PHOENIX TESTLAB
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TEST REPORT

Test Report Reference: R70125 Edition 1

Equipment under Test: SUNNYBEAMREPU

Serial Number: 8

FCC ID: SVFSUNNYBEAMREPU

Applicant: SMA Technologie AG

Manufacturer: SMA Technologie AG

Test Laboratory
(CAB)
accredited by
DATech GmbH
in compliance with DIN EN ISO/IEC 17025
under the
Reg. No. DAT-P-105/99-21 and
FCC Test site registration number 90877

Contents: **Page**

1 IDENTIFICATION 3
1.1 APPLICANT 3
1.2 MANUFACTURER 3
1.3 DATES 3
1.4 TEST LABORATORY 4
1.5 RESERVATION 4
1.6 NORMATIVE REFERENCES 4
1.7 TEST RESULTS 4
2 TECHNICAL DATA OF EQUIPMENT 5
2.1 DEVICE UNDER TEST 5
2.2 PERIPHERY DEVICES 5
3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES 6
4 ADDITIONAL INFORMATION 6
5 REQUIREMENT OVERVIEW 7
6 METHOD OF MEASUREMENT 8
6.1 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz) 8
6.2 RADIATED EMISSIONS 9
6.2.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS) 9
7 TEST RESULTS 12
7.1 CONDUCTED EMISSION MEASUREMENT ON AC MAINS (150 kHz to 30 MHz) 12
7.2 RADIATED EMISSIONS 14
7.2.1 PRELIMINARY MEASUREMENT (30 MHz to 1 GHz) 14
7.2.2 FINAL MEASUREMENT (30 MHz to 1 GHz) 16
7.3 OCCUPIED BANDWIDTH 18
8 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS 19
9 LIST OF ANNEXES 23

1 IDENTIFICATION

1.1 APPLICANT

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	34266 Niestetal
Country:	Germany
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1.2 MANUFACTURER

Name:	SMA Technologie AG
Address:	Hannoversche Straße 1-5
	34266 Niestetal
Country:	Germany
Name for contact purposes:	Mr. Gerald KÄMPF
Tel:	+ 49 561 95 22-205
Fax:	+ 49 561 95 22 280
e-mail address:	Gerald.Kaempf@SMA.de

1.3 DATES

Date of receipt of test sample:	23 January 2007
Start of test:	24 January 2007
End of test:	25 January 2007

1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**
Königswinkel 10
D-32825 Blomberg **Phone:** **+49 (0) 52 35 / 95 00-0**
Germany **Fax:** **+49 (0) 52 35 / 95 00-10**

accredited by DATech GmbH in compliance with DIN EN ISO/IEC 17025 under Reg. No. DAT-P-105/99-21 and FCC Test site registration number 90877

Test engineer:	Thomas KÜHN		29 January 2007
	Name	Signature	Date
Test report checked:	Bernd STEINER		29 January 2007
	Name	Signature	Date

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Tel. 0 52 35 / 95 00-0
Fax 0 52 35 / 95 00-10

Stamp

1.5 RESERVATION

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT REFERENCE.

1.6 NORMATIVE REFERENCES

[1] **ANSI C63.4-2003** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[2] **FCC CFR 47 Part 15 (August 2006)** Radio Frequency Devices

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

2 TECHNICAL DATA OF EQUIPMENT

2.1 DEVICE UNDER TEST

Type of equipment: *	Short range device transceiver
Type designation: *	SUNNYBEAMREPU
Serial number: *	8
FCC ID:	SVFSUNNYBEAMREPU
Antenna type: *	LINX-TECHNOLOGIES ANT-916-PML
Antenna gain: *	0.44 dBi
Antenna connector: *	Fixed antenna
Power supply: *	5.0 V from USB-power adaptor Model TR10R050
Type of modulation: *	FSK
Operating frequency range:*	917.78 MHz
Number of channels: *	None channelised equipment
Highest/lowest internal Frequency: *	Below 100 MHz (unintentional radiator)
Temperature range: *	0 °C to 55 °C

*: Declared by the applicant.

The following external I/O cables were used:

Cable	Length	Shielding	Connector
Power supply	1.8 m	No	USB

*: Length during the test if no other specified.

2.2 PERIPHERY DEVICES

- USB power adaptor CINCON ELECTRONICS Co., Ltd. Model TR10R050.

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

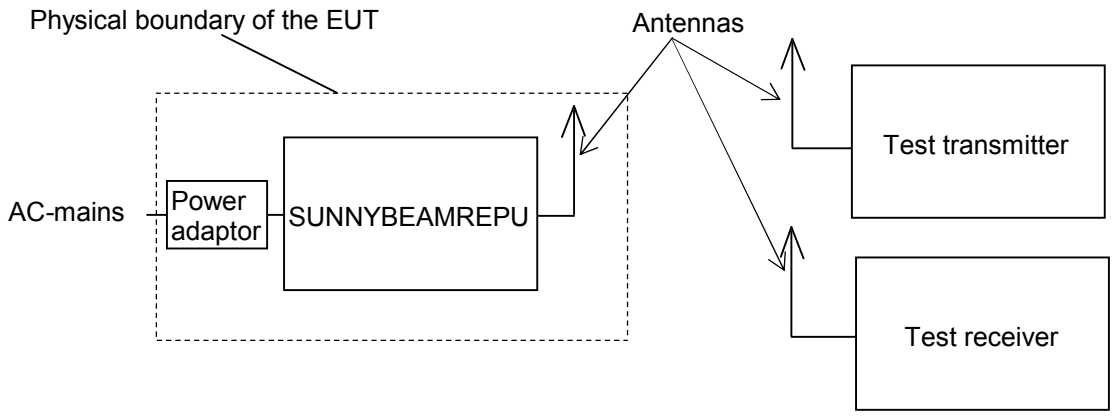
The EUT is a transceiver, which is intended to use for transmission of data from solar converters to a display unit and back. The tests were carried out with an unmodified sample running with a test-software, which communicates with a test receiver and a test transmitter (both supplied by the applicant) in shorted transmit and receive intervals.

During the tests the test sample was powered by the USB power adaptor TR10R050 with 5.0 V DC. The USB power adaptor was powered with 120 V AC / 60 Hz during all tests.

As declared by the applicant, the EUT was not labelled with the correct type plate.

The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Receive and transmit on 917.78 MHz with normal modulation and shorted repetition rate



4 ADDITIONAL INFORMATION

The transmitter part of the SUNNYBEAMREPU is already tested under PHOENIX-TESTLAB test report reference R60136_D and listed under FCC ID SVFSUNNYBEAMU. This transmitter will be used with software modifications only. So this test report only documents the emissions of the unintentional radiator part. The transmitter power and the occupied bandwidth were measured to document that the intentional radiator still meets the requirements of CFR 47 Part 15.249.

5 REQUIREMENT OVERVIEW

Conducted emissions FCC 47 CFR Part 15 section 15.107 (a)[2]					
Application	Frequency range	Limits	Reference standard	Remark	Status
On AC supply line	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dBµV (QP) * 56 to 46 dBµV (AV) * 56 dBµV (QP) 46 dBµV (AV) 60 dBµV (QP) 50 dBµV (AV)	ANSI C63.4 (2003)	-	Passed
*: Decreases with the logarithm of the frequency					
Radiated emissions FCC 47 CFR Part 15 section 15.109 [2]					
Application	Frequency range	Limits (microvolts/meter)	Reference standard	Remark	Status
Unintentional radiator	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz	40.0 dBµV/m at 3 m 43.5 dBµV/m at 3 m 46.0 dBµV/m at 3 m 54.0 dBµV/m at 3 m	ANSI C63.4 (2003);	-	Passed
Antenna requirement FCC 47 CFR Part 15 section 15.203 [2]					
					Status
The antenna is fixed (soldered to the PCB and glued to the housing).					Passed

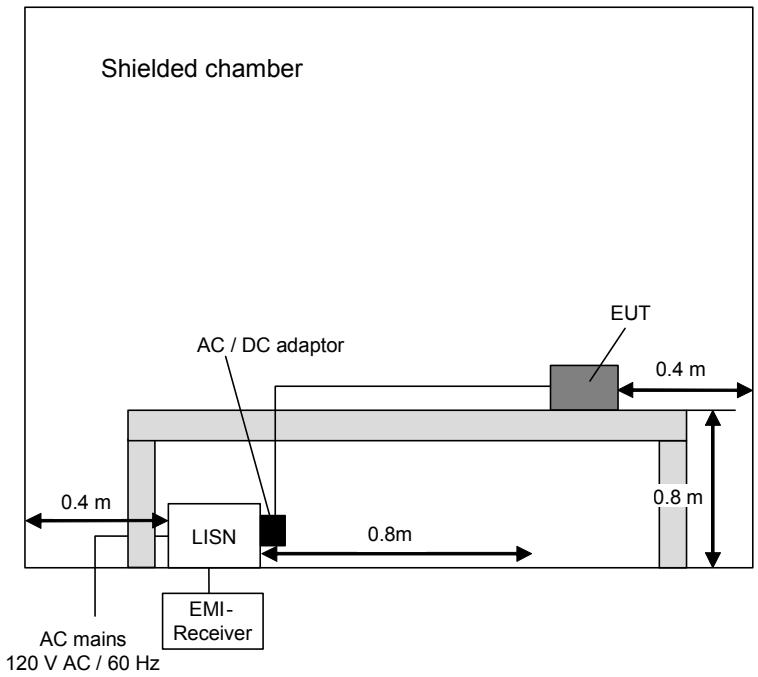
6 METHOD OF MEASUREMENT

6.1 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz)

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to
ANSI C63.4-2003 [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriable limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



6.2 RADIATED EMISSIONS

6.2.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into two stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an open area test side with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.

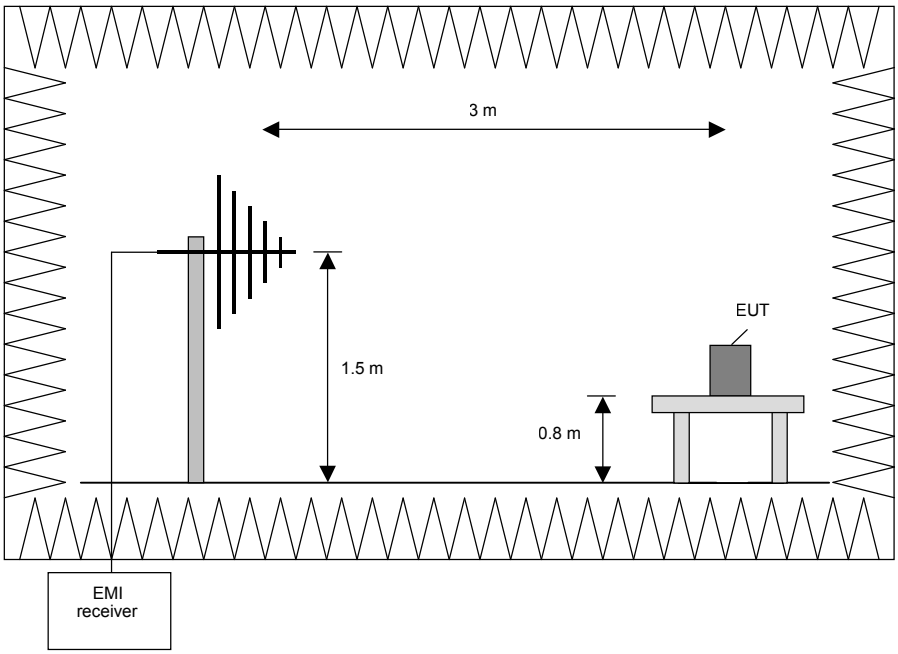
Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 230 MHz	100 kHz
230 MHz to 1 GHz	100 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.
The following procedure will be used:

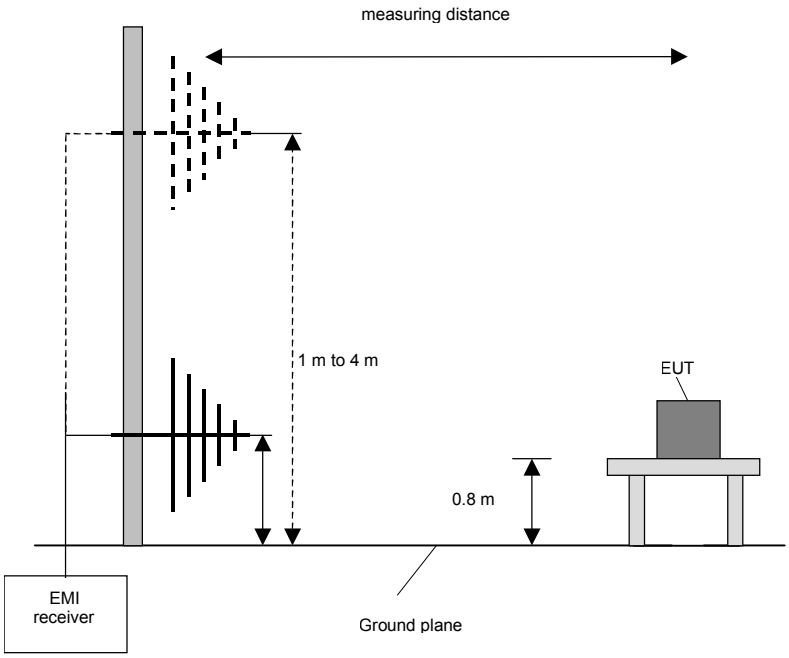
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat 1) to 4) with the other orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).
7. Repeat 1) to 5) with the vertical polarisation of the measuring antenna.

Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of
0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
4) Repeat 1) to 3) for the other orthogonal antenna polarization.
5) Move the antenna and the turntable to the position where the maximum value is detected.
6) Measure while moving the antenna slowly +/- 1 m.
7) Set the antenna to the position where the maximum value is found.
8) Measure while moving the turntable +/- 45 °.
9) Set the turntable to the azimuth where the maximum value is found.
10) Measure with Final detector (QP and AV) and note the value.
11) Repeat 5) to 10) for each frequency.
12) Repeat 1) to 11) for each orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).

7 TEST RESULTS

7.1 CONDUCTED EMISSION MEASUREMENT ON AC MAINS (150 kHz to 30 MHz)

Ambient temperature:	18 °C	Relative humidity:	29 %

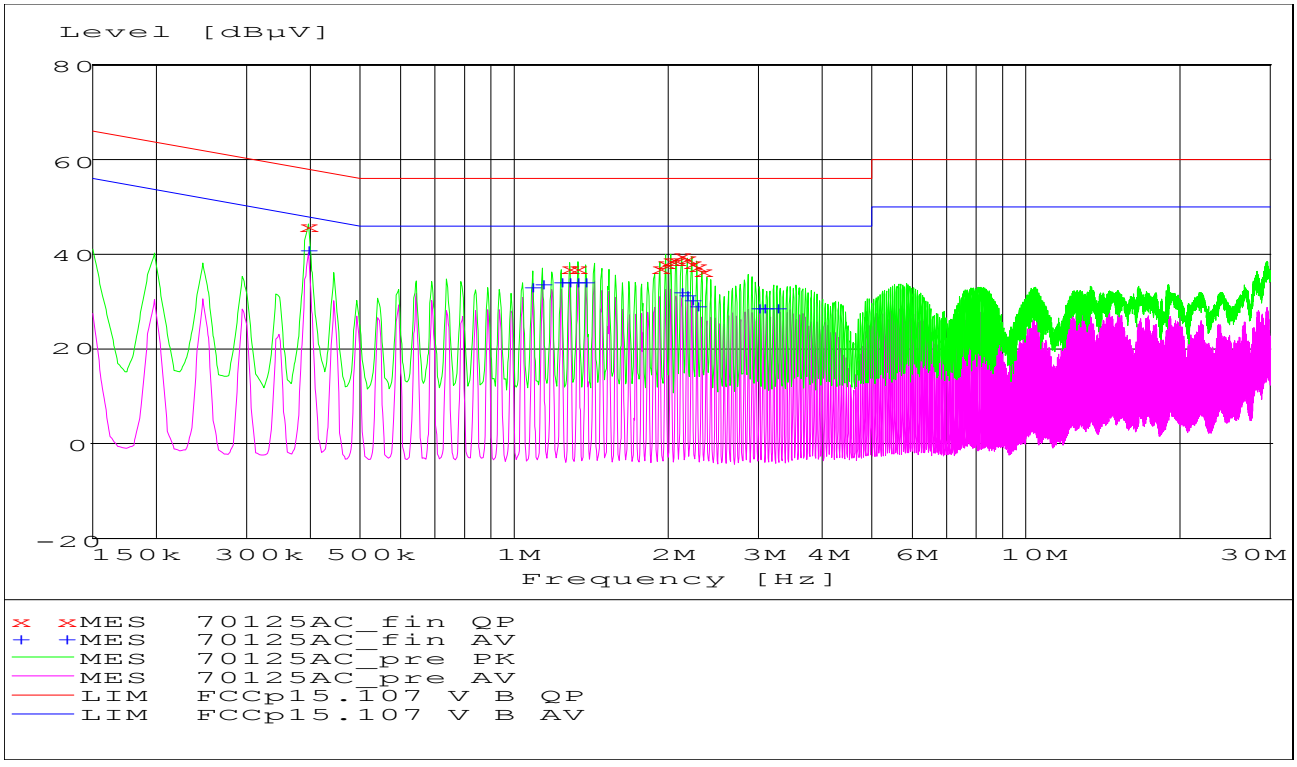
Position of EUT: The EUT was set-up on a wooden table of a height of 0.8 m.

Cable guide: The cable of the EUT was fixed on the wooden table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: Where not otherwise stated the test was carried out in test mode 1 of the EUT. All results are shown in the following.

Power supply: During all measurements the EUT was supplied with 5.0 V from USB power adaptor, which was powered by AC-mains with 120 V AC / 60 Hz.

Title: AC Powerline Conducted Emission Test with protective ground conductor simulating network
EUT: REPEATER Sunny Beam U
Manufacturer: SMA Technologie AG
Operating Condition: Receive and transmit
Test site: PHOENIX TESTLAB Blomberg M4
Operator: Th. KÜHN
Test Specification: Powered with 120 V AC
Comment: Using AC/DC adaptor TR10R050



Data record name: 70125AC

Result measured with the quasipeak detector:

(These values are marked in the above diagram by x)

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.394890	46.20	0.9	58.0	11.8	L1	FLO
1.283460	37.30	0.7	56.0	18.7	L1	FLO
1.332690	37.00	0.7	56.0	19.0	L1	FLO
1.925430	37.20	0.7	56.0	18.8	L1	FLO
1.974840	38.30	0.8	56.0	17.7	L1	FLO
2.024340	39.00	0.8	56.0	17.0	L1	FLO
2.073660	39.00	0.7	56.0	17.0	L1	FLO
2.127750	39.90	0.8	56.0	16.1	L1	FLO
2.176980	39.40	0.8	56.0	16.6	L1	FLO
2.226390	38.50	0.8	56.0	17.5	L1	FLO
2.276070	37.60	0.7	56.0	18.4	L1	FLO
2.325750	36.50	0.7	56.0	19.5	L1	FLO

Data record name: 70125AC_fin QP

Result measured with the average detector:

(These values are marked in the above diagram by +)

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.395070	41.10	0.9	48.0	6.8	L1	FLO
1.086090	33.10	0.8	46.0	12.9	L1	FLO
1.135950	34.00	0.7	46.0	12.0	L1	FLO
1.234770	34.50	0.7	46.0	11.5	L1	FLO
1.284180	34.50	0.7	46.0	11.5	L1	FLO
1.333410	34.20	0.7	46.0	11.8	L1	FLO
1.383180	34.20	0.7	46.0	11.8	L1	FLO
2.127840	32.40	0.8	46.0	13.6	L1	FLO
2.177340	31.40	0.8	46.0	14.6	L1	FLO
2.226750	30.20	0.8	46.0	15.8	L1	FLO
2.276250	29.00	0.7	46.0	17.0	L1	FLO
3.018930	28.90	0.8	46.0	17.1	L1	FLO
3.068250	28.90	0.7	46.0	17.1	L1	FLO
3.266340	28.60	0.7	46.0	17.4	L1	FLO

Data record name: 70125AC_fin AV

Test: Passed

TEST EQUIPMENT USED:

1 - 3, 5, 6

7.2 RADIATED EMISSIONS

7.2.1 PRELIMINARY MEASUREMENT (30 MHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	27 %

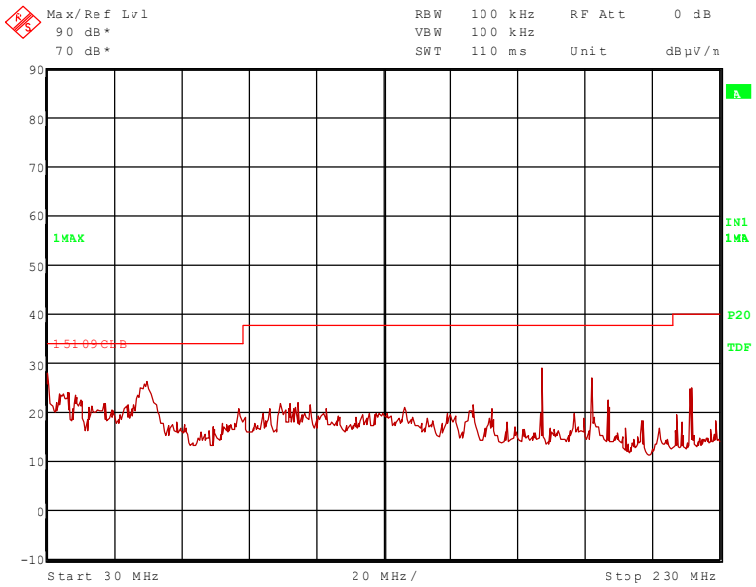
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

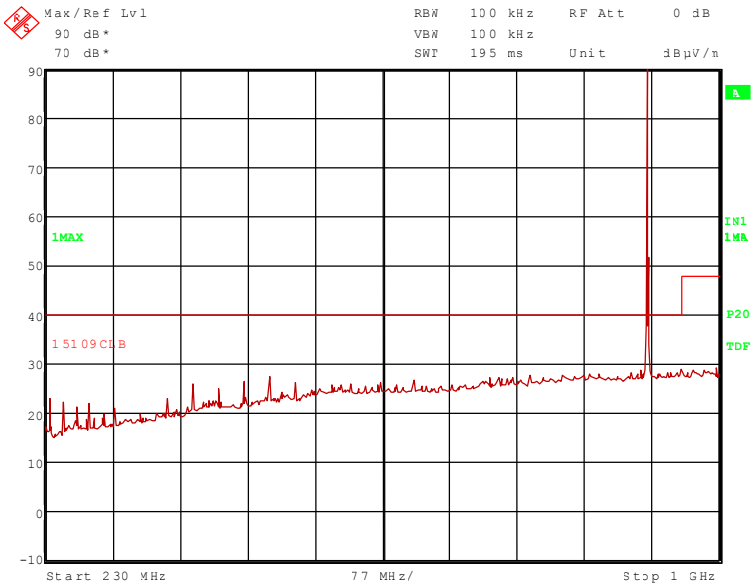
Test record: Where not otherwise stated the test was carried out in test mode 1 of the EUT. All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V from the USB power adaptor.

70125_4.wmf: Spurious emissions from 30 MHz to 230 MHz:



70125_2.wmf: Spurious emissions from 230 MHz to 1 GHz:



The following emissions were found according to FCC 47 CFR Part 15 section 15.109.

30.190 MHz, 59.449 MHz, 176.954 MHz, 191.700 MHz, MHz, 221.191 MHz, 235.936 MHz, 398.142 MHz, 486.618 MHz and 917.776 MHz.

These frequencies have to be measured on the outdoor test site. The result of this final measurement is shown in subclause 7.2.2 of this test report.

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 36, 43, 44, 49

7.2.2 FINAL MEASUREMENT (30 MHz to 1 GHz)

Ambient temperature:	18 °C	Relative humidity:	29 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

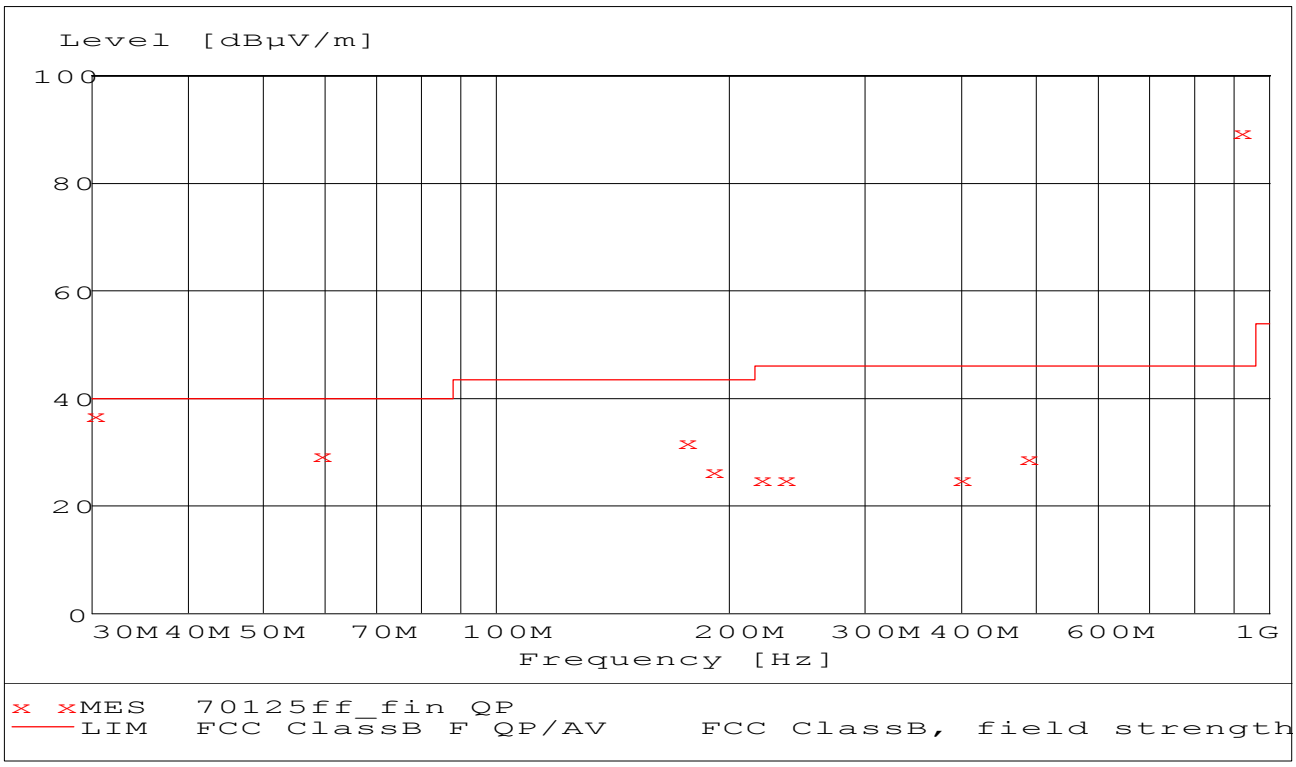
Test record: Where not otherwise stated the test was carried out in test mode 1 of the EUT. All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V from the USB power adaptor.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with x are the measured results of the standard final measurement on the open area test site.



Data record name: 70125ff

The results of the standard final measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 10 seconds.

Spurious emissions									
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
30.190	37.1	40.0	2.9	17.2	19.6	0.3	181.0	157.0	Vert.
59.449	29.4	40.0	10.6	22.6	6.3	0.5	100.0	63.0	Vert.
176.954	32.2	43.5	11.3	21.6	9.8	0.8	125.0	9.0	Hor.
191.700	26.6	43.5	16.9	16.8	9.0	0.8	118.0	323.0	Hor.
221.191	25.1	46.0	20.9	14.3	9.9	0.9	151.0	112.0	Hor.
235.936	24.9	46.0	21.1	13.3	10.6	1.0	150.0	112.0	Hor.
398.142	25.3	46.0	20.7	8.5	15.6	1.2	266.0	112.0	Hor.
486.618	28.8	46.0	17.2	10.3	17.1	1.4	181.0	112.0	Hor.
917.776	89.6	94.0	4.4	64.6	23.0	2.0	100.0	293.00	Vert.

The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

7.3 OCCUPIED BANDWIDTH

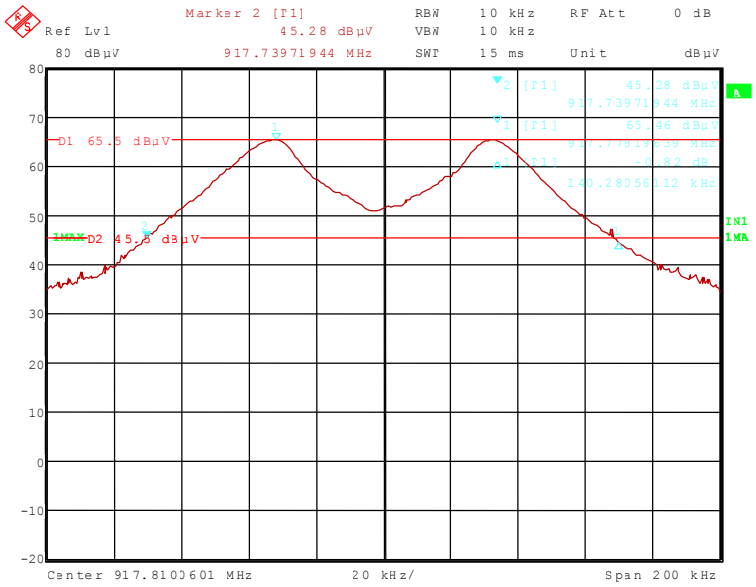
Ambient temperature:	21 °C	Relative humidity:	27 %

Test set-up: For this test a test fixture was used, to couple the transmitter output signal to the spectrum analyser.

Supply voltage: During all measurements the EUT was supplied with 3.0 V from the internal batteries.

Test record: Where not otherwise stated the test was carried out in test mode 1 of the EUT. All results are shown in the following.

70125_5.wmf: Occupied bandwidth (20 dB) of the SUNNYBEAMU Repeater:



F_L	F_U	BW (F_U - F_L)
917.739719 MHz	917.880000 MHz	140.281 kHz

TEST EQUIPMENT USED THE TEST:

29, 30, 34, 35, 43

8 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

Emission measurement at AC mains and DC in / out ports at M4					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088
2	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026
3	LISN	NSLK8128	Schwarzbeck	8128155	480058
4	DC-filter	B84266-A21-E13	Siemens	940164525	480099
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M5					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
7	Fully anechoic chamber M5	-	Siemens	B83177-S1-X156	480073
8	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
9	Controller	HD100	Deisel	100/324	480067
10	Antenna support	MA240	Deisel	228/314	480069
11	Turntable	DS412	Deisel	412/317	480070
12	Antenna	CBL6112C	Chase	2689	480327
13	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M6					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
14	Open area test site	-	Phoenix Test-Lab	-	480085
15	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
16	Controller	HD100	Deisel	100/670	480139
17	Turntable	DS420HE	Deisel	420/620/80	480087
18	Antenna support	AS615P	Deisel	615/310	480086
19	Antenna	CBL6111 A	Chase	1643	480147
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M8					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
21	Fully anechoic chamber M8	-	Siemens	B83117-E7019-T231	480190
22	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
23	Measuring receiver	ESCS 30	Rohde & Schwarz	828985/014	480270
24	Controller	HD100	Deisel	100/427	480181
25	Turntable	DS420	Deisel	420/435/97	480186
26	Antenna support	AS615P	Deisel	615/310	480187
27	Antenna	CBL6112 A	Chase	2034	480185
28	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M20					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303
30	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355
32	Controller	HD100	Deisel	100/670	480326
33	Turntable	DS420HE	Deisel	420/620/80	480315
34	Antenna support	AS615P	Deisel	615/310	480187
35	Antenna	CBL6112 B	Chase	2688	480328
36	Antenna	3115 A	EMCO	9609-4918	480183
37	Standard Gain Horn 11.9 GHz – 18 GHz	18240-20	Flann Microwave	483	480294
38	Standard Gain Horn 11.9 GHz – 18 GHz	18240-20	Flann Microwave	482	480295
39	Standard Gain Horn 17.9 GHz – 26.7 GHz	20240-20	Flann Microwave	411	480297
40	Standard Gain Horn 17.9 GHz – 26.7 GHz	20240-20	Flann Microwave	410	480296
41	Standard Gain Horn 26.4 GHz – 40.1 GHz	22240-20	Flann Microwave	469	480299

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
42	Standard Gain Horn 26.4 GHz – 40.1 GHz	22240-20	Flann Microwave	468	480298
43	RF-cable No. 30	RTK 081	Rosenberger	-	410141
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142
45	RF-cable 1 m	KPS-1533-400-KPS	Insulated Wire	-	480300
46	RF-cable 1 m	KPS-1533-400-KPS	Insulated Wire	-	480301
47	RF-cable 2 m	KPS-1533-400-KPS	Insulated Wire	-	480302
48	RF-cable No. 5	RTK 081	Rosenberger		410097
49	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337
50	Preamplifier	JS3-12001800-16-5A	Miteq	571667	480343
51	Preamplifier	JS3-18002600-20-5A	Miteq	658697	480342
52	Preamplifier	JS3-26004000-25-5A	Miteq	563593	480344
53	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Ancillary equipment used for testing					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
54	Power supply	TOE 8852	Toellner	51712	480233
55	High Pass Filter	HP4000	Dirk Fischer Elektronik	-	480445
56	High Pass Filter	WHJS1000C 11/60EF	Wainwright Instruments GmbH	1	480413
57	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059
-	-	-	-	-	-

All used measurement equipment was calibrated (if necessary). The calibration intervals and the calibration history will be given out on request.

9 LIST OF ANNEXES

Annex A	**Photographs of the test set-ups:**	**4 pages**
	SUNNYBEAMREPU, test set-up fully anechoic chamber	70125_b.jpg
	SUNNYBEAMREPU, test set-up fully anechoic chamber	70125_a.jpg
	SUNNYBEAMREPU, test set-up open area test-site	70125_c.jpg
	SUNNYBEAMREPU, test set-up conducted emission measurement	70125_d.jpg
ANNEX B	**INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**5 pages**
	SUNNYBEAMREPU, internal view	70125_5.jpg
	SUNNYBEAMREPU, transceiver PCB, top view	70125_4.jpg
	SUNNYBEAMREPU, transceiver PCB, bottom view	70125_3.jpg
	SUNNYBEAMREPU, main PCB, top view	70125_2.jpg
	SUNNYBEAMREPU, main PCB, bottom view	70125_1.jpg
ANNEX C	**EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**5 pages**
	SUNNYBEAMREPU, total view	70125_9.jpg
	SUNNYBEAMREPU, 3D view 1	70125_8.jpg
	SUNNYBEAMREPU, 3D view 2	70125_7.jpg
	SUNNYBEAMREPU, type plate view	70125_6.jpg
	USB power adaptor, type plate view	70125_10.jpg