

Annex 1: Measurement diagrams 20-1-0017102T02a-A1

| | | | |
|---|---|------------------------|--------------|
| Number of pages: | 19 | Date of Report: | 2021-Mar-16 |
| Testing company: | CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150 | Applicant: | SICK AG |
| Test Object / Tested Device(s): | UWB Tag, LOCU101-0110 | | |
| FCC ID: | WRMLOCU1 | IC: | 10066A-LOCU1 |
| Testing has been carried out in accordance with: | Title 47 CFR, Chapter I FCC Regulations, Subchapter A §15.247 (DTS) ISED-Regulations RSS-Gen, Issue 5 RSS 247, Issue 2 Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit". | | |

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1 Measurement diagrams

1.1 Radiated Measurements

2.01a_high

Common Information

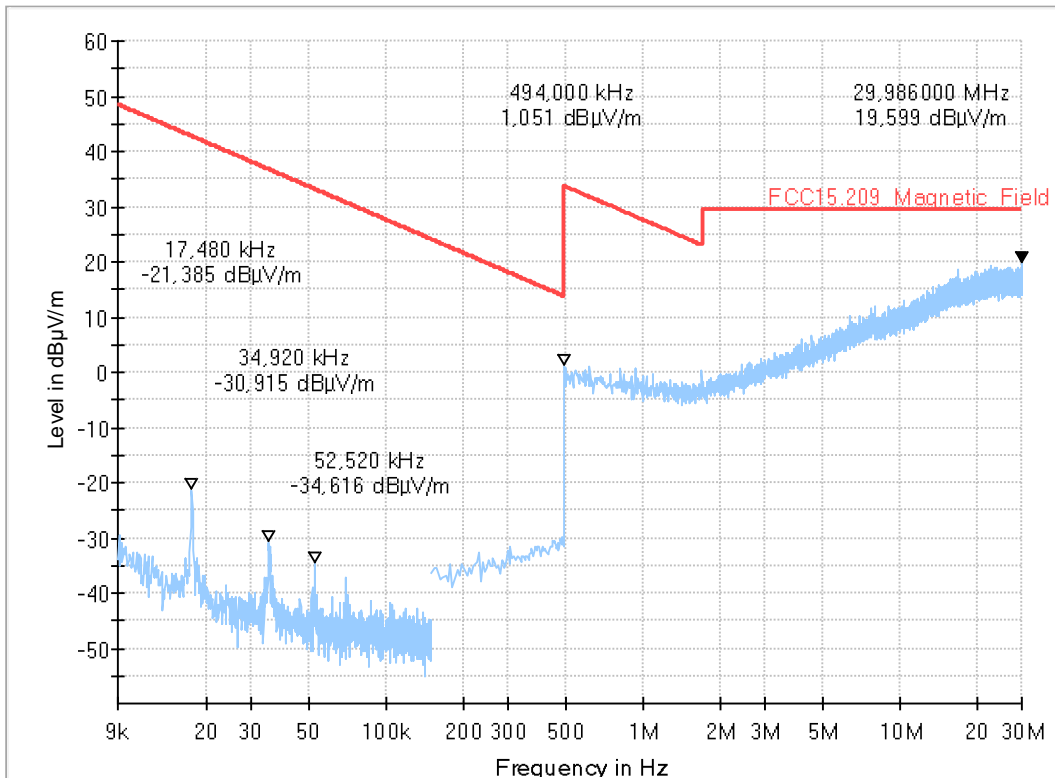
| | |
|--------------------------|---|
| Test Description: | Magnetic Field Strength Measurement related to 30/300 m distance |
| Test Site Location: | Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance |
| Version of Testsoftware: | EMC32 V10.50.0 |
| Distance correction: | used accord. table, pls. see test report |
| Technical Data: | Please see page 2 for detailed data of measurement setup |
| Rec. antenna (pre-scan): | height 1.00 m, parallel and 90° to EUT polarisation |
| Used Filter: | bypass |
| Test Standard: | FCC 15.205 § 15.209; RSS-Gen: Issue 5 |

| | |
|----------------------------|--|
| Operator: | TFra |
| Operating Mode: | 1Mbps PWR4 Channel high EUT Standing |
| Environmental Conditions:: | Humidity : 50%rH; Temperature: 20°C |
| EUT Setup: | 1 |
| Verdict: | Passed |
| Power Supply | 3.7V DC |

EUT Information

| | |
|---------------|-------------------|
| PMT number: | 20-1-00171S26_C01 |
| Manufacturer: | SICK AG |

Full Spectrum



2.01b_high

Common Information

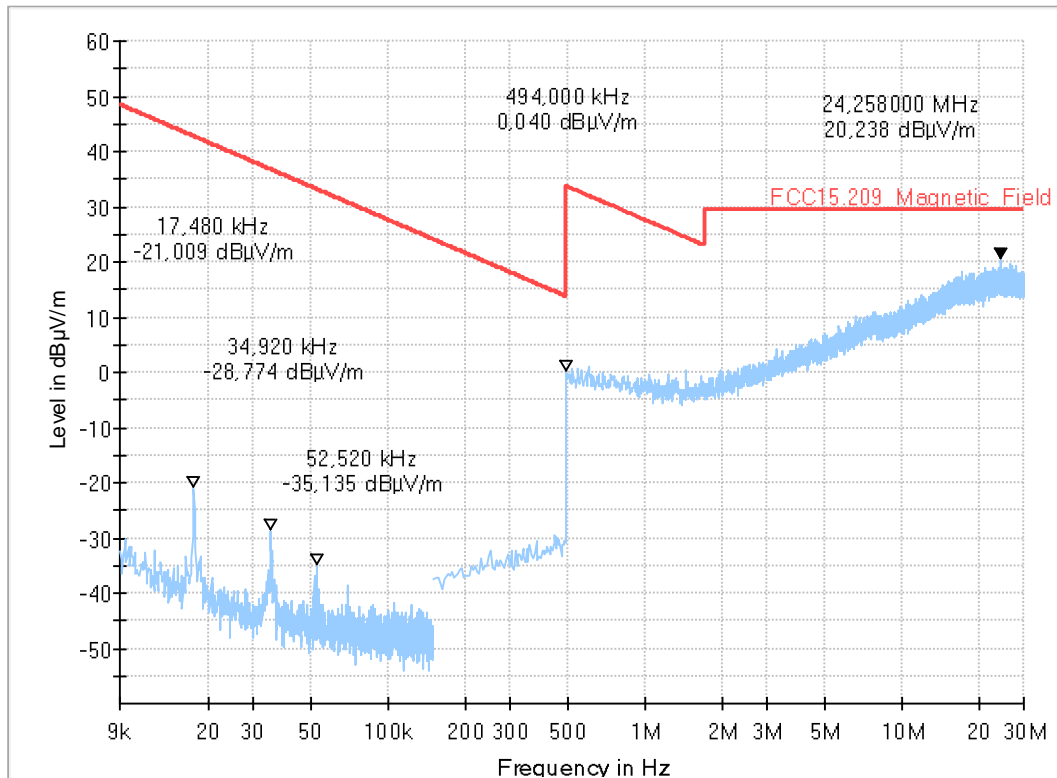
| | |
|--------------------------|---|
| Test Description: | Magnetic Field Strength Measurement related to 30/300 m distance |
| Test Site Location: | Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance |
| Version of Testsoftware: | EMC32 V10.50.0 |
| Distance correction: | used accord. table, pls. see test report |
| Technical Data: | Please see page 2 for detailed data of measurement setup |
| Rec. antenna (pre-scan): | height 1.00 m, parallel and 90° to EUT polarisation |
| Used Filter: | bypass |
| Test Standard: | FCC 15.205 § 15.209; RSS-Gen: Issue 5 |

| | |
|----------------------------|---|
| Operator: | TFra |
| Operating Mode: | 1Mbps PWR4 Channel high EUT Laying |
| Environmental Conditions:: | Humidity : 50%rH; Temperature: 20°C |
| EUT Setup: | 1 |
| Verdict: | Passed |
| Power Supply | 3.7V DC |
| Comment: | |

EUT Information

| | |
|---------------|-------------------|
| PMT number: | 20-1-00171S26_C01 |
| Manufacturer: | SICK AG |

Full Spectrum



3.01a_high

Common Information

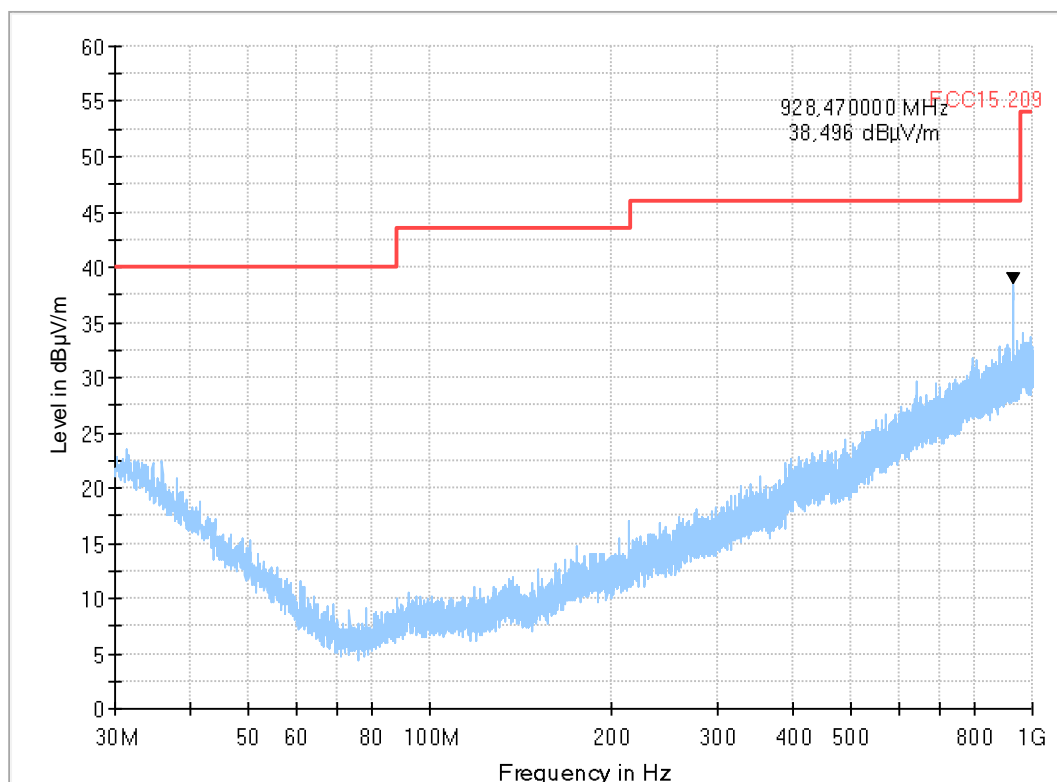
Test Description: Radiated field strength emission in 3m distance
 Test Site: CETECOM GmbH Essen
 Test Standard: FCC 15.205&15.209 RSS Gen Issue 5 Intentional Radiator
 Antenna polarisation: horizontal/vertical

Environmental Conditions: Humidity : 50%rH; Temperature: 20°C
 Operator Name: Tfra
 Power Supply: 3.7V DC
 Operating Mode: 1Mbps | PWR4| Channel high| EUT Standing
 Verdict: Passed

EUT Information

PMT number: 20-1-00171S26_C01
 Manufacturer: SICK AG

Full Spectrum



Remark: Peak at 928.470 MHz is a known external Interferer from outside the chamber, not related to results

3.01b_high

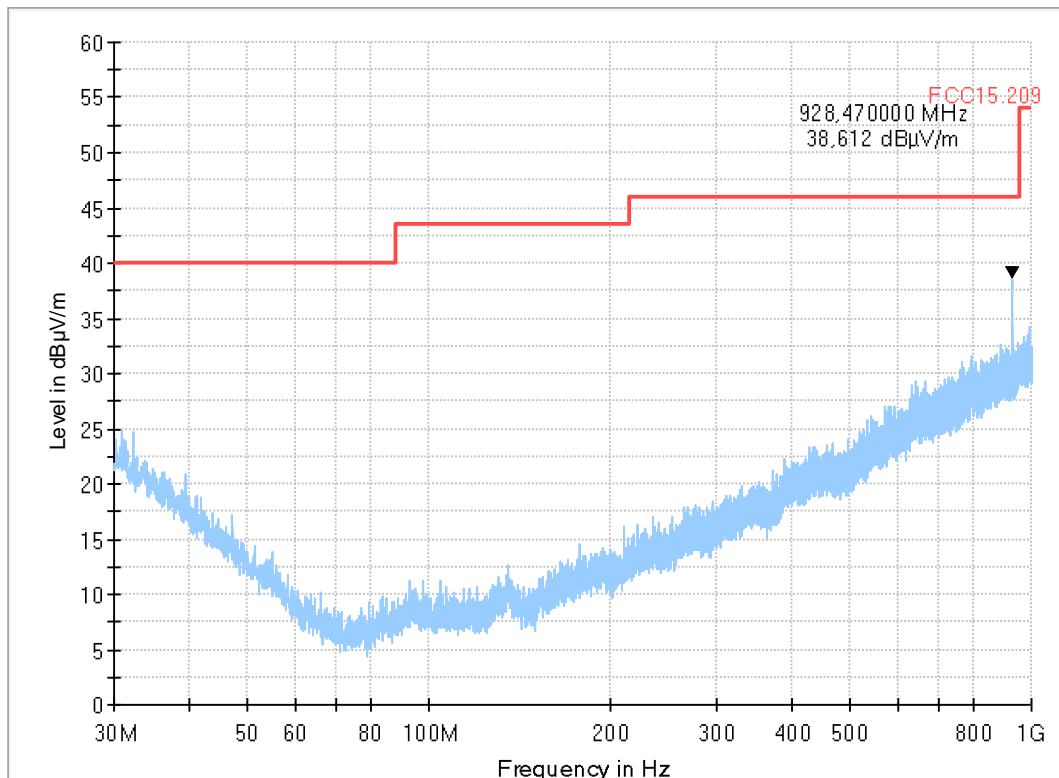
Common Information

| | |
|---------------------------|--|
| Test Description: | Radiated field strength emission in 3m distance |
| Test Site: | CETECOM GmbH Essen |
| Test Standard: | FCC 15.205&15.209 RSS Gen Issue 5 Intentional Radiator |
| Antenna polarisation: | horizontal/vertical |
| Environmental Conditions: | Humidity : 50%rH; Temperature: 20°C |
| Operator Name: | Tfra |
| Power Supply: | 3.7V DC |
| Operating Mode: | 1Mbps PWR4 Channel high EUT Laying |
| Verdict: | Passed |

EUT Information

| | |
|---------------|-------------------|
| PMT number: | 20-1-00171S26_C01 |
| Manufacturer: | SICK AG |

Full Spectrum



Remark: Peak at 928.470 MHz is a known external Interferer from outside the chamber, not related to results

4.01a

Common Information

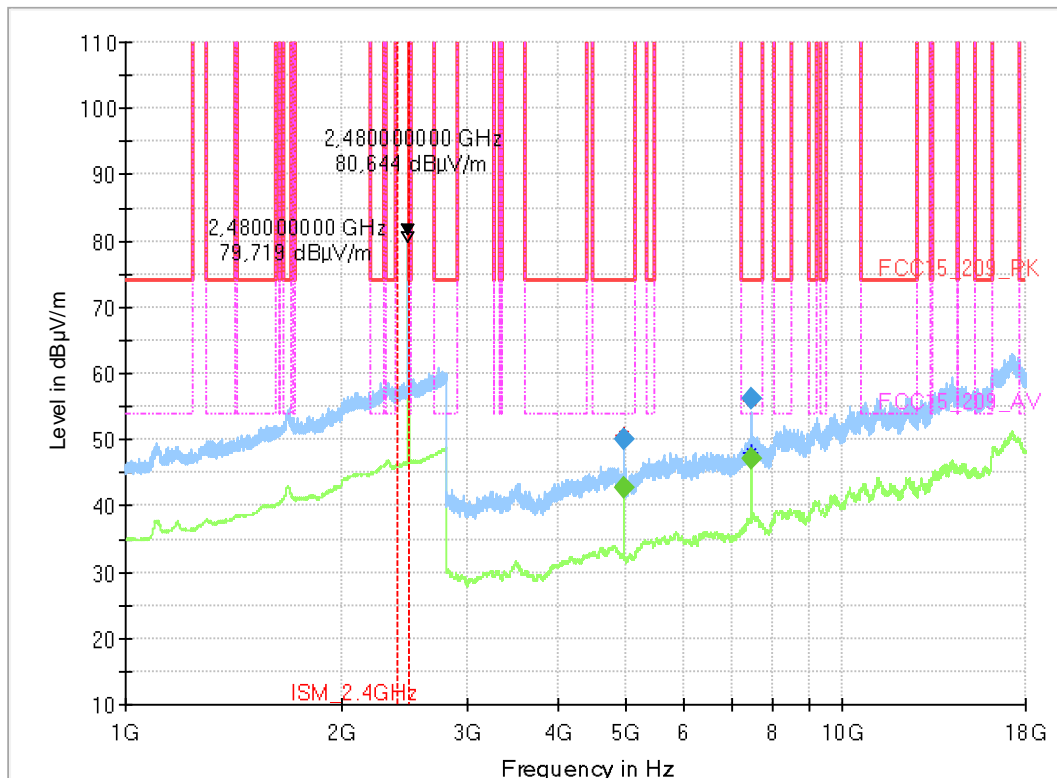
Test Description: Radiated field strength emission in 3m distance
 Test Site: Fully Anechoic Chamber (FAC1) - EMC32 V10.50.0
 Test Standard: FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
 Antenna polarisation: horizontal/vertical

Operating Mode: 1Mbps | PWR4| Channel high
 Operator: TFra
 Power Supply: 3.7V DC
 EUT Setup: 1
 Verdict: Passed

EUT Information

PMT number: 20-1-00171S26_C01
 Manufacturer: SICK AG

Full Spectrum



Final Result

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Elevation (deg) | Corr. (dB/m) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 4959.600000 | 50.11 | --- | 74.00 | 23.89 | 100.0 | 1000.000 | 155.0 | V | 44.0 | 90.0 | 5 |
| 4960.000000 | --- | 42.77 | 54.00 | 11.23 | 100.0 | 1000.000 | 155.0 | V | 46.0 | 90.0 | 5 |
| 7440.000000 | 56.28 | --- | 74.00 | 17.72 | 100.0 | 1000.000 | 155.0 | H | 216.0 | 0.0 | 13 |
| 7440.400000 | --- | 47.21 | 54.00 | 6.79 | 100.0 | 1000.000 | 155.0 | H | 221.0 | 0.0 | 13 |

4.01b

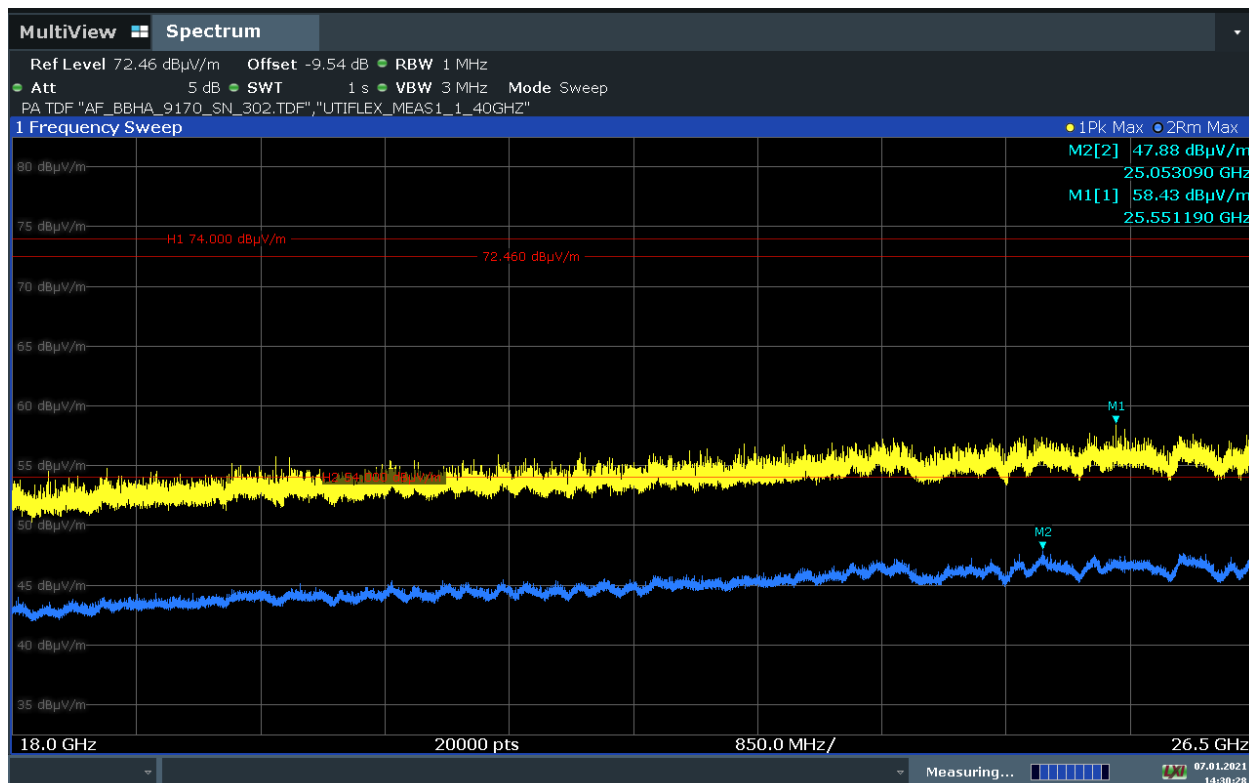
Common Information

Test Description: Radiated field strength emission in 3m distance
 Test Site: Fully Anechoic Chamber (FAC2)
 Test Standard: FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
 Antenna polarisation: horizontal/vertical

Operating Mode: 1Mbps | PWR4| Channel high
 Operator: Mah
 Power Supply: 3.7V DC
 EUT Setup: 1
 Verdict: Passed

EUT Information

PMT number: 20-1-00171S26_C01
 Manufacturer: SICK AG



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9.01_BE_low

Common Information

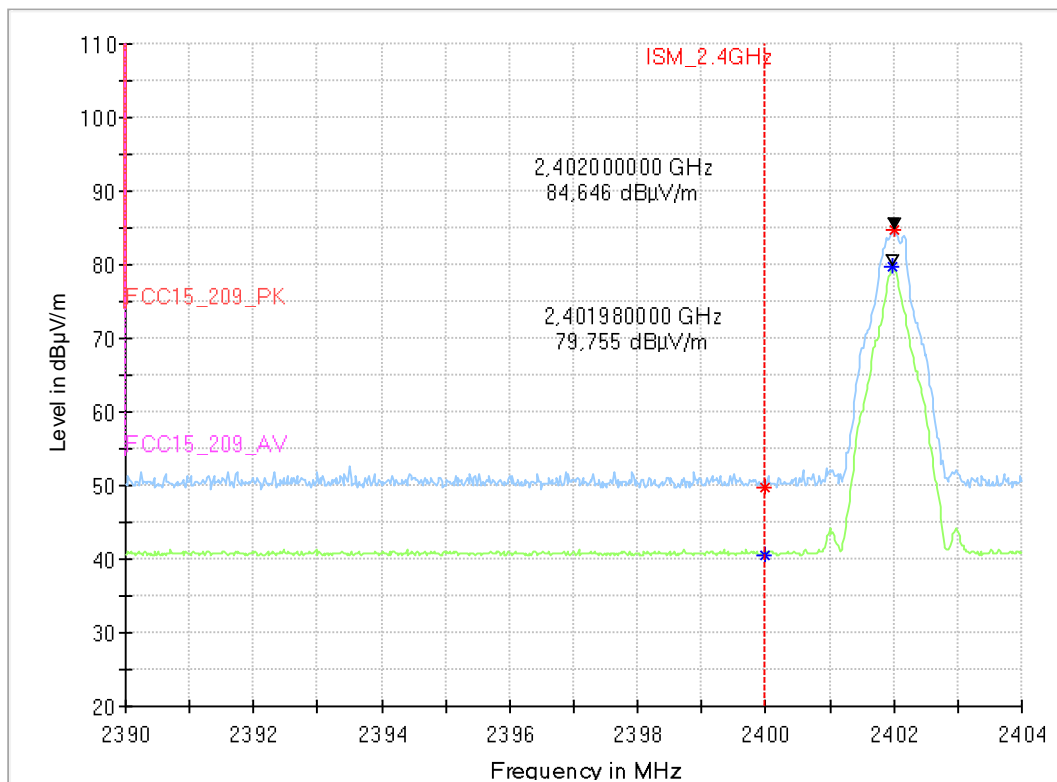
Test Description: Band-Edge: Radiated Field Strength Emissions in 3m distance
 Test Site: Fully Anechoic Chamber (FAC1) - EMC32 V10.50.0
 Test Standard: FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
 Antenna polarisation: horizontal/vertical

 Operating Mode: 1Mbps | PWR4| Channel low
 Operator: TFra
 Power Supply: 3.7V DC
 EUT Setup: 1
 Verdict: Passed

EUT Information

PMT number: 20-1-00171S26_C01
 Manufacturer: SICK AG

Full Spectrum



Critical Freqs

| Frequency (MHz) | MaxPeak (dBµV/m) | RMS (dBµV/m) | Limit (dBµV/m) | Margin | Height | Pol | Azimuth | Elevation | Corr. (dB/m) |
|-----------------|------------------|--------------|----------------|--------|--------|-----|---------|-----------|--------------|
| 2400.000000 | --- | 40.58 | 150.00 | 109.42 | 155.0 | H | 46.0 | 90.0 | 36 |
| 2400.000000 | 49.85 | --- | 150.00 | 100.15 | 155.0 | H | 46.0 | 90.0 | 36 |
| 2401.980000 | --- | 79.75 | 150.00 | 70.25 | 155.0 | V | 162.0 | 90.0 | 36 |
| 2402.000000 | 84.65 | --- | 150.00 | 65.35 | 155.0 | H | 300.0 | 0.0 | 36 |

9.02_BE_high

Common Information

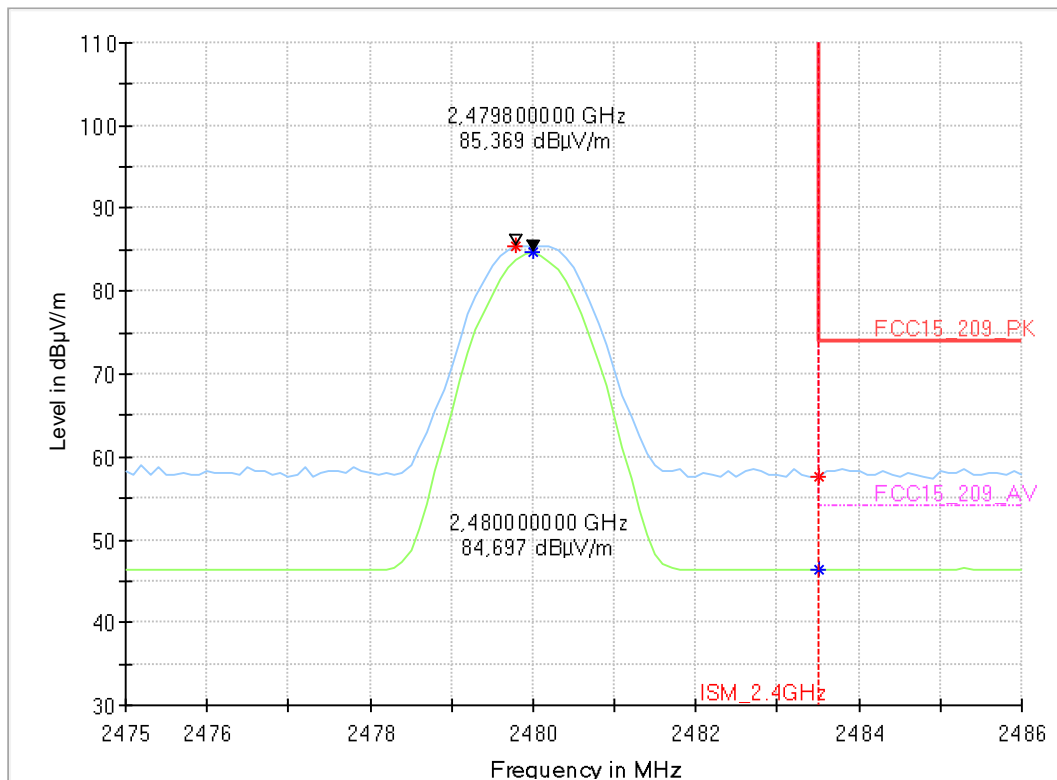
Test Description: Band-Edge: Radiated Field Strength Emissions in 3m distance
 Test Site: Fully Anechoic Chamber (FAC1) - EMC32 V10.50.0
 Test Standard: FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
 Antenna polarisation: horizontal/vertical

Operating Mode: 1Mbps | PWR4| Channel high
 Operator: TFra
 Power Supply: 3.7V DC
 EUT Setup: 1
 Verdict: Passed

EUT Information

PMT number: 20-1-00171S26_C01
 Manufacturer: SICK AG

Full Spectrum



Critical Freqs

| Frequency (MHz) | MaxPeak (dBµV/m) | RMS (dBµV/m) | Limit (dBµV/m) | Margin | Height | Pol | Azimuth | Elevation | Corr. (dB/m) |
|-----------------|------------------|--------------|----------------|--------|--------|-----|---------|-----------|--------------|
| 2479.800000 | 85.37 | --- | 150.00 | 64.63 | 155.0 | V | 166.0 | 90.0 | 36 |
| 2480.000000 | --- | 84.70 | 150.00 | 65.30 | 155.0 | V | 166.0 | 90.0 | 36 |
| 2483.500000 | 57.55 | --- | 74.00 | 16.45 | 155.0 | H | 202.0 | 90.0 | 36 |
| 2483.500000 | --- | 46.43 | 54.00 | 7.57 | 155.0 | H | 307.0 | 0.0 | 36 |

1.2 Conducted Measurements

Peak output power (Sweep)

| Mode | DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|-------------------------|---------------------|------------------|-----------------|-------------|
| 10,000 ; 2402MHz | 2402.000000 | 3.1 | 30.0 | PASS |
| 10,000 ; 2440MHz | 2440.000000 | 3.1 | 30.0 | PASS |
| 10,000 ; 2442MHz | 2442.000000 | 3.1 | 30.0 | PASS |
| 10,000 ; 2480MHz | 2480.000000 | 3.2 | 30.0 | PASS |

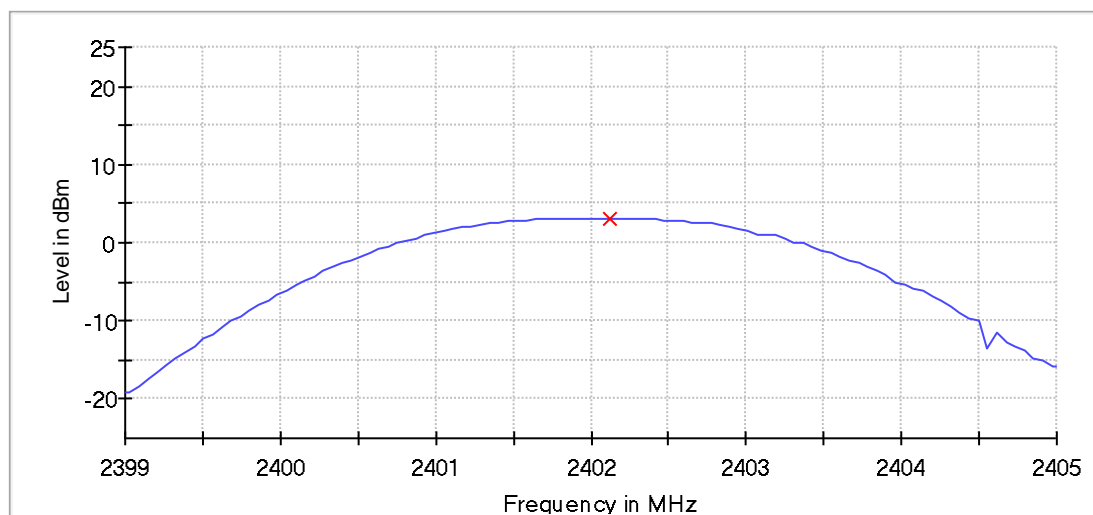
RF output power

| Mode | DUT Frequency | Gated RMS | Limit Max (dBm) | DutyCycle (%) | Result |
|-------------------------|------------------|------------|-----------------|---------------|-------------|
| 10,000 ; 2402MHz | 2402.0000 | 3.2 | 30.0 | 94.798 | PASS |
| 10,000 ; 2440MHz | 2440.0000 | 3.0 | 30.0 | 94.797 | PASS |
| 10,000 ; 2442MHz | 2442.0000 | 3.0 | 30.0 | 94.796 | PASS |
| 10,000 ; 2480MHz | 2480.0000 | 3.2 | 30.0 | 94.796 | PASS |

Peak output power (Sweep) (2402 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---------------------|------------------|-----------------|--------|
| 2402.000000 | 3.1 | 30.0 | PASS |



— Connector 1 × Peak Connector 1

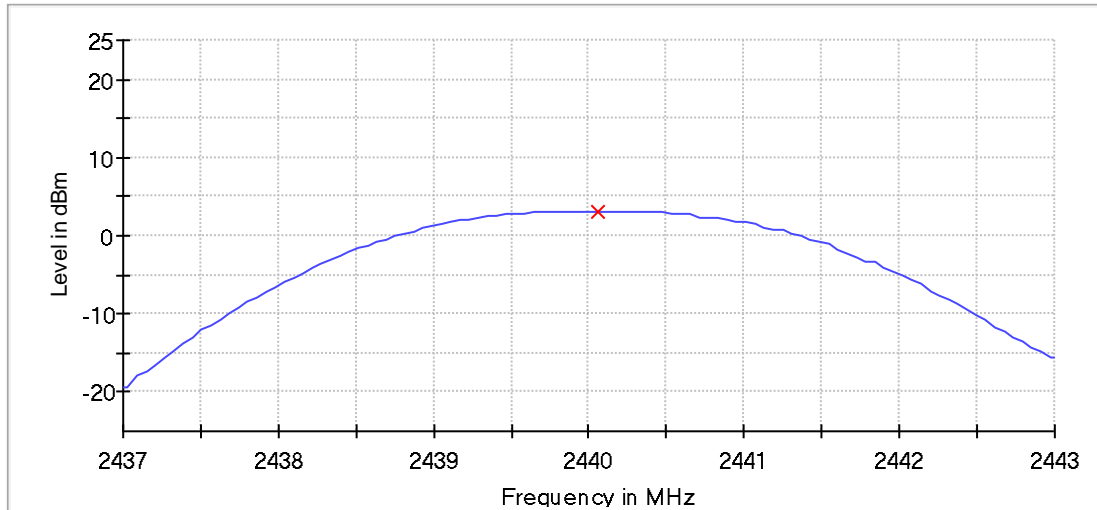
Measurement

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|--------------|
| Start Frequency | 2.39900 GHz | 2.39900 GHz |
| Stop Frequency | 2.40500 GHz | 2.40500 GHz |
| Span | 6.000 MHz | 6.000 MHz |
| RBW | 2.000 MHz | >= 1.000 MHz |
| VBW | 10.000 MHz | >= 6.000 MHz |
| SweepPoints | 101 | ~ 101 |
| Sweptime | 1.000 ms | AUTO |
| Reference Level | 10.000 dBm | 10.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | Sweep | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 7 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.11 dB | 0.50 dB |

Peak output power (Sweep) (2440 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---------------------|------------------|-----------------|--------|
| 2440.000000 | 3.1 | 30.0 | PASS |



— Connector 1 × Peak Connector 1

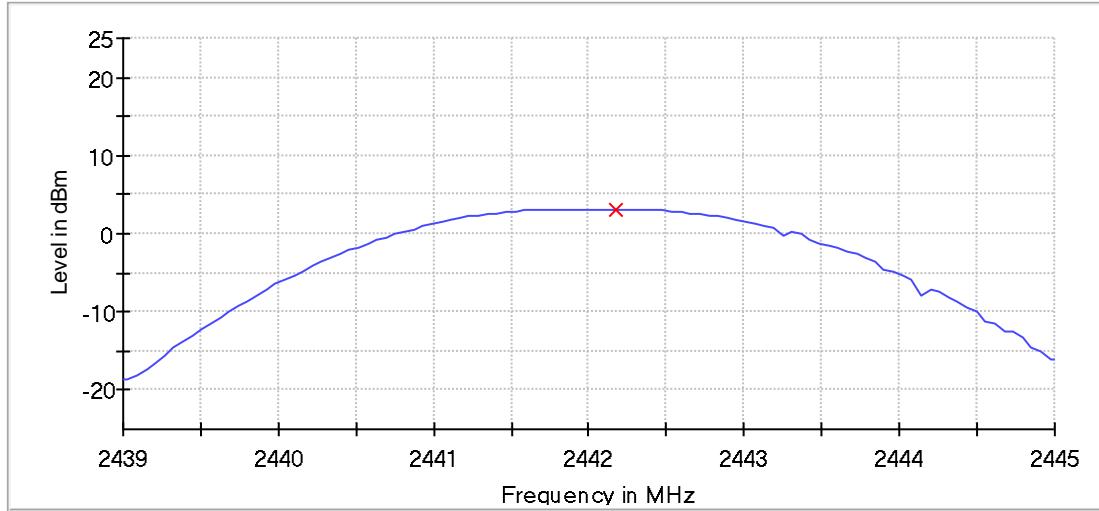
Measurement

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|--------------|
| Start Frequency | 2.43700 GHz | 2.43700 GHz |
| Stop Frequency | 2.44300 GHz | 2.44300 GHz |
| Span | 6.000 MHz | 6.000 MHz |
| RBW | 2.000 MHz | >= 1.000 MHz |
| VBW | 10.000 MHz | >= 6.000 MHz |
| SweepPoints | 101 | ~ 101 |
| Sweeptime | 1.000 ms | AUTO |
| Reference Level | 10.000 dBm | 10.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | Sweep | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 7 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.29 dB | 0.50 dB |

Peak output power (Sweep) (2442 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---------------------|------------------|-----------------|--------|
| 2442.000000 | 3.1 | 30.0 | PASS |



— Connector 1 × Peak Connector 1

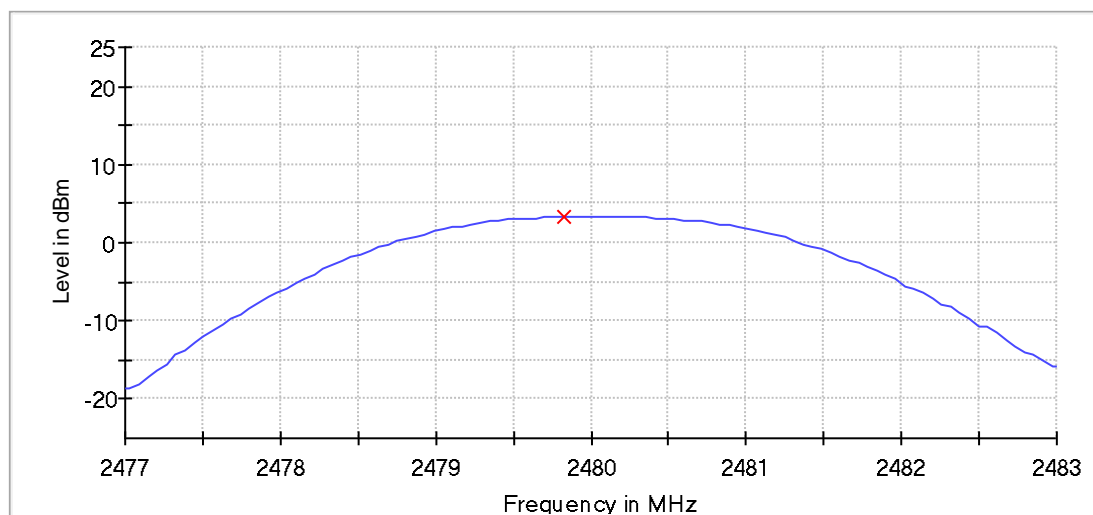
Measurement

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|--------------|
| Start Frequency | 2.43900 GHz | 2.43900 GHz |
| Stop Frequency | 2.44500 GHz | 2.44500 GHz |
| Span | 6.000 MHz | 6.000 MHz |
| RBW | 2.000 MHz | >= 1.000 MHz |
| VBW | 10.000 MHz | >= 6.000 MHz |
| SweepPoints | 101 | ~ 101 |
| SweepTime | 1.000 ms | AUTO |
| Reference Level | 10.000 dBm | 10.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | Sweep | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 6 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.40 dB | 0.50 dB |

Peak output power (Sweep) (2480 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---------------------|------------------|-----------------|--------|
| 2480.000000 | 3.2 | 30.0 | PASS |



— Connector 1 × Peak Connector 1

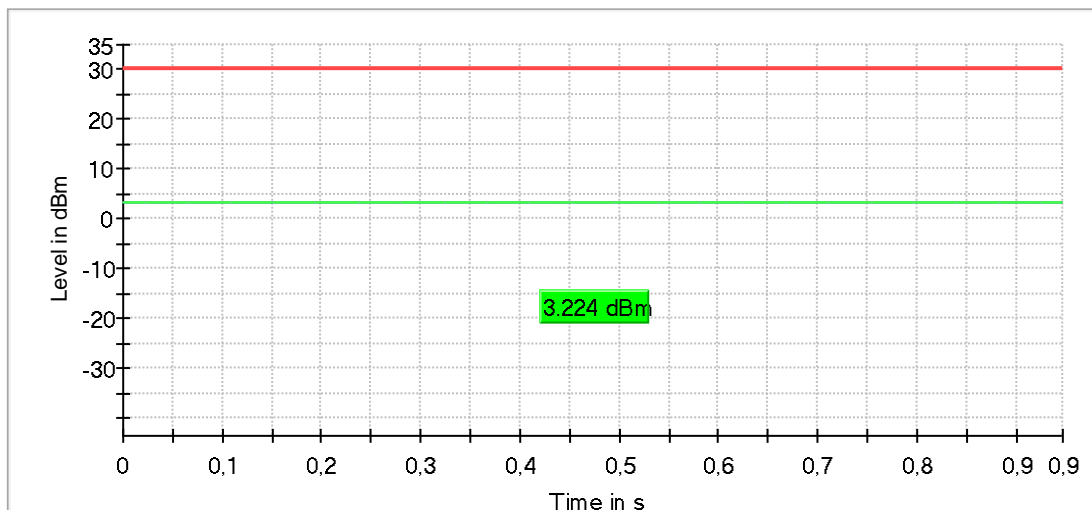
Measurement

| Setting | Instrument Value | Target Value |
|-----------------------|------------------|--------------|
| Start Frequency | 2.47700 GHz | 2.47700 GHz |
| Stop Frequency | 2.48300 GHz | 2.48300 GHz |
| Span | 6.000 MHz | 6.000 MHz |
| RBW | 2.000 MHz | >= 1.000 MHz |
| VBW | 10.000 MHz | >= 6.000 MHz |
| SweepPoints | 101 | ~ 101 |
| Sweeptime | 1.000 ms | AUTO |
| Reference Level | 10.000 dBm | 10.000 dBm |
| Attenuation | 20.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| SweepType | Sweep | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 10 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.05 dB | 0.50 dB |

RF output power (2402 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Gated RMS (dBm) | Limit Max (dBm) | DutyCycle (%) | Result |
|---------------------|-----------------|-----------------|---------------|--------|
| 2402.000000 | 3.2 | 30.0 | 94.798 | PASS |



— Gated Trace — Overall — Limit

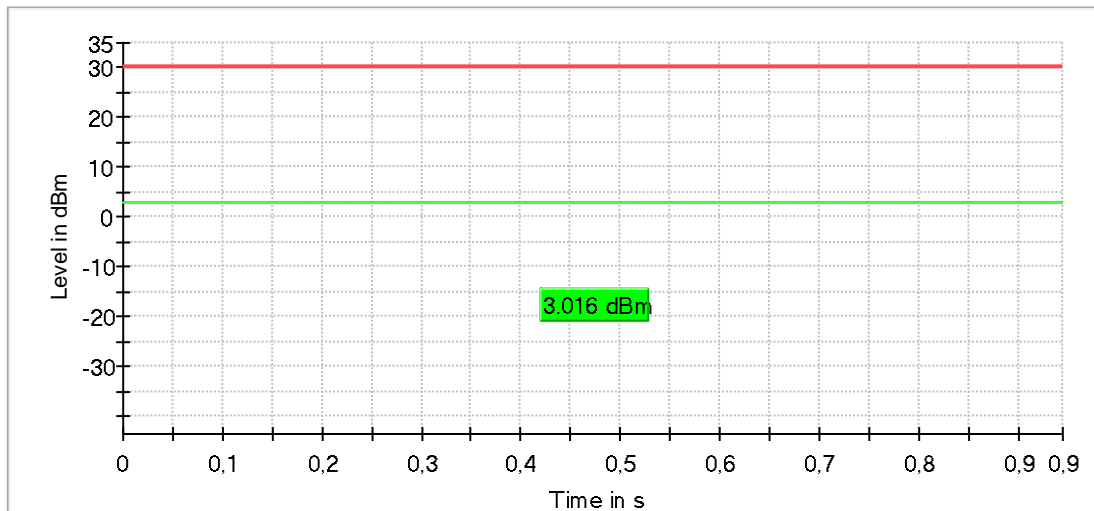
OSP PowerMeter settings

| Setting | Instrument Value | Target Value |
|------------------|------------------|---------------|
| Measurement Time | 1.000 s | 1.000 s |
| Points | 1000000 | 1000000 |
| Time resolution | 1.000 μ s | 1.000 μ s |

RF output power (2440 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Gated RMS (dBm) | Limit Max (dBm) | DutyCycle (%) | Result |
|---------------------|-----------------|-----------------|---------------|--------|
| 2440.000000 | 3.0 | 30.0 | 94.797 | PASS |



— Gated Trace
 — Overall
 — Limit

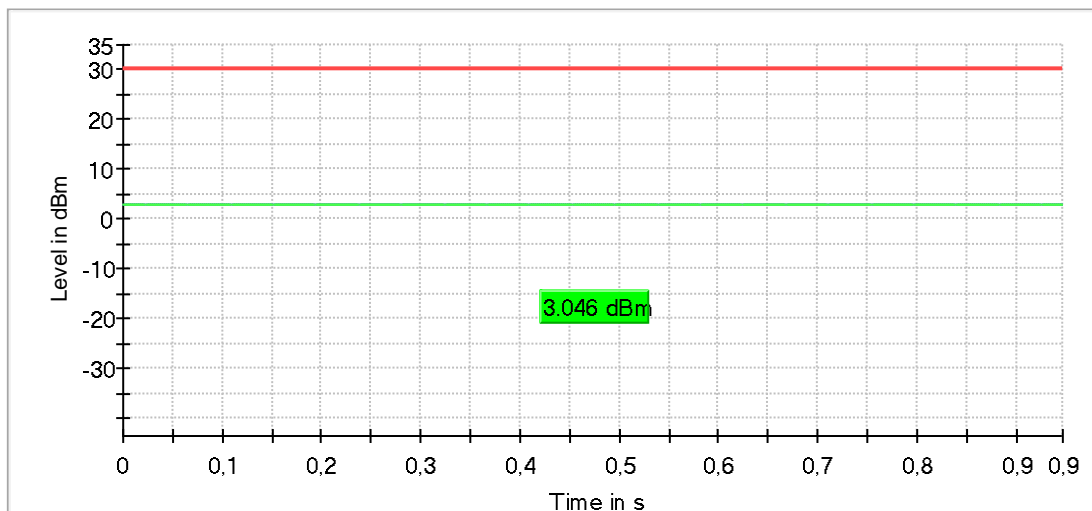
OSP PowerMeter settings

| Setting | Instrument Value | Target Value |
|------------------|------------------|---------------|
| Measurement Time | 1.000 s | 1.000 s |
| Points | 1000000 | 1000000 |
| Time resolution | 1.000 μ s | 1.000 μ s |

RF output power (2442 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Gated RMS (dBm) | Limit Max (dBm) | DutyCycle (%) | Result |
|---------------------|-----------------|-----------------|---------------|--------|
| 2442.000000 | 3.0 | 30.0 | 94.796 | PASS |



— Gated Trace — Overall — Limit

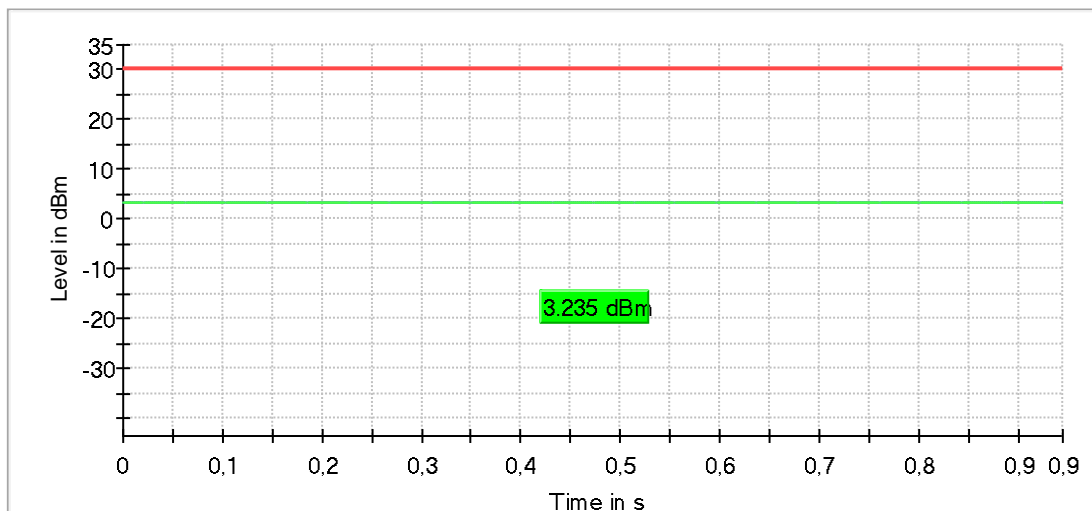
OSP PowerMeter settings

| Setting | Instrument Value | Target Value |
|------------------|------------------|---------------|
| Measurement Time | 1.000 s | 1.000 s |
| Points | 1000000 | 1000000 |
| Time resolution | 1.000 μ s | 1.000 μ s |

RF output power (2480 MHz; 10,000 dBm; 1 MHz)

Result

| DUT Frequency (MHz) | Gated RMS (dBm) | Limit Max (dBm) | DutyCycle (%) | Result |
|---------------------|-----------------|-----------------|---------------|--------|
| 2480.000000 | 3.2 | 30.0 | 94.796 | PASS |



— Gated Trace
 — Overall
 — Limit

OSP PowerMeter settings

| Setting | Instrument Value | Target Value |
|------------------|------------------|---------------|
| Measurement Time | 1.000 s | 1.000 s |
| Points | 1000000 | 1000000 |
| Time resolution | 1.000 μ s | 1.000 μ s |

End Of Annex 1