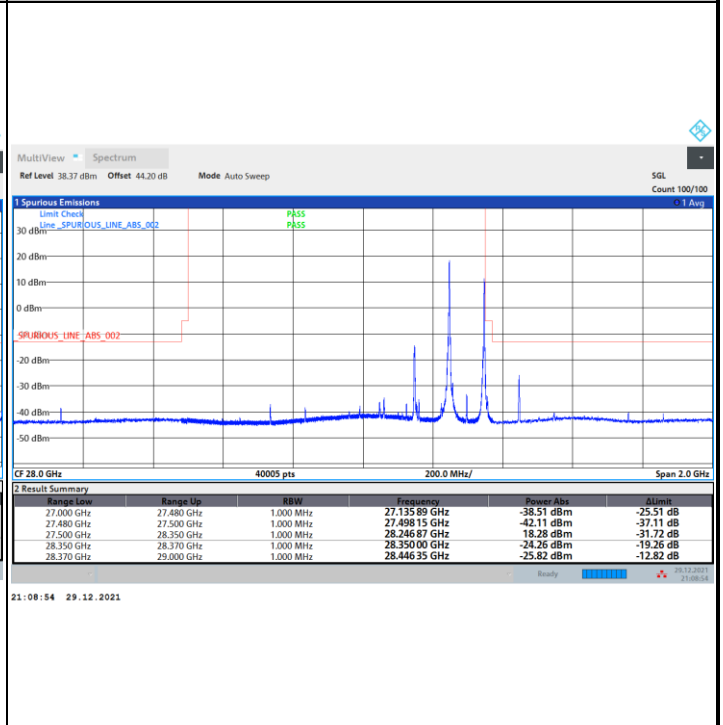
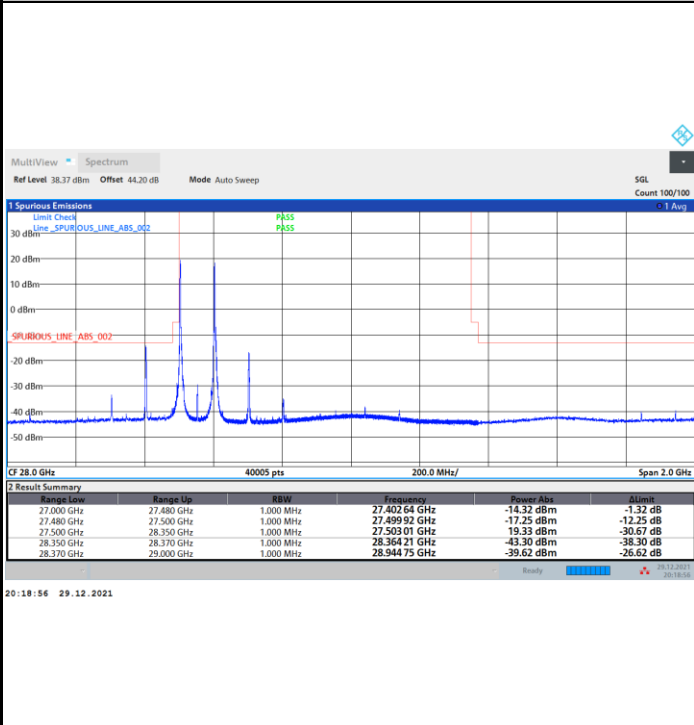




NR Band n261 / 200MHz / QPSK

Lowest Band Edge / 1 RB

Highest Band Edge / 1 RB

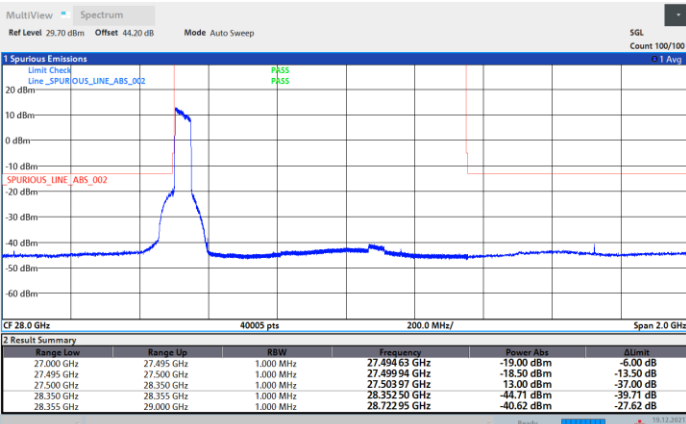




DFT-s-OFDM Module 1

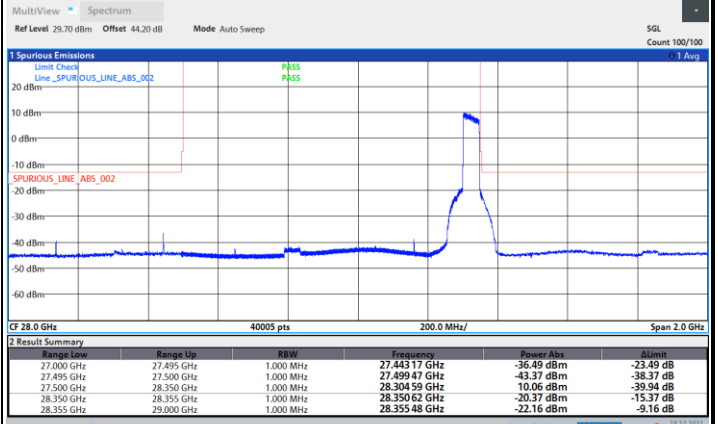
NR Band n261 / 50MHz / QPSK

Lowest Band Edge / Full RB



21:44:44 19.12.2021

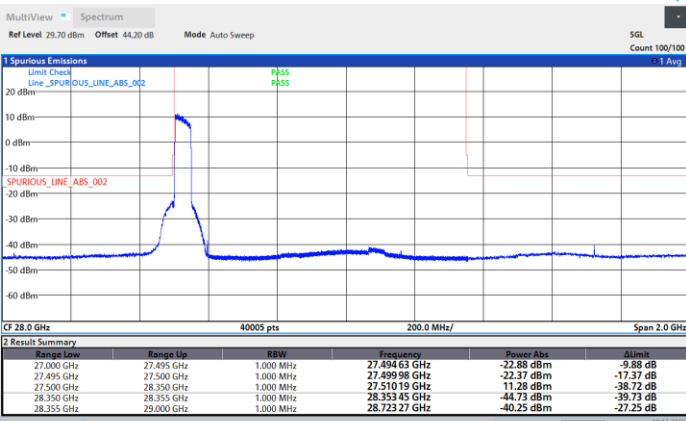
Highest Band Edge / Full RB



23:09:24 19.12.2021

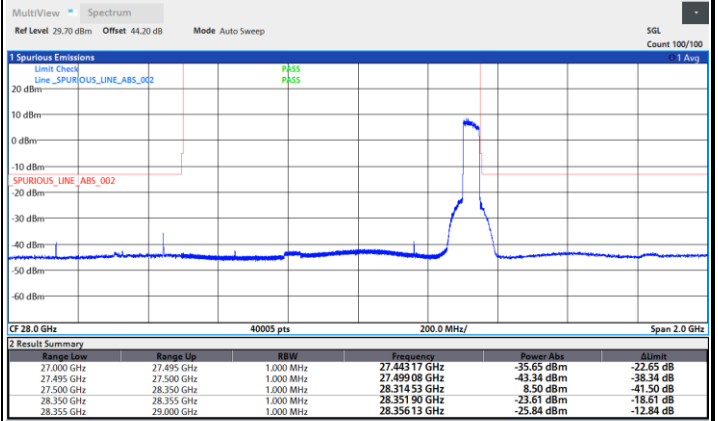
NR Band n261 / 50MHz / 16QAM

Lowest Band Edge / Full RB



21:45:27 19.12.2021

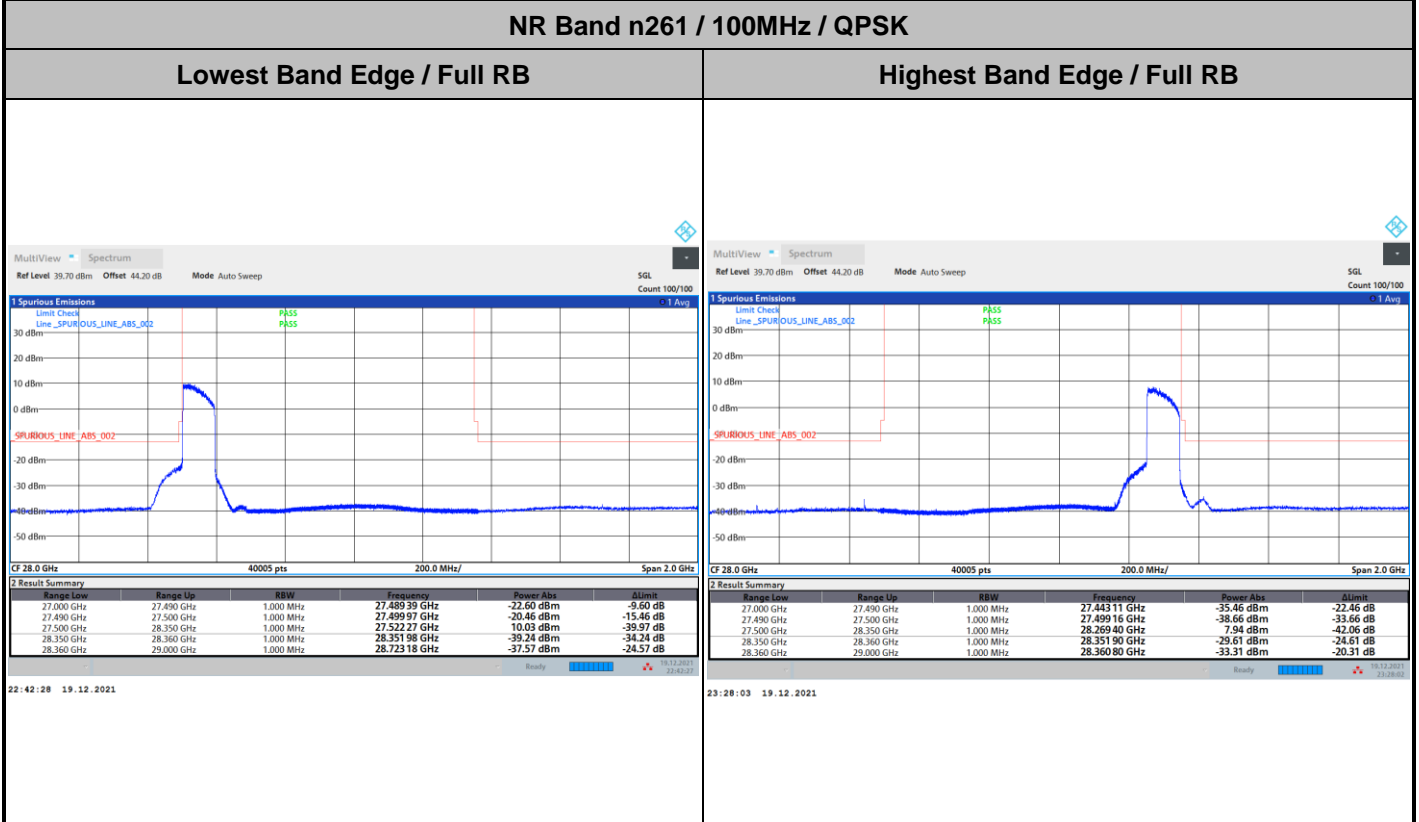
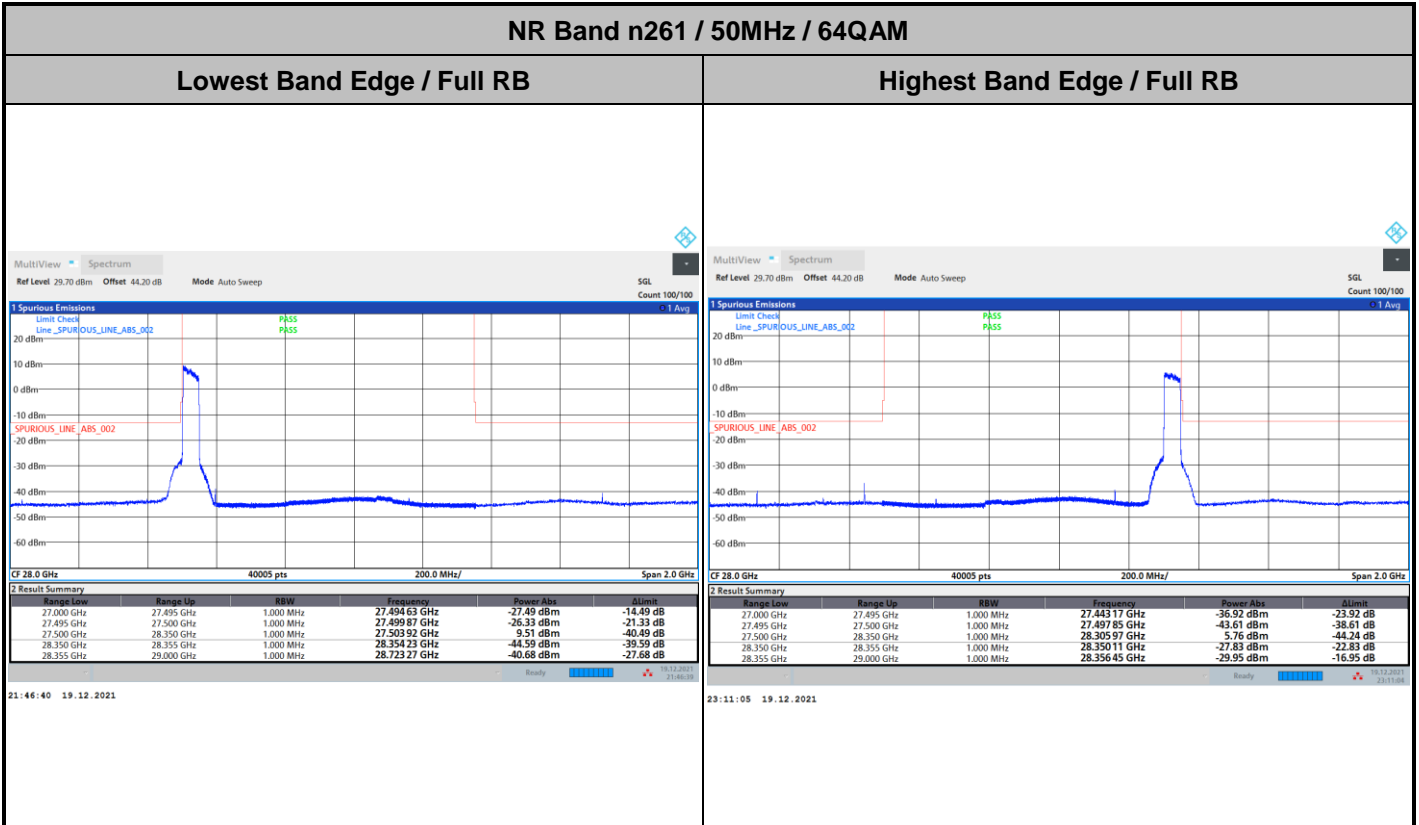
Highest Band Edge / Full RB



23:10:09 19.12.2021



DFT-s-OFDM Module 1

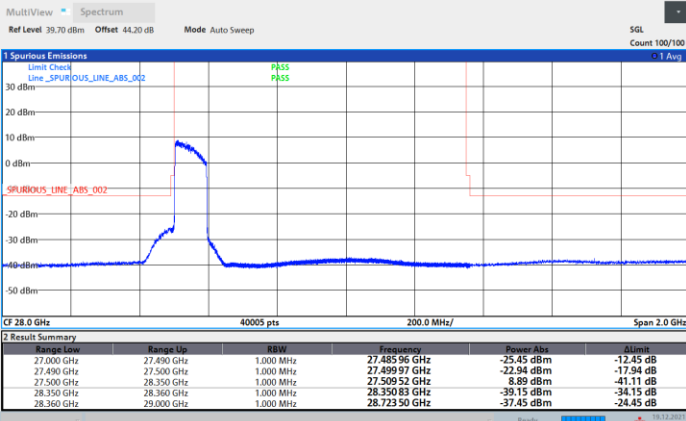




DFT-s-OFDM Module 1

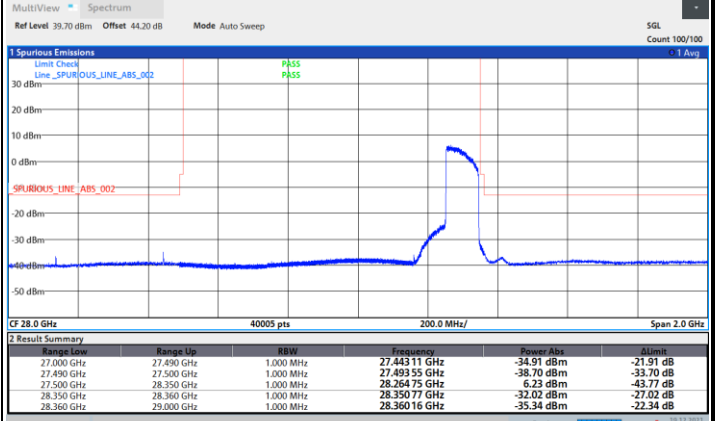
NR Band n261 / 100MHz / 16QAM

Lowest Band Edge / Full RB



22:43:15 19.12.2021

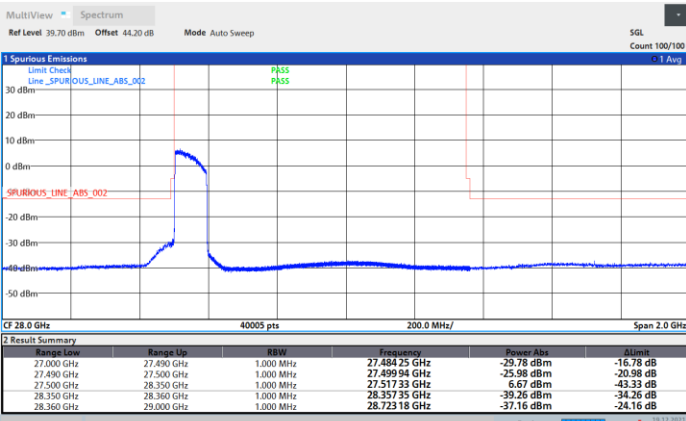
Highest Band Edge / Full RB



23:29:11 19.12.2021

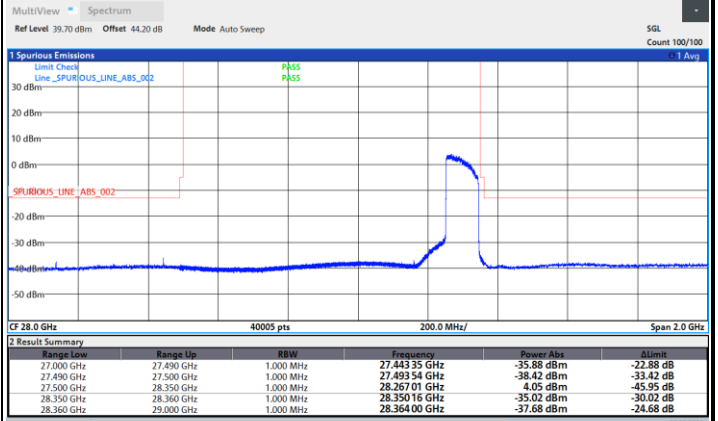
NR Band n261 / 100MHz / 64QAM

Lowest Band Edge / Full RB



22:44:00 19.12.2021

Highest Band Edge / Full RB



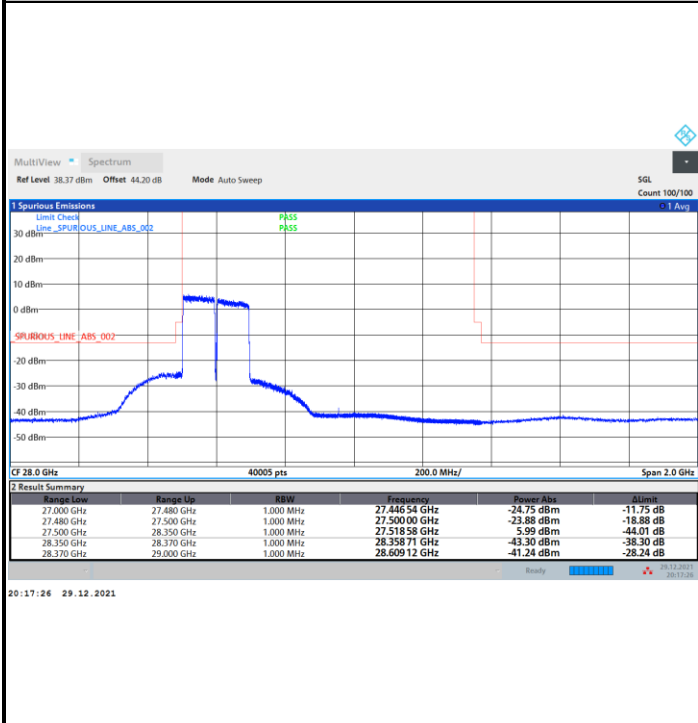
23:30:06 19.12.2021



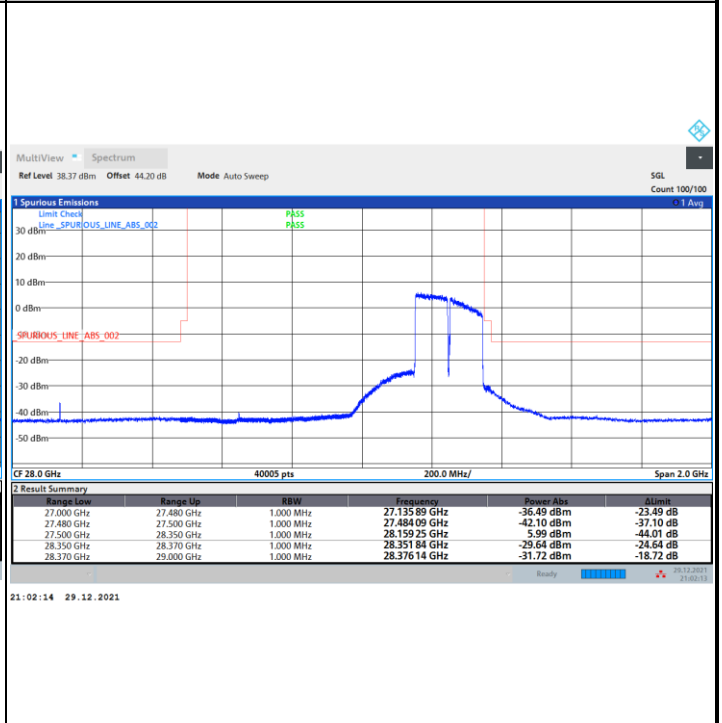
DFT-s-OFDM Module 1

NR Band n261 / 200MHz / QPSK

Lowest Band Edge / Full RB

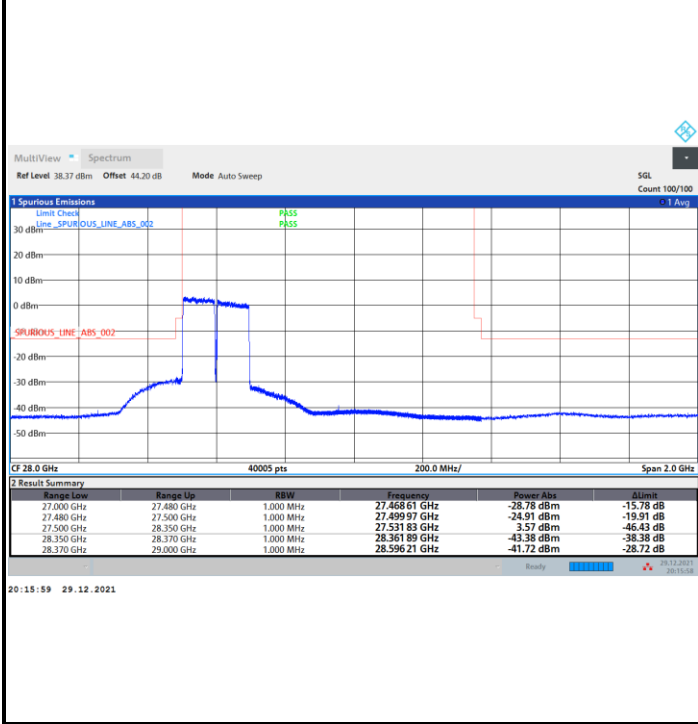


Highest Band Edge / Full RB

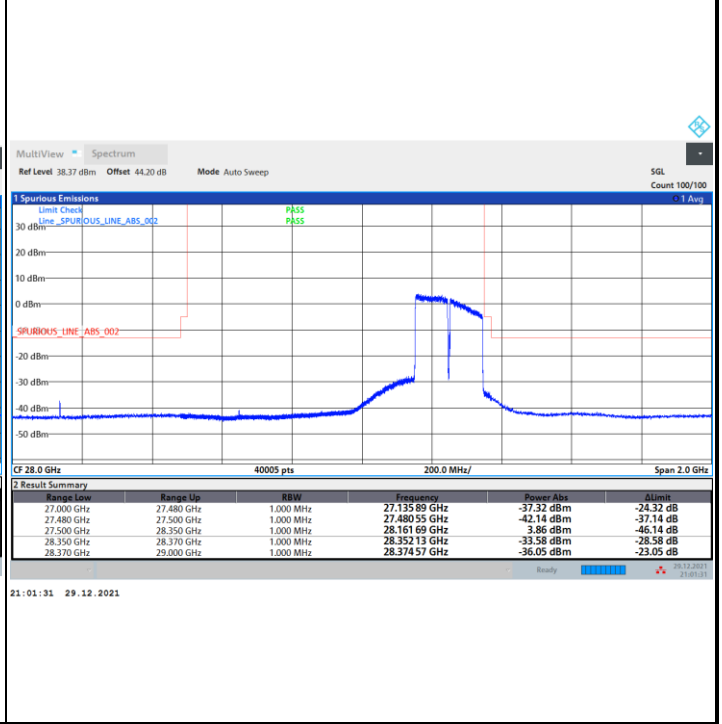


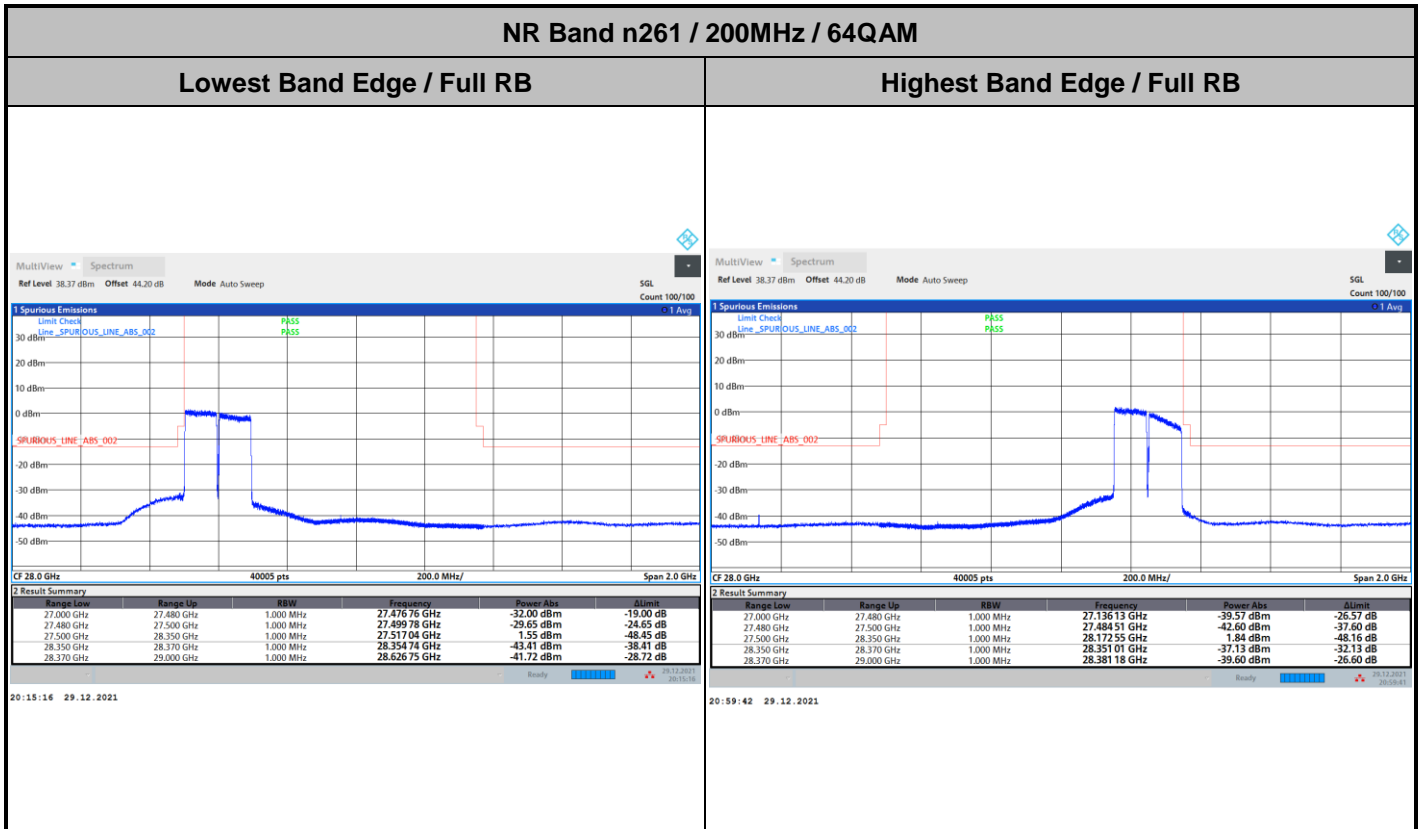
NR Band n261 / 200MHz / 16QAM

Lowest Band Edge / Full RB



Highest Band Edge / Full RB



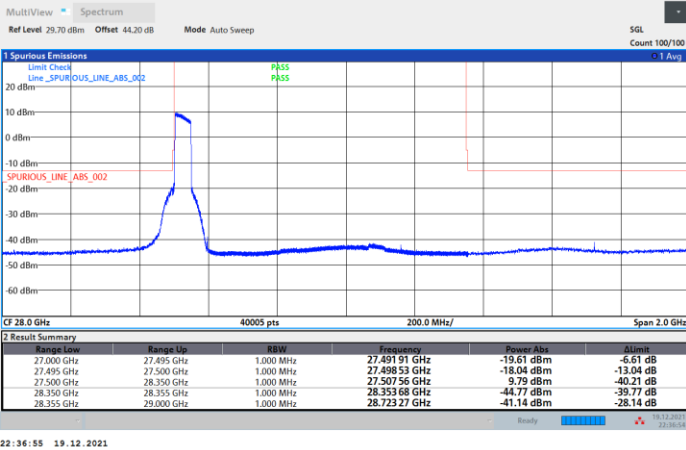




CP-OFDM Module 1

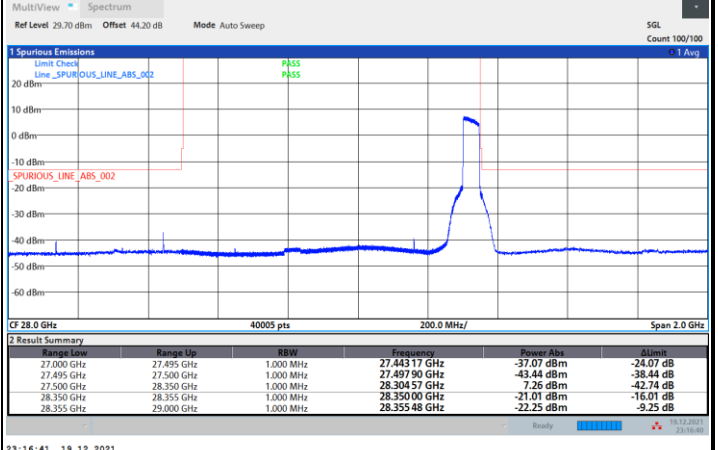
NR Band n261 / 50MHz / QPSK

Lowest Band Edge / Full RB



22:16:55 19.12.2021

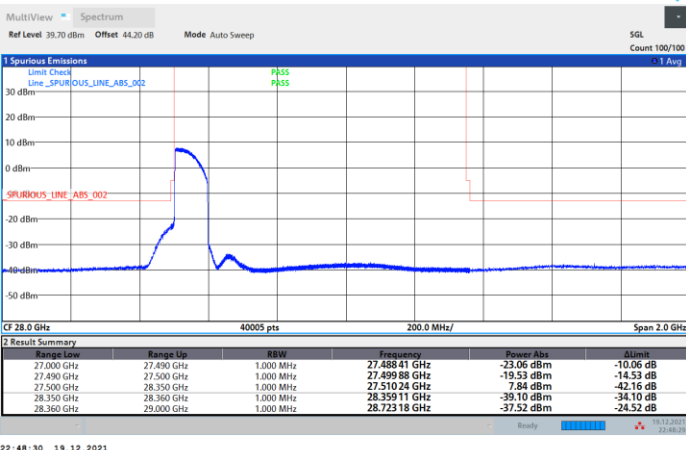
Highest Band Edge / Full RB



23:16:41 19.12.2021

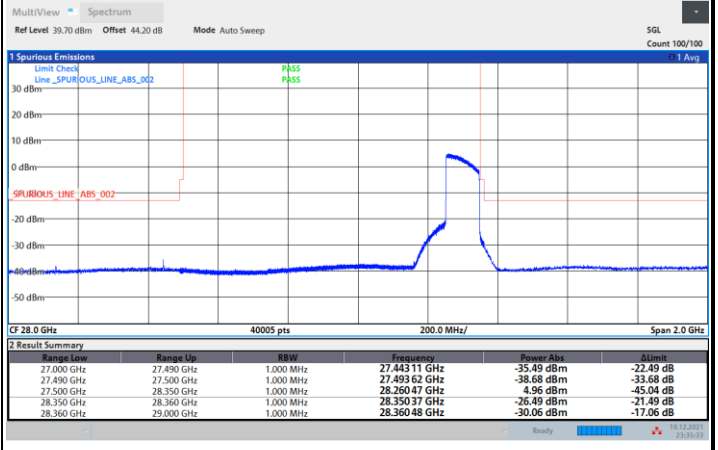
NR Band n261 / 100MHz / QPSK

Lowest Band Edge / Full RB



22:48:30 19.12.2021

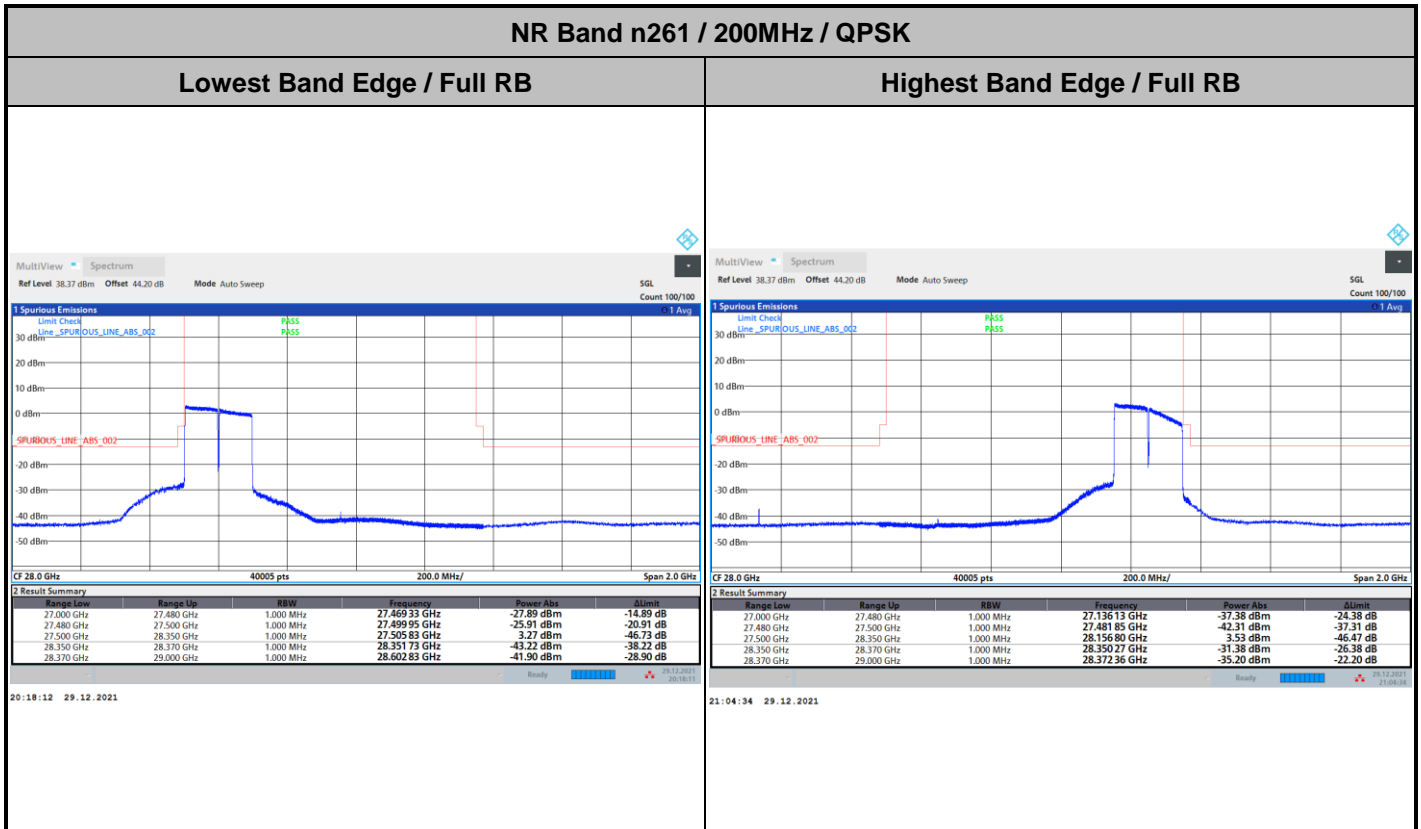
Highest Band Edge / Full RB



23:35:34 19.12.2021



CP-OFDM Module 1

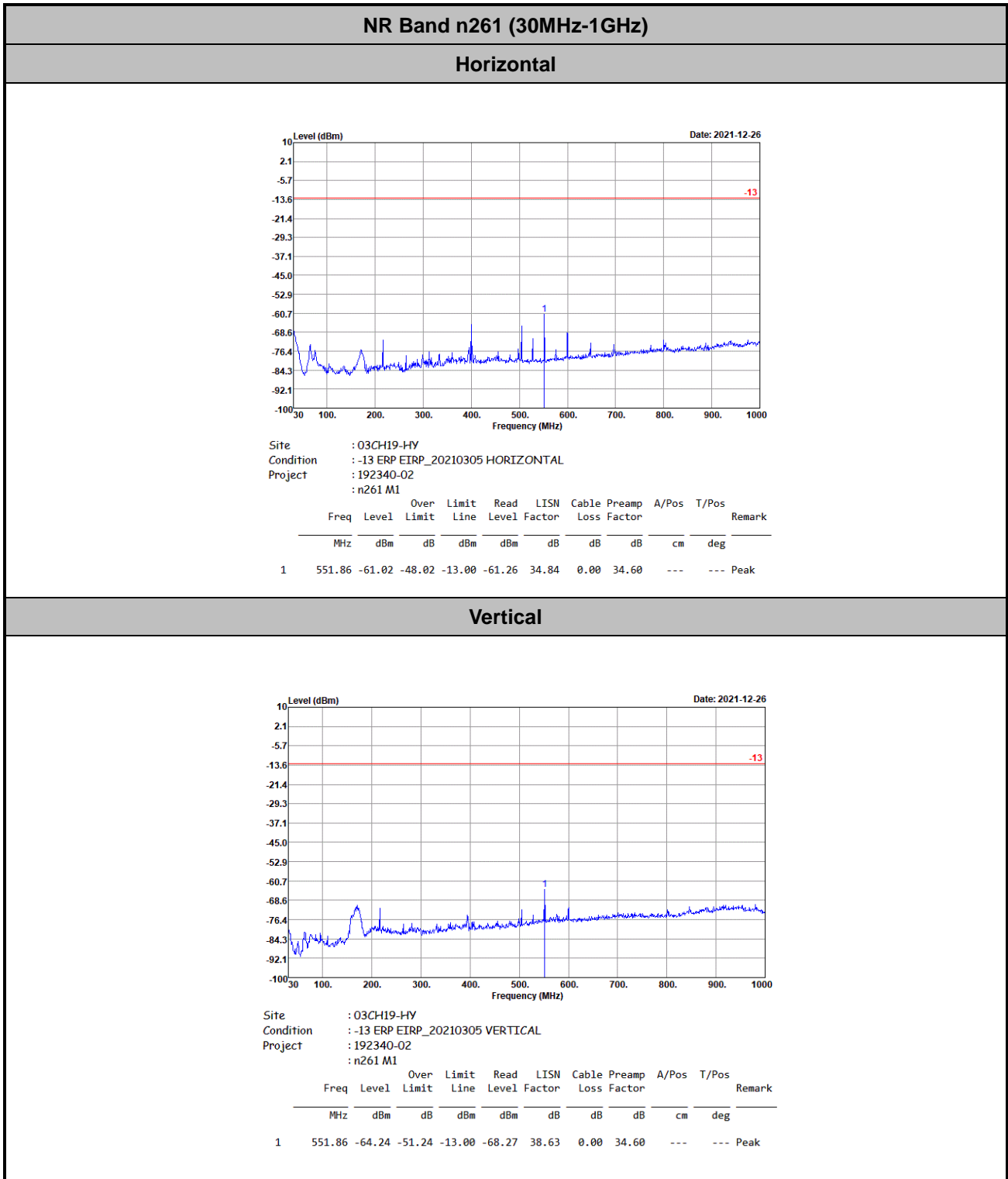






# Spurious Emission

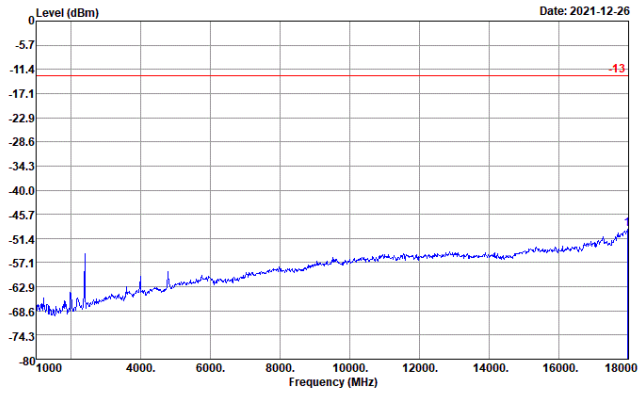
There is no significant spurious emission signal found for frequency started from 30MHz up to 18GHz.  
Only the noise floor is reported.





NR Band n261 (1GHz-18GHz)

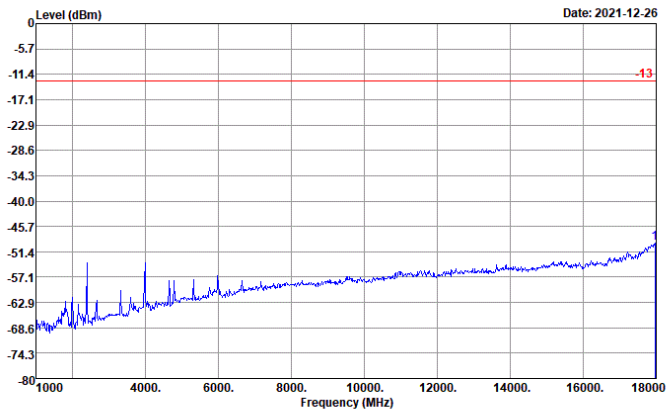
Horizontal



Site : 03CH19-HY  
 Condition : -13 ERP EIRP\_20210305 HORIZONTAL  
 Project : 192340-02  
 : n261 M1

Freq	Level	Over	Limit	Read	LISN	Cable	Preamp	A/Pos	T/Pos	Remark
MHz	dBm	dB	dBm	dBm	dB	dB	dB	cm	deg	
1 17966.00	-49.22	-36.22	-13.00	-82.87	79.95	0.00	46.30	---	---	Peak

Vertical



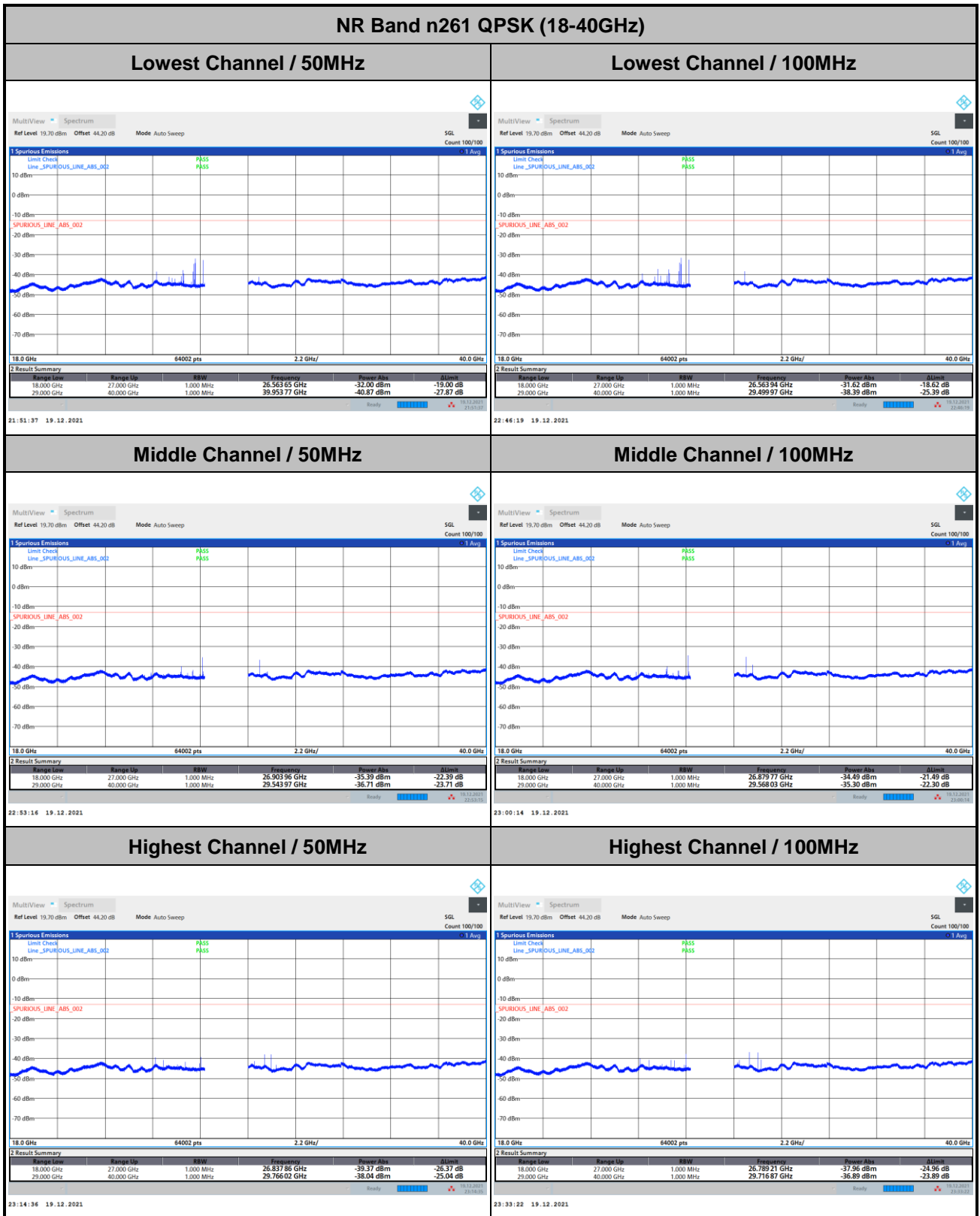
Site : 03CH19-HY  
 Condition : -13 ERP EIRP\_20210305 VERTICAL  
 Project : 192340-02  
 : n261 M1

Freq	Level	Over	Limit	Read	LISN	Cable	Preamp	A/Pos	T/Pos	Remark
MHz	dBm	dB	dBm	dBm	dB	dB	dB	cm	deg	
1 17966.00	-49.46	-36.46	-13.00	-82.87	79.71	0.00	46.30	---	---	Peak



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

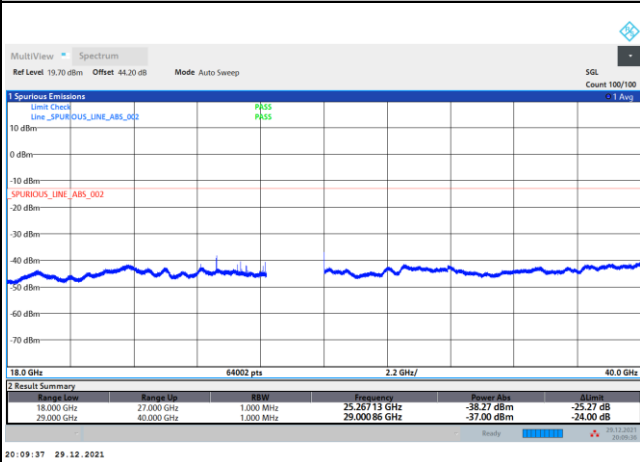
DFT-s-OFDM Module 1



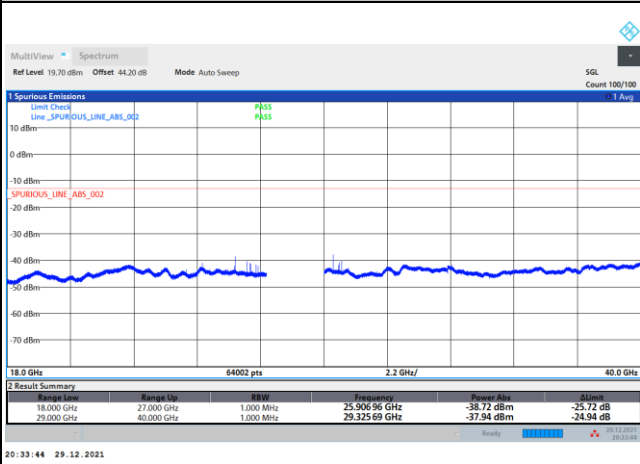


NR Band n261 QPSK (18-40GHz)

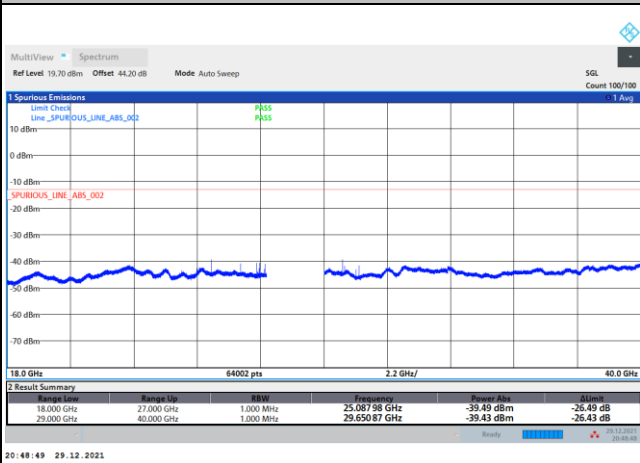
Lowest Channel / 200MHz



Middle Channel / 200MHz



Highest Channel / 200MHz



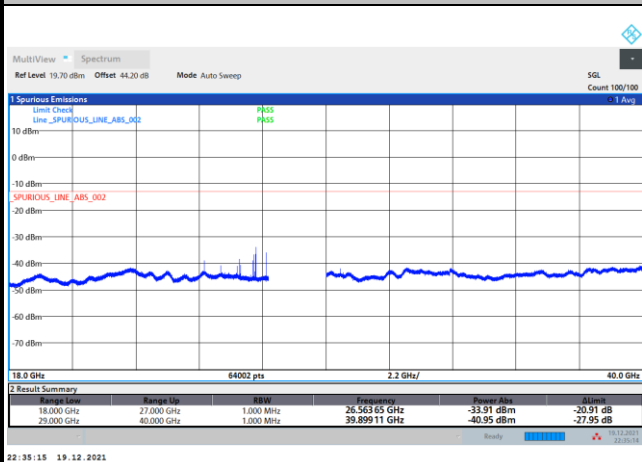
Remark: Above plots, the spurious emissions were measured from 18GHz to 27GHz and 29GHz to 40GHz. The test results within the omitted frequency 27GHz to 29GHz were measured and reported in the section of Radiated Out of Band Emission with frequency range, 27GHz to 29GHz, and all spurious comply with limits.



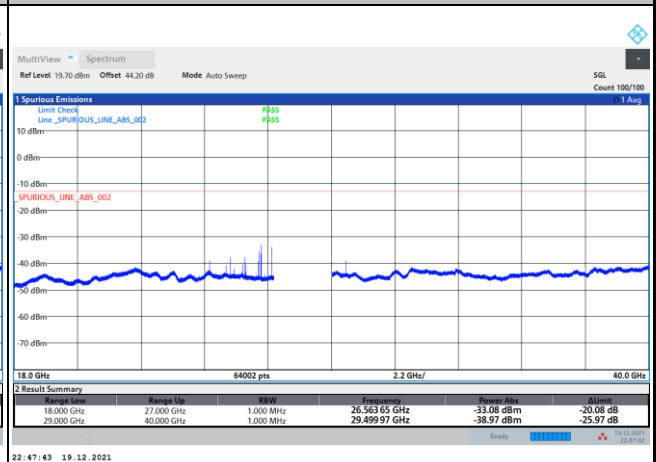
CP-OFDM Module 1

NR Band n261 QPSK (18-40GHz)

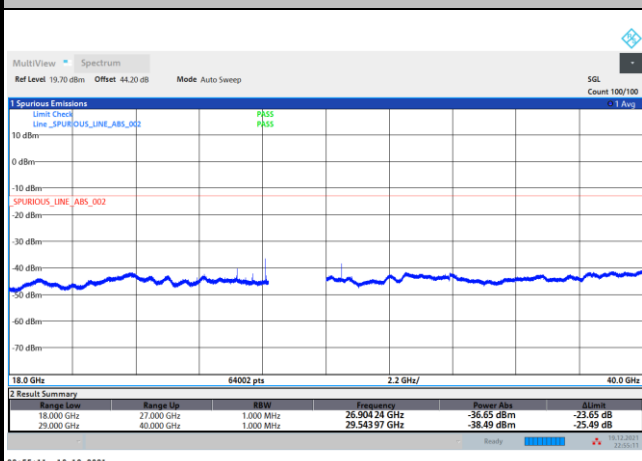
Lowest Channel / 50MHz



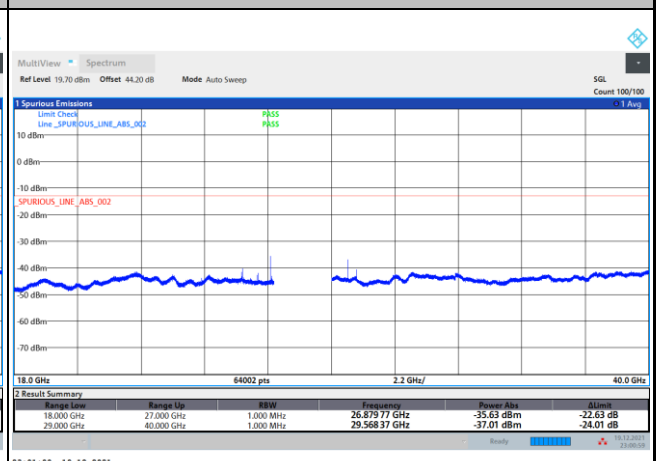
Lowest Channel / 100MHz



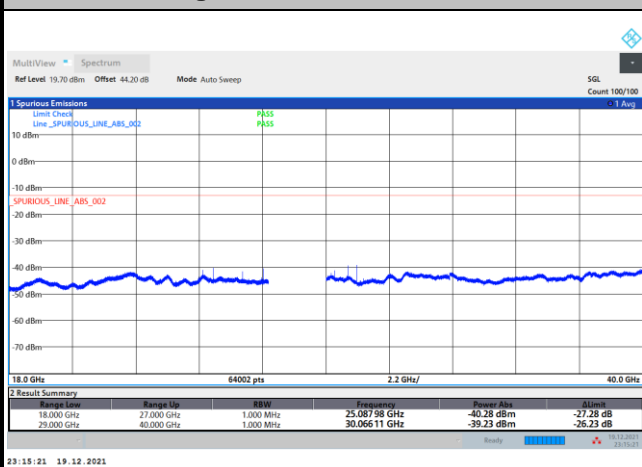
Middle Channel / 50MHz



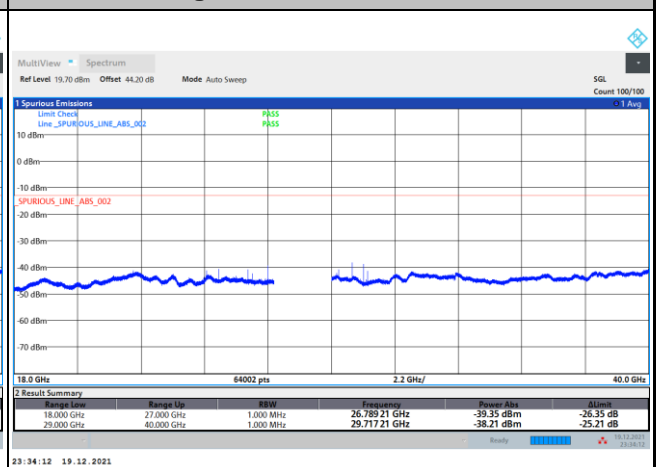
Middle Channel / 100MHz



Highest Channel / 50MHz



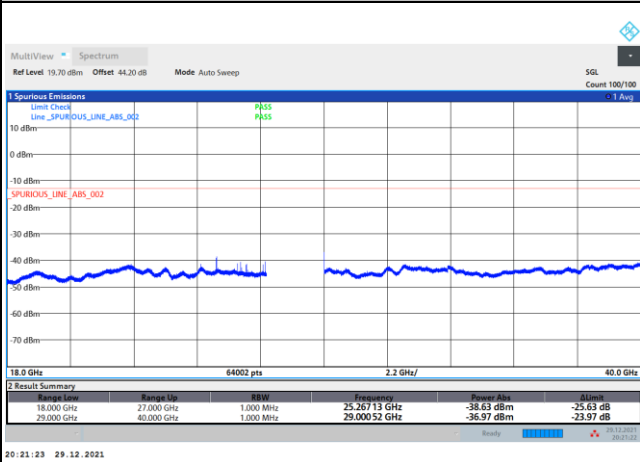
Highest Channel / 100MHz



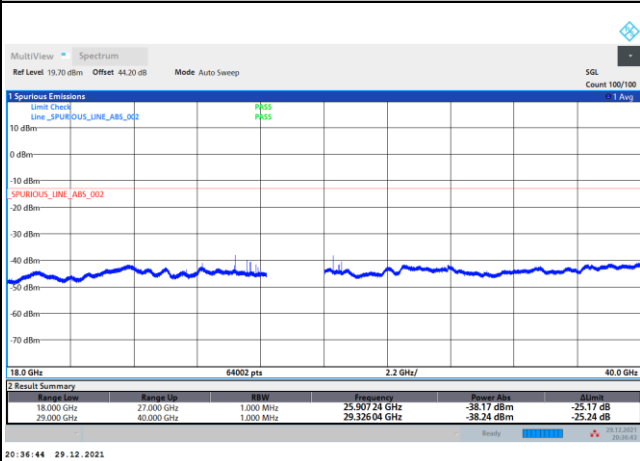


NR Band n261 QPSK (18-40GHz)

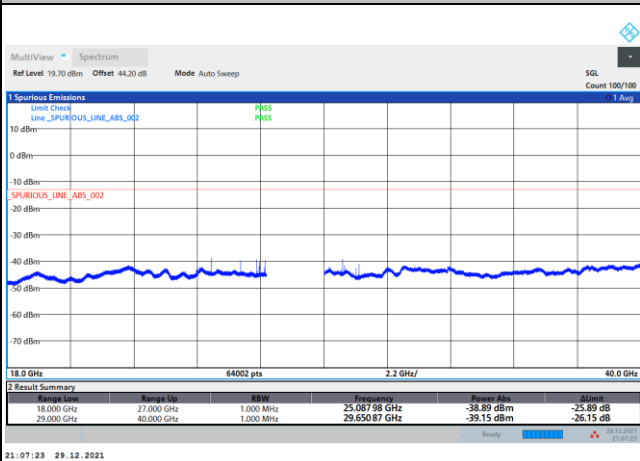
Lowest Channel / 200MHz



Middle Channel / 200MHz



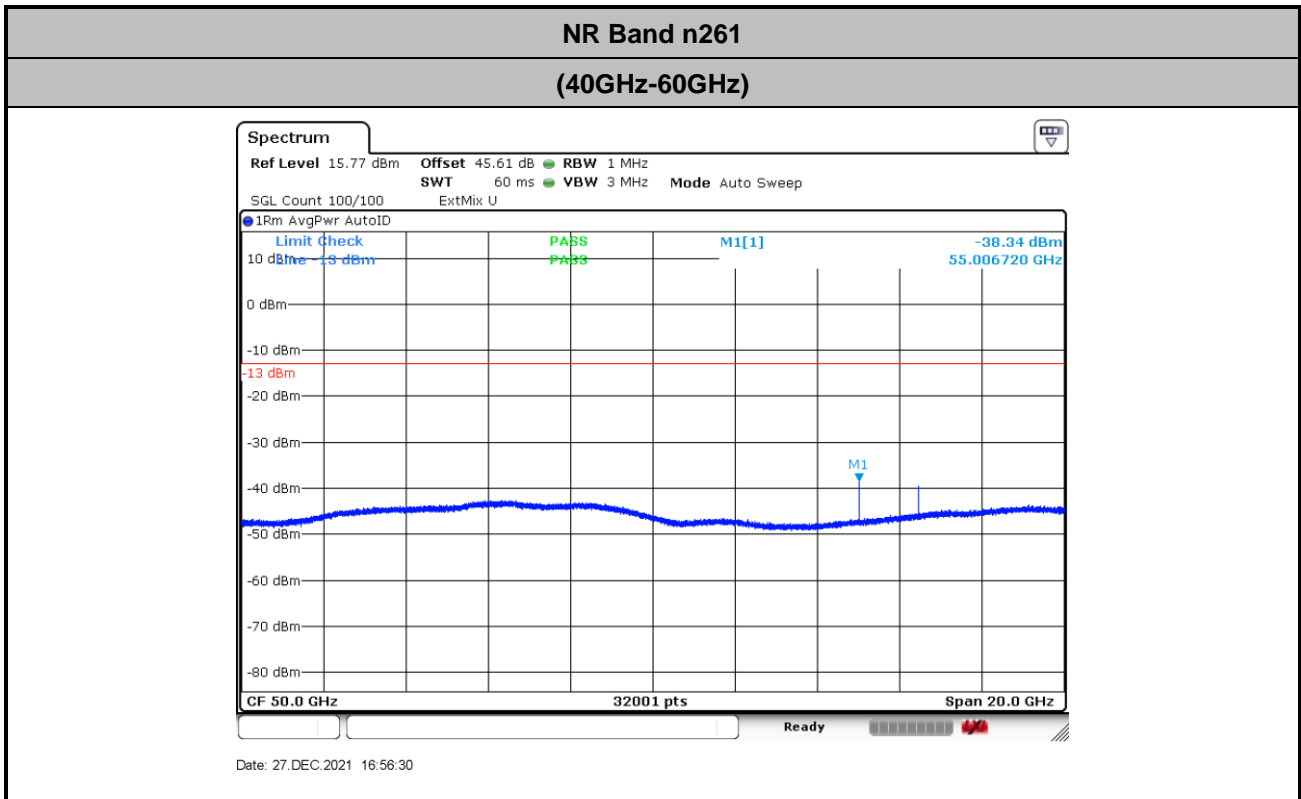
Highest Channel / 200MHz



Remark: Above plots, the spurious emissions were measured from 18GHz to 27GHz and 29GHz to 40GHz. The test results within the omitted frequency 27GHz to 29GHz were measured and reported in the section of Radiated Out of Band Emission with frequency range, 27GHz to 29GHz, and all spurious comply with limits.

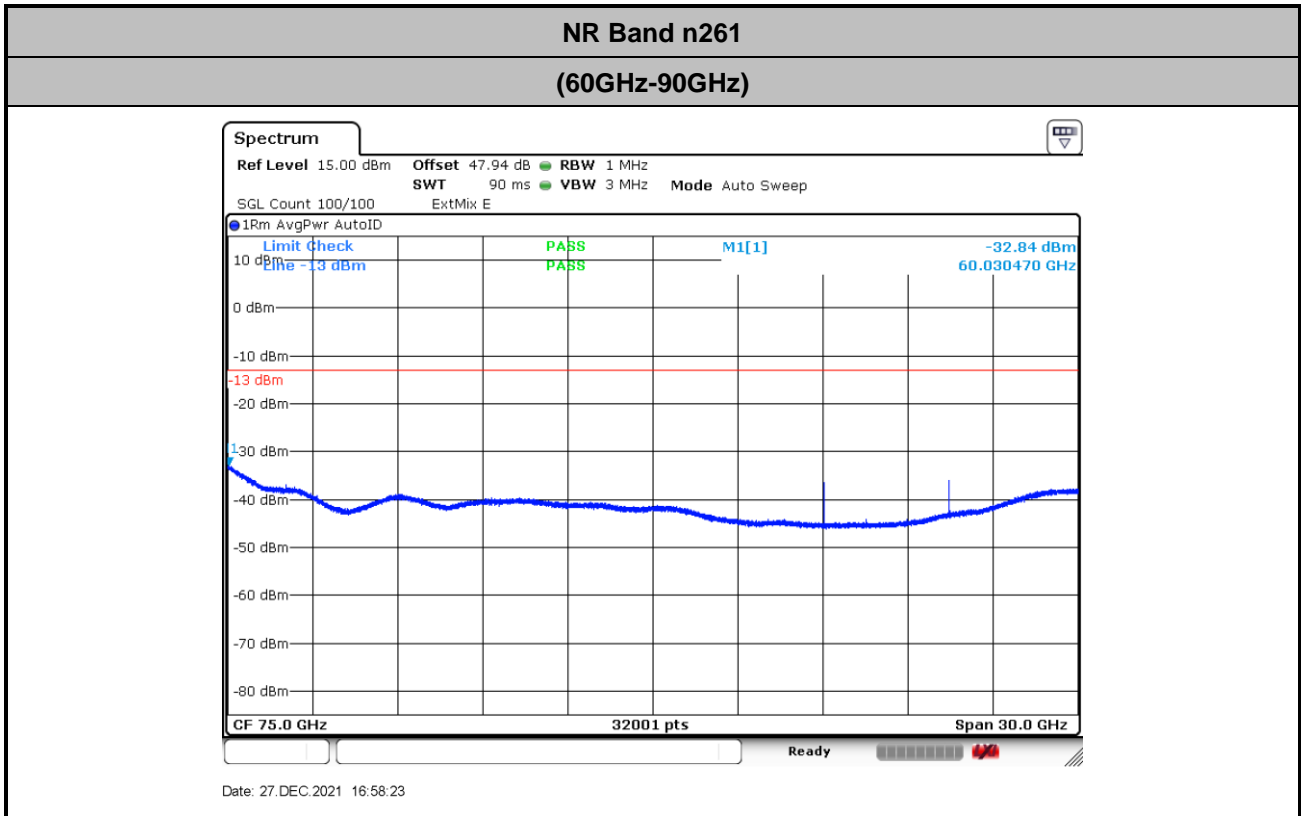


There is no significant spurious emission signal found for frequency started from 40GHz up to 100GHz. Only the noise floor is reported.



$$\text{Offset} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8$$

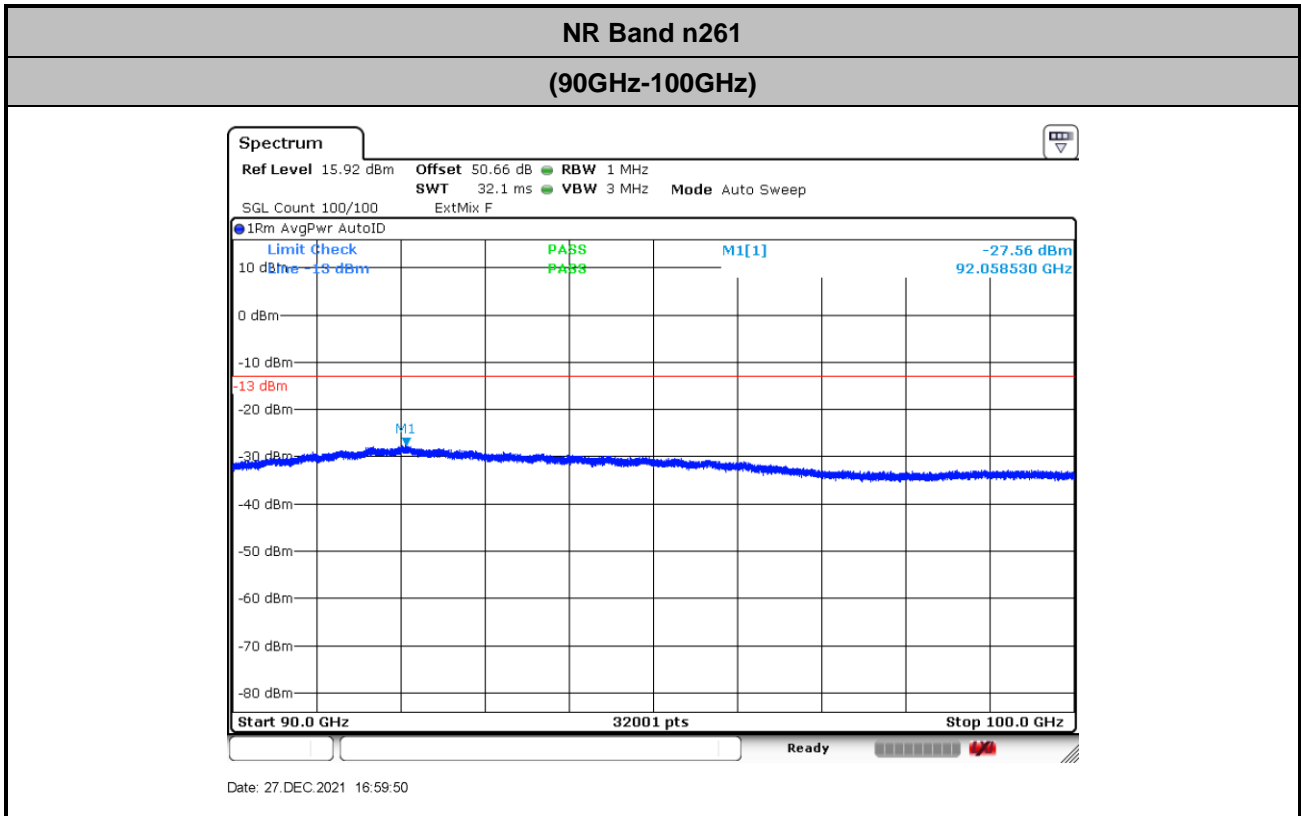
$$= 43 + 0.41 + 107 + 20\log(1) - 104.8 = 45.61 \text{ (dB)}$$



$$\text{Offset} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8$$

$$= 45.4 + 0.34 + 107 + 20\log(1) - 104.8 = 47.94 \text{ (dB)}$$





$$\text{Offset} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8$$

$$= 48.05 + 0.41 + 107 + 20\log(1) - 104.8 = 50.66 \text{ (dB)}$$



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	27.9252118	-212.800	7.620	Pass
40	Normal Voltage	27.9251439	-144.900	5.189	
30	Normal Voltage	27.9250839	-84.900	3.040	
20(Ref.)	Normal Voltage	27.924999	0.000	0.000	
10	Normal Voltage	27.924962	37.000	1.325	
0	Normal Voltage	27.9249211	77.900	2.790	
-10	Normal Voltage	27.9248811	117.900	4.222	
-20	Normal Voltage	27.9248492	149.800	5.364	
-30	Normal Voltage	27.9247652	233.800	8.372	
20	Maximum Voltage	27.924988	11.000	0.394	
20	Normal Voltage	27.924994	5.000	0.179	
20	Battery End Point	27.924967	32.000	1.146	

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



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



# Calibration Certificate

**Certificate Number 24-0060-101033-01**

Kalibrierschein

Zertifikatsnummer

## Unit Data

**Item** Harmonic Mixer, 40 GHz to 60 GHz  
Gegenstand

**Manufacturer** RPG  
Hersteller

**Type** RPG FS-Z60  
Typ

**Material Number** 1048.0171.02      **Serial Number** 101033  
Materialnummer                              Seriennummer

**Asset Number**  
Inventarnummer

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.

## Order Data

**Customer**  
Auftraggeber

**Order Number**  
Bestellnummer

**Date of Receipt**  
Eingangsdatum

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.

## 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**

## Radiometer Physics GmbH; Meckenheim

**Date of Issue**  
Ausstellungsdatum

**2020-03-20**

**Head of Laboratory**  
Laborleitung

Schulze

**Person Responsible**  
Bearbeiter

Heinze

**Page (Seite) 1/2**  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23 <sup>+7</sup>/<sub>-3</sub>) °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

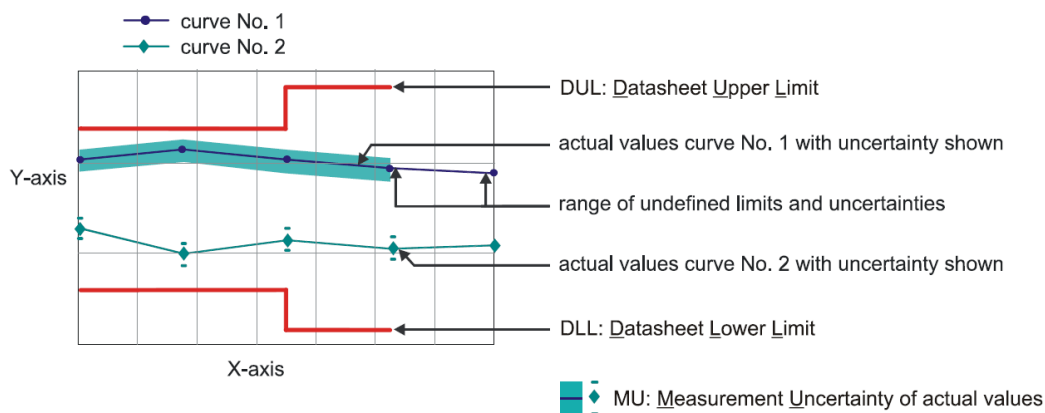
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

Measurement Studio Professional Edition  
MixerCertification

**Version**

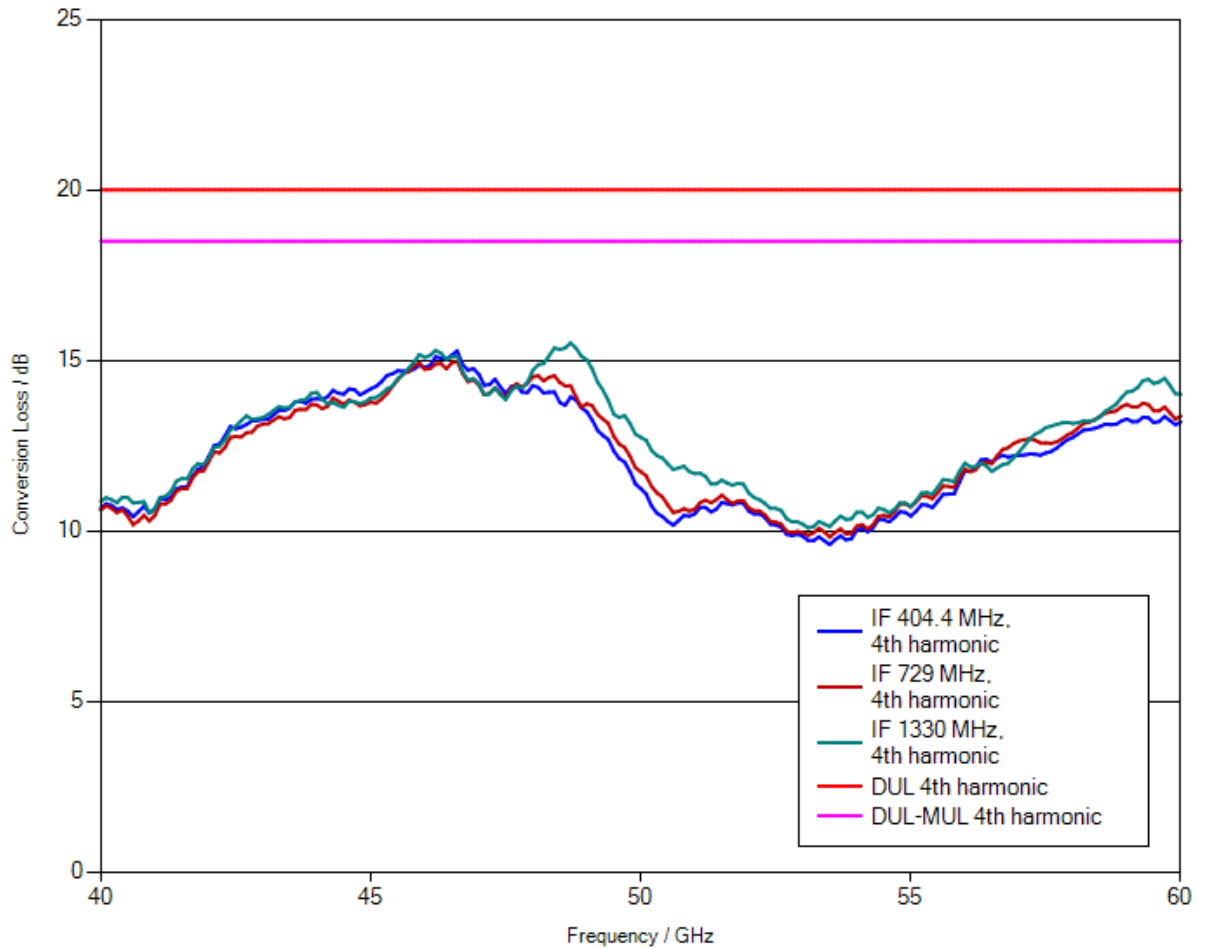
2013  
7\_13

**Remark**

### 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



Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23<sup>+7</sup><sub>-3</sub>) °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	0001-300474490	2019-08-06
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

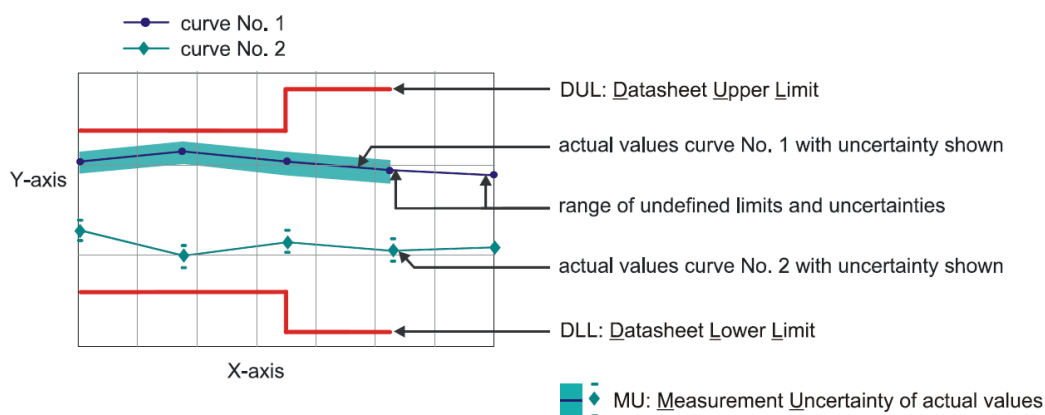
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is 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.
- {d) Typical value, refer to performance test.
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- DL or DT Data Limit for symmetrical tolerance limits
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- MLL or MLV Measurement Uncertainty Lower Value
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- 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**

Measurement Studio Professional Edition  
MixerCertification

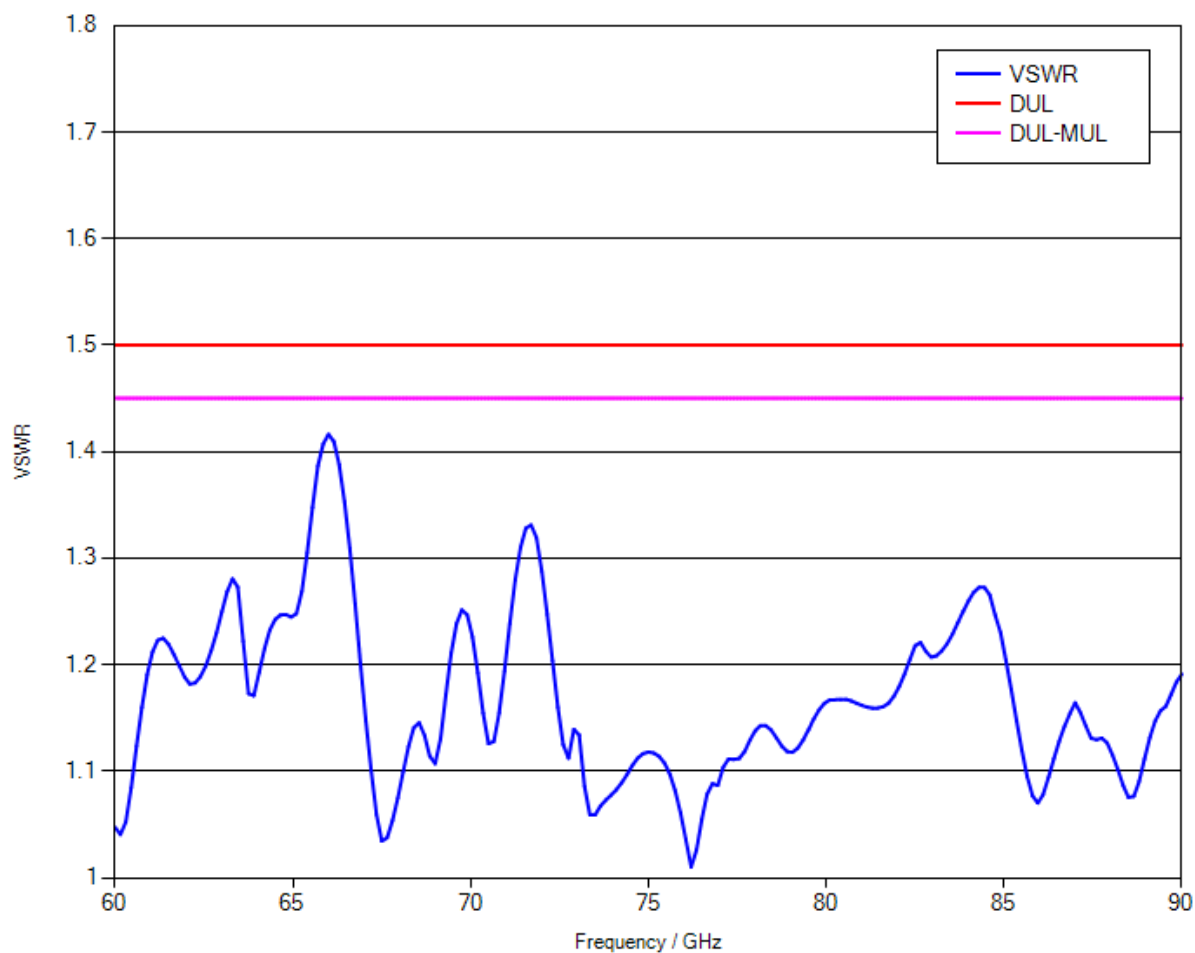
**Version**

2013  
7\_09

**Remark**

### 1.1 RF Input – VSWR

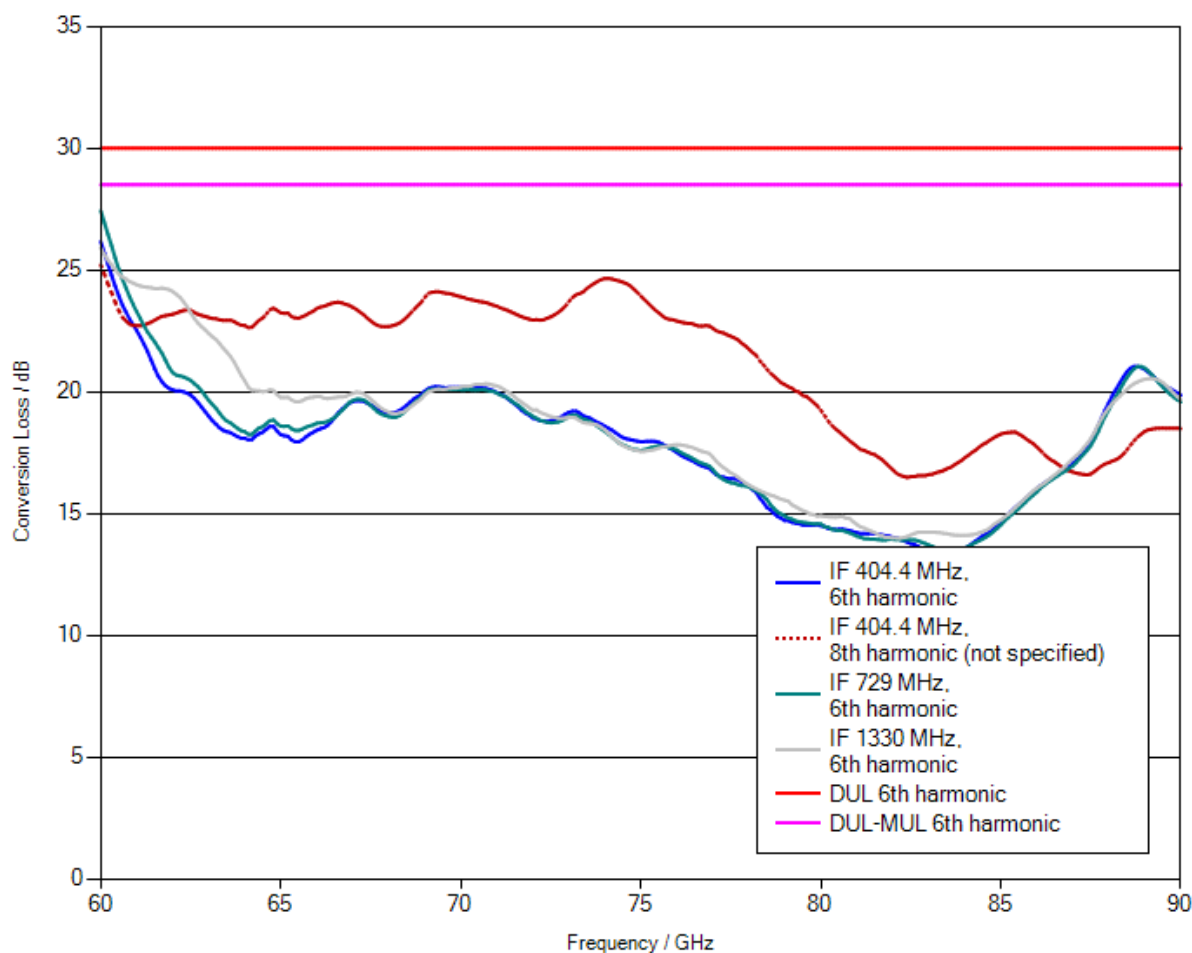
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +14 dBm nominal  
 Bias 0 A

Measurement uncertainty: 1.5 dB



**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.

### 1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 6th harmonic	6 dB	3.42 dB	PASS
IF = 404.4 MHz, 8th harmonic	not specified	2.49 dB	not specified
IF = 729 MHz, 6th harmonic	6 dB	3.85 dB	PASS
IF = 1330 MHz, 6th harmonic	6 dB	2.01 dB	PASS





# Calibration Certificate

**Certificate Number 24-0140-101128-02**

Kalibrierschein

Zertifikatsnummer

## Unit Data

**Item** Harmonic Mixer, 90 GHz to 140 GHz  
Gegenstand

**Manufacturer** RPG Radiometer-Physics GmbH  
Hersteller

**Type** RPG FS-Z140  
Typ

**Material Number** 3622.0708.02    **Serial Number** 101128  
Materialnummer    Seriennummer

**Asset Number**  
Inventarnummer

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.

## Order Data

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

**Order Number** 8800003072  
Bestellnummer

**Date of Receipt** 2020-10-06  
Eingangsdatum

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.

## 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**

## RPG Radiometer-Physics GmbH; Meckenheim

**Date of Issue**  
Ausstellungsdatum

**2020-10-27**

**Head of Laboratory**  
Laborleitung

Schulze

**Person Responsible**  
Bearbeiter

Gottbehüt

**Page (Seite) 1/2**  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23 <sup>+7</sup>/<sub>-3</sub>) °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

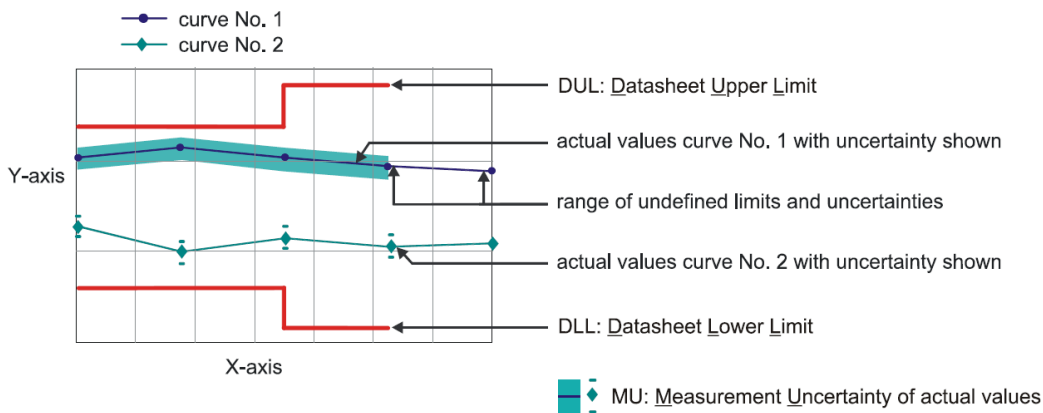
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

Measurement Studio Professional Edition  
MixerCertification

**Version**

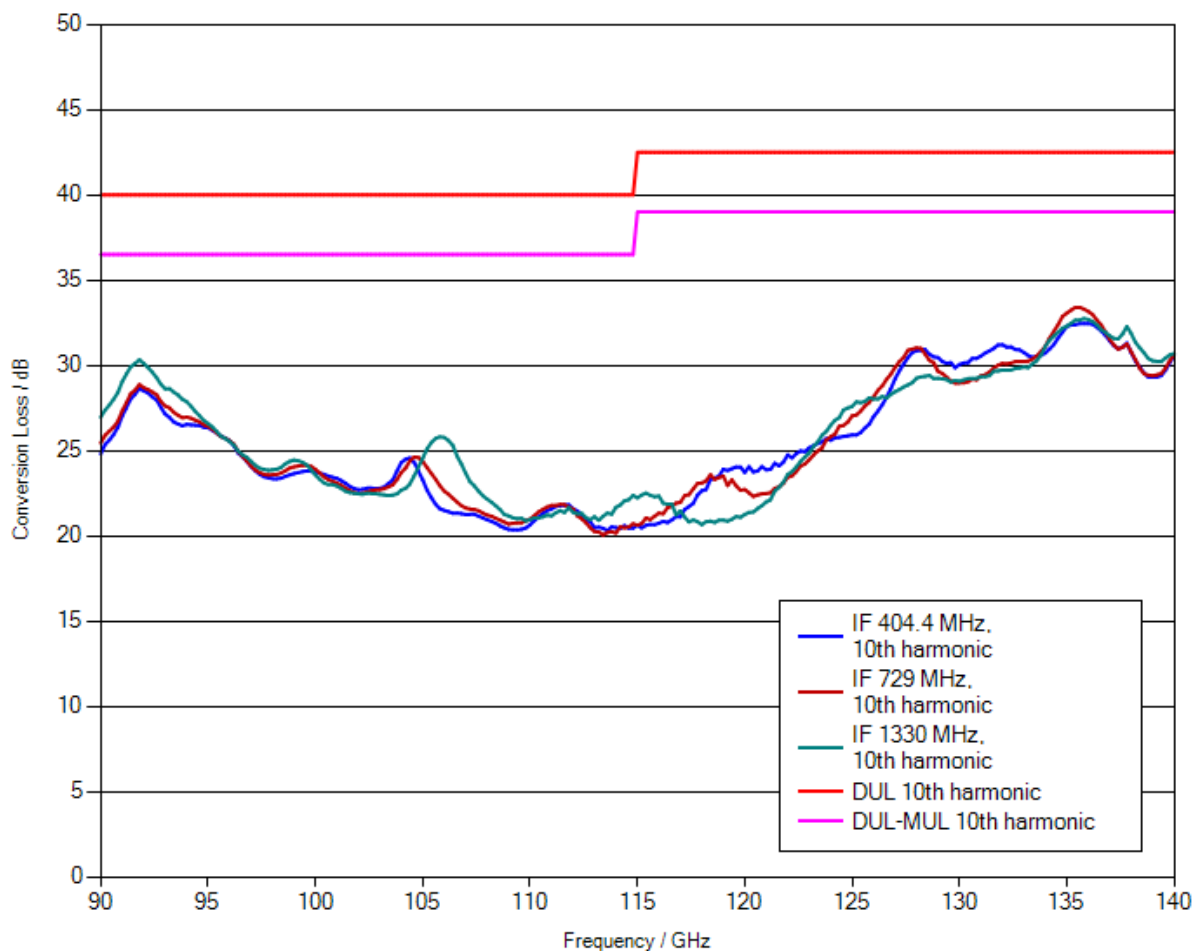
2013  
7\_14

**Remark**

### 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



# Calibration Certificate

**Certificate Number 24-0220-101042-01**

Kalibrierschein

Zertifikatsnummer

## Unit Data

**Item** Harmonic Mixer, 140 GHz to 220 GHz  
Gegenstand

**Manufacturer** RPG Radiometer-Physics GmbH  
Hersteller

**Type** RPG FS-Z220  
Typ

**Material Number** 3593.3250.02    **Serial Number** 101042  
Materialnummer                      Seriennummer

**Asset Number**  
Inventarnummer

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.

## Order Data

**Customer**  
Auftraggeber

**Order Number**  
Bestellnummer

**Date of Receipt**  
Eingangsdatum

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.

## Performance

**Place and Date of Calibration**  
Ort und Datum der Kalibrierung

**Meckenheim, 2020-09-15**

**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**

## RPG Radiometer-Physics GmbH; Meckenheim

**Date of Issue**  
Ausstellungsdatum

**2020-09-18**

**Head of Laboratory**  
Laborleitung

Schulze

**Person Responsible**  
Bearbeiter

Heinze

**Page (Seite) 1/2**  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23<sup>+7</sup><sub>-3</sub>) °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.

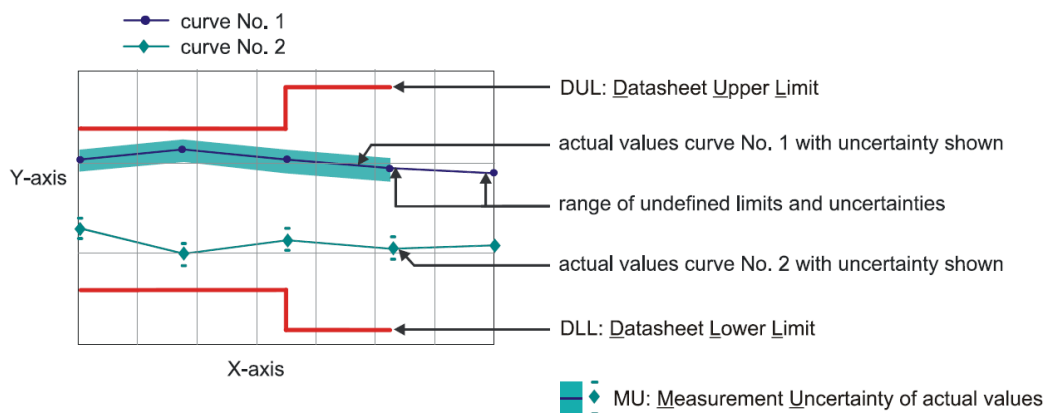


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- DU Datasheet Uncertainty

## Explanation of charts



**Software used for measurement**

**Item Type**

Measurement Studio Professional Edition  
MixerCertification

**Version**

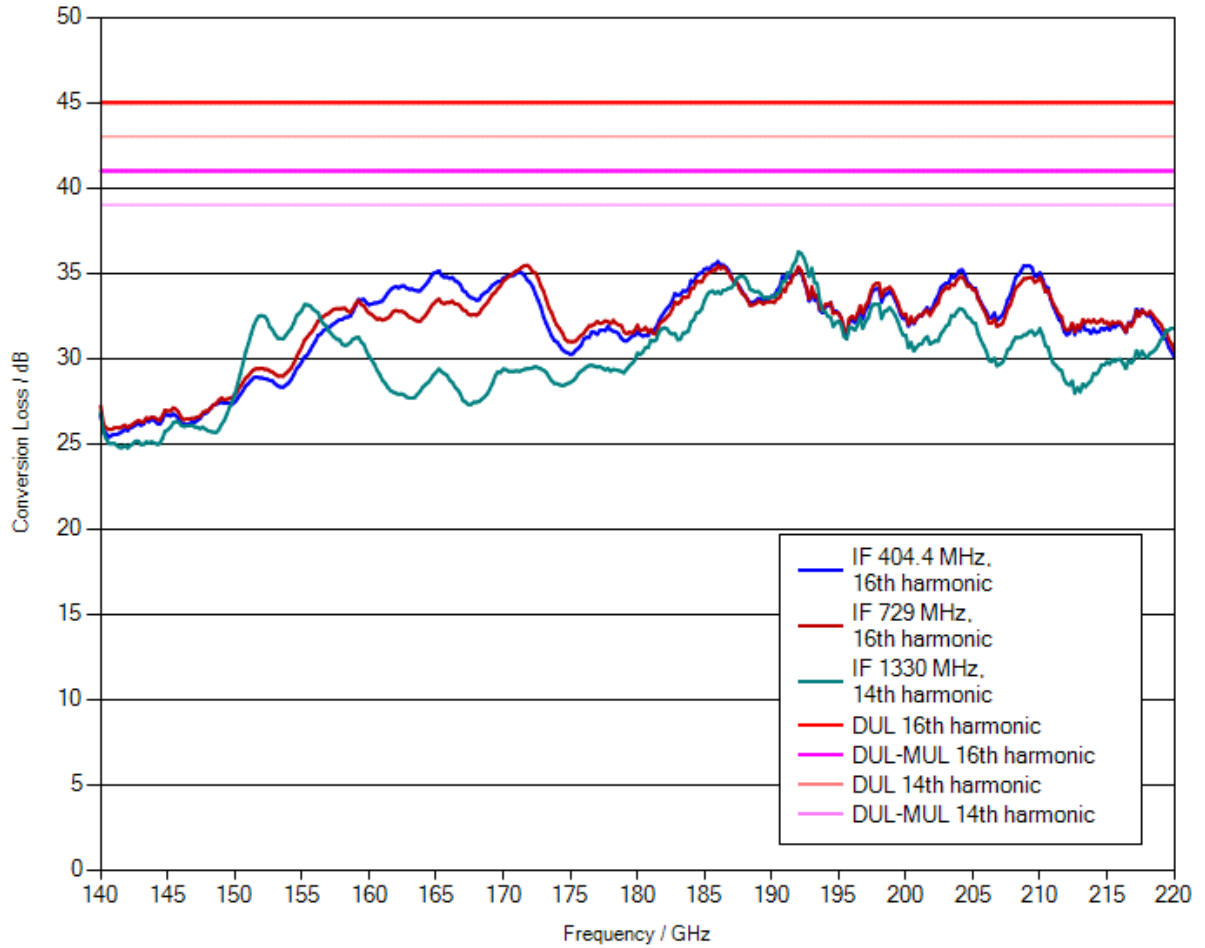
2013  
7\_14

**Remark**

### 1.1 Conversion loss

LO level +13 dBm nominal  
 Bias 0 A

Measurement uncertainty: 4 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.

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## 1.2 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 16th harmonic	6 dB	2.23 dB	PASS
IF = 729 MHz, 16th harmonic	6 dB	2.1 dB	PASS
IF = 1330 MHz, 14th harmonic	6 dB	2.94 dB	PASS

Calibration Laboratory of Microwave Measuring Equipment  
of MWMLab



Calibration certificate

ISO 17025  
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 36-21 Date when calibrated 06.07.2021 Page 1 of 2

Item calibrated Antenna QWH-UPRR00 # 1410300003

Customer Sporton International Inc.

Method of calibration GOST 20271.1, MK KL 8.2-16

*All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Gain measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.*

Authorising  
signature



/ Technical manager Date of issue 06.07.2021

# Calibration Certificate

Certificate number **36-21**

Page 2 of 2

## Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M1-11	Calibrator of power with wattmeter M3-22A	841202/ 037410	08 December 2021	3882-43	RF Power
M 568	Reference power meter	164	24 March 2022	1/111-175-20	RF Power
G4-161	Signal generator	3	12 October 2021	20-20	RF Power
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
P6-133	Horn antenna	15005	23 September 2021	2374-43	Gain
P6-11B	Measuring horn antenna	08051	23 September 2021	2370-43	Gain

## Calibration conditions

Temperature: 23.8 °C.  
Humidity: 43.2 %.  
Pressure: 100.1 kPa.

## Calibration results are given in the measurement report # 36-21

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	40 – 60 GHz	Corresponds
2	Antenna Gain	22.5* dBi	Corresponds (Table 1)
3	Antenna Factor	42 dB/m	Corresponds (Table 1)

\* – Expanded uncertainty of measurements 2.0 dB.

*The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$  such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of  $k=2$  for a normal distribution.*

**Signature of the person who has performed calibration**

 / Engineer

**Calibration Laboratory of  
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 5.0065

Address: 6, P. Brovki str., Minsk  
220013, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

July 6, 2021

**MEASUREMENT REPORT # 36-21**

July 6, 2021

Customer:	Sporton International Inc.
Item calibrated:	<b>Antenna QWH-UPRR00 # 1410300003</b>
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	21.06.2021
Date of calibration:	From 21.06.2021 to 06.07.2021