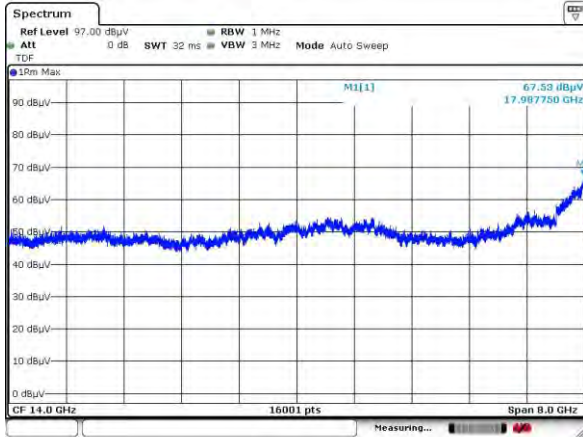
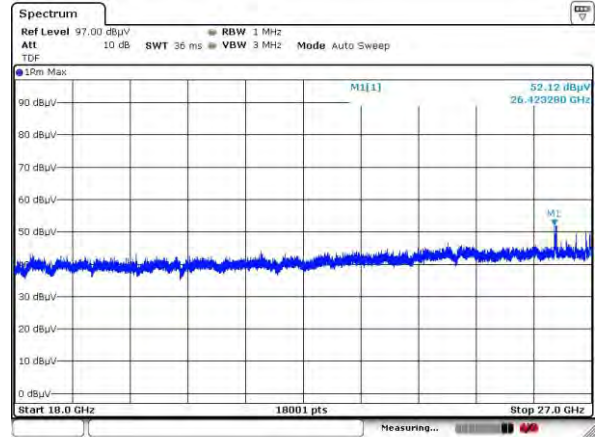


**L patch: module 1**

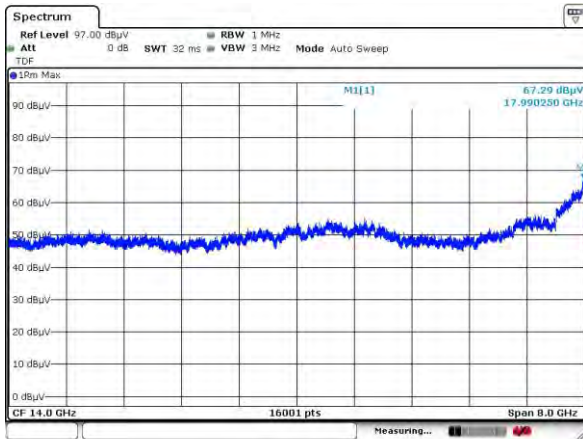
**n261 [10 GHz ~ 18 GHz]  
Low Channel**



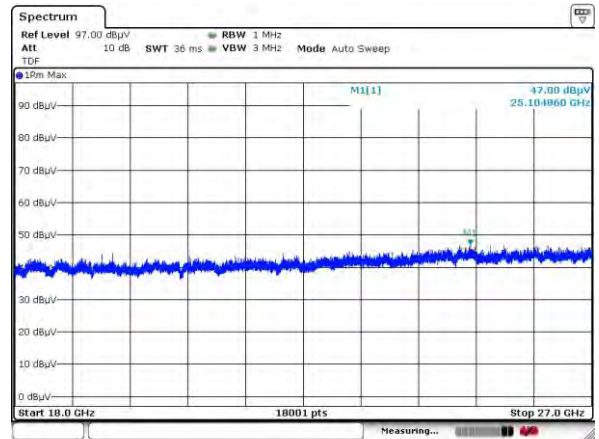
**n261 [18 GHz ~ 27 GHz]  
Low Channel**



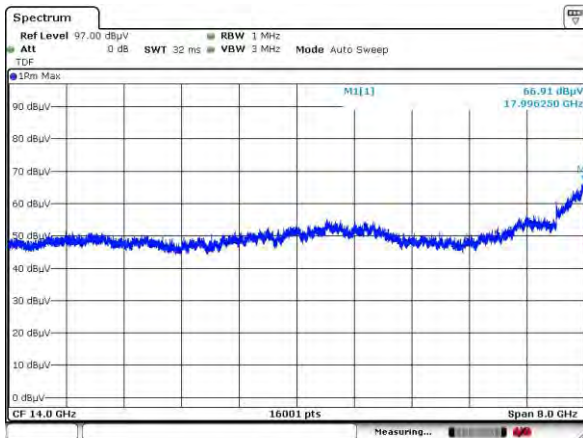
**Middle Channel**



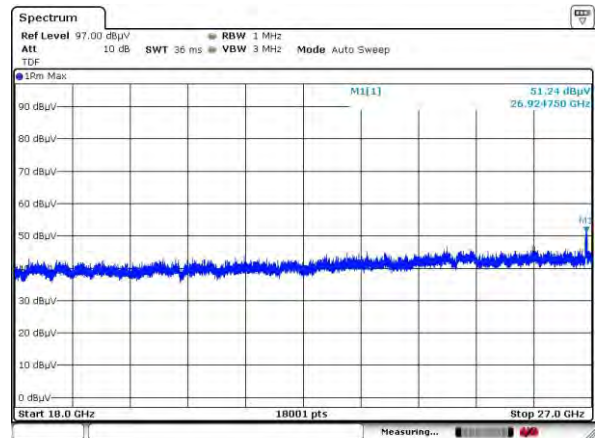
**Middle Channel**



**High Channel**

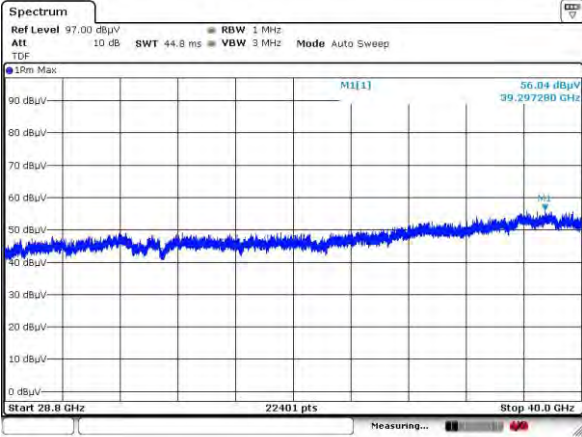


**High Channel**

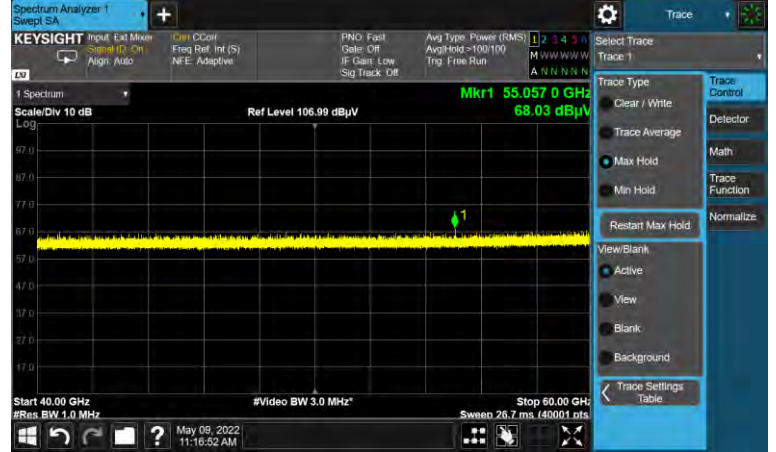


L patch: module 1

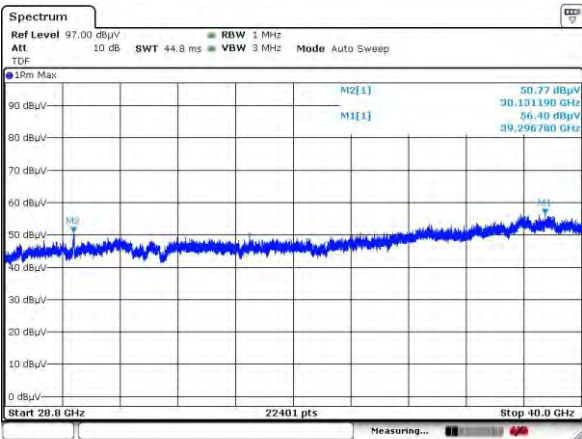
n261 [28.8 GHz ~ 40 GHz]  
Low Channel



n261 [40 GHz ~ 60 GHz]  
Low Channel



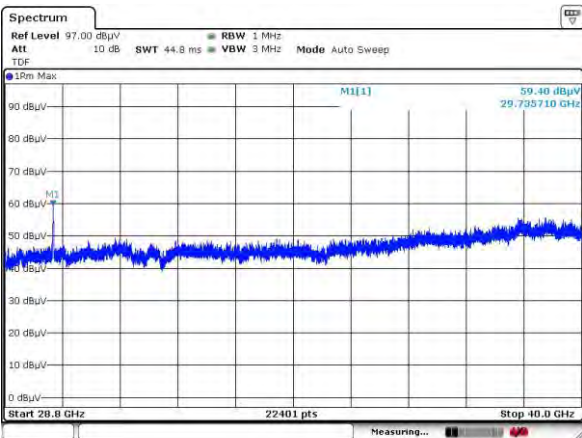
Middle Channel



Middle Channel



High Channel

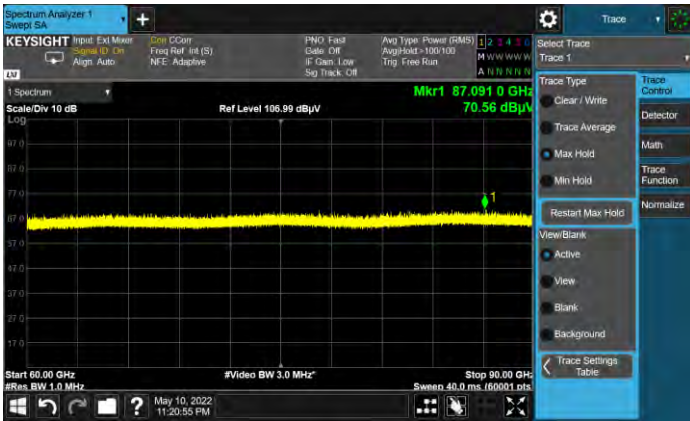


High Channel



L patch: module 1

n261 [60 GHz ~ 90 GHz]  
Low Channel



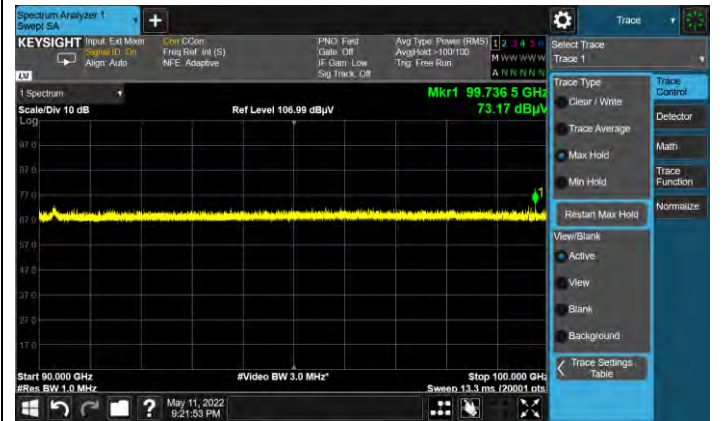
n261 [90 GHz ~ 100 GHz]  
Low Channel



Middle Channel



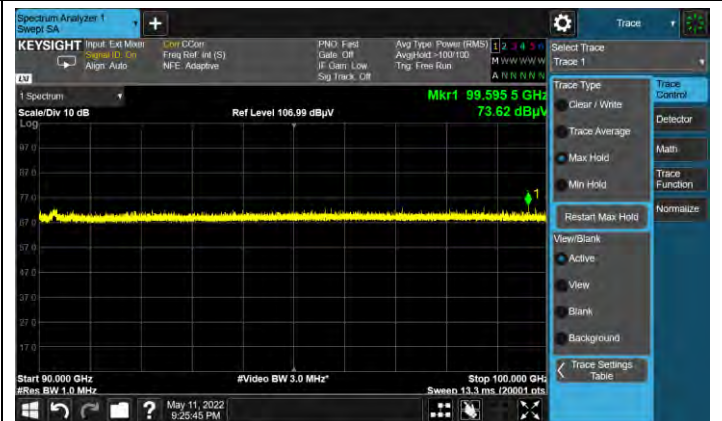
Middle Channel



High Channel

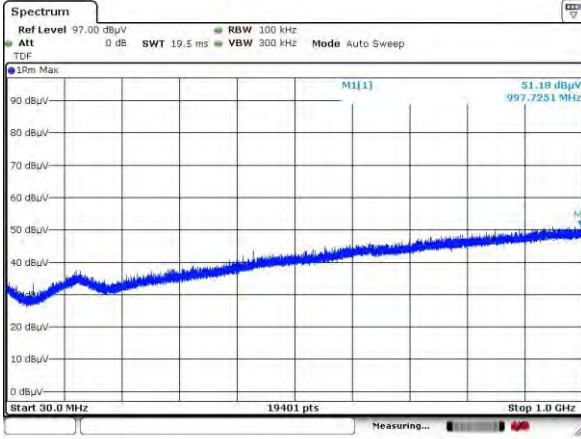


High Channel

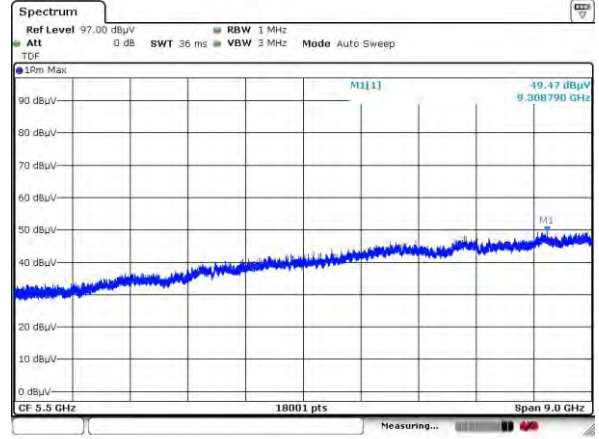


**K patch: module 0**

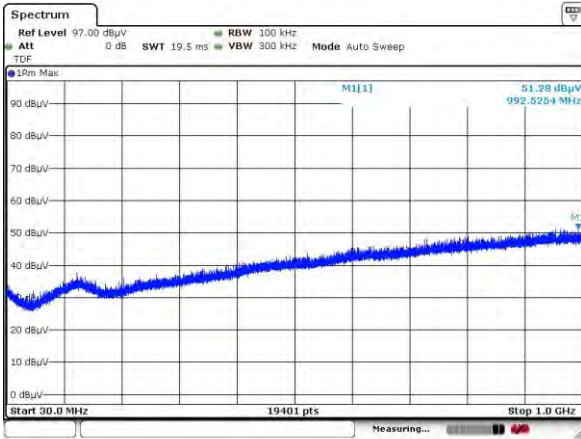
**n260 [30 MHz ~ 1 GHz]  
Low Channel**



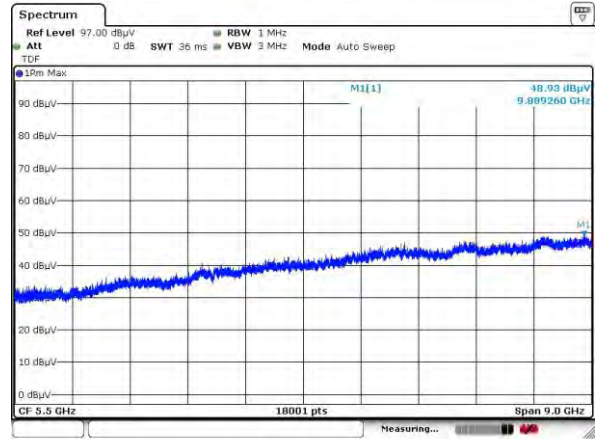
**n260 [1 GHz ~ 10 GHz]  
Low Channel**



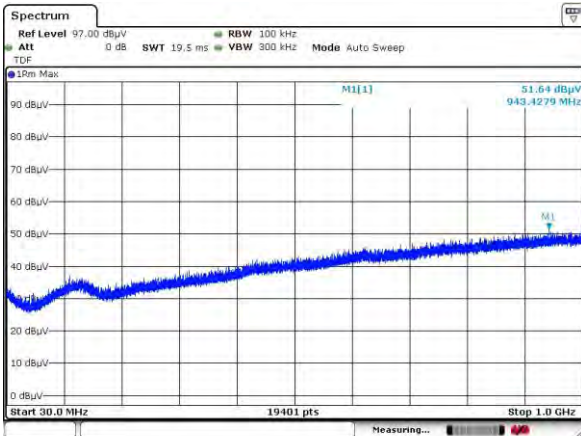
**Middle Channel**



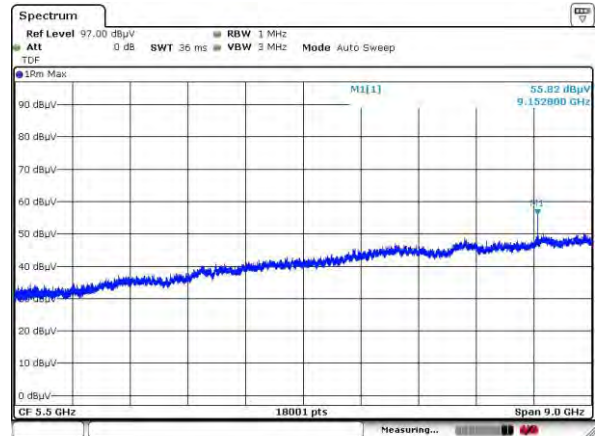
**Middle Channel**



**High Channel**

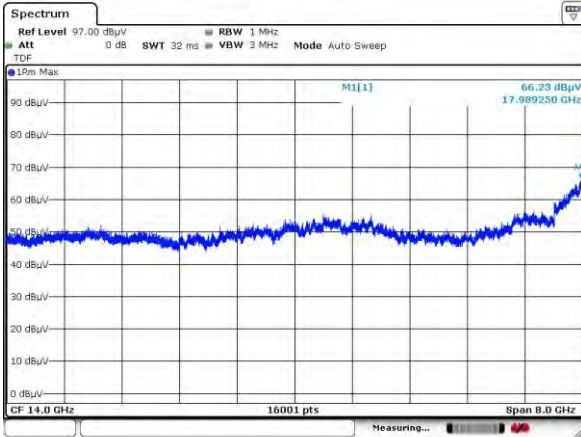


**High Channel**

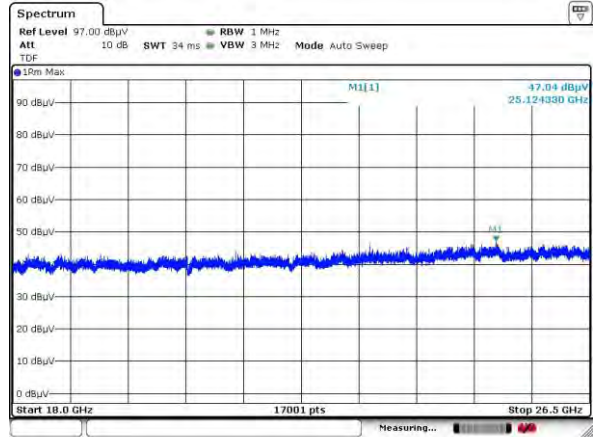


**K patch: module 0**

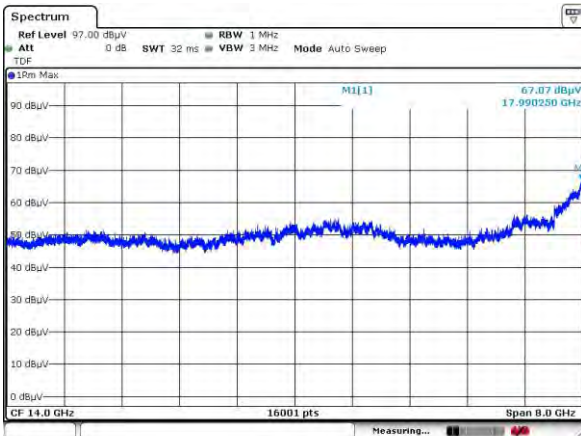
**n260 [10 GHz ~ 18 GHz]  
Low Channel**



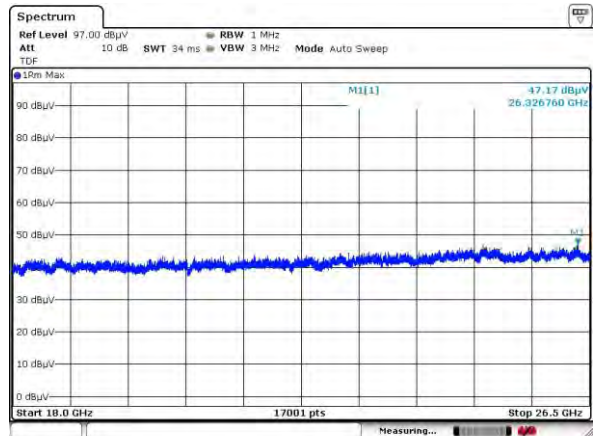
**n260 [18 GHz ~ 26.5 GHz]  
Low Channel**



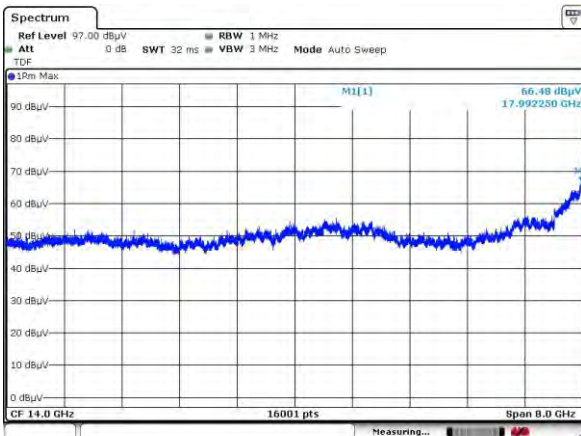
**Middle Channel**



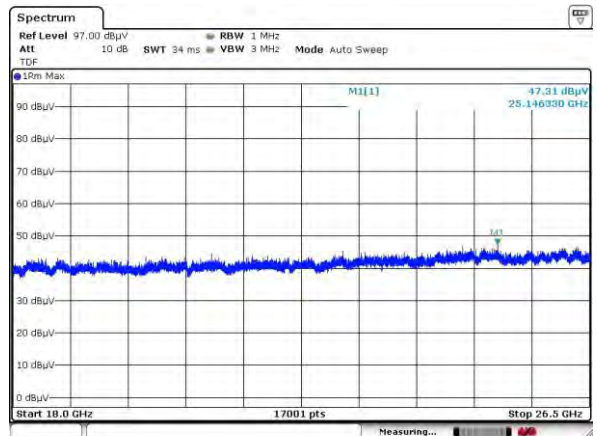
**Middle Channel**



**High Channel**



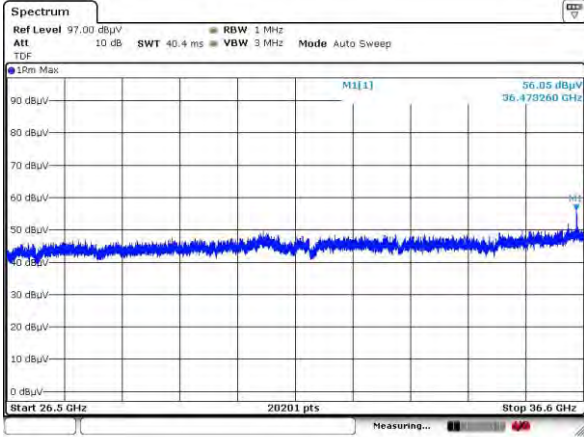
**High Channel**



**K patch: module 0**

**n260 [26.5 GHz ~ 36.6 GHz]**

**Low Channel**

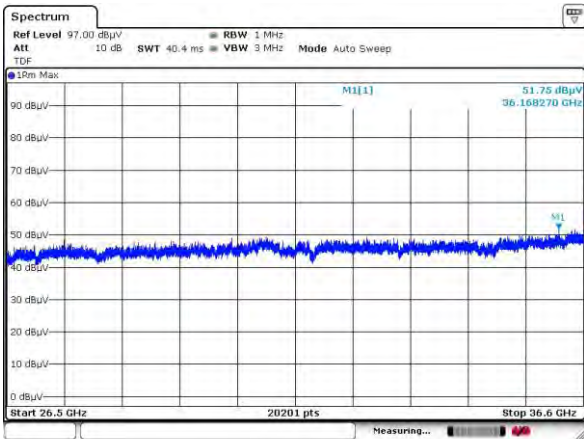


**n260 [40 GHz ~ 60 GHz]**

**Low Channel**



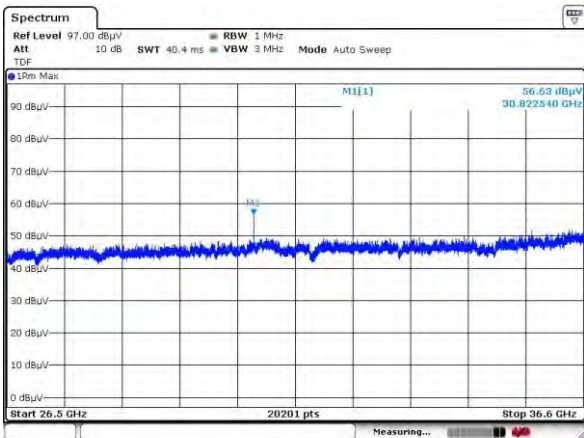
**Middle Channel**



**Middle Channel**



**High Channel**

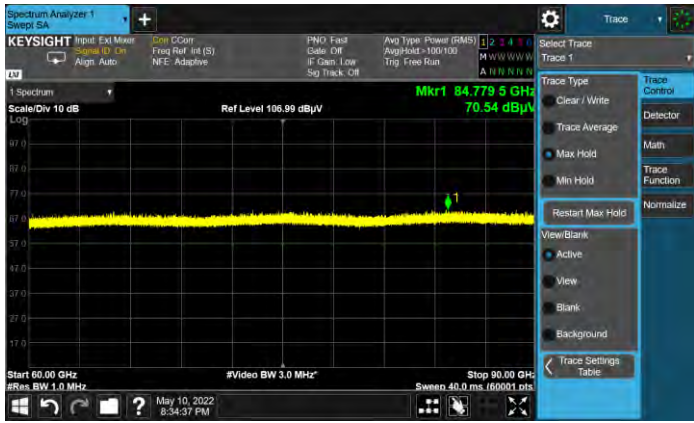


**High Channel**

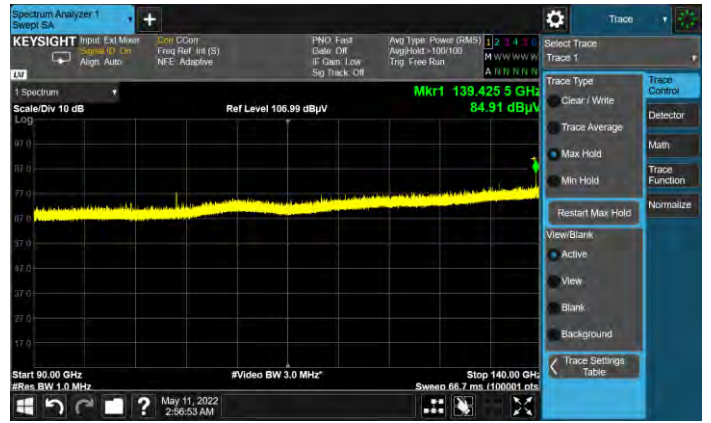


**K patch: module 0**

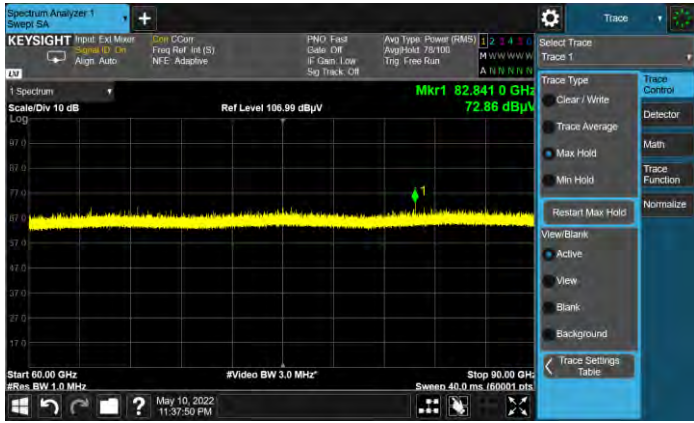
**n260 [60 GHz ~ 90 GHz]  
Low Channel**



**n260 [90 GHz ~ 140 GHz]  
Low Channel**



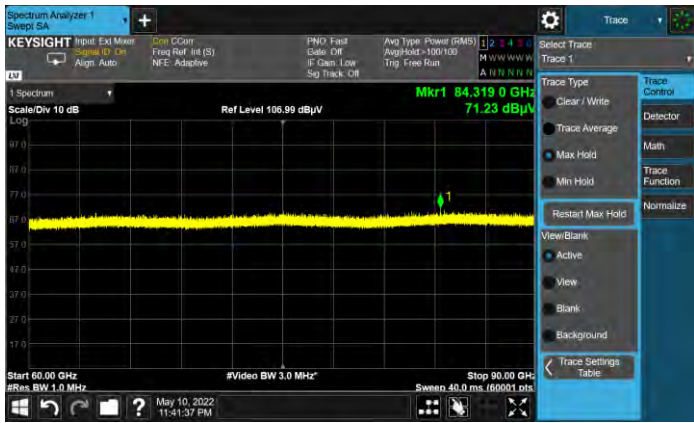
**Middle Channel**



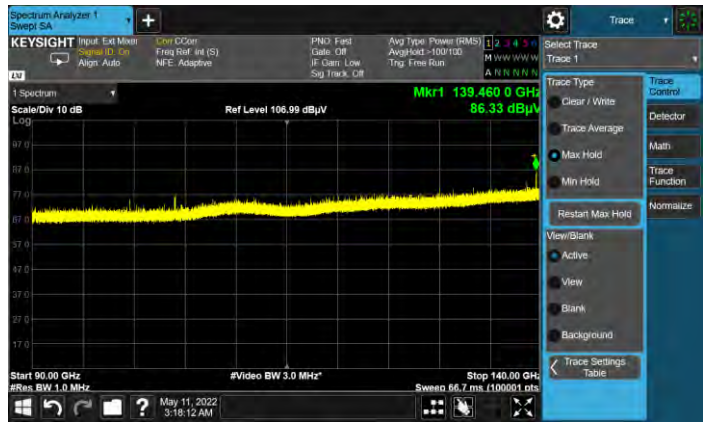
**Middle Channel**



**High Channel**



**High Channel**



**K patch: module 0**

**n260 [140 GHz ~ 170 GHz]  
Low Channel**



**n260 [170 GHz ~ 200 GHz]  
Low Channel**



**Middle Channel**



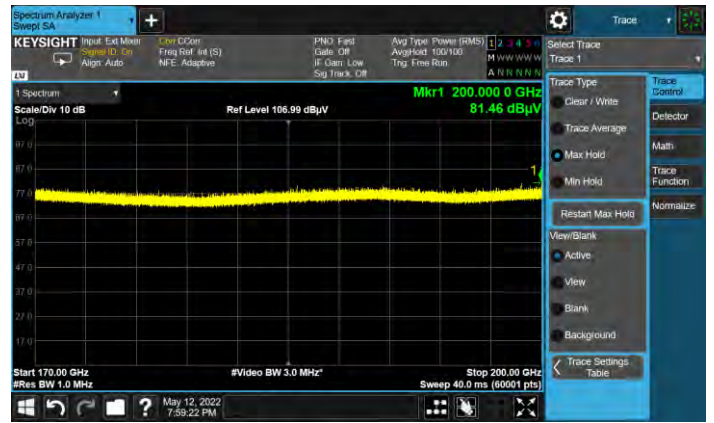
**Middle Channel**



**High Channel**



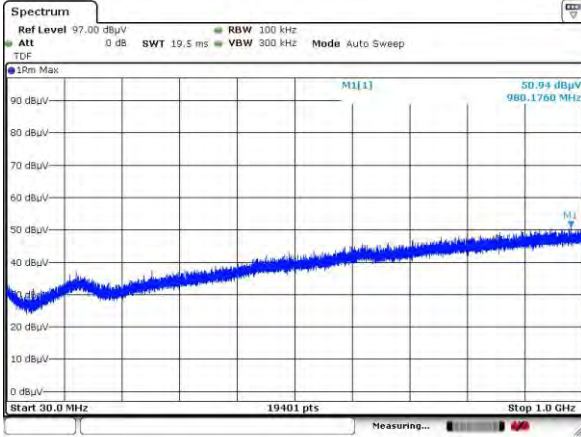
**High Channel**



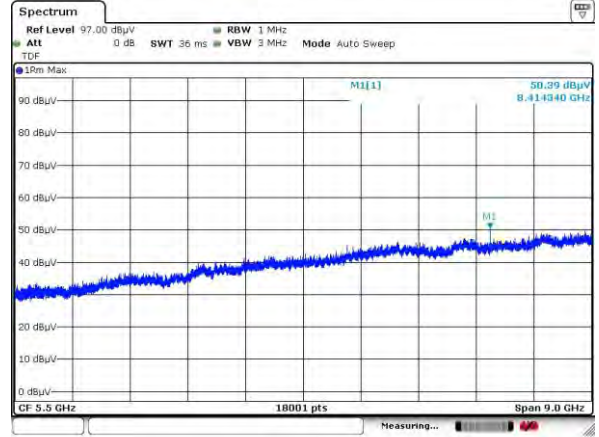


L patch: module 1

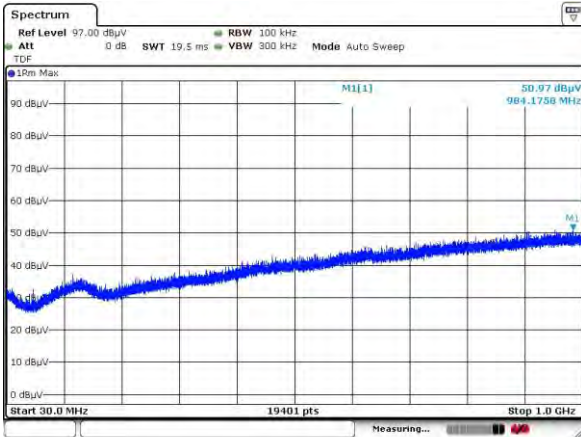
n260 [30 MHz ~ 1 GHz]  
Low Channel



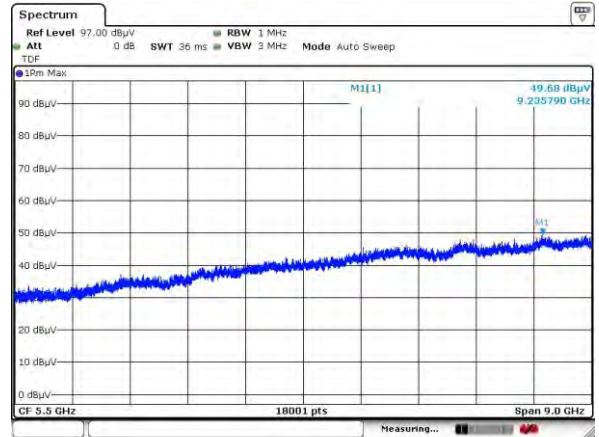
n260 [1 GHz ~ 10 GHz]  
Low Channel



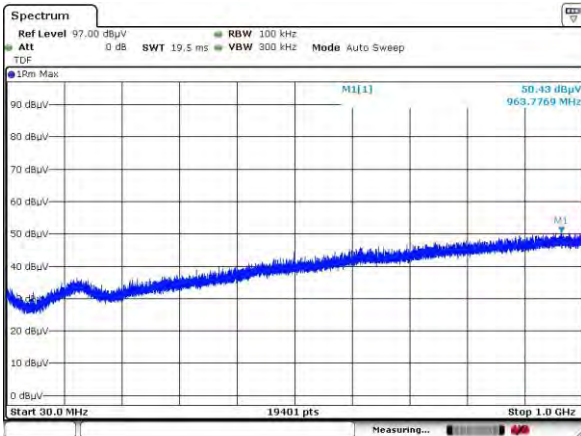
Middle Channel



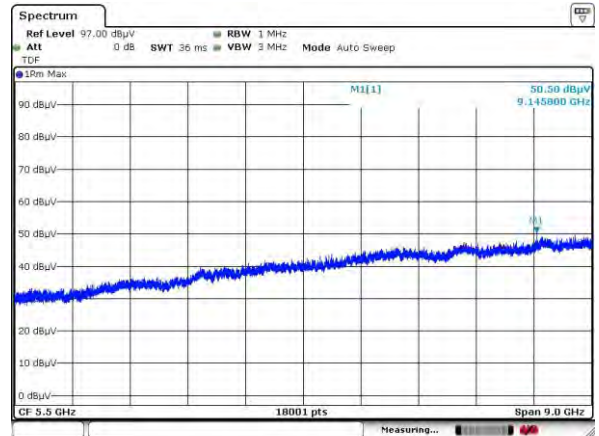
Middle Channel



High Channel

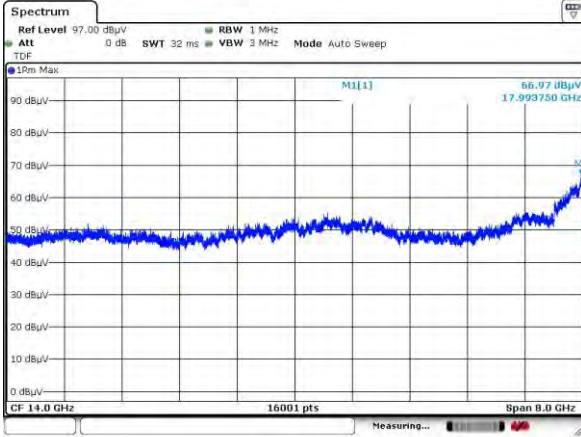


High Channel

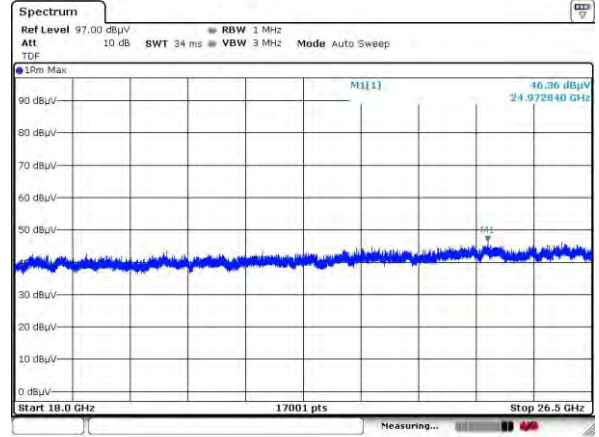


**L patch: module 1**

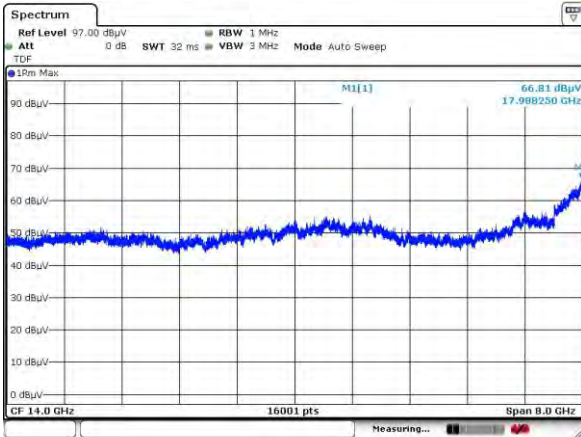
**n260 [10 GHz ~ 18 GHz]  
Low Channel**



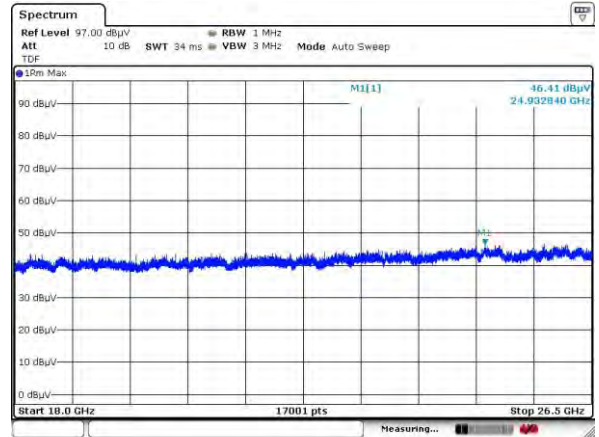
**n260 [18 GHz ~ 26.5 GHz]  
Low Channel**



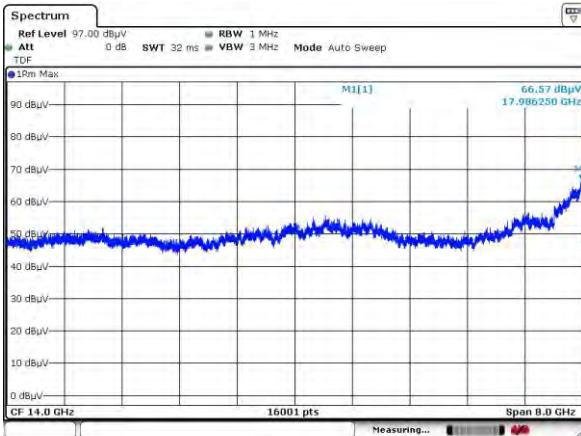
**Middle Channel**



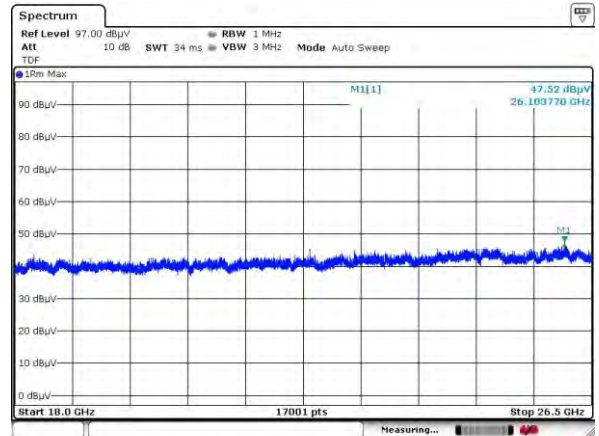
**Middle Channel**



**High Channel**



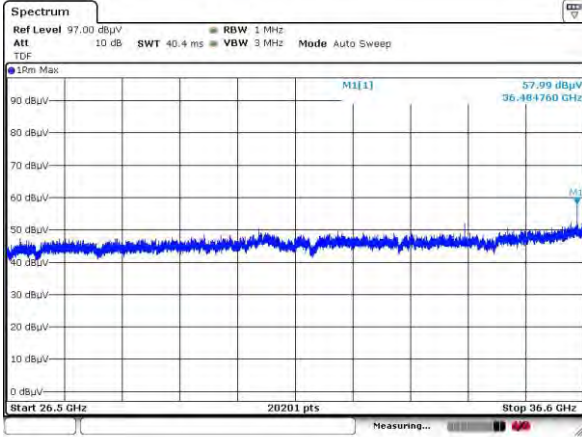
**High Channel**



**L patch: module 1**

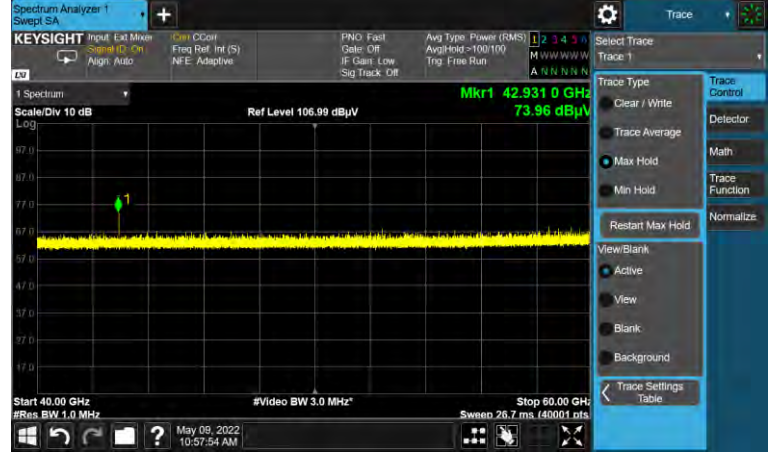
**n260 [26.5 GHz ~ 36.6 GHz]**

**Low Channel**

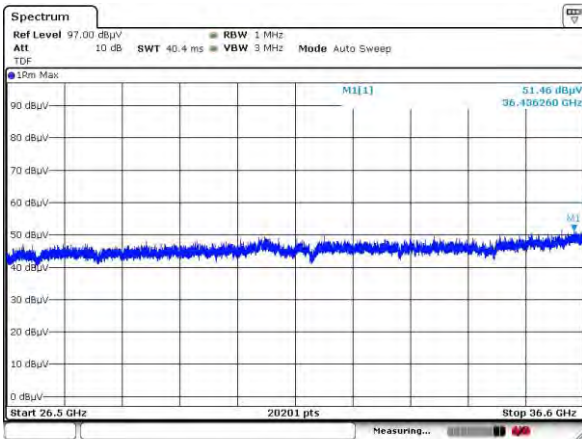


**n260 [40 GHz ~ 60 GHz]**

**Low Channel**



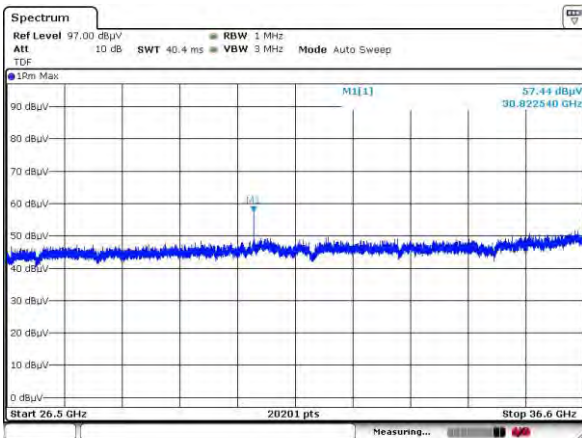
**Middle Channel**



**Middle Channel**



**High Channel**

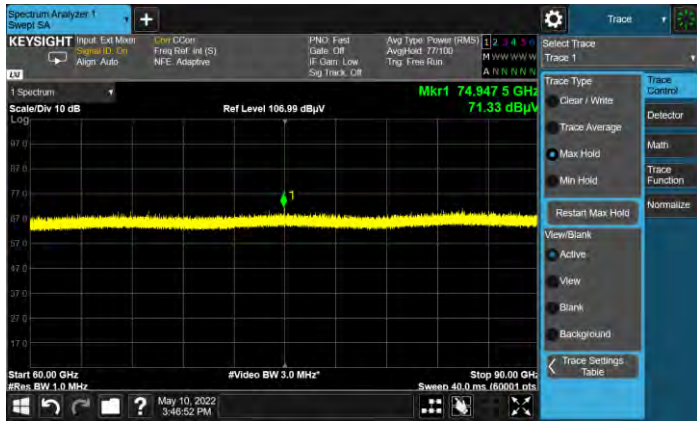


**High Channel**



L patch: module 1

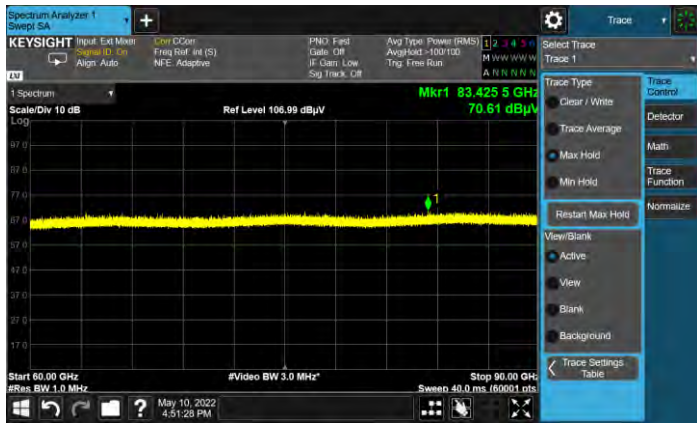
n260 [60 GHz ~ 90 GHz]  
Low Channel



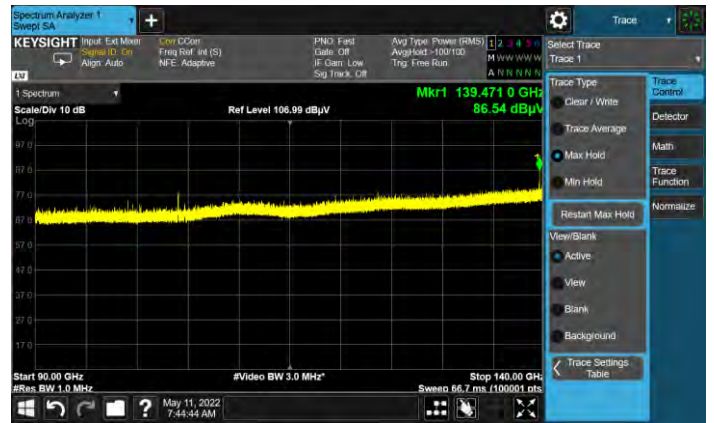
n260 [90 GHz ~ 140 GHz]  
Low Channel



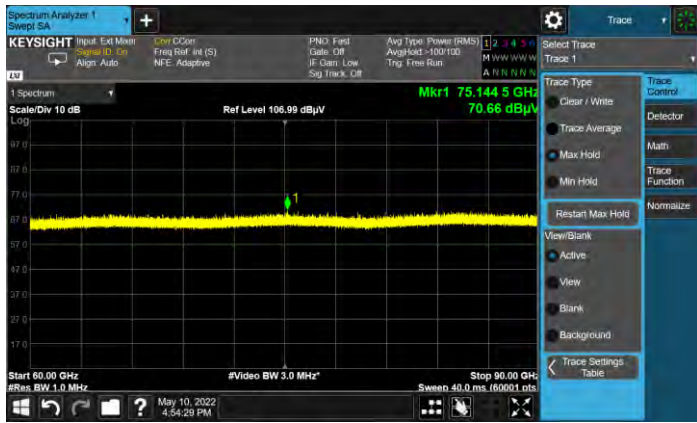
Middle Channel



Middle Channel



High Channel



High Channel



L patch: module 1

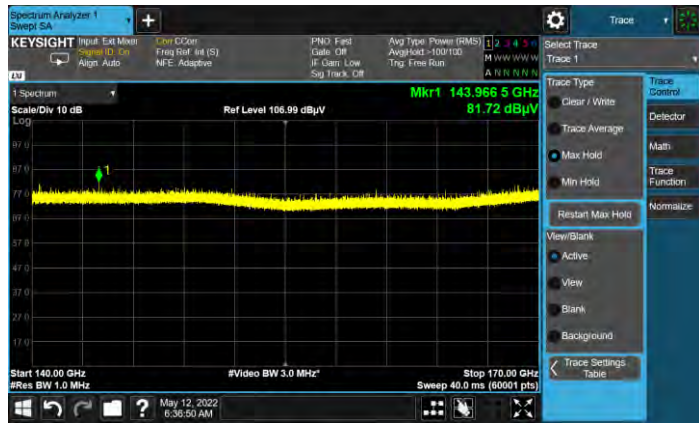
n260 [140 GHz ~ 170 GHz]  
Low Channel



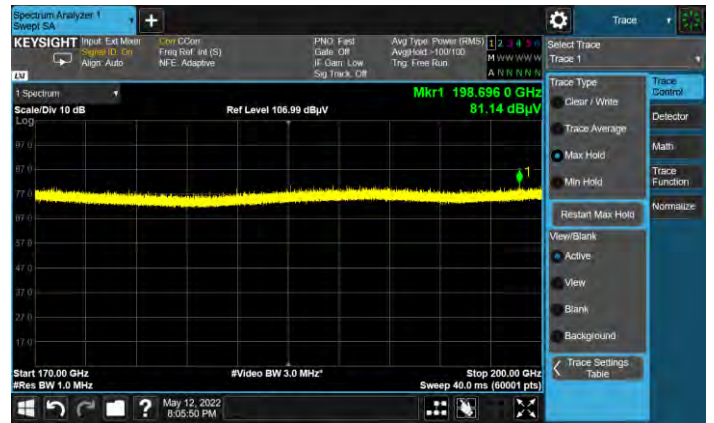
n260 [170 GHz ~ 200 GHz]  
Low Channel



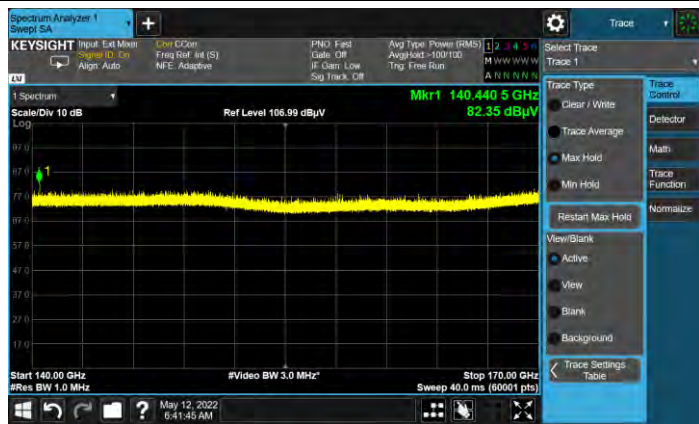
Middle Channel



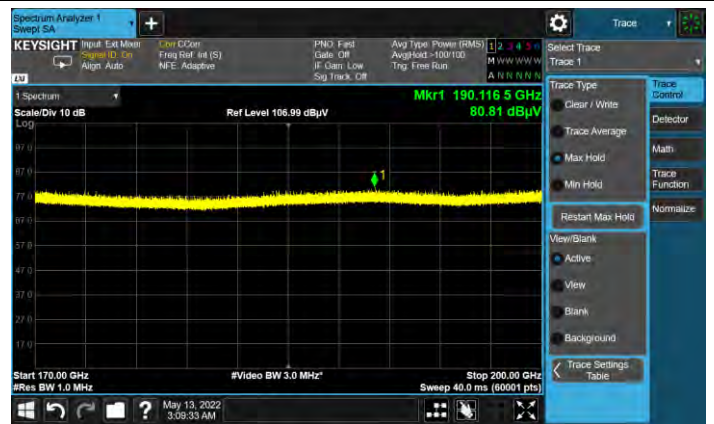
Middle Channel



High Channel



High Channel



## 5.5. FREQUENCY STABILTY

### FCC Rules

#### Test Requirements:

##### § 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

#### Test Procedures:

The measurement is performed in accordance with Section 5.6.4 and 5.6.5 of ANSI C63.26.

##### 5.6.4 Frequency stability over variations in temperature

- a) Supply the EUT with a nominal 60 Hz ac voltage, dc voltage, or install a new or fully charged battery in the EUT.
- b) If possible a dummy load should be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible.
- c) Turn on the EUT, and tune it to the center frequency of the operating band.
- d) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible, make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away).

*NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.*

- e) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.
- f) Turn the EUT off, and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.
- g) Set the temperature control on the chamber to the highest temperature specified in the regulatory requirements for the type of device, and allow the oscillator heater and the chamber temperature to stabilize. Unless otherwise instructed by the regulatory authority, this temperature should be  $50^{\circ}\text{C}$ .
- h) While maintaining a constant temperature inside the environmental chamber, turn on the EUT and allow sufficient time for the EUT temperature to stabilize.

- i) Measure the frequency.
- j) Switch off the EUT, but do not switch off the oscillator heater.
- k) Lower the chamber temperature to the next level that is required by the standard and allow the temperature inside the chamber to stabilize. Unless otherwise instructed by the regulators, this temperature step should be 10 °C.
- l) Repeat step h) through step k) down to the lowest specified temperature. Unless otherwise instructed by the regulators, this temperature should be -30 °C. When the frequency stability limit is stated as being sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point shall be established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as  $f_L$  and  $f_H$  respectively. The worst-case frequency offset determined in the above methods shall be added or subtracted from the values of  $f_L$  and  $f_H$  and the resulting frequencies must remain within the band.
- m) Omitted

#### 5.6.5 Frequency stability when varying supply voltage

- a) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away)
- b) Supply the EUT with nominal ac or dc voltage. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.
- c) Turn on the EUT, and couple its output to a frequency counter or other frequency-measuring instrument.
- d) Tune the EUT to the center frequency of the operating band. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.  
*NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.*
- e) Measure the frequency.
- f) Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.
- g) For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- h) Repeat the frequency measurement.

NOTE—For band-edge compliance, it can be required to make these measurements at the low and high channel of the operating band.

**Note:**

- 1) The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each path, so we are attached only the worst case data.
- 2) We were performed the test using call simulator



**Test Results:**

Reference: Voltage = DC 3.88 V

K patch: module 0, n261

Low Frequency = 27 525.00 MHz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	3.88	+20(Ref)	27525 000 000	1.987	0.000	0.00000
		-30	27525 000 003	3.342	1.354	0.00005
		-20	27525 000 004	3.708	1.721	0.00006
		-10	27525 000 009	9.264	7.277	0.00026
		0	27525 000 001	0.951	-1.036	-0.00004
		+10	27525 000 001	1.154	-0.833	-0.00003
		+30	27525 000 009	9.174	7.187	0.00026
		+40	27525 000 007	7.425	5.438	0.00020
		+50	27525 000 006	6.030	4.043	0.00015
HIGH	4.47	+20	27525 000 007	6.547	4.559	0.00017
LOW	3.65	+20	27525 000 001	1.230	-0.757	-0.00003

High Frequency = 28 324.92 MHz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	3.88	+20(Ref)	28324 920 000	8.296	0.000	0.00000
		-30	28324 920 005	5.065	-3.231	-0.00011
		-20	28324 920 002	2.439	-5.857	-0.00021
		-10	28324 920 007	6.855	-1.441	-0.00005
		0	28324 920 006	5.930	-2.366	-0.00008
		+10	28324 920 002	1.642	-6.654	-0.00023
		+30	28324 920 001	0.628	-7.668	-0.00027
		+40	28324 920 001	1.150	-7.146	-0.00025
		+50	28324 920 002	1.923	-6.373	-0.00023
HIGH	4.47	+20	28324 920 006	6.226	-2.070	-0.00007
LOW	3.65	+20	28324 920 001	1.177	-7.119	-0.00025

L patch: module 1, n261

Low Frequency = 27 525.00 MHz

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(Hz)	
100%	3.88	+20(Ref)	27525 000 000	6.869	0.000	0.00000
		-30	27525 000 009	8.510	6.522	0.00024
		-20	27525 000 009	9.040	7.053	0.00026
		-10	27525 000 007	7.171	5.184	0.00019
		0	27525 000 008	7.974	5.986	0.00022
		+10	27525 000 008	8.437	6.450	0.00023
		+30	27525 000 007	6.844	4.857	0.00018
		+40	27525 000 001	0.993	-0.994	-0.00004
		+50	27525 000 007	6.647	4.660	0.00017
HIGH	4.47	+20	27525 000 005	5.482	3.495	0.00013
LOW	3.65	+20	27525 000 010	9.709	7.722	0.00028

High Frequency = 28 324.92 MHz

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(Hz)	
100%	3.88	+20(Ref)	28324 920 000	5.733	0.000	0.00000
		-30	28324 920 004	3.713	-4.583	-0.00016
		-20	28324 920 006	6.228	-2.068	-0.00007
		-10	28324 920 007	6.791	-1.505	-0.00005
		0	28324 920 010	9.971	1.674	0.00006
		+10	28324 920 005	4.869	-3.428	-0.00012
		+30	28324 920 001	1.105	-7.191	-0.00025
		+40	28324 920 001	0.688	-7.608	-0.00027
		+50	28324 920 003	2.775	-5.521	-0.00019
HIGH	4.47	+20	28324 920 009	8.957	0.661	0.00002
LOW	3.65	+20	28324 920 002	1.875	-6.421	-0.00023

K patch: module 0, n260

Low Frequency = 37 025.04 MHz

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(Hz)	
100%	3.88	+20(Ref)	37025 040 000	9.826	0.000	0.00000
		-30	37025 040 009	8.567	-1.259	-0.00003
		-20	37025 040 005	5.027	-4.799	-0.00013
		-10	37025 040 007	6.694	-3.132	-0.00008
		0	37025 040 005	5.185	-4.641	-0.00013
		+10	37025 040 007	6.517	-3.309	-0.00009
		+30	37025 040 000	0.355	-9.471	-0.00026
		+40	37025 040 010	9.849	0.023	0.00000
		+50	37025 040 000	0.448	-9.378	-0.00025
HIGH	4.47	+20	37025 040 009	9.195	-0.631	-0.00002
LOW	3.65	+20	37025 040 008	8.251	-1.575	-0.00004

High Frequency = 39 975.00 MHz

Voltage	Power	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(Hz)	
100%	3.88	+20(Ref)	39975 000 000	2.938	0.000	0.00000
		-30	39975 000 001	1.374	-1.564	-0.00004
		-20	39975 000 002	1.768	-1.170	-0.00003
		-10	39975 000 004	4.363	1.425	0.00004
		0	39975 000 006	5.808	2.870	0.00007
		+10	39975 000 001	0.704	-2.234	-0.00006
		+30	39975 000 003	3.362	0.424	0.00001
		+40	39975 000 001	1.199	-1.738	-0.00004
		+50	39975 000 001	1.205	-1.733	-0.00004
HIGH	4.47	+20	39975 000 002	2.283	-0.655	-0.00002
LOW	3.65	+20	39975 000 010	9.852	6.914	0.00017

L patch: module 1, n260

Low Frequency = 37 025.04 MHz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	3.88	+20(Ref)	37025 040 000	7.663	0.000	0.00000
		-30	37025 040 005	4.635	-5.190	-0.00014
		-20	37025 040 005	5.264	-4.562	-0.00012
		-10	37025 040 007	7.467	-2.359	-0.00006
		0	37025 040 003	2.823	-7.003	-0.00019
		+10	37025 040 004	4.072	-5.754	-0.00016
		+30	37025 040 005	5.421	-4.405	-0.00012
		+40	37025 040 004	4.450	-5.376	-0.00015
		+50	37025 040 000	0.473	-9.352	-0.00025
HIGH	4.47	+20	37025 040 000	0.305	-9.520	-0.00026
LOW	3.65	+20	37025 040 009	9.320	-0.506	-0.00001

High Frequency = 39 975.00 MHz

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	3.88	+20(Ref)	39975 000 000	8.048	0.000	0.00000
		-30	39975 000 009	8.768	5.830	0.00015
		-20	39975 000 009	9.210	6.272	0.00016
		-10	39975 000 005	5.029	2.091	0.00005
		0	39975 000 003	3.013	0.075	0.00000
		+10	39975 000 006	6.195	3.257	0.00008
		+30	39975 000 008	7.604	4.666	0.00012
		+40	39975 000 009	8.883	5.945	0.00015
		+50	39975 000 008	7.508	4.570	0.00011
HIGH	4.47	+20	39975 000 006	5.670	2.732	0.00007
LOW	3.65	+20	39975 000 001	1.132	-1.806	-0.00005



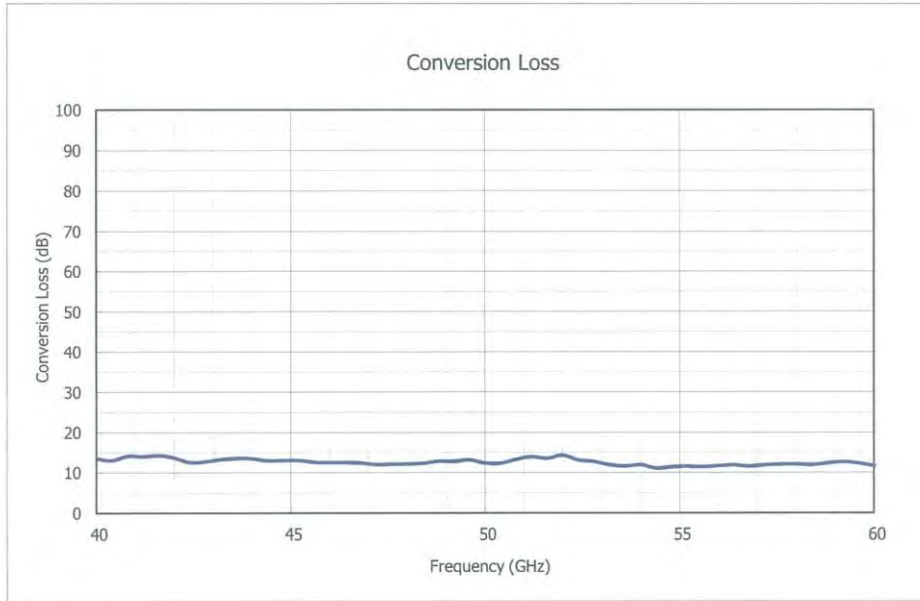
**교정결과**  
CALIBRATION RESULT



성적서발급번호(Certificate No) : IC-2022-019242  
교정번호(Calibration No) : C-2022-022980

페이지(page) : 2 of 3

1. Conversion Loss Graph



Note) 측정 조건 : RF = -30 dBm, Harmonic Order = 8, L.O. Level = 10 dBm, IF = 322.5 MHz, Bias Value = 0.00 mA

F-02P-02-008 (Rev.02)

**교 정 결 과**  
CALIBRATION RESULT



성적서발급번호(Certificate No) : IC-2022-019242  
교 정 번 호(Calibration No) : C-2022-022980

페이지(page) : 3 of 3

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
40.0	13.58	0.82	50.4	12.33	0.82
40.4	13.03	0.82	50.8	13.30	0.82
40.8	14.14	0.82	51.2	13.92	0.82
41.2	14.00	0.82	51.6	13.52	0.82
41.6	14.29	0.82	52.0	14.28	0.82
42.0	13.68	0.82	52.4	13.10	0.82
42.4	12.57	0.82	52.8	12.71	0.82
42.8	12.73	0.82	53.2	11.92	0.82
43.2	13.27	0.82	53.6	11.59	0.82
43.6	13.54	0.82	54.0	11.93	0.82
44.0	13.48	0.82	54.4	11.07	0.82
44.4	12.98	0.82	54.8	11.40	0.82
44.8	13.02	0.82	55.2	11.52	0.82
45.2	13.06	0.82	55.6	11.42	0.82
45.6	12.59	0.82	56.0	11.68	0.82
46.0	12.55	0.82	56.4	11.85	0.82
46.4	12.48	0.82	56.8	11.56	0.82
46.8	12.42	0.82	57.2	11.90	0.82
47.2	12.01	0.82	57.6	12.03	0.82
47.6	12.10	0.82	58.0	12.08	0.82
48.0	12.14	0.82	58.4	11.92	0.82
48.4	12.32	0.82	58.8	12.35	0.82
48.8	12.84	0.82	59.2	12.64	0.82
49.2	12.80	0.82	59.6	12.31	0.82
49.6	13.14	0.82	60.0	11.70	0.82
50.0	12.39	0.82	-	-	-

끝.

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**교정성적서**  
CALIBRATION CERTIFICATE



경기도 이천시 마장면 서이천로 578번길 74  
TEL : 031-645-6900, FAX : 031-645-6969

성적서발급번호(Certificate No) : IC-2022-019241  
교정번호(Calibration No) : C-2022-022979

페이지(page) : 1 of 4

**1. 의뢰자 (Client)**

- 기관명 (Name) : (주)에이치시티  
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

**2. 측정기 (Calibration Subject)**

◇ 등록번호 : 415873  
- 기기명 (Description) : SA EXTENSION MODULE  
- 제작회사 및 형식 (Manufacturer and Model Name) : VDI / SAX WR12  
- 기기번호 (Serial Number) : SAX773

**3. 교정일자 (Date of Calibration)**

: 2022.03.17  
차기교정예정일자 : 2023.03.17  
(The due date of next Calibration)

**4. 교정환경 (Environment)**

- 온도(Temperature) : ( 22.7 ± 0.1 ) °C - 습도(Humidity) : ( 48 ± 1 ) % R.H.  
- 교정장소 (Location) : 고정표준실(Permanent Calibration Lab)  
(주소: 경기도 이천시 마장면 서이천로 578번길 74)

**5. 측정표준의 소급성 (Traceability)**

◇ Field code : 40641(RF SPECTRUM ANALYZER)  
교정방법 및 소급성 서술 (Calibration method and/or brief description)  
상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)



기기명 (Description)	제작회사 / 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT/N5173B	MY61252589	2022/10/15	(주)에이치시티
EPM-P SERIES POWER METER	AGILENT/E4417A	GB41291582	2022/06/04	(주)에이치시티
POWER SENSOR	KEYSIGHT/V8486A	MY56330017	2022/12/07	Keysight Technologies
POWER SENSOR	KEYSIGHT/W8486A	MY56370005	2022/12/08	Keysight Technologies
WR-12 MULTIPLIER SOURCE MODULE	OML/S12MS-A	160419-1	2022/09/07	(주)에이치시티

**6. 교정결과 (Calibration result)**

: 교정결과 참조 (Refer to attachment)

**7. 측정불확도 (Measurement uncertainty)**

: 교정결과 참조 (Refer to attachment)  
신뢰수준 약 95 %, k = 2 ( Confidence level about 95 %, k = 2 )

<b>확 인</b> (affirmation)	작성자 (Measurements performed by)		승인자 (Approved by)	
	성명 (Name) 고형재		직위 (Title) 기술책임자(Technical Cal. Manager)	
			성명 (Name) 김광철	

위 성적서는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인 받은 분야의 교정결과입니다.

2022. 03. 17

한국인정기구 인정  
Accredited by KOLAS, Republic of KOREA

(주)에이치시티 대표이사  
President, HCT Co., Ltd.



※ 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다.  
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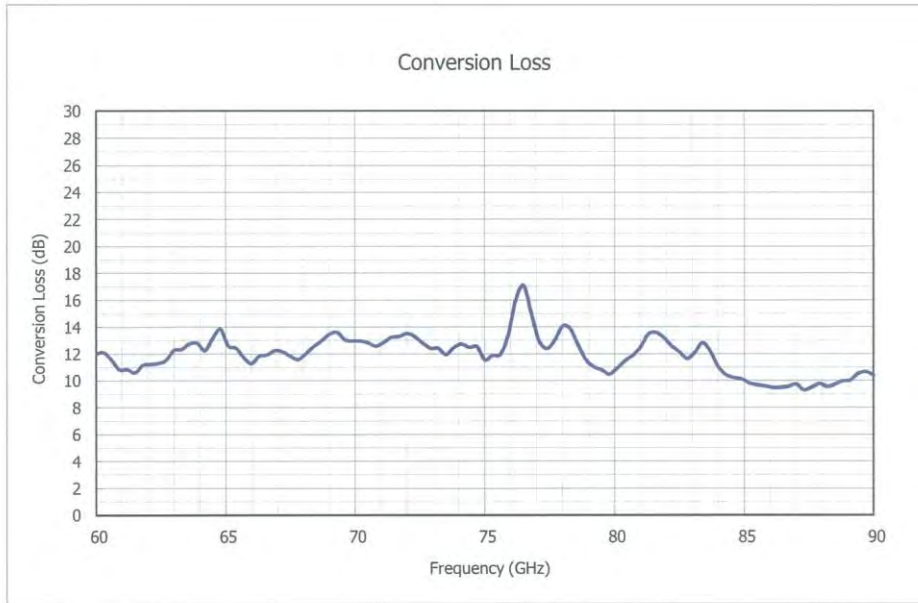
**교정결과**  
CALIBRATION RESULT



성적서발급번호(Certificate No) : IC-2022-019241  
교정번호(Calibration No) : C-2022-022979

페이지(page) : 2 of 4

1. Conversion Loss Graph



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 12, L.O. Level = 10 dBm, IF = 322.5 MHz, Bias Value = 0.00 mA
2. This is the result of measuring the requested equipment and Keysight N9030B (S/N : MY55480110) together.

F-02P-02-008 (Rev.02)

**교 정 결 과**  
CALIBRATION RESULT



성적서발급번호(Certificate No) : IC-2022-019241  
교 정 번 호(Calibration No) : C-2022-022979

페이지(page) : 3 of 4

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
60.0	12.01	0.82	71.1	13.45	0.82
60.3	12.08	0.82	71.4	13.59	0.82
60.6	11.53	0.82	71.7	13.06	0.82
60.9	10.83	0.82	72.0	12.96	0.82
61.2	10.83	0.82	72.3	12.96	0.82
61.5	10.59	0.82	72.6	12.82	0.82
61.8	11.15	0.82	72.9	12.57	0.82
62.1	11.22	0.82	73.2	12.85	0.82
62.4	11.30	0.82	73.5	13.23	0.82
62.7	11.53	0.82	73.8	13.28	0.82
63.0	12.26	0.82	74.1	13.51	0.82
63.3	12.33	0.82	74.4	13.28	0.82
63.6	12.75	0.82	74.7	12.82	0.82
63.9	12.79	0.82	75.0	12.41	0.82
64.2	12.24	0.82	75.3	12.41	0.82
64.5	13.15	0.82	75.6	11.93	0.82
64.8	13.84	0.82	75.9	12.46	0.82
65.1	12.60	0.82	76.2	12.72	0.82
65.4	12.41	0.82	76.5	12.47	0.82
65.7	11.71	0.82	76.8	12.53	0.82
66.0	11.27	0.82	77.1	11.54	0.82
66.3	11.81	0.82	77.4	11.86	0.82
66.6	11.92	0.82	77.7	11.95	0.82
66.9	12.24	0.82	78.0	13.38	0.82
67.2	12.14	0.82	78.3	16.05	0.82
67.5	11.81	0.82	78.6	17.08	0.82
67.8	11.57	0.82	78.9	14.96	0.82
68.1	12.01	0.82	79.2	12.93	0.82
68.4	12.55	0.82	79.5	12.38	0.82
68.7	12.96	0.82	79.8	13.01	0.82
69.0	14.04	0.82	80.1	10.43	0.82
69.3	13.84	0.82	80.4	10.21	0.82
69.6	12.63	0.82	80.7	10.10	0.82
69.9	11.52	0.82	81.0	9.81	0.82
70.2	11.02	0.82	81.3	9.68	0.82
70.5	10.79	0.82	81.6	9.60	0.82
70.8	10.47	0.82	81.9	9.48	0.82

F-02P-02-008 (Rev.02)

**교 정 결 과**  
**CALIBRATION RESULT**



성적서발급번호(Certificate No) : IC-2022-019241  
교 정 번 호(Calibration No) : C-2022-022979

페이지(page) : 4 of 4

2. Conversion Loss Data (cont.)

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
82.2	10.90	0.82	86.4	9.49	0.82
82.5	11.45	0.82	86.7	9.56	0.82
82.8	11.86	0.82	87.0	9.73	0.82
83.1	12.50	0.82	87.3	9.31	0.82
83.4	13.45	0.82	87.6	9.50	0.82
83.7	13.58	0.82	87.9	9.77	0.82
84.0	13.18	0.82	88.2	9.56	0.82
84.3	12.58	0.82	88.5	9.72	0.82
84.6	12.13	0.82	88.8	9.97	0.82
84.9	11.63	0.82	89.1	10.03	0.82
85.2	12.10	0.82	89.4	10.53	0.82
85.5	12.82	0.82	89.7	10.65	0.82
85.8	12.16	0.82	90.0	10.39	0.82
86.1	11.03	0.82	-	-	-

END.

F-02P-02-008 (Rev.02)

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**교정성적서**  
CALIBRATION CERTIFICATE



경기도 이천시 마장면 서이천로 578번길 74  
TEL: 031-645-6900, FAX: 031-645-6969

성적서발급번호(Certificate No) : IC-2022-019244  
교정번호(Calibration No) : C-2022-022982

페이지(page) : 1 of 3

**1. 의뢰자 (Client)**

- 기관명 (Name) : (주)에이치시티  
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

**2. 측정기 (Calibration Subject)**

◇ 등록번호 : 415877

- 기기명 (Description) : SA EXTENSION MODULE  
- 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR8.0  
- 기기번호 (Serial Number) : SAX779

**3. 교정일자 (Date of Calibration) : 2022.03.17**

차기교정예정일자 : 2023.03.17  
(The due date of next Calibration)

**4. 교정환경 (Environment)**

- 온도(Temperature) : ( 22.9 ± 0.1 ) °C - 습도(Humidity) : ( 47 ± 2 ) % R.H.  
- 교정장소 (Location) : 고정표준실(Permanent Calibration Lab)  
(주소: 경기도 이천시 마장면 서이천로 578번길 74)

**5. 측정표준의 소급성 (Traceability) ◇Field code : 40641(RF SPECTRUM ANALYZER)**

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 / 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT/N5173B	MY61252589	2022/10/15	(주)에이치시티
EPM-P SERIES POWER METER	AGILENT/E4417A	GB41291582	2022/06/04	(주)에이치시티
POWER SENSOR	KEYSIGHT/W8486A	MY56370005	2022/12/08	Keysight Technologies
WR-08 MULTIPLIER SOURCE MODULE	OML/S08MS-A	160419-1	2022/09/07	(주)에이치시티

**6. 교정결과 (Calibration result)**

: 교정결과 참조 (Refer to attachment)

**7. 측정불확도 (Measurement uncertainty)**

: 교정결과 참조 (Refer to attachment)

신뢰수준 약 95 %, k = 2 ( Confidence level about 95 %, k = 2 )

<b>확인 (affirmation)</b>	작성자 (Measurements performed by)		승인자 (Approved by)	
	성명 (Name) 고형재		직위 (Title) 기술책임자(Technical Cal. Manager)	
			성명 (Name) 김광철	

위 성적서는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인 받은 분야의 교정결과입니다.

2022. 03. 17

한국인정기구 인정  
Accredited by KOLAS, Republic of KOREA

(주)에이치시티 대표이사  
President, HCT Co., Ltd.



※ 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다.  
※ 고객연락사이트(http://www.callab.co.kr)에서 성적서의 진위여부 확인이 가능합니다.  
※ 성적서의 원본은 상단에 HCT홀로그램이 들어간 워터마크 방지 용지에 인쇄되어 발급되며, 원본 복사시에는 복사본이라는 표시가 처리됩니다.

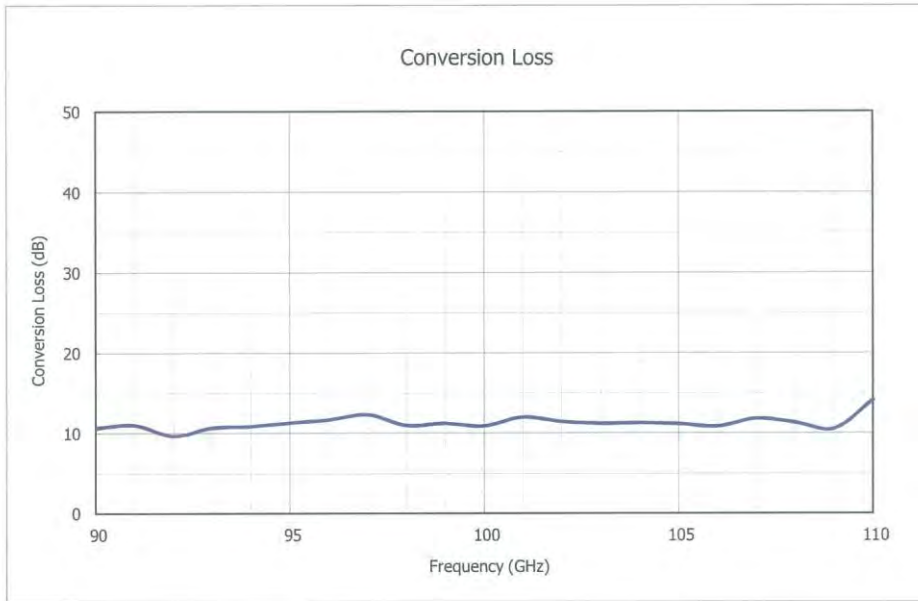
**교정결과**  
CALIBRATION RESULT



성적서발급번호(Certificate No) : IC-2022-019244  
교 정 번 호(Calibration No) : C-2022-022982

페이지(page) : 2 of 3

1. Conversion Loss Graph



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 12, L.O. Level = 10 dBm, IF = 322.5 MHz, Bias Value = 0.00 mA
2. This is the result of measuring the requested equipment and Keysight N9030B (S/N : MY55480110) together.

F-02P-02-008 (Rev.02)

**교 정 결 과**  
**CALIBRATION RESULT**



성적서발급번호(Certificate No) : IC-2022-019244  
교 정 번 호(Calibration No) : C-2022-022982

페이지(page) : 3 of 3

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
90.0	10.67	0.82	101.0	12.00	0.82
91.0	11.01	0.82	102.0	11.43	0.82
92.0	9.66	0.82	103.0	11.20	0.82
93.0	10.67	0.82	104.0	11.27	0.82
94.0	10.87	0.82	105.0	11.16	0.82
95.0	11.29	0.82	106.0	10.86	0.82
96.0	11.67	0.82	107.0	11.82	0.82
97.0	12.32	0.82	108.0	11.31	0.82
98.0	10.98	0.82	109.0	10.56	0.82
99.0	11.22	0.82	110.0	14.16	0.82
100.0	10.89	0.82	-	-	-

END.

F-02P-02-008 (Rev.02)

열 람 용

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## Measurement Report

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea 17383  
Tel :82-31-645-6900, www.hct.co.kr

보고서번호(Report No) : IC-2022-019240  
측정번호(Measurement No) : C-2022-022978

페이지(page) : 1 of 4

1. 의뢰자 (Client)
  - 기기명 (Name) : (주)에이치시티
  - 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74
2. 대상품목 (Measurement Item) ◇ HCT 등록번호 : 415876
  - 기기명 (Description) : SA EXTENSION MODULE
  - 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR5.1
  - 기기번호 (Serial Number) : SAX774
3. 측정일자 (Measurement date) : 2022.03.17

4. 측정환경 (Environment)
  - 온도(Temperature) : ( 23.3 ± 0.2 ) °C
  - 습도(Humidity) : ( 48 ± 2 ) % R.H.


5. 측정방법 (Measurement method used)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비와 자체 점검된 장비를 사용하여 측정 되었음.

측정에 사용한 표준장비 명세 (List of used standards/specifications)


기기명 (Description)	제작회사 / 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT/N5173B	MY61252589	2022/10/15	(주)에이치시티
ERICKSON POWER METER	VDI/PM5	394V	측정	(주)에이치시티
WR-05 MULTIPLIER SOURCE MODULE	OML/S05MS-A	160419-1	측정	(주)에이치시티

6. 측정결과 (Measurement result) : 측정결과 참조 (Refer to attachment)  
 (이 측정결과는 의뢰자가 제시한 시료 및 시료명에만 한정됩니다.  
 The measurement results shown in this report refer only to the sample(s) measured unless otherwise stated.


<b>확 인</b> (Affirmation)	작성자 (Tested by) 성명 (Name) : 고흥재		승인자 (Approved by) 직위 (Title) : 기술책임자(Technical Manager) 성명 (Name) : 김광철
-----------------------------	------------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------

이 성적서는 ILAC MRA 서명 기관인 KOLAS(Korea Laboratory Accreditation Scheme)와 A2LA (American Laboratory for Laboratory Accreditation)의 인정과 무관합니다. This calibration certificate is Not an accredited report by KOLAS(Korea Laboratory Accreditation Scheme) and A2LA(American Association for Laboratory Accreditation), a ILAC MRA signatory.

2022. 03. 17



(주)에이치시티 대표이사  
President, HCT Co., Ltd.



⚠ 측정결과는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다. If any significant instability or other adverse factor(overload, temperature, humidity etc.) manifests itself before, during or after calibration, and is likely to affect the validity of the calibration.

F-02P-02-010 (Rev.01)

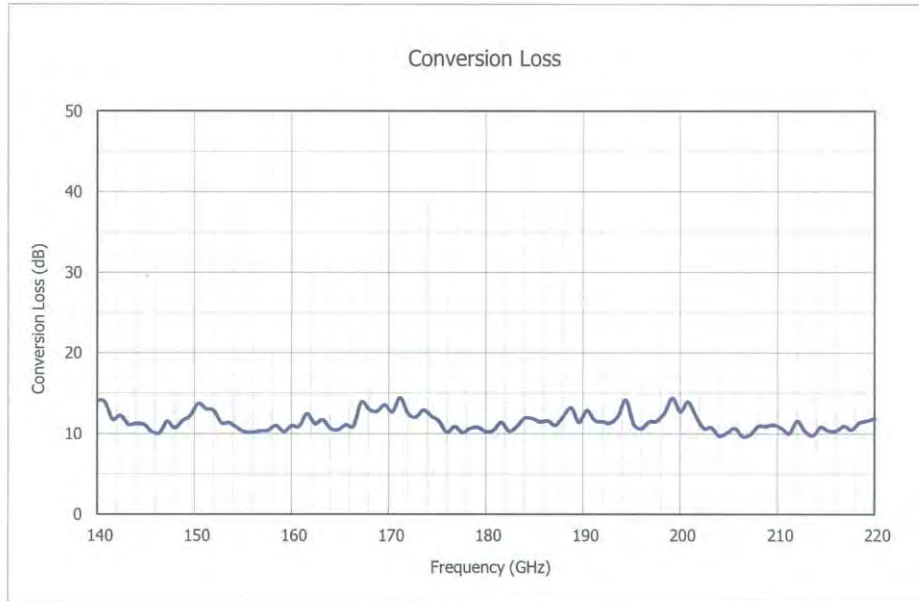
## MEASUREMENT RESULT

보고서번호(Report No) : IC-2022-019240

페이지(page) : 2 of 4

측정번호(Measurement No) : C-2022-022978

### 1. Conversion Loss Graph



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 24, L.O. Level = 10 dBm, IF = 322.5 MHz, Bias Value = 0.00 mA
2. This is the result of measuring the requested equipment and Keysight N9030B (S/N : MY55480110) together.
3. 110 GHz 초과 대역의 전력은 국제적인 표준 소급이 없으므로 HCT에서 자체 점검된 기준기를 사용하여 측정되었음.
4. 상기 결과는 고객의 요청에 의해서 측정되었음.

F-02P-02-010 (Rev.01)



## MEASUREMENT RESULT

보고서번호(Report No) : IC-2022-019240

페이지(page) : 3 of 4

측 정 번 호(Measurement No) : C-2022-022978

### 2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
140.0	14.15	0.89	169.6	13.51	0.89
140.8	13.89	0.89	170.4	12.67	0.89
141.6	11.75	0.89	171.2	14.40	0.89
142.4	12.22	0.89	172.0	12.47	0.89
143.2	11.13	0.89	172.8	12.00	0.89
144.0	11.21	0.89	173.6	12.89	0.89
144.8	11.11	0.89	174.4	12.13	0.89
145.6	10.27	0.89	175.2	11.48	0.89
146.4	10.06	0.89	176.0	10.14	0.89
147.2	11.44	0.89	176.8	10.85	0.89
148.0	10.69	0.89	177.6	10.12	0.89
148.8	11.57	0.89	178.4	10.62	0.89
149.6	12.18	0.89	179.2	10.75	0.89
150.4	13.69	0.89	180.0	10.23	0.89
151.2	13.06	0.89	180.8	10.38	0.89
152.0	12.82	0.89	181.6	11.36	0.89
152.8	11.32	0.89	182.4	10.30	0.89
153.6	11.31	0.89	183.2	10.84	0.89
154.4	10.71	0.89	184.0	11.87	0.89
155.2	10.21	0.89	184.8	11.83	0.89
156.0	10.15	0.89	185.6	11.43	0.89
156.8	10.33	0.89	186.4	11.53	0.89
157.6	10.38	0.89	187.2	11.02	0.89
158.4	10.96	0.89	188.0	12.12	0.89
159.2	10.23	0.89	188.8	13.14	0.89
160.0	10.93	0.89	189.6	11.37	0.89
160.8	10.89	0.89	190.4	12.83	0.89
161.6	12.42	0.89	191.2	11.61	0.89
162.4	11.20	0.89	192.0	11.45	0.89
163.2	11.67	0.89	192.8	11.30	0.89
164.0	10.64	0.89	193.6	12.15	0.89
164.8	10.46	0.89	194.4	14.12	0.89
165.6	11.06	0.89	195.2	11.16	0.89
166.4	10.92	0.89	196.0	10.60	0.89
167.2	13.85	0.89	196.8	11.42	0.89
168.0	12.97	0.89	197.6	11.52	0.89
168.8	12.73	0.89	198.4	12.57	0.89

F-02P-02-010 (Rev.01)

## MEASUREMENT RESULT

보고서번호(Report No) : IC-2022-019240

페이지(page) : 4 of 4

측 정 번 호(Measurement No) : C-2022-022978

2. Conversion Loss Data (cont.)

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
199.2	14.35	0.89	210.4	10.63	0.89
200.0	12.69	0.89	211.2	10.00	0.89
200.8	13.88	0.89	212.0	11.50	0.89
201.6	12.17	0.89	212.8	10.28	0.89
202.4	10.65	0.89	213.6	9.73	0.89
203.2	10.73	0.89	214.4	10.77	0.89
204.0	9.69	0.89	215.2	10.31	0.89
204.8	10.08	0.89	216.0	10.30	0.89
205.6	10.63	0.89	216.8	10.90	0.89
206.4	9.62	0.89	217.6	10.46	0.89
207.2	9.89	0.89	218.4	11.30	0.89
208.0	10.87	0.89	219.2	11.56	0.89
208.8	10.89	0.89	220.0	11.82	0.89
209.6	11.05	0.89	-	-	-

END.

F-02P-02-010 (Rev.01)

**열람용**

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**교정성적서**  
CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74  
TEL : 031-645-6900, FAX : 031-645-6969



성적서발급번호(Certificate No) : IC-2021-74956  
교정번호(Calibration No) : C-2021-090852

페이지(page) : 1 of 4

**1. 의뢰자 (Client)**

- 기관명 (Name) : (주)에이치시티  
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

**2. 측정기 (Calibration Subject)**

◇ 등록번호 : 400353

- 기기명 (Description) : AMPLIFIER  
- 제작회사 및 형식(Manufacturer and Model Name) : T&M SYSTEM / Thru1 + LLAU1183540Q  
- 기기번호 (Serial Number) : NONE

**3. 교정일자 (Date of Calibration) : 2021.09.16**

차기교정예정일자 : 2022.09.16  
(The due date of next Calibration)

**4. 교정환경 (Environment)**

- 온도(Temperature) : ( 22.7 ± 0.2 ) °C      - 습도(Humidity) : ( 48 ± 1 ) % R.H.  
- 교정장소 (Location) : 고정표준실(Permanent Calibration Lab)  
(주소: 경기도 이천시 마장면 서이천로 578번길 74)

**5. 측정표준의 소급성 (Traceability) ◇Field code : 40601(RF AMPLIFIER)**

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 증폭기의 교정절차(HCT-CS-105-40601)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 / 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
NETWORK ANALYZER	AGILENT/E5061B	MY49203861	2021/09/29	(주)에이치시티
CALIBRATION KIT(3.5 mm)	AGILENT/85052D	3101A05252	2023/07/20	한국표준과학연구원
NETWORK ANALYZER	AGILENT/N5230C	MY49001853	2021/09/29	(주)에이치시티

**6. 교정결과 (Calibration result) : 교정결과 참조 (Refer to attachment)**

**7. 측정불확도 (Measurement uncertainty) : 교정결과 참조 (Refer to attachment)**

신뢰수준 약 95%, k = 2 ( Confidence level about 95%, k = 2 )

<b>확 인</b> (affirmation)	작성자 (Measurements performed by)	승인자 (Approved by)
	성명 (Name) 유성노	직위 (Title) 기술책임자(Technical Cal. Manager) 성명 (Name) 이승찬 <span style="float: right;">(서명)</span>

위 성적서는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인 받은 분야의 교정결과입니다.

2021. 09. 16  
한국인정기구 인정      (주)에이치시티 대표이사  
Accredited by KOLAS, Republic of KOREA      President, HCT Co., Ltd.



※ 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다.  
※ 고객전용사이트(http://www.callab.co.kr)에서 성적서의 진위여부 확인이 가능합니다.  
※ 성적서의 원본은 상단에 HCT출력프로그램이 들어간 워터마크 필드 용지에 인쇄되어 발급되며, 원본 복사시에는 복사본이라는 표시가 처리됩니다.

# 교정결과

## CALIBRATION RESULT

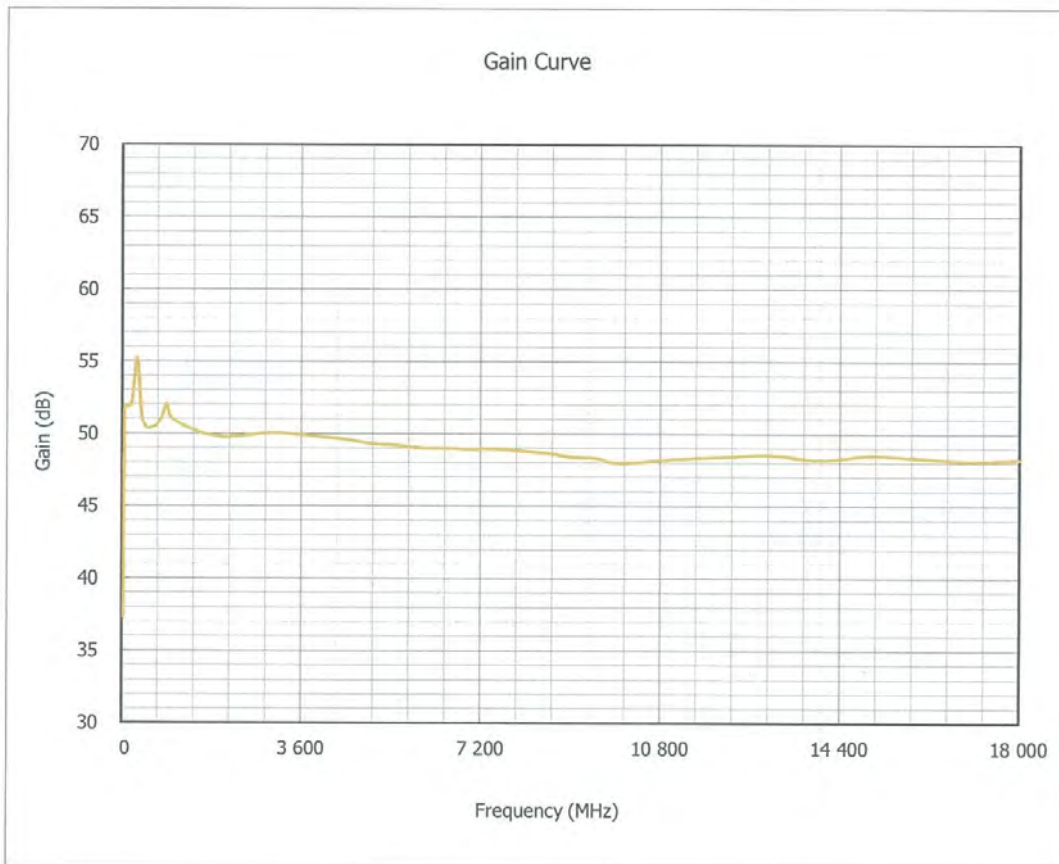


성적서발급번호(Certificate No) : IC-2021-74956

교정번호(Calibration No) : C-2021-090852

페이지(page) : 2 of 4

※ Measurement Curve



F-02P-02-008 (Rev.02)

**교정결과**  
**CALIBRATION RESULT**



성적서발급번호(Certificate No) : IC-2021-74956

교정번호(Calibration No) : C-2021-090852

페이지(page) : 3 of 4

1. Gain Calibration

Frequency	Measured Value	Uncertainty
30 MHz	37.31 dB	0.11 dB
50 MHz	51.74 dB	0.11 dB
100 MHz	51.89 dB	0.11 dB
200 MHz	52.12 dB	0.11 dB
300 MHz	55.25 dB	0.11 dB
400 MHz	51.07 dB	0.11 dB
500 MHz	50.38 dB	0.11 dB
600 MHz	50.43 dB	0.11 dB
700 MHz	50.60 dB	0.11 dB
800 MHz	51.17 dB	0.11 dB
900 MHz	52.02 dB	0.11 dB
1.0 GHz	51.04 dB	0.11 dB
1.5 GHz	50.15 dB	0.11 dB
2.0 GHz	49.78 dB	0.11 dB
2.5 GHz	49.88 dB	0.11 dB
3.0 GHz	50.03 dB	0.14 dB
3.5 GHz	49.94 dB	0.14 dB
4.0 GHz	49.76 dB	0.14 dB
4.5 GHz	49.59 dB	0.14 dB
5.0 GHz	49.31 dB	0.14 dB
5.5 GHz	49.19 dB	0.14 dB
6.0 GHz	49.01 dB	0.14 dB
6.5 GHz	49.00 dB	0.14 dB
7.0 GHz	48.92 dB	0.14 dB
7.5 GHz	48.96 dB	0.14 dB
8.0 GHz	48.80 dB	0.14 dB
8.5 GHz	48.66 dB	0.14 dB
9.0 GHz	48.40 dB	0.14 dB
9.5 GHz	48.33 dB	0.14 dB
10.0 GHz	47.96 dB	0.14 dB
11.0 GHz	48.22 dB	0.23 dB
12.0 GHz	48.39 dB	0.23 dB
13.0 GHz	48.54 dB	0.23 dB
14.0 GHz	48.18 dB	0.23 dB
15.0 GHz	48.49 dB	0.23 dB
16.0 GHz	48.31 dB	0.23 dB

F-02P-02-008 (Rev.02)

**교정결과**  
CALIBRATION RESULT



성적서발급번호(Certificate No) : IC-2021-74956

교정번호(Calibration No) : C-2021-090852

페이지(page) : 4 of 4

1. Gain Calibration (cont.)

Frequency	Measured Value	Uncertainty
17.0 GHz	48.11 dB	0.23 dB
18.0 GHz	48.20 dB	0.23 dB

끝.

### 7. Annex A\_EUT AND TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2205-FC018-P