

Annex 201: Measurement diagrams

23-1-0014801T032_TR1-A201-R03

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Testing company:	cetecom advanced GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken GERMANY	Applicant:	VALEO Telematik und Akustik GmbH
Product:	Antenna and Remote Telematics Integrated System		
Model:	ARTEMIS-NAR-01		
FCC ID:	QWY-ARTEMIS-NAR01	IC:	6588A-ARTEMISNAR1
		PMN:	ARTEMIS-NAR-01
		HVIN:	ARTEMIS-NAR-01
		FVIN:	E20 R550
Testing has been carried out in accordance with:	FCC Regulations: Title 47 CFR, Chapter I, Subchapter A, Subpart C: §15.231 ISED Regulations: RSS-210, Issue 11 RSS-Gen, Issue 5 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 Conducted measurements

D001_01_RKE1_chMid_20dB



01:40:10 PM 04/16/2024

D001_02_RKE1_chMid_99%



01:41:00 PM 04/16/2024

D002_01_RKE2_chMid_20dB



01:45:40 PM 04/16/2024

D002_02_RKE2_chMid_99%



1.2 Radiated measurements

Diagram 2.01a

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 V10.60.20
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, PSt
Operating Mode:	RKE Ch Mid Ant 1
Comment 1:	EUT Laying
Environmental Conditions:	Humidity: 44% rH; Temperature: 20.2 °C
EUT Setup:	1
Verdict:	Passed

EUT Information

Sample:	23-1-00148S178_C01
Power Supply:	12 V DC

Full Spectrum

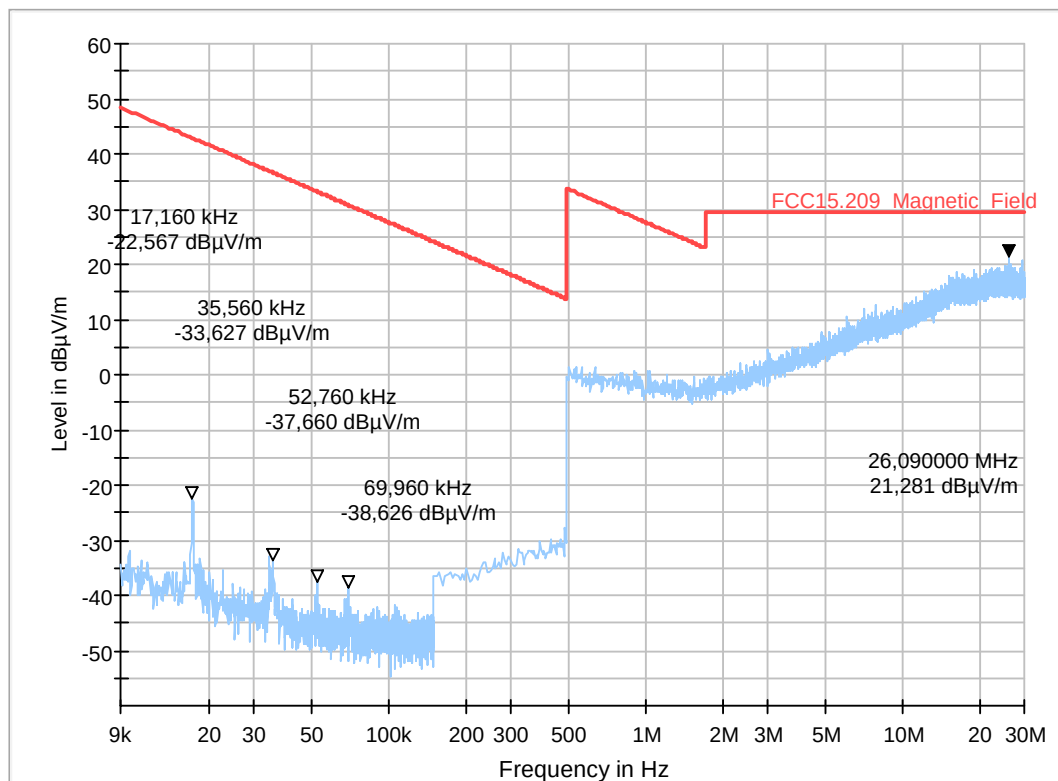


Diagram 2.02a

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 V10.60.20
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, PST
Operating Mode:	RKE Ch Mid Ant 2
Comment 1:	EUT Laying
Environmental Conditions:	Humidity: 44% rH; Temperature: 20.2 °C
EUT Setup:	1
Verdict:	Passed

EUT Information

Sample:	23-1-00148S178_C01
Power Supply:	12 V DC

Full Spectrum

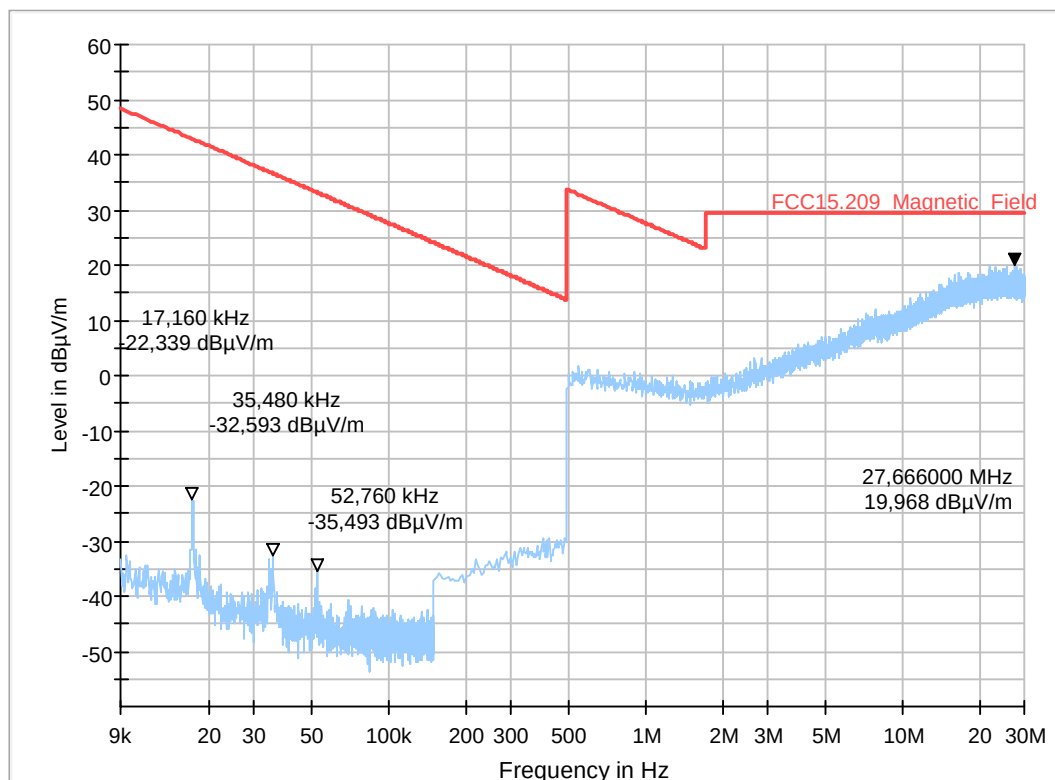


Diagram 3.01

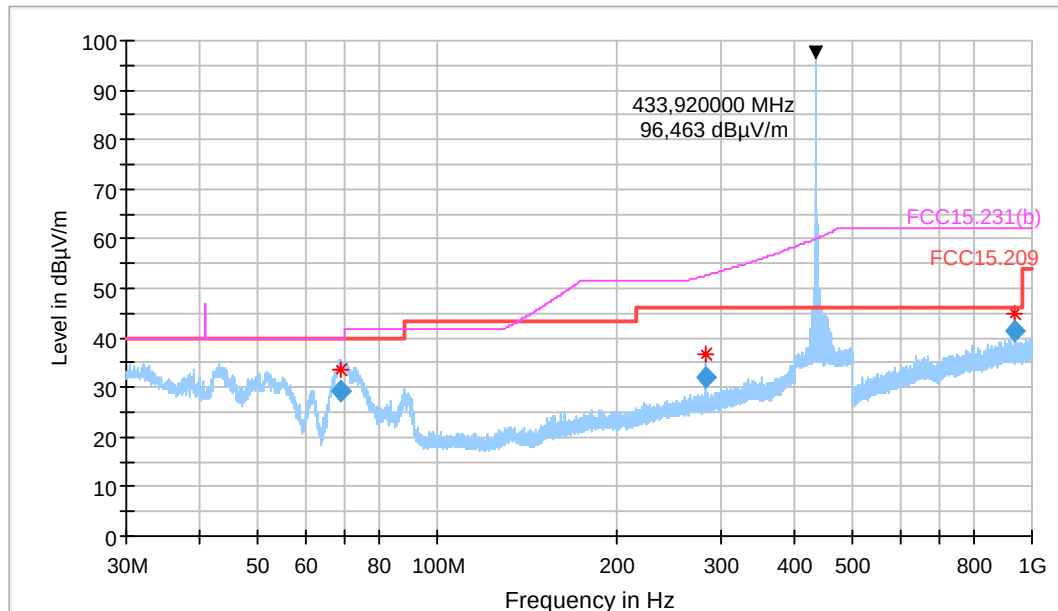
Common Information

Test Description: Radiated field strength emission in 3m distance
Test Site: cetecom advanced GmbH
Test Standard: FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation: horizontal/vertical

Environmental Conditions: Humidity: 41 %rH; Temperature: 21 °C
Operator Name: TFra
Operating Mode: RKE ANT1 chMid
Verdict: Passed

EUT Information

Sample: 23-1-00148S178_C01
Power Supply: 12 V DC



Remark: due to testmode EUT was transmitting in a continuous mode and is measured with a peak detector, therefore a duty-cycle factor is applied reducing the peak value by 17.32 dB. See section 1.4 for more information.

$$96.463 \text{ dB}\mu\text{V/m (PK)} - 17.32 \text{ dB} = 79.143 \text{ dB}\mu\text{V/m}$$

Carrier limit at 433.92 MHz:

Linear interpolation $10996.667 \mu\text{V/m}$
Microvolt to dB- Microvolt $20 * \log(10996.667 \mu\text{V/m}) = 80.83 \text{ dB}\mu\text{V/m}$
 $80.83 \text{ dB}\mu\text{V/m} > 79.143 \text{ dB}\mu\text{V/m} = \text{PASSED}$

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Trd Corr. (dB/m)
68.902000	29.19	40.00	10.81	120.000	184.0	V	182.0	5.6
282.846000	31.87	46.00	14.13	120.000	130.0	H	299.0	12.8
934.834000	41.57	46.00	4.43	120.000	368.0	H	317.0	23.7

Diagram 3.02

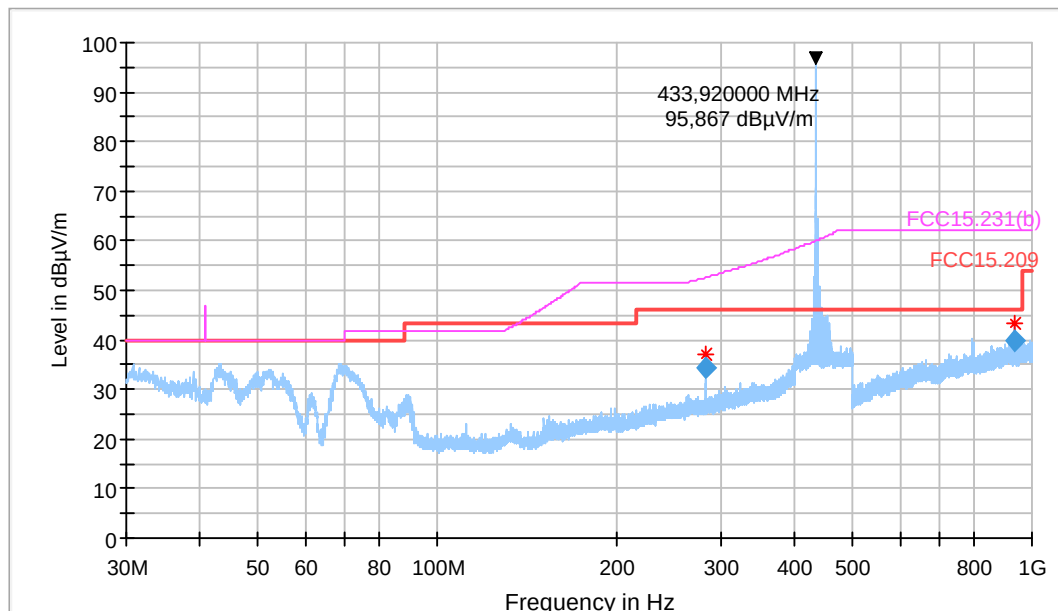
Common Information

Test Description: Radiated field strength emission in 3m distance
Test Site: cetecom advanced GmbH
Test Standard: FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation: horizontal/vertical

Environmental Conditions: Humidity: 41 %rH; Temperature: 21 °C
Operator Name: TFra
Operating Mode: RKE ANT2 chMid
Verdict: Passed

EUT Information

Sample: 23-1-00148S178_C01
Power Supply: 12 V DC



Remark: due to testmode EUT was transmitting in a continuous mode and is measured with a peak detector, therefore a duty-cycle factor is applied reducing the peak value by 17.41 dB. See section 1.4 and Chapter 1.4 of Annex 201 for more information.

$$95.867 \text{ dB}\mu\text{V/m(PK)} - 17.2 \text{ dB} = 78.66 \text{ dB}\mu\text{V/m}$$

Carrier limit at 433.92 MHz:

Linear interpolation $10996.667 \mu\text{V/m}$
Microvolt to dB-microvolt $20 * \log(10996.667 \mu\text{V/m}) = 80.83 \text{ dB}\mu\text{V/m}$
 $80.83 \text{ dB}\mu\text{V/m} > 78.66 \text{ dB}\mu\text{V/m} = \text{PASSED}$

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Trd Corr. (dB/m)
282.554000	34.34	46.00	11.66	120.000	137.0	H	306.0	12.8
934.834000	39.70	46.00	6.30	120.000	265.0	H	37.0	23.7

Diagram 4.01a

RSE_Ant1_chMid_lying

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard:	FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation:	horizontal/vertical

Operating Mode:	RKE Ch Mid Ant 1
Set-up no.	2
Operator:	TFra
Comment:	lying
Environmental Conditions:	Humidity : 50%rH; Temperature: 20°C
Verdict:	Passed

EUT Information

Sample:	23-1-00148S178_C01
Power Supply:	12 V DC

Full Spectrum

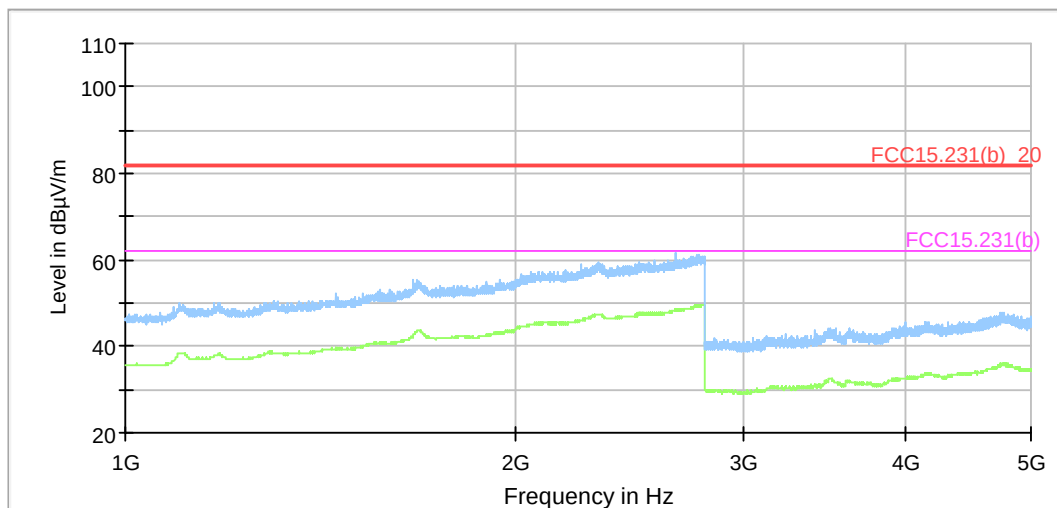


Diagram 4.02a

RSE_Ant2_chMid_lying

Common Information

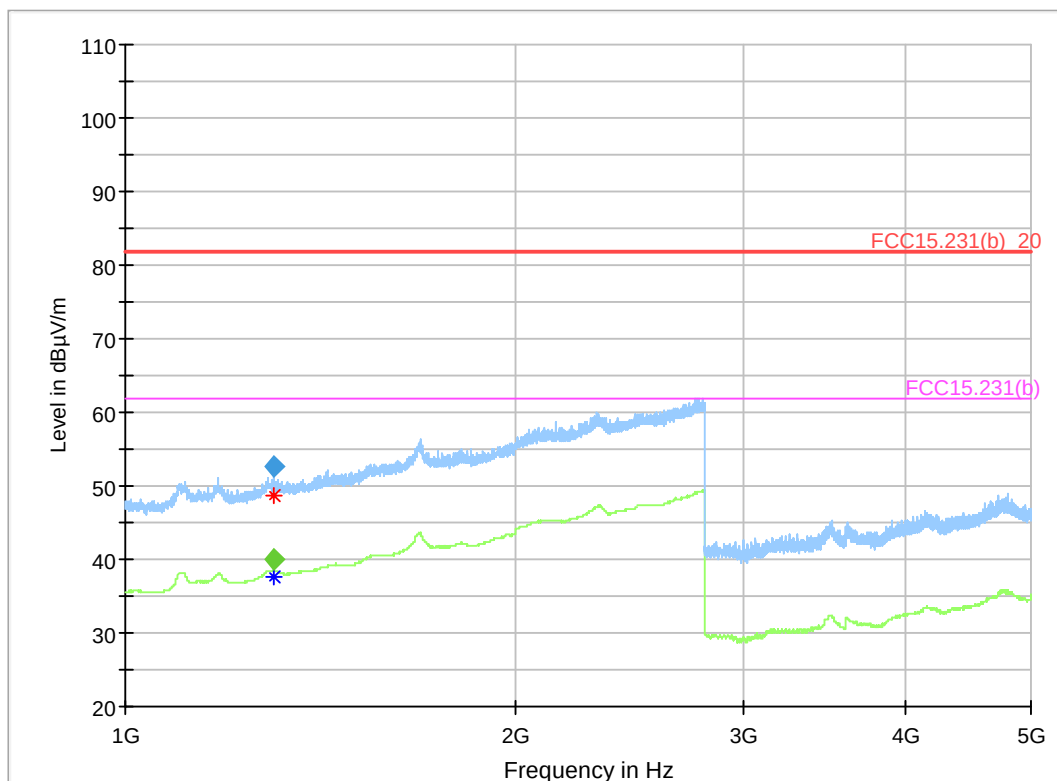
Test Description: Radiated field strength emission in 3m distance
Test Site: Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard: FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation: horizontal/vertical

Operating Mode: RKE | Ch Mid | Ant 2
Set-up no. 2
Operator: TFra
Comment: lying
Environmental Conditions: Humidity : 50%rH; Temperature: 20°C
Verdict: Passed

EUT Information

Sample: 23-1-00148S178_C01
Power Supply: 12 V DC

Full Spectrum



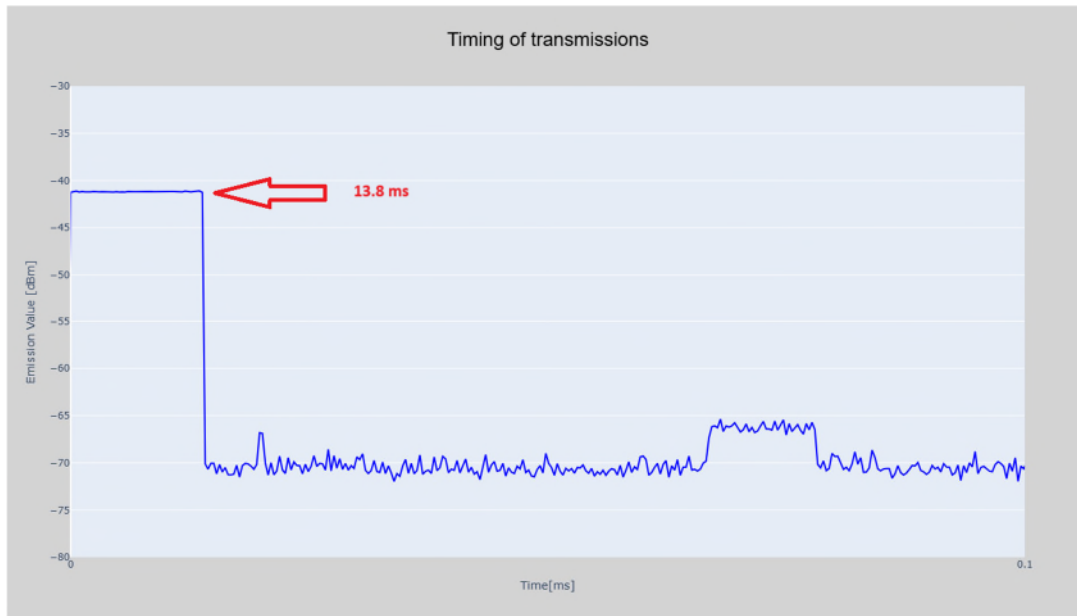
Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation
1301.650000	---	40.02	61.93	21.91	100.0	1000.000	155.0	V	7.0	0.0
1301.730000	52.61	---	81.93	29.32	100.0	1000.000	155.0	V	0.0	0.0

1.3 Timing measurements

1.3.1 Duty-cycle

TID001_Timing_Scenario1_RKE

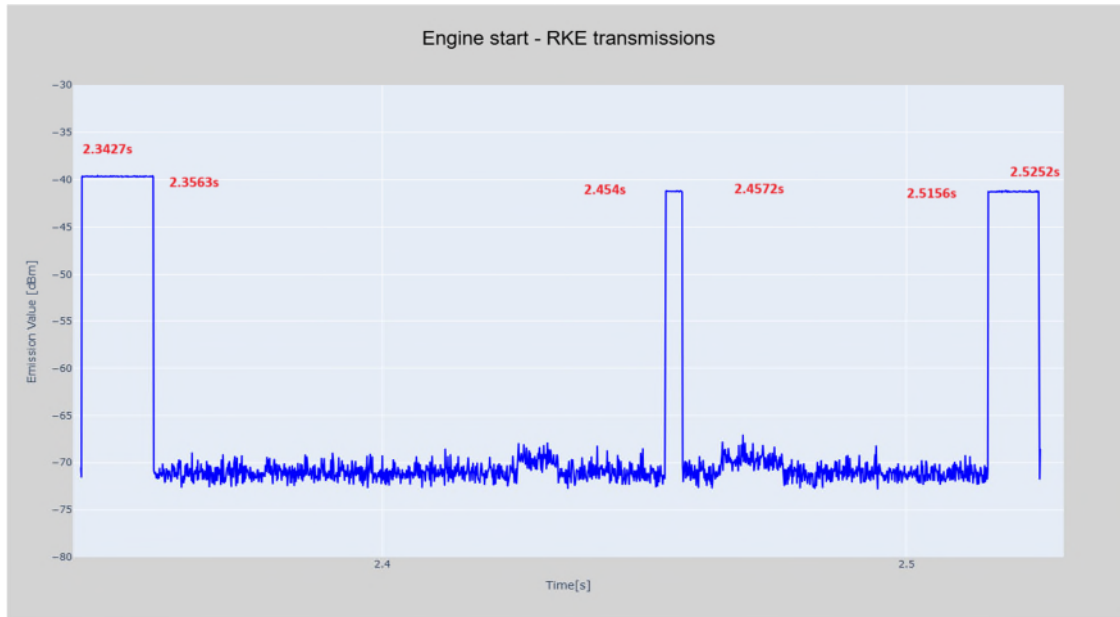


One pulse transmission length of EUT: 13.8 ms

Duty-Cycle correction factor:

$$20 \cdot \log_{10}(13.8\text{ms}/100\text{ms}) = -17.2\text{dB}$$

17.2dB reduction over 100ms period for Average over peak emissions.

TID004_Timing_Scenario2_Engine_start_RKE


1st-Pulse width: 13.6ms

2nd-Pulse width: 3.2ms

3rd -Pulse width: 9.6ms

Distance Pulse1 to Pulse2 = $2.454s - 2.3427s = 111.ms$ ($> 100ms$ Window)

Distance Pulse2 to Pulse3 = $2.5156s - 2.454s = 61.6ms$

Therefore:

2 Pulses within 100ms window:

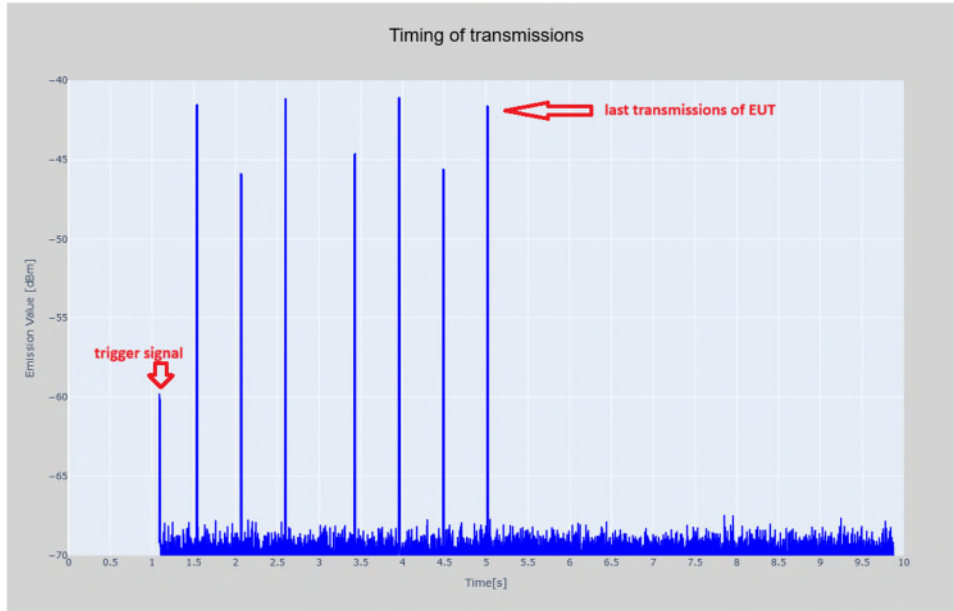
2nd Pulse width + 3rd pulse width = $3.2ms + 9.6ms = 12.8ms$

Duty-Cycle correction factor AV-Peak:

$20 * \log_{10}(12.8ms/100ms) = -17.85dB$ (not worst-case)

1.3.2 Transmitter timing

TID005_Timing_Automatic_deactivation



Marker-1 (left) denotes receipt of trigger signal at timestamp 1.088ms., Marker-2 (right) shows last emission of EUT (RKE): difference to Marker-1: 3.92545s

Limit: 5 seconds

Verdict: Pass

1.4 Duty-cycle correction

A duty-cycle Peak to Average correction factor applies since the transmitter is not 100% on during one complete pulse train, as long the pulse train does not exceed 100 ms. When the Pulse train exceeds 100 ms the absolute voltage during a 100 ms window where the field strength is at its maximum, shall be used to determine the correction factor.

PEAK to AVERAGE calculation:

Pulse train exceeds 100 ms time periode, therefore cumulative TX_{on}-Time within a 100 ms time periode used.

Only one pulse can be observed during a 100 ms time period.

TX_{on}(100ms) = 13.8ms

Scenario1: TX-Transmissions (Diagram TID001)

$$\delta[dB] = 20 * \log_{10} \left(\frac{13.8ms}{100ms} \right) = -17.2dB$$

Scenario2: TX-Transmissions (Diagram TID004)

$$\delta[dB] = 20 * \log_{10} \left(\frac{12.8ms}{100ms} \right) = -17.85dB$$

Verdict: -17.2dB correction factor can be applied to peak data of TX-transmissions and correlated carrier harmonics.

End Of Annex 201