



FCC TEST REPORT FCC 47 CFR Part 90 Private Land Mobile Radio Services (PMR)	
Report Reference No.	G0M-1801-7152-TFC90PMR-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	<div style="display: flex; justify-content: center; align-items: center;">   </div> <p style="text-align: center; margin-top: 5px;"> A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Test Firm Designation Number: DE0008 IC OATS Filing assigned code: 3470A-2 </p>
Applicant's name	Kamstrup A/S
Address	Industrivej 28 8660 Skanderborg DENMARK
Test specification:	
Standard.....	47 CFR Part 90I
Equipment under test (EUT):	
Product description	Kamstrup READy Collector Top
Model No.	Kamstrup READy Collector Top
Additional Model(s)	None
Brand Name(s)	None
Hardware version	RFboard: F1. CPUboard: D4 Complete box: A1
Firmware / Software version	C1
	FCC-ID: OUY-READYAMI IC: N/A
Test result	Passed

Possible test case verdicts:

- neither assessed nor tested : N/N
- required by standard but not appl. to test object : N/A
- required by standard but not tested : N/T
- not required by standard for the test object : N/R
- test object does meet the requirement : P (Pass)
- test object does not meet the requirement : F (Fail)

Testing:

Test Lab Temperature : 20 – 23 °C

Test Lab Humidity : 32 – 38 %

Date of receipt of test item : 2018-02-20

Date (s) of performance of tests : 2018-02-20 – 2018-02-21


Compiled by : Toralf Jahn


Tested by (+ signature) : Toralf Jahn
 (Responsible for Test)

Approved by (+ signature) : Christian Weber
 (Head of Lab)

Date of issue : 2018-03-07

Total number of pages : 64




General remarks:

The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional comments:

Version History

Version	Issue Date	Remarks	Revised by
01	2018-03-07	Initial Release	

REPORT INDEX

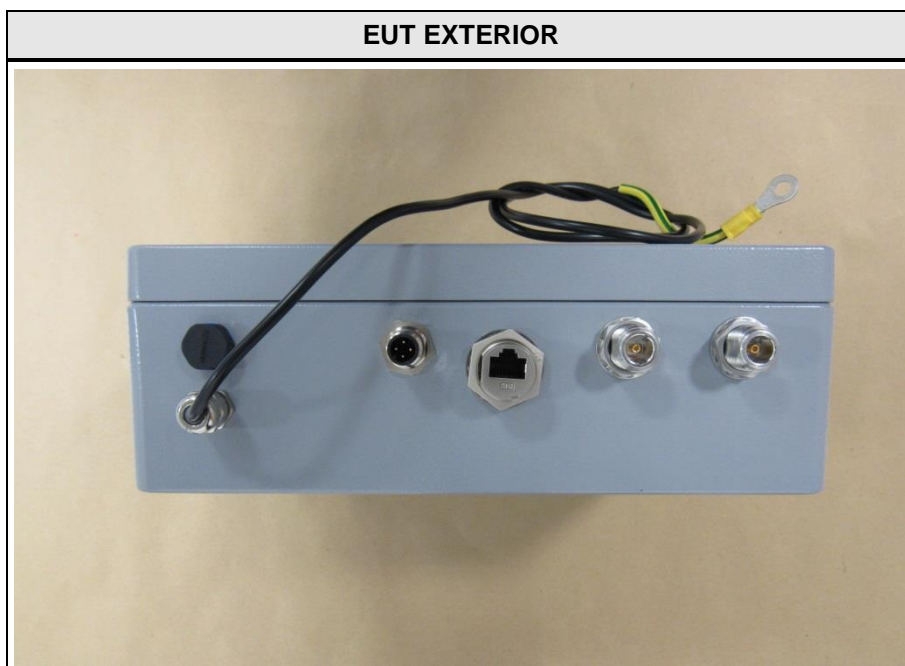
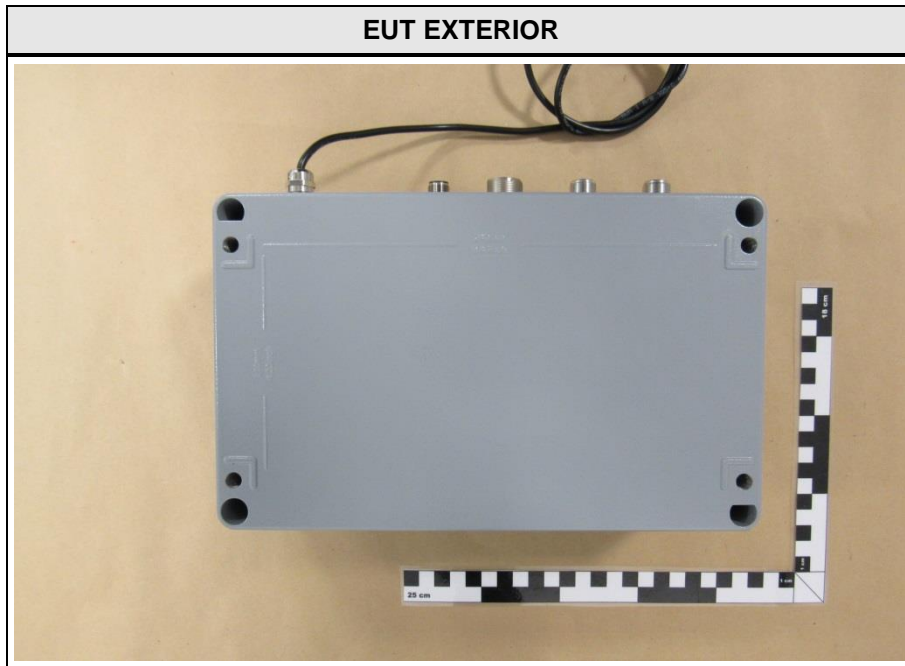
1	EQUIPMENT (TEST ITEM) DESCRIPTION	5
1.1	Photos - Equipment external	7
1.2	Photos - Equipment internal	9
1.3	Photos – Test setup	13
1.4	Supporting Equipment Used During Testing	14
1.5	Test Modes	14
1.6	Test Equipment Used During Testing	15
2	RESULT SUMMARY	16
3	TEST CONDITIONS AND RESULTS	17
3.1	Power	17
3.2	Emission Mask and authorized bandwidth	19
3.3	Spurious emission at antenna terminal	33
3.4	Spurious emissions radiated	47
3.5	Frequency Stability	49
3.6	Transient Frequency Behavior	51

1 Equipment (Test item) Description

Description	Kamstrup READy Collector Top	
Model	Kamstrup READy Collector Top	
Additional Model(s)	None	
Brand Name(s)	None	
Serial number	None	
Hardware version	RFboard: F1. CPUboard: D4 Complete box: A1	
Software / Firmware version	C1	
PMN	None	
HVIN	Kamstrup READy Collector Top	
FVIN	None	
HMN	None	
FCC-ID	OUY-READYAMI	
IC	N/A	
Equipment type	End Product	
Radio type	PMR	
Number of Radios	2 (Transmitter No. 0 and No. 1)	
Operating frequency range	451.025 – 469.975 MHz	
Assigned frequency band	421 – 512 MHz	
Main test frequencies	F _{LOW}	451.025 MHz
	F _{MID}	460.65 MHz
	F _{HIGH}	469.975 MHz
Modulations	4-FSK	
Emission designator	F1D	
Channel bandwidth	12.5 kHz	
Authorized bandwidth	11.25 kHz	
Channel spacing	12.5 kHz	
Number of antennas	1	

Antenna 1	Type	external, rod antenna
	Model	CLX 70-3LW/h
	Manufacturer	Procom
	Gain	5 dBi
Manufacturer	Kamstrup A/S Industrivej 28 8660 Skanderborg DENMARK	
Power supply	V _{NOM}	24.0 VDC
	V _{MIN}	18.0
	V _{MAX}	30.0
AC/DC-Adaptor	Model	none
	Vendor	none
	Input	none
	Output	none
Temperature	T _{NOM}	20°C
	T _{MIN}	-30°C
	T _{MAX}	65°C

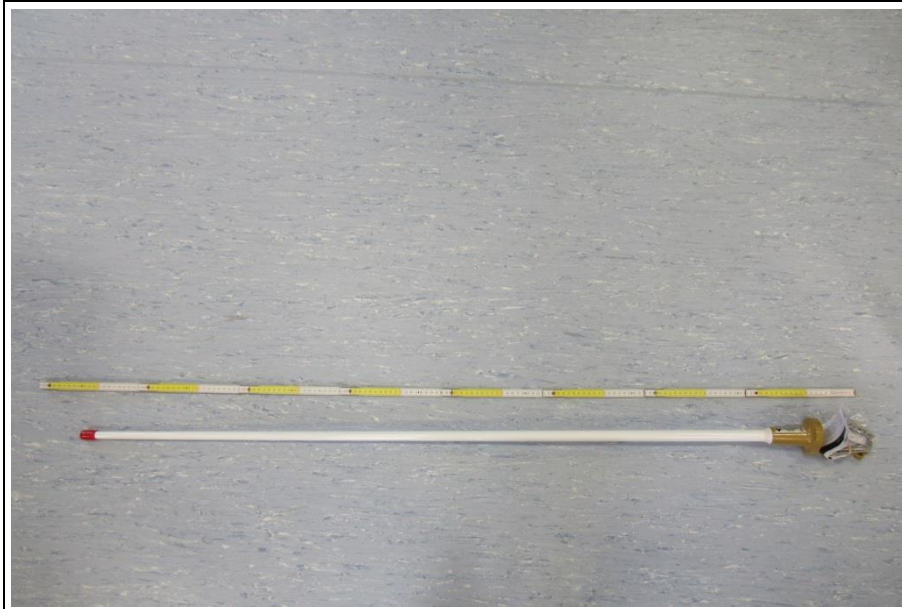
1.1 Photos - Equipment external



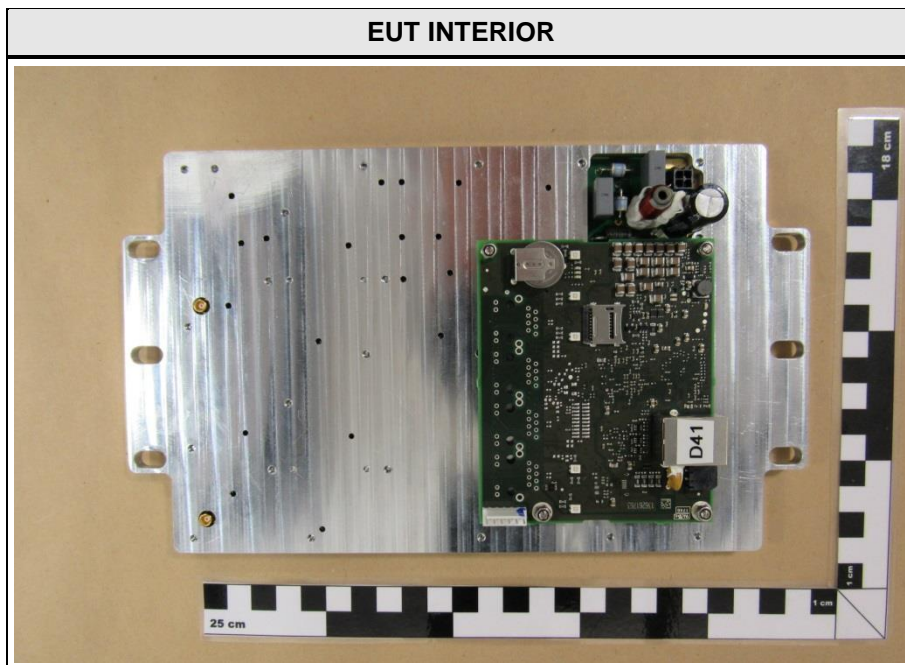
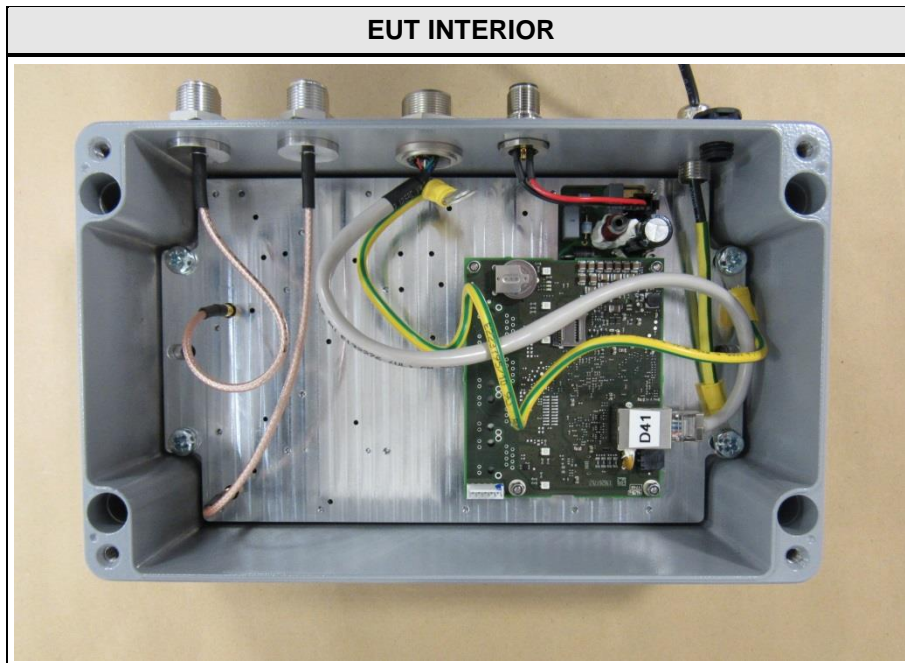
EUT EXTERIOR

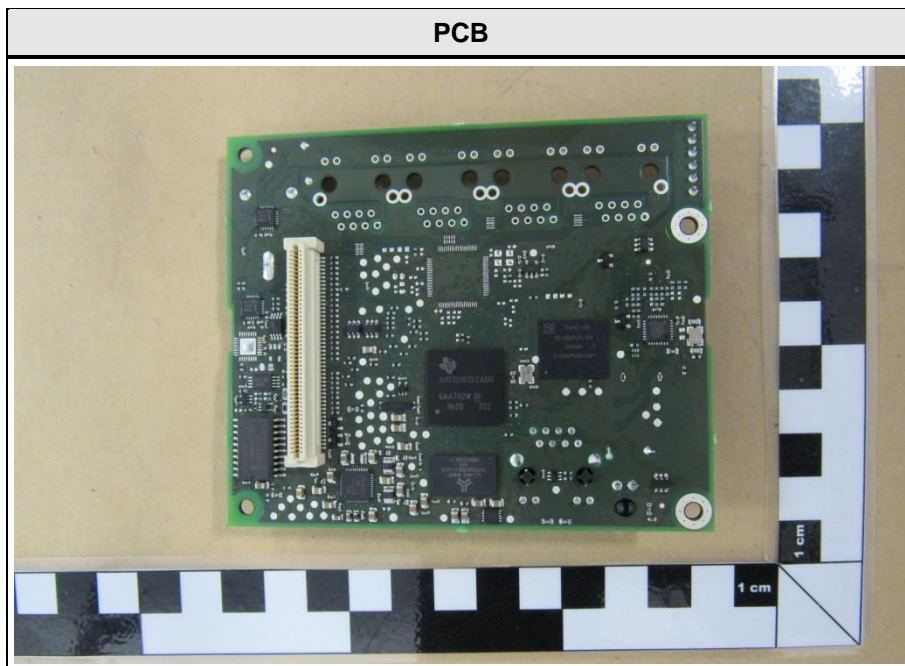
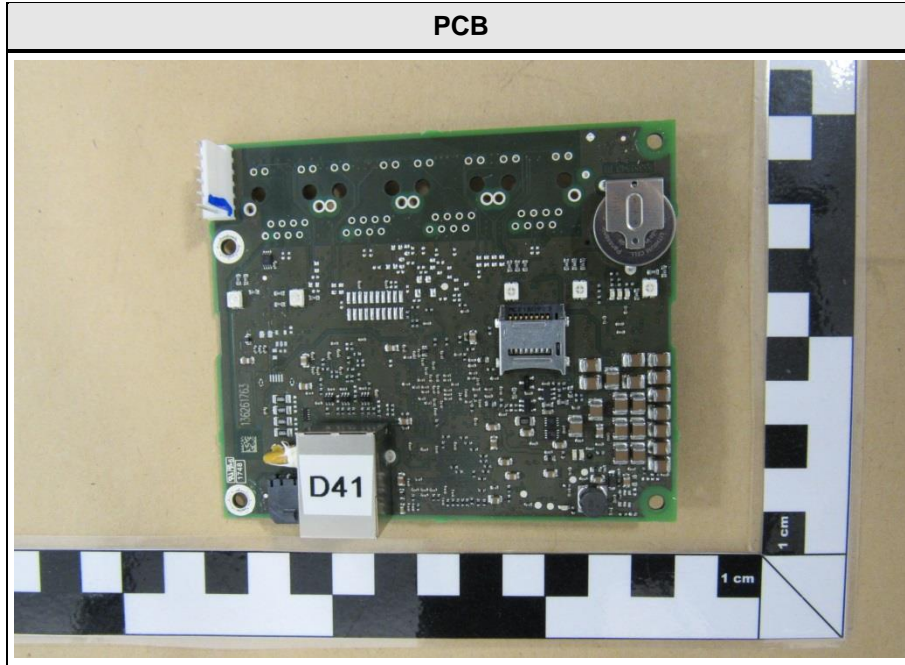


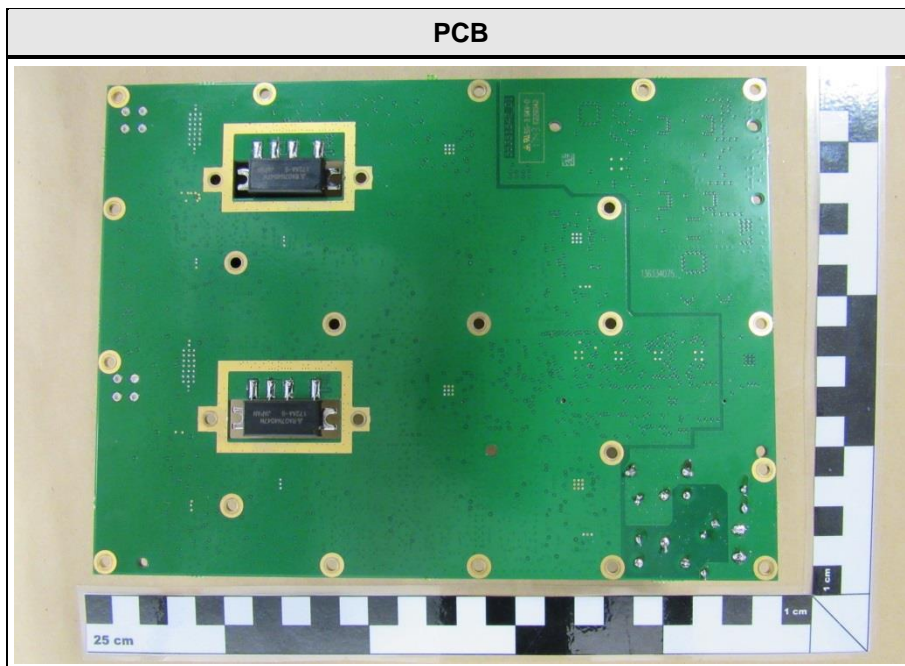
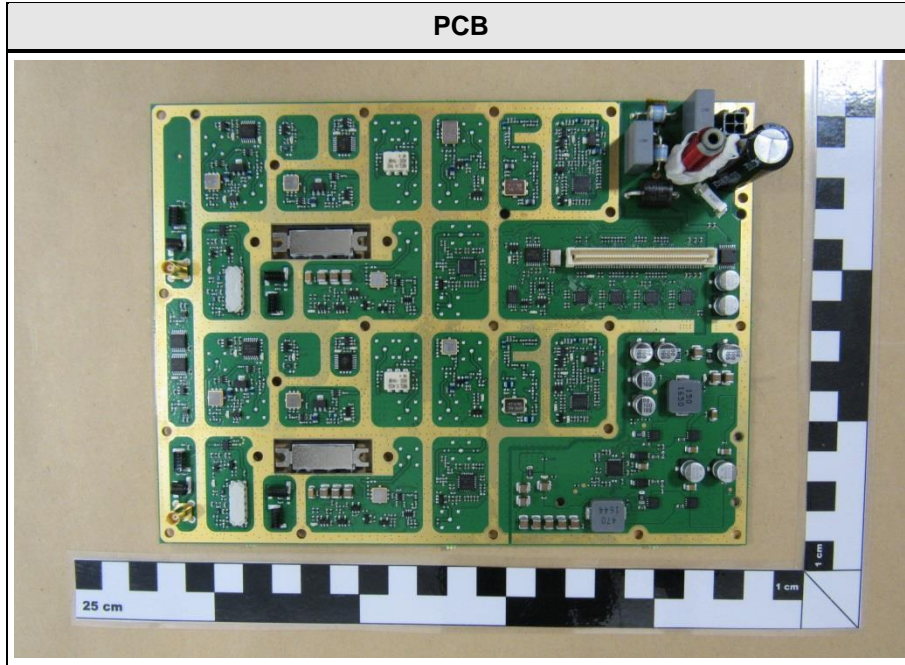
ANTENNA 1

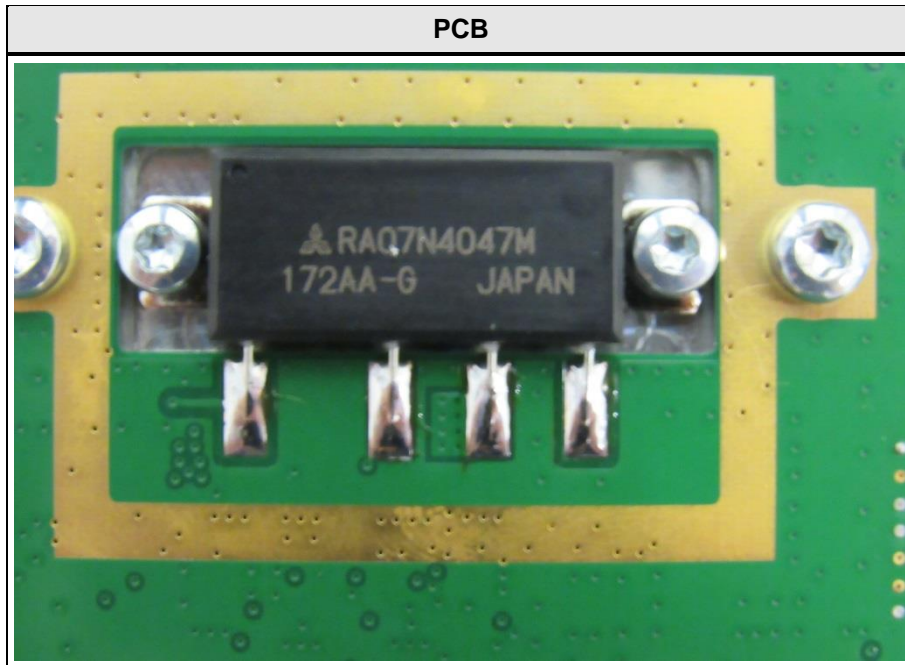


1.2 Photos - Equipment internal

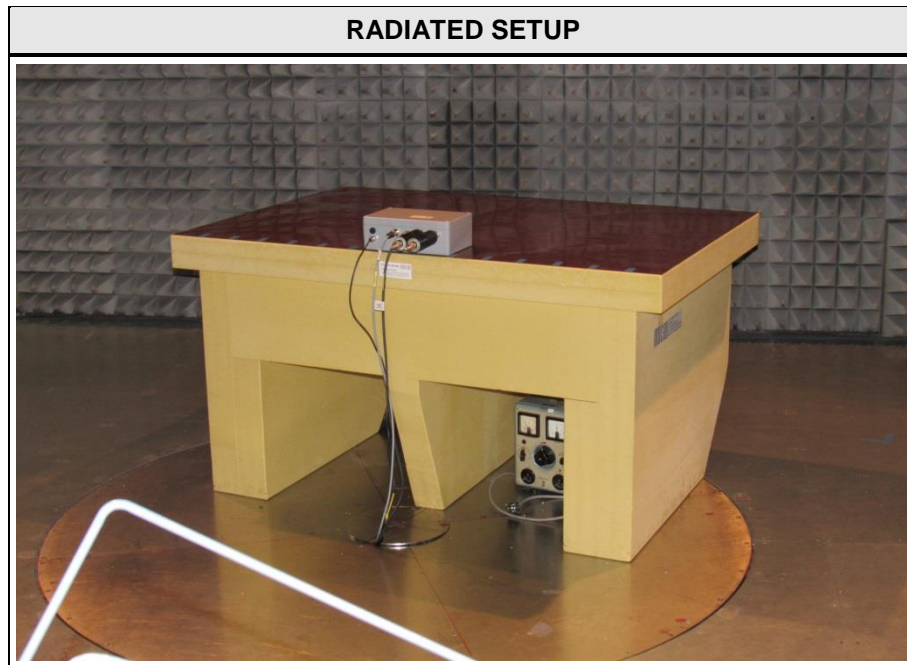








1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Laboratory power supply	Korad	KD6005P	
CBL	Power cable			
CBL	Ethernet			
CBL	Ground cable			EUT ground connected to chamber ground

***Note:** Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or

SIM : Simulator (Not Subjected to Test)

CABL : Connecting cables

1.5 Test Modes

Mode #	Description	
Transmit modulated	General conditions:	EUT powered by laboratory power supply.
	Radio conditions:	Mode = standalone mode Modulation = 4-FSK Duty cycle = 100% Power level = maximum
Transmit unmodulated	General conditions:	EUT powered by laboratory power supply.
	Radio conditions:	Mode = standalone mode Modulation = none Duty cycle = 100% Power level = maximum

1.6 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2015.2.4

Conducted					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01003	2017-07	2018-07
Modulation Domain Analyzer	R&S	FSIQ 26	EF00151	2017-07	2018-07
Rubidium Frequency Standard	EFRATOM	MFS	EF00308	2017-07	2022-07

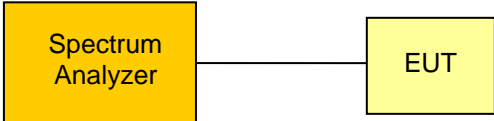
Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
MXE EMI Receiver	Keysight Technologies	N9038A-526/WXP	EF01070	2017-08	2018-08
Biconical Antenna	R&S	HK 116	EF00203	2016-06	2018-06
LPD Antenna	R&S	HL 223	EF00187	2016-05	2019-05
Horn Antenna	R&S	BBHA 9120D	EF00018	2016-09	2019-09

2 Result Summary

FCC 47 CFR Part 90I				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
FCC 90.205 FCC 2.1046	Power	ANSI C63.26-2015 5.2	PASS	
FCC 90.209 FCC 90.210 FCC 2.1049	Authorized bandwidth Emission masks Occupied bandwidth	FCC 90.210 ANSI C63.26-2015 5.4	PASS	
FCC 90.210 FCC 2.1051	Spurious emissions at antenna terminal	FCC 90.210 ANSI C63.26-2015 5.7	PASS	
FCC 90.210 FCC 2.1053	Spurious emissions radiated	FCC 90.210 ANSI C63.26-2015 5.5	PASS	
FCC 90.213 FCC 2.1055	Frequency stability	ANSI C63.26-2015 5.6	PASS	
FCC 90.214	Transient frequency behavior	ANSI C63.26-2015 6.5	PASS	
Remarks:				


3 Test Conditions and Results

3.1 Power

Maximum peak conducted power acc. to FCC 90.205		Verdict: PASS
EUT requirement rule parts and clause	Reference	
	FCC 90.205, FCC 2.1046	
Test according to measurement reference	Reference Method	
	ANSI C63.26-2015 5.2	
Test frequency range	Tested frequencies	
	$F_{LOW} / F_{MID} / F_{HIGH}$	
EUT test mode	Transmit unmodulated	
Maximum antenna gain	5 dBi	
Limit		
100 W (50 dBm) ERP (up to 15 m HAAT)		
Test setup		
 <pre> graph LR SA[Spectrum Analyzer] --- EUT[EUT] </pre>		
Test procedure		
<ul style="list-style-type: none"> • EUT set to transmit mode • Center frequency set to test channel center frequency • Span set to twice the 20 dB bandwidth and detector to peak and max hold • Resolution bandwidth is set to 3 MHz • Peak conducted power is determined from peak of spectrum envelope 		
ERP calculation		
<ul style="list-style-type: none"> • $EIRP [dBm] = \text{Conducted power [dBm]} + \text{Max EUT antenna gain [dBi]}$ • $ERP [dBm] = EIRP [dBm] - 2.15 \text{ dB}$ 		

Test results Transmitter 0					
Channel	Conducted peak power [dbm]	ERP peak power [dbm]	ERP peak power [W]	ERP Limit [dBm]	Margin [dB]
F _{LOW}	37.51	40.36	10.86	50	-09.64
F _{MID}	37.62	40.47	11.14	50	-09.53
F _{HIGH}	37.59	40.44	11.07	50	-09.56
Test results Transmitter 1					
Channel	Conducted peak power [dbm]	ERP peak power [dbm]	ERP peak power [W]	ERP Limit [dBm]	Margin [dB]
F _{LOW}	36.97	39.82	9.59	50	-10.18
F _{MID}	36.73	39.58	9.08	50	-10.42
F _{HIGH}	36.97	39.82	9.59	50	-10.18
Comments:					

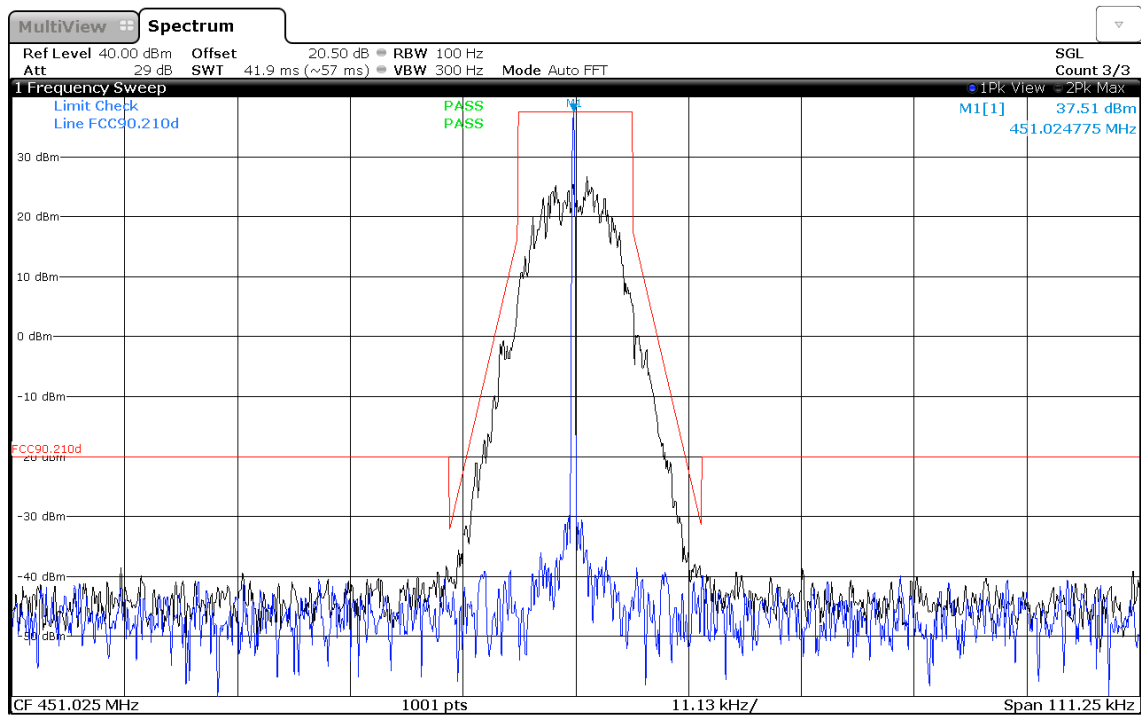
3.2 Emission Mask and authorized bandwidth

Emission mask acc. to FCC 90.209, FCC 90.210		Verdict: PASS
EUT requirement rule parts and clause	Reference	
	FCC 90.209(b), FCC 90.210 (d), FCC 2.1049	
Test according to measurement reference	Reference Method	
	FCC 90.210, ANSI C63.26-2015 5.4	
Test frequency range	Tested frequencies	
	$F_{\text{LOW}} / F_{\text{MID}} / F_{\text{HIGH}}$	
EUT test mode	Transmit modulated	
Limits		
<p>Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth.</p> <p>Emission Mask D—12.5 kHz channel bandwidth equipment.</p> <p>For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:</p> <p>(1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0: Zero dB.</p> <p>(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.</p> <p>(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.</p>		
Test setup		
 <pre> graph LR EUT[EUT] --- SA[Spectrum Analyzer] SA --- RR[Rubidium Reference] </pre>		
Test procedure		
<ul style="list-style-type: none"> • EUT set to transmit mode • Center frequency set to test channel center frequency and the highest emission is determined • Resolution bandwidth is set to 100 Hz and detector to peak and max hold. • As for the authorized bandwidth the 99% power bandwidth is measured. 		

Test results emission mask Transmitter 0			
Channel	Verdict		
F _{LOW}	PASS		
F _{MID}	PASS		
F _{HIGH}	PASS		
Test results emission mask Transmitter 1			
Channel	Verdict		
F _{LOW}	PASS		
F _{MID}	PASS		
F _{HIGH}	PASS		
Test results authorized bandwidth Transmitter 0			
Channel	Authorized bandwidth [kHz]	Limit [kHz]	Verdict
F _{LOW}	9.71	11.25	PASS
F _{MID}	9.57	11.25	PASS
F _{HIGH}	9.69	11.25	PASS
Test results authorized bandwidth Transmitter 1			
Channel	Authorized bandwidth [kHz]	Limit [kHz]	Verdict
F _{LOW}	9.68	11.25	PASS
F _{MID}	9.65	11.25	PASS
F _{HIGH}	9.68	11.25	PASS
Comments:			

Emission Mask

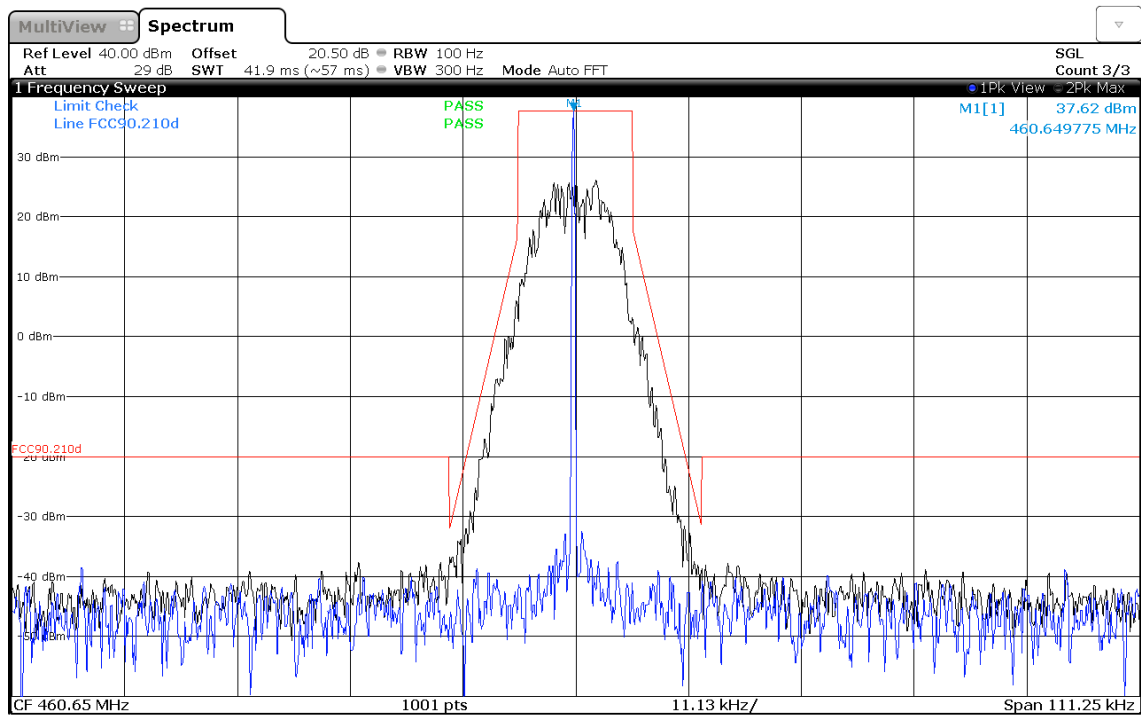
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Flow



08:15:25 21.02.2018

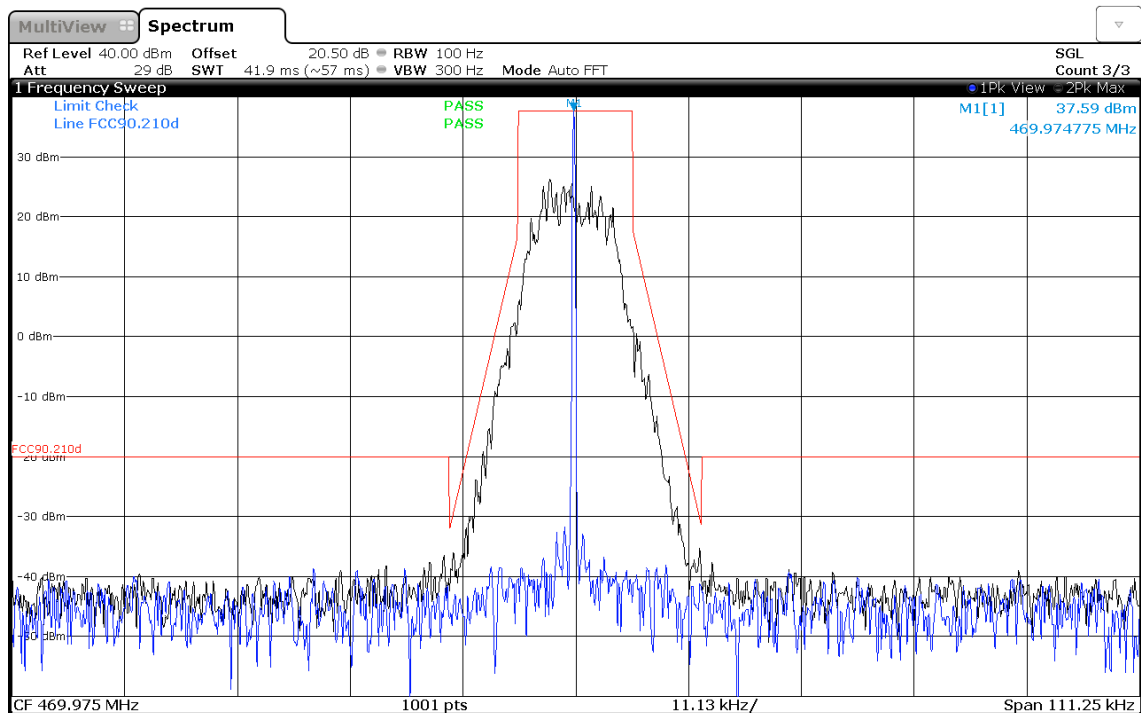
Emission Mask

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fmid



Emission Mask

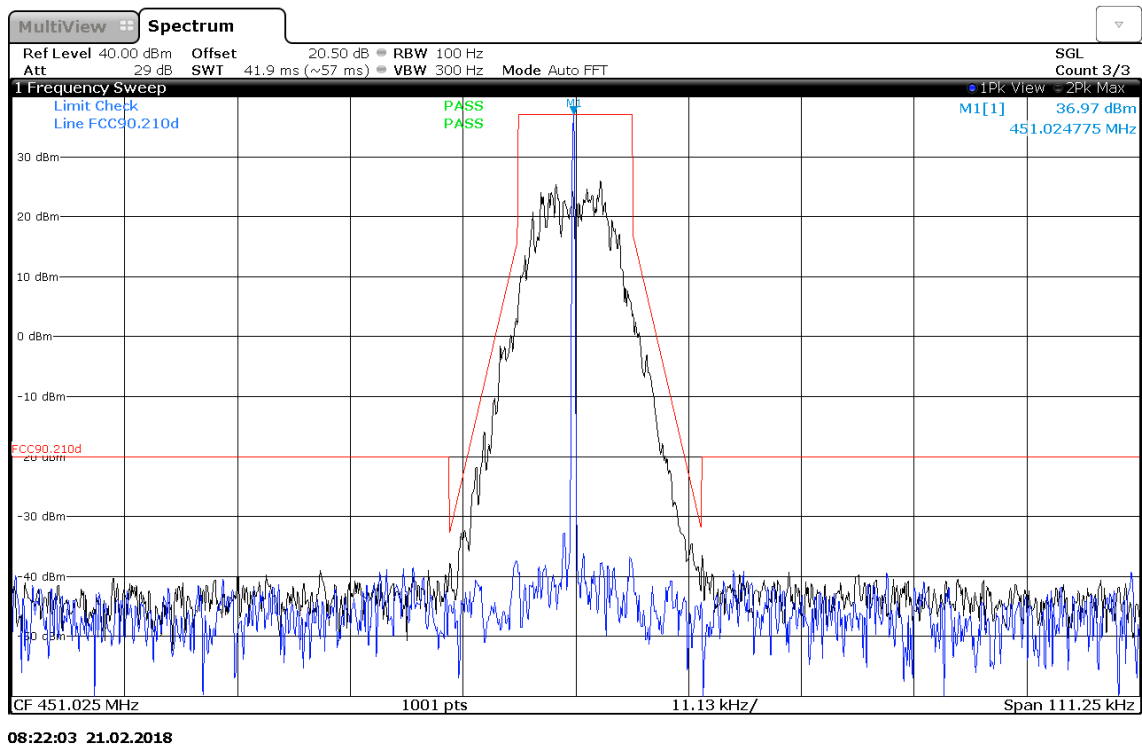
Project Number:	G0M-1801-7152
Applicant:	Kamstrup A/S
Model Description:	Kamstrup READY Collector Top
Model:	Kamstrup READY Collector Top
Test Sample ID:	17451
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2018-02-21
Note 1:	Transmitter 0
Note 2:	Fhigh



08:13:10 21.02.2018

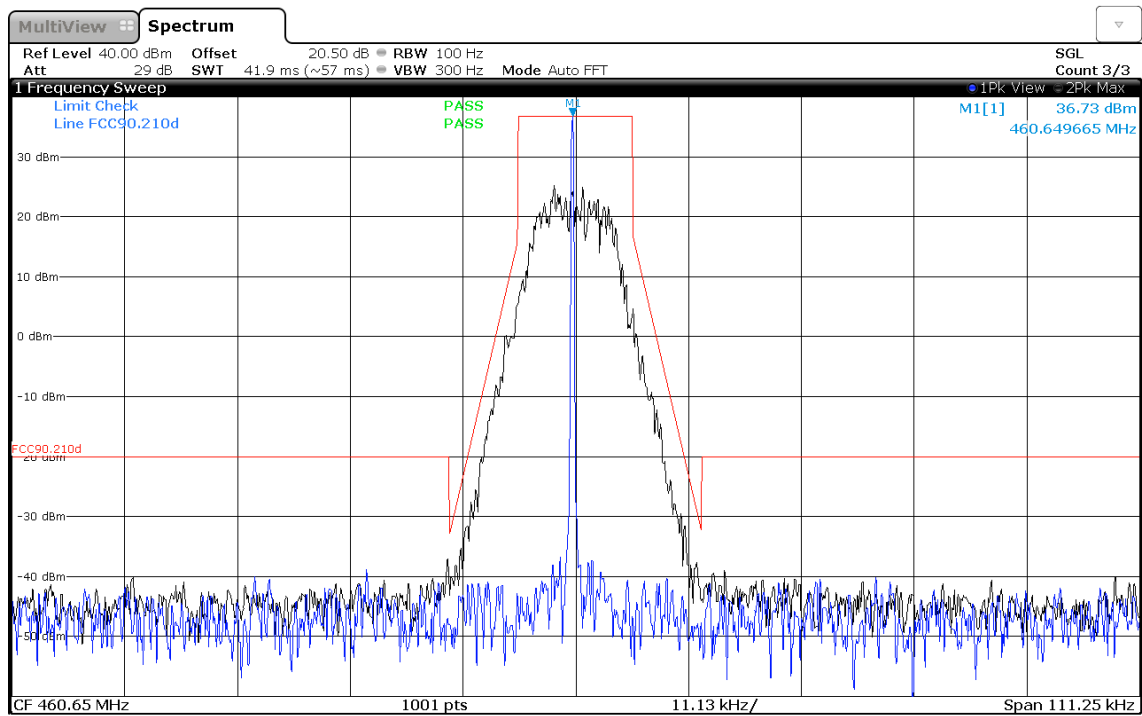
Emission Mask

Project Number:	G0M-1801-7152
Applicant:	Kamstrup A/S
Model Description:	Kamstrup READY Collector Top
Model:	Kamstrup READY Collector Top
Test Sample ID:	17451
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2018-02-21
Note 1:	Transmitter 1
Note 2:	Flow



Emission Mask

Project Number:	G0M-1801-7152
Applicant:	Kamstrup A/S
Model Description:	Kamstrup READY Collector Top
Model:	Kamstrup READY Collector Top
Test Sample ID:	17451
Operator:	Toralf Jahn
Test Site:	Eurofins Product Service GmbH
Test Date:	2018-02-21
Note 1:	Transmitter 1
Note 2:	Fmid



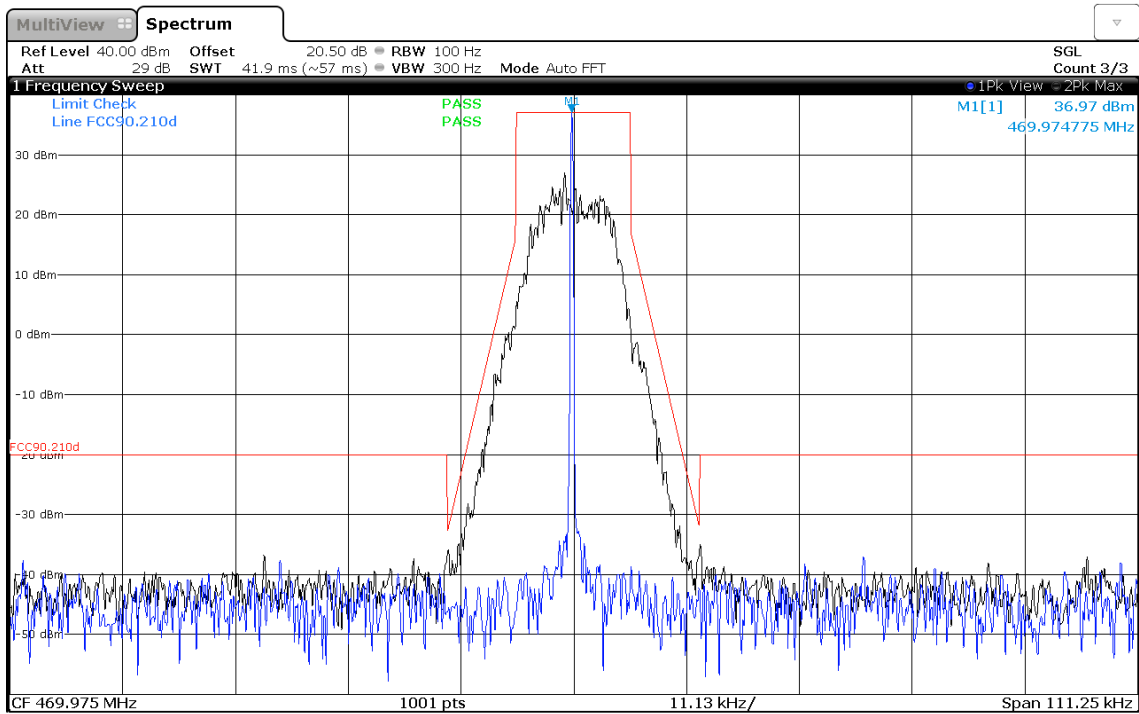
08:24:29 21.02.2018

Test Report No.: G0M-1801-7152-TFC90PMR-V01

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

Emission Mask

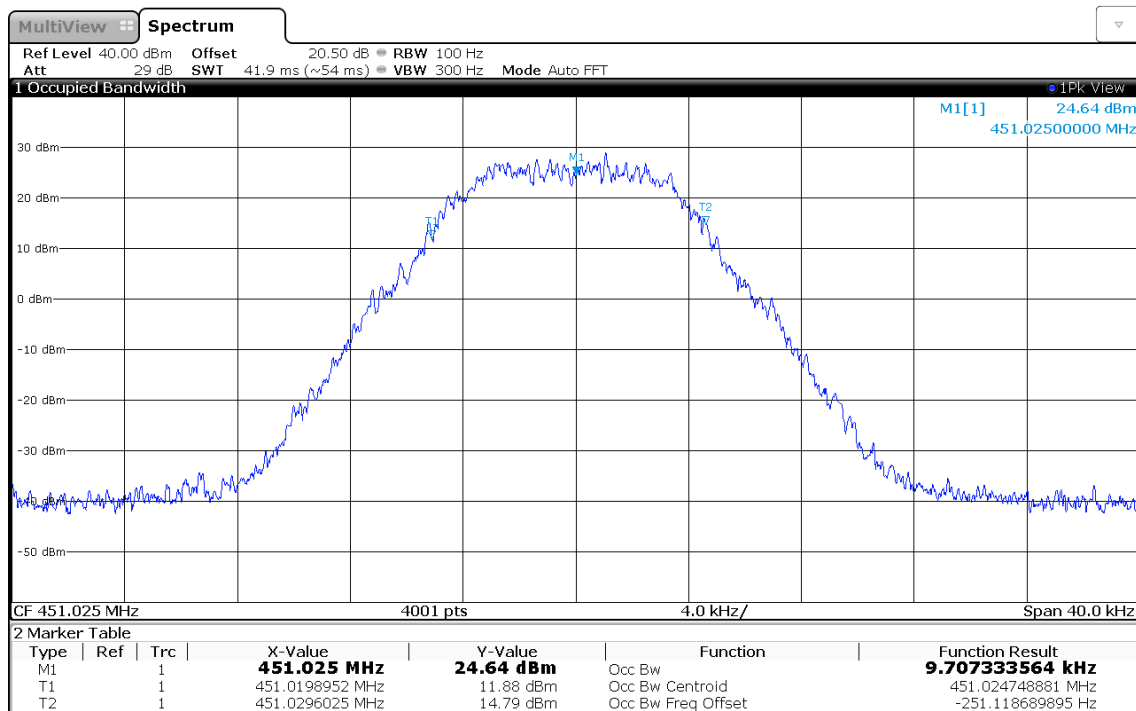
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fhigh



08:26:57 21.02.2018

Authorized Bandwidth

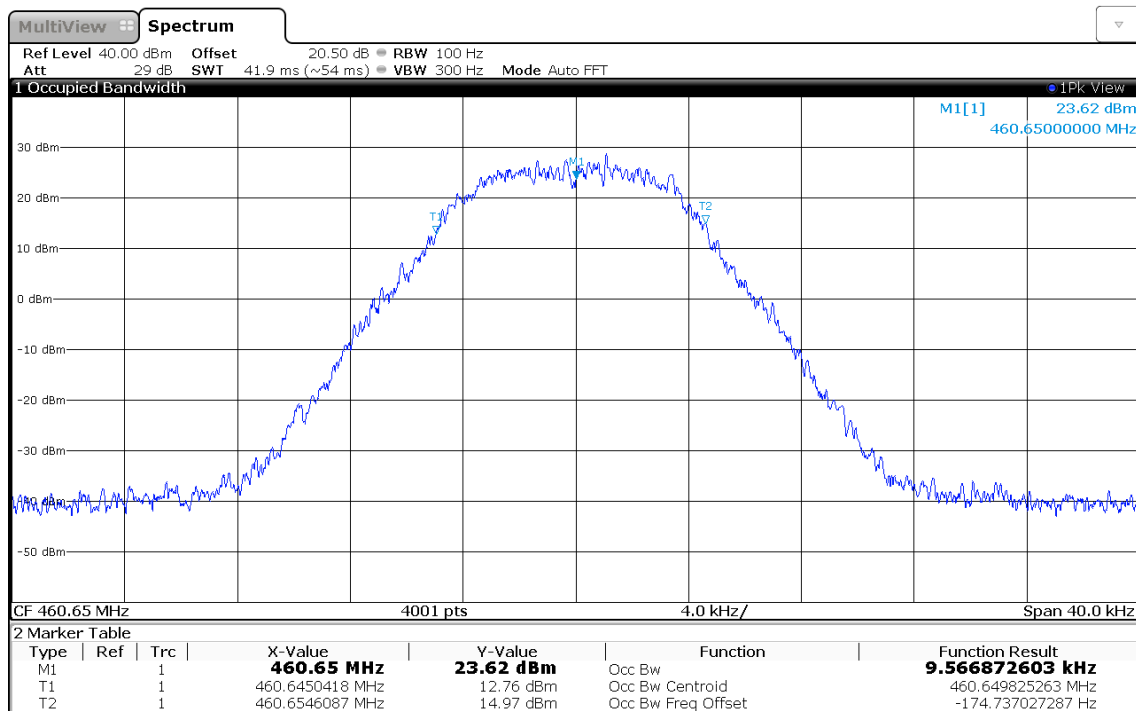
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Flow



08:59:59 21.02.2018

Authorized Bandwidth

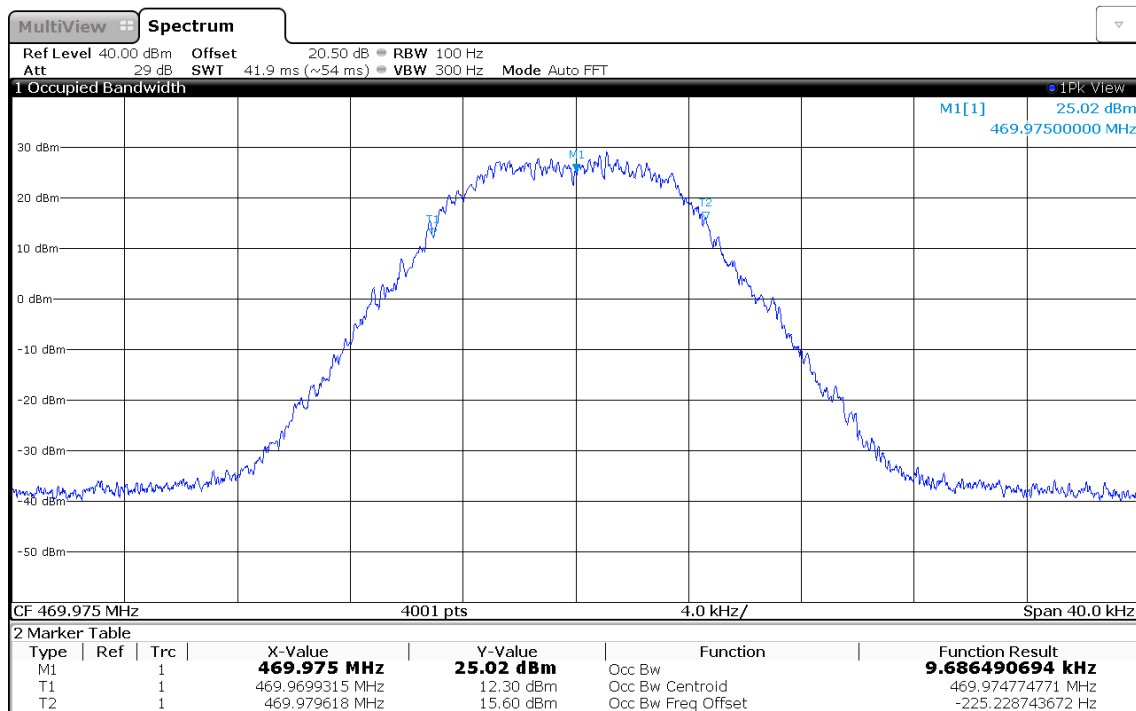
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fmid



09:02:23 21.02.2018

Authorized Bandwidth

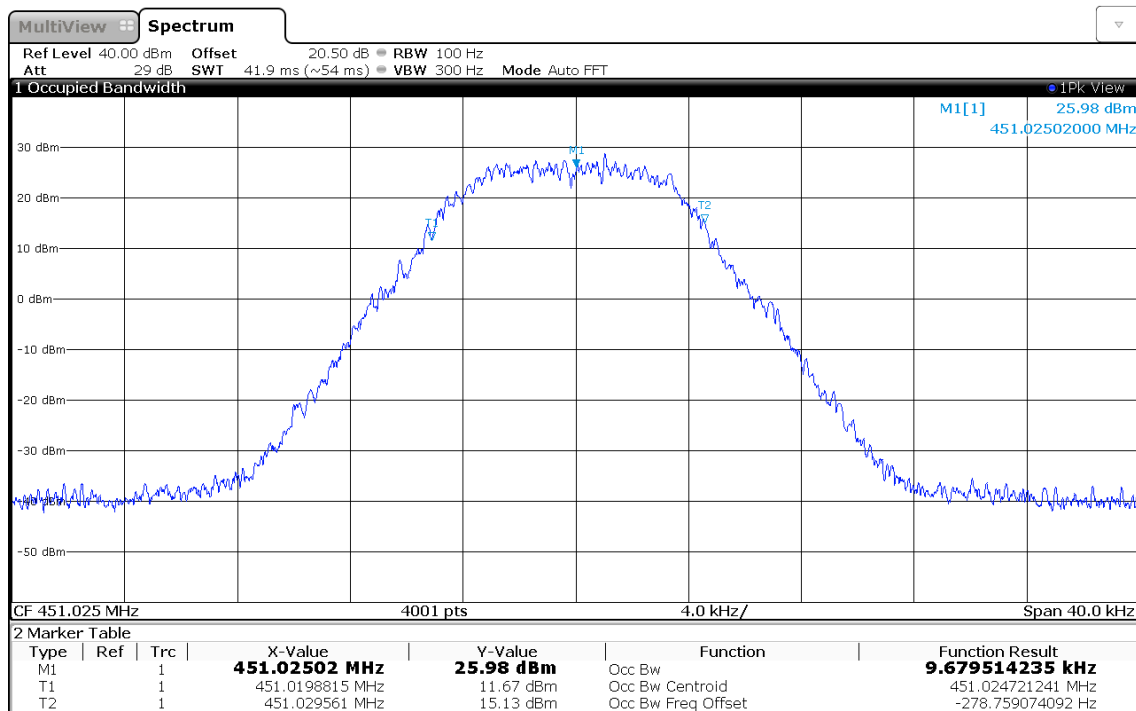
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fhigh



08:57:42 21.02.2018

Authorized Bandwidth

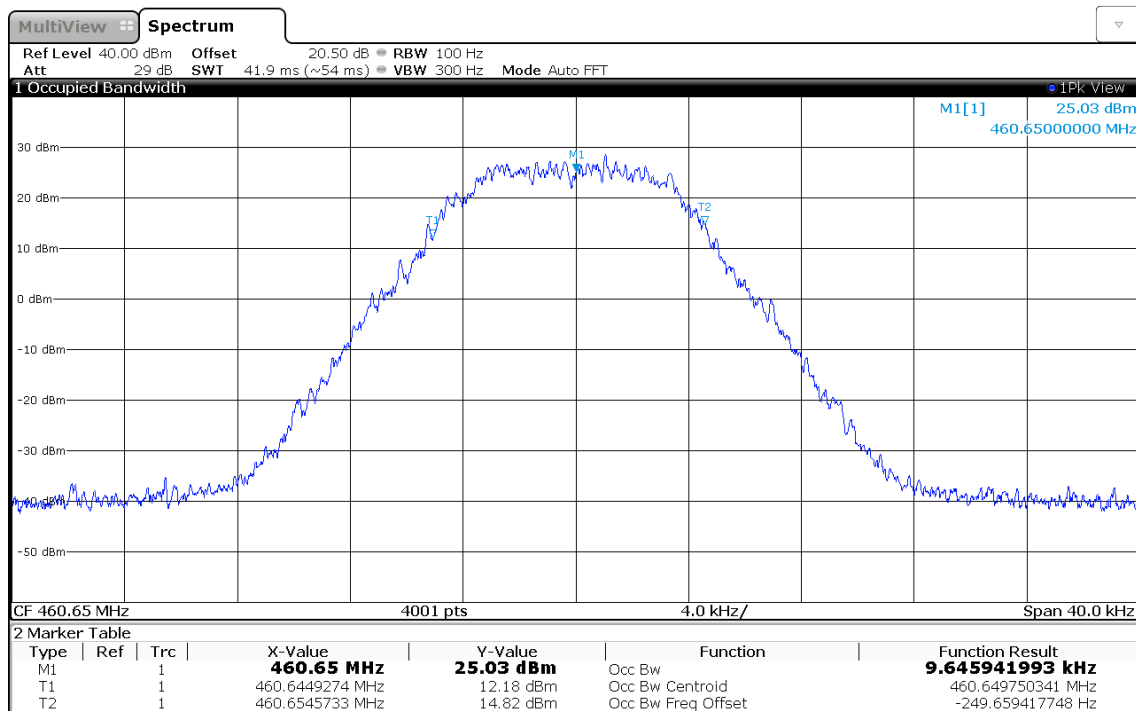
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Flow



08:48:43 21.02.2018

Authorized Bandwidth

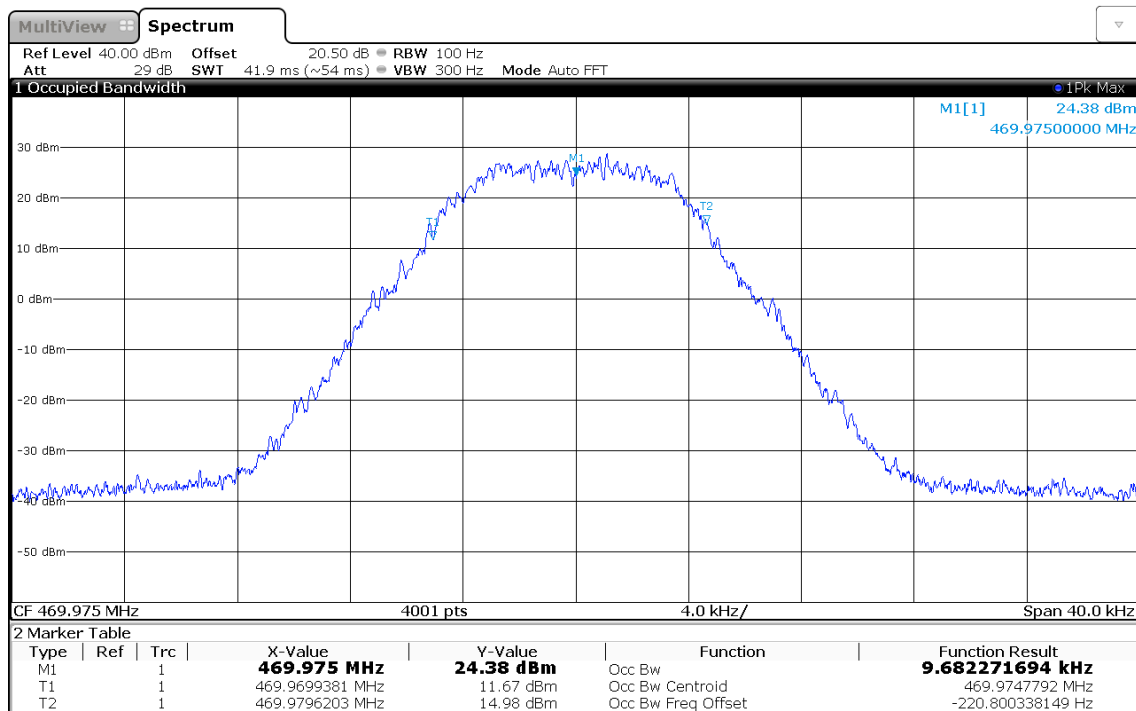
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fmid



08:51:13 21.02.2018


Authorized Bandwidth

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fhigh



08:53:54 21.02.2018

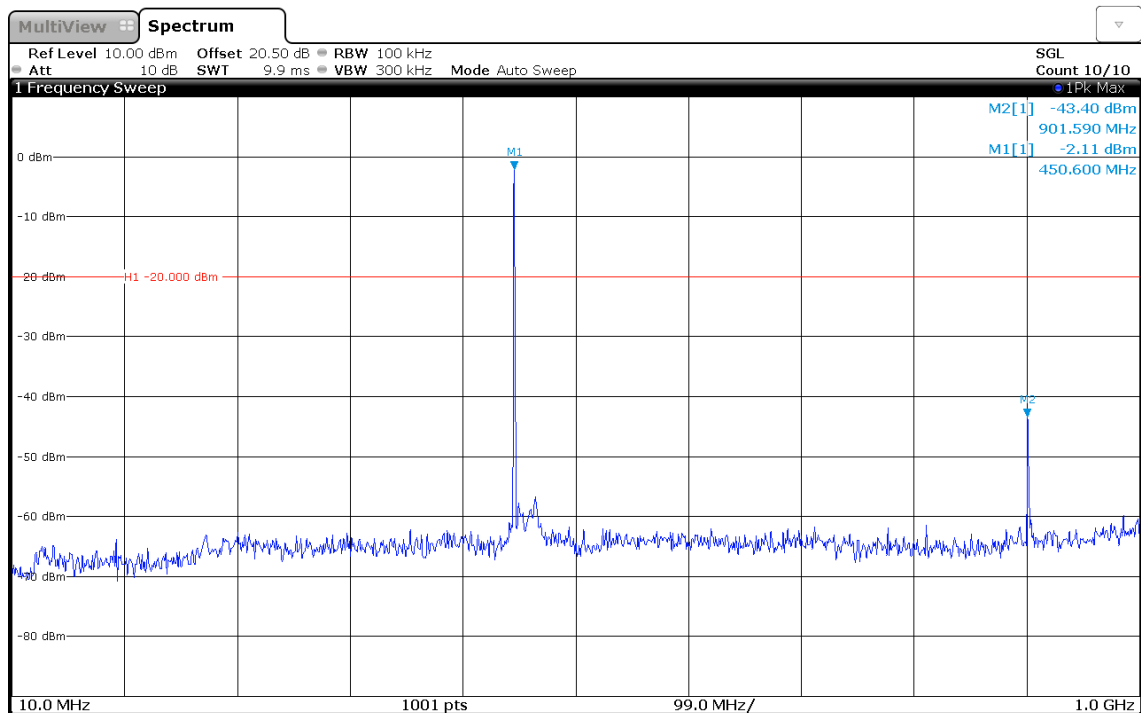
3.3 Spurious emission at antenna terminal

Spurious emission at antenna terminal acc. to FCC 90.210		Verdict: PASS
EUT requirement rule parts and clause	Reference	
	FCC 90.210 (d), FCC 2.1051	
Test according to measurement reference	Reference Method	
	FCC 90.210, ANSI C63.26-2015 5.7	
Test frequency range	Tested frequencies	
	10 MHz – 10 th Harmonic	
EUT test mode	Transmit unmodulated	
Limits		
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.		
Test setup		
 <pre> graph LR EUT[EUT] --- SA[Spectrum Analyzer] </pre>		
Test procedure		
<ul style="list-style-type: none"> • EUT set to transmit mode • Center frequency set to test channel center frequency • Below 1 GHz the carrier is suppressed with a notch filter. Above 1 GHz the carrier is suppressed with a high pass filter. • The detector is set to peak and max hold • Below 1 GHz the resolution bandwidth is set to 100 kHz. Above 1 GHz the resolution bandwidth is set to 1 MHz. 		

Test results Transmitter 0		
Channel	Limit [dBm]	Verdict
F _{LOW}	-20	PASS
F _{MID}	-20	PASS
F _{HIGH}	-20	PASS
Test results Transmitter 1		
Channel	Limit [dBm]	Verdict
F _{LOW}	-20	PASS
F _{MID}	-20	PASS
F _{HIGH}	-20	PASS
Comments:		

Spurious emission at antenna terminal

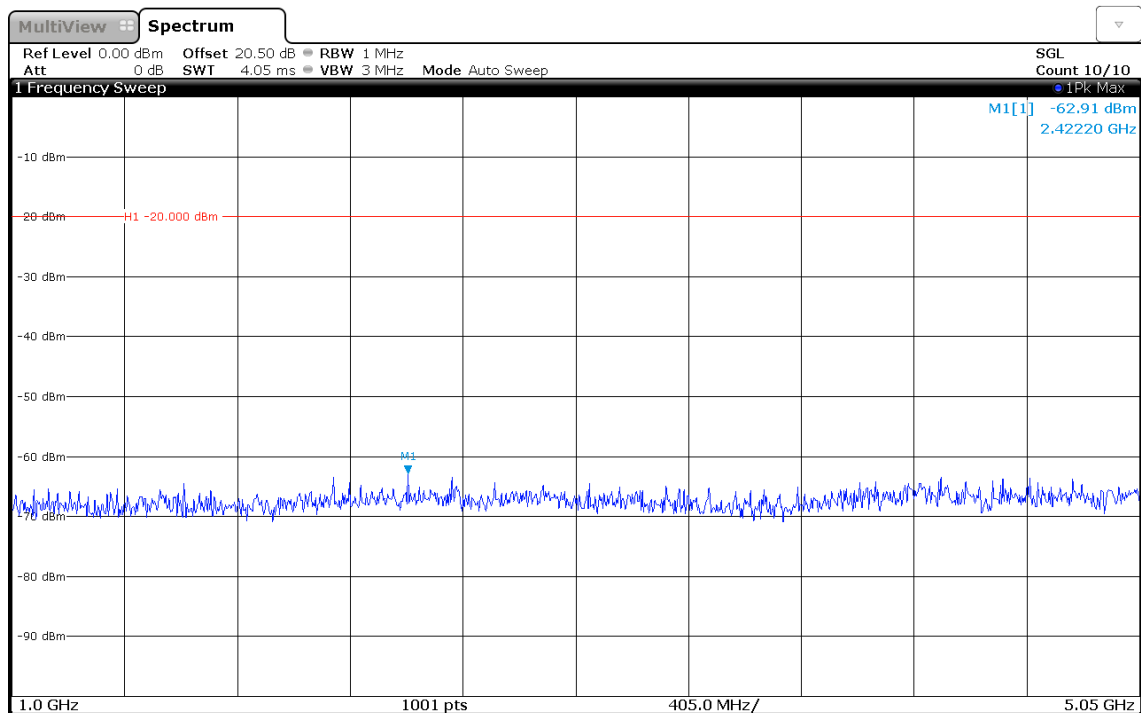
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Flow
 Note 3: Carrier notched



09:14:32 21.02.2018

Spurious emission at antenna terminal

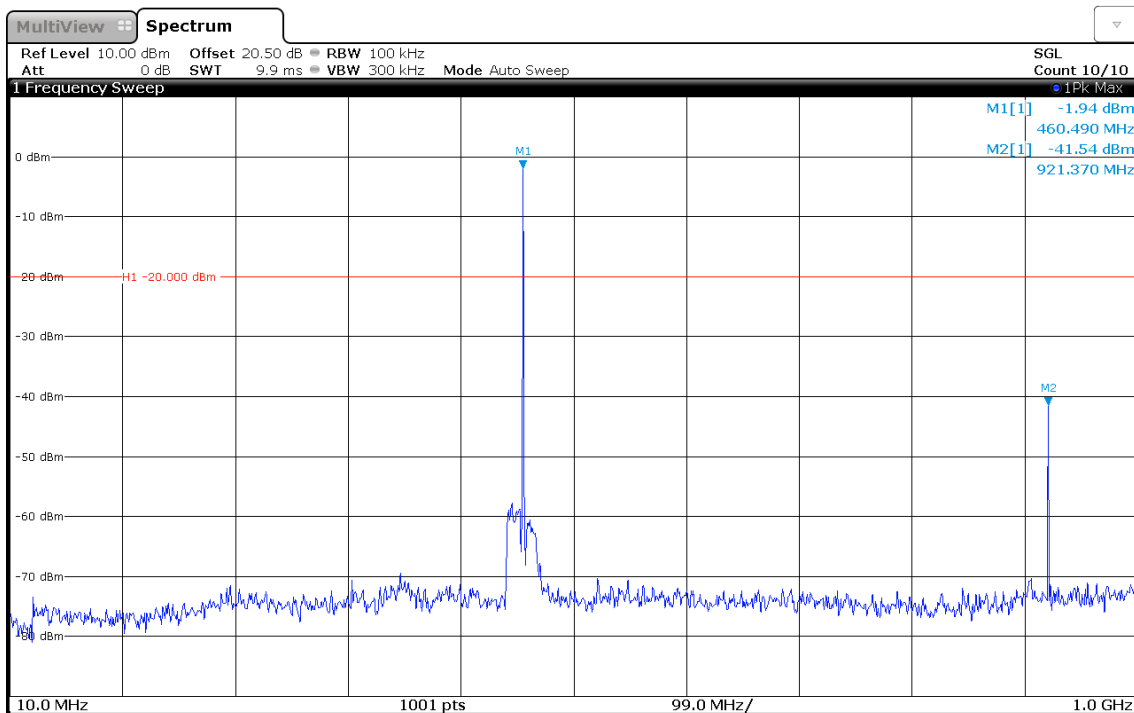
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Flow
 Note 3: High pass filter



10:26:33 21.02.2018

Spurious emission at antenna terminal

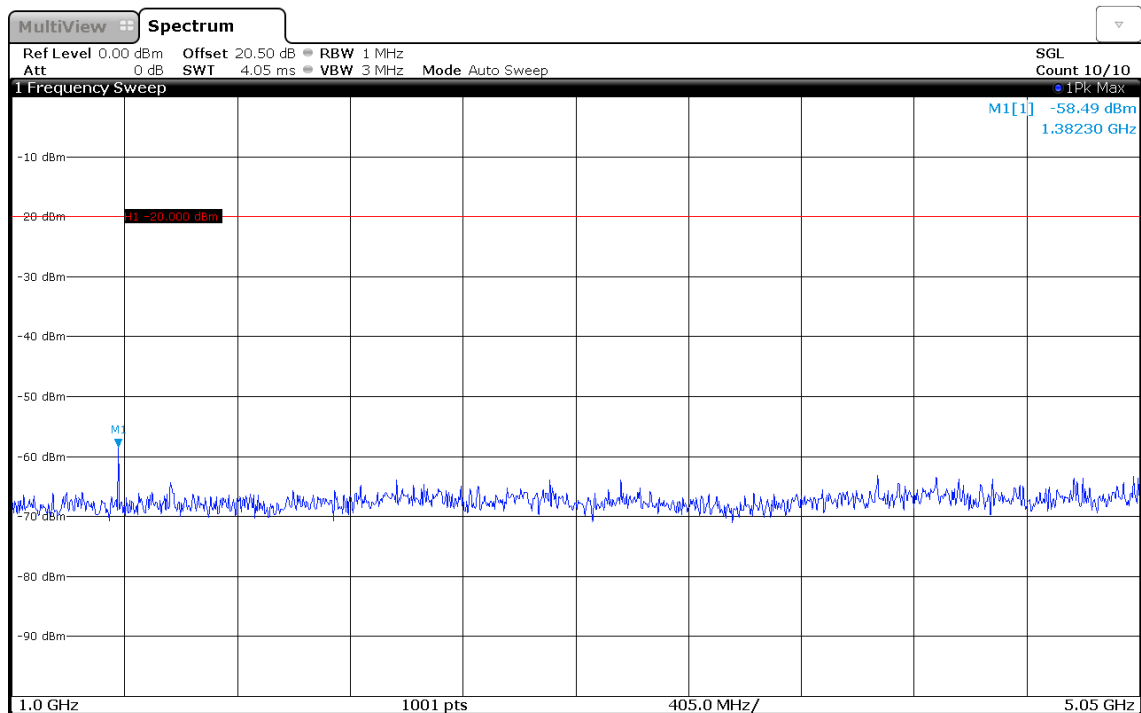
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fmid
 Note 3: Carrier notched



09:17:17 21.02.2018

Spurious emission at antenna terminal

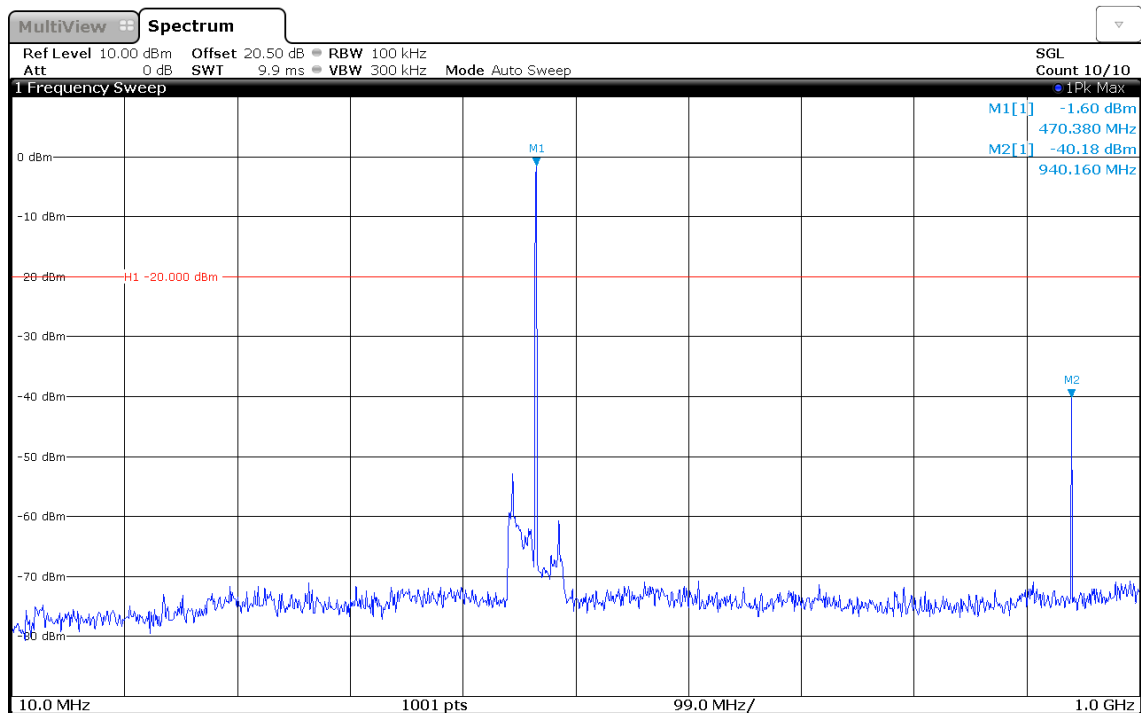
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fmid
 Note 3: High pass filter



10:27:58 21.02.2018

Spurious emission at antenna terminal

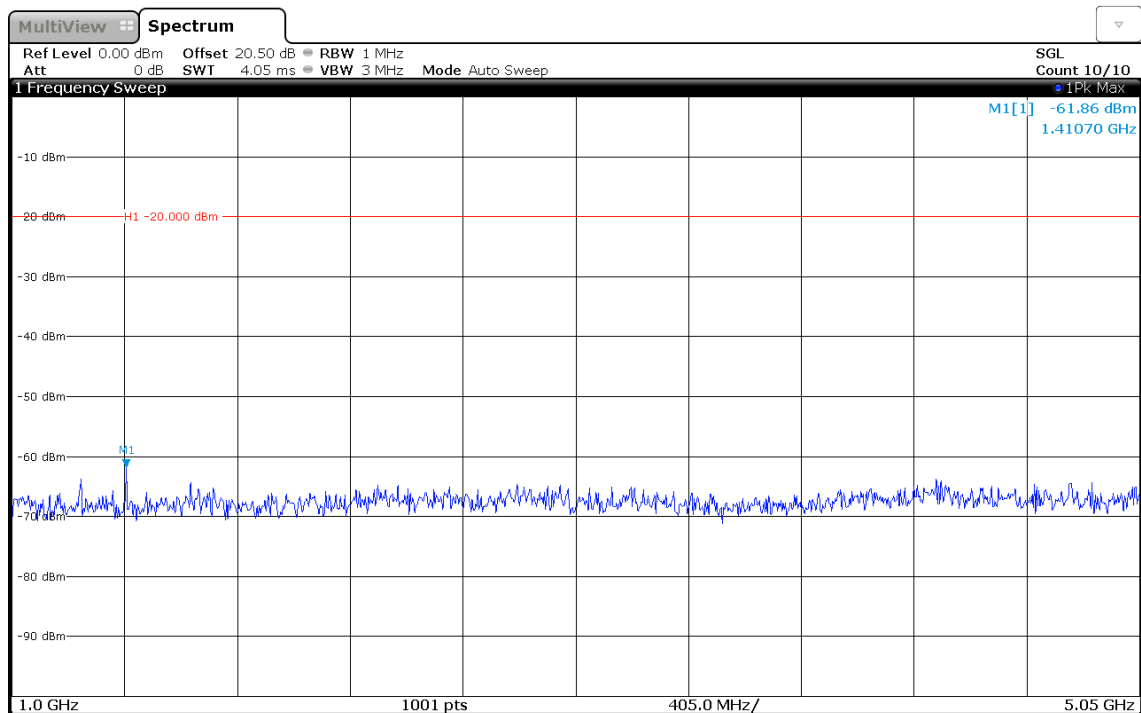
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fhigh
 Note 3: Carrier notched



09:20:32 21.02.2018

Spurious emission at antenna terminal

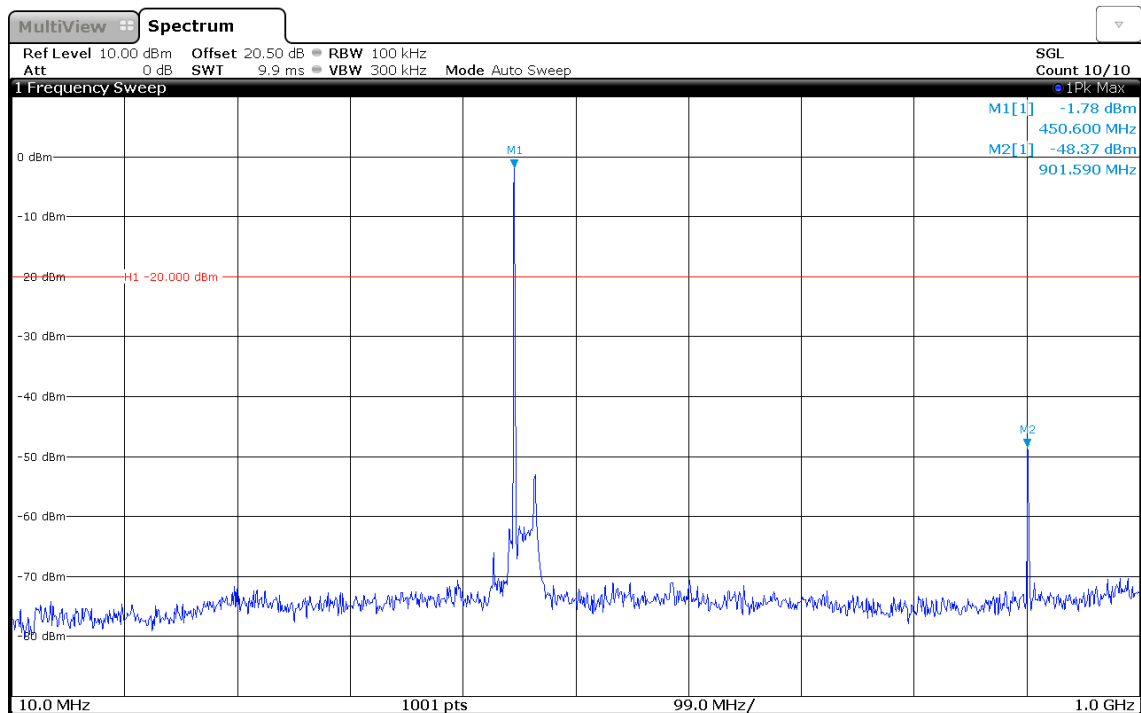
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fhigh
 Note 3: High pass filter



10:29:20 21.02.2018

Spurious emission at antenna terminal

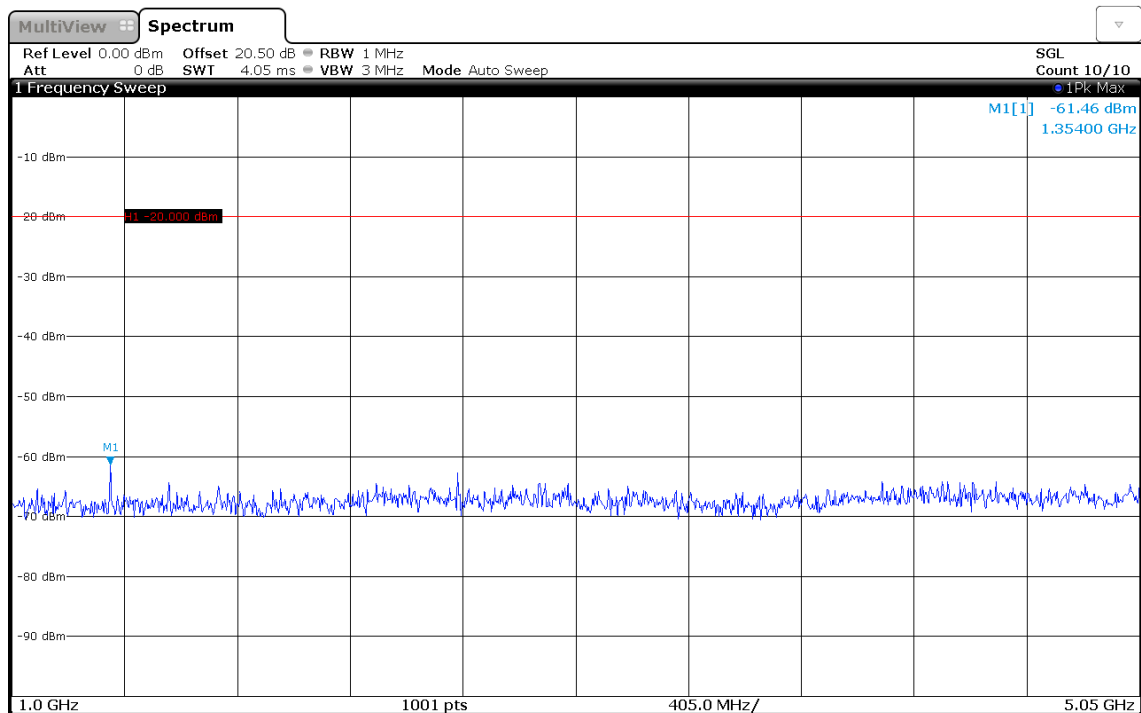
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Flow
 Note 3: Carrier notched



09:26:41 21.02.2018

Spurious emission at antenna terminal

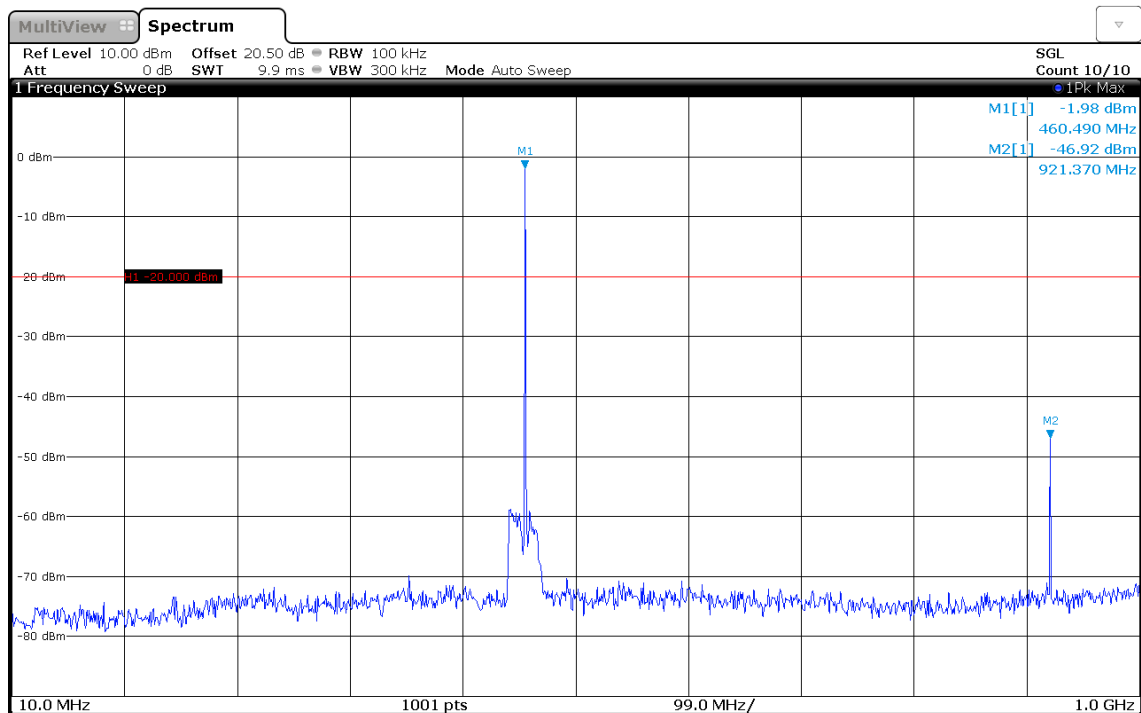
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Flow
 Note 3: High pass filter



09:44:22 21.02.2018

Spurious emission at antenna terminal

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fmid
 Note 3: Carrier notched



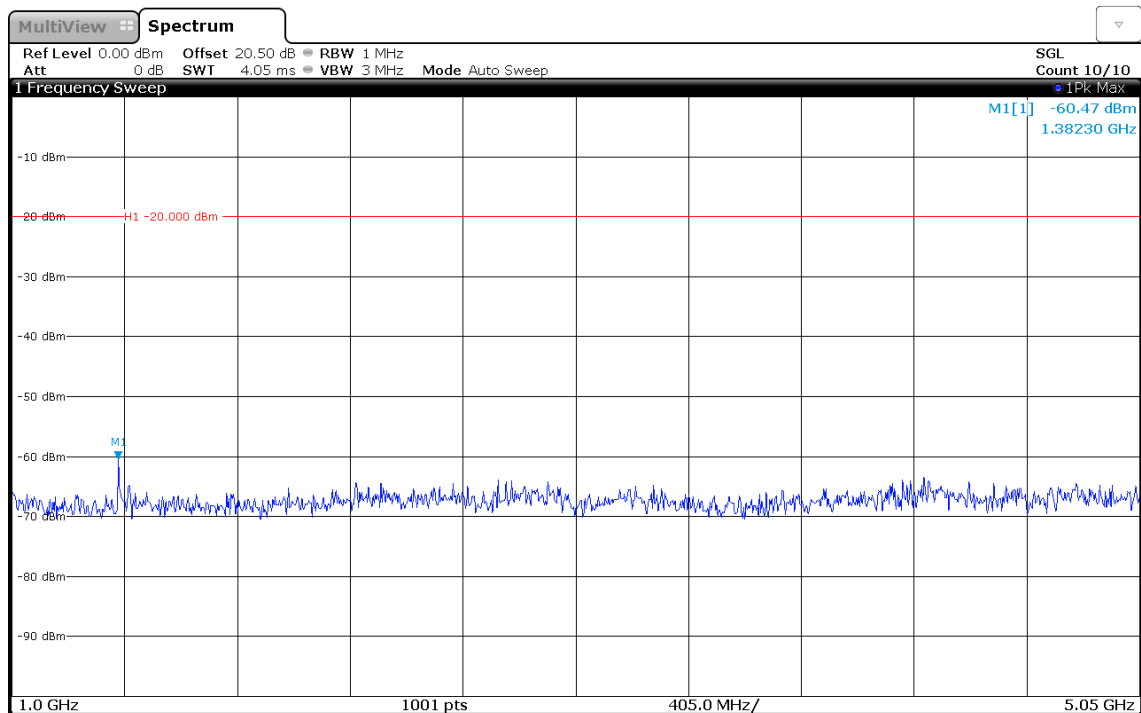
09:24:58 21.02.2018

Test Report No.: G0M-1801-7152-TFC90PMR-V01

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

Spurious emission at antenna terminal

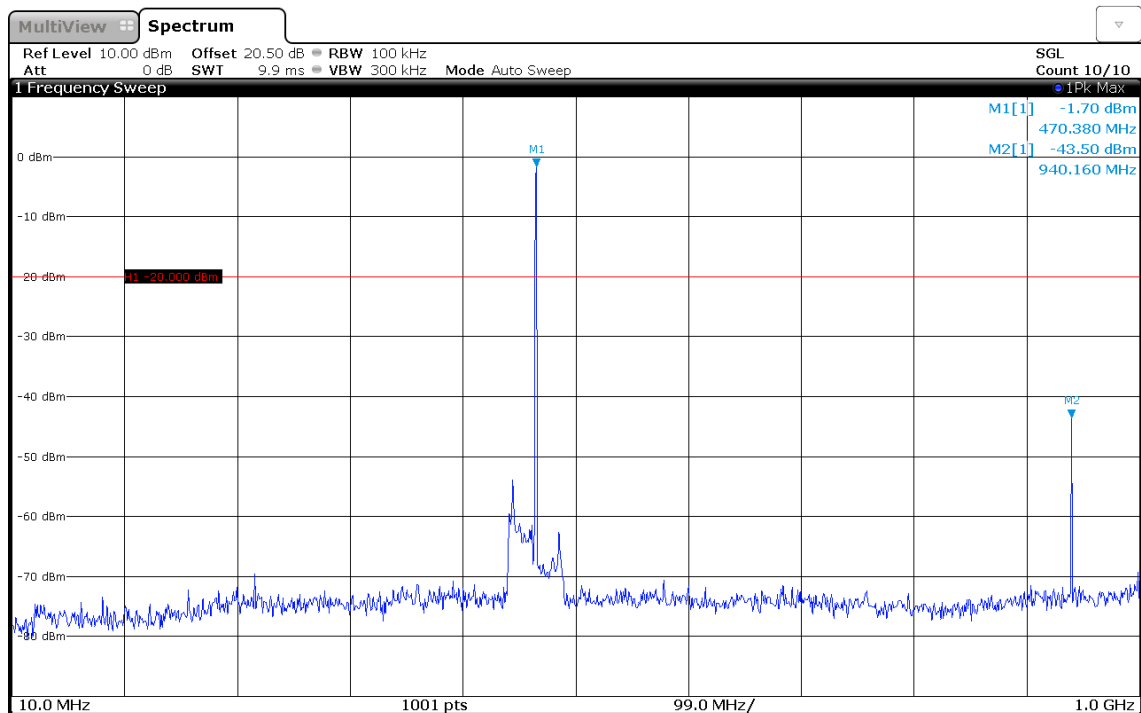
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fmid
 Note 3: High pass filter



09:46:55 21.02.2018

Spurious emission at antenna terminal

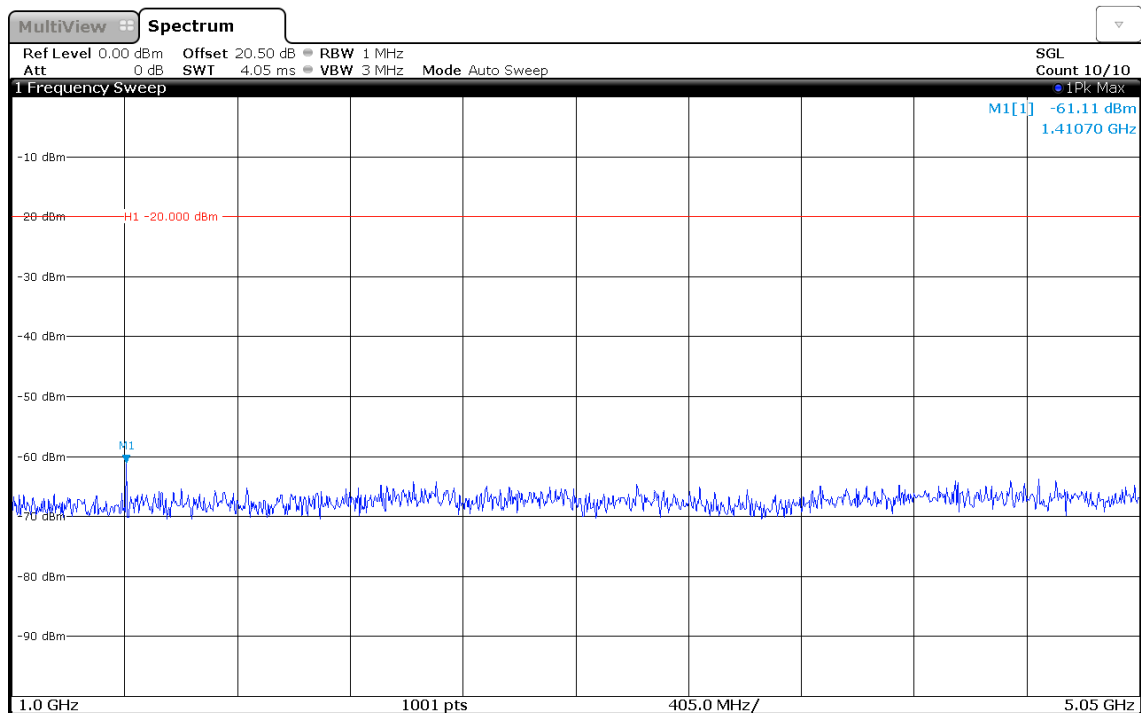
Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fhigh
 Note 3: Carrier notched



09:22:47 21.02.2018

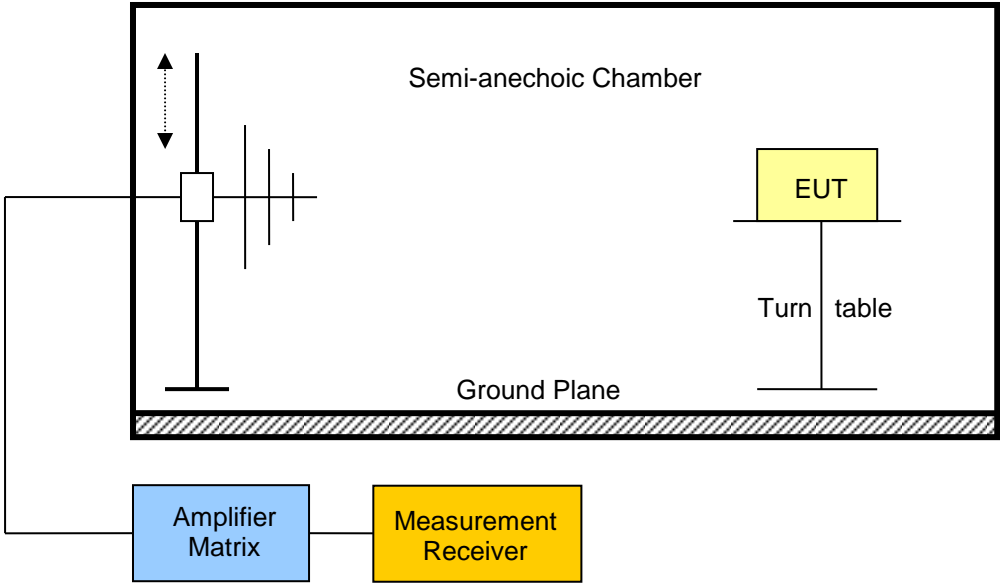
Spurious emission at antenna terminal

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fhigh
 Note 3: High pass filter




09:48:21 21.02.2018

3.4 Spurious emissions radiated

Spurious emissions radiated acc. to FCC 90.210		Verdict: PASS
Test according referenced standards	Reference Method	
	FCC 15.210(d), FCC 2.1053	
Test according to measurement reference	Reference Method	
	FCC 90.210, ANSI C63.26-2015 5.5	
Test frequency range	Tested frequencies	
	30 MHz – 10 th Harmonic	
EUT test mode	Transmit unmodulated	
Limits		
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation..		
Test setup		
		
Test procedure		
<ol style="list-style-type: none"> 1. EUT antenna output connected to 50 Ohm load. 2. EUT set to transmit mode 3. Maximum emission level is measured by rotating the EUT and adjusting the antenna height for vertical polarization 4. The EUT is replaced by a substitution antenna and generator 5. The power level is set to obtain the same power reading 6. Measurement is repeated for horizontal polarization 		

Test results Transmitter 0					
Channel	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]
F _{LOW}	1348	-39.90	hor	-20.00	-19.90
F _{LOW}	1348	-40.60	ver	-20.00	-20.56
F _{LOW}	1798	-47.30	hor	-20.00	-27.34
F _{LOW}	1804	-54.50	ver	-20.00	-34.45
F _{LOW}	2254	-55.30	ver	-20.00	-35.33
F _{MID}	1378	-33.90	hor	-20.00	-13.89
F _{MID}	1378	-35.40	ver	-20.00	-15.41
F _{MID}	1840	-50.70	hor	-20.00	-30.72
F _{MID}	1840	-53.40	ver	-20.00	-33.35
F _{MID}	2302	-55.70	hor	-20.00	-35.74
F _{HIGH}	1408	-27.40	hor	-20.00	-07.44
F _{HIGH}	1408	-29.70	ver	-20.00	-09.75
Test results Transmitter 1					
Channel	Emission [MHz]	Level [dbm]	Pol.	Limit [dBm]	Margin [dB]
F _{LOW}	1348	-32.20	hor	-20.00	-12.24
F _{LOW}	1348	-38.70	ver	-20.00	-18.67
F _{LOW}	1804	-50.80	hor	-20.00	-30.81
F _{LOW}	1804	-50.70	ver	-20.00	-30.74
F _{MID}	1378	-41.20	hor	-20.00	-21.21
F _{MID}	1378	-45.30	ver	-20.00	-25.32
F _{HIGH}	1408	-43.70	hor	-20.00	-23.68
F _{HIGH}	1408	-44.60	ver	-20.00	-24.64
Comments:					

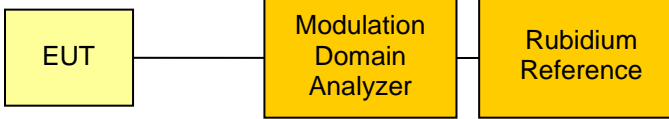
3.5 Frequency Stability

Frequency stability acc. to FCC 90.213		Verdict: PASS
EUT requirement rule parts and clause	Reference	
	FCC 90.213, FCC 2.1055	
Test according to measurement reference	Reference Method	
	ANSI C63.26-2015 5.6	
Test frequency range	Tested frequencies	
	F_{MID}	
EUT test mode	Transmit unmodulated	
Limits		
<p>In the 421-512 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 0.5 ppm.</p> <p>In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.</p>		
Test setup		
 <pre> graph LR EUT[EUT] --- SA[Spectrum Analyzer] SA --- RR[Rubidium Reference] </pre>		
Test procedure		
<ul style="list-style-type: none"> • The EUT is placed in a climatic chamber • EUT set to transmit mode • The frequency counter function of the spectrum analyzer is used • The frequency stability measurements are repeated within temperature and voltage range 		

Test results Transmitter 0				
Voltage	Temperature	Reference Frequency [MHz]		
24.0 VDC	20°C	460.649800		
Voltage	Temperature	Frequency Error [ppm]	Limit [ppm]	Verdict
18.0 VDC	20°C	0.01	± 1.5	PASS
30.0 VDC	20°C	0.01	± 1.5	PASS
24.0 VDC	-30°C	-0.24	± 1.5	PASS
24.0 VDC	-20°C	-0.18	± 1.5	PASS
24.0 VDC	-10°C	-0.06	± 1.5	PASS
24.0 VDC	0°C	-0.02	± 1.5	PASS
24.0 VDC	10°C	-0.04	± 1.5	PASS
24.0 VDC	30°C	0.01	± 1.5	PASS
24.0 VDC	40°C	0.06	± 1.5	PASS
24.0 VDC	50°C	0.06	± 1.5	PASS
24.0 VDC	60°C	-0.11	± 1.5	PASS
24.0 VDC	65°C	-0.10	± 1.5	PASS
Test results Transmitter 1				
Voltage	Temperature	Reference Frequency [MHz]		
24.0 VDC	20°C	460.649800		
Voltage	Temperature	Frequency Error [ppm]	Limit [ppm]	Verdict
18.0 VDC	20°C	0.01	± 1.5	PASS
30.0 VDC	20°C	0.01	± 1.5	PASS
24.0 VDC	-30°C	-0.26	± 1.5	PASS
24.0 VDC	-20°C	-0.20	± 1.5	PASS
24.0 VDC	-10°C	-0.05	± 1.5	PASS
24.0 VDC	0°C	0.02	± 1.5	PASS
24.0 VDC	10°C	-0.04	± 1.5	PASS
24.0 VDC	30°C	-0.02	± 1.5	PASS
24.0 VDC	40°C	0.07	± 1.5	PASS
24.0 VDC	50°C	0.06	± 1.5	PASS
24.0 VDC	60°C	-0.11	± 1.5	PASS
24.0 VDC	65°C	-0.11	± 1.5	PASS

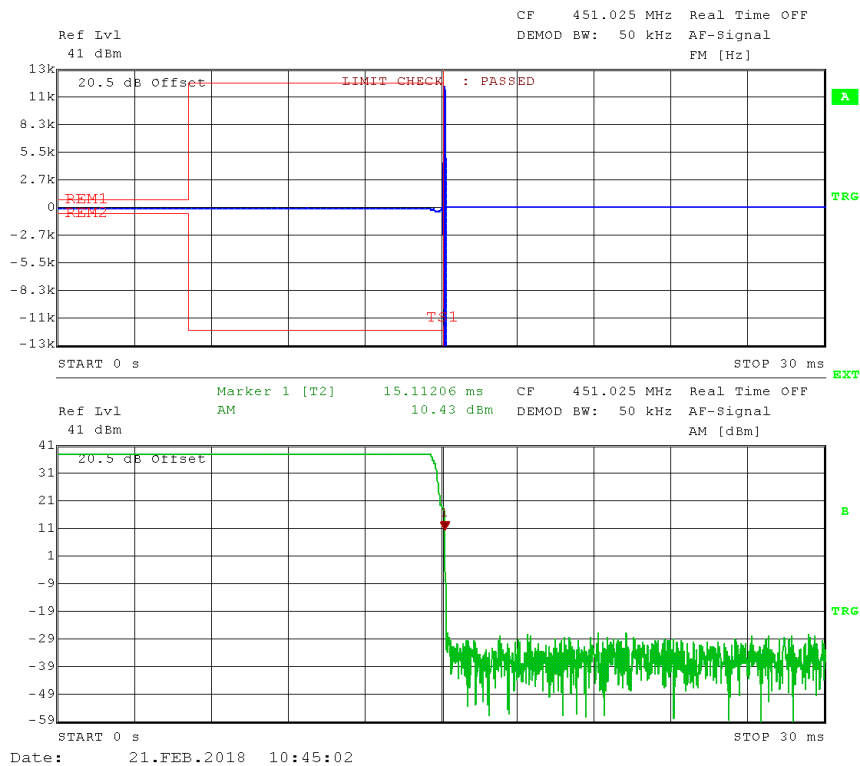
3.6 Transient Frequency Behavior

Frequency stability acc. to FCC 90.214		Verdict: PASS	
EUT requirement rule parts and clause	Reference		
	FCC 90.214		
Test according to measurement reference	Reference Method		
	ANSI C63.26-2015 6.5		
Test frequency range	Tested frequencies		
	F_{LOW} , F_{MID} , F_{HIGH}		
EUT test mode	Transmit unmodulated		
Limits			
Time intervals ^{1, 2}	Maximum frequency difference ³	All equipment ⁴	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
$t_{1,4}$	± 25.0 kHz	5.0 ms	10.0 ms
$t_{2,4}$	± 12.5 kHz	20.0 ms	25.0 ms
$t_{3,4}$	± 25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
$t_{1,4}$	± 12.5 kHz	5.0 ms	10.0 ms
$t_{2,4}$	± 6.25 kHz	20.0 ms	25.0 ms
$t_{3,4}$	± 12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
$t_{1,4}$	± 6.25 kHz	5.0 ms	10.0 ms
$t_{2,4}$	± 3.125 kHz	20.0 ms	25.0 ms
$t_{3,4}$	± 6.25 kHz	5.0 ms	10.0 ms
¹ t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing. ¶ ² t_1 is the time period immediately following t_{on} . ¶ ³ t_2 is the time period immediately following t_1 . ¶ ⁴ t_3 is the time period from the instant when the transmitter is turned off until t_{off} . ¶ ⁵ t_{off} is the instant when the 1 kHz test signal starts to rise. ¶ ⁶ During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in §90.213. ¶ ⁷ Difference between the actual transmitter frequency and the assigned transmitter frequency. ¶ ⁸ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period. ¶			

Test setup		
		
Test procedure		
<ul style="list-style-type: none"> • EUT set to transmit mode • Center frequency set to test channel center frequency • The transient behavior is captured during switching the transmitter on and off 		
Test results Transmitter 0		
Channel	State	Verdict
F _{LOW}	Tx off	PASS
F _{MID}	Tx off	PASS
F _{HIGH}	Tx off	PASS
F _{LOW}	Tx on	PASS
F _{MID}	Tx on	PASS
F _{HIGH}	Tx on	PASS
Test results Transmitter 1		
Channel	State	Verdict
F _{LOW}	Tx off	PASS
F _{MID}	Tx off	PASS
F _{HIGH}	Tx off	PASS
F _{LOW}	Tx on	PASS
F _{MID}	Tx on	PASS
F _{HIGH}	Tx on	PASS
Comments:		

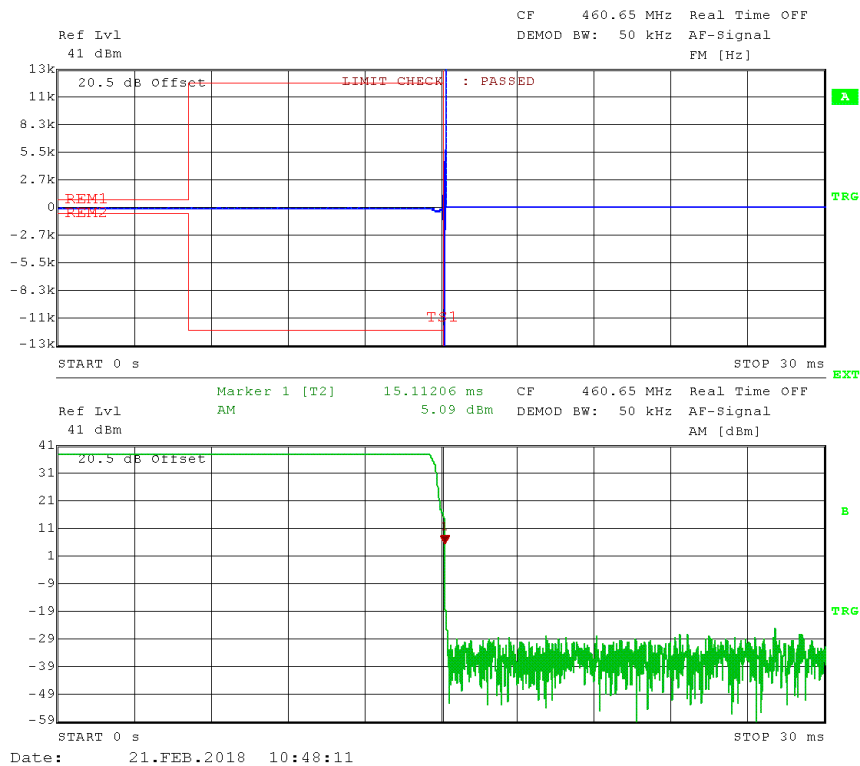
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Flow
 Note 3: Tx off



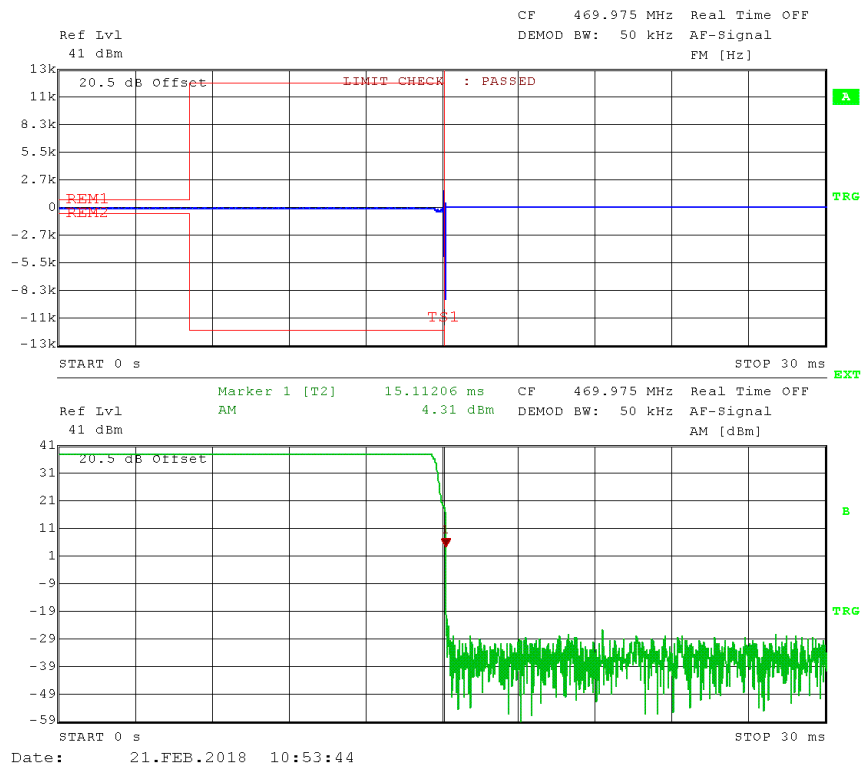
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fmid
 Note 3: Tx off



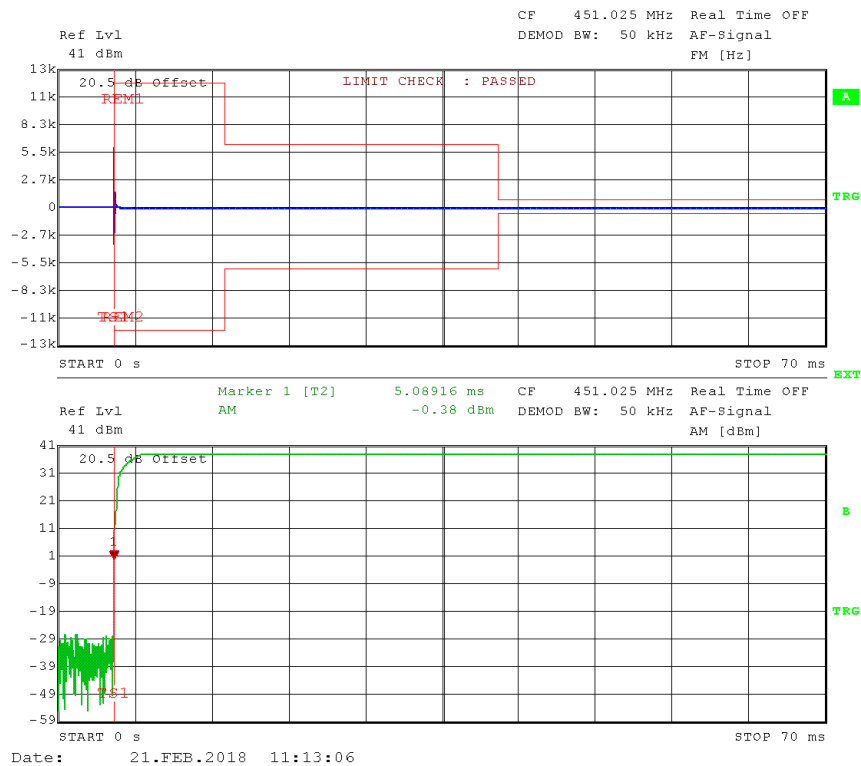
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fhigh
 Note 3: Tx off



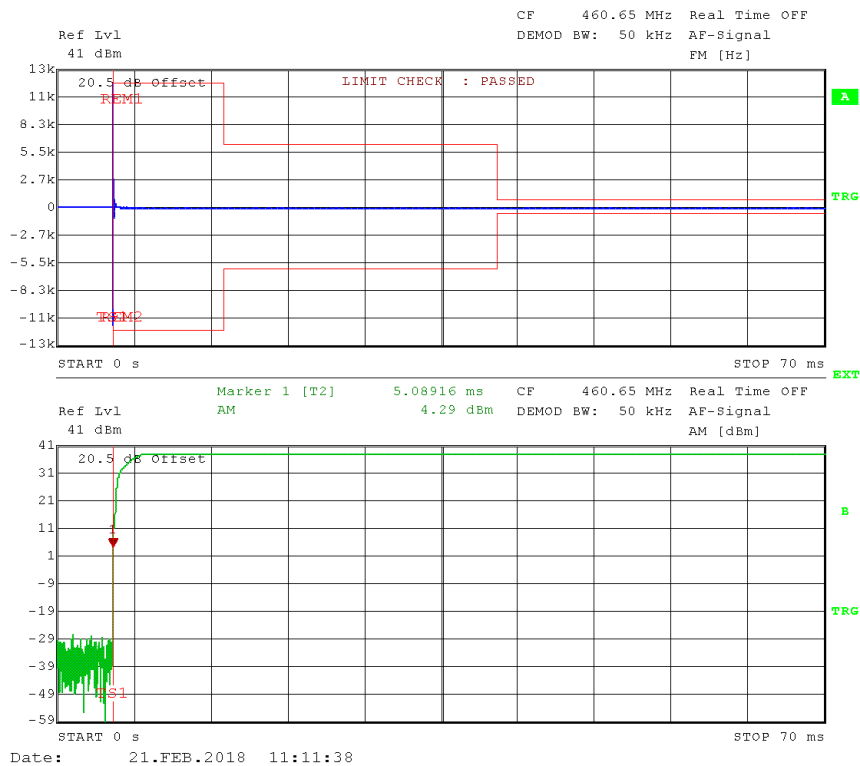
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Flow
 Note 3: Tx on



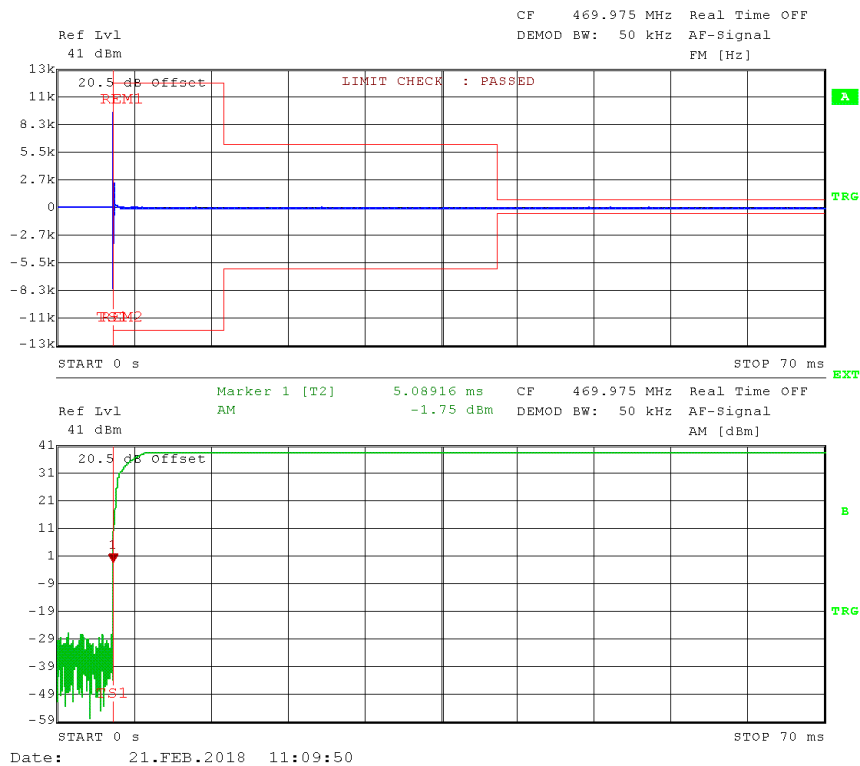
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fmid
 Note 3: Tx on



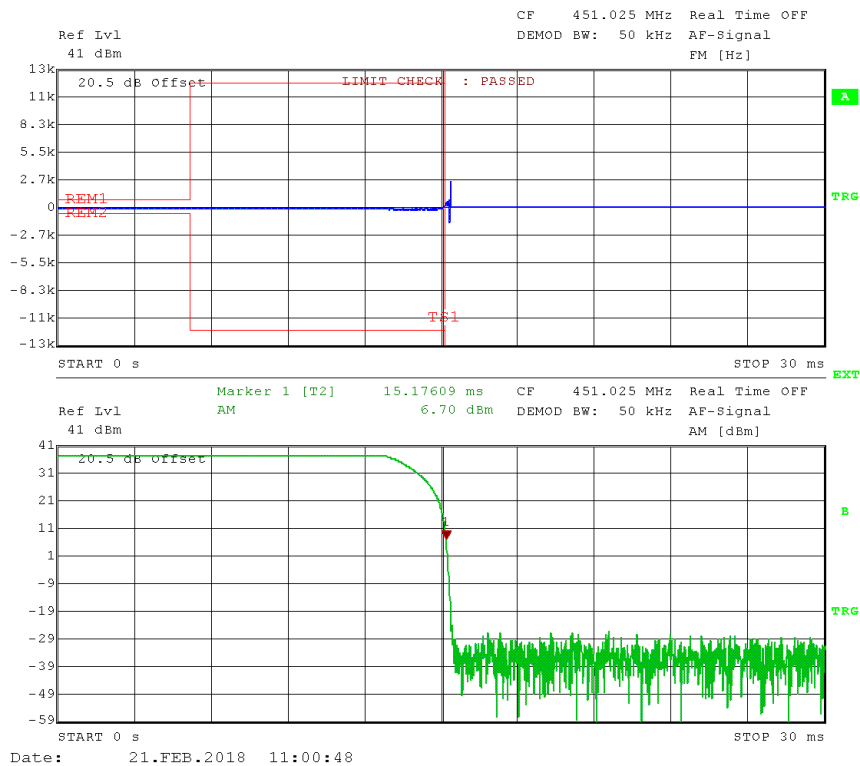
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 0
 Note 2: Fhigh
 Note 3: Tx on



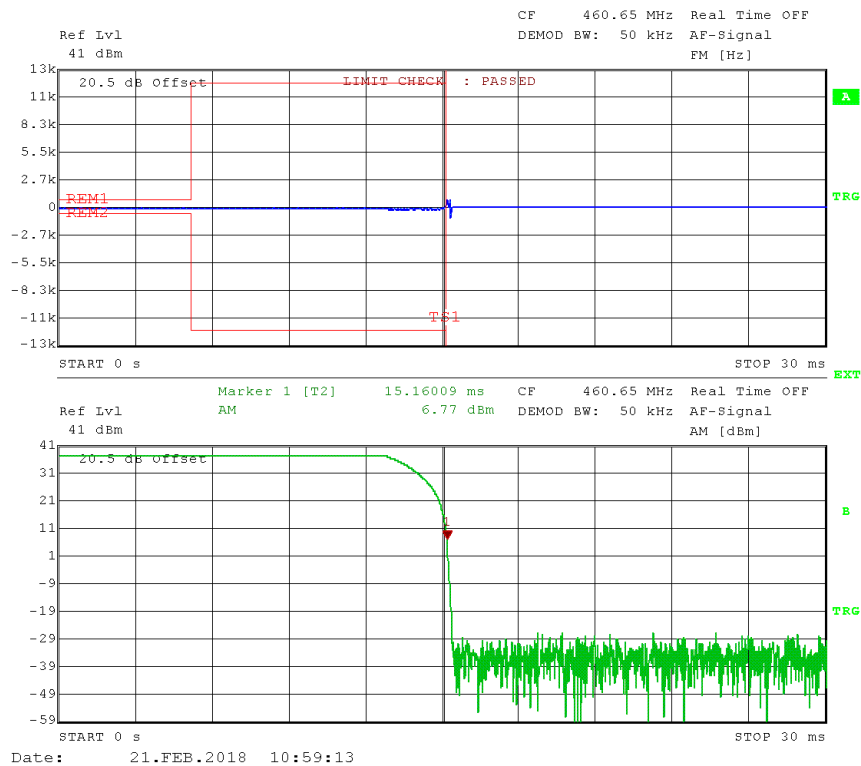
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Flow
 Note 3: Tx off



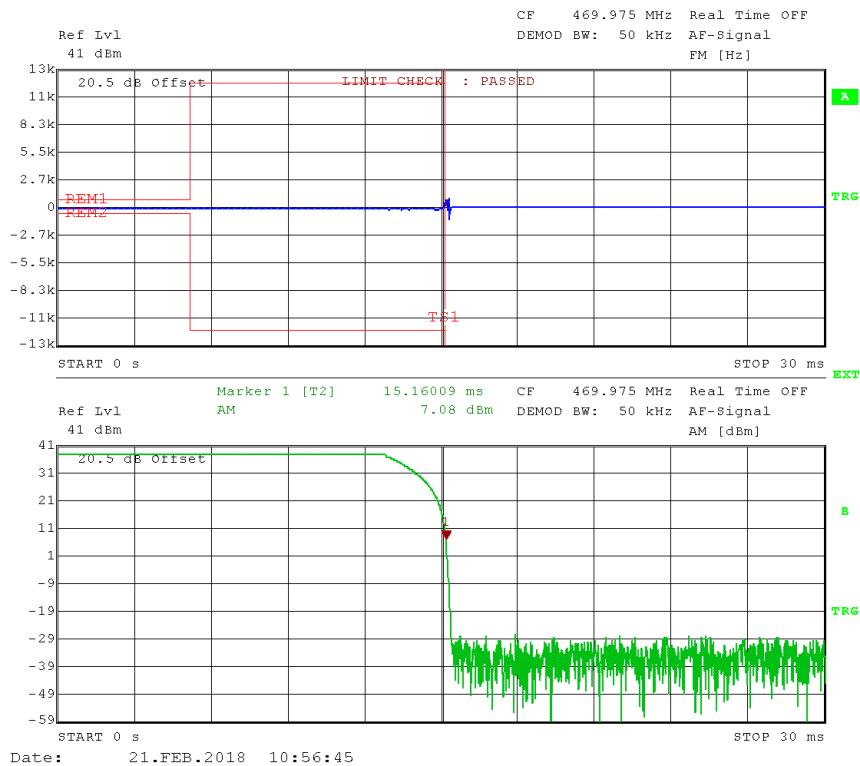
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fmid
 Note 3: Tx off



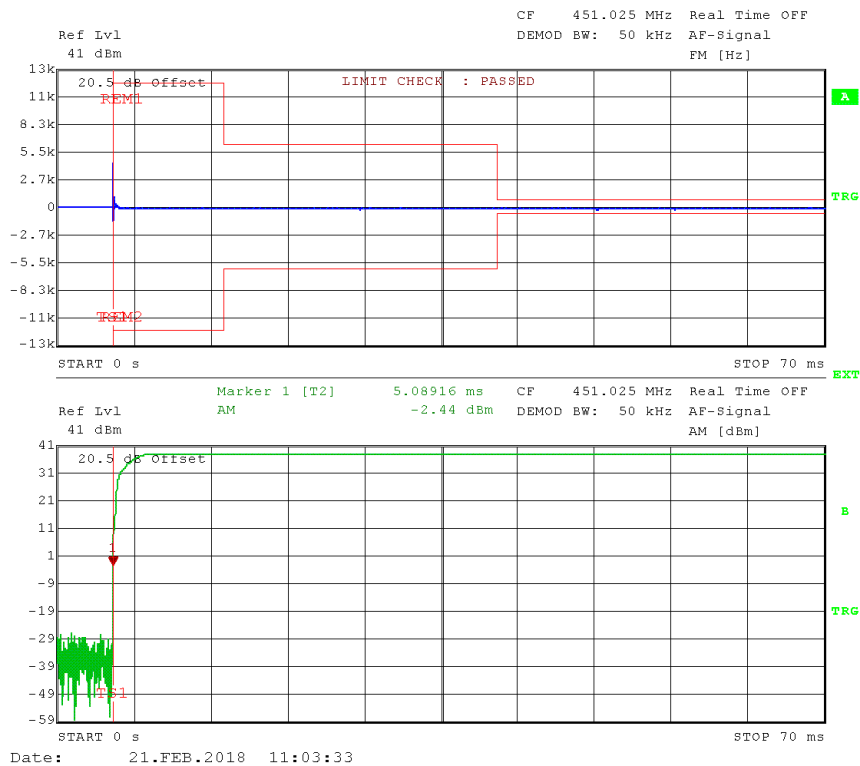
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fhigh
 Note 3: Tx off



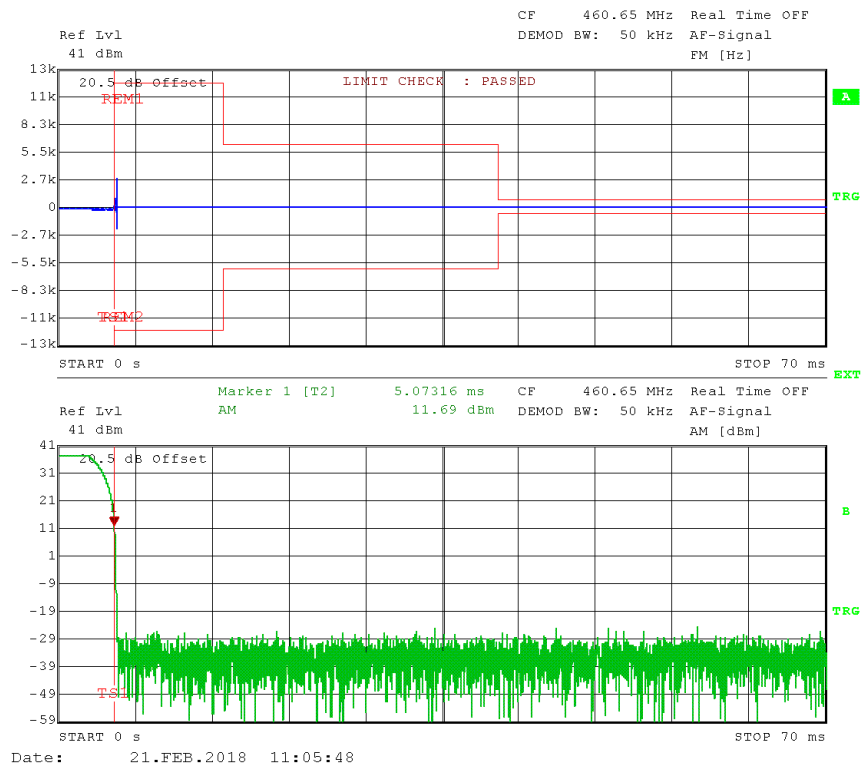
Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Flow
 Note 3: Tx on



Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fmid
 Note 3: Tx on



Transient Frequency Behavior

Project Number: G0M-1801-7152
 Applicant: Kamstrup A/S
 Model Description: Kamstrup READY Collector Top
 Model: Kamstrup READY Collector Top
 Test Sample ID: 17451
 Operator: Toralf Jahn
 Test Site: Eurofins Product Service GmbH
 Test Date: 2018-02-21
 Note 1: Transmitter 1
 Note 2: Fhigh
 Note 3: Tx on

