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Tested by:



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SORT OF EQUIPMENT:

UHF Radio Modem Receiver

MARKETING NAME:

CGR10 and CGR15

TYPE:

SATEL-TA21

MANUFACTURER:

Satel Oy

SERIAL NUMBER:

-

CLIENT:

Satel Oy

ADDRESS:

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TEST SPECIFICATION:

**EN 301 489-1, v.1.8.1, EN 301 489-5, v.1.3.1,
EN 300 113-2 v.1.6.1****SUMMARY:**

In regard to the performed tests the EUT fulfils the requirements defined in the test specifications EN 301 489-1, v.1.8.1, EN 301 489-7, v.1.3.1, EN 300 113-1 v.1.6.1. All tests have not been performed, see page 2 for details.

According to the standards the emission measurement results have been compared directly with the limit lines without considering measurement uncertainties.

The test results are valid for the tested unit only. Without a written permission of Nemko Oy it is allowed to copy this report as a whole, but not partially.

Summary of performed tests and test results

Immunity tests according to the test specifications EN 301 489-1 and EN 301 489-5:

Immunity test	Test method	Conclusion
Radiated radio-frequency electromagnetic field	EN 61000-4-3	Pass
Electrostatic discharge (ESD)	EN 61000-4-2	Pass

Emission tests according to the test specification EN 300 113-2:

Emission test	Test method	Conclusion
Radiated spurious emissions 30-4000 MHz	EN 300 113-1	Pass

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1. General

The equipment under test (EUT) was a UHF Radio Modem Receiver. The purpose of the performed tests was to see if in regard to these tests the EUT fulfils the EMC requirements defined in the EC Council Directives 2004/108/EC and 1999/5/EC. The tests were performed according to the test specifications EN 301 489-1, v.1.8.1, EN 301 489-5, v.1.3.1 and EN 300 113-2 v.1.6.1 by using accredited test methods.

2. System Configuration

2.1 Test set-up

Equipment under test (EUT):

- UHF Radio Modem Receiver, type: SATEL-TA21, s/n: -

Ancillary units:

- Leica Viva, s/n: -
- Satel radio modem (placed outside of the test area)

Operating voltage of the EUT during the tests:

- 5.0 V DC.

2.2 Operating conditions of the EUT

The EUT was connected to the Leica Viva unit. During the test the transmitter was sending continuously the text to the EUT. The received data was monitored from the display of Leica Viva unit. The receiver frequency was 438 MHz.

2.3 Performance criteria for immunity tests

Criterion CR

Four messages of five or 90 % of the transmitted symbols shall be received correctly.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained during the test.

Criterion TR

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained during the test.

3. Test procedures

3.1 Emission tests

3.1.1 Radiated spurious emission test

The test was performed as a compliance test. The test parameters concerned were as follows:

Parameter	Specification
Test method	EN 300 113-1
Frequency range	30 – 4000 MHz
Site name	Nemko / Perkkaa
Date of testing	09.08.2011
Test equipment	350, 566, 567, 564, 525, 542, 319, 417
Test uncertainty U95:	±4.6 dB
Test conditions	24 °C, 47 % RH

The test was performed in a semi-anechoic shielded room by using the substitution method. For the duration of the test the EUT was first placed on a non-conductive table 0.8 m high (see photograph 1). During the test the distance from the EUT to the measuring antenna was 3 meters. In order to find the maximum levels of the disturbance radiation the angle of the turntable, the height of the measuring antenna were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.

3.2 Immunity tests

3.2.1 Radiated radio-frequency electromagnetic field immunity test

The test was performed as a compliance test. The test parameters concerned were as follows:

Parameter	Specification
Test method	EN 61000-4-3
Frequency range	80 – 1000 MHz, 1400 – 2700 MHz
Modulation	AM 80% 1 kHz
Sweep	Step: 1 %, Time/step: 3 s
Test level	3 V/m
Performance criterion	CR
Site name	Nemko Oy / Perkkaa
Date of testing	08.08.2011
Test equipment	176, 567, 354, 417, 525, 575
Test conditions	24 °C, 47 % RH

The test was carried out in an absorber lined anechoic shielded room. The EUT was placed on a non-conductive turntable 1 m above the floor absorbers (see photograph 2). The distance between the transmitting bilog antenna (80 – 1000 MHz) and the EUT was 2.2 m measured from the antenna tip. The distance between the transmitting horn antenna (1400 – 2700 MHz) and the EUT was 3.0 m. The test was performed with the field generating antenna facing one surface of the EUT. Both vertical and horizontal polarizations were tested. The field strength was checked with a calibrated field sensor. The uniformity of field has been calibrated. The cables were oriented in a position anticipated to be the worst-case.

3.2.2 Electrostatic discharge (ESD) immunity test

The test was performed as a compliance test. The test parameters concerned were as follows:

Parameter	Specification
Test method	EN 61000-4-2
Test level	Contact discharge: ± 4 kVp Air discharge: ± 8 kVp
Performance criterion	TR
Site name	Nemko Oy / Perkkää
Date of testing	30.09.2011
Test equipment	409, 348, 405, 406
Test conditions	24 °C, 41 % RH, 1003 mbar

The test was carried out inside a shielded room. The EUT was placed on a horizontal coupling plane (HCP) on the 0.8 m high wooden table standing on the reference ground plane (RGP). The EUT was isolated from the HCP by an insulating support 0.5 mm thick. Indirect contact discharges were applied on the EUT by discharging to a horizontal coupling plane and vertical coupling plane (VCP). Direct contact discharges were applied on the conductive parts of the EUT and air discharges were applied on the non-conductive parts of the EUT (see photographs 3 and 4). At least 10 discharges of both polarities were applied on each test point at each test level.

4. Test results

4.1 Emission tests

4.1.1 Radiated spurious emission test

Frequency MHz	Result dBm	Limit dBm	Conclusion Pass/Fail	Conclusion Pass/Fail
30.12	-66.0	-36	9.0	Pass
119.76	-66.3	-36	9.3	Pass
266.04	-60.9	-36	3.9	Pass
1462.7	-64.3	-47	17.3	Pass
3921.0	-59.1	-47	12.1	Pass

4.2 Immunity tests

4.2.1 Radiated radio-frequency immunity test

Polarization	Frequency MHz	Test level V/m	Remarks	Conclusion Pass/Fail
Vertical	80 – 1000	3	-	Pass
Vertical	1400 – 2700	3	-	Pass
Horizontal	80 – 1000	3	-	Pass
Horizontal	1400 – 2700	3	-	Pass

4.2.2 Electrostatic discharge (ESD) immunity test

Discharge mode	Test points	Test level kVp	Remarks	Conclusion Pass/Fail
Direct contact	Discharge points marked with “☆” See photographs	$\pm 2, \pm 4$	–	Pass
Indirect contact	HCP, VCP Discharge points marked with “☆” See photographs	$\pm 2, \pm 4$	–	Pass
Air	Discharge points marked with “O” See photographs	$\pm 2, \pm 4, \pm 8$	–	Pass

5. List of test equipment

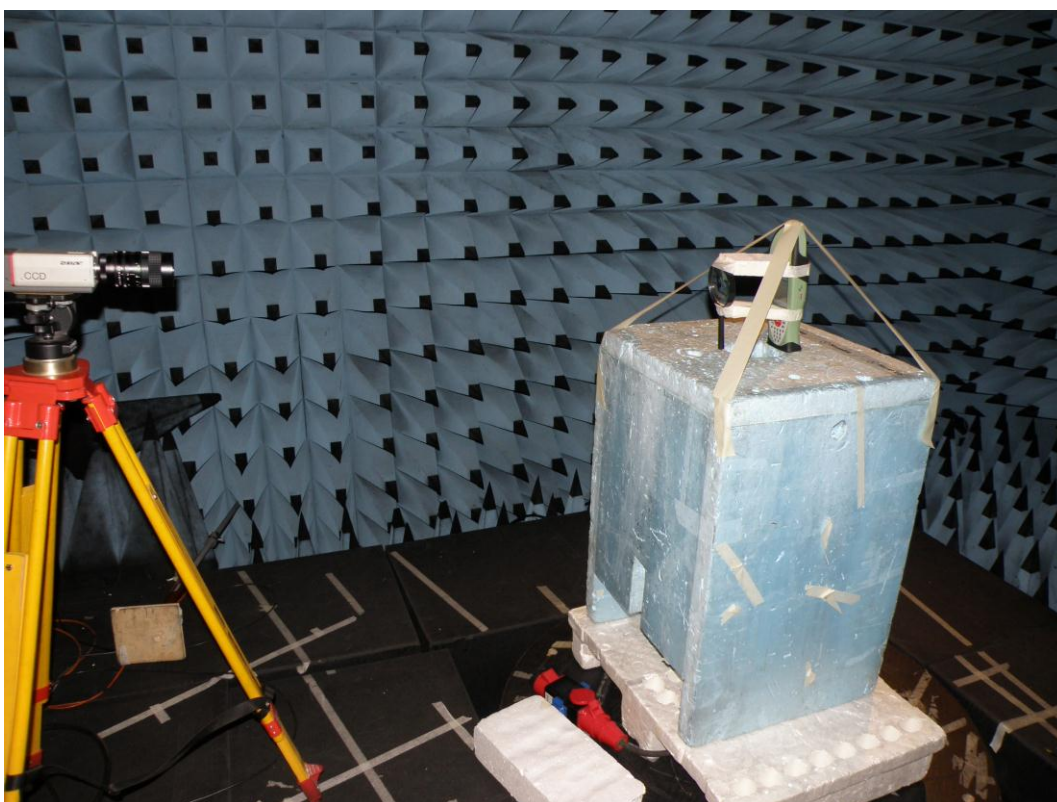
Nr.	Equipment	Type	Manufacturer	Serial number
5	Test receiver	ESH-3	Rohde & Schwarz	894718/015
10	Oscilloscope	9400A	LeCroy	8878
38	RF generator	SMG	Rohde & Schwarz	883590/035
42	Spectrum analyzer	8566B	Hewlett Packard	2637A04102
43	Spectrum analyzer	8568B	Hewlett Packard	2039A01256
56	Power meter	NAUS 3	Rohde & Schwarz	87076/087
79	Power supply	B60-15R	Oltronix	512
85	Antenna	642	Narda	7912
86	Antenna	640	Narda	09
87	Antenna	639	Narda	7909
89	Antenna	3147	EMCO	9202-1078
167	Artificial Mains	NSLK 8126	Schwarzbeck	8126101
168	Artificial Mains	NSLK 8127	Schwarzbeck	8127162
176	Anechoic chamber	RFD-60	Euroshield	509
184	Temp. & humidity meter	H MI 32	Vaisala	63837
188	Antenna	CBL6111	Chase	1028
190	Shielded room	L3000	Belling-Lee	S4566
193	ESD generator	NSG435	Schaffner	316
196	Ferrite clamp	FGZ 40X15E	Lüthi	4057
197	Ferrite clamp	FGZ 40X15E	Lüthi	4058
198	Ferrite clamp	FGZ 40X15E	Lüthi	4069
201	RF-Generator	2042	Marconi	119571/062
211	Bandpass Filter	TTF 1500-5-5EE	Telonic Berkeley Inc	93037-3
212	Bandpass Filter	TTF 3000-5-5EE	Telonic Berkeley Inc	93039-1
222	Impulse tester	PSURGE4	Haefely	083070-10
223	Coupling network	IP6.2	Haefely	083038-20
224	EFT/Burst generator	PEFT JUNIOR	Haefely	083180-46
225	HF coupling clamp	IP4A	Haefely	083078-008
289	Universal power analyzer	PM 3000A	Voltech	8448
290	Ref. impedance network	IEC555	Voltech	8448
291	Field sensor	BA05		
292	Optical repeater	ORO1		
293	Isotropic field meter	PMM 8051		
294	DCN-network	801-M2/M3	Lüthi GmbH	
299	RF injection clamp	EM 100	Lüthi GmbH	-
300	Coupling network	CDN 801-AF2	Self made	-
316	Power supply	HP 6032A	Hewlett Packard	2517A-00654
317	RF generator	2052	Marconi	119754/058
319	Antenna	CBL6112	Chase	2018
320	Voltage dip tester	PLINE 1610	Haefely Trench AG	083690-22
321	Coupling network	FP-EFT 32.1	Haefely Trench	083590-08
322	Coupling network	HV-SURGE 63.3	EMCEC OY	011996
323	T-network	EZ-10	Rohde & Schwarz	843074/005
324	T-network	ESH3-Z4	Rohde & Schwarz	842929/012
325	T-network	ESH3-Z4	Rohde & Schwarz	842929/010
336	Magnetic field tester	MAG 100.1	Haefely Trench AG	080015-9
338	Test receiver	ESS	Rohde & Schwarz	847151/009
339	RF-power amplifier	116FC-CE	Kalmus	7583A-1
340	RF-power amplifier	7100LC-CE	Kalmus	7583B1
341	Multimeter	Fluke 87	Fluke	593100386
342	Multimeter	Fluke 12	Fluke	58720270
343	Artificial Mains Network	NSLK8128	Schwarzbeck	8128177
344	mV-meter	URV4	Rohde & Schwarz	879747/013
347	Automotive test system	NSG5000	Shaffner	EK3396-021
348	Shielded room	RFSD-100	Euroshield Oy	1320
349	Shielded room	RFSD-100	Euroshield Oy	1319
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327
351	RF generator	SMT 06	Rohde & Schwarz	845715/001
352	Antenna	3142	EMCO	9701-1122
353	RF power amplifier	AR 10S1G4	Amplifier Research	20156
354	RF power amplifier	AR 500W1000M7	Amplifier Research	20487
355	RF power amplifier	LA100V - CE	Kalmus	7809-1
359	E-field probe	HI-4422	Holaday	95835
360	Antenna	3303	Emco	9702-2978

361	Current probe	CIP 9136	Chase	1043
363	Coupling/decoupling dev.	CDN 801-S1	Robert Lüthi GmbH	554
364	Coupling/decoupling dev.	CDN 801-M4/63A	MEB	12998
365	Coupling/decoupling dev.	CDN 801-M5/25A	MEB	11514
366	RF-amplifier	AR15A25	Amplifier Research	10783
367	LISN	NNB-4/200	Rolf Heine	4/200X-96009
369	Discont.Interf.analyzer	DIA 1512A	Chase	5115
370	AC Power source	15003i-400/3	California Instr.	
371	AC Power source	500i-400	California Instr.	HK 52064
372	AC Power source	500i-400	California Instr.	HK 52065
373	AC Power source	500i-400	California Instr.	HK 52063
374	Impedance network	OMNI 3-18i	California Instr.	X71344
382	Multimeter	HP 3478A	Hewlett Packard	2301A16345
398	Oscilloscope	TDS 684A	Tektronix	B010868
401	GSM MS Test System	HP 8922P	Hewlett Packard	3639U01643
403	Processmeter	787	Fluke	6975028
404	Processmeter	787	Fluke	7005196
405	Horizontal coupling plane	HCP1	Self made	-
406	Vertical coupling plate	VCP1	Self made	-
409	ESD generator	NSG435	Schaffner	2288
410	ELF Survey meter	HI-3604	Holaday	91604
411	E-field probe	HI-4433-GRE	Holaday	96730
412	Decoupling clamp	FGZ 40X15 C	Lüthi	4561
413	Decoupling clamp	FGZ 40X15 C	Lüthi	4562
414	Decoupling network	DEC1A	Haefely	080 641-04
416	RF High-Power Attenuator	765-6	Narda	9708
417	Antenna, bilog	CBL 6141	Chase	4028
418	Coupling network	CDN L801 M2/50	Luthi	1655
419	Audio power amplifier	S900	Dynacord	9815010364
421	Hand simulator	-	Oma valmiste	021996
427	Directional coupler	DC2500	Amplifier Research	24148
428	Directional coupler	RK 100	MEB	13703
429	Directional coupler	DC6280	Amplifier Research	24067
430	Directional coupler	DC7144	Amplifier Research	24230
431	Power meter	NRVD	Rohde & Schwarz	826224/047
432	Voltage probe	URV5-Z2	Rohde & Schwarz	826853/030
433	Voltage probe	UVR5-Z2	Rohde & Schwarz	826853/029
485	Horizontal coupling plane	HCP2	Self made	992
506	4 wire ISN	ENY41	Rohde & Schwarz	866824/029
507	2 x 2 wire ISN	ENY22	Rohde & Schwarz	833823/017
510	Audio isolation transformer	6220-1A	Solar Electronics Co.	
519	RF High-Power Attenuator	765-20	Narda	
520	Injection clamp	EM101	Robert Lüthi GmbH	903557
524	Active Rod Antenna	3301B	Emco	4432
525	Double-Ridged Horn	3115	Emco	6691
528	Matching device	CN-DC1	Emcec Oy	01
529	Matching device	CN-DC1	Emcec Oy	02
534	RF-amplifier	25S1G4A	Amplifier Research	303881
535	True RMS Multimeter	189	Fluke	80350519
542	Double-Ridged Horn	3115	Emco	00023905
544	RF-amplifier	ZFL-2000VH2	Mini-Circuits	D01080
545	GSM MS Test System	CMU	Rohde & Schwarz	836536/049
546	Bluetooth Test Set	MT8850A	Anritsu	6K00000092
548	Notch Filter	WRCT902.4-0.2/40-8SS	Wainwright Instruments GmbH	1
549	Notch Filter	WRCD1747.4-0.2/40-10SS	Wainwright Instruments GmbH	1
550	Tunable Notch Filter	WRCD1800/2000-0.2/40-5SSSD	Wainwright Instruments GmbH	1
551	Tunable Notch Filter	WRCT800/880-0.2/40-5SSSD	Wainwright Instruments GmbH	2
552	Highpass Filter	WHK2.3/18G-10SS	Wainwright Instruments GmbH	1
559	Highpass filter	WHKX3.0/18G-10ss	Wainwright	1
560	Power attenuator 6 dB	BN 74 53 52	Spinner	-
561	Power attenuator 6 dB	BN 74 53 52	Spinner	-
564	RF-amplifier	CA018-4010	CIAO Wireless	101
566	Spectrum analyzer	E4448A	Agilent	US42510236
567	Signal generator	E8257C	Agilent	MY43320736
572	Highpass Filter	WHKX1.5/15G-12SS	Wainwright Instruments GmbH	4
575	RF power amplifier	AS0825-65	Milmega	1011966

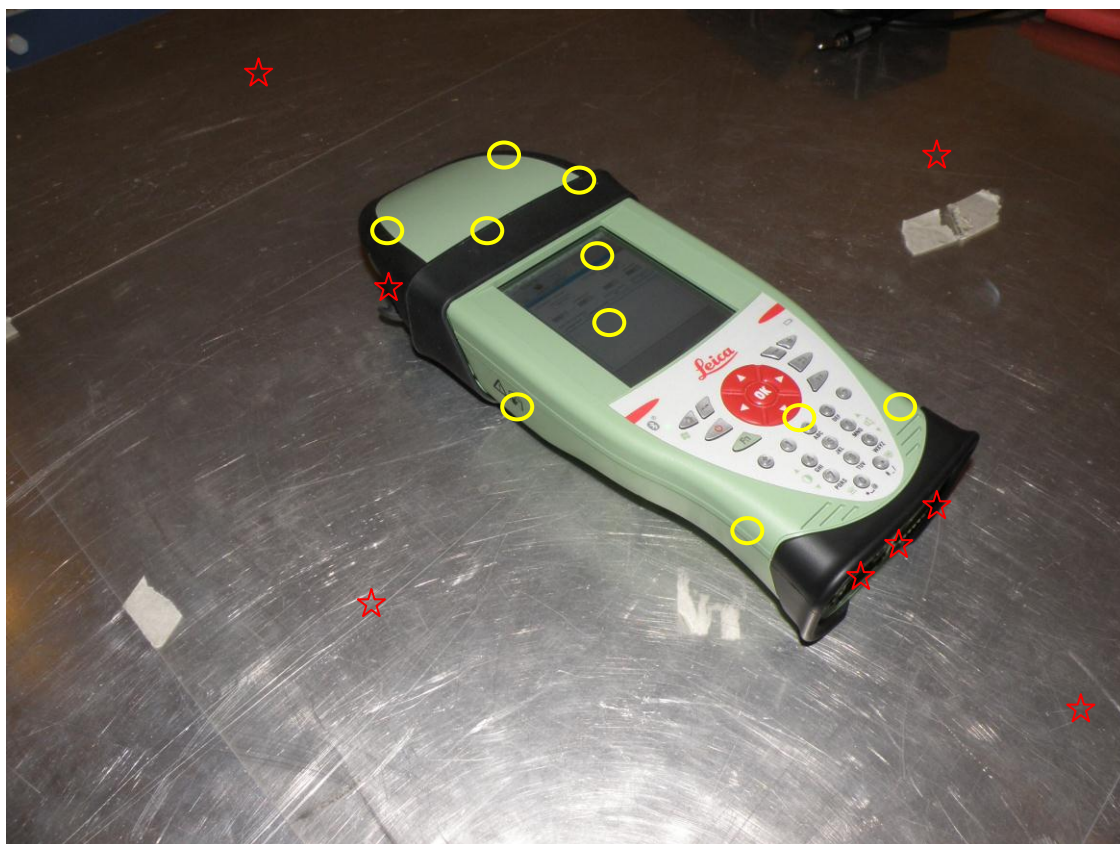
6. Photographs



Photograph 1. Radiated spurious emission test.



Photograph 2. Radiated radio-frequency electromagnetic field immunity test.



Photograph 3. Electrostatic discharge (ESD) immunity test.



Photograph 4. Electrostatic discharge (ESD) immunity test.