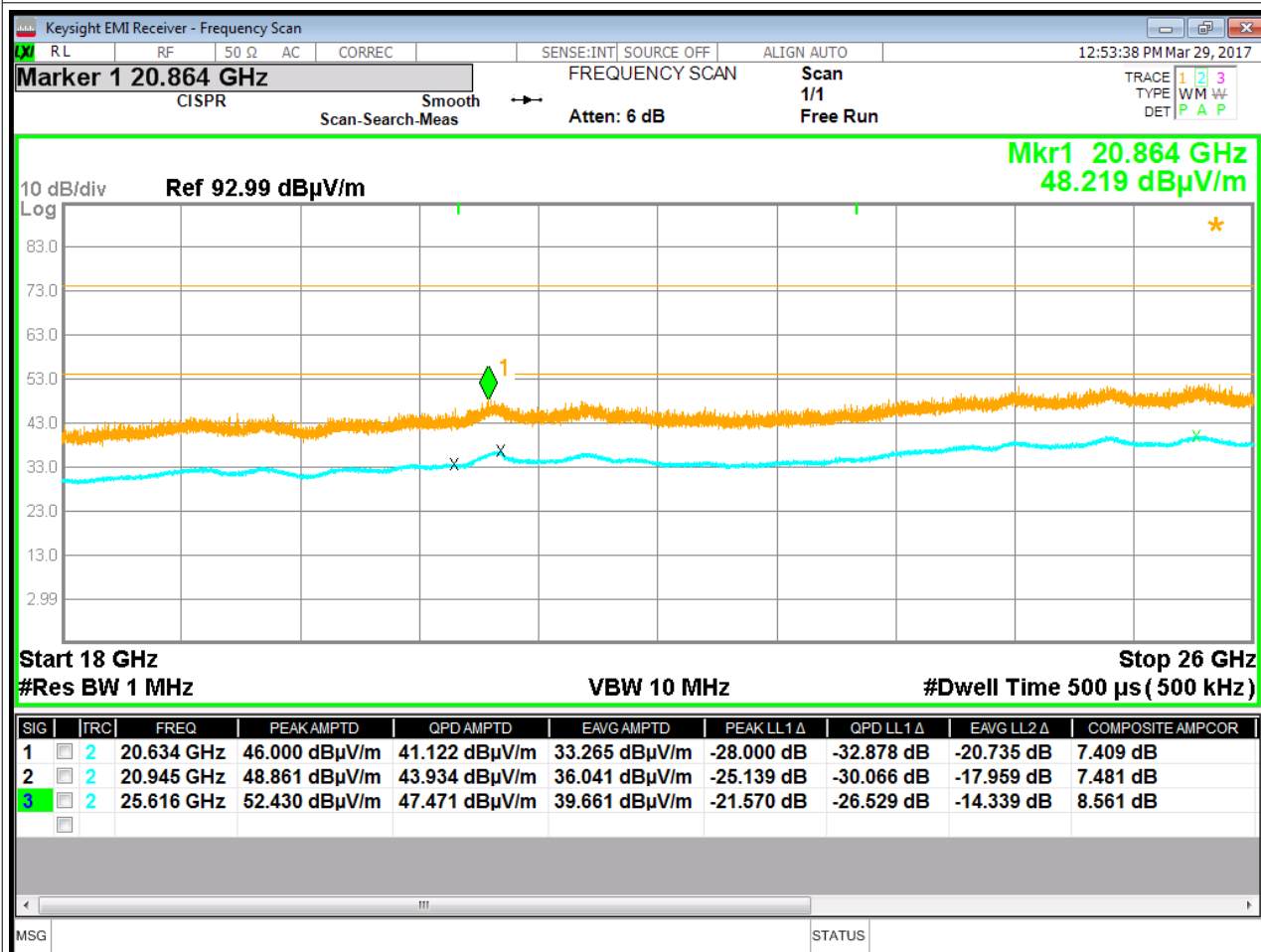
Note:

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Pol. H
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-
EUT mode: operative
Auxiliary apparatus: all ON
channel 11
modulation type n
max speed (mcs7; 20MHz; 65 Mbps)

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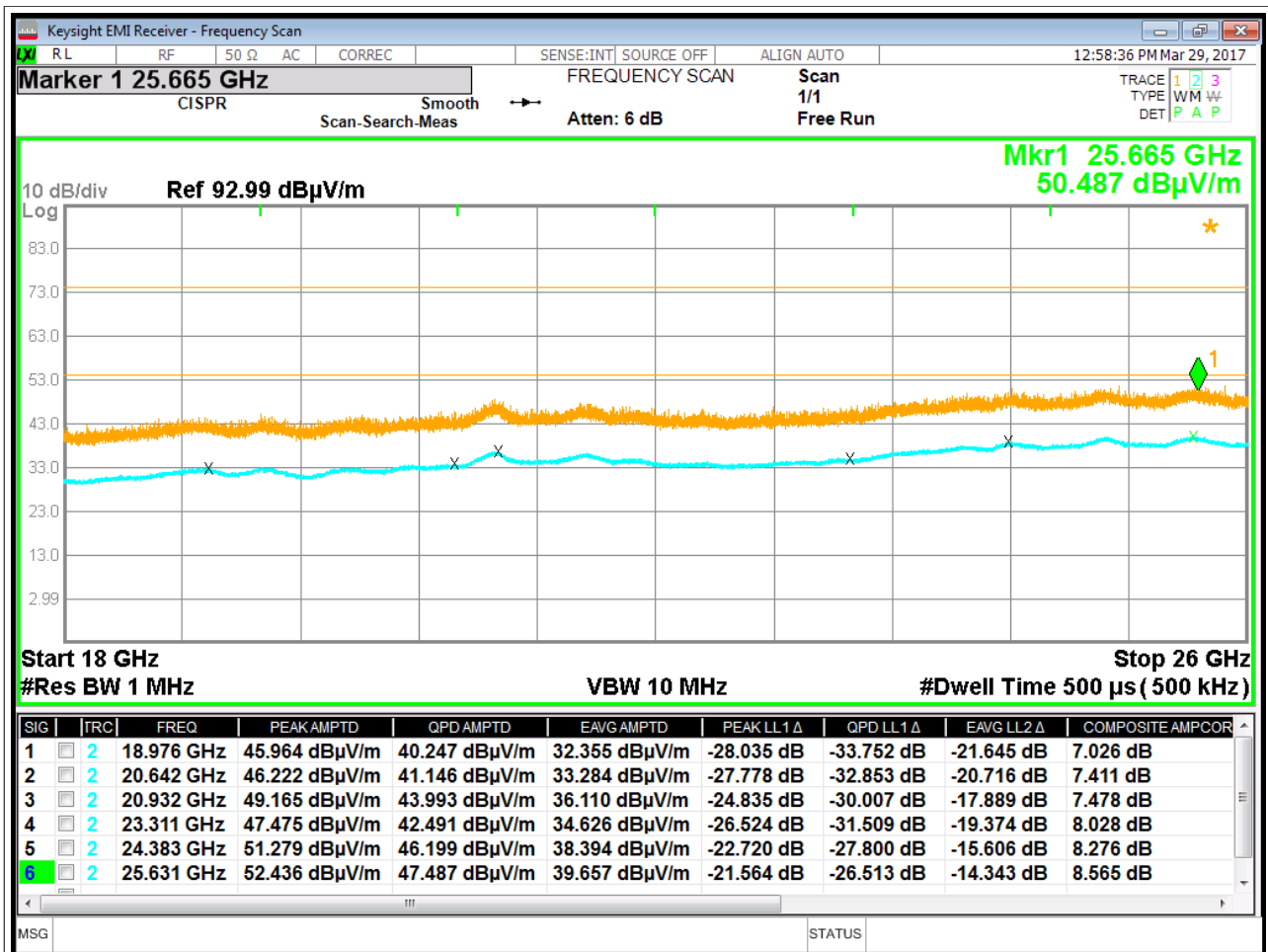
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Note:

EUT
Pol. V
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-
EUT mode: operative
Auxiliary apparatus: all ON



Note:

EUT
Pol. H

-

-

EUT mode: operative

Auxiliary apparatus: all ON

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9. PHOTOS

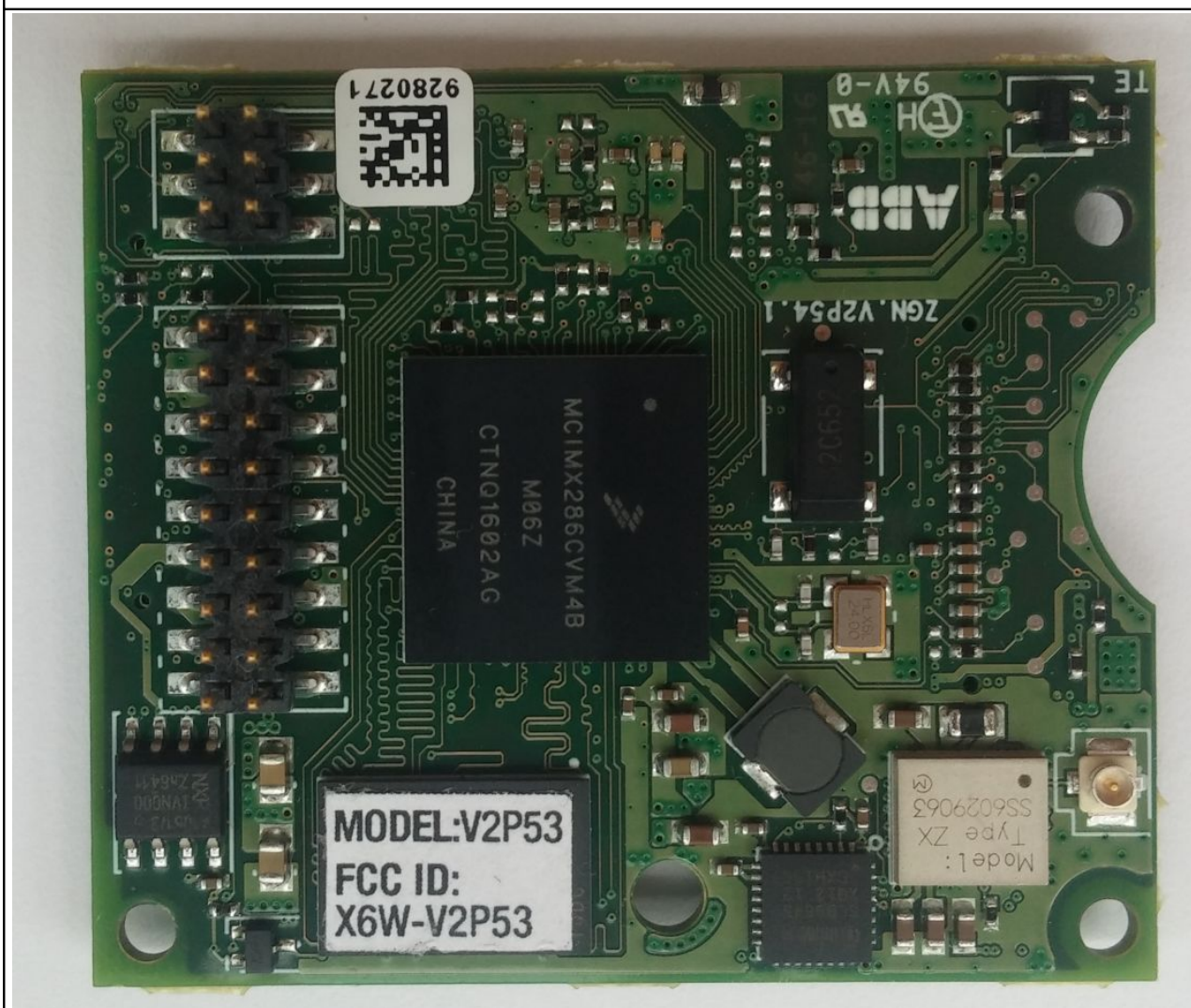


Fig. 9.1

V2P53 – Top Side

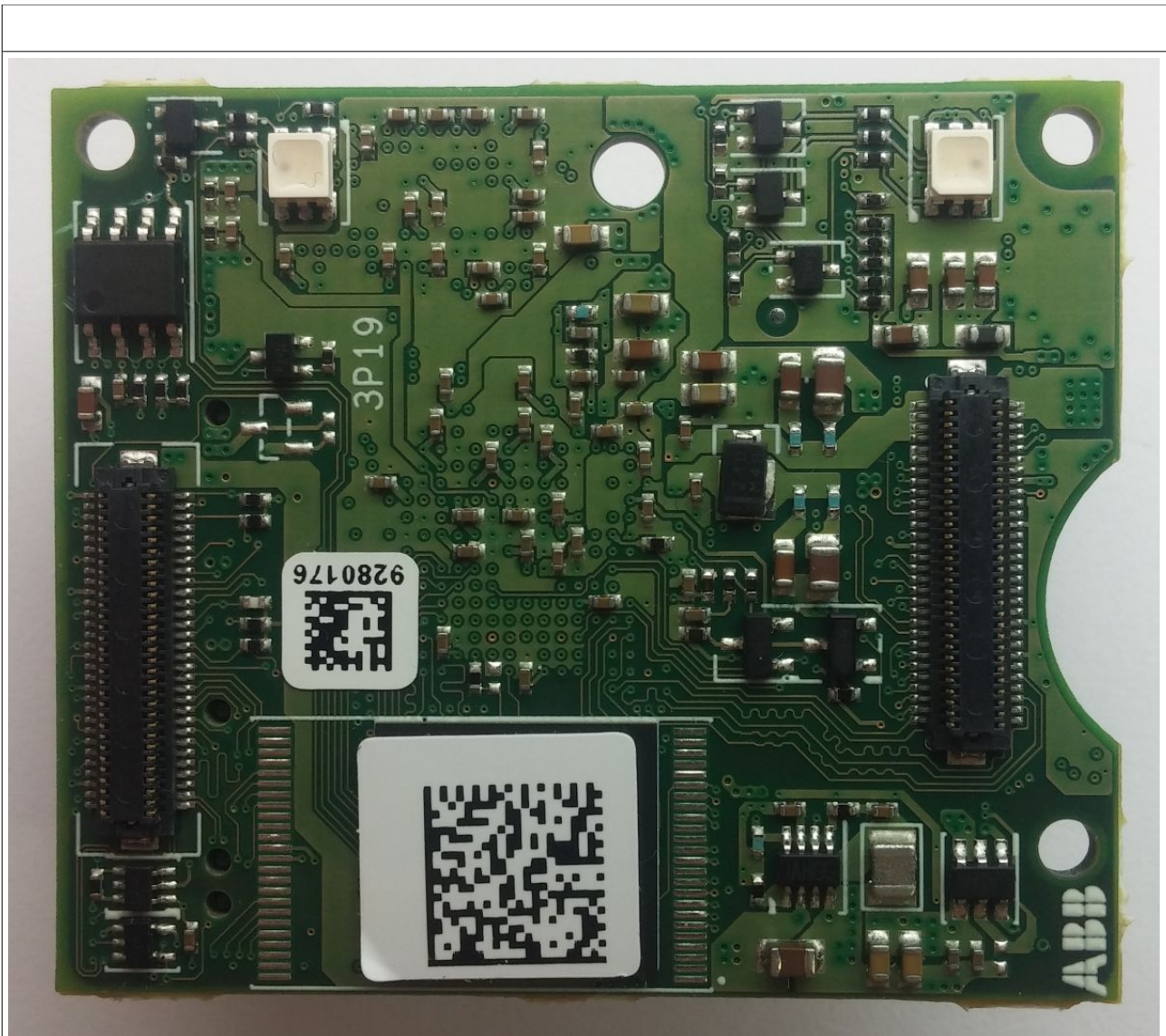


Fig. 9.2

V2P53 – Bottom Side

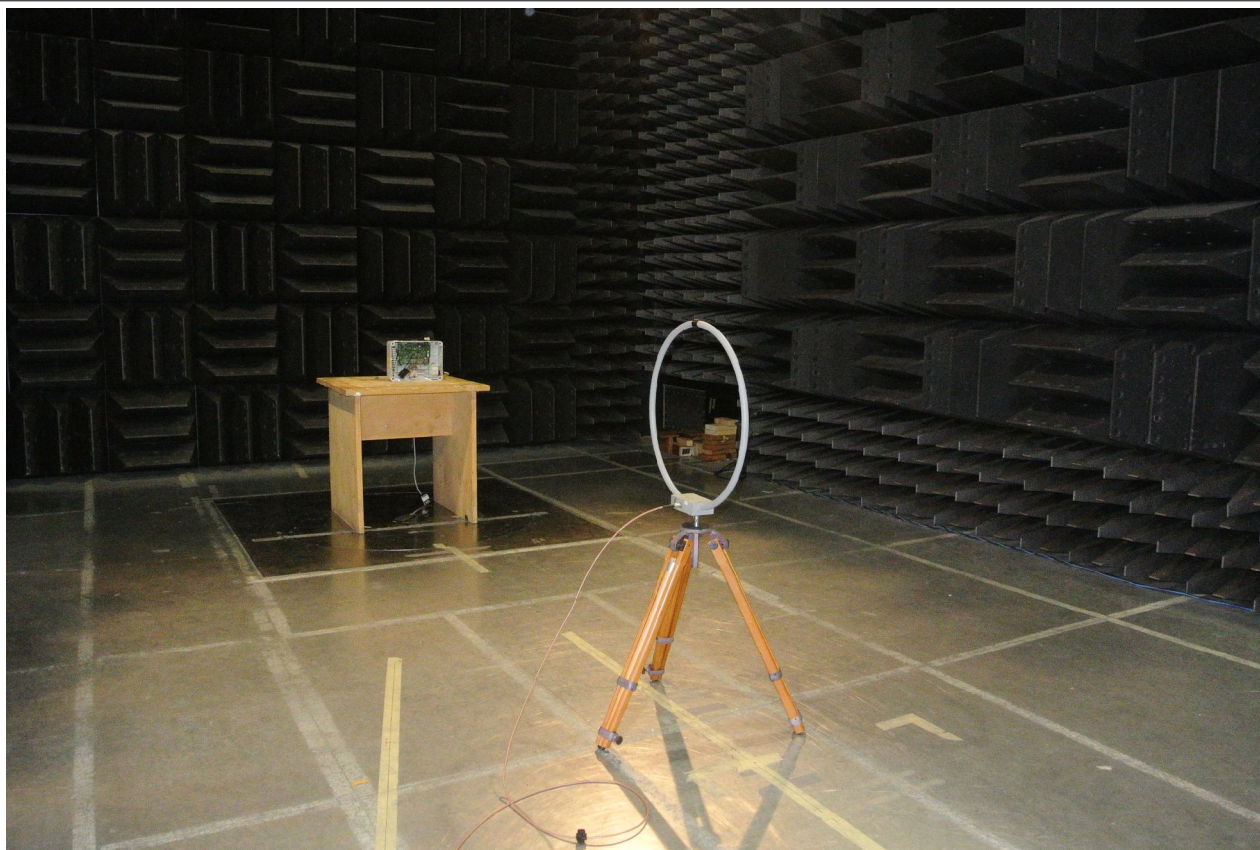


Fig. 9.3

Radiated Emissions Test Set-up (9kHz - 30MHz)

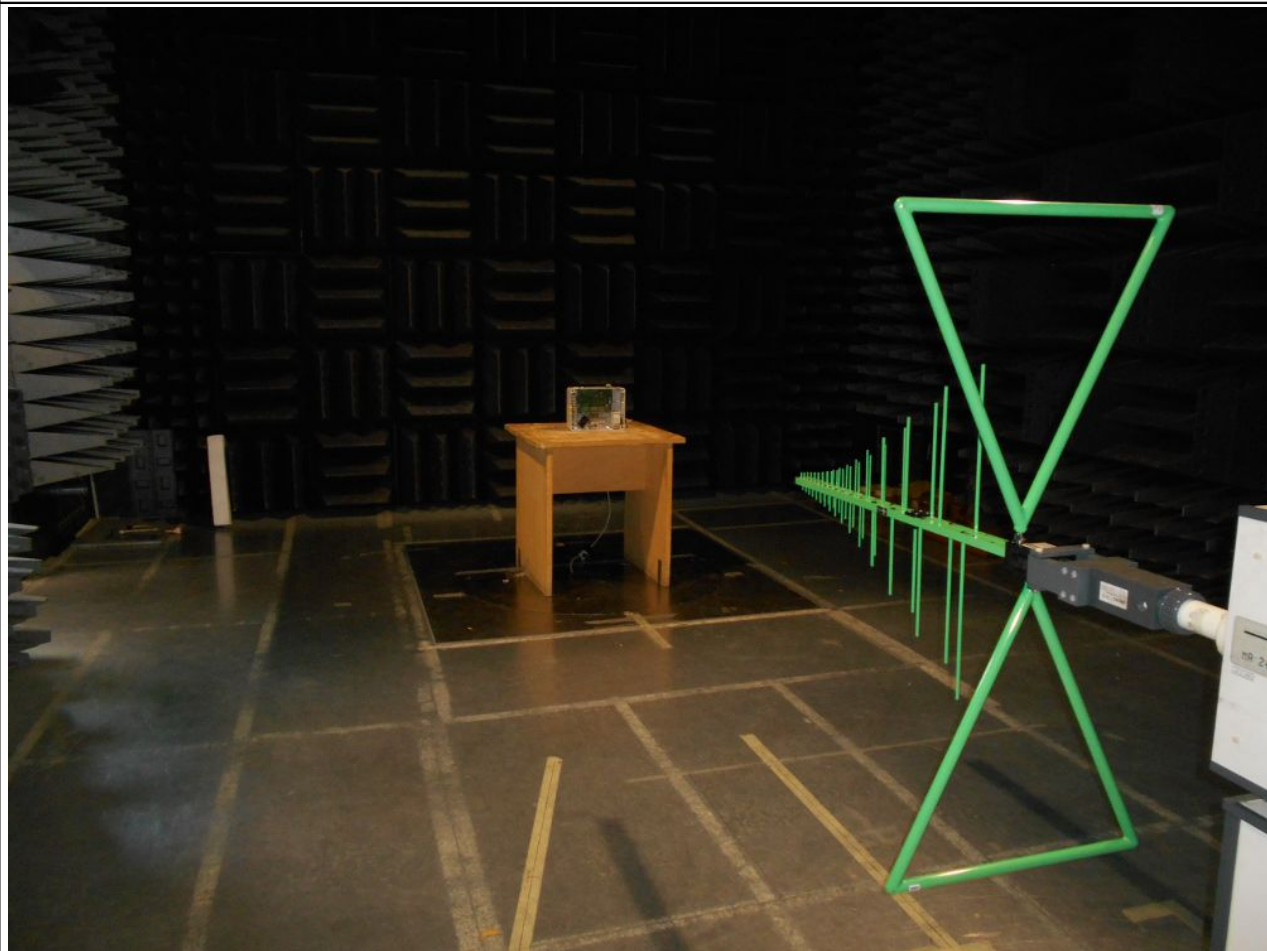


Fig. 9.4

Radiated Emissions Test Set-up (30MHz – 1 GHz)



Fig. 9.5

Radiated Emissions Test Set-up (1GHz – 18GHz)

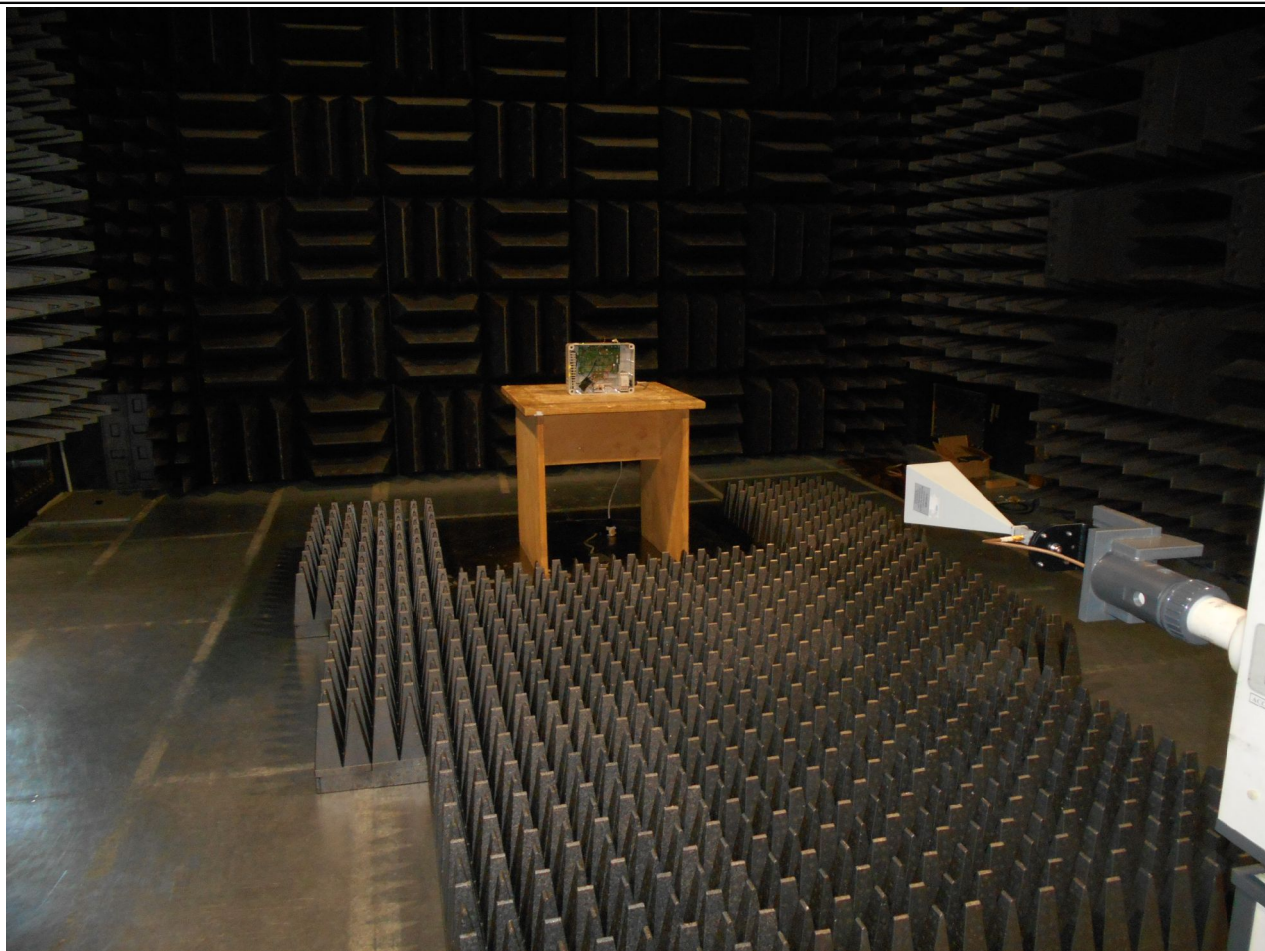


Fig. 9.6

Radiated Emissions Test Set-up (1GHz - 26GHz)

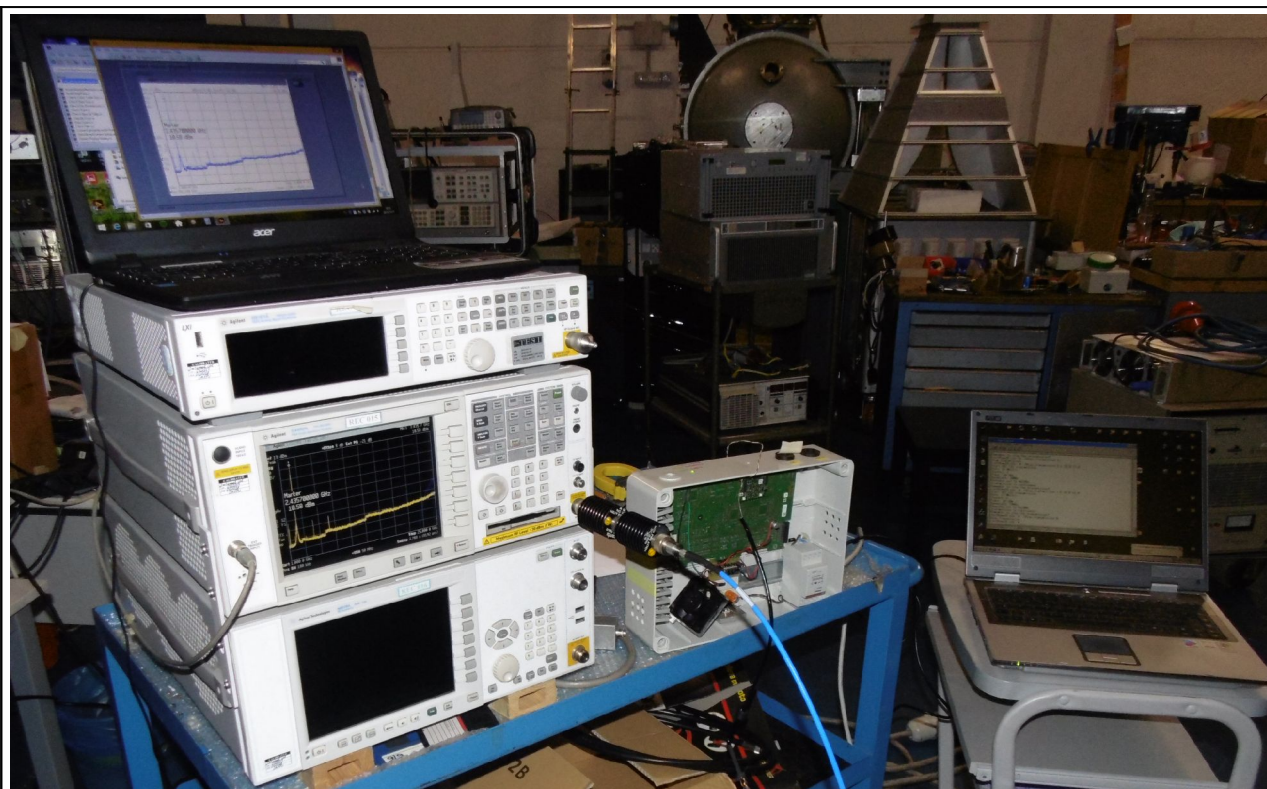


Fig. 9.7

Antenna Port Conducted Emissions Test Set-up