

TEST RECORDS

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PART 1

TEST INFORMATION

1 General

Configuration	Description
Ambient Environment	Temperature: 15 to 30 °C Relative Humidity: 20 to 85 % Atmospheric Pressure: Not applicable

2 Auxiliary Facilities Supporting Tests

NOTE: The EUT was tested together with other necessary auxiliary facilities so as to form representative EUT installation configurations and test setup configurations during the tests.

Facility	Manufacturer	Model	Identification	Remark
UMPT	HUAWEI	UMPT	021VGH6TF16077 07	Universal Main Processing & Transmission unit
UBBP	HUAWEI	UBBP	022HEM4MFA029 104	Baseband Processing and Interface Unit

3 Main Measurement Instruments

NOTE 1: NCR = No calibration required, VOU = Verified on use.

NOTE 2: Unless otherwise specified, the calibration intervals for test instruments were Annual (per year). The other intervals, if applicable, are marked with (##y), which denotes ## years calibration interval.

3.1 Current Test Project/Report

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
For Conducted Test Items				
Spectrum Analyzer	Agilent	N9020A	MY51240619	2018-11-26
Climate Chamber	ESPEC	EW0470S	12113066	2018-07-20
Power Supply	Chroma	62012P-80-60	62012PD01403	2018-10-29
Conducted Test Paths (Cables, RF Switches, etc.)	HUAWEI	(Customized)	---	VOU
For Radiated Test Items				
EMI Test Receiver	Keysight	N9038A	MY52260169	2018-09-05
Spectrum Analyzer	Keysight	N9010A	MY52220816	2018-09-05
Signal Generator	Agilent	E8257D	MY51110541	2019-05-03
Bilog Antenna	TESEQ	CBL 6112D	35239	2019-10-30 (2y)
Horn Antenna	SWARZBECK	BBHA 9120D	1077	2019-10-30 (2y)
Horn Antenna	ETS	3160-09	00117544	2019-10-16 (2y)
Software	TOYO	EP5 V5.5	---	NCR

PART 2

TEST PLANS

1 Test Environments

NOTE: The values used in tests may be stringent than that of declared.

Test Environment #	Temperature	Voltage	Relative Humidity
NTNV	See Ambient Environment	-48 VDC	See Ambient Environment
xT_NV	xT denotes the temperature specified by relevant rules/standards, e.g. -30 °C to +50 °C with step of 10 °C	-48 VDC	---
20°C_85%NV	+20 °C	-40.8 VDC	---
20°C_100%NV	+20 °C	-48 VDC	---
20°C_115%NV	+20 °C	-55.2 VDC	---

2 EUT Configurations

NOTE: For the column of "Antenna",

(1) the expression "1,2,3,...,N" (discrete), "1-N" (continuous range), or "All" denotes N ports 1, 2, 3, ..., N or all ports work independently (e.g. SISO), and

(2) the expression "1+2+3+...", "SUM(1,2,3,...)", or "SUM(All)" denotes work dependently (e.g. MIMO).

EUT Config. #	Ant	Sys	Gap next?	Band	Freq. [MHz]	ChBW [MHz]	Power [dBm]	Test Mode
TX_1NB_B	1+2	NB-IoT	No	---	2000.2	0.2	43	N-TM
TX_1NB_M	1+2	NB-IoT	No	---	2010	0.2	43	N-TM
TX_1NB_T	1+2	NB-IoT	No	---	2019.8	0.2	43	N-TM
TX_2NB_B	1+2	NB-IoT	No	---	2000.2, 2000.5	0.2 0.2	43 43	N-TM
TX_2NB_M	1+2	NB-IoT	No	---	2010, 2010.3	0.2 0.2	43 43	N-TM
TX_2NB_T	1+2	NB-IoT	No	---	2019.5, 2019.8	0.2 0.2	43 43	N-TM
TX_CW_M	1+2	---	---	---	2010	---	43	CW

3 Test Configurations

#	Test Item	Test Environment #	EUT Config. #
1	RF power output	NTNV	TX_1NB_B, TX_1NB_M, TX_1NB_T, TX_2NB_B, TX_2NB_M, TX_2NB_T
1a	Modulation Characteristics	NTNV	(informative)
2	Bandwidth	NTNV	TX_1NB_B, TX_1NB_M, TX_1NB_T
3	Band Edges Compliance / Emission Mask	NTNV	TX_1NB_B, TX_1NB_M, TX_1NB_T, TX_2NB_B, TX_2NB_M, TX_2NB_T
4	Spurious emissions at antenna terminals	NTNV	TX_1NB_B, TX_1NB_M, TX_1NB_T, TX_2NB_B, TX_2NB_M, TX_2NB_T
5	Field strength of spurious radiation	NTNV	TX_2NB_M
6	Frequency stability	xT_NV	TX_CW_M
		20°C_85%NV	TX_CW_M
		20°C_100%NV	TX_CW_M
		20°C_115%NV	TX_CW_M

PART 3

TEST RESULTS

Test item 1

RF power output

1 Result Table

1.1 Channel Power, Total

NOTE 1: If applicable, the EIRP [W] = $10^{((\text{Channel Power [dBm]} + \text{Antenna Gain [dBi]}) / 10 - 3)}$, and the ERP [W] = EIRP [W] / 1.64.

NOTE 2: When the EUT is put into service, the practical maximum antenna gain may exceed the value as below, and if exceed, the combination of the practical output power and the practical antenna gain should NOT exceed the required ERP/EIRP limit.

EUT Conf.	Output Power [dBm]	Offset from Rated [dB]	Antenna Gain [dBi]	EIRP [W]	ERP [W]	Combined Total for multiple ports [W]	Verdict
TX_1NB_B	43.02	+0.02	---	20.04	---	40.08	Pass
TX_1NB_M	42.78	-0.22	---	18.97	---	37.94	Pass
TX_1NB_T	42.84	-0.16	---	19.23	---	38.46	Pass
TX_2NB_B	43.12	+0.12	---	41.07	---	82.14	Pass
	43.13	+0.13	---				
TX_2NB_M	42.94	-0.06	---	39	---	78	Pass
	42.86	-0.14	---				
TX_2NB_T	42.87	-0.13	---	38.64	---	77.28	Pass
	42.85	-0.15	---				

1.2 Peak-to-Average Ratio

NOTE: Only the worst case result between TRXA and TRXB antenna ports is listed in the report.

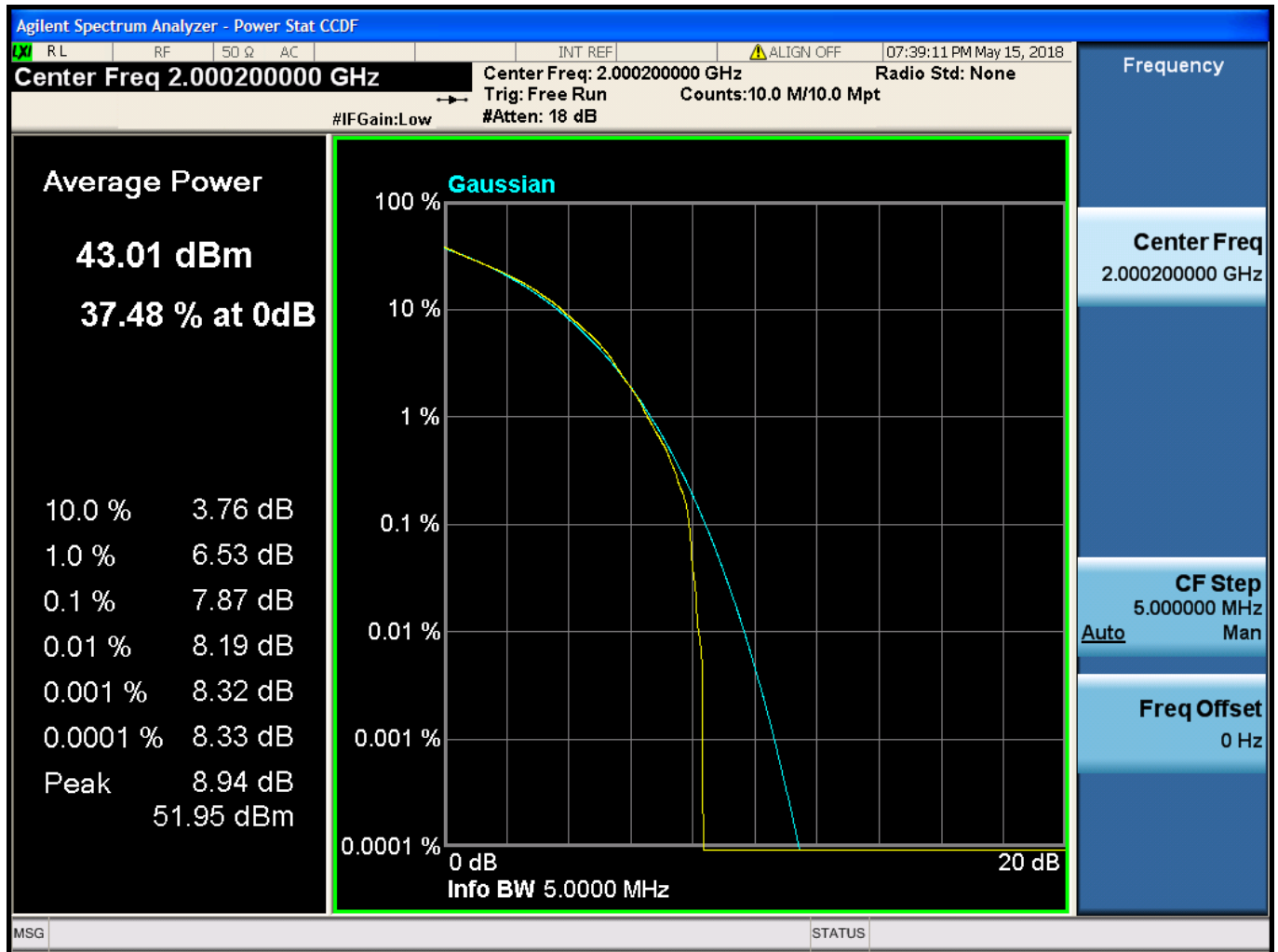
EUT Conf.	Peak-to-Average Ratio@0.1% [dB]	Verdict
TX_1NB_B	7.87	Pass
TX_1NB_M	7.86	Pass
TX_1NB_T	7.87	Pass

2 Test Plot

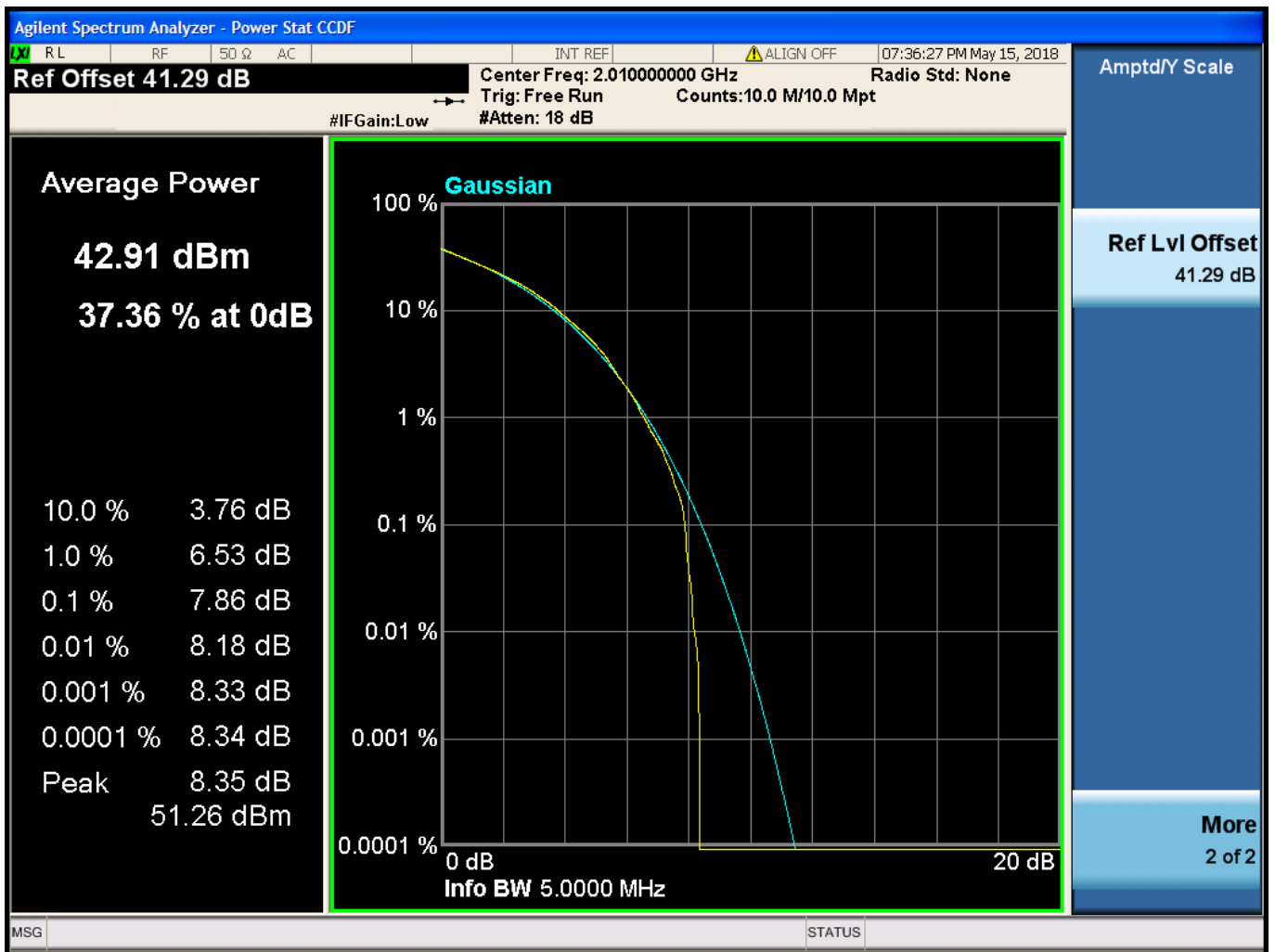
NOTE: Only the test plots for the measurements of Spectral Density and Peak-to-Average Ratio are supplied.

2.1 Peak-to-Average Ratio

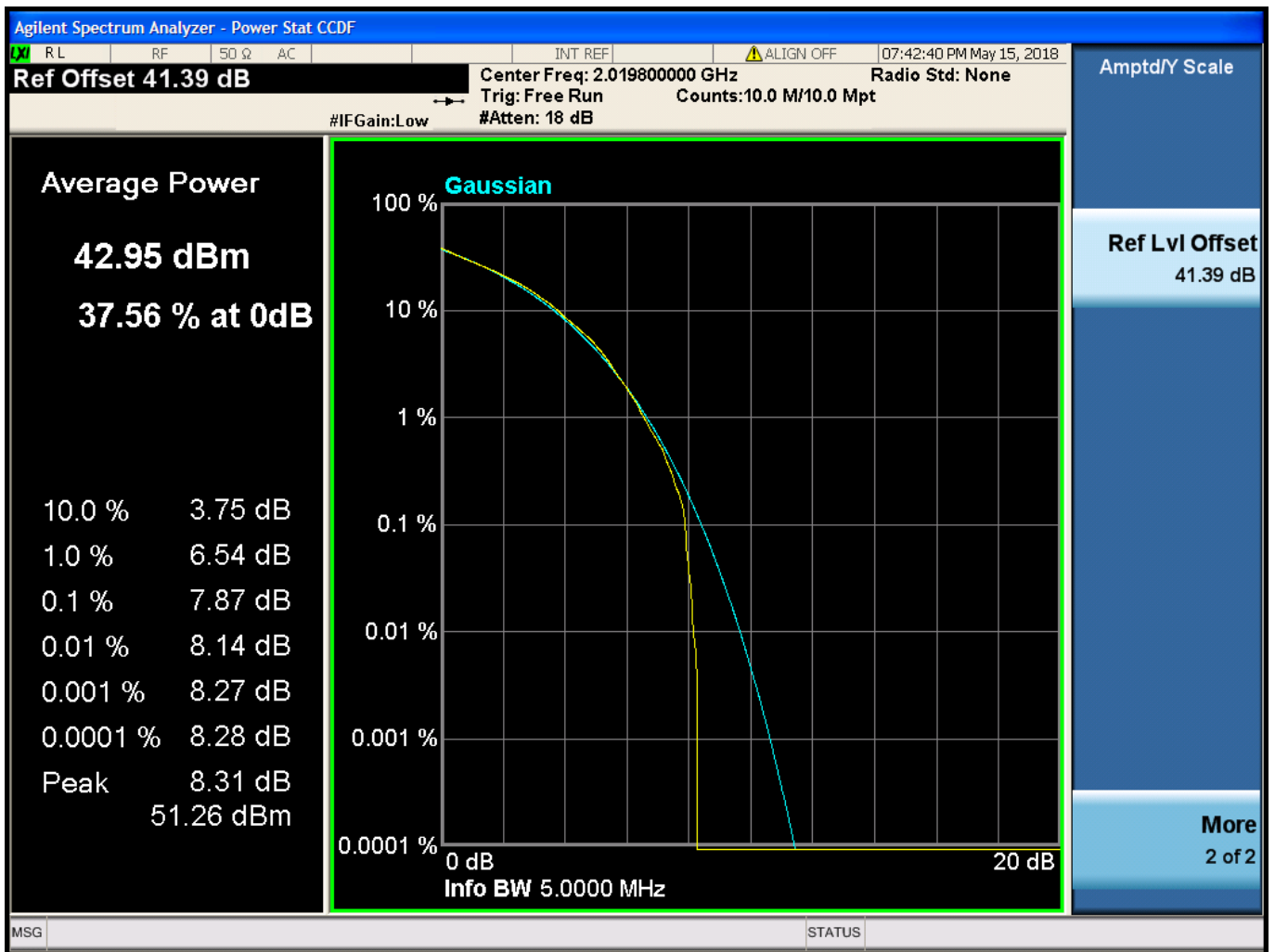
2.1.1 TX_1NB_B



2.1.2 TX_1NB_M



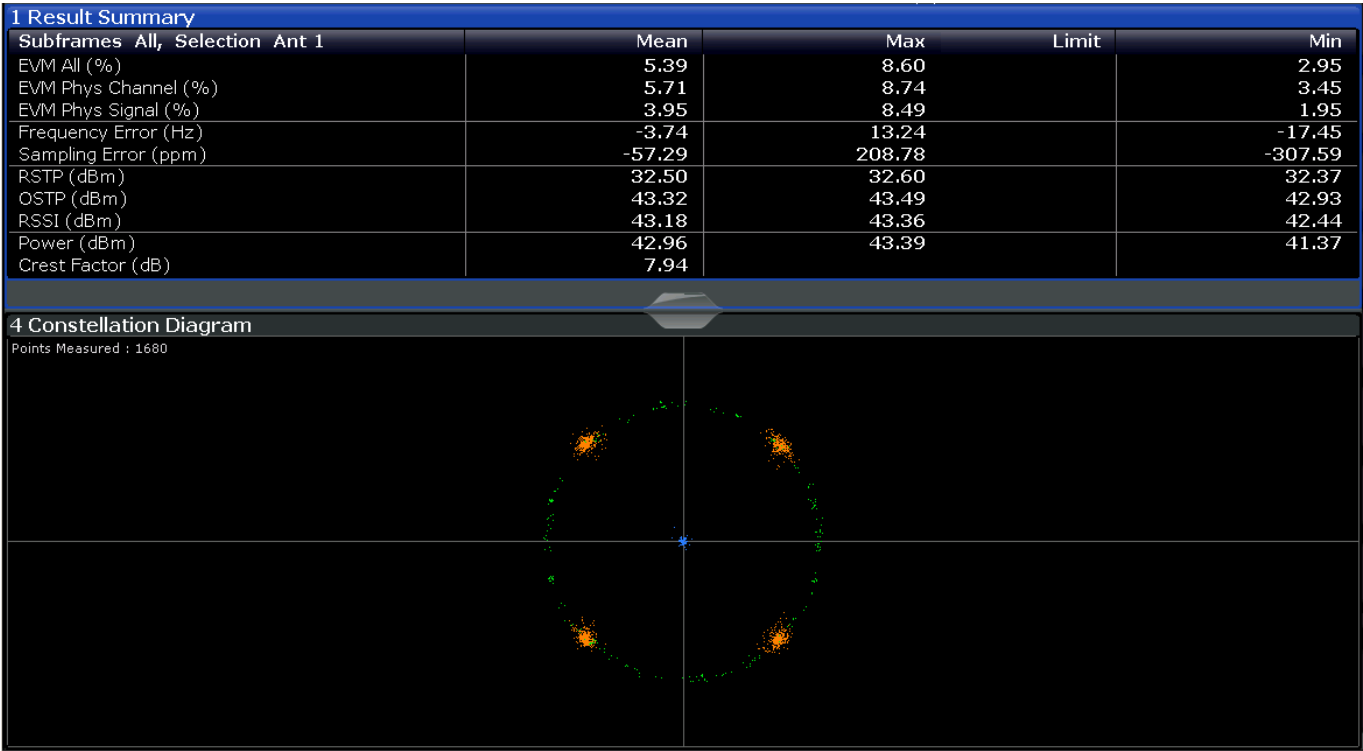
2.1.3 TX_1NB_T



Test item 1a

Modulation Characteristics

QPSK modulation information:



Test item 2

Bandwidth

1 Result Table

1.1 Occupied Bandwidth

NOTE: Only the worst case result between TRXA and TRXB antenna ports is listed in the report.

EUT Conf.	Occupied Bandwidth [MHz]	Verdict
TX_1NB_B	0.183938	--
TX_1NB_M	0.183916	--
TX_1NB_T	0.18389	--

1.2 Emission Bandwidth

NOTE: Only the worst case result between TRXA and TRXB antenna ports is listed in the report.

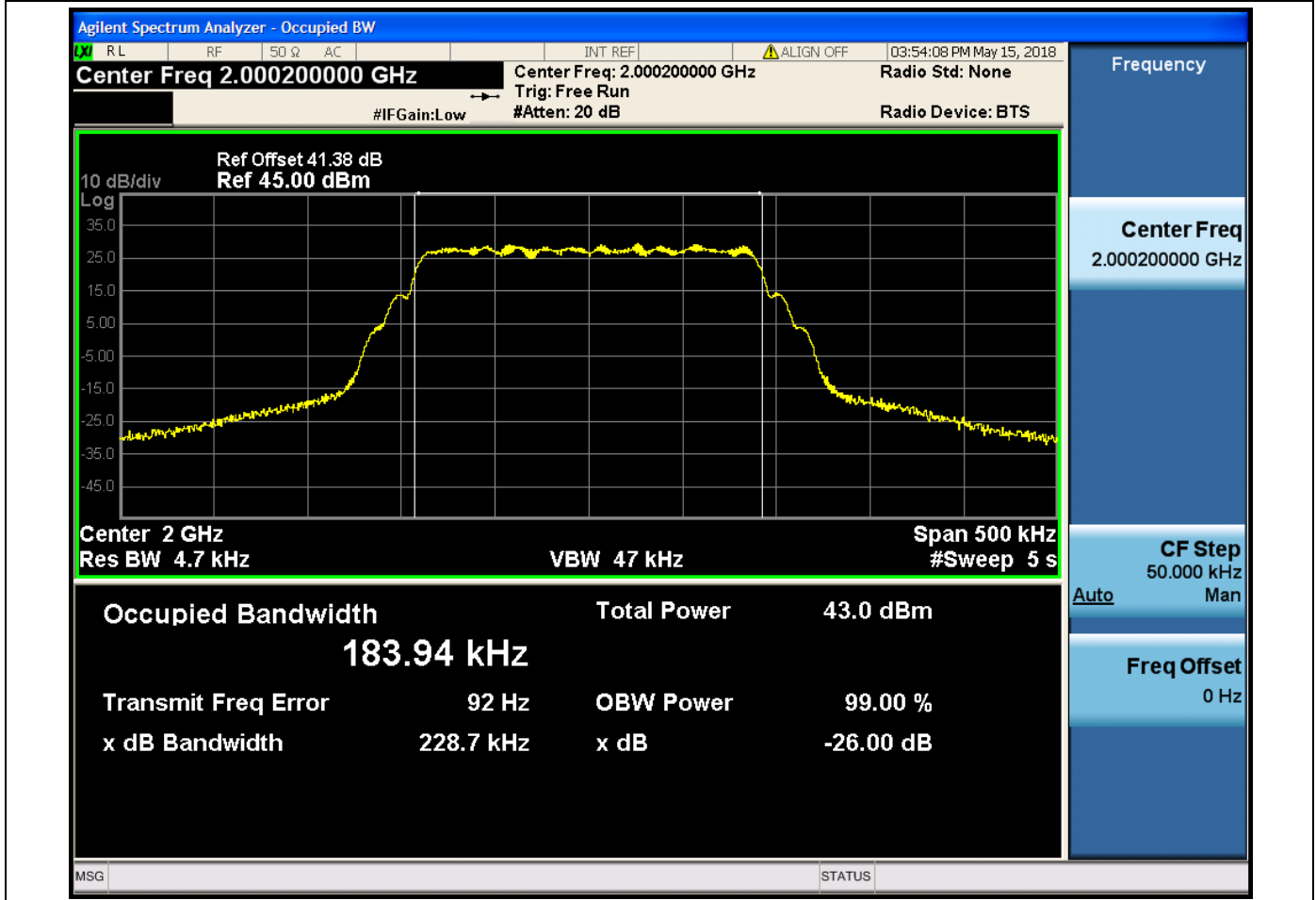
EUT Conf.	Emission Bandwidth, -26 dBc [MHz]	Verdict
TX_1NB_B	0.222976	--
TX_1NB_M	0.223872	--
TX_1NB_T	0.214656	--

2 Test Plot

2.1 Occupied Bandwidth

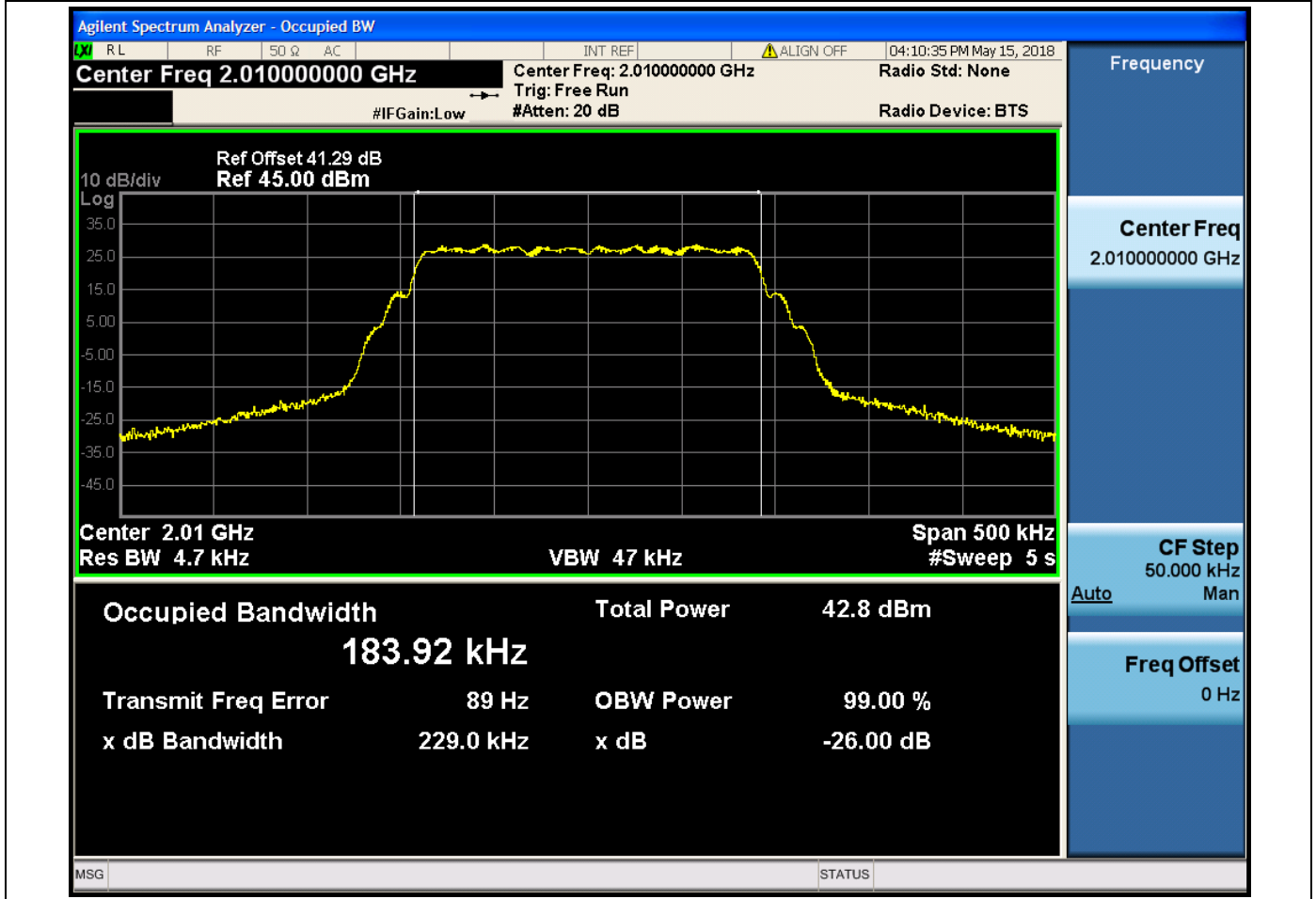
2.1.1 TX_1NB_B

Center Frequency [MHz]	OBW Power [%]	RBW [MHz]	Detector	OBW [MHz]	Verdict
2000.2	99	Auto	RMS	0.183938	No Conclusion

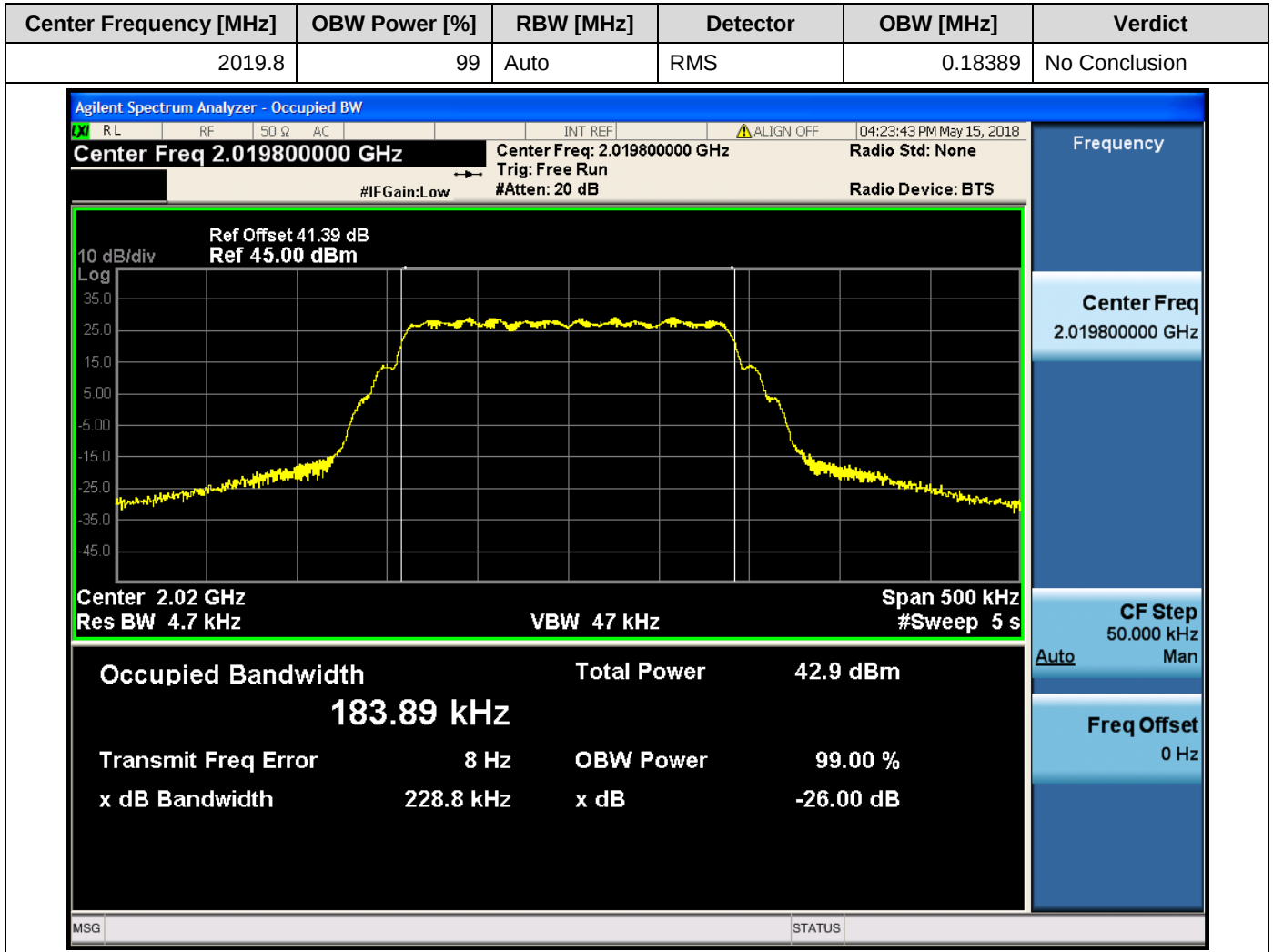


2.1.2 TX_1NB_M

Center Frequency [MHz]	OBW Power [%]	RBW [MHz]	Detector	OBW [MHz]	Verdict
2010	99	Auto	RMS	0.183916	No Conclusion



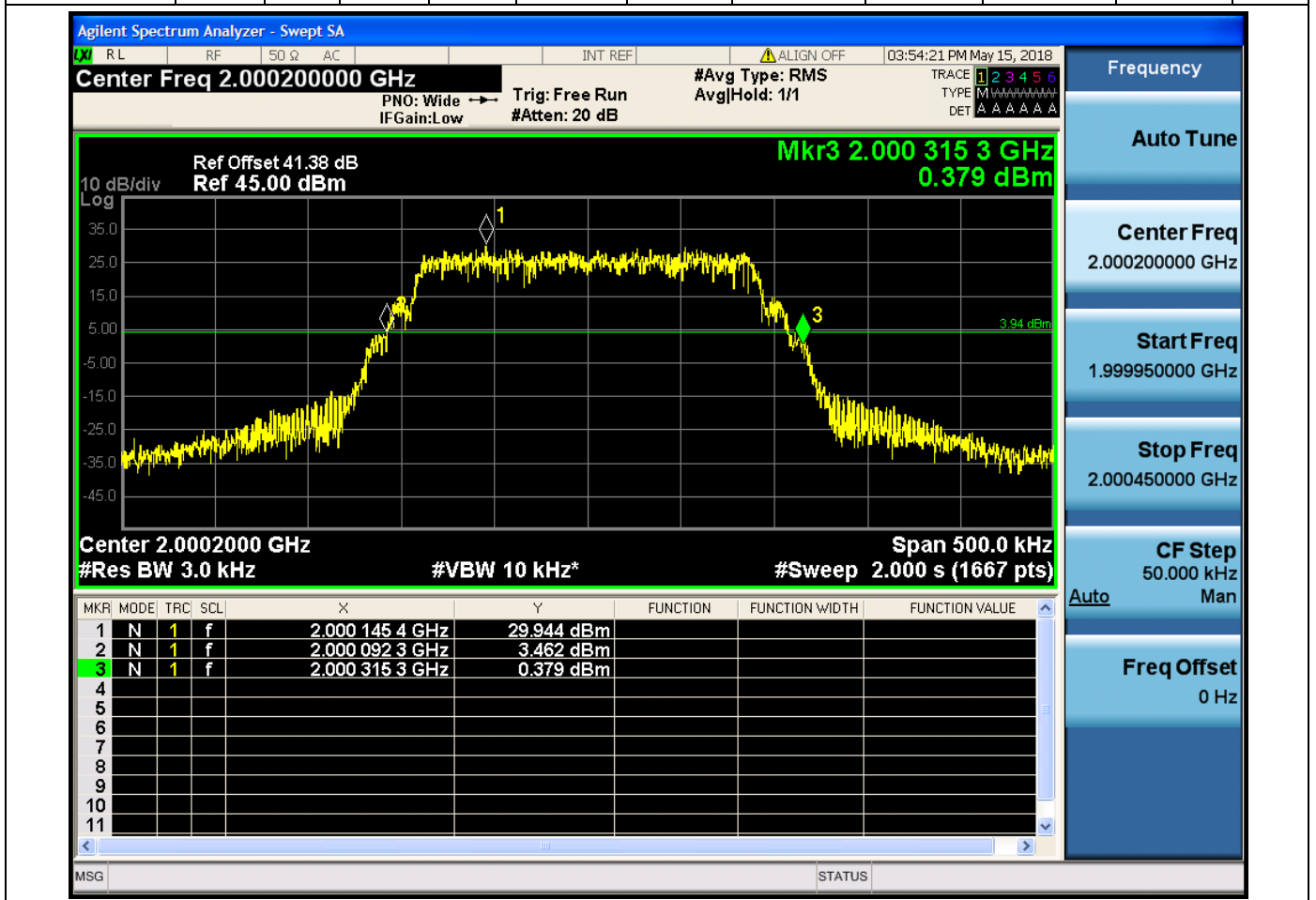
2.1.3 TX_1NB_T



2.2 Emission Bandwidth

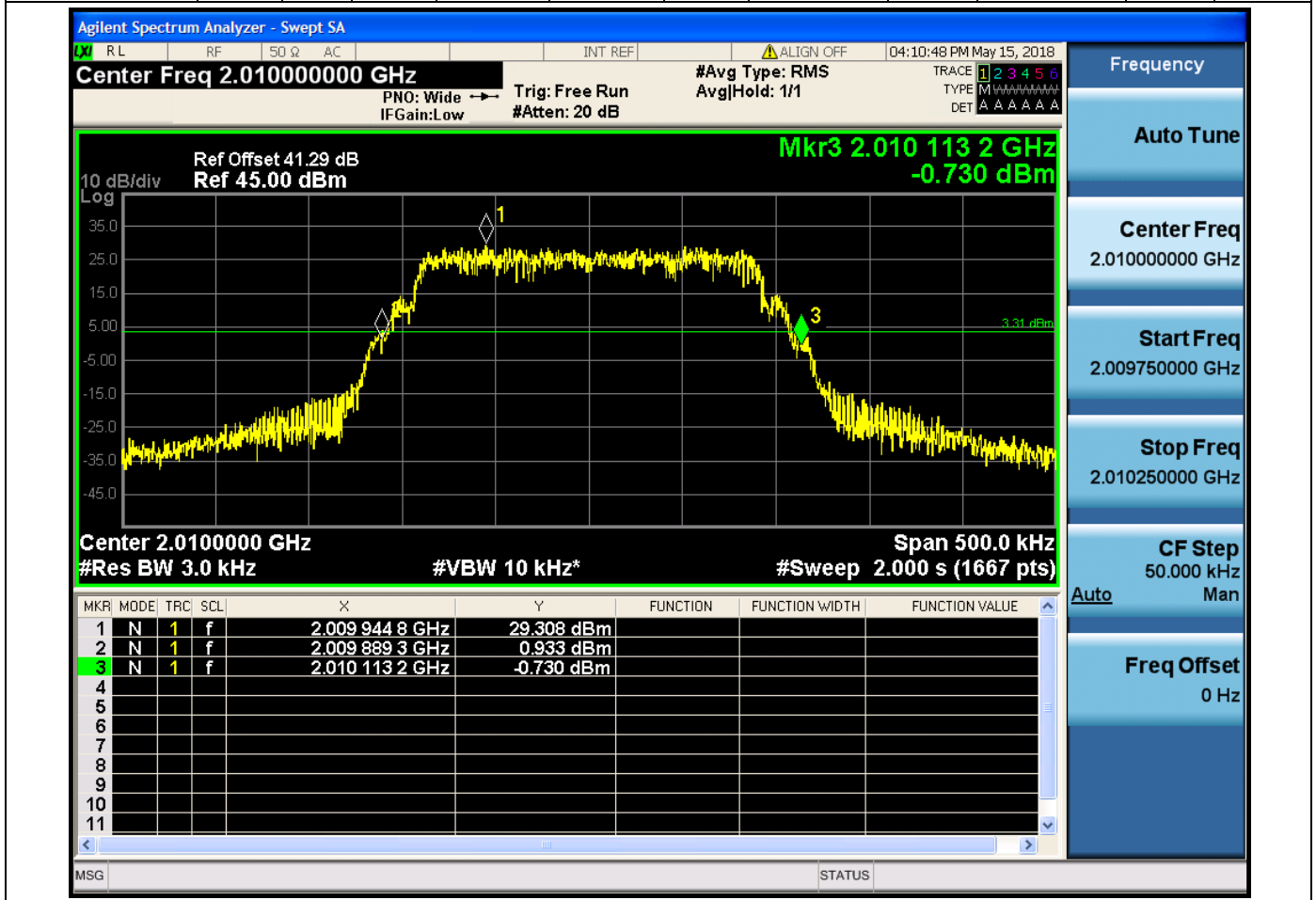
2.2.1 TX_1NB_B

Center Frequency[MHz]	Span [MHz]	ndB [dB]	RBW [MHz]	Detector	ndB BW [MHz]	BW Limit [MHz]	Lower Freq [MHz]	Lower Limit [MHz]	Upper Freq [MHz]	Upper Limit [MHz]	Verdict
2000.2	0.5	26	0.003	RMS	0.222976	0.2	2000.092288	2000	2000.315264	2020	No Conclusion



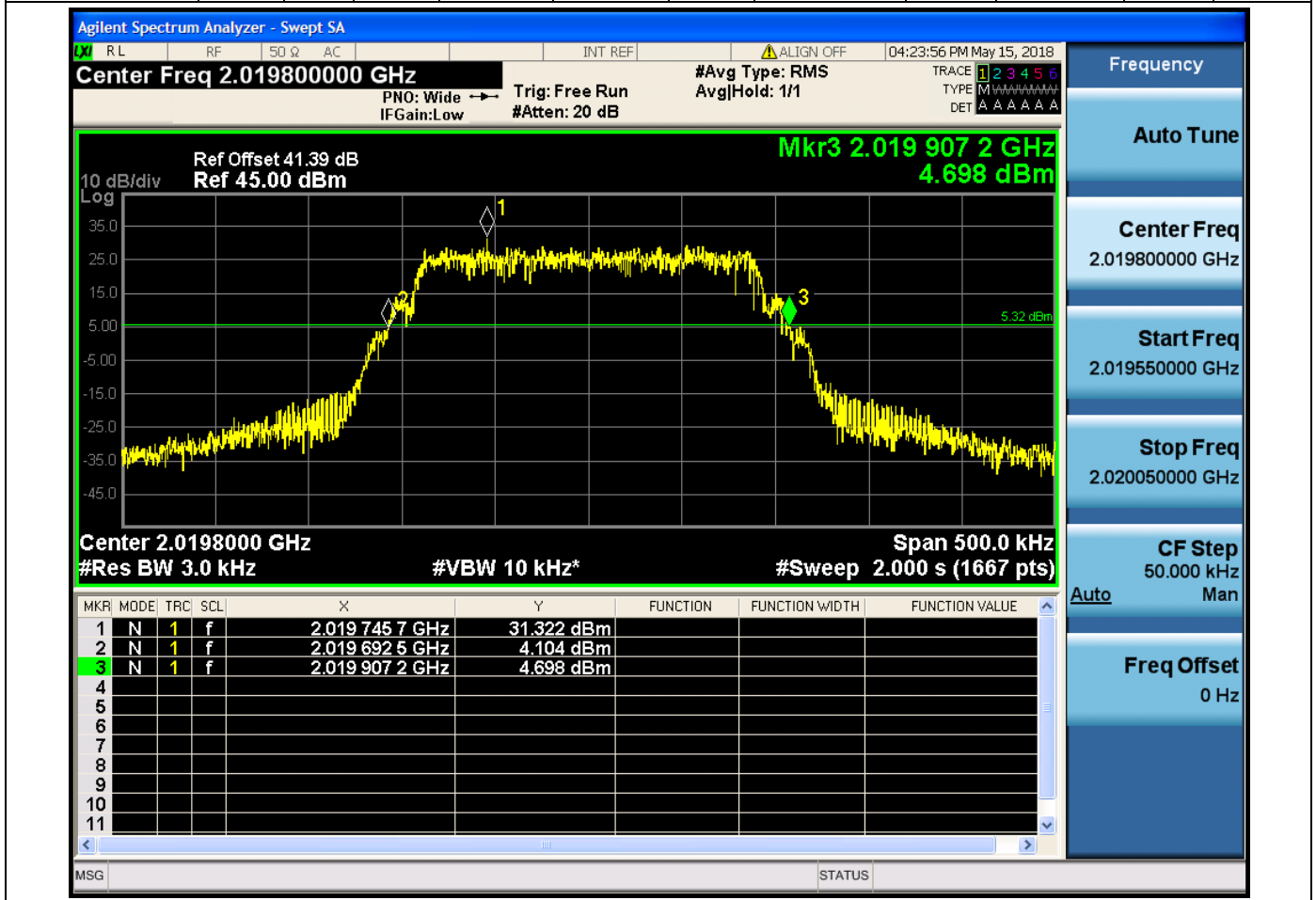
2.2.2 TX_1NB_M

Center Frequency[MHz]	Span [MHz]	ndB [dB]	RBW [MHz]	Detector	ndB BW [MHz]	BW Limit [MHz]	Lower Freq [MHz]	Lower Limit [MHz]	Upper Freq [MHz]	Upper Limit [MHz]	Verdict
2010	0.5	26	0.003	RMS	0.223872	0.2	2009.88928	2000	2010.113152	2020	No Conclusion



2.2.3 TX_1NB_T

Center Frequency[MHz]	Span [MHz]	ndB [dB]	RBW [MHz]	Detector	ndB BW [MHz]	BW Limit [MHz]	Lower Freq [MHz]	Lower Limit [MHz]	Upper Freq [MHz]	Upper Limit [MHz]	Verdict
2019.8	0.5	26	0.003	RMS	0.214656	0.2	2019.692544	2000	2019.9072	2020	No Conclusion



Test item 3

Band Edges Compliance / Emission Mask

1 Result Table

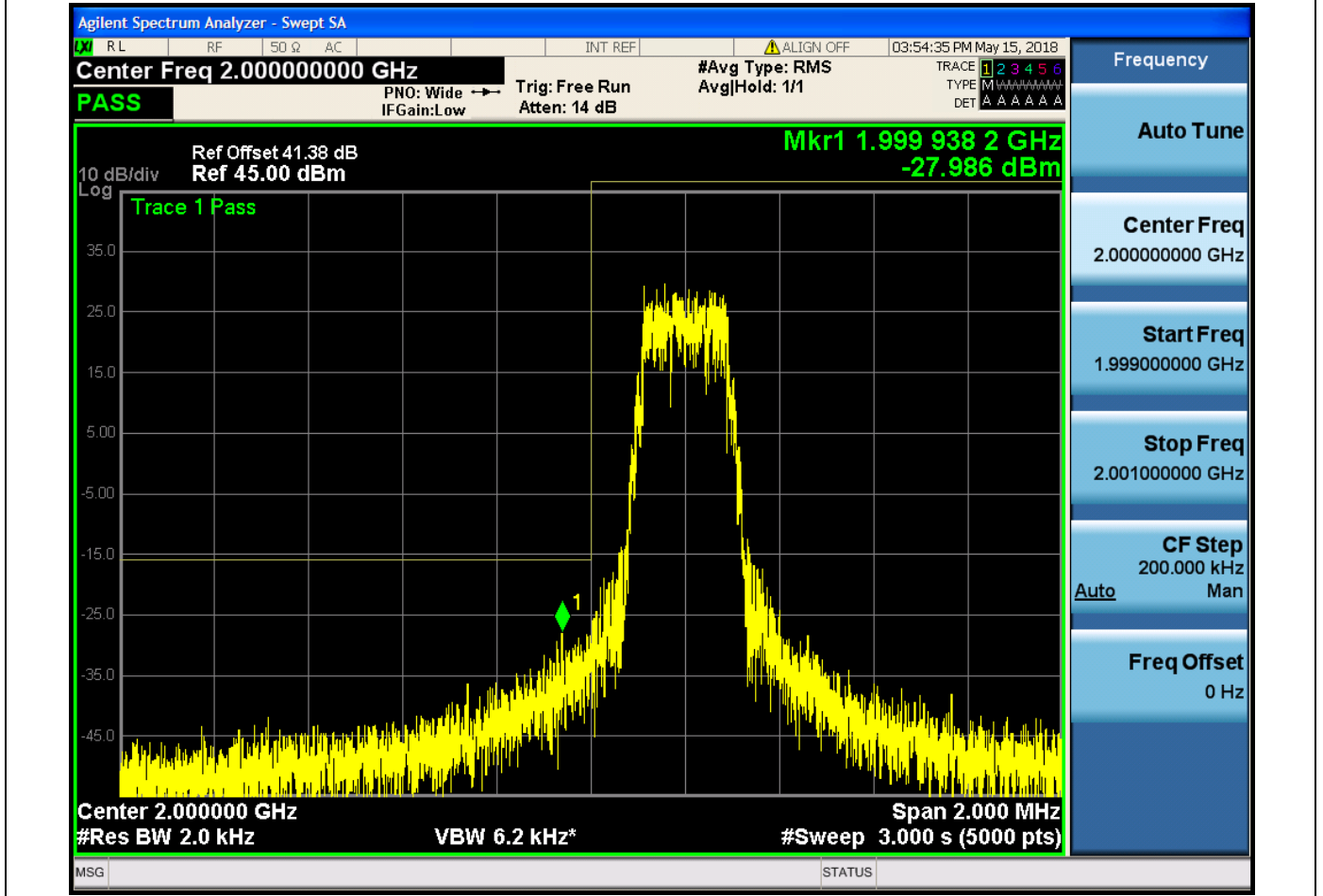
NOTE: Only the worst case result between TRXA and TRXB antenna ports is listed in the report. The limit is for per antenna port (with a 3 dB decrease)

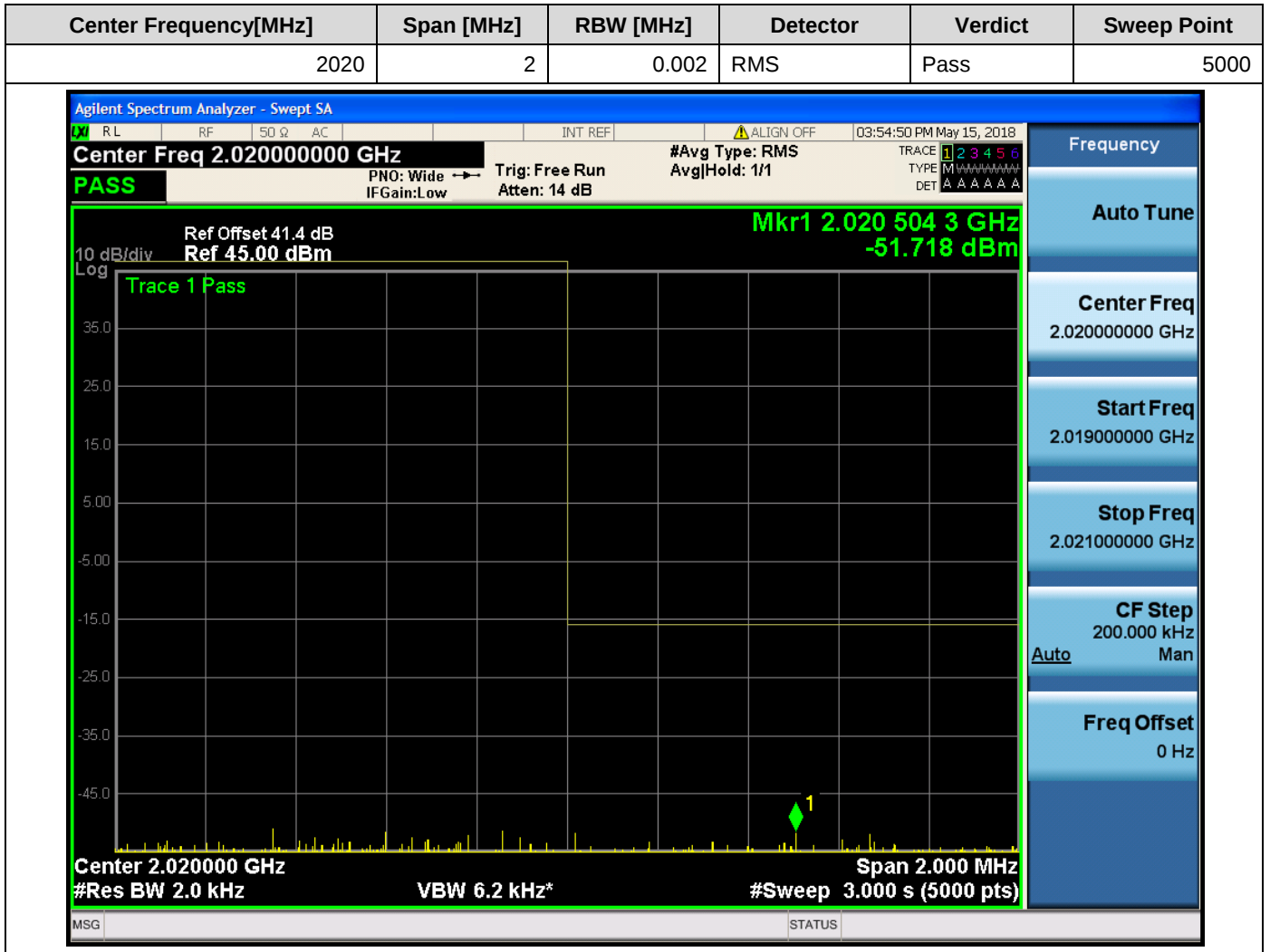
EUT Conf.	Maximum Emission [dBm]	Verdict
TX_1NB_B	-27.986	Pass
TX_1NB_M	-49.283	Pass
TX_1NB_T	-27.331	Pass
TX_2NB_B	-23.998	Pass
TX_2NB_M	-48.293	Pass
TX_2NB_T	-22.679	Pass

2 Test Plot

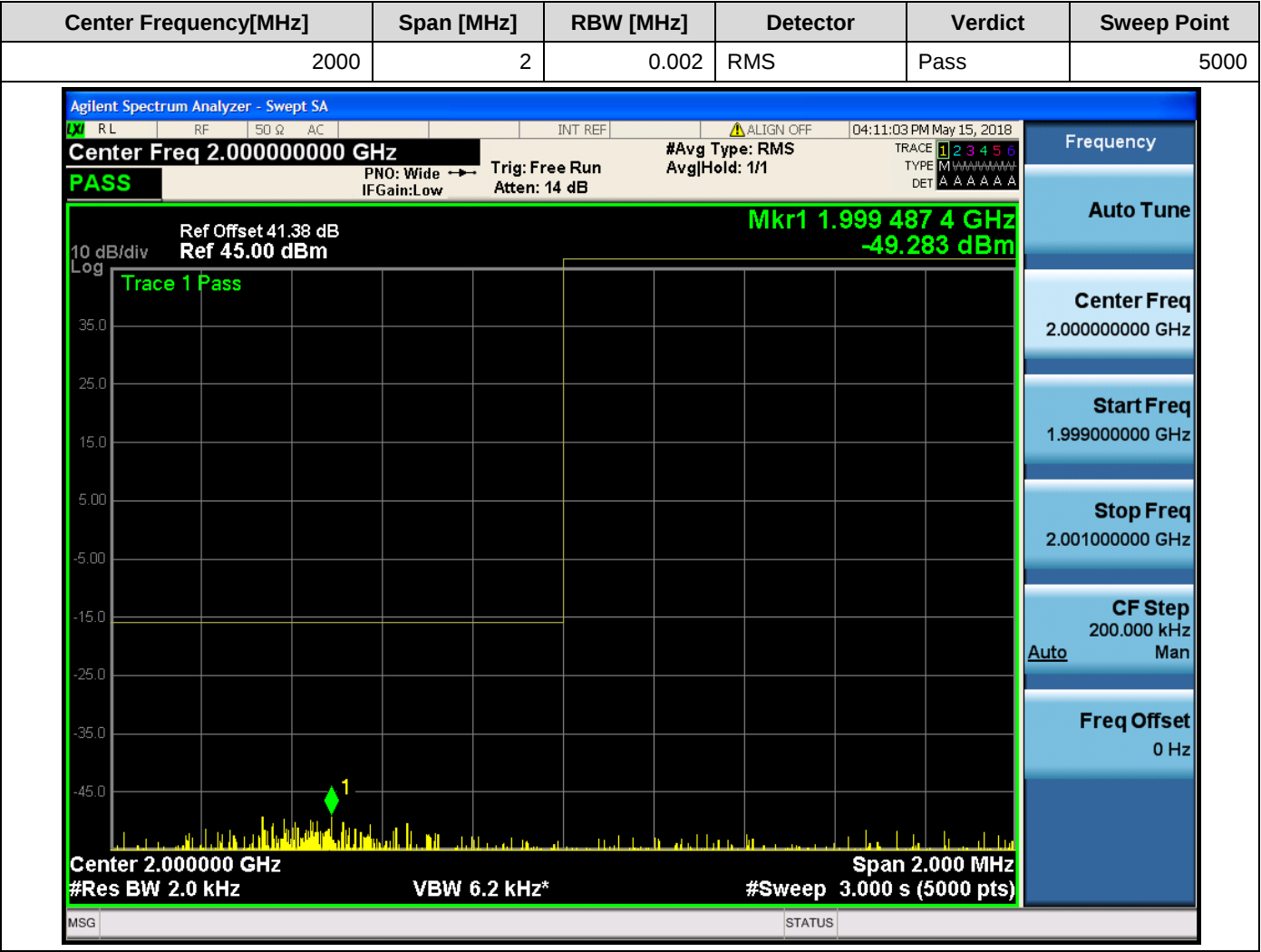
2.1 TX_1NB_B

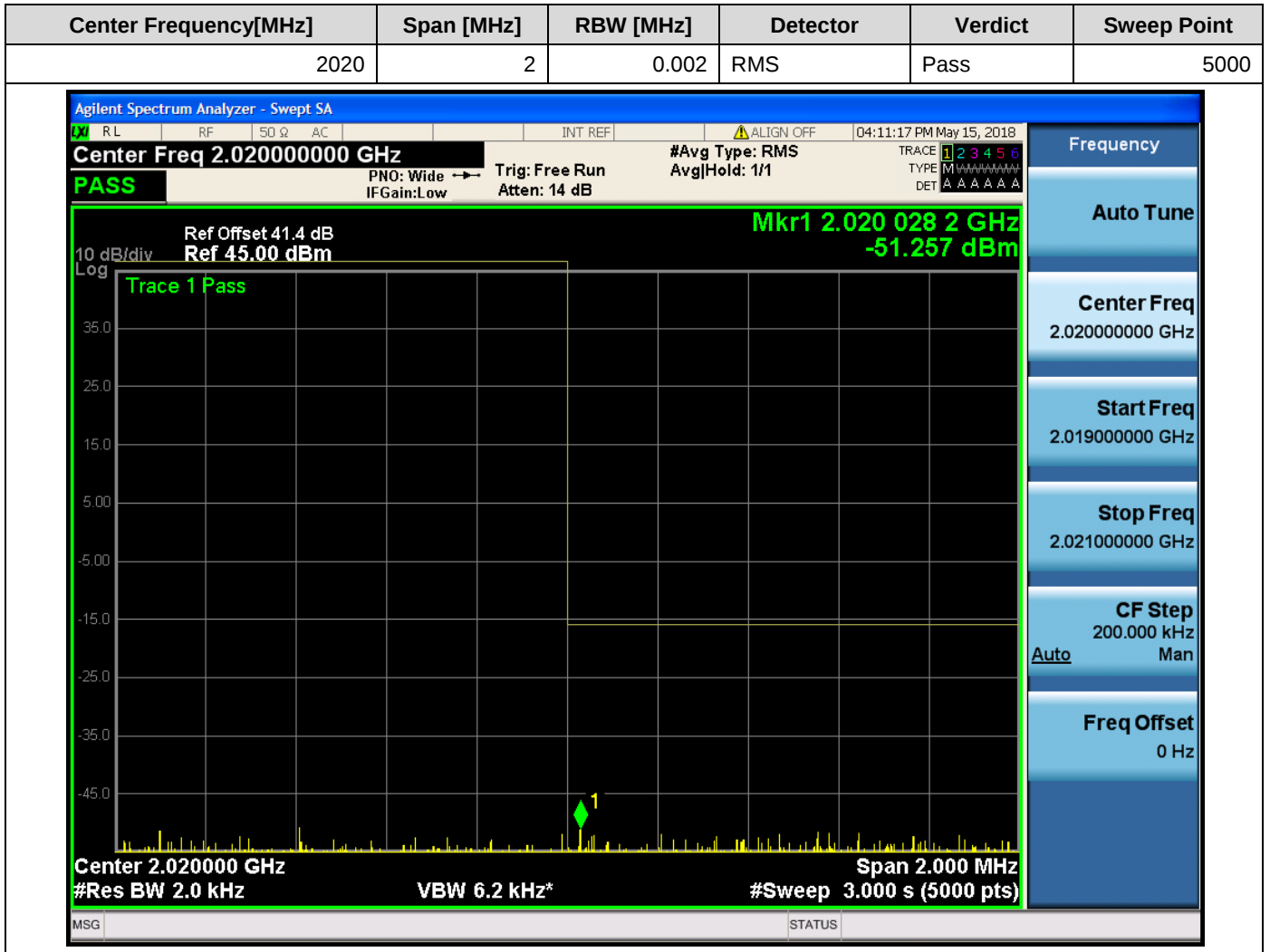
Center Frequency[MHz]	Span [MHz]	RBW [MHz]	Detector	Verdict	Sweep Point
2000	2	0.002	RMS	Pass	5000



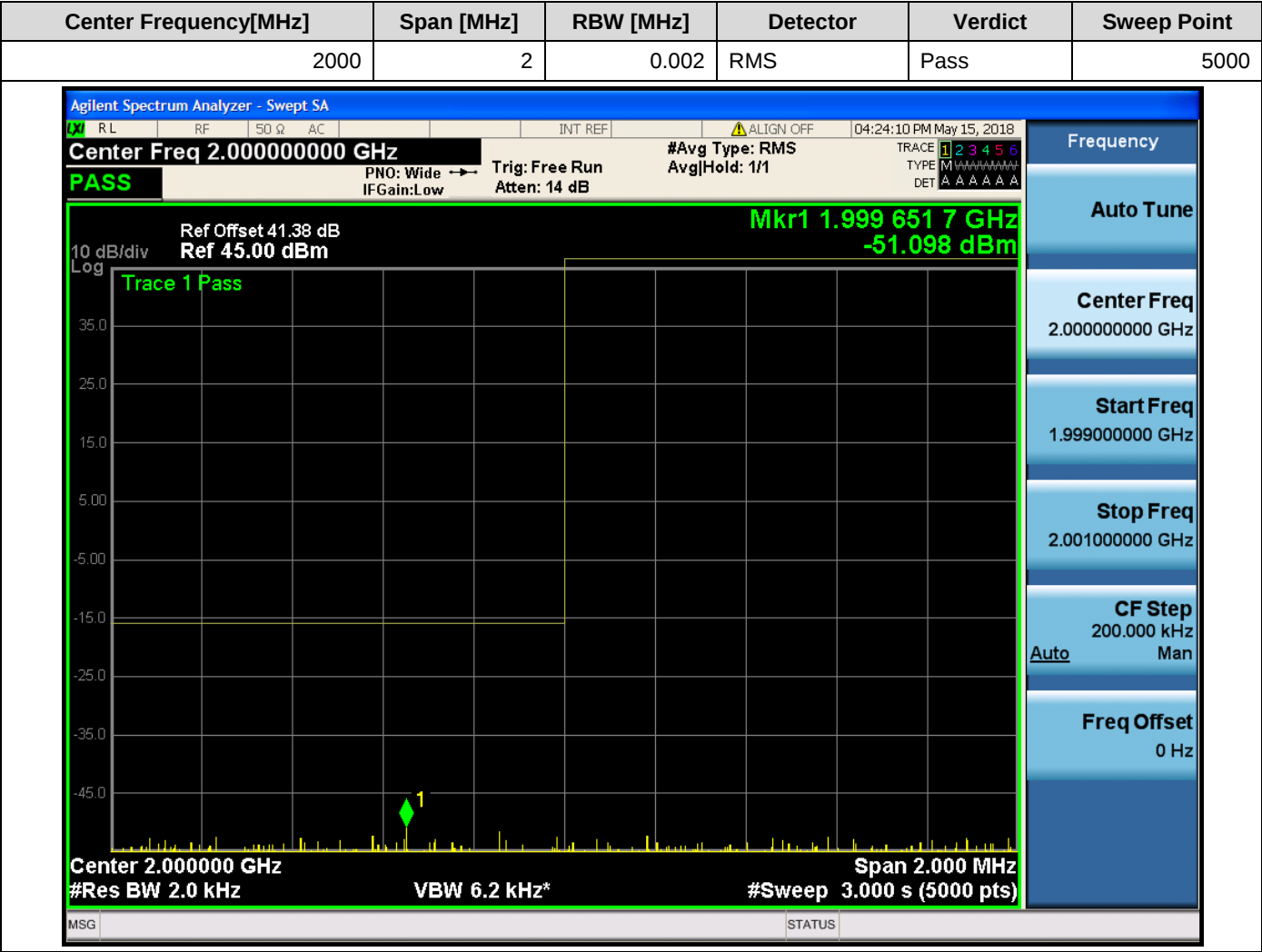


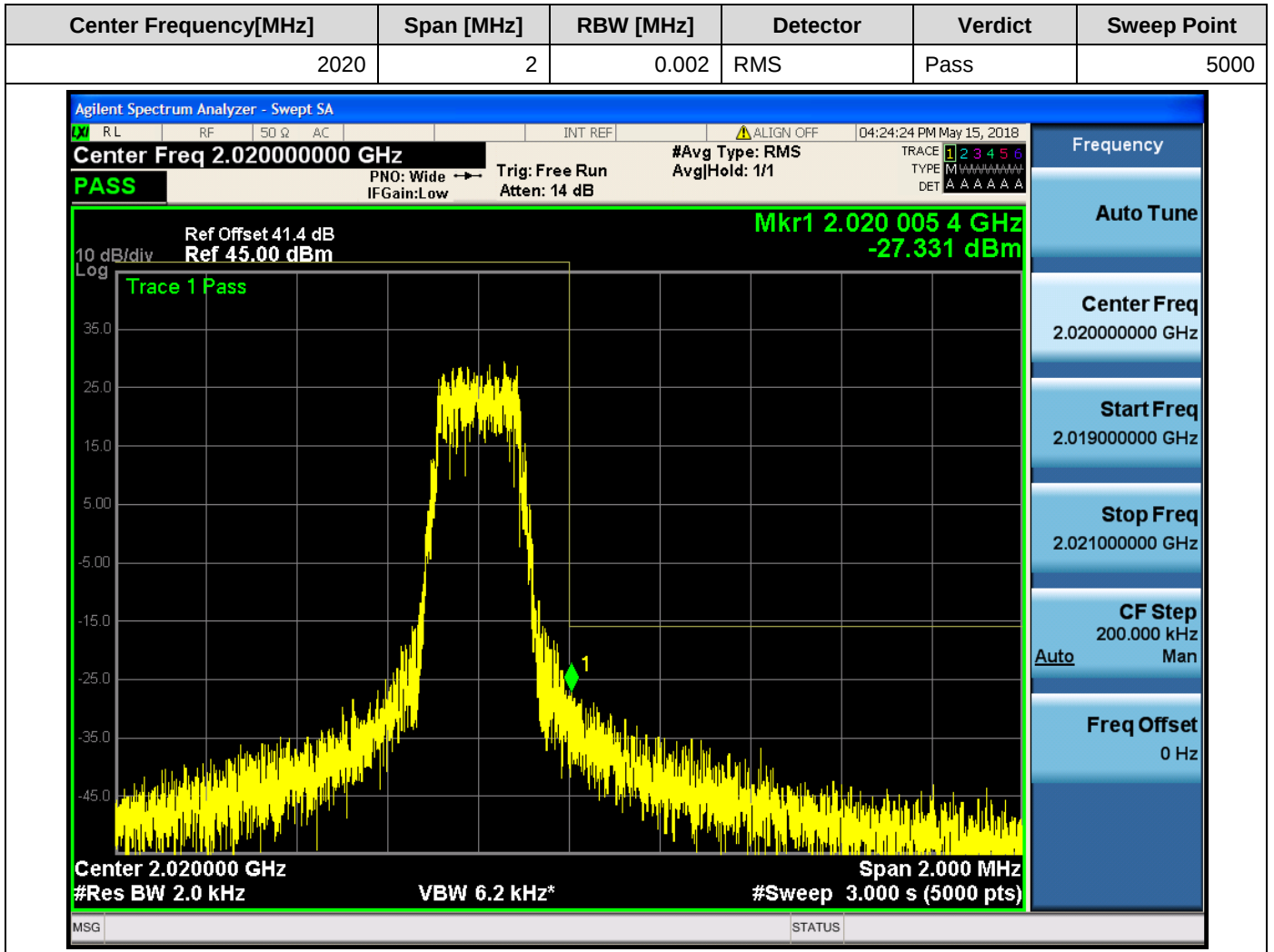
2.2 TX_1NB_M



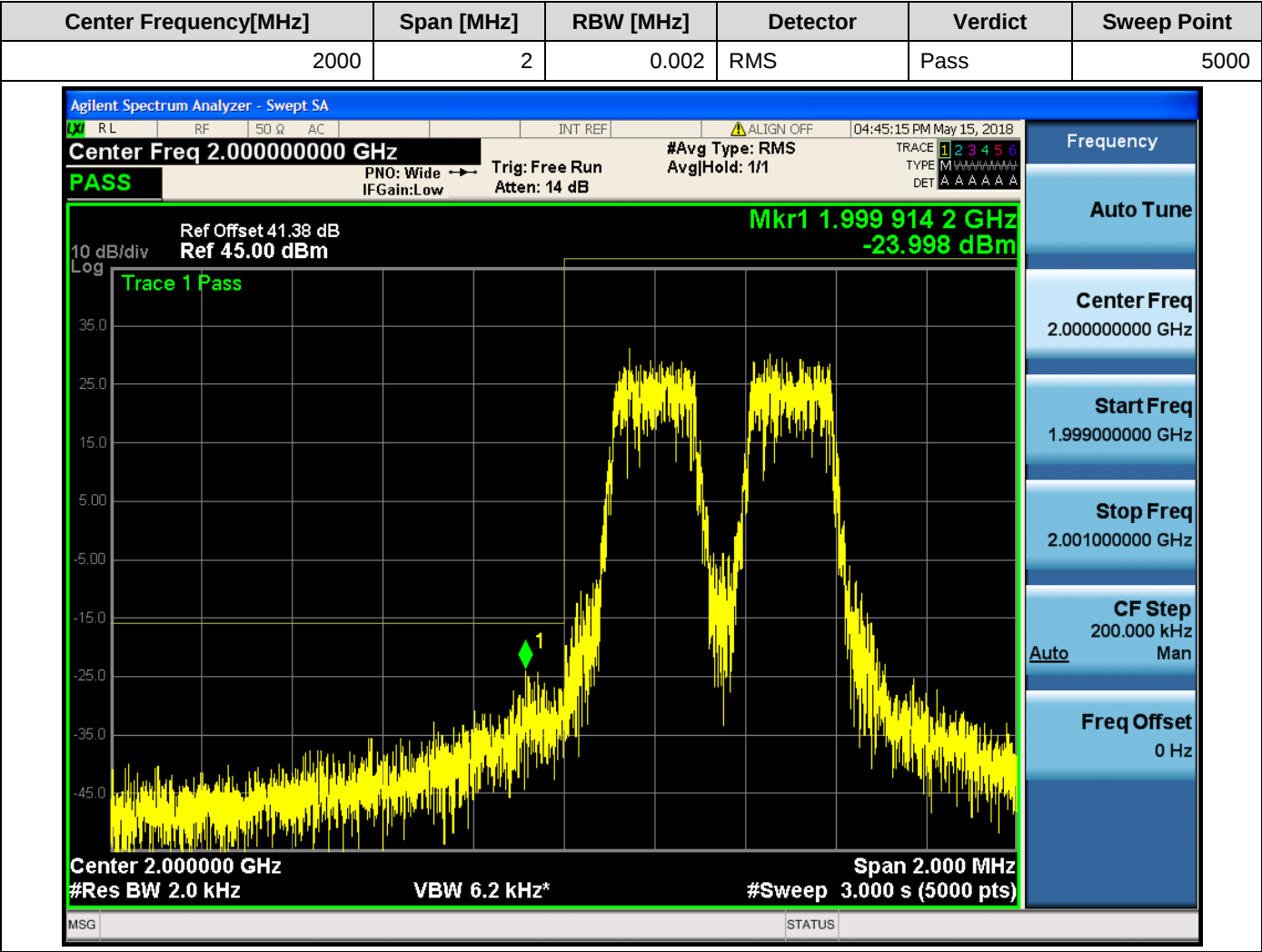


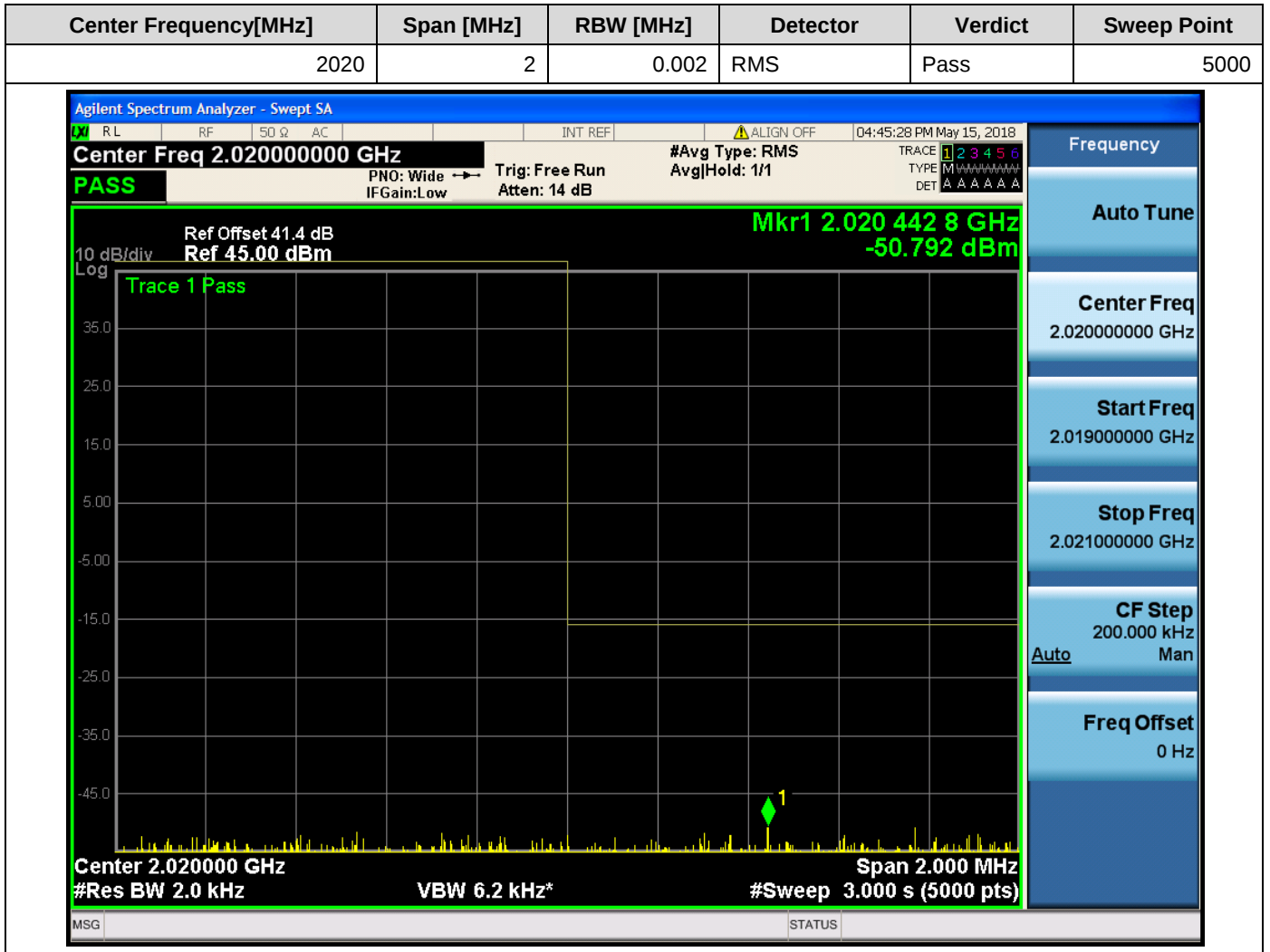
2.3 TX_1NB_T



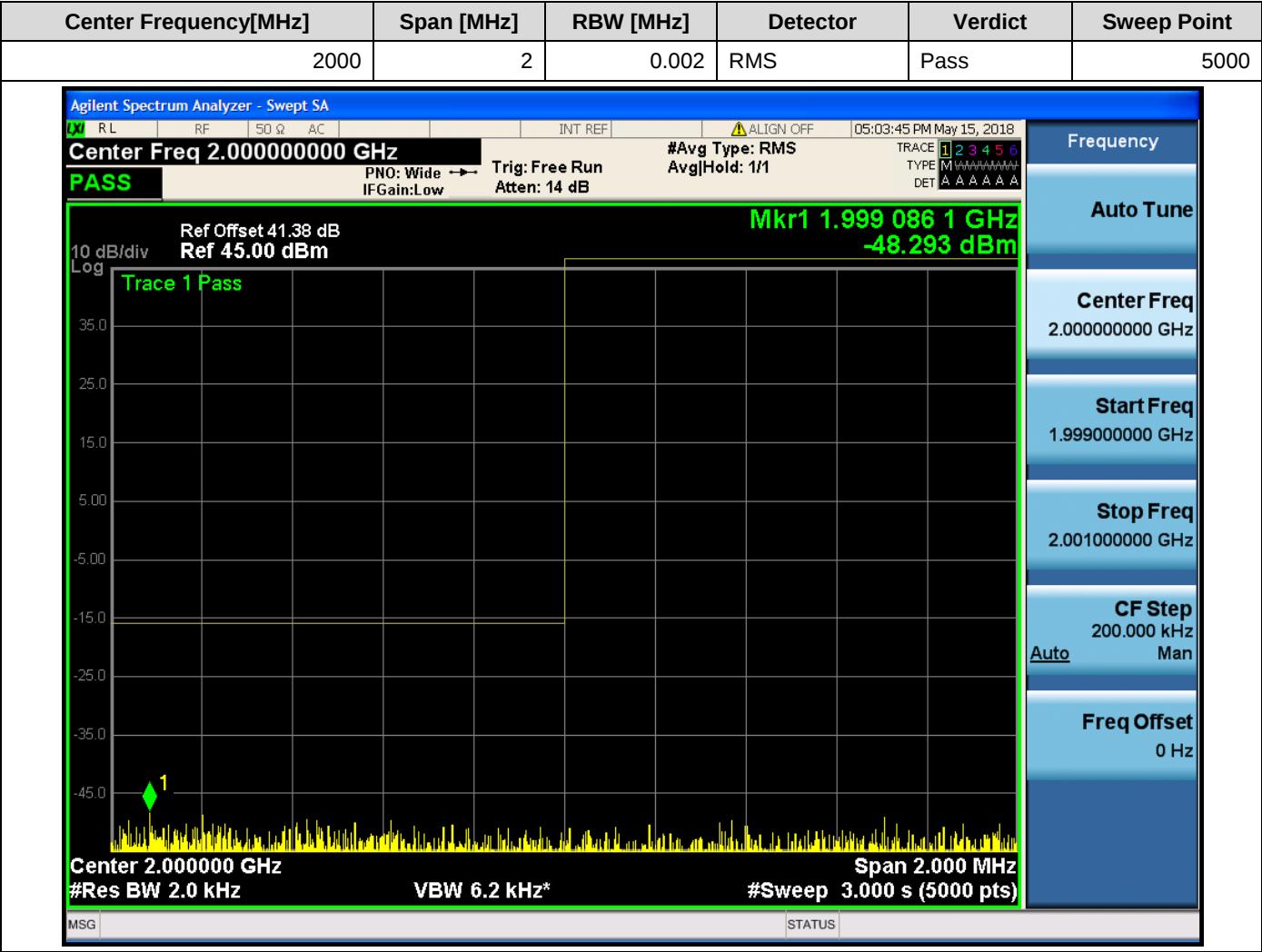


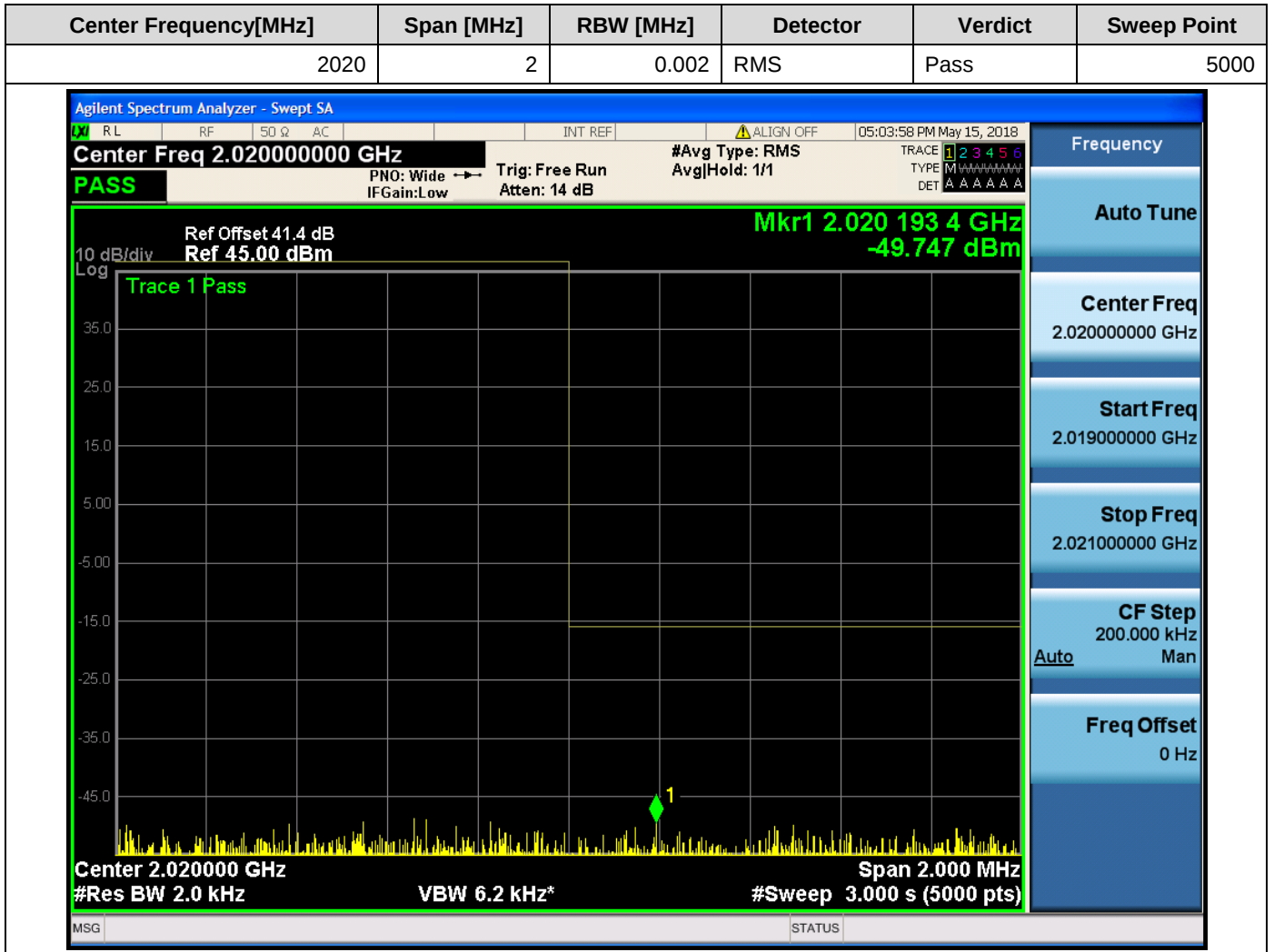
2.4 TX_2NB_B



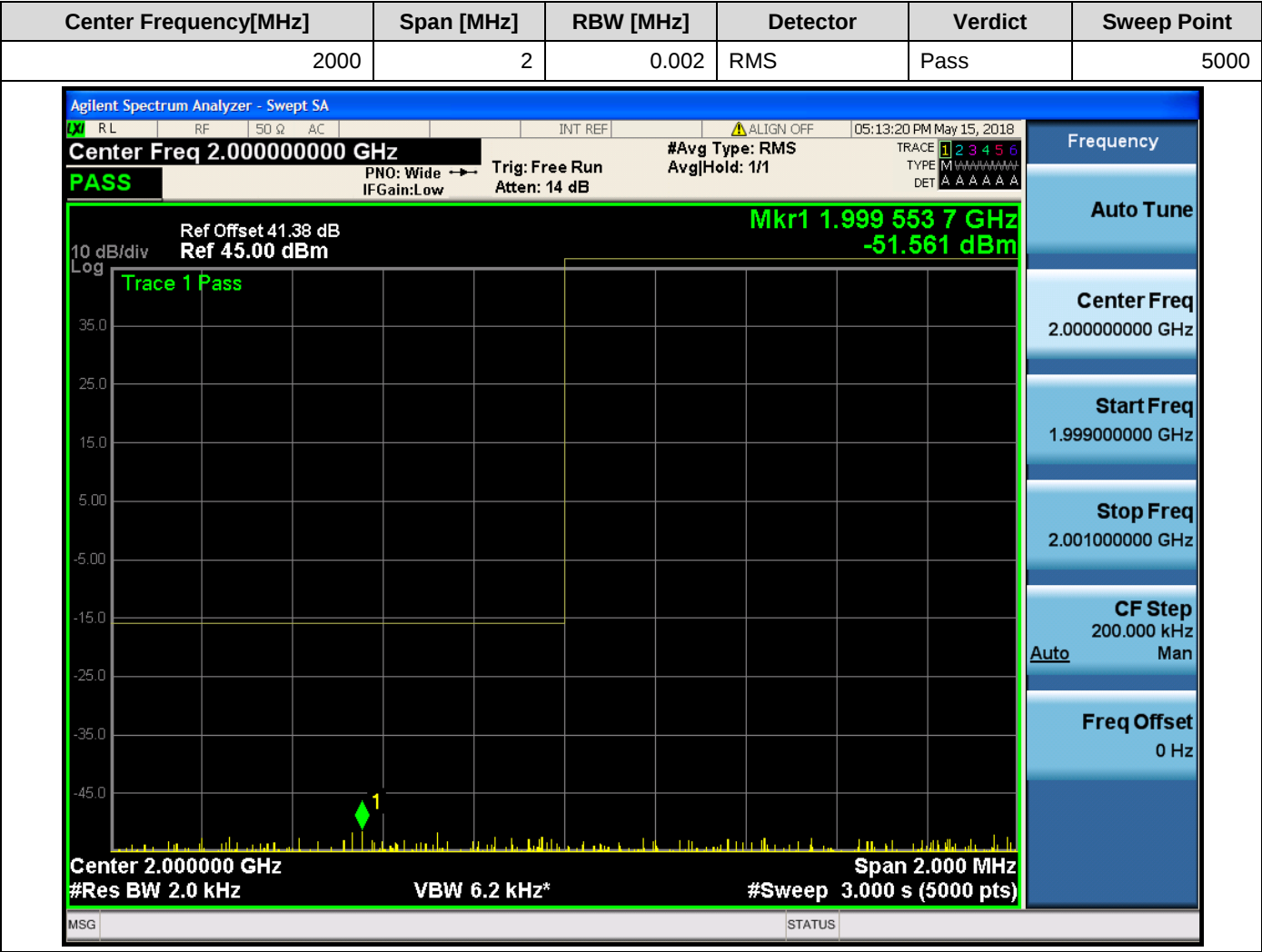


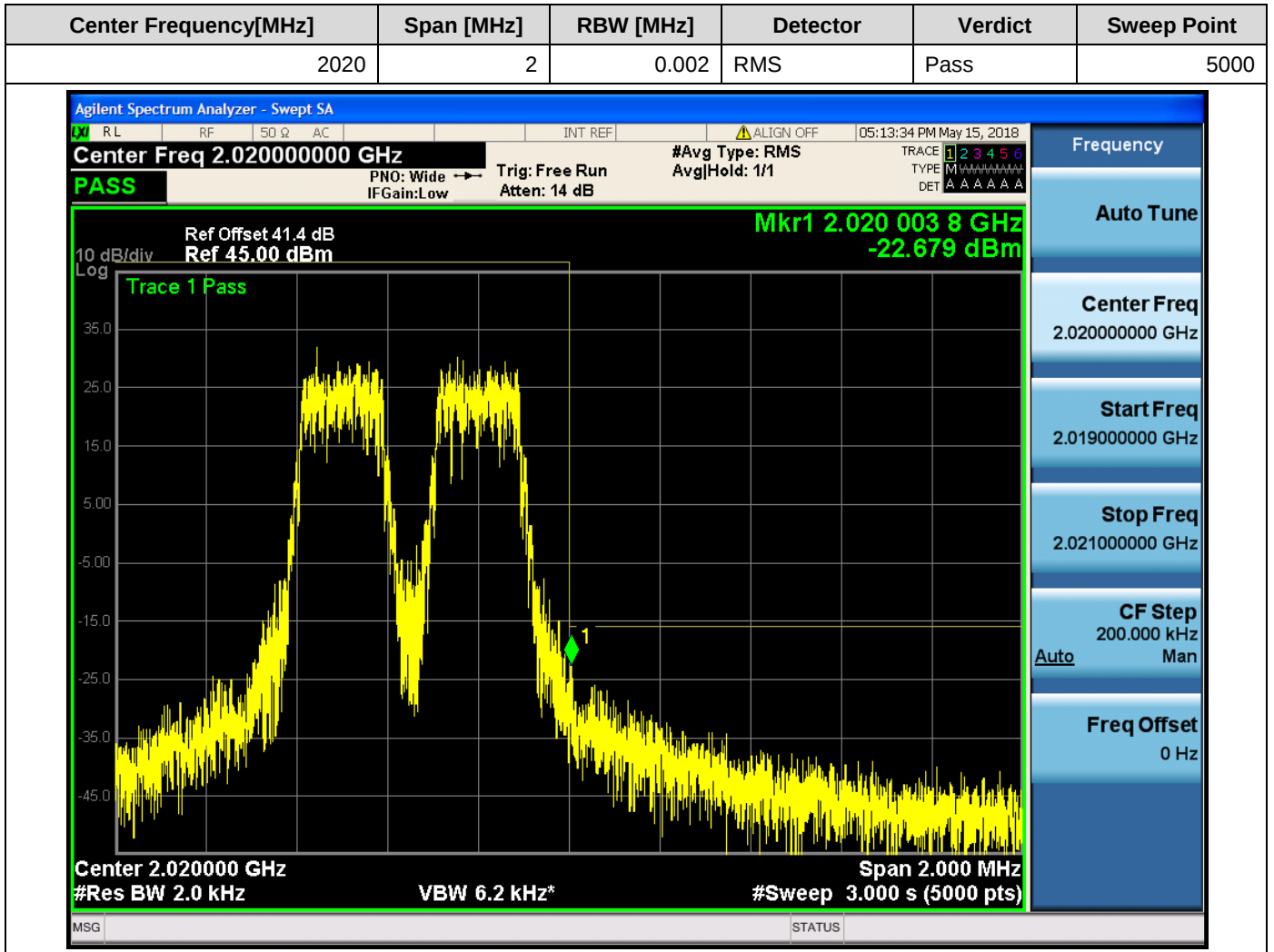
2.5 TX_2NB_M





2.6 TX_2NB_T





Test item 4

Spurious emissions at antenna terminals

1 Result Table

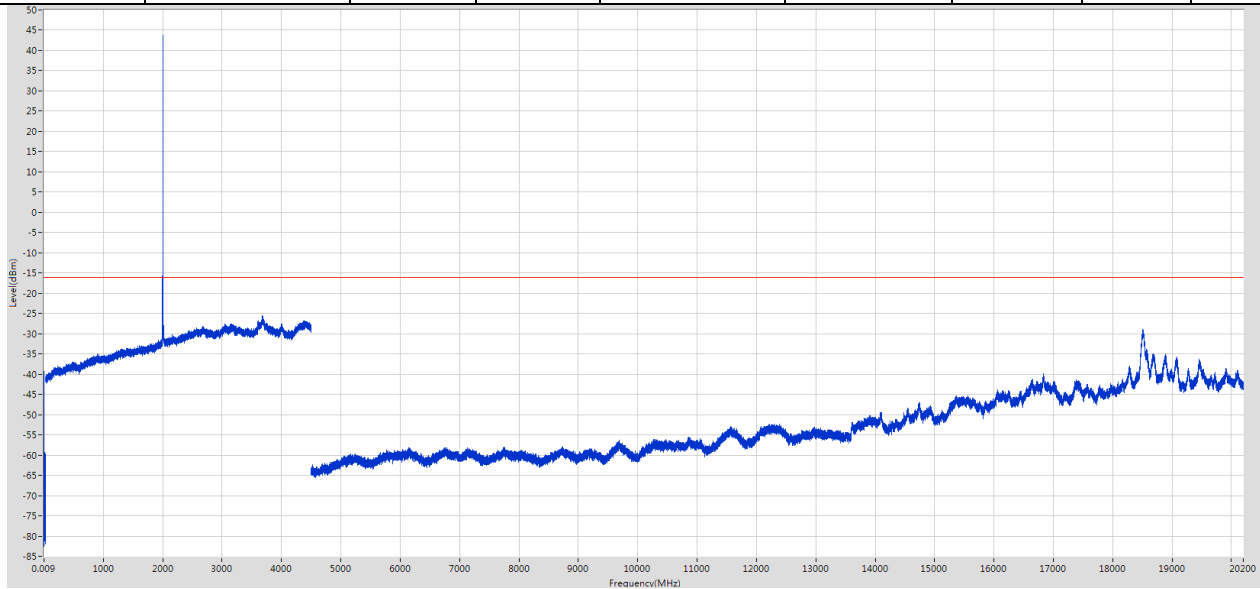
NOTE: Only the worst case result between TRXA and TRXB antenna ports is listed in the report. The limit is for per antenna port (with a 3 dB decrease)

EUT Conf.	Maximum Emission [dBm]	Verdict
TX_1NB_B	< Limit – 3 dB	Pass
TX_1NB_M	< Limit – 3 dB	Pass
TX_1NB_T	< Limit – 3 dB	Pass
TX_2NB_B	< Limit – 3 dB	Pass
TX_2NB_M	< Limit – 3 dB	Pass
TX_2NB_T	< Limit – 3 dB	Pass

2 Test Plot

2.1 TX_1NB_B

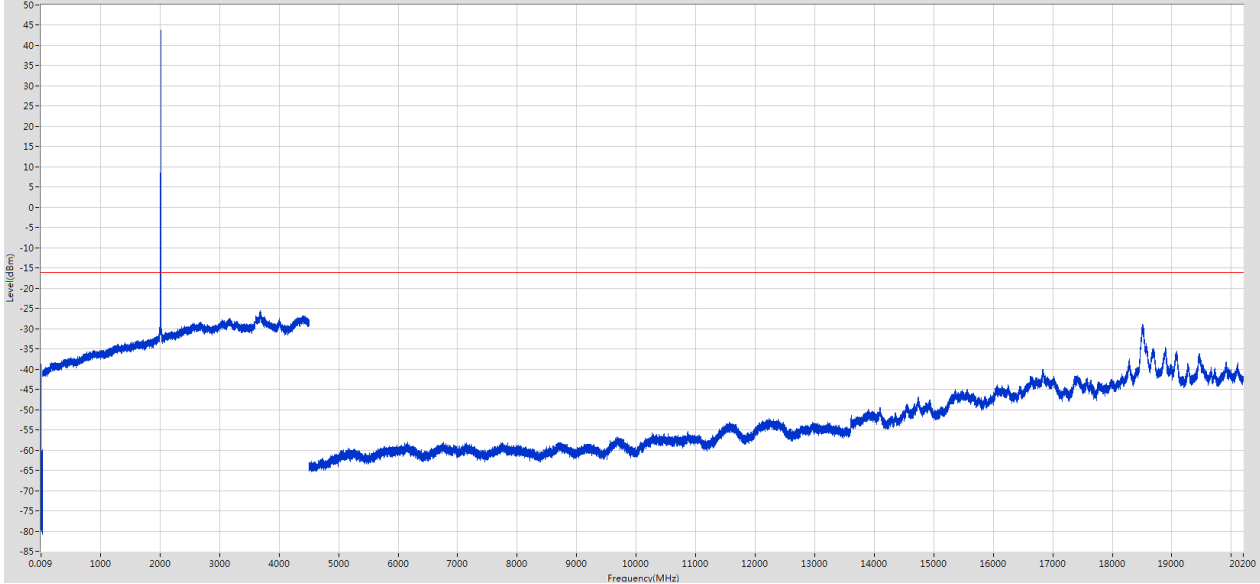
Start Frequency [MHz]	Stop Frequency [MHz]	RBW [MHz]	Detector	Frequency [Hz]	Emission [dBm]	Limit [dBm]	Verdict	Sweep Point
0.009	0.15	0.001	RMS	60.042 k	-39.3	-16	Pass	1001
0.15	30	0.01	RMS	156 k	-44.04	-16	Pass	14925
30	4500	1	RMS	2000.288156 M	43.71	-16	Pass	22350
4500	20200	1	RMS	18503.555935 M	-28.97	-16	Pass	78500



Note: the spike exceeds the limit is the fundamental emission.

2.2 TX_1NB_M

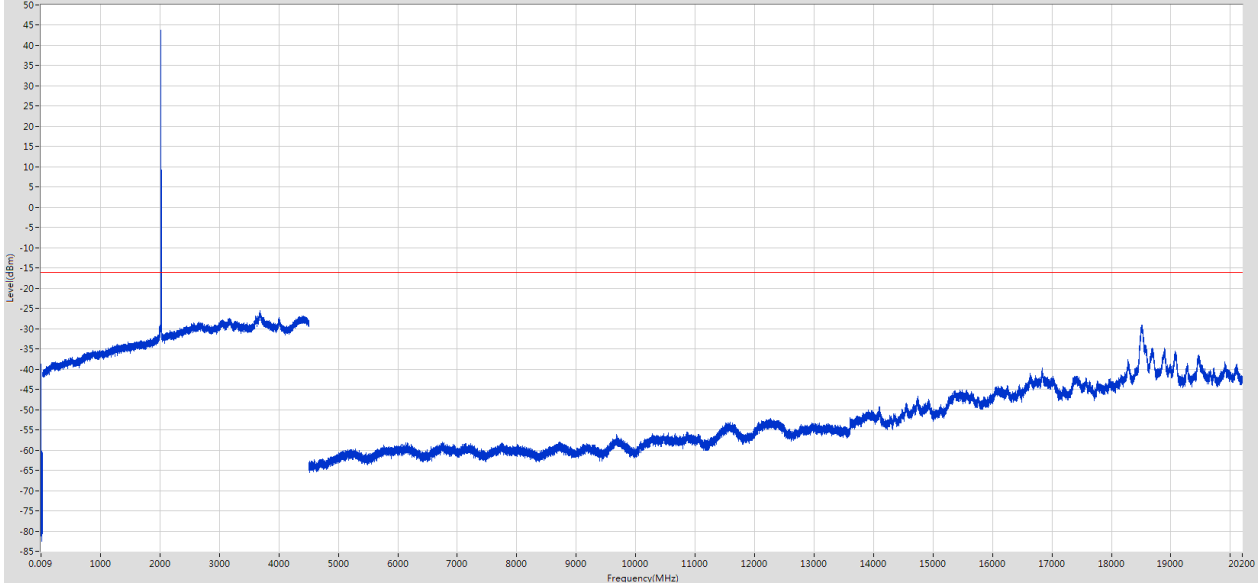
Start Frequency [MHz]	Stop Frequency [MHz]	RBW [MHz]	Detector	Frequency [Hz]	Emission [dBm]	Limit [dBm]	Verdict	Sweep Point
0.009	0.15	0.001	RMS	60.042 k	-38.71	-16	Pass	1001
0.15	30	0.01	RMS	178.002 k	-44.62	-16	Pass	14925
30	4500	1	RMS	2009.888586 M	43.75	-16	Pass	22350
4500	20200	1	RMS	18505.955998 M	-28.89	-16	Pass	78500



Note: the spike exceeds the limit is the fundamental emission.

2.3 TX_1NB_T

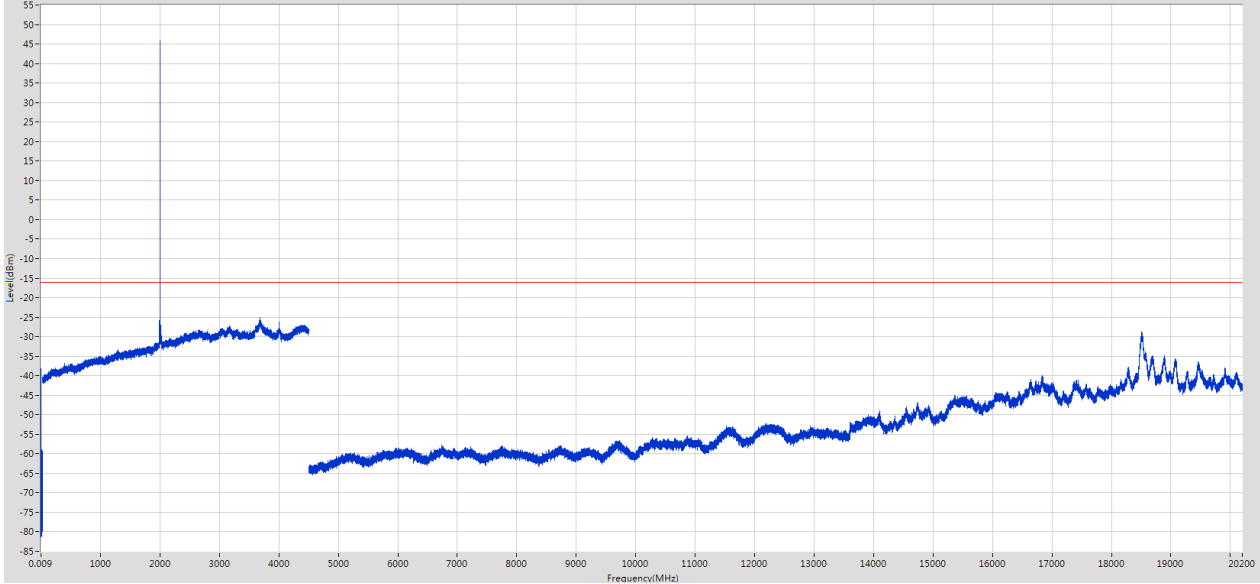
Start Frequency [MHz]	Stop Frequency [MHz]	RBW [MHz]	Detector	Frequency [Hz]	Emission [dBm]	Limit [dBm]	Verdict	Sweep Point
0.009	0.15	0.001	RMS	60.606 k	-38.77	-16	Pass	1001
0.15	30	0.01	RMS	162.001 k	-44.31	-16	Pass	14925
30	4500	1	RMS	2019.689024 M	43.73	-16	Pass	22350
4500	20200	1	RMS	18512.756174 M	-29.07	-16	Pass	78500



Note: the spike exceeds the limit is the fundamental emission.

2.4 TX_2NB_B

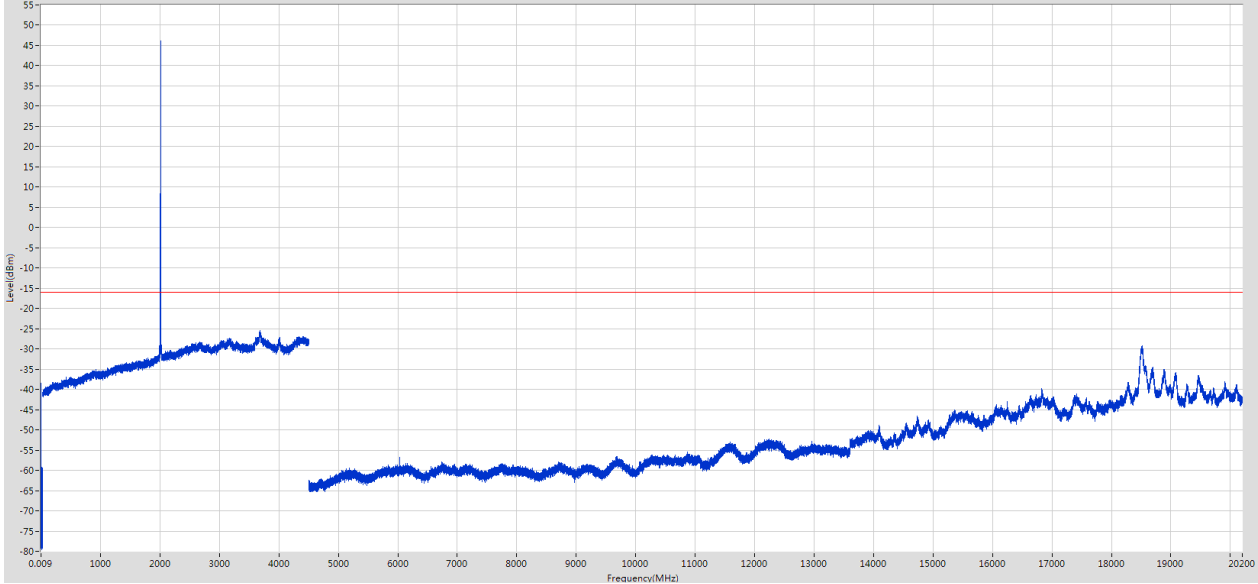
Start Frequency [MHz]	Stop Frequency [MHz]	RBW [MHz]	Detector	Frequency [Hz]	Emission [dBm]	Limit [dBm]	Verdict	Sweep Point
0.009	0.15	0.001	RMS	60.465 k	-38.29	-16	Pass	1001
0.15	30	0.01	RMS	152 k	-42.59	-16	Pass	14925
30	4500	1	RMS	2000.288156 M	45.73	-16	Pass	22350
4500	20200	1	RMS	18505.955998 M	-28.79	-16	Pass	78500



Note: the spike exceeds the limit is the fundamental emission.

2.5 TX_2NB_M

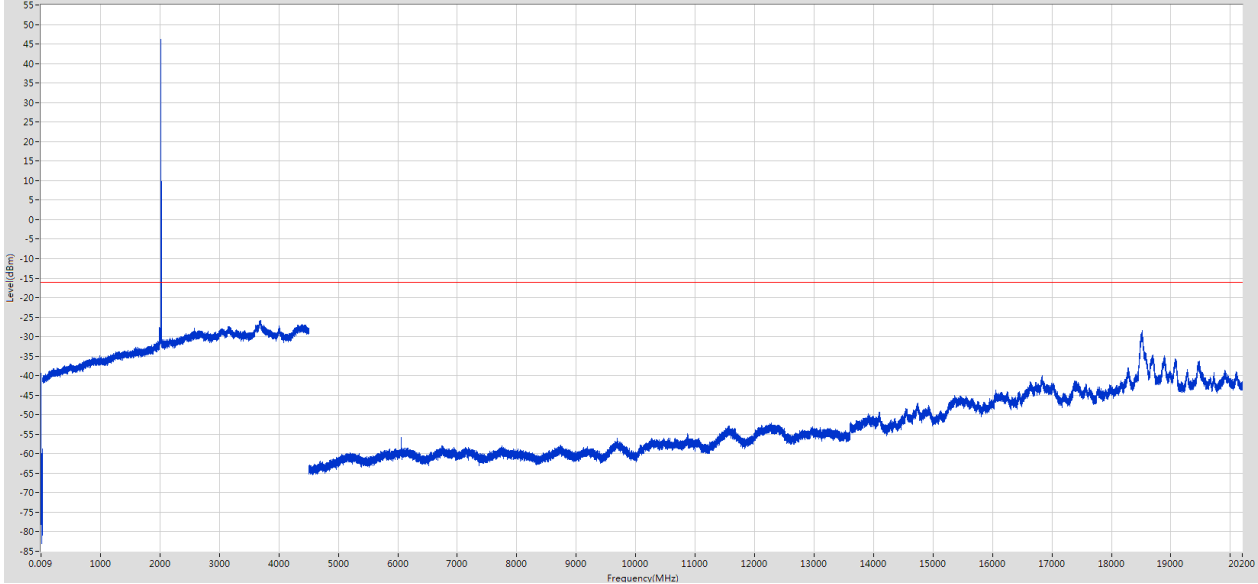
Start Frequency [MHz]	Stop Frequency [MHz]	RBW [MHz]	Detector	Frequency [Hz]	Emission [dBm]	Limit [dBm]	Verdict	Sweep Point
0.009	0.15	0.001	RMS	60.183 k	-38.49	-16	Pass	1001
0.15	30	0.01	RMS	160.001 k	-41.41	-16	Pass	14925
30	4500	1	RMS	2010.288604 M	46.07	-16	Pass	22350
4500	20200	1	RMS	18516.356268 M	-29.16	-16	Pass	78500



Note: the spike exceeds the limit is the fundamental emission.

2.6 TX_2NB_T

Start Frequency [MHz]	Stop Frequency [MHz]	RBW [MHz]	Detector	Frequency [Hz]	Emission [dBm]	Limit [dBm]	Verdict	Sweep Point
0.009	0.15	0.001	RMS	60.042 k	-39.28	-16	Pass	1001
0.15	30	0.01	RMS	150 k	-40.43	-16	Pass	14925
30	4500	1	RMS	2019.489015 M	46.25	-16	Pass	22350
4500	20200	1	RMS	18512.556169 M	-28.46	-16	Pass	78500



Note: the spike exceeds the limit is the fundamental emission.

Test item 5

Field strength of spurious radiation

1 Result Table

1.1 Field Strength of Spurious Radiation

Test Range	EUT Conf.	Maximum Emission	Verdict
30 MHz to 1 GHz	TX_2NB_M	< Limit	Pass
1 GHz to 18 GHz	TX_2NB_M	< Limit	Pass
18 GHz to 26.5 GHz	TX_2NB_M	< Limit	Pass

1.2 Radiated Measurements for Spurious Emissions at Antenna Terminals

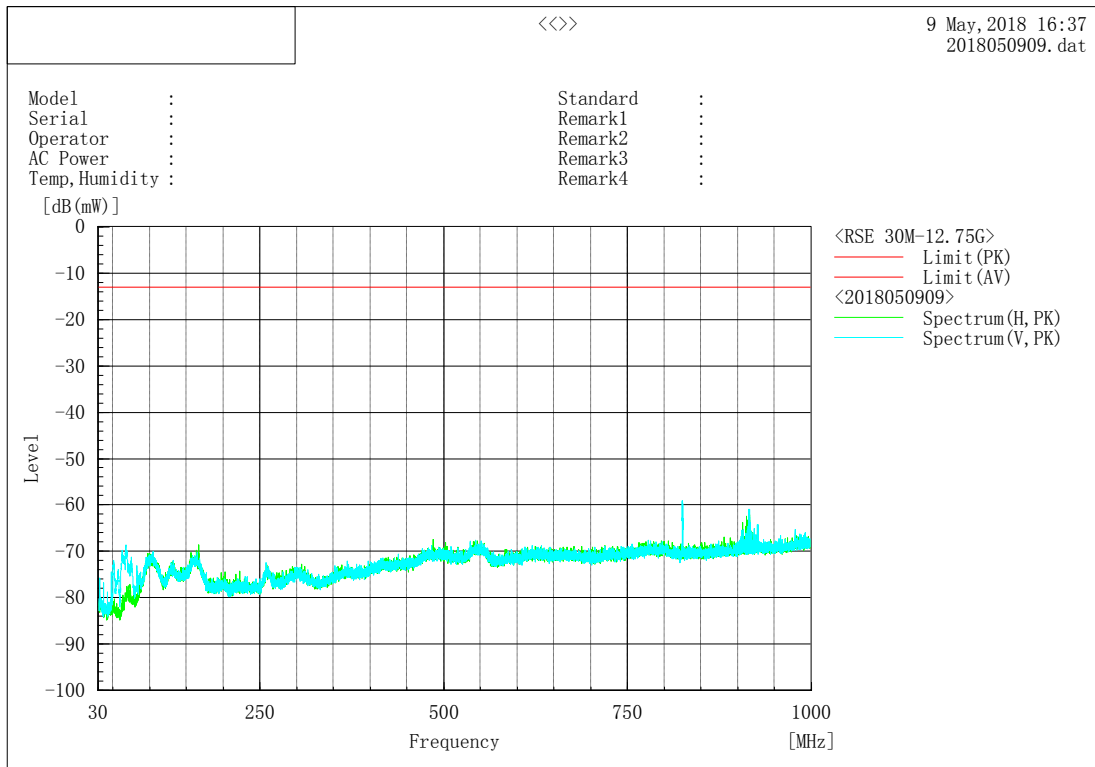
(Not applicable)

2 Test Plot

2.1 Field Strength of Spurious Radiation

2.1.1 Test range of "30 MHz to 1 GHz"

2.1.1.1 TX_2NB_M

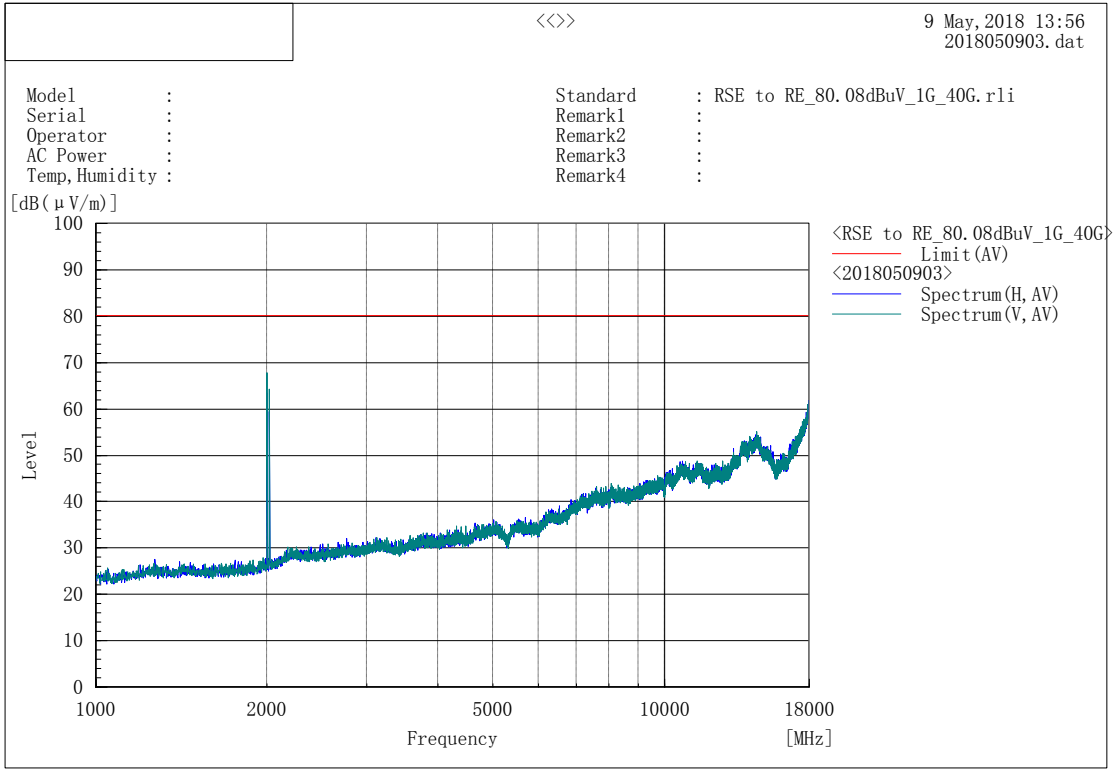


Final Result

No.	Frequency (P)	c. f	Height	Angle	Remark
	[MHz]	[dB]	[cm]	[°]	

2.1.2 Test range of "1 GHz to 18 GHz"

2.1.2.1 TX_2NB_M



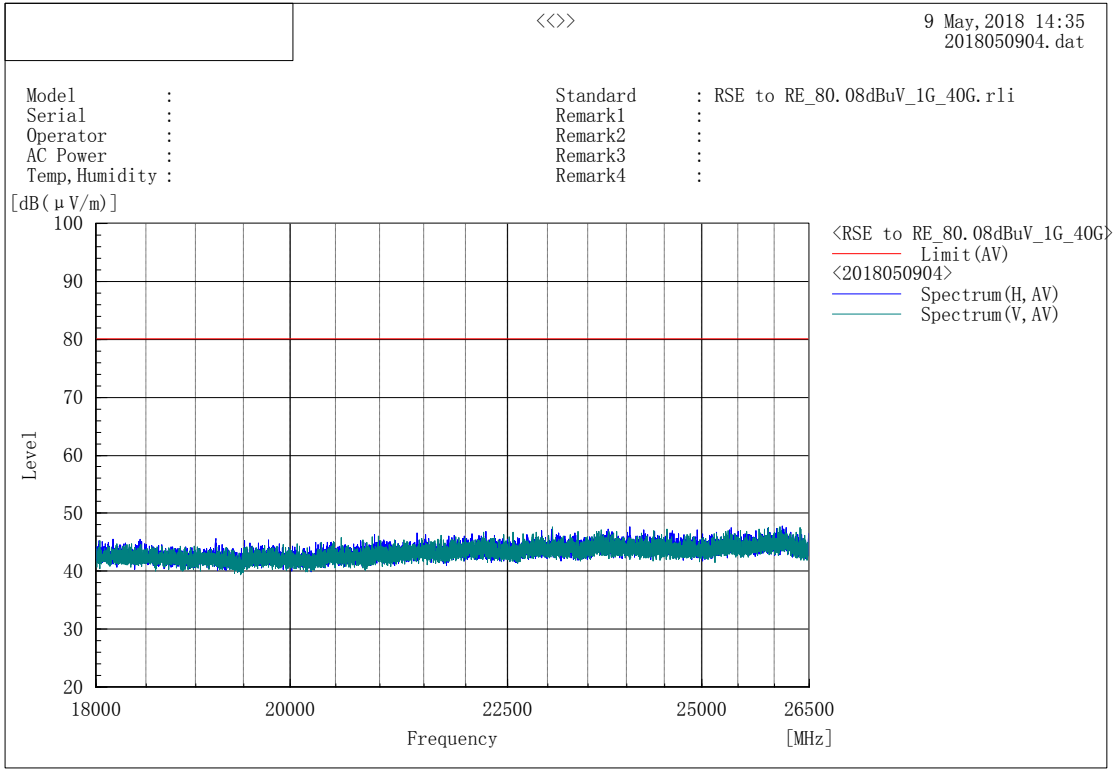
Final Result

No.	Frequency (P)	c.f	Height	Angle	Remark
	[MHz]	[dB(1/m)]	[cm]	[°]	

(Note: the limit in the plot shall be read as 84.41 dBμV/m, which is calculated to limit -13 dBm ERP at 3 m distance for the whole EUT)

2.1.3 Test range of “18 GHz to 26.5 GHz”

2.1.3.1 TX_2NB_M



Final Result

No.	Frequency (P)	c.f	Height	Angle	Remark
	[MHz]	[dB(1/m)]	[cm]	[°]	

(Note: the limit in the plot shall be read as 84.41 dBμV/m, which is calculated to limit -13 dBm ERP at 3 m distance for the whole EUT)

2.2 Radiated Measurements for Spurious Emissions at Antenna Terminals

(Not applicable)

Test item 6

Frequency stability

1 Result Table

1.1 Frequency Error

EUT Conf.	Environment Parameter (Temperature & Voltage)	Freq. Error, f(offset) [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Verdict
TX_CW_M	20°C_100%NV (20°C_NV)	+0.111	0.000055	---	---
	20°C_85%NV	-0.02	-0.000010	---	---
	20°C_115%NV	+0.037	0.000018	---	---
	-30°C_NV	+0.076	0.000038	---	---
	-20°C_NV	+0.034	0.000017	---	---
	-10°C_NV	-0.028	-0.000014	---	---
	0°C_NV	-0.174	-0.000087	---	---
	10°C_NV	-0.017	-0.000008	---	---
	30°C_NV	+0.05	0.000025	---	---
	40°C_NV	+0.116	0.000058	---	---
	50°C_NV	-0.038	-0.000019	---	---

1.2 Frequency Range of Bandwidth

(Not applicable)



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END