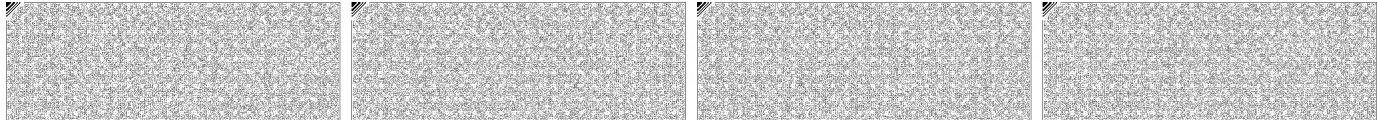




KIEL2506-YW05992

RF TEST REPORT			
Report Number		KIEL2506-YW05992	
Applicant	Company Name	H1 Radio Co., Ltd	
	Address	Room 1510, A-dong, Pyeongchon SmartBay Building, Beolmal-ro 123, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea	
Product	Product Name	HaLow AP	
	Model Name	H432AH-A	
	FCC ID	2BNGX-H432AHA	
	Manufacturer	H1 Radio Co., Ltd	
Other	Receipt Date	2024.12.18	Receipt Number RQW2412-0832
	Issued Date	2025.06.19	Tested Date 2024.12.30 ~ 2025.05.23
Standards		FCC Part 15 Subpart C ANSI C63.10-2020	
Tested by		Dominic Sim (Sign)	
Approved by		Allen Choi (Sign)	
KIEL Institute Daewoo Technopark A-403, 261, Doyak-ro, Bucheon-si, Gyeonggi-do, 14523, Korea. Tel : +82-32-670-8888, Fax : +82-32-670-8889 <i>o This is certified that the above mentioned products have been tested for the sample provided by client.</i> <i>o No part of this document may not be duplicated or reproduced by any means without the express written permission of KIEL Institute.</i> <i>o This test report is irrelevant to KS Q ISO/IEC 17025 and KOLAS accreditation</i>			

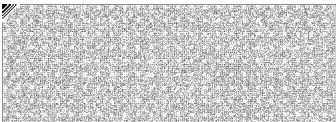




KIEL2506-YW05992

Revision History

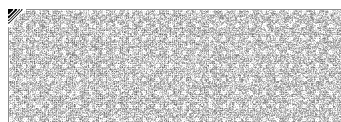
Issued Date	Issued Report No.	Revisions
2025.06.19	KIEL2506-YW05992	Initial Issue





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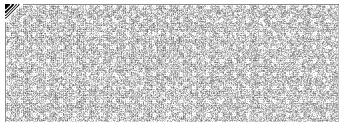
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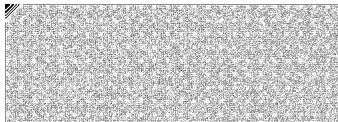
KIEL2506-YW05992

1.0 Laboratory Information

Laboratory Name	KIEL Institute
Location	1-1, Gilju-ro, Bucheon-city, Gyeonggi-do, Korea 14505
FCC Registration No.	KR0167 (RRA accredited Lab.)
IC Registration No.	KR0167 (31291)
Phone	+82-32-325-7045
Fax	+82-32-670-8889

2.0 Applicant Information

Applicant Name	H1 Radio Co., Ltd
Applicant Address	Room 1510, A-dong, Pyeongchon SmartBay Building, Beolmal-ro 123, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea
Manufacturer Name	H1 Radio Co., Ltd
Manufacturer Address	Room 1510, A-dong, Pyeongchon SmartBay Building, Beolmal-ro 123, Dongan-gu, Anyang-si, Gyeonggi-do, South Korea



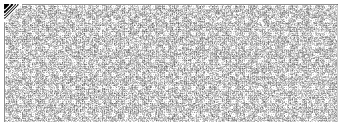
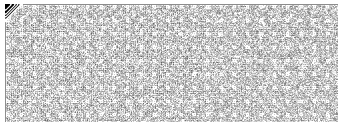


3.0 Summary of Test Results

Applied standard: FCC part 15, subpart C 15.247

FCC Part Section(s)	Test Item	Reference	Result
15.247 (a)(2)	6 dB Channel Bandwidth (DTS Bandwith)	Section 6.2	P
15.247 (b)(3)	Maximum Conducted Output Power	Section 6.3	P
15.247 (e)	Power Spectral Density	Section 6.4	P
15.247 (d)	Band Edge / Out-of-Band Emissions (Conducted Spurious Emission)	Section 6.5	P
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Section 6.5	P
15.207	AC Power Line Conducted Emissions (150 kHz – 30 MHz)	Section 6.6	P

- (Note 1) P = Pass, NC = Not comply, NT = Not Tested, NA = Not Applicable
- (Note 2) The general test methods used to test on this devices are ANSI C63.10.
- (Note 3) Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- (Note 4) For emission test from 9 kHz to 30 MHz,
Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.





3.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement Items	Frequency Range	Expanded Uncertainty U = kUc (k = 2)
Conducted Emission at main ports	150 kHz – 30 MHz	Line : 2.88 dB Neutral : 2.88 dB
Radiated Spurious Emissions	9 kHz – 30 MHz	Horizontal: 3.39 dB Vertical : 3.38 dB
	30 MHz – 1 GHz	Horizontal: 4.69 dB Vertical : 4.75 dB
	1 GHz – 18 GHz	Horizontal: 3.05 dB Vertical : 3.18 dB
	18 GHz – 40 GHz	Horizontal: 4.45 dB Vertical : 4.54 dB

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





4.0 General Information

4.1 EUT Description

Product name	HaLow AP
Basic model	H432AH-A
Product S/N	-
Variant model(s)	-
Model Difference	-
Power supply	Adaptor(DC 5 V) & POE(DC 48V)
Modulation	OFDM
Transfer Rate	802.11n(HT20), (HT40) : 0 to 7 [MCS][SISO] 802.11n(HT20), (HT40) : 8 to 15 [MCS][MIMO] 802.11ah(USN. HaLow) : MCS10, MCS0~MCS7(1M), MCS0~MCS7(2M,4M)
Operating Frequency	802.11n(HT20) : 2 412 ~ 2 462 [MHz] 802.11n(HT40) : 2 422 ~ 2 452 [MHz] 802.11ah(USN. HaLow) : 903.5 ~ 926.5 [MHz](1M), 905 ~ 925 [MHz](2M), 906 ~ 922[MHz](4M)
Number of channel	802.11n(HT20) : 11 channels 802.11n(HT40) : 7 channels 802.11ah(USN. HaLow) : 24 Channels(1M), 11 Channels(2M), 5 Channels(4M)
Output Power	802.11n(HT20) : 20.61 dBm 802.11ah(USN. HaLow) : 24.58 dBm
Antenna Type	802.11n(HT20,HT40) : DiPole & FPCB (2T2R) 802.11ah(USN. HaLow) : Dipole
Antenna Connector	Permanently Attached

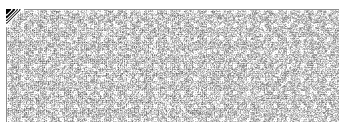
(Note 1) The above equipment has been tested by KIEL Institute, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

4.1.1 List of Accessories

Accessories	Brand	Model	Manufacturer	Specification
-	-	-	-	-

4.1.2 Auxiliary Test equipment

Accessories	Brand	Model	Manufacturer	Specification
Laptop	Lenovo IdeaPad S500 Touch	20248	Lenovo PC HK Limited	-
AC Adapter(Laptop)	Lenovo	ADLX45NCC3A	CHICONY POWER TECHNOLOGY (SUZHOU) CO.,LTD.	Input: AC 100 V ~ 240 V / 50 ~ 60 Hz Output: DC 20 V





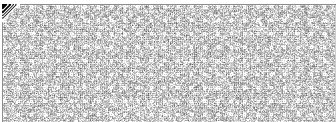
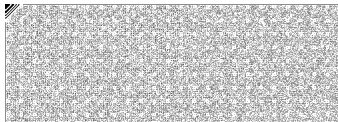
4.1.3 Antenna Information

Antenna	Type	Frequency Range	Peak Gain
Ant A (Wi-Fi)	FPC	2 400 MHz – 2 483.5 MHz	4.09 dBi
Ant B (Wi-Fi)	Dipole	2 400 MHz – 2 483.5 MHz	5.17 dBi
Ant C (HaLow)	Dipole	900 MHz – 928 MHz	2.50 dBi

4.1.4 Channel List of EUT

802.11n(HT20)							
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
1	2 412	4	2 427	7	2 442	10	2 457
2	2 417	5	2 432	8	2 447	11	2 462
3	2 422	6	2 437	9	2 452		

802.11n(HT40)					
Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
3	2 422	6	2 437	9	2 452
4	2 427	7	2 442		
5	2 437	8	2 447		





4.2 Description of Test Mode

4.2.1 Test Mode Configuration

The equipment Under Test(EUT) was a Halow-Ap, With 802.11n and 802.11ah capabilities in the 900 MHz and 2.4GHz bands.

All modes of operation and data rates were investigated. The test results shown in the following sections represent worst-case

- Axis worst case

Pre-Scan has been performed to determine the worst case axis between antenna port, XYZ axis and frequency band.

EUT Configuration	Applicable to		Description
	Ant A	Ant B	
Transmission	X axis	X axis	-

- Radiated Emission (Below 1 GHz, Above 18 GHz, and AC Power line conducted emission) worst case

Radiated emission below 1 GHz, above 18 GHz and AC power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Tested Mode	Tested Channel	Data Rate	Description
802.11n(HT20)	6	MCS 8	MIMO

- Radiated Emission (Above 1 GHz)

Radiated emission above 1 GHz was performed with the EUT set to transmit Low/Mid/High channels.

Tested Mode	Tested Channel	Data Rate / Packet Type	Description
802.11n(HT20)	1, 6, 11	MCS 8	MIMO
802.11n(HT40)	3, 6, 9	MCS 8	MIMO

- Simultaneous Transmission

EUT was configured for simultaneous transmission in the following mode of operation

Tested Mode	Frequency Bands [MHz]	Data Rate / Packet Type	Description
802.11n(HT20)	2 412 ~ 2 462	MCS 8	-
802.11ah	903.5 ~ 926.5	MCS 10	-





- Antenna Port Conducted Measurement

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

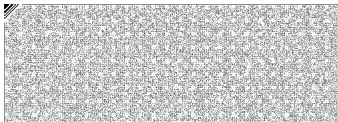
Tested Mode	Tested Channel	Data Rate / Packet Type	Description
802.11n(HT20)	1, 6, 11	MCS 8	MIMO
802.11n(HT40)	3, 6, 9	MCS 8	MIMO

- Test Conditon

Applicable to	Environmental Conditions	Test Voltage	Tested by
Radiated emissions(< 1GHz)	(22.9 ± 2) °C, (43.2 ± 3) % R.H.	DC 5 V & DC 48 V	Dominic Sim
Radiated emissions(> 1GHz)	(22.9 ± 2) °C, (43.2 ± 3) % R.H.	DC 5 V	Dominic Sim
AC power line emission	(22.2 ± 2) °C, (44.2 ± 3) % R.H.	AC 120 V, 60 Hz	Dominic Sim
Antenna port conducted	(23.3 ± 2) °C, (44.3 ± 3) % R.H.	DC 5 V	Dominic Sim

- Worst case of data rates

Transmission	Test Mode	Bandwidth [MHz]	Worst Case Data Rate / Packet Type
MIMO	802.11n	20	MCS 8
		40	MCS 8



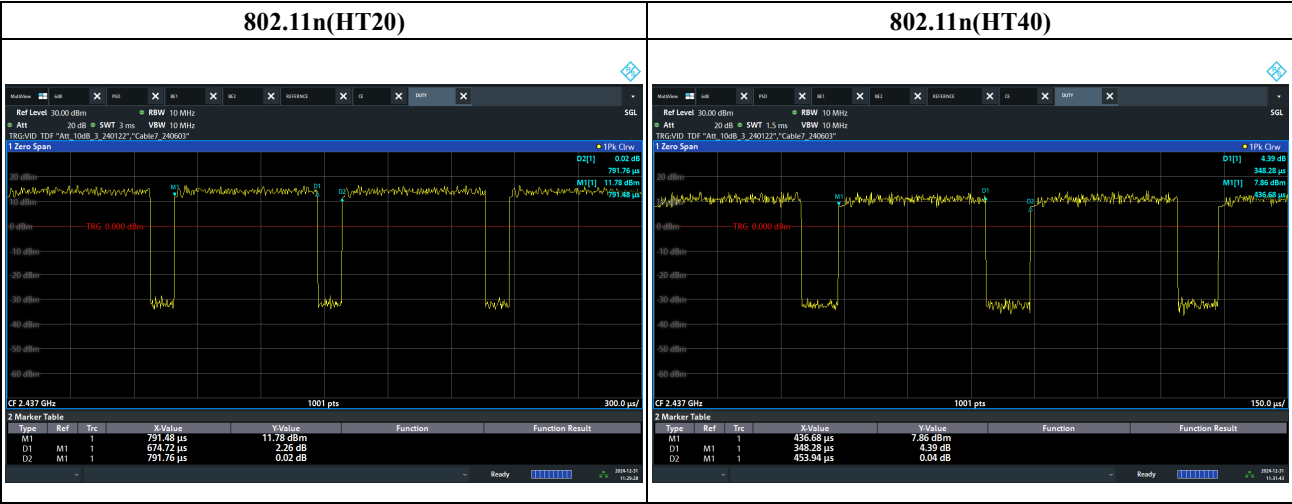


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- Duty Cycle of Test Signal

Test Mode	On Time [msec]	Period [msec]	Duty cycle X [Linear]	Duty Cycle [%]	DCCF [dB]
802.11n(HT20)	0.674 72	0.791 76	0.852 18	85.218	0.69
802.11n(HT40)	0.348 28	0.453 94	0.767 24	76.724	1.15

- Test Plots of Duty Cycle



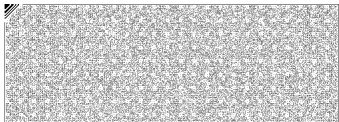


4.3 General Description of Applied Standard

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards.

FCC CFR 47 Part 15, Subpart C (§15.247)
KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2020

All test items in this test report have been performed and recorded as per the above standards.



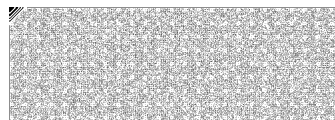
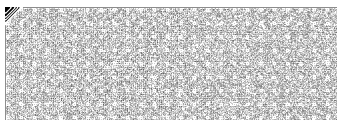


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5.0 Test Equipment

Test Equipment is traceable to the National Institute of Standards and Technology (NIST). Measurement antenna used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

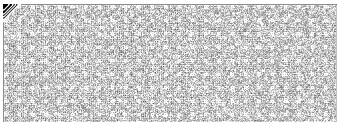
	Equipment	Manufacturer	Model	S/N	Description	Cal Due
■	Spectrum Analyzer	Rohde & Schwarz	FSV3044	101034	10 Hz ~ 44 GHz	2026-01-22
□	Spectrum Analyzer	Rohde & Schwarz	FSV3030	102117	10 Hz ~ 30 GHz	2026-05-20
□	DC Power Supply	ODA	OPM-305D	ODA-04-0923-07960	DC 30 V, 5 A	2026-01-23
■	DC Power Supply	ODA	OPM-6010D	ODA-04-0923-07962	DC 60 V, 10 A	2026-01-24
■	Signal Generator	Rohde & Schwarz	SMBV100B	101818	8 kHz ~ 6 GHz	2026-01-23
■	Vector Signal Generator	Rohde & Schwarz	SMB100A	180880	100 kHz ~ 40 GHz	2026-05-19
■	Attenuator	INMET	26A-10	2	DC to 26.5 GHz, 10 dB	2026-01-22
■	Attenuator	INMET	26A-10	3	DC to 26.5 GHz, 10 dB	2026-01-22
■	True RMS Multimeter	FLUKE	177	59570153	1000 V, 10 A	2026-01-31
■	Power Meter	Rohde & Schwarz	NRX	101971	DC ~ 40 GHz	2026-01-21
■	Power Sensor	Rohde & Schwarz	NRP-Z86	104137	50 MHz ~ 40 GHz	2026-05-22
■	Notch Filter	Micro-Tronics	BRM50702	G577	Stop band: 2 400 MHz ~ 2 500 MHz	2026-05-21
■	High Pass Filter	WT Microwave INC.	WT-A3331-HS	23041001-1	Pass band: 6.0 GHz ~ 24.5 GHz	2026-05-21
■	High Pass Filter	WT Microwave INC.	WT-A1696-HS	WT190313-6-2	Pass band: 1.2 GHz ~ 11.5 GHz	2025-11-13
■	EMI Test Receiver	Rohde & Schwarz	ESW44	101737	1 Hz ~ 44 GHz	2026-01-21
■	EMI Test Receiver	Rohde & Schwarz	ESW26	103106	1 Hz ~ 26.5 GHz	2026-01-21
■	Active Loop Antenna	Rohde & Schwarz	HFH2-Z2E	100858	8.3 kHz ~ 30 MHz	2026-05-24
■	Bi-Log Antenna	SCHWARZBECK	VULB9168	00915	25 MHz ~ 2 GHz	2026-06-26
■	Horn Antenna	Rohde & Schwarz	HF907	102722	800 MHz ~ 18 GHz	2026-05-21
■	Horn Antenna	SCHWARZBECK	BBHA9170	00981	15 GHz ~ 40 GHz	2026-02-04
■	Preamplifier	Rohde & Schwarz	SCU-01F	100465	10 kHz ~ 1 GHz, 35 dB	2026-01-20
■	Preamplifier	Rohde & Schwarz	SCU-18F	180084	1 GHz ~ 18 GHz	2026-05-19
■	Preamplifier	EXYNOD	ELNA40-50	2305161	18 GHz ~ 40 GHz	2026-05-20
■	6dB Attenuator	Fairview Microwave	SA3N5W-06	190311028	DC ~ 3 GHz, 6 dB	2026-06-26
■	EMI Test Receiver	Rohde & Schwarz	ESR3	102444	10 Hz ~ 3 GHz	2026-05-19
■	LISN	Rohde & Schwarz	ENV216	102347	9 kHz ~ 30 MHz	2026-05-19
■	LISN	AFJ	LTC32C/10	3203816260	9 kHz ~ 30 MHz	2026-05-19
■	Turntable	Innco	DT 3000-3t	-	-	-





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☐	Antenna Mast_L	Innco	MA4000-EP	-	-	-
☒	Antenna Mast_R	Innco	MA4000-EP	-	-	-
☒	Controller_1	Innco	CO3000	1062	-	-
☒	Controller_2	Innco	CO3000	1063	-	-
☒	Software	Rohde & Schwarz	EMC32	101535	-	-
☒	Software	Rohde & Schwarz	ELEKTRA	102739	-	-





6.0 Test Results

6.1 Antenna Requirement

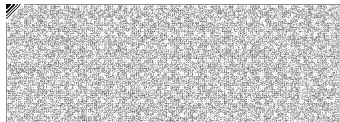
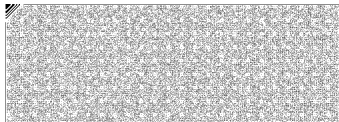
Except from §15.203 of the FCC Rules/Regulations:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 shall be considered sufficient to comply with the provisions of the section.

- The antenna(s) of the EUT are Unique (non-standard) antenna connector.
 - The connector is within the transmitter enclosure
- There are no provisions for connection to an external antenna.

6.1.1 Result

The EUT complies with the requirement of §15.203



6.2 6 dB Bandwidth

6.2.1 Regulation

§15.247(a)(2) : Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

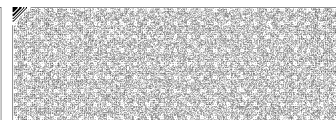
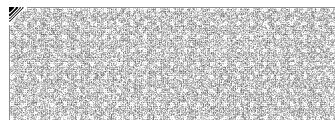
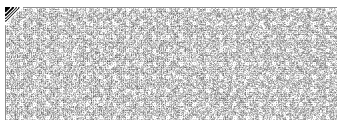
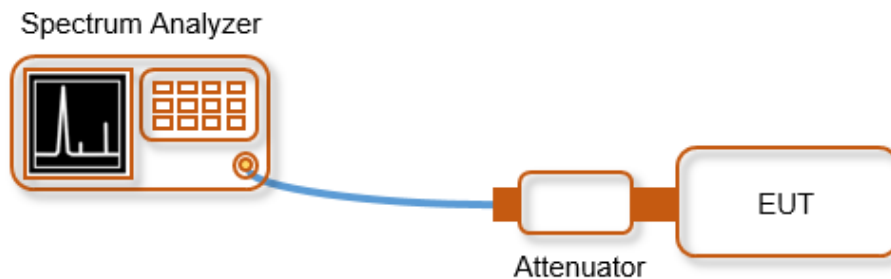
6.2.2 Test Procedure

The method of measurement used to test this DTS device is ANSI C63.10-2020.

The following procedures shall be used for measuring the OBW of the fundamental frequencies of certain unlicensed wireless devices, when required.

- a) Use the following spectrum analyzer settings:
 - 1) Set RBW = shall be 100 kHz.
 - 2) Set the VBW $\geq [3 \times \text{RBW}]$.
 - 3) Detector = Peak.
 - 4) Trace mode = Max hold.
 - 5) Sweep = No faster than coupled (auto) time.
- b) Allow trace to stabilize
- c) Use the N dB down function and set N value to -6.
- d) In case of 99 % bandwidth, Use 99 % power bandwidth function.
- e) A plot of the test results and setup description shall be included in the test report.

6.2.3 Test Setup

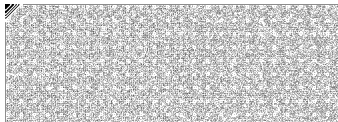




6.2.4 Test Result

-Adaptor (DC 5 V)

Test Mode	Antenna	Channel	Frequency [MHz]	6 dB BW [MHz]
802.11n(HT20)	SISO ANT A	1	2 412	15.114
		6	2 437	15.115
		11	2 462	15.111
	SISO ANT B	1	2 412	15.111
		6	2 437	15.108
		11	2 462	15.109
802.11n(HT40)	SISO ANT A	3	2 422	35.079
		6	2 437	35.081
		9	2 452	35.095
	SISO ANT B	3	2 422	35.093
		6	2 437	35.087
		9	2 452	35.068
02.11n(HT20)	MIMO ANT A	1	2 412	15.106
		6	2 437	15.088
		11	2 462	15.111
	MIMO ANT B	1	2 412	15.106
		6	2 437	15.686
		11	2 462	15.104
802.11n(HT40)	MIMO ANT A	3	2 422	35.091
		6	2 437	35.085
		9	2 452	35.075
	MIMO ANT B	3	2 422	35.071
		6	2 437	35.068
		9	2 452	35.066





-POE (DC 48 V)

Test Mode	Antenna	Channel	Frequency [MHz]	6 dB BW [MHz]
802.11n(HT20)	SISO ANT A	1	2 412	15.113
		6	2 437	15.114
		11	2 462	15.111
	SISO ANT B	1	2 412	15.113
		6	2 437	15.108
		11	2 462	15.119
802.11n(HT40)	SISO ANT A	3	2 422	35.089
		6	2 437	35.069
		9	2 452	35.074
	SISO ANT B	3	2 422	35.079
		6	2.437	35.069
		9	2 452	35.081
802.11n(HT20)	MIMO ANT A	1	2 412	15.109
		6	2 437	15.101
		11	2 462	15.114
	MIMO ANT B	1	2 412	15.104
		6	2 437	15.669
		11	2 462	15.110
802.11n(HT40)	MIMO ANT A	3	2 422	35.073
		6	2 437	35.079
		9	2 452	35.077
	MIMO ANT B	3	2 422	35.068
		6	2 437	35.071
		9	2 452	35.068

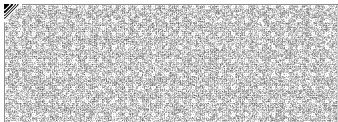
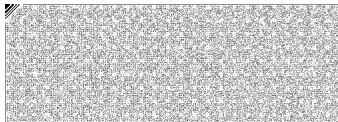
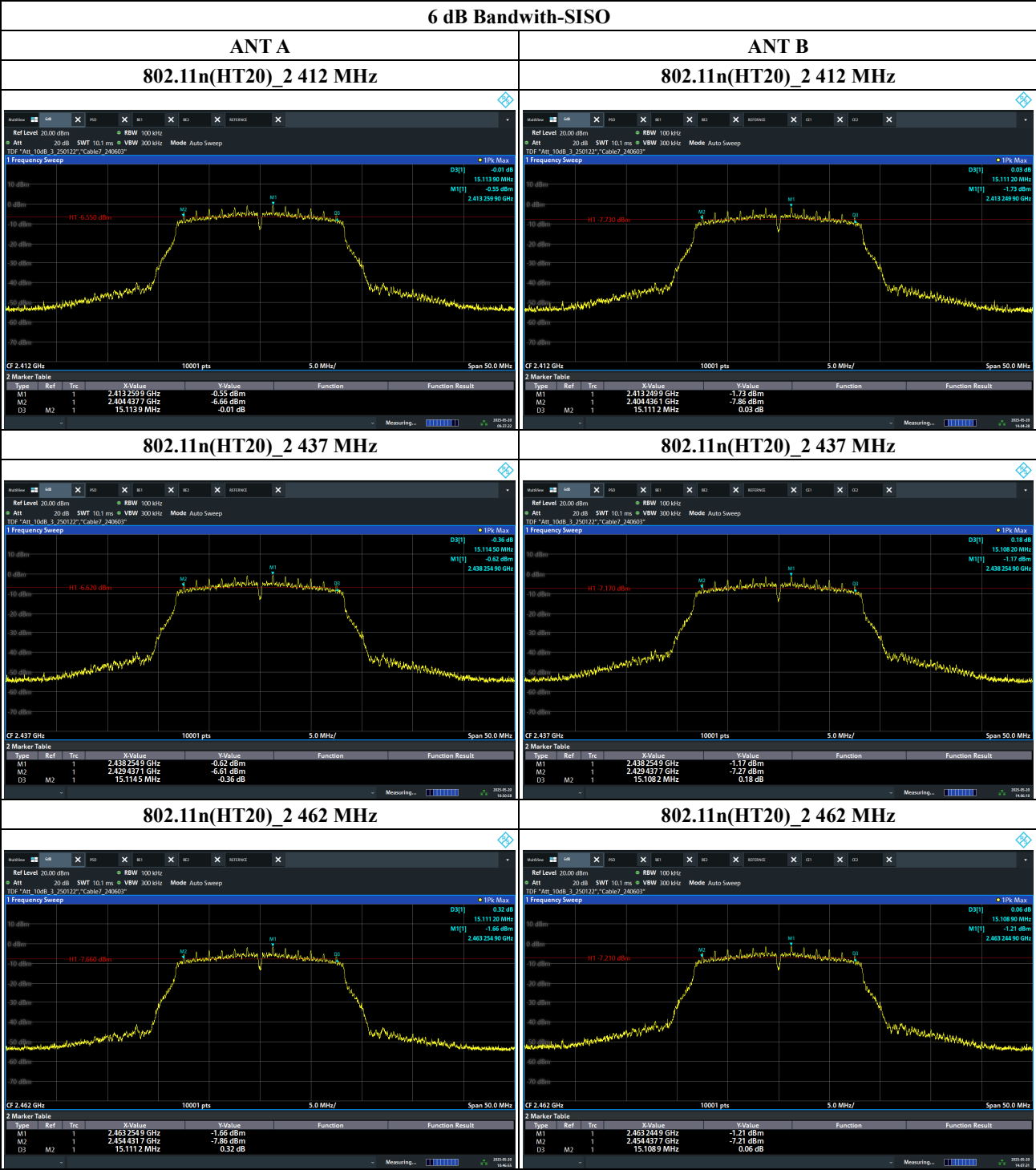




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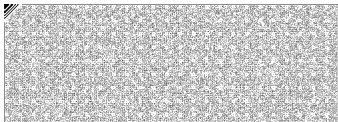
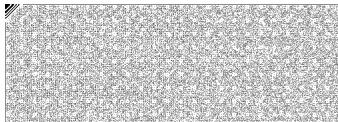
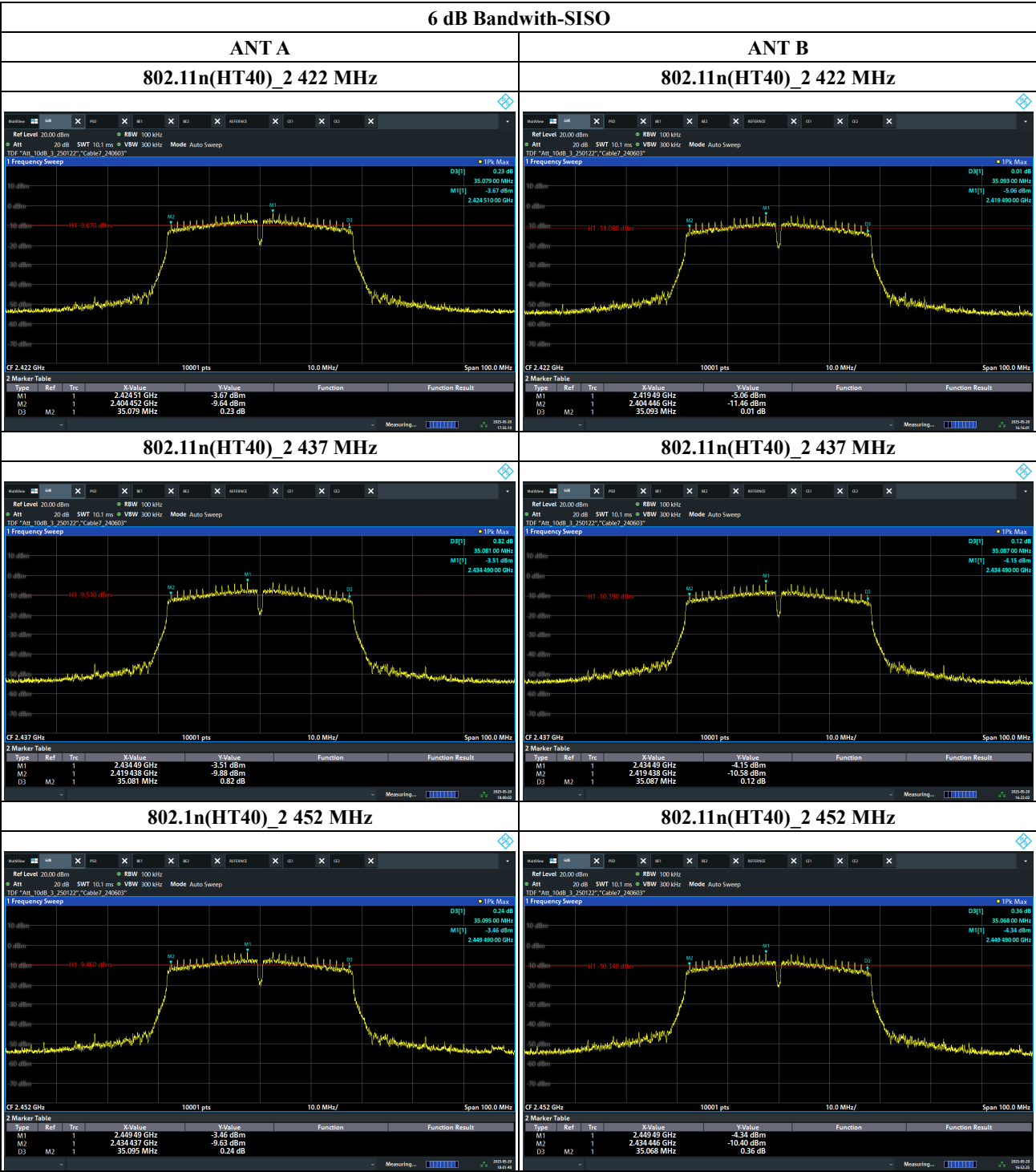
Test Plot of 6 dB Bandwidth

-Adaptor(DC 5 V)



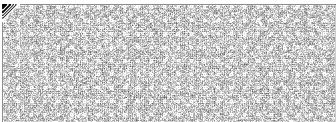
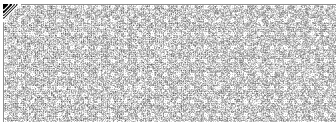
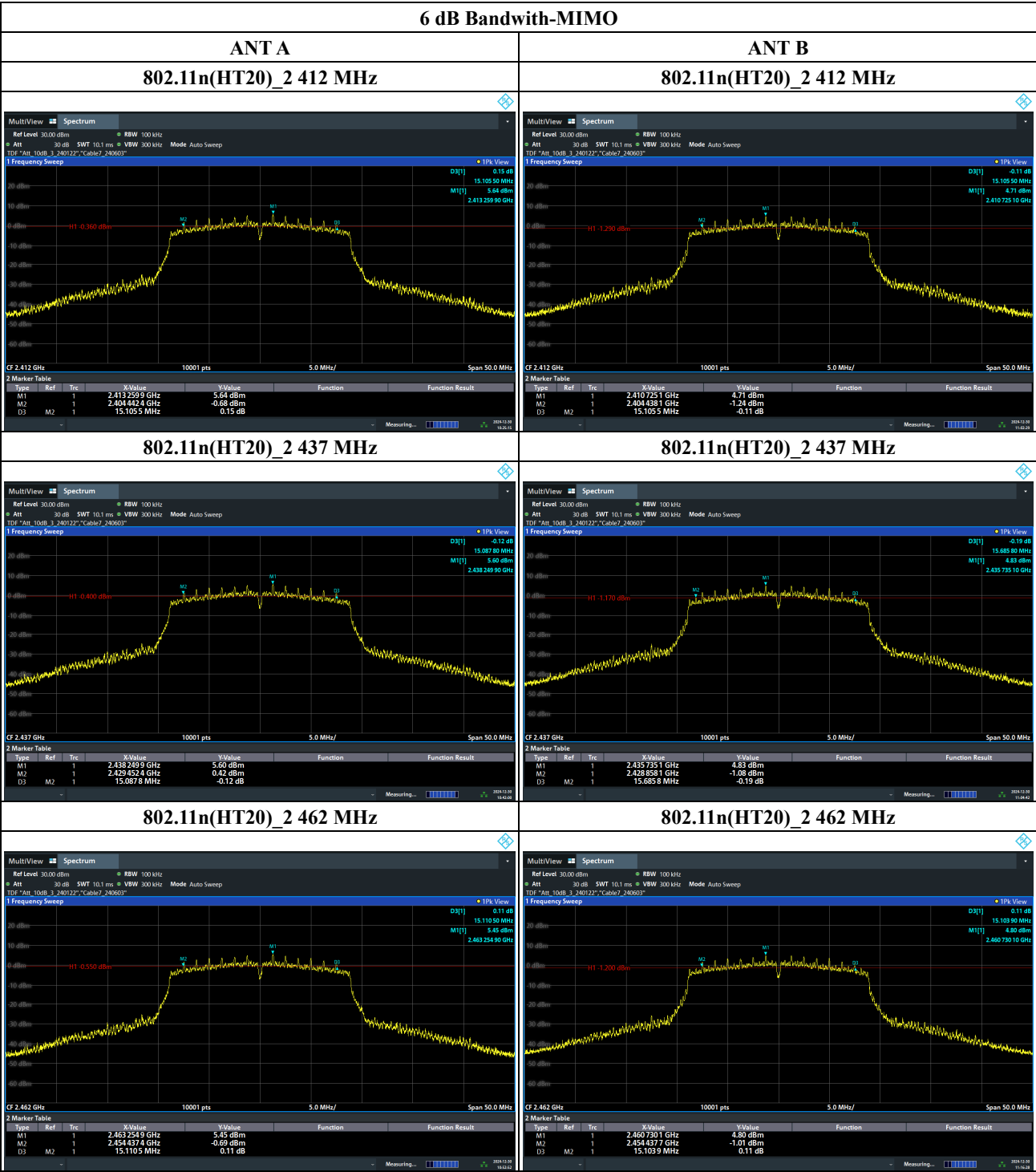


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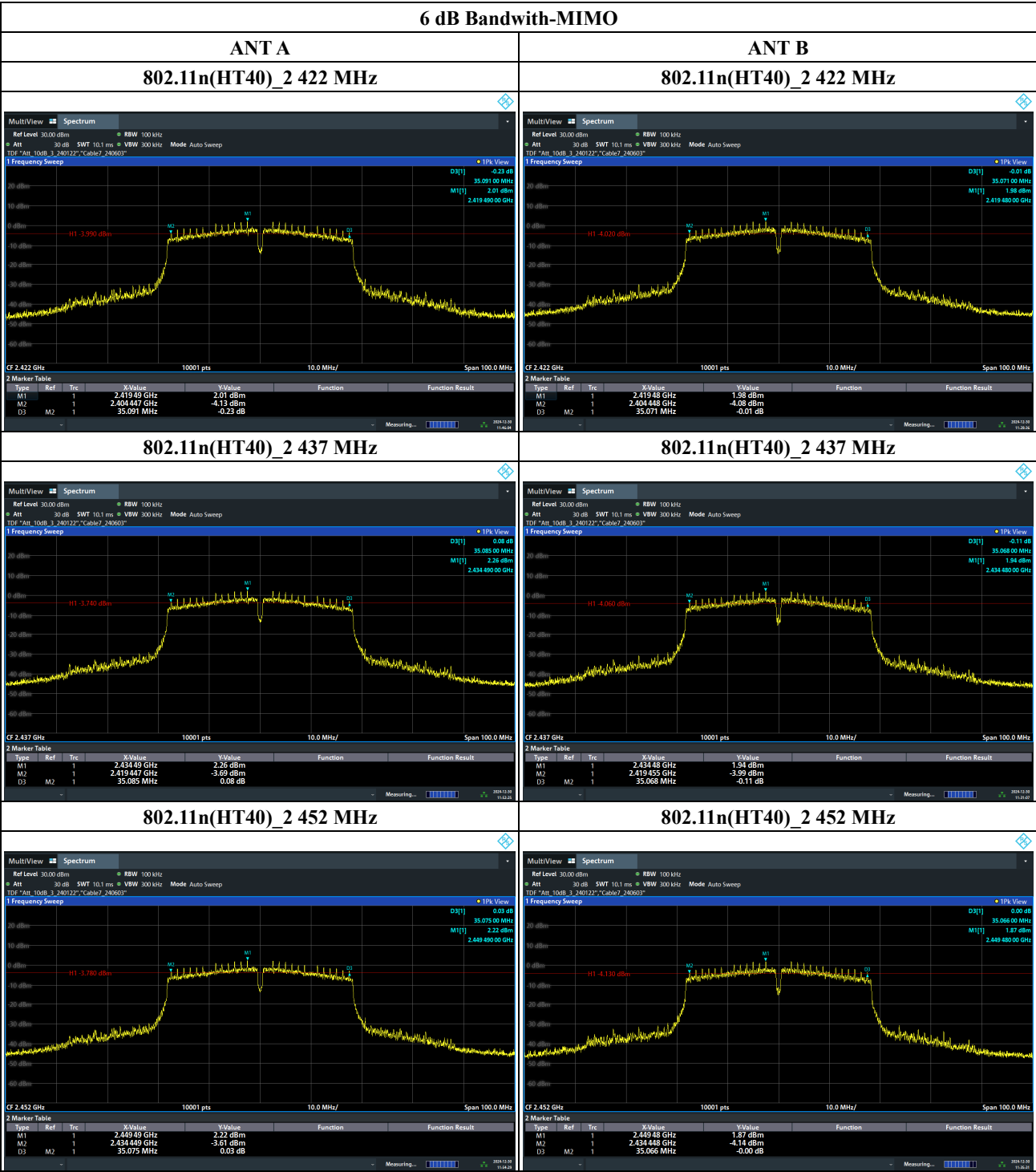


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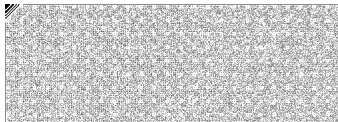
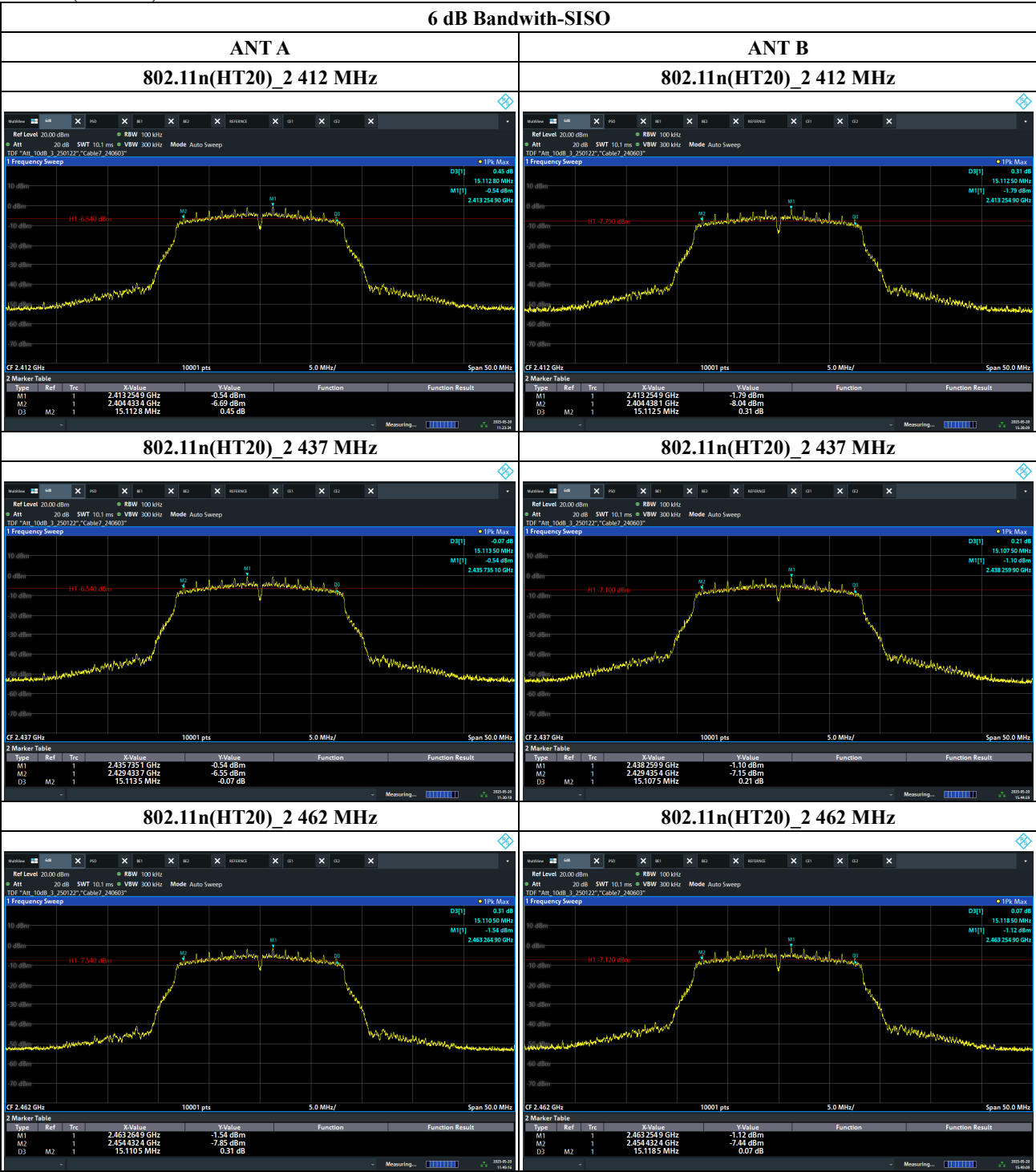
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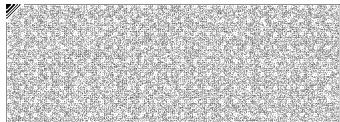
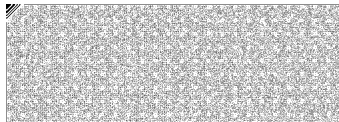
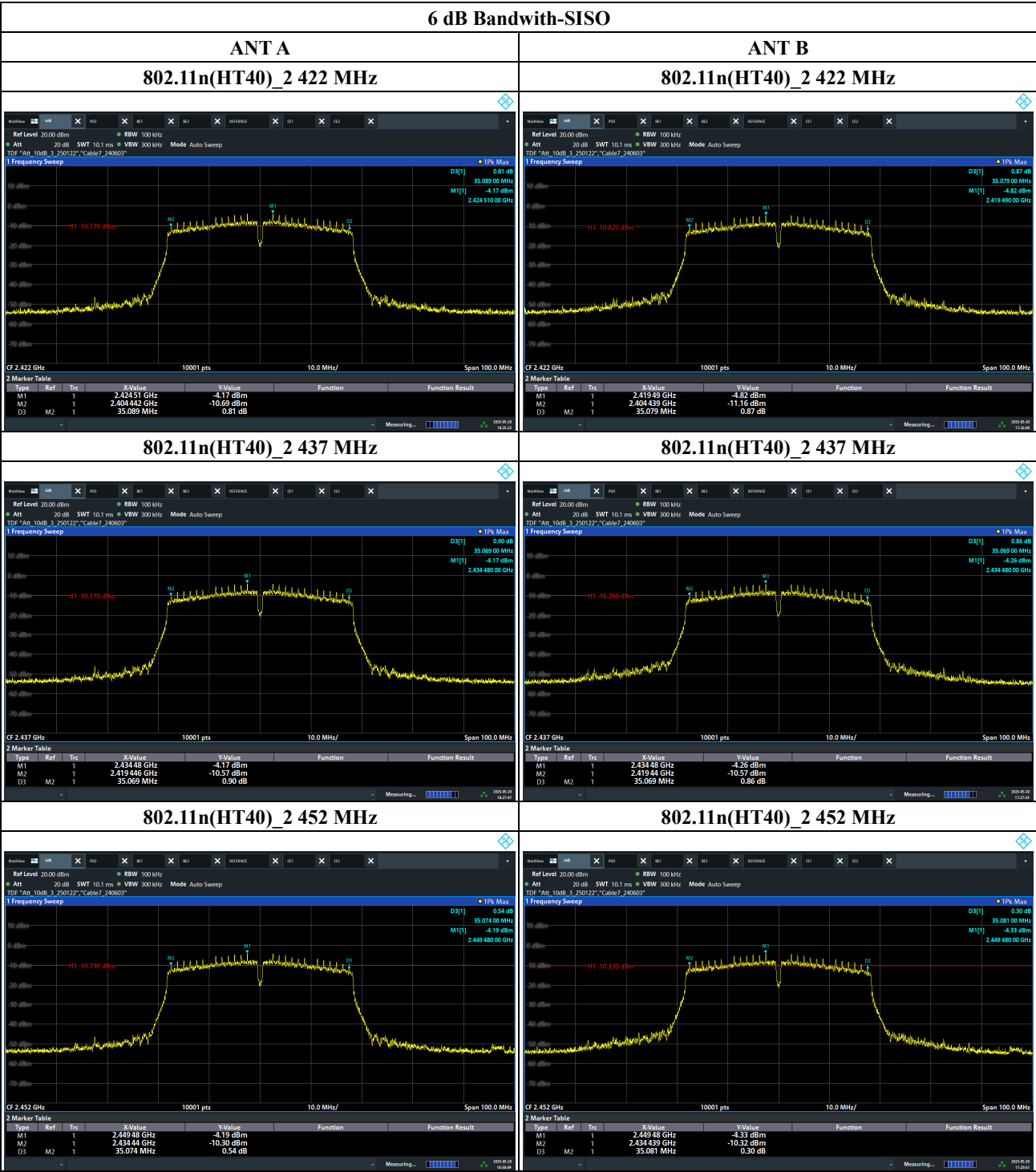
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-POE(DC 48 V)





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