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TEST REPORT

Report No. : CQASZ20191101241E-01
Applicant: Winstars Technology Limited
Address of Applicant: Block 4, Taisong Industrial Park, Dalang Street, Longhua Town, Bao'an District, Shenzhen, China
Equipment Under Test (EUT):
EUT Name: Wireless Repeater
Model No.: WS-WN575A2, WL-WN575A2, WS-WN575A3, WL-WN575A3, WS-WN575A4, WL-WN575A4, WS-WN575A5, WL-WN575A5, WS-WN575B5, WL-WN575B5, WS-WN578R2, WL-WN578R2, WS-WN578HR2, WL-WN578HR2, WS-WN578S2, WL-WN578S2, WS-WN579G3, WL-WN579G3, WS-WN579X3, WL-WN579X3, AERIAL X, AERIAL MAX, AERIAL S2, AERIAL S2H, AERIAL S2Q, AERIAL S2M
Test Model No.: WL-WN575A3
Brand Name: N/A
FCC ID: NZ3-WN0001
Standards: 47 CFR Part 15, Subpart C
Date of Receipt: 2019-11-29
Date of Test: 2019-11-29 to 2019-12-31
Date of Issue: 2019-12-31
Test Result : **PASS***

*In the configuration tested, the EUT complied with the standards specified above

Tested By:

Tom Chen

(Tom Chen)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai
(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20191101241E-01	Rev.01	Initial report	2019-12-31

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
Conducted Peak & Average Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10 2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10 2013	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10 2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

Model No.: WS-WN575A2,WL-WN575A2,WS-WN575A3,WL-WN575A3,WS-WN575A4,WL-WN575A4, WS-WN575A5,WL-WN575A5,WS-WN575B5,WL-WN575B5,WS-WN578R2,WL-WN578R2, WS-WN578HR2,WL-WN578HR2,WS-WN578S2,WL-WN578S2,WS-WN579G3,WL-WN579G3, WS-WN579X3,WL-WN579X3,AERIAL X,AERIAL MAX,AERIAL S2,AERIAL S2H,AERIAL S2Q, AERIAL S2M

Only the model WL-WN575A3 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

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4 General Information

4.1 Client Information

Applicant:	Winstars Technology Limited
Address of Applicant:	Block 4, Taisong Industrial Park, Dalang Street, Longhua Town, Bao'an District, Shenzhen, China
Manufacturer:	Winstars Technology Limited
Address of Manufacturer:	Block 4, Taisong Industrial Park, Dalang Street, Longhua Town, Bao'an District, Shenzhen, China

4.2 General Description of EUT

Product Name:	Wireless Repeater
Model No.:	WS-WN575A2, WL-WN575A2, WS-WN575A3, WL-WN575A3, WS-WN575A4, WL-WN575A4, WS-WN575A5, WL-WN575A5, WS-WN575B5, WL-WN575B5, WS-WN578R2, WL-WN578R2, WS-WN578HR2, WL-WN578HR2, WS-WN578S2, WL-WN578S2, WS-WN579G3, WL-WN579G3, WS-WN579X3, WL-WN579X3, AERIAL X, AERIAL MAX, AERIAL S2, AERIAL S2H, AERIAL S2Q, AERIAL S2M
Test Model No.:	WL-WN575A3
Trade Mark:	N/A
Hardware version:	WS-WN575A3-A V1.3
Software version:	RPT75A3.V4300.180801
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20 and HT40) : OFDM (64QAM, 16QAM, QPSK, BPSK)
Transfer Rate:	IEEE for 802.11b: 1Mbps/2Mbps/5.5Mbps/11Mbps IEEE for 802.11g : 6Mbps/9Mbps/12Mbps/18Mbps/24Mbps/36Mbps/48Mbps/54Mbps IEEE for 802.11n(HT20) : 6.5Mbps/13Mbps/19.5Mbps/26Mbps/39Mbps/52Mbps/58.5Mbps/65Mbps IEEE for 802.11n(HT40) : 13.5Mbps/27Mbps/40.5Mbps/54Mbps/81Mbps/108Mbps/121.5Mbps/135Mbps
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Test Software of EUT:	MT7603 QA V0.0.0.71 (manufacturer declare)
Antenna Type:	Omni Directional Antenna
Antenna Gain:	ANT1:3dBi ANT2:3dBi
Power Supply:	100-240V 50/60Hz

Operation Frequency each of channel(802.11b/g/n HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		
Operation Frequency each of channel(802.11n HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2422MHz	4	2437MHz	7	2452MHz		
2	2427MHz	5	2442MHz				
3	2432MHz	6	2447MHz				

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11b/g/n (HT20):

Channel	Frequency
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz

For 802.11n (HT40):

Channel	Frequency
The Lowest channel	2422MHz
The Middle channel	2437MHz
The Highest channel	2452MHz

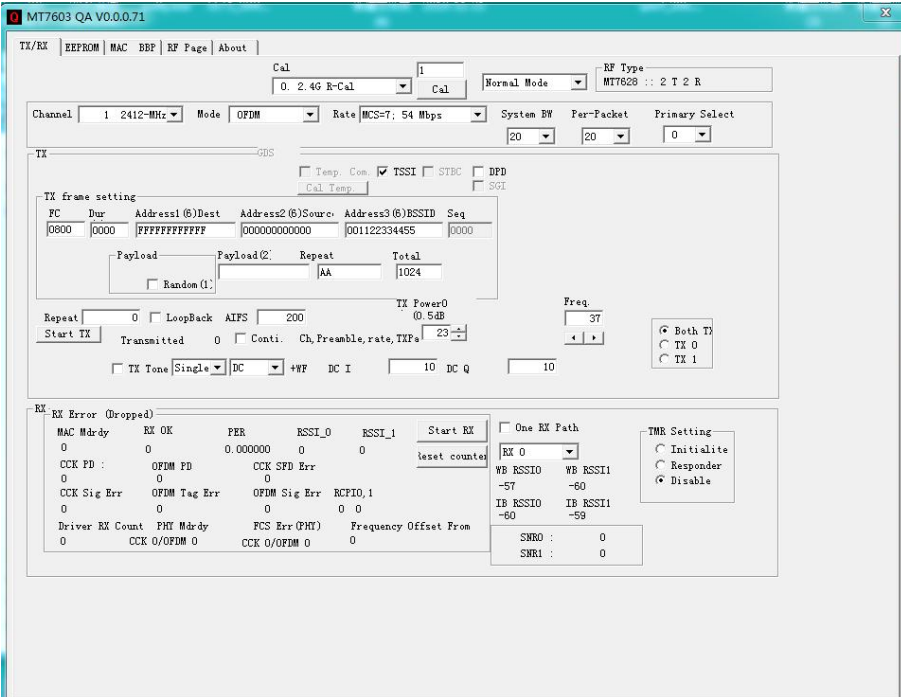
Note:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.3 Test Environment and Mode

Operating Environment:	
Radiated Emissions:	
Temperature:	23.3 °C
Humidity:	48 % RH
Atmospheric Pressure:	1015 mbar
Conducted Emissions:	
Temperature:	23.8 °C
Humidity:	36 % RH
Atmospheric Pressure:	1015 mbar
Radio conducted item test (RF Conducted test room):	
Temperature:	24.7 °C
Humidity:	42 % RH
Atmospheric Pressure:	1015 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

Run Software:



The screenshot shows the MT7603 QA V0.0.0.71 software interface. The main window is titled "TX/RX" and contains several configuration sections:

- Channel Settings:** Channel 1, 2.4G R-Cal, Mode OFDM, Rate MCS-7, 54 Mbps, System BW 20, Per-Packet 20, Primary Select 0.
- TX Frame Setting:** Includes fields for PC, Dur, Address1(6)Dest, Address2(6)Source, Address3(6)RSSID, Seq, Payload, Repeat, and Total. TX Power is set to 0.5dB and Freq to 37.
- TX Error (Dropped):** A table showing error statistics:

MAC Mardy	RX OK	PER	RSSI_0	RSSI_1	Start RX
0	0	0.000000	0	0	reset count
CCK PD :	OFDM PD	CCK SFD Err			
0	0	0			
CCK Sig Err	OFDM Tag Err	OFDM Sig Err	RFIO,1		
0	0	0	0		
Driver RX Count	PHY Mardy	FCS Err (PHY)	Frequency Offset From		
0	CCK 0/OFDM 0	CCK 0/OFDM 0	0		
- TX Error (Dropped) Summary:** Includes fields for MAC Mardy, RX OK, PER, RSSI_0, RSSI_1, Start RX, and reset count.
- TX Error (Dropped) Details:** Includes fields for CCK PD, OFDM PD, CCK SFD Err, RFIO,1, CCK Sig Err, OFDM Tag Err, OFDM Sig Err, Driver RX Count, PHY Mardy, FCS Err (PHY), and Frequency Offset From.
- TX Error (Dropped) Summary:** Includes fields for MAC Mardy, RX OK, PER, RSSI_0, RSSI_1, Start RX, and reset count.
- TX Error (Dropped) Details:** Includes fields for CCK PD, OFDM PD, CCK SFD Err, RFIO,1, CCK Sig Err, OFDM Tag Err, OFDM Sig Err, Driver RX Count, PHY Mardy, FCS Err (PHY), and Frequency Offset From.
- TX Error (Dropped) Summary:** Includes fields for MAC Mardy, RX OK, PER, RSSI_0, RSSI_1, Start RX, and reset count.
- TX Error (Dropped) Details:** Includes fields for CCK PD, OFDM PD, CCK SFD Err, RFIO,1, CCK Sig Err, OFDM Tag Err, OFDM Sig Err, Driver RX Count, PHY Mardy, FCS Err (PHY), and Frequency Offset From.

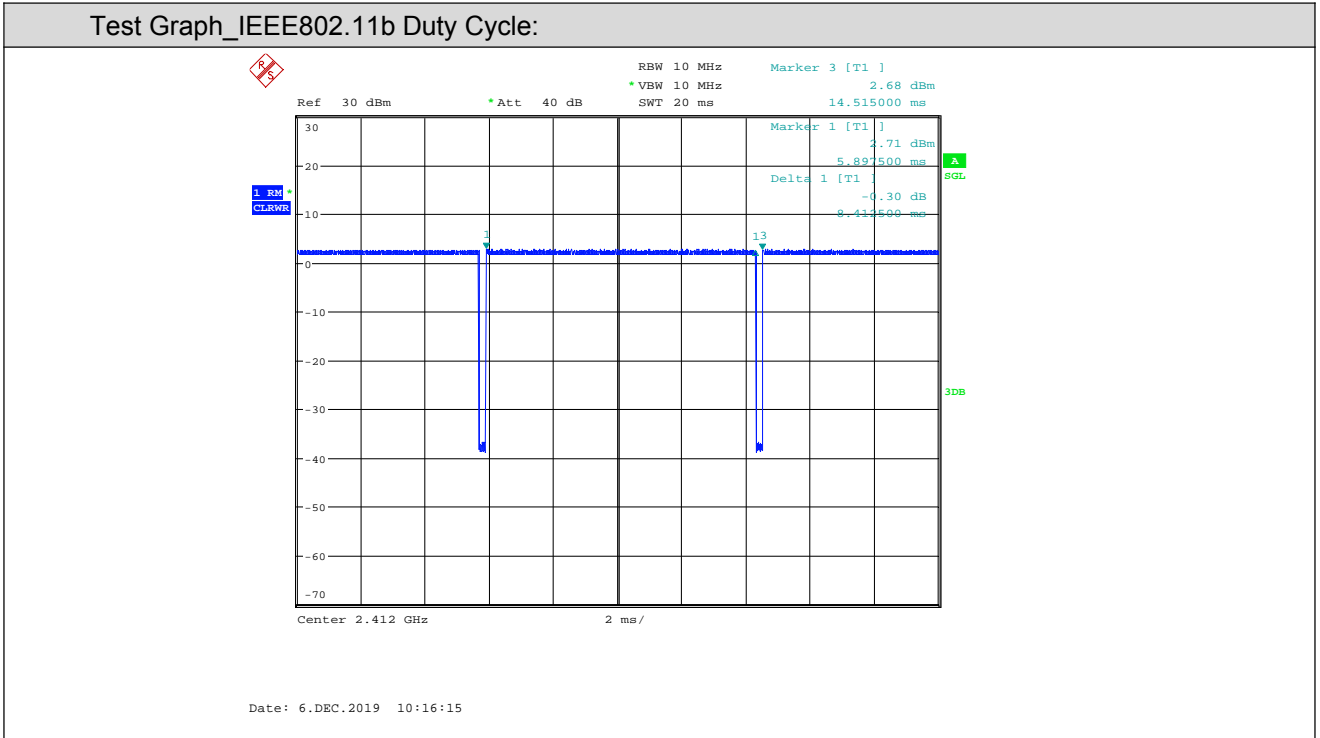
Operated Mode for Worst Duty Cycle:			
Test Mode		Duty Cycle(x)	Average correction factor(dB)
ANT1	IEEE802.11b	97.62%	0.10
	IEEE802.11g	86.88%	0.61
	IEEE802.11n (HT20) SISO	86.43%	0.63
	IEEE802.11n (HT40) SISO	76.60%	1.16
	IEEE802.11n (HT20) MIMO	83.90%	0.76
	IEEE802.11n (HT40) MIMO	75.68%	1.21
ANT2	IEEE802.11b	97.03%	0.13
	IEEE802.11g	83.99%	0.76
	IEEE802.11n (HT20) SISO	89.12%	0.50
	IEEE802.11n (HT40) SISO	78.26%	1.06
	IEEE802.11n (HT20) MIMO	83.36%	0.79
	IEEE802.11n (HT40) MIMO	68.29%	1.66

Remark:

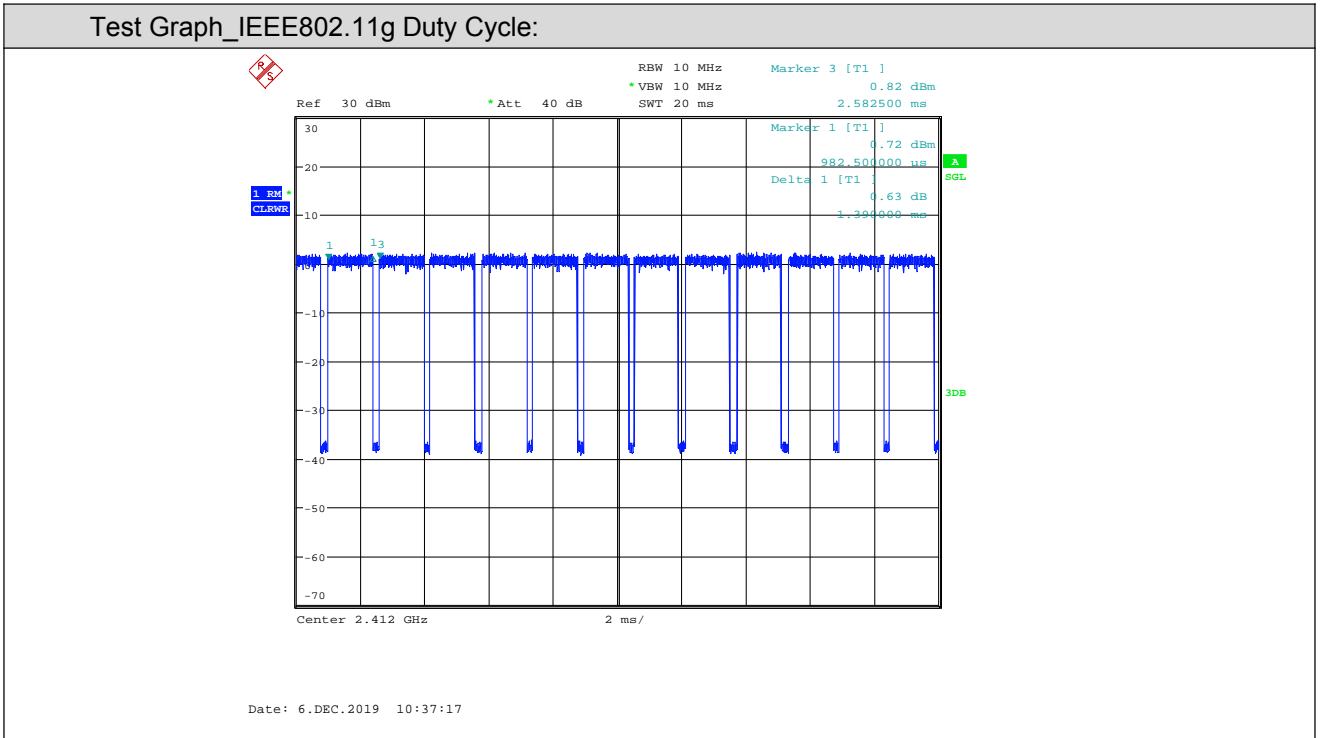
- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;

ANT1:

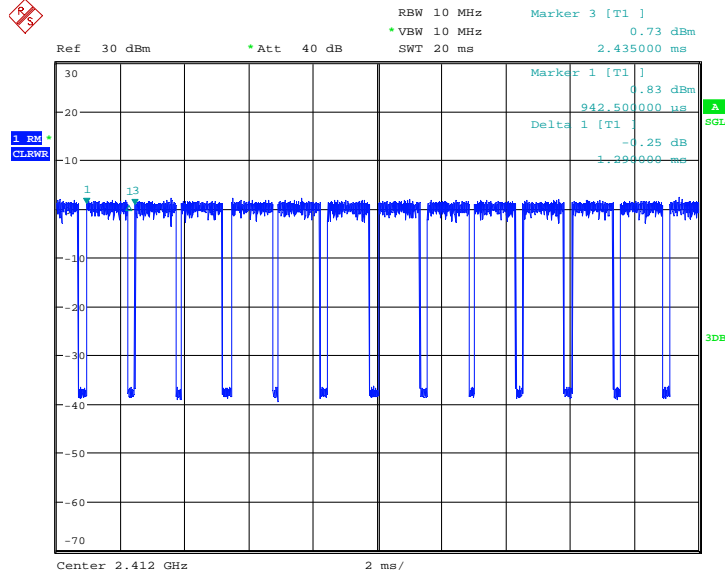
Test Graph_ IEEE802.11b Duty Cycle:



Test Graph_ IEEE802.11g Duty Cycle:

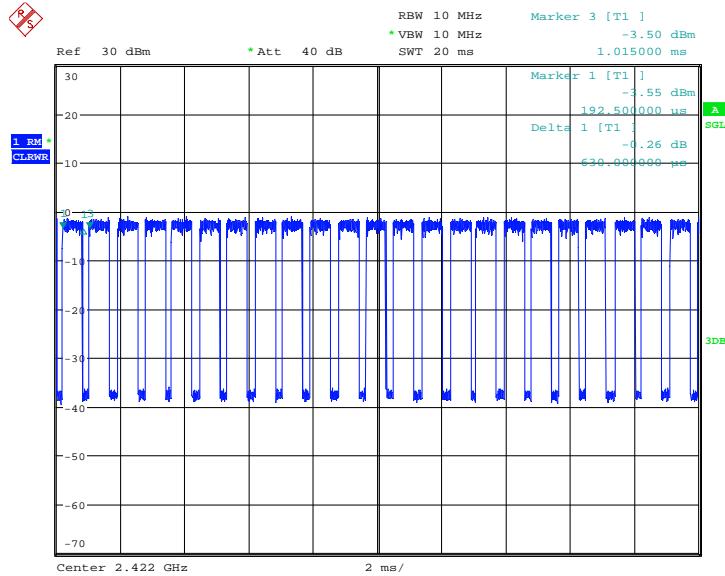


Test Graph_ IEEE802.11 n (HT20) SISO Duty Cycle:



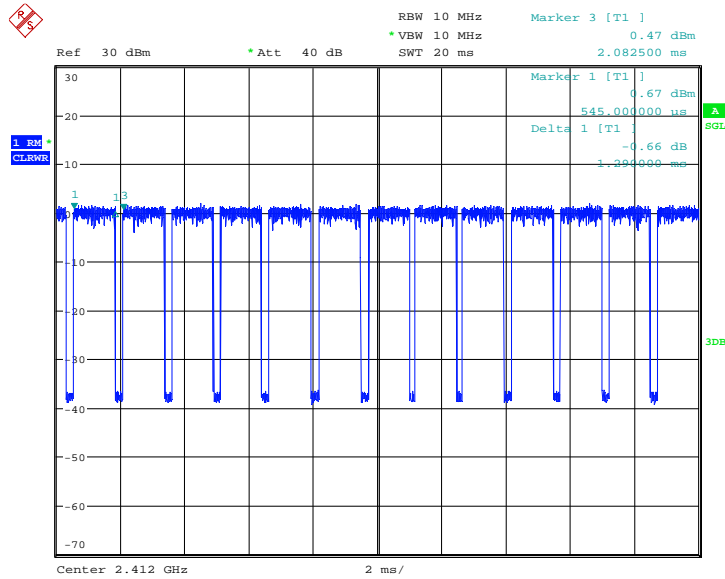
Date: 6.DEC.2019 10:55:46

Test Graph_ IEEE802.11 n (HT40) SISO Duty Cycle:



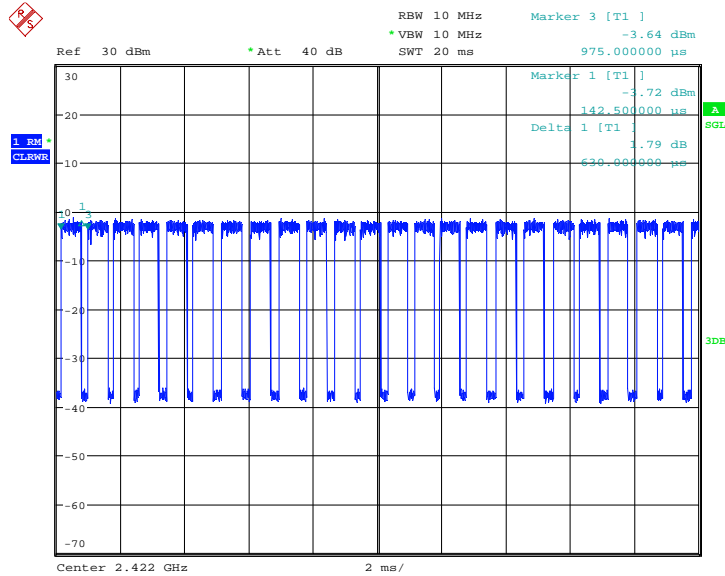
Date: 6.DEC.2019 11:19:16

Test Graph_ IEEE802.11 n (HT20) MIMO Duty Cycle:



Date: 6.DEC.2019 14:30:41

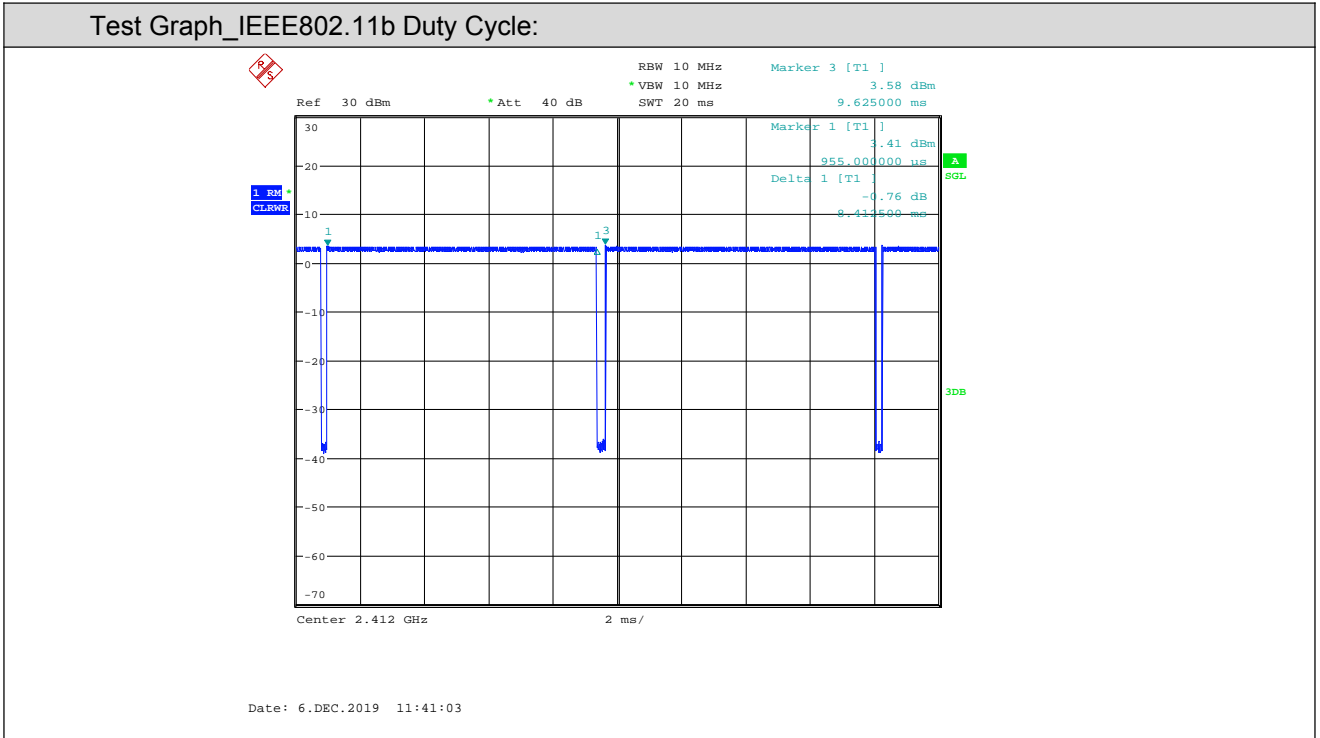
Test Graph_ IEEE802.11 n (HT40) MIMO Duty Cycle:



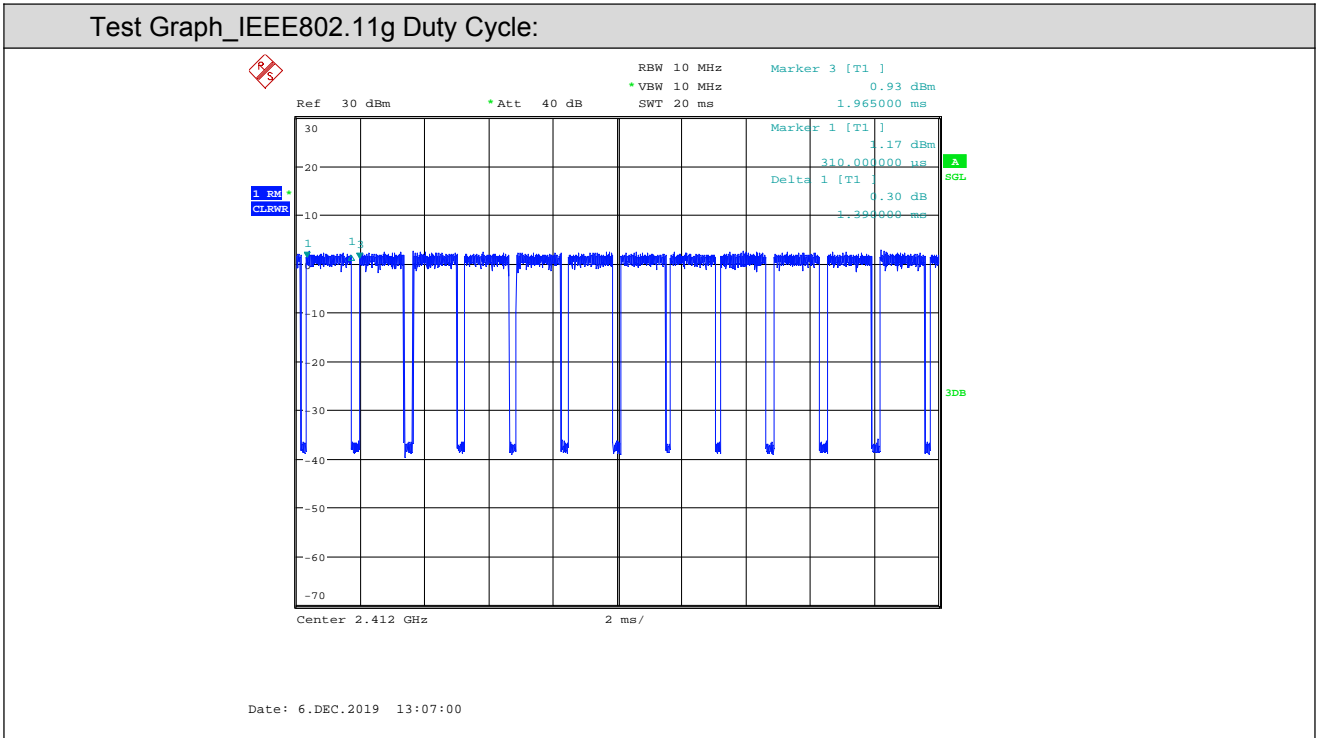
Date: 6.DEC.2019 14:57:42

ANT2:

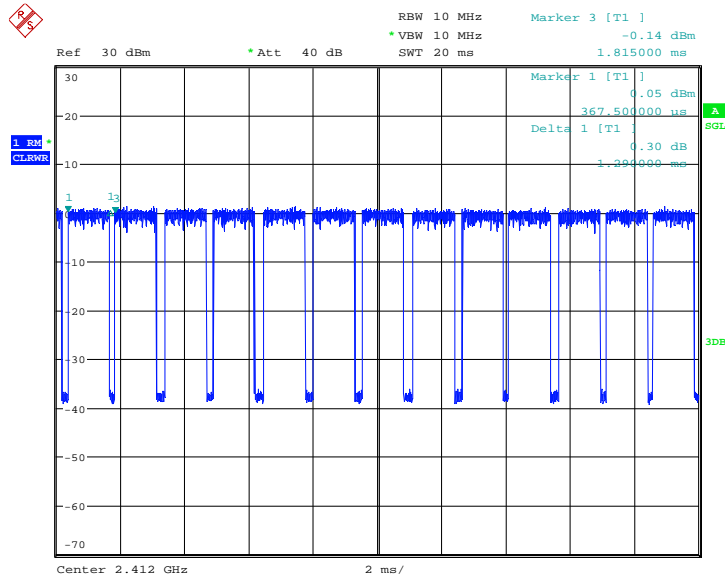
Test Graph_ IEEE802.11b Duty Cycle:



Test Graph_ IEEE802.11g Duty Cycle:

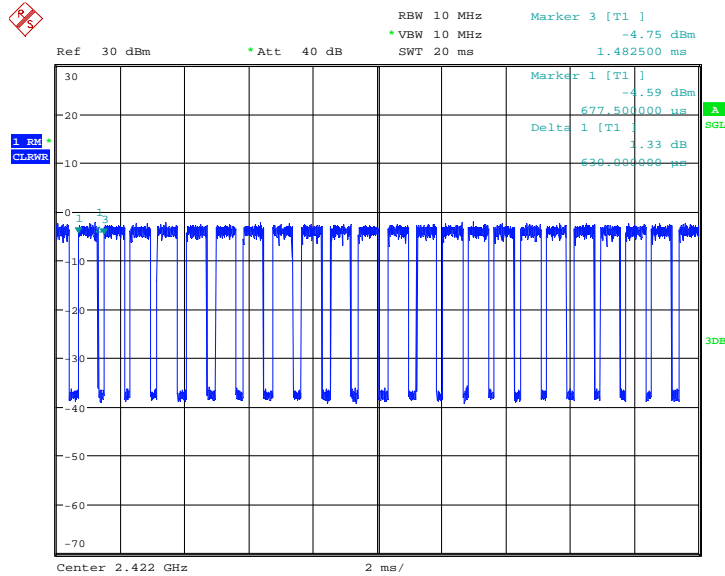


Test Graph_ IEEE802.11 n (HT20) SISO Duty Cycle:



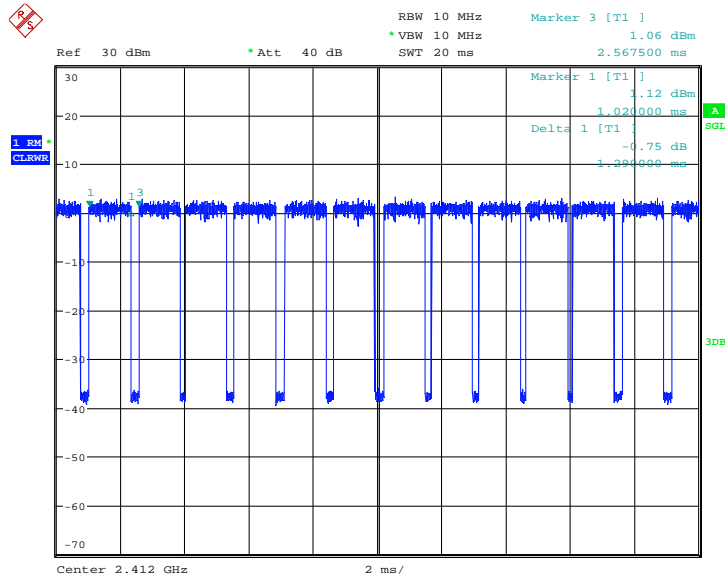
Date: 6.DEC.2019 13:28:23

Test Graph_ IEEE802.11 n (HT40) SISO Duty Cycle:



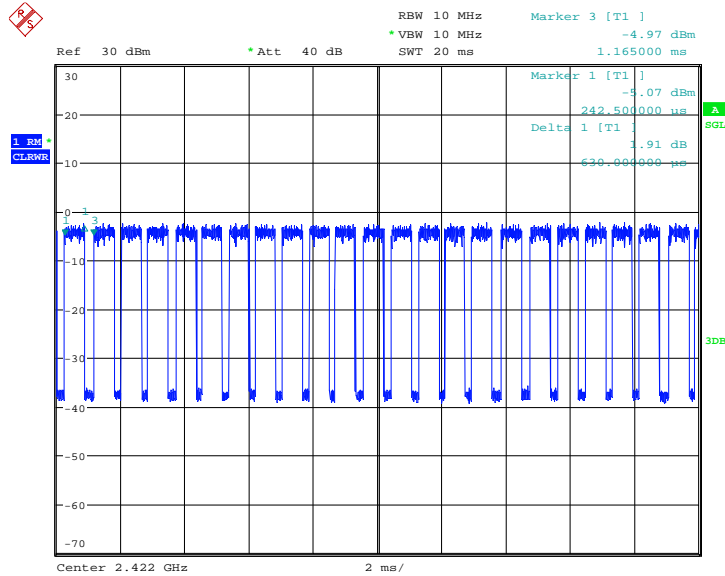
Date: 6.DEC.2019 13:55:44

Test Graph_ IEEE802.11 n (HT20) MIMO Duty Cycle:



Date: 6.DEC.2019 15:15:04

Test Graph_ IEEE802.11 n (HT40) MIMO Duty Cycle:



Date: 6.DEC.2019 15:39:51

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

1) Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
PC	Lenovo	ThinkPad E450c	FCC ID and DOC	CQA

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

4.6 Test Facility

• **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8°C	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

4.10 Other Information Requested by the Customer

None.

4.11 Equipment List


Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSV40	CQA-075	2019/6/11	2020/6/10
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	4012339	2019/10/25	2020/10/24
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2019/10/25	2020/10/24
Preamplifier	EMCI	EMC184055SE	CQA-089	2019/9/25	2020/9/24
Loop antenna	Schwarzbeck	FMZB1516	CQA-065	2019/10/21	2020/10/20
Bilog Antenna	R&S	HL562	CQA-011	2019/9/26	2020/9/25
Horn Antenna	R&S	HF906	CQA-012	2019/9/26	2020/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2019/9/25	2020/9/24
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2019/9/26	2020/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2019/9/26	2020/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2019/9/26	2020/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2019/9/26	2020/9/25
LISN	R&S	ENV216	CQA-003	2019/10/23	2020/10/22
Coaxial cable	CQA	N/A	CQA-C009	2019/9/26	2020/9/25

Note:

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

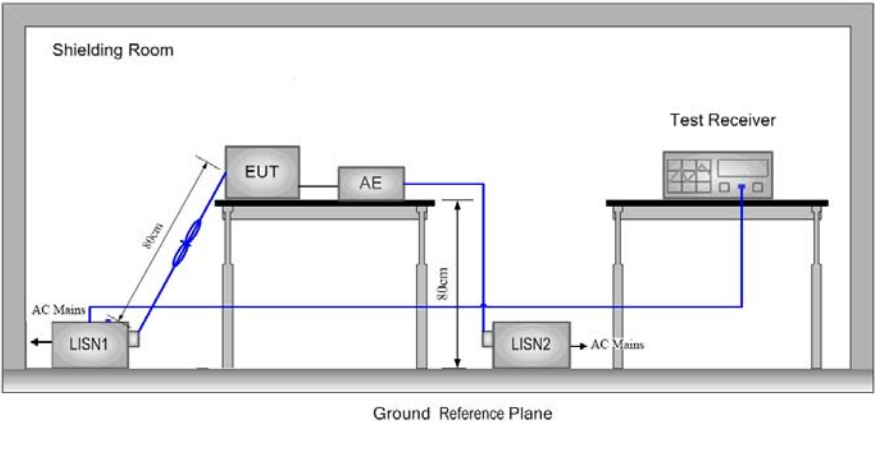
5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
EUT Antenna:	
<p>The antenna is Omni Directional Antenna. The best case gain of the ANT1 is 3.0dBi. The best case gain of the ANT2 is 3.0dBi. MIMO mode: the antenna gain is 6.01dBi Note: transmit signals are correlated with each other, Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi=3.0+10log(2)dBi=6.01dBi</p>	

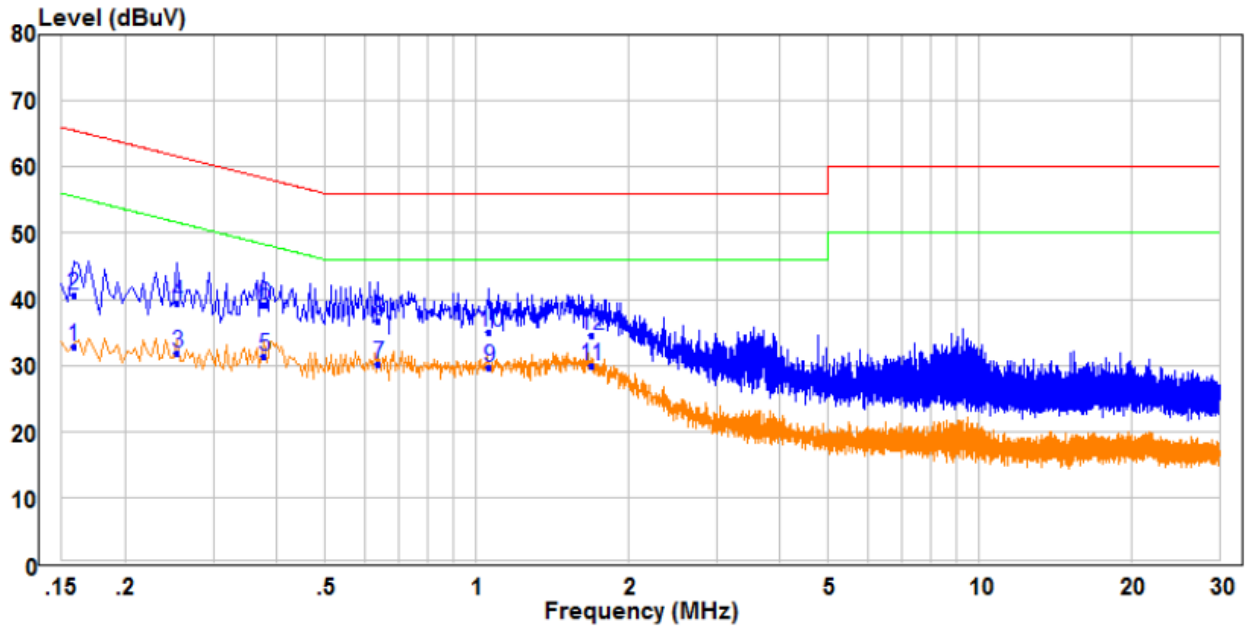
5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<ol style="list-style-type: none"> 1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. 		

<p>Test Setup:</p>	
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the 6.5Mbps of rate of 802.11n(HT20) at ANT1+2 highest channel is the worst case. Only the worst case is recorded in the report.</p>
<p>Test Voltage:</p>	<p>AC120V and AC240V have been tested, find the AC120V is the worst case, only the worst case is recorded in the report.</p>
<p>Test Results:</p>	<p>Pass</p>

Measurement Data

Live Line:

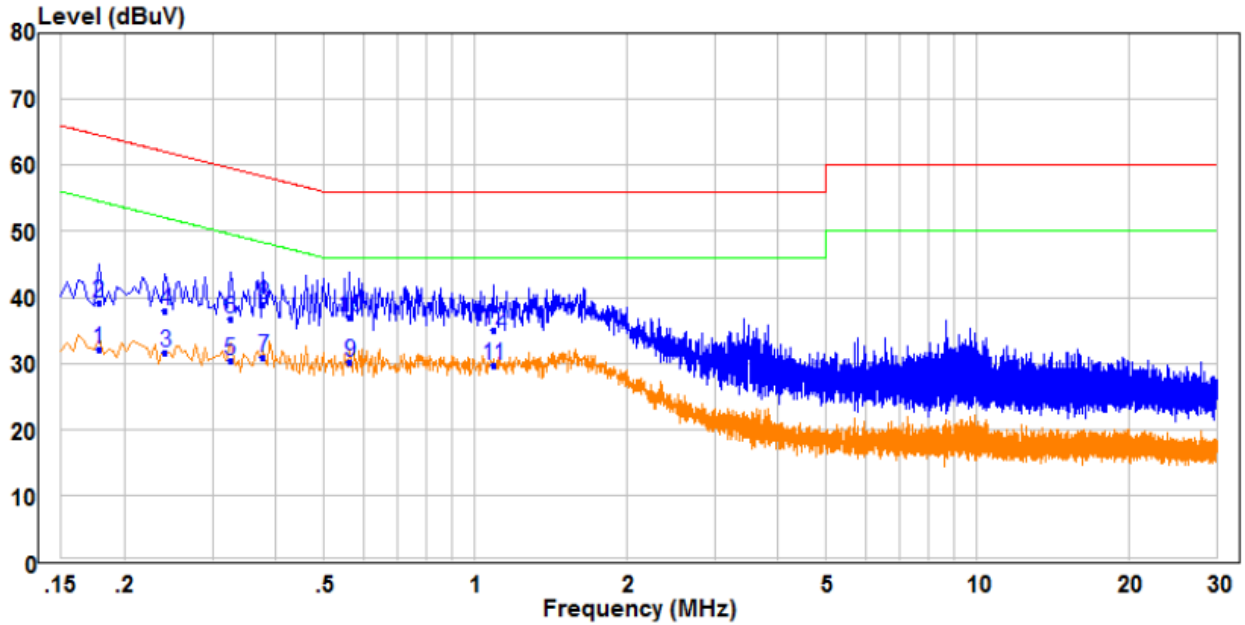


	Read	Limit	Over						
	Freq	Level	Factor	Level	Line	Limit	Remark	Pol/Phase	
	MHz	dBuV	dB	dBuV	dBuV	dB			
1	0.158	23.43	9.49	32.92	55.57	-22.65	Average	Line	
2	0.158	31.10	9.49	40.59	65.57	-24.98	QP	Line	
3	0.254	22.40	9.49	31.89	51.63	-19.74	Average	Line	
4	0.254	29.83	9.49	39.32	61.63	-22.31	QP	Line	
5	0.378	21.96	9.50	31.46	48.32	-16.86	Average	Line	
6	QP	0.378	29.66	9.50	39.16	58.32	-19.16	QP	Line
7	PP	0.638	20.28	9.77	30.05	46.00	-15.95	Average	Line
8		0.638	26.86	9.77	36.63	56.00	-19.37	QP	Line
9		1.062	20.12	9.53	29.65	46.00	-16.35	Average	Line
10		1.062	25.49	9.53	35.02	56.00	-20.98	QP	Line
11		1.690	20.46	9.52	29.98	46.00	-16.02	Average	Line
12		1.690	25.12	9.52	34.64	56.00	-21.36	QP	Line

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral Line:

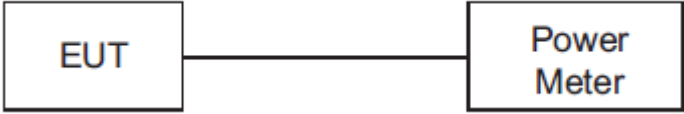


	Freq	Read	Factor	Limit	Over	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.178	22.70	9.48	32.18	54.58	-22.40	Average Neutral
2	0.178	29.64	9.48	39.12	64.58	-25.46	QP Neutral
3	0.242	22.17	9.48	31.65	52.03	-20.38	Average Neutral
4	0.242	28.35	9.48	37.83	62.03	-24.20	QP Neutral
5	0.326	21.02	9.50	30.52	49.55	-19.03	Average Neutral
6	0.326	27.23	9.50	36.73	59.55	-22.82	QP Neutral
7	0.378	21.47	9.53	31.00	48.32	-17.32	Average Neutral
8	0.378	29.36	9.53	38.89	58.32	-19.43	QP Neutral
9 PP	0.562	20.55	9.66	30.21	46.00	-15.79	Average Neutral
10 QP	0.562	27.25	9.66	36.91	56.00	-19.09	QP Neutral
11	1.086	19.97	9.71	29.68	46.00	-16.32	Average Neutral
12	1.086	25.30	9.71	35.01	56.00	-20.99	QP Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

5.3 Conducted Peak & Average Output Power

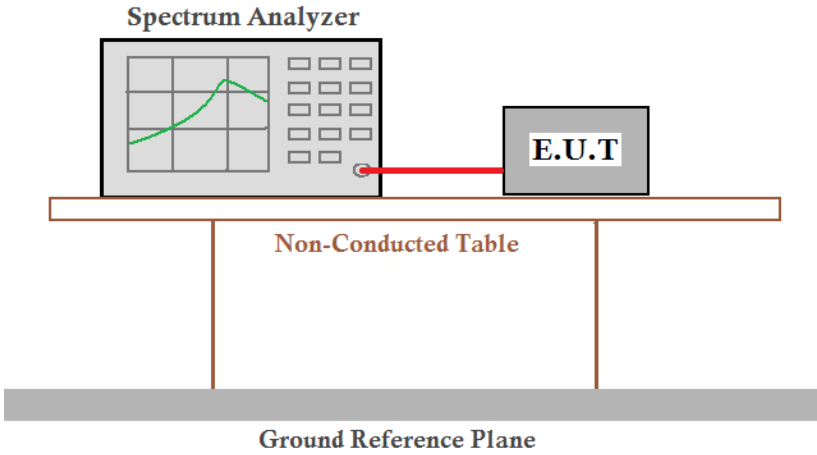
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <pre> graph LR EUT[EUT] --- PM[Power Meter] </pre>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) Only the worst case is recorded in the report.
Limit:	30dBm
Test Results:	Pass

Measurement Data

802.11b mode					
Test channel	Antenna	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	Ant1	15.18	12.08	30.00	Pass
Lowest	Ant2	15.91	12.26	30.00	Pass
Middle	Ant1	15.58	12.56	30.00	Pass
Middle	Ant2	15.84	12.87	30.00	Pass
Highest	Ant1	15.47	12.51	30.00	Pass
Highest	Ant2	15.96	12.9	30.00	Pass
802.11g mode					
Test channel	Antenna	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	Ant1	19.98	12.51	30.00	Pass
Lowest	Ant2	20.14	12.8	30.00	Pass
Middle	Ant1	20.28	12.96	30.00	Pass
Middle	Ant2	20.01	12.46	30.00	Pass
Highest	Ant1	20.02	12.9	30.00	Pass
Highest	Ant2	19.95	12.69	30.00	Pass
802.11n(HT20) SISO mode					
Test channel	Antenna	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	Ant1	19.78	12.39	30.00	Pass
Lowest	Ant2	20.11	12.55	30.00	Pass
Middle	Ant1	20.46	12.93	30.00	Pass
Middle	Ant2	19.94	12.33	30.00	Pass
Highest	Ant1	20.01	12.54	30.00	Pass
Highest	Ant2	20.27	12.53	30.00	Pass
802.11n(HT40) SISO mode					
Test channel	Antenna	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	Ant1	19.61	12.66	30.00	Pass
Lowest	Ant2	19.27	12.16	30.00	Pass
Middle	Ant1	20.23	13.59	30.00	Pass
Middle	Ant2	19.95	12.88	30.00	Pass
Highest	Ant1	19.25	12.24	30.00	Pass
Highest	Ant2	19.92	12.85	30.00	Pass

802.11n(HT20) MIMO mode					
Test channel	Antenna	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	Ant1	19.45	12.16	30.00	Pass
Lowest	Ant2	20.58	11.73	30.00	Pass
Lowest	Ant1+2	23.06	14.96	30.00	Pass
Middle	Ant1	20.15	12.72	30.00	Pass
Middle	Ant2	19.76	12.12	30.00	Pass
Middle	Ant1+2	22.97	15.44	30.00	Pass
Highest	Ant1	19.86	12.68	30.00	Pass
Highest	Ant2	20.54	12.49	30.00	Pass
Highest	Ant1+2	23.22	15.60	30.00	Pass
802.11n(HT40) MIMO mode					
Test channel	Antenna	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
Lowest	Ant1	18.91	11.95	30.00	Pass
Lowest	Ant2	18.75	12.11	30.00	Pass
Lowest	Ant1+2	21.84	15.04	30.00	Pass
Middle	Ant1	19.46	12.48	30.00	Pass
Middle	Ant2	18.57	11.79	30.00	Pass
Middle	Ant1+2	22.05	15.16	30.00	Pass
Highest	Ant1	19.56	12.87	30.00	Pass
Highest	Ant2	19.03	11.8	30.00	Pass
Highest	Ant1+2	22.31	15.38	30.00	Pass
Remark:					
1. Average Output Power was for reference only					
2. Average Output Power had added duty cycle factor					

5.4 6dB Occupy Bandwidth

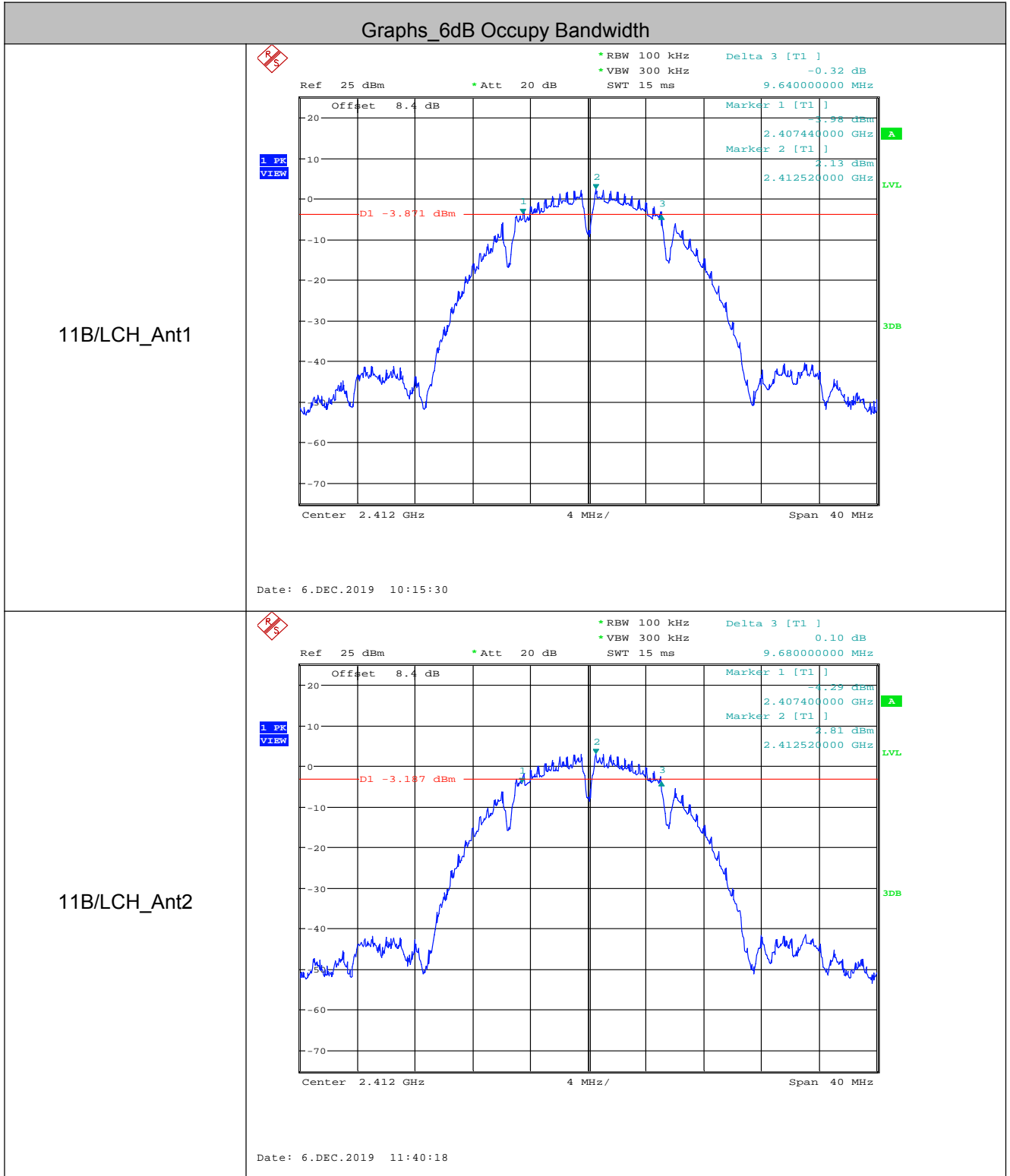
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p style="text-align: center;">Offset=cable loss+ attenuation factor</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) Only the worst case is recorded in the report.
Limit:	≥ 500 kHz
Test Results:	Pass

Measurement Data

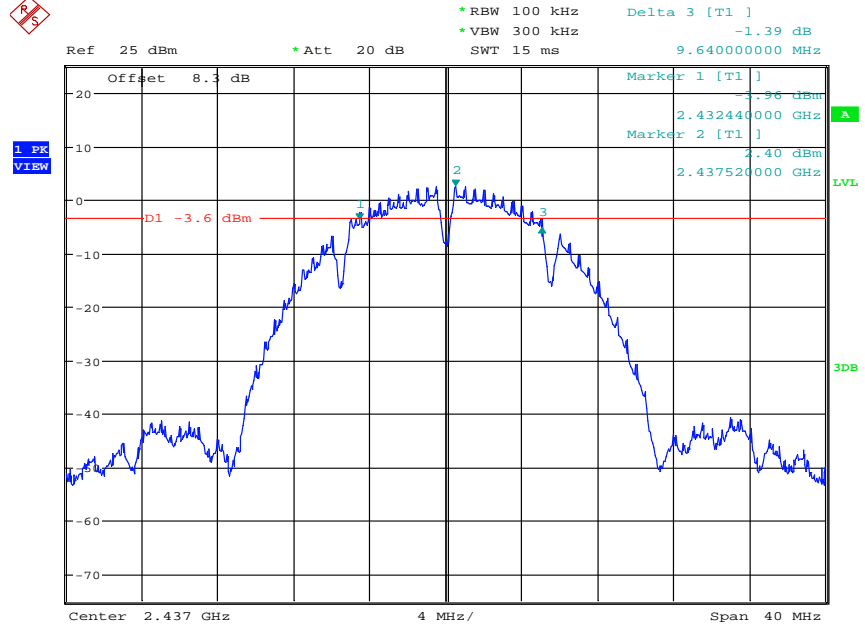
802.11b mode					
Test channel	Antenna	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	Ant1	9.640	14.320	≥0.5	Pass
Lowest	Ant2	9.680	14.280	≥0.5	Pass
Middle	Ant1	9.640	14.200	≥0.5	Pass
Middle	Ant2	9.880	14.240	≥0.5	Pass
Highest	Ant1	9.360	14.240	≥0.5	Pass
Highest	Ant2	9.640	14.200	≥0.5	Pass
802.11g mode					
Test channel	Antenna	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	Ant1	15.160	16.760	≥0.5	Pass
Lowest	Ant2	15.080	16.800	≥0.5	Pass
Middle	Ant1	15.200	16.720	≥0.5	Pass
Middle	Ant2	15.200	16.800	≥0.5	Pass
Highest	Ant1	13.960	16.760	≥0.5	Pass
Highest	Ant2	15.160	16.720	≥0.5	Pass
802.11n(HT20) SISO mode					
Test channel	Antenna	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	Ant1	15.240	17.720	≥0.5	Pass
Lowest	Ant2	16.160	17.640	≥0.5	Pass
Middle	Ant1	15.200	17.680	≥0.5	Pass
Middle	Ant2	15.200	17.680	≥0.5	Pass
Highest	Ant1	15.160	17.680	≥0.5	Pass
Highest	Ant2	15.160	17.680	≥0.5	Pass
802.11n(HT40) SISO mode					
Test channel	Antenna	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	Ant1	33.920	36.000	≥0.5	Pass
Lowest	Ant2	35.200	36.000	≥0.5	Pass
Middle	Ant1	35.280	36.160	≥0.5	Pass
Middle	Ant2	35.280	36.080	≥0.5	Pass
Highest	Ant1	35.280	36.080	≥0.5	Pass
Highest	Ant2	34.000	36.000	≥0.5	Pass

802.11n(HT20) MIMO mode					
Test channel	Antenna	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	Ant1	15.200	17.720	≥0.5	Pass
Lowest	Ant2	15.160	17.560	≥0.5	Pass
Middle	Ant1	15.200	17.680	≥0.5	Pass
Middle	Ant2	15.160	17.520	≥0.5	Pass
Highest	Ant1	15.200	17.680	≥0.5	Pass
Highest	Ant2	15.160	17.560	≥0.5	Pass
802.11n(HT40) MIMO mode					
Test channel	Antenna	6dB Occupy Bandwidth (MHz)	99% OBW [MHz]	Limit (MHz)	Result
Lowest	Ant1	35.200	36.000	≥0.5	Pass
Lowest	Ant2	35.200	36.240	≥0.5	Pass
Middle	Ant1	35.280	36.000	≥0.5	Pass
Middle	Ant2	34.000	36.320	≥0.5	Pass
Highest	Ant1	35.280	36.080	≥0.5	Pass
Highest	Ant2	35.200	36.240	≥0.5	Pass
Remark:					
1. 99% OBW was for reference only					

Test plot as follows:

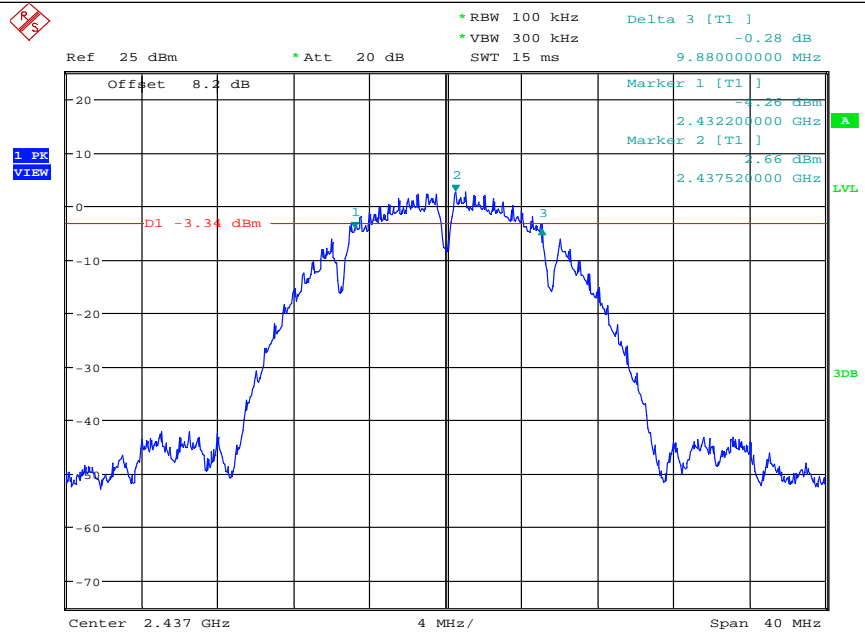


11B/MCH_Ant1



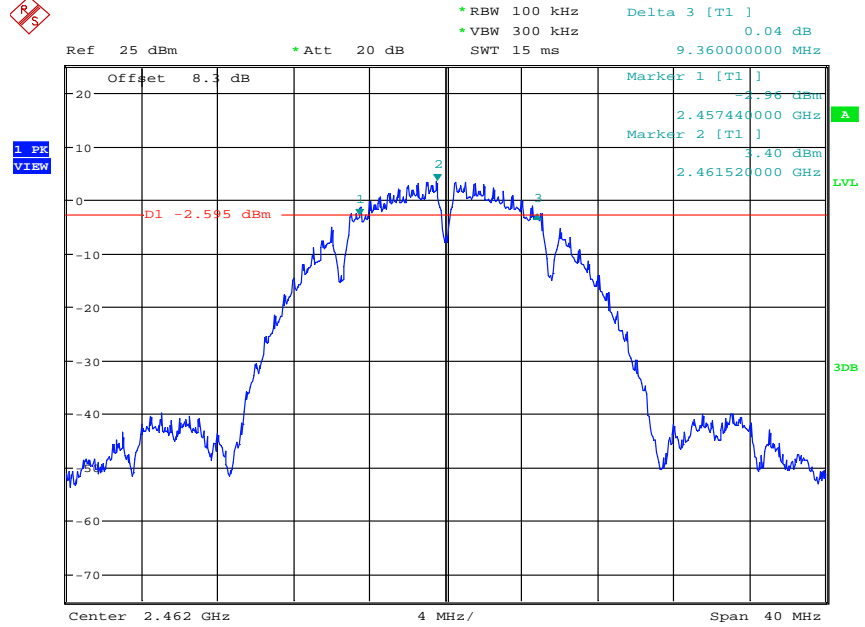
Date: 6.DEC.2019 10:20:39

11B/MCH_Ant2



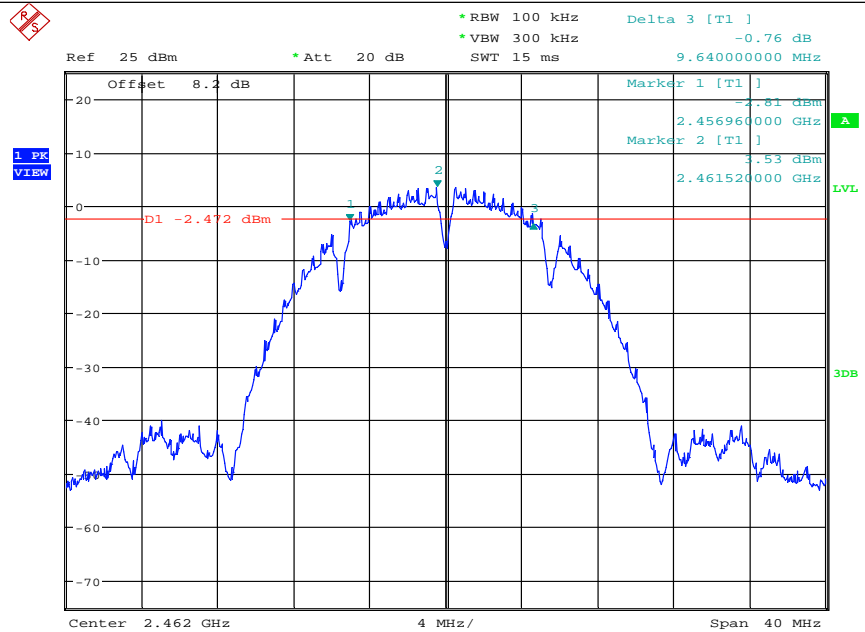
Date: 6.DEC.2019 11:45:42

11B/HCH_Ant1



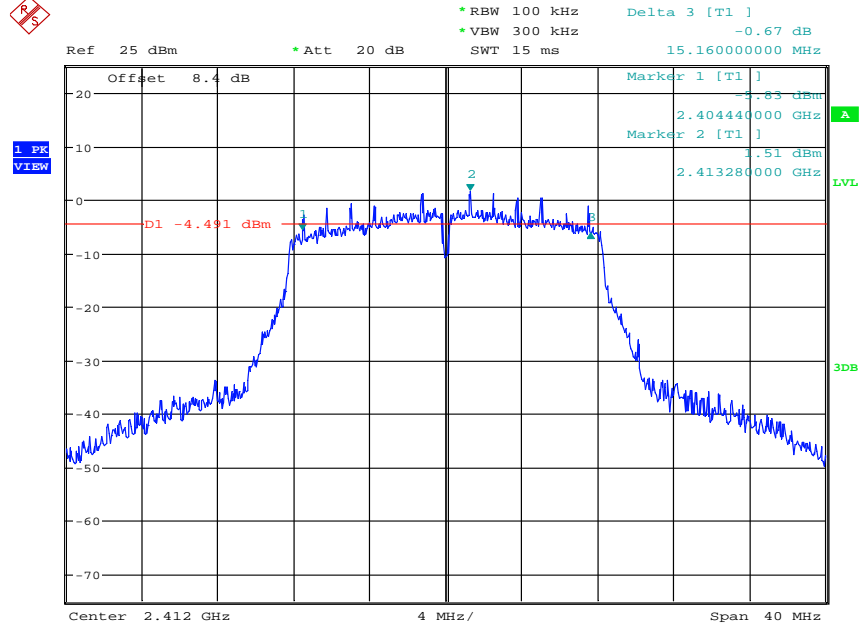
Date: 6.DEC.2019 10:25:17

11B/HCH_Ant2



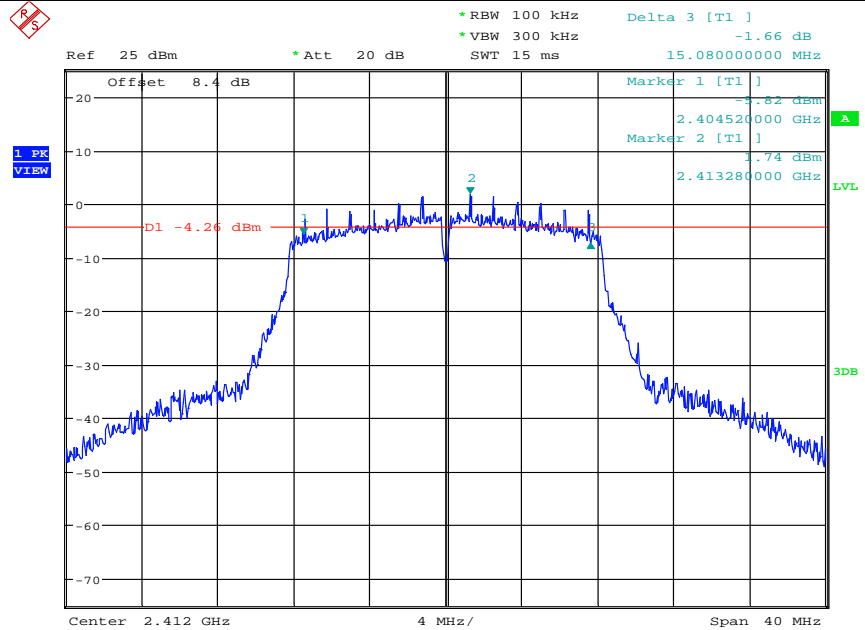
Date: 6.DEC.2019 13:00:33

11G/LCH_Ant1

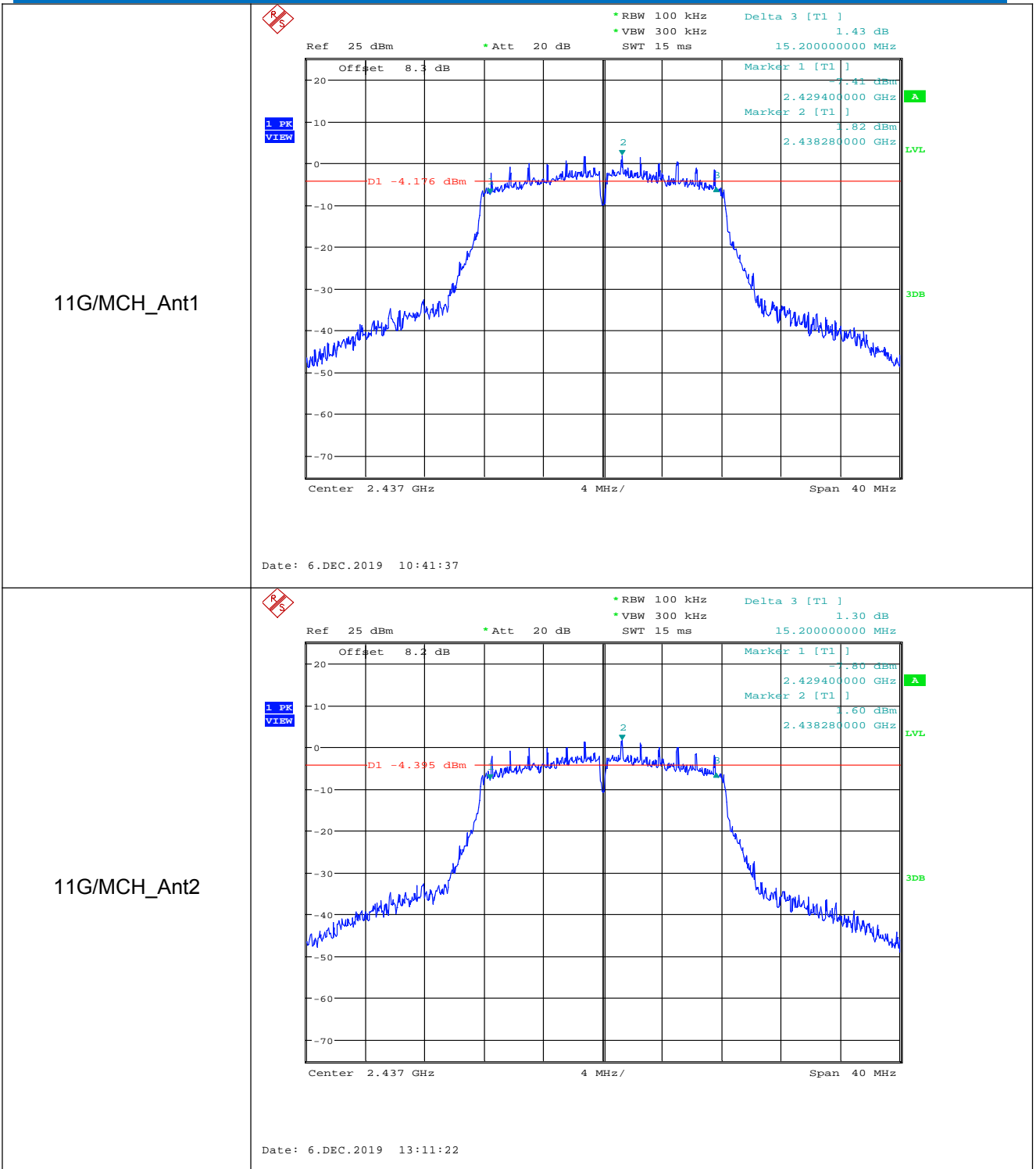


Date: 6.DEC.2019 10:36:31

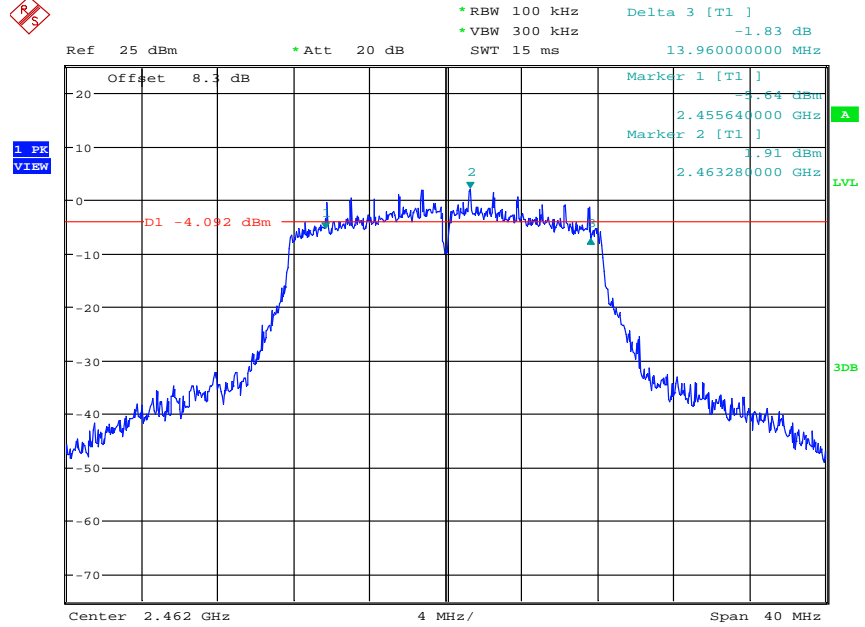
11G/LCH_Ant2



Date: 6.DEC.2019 13:06:14

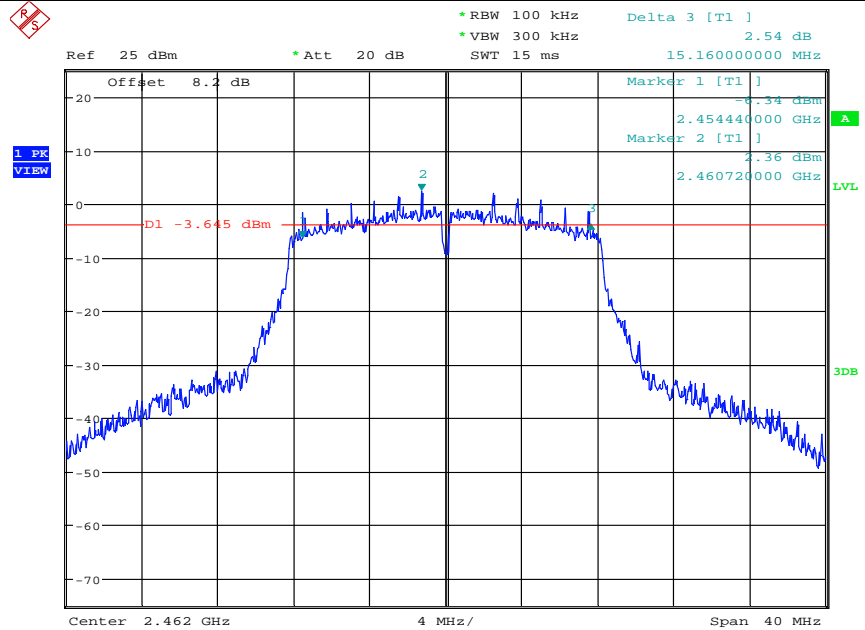


11G/HCH_Ant1



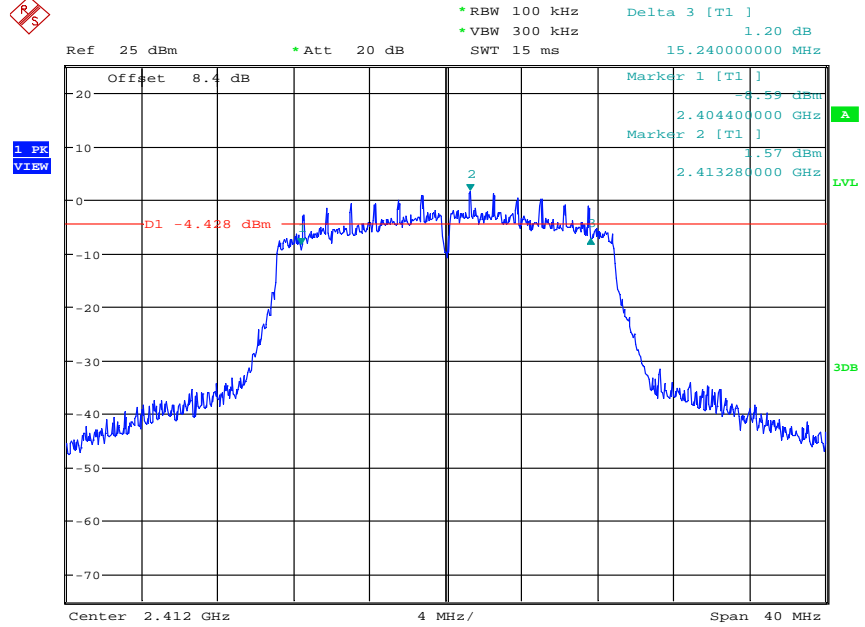
Date: 6.DEC.2019 10:46:13

11G/HCH_Ant2



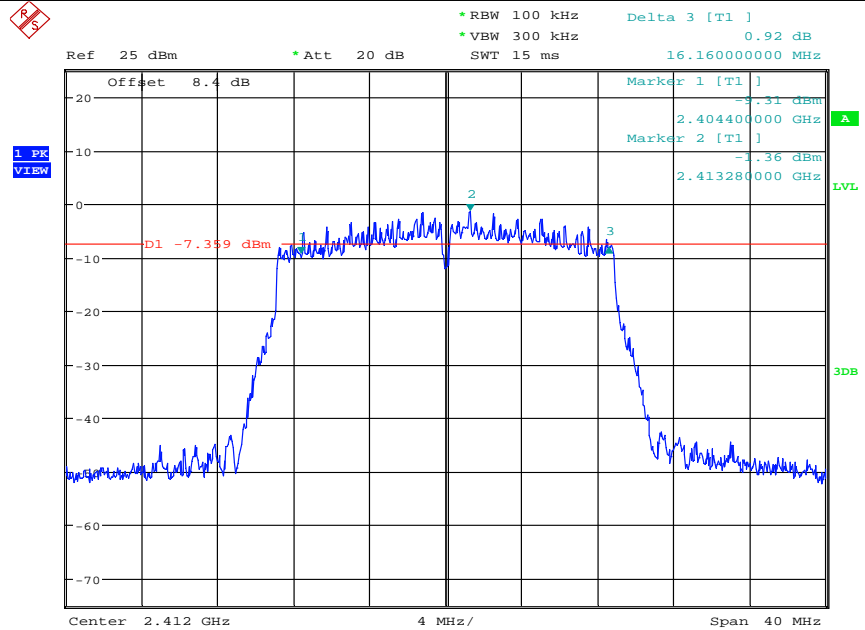
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11N20SISO/LCH_Ant1



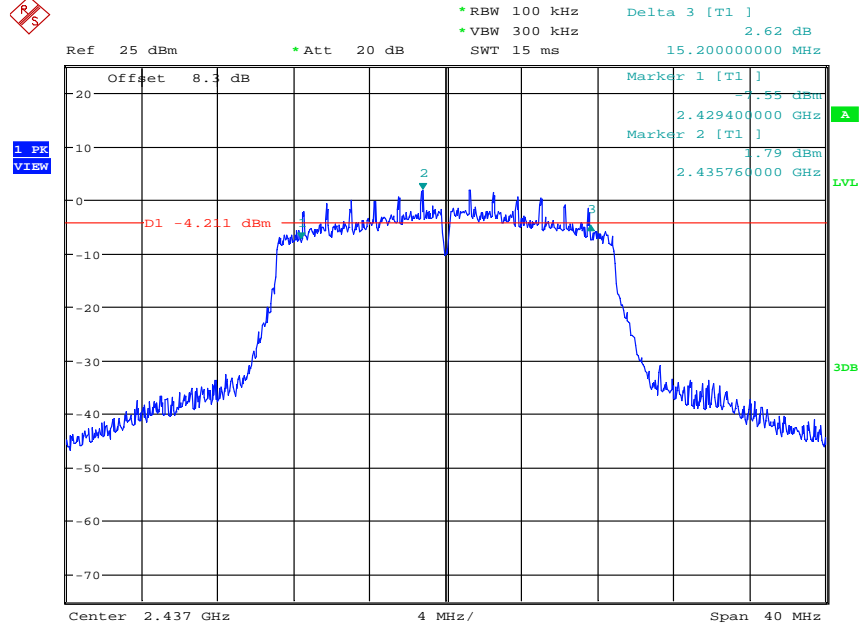
Date: 6.DEC.2019 10:54:40

11N20SISO/LCH_Ant2



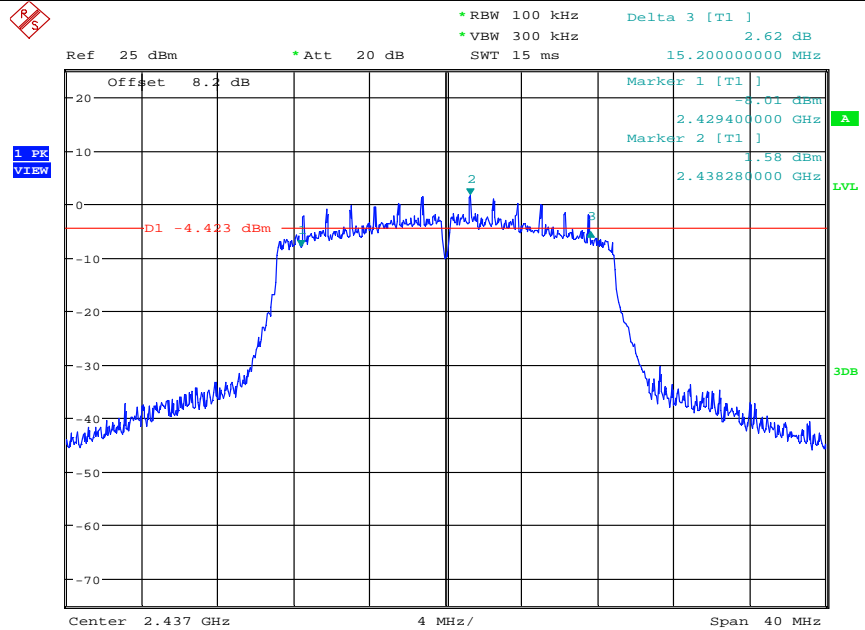
Date: 6.DEC.2019 13:26:14

11N20SISO/MCH_Ant1



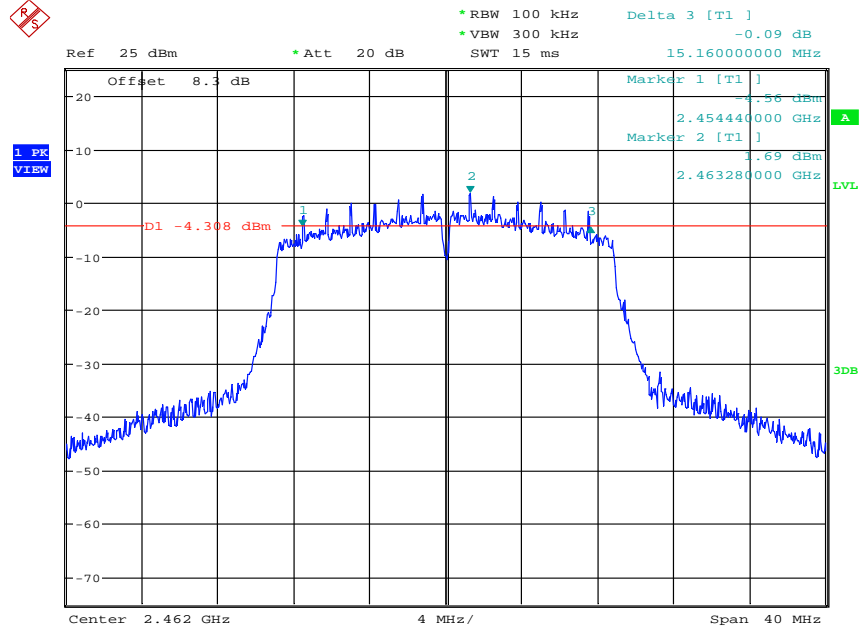
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11N20SISO/MCH_Ant2



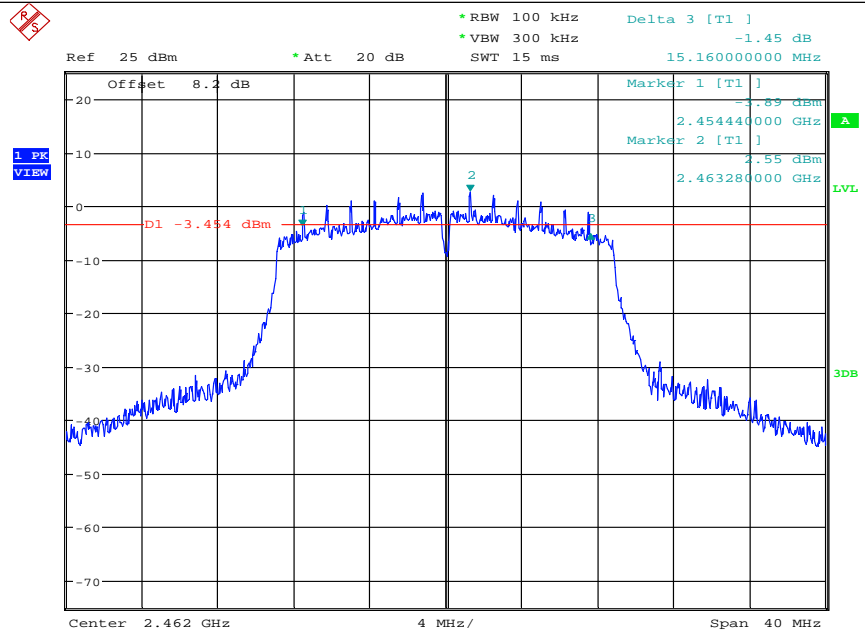
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11N20SISO/HCH_Ant1



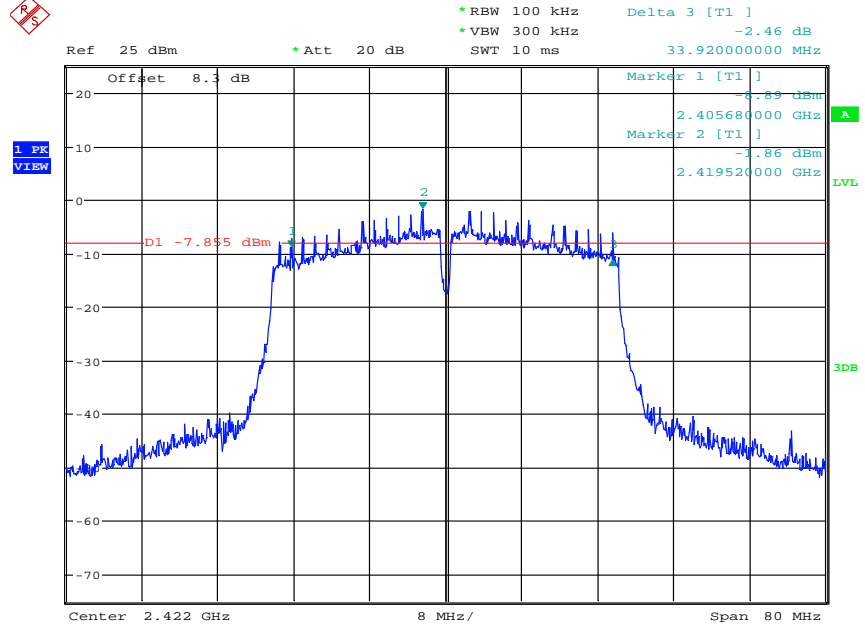
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11N20SISO/HCH_Ant2



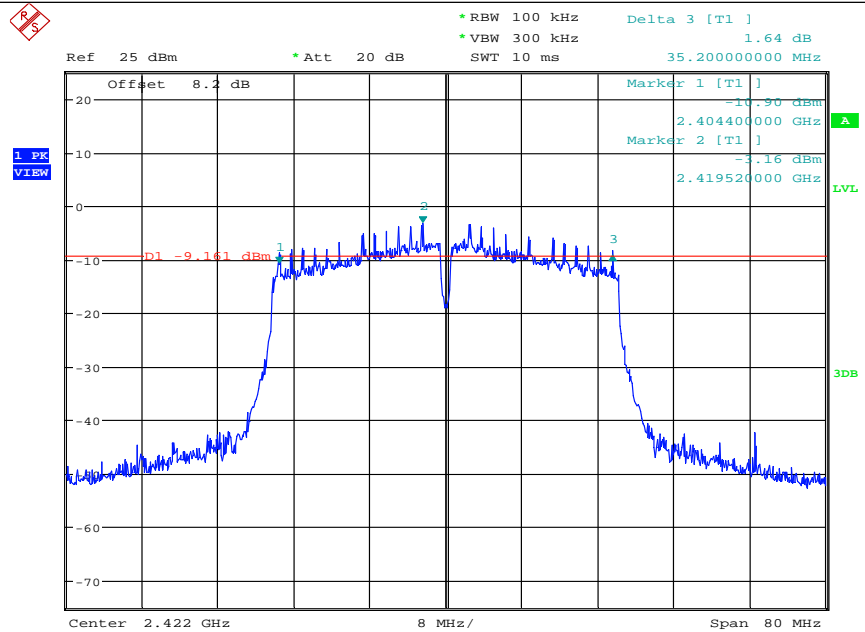
Date: 6.DEC.2019 13:47:09

11N40SISO/LCH_Ant1



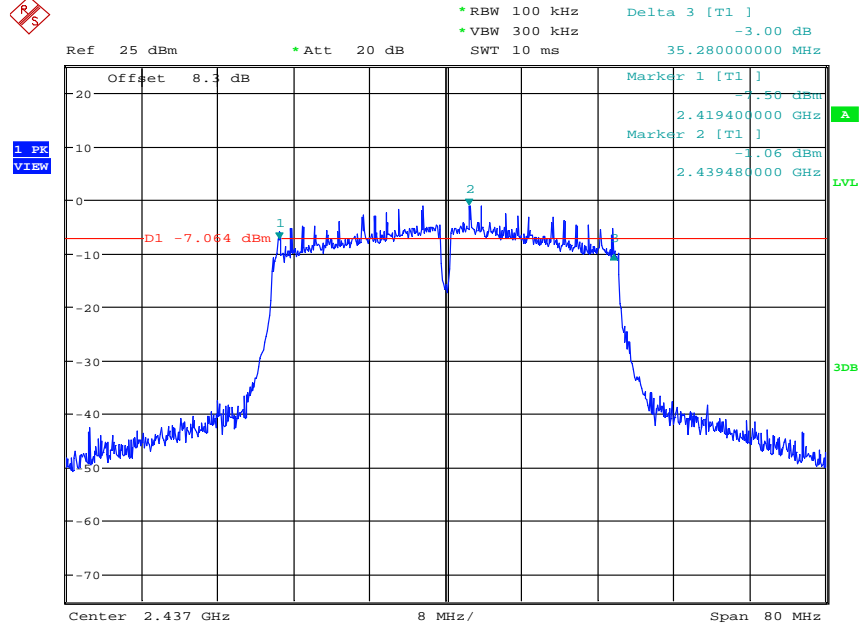
Date: 6.DEC.2019 11:18:31

11N40SISO/LCH_Ant2



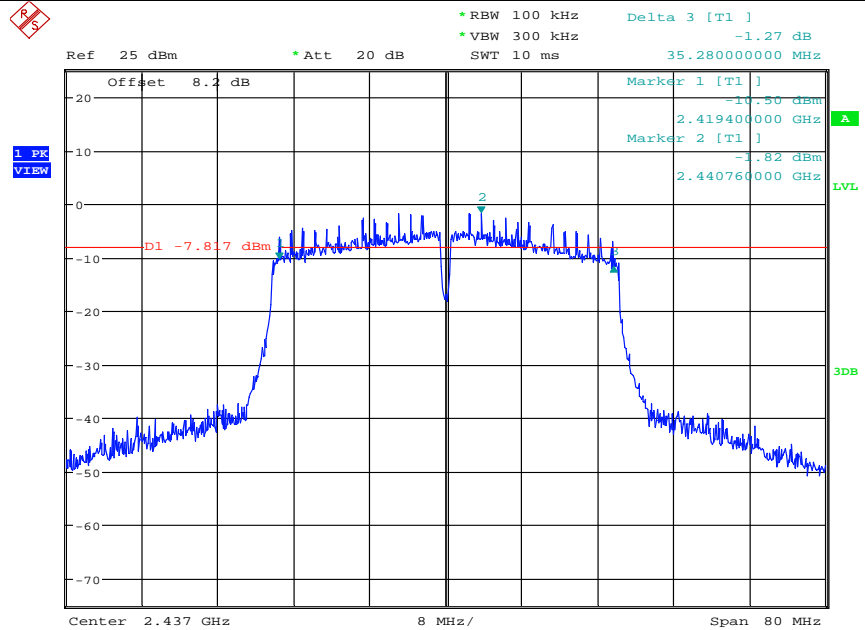
Date: 6.DEC.2019 13:54:58

11N40SISO/MCH_Ant1



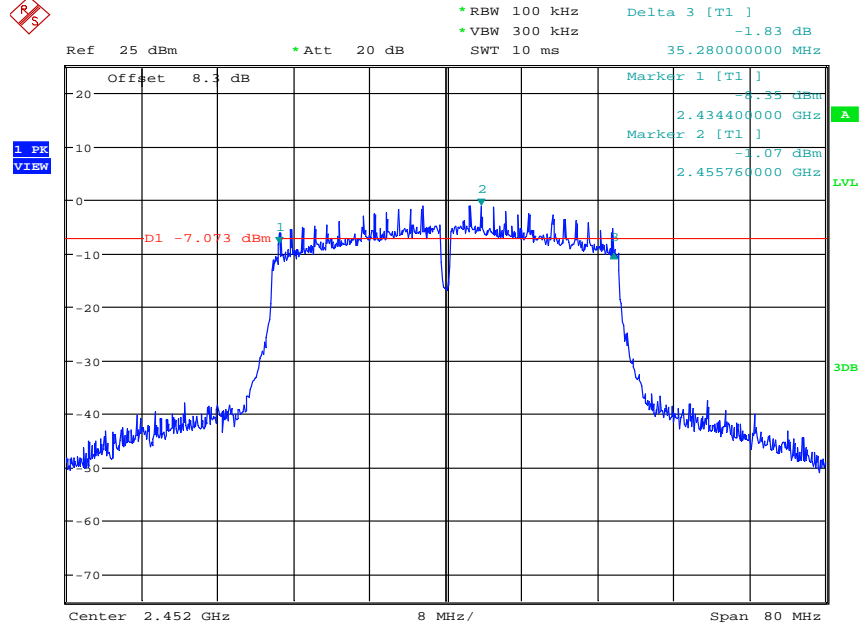
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11N40SISO/MCH_Ant2



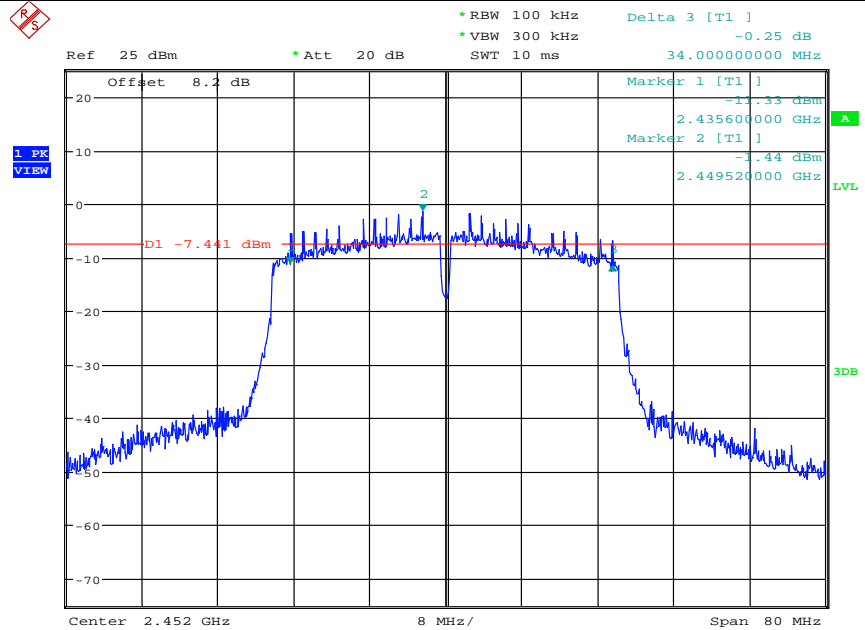
Date: 6.DEC.2019 14:17:47

11N40SISO/HCH_Ant1



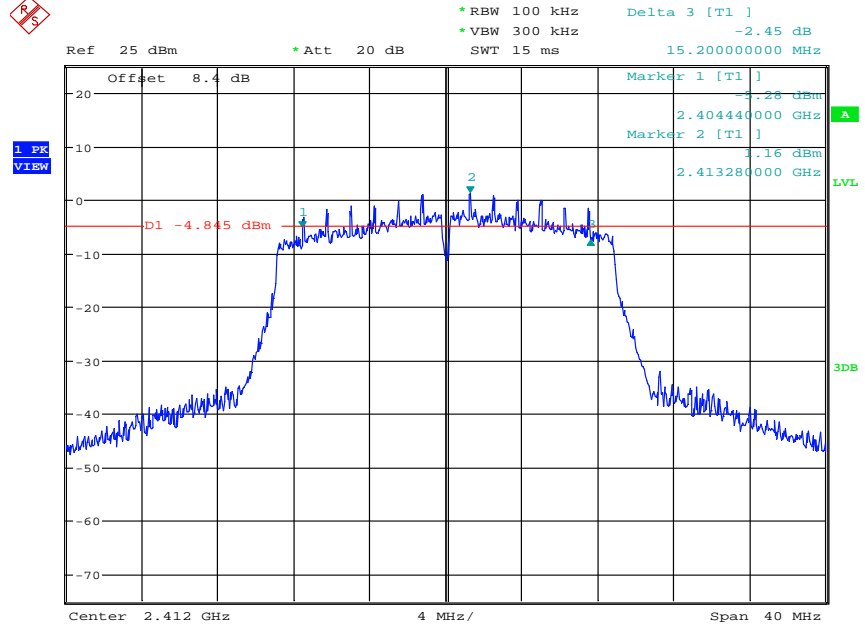
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11N40SISO/HCH_Ant2



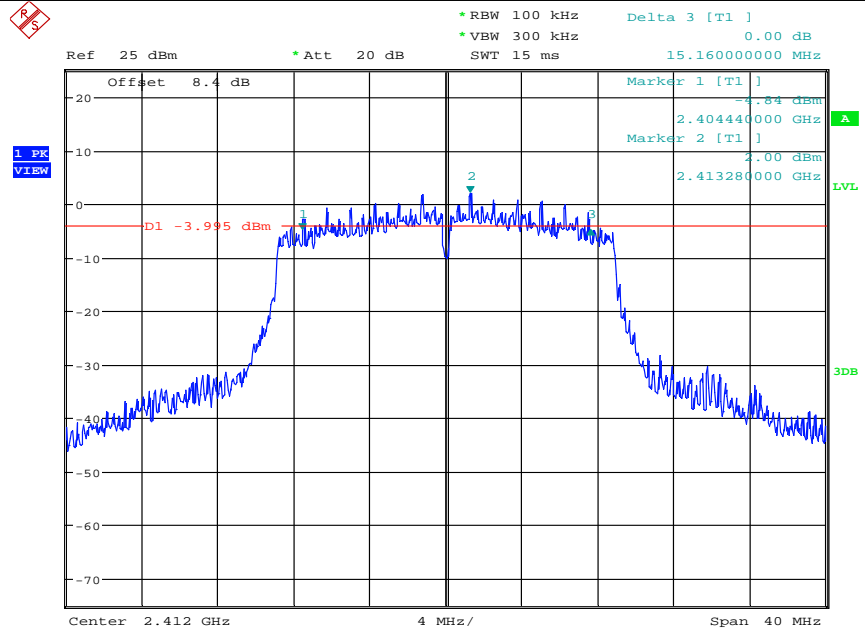
Date: 6.DEC.2019 14:22:34

11N20MIMO/LCH_Ant1



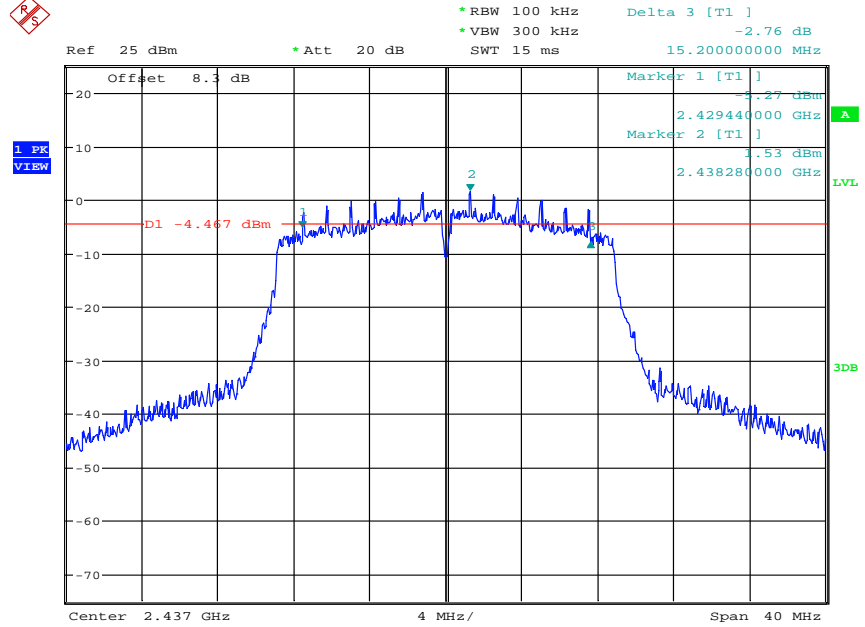
Date: 6.DEC.2019 14:29:36

11N20MIMO/LCH_Ant2



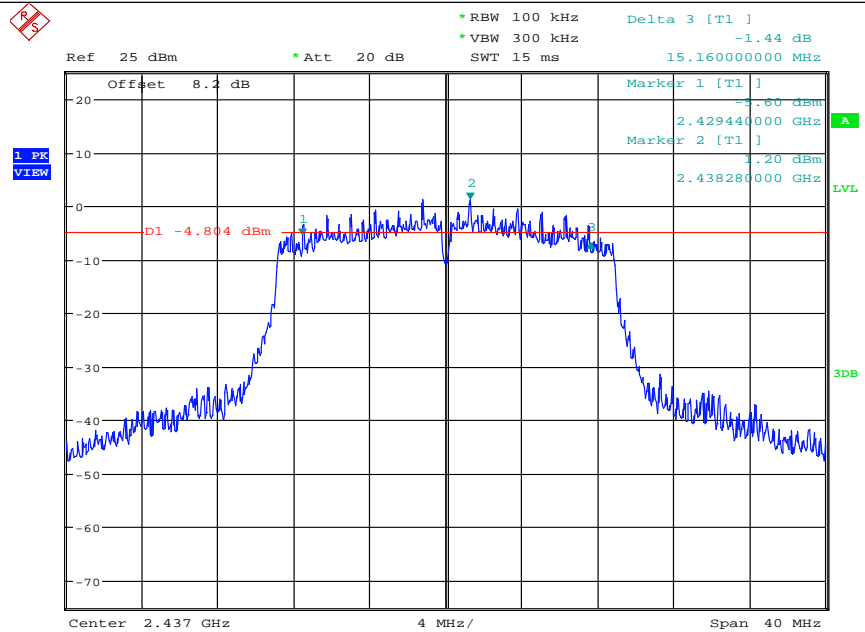
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11N20MIMO/MCH_Ant1



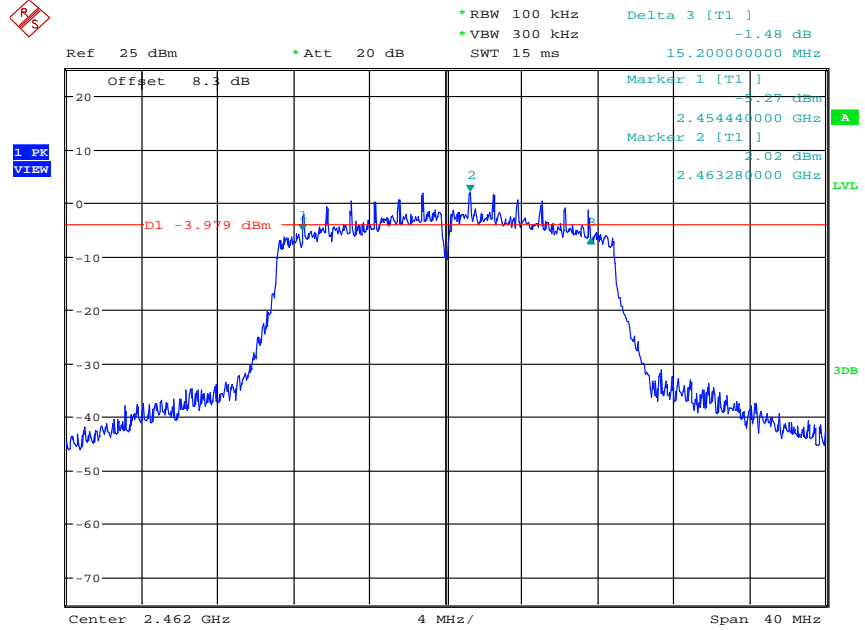
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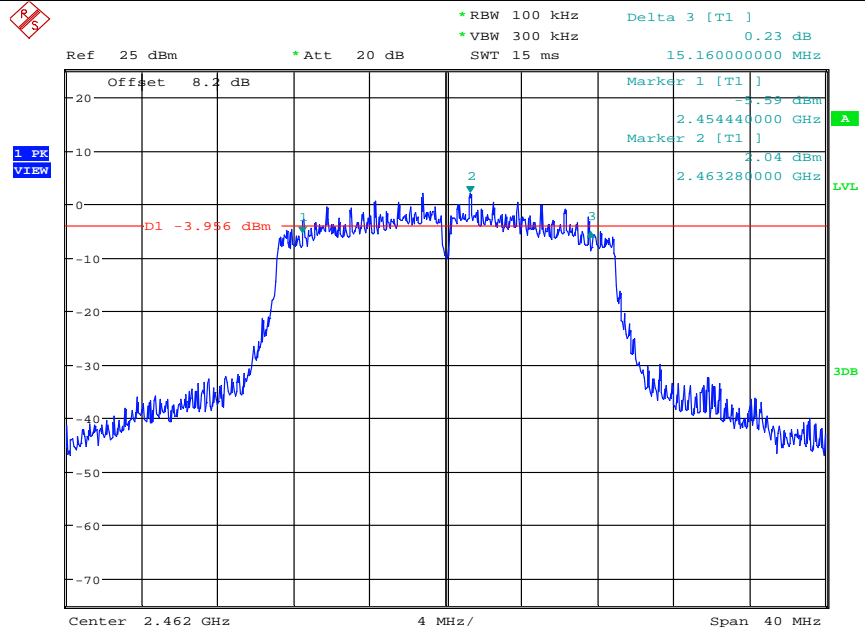
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11N20MIMO/HCH_Ant1



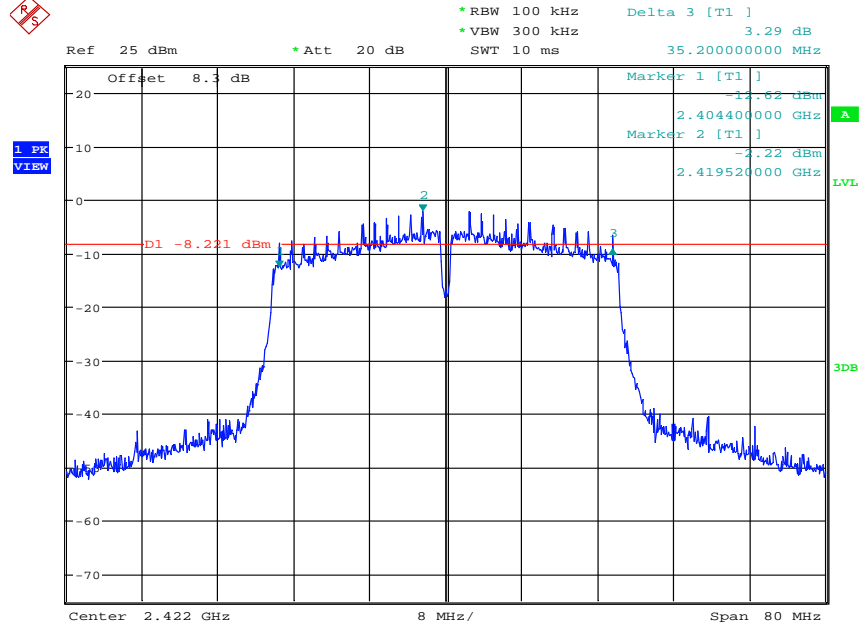
Date: 6.DEC.2019 14:45:28

11N20MIMO/HCH_Ant2



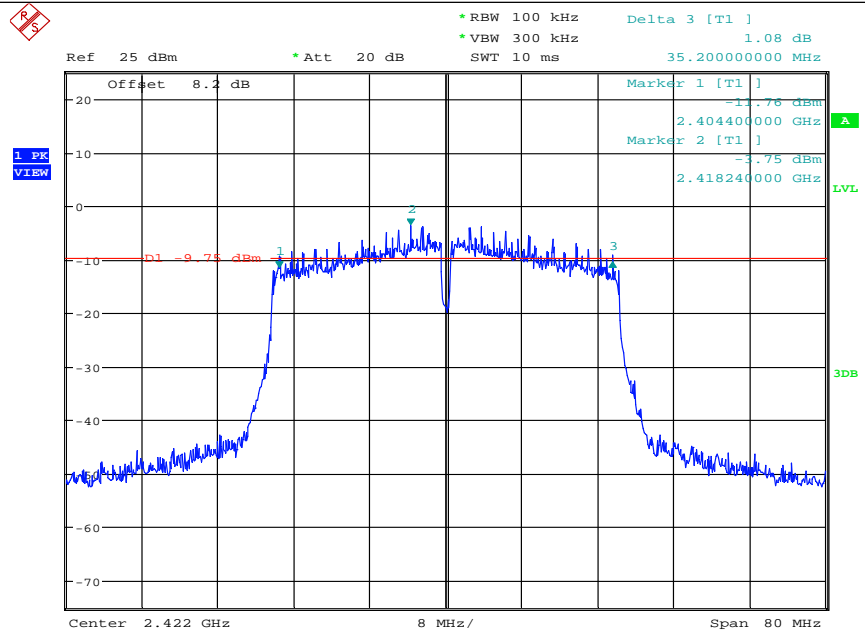
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11N40MIMO/LCH_Ant1

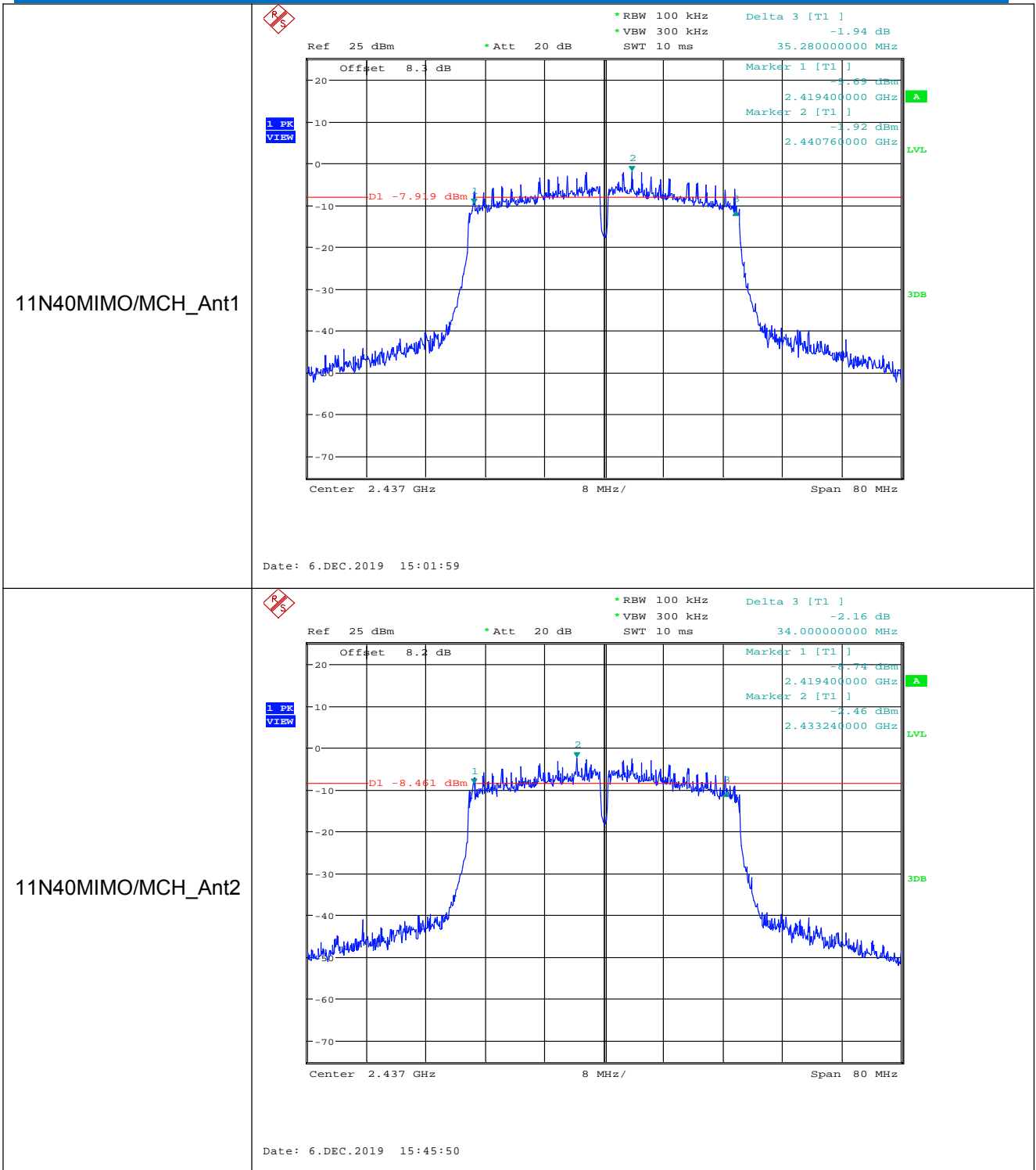


Date: 6.DEC.2019 14:56:56

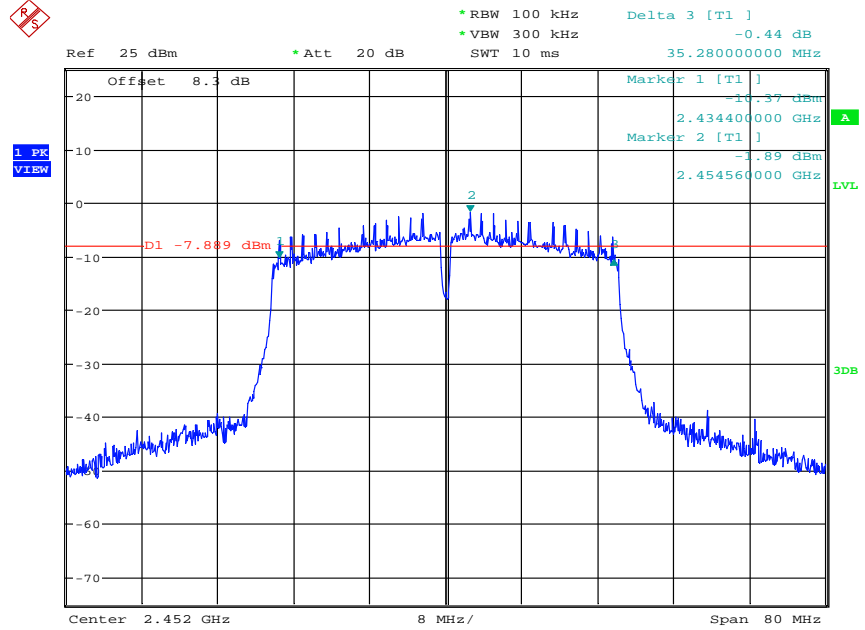
11N40MIMO/LCH_Ant2



Date: 6.DEC.2019 15:39:05

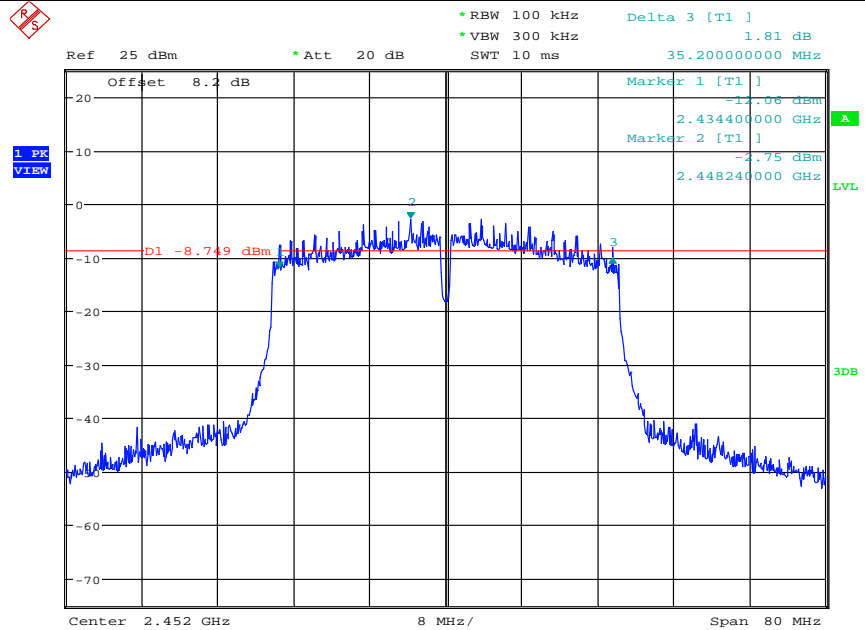


11N40MIMO/HCH_Ant1



Date: 6.DEC.2019 15:08:02

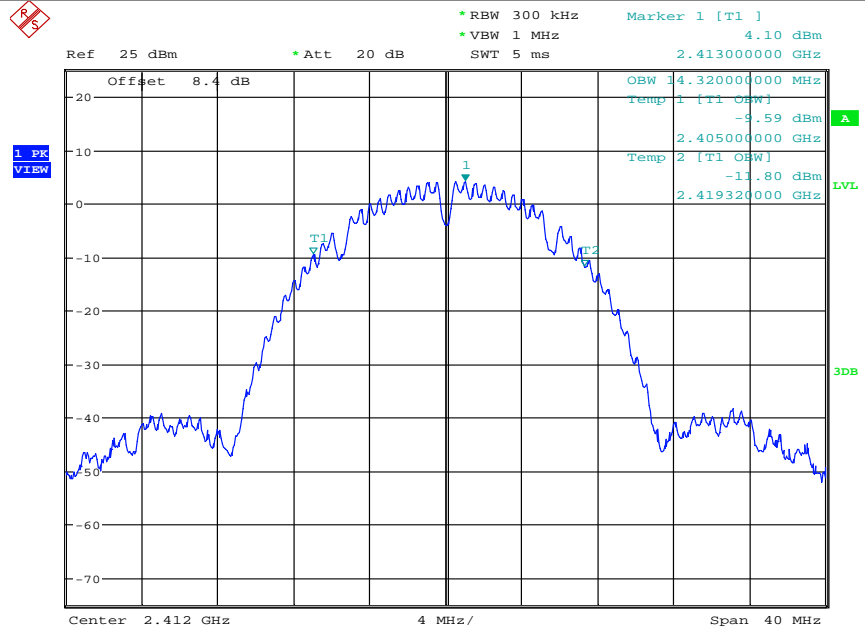
11N40MIMO/HCH_Ant2



Date: 6.DEC.2019 15:50:38

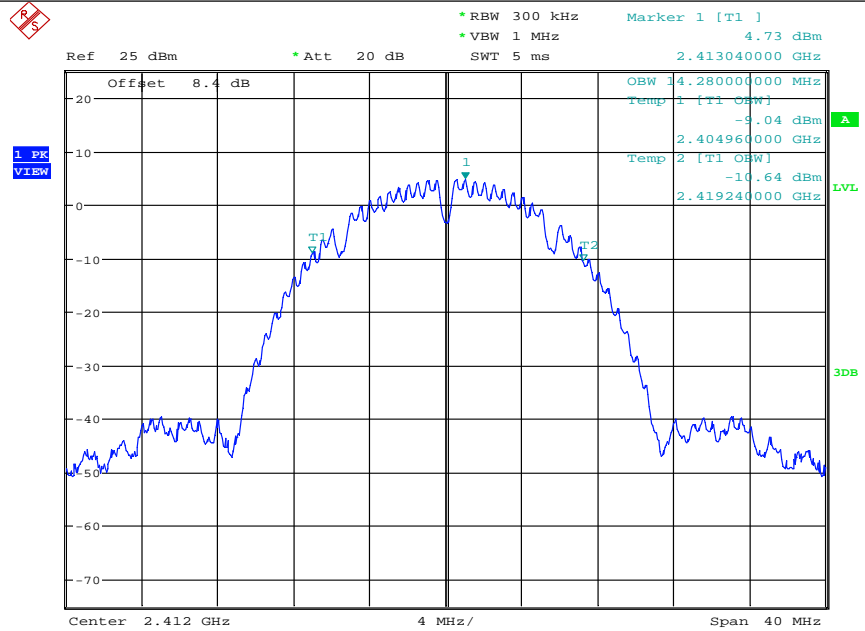
Graphs_99% OBW

11B/LCH_Ant1



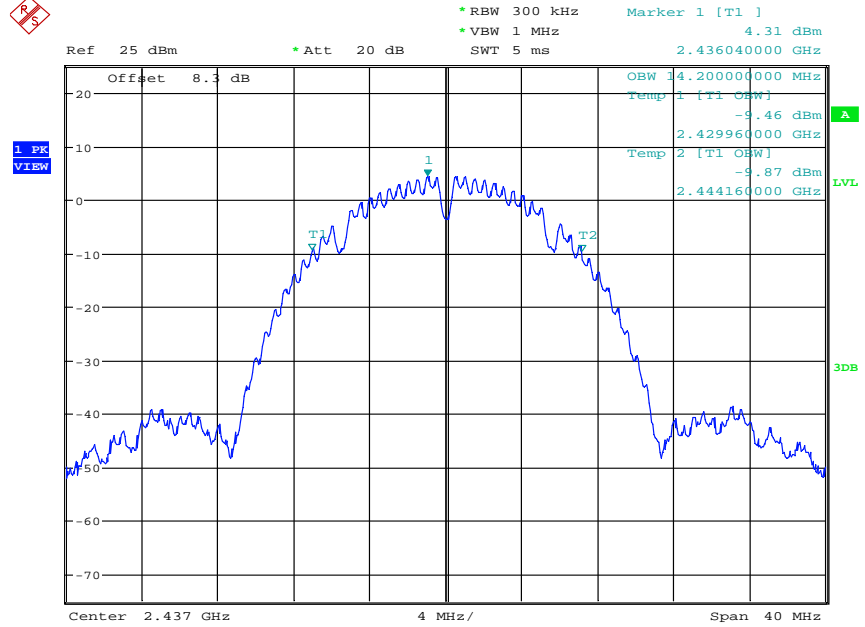
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11B/LCH_Ant2



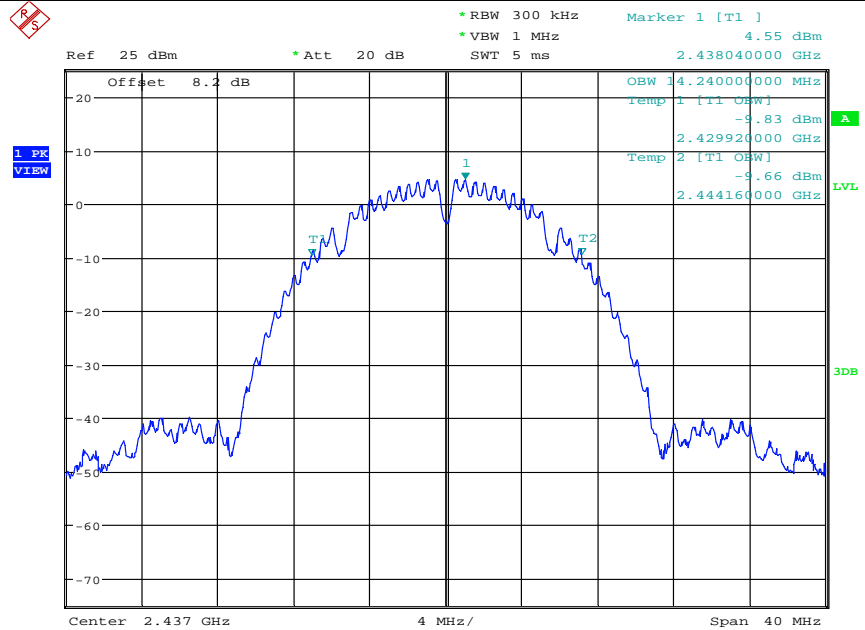
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11B/MCH_Ant1

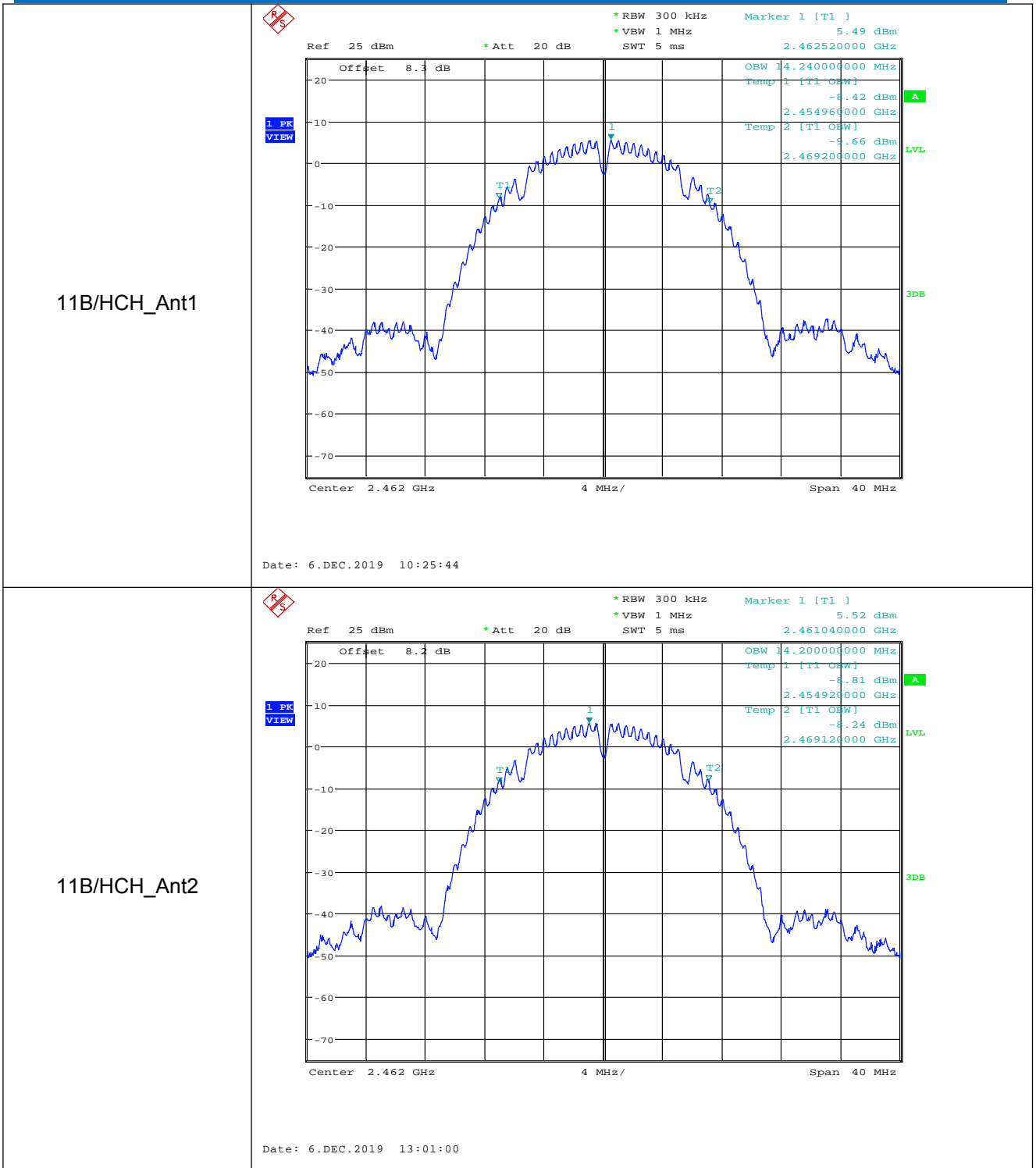


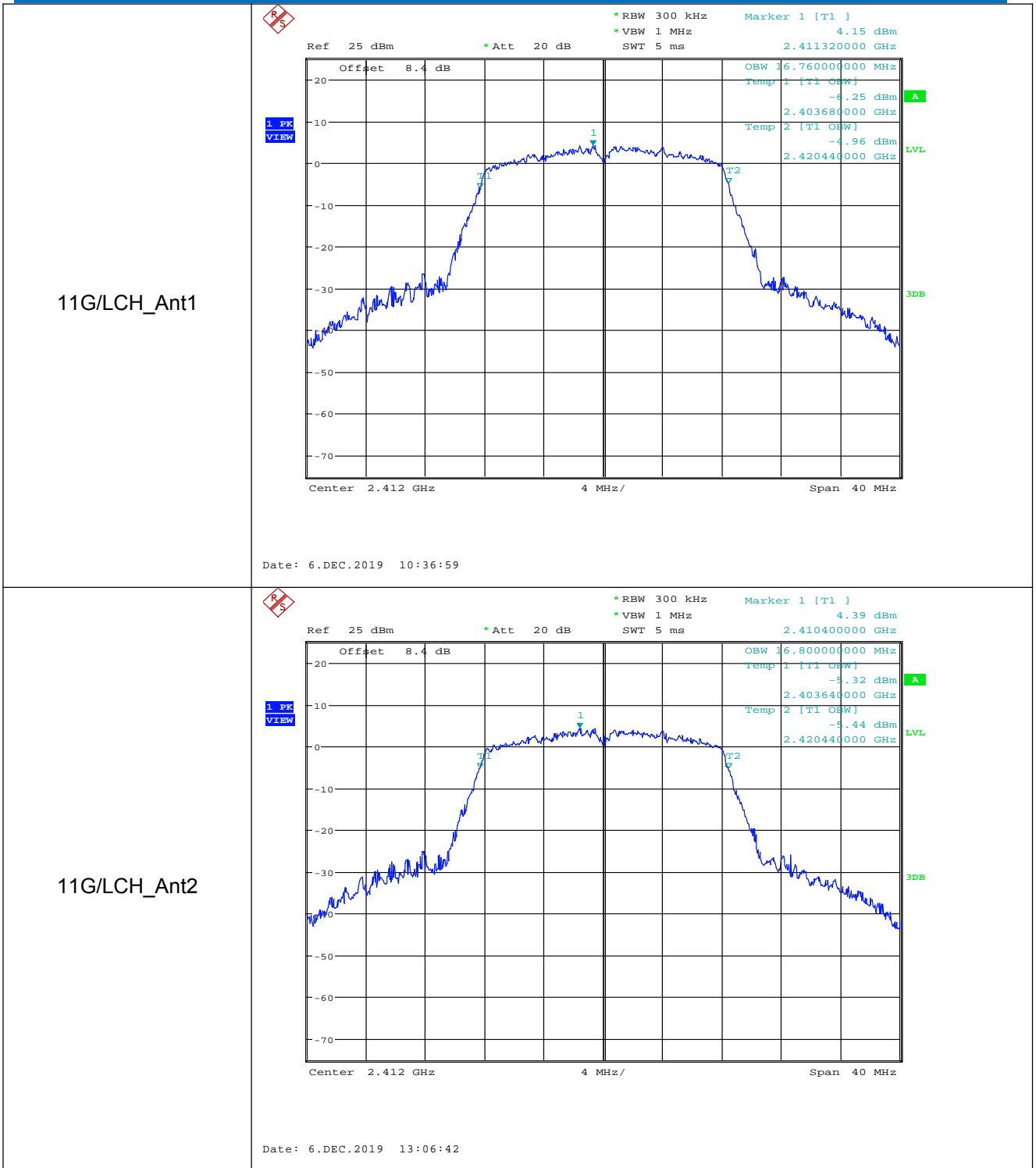
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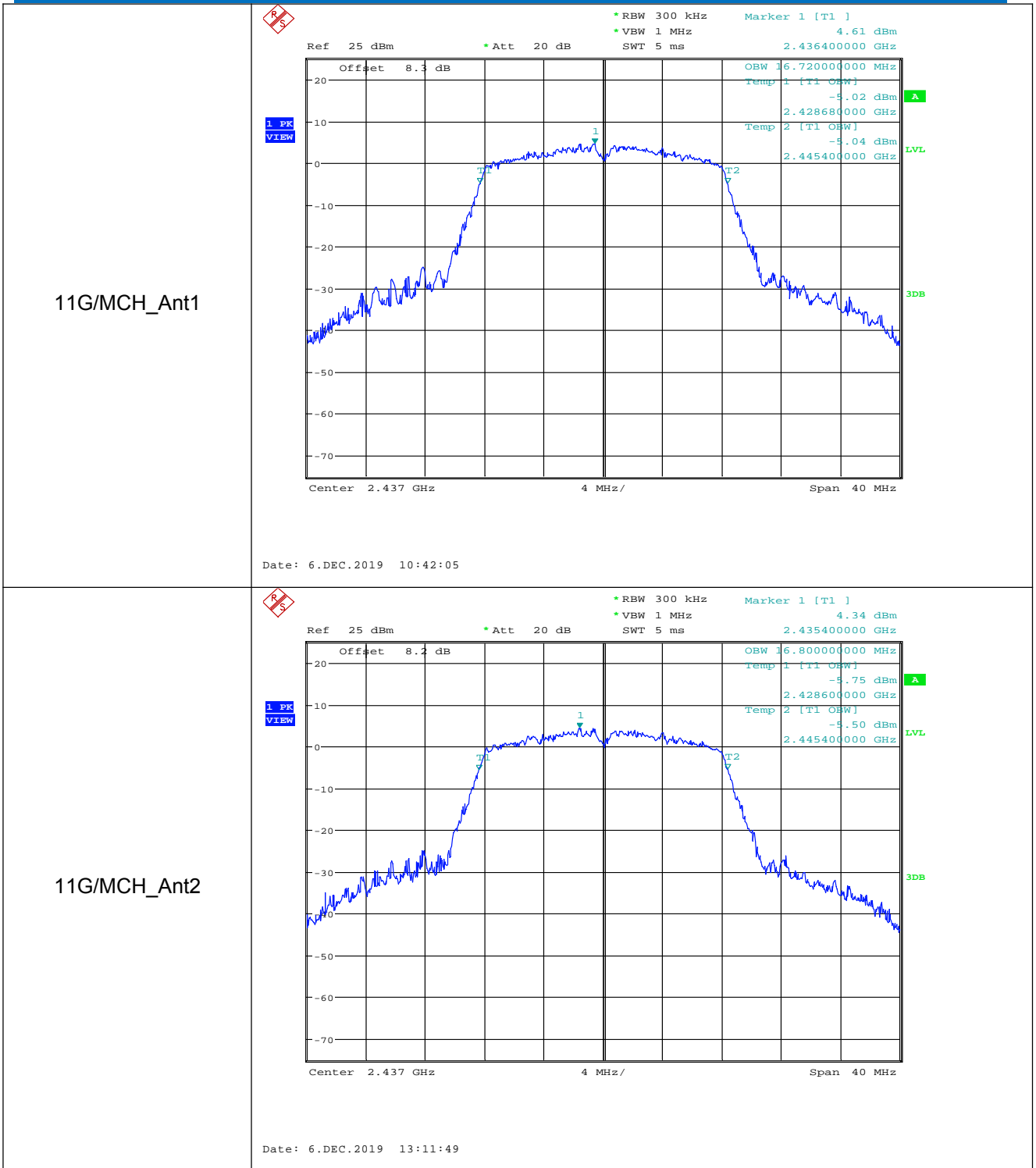
11B/MCH_Ant2

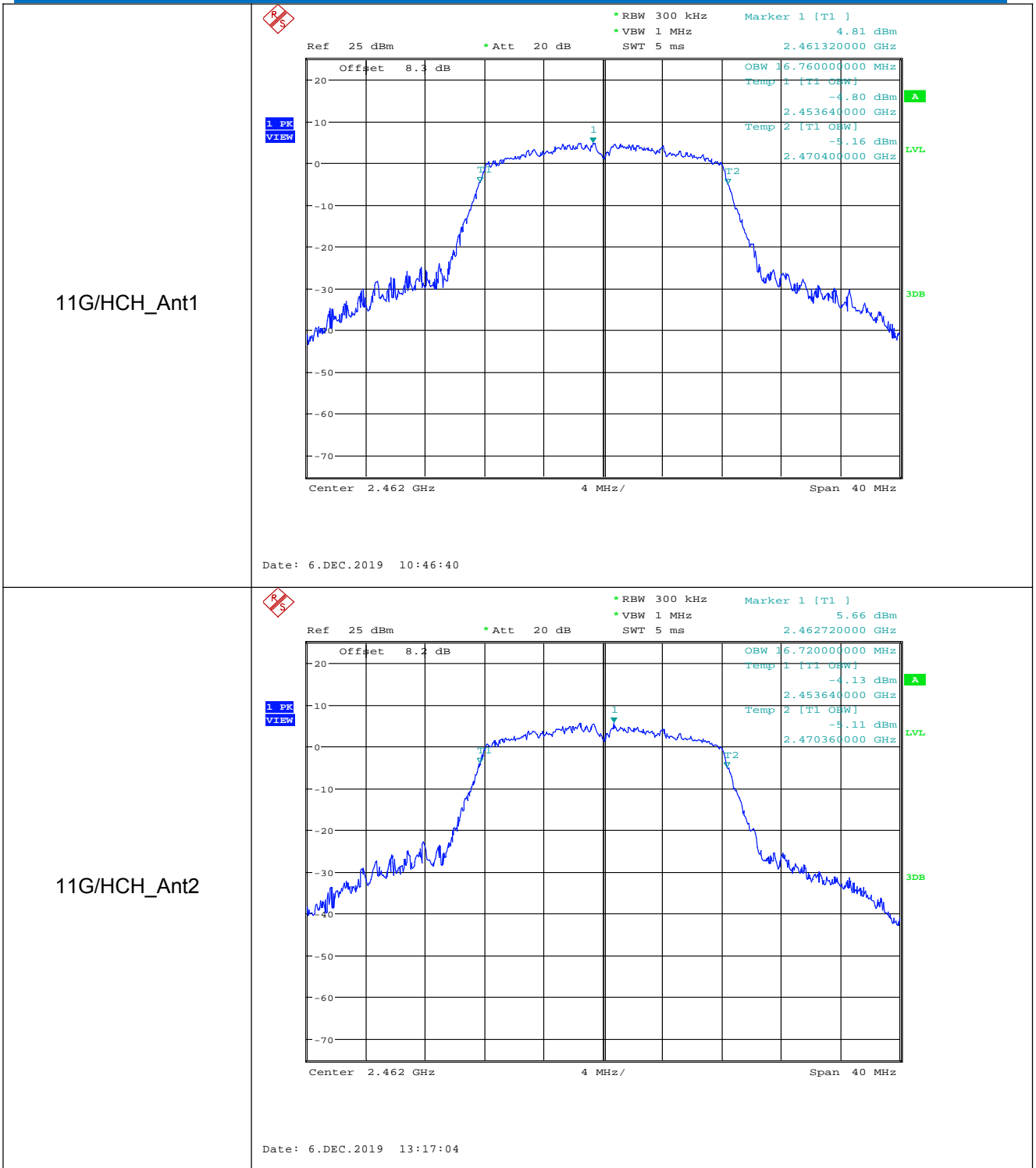


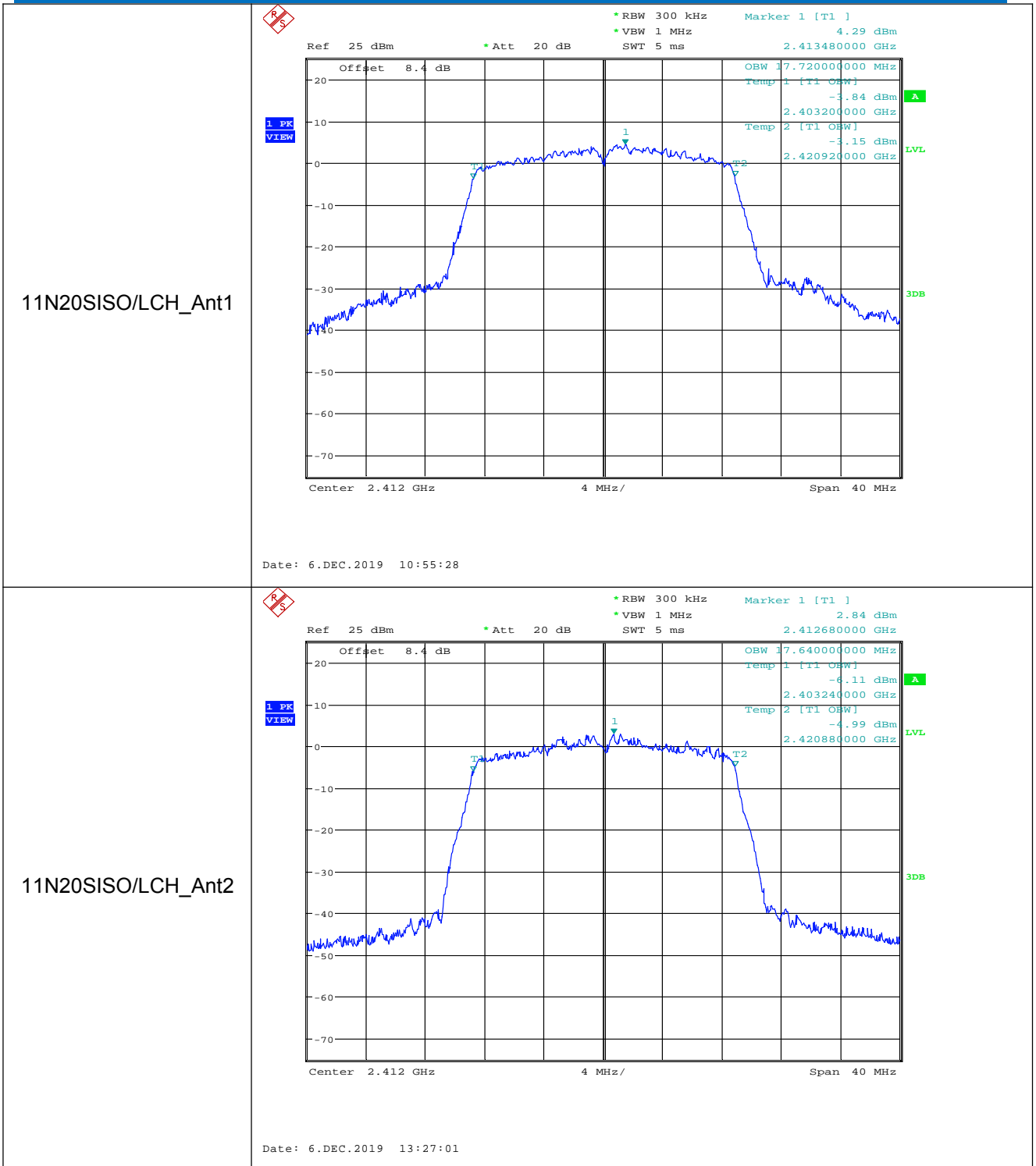
Date: 6.DEC.2019 11:46:10

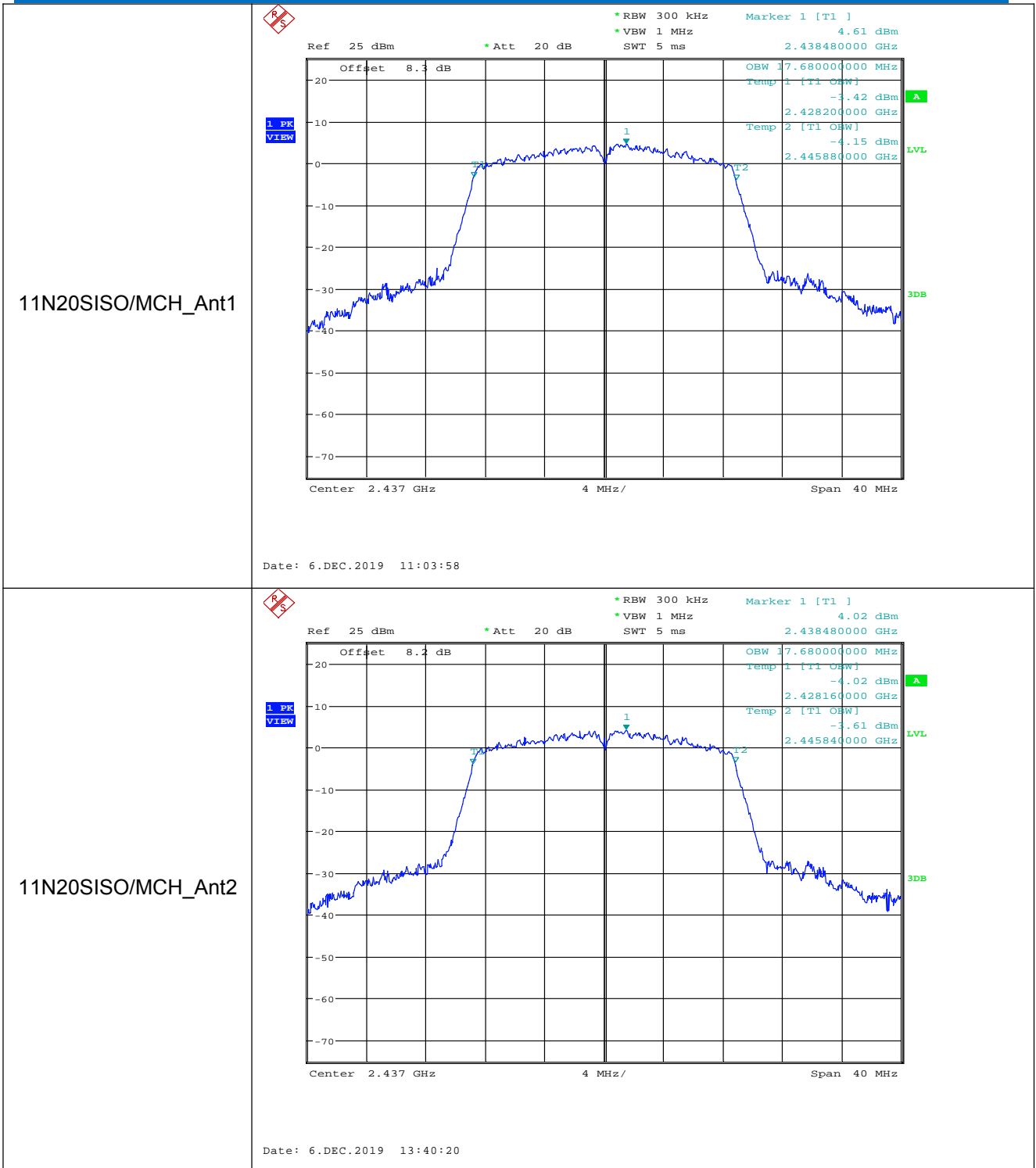


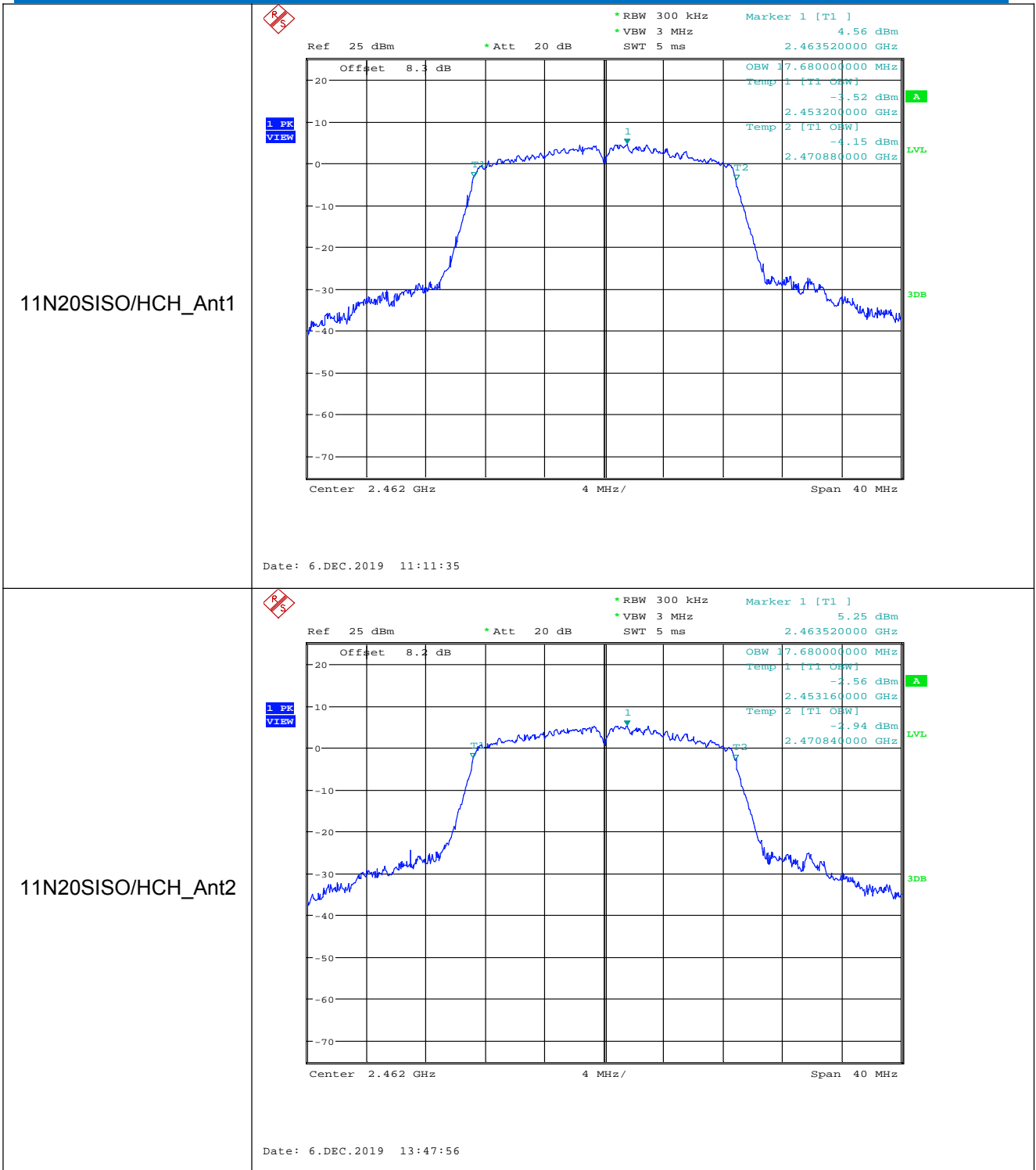


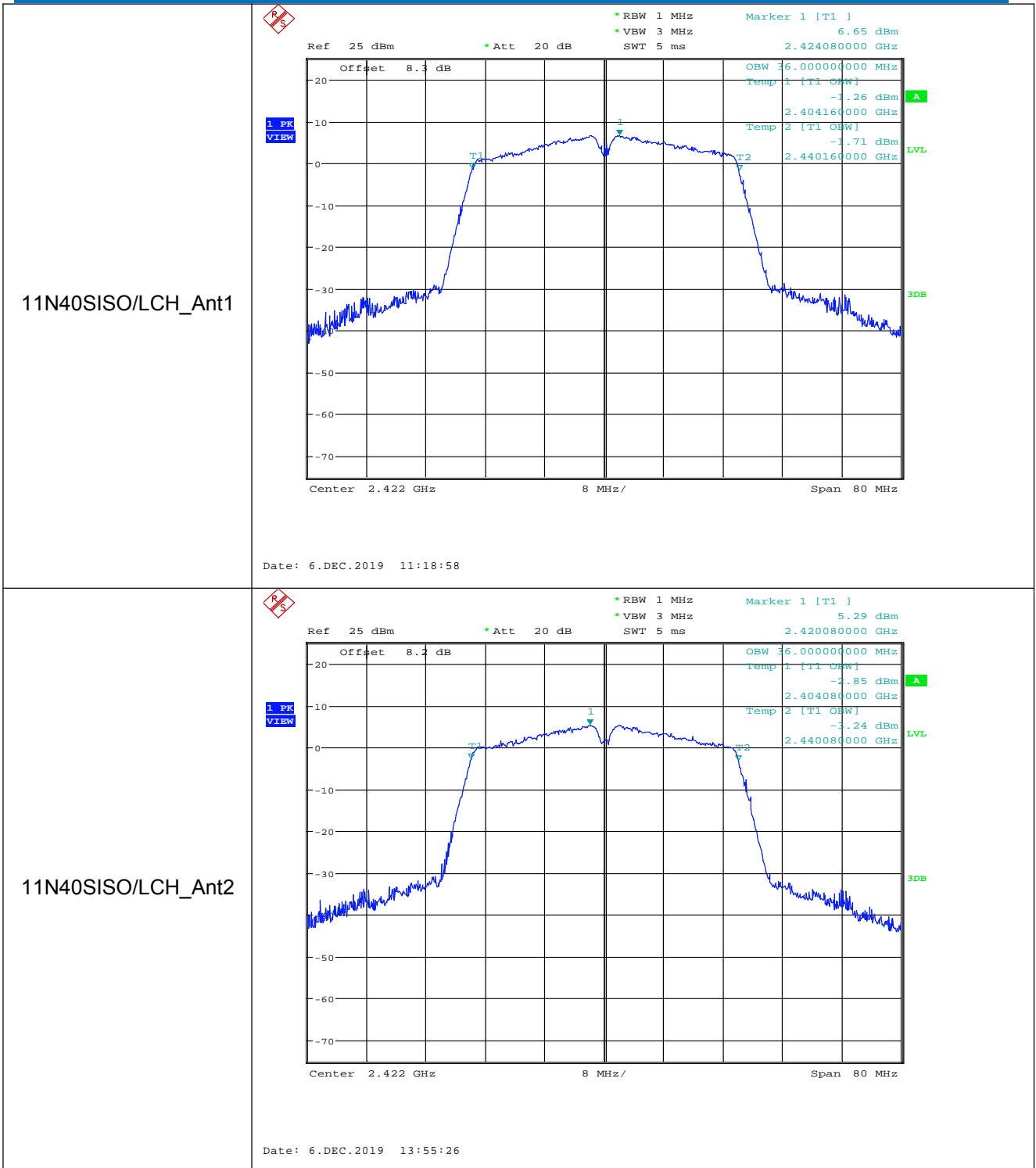


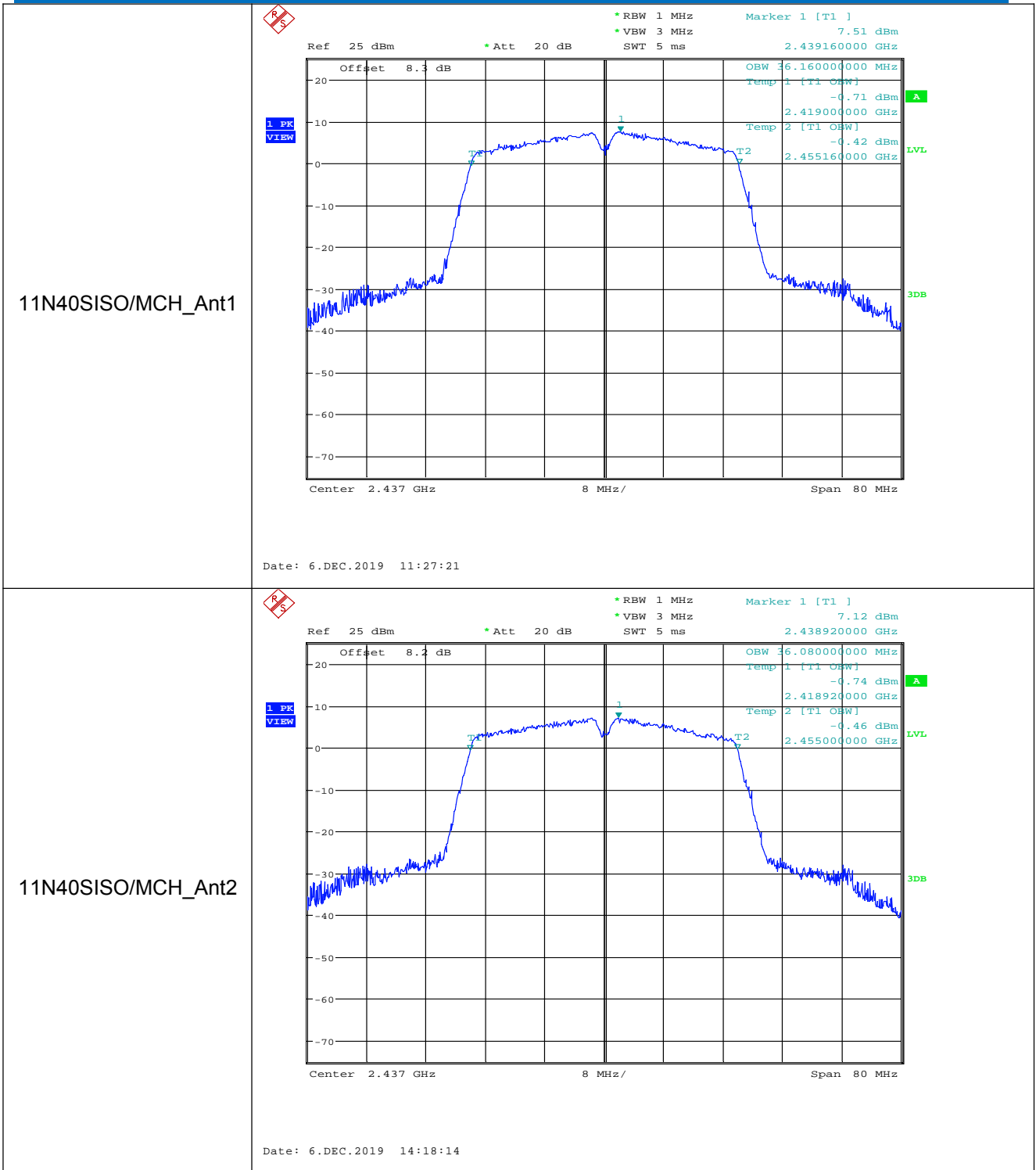


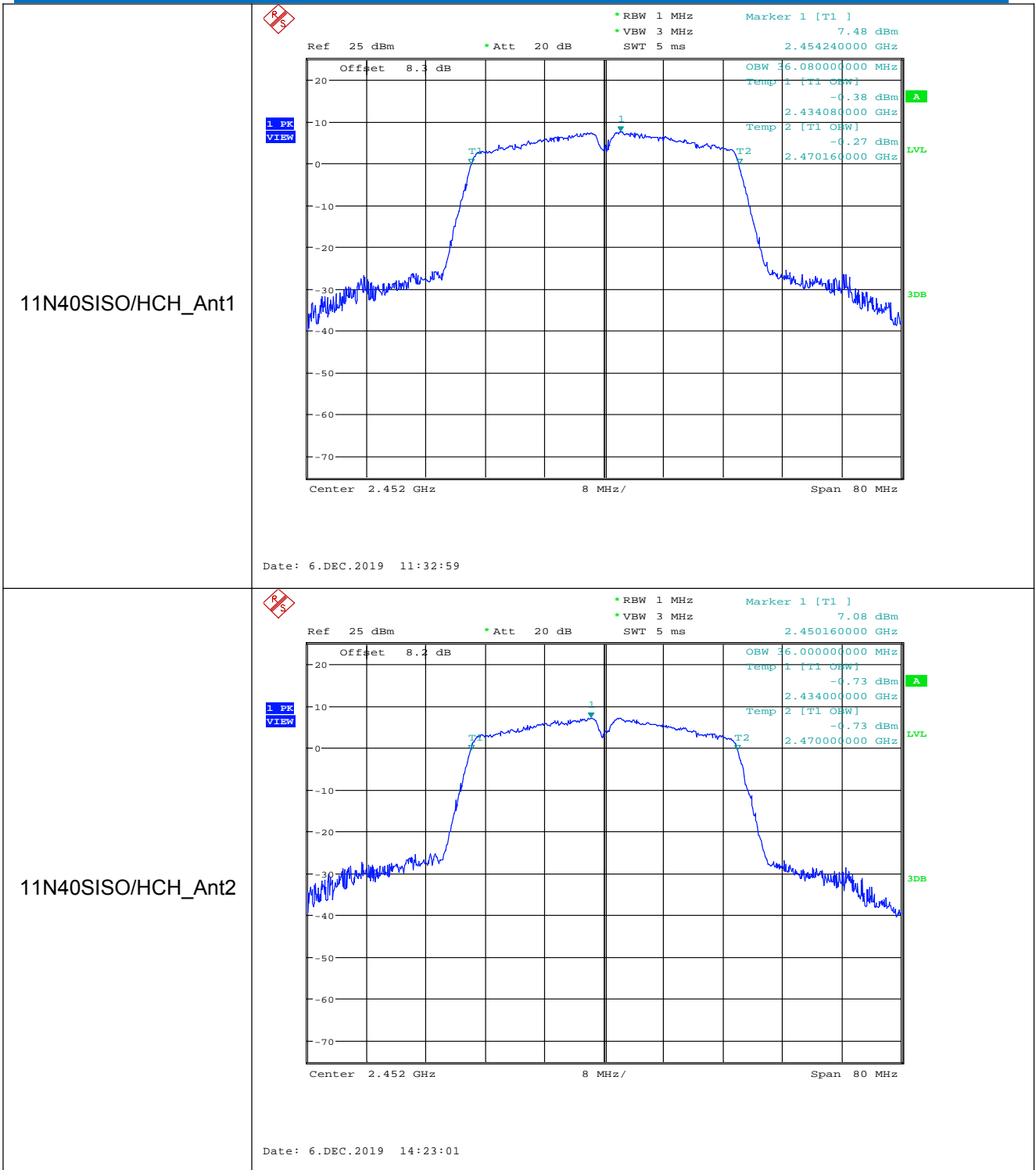




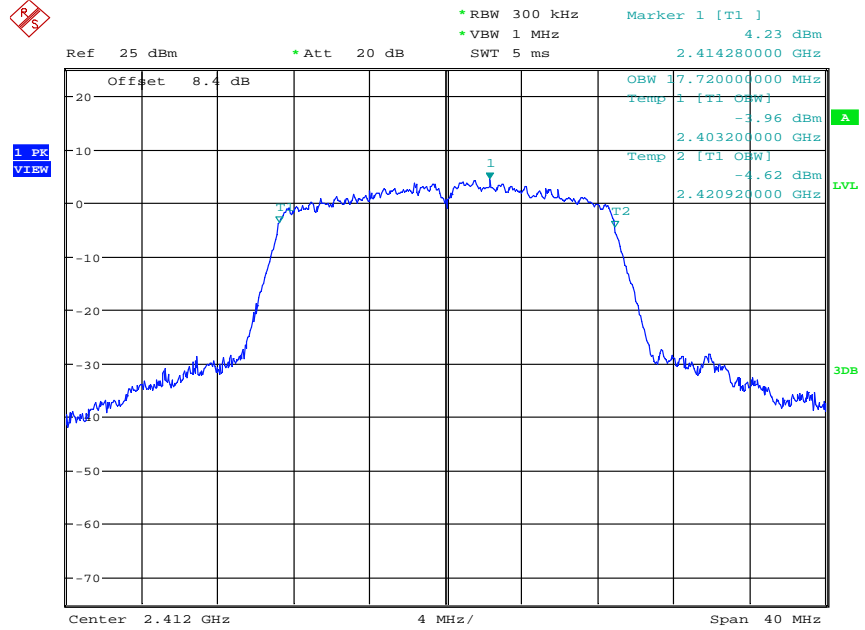






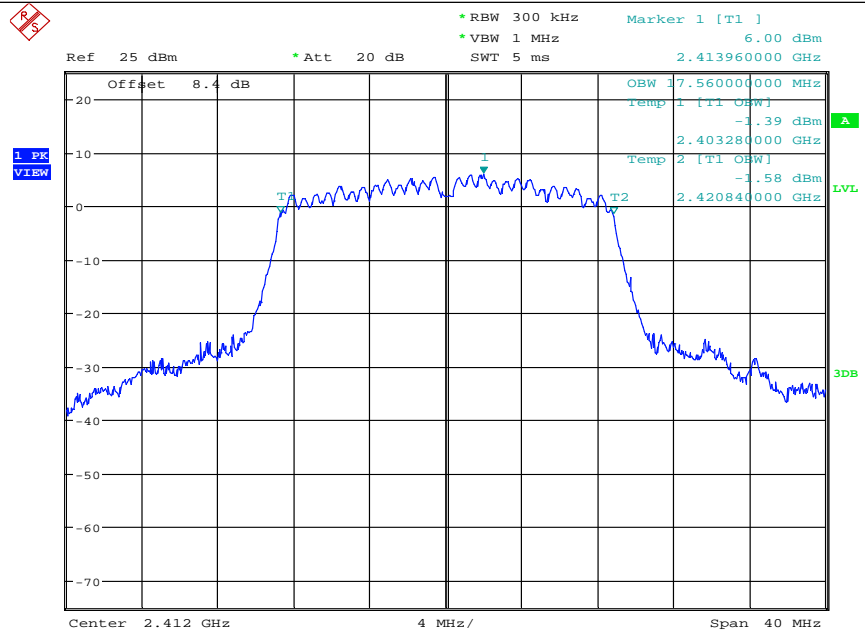


11N20MIMO/LCH_Ant1

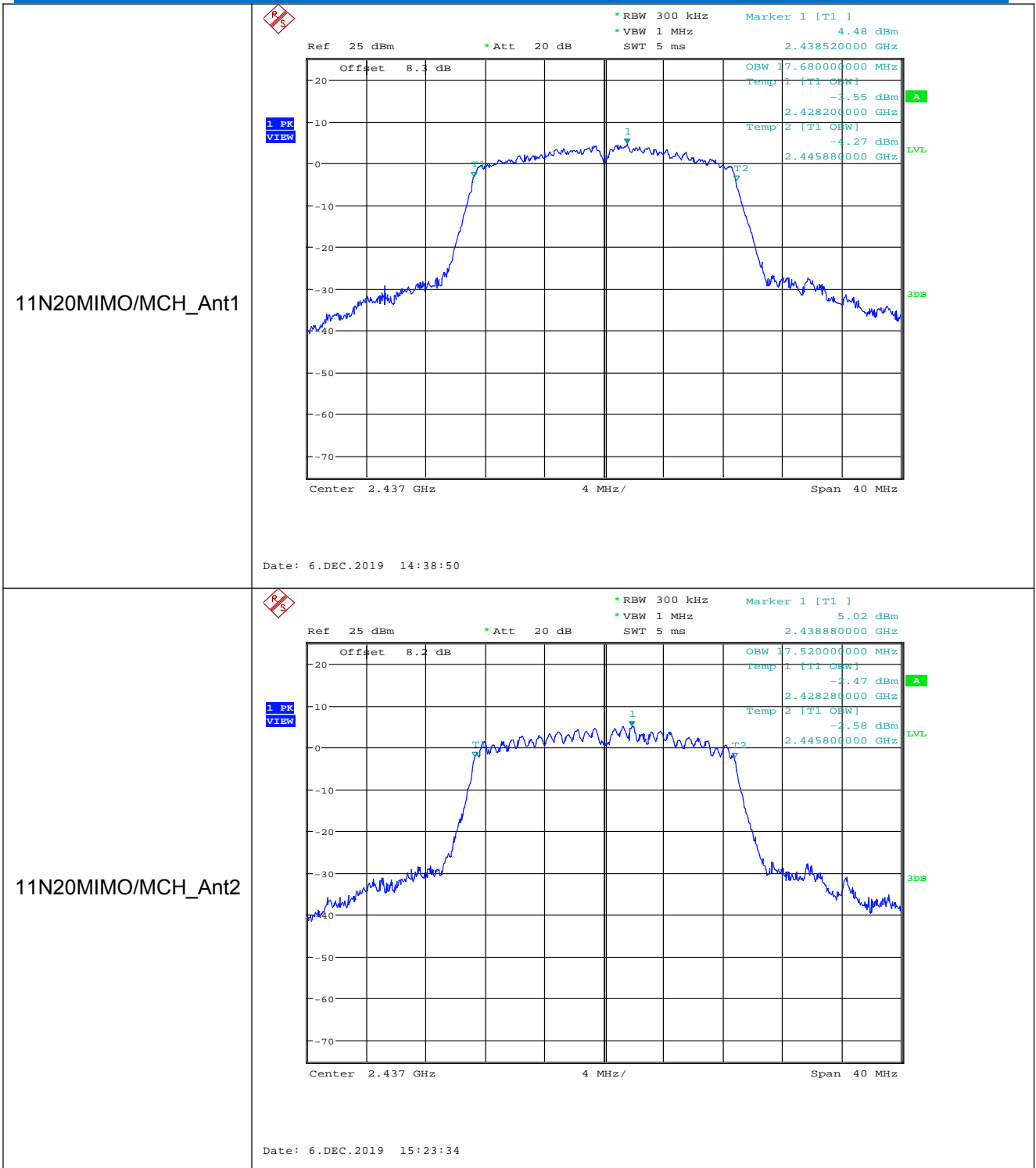


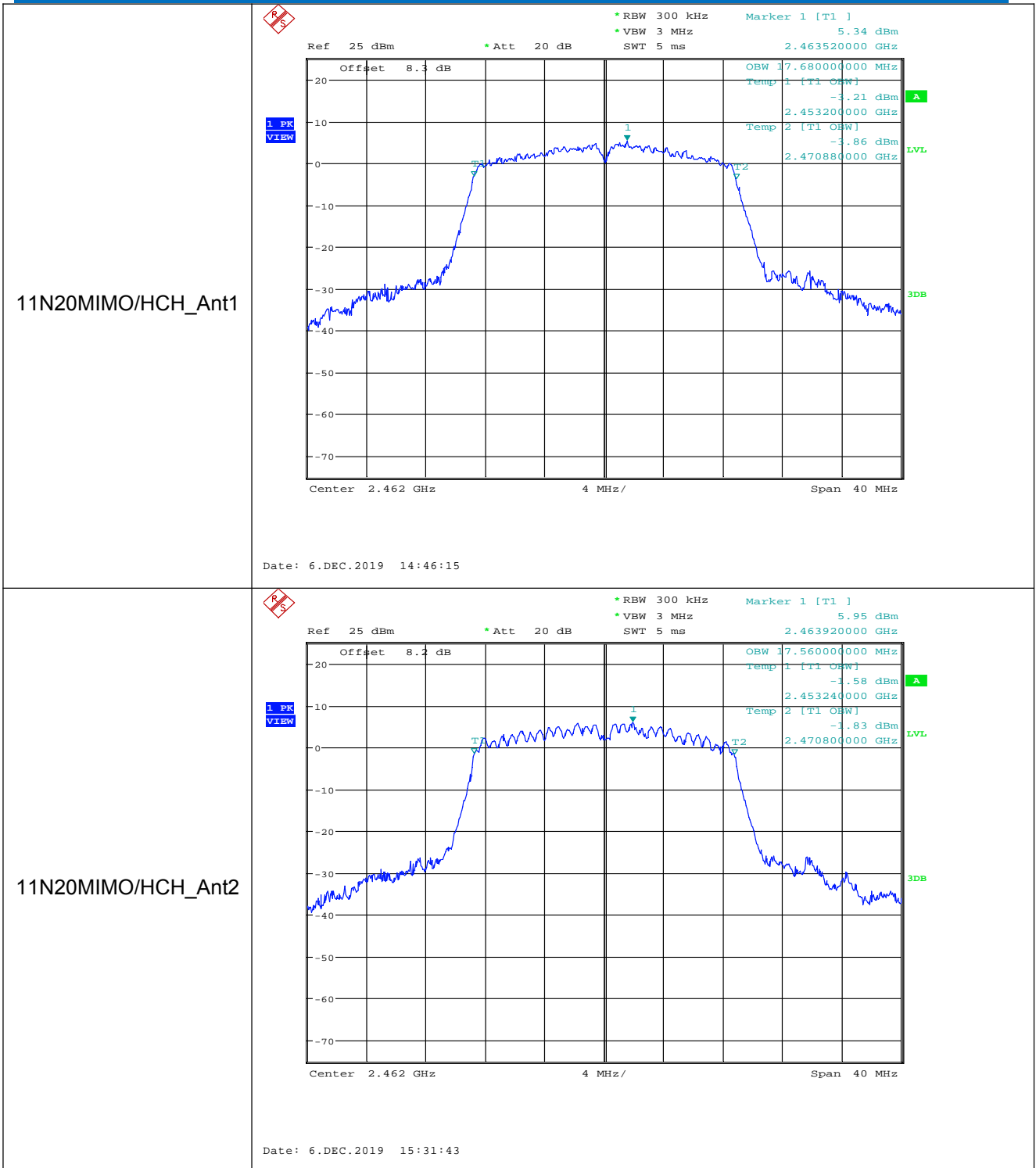
Date: 6.DEC.2019 14:30:23

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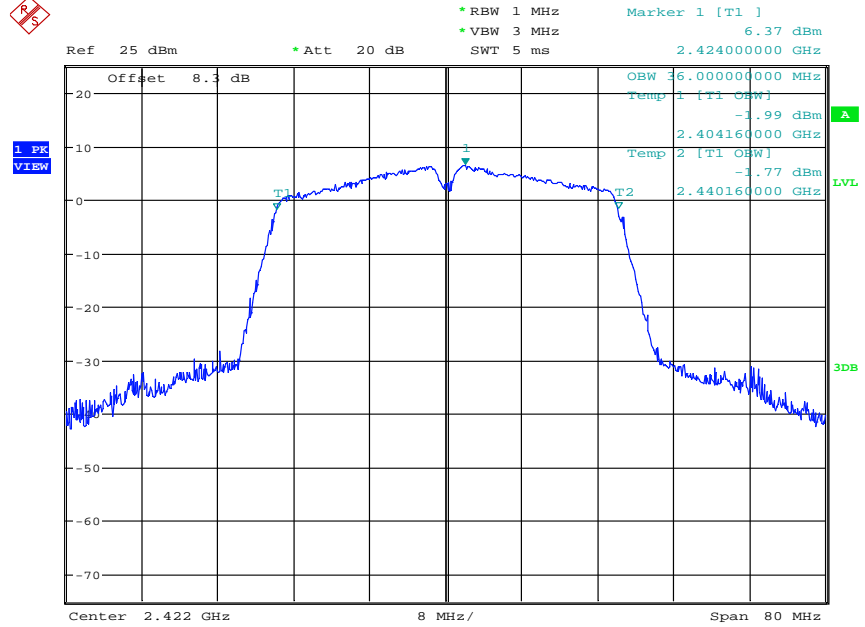


Date: 6.DEC.2019 15:14:46



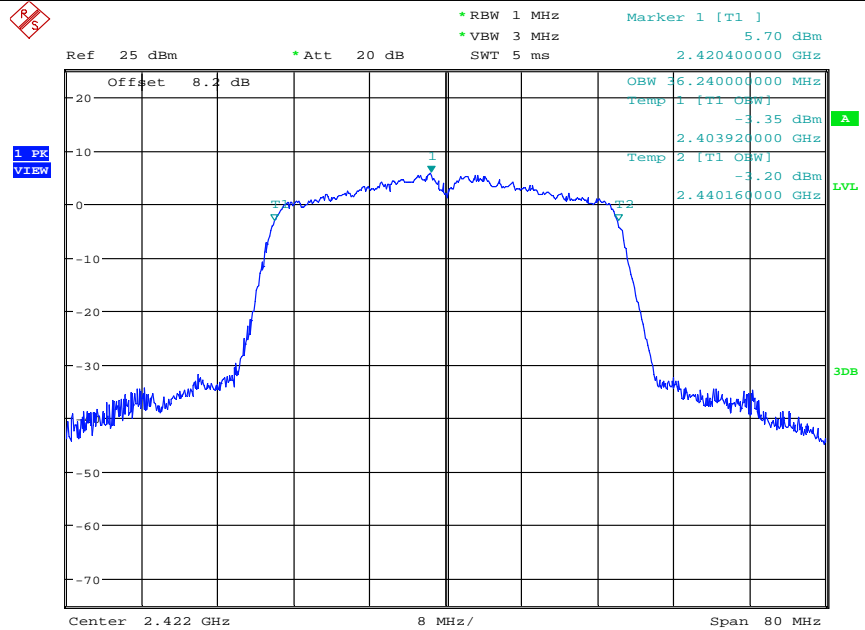


11N40MIMO/LCH_Ant1

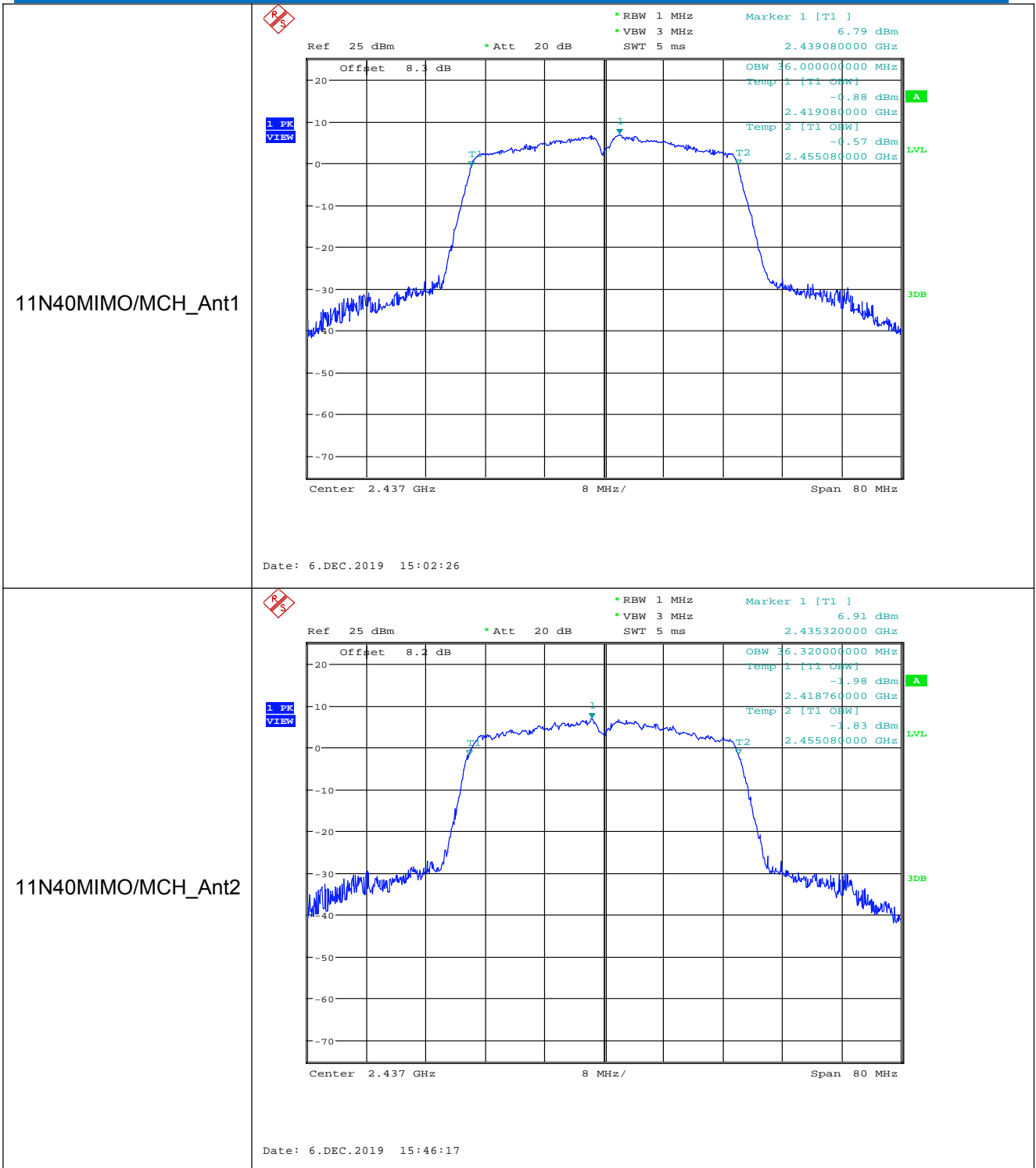


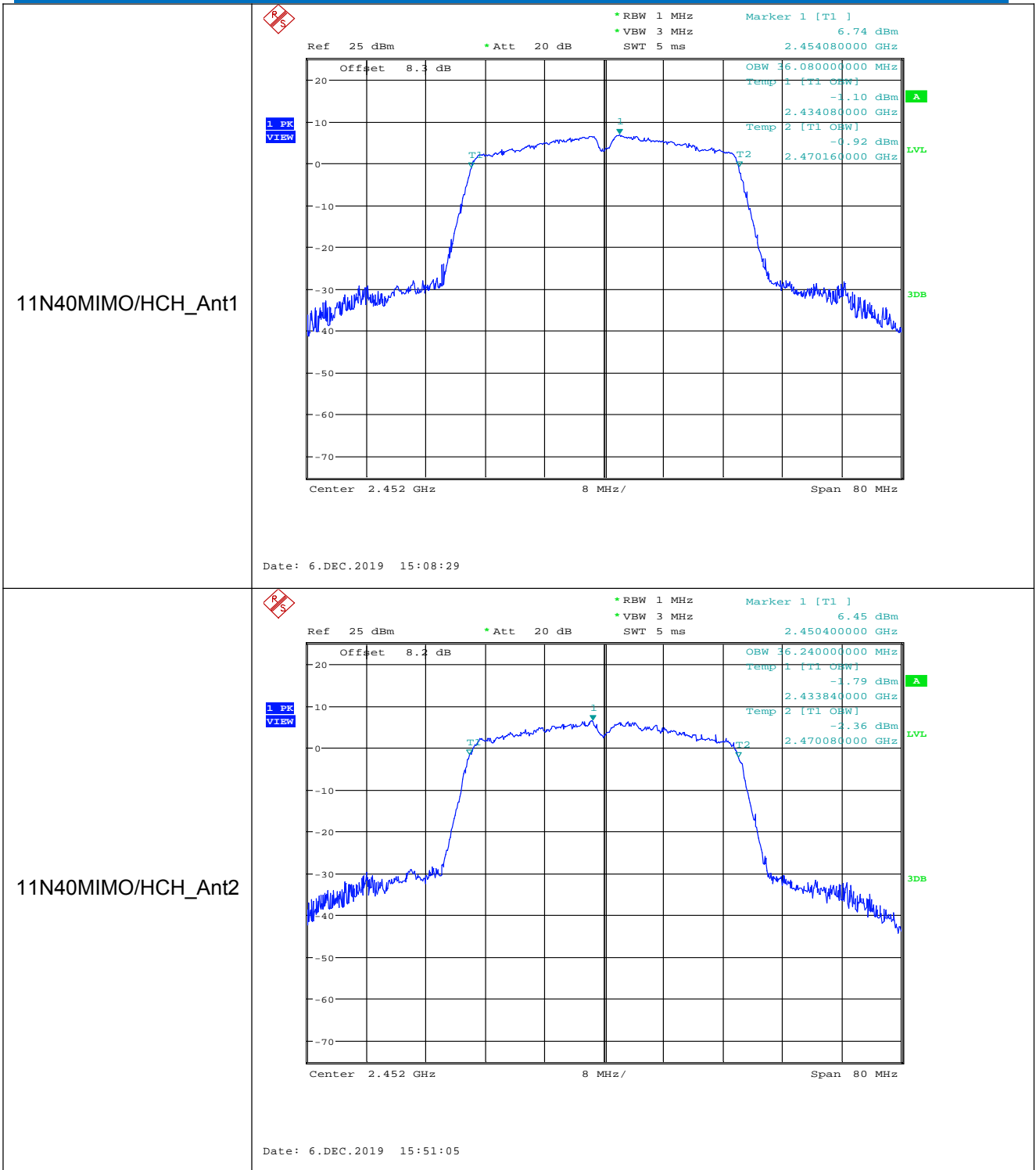
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11N40MIMO/LCH_Ant2

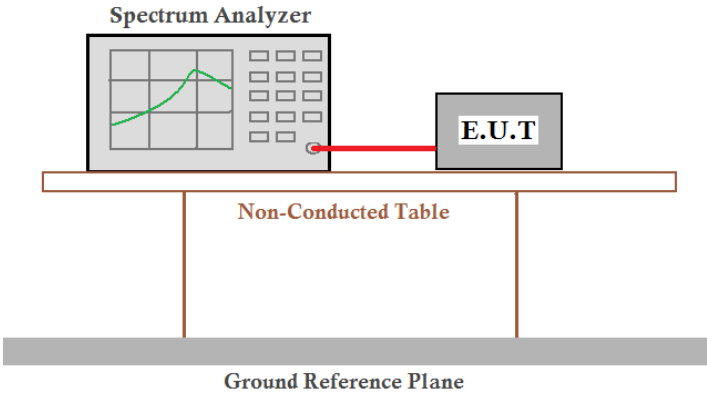


Date: 6.DEC.2019 15:39:33





5.5 Power Spectral Density

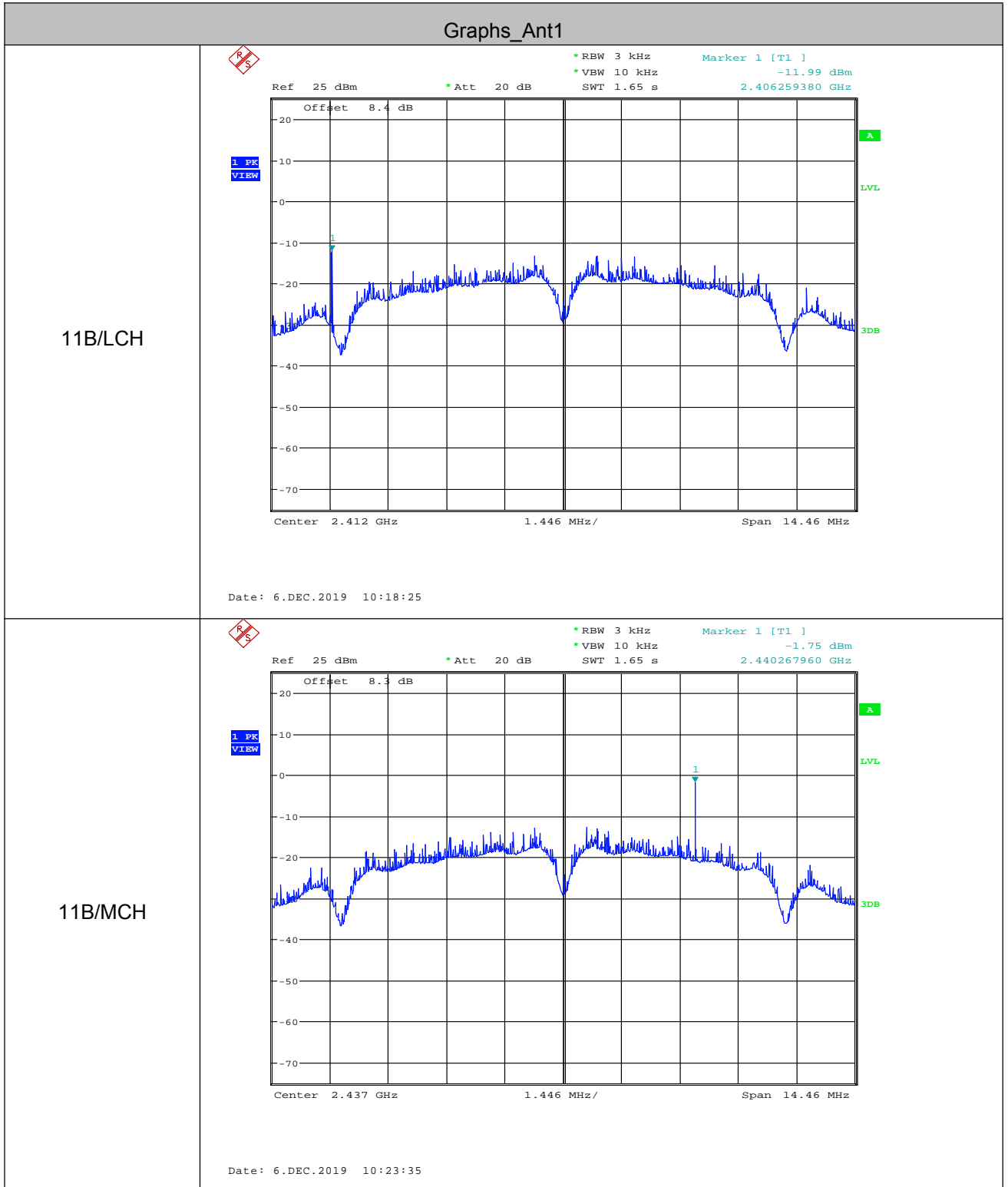
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p>Offset=cable loss+ attenuation factor</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) Only the worst case is recorded in the report.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

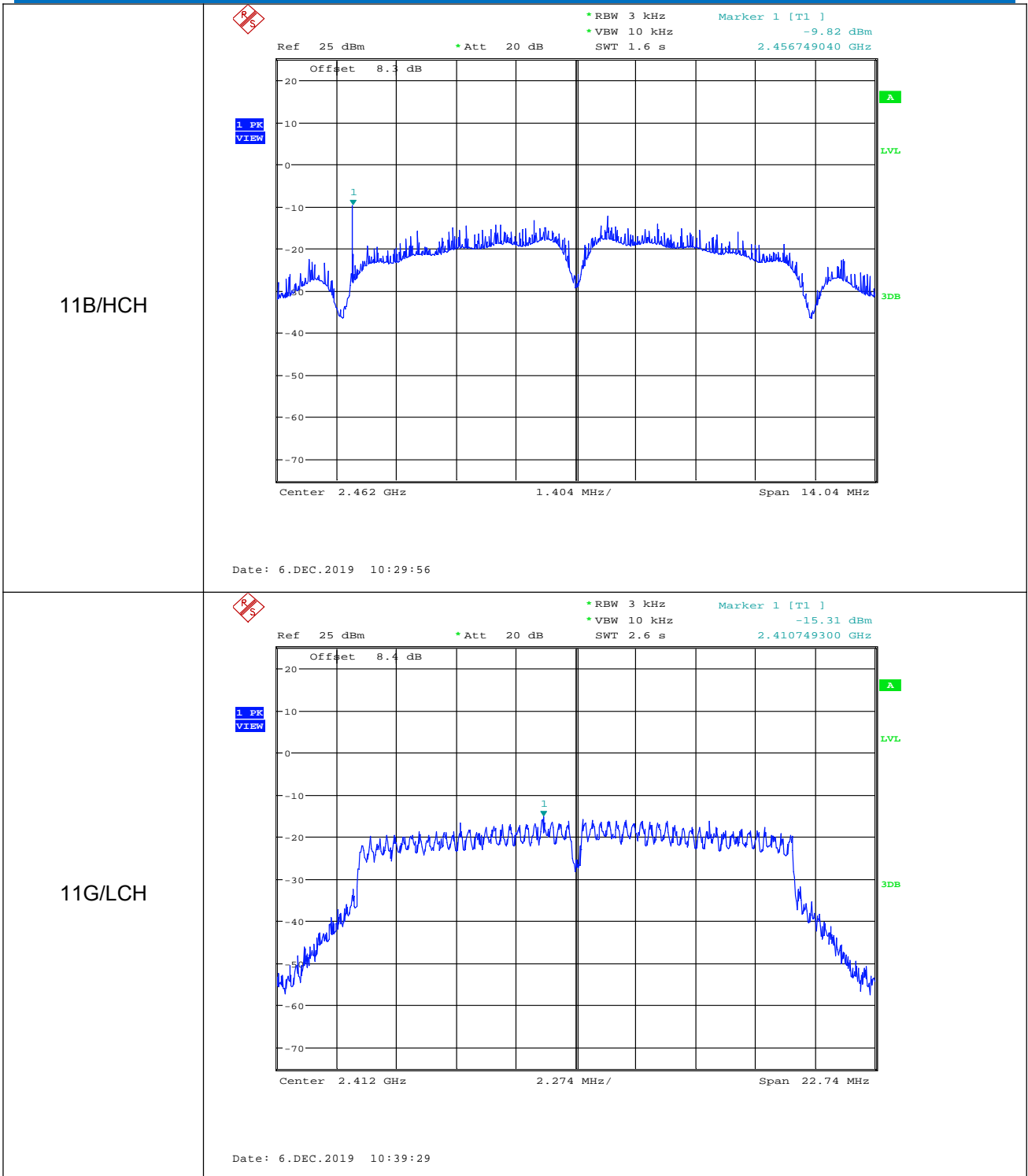
Measurement Data

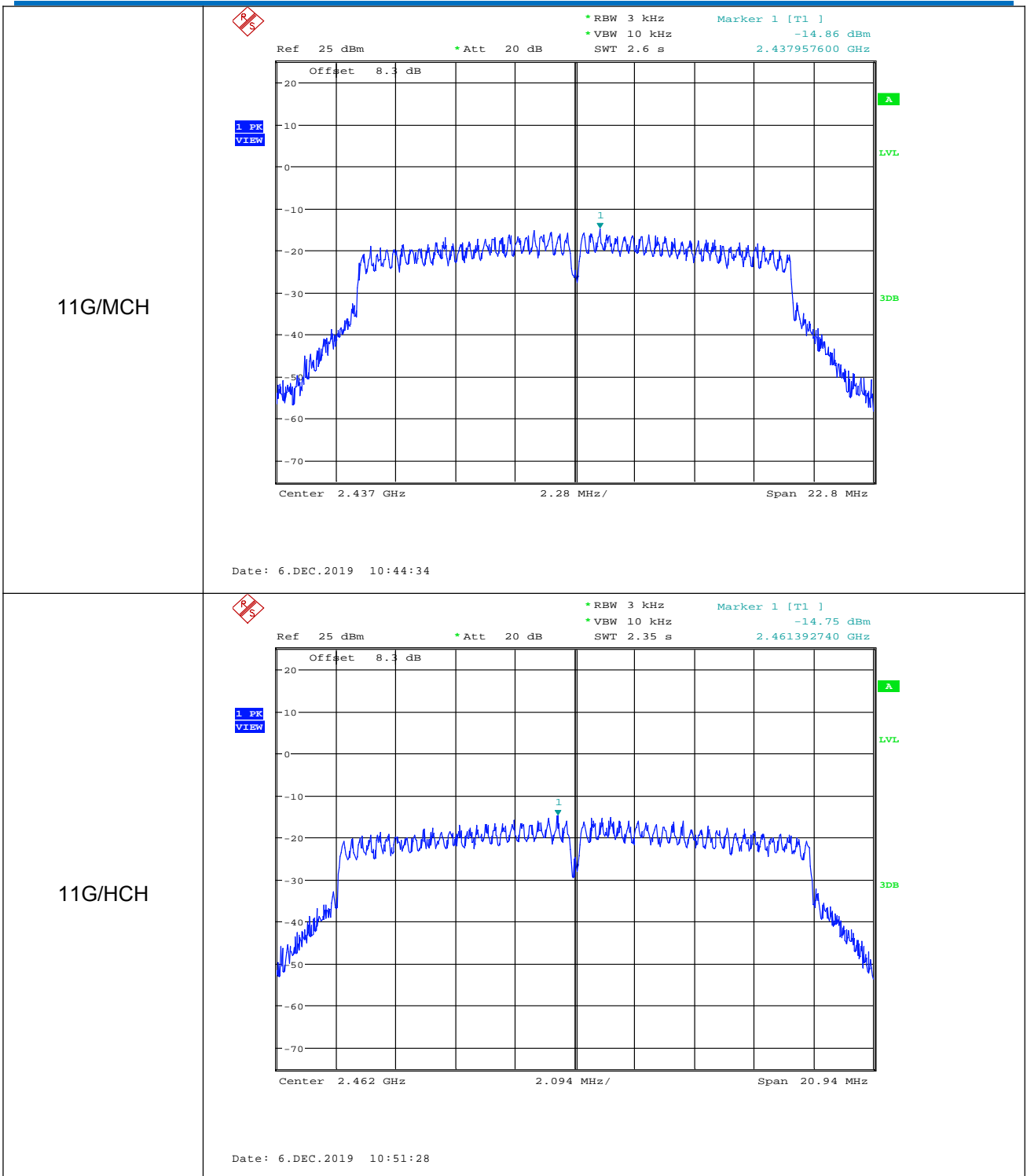
802.11b mode				
Test channel	Antenna	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	Ant1	-11.990	≤8.00	Pass
Lowest	Ant2	-13.990	≤8.00	Pass
Middle	Ant1	-1.750	≤8.00	Pass
Middle	Ant2	-10.760	≤8.00	Pass
Highest	Ant1	-9.820	≤8.00	Pass
Highest	Ant2	-12.960	≤8.00	Pass
802.11g mode				
Test channel	Antenna	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	Ant1	-15.310	≤8.00	Pass
Lowest	Ant2	-15.440	≤8.00	Pass
Middle	Ant1	-14.860	≤8.00	Pass
Middle	Ant2	-14.990	≤8.00	Pass
Highest	Ant1	-14.750	≤8.00	Pass
Highest	Ant2	-14.660	≤8.00	Pass
802.11n(HT20) SISO mode				
Test channel	Antenna	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	Ant1	-15.340	≤8.00	Pass
Lowest	Ant2	-15.880	≤8.00	Pass
Middle	Ant1	-14.150	≤8.00	Pass
Middle	Ant2	-14.740	≤8.00	Pass
Highest	Ant1	-13.890	≤8.00	Pass
Highest	Ant2	-15.400	≤8.00	Pass
802.11n(HT40) SISO mode				
Test channel	Antenna	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	Ant1	-16.410	≤8.00	Pass
Lowest	Ant2	-17.870	≤8.00	Pass
Middle	Ant1	-16.670	≤8.00	Pass
Middle	Ant2	-18.340	≤8.00	Pass
Highest	Ant1	-16.880	≤8.00	Pass
Highest	Ant2	-18.620	≤8.00	Pass

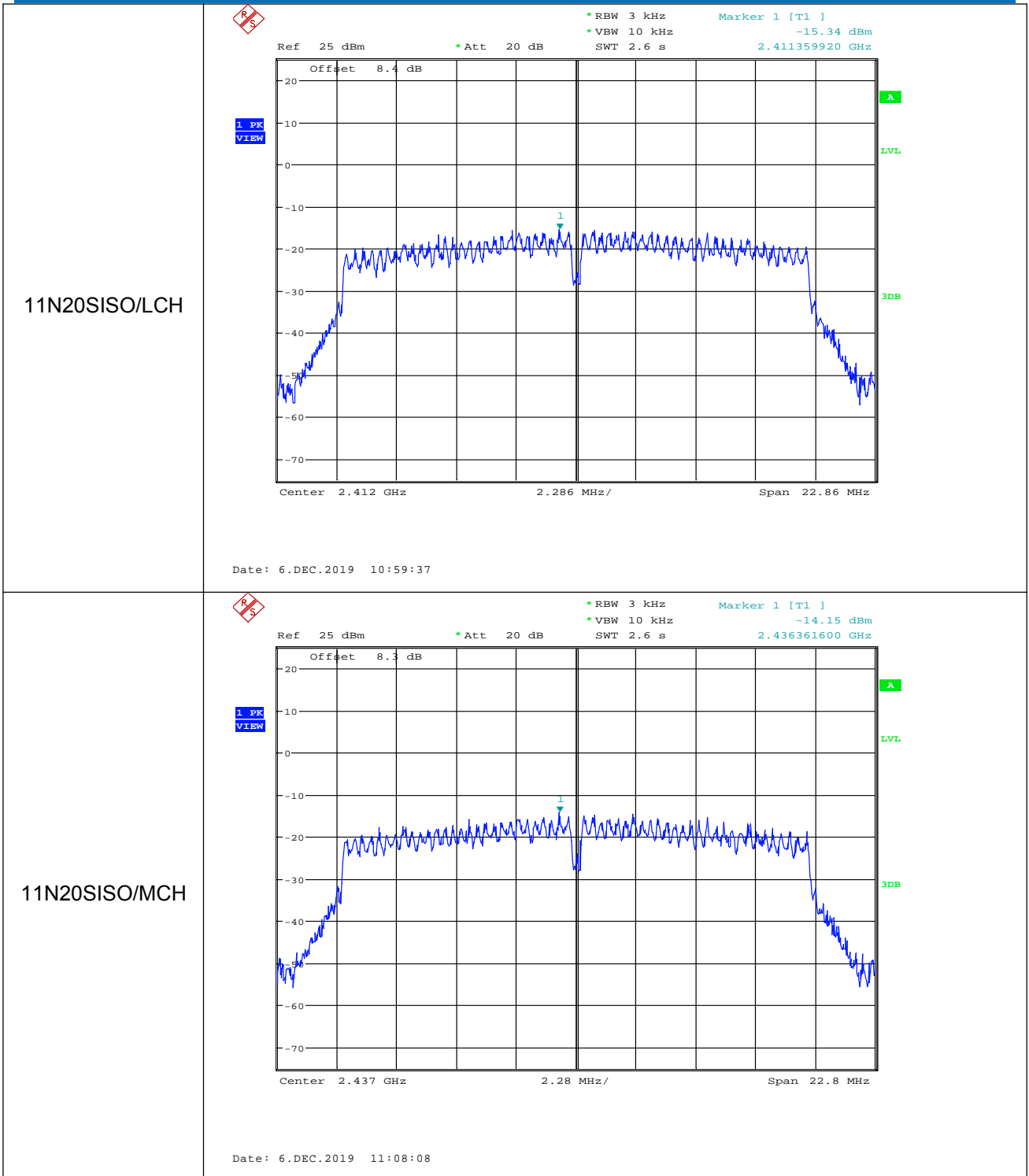
802.11n(HT20) MIMO mode				
Test channel	Antenna	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	Ant1	-15.950	≤8.00	Pass
Lowest	Ant2	-16.300	≤8.00	Pass
Lowest	Ant1+2	-13.11	≤7.99	Pass
Middle	Ant1	-15.190	≤8.00	Pass
Middle	Ant2	-15.350	≤8.00	Pass
Middle	Ant1+2	-12.26	≤7.99	Pass
Highest	Ant1	-14.710	≤8.00	Pass
Highest	Ant2	-14.860	≤8.00	Pass
Highest	Ant1+2	-11.77	≤7.99	Pass
802.11n(HT40) MIMO mode				
Test channel	Antenna	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	Ant1	-19.370	≤8.00	Pass
Lowest	Ant2	-19.740	≤8.00	Pass
Lowest	Ant1+2	-16.54	≤7.99	Pass
Middle	Ant1	-18.360	≤8.00	Pass
Middle	Ant2	-19.310	≤8.00	Pass
Middle	Ant1+2	-15.80	≤7.99	Pass
Highest	Ant1	-18.530	≤8.00	Pass
Highest	Ant2	-18.460	≤8.00	Pass
Highest	Ant1+2	-15.48	≤7.99	Pass

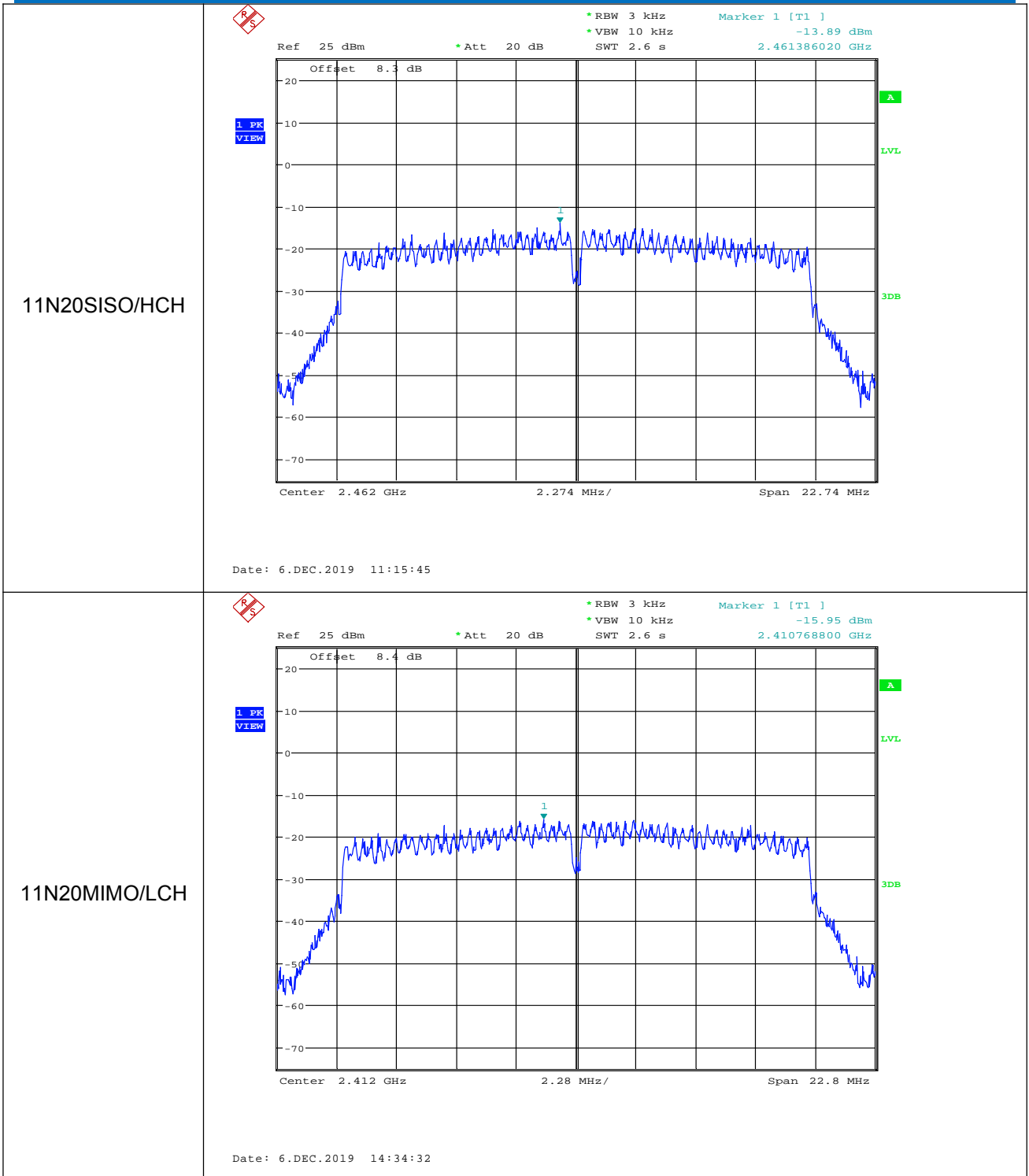
Test plot as follows:



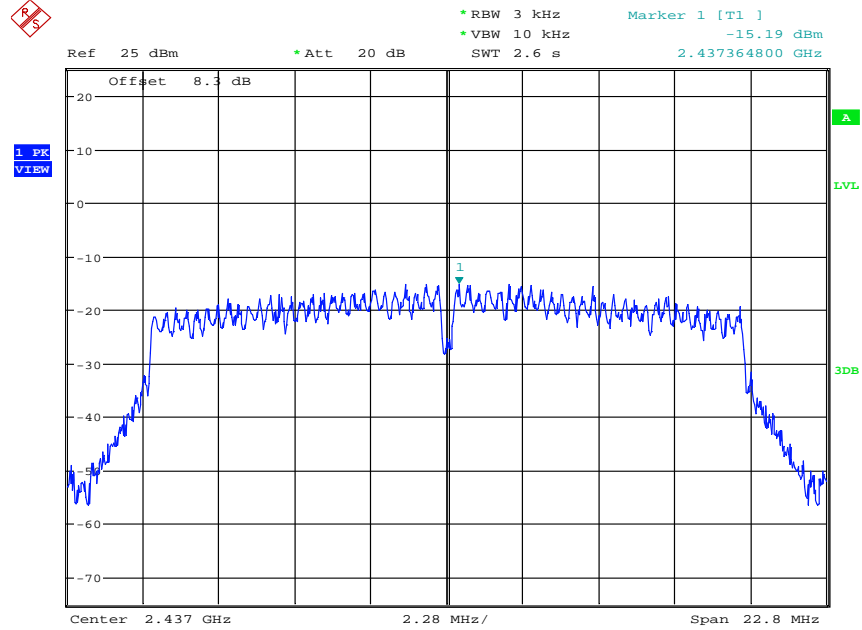




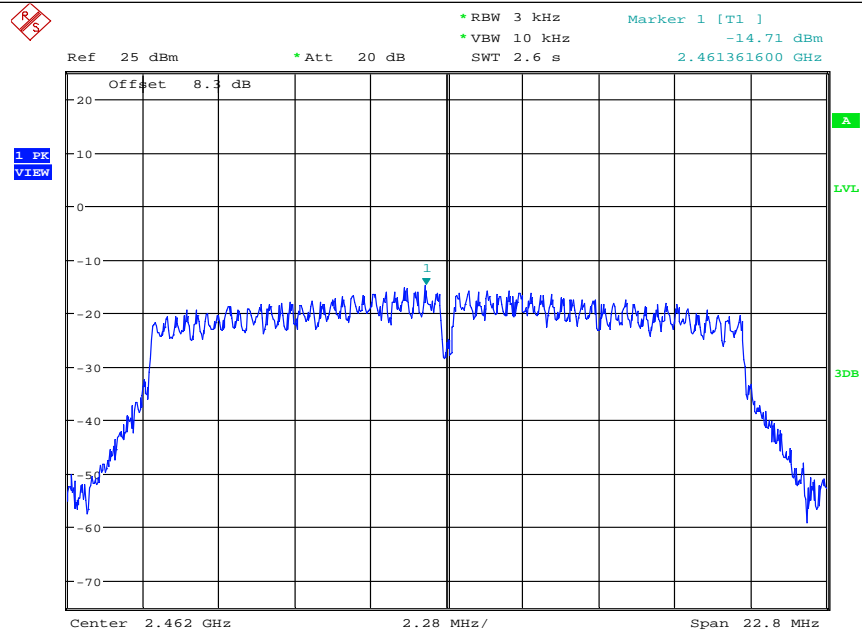


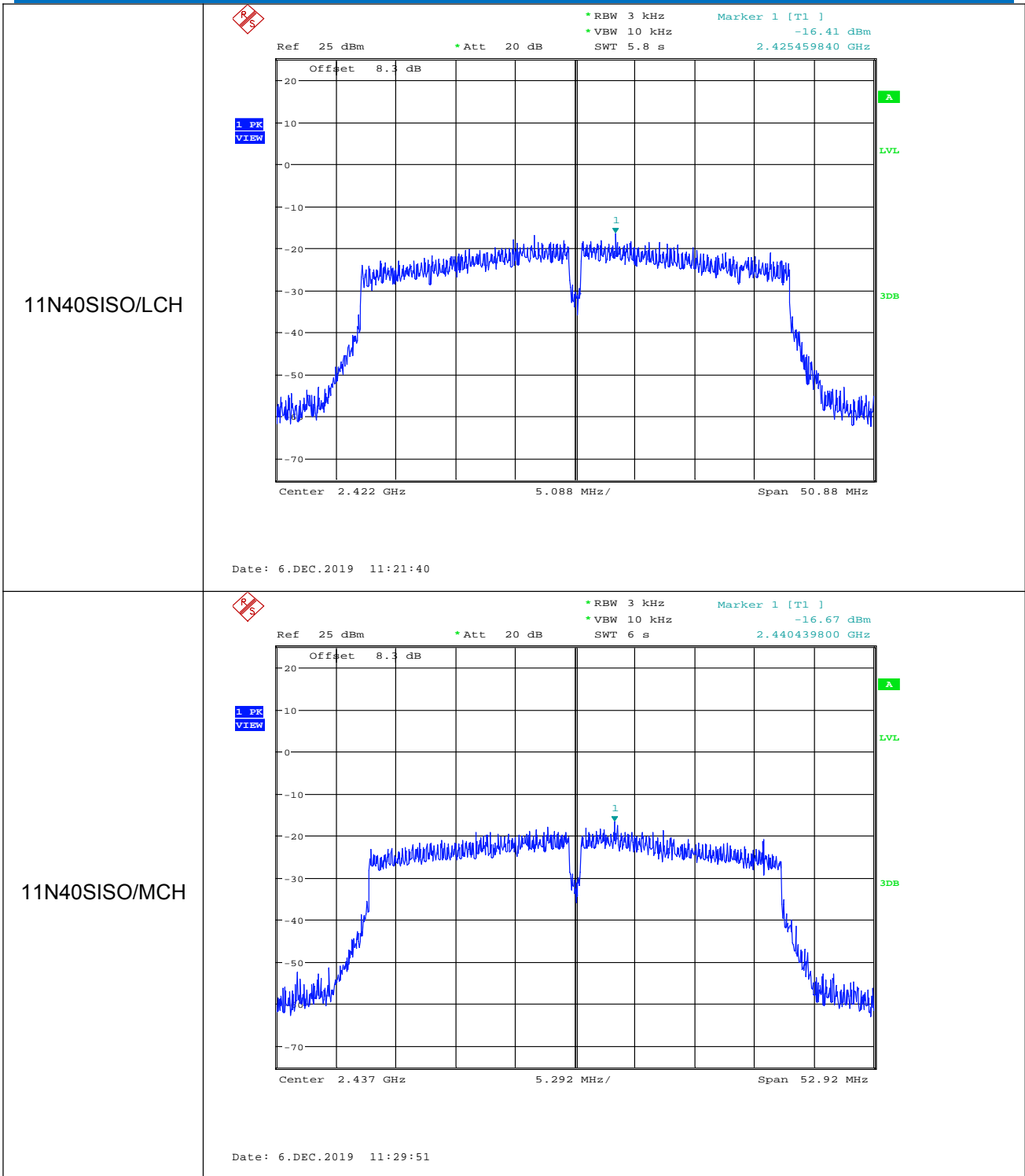


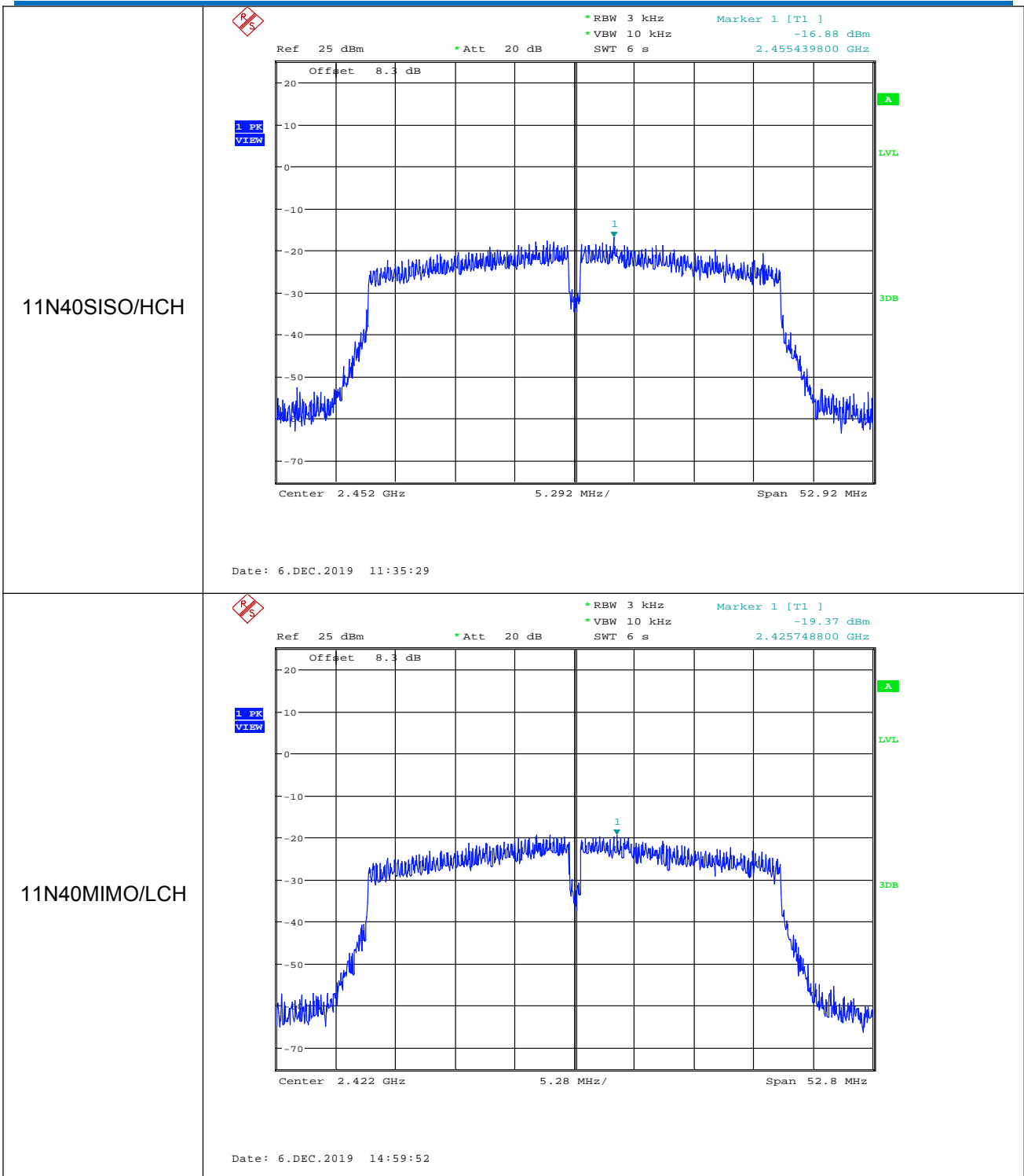
11N20MIMO/MCH



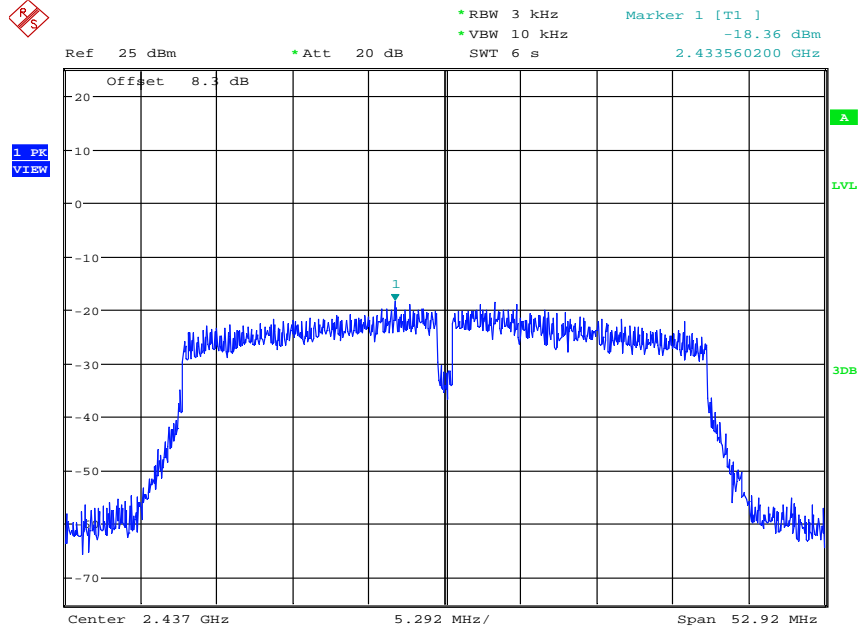
11N20MIMO/HCH





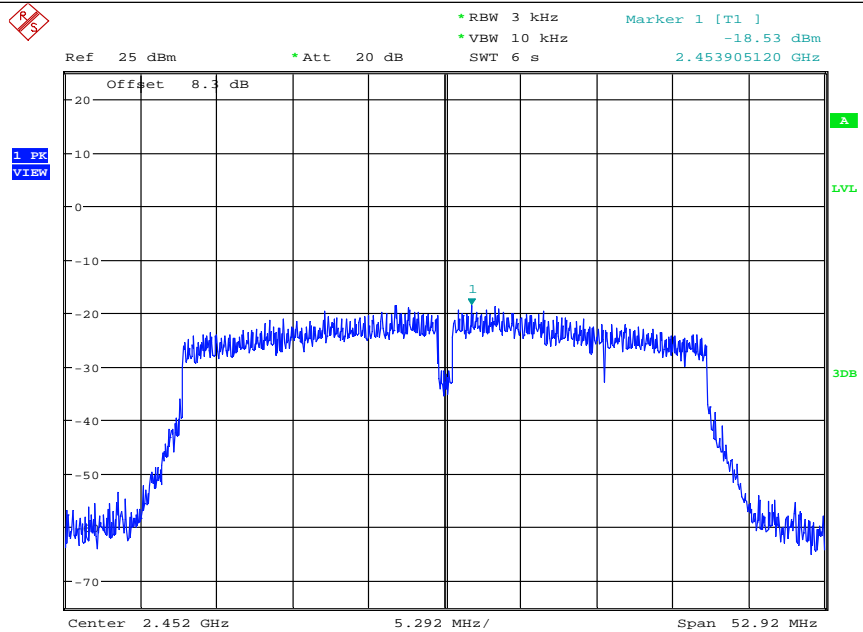


11N40MIMO/MCH

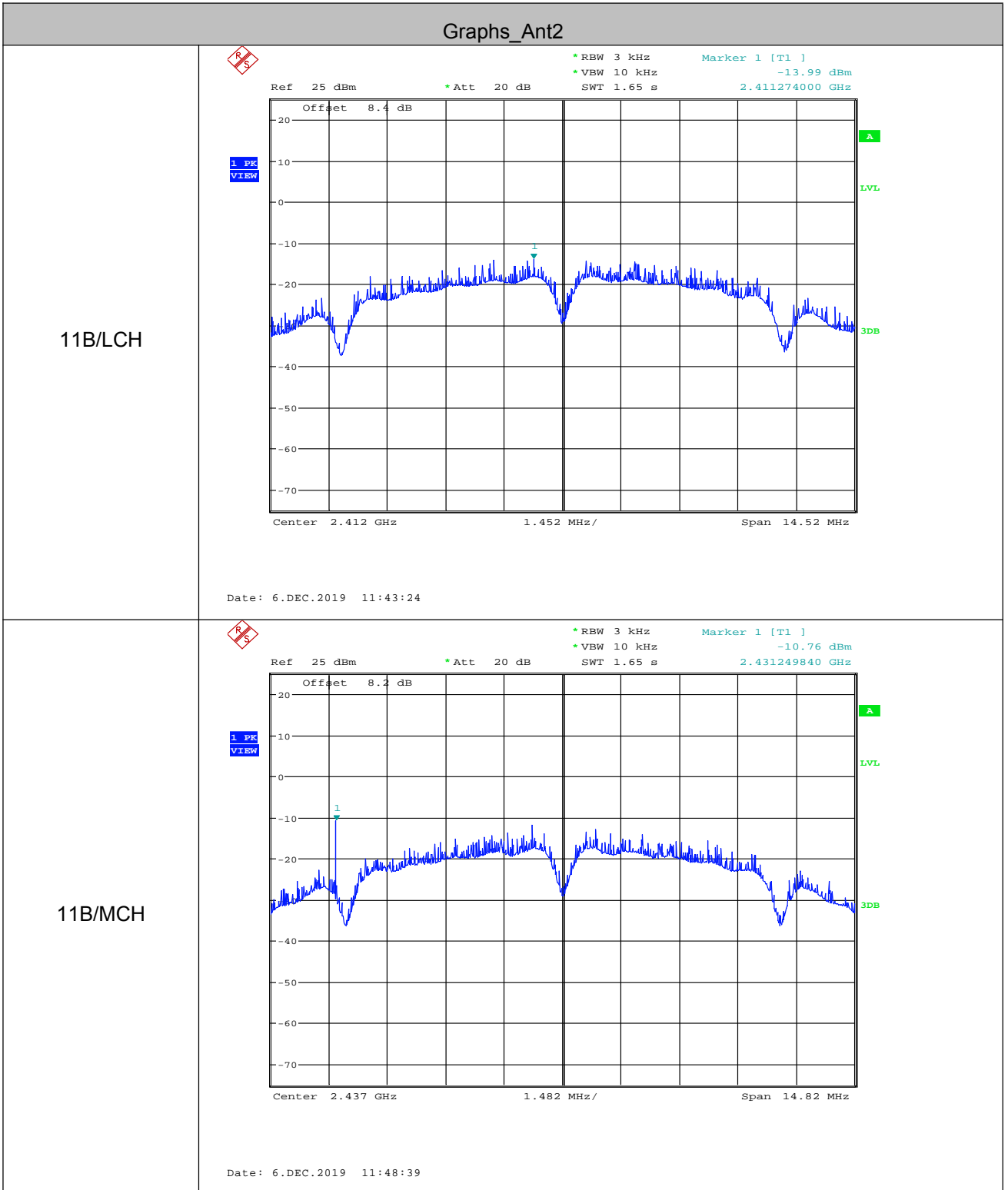


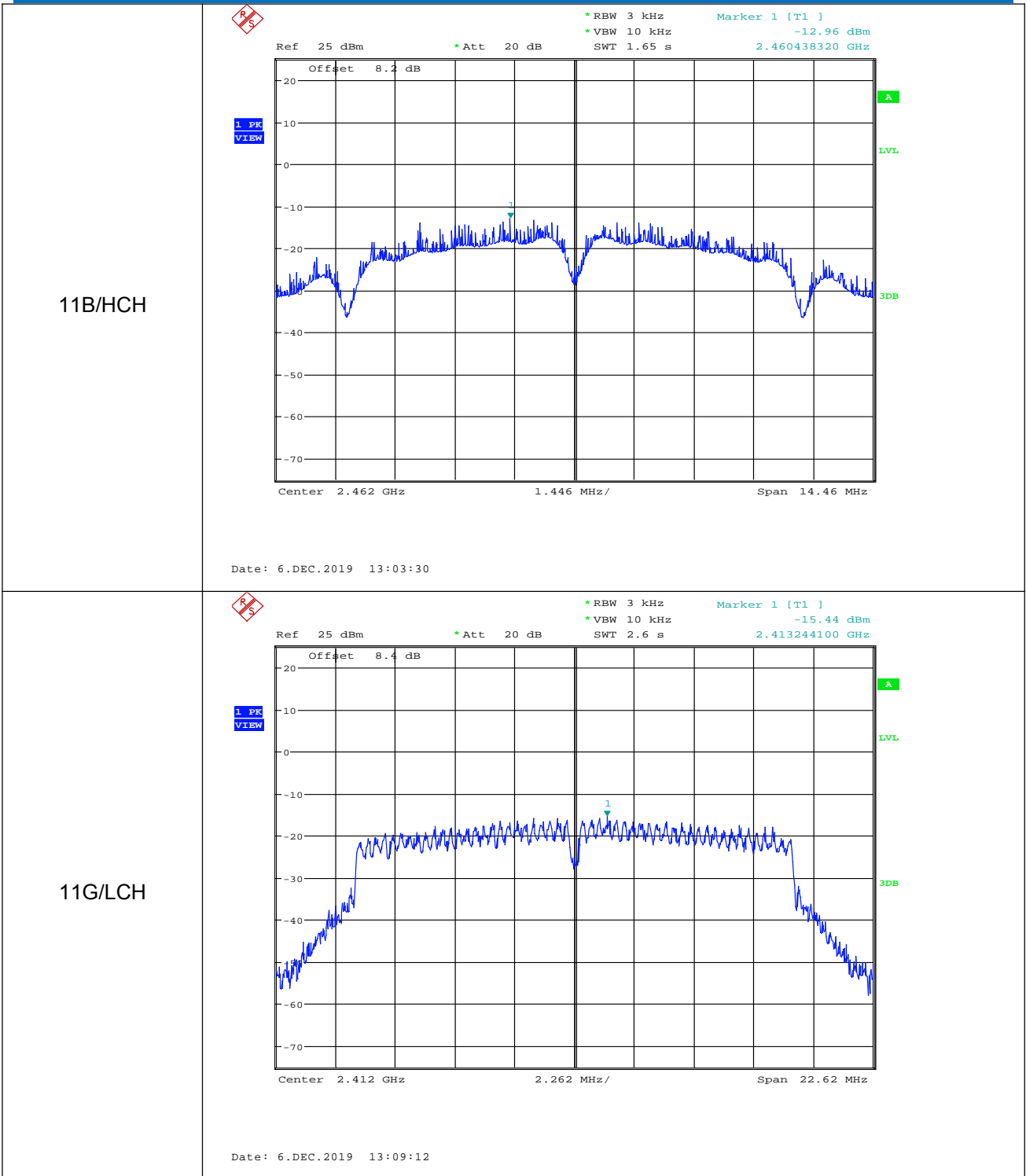
Date: 6.DEC.2019 15:04:56

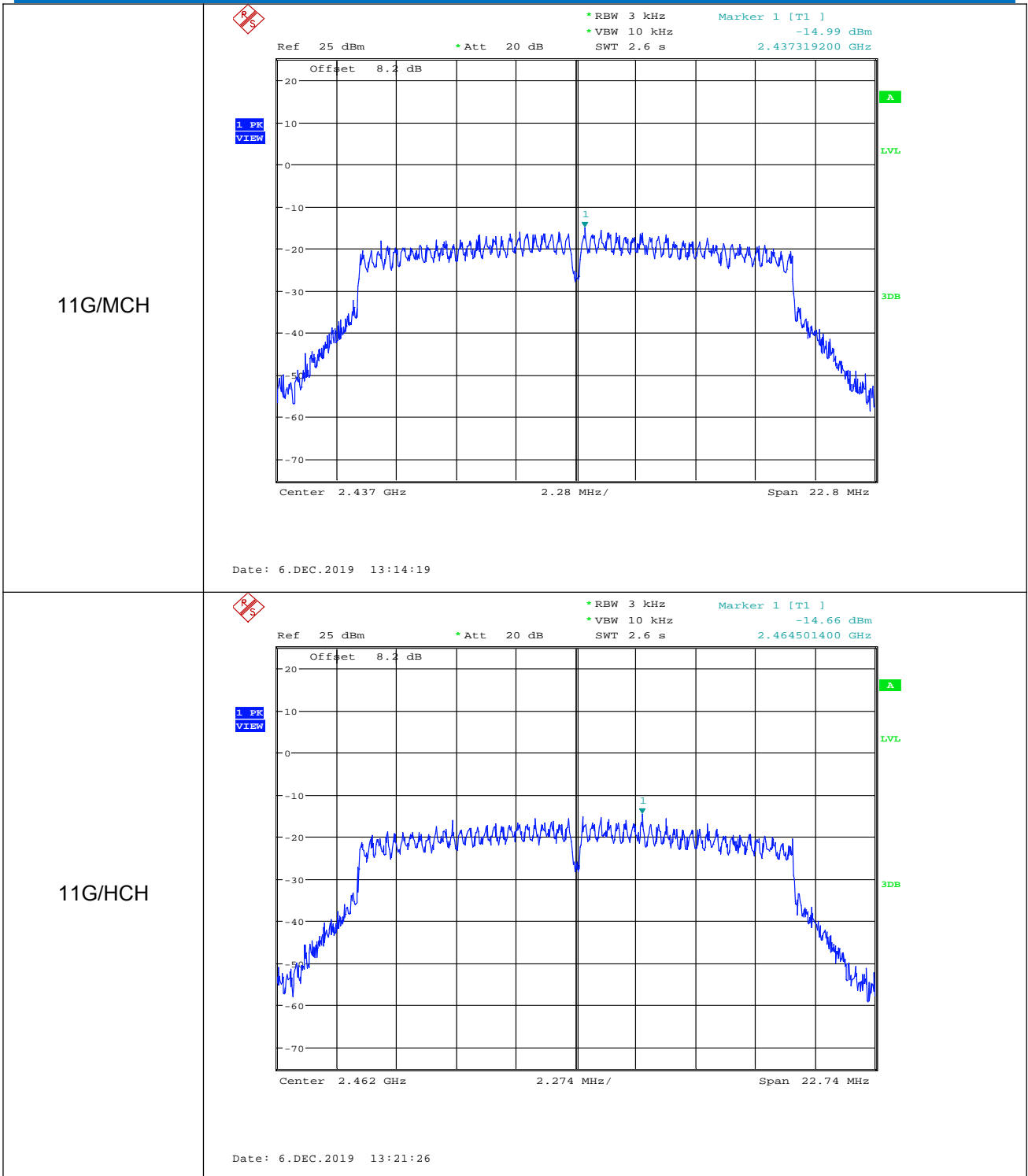
11N40MIMO/HCH

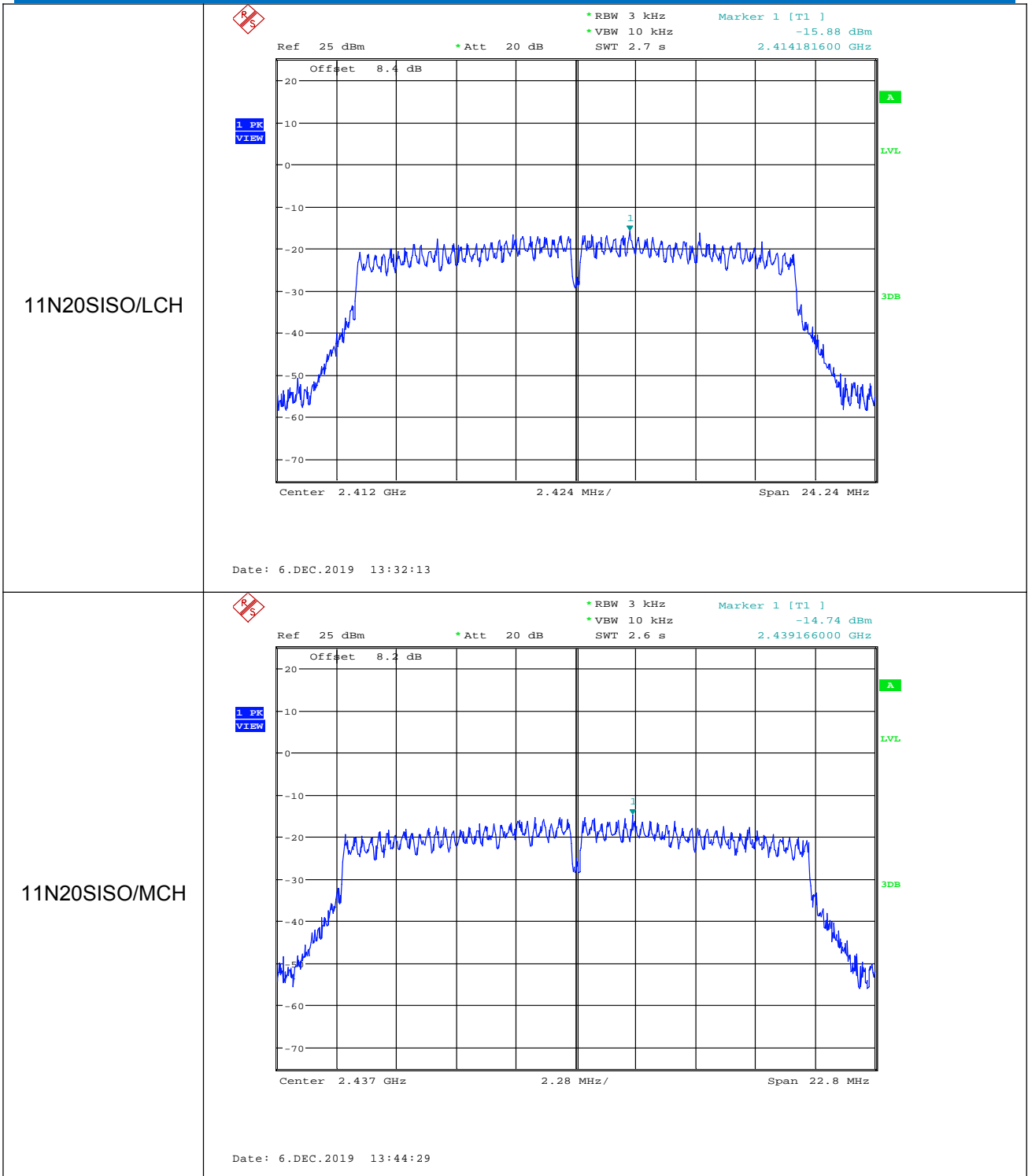


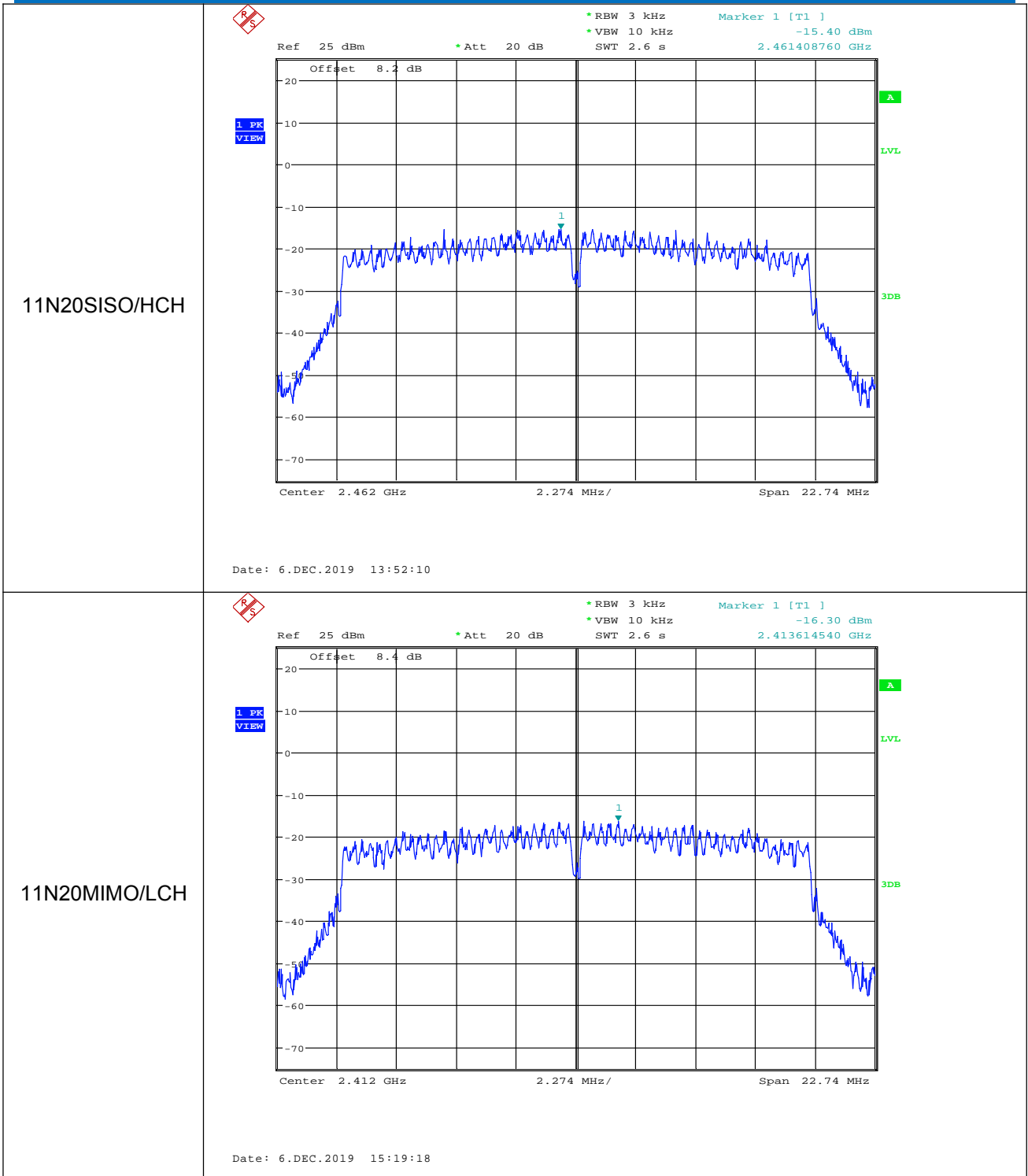
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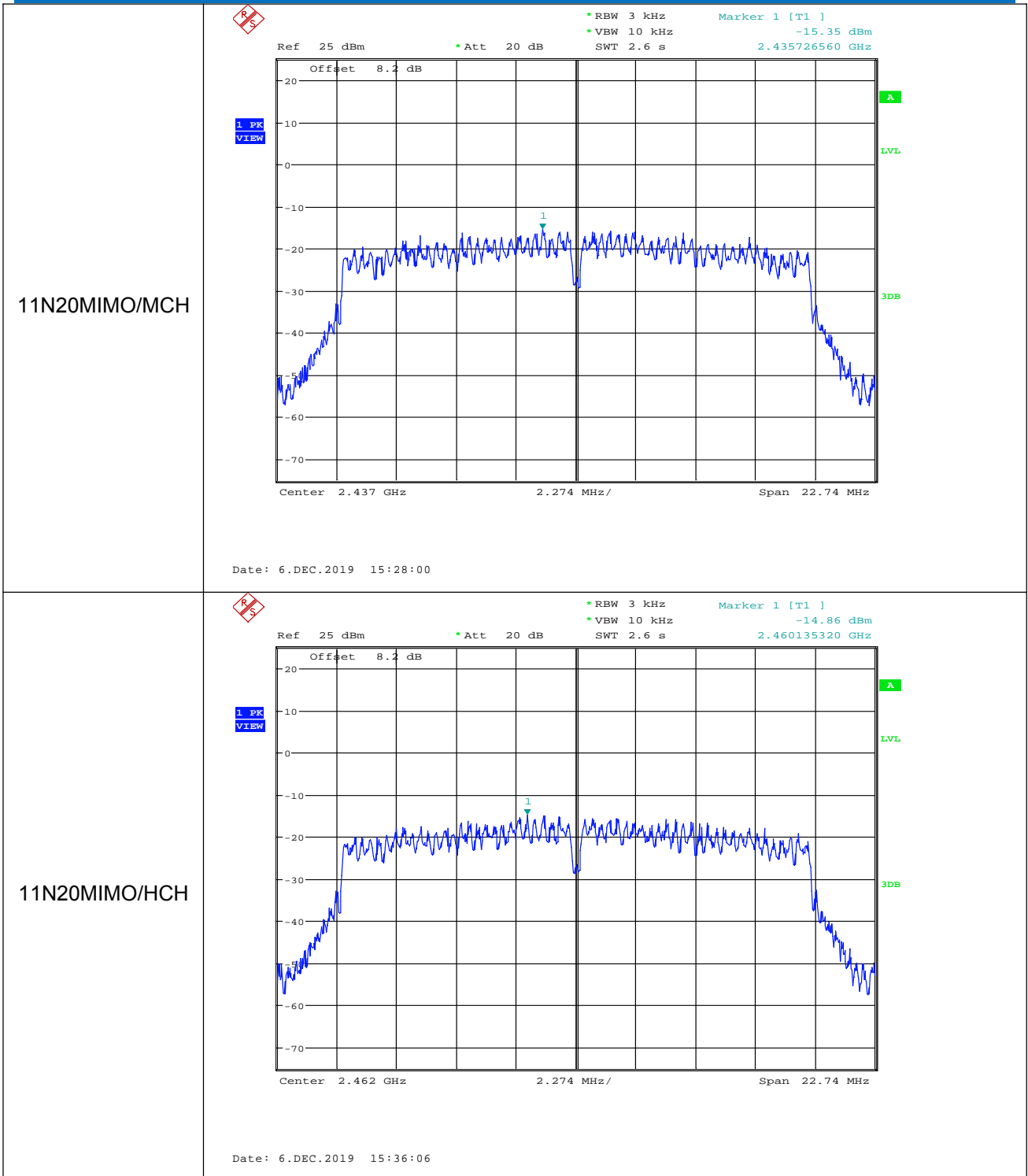


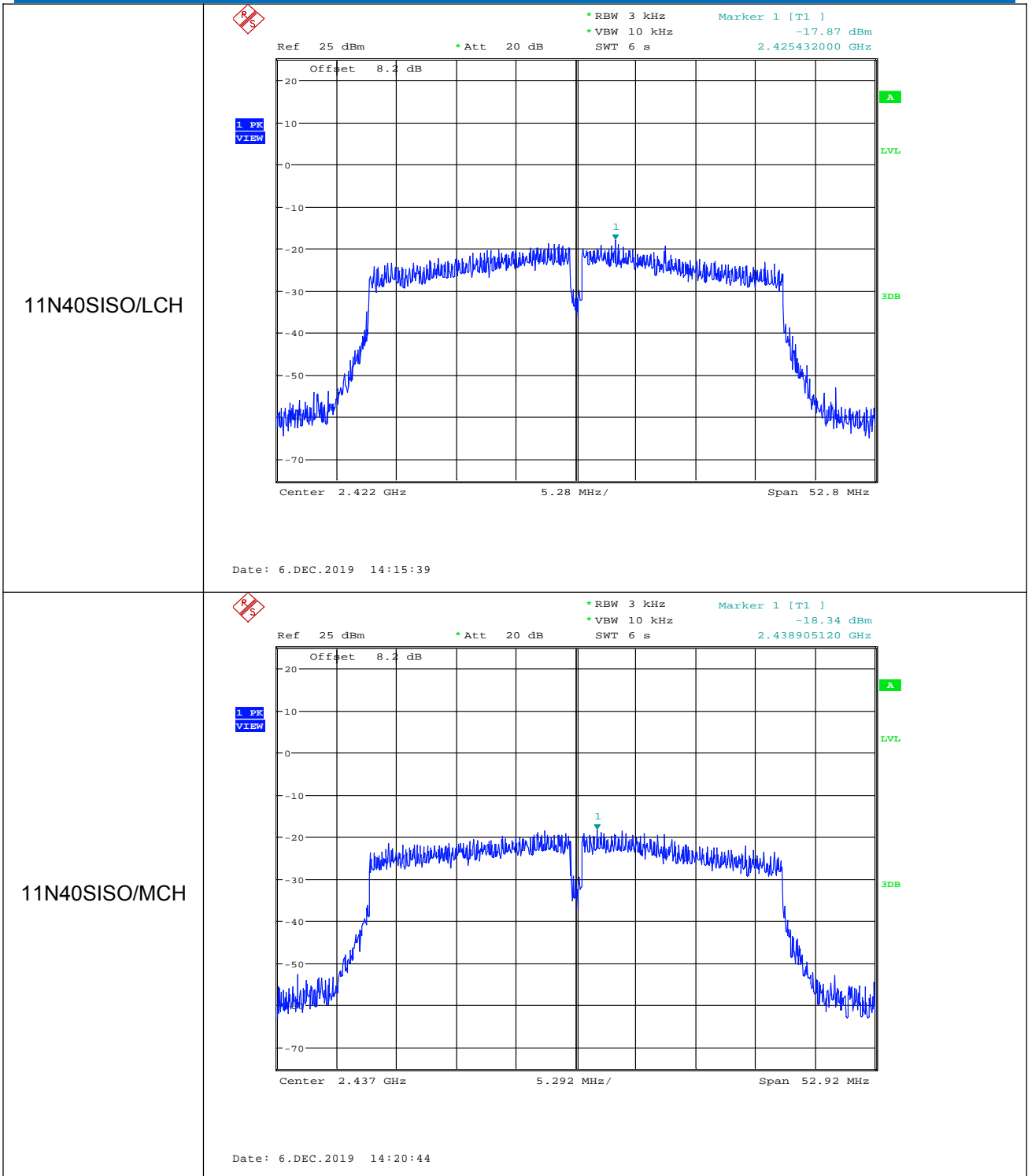


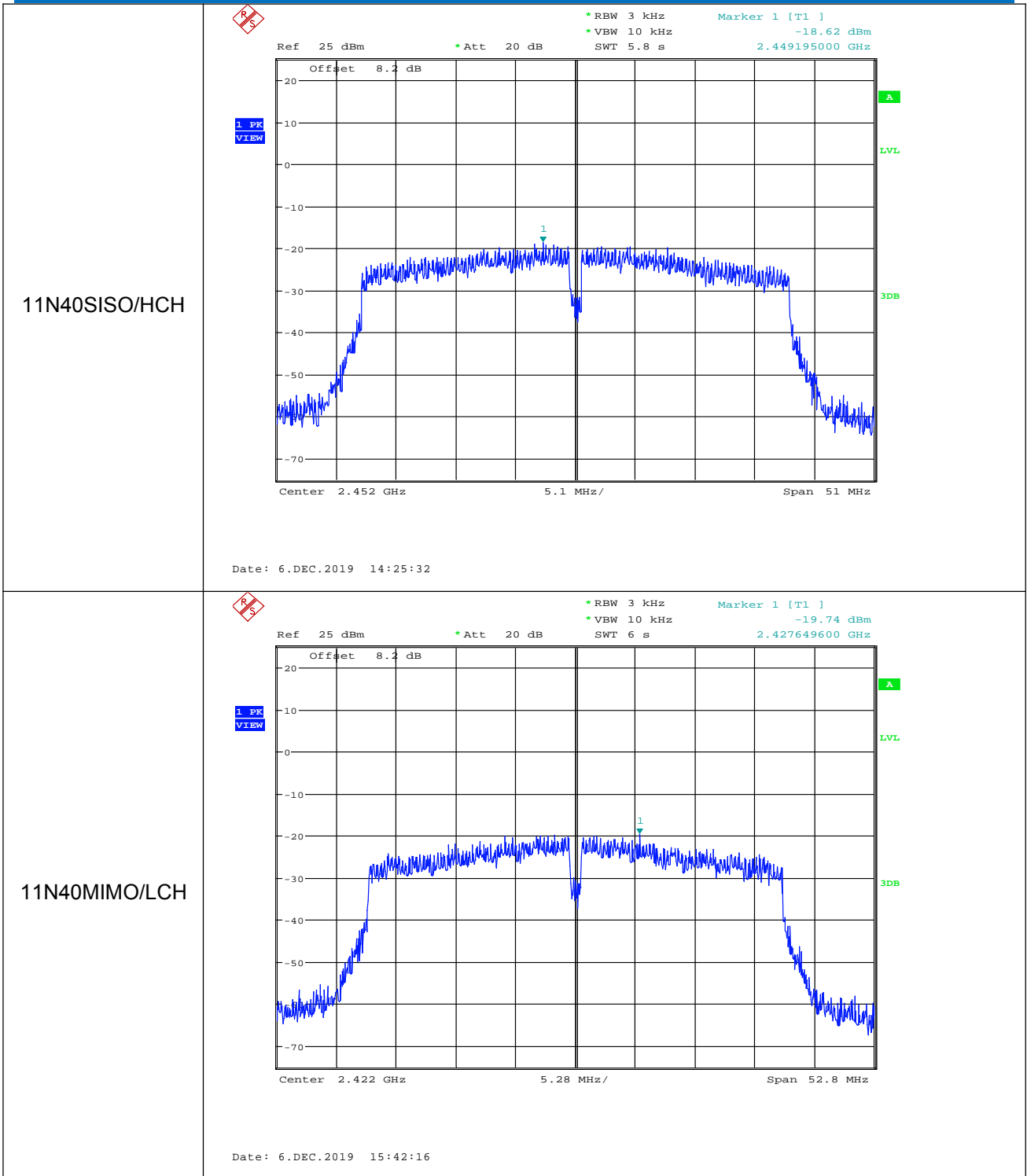




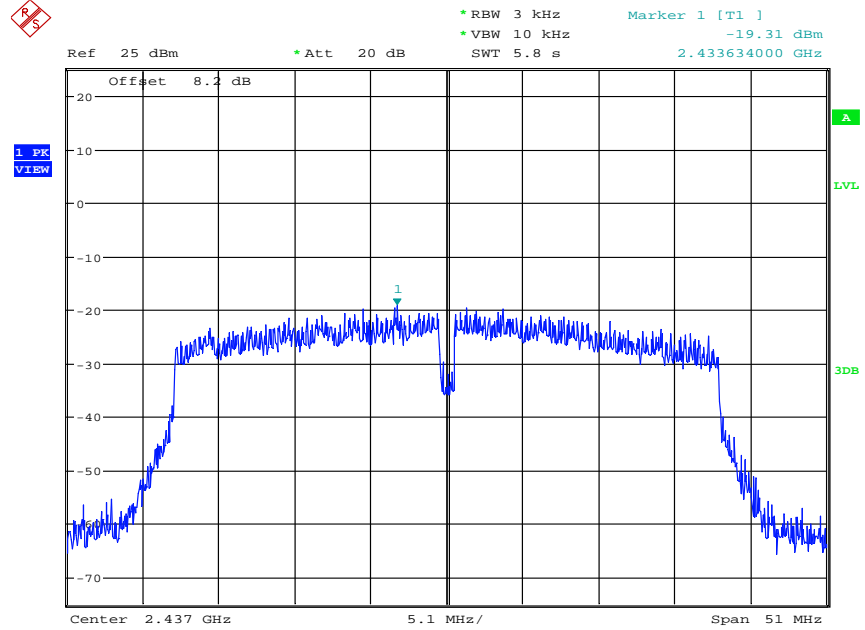






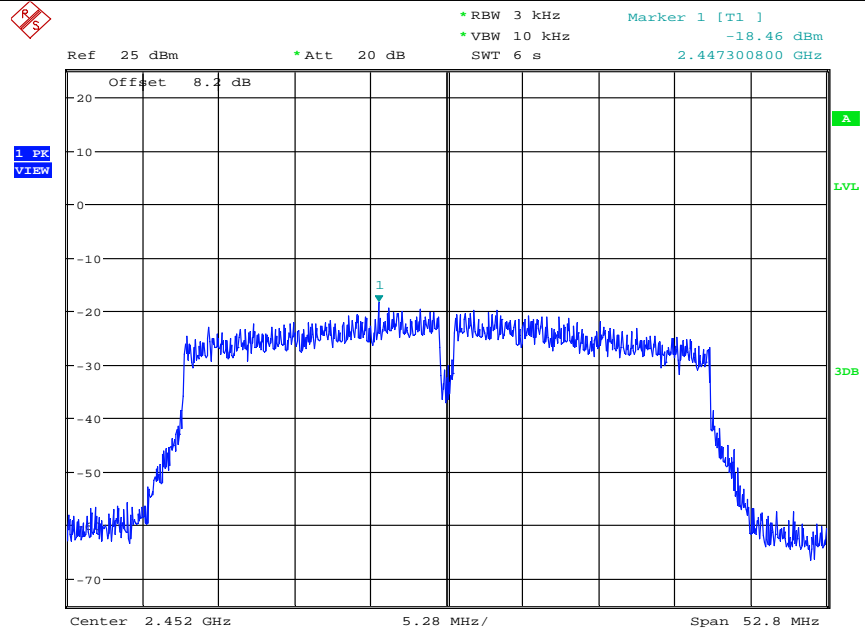


11N40MIMO/MCH



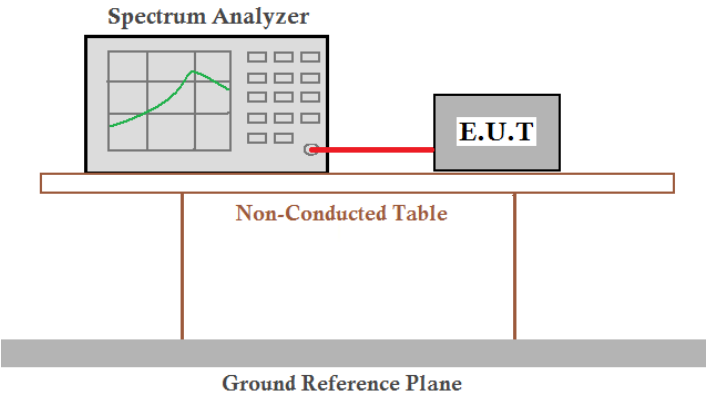
Date: 6.DEC.2019 15:48:56

11N40MIMO/HCH



Date: 6.DEC.2019 15:53:37

5.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 <p>Offset=cable loss+ attenuation factor</p>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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 Results:	Pass

Test Data:

Test mode: 802.11b					
Test channel	Antenna	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	Ant1	2400	-38.470	-18.22	Pass
Lowest	Ant2	2400	-38.760	-18.13	Pass
Highest	Ant1	2483.5	-52.890	-17.83	Pass
Highest	Ant2	2483.5	-52.330	-17.6	
Test mode: 802.11g					
Test channel	Antenna	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	Ant1	2400	-35.620	-18.6	Pass
Lowest	Ant2	2400	-34.190	-18.6	Pass
Highest	Ant1	2483.5	-49.800	-18.35	Pass
Highest	Ant2	2483.5	-49.120	-19.42	Pass
Test mode: 802.11n(HT20) SISO					
Test channel	Antenna	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	Ant1	2400	-32.360	-18.2	Pass
Lowest	Ant2	2400	-36.160	-19.24	Pass
Highest	Ant1	2483.5	-47.540	-18.05	Pass
Highest	Ant2	2483.5	-47.470	-18.31	Pass
Test mode: 802.11n(HT40) SISO					
Test channel	Antenna	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	Ant1	2400	-37.760	-20.86	Pass
Lowest	Ant2	2400	-38.600	-21.81	Pass
Highest	Ant1	2483.5	-43.630	-21.19	Pass
Highest	Ant2	2483.5	-47.440	-22.11	Pass
Test mode: 802.11n(HT20) MIMO					
Test channel	Antenna	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	Ant1	2400	-35.840	-18.6	Pass
Lowest	Ant2	2400	-36.130	-19.21	Pass
Highest	Ant1	2483.5	-48.040	-18.19	Pass
Highest	Ant2	2483.5	-48.040	-18.14	Pass
Test mode: 802.11n(HT40) MIMO					
Test channel	Antenna	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
Lowest	Ant1	2400	-37.950	-22.31	Pass
Lowest	Ant2	2400	-38.640	-22.77	Pass
Highest	Ant1	2483.5	-45.730	-21.88	Pass
Highest	Ant2	2483.5	-47.770	-22.98	Pass

Test plot as follows:

