

TEST REPORT
ANSI C63.5-2006

(Revision of ANSI C63.5-2004)

American National Standard Electromagnetic Compatibility–Radiated
Emission Measurements in Electromagnetic Interference (EMI) Control–Calibration of
Antennas (9 kHz to 40 GHz)

Report Reference No. : 141752-2TRFEMC**Tested by (name + signature)** : Daniele Guarnone**Approved by (name + signature)** : Paolo Barbieri**Date of issue** : 2010-01-19**Testing Laboratory** : **Nemko Spa****Address** : Via del Carroccio, 4 – IT 20046 Biassono (MB)**Testing location** : Nemko Spa**Address** : Via del Carroccio, 4 – IT 20046 Biassono (MB)**Applicant's name** : Pepperl+Fuchs s.r.l.**Address** : Via Delle Arti e Mestieri, 4 - I 20050 Sulbiate (MB) – Italy**Test specification:****Standard** : ANSI C63.5-2006

Full application of the standards

☐

Partial application of the standards

☒**Test procedure** : Nemko WM L0077, WM L0177 and WM L1002**Test Report Form No.** : --**TRF Originator** : Nemko Spa**Master TRF** : 2009-03**Nemko Spa, I-20046 Biassono MI, Italy. All rights reserved.**

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Test item description : Antenna Wireless Gateway**Trade Mark** :**Manufacturer** : Pepperl+Fuchs s.r.l.**Address of manufacturer** : Via Delle Arti e Mestieri, 4 - I 20050 Sulbiate (MB) – Italy**Model** : W-ANT-2400-2-ROD**Ratings** : --

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The test report merely corresponds to the test sample.*

Test Report No. :	141752-2TRFEMC	2010-01-19 Date of issue
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Short description of the EuT	Copy of marking plate
2.4GHz omnidirectional Antenna, 2dBi, N connector.	Not labelled
Number of tested samples:	1
Serial number:	--
Electromagnetic environment:	--
Equipment classification:	--
Accessories and detachable parts included:	--
Testing	
Date of receipt of test sample:	2009-12-16
Testing commenced on:	2009-12-16
Testing concluded on:	2010-01-15
Possible test case verdicts:	
test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)
Symbols used in this test report	
☒ The crossed square indicates that the listed condition, standard or equipment is applicable for this report. ☐ The empty square indicates that the listed condition, standard or equipment is not applicable for this report.	
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.	

Verdict according to the standards on page 4:	--
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1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

PT_164

Technical procedure for antenna gain measurements (1 to 18 GHz)

ANSI C63.5-2006

(Revision of ANSI C63.5-2004)

American National Standard Electromagnetic Compatibility–Radiated Emission Measurements in Electromagnetic Interference (EMI) Control–Calibration of Antennas (9 kHz to 40 GHz)

2 SUMMARY OF TEST RESULTS

Requirement – Test	Frequency range	Verdict
Antenna Gain and Radiation Diagram	2.4 GHz ÷ 2.5 GHz	--
GENERAL REMARKS		

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage:	☐	--	☐	--
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3.2 EuT operation modes

Mode	Description
1	The EUT has been supplied with unmodulated RF signals (2.4 GHz, 2.45 GHz, 2.5 GHz).

3.3 EuT configuration modes

Mode	Description
1	The antenna has been tested stand-alone

3.4 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
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*Note:

AC = AC Power Port

DC = DC Power Port

N/E = Non-Electrical

I/O = Signal/Control Input or Output Port

TP = Telecommunication Ports

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
AE	--	--	--	---

Note: * Use

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment (Not Subjected to Test)

SIM - Simulator (Not Subjected to Test)

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
I-20046 Biassono (MB)

Tests site/benches are in accordance with applicable standard/s, and have been utilized under Nemko Spa testing engineer

4.2 Environmental conditions

During the measurement the environmental conditions were:

Temperature: 18-33 °C

Humidity: 30-60 %

Atmospheric pressure: 860-1060 hPa

4.3 Test equipment used for the monitoring of the environmental conditions

<i>Equipment</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Serial N°</i>
Thermohygrometer data loggers	Testo	175-H2	20012380/305
Digital barometer	Haemmi	ZED 150/111.121	900301402/0013

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Antenna Gain and Radiation Diagram	Antenna distance 3m (30÷18000) MHz	± 3.0 dB	(1)

NOTES:

- (1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$ which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %.

5 TEST CONDITIONS AND RESULTS

5.1 Antenna Gain and Radiation Diagram

5.1.1 Photo documentation of the test set-up



5.1.2 Test method

The antenna gain has been derived by substitution against the reference dipole antenna (three antenna method). To calibrate the unknown antenna against the reference dipole antenna, first has been measured signal strength with the reference antenna. The antenna has been raised between 2.5 m and 4 m above the ground. The position in the 2.5 m to 4 m range where the signal amplitude was varying slowly with height has been noted. After the signal strength has been noted with the reference dipole antenna, the antenna being calibrated has been substituted for the reference dipole, keeping the antenna to be calibrated at exactly the same height and position, as was the reference dipole. (Scanning the receiving antennas in height while recording the maximum received). The ratio between the two measurements of the generated field strength is the difference (in dB) in the antenna gain between the reference antenna and the unknown antenna. If a lower signal is measured with the unknown antenna, the difference (in dB) shall be added to the antenna factor of the reference antenna to obtain the antenna gain of the unknown antenna. If the signal measured with the unknown antenna is larger than the signal measured with the reference antenna, the difference shall be subtracted from the antenna gain of the reference antenna to obtain the antenna factor of the unknown antenna. The radiation diagram of antenna has been derived rotating antenna under test (step = 5 degree) and measuring on receiver the amplitude of signal received versus degree. The procedure was repeated for vertical and horizontal polarization of antenna and at the frequency 2.4 GHz, 2.45 GHz and 2.5 GHz.

5.1.3 Test result

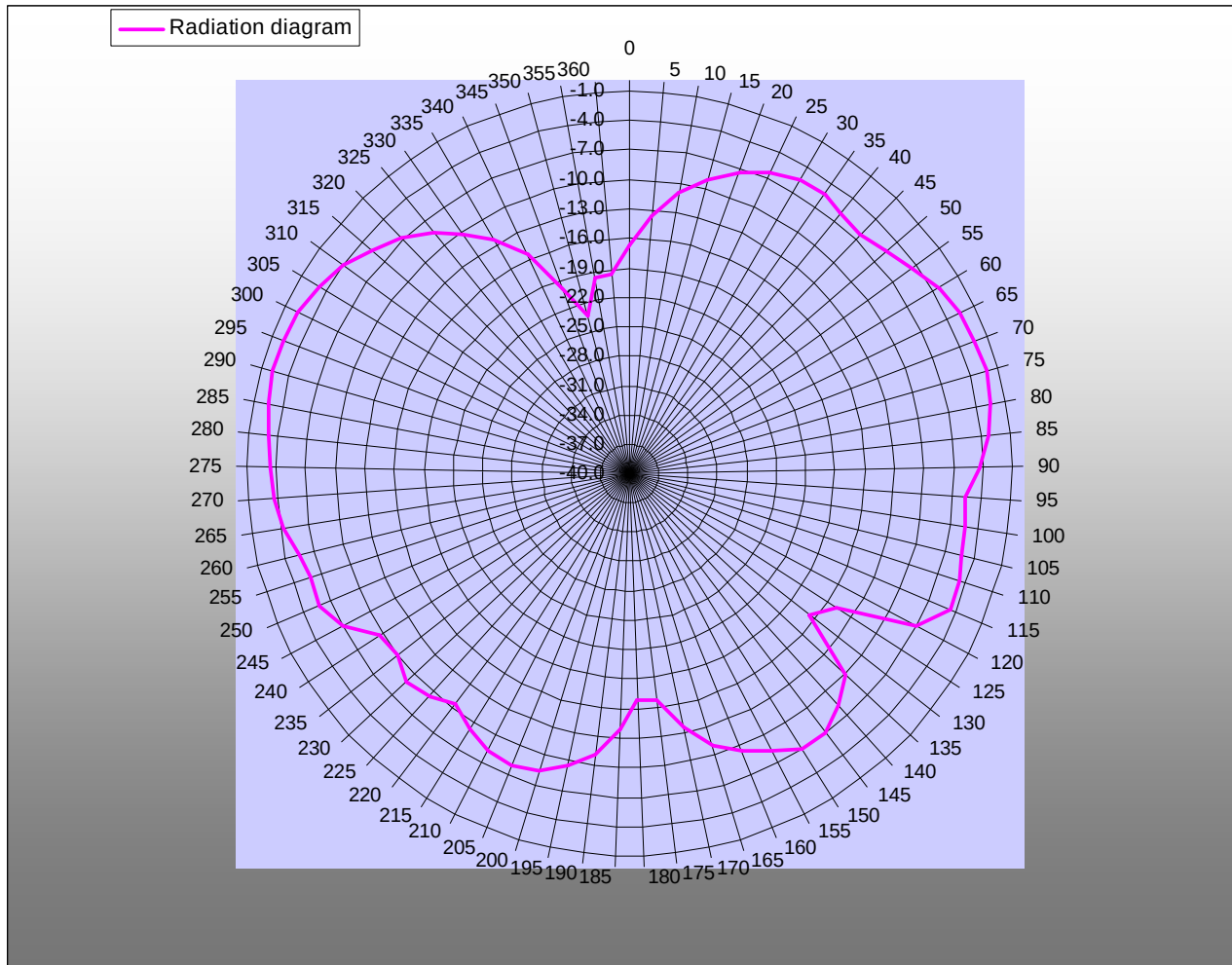
Frequency range:	2.4 GHz to 2.5 GHz
Kind of test site:	Semi anechoic Chamber
Measurement distance:	3 m
Remarks:	

5.1.4 Test protocol

Operation mode: 1
 Configuration mode: 1
 Remarks: Horizontal polarization

Verdict: --

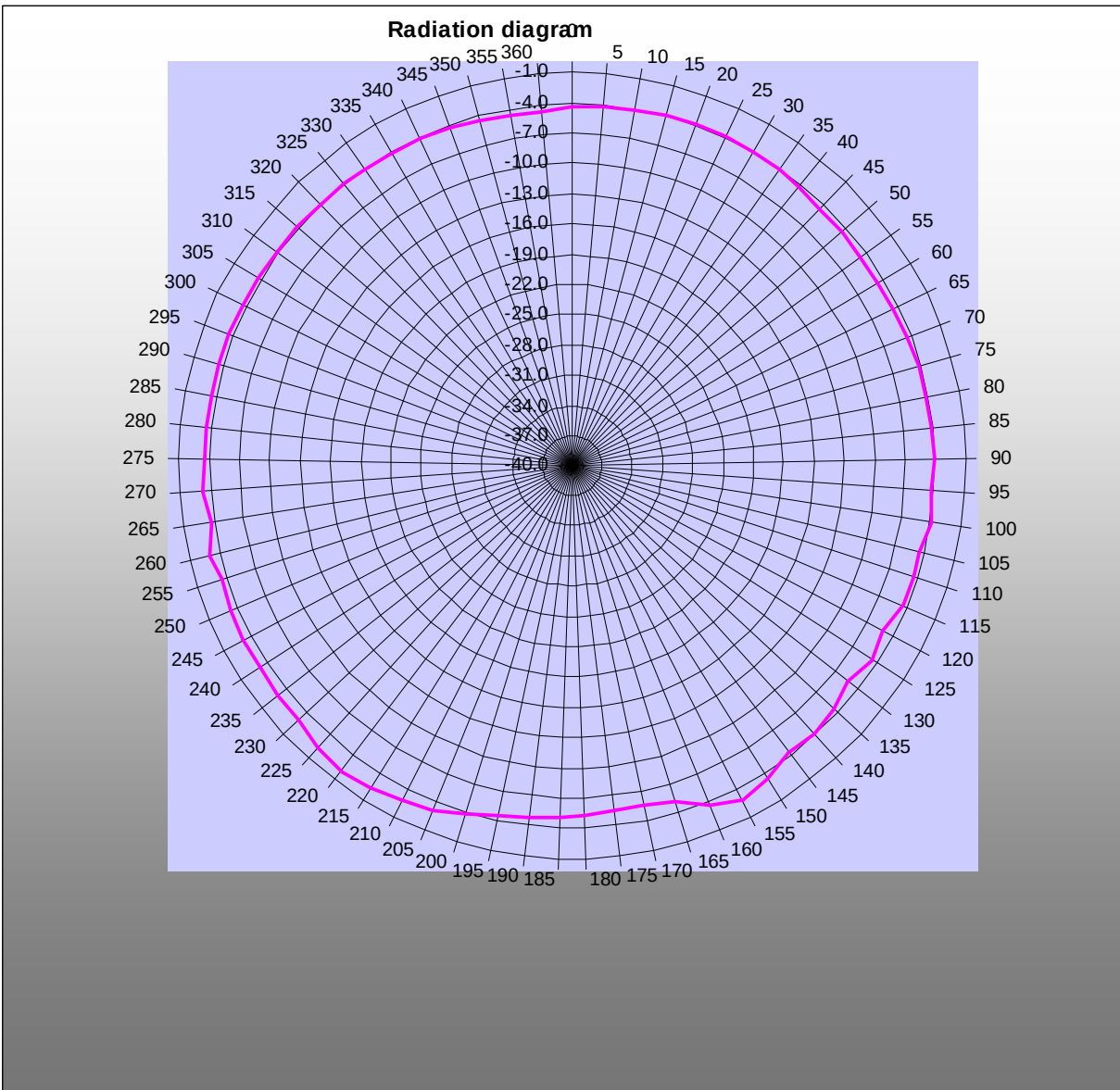
Antenna Gain: -2.1 dBi at 2.4 GHz (gain obtained at 290 degree)



Operation mode: 1
 Configuration mode: 1
 Remarks: Vertical polarization

Verdict: --

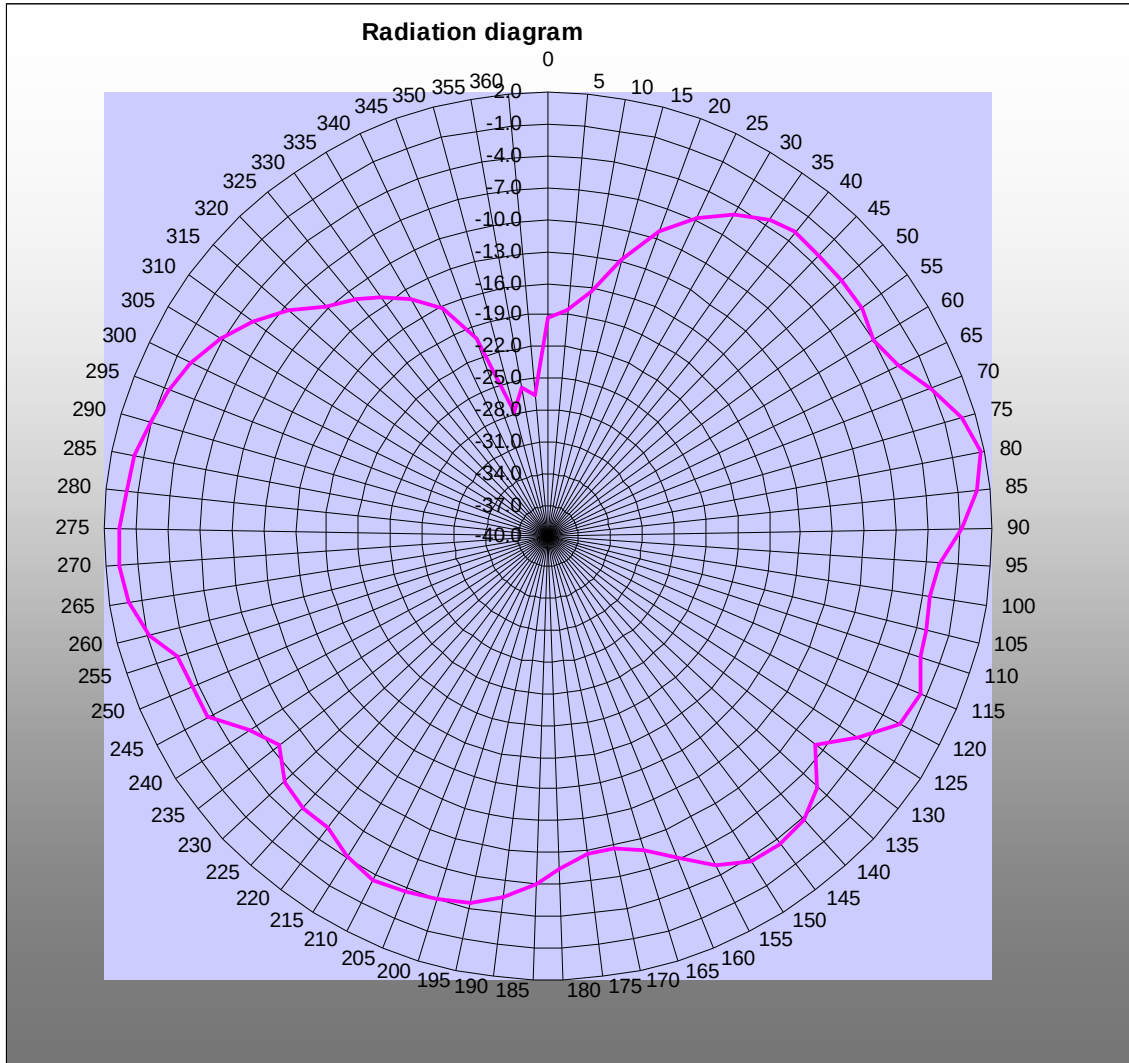
Antenna Gain: -2.1 dBi at 2.4 GHz (gain obtained at 220 degree)



Operation mode: 1
Configuration mode: 1
Remarks: Horizontal polarization

Verdict: --

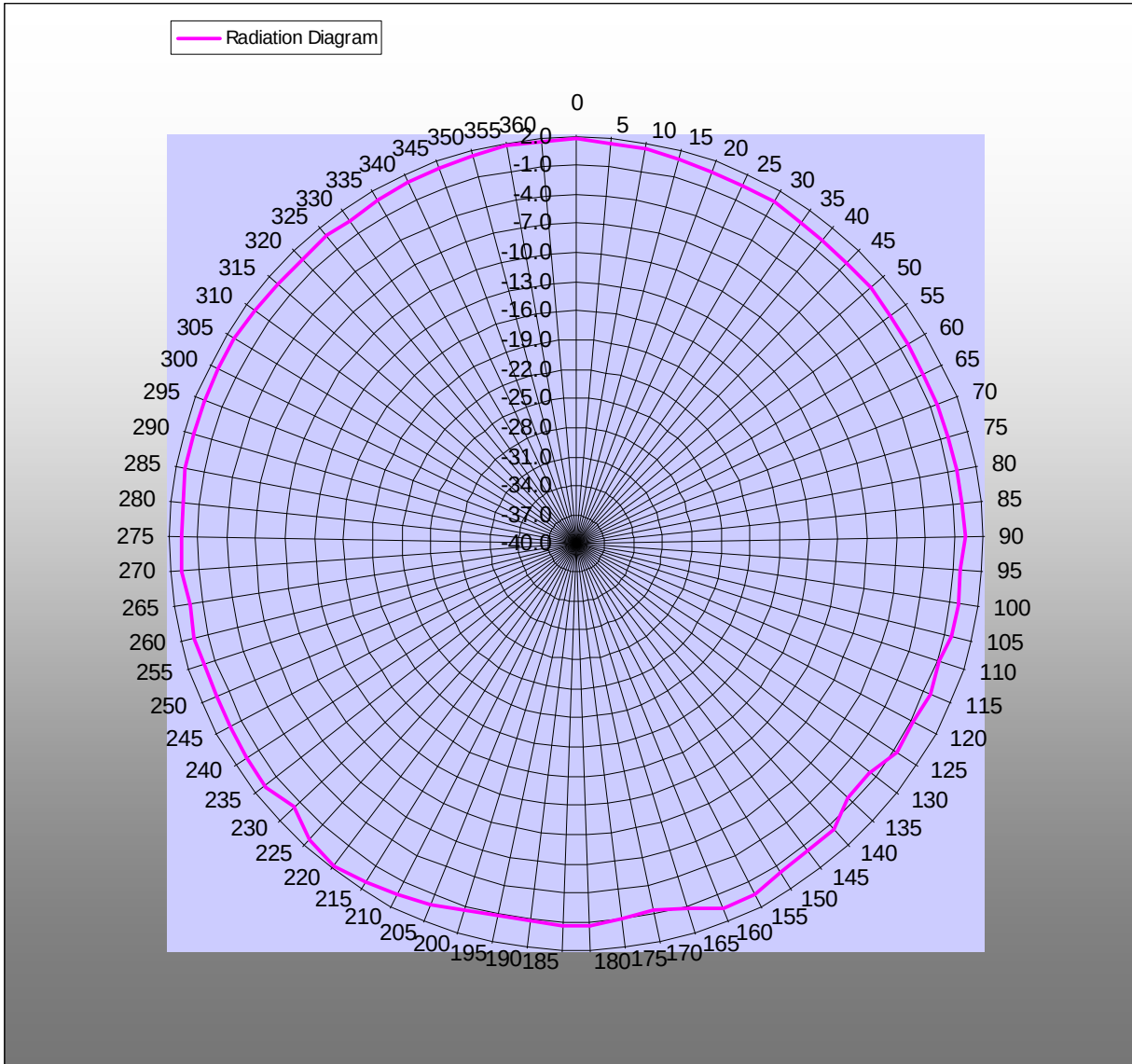
Antenna Gain: 1.6 dBi at 2.45 GHz (gain obtained at 80 degree)



Operation mode: 1
 Configuration mode: 1
 Remarks: Vertical polarization

Verdict: --

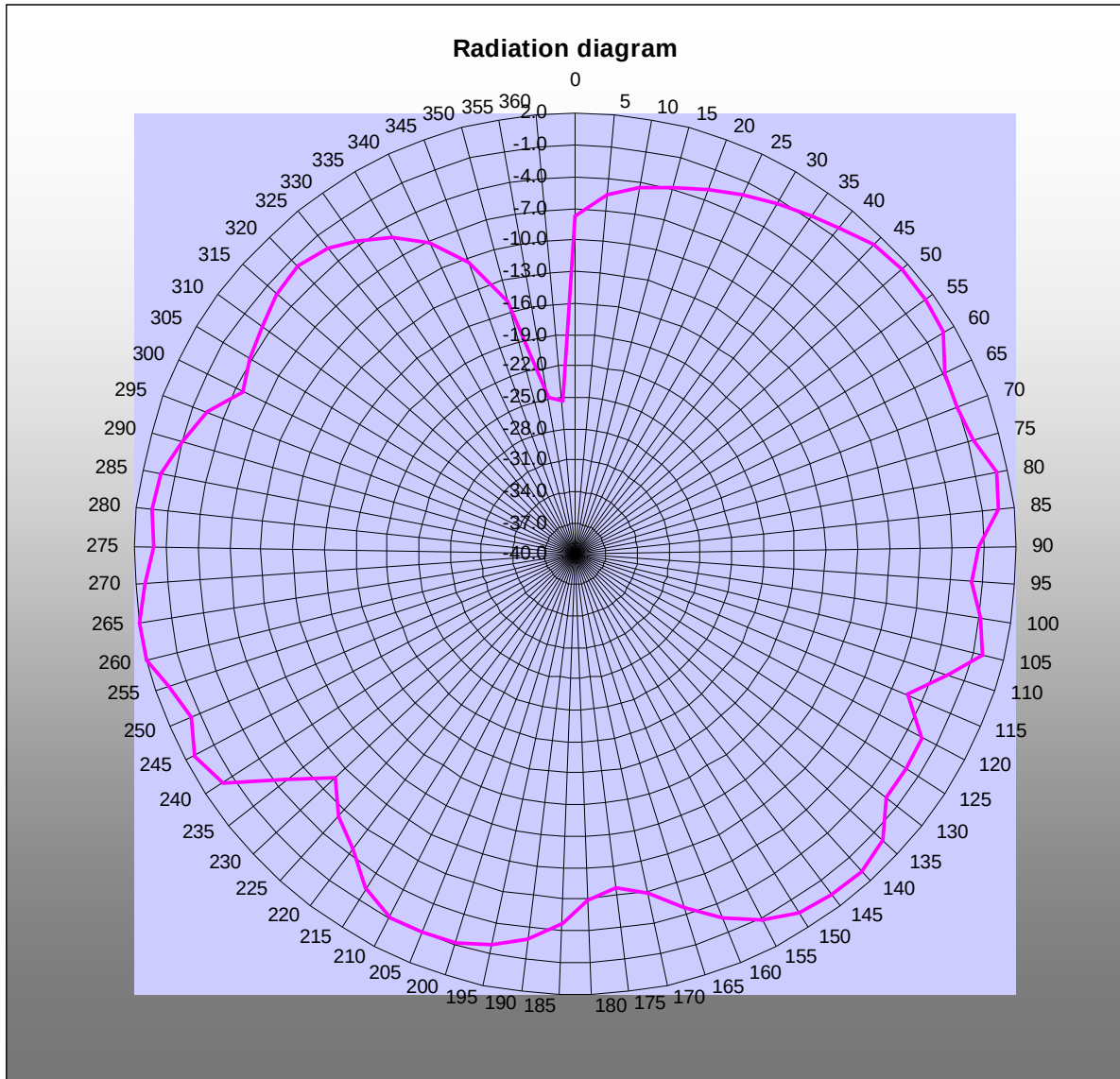
Antenna Gain: 1.6 dBi at 2.45 GHz (gain obtained at 0 degree)



Operation mode: 1
 Configuration mode: 1
 Remarks: Horizontal polarization

Verdict: --

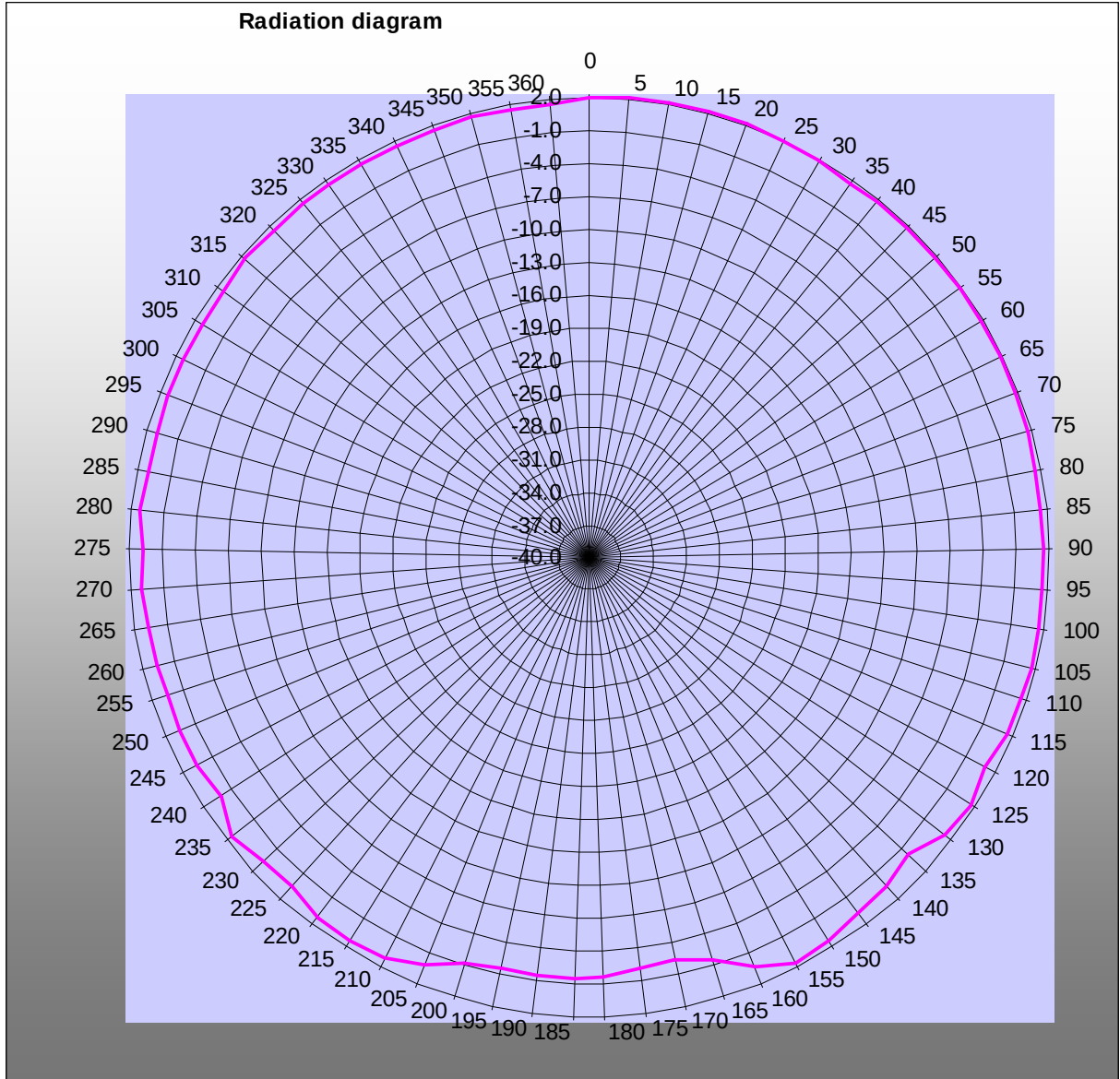
Antenna Gain: 2 dBi at 2.5 GHz (gain obtained at 260 degree)



Operation mode: 1
 Configuration mode: 1
 Remarks: Vertical polarization

Verdict: --

Antenna Gain: 2 dBi at 2.5 GHz (gain obtained at 0 degree)



5.1.5 Test equipment used

<i>Equipment</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Serial N°</i>
Spectrum Analyzer 9 kHz ÷ 40GHz	R&S	FSEK	848255/005
Bilog antenna 1÷18 GHz	Schwarzbeck	STLP 9148-123	123
Biconical Antenna	Schwarzbeck	SBA 9112	VULB 9163-286
Turn-table	R&S	HCT	835 803/03
Antenna mast	R&S	HCM	836 529/05
Controller	R&S	HCC	836 620/7
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947
RF generator 10 ÷ 20000 MHz	R&S	SMP22	830857/001

6 EUT PHOTOS

