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Tested by:



Pekka Kälviäinen, Test Engineer



Reviewed by:



Janne Nyman, Compliance Specialist

SORT OF EQUIPMENT:

Radio modem (PCB-unit)

MODEL:

SATELLINE-M3-TR1

TYPE:

SATEL-TA13 (*)

MANUFACTURER:

Satel Oy, Finland

SERIAL NUMBER:

1235 72066

CLIENT:

Satel Oy

ADDRESS:

Meriniitynkatu 17, FI-24100 Salo, Finland

TELEPHONE:

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TEST SPECIFICATION

EN 300 113-2 V1.5.1 (2011-11)

REMARKS:

***) This test report includes the results of the version of the supply voltage 6 VDC.**

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.

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1. General

Type:	SATEL-TA13		
Alignment range:	403 – 473 MHz		
Switching range:	One channel		
	Category: AR3		

Measurement Frequencies:	Equipment 1 Serial no. 7 1235 72066 1) 403,000 MHz 2) 473,000 MHz	Equipment 1 Serial no. 3)	Equipment 1 Serial no. 4)
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Voltages: Temperatures: Humidity:	Normal 6,0 VDC 23,0° ± 1,5°C 30 % ± 8 %	Minimum	Maximum
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Effective radiated power:	1 W / 100 mW	Antenna:	50 ohm (two SMA-connector)
Number of channels:	1	Production model:	Pre-production model
Channel separation:	12,5, 20,0 and 25,0 kHz	Modulation:	Multilevel State FM (12,5 kHz: 9600 bps and 25 kHz: 19200 bps)

The following measurements been performed according EN 300 113-1 V1.7.1 (2011-11) standard:

Eq. 1	Eq. 1 and 1	Eq. 1	
Freq 3)	Freq 1) 2)	Freq 4)	
☐	☐	☐	7.1 Frequency error
☐	☐	☐	7.2 Transmitter power (conducted)
☐	☐	☐	7.3 Maximum Effective radiated power
☐	☐	☐	7.4 Adjacent channel power
☐	☒	☒	7.5.1 a Spurious emissions (conducted)
☐	☒	☒	7.5.1 b Spurious emissions (radiated)
☐	☐	☐	7.5 Intermodulation attenuation
☐	☐	☐	7.7 Transmitter attack time
☐	☐	☐	7.8 Transmitter release time
☐	☐	☐	7.9.3.1 Time domain measurements of power and frequency
☐	☐	☐	7.9.3.3 Adjacent channel transient power measurements
☐	☐	☐	8.1 Maximum useable sensitivity (digital, conducted)
☐	☐	☐	8.2 Average usable sensitivity (digital, field strength)
☐	☐	☐	8.3 Level of the wanted signal for the degradation measurements
☐	☐	☐	8.4 Error behaviour at high input levels
☐	☐	☐	8.5 Co-channel rejection
☐	☐	☐	8.6 Adjacent channel selectivity
☐	☐	☐	8.7 Spurious response rejection
☐	☐	☐	8.8 Intermodulation response rejection
☐	☒	☒	8.9 Blocking or desensitization
☐	☒	☒	8.10.1 a Spurious radiations (conducted)
☐	☒	☒	8.10.1 b Spurious radiations (radiated)
☐	☐	☐	Duplex operation
☐	☐	☐	9.1 Receiver desensitization
☐	☐	☐	9.2 Receiver spurious response rejection

REMARKS:

2. Summary of performed tests and test results

(This interpretation of the test report's results does not belong to the scope of our accreditation.)

<i>ETSI EN 300 113-1 V1.6.1 (2007-07)</i>		<i>Result</i>
<i>7.5.1 a</i>	<i>Spurious emissions (conducted)</i>	PASS
<i>7.5.1 b</i>	<i>Spurious emissions (radiated)</i>	PASS
<i>8.10.1 a</i>	<i>Receiver spurious radiations (conducted)</i>	PASS
<i>8.10.1 b</i>	<i>Receiver spurious radiations (radiated)</i>	PASS

According to the standard the measurement results have been compared directly with the limits without considering measurement uncertainties.

Explanations:

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.

3. Test results

3.1 Unwanted emissions in the spurious domain Clause 7.5 Transmitter Spurious Emissions (Conducted) 7.5.1 a

Date: 04.01.2013

Method of measurement: Clause 7.5.2

Rated output power: Low: 100 mW and high: 1W

Frequency 1			Frequency 2		
Frequency (MHz)	Results / dBm (P: low)	Results / dBm (P: high)	Frequency (MHz)	Results / dBm (P: low)	Results / dBm (P: high)
Tx operating			Tx operating		
377,0	-	46,1	390,3	-	-47,2
390,3	-49,0	-39,0	402,9	-	-44,0
415,7	-48,2	-37,9	408,0	-	-44,6
428,8	-	-43,8	428,7	-	-42,7
455,2	-	-47,2	447,2	-	-42,1
533,6	-	-38,6	499,3	-	-43,9
545,8	-	-48,3	516,7	-	-44,2
679	-57,0	-54,7	537,7	-	43,8
806	-47,2	-42,2	543,5	-49,2	-42,4
1209	-	-56,7	556,2	-49,0	-45,4
3624	-55,4	-56,5	605	-	-58,5
			946	-57,9	-
			2835	-57,8	-55,0
			3784	-46,7	-47,8
Others 30 MHz to 4.0 GHz	< -60,0	< -60,0	Others 30 MHz to 4.0 GHz	< -60,0	< -60,0
			All 4 GHz to 12,75 GHz	< -50,0	< -50,0
Tx on standby			Tx on standby		
553	-64,5		602	-68,5	
1035	-70,2		1035	-69,0	
1065	-68,3				
others 9 kHz to 4,0 GHz	< -75,0		others 9 kHz to 4,0 GHz	< -75,0	
			all 1 GHz to 12,75 GHz	< -70,0	
Measurement uncertainty	± 1.8 dB				

LIMITS Clause 7.5.4

Table 4: Conducted emissions

Frequency range	Tx operating	Tx standby
9 kHz to 1 GHz	0.25 µW (- 36.0 dBm)	2.0 nW (- 57.0 dBm)
above 1 to 4 GHz or above 1 to 12.75 GHz,	1.00 µW (- 30.0 dBm)	20.0 nW (- 47.0 dBm)

TEST EQUIPMENT USED: 566, 328, 390, 394, 571, 145, 316, 341

3.2 Unwanted emissions in the spurious domain Clause 7.5

Transmitter Spurious Emissions (Radiated) 7.5.1 b

Date: 05.11.2012

Method of measurement: Clause 7.5.3

Rated output power: Low: 100 mW and high: 1W

Frequency 1			Frequency 2		
Frequency (MHz)	Results / dBm (P: low)	Results / dBm (P: high)	Frequency (MHz)	Results / dBm (P: low)	Results / dBm (P: high)
Tx operating			Tx operating		
All 30 MHz to 4.0 GHz	< -56,0	< -56,0	All 30 MHz to 4.0 GHz	< -56,0	< -56,0
			All 4 GHz to 12,75 GHz	< -50,0	< -50,0
Tx on standby			Tx on standby		
All 30 MHz to 1.0 GHz	< - 70,0		All 30 MHz to 1,0 GHz	< - 70,0	
All 1 GHz to 4.0 GHz	< - 65,0		All 1 GHz to 4,0 GHz	< - 65,0	
			all 1 GHz to 12,75 GHz	< - 60,0	
Measurement uncertainty	- 4.4 dB / +3.4 dB				

LIMITS Clause 7.5.4

Table 4: Radiated emissions

Frequency range	Tx operating	Tx standby
30 MHz to 1 GHz	0.25 μ W (- 36.0 dBm)	2.0 nW (- 57.0 dBm)
above 1 to 4 GHz or above 1 to 12.75 GHz,	1.00 μ W (- 30.0 dBm)	20.0 nW (- 47.0 dBm)

TEST EQUIPMENT USED: 176, 566, 201, 205, 89, 185, 417, 525, 542, 328, 133, 571, 316, 341

3.3 Receiver spurious radiation Clause 8.10

Conducted Clause 8.10.1 a)

Date: 06.11.2012

Measurement method: Clause 8.10.2

Frequency 1		Frequency 2		Remarks
Frequency (MHz)	Level (dBm)	Frequency (MHz)	Level (dBm)	
553	-64,5	602	-68,5	
1035	-70,2	1035	-69,0	
1065	-68,3			
others 9 kHz to 4,0 GHz	< -75,0	others 9 kHz to 4,0 GHz	< -75,0	
		all 1 GHz to 12,75 GHz	< -70,0	
Measurement uncertainty	- 4.4 dB / +3.4 dB			

LIMITS: Clause 8.10.4

Table 9: Conducted components

Frequency range	Limit
9 kHz to 1 GHz	2,0 nW (-57 dBm)
Above 1 GHz to 4 GHz, or above 1 GHz to 12,75 GHz	20,0 nW (-47 dBm)

TEST EQUIPMENT USED: 566, 389, 316, 404

3.4 Receiver spurious radiation Clause 8.10

Radiated Clause 8.10.1 b)

Date: 05.11.2013

Measurement method: Clause 8.10.3

Frequency 1		Frequency 2		Remarks
Frequency (MHz)	Level (dBm)	Frequency (MHz)	Level (dBm)	
Tx operating		Tx operating		
All 30 MHz to 1.0 GHz	< - 70,0	All 30 MHz to 1,0 GHz	< - 70,0	
All 1 GHz to 4.0 GHz	< - 65,0	All 1 GHz to 4,0 GHz	< - 65,0	
		all 1 GHz to 12,75 GHz	< - 60,0	
Measurement uncertainty	- 4.4 dB / +3.4 dB			

LIMITS: Clause 8.10.4

Table 10a: Radiated components

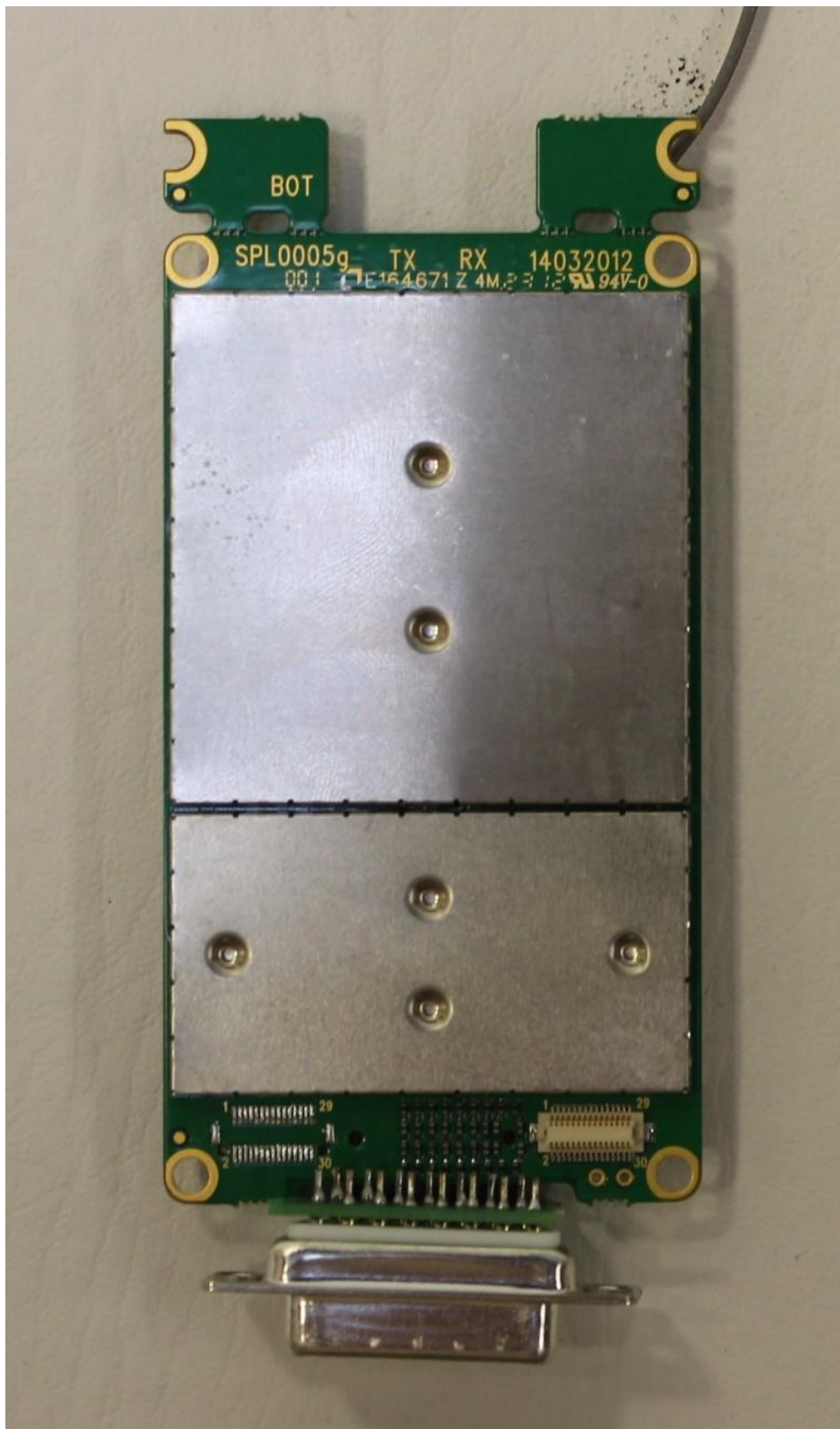
Frequency range	Limit
30 MHz to 1 GHz	2,0 nW (-57 dBm)
Above 1 GHz to 4 GHz	20,0 nW (-47 dBm)

TEST EQUIPMENT USED: 566, 201, 205, 133, 89, 176, 185, 417, 316, 404

4. Photographs



Photograph 1.



Photograph 2.

5. List of measuring equipment:

No.	Equipment	Type	Manufacturer	Serial Number
10	Oscilloscope	9400A	LeCroy	8878
42	Spectrum analyzer	8566B	Hewlett Packard	2637A04102
43	Spectrum analyzer	8568B	Hewlett Packard	2039A01256
62	Audio amplifier	PRL ?	Self made	
89	Antenna	3147	EMCO	9202-1078
102	Hybrid	H 9	Anzac	
133	Termination 50Ω	370 BNM	Narda	
145	Notch Filter	TTR - 375 - 3EE	Telonic	3062 - 1
146	Dual directional coupler	778D	Hewlett Packard	1144A02333
157	Temp. test chamber	VMT 04/240	Vötsch	31884
176	Anechoic chamber	888 cm x 585 cm x 416 cm	length of absorber 66 cm	
185	Antenna	PRL LogPer	Self made	1A93
201	RF-Generator	2042	Marconi	119571/062
205	RF-Amplifier	ZHL-1042J	Mini-Circuits	012288-11
316	Power supply	HP 6032A	Hewlett Packard	2517A-00654
328	Power attenuator	765-20	Narda	-
332	IF-filter	10.7MHz/25kHz	Ultracom Oy	-
334	IF-filter	10.7MHz/12.5kHz	Ultracom Oy	-
335	Mixer	ZFM-150	Mini-Circuits	-
337	Modulation analyzer	HP 8901B	Hewlett Packard	3538A05622
341	Multimeter	Fluke 87	Fluke	593100386
386	RF attenuator PAD	WA2-3	Weinschel	3780
390	RF attenuator PAD	WA2-10	Weinschel	3784
392	RF attenuator PAD	1A (6dB)	Weinschel	
394	RF attenuator PAD	1A (20dB)	Weinschel	
417	Antenna, bilog	CBL 6141	Chase	4028
525	Double-Ridged Horn	3115	Emco	6691
542	Double-Ridged Horn	3115	Emco	00023905
563	Thermometer	52 II	Fluke	81210080
566	Spectrum analyzer	E4448A	Agilent	US42510236
567	RF generator	E8257C	Agilent	MY43320736
571	High Pass Filter	WHK0.6/13G-10SS	Wainwright Instruments	1
2039	Power sensor	8482A	Hewlett Packard	1925A03475
2040	Power meter	438A	Hewlett Packard	2517U00427
2046	Counter	5351B	Hewlett Packard	2844U00220