



Shenzhen Academy of Metrology & Quality Inspection

NETC National Digital Electronic Product Testing Center

EMC TEST REPORT

For

Oxygen analyser

Model Number: VN202



Report Number: WT148000217

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection National Digital Electronic Product Testing Center
Site Location	:	NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China
Tel	:	0086-755-86928965
Fax	:	0086-755-86009898-31396
Web	:	www.smq.com.cn





TEST REPORT DECLARATION

Applicant : Vandagraph Limited
Address : 15 Station Road Crosshills Keighley West Yorkshire BD20 7DT
Manufacturer : Vandagraph Limited
Address : 15 Station Road Crosshills Keighley West Yorkshire BD20 7DT
Factory : Justec Shenzhen Co., Ltd.
Address : 2F, Building 64, Majialong Industry Zone, Daxing Rd., Nanshan, Shenzhen, China, 518054
EUT Description : Oxygen analyser
MODEL No : VN202
Trade mark : ---

Test Standards:

EN 60601-1-2:2007
IEC 60601-1-2:2007

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT and ensure the EUT to be compliance with the immunity requirements of the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. Also, this report shows that the EUT technically complies with essential requirements as given in **Directive 93/42/EEC**.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Project Engineer:

(Zou Qiang)

Date: Mar. 20, 2014

Checked by:

(Yang DongPing)

Date: Mar. 20, 2014

Approved by:

(Lin Bin)

Date: Mar. 20, 2014



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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	Compliance Level
Radiated disturbance	CISPR 11 Group 1 Class B
ESD Immunity	±6kV Contact, ±8kV air
Radiated Electromagnetic Field Immunity	3V/m
Power Frequency Magnetic Field	3A/m



2. GENERAL INFORMATION

2.1. Report information

- 2.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.
- 2.1.2. The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 2.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.



The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at No.4 TongFa Road, Xili Town, Nanshan District, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number are 446246 806614 994606(semi anechoic chamber).

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the registration number is 11177A.

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the registration number is E2024086Z02.

2.3. Measurement Uncertainty

Radiated Emission

30MHz~1000MHz 4.5dB

1GHz~18GHz 4.6dB

ESD Immunity

It is compliant with the requirements of the standard at the confidence of 95%.

Radiated Immunity

1.78dB

Power Frequency Magnetic Field Immunity

It is compliant with the requirements of the standard at the confidence of 95%.

*The measurement uncertainty was given with the confidence of 95%.



3. PRODUCT DESCRIPTION

3.1.EUT Description

Description : Oxygen analyser

Applicant : Vandagraph Limited

Model Number : VN202 (With cable A, cable B and cable C)

EUT Classification : Not LIFE-SUPPORTING EQUIPMENT and SYSTEMS

Operating Location : Non-shielded Location

Rated Voltage : DC 3V (Battery 1.5V×2)

Remark: VN202 include three Connecting cables, which are cable A, cable B and cable C. Therefore, full test items were performed with cable B, additional radiated disturbance and radiated electromagnetic field immunity test were performed with cable A and cable C for confirmation.

3.2.Block Diagram of EUT Configuration



Test mode 1

3.3.Operating Condition of EUT

Test mode 1: Measuring

3.4.Test Conditions

Date of test: Jan. 29, 2014 - Mar. 13, 2014

Date of EUT Receive: Jan. 16, 2014

Temperature: 20℃-22℃

Relative Humidity: 41%-55%



N/A

3.6. Performance Criterion

The EQUIPMENT and SYSTEMS shall be able to provide the essential performance and remain safe. The following DEGRADATIONS associated with essential performance and safety shall not be allowed:

- component failures;
- changes in programmable parameters;
- reset to factory defaults (manufacturer's presets);
- change of operating mode;
- false alarms;
- cessation or interruption of any intended operation, even if accompanied by an alarm;
- initiation of any unintended operation, including unintended or uncontrolled motion, even if accompanied by an alarm;
- error of a displayed numerical value sufficiently large to affect diagnosis or treatment;
- noise on a waveform in which the noise would interfere with diagnosis, treatment or monitoring;
- artifact or distortion in an image in which the artifact would interfere with diagnosis, treatment or monitoring;
- failure of automatic diagnosis or treatment EQUIPMENT and SYSTEMS to diagnose or treat, even if accompanied by an alarm.

For EQUIPMENT and SYSTEMS with multiple FUNCTIONS, the criteria apply to each FUNCTION, parameter and channel.

The EQUIPMENT and SYSTEMS may exhibit DEGRADATION of performance (e.g. deviation from manufacturer's specifications) that does not affect essential performance or safety.



4. TEST EQUIPMENT USED

4.1. Test Equipment Used to Measure Radiated Disturbance

Table 2 Radiated Disturbance Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB4538	EMI Test Receiver	Rohde & Schwarz	ESIB7	Jan.20,2014	1 Year
SB5472/02	Bilog Antenna	SCHWARZBECK	VULB9163	Jan.20,2014	1 Year

4.2. Test Equipment Used to Measure Electrostatic Discharge Immunity

Table 3 ESD Immunity Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB8001	ESD tester	EM TEST	ESD30N	Jan.20,2014	1 Year

4.3. Test Equipment Used to Measure Radio Frequency Electromagnetic Fields Immunity

Table 4 Radiated Electromagnetic Field Immunity Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB3433	Signal Generator	Rohde & Schwarz	SMT03	Jan. 15, 2014	1 Year
SB3437/02	Voltage Probe	Rohde & Schwarz	URV5-Z2	Jun.26,2013	1 Year
SB7933	Power Amplifier	AR	250W1000A	May.15,2013	1 Year
SB7934	Power Amplifier	MILMEGA	AS0860-75/45	May.15,2013	1 Year
SB3171	Bilog Antenna	AR	AT1080		
SB3937	Horn Antenna	AR	AT4002A		

4.4. Test Equipment Used to Measure Power frequency magnetic field Immunity

Table 5 Power Frequency Magnetic Field Immunity Test

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB3070	Simulator	EM Test	UCS500M4	Jan.20,2014	1 Year
SB3070/03	Voltage regulator	EM Test	MV2616	Jan.20,2014	1 Year
SB3070/04	Coil	EM Test	MS100	Jan.20,2014	1 Year
SB3070/05	transformer	EM Test	MC2630	Jan.20,2014	1 Year



5. RADIATED DISTURBANCE TEST

5.1. Test Standard and Limit

5.1.1. Test Standard

EN 60601-1-2:2007

IEC 60601-1-2:2007

5.1.2. Test Limit

Table 6 Radiated Disturbance Test Limit (Class B)

Frequency	Limit (dB μ V/m)
	Quasi-peak Level
30MHz~230MHz	30
230MHz~1000MHz	37

* The lower limit shall apply at the transition frequency.

* The test distance is 10m.

5.2. Test Procedure

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 10 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

5.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

5.4. Test Data

Emissions don't show below are too low against the limits, the test curves are shown in the next page.

Table 7 Radiated Disturbance Test Data



Model No.: VN202 Connecting cable: A Test Mode: 1			
Frequency MHz	Readings dB(μV/m)	Polarization	Limits dB (μV/m)
43.607	12.2	Horizontal	30
59.158	12.9	Vertical	30

Table 8 Radiated Disturbance Test Data

Model No.: VN202 Connecting cable: B Test Mode: 1			
Frequency MHz	Readings dB(μV/m)	Polarization	Limits dB (μV/m)
33.887	15.5	Horizontal	30
60.158	11.4	Vertical	30

Table 9 Radiated Disturbance Test Data

Model No.: VN202 Connecting cable: C Test Mode: 1			
Frequency MHz	Readings dB(μV/m)	Polarization	Limits dB (μV/m)
35.831	14.3	Vertical	30
70.827	17.8	Vertical	30
43.607	11.6	Horizontal	30



EUT: M/N:VN202 (Cable A)

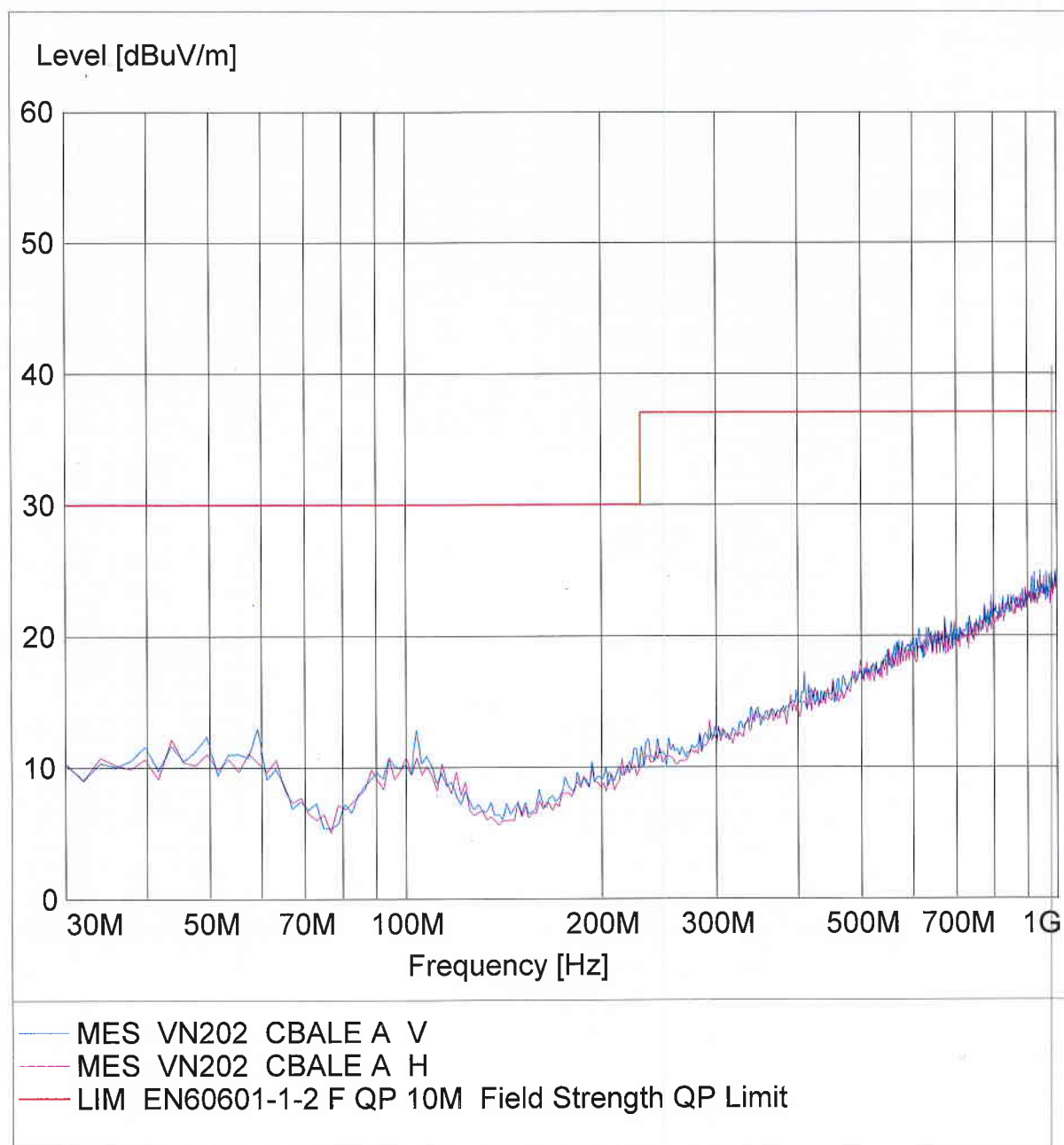
Operating Condition: Working

Test Site: SMQ EMC Lab. SAC2

Test Specification: Vertical & Horizontal

Comment: DC 3V

Comment:





Radiated Emission

EUT: *M/N : VN202 (Cable B)*

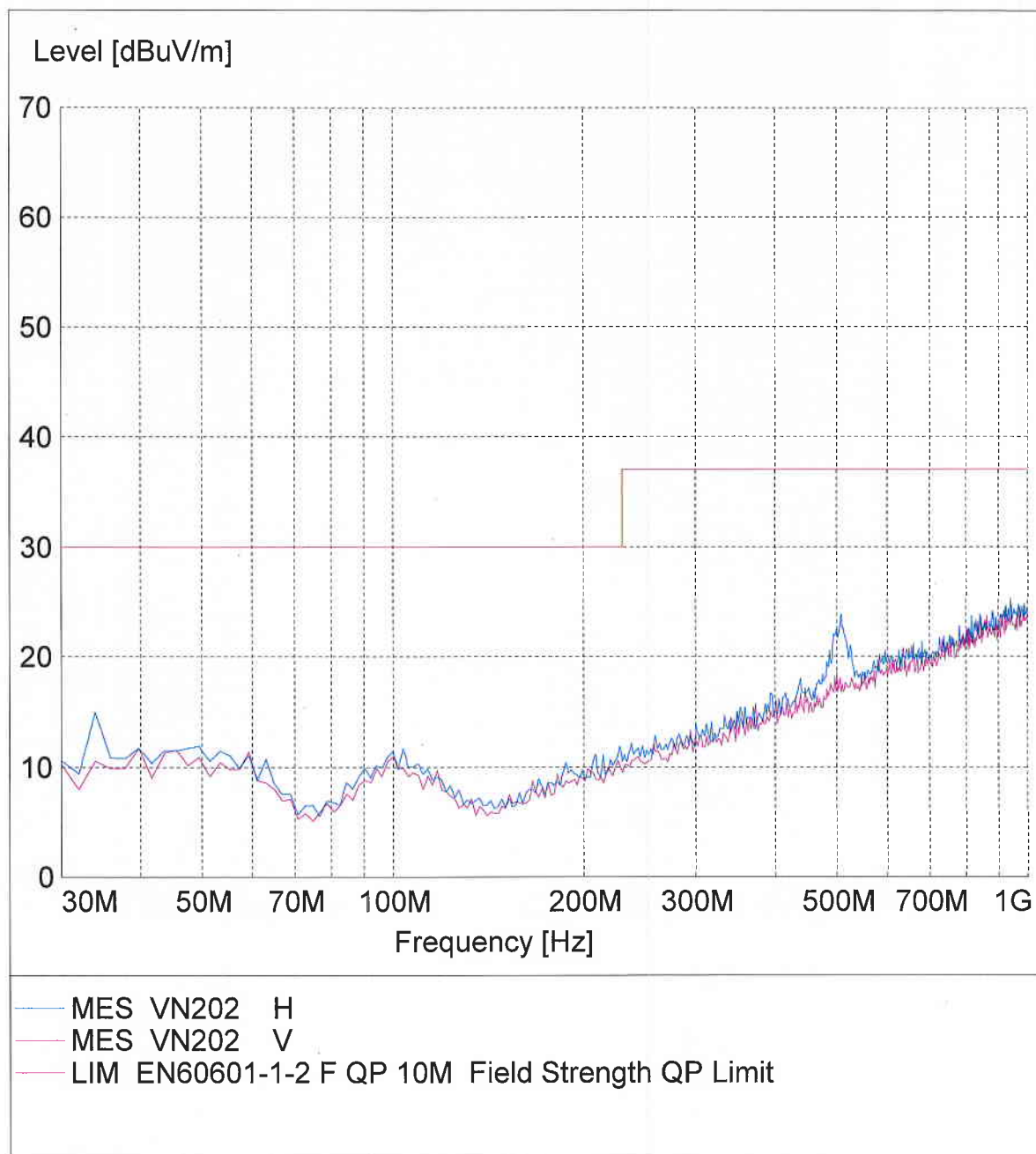
Operating Condition: *Working*

Test Site: *SMQ EMC Lab. SAC2*

Test Specification: *Vertical & Horizontal*

Comment: *DC 3V*

Comment:





Radiated Disturbance

EUT: M/N: VN202 (Cable C)

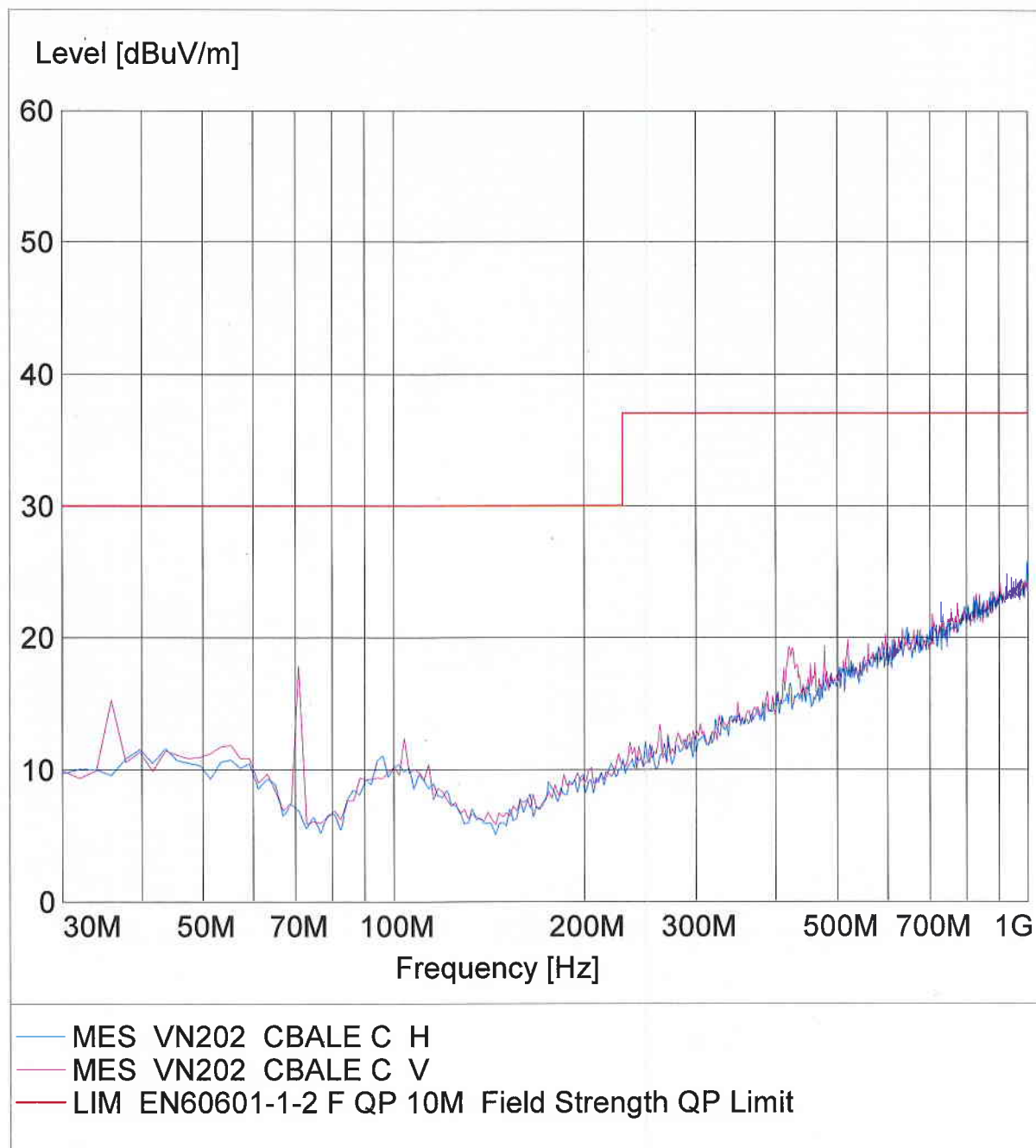
Operating Condition: Working

Test Site: SMQ EMC Lab. SAC2

Test Specification: Vertical & Horizontal

Comment: DC 3V

Comment:





6. ELECTROSTATIC DISCHARGE IMMUNITY TEST

6.1. Test Requirements

6.1.1. Test Standard

EN 60601-1-2:2007

IEC 60601-1-2:2007

6.1.2. Test Level

Table 10 Test Level for ESD

Port	IEC 60601 test level
Enclosure Port	±2; 4; 8kV air discharge ±2; 4; 6kV contact discharge

6.2. Test Procedure

6.2.1. Contact Discharge

The ESD generator is held perpendicular to the surface to which the discharge is applied and the tip of the discharge electrode touch the surface of EUT. Then turn the discharge switch. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the contact discharge completed.

6.2.2. Air Discharge

Air discharge is used where contact discharge can't be applied. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

6.2.3. Indirect discharge for horizontal coupling plane

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT.

6.2.4. Indirect discharge for vertical coupling plane

At least 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.



Table 11 ESD Test Data

Model No.: VN202 Connecting Cable: B Test Mode: 1				
Location	Voltage	Amount of test points	Discharge Method	Results
HCP	±2,4,6kV	4	C	Pass
VCP	±2,4,6kV	4	C	Pass
Screen	±2,4,8kV	4	A	Pass
Buttons	±2,4,8kV	1	A	Pass
Nonconductive Enclosure	±2,4,8kV	10	A	Pass

Note: A - Air Discharge, C - Contact Discharge



7. RADIATED ELECTROMAGNETIC FIELD IMMUNITY TEST

7.1. Test Requirements

7.1.1. Test Standard

EN 60601-1-2:2007

IEC 60601-1-2:2007

7.1.2. Test Level

Table 12 Test Level for Radiated Electromagnetic Field Immunity Test

Port	IEC 60601 test level
Enclosure Port	80-2500MHz 3 V/m 80 % AM(1kHz)

7.2. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on Test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance, a camera is used to monitor EUT status.

7.3. Test Data

Table 13 Radiated Electromagnetic Field Immunity Test Data

Model No.: VN202 Connecting Cable: A Test Mode: 1		
Frequency Range (MHz)	80-2500 MHz	
Field Strength (V/m)	3V/m	
Dwell time	1s	
Steps (%)	1%	
	Horizontal	Vertical
Front	Pass	Pass
Rear	Pass	Pass
Left	Pass	Pass
Right	Pass	Pass

Table 14 Radiated Electromagnetic Field Immunity Test Data



Model No.: VN202 Connecting Cable: B Test Mode: 1		
Frequency Range (MHz)	80-2500 MHz	
Field Strength (V/m)	3V/m	
Dwell time	1s	
Steps (%)	1%	
	Horizontal	Vertical
Front	Pass	Pass
Rear	Pass	Pass
Left	Pass	Pass
Right	Pass	Pass

Table 15 Radiated Electromagnetic Field Immunity Test Data

Model No.: VN202 Connecting Cable: C Test Mode: 1		
Frequency Range (MHz)	80-2500 MHz	
Field Strength (V/m)	3V/m	
Dwell time	1s	
Steps (%)	1%	
	Horizontal	Vertical
Front	Pass	Pass
Rear	Pass	Pass
Left	Pass	Pass
Right	Pass	Pass



8. POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

8.1. Test Requirements

8.1.1. Test Standard

EN 60601-1-2:2007

IEC 60601-1-2:2007

8.1.2. Level

Table 16 Test Level for Power Frequency Magnetic Field Immunity

Port	IEC 60601 test level
Enclosure	3A/m

8.2. Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m×1m). The induction coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

8.3. Test Data

Table 17 Power Frequency Magnetic Field Immunity Test Data

Model No.: VN202 Connecting Cable: B Test Mode: 1				
Frequency	Polarity	Duration (s)	Level (A/m)	Results
50Hz	X	120	3	Pass
50Hz	Y	120	3	Pass
50Hz	Z	120	3	Pass
60Hz	X	120	3	Pass
60Hz	Y	120	3	Pass
60Hz	Z	120	3	Pass



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APPENDIX I TEST PHOTOS

Photo 1 Radiated Disturbance Test (with connecting cable A)

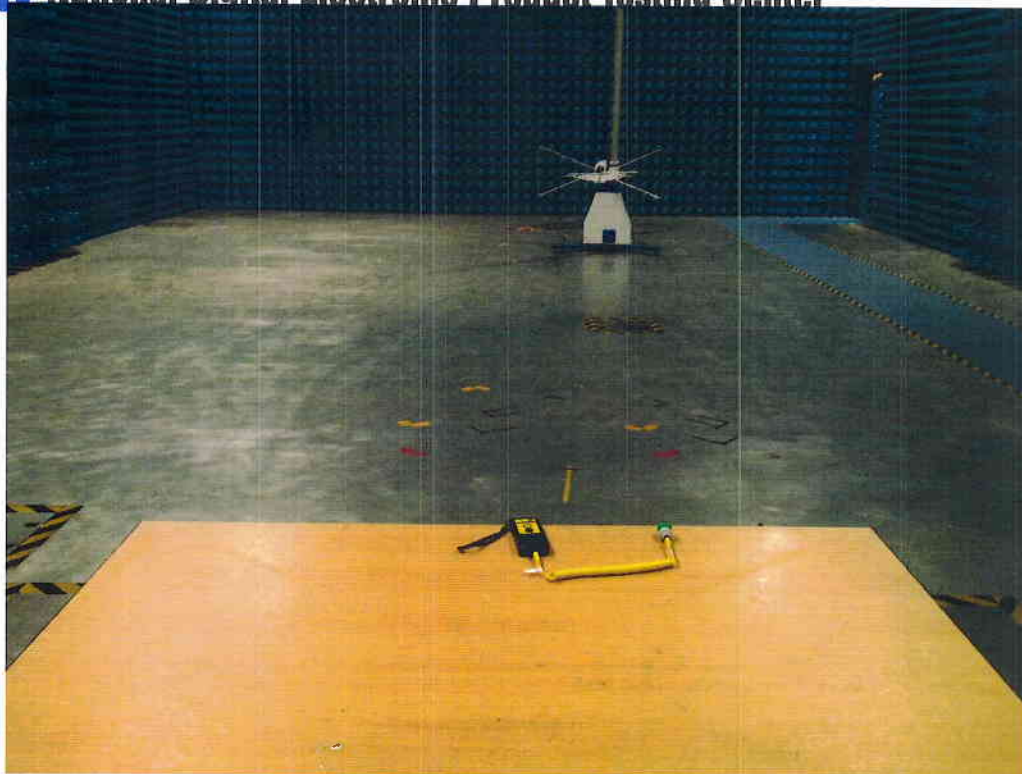


Photo 2 Radiated Disturbance Test (with connecting cable B)

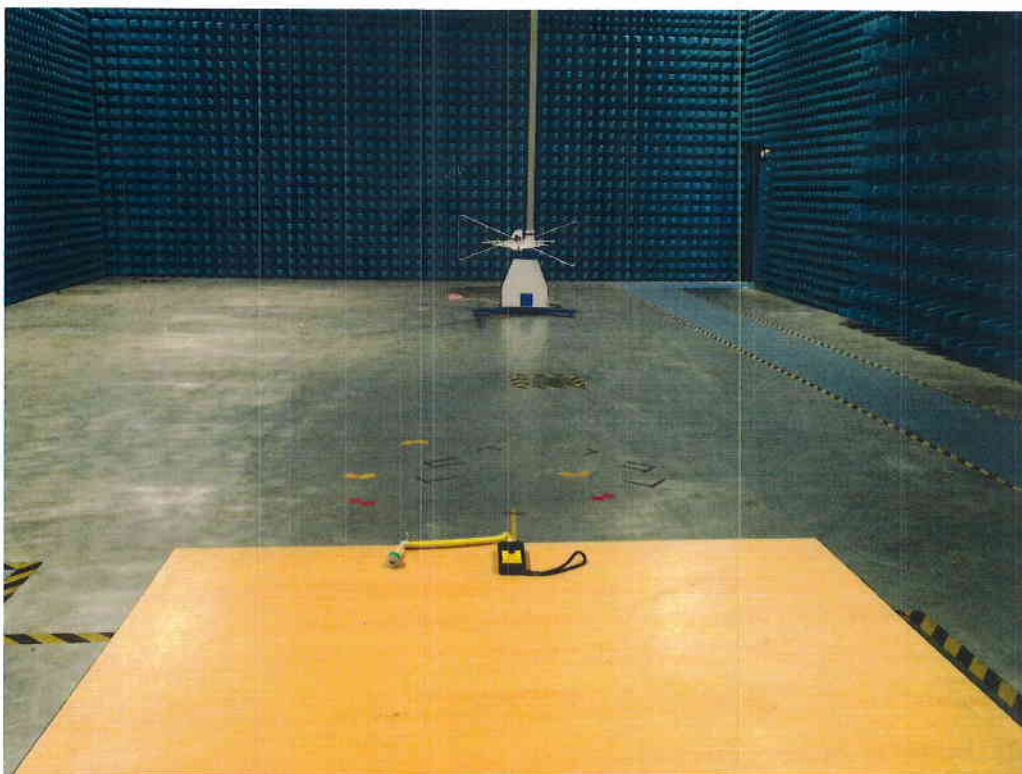


Photo 3 Radiated Disturbance Test (with connecting cable C)

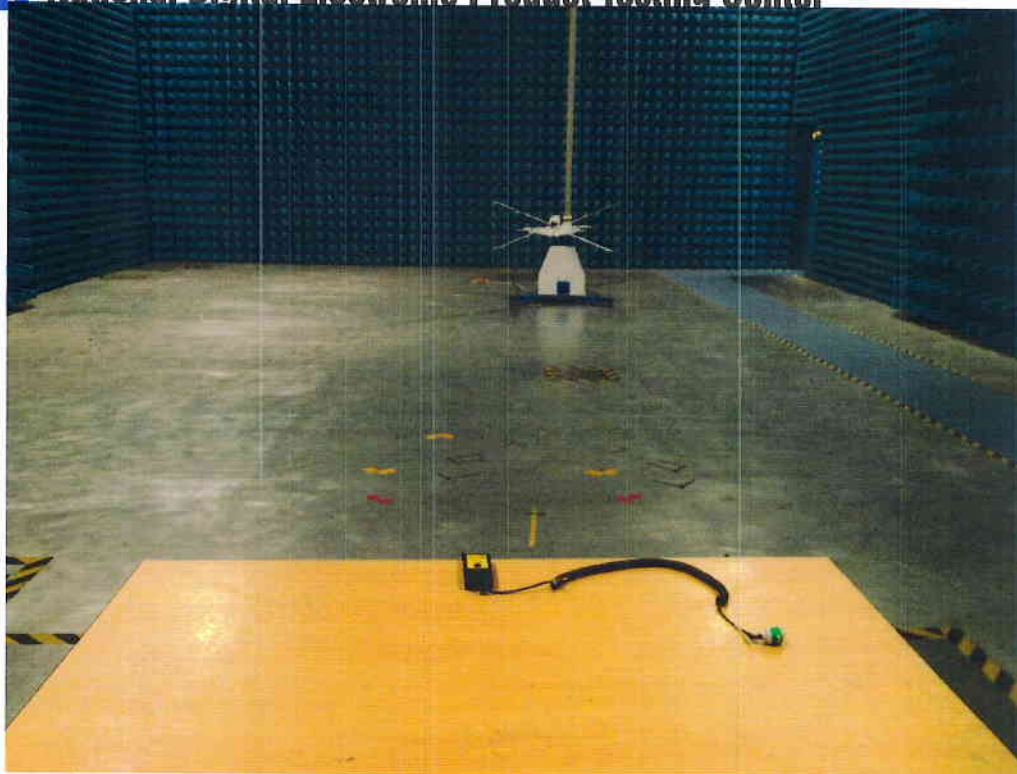


Photo 4 ESD Immunity Test

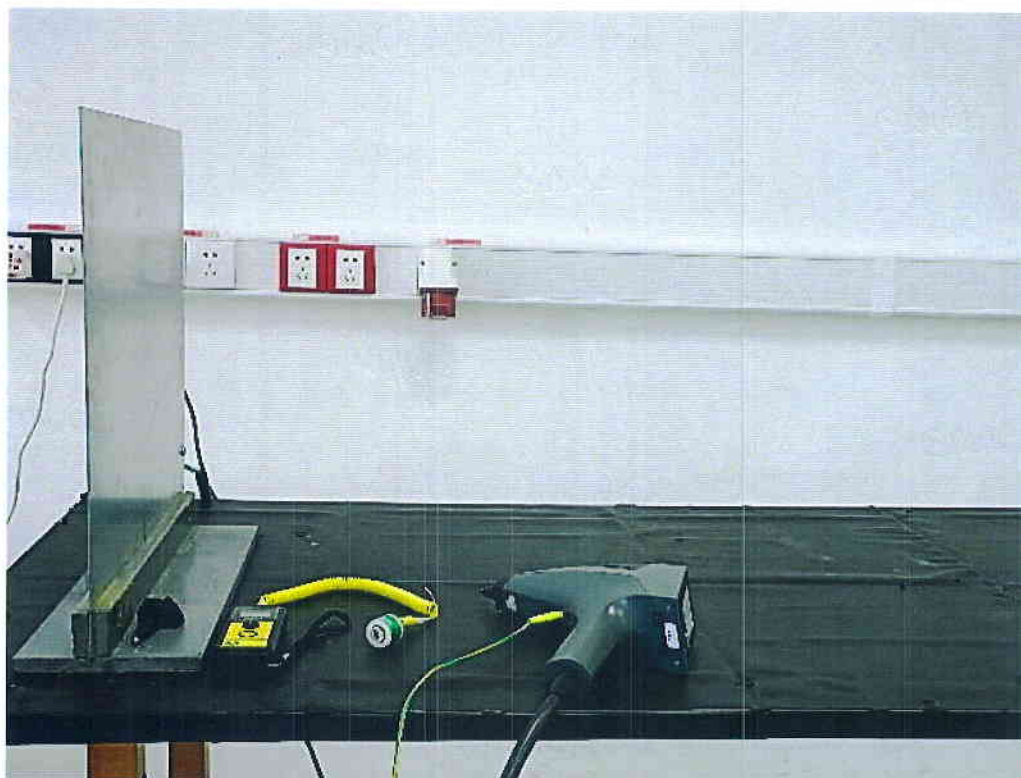


Photo 5 Radio Frequency Electromagnetic Fields Immunity test (with connecting cable A)

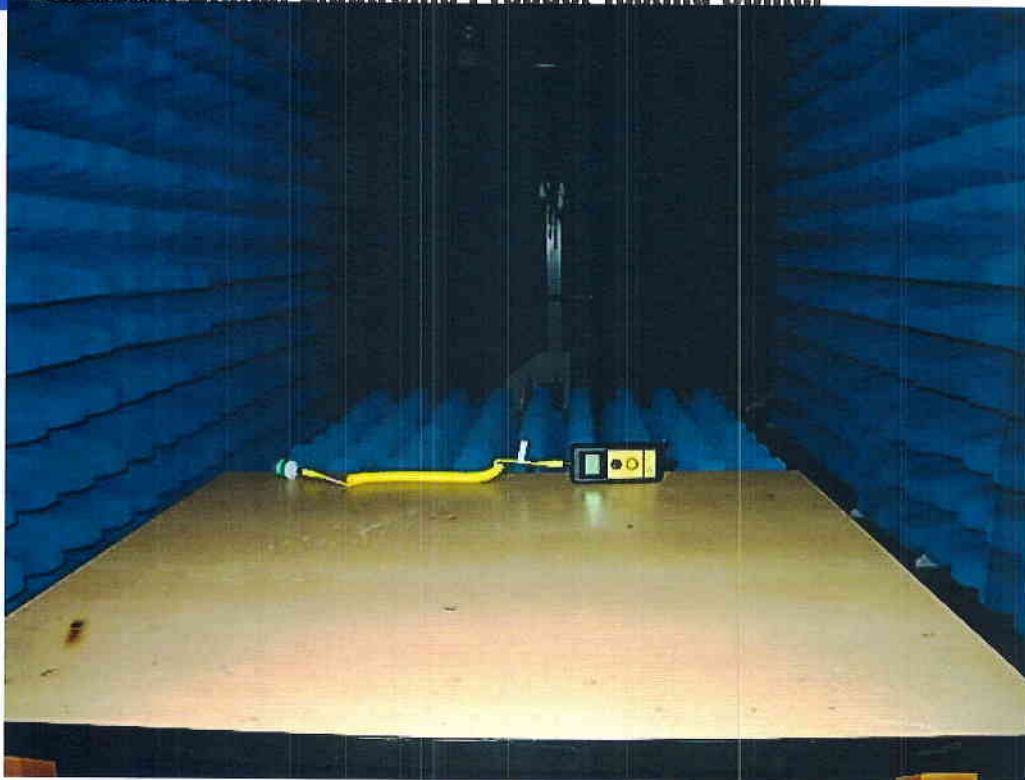


Photo 6 Radio Frequency Electromagnetic Fields Immunity test (with connecting cable A)



Photo 7 Radio Frequency Electromagnetic Fields Immunity test (with connecting cable B)

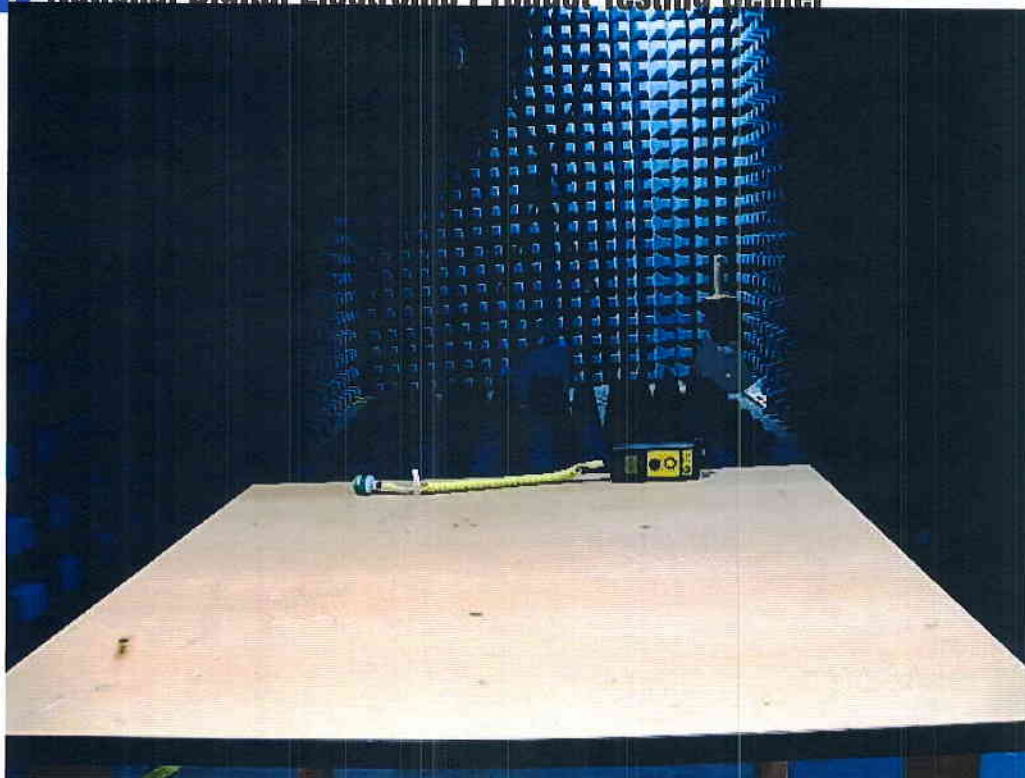


Photo 8 Radio Frequency Electromagnetic Fields Immunity test (with connecting cable B)

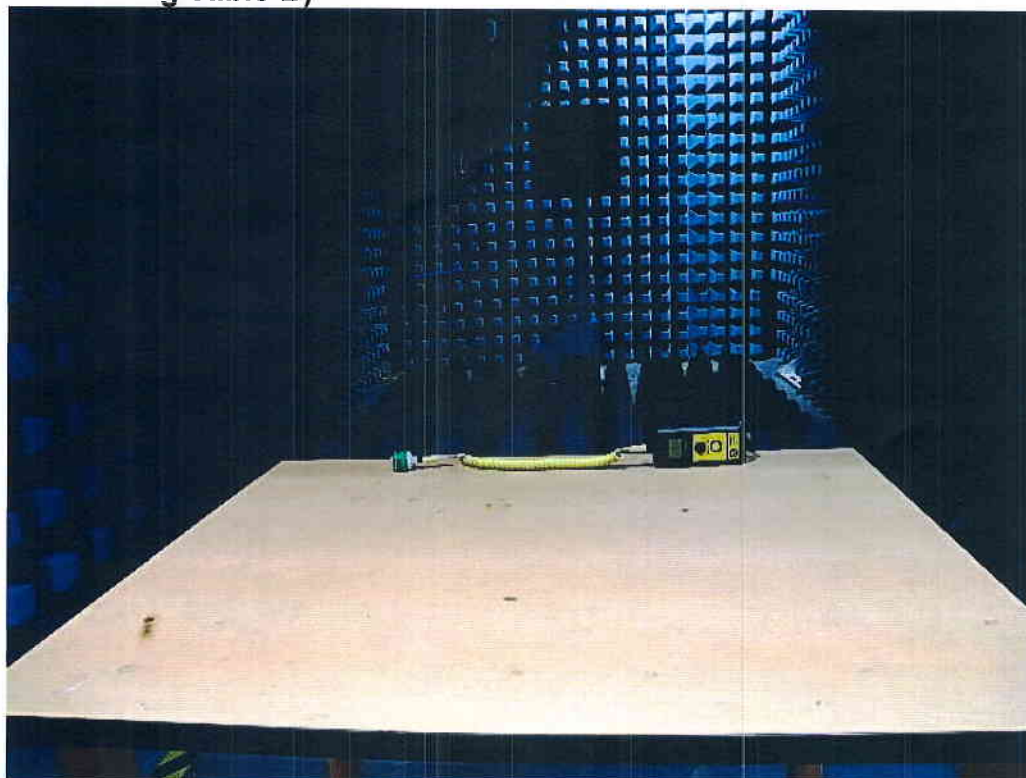


Photo 9 Radio Frequency Electromagnetic Fields Immunity test (with connecting cable C)

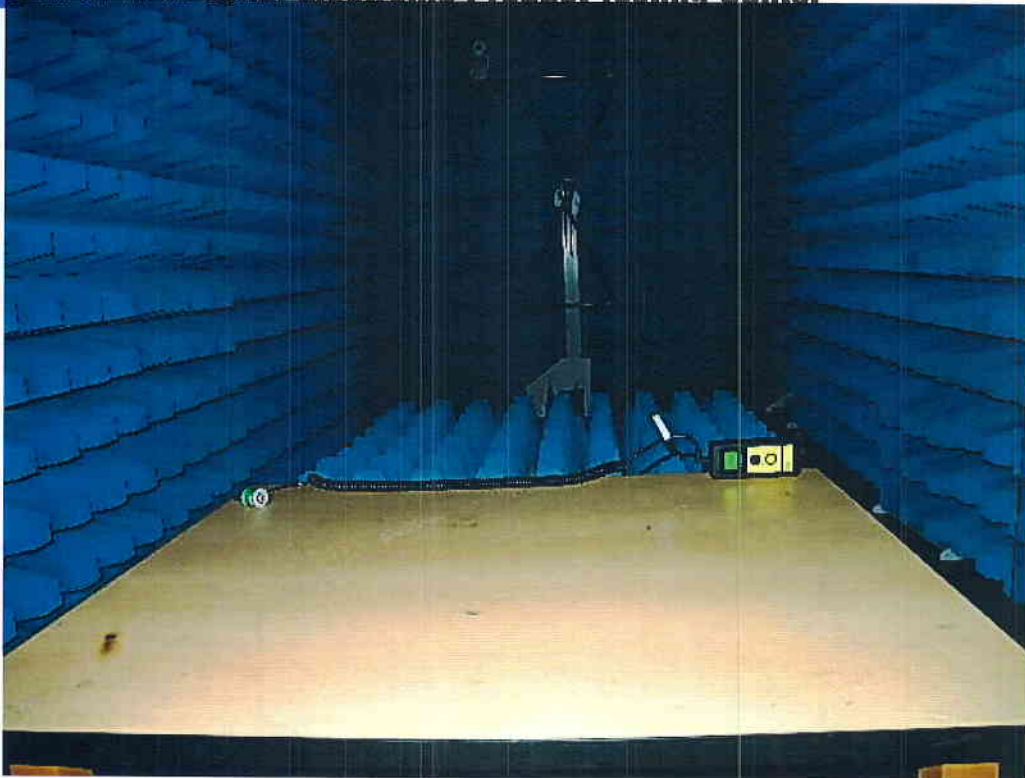


Photo 10 Radio Frequency Electromagnetic Fields Immunity test (with connecting cable C)

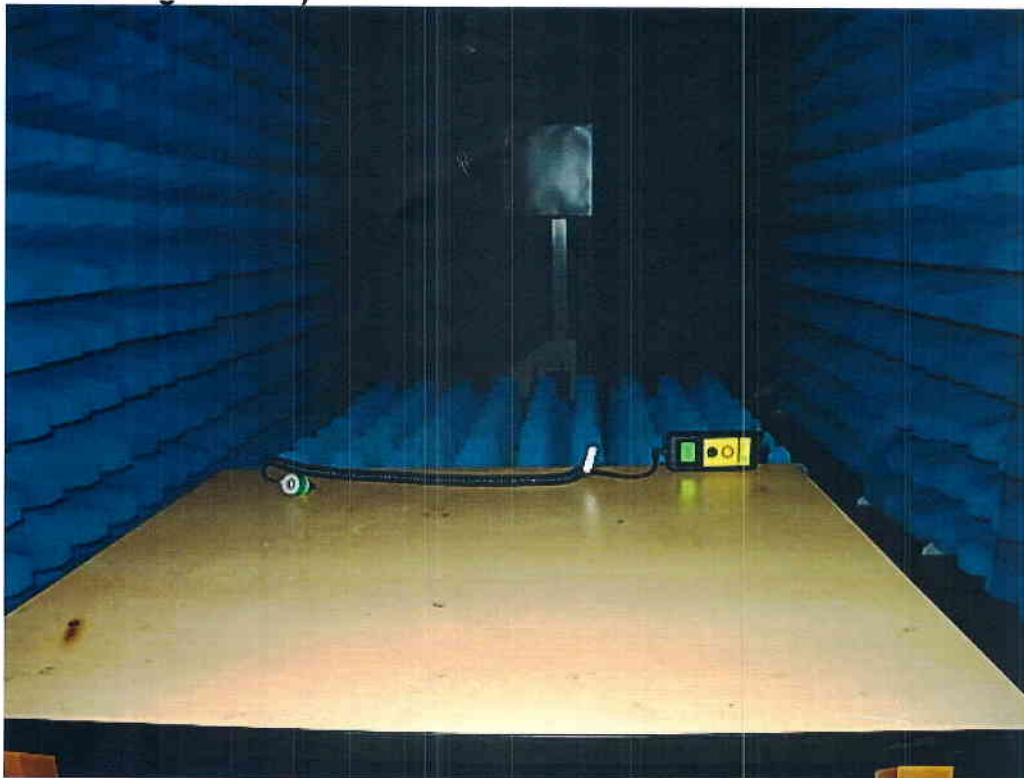
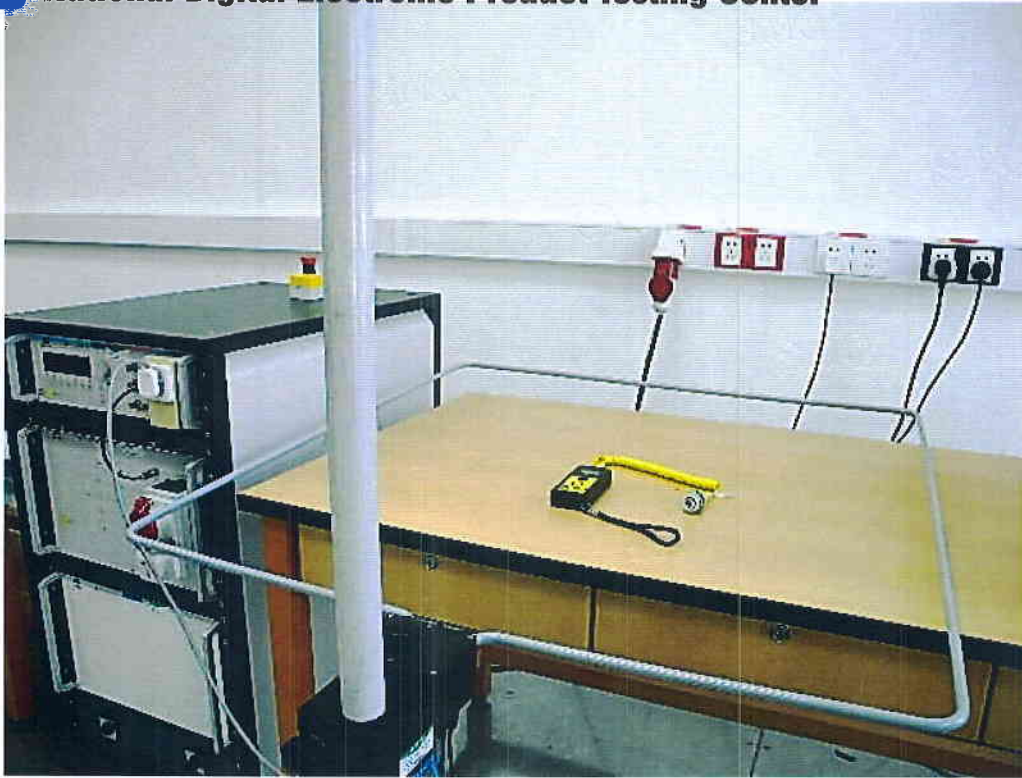


Photo 11 Power Frequency Magnetic Field Immunity





Shenzhen Academy of Metrology & Quality Inspection

NiTC National Digital Electronic Product Testing Center

APPENDIX II EUT PHOTOS

Photo 1 Appearance of EUT

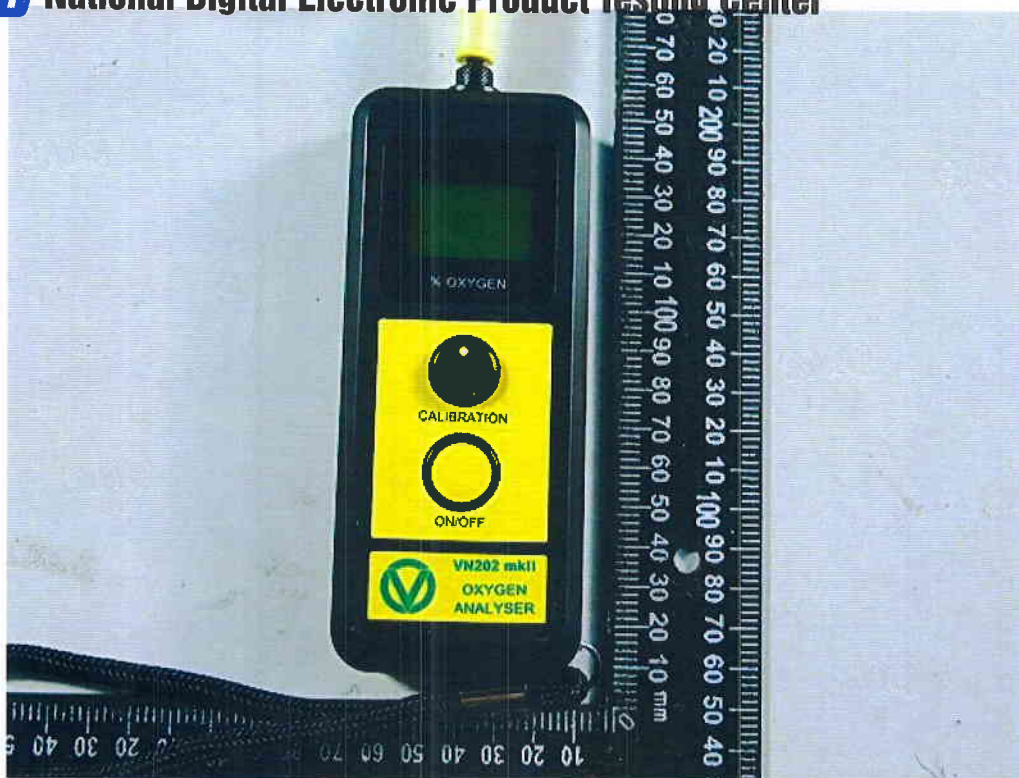


Photo 2 Appearance of EUT



Photo 3 Inside of EUT

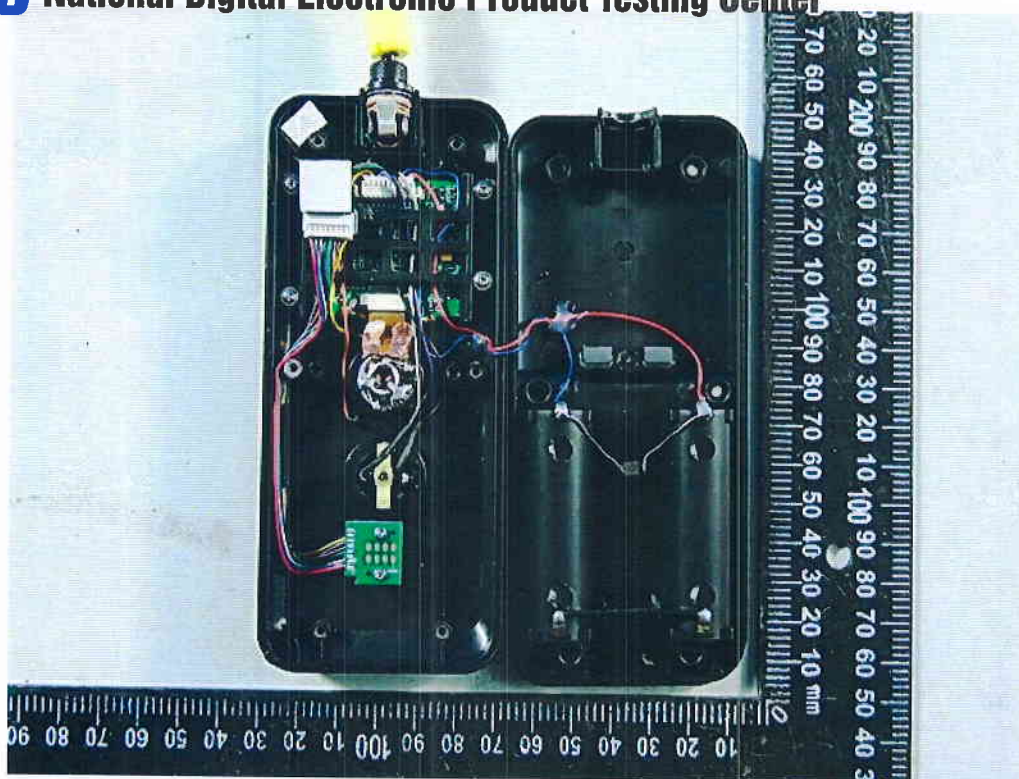


Photo 4 Inside of EUT

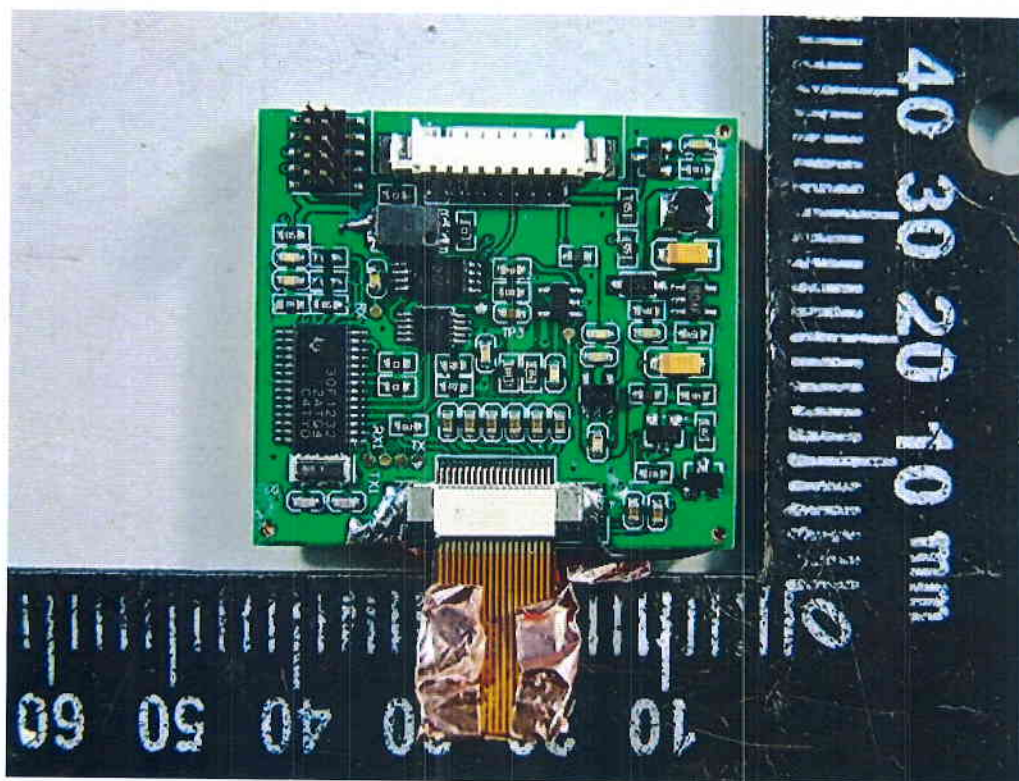


Photo 5 Inside of EUT

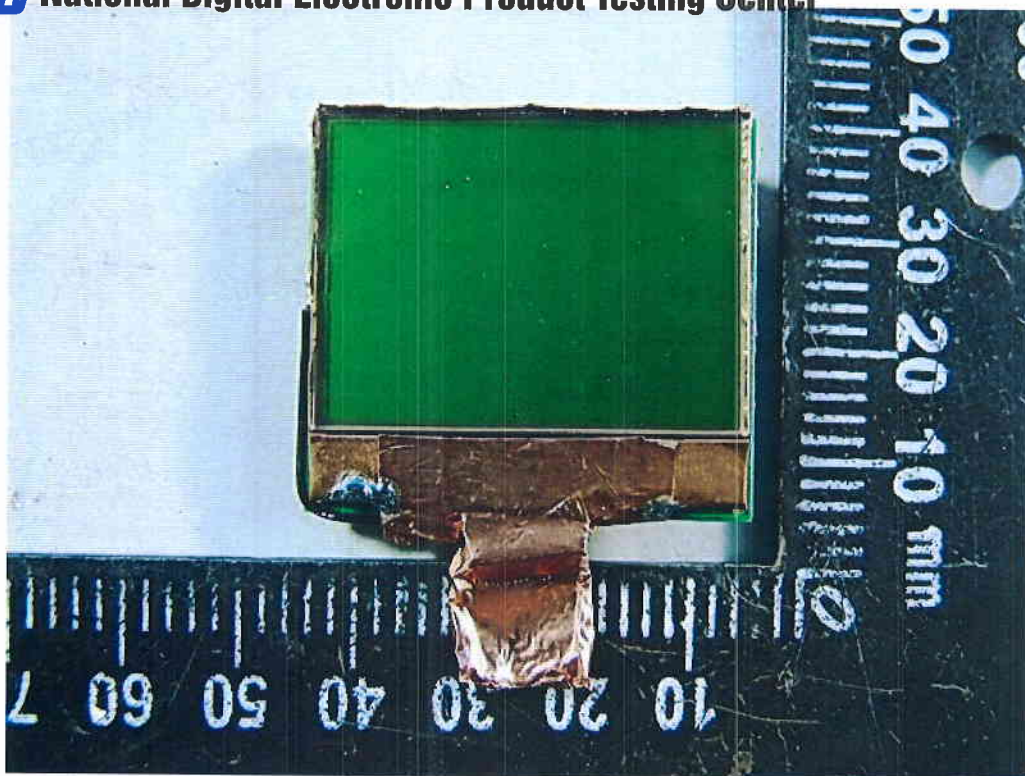


Photo 6 Connecting cable A of VN202

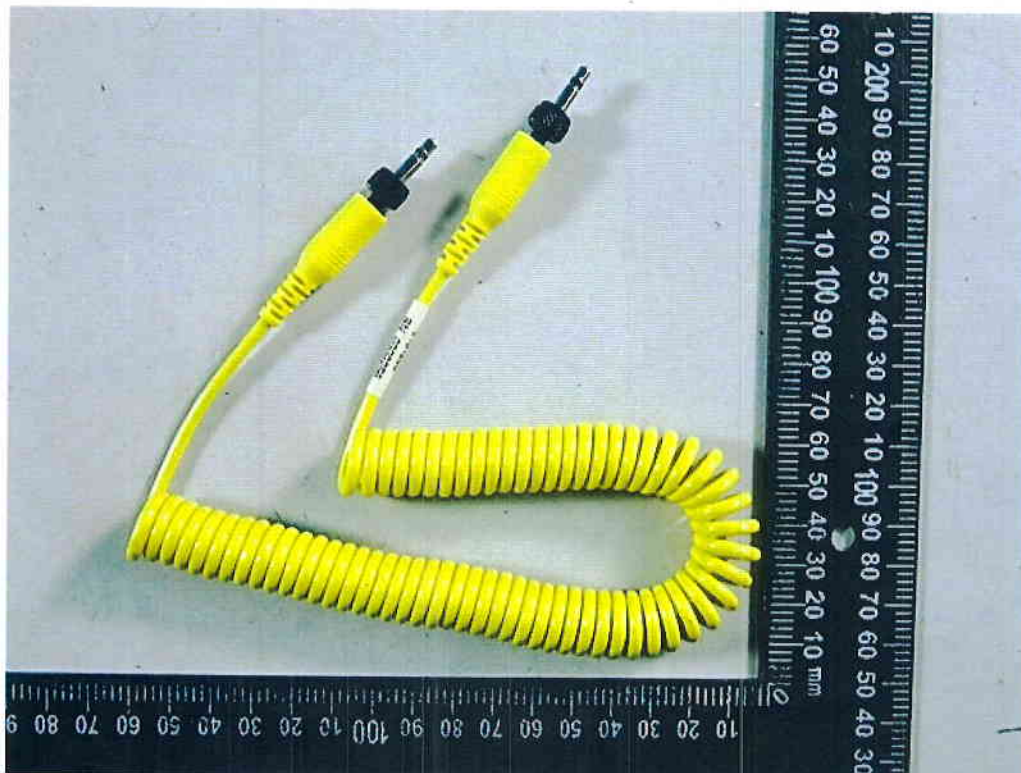
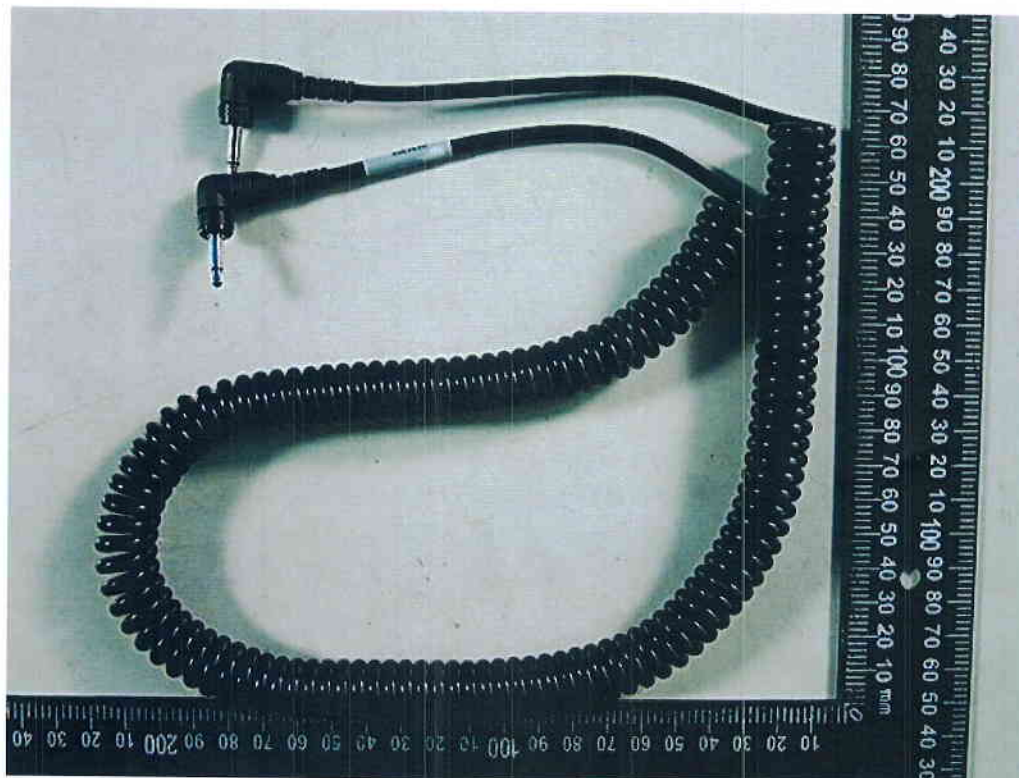


Photo 7 Connecting cable B of VN202



Photo 8 Connecting cable C of VN202





APPENDIX III EXAMPLE OF GUIDANCE AND MANUFACTURER'S

DECLARATION

Guidance and manufacturer's declaration

Guidance and manufacturer's declaration – electromagnetic emissions		
The VN202 are intended for use in the electromagnetic environment specified below. The customer or the user of the VN202 should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	The VN202 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The VN202 are suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Not applicable	



Guidance and manufacturer's declaration – electromagnetic immunity


The VN202 are intended for use in the electromagnetic environment specified below. The customer or the user of the VN202 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6kV Contact ±8kV Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %. If ESD interfere with the operation of equipment, counter measurements such as wrist strap, grounding shall be considered.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines	Not applicable	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	Not applicable	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % UT (>95 % dip in UT) for 0,5 cycle 40 % UT (60 % dip in UT) for 5 cycles 70 % UT (30 % dip in UT) for 25 cycles <5 % UT (>95 % dip in UT) for 5 sec	Not applicable	Mains power quality should be that of a typical commercial or hospital environment. If the user of the VN202 requires continued operation during power mains interruptions, it is recommended that the VN202 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.



Guidance and manufacturer's declaration – electromagnetic immunity

The VN202 is intended for use in the electromagnetic environment specified below. The customer or the user of the VN202 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	Not applicable	Portable and mobile RF communications equipment should be used no closer to any part of the VN202, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2 \sqrt{P}$ $d = 1.2 \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2.3 \sqrt{P} \quad 800 \text{ MHz to } 2,5 \text{ GHz}$ where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3V/m	



Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM –
For EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Recommended separation distances between Portable and mobile RF communications equipment and the VN202

The VN202 are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the VN202 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the VN202 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1.16 \sqrt{P}$	80 MHz to 800 MHz $d = 1.16 \sqrt{P}$	800 MHz to 2.5 GHz $d = 2.33 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.