FCC TEST REPORT

Test report
On Behalf of
TransAct Technologies Inc
For
BOHA!™ tablet
Model No.: 10 inch Tablet PC, BOHA!™ tablet

FCC ID: 2ASX3-BOHA

Prepared for : **TransAct Technologies Inc**
2319 Whitney Avenue, Suite 3B Hamden, CT 06518, USA

Prepared By : **Shenzhen Tongzhou Testing Co.,Ltd**
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Date of Test: **2020/3/2 ~ 2020/3/25**

Date of Report: **2020/3/26**

Report Number: **TZ191201191-E6**

The test report apply only to the specific sample(s) tested under stated test conditions
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TEST RESULT CERTIFICATION

Applicant's name ..... : **TransAct Technologies Inc**

Address ..... : 2319 Whitney Avenue, Suite 3B Hamden, CT 06518, USA

Manufacture's Name ..... : **ERHINO TECHNOLOGY LTD.**

Address ..... : 2602A, Block A, World Trade Plaza, Fuhong Road, Futian Dist., Shenzhen, Guangdong, China

Product description

Trade Mark .....: BOHA!™

Product name .....: BOHA!™ tablet

Model and/or type reference . : 10 inch Tablet PC, BOHA!™ tablet

Standards ..... : FCC Rules and Regulations Part 22 & Part 24
ANSI C63.26:2015

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Date of Test ..... :

Date (s) of performance of tests..... : 2020/3/5 ~ 2020/3/25

Date of Issue ..... : 2020/3/26

Test Result..... : **Pass**

Testing Engineer : Anna Hu

(Anna Hu)

Technical Manager : Hugo Chen

(Hugo Chen)

Authorized Signatory : Andy Zhang

(Andy Zhang)

Revision History

Revision	Issue Date	Revisions	Revised By
000	2020/3/26	Initial Issue	Andy Zhang

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1 TEST STANDARDS

The tests were performed according to following standards:
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
FCC Part 22 Subpart H: PRIVATE LAND MOBILE RADIO SERVICES.
FCC Part 24 Subpart E: PUBLIC MOBILE SERVICES
ANSI/TIA-603-E-2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
ANSI C63.26-2015: IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
FCCKDB971168D01 Power Meas License Digital Systems

2 SUMMARY

2.1 Product Description

EUT	:	BOHA!™ tablet
Model Number	:	10 inch Tablet PC, BOHA!™ tablet
Model Declaration	:	All the same except for the model name
Test Model	:	10 inch Tablet PC
Power Supply	:	DC 3.8V by battery
Hardware version	:	P23L_E221_V1.0
Software version	:	9.0
Sample ID	:	TZ191201191–1#
Bluetooth		
Bluetooth Version	:	V4.1+EDR
Channel Number	:	79 Channels for Bluetooth BR/EDR(DSS) 40 Channels for BLE (DTS)
Modulation Technology	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth BR/EDR (DSS) GFSK for BLE (DTS)
Data Rates	:	Bluetooth BR/EDR (DSS): 1/2/3Mbps BLE (DTS): 1Mbps
Antenna Type And Gain		Internal Antenna /1.4 dBi(Max.)
Sample ID	:	TZ191201191–1#
WiFi		
WLAN	:	Supported IEEE 802.11a/b/g/n
WLAN FCC Operation Frequency	:	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz / 5180-5240MHz / 5745-5825MHz IEEE 802.11n HT40:2422-2452MHz / 5190-5230MHz / 5755-5795MHz IEEE 802.11a: 5180-5240MHz / 5745-5825MHz
WLAN Channel Number	:	11 Channels for 2412-2462MHz(IEEE 802.11b/g/n HT20) 7 Channels for 2422-2452MHz(IEEE 802.11n HT40) 4 Channels for 5180-5240MHz (IEEE 802.11a/n HT20) 2 Channels for 5190-5230MHz (IEEE 802.11n HT40) 5 Channels for 5745-5825MHz(IEEE 802.11a/n HT20) 2 Channels for 5755-5795MHz(IEEE 802.11n HT40)
WLAN Modulation Technology	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Type And Gain	:	Internal Antenna /1.4 dBi(Max.)
GSM		
Support Bands	:	☒GSM 850 ☒PCS 1900 ☒GSM 900 ☒PCS 1800
GSM FCC Operation Frequency	:	GSM850(UL: 824 – 849 MHz/DL: 869 – 894 MHz) GSM1900(UL: 1850 –1910 MHz/DL: 1930 – 1990 MHz)

Channel Separation	:	0.2MHz
Modulation Technology	:	GMSK,8PSK
Antenna Type And Gain	:	Internal Antenna GSM850: 0.8dBi PCS1900: 1.3dBi
UTRA		
Support Bands	:	☒WCDMA BAND II ☒WCDMA BAND V ☒WCDMA BAND I ☒WCDMA BAND VIII
UTRA FCC Operation Frequency	:	WCDMA BAND V (UL: 824 – 849 MHz/DL: 869 – 894 MHz) WCDMA BAND II (UL: 1850 –1910 MHz/DL: 1930 – 1990 MHz)
Channel Separation	:	0.2MHz
Modulation Technology	:	OFDM (16QAM, QPSK)
Antenna Type And Gain	:	Internal Antenna WCDMA BAND II: 1.1dBi WCDMA BAND V: 1.2dBi
E-UTRA		
Support Bands	:	☒FDD Band 2 ☒FDD Band 4 ☒FDD Band 12 ☒FDD Band 17
E-UTRA FCC Operation Frequency	:	☒FDD Band 2 (UL: 1850 – 1910 MHz/DL: 1930 – 1990 MHz) ☒FDD Band 4 (UL: 1710 – 1755 MHz/DL: 2110 – 2155 MHz) ☒FDD Band 12 (UL: 699 – 716 MHz/DL: 729 – 746 MHz) ☒FDD Band 17 (UL: 704 – 716 MHz/DL: 734 – 746 MHz)
Channel Separation	:	0.1 MHz
Modulation Technology	:	OFDM (16QAM, QPSK)
Antenna Type And Gain	:	Internal Antenna FDD Band 2: 1.4dBi FDD Band 4: 1.4dBi FDD Band 12: 1.2dBi FDD Band 17: 1.4dBi

Note: Antenna position refer to EUT Photos.

GSM/WCDMA Card Slot :

	Maximum ERP/EIRP (dBm)	Max. Conducted Power (dBm)	Max. Average Burst Power (dBm)
GSM 850	26.20	31.88	31.76
PCS 1900	25.68	29.86	29.66
UMTS BAND II	20.68	24.54	22.30
UMTS BAND V	20.19	24.93	22.43

2.2 Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate

2.3 Short description of the Equipment under Test (EUT)

2.3.1 General Description

EUT is subscriber equipment in the LTE/WCDMA/GSM system. Support bands as list in section 2.1 of this report.

2.4 Normal Accessory setting

Fully charged battery was used during the test.

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

☑supplied by the lab ☐ supplied by the manufacturer

Manufacturer	Description	Model	Serial Number	Certificate
GuaiKaiYuan	Adapter	GKYPG0200050US2	N/A	N/A

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2ASX3-BOHA**filing to comply with FCC Part 22 Rules and FCC Part 24.

2.7 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Test Facility

Designation Number: CN1275
Test Firm Registration Number: 167722

The 3m-Semi anechoic test site fulfills CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010

3.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3 Test Description

PCS 1900 and UMTS BAND II:

Test Item	FCC Rule No.	Requirements	Judgement
Effective (Isotropic) Radiated Power	2.1046, 24.232(c)	EIRP ≤ 2W(33dBm)	Pass
Bandwidth	2.1049 24.238(a)	OBW: No limit. EBW: No limit.	Pass
Band Edges	2.1051, 24.238(a)	-13dBm	Pass
Spurious Emission at Antenna Terminals	2.1051, 24.238(a)	-13dBm	Pass
Field Strength of Spurious Radiation	2.1053, 24.238(a)	-13dBm	Pass
Frequency Stability	2.1055, 24.235	the fundamental emission stays within the authorized frequency block.	Pass
Peak to average ratio	24.232(d)	<13dB	Pass

GSM850 and UMTS BAND V:

Test Item	FCC Rule No.	Requirements	Judgement
Effective (Isotropic) Radiated Power	2.1046, 2.913(a)	EIRP ≤ 7W(33dBm)	Pass
Occupied Bandwidth	2.1049	OBW: No limit.	Pass
Emission Bandwidth	22.917(b)	EBW: No limit.	Pass
Band Edges Compliance	2.1051, 22.917(a)(b)	KDB 971 168 D02 971168 D02 Misc OOBE License Digital Systems v01 &27.53(m) for detail the limit is upon different OBW	Pass
Spurious Emission at Antenna Terminals	2.1051, 22.917	-13dBm	Pass
Field Strength of Spurious Radiation	2.1053, 22.917	-13dBm	Pass
Frequency Stability	2.1055, 22.355	the fundamental emissions stay within the authorized bands of operation. (2.5ppm)	Pass

3.4 Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2020/1/2	2021/1/1
2	Power Sensor	Agilent	U2021XA	MY5365004	2020/1/2	2021/1/1
3	Power Meter	Agilent	U2531A	TW53323507	2020/1/2	2021/1/1
4	Wideband Antenna	schwarzbeck	VULB 9163	958	2019/11/16	2022/11/15
5	Horn Antenna	schwarzbeck	9120D-1141	1574	2019/11/16	2022/11/15
6	EMI Test Receiver	R&S	ESCI	100849/003	2020/1/2	2021/1/1
7	Controller	MF	MF7802	N/A	N/A	N/A
8	Amplifier	schwarzbeck	BBV 9743	209	2020/1/2	2021/1/1
9	Amplifier	Tonscend	TSAMP-0518SE	--	2020/1/2	2021/1/1
10	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	N/A	2020/1/2	2021/1/1
11	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	N/A	2020/1/2	2021/1/1
12	Artificial Mains	ROHDE & SCHWARZ	ENV 216	101333-IP	2020/1/2	2021/1/1
12	EMI Test Software	ROHDE & SCHWARZ	ESK1	V1.71	N/A	N/A
14	RE test software	Tonscend	JS32-RE	V2.0.2.0	N/A	N/A
15	Test Software	Tonscend	JS1120-2	V2.5.77.0418	N/A	N/A
16	UNIVERSAL RADIO COMMUNICATION	R&S	CMW500	101855	2020/1/2	2021/1/1

3.5 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 ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen Tongzhou Testing 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 Shenzhen Tongzhou Testing Co.,Ltd is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.70 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occuiped Bandwidth	9KHz~40GHz	-	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4 DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester (CMU 200)to ensure max power transmission and proper modulation. Three channels (The top channel, the middle channel and the bottom channel) were chosen for testing on both GSM and PCS frequency band.

*****Note:** GSM/GPRS 850, GSM/GPRS 1900, WCDMA/HSPA band II, WCDMA/HSPA band V mode have been tested during the test.

The worst condition was recorded in the test report if no other modes test data.

5 TEST CONDITIONS AND RESULTS

5.1 OUTPUT POWER

5.1.1 CONDUCTED OUTPUT POWER

5.1.1.1 MEASUREMENT METHOD

The transmitter output port was connected to base station.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

Measure the maximum burst average power and average power for other modulation signal.

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all modes(GSM/GPRS 850, GSM/GPRS 1900, WCDMA/HSPA band II , WCDMA/HSPA band V)at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

5.1.1.2 MEASUREMENT RESULT

Conducted Output Power Limits for GSM/GPRS 850 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	33 dBm (2W)	+1/- 1
GPRS	33 dBm (2W)	+1/- 1
Conducted Output Power Limits for GSM/GPRS 1900 band		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
GSM	30 dBm (1W)	+1/- 1
GPRS	33 dBm (2W)	+1/- 1
Conducted Output Power Limits for UMTS band II		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24dBm (0.25W)	+1.7/-3.7
Conducted Output Power Limits for UMTS band V		
Mode	**Nominal Peak Power**	**Tolerance(dB)**
WCDMA	24dBm (0.25W)	+1.7/- 3.7

GSM 850

Mode	Frequency (MHz)	Peak Power	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power (dBm)	Peak to Average Ratio
GPRS850 (1 Slot)	824.2	31.75	31.61	-9	22.61	0.14
	836.6	**31.88**	**31.76**	-9	22.76	0.12
	848.8	31.69	31.47	-9	22.47	0.22
GPRS850 (2 Slot)	824.2	30.08	29.86	-6	23.86	0.22
	836.6	30.45	30.29	-6	24.29	0.15
	848.8	30.09	29.82	-6	23.82	**0.28**
GPRS850 (3 Slot)	824.2	29.10	28.96	-4.26	24.70	0.14
	836.6	29.29	29.11	-4.26	24.85	0.18
	848.8	29.49	29.37	-4.26	**25.11**	0.12
GPRS850 (4 Slot)	824.2	27.37	27.23	-3	24.23	0.15
	836.6	27.20	26.97	-3	23.97	0.23
	848.8	27.43	27.30	-3	24.30	0.13
EGPRS850 (1 Slot)	824.2	26.23	23.61	-9	14.61	2.62
	836.6	26.33	24.01	-9	15.01	2.32
	848.8	26.34	24.26	-9	15.26	2.08
EGPRS850 (2 Slot)	824.2	24.41	22.23	-6	16.23	2.18
	836.6	24.34	21.38	-6	15.38	2.96
	848.8	24.06	21.08	-6	15.08	**2.98**
EGPRS850 (3 Slot)	824.2	22.24	19.65	-4.26	15.39	2.58
	836.6	22.19	19.27	-4.26	15.01	2.92
	848.8	22.16	20.02	-4.26	15.76	2.14
EGPRS850 (4 Slot)	824.2	20.43	18.32	-3	15.32	2.11
	836.6	20.22	17.81	-3	14.81	2.40
	848.8	20.47	17.54	-3	14.54	2.93

GSM1900

Mode	Frequency (MHz)	Peak Power	Avg.Burst Power	Duty cycle Factor(dB)	Frame Power(dBm)	Peak to Average Ratio
GPRS1900 (1 Slot)	1850.2	29.84	29.65	-9	20.65	0.19
	1880	29.66	29.39	-9	20.39	**0.28**
	1909.8	**29.86**	**29.66**	-9	20.66	0.20
GPRS1900 (2 Slot)	1850.2	27.51	27.35	-6	21.35	0.16
	1880	27.68	27.57	-6	21.57	0.11
	1909.8	27.56	27.45	-6	21.45	0.12
GPRS1900 (3 Slot)	1850.2	26.51	26.30	-4.26	22.04	0.21
	1880	26.94	26.83	-4.26	22.57	0.10
	1909.8	26.71	26.53	-4.26	22.27	0.18
GPRS1900 (4 Slot)	1850.2	25.84	25.74	-3	22.74	0.11
	1880	25.57	25.44	-3	22.44	0.13
	1909.8	25.75	25.60	-3	22.60	0.15
EGPRS1900 (1 Slot)	1850.2	27.10	24.05	-9	15.05	3.04
	1880	27.14	24.09	-9	15.09	3.05
	1909.8	27.45	24.02	-9	15.02	3.43
EGPRS1900 (2 Slot)	1850.2	26.18	22.47	-6	16.47	3.71
	1880	26.05	22.34	-6	16.34	3.71
	1909.8	26.13	22.49	-6	16.49	3.64
EGPRS1900 (3 Slot)	1850.2	24.61	21.20	-4.26	16.94	3.41
	1880	24.99	21.25	-4.26	16.99	**3.74**
	1909.8	24.50	21.13	-4.26	16.87	3.37
EGPRS1900 (4 Slot)	1850.2	23.03	19.90	-3	16.90	3.13
	1880	23.35	19.68	-3	16.68	3.67
	1909.8	23.41	20.24	-3	17.24	3.17

UMTS BAND II

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power	Peak to Average Ratio
WCDMA1900 RMC	1852.4	24	**24.54**	0.54	**22.30**	2.24
	1880	24	23.35	-0.65	21.98	1.37
	1907.6	24	23.82	-0.18	22.21	1.60
WCDMA1900 AMR	1852.4	24	24.11	0.11	22.28	1.82
	1880	24	23.85	-0.15	22.04	1.82
	1907.6	24	23.46	-0.54	21.67	1.80
HSDPA Subtest 1	1852.4	24	22.12	-1.88	20.99	1.13
	1880	24	23.44	-0.56	21.10	2.34
	1907.6	24	23.10	-0.90	20.90	2.20
HSDPA Subtest 2	1852.4	24	21.46	-2.54	20.35	1.12
	1880	24	21.65	-2.35	19.92	1.74
	1907.6	24	22.49	-1.51	20.50	1.99
HSDPA Subtest 3	1852.4	24	21.33	-2.67	19.89	1.45
	1880	24	21.91	-2.09	19.79	2.12
	1907.6	24	21.38	-2.62	19.97	1.41
HSDPA Subtest 4	1852.4	24	21.13	-2.87	20.07	1.06
	1880	24	21.52	-2.48	20.31	1.21
	1907.6	24	22.49	-1.51	20.64	1.85
HSUPA Subtest 1	1852.4	24	22.28	-1.72	20.76	1.52
	1880	24	21.63	-2.37	20.17	1.46
	1907.6	24	22.17	-1.83	20.37	1.79
HSUPA Subtest 2	1852.4	24	22.77	-1.23	21.37	1.40
	1880	24	23.33	-0.67	21.83	1.50
	1907.6	24	22.67	-1.33	21.38	1.29
HSUPA Subtest 3	1852.4	24	22.93	-1.07	21.07	1.87
	1880	24	22.35	-1.65	21.01	1.34
	1907.6	24	23.22	-0.78	21.31	1.91
HSUPA Subtest 4	1852.4	24	23.42	-0.58	21.38	2.04
	1880	24	23.79	-0.21	**22.35**	1.45
	1907.6	24	23.98	-0.02	22.10	1.88
HSUPA Subtest 5	1852.4	24	23.28	-0.72	21.06	2.21
	1880	24	24.35	0.35	21.87	**2.48**
	1907.6	24	23.86	-0.14	21.73	2.13

UMTS BAND V

Mode	Frequency (MHz)	Reference power	Peak Power	Tolerance	Avg.Burst Power	Peak to Average Ratio
WCDMA850 RMC	826.4	24	**24.93**	0.93	**22.43**	**2.50**
	836.4	24	23.54	-0.46	21.82	1.72
	846.6	24	23.97	-0.03	21.96	2.01
WCDMA850 AMR	1852.4	24	23.64	-0.36	22.14	1.50
	1880	24	24.27	0.27	22.06	2.22
	1907.6	24	24.16	0.16	21.94	2.22
HSDPA Subtest 1	826.4	24	22.11	-1.89	21.08	1.03
	836.4	24	22.13	-1.87	20.86	1.26
	846.6	24	23.04	-0.96	20.99	2.04
HSDPA Subtest 2	826.4	24	22.70	-1.30	20.27	2.44
	836.4	24	21.64	-2.36	20.08	1.56
	846.6	24	21.74	-2.26	20.72	1.02
HSDPA Subtest 3	826.4	24	22.08	-1.92	19.84	2.24
	836.4	24	21.97	-2.03	19.92	2.05
	846.6	24	21.69	-2.31	20.17	1.52
HSDPA Subtest 4	826.4	24	21.53	-2.47	20.01	1.52
	836.4	24	22.47	-1.53	20.60	1.87
	846.6	24	23.08	-0.92	20.64	2.44
HSUPA Subtest 1	826.4	24	22.96	-1.04	20.52	2.44
	836.4	24	22.17	-1.83	20.24	1.93
	846.6	24	22.46	-1.54	20.34	2.12
HSUPA Subtest 2	826.4	24	22.70	-1.30	21.52	1.18
	836.4	24	24.12	0.12	21.82	2.30
	846.6	24	23.10	-0.90	21.28	1.82
HSUPA Subtest 3	826.4	24	22.60	-1.40	21.14	1.47
	836.4	24	22.76	-1.24	21.10	1.66
	846.6	24	22.73	-1.27	20.98	1.75
HSUPA Subtest 4	826.4	24	22.78	-1.22	21.22	1.55
	836.4	24	23.46	-0.54	22.33	1.13
	846.6	24	24.00	0.00	22.29	1.71
HSUPA Subtest 5	826.4	24	22.55	-1.45	21.10	1.45
	836.4	24	23.25	-0.75	21.50	1.75
	846.6	24	23.30	-0.70	21.71	1.59

According to 3GPP 25.101 sub-clause 6.2.2 , the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15, β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

5.1.2 RADIATED OUTPUT POWER

5.1.2.1 MEASUREMENT METHOD

The measurements procedures specified in ANSI/TIA-603-E-2016 were applied.

1. Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signal operating below 1GHz are performed using dipole antennas. Measurements on signals operating above 1GHz are performed using broadband horn antennas. All measurements are performed as RMS average measurements while the EUT operating at its maximum duty cycle, at maximum power, and at the approximate frequencies.
2. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
3. The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. TheARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl
4. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
5. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
6. The EUT is then put into continuously transmitting mode at its maximum power level.
7. Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
8. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).
9. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi...

5.1.2.2 PROVISIONS APPLICABLE

Mode	FCC Part Section(s)	Nominal Peak Power
GPRS 850	22.913(a)(2)	<=38.45dBm (7W). ERP
GPRS 1900	24.232(c)	<=33dBm (2W). EIRP
UMTS BAND II	24.232(c)	<=33dBm (2W),EIRP
UMTS BANDV	22.913(a)(2)	<=38.45dBm (7W).ERP

5.1.2.3 Measurement Result

Radiated Power (ERP) for GSM/GPRS 850				
Mode	Frequency	Result		Conclusion
		Max. Peak ERP (dBm)	Polarization Of Max. ERP	
GPRS	824.2	25.24	Horizontal	Pass
	836.6	**26.20**	Horizontal	Pass
	848.8	22.29	Horizontal	Pass
	824.2	23.29	Vertical	Pass
	836.6	23.91	Vertical	Pass
	848.8	22.74	Vertical	Pass
EGPRS	824.2	**19.28**	Horizontal	Pass
	836.6	17.75	Horizontal	Pass
	848.8	18.38	Horizontal	Pass
	824.2	16.85	Vertical	Pass
	836.6	17.69	Vertical	Pass
	848.8	17.93	Vertical	Pass

Radiated Power (E.I.R.P) for GSM/GPRS 1900				
Mode	**Frequency**	**Result**		**Conclusion**
		Max. Peak E.I.R.P.(dBm)	**Polarization Of Max. E.I.R.P.**	
GPRS	1850.2	25.57	Horizontal	Pass
	1880.0	**25.68**	Horizontal	Pass
	1909.8	25.46	Horizontal	Pass
	1850.2	20.42	Vertical	Pass
	1880.0	21.81	Vertical	Pass
	1909.8	21.14	Vertical	Pass
EGPRS	1850.2	19.46	Horizontal	Pass
	1880.0	19.08	Horizontal	Pass
	1909.8	18.79	Horizontal	Pass
	1850.2	19.12	Vertical	Pass
	1880.0	18.99	Vertical	Pass
	1909.8	19.18	Vertical	Pass

Radiated Power (E.I.R.P) for UMTS band II				
Mode	**Frequency**	**Result**		**Conclusion**
		Max. Peak E.I.R.P (dBm)	**Polarization Of Max. E.I.R.P**	
UMTS	1852.4	18.90	Horizontal	Pass
	1880	**20.68**	Horizontal	Pass
	1907.6	18.51	Horizontal	Pass
	1852.4	18.48	Vertical	Pass
	1880	17.22	Vertical	Pass
	1907.6	17.60	Vertical	Pass

Radiated Power (ERP) for UMTS band V				
Mode	**Frequency**	**Result**		**Conclusion**
		Max. Peak ERP (dBm)	**Polarization Of Max. ERP**	
UMTS	826.4	20.05	Horizontal	Pass
	836.4	18.31	Horizontal	Pass
	846.6	**20.19**	Horizontal	Pass
	826.4	17.10	Vertical	Pass
	836.4	18.24	Vertical	Pass
	846.6	16.25	Vertical	Pass

Note: Above is the worst mode data.

5.2 PEAK-TO-AVERAGE RATIO

5.2.1 MEASUREMENT METHOD

Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

PAPR (dB) = PPk (dBm) - PAvg (dBm).

5.2.2 PROVISIONS APPLICABLE

This is the test for the Peak-to-Average Ratio from the EUT.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

5.2.3 MEASUREMENT RESULT

Modes	Max Peak to Average Ratio(dB)	Upper limit(dB)	Result
GPRS850	0.28	13	Pass
EGPRS850	2.98	13	Pass
GPRS1900	0.28	13	Pass
EGPRS1900	3.74	13	Pass
UMTS BAND II	2.48	13	Pass
UMTS BAND V	2.50	13	Pass
Note: refer to section of 5.1.1.2.			

5.3 OCCUPIED BANDWIDTH

5.3.1 MEASUREMENT METHOD

1. The Occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper Frequency limits, the mean power radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

2. RBW=1~5% of the expected OBW, VBW>=3 x RBW, Detector=Peak, Trace mode=max hold, Sweep=auto couple, and the trace was allowed to stabilize.

5.3.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

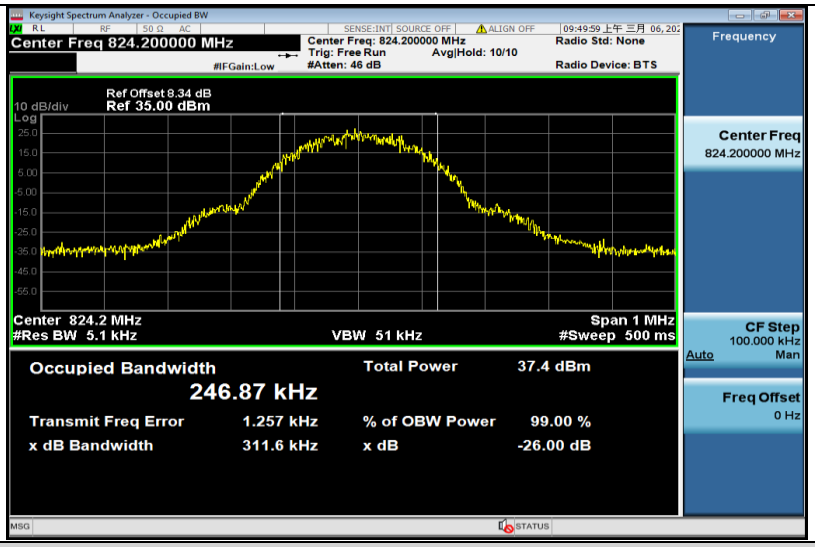
5.3.3 MEASUREMENT RESULT

For GSM

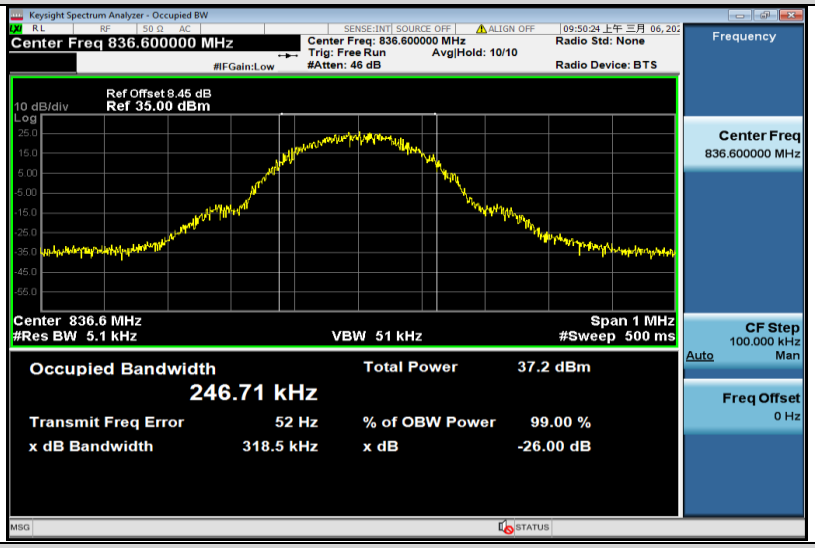
Band	Channel	Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Limit(kHz)	Verdict
GPRS850	128	246.9	312	---	PASS
GPRS850	190	246.7	318	---	PASS
GPRS850	251	246.9	311	---	PASS
EGPRS850	128	255.4	318	---	PASS
EGPRS850	190	251.7	309	---	PASS
EGPRS850	251	251.8	324	---	PASS
GPRS1900	512	247.5	316	---	PASS
GPRS1900	661	245.9	313	---	PASS
GPRS1900	810	244.8	311	---	PASS
EGPRS1900	512	243.8	315	---	PASS
EGPRS1900	661	243.7	305	---	PASS
EGPRS1900	810	245.4	306	---	PASS

Band	Channel	Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)	Limit(kHz)	Verdict
Band II	9262	4201.6	4781	---	PASS
Band II	9400	4178.9	4748	---	PASS
Band II	9538	4196.7	4785	---	PASS
Band V	4132	4176.2	4741	---	PASS
Band V	4182	4162.4	4715	---	PASS
Band V	4233	4175.8	4723	---	PASS

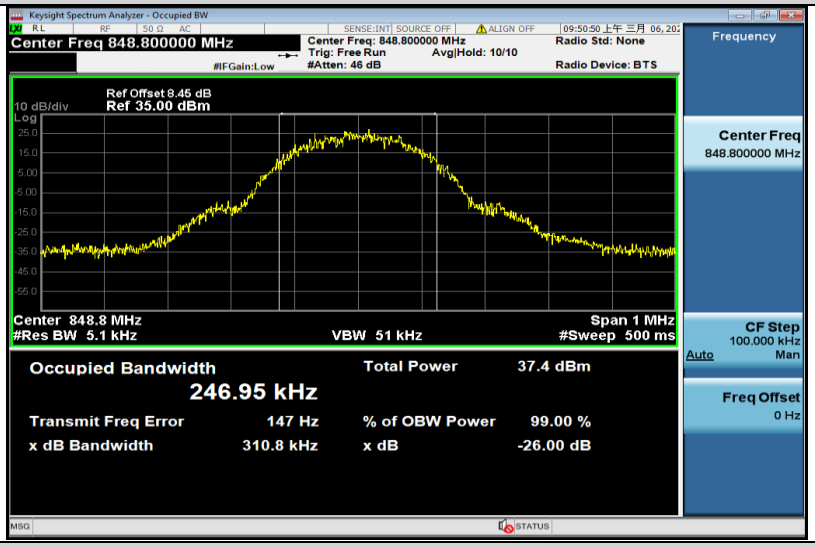
5.3.4 Test Graphs



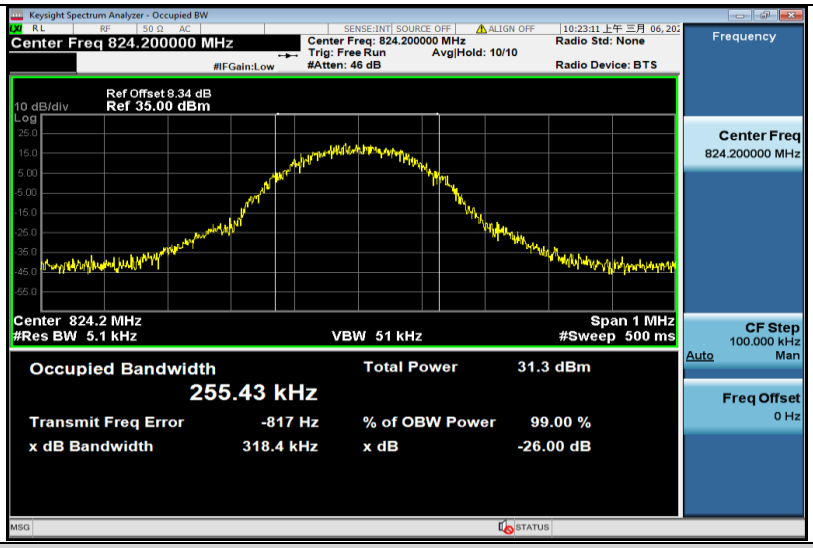
GPRS850-128



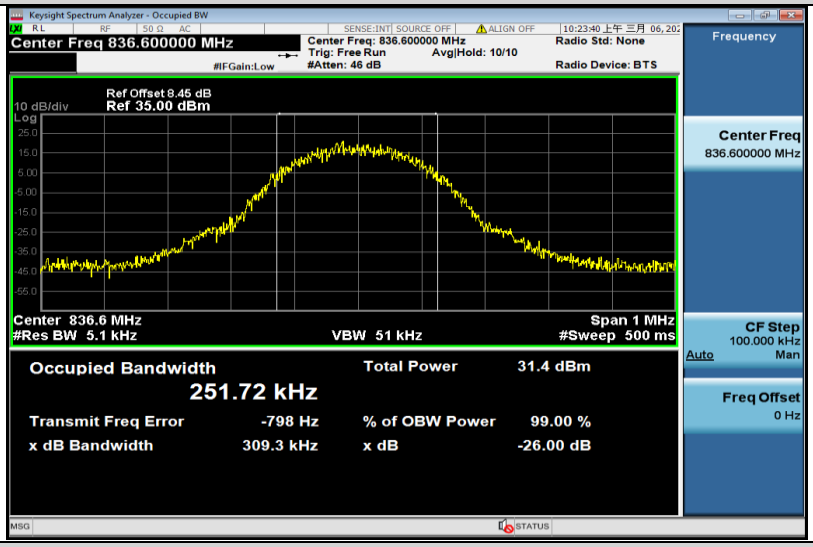
GPRS850-190



GPRS850-251



EGPRS850-128



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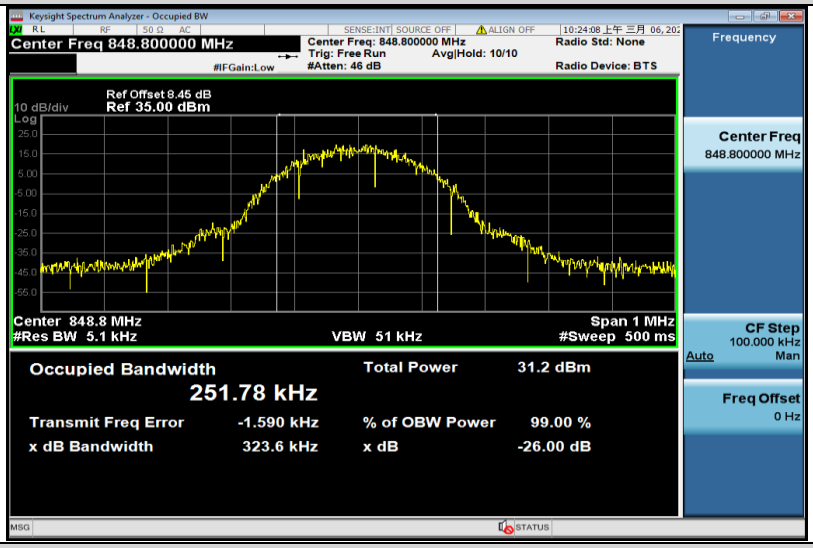

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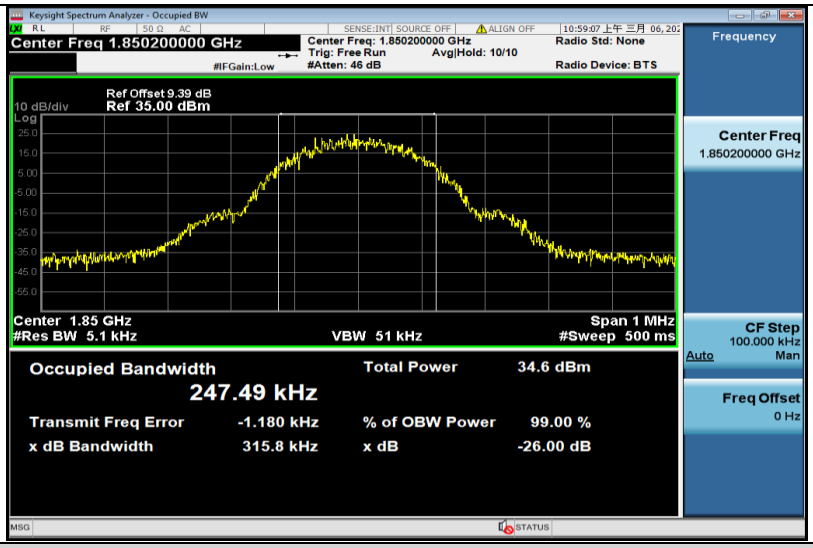
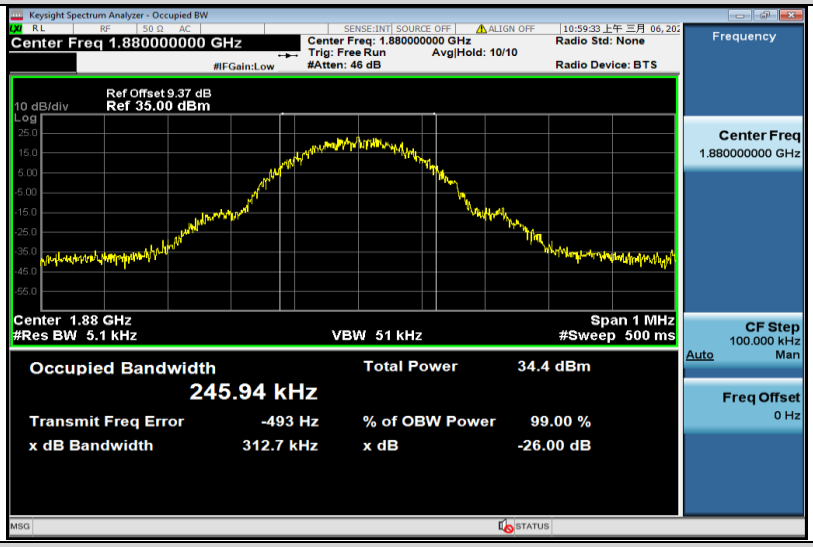
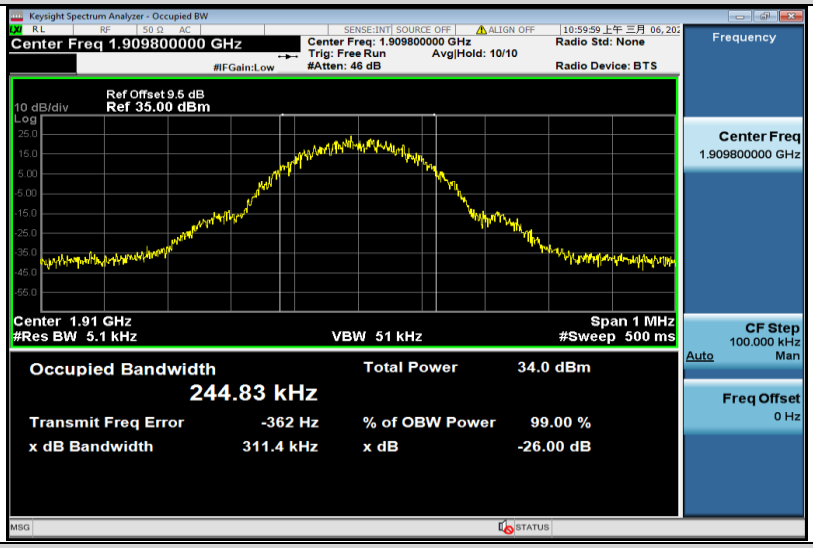


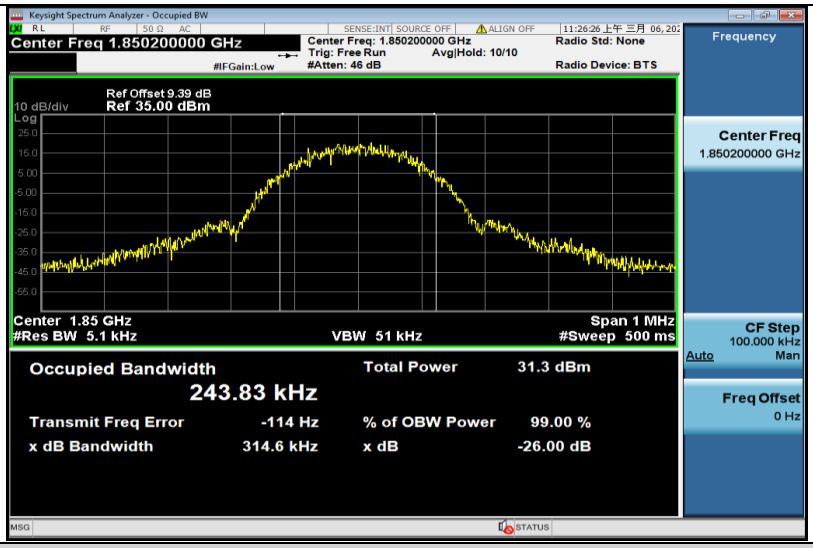
GPRS1900-512



GPRS1900-661



GPRS1900-810



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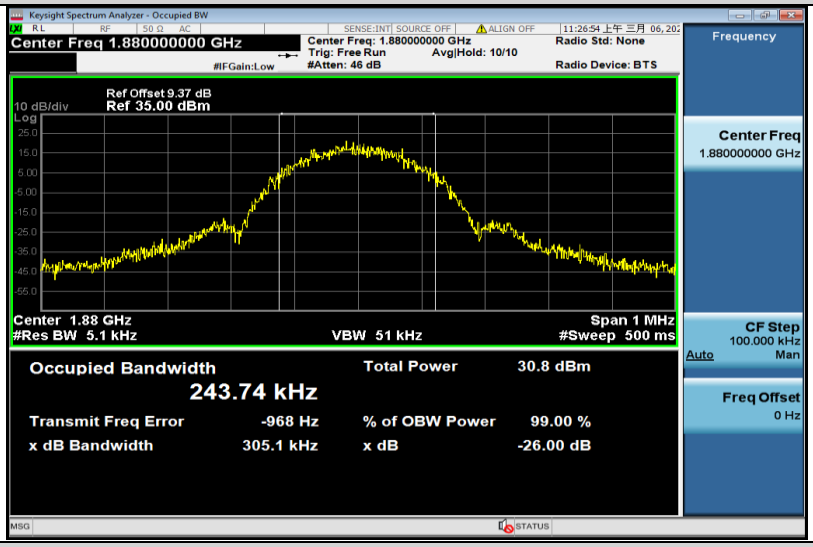

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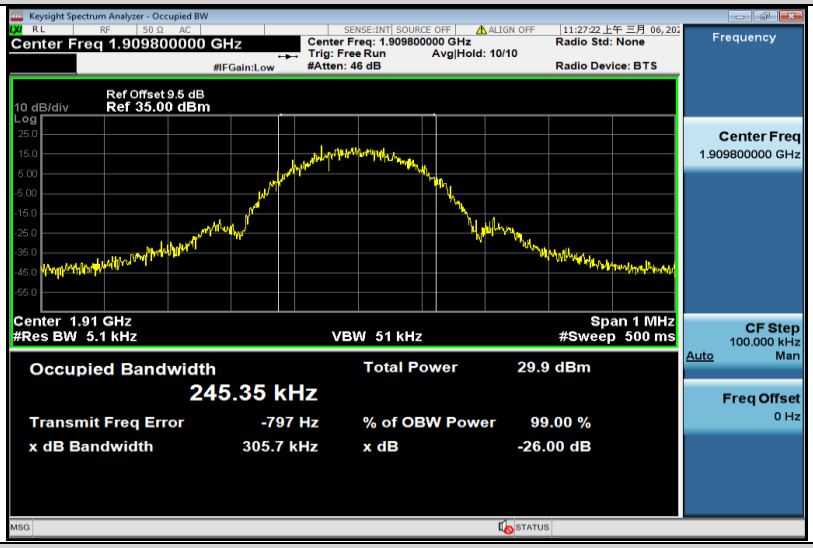

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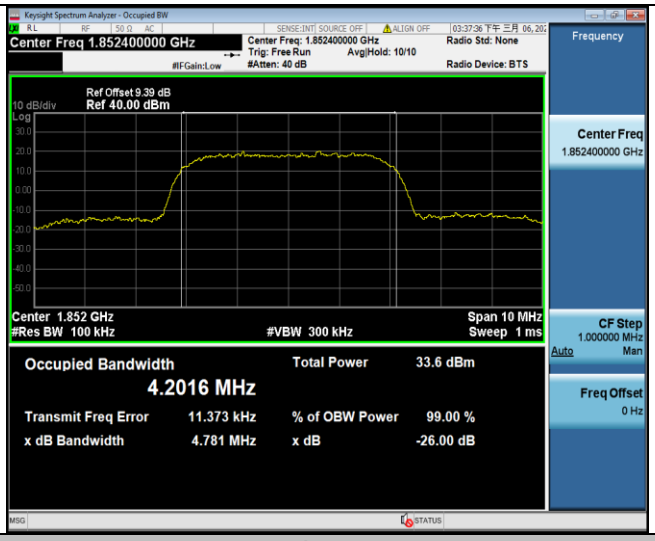
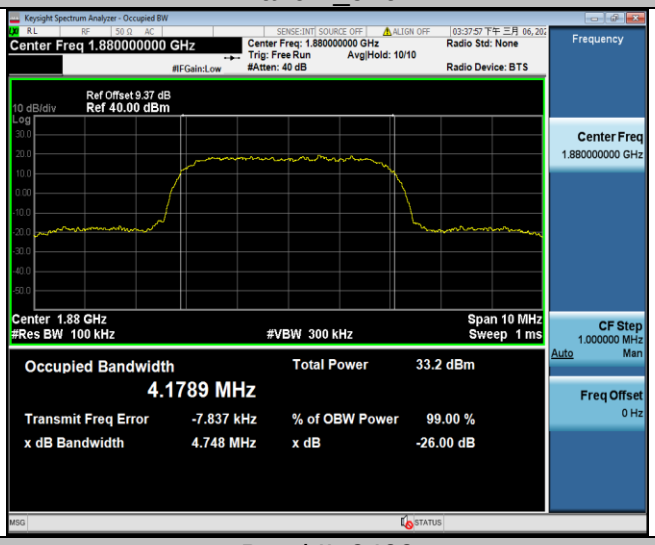
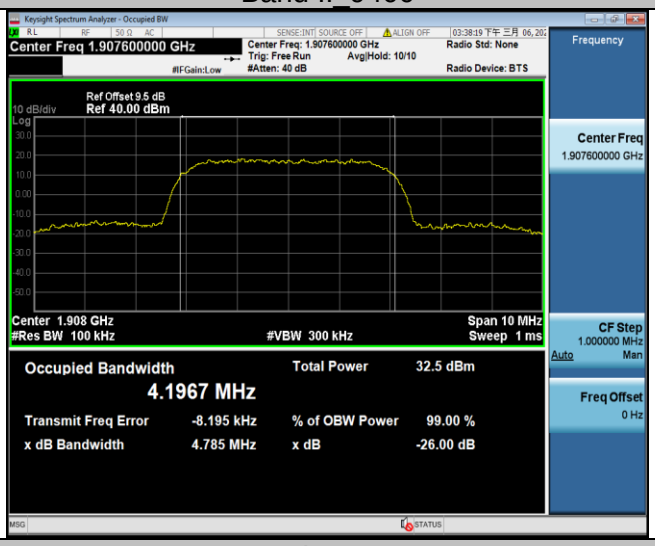


Band II_9262

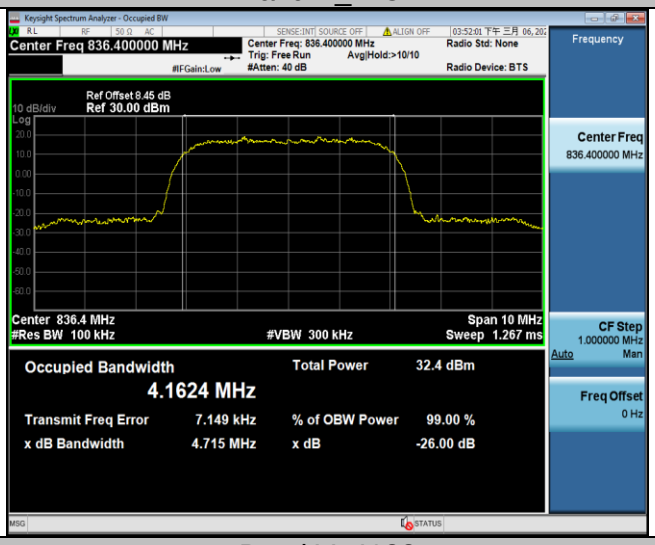


Band II_9400

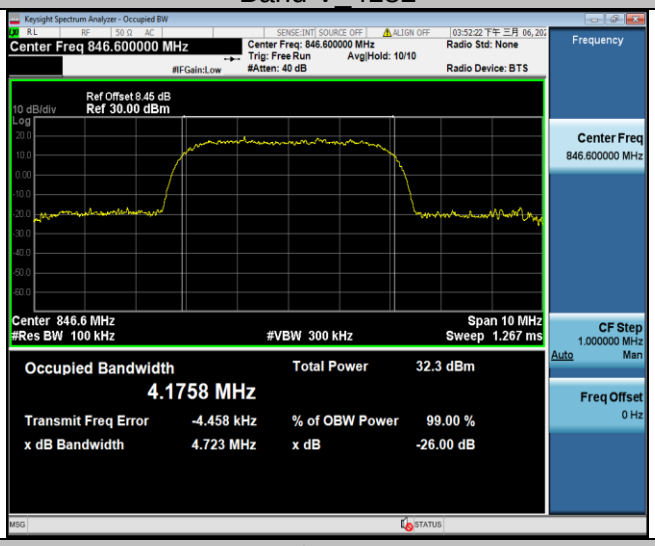


Band II_9538

Band V_4132



Band V_4182



Band V_4233

5.4 BAND EDGE

5.4.1 MEASUREMENT METHOD

1. All out of band emissions are measured with an analyzer spectrum connected to the antenna terminal of the EUT while the EUT at its maximum duty cycle, at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration
2. The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.
3. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
4. Span was set large enough so as to capture all out of band emissions near the band edge.
5. RBW>1% of the emission bandwidth, VBW >=3 x RBW, Detector=RMS, Number of points>=2 x Span/RBW, Trace mode=max hold, Sweep time=auto couple, and the trace was allowed to stabilize

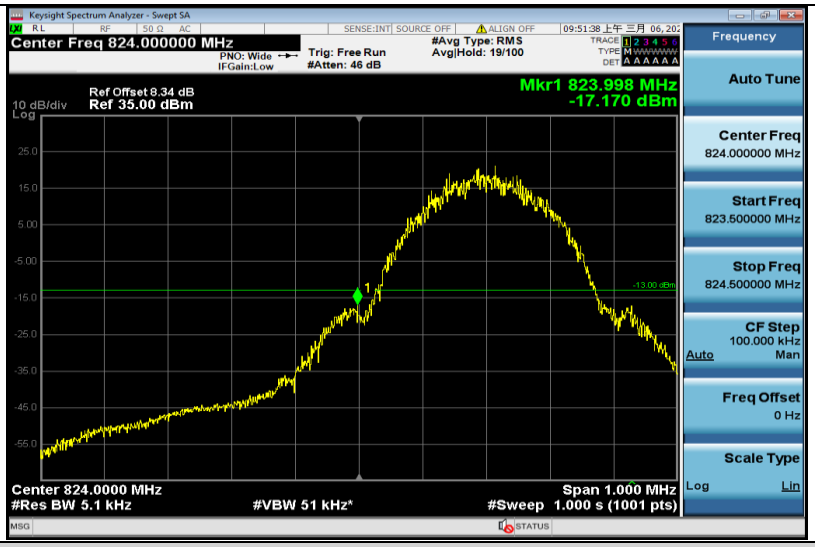
5.4.2 PROVISIONS APPLICABLE

As Specified in FCC rules of 22.917(a), 24.238(a)and KDB 971168 D1 V03R01.

5.4.3 Test Results

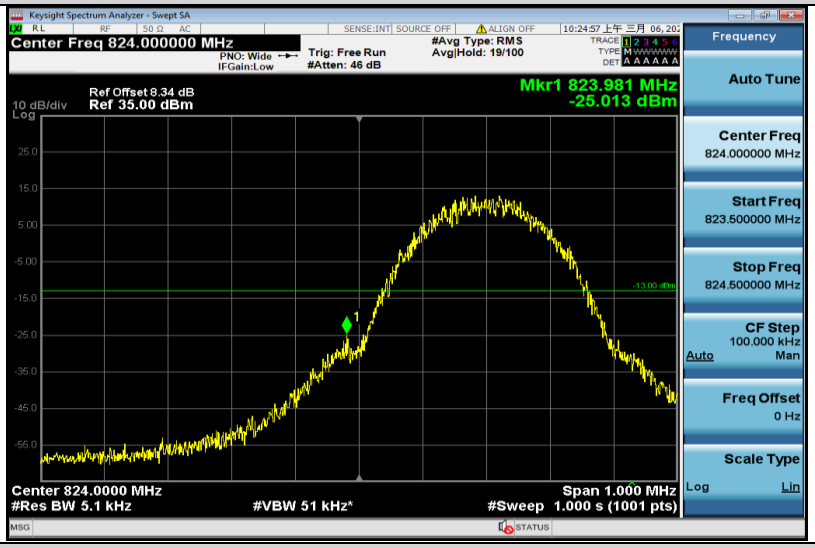
Band	Channel	Value(dBm)	Limit(dBm)	Verdict
GPRS850	128	-17.17	-13	PASS
GPRS850	251	-16.54	-13	PASS
EGPRS850	128	-25.01	-13	PASS
EGPRS850	251	-26.75	-13	PASS
GPRS1900	512	-19.86	-13	PASS
GPRS1900	810	-19.67	-13	PASS
EGPRS1900	512	-25.79	-13	PASS
EGPRS1900	810	-25.39	-13	PASS

Band	Channel	Value(dBm)	Limit(dBm)	Verdict
Band II	9262	-13.08	-13	PASS
Band II	9538	-14.99	-13	PASS
Band V	4132	-14.50	-13	PASS
Band V	4233	-15.78	-13	PASS



GPRS850-128

GPRS850-251



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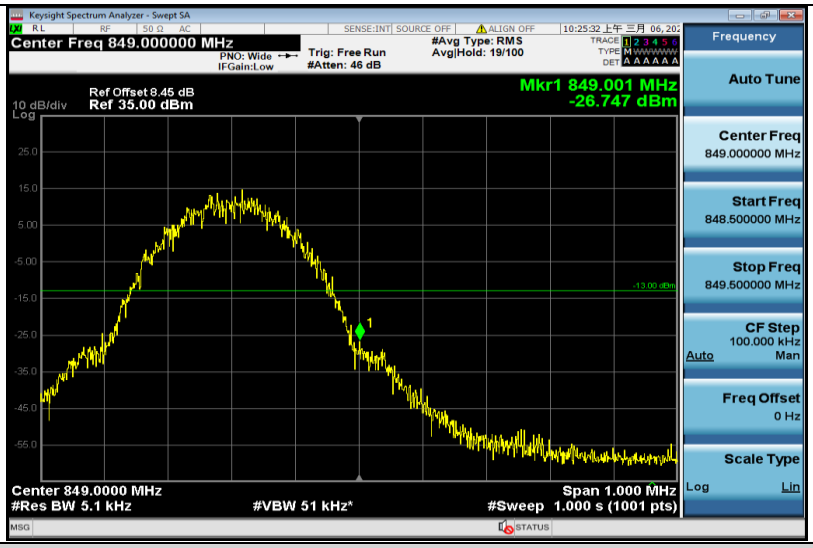

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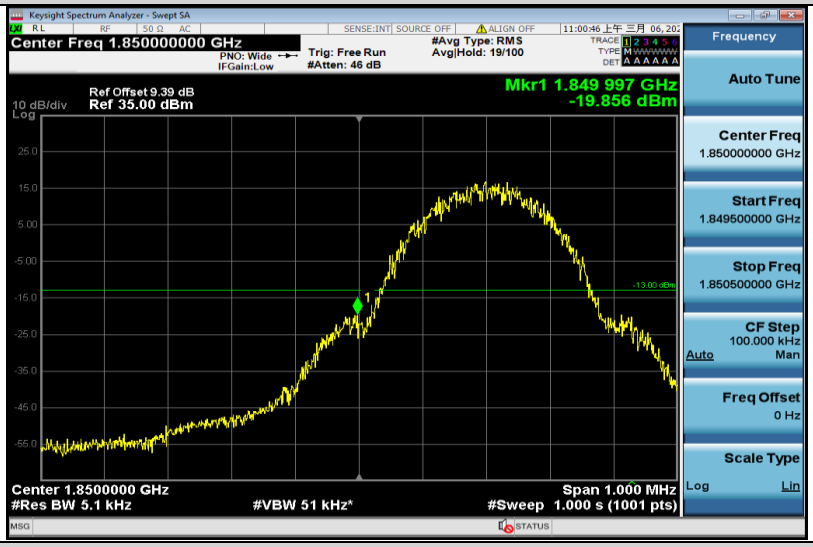
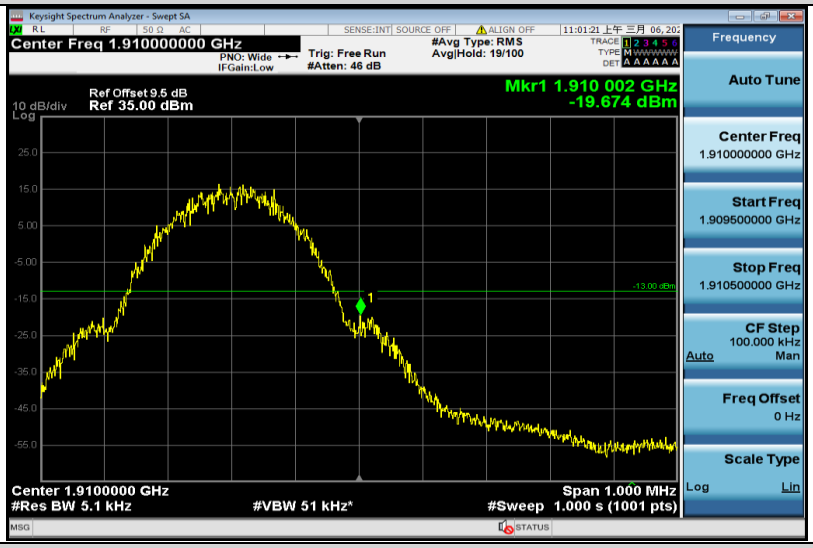


GPRS1900-512



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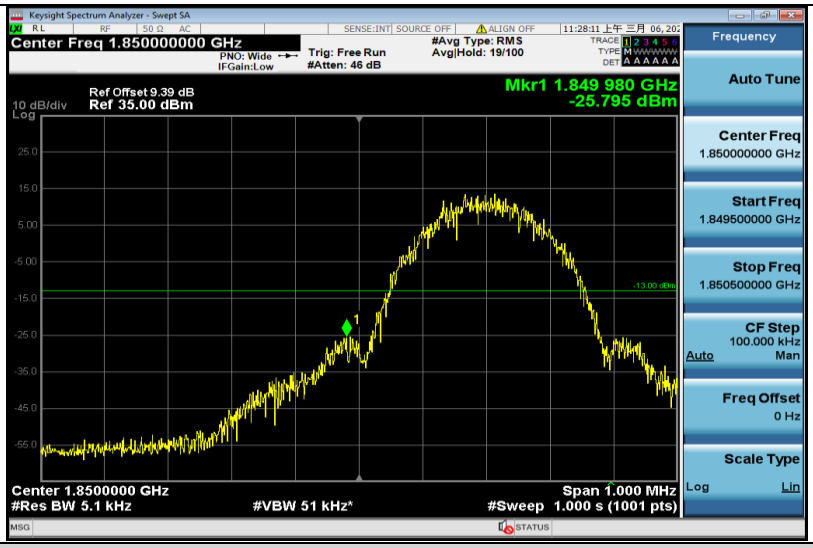

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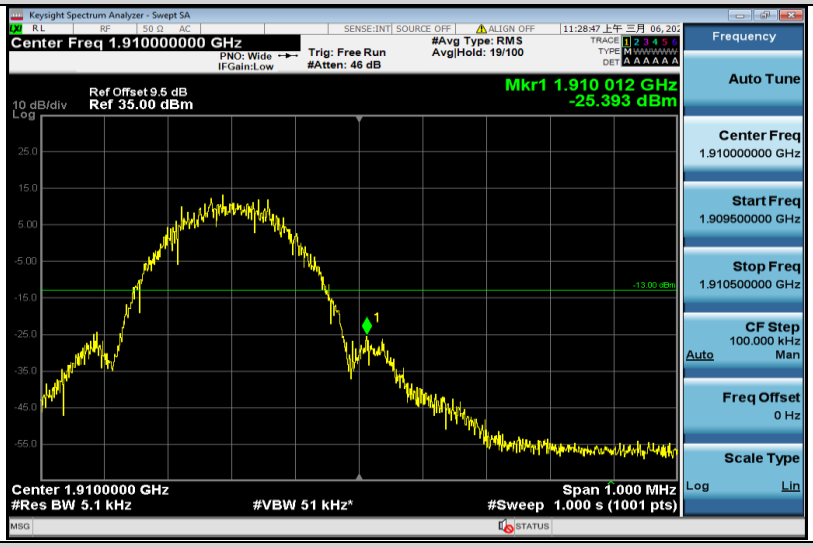

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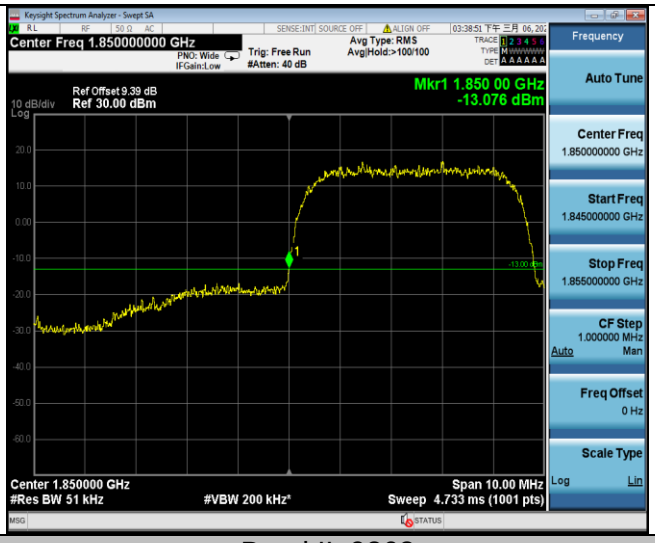
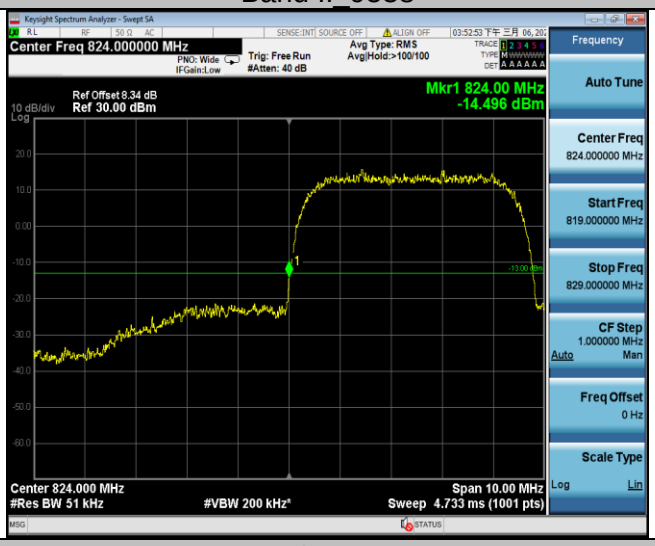
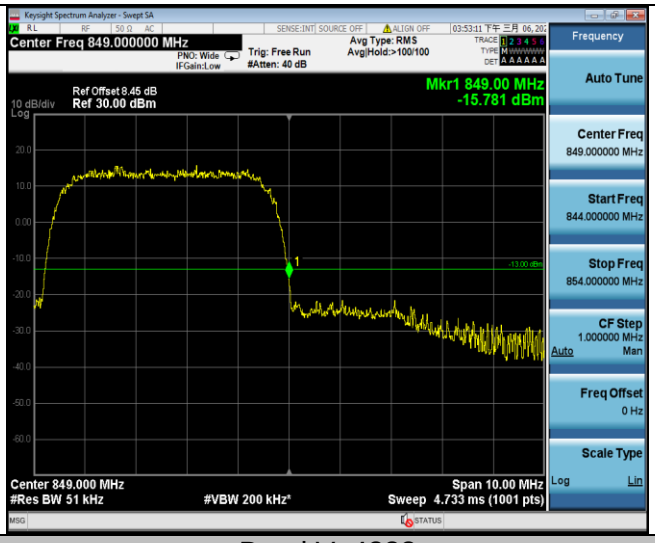


Band II_9262

Band II_9538



Band V_4132


Keysight Spectrum Analyzer - Swept SA
Center Freq 849.000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: RMS
Avg|Hold:>100/100
Ref Offset 8.45 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 849.00 MHz
-15.781 dBm
-13.00 dBm
Center 849.000 MHz
#Res BW 51 kHz
#VBW 200 kHz*
Span 10.00 MHz
Sweep 4.733 ms (1001 pts)
Frequency
Auto Tune
Center Freq
849.000000 MHz
Start Freq
844.000000 MHz
Stop Freq
854.000000 MHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

Band V_4233

5.5 SPURIOUS EMISSION

5.5.1 CONDUCTED SPURIOUS EMISSION

5.5.1.1 MEASUREMENT METHOD

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. The level of the carrier and the various conducted spurious and harmonic frequency is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration.
2. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 9 GHz.
3. Determine EUT transmit frequencies: the following typical channelswere chosen to conducted emissions testing.

Typical Channels for testing of GSM 850	
Channel	Frequency (MHz)
128	824.2
190	836.6
251	848.8

Typical Channels for testing of PCS 1900	
Channel	Frequency (MHz)
512	1850.2
661	1880.0
810	1909.8

Typical Channels for testing of UMTS band II	
Channel	Frequency (MHz)
9262	1852.4
9400	1880
9538	1907.6

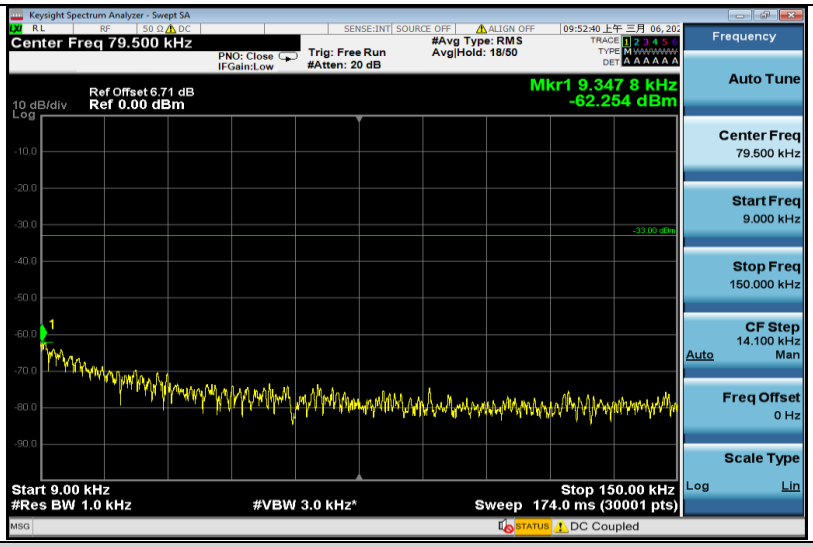
Typical Channels for testing of UMTS band V	
Channel	Frequency (MHz)
4132	846.4
4182	836.4
4233	846.6

5.5.1.2 PROVISIONS APPLICABLE

On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

5.5.1.3 MEASUREMENT RESULT

Pass



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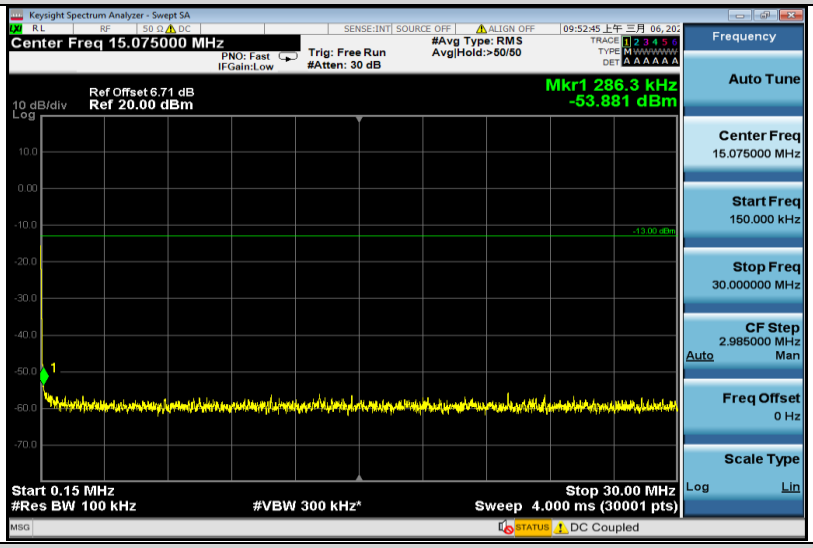

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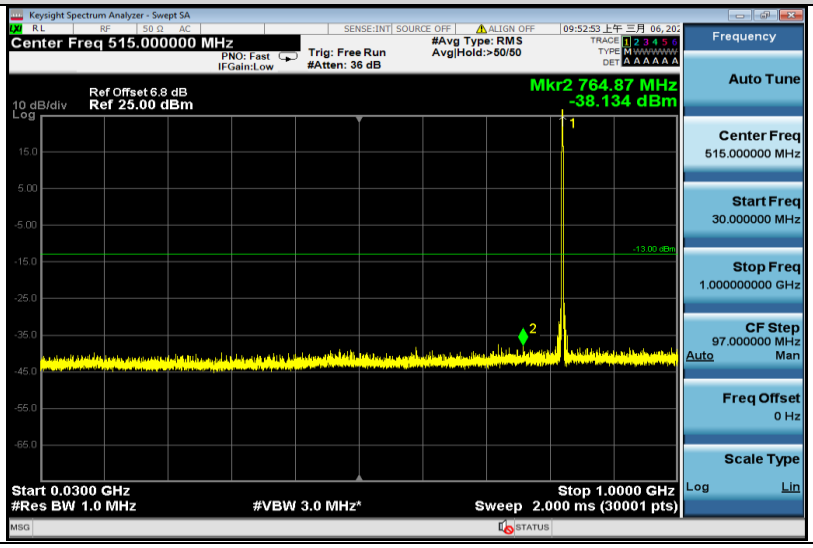

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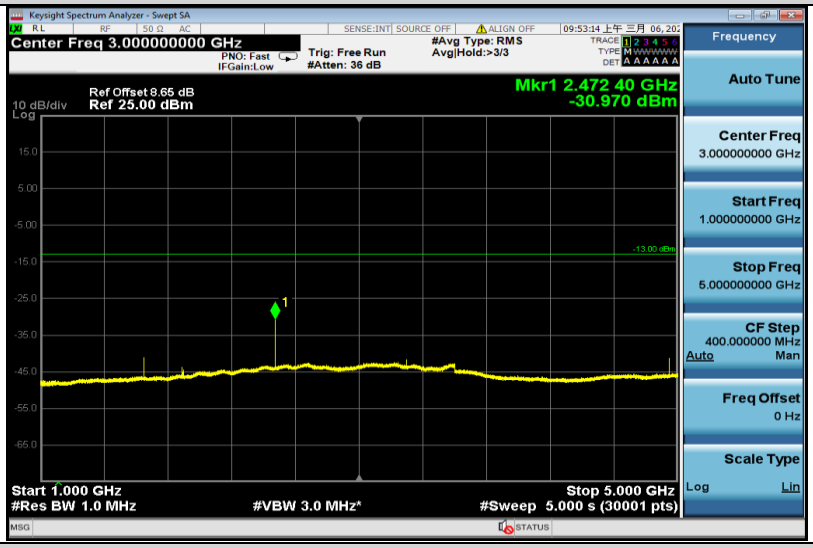

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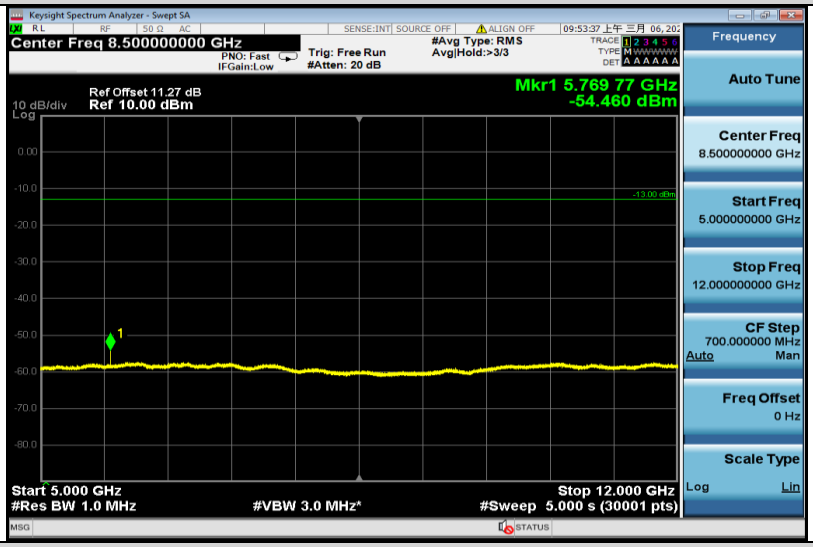

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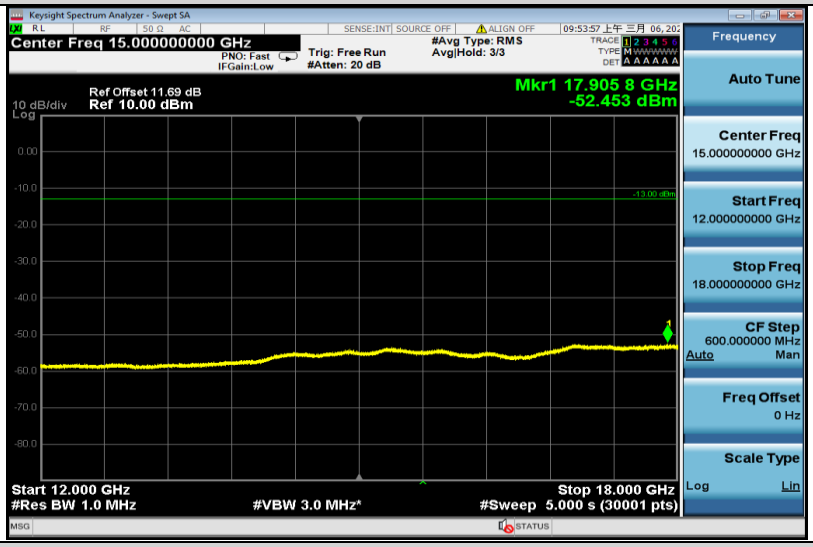

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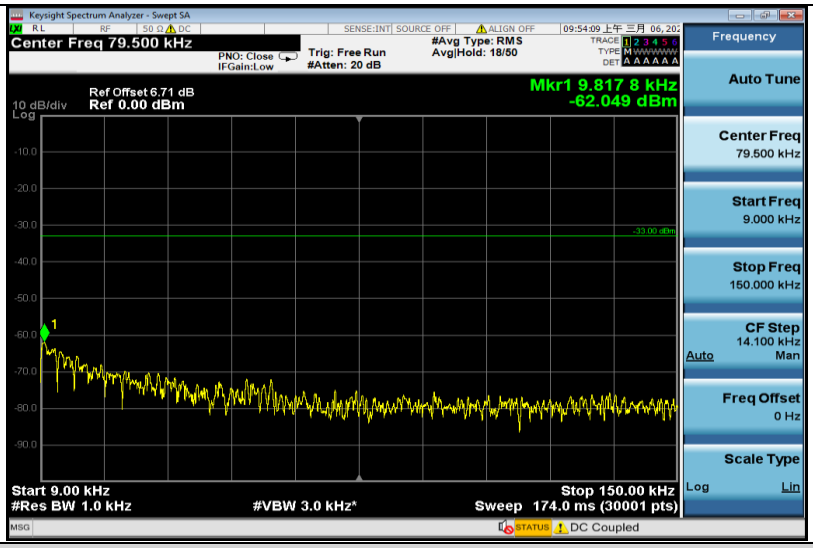

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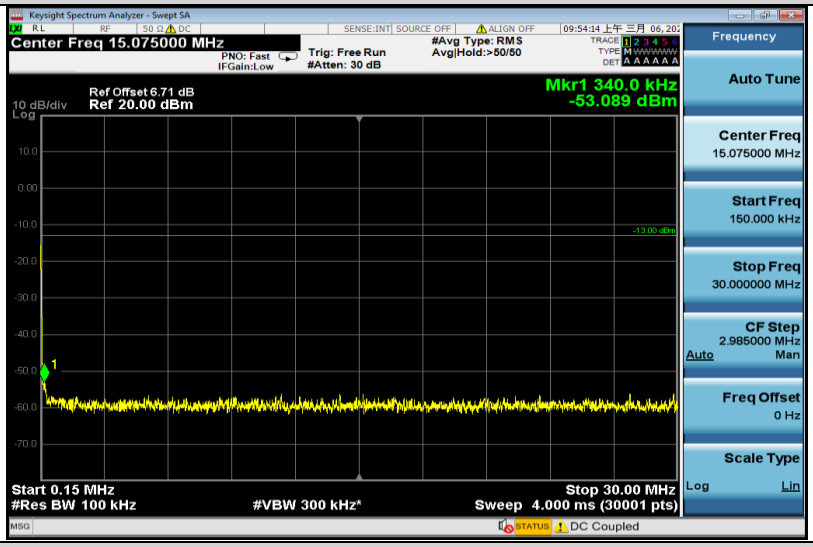

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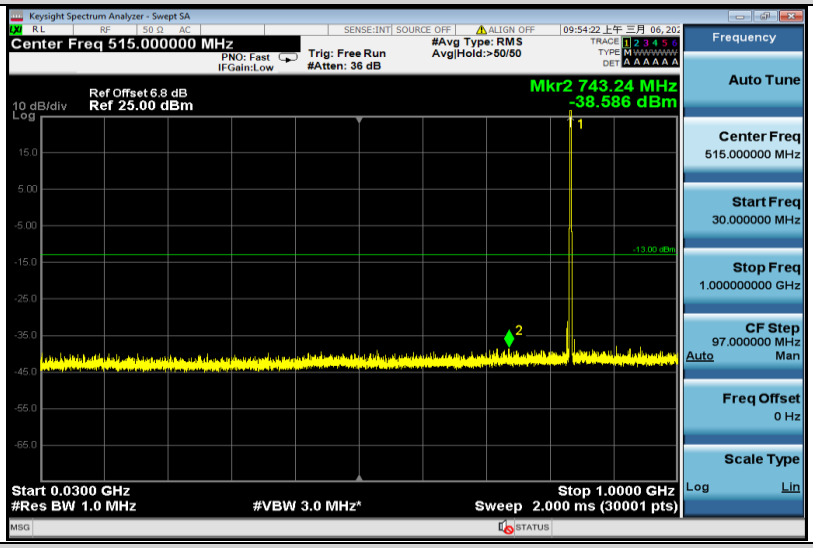

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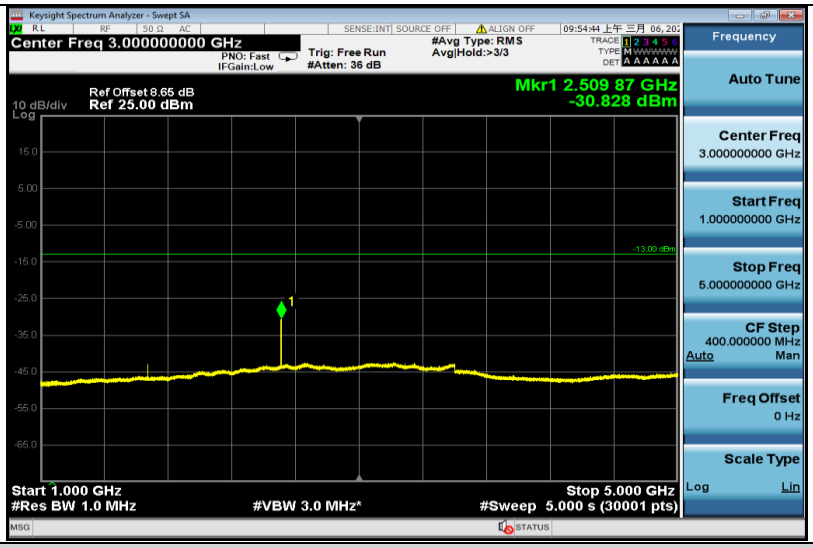

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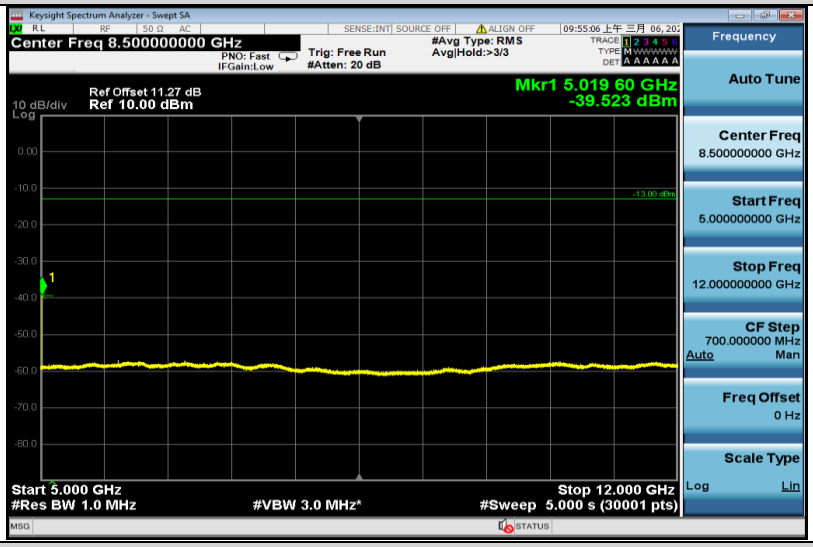

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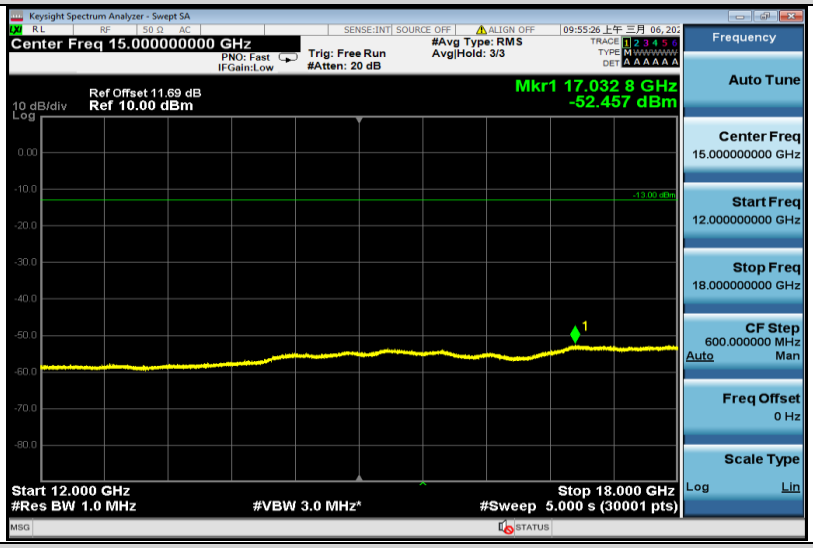

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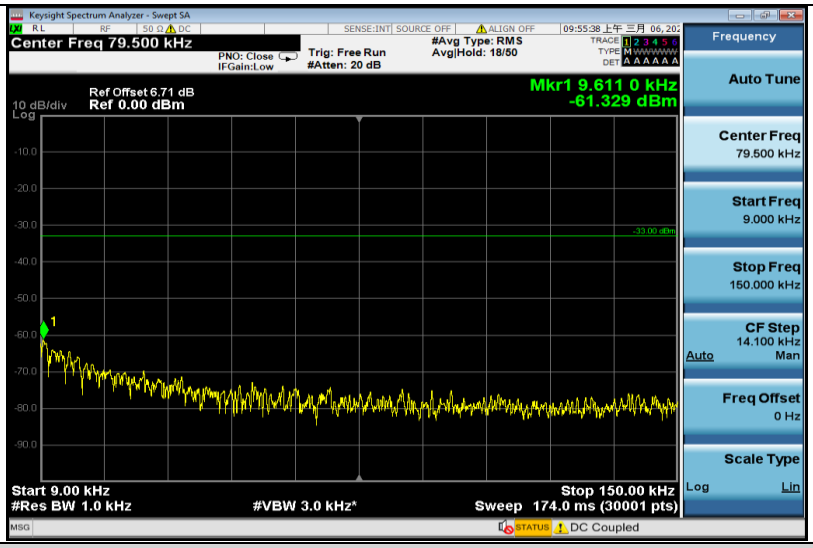

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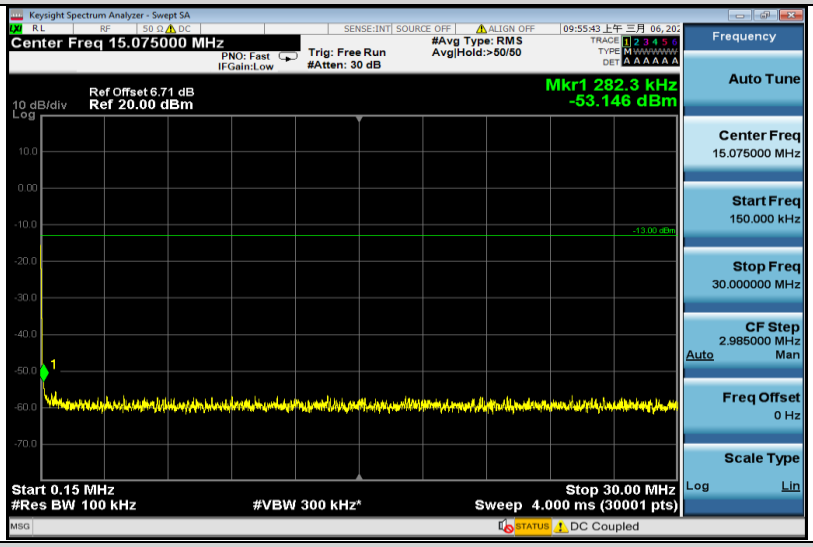

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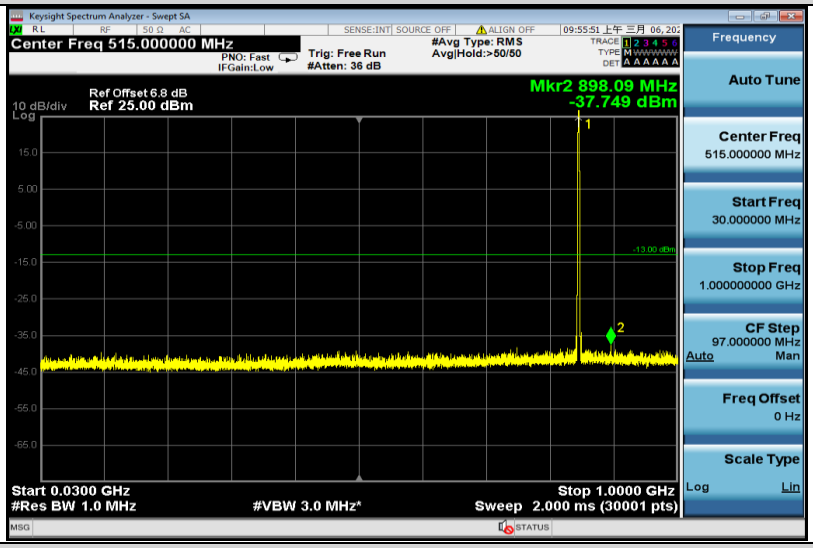

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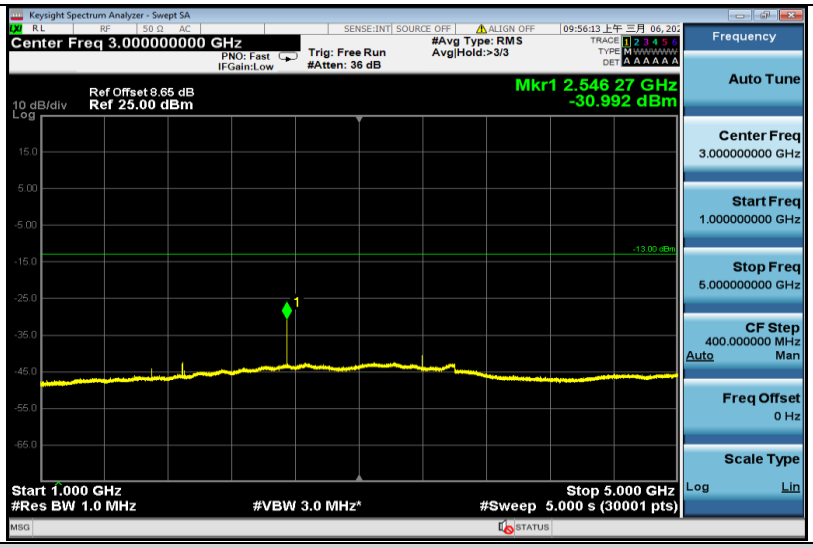

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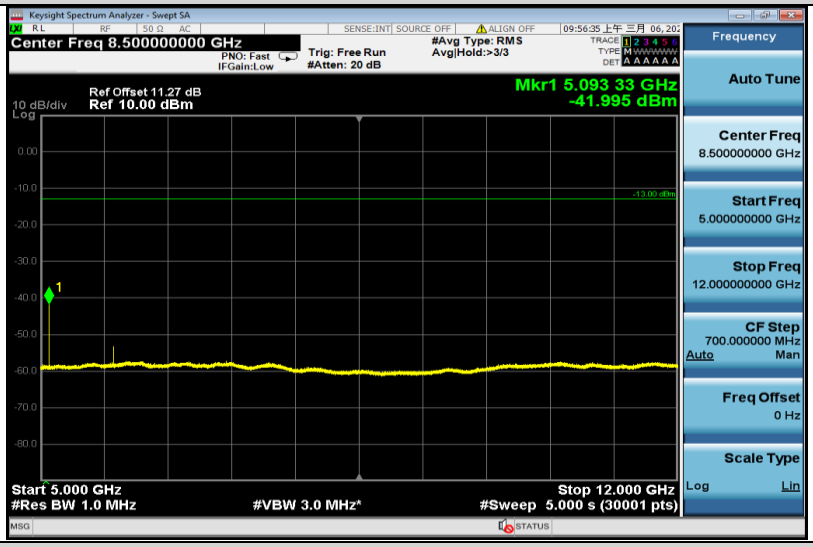

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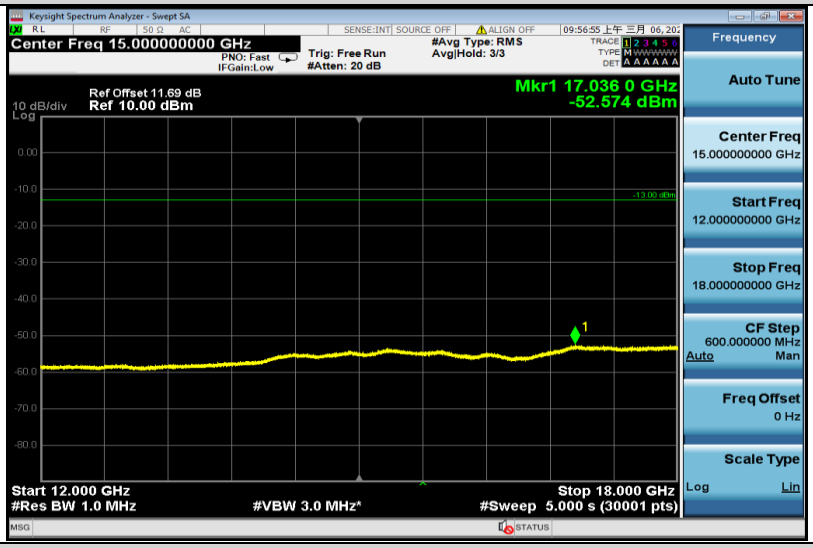

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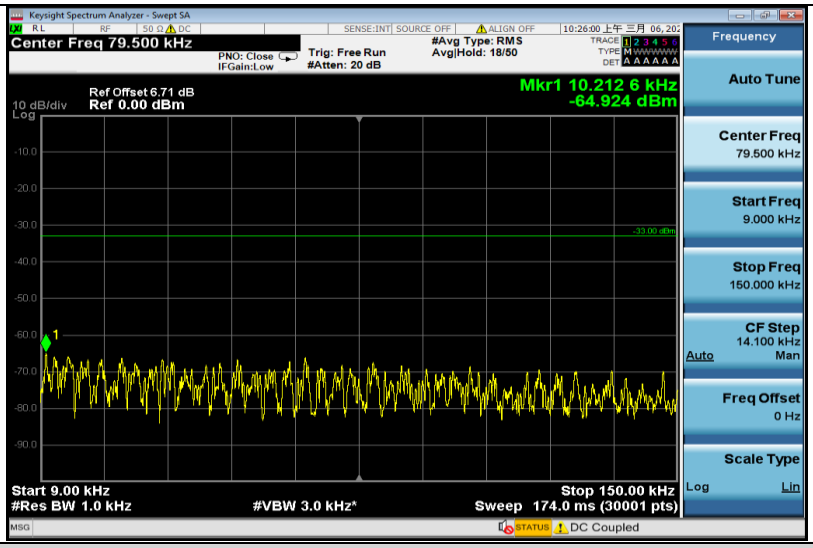

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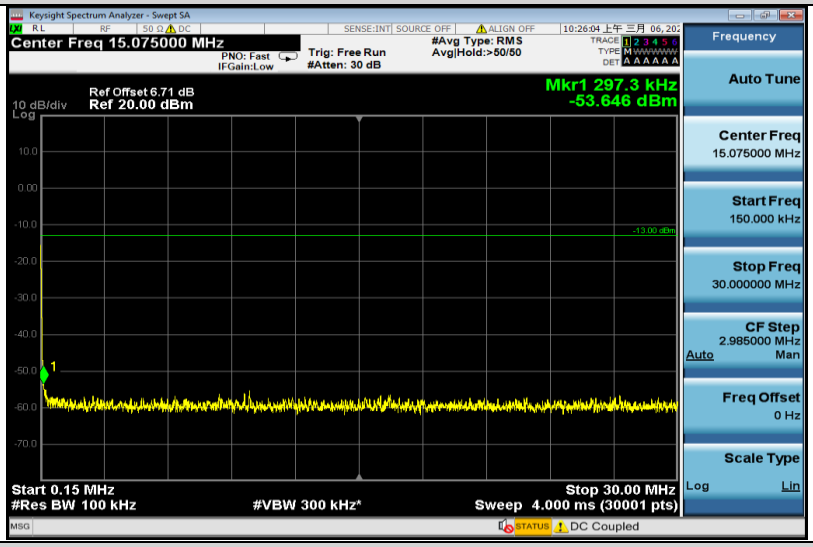

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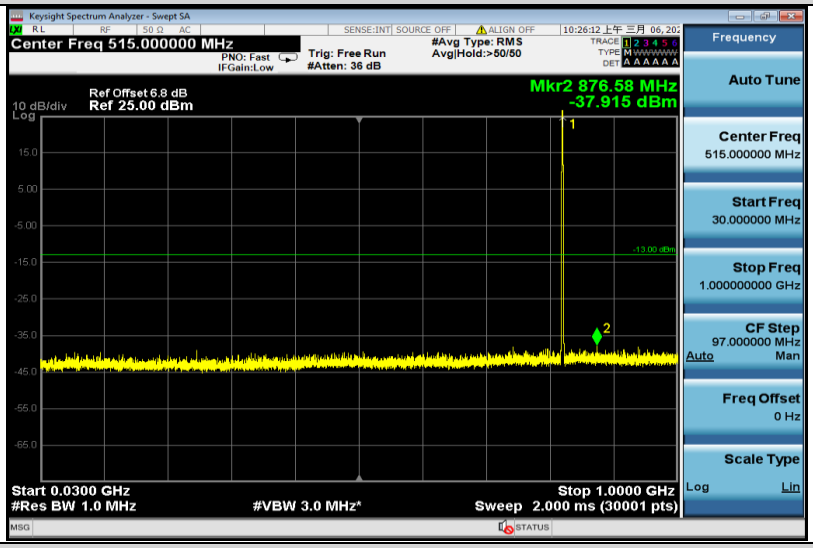

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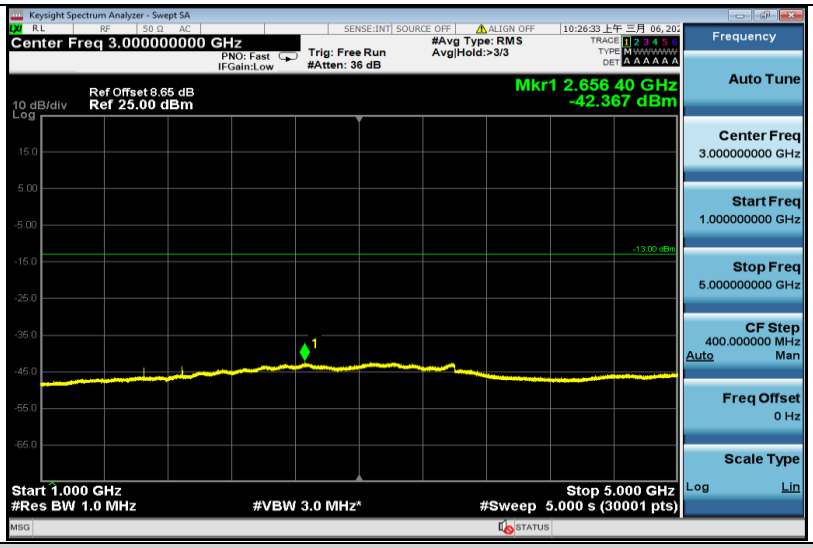

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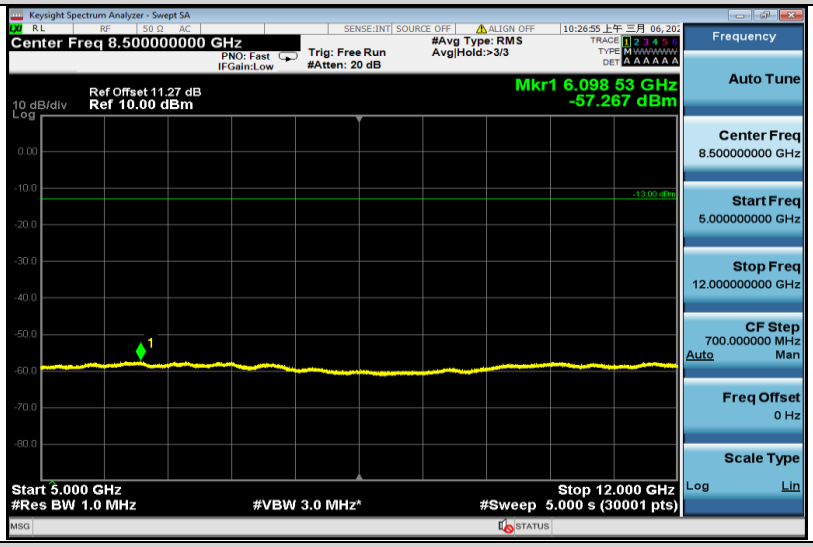

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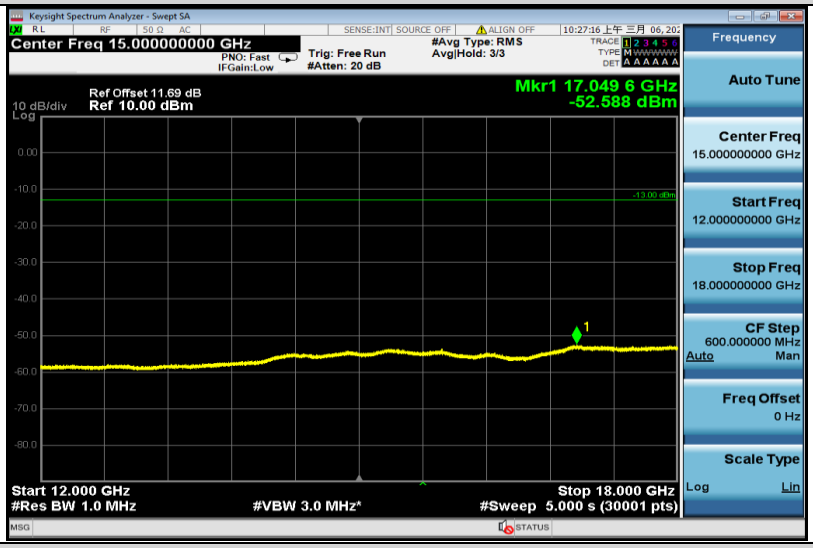

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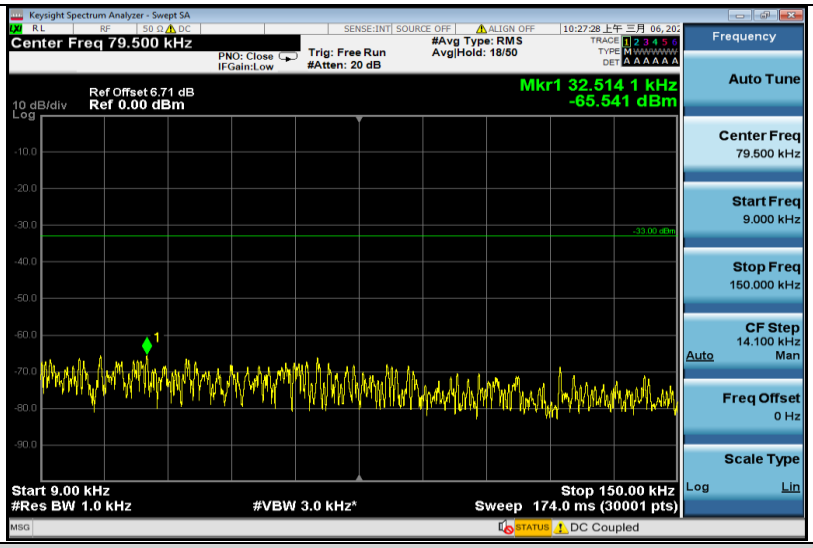

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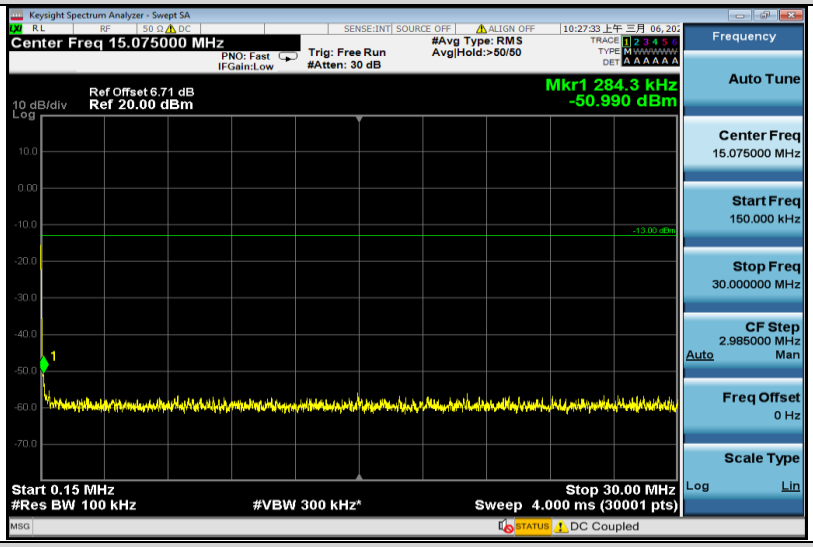

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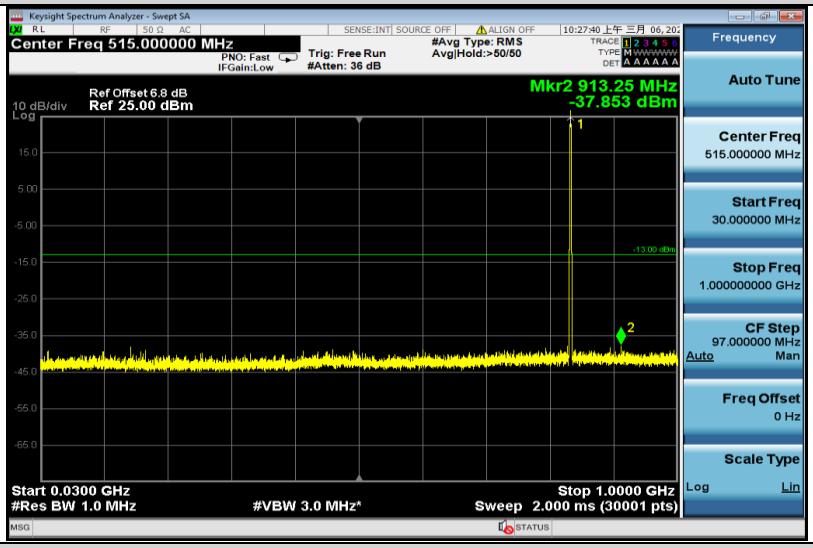

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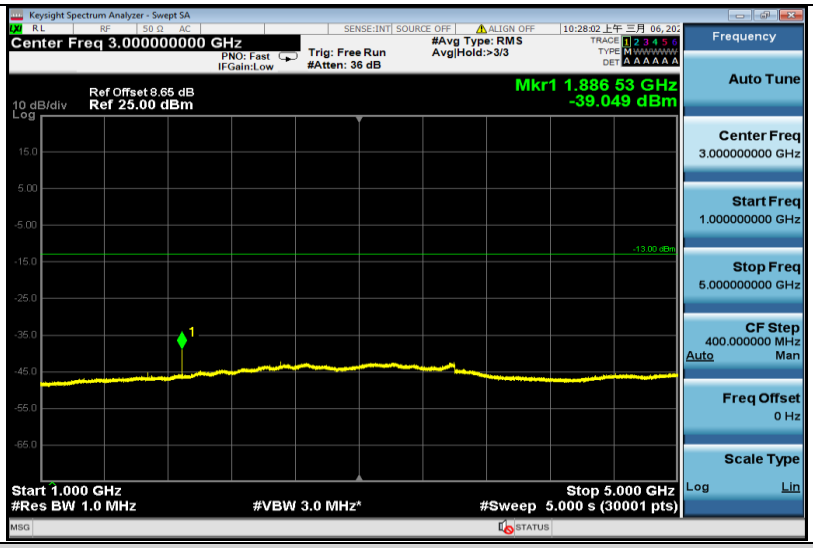

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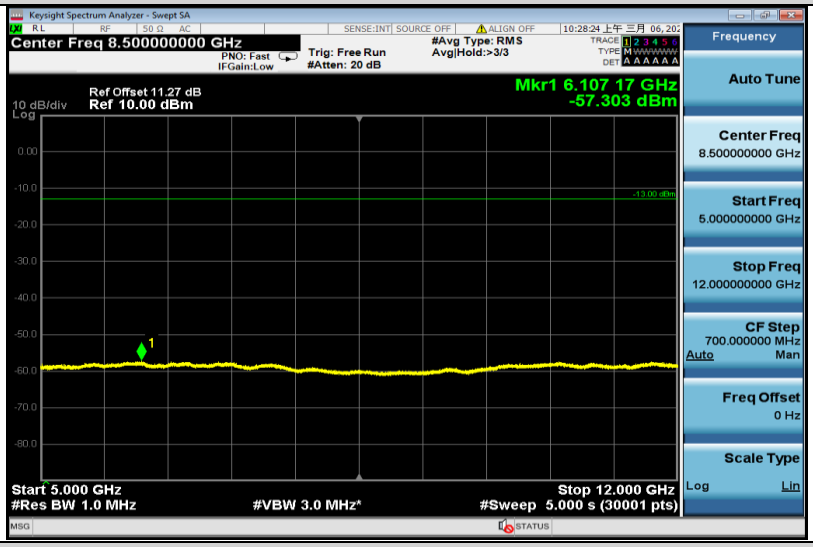

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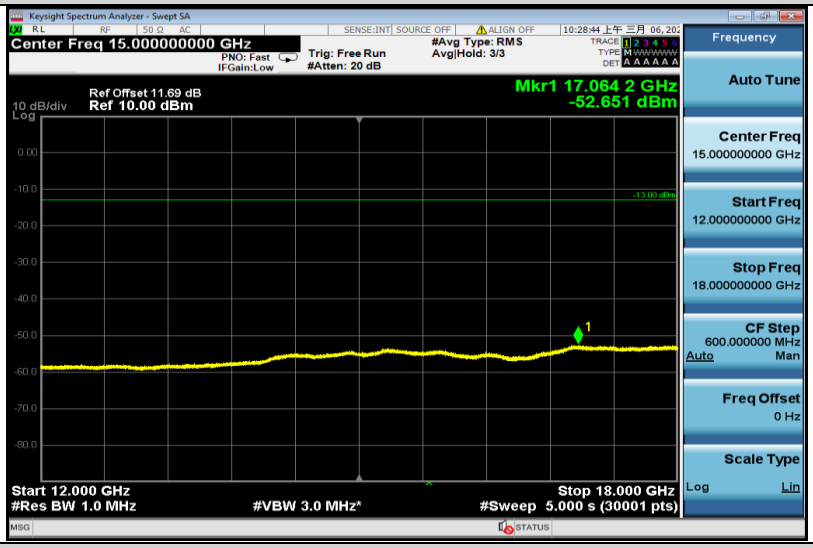

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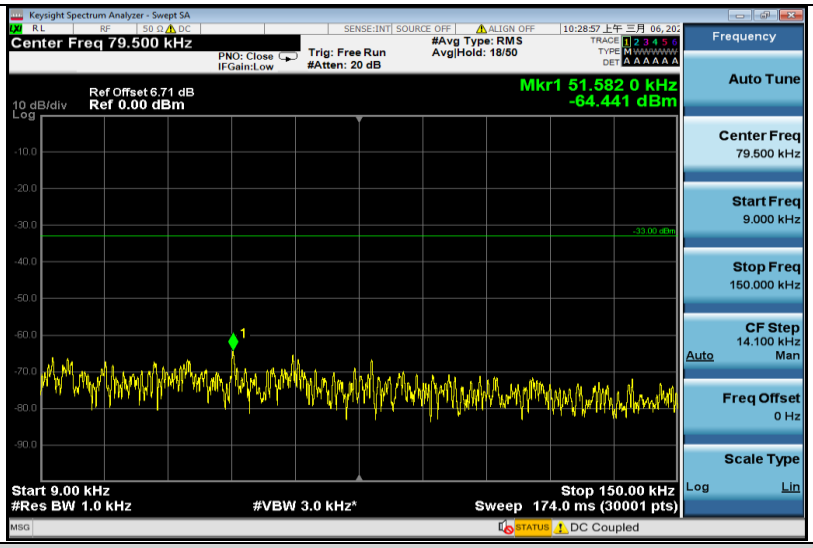

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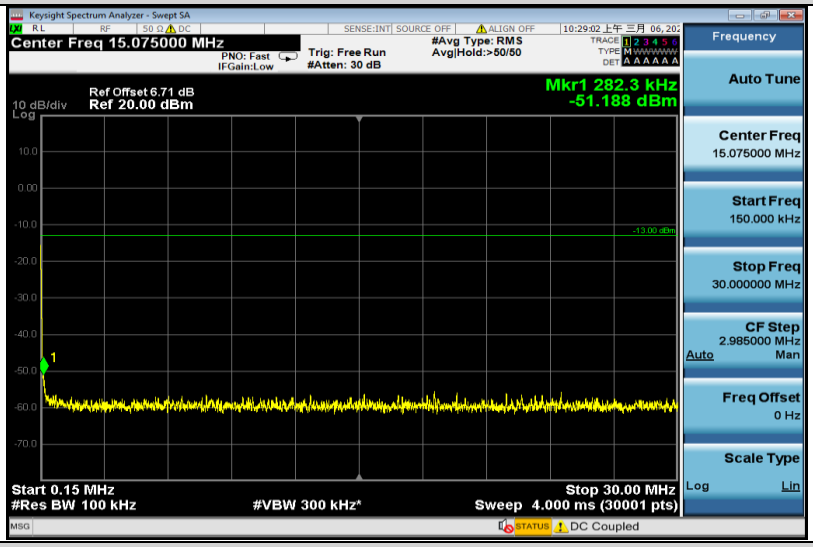

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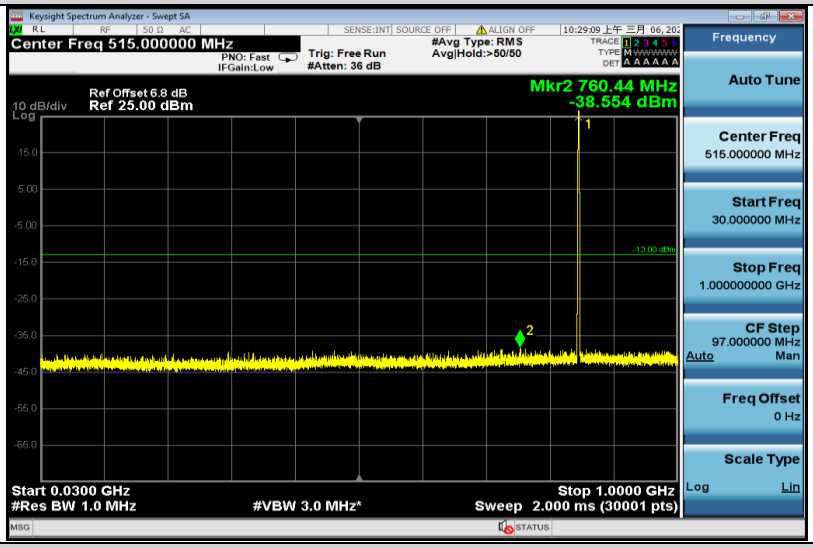

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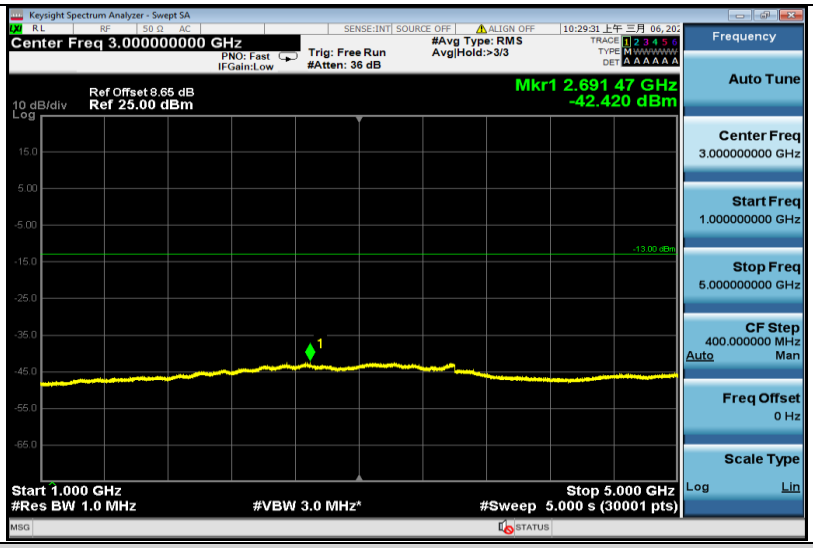

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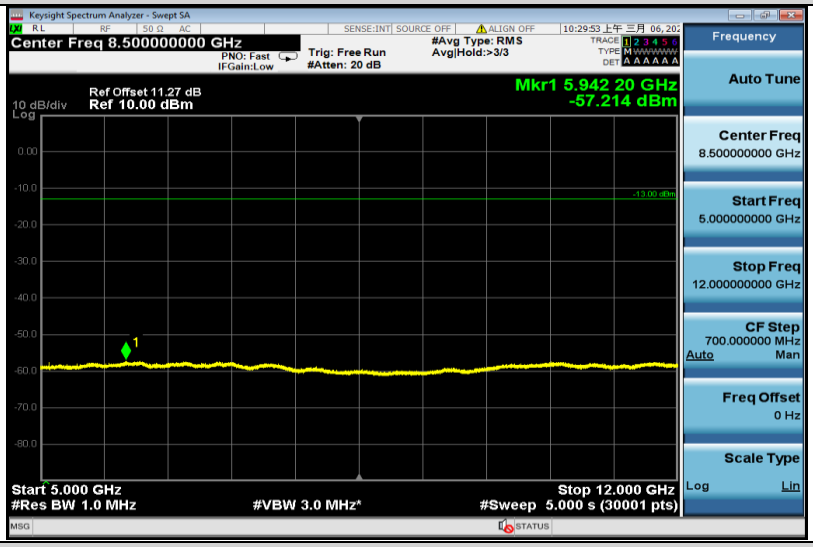

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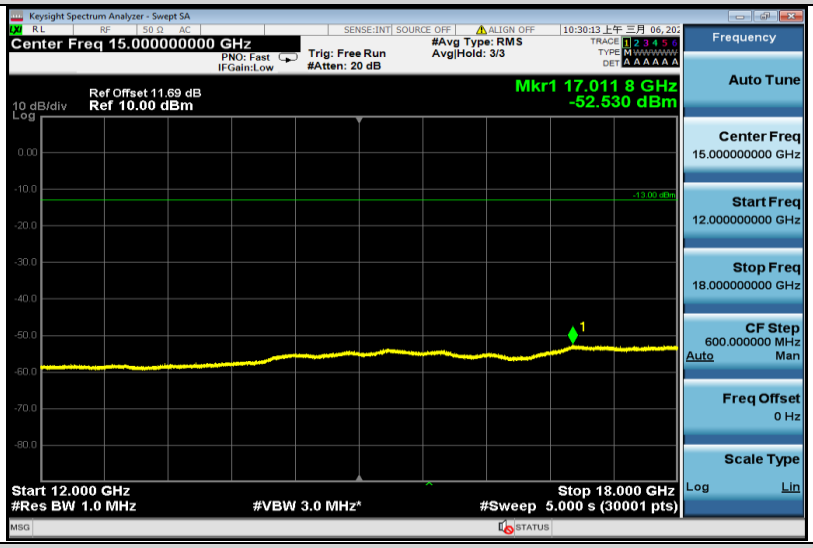

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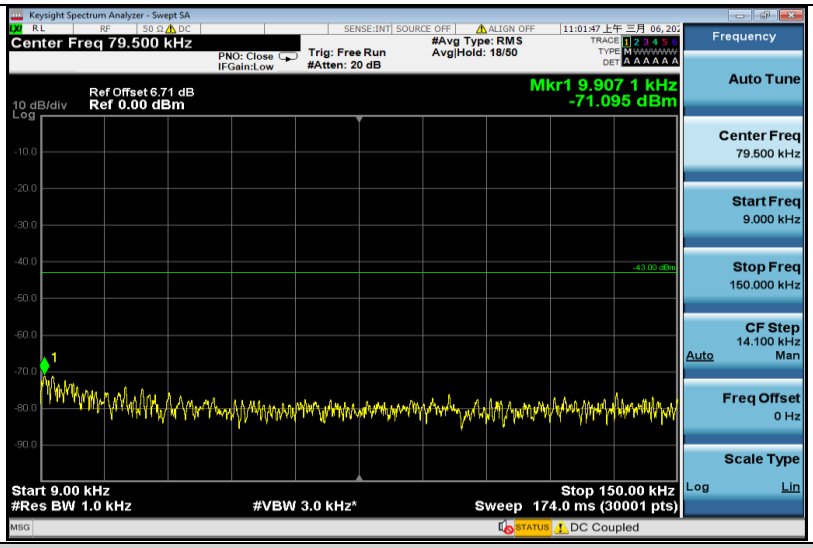

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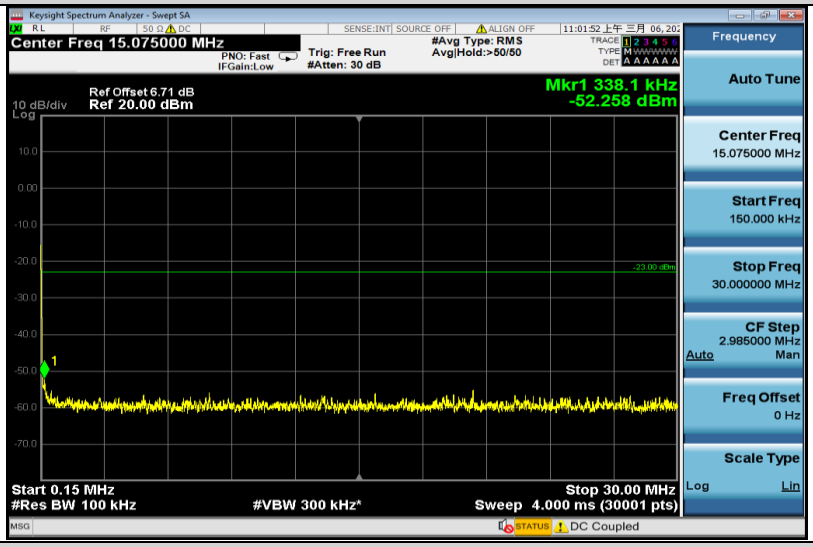

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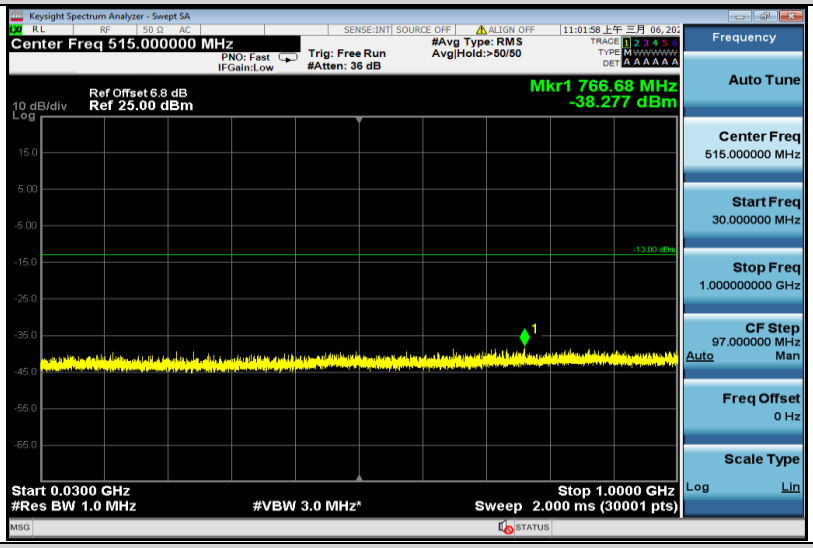

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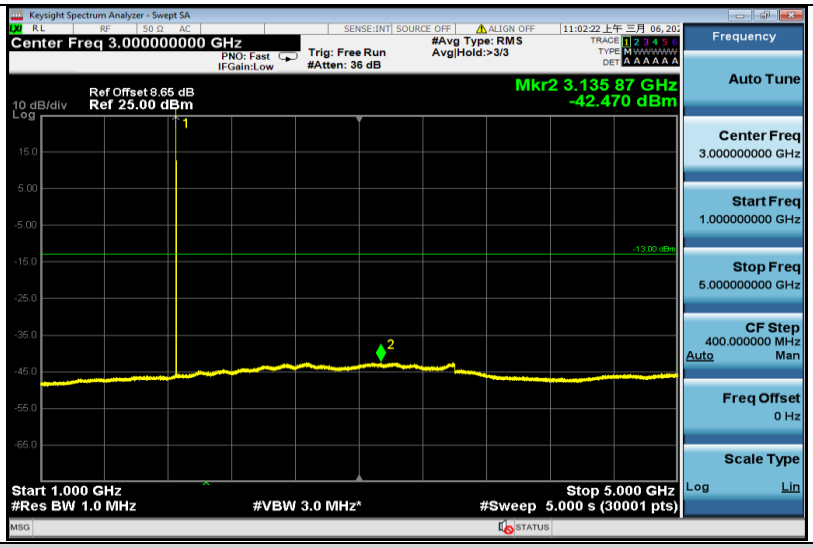

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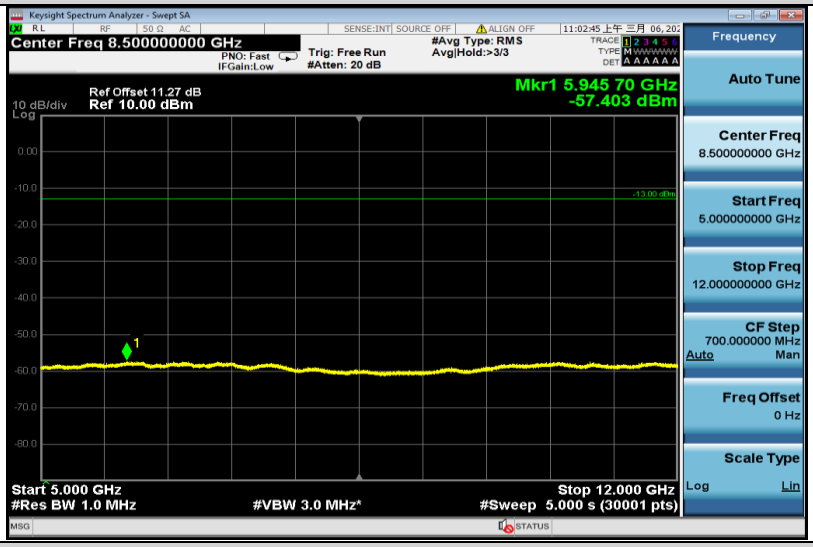

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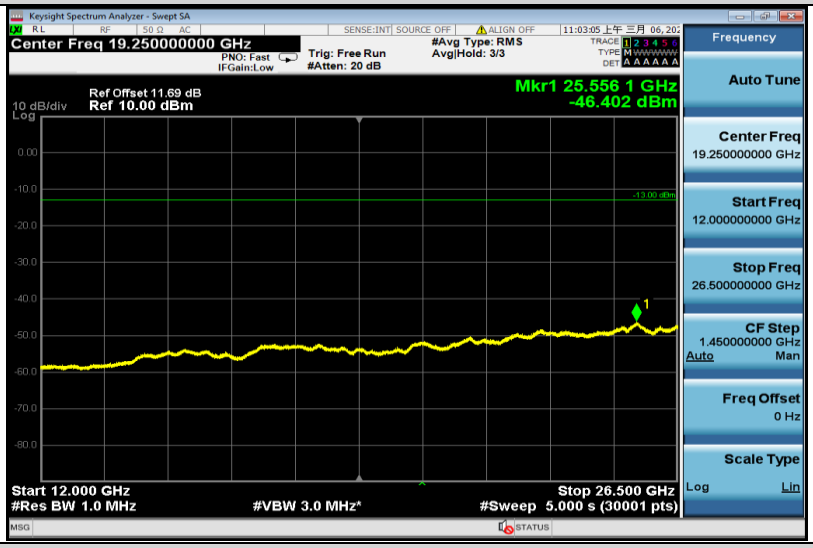

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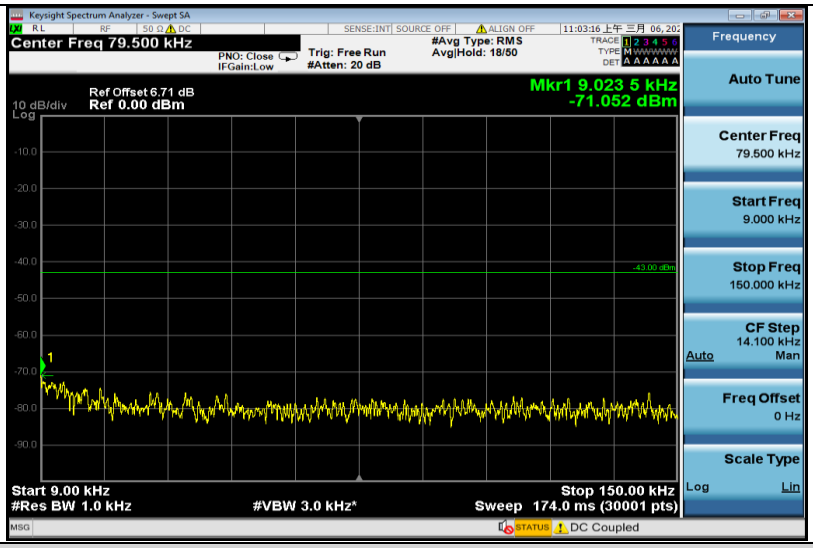

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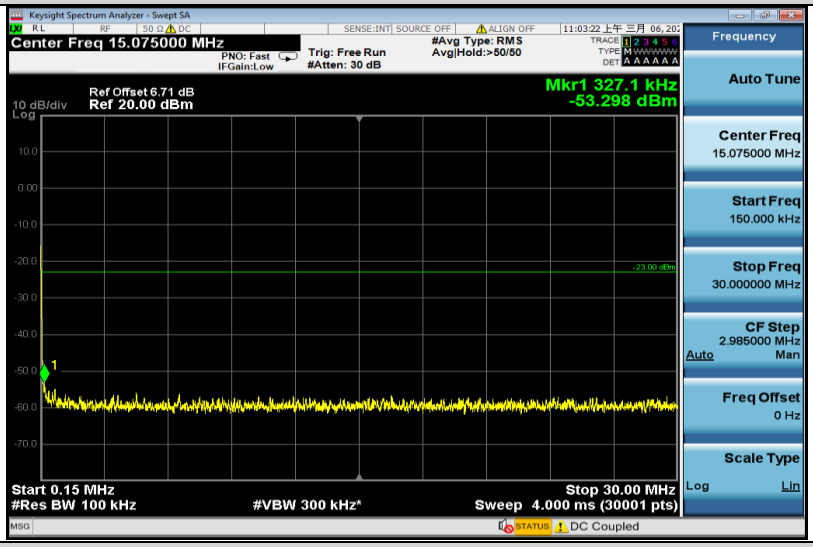

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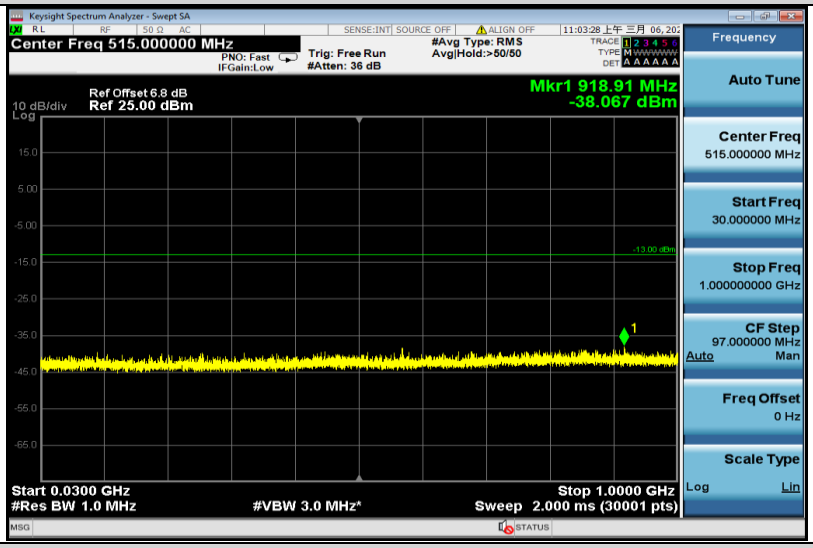

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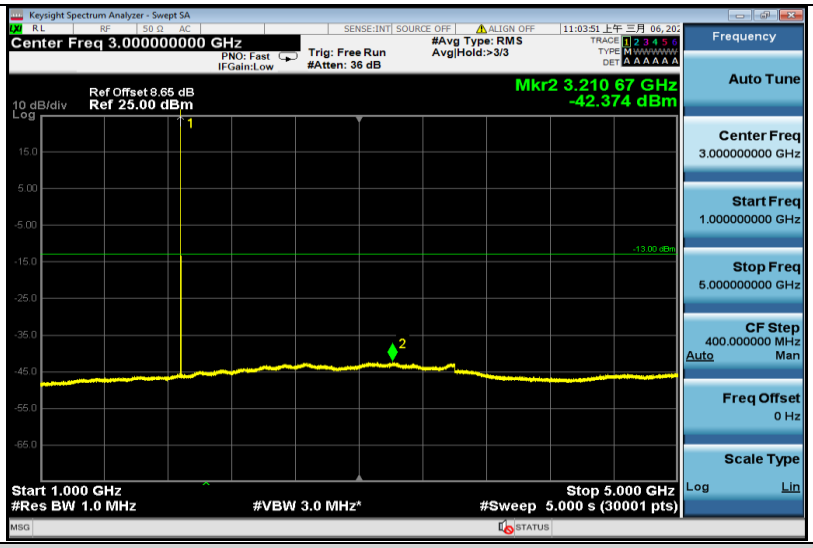

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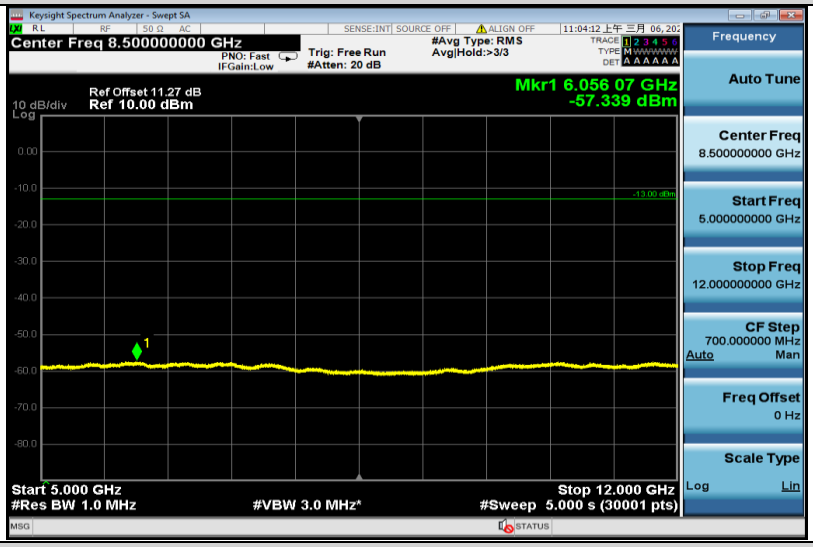

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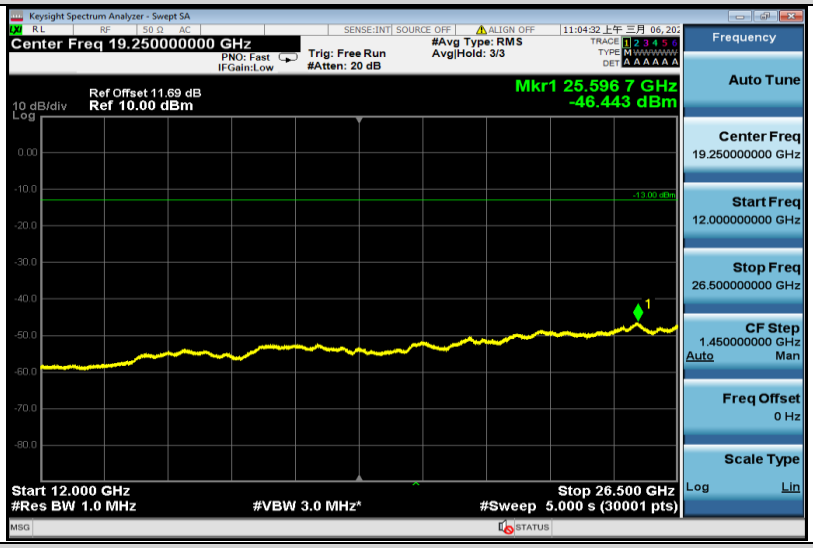

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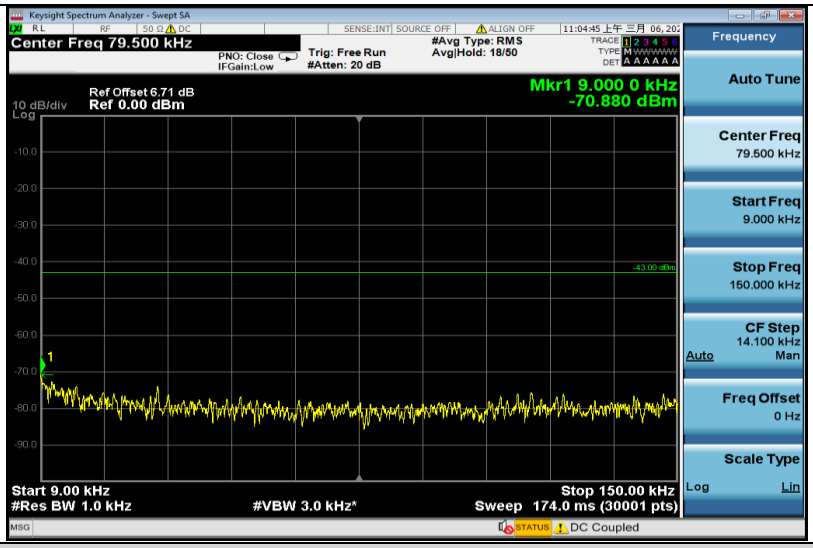

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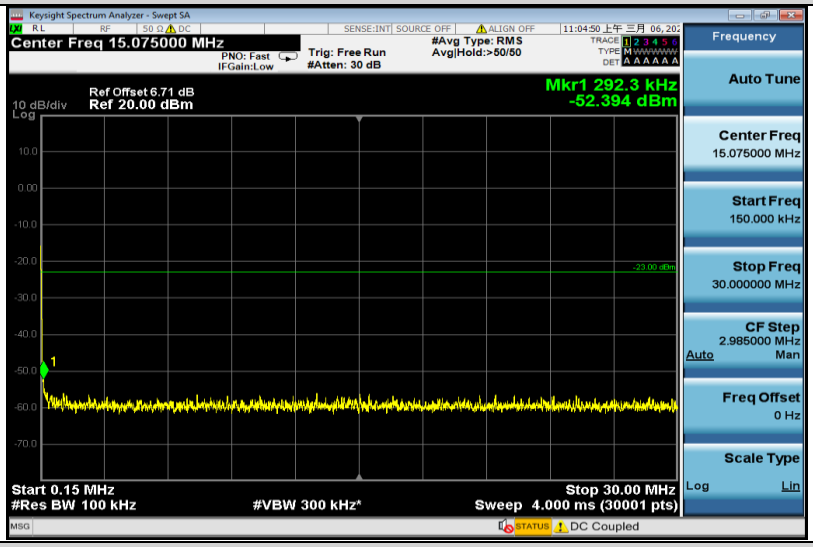

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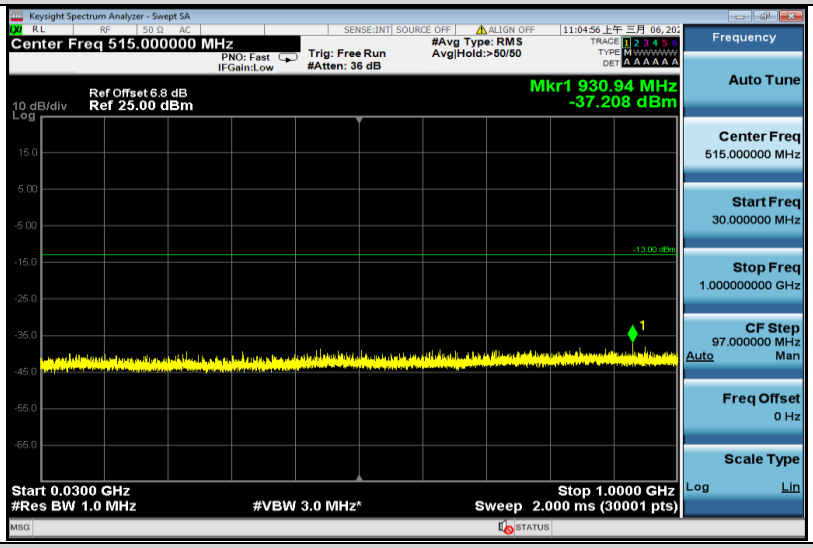

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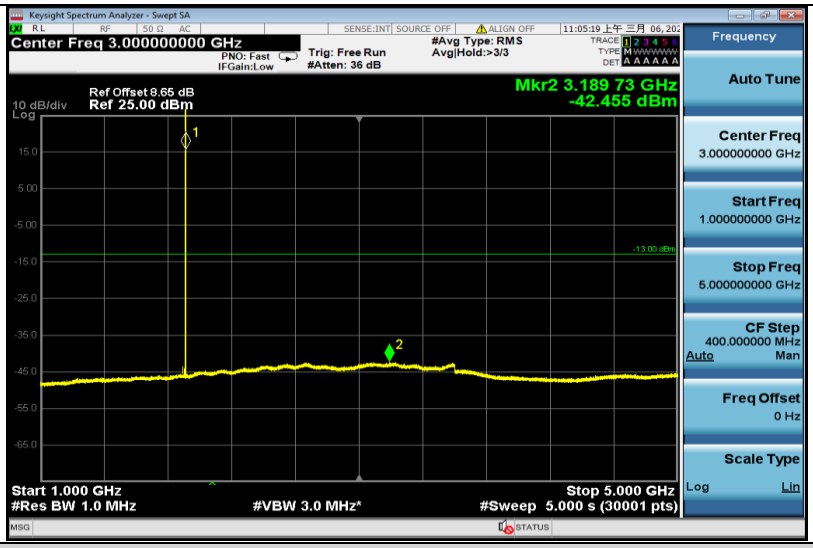

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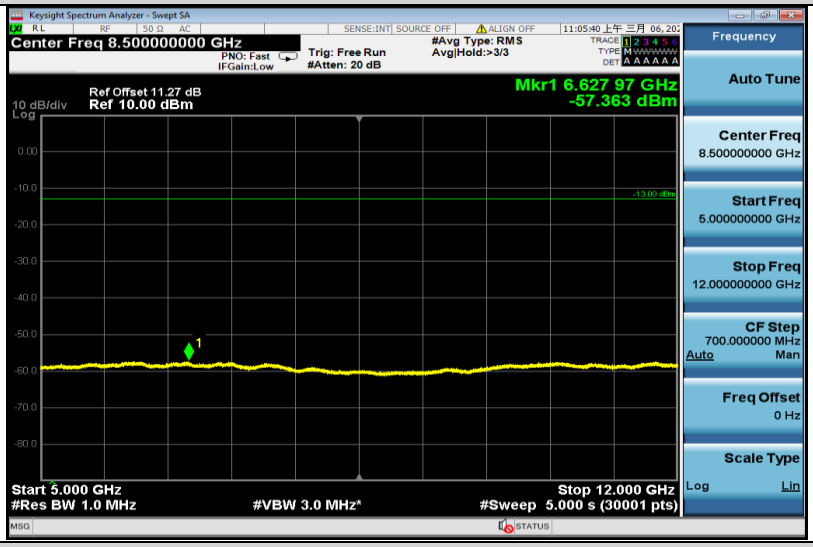

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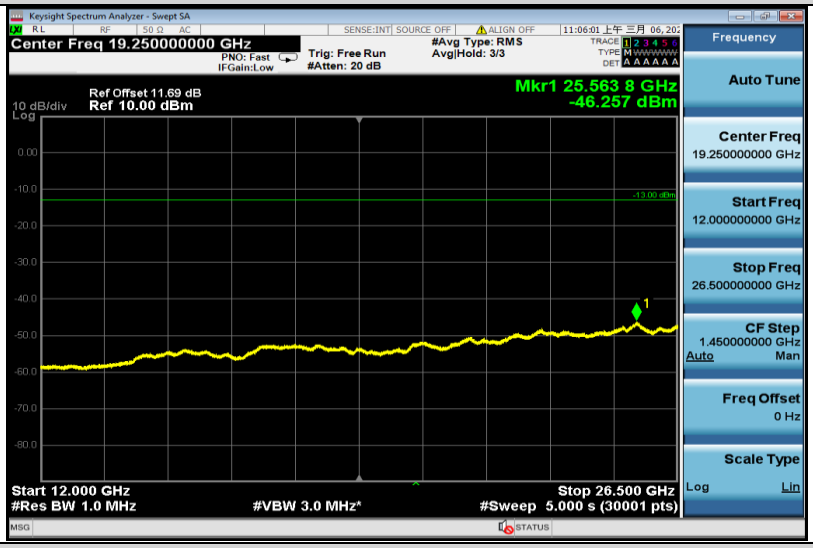

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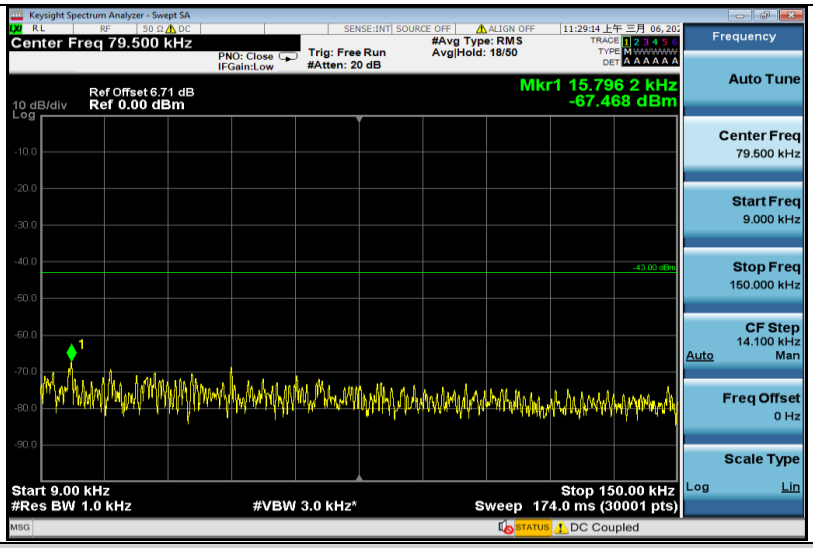

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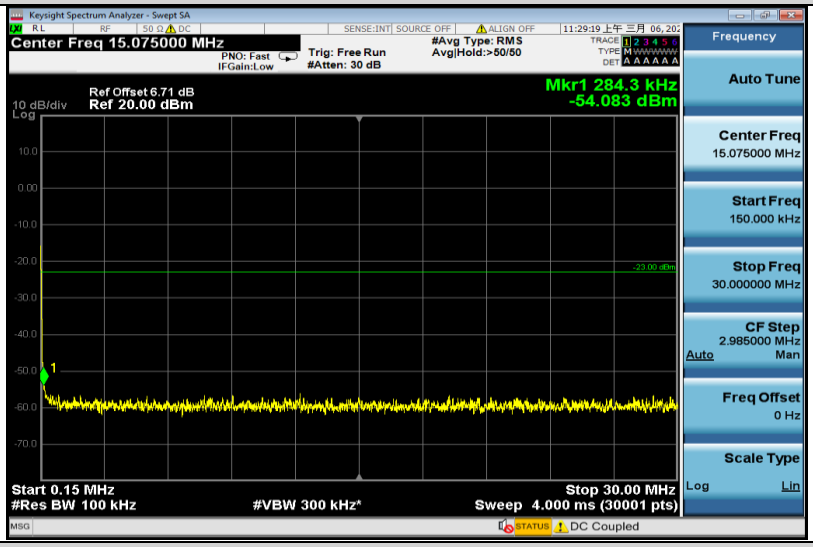

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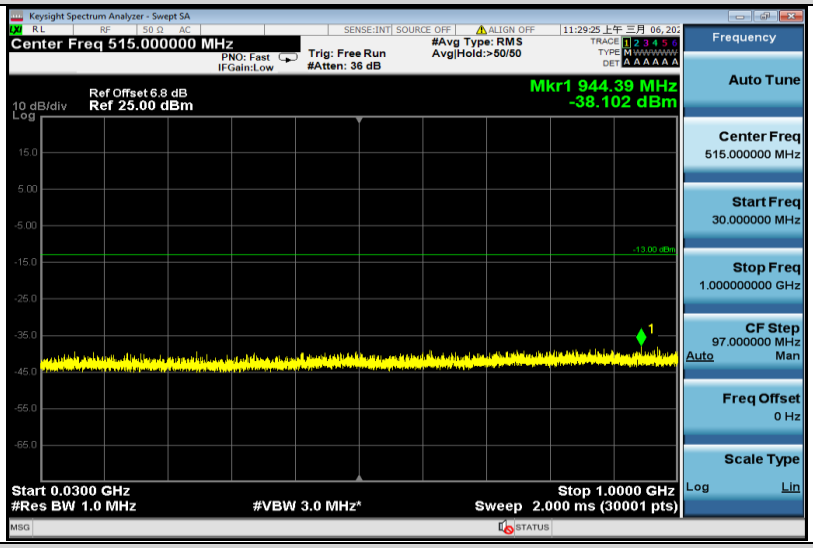

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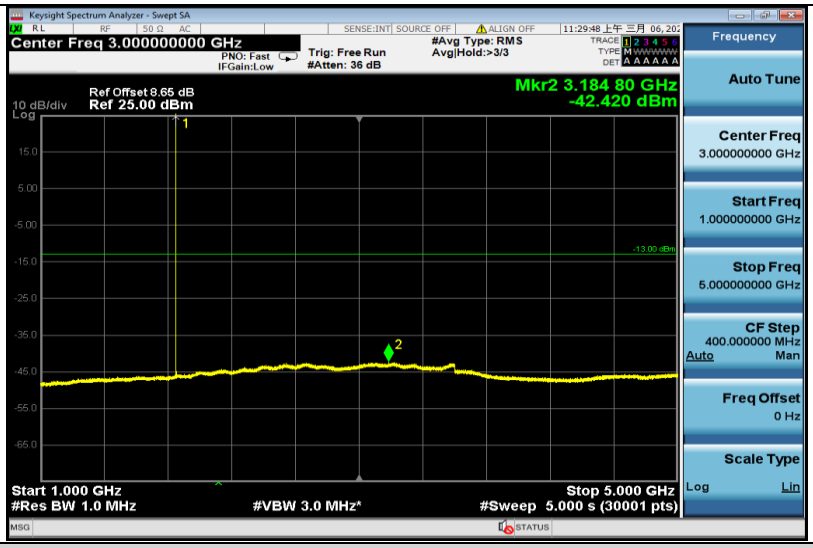

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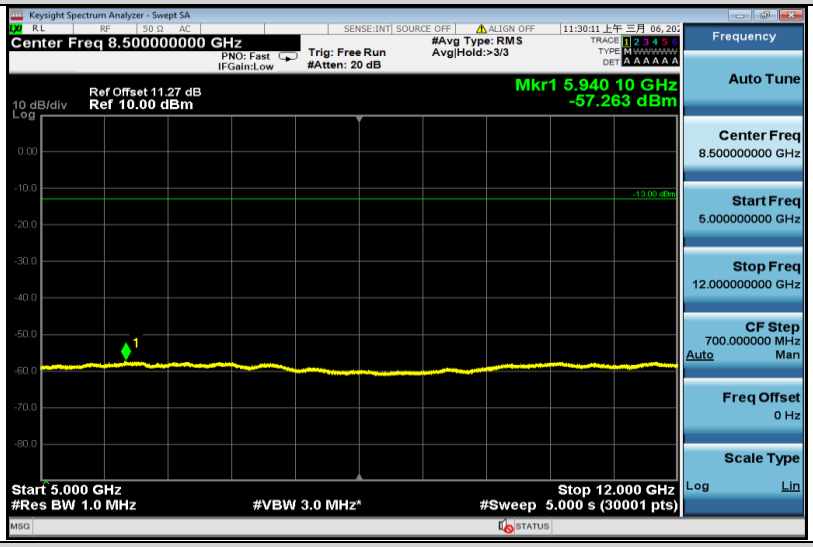

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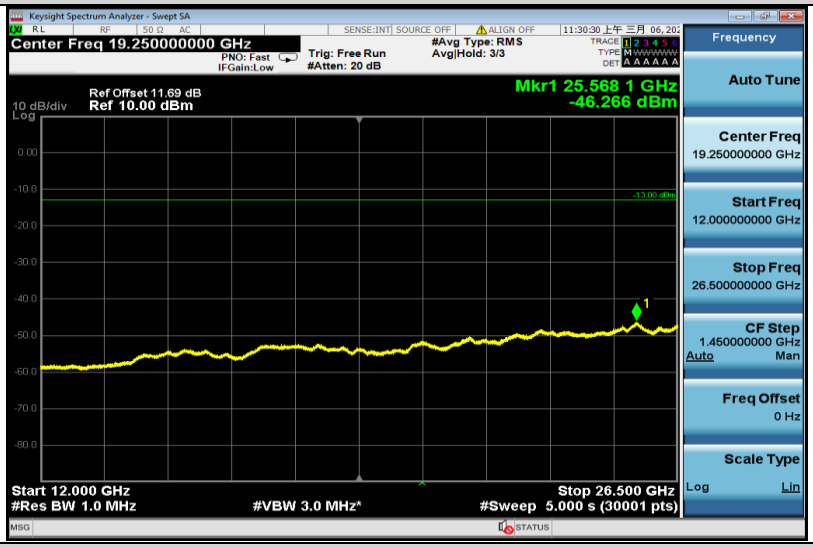

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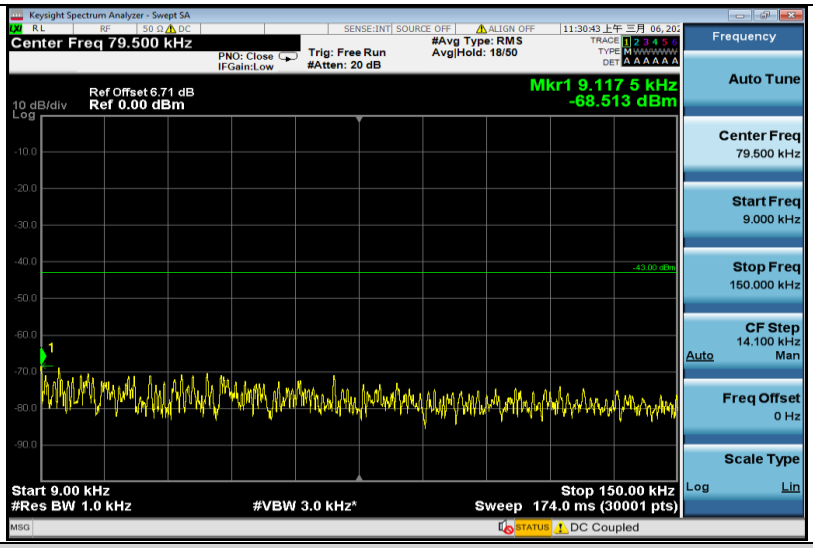

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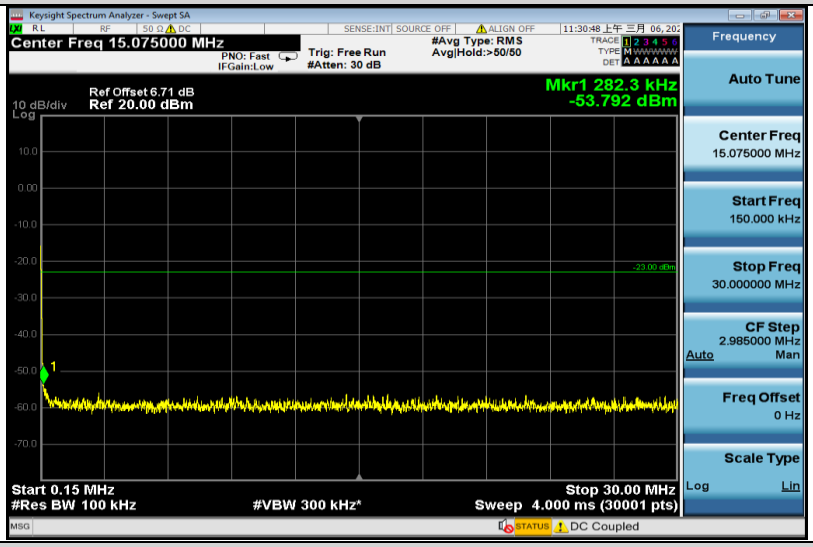

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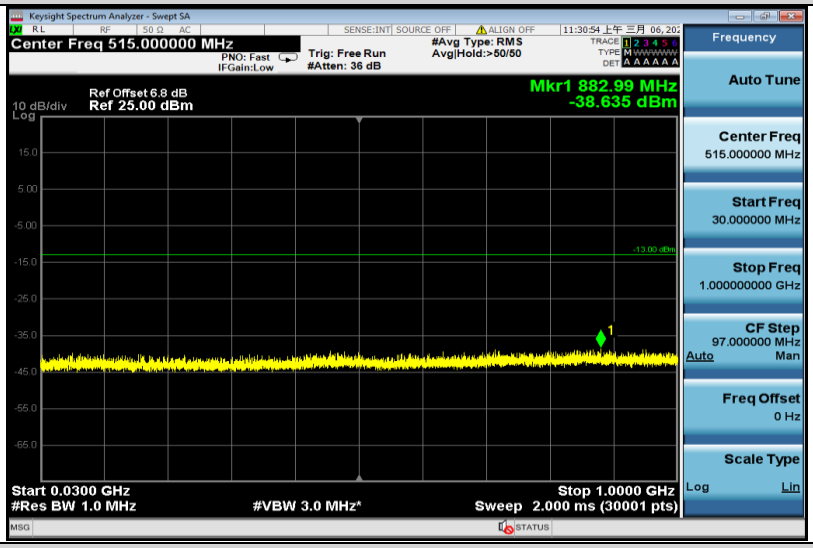

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