



**TEST REPORT OF A 2.4 GHZ MICROWAVE ID
SYSTEM, BRAND NEDAP, MODEL TRANS-IT XS AND
TRANS-IT, IN CONFORMITY WITH 47 CFR PART 15
(2001-12-18).**

FCC listed : 90828
Industry Canada : IC3501

TNO Electronic Products & Services (EPS) B.V.
P.O. Box 15
9822 ZG Niekerk (NL)
Smidshornerweg 18
9822 TL Niekerk (NL)

Telephone: +31 594 505005
Telefax: +31 594 504804

E-mail: info@eps.tno.nl



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz Microwave ID System
Manufacturer: N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand mark: Nedap
Model: TRANS-IT (series) and TRANS-IT XS (specific)
FCC ID: CGDTRANSIT

MEASUREMENT/TECHNICAL REPORT

N.V. Nederlandsche Apparatenfabriek "Nedap"

Model : TRANST-IT (series) and TRANS-IT XS (specific)

FCC ID: CGDTRANSIT

October 24, 2002

This report concerns:	Original grant/certification	Class 2 change	Verification
Equipment type:	2.4 GHz Microwave ID system		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	Yes	No	
Report prepared by:	Name	: P.A.J.M. Robben, 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	

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 and the measurement procedures of ANSI C63.4-1992. 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: October 24, 2002

Signature:

P. de Beer
TNO Electronic Products & Services (EPS) B.V.



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Description of test item

Test item : 2.4 GHz Microwave ID System
Manufacturer : N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand : Nedap
Model : TRANS-IT (series) and TRANS-IT XS (specific)
Serial numbers : P909.0003
Revision : n.a.
Receipt number : 1
Receipt date : July 5, 2002

Applicant information

Applicant's representative : Mr. J.A.M. Hulshof
Company : N.V. Nederlandsche Apparatenfabriek "Nedap"
Address : Parallelweg 2
Postal code : 7141 DC
City : GROENLO
PO-box : 6
Postal code : 7140 AA
City : GROENLO
Country : The Netherlands
Telephone number : +31 544 471 162
Telefax number : +31 544 463 475

Information on EUT box

Manufacturer on box : IDEAS, N.V. Nederlandsche Apparatenfabriek "Nedap"
Address on box : Parallelweg 2e
Postal code : NL-7141 DC Groenlo
PO-box : 103
Postal code : NL-7140 AC Groenlo
Country : The Netherlands

Test(s) performed

Location : Niekerk
Test(s) started : August 16, 2002
Test(s) completed : August 24, 2002
Purpose of test(s) : Type approval / certification
Test specification(s) : 47 CFR Part 15.245

Test engineer : H.J. Pieters
Project leader : D.H. Kruiter, B.Sc.E.E. & B.Sc.T.M.
Report written by : P.A.J.M. Robben, B.Sc.E.E.
Report date : October 24, 2002



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.

The 2.4 GHz Microwave ID System, brand Nedap, model TRANS-IT (series) and TRANS-IT XS (specific), is designed to operate in the 2.4 GHz ISM frequency band, channels 1 to 30 (2438.4 MHz to 2457.0 MHz), as specified by the Federal Communications Commission in the USA.

The 2.4 GHz Microwave ID System, brand Nedap, model TRANS-IT (series) and TRANS-IT XS (specific), incorporates an integral antenna, having a gain of 8 dBi. The material is of PTFE and is 1.6 mm thick.

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 its components, as it has been tested, can be found in table 1 below.

Description	Model number	Serial number	FCC ID	Cable descriptions
2.4 GHz Microwave ID system	TRANS-IT XS	P909.0003	CGDTRANSIT	-Unshielded power cord to AC mains

Table 1 - Tested system details overview.

1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (2001-12-18), sections 15.207, 15.209, 15.205 and 15.245.

The test methods, which have been used, are based on ANSI C63.4: 1992.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters. Below 30 MHz the radiated emission tests were carried out at measurement distances of 3 and 10 meters. The test results regarding the radiated emission tests on frequencies below 30 MHz have been extrapolated in order to determine the field strength of the measured values at measurement distances of 30 and 300 meters (as required by 47 CFR Part 15).

The bandwidth of the receiver is 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.

Radiated emission tests on frequencies above 1 GHz were performed with appropriate pre-amplifiers, antennas and a spectrum analyzer. At frequencies on which radiated emissions were found the level at the input of the pre-amplifier was reproduced by means of a RF signal generator. The output level of the signal generator was then increased with the antenna factor in order to obtain the actual field strength value for each individual frequency on which radiated emissions were found.



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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.

In accordance with 47 CFR Part 2.925 (a)(1), the FCC ID shall be placed on a label, which is 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)(2), 47 CFR Part 15.19 (b)(4), 47 CFR Part 2.925 and 47 CFR Part 2.926.

1.7 System test configuration.

1.7.1 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: 1992.

Tests were performed at the lowest operating frequency (channel 1: 2438.4 MHz), the operating frequency in the middle of the specified frequency band (channel 16: 2448 MHz) and the highest operating frequency (channel 30: 2457 MHz). Further details may be found in table 2 below.

Channel	Operating frequencies (MHz)	Rated output power (mV/m)	Test performed
1	2438.4	425.0	yes
16	2448.0	425.0	yes
30	2457.0	425.0	yes

Table 2 - Specification of channels and rated maximum radiated field strength

1.7.2 EUT exercise software.

The EUT could be enabled to transmit on channels 1 (2438.4 MHz), 16 (2448.0 MHz) and 30 (2457.0 MHz). The channels could be enabled by means of dipswitches.



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1.8 Special accessories.

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

1.9 Equipment modifications.

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

1.10 Configuration of the tested system.

Not applicable. See table 1 in section 1.3 of this test report.

1.11 Block diagram(s) of the EUT.

The block diagram is available as part of the documentation which is to be submitted to the FCC/TCB.



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2 Radiated emission data.

2.1 Test results with EUT operating in receive mode on channel 1.

The EUT was not tested in receive mode due to the fact that the device only operates in a transmit mode.

Test engineer

Signature

: 

Name : H.J. Pieters

Date : August 16, 2002

2.2 Test results with EUT operating in receive mode on channel 16.

The EUT was not tested in receive mode due to the fact that the device only operates in a transmit mode.

Test engineer

Signature

: 

Name : H.J. Pieters

Date : August 16, 2002

2.3 Test results with EUT operating in receive mode on channel 30.

The EUT was not tested in receive mode due to the fact that the device only operates in a transmit mode.

Test engineer

Signature

: 

Name : H.J. Pieters

Date : August 16, 2002



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2.4 Test results with EUT operating in transmit mode on channel 1.

2.4.1 47 CFR Part 15.205, 47 CFR Part 15.209, 47 CFR Part 15.245 (b)(1) and 47 CFR Part 15.245 (b)(3).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.205, 47 CFR Part 15.209 and 47 CFR Part 15.245 (b)(3), with the EUT operating in transmit mode on channel 1 (2438.4 MHz), are depicted in table 3.

Frequency (MHz)	Test results quasi peak (dBμV/m)		Test results average (dBμV/m)		Test results peak (dBμV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBμV/m)	Average limits (dBμV/m)	Peak limits (dBμV/m)
	V	H	V	H	V	H				
353.4	29.8	27.7	-	-	-	-	120	46.0	-	-
384.1	27.0	27.7	-	-	-	-	120	46.0	-	-
414.8	21.8	26.5	-	-	-	-	120	46.0	-	-
430.2	22.2	24.8	-	-	-	-	120	46.0	-	-
445.5	28.9	29.1	-	-	-	-	120	46.0	-	-
476.3	30.8	30.7	-	-	-	-	120	46.0	-	-
506.9	29.9	32.0	-	-	-	-	120	46.0	-	-
537.7	27.9	30.7	-	-	-	-	120	46.0	-	-
568.4	31.4	32.4	-	-	-	-	120	46.0	-	-
4876.8	-	-	n.t.	n.t.	50.8	52.1	1000	-	54.0	74.0
7315.2	-	-	n.t.	n.t.	52.0	53.0	1000	-	54.0	74.0
9753.6	-	-	n.t.	n.t.	45.6	46.6	1000	-	54.0	74.0
12192.0	-	-	n.t.	n.t.	44.5	44.5	1000	-	54.0	74.0

Table 3 - Test results with the EUT operating in transmit mode on channel 1 (2438.4 MHz).

Note: Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 3 are more than 20 dB below the applicable limit.

Test engineer

Signature :

Name : H.J. Pieters

Date : August 16, 2002



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2.4.2 47 CFR Part 15.245 (b).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.245 (b), with the EUT operating in transmit mode on channel 1 (2438.4 MHz), are depicted in table 4.

Frequency (MHz)	Test results average (mV/m)		Test results peak (mV/m)		Resolution bandwidth (kHz)	Average limits (mV/m)
	V	H	V	H		
2438.4	n.t.	n.t.	423.1	408.7	1000	500.0
4876.8	n.t.	n.t.	0.35	0.40	1000	1.6
7315.2	n.t.	n.t.	0.39	0.45	1000	1.6
9753.6	n.t.	n.t.	0.19	0.21	1000	1.6
12192.0	n.t.	n.t.	0.17	0.17	1000	1.6

Table 4 - Test results with the EUT operating in transmit mode on channel 1 (2438.4 MHz).

Note: Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 4 are more than 20 dB below the applicable limit.

Test engineer

Signature

Name : H.J. Pieters

Date : August 16, 2002



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2.5 Test results with EUT operating in transmit mode on channel 16.

2.5.1 47 CFR Part 15.205, 47 CFR Part 15.209, 47 CFR Part 15.245 (b)(1) and 47 CFR Part 15.245 (b)(3).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.205, 47 CFR Part 15.209 and 47 CFR Part 15.245 (b)(3), with the EUT operating in transmit mode on channel 16 (2448 MHz), are depicted in table 5.

Frequency (MHz)	Test results quasi peak (dBμV/m)		Test results average (dBμV/m)		Test results peak (dBμV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBμV/m)	Average limits (dBμV/m)	Peak limits (dBμV/m)
	V	H	V	H	V	H				
353.4	29.8	27.7	-	-	-	-	120	46.0	-	-
384.1	27.0	27.7	-	-	-	-	120	46.0	-	-
414.8	21.8	26.5	-	-	-	-	120	46.0	-	-
430.2	22.2	24.8	-	-	-	-	120	46.0	-	-
445.5	28.9	29.1	-	-	-	-	120	46.0	-	-
476.3	30.8	30.7	-	-	-	-	120	46.0	-	-
506.9	29.9	32.0	-	-	-	-	120	46.0	-	-
537.7	27.9	30.7	-	-	-	-	120	46.0	-	-
568.4	31.4	32.4	-	-	-	-	120	46.0	-	-
4896.0	-	-	n.t.	n.t.	51.1	52.1	1000	-	54.0	74.0
7344.0	-	-	n.t.	n.t.	52.0	54.0	1000	-	54.0	74.0
9792.0	-	-	n.t.	n.t.	45.8	46.6	1000	-	54.0	74.0
12240.0	-	-	n.t.	n.t.	45.0	46.0	1000	-	54.0	74.0

Table 5 - Test results with the EUT operating in transmit mode on channel 16 (2448 MHz).

Note: Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 5 are more than 20 dB below the applicable limit.

Test engineer

Signature :

Name : H.J. Pieters

Date : August 16, 2002



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2.5.2 47 CFR Part 15.245 (b).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.245 (b), with the EUT operating in transmit mode on channel 16 (2448 MHz), are depicted in table 6.

Frequency (MHz)	Test results average (mV/m)		Test results peak (mV/m)		Resolution bandwidth (kHz)	Average limits (mV/m)
	V	H	V	H		
2448.0	n.t.	n.t.	395.8	393.5	1000	500.0
4896.0	n.t.	n.t.	0.36	0.40	1000	1.6
7344.0	n.t.	n.t.	0.39	0.50	1000	1.6
9792.0	n.t.	n.t.	0.19	0.21	1000	1.6
12240.0	n.t.	n.t.	0.18	0.20	1000	1.6

Table 6 - Test results with the EUT operating in transmit mode on channel 16 (2448 MHz).

Note: Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 6 are more than 20 dB below the applicable limit.

Test engineer

Signature

Name : H.J. Pieters

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2.6 Test results with EUT operating in transmit mode on channel 30.

2.6.1 47 CFR Part 15.205, 47 CFR Part 15.209, 47 CFR Part 15.245 (b)(1) and 47 CFR Part 15.245 (b)(3).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.205, 47 CFR Part 15.209 and 47 CFR Part 15.245 (b)(3), with the EUT operating in transmit mode on channel 30 (2457 MHz), are depicted in table 7.

Frequency (MHz)	Test results quasi peak (dBμV/m)		Test results average (dBμV/m)		Test results peak (dBμV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBμV/m)	Average limits (dBμV/m)	Peak limits (dBμV/m)
	V	H	V	H	V	H				
353.4	29.8	27.7	-	-	-	-	120	46.0	-	-
384.1	27.0	27.7	-	-	-	-	120	46.0	-	-
414.8	21.8	26.5	-	-	-	-	120	46.0	-	-
430.2	22.2	24.8	-	-	-	-	120	46.0	-	-
445.5	28.9	29.1	-	-	-	-	120	46.0	-	-
476.3	30.8	30.7	-	-	-	-	120	46.0	-	-
506.9	29.9	32.0	-	-	-	-	120	46.0	-	-
537.7	27.9	30.7	-	-	-	-	120	46.0	-	-
568.4	31.4	32.4	-	-	-	-	120	46.0	-	-
4914.0	-	-	n.t.	n.t.	53.1	52.1	1000	-	54.0	74.0
7371.0	-	-	n.t.	n.t.	53.0	52.0	1000	-	54.0	74.0
9828.0	-	-	n.t.	n.t.	46.1	45.8	1000	-	54.0	74.0
12285.0	-	-	n.t.	n.t.	46.6	45.6	1000	-	54.0	74.0

Table 7 - Test results with the EUT operating in transmit mode on channel 30 (2457 MHz).

Note: Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 7 are more than 20 dB below the applicable limit.

Test engineer

Signature :

Name : H.J. Pieters

Date : August 16, 2002

2.6.2 47 CFR Part 15.245 (b).

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.245 (b), with the EUT operating in transmit mode on channel 30 (2457 MHz), are depicted in table 8.

Frequency (MHz)	Test results average (mV/m)		Test results peak (mV/m)		Resolution bandwidth (kHz)	Average limits (mV/m)
	V	H	V	H		
2457.0	n.t.	n.t.	356.0	356.0	1000	500.0
4914.0	n.t.	n.t.	0.45	0.40	1000	1.6
7371.0	n.t.	n.t.	0.45	0.39	1000	1.6
9828.0	n.t.	n.t.	0.20	0.19	1000	1.6
12285.0	n.t.	n.t.	0.21	0.19	1000	1.6

Table 8 - Test results with the EUT operating in transmit mode on channel 30 (2457 MHz).

Note: Above 1 GHz, all measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, all spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 8 are more than 20 dB below the applicable limit.

Test engineer

Signature



Name : H.J. Pieters

Date : August 16, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz Microwave ID System
Manufacturer: N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand mark: Nedap
Model: TRANS-IT (series) and TRANS-IT XS (specific)
FCC ID: CGDTRANSIT

3 Conducted emission data.

3.1 AC mains with EUT operating in transmit mode.

The (worst-case) results of the conducted emission tests at the 110 Volts AC mains connection terminals of the EUT, carried out in accordance with 47 CFR Part 15.207, with the EUT operating in transmit mode on channels 1 (2438.6 MHz), 16 (2448 MHz) and 30 (2457 MHz), are depicted in table 9.

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	QP	QP	QP	QP	
0.26	42.7	39.8	48.0	-5.3	-8.2	PASS
0.53	34.0	33.8	48.0	-14.0	-14.2	PASS
0.79	29.8	30.0	48.0	-18.2	-18.0	PASS
2.11	14.7	14.7	48.0	-33.3	-33.3	PASS
5.00	15.1	14.5	48.0	-32.9	-33.5	PASS
8.50	10.4	12.4	48.0	-37.6	-35.6	PASS
9.60	12.6	13.4	48.0	-35.4	-34.6	PASS

Table 9 - Test results with the EUT operating in transmit mode.

Note: Disturbance voltage values of conducted emissions at frequencies not listed in table 9 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : H.J. Pieters

Date : August 24, 2002

3.2 AC mains with EUT operating in receive mode.

The EUT was not tested in receive mode, due to the fact that the device only operates in a transmit mode.

Test engineer

Signature : 

Name : H.J. Pieters

Date : August 24, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz Microwave ID System
Manufacturer: N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand mark: Nedap
Model: TRANS-IT (series) and TRANS-IT XS (specific)
FCC ID: CGDTRANSIT

4 List of utilized test equipment.

Inventory number	Description	Brand	Model
12471	Biconical antenna 20MHz-200MHz	EATON	94455-1
12473	Log-per antenna 200-1000MHz	EATON	96005
12476	Antenna mast	EMCO	TR3
12477	Antenna mast 1-4 mtr	Poelstra	--
12482	Loop antenna	EMCO	6507
12483	Guidehorn	EMCO	3115
12484	Guidehorn	EMCO	3115
12488	Guidehorn 18 - 26.5 GHz	EMCO	RA42-K-F-4B-C
12533	Signalgenerator	MARCONI	2032
12559	Digital storage oscilloscope	Le Croy	9310M
12561	DC Power Supply 20A/70V	DELTA	SM7020D
12567	Plotter	HP	7440A
12605	calibrated dipole 28MHz-1GHz	Emco	3121c
12608	HF milliwattmeter	Hewlett Packard	HP435a
12609	Power sensor 10MHz-18GHz	Hewlett Packard	HP8481A
12636	Polyester chamber	Polyforce	--
12640	Temperature chamber	Heraeus	VEM03/500
13664	Spectrum analyzer	HP	HP8593E
13078	Preamplifier 0.1 GHz - 12 GHz	Miteq	AMF-3D-001120-35-14p
13452	Digital multi meter	HP	34401A
13526	Signalgenerator 20 GHz	Hewlett & Packard	83620A
13594	Preamplifier 10 GHz - 25 GHz	Miteq	AMF-6D-100250-10p
13886	Open Area testsite	Comtest	--
14051	Anechoic room	Comtest	--
14450	2.4 GHz bandrejectfilter	BSC	XN-1783
15633	Biconilog Testantenna	Chase	CBL 6111B
15667	Measuring receiver	R&S	ESCS 30
99045	DC Power Supply 3A/30V	DELTA	E030/3
99055	Non-conducting support	NMi	--
99061	Non-conducting support 150cm	NMi	--
99068	Detector N-F/BNC-F	Radiall	R451576000
99069	Cable 5m RG214	NMi	--
99071	Cable 10m RG214	NMi	--
99076	Bandpassfilter 4 - 10 GHz	Reactel	7AS-7G-6G-511
99077	Regulating trafo	RFT	LTS006
99112	Tripod	Chase	--
99136	Bandpassfilter 10 - 26.5 GHz	Reactel	9HS-10G/26.5G-S11