

TEST REPORT

Test report no.: 1-7824-24-01-16_TR1-R01



Testing laboratory

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS).

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number:

D-PL-12047-01-00.

ISED Testing Laboratory Recognized Listing Number: DE0001

FCC designation number: DE0002

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Manufacturer

ROBERT BOSCH GmbH

Robert-Bosch-Platz 1

70839 Gerlingen / GERMANY

Test standard/s

FCC - Title 47 CFR Part 15 FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: **Perfectly Keyless Anchor**

Model name: **PKA3AA**

FCC ID: **2AAJC-PKA3AA**

Frequency band: 4750 MHz to 10600 MHz

Technology tested: UWB

Antenna: Integrated antenna

Power supply: 6 V to 16 V DC by external power supply (vehicular battery)

Temperature range: -40°C to +95°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. cetecom advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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2.2 Application details

Date of receipt of order:	2024-07-18
Date of receipt of test item:	2025-06-10 (H07 PKA3AA)
	2025-06-16 (H07 PKA3AA, UWB antenna disconnected)
	2025-09-10 (H10 PKA3AA)
Start of test:*	2025-06-10
End of test:*	2025-11-06
Person(s) present during the test:	-/-

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Involved test locations

Saarbruecken lab		Essen lab	
☒	Untertuerkheimer Str. 6-10 66117 Saarbruecken Germany	☐	Im Teelbruch 116 45219 Essen Germany

2.4 Test laboratories sub-contracted

None

2.5 Laboratory listings and recognitions

	Saarbruecken	Essen
FCC	DE0002	DE0003
ISED	DE0001 3462C	DE0001 3462D

3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

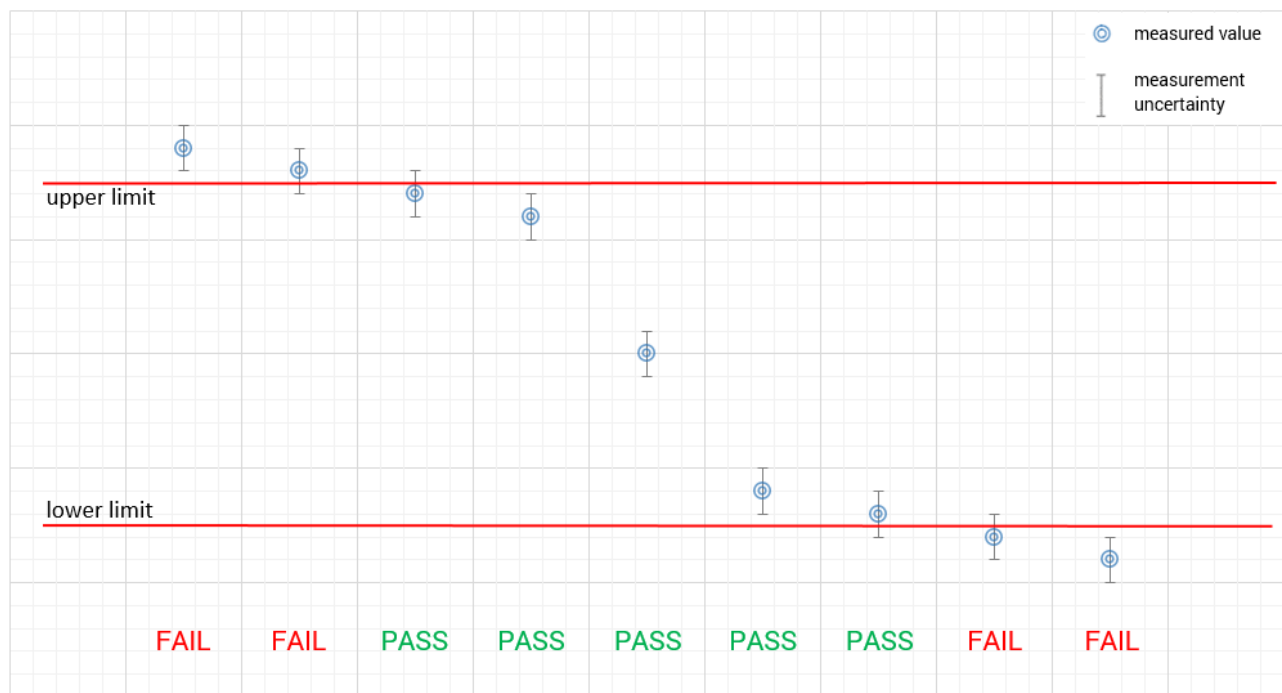
Guidance	Version	Description
ANSI C63.4-2014	-/-	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2020	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
UWB KDB	v02r01	393764 D01 UWB FAQ v02r01: ULTRA-WIDEBAND (UWB) DEVICES FREQUENTLY ASKED QUESTIONS

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.

measured value, measurement uncertainty, verdict



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests -/- no high temperature tests -/- no low temperature tests
Relative humidity content	:		49 %
Barometric pressure	:		990 hPa to 1010 hPa
Power supply	:	V_{nom} V_{max} V_{min}	13.5 V DC by external power supply -/- V -/- V

6 Test item

6.1 General description

Kind of test item	:	Perfectly Keyless Anchor
Model name	:	PKA3AA
S/N serial number	:	DUT6 (PKA3AA): BPA-08506.06.2509340002 DUT22 (PKA3AA, UWB antenna disconnected): BPA-08506.06.2509340012 DUT102 (PKA3AA): BPA-08508.09.2509340008 DUT103 (PKA3AA): BPA-08508.09.2509340004 Note: In chapter 12, it is clearly stated which DUT is used for a particular test.
Hardware status	:	DUT6 (PKA3AA): H07 DUT22 (PKA3AA, UWB antenna disconnected): H07 (modified) DUT102 (PKA3AA): H10 DUT103 (PKA3AA): H10
Software status	:	Device software (DUT-SW installed on DUT): • DUT6: SW06.14.2H • DUT22: SW06.14.2H • DUT102: SW06.14.6H • DUT103: SW06.14.6H GUI (SW installed on notebook): • received 2025-06-10 (no version mentioned) • V2.10 (used with DUT102 and DUT103) Note: In chapter 12, it is clearly stated which device software and which GUI is used for a particular test.
Frequency band	:	4750 MHz to 10600 MHz
Type of radio transmission	:	Pulse
Use of frequency spectrum	:	
Type of modulation	:	BPSK / BPM
Number of UWB channels	:	4 (CH5, CH6, CH8, CH9)
Number of frame types	:	Transmission by the device: 2 (CCC-SP3, RAD-SP3)
Power settings	:	CCC-SP3, CH5: 36 CCC-SP3, CH9: 36 RAD-SP3, CH5: 32 RAD-SP3, CH6: 24 RAD-SP3, CH8: 28 RAD-SP3, CH9: 40
Antenna	:	Integrated antenna
Power supply	:	6 V to 16 V DC by external power supply (vehicular battery)
Temperature range	:	-40°C to +95°C

6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report:

- 1-7824-24-01-01_TR2-A101-R02 (External photographs of EUT)
- 1-7824-24-01-01_TR3-A102-R01 (Internal photographs of EUT)
- 1-7824-24-01-01_TR2-A103-R02 (Test set-up photographs)
- Note: The referenced photos show EUT delivered by the customer in this project, not necessarily the exact one used for the specific tests. EUT identification shown in the photos may differ.

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

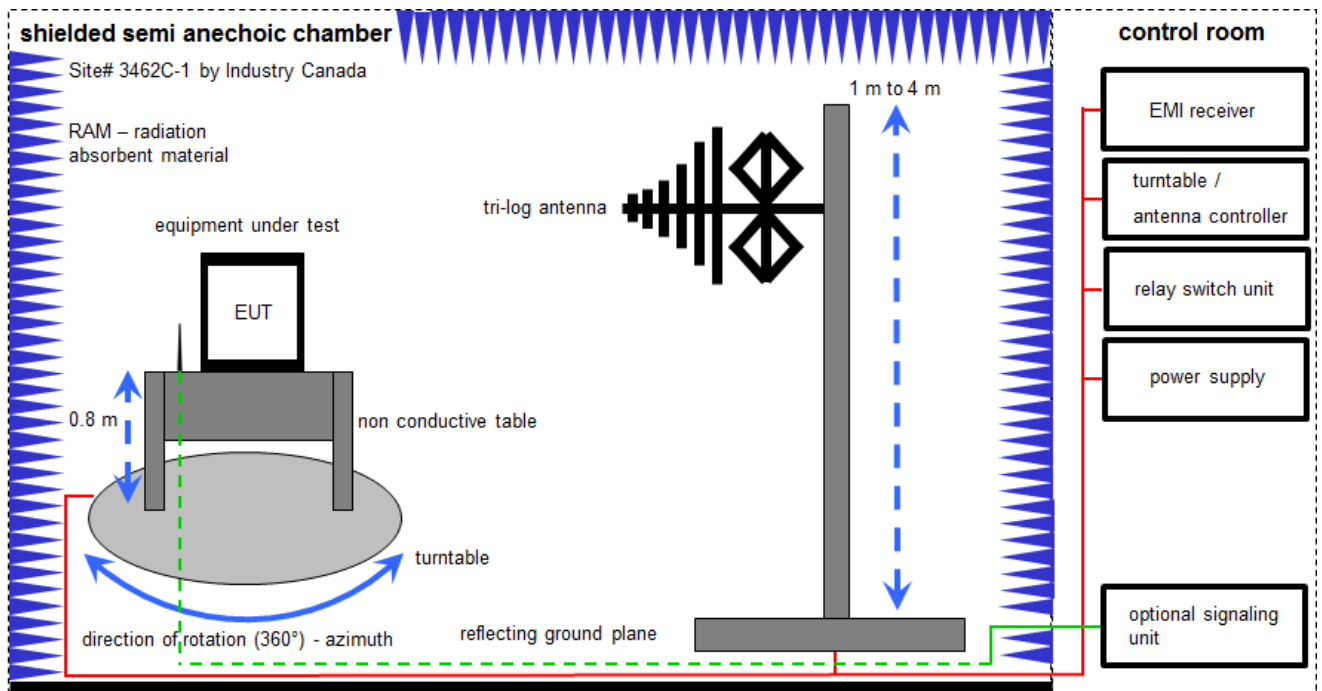
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k/cal	calibration / calibrated	EK	limited calibration
Ne/cnn	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
Ev/chk	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress
cpu	check prior usage		

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter;

$$FS = UR + CL + AF$$

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

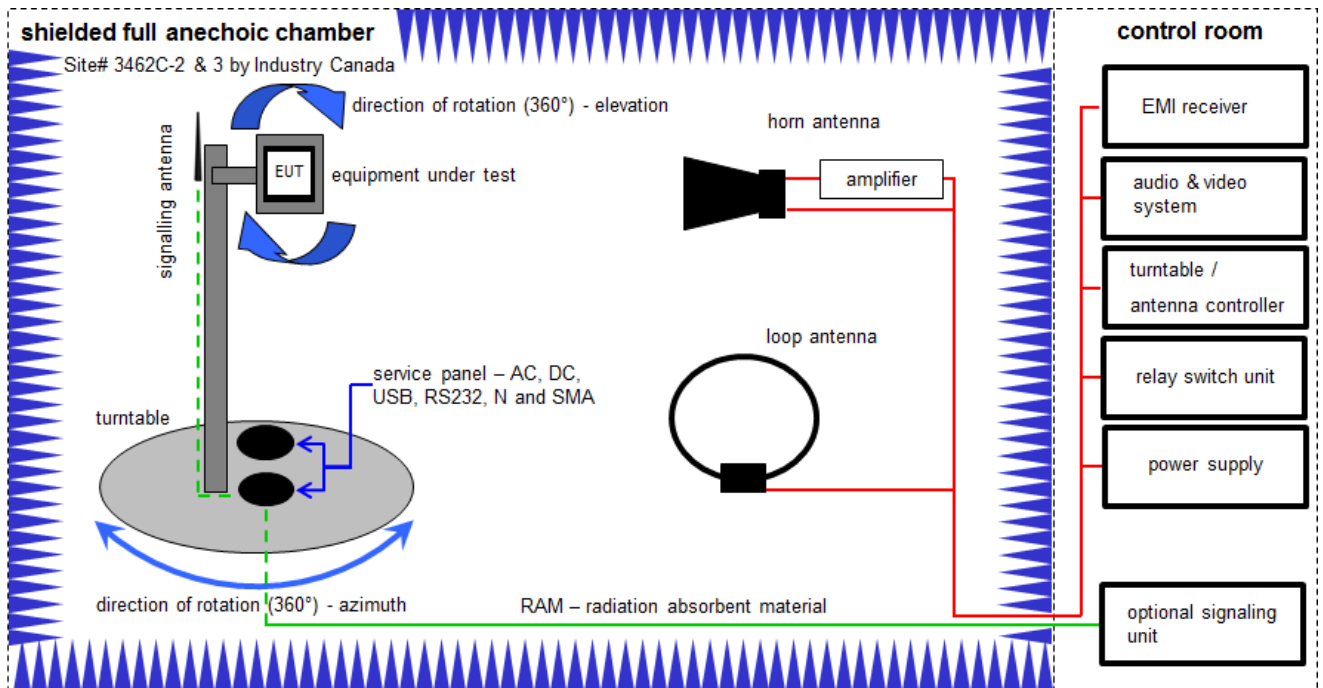
Example calculation:

$$FS \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB/m]} = 31.05 \text{ [dB}\mu\text{V/m]} \text{ (35.69 } \mu\text{V/m) @ distance}$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Analyzer-Impedence-System	AIS16/1	Spitzenberger + Spies GmbH & Co. KG	UO2076 07/0 1023	400001751-0000	cal	19.10.2023	31.10.2025
2	n. a.	Antenna Tower	2175	ETS-Lindgren GmbH / Taufkirchen	64762	300003745	cnn	-/-	-/-
3	n. a.	EMI Test Receiver	ESR3 9kHz-3.6GHz	Rohde & Schwarz Messgerätebau GmbH / Memmingen	102587	300005771	cal	05.12.2024	05.12.2025
4	n. a.	Positioning Controller	2090	ETS-Lindgren GmbH / Taufkirchen	64672	300003746	cnn	-/-	-/-
5	n. a.	Power Supply	6032A	Hewlett Packard	2920A04466	300000580	cnn	-/-	-/-
6	n. a.	Semi anechoic chamber	3000023	MWB AG		300000551-0000	cnn	-/-	-/-
7	n. a.	Switch-Unit	3488A	Hewlett Packard	2719A14505	300000368	cpu	-/-	-/-
8	n. a.	TRILOG Broadband Antenna	VULB9163	Schwarzbeck Mess-Elektronik OHG / Schönaun	371	300003854-0000	cal	11.07.2024	11.07.2026
9	n. a.	Turntable	2089-4.0	EMCO Elektronik GmbH / Gilching		300004394-0000	cnn	-/-	-/-

7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter

$$FS = UR + CA + AF$$

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:

$$FS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} \text{ (71.61 } \mu\text{V/m) @ distance}$$

$$OP = AV + D - G + CA$$

(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:

$$OP \text{ [dBm]} = -65.0 \text{ [dBm]} + 50 \text{ [dB]} - 20 \text{ [dBi]} + 5 \text{ [dB]} = -30 \text{ [dBm]} \text{ (1 } \mu\text{W)}$$

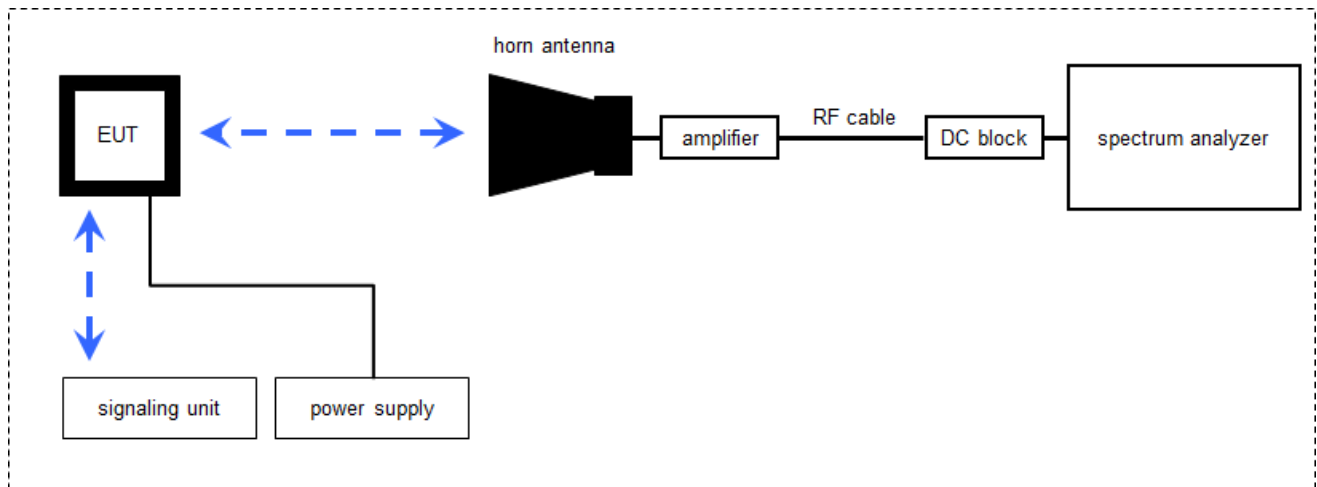
Equipment table (A):

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	EMI Test Receiver	ESR26 9kHz-26.5GHz	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101376	300005063-0000	cal	06.12.2024	06.12.2025
2	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies Deutschland GmbH / Böblingen	MY50000032	300004510-0000	cnn	-/-	-/-
3	n. a.	NEXIO EMV-Software	BAT EMC V2022.0.32.0	Nexio		300004682-0000	cnn	-/-	-/-
4	n. a.	Anechoic chamber	Anechoic chamber	TDK		300003726-0000	cnn	-/-	-/-
5	n. a.	Power Supply	HMP2020	Rohde & Schwarz Messgerätebau GmbH / Memmingen	120626	300006408-0000	cal	02.05.2023	31.05.2026
6	n. a.	Active Loop Antenna	6502	EMCO Elektronik GmbH / Gilching	2210	300001015	cal	07.07.2025	07.07.2027

Equipment table (OTA):

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n.a.	CTIA-Chamber	AMS 8500	ETS-Lindgren Finland	-/-	300003327-0000	cnn	-/-	-/-
2	n.a.	CTIA-Chamber - Positioning Equipment	CTIA-Chamber - Positioning Equipment	EMCO Elektronik GmbH / Gilching	-/-	300003328-0000	cpu	-/-	-/-
3	n.a.	Double-Ridged Waveguide Horn Antenna	3115	EMCO Elektronik GmbH / Gilching	9709-5290	300000212	cpu	-/-	-/-
4	n.a.	Double-Ridged Waveguide Horn Antenna	3115	EMCO Elektronik GmbH / Gilching	9709-5289	300000213	cal	24.09.2024	24.09.2026
5	n.a.	Measurement Software	EMC32	Rohde & Schwarz Messgerätebau GmbH / Memmingen	-/-	300005477-0000	cpu	-/-	-/-
6	n.a.	Power supply GPIB dc power supply, 0-50 Vdc, 0-2 A	6633A	Hewlett Packard	2851A01222	300001530-0000	cal	15.12.2022	31.12.2025
7	n.a.	RF-Amplifier	NSP1800-25-NC	Miteq Inc.	1723615	300004236-0000	cpu	-/-	-/-
8	n.a.	Signal- and Spectrumalyzer	FSW50	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101928	140607335-0000	cal	26.02.2025	26.02.2026
9	n.a.	Signal Generator 100 kHz - 40 GHz	SMB100A	Rohde & Schwarz Messgerätebau GmbH / Memmingen	183320	300006330-0000	cal	07.01.2025	07.01.2028
10	n.a.	Std. Gain Horn Antenna 11.90-18.00 GHz	11.90-18.00 GHz 1824-20	Flann	263	300002471-0000	cnn	-/-	-/-
11	n.a.	Waveguide Adapter	RA62-K-F-UBR140-C	CMT	951753-002	300002177-0005	cpu	-/-	-/-

7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna e.g. 75 cm

$$FS = UR + CA + AF$$

(FS-field strength; UR-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB\mu V/m] (6.79 \mu V/m) @ distance$$

$$OP = AV + D - G + CA$$

(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:

$$OP [dBm] = -59.0 [dBm] + 44.0 [dB] - 20.0 [dBi] + 5.0 [dB] = -30 [dBm] (1 \mu W)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Horn Antenna 18,0-40,0 GHz	LHAF180	Microw.Devel	39180-103-021	300001747-0000	cal	24.01.2024	31.01.2026
2	n. a.	Low Noise Amplifier, Broadband 18-50 GHz	BZT-18005000-550835-SL2525-SL	B&Z Technologies	27887-27889	300006363-0000	cpu	-/-	-/-
3	n. a.	Power supply	N5767A	Agilent Technologies Deutschland GmbH / Böblingen	US14J1569P	300004851-0000	cal	06.12.2023	31.12.2026
4	n. a.	Signal- and Spectrum Analyzer 2 Hz - 50 GHz	FSW50	Rohde & Schwarz Messgerätebau GmbH / Memmingen	101332	300005935-0000	cal	09.01.2025	09.01.2026
5	n. a.	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	82-16	300000510-0000	cal	24.01.2024	24.01.2026

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

*)Note: The sequence will be repeated three times with different EUT orientations.

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position $\pm 45^\circ$ and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

8.5 Sequence of testing efficient use of spectrum

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- The EUT positioned at a distance of approx. 0.5m to the horn antenna used for the measurement.
- The associated receiver is positioned between the EUT the horn antenna to assure that the received signal level of the associated receiver at the spectrum analyzer is higher than the level of the EUT.

Measurement:

- Switch on EUT and associated receiver and wait until the connection is established.
- Start Analyzer sweep in Zerospan with a sweep time of 15 s.
- Switch of the associated receiver.
- When switching of the associated receiver, a drop in the received signal level at the spectrum analyzer can be observed. → position marker 1
- Position marker two at the point where the transmission of the EUT stops.
- Measure time difference between marker 1 and marker 2.

9 Measurement uncertainty

Test case	Uncertainty
Equivalent isotropically radiated power (e.i.r.p.)	Conducted value ± 1 dB Radiated value ± 3.5 dB
Permitted range of operating frequencies	± 100 kHz
Conducted unwanted emissions in the spurious domain (up to 18 GHz)	± 1 dB
Radiated unwanted emissions in the spurious domain (up to 18 GHz)	± 3.5 dB
Conducted unwanted emissions in the spurious domain (18 to 40 GHz)	± 4 dB
Radiated unwanted emissions in the spurious domain (18 to 40 GHz)	± 4 dB
Conducted unwanted emissions in the spurious domain (40 to 50 GHz)	± 4.5 dB
Radiated unwanted emissions in the spurious domain (40 to 50 GHz)	± 4.5 dB
Conducted unwanted emissions in the spurious domain (above 50 GHz)	± 5 dB
Radiated unwanted emissions in the spurious domain (above 50 GHz)	± 5 dB
DC and low frequency voltages	± 3 %
Temperature	± 1 °C
Humidity	± 3 %

10 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR47 §15.207, §15.209, §15.503, §15.519, §15.521	see table	2025-11-07	-/-

PKA3AA (UWB + BLE variant):

Test specification clause	Test case	Temperature conditions	Power source	Pass	Fail	NA	NP	Remark
§15.503 §15.519(b)	10 dB Bandwidth	Nominal	Nominal	☒	☐	☐	☐	complies
§15.209 §15.519 §15.521	TX Radiated Emissions	Nominal	Nominal	☒	☐	☐	☐	complies
§15.519(a)(1)	Efficient use of spectrum	Nominal	Nominal	☒	☐	☐	☐	complies
§15.519(a)(2) §15.521 (b) §§15.203 & 15.204	Antenna requirement	-/-	-/-	☒	☐	☐	☐	complies
§15.521(j) §15.207	Conducted emissions < 30 MHz	Nominal	Nominal	☐	☐	☒	☐	-/-

Note: NA = Not Applicable; NP = Not Performed

11 Additional comments

Reference documents: "PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC_KDB_DEV6158-02.pptx"
(Title: "PK GEN3 UWB 2nd Harmonic testing for FCC Exemption", Date 29/09/25)

Special test descriptions: None

Configuration descriptions: "User_Manual_PK_RTA_Setup_250623.docx"

Additional test modes:

☐ No test mode available.

☒ Special test mode/software is used (see description below)

Test device (DUT):

- DUT 6:
 - UWB emissions are turned on and the below described UWB test mode is used (selected via GUI: UWB TX).
- DUT22:
 - The UWB antenna is disconnected. UWB emissions are turned on (UWB chip) and the below described UWB test mode is used (selected via GUI: UWB TX).
 - This sample is used for supporting measurements only (see chapter 12.2.7)
- DUT 102 & DUT103:
 - UWB emissions are turned on and the below described UWB test mode is used (selected via GUI: UWB TX).
 - UWB emissions are turned on and the normal mode (intended use) is used (selected via GUI: e.g. Ranging).
- The specific test mode can be selected via the software setting in GUI (see description below).

Associated UWB equipment (AE):

- AE1: Notebooks (with GUI)
- AE2: Vector CAN/LIN interface (VN1640A, VN1610)
- AE3: Cables and looms
- Note: three device setups including the above-mentioned AE have been provided

Description of special test modes as declared by customer:

- UWB test mode (Test mode 1):
 - Signal repetition time (cycle time) = 1 ms
 - Remaining transmission parameters as in case of corresponding normal UWB operation mode(s)
(→ resulting in e.g. the same bandwidth as in the corresponding normal UWB operation mode(s))
 - Parameters (e.g. payload, number of UWB frames, frame length, pulse repetition frequency, different power setting) selected so that the maximum average and peak output power and power spectral density is obtained.
 - Other technologies (e.g. Bluetooth) switched off
- Normal mode:
 - UWB emissions are turned on and the normal UWB operation mode (intended use) is used.
- Test modes are configured by GUI software (see below).
The configuration is carried out in accordance with the customer's document "User_Manual_PK_RTA_Setup_250623.docx" and in accordance with the customer's subsequent requirements and changes.

Details on the device and setup:

- Device software (DUT-SW): This software is installed in the DUT.
- GUI: This software is installed on the notebook connected to the DUT via a CAN case. The GUI is used to control the device settings (Channel, Frame type, Power setting, test mode, normal mode etc) and the specific test cases (Ranging, UWB TX (test mode), etc).

12 Measurement results

12.1 10 dB - Bandwidth

Description:

Measurement of the -10 dB bandwidth of the wanted signal.

§15.503(a)

UWB bandwidth. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L . The frequency at which the highest radiated emission occurs is designated f_M .

§15.503(b)

Center frequency. The center frequency, f_C , equals $(f_H + f_L)/2$.

§15.503(c)

Fractional bandwidth. The fractional bandwidth equals $2(f_H - f_L) / (f_H + f_L)$.

Limits and provisions:

§15.503(d)

Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

§15.519(b)

The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

Lower -10 dB point > 3.1 GHz Upper -10 dB point < 10.6 GHz

-10 dB bandwidth $\geq$ 500 MHz or -10 dB fractional bandwidth > 0.2
--

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

Note:

- ANSI C63.10-2020 §10.1.
- ANSI/USEMCSC C63.10-2020/Cor 1-2023 §10.1.

Device information for this chapter:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10, feature "UWB TX" is used

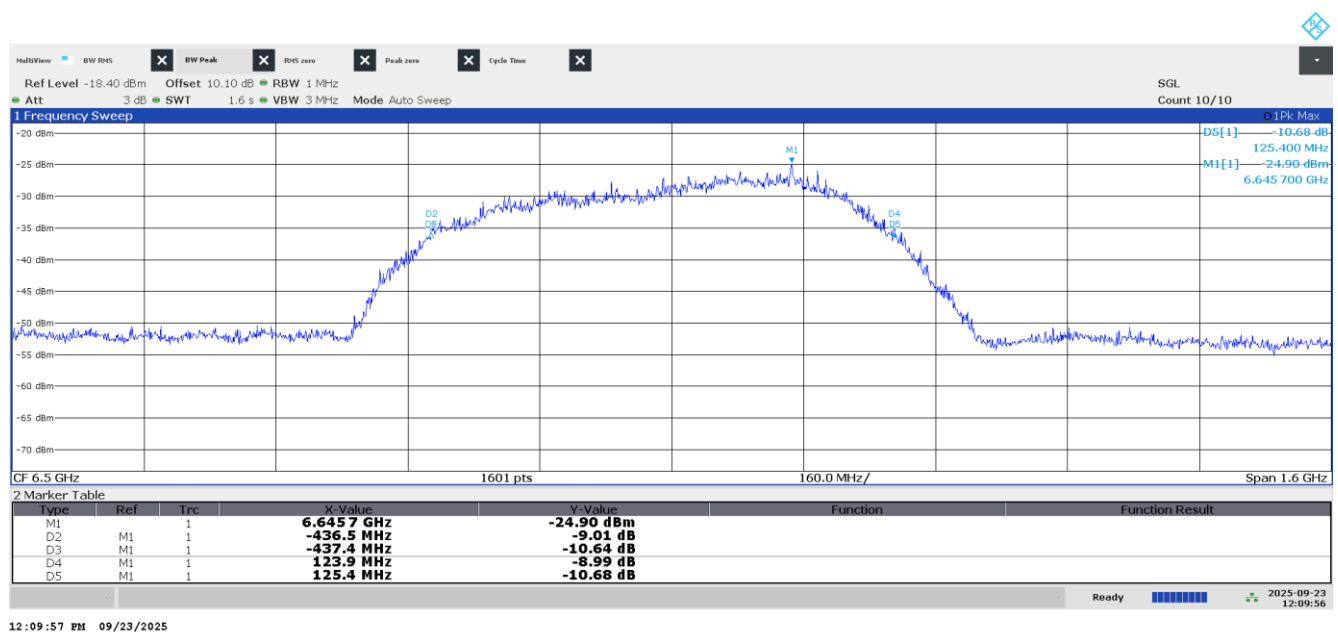
12.1.1 Results: Frame CCC-SP3, Channel CH5, Power setting 36

Results:

DUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]
102 (PKA3AA)	6.209	6.769	560

Verdict: Compliant

Plot 1: 10 dB bandwidth, UWB test mode



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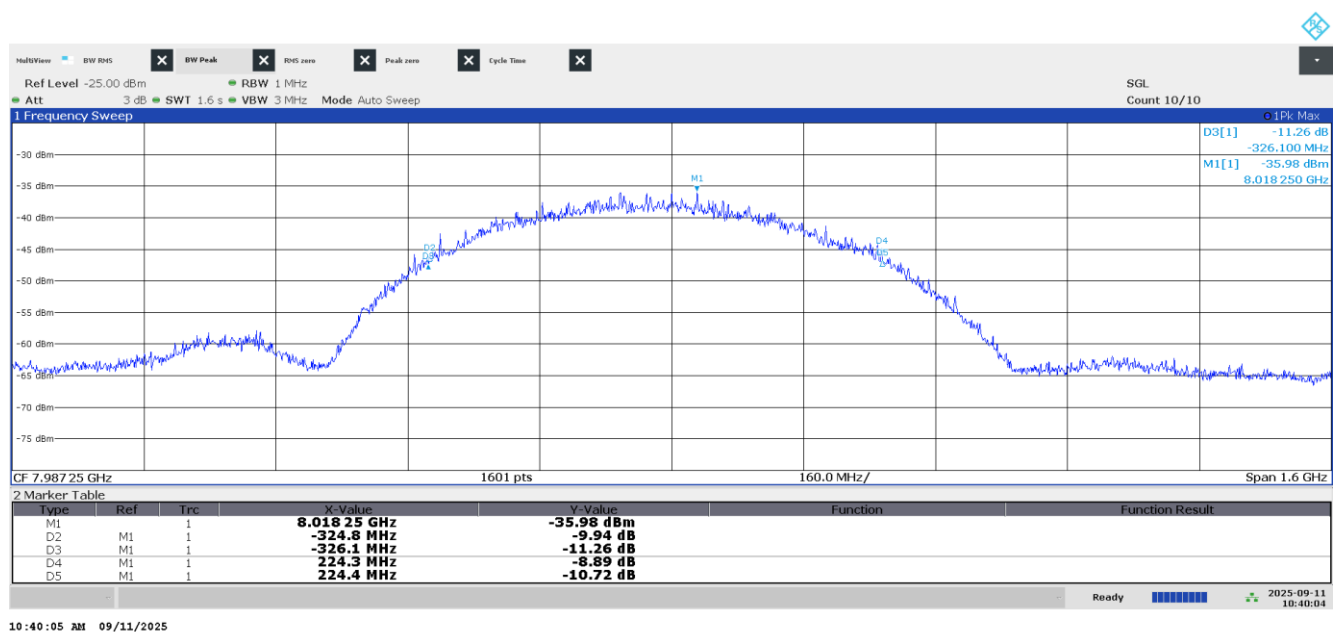
12.1.2 Results: Frame CCC-SP3, Channel CH9, Power setting 36

Results:

DUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]
102 (PKA3AA)	7.694	8.243	549

Verdict: Compliant

Plot 2: 10 dB bandwidth, UWB test mode



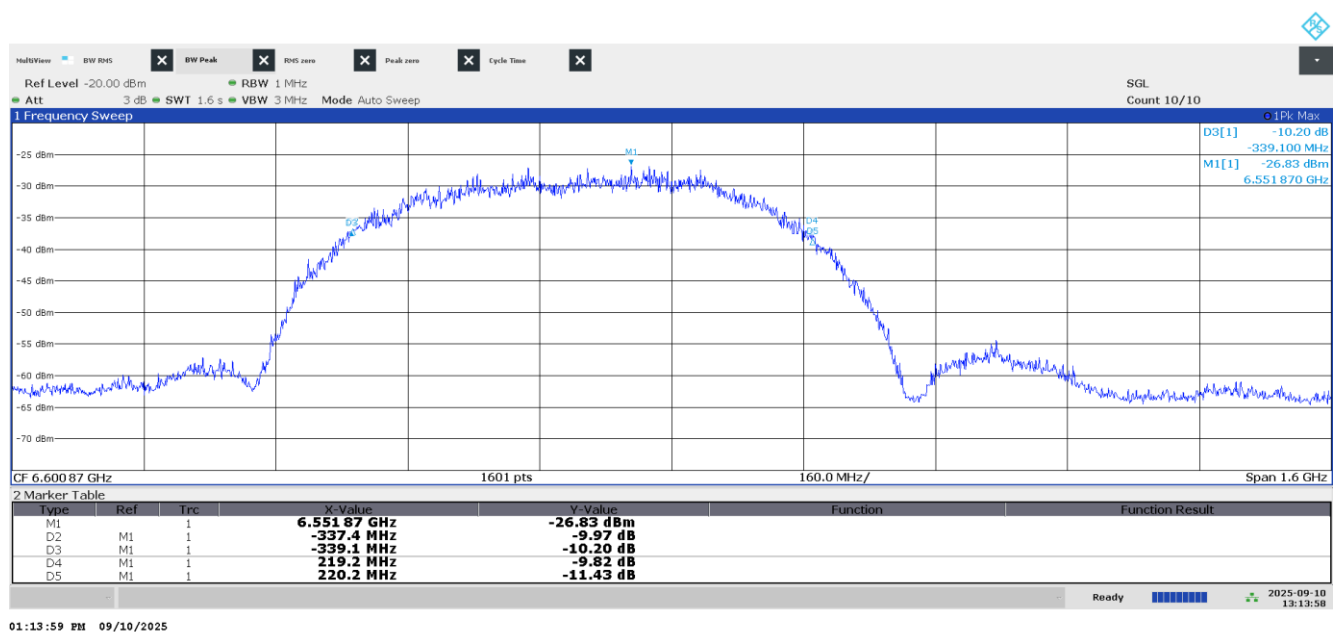
12.1.3 Results: Frame RAD-SP3, Channel CH5, Power setting 32

Results:

DUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]
102 (PKA3AA)	6.214	6.771	557

Verdict: Compliant

Plot 3: 10 dB bandwidth, UWB test mode



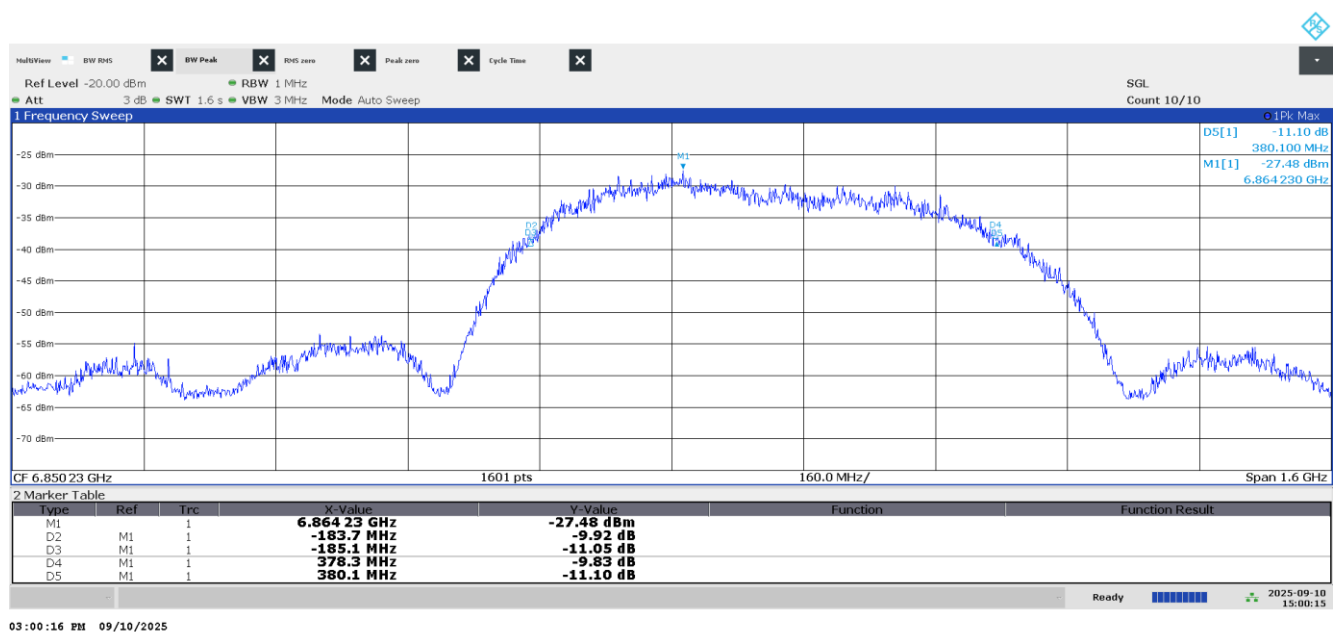
12.1.4 Results: Frame RAD-SP3, Channel CH6, Power setting 24

Results:

DUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]
102 (PKA3AA)	6.680	7.242	562

Verdict: Compliant

Plot 4: 10 dB bandwidth, UWB test mode



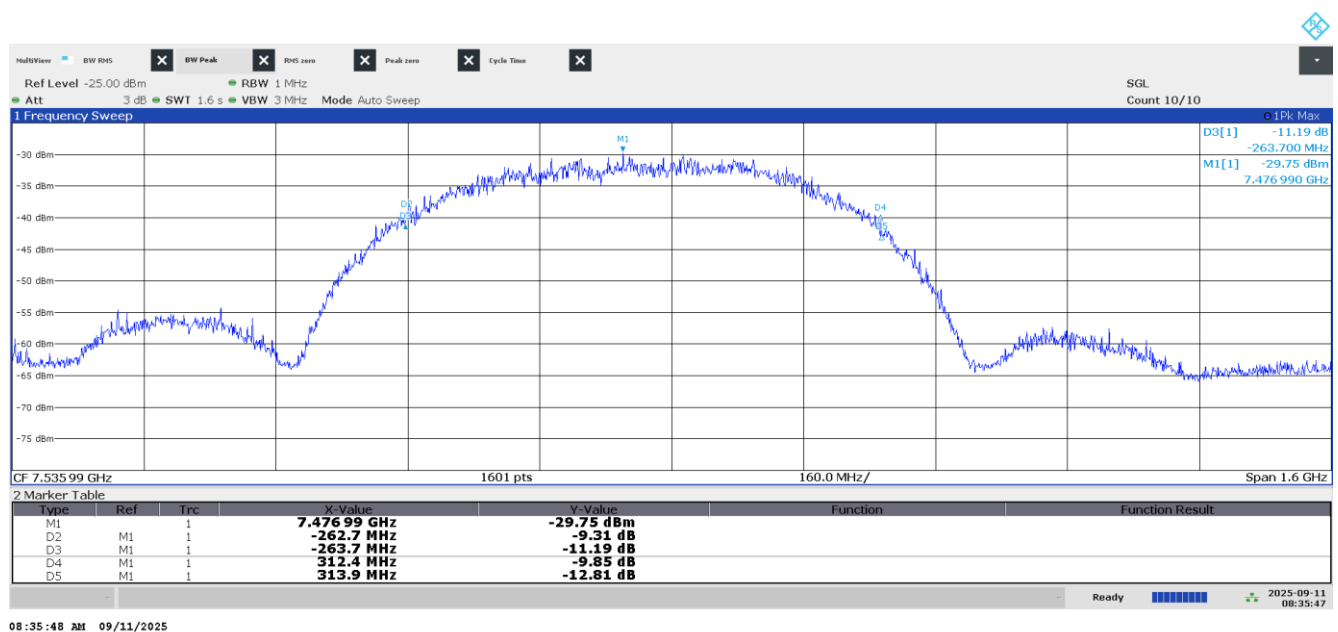
12.1.5 Results: Frame RAD-SP3, Channel CH8, Power setting 28

Results:

DUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]
102 (PKA3AA)	7.214	7.789	575

Verdict: Compliant

Plot 5: 10 dB bandwidth, UWB test mode



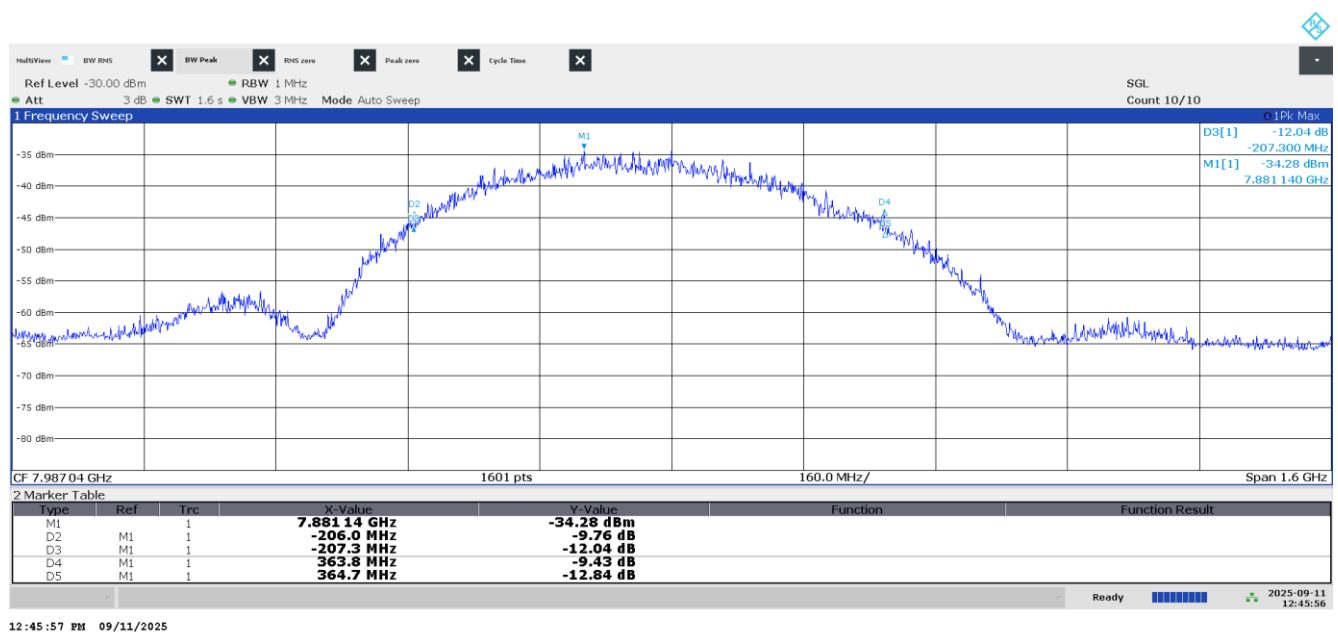
12.1.6 Results: Frame RAD-SP3, Channel CH9, Power setting 40

Results:

DUT	Lower -10 dB point [GHz]	Higher -10 dB point [GHz]	UWB bandwidth [MHz]
102 (PKA3AA)	7.675	8.245	570

Verdict: Compliant

Plot 6: 10 dB bandwidth, UWB test mode



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12.2 TX Radiated Emissions

Description:

Measurement of the radiated emissions in transmit mode.

Limits and provisions:

Radiated emissions at or below 960 MHz (§15.209):

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dB $\mu\text{V/m}$)	30
30 – 88	100 (40 dB $\mu\text{V/m}$)	3
88 – 216	150 (43.5 dB $\mu\text{V/m}$)	3
216 – 960	200 (46 dB $\mu\text{V/m}$)	3
> 960	500 (54 dB $\mu\text{V/m}$)	3

§15.519 (c)

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209.

The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits based on measurements using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960 to 1610	-75.3
1610 to 1990	-63.3
1990 to 3100	-61.3
3100 to 10600	-41.3
Above 10600	-61.3

§15.519 (d)

In addition to the radiated emission limits specified in the table in paragraph of §15.519 (c), UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164 to 1240	-85.3
1559 to 1610	-85.3

§15.519 (e)

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_m . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

§15.521 (c)

Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in §15.209, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of this part.

§15.521 (d)

Within the tables in §§15.509, 15.511, 15.513, 15.515, 15.517, and 15.519, the tighter emission limit applies at the band edges. Radiated emission levels at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Radiated emission levels above 960 MHz are based on RMS average measurements over a 1 MHz resolution bandwidth. The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time. Unless otherwise stated, if pulse gating is employed where the transmitter is quiescent for intervals that are long compared to the nominal pulse repetition interval, measurements shall be made with the pulse train gated on. Alternative measurement procedures may be considered by the Commission.

§15.521(e)

The frequency at which the highest radiated emission occurs, f_M , must be contained within the UWB bandwidth.

§15.521(g)

When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, f_M . If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using $E(\text{dBuV/m}) = P(\text{dBm EIRP}) + 95.2$. If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

§15.521(h)

The highest frequency employed in §15.33 to determine the frequency range over which radiated measurements are made shall be based on the center frequency, f_c , unless a higher frequency is generated within the UWB device. For measuring emission levels, the spectrum shall be investigated from the lowest frequency generated in the UWB transmitter, without going below 9 kHz, up to the frequency range shown in §15.33(a) or up to $f_c + 3/(\text{pulse width in seconds})$, whichever is higher. There is no requirement to measure emissions beyond 40 GHz provided f_c is less than 10 GHz; beyond 100 GHz if f_c is at or above 10 GHz and below 30 GHz; or beyond 200 GHz if f_c is at or above 30 GHz.

Measurement:**§15.209:**

Measurement parameter	
Detector:	Peak/QPeak
Sweep time:	1 s
Resolution bandwidth:	120kHz
Video bandwidth:	≥ RBW
Trace-Mode:	Max Hold

§15.519(c):

Measurement parameter	
Detector:	RMS
Sweep time:	1 ms/pt
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Trace-Mode:	Max Hold

Note: Evaluating rms-average power spectral density ANSI C63.10-2020 §10.3.7

§15.519(d):

Measurement parameter	
Detector:	RMS
Sweep time:	1 ms/pt
Resolution bandwidth:	30 kHz / 1 kHz
Video bandwidth:	300 kHz / 3 kHz
Trace-Mode:	Max Hold

Note: Spectral line measurement ANSI C63.10-2020 §10.3.10

§15.519(e):

Measurement parameter	
Detector:	Pos-Peak
Resolution bandwidth:	50 MHz
Video bandwidth:	80 MHz
Span:	Zero span
Trace-Mode:	Max Hold

Device information:

The information on the device used for the measurement results shown is provided below every plot.

12.2.1 Results: Frame CCC-SP3, Channel CH5, Power setting 36

Results:

Measurements of the fundamental emission:

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/MHz]	Applicable limit [dBm/MHz]	Margin [dB]	Plot
		average value			
102 (PKA3AA)	6.646	-44.0	-41.3	2.7	7

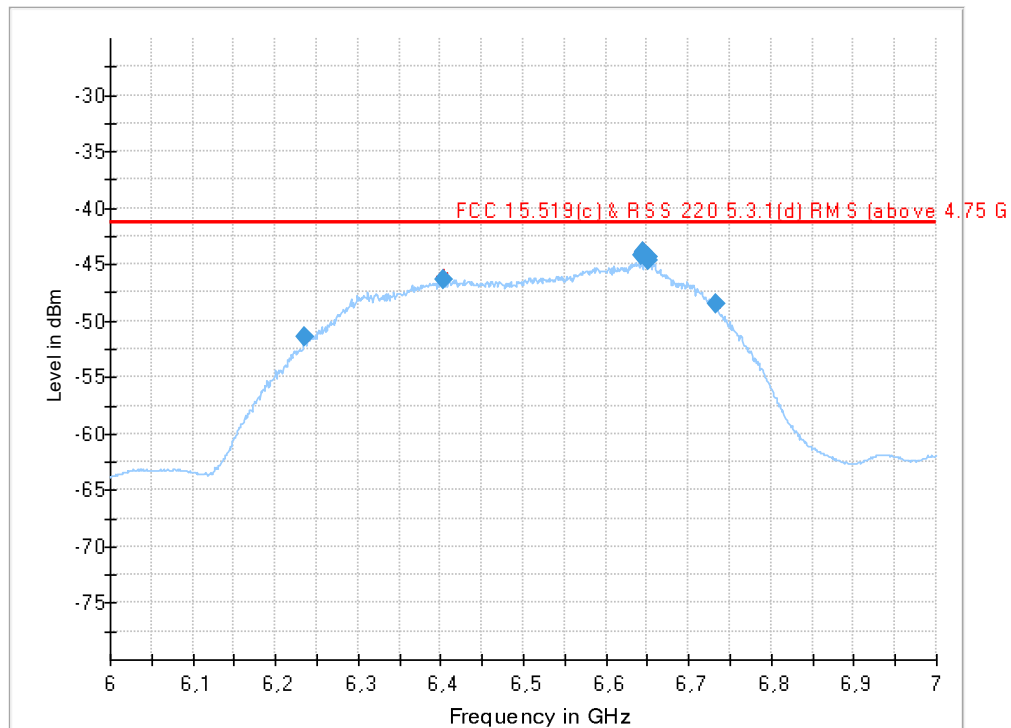
DUT	Frequency [GHz]	Max e.i.r.p. [dBm/50 MHz]	Applicable limit [dBm/50 MHz]	Margin [dB]	Plot
		peak value			
102 (PKA3AA)	6.646	-14.1	0	14.1	8

Emissions outside the band:

Frequency f [MHz]	Detector	Measured level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Frequency f [GHz]	Detector	Measured level [dBm]	Limit [dBm]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
25.958	RMS	-66.0	-61.3	4.7
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

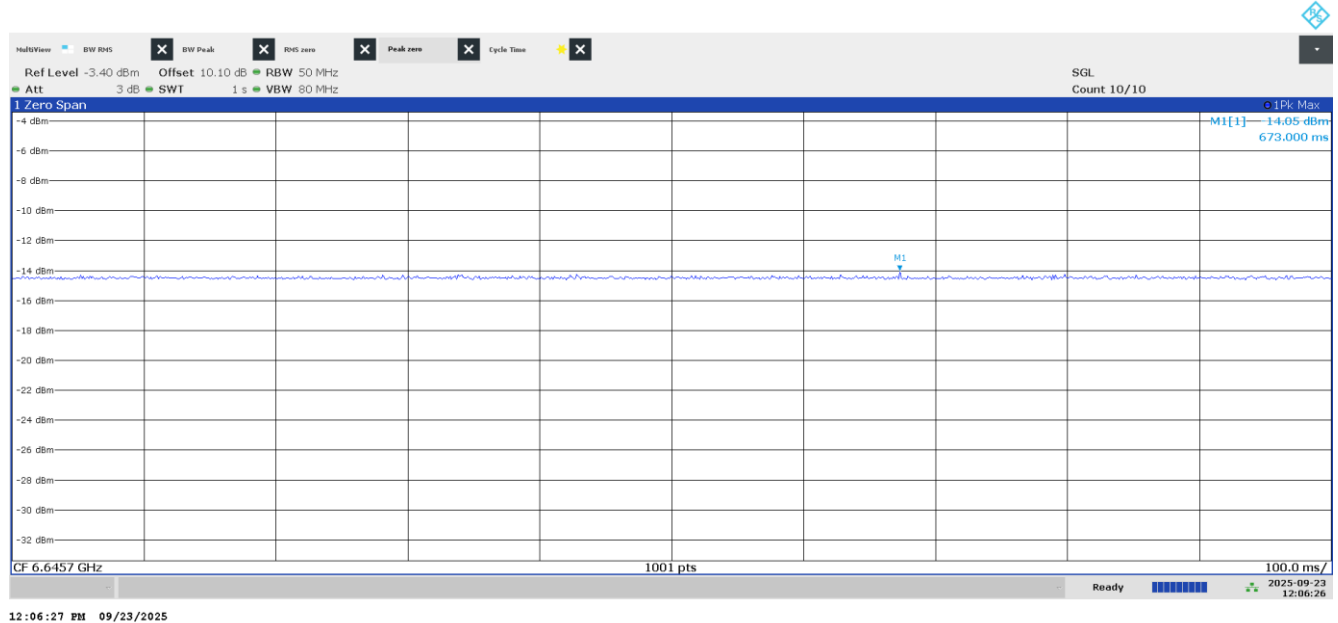
Verdict: Compliant

Plot 7: Fundamental emission (UWB test mode): RMS

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)
6235.930000	-51.41	-41.30	10.11	1000.000	V	56.0	27.0
6403.150000	-46.28	-41.30	4.98	1000.000	V	48.0	26.0
6642.630000	-44.15	-41.30	2.85	1000.000	V	78.0	50.0
6645.730000	-43.96	-41.30	2.66	1000.000	V	78.0	49.0
6645.760000	-44.10	-41.30	2.80	1000.000	V	78.0	46.0
6648.210000	-44.29	-41.30	2.99	1000.000	V	77.0	46.0
6650.440000	-44.36	-41.30	3.06	1000.000	V	70.0	36.0
6650.760000	-44.63	-41.30	3.33	1000.000	V	76.0	46.0
6733.420000	-48.53	-41.30	7.23	1000.000	V	78.0	41.0

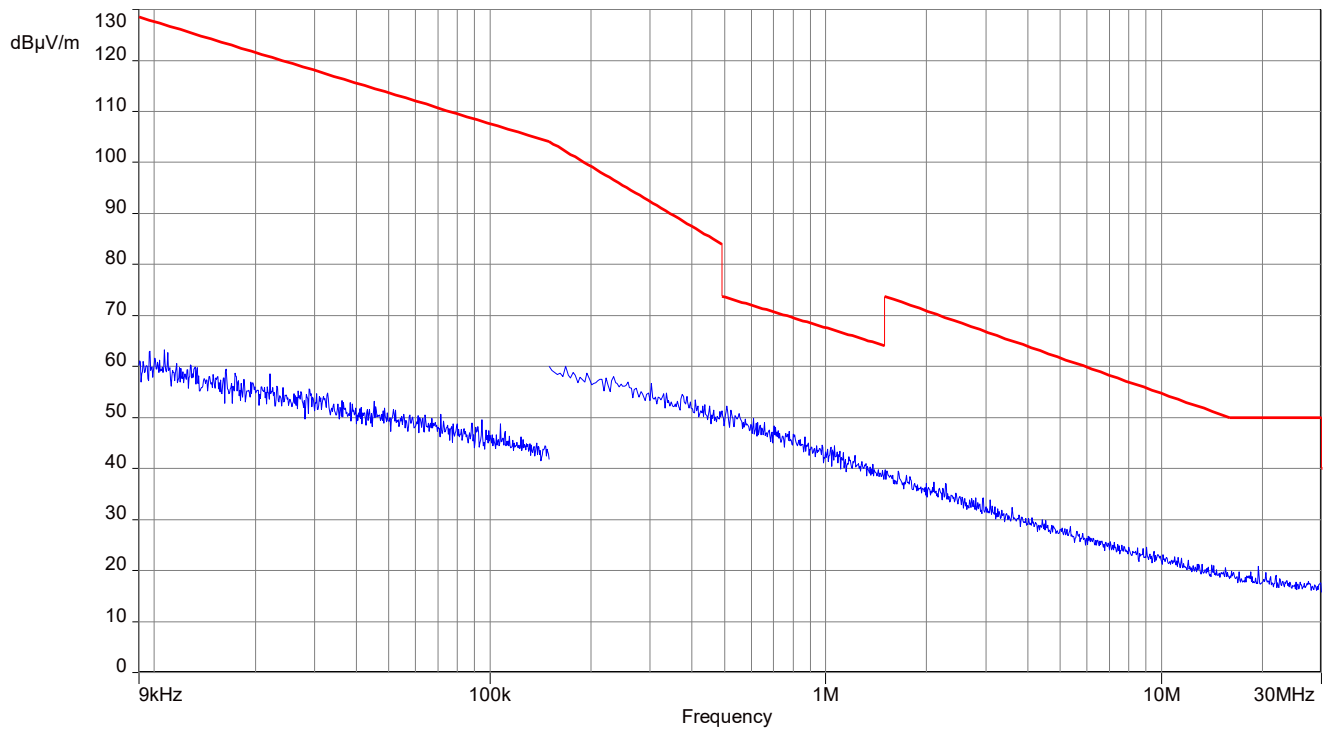
Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 8: Fundamental emission (UWB test mode): Max Peak

Device information for this plot:

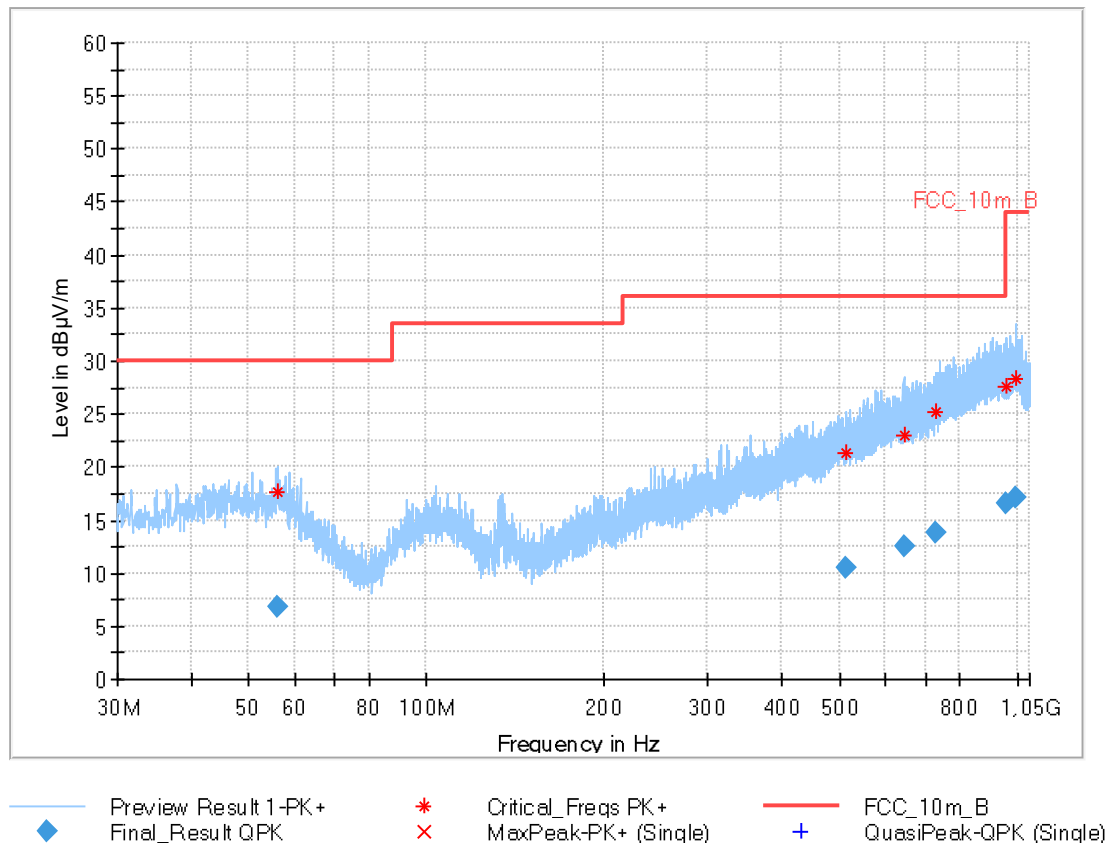
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 9: 9 kHz to 30 MHz, UWB test mode

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 10: 30 MHz to 1 GHz, UWB test mode

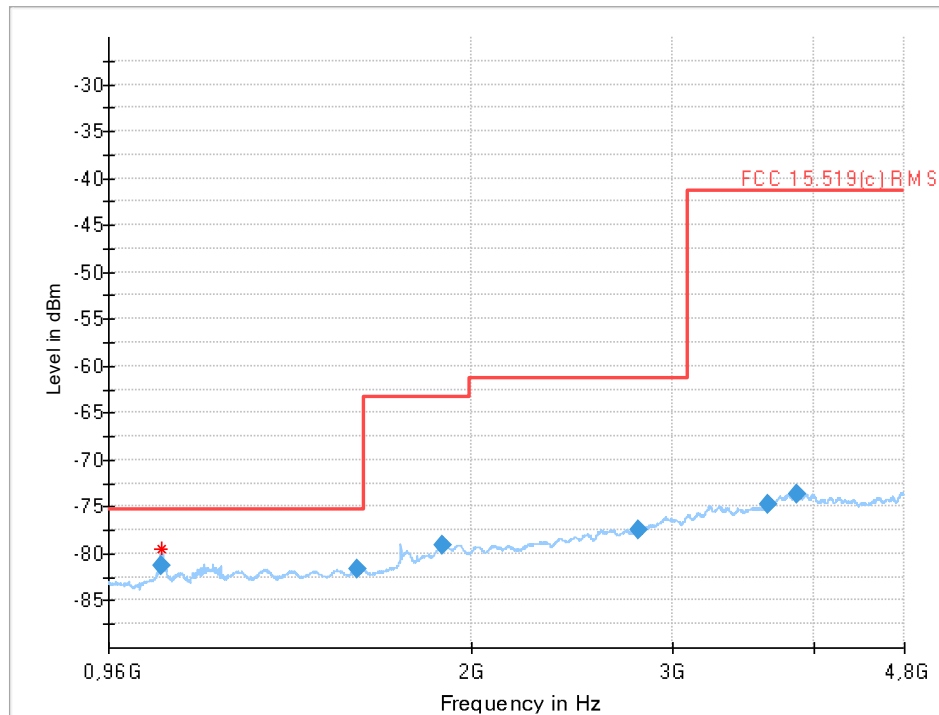


Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
56.088	6.84	30.0	23.2	1000	120.0	104.0	V	37	16
513.846	10.43	36.0	25.6	1000	120.0	130.0	V	170	20
642.726	12.47	36.0	23.5	1000	120.0	195.0	H	9	22
730.235	13.83	36.0	22.2	1000	120.0	195.0	H	270	23
957.003	16.51	36.0	19.5	1000	120.0	195.0	V	127	25
992.018	17.11	44.0	26.9	1000	120.0	195.0	V	198	26

Device information for this plot:

- DUT#: DUT103 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

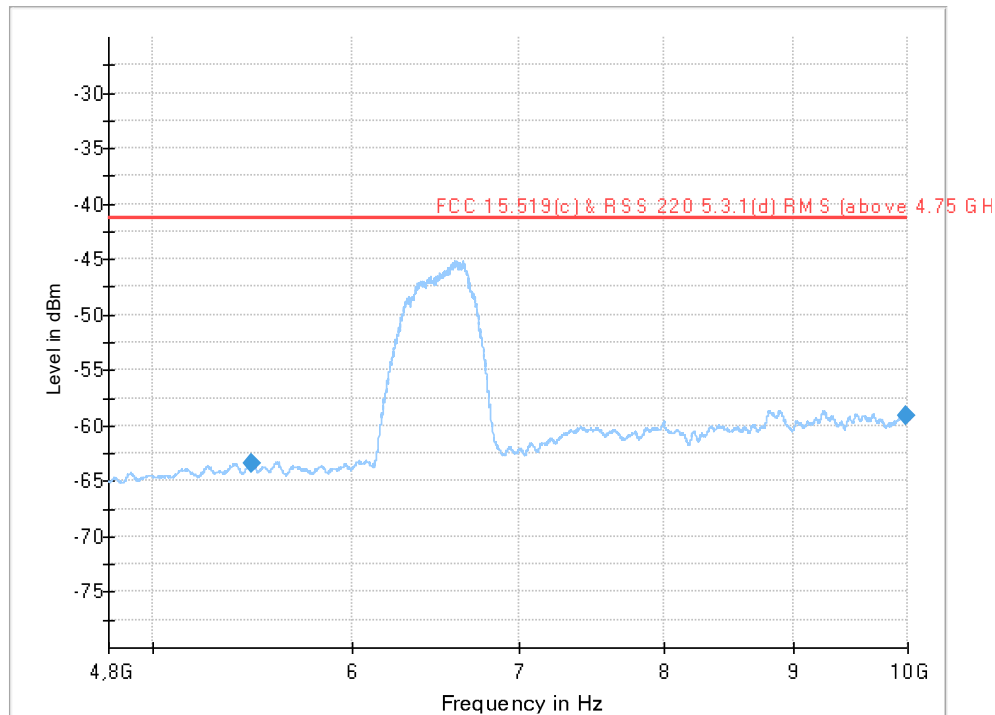
Plot 11: 960 MHz to 4.8 GHz (Limit acc. to §15.519 (c)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1067.043000	-81.25	-75.30	5.95	1000.000	V	184.0	116.0	-119.2
1586.946600	-81.69	-75.30	6.39	1000.000	H	223.0	193.0	-116.7
1886.064000	-79.02	-63.30	15.72	1000.000	V	187.0	15.0	-113.6
2799.300600	-77.55	-61.30	16.25	1000.000	H	227.0	130.0	-112.9
3643.474800	-74.79	-41.30	33.49	1000.000	V	130.0	157.0	-110.1
3865.055400	-73.66	-41.30	32.36	1000.000	V	145.0	147.0	-108.6

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

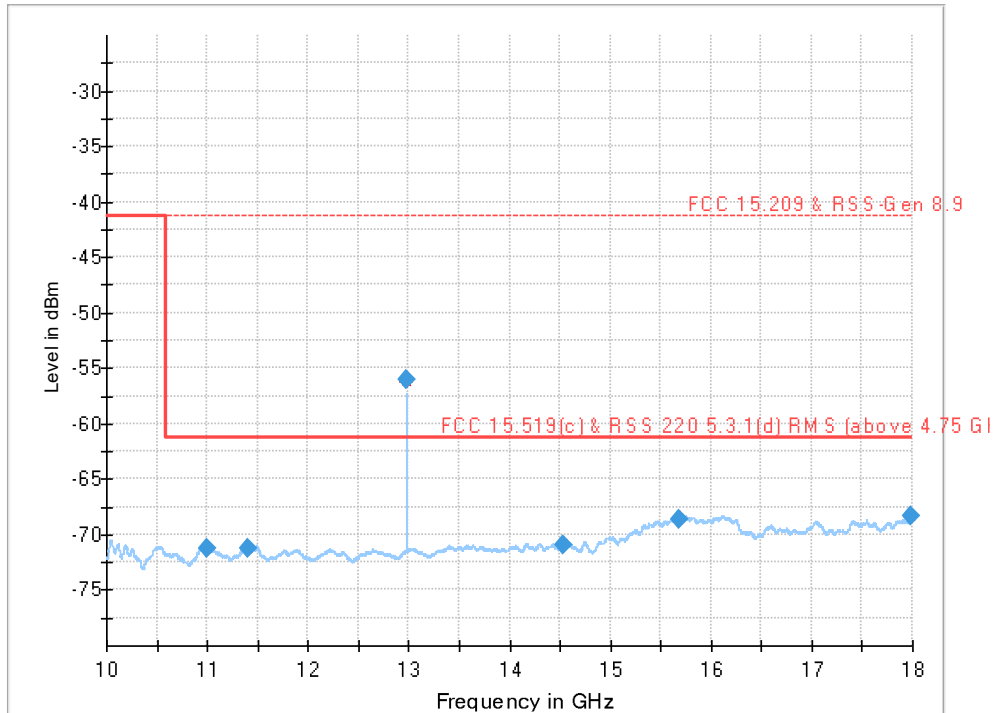
Plot 12: 4.8 GHz to 10 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5475.502857	-63.44	-41.30	22.14	1000.000	H	216.0	116.0	-98.0
9986.012857	-59.16	-41.30	17.86	1000.000	V	36.0	6.0	-89.5

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 13: 10 GHz to 18 GHz, UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10996.897100	-71.25	-61.30	9.95	1000.000	V	185.0	150.0	-103.5
11406.282300	-71.22	-61.30	9.92	1000.000	H	333.0	90.0	-104.1
12979.091100	-56.10	-41.30 (see note)	14.80	1000.000	H	215.0	16.0	-105.0
14529.175900	-70.94	-61.30	9.64	1000.000	H	214.0	57.0	-105.4
15678.570400	-68.57	-61.30	7.27	1000.000	H	18.0	11.0	-104.1
17974.659500	-68.36	-61.30	7.06	1000.000	V	15.0	165.0	-102.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

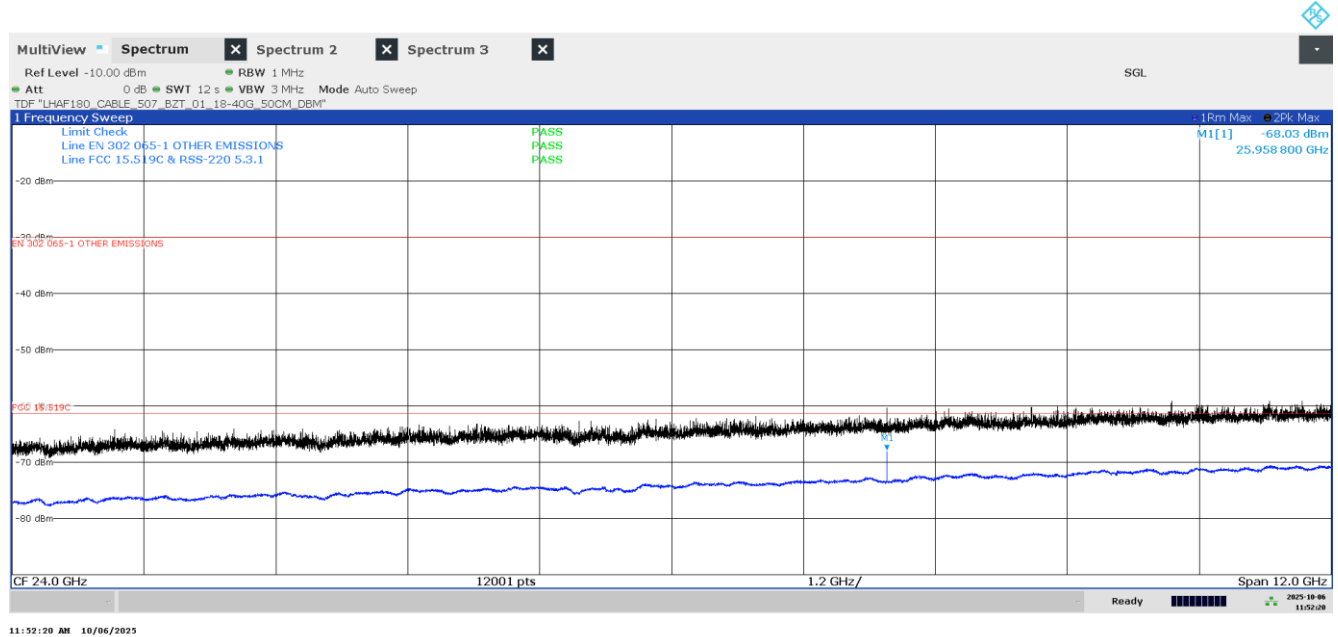
- Emission at 12.979 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

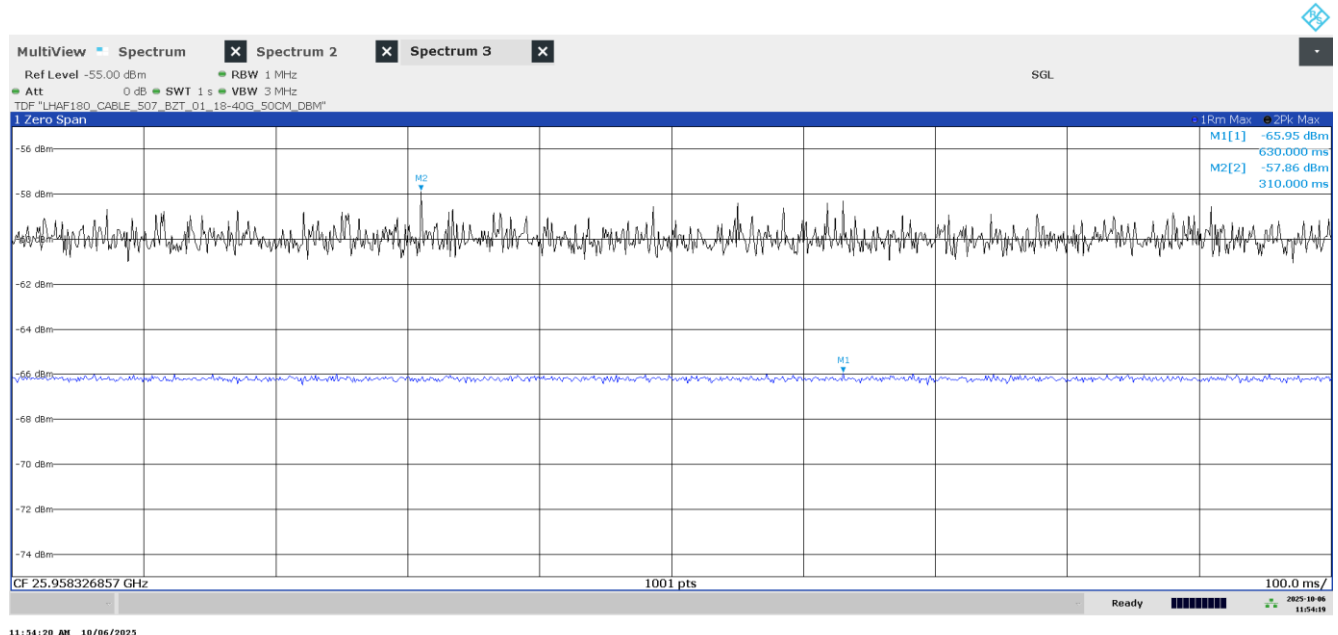
Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

Plot 14: 18 GHz to 30 GHz, UWB test mode

Device information for this plot:

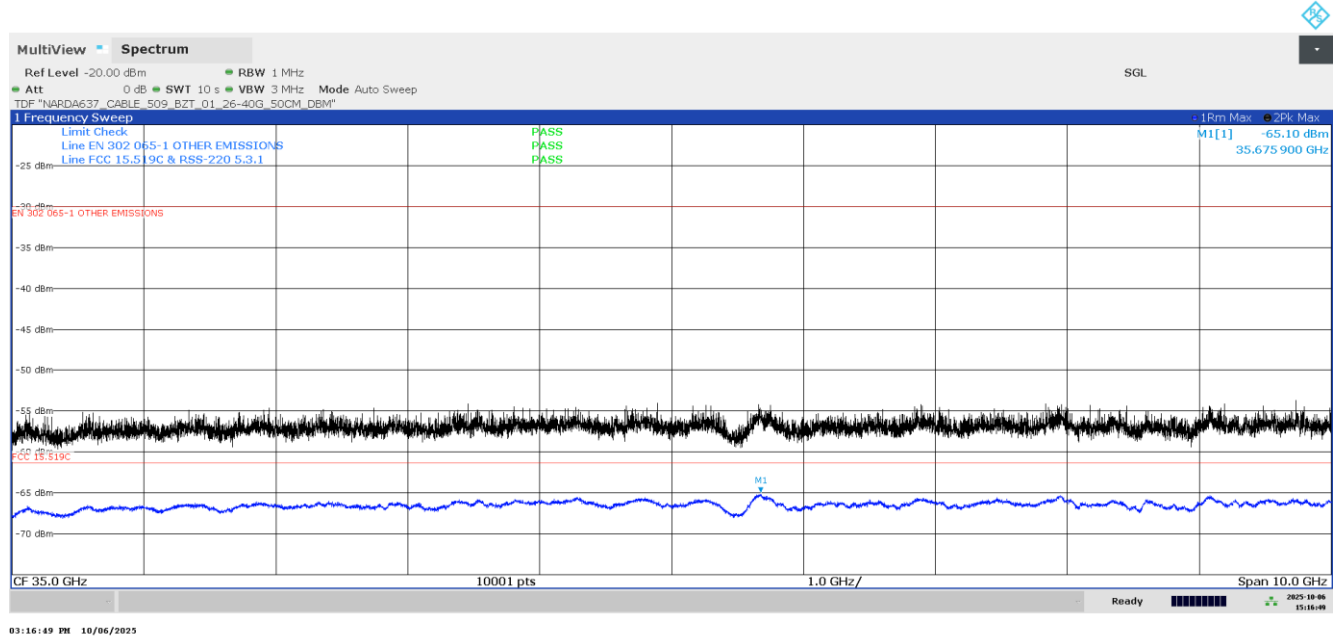
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 15: Spurious emission on 25.9 GHz, UWB test mode, Detail

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

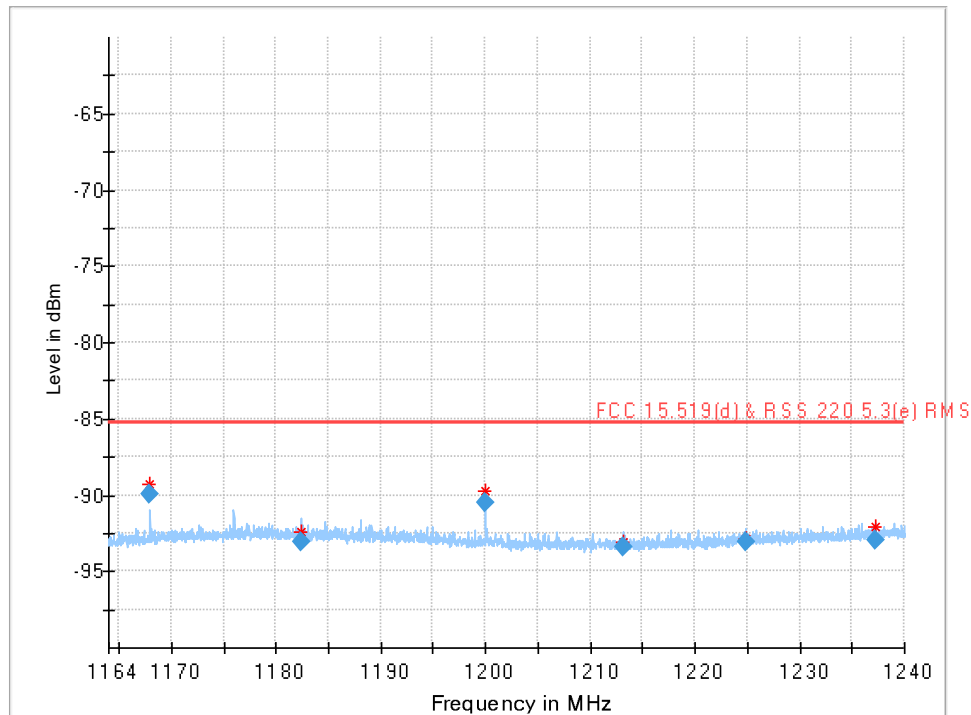
Plot 16: 30 GHz to 40.0 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 17: 1164 MHz to 1240 MHz (§15.519 (d)), UWB test mode

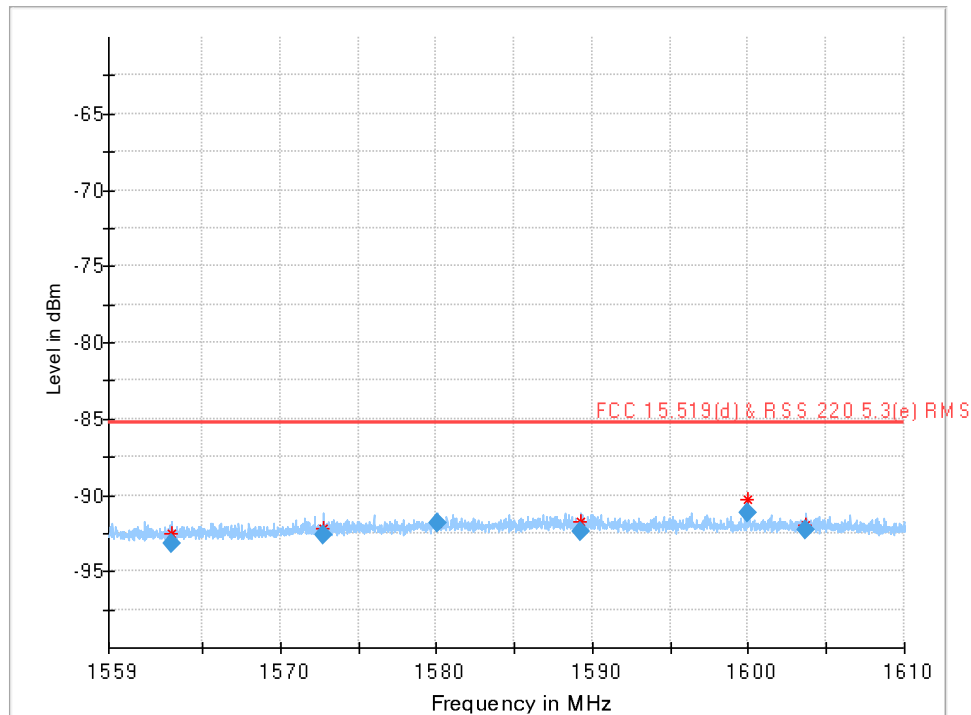


Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1167.974453	-89.90	-85.30	4.60	30.000	V	207.0	23.0	-114.0
1182.393573	-93.07	-85.30	7.77	30.000	H	300.0	90.0	-113.4
1199.995787	-90.49	-85.30	5.19	30.000	H	164.0	139.0	-114.7
1213.183893	-93.36	-85.30	8.06	30.000	H	318.0	152.0	-115.3
1224.911503	-93.09	-85.30	7.79	30.000	H	71.0	47.0	-114.5
1237.251523	-92.93	-85.30	7.63	30.000	H	115.0	121.0	-113.5

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 18: 1559 MHz to 1610 MHz (§15.519 (d)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1563.084510	-93.19	-85.30	7.89	30.000	H	184.0	89.0	-114.2
1572.739690	-92.58	-85.30	7.28	30.000	H	128.0	135.0	-113.9
1580.093540	-91.81	-85.30	6.51	30.000	H	-3.0	135.0	-113.5
1589.248710	-92.35	-85.30	7.05	30.000	H	335.0	102.0	-113.2
1599.994820	-91.20	-85.30	5.90	30.000	H	173.0	90.0	-113.3
1603.695660	-92.32	-85.30	7.02	30.000	H	96.0	133.0	-113.4

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

12.2.2 Results: Frame CCC-SP3, Channel CH9, Power setting 36

Results:

Measurements of the fundamental emission:

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/MHz]	Applicable limit [dBm/MHz]	Margin [dB]	Plot
		average value			
102 (PKA3AA)	7.987	-44.5	-41.3	3.2	19

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/50 MHz]	Applicable limit [dBm/50 MHz]	Margin [dB]	Plot
		peak value			
102 (PKA3AA)	7.987	-12.7	0	12.7	20

Emissions outside the band:

Frequency f [MHz]	Detector	Measured level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Frequency f [GHz]	Detector	Measured level [dBm]	Limit [dBm]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
31.949	RMS	-60.6	-41.3 (see note)	19.3
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Note:

- Emission at 31.949 GHz:
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

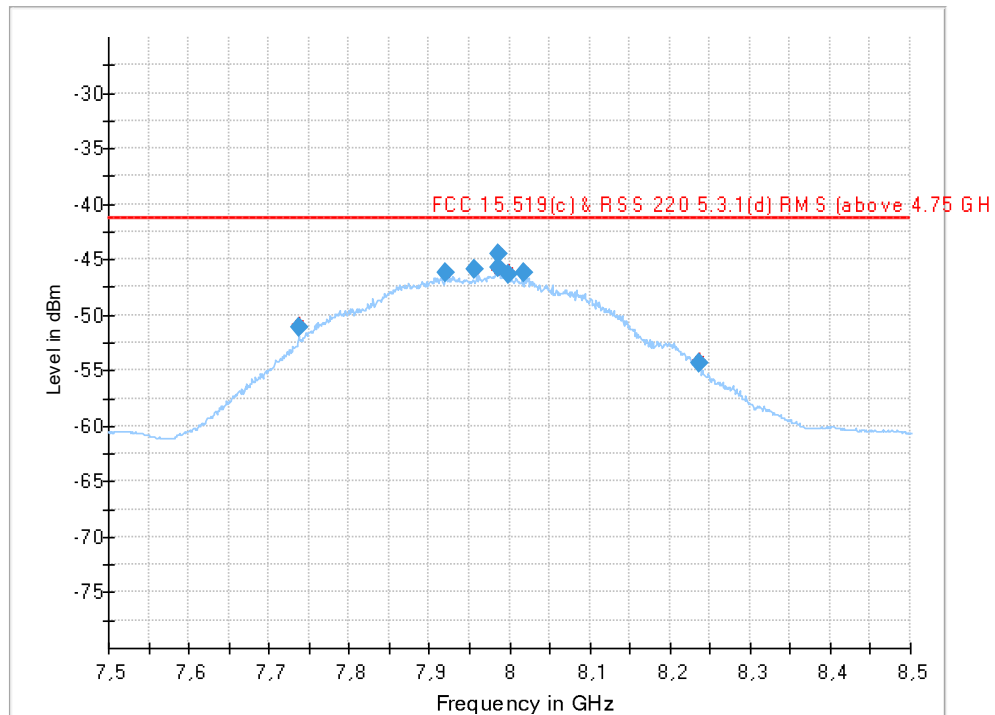
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

Verdict: Compliant

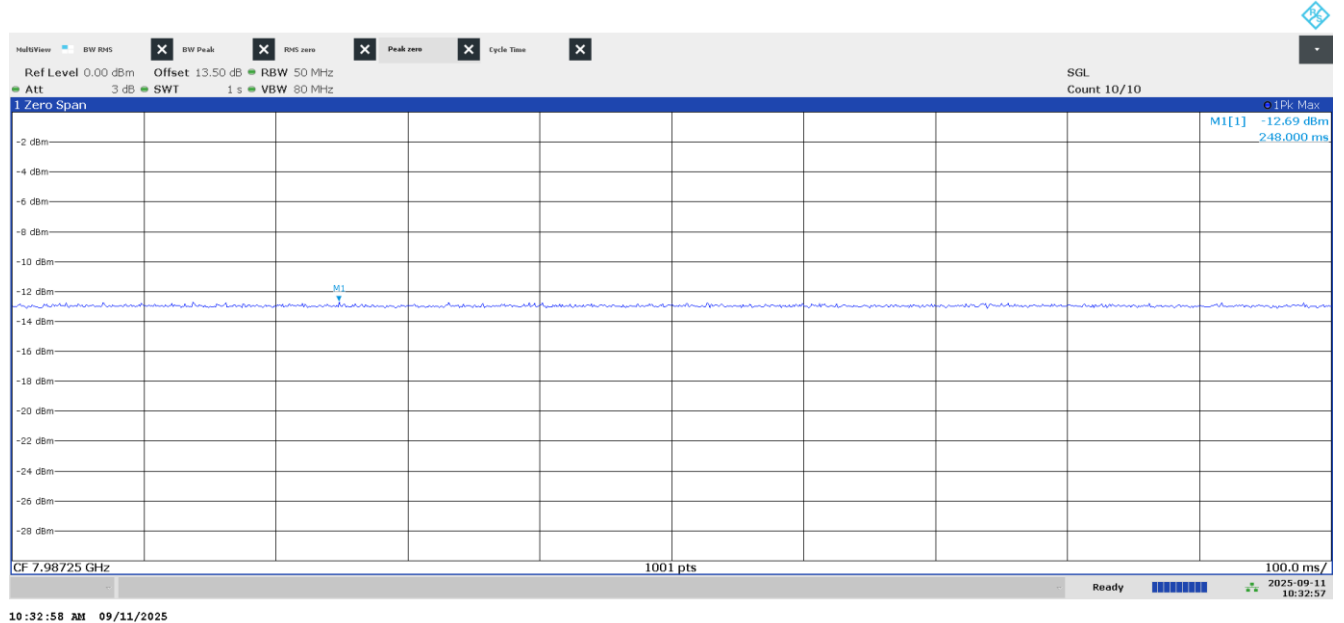
Plot 19: Fundamental emission (UWB test mode): RMS

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
7737.590000	-51.11	-41.30	9.81	1000.000	V	244.0	186.0	-94.1
7920.510000	-46.14	-41.30	4.84	1000.000	V	94.0	0.0	-93.9
7956.160000	-45.97	-41.30	4.67	1000.000	V	95.0	18.0	-93.7
7987.250000	-44.45	-41.30	3.15	1000.000	V	102.0	19.0	-93.5
7987.260000	-45.71	-41.30	4.41	1000.000	V	231.0	2.0	-93.5
7999.740000	-46.38	-41.30	5.08	1000.000	V	75.0	17.0	-93.4
8018.550000	-46.23	-41.30	4.93	1000.000	V	95.0	16.0	-93.5
8237.040000	-54.36	-41.30	13.06	1000.000	V	78.0	18.0	-93.8

Device information for this plot:

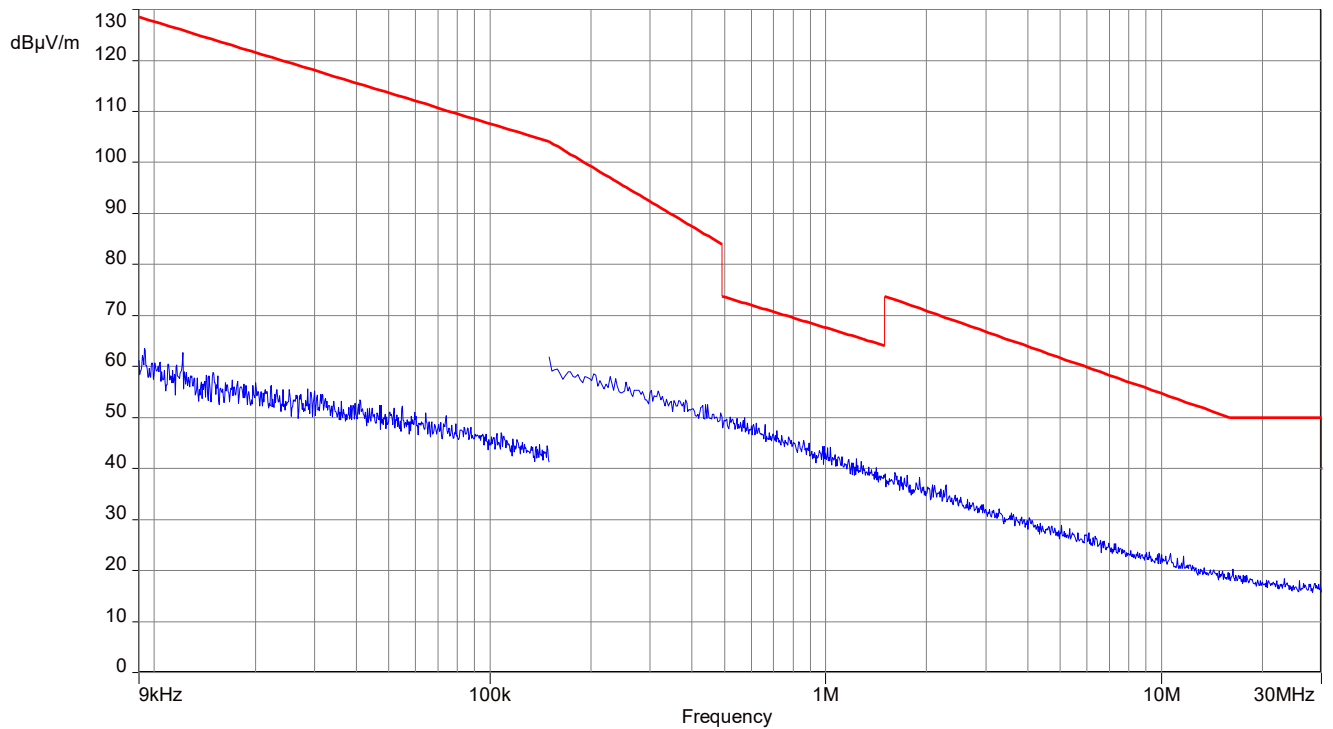
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 20: Fundamental emission (UWB test mode): Max Peak



Device information for this plot:

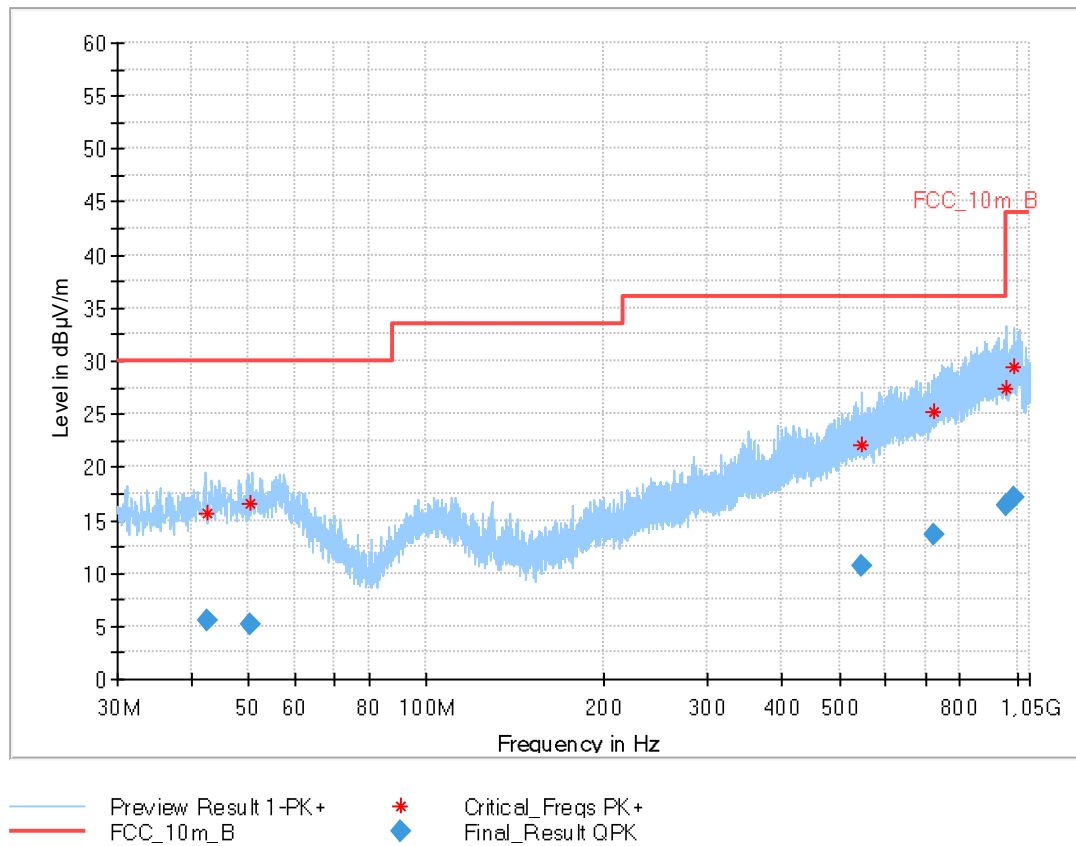
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 21: 9 kHz to 30 MHz, UWB test mode

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 22: 30 MHz to 1 GHz, UWB test mode

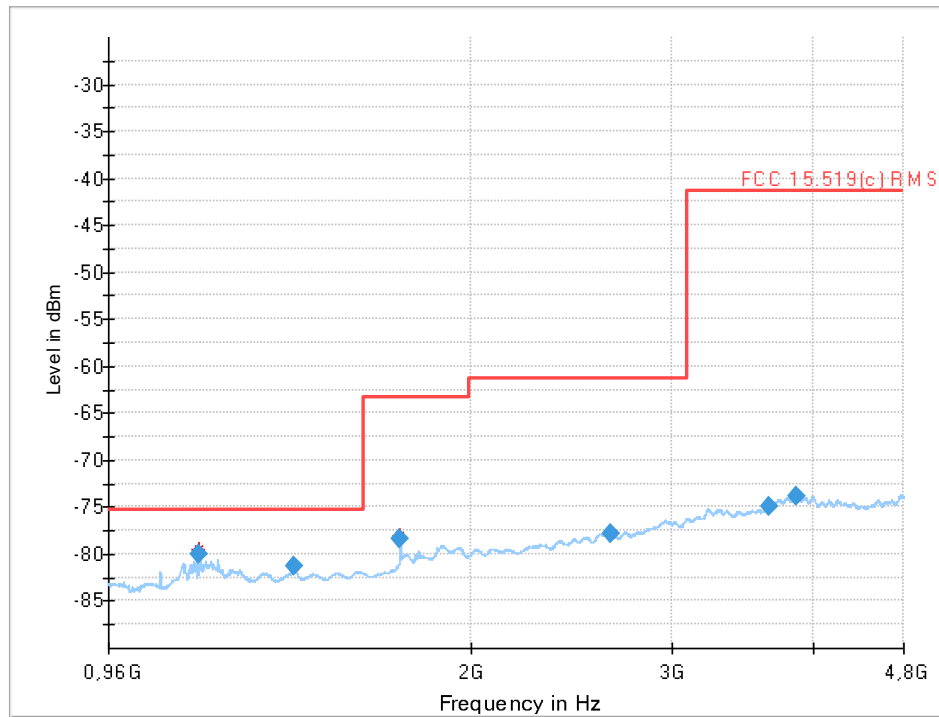


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
42.689	5.46	30.0	24.5	1000	120.0	129.0	V	177	15
50.494	5.20	30.0	24.8	1000	120.0	195.0	V	20	15
547.076	10.67	36.0	25.3	1000	120.0	195.0	H	285	20
724.290	13.63	36.0	22.4	1000	120.0	118.0	H	156	23
955.451	16.42	36.0	19.6	1000	120.0	195.0	V	263	25
988.690	17.15	44.0	26.9	1000	120.0	151.0	H	37	26

Device information for this plot:

- DUT#: DUT103 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 23: 960 MHz to 4.8 GHz (Limit acc. to §15.519 (c)), UWB test mode

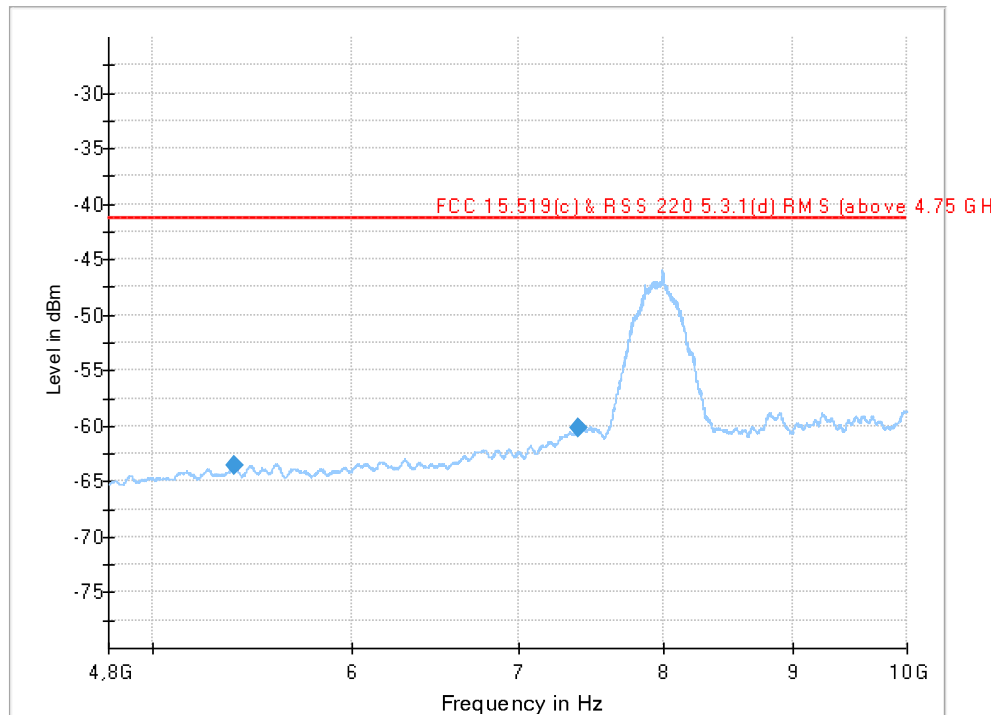


Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1154.242200	-80.04	-75.30	4.74	1000.000	V	210.0	165.0	-118.6
1399.951200	-81.30	-75.30	6.00	1000.000	V	226.0	153.0	-117.1
1733.607000	-78.38	-63.30	15.08	1000.000	H	136.0	135.0	-115.9
2652.739800	-77.88	-61.30	16.58	1000.000	V	182.0	69.0	-112.7
3660.593400	-74.89	-41.30	33.59	1000.000	V	135.0	90.0	-109.7
3861.350400	-73.93	-41.30	32.63	1000.000	V	230.0	24.0	-108.6

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

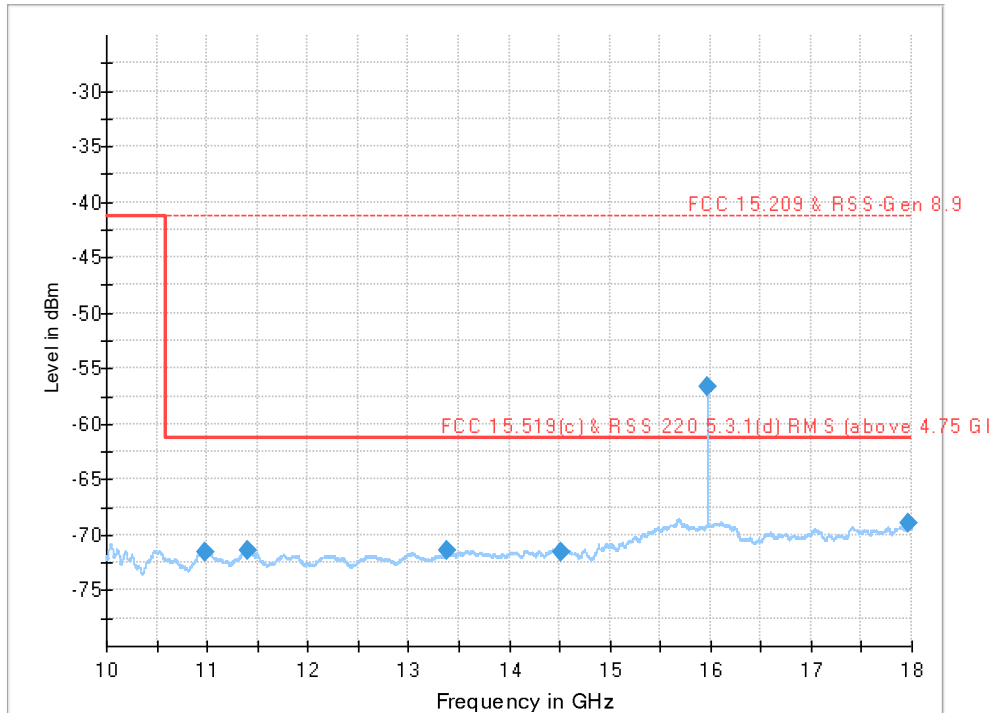
Plot 24: 4.8 GHz to 10 GHz, UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5390.745714	-63.58	-41.30	22.28	1000.000	H	180.0	144.0	-98.2
7395.281429	-60.23	-41.30	18.93	1000.000	V	60.0	55.0	-93.7

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 25: 10 GHz to 18 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10975.342800	-71.62	-61.30	10.32	1000.000	V	274.0	19.0	-103.8
11410.066700	-71.36	-61.30	10.06	1000.000	V	240.0	17.0	-104.1
13390.721300	-71.47	-61.30	10.17	1000.000	H	339.0	0.0	-105.0
14512.651200	-71.52	-61.30	10.22	1000.000	V	302.0	3.0	-105.6
15974.343600	-56.65	-41.30 (see note)	-4.65	1000.000	H	150.0	17.0	-104.3
17971.583700	-68.93	-61.30	7.63	1000.000	V	321.0	17.0	-102.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

- Emission at 15.974 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

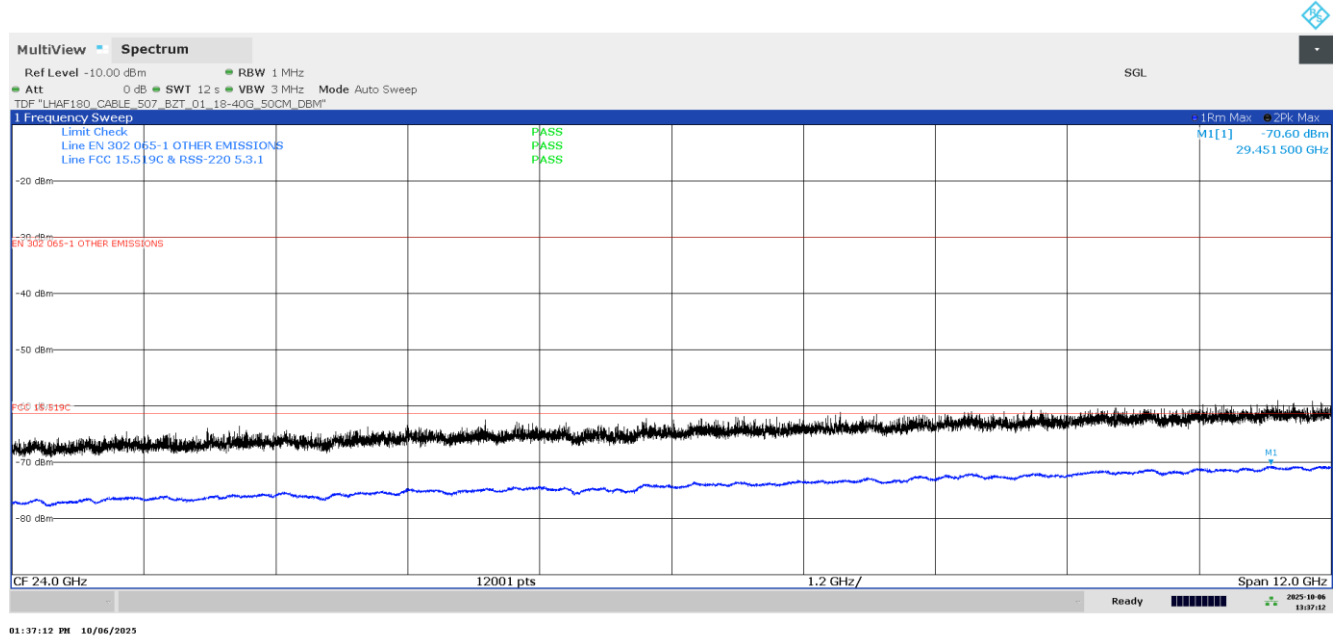
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

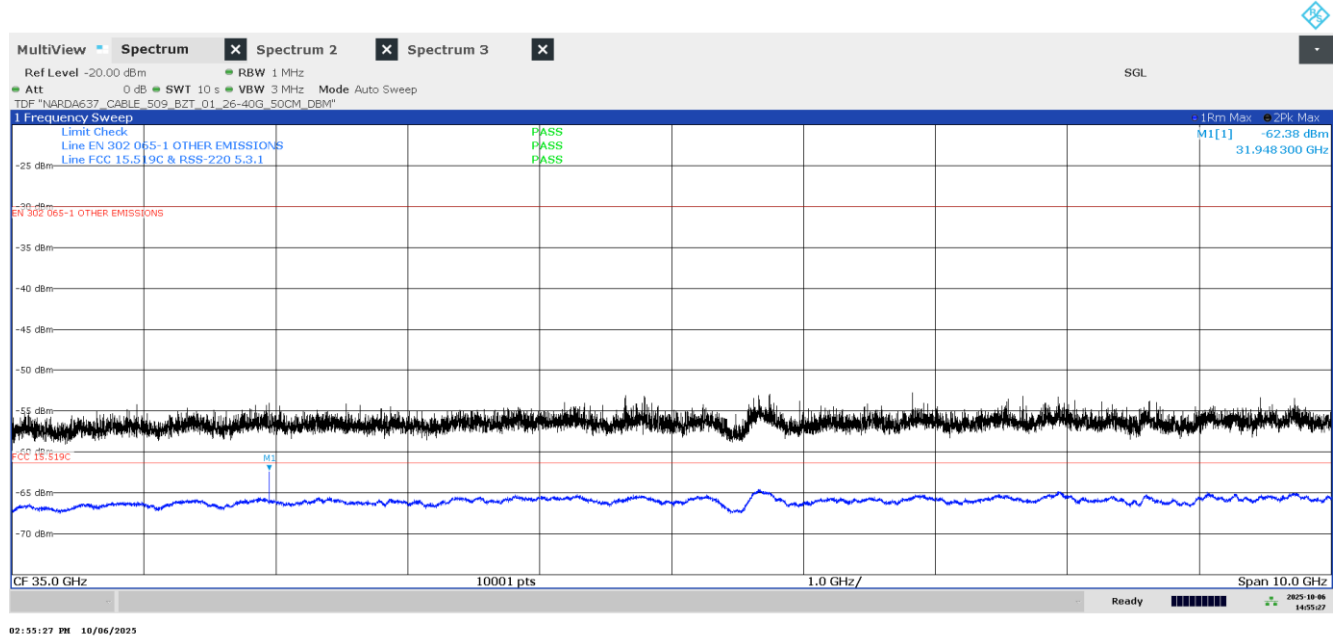
Plot 26: 18 GHz to 30 GHz, UWB test mode



Device information for this plot:

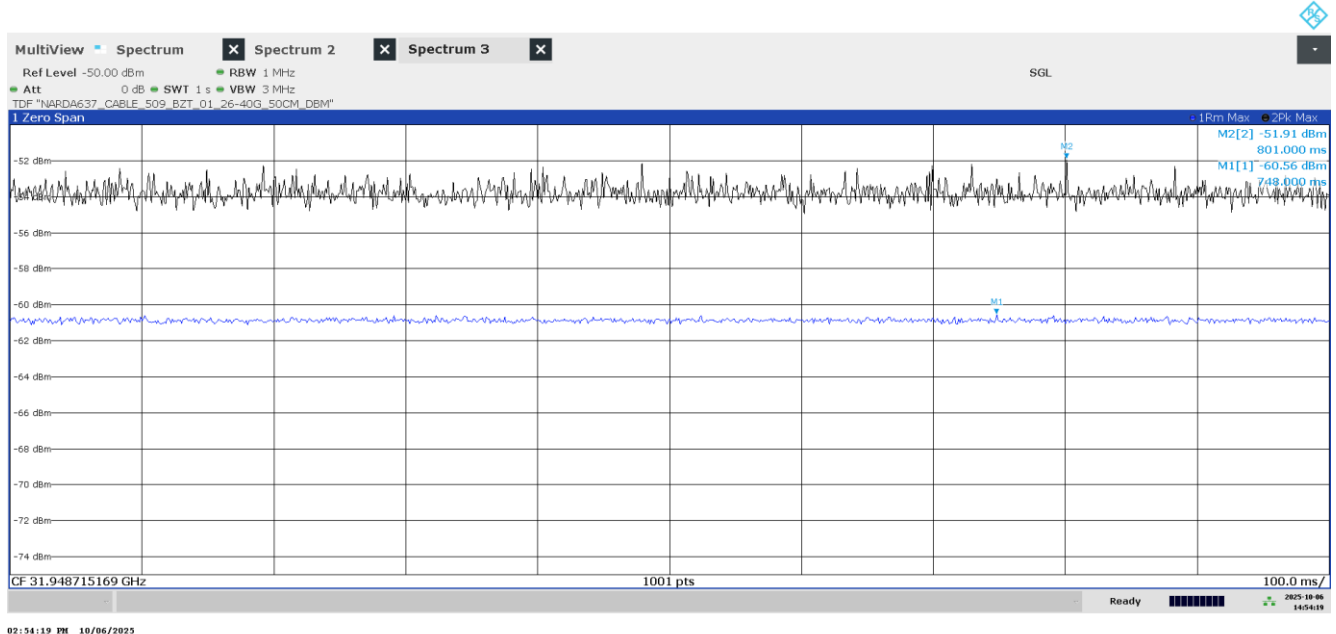
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 27: 30 GHz to 40.0 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 28: Spurious emission on 31.9 GHz, UWB test mode, Detail**Device information for this plot:**

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

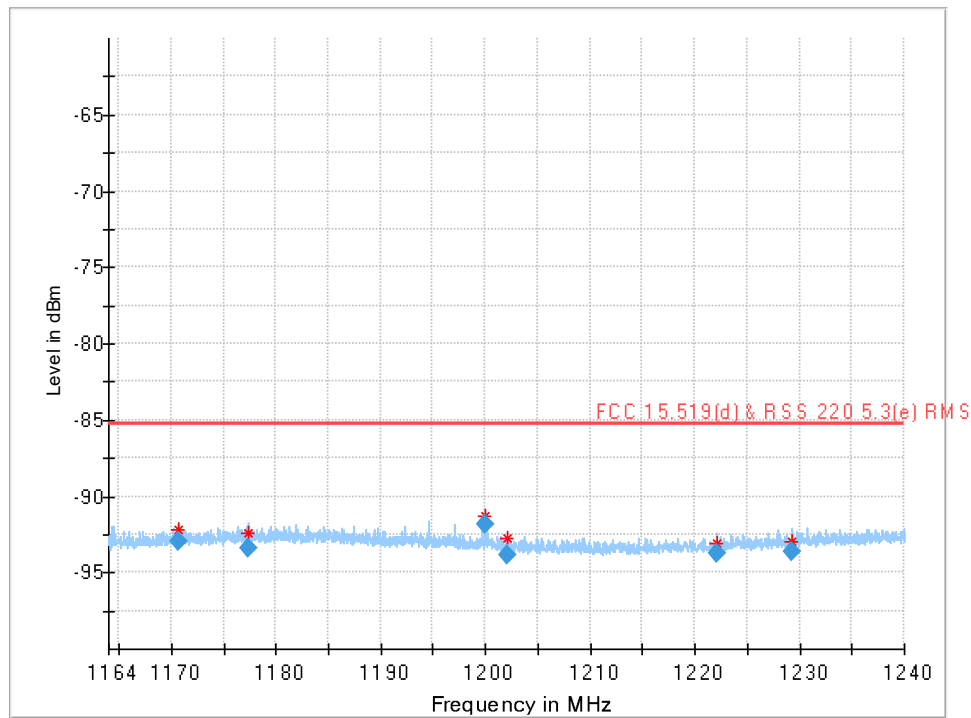
- Emission at 31.949 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

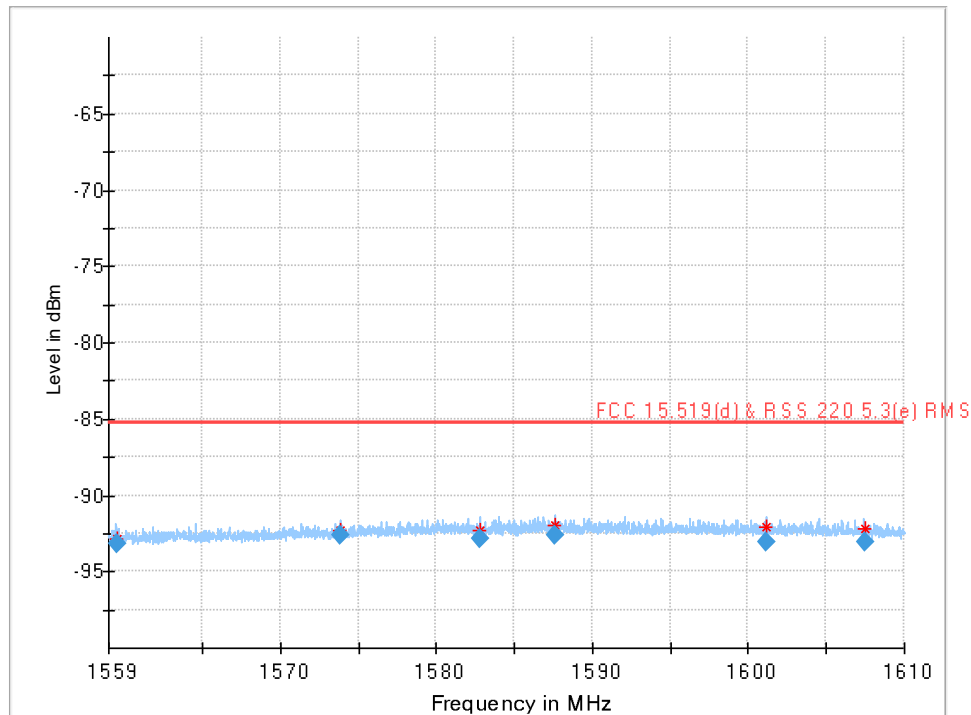
Plot 29: 1164 MHz to 1240 MHz (§15.519 (d)), UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1170.747173	-92.95	-85.30	7.65	30.000	V	346.0	129.0	-113.8
1177.364437	-93.38	-85.30	8.08	30.000	V	332.0	90.0	-113.6
1200.010787	-91.81	-85.30	6.51	30.000	H	176.0	45.0	-114.7
1202.094207	-93.84	-85.30	8.54	30.000	V	351.0	124.0	-115.1
1222.106960	-93.76	-85.30	8.46	30.000	H	329.0	127.0	-114.8
1229.328937	-93.65	-85.30	8.35	30.000	H	99.0	165.0	-114.1

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 30: 1559 MHz to 1610 MHz (§15.519 (d)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1559.512270	-93.23	-85.30	7.93	30.000	H	6.0	56.0	-114.3
1573.852420	-92.60	-85.30	7.30	30.000	H	210.0	103.0	-113.8
1582.811890	-92.83	-85.30	7.53	30.000	H	156.0	30.0	-113.4
1587.580640	-92.59	-85.30	7.29	30.000	H	129.0	153.0	-113.2
1601.132000	-93.11	-85.30	7.81	30.000	H	332.0	78.0	-113.3
1607.466270	-93.09	-85.30	7.79	30.000	H	224.0	180.0	-113.5

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

12.2.3 Results: Frame RAD-SP3, Channel CH5, Power setting 32

Results:

Measurements of the fundamental emission:

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/MHz]	Applicable limit [dBm/MHz]	Margin [dB]	Plot
		average value			
102 (PKA3AA)	6.601	-44.8	-41.3	3.5	31

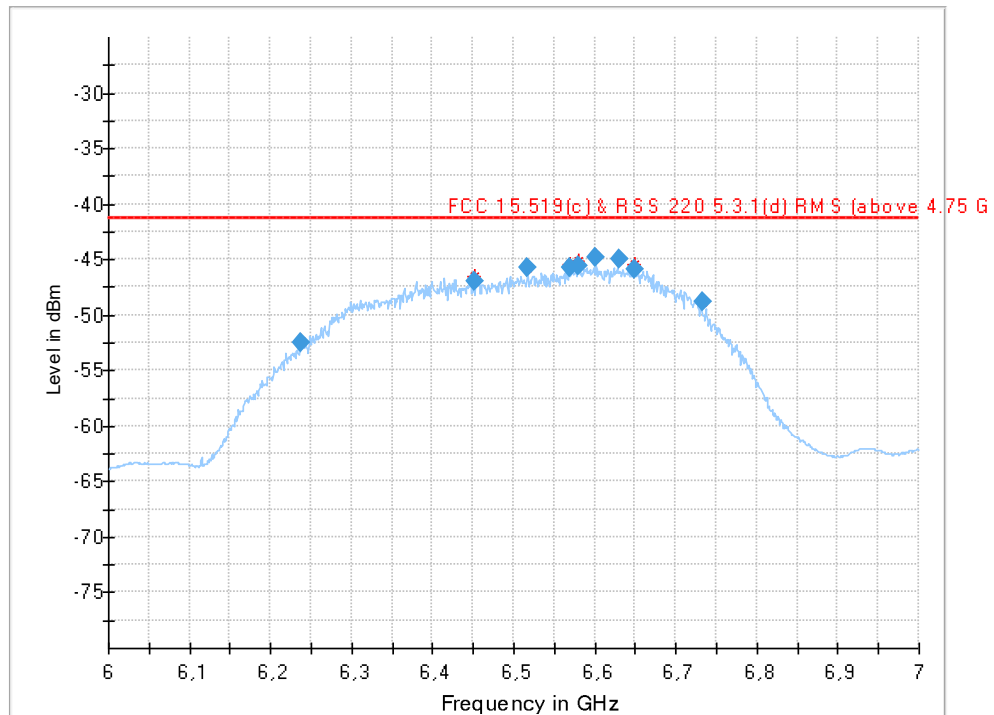
DUT	Frequency [GHz]	Max e.i.r.p. [dBm/50 MHz]	Applicable limit [dBm/50 MHz]	Margin [dB]	Plot
		peak value			
102 (PKA3AA)	6.601	-10.7	0	10.7	32

Emissions outside the band:

Frequency f [MHz]	Detector	Measured level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Frequency f [GHz]	Detector	Measured level [dBm]	Limit [dBm]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
25.958	RMS	-65.8	-61.3	4.5
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Verdict: Compliant

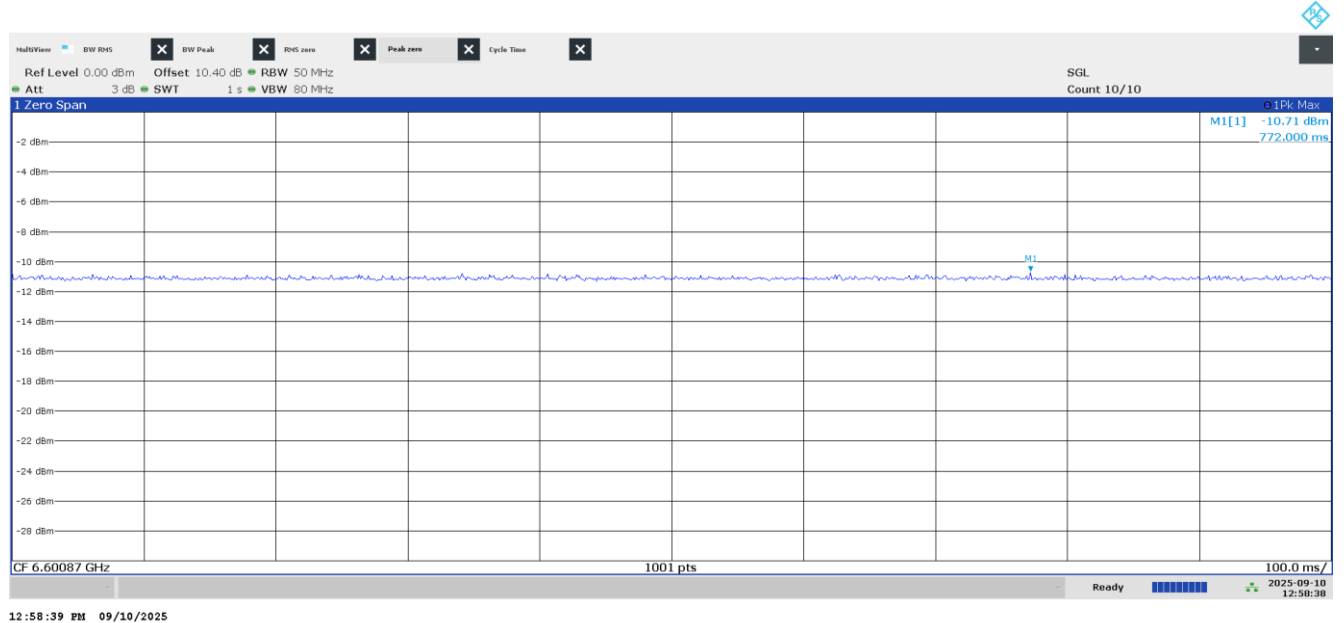
Plot 31: Fundamental emission (UWB test mode): RMS

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
6237.290000	-52.52	-41.30	11.22	1000.000	V	62.0	30.0	-97.7
6451.140000	-46.94	-41.30	5.64	1000.000	V	79.0	34.0	-97.2
6517.010000	-45.81	-41.30	4.51	1000.000	V	87.0	22.0	-97.4
6569.120000	-45.80	-41.30	4.50	1000.000	V	102.0	22.0	-97.5
6579.840000	-45.61	-41.30	4.31	1000.000	V	62.0	31.0	-97.2
6600.870000	-44.76	-41.30	3.46	1000.000	V	81.0	16.0	-96.6
6629.440000	-45.02	-41.30	3.72	1000.000	V	92.0	18.0	-96.9
6649.590000	-45.88	-41.30	4.58	1000.000	V	97.0	39.0	-96.8
6732.170000	-48.85	-41.30	7.55	1000.000	V	239.0	32.0	-95.9

Device information for this plot:

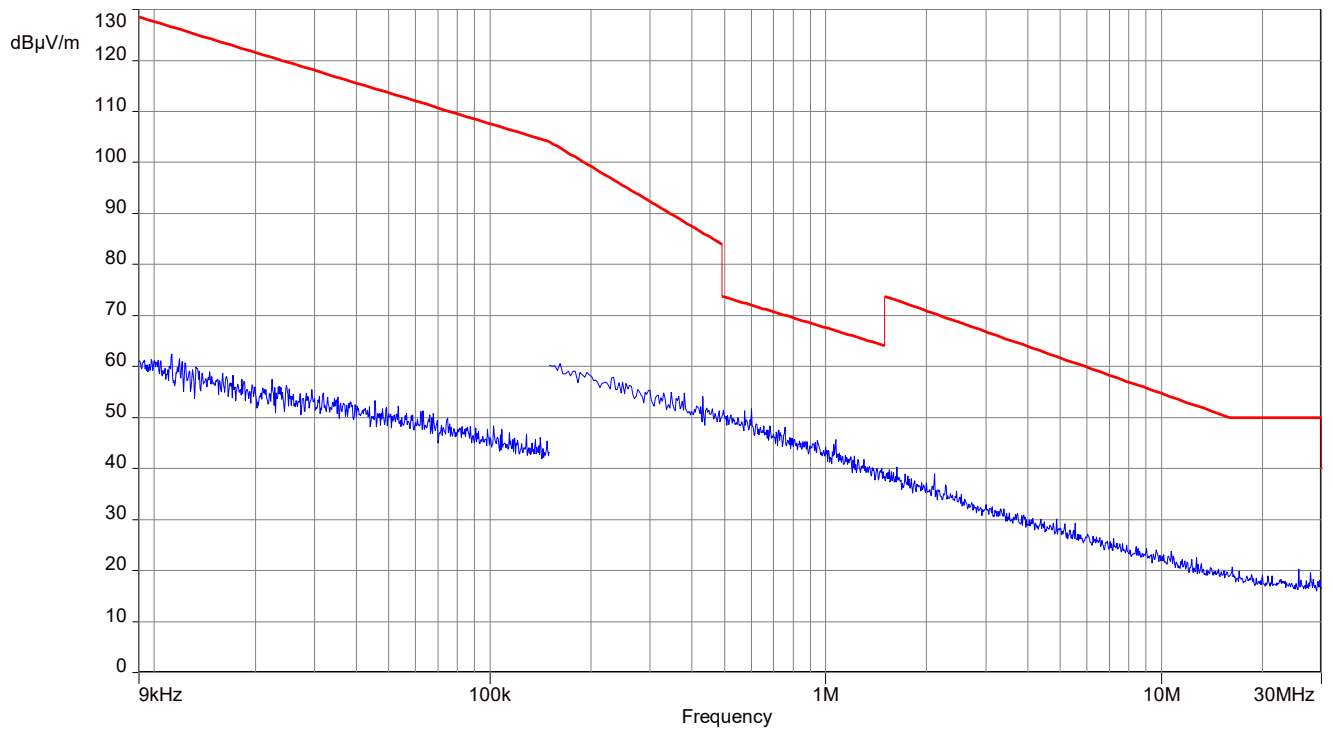
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 32: Fundamental emission (UWB test mode): Max Peak



Device information for this plot:

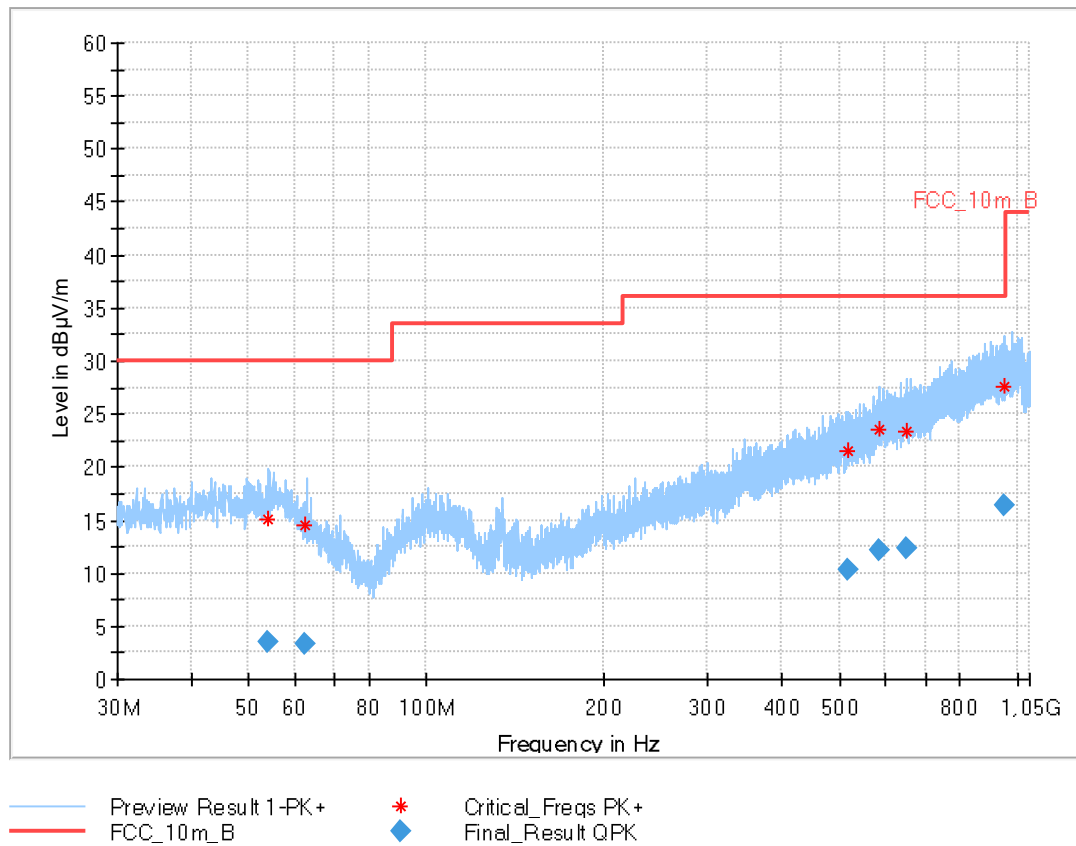
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 33: 9 kHz to 30 MHz, UWB test mode

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 34: 30 MHz to 1 GHz, UWB test mode

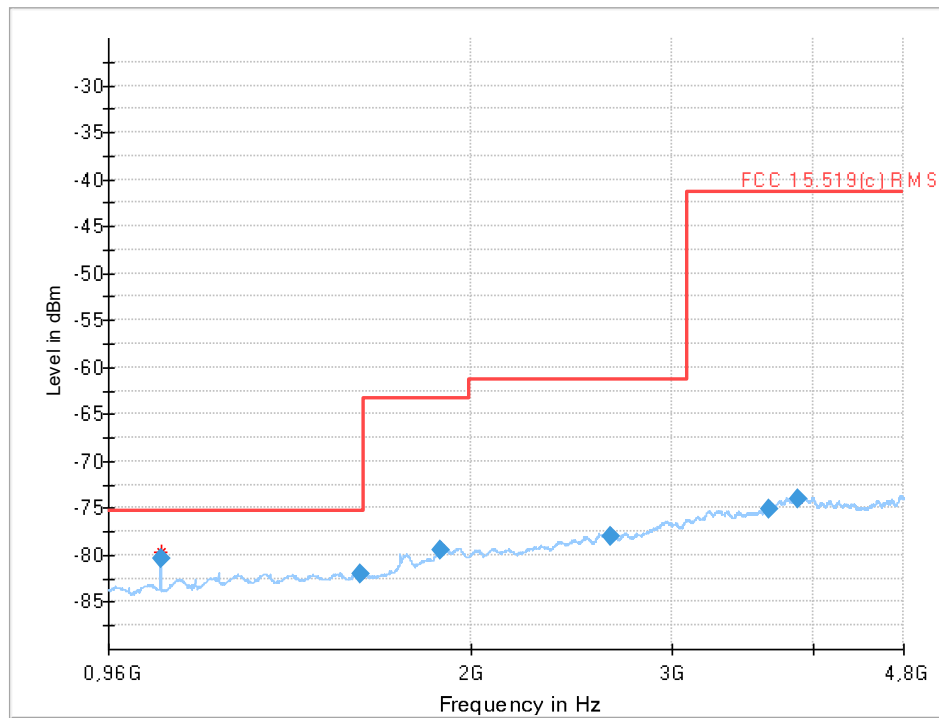


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
53.724	3.52	30.0	26.5	1000	120.0	195.0	H	-21	15
62.424	3.32	30.0	26.7	1000	120.0	189.0	V	146	13
515.335	10.28	36.0	25.7	1000	120.0	101.0	H	9	20
583.479	12.07	36.0	23.9	1000	120.0	195.0	H	37	21
652.225	12.39	36.0	23.6	1000	120.0	195.0	H	233	22
950.309	16.40	36.0	19.6	1000	120.0	98.0	V	27	25

Device information for this plot:

- DUT#: DUT103 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

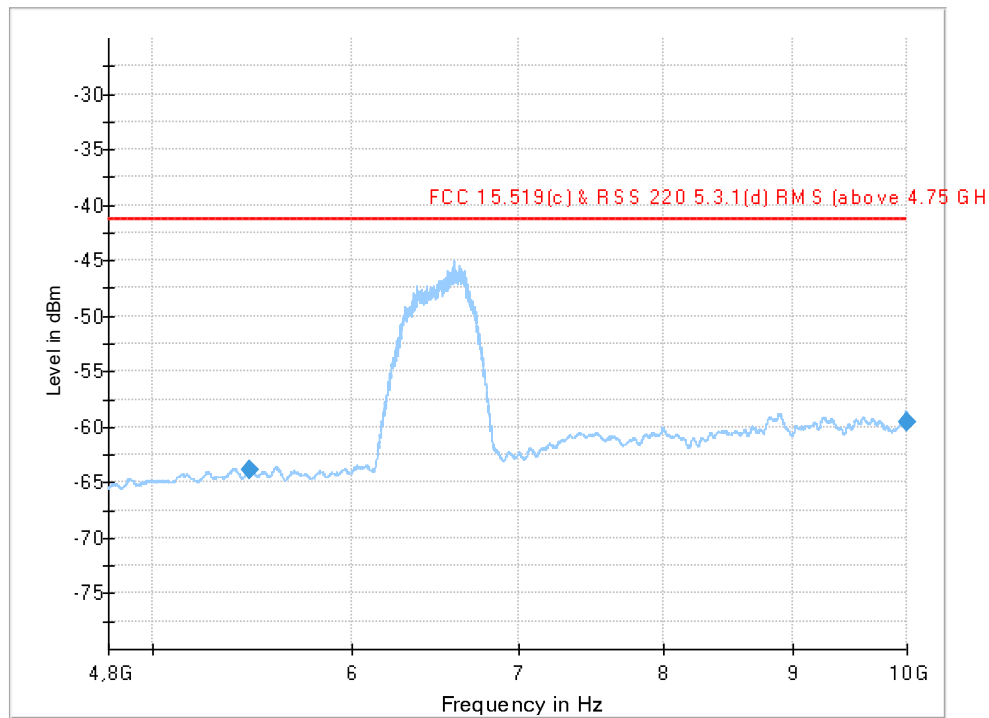
Plot 35: 960 MHz to 4.8 GHz (Limit acc. to §15.519 (c)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3872.868000	-74.11	-41.30	32.81	1000.000	V	357.0	15.0	-108.6
3655.729200	-75.07	-41.30	33.77	1000.000	V	272.0	19.0	-109.8
2652.468600	-77.97	-61.30	16.67	1000.000	V	326.0	4.0	-112.7
1880.714400	-79.43	-63.30	16.13	1000.000	V	240.0	0.0	-113.7
1066.873200	-80.30	-75.30	5.00	1000.000	H	195.0	25.0	-119.5
1600.115400	-82.08	-75.30	6.78	1000.000	V	1.0	15.0	-116.8

Device information for this plot:

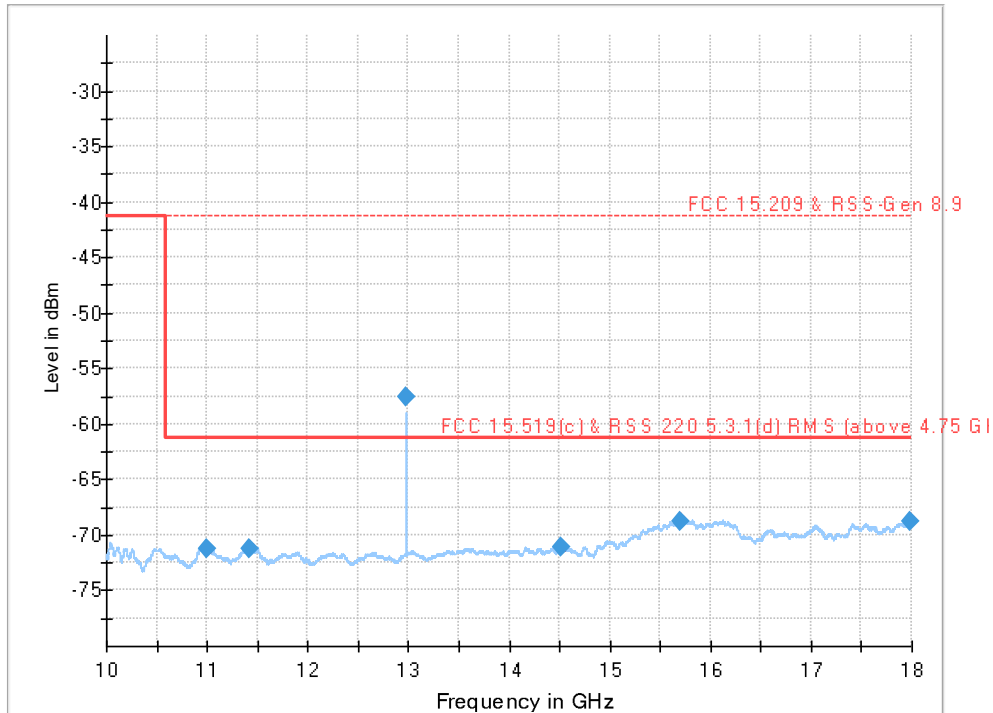
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 36: 4.8 GHz to 10 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5467.094286	-63.84	-41.30	22.54	1000.000	H	238.0	17.0	-98.1
9993.561429	-59.62	-41.30	18.32	1000.000	V	19.0	76.0	-89.6

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 37: 10 GHz to 18 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10995.290700	-71.23	-61.30	9.93	1000.000	V	60.0	25.0	-103.5
11423.472400	-71.29	-61.30	9.99	1000.000	V	19.0	49.0	-104.1
12979.184100	-57.52	-41.30 (see note)	16.22	1000.000	H	215.0	11.0	-105.0
14521.188200	-71.10	-61.30	9.80	1000.000	H	309.0	195.0	-105.4
15697.637100	-68.77	-61.30	7.47	1000.000	V	165.0	10.0	-104.0
17974.838600	-68.71	-61.30	7.41	1000.000	V	6.0	0.0	-102.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

- Emission at 12.979 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

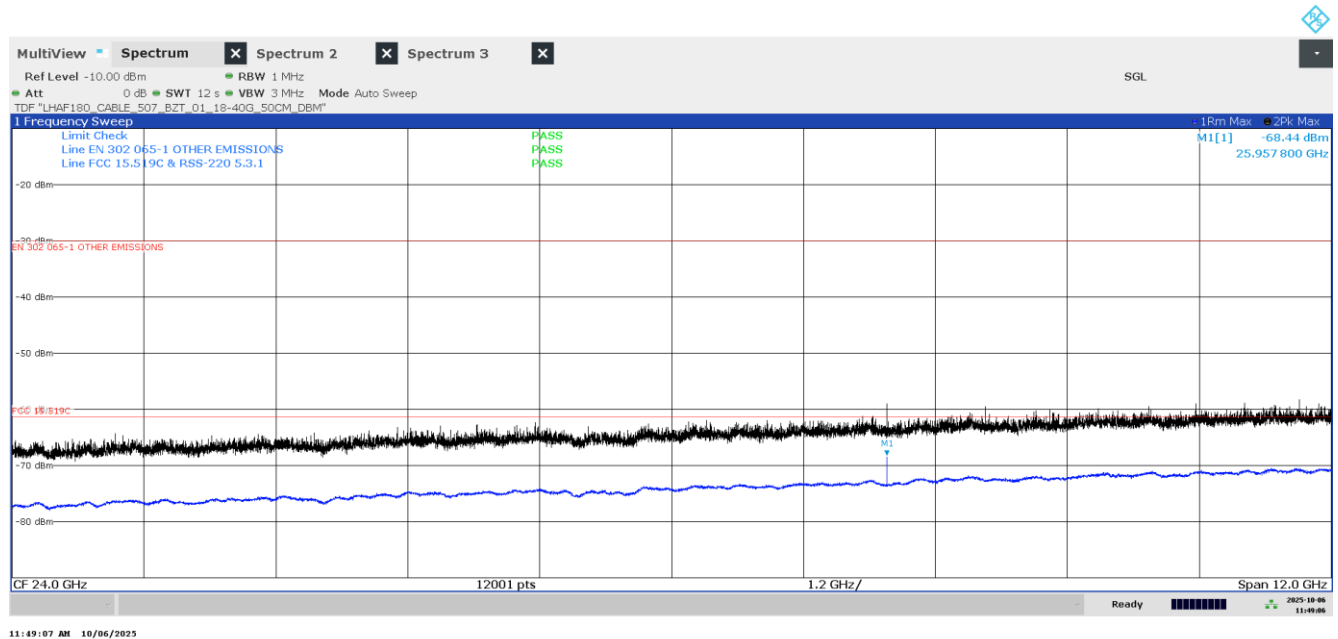
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

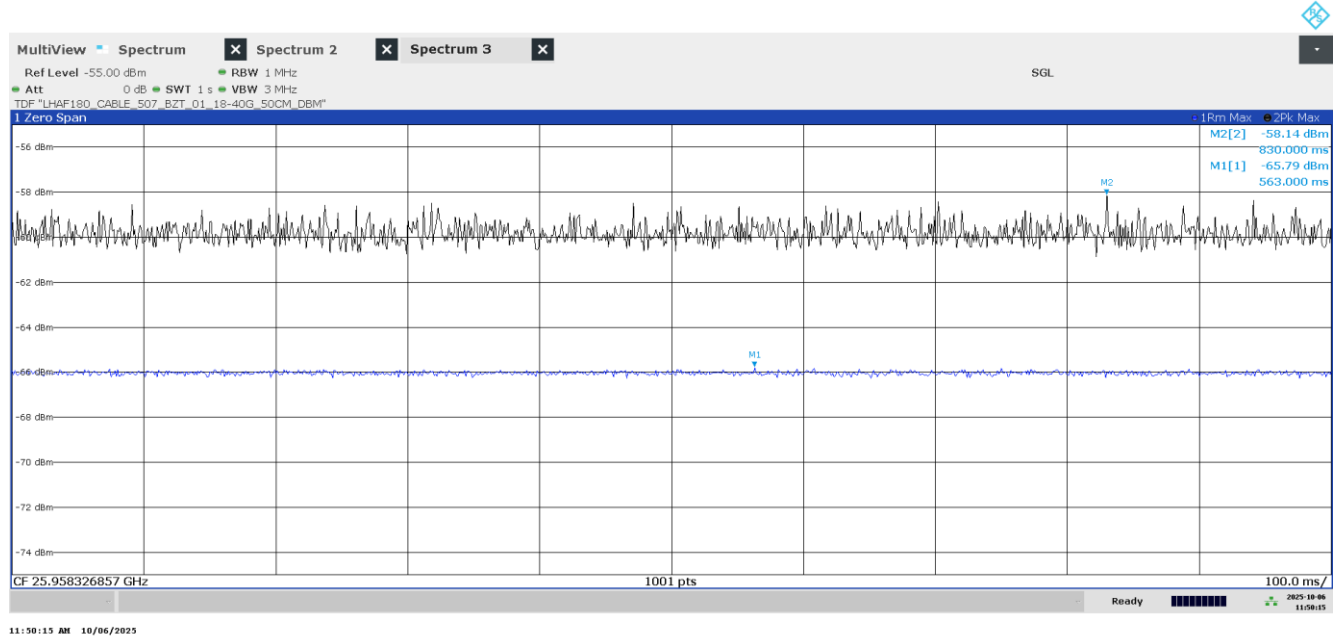
Plot 38: 18 GHz to 30 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

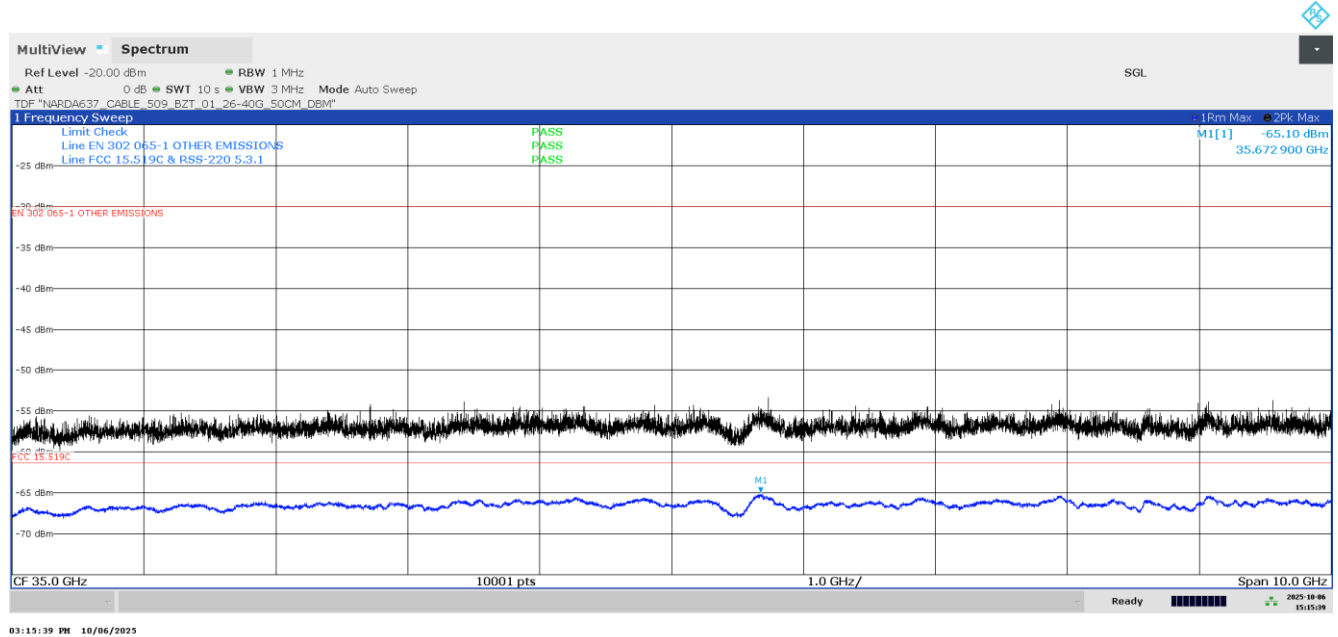
Plot 39: Spurious emission on 25.9 GHz, UWB test mode, Detail



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

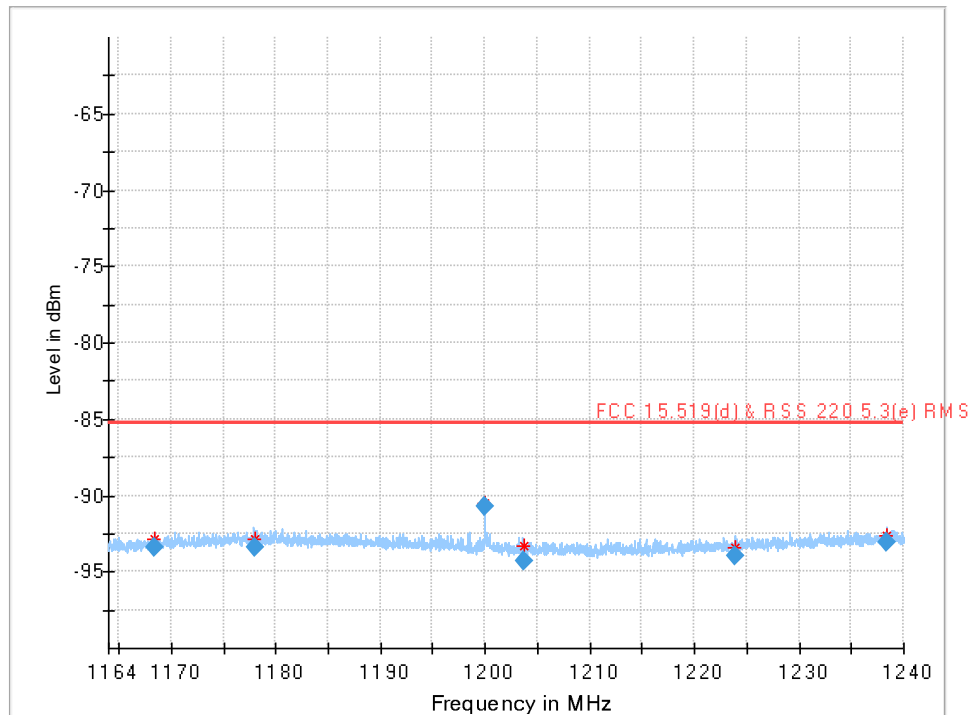
Plot 40: 30 GHz to 40.0 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

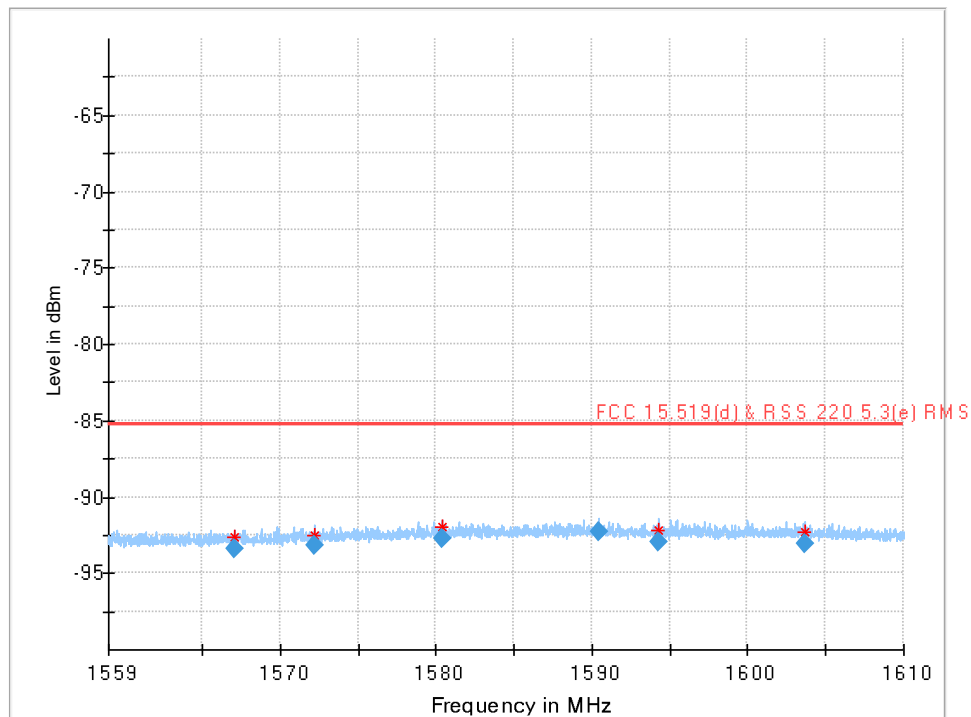
Plot 41: 1164 MHz to 1240 MHz (§15.519 (d)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1168.468417	-93.41	-85.30	8.11	30.000	H	83.0	33.0	-113.8
1177.939620	-93.37	-85.30	8.07	30.000	H	250.0	48.0	-113.4
1200.001187	-90.71	-85.30	5.41	30.000	H	149.0	51.0	-114.7
1203.656793	-94.31	-85.30	9.01	30.000	H	225.0	24.0	-115.0
1223.905087	-94.00	-85.30	8.70	30.000	V	309.0	46.0	-114.9
1238.377030	-93.10	-85.30	7.80	30.000	H	207.0	45.0	-113.5

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 42: 1559 MHz to 1610 MHz (§15.519 (d)), UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1567.101320	-93.44	-85.30	8.14	30.000	H	291.0	114.0	-114.1
1572.168380	-93.14	-85.30	7.84	30.000	H	283.0	32.0	-113.9
1580.365800	-92.77	-85.30	7.47	30.000	H	11.0	178.0	-113.5
1590.433260	-92.34	-85.30	7.04	30.000	H	291.0	15.0	-113.2
1594.310670	-92.94	-85.30	7.64	30.000	H	271.0	152.0	-113.2
1603.677410	-93.06	-85.30	7.76	30.000	H	46.0	171.0	-113.4

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

12.2.4 Results: Frame RAD-SP3, Channel CH6, Power setting 24

Results:

Measurements of the fundamental emission:

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/MHz]	Applicable limit [dBm/MHz]	Margin [dB]	Plot
		average value			
102 (PKA3AA)	6.850	-44.7	-41.3	3.4	43

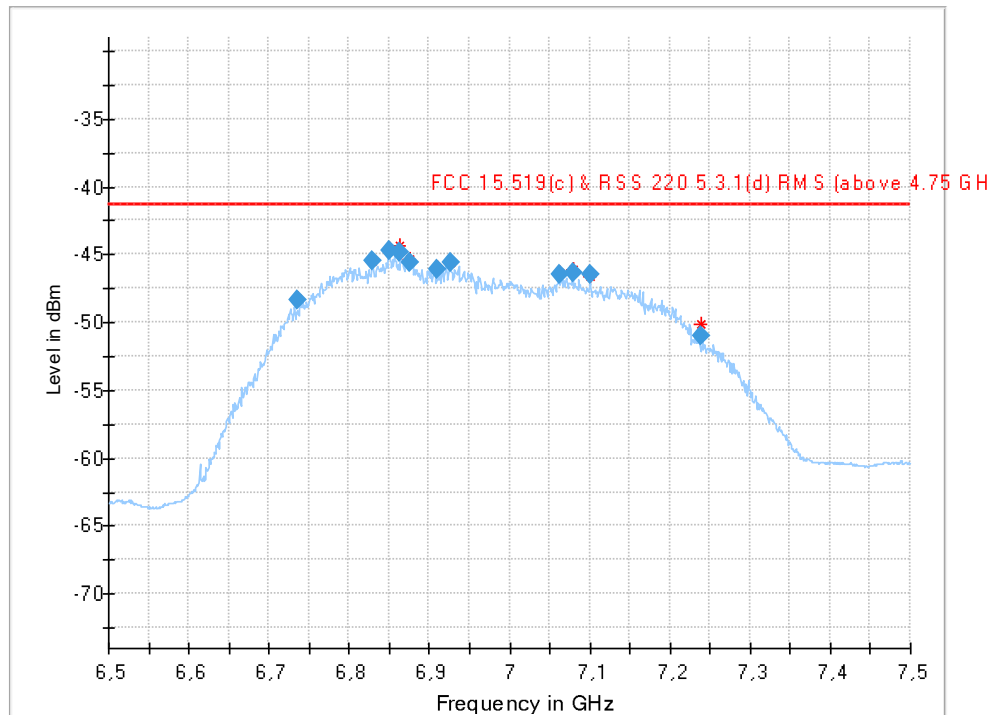
DUT	Frequency [GHz]	Max e.i.r.p. [dBm/50 MHz]	Applicable limit [dBm/50 MHz]	Margin [dB]	Plot
		peak value			
102 (PKA3AA)	6.850	-11.5	0	11.5	44

Emissions outside the band:

Frequency f [MHz]	Detector	Measured level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Frequency f [GHz]	Detector	Measured level [dBm]	Limit [dBm]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
27.955	RMS	-66.1	-61.3	4.8
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

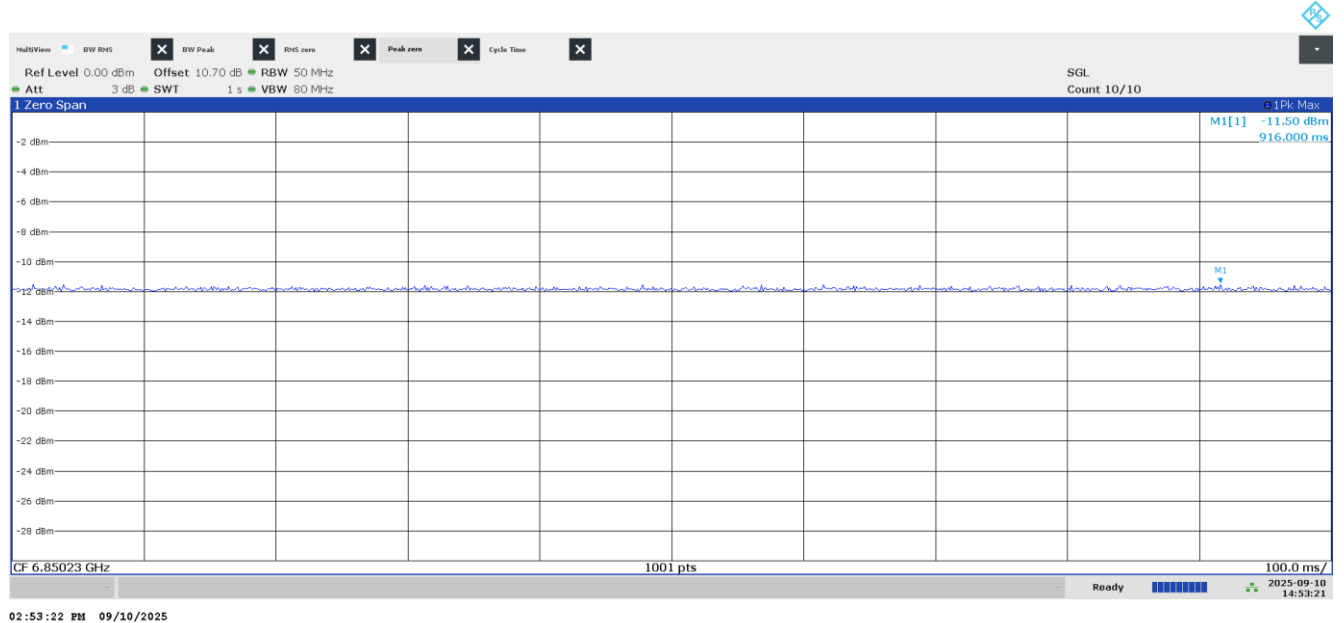
Verdict: Compliant

Plot 43: Fundamental emission (UWB test mode): RMS

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
6736.560000	-48.34	-41.30	7.04	1000.000	V	241.0	32.0	-95.8
6829.690000	-45.45	-41.30	4.15	1000.000	V	76.0	20.0	-96.1
6850.230000	-44.73	-41.30	3.43	1000.000	V	87.0	16.0	-96.3
6864.030000	-44.79	-41.30	3.49	1000.000	V	100.0	172.0	-96.0
6875.250000	-45.55	-41.30	4.25	1000.000	V	88.0	12.0	-95.8
6909.240000	-46.10	-41.30	4.80	1000.000	V	90.0	16.0	-96.4
6926.930000	-45.55	-41.30	4.25	1000.000	V	238.0	37.0	-96.1
7061.610000	-46.51	-41.30	5.21	1000.000	V	78.0	42.0	-95.6
7080.480000	-46.32	-41.30	5.02	1000.000	V	90.0	21.0	-95.2
7099.970000	-46.47	-41.30	5.17	1000.000	V	85.0	38.0	-95.5
7239.850000	-51.01	-41.30	9.71	1000.000	V	93.0	21.0	-94.6

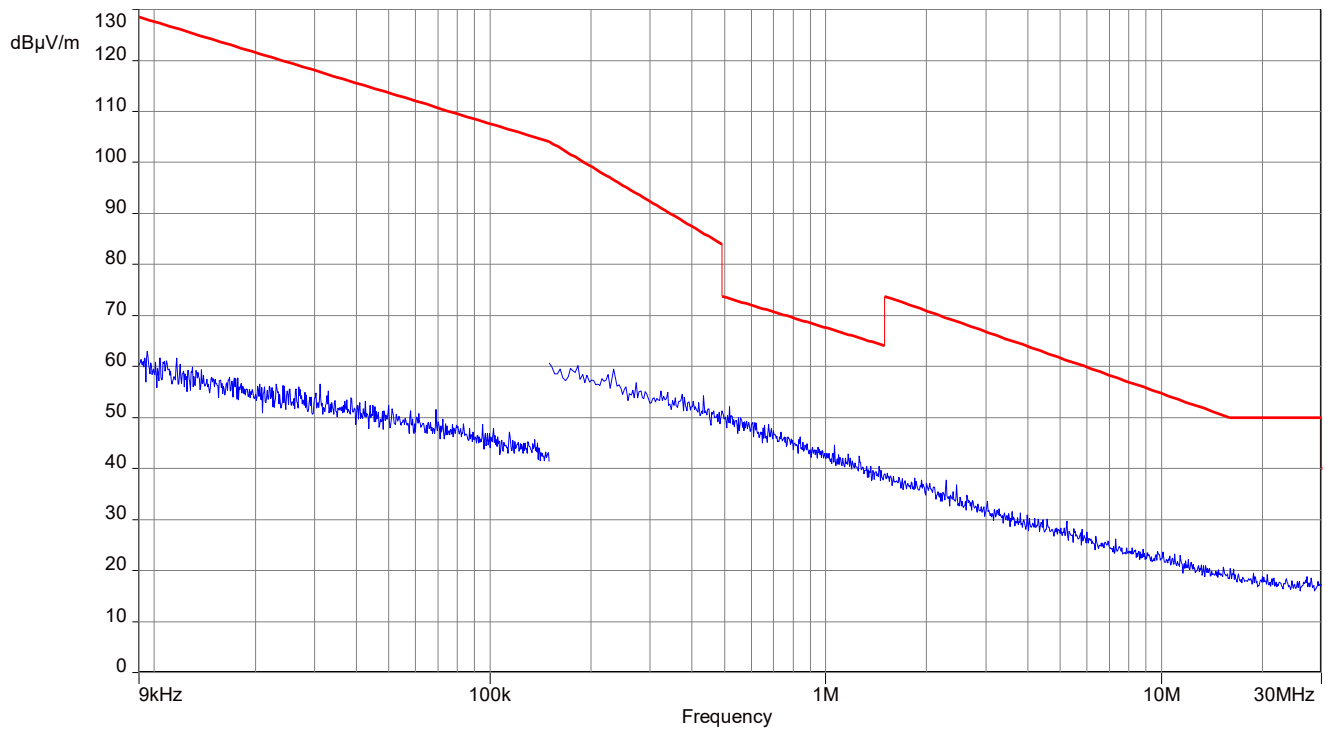
Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 44: Fundamental emission (UWB test mode): Max Peak

Device information for this plot:

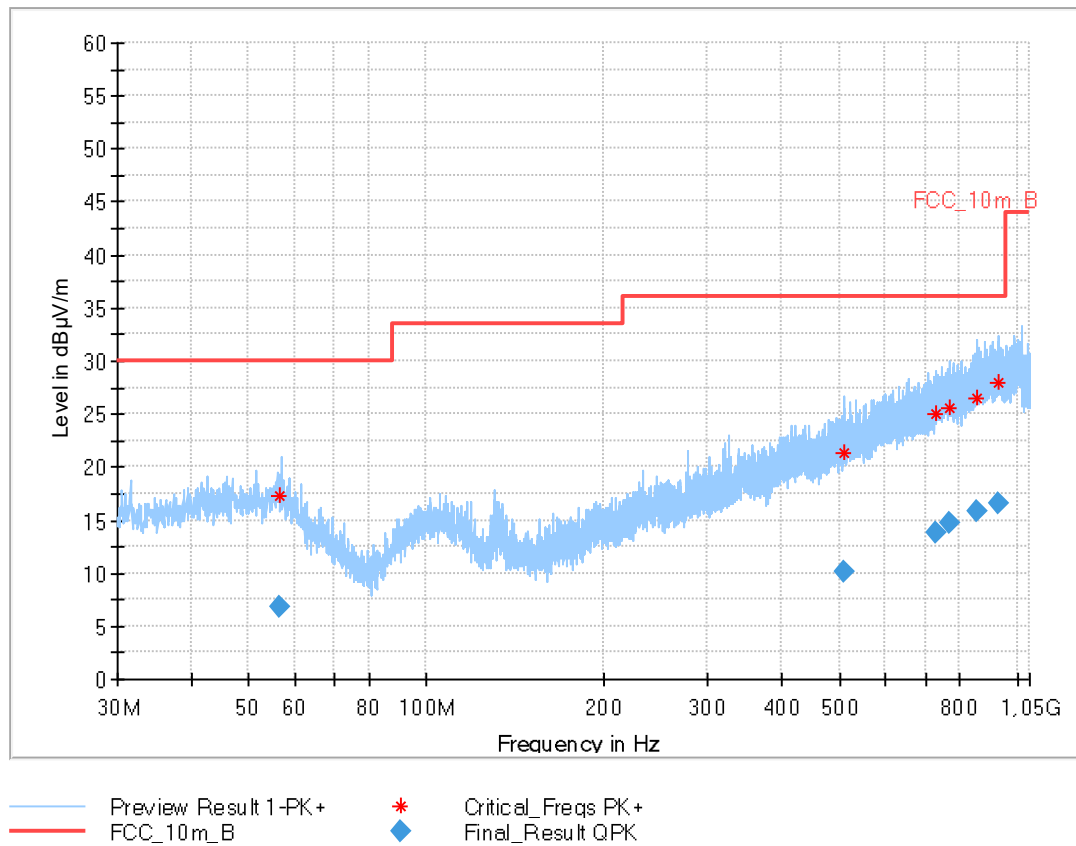
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 45: 9 kHz to 30 MHz, UWB test mode

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

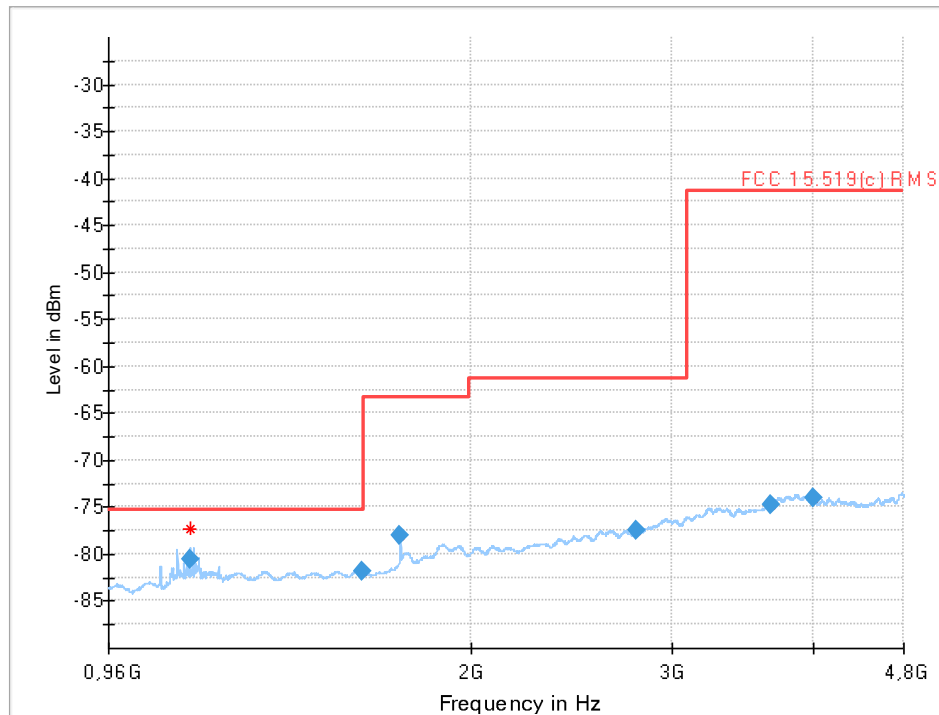
Plot 46: 30 MHz to 1 GHz, UWB test mode



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
56.398	6.73	30.0	23.3	1000	120.0	102.0	V	184	16
509.636	10.18	36.0	25.8	1000	120.0	131.0	H	127	20
731.261	13.89	36.0	22.1	1000	120.0	195.0	V	-29	23
768.646	14.66	36.0	21.3	1000	120.0	162.0	V	251	24
852.354	15.81	36.0	20.2	1000	120.0	195.0	V	84	25
927.045	16.55	36.0	19.5	1000	120.0	195.0	V	127	25

Device information for this plot:

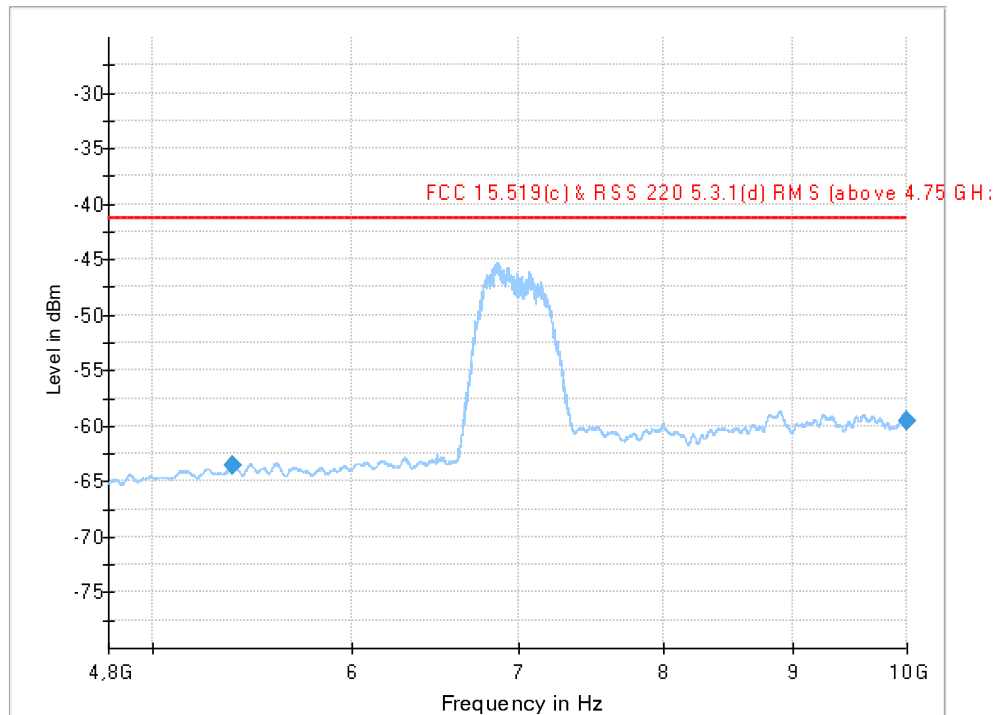
- DUT#: DUT103 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 47: 960 MHz to 4.8 GHz (Limit acc. to §15.519 (c)), UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1133.182800	-80.50	-75.30	5.20	1000.000	V	209.0	127.0	-118.9
1602.306600	-81.89	-75.30	6.59	1000.000	H	205.0	192.0	-116.7
1733.358600	-78.08	-63.30	14.78	1000.000	H	162.0	184.0	-115.9
2798.637000	-77.48	-61.30	16.18	1000.000	H	56.0	2.0	-112.9
3664.197600	-74.78	-41.30	33.48	1000.000	V	16.0	12.0	-109.7
4000.453800	-74.01	-41.30	32.71	1000.000	V	16.0	4.0	-108.7

Device information for this plot:

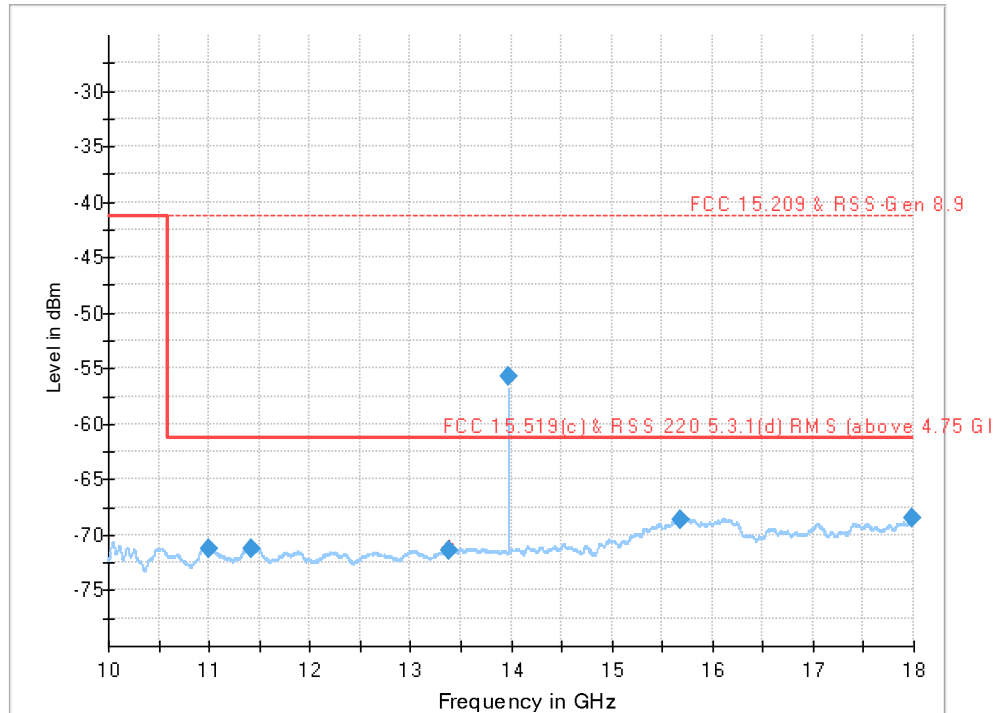
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 48: 4.8 GHz to 10 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5384.228571	-63.53	-41.30	22.23	1000.000	H	6.0	191.0	-98.6
9995.902857	-59.55	-41.30	18.25	1000.000	V	10.0	60.0	-89.7

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 49: 10 GHz to 18 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10997.619900	-71.21	-61.30	9.91	1000.000	V	127.0	120.0	-103.5
11424.358500	-71.20	-61.30	9.90	1000.000	H	210.0	139.0	-104.0
13389.648300	-71.33	-61.30	10.03	1000.000	H	214.0	106.0	-105.0
13977.493200	-55.73	-41.30 (see note)	14.43	1000.000	H	45.0	62.0	-105.5
15680.169100	-68.65	-61.30	7.35	1000.000	H	238.0	152.0	-104.0
17979.585500	-68.49	-61.30	7.19	1000.000	V	97.0	11.0	-102.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

- Emission at 13.977 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

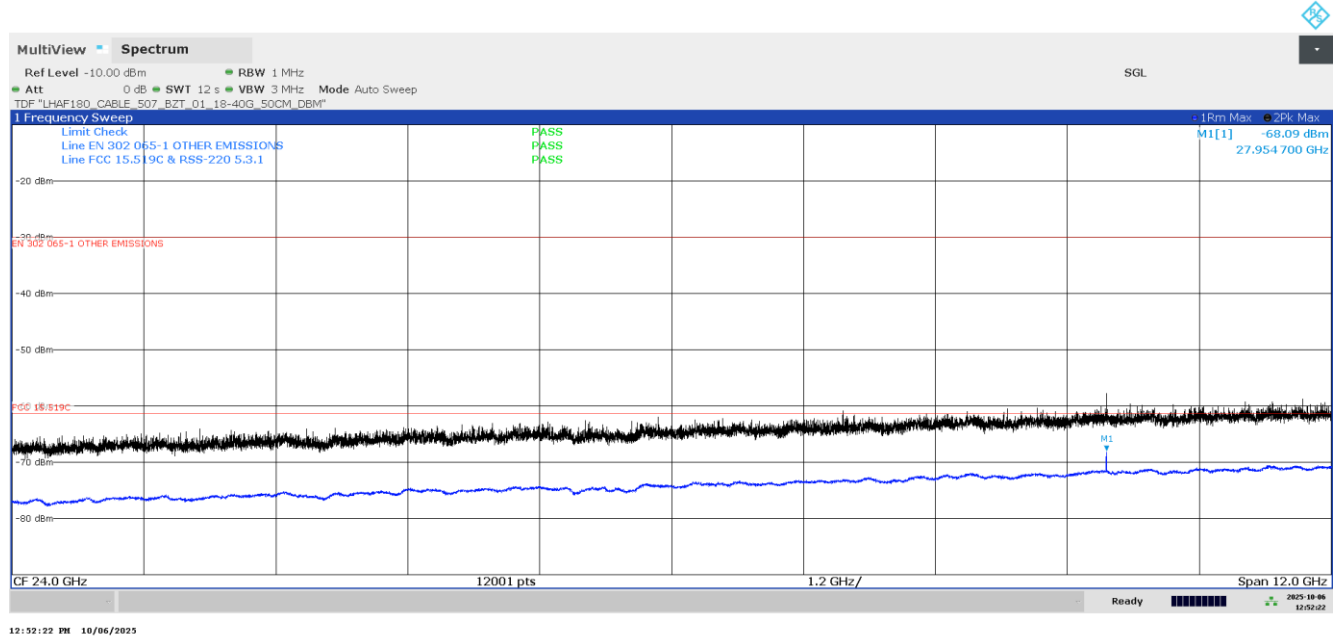
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

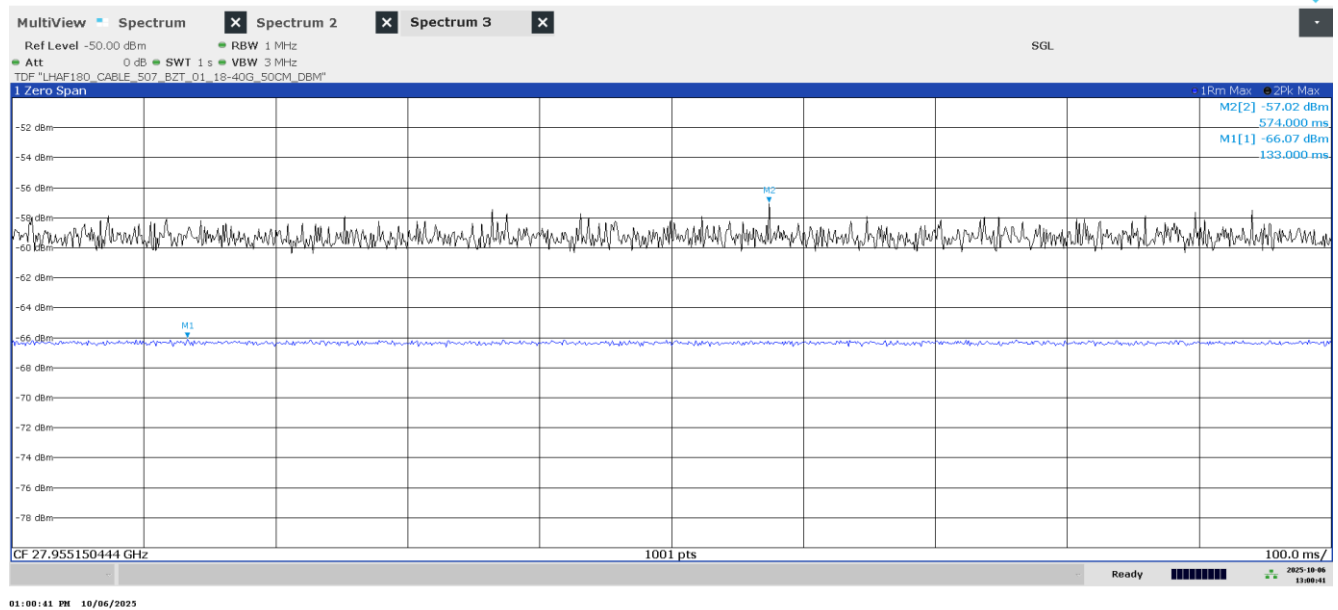
Plot 50: 18 GHz to 30 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

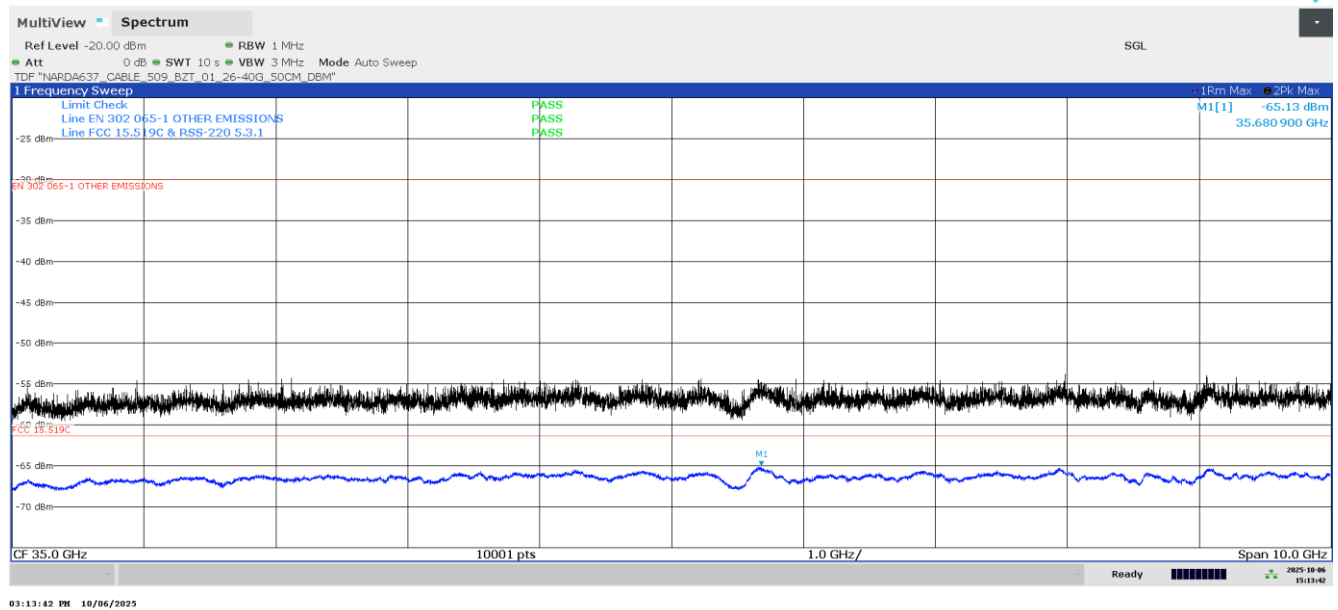
Plot 51: Spurious emission on 27.9 GHz, UWB test mode, Detail



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

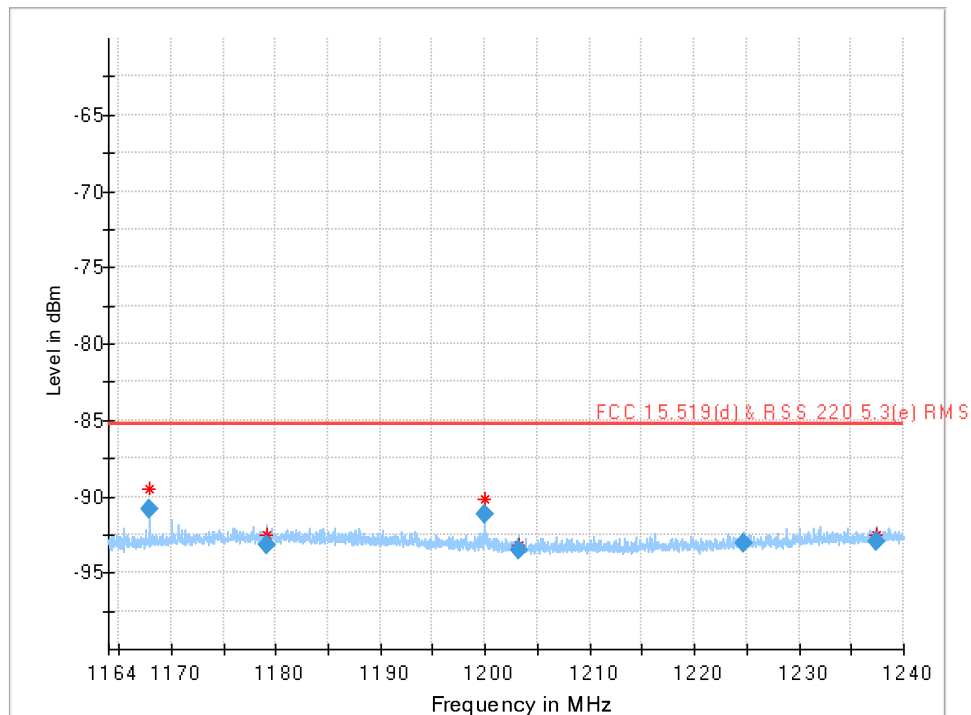
Plot 52: 30 GHz to 40.0 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

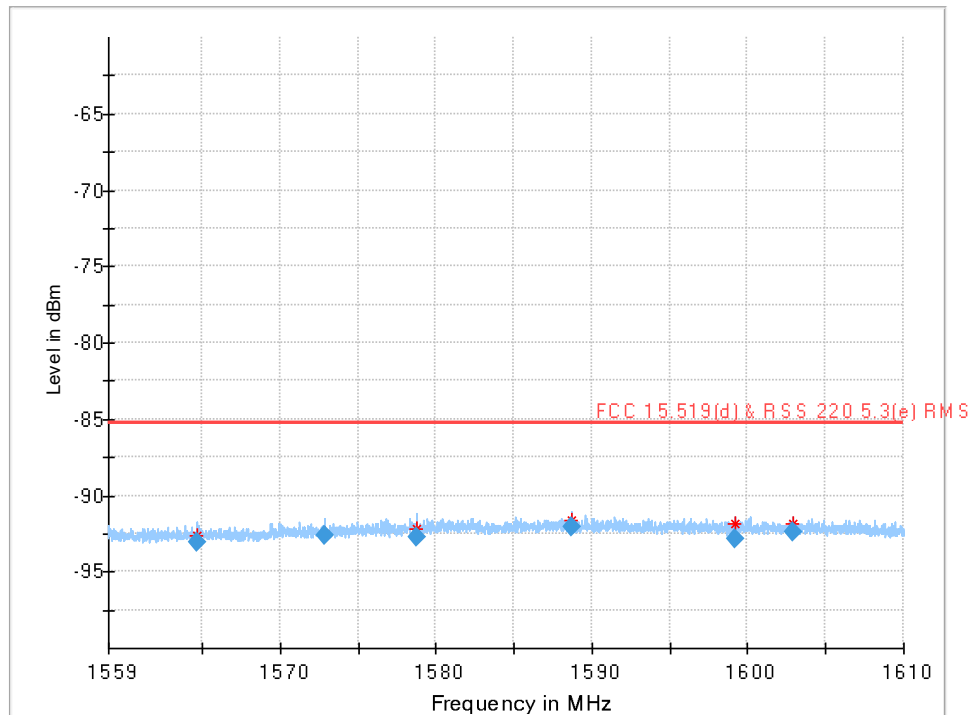
Plot 53: 1164 MHz to 1240 MHz (§15.519 (d)), UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 54: 1559 MHz to 1610 MHz (§15.519 (d)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1564.664820	-93.05	-85.30	7.75	30.000	H	152.0	162.0	-114.2
1572.818110	-92.62	-85.30	7.32	30.000	H	17.0	30.0	-113.9
1578.747260	-92.72	-85.30	7.42	30.000	H	119.0	138.0	-113.5
1588.696040	-92.12	-85.30	6.82	30.000	H	-1.0	195.0	-113.2
1599.149990	-92.84	-85.30	7.54	30.000	V	8.0	131.0	-113.5
1602.876770	-92.40	-85.30	7.10	30.000	H	0.0	65.0	-113.4

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

12.2.5 Results: Frame RAD-SP3, Channel CH8, Power setting 28

Results:

Measurements of the fundamental emission:

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/MHz]	Applicable limit [dBm/MHz]	Margin [dB]	Plot
		average value			
102 (PKA3AA)	7.536	-44.5	-41.3	3.2	55

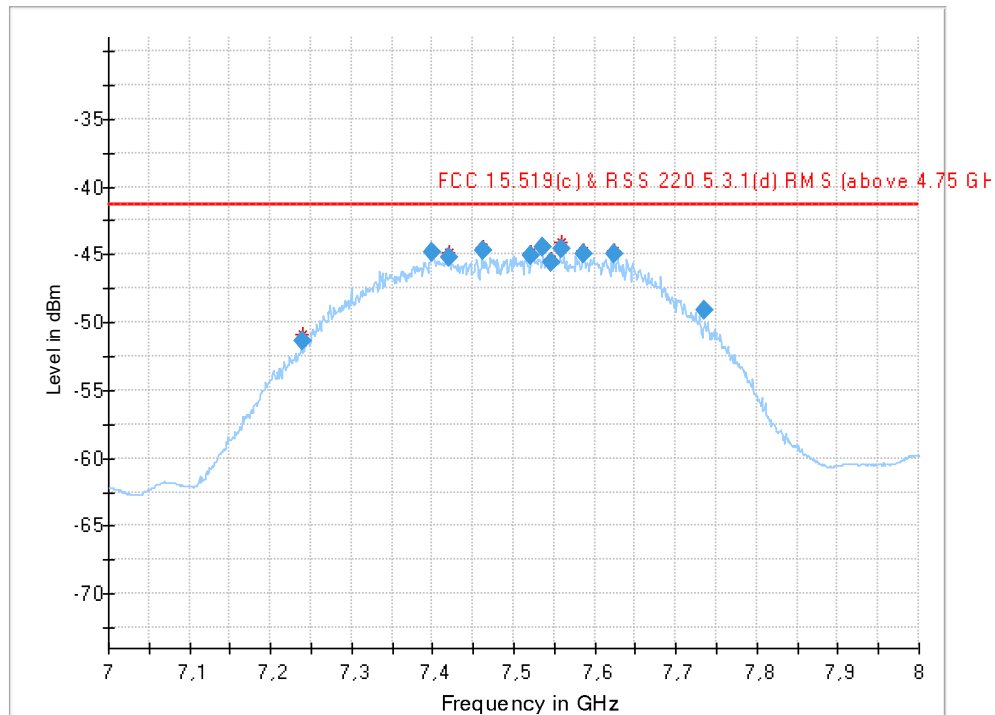
DUT	Frequency [GHz]	Max e.i.r.p. [dBm/50 MHz]	Applicable limit [dBm/50 MHz]	Margin [dB]	Plot
		peak value			
102 (PKA3AA)	7.536	-10.5	0	10.5	56

Emissions outside the band:

Frequency f [MHz]	Detector	Measured level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Frequency f [MHz]	Detector	Measured level [dBm]	Limit [dBm]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
29.952	RMS	-65.8	-61.3	4.5
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

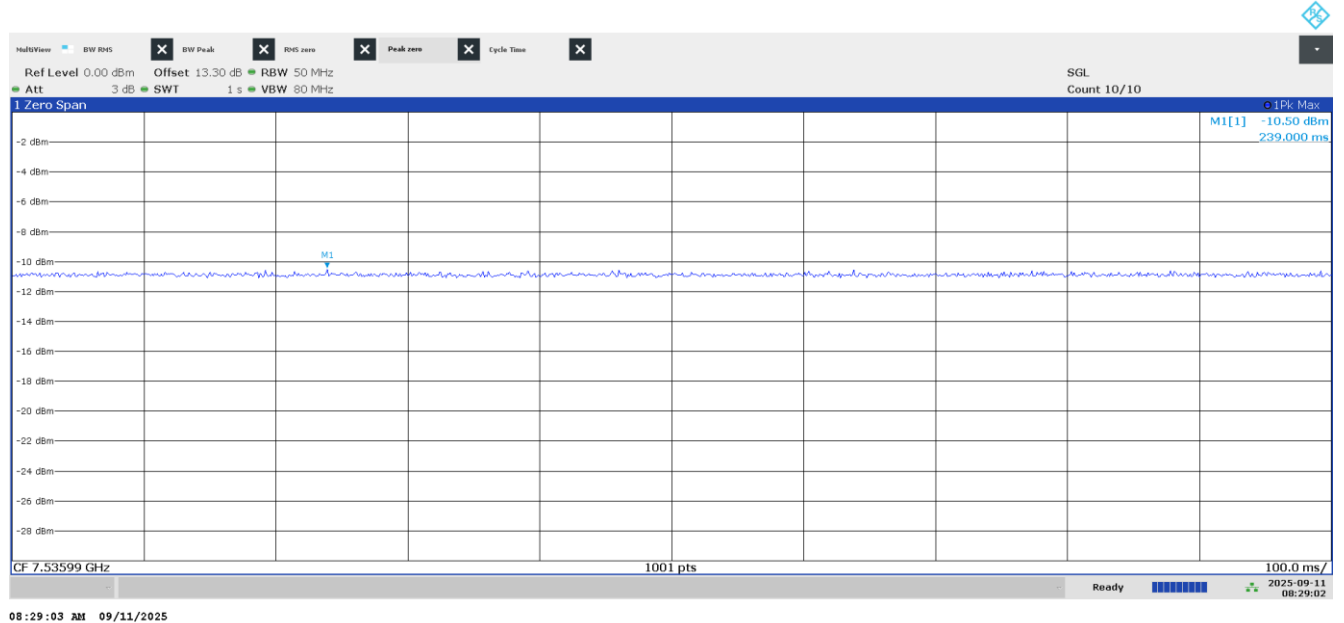
Verdict: Compliant

Plot 55: Fundamental emission (UWB test mode): RMS

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
7238.460000	-51.37	-41.30	10.07	1000.000	V	71.0	28.0	-94.5
7398.820000	-44.82	-41.30	3.52	1000.000	V	71.0	20.0	-93.8
7420.920000	-45.26	-41.30	3.96	1000.000	V	85.0	10.0	-93.9
7461.800000	-44.66	-41.30	3.36	1000.000	V	251.0	192.0	-93.7
7520.750000	-45.06	-41.30	3.76	1000.000	V	72.0	33.0	-93.3
7535.990000	-44.50	-41.30	3.20	1000.000	V	86.0	8.0	-93.7
7545.550000	-45.56	-41.30	4.26	1000.000	V	230.0	17.0	-94.0
7559.140000	-44.64	-41.30	3.34	1000.000	V	93.0	5.0	-94.2
7585.650000	-45.02	-41.30	3.72	1000.000	V	80.0	27.0	-93.8
7624.990000	-45.01	-41.30	3.71	1000.000	V	98.0	10.0	-94.4
7734.730000	-49.14	-41.30	7.84	1000.000	V	93.0	3.0	-94.1

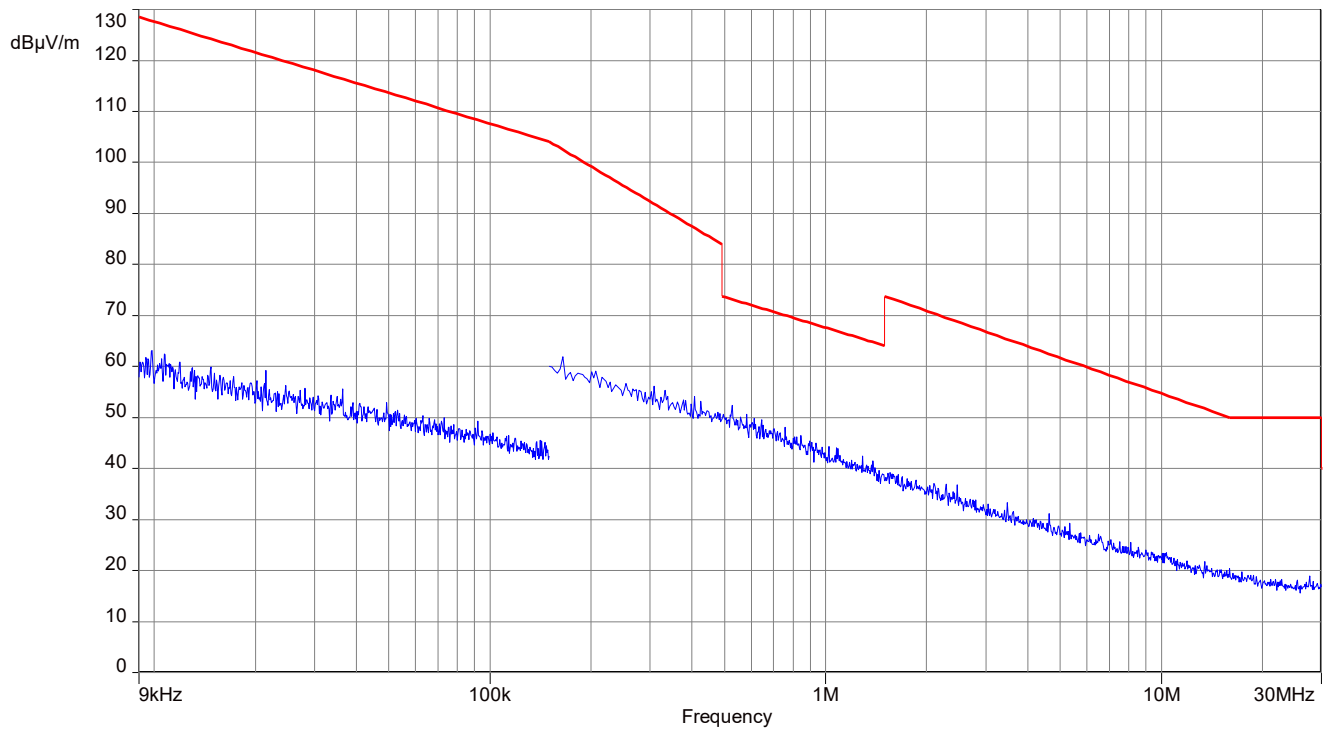
Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 56: Fundamental emission (UWB test mode): Max Peak

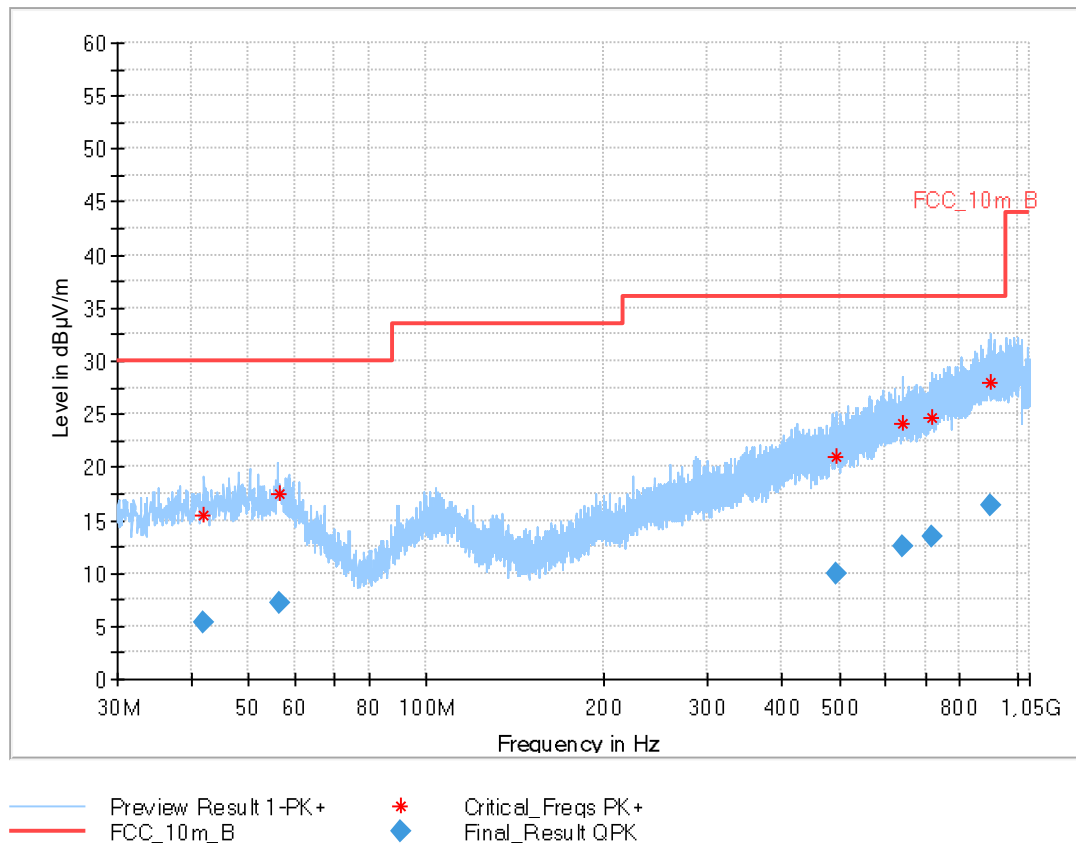
Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 57: 9 kHz to 30 MHz, UWB test mode

Device information for this plot:

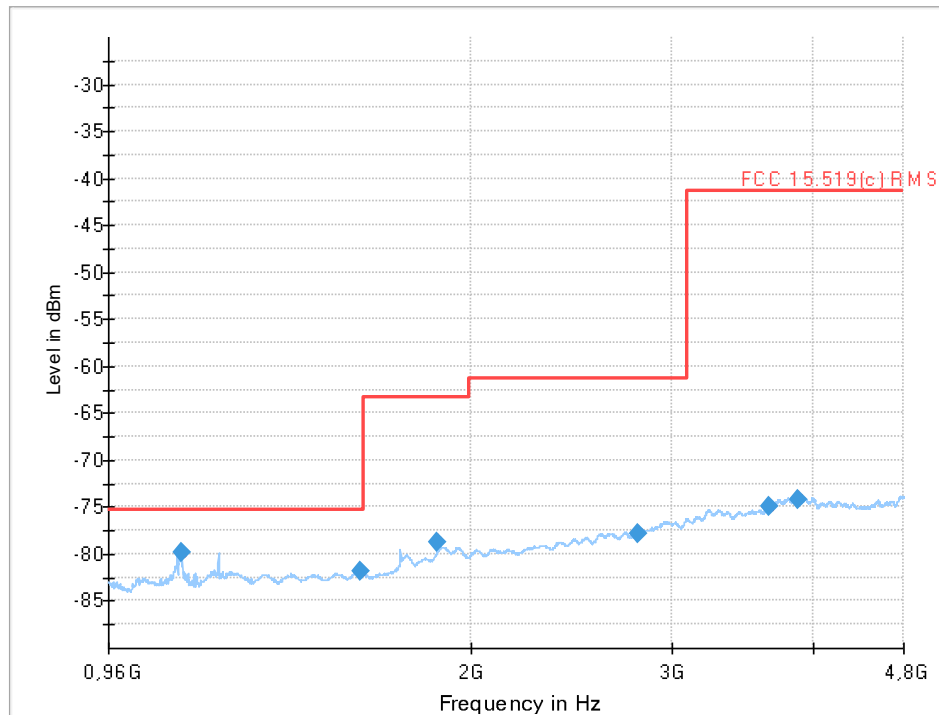
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 58: 30 MHz to 1 GHz, UWB test mode

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
42.027	5.25	30.0	24.8	1000	120.0	100.0	H	-32	15
56.339	7.22	30.0	22.8	1000	120.0	195.0	V	37	16
493.959	9.89	36.0	26.1	1000	120.0	195.0	V	189	19
642.077	12.53	36.0	23.5	1000	120.0	153.0	H	297	22
719.727	13.52	36.0	22.5	1000	120.0	195.0	V	298	23
902.865	16.41	36.0	19.6	1000	120.0	195.0	H	271	25

Device information for this plot:

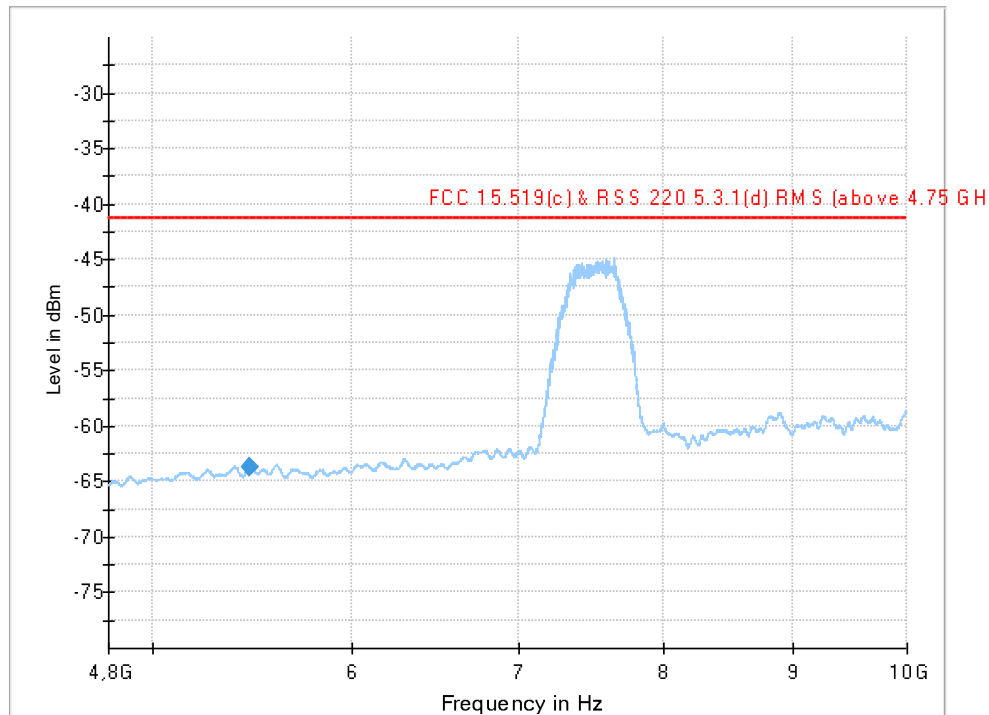
- DUT#: DUT103 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 59: 960 MHz to 4.8 GHz (Limit acc. to §15.519 (c)), UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1113.529200	-79.79	-75.30	4.49	1000.000	V	210.0	174.0	-116.9
1600.294200	-81.91	-75.30	6.61	1000.000	H	8.0	90.0	-116.7
1866.807600	-78.72	-63.30	15.42	1000.000	H	153.0	83.0	-115.0
2803.645800	-77.92	-61.30	16.62	1000.000	H	206.0	151.0	-112.9
3652.735800	-75.01	-41.30	33.71	1000.000	H	138.0	75.0	-109.9
3876.296400	-74.13	-41.30	32.83	1000.000	V	306.0	150.0	-108.8

Device information for this plot:

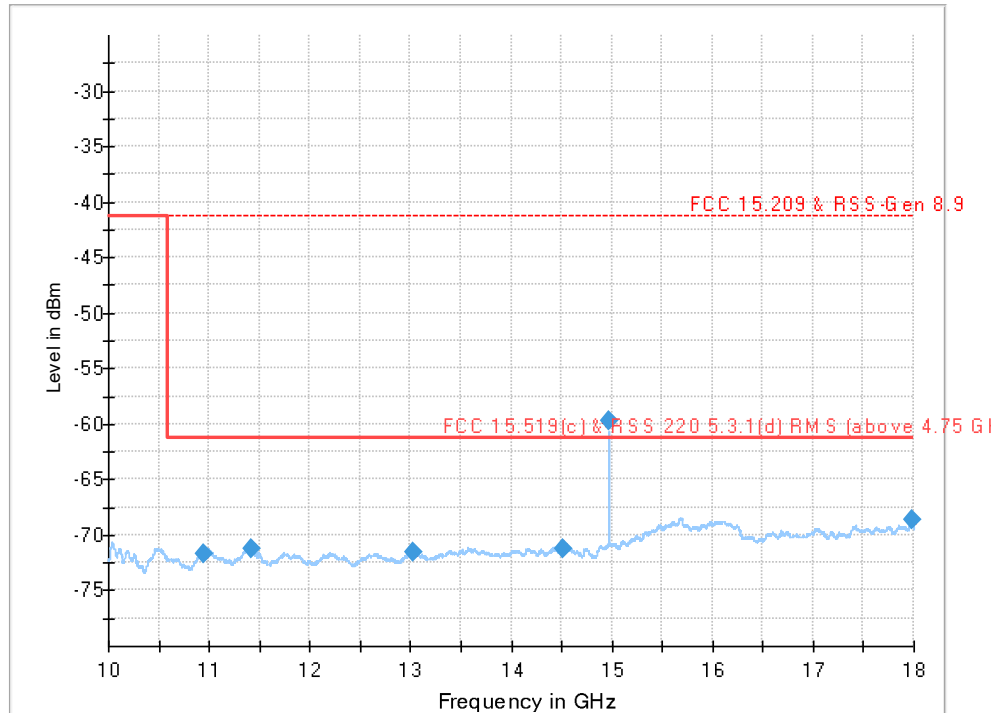
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 60: 4.8 GHz to 10 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5465.602857	-63.72	-41.30	22.42	1000.000	V	176.0	90.0	-98.2

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 61: 10 GHz to 18 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10940.373400	-71.77	-61.30	10.47	1000.000	V	88.0	41.0	-103.8
11414.981600	-71.21	-61.30	9.91	1000.000	H	99.0	43.0	-104.1
13025.734500	-71.59	-61.30	10.29	1000.000	V	18.0	33.0	-105.1
14514.548800	-71.27	-61.30	9.97	1000.000	H	297.0	15.0	-105.5
14975.943600	-59.79	-41.30 (see note)	18.49	1000.000	V	149.0	87.0	-105.4
17987.641600	-68.66	-61.30	7.36	1000.000	H	183.0	186.0	-102.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

- Emission at 14.975 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

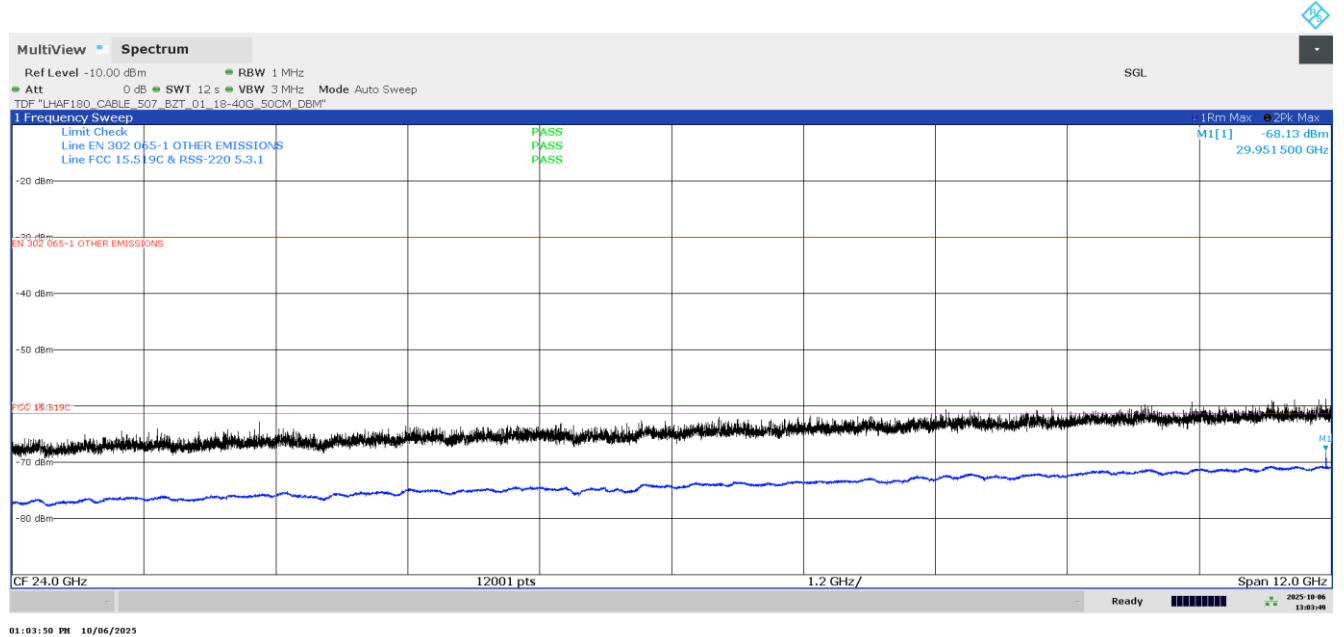
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

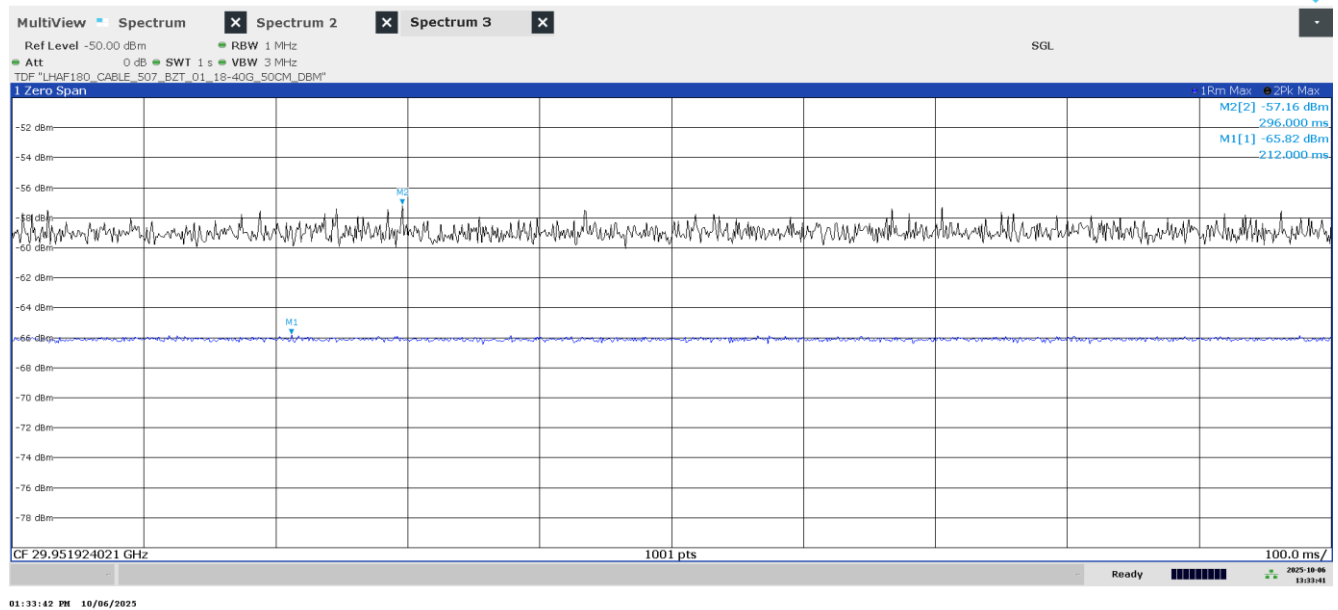
Plot 62: 18 GHz to 30 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

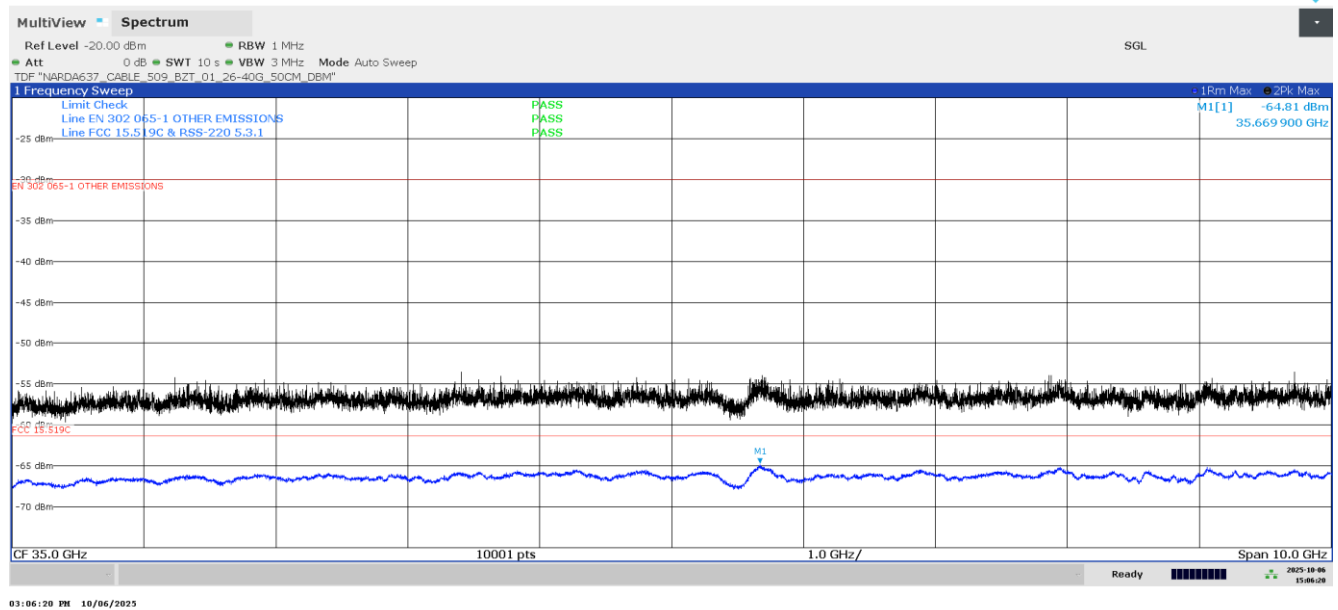
Plot 63: Spurious emission on 29.9 GHz, UWB test mode, Detail



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

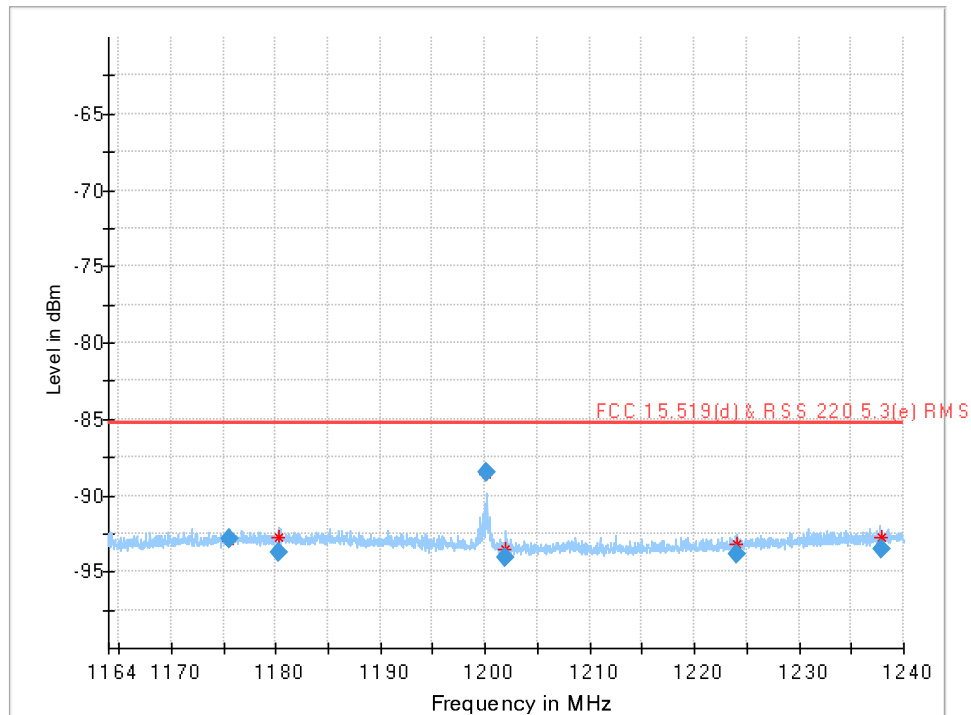
Plot 64: 30 GHz to 40.0 GHz, UWB test mode



Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 65: 1164 MHz to 1240 MHz (§15.519 (d)), UWB test mode

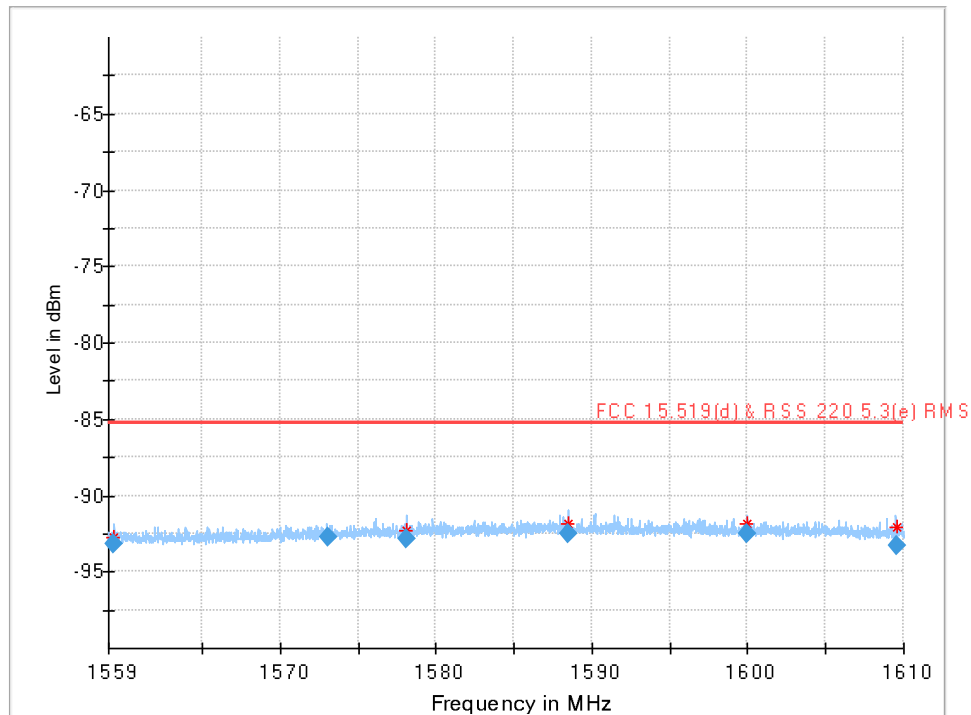


Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1175.513017	-92.90	-85.30	7.60	30.000	V	184.0	30.0	-113.6
1180.226263	-93.69	-85.30	8.39	30.000	V	101.0	40.0	-113.5
1200.196713	-88.54	-85.30	3.24	30.000	V	159.0	150.0	-114.8
1201.942557	-94.05	-85.30	8.75	30.000	V	-4.0	157.0	-115.0
1224.100430	-93.86	-85.30	8.56	30.000	H	264.0	33.0	-114.6
1237.832360	-93.51	-85.30	8.21	30.000	H	161.0	60.0	-113.5

information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 66: 1559 MHz to 1610 MHz (§15.519 (d)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1559.339350	-93.21	-85.30	7.91	30.000	H	317.0	106.0	-114.3
1573.043520	-92.72	-85.30	7.42	30.000	H	291.0	90.0	-113.9
1578.092480	-92.86	-85.30	7.56	30.000	H	146.0	58.0	-113.6
1588.475460	-92.52	-85.30	7.22	30.000	H	314.0	147.0	-113.2
1599.909620	-92.52	-85.30	7.22	30.000	H	224.0	59.0	-113.3
1609.547080	-93.27	-85.30	7.97	30.000	H	311.0	80.0	-113.6

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

12.2.6 Results: Frame RAD-SP3, Channel CH9, Power setting 40

Results:

Measurements of the fundamental emission:

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/MHz]	Applicable limit [dBm/MHz]	Margin [dB]	Plot
		average value			
102 (PKA3AA)	7.987	-47.1	-41.3	5.8	67

DUT	Frequency [GHz]	Max e.i.r.p. [dBm/50 MHz]	Applicable limit [dBm/50 MHz]	Margin [dB]	Plot
		peak value			
102 (PKA3AA)	7.987	-12.6	0	12.6	68

Emissions outside the band:

Frequency f [MHz]	Detector	Measured level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Frequency f [MHz]	Detector	Measured level [dBm]	Limit [dBm]	Margin [dB]
Please refer to the following plots for more information on the level of spurious emissions				
31.949	RMS	-60.7	-41.3 (see note)	19.4
-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-

Note:

- Emission at 31.949 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

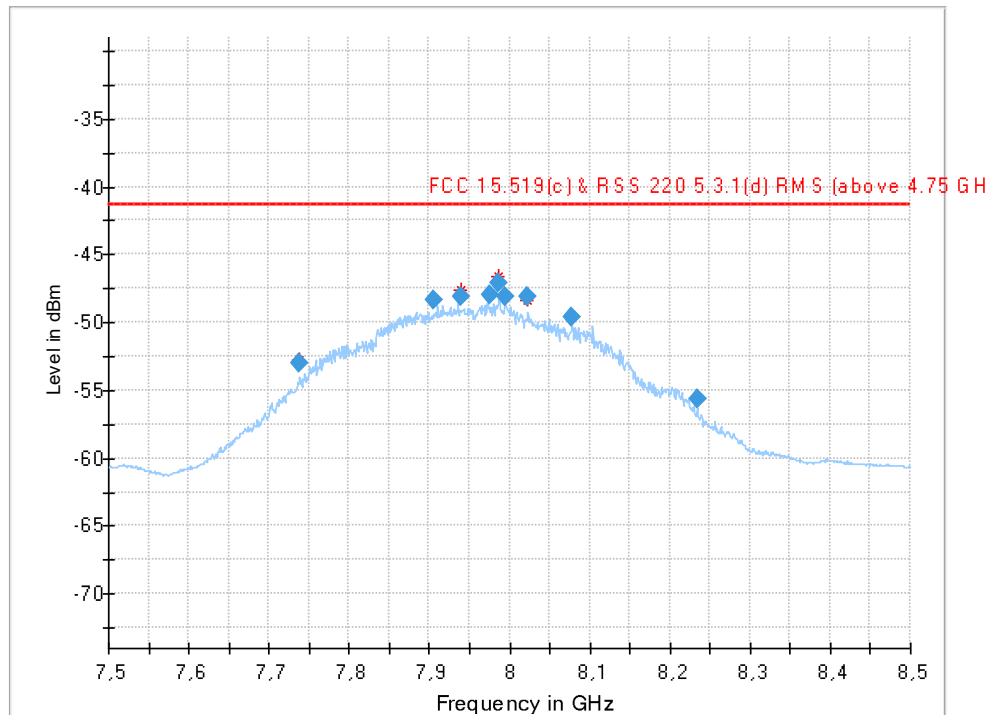
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

Verdict: Compliant

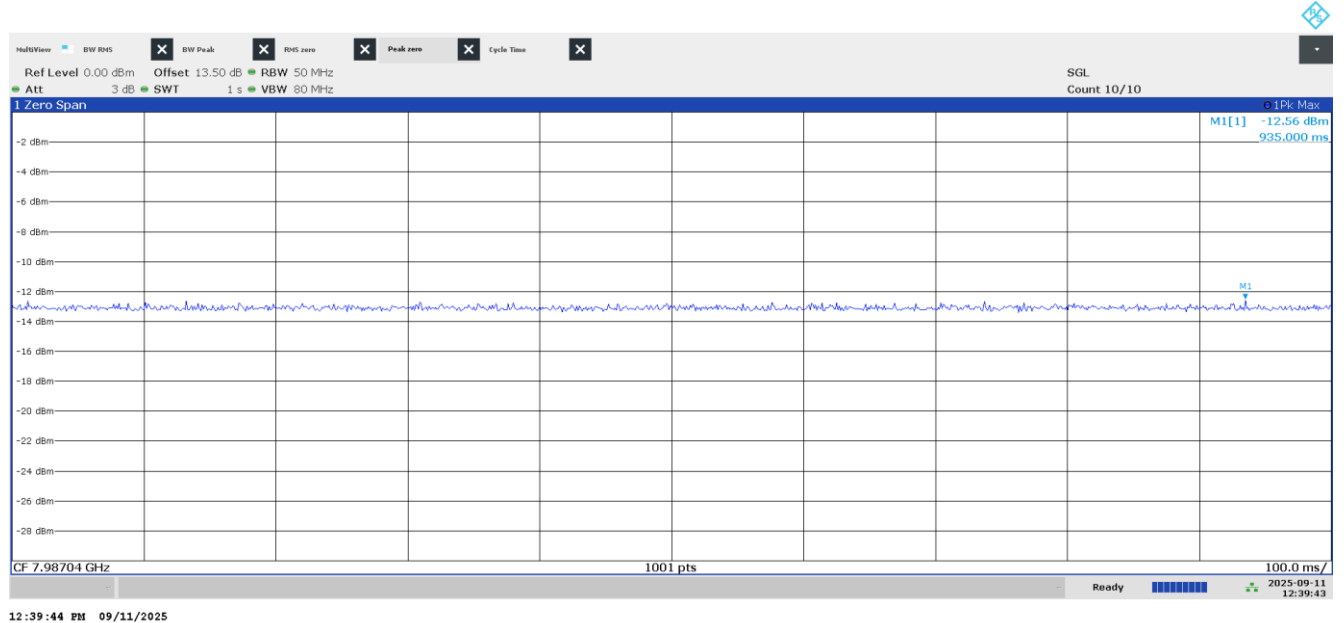
Plot 67: Fundamental emission (UWB test mode): RMS

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
7737.620000	-52.96	-41.30	11.66	1000.000	V	93.0	9.0	-94.1
7906.140000	-48.40	-41.30	7.10	1000.000	V	102.0	27.0	-94.1
7939.110000	-48.09	-41.30	6.79	1000.000	V	242.0	195.0	-93.8
7976.290000	-48.01	-41.30	6.71	1000.000	V	76.0	19.0	-93.6
7987.040000	-47.11	-41.30	5.81	1000.000	V	96.0	11.0	-93.5
7994.570000	-48.15	-41.30	6.85	1000.000	V	95.0	5.0	-93.4
8021.270000	-48.13	-41.30	6.83	1000.000	V	77.0	20.0	-93.5
8077.400000	-49.60	-41.30	8.30	1000.000	V	97.0	19.0	-93.4
8234.110000	-55.65	-41.30	14.35	1000.000	V	240.0	195.0	-93.7

Device information for this plot:

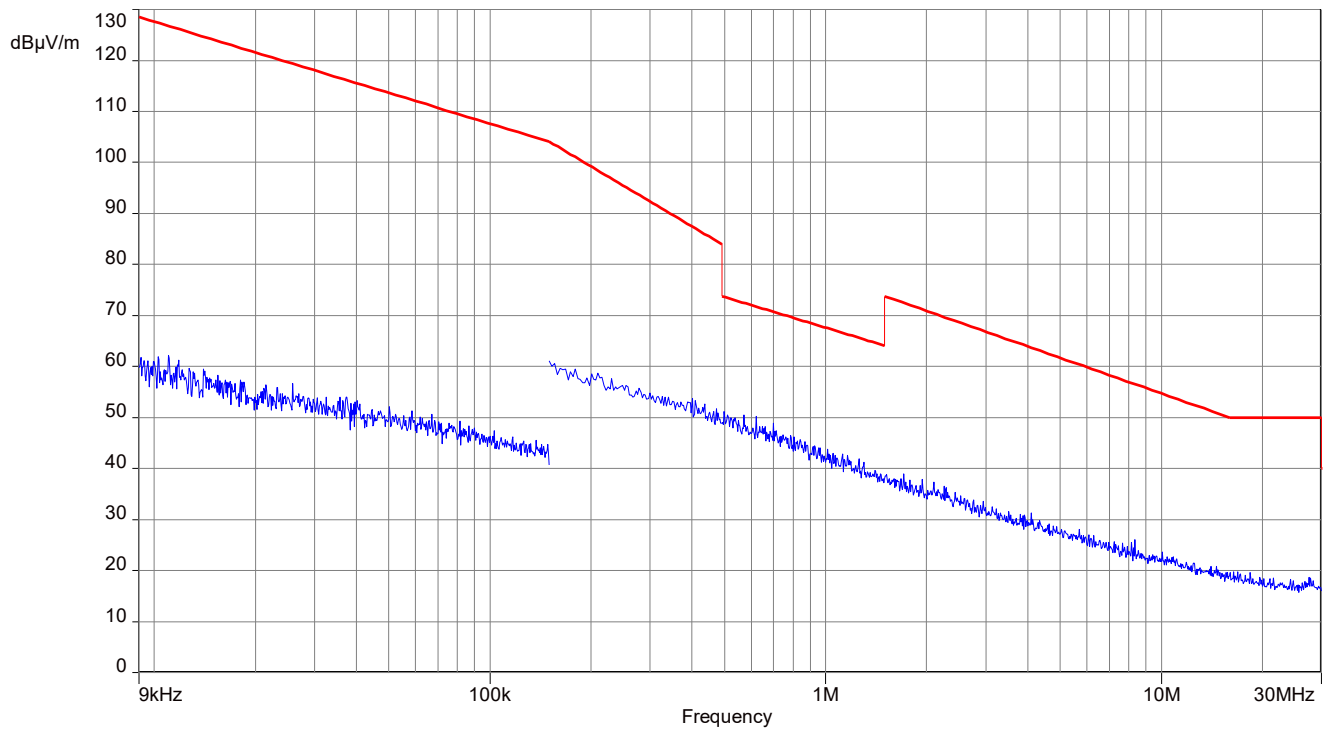
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 68: Fundamental emission (UWB test mode): Max Peak



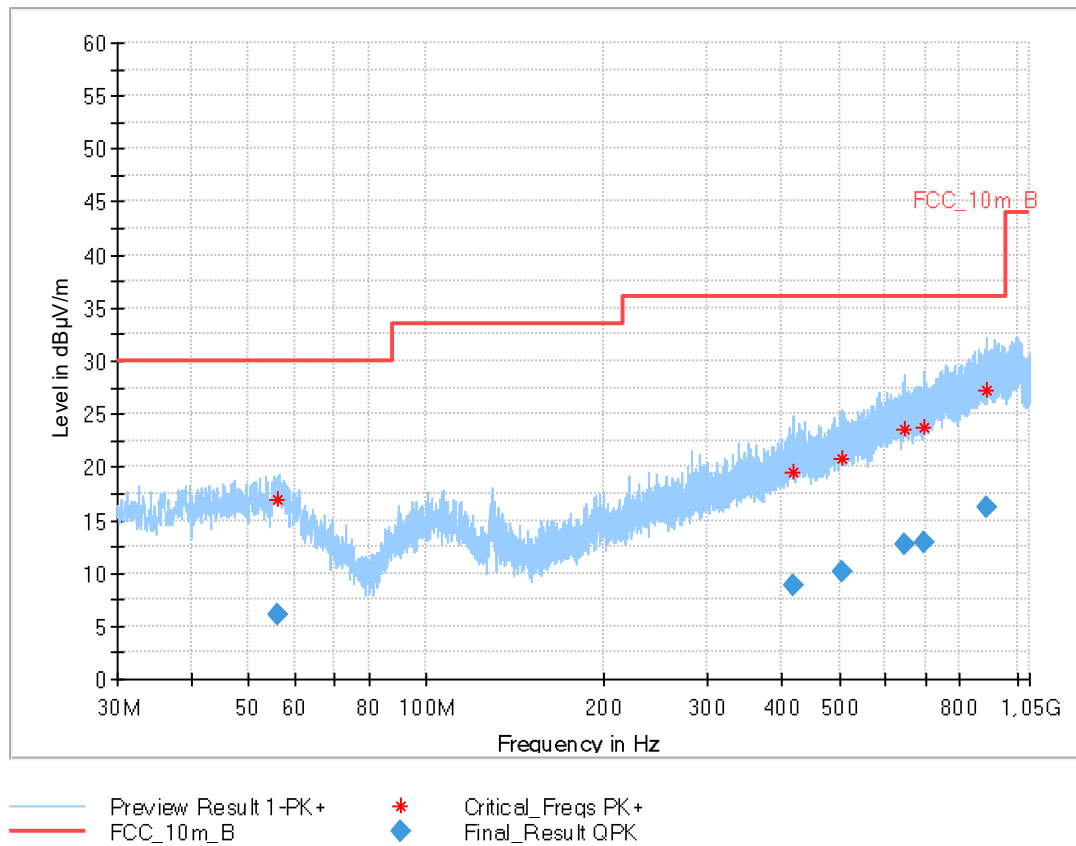
Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 69: 9 kHz to 30 MHz, UWB test mode

Device information for this plot:

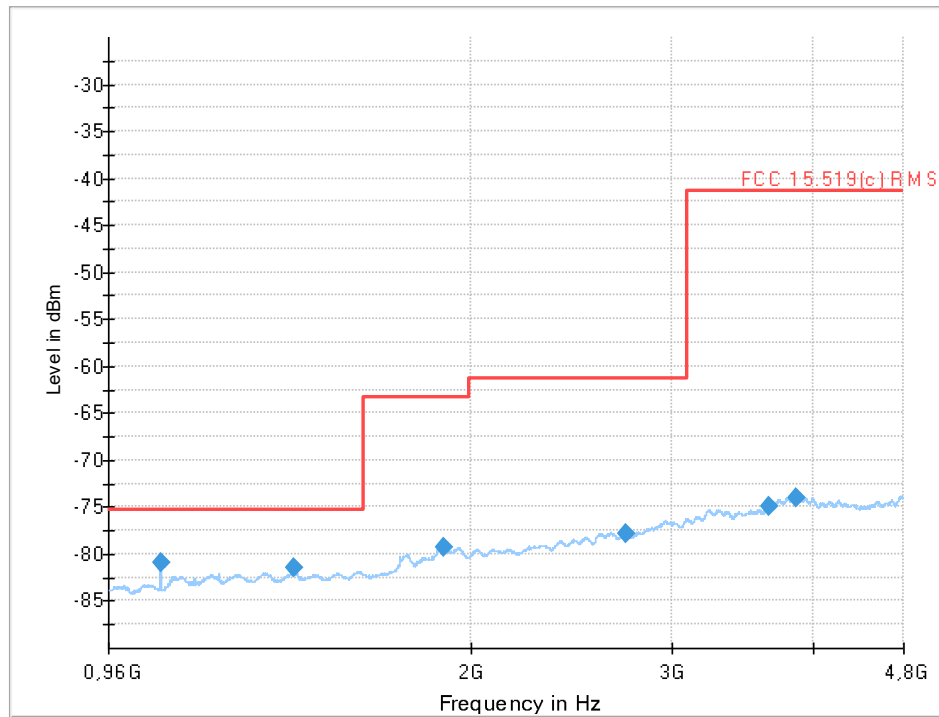
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 70: 30 MHz to 1 GHz, UWB test mode

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
56.073	6.14	30.0	23.9	1000	120.0	195.0	V	307	16
416.907	8.83	36.0	27.2	1000	120.0	195.0	H	191	19
506.439	10.20	36.0	25.8	1000	120.0	195.0	H	-29	20
646.665	12.62	36.0	23.4	1000	120.0	195.0	H	307	22
694.377	12.83	36.0	23.2	1000	120.0	195.0	V	53	22
886.322	16.11	36.0	19.9	1000	120.0	195.0	H	30	25

Device information for this plot:

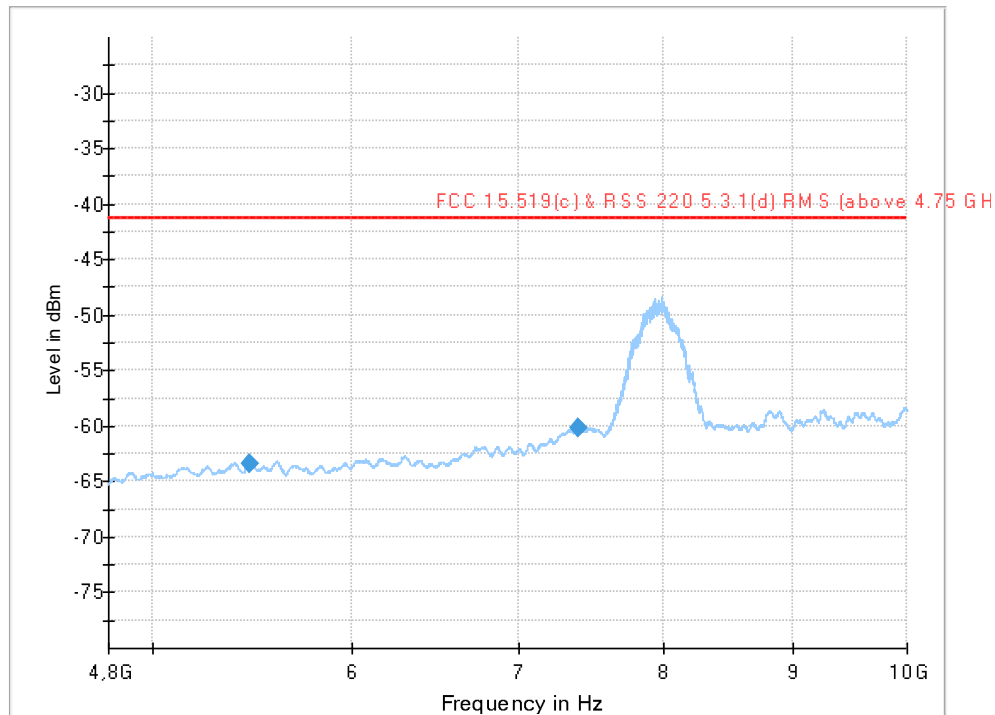
- DUT#: DUT103 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 71: 960 MHz to 4.8 GHz (Limit acc. to §15.519 (c)), UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1066.696200	-80.98	-75.30	5.68	1000.000	V	103.0	0.0	-119.1
1400.007000	-81.54	-75.30	6.24	1000.000	V	223.0	75.0	-117.1
1894.414200	-79.30	-63.30	16.00	1000.000	V	303.0	145.0	-113.7
2733.340800	-77.84	-61.30	16.54	1000.000	V	310.0	105.0	-112.9
3660.916800	-74.99	-41.30	33.69	1000.000	V	135.0	139.0	-109.7
3866.844600	-74.00	-41.30	32.70	1000.000	V	211.0	18.0	-108.6

Device information for this plot:

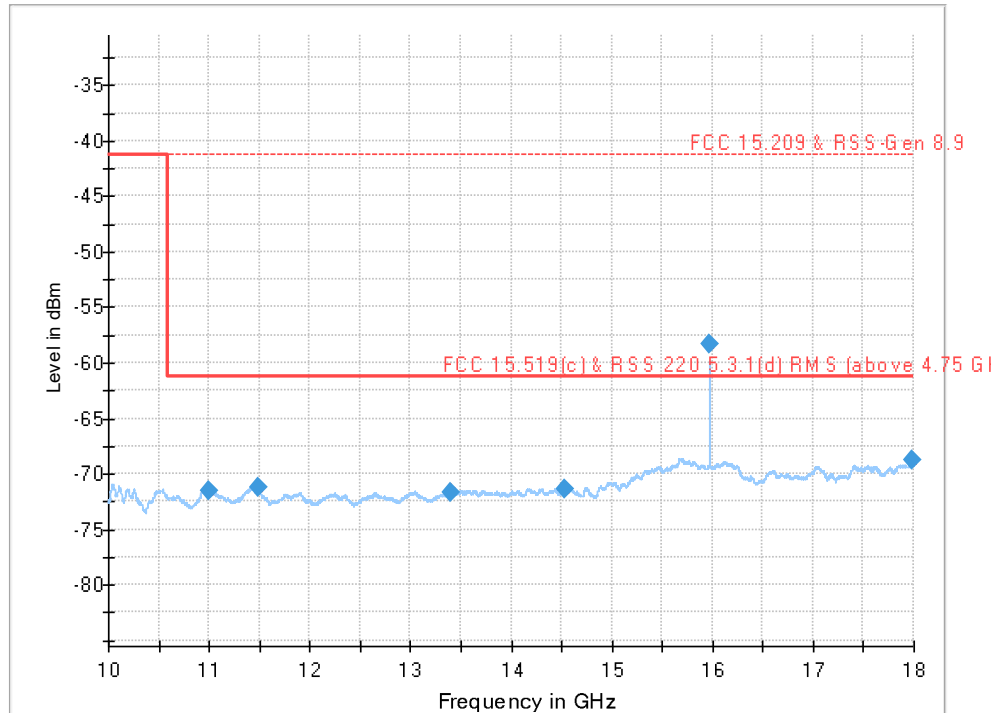
- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 72: 4.8 GHz to 10 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5466.845714	-63.36	-41.30	22.06	1000.000	H	130.0	80.0	-98.1
7397.094286	-60.17	-41.30	18.87	1000.000	H	127.0	109.0	-93.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 73: 10 GHz to 18 GHz, UWB test mode

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
10995.721300	-71.58	-61.30	10.28	1000.000	V	155.0	35.0	-103.5
11491.822700	-71.23	-61.30	9.93	1000.000	V	24.0	90.0	-104.2
13395.084100	-71.69	-61.30	10.39	1000.000	V	30.0	14.0	-105.1
14524.380000	-71.40	-61.30	10.10	1000.000	H	196.0	190.0	-105.4
15974.283600	-58.31	-41.30 (see note)	17.01	1000.000	H	150.0	16.0	-104.3
17980.831800	-68.81	-61.30	7.51	1000.000	V	330.0	60.0	-102.9

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

- Emission at 15.974 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

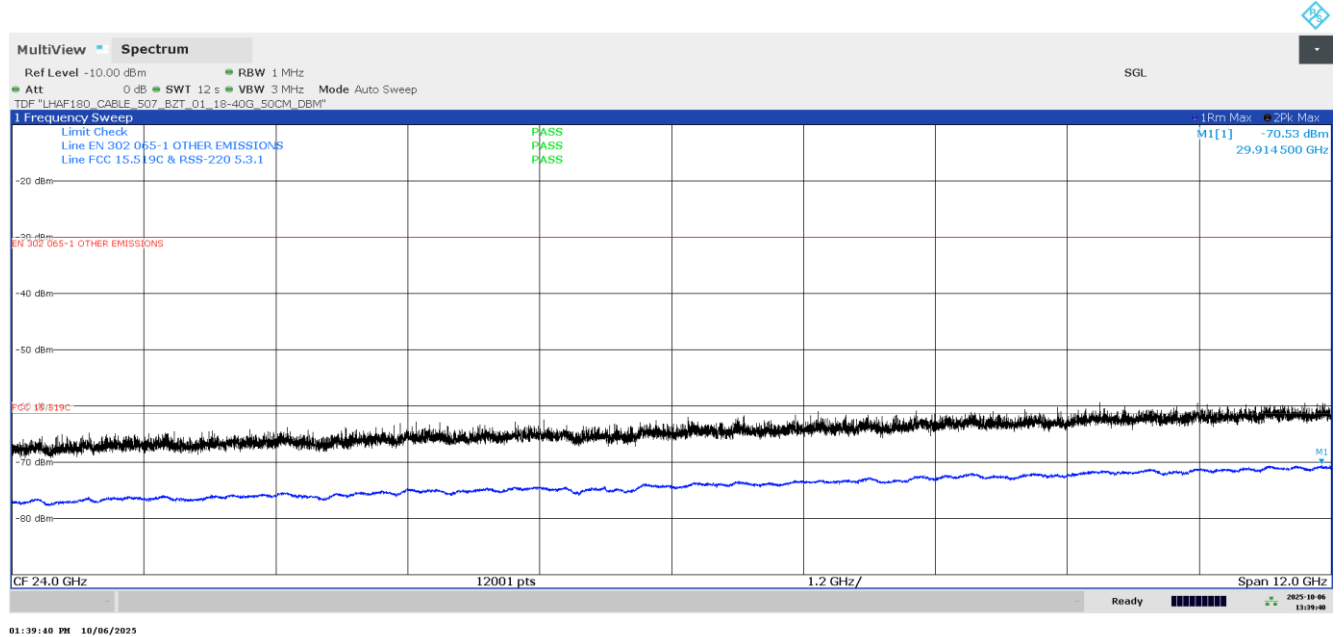
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

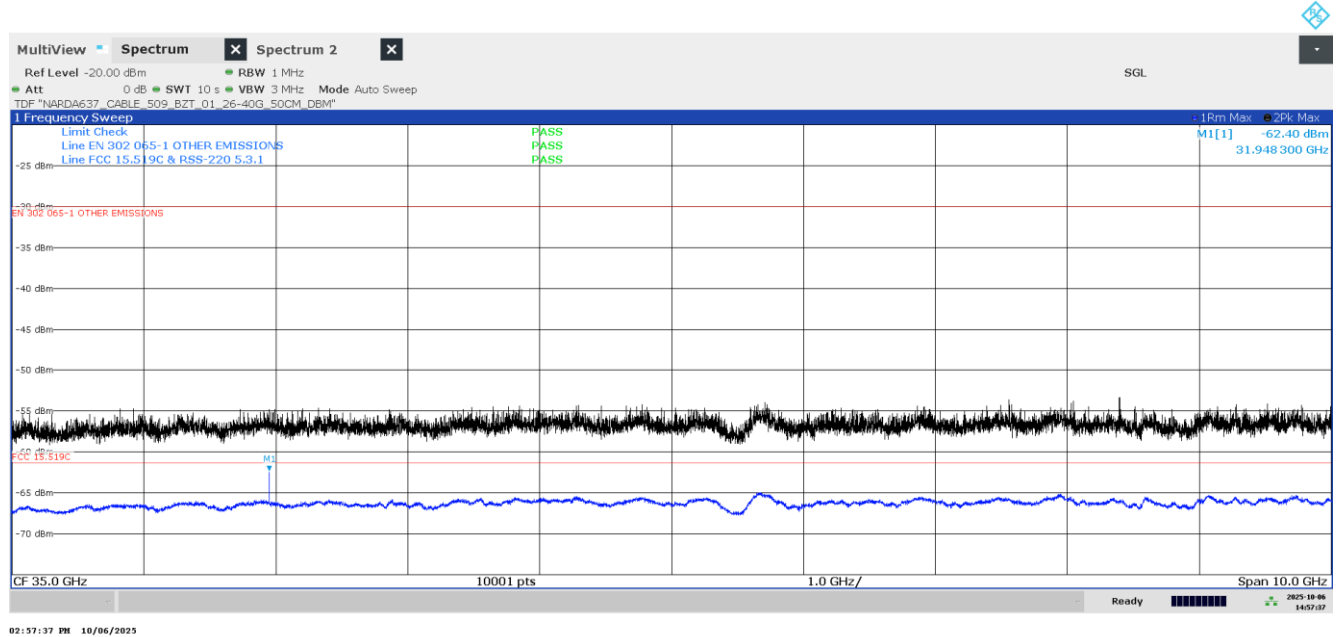
The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

Plot 74: 18 GHz to 30 GHz, UWB test mode



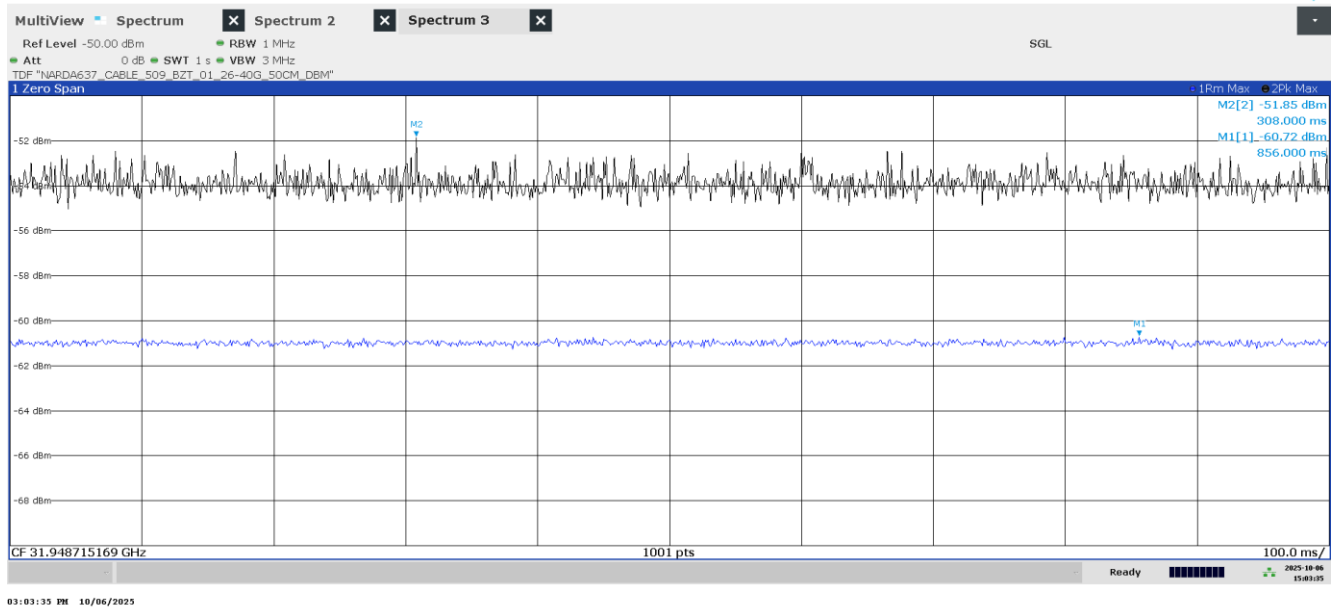
Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 75: 30 GHz to 40.0 GHz, UWB test mode

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Plot 76: Spurious emission on 31.9 GHz, UWB test mode, Detail

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

Note:

- Emission at 31.949 GHz (Limit 'FCC 15.209 & RSS-Gen 8.9'):
This emission satisfies the requirements of Section 15.521(c) and is therefore to be evaluated under the limits set forth in Section 15.209, as confirmed by TCB.

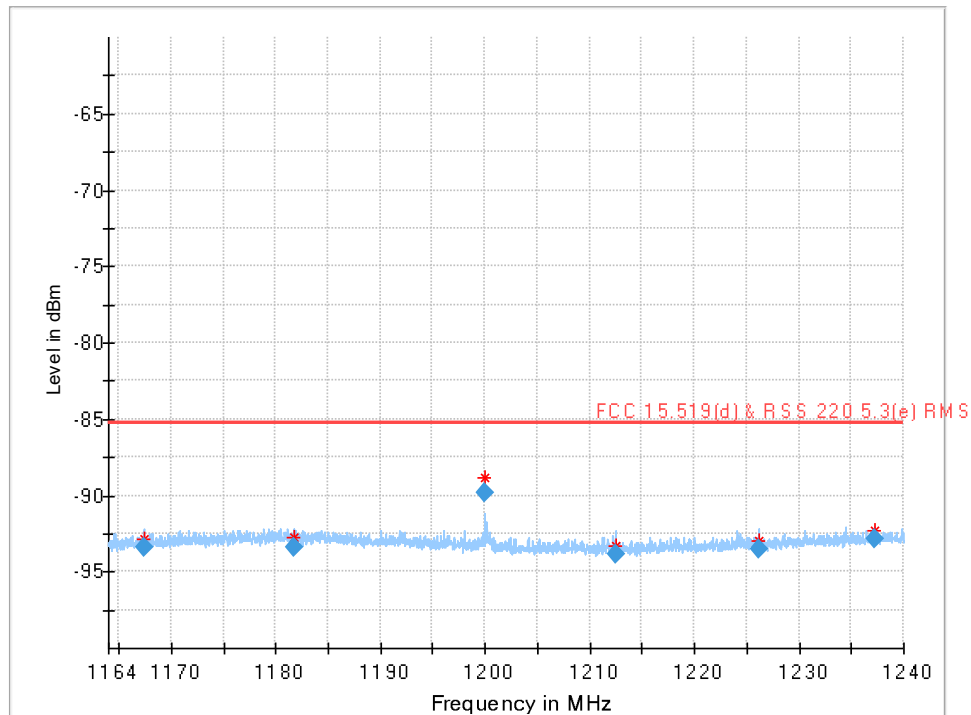
Verification can be found in the referenced document provided by the customer
"PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".

Comparative measurements can be found in chapter 12.2.7.

Applicable limit above 960 MHz according to §15.209: -41.3 dBm

The conversion of the limit mentioned in §15.209 is done according to ANSI C63.10-2020 9.2.3.

Plot 77: 1164 MHz to 1240 MHz (§15.519 (d)), UWB test mode



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1167.350660	-93.37	-85.30	8.07	30.000	H	339.0	16.0	-113.9
1181.774627	-93.45	-85.30	8.15	30.000	V	23.0	42.0	-113.5
1199.997587	-89.84	-85.30	4.54	30.000	V	223.0	1.0	-114.8
1212.440093	-93.85	-85.30	8.55	30.000	H	288.0	135.0	-115.3
1226.161133	-93.56	-85.30	8.26	30.000	H	168.0	5.0	-114.4
1237.210827	-92.81	-85.30	7.51	30.000	H	290.0	195.0	-113.5

Device information for this plot:

- DUT#: DUT102 (PKA3AA)
- DUT hardware: H10
- DUT software: DUT-SW 6.14.6H
- GUI: Version V2.10; feature "UWB TX" is used

12.2.7 Supplement: Comparative measurement on device with disconnected antenna

Description:

Comparative measurements (frequency range 10 GHz to 18 GHz) on a device with a disconnected antenna are performed.

These measurements are carried out in the context of Section 15.521(c) and the evaluation of the observed emissions under the limits set forth in Section 15.209.

Note:

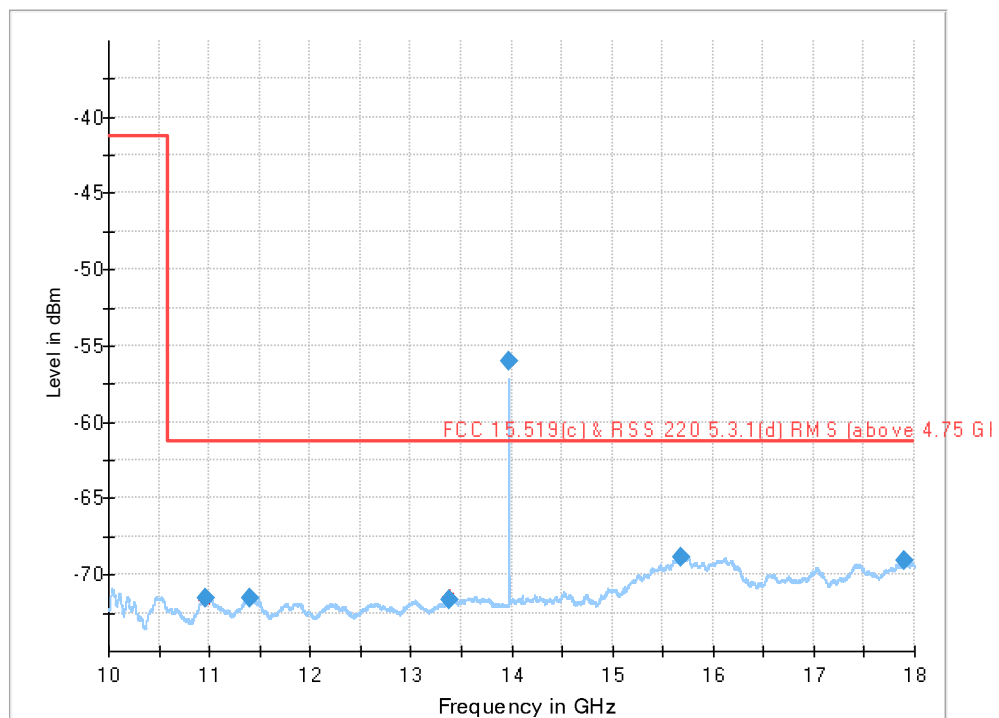
- Additional measurements can be found in the referenced document provided by the customer "PK0008b_HAGDA_01_GEN3_UWB_2nd_Harmonic_FCC KDB_DEV6158-02.pptx".
- The conversion of the limit mentioned in §15.209 & RSS-Gen 8.9 is done according to ANSI C63.10-2020 9.2.3. Converted limit above 960 MHz according to §15.209 / RSS-Gen 8.9: -41.3 dBm.

Case 1: Device with antennaDevice information for this case:

- DUT#: DUT6 (PKA3AA)
- DUT hardware: H07
- DUT software: DUT-SW 6.14.2H
- GUI: received 2025-06-10 (no version mentioned); feature "UWB TX" is used

Device settings for this case:

- Frame RAD-SP3
- Channel CH6
- Power setting 37

Measurement Results:

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)
10970.795500	-71.58	-61.30	10.28	1000.000	H	201.0	160.0
11401.527800	-71.53	-61.30	10.23	1000.000	H	326.0	0.0
13383.640400	-71.62	-61.30	10.32	1000.000	H	271.0	15.0
13976.691700	-56.05	-41.30 (see note above)	14.75	1000.000	H	117.0	119.0
15688.972400	-68.82	-61.30	7.52	1000.000	H	293.0	9.0
17897.320500	-69.03	-61.30	7.73	1000.000	V	93.0	41.0

Case 2: Device with disconnected antenna

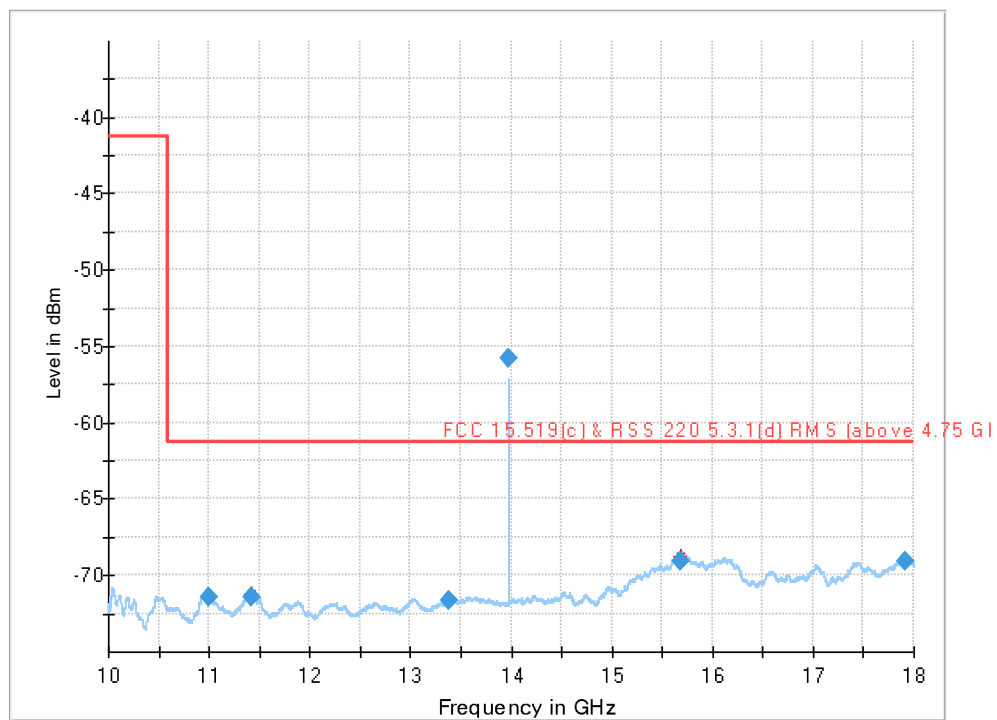
Device information for this case:

- DUT#: DUT22 (PKA3AA, UWB antenna disconnected)
- DUT hardware: H07 (modified: UWB antenna disconnected)
- DUT software: DUT-SW 6.14.2H
- GUI: received 2025-06-10 (no version mentioned); feature "UWB TX" is used

Device settings for this case:

- Frame RAD-SP3
- Channel CH6
- Power setting 37

Measurement Results:



Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)
11001.198000	-71.40	-61.30	10.10	1000.000	V	50.0	45.0
11421.208600	-71.38	-61.30	10.08	1000.000	V	326.0	120.0
13381.054200	-71.60	-61.30	10.30	1000.000	V	85.0	110.0
13976.707000	-55.73	-41.30 (see note above)	14.43	1000.000	V	227.0	160.0
15682.765100	-69.03	-61.30	7.73	1000.000	V	278.0	33.0
17913.090500	-69.06	-61.30	7.76	1000.000	V	321.0	105.0

12.3 Efficient use of spectrum acc. to §15.519(a)(1)

Description:

§15.519(a)(1)

A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

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An acknowledgement of reception must continue to be received by the UWB device at least once every 10 seconds, or else the device shall cease transmission of any information other than periodic signals for use in the establishment or re-establishment of a communications link with an associated receiver.

Limits and provisions:

§15.519(a)(1) & KDB 393764

EUT shall cease transmission of information within 10 seconds unless it receives an acknowledgement from the associated receiver.

However, periodic signals used for the establishment or re-establishment of a communication link with an associated receiver may be transmitted.

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Resolution bandwidth:	50 MHz
Video bandwidth:	80 MHz
Span	Zero

Device information:

- DUT#: DUT102 (PKA3AA, device under test), DUT103 (PKA3AA, companion device/associated receiver)
- DUT hardware (both): H10
- DUT software (both): DUT-SW 6.14.6H
- GUI:
 - Version V2.10
 - Software feature "Ranging" is used

Declaration of representative channels and frame types:

The customer declared the following:

The switch-off behavior is a general feature which comes along with the CCC and RAD protocol.

It is sufficient to show the switch off behavior exemplary for a single UWB channel, e.g. CCC CH9 and RAD CH5.

Conclusion:

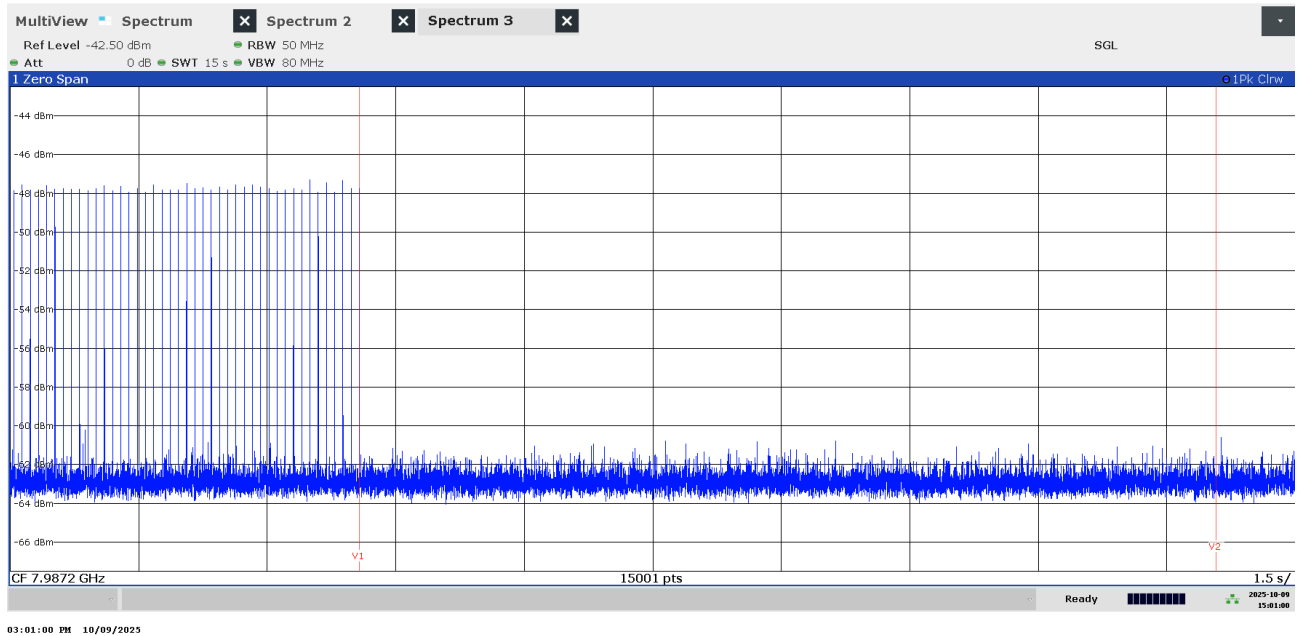
According to this declaration, the tests below are representative for all channels and frame types. Hence, ceasing the transmission of information in case no acknowledgement from the associated receiver is received also applies for:

- Frame CCC-SP3, Channel CH5
- Frame RAD-SP3, Channel CH6
- Frame RAD-SP3, Channel CH8
- Frame RAD-SP3, Channel CH9

12.3.1 Results: Frame CCC-SP3, Channel CH9

Results:

Plot 78: Emissions of EUT, only at the beginning with companion device/associated receiver (Normal mode)



Vertical line V1 indicates the time when the companion device/associated receiver is switched off.
Vertical line V2 indicates 10 s after the companion device/associated receiver is switched off.

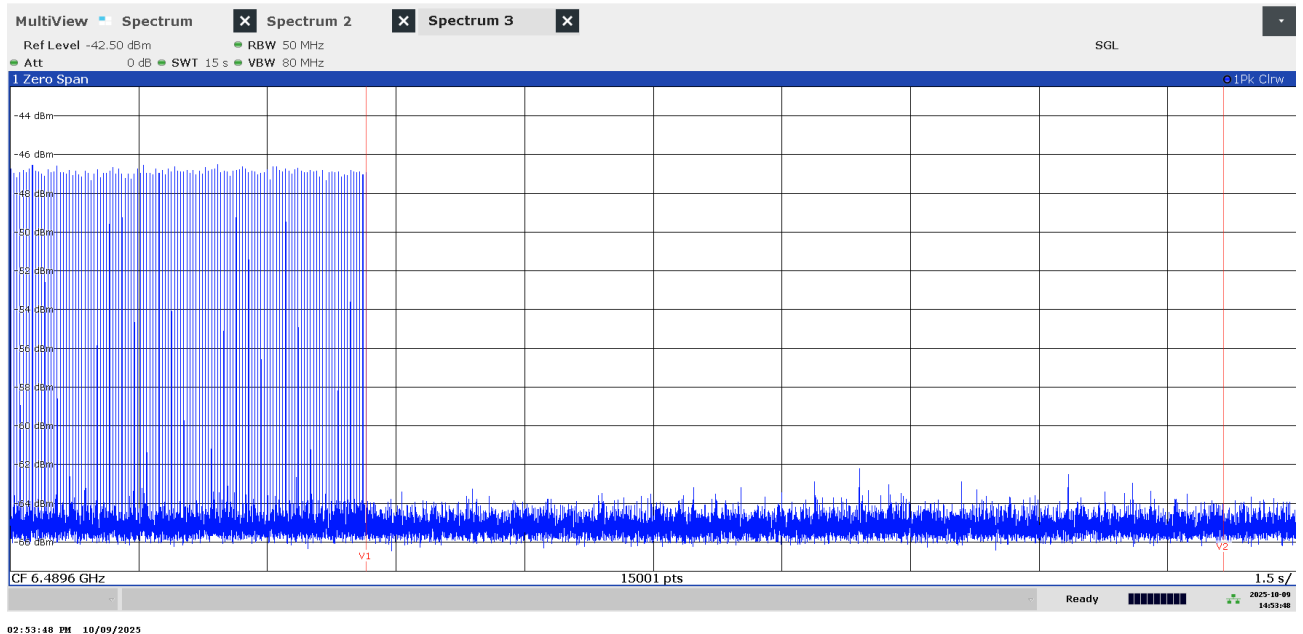
→ The EUT ceases transmission of information almost immediately after the companion device/associated receiver is switched off.

Verdict: Compliant

12.3.2 Results: Frame RAD-SP3, Channel CH5

Results:

Plot 79: Emissions of EUT, only at the beginning with companion device/associated receiver (Normal mode)



Vertical line V1 indicates the time when the companion device/associated receiver is switched off.
Vertical line V2 indicates 10 s after the companion device/associated receiver is switched off.

→ The EUT ceases transmission of information almost immediately after the companion device/associated receiver is switched off.

Verdict: Compliant

12.4 Antenna requirements

Description:

§15.519(a)(2)

The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device.

§15.521(b)

Manufacturers and users are reminded of the provisions of §§15.203 and 15.204.

Results:

Integrated antenna.

Verdict: Compliant

12.5 Conducted emissions < 30MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Limits and provisions:

FCC		IC	
CFR Part 15.207(a)		RSS-Gen 8.8	
Conducted Spurious Emissions < 30 MHz			
Frequency (MHz)	Quasi-Peak (dBμV)		Average (dBμV)
0.15 – 0.5	66 to 56*		56 to 46*
0.5 – 5	56		46
5 – 30.0	60		50

*Decreases with the logarithm of the frequency

Measurement:

Parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

§15.521(j)

Responsible parties are reminded of the other standards and requirements cross referenced in §15.505, such as a limit on emissions conducted onto the AC power lines.

§15.207(c)

Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Results:

The device only employs battery power for operation (as declared by manufacturer).

Verdict: Not applicable

13 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Combination of Grantee Code and Equipment Product Code
ISED	Innovation, Science and Economic Development Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Continuous wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N₀	Carrier to noise-density ratio, expressed in dB-Hz

14 Document history

Version	Applied changes	Date of release
TR1-R01	Initial release	2025-11-07

END OF TEST REPORT