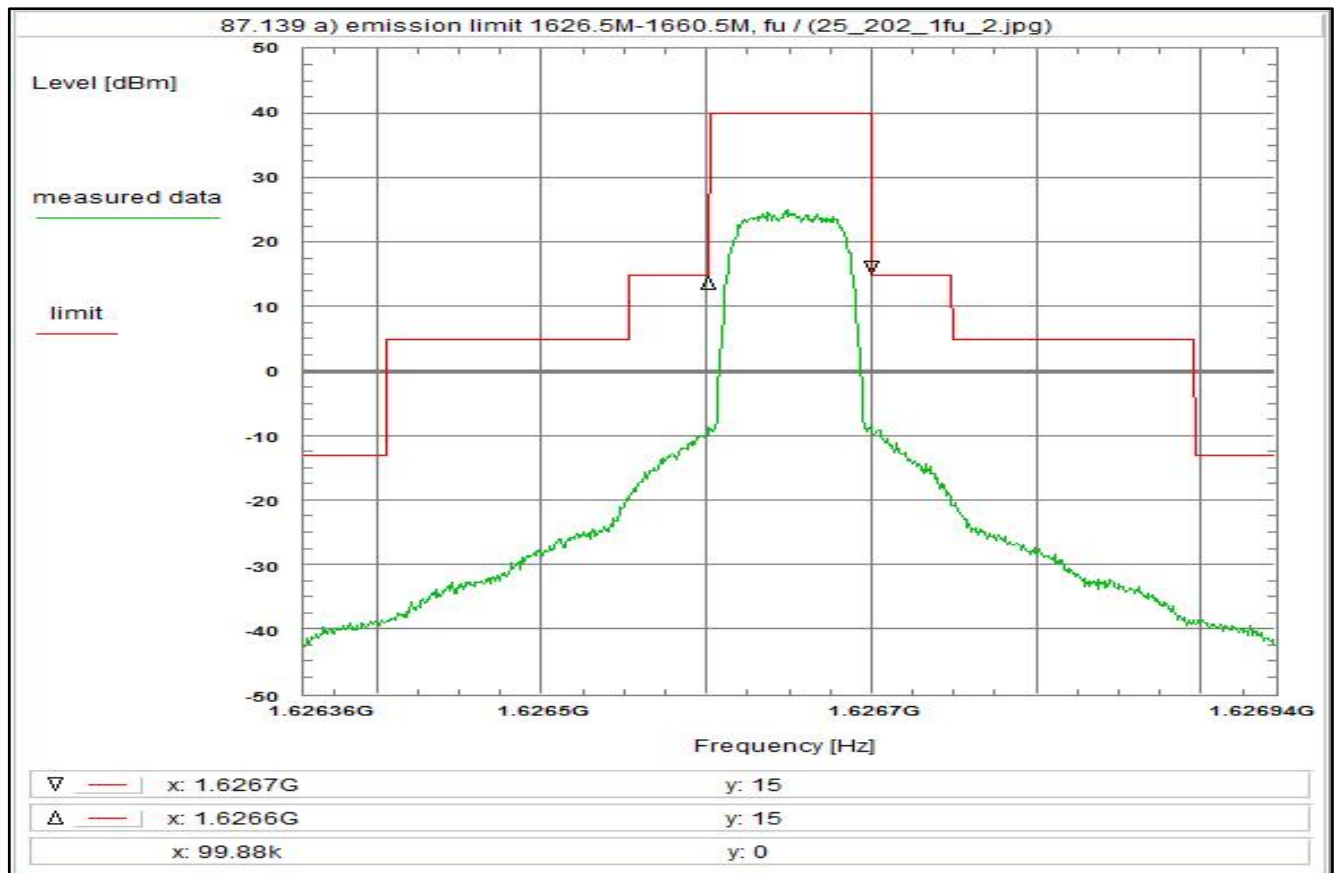


Plot No. 178



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43+10\log(P_{max})\text{dBc/4kHz} = -43\text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fl, max hold, valid for R5T2XD-R20T2XD-R5T2QD-R20T2QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 13:57:37

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.626356 GHz

Stop frequency: 1.626944 GHz

Center frequency: 1.62665 GHz

Frequency span: 588 kHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 10 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

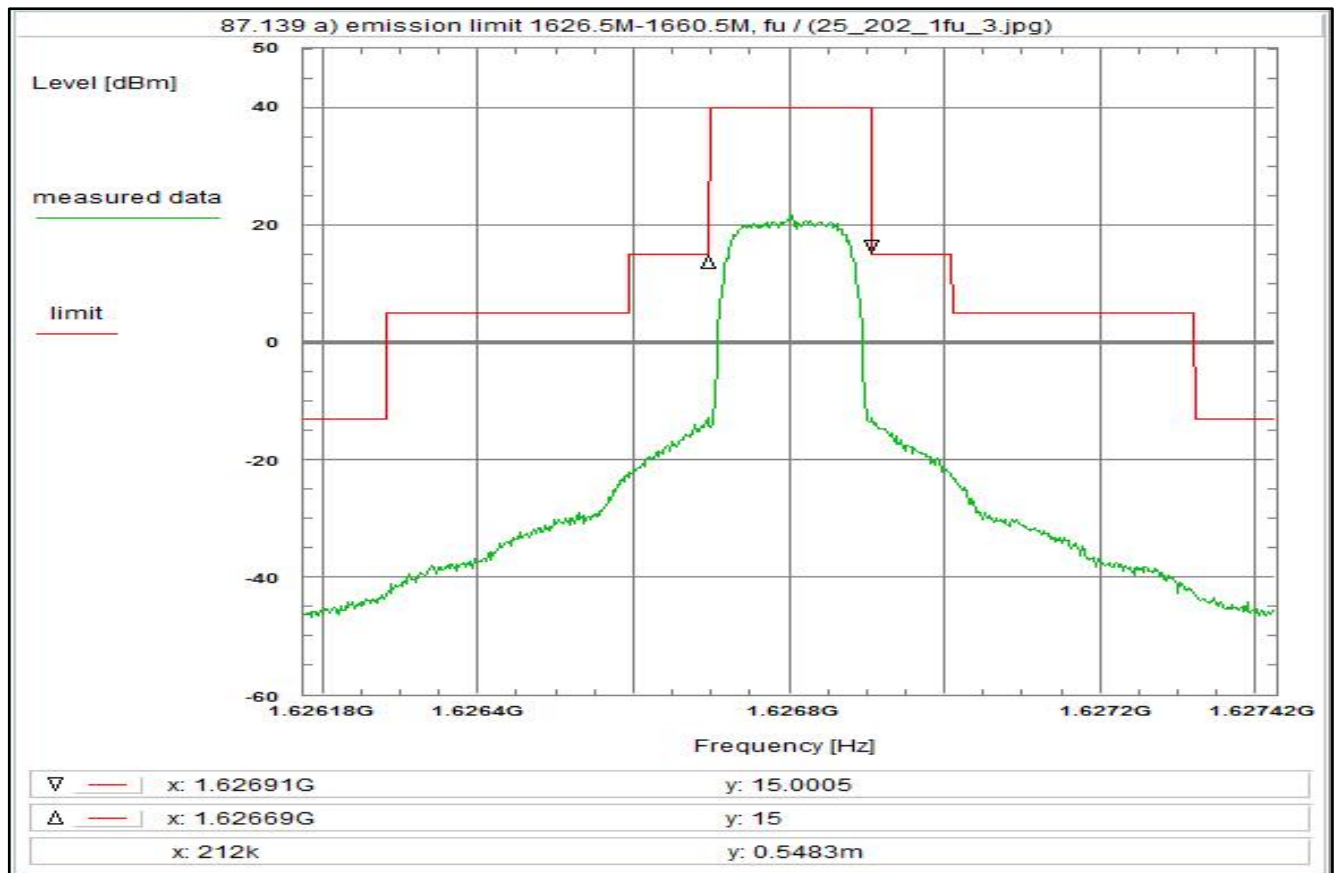
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 179



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fl, max hold, valid for R5T4.5XD-R20T4.5XD-R5T4.5QD-R20T4.5QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:02:17

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.626176 GHz

Stop frequency: 1.627424 GHz

Center frequency: 1.6268 GHz

Frequency span: 1.248 MHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 10 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

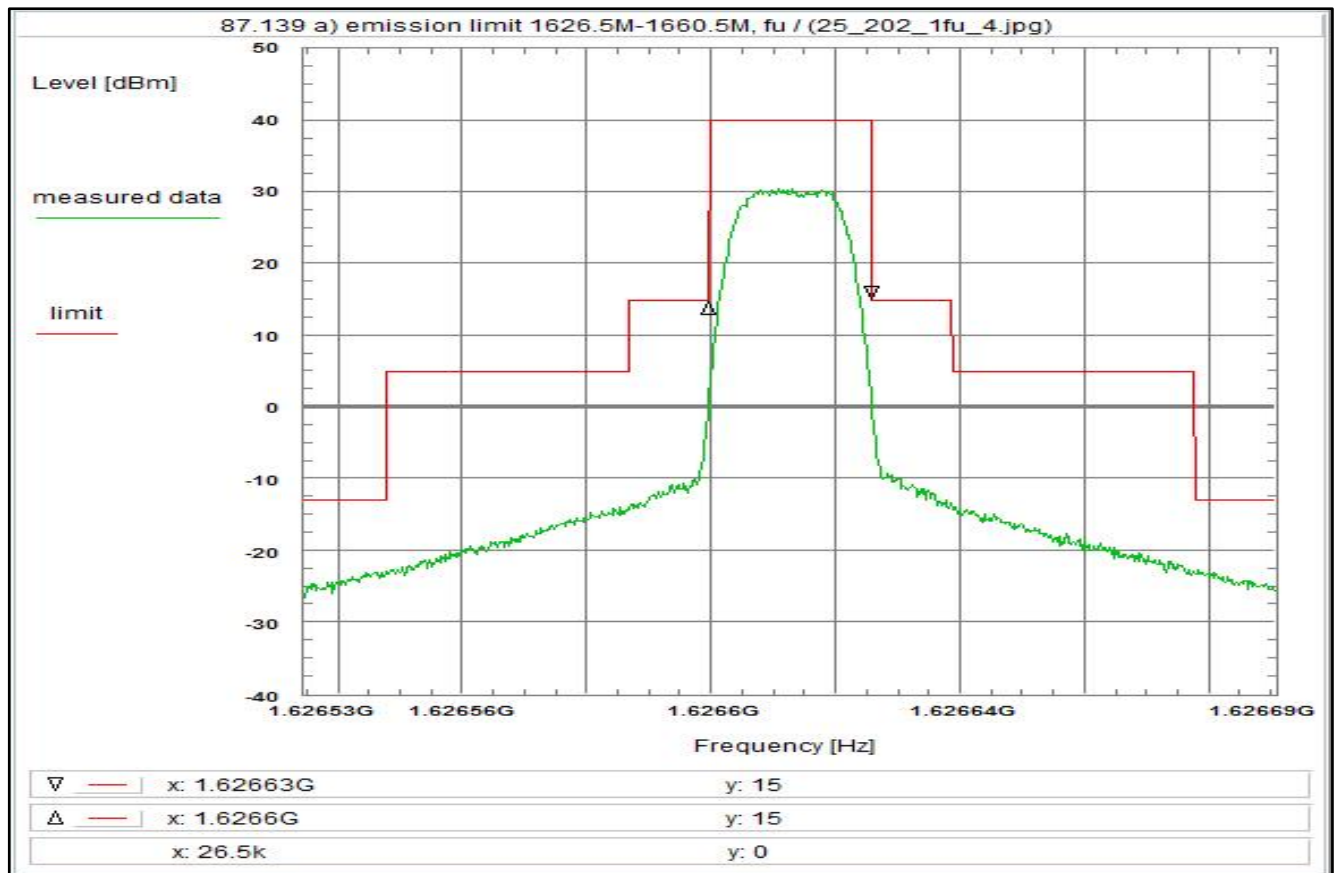
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 180



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fl, max hold, valid for R20T0.5XD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:05:01
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6265345 GHz
Stop frequency: 1.6266905 GHz
Center frequency: 1.6266125 GHz
Frequency span: 156 kHz
Resolution-BW: 3 kHz
Video-BW: 10 kHz
Input attenuation: 10 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

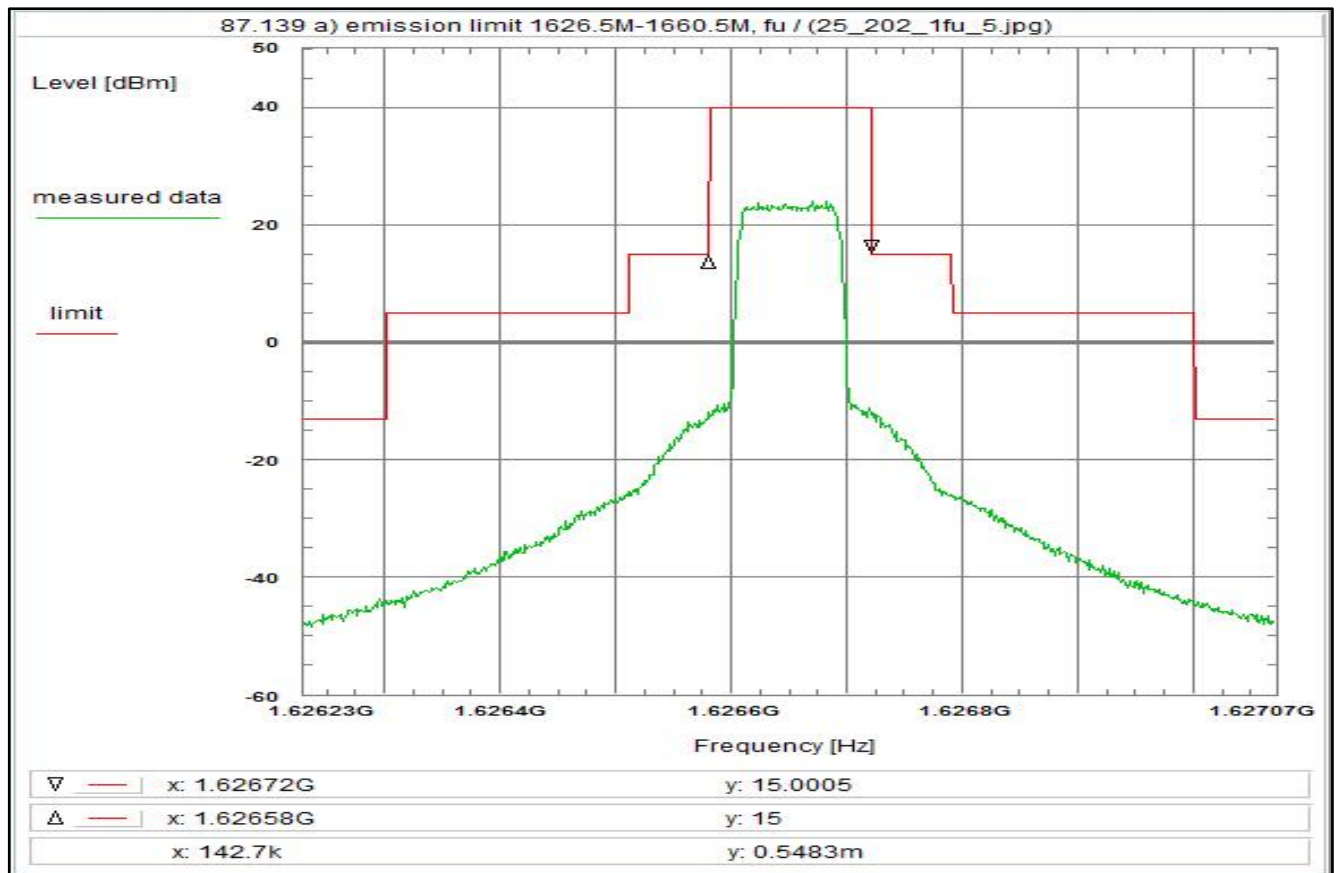
(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 181



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fl, max hold, valid for FR80T2.5X16-FR80T2.5X32-FR80T2.5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:29:00

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.62623 GHz

Stop frequency: 1.62707 GHz

Center frequency: 1.62665 GHz

Frequency span: 840 kHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 0 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

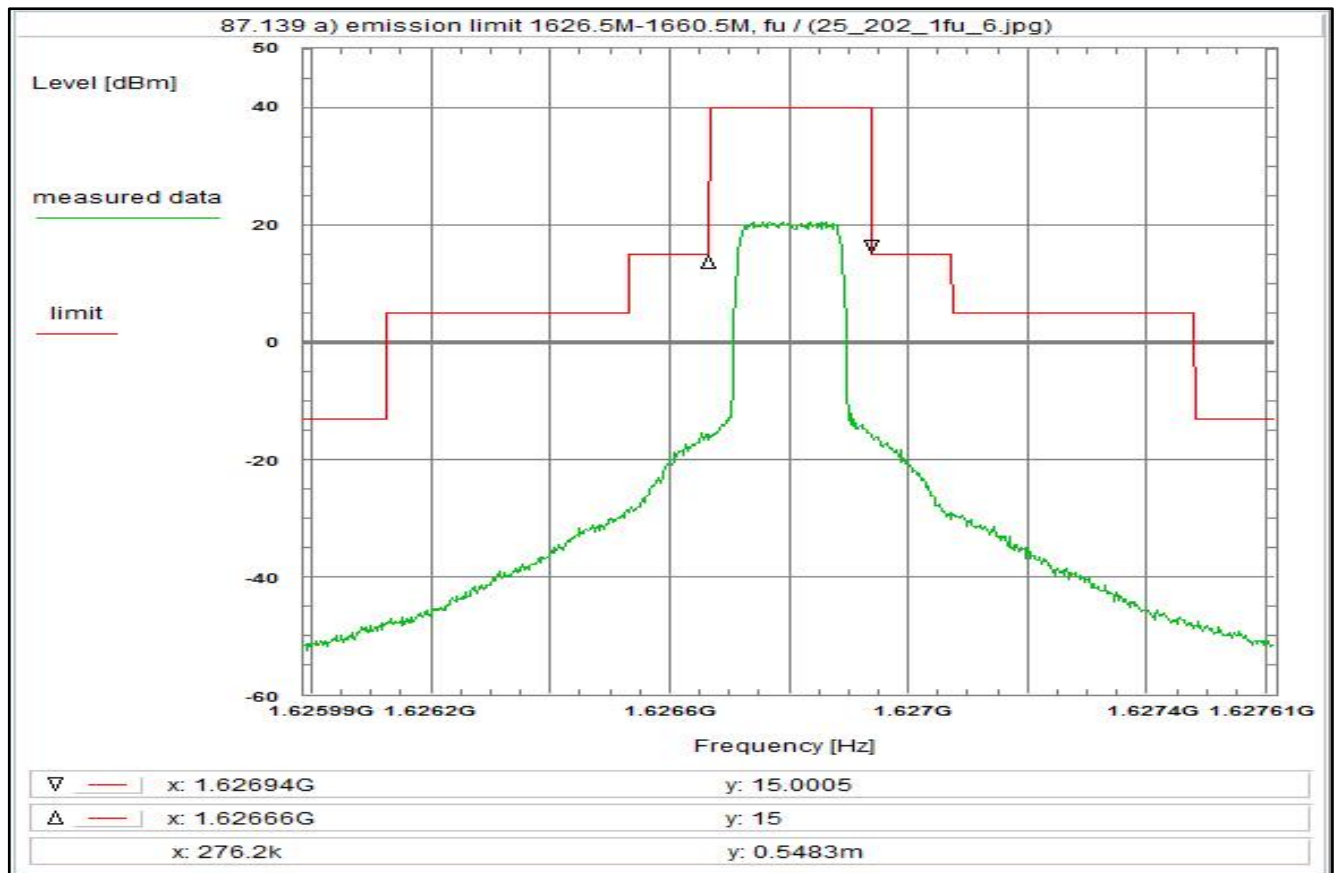
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 182



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fl, max hold, valid for FR80T5X16-FR80T5X32-FR80T5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:33:05

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.625987 GHz

Stop frequency: 1.627613 GHz

Center frequency: 1.6268 GHz

Frequency span: 1.626 MHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 10 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dB

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

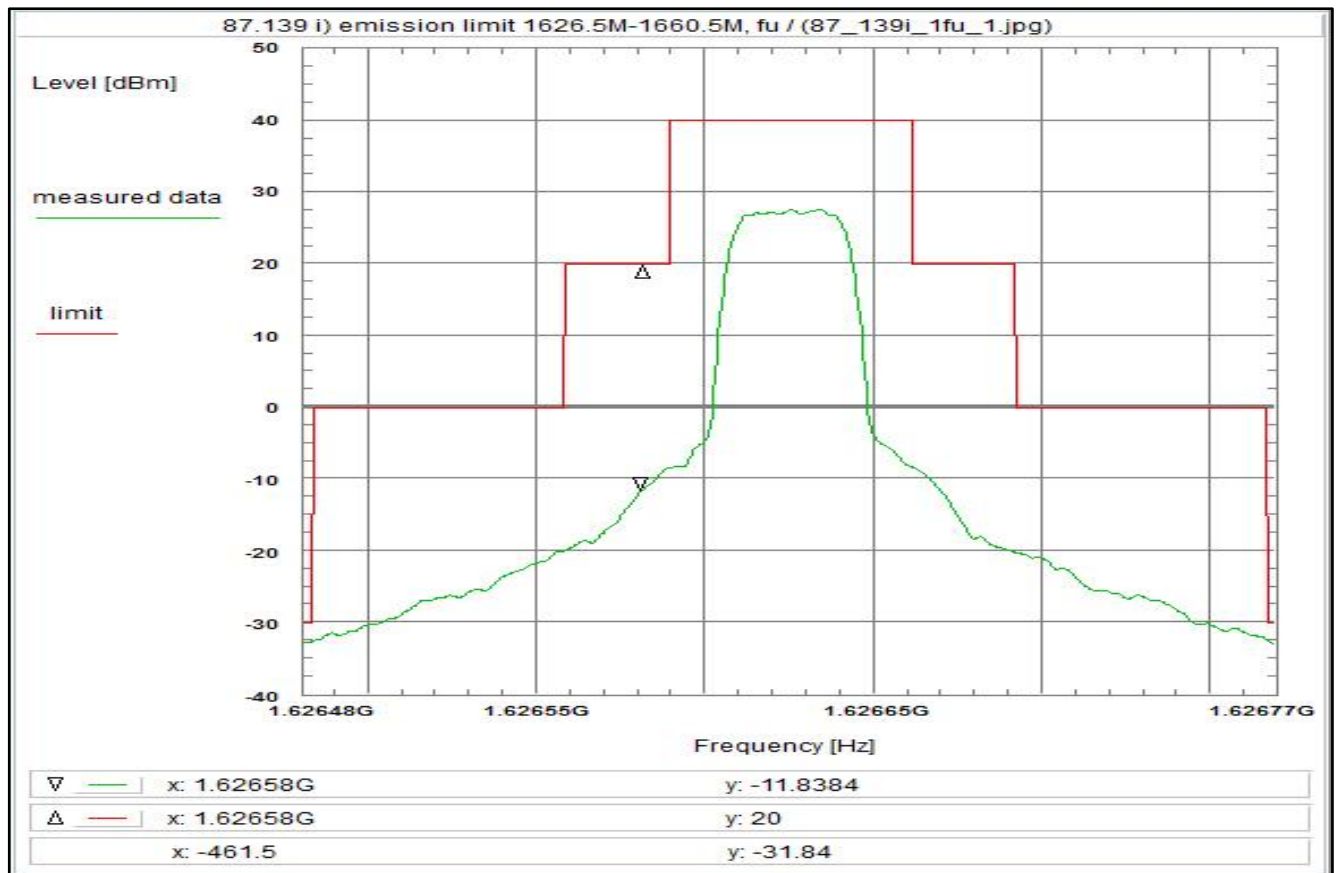
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 183



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for R5T1XD-R20T1XD-R20T1QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 13:55:55
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.626481 GHz
Stop frequency: 1.626769 GHz
Center frequency: 1.626625 GHz
Frequency span: 288 kHz
Resolution-BW: 3 kHz
Video-BW: 10 Hz
Input attenuation: 10 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

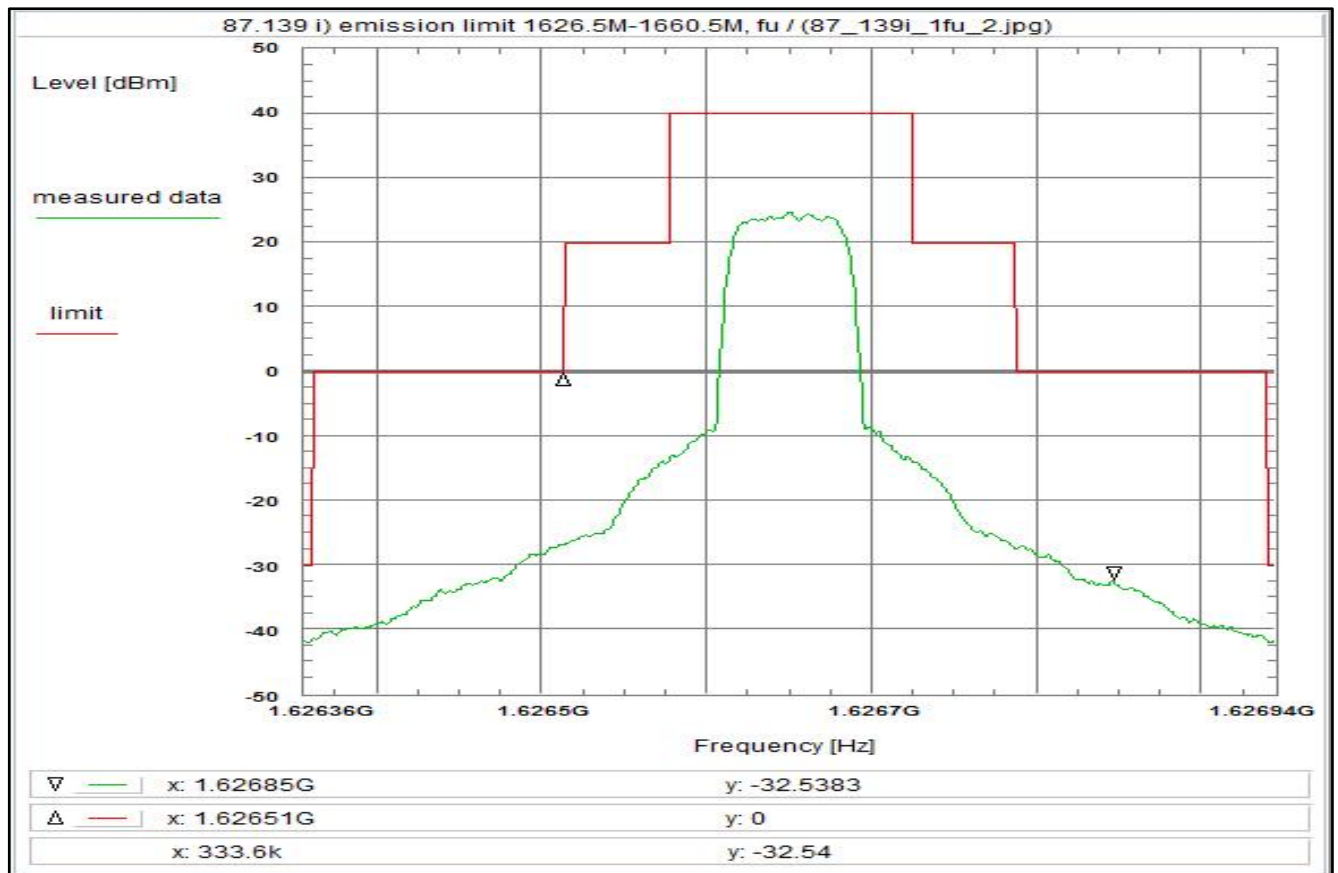
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 184



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for R5T2XD-R20T2XD-R5T2QD-R20T2QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 13:58:55
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.626356 GHz
Stop frequency: 1.626944 GHz
Center frequency: 1.62665 GHz
Frequency span: 588 kHz
Resolution-BW: 3 kHz
Video-BW: 10 Hz
Input attenuation: 10 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

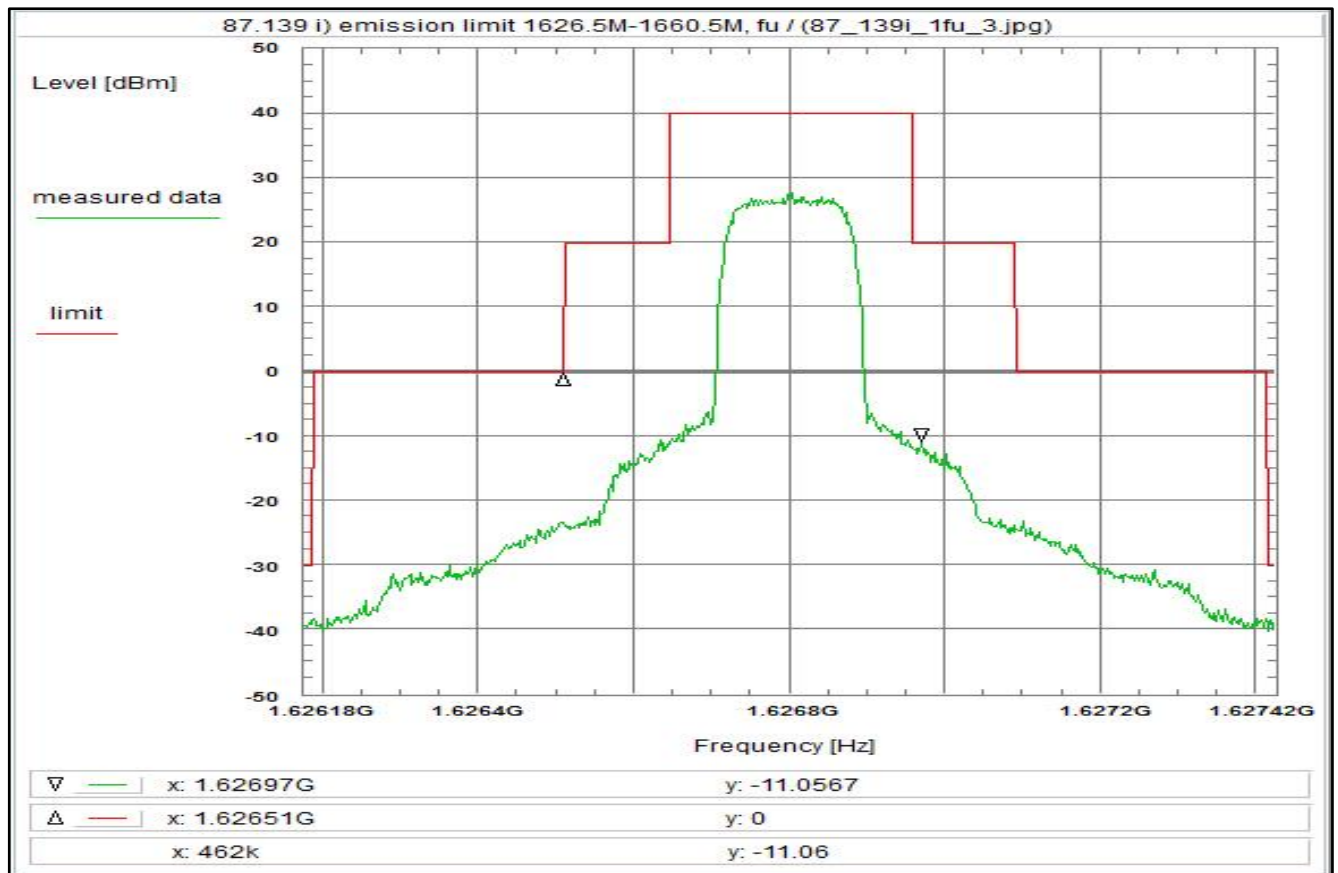
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 185



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for R5T4.5XD-R20T4.5XD-R5T4.5QD-R20T4.5QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:01:07
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.626176 GHz
Stop frequency: 1.627424 GHz
Center frequency: 1.6268 GHz
Frequency span: 1.248 MHz
Resolution-BW: 3 kHz
Video-BW: 1 kHz
Input attenuation: 10 dB
Trace-Mode: Max-Hold
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

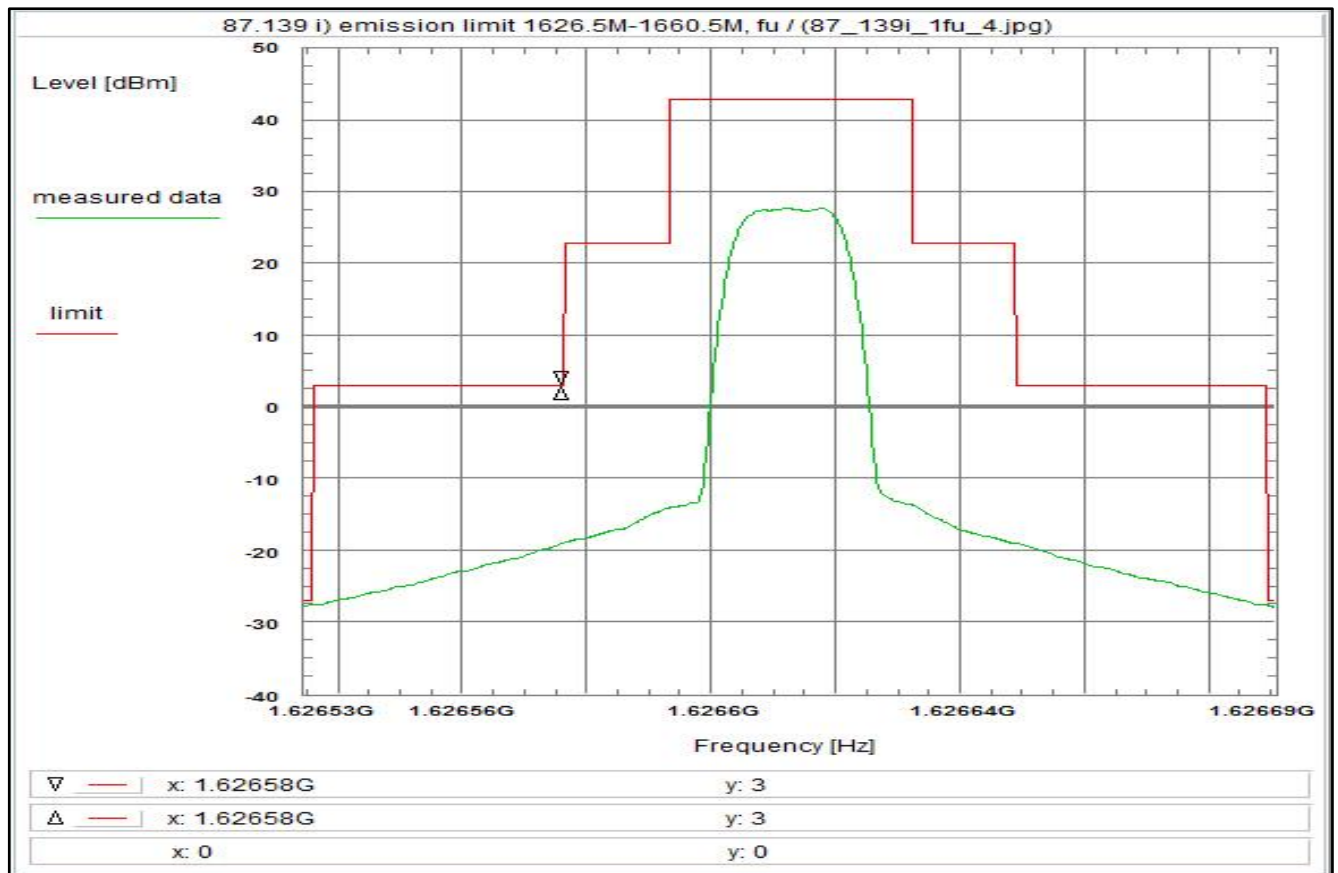
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 186



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for R20T0.5XD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: R001

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:23:29
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6265345 GHz
Stop frequency: 1.6266905 GHz
Center frequency: 1.6266125 GHz
Frequency span: 156 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: Neg Peak

Correction:

(W_RE) - 4.5 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 40.9 dB

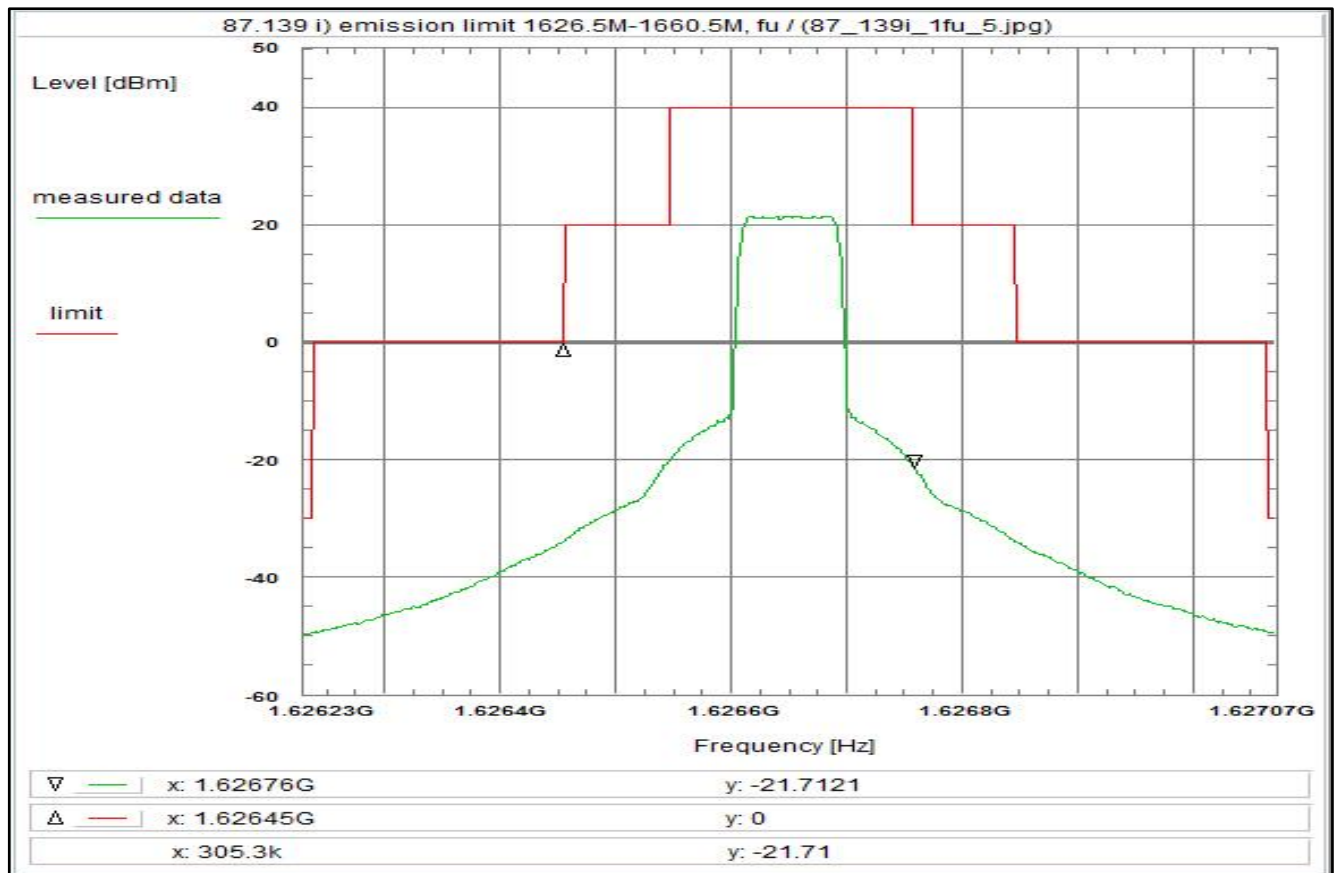
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 187



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for FR80T2.5X16-FR80T2.5X32-FR80T2.5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:27:37
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.62623 GHz
Stop frequency: 1.62707 GHz
Center frequency: 1.62665 GHz
Frequency span: 840 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: Neg Peak

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

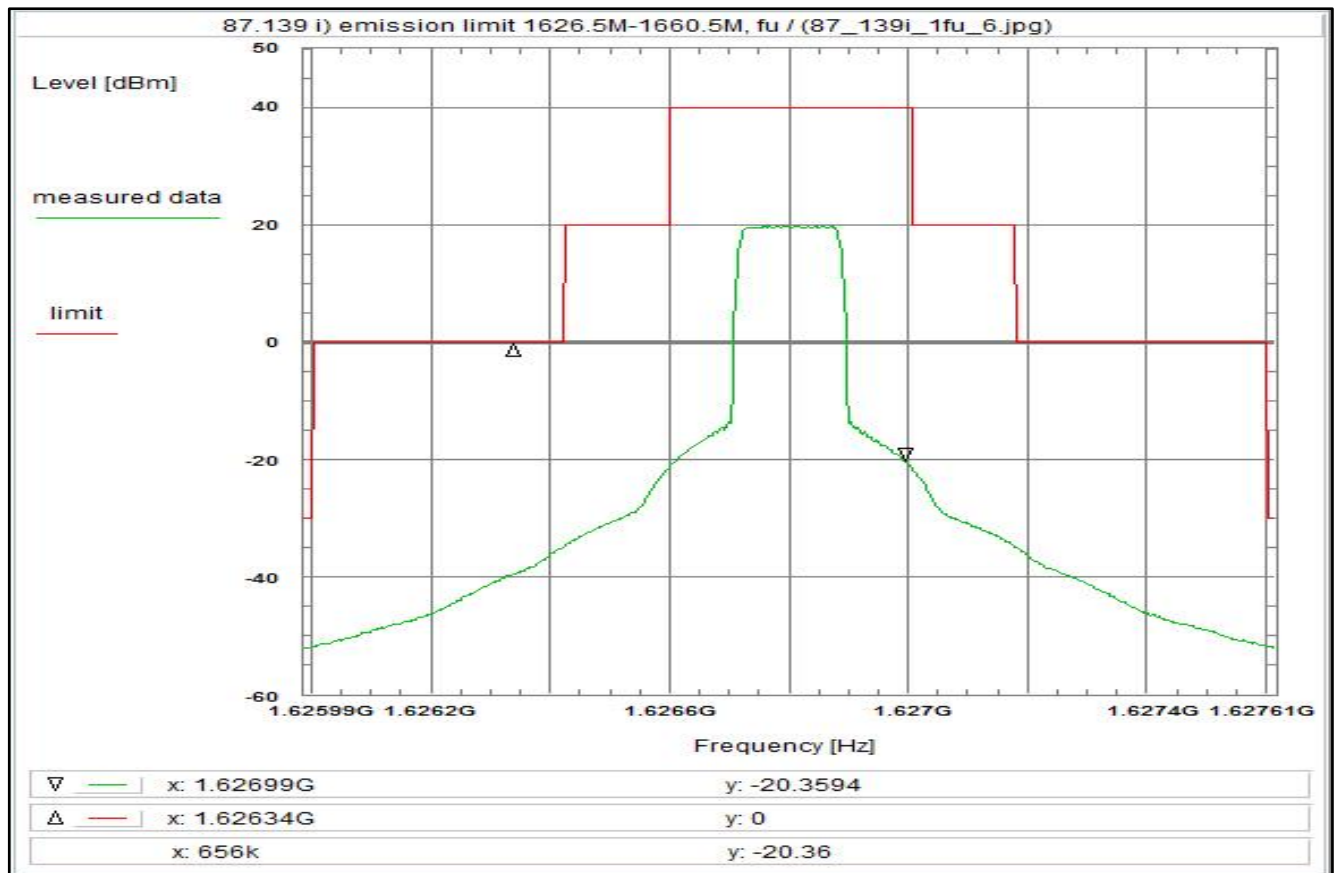
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 188



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for FR80T5X16-FR80T5X32-FR80T5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:33:58
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.625987 GHz
Stop frequency: 1.627613 GHz
Center frequency: 1.6268 GHz
Frequency span: 1.626 MHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 10 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

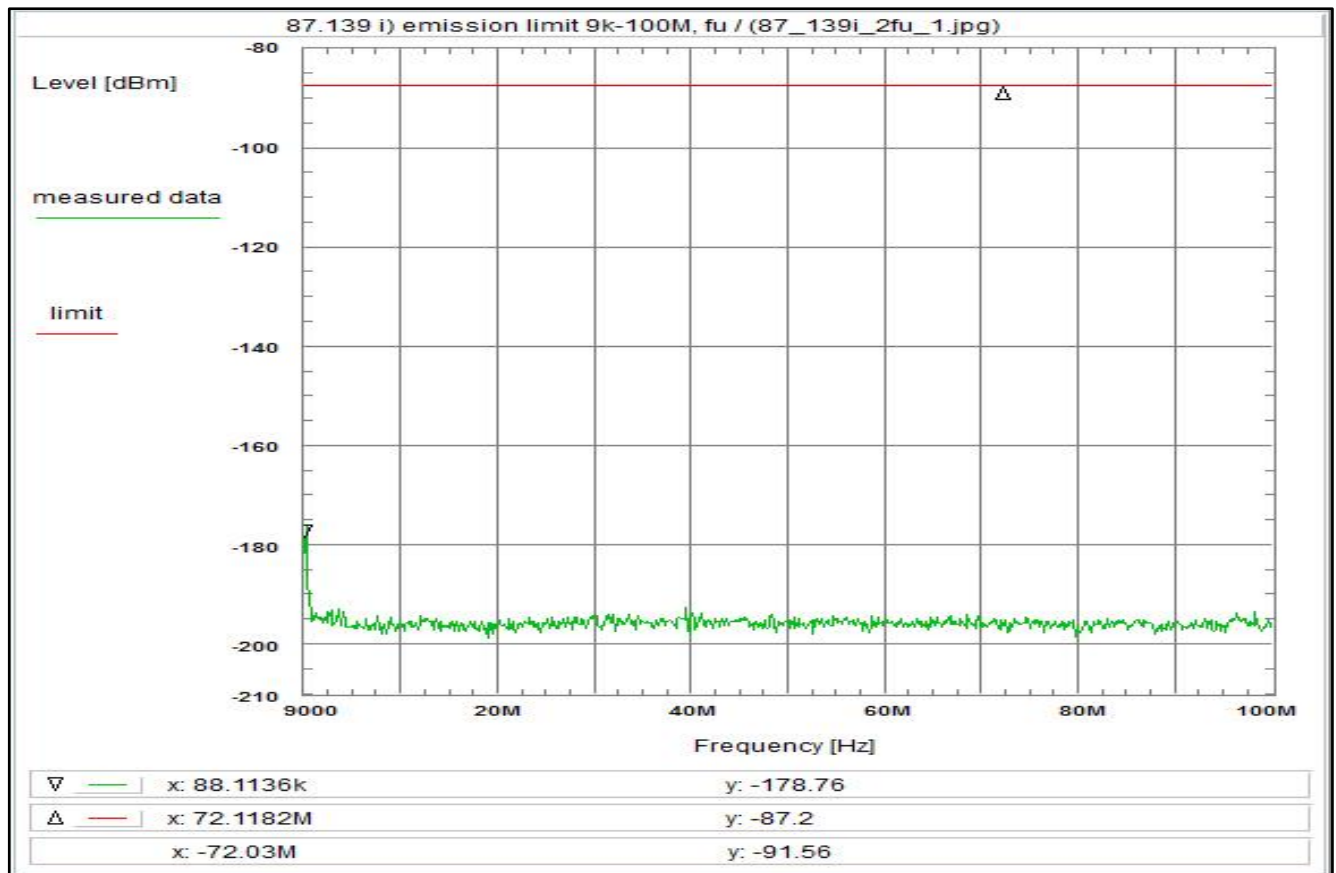
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 189



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, max hold, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:41:19
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 9 kHz
Stop frequency: 100 MHz
Center frequency: 50.0045 MHz
Frequency span: 99.991 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 120.0 dB
Coaxial cable (C107) + 0.5 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.3 dB
TOTAL CORRECTION: - 76.0 dB

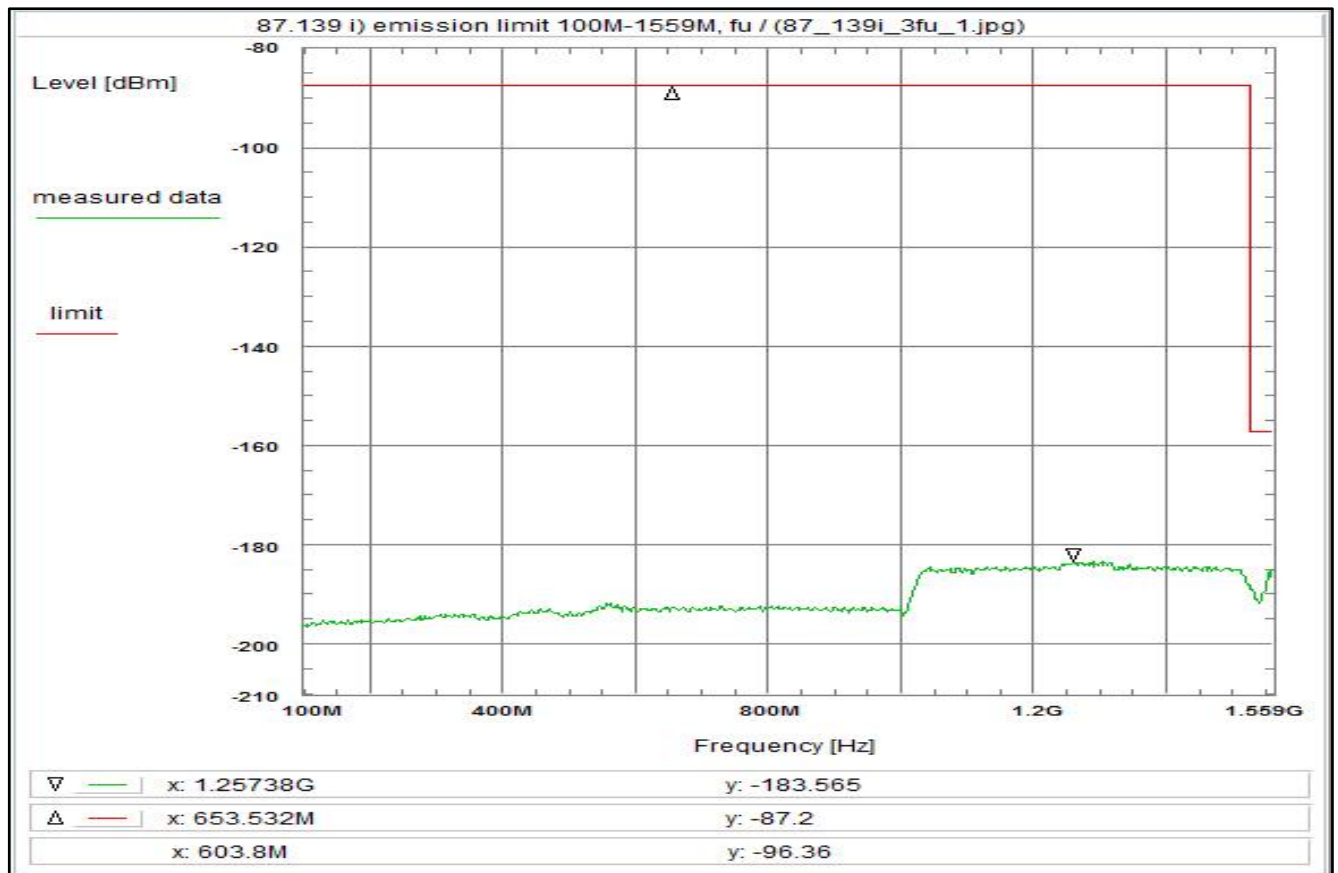
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 190



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4
fl, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Tue 26/Sep/2023 20:55:35
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 100 MHz
Stop frequency: 1.559 GHz
Center frequency: 829.5 MHz
Frequency span: 1.459 GHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 115.7 dB
Coaxial cable (C107) + 0.9 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.7 dB
TOTAL CORRECTION: - 70.9 dB

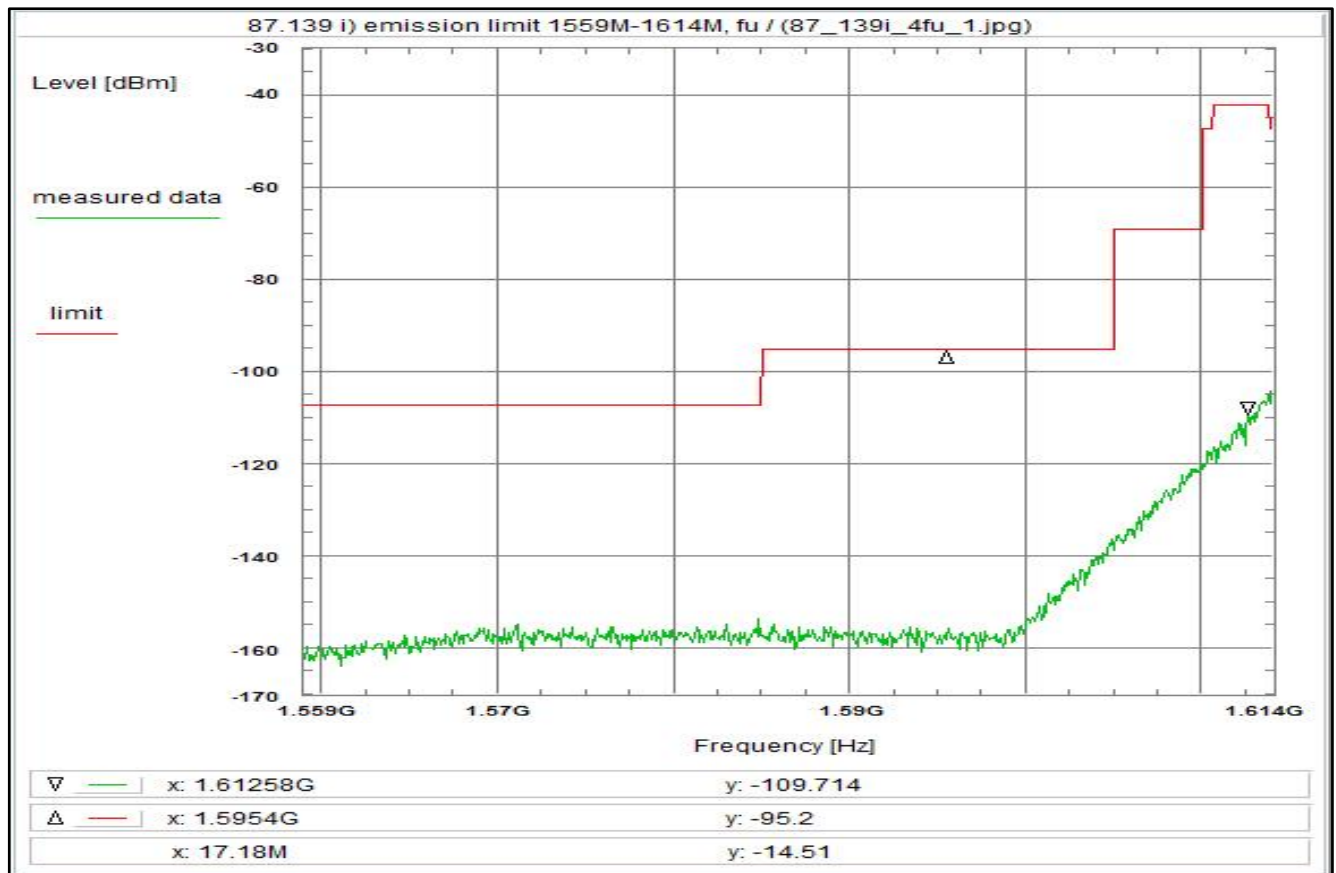
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 191



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4 fl, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Tue 26/Sep/2023 20:58:06
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.614 GHz
Center frequency: 1.5865 GHz
Frequency span: 55 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 1M) + 25.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 34.7 dB

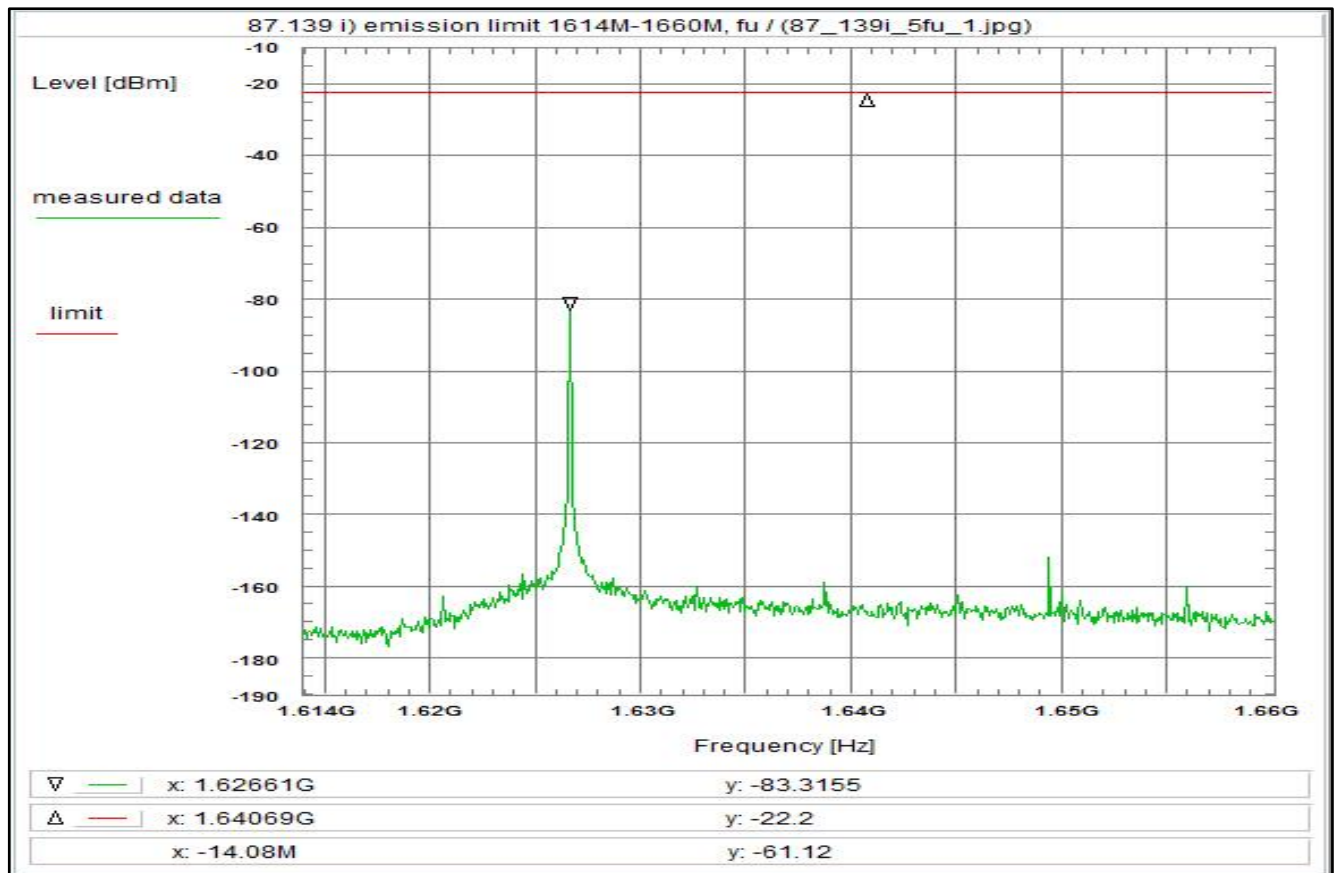
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 192



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fl, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Tue 26/Sep/2023 20:59:30
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.614 GHz
Stop frequency: 1.66 GHz
Center frequency: 1.637 GHz
Frequency span: 46 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 58.7 dB

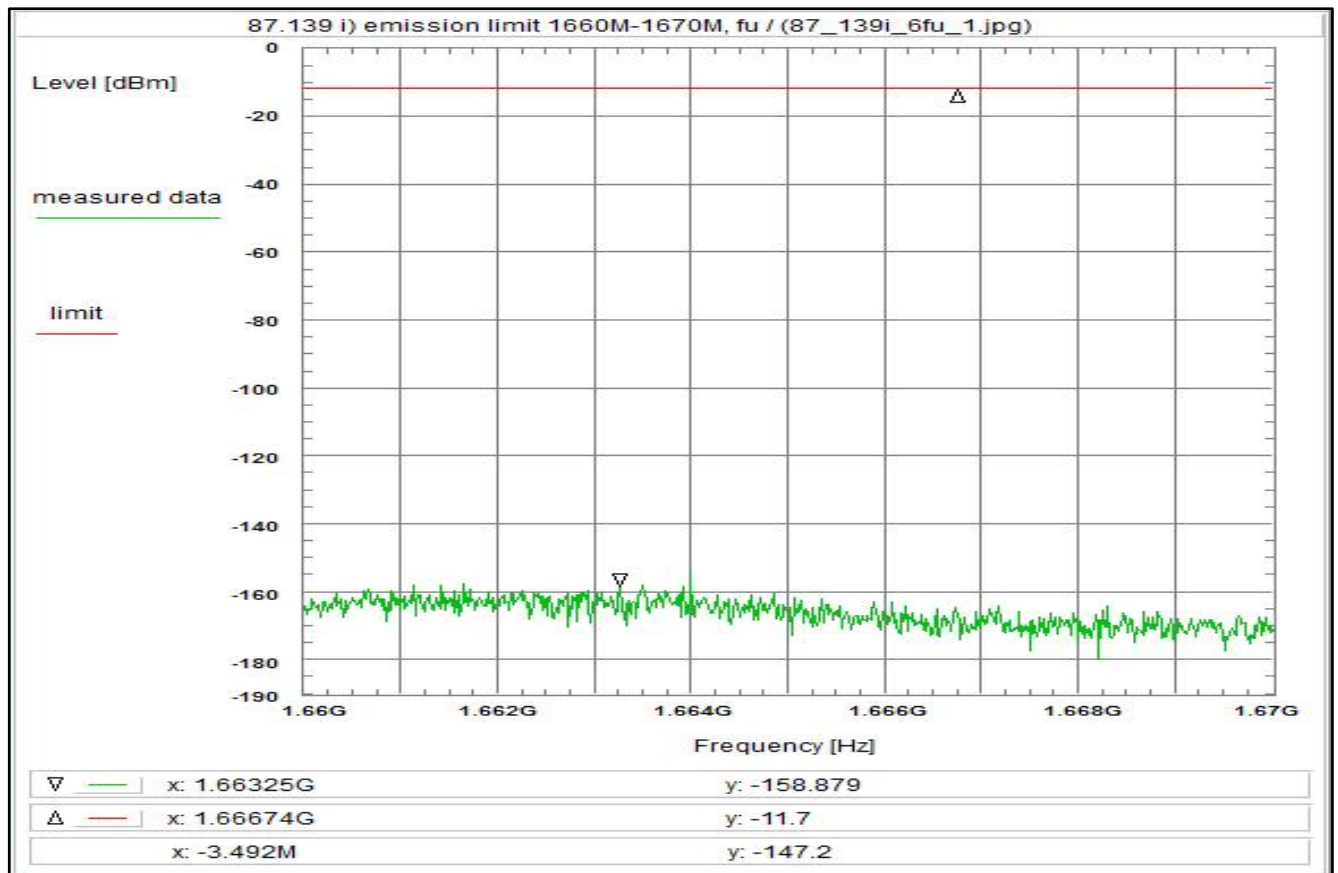
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 193



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4 fl, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Tue 26/Sep/2023 20:59:59
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66 GHz
Stop frequency: 1.67 GHz
Center frequency: 1.665 GHz
Frequency span: 10 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 1.4 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 20k) + 8.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 51.6 dB

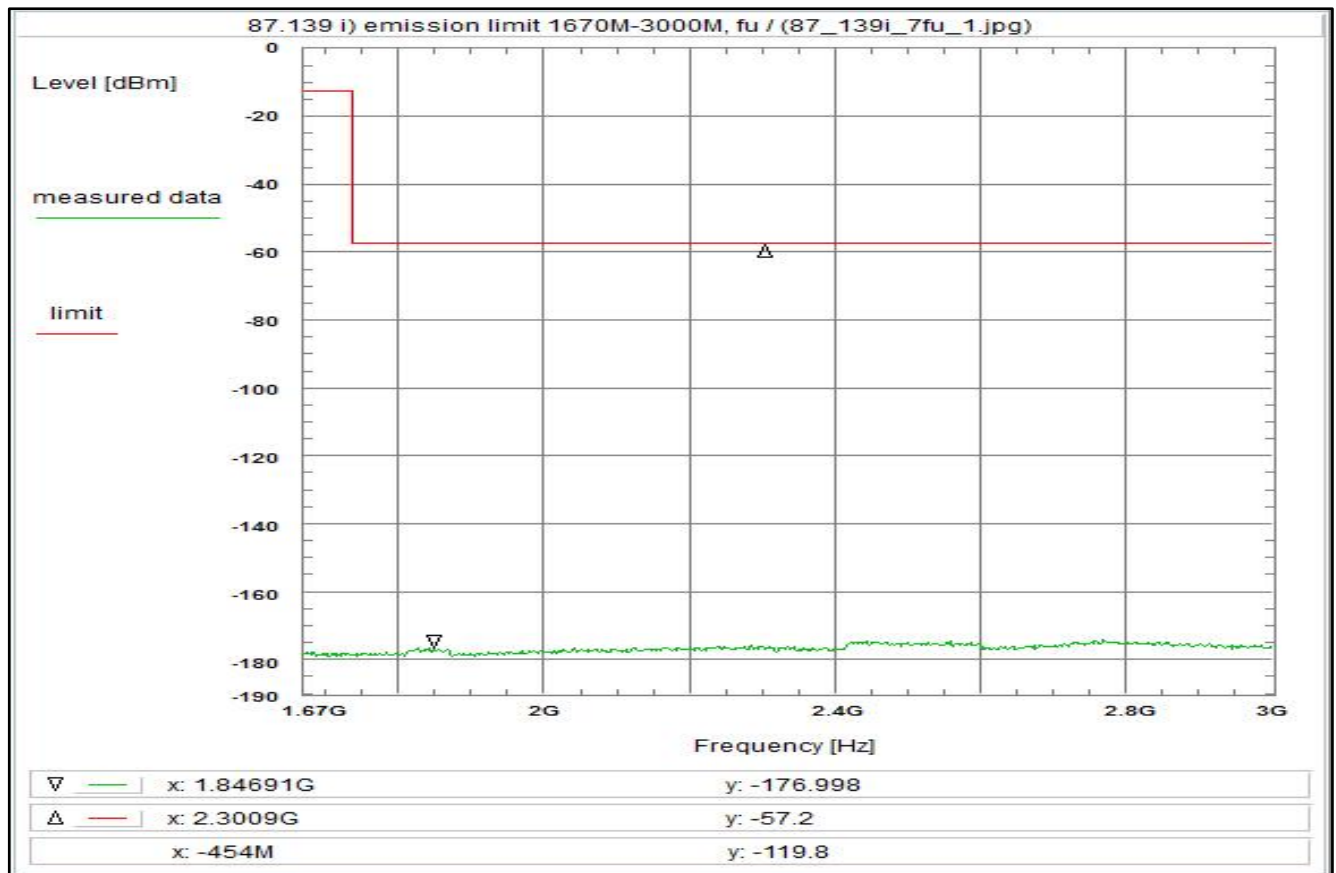
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 194



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fl, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Tue 26/Sep/2023 21:01:17
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.67 GHz
Stop frequency: 3 GHz
Center frequency: 2.335 GHz
Frequency span: 1.33 GHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

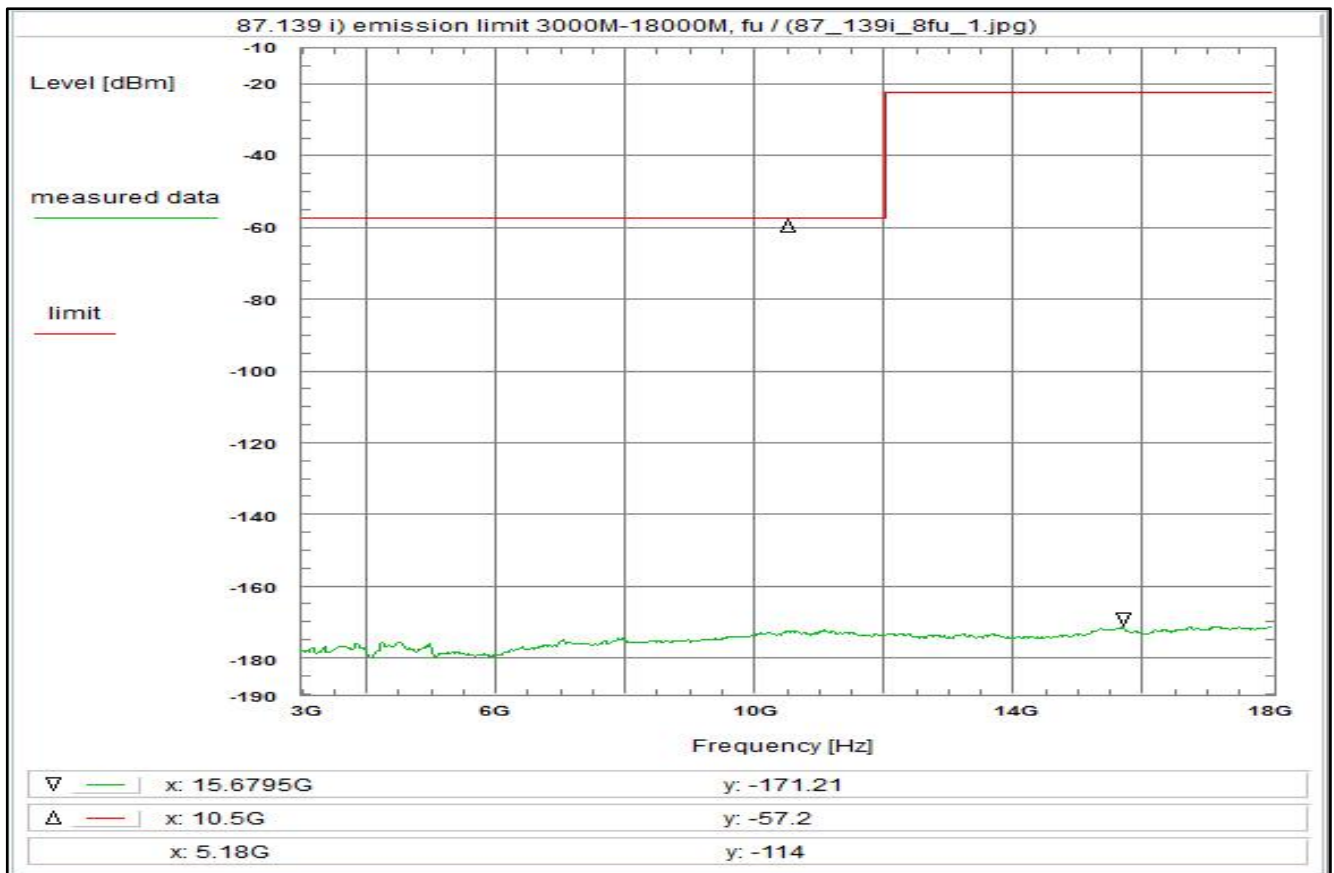
Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 1.5 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 32.0 dB
TOTAL CORRECTION: - 58.4 dB

Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)
For EIRP calculation:
'worst-case' = maximum antenna gain

Plot No. 195



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fu)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fl, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Tue 26/Sep/2023 21:00:57
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 3 GHz
Stop frequency: 18 GHz
Center frequency: 10.5 GHz
Frequency span: 15 GHz
Resolution-BW: 10 kHz
Video-BW: 100 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 3.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (10k -> 4k) - 4.0 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 33.4 dB
TOTAL CORRECTION: - 60.4 dB

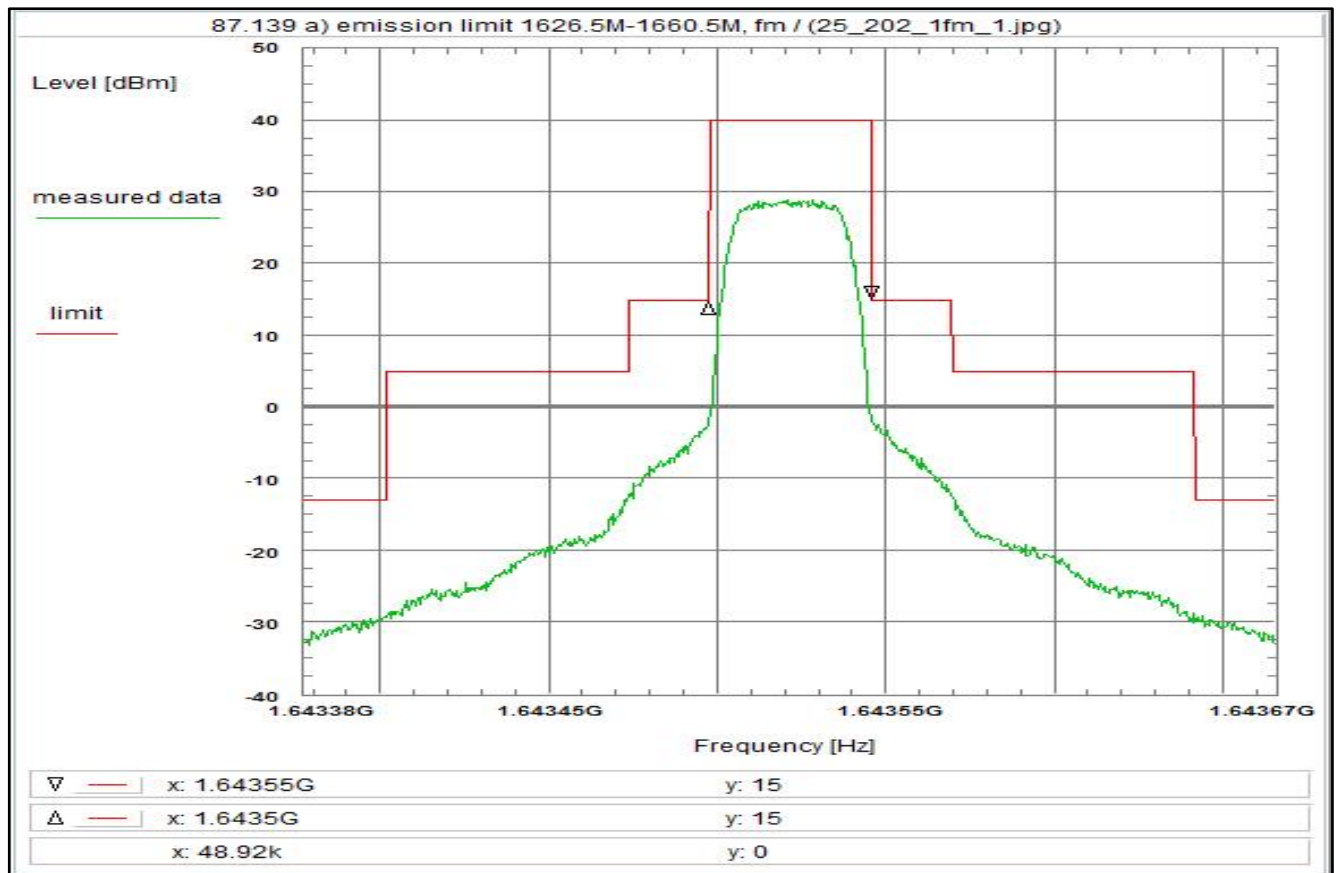
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 196



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for R5T1XD-R20T1XD-R20T1QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:53:02
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.64337725 GHz
Stop frequency: 1.64366525 GHz
Center frequency: 1.64352125 GHz
Frequency span: 288 kHz
Resolution-BW: 3 kHz
Video-BW: 10 kHz
Input attenuation: 10 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

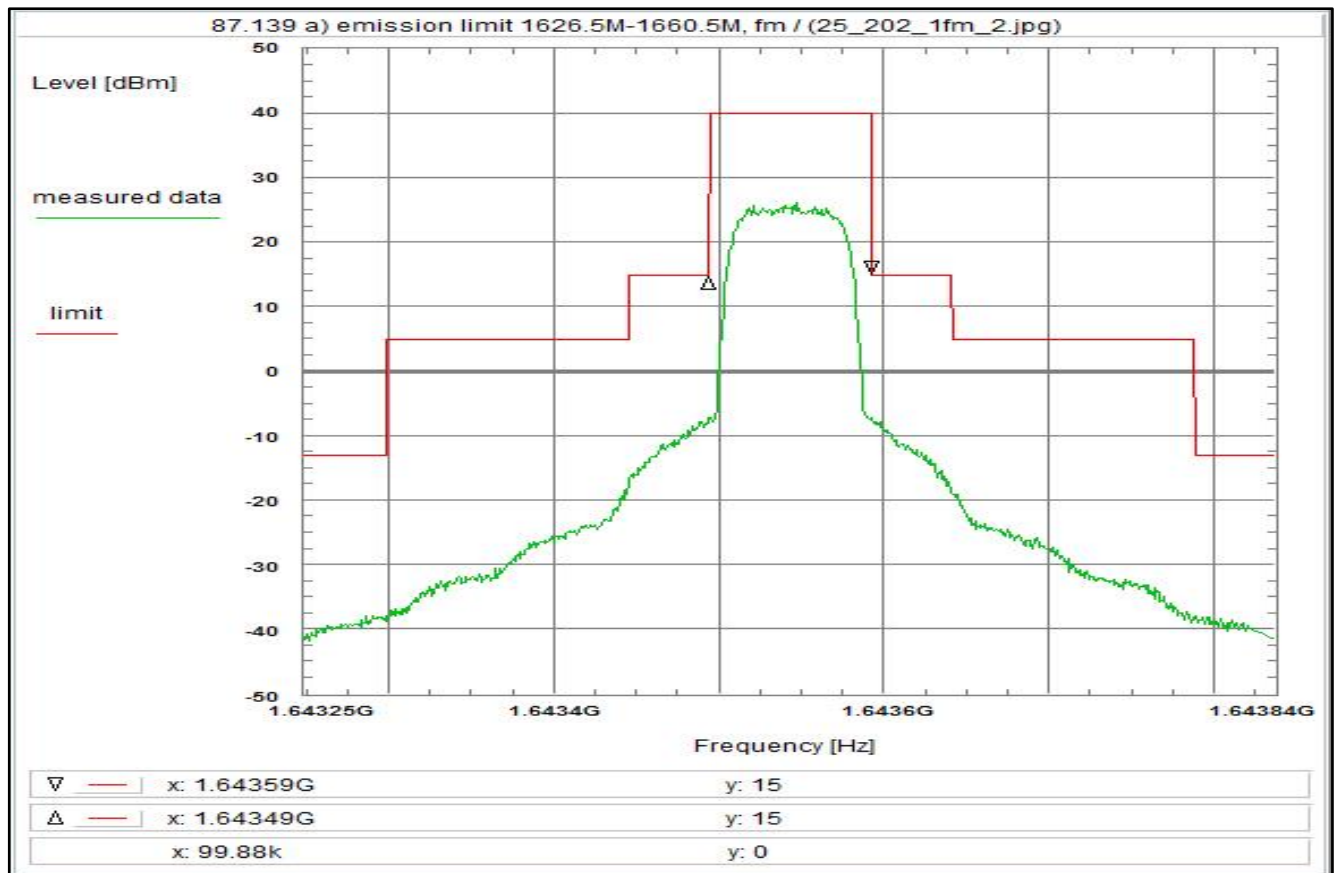
(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn (U330)	- 0.0 dB
TOTAL CORRECTION:	+ 40.9 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 197



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{\max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fm, max hold, valid for R5T2XD-R20T2XD-R5T2QD-R20T2QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:56:21

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6432485 GHz

Stop frequency: 1.6438365 GHz

Center frequency: 1.6435425 GHz

Frequency span: 588 kHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

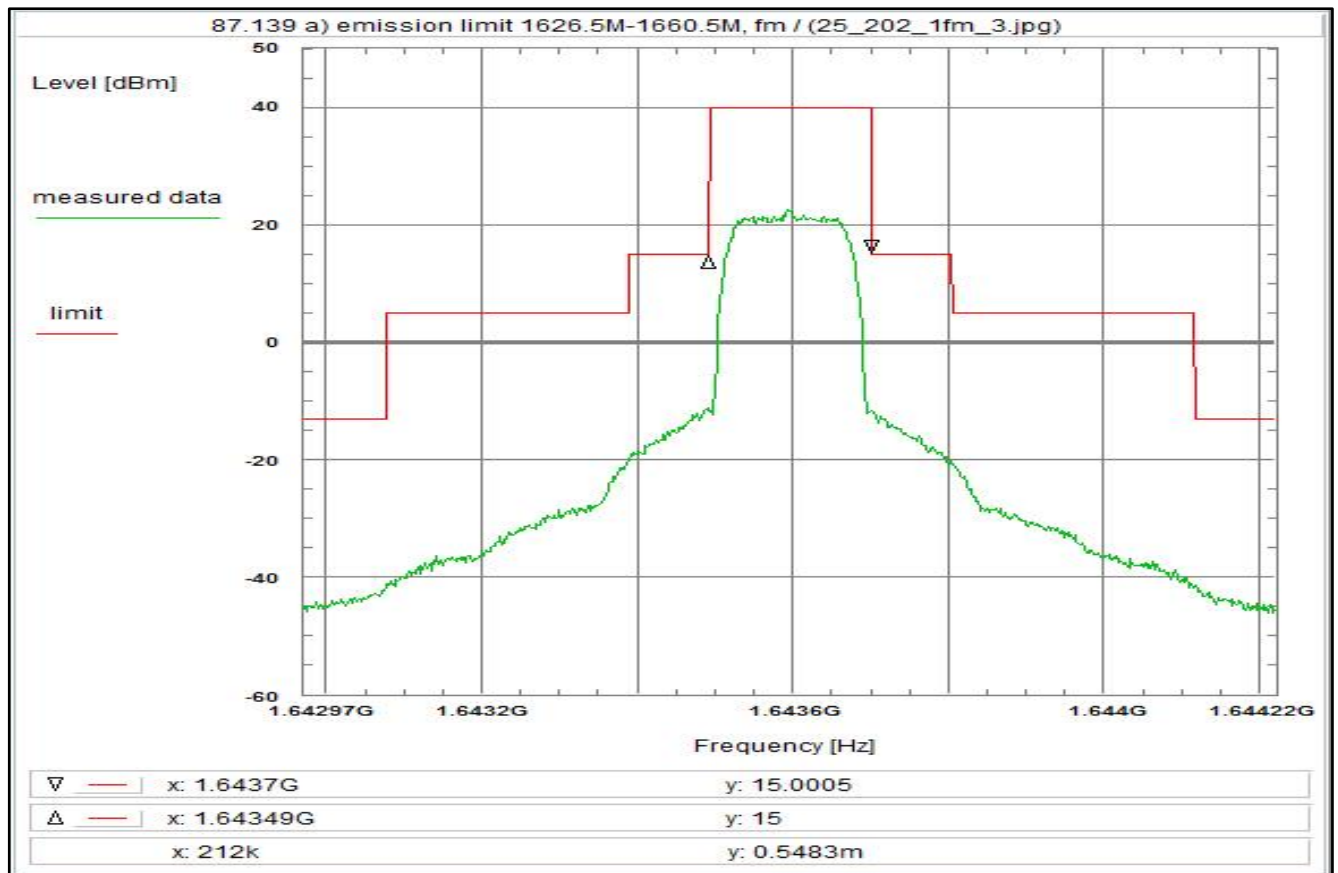
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 198



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fm, max hold, valid for R5T4.5XD-R20T4.5XD-R5T4.5QD-R20T4.5QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:57:37

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.642971 GHz

Stop frequency: 1.644219 GHz

Center frequency: 1.643595 GHz

Frequency span: 1.248 MHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

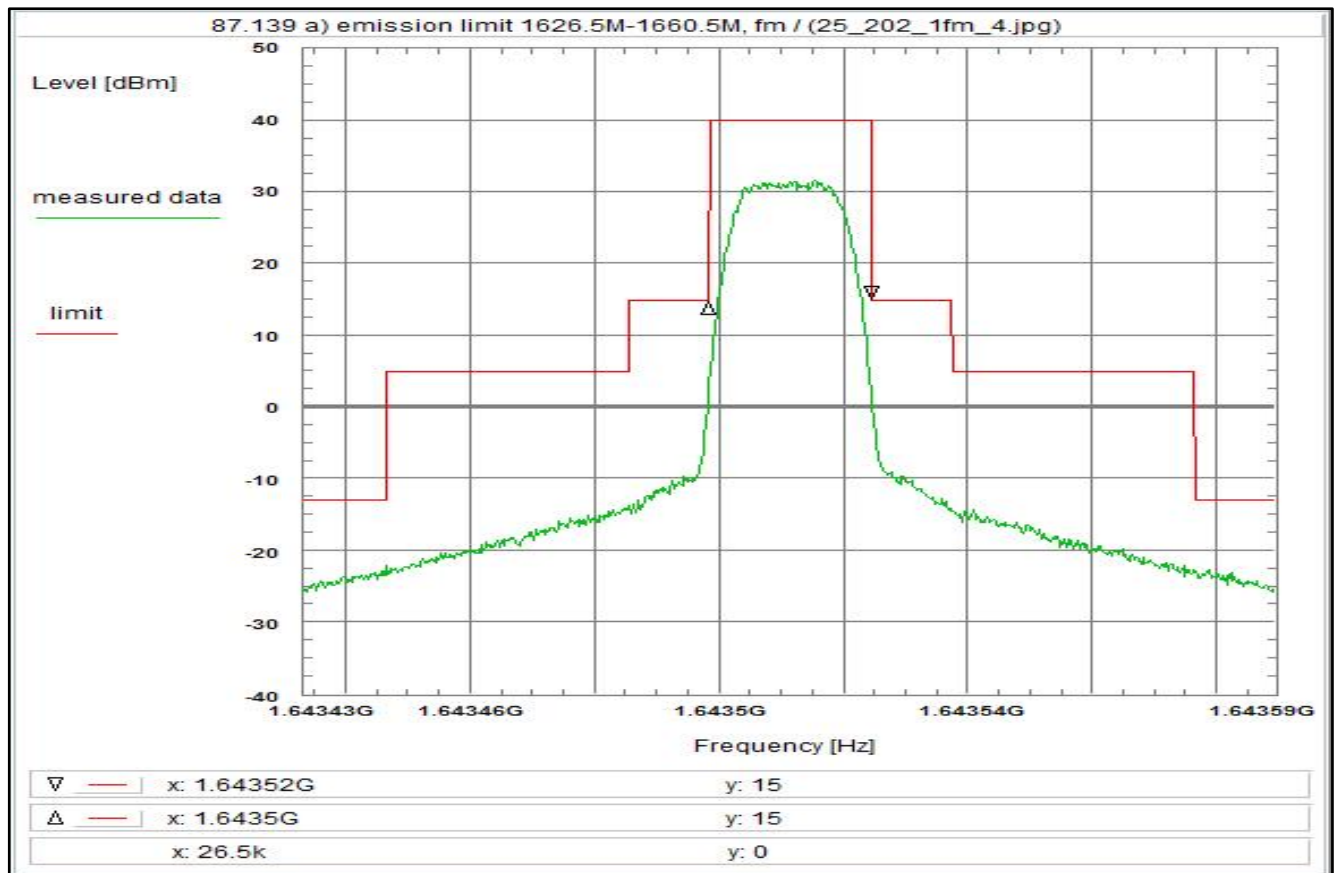
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 199



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for R20T0.5XD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: R001

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:07:50
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.64343325 GHz
Stop frequency: 1.64358925 GHz
Center frequency: 1.64351125 GHz
Frequency span: 156 kHz
Resolution-BW: 3 kHz
Video-BW: 10 kHz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

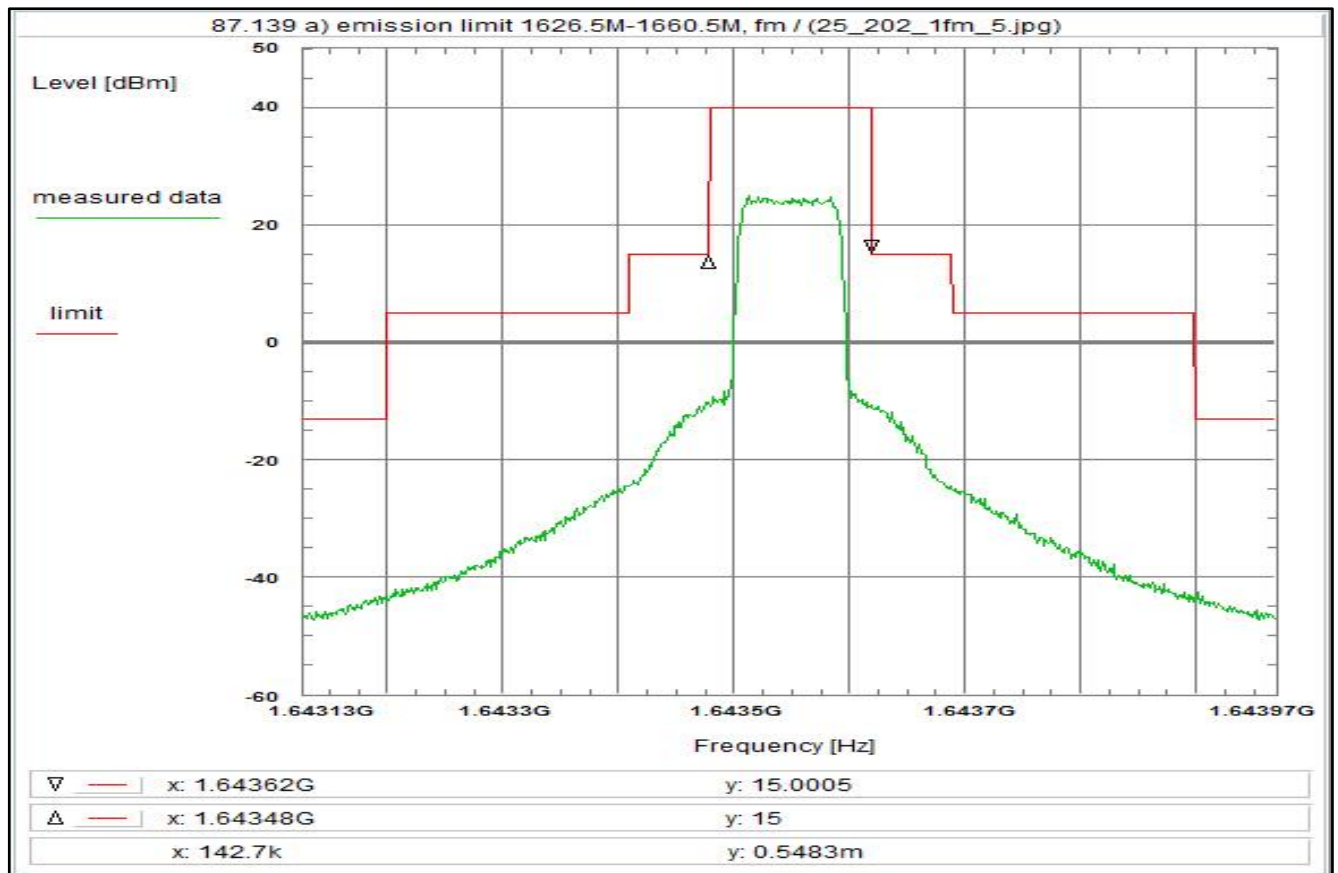
(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 200



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fm, max hold, valid for FR80T2.5X16-FR80T2.5X32-FR80T2.5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:10:25

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6431275 GHz

Stop frequency: 1.6439675 GHz

Center frequency: 1.6435475 GHz

Frequency span: 840 kHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

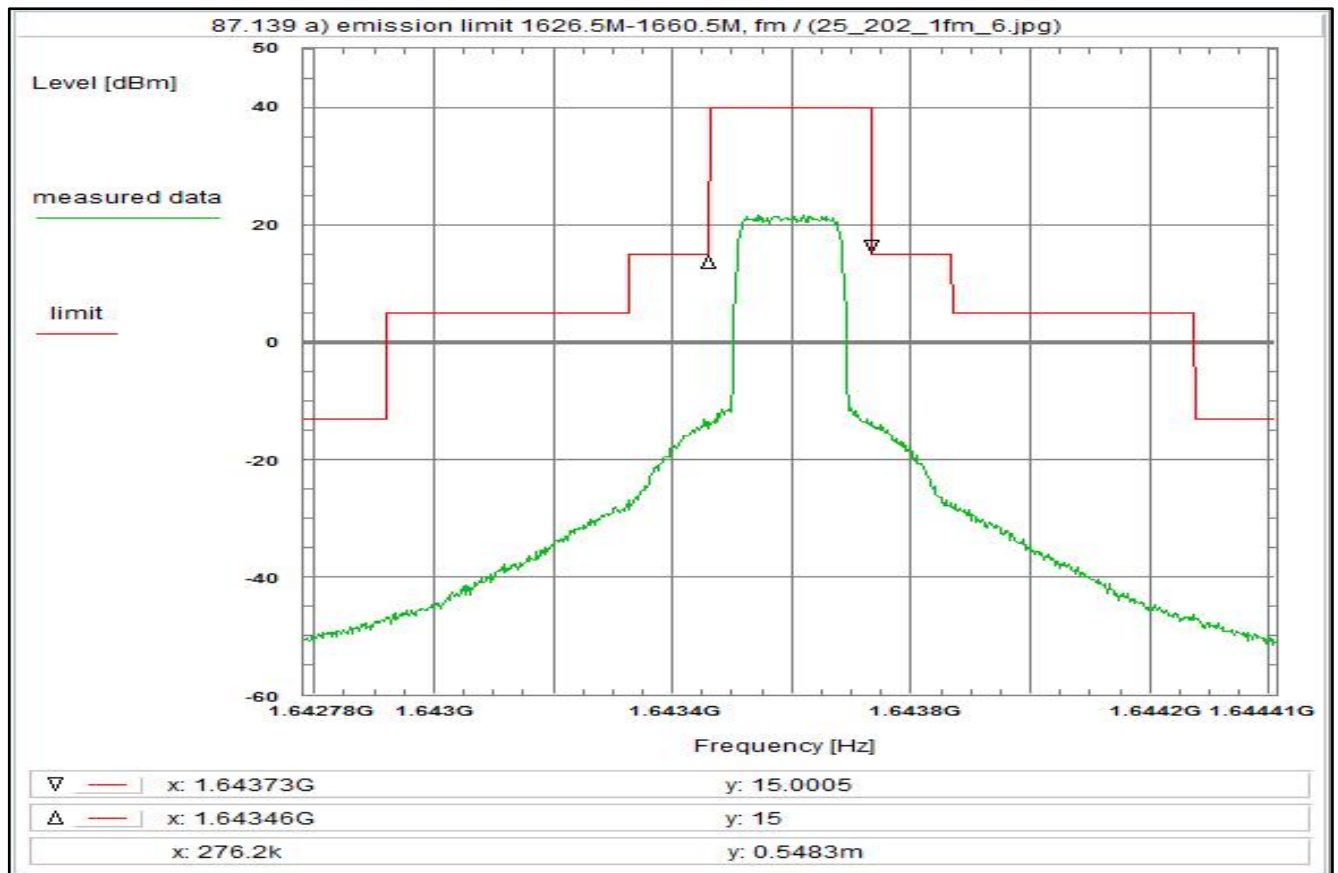
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 201



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fm, max hold, valid for FR80T5X16-FR80T5X32-FR80T5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:15:39

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.642782 GHz

Stop frequency: 1.644408 GHz

Center frequency: 1.643595 GHz

Frequency span: 1.626 MHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dB

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

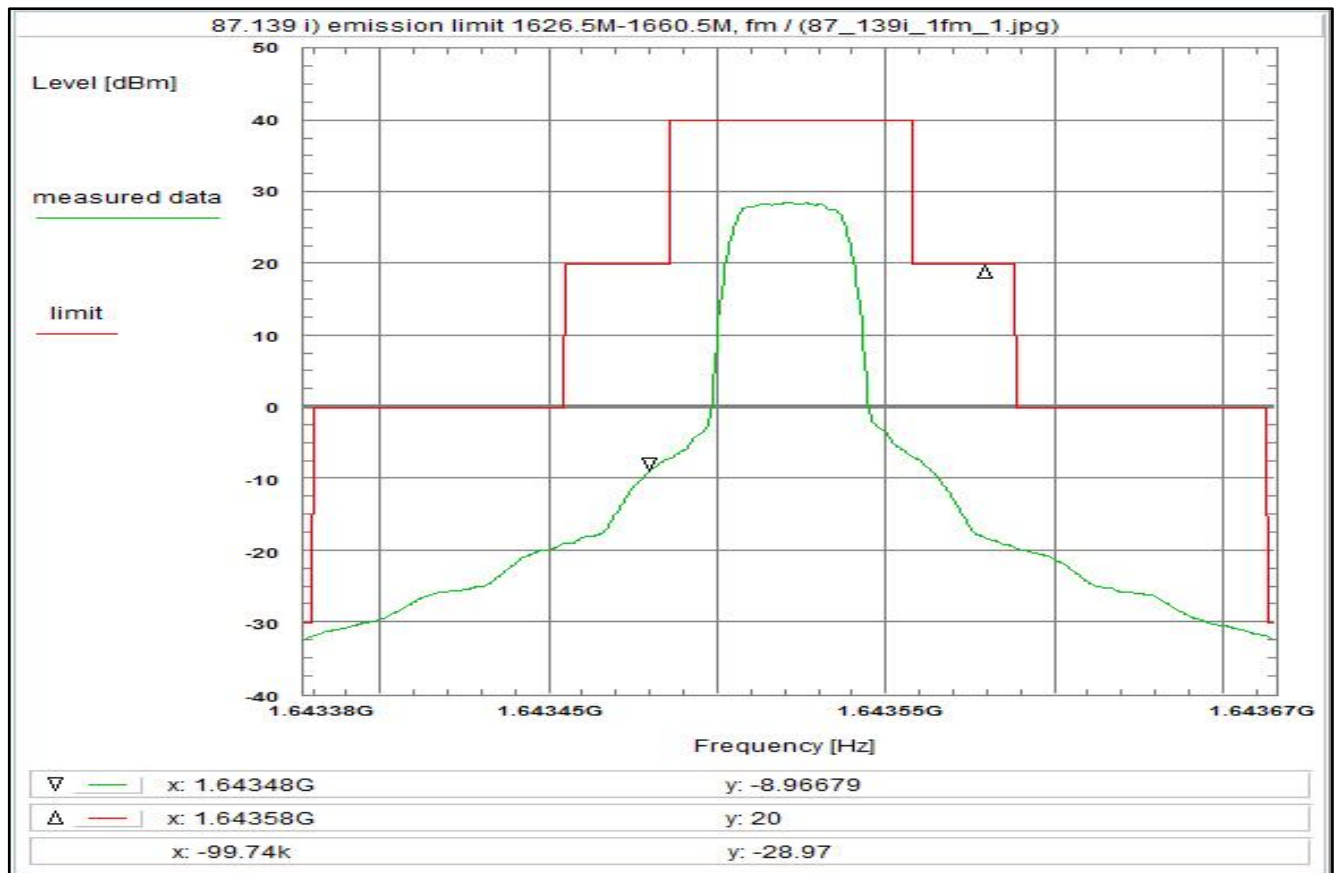
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 202



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for R5T1XD-R20T1XD-R20T1QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:54:22
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.64337725 GHz
Stop frequency: 1.64366525 GHz
Center frequency: 1.64352125 GHz
Frequency span: 288 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 10 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

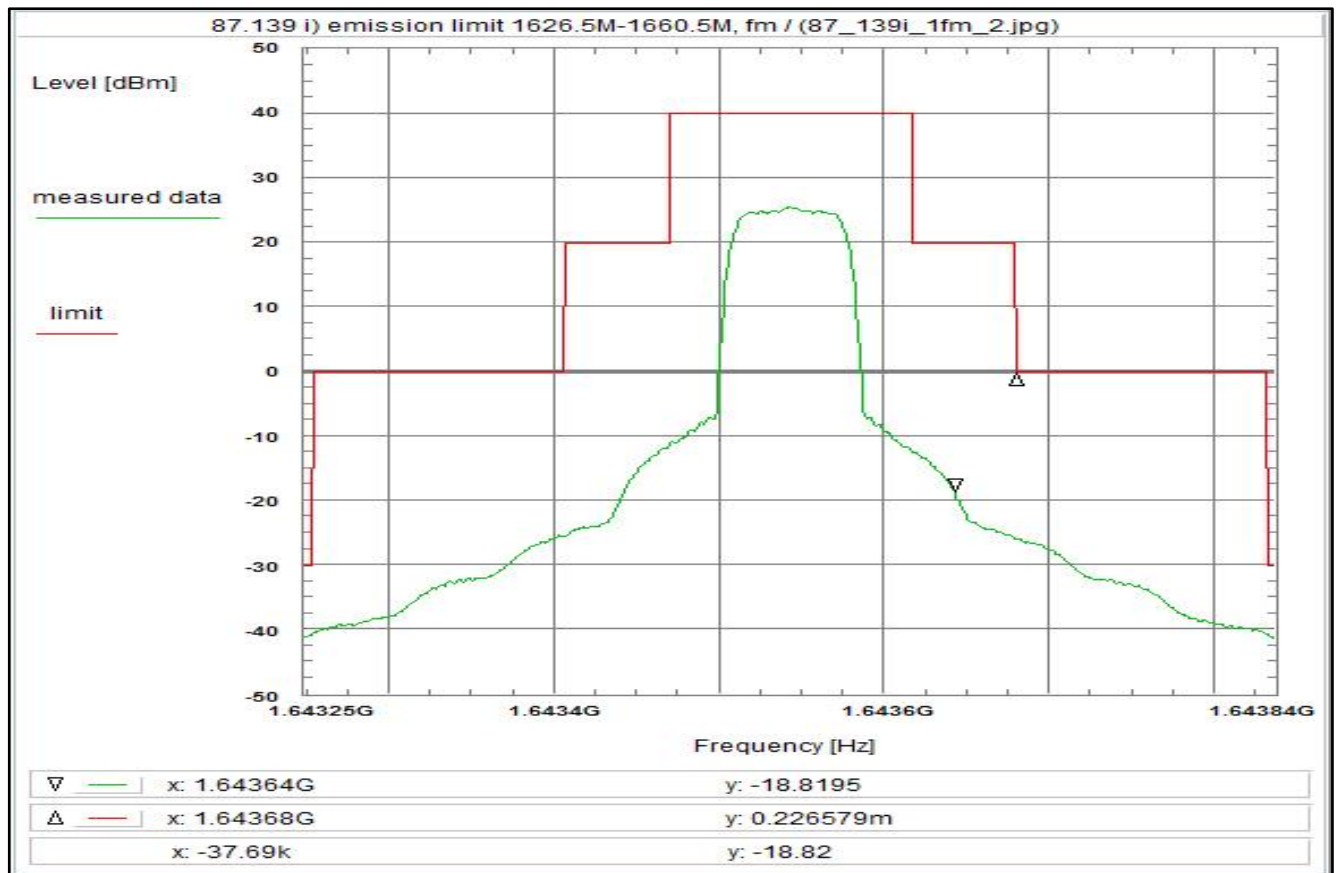
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 203



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for R5T2XD-R20T2XD-R5T2QD-R20T2QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:55:40
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6432485 GHz
Stop frequency: 1.6438365 GHz
Center frequency: 1.6435425 GHz
Frequency span: 588 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

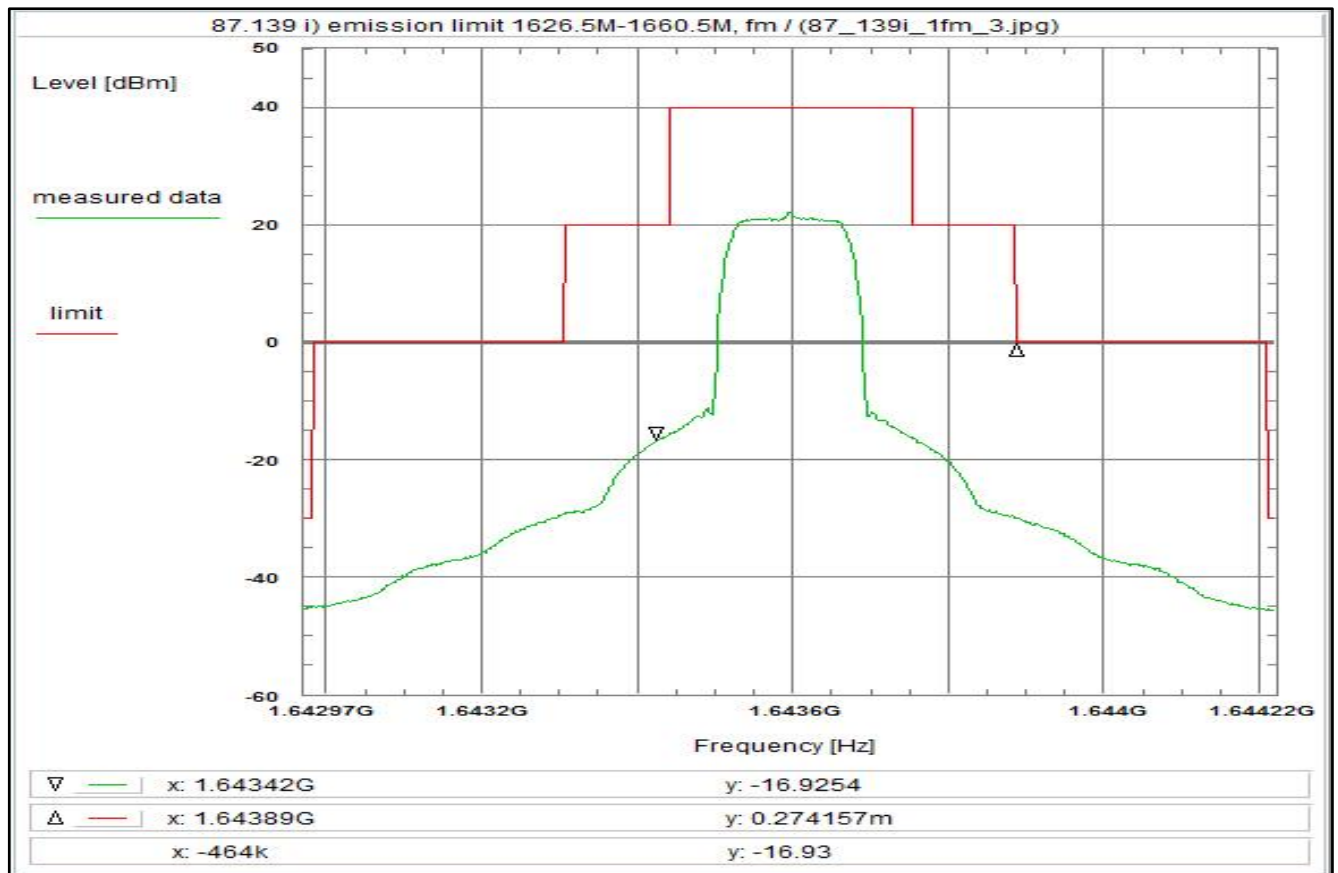
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 204



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4
fm, max hold, valid for R5T4.5XD-R20T4.5XD-R5T4.5QD-R20T4.5QD

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 14:58:20
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.642971 GHz
Stop frequency: 1.644219 GHz
Center frequency: 1.643595 GHz
Frequency span: 1.248 MHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

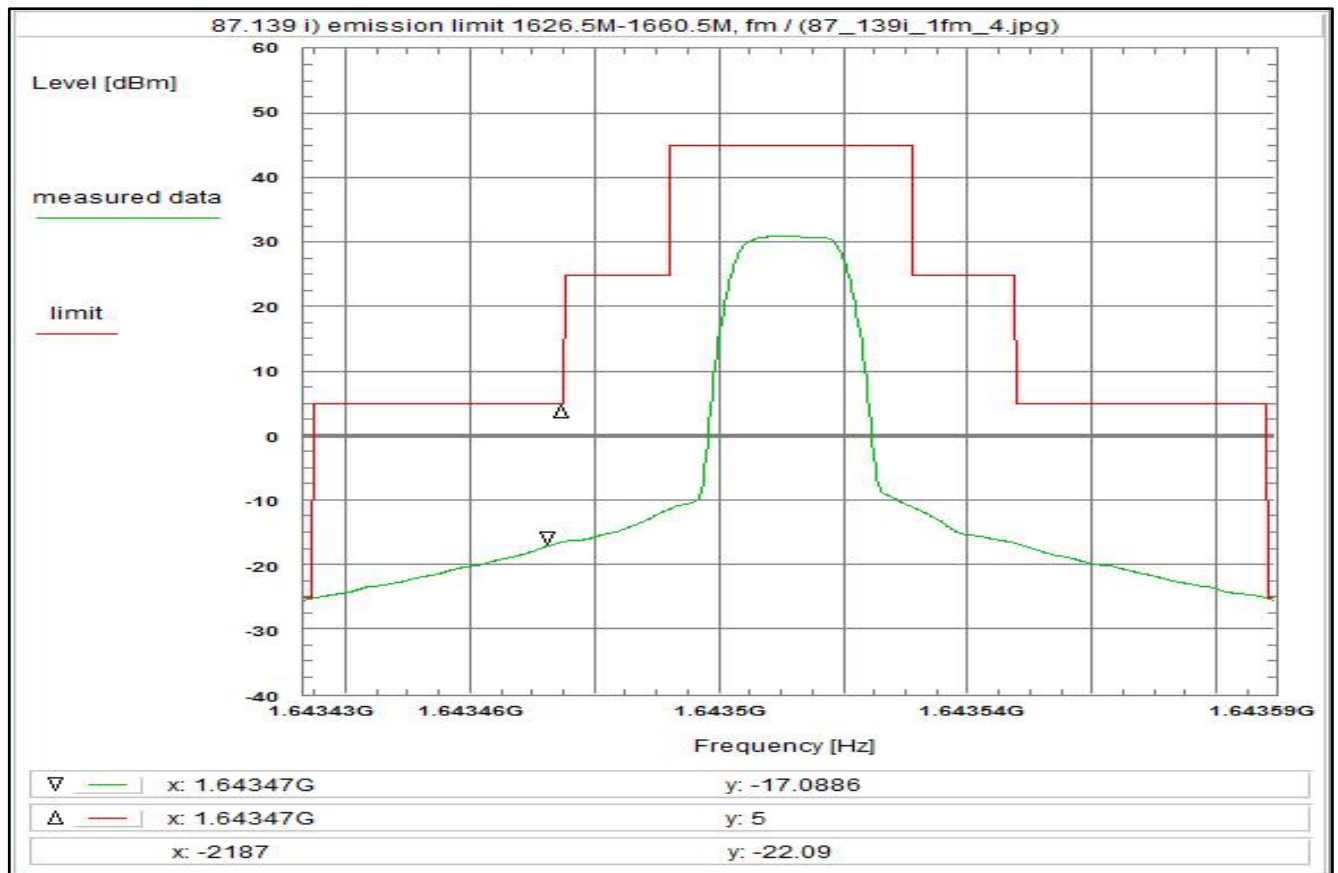
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 205



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for R20T0.5XD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:01:51
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.64343325 GHz
Stop frequency: 1.64358925 GHz
Center frequency: 1.64351125 GHz
Frequency span: 156 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

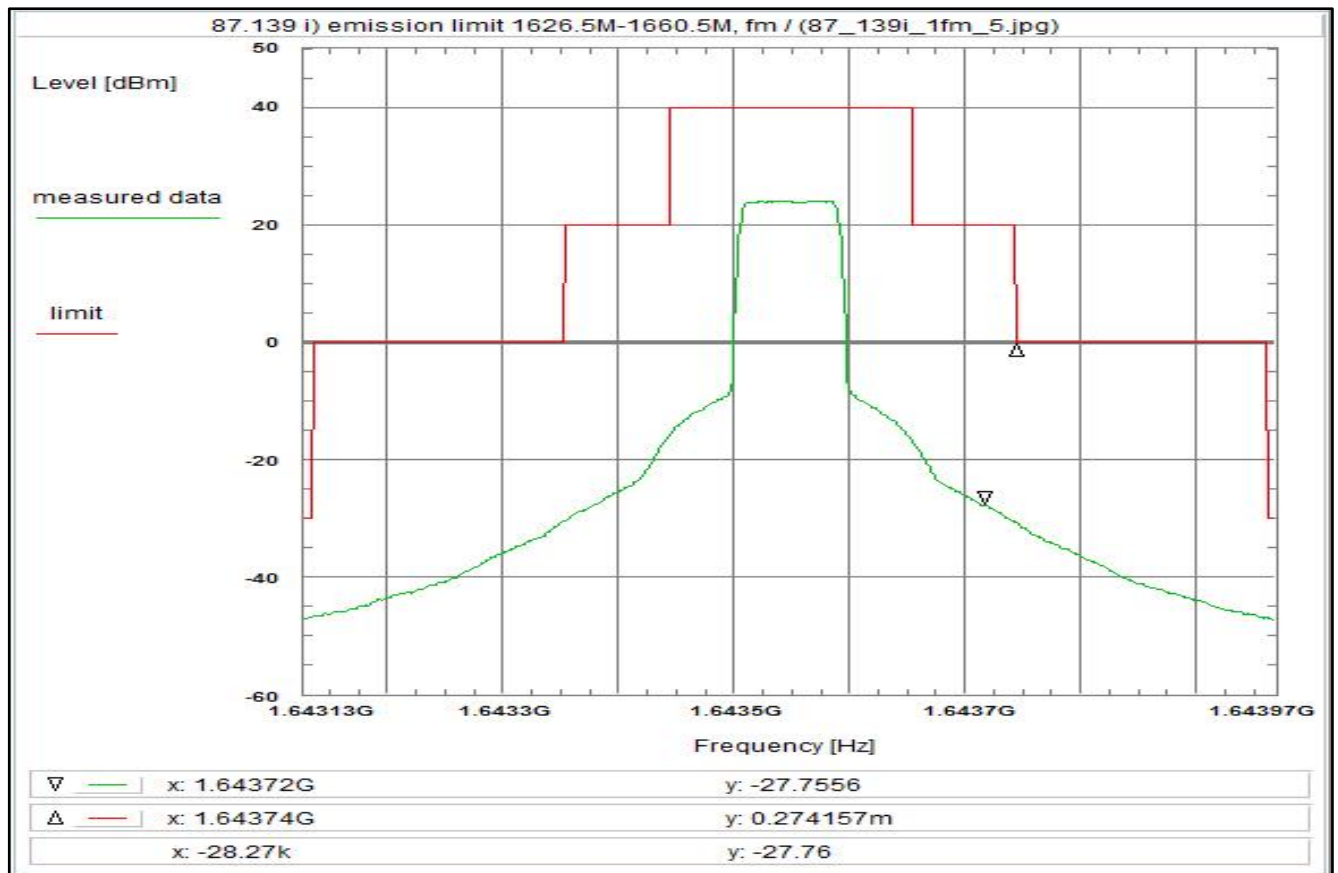
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 206



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for FR80T2.5X16-FR80T2.5X32-FR80T2.5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:11:10
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6431275 GHz
Stop frequency: 1.6439675 GHz
Center frequency: 1.6435475 GHz
Frequency span: 840 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

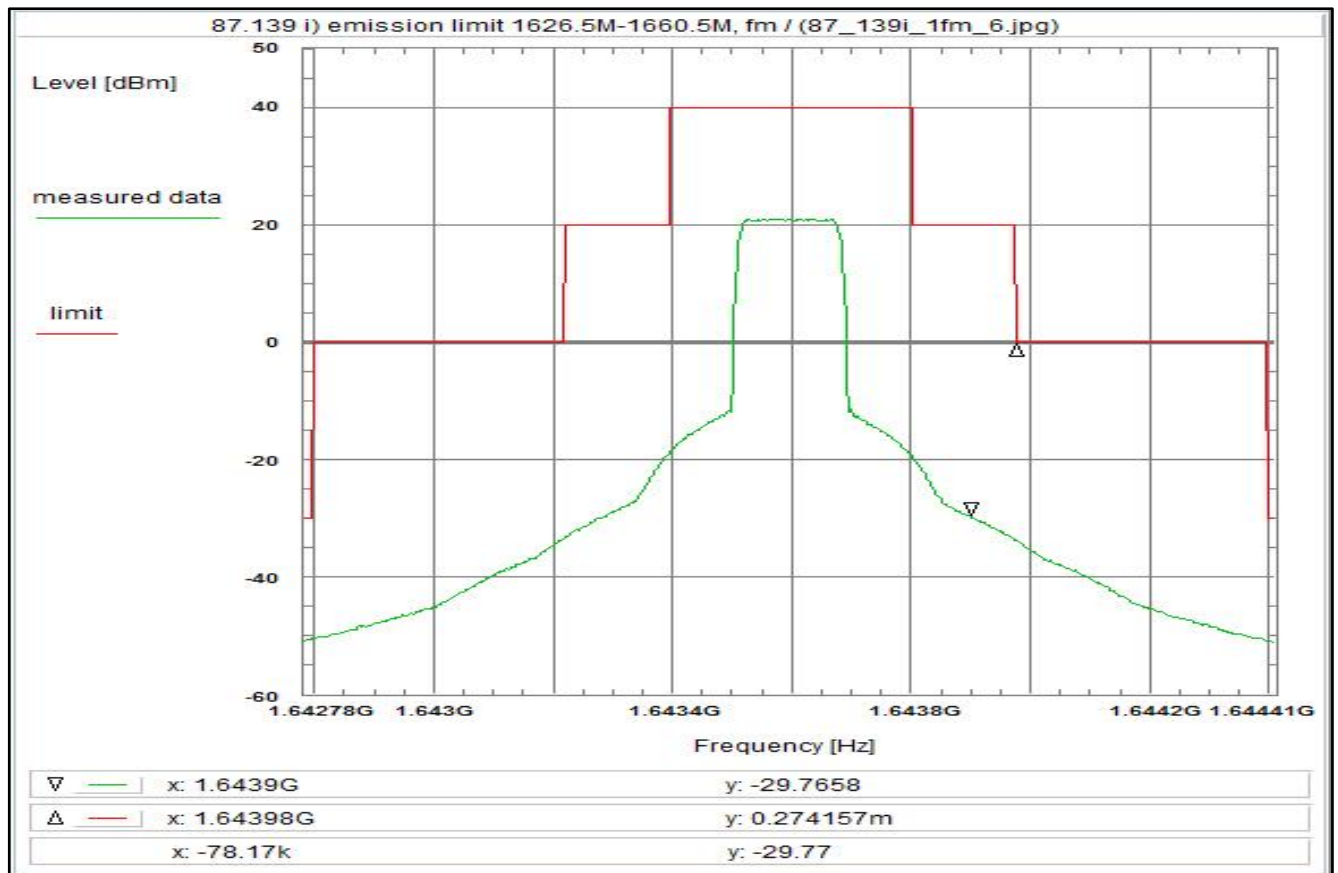
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 207



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, max hold, valid for FR80T5X16-FR80T5X32-FR80T5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:14:48
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.642782 GHz
Stop frequency: 1.644408 GHz
Center frequency: 1.643595 GHz
Frequency span: 1.626 MHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

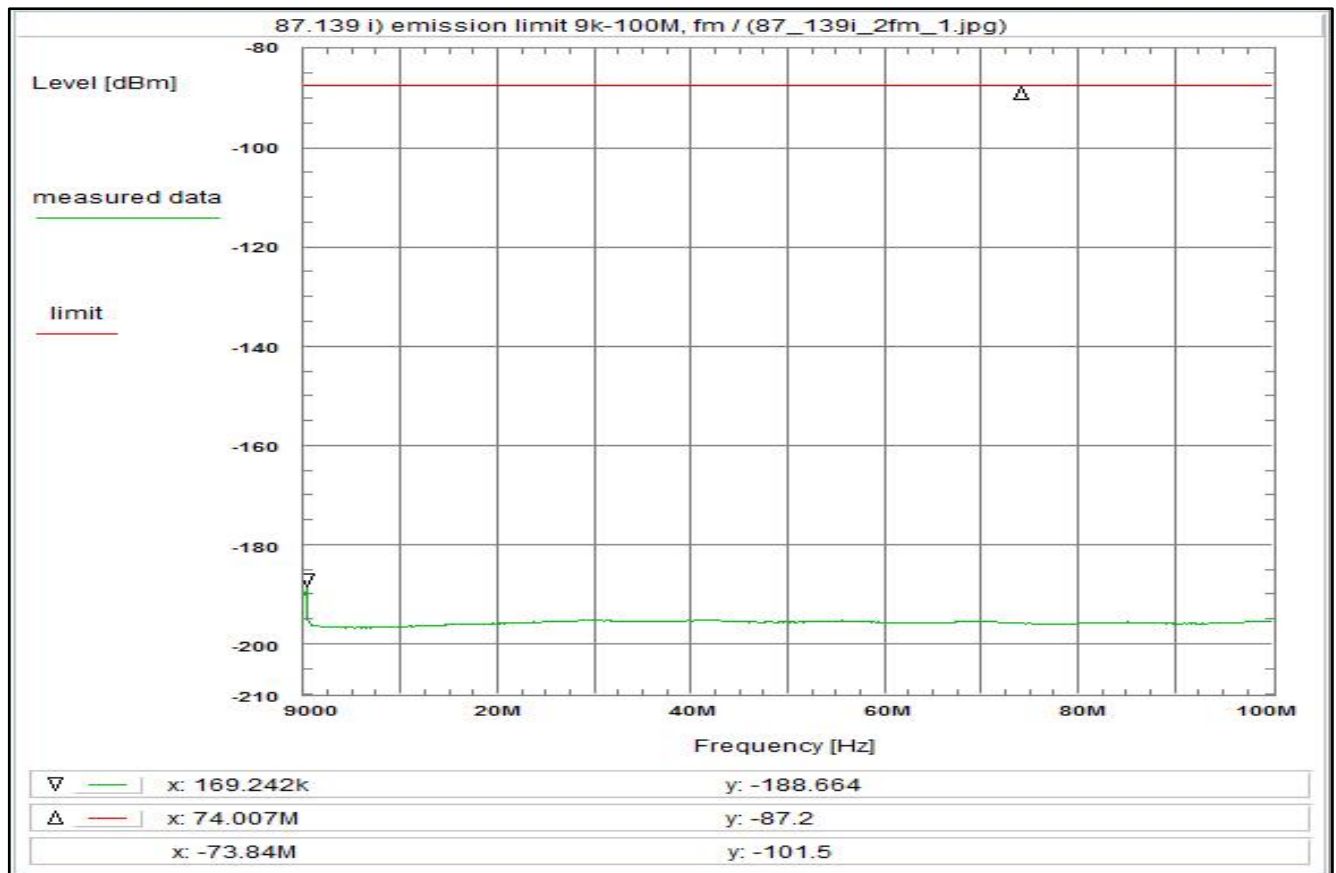
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 208



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4
fm, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:29:55
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 9 kHz
Stop frequency: 100 MHz
Center frequency: 50.0045 MHz
Frequency span: 99.991 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 120.0 dB
Coaxial cable (C107) + 0.5 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.3 dB
TOTAL CORRECTION: - 76.0 dB

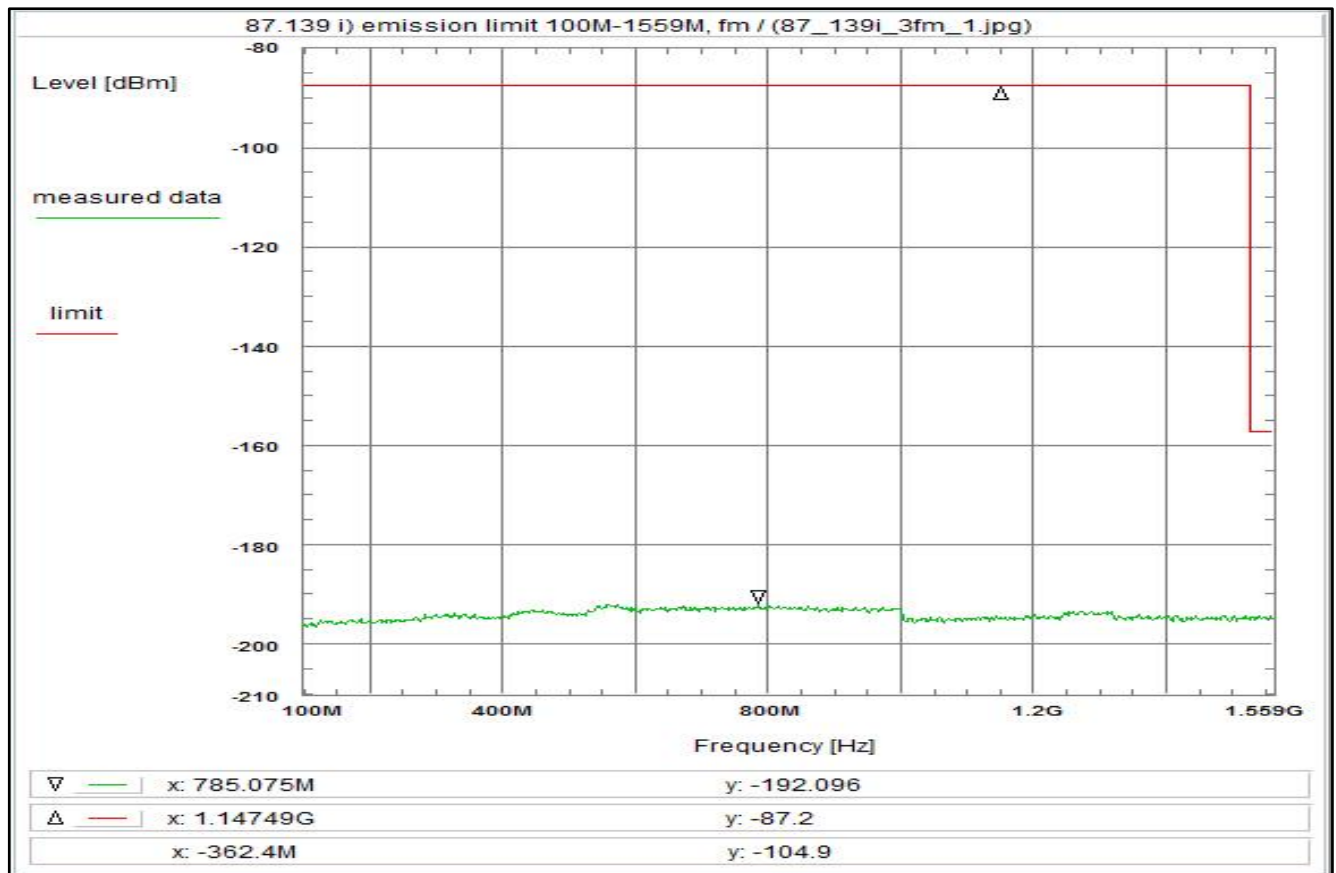
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 209



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fm, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:31:22
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 100 MHz
Stop frequency: 1.559 GHz
Center frequency: 829.5 MHz
Frequency span: 1.459 GHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

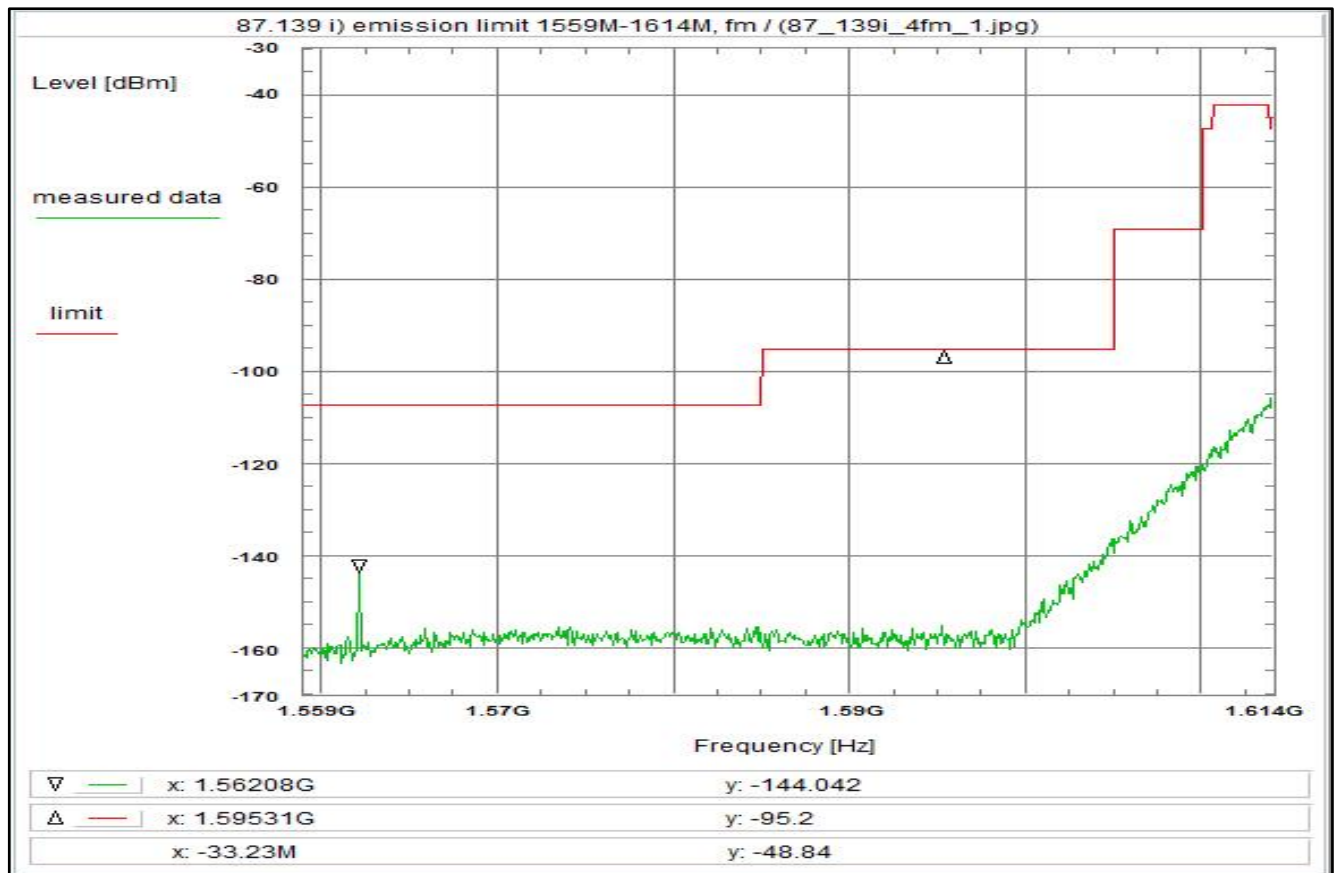
Correction:

(W_RE) - 120.0 dB
Coaxial cable (C107) + 0.9 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.7 dB
TOTAL CORRECTION: - 75.2 dB

Remarks:

Carrier-on state / Carrier in the middle of the band (fm)
For EIRP calculation:
'worst-case' = maximum antenna gain

Plot No. 210



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4
fm, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:33:35
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.614 GHz
Center frequency: 1.5865 GHz
Frequency span: 55 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 1M) + 25.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 34.7 dB

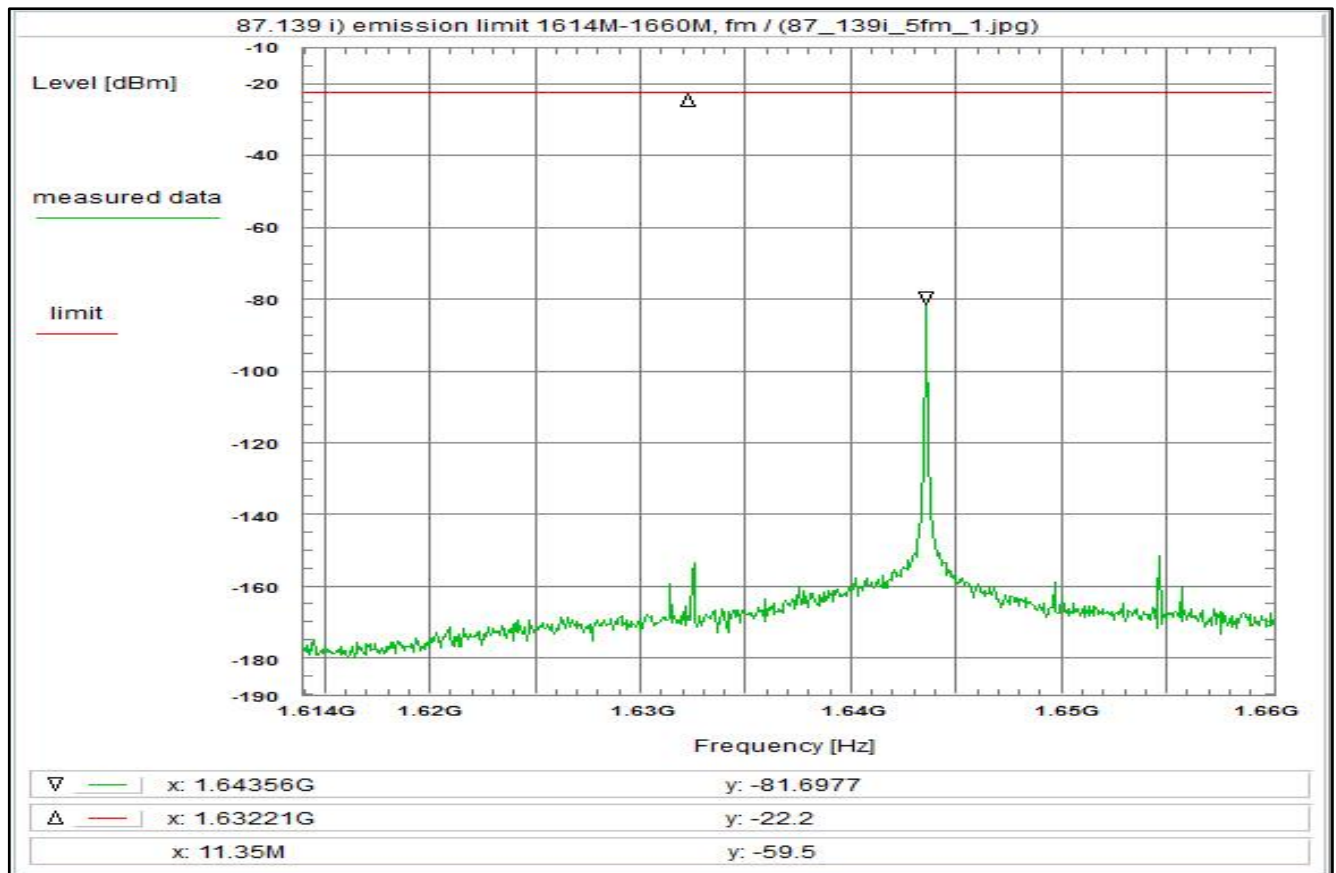
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 211



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:35:25
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.614 GHz
Stop frequency: 1.66 GHz
Center frequency: 1.637 GHz
Frequency span: 46 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 104.1 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 58.7 dB

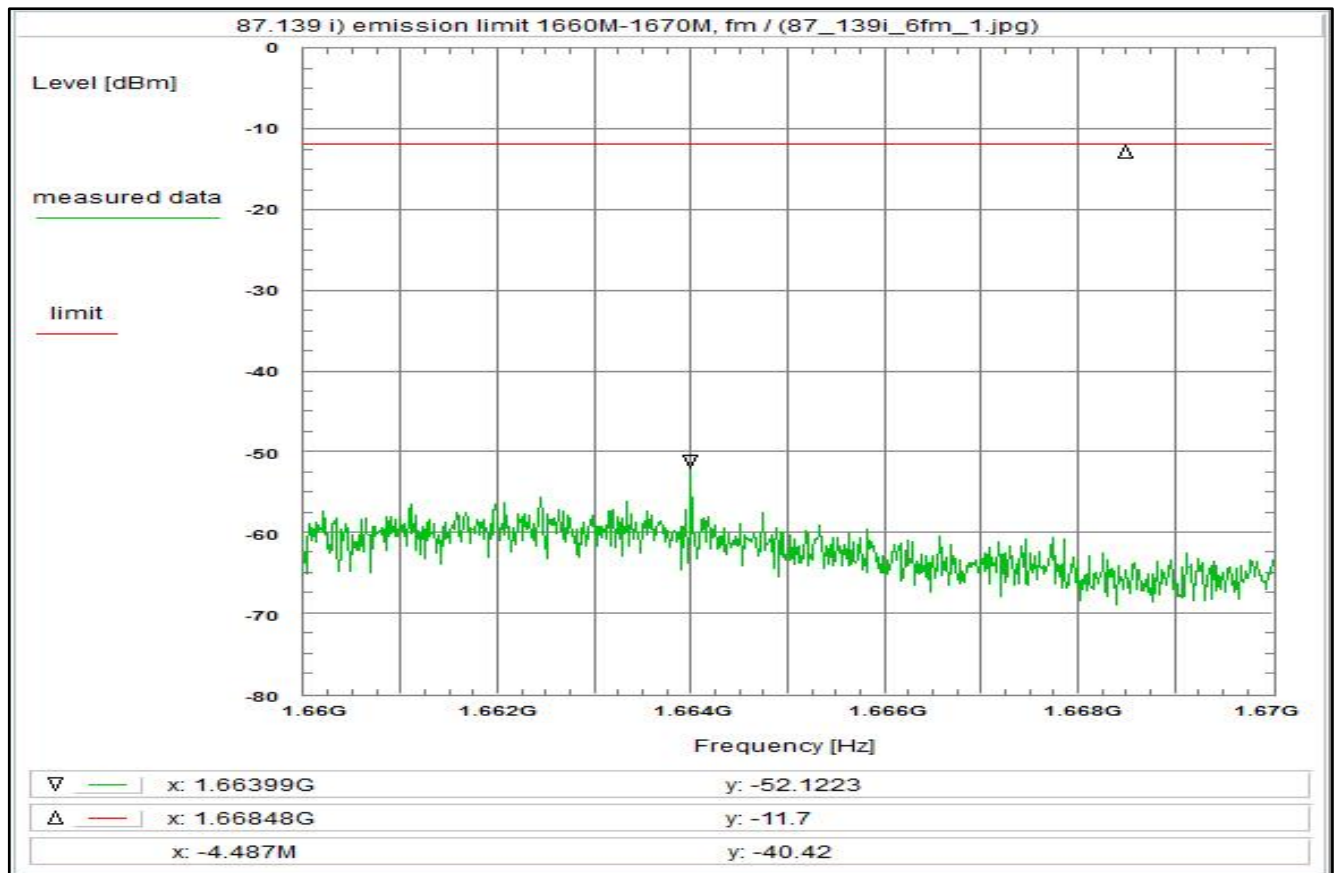
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 212



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fm, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:36:39
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66 GHz
Stop frequency: 1.67 GHz
Center frequency: 1.665 GHz
Frequency span: 10 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.4 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 20k) + 8.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 52.5 dB

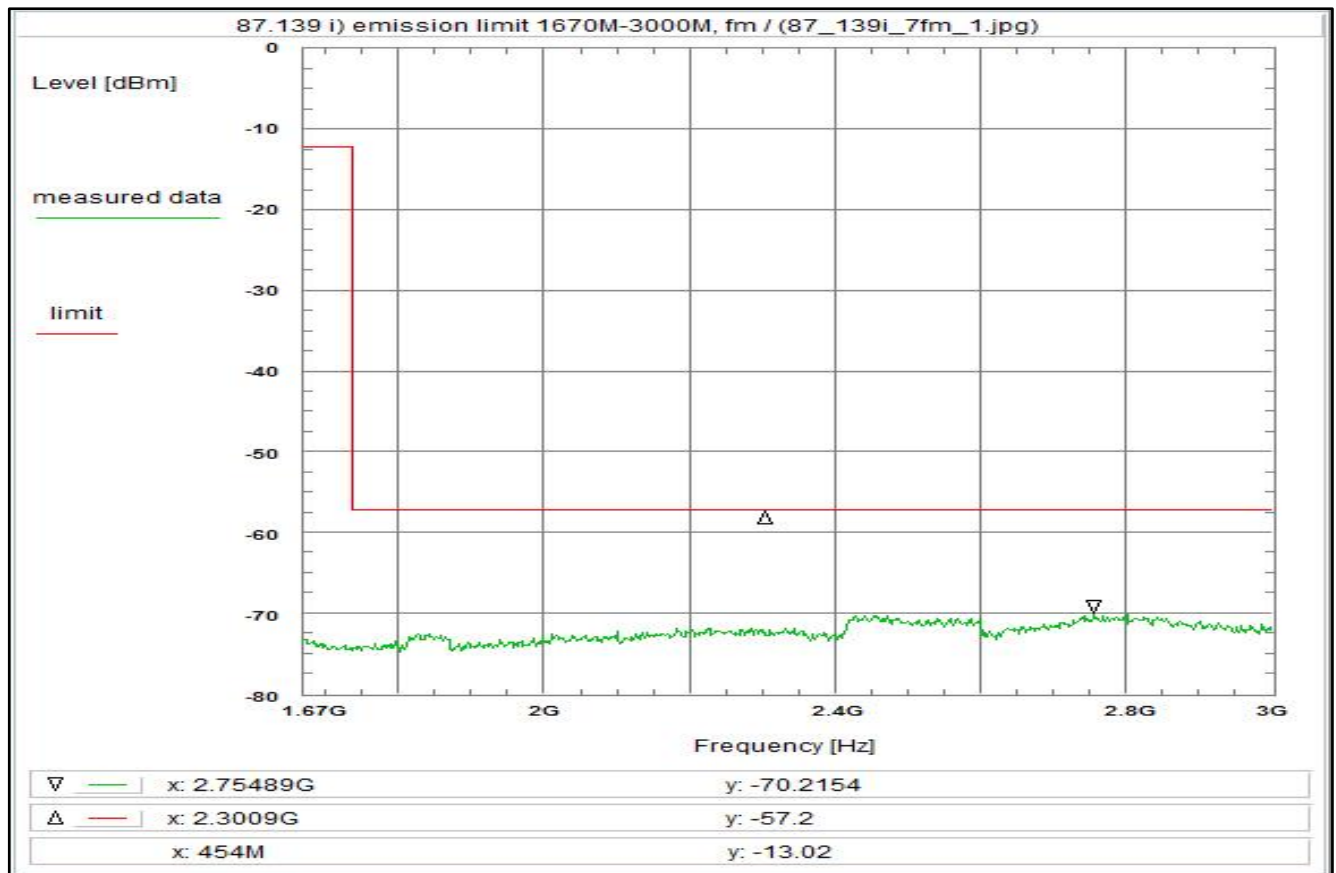
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 213



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fm, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:37:07
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.67 GHz
Stop frequency: 3 GHz
Center frequency: 2.335 GHz
Frequency span: 1.33 GHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.5 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 32.0 dB
TOTAL CORRECTION: + 45.7 dB

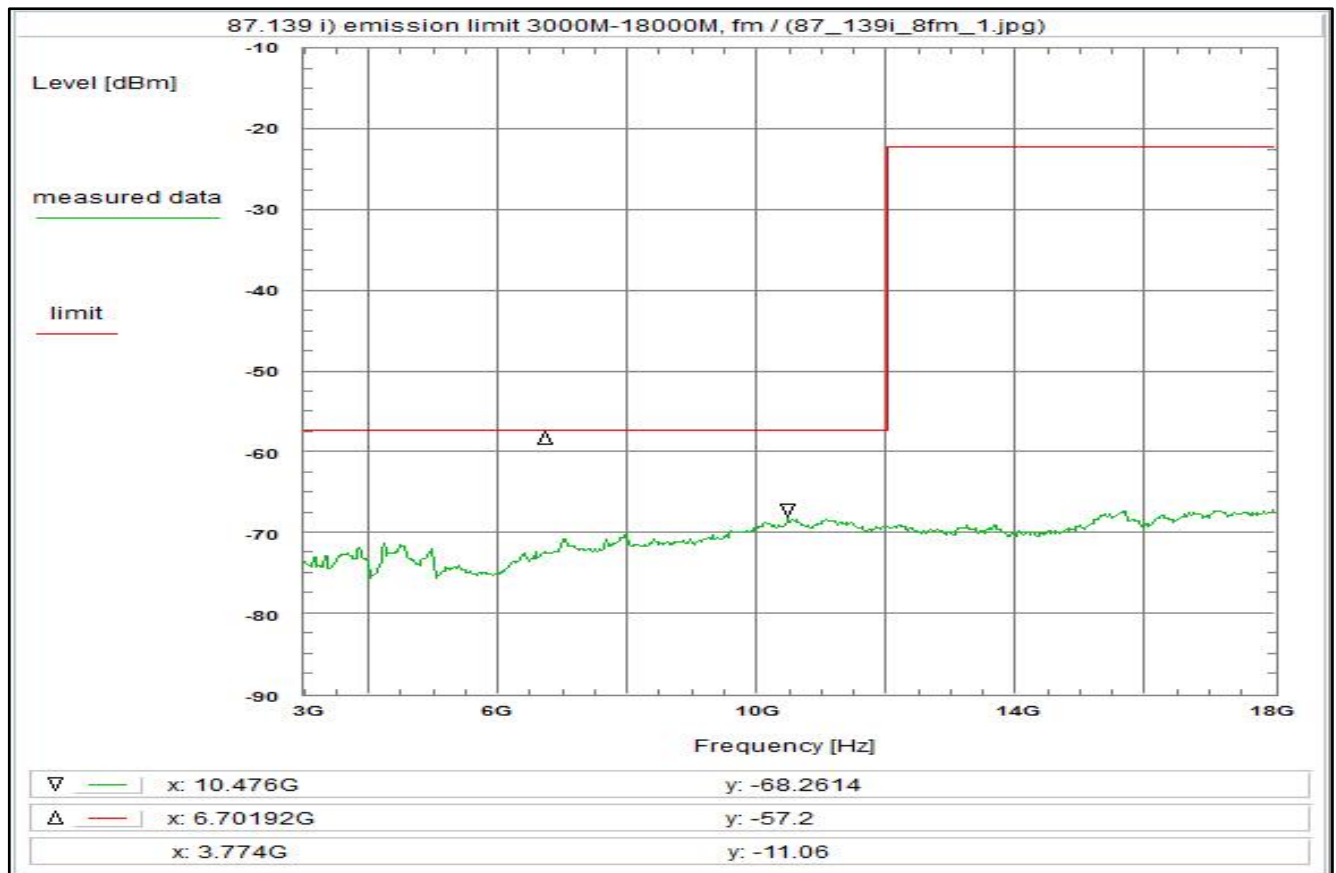
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 214



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fm)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fm, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:37:53
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 3 GHz
Stop frequency: 18 GHz
Center frequency: 10.5 GHz
Frequency span: 15 GHz
Resolution-BW: 10 kHz
Video-BW: 100 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 3.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (10k -> 4k) - 4.0 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 33.4 dB
TOTAL CORRECTION: + 43.7 dB

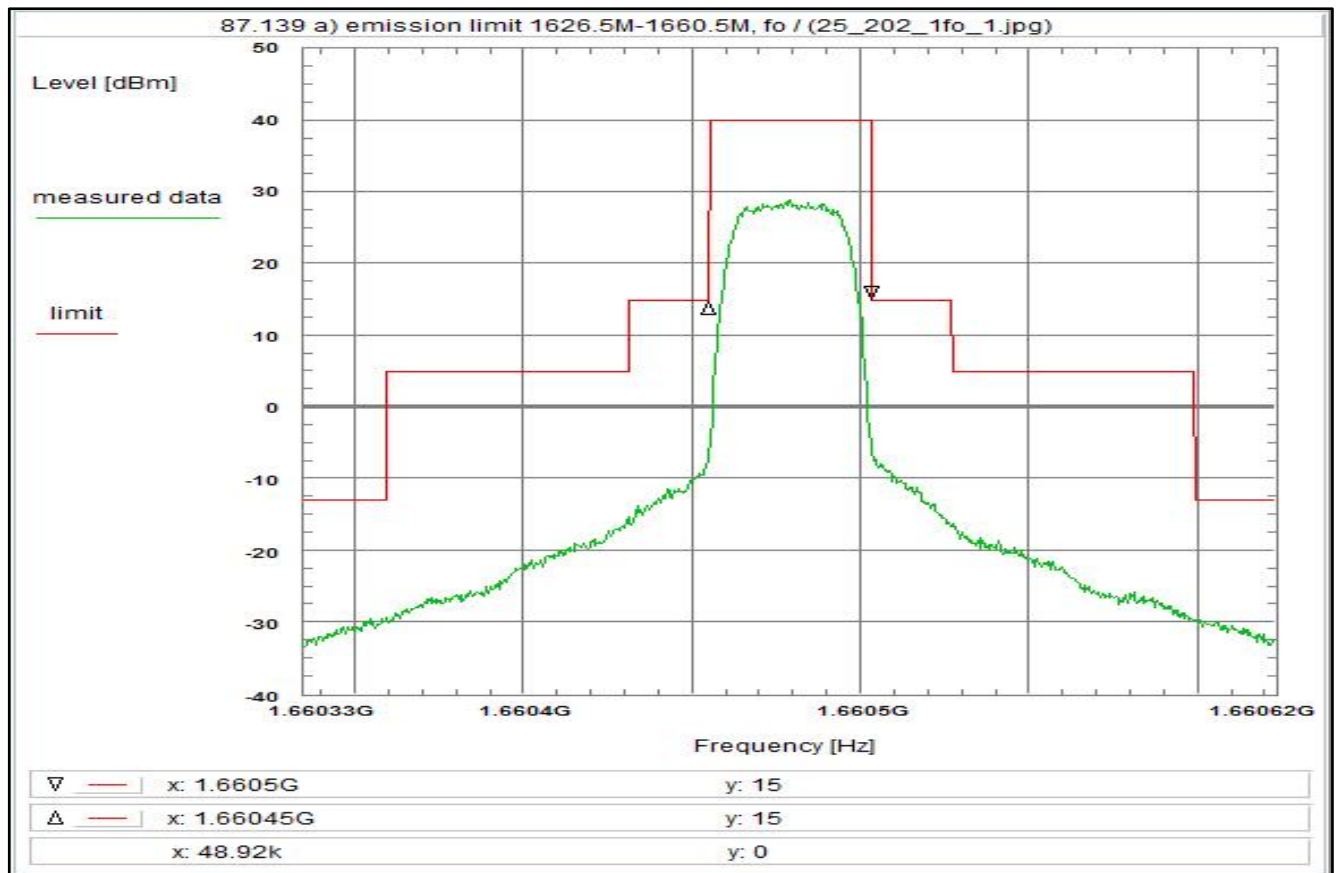
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 215



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fo)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for R5T1XD-R20T1XD-R20T1QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:17:39
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66033475 GHz
Stop frequency: 1.66062275 GHz
Center frequency: 1.66047875 GHz
Frequency span: 288 kHz
Resolution-BW: 3 kHz
Video-BW: 10 kHz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

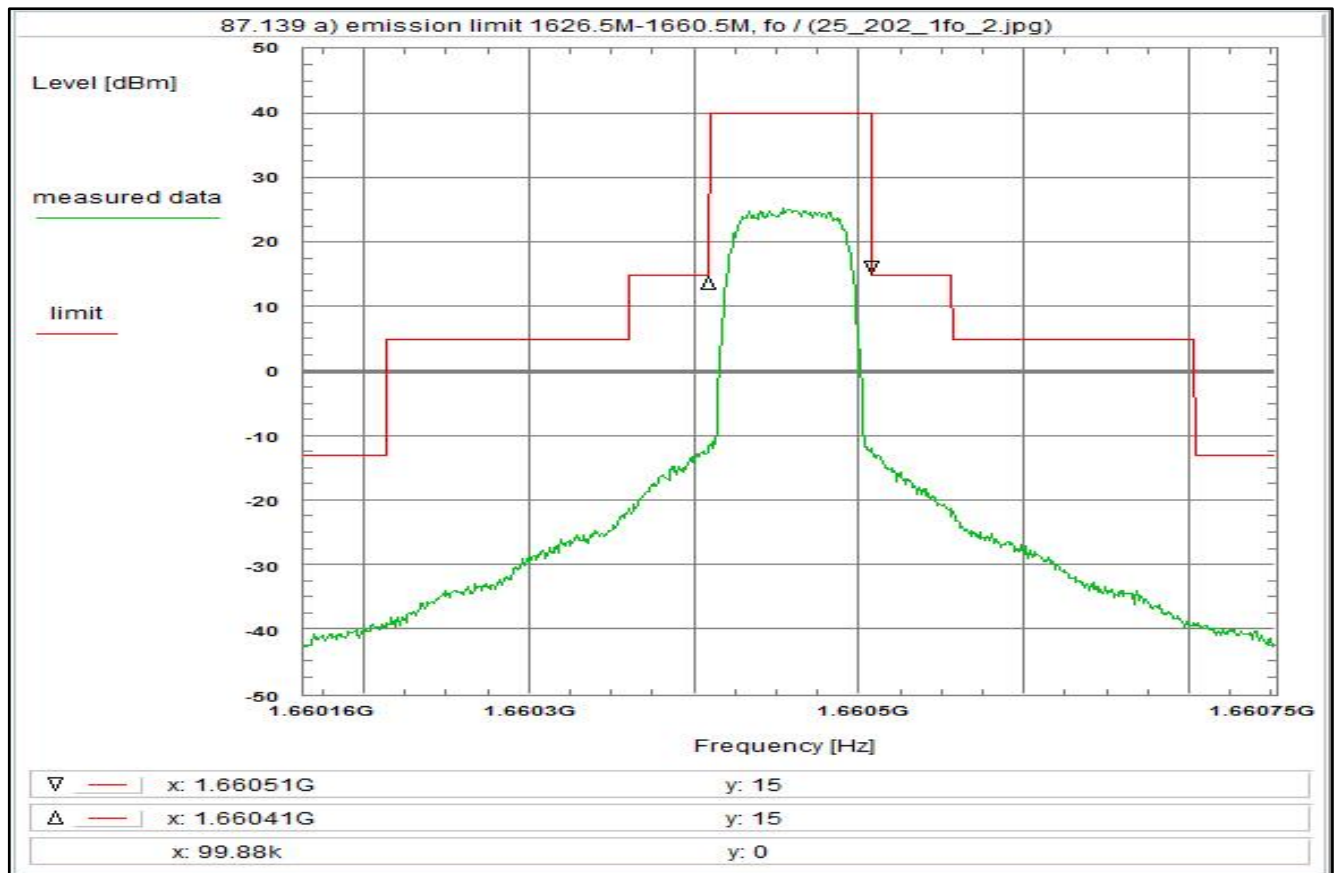
(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.4 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 41.0 dB

Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 216



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fo)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{\max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fh, max hold, valid for R5T2XD-R20T2XD-R5T2QD-R20T2QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:20:27

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6601635 GHz

Stop frequency: 1.6607515 GHz

Center frequency: 1.6604575 GHz

Frequency span: 588 kHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.4 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

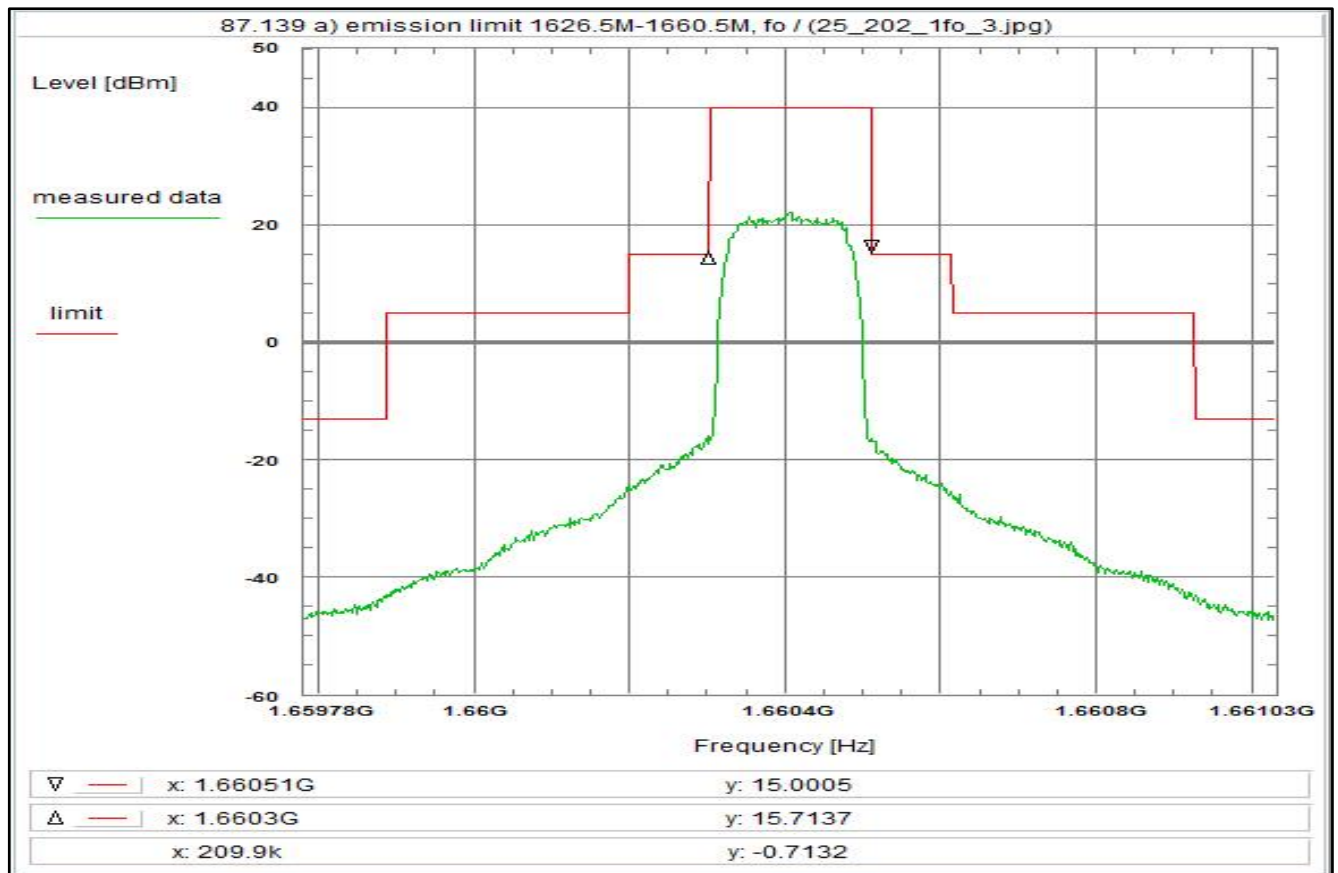
TOTAL CORRECTION: + 41.0 dB

Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 217



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fo)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fh, max hold, valid for R5T4.5XD-R20T4.5XD-R5T4.5QD-R20T4.5QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time:

Wed 27/Sep/2023 15:28:50

Location:

CTC advanced GmbH, Laboratory RC-SYS

Temperature:

22 °C

Humidity:

55 %

Voltage:

230 Vac

Setup of measurement equipment:

Start frequency: 1.659781 GHz

Stop frequency: 1.661029 GHz

Center frequency: 1.660405 GHz

Frequency span: 1.248 MHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.4 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

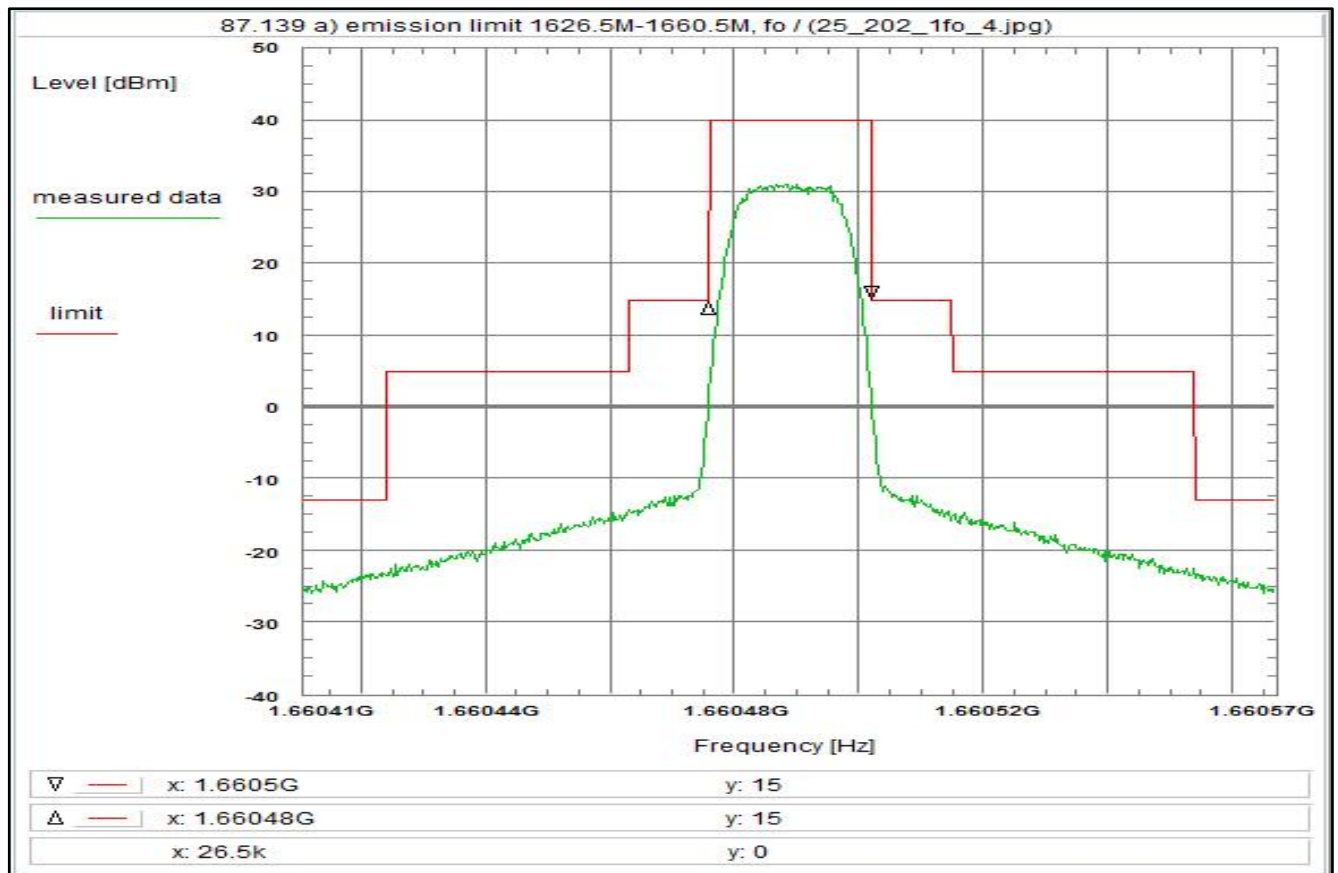
TOTAL CORRECTION: + 41.0 dB

Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 218



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fo)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for R20T0.5XD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:33:17
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66041075 GHz
Stop frequency: 1.66056675 GHz
Center frequency: 1.66048875 GHz
Frequency span: 156 kHz
Resolution-BW: 3 kHz
Video-BW: 10 kHz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

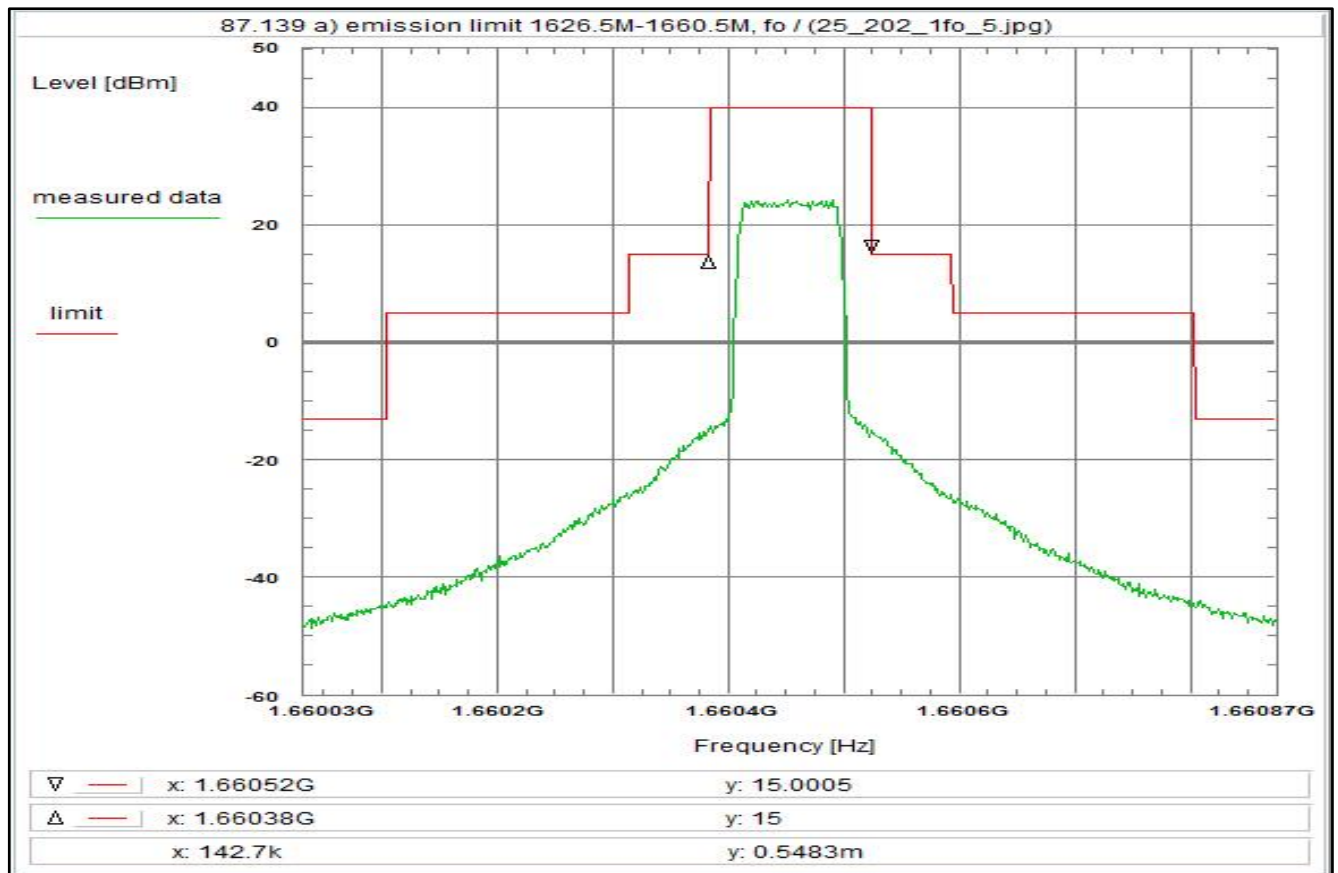
(W_RE) - 4.5 dB
Coaxial cable (C107) + 1.4 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 41.0 dB

Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 219



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fo)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fh, max hold, valid for FR80T2.5X16-FR80T2.5X32-FR80T2.5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:35:22

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6600325 GHz

Stop frequency: 1.6608725 GHz

Center frequency: 1.6604525 GHz

Frequency span: 840 kHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.4 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

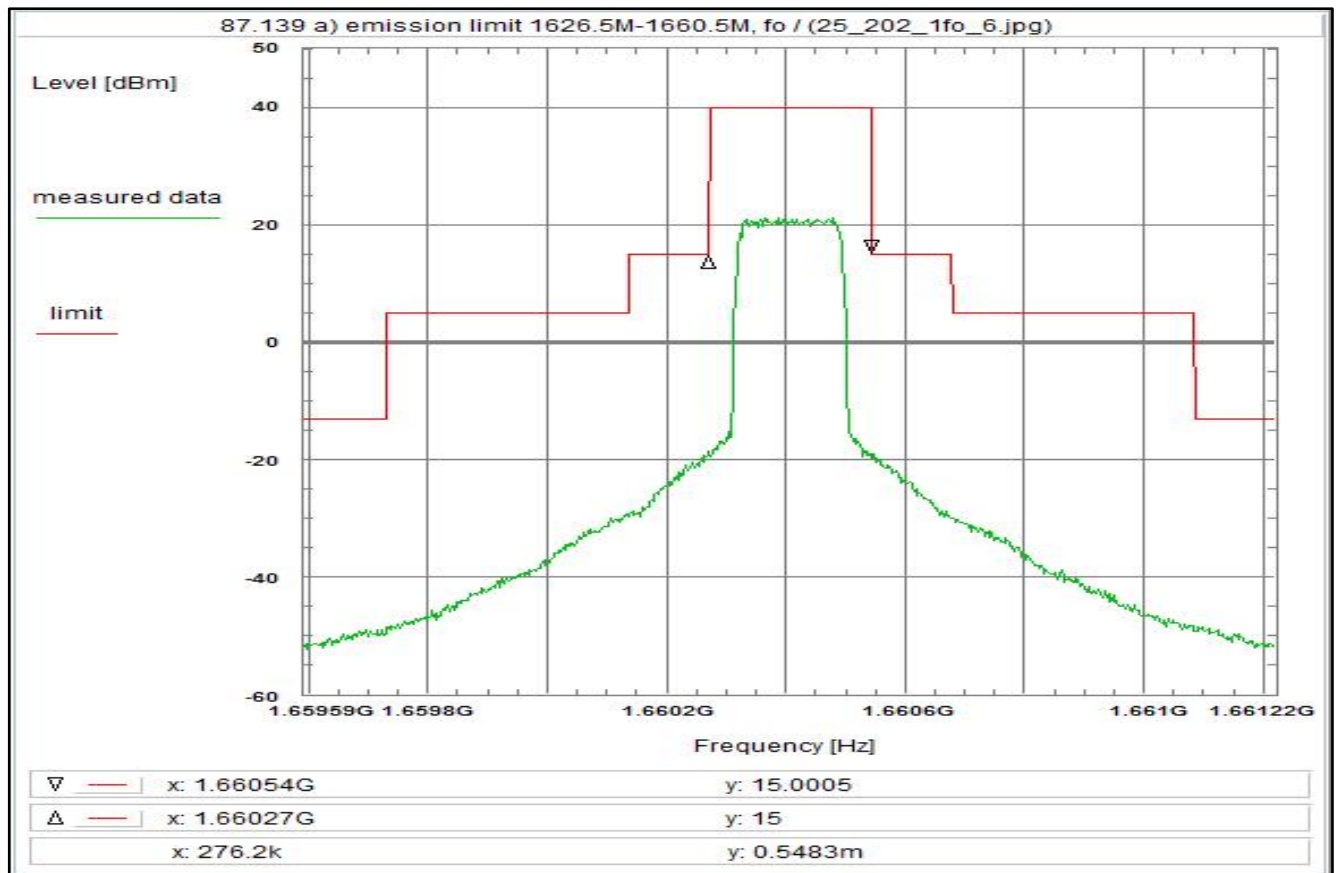
TOTAL CORRECTION: + 41.0 dB

Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 220



Subclause: 87.139 a) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier in the middle of the band (fo)

Limit:

Limit according to 87.139 a):

50-100% of assigned bw: -25dBc/4kHz

100-250% of assigned bw: -35dBc/4kHz

> 250% of assigned bw: $-43 + 10 \log(P_{max}) \text{ dBc/4kHz} = -43 \text{ dBW}$

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the above schedule.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4

fh, max hold, valid for FR80T5X16-FR80T5X32-FR80T5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:38:00

Location: CTC advanced GmbH, Laboratory RC-SYS

Temperature: 22 °C

Humidity: 55 %

Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.659592 GHz

Stop frequency: 1.661218 GHz

Center frequency: 1.660405 GHz

Frequency span: 1.626 MHz

Resolution-BW: 3 kHz

Video-BW: 10 kHz

Input attenuation: 15 dB

Trace-Mode: Clear Write

Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB

Coaxial cable (C107) + 1.3 dB

DUT-Antenna (on-axis) + 11.0 dBi

Test antenna + 0.0 dB

BW correction factor (3k -> 4k) + 1.2 dB

Atten. between HPA and feedhorn - 0.0 dB

(U330) + 31.9 dB

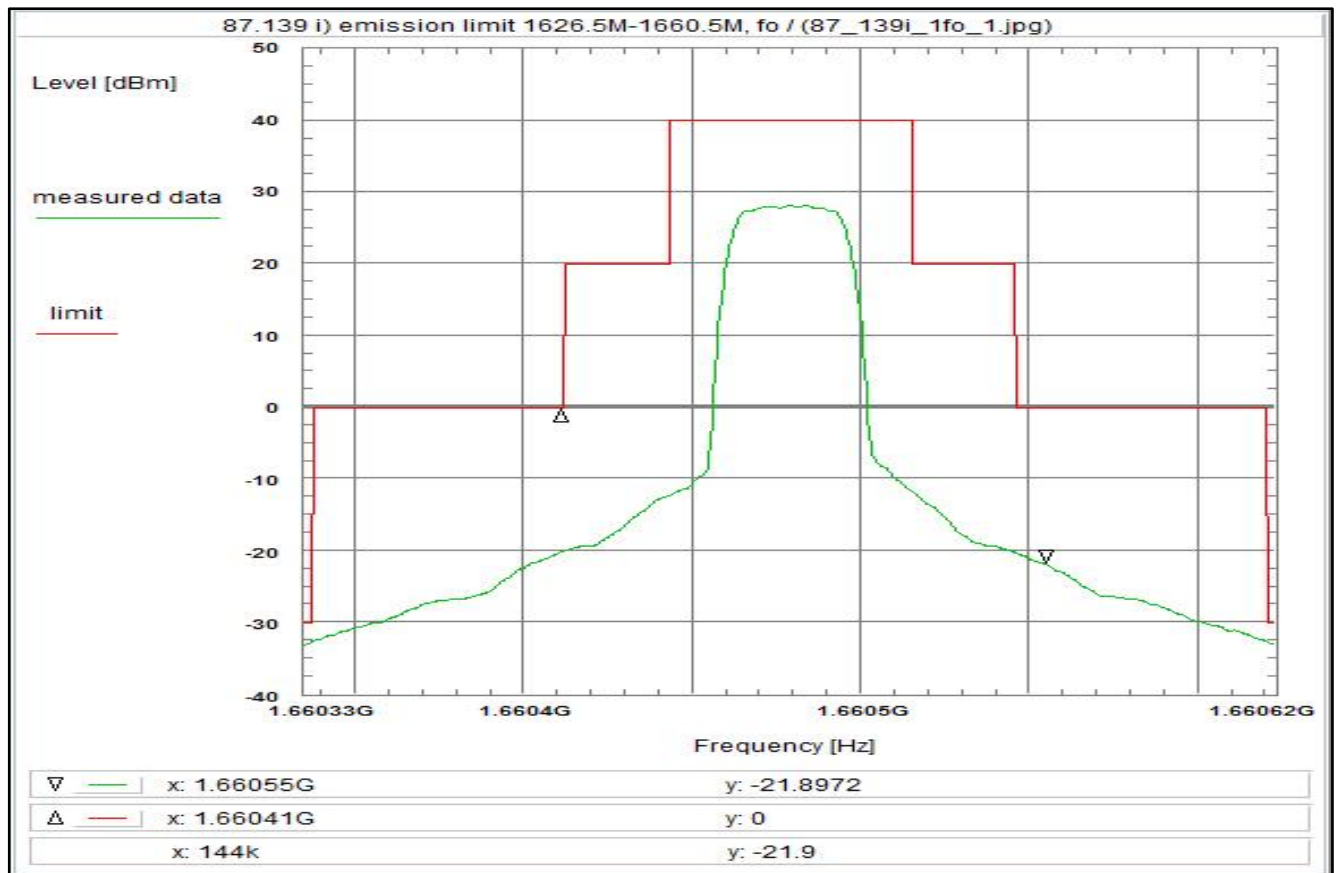
TOTAL CORRECTION: + 40.9 dB

Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

Reference limit = 40 dBm / Spectrum mask referenced to necessary bandwidth

Plot No. 221



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for R5T1XD-R20T1XD-R20T1QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:18:17
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66033475 GHz
Stop frequency: 1.66062275 GHz
Center frequency: 1.66047875 GHz
Frequency span: 288 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.4 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 41.0 dB

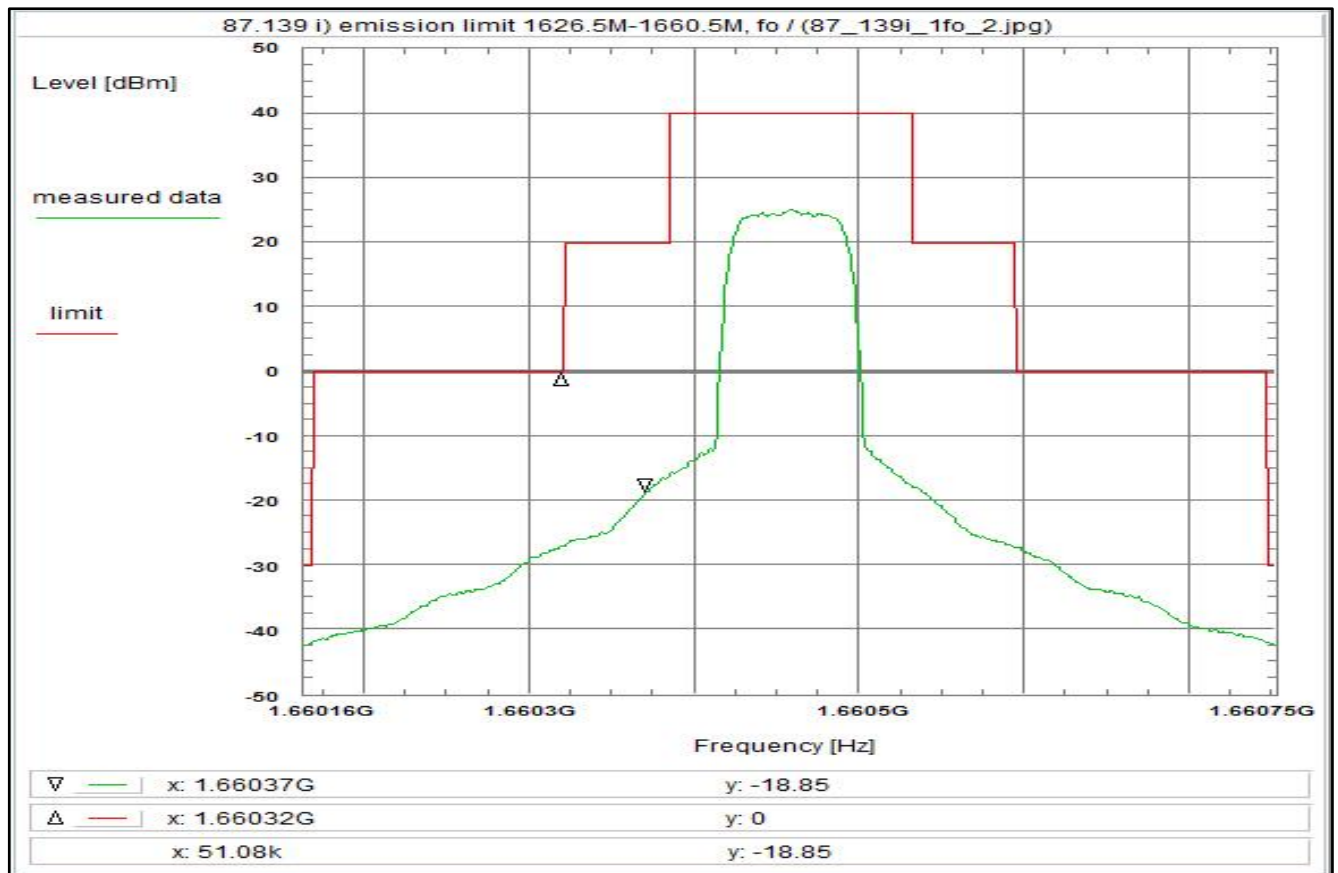
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 222



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for R5T2XD-R20T2XD-R5T2QD-R20T2QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:19:45
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6601635 GHz
Stop frequency: 1.6607515 GHz
Center frequency: 1.6604575 GHz
Frequency span: 588 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB
Coaxial cable (C107) + 1.4 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 41.0 dB

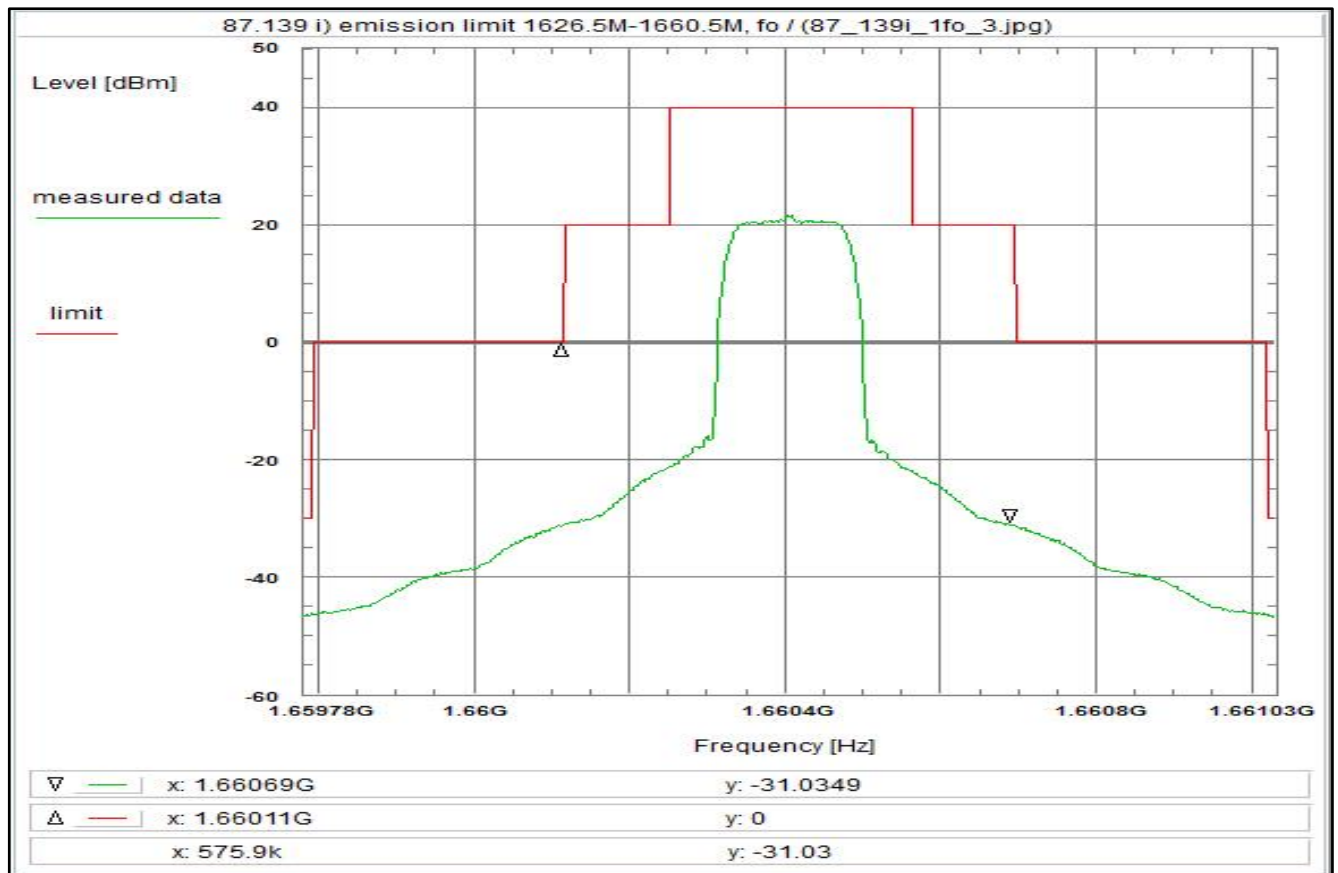
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 223



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for R5T4.5XD-R20T4.5XD-R5T4.5QD-R20T4.5QD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:29:26
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.659781 GHz
Stop frequency: 1.661029 GHz
Center frequency: 1.660405 GHz
Frequency span: 1.248 MHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.4 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 41.0 dB

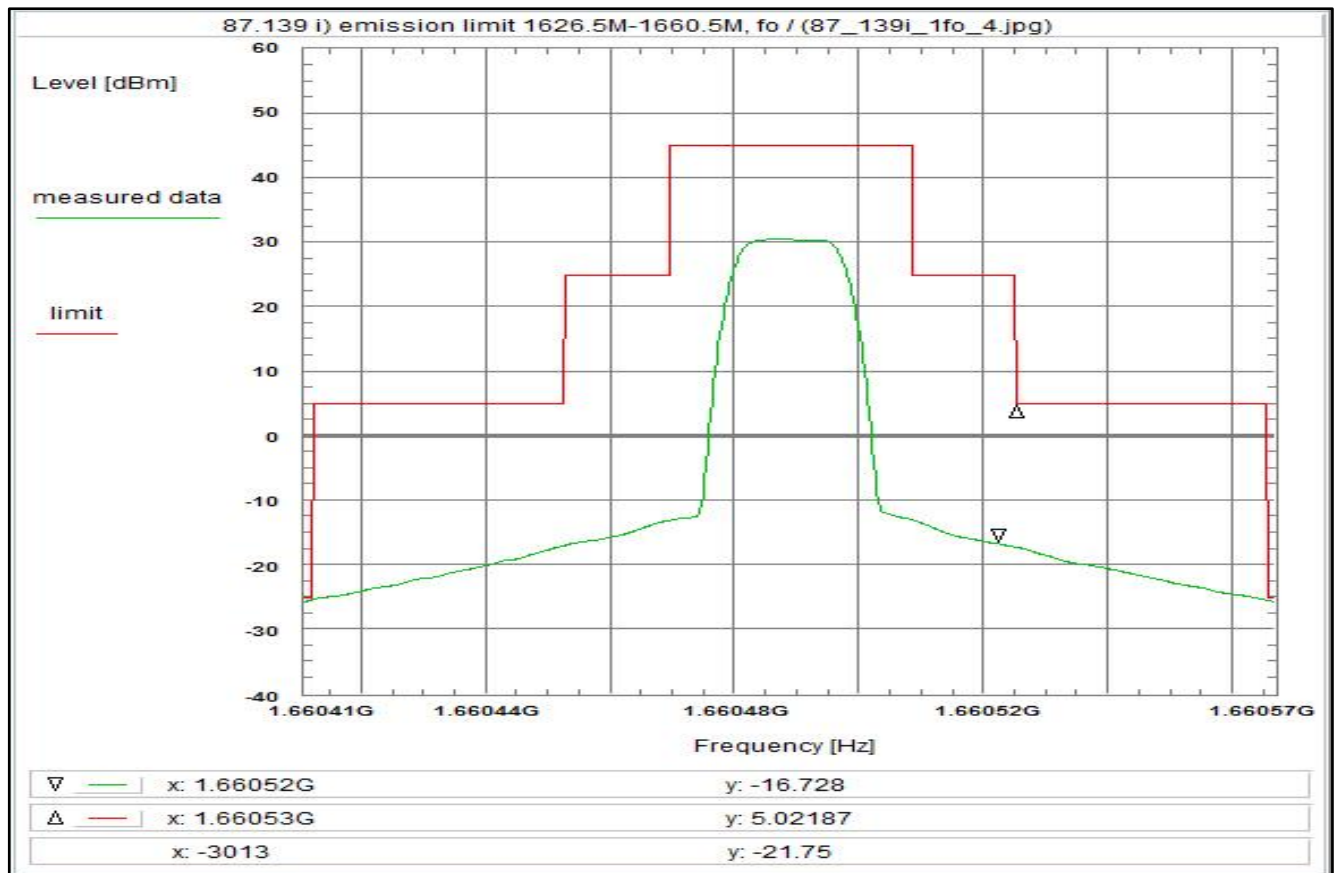
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 224



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for R20T0.5XD

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:31:55
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66041075 GHz
Stop frequency: 1.66056675 GHz
Center frequency: 1.66048875 GHz
Frequency span: 156 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 4.5 dB
Coaxial cable (C107) + 1.4 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 41.0 dB

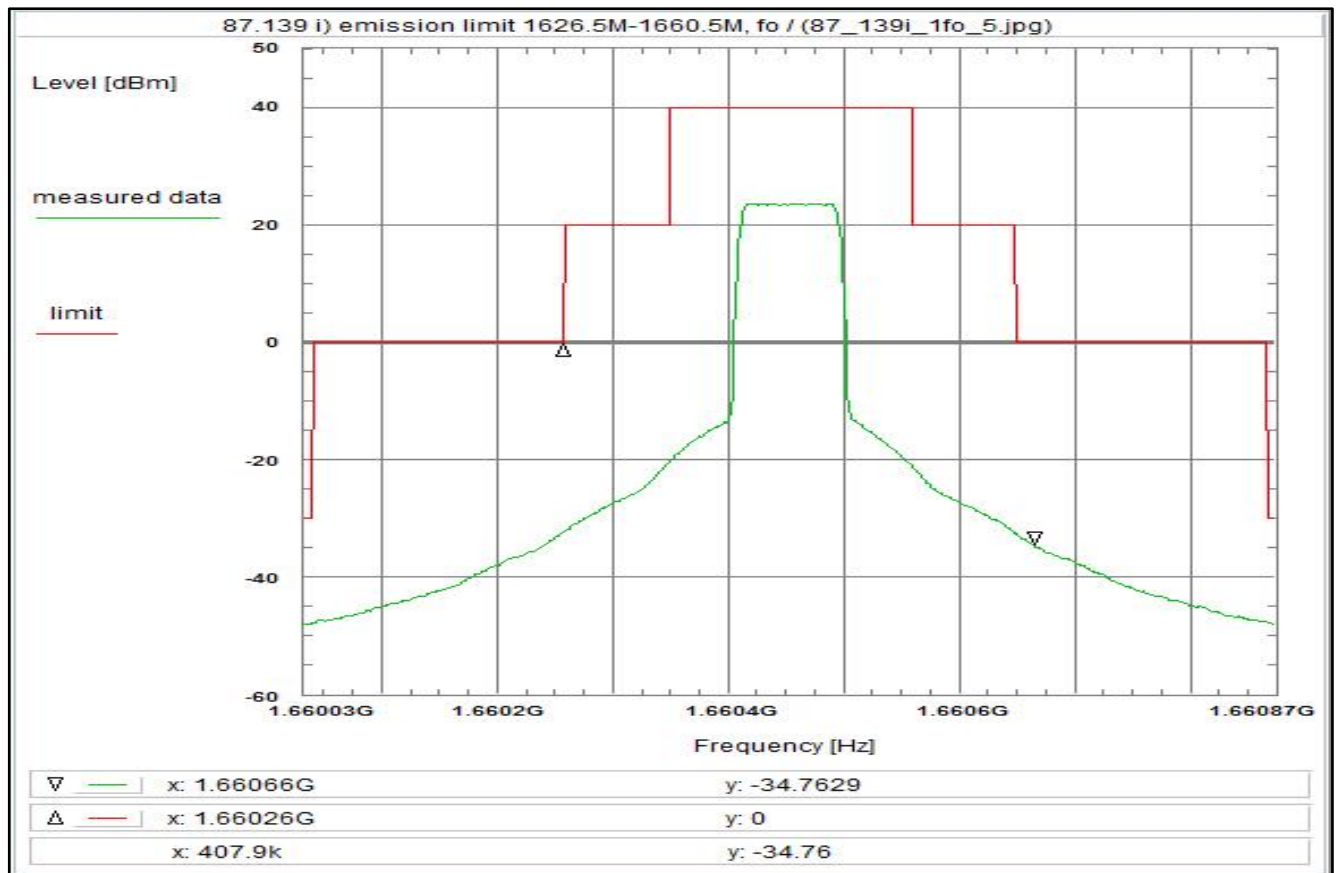
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 225



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, max hold, valid for FR80T2.5X16-FR80T2.5X32-FR80T2.5X64

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:35:59
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.6600325 GHz
Stop frequency: 1.6608725 GHz
Center frequency: 1.6604525 GHz
Frequency span: 840 kHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.4 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 41.0 dB

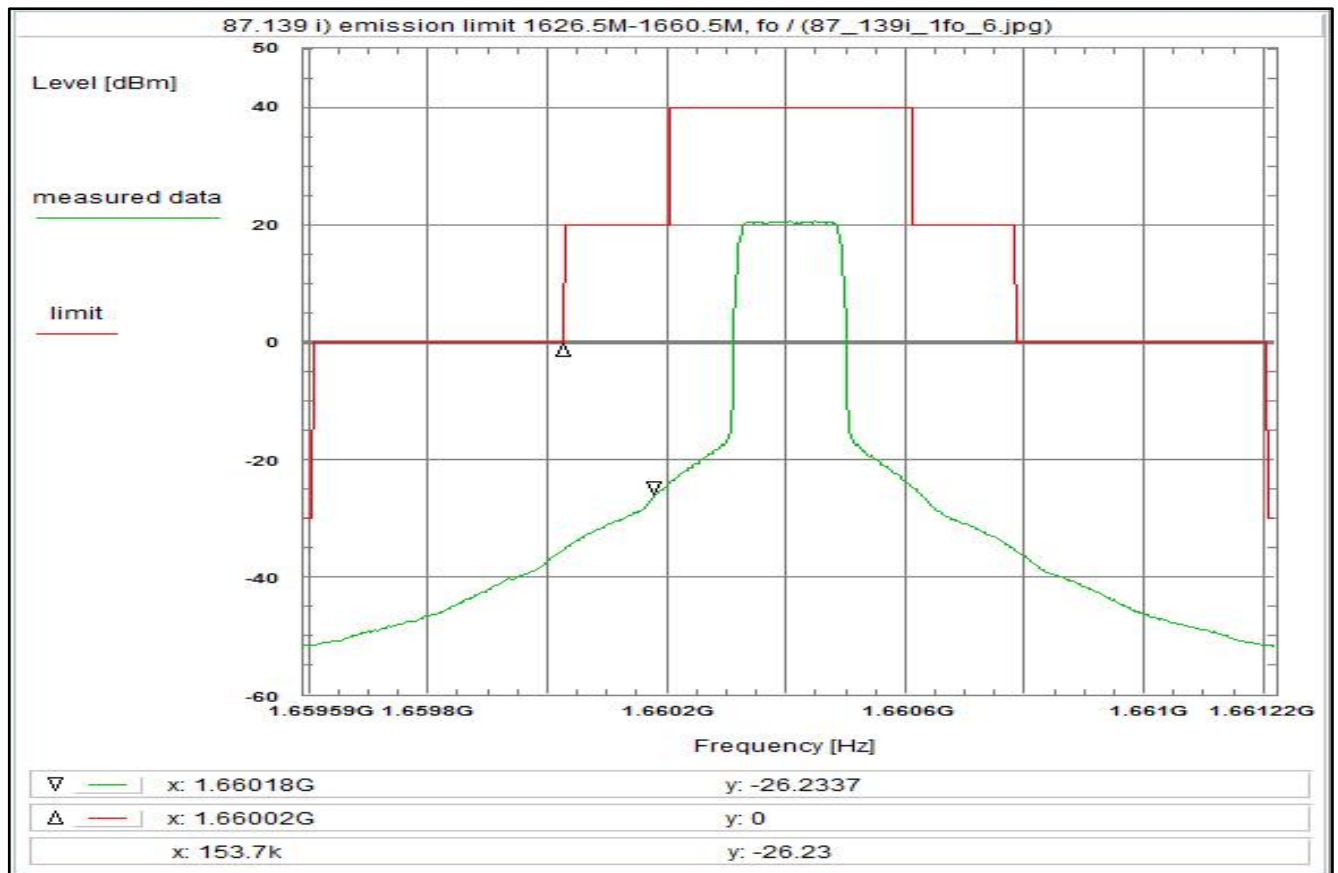
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 226



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4
fh, max hold, valid for FR80T5X16-FR80T5X32-FR80T5X64

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:37:19
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.659592 GHz
Stop frequency: 1.661218 GHz
Center frequency: 1.660405 GHz
Frequency span: 1.626 MHz
Resolution-BW: 3 kHz
Video-BW: 1 Hz
Input attenuation: 15 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE)	- 4.5 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor (3k -> 4k)	+ 1.2 dB
Atten. between HPA and feedhorn	- 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 40.9 dB

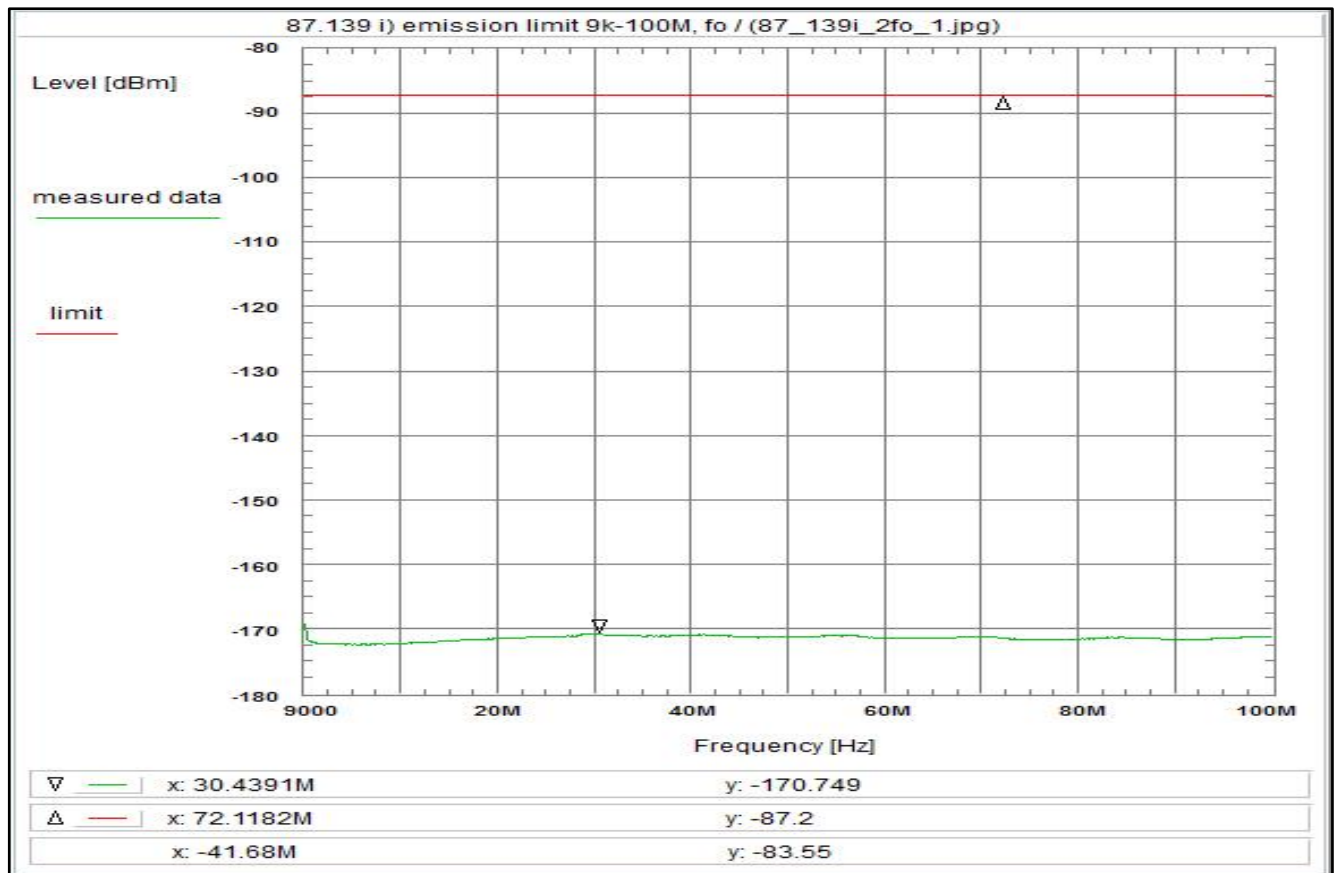
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 227



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4 fh, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:56:43
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 9 kHz
Stop frequency: 100 MHz
Center frequency: 50.0045 MHz
Frequency span: 99.991 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 20 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 115.7 dB
Coaxial cable (C107) + 0.5 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.3 dB
TOTAL CORRECTION: - 71.7 dB

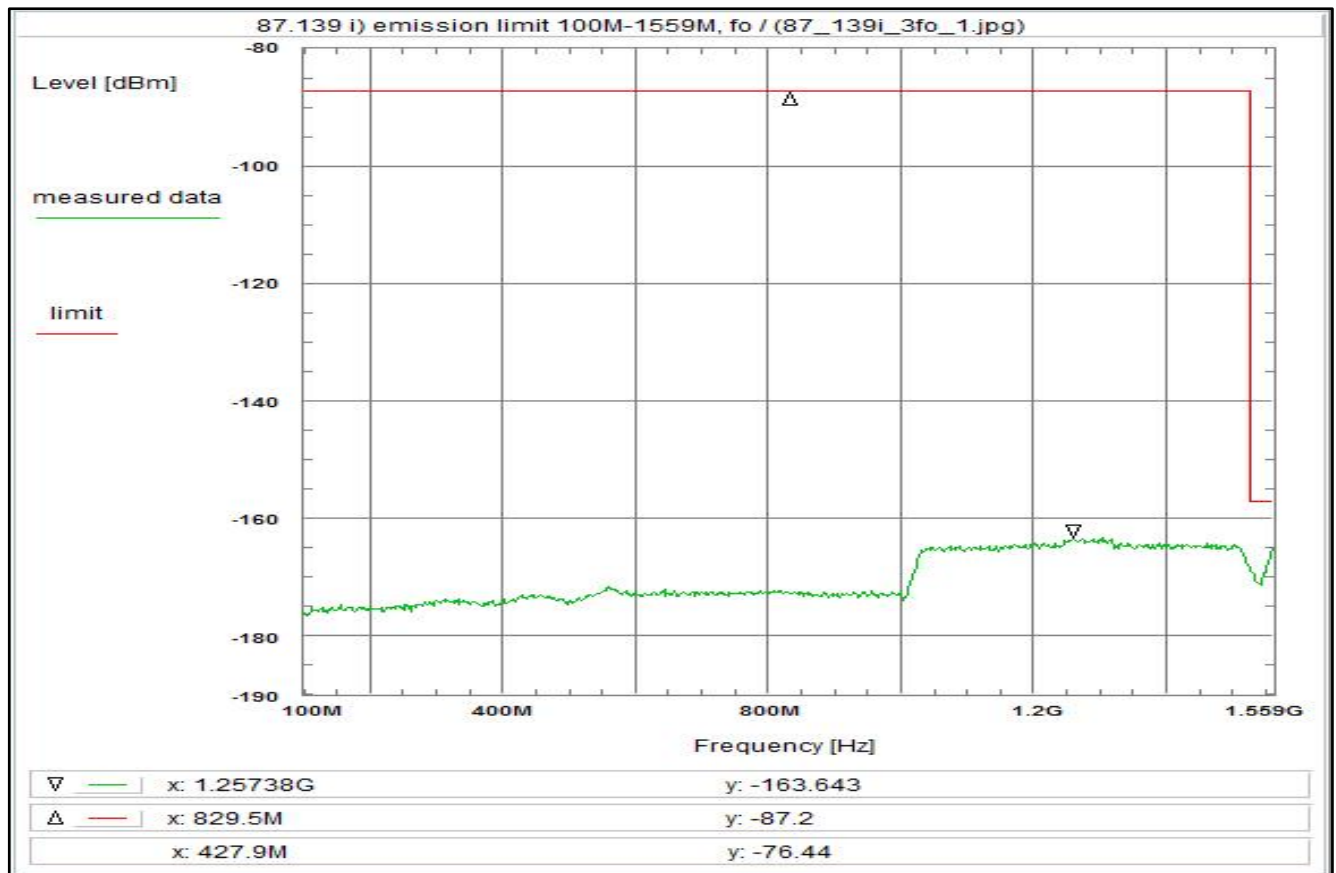
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 228



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4
fh, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:50:30
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 100 MHz
Stop frequency: 1.559 GHz
Center frequency: 829.5 MHz
Frequency span: 1.459 GHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 20 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 115.7 dB
Coaxial cable (C107) + 0.9 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.7 dB
TOTAL CORRECTION: - 70.9 dB

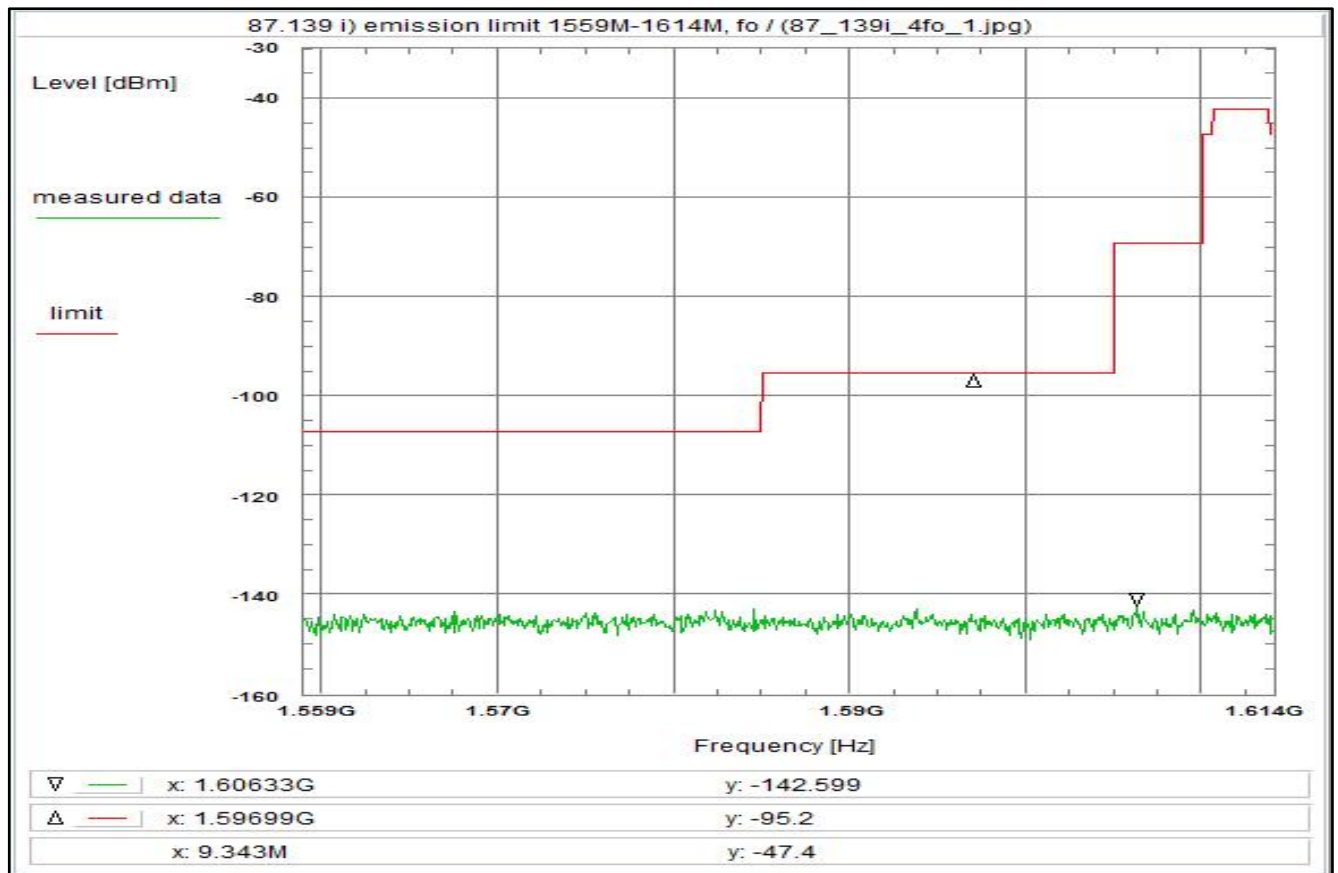
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 229



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4 fh, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330, W_RE

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:53:09
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.614 GHz
Center frequency: 1.5865 GHz
Frequency span: 55 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 20 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 115.7 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 1M) + 25.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 46.3 dB

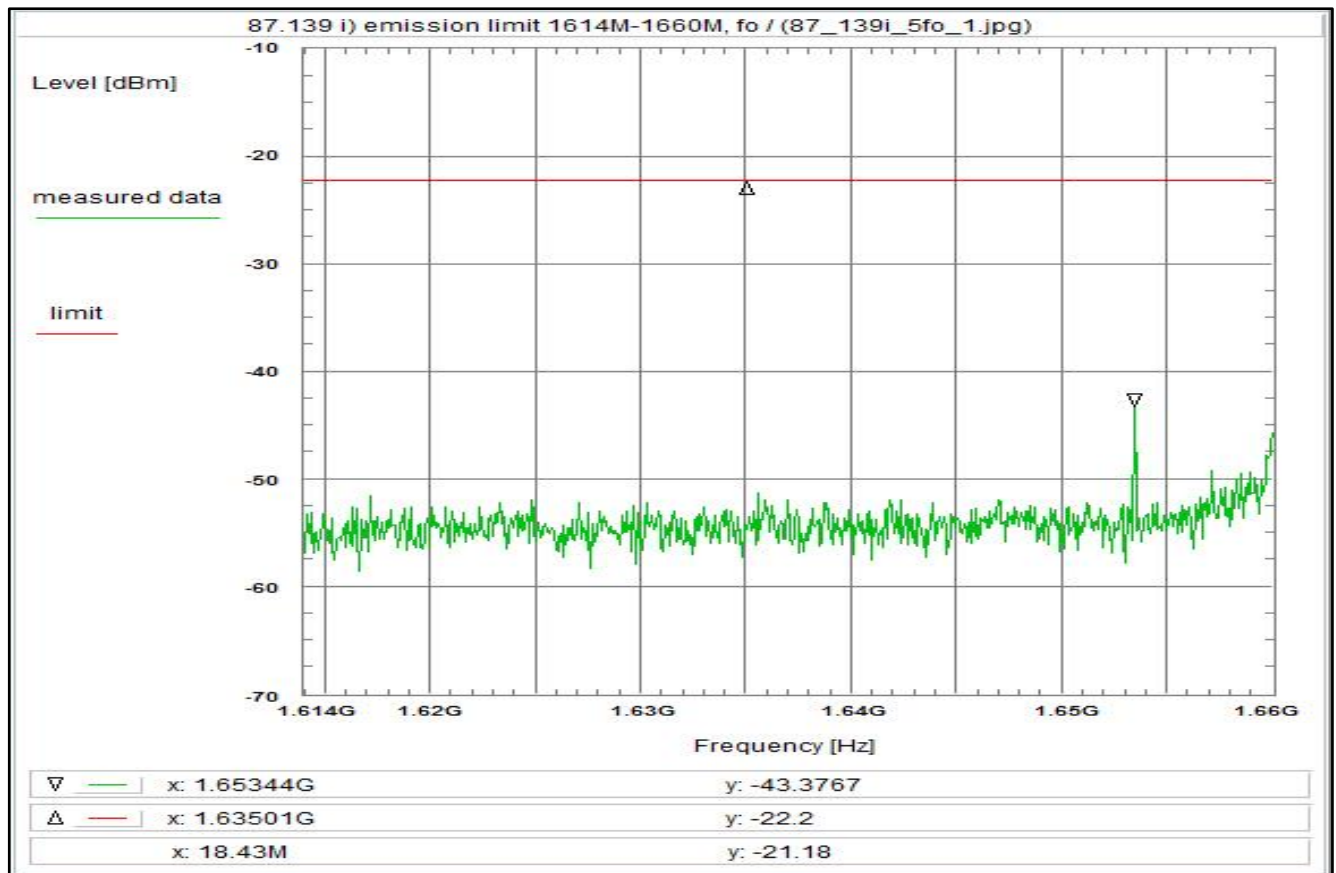
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 230



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:
Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see test report chapter 6.4 fh, valid for all modulations

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:48:50
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.614 GHz
Stop frequency: 1.66 GHz
Center frequency: 1.637 GHz
Frequency span: 46 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 20 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 45.4 dB

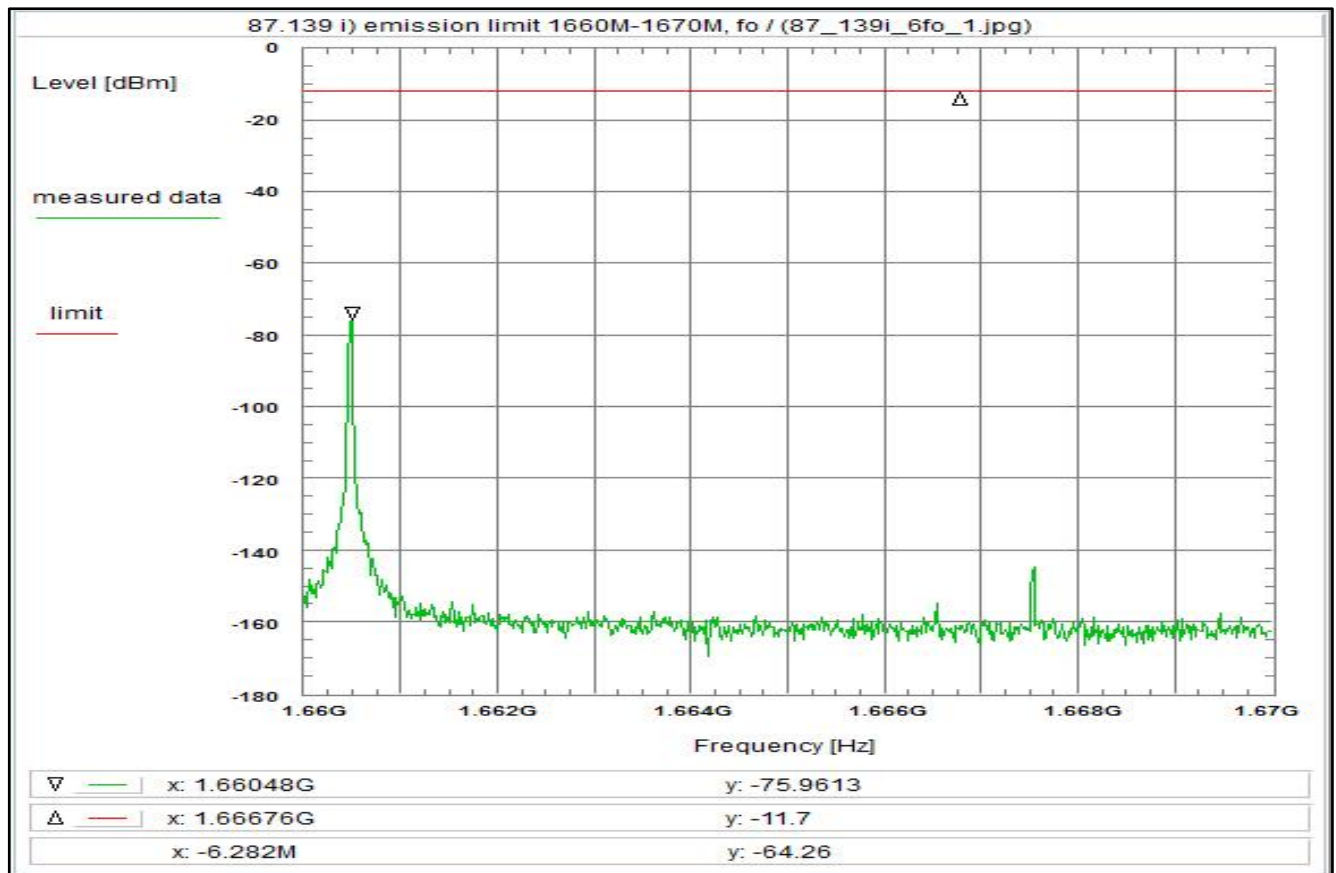
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 231



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fh, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:54:47
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.66 GHz
Stop frequency: 1.67 GHz
Center frequency: 1.665 GHz
Frequency span: 10 MHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 20 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

(W_RE) - 115.7 dB
Coaxial cable (C107) + 1.4 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 20k) + 8.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: - 63.2 dB

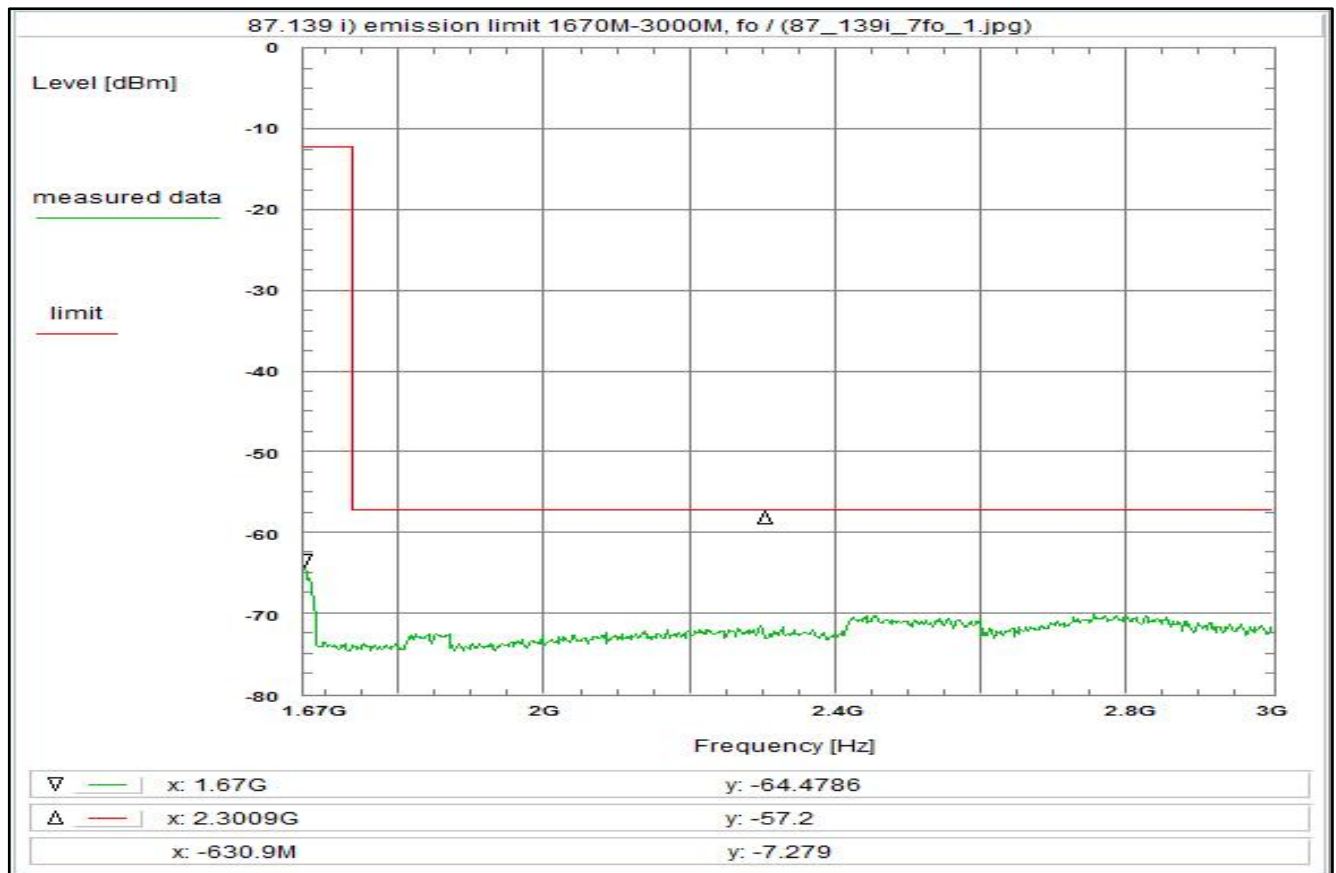
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 232



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4 fh, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:47:45
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.67 GHz
Stop frequency: 3 GHz
Center frequency: 2.335 GHz
Frequency span: 1.33 GHz
Resolution-BW: 3 kHz
Video-BW: 30 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.5 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (3k -> 4k) + 1.2 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 32.0 dB
TOTAL CORRECTION: + 45.7 dB

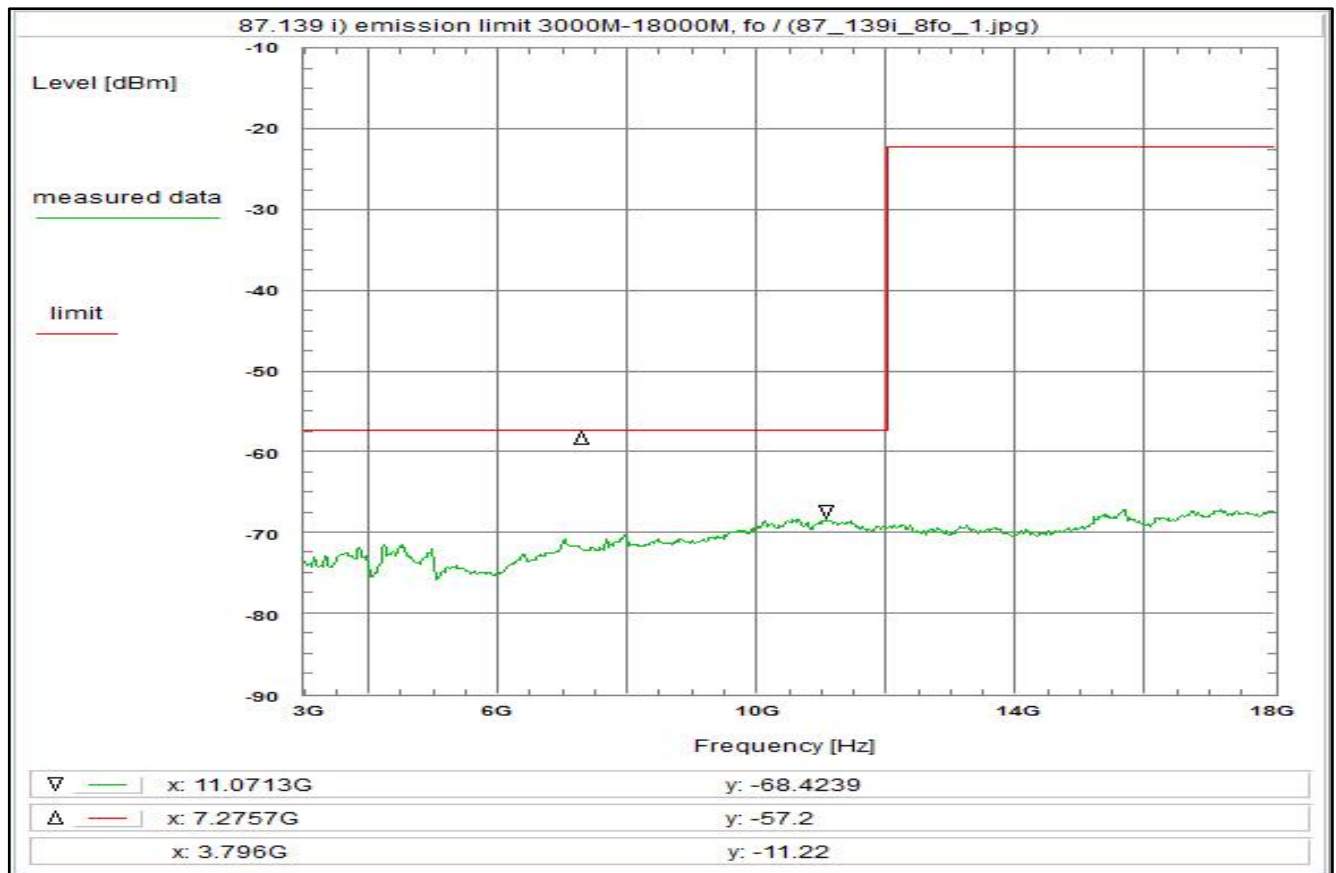
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 233



Subclause: 87.139 i) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the upper edge of the band (fo)

Limit:

Limit according to 87.139(i)(1)
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with 87.139(i)(1).

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fh, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:47:05
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 3 GHz
Stop frequency: 18 GHz
Center frequency: 10.5 GHz
Frequency span: 15 GHz
Resolution-BW: 10 kHz
Video-BW: 100 kHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 3.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor (10k -> 4k) - 0.0 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 33.4 dB
TOTAL CORRECTION: + 43.7 dB

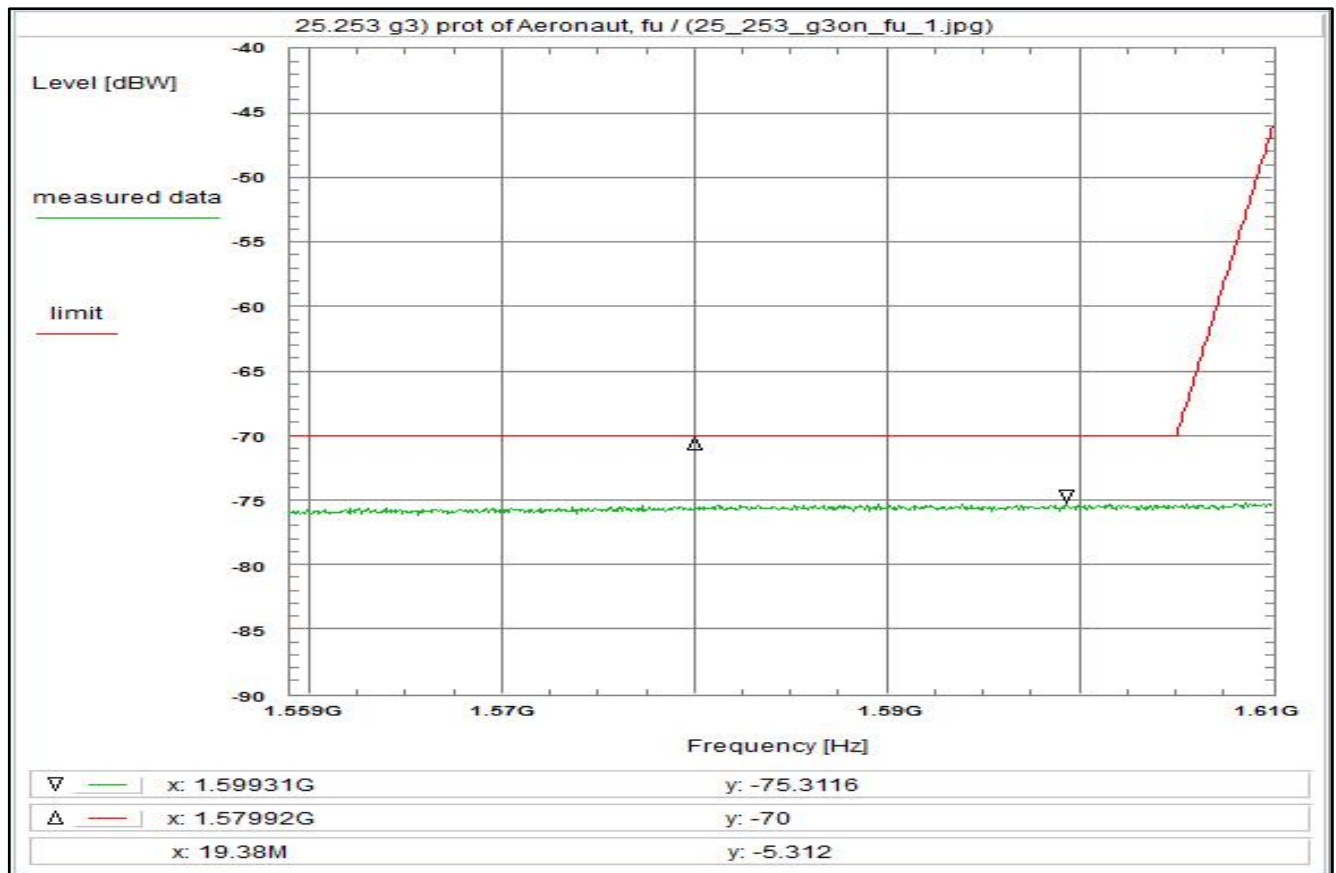
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 234



Subclause: 25.253 g3) Special requirements for ancillary terrestrial components operating in the 1626.5-1660.5 MHz / 1525-1559 MHz bands
Carrier-on state, modulated carrier at the lower edge of the band (fu)
Conducted measurement at the antenna-connector

Limit:

Limit according to 25.253 g3):

1559.0 - 1605.0MHz: -70dBW/1MHz

1605.0 - 1610MHz: -70 to -46dBW/1MHz (linear interpolated)

The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fi, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:21:36
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.61 GHz
Center frequency: 1.5845 GHz
Frequency span: 51 MHz
Resolution-BW: 1 MHz
Video-BW: 10 MHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Directional coupler	- 0.0 dB
Coaxial cable (C107)	+ 1.3 dB
DUT-Antenna (on-axis)	+ 11.0 dBi
Test antenna	+ 0.0 dB
BW correction factor	+ 0.0 dB
Atten. between HPA and feedhorn	+ 0.0 dB
(U330)	+ 31.9 dB
TOTAL CORRECTION:	+ 44.2 dB

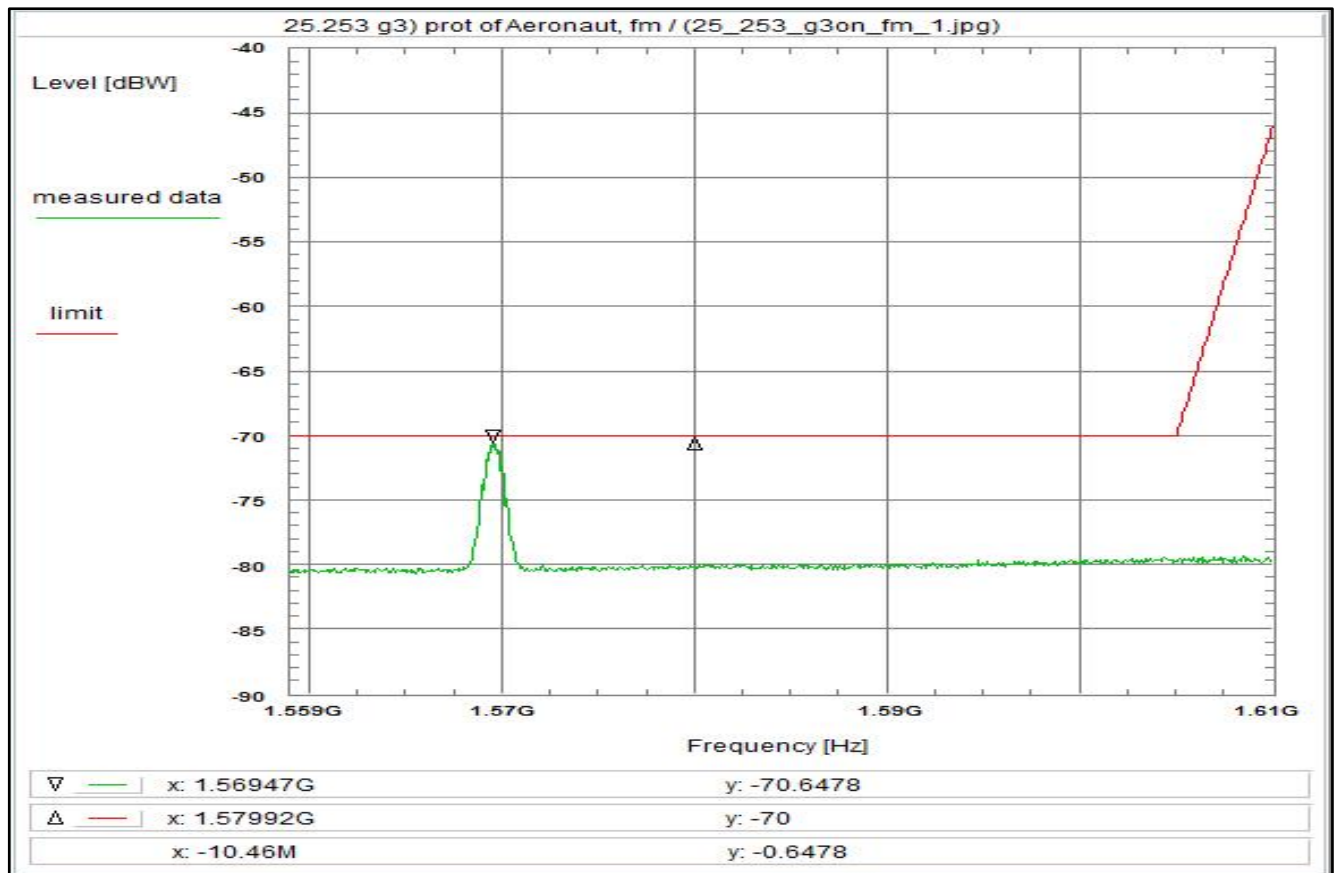
Remarks:

Carrier-on state / Carrier at the lower edge of the band (fu)
Measurement with 1 MHz resolution/video filter and noise averaging.

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 235



Subclause: 25.253 g3) Special requirements for ancillary terrestrial components operating in the 1626.5-1660.5 MHz / 1525-1559 MHz bands
Carrier-on state, modulated carrier in the middle of the band (fm)
Conducted measurement at the antenna-connector

Limit:

Limit according to 25.253 g3):

1559.0 - 1605.0MHz: -70dBW/1MHz

1605.0 - 1610MHz: -70 to -46dBW/1MHz (linear interpolated)

The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fm, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:39:54
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.61 GHz
Center frequency: 1.5845 GHz
Frequency span: 51 MHz
Resolution-BW: 1 MHz
Video-BW: 10 MHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor + 0.0 dB
Atten. between HPA and feedhorn - 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 44.2 dB

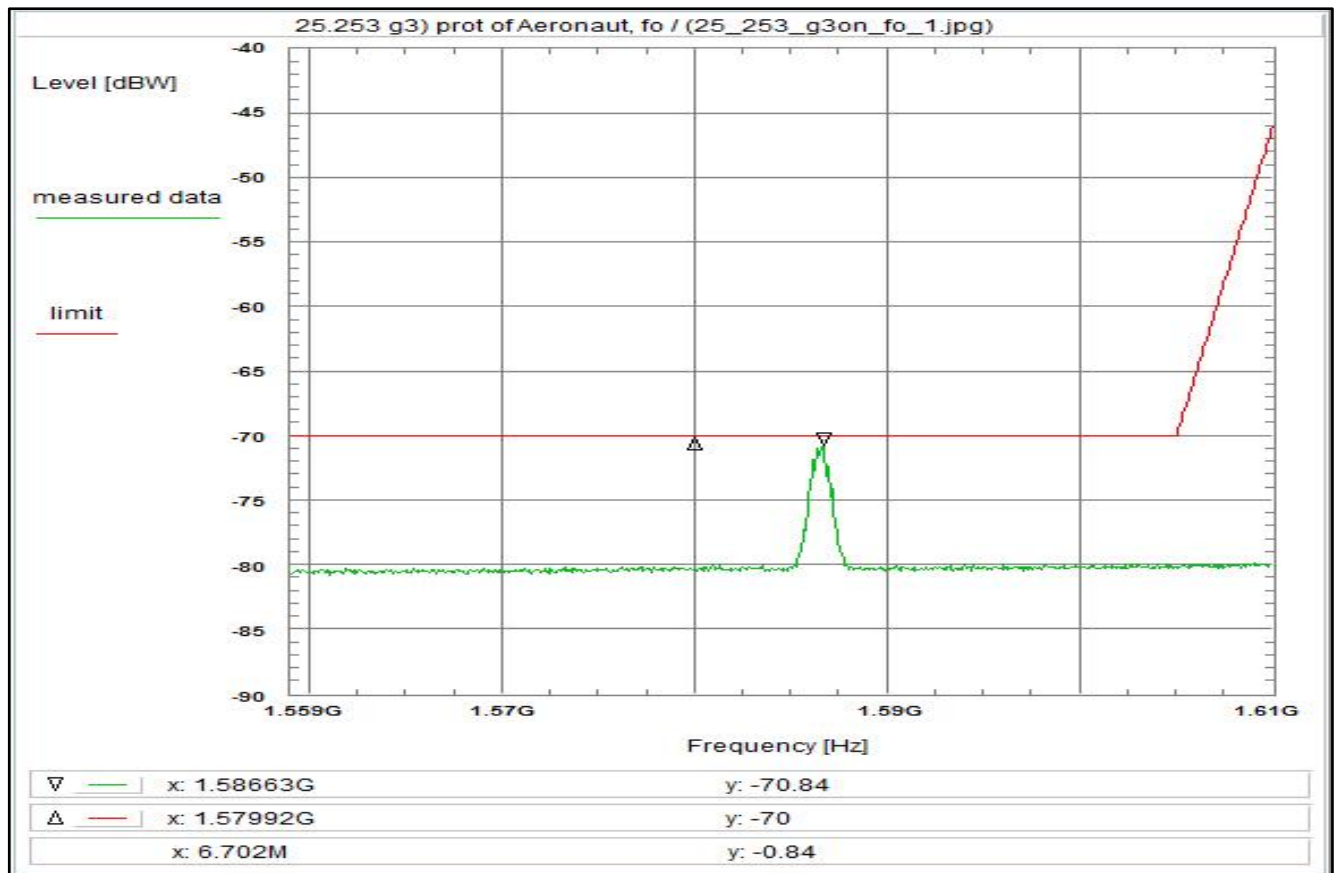
Remarks:

Carrier-on state / Carrier in the middle of the band (fm)
Measurement with 1 MHz resolution/video filter and noise averaging.

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 236



Subclause: 25.253 g3) Special requirements for ancillary terrestrial components operating in the 1626.5-1660.5 MHz / 1525-1559 MHz bands
Carrier-on state, modulated carrier at the upper edge of the band (fo)
Conducted measurement at the antenna-connector

Limit:

Limit according to 25.253 g3):

1559.0 - 1605.0MHz: -70dBW/1MHz

1605.0 - 1610MHz: -70 to -46dBW/1MHz (linear interpolated)

The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:

see plot (an explicit table was not generated)

Operating condition of DUT:

operating condition 1, see test report chapter 6.4
fn, valid for all modulations

Test setup:

see test report chapter 7.2:

Test equipment:

see test report chapter 7.1-7.2: C107, R001, U330

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 12:44:50
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.61 GHz
Center frequency: 1.5845 GHz
Frequency span: 51 MHz
Resolution-BW: 1 MHz
Video-BW: 10 MHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor + 0.0 dB
Atten. between HPA and feedhorn + 0.0 dB
(U330) + 31.9 dB
TOTAL CORRECTION: + 44.2 dB

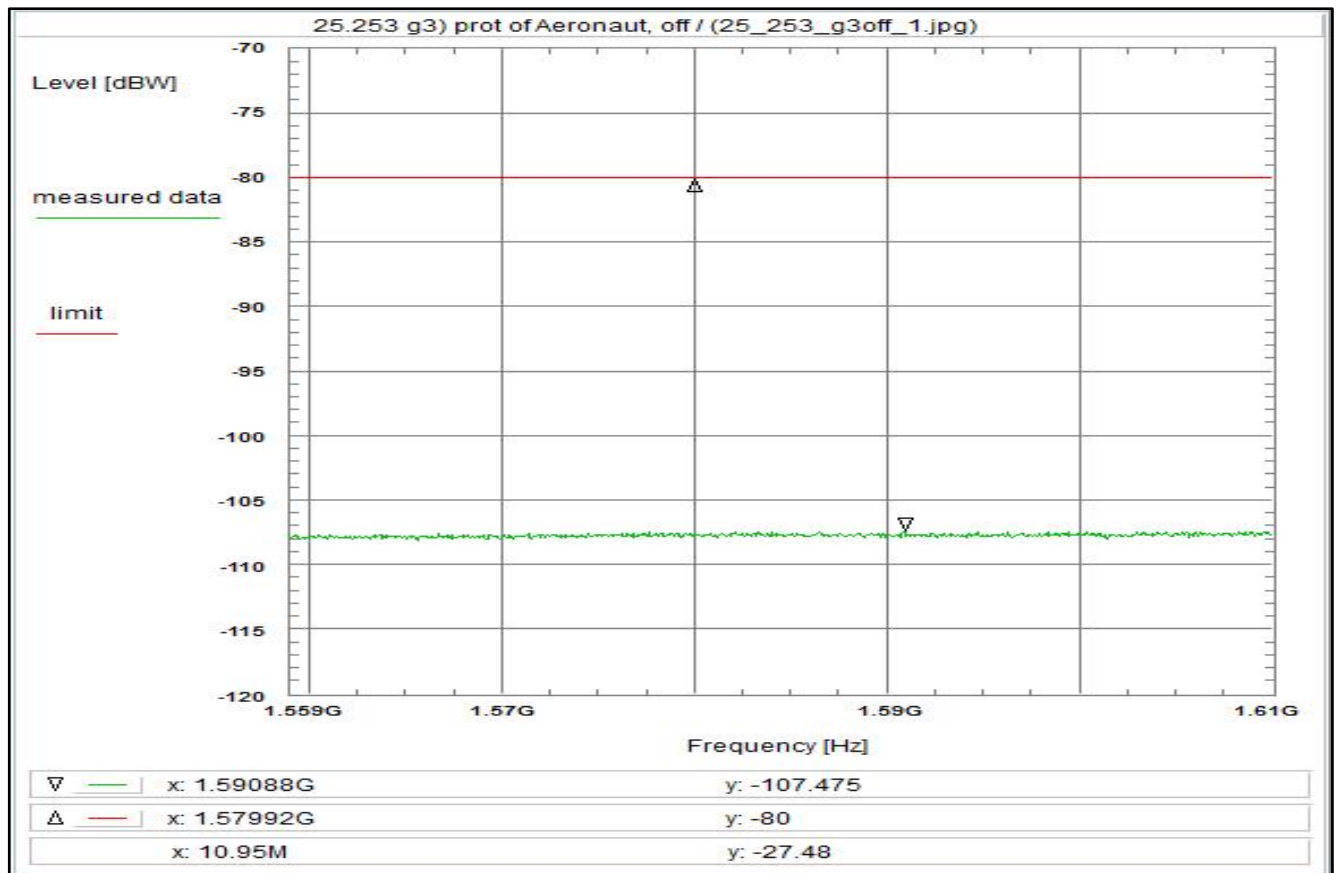
Remarks:

Carrier-on state / Carrier at the upper edge of the band (fo)
Measurement with 1 MHz resolution/video filter and noise averaging.

For EIRP calculation:

'worst-case' = maximum antenna gain

Plot No. 237



Subclause: 25.253 g3) Special requirements for ancillary terrestrial components operating in the 1626.5-1660.5 MHz / 1525-1559 MHz bands
Carrier-off state, conducted measurement at the antenna-connector

Limit:
Limit according to 25.253 g3): -80dBW/1MHz

The EIRP, averaged over any two-millisecond active transmission interval from the MESS in the carrier-off state shall not exceed the limit above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 2, see test report chapter 6.4
TX-Off

Test setup:
see test report chapter 7.2:

Test equipment:
see test report chapter 7.1-7.2: C107, R001

Remark:

Test result: Test passed

Environment condition:

Date & Time: Wed 27/Sep/2023 15:40:53
Location: CTC advanced GmbH, Laboratory RC-SYS
Temperature: 22 °C
Humidity: 55 %
Voltage: 230 Vac

Setup of measurement equipment:

Start frequency: 1.559 GHz
Stop frequency: 1.61 GHz
Center frequency: 1.5845 GHz
Frequency span: 51 MHz
Resolution-BW: 1 MHz
Video-BW: 10 MHz
Input attenuation: 0 dB
Trace-Mode: Clear Write
Detector-Mode: AVG

Correction:

Direction coupler - 0.0 dB
Coaxial cable (C107) + 1.3 dB
DUT-Antenna (on-axis) + 11.0 dBi
Test antenna + 0.0 dB
BW correction factor + 0.0 dB
Atten. between HPA and feedhorn - 0.0 dB
(+ 0.0 dB
TOTAL CORRECTION: + 12.3 dB

Remarks:

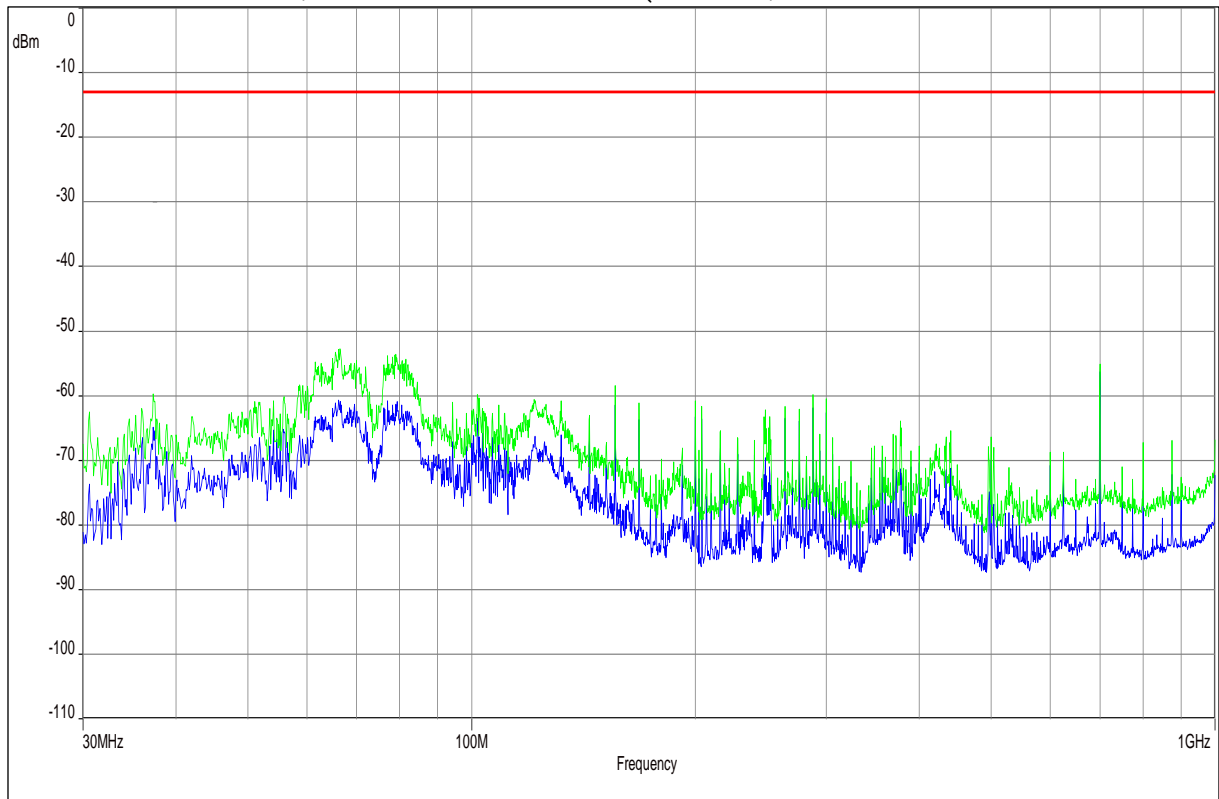
Carrier-off state.
Measurement with 1 MHz resolution filter and noise averaging.

For EIRP calculation:
'worst-case' = maximum antenna gain

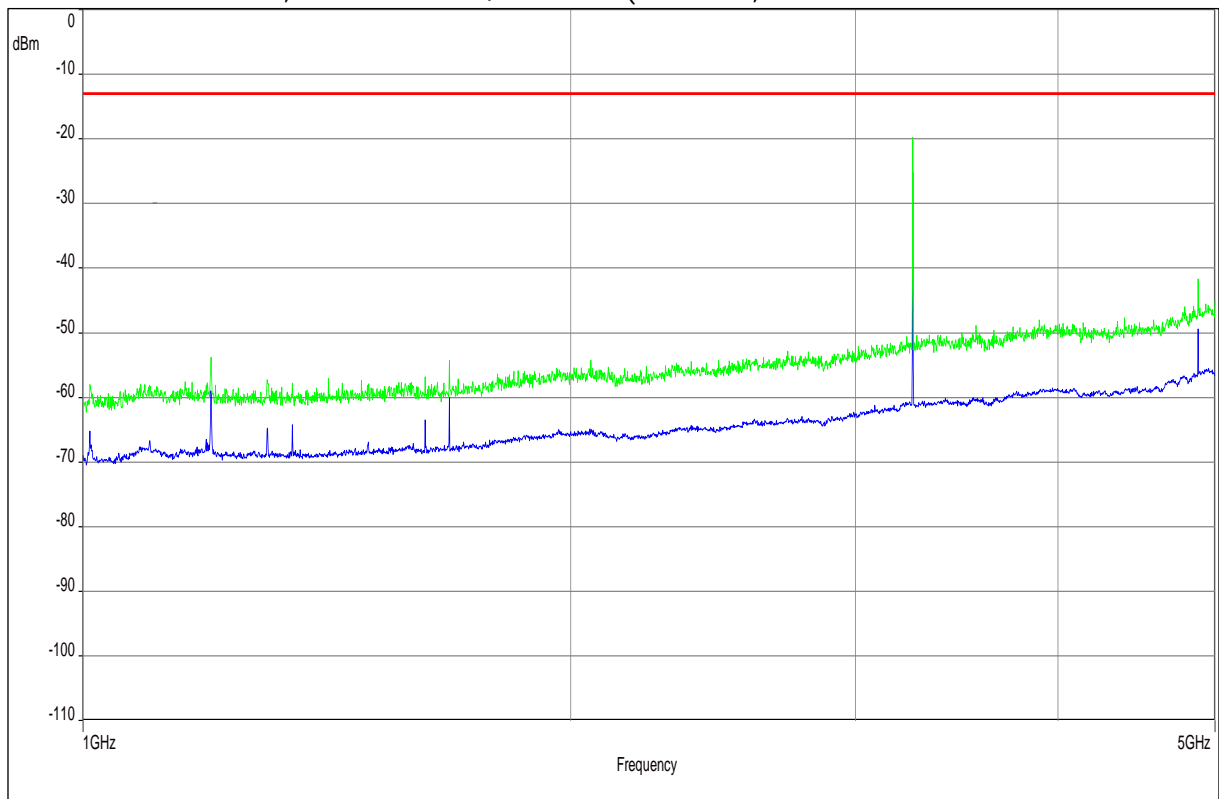
4. Measurement results, Spurious emissions 30MHz - 18 GHz

This Chapter 4 consists of 7 pages including this page.

Plot No. 238: 30 MHz – 1 GHz, antenna vertical/horizontal (CLASS 15, valid for all channels and all modulations)

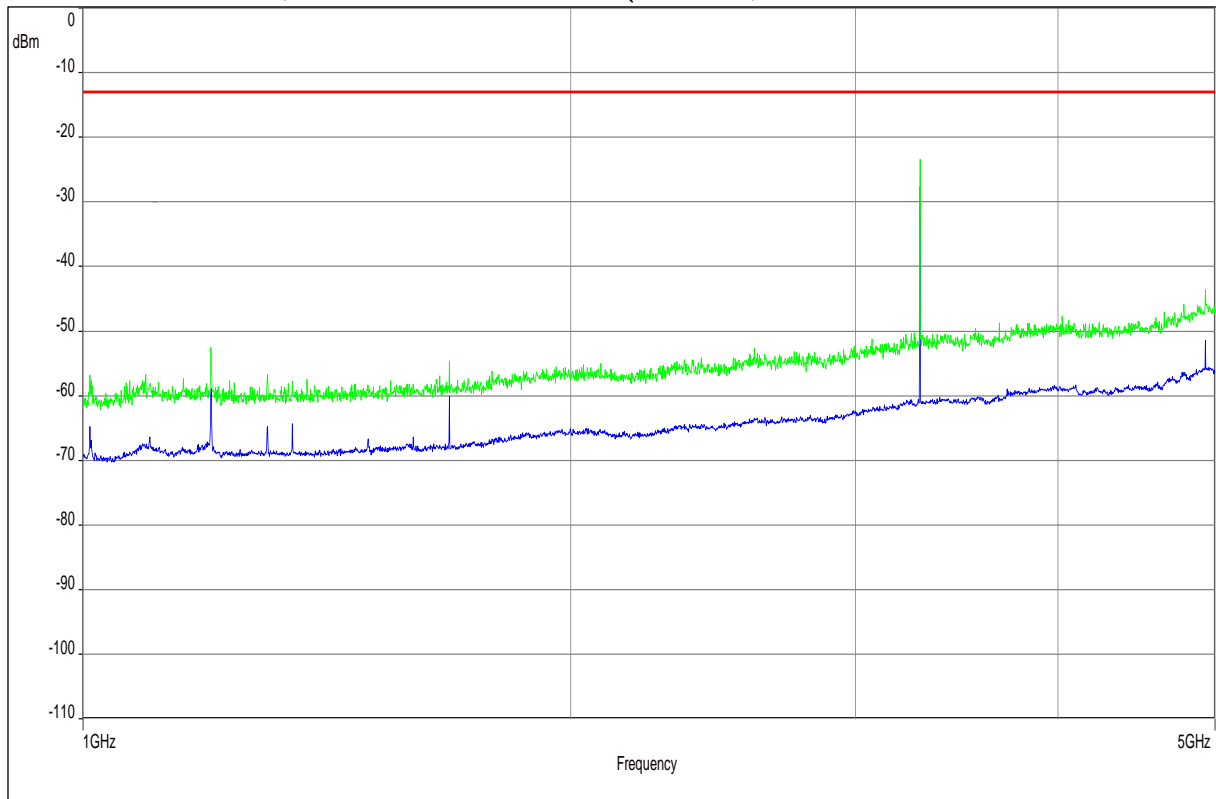


Plot No. 239: 1 GHz – 5 GHz, antenna vertical/horizontal (CLASS 15, valid for low channels and all modulations)



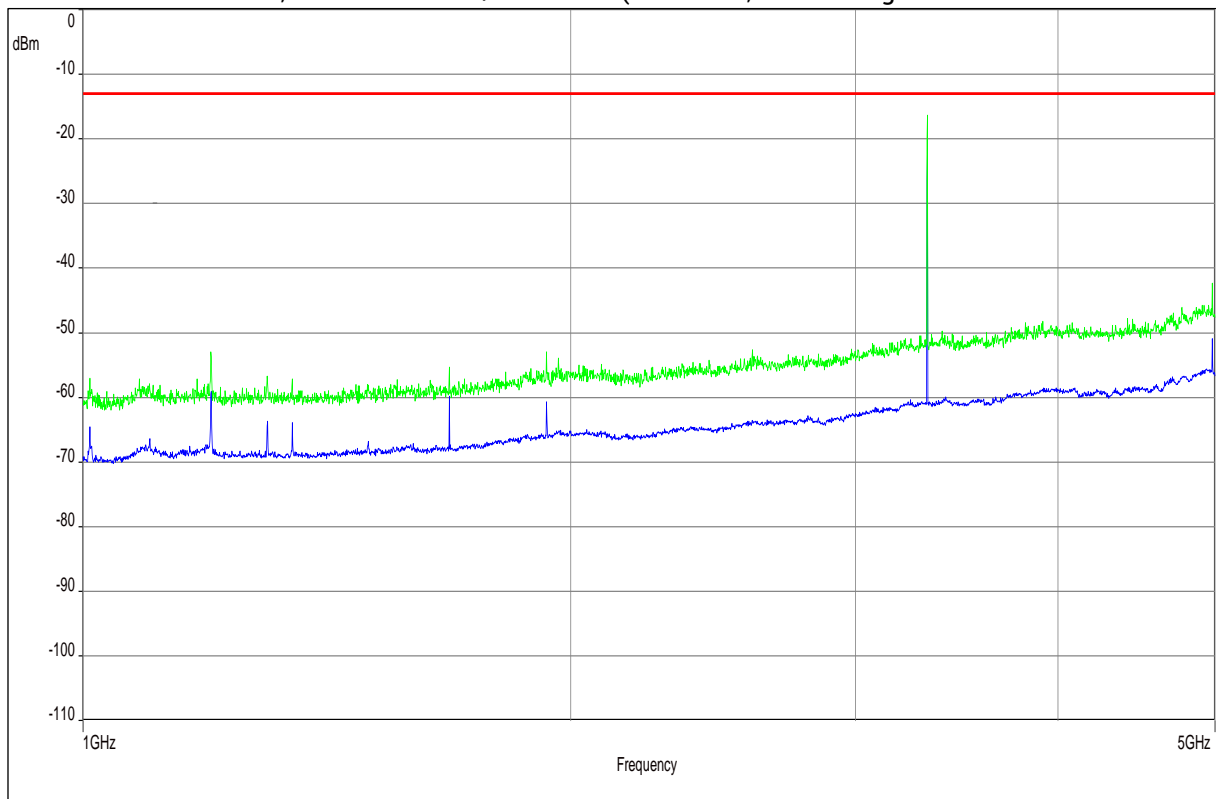
Wanted signal notched with WRCGV14-1616-1626-1661-1671-70SS Band Reject Filter

Plot No. 240: 1 GHz – 5 GHz, antenna vertical/horizontal (CLASS 15, valid for mid channels and all modulations)



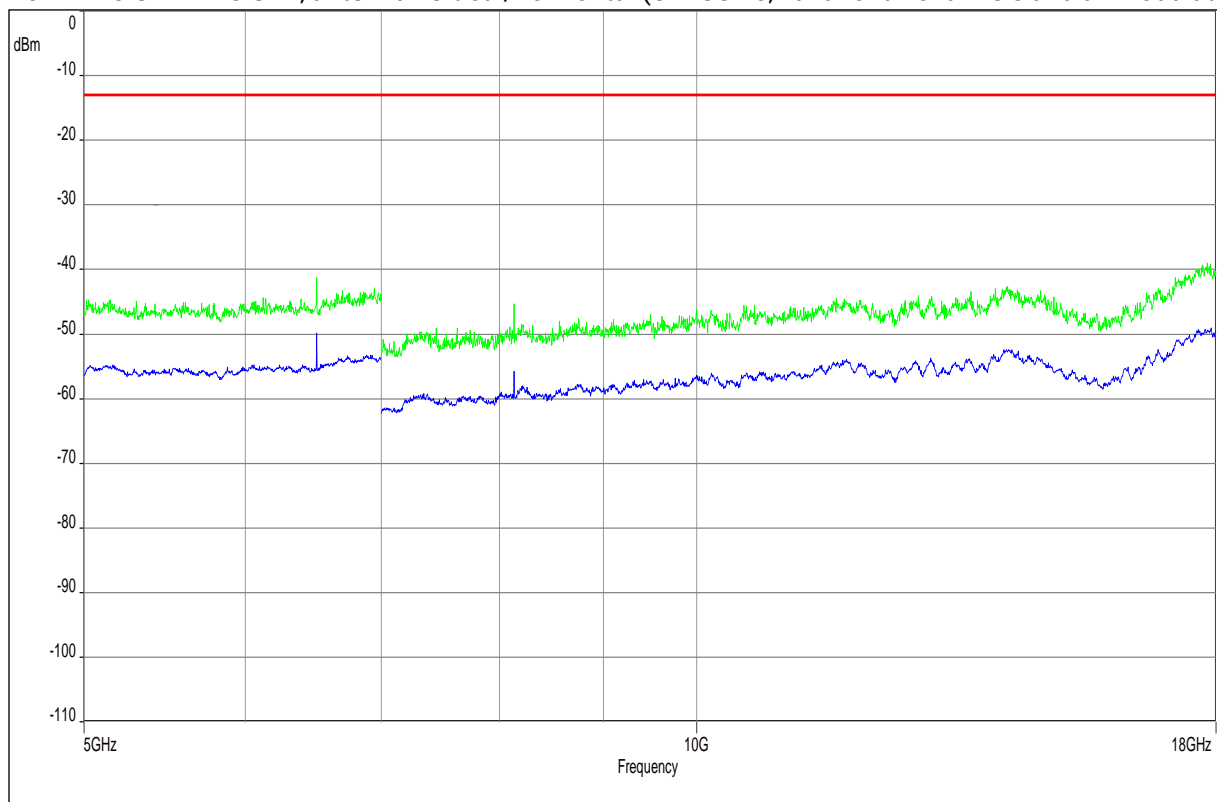
Wanted signal notched with WRCGV14-1616-1626-1661-1671-70SS Band Reject Filter

Plot No. 241: 1 GHz – 5 GHz, antenna vertical/horizontal (CLASS 15, valid for high channels and all modulations)



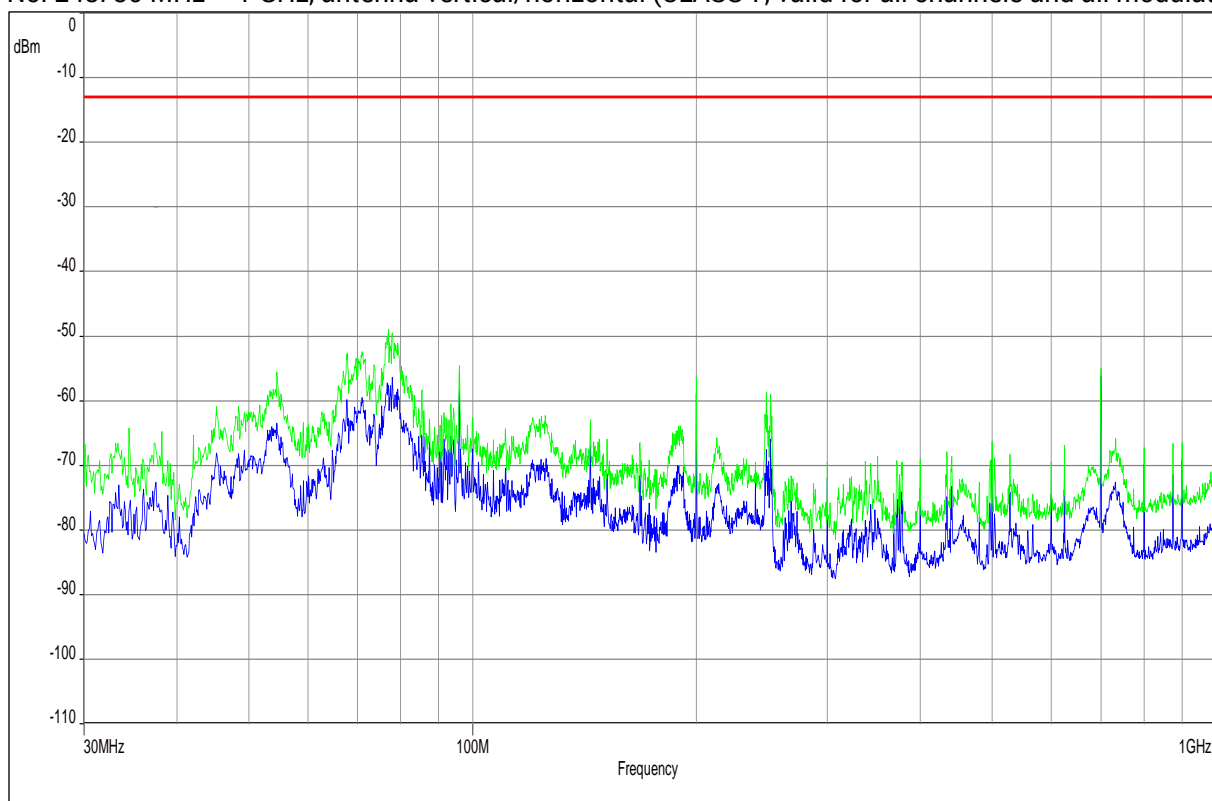
Wanted signal notched with WRCGV14-1616-1626-1661-1671-70SS Band Reject Filter

Plot No. 242: 5 GHz – 18 GHz, antenna vertical/horizontal (CLASS 15, valid for all channels and all modulations)

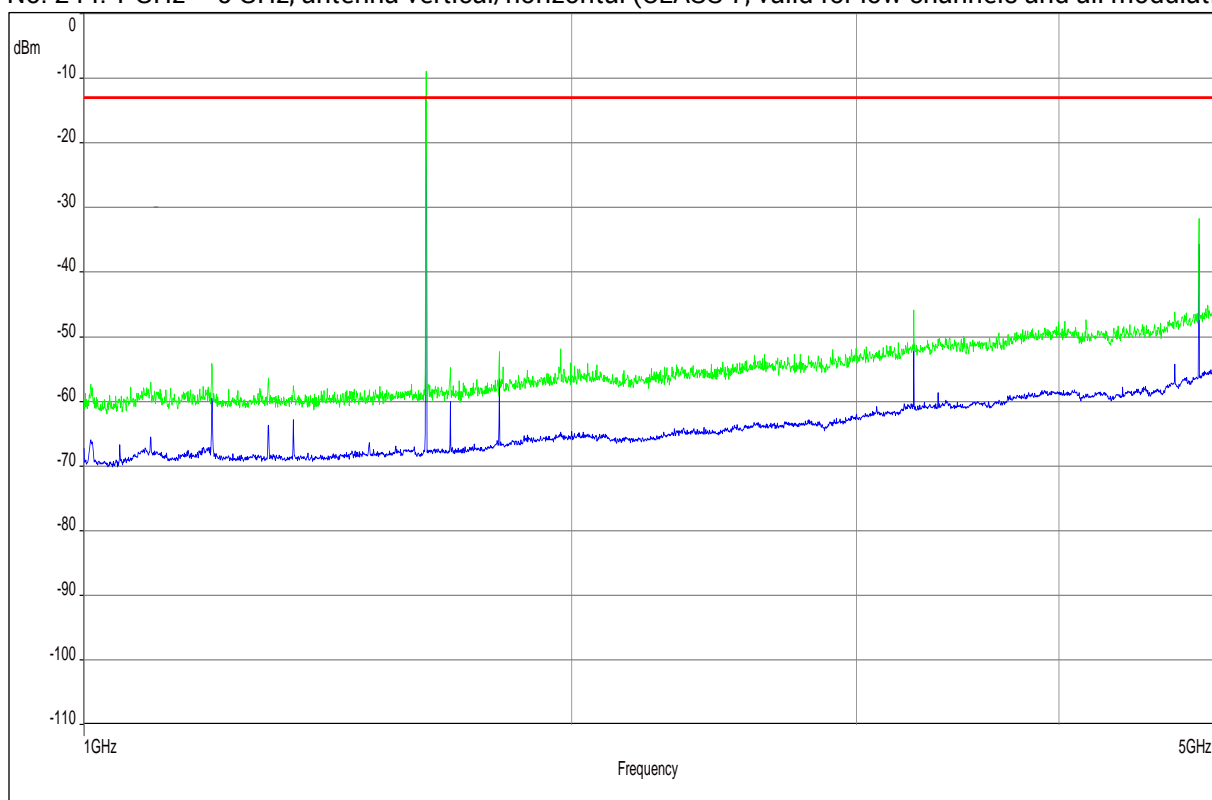


Measurement with a SHC2600/12750-1.5-KK HP filter

Plot No. 243: 30 MHz – 1 GHz, antenna vertical/horizontal (CLASS 7, valid for all channels and all modulations)

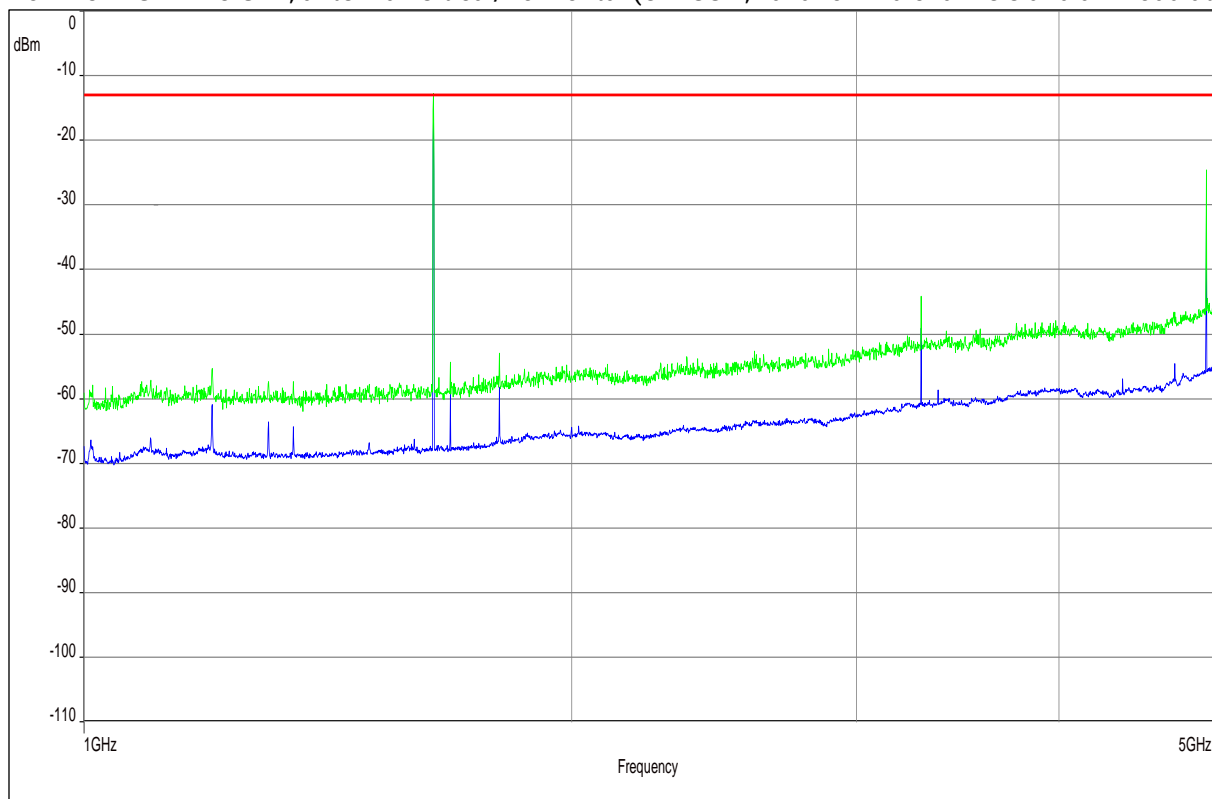


Plot No. 244: 1 GHz – 5 GHz, antenna vertical/horizontal (CLASS 7, valid for low channels and all modulations)



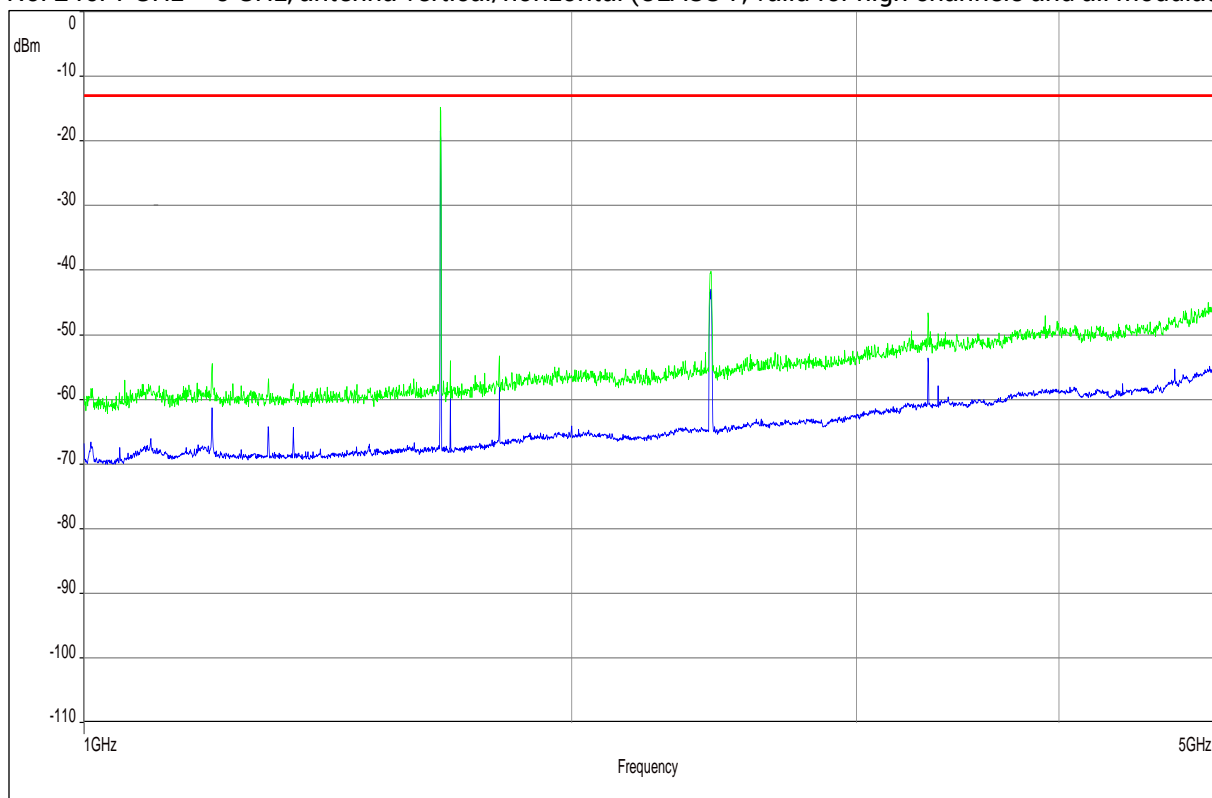
Wanted signal notched with WRCGV14-1616-1626-1661-1671-70SS Band Reject Filter

Plot No. 245: 1 GHz – 5 GHz, antenna vertical/horizontal (CLASS 7, valid for mid channels and all modulations)



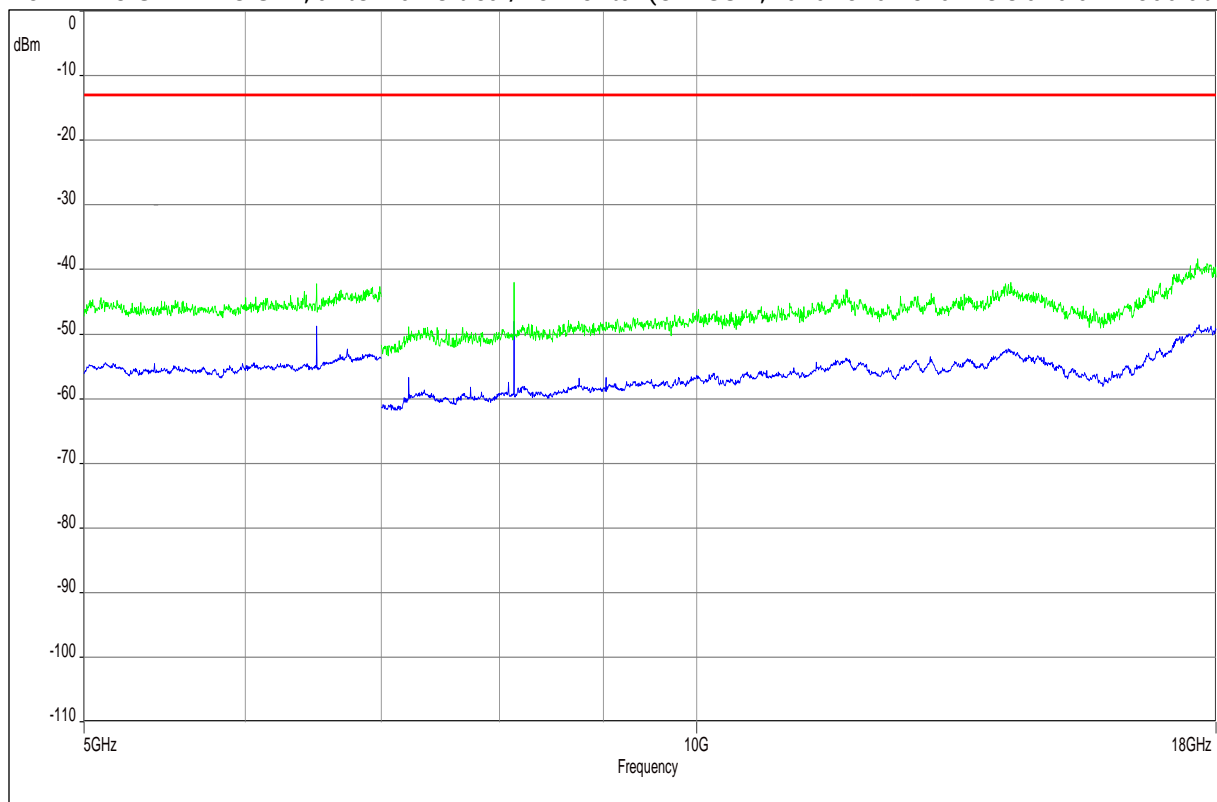
Wanted signal notched with WRCGV14-1616-1626-1661-1671-70SS Band Reject Filter

Plot No. 246: 1 GHz – 5 GHz, antenna vertical/horizontal (CLASS 7, valid for high channels and all modulations)



Wanted signal notched with WRCGV14-1616-1626-1661-1671-70SS Band Reject Filter

Plot No. 247: 5 GHz – 18 GHz, antenna vertical/horizontal (CLASS 7, valid for all channels and all modulations)



Measurement with a SHC2600/12750-1.5-KK HP filter

5. Document history

Version	Applied changes	Date of release
	Initial release - DRAFT	2023-12-21
	Minor changes	2024-02-27