TEST REPORT OF A TANK LEVEL PROBING RADAR (TLPR), BRAND ENRAF, MODEL SMARTRADAR FLEXLINE, IN CONFORMITY WITH 47 CFR PART 15 (AUGUST 14, 2006).

FCC listed	: 90828
Industry Canada	: IC3501
VCCI registered	: R-1518, C-1598

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MEASUREMENT/TECHNICAL REPORT

Enraf B.V.

Model : SmartRadar FlexLine

FCC ID: LOM990SRFL

May 31, 2007

This report concerns:	Original grant/certification	~~Class 2 change~~	~~Verification~~
Equipment type:	Tank Level Probing Radar		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	~~Yes~~	~~No~~	n.a.

Report prepared by:		
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (August 14, 2006) and the measurement procedures of ANSI C63.4-2003. TNO Electronic Products & Services (EPS) B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: July 17, 2007

Signature:

H.J. Pieters
Project Manager TNO Electronic Products & Services (EPS) B.V.

Description of test item

Test item	:	9.5 – 10.6 GHz Tank Level Probing Radar (TLPR)
Manufacturer	:	Enraf B.V.
Brand	:	Enraf
Model	:	SmartRadar FlexLine
Serial number(s)	:	n.a.
Revision	:	1
Receipt date	:	January 20, 2007

Applicant information

Applicant's representative	:	Mr. M. Rog
Company	:	Enraf B.V.
Address	:	Delftechpark 39
Postal code	:	2628 XJ
City	:	DELFT
PO-box	:	812
Postal code	:	2600 AV
City	:	DELFT
Country	:	The Netherlands
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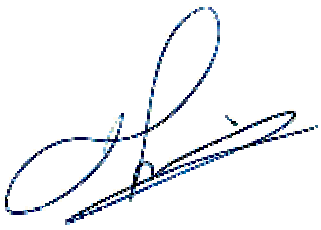
Test(s) performed

Location	:	Niekerk
Test(s) started	:	January 20, 2007
Test(s) completed	:	May 31, 2007
Purpose of test(s)	:	Equipment Authorisation (Original grant/certification)
Test specification(s)	:	47 CFR Part 15 (August 14, 2006)
Test engineer	:	T.E.T. Koning
Report written by	:	T.E.T. Koning



Report date	:	July 17, 2007

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1 General information.

1.1 Product description.

1.1.1 Introduction.

The EUT is a Tank Level Probing Radar working in the frequency band 9.538 GHz to 10.561 GHz as swept frequency equipment (continuous transmission with a duty cycle of 100%).

This report is a second amended report with additional information. The measurement results have not been changed other than the way of presenting the data.

1.2 Related submittal(s) and/or Grant(s).

1.2.1 General.

This test report supports the original grant/certification in equipment authorization files under FCC ID LOM990SRFL.

1.2.2 FCC ID LOM990SRFL.

This report supports the results of the 9.5 – 10.6 GHz Tank Level Probing Radar with FCC ID LOM990SRFL

1.3 Tested system details.

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Tank Level Probing Radar
Frequency band	:	9.538 GHz to 10.561 GHz
Maximum EIRP	:	2.5 mW (including the maximum antenna gain of 26 dBi)
Mode	:	Swept frequency equipment, continuous transmission
Duty cycle	:	100%
Manufacturer	:	Enraf B.V.
Brand	:	Enraf
Model	:	SmartRadar FlexLine
Serial number	:	n.a.
Voltage input rating	:	65 – 240 VAC or 24-65 VDC
Current input rating	:	-
Remarks	:	-

1.3.1 Description of input and output ports.

Number	Ports	From	To	Shielding	Remarks
1	AC mains or DC power	AC or DC source	EUT	~~yes~~ / no	**None**
2	Field communication BPM	EUT	controller	~~yes~~ / no	**None**
3	Communication RS485	EUT	controller	yes / ~~no~~	**None**
4	External Display	EUT	Remote display	yes / ~~no~~	**None**

AE = Auxiliary equipment

1.4 Test methodology.

The test methodology is based on the requirements of 47 CFR Part 15 (August 14, 2006), sections 15.207 and 15.209.
The test methods, which have been used, are based on ANSI C63.4: 2003.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.
Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters and 10 meters. To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the calculation in appendix 1 has been applied.

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.5 Test facility.

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (EPS) B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 23, 2000.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at http://www.fcc.gov.

1.6 Product labeling.

In accordance with 47 CFR Part 15.19 (a)(3) the following text shall be placed on a label, which is attached to the EUT:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

A label, in accordance with 47 CFR Part 15.19 (b)(1)(i), shall be attached to the EUT.

For further details about the labeling requirements (size, legibility, etc.) as set by the Federal Communications Commission see 47 CFR Part 15.19 (a)(3), 47 CFR Part 15.19 (b)(1), 47 CFR Part 15.19 (b)(2) and 47 CFR Part 15.19 (b)(4).

2 System test configuration.

2.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 2003.

2.2 EUT mode of operation.

The EUT is swept frequency equipment working in the frequency band 9.538 GHz to 10.561 GHz.
Conducted emission tests in accordance with 47 CFR Part 15 section 15.207 and Radiated emission tests in accordance with 47 CFR Part 15 section 15.209 were performed in normal operational mode with the frequency sweep turned on, and with the sweep stopped at the following frequencies. Worst case results were noted down:

Test channel	Test frequency (GHz)
1	9.538
2	10.049
3	10.561

The EUT is tested built on a test tank.
In normal operational mode with the frequency sweep turned on, it continuously reads the height level and displays it on the standard display. The tests have been performed with a complete functioning EUT and interconnections.

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance with the appropriate sections of 47 CFR Part 15.

2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance with the appropriate sections of 47 CFR Part 15.

2.5 Block diagram of the EUT.

The block diagram is available in the technical documentation package, which will be submitted to the Commission.

2.6 Schematics of the EUT.

The schematics are available in the technical documentation package, which will be submitted to the Commission.

2.7 Part list of the EUT.

The part list is available in the technical documentation package, which will be submitted to the Commission.

3 Radiated emission data.

3.1 Radiated field strength measurements (30 MHz – 50 GHz, E-field).

3.1.1 Average and Quasi peak values of the emissions

Frequency (MHz)	Measurement results dB(µV)/m @ 3 metres		Detector	Limits dB(µV)/m	Margin (dB)		Result
	Vertical	Horizontal			Vertical	Horizontal	
52.5	24.4	< 20.0	QP	40.0	-15.6	< -20.0	PASS
53.0	24.9	< 20.0	QP	40.0	-15.1	< -20.0	PASS
58.5	25.0	< 20.0	QP	40.0	-15.0	< -20.0	PASS
59.0	24.7	< 20.0	QP	40.0	-15.3	< -20.0	PASS
144.0	32.1	< 23.5	QP	43.5	-11.4	< -20.0	PASS
156.0	22.0	< 23.5	QP	43.5	-21.5	< -20.0	PASS
192.0	26.9	< 23.5	QP	43.5	-16.6	< -20.0	PASS
208.0	24.2	< 23.5	QP	43.5	-19.3	< -20.0	PASS
224.0	26.3	25.3	QP	46.0	-19.7	< -20.0	PASS
288.0	22.0	< 46.0	QP	46.0	-24.0	< -20.0	PASS
400.0	25.0	< 46.0	QP	46.0	-21.0	< -20.0	PASS
1136.7	32.5	30.5	AV	54.0	-21.5	-23.5	PASS
2512.3	50.9	51.6	AV	54.0	-3.1	-2.4	PASS
3859.0	32.1	32.9	AV	54.0	-21.9	-21.1	PASS
5024.5	53.5	51.8	AV	54.0	-0.5	-2.2	PASS
7536.8	44.5	53.7	AV	54.0	-9.5	-0.3	PASS
8570.0	41.5	42.2	AV	54.0	-12.5	-11.8	PASS
>8570-50000	< 34.0	< 34.0	AV	54.0	< -20.0	< -20.0	PASS

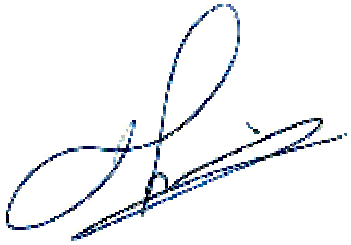
Table 1
Radiated emissions, Average and Quasi peak values of the EUT while operating in transmit mode on channel 2 (10.049 GHz).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, sections 15.205 and 15.209 are depicted in table 1.

Notes:

1. (AV) average detector
2. (QP) quasi peak detector
3. Maximum emissions from normal operational mode with the frequency sweep turned on, and with the sweep stopped on 10.049 GHz.
4. Resolution bandwidth for QP: 120 kHz, Video bandwidth: not applicable
   Resolution bandwidth for AV: 1 MHz, Video bandwidth: 10 Hz (linear amplitude scale).
5. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.
6. Up to 50 GHz

Test engineer

Signature : 

Name : T.E.T. Koning

Date : May 31, 2007

3.1.2 Peak values of the emissions

Frequency (MHz)	Measurement results dB(µV)/m @ 3 metres		Detector	Limits dB(µV)/m	Margin (dB)		Result
	Vertical	Horizontal			Vertical	Horizontal	
1136.7	32.5	30.5	PK	74.0	-41.5	-43.5	PASS
2512.3	50.9	51.6	PK	74.0	-23.1	-22.4	PASS
3859.0	32.1	32.9	PK	74.0	-41.9	-41.1	PASS
5024.5	53.5	51.8	PK	74.0	-20.5	-22.2	PASS
7536.8	44.5	53.7	PK	74.0	-29.5	-20.3	PASS
8570.0	41.5	42.2	PK	74.0	-32.5	-31.8	PASS
>8570-50000	< 54.0	< 54.0	PK	74.0	< -20.0	< -20.0	PASS

Table 2
Radiated emissions, Peak values of the EUT
while operating in transmit mode on channel 2 (10.049 GHz).

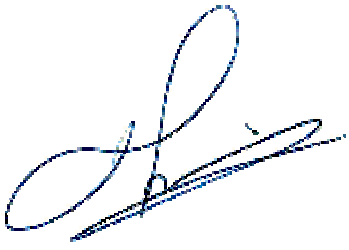
The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, section 15.35, are depicted in table 2.

Notes:

1. (PK) peak detector.
2. Maximum emissions from normal operational mode with the frequency sweep turned on, and with the sweep stopped on 10.049 GHz.
3. Resolution bandwidth 1 MHz; Video bandwidth 3 MHz.
4. Only for frequencies where average radiated emission measurements are specified.
5. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.
6. Up to 50 GHz.

Test engineer

Signature :



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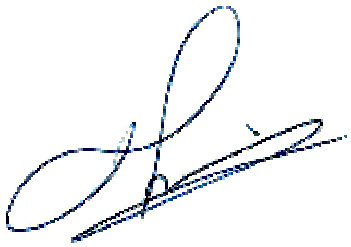
3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).

Frequency (MHz)	Measurement results dBµV		Antenna factor	Cable loss	Measurement results dB(µV)/m for 30 m (calculated)	Limits Part 15.209 & Part 15.225 dB(µV)/m
	3 meters	10 meters	dB	dB		
0.009-30.0	n.a.	n.a	--	--	n.a.	--

Table 3
As the products does not generate RF emissions in the band 0.009 – 30 MHz, no measurements have been carried out in this frequency range.

Test engineer

Signature : 

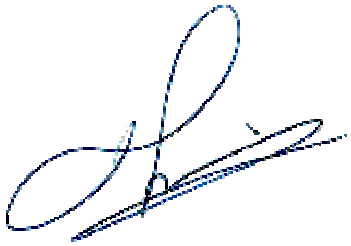
Name : T.E.T. Koning

Date : May 31, 2007

3.3 Carrier stability under special conditions.

No particular requirements other than in section 3.1 of this report.
Frequency stability will not cause non-compliant situations with respect to exclusion bands or emissions outside permissible bands (band edges). In the frequency range of 9.5 – 10.6 GHz no radiation outside the test tank has been measured.

Test engineer

Signature : 

Name : T.E.T. Koning

Date : May 31, 2007

4 Conducted emission data.

4.1 Conducted emission data of he EUT.

Frequency (MHz)	Measurement results dB(µV) Neutral		Measurement results dB(µV) Line 1		Limits dB(µV)		Margin (dB) Neutral		Margin (dB) Line 1		Result
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
0.15	35.0	14.5	44.3	20.6	66.0	56.0	-31.0	-41.5	-21.7	-35.4	PASS
0.22	15.7	14.6	39.9	16.4	62.9	52.9	-47.2	-38.3	-23.0	-36.5	PASS
0.26	52.5	42.3	51.3	40.9	61.4	51.4	-8.9	-9.1	-10.1	-10.5	PASS
0.40	45.3	34.2	52.0	28.6	57.9	47.9	-12.6	-13.7	-5.9	-19.3	PASS
0.53	49.0	31.3	51.0	37.0	56.0	46.0	-7.0	-14.7	-5.0	-9.0	PASS
0.66	29.0	18.0	32.5	20.0	56.0	46.0	-27.0	-28.0	-23.5	-26.0	PASS
0.80	37.1	21.3	38.2	22.3	56.0	46.0	-18.9	-24.7	-17.8	-23.7	PASS
0.93	40.3	21.2	43.4	24.2	56.0	46.0	-15.7	-24.8	-12.6	-21.8	PASS
1.06	44.0	21.2	46.0	25.0	56.0	46.0	-12.0	-24.8	-10.0	-21.0	PASS
3.26	40.2	20.2	40.4	19.5	56.0	46.0	-15.8	-25.8	-15.6	-26.5	PASS
5.70	40.3	23.5	40.0	36.5	60.0	50.0	-19.7	-26.5	-20.0	-13.5	PASS
8.70	38.3	17.4	39.0	35.1	60.0	50.0	-21.7	-32.6	-21.0	-14.9	PASS
9.0 - 30.0	< 30.0	< 20.0	< 30.0	< 20.0	60.0	50.0	< -30.0	< -30.0	< -30.0	< -30.0	PASS

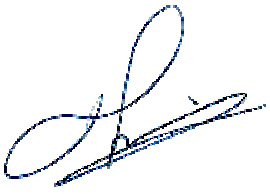
Table 4
Conducted emission measurements.

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15, section 15.207, at the 110 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in table 4.

Notes:

1. (AV) average detector
2. (QP) quasi peak detector
3. Maximum emissions in normal operational mode while mounted on the test tank.
4. Resolution bandwidth for QP: 9 kHz; for AV: 9 kHz.

Test engineer

Signature : 

Name : T. E.T. Koning

Date : May 31, 2007

5 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12476	Antenna mast	EMCO	TR3	-	-
12477	Antenna mast 1-4 mtr	Poelstra	--	-	-
12482	Loop antenna	EMCO	6507	04/2007	04/2008
12483	Guidehorn	EMCO	3115	03/2007	03/2008
12484	Guidehorn	EMCO	3115	03/2007	03/2008
12533	Signalgenerator	MARCONI	2032	03/2007	03/2008
12605	Calibrated dipole 28MHz-1GHz	EMCO	3121c	09/2002	09/2007
12640	Temperature chamber	Heraeus	VEM03/500	01/2007	01/2008
13664	Spectrum analyzer	HP	HP8593E	08/2006	08/2007
13886	Open Area testsite	Comtest	--	09/2006	09/2009
14051	Anechoic room	Comtest	--	-	-
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2007	02/2008
15667	Measuring receiver	R&S	ESCS 30	04/2007	04/2008
99596	Preamplifier 0.5 GHz - 18 GHz	Miteq	AMF-5D-005180-28-13p	07/2006	07/2008
99538	Spectrum analyzer	R&S	FSP40	04/2007	04/2008

Appendix 1

Calculated measurements results radiated field strength, H-Field

General Formula:

d_1 = short distance

d_2 = long distance

So: $(d_1/d_2))^n = H_{d2}/H_{d1}$

$n \log(d_1/d_2) = \log(H_{d2}/H_{d1})$

Measured field strength at xxx MHz:

Not measurable

Calculated field strength at xxx MHz (10m --> 30m):

Not calculated