



**TEST REPORT CONCERNING THE COMPLIANCE
OF AN LOOPLESS TRIGGER RADAR, BRAND
GATSOMETER, MODEL LTR WITH 47 CFR PART 15
(2006-02-01).**

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

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Test specification(s): 47 CFR Part 15 (2006-02-01)
Description of EUT: Loopless Trigger Radar
Manufacturer: Gatsometer B.V.
Brand mark: GATSO
Model: LTR
FCC ID: TVO-LTR-NID-0001

MEASUREMENT/TECHNICAL REPORT

Gatsometer B.V.

Model : LTR

FCC ID: TVO-LTR-NID-0001

March 15, 2006

This report concerns:	Original grant/certification	Class 2 change	Verification
Equipment type:	Field disturbance sensor operating in the band 24075 - 24175 MHz		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	Yes	No	n.a.
Report prepared by:	<p>Name : J. Schuurmans, B.Sc.E.E. Company name : TNO Electronic Products & Services (EPS) B.V. Address : Smidshornerweg 18 Postal code/city : 9822 ZG Niekerk Mailing address : P.O. Box 15 Postal code/city : 9822 TL Niekerk Country : The Netherlands Telephone number : + 31 594 505 005 Telefax number : + 31 594 504 804 E-mail : info@eps.tno.nl</p>		

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 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: March 15, 2006

Signature:

P.A.J.M. Robben, B.Sc.E.E.
TNO Electronic Products & Services (EPS) B.V.



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Description of test item

Test item : Loopless Trigger Radar
Manufacturer : Gatsometer B.V.
Brand : GATSO
Model : LTR
Serial number(s) : --
Revision : Not applicable
Receipt date : July 22, 2005

Applicant information

Applicant's representative : Mr. W.A.L. Passchier
Company : Gatsometer B.V.
Address : Claes Tillyweg
Postal code : 2031 CW
City : Haarlem
PO-box : 4959
Postal code : 2003 EZ
City : Haarlem
Country : The Netherlands
Telephone number : +31 23 5255050
Telefax number : +31 23 5276961

Test(s) performed

Location : Niekerk
Test(s) started : September 2, 2005
Test(s) completed : April 4, 2006
Purpose of test(s) : Equipment Authorisation (Certification).

Test specification(s) : 47 CFR Part 15 (2006-02-01)

Test engineers : H.J. Pieters

Report written by : J. Schuurmans, B.Sc.E.E.

Report date : April 19, 2006

This report is in conformity with NEN-EN-ISO/IEC 17025: 2000.

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The test results relate only to the item(s) tested.



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1 General information.

1.1 Product description.

1.1.1 Introduction.

The EUT is a radar intended to detect vehicles in a section of road or lane. The radar is intended to replace or prevent the application of detection loops, hence the description loopless trigger radar.

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

Not applicable.

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.

Test item	: Loopless Trigger Radar
Manufacturer	: Gatsometer B.V.
Brand	: Gatso
Model	: LTR
Serial number	: n.a.
Voltage input rating	: 230 VAC
Current input rating	: n.a.
Antenna	: Integral / External / Temporary antenna connector
Frequency	: 24075 – 24175 MHz
Remarks	: -

The EUT consists of a supply unit, and an antenna unit. The RF function is contained inside the antenna unit.



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1.3.1 Description of input and output ports.

Number	Ports	From	To	Length (metres)	Shielding	Remarks
1	Mains input	Mains	Power supply / interface unit	> 3	Yes	-
2	Data in / output and DC supply	Power supply / interface unit	RF unit	> 3	Yes	-
3	RS422 data output to PC	Power supply / interface unit	PC	> 3	Yes	-
4	RS422 data input from PC	PC	Power supply / interface unit	> 3	Yes	-

AE = Auxiliary equipment

1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (2006-02-01), sections 15.205, 15.207, 15.209 and 15.245

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 above 24 GHz were performed on 1m. 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.



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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).



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2 System test configuration.

2.1 Justification.

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 employs FSK, using on two frequencies inside the band 24075 – 24175 MHz. The reflected signals are received and transformed. Digital signal processing is employed to determine vehicles and their speed and location inside the road or lane section. During the field strength measurements above 1 GHz, the EUT was set at a fixed frequency, without modulation.

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.



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3 Radiated emission data.

3.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field).

Frequency (MHz)	Measurement results dB(μ V)/m @ 3 metres Quasi-peak		Limits dB(μ V)/m @ 3 metres Quasi-peak	Margin (dB) Quasi-peak		Result
	Vertical	Horizontal		Vertical	Horizontal	
44.21	16.6	12.5	40.0	-23.4	-27.5	PASS
78.56	16.0	12.2	40.0	-24.0	-27.8	PASS
124.50	18.1	21.9	43.5	-25.4	-21.6	PASS
582.90	26.9	26.9	46.0	-19.1	-19.1	PASS
844.80	32.4	32.4	46.0	-13.6	-13.6	PASS

Table 1: Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, section 15.209, with the EUT tested in active mode.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.

Test engineer

signature

Name : H.J. Pieters

Date : August 5, 2005



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3.2 Radiated field strength measurements (24 GHz – 100 GHz).

Frequency (MHz)	Measurement results mV/m Quasi-peak		Limits Part 15.245 mV/m
	Horizontally polarized	Vertically polarized	
24105.2	132	n.a.	
24113.4	133	n.a.	
24115.9	134	n.a.	
24126.2	130	n.a.	

Table 2 Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, sections 15.245 and 15.33 (a)(2), with the EUT operating in unmodulated continuous transmit mode on 24 GHz, are depicted in table 2.

Frequency (GHz)	Measurement results mV/m Quasi-peak		Limits Part 15.245 mV/m
	Horizontally polarized	Vertically polarized	
48.2	<25	<25	
72.3	<25	<25	
96.4	<25	<25	

Table 3 Harmonics of the fundamental frequency

The results of the radiated emission measurement of harmonics, carried out in accordance with 47 CFR Part 15, sections 15.245 and 15.33 (a)(2), with the EUT operating in unmodulated continuous transmit mode on 24 GHz, are depicted in table 3.

Notes:

- An account of the measurement method used may be found Appendix 1.
- n.a. indicates that no field strength values could be measured on the listed frequencies or in the listed frequency range
- The signal of the EUT is linearly polarized. The dominant polarisation is dependent on the mounting of the antenna on its mounting pole.
- The harmonics are measured using the set up and procedure described in Appendix 1.
- The fundamental frequency was checked on its dependence of the AC mains voltage. No deviation could be detected.

Test engineer

Signature :

Name : H.J. Pieters / J. Schuurmans

Date : November, 2005 and April 5, 2006



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4 Conducted emission data.

4.1 Conducted emission data of the 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	
0.26	45.2	19.3	44.8	28.4	61.4	51.4	-16.2	-32.1	-16.6	-23.0	PASS
0.33	10.8	7.2	9.1	4.6	59.5	49.5	-48.7	-42.3	-50.4	-44.9	PASS
0.53	24.6	10.4	25.4	12.5	56.0	46.0	-31.4	-35.6	-30.6	-33.5	PASS
1.08	29.5	26.3	29.1	26.1	56.0	46.0	-26.5	-19.7	-26.9	-19.9	PASS
3.03	37.3	33.9	32.7	24.8	56.0	46.0	-18.7	-12.1	-23.3	-21.2	PASS
3.70	40.6	37.5	35.8	23.4	56.0	46.0	-15.4	-8.5	-20.2	-22.6	PASS
6.95	18.4	5.9	31.1	30.7	60.0	50.0	-41.6	-44.1	-28.9	-19.3	PASS
8.42	33.3	32.8	26.5	23.3	60.0	50.0	-26.7	-17.2	-33.5	-26.7	PASS
10.58	36.4	35.3	35.8	34.0	60.0	50.0	-23.6	-14.7	-24.2	-16.0	PASS
14.89	20.0	13.7	17.1	11.3	60.0	50.0	-40.0	-36.3	-42.9	-38.7	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. The conducted emissions on frequencies which are not listed in the table above were found to be below 25 dBµV on both line 1 and line 2.

Test engineer

Signature :

Name : H.J. Pieters

Date : August 3, 2005



Test specification(s): 47 CFR Part 15 (2006-02-01)
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5 List of utilized test equipment.

inventory nr.	description	brand	model	serial
12476	Tripod	Emco	TR3	-
12491	Measuring receiver	Rohde & Schwarz	ESH3	891806/004
12493	Spectrum monitor ESH3	Rohde & Schwarz	EZM	891979/018
12512	LISN FCC 50 uH / 50 ohm	Emco	3725/2	8812-2027
12605	Calibrated Dipole	Emco	3121c	300
12636	OATS plastic cover	Polyforce	11088	-
13313	Pulse limiter	Rohde & Schwarz	ESH3-Z2	357.8810.52
15633	Biconilog OATS	Chase	CBL6111B	1278
15667	Measuring receiver	Rohde & Schwarz	ESCS30	123987
99055	Support 1 m	NMi Certin B.V.	-	-
99061	Support 150cm	NMi Certin B.V.	Support 150	-
99077	Variac 250V 6A	RFT	LTS006	831347
99112	Tripod	Chase	CAS6012	-
99538	Spectrum analyzer	Rohde & Schwarz	FSP40	100007
99541	Gain horn 18 - 26.5 GHz	EMCO	3160-09	28219
99542	Gain horn 26.5 - 40 GHz	EMCO	3160-10	29092

Appendix 1

The harmonics were assessed in the compact antenna test range of the European Space Agency in Noordwijk, The Netherlands. The equipment was set up according the manufacturer's specifications. The modulation was switched off, and the frequency was set to the centre of the operating frequency range.

At 1m, a receive gain horn was used, connected to a harmonic mixer, part of the external harmonic mixer system (11970 U) of the Agilent 8465EC spectrum analyzer. Before taking a reading, the set up was calibrated using a identical gain horn connected to a microwave source Agilent E8254A with doubler/tripler unit. The power from the source was measured and the antenna was connected. The path loss was calculated and the display line of the spectrum analyzer was set at the appropriate field strength level. For the third an fourth harmonic, measuring with a band with of 1 MHz, the noise level is equal or above the applicable limit. Since the carrier of the EUT is unmodulated, the bandwidth of the receiver was decreased to show a noise level well below the limit. In addition, the limit line was placed in the display of the receiver without conversion of the distance from 3m (for which the limit is given) to 1m. All this is evidence that at the harmonic frequencies, the field strength at 3m distance of the EUT are well below the limit.

The photographs below show photographs of the receiver display. The test set up is documented in the test set up photographs exhibit, which is submitted to the Commission as a separate exhibit.

In addition to the measurements on harmonic frequencies, spurious emissions could not be detected.

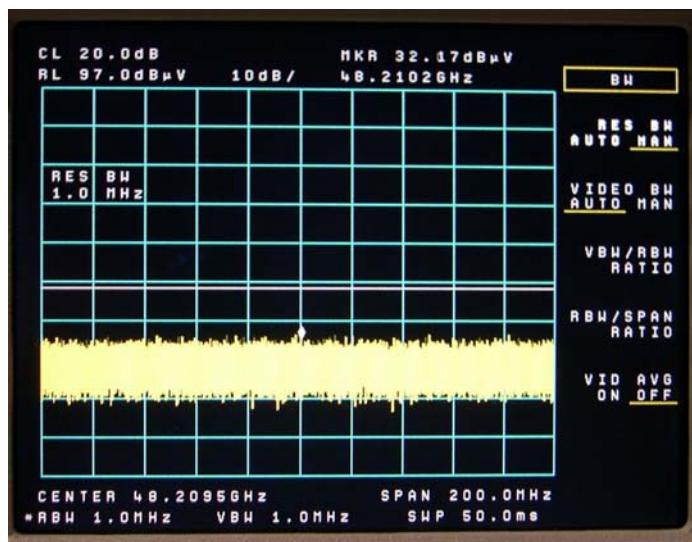


Photo 1: display photo of the measurement of the 2nd harmonic

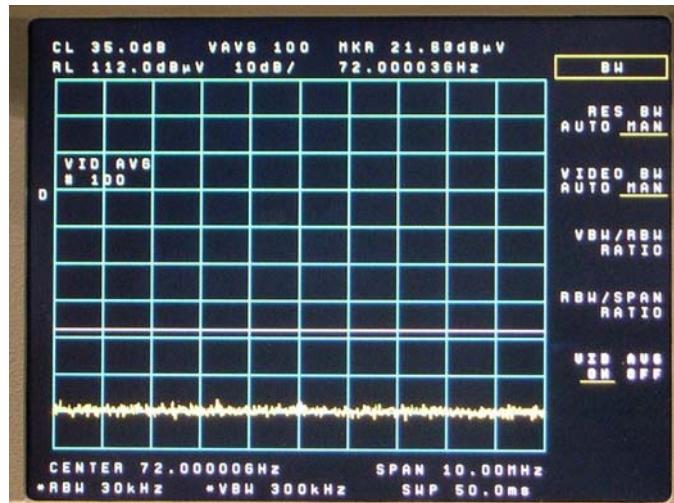


Photo 2: display photo of the measurement of the 3rd harmonic

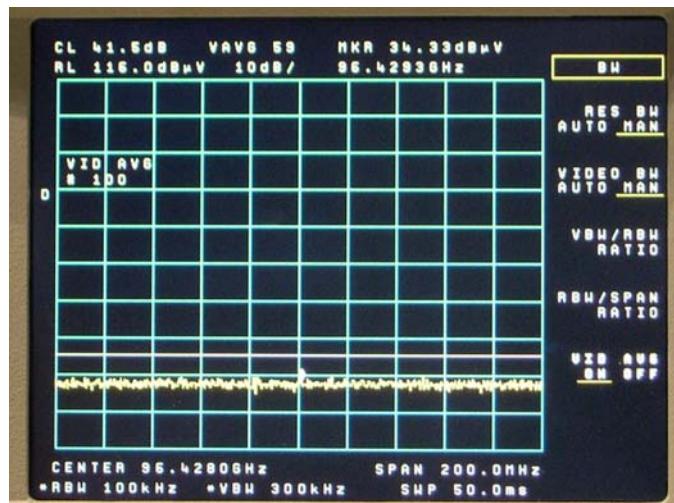


Photo 3: display photo of the measurement of the 4th harmonic



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Measurement equipment as used for the harmonics emission measurements.

ESTEC/ESA inventory nr.	description	brand	model	serial	date cal due
107582	Spectrum Analyzer	Agilent	8546EC	4123A00573	25-11-2006
111274	Harmonic mixer system	Hewlett Packard	11970	3003A01454	-
51184	Frequency doubler/tripler	Hewlett Packard	U85325A	-	-
-	Microwave signal Generator	Agilent	E8254	-	26-02-2007
-	Mixer U band	Hewlett Packard	11970U	3003A01454	25-11-2006
-	Mixer V band	Hewlett Packard	11970V	2521A00856	25-11-2006
	Mixer W band	Hewlett Packard	11970W	2521A01001	25-11-2006
-	Gain Horn 75 – 110 GHz	Custom Microwave Inc.	HO10	-	-
-	Gain Horn 50 – 75 GHz	Custom Microwave Inc.	HO15	-	-
-	Gain Horn 40 – 60 GHz	Custom Microwave Inc.	HO19	-	-
109518	Power Meter	Agilent	E4419B	-	25-11-2006
-	Microwave Power sensor 50 MHz - 50 GHz	Hewlett Packard	8487A	+MY41090686	15-7-2006
	Microwave Power sensor 75 –110 GHz	Hewlett Packard	W8486A	-	15-7-2006
	Microwave Power sensor 50 –75 GHz	Hewlett Packard	V8486A	-	15-7-2006