

## TEST REPORT



Your Ref:

Date: 19 Aug 2004

Our Ref: 56S040195/05A

Page: 1 of 18

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH  
FCC Parts 15B & C : 2003  
OF A  
DVD HOME ENTERTAINMENT SYSTEM  
[ MODEL : SS12MKII ]  
[ FCC IDs : R9RD227001 & R9RD227002 ]

<b>TEST FACILITY</b>	Telecoms & EMC, Testing Group, PSB Corporation Pte Ltd 1 Science Park Drive, Singapore 118221
<b>FCC REG. NO.</b>	90937 (3m & 10m OATS) 99142 (10m Anechoic Chamber) 871638 (5m Anechoic Chamber)
<b>IND. CANADA REG. NO.</b>	IC 4257 (10m Anechoic Chamber)
<b>PREPARED FOR</b>	Nakamichi Research (S) Pte Ltd 146 Robinson Road #01-01 Overseas Union Trust Building Singapore 068909
	Tel : 6221 0010      Fax : 6221 0012

**JOB NUMBER**      56S040195

**TEST PERIOD**      15 Mar 2004 – 19 Aug 2004

**PREPARED BY**

**APPROVED BY**

A stylized, handwritten signature in black ink, appearing to read "Lim Cher Hwee".

A stylized, handwritten signature in black ink, appearing to read "Deng Jun Hong".

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Lim Cher Hwee  
Engineer

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Deng Jun Hong  
Assistance Vice President

TEST SUMMARY

PRODUCT DESCRIPTION

SUPPORTING  
EQUIPMENT LIST

EUT OPERATING  
CONDITION

TEST RESULTS

ANNEX A	- TEST INSTRUMENTATION & GENERAL PROCEDURES
ANNEX B	- EUT PHOTOGRAPHS / DIAGRAMS
ANNEX C	- USER MANUAL, TECHNICAL DESCRIPTION, BLOCK & CIRCUIT DIAGRAMS
ANNEX D	- FCC LABEL & POSITION

## TEST SUMMARY

The product was tested in accordance with the customer's specifications.

### Test Results Summary

Test Standard	Description	Pass / Fail
FCC Part 15B & C: 2003		
15.107, 15.207	Conducted Emissions	Pass
15.205	Radiated Emissions (Restricted Band Requirements)	Pass
15.109, 15.209	Radiated Emissions (Spurious Emissions)	Pass
15.249 (a)	Radiated Emissions (Fundamental Field Strength @ 3m)	Pass
	Radiated Emissions (Harmonics Field Strength @ 3m)	Pass
1.1310	Maximum Permissible Exposure	Pass

### Notes

- Three channels as listed below, which respectively represent the lower, middle and upper channels of the equipment under test (EUT) were chosen and tested. For each channel, the EUT was configured to operate in the test mode.  

<u>Transmit Channel</u>	<u>Frequency (GHz)</u>
Channel 0	2.402
Channel 39	2.441
Channel 78	2.480
- The EUT is a Class B device when in non-transmitting state and meets the FCC Part15B Class B requirements for broadcast receiver as stated under section 15.101.

### Modifications

The EUT was brought to compliance with the radiated emissions with following modifications:

- A ferrite core, FRC 16X28X9-M2 (P/N: 708D000001) was added respectively onto the power cable of the left and right of the rear speakers.

## PRODUCT DESCRIPTION

Description	: The Equipment Under Test (EUT) is a <b>DVD HOME ENTERTAINMENT SYSTEM</b> . The system consists of: <ul style="list-style-type: none"> <li>- <b>AV Unit</b></li> <li>- <b>Main Unit</b></li> <li>- <b>Left and right wireless speakers (satellite speakers)</b></li> <li>- <b>Center speaker</b></li> <li>- <b>Subwoofer Unit</b></li> <li>- <b>Main Remote Control</b></li> <li>- <b>Sub Remote Control</b></li> </ul>
Manufacturer	: Nakamichi Malaysia Sdn. Bhd. Lot 4A., Jalan Sultan Mohamed 3 Kaw Perindustrian Bandar Sultan Suleiman 42000 Port Klang, Selangor Daru Ehsan, Malaysia
Model Number	: SS12MKII
FCC IDs	: R9RD227001 (AV Unit) R9RD227002 (Wireless Speaker - Left & Right)
Serial Number	: 3SNB 3S016
Microprocessor	: Hitachi H8S/2238B NEC uPD78018F
Operating / Transmitting Frequency	: 2.402GHz to 2.480GHz 79 channels. Starting at 2.402MHz with subsequent channel at 1MHz interval from the preceding channel.
Clock / Oscillator Frequency	: 33.8688MHz (DVD Front end M5705) 27.0000MHz (DVD MPEG Decoder Ziva -5) 24.5760MHz (Surround DSP YSS932) 16.9344MHz (CD DSP CXD2587Q) 12.2880MHz (Main Controller H8S/2238B) 8.3800MHz ( CD Controller uPD78018F)
Modulation	: Gaussian Frequency Shift Keying (GFSK)
Pulse Train Cycle	: 1.25ms / 3.75ms / 6.25ms / Continuous signal (in testing)
Port / Connectors	: Refer to manufacturer's user manual
Rated Input Power	: 120V 60Hz 110W (AV Unit) 120V 60Hz 110W (Subwoofer) 120V 60Hz 110W (Rear Left & Right Speakers)

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**SUPPORTING EQUIPMENT DESCRIPTION**

The DVD Home Entertainment System was tested as a stand-alone system without having any supporting equipment used during the test.

## EUT OPERATING CONDITIONS

The DVD Home Entertainment System was powered from 110V, 60Hz mains supply.

Tests	Description Of Operation
<ol style="list-style-type: none"> <li>1. Conducted Emissions</li> <li>2. Radiated Emissions</li> <li>3. Maximum Permissible Exposure</li> </ol>	<p>The EUT was exercised by operating in the test mode with maximum transmitting power during the tests. The test mode allows the EUT to have a continuous RF transmission at low (2.402GHz), mid (2.441GHz) and high (2.480GHz) channels respectively.</p>

## TEST RESULTS

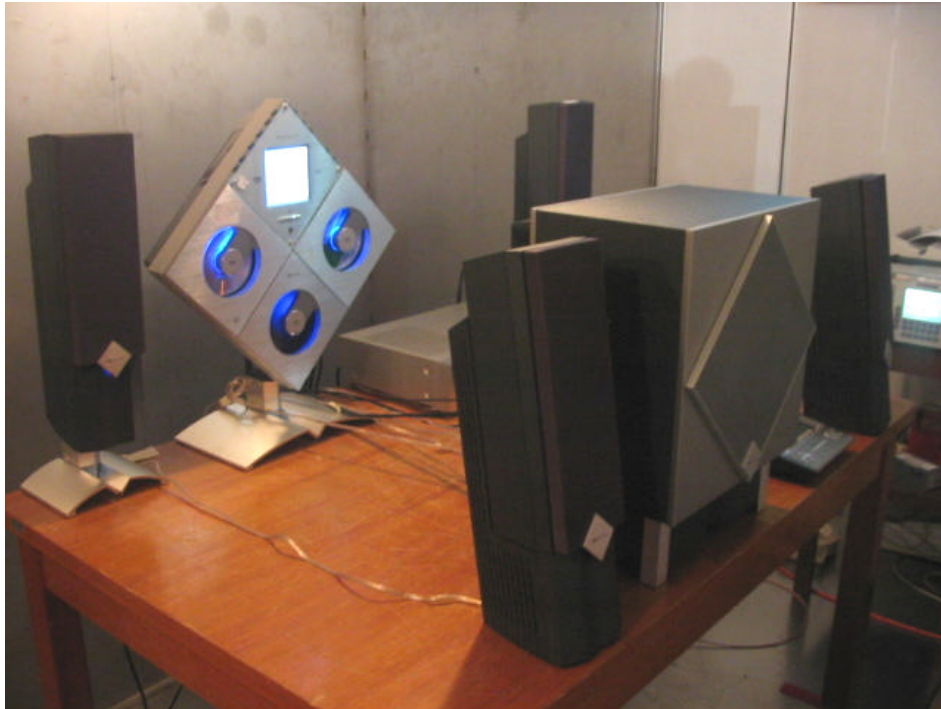
### FCC Part 15B (15.107 & 15.207) Class B Conducted Emission Results

Frequency (MHz)	Q-P Value (dB <sub>mV</sub> )	Q-P Margin (dB)	AV Value (dB <sub>mV</sub> )	AV Margin (dB)	Line	Channel	Mode
0.1512	26.3	-39.6	23.7	-32.2	Live / Right Speaker	0	DVD
0.1715	26.1	-39.6	23.4	-32.3	Live / Left Speaker	0	DVD
1.5710	41.5	-20.0	30.6	-20.9	Neutral / AV Unit	0	DVD
1.8327	35.1	-26.1	27.5	-23.7	Neutral / Subwoofer	0	DVD
3.3261	40.1	-20.0	29.8	-20.3	Neutral / AV Unit	0	DVD
3.9427	27.6	-32.2	26.1	-23.7	Neutral / Subwoofer	0	DVD

Tested by: LCH

#### Notes

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. For tuner mode, the test was conducted with the tuner port terminated with 50Ω terminator as the power level output at the tuner port was less than 2nW.
3. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
4. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
9kHz - 30MHz  
 RBW: 10kHz      VBW: 30kHz
5. Conducted Emissions Measurement Uncertainty  
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±2.4dB.



**Conducted Emissions Setup (Front View)**



**Conducted Emissions Setup (Rear View)**



## TEST RESULTS

### FCC Part 15 (15.109 & 15.209) Class B Radiated Emission (Spurious Emissions) Results

Test Distance : 3m

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBmV/m)	Q-P Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
539.9829	44.5	-1.5	0	116	100	V
755.9699	38.8	-7.2	0	100	100	V
931.3539	30.6	-15.4	78	332	100	V
932.8448	42.8	-3.2	0	142	100	V
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Spurious Emissions above 1GHz

Frequency (GHz)	Peak Value (dBmV/m)	Average Value (dBmV/m)	Average Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Pol (H/V)
1.8655	53.8	46.5	-7.5	39	262	100	V
7.2060	52.2	39.9	-14.1	0	0	100	H
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Tested by: LCH

#### Notes

- All possible modes of operation were investigated using the correct CISPR detectors. The "--" indicates no emissions were found in the band of interest and showed compliance to the limits as specified in section 15.209. The emissions were merely the noise floor.
- The RF transmitting antenna was found to be in the worst case condition when it was orientated in a vertical position.
- For tuner mode, the test was conducted with the tuner port terminated with 50Ω terminator as the power level output at the tuner port was less than 2nW.
- Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 1GHz  
RBW: 120kHz VBW: 1MHz  
>1GHz  
RBW: 1MHz VBW: 1MHz
- The peak emissions above 1GHz show compliance to the requirement stated in Section 15.35 (b).
- The upper frequency of radiated emission investigations were according to requirements stated in Section 15.33 (a) for intentional radiators & Section 15.33 (b) for unintentional radiators.

9. The channel in the table refers to the transmit channel of the EUT.
10. Radiated Emissions Measurement Uncertainty  
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz (QP only @ 3m & 10m) is  $\pm 4.3\text{dB}$  (for EUTs < 0.5m X 0.5m X 0.5m).

## TEST RESULTS

### FCC Part 15C (15.205) Radiated Emissions (Restricted Band Requirements) Results

Test Distance : 3m

Spurious Emissions (Restricted Band) ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBmV/m)	Q-P Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
404.9722	41.3	-4.7	0	123	137	V
971.9766	37.3	-16.7	78	157	100	V
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Spurious Emissions (Restricted Band) above 1GHz

Frequency (GHz)	Peak Value (dBmV/m)	Average Value (dBmV/m)	Average Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Pol (H/V)
1.1880	39.0	37.0	-17.0	0	0	100	H
2.2276	48.4	35.1	-18.9	78	24	100	H
2.2948	47.6	35.2	-18.8	39	0	100	V
4.8040	52.1	39.9	-14.1	0	0	100	H
4.9600	52.9	40.8	-13.2	78	0	100	H
7.4400	52.9	41.0	-13.0	78	0	100	H

Tested by: LCH

#### Notes

- All possible modes of operation were investigated using the correct CISPR detectors. The "--" indicates no emissions were found in the band of interest and showed compliance to the limits as specified in section 15.209. The emissions were merely the noise floor.
- The RF transmitting antenna was found to be in the worst case condition when it was orientated in a vertical position.
- For tuner mode, the test was conducted with the tuner port terminated with 50Ω terminator as the power level output at the tuner port was less than 2nW.
- Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 1GHz  
RBW: 120kHz VBW: 1MHz  
>1GHz  
RBW: 1MHz VBW: 1MHz
- The peak emissions above 1GHz show compliance to the requirement stated in Section 15.35 (b).
- The upper frequency of radiated emission investigations were according to requirements stated in Section 15.33 (a) for intentional radiators & Section 15.33 (b) for unintentional radiators.

9. The channel in the table refers to the transmit channel of the EUT.
10. Radiated Emissions Measurement Uncertainty  
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz (QP only @ 3m & 10m) is  $\pm 4.3\text{dB}$  (for EUTs < 0.5m X 0.5m X 0.5m).

# TEST RESULTS

## FCC Part 15 (15.249(a)) Radiated Emissions (Fundamental Field Strength @ 3m) Results

Test Distance : 3m  
Unit Under Test : AV Unit

Frequency (GHz)	Peak Value (dBm V/m)	Average Value (dBm V/m)	Average Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Pol (H/V)
2.402	103.9	92.8	-1.2	0	205	100	V
2.441	103.8	90.9	-3.1	39	161	100	V
2.480	104.5	92.1	-1.9	78	157	114	V

Test Distance : 3m  
Unit Under Test : Wireless Speaker

Frequency (GHz)	Peak Value (dBm V/m)	Average Value (dBm V/m)	Average Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Pol (H/V)
2.402	105.4	93.0	-1.0	0	136	100	V
2.441	104.2	92.2	-1.8	39	144	100	V
2.480	105.2	92.4	-1.6	78	235	100	V

Tested by: LCH

### Notes

- For wireless speaker, only the left speaker was tested as both the RF module used in both the left and right wireless speakers are identical.
- The RF transmitting antenna was found to be in the worst case condition when it was orientated in a vertical position.
- Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
Peak  
RBW: 1MHz VBW: 1MHz  
  
Average  
RBW: 1MHz VBW: 10Hz
- The peak emissions above 1GHz show compliance to the requirement stated in Section 15.35 (b) and 15.249
- The channel in the table refers to the transmit channel of the EUT.
- Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz (QP only @ 3m & 10m) is  $\pm 4.3\text{dB}$  (for EUTs < 0.5m X 0.5m X 0.5m).

## TEST RESULTS

### FCC Part 15 (15.249(a)) Radiated Emissions (Harmonics Field Strength @ 3m) Results

Test Distance : 3m  
Unit Under Test : AV Unit

Frequency (GHz)	Peak Value (dBm V/m)	Average Value (dBm V/m)	Average Margin (dB)	Channel	Azimuth (Degrees)	Height (cm)	Pol (H/V)
4.804	52.1	39.9	-14.1	0	0	100	H
4.960	52.9	40.8	-13.2	78	0	100	H
7.206	52.2	39.9	-14.1	0	0	100	H
7.440	52.9	41.0	-13.0	78	0	100	H

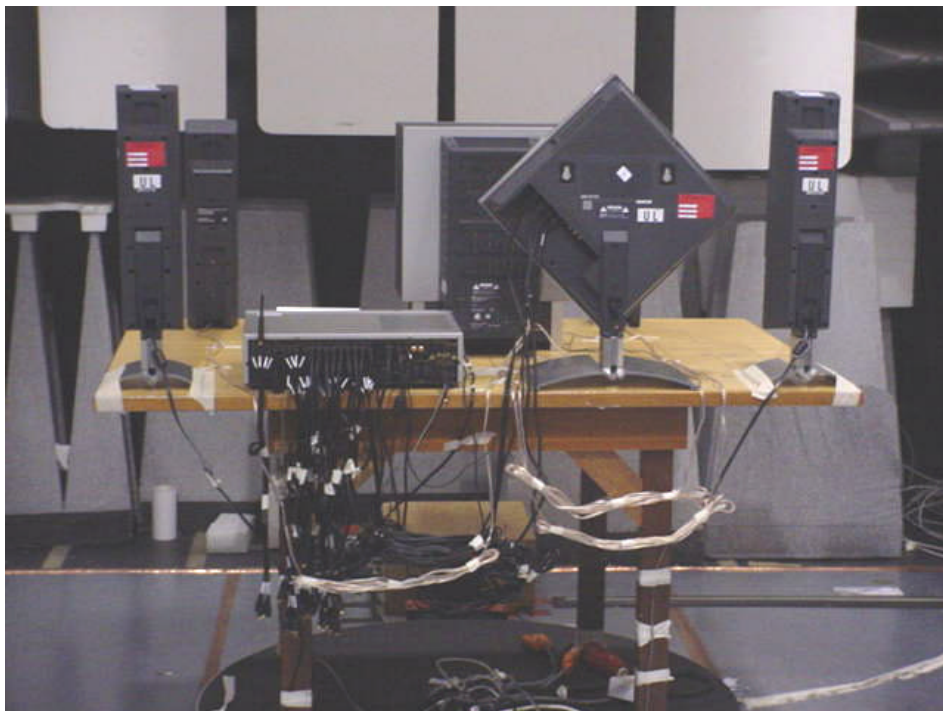
Tested by: LCH

#### Notes

- All harmonics of EUT were investigated using the correct CISPR detectors. The tables above indicate the harmonics found. No other harmonics were found and it was merely a noise floor, which was below the limit of harmonics as specified in section 15.249(a).
- No harmonics emissions were found for the wireless speaker.
- The RF transmitting antenna was found to be in the worst case condition when it was orientated in a vertical position.
- Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
Peak  
RBW: 1MHz VBW: 1MHz  
  
Average  
RBW: 1MHz VBW: 10Hz
- The peak emissions above 1GHz show compliance to the requirement stated in Section 15.35 (b) and 15.247(e)
- The channel in the table refers to the transmit channel of the EUT.
- Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz (QP only @ 3m & 10m) is  $\pm 4.3\text{dB}$  (for EUTs < 0.5m X 0.5m X 0.5m).



**Radiated Emissions Setup (Front View)**



**Radiated Emissions Setup (Rear View)**

## TEST RESULTS

### FCC Part 1.1310 Maximum Permissible Exposure (MPE) Results

Frequency (MHz)	Power Density Value (mW/cm <sup>2</sup> )	Averaging Time (min)	Limit (mW/cm <sup>2</sup> )	Margin (mW/cm <sup>2</sup> )	Channel
2.402GHz (AV Unit)	0.0053	30	1.0	-29.9947	Channel 0
2.402GHz (Wireless Speaker)	0.0022	30	1.0	-29.9978	Channel 0

Tested by: LCH

### Notes

1. All possible modes of operation were investigated. Only the worst case, highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 0.1MHz – 3GHz is  $\pm 15\%$ .





**Maximum Permissible Exposure Measurement Test Setup – AV Unit**



**Maximum Permissible Exposure Measurement Test Setup – Wireless Speaker**

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August 2003

## ANNEX A

### TEST INSTRUMENTATION & GENERAL PROCEDURES

## FCC LABEL & POSITION

## ANNEX D

### 3m OATS Test Instrumentation (Conducted Emissions)

<u>Instrument</u>	<u>Model</u>	<u>S/No</u>	<u>Cal Due Date</u>	
R&S Test Receiver (9kHz30MHz)	ESH3	862301/005	25 Jul 2004	x
Schaffner Pulse Limiter	CFL 9206	1720	1 Apr 2005	x
EMCO LISN (for EUT) – LISN6	3825/2	9309-2127	20 May 2005	x

### 3m Anechoic Chamber Test Instrumentation (Radiated Emissions)

<u>Instrument</u>	<u>Model</u>	<u>S/No</u>	<u>Cal Due Date</u>	
R&S Test Receiver (20H z 26.5GHz) – ESMI3	ESMI	829214/005 829550/004	25 Apr 2005	x
HP Preamplifier (for ESMI3, 0.01 -3GHz) – PA6	87405A	3950M00353	1 Apr 2005	x
MITEQ Preamplifier (0.1 -26.5GHz) – PA11	NSP2650-N	728231	1 Apr 2005	x
Schaffner Bilog Antenna – BL5	CBL6143	5041	18 May 2005	x
EMCO Horn Antenna – H14	3115	0003-6087	22 May 2005	x
Micro-tronics Band-Stop Filter	BRM50701	017	1 Apr 2005	x

### Maximum Permissible Exposure Test Instrumentation

<u>Instrument</u>	<u>Model</u>	<u>S/N</u>	<u>Cal Due Date</u>	
PMM 8053 Portable Field Meter	8053	0220J10308	17 Apr 2005	x
PMM Electric and Magnetic Field Analyzer	EHP-50A	1311L10515	16 May 2005	x

## FCC LABEL & POSITION

## ANNEX D

### CONDUCTED EMISSIONS TEST DESCRIPTION

#### Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

#### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

#### Sample Calculation Example

At 20 MHz	limit = 250 μV = 47.96 dBμV
Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB	
Q-P reading obtained directly from EMI Receiver = 40 dBμV (Calibrated for system losses)	
Therefore, Q-P margin = 40- 47.96 = -7.96	i.e. <b>7.96 dB below limit</b>

## FCC LABEL & POSITION

## ANNEX D

### RADIATED EMISSIONS TEST DESCRIPTION (3m ANC) – SPURIOUS & HARMONICS EMISSIONS

#### Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

#### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst frequencies .
3. The test was carried out at the selected frequency points obtained from the prescan. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from 30MHz to 25GHz, using the Bi-log antenna for frequencies from 30MHz up to 3GHz, and the Horn antenna above 3GHz.

#### Sample Calculation Example

At 300 MHz	limit = $200 \mu\text{V/m} = 46 \text{ dB } \mu\text{V/m}$
Log-periodic antenna factor & cable loss at 300 MHz = 18.511 dB	
Q-P reading obtained directly from EMI Receiver = $40 \text{ dB } \mu\text{V/m}$ (Calibrated level including antenna factors & cable losses)	
Therefore, Q-P margin = $40 - 46 = -6$	i.e. <b>6 dB below limit</b>

## FCC LABEL & POSITION

## ANNEX D

### RADIATED EMISSIONS TEST DESCRIPTION (3m ANC)– CARRIER FIELD STRENGTH @ 3m

#### Test Set-up

2. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
3. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
4. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

#### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected transmitting channels, i.e low (2.402GHz), mid (2.441GHz) and high (2.48GHz). Maximization of the carrier's field strength at 3m test distance was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. Average and peak measurements were made for the selected carrier frequency.
5. Steps 3 and 4 were repeated for the next selected carrier frequency, until all selected carrier frequencies were measured.
6. A Bi-log was used for the measurement.

#### Sample Calculation Example

At 2405 MHz	limit = 200 $\mu$ V/m = 94 dB $\mu$ V/m
Log-periodic antenna factor & cable loss at 2405 MHz = 18.511 dB	
Average reading obtained directly from EMI Receiver = 85 dB $\mu$ V/m (Calibrated level including antenna factors & cable losses)	
Therefore, average margin = 85 - 94 = -9	i.e. <b>9 dB below limit</b>

## FCC LABEL & POSITION

## ANNEX D

### MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST DESCRIPTION

#### EUT Characterisation

EUT characterisation, over the required frequency range as given in table 1 of FCC Part 1.1310 was carried out to determine the EUT mode of operation that produces the highest possible level of radio frequency radiation.

The EUT was setup as shown in the setup photo. Its radio frequency radiation profile was observed, using a field meter with the appropriate field probe antenna attached and 20cm away from the EUT. E-field (V/m) readings are recorded, since the field meter is most sensitive at this setting. Positions where maximum E-field readings are detected are noted for the final, actual measurement.

#### Test Set-up

1. The EUT and supporting equipment were set up on top of a non-metallic table.
2. The relevant field probe was positioned at least 20cm away from the EUT and supporting equipment boundary.

#### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected positions obtained from the EUT characterisation.
3. Power density measurement ( $\text{mW}/\text{cm}^2$ ) was made using the field meter set to the required averaging time.
4. Steps 2 and 3 were repeated for the next position and its associate EUT operating mode, until all selected positions and modes were measured.

#### Sample Calculation Example

At 2400 MHz, limit =  $1.0 \text{ mW}/\text{cm}^2$

Power density reading obtained directly from field meter =  $0.3 \text{ mW}/\text{cm}^2$  averaged over the required 30 minutes.

Therefore, margin =  $0.3 - 1.0 = -0.7 \text{ mW}/\text{cm}^2$

i.e.  **$0.7 \text{ mW}/\text{cm}^2$  below limit**