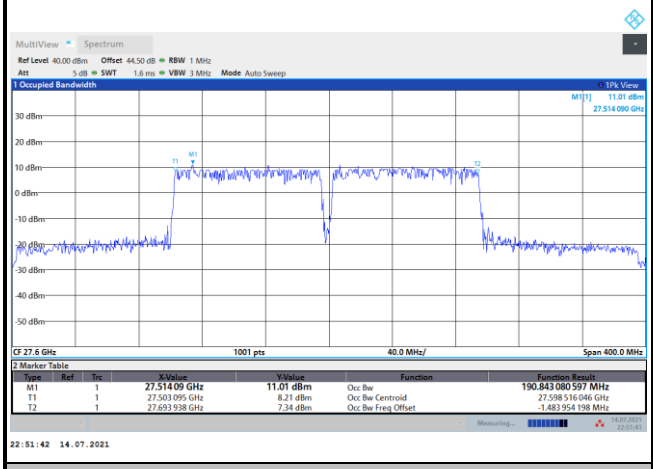
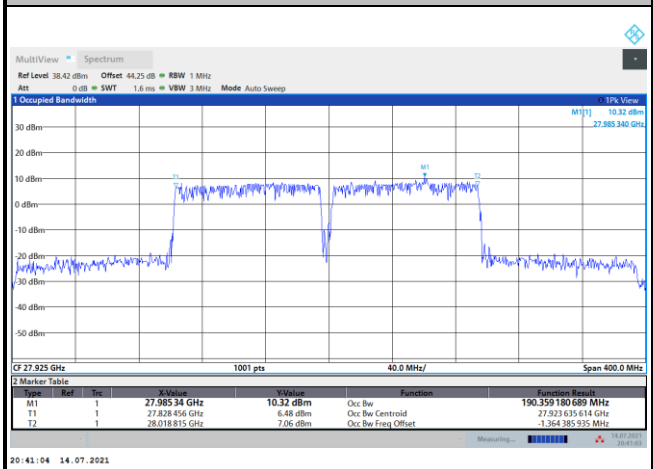
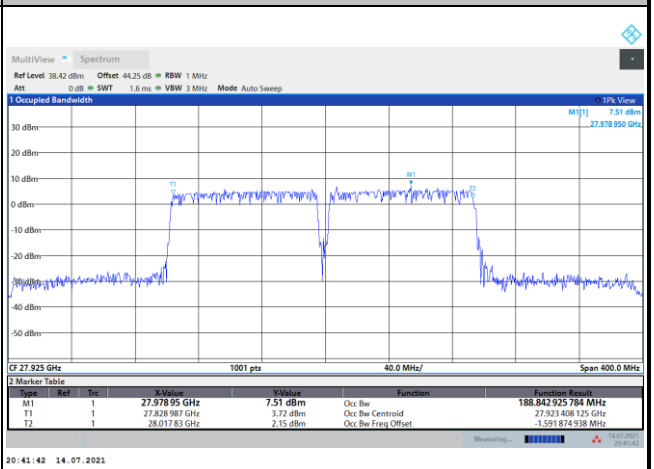
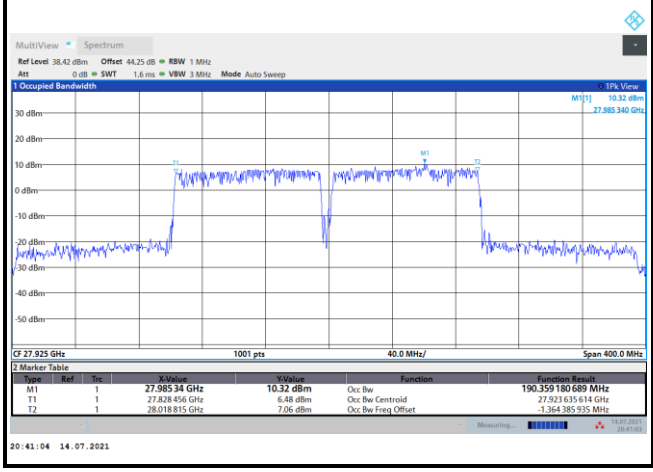
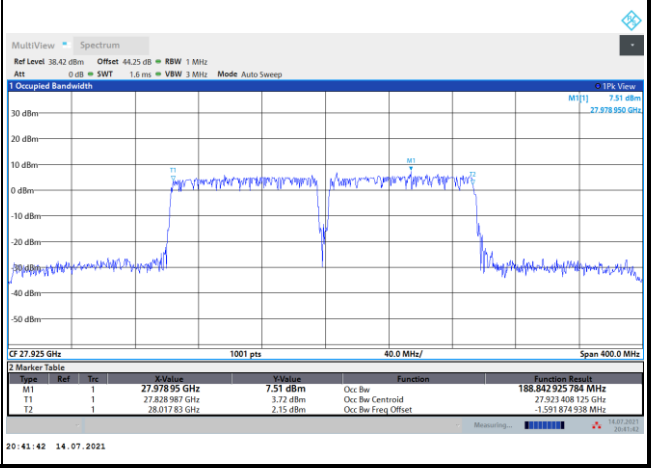
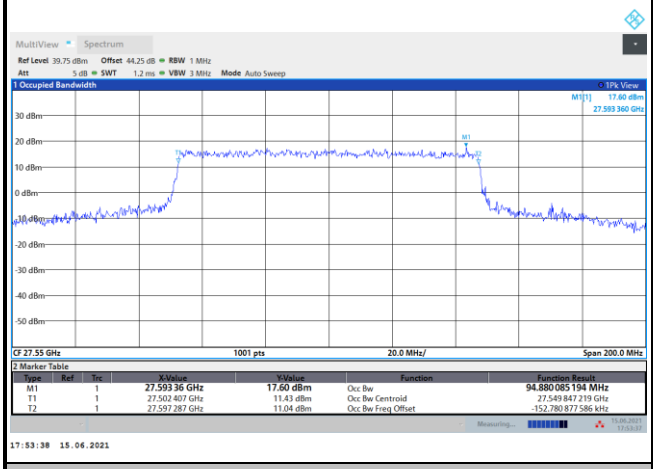
DFT-s-OFDM Module B

NR Band n261	
Lowest Channel / 200MHz / 16QAM	**Lowest Channel / 200MHz / 64QAM**
	
Middle Channel / 200MHz / 16QAM	**Middle Channel / 200MHz / 64QAM**
	
Highest Channel / 200MHz / 16QAM	**Highest Channel / 200MHz / 64QAM**
	

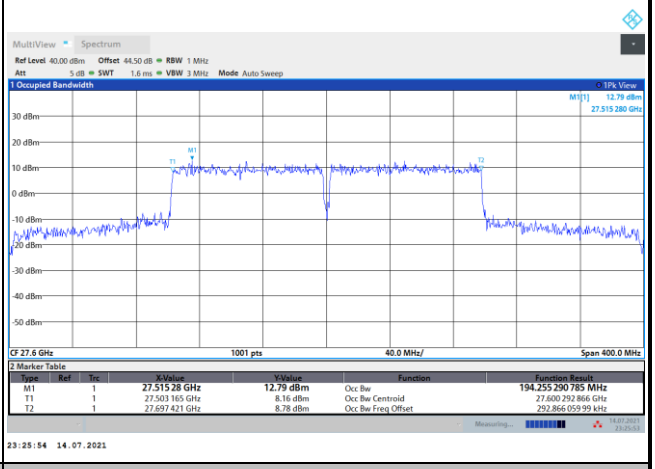
CP-OFDM Module B

NR Band n261

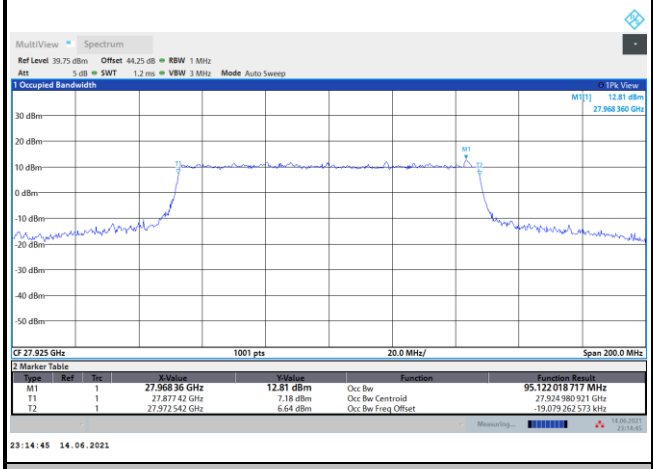
Lowest Channel / 100MHz / QPSK



Lowest Channel / 200MHz / QPSK

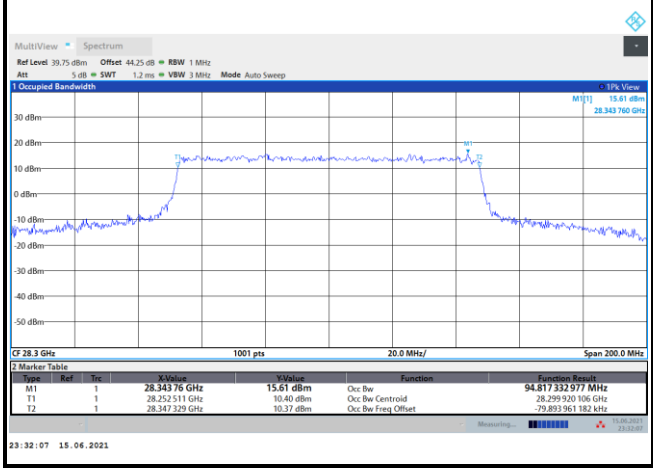


Middle Channel / 100MHz / QPSK



Middle Channel / 200MHz / QPSK

Highest Channel / 100MHz / QPSK



Highest Channel / 200MHz / QPSK

Radiated Out of Band Emissions

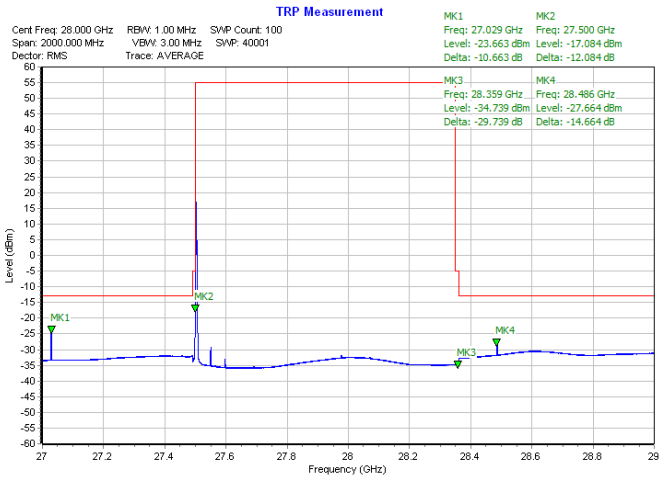
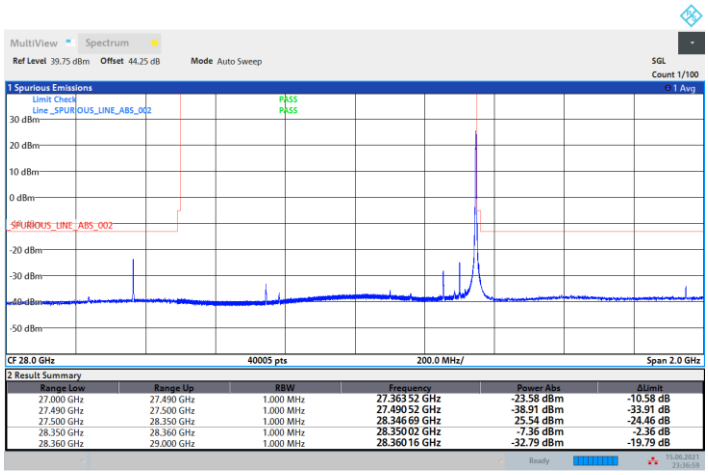
Mode			DFT-s-OFDM Module B NR Band n261 : BE (dBm) 1 RB					
BW			100MHz			200MHz		
Limit (dBm)			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
Low CH	0~10%OB	≦-5	-17.08	-19.44	-9.96	-9.94	-11.99	-13.15
	>10%OB	≦-13	-23.66	-24.96	-16.03	-13.69	-15.07	-19.00
High CH	0~10%OB	≦-5	-7.36	-10.67	-11.42	-11.68	-14.29	-16.12
	>10%OB	≦-13	-32.79	-33.85	-35.42	-13.68	-14.71	-24.66
Result			Compliance					

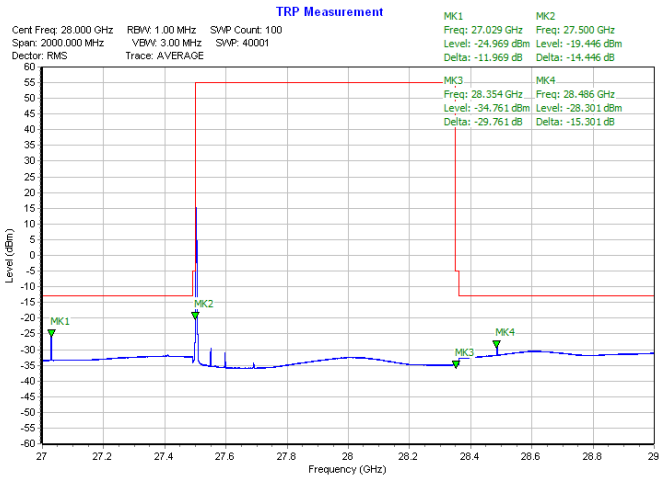
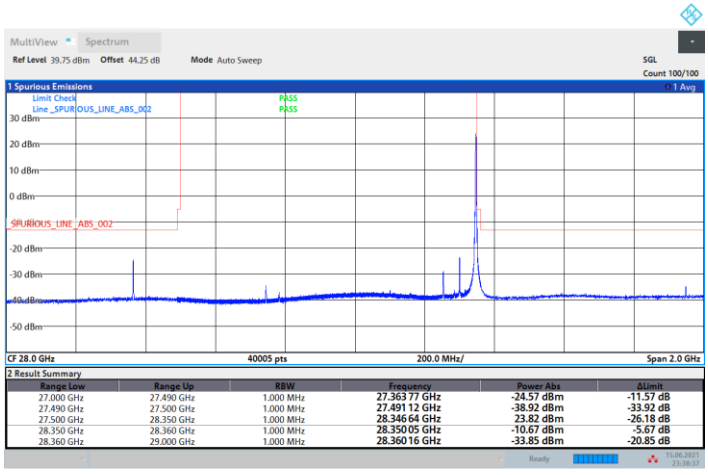
Mode			CP-OFDM Module B NR Band n261 : BE (dBm) 1 RB	
BW			100MHz	200MHz
Limit (dBm)			QPSK	QPSK
Low CH	0~10%OB	≦-5	-20.10	-13.42
	>10%OB	≦-13	-25.25	-13.70
High CH	0~10%OB	≦-5	-8.73	-13.12
	>10%OB	≦-13	-34.11	-13.87
Result			Compliance	

Mode			DFT-s-OFDM Module B NR Band n261 : BE (dBm) Full RB					
BW			100MHz			200MHz		
Limit (dBm)			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
Low CH	0~10%OB	≦-5	-21.32	-14.59	-19.35	-17.51	-20.16	-25.09
	>10%OB	≦-13	-21.50	-17.14	-24.13	-19.65	-24.11	-29.65
High CH	0~10%OB	≦-5	-17.06	-20.46	-25.11	-23.19	-25.82	-29.09
	>10%OB	≦-13	-20.19	-23.41	-30.30	-25.38	-28.41	-31.89
Result			Compliance					

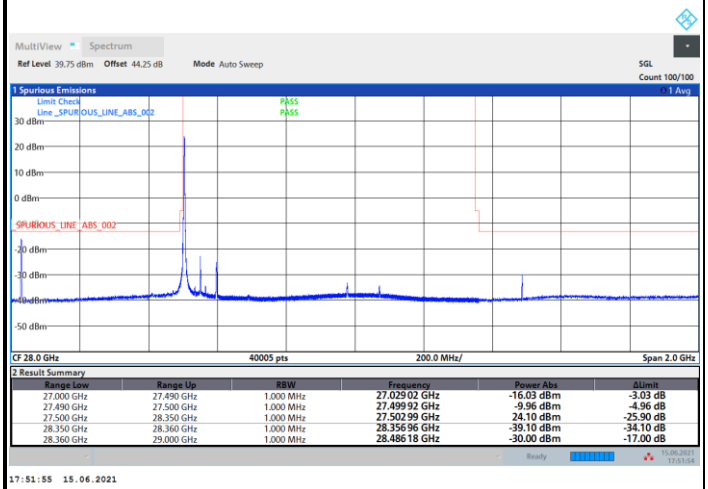
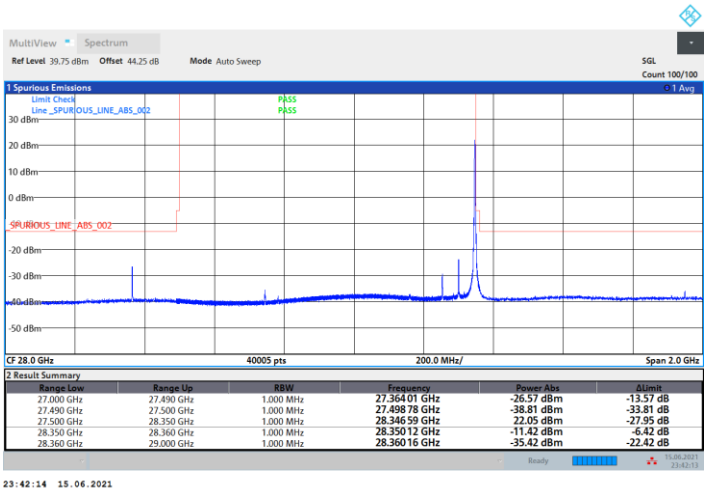
Mode			CP-OFDM Module B NR Band n261 : BE (dBm) Full RB	
BW			100MHz	200MHz
Limit (dBm)			QPSK	QPSK
Low CH	0~10%OB	≦-5	-12.35	-15.38
	>10%OB	≦-13	-15.00	-18.36
High CH	0~10%OB	≦-5	-16.39	-18.99
	>10%OB	≦-13	-20.39	-22.10
Result			Compliance	

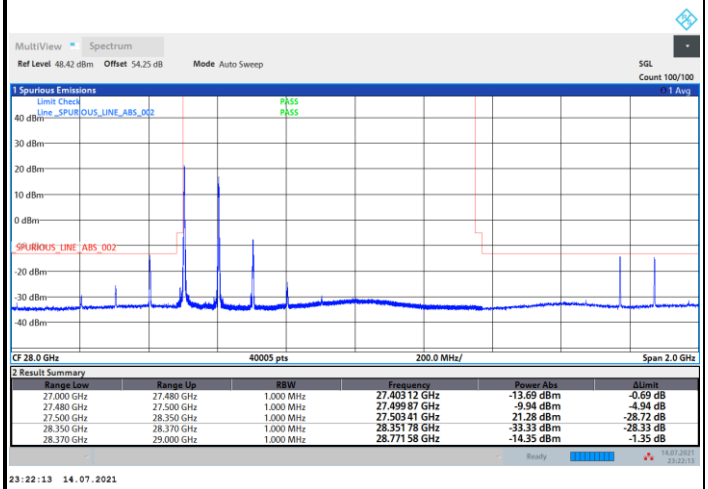
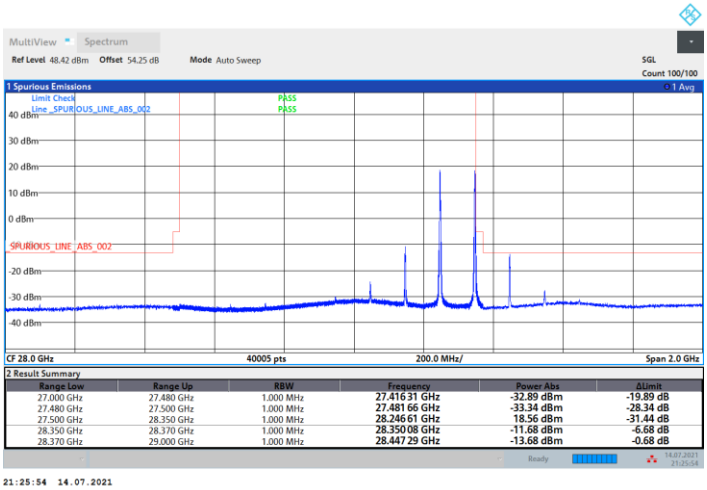
DFT-s-OFDM Module B

NR Band n261 / 100MHz / QPSK	
Lowest Band Edge / 1 RB	**Highest Band Edge / 1 RB**
	

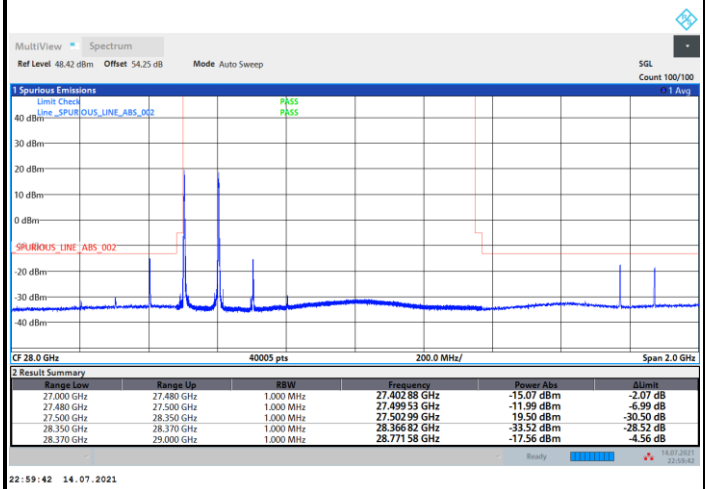
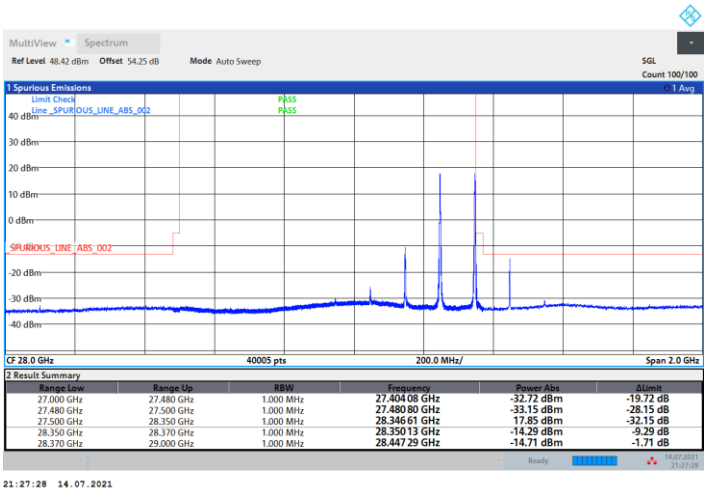
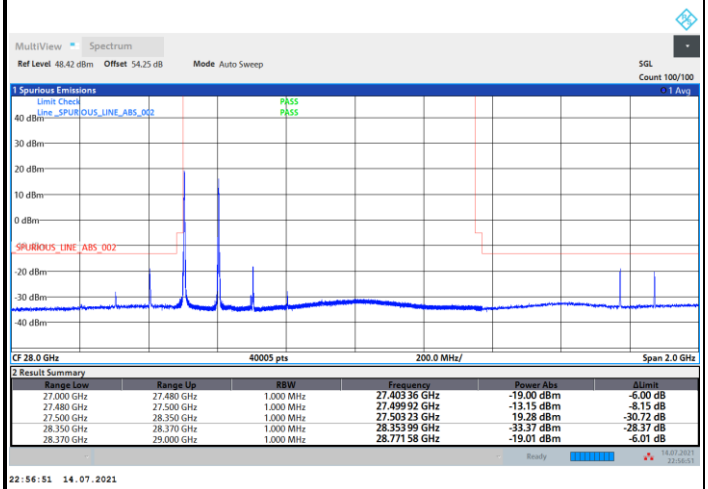
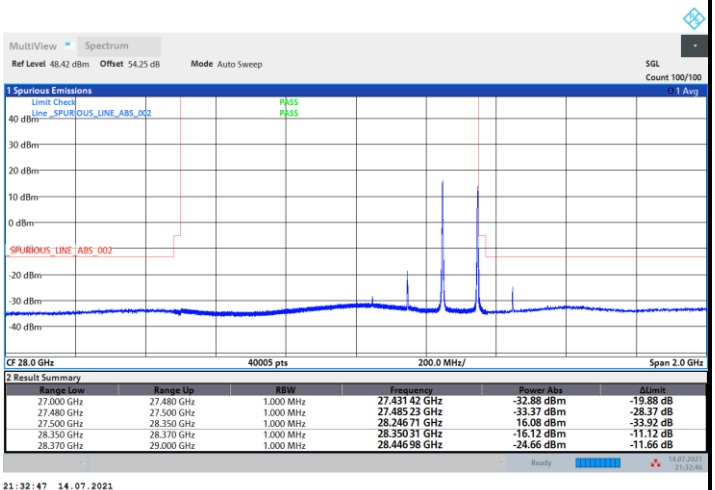
NR Band n261 / 100MHz / 16QAM	
Lowest Band Edge / 1 RB	**Highest Band Edge / 1 RB**
	

DFT-s-OFDM Module B

NR Band n261 / 100MHz / 64QAM	
Lowest Band Edge / 1 RB	**Highest Band Edge / 1 RB**
	
17:51:55 15.06.2021	23:42:14 15.06.2021

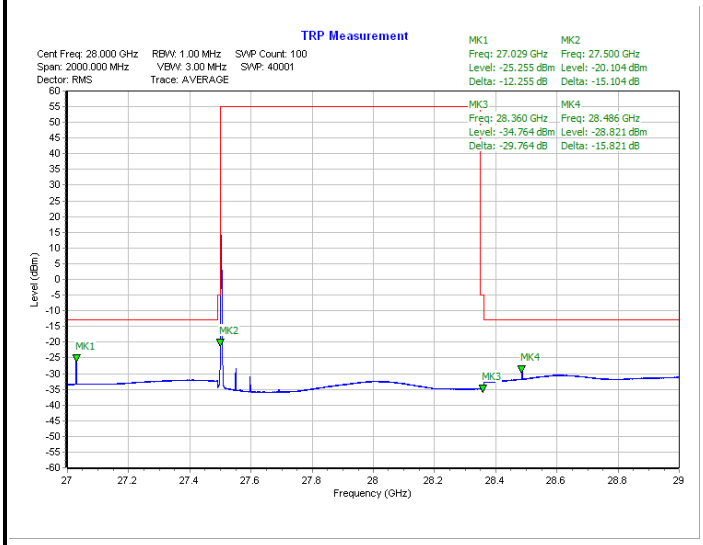
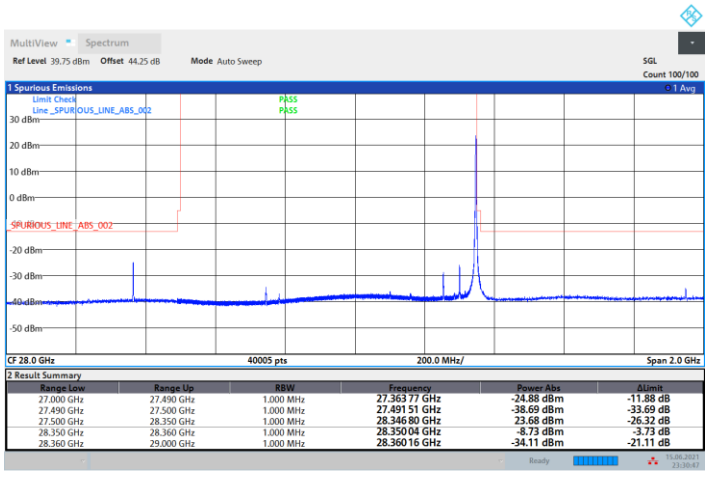
NR Band n261 / 200MHz / QPSK	
Lowest Band Edge / 1 RB	**Highest Band Edge / 1 RB**
	
23:22:13 14.07.2021	21:25:54 14.07.2021

DFT-s-OFDM Module B

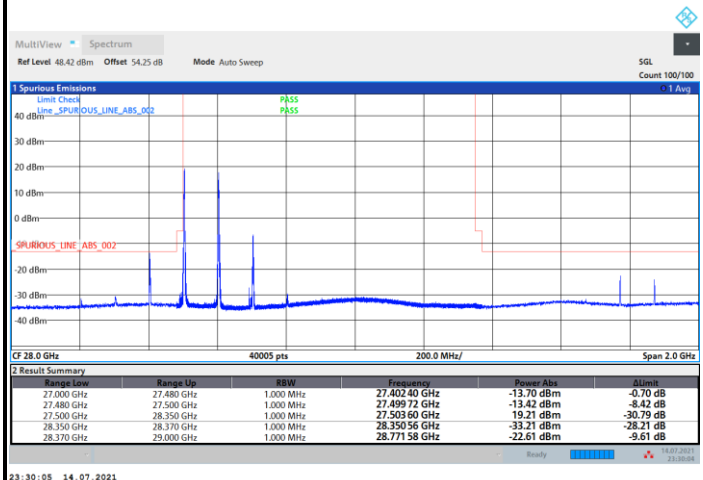
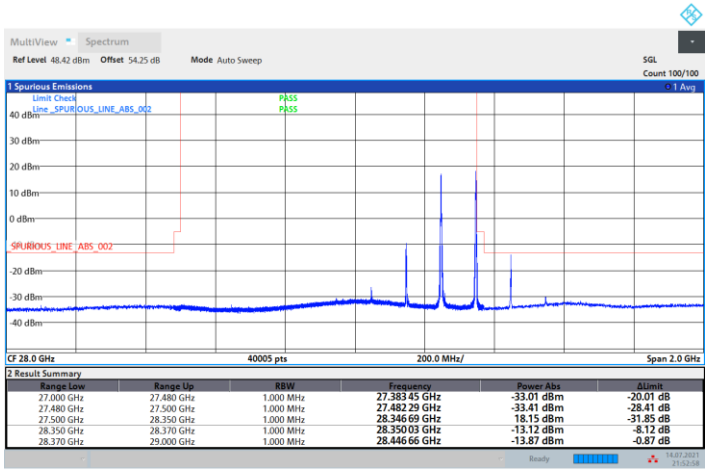
NR Band n261 / 200MHz / 16QAM	
Lowest Band Edge / 1 RB	**Highest Band Edge / 1 RB**
	
NR Band n261 / 200MHz / 64QAM	
Lowest Band Edge / 1 RB	**Highest Band Edge / 1 RB**
	

CP-OFDM Module B

NR Band n261 / 100MHz / QPSK

Lowest Band Edge / 1 RB	Highest Band Edge / 1 RB
	

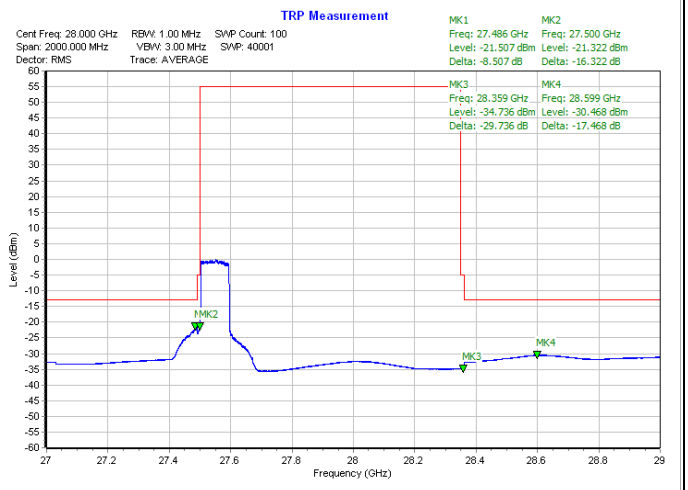
NR Band n261 / 200MHz / QPSK

Lowest Band Edge / 1 RB	Highest Band Edge / 1 RB
	

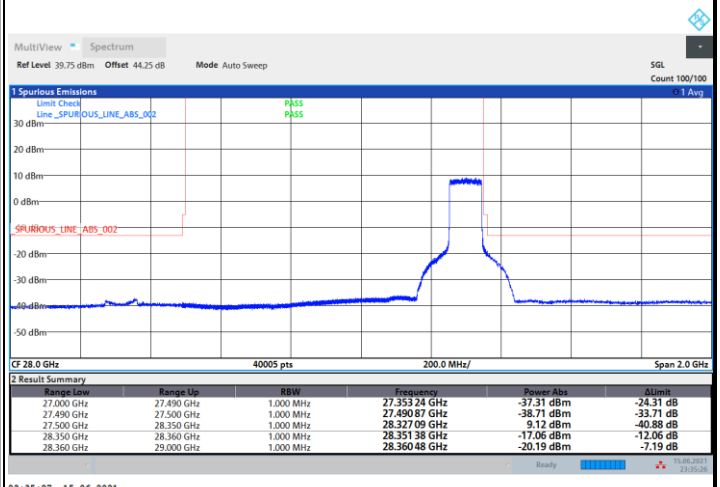
DFT-s-OFDM Module B

NR Band n261 / 100MHz / QPSK

Lowest Band Edge / Full RB

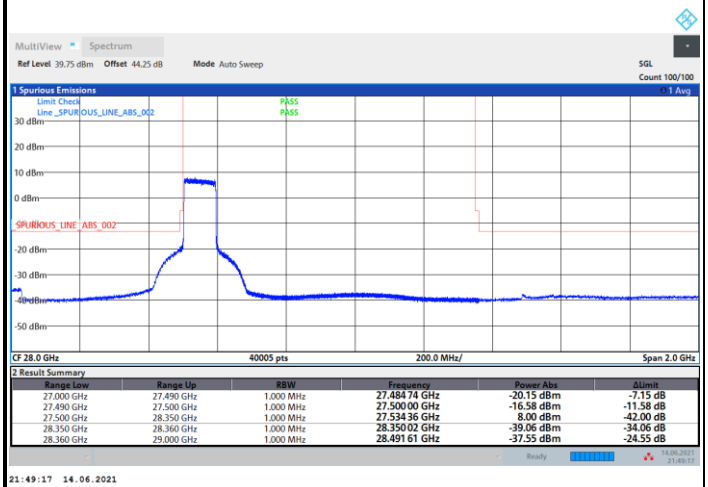


Highest Band Edge / Full RB

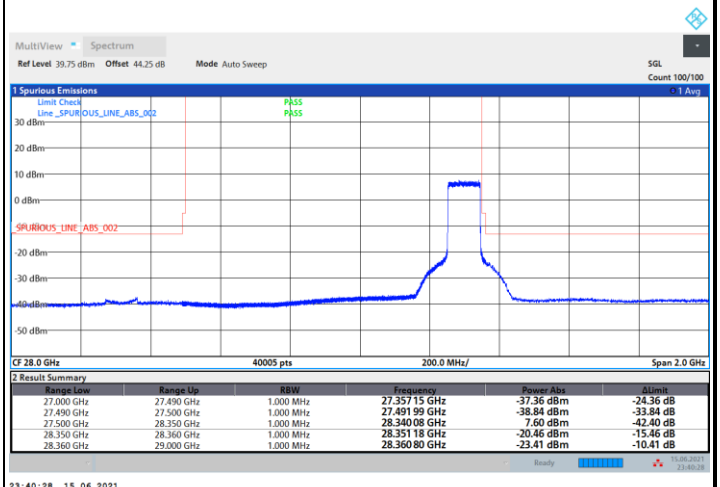


NR Band n261 / 100MHz / 16QAM

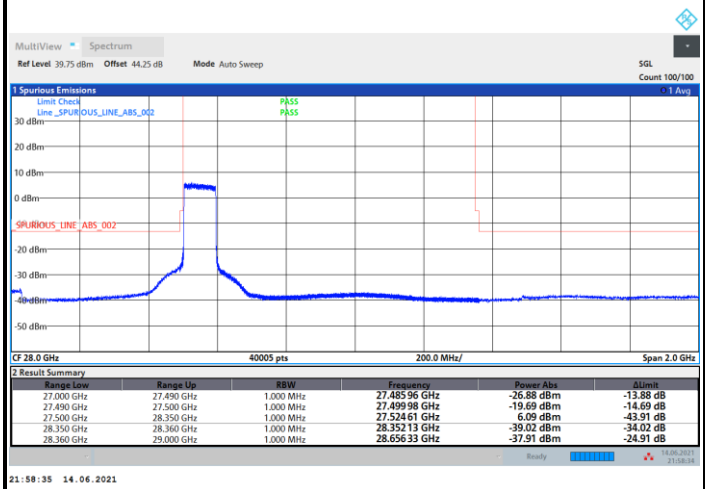
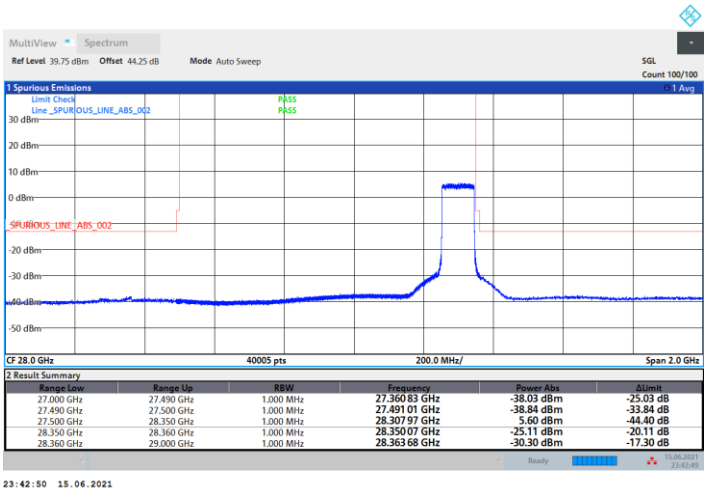
Lowest Band Edge / Full RB

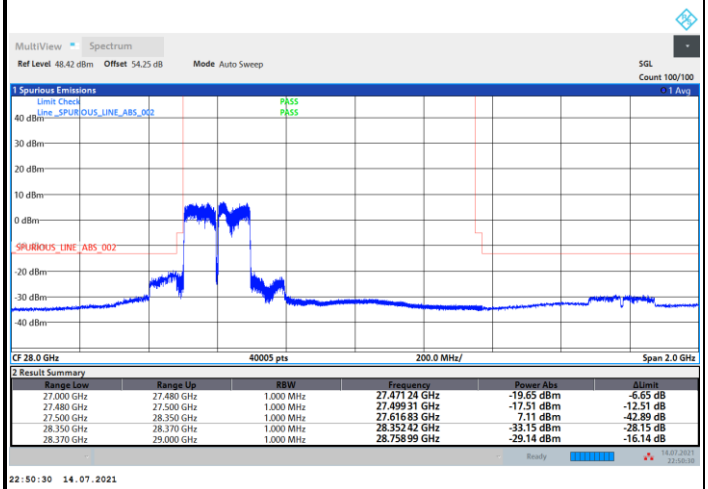
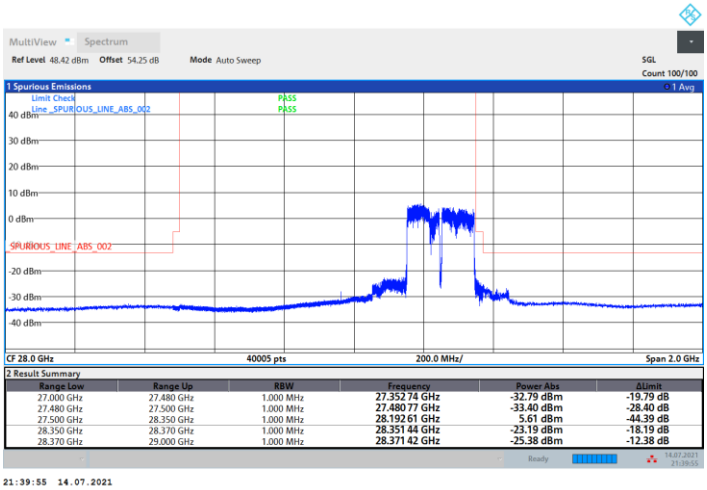


Highest Band Edge / Full RB

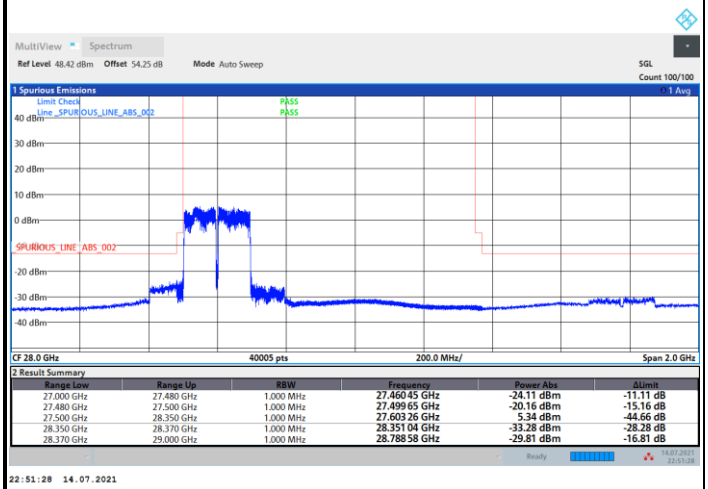
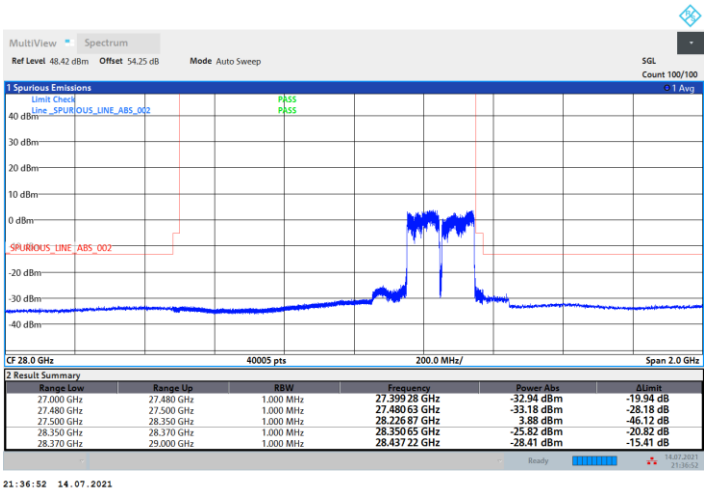


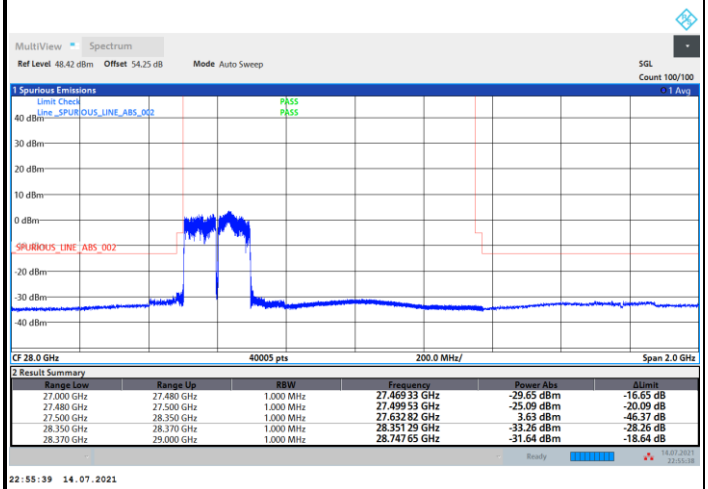
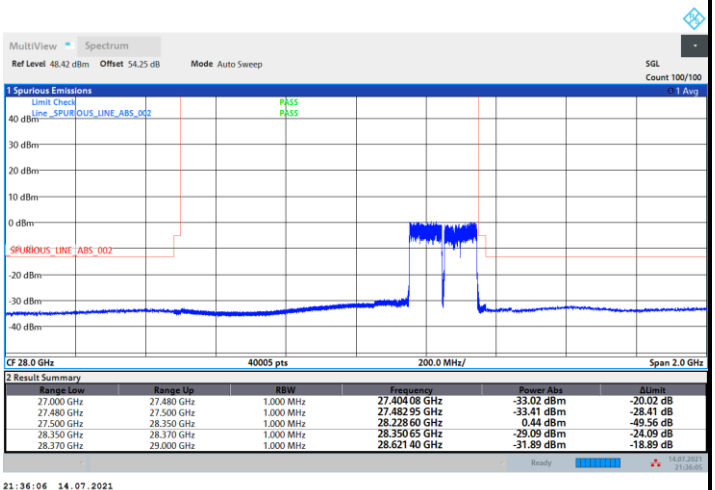
DFT-s-OFDM Module B

NR Band n261 / 100MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	
21:58:35 14.06.2021	23:42:50 15.06.2021

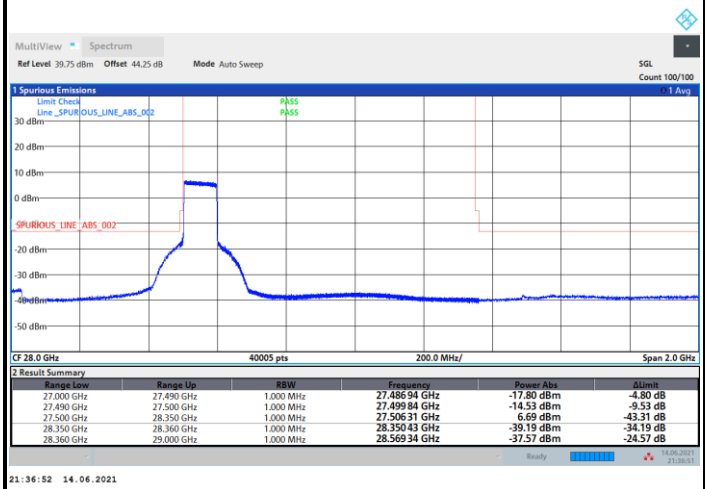
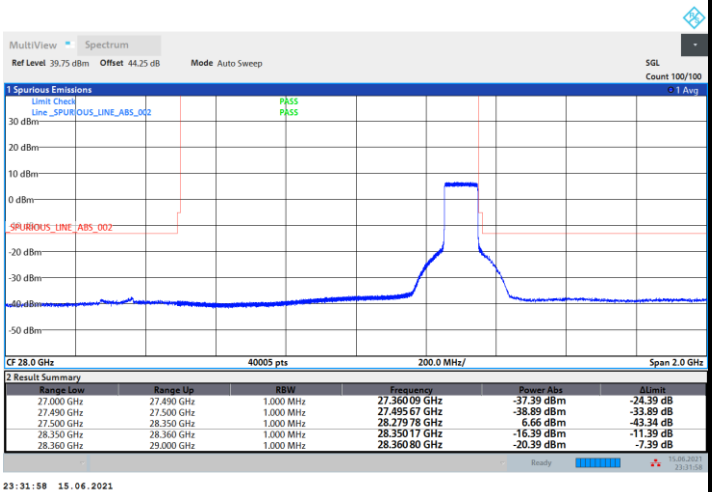
NR Band n261 / 200MHz / QPSK	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	
22:50:30 14.07.2021	21:39:55 14.07.2021

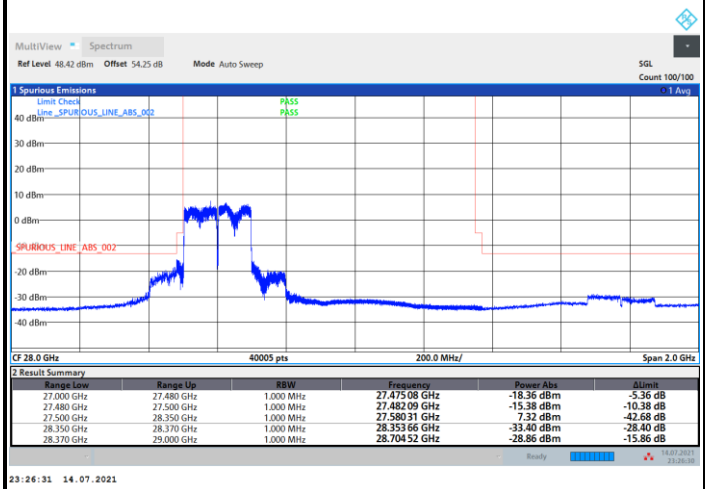
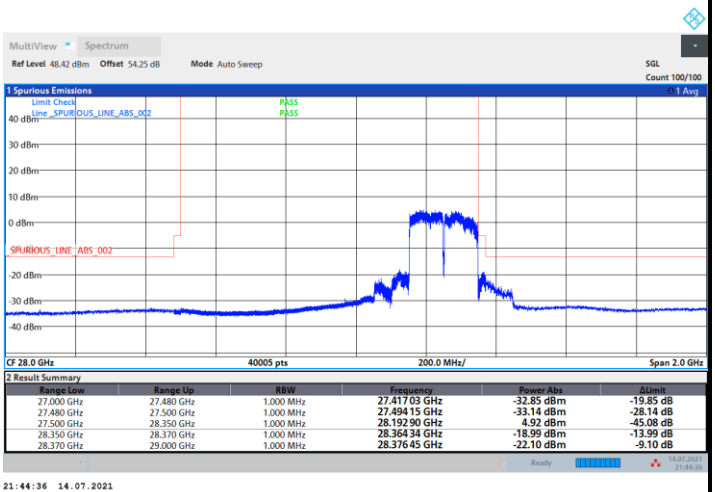
DFT-s-OFDM Module B

NR Band n261 / 200MHz / 16QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	
22:51:28 14.07.2021	21:36:52 14.07.2021

NR Band n261 / 200MHz / 64QAM	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	
22:55:39 14.07.2021	21:36:06 14.07.2021

CP-OFDM Module B

NR Band n261 / 100MHz / QPSK	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

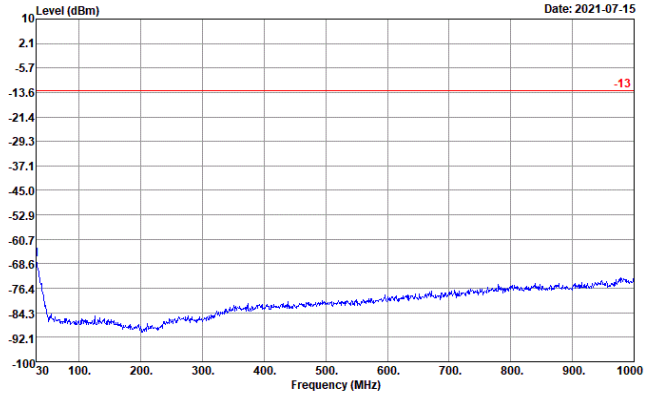
NR Band n261 / 200MHz / QPSK	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

Spurious Emission

There is no significant spurious emission signal found for frequency started from 30MHz up to 18GHz.

Only the noise floor is reported.

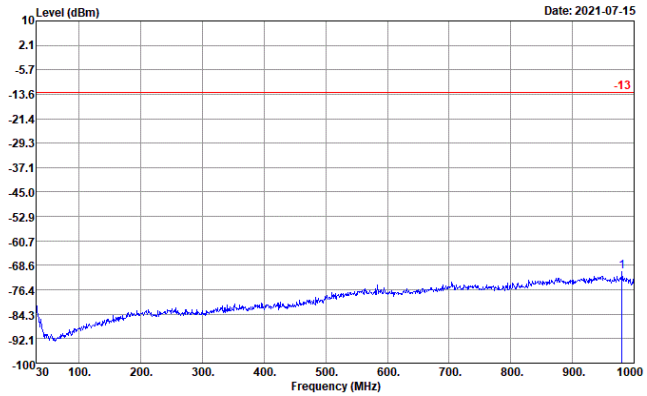
NR Band n261 (30MHz-1GHz)
Horizontal



Site : 03CH19-HY
Condition : -13 ERP EIRP_20210305 HORIZONTAL
Project : 0D2942-04
: n261 MB

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	30.00	-67.14	-54.14	-13.00	-78.85

Vertical

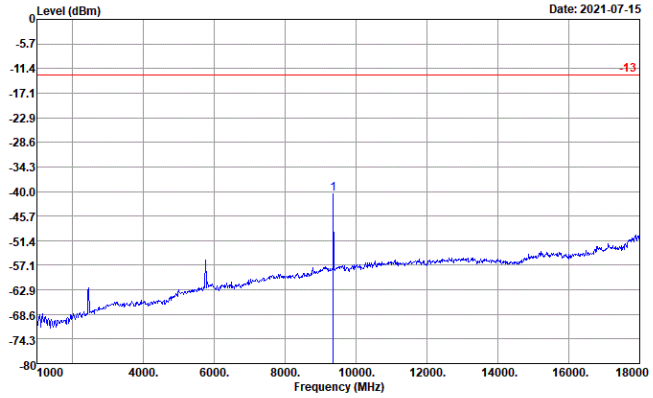


Site : 03CH19-HY
Condition : -13 ERP EIRP_20210305 VERTICAL
Project : 0D2942-04
: n261 MB

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	980.60	-70.57	-57.57	-13.00	-80.00

NR Band n261 (1GHz-18GHz)

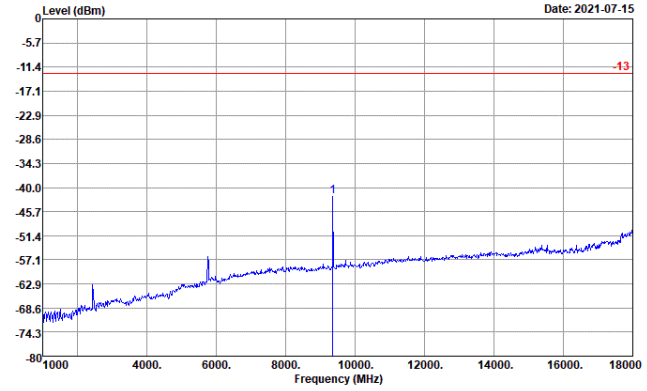
Horizontal



Site : 03CH19-HY
Condition : -13 ERP EIRP_20210305 HORIZONTAL
Project : 0D2942-04
: n261 MB

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	9364.00	-40.56	-27.56	-13.00	-66.89

Vertical

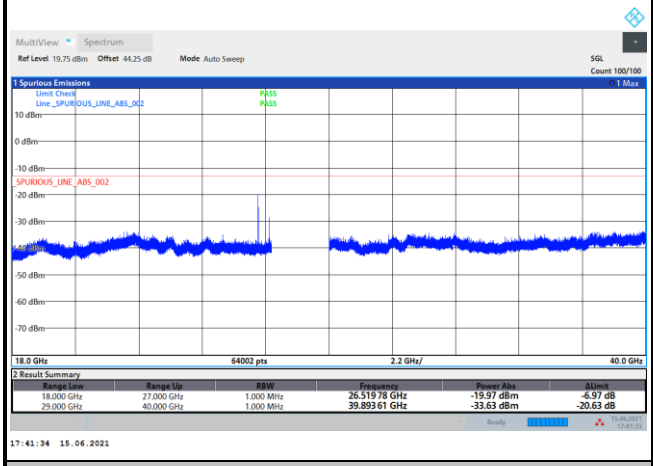
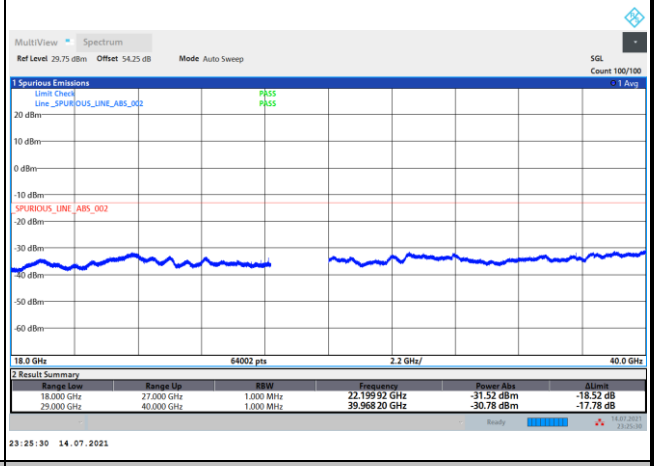
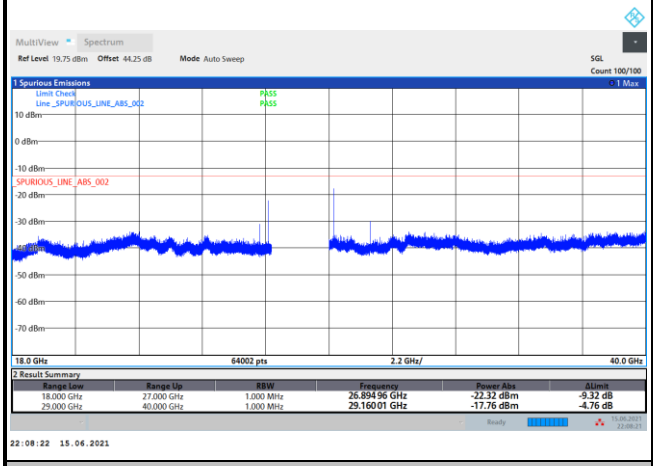
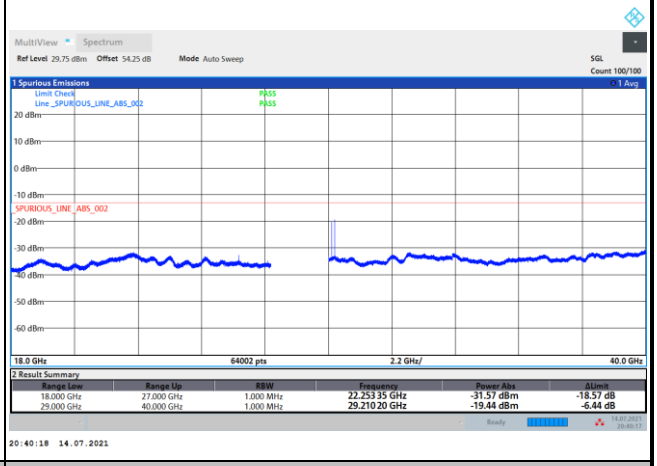
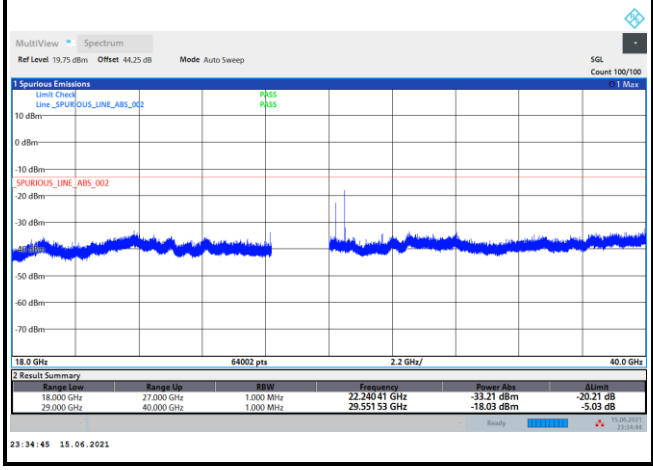
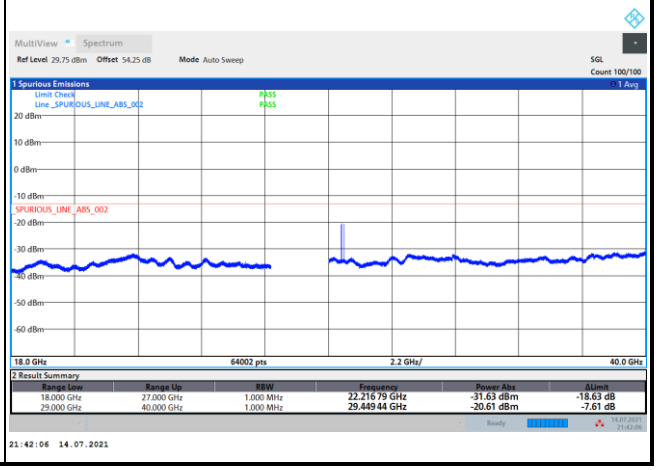


Site : 03CH19-HY
Condition : -13 ERP EIRP_20210305 VERTICAL
Project : 0D2942-04
: n261 MB

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	9364.00	-42.06	-29.06	-13.00	-67.45

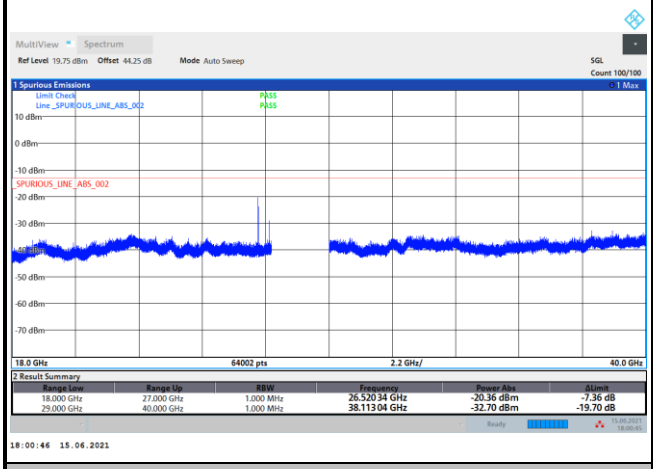
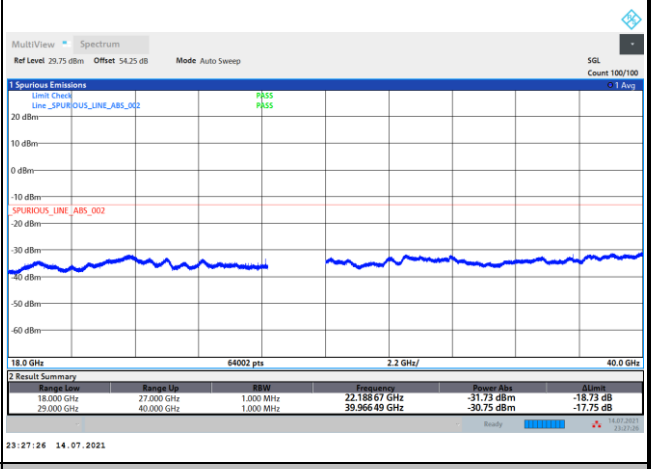
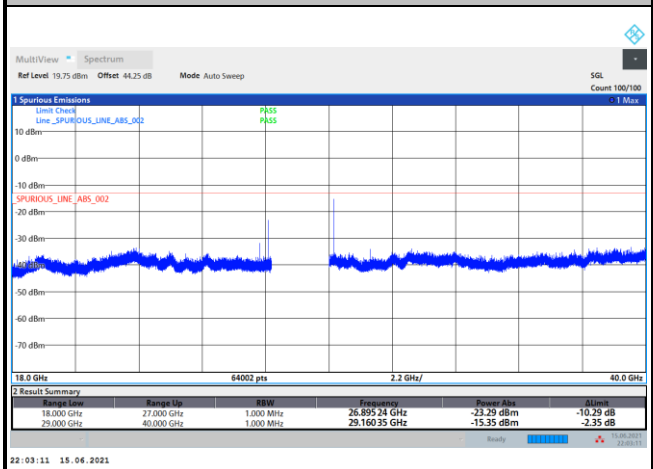
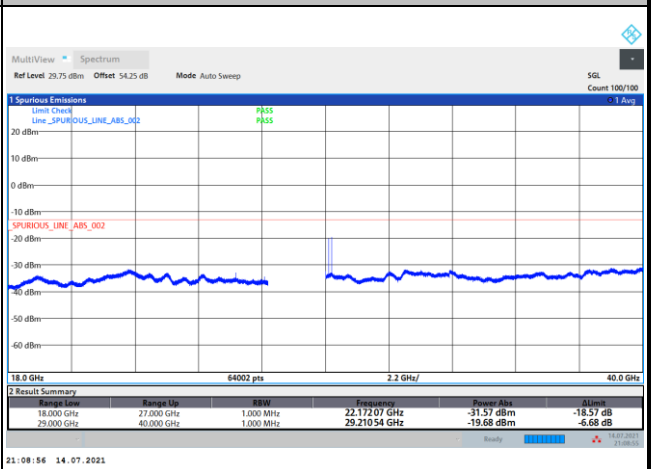
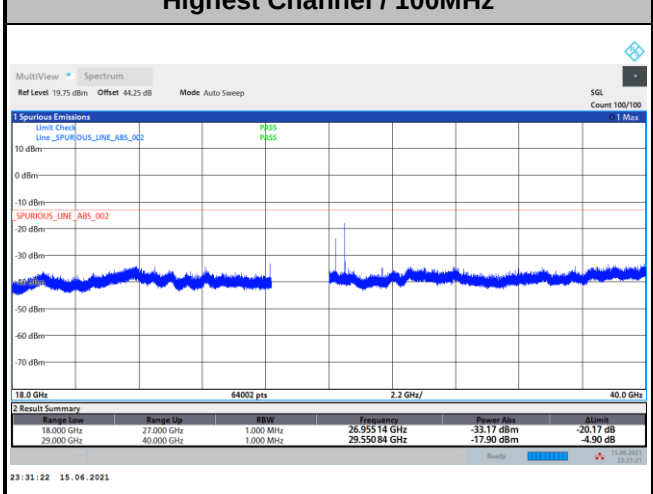
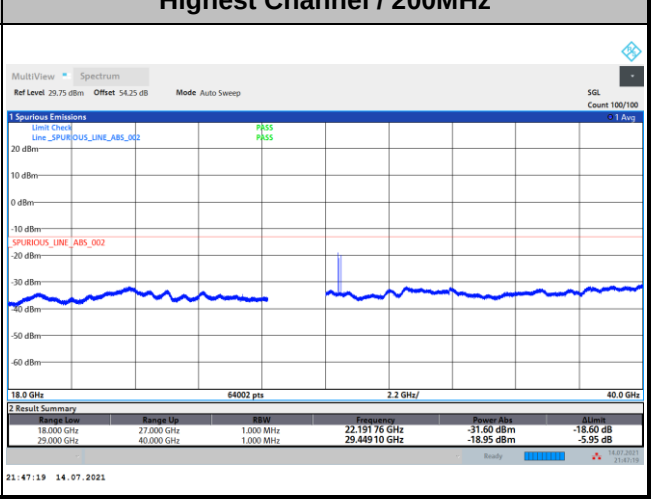
Spurious emission between 18GHz to 40GHz worst case plot is reported as following.

DFT-s-OFDM Module B

NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 100MHz	**Lowest Channel / 200MHz**
	
Middle Channel / 100MHz	**Middle Channel / 200MHz**
	
Highest Channel / 100MHz	**Highest Channel / 200MHz**
	

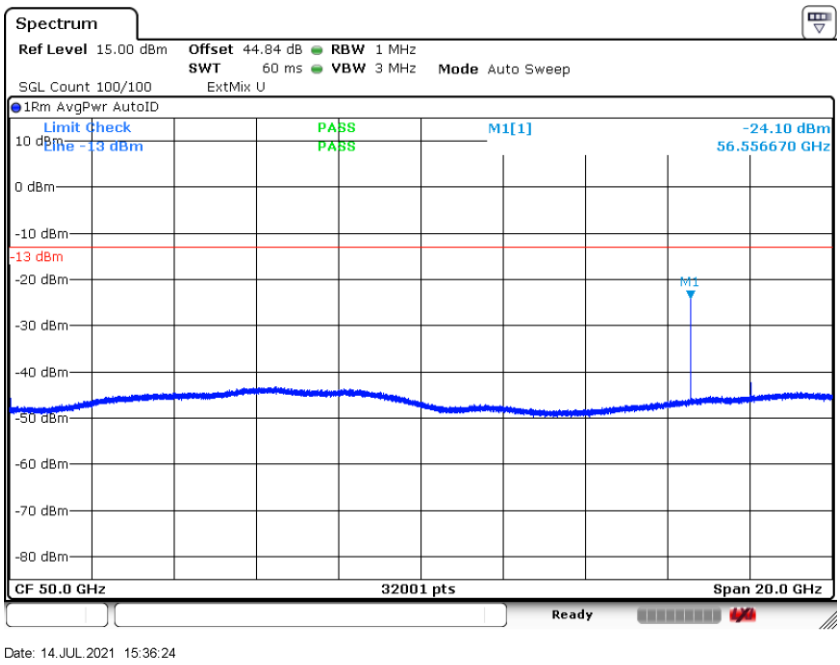
Remark: In band and out of band frequencies that has reported in previous results are omitted.

CP-OFDM Module B

NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 100MHz	**Lowest Channel / 200MHz**
	
Middle Channel / 100MHz	**Middle Channel / 200MHz**
	
Highest Channel / 100MHz	**Highest Channel / 200MHz**
	

Remark: In band and out of band frequencies that has reported in previous results are omitted.

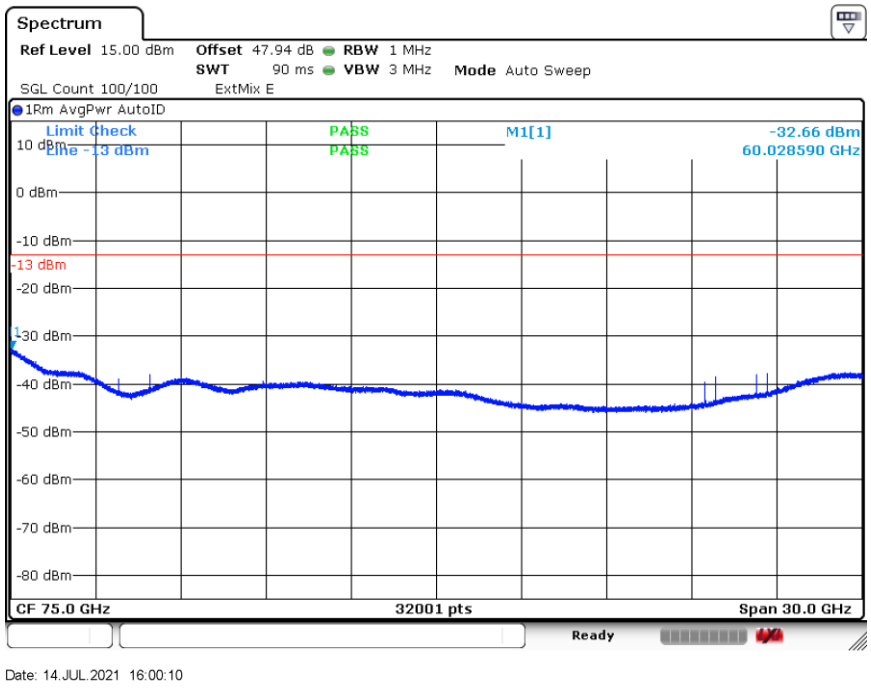
NR Band n261
(40GHz-60GHz)



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

= 42.3 + 0.34 + 107 + 20log(1) – 104.8 = 44.84 (dB)

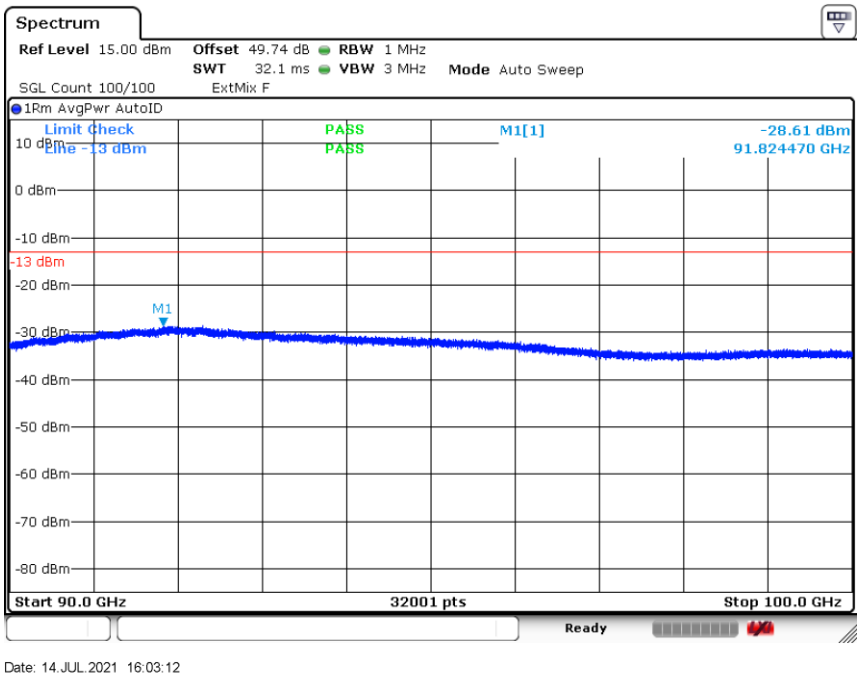
NR Band n261
(60GHz-90GHz)



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

= 45.4 + 0.34 + 107 + 20log(1) – 104.8 = 47.94 (dB)

NR Band n261
(90GHz-100GHz)



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

= 48.8 + 0.34 + 107 + 20log(1) – 104.8 = 51.34 (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	27.925006	6.000	0.215	Pass
40	Normal Voltage	27.925006	6.000	0.215	
30	Normal Voltage	27.925007	5.000	0.179	
20(Ref.)	Normal Voltage	27.925012	0.000	0.000	
10	Normal Voltage	27.925035	-23.000	0.824	
0	Normal Voltage	27.925017	-5.000	0.179	
-10	Normal Voltage	27.925035	-23.000	0.824	
-20	Normal Voltage	27.925016	-4.000	0.143	
-30	Normal Voltage	27.925011	1.000	0.036	
20	Maximum Voltage	27.925012	0.000	0.000	
20	Normal Voltage	27.925006	6.000	0.215	
20	Battery End Point	27.925009	3.000	0.107	

Note: The frequency fundamental emissions stay within the operation band.

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

Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate
Kalibrierschein

Certificate Number 24-0060-101033-01
Zertifikatsnummer

Unit Data

Item
Gegenstand
Harmonic Mixer, 40 GHz to 60 GHz

Manufacturer
Hersteller
RPG

Type
Typ
RPG FS-Z60

Material Number
Materialnummer
1048.0171.02

Serial Number
Seriennummer
101033

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber

Order Number
Bestellnummer

Date of Receipt
Eingangsdatum

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung
Meckenheim, 2020-03-17

Scope of Calibration
Umfang der Kalibrierung
Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)
New device

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung)
All measured values are within the data sheet specifications.

Extend of Calibration Documents
Umfang des Kalibrierdokuments
2 pages Calibration Certificate
4 pages Outgoing Results

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor k = 2). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit k = 2). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Radiometer Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum
2020-03-20

Head of Laboratory
Laborleitung
Schulze

Person Responsible
Bearbeiter
Heinze

Radiometer Physics GmbH ● Werner-von-Siemens-Str. 4 ● 53340 Meckenheim ● Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 ● Managing Director: Achim Walber, Dr. Thomas Rose ● Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 ● VAT Identification No.: DE 123 377 395

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity **20 % - 80 %**
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23 $^{+7}_{-3}$) °C

Working standards used (having a significant effect on the accuracy)
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

Item Gegenstand	**Type** Typ	**Serial Number** Seriennummer	**Calibration Certificate Number** Kalibrierscheinnummer	**Cal. Due** Kalibr. bis
Vector Network Analyzer	R&S® ZVA40	100103	0001-300467129	2021-06-13
Powersensor	R&S® NRP-Z55	140091	509915_D-K-15195-01-01_2019-05	2020-05-22
Powersensor	R&S® NRP-Z57	101423	508173_D-K-15195-01-01_2019-05	2020-05-07

UGB1 **A compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

UGB2 **A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

Notes
Anmerkungen

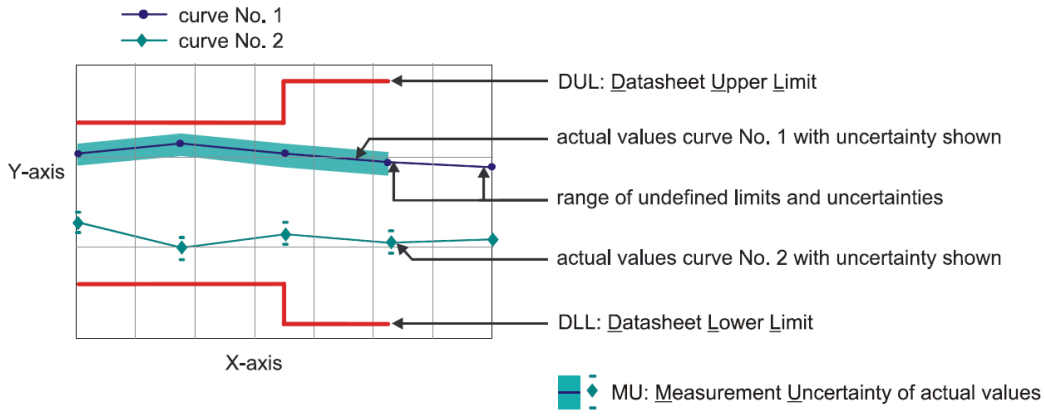
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

Outgoing Results

The following abbreviations may be used in this document

{a}	No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
{b}	The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
{c}	Functional test, therefore no measurement uncertainty is stated.
{d}	Typical value, refer to performance test.
{e}	The measurement uncertainty is taken into account when setting the measuring system.
DL or DT	Data Limit for symmetrical tolerance limits
DLL	Datasheet Lower Limit
DUL	Datasheet Upper Limit
MU	Measurement Uncertainty
MLL or MLV	Measurement Uncertainty Lower Value
MUL or MUV	Measurement Uncertainty Upper Value
Nom.	Nominal Value
Dev.	Deviation
MErr.	Measurement Error
Act.	Actual Value
UGB	Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
UGB1	Measurement results marked as UGB1 show conformity with a probability of >50 %and <95 %.
UGB2	Measurement results marked as UGB2 show non-conformity with a probability of >50 %and <95 %.
DU	Datasheet Uncertainty

Explanation of charts



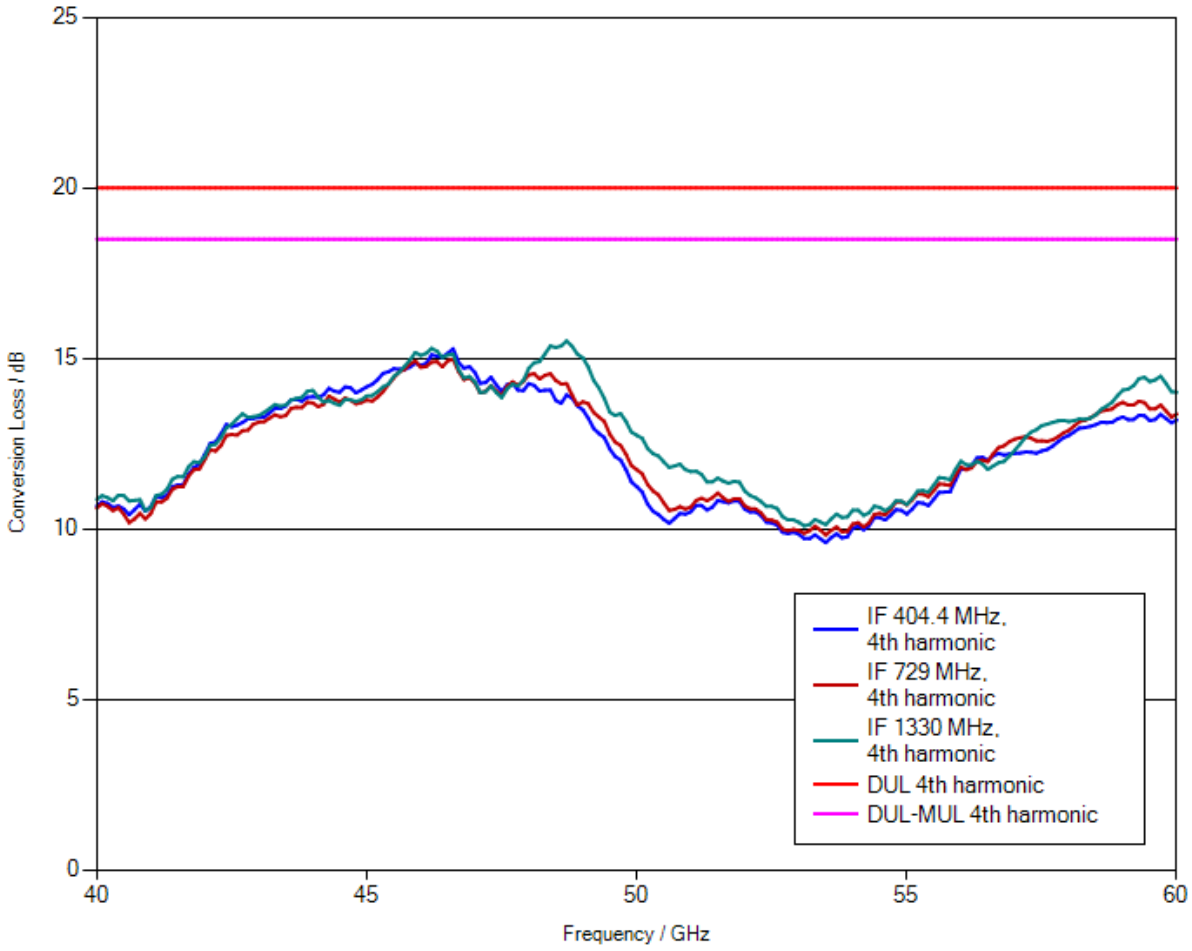
Software used for measurement

Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_13	

1.1 Conversion loss

LO level +13 dBm nominal
Bias 0 A

Measurement uncertainty: 1.5 dB



Note: Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the "paper clip" symbol to display the file.

The file has been renamed for safety reasons.
When downloading the file onto your PC, please delete the ".file" extension and unzip the data.

1.2 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 4th harmonic	4 dB	2.16 dB	PASS
IF = 729 MHz, 4th harmonic	4 dB	2.04 dB	PASS
IF = 1330 MHz, 4th harmonic	4 dB	2.19 dB	PASS

ROHDE&SCHWARZ

Calibration Certificate
Kalibrierschein

Certificate Number 24-0090-101811-01
Zertifikatsnummer

Unit Data

Item / Gegenstand: **Harmonic Mixer, 60 GHz to 90 GHz**

Manufacturer / Hersteller: **ROHDE & SCHWARZ**

Type / Typ: **R&S® FS-Z90**

Material Number / Materialnummer: **1048.0371.02**

Serial Number / Seriennummer: **101811**

Asset Number / Inventarnummer:

Order Data

Customer / Auftraggeber:

Order Number / Bestellnummer:

Date of Receipt / Eingangsdatum:

Performance

Place and Date of Calibration / Ort und Datum der Kalibrierung: **Meckenheim, 2018-07-16**

Scope of Calibration / Umfang der Kalibrierung: **Standard Calibration**

Statement of Compliance (Incoming) / Konformitätsaussage (Anlieferung): **New device**

Statement of Compliance (Outgoing) / Konformitätsaussage (Auslieferung): **All measured values are within the data sheet specifications.**

Extend of Calibration Documents / Umfang des Kalibrierdokuments: **2 pages Calibration Certificate**
5 pages Outgoing Results

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor k = 2). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit k = 2). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Radiometer Physics GmbH; Meckenheim

Date of Issue / Ausstellungsdatum: **2018-07-19**

Head of Laboratory / Laborleitung: Ceru

Person Responsible / Bearbeiter: Grossmindorf

Radiometer Physics GmbH • Werner-von-Siemens-Str. 4 • 53340 Meckenheim • Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 • Managing Director: Achim Walber, Dr. Thomas Rose • Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 • VAT Identification No.: DE 123 377 395

Material Number 1048.0371.02 Serial Number 101811

Certificate Number 24-0090-101811-01

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

$(23\ ^{+7}_{-3})$ °C

Working standards used (having a significant effect on the accuracy)
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

Item Gegenstand	Type Typ	Serial Number Seriennummer	Calibration Certificate Number Kalibrierscheinnummer	Cal. Due Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17
Powersensor	R&S® NRP-Z58	101063	20-611462	2018-07-21
Calibration kit	WR12	E10001	RPG-PAQA-TN-2014-005	2019-02-01

UGB1	**A compliance statement may be possible where a confidence level of less than 95 % is acceptable.** Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.
UGB2	**A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.** Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

Notes
Anmerkungen

If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

Outgoing Results

The following abbreviations may be used in this document

{a}	No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
{b}	The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
{c}	Functional test, therefore no measurement uncertainty is stated.
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{e}	The measurement uncertainty is taken into account when setting the measuring system.
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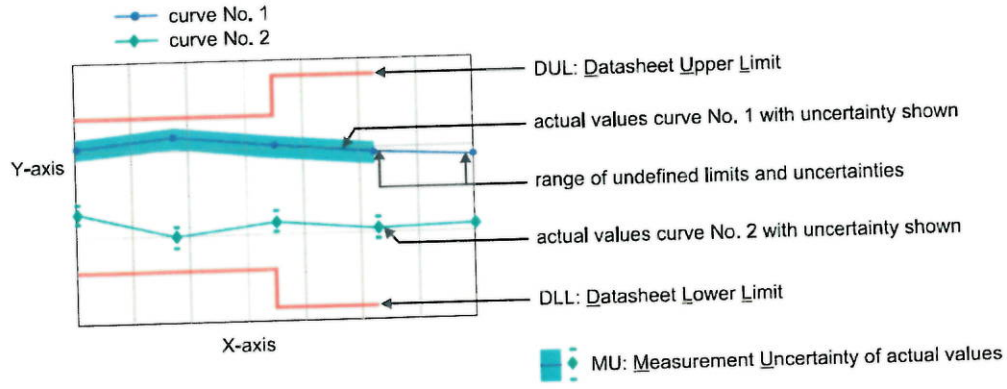
DLL	Datasheet Lower Limit
DUL	Datasheet Upper Limit
MU	Measurement Uncertainty
MLL or MLV	Measurement Uncertainty Lower Value
MUL or MUV	Measurement Uncertainty Upper Value
Nom.	Nominal Value
Dev.	Deviation
MErr.	Measurement Error
Act.	Actual Value
UGB	Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
UGB1	Measurement results marked as UGB1 show conformity with a probability of >50 %and <95 %.
UGB2	Measurement results marked as UGB2 show non-conformity with a probability of >50 %and <95 %.
DU	Datasheet Uncertainty

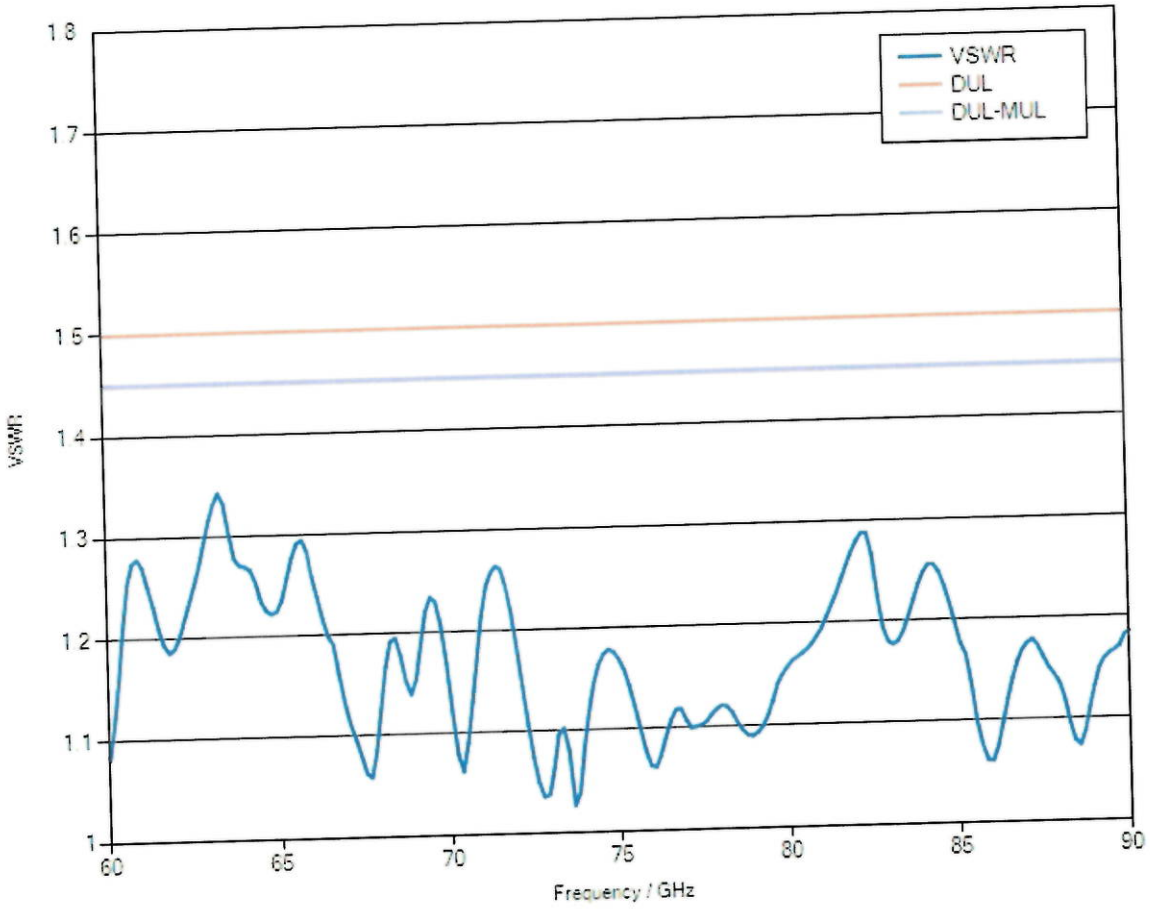
Explanation of charts



Software used for measurement Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_08	

1.1 RF Input – VSWR

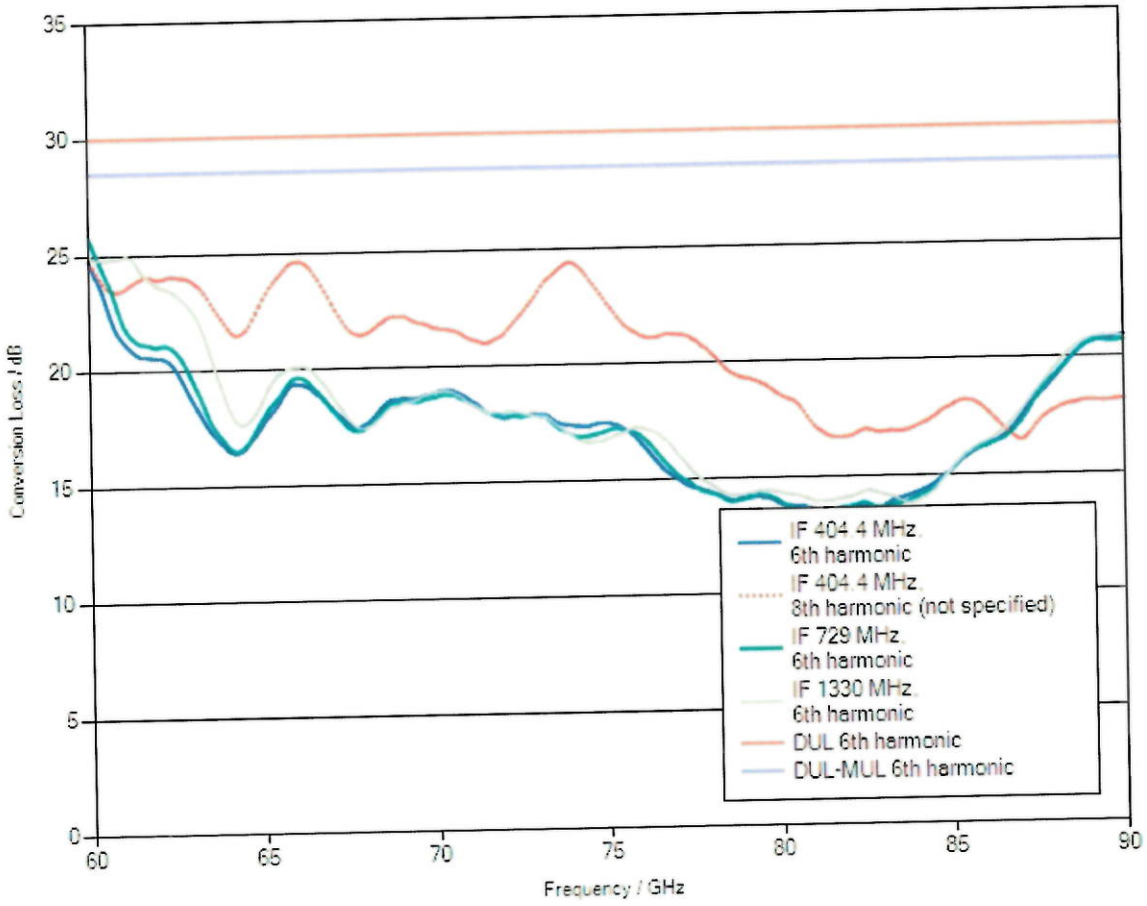
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +14 dBm nominal
Bias 0 A

Measurement uncertainty: 1.5 dB



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The file has been renamed for safety reasons.
When downloading the file onto your PC, please delete the ".file" extension and unzip the data.

1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 6th harmonic	6 dB	3.29 dB	PASS
IF = 404.4 MHz, 8th harmonic	not specified	2.25 dB	not specified
IF = 729 MHz, 6th harmonic	6 dB	3.47 dB	PASS
IF = 1330 MHz, 6th harmonic	6 dB	3.84 dB	PASS

Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate
Kalibrierschein

Certificate Number 24-0140-101128-02
Zertifikatsnummer

Unit Data

Item
Gegenstand
Harmonic Mixer, 90 GHz to 140 GHz

Manufacturer
Hersteller
RPG Radiometer-Physics GmbH

Type
Typ
RPG FS-Z140

Material Number
Materialnummer
3622.0708.02

Serial Number
Seriennummer
101128

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber
Sporton International Inc.
No. 106 6F., Sec. 1, Hsin Tai Wu Rd.,
Xizhi Dist.,
000000
NEW TAIPEI CITY-000000
221- TAIWAN

Order Number
Bestellnummer
8800003072

Date of Receipt
Eingangsdatum
2020-10-06

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung
Meckenheim, 2020-10-26

Scope of Calibration
Umfang der Kalibrierung
Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)
Defective.

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung)
All measured values are within the data sheet specifications.

Extend of Calibration Documents
Umfang des Kalibrierdokuments
2 pages Calibration Certificate
4 pages Outgoing Results

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor k = 2). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit k = 2). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

RPG Radiometer-Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum
2020-10-27

Head of Laboratory
Laborleitung
Schulze

Person Responsible
Bearbeiter
Gottbehüt

RPG Radiometer-Physics GmbH ● Werner-von-Siemens-Str. 4 ● 53340 Meckenheim ● Telephone national: 02225/99981-0 international: 0049 2225-99981-0
Fax: 02225/99981-99 ● Managing Director: Achim Walber ● Company's Place of Business: Meckenheim
Commercial Register No.: Bonn, HRB 10291 ● VAT Identification No.: DE 123 377 395

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity **20 % - 80 %**
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23 $^{+7}_{-3}$) °C

Working standards used (having a significant effect on the accuracy)
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

Item Gegenstand	**Type** Typ	**Serial Number** Seriennummer	**Calibration Certificate Number** Kalibrierscheinnummer	**Cal. Due** Kalibr. bis
Vector Network Analyzer	R&S® ZVA40	100103	0001-300467129	2021-06-13
Powersensor	R&S® NRP-Z55	140093	509916_D-K-15195-01-01_2019-05	2021-05-22

UGB1 **A compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

UGB2 **A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

Notes
Anmerkungen

If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

Outgoing Results

The following abbreviations may be used in this document

{a}	No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
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DL or DT	Data Limit for symmetrical tolerance limits
DLL	Datasheet Lower Limit
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MU	Measurement Uncertainty
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Nom.	Nominal Value
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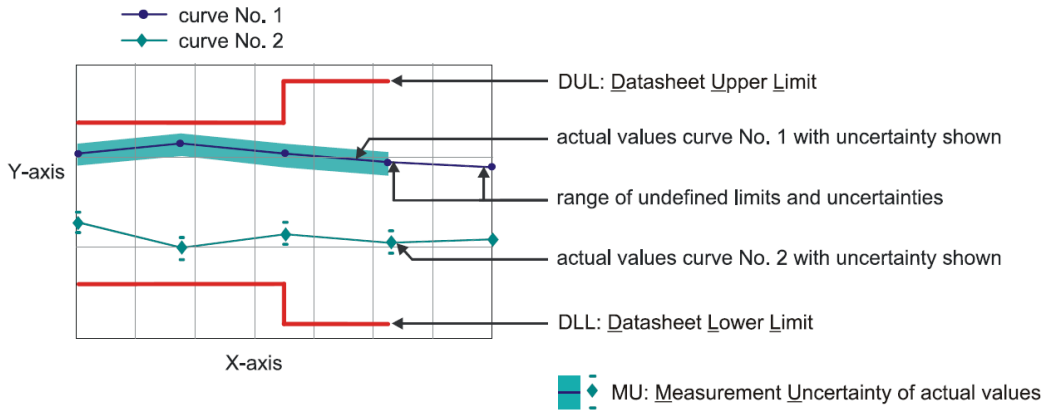
Explanation of charts



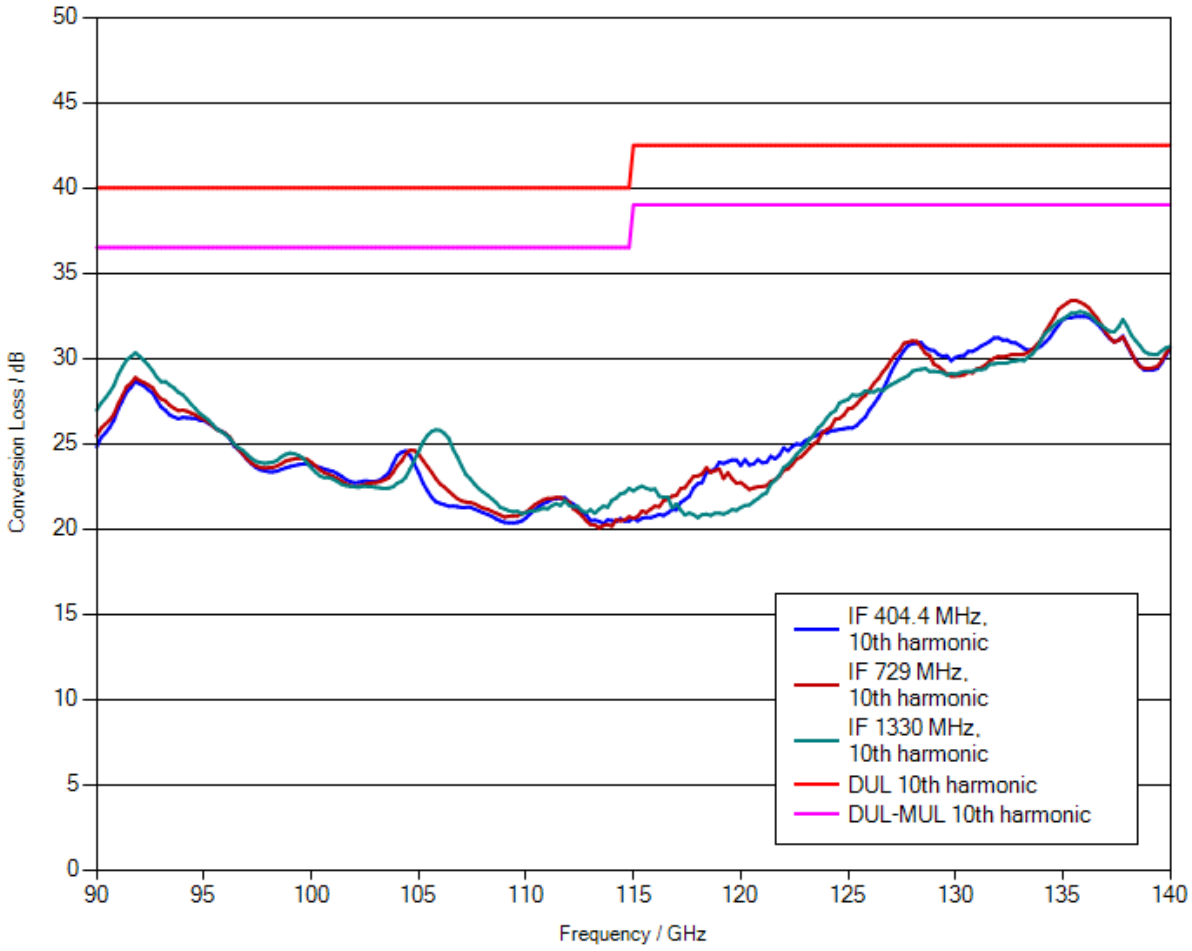
Software used for measurement

Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_14	

1.1 Conversion loss

LO level +14 dBm nominal
Bias 0 A

Measurement uncertainty: 3.5 dB



Note: Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the "paper clip" symbol to display the file.

The file has been renamed for safety reasons.
When downloading the file onto your PC, please delete the ".file" extension and unzip the data.

1.2 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 10th harmonic	6 dB	2.1 dB	PASS
IF = 729 MHz, 10th harmonic	6 dB	1.96 dB	PASS
IF = 1330 MHz, 10th harmonic	6 dB	2.13 dB	PASS

Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate
Kalibrierschein

Certificate Number 24-0220-101014-01
Zertifikatsnummer

Unit Data

Item
Gegenstand
Harmonic Mixer, 140 GHz to 220 GHz

Manufacturer
Hersteller
RPG

Type
Typ
RPG FS-Z220

Material Number
Materialnummer
3593.3250.02

Serial Number
Seriennummer
101014

Asset Number
Inventarnummer

Order Data

Customer
Auftraggeber

Order Number
Bestellnummer

Date of Receipt
Eingangsdatum

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung
Meckenheim, 2018-08-27

Scope of Calibration
Umfang der Kalibrierung
Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)
New device

Statement of Compliance (Outgoing)
Konformitätsaussage (Auslieferung)
All measured values are within the data sheet specifications.

Extend of Calibration Documents
Umfang des Kalibrierdokuments
2 pages Calibration Certificate
5 pages Outgoing Results

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Radiometer Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum
2018-08-28

Head of Laboratory
Laborleitung
Schulze

Person Responsible
Bearbeiter
Heinze

Radiometer Physics GmbH ● Werner-von-Siemens-Str. 4 ● 53340 Meckenheim ● Telephone national: 02225/99981-0 international: 0049 2225-99981-0
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Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17

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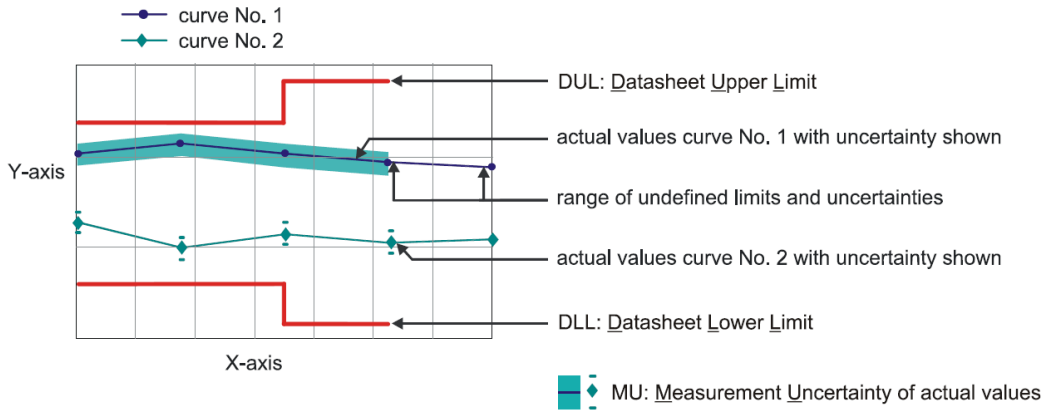
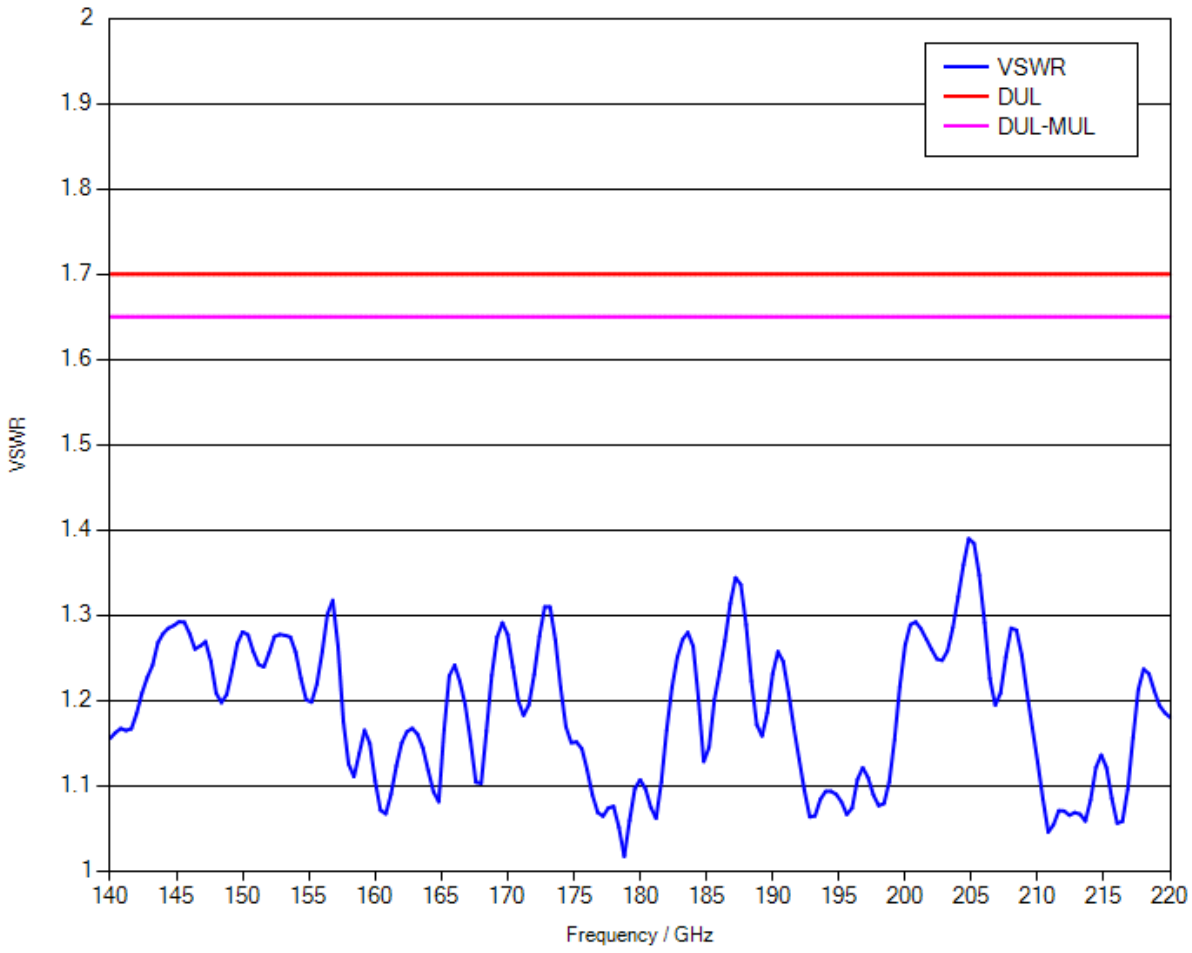


Software used for measurement

Item Type	Version	Remark
Measurement Studio Professional Edition	2013	
MixerCertification	7_09	

1.1 RF Input – VSWR

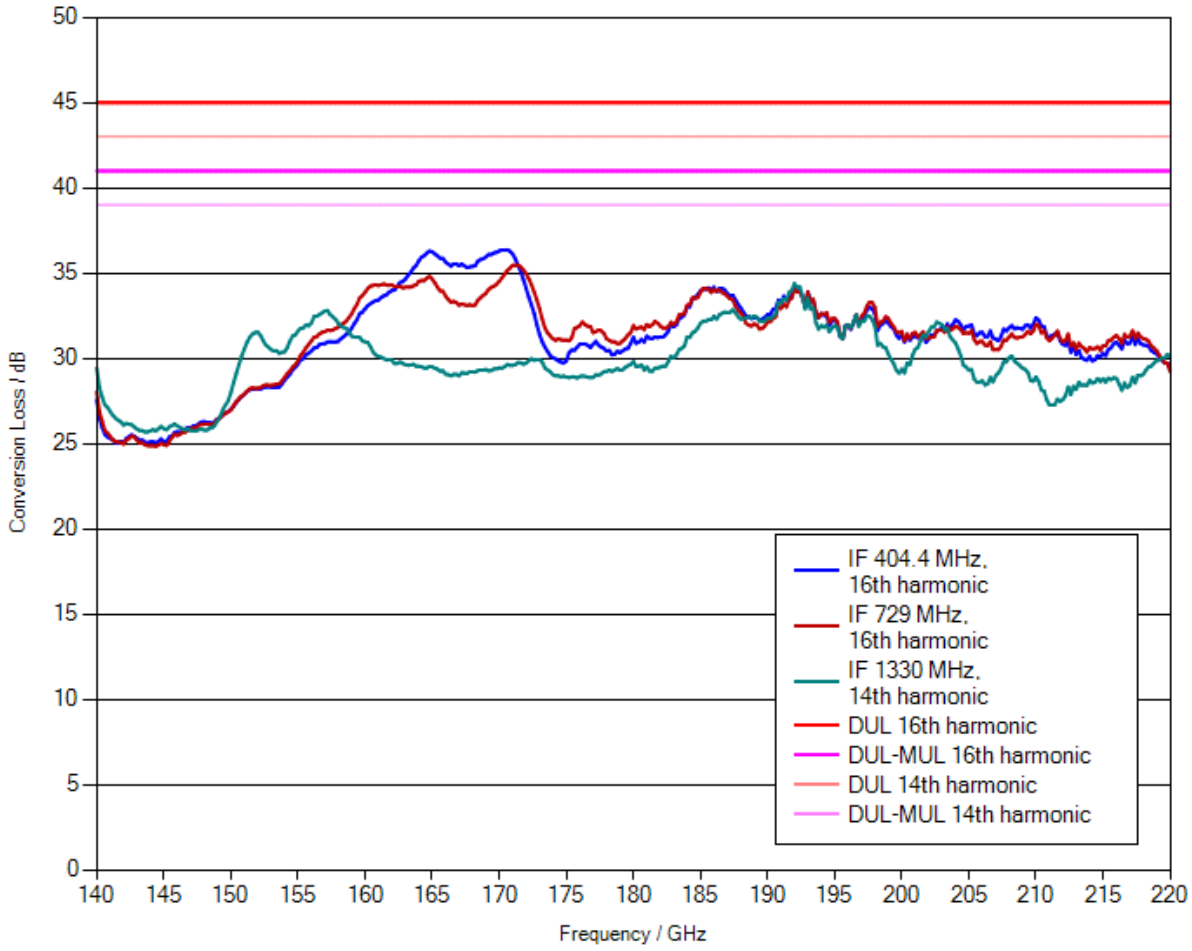
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +13 dBm nominal
Bias 0 A

Measurement uncertainty: 4 dB



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1.3 Frequency response within 1 GHz

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IF = 729 MHz, 16th harmonic	6 dB	2.61 dB	PASS
IF = 1330 MHz, 14th harmonic	6 dB	2.61 dB	PASS

Calibration Laboratory of Microwave Measuring Equipment
of MWM lab

ISO 17025
ACCREDITED LABORATORY

Calibration certificate

Accreditation certificate No. **№ BY/112 02.5.0.0065** **of** **09.01.2015**

Certificate number **25-18** **Date when calibrated** 08/17/2018 **Page** 1 **of** 2

Item calibrated Antenna QWH-UPRR00 # 923600007
Description of measurement standard / measuring instrument / identification

Customer Sporton International Inc.
No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.
Name of the customer, address

Method of calibration GOST 20271.1, MK KL 8.2-16
Name of the method / identification

Authorising signature M. Svirid/ Technical manager **Date of issue** 08/17/2018
Name and position

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220013, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Certificate

Calibration is performed by using

#	Measuring equipment	Serial number
1	Wattmeter M 568	164
2	Wattmeter M 546	163
3	Signal generator G4-186	5
4	Signal generator G4-161	3
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Horn antenna P6-133	15005

Calibration conditions

Temperature: 22.5 °C.
Humidity: 44.0 %.
Pressure: 99.9 kPa.

Calibration results are given in the Measuring report # 25-18.

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	40 – 60 GHz	Corresponds (Table 1)
2	Waveguide Interface	WR-19	Corresponds
3	Antenna Gain	24 dB	Corresponds (Table 1)
4	Antenna Factor	42 dB/m	Corresponds (Table 1)

Signature of the person who has performed calibration

M. Kasperovich/ Engineer
Name and function

Calibration Laboratory of
Microwave Measuring Equipment
Accreditation certificate
No. BY/112 02.5.0.0065
Address: 6, P. Brovki str., Minsk
220027, Belarus
Phone/Fax: +375 17 2938496

Technical Manager

_____ M. Svirid

August 17, 2018

MEASURING REPORT # 25-18

August 17, 2018

Customer:	Sporton International Inc. No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.
Item calibrated:	**Antenna QWH-UPRR00 # 923600007**
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	07/20/2018
Date of calibration:	From 07/23/2018 to 08/17/2018

MEASURING CONDITIONS

Temperature: 22.5 °C	Humidity: 44 %	Pressure: 99.9 kPa

MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 568	164
2	Wattmeter M 546	163
3	Signal generator G4-186	5
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5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Horn antenna P6-133	15005

MEASURING RESULTS

Distance between the testing and generating antennas was 2 m.

Table 1

Frequency, GHz	40	50	60
Input power, mW	10.0	10.0	10.0
Power density of electromagnetic field, W/m^2	0.049	0.067	0.072
Maximum level of measured power, μW	36.56	37.07	31.98
Gain, dB	22.2	22.8	23.5
Antenna factor, dB/m	40.0	41.4	42.3
Expanded uncertainty, dB	2.1	2.1	2.1

Engineer _____ M. Kasperovich

Quality Manager _____ A. Kostrikin