

TEST REPORT



CISPR 22

Electromagnetic Compatibility – Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.

Test Report

Reference No. : **4786340646-EB00**

Checked by (+ signature) : Richard Takau
Project Engineer

Approved by (+ signature) : Vinesh Chand
IANZ Signatory

Date of issue : 25 March 2014

Date of testing : 12 and 18 March 2014

Contents : 13 pages

Laboratory details

Name : **UL International New Zealand Ltd**

Physical Address : 10 Vanadium Place, Middleton, Christchurch, New Zealand

Contact Details : Telephone (+64) 3 940 4400 Facsimile (+64) 3 940 4411

Test specification

Standard : IEC CISPR 22, Ed. 6.0 (2008)
EN 55022:2011
AS/NZS CISPR 22:2009/A1:2010
FCC 47 CFR, Part 15.107
FCC 47 CFR, Part 15.109

Client details

Applicant : Enphase Energy

Address : 9 Baigent Way, Middleton, Christchurch 8024, New Zealand

Product details

(see additional details on page 3)

Type of test object : Micro Inverter

Model/type reference : M250-60-230-S22

Rating : 240 Watts

Accreditation details



International Accreditation New Zealand (IANZ) has a Mutual Recognition Agreement (MRA) with the National Association of Testing Authorities, Australia (NATA) such that both organisations recognise accreditations by IANZ and NATA as being equivalent.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

The issuance of this report in no way implies Listing, Classification or Recognition by UL and does not authorize the use of UL Listing, Classification or Recognition Marks or any other reference to UL on or in connection with the product or system. You cannot use this test data or UL's name or marks in connection with any product, packaging, advertising, promotion or marketing without UL's prior written permission. Please be informed that UL neither selected the sample nor determined whether the sample was representative of production samples. The test results apply only to the actual samples tested.

Revision 121127



Possible results
 Test case does not apply to the test object..... : N(.A.)
 Test sample does meet the requirement : P(Pass)
 Test sample does not meet the requirement : F(Fail)

Marginal notations
 AS/NZS : AS/NZS deviation from the IEC standard

Abbreviations
 EUT : Equipment under test

General remarks
 "(see remark #)" refers to a remark appended to the report.
 "(see appended table)" refers to a table appended to the report.
 "(see appended results)" refers to results appended to the report.
 The test results presented in this report relate only to the sample tested.
 The test sample was provided by the client and was tested as submitted.
 This report does not contain corrections or erasures.
 All measurements within this test report are made using instruments with accuracy in accordance with IEC/IEC CTL Decision Sheet DSH 251B. A detail of specific measurement uncertainty is available upon request.
 This report shall not be reproduced except in full without the written approval of the testing laboratory.

Specific remarks
 Test Methods: ANSI C63.4
 Tested to the provisions of the applied standard to Class B disturbance limits.

Statement of results

Clause	Requirement - Test	Verdict
5.1	Frequency range 148.5 kHz to 30 MHz (conducted emissions)	P
6.1	Frequency range 30 to 1000 MHz (radiated emissions)	P



Product details	
Classification of equipment.....:	Inverter
Device type.....:	Micro Inverter
Accessories / detachable parts	None
Highest Clock Frequency	25 MHz
Other options included.....:	None
Serial number or identification	121408024339
Mains or power interface	
Electrical class	I
Rated supply voltage	Full power range 27 – 39V d.c input; 240V a.c output
Rated current / power	240 Watts
Frequency	50Hz
Phases.....:	1
Other interface (signal, control and data terminals, terminals for ancillary devices)	
D.C. input port	
EUT operation modes used for testing	
Converting d.c to mains voltage	Normal Operation
EUT configurations	
Converting d.c to mains voltage	Normal Operation
Test equipment used	
Refer individual test results	
General comments	
<p>The Enphase Micro-inverter M250-60-230-S22 (s/n 121408024339), enclosure was made of aluminium material. The PCB was version 0602 and the software was: PCT: 541-00047-r01-v01.16.00 Processor load: 520-00045-r01-v01.18.01 Parameter table: 540-00061-r01-v01.18.02</p> <p>In a typical installation, power to the unit would be supplied via photovoltaic solar cells.</p>	



Test and measuring results

Measurement of disturbance voltage (148.5 kHz - 30 MHz)

Continuous RF disturbances (148.5 kHz - 30 MHz)

General information about the test:

Tested by:	Vinesh Chand
Test date:	18 March 2014

Instruments:

Inventory number	Description	Manufacturer	Type
RCV03	Test receiver	Rohde & Schwarz	ESCS 30
LSN01	Artificial mains network	Rohde & Schwarz	ESH2-Z5
TL1120	Pulse limiter	Rohde & Schwarz	ESH3-Z2
DMM12	True RMS multimeter	Fluke	23
02-E-00076/43	Environmental monitor	Omega	iTHX-W

Information concerning the test:

Test set-up:	Refer to photos in the appendix.
Operating modes used:	Normal operation with various input voltages.
Mains voltage	Output 230V AC

Result: **PASS**

Environmental conditions:

Parameter	Rated value	Measured value
Ambient temperature:	15 °C - 35 °C	23 °C
Atmospheric pressure:	(860 - 1060) hPa	1013 hPa
Relative humidity:	30 % - 60 %	31 %



Measurement of radiated RF disturbance (30 - 1000 MHz)

Continuous RF disturbances (30 MHz - 1000 MHz)

General information about the test:

Tested by:	Vinesh Chand
Test date:	12 March 2014

Instruments:

Inventory number	Description	Manufacturer	Type
RCV03	Test receiver	Rohde & Schwarz	ESCS-30
TL1229	Bilog antenna	Schaffner	CBL 6141A
OATS	Open area test site	-	-
02-E-00044	Weather station	Omega	iTHX-W

Information concerning the test:

Test set-up:	Refer to photos in the appendix.
Operating modes:	Normal operation with various input voltages.
Operating voltage	Output 230V AC

Result: **PASS**

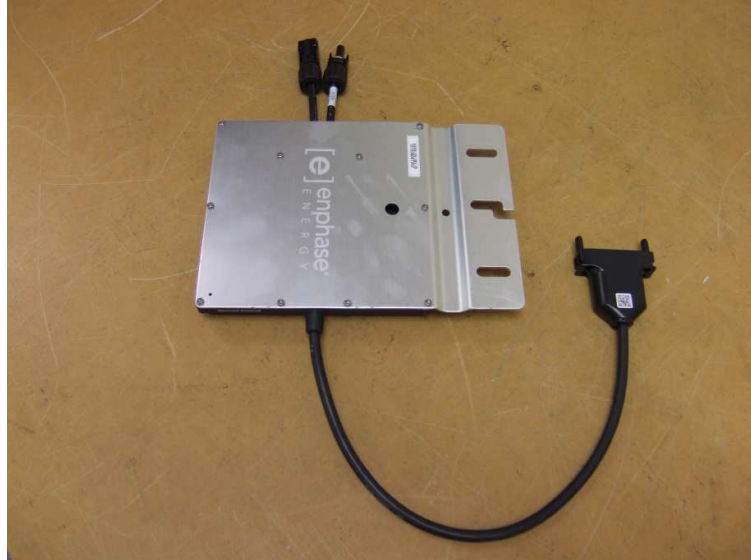
Environmental conditions:

Parameter	Rated value	Measured value
Ambient temperature:	15 °C - 35 °C	21 °C
Atmospheric pressure:	(860 - 1060) hPa	1009 hPa
Relative humidity:	30 % - 60 %	34 %

Appendix

Photos

Overall view

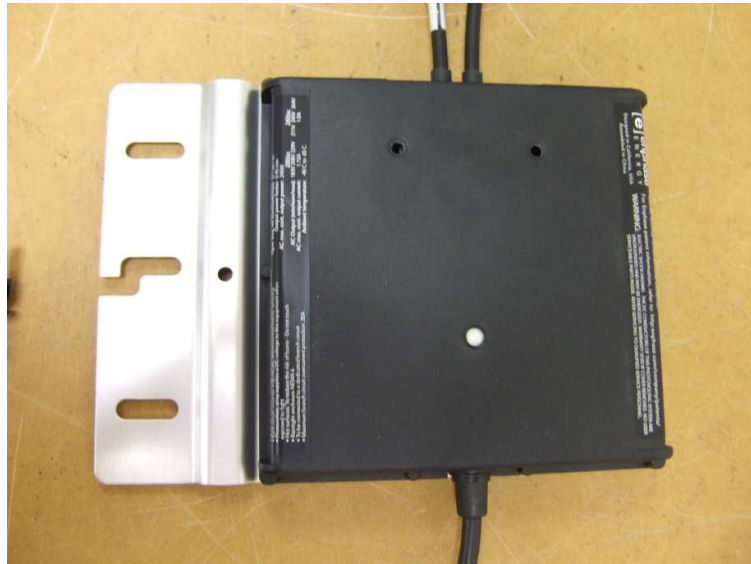


Rear View

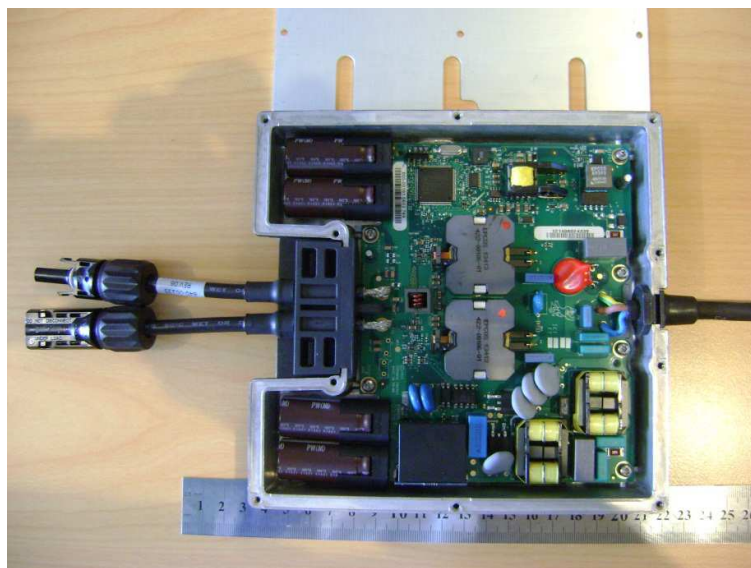




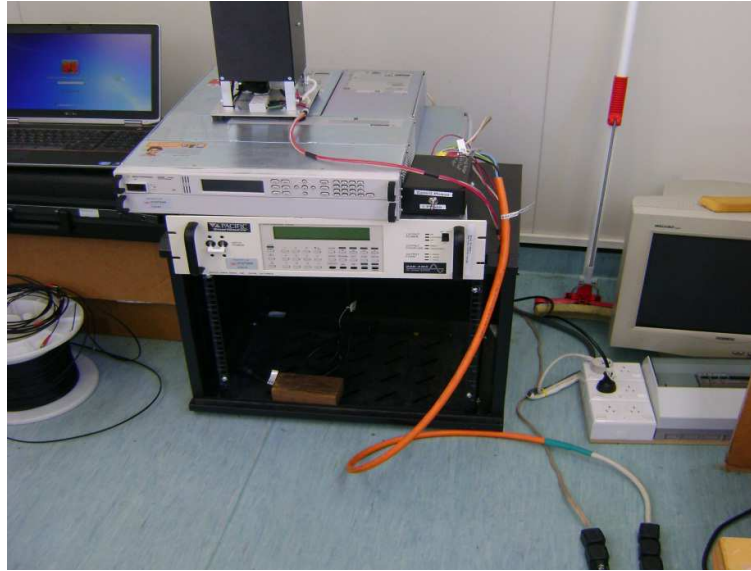
Front view



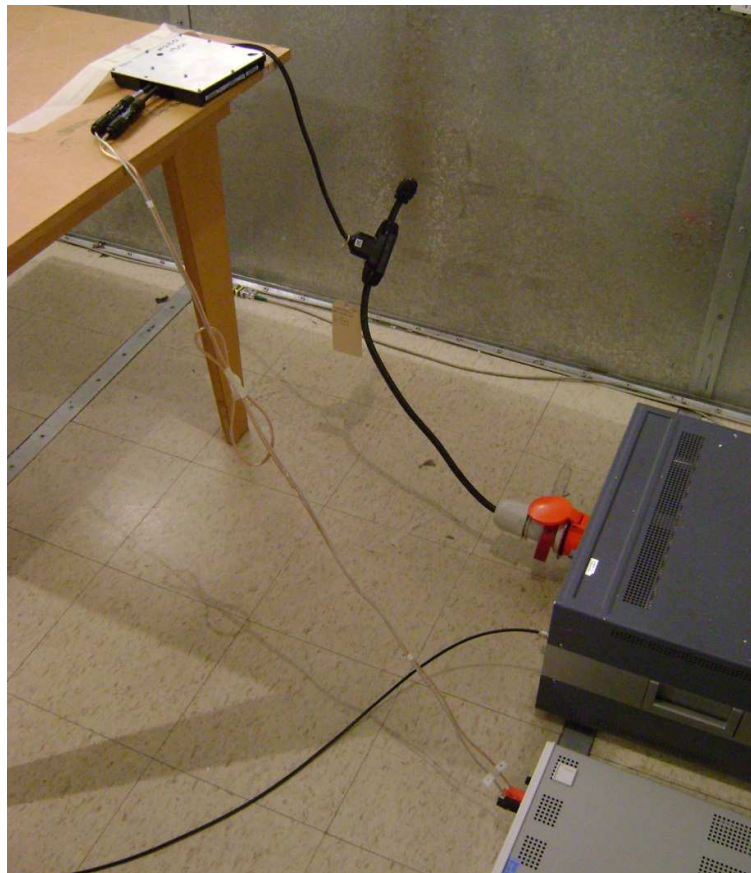
PCB View



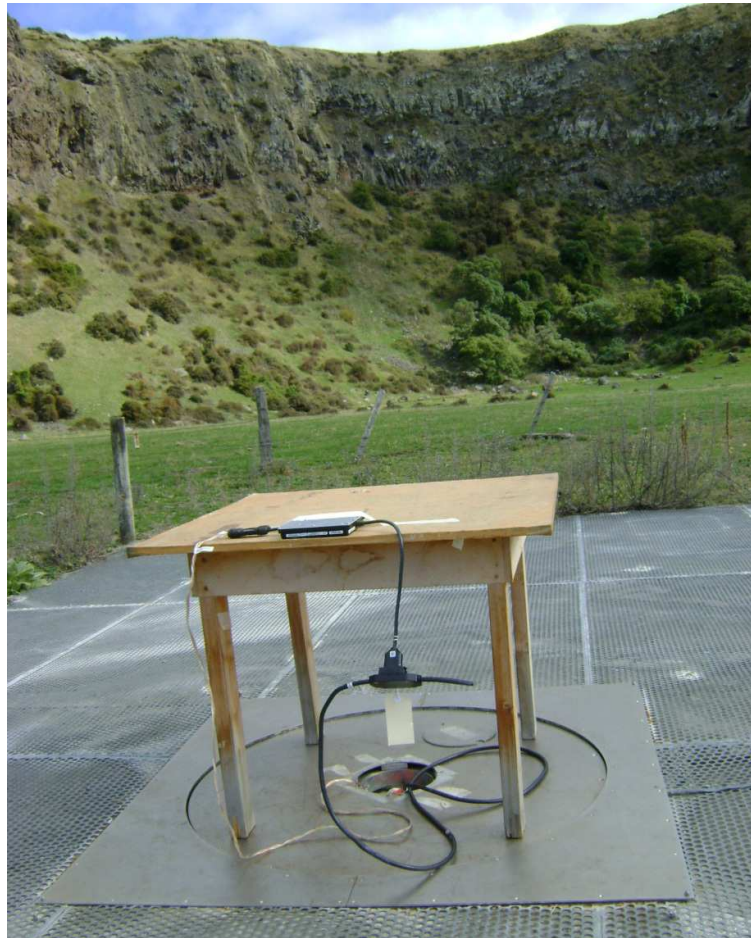
Auxiliary equipment used during testing



Conducted emissions setup



Radiated emissions setup



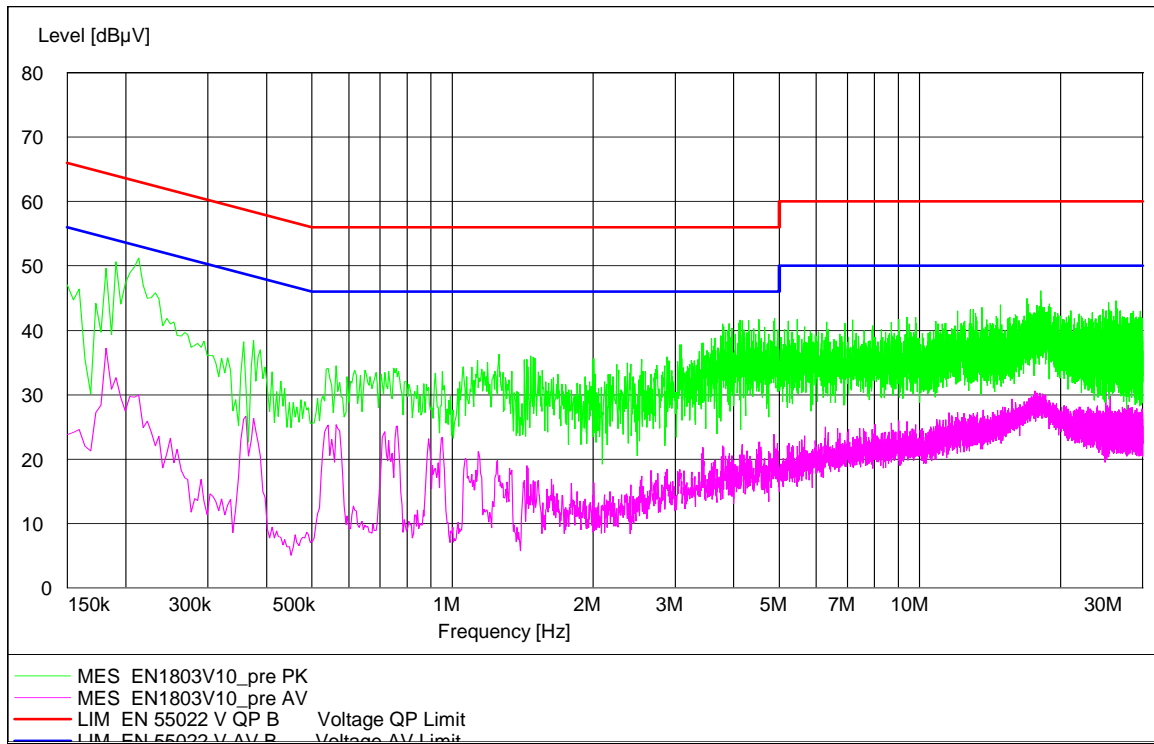


Conducted emission results

EUT: Micro Inverter Model M250-60-230-S22
 Manufacturer: Enphase
 Operating Condition: 39V d.c., 230V a.c @ 245W
 Test Site: Shielded Room
 Operator: Vinesh Chand
 Test Specification: CISPR 22
 Comment: Simulated normal operation
 SN 121408024339

SCAN TABLE: "3-P LISN ESCSFin"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	100.0 ms	200 Hz	ESH2-Z5 Feb 10
150.0 kHz	30.0 MHz	4.5 kHz	QuasiPeak Average	1.0 s	9 kHz	ESH2-Z5 Feb 10

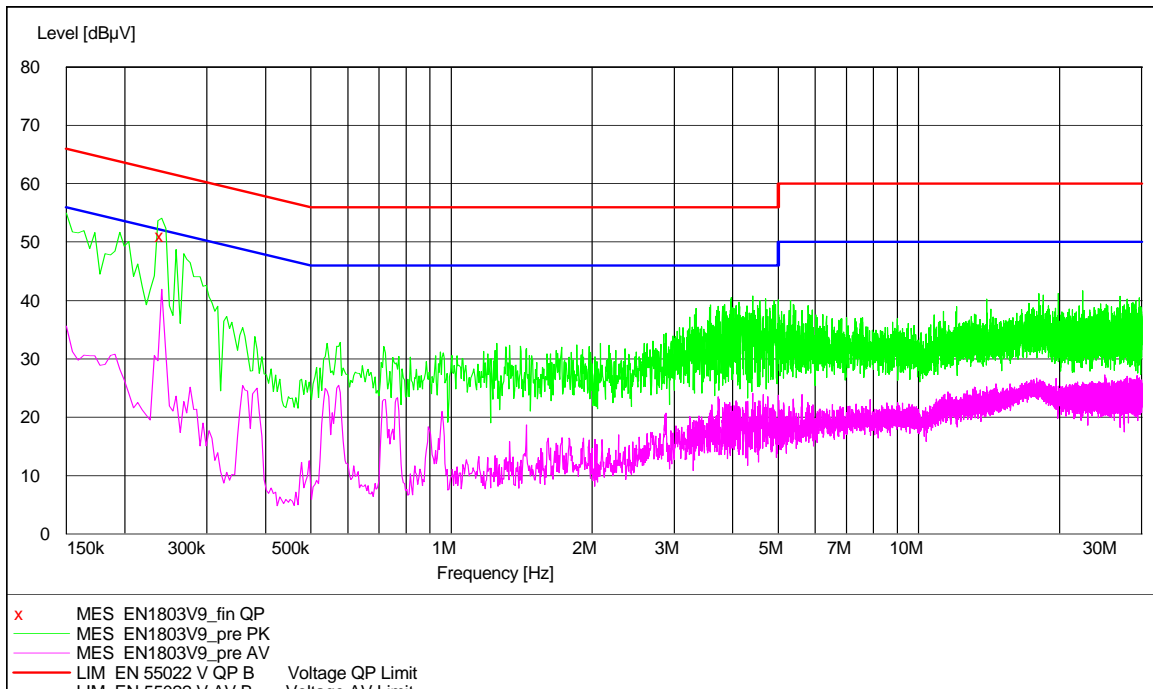




EUT: Micro Inverter Model M250-60-230-S22
 Manufacturer: Enphase
 Operating Condition: 27V d.c., 230V a.c @ 245W
 Test Site: Shielded Room
 Operator: Vinesh Chand
 Test Specification: CISPR 22
 Comment: Simulated normal operation
 SN 121408024339

SCAN TABLE: "3-P LISN ESCSFin"

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9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	100.0 ms	200 Hz	ESH2-Z5 Feb 10
150.0 kHz	30.0 MHz	4.5 kHz	QuasiPeak	1.0 s	9 kHz	ESH2-Z5 Feb 10
			Average			



QUASI PEAK MEASUREMENT RESULT: "EN1803V9_fin QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.240000	51.00	9.9	62	11.1	L1	GND

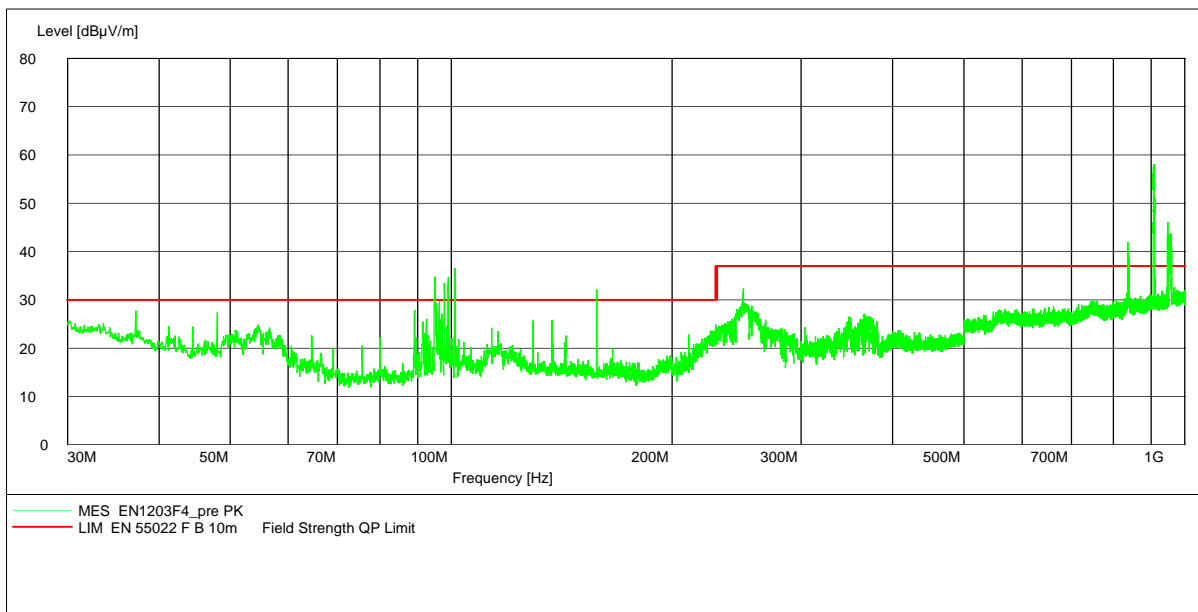


Radiated emission results

EUT: Micro Inverter Model M250-60-230-S22
Manufacturer: Enphase
Operating Condition: 27V d.c., 230V a.c @ 245W
Test Site: Birdlings Flat Open Area Test Site
Operator: Vinesh Chand
Test Specification: CISPR 22
Comment: Simulated setup
SN121408024339

SCAN TABLE: "EN 55022 Field 10m"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	2.0 ms	120 kHz	BILOGTL1229



EUT with no emissions:

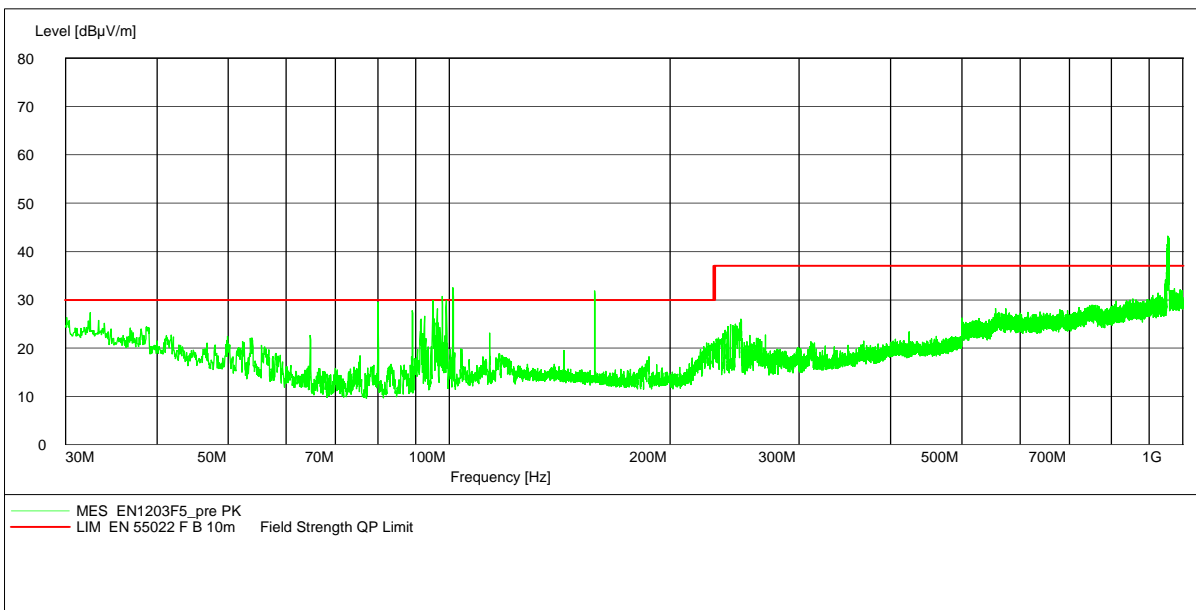
*No detectable emissions were measured from the EUT. All peaks above or within 6dB of the limit line were verified to be ambient.



EUT: Micro Inverter Model M250-60-230-S22
 Manufacturer: Enphase
 Operating Condition: 39V d.c., 230V a.c @ 245W
 Test Site: Birdlings Flat Open Area Test Site
 Operator: Vinesh Chand
 Test Specification: CISPR 22
 Comment: Simulated setup
 SN121408024339

SCAN TABLE: "EN 55022 Field 10m"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	2.0 ms	120 kHz	BILOGTTL1229



EUT with no emissions:

*No detectable emissions were measured from the EUT. All peaks above or within 6dB of the limit line were verified to be ambient.

END OF REPORT