TEST REPORT CONCERNING THE COMPLIANCE OF A DIGITAL TRANSMISSION SYSTEM, BRAND AMBIENT, MODEL GW3030v2, WITH THE STANDARDS: 47 CFR PART 15B (10-1-14 Edition) AND ICES-003 (Issue 5, August 2012)

FCC listed : 90828
Industry Canada : 2932G-2
R&TTE, LVD, EMC Notified Body : 1856

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MEASUREMENT/TECHNICAL REPORT

DIGITAL TRANSMISSION SYSTEM,
BRAND ambient
MODEL GW3030v2

FCC ID: XGR-GW3000V2
IC: 8398A-GW3000V2

This report concerns: ~~Original grant/certification Class 2 change~~ Verification

Equipment type: Digital Device

Report prepared by:

Name	: R. van der Meer
Company name	: TÜV Rheinland Nederland B.V.
Address	: Eiberkamp 10
Postal code/city	: 9351 VT Leek
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15B (10-1-2014 Edition) and ICES-003 (Issue 5, August 2012) applying the measurement procedures of ANSI C63.4-2014. TÜV Rheinland Nederland B.V. at Leek, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: April 02, 2015 Signature:

Ties E.T. Koning
Senior Engineer EMC

Description of test item

Test item	:	Digital Transmission System
Manufacturer	:	Ambient Systems B.V.
Brand	:	ambient
Model	:	GW3030v2
Serial number(s)	:	--
FCC ID	:	XGR-GW3000V2
IC	:	8398A-GW3000V2

Applicant information

Company	:	Ambient Systems B.V.
Address	:	Demmersweg 66
Postal code	:	7559 BN
City	:	Hengelo (Ov)
Country	:	Netherlands
Telephone number	:	+31(0)882624368
Telefax number	:	+31(0)882624399
Email		info@ambient-systems.net

Test(s) performed

Location	:	Leek
Test(s) started	:	March 25, 2015
Test(s) completed	:	April 02, 2015
Purpose of test(s)	:	Compliance with relevant standards
Test specification(s)	:	47 CFR Part 15B (10-1-14 Edition) and ICES-003 (Issue 5, August 2012)
Test engineer(s)	:	R. van der Meer 
Report written by	:	R. van der Meer 
Report date	:	April 02, 2015

Table of contents

1 General information.

1.1 Description of EUT.

The Digital Transmission System brand ambient, model/type: GW3030v2, will be referred to as EUT for the purpose of this test report.

The product identical (model MR3000v2) to EUT (but not included in the tests) is described in the annexed Letter of Similarity. The judgment of the conformity of the model MR3000v2 is outside of the scope of TÜV Rheinland Nederland B.V.

Photo 1: photo of the EUT

1.2 Related submittal(s) and/or Grant(s).

1.2.1 General.

Not applicable

1.2.2 Description of test configuration.

Test item EUT	:	Digital Transmission System (Digital Device)
Manufacturer	:	Ambient Systems B.V.
Brand	:	ambient
Model	:	GW3030v2
Serial number	:	n.a.
Power	:	5 - 48 Vdc
Auxiliary item AUX1	:	Laptop
Brand	:	HP
Model	:	Compaq 610
Remarks	:	--
Auxiliary item AUX2	:	Power supply
Brand:	:	HN Power Germany
Model:	:	HNP06-090
Serial Number	:	--
Input	:	100-240 Vac 50/60 Hz 0.3A
Output	:	9.0 Vdc 670mA
Remark	:	used to power EUT
AUX3		
Product	:	USB to RS-232 converter
Brand	:	--
Model	:	UC-232A
Serial Number	:	--
Remark	:	for communication between AUX1 and EUT

1.2.3 Description of tested input and output ports.

No.	Port	From	To	Remarks
1.	Mains	Mains	Laptop (AUX1)	Unshielded cable <3m
2.	Data com.	Laptop USB	EUT	Shielded cable <1m; (either by USB or USB > RS-232)
3.	DC power	AUX2	EUT	Unshielded cable <3m
4.	Antenna port	EUT	Spectrum analyzer	Conducted tests, shielded cable 30cm

Table 1

1.3 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15B (10-01-14 Edition), sections 15.107 and 15.109 (Class B digital devices, verification), including ICES-003 (Issue 5, August 2012) requirements.

The test methods, which have been used, are based on ANSI C63.4: 2014.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.4 Test Summary

The EUT was tested in accordance with the specifications given in the table below.

Test Standard		Description		Pass / Fail
47 CFR Part 15 Subpart B (10-1-14 Edition)	ICES-003 Issue 5, August 2012		Page	
15.107(a)	Section 6.1 Table 2	Conducted emissions	13 – 15	Pass
15.109(a)	Section 6.2.1 Table 5	Radiated emissions	10 – 12	Pass

Table : testspecifications

Testmethods: ANSI C63.4-2014

1.5 Test facility.

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland Nederland B.V. , located in Leek, 9351 VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-2. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

1.6 Test conditions.

Normal test conditions:

Temperature (*) : 18 - 23 °C
Relative humidity(*) : 30 % to 50 %
Supply voltage : 120 V AC/60 Hz to the Power Supply
Air pressure : 950 – 1050 hPa

When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2 System test configuration.

2.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 2014.

2.2 EUT mode of operation.

Operation mode 1: Active. The EUT is in operational function

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance.

2.4 Equipment modifications.

No modifications have been made to the tested equipment in order to achieve compliance.

2.5 Product Labeling and other required texts

The device shall bear the following statement in a conspicuous location on the device:
This device complies with part 15 of the FCC Rules and ICES-003 Canadian Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

2.6 Block diagram of the EUT.

The block diagram is available at Benchmark Electronics

2.7 Schematics of the EUT.

The schematics are available at Benchmark Electronics

2.8 Part list of the EUT.

The part list is available at Benchmark Electronics

3 Radiated field strength measurements (30 MHz – 1 GHz, E-field)

RESULT: PASS

Date of testing: 2015-04-02

Frequency range: 30MHz - 1000MHz

Requirements:

FCC 15.109(a) and IC ICES-003 section 6.2

Except for Class A digital devices, the field strength of radiated emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Test procedure:

ANSI C63.4-2014.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30 MHz to 1 GHz. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

3.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field), testresults.

Frequency [MHz]	Antenna Orientation	Level QP [dBµV/m]	Limit QP [dBµV/m]	Verdict [Pass/Fail]
32.478	Horizontal	37.2	40.0	Pass
53.974	Vertical	35.2	40.0	Pass
59.368	Vertical	38.0	40.0	Pass
108.520	Vertical	38.2	43.5	Pass
211.372	Vertical	41.0	43.5	Pass
218.190	Horizontal	42.1	46.0	Pass

Table 3 Results Radiated emission

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.109 (Class B digital devices, verification) and ICES-003 with the EUT operating in mode switched to generate maximum levels. Maximum level recorded of the total system.

Notes:

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

1. Measurement uncertainty is ±5.0 dB
2. The reported field strength values are the worst case values at the indicated frequency. The receiving antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
3. A Quasi-Peak detector was used with a resolution bandwidth of 120 kHz.

Test engineer

Signature :

Name : R. van der Meer

Date : April 02, 2015

3.2 Radiated field strength measurements (30 MHz – 1 GHz, E-field), testsetup photograph.

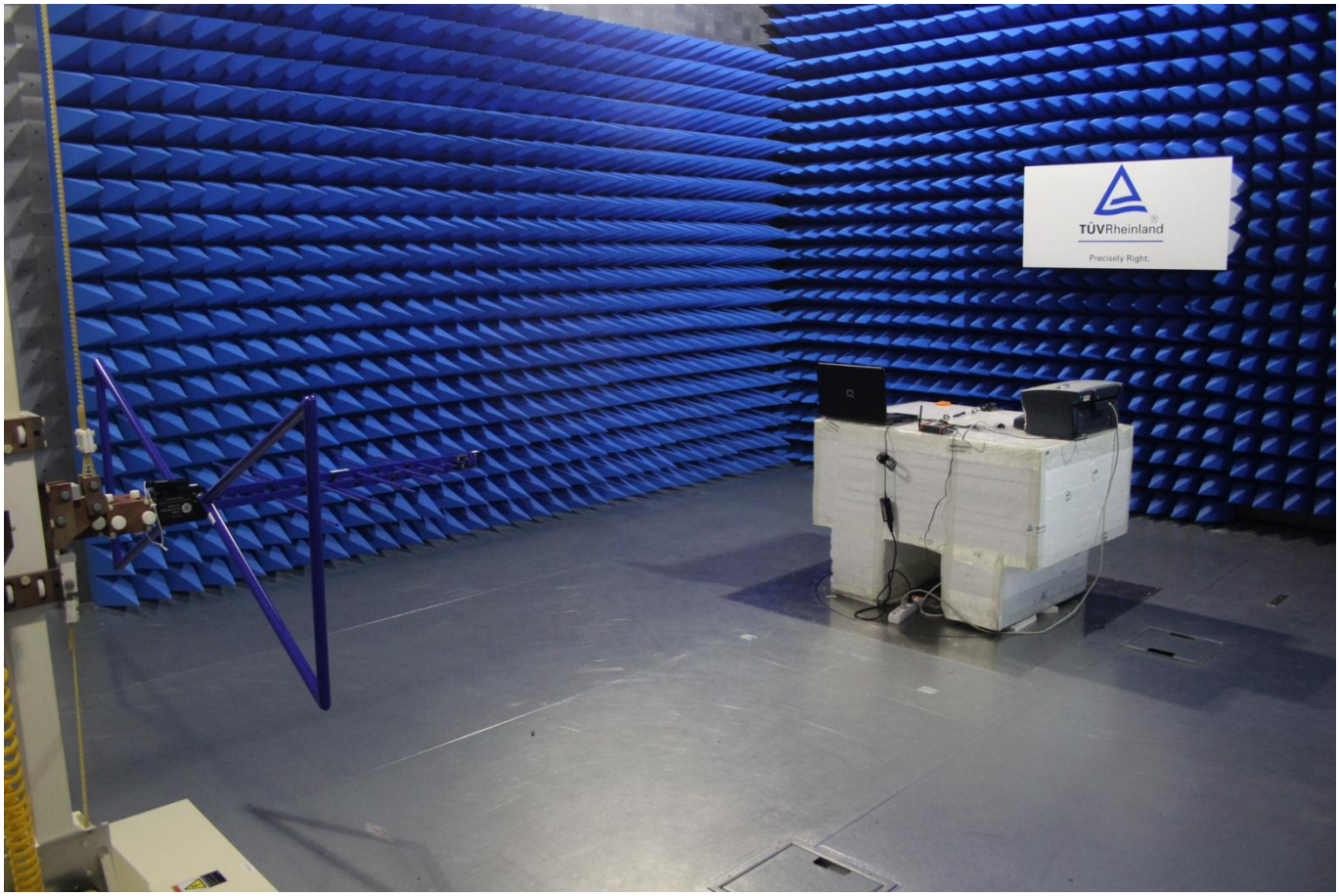

Photo 2a: Set-up RF Radiated emission

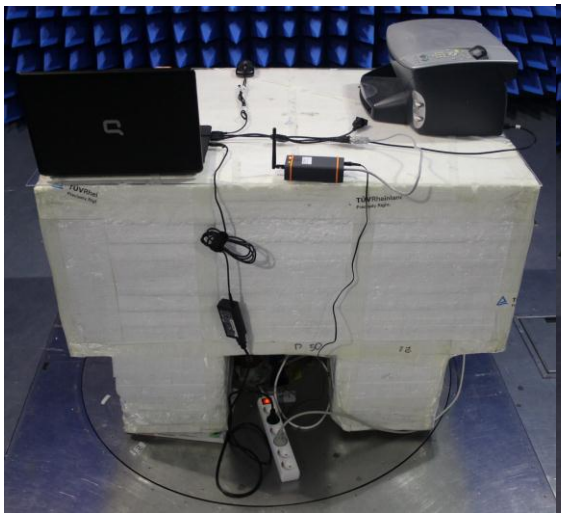

Photo 3b: tabletop set-up front view

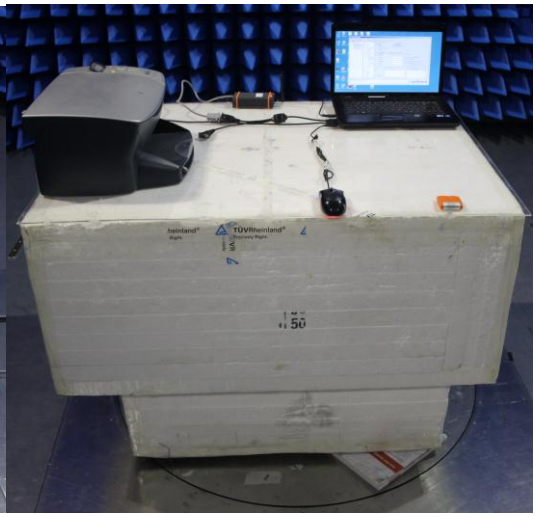

Photo 4c: tabletop Set-up rear view

4 AC Power Line Conducted emission data.

RESULT: PASS.

Date of testing: 2015-03-25

Requirements: for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted Limit (dBµV) Quasi-Peak	Conducted Limit (dBµV) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

*Decreases with the logarithm of the frequency.

Test procedure:

ANSI C63.4-2014.

Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a 50 µH / 50 Ω LISN. The frequency range from 150kHz to 30MHz was searched. The six highest EUT emissions relative to the limit were noted. The EUT was positioned at least 80cm from the LISN.

4.1 AC Power Line Conducted Emissions Testresults

Frequency (MHz)	Measurement results (dBµV) L1		Measurement results (dBµV) L2/Neutral		Limits (dBµV)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.150	57.8	33.2	56.4	33.5	66.0	56.0	Pass
0.215	43.7	28.2	42.9	32.5	62.8	52.8	Pass
0.245	44.8	28.7	46.6	36.4	61.8	51.8	Pass
0.328	45.3	29.5	48.0	37.2	59.5	49.5	Pass
0.420	43.8	29.2	47.8	41.3	57.3	47.3	Pass
0.518	44.7	30.1	47.6	37.8	56.0	46.0	Pass
10.600	45.5	35.7	47.3	40.4	60.0	50.0	Pass
14.450	50.1	40.5	52.4	45.7	60.0	50.0	Pass
21.260	45.5	39.8	47.5	41.4	60.0	50.0	Pass

Table 3a Results of the EUT with USB connection

Frequency (MHz)	Measurement results (dBµV) L1		Measurement results (dBµV) L2/Neutral		Limits (dBµV)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.150	57.5	34.4	56.9	34.3	66.0	56.0	Pass
0.215	41.1	26.0	43.9	31.5	62.8	52.8	Pass
0.255	46.8	30.8	46.9	34.2	61.4	51.4	Pass
0.328	44.5	30.3	46.5	37.2	59.5	49.5	Pass
0.420	44.1	31.2	47.4	38.7	57.3	47.3	Pass
0.518	43.8	31.1	45.8	36.2	56.0	46.0	Pass
0.670	43.1	28.3	44.5	35.7	56.0	46.0	Pass
1.855	39.9	25.7	40.4	30.3	56.0	46.0	Pass
21.285	37.5	24.4	40.1	29.0	56.0	46.0	Pass

Table 3b Results of the EUT with USB to RS-232 connection

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.109 (Class B digital devices, verification), at the AC mains connection terminals which were connected to the EUT, are depicted inTable 3a an 3b. Maximum values recorded. The system is tested as in whole, so with all equipment in place and functioning. Being the worst case situation and maximum results are reported.

Notes:

1. Measurement uncertainty is ±3.5 dB
2. The resolution bandwidth used was 9 kHz.

Test engineer

Signature :
Name : R. van der Meer
Date : March 25, 2015

4.1.1 AC Power Line Conducted Emissions Testsetup

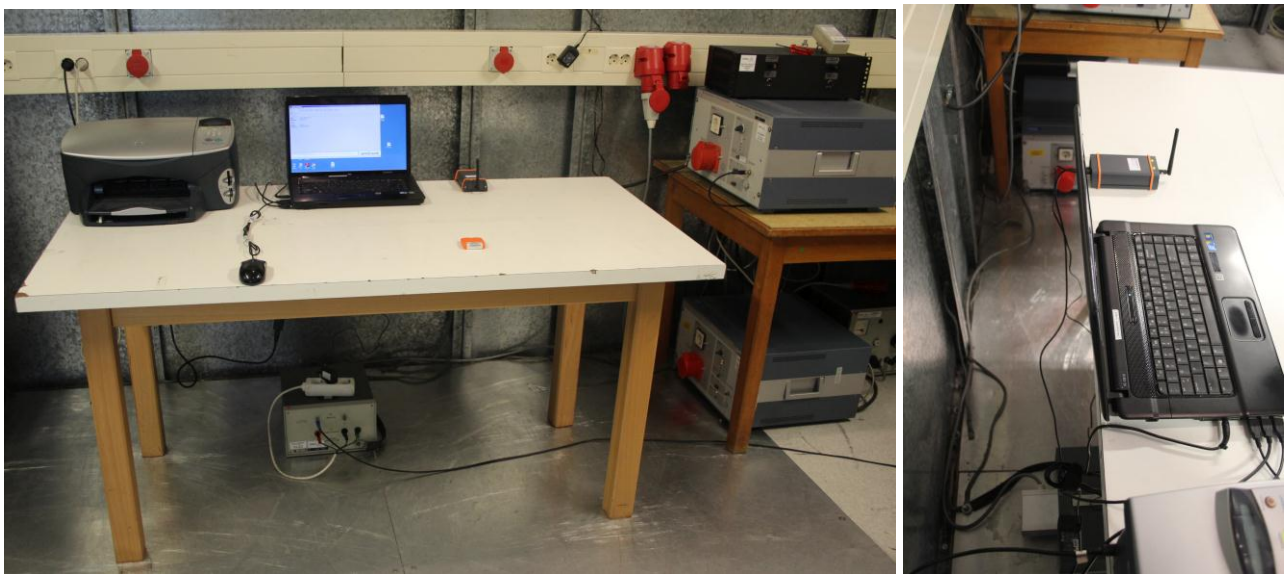

Photo 5a: Set-up for AC Power Line Conducted Emissions, EUT with USB connection

Photo 6b: Set-up for AC Power Line Conducted Emissions, EUT with Serial to USB connection

5 List of utilized test equipment.

Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	09/2014	09/2015
RF Cable S-AR <1GHz	Gigalink	APG0500	A00447	01/2015	01/2016
Controller	Maturo	SCU/088/ 8090811	A00450	N/A	N/A
Controller	EMCS	DOC202	A00257	N/A	N/A
Test facility	Comtest	FCC listed: 90828 IC: 2932G-2	A00235	04/2014	04/2017
Antenna mast	EMCS	AP-4702C	A00258	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	A00444	03-12/2015	03-12/2016
Biconilog Testantenna	Teseq	CBL 6111D	A00466	06/2014	06/2015
For AC Powerline Conducted Emissions					
Pulse limiter	R&S	ESH3-Z2	A00051	01/2015	01/2016
Variac	RFT	LSS020	A00171	NA	NA
LISN	EMCO	3625/2	A00022	01/2014	01/2016
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	09/2014	09/2015
Shielded room for Conducted emissions	--	--	A00437	NA	NA
Temperature-Humiditymeter	Extech	SD500	A00441	03-12/2015	03-12/2016

End of report

Ambient Systems B.V.
Attn Mr. L. van Hoesel
Demmersweg 66
7556BN Hengelo
The Nederlands

Date: 2014-11-14

Subject: Identical Equipment Declaration

To whom it may concern:

The RF portion of GW3030v2 is identical to the RF portion of MR3000v2 from hw/firmware point of view. MR3000v2 has no serial port and is a de-populated version of GW3030v2.

Yours sincerely

L. van Hoesel

L. van Hoesel
CTO