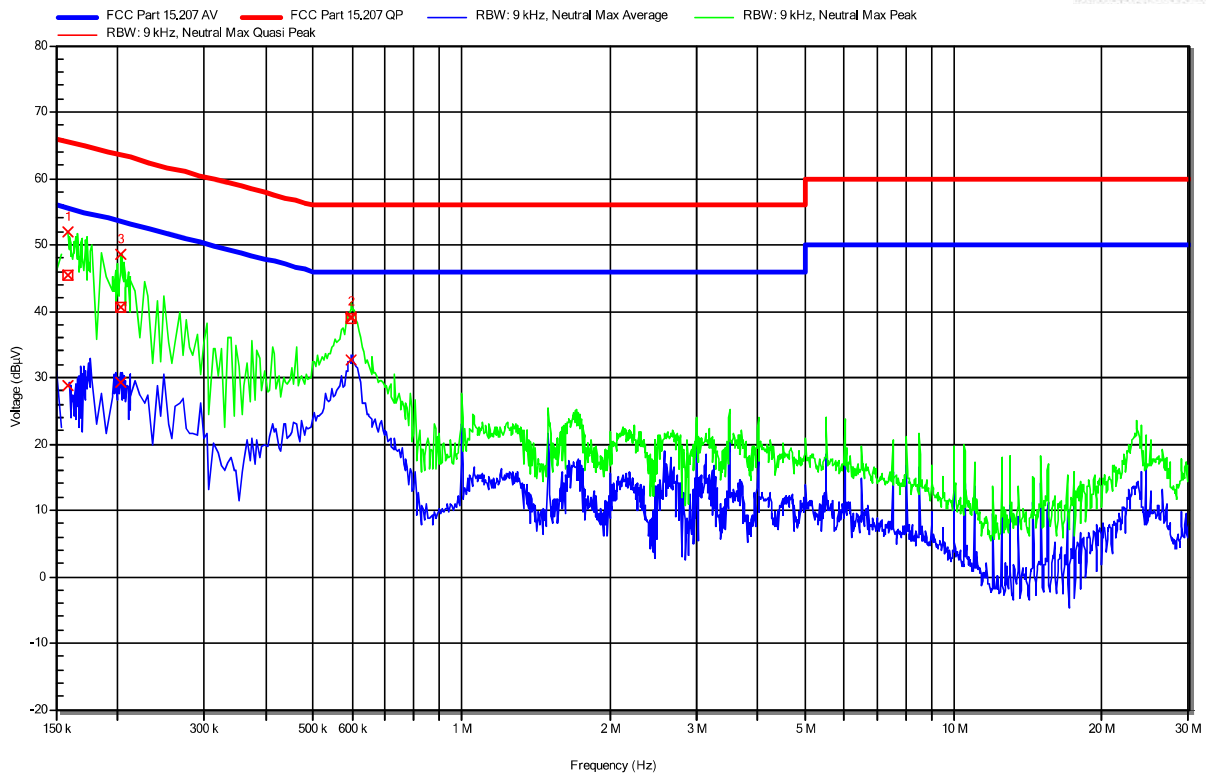


Conducted emissions at the mains power port according to FCC part 15 C

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48551
 Test Site: Eurofins Product Service GmbH
 Operator: Ibraimov Azamat
 Test Date: 2024-06-20
 Operating Conditions: ambient temperature: 24 °Celsius
 power input: 120 V AC, 60 Hz converted to 24 V DC
 LISN: Schwarzbeck NSLK 8127 N
 Operational Mode: 802.15.4_TX_CH_18
 Applied to Port: Mains
 Note 1: Power Adapter 24 V

Index 2

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	159 kHz	45.38 dBµV	65.52 dBµV	-20.14 dB	Pass	Neutral
2	595.5 kHz	38.98 dBµV	56 dBµV	-17.02 dB	Pass	Neutral
3	203.55 kHz	40.52 dBµV	63.46 dBµV	-22.95 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	159 kHz	28.9 dBµV	55.52 dBµV	-26.61 dB	Pass	Neutral
2	595.5 kHz	32.72 dBµV	46 dBµV	-13.28 dB	Pass	Neutral
3	203.55 kHz	29.17 dBµV	53.46 dBµV	-24.3 dB	Pass	Neutral

Test Report No.: G0M-2403-2508-TFC247ZB-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.5 Test Conditions and Results - Band-edge compliance

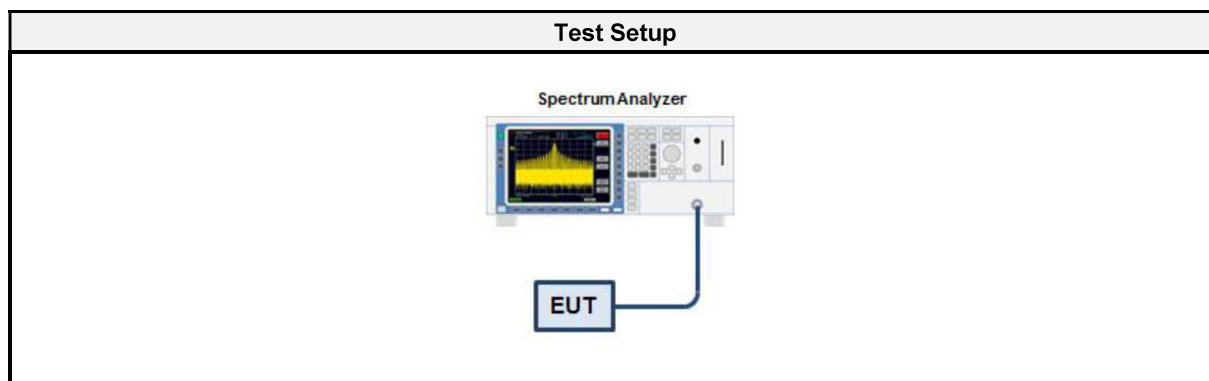
3.5.1 Information

Test Information	
Reference	FCC § 15.247(d)
Measurement Uncertainty	± 3.64 dB
Measurement Method	ANSI C63.10 11.13
Operator	Azamat Ibraimov
Date	2024-06-19

3.5.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.5.3 Setup



3.5.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable	Gigalane	1730	EF00779 (CAABE)	2024-04	2025-04

3.5.5 Procedure

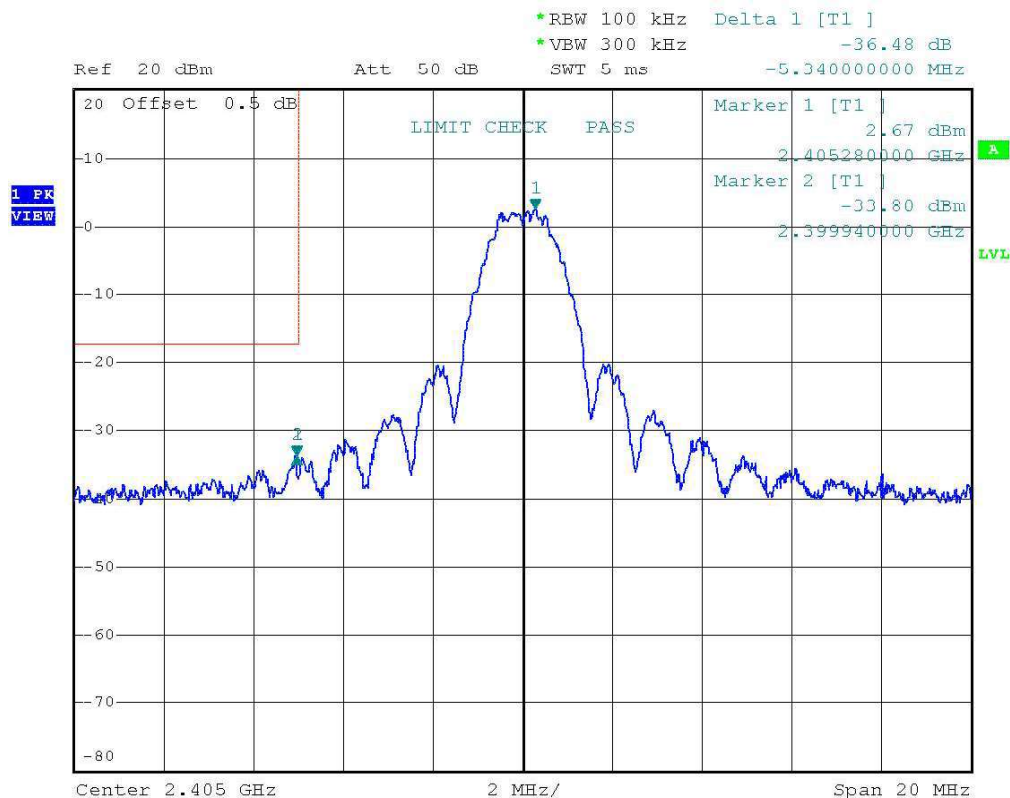
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge attenuation is determined from level difference

3.5.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
O-QPSK	2405	-36.48	-20	PASS
O-QPSK	2475	-46.7	-20	PASS

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48863
 Reference Standards: FCC 15.247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 11, 2405 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Azamat Ibraimov
 Test Site: Eurofins Product Service GmbH
 Test Date: 2024-06-19
 Note: RFR2a
 Band-edge: Lower
 In-band Frequency [MHz]: 2405.28
 Max. in-band Level [dBm/100 kHz]: 2.674
 Out-of-band Frequency [MHz]: 2399.94
 Max. out-of-band Level [dBm/100 kHz]: -33.804
 Attenuation [dB]: -36.48



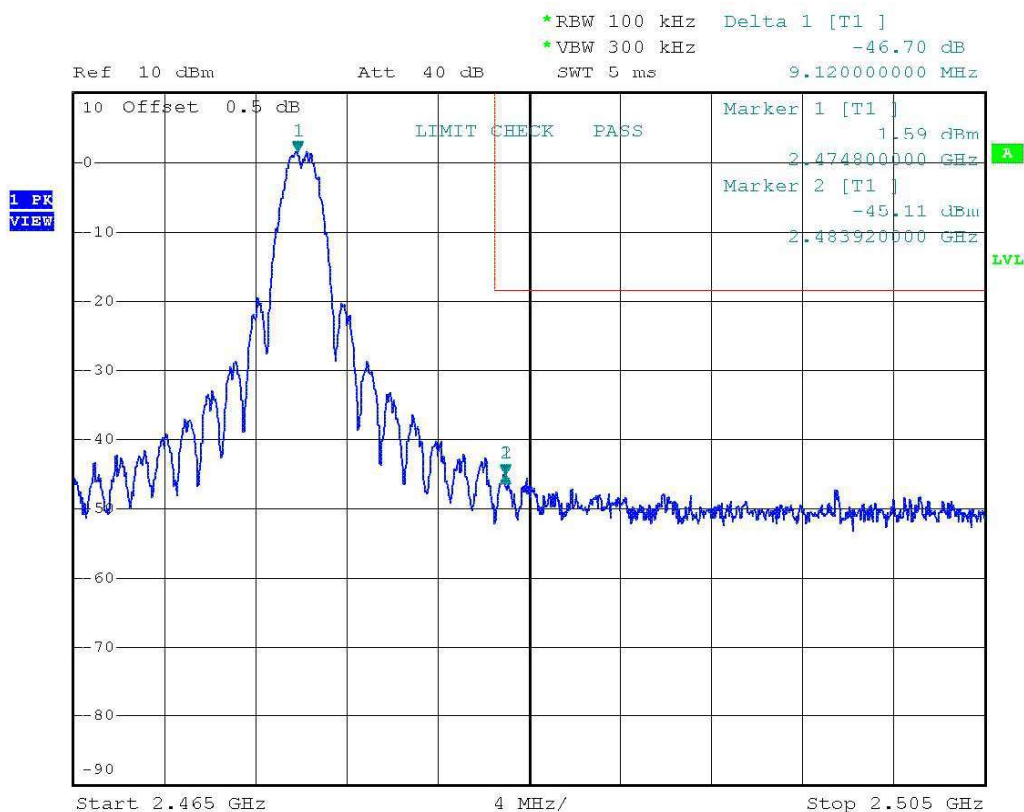
Date: 19.JUN.2024 09:43:27

Test Report No.: G0M-2403-2508-TFC247ZB-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48863
 Reference Standards: FCC 15.247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Azamat Ibraimov
 Test Site: Eurofins Product Service GmbH
 Test Date: 2024-06-19
 Note: RFR2a
 Band-edge: Upper
 In-band Frequency [MHz]: 2474.8
 Max. in-band Level [dBm/100 kHz]: 1.586
 Out-of-band Frequency [MHz]: 2483.92
 Max. out-of-band Level [dBm/100 kHz]: -45.114
 Attenuation [dB]: -46.7



Date: 19.JUN.2024 10:09:27

Test Report No.: G0M-2403-2508-TFC247ZB-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.6 Test Conditions and Results - Conducted spurious emissions

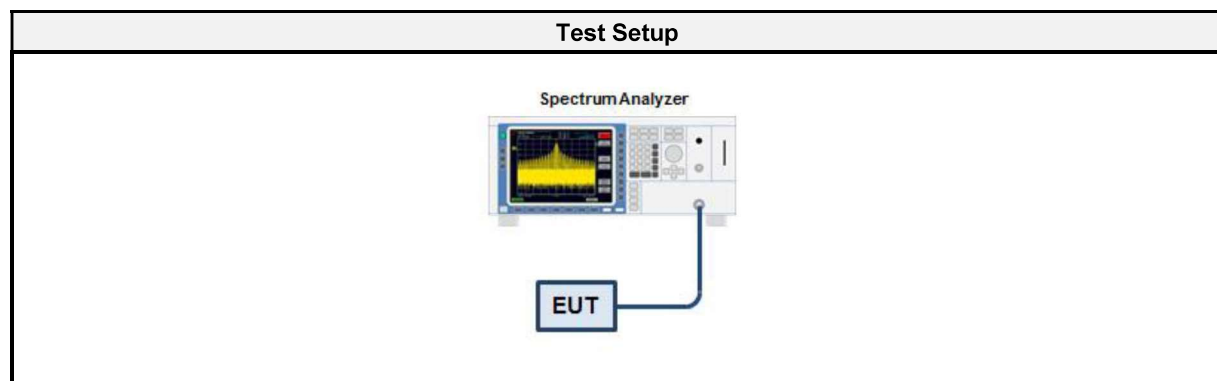
3.6.1 Information

Test Information	
Reference	FCC § 15.247(d)
Measurement Uncertainty	± 4.25 dB
Measurement Method	ANSI C63.10 11.11
Operator	Azamat Ibraimov
Date	2024-06-19

3.6.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.6.3 Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSP 30	EF00312	2023-08	2024-08
Cable	Huber+Suhner	Sucoflex 102EA	EF00779 (CAABR)	2024-04	2025-04

3.6.5 Procedure

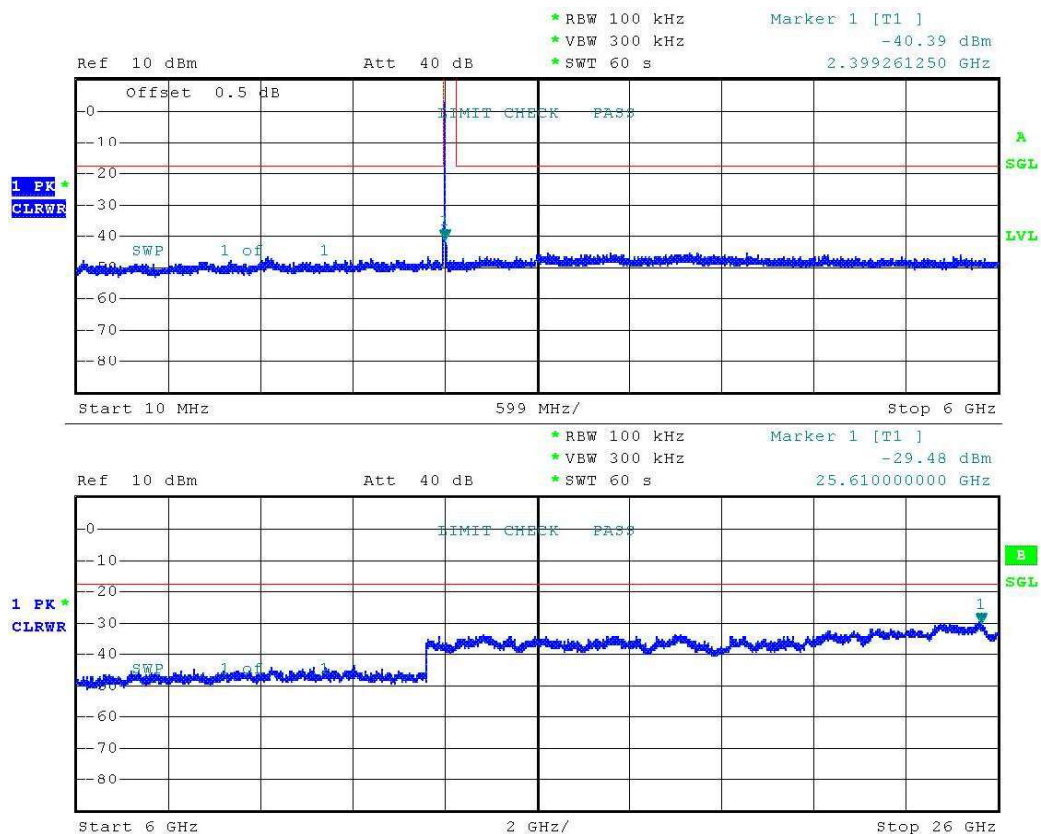
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels outside frequency band

3.6.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
O-QPSK	2405	PASS
O-QPSK	2440	PASS
O-QPSK	2475	PASS

Conducted Spurious Emissions

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48863
 Reference Standards: FCC 15.247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 11, 2405 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Azamat Ibraimov
 Test Site: Eurofins Product Service GmbH
 Test Date: 2024-06-19
 Note: RFR2a
 Max. in-band Frequency [MHz]: 2405.3
 Max. in-band Level [dBm/100 kHz]: 2.3
 Out-of-band Limit [dBm/100 kHz]: -17.7



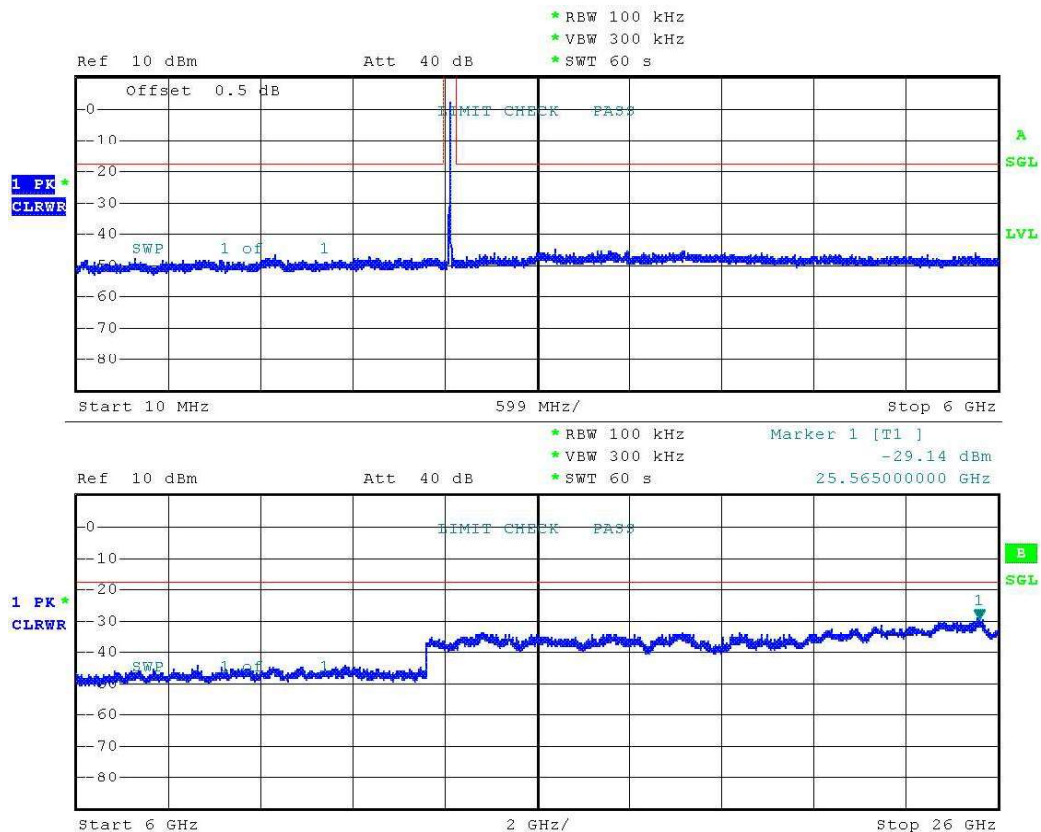
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Test Report No.: G0M-2403-2508-TFC247ZB-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Conducted Spurious Emissions

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48863
 Reference Standards: FCC 15.247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 18, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Azamat Ibraimov
 Test Site: Eurofins Product Service GmbH
 Test Date: 2024-06-19
 Note: RFR2a
 Max. in-band Frequency [MHz]: 2440.3
 Max. in-band Level [dBm/100 kHz]: 2.2
 Out-of-band Limit [dBm/100 kHz]: -17.8



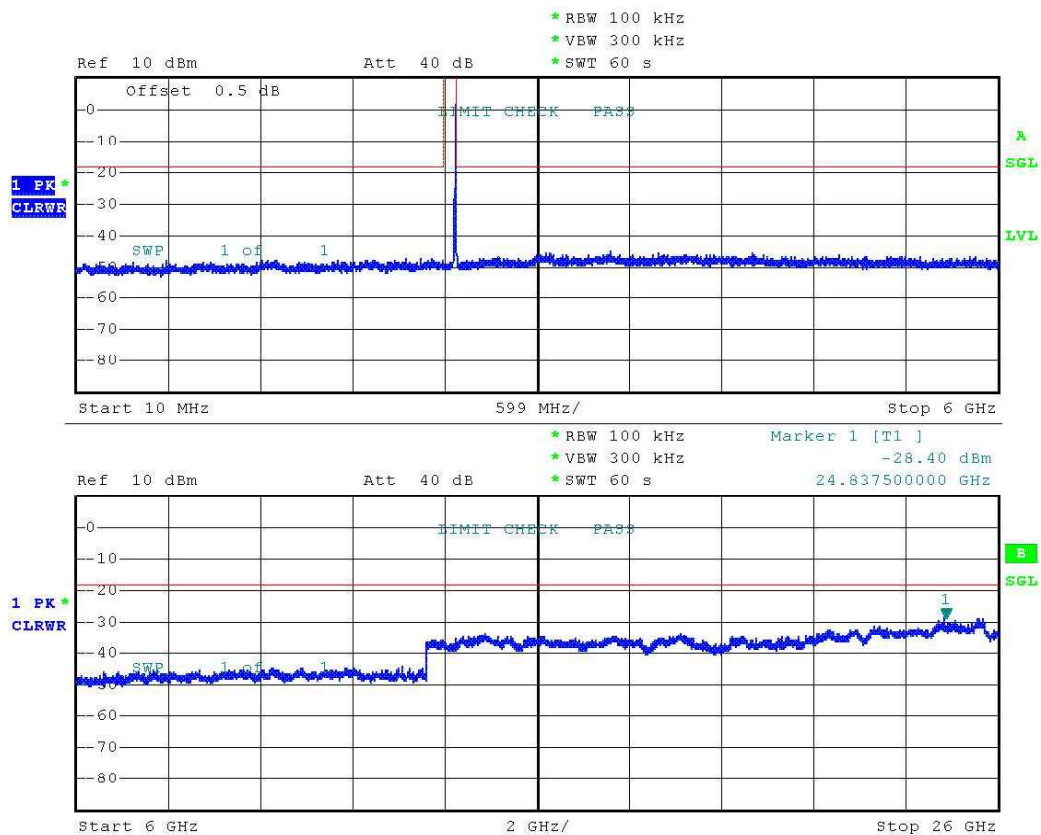
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Test Report No.: G0M-2403-2508-TFC247ZB-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Conducted Spurious Emissions

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48863
 Reference Standards: FCC 15.247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Azamat Ibrahimov
 Test Site: Eurofins Product Service GmbH
 Test Date: 2024-06-19
 Note: RFR2a
 Max. in-band Frequency [MHz]: 2475.2
 Max. in-band Level [dBm/100 kHz]: 1.6
 Out-of-band Limit [dBm/100 kHz]: -18.4



Date: 19.JUN.2024 10:23:50

Test Report No.: G0M-2403-2508-TFC247ZB-V01

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.7 Test Conditions and Results - Transmitter radiated emissions

3.7.1 Information

Test Information	
Reference	FCC § 15.247(d); FCC § 15.209
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Azamat Ibraimov
Date	2024-06-17 - 2024-06-20

3.7.2 Limits

Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
0.009 - 0.09	Average	2400/F[kHz]	300
0.09 - 0.110	Quasi-Peak	2400/F[kHz]	300
0.110 - 0.490	Average	2400/F[kHz]	300
0.490 - 1.705	Quasi-Peak	24000/F[kHz]	30
1.705 - 30.0	Quasi-Peak	30	30
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

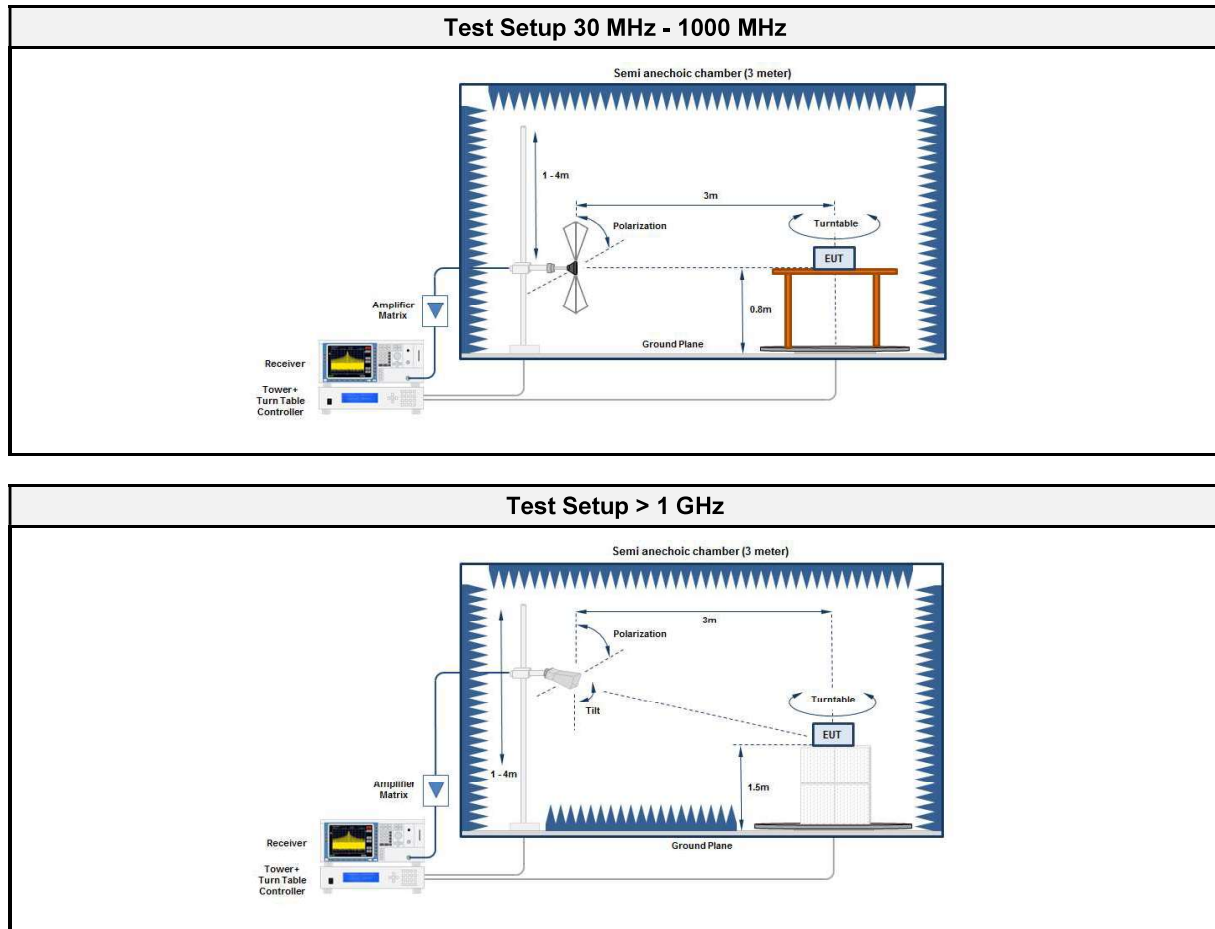
3.7.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2020.1.8
EMC Software	DARE Instruments	RadiMation	2023.2.6

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2022-11	2025-11
Test Receiver	Rohde & Schwarz	ESW44	EF01856	2024-04	2025-04
Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2025-10

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC2	EF01616	2023-12	2024-12
Spectrum analyzer	Rohde & Schwarz	FSU26	EF01407	2023-08	2024-08
Antenna	Schwarzbeck	BBHA 9120B	EF01678	2024-05	2027-05
Antenna	Schwarzbeck	HWRD 650	EF01679	2024-05	2027-05
Antenna	Amplifier Research	AT4560	EF00302	2023-09	2025-09

3.7.4 Setup



3.7.5 Procedure

Test Procedure 30 MHz - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

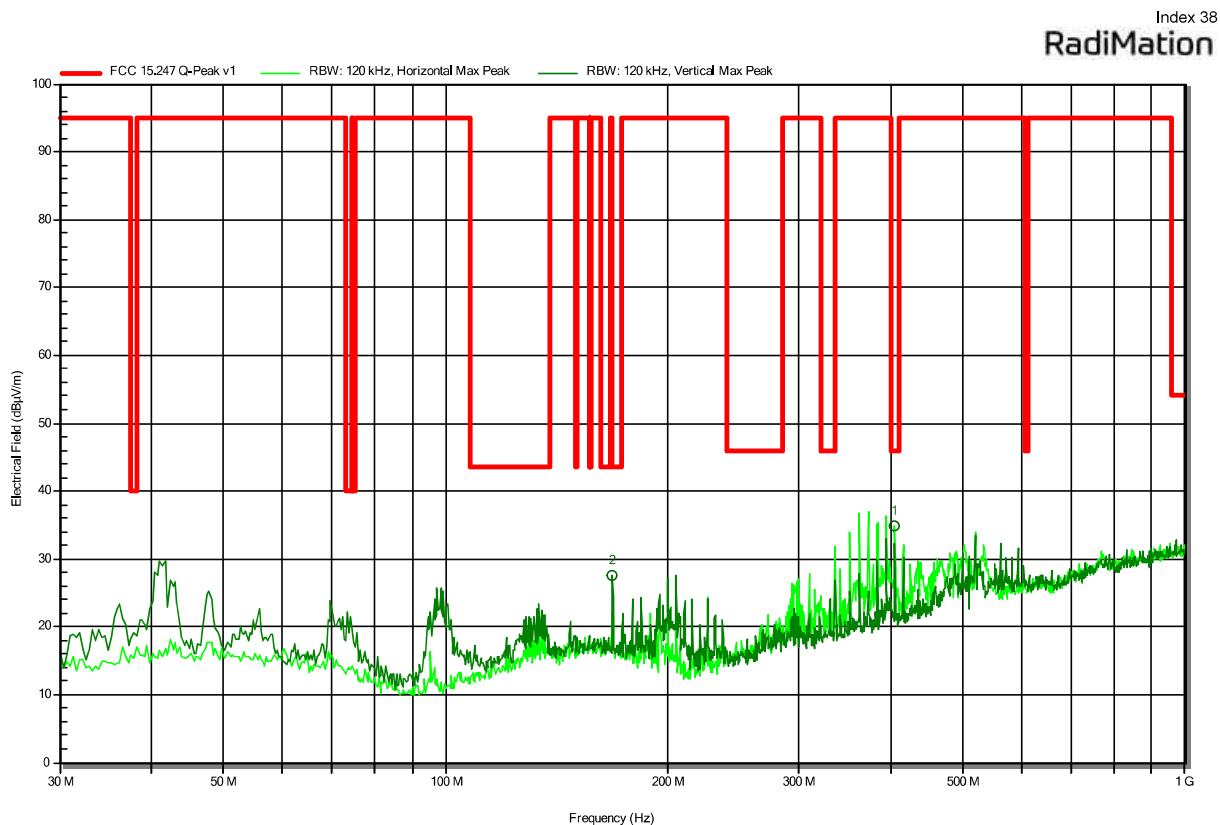
3.7.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2405	167.74	27.5	pk	ver	43.5	-15.97
2405	404.42	34.8	pk	hor	46	-11.23
2405	1318.8467	42.39	pk	hor	74	-31.61
2405	1318.8467	38.62	avg	hor	54	-15.38
2405	2236.95	38.17	pk	hor	74	-35.83
2405	2236.95	32.7	avg	hor	54	-21.3
2405	4811.0062	56.79	pk	hor	74	-17.21
2405	4811.0062	52.07	avg	hor	54	-1.93
2440	404.2402	33.7	qpk	hor	46	-12.34
2440	4881.0293	56.01	pk	hor	74	-17.99
2440	4881.0293	51.09	avg	hor	54	-2.91
2440	7321.6	53.16	pk	hor	74	-20.84
2440	7321.6	46.63	avg	hor	54	-7.37
2475	404.3366	33	qpk	hor	46	-13.04
2475	1318.9667	42.41	pk	hor	74	-31.59
2475	1318.9667	38.5	avg	hor	54	-15.5
2475	1531.1133	40.55	pk	ver	74	-33.45
2475	1531.1133	25.98	avg	ver	54	-28.02
2475	2483.7189	58.2	pk	hor	74	-15.8
2475	2483.7189	50.49	avg	hor	54	-3.51
2475	4951.0028	51.14	pk	hor	74	-22.86
2475	4951.0028	45.72	avg	hor	54	-8.28
2475	7423.4168	48.6	pk	hor	74	-25.4
2475	7423.4168	41.19	avg	hor	54	-12.81

ANNEX A Transmitter spurious emissions

Radiated Spurious Emissions according to 47 CFR Part 15.247

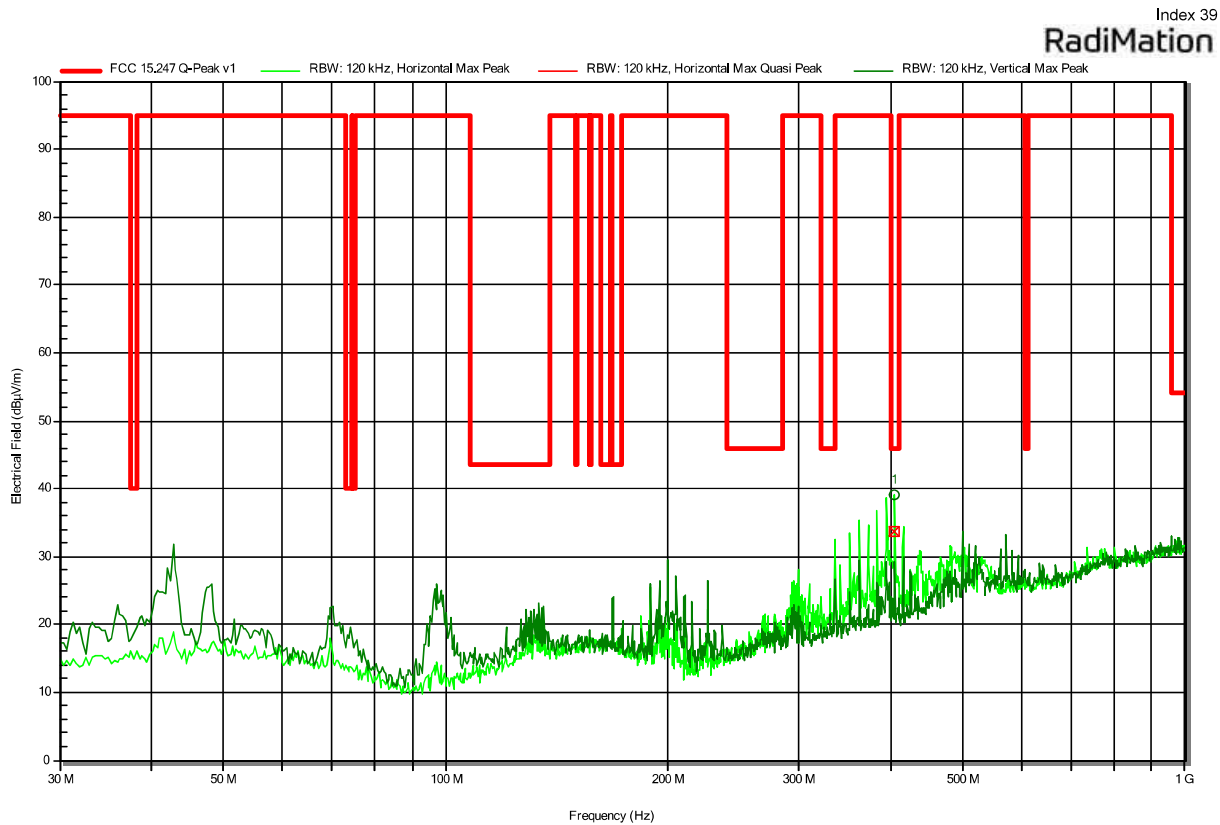
Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48551
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Ibraimov
 Measurement software: RadiMation, version 2023.2.6
 Test Conditions: Tnom: 25 °Celsius, Vnom: 24 V DC
 Antenna: Schwarzbeck VULB 9168
 Measurement distance: 3 m
 Mode: Tx; 802.15.4_2405 MHz_Tx
 Test Date: 2024-06-20



Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Peak Difference (dB)	Peak Status	Polarization
1	404.42	34.8	46	-11.23	Pass	Horizontal
2	167.74	27.5	43.5	-15.97	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 15.247

Project Number: G0M-2403-2508
 Applicant: Jungheinrich AG
 Model Description: UWB-Location-System
 Model: 52445052, Truck Tag
 Test Sample ID: 48551
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Ibrahimov
 Measurement software: RadiMation, version 2023.2.6
 Test Conditions: Tnom: 25 °Celsius, Vnom: 24 V DC
 Antenna: Schwarzbeck VULB 9168
 Measurement distance: 3 m
 Mode: Tx; 802.15.4_2440 MHz_Tx
 Test Date: 2024-06-20



Peak Number	Frequency (MHz)	Quasi-Peak (dBuV/m)	Quasi-Peak Limit (dBuV/m)	Quasi-Peak Difference (dB)	Quasi-Peak Status	Polarization
1	404.2402	33.7	46	-12.34	Pass	Horizontal