



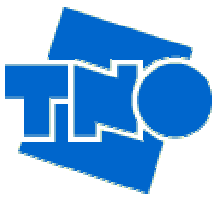
**TEST REPORT OF A 2.4 GHZ LOW POWER WLAN  
USB DEVICE, BRAND SAMSUNG,  
TYPE SWL-2300U, IN CONFORMITY WITH  
47 CFR PART 15 (2003-03-13).**

FCC listed : 90828  
Industry Canada : IC3501

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Test specification(s): 47 CFR Part 15 (2003-03-13)  
Description of EUT: 2.4 GHz low power WLAN USB Device  
Manufacturer: Samsung  
Brand mark: Samsung  
Type: SWL-2300U  
FCC ID: E2XSWL2300U

## MEASUREMENT/TECHNICAL REPORT

**SAMSUNG**

**Model : SWL-2300U**

**FCC ID: E2XSWL-2300U**

August 22, 2003

This report concerns:	Original grant/certification	Class 2 change	Verification
Equipment type:	Direct Sequence Spread Spectrum Transceiver		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	Yes	No	
Report prepared by:	Name	: J. Schuurmans, B.Sc.E.E.	
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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: August 22, 2003

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



Test specification(s): 47 CFR Part 15 (2003-03-13)  
Description of EUT: 2.4 GHz low power WLAN USB Device  
Manufacturer: Samsung  
Brand mark: Samsung  
Type: SWL-2300U  
FCC ID: E2XSWL2300U

**Description of test item**


Test item : 2.4 GHz low power WLAN USB device  
Manufacturer : SAMSUNG  
Brand : SAMSUNG  
Type : SWL-2300U  
Serial numbers : TUKRAA – 230015119  
Revision : n.a.  
Receipt number : n.a.  
Receipt date : August 14, 2003


**Applicant information**


Applicant's representative :  
Company : TELEFICATION BV  
Address : Edisonstraat 12a  
Postal code : 6902 PK  
City : Zevenaar  
PO-box : -  
Postal code : -  
City : -  
Country : Netherlands  
Telephone number :  
Telefax number :

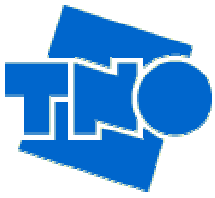
**Test(s) performed**

Location : Niekerk  
Test(s) started : August 18, 2003  
Test(s) completed : August 22, 2003  
Purpose of test(s) : Type approval / certification  
Test specification(s) : 47 CFR Part 15 (2003-03-13)

Test engineer : O.H. Hoekstra 

Report written by : J. Schuurmans on behalf of  
  
P.A.M.R. Robben B.SC.E.E 

Project leader : P. De Beer, 



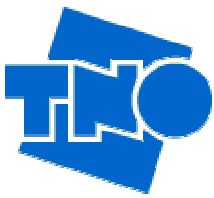
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**This report is in conformity with NEN-EN-ISO/IEC 17025: 2000.**

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

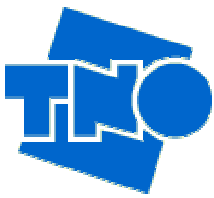


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**Manufacturer:** Samsung  
**Brand mark:** Samsung  
**Type:** SWL-2300U  
**FCC ID:** E2XSWL2300U

# 1 General information.

## 1.1 Product description.

The 2.4 GHz low power WLAN USB Device, brand Samsung, type SWL-2300, is designed to operate in the 2.4 GHz ISM frequency band, channels 1 to 11 (2412 MHz to 2462 MHz), as specified by the Federal Communications Commission in the USA.

The 2.4 GHz low power WLAN USB Device, brand Samsung, type SWL-2300, utilizes Direct Sequence Spread Spectrum (DSSS) technology.

## 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. FCC ID's are stated in this overview where applicable. The EUT is listed in the first row of this table 1.

Description	Type number	Serial number	FCC ID	Cable descriptions
2.4 GHz low power WLAN USB Device	SWL-2300	TUKRAA 320015119	E2XSWL2300U	USB cable
Toshiba Laptop	4070DCT	79174477E PCN0285	n.a. (DoC)	-Unshielded DC power cord to AC/DC adapter -Shielded parallel cable to printer
Toshiba AC/DC power adapter 100-240 VAC/ 0.95 0.55 Amps to +15 VDC/3 Amps	PA2450U	1578169	n.a. (DoC)	-Unshielded DC power cord to notebook computer -Unshielded power cord to AC mains
Microsoft Mouse	52463 OEM	7268435-00000	n.a. (DoC)	- serial cable
HP DeskJet 895Cxi	C6410A	ES8B42307H	n.a. (DoC)	-Unshielded DC power cord to AC/DC adapter -Shielded parallel cable to notebook computer
HP AC/DC power adapter 100-240 VAC/1 Amps to +18 VDC/1.1 Amps	C6409-60014	n.a.	n.a. (DoC)	-Unshielded DC power cord to printer -Unshielded power cord to AC mains

Table 1 - Tested system details overview.



**Test specification(s):** 47 CFR Part 15 (2003-03-13)  
**Description of EUT:** 2.4 GHz low power WLAN USB Device  
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**Brand mark:** Samsung  
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**FCC ID:** E2XSWL2300U

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## 1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (2003-03-13), sections 15.107, 15.207, 15.109, 15.209 and 15.205.

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.

## 1.5 Test facility.

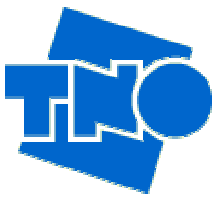
The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (EPS) B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47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

(n.a.)



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## 1.7 System test configuration.

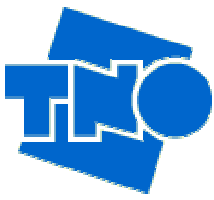
### 1.7.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it). Photographs of the setup are provided below:



**Photo 1 Photograph 1 of equipment in test setup**





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**Photo 2 Photograph 2 of equipment in test setup**

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: 2412 MHz), the operating frequency in the middle of the specified frequency band (channel 6: 2437 MHz) and the highest operating frequency (channel 11: 2462 MHz).

### **1.7.2 EUT test software.**

The EUT could be enabled to transmit or receive continuously by means of test software, which was supplied by the manufacturer of the EUT.

### **1.8 Special accessories.**

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



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## **1.9 Equipment modifications.**

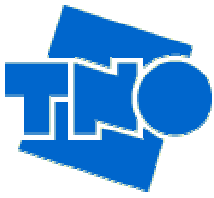
No modifications have been made to the equipment in order to achieve compliance with the appropriate sections of 47 CFR Part 15.

## **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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**FCC ID:** E2XSWL2300U

## 2 Radiated emission data.

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

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109 and 47 CFR Part 15.209 with the EUT operating in receive mode on channel 1 (2412 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				
61.4	34.0	37.3	-	-	-	-	120	40.0	-	-
144.0	29.5	29.1	-	-	-	-	120	43.5	-	-
233.2	40.4	41.2	-	-	-	-	120	46.0	-	-
399.2	43.2	42.9	-	-	-	-	120	46.0	-	-

Table 3 - Test results with the EUT operating in transmit mode.

Note: Above 1 GHz, most 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, most 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 : Onno H. Hoekstra

Date : August 22, 2003



**Test specification(s):** 47 CFR Part 15 (2003-03-13)  
**Description of EUT:** 2.4 GHz low power WLAN USB Device  
**Manufacturer:** Samsung  
**Brand mark:** Samsung  
**Type:** SWL-2300U  
**FCC ID:** E2XSWL2300U

## 2.2 Test results with EUT operating in receive mode on channel 6.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109 and 47 CFR Part 15.209 with the EUT operating in receive mode on channel 6 (2437 MHz), are depicted in table 4.

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				
61.4	34.0	37.3	-	-	-	-	120	40.0	-	-
144.0	29.5	29.1	-	-	-	-	120	43.5	-	-
233.2	40.4	41.2	-	-	-	-	120	46.0	-	-
399.2	43.2	42.9	-	-	-	-	120	46.0	-	-

Table 4 - Test results with the EUT operating in receive mode on channel 6 (2437 MHz).

Note: Above 1 GHz, most 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, most 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 : Onno H. Hoekstra

Date : August 22, 2003



**Test specification(s):** 47 CFR Part 15 (2003-03-13)  
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**Manufacturer:** Samsung  
**Brand mark:** Samsung  
**Type:** SWL-2300U  
**FCC ID:** E2XSWL2300U

### 2.3 Test results with EUT operating in receive mode on channel 11.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109 and 47 CFR Part 15.209 with the EUT operating in receive mode on channel 11 (2462 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				
61.4	34.0	37.3	-	-	-	-	120	40.0	-	-
144.0	29.5	29.1	-	-	-	-	120	43.5	-	-
233.2	40.4	41.2	-	-	-	-	120	46.0	-	-
399.2	43.2	42.9	-	-	-	-	120	46.0	-	-

Table 5 - Test results with the EUT operating in receive mode on channel 11 (2462 MHz).

Note: Above 1 GHz, most 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, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

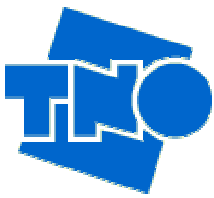
Note: Field strength values of radiated emissions at frequencies not listed in table 5 are more than 20 dB below the applicable limit.

#### Test engineer

Signature :

Name : Onno H. Hoekstra

Date : August 22, 2003



Test specification(s): 47 CFR Part 15 (2003-03-13)  
Description of EUT: 2.4 GHz low power WLAN USB Device  
Manufacturer: Samsung  
Brand mark: Samsung  
Type: SWL-2300U  
FCC ID: E2XSWL2300U

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

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109, 47 CFR Part 15.209 and 47 CFR Part 15.205 (restricted bands of operation) with the EUT operating in transmit mode on channel 1 (2412 MHz), are depicted in table 6.

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				
61.4	34.2	37.2	-	-	-	-	120	40.0	-	-
144.0	28.5	32.5	-	-	-	-	120	43.5	-	-
233.2	37.2	42.0	-	-	-	-	120	46.0	-	-
399.9	43.2	42.5	-	-	-	-	120	46.0	-	-
1061.0	-	-	n.t.	n.t.	43.5	33.9	1000	-	54.0	74.0
4824.0	-	-	n.t.	n.t.	45.4	44.8	1000	-	54.0	74.0

Table 6 - Test results with the EUT operating in transmit mode on channel 1 (2412 MHz).

Note: Radiated emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 6.

Note: Above 1 GHz, most 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, most 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 : Onno H. Hoekstra

Date : August 22, 2003



Test specification(s): 47 CFR Part 15 (2003-03-13)  
Description of EUT: 2.4 GHz low power WLAN USB Device  
Manufacturer: Samsung  
Brand mark: Samsung  
Type: SWL-2300U  
FCC ID: E2XSWL2300U

## 2.5 Test results with EUT operating in transmit mode on channel 6.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109, 47 CFR Part 15.209 and 47 CFR Part 15.205 (restricted bands of operation) with the EUT operating in transmit mode on channel 6 (2437 MHz), are depicted in table 7.

Frequency (MHz)	Test results quasi peak (dB $\mu$ V/m)		Test results average (dB $\mu$ V/m)		Test results peak (dB $\mu$ V/m)		Resolution bandwidth (kHz)	Quasi peak limits (dB $\mu$ V/m)	Average limits (dB $\mu$ V/m)	Peak limits (dB $\mu$ V/m)
	V	H	V	H	V	H				
61.4	34.2	37.2	-	-	-	-	120	40.0	-	-
144.0	28.5	32.5	-	-	-	-	120	43.5	-	-
233.2	37.2	42.0	-	-	-	-	120	46.0	-	-
399.9	43.2	42.5	-	-	-	-	120	46.0	-	-
1042.0	-	-	n.t.	n.t.	42.8	32.2	1000	-	54.0	74.0
4874	-	-	n.t.	n.t.	47.0	44.6	1000	-	54.0	74.0

Table 7 - Test results with the EUT operating in transmit mode on channel 6 (2437 MHz).

Note: Radiated emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 7.

Note: Above 1 GHz, most 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, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

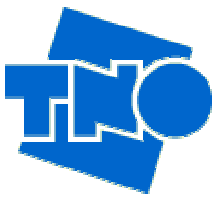
Note: Field strength values of radiated emissions at frequencies not listed in table 7 are more than 20 dB below the applicable limit.

### Test engineer

Signature :

Name : Onno H. Hoekstra

Date : August 22, 2003



Test specification(s): 47 CFR Part 15 (2003-03-13)  
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Brand mark: Samsung  
Type: SWL-2300U  
FCC ID: E2XSWL2300U

## 2.6 Test results with EUT operating in transmit mode on channel 11.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109, 47 CFR Part 15.209 and 47 CFR Part 15.205 (restricted bands of operation) with the EUT operating in transmit mode on channel 11 (2462 MHz), are depicted in table 8.

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				
61.4	34.2	37.2	-	-	-	-	120	40.0	-	-
144.0	28.5	32.5	-	-	-	-	120	43.5	-	-
233.2	37.2	42.0	-	-	-	-	120	46.0	-	-
399.9	43.2	42.5	-	-	-	-	120	46.0	-	-
1042.0	-	-	n.t.	n.t.	43.1	33.1	1000	-	54.0	74.0
4924.0	-	-	n.t.	n.t.	48.7	48.5	1000	-	54.0	74.0

Table 8 - Test results with the EUT operating in transmit mode on channel 11 (2462 MHz).

Note: Radiated emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 8.

Note: Above 1 GHz, most 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, most 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.

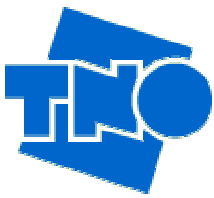
### Test engineer

Signature :

Name : Onno H. Hoekstra

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Test specification(s): 47 CFR Part 15 (2003-03-13)  
Description of EUT: 2.4 GHz low power WLAN USB Device  
Manufacturer: Samsung  
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Type: SWL-2300U  
FCC ID: E2XSWL2300U

### 3 List of utilized test equipment.

Inventory number	Description	Brand	Type
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