EMC TEST REPORT

Type of equipment:	**Radon Sensor**
Model:	**TDSPSRH4**
Marketing name:	**Aranet Radon One sensor Home**
Sub model:	-
Serial number:	-
Applicant:	**SAF Tehnika JSC**
Manufacturer:	**SAF Tehnika JSC**
Test standard:	Testing carried out according to LEITC internal procedure P-17 Current tests are outside the scope of accreditation.
Test report no.:	LEITC-TR-24-056(01)
Identification no.:	ID_1529
Testing laboratory:	SIA LEITC
Result summary:	-

Test responsible:	Gundars Ašmanis
Laboratory responsible:	Uldis Stūre
Date of issue:	13.08.2024.

Contents

1. REVISION HISTORY

Revision no.	Description	Date	Pages revised
00	First release.	28.06.2024.	N/A
01	Deleted EUT positioning photo due to client request.	13.08.2024.	11.; 12.; 13
01	Deleted Test photographs section due to client request.	13.08.2024.	-

2. LABORATORY INFORMATION

Latvian Electronic Equipment Testing Centre

Testing laboratory:	**SIA LEITC**
Address:	Azenes street 12, Riga, Latvia, LV-1048
Telephone number:	+371 22001023
Contact Person:	Uldis Stūre
E-mail:	info@leitc.lv
	uldis.sture@leitc.lv
	andris.dzenis@leitc.lv
Web site:	http://www.leitc.lv

3. CLIENT INFORMATION

Applicant:	SAF Tehnika JSC
Address:	Ganibu dambis 24a, Riga, Latvia, LV-1005
Telephone number:	+371 67046840
Contact Person:	Andrejs Arhipovs
E-mail:	info@saftehnika.com, andrejs.arhipovs@saftehnika.com
Web:	http://saftehnika.com/

Manufacturer:	SAF Tehnika JSC
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Telephone number:	+371 67046840
Contact Person:	Andrejs Arhipovs
E-mail:	info@saftehnika.com, andrejs.arhipovs@saftehnika.com
Web:	http://saftehnika.com/

4. SUMMARY OF TEST RESULTS

Standard:	Internal procedure P-17
Title:	*Integrated antenna gain measurement using Friis free space equation*
Reference Standard:	-
Title:	-

No.	Measurement type	Reference standard	Applicability	Result
1.	Gain	-	Y	**N/A**

Notes: Y- applied; N/A – not applicable.

Deviations from standard specification: no deviations from the test standards.

5. DESCRIPTION OF EQUIPMENT UNDER TEST

5.1 Description of EUT

LEITC identification no.: ID_1529

Aranet Radon Sensor

No.	EUT	Model	Serial No.	Manufacturer
1.	Radon Sensor	TDSPSRH4	-	SAF Tehnika JSC

5.2 Peripherals and associated equipment

No.	Description	Model	Serial No.	Manufacturer
1.	-	-	-	-

5.3 Cables used during the testing

No.	Cable type	Shielded	Ferrite	Length used during test	Connection 1	Connection2
1.	-	☐	☐	-	-	-

5.4 EUT configuration

Device was prepared specially for antenna gain measurements, with continuous transmission mode.

Transmitted power at the integrated antenna input P_{tx}=1.10dBm. Power was measured with receiver and coax cable, that was soldered directly to RF chip, while integrated antenna was disconnected.

5.4.1 Operating modes/load

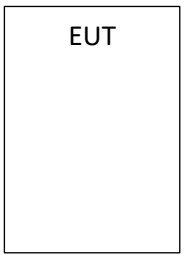
1.	Turned on in continuous transmission mode.

5.4.2 Modification state

1.	No modification made.

5.4.3 Radio frequency transmitters incorporated in EUT

No.	Description	Frequency	Modulation
1.	Radio module	2402MHz	CW



6. INSTRUMENTATION AND CALIBRATION

Equipment and EUT during the tests are operated in temperature range of 21^0 to 25^0C, humidity range of 40% to 60%, if not mentioned more precisely next to measurement data.

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with manufacturer's recommendations or quality manager deliverance and it is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

The following list contains measurement equipment used for testing. The equipment conforms to the requirements of CISPR 16-1 and other standard requirements.

Radiated emissions				
Device	**Manufacturer**	**Model**	**Serial number**	**Notes**
Antenna	Rohde & Schwarz	HF906	100448	Certificate of calibration No. 202200066.00; 14.02.2022
Receiver	Rohde & Schwarz	ESIB26	1088.7490K26	Certificate of calibration No. 202204692.00; 26.01.2023
Turntable	FRANKONIA	FCTAM01	-	Not applicable.
Test site	FRANKONIA	SAC3	-	Not applicable.
Software for EMC measurements EMC32	Rohde & Schwarz	Version 8.53.0	-	Not applicable.

7. TEST PROCEDURES

P-17 Integrated antenna gain measurement using Friis free space equation

Assuming that semi-anechoic chamber is fulfilling free space conditions and antennas are located in far field, gain is calculated based on Friis equation:

$$P_{rx} = P_{tx} G_{tx} G_{rx} \left(\frac{\lambda}{4\pi d}\right)^2$$

where

P_{rx} – Power at receiving antenna output;

P_{tx} – Power at transmitting antenna input;

G_{rx} – Receiving antenna gain;

G_{tx} – Transmitting antenna gain;

λ – wavelength, where $\lambda = c/f$, c = speed of light, f = frequency;

d – Distance, between two antennas;

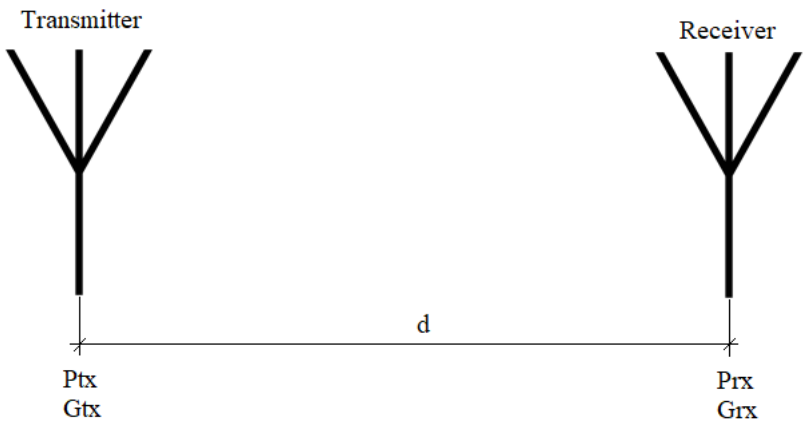
c – Speed of light in vacuum 299.972458×106 m/s;

Gain of the transmitting antenna can be calculated as follows:

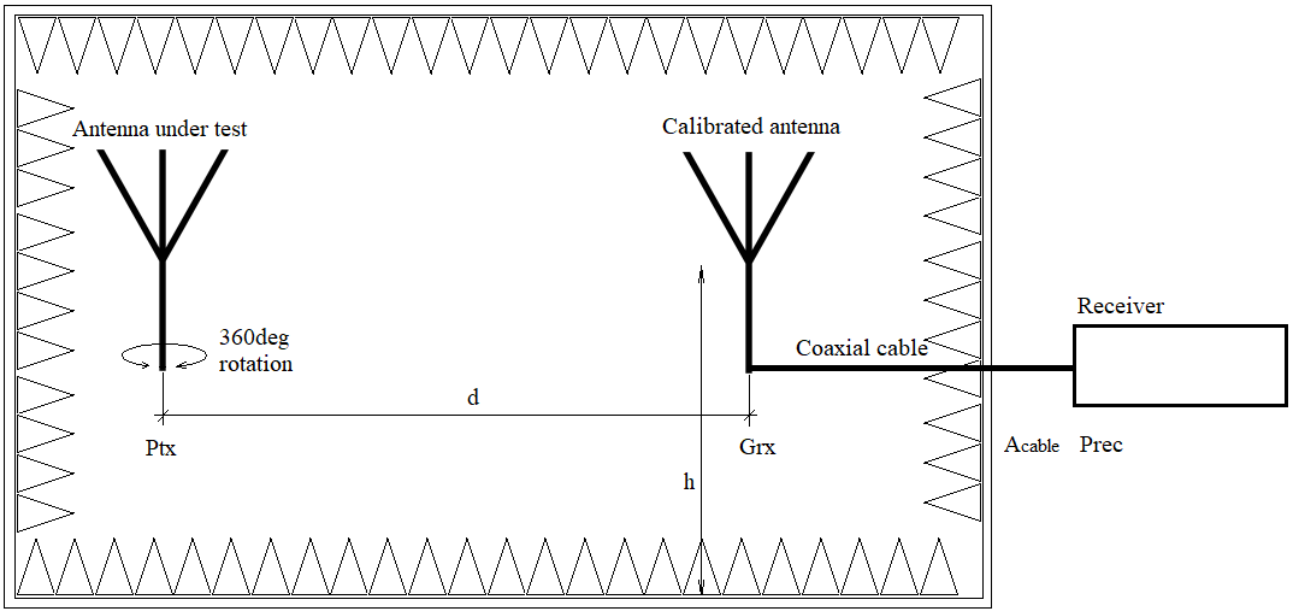
$$G_{tx} = \frac{P_{rx}}{P_{tx} G_{rx}} \left(\frac{4\pi d}{\lambda}\right)^2$$

Or in terms of dB

$$G_{tx} = P_{rx} - P_{tx} - G_{rx} - 20 \log_{10}\left(\frac{\lambda}{4\pi d}\right)^2$$



Antenna under test (transmitting antenna) is integrated in IoT product that has an internal RF power source providing power P_{tx}. Calibrated receiving antenna with known G_{rx} is connected to receiver via coaxial cable with cable loss A_{cable}. Receiver reading P_{rec}. Both antennas are located at the same height above reference ground plane h. Antenna under test is rotated 360deg to measure antenna pattern. Calibrated antenna positioning (polarization) is not changed during the measurements.

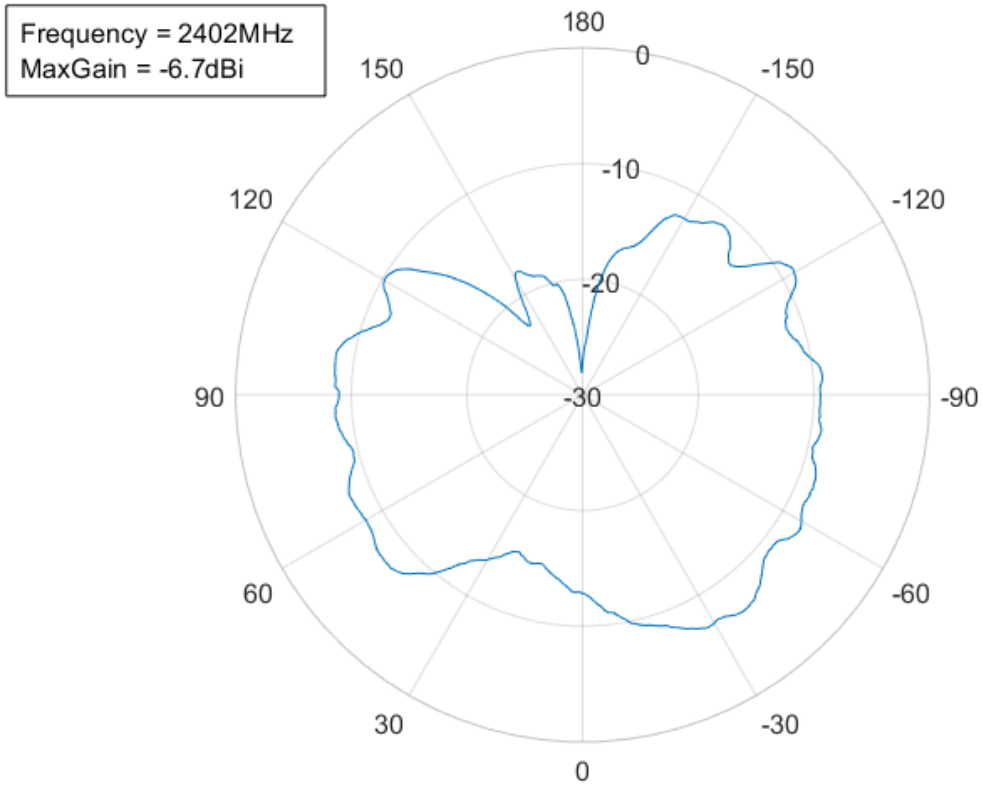


Gain of antenna under test is calculated as follows:

$$G_{tx} = P_{rec} + A_{cable} - P_{tx} - G_{rx} - 20\log_{10}\left(\frac{\lambda}{4\pi d}\right)^2$$

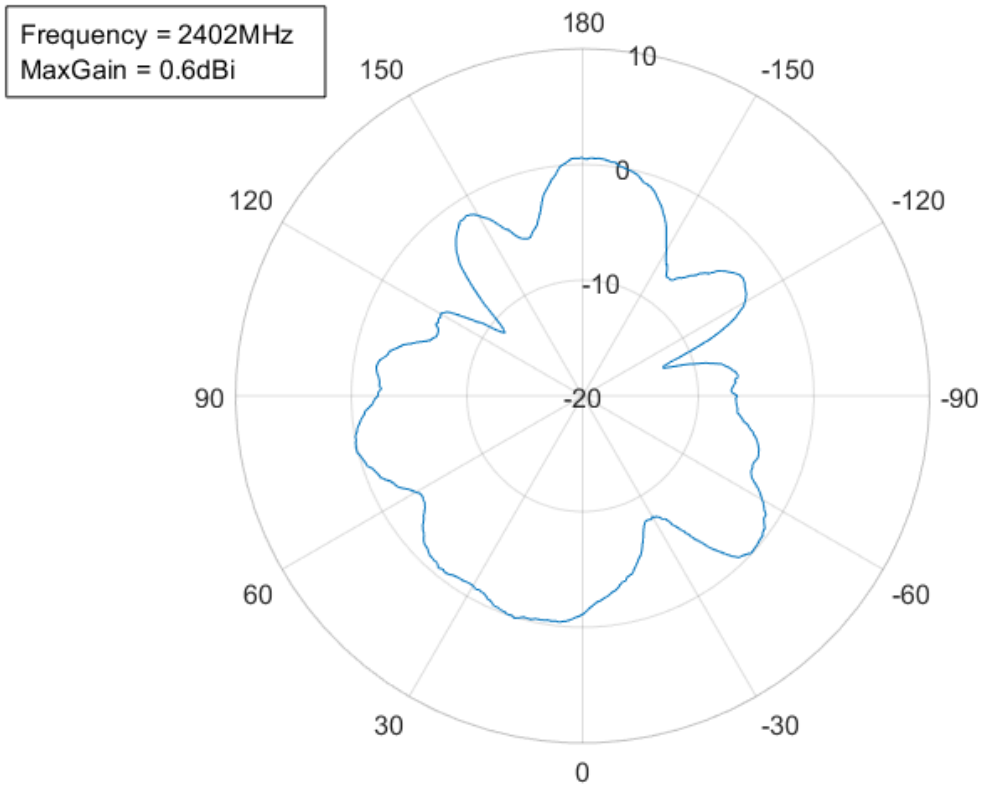
8. TEST RESULTS

	8.1 Gain	Plot	



Date:	26.06.2024.	**Test engineer:**	Gundars Asmanis		
Method:	P-17	**Port:**	Enclosure		
Notes: Device positioning coincide gain polar plot.					
Chamber:	SAC3	**Height:**	1m	**Mode:**	1
Distance:	4.55m	**Polarization:**	V	**Mod. State:**	1
Angle:	$-180^0..+180^0$	**File:**	-		

	8.2 Gain	Plot	



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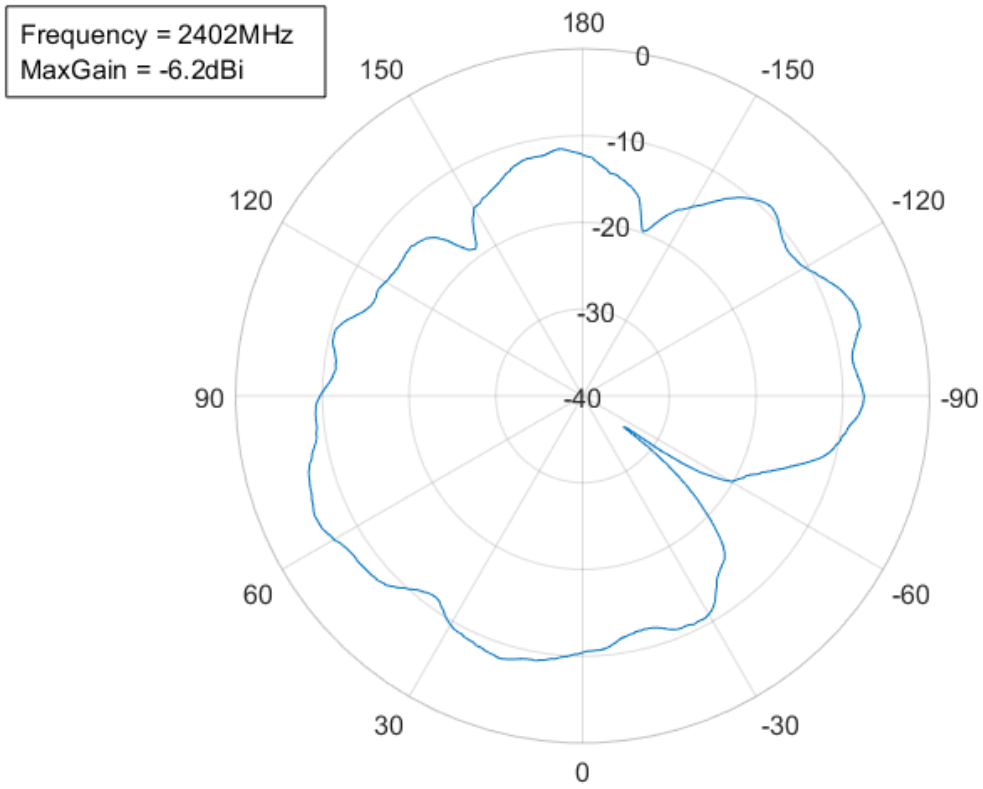
	8.3 Gain	Plot	



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