

Prüfbericht – Produkte
Test Report - Products

Prüfbericht-Nr.: <i>Test report no.:</i>	IN23I1L3 001	Auftrags-Nr.: <i>Order no.:</i>	146815199 0010	Seite 1 von 59 Page 1 of 59
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	2324191	Auftragsdatum: <i>Order date:</i>	2023-07-28	
Auftraggeber: <i>Client:</i>	elInfochips Inc 181 Metro Drive, Suite 170, San Jose, CA 95110			
Prüfgegenstand: <i>Test item:</i>	Aikri-82X-50AS-8	Product Type	Wi-Fi BT Module	
Bezeichnung: <i>Identification .:</i>	EIC-QCS8250-200-001			
Auftrags-Inhalt: <i>Order content:</i>	Testing and issue of Test Report and Grant Certificate			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C 15.247, 15.207, 15.205 & 15.209			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-08-18			
Prüfmuster-Nr & Serien-Nr.: <i>Test sample no & serial no.:</i>	A003542986-001 A003542986-002			
Prüfzeitraum: <i>Testing period:</i>	2023-08-18 - 2023-08-24			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt.Ltd.,27/B, 2nd Cross, Electronic City Phase1 Bangalore -560 100, India FCC Test site registration number: 496599			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>			genehmigt von: <i>authorized by:</i>	
Datum: <i>Date:</i>	2024-05-30		Ausstellatum: <i>Issue date:</i>	2024-05-31
Stellung / Position:	Likhithesh M D Senior Engineer		Stellung / Position:	Madhu K.N Assistant Manager
Sonstiges / Other:	FCC ID: 2ATUP-AIKRI-82X-50S			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 2 von 59

Page 2 of 59

- | | |
|---|---|
| 1 | <p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</p> <p>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p> |
| 2 | <p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i></p> |
| 3 | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.</p> <p>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i></p> <p><i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>Die Entscheidungsregel für Konformitätserklärungen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird.</p> <p><i>The decision rule for statements of conformity in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report.</i></p> |

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 3 von 59
Page 3 of 59

TEST SUMMARY

Test Item	FCC Clause	Result
Maximum conducted (Peak) output power	FCC 15.247(b)(1)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	NA
DTS Bandwidth	FCC 15.247(a)(iii)	Pass
Channel Frequency Separation	15.247(a)(1)	Pass
Number of Hopping Channels	15.247(a)(iii)	Pass
Time of Occupancy(Dwell Time)	15.247(a)(iii)	Pass
Emissions in non-restricted frequency bands	FCC 15.247(d)	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	Pass
Conducted Emissions on a.c power Lines	FCC 15.207	Pass

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Note: *N/A (Not Applicable)

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 4 von 59

Page 4 of 59

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
IN23I1L3 001	01	Initial Issue of Test Report	2024-05-31

Table of Contents

1	GENERAL REMARKS	6
1.1	Attachments	6
2	TEST SITES	7
2.1	Testing Facilities.....	7
2.2	List of Test and Measurement Instruments.....	7
3	GENERAL PRODUCT INFORMATION.....	8
3.1	Product Function and Intended Use.....	8
3.2	Ratings and System Details of Equipment under Test	8
3.3	Measurement Uncertainty:	9
4	TEST SET-UP AND OPERATION MODE.....	10
4.1	Principle of Configuration Selection	10
4.2	UUT Operation and Software	10
4.3	Special Accessories and Auxiliary Equipment	10
4.4	Simultaneous Transmission	10
4.5	Countermeasures to achieve EMC Compliance	10
4.6	List of frequencies	10
4.7	Report references.....	11
5	OPERATIONAL DESCRIPTION.....	12
6	TEST METHODOLOGY	14
6.1	Conducted Spurious Emission Test on AC Power Line.....	14
6.1.1	Test Setup Configuration	14
6.2	Radiated Emission Test	15
6.2.1	Test Setup Configuration	15
7	TEST RESULTS FOR BLUETOOTH	17
7.1	Maximum Peak Conducted Output Power	17
7.2	20dB Bandwidth & 99% Bandwidth.....	20
7.3	Number of Hopping Channels.....	23
7.4	Carrier Frequency Separation.....	26
7.5	Time Of Occupancy(Dwell Time)	28
7.6	Emissions in non-restricted frequency bands and Conducted Spurious Emission.....	30
7.6.1	Reference plots	31
7.6.2	Band Edge.....	32
7.6.3	Hopping mode ON condition Band Edge	33
7.6.4	Out-Of-Band Emissions.....	34
7.7	Spurious Radiated Emissions & Restricted Bands of Operation	37
7.8	Hopping Mode ON Condition Band Edge	54
8	CONDUCTED SPURIOUS EMISSION TEST ON AC POWER LINE	56
9	LIST OF TABLES.....	59
10	LIST OF FIGURES.....	59
11	POWER LEVEL USED FOR TESTING	59

1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1: TEST SETUP PHOTOS

2: EUT EXTERNAL PHOTOS

3: EUT INTERNAL PHOTOS

4: FCC LABEL AND LABEL LOCATION

5: BLOCK DIAGRAM

6: SPECIFICATION OF EUT

7: SCHEMATIC DIAGRAM

8: BILL OF MATERIAL

9: USER MANUAL

10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 7 von 59
Page 7 of 59

2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India

2. TUV Rheinland (India) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.
India

Radiated Measurement site type :
Fully anechoic chamber (used for above 1 GHz
measurements)

Radiated Measurement site type :
Semi anechoic chamber (used for below 1 GHz
measurements)

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73 SP5	30.07.2024	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	02.03.2024	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	16.02.2024	Yearly	
Log-Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-111	-	17.02.2024	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-01944	-	18.10.2023	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	13.10.2023		
EMI Test Receiver	Rohde & Schwarz	ESW44	101773	1.72.SP1	15.02.2024	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Spectrum Analyzer	Agilent	E4407B	US41192772	A.14.07	27-12-2023	Yearly	Conducted Test Parameters
Signal Analyser	Rohde & Schwarz	FSV7	101644	FW 3.40	03-02-2024	Yearly	Conducted AC Power line Test
EMI Receiver	Rohde & Schwarz	ESR7	101133	3.48 SP3	29.07.2024	Yearly	
Line Impedance Stabilization Network	Rohde & Schwarz	ENV 216	101434	-	10.10.2023	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	12.07.2024	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in 10mtr-SAC	BAT EMC	3.20.0.17
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.20
3	Antenna Port conducted measurement: TS8997 system	WMS 32	10.11.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

This is a system on module (SoM) device based on QCS8250 processor. This SoM further can be used in any type of end product as a core of the system which can control the operations of the end product as well as can also provide interfaces like DSI, CSI, PCIe, I2S, I2C, GPIOs which can be accessible through its board to board connector on the host board.

The SoM is designed to be used in various product segments and the end usecase will be dependent on the end product.

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

Radio Protocol		Bluetooth
Operating Frequency Range		2402MHz to 2480MHz
No. of Channels		79
Channel Spacing		1MHz
Transmitting Power Level		Refer clause 11
Maximum Measured Power		8.73 dBm @ 1 Mbps 2440MHz
Modulation		GFSK, pi/4-DQPSK,8-DPSK
Number of antennas		1
Antenna type & gain		Patch Antenna FXP840.07.0055B 3.60dBi
Supply Voltage to Product		3.8V DC through AC/DC Adapter , < 2.0A
Environmental conditions	Storage	-20°C to +50 °C Relative Humidity <95%
	Operating	
EUT Dimension (LXW)		59.7 mm x 32.2 mm

***Disclaimer:** The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^{\circ}\text{C}$
Supply Voltages	$\pm 3 \%$
Time	$\pm 5 \%$

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channels

4.2 UUT Operation and Software

Hardware Version Identification number (HVIN) : QCS8250 SOM REV 2.0
Software version : QCS8250_AND.10.0.0_EI.2.2.0

4.3 Special Accessories and Auxiliary Equipment

Test laptop (QRCT Radio control tool V4.0 Software Version : 4.0.00192.0),
USB cable

4.4 Simultaneous Transmission

This product supports Simultaneous transmission

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 List of frequencies

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2400 – 2483.5 BT(BDR+EDR)	0	2402
	1	2403
	2	2404
	3	2405
	:	:
	:	:
	:	:
	37	2439
	38	2440
	39	2441
	40	2442
	:	:
	:	:
	:	:
	74	2476
	75	2477
	:	:
	:	:
	78	2480

Table 5: List of Bluetooth center Frequencies

Channel used for Bluetooth testing

Channel low : 2402MHz

Channel mid : 2440MHz

Channel high : 2480MHz

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 11 von 59

Page 11 of 59

Note:

TUV Sample Identification number	A003542986-001	Radiated test Sample
	A003542986-002	Conducted test Sample

4.7 Report references

Note: Product **Aikri-82X-50AS-8** has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, following table lists the report numbers.

Radio Protocol	Report Number
RF test report for Wi-Fi (2.4GHz) & BLE (2.4GHz)	IN23LG3K 001
RF test report for Bluetooth (2.4GHz) → This Report	IN23I1L3 001
RF test report for Wi-Fi (5GHz)	IN23ULAF 001

5 OPERATIONAL DESCRIPTION

QCS8250 SOM can be used in different types of end product as an main processing unit. Application can be used with a custom designed carrier board. SOM will be connected to Carrier board using its 4 Board to Board connector.

- Video Streaming over ethernet/USB with Audio.
- Video Streaming over Display with Audio
- In robotics application with motion and camera recording.
- Video Conferencing Devices (Camera and Display both are required).
- Camera related application ex.: drone, in robotics.
- Medical Devices which requires camera and display interfaces like endoscopy device etc... any medical related certification needs to be considered at end product level

Main parts on SOM and respective top level features are as below:

1. Processor QCS8250 Features:

- QCS8250 SoM is based on QCS8250 Qualcomm® processor.
- QCS8250 is the new generation Qualcomm® Snapdragon™ premium-tier processor with robotic application. It is designed with the 7 nm process, for superior performance and power efficiency.

2. Memory:

LPDDR5:

- The QCS8250 device PoP supports 64-bit (4 × 16) 4-channel stacked memory LPDDR5, thereby increasing operational bandwidth and simplifying routing—no pre-stacking is needed.

UFS:

- The UFS host controller support UFS 3.1, QCS8250 kit memory configuration is UFS 2.1

3. Multimedia Features:

- Supports 6x 4-lane CSIs (D-PHY V1.2), supporting 2.5Gbps per lane. Dedicated camera I2C ports for the camera control interface
- Supports 2x 4-Lane MIPI DSI D-PHY 1.2 supporting resolutions up to 4K@60 (after combined 2 MIPI ports)
- Support USB Display port 1.4 over Type C, can support two 4K@60 streams using MST HUB or one 4K@60 stream using SST adapter.
- Supports 2x PCIe Gen3 2-lane.
- Supports 1x USB 3.1 Type-C connector.
- Supports 1x USB 3.1 Type-A connector.
- Supports 1x Micro-SD card V3.0 interface.

4. Audio Features:

- Six Native DMIC support on carrier board
- SLIMBUS – BT Audio (with Wi-Fi/BT chipset on SoM)

5. Wireless Connectivity:

- Wi-Fi and BT combo chipset QCA6391 of Qualcomm on SOM
- QCA6391 chipset supports Wi-Fi 6 (802.11 b/g/n/a/ac/ax) and Bluetooth 5.1 (with BLE) with external power amplifier for 2.4G, 5G frequencies.
- QCA6391 Chipset supports simultaneous 2.4GHZ and 5GHZ (MIMO).
- Supports 2 Channel MIMO (2 x 2)
- To connect external antenna on SoM board, U.FL connector is provided.
- Throughput and performance have been measured using external antenna: PN# FXP840.07.0055B by eInfochips.

6. Power Management:

Six PMICs:

- PM8150B
- PM8250
- PM8150L
- PM8002
- PM8009
- PM3003
- Different PMIC supply provisions are available at B2B connector, if required.

Above listed are the features of SOM Board, it can be used in below mentioned applications with a custom designed carrier board. SOM will be connected to Carrier board using its 4 Board to Board connector.

- Video Streaming over ethernet/USB with Audio.
- Video Streaming over Display with Audio
- In robotics application with motion and camera recording.
- Video Conferencing Devices (Camera and Display both are required).
- Camera related application ex.: drone, in robotics.
- Medical Devices

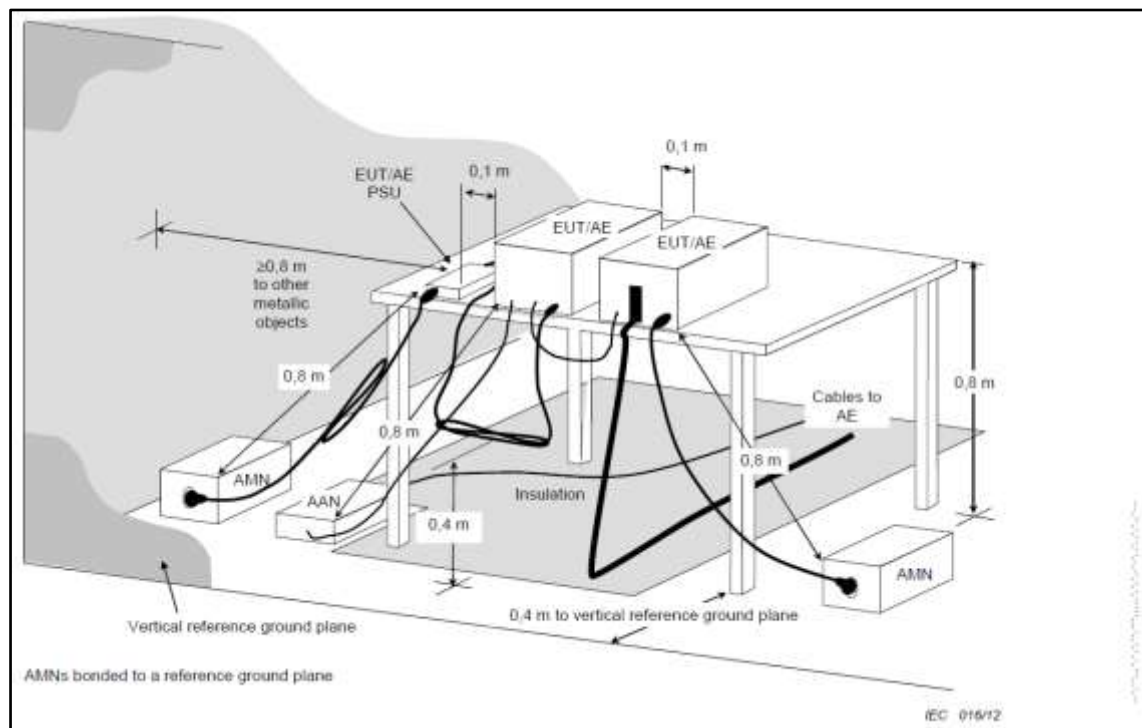
6 TEST METHODOLOGY

6.1 Conducted Spurious Emission Test on AC Power Line

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the reference ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered with an AC adaptor with 110V AC 60Hz supply.

6.1.1 Test Setup Configuration



6.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and measurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

6.2.1 Test Setup Configuration

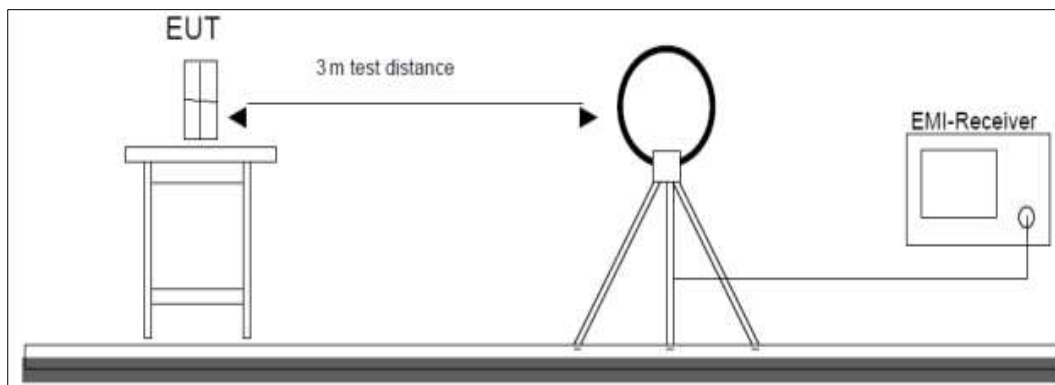


Figure 1: Frequency Range 9 kHz - 30 MHz

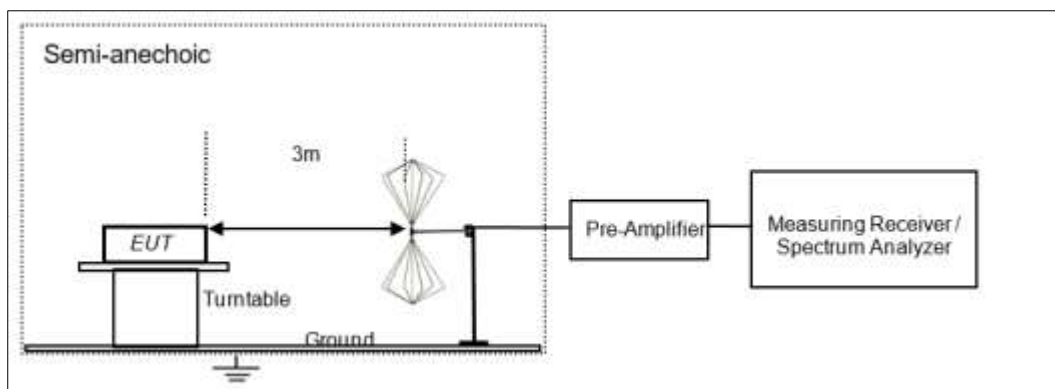


Figure 2: Frequency Range 30 MHz - 200 MHz

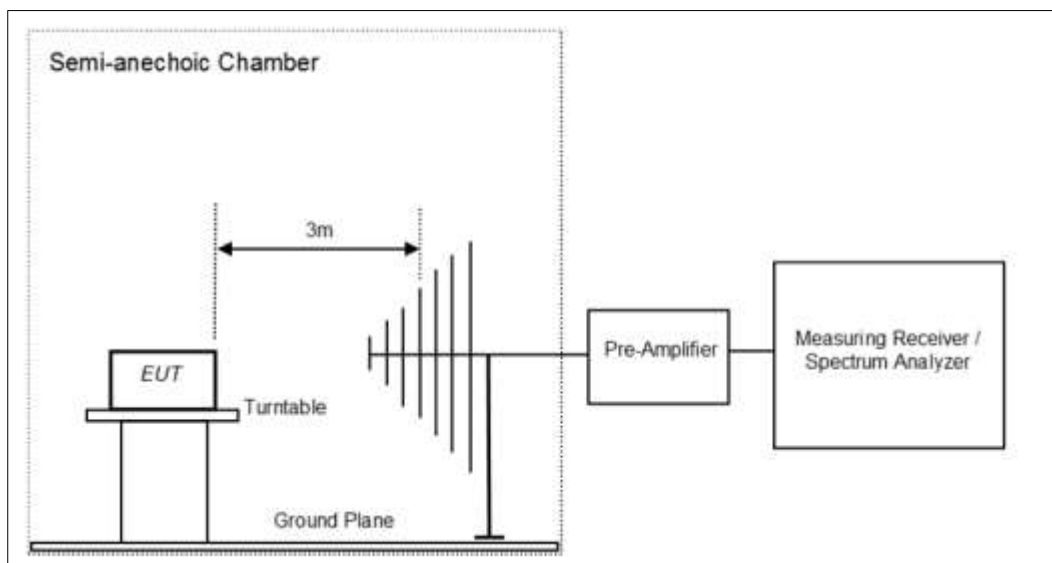


Figure 3: Frequency Range 200 MHz - 1GHz

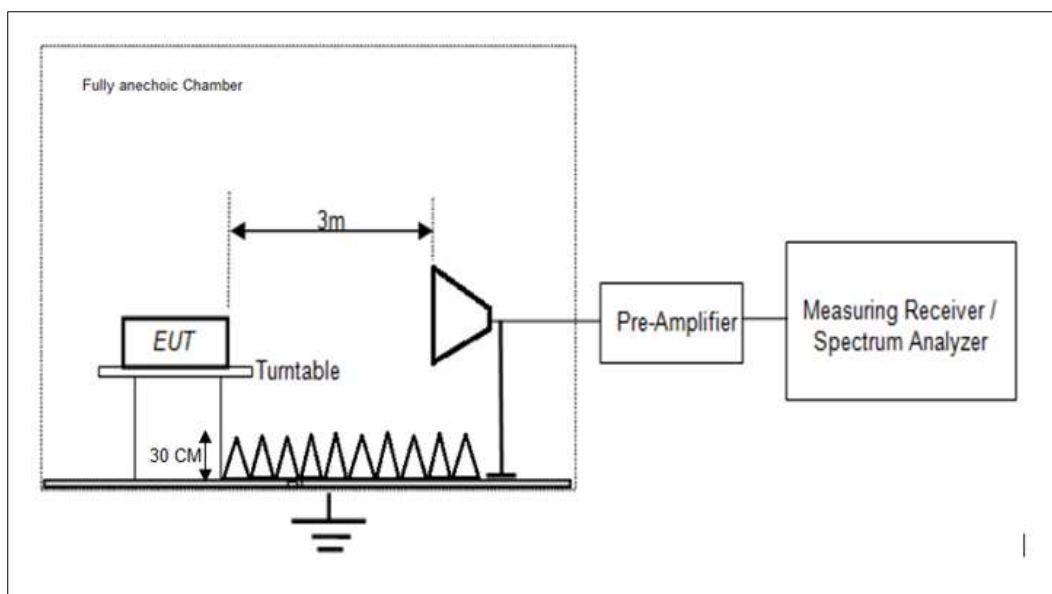


Figure 4: Frequency Range above 1 GHz

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 17 von 59
Page 17 of 59

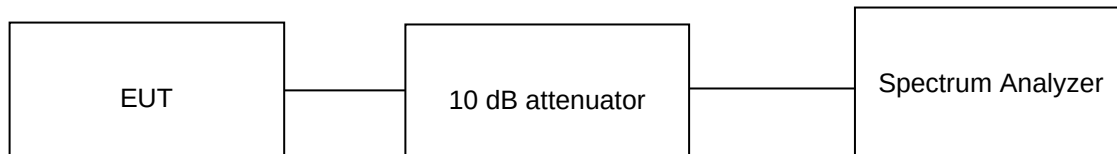
7 TEST RESULTS FOR BLUETOOTH

7.1 Maximum Peak Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(1)
Test Method	Subclause 7.8.5 of ANSI C63.10
Measurement Bandwidth	1MHz
Detector	Peak
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 9 b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 18 von 59

Page 18 of 59

Test results:

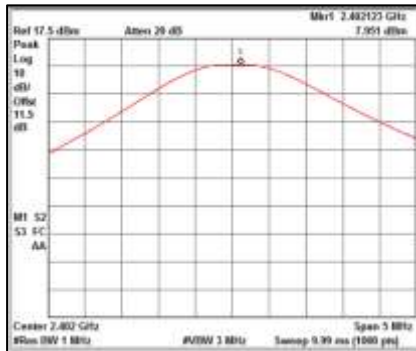
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (1.4dB)

Data Rate (Mbps)	Channel Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	Power Limit (dBm)
1	2402	7.95	30.00
	2440	8.73	30.00
	2480	7.15	30.00
2	2402	7.65	30.00
	2440	8.53	30.00
	2480	6.96	30.00
3	2402	7.86	30.00
	2440	8.68	30.00
	2480	7.10	30.00

Test Plots:

Data Rate: 1Mbps



Channel Frequency: 2402MHz

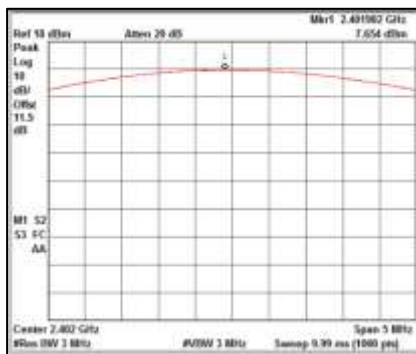


Channel Frequency: 2440MHz

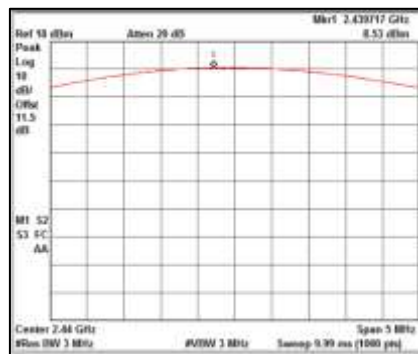


Channel Frequency: 2480MHz

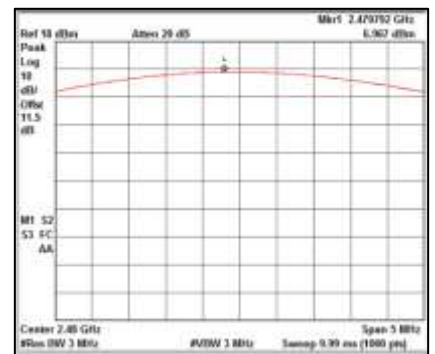
Data Rate: 2Mbps



Channel Frequency: 2402MHz

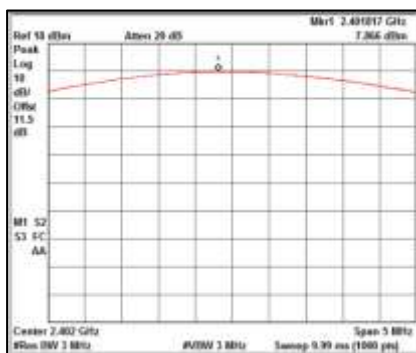


Channel Frequency: 2440MHz

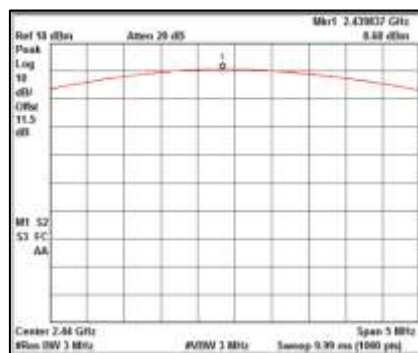


Channel Frequency: 2480MHz

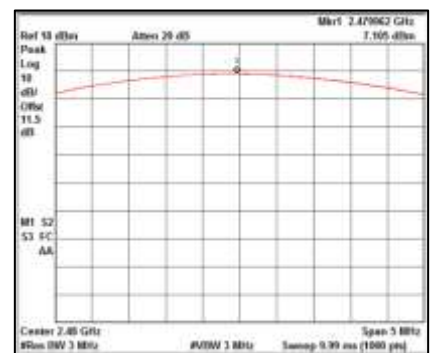
Data Rate: 3Mbps



Channel Frequency: 2402MHz



Channel Frequency: 2440MHz



Channel Frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 20 von 59
Page 20 of 59

7.2 20dB Bandwidth & 99% Bandwidth

Result

Pass

Test Specification FCC part 15 Subpart C 15.247 (a) (i)

Test Method Subclause 7.8.7 of ANSI C63.10

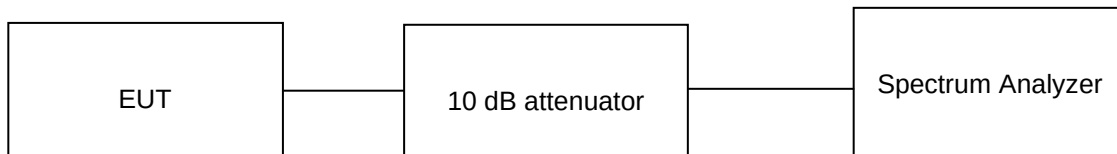
Measurement Bandwidth 30 kHz

Detector Peak

Port of testing Antenna port

Requirement The bandwidth of frequency hopping channel is the 20 dB emission bandwidth ,measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random , with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long-term distribution appears evenly distributed.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 21 von 59
Page 21 of 59

Test results:

1. All the losses are included during measurement and final values are mentioned in the test report.

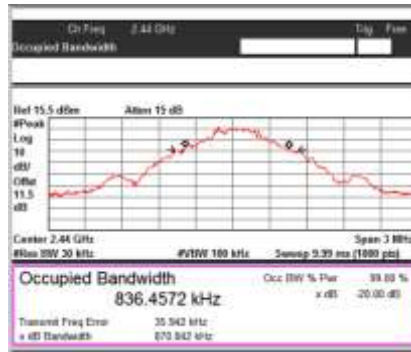
Data Rate (Mbps)	Channel Frequency (MHz)	20 dB Bandwidth (MHz)	99% OBW (MHz)
1	2402	855.05	828.09
	2440	870.84	832.69
	2480	915.51	841.64
2	2402	1.26	1.17
	2440	1.29	1.18
	2480	1.26	1.18
3	2402	1.25	1.16
	2440	1.24	1.17
	2480	1.24	1.15

20dB Bandwidth

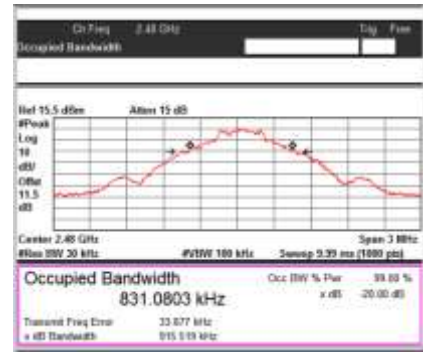
Data Rate: 1Mbps



Channel Frequency:2402MHz



Channel Frequency:2440MHz

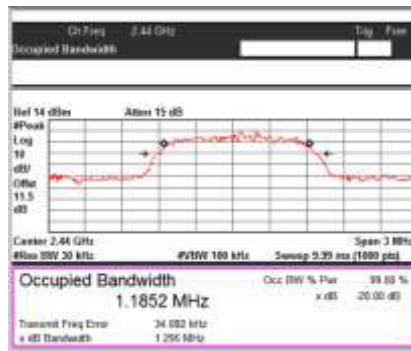


Channel Frequency:2480MHz

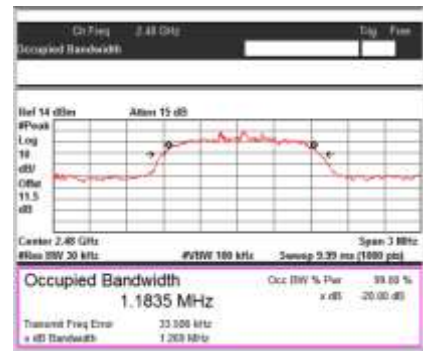
Data Rate: 2Mbps



Channel Frequency:2402MHz

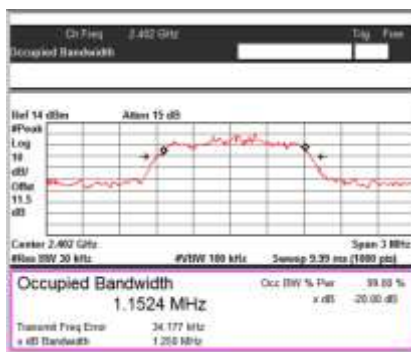


Channel Frequency:2440MHz

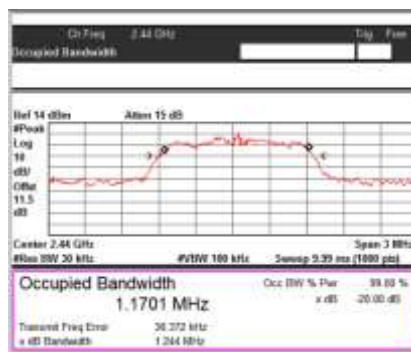


Channel Frequency:2480MHz

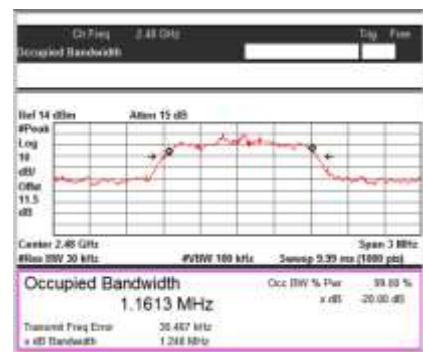
Data Rate: 3Mbps



Channel Frequency:2402MHz



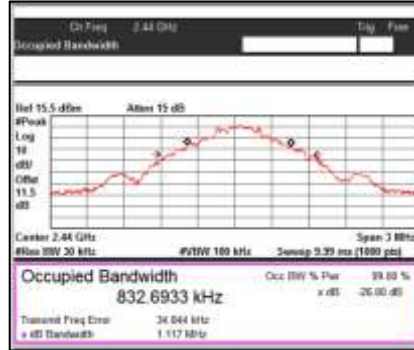
Channel Frequency:2440MHz



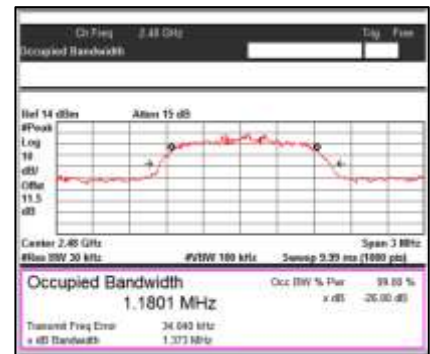
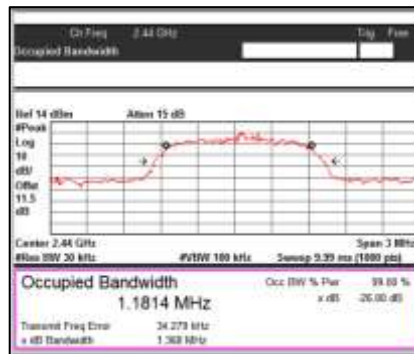
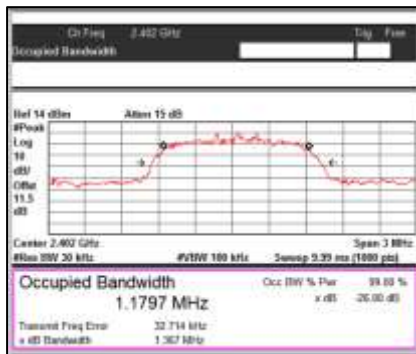
Channel Frequency:2480MHz

99% Bandwidth

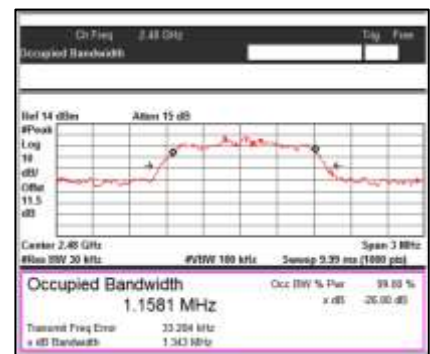
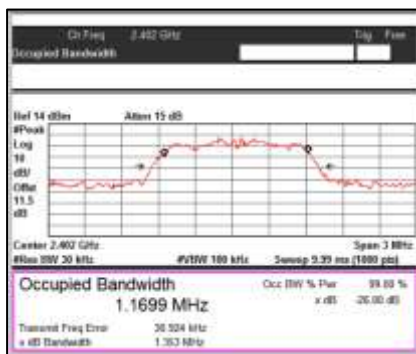
Data Rate: 1Mbps



Data Rate: 2Mbps



Data Rate: 3Mbps



Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 23 von 59
Page 23 of 59

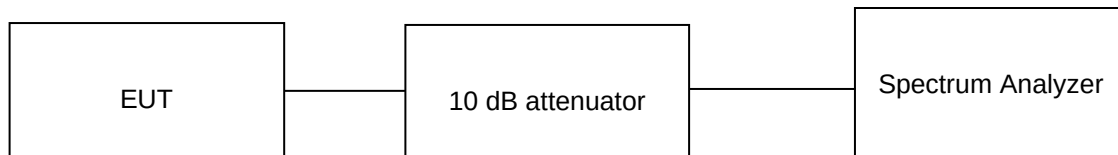
7.3 Number of Hopping Channels

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (i)
Test Method	Subclause 7.8.3 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

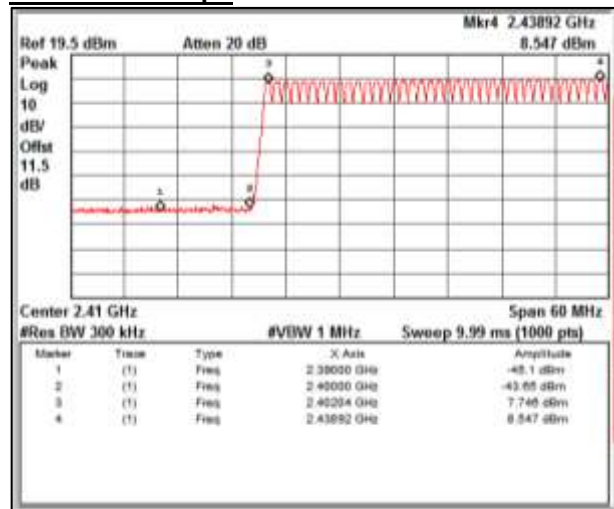
Test results:

Note:

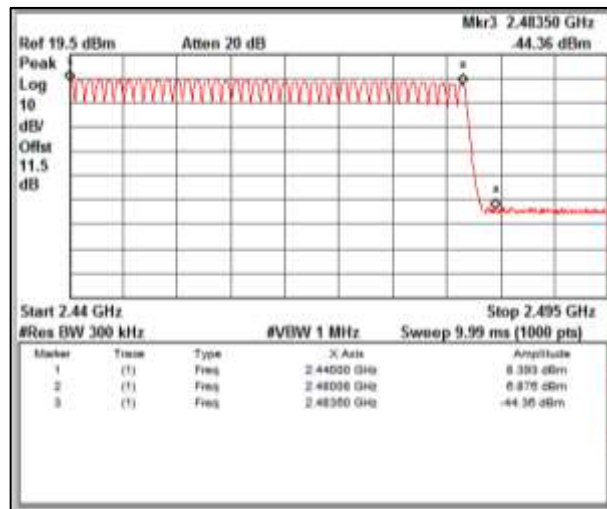
1. All the losses are included during measurement and final values are mentioned in the test report.

Test Plots:

Data Rate: 1Mbps

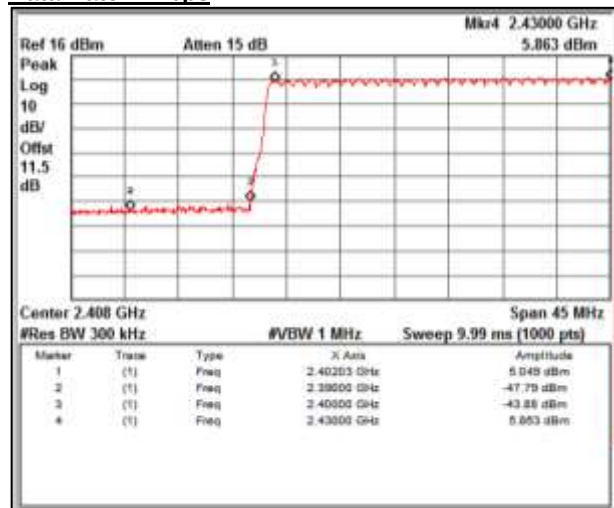


Frequency range: 2380MHz to 2440MHz

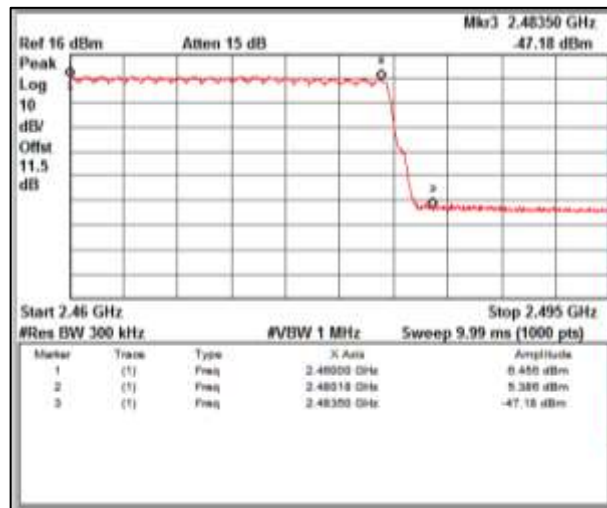


Frequency range: 2440MHz to 2500MHz

Data Rate: 2Mbps

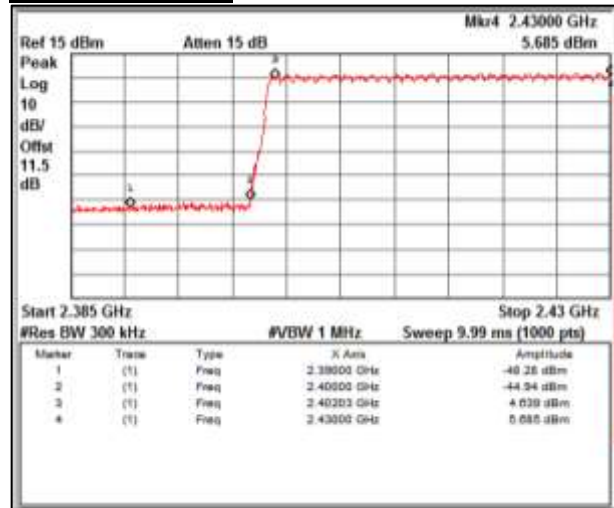


Frequency range: 2380MHz to 2440MHz

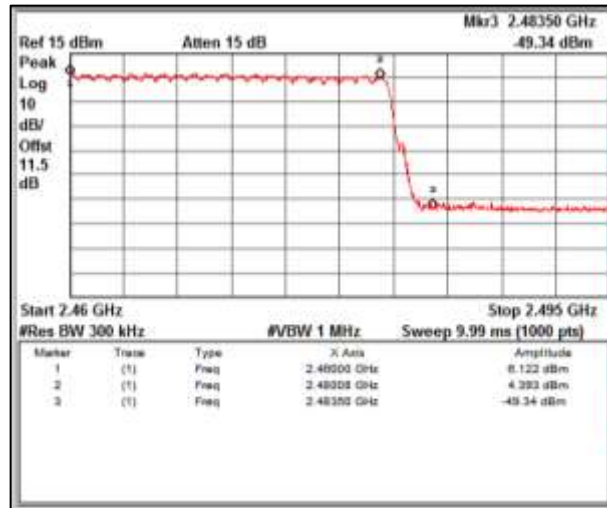


Frequency range: 2440MHz to 2500MHz

Data Rate: 3Mbps



Frequency range: 2380MHz to 2440MHz

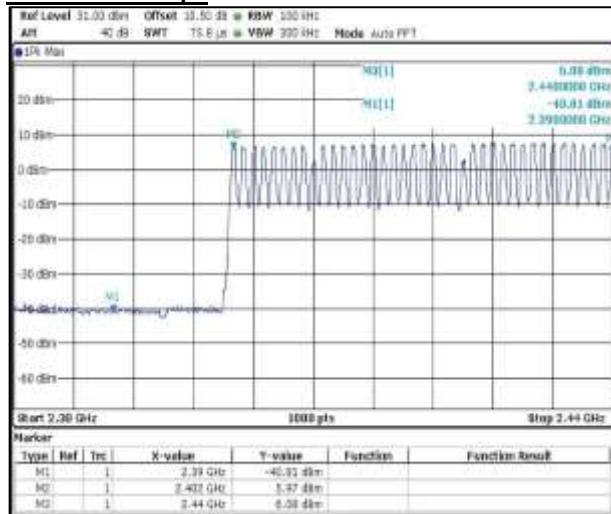


Frequency range: 2440MHz to 2500MHz

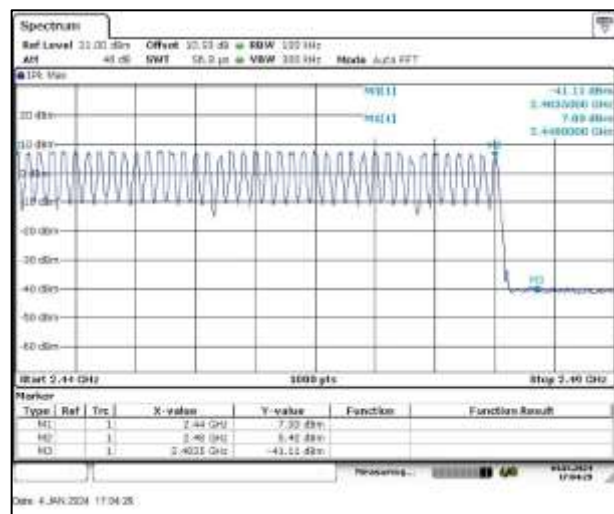
Number of Hopping frequencies for all data rates = 79

Hopping mode ON condition test results.

Data Rate: 1Mbps

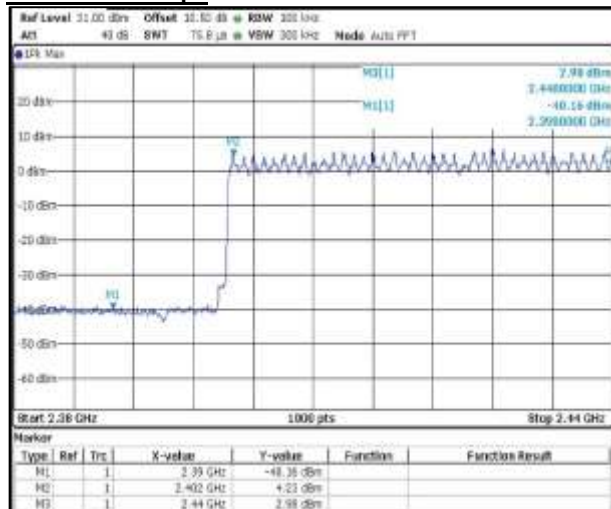


Frequency range: 2380MHz to 2440MHz



Frequency range: 2440MHz to 2500MHz

Data Rate: 2Mbps

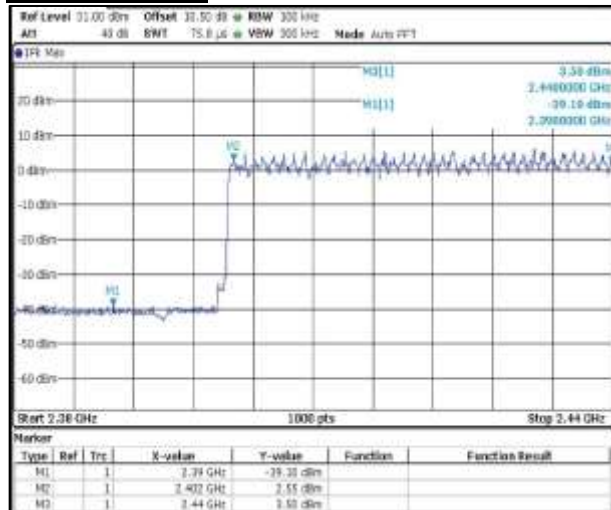


Frequency range: 2380MHz to 2440MHz

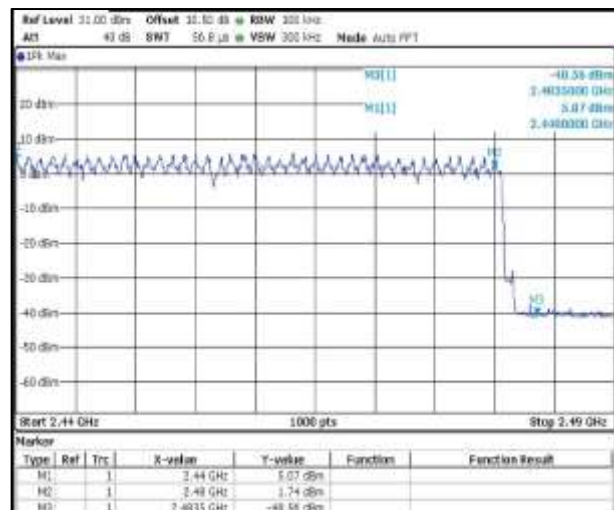


Frequency range: 2440MHz to 2500MHz

Data Rate: 3Mbps



Frequency range: 2380MHz to 2440MHz



Frequency range: 2440MHz to 2500MHz

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 26 von 59
Page 26 of 59

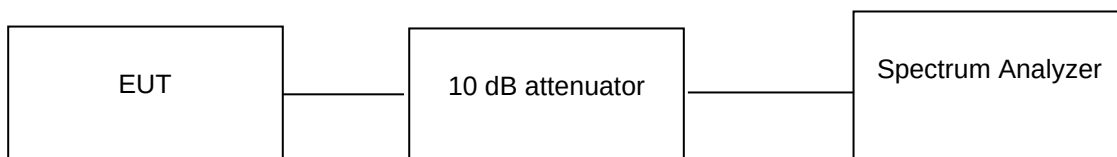
7.4 Carrier Frequency Separation

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (a) (1)
Test Method	Clause 7.8.2 of ANSI C63.10
Measurement Bandwidth	300 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	Frequency hopping systems shall have hopping channel carrier frequency separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 27 von 59
Page 27 of 59

Test results:

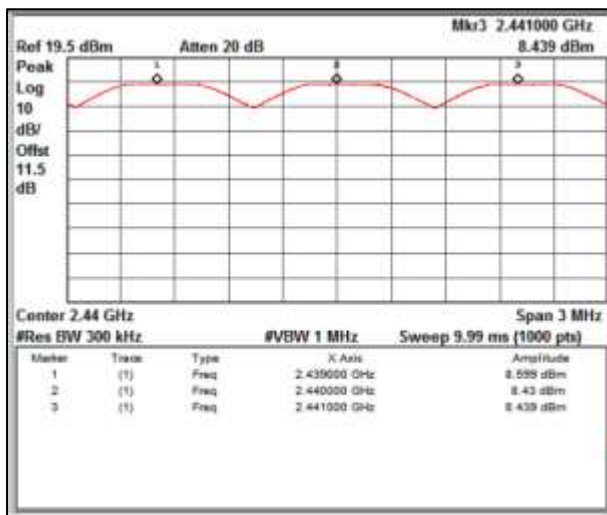
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.

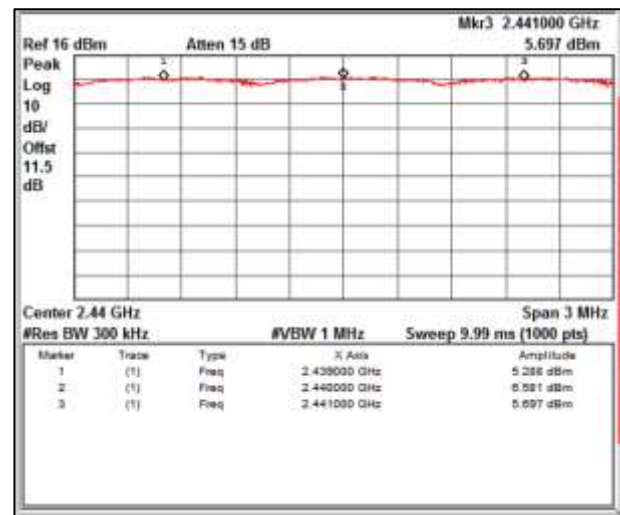
Data rate (Mbps)	Channel Frequency (MHz)	Channel spacing Observed (MHz)	20 dB Bandwidth (MHz)
1	2439	1	855.05
	2440	1	870.84
	2441	1	915.51
2	2439	1	1.26
	2440	1	1.29
	2441	1	1.26
3	2439	1	1.25
	2440	1	1.24
	2441	1	1.24

Test Plots:

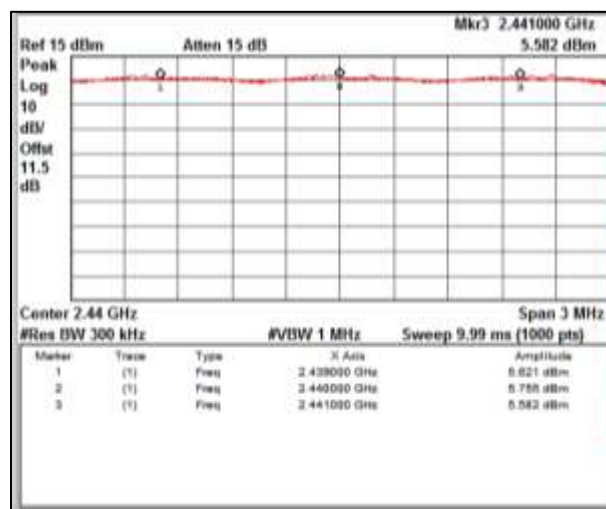
Data rate:1Mbps



Data rate:2Mbps



Data rate:3Mbps



Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 28 von 59
Page 28 of 59

7.5 Time Of Occupancy(Dwell Time)

Result

Pass

Test Specification FCC Part 15 Subpart C Section 15.247 (a) (i)

Test Method Clause 7.8.4 of ANSI C63.10

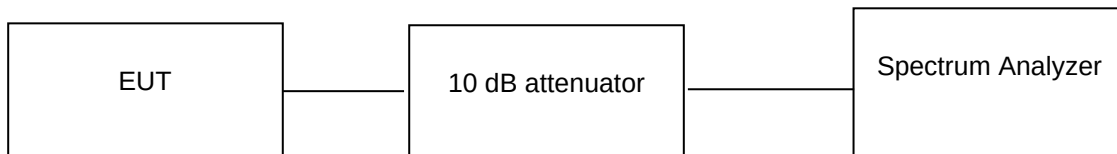
Measurement Bandwidth 100 kHz

Detector Peak

Port of testing Antenna port

Requirement The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

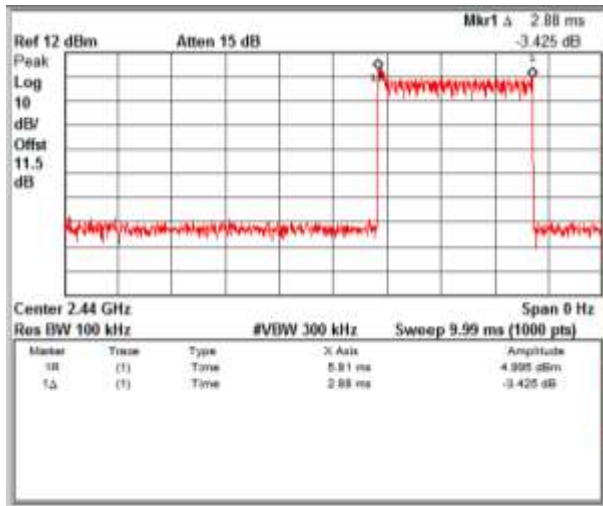
Seite 29 von 59
Page 29 of 59

Test results:

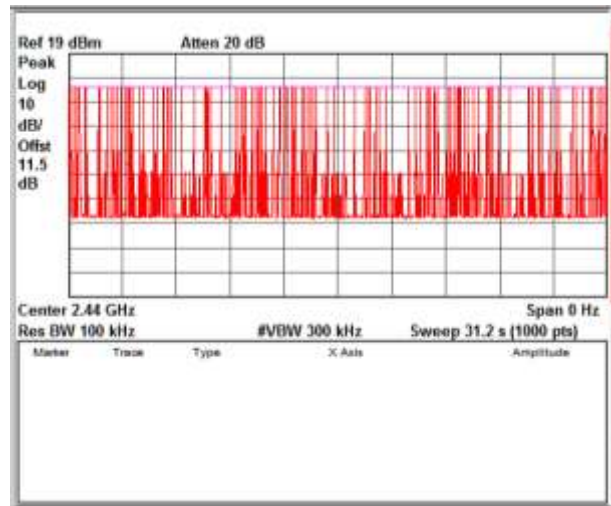
Note:

1. All the losses are included during measurement and final values are mentioned in the test report
2. Testing is performed for all the applicable data rates only worst case graphs are reported (3DH5)

Data Rate: 3DH5



Dwell time



No. of Bin Calculation

Single Burst	2.88	ms
Measured Span (Seconds)	31.6	sec
No. Of Bins/Bursts in Measured Span	89	No.
Observation Period (79 hop ch x0.4s) - Seconds	31.6	sec
Total Burst in 31.6sec	256.32	ms
Limit	400.00	ms

7.6 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result

Pass

Test Specification FCC part 15 Subpart C 15.247 (d)

Test Method Subclause 11.11 of ANSI C63.10

Measurement Bandwidth 100 kHz

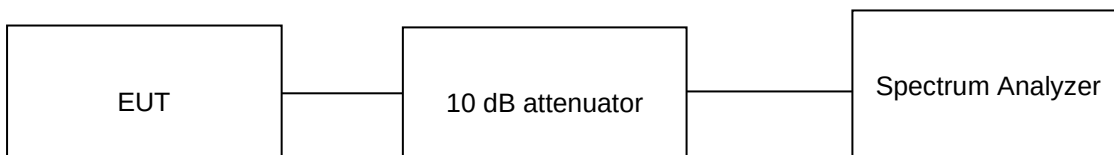
Detector Peak

Port of testing Antenna port

Requirement In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 8.5 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

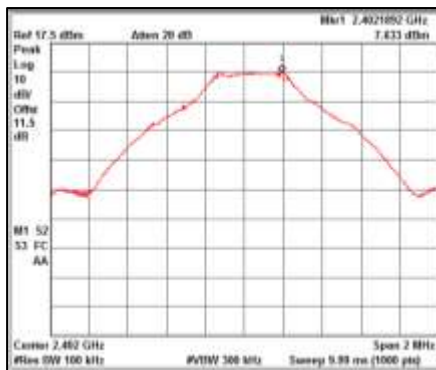
Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Final Value (dBm) = Measured Value (dBm) + Attenuator factor (10dB) + Cable loss (0.5dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 3.60 dBi

7.6.1 Reference plots

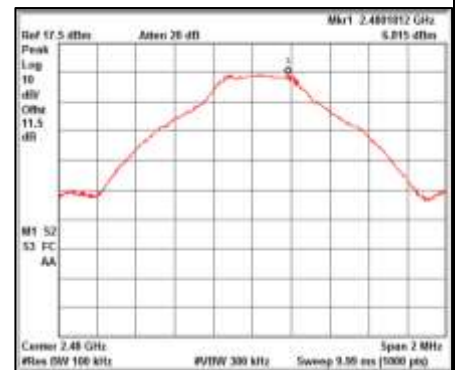
Data Rate: 1Mbps



Reference Plot for Channel Frequency 2402MHz



Reference Plot for Channel Frequency 2440MHz

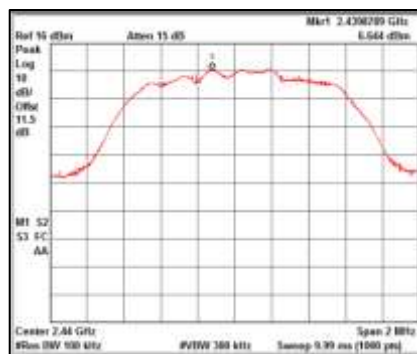


Reference Plot for Channel Frequency 2480MHz

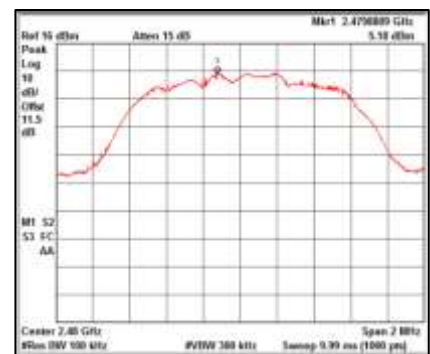
Data Rate: 2Mbps



Reference Plot for Channel Frequency 2402MHz

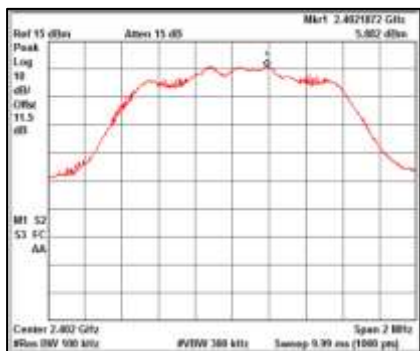


Reference Plot for Channel Frequency 2440MHz

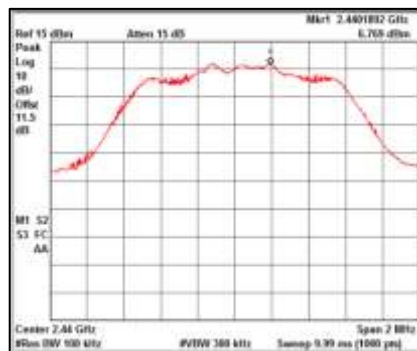


Reference Plot for Channel Frequency 2480MHz

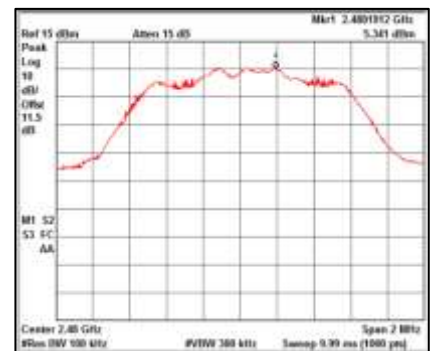
Data Rate: 3Mbps



Reference Plot for Channel Frequency 2402MHz



Reference Plot for Channel Frequency 2440MHz



Reference Plot for Channel Frequency 2480MHz

Prüfbericht - Nr.:

Test Report No.:

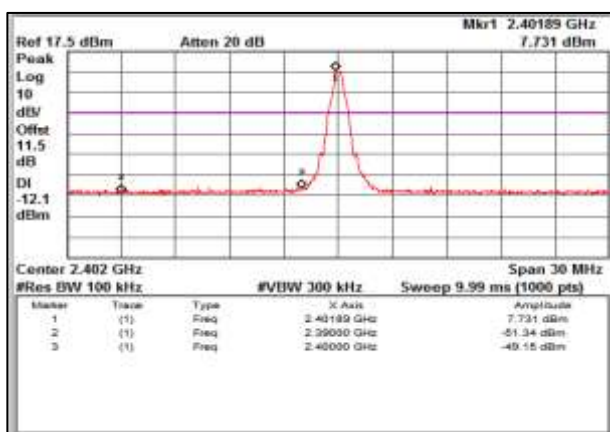
IN2311L3 001

Seite 32 von 59

Page 32 of 59

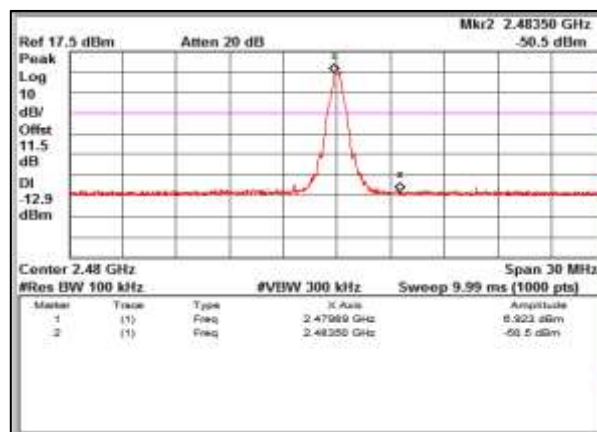
7.6.2 Band Edge

Data rate	Channel Frequency (MHz)	Band edge frequency (MHz)	Value at band edge (A) (dBm)	Reference value (B) (dBm)	A-B (dBc)	Minimum Limit (dBc)
1Mbps	2402.00	2400.00	-51.34	7.63	-58.97	-20
	2480.00	2483.50	-50.50	8.36	-58.86	-20
2Mbps	2402.00	2400.00	-53.11	5.70	-58.81	-20
	2480.00	2483.50	-52.19	5.18	-57.37	-20
3Mbps	2402.00	2400.00	-53.44	5.88	-59.32	-20
	2480.00	2483.50	-54.71	6.76	-61.47	-20



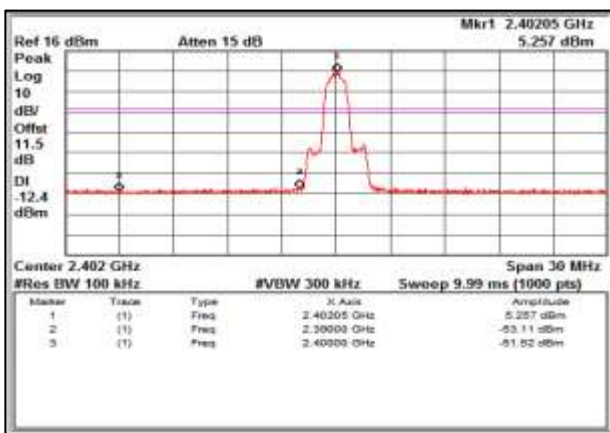
Data rate: 1Mbps

Channel Frequency 2402MHz



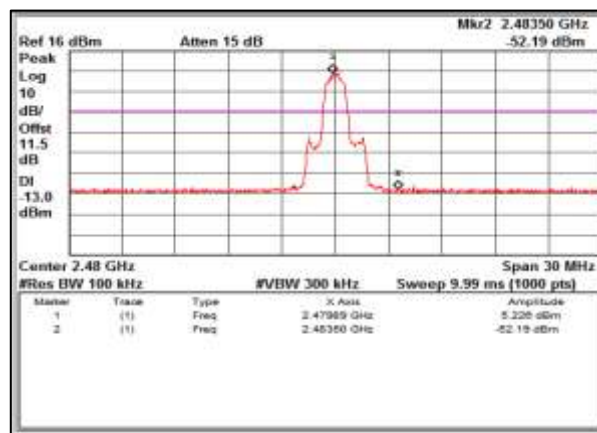
Data rate: 1Mbps

Channel Frequency 2480MHz



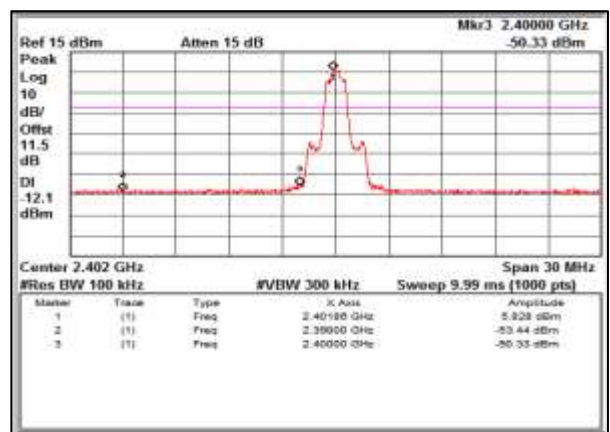
Data rate: 2Mbps

Channel Frequency 2402MHz



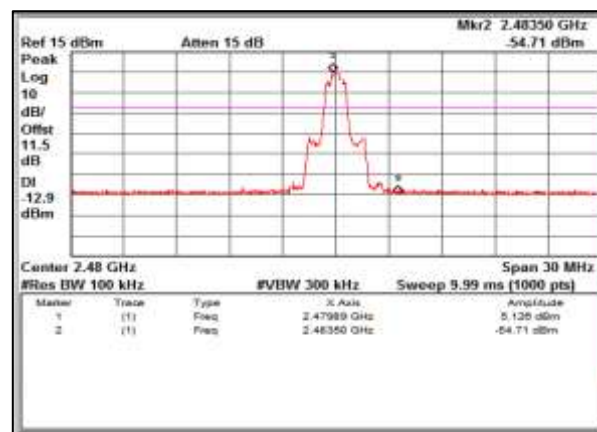
Data rate: 2Mbps

Channel Frequency 2480MHz



Data rate: 3Mbps

Channel Frequency 2402MHz

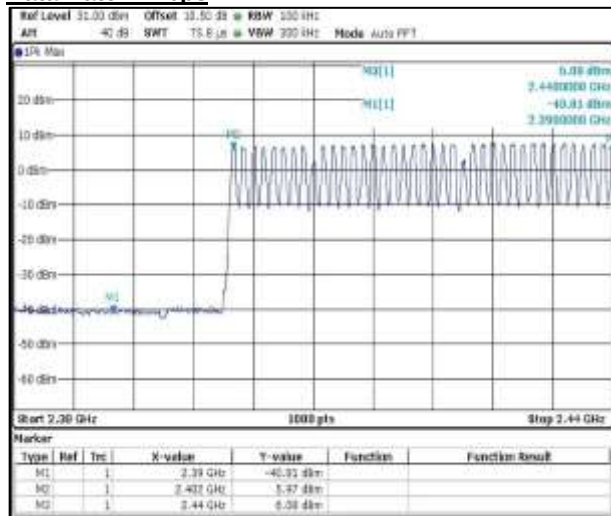


Data rate: 3Mbps

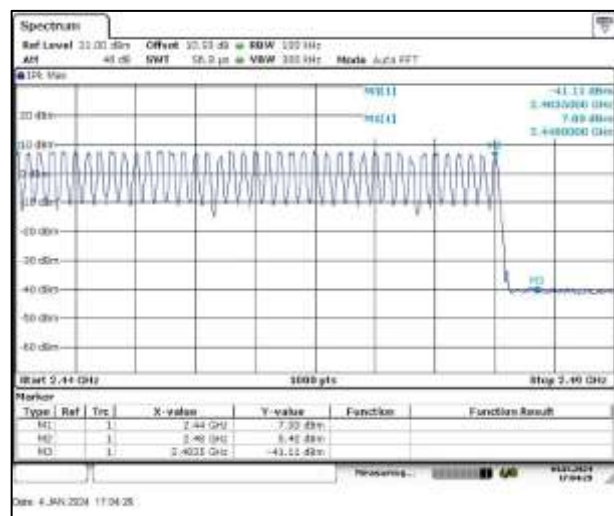
Channel Frequency 2480MHz

7.6.3 Hopping mode ON condition Band Edge

Data Rate: 1Mbps

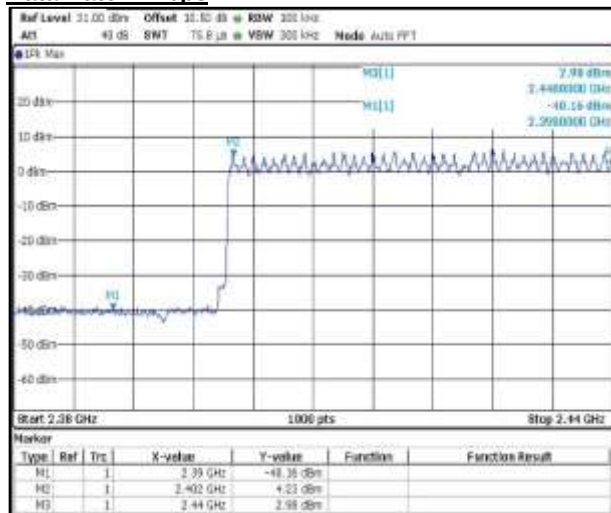


Frequency range: 2380MHz to 2440MHz

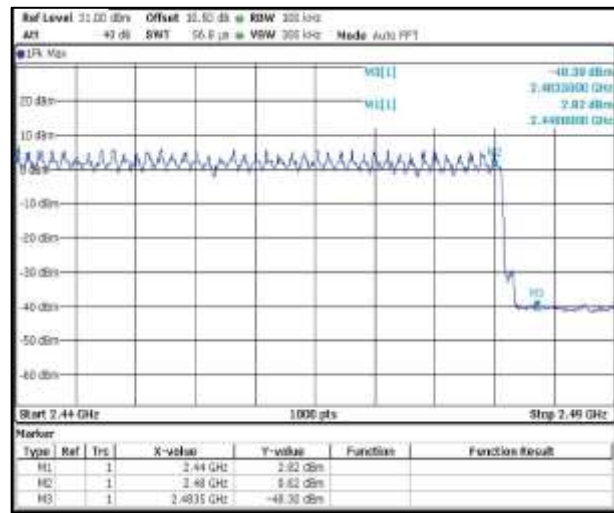


Frequency range: 2440MHz to 2500MHz

Data Rate: 2Mbps

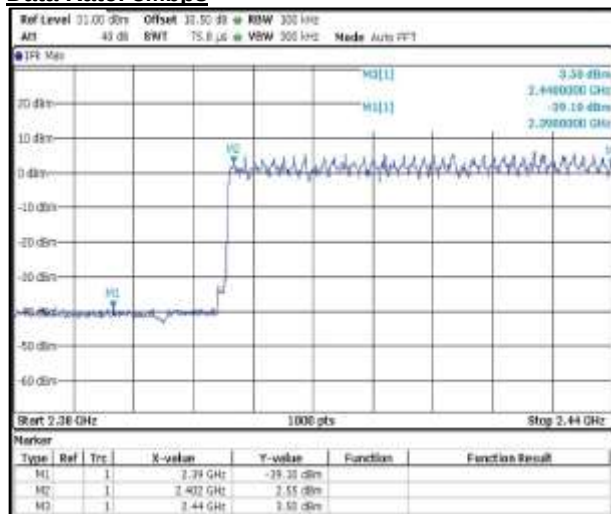


Frequency range: 2380MHz to 2440MHz

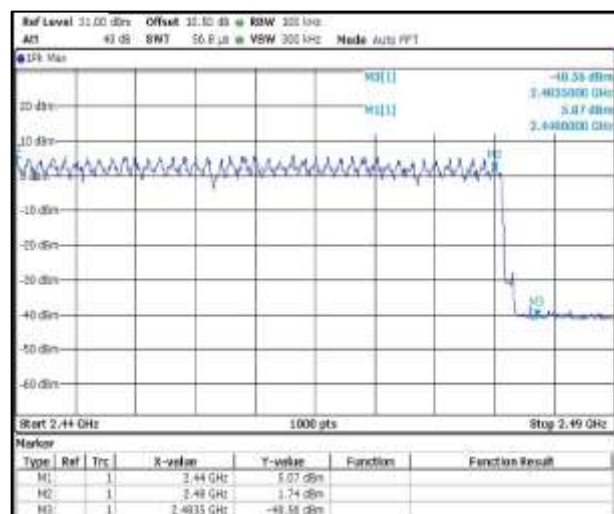


Frequency range: 2440MHz to 2500MHz

Data Rate: 3Mbps



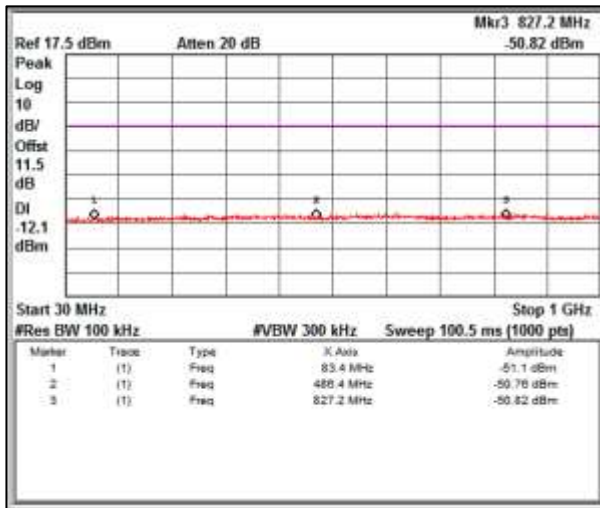
Frequency range: 2380MHz to 2440MHz



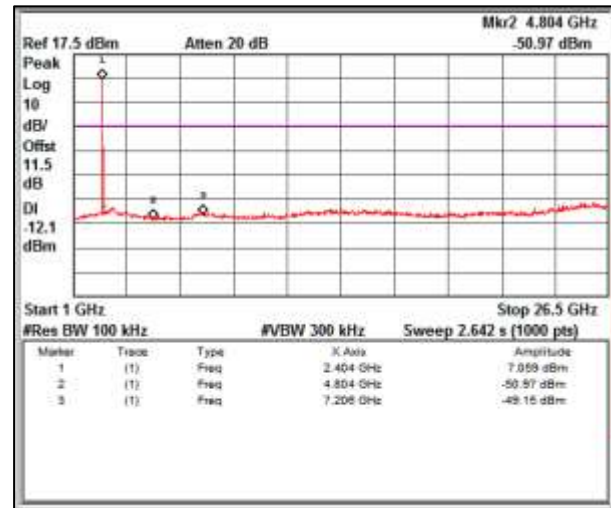
Frequency range: 2440MHz to 2500MHz

7.6.4 Out-Of-Band Emissions

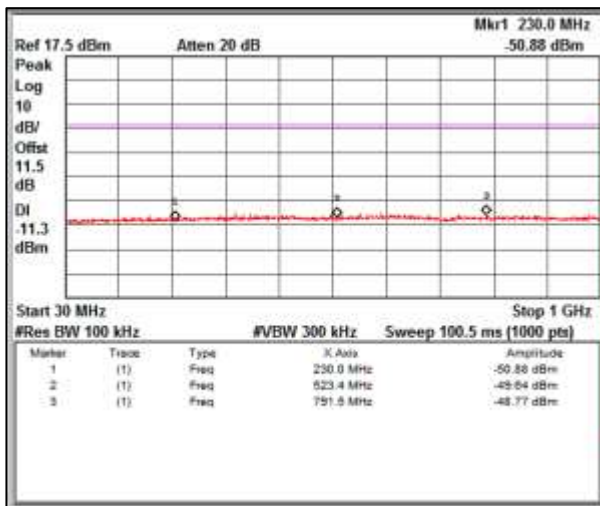
Data Rate: 1Mbps



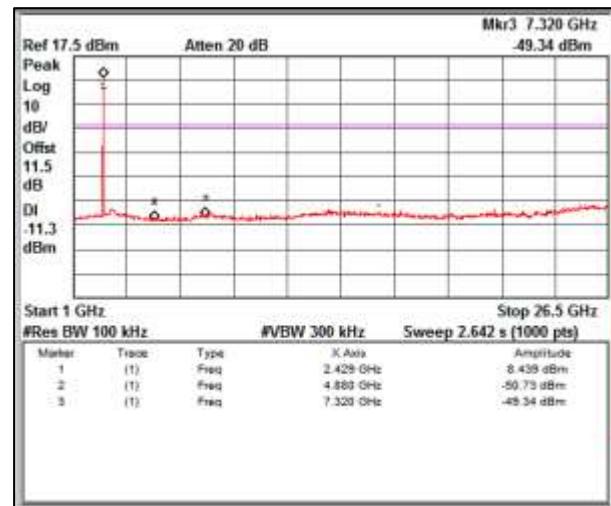
Channel Frequency 2402MHz Frequency Range 30 MHz – 1GHz



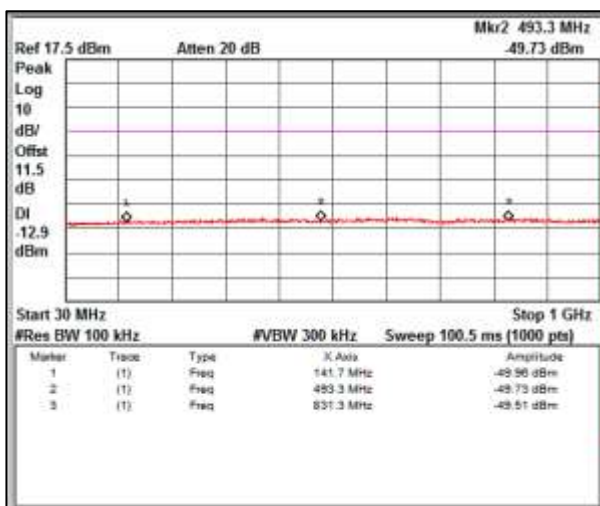
Channel Frequency 2402MHz Frequency Range 1 GHz – 26.5GHz



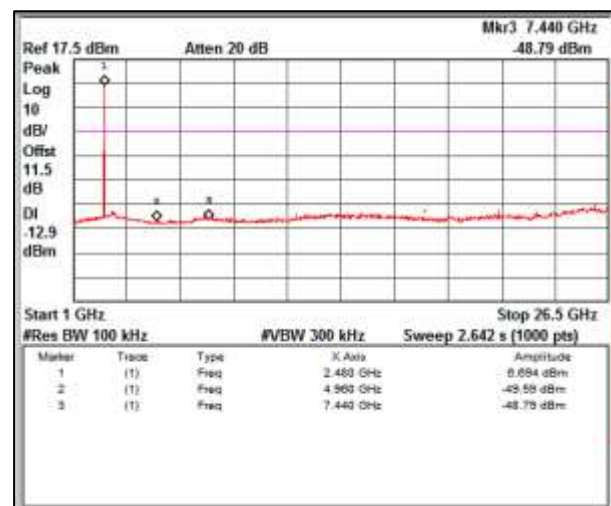
Channel Frequency 2440MHz Frequency Range 30 MHz – 1GHz



Channel Frequency 2440MHz Frequency Range 1 GHz – 26.5GHz

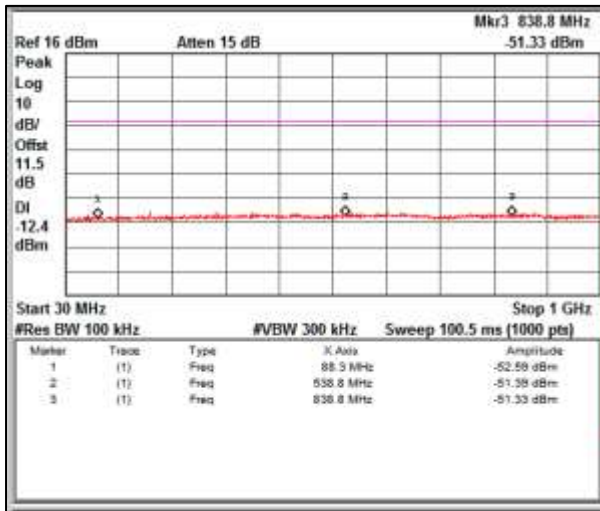


Channel Frequency 2480MHz Frequency Range 30 MHz – 1GHz

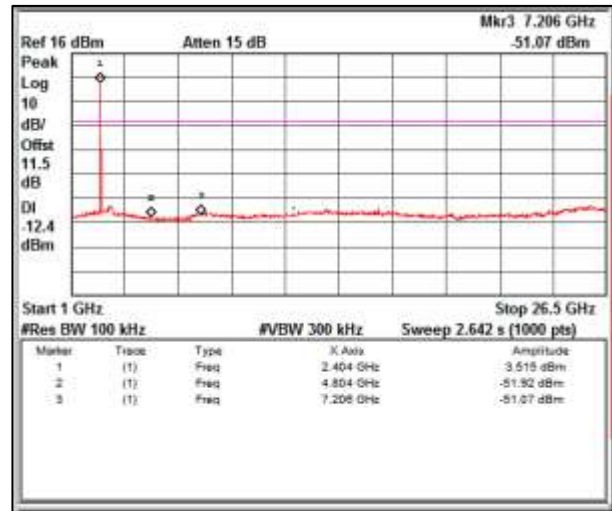


Channel Frequency 2480MHz Frequency Range 1 GHz – 26.5GHz

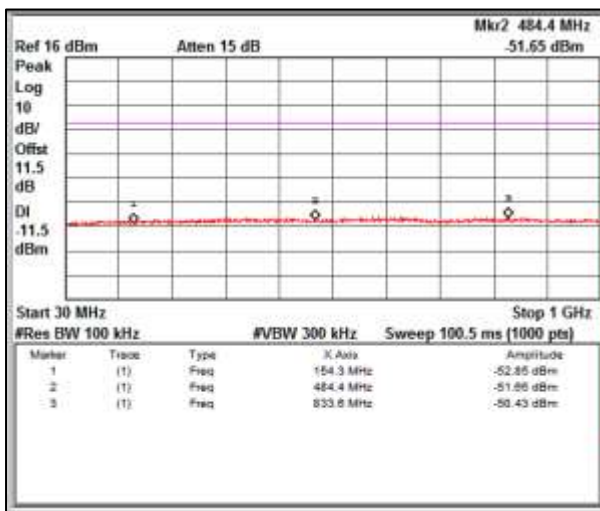
Data Rate: 2Mbps



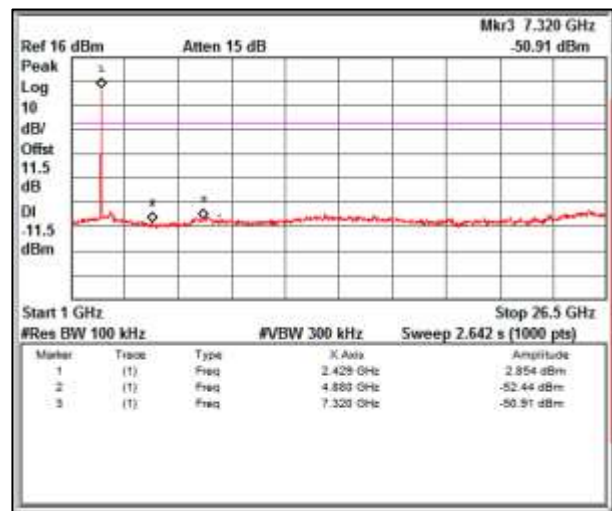
Channel Frequency 2402MHz Frequency Range 30 MHz – 1GHz



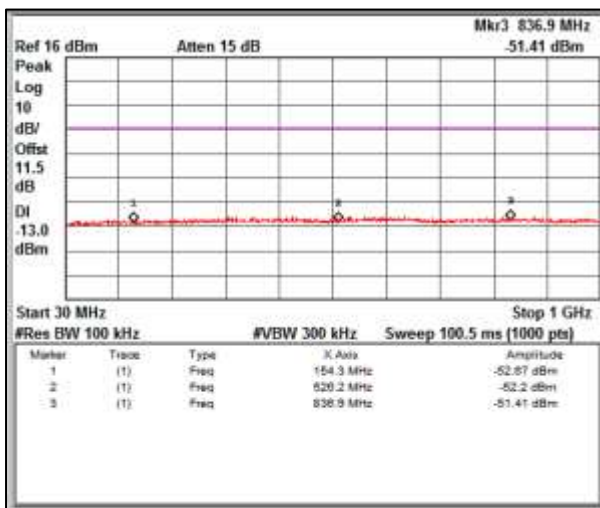
Channel Frequency 2402MHz Frequency Range 1 GHz – 26.5GHz



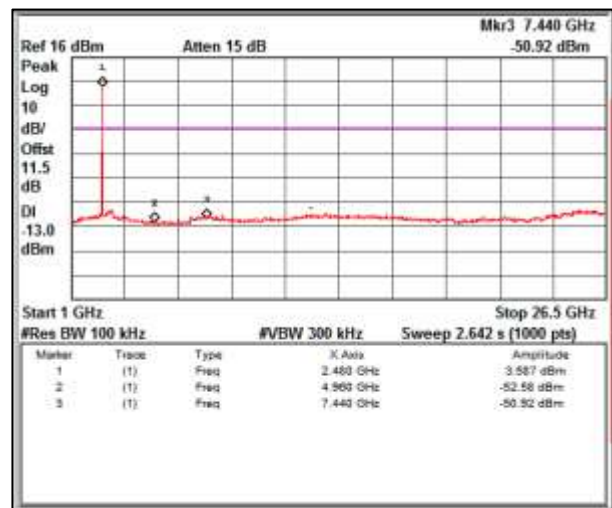
Channel Frequency 2440MHz Frequency Range 30 MHz – 1GHz



Channel Frequency 2440MHz Frequency Range 1 GHz – 26.5GHz

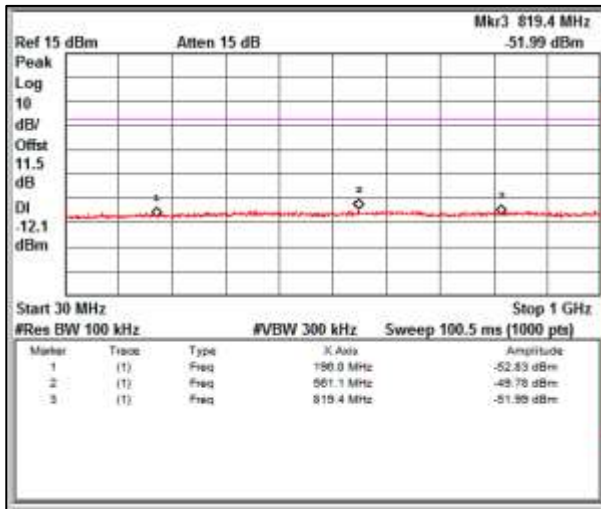


Channel Frequency 2480MHz Frequency Range 30 MHz – 1GHz

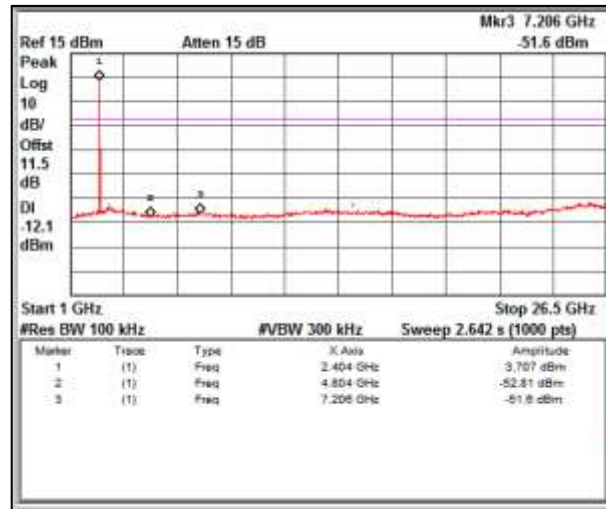


Channel Frequency 2480MHz Frequency Range 1 GHz – 26.5GHz

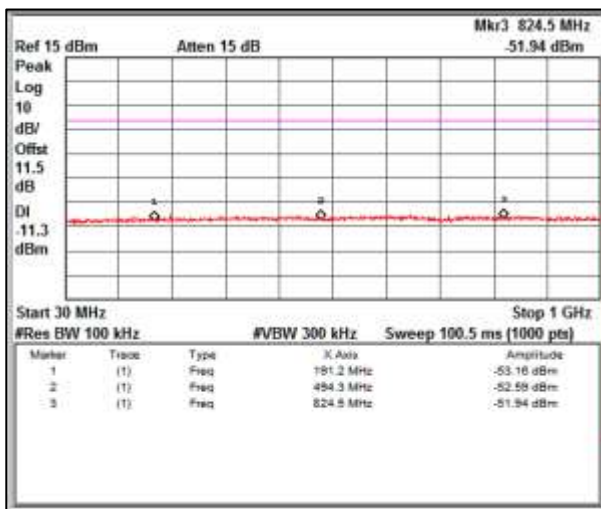
Data Rate: 3Mbps



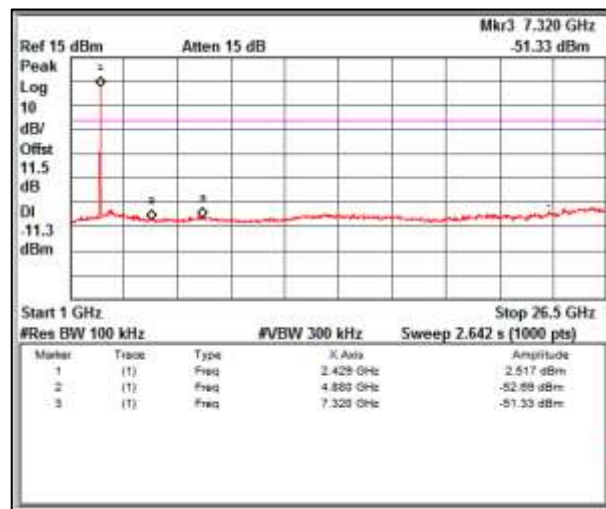
Channel Frequency 2402MHz Frequency Range 30 MHz – 1GHz



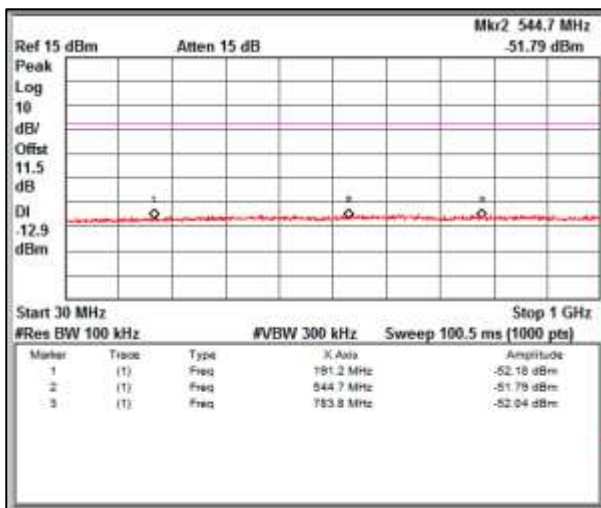
Channel Frequency 2402MHz Frequency Range 1 GHz – 26.5GHz



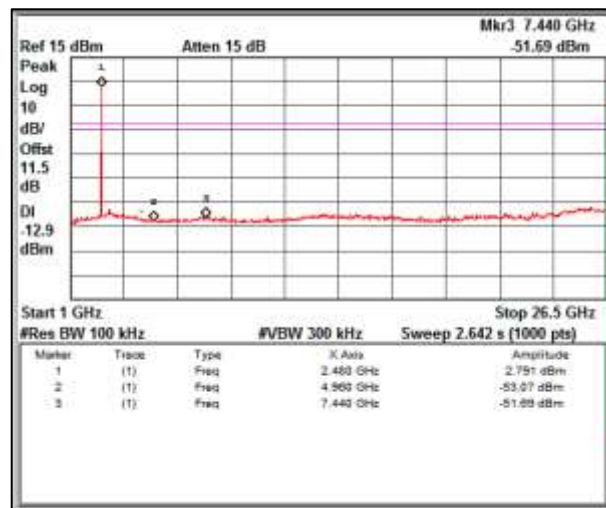
Channel Frequency 2440MHz Frequency Range 30 MHz – 1GHz



Channel Frequency 2440MHz Frequency Range 1 GHz – 26.5GHz



Channel Frequency 2480MHz Frequency Range 30 MHz – 1GHz



Channel Frequency 2480MHz Frequency Range 1 GHz – 26.5GHz

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 37 von 59
Page 37 of 59

7.7 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205)
Test Method	ANSI C63.10
Measurement Location	Semi Anechoic Chamber 30MHz - 1 GHz Fully Anechoic Chamber 1 GHz - 40GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer TEST METHODOLOGY

Table 6: Transmitter limits for Radiated emission

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Conditions:

Temperature (Norm) = + 25 °C Voltage = 3.8V DC through AC to DC adaptor Relative humidity: 62%

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 38 von 59

Page 38 of 59

Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported

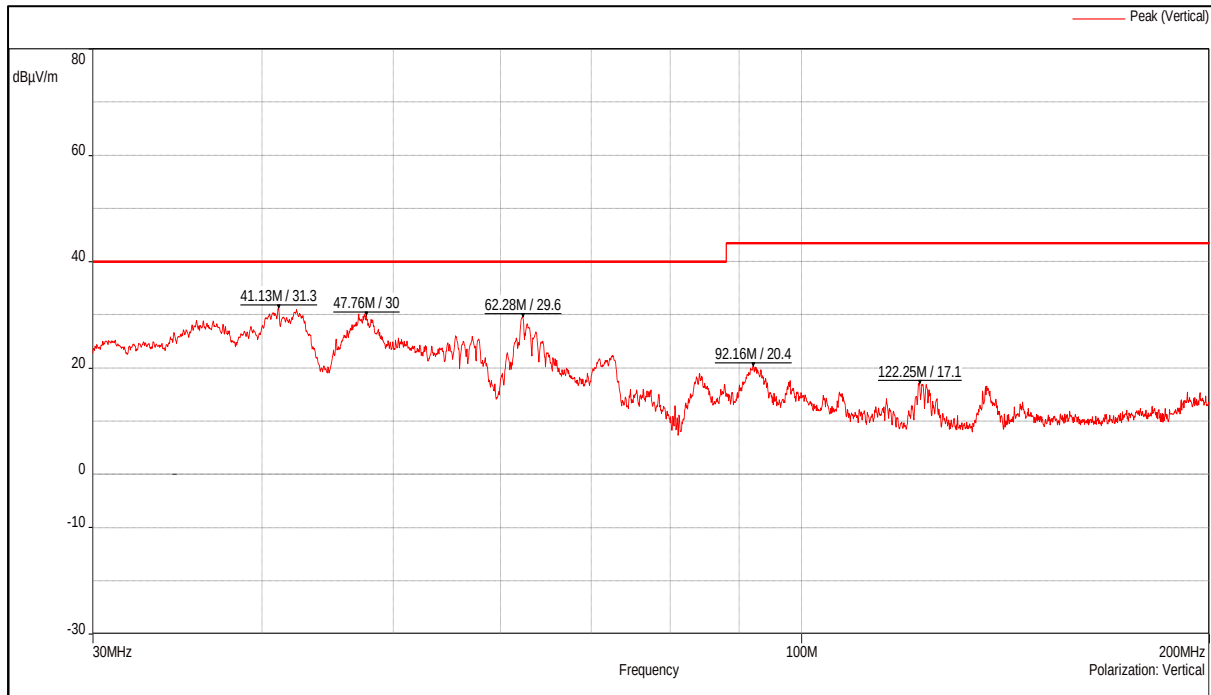
Test results for frequency range 30MHz – 1GHz

Antenna Polarization	Measured Frequency (MHz)	Measured Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Vertical	41.13	31.30	40.00	-8.70
	47.76	30.00	40.00	-10.00
	62.28	29.60	40.00	-10.40
	92.16	20.40	43.50	-23.10
	122.25	17.10	43.50	-26.40
	245.18	24.00	46.00	-22.00
	305.24	22.20	46.00	-23.80
	342.38	21.00	46.00	-25.00
Horizontal	42.33	16.30	40.00	-23.70
	62.16	11.60	40.00	-28.40
	104.01	12.80	43.50	-30.70
	149.31	12.80	43.50	-30.70
	244.43	22.60	46.00	-23.40
	341.45	18.50	46.00	-27.50
	468.44	17.80	46.00	-28.20

Prüfbericht - Nr.:
Test Report No.:

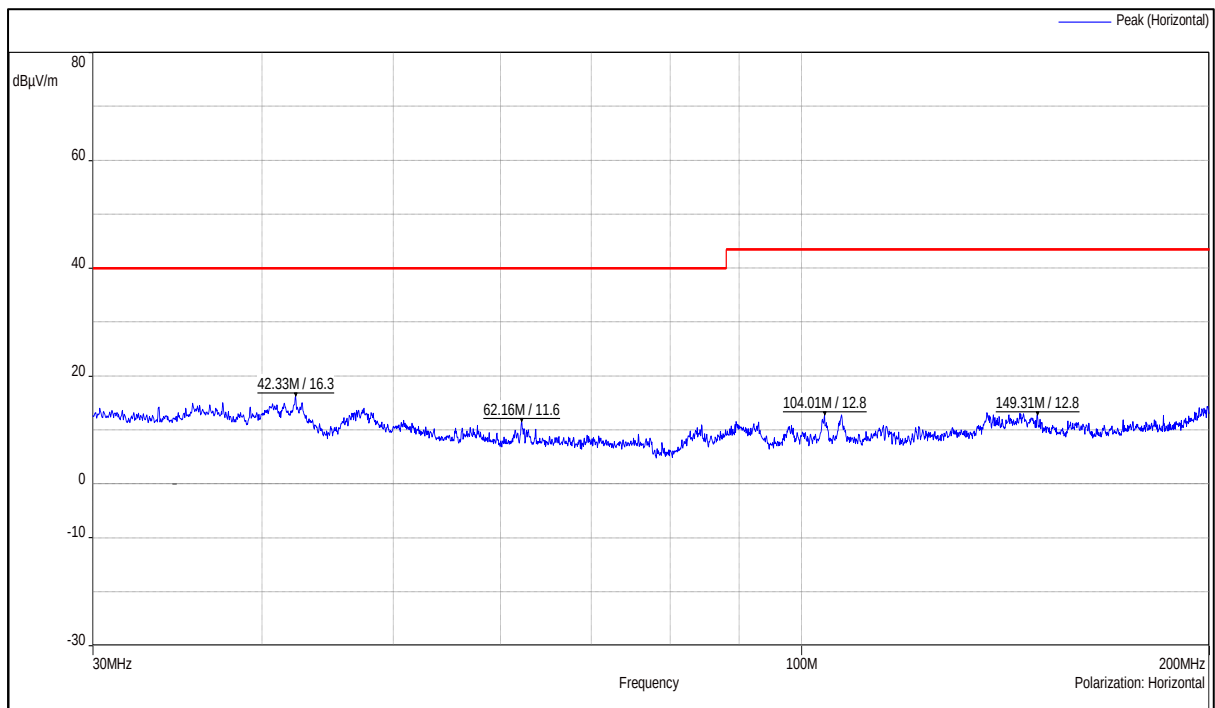
IN23I1L3 001

Seite 39 von 59
Page 39 of 59



Channel Frequency 30MHz – 200MHz

Polarization Vertical



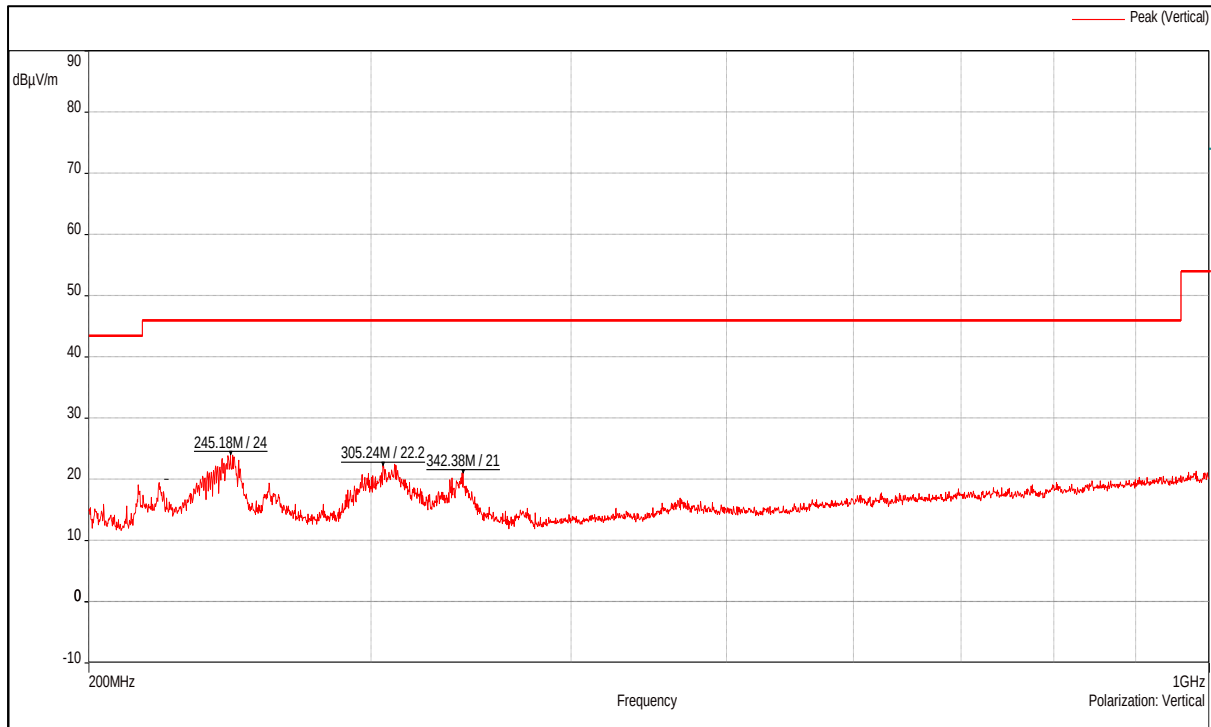
Channel Frequency 30MHz – 200MHz

Polarization Horizontal

Prüfbericht - Nr.:
Test Report No.:

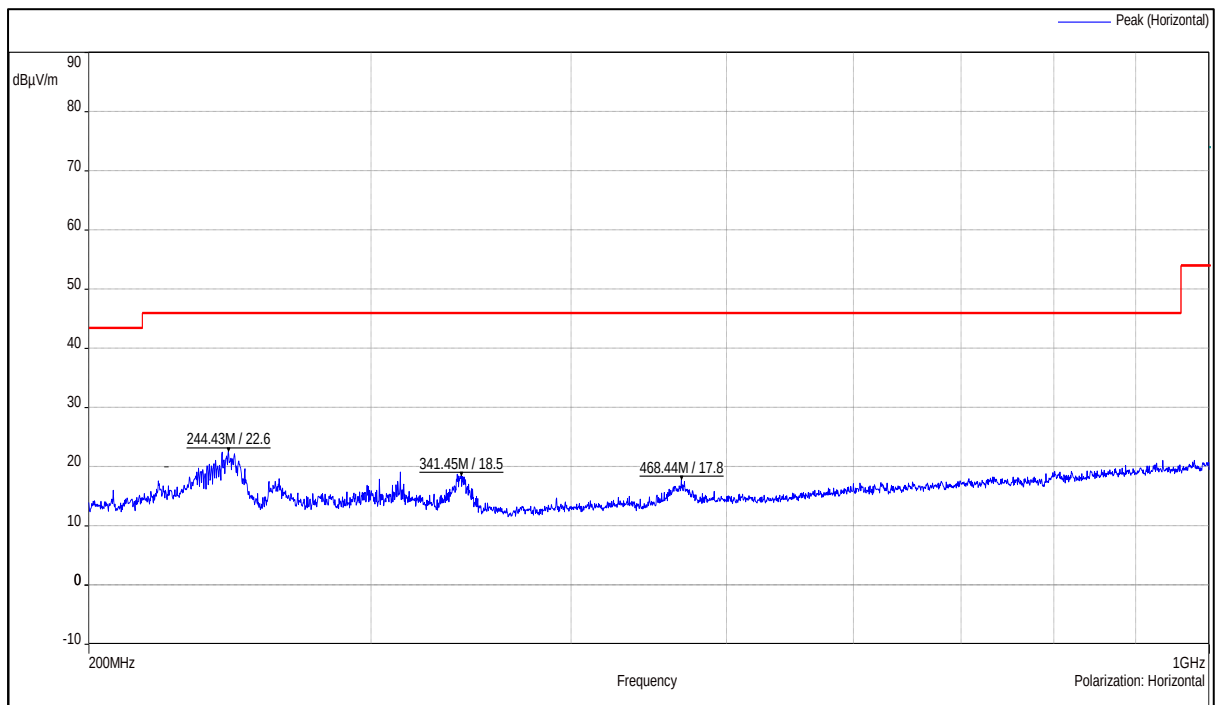
IN23I1L3 001

Seite 40 von 59
Page 40 of 59



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

Prüfbericht - Nr.:
Test results for the frequencies above 1GHz **IN23I1L3 001**
Test Report No.:

Seite 41 von 59
Page 41 of 59

Data rate (Mbps)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	2402	2390(Pk)	Vertical	91.97	74.00*	17.97
		2390(Av)		89.45	54.00*	35.45
		2402(Pk)		37.17	-	-
		2402(Av)		24.25	-	-
		4804(Pk)		42.17	74.00	-31.83
		4804(Av)		29.09	54.00	-24.91
		7206(Pk)		46.86	74.00	-27.14
		7206(Av)		35.11	54.00	-18.89
		2390(Pk)	Horizontal	92.71	74.00*	18.71
		2390(Av)		90.16	54.00*	36.16
		2402(Pk)		36.81	-	-
		2402(Av)		24.37	-	-
		4804(Pk)		41.67	74.00	-32.33
		4804(Av)		29.15	54.00	-24.85
		7206(Pk)		47.40	74.00	-26.60
		7206(Av)		35.10	54.00	-18.90
	2440	2440(Pk)	Vertical	94.26	-	-
		2440(Av)		91.42	-	-
		4880(Pk)		41.15	74.00	-32.85
		4880(Av)		29.05	54.00	-24.95
		7320(Pk)		47.81	74.00	-26.19
		7320(Av)		34.97	54.00	-19.03
		2440(Pk)	Horizontal	95.67	-	-
		2440(Av)		92.63	-	-
		4880(Pk)		41.69	74.00	-32.31
		4880(Av)		29.03	54.00	-24.97
		7320(Pk)		47.22	74.00	-26.78
		7320(Av)		34.96	54.00	-19.04
	2480	2480(Pk)	Vertical	96.85	-	-
		2480(Av)		94.30	-	-
		2483.5(Pk)		42.60	74.00*	-31.40
		2483.5(Av)		26.32	54.00*	-27.68
		4960(Pk)		41.42	74.00	-32.58
		4960(Av)		29.07	54.00	-24.93
		7440(Pk)		47.19	74.00	-26.81
		7440(Av)		35.00	54.00	-19.00
		2480(Pk)	Horizontal	96.85	-	-
		2480(Av)		94.30	-	-
		2483.5(Pk)		42.60	74.00*	-31.40
		2483.5(Av)		26.32	54.00*	-27.68
		4960(Pk)		40.62	74.00	-33.38
		4960(Av)		29.42	54.00	-24.58
		7440(Pk)		47.47	74.00	-26.53
		7440(Av)		35.00	54.00	-19.00

* : Indicate restricted band of operation §15.205

- : Fundamental Frequency

Pk: Peak Detector; Av: Average Detector

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 42 von 59

Page 42 of 59

Data rate (Mbps)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2	2402	2390(Pk)	Vertical	90.45	74.00*	16.45
		2390(Av)		84.85	54.00*	30.85
		2402(Pk)		36.53	-	-
		2402(Av)		24.11	-	-
		4804(Pk)		41.40	74.00	-32.60
		4804(Av)		29.08	54.00	-24.92
		7206(Pk)		47.22	74.00	-26.78
		7206(Av)		35.07	54.00	-18.93
		2390(Pk)	Horizontal	90.03	74.00*	16.03
		2390(Av)		84.88	54.00*	30.88
		2402(Pk)		36.66	-	-
		2402(Av)		24.06	-	-
		4804(Pk)		41.32	74.00	-32.68
		4804(Av)		29.04	54.00	-24.96
		7206(Pk)		47.00	74.00	-27.00
		7206(Av)		35.10	54.00	-18.90
	2440	2440(Pk)	Vertical	92.76	-	-
		2440(Av)		87.62	-	-
		4880(Pk)		41.54	74.00	-32.46
		4880(Av)		29.00	54.00	-25.00
		7320(Pk)		47.08	74.00	-26.92
		7320(Av)		34.93	54.00	-19.07
		2440(Pk)	Horizontal	94.44	-	-
		2440(Av)		89.09	-	-
		4880(Pk)		41.14	74.00	-32.86
		4880(Av)		29.03	54.00	-24.97
		7320(Pk)		47.97	74.00	-26.03
		7320(Av)		34.97	54.00	-19.03
	2480	2480(Pk)	Vertical	94.15	-	-
		2480(Av)		89.10	-	-
		2483.5(Pk)		40.62	74.00*	-33.38
		2483.5(Av)		25.76	54.00*	-28.24
		4960(Pk)		41.06	74.00	-32.94
		4960(Av)		29.01	54.00	-24.99
		7440(Pk)		47.33	74.00	-26.67
		7440(Av)		35.01	54.00	-18.99
		2480(Pk)	Horizontal	95.49	-	-
		2480(Av)		90.36	-	-
		2483.5(Pk)		40.87	74.00*	-33.13
		2483.5(Av)		25.94	54.00*	-28.06
		4960(Pk)		40.56	74.00	-33.44
		4960(Av)		29.09	54.00	-24.91
		7440(Pk)		47.57	74.00	-26.43
		7440(Av)		35.01	54.00	-18.99

* : Indicate restricted band of operation §15.205

- : Fundamental Frequency

Pk: Peak Detector; Av: Average Detector

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 43 von 59

Page 43 of 59

Data Rate (Mbps)	Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
3	2402	2390(Pk)	Vertical	90.88	74.00*	16.88
		2390(Av)		85.37	54.00*	31.37
		2402(Pk)		37.62	-	-
		2402(Av)		24.12	-	-
		4804(Pk)		41.45	74.00	-32.55
		4804(Av)		29.19	54.00	-24.81
		7206(Pk)		47.18	74.00	-26.82
		7206(Av)		35.11	54.00	-18.89
		2390(Pk)	Horizontal	91.58	74.00*	17.58
		2390(Av)		86.24	54.00*	32.24
		2402(Pk)		37.28	-	-
		2402(Av)		24.10	-	-
		4804(Pk)		41.13	74.00	-32.87
		4804(Av)		29.17	54.00	-24.83
		7206(Pk)		47.35	74.00	-26.65
		7206(Av)		35.08	54.00	-18.92
	2440	2440(Pk)	Vertical	93.15	-	-
		2440(Av)		87.77	-	-
		4880(Pk)		41.32	74.00	-32.68
		4880(Av)		29.03	54.00	-24.97
		7320(Pk)		46.77	74.00	-27.23
		7320(Av)		34.94	54.00	-19.06
		2440(Pk)	Horizontal	94.67	-	-
		2440(Av)		89.38	-	-
		4880(Pk)		41.41	74.00	-32.59
		4880(Av)		29.06	54.00	-24.94
		7320(Pk)		46.70	74.00	-27.30
		7320(Av)		34.99	54.00	-19.01
	2480	2480(Pk)	Vertical	93.81	-	-
		2480(Av)		88.92	-	-
		2483.5(Pk)		41.03	74.00*	-32.97
		2483.5(Av)		25.71	54.00*	-28.29
		4960(Pk)		41.19	74.00	-32.81
		4960(Av)		29.04	54.00	-24.96
		7440(Pk)		47.44	74.00	-26.56
		7440(Av)		35.04	54.00	-18.96
		2480(Pk)	Horizontal	95.75	-	-
		2480(Av)		90.34	-	-
		2483.5(Pk)		41.24	74.00*	-32.76
		2483.5(Av)		25.85	54.00*	-28.15
		4960(Pk)		41.10	74.00	-32.90
		4960(Av)		29.00	54.00	-25.00
		7440(Pk)		47.11	74.00	-26.89
		7440(Av)		35.00	54.00	-19.00

* : Indicate restricted band of operation §15.205

- : Fundamental Frequency

Pk: Peak Detector; Av: Average Detector

Prüfbericht - Nr.:

Test Report No.:

IN23I1L3 001

Seite 44 von 59

Page 44 of 59

Simultaneous Opertaion:

Combination of Wi-Fi 2.4GHz and Bluetooth 2.4GHz:

Channnel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	4824(Pk)	46.15	74.00	-27.85
		4824(Av)	31.81	54.00	-22.19
		7236(Pk)	47.41	74.00	-26.59
		7236(Av)	34.79	54.00	-19.21
2402		4804(Pk)	41.86	74.00	-32.14
		4804(Av)	28.92	54.00	-25.08
		7206(Pk)	48.38	74.00	-25.62
		7206(Av)	34.80	54.00	-19.20
2412	Horizontal	4824(Pk)	43.39	74.00	-30.61
		4824(Av)	30.05	54.00	-23.95
		7236(Pk)	46.88	74.00	-27.12
		7236(Av)	34.70	54.00	-19.30
2402		4804(Pk)	42.09	74.00	-31.91
		4804(Av)	28.89	54.00	-25.11
		7206(Pk)	47.43	74.00	-26.57
		7206(Av)	34.74	54.00	-19.26

Prüfbericht - Nr.:

Test Report No.:

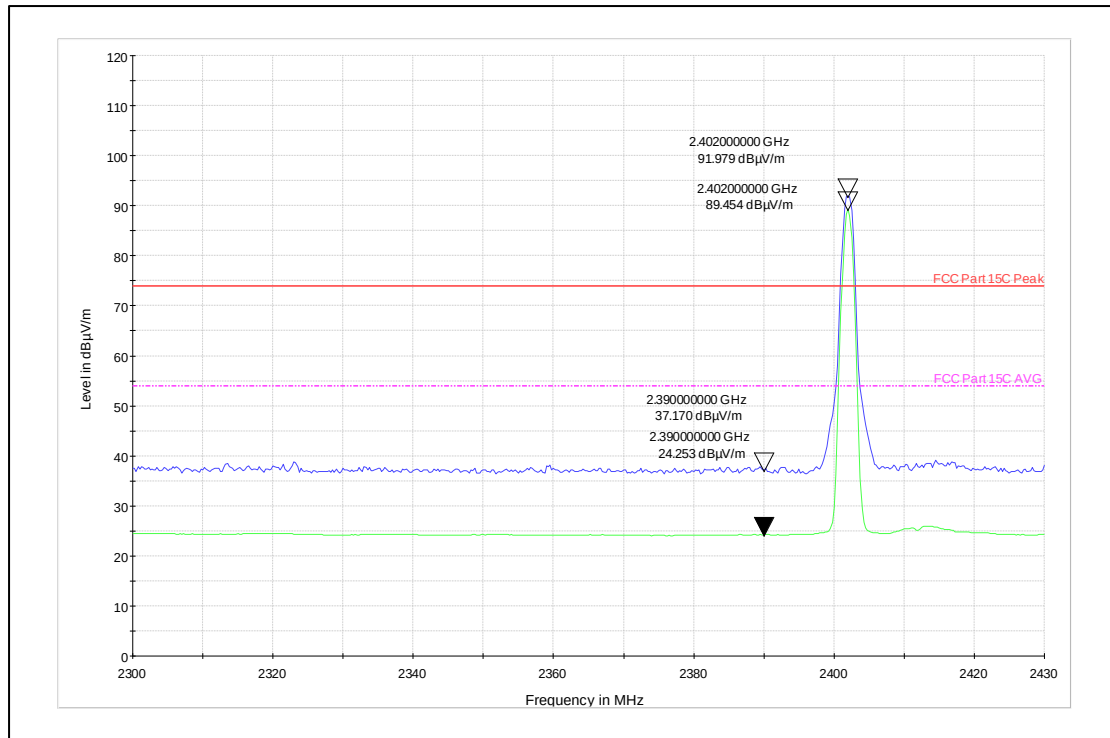
IN2311L3 001

Seite 45 von 59

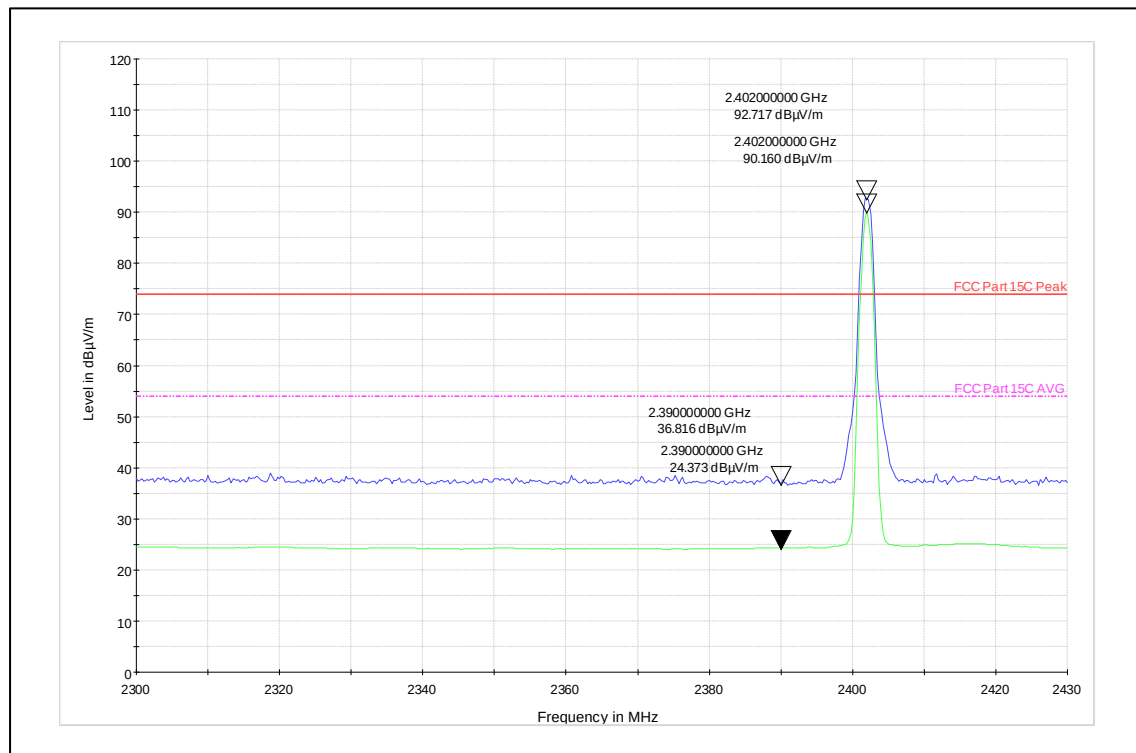
Page 45 of 59

Worst Case Plots Reported

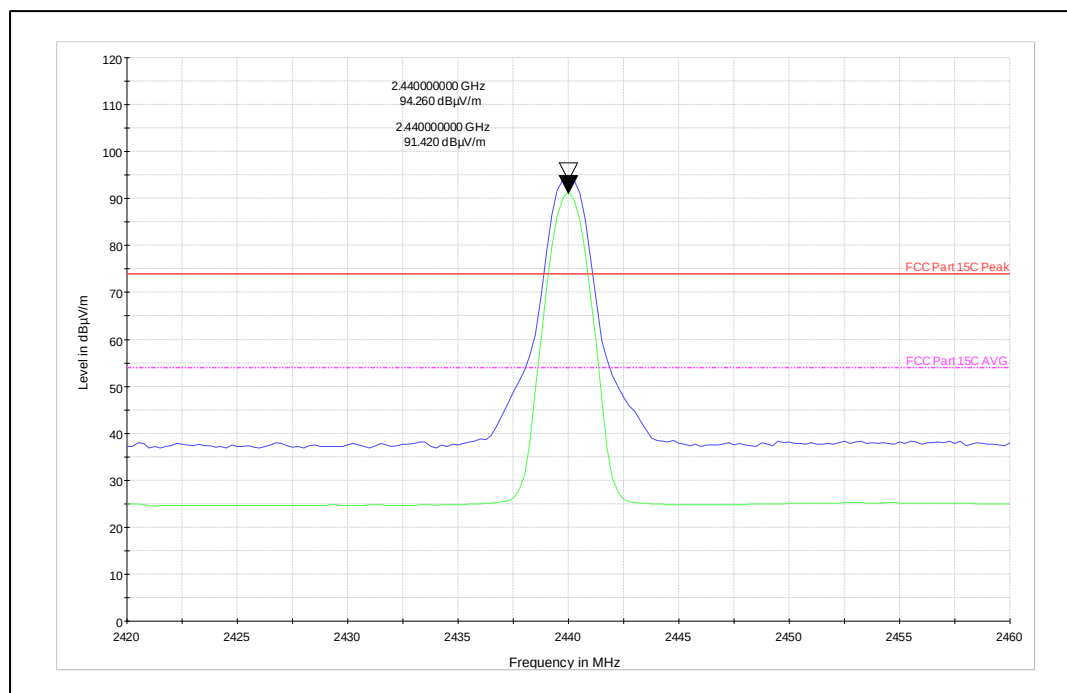
Channel Frequency -2402MHz_Vertical Polarization



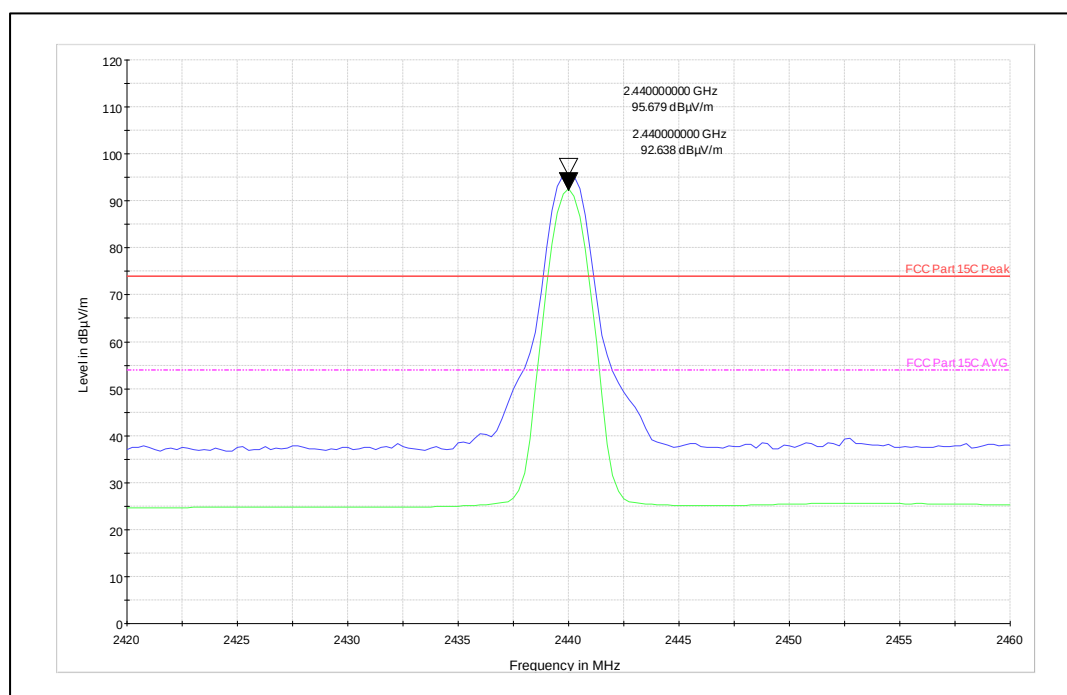
Channel Frequency -2402MHz_Horizontal Polarization



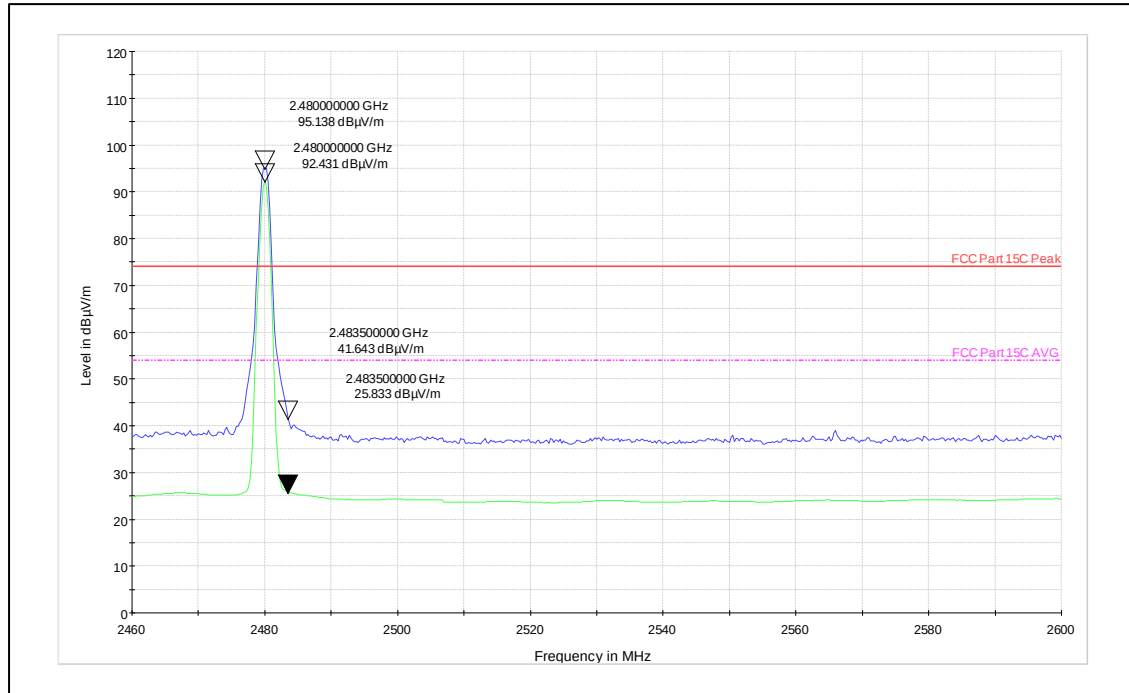
Channel Frequency -2440MHz_Vertical Polarization



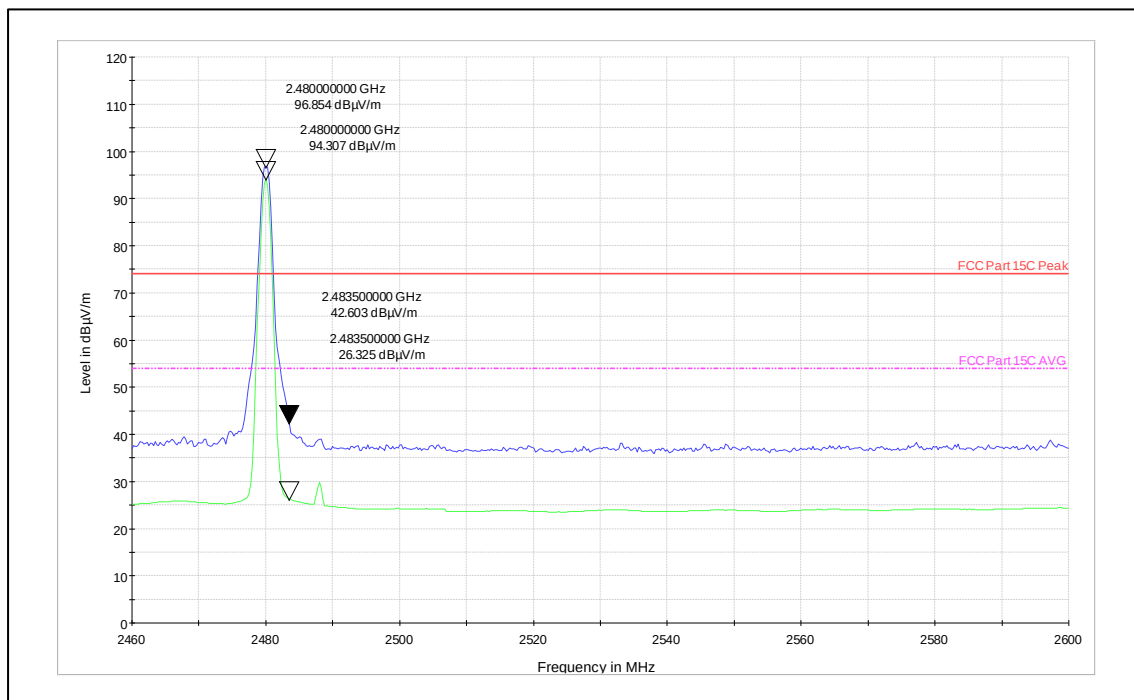
Channel Frequency -2440MHz_Horizontal Polarization



Channel Frequency -2480MHz_Vertical Polarization



Channel Frequency -2480MHz_Horizontal Polarization



Prüfbericht - Nr.:

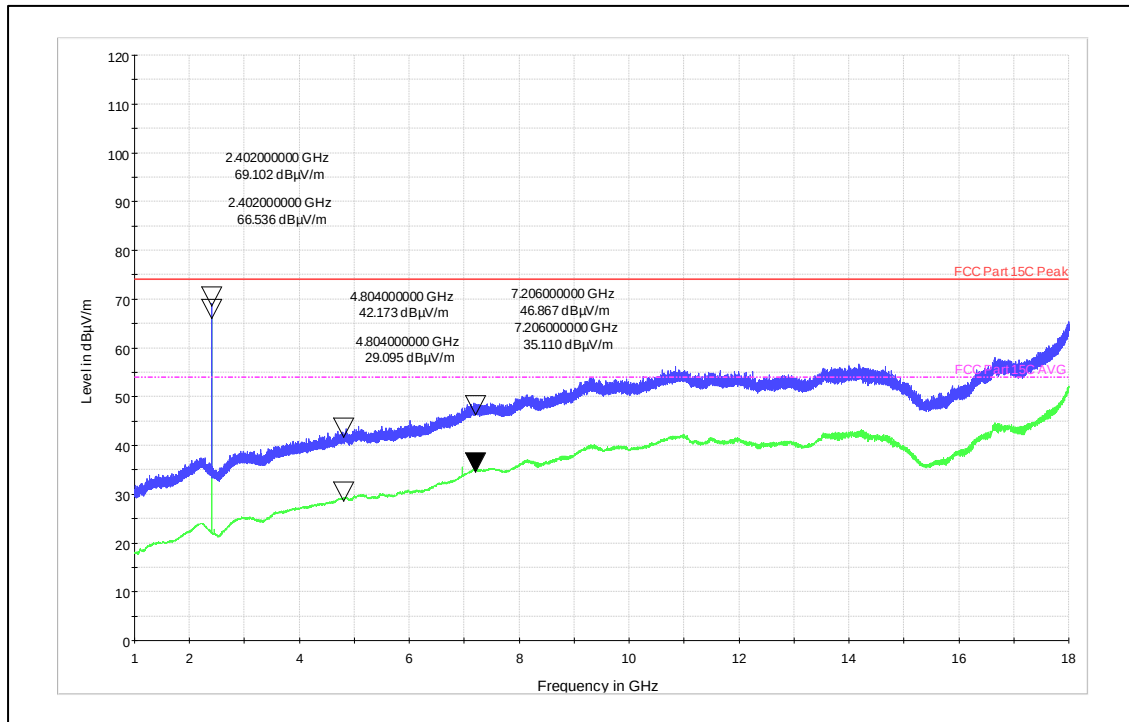
Test Report No.:

IN23I1L3 001

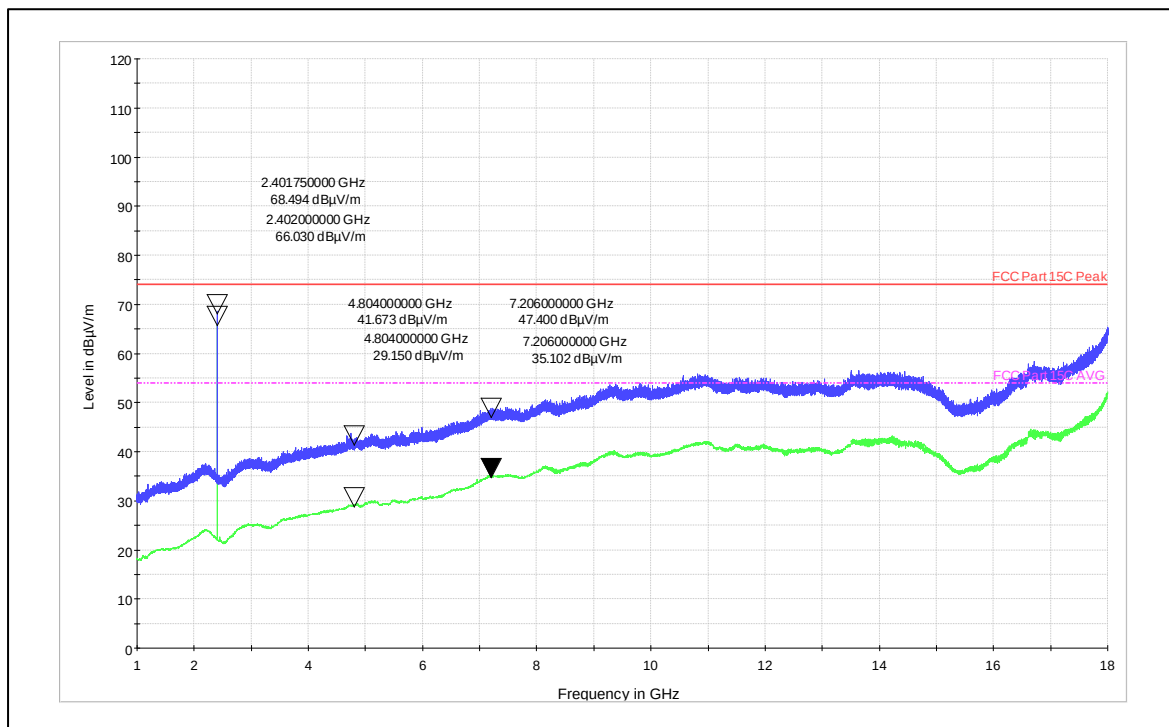
Seite 48 von 59

Page 48 of 59

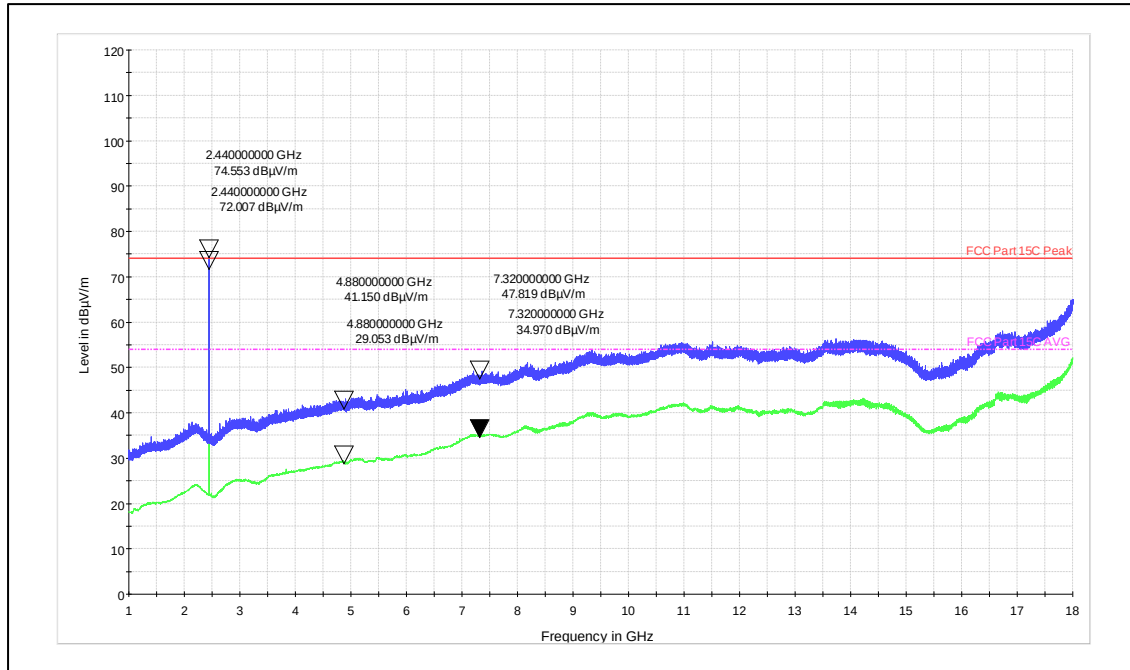
Channel Frequency -2402MHz_Vertical Polarization _1-18GHz



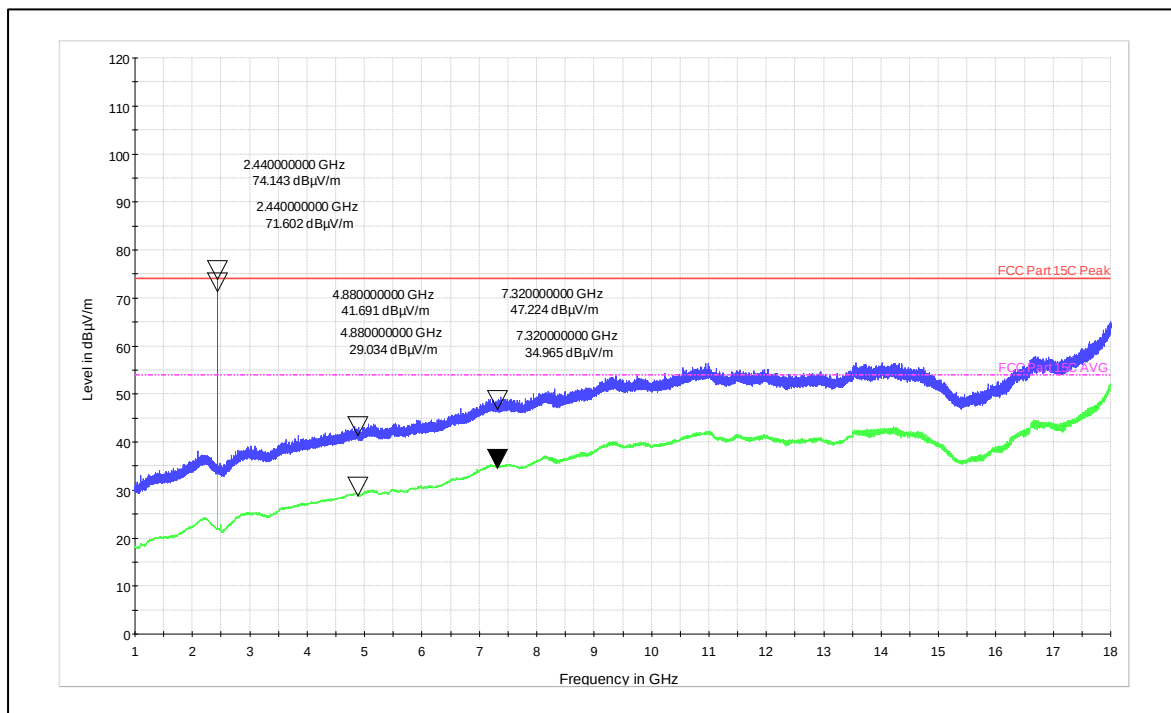
Channel Frequency-2402MHz_Horizontal Polarization _1-18GHz



Channel Frequency -2440MHz_Vertical Polarization _1-18GHz



Channel Frequency-2440MHz_Horizontal Polarization _1-18GHz



Prüfbericht - Nr.:

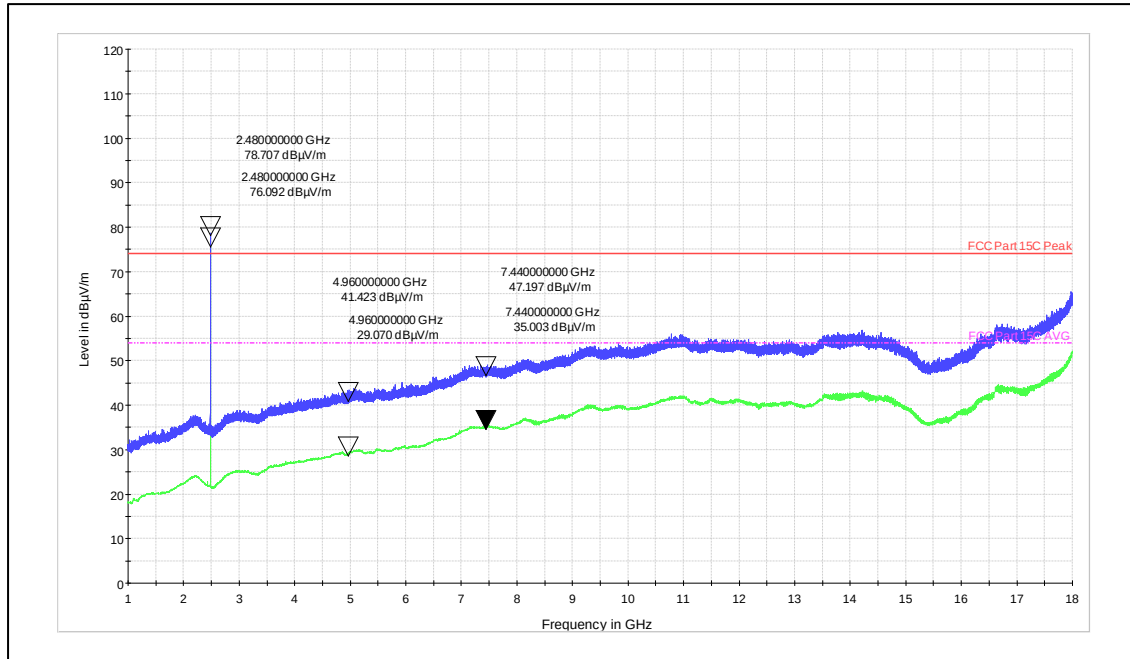
Test Report No.:

IN23I1L3 001

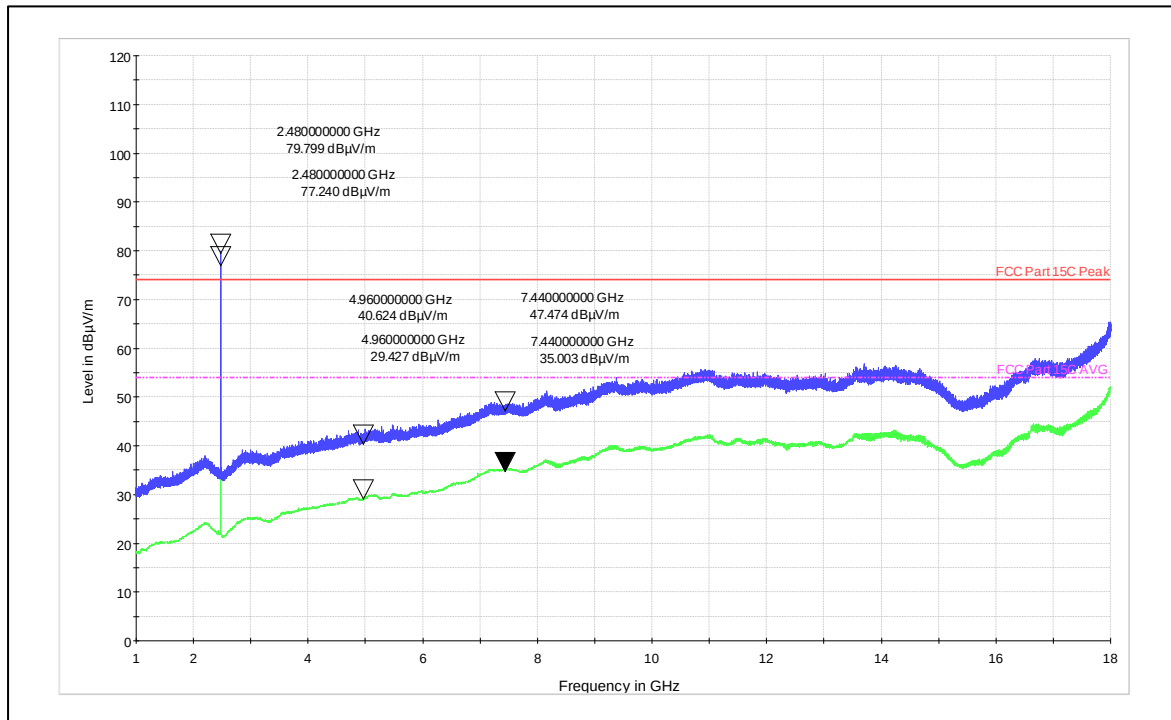
Seite 50 von 59

Page 50 of 59

Channel Frequency -2480MHz_Vertical Polarization _1-18GHz



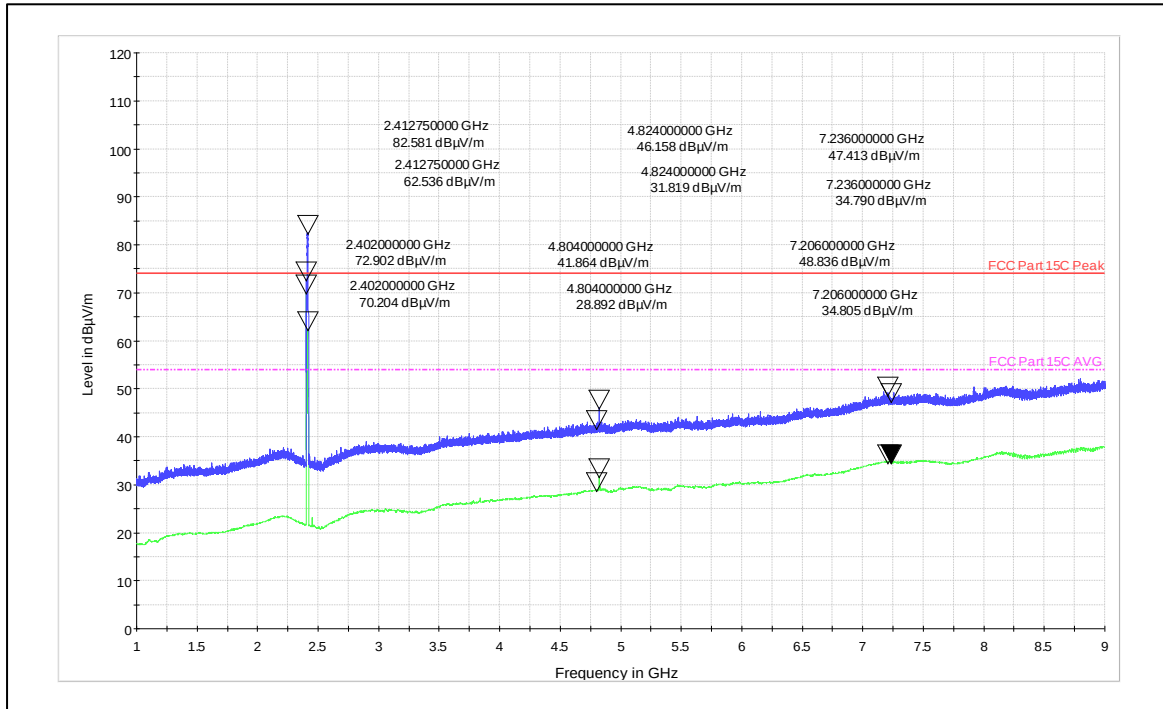
Channel Frequency-2480MHz_Horizontal Polarization _1-18GHz



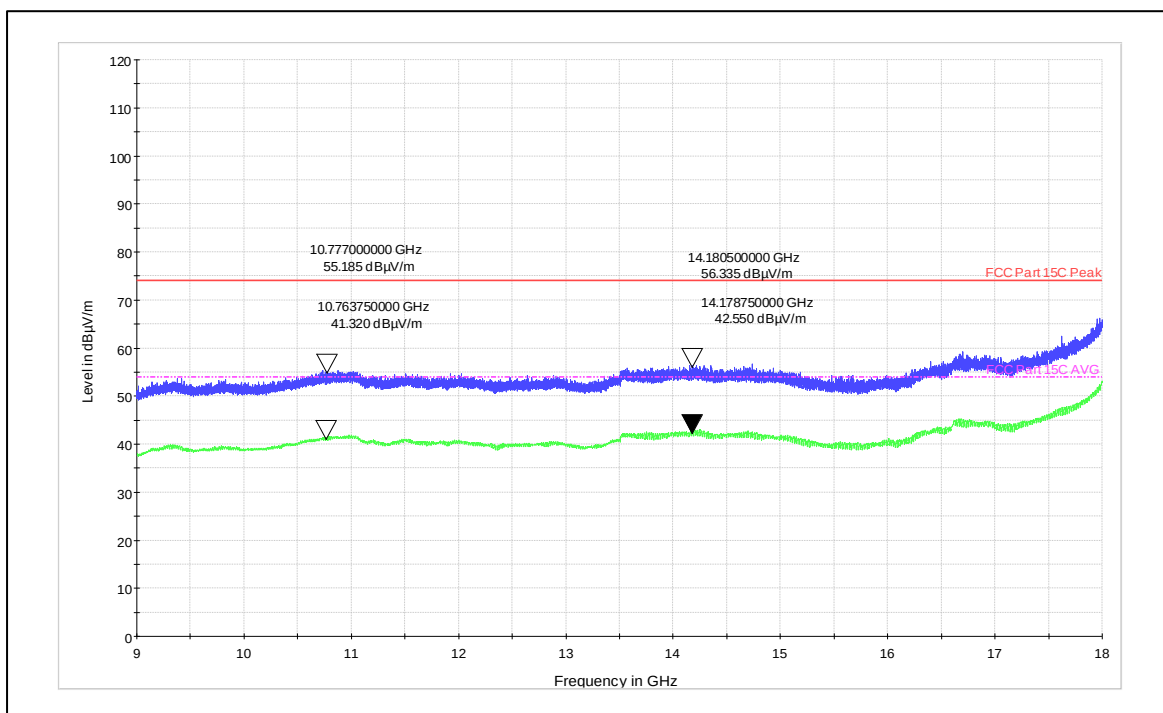
Simultaneous Operation:

Combination of Wi-Fi 2.4GHz and Bluetooth 2.4GHz:

Channel Frequency -2412MHz and Channel Frequency 2402MHz_Vertical Polarization 1GHz-9GHz



Channel Frequency -2412MHz and Channel Frequency 2402MHz_Vertical Polarization _9GHz-18GHz



Prüfbericht - Nr.:

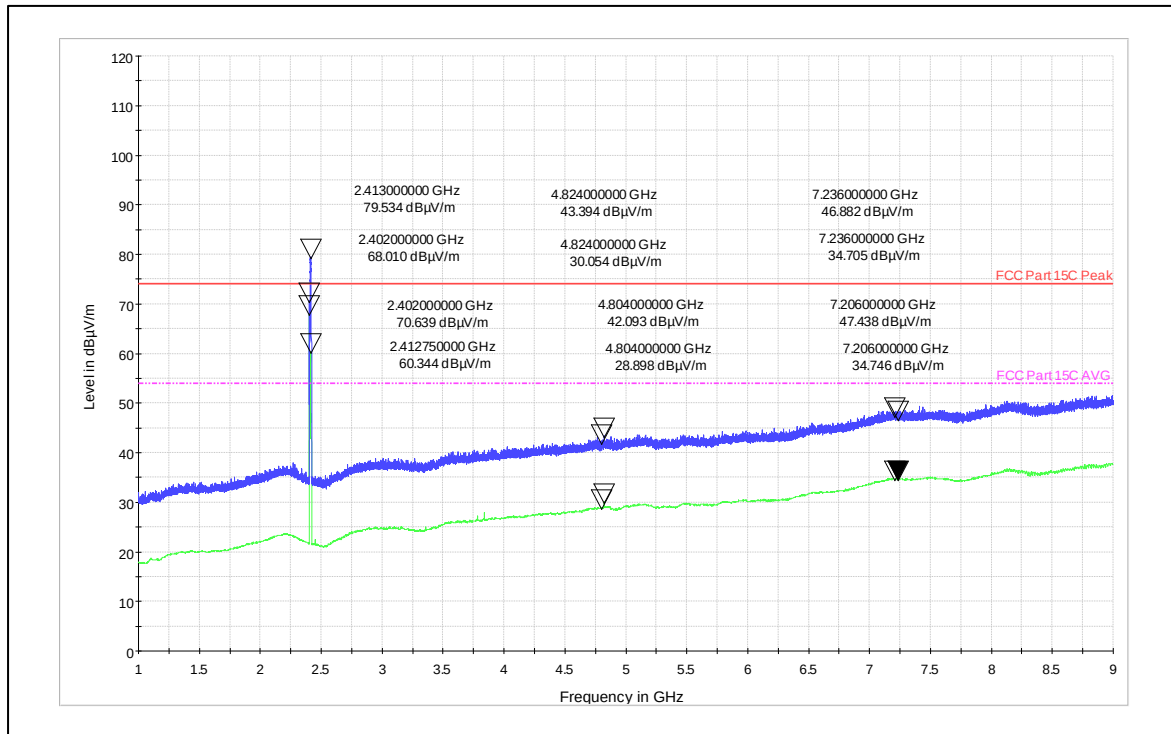
Test Report No.:

IN23I1L3 001

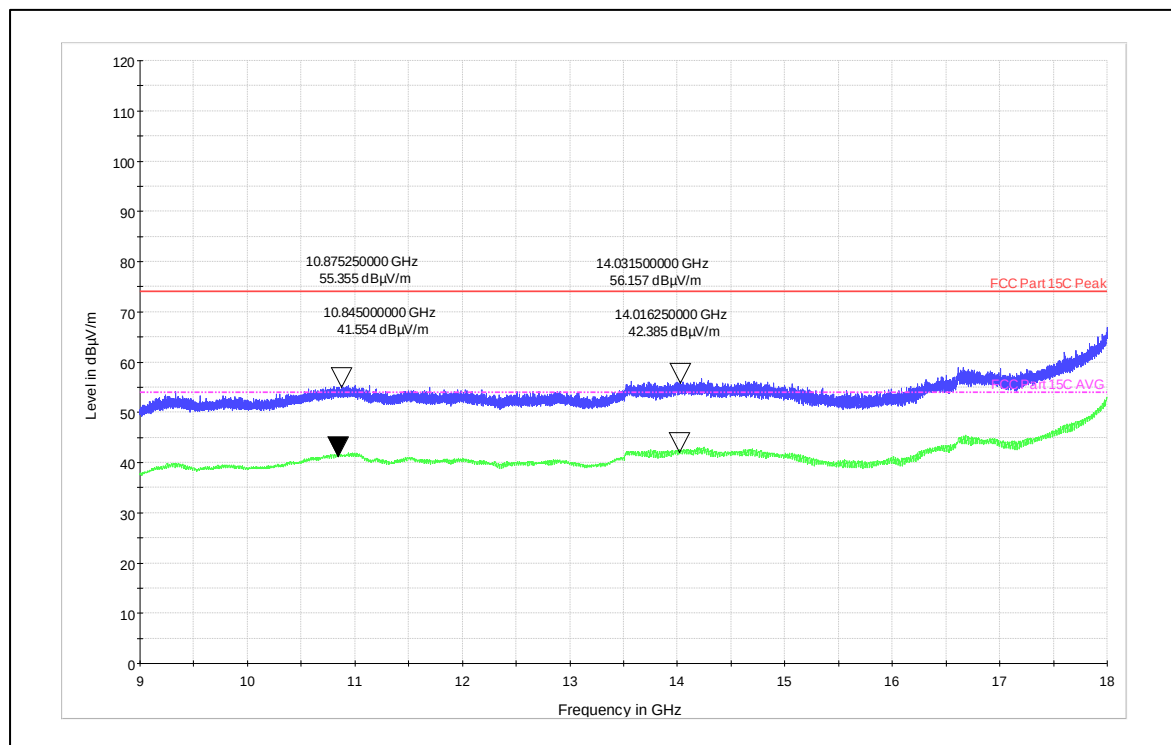
Seite 52 von 59

Page 52 of 59

Channel Frequency -2412MHz and Channel Frequency 2402MHz_Horizontal Polarization _1GHz-9GHz



Channel Frequency -2412MHz and Channel Frequency 2402MHz_Horizontal Polarization _9GHz-18GHz



Prüfbericht - Nr.:

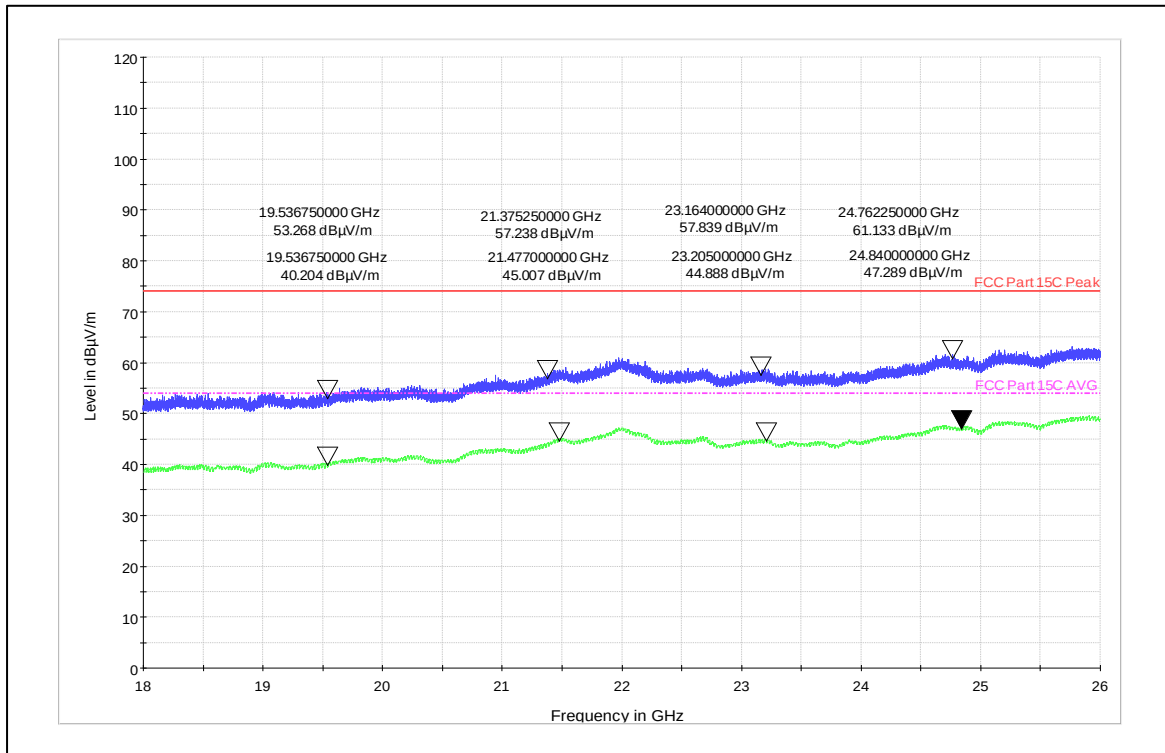
Test Report No.:

IN23I1L3 001

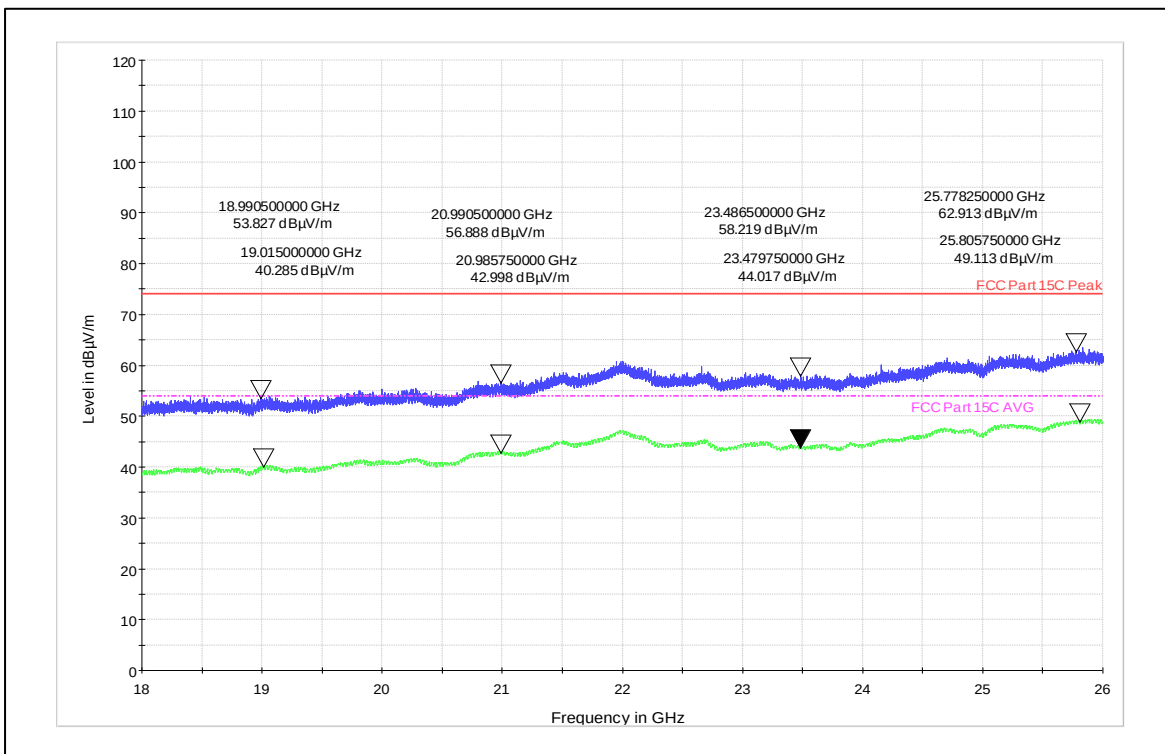
Seite 53 von 59

Page 53 of 59

Frequency Range: 18GHz - 26GHz_Vertical Polarization

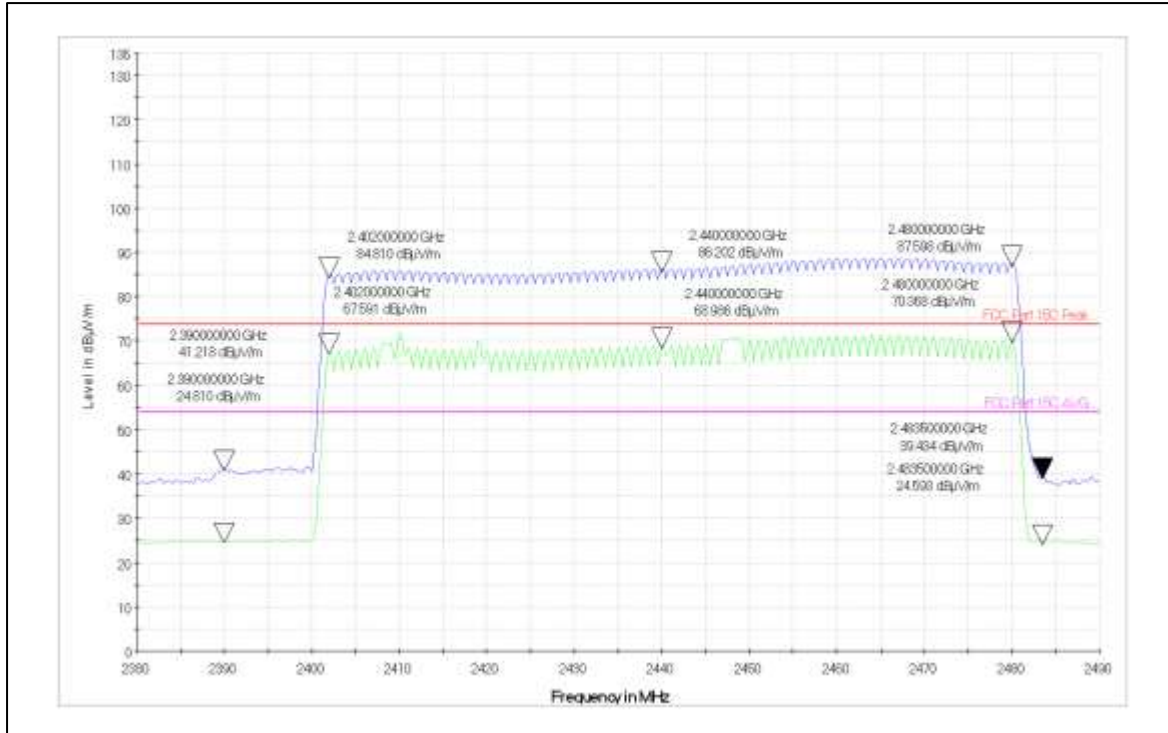


Frequency Range: 18GHz - 26GHz_Horizontal Polarization

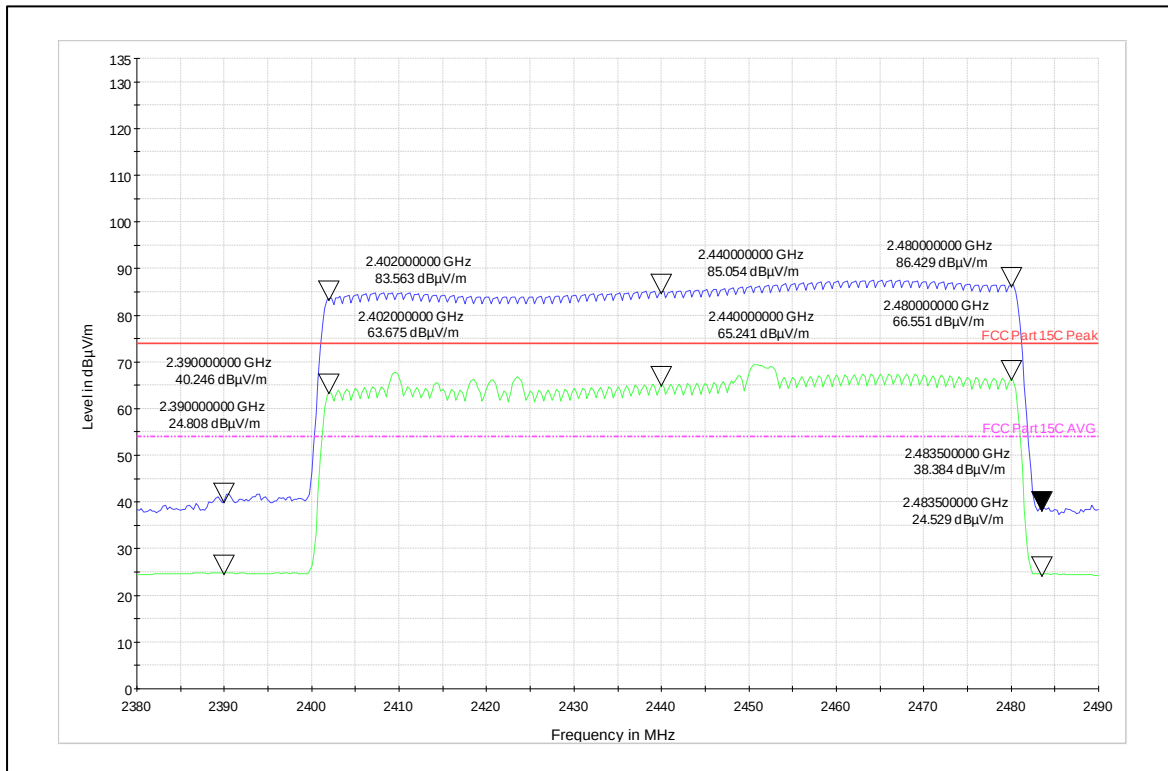


7.8 Hopping Mode ON Condition Band Edge

Frequency Range - 2402MHz – 2480MHz _1Mbps Data Rate



Frequency Range - 2402MHz – 2480MHz _2Mbps Data Rate



Prüfbericht - Nr.:

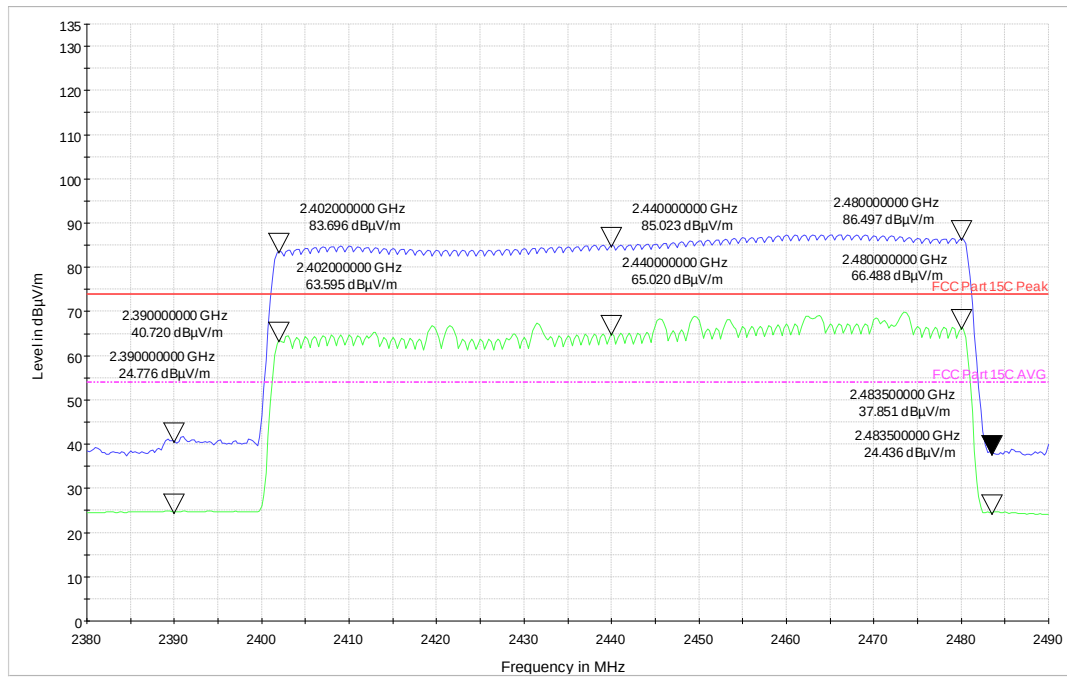
Test Report No.:

IN23I1L3 001

Seite 55 von 59

Page 55 of 59

Frequency Range - 2402MHz – 2480MHz _3Mbps Data Rate



Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 56 von 59
Page 56 of 59

8 CONDUCTED SPURIOUS EMISSION TEST ON AC POWER LINE

Result

Pass

Test Specification : FCC Part 15 Section 15.207
Test Method : ANSI C 63.10-2013
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 110VAC,60Hz
Test Method : Refer TEST METHODOLOGY

Limits of section 15.207

Frequency of emission	QP Limit	AV Limit
(MHz)	(dBμV)	(dBμV)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Conditions:

Normal Temperature = +24°C Voltage (V norm) = 110V AC (Through AC to DC Adapter) Relative Humidity = 64%

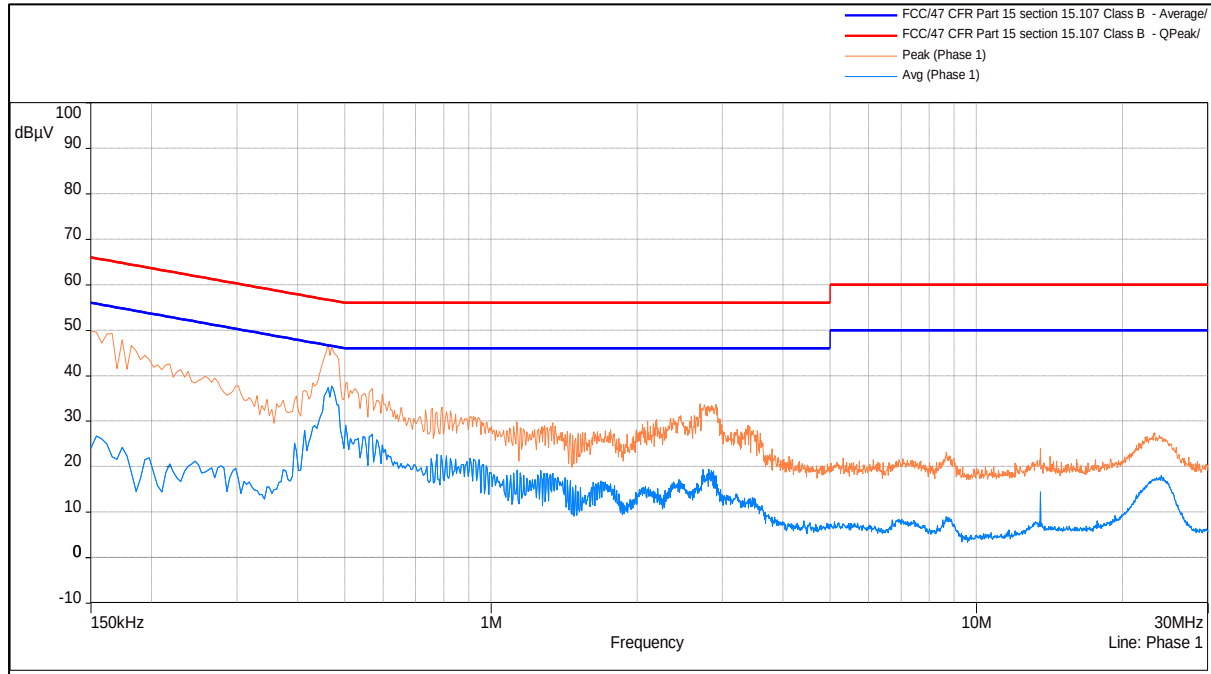
Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 57 von 59
Page 57 of 59

Test result:

Power: 110V 60HZ_LINE



Line Graph

Frequency (MHz)	Level (dBμV)	Limit (dBμV)	Margin (dB)	Detector	Comments
0.46685	44.92	56.58	-11.67	Quasipeak	Pass
0.56415	33.58	56.00	-22.42	Quasipeak	Pass
0.1518	41.22	66.00	-24.78	Quasipeak	Pass
2.8239	29.26	56.00	-26.74	Quasipeak	Pass
0.1809	36.98	64.39	-27.42	Quasipeak	Pass
0.783	28.18	56.00	-27.82	Quasipeak	Pass
0.2881	28.18	60.52	-32.35	Quasipeak	Pass
0.46685	37.03	46.58	-9.56	Average	Pass
0.56415	25.50	46.00	-20.50	Average	Pass
0.783	18.87	46.00	-27.13	Average	Pass
2.8239	17.07	46.00	-28.93	Average	Pass
0.1518	25.88	56.00	-30.12	Average	Pass
0.2881	18.06	50.52	-32.46	Average	Pass
0.1809	20.34	54.39	-34.05	Average	Pass

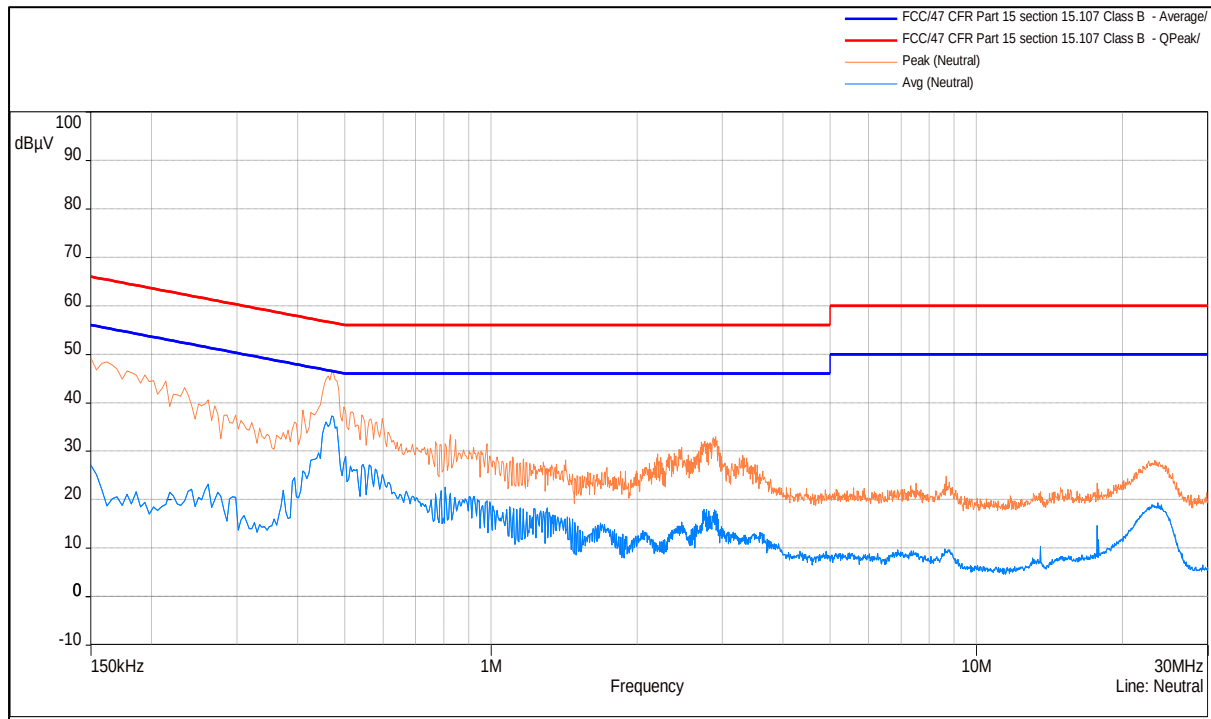
Line Table

Prüfbericht - Nr.:
Test Report No.:

IN23I1L3 001

Seite 58 von 59
Page 58 of 59

Power: 110V60HZ_NEUTRAL



Neutral Graph

Frequency (MHz)	Level (dBμV)	Limit (dBμV)	Margin (dB)	Detector	Comments
0.4668	44.38	56.58	-12.21	Quasipeak	Pass
0.5629	33.11	56.00	-22.89	Quasipeak	Pass
0.4003	32.48	57.81	-25.33	Quasipeak	Pass
2.8783	27.9	56.00	-28.10	Quasipeak	Pass
0.82625	27.42	56.00	-28.58	Quasipeak	Pass
0.244	32.95	61.89	-28.94	Quasipeak	Pass
1.1599	22.9	56.00	-33.10	Quasipeak	Pass
1.31005	22.41	56.00	-33.59	Quasipeak	Pass
0.4668	36.51	46.58	-10.07	Average	Pass
0.5629	25.46	46.00	-20.54	Average	Pass
0.4003	22.93	47.81	-24.88	Average	Pass
0.82625	18.59	46.00	-27.41	Average	Pass
0.244	22.13	51.89	-29.76	Average	Pass
1.31005	16.14	46.00	-29.86	Average	Pass
2.8783	14.83	46.00	-31.17	Average	Pass
1.1599	14.71	46.00	-31.29	Average	Pass

Neutral Table

9 LIST OF TABLES

Table 1: List of test and measurement instruments	7
Table 2: Instrument application Software versions	7
Table 3: Ratings and System Details as declared by Client*	8
Table 4: Measurement Uncertainty	9
Table 5: List of Bluetooth center Frequencies	10
Table 6: Transmitter limits for Radiated emission	37

10 LIST OF FIGURES

Figure 1: Frequency Range 9 kHz- 30 MHz	15
Figure 2: Frequency Range 30 MHz – 200 MHz	15
Figure 3: Frequency Range 200 MHz - 1GHz	16
Figure 4: Frequency Range above 1 GHz	16

11 POWER LEVEL USED FOR TESTING

Bluetooth 2.4GHz

Channel BandWidth	Data rate (Mbps)	Channel Frequency (MHz)	Power level (dBm)
1MHz	1	2402	9.00
		2440	9.00
		2480	9.00
	2	2402	9.00
		2440	9.00
		2480	9.00
	3	2402	9.00
		2440	9.00
		2480	9.00

*****END OF TEST REPORT*****