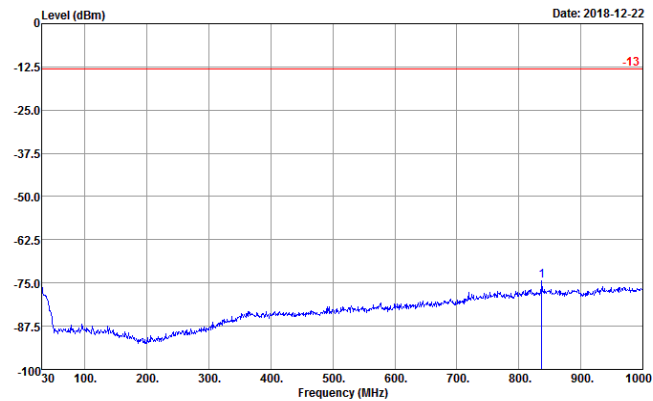


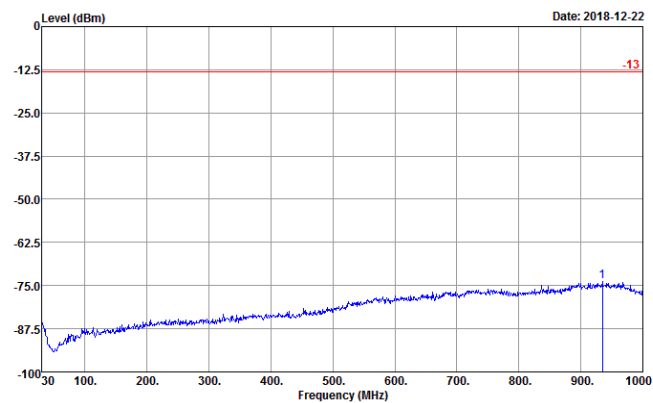


There is no significant spurious emission signal found for frequency started from 9kHz up to 18GHz.
Only the noise floor is reported.

NR Band n261 (30MHz-18GHz)**Horizontal**

Site : 03CH10-HY
Condition : -13 EIRP_WO HORIZONTAL
Project : 890514

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	837.04	-74.50	-61.50	-13.00	-80.25

Vertical

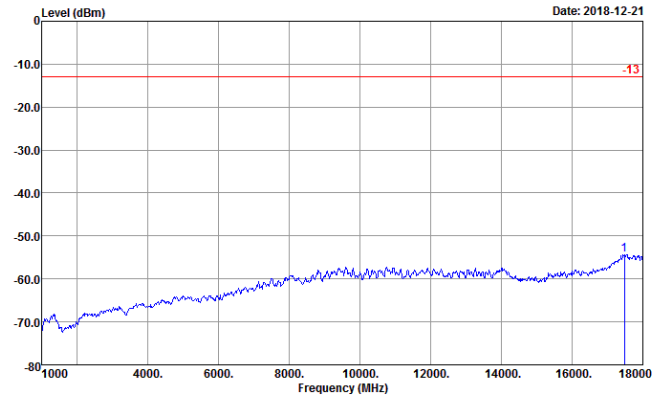
Site : 03CH10-HY
Condition : -13 EIRP_WO VERTICAL
Project : 890514

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	935.01	-73.93	-60.93	-13.00	-83.12



NR Band n261 (1GHz-18GHz)

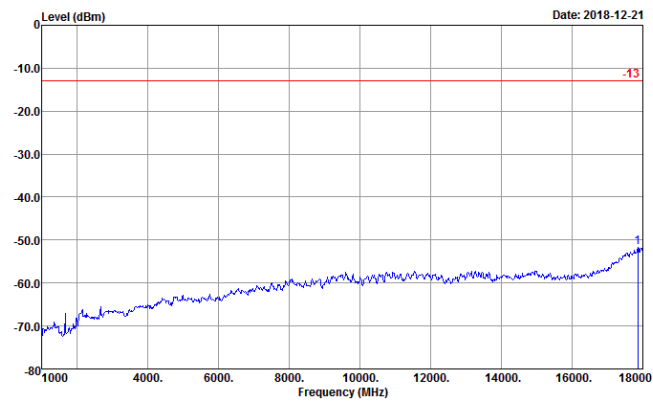
Horizontal



Site : 03CH10-HY
Condition : -13 EIRP_WO HORIZONTAL
Project : 890514

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	17473.00	-54.34	-41.34	-13.00	-64.28

Vertical



Site : 03CH10-HY
Condition : -13 EIRP_WO VERTICAL
Project : 890514

	Freq	Level	Over Limit	Limit Line	Read Level
	MHz	dBm	dB	dBm	dBm
1	17864.00	-51.81	-38.81	-13.00	-64.73

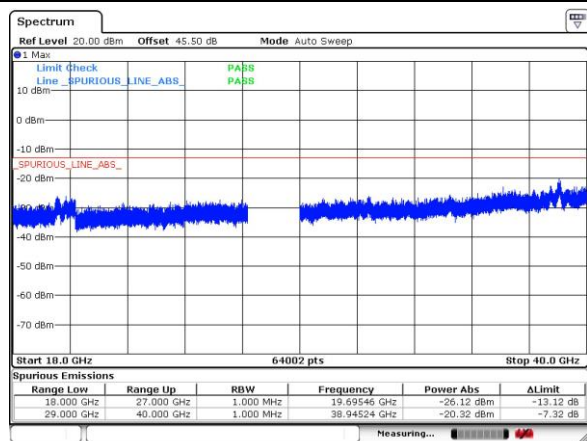


Spurious emission between 18GHz to 40GHz worst case plot is reported as following.

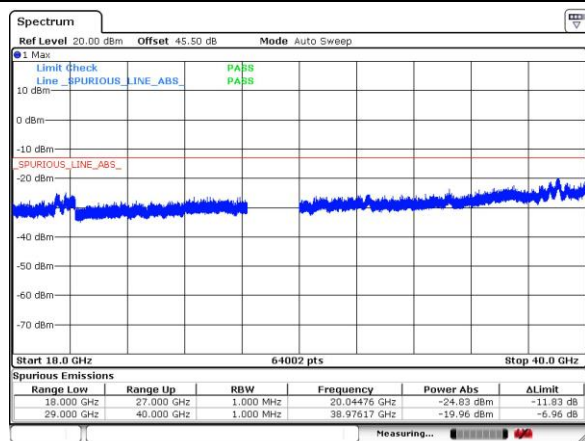
Module 0

NR Band n261 QPSK (18-40GHz)

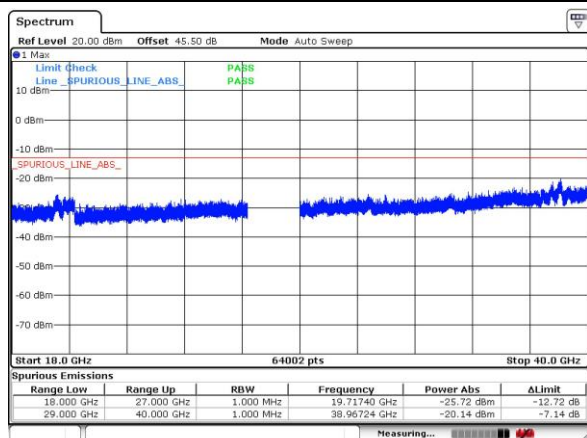
Lowest Channel / 50MHz



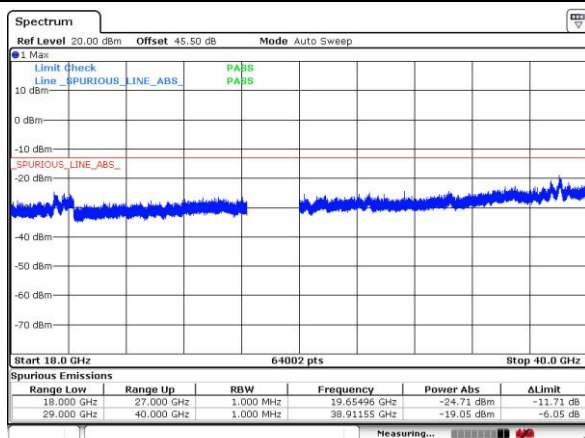
Lowest Channel / 100MHz



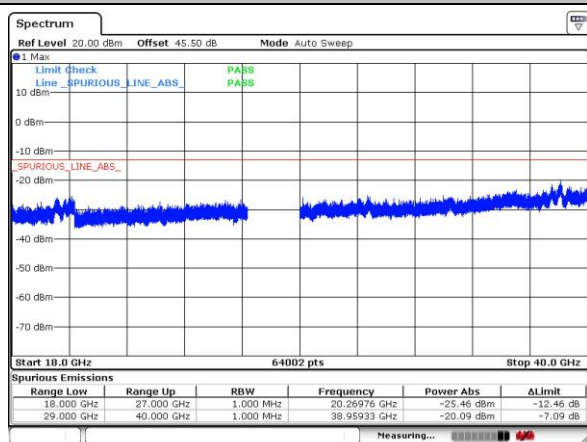
Middle Channel / 50MHz



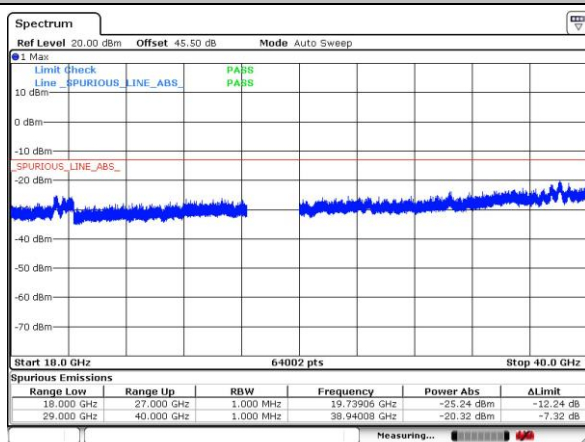
Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz

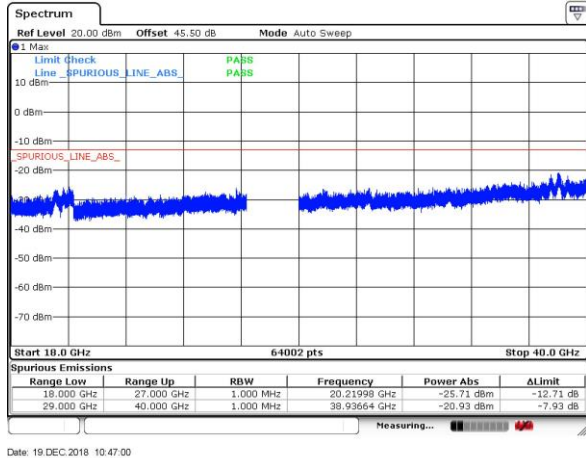


Remark: In band and out of band frequencies are omitted.

Module 0

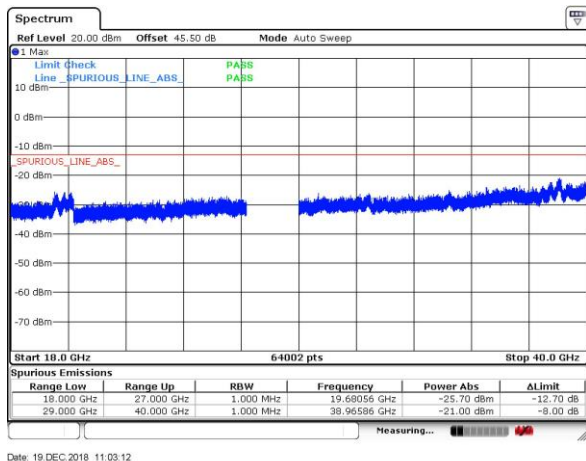
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 400MHz



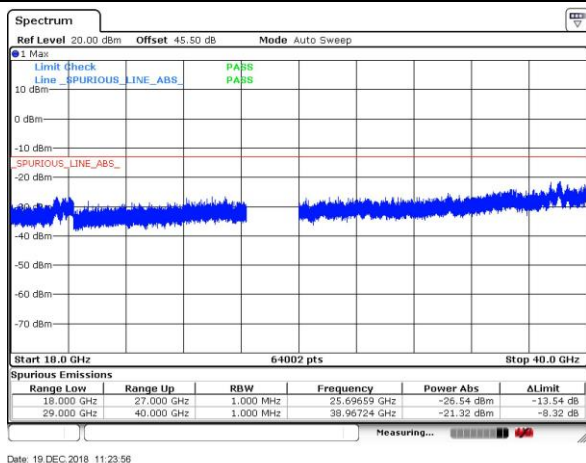
intentionally blank

Middle Channel / 400MHz



intentionally blank

Highest Channel / 400MHz



intentionally blank

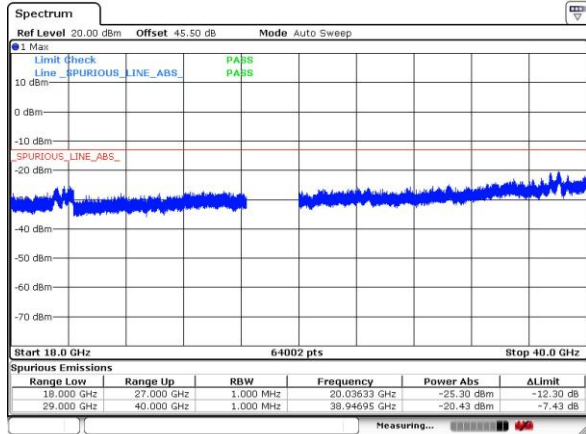
Remark: In band and out of band frequencies are omitted.



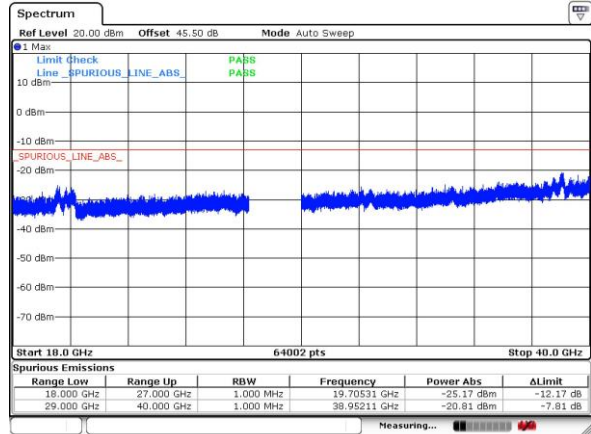
Module 1

NR Band n261 QPSK (18-40GHz)

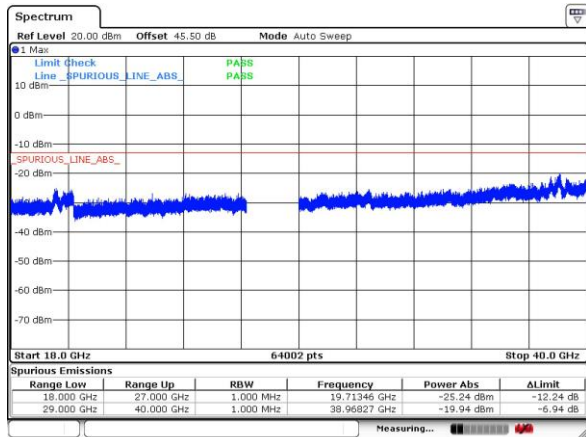
Lowest Channel / 50MHz



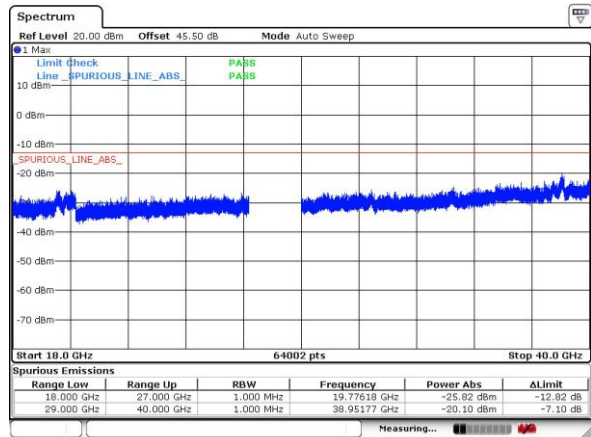
Lowest Channel / 100MHz



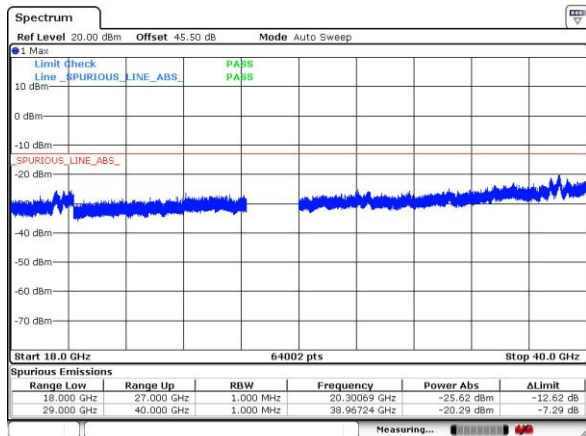
Middle Channel / 50MHz



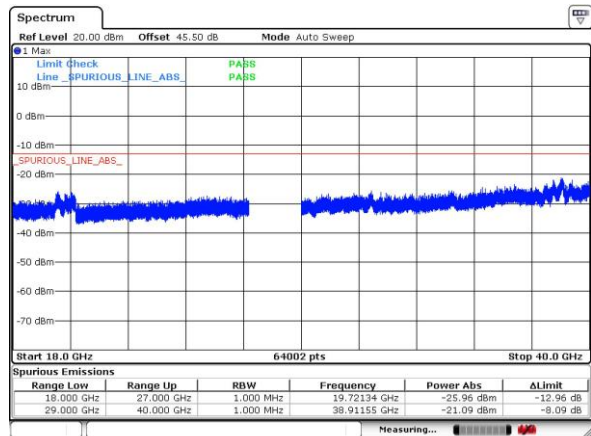
Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz



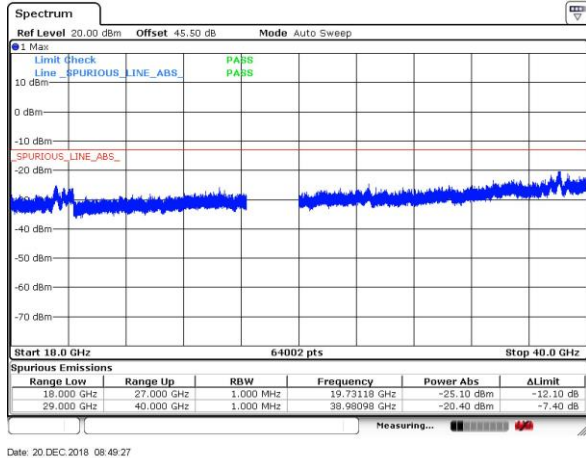
Remark: In band and out of band frequencies are omitted.



Module 1

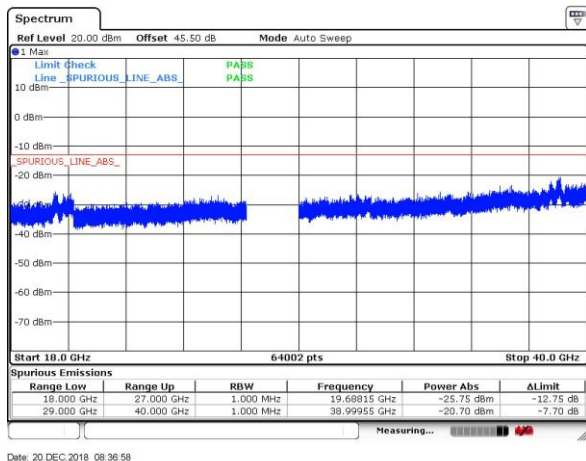
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 400MHz



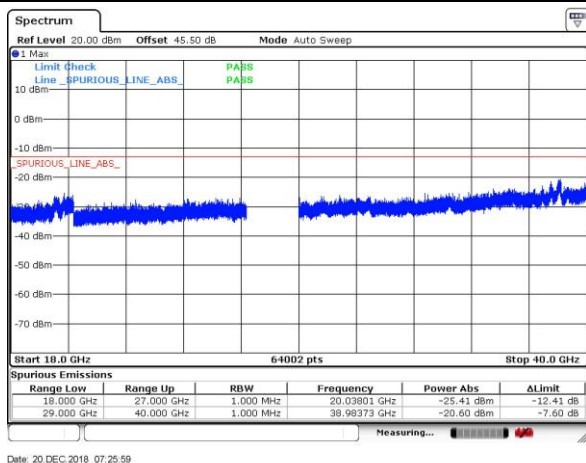
intentionally blank

Middle Channel / 400MHz



intentionally blank

Highest Channel / 400MHz



intentionally blank

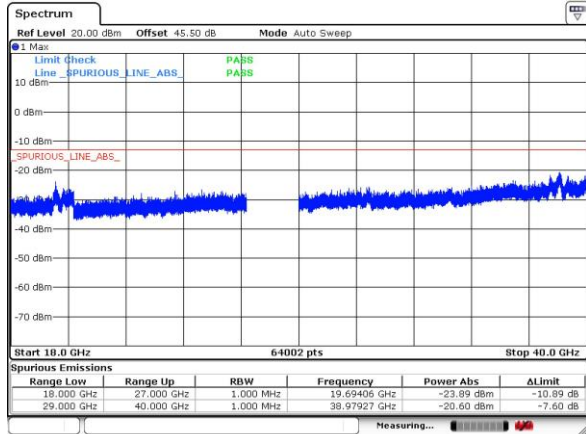
Remark: In band and out of band frequencies are omitted.



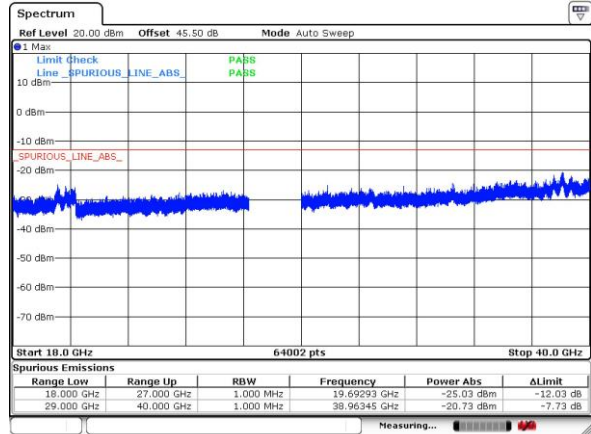
Module 2

NR Band n261 QPSK (18-40GHz)

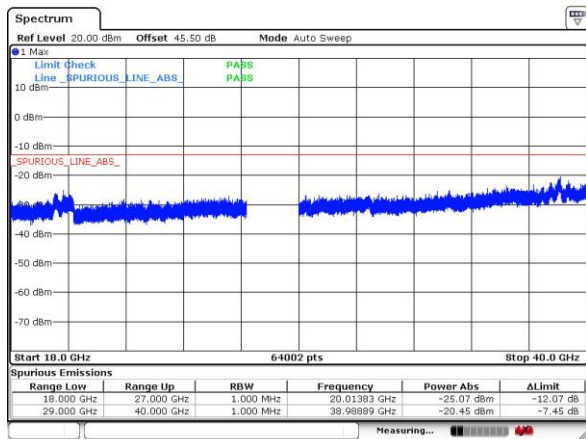
Lowest Channel / 50MHz



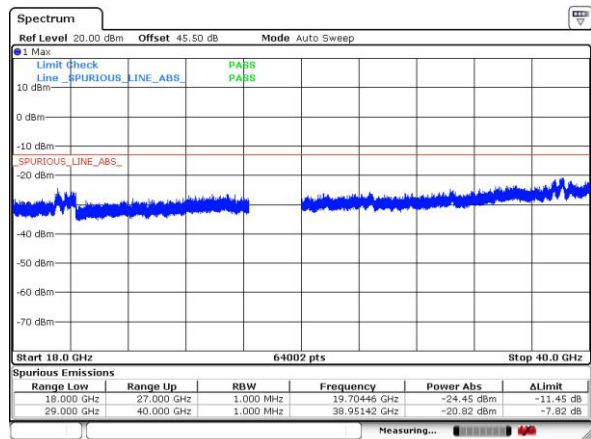
Lowest Channel / 100MHz



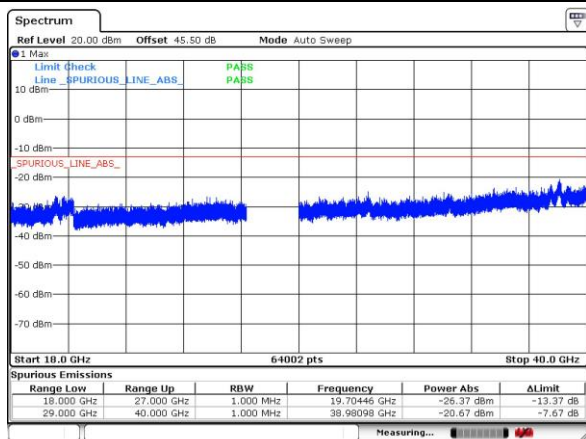
Middle Channel / 50MHz



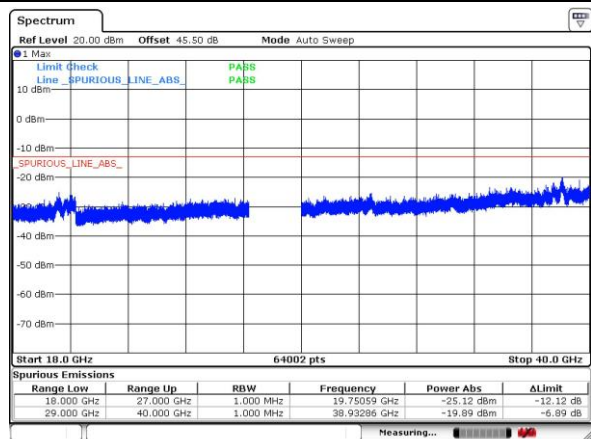
Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz

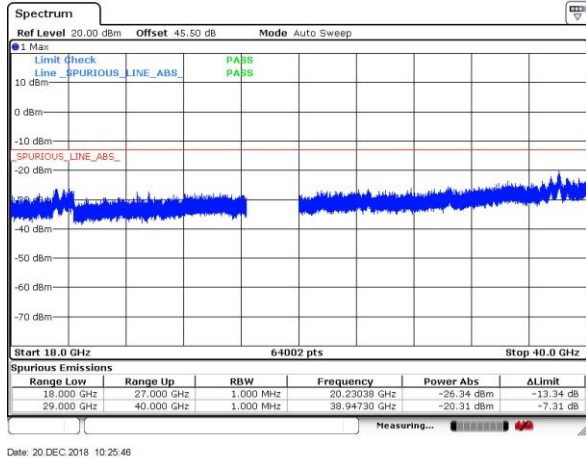


Remark: In band and out of band frequencies are omitted.

Module 2

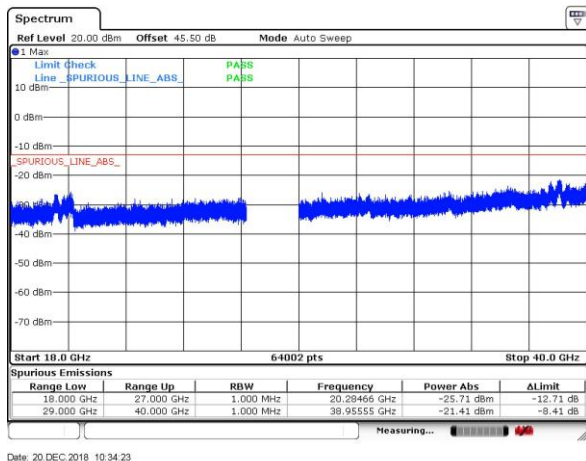
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 400MHz



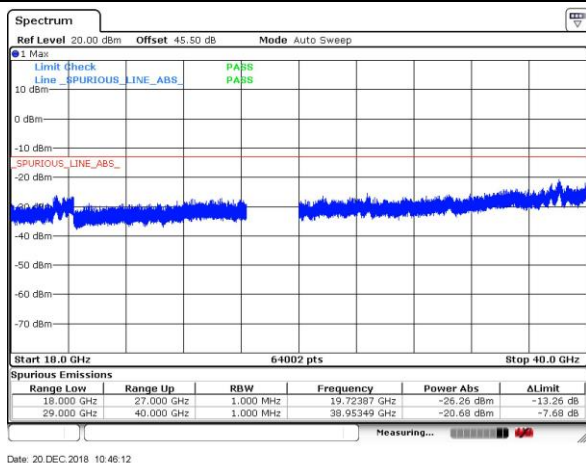
intentionally blank

Middle Channel / 400MHz



intentionally blank

Highest Channel / 400MHz



intentionally blank

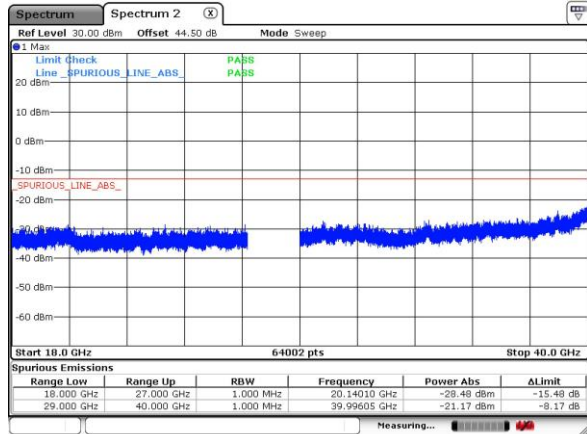
Remark: In band and out of band frequencies are omitted.



Module 3

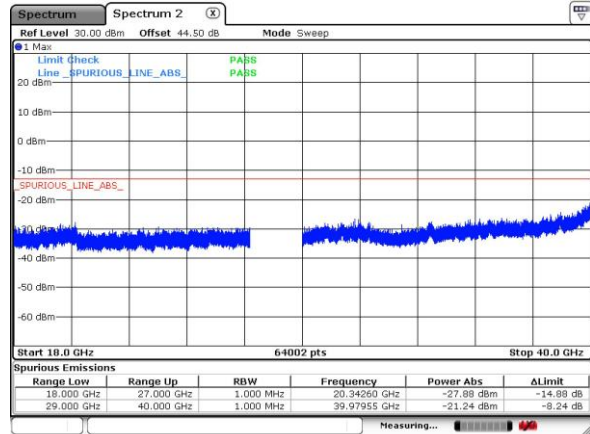
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 50MHz



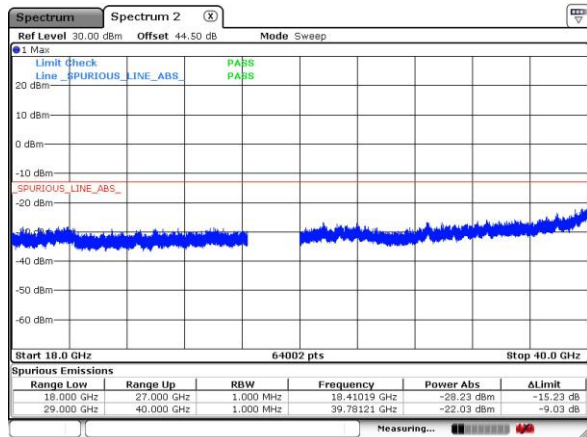
Date: 13, DEC, 2018 08:14:23

Lowest Channel / 100MHz



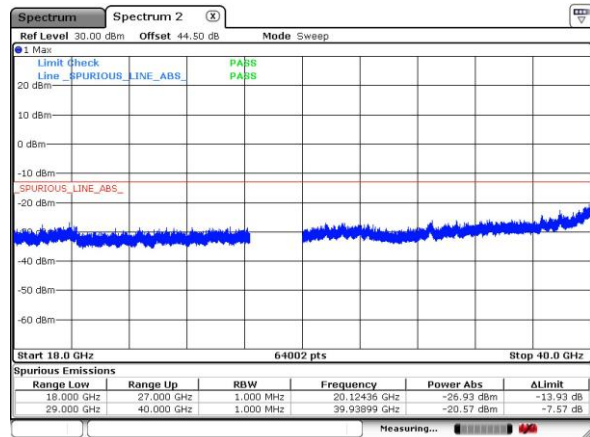
Date: 13, DEC, 2018 08:13:58

Middle Channel / 50MHz



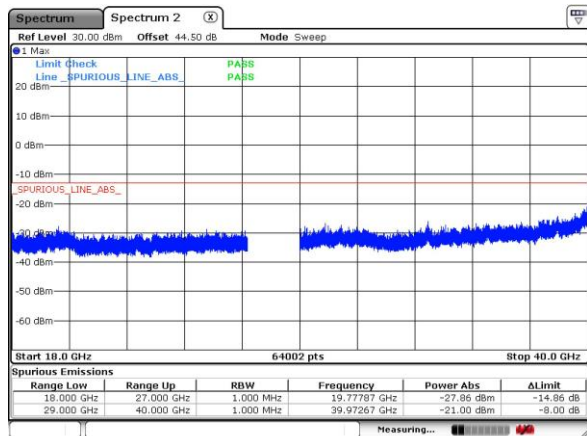
Date: 13, DEC, 2018 08:15:14

Middle Channel / 100MHz



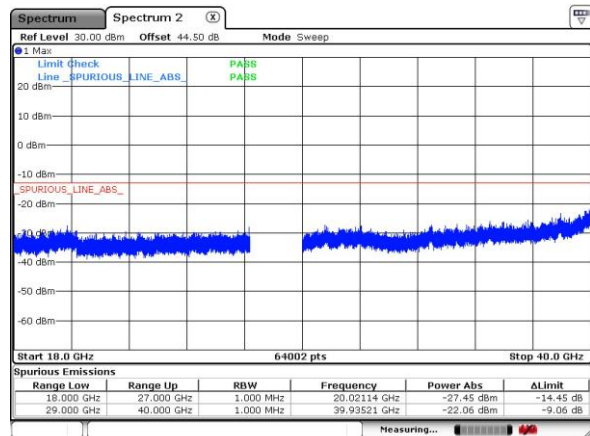
Date: 13, DEC, 2018 08:13:28

Highest Channel / 50MHz



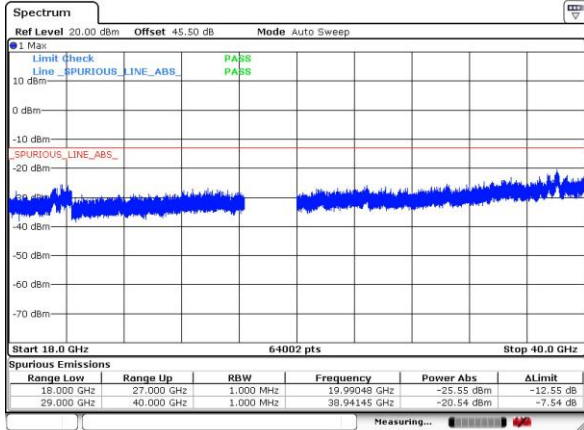
Date: 13, DEC, 2018 08:15:39

Highest Channel / 100MHz



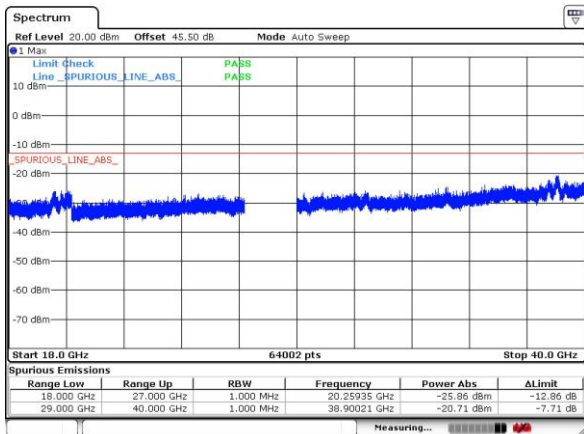
Date: 13, DEC, 2018 08:11:19

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

Module 3
NR Band n261 QPSK (18-40GHz)
Lowest Channel / 400MHz


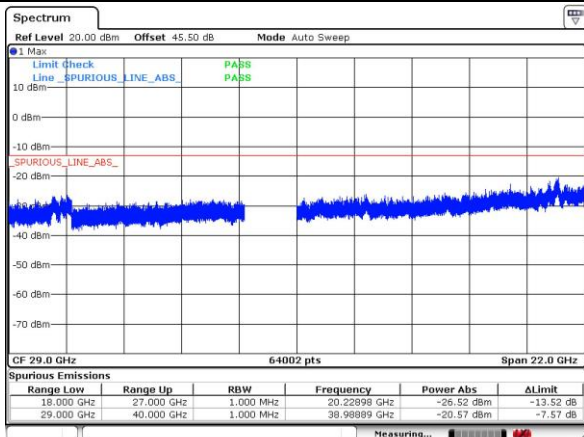
Date: 19 DEC 2018 08:39:25

intentionally blank

Middle Channel / 400MHz


Date: 19 DEC 2018 08:39:47

intentionally blank

Highest Channel / 400MHz


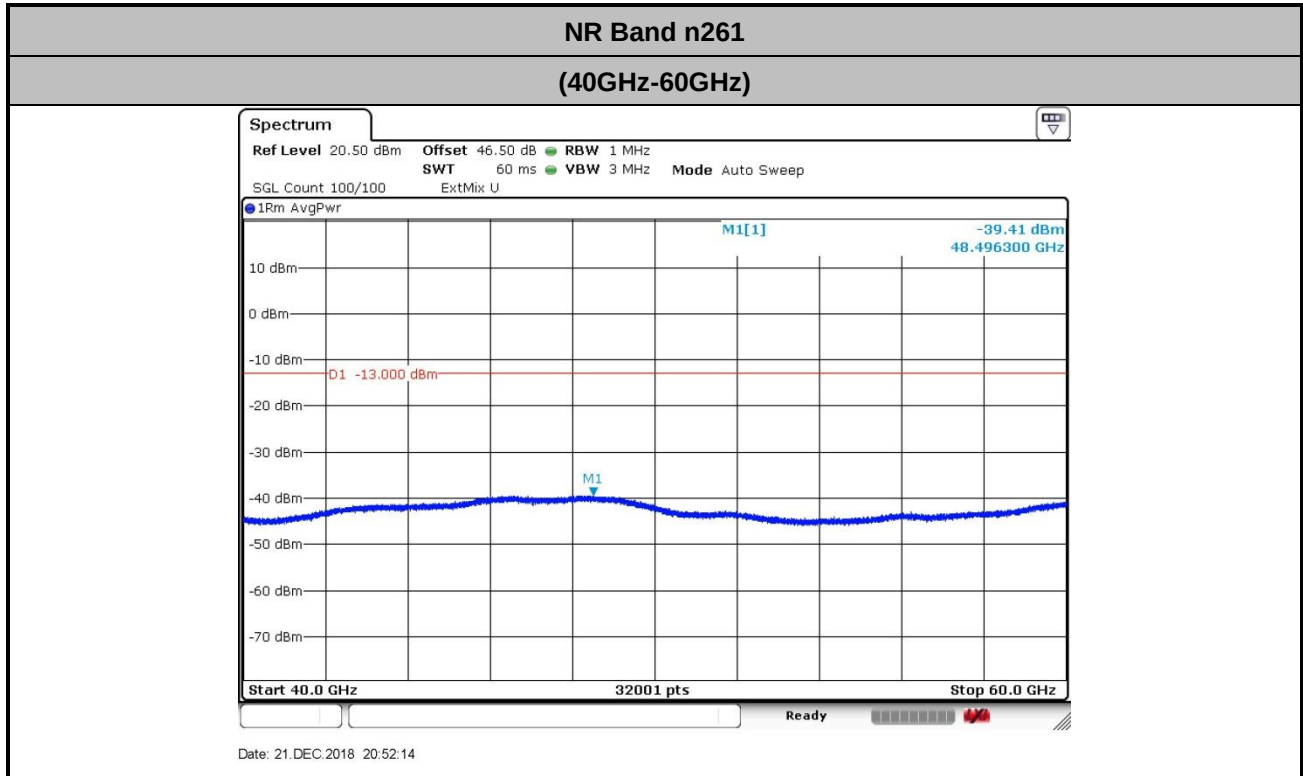
Date: 19 DEC 2018 09:50:18

intentionally blank

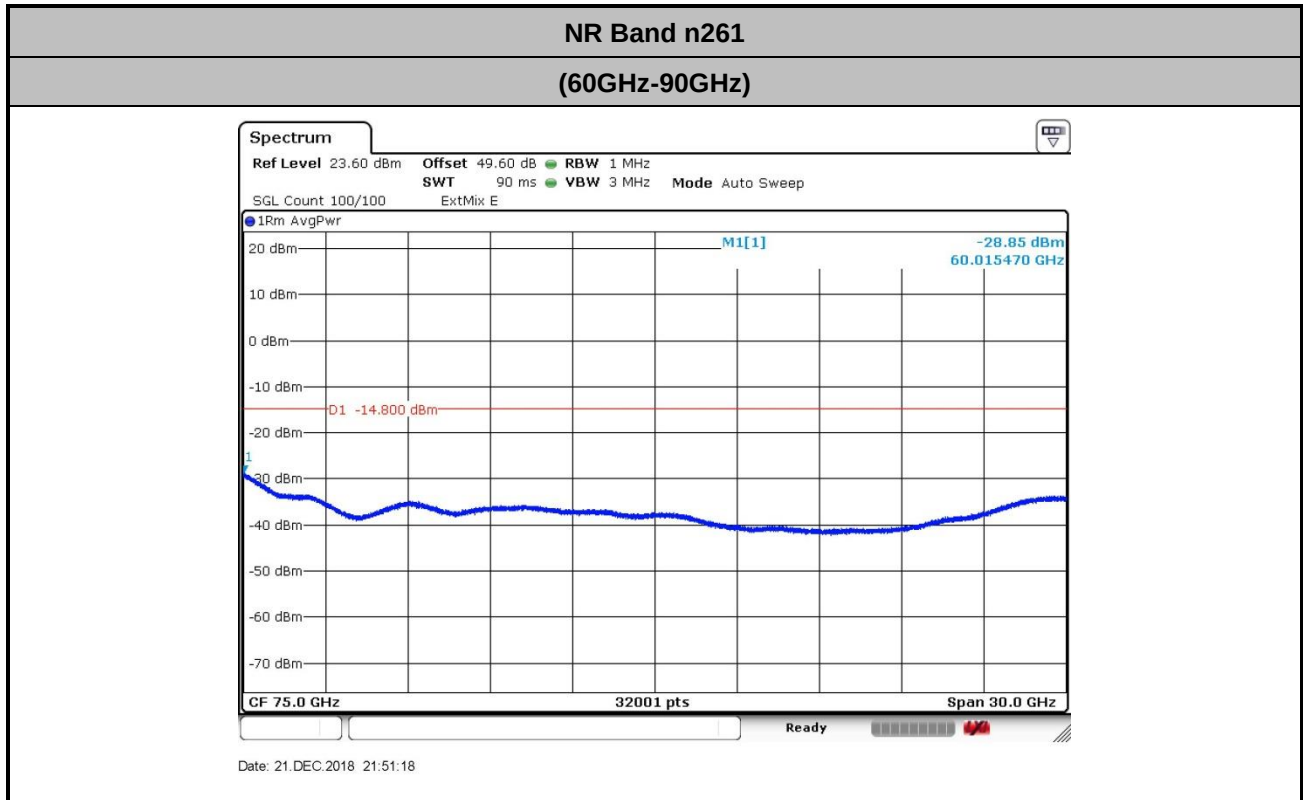
Remark: In band and out of band frequencies are omitted.



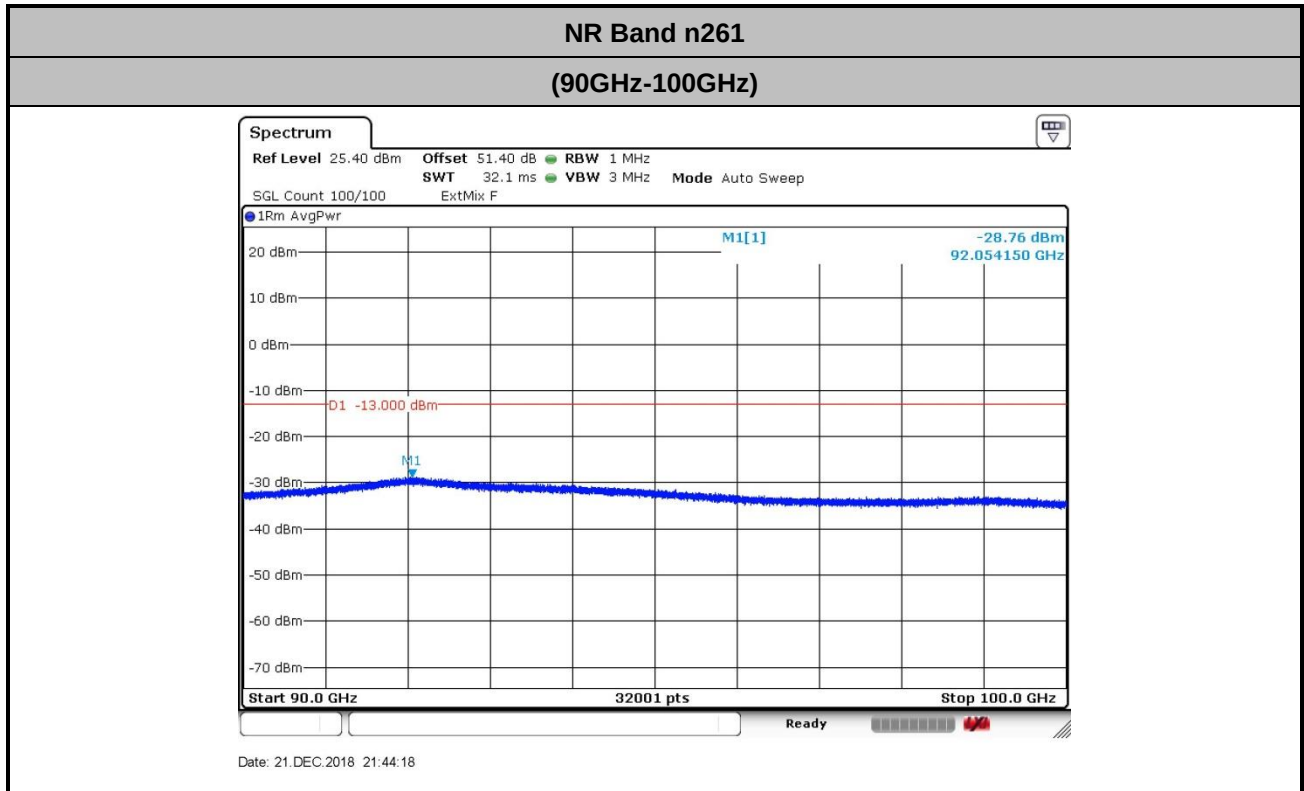
There is no significant spurious emission signal found for frequency started from 40GHz up to 100GHz.
Only the noise floor is reported.



$$\begin{aligned} \text{Offset} &= \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8 \\ &= 42.1 + 2.2 + 107 + 20\log(1) - 104.8 = 46.5 \text{ (dB)} \end{aligned}$$



$$\begin{aligned} \text{Offset} &= \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8 \\ &= 47.2 + 2.2 + 107 + 20\log(1) - 104.8 = 49.6 \text{ (dB)} \end{aligned}$$



$$\begin{aligned}
 \text{Offset} &= \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8 \\
 &= 49.0 + 2.2 + 107 + 20\log(1) - 104.8 = 51.4 \text{ (dB)}
 \end{aligned}$$

Frequency Stability

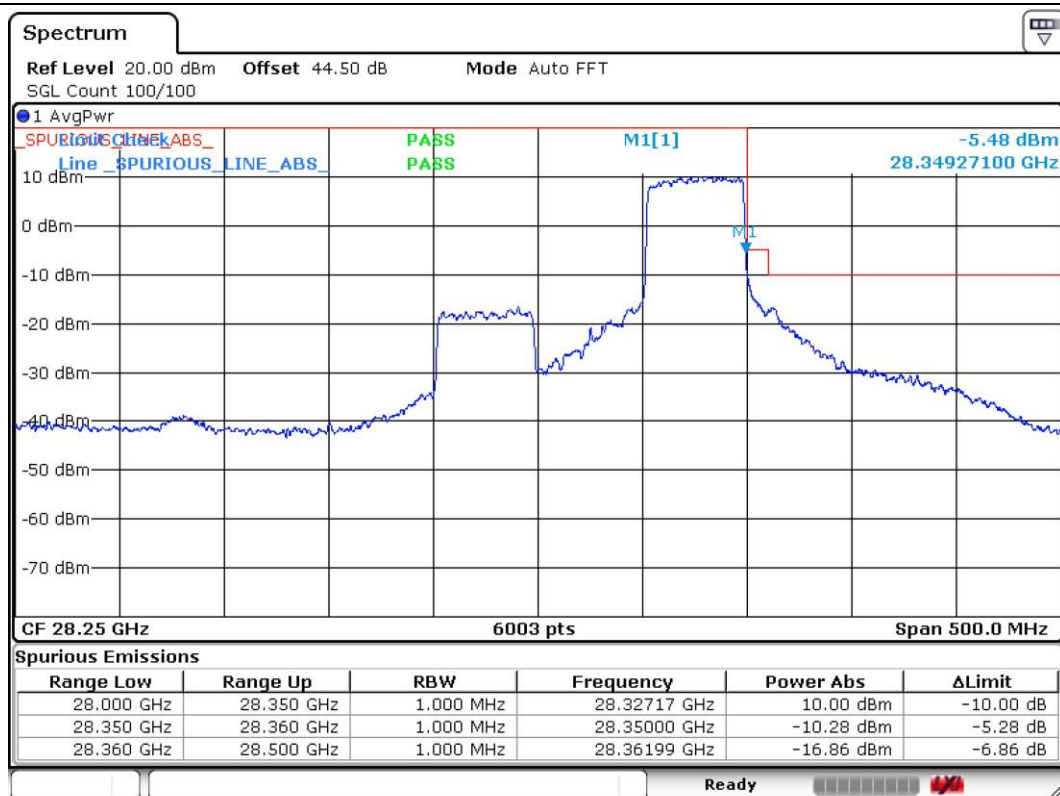
Test Conditions		NR Band n261 / Middle Channel			Limit
Temperature (°C)	Voltage (Volt)	CW tone			Note 2.
		Frequency (GHz)	Deviation (kHz)	Deviation (ppm)	Result
50	Normal Voltage	27.924935600	-141.1	-5.05	PASS
40	Normal Voltage	27.924950070	-126.63	-4.53	
30	Normal Voltage	27.925005790	-70.91	-2.54	
20(Ref.)	Normal Voltage	27.925076700	0	0.00	
10	Normal Voltage	27.925164250	87.55	3.14	
0	Normal Voltage	27.925201880	125.18	4.48	
-10	Normal Voltage	27.925231550	154.85	5.55	
-20	Normal Voltage	27.925197540	120.84	4.33	
-30	Normal Voltage	27.925116500	39.8	1.43	
20	Maximum Voltage	27.925075980	-0.72	-0.03	
20	Normal Voltage	27.925076700	0	0.00	
20	Battery End Point	27.925072360	-4.34	-0.16	

Note:

1. Normal Voltage =3.85 V. ; Battery End Point (BEP) =3.4 V. ; Maximum Voltage =4.35 V.
2. The frequency fundamental emissions stay within the operation band.
3. The test result at the next page provides confidence that the maximum frequency deviation will not lead to out of band operation during normal and extreme condition.

Channel Bandwidth	Low channel edge frequency close to -5dBm/MHz limit (Hz)	Freq. gap to the lower edge 27,500,000,000Hz (Hz)	Maximum CW tone Deviation (Hz)	Within the band
50MHz	27,501,291,000	1,291,000	126,630	Compliance
100MHz	27,501,292,400	1,292,400	126,630	Compliance
400MHz	27,502,524,000	2,524,000	126,630	Compliance

Channel Bandwidth	High channel edge frequency close to -5dBm/MHz limit (Hz)	Freq. gap to the lower edge 28,350,000,000Hz (Hz)	Maximum CW tone Deviation (Hz)	Within the band
50MHz	28,349,271,000	729,000	154,850	Compliance
100MHz	28,348,438,000	1,562,000	154,850	Compliance
400MHz	28,347,622,000	2,378,000	154,850	Compliance

Worst case 50MHz QPSK High channel edge plot


Date: 25.DEC.2018 17:16:32



Appendix B. R&S Mixer Certificate



Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate

Kalibrierschein

Certificate Number 24-0060-100986-01

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
100986

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

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung

Scope of Calibration
Umfang der Kalibrierung

Statement of Compliance
(Incoming)
Konformitätsaussage
(Anlieferung)

Statement of Compliance
(Outgoing)
Konformitätsaussage
(Auslieferung)

Extend of Calibration Documents
Umfang des Kalibrierdokuments

Meckenheim, 2018-10-31

Standard Calibration

New device

All measured values are within the data sheet specifications.

**2 pages Calibration Certificate
5 pages Outgoing Results**

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

2018-11-05

Head of Laboratory
Laborleitung

Schulze

Person Responsible
Bearbeiter

D. Heinze

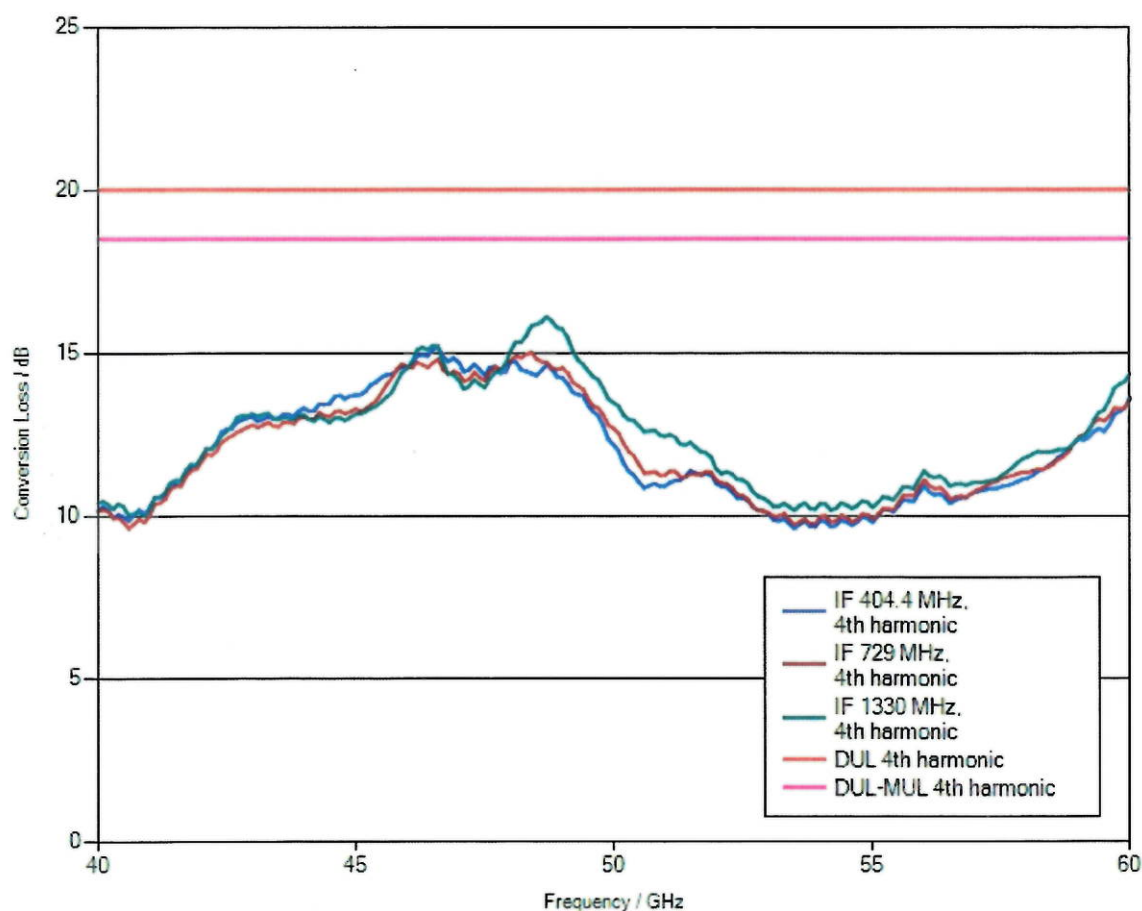
Heinze

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

1.2 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.

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

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

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**

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

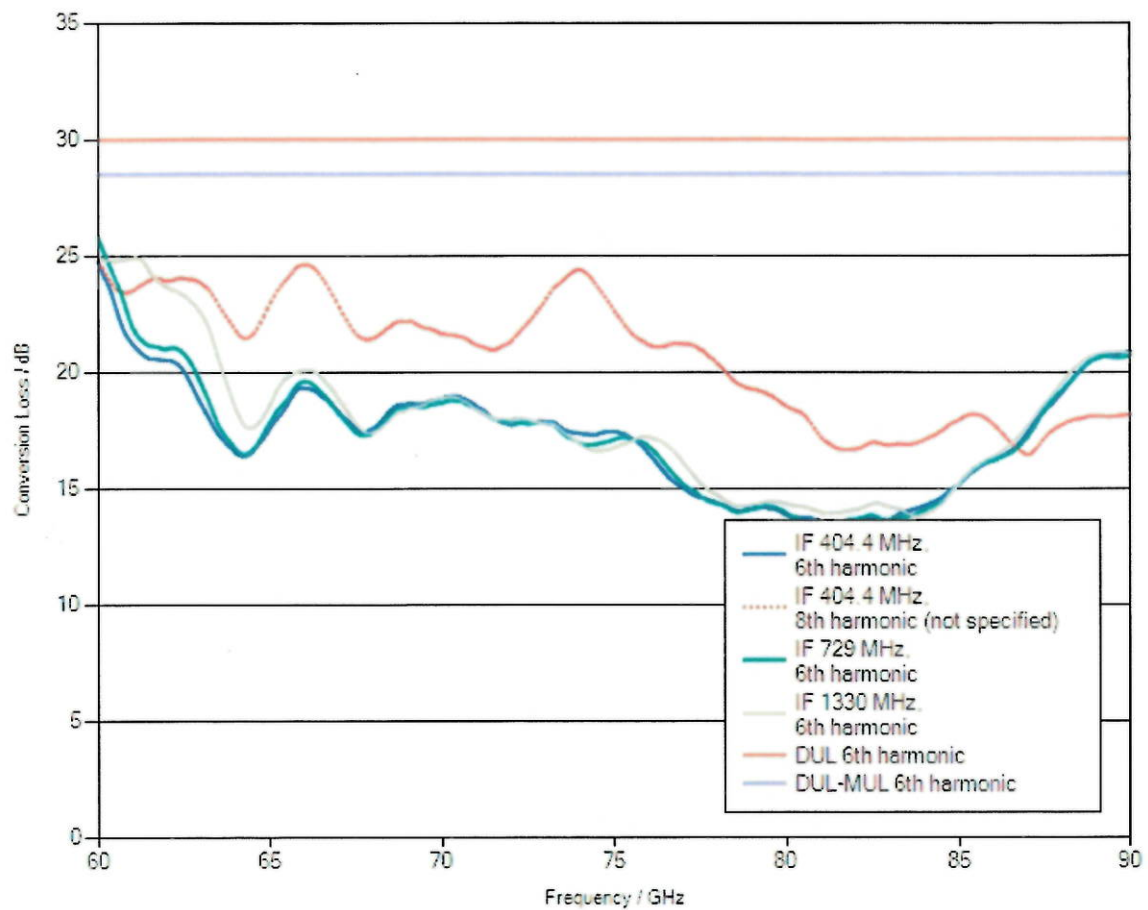

Grossmindorf

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

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.



Radiometer Physics
A Rohde & Schwarz Company

Calibration Certificate

Kalibrierschein

Certificate Number 24-0140-101128-01

Zertifikatsnummer

Unit Data

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

Manufacturer
Hersteller **RPG**

Type
Typ **RPG FS-Z140**

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

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

Performance

Place and Date of Calibration
Ort und Datum der Kalibrierung

Meckenheim, 2018-09-03

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**

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

Head of Laboratory
Laborleitung

Person Responsible
Bearbeiter

2018-09-06

Schulze

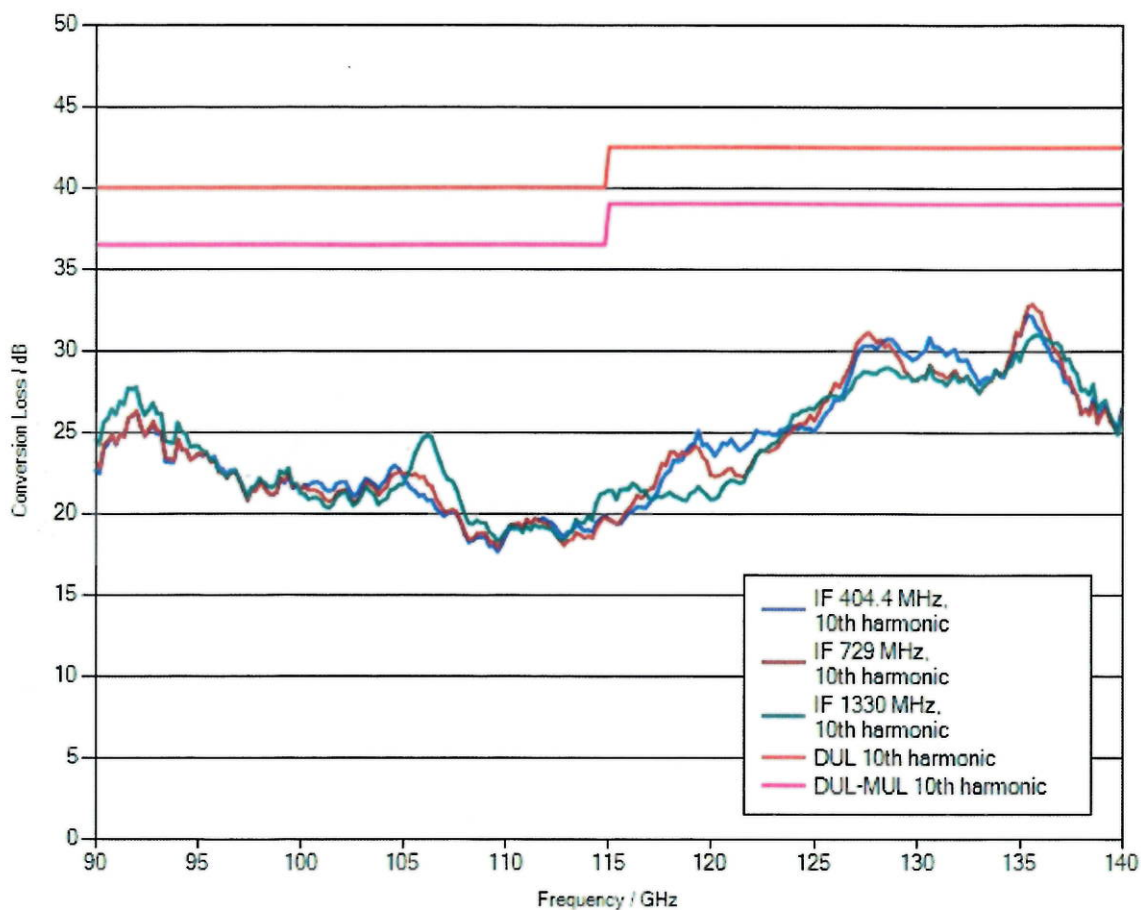
Dick

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Vers2010-05-05/
RPG2014-02-28

1.2 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.