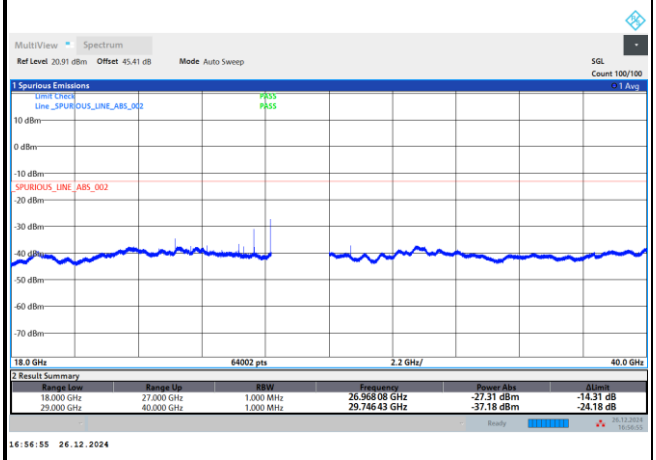
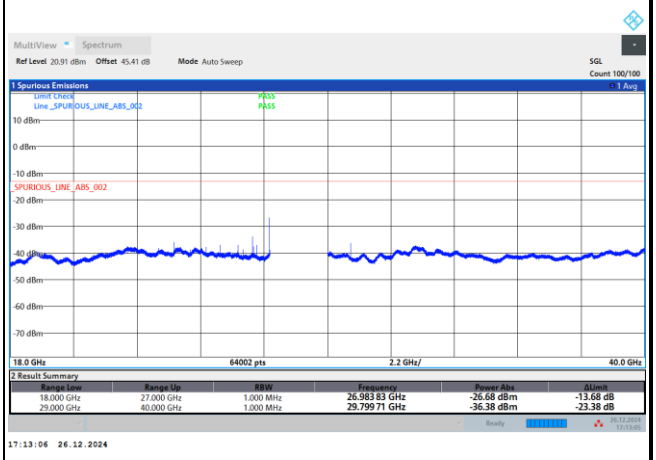
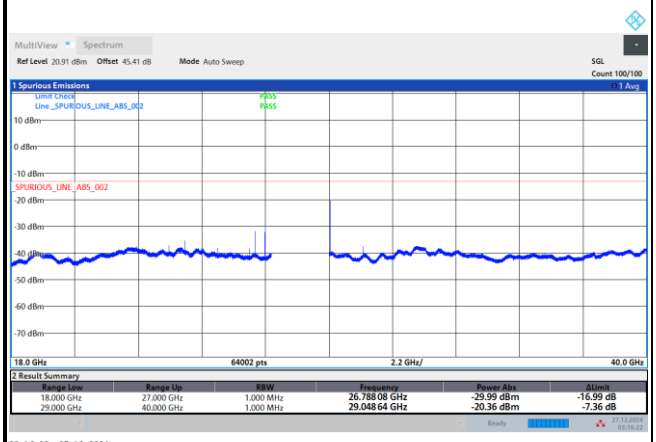
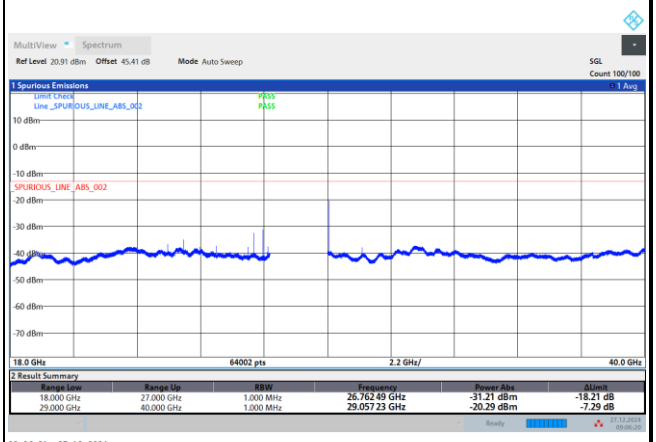
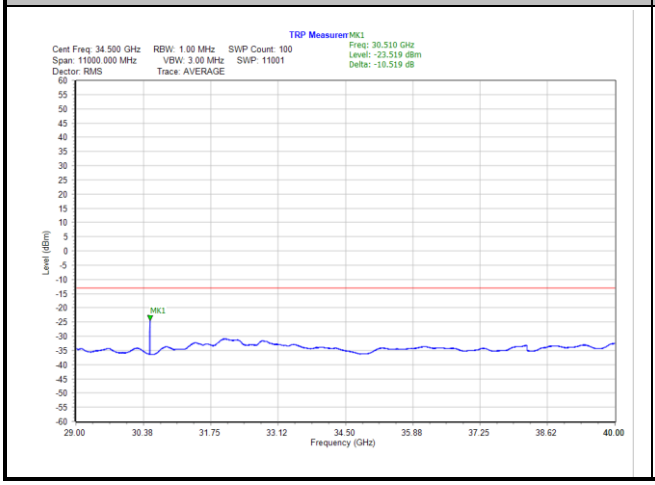
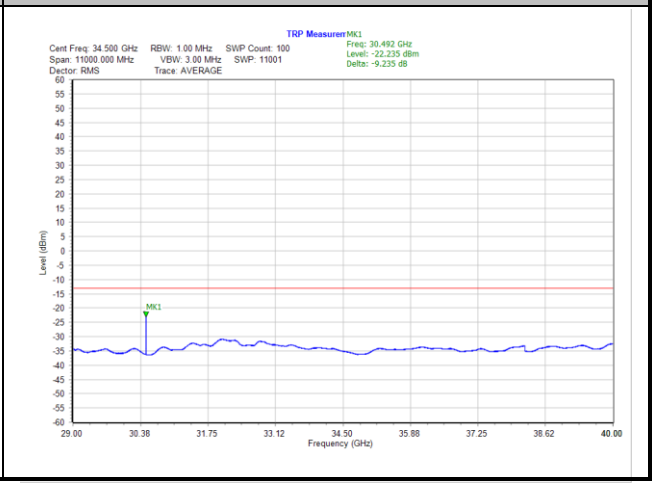
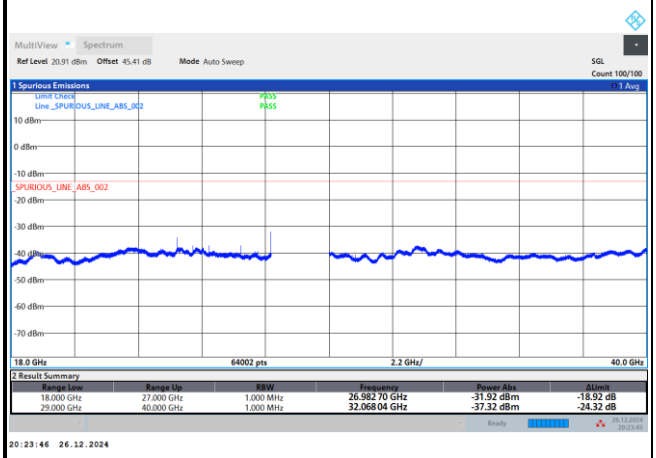
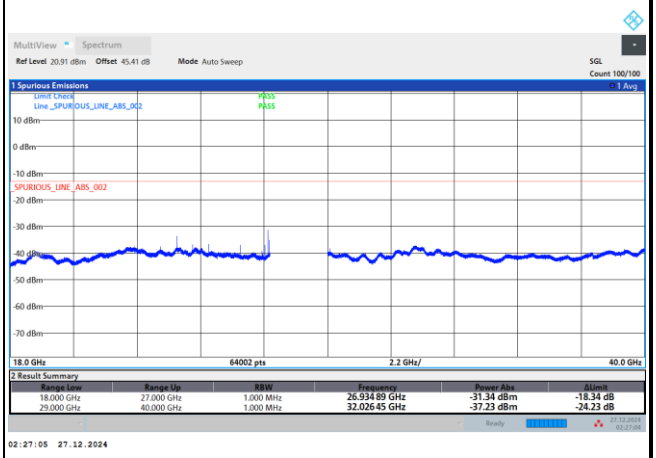
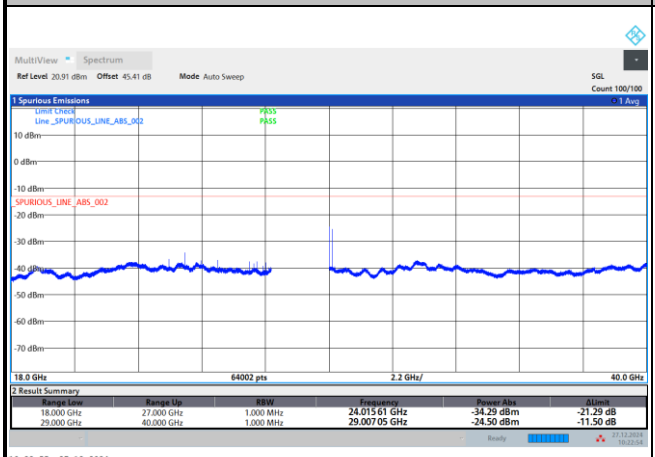
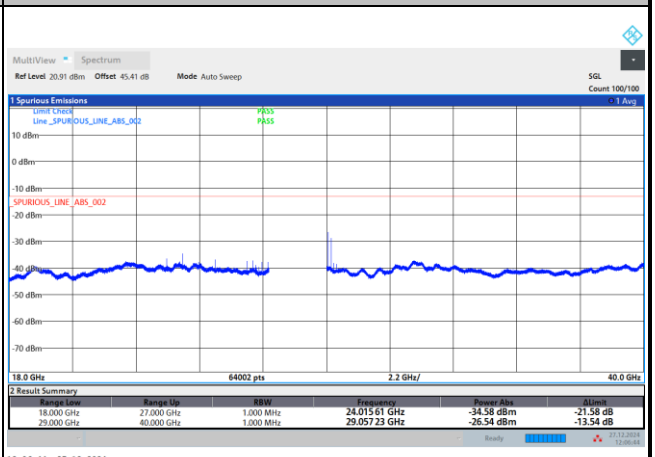
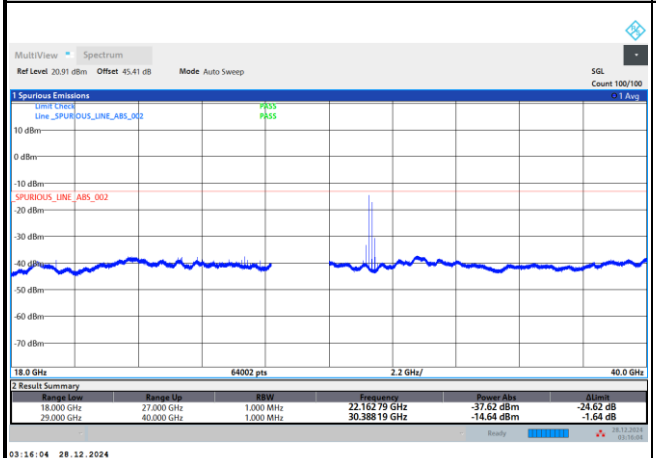
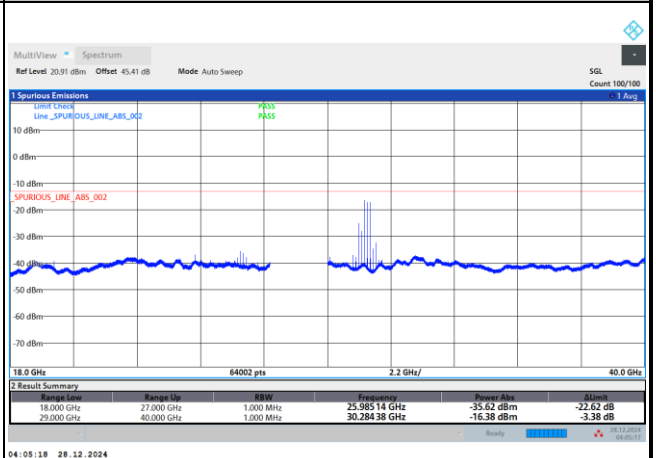
CP-OFDM

NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 50MHz	**Lowest Channel / 100MHz**
	
Middle Channel / 50MHz	**Middle Channel / 100MHz**
	
Highest Channel / 50MHz	**Highest Channel / 100MHz**
	

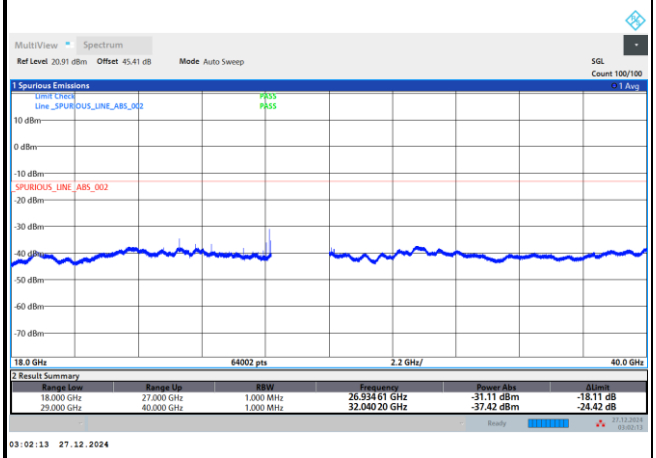
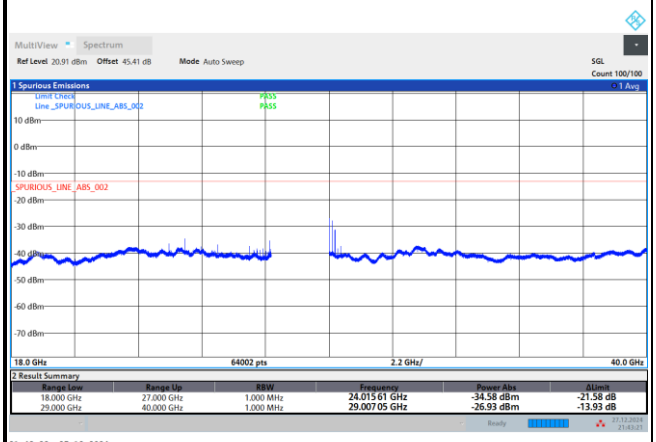
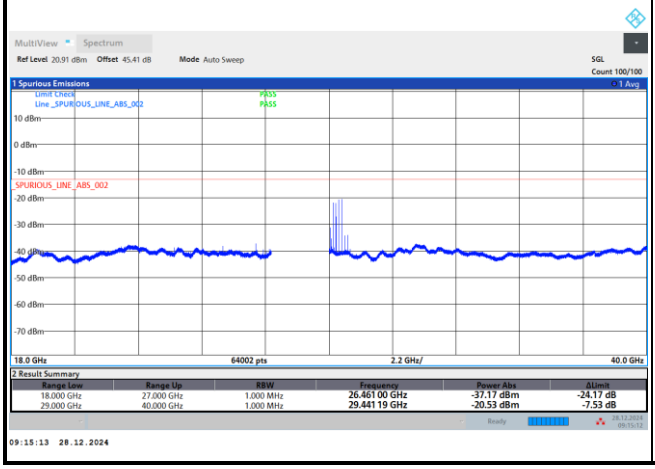
Remark: In band and out of band frequencies are omitted.

CP-OFDM

NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 200MHz	**Lowest Channel / 300MHz**
	
Middle Channel / 200MHz	**Middle Channel / 300MHz**
	
Highest Channel / 200MHz	**Highest Channel / 300MHz**
	

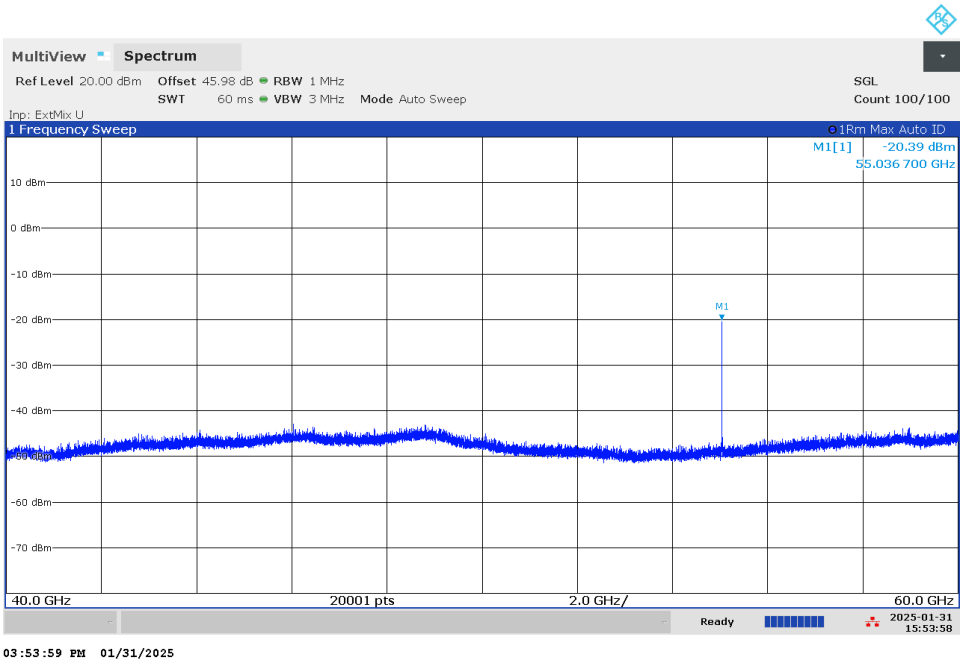
Remark: In band and out of band frequencies are omitted.

CP-OFDM

NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 400MHz	
	**intentionally blank**
Middle Channel / 400MHz	
	**intentionally blank**
Highest Channel / 400MHz	
	**intentionally blank**

Remark: In band and out of band frequencies are omitted.

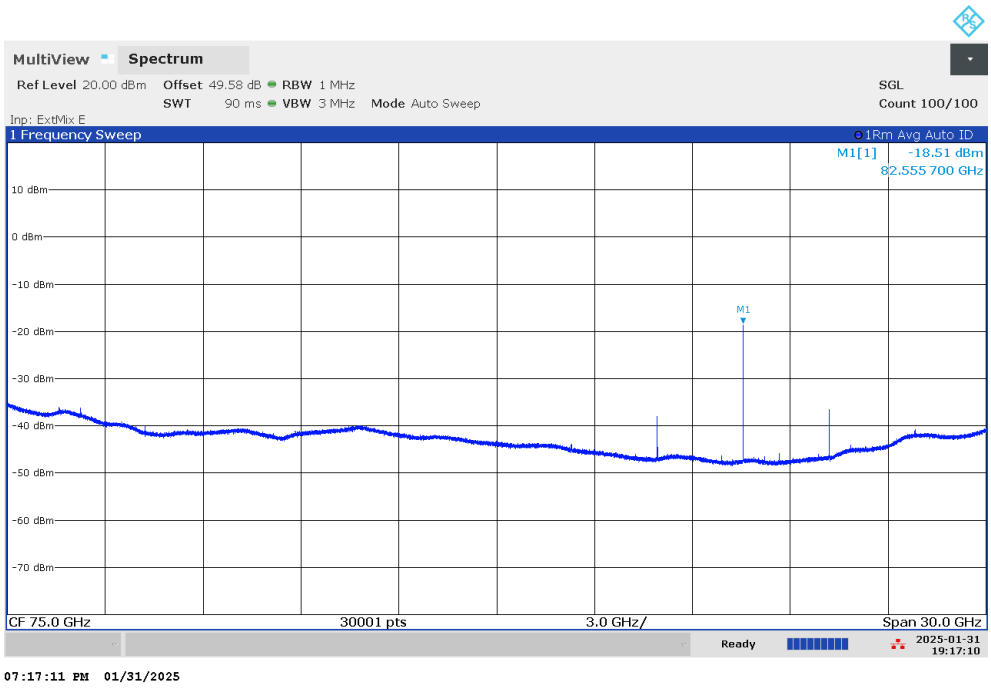
NR Band n261
(40GHz-60GHz)
Limit -13dBm/MHz, PASS



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8

= 42.6 + 1.18 + 107 + 20log(1) – 104.8 = 45.98(dB)

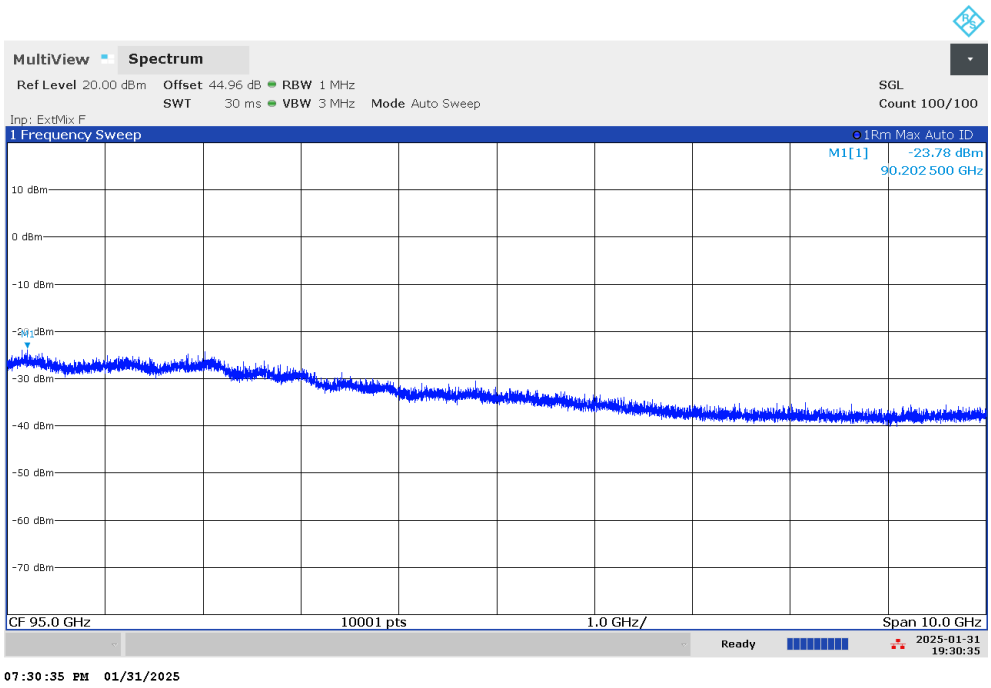
NR Band n261
(60GHz-90GHz)
Limit -13dBm/MHz, PASS



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8

= 46.2 + 1.18 + 107 + 20log(1) – 104.8 = 49.58 (dB)

NR Band n261
(90GHz-100GHz)
Limit -13dBm/MHz, PASS



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8

= 47.6 + 1.18 + 107 + 20log(0.5) – 104.8 = 44.96 (dB)

Frequency Stability

Test Conditions		NR Band n261 / Middle Channel			Limit
Temperature (°C)	Voltage (Volt)	CW tone			Note 2.
		Frequency (GHz)	Deviation (kHz)	Deviation (ppm)	Result
50	Normal Voltage	27.924957	93.000	3.330	Pass
40	Normal Voltage	27.924982	68.000	2.435	
30	Normal Voltage	27.925013	37.000	1.325	
20(Ref.)	Normal Voltage	27.92505	0.000	0.000	
10	Normal Voltage	27.9250679	-17.900	0.641	
0	Normal Voltage	27.9251169	-66.900	2.396	
-10	Normal Voltage	27.9251389	-88.900	3.184	
-20	Normal Voltage	27.9251289	-78.900	2.825	
-30	Normal Voltage	27.9250739	-23.900	0.856	
20	Maximum Voltage	27.925041	9.000	0.322	
20	Normal Voltage	27.925044	6.000	0.215	
20	Battery End Point	27.925042	8.000	0.286	

Note:

1. Normal Voltage = 3.9 V.；Minimum Voltage = 3.6 V.；Maximum Voltage = 4.5 V.
2. The frequency fundamental emissions stay within the operation band.

Appendix B. R&S Mixer and Horn Antenna Calibration Reports

CALIBRATION CERTIFICATE

74, SEOICHEON-RO 578BEON-GIL, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, KOREA 17383
TEL :82-31-645-6900, FAX :82-31-645-6969

- Certificate No : IC-2024-057622
- Calibration No : C-2024-067791

1. Client

- Name : SPORTON INTERNATIONAL INC.
- Address : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. Calibration Subject ◇Registration No : 527287

- Description : HARMONIC MIXER
- Manufacturer and Model Name : ROHDE & SCHWARZ / FS-Z60
- Serial Number : 101033

3. Date of Calibration : 2024.06.27

4. Environment

- Temperature : (23.1 ± 0.3) ℃ - Humidity : (48 ± 2) % R.H.
- Location : Permanent Calibration Lab
  (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea)

5. Traceability

Calibration method and/or brief description

This certifies that the equipment has been calibrated using applicable HCT procedure(HCT-CS-125-40641), in compliance with ISO/IEC 17025. Measurement are traceable to the International System of Unit (SI) via national metrology institutes.

List of used standards/specifications

Description	Manufacturer / Model Name	Serial Number	The due date of next Calibration	Calibration laboratory
PSG ANALOG SIGNAL GENERATOR	AGILENT/E8257D	MY46130629	2025/06/12	HCT CO., LTD.
THERMAL POWER SENSOR	ROHDE & SCHWARZ/NRP110T	101259	2025/05/14	ROHDE & SCHWARZ
WR-19 MULTIPLIER SOURCE MODULE	OML/S19MS-A	160516-1	2024/07/19	HCT CO., LTD.
SIGNAL & SPECTRUM ANALYZER	ROHDE & SCHWARZ/FSW43	102337	2024/07/11	HCT CO., LTD.

6. Calibration result : **Refer to attachment**

7. Measurement uncertainty : **Refer to attachment**
(Confidence level about 95 %, k = 2)

affirmation	Measurements performed by Name : **Seokhoon Kang** (signature)	Approved by Title Technical Cal. Manager Name **Kwangchul Kim** (signature)

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024. 06. 27

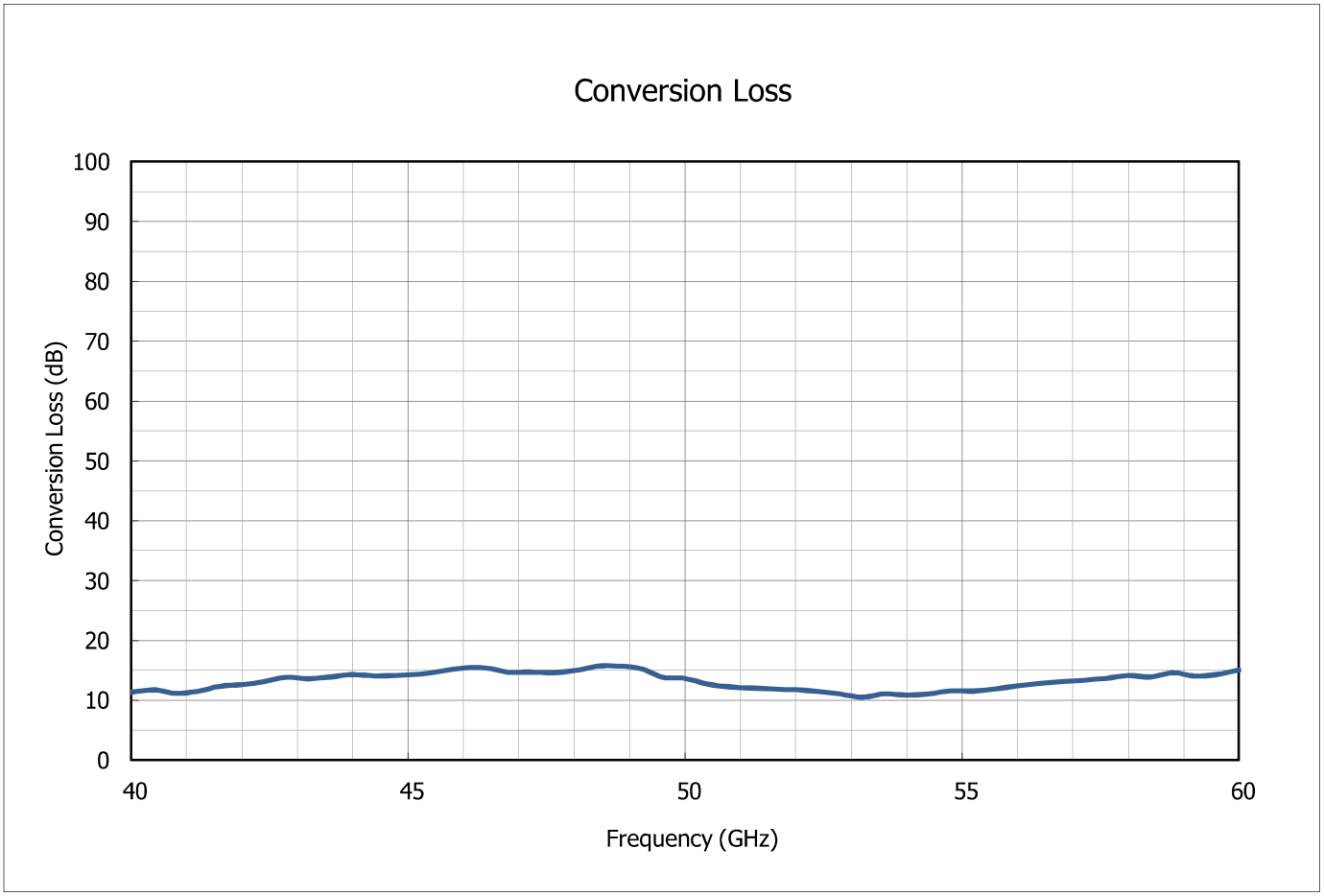
Accredited by KOLAS, Republic of KOREA **HCT Co., Ltd.**

(NOTE) 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.

Calibration Results

Certificate No : IC-2024-057622
Calibration No : C-2024-067791

※ **Conversion Loss Graph**



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 4, L.O. Level = 15.5 dBm, IF = 1 330 MHz, Bias Value = 0.00 mA

Calibration Results

Certificate No : IC-2024-057622
Calibration No : C-2024-067791

1. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
40.0	11.34	0.82	50.4	12.73	0.82
40.4	11.77	0.82	50.8	12.26	0.82
40.8	11.17	0.82	51.2	12.05	0.82
41.2	11.51	0.82	51.6	11.87	0.82
41.6	12.36	0.82	52.0	11.77	0.82
42.0	12.64	0.82	52.4	11.48	0.82
42.4	13.13	0.82	52.8	11.06	0.82
42.8	13.85	0.82	53.2	10.53	0.82
43.2	13.60	0.82	53.6	11.10	0.82
43.6	13.91	0.82	54.0	10.88	0.82
44.0	14.31	0.82	54.4	11.08	0.82
44.4	14.08	0.82	54.8	11.60	0.82
44.8	14.18	0.82	55.2	11.56	0.82
45.2	14.36	0.82	55.6	11.90	0.82
45.6	14.88	0.82	56.0	12.44	0.82
46.0	15.42	0.82	56.4	12.81	0.82
46.4	15.42	0.82	56.8	13.11	0.82
46.8	14.70	0.82	57.2	13.37	0.82
47.2	14.73	0.82	57.6	13.69	0.82
47.6	14.63	0.82	58.0	14.13	0.82
48.0	14.95	0.82	58.4	13.91	0.82
48.4	15.68	0.82	58.8	14.61	0.82
48.8	15.72	0.82	59.2	14.08	0.82
49.2	15.30	0.82	59.6	14.33	0.82
49.6	13.86	0.82	60.0	15.07	0.82
50.0	13.68	0.82	-	-	-

END.

CALIBRATION CERTIFICATE

74, SEOICHEON-RO 578BEON-GIL, MAJANG-MYEON,
ICHEON-SI, GYEONGGI-DO, KOREA 17383
TEL :82-31-645-6900, FAX :82-31-645-6969

- Certificate No : IC-2024-057625
- Calibration No : C-2024-067794

1. Client

- Name : SPORTON INTERNATIONAL INC.
- Address : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. Calibration Subject ◇Registration No : 527290

- Description : HARMONIC MIXER
- Manufacturer and Model Name : ROHDE & SCHWARZ / FS-Z90
- Serial Number : 101867

3. Date of Calibration : 2024.06.27

4. Environment

- Temperature : (23.2 ± 0.3) ℃ - Humidity : (48 ± 2) % R.H.
- Location : Permanent Calibration Lab
  (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea)

5. Traceability

Calibration method and/or brief description

This certifies that the equipment has been calibrated using applicable HCT procedure(HCT-CS-125-40641), in compliance with ISO/IEC 17025. Measurement are traceable to the International System of Unit (SI) via national metrology institutes.

List of used standards/specifications

Description	Manufacturer / Model Name	Serial Number	The due date of next Calibration	Calibration laboratory
PSG ANALOG SIGNAL GENERATOR	AGILENT/E8257D	MY46130629	2025/06/12	HCT CO., LTD.
WR-12 MULTIPLIER SOURCE MODULE	OML/S12MS-A	160419-1	2024/07/19	HCT CO., LTD.
SIGNAL & SPECTRUM ANALYZER	ROHDE & SCHWARZ/FSW43	102337	2024/07/11	HCT CO., LTD.
THERMAL POWER SENSOR	ROHDE & SCHWARZ/NRP110T	101259	2025/05/14	ROHDE & SCHWARZ

6. Calibration result : **Refer to attachment**

7. Measurement uncertainty : **Refer to attachment**
(Confidence level about 95 %, k = 2)

affirmation	Measurements performed by Name : **Seokhoon Kang** (signature)	Approved by Title Technical Cal. Manager Name **Kwangchul Kim** (signature)

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024. 06. 27

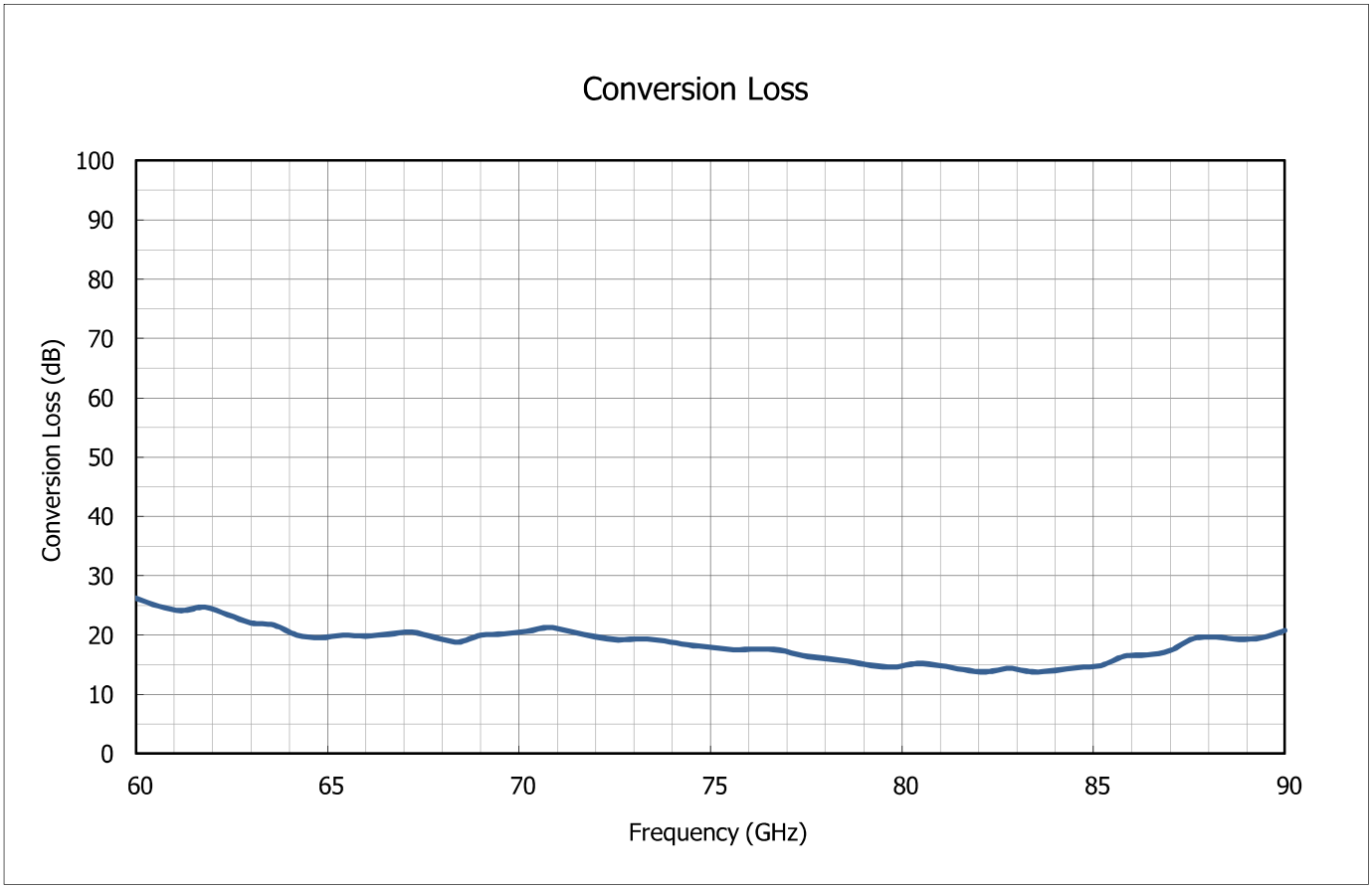
Accredited by KOLAS, Republic of KOREA **HCT Co., Ltd.**

(NOTE) 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.

Calibration Results

Certificate No : IC-2024-057625
Calibration No : C-2024-067794

※ **Conversion Loss Graph**



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 6, L.O. Level = 15.5 dBm, IF = 1 330 MHz, Bias Value = 0.00 mA

Calibration Results

Certificate No : IC-2024-057625
Calibration No : C-2024-067794

1. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
60.0	26.25	0.82	75.6	17.55	0.82
60.6	24.88	0.82	76.2	17.67	0.82
61.2	24.13	0.82	76.8	17.48	0.82
61.8	24.70	0.82	77.4	16.54	0.82
62.4	23.44	0.82	78.0	16.09	0.82
63.0	22.07	0.82	78.6	15.56	0.82
63.6	21.70	0.82	79.2	14.91	0.82
64.2	20.03	0.82	79.8	14.63	0.82
64.8	19.57	0.82	80.4	15.22	0.82
65.4	19.98	0.82	81.0	14.88	0.82
66.0	19.85	0.82	81.6	14.17	0.82
66.6	20.17	0.82	82.2	13.81	0.82
67.2	20.50	0.82	82.8	14.41	0.82
67.8	19.62	0.82	83.4	13.81	0.82
68.4	18.82	0.82	84.0	14.05	0.82
69.0	19.95	0.82	84.6	14.53	0.82
69.6	20.23	0.82	85.2	14.88	0.82
70.2	20.61	0.82	85.8	16.44	0.82
70.8	21.30	0.82	86.4	16.67	0.82
71.4	20.49	0.82	87.0	17.38	0.82
72.0	19.73	0.82	87.6	19.41	0.82
72.6	19.21	0.82	88.2	19.67	0.82
73.2	19.38	0.82	88.8	19.31	0.82
73.8	19.00	0.82	89.4	19.56	0.82
74.4	18.34	0.82	90.0	20.80	0.82
75.0	17.98	0.82	-	-	-

END.

CALIBRATION CERTIFICATE

74, SEOICHEON-RO 578BEON-GIL, MAJANG-MYEON,
ICHEON-SI, GYEONGGI-DO, KOREA 17383
TEL :82-31-645-6900, FAX :82-31-645-6969

- Certificate No : IC-2024-057623
- Calibration No : C-2024-067792

1. Client

- Name : SPORTON INTERNATIONAL INC.
- Address : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. Calibration Subject ◇Registration No : 527288

- Description : HARMONIC MIXER
- Manufacturer and Model Name : ROHDE & SCHWARZ / FS-Z140
- Serial Number : 101130

3. Date of Calibration : 2024.06.27

4. Environment

- Temperature : (23.1 ± 0.4) ℃ - Humidity : (49 ± 2) % R.H.
- Location : Permanent Calibration Lab
  (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea)

5. Traceability

Calibration method and/or brief description

This certifies that the equipment has been calibrated using applicable HCT procedure(HCT-CS-125-40641), in compliance with ISO/IEC 17025. Measurement are traceable to the International System of Unit (SI) via national metrology institutes.

List of used standards/specifications

Description	Manufacturer / Model Name	Serial Number	The due date of next Calibration	Calibration laboratory
PSG ANALOG SIGNAL GENERATOR	AGILENT/E8257D	MY46130629	2025/06/12	HCT CO., LTD.
THERMAL POWER SENSOR	ROHDE & SCHWARZ/NRP110T	101259	2025/05/14	ROHDE & SCHWARZ
WR-08 MULTIPLIER SOURCE MODULE	OML/S08MS-A	160419-1	2024/07/19	HCT CO., LTD.
SIGNAL & SPECTRUM ANALYZER	ROHDE & SCHWARZ/FSW43	102337	2024/07/11	HCT CO., LTD.

6. Calibration result : **Refer to attachment**

7. Measurement uncertainty : **Refer to attachment**
(Confidence level about 95 %, k = 2)

affirmation	Measurements performed by Name : **Seokhoon Kang** (signature)	Approved by Title Technical Cal. Manager Name **Kwangchul Kim** (signature)

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024. 06. 27

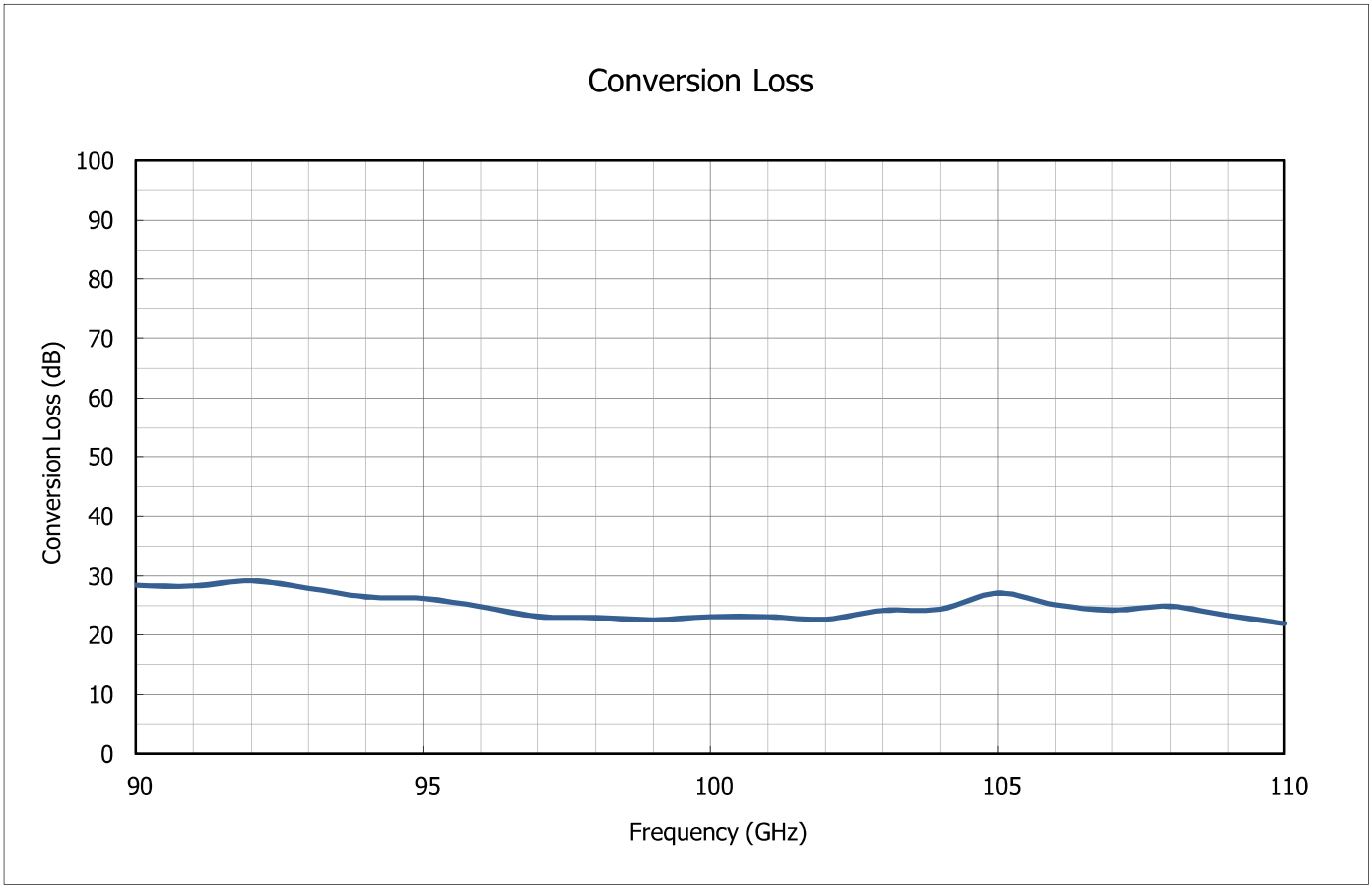
Accredited by KOLAS, Republic of KOREA **HCT Co., Ltd.**

(NOTE) 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.

Calibration Results

Certificate No : IC-2024-057623
Calibration No : C-2024-067792

※ **Conversion Loss Graph**



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 10, L.O. Level = 15.5 dBm, IF = 1 330 MHz, Bias Value = 0.00 mA

Calibration Results

Certificate No : IC-2024-057623
Calibration No : C-2024-067792

1. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
90.0	28.44	0.82	101.0	23.08	0.82
91.0	28.33	0.82	102.0	22.69	0.82
92.0	29.21	0.82	103.0	24.17	0.82
93.0	27.97	0.82	104.0	24.41	0.82
94.0	26.49	0.82	105.0	27.13	0.82
95.0	26.21	0.82	106.0	25.15	0.82
96.0	24.82	0.82	107.0	24.24	0.82
97.0	23.16	0.82	108.0	24.88	0.82
98.0	22.96	0.82	109.0	23.31	0.82
99.0	22.60	0.82	110.0	21.96	0.82
100.0	23.10	0.82	-	-	-

END.

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-2024-059304
측 정 번 호(Measurement No) : C-2024-069557

1. 의뢰자 (Client)
- 기관명 (Name) : SPORTON INTERNATIONAL INC.
- 주소 (Address) : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. 대상품목 (Measurement Item) ◇ HCT 등록번호 : 527857
- 기기명 (Description) : HARMONIC MIXER
- 제작회사 및 형식(Manufacturer and Model Name) : ROHDE & SCHWARZ / FS-Z140
- 기기번호 (Serial Number) : 101130

3. 측정일자 (Measurement date) : 2024.06.27

4. 측정환경 (Environment)
- 온도(Temperature) : (23.2 ± 0.3) ℃ - 습도(Humidity) : (46 ± 3) % R.H.

5. 측정방법 (Measurement method used)

This certifies that the above equipment was measured using the standard equipment below according to customer requirements.

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)
PSG ANALOG SIGNAL GENERATOR	AGILENT/E8257D	MY46130629	2025/06/12	HCT CO., LTD.
SIGNAL & SPECTRUM ANALYZER	ROHDE & SCHWARZ/FSW43	102337	2024/07/11	HCT CO., LTD.
ERICKSON POWER METER	VDI/PM5	394V	NCR	HCT CO., LTD.
WR-08 MULTIPLIER SOURCE MODULE	OML/S08MS-A	160419-1	NCR	HCT CO., LTD.

6. 측정결과 (Messurement result) : 측정결과 참조 (Refer to attachment)

㈜ 이 측정결과는 의뢰자가 제시한 시료 및 시료명에만 한정됩니다.
The messuremen results shown in this report refer only to the sample(s) measured unless otherwise stated.

확 인 (Affirmation)	작성자 (Tested by)	승인자 (Approved by)
	성명 (Name) : **Seokhoon Kang** (서명)	직위 (Title) 기술책임자(Technical Manager) 성명 (Name) **Kwangchul Kim** (서명)

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.

2024. 07. 17

HCT

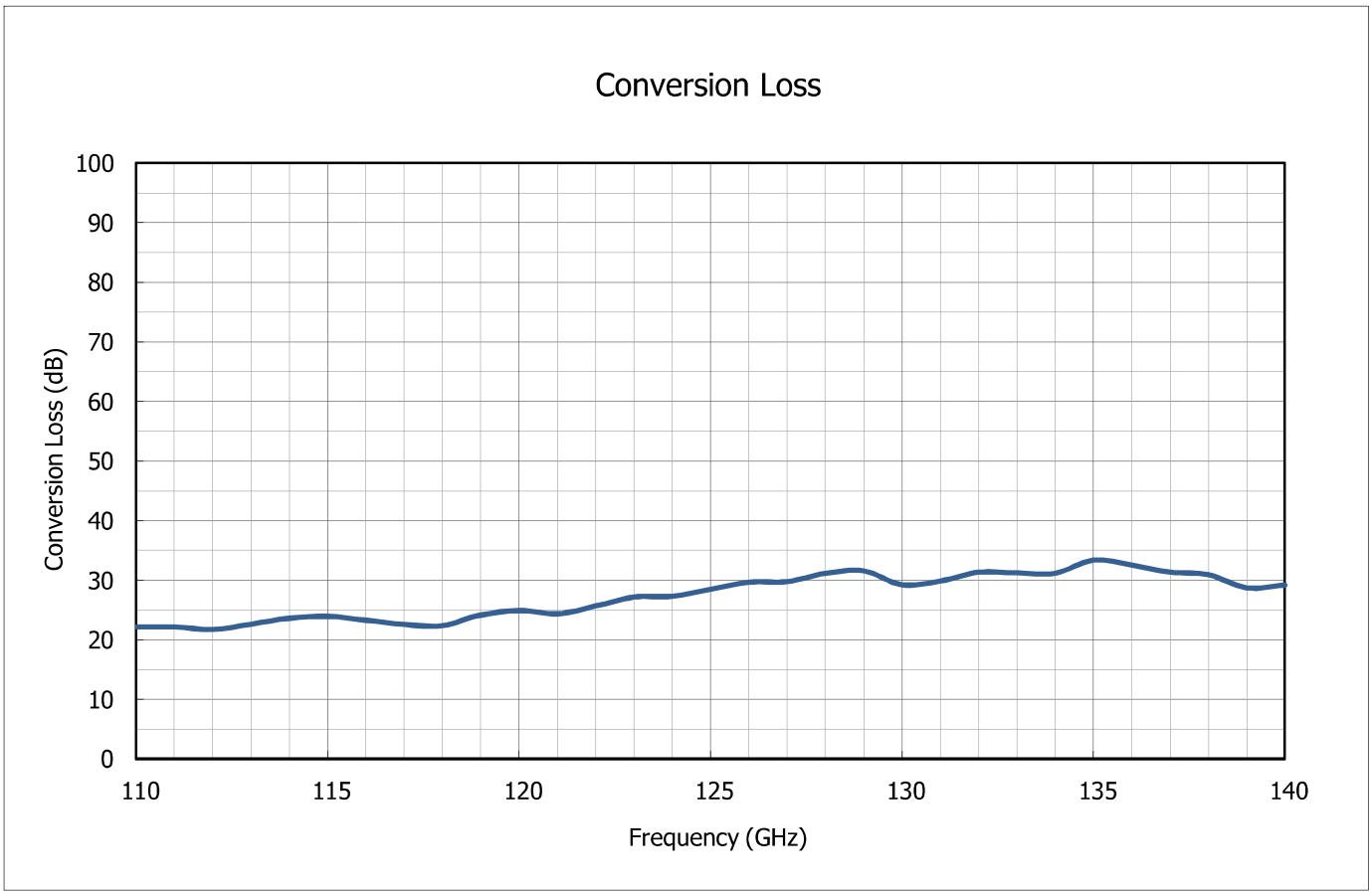
㈜에이치시티 대표이사
***President*, HCT Co., Ltd.**

㈜ 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.

*NCR(No Calibration Requirement)

Measurement Results

※ **Conversion Loss Graph**



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 10, L.O. Level = 15.5 dBm, IF = 1 330 MHz, Bias Value = 0.00 mA

Measurement Results

1. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
110.0	22.13	0.82	126.0	29.66	0.82
111.0	22.13	0.82	127.0	29.76	0.82
112.0	21.74	0.82	128.0	31.13	0.82
113.0	22.62	0.82	129.0	31.56	0.82
114.0	23.61	0.82	130.0	29.23	0.82
115.0	23.92	0.82	131.0	29.85	0.82
116.0	23.30	0.82	132.0	31.32	0.82
117.0	22.57	0.82	133.0	31.22	0.82
118.0	22.37	0.82	134.0	31.15	0.82
119.0	24.14	0.82	135.0	33.35	0.82
120.0	24.89	0.82	136.0	32.51	0.82
121.0	24.37	0.82	137.0	31.34	0.82
122.0	25.64	0.82	138.0	30.90	0.82
123.0	27.16	0.82	139.0	28.72	0.82
124.0	27.30	0.82	140.0	29.16	0.82
125.0	28.48	0.82	-	-	-

END.

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-2024-057626
측 정 번 호(Measurement No) : C-2024-067795

1. 의뢰자 (Client)
- 기관명 (Name) : SPORTON INTERNATIONAL INC.
- 주소 (Address) : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. 대상품목 (Measurement Item) ◇ HCT 등록번호 : 527291
- 기기명 (Description) : HARMONIC MIXER
- 제작회사 및 형식(Manufacturer and Model Name) : ROHDE & SCHWARZ / FS-Z220
- 기기번호 (Serial Number) : 101042

3. 측정일자 (Measurement date) : 2024.06.27

4. 측정환경 (Environment)
- 온도(Temperature) : (23.1 ± 0.3) ℃ - 습도(Humidity) : (49 ± 2) % R.H.

5. 측정방법 (Measurement method used)

This certifies that the above equipment was measured using the standard equipment below according to customer requirements.

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)
PSG ANALOG SIGNAL GENERATOR	AGILENT/E8257D	MY46130629	2025/06/12	HCT CO., LTD.
SIGNAL & SPECTRUM ANALYZER	ROHDE & SCHWARZ/FSW43	102337	2024/07/11	HCT CO., LTD.
ERICKSON POWER METER	VDI/PM5	394V	NCR	HCT CO., LTD.
WR-05 MULTIPLIER SOURCE MODULE	OML/S05MS-A	160419-1	NCR	HCT CO., LTD.

6. 측정결과 (Messurement result) : 측정결과 참조 (Refer to attachment)

㈜ 이 측정결과는 의뢰자가 제시한 시료 및 시료명에만 한정됩니다.
The messuremen results shown in this report refer only to the sample(s) measured unless otherwise stated.

확 인 (Affirmation)	작성자 (Tested by)	승인자 (Approved by)
	성명 (Name) : **Seokhoon Kang** (서명)	직위 (Title) 기술책임자(Technical Manager) 성명 (Name) **Kwangchul Kim** (서명)

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.

2024. 07. 17

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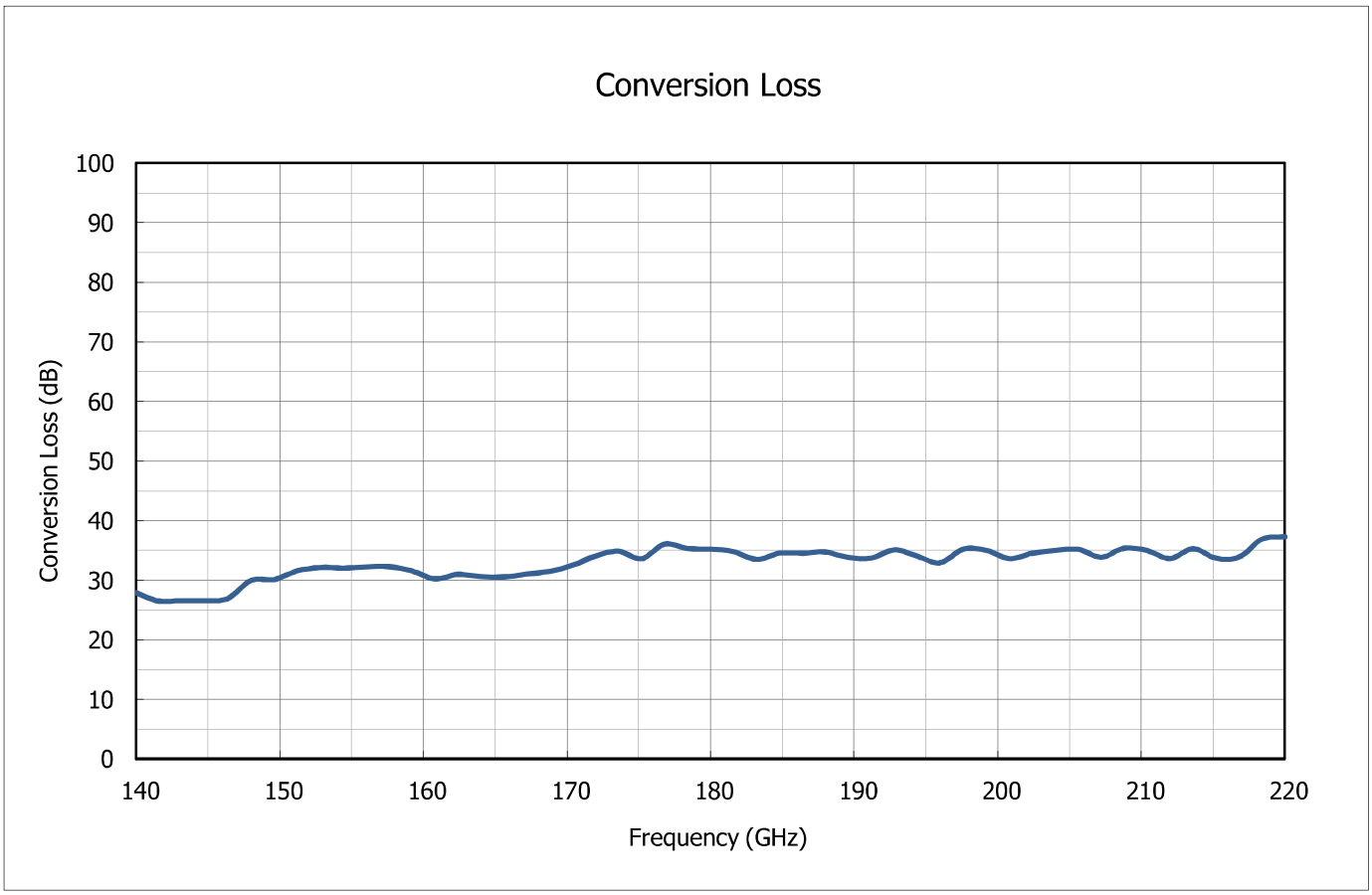
㈜에이치시티 대표이사
***President*, HCT Co., Ltd.**

㈜ 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.

*NCR(No Calibration Requirement)

Measurement Results

1. Conversion Loss Graph



[Note]

1. Measurement Condition : RF = -30 dBm, Harmonic Order = 16, L.O. Level = 15.5 dBm, IF = 1 330 MHz, Bias Value = 0.00 mA

Measurement Results

Certificate No : IC-2024-057626
Measurement No : C-2024-067795

1. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
140.00	27.89	0.89	181.60	34.79	0.89
141.60	26.48	0.89	183.20	33.48	0.89
143.20	26.57	0.89	184.80	34.51	0.89
144.80	26.57	0.89	186.40	34.52	0.89
146.40	26.91	0.89	188.00	34.72	0.89
148.00	29.94	0.89	189.60	33.82	0.89
149.60	30.10	0.89	191.20	33.72	0.89
151.20	31.53	0.89	192.80	35.08	0.89
152.80	32.12	0.89	194.40	33.99	0.89
154.40	32.02	0.89	196.00	32.90	0.89
156.00	32.21	0.89	197.60	35.20	0.89
157.60	32.26	0.89	199.20	34.97	0.89
159.20	31.54	0.89	200.80	33.62	0.89
160.80	30.23	0.89	202.40	34.50	0.89
162.40	30.97	0.89	204.00	34.98	0.89
164.00	30.57	0.89	205.60	35.16	0.89
165.60	30.55	0.89	207.20	33.84	0.89
167.20	31.00	0.89	208.80	35.35	0.89
168.80	31.48	0.89	210.40	34.95	0.89
170.40	32.48	0.89	212.00	33.62	0.89
172.00	34.05	0.89	213.60	35.25	0.89
173.60	34.85	0.89	215.20	33.66	0.89
175.20	33.57	0.89	216.80	33.88	0.89
176.80	36.03	0.89	218.40	36.85	0.89
178.40	35.30	0.89	220.00	37.27	0.89
180.00	35.18	0.89	-	-	-

END.

CALIBRATION CERTIFICATE

74, SEOICHEON-RO 578BEON-GIL, MAJANG-MYEON,
ICHEON-SI, GYEONGGI-DO, KOREA 17383
TEL :82-31-645-6900, FAX :82-31-645-6969

- Certificate No : IC-2024-057639
- Calibration No : C-2024-067808

1. Client

- Name : SPORTON INTERNATIONAL INC.
- Address : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. Calibration Subject ◇Registration No : 527313

- Description : ANTENNA
- Manufacturer and Model Name : QUINSTAR / QWH-UPRR00
- Serial Number : 1410300003

3. Date of Calibration : 2024.06.27

4. Environment

- Temperature : (22.7 ± 0.1) ℃ - Humidity : (48 ± 2) % R.H.
- Location : Permanent Calibration Lab
  (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea)

5. Traceability

Calibration method and/or brief description

This certifies that the equipment has been calibrated using applicable HCT procedure(HCT-CS-264-40707), (HCT-CS-264-40707), in compliance with ISO/IEC 17025. Measurement are traceable to the International System of Unit (SI) via national metrology institutes.

List of used standards/specifications

Description	Manufacturer / Model Name	Serial Number	The due date of next Calibration	Calibration laboratory
PNA SERIES NETWORK ANALYZER	AGILENT/E8363B	MY43030182	2025/06/18	HCT CO., LTD.
NETWORK ANALYZER	AGILENT/N5230C	MY49001853	2024/09/27	HCT CO., LTD.
TRANSMISSION/REFLECTION MODULE SET	OML/V15VNA2-T/R	200722-1	2024/10/18	HCT CO., LTD.
CALIBRATION KIT(2.4 ㎜)	KEYSIGHT/85056D	MY53400508	2025/02/28	KRISS
CALIBRATION KIT	Keysight Technologies/V11644A	MY46042094	2024/10/06	Keysight Technologies

6. Calibration result : **Refer to attachment**

7. Measurement uncertainty : **Refer to attachment**
(Confidence level about 95 %, k = 2)

affirmation	Measurements performed by Name : **Minhyeong Shin** (signature)	Approved by Title Technical Cal. Manager Name **Jaesang So** (signature)

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024. 06. 27

Accredited by KOLAS, Republic of KOREA **HCT Co., Ltd.**

(NOTE) 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.

Calibration Results

Certificate No : IC-2024-057639
Calibration No : C-2024-067808

1. Antenna Factor & Gain

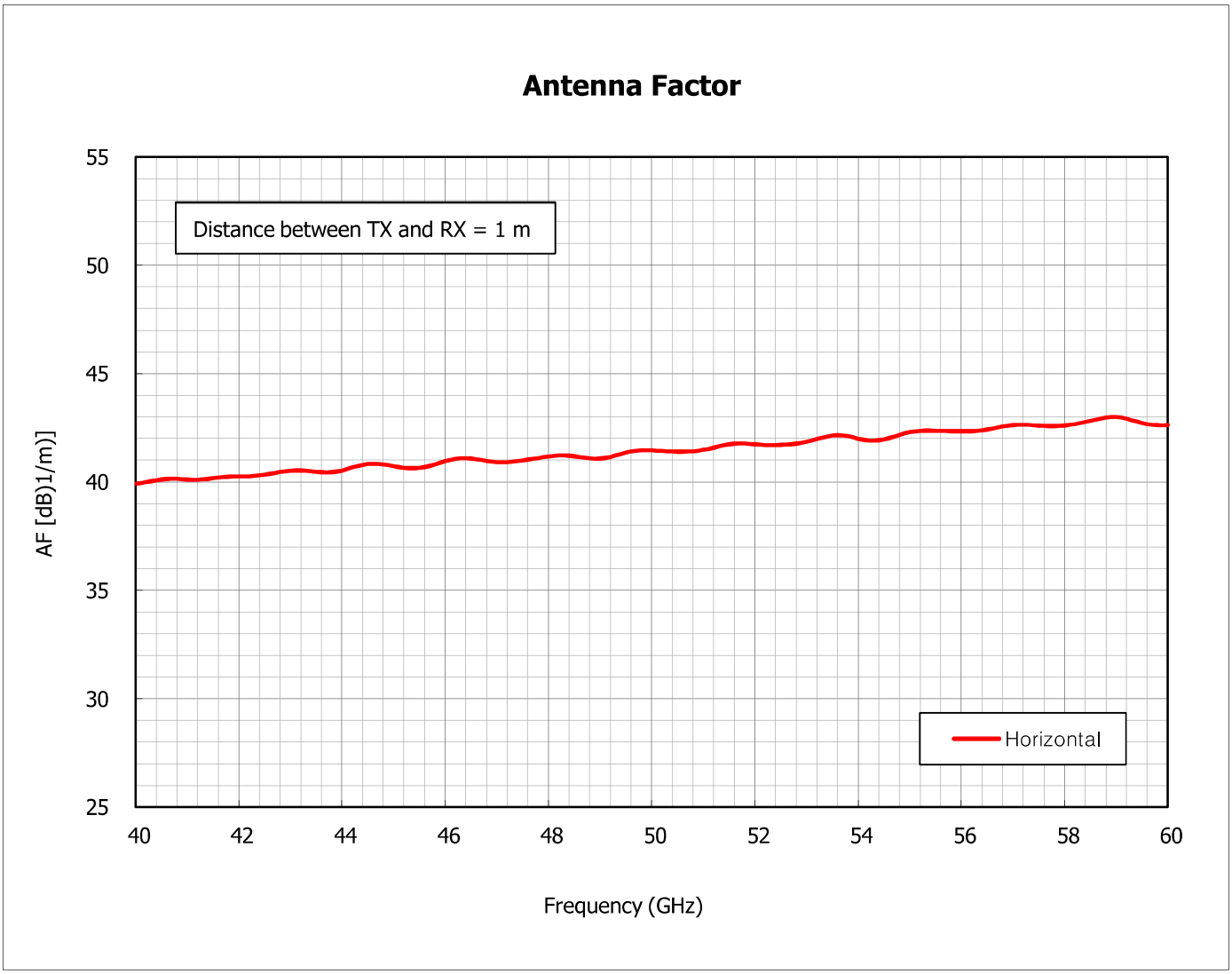
Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
40.00	39.9	22.4	43.70	40.4	22.6	47.40	41.0	22.8
40.10	39.9	22.3	43.80	40.4	22.6	47.50	41.0	22.8
40.20	40.0	22.3	43.90	40.5	22.6	47.60	41.0	22.8
40.30	40.0	22.3	44.00	40.5	22.6	47.70	41.1	22.7
40.40	40.1	22.3	44.10	40.6	22.5	47.80	41.1	22.7
40.50	40.1	22.3	44.20	40.7	22.5	47.90	41.1	22.7
40.60	40.1	22.3	44.30	40.7	22.4	48.00	41.2	22.7
40.70	40.1	22.3	44.40	40.8	22.4	48.10	41.2	22.7
40.80	40.1	22.3	44.50	40.8	22.4	48.20	41.2	22.7
40.90	40.1	22.3	44.60	40.8	22.4	48.30	41.2	22.7
41.00	40.1	22.4	44.70	40.8	22.4	48.40	41.2	22.7
41.10	40.1	22.4	44.80	40.8	22.4	48.50	41.2	22.8
41.20	40.1	22.4	44.90	40.8	22.5	48.60	41.1	22.8
41.30	40.1	22.4	45.00	40.7	22.6	48.70	41.1	22.9
41.40	40.1	22.4	45.10	40.7	22.6	48.80	41.1	22.9
41.50	40.2	22.4	45.20	40.7	22.7	48.90	41.1	22.9
41.60	40.2	22.4	45.30	40.6	22.7	49.00	41.1	22.9
41.70	40.2	22.4	45.40	40.6	22.7	49.10	41.1	22.9
41.80	40.2	22.4	45.50	40.7	22.7	49.20	41.2	22.9
41.90	40.2	22.4	45.60	40.7	22.7	49.30	41.2	22.9
42.00	40.2	22.4	45.70	40.7	22.7	49.40	41.3	22.8
42.10	40.2	22.5	45.80	40.8	22.6	49.50	41.3	22.8
42.20	40.3	22.5	45.90	40.9	22.6	49.60	41.4	22.7
42.30	40.3	22.5	46.00	41.0	22.5	49.70	41.4	22.7
42.40	40.3	22.5	46.10	41.0	22.5	49.80	41.5	22.7
42.50	40.3	22.5	46.20	41.1	22.5	49.90	41.5	22.7
42.60	40.4	22.4	46.30	41.1	22.4	50.00	41.5	22.8
42.70	40.4	22.4	46.40	41.1	22.5	50.10	41.4	22.8
42.80	40.5	22.4	46.50	41.1	22.5	50.20	41.4	22.8
42.90	40.5	22.4	46.60	41.0	22.5	50.30	41.4	22.8
43.00	40.5	22.4	46.70	41.0	22.6	50.40	41.4	22.9
43.10	40.5	22.4	46.80	41.0	22.7	50.50	41.4	22.9
43.20	40.5	22.4	46.90	40.9	22.7	50.60	41.4	22.9
43.30	40.5	22.4	47.00	40.9	22.8	50.70	41.4	22.9
43.40	40.5	22.5	47.10	40.9	22.8	50.80	41.4	22.9
43.50	40.5	22.5	47.20	40.9	22.8	50.90	41.4	22.9
43.60	40.4	22.6	47.30	40.9	22.8	51.00	41.5	22.9

1. Antenna Factor & Gain (cont.)

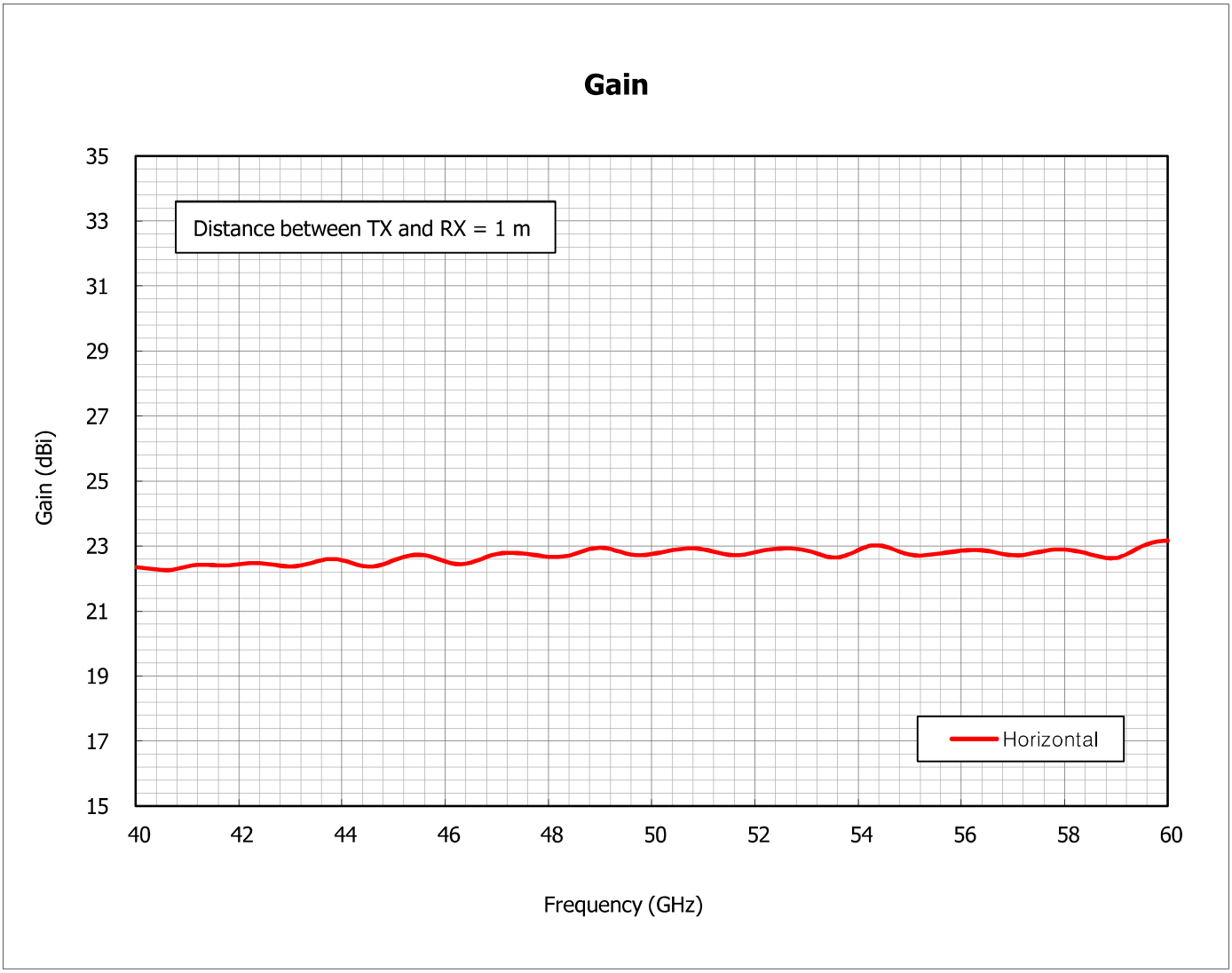
Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
51.10	41.5	22.9	54.10	41.9	22.9	57.10	42.6	22.7
51.20	41.6	22.8	54.20	41.9	23.0	57.20	42.6	22.7
51.30	41.6	22.8	54.30	41.9	23.0	57.30	42.6	22.8
51.40	41.7	22.8	54.40	41.9	23.0	57.40	42.6	22.8
51.50	41.7	22.7	54.50	42.0	23.0	57.50	42.6	22.8
51.60	41.8	22.7	54.60	42.0	22.9	57.60	42.6	22.9
51.70	41.8	22.7	54.70	42.1	22.9	57.70	42.6	22.9
51.80	41.8	22.7	54.80	42.2	22.8	57.80	42.6	22.9
51.90	41.8	22.8	54.90	42.2	22.8	57.90	42.6	22.9
52.00	41.7	22.8	55.00	42.3	22.7	58.00	42.6	22.9
52.10	41.7	22.8	55.10	42.3	22.7	58.10	42.6	22.9
52.20	41.7	22.9	55.20	42.4	22.7	58.20	42.7	22.9
52.30	41.7	22.9	55.30	42.4	22.7	58.30	42.7	22.8
52.40	41.7	22.9	55.40	42.4	22.7	58.40	42.8	22.8
52.50	41.7	22.9	55.50	42.4	22.8	58.50	42.8	22.7
52.60	41.7	22.9	55.60	42.3	22.8	58.60	42.9	22.7
52.70	41.7	22.9	55.70	42.3	22.8	58.70	42.9	22.7
52.80	41.8	22.9	55.80	42.3	22.8	58.80	43.0	22.6
52.90	41.8	22.9	55.90	42.3	22.8	58.90	43.0	22.6
53.00	41.8	22.9	56.00	42.3	22.9	59.00	43.0	22.6
53.10	41.9	22.8	56.10	42.3	22.9	59.10	43.0	22.7
53.20	42.0	22.8	56.20	42.3	22.9	59.20	42.9	22.7
53.30	42.0	22.7	56.30	42.4	22.9	59.30	42.9	22.8
53.40	42.1	22.7	56.40	42.4	22.9	59.40	42.8	22.9
53.50	42.1	22.7	56.50	42.4	22.9	59.50	42.7	23.0
53.60	42.2	22.7	56.60	42.5	22.8	59.60	42.7	23.1
53.70	42.1	22.7	56.70	42.5	22.8	59.70	42.6	23.1
53.80	42.1	22.7	56.80	42.6	22.8	59.80	42.6	23.1
53.90	42.1	22.8	56.90	42.6	22.7	59.90	42.6	23.2
54.00	42.0	22.9	57.00	42.6	22.7	60.00	42.6	23.2

※ The measurement uncertainty of this result is 1.2 dB (Confidence level about 95 %, k = 2)

2. Antenna Factor Curve



3. Gain Curve



END.

CALIBRATION CERTIFICATE

74, SEOICHEON-RO 578BEON-GIL, MAJANG-MYEON,
ICHEON-SI, GYEONGGI-DO, KOREA 17383
TEL :82-31-645-6900, FAX :82-31-645-6969

- Certificate No : IC-2024-057635
- Calibration No : C-2024-067804

1. Client

- Name : SPORTON INTERNATIONAL INC.
- Address : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. Calibration Subject ◇Registration No : 527309

- Description : ANTENNA
- Manufacturer and Model Name : QUINSTAR / QWH-EPRR00
- Serial Number : 1372000000

3. Date of Calibration : 2024.06.27

4. Environment

- Temperature : (22.6 ± 0.1) ℃ - Humidity : (46 ± 2) % R.H.
- Location : Permanent Calibration Lab
  (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea)

5. Traceability

Calibration method and/or brief description

This certifies that the equipment has been calibrated using applicable HCT procedure(HCT-CS-264-40707), (HCT-CS-264-40707), in compliance with ISO/IEC 17025. Measurement are traceable to the International System of Unit (SI) via national metrology institutes.

List of used standards/specifications

Description	Manufacturer / Model Name	Serial Number	The due date of next Calibration	Calibration laboratory
PNA SERIES NETWORK ANALYZER	AGILENT/E8363B	MY43030182	2025/06/18	HCT CO., LTD.
TRANSMISSION/REFLECTION MODULE SET	OML/V15VNA2-T/R	200722-1	2024/10/18	HCT CO., LTD.
TRANSMISSION/REFLECTION MODULE SET	OML/V10VNA2-T/R	200722-1	2024/10/18	HCT CO., LTD.
CALIBRATION KIT	Keysight Technologies/V11644A	MY46042094	2024/10/06	Keysight Technologies
CALIBRATION KIT	Keysight Technologies/W11644A	MY46042118	2024/10/08	Keysight Technologies

6. Calibration result : **Refer to attachment**

7. Measurement uncertainty : **Refer to attachment**
(Confidence level about 95 %, k = 2)

affirmation	Measurements performed by Name : **Minhyeong Shin** (signature)	Approved by Title Technical Cal. Manager Name **Jaesang So** (signature)

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024. 06. 27

Accredited by KOLAS, Republic of KOREA **HCT Co., Ltd.**

(NOTE) 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.

Calibration Results

Certificate No : IC-2024-057635
Calibration No : C-2024-067804

1. Antenna Factor & Gain

Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
60.00	43.6	22.2	63.70	43.8	22.5	67.40	44.0	22.8
60.10	43.6	22.2	63.80	43.8	22.5	67.50	44.0	22.8
60.20	43.6	22.2	63.90	43.8	22.5	67.60	44.0	22.8
60.30	43.7	22.2	64.00	43.8	22.6	67.70	44.1	22.8
60.40	43.7	22.2	64.10	43.8	22.6	67.80	44.1	22.8
60.50	43.7	22.2	64.20	43.8	22.6	67.90	44.1	22.8
60.60	43.7	22.2	64.30	43.8	22.6	68.00	44.1	22.7
60.70	43.7	22.2	64.40	43.8	22.7	68.10	44.2	22.7
60.80	43.7	22.2	64.50	43.7	22.7	68.20	44.2	22.7
60.90	43.7	22.2	64.60	43.7	22.7	68.30	44.2	22.7
61.00	43.7	22.3	64.70	43.7	22.7	68.40	44.3	22.7
61.10	43.6	22.3	64.80	43.8	22.7	68.50	44.3	22.6
61.20	43.6	22.4	64.90	43.8	22.7	68.60	44.3	22.6
61.30	43.6	22.4	65.00	43.8	22.6	68.70	44.4	22.6
61.40	43.5	22.4	65.10	43.9	22.6	68.80	44.4	22.6
61.50	43.5	22.5	65.20	43.9	22.6	68.90	44.4	22.6
61.60	43.5	22.5	65.30	44.0	22.6	69.00	44.4	22.6
61.70	43.5	22.5	65.40	44.0	22.5	69.10	44.3	22.7
61.80	43.5	22.5	65.50	44.0	22.5	69.20	44.3	22.7
61.90	43.6	22.5	65.60	44.0	22.5	69.30	44.3	22.7
62.00	43.6	22.5	65.70	44.0	22.5	69.40	44.3	22.8
62.10	43.6	22.5	65.80	44.0	22.5	69.50	44.3	22.8
62.20	43.7	22.4	65.90	44.1	22.5	69.60	44.2	22.8
62.30	43.7	22.4	66.00	44.1	22.6	69.70	44.2	22.9
62.40	43.7	22.4	66.10	44.1	22.6	69.80	44.2	22.9
62.50	43.7	22.4	66.20	44.1	22.6	69.90	44.2	22.9
62.60	43.7	22.4	66.30	44.1	22.6	70.00	44.2	22.9
62.70	43.8	22.4	66.40	44.1	22.6	70.10	44.2	22.9
62.80	43.8	22.4	66.50	44.1	22.6	70.20	44.2	22.9
62.90	43.8	22.4	66.60	44.0	22.7	70.30	44.3	22.9
63.00	43.8	22.4	66.70	44.0	22.7	70.40	44.3	22.9
63.10	43.9	22.4	66.80	44.0	22.7	70.50	44.3	22.9
63.20	43.9	22.4	66.90	44.0	22.7	70.60	44.3	22.9
63.30	43.9	22.4	67.00	44.0	22.8	70.70	44.4	22.8
63.40	43.9	22.4	67.10	44.0	22.8	70.80	44.4	22.8
63.50	43.9	22.4	67.20	44.0	22.8	70.90	44.4	22.8
63.60	43.8	22.4	67.30	44.0	22.8	71.00	44.5	22.8

1. Antenna Factor & Gain (cont.)

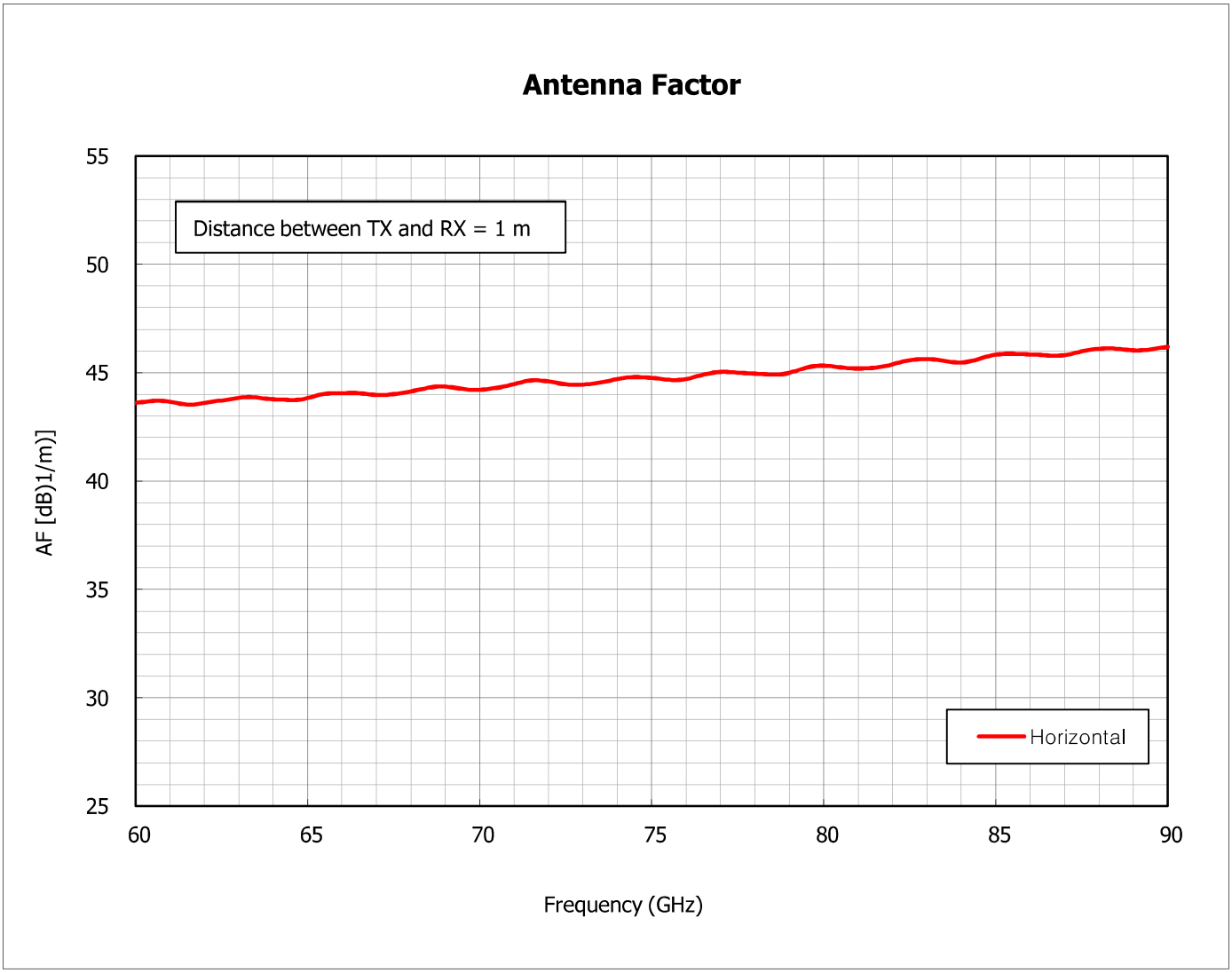
Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
71.10	44.5	22.7	74.60	44.8	22.9	78.10	44.9	23.1
71.20	44.6	22.7	74.70	44.8	22.9	78.20	44.9	23.1
71.30	44.6	22.7	74.80	44.8	22.9	78.30	44.9	23.2
71.40	44.6	22.7	74.90	44.8	22.9	78.40	44.9	23.2
71.50	44.6	22.7	75.00	44.8	23.0	78.50	44.9	23.2
71.60	44.6	22.7	75.10	44.7	23.0	78.60	44.9	23.2
71.70	44.6	22.7	75.20	44.7	23.0	78.70	44.9	23.2
71.80	44.6	22.7	75.30	44.7	23.0	78.80	44.9	23.2
71.90	44.6	22.7	75.40	44.7	23.1	78.90	45.0	23.2
72.00	44.6	22.8	75.50	44.7	23.1	79.00	45.0	23.2
72.10	44.6	22.8	75.60	44.7	23.1	79.10	45.0	23.1
72.20	44.5	22.9	75.70	44.7	23.1	79.20	45.1	23.1
72.30	44.5	22.9	75.80	44.7	23.2	79.30	45.1	23.1
72.40	44.5	22.9	75.90	44.7	23.1	79.40	45.2	23.0
72.50	44.5	23.0	76.00	44.7	23.1	79.50	45.2	23.0
72.60	44.5	23.0	76.10	44.7	23.1	79.60	45.3	23.0
72.70	44.4	23.0	76.20	44.8	23.1	79.70	45.3	23.0
72.80	44.4	23.0	76.30	44.8	23.0	79.80	45.3	22.9
72.90	44.4	23.0	76.40	44.9	23.0	79.90	45.3	23.0
73.00	44.5	23.0	76.50	44.9	23.0	80.00	45.3	23.0
73.10	44.5	23.0	76.60	44.9	23.0	80.10	45.3	23.0
73.20	44.5	23.0	76.70	45.0	22.9	80.20	45.3	23.0
73.30	44.5	23.0	76.80	45.0	22.9	80.30	45.3	23.0
73.40	44.5	23.0	76.90	45.0	22.9	80.40	45.3	23.1
73.50	44.5	23.0	77.00	45.0	22.9	80.50	45.2	23.1
73.60	44.6	23.0	77.10	45.0	22.9	80.60	45.2	23.1
73.70	44.6	23.0	77.20	45.0	22.9	80.70	45.2	23.1
73.80	44.6	22.9	77.30	45.0	23.0	80.80	45.2	23.2
73.90	44.7	22.9	77.40	45.0	23.0	80.90	45.2	23.2
74.00	44.7	22.9	77.50	45.0	23.0	81.00	45.2	23.2
74.10	44.7	22.9	77.60	45.0	23.0	81.10	45.2	23.2
74.20	44.8	22.9	77.70	45.0	23.1	81.20	45.2	23.2
74.30	44.8	22.9	77.80	45.0	23.1	81.30	45.2	23.2
74.40	44.8	22.9	77.90	45.0	23.1	81.40	45.2	23.2
74.50	44.8	22.9	78.00	45.0	23.1	81.50	45.2	23.2

1. Antenna Factor & Gain (cont.)

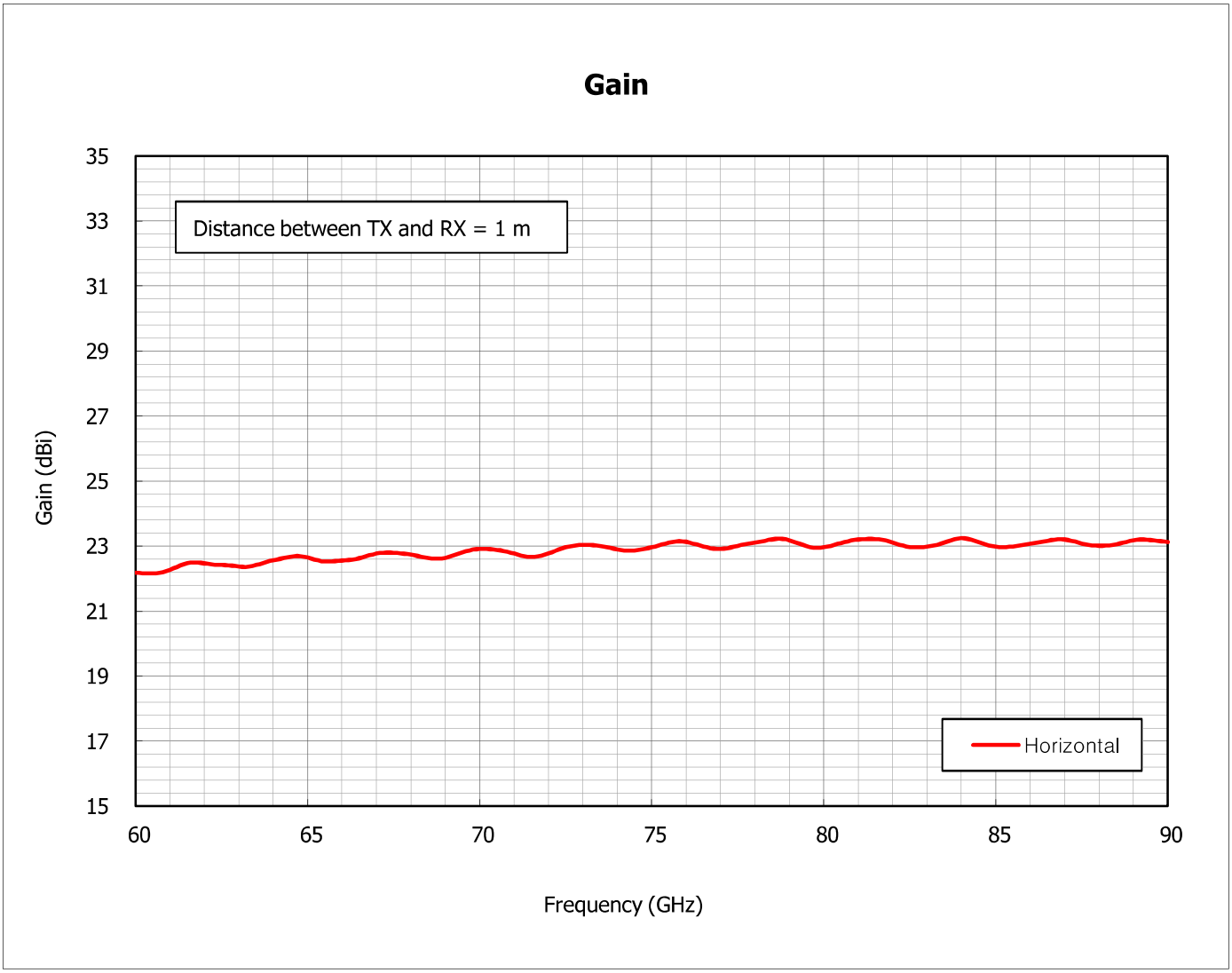
Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
81.60	45.3	23.2	84.50	45.6	23.1	87.40	45.9	23.1
81.70	45.3	23.2	84.60	45.7	23.1	87.50	46.0	23.1
81.80	45.3	23.2	84.70	45.7	23.1	87.60	46.0	23.1
81.90	45.3	23.1	84.80	45.8	23.0	87.70	46.0	23.0
82.00	45.4	23.1	84.90	45.8	23.0	87.80	46.1	23.0
82.10	45.4	23.1	85.00	45.8	23.0	87.90	46.1	23.0
82.20	45.5	23.0	85.10	45.9	23.0	88.00	46.1	23.0
82.30	45.5	23.0	85.20	45.9	23.0	88.10	46.1	23.0
82.40	45.6	23.0	85.30	45.9	23.0	88.20	46.1	23.0
82.50	45.6	23.0	85.40	45.9	23.0	88.30	46.1	23.0
82.60	45.6	23.0	85.50	45.9	23.0	88.40	46.1	23.0
82.70	45.6	23.0	85.60	45.9	23.0	88.50	46.1	23.1
82.80	45.6	23.0	85.70	45.9	23.0	88.60	46.1	23.1
82.90	45.6	23.0	85.80	45.9	23.0	88.70	46.1	23.1
83.00	45.6	23.0	85.90	45.8	23.1	88.80	46.1	23.1
83.10	45.6	23.0	86.00	45.8	23.1	88.90	46.0	23.2
83.20	45.6	23.0	86.10	45.8	23.1	89.00	46.0	23.2
83.30	45.6	23.0	86.20	45.8	23.1	89.10	46.0	23.2
83.40	45.6	23.1	86.30	45.8	23.1	89.20	46.0	23.2
83.50	45.5	23.1	86.40	45.8	23.1	89.30	46.0	23.2
83.60	45.5	23.1	86.50	45.8	23.2	89.40	46.1	23.2
83.70	45.5	23.2	86.60	45.8	23.2	89.50	46.1	23.2
83.80	45.5	23.2	86.70	45.8	23.2	89.60	46.1	23.2
83.90	45.5	23.2	86.80	45.8	23.2	89.70	46.1	23.2
84.00	45.5	23.2	86.90	45.8	23.2	89.80	46.1	23.1
84.10	45.5	23.2	87.00	45.8	23.2	89.90	46.2	23.1
84.20	45.5	23.2	87.10	45.8	23.2	90.00	46.2	23.1
84.30	45.5	23.2	87.20	45.9	23.2	-	-	-
84.40	45.6	23.2	87.30	45.9	23.1	-	-	-

※ The measurement uncertainty of this result is 1.2 dB (Confidence level about 95 %, k = 2)

2. Antenna Factor Curve



3. Gain Curve



END.

CALIBRATION CERTIFICATE

74, SEOICHEON-RO 578BEON-GIL, MAJANG-MYEON,
ICHEON-SI, GYEONGGI-DO, KOREA 17383
TEL :82-31-645-6900, FAX :82-31-645-6969

- Certificate No : IC-2024-057643
- Calibration No : C-2024-067812

1. Client

- Name : SPORTON INTERNATIONAL INC.
- Address : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. Calibration Subject ◇Registration No : 527323

- Description : ANTENNA
- Manufacturer and Model Name : QUINSTAR / QWH-FPRR00
- Serial Number : 1011500008

3. Date of Calibration : 2024.06.27

4. Environment

- Temperature : (23.1 ± 0.3) ℃ - Humidity : (49 ± 2) % R.H.
- Location : Permanent Calibration Lab
  (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea)

5. Traceability

Calibration method and/or brief description

This certifies that the equipment has been calibrated using applicable HCT procedure(HCT-CS-264-40707), (HCT-CS-264-40707), in compliance with ISO/IEC 17025. Measurement are traceable to the International System of Unit (SI) via national metrology institutes.

List of used standards/specifications

Description	Manufacturer / Model Name	Serial Number	The due date of next Calibration	Calibration laboratory
PNA SERIES NETWORK ANALYZER	AGILENT/E8363B	MY43030182	2025/06/18	HCT CO., LTD.
TRANSMISSION/REFLECTION MODULE SET	OML/V10VNA2-T/R	200722-1	2024/10/18	HCT CO., LTD.
CALIBRATION KIT	Keysight Technologies/W11644A	MY46042118	2024/10/08	Keysight Technologies

6. Calibration result : **Refer to attachment**

7. Measurement uncertainty : **Refer to attachment**
(Confidence level about 95 %, k = 2)

affirmation	Measurements performed by Name : **Minhyeong Shin** (signature)	Approved by Title Technical Cal. Manager Name **Jaesang So** (signature)

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024. 06. 27

Accredited by KOLAS, Republic of KOREA **HCT Co., Ltd.**

(NOTE) 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.

Calibration Results

Certificate No : IC-2024-057643
Calibration No : C-2024-067812

1. Antenna Factor & Gain

Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
90.00	47.1	22.2	93.70	47.2	22.5	97.40	47.4	22.6
90.10	47.1	22.2	93.80	47.2	22.5	97.50	47.4	22.6
90.20	47.1	22.2	93.90	47.2	22.5	97.60	47.4	22.6
90.30	47.1	22.2	94.00	47.2	22.5	97.70	47.5	22.6
90.40	47.1	22.2	94.10	47.2	22.5	97.80	47.5	22.6
90.50	47.1	22.3	94.20	47.2	22.5	97.90	47.5	22.6
90.60	47.1	22.3	94.30	47.2	22.5	98.00	47.5	22.6
90.70	47.1	22.3	94.40	47.2	22.5	98.10	47.5	22.6
90.80	47.1	22.3	94.50	47.2	22.5	98.20	47.5	22.6
90.90	47.1	22.3	94.60	47.2	22.5	98.30	47.5	22.6
91.00	47.1	22.3	94.70	47.3	22.5	98.40	47.5	22.6
91.10	47.0	22.4	94.80	47.3	22.5	98.50	47.5	22.6
91.20	47.0	22.4	94.90	47.3	22.5	98.60	47.5	22.6
91.30	47.0	22.4	95.00	47.3	22.5	98.70	47.5	22.6
91.40	47.1	22.4	95.10	47.3	22.5	98.80	47.5	22.6
91.50	47.1	22.4	95.20	47.3	22.5	98.90	47.6	22.6
91.60	47.1	22.4	95.30	47.3	22.5	99.00	47.6	22.5
91.70	47.1	22.3	95.40	47.3	22.5	99.10	47.6	22.5
91.80	47.2	22.3	95.50	47.3	22.5	99.20	47.6	22.5
91.90	47.2	22.3	95.60	47.3	22.5	99.30	47.6	22.5
92.00	47.2	22.3	95.70	47.4	22.5	99.40	47.6	22.6
92.10	47.2	22.3	95.80	47.4	22.5	99.50	47.6	22.6
92.20	47.2	22.4	95.90	47.4	22.5	99.60	47.6	22.6
92.30	47.2	22.4	96.00	47.4	22.5	99.70	47.6	22.6
92.40	47.1	22.4	96.10	47.4	22.5	99.80	47.6	22.6
92.50	47.1	22.4	96.20	47.4	22.5	99.90	47.6	22.6
92.60	47.2	22.4	96.30	47.4	22.5	100.00	47.6	22.6
92.70	47.2	22.4	96.40	47.4	22.5	100.10	47.6	22.6
92.80	47.2	22.4	96.50	47.4	22.5	100.20	47.6	22.6
92.90	47.2	22.4	96.60	47.4	22.5	100.30	47.6	22.6
93.00	47.2	22.4	96.70	47.4	22.5	100.40	47.6	22.6
93.10	47.2	22.4	96.80	47.4	22.5	100.50	47.6	22.7
93.20	47.2	22.4	96.90	47.4	22.5	100.60	47.6	22.7
93.30	47.2	22.4	97.00	47.4	22.6	100.70	47.6	22.7
93.40	47.2	22.4	97.10	47.4	22.6	100.80	47.6	22.7
93.50	47.2	22.4	97.20	47.4	22.6	100.90	47.6	22.7
93.60	47.2	22.5	97.30	47.4	22.6	101.00	47.6	22.7

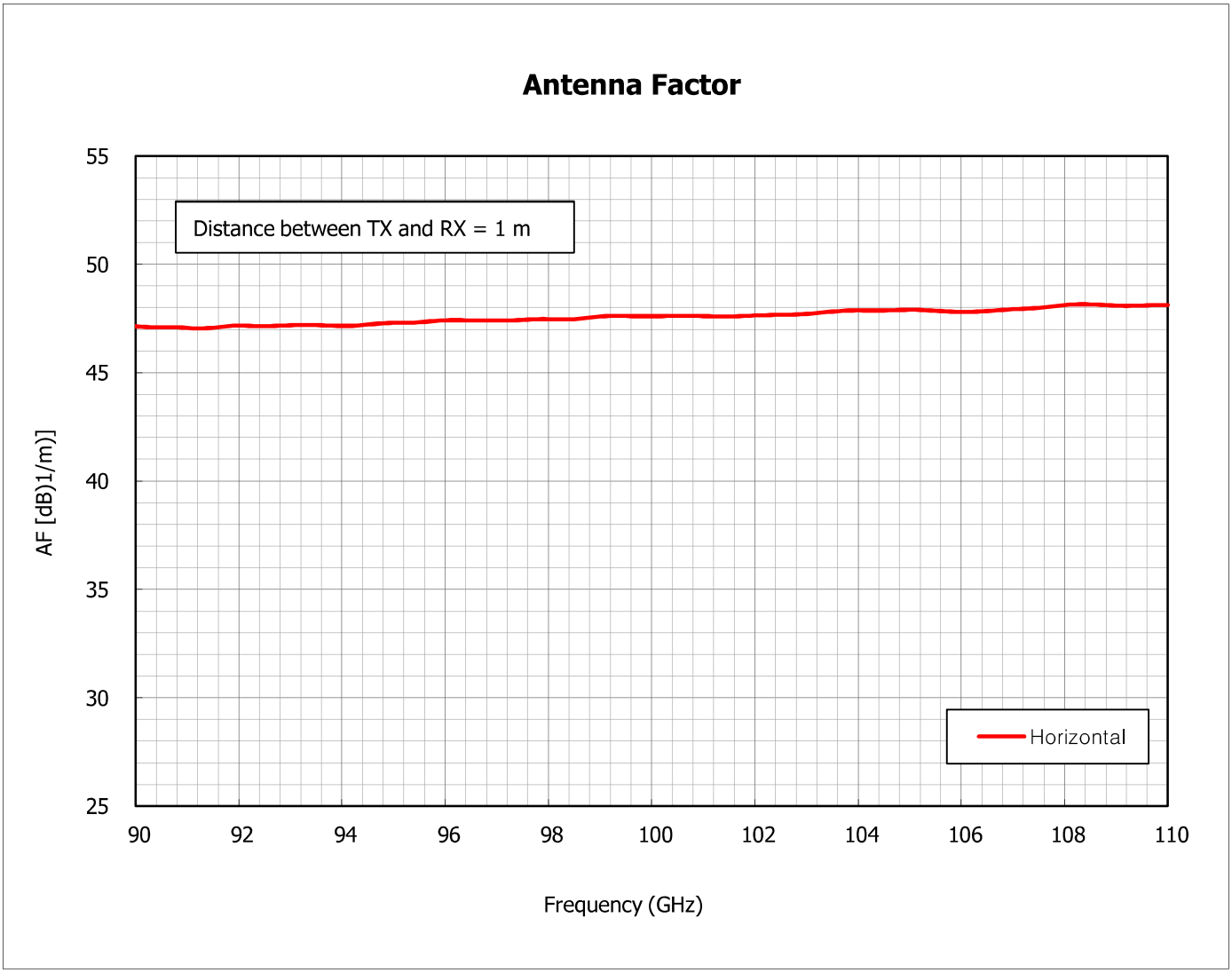
Calibration Results

1. Antenna Factor & Gain (cont.)

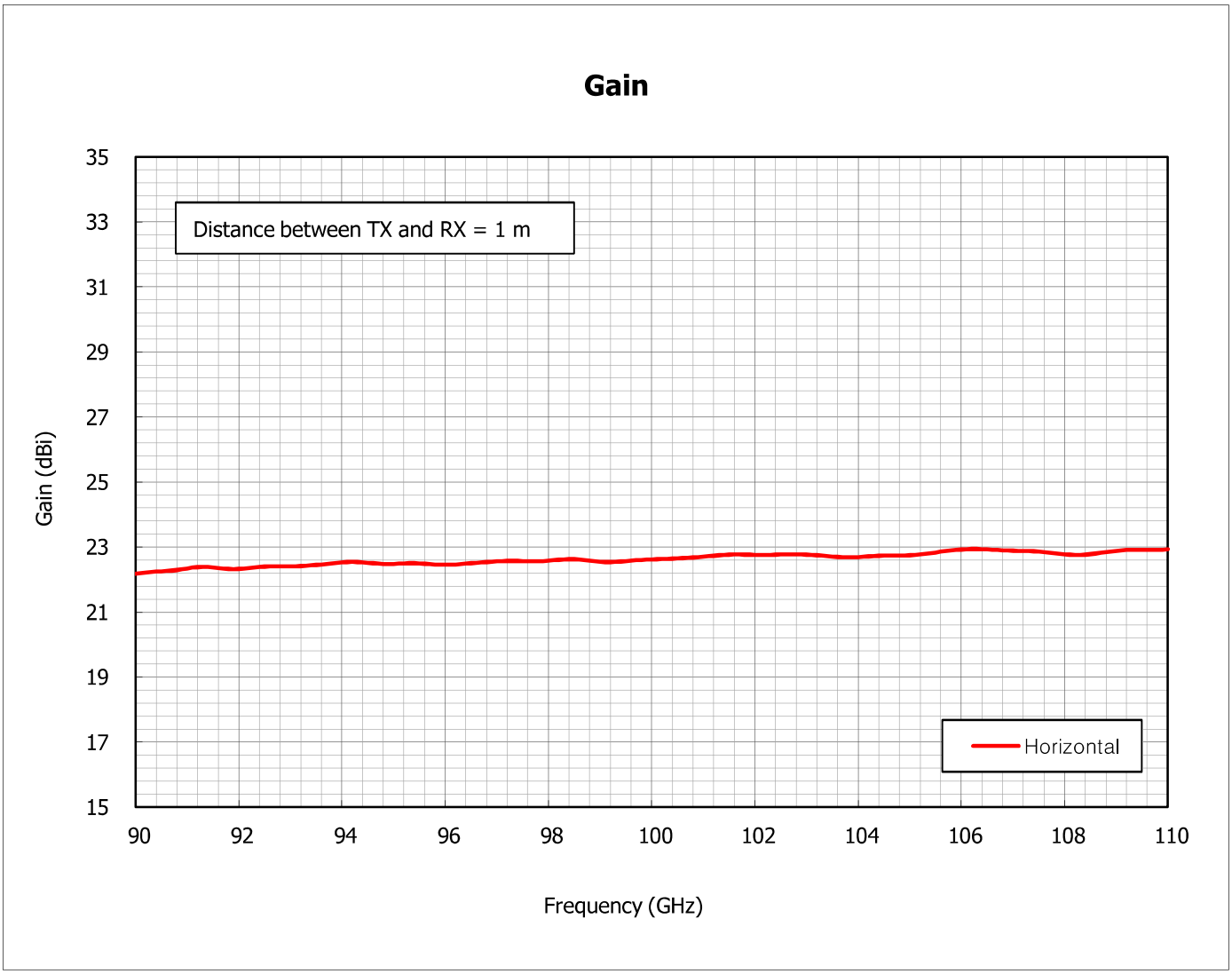
Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)	Frequency (GHz)	AF [dB(1/m)]	Gain (dBi)
101.10	47.6	22.7	104.10	47.9	22.7	107.10	47.9	22.9
101.20	47.6	22.7	104.20	47.9	22.7	107.20	47.9	22.9
101.30	47.6	22.7	104.30	47.9	22.7	107.30	48.0	22.9
101.40	47.6	22.8	104.40	47.9	22.7	107.40	48.0	22.9
101.50	47.6	22.8	104.50	47.9	22.7	107.50	48.0	22.9
101.60	47.6	22.8	104.60	47.9	22.7	107.60	48.0	22.8
101.70	47.6	22.8	104.70	47.9	22.7	107.70	48.0	22.8
101.80	47.6	22.8	104.80	47.9	22.7	107.80	48.1	22.8
101.90	47.6	22.8	104.90	47.9	22.7	107.90	48.1	22.8
102.00	47.6	22.8	105.00	47.9	22.7	108.00	48.1	22.8
102.10	47.6	22.8	105.10	47.9	22.8	108.10	48.1	22.8
102.20	47.7	22.8	105.20	47.9	22.8	108.20	48.1	22.8
102.30	47.7	22.8	105.30	47.9	22.8	108.30	48.2	22.8
102.40	47.7	22.8	105.40	47.9	22.8	108.40	48.2	22.8
102.50	47.7	22.8	105.50	47.9	22.8	108.50	48.2	22.8
102.60	47.7	22.8	105.60	47.8	22.9	108.60	48.1	22.8
102.70	47.7	22.8	105.70	47.8	22.9	108.70	48.1	22.8
102.80	47.7	22.8	105.80	47.8	22.9	108.80	48.1	22.8
102.90	47.7	22.8	105.90	47.8	22.9	108.90	48.1	22.9
103.00	47.7	22.8	106.00	47.8	22.9	109.00	48.1	22.9
103.10	47.7	22.8	106.10	47.8	22.9	109.10	48.1	22.9
103.20	47.7	22.7	106.20	47.8	22.9	109.20	48.1	22.9
103.30	47.8	22.7	106.30	47.8	22.9	109.30	48.1	22.9
103.40	47.8	22.7	106.40	47.8	22.9	109.40	48.1	22.9
103.50	47.8	22.7	106.50	47.8	22.9	109.50	48.1	22.9
103.60	47.8	22.7	106.60	47.9	22.9	109.60	48.1	22.9
103.70	47.9	22.7	106.70	47.9	22.9	109.70	48.1	22.9
103.80	47.9	22.7	106.80	47.9	22.9	109.80	48.1	22.9
103.90	47.9	22.7	106.90	47.9	22.9	109.90	48.1	22.9
104.00	47.9	22.7	107.00	47.9	22.9	110.00	48.1	22.9

※ The measurement uncertainty of this result is 1.2 dB (Confidence level about 95 %, k = 2)

2. Antenna Factor Curve



3. Gain Curve



END.

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-2024-057785
측 정 번 호(Measurement No) : C-2024-067936

1. 의뢰자 (Client)
- 기관명 (Name) : SPORTON INTERNATIONAL INC.
- 주소 (Address) : No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan, R.O.C.

2. 대상품목 (Measurement Item) ◇ HCT 등록번호 : 527377
- 기기명 (Description) : ANTENNA
- 제작회사 및 형식(Manufacturer and Model Name) : QUINSTAR / QWH-FPRR00
- 기기번호 (Serial Number) : 1011500008

3. 측정일자 (Measurement date) : 2024.06.27

4. 측정환경 (Environment)
- 온도(Temperature) : (23.1 ± 0.3) ℃ - 습도(Humidity) : (49 ± 2) % R.H.

5. 측정방법 (Measurement method used)

This certifies that the above equipment was measured using the standard equipment below according to the customer requirements. This equipment was simulated by the size of the antenna.

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)
VIDEO MEASURING SYSTEM	RATIONAL/VMS-2010G	VBG00090	2025/02/17	HCT CO., LTD.

6. 측정결과 (Messurement result) : 측정결과 참조 (Refer to attachment)

㈜ 이 측정결과는 의뢰자가 제시한 시료 및 시료명에만 한정됩니다.
The messuremen results shown in this report refer only to the sample(s) measured unless otherwise stated.

확 인 (Affirmation)	작성자 (Tested by)	승인자 (Approved by)
	성명 (Name) : **Minhyeong Shin** (서명)	직위 (Title) 기술책임자(Technical Manager) 성명 (Name) **Jaesang So** (서명)

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.

2024. 06. 27

HCT ㈜에이치시티 대표이사
***President*, HCT Co., Ltd.**

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