CETECOM ICT Services GmbH

Radio Satellite Communication
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Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3463 (IC)
TCB ID: DE 0001

Accredited by the
German Accreditation Council
DAR–Registration Number
TTI–P–G 081/94-D0

Independent ETSI
compliance test house

Accredited Bluetooth™ Test Facility (BQTF)

Test report no.: 4_1231-01-05/04
FCC Part 24/22/15
SMASH-D
(contains the GSM-Module with the
FCC ID: PY76220511
IC: 4170B-6220511)

CETECOM – ICT Services GmbH
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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

1.2 Testing laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6 - 10
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Germany
Telephone : + 49 681 598 - 9100
Telefax : + 49 681 598 - 9075
E-mail : info@ict.cetecom.de
Internet : www.cetecom-ict.de

Accredited testing laboratory
The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025.
DAR registration number: TTI-P-G-081/94-D0
Listed by : Federal Communications Commission (FCC)
Identification/Registration No : 90462
Accredited Bluetooth™ Test Facility (BQTF)
BLUETOOTH™ is a trademark owned by Bluetooth SIG, Inc. and licensed to CETECOM

1.3 Details of applicant

Name : S.A. Banksys N.V.
Street : Chaussée de Haecht, 1442 Haachtsesteenweg
City : B-1130 Bruxelles
Country : Belgium
Telephone : +32(0)2 727 61 81
Telefax : +32(0)2 726 89 26
Contact : Mr. Werner Meskens
Telephone : +32(0)2 727 61 81
e-mail : Werner.meskens@banksys.be

1.4 Application details

Date of test : 2004-04-21 to 2004-04-22

1.5 Test item

Type of equipment	:	**Dual-Band GSM credit card terminal**
Type designation	:	**SMASH-D**
Manufacturer	:	**S.A. Banksys N.V.**
Street	:	**Chaussée de Haecht, 1442 Haachtsesteenweg**
City	:	**B-1130 Bruxelles**
Country	:	**Belgium**
Serial numbers	:	ACV2617
IMEI	:	010257-00-000114-0

Additional information	**:**	
Frequency	:	824.2 – 849.8 MHz and 1850.2 – 1909.8 MHz
Type of modulation	:	300KGXW / 300KG7W
Number of channels	:	300 (PCS1900) and 125 (PCS850)
Antenna	:	Integral antenna
Power supply	:	6V NiMH Battery
Output power GSM 850	:	ERP: 26.70 dBm (Burst); EIRP: 28.85 dBm (Burst)
Output power GSM 1900	:	ERP: 28.90 dBm (Burst); EIRP: 31.05 dBm (Burst)
Temperature	:	+23°C
FCC – ID	:	**PY76220511**
IC	:	**4170B-6220511**
Hardware	:	Pre-series
Software	:	C-ZAM/Smash test software

1.6 Test standards: **FCC Part 24, 22**
FCC Part 15

2 Technical test

For Part 24/22 we use the substitution method (TIA/EIA 603).

All measurements in this report are done in GSM mode. Device is able to transmit data in GPRS mode also. But because the current measurements are performed in PEAK mode no other results from GPRS mode are possible. (GPRS mode 8).

Remarks:

Test setup:
The radiated measurements were performed with Charger AC Adapter SDA3006 (100-240V)

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

FINAL VERDICT: PASS

Technical responsibility for area of testing :

2004-04-22	**RSC 8431**	**Gillmann D.**	
Date	**Section**	**Name**	**Signature**

Technical responsibility for area of testing :

2004-04-22	**RSC 8412**	**Hausknecht D.**	
Date	**Section**	**Name**	**Signature**

2.2 Test report

TEST REPORT

Test report no. : 4-1231-01-05/04

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

PART PCS 1900

POWER OUTPUT SUBCLAUSE § 24.232

EIRP Measurements
Description: This is the test for the maximum radiated power from the phone.
Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts e.i.r.p. peak power…" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) The measurements was performed with full rf output power and modulation.
(b) Test was performed at listed 3m test site (listed with FCC, IC).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(f) Set the EMI Receiver and #2 as follows:

Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency	: equal to the signal source
Resolution BW	: 10 kHz
Video BW	: same
Detector Mode	: positive
Average	: off
Span	: 3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
.DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
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(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Limits:

Power Step	Burst PEAK EIRP (dBm)
0	<33

Power Measurements (Radiated)

Frequency (MHz)	Power Step	BURST PEAK EIRP (dBm)		MODULATION AVERAGE (dBm)	
		EIRP	ERP	EIRP	ERP
1880.0	0	31.05	28.90		
Measurement uncertainty		±3 dB			

Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERIP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1880.0	19.2	24.3	8.4	0.0	3.3	31.05			

EIRP = SG (dBm) - Cable Loss (dB) + Ant. gain (dBi)

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
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EMISSIONS LIMITS §24.238

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:
a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load.
c) A double ridged wave-guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.
e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

Measurement Limit:
Sec. 24.238 Emission Limits.
(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
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Measurement Results:
Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1879.8 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:
The final open field radiated levels are presented on the next pages.
All measurements were done in horizontal and vertical polarization, the plots show the worst case.
As can be seen from this data, the emissions from the test item were within the specification limit.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:

EMISSION LIMITATIONS					
f (MHz)		**amplitude of emission (dBm)**	**limit max. allowed emission power (dBm)**	**actual attenuation below frequency of operation (dBc)**	**results**
CH 661					
1880.0	-	31.05	-13.0 (44.05 dBc)	-	carrier
-	-	-		-	
No traceable peak found				-	-
Measurement uncertainty			± 0.5dB		

Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERIP Result			
MHz	**dBµV**	**dBm**	**dBi**	**dBd**	**dB**	**dBm**			
1880.0	**19.2**	**24.3**	**8.4**	**0.0**	**3.3**	**31.05**			

EIRP = SG (dBm) - Cable Loss (dB) + Ant. gain (dBi)

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
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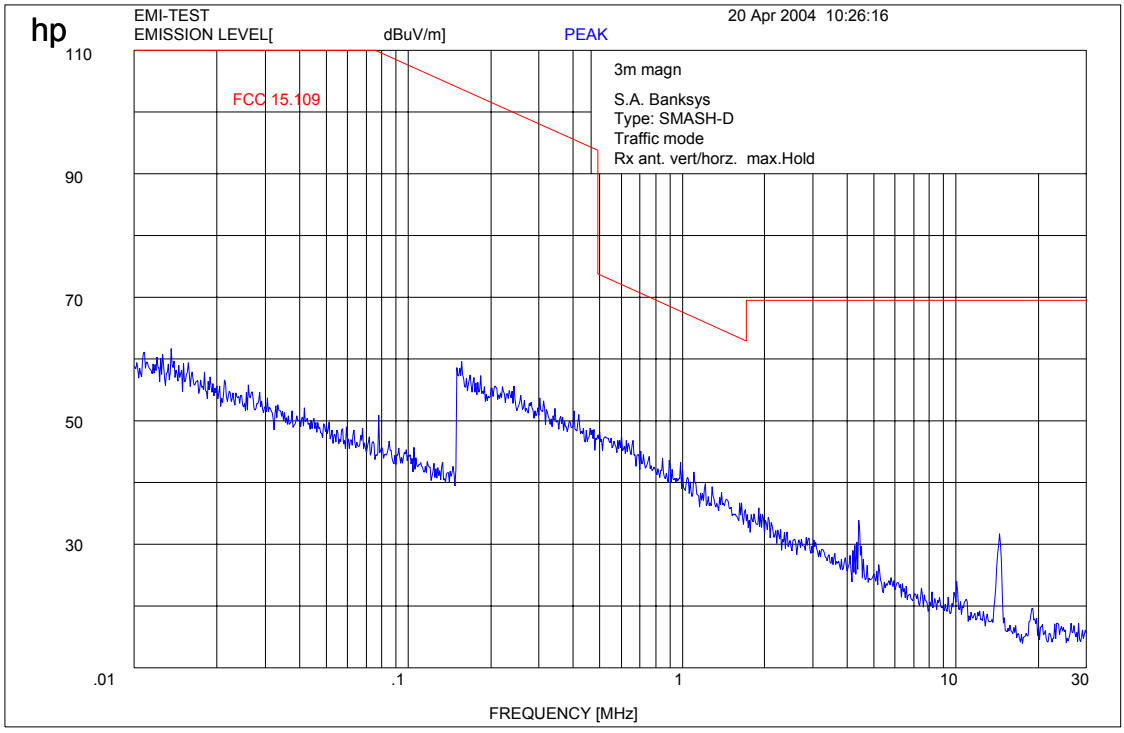
Part 15.209 Magnetics

Traffic Mode - (9 kHz up to 30 MHz)



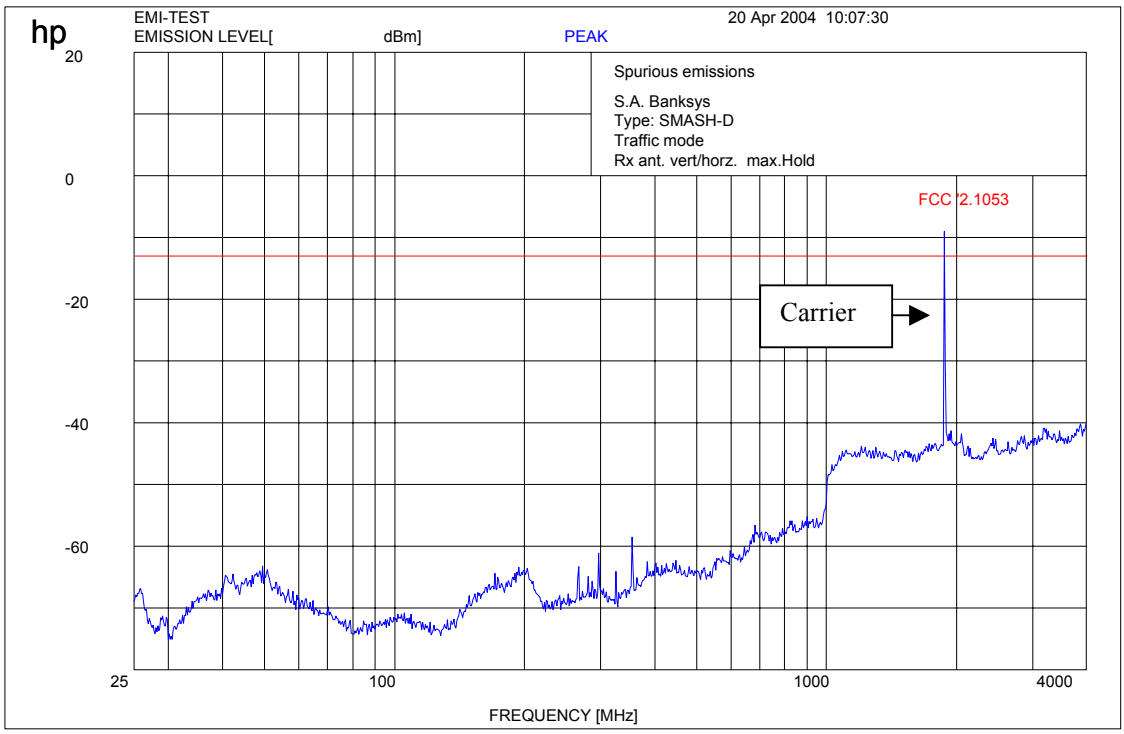
For peak measurement we use 100 kHz RBW/VBW
For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz
9 kHz from 150 kHz to 30 MHz

Limits **SUBCLAUSE § 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Channel 661 (up to 4 GHz)

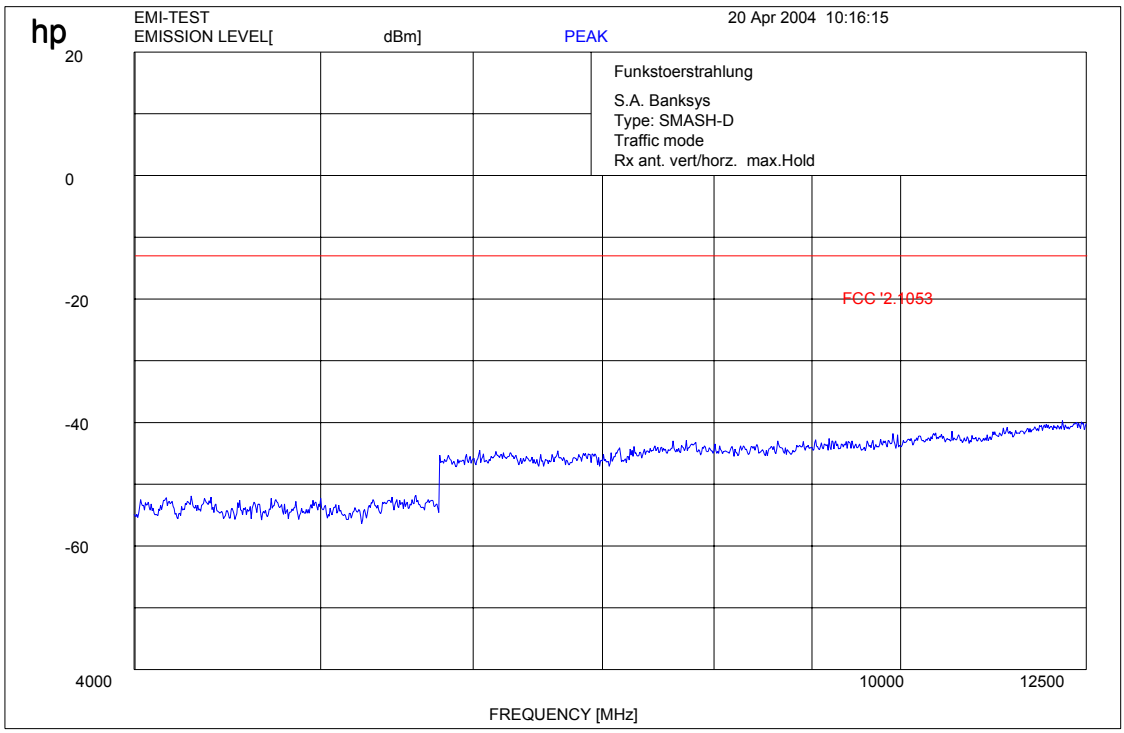


f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW / VBW 1 MHz**

Carrier suppressed with a rejection filter.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

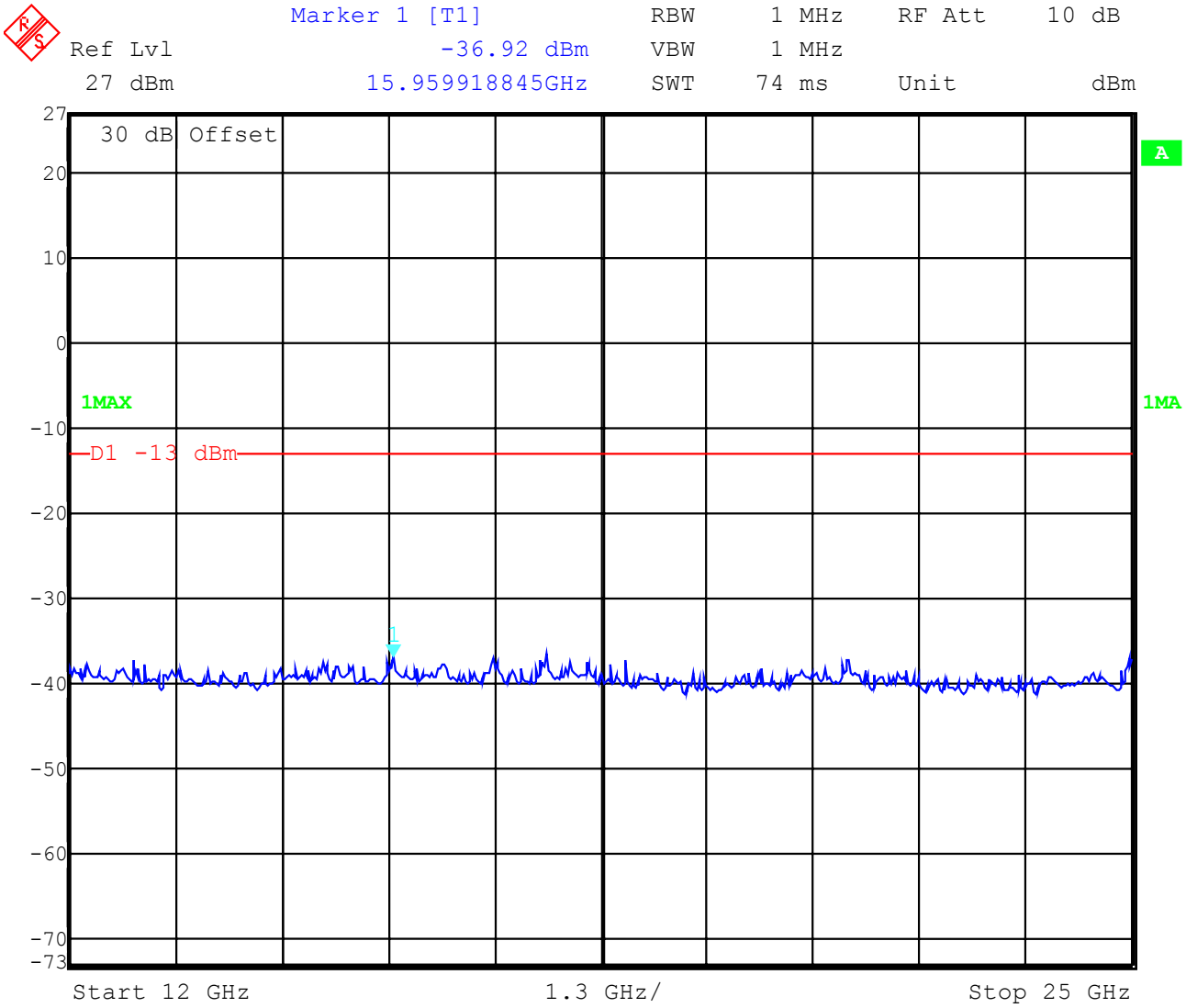
Channel 661 (up to 12 GHz)



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW / VBW 1 MHz**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Channel 661 (up to 25 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

RECEIVER SPURIOUS RADIATION **§ 15.109**
Radiated

SPURIOUS EMISSIONS LEVEL (µV/m)								
CH 661								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
			-	-	-	-	-	-
296.97	Peak	35.5	-	-	-	-	-	-
355.85	Peak	38.6	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**
H = Horizontal ; V= Vertical

Measurement distance see table

Limits **SUBCLAUSE § 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
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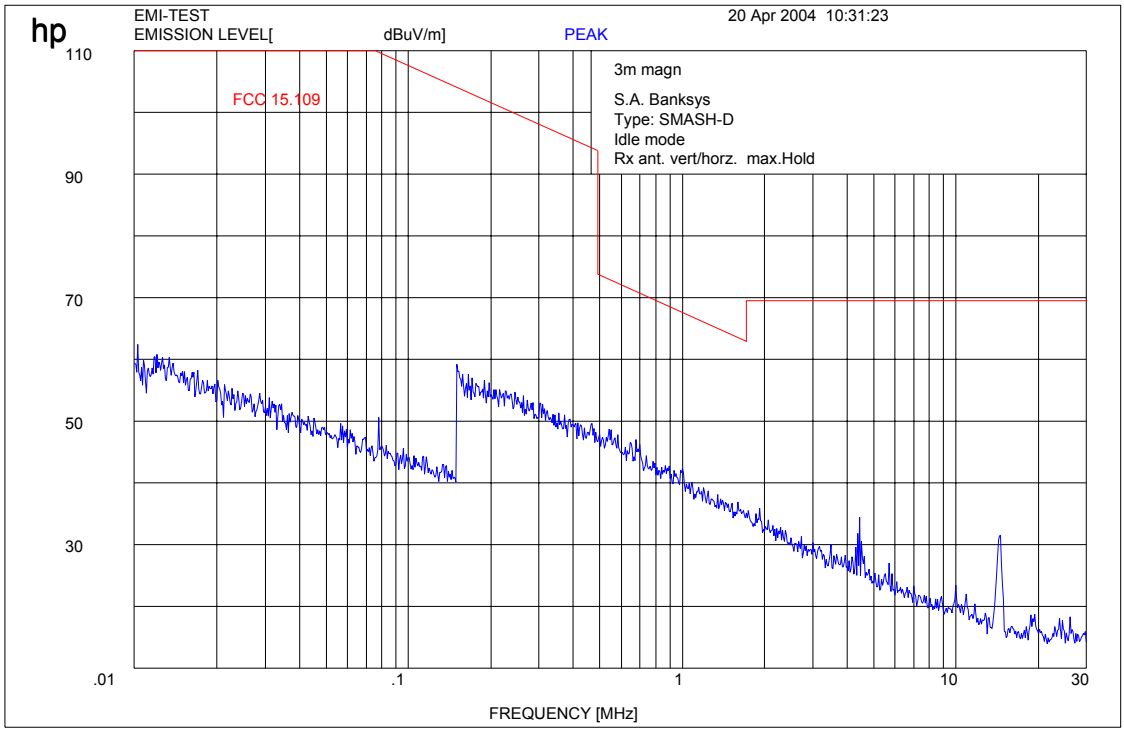
Part 15.209 Magnetics

Idle Mode (9 kHz up to 30 MHz)



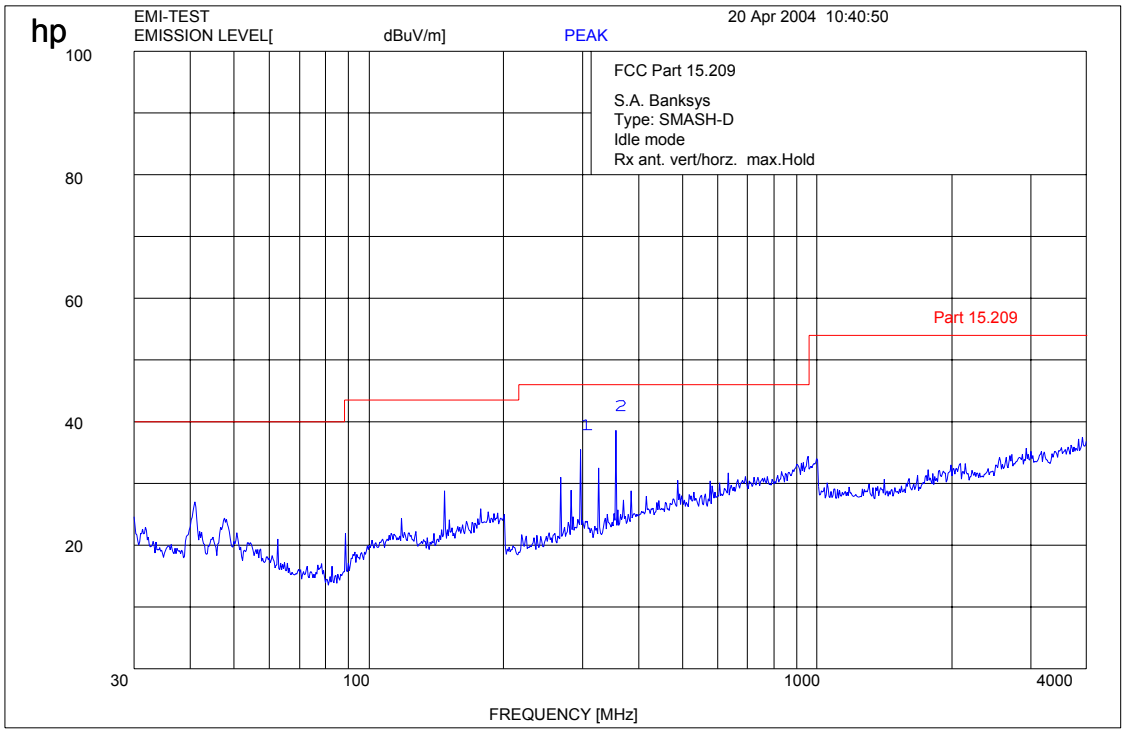
For peak measurement we use 100 kHz RBW/VBW
For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz
9 kHz from 150 kHz to 30 MHz

Limits **SUBCLAUSE § 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

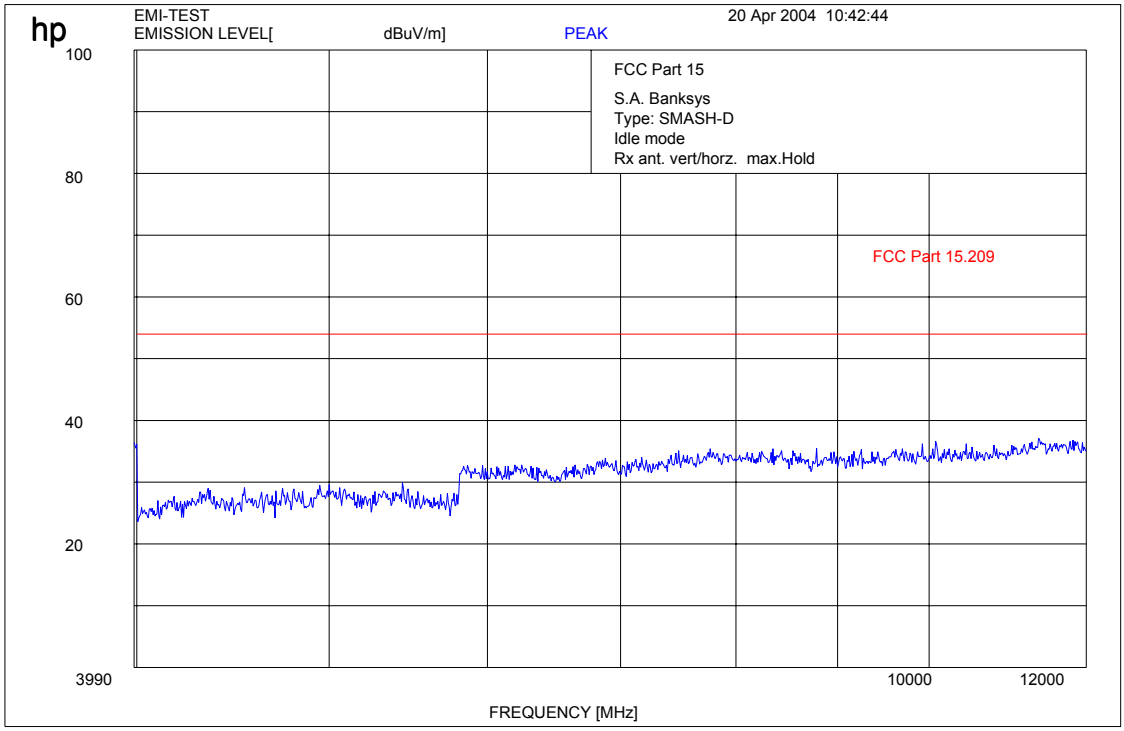
Idle-Mode (up to 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW 1 MHz**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Idle-Mode (up to 12 GHz)



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW 1 MHz**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
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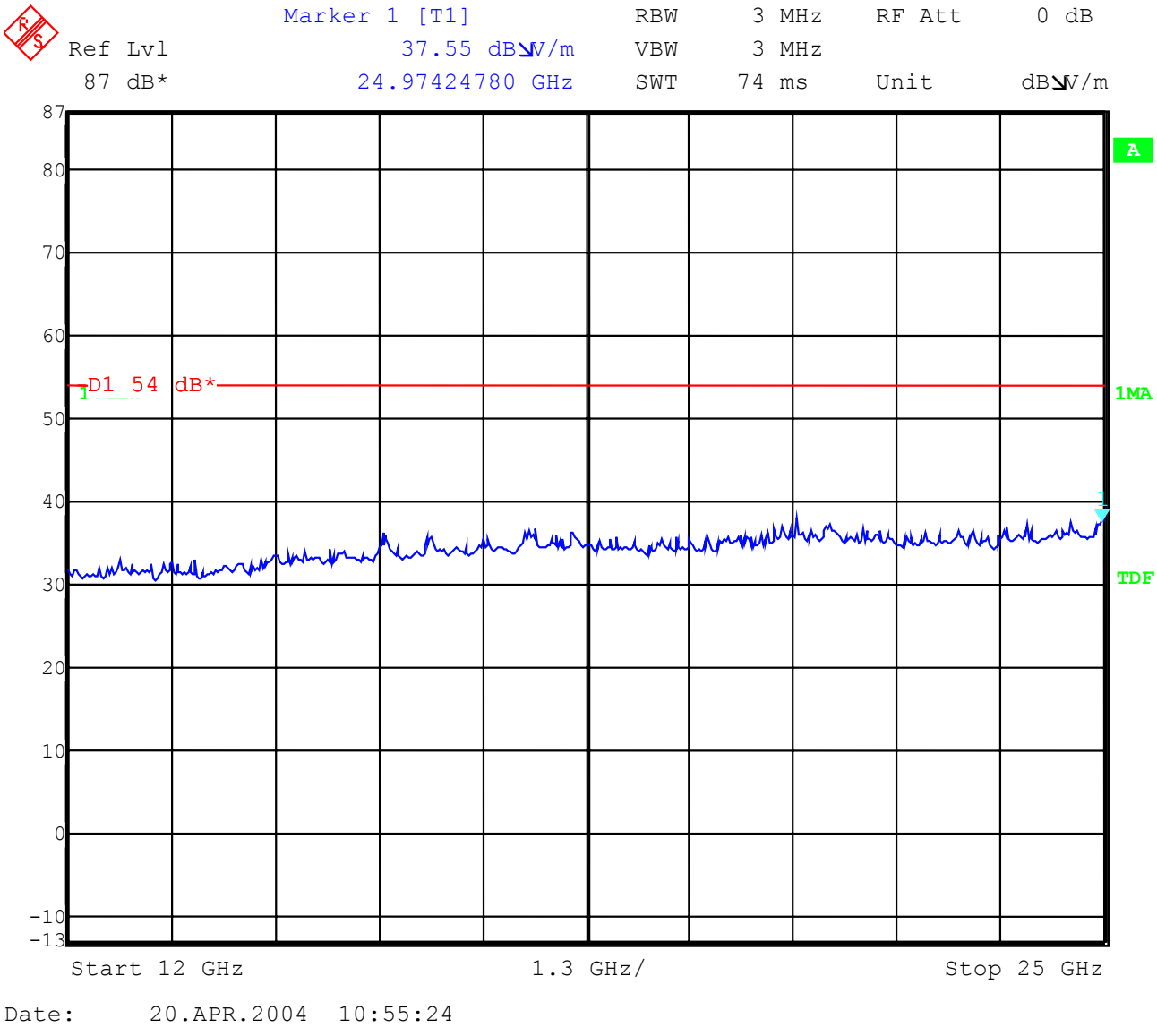
Idle-Mode (up to 25 GHz)

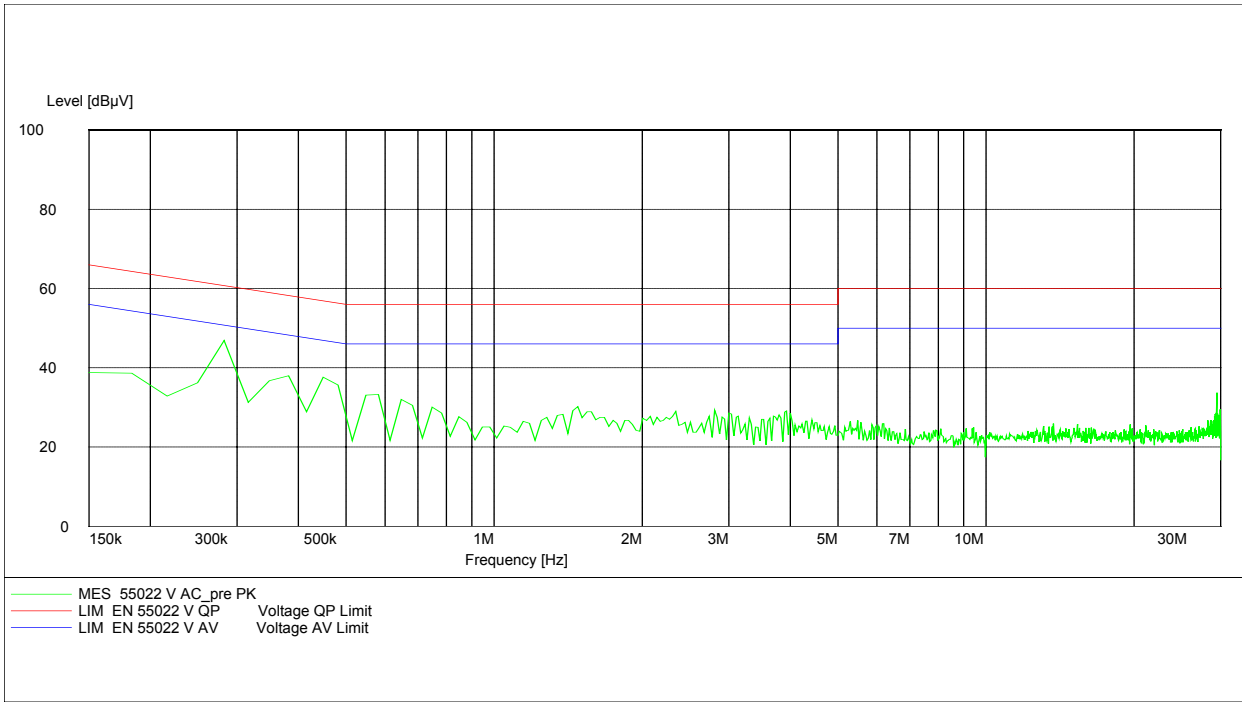


For this measurement we used a special wideband horn antenna and a low noise preamp.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

EUT: SMASH-D
Manufacturer: S.A. Banksys N.V.
Operating Condition: Traffic mode
Test Site: Room 006 (Shielded chamber)
Operator: Gillmann
Start of Test: 20.04.04 / 13:36:44

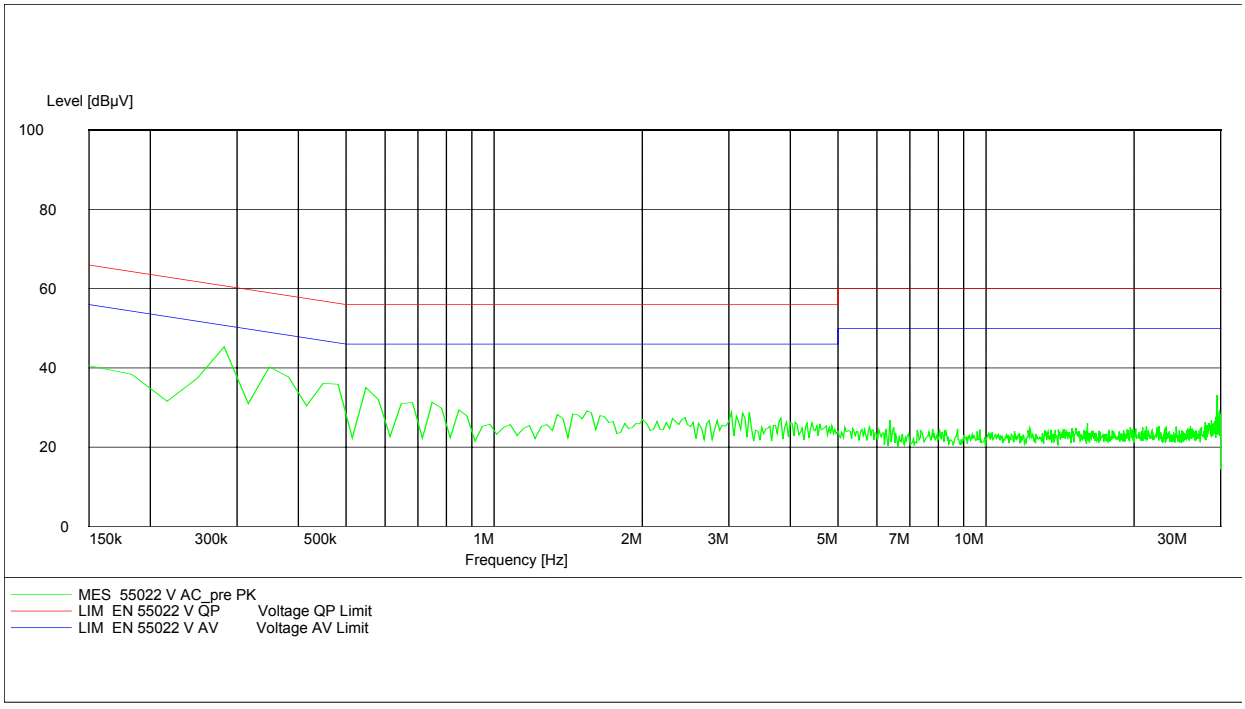
SCAN TABLE: "EN 55022 V"



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

EUT:	SMASH-D
Manufacturer:	S.A. Banksys N.V.
Operating Condition:	Idle mode
Test Site:	Room 006 (Shielded chamber)
Operator:	Gillmann
Start of Test:	20.04.04 / 13:34:14

SCAN TABLE: "EN 55022 V"



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

PART PCS 850

POWER OUTPUT SUBCLAUSE § 22.913

ERP Measurements
Description: This is the test for the maximum radiated power from the phone.
Rule Part 22.913 specifies that "Mobile/portable stations are limited to 7 watts ERP.

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) The measurements was performed with full rf output power and modulation.
(b) Test was performed at listed 3m test site (listed with FCC, IC).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(f) Set the EMI Receiver and #2 as follows:

Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency	: equal to the signal source
Resolution BW	: 10 kHz
Video BW	: same
Detector Mode	: positive
Average	: off
Span	: 3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
.DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Limits:

Power Step	Burst Peak (dBm)
0	<33

Power Measurements (Radiated)

Frequency (MHz)	Power Step	BURST Peak (dBm)		MODULATION AVERAGE (dBm)	
		EIRP	ERP	EIRP	ERP
836.4	5	28.85	26.7		
Measurement uncertainty		±3 dB			

Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERIP Result	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBd	dB	dBm	dBm	
836.4	124.3	38.6		-10.50	1.67		26.7	UHAP Schwarzbeck S/N 460

ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)
***ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

EMISSIONS LIMITS §22.917

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognized by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 848.8 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:
a) The test item was placed on a 0. 8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load.
c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:
e)Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603 .

Measurement Limit:
Sec. 22.917 Emission Limits.
(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Measurement Results:
Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (824.2 MHz, 836.2 MHz and 848.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-22:
The final open field radiated levels are presented on the next pages.
All measurements were done in horizontal and vertical polarization, the plots shows the worst case.
As can be seen from this data, the emissions from the test item were within the specification limit.

EMISSION LIMITATIONS					
f (MHz)		**amplitude of emission ERP (dBm)**	**limit max. allowed emission power (dBm)**	**actual attenuation below frequency of operation (dBc)**	**results**
CH 189					
836.4		**26.7**	**-13.0 (39.7 dBc)**	**-**	**carrier**
-	**-**	**-**		**-**	**-**
Measurement uncertainty		**± 0.5dB**			

Sample calculation:

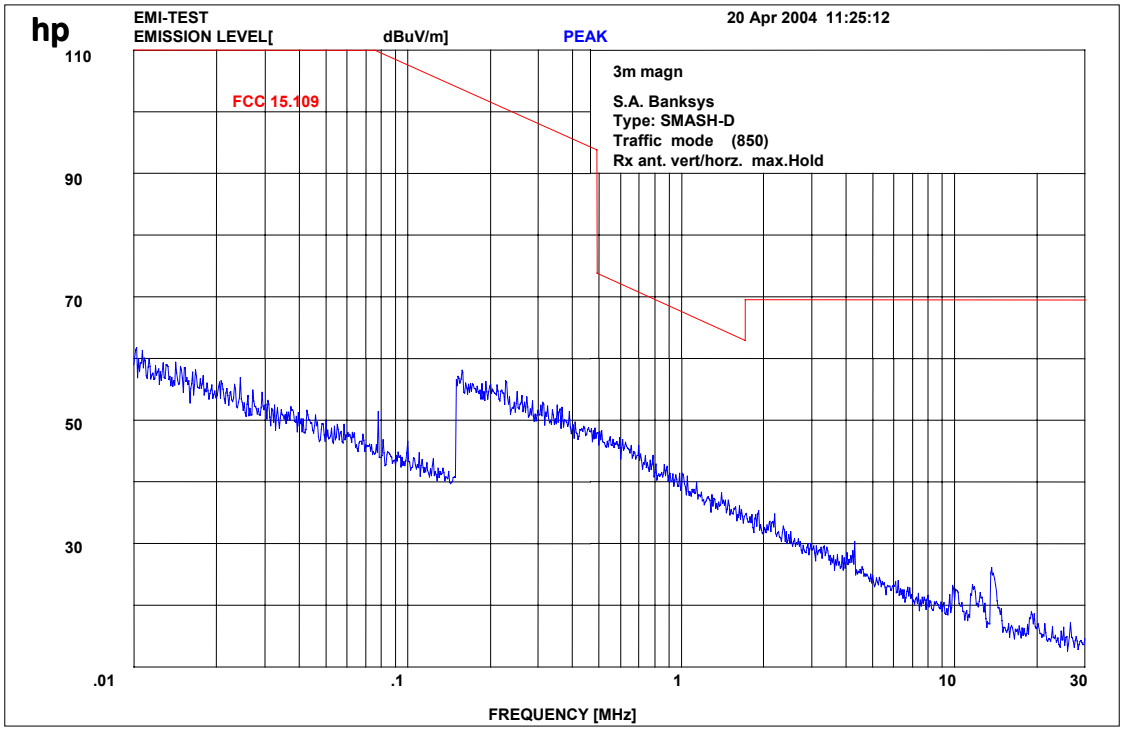
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERIP Result	ERP	Substitution Antenna
MHz	**dBµV**	**dBm**	**dBi**	**dBd**	**dB**	**dBm**	**dBm**	
836.4	**122.0**	**38.6**		**-10.50**	**1.67**		**26.4**	**UHAP chwarzbeck S/N 460**

ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)
***ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Part 15.209 Magnetics

Traffic Mode - (9 kHz up to 30 MHz)



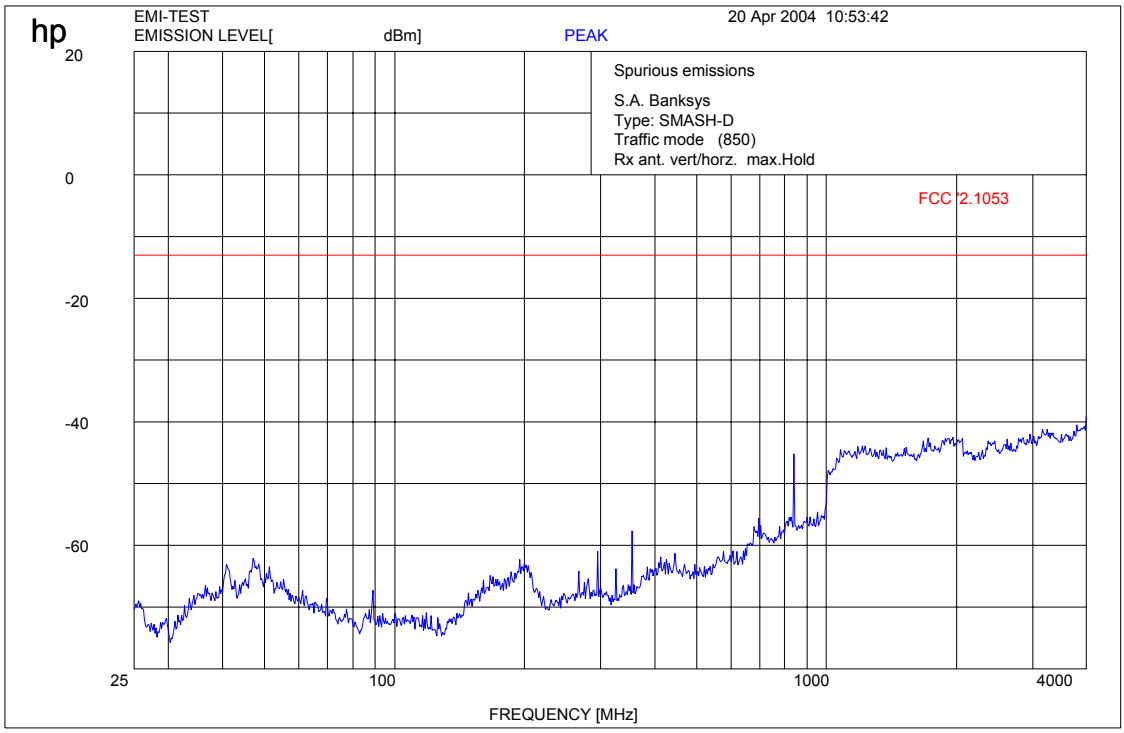
For peak measurement we use 100 kHz RBW/VBW
For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz
9 kHz from 150 kHz to 30 MHz

Limits **SUBCLAUSE § 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Channel 189 (up to 4 GHz)

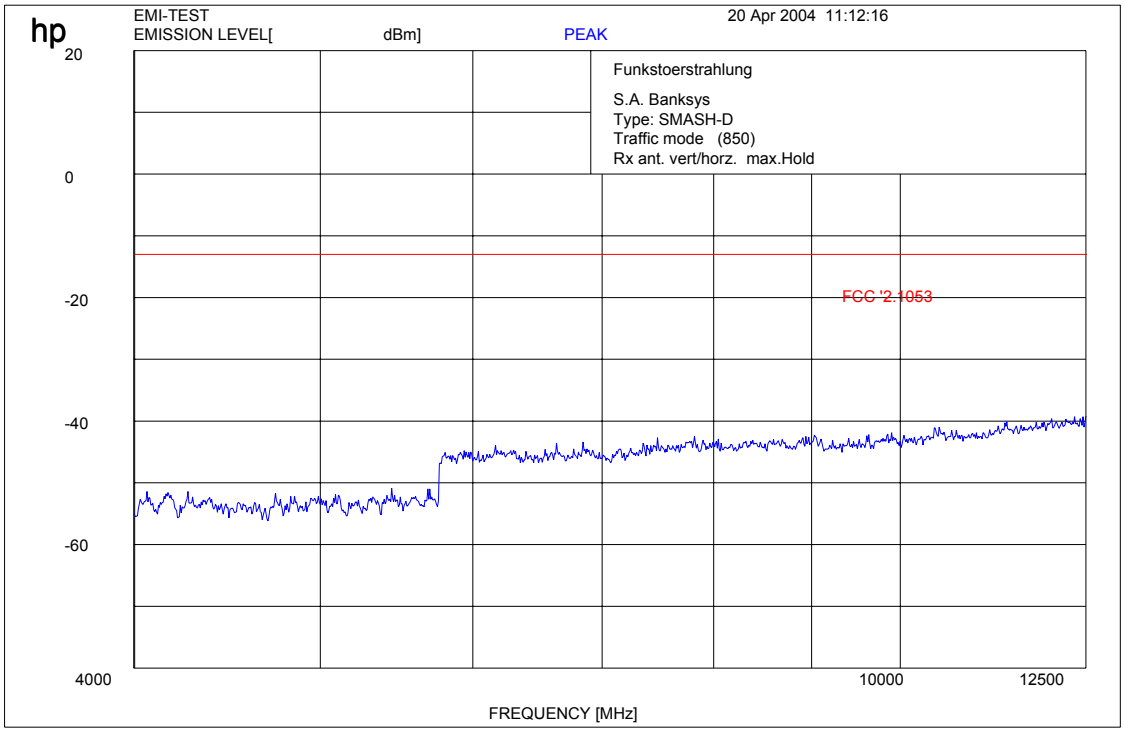


f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW 1 MHz**

Carrier suppressed with a rejection filter

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

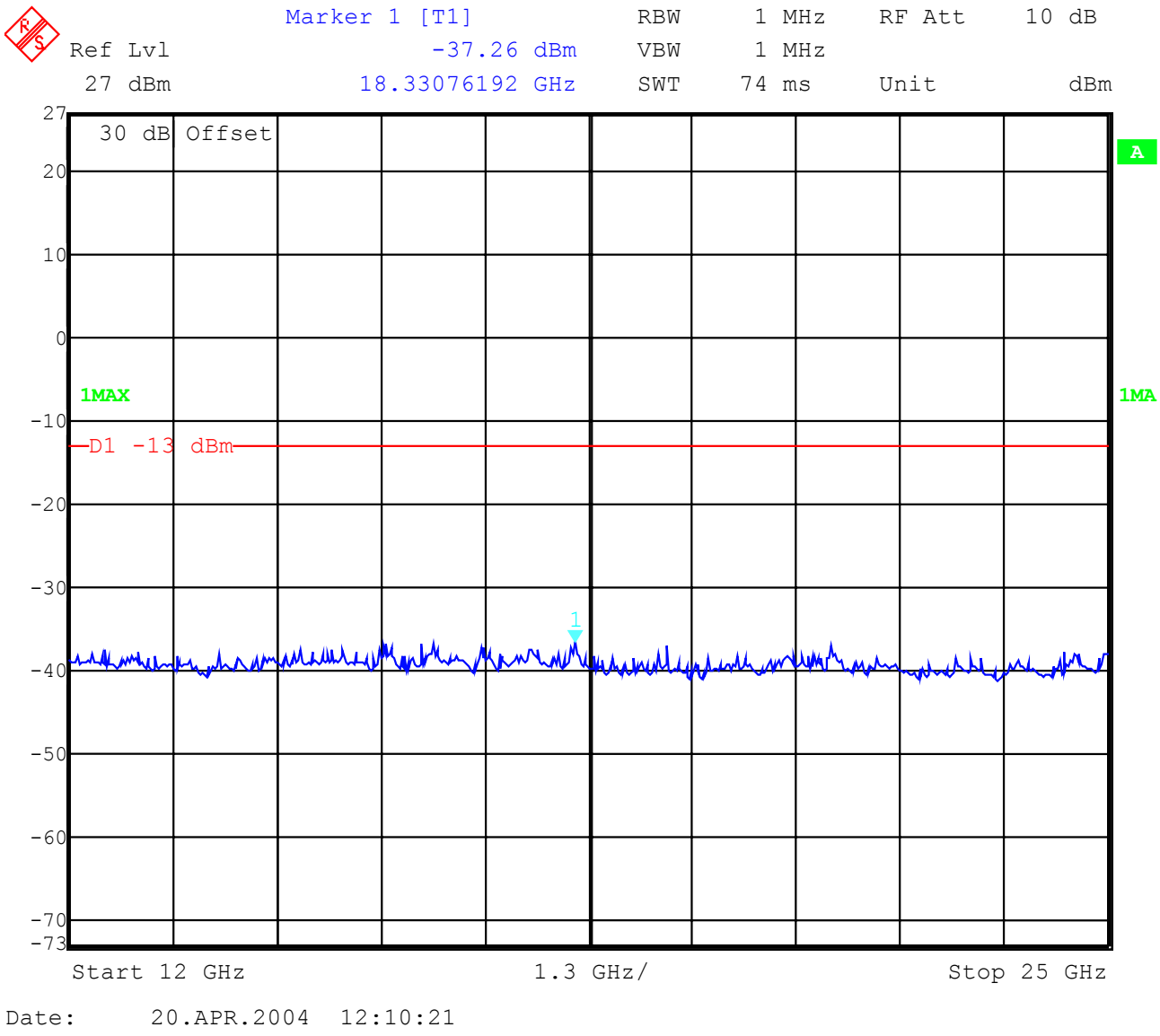
Channel 189 (up to 12 GHz)



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW 1 MHz**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Channel 189 (up to 25 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

RECEIVER SPURIOUS RADIATION **§ 15.109**
Radiated

SPURIOUS EMISSIONS LEVEL (µV/m)								
CH 128,189,251								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
265.5	Peak	35.4	-	-	-	-	-	-
299.6	Peak	35.9	-	-	-	-	-	-
355.8	Peak	38.0	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**
H = Horizontal ; V= Vertical

Measurement distance see table

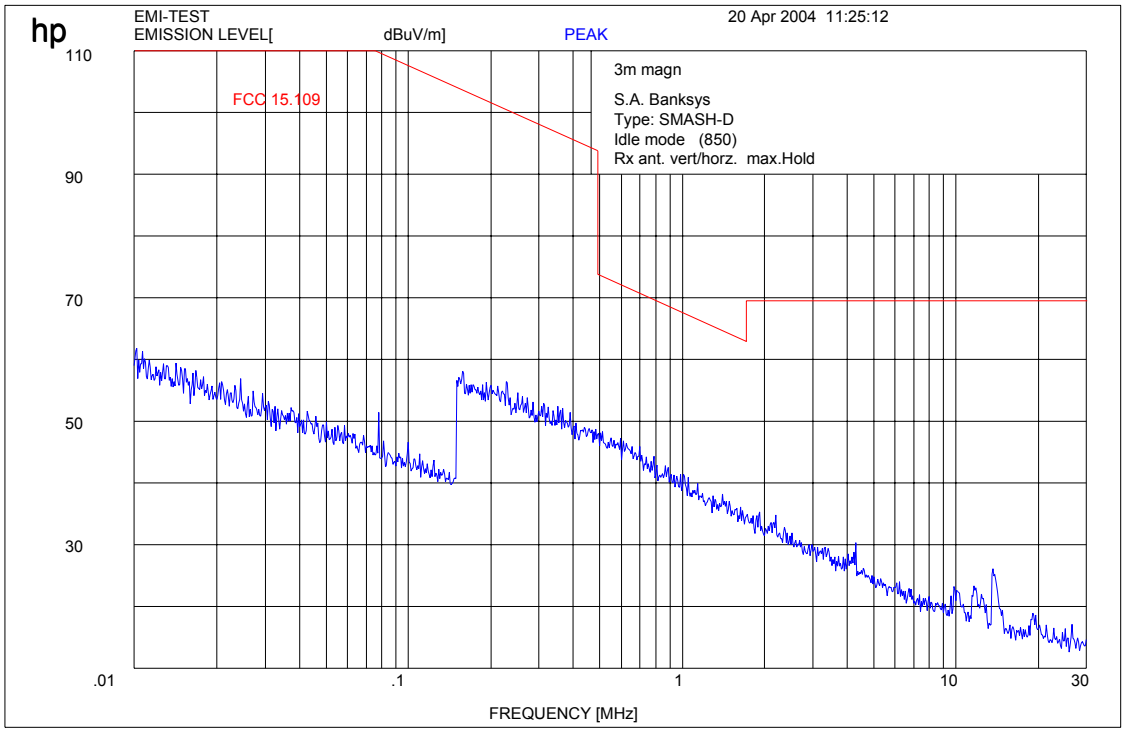
Limits **SUBCLAUSE § 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

Part 15.209 Magnetics

Idle Mode (9 kHz up to 30 MHz)



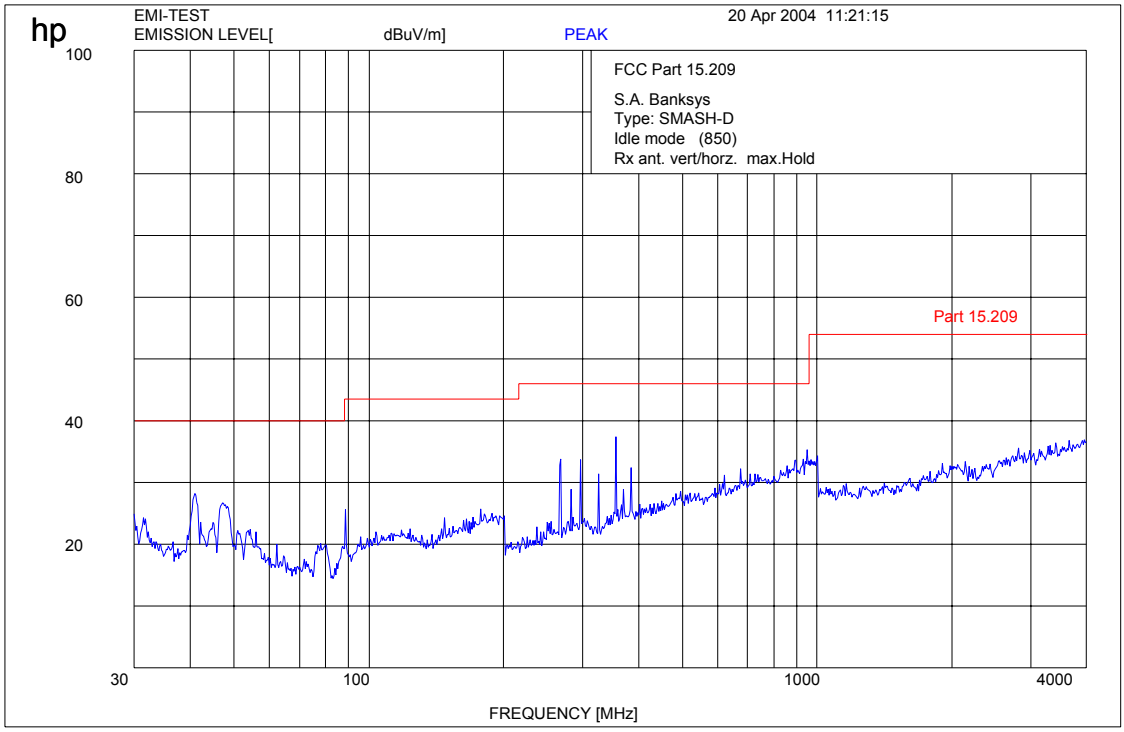
For peak measurement we use 100 kHz RBW/VBW
For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz
9 kHz from 150 kHz to 30 MHz

Limits **SUBCLAUSE § 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

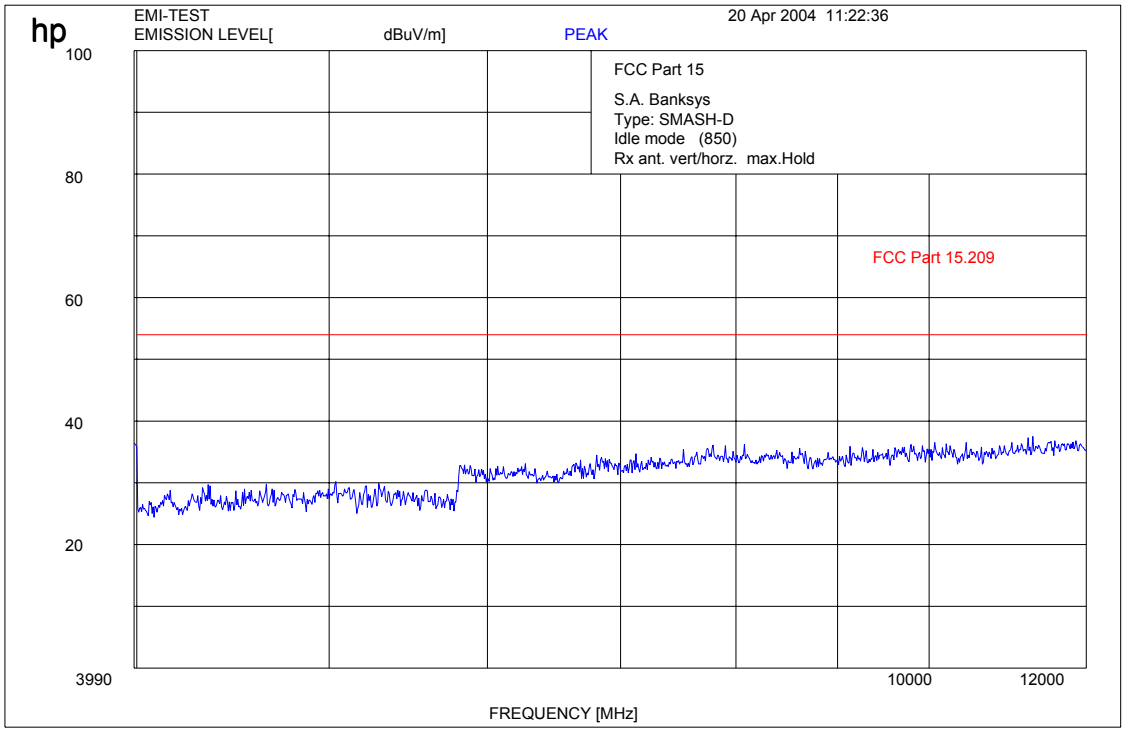
Idle-Mode (this is valid for all channels and up to 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW 1 MHz**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

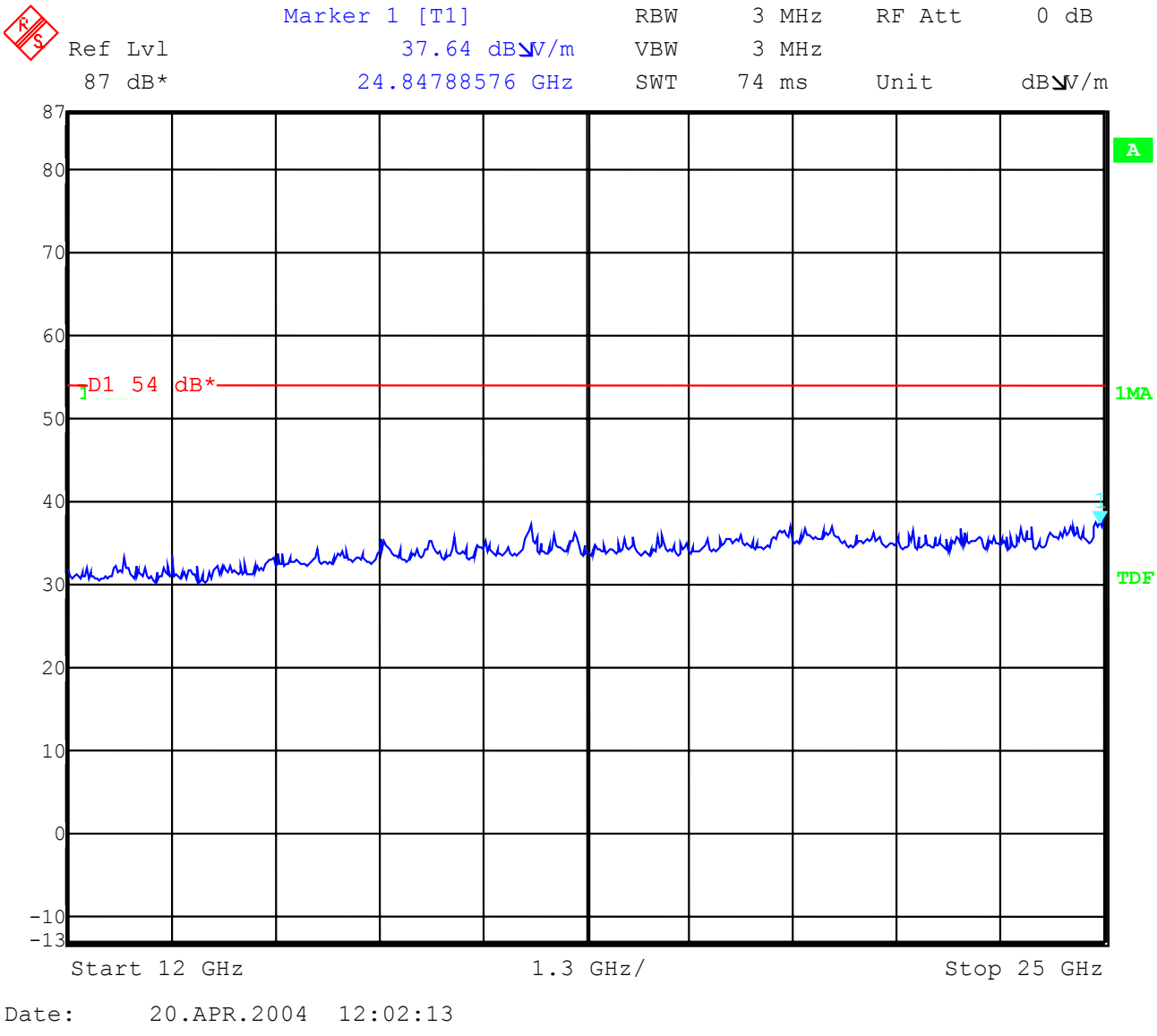
Idle-Mode (this is valid for all channels and up to 12 GHz)



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW 1 MHz**

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

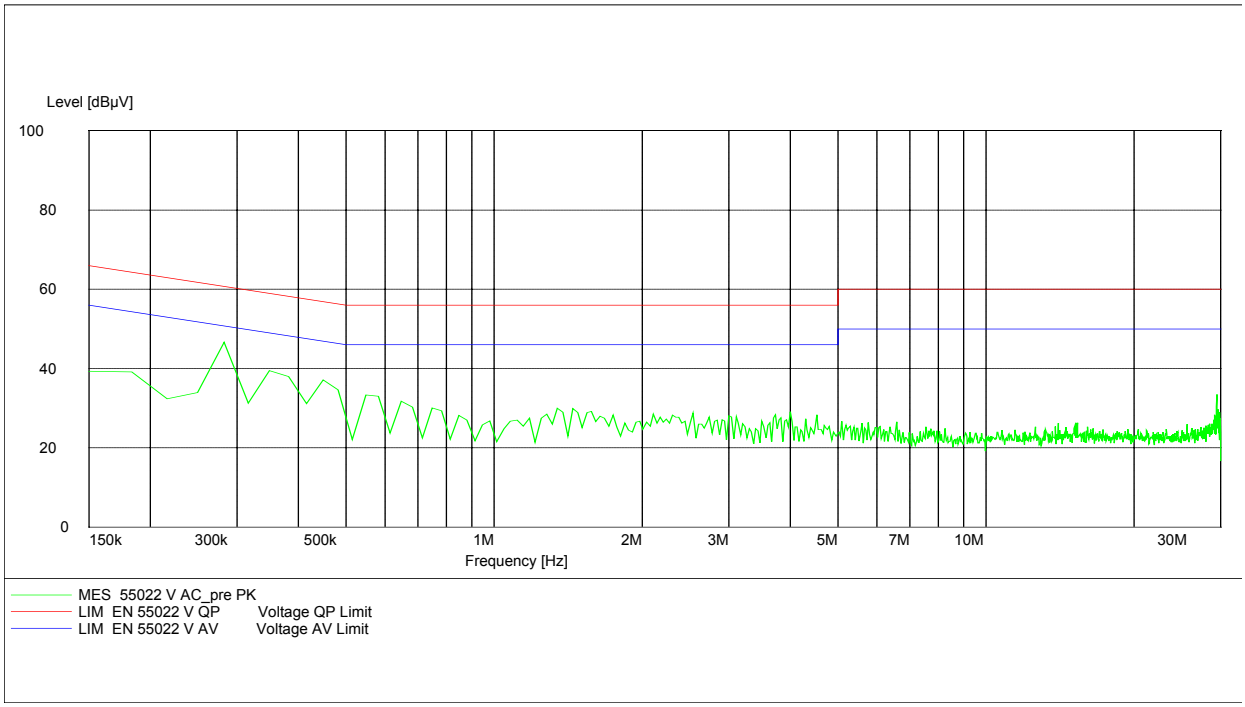
Idle-Mode (this is valid for all 3 channels and up to 25 GHz)



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

EUT: SMASH-D
Manufacturer: S.A. Banksys N.V.
Operating Condition: Traffic mode
Test Site: Room 006 (Shielded chamber)
Operator: Gillmann
Start of Test: 20.04.04 / 13:52:20

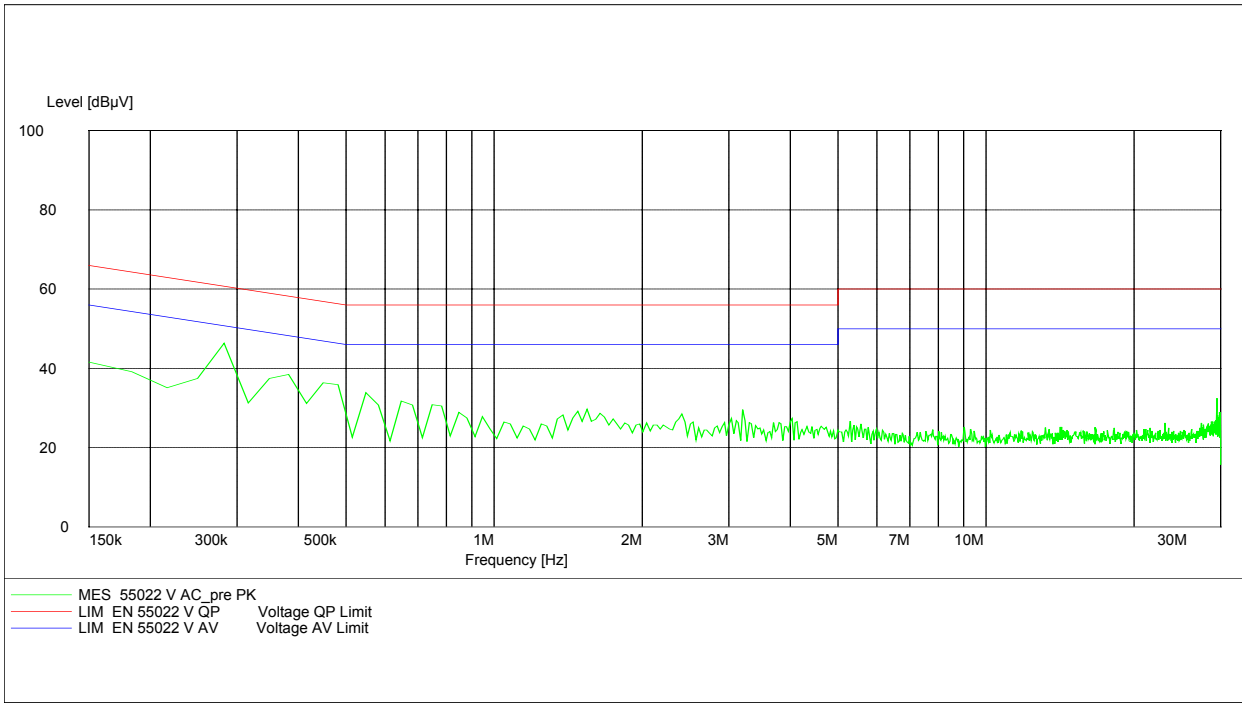
SCAN TABLE: "EN 55022 V"



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

EUT: SMASH-D
Manufacturer: S.A. Banksys N.V.
Operating Condition: Idle mode
Test Site: Room 006 (Shielded chamber)
Operator: Gillmann
Start of Test: 20.04.04 / 13:53:10

SCAN TABLE: "EN 55022 V"



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 – 24, 64

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Communication Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Function Generator	AFGU	Rohde & Schwarz	862 480/032
09	Regulating Transformer	MPL	Erfi	91350
10	LISN	NNLA 8120	Schwarzbeck	8120331
11	Relay-Matrix	PSU	Rohde & Schwarz	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulation Meter	9008	Racal-Dana	2647
16	Frequency Counter	5340 A	Hewlett-Packard	1532A03899
17	Anechoic Chamber	---	MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768
22	Biconical Antenna	3104	Emco	3758
23	Log. Per. Antenna	3146	Emco	2130
24	Double Ridged Horn	3115	Emco	3088
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008
27	Biconical Antenna	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenna	HL 223	Rohde & Schwarz	825 584/002
29	Relay-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Anechoic Chamber		Frankonia	
33	Control Computer	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Receiver	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Control Computer	HD 100	Deisel	100/322/93
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spectrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Measuring Receiver	ESH 3	Rohde & Schwarz	890 174/002
43	Measuring Receiver	ESVP	Rohde & Schwarz	891 752/005
44	Bicon Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisation Network	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridged Horn Antenna 1-26.5 GHz	3115	EMCO	9107-3696
50	Microw. Sys. Amplifier 0.5- 26.5 GHz	8317A	Hewlett Packard	3123A00105
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04
52	Controler	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Network	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Network	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phase V-Network	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Power Supply	6032A	Rohde & Schwarz	2933A05441
59	RF-Test Receiver	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	RF-Test Receiver	ESH3	Rohde & Schwarz	881 515/002
62	Relay Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relay Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773
66				
67				
68				