

RF Exposure Evaluation Report

Report Number:

F251885E8

Equipment under Test (EUT):

Controlunit PILOT3

Applicant:

Fronius International GmbH

Manufacturer:

Fronius International GmbH



Deutsche
Akkreditierungsstelle
D-PL-17186-01-00

References

- [1] **CFR 47 Rule part 1** Practice and Procedure
- [2] **CFR 47 Rule part 2** Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
- [3] **KDB 447498 D04 Interim General RF Exposure Guidance v01**

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

"Passed" indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account. However, the measurement uncertainty is calculated and shown in this test report.

Tested and written
by:



Mohamed Yassine KHALEK
29.06.2026
Signature

Reviewed and
approved by:



Bernward ROHDE
29.06.2026
Signature

This test report is only valid in its original form.

Any reproduction of its contents in extracts without written permission of the accredited test laboratory NMI TESTLAB GmbH is prohibited.

The test results herein refer only to the tested sample. NMI TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the NMI TESTLAB Logo and the TEST REPORT NUMBER.

Contents:	Page
1 Identification	5
1.1 Applicant.....	5
1.2 Manufacturer	5
1.3 Test Laboratory	5
1.4 EUT (Equipment under Test).....	6
1.5 Technical Data of Equipment.....	7
2 Evaluation Methods.....	9
2.1 RF exposure test exemptions for single sources	9
2.1.1 General Exemption CFR 47 §1.1307(b)(3)(i)(A)	9
2.1.2 SAR Based Exemption CFR 47 §1.1307(b)(3)(i)(B)	9
2.1.3 MPE Based Exemption CFR 47 §1.1307(b)(3)(i)(C)	9
2.1.4 Stand alone MPE evaluation limits.....	10
2.2 RF exposure test exemptions for simultaneous transmission sources	11
2.2.1 1 mW Test Exemption for simultaneous transmission sources	11
2.2.2 Simultaneous transmission SAR based and MPE based test exemptions	11
2.2.3 Test exemption based on the SAR to Peak Location Separation Ratio	12
3 Results of evaluation.....	13
3.1 Used evaluation methods.....	13
3.2 Evaluation Distance	13
3.3 WLAN 2.4 GHz Emissions	14
4 Conclusion	14
5 Report History	14

1 Identification

1.1 Applicant

Name:	Fronius International GmbH
Address:	Günter-Fronius-Straße 1, 4600 Wels-Thalheim
Country:	Austria
Name for contact purposes:	Mr. Jan HERNDLER
Phone:	+43 7242-241-0
eMail address:	herndler.jan@fronius.com

1.2 Manufacturer

Name:	Fronius International GmbH
Address:	Fronius Straße 5, 4642 Sattledt
Country:	Austria
Name for contact purposes:	Mr. Jan HERNDLER
Phone:	+43 7242-241-0
eMail address:	herndler.jan@fronius.com

1.3 Test Laboratory

The tests were carried out by: **NMI TESTLAB GmbH formerly PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

accredited by **Deutsche Akkreditierungsstelle GmbH (DAkkS)** according to DIN EN ISO/IEC 17025:2018. The accreditation is only valid for the scope of accreditation listed in the annex of the certificate D-PL-17186-01-00. FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISCED# 3469A.

1.4 EUT (Equipment under Test)

Test object: *	Control and steering unit for solar inverters
Model name: *	Controlunit PILOT3
Model number: *	43,0001,1844
Order number: *	N/A
FCC ID: *	QKWPILOT3

	EUT number	
	1	Type plate
Serial number: *	036007 0003	
PCB identifier: *	4,071,926,RD	
Hardware version: *	V1.1A_A	
Software version: *	N/A	

* Declared by the applicant

Note: NMI TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

General EUT data			
Power supply EUT: *	DC		
Supply voltage EUT: *	$U_{nom} = 12 \text{ V}$	$U_{min} = 10.8 \text{ V}$	$U_{max} = 13.2 \text{ V}$
Supply voltage EUT: *	$U_{nom} = 24 \text{ V}$	$U_{min} = 22.6 \text{ V}$	$U_{max} = 26.4 \text{ V}$
Temperature range: *	-40°C to $+65^{\circ}\text{C}$		
Lowest / highest internal clock frequency: *	10 kHz / 2462 MHz		

IEEE 802.11 frequencies	
20 MHz	
Channel 1	2412 MHz
Channel 2	2417 MHz
Channel 3	2422 MHz
Channel 4	2427 MHz
Channel 5	2432 MHz
Channel 6	2437 MHz
Channel 7	2442 MHz
Channel 8	2447 MHz
Channel 9	2452 MHz
Channel 10	2457 MHz
Channel 11	2462 MHz

* Declared by the applicant

IEEE 802.11 radio mode				
Fulfil radio specification: * ¹	IEEE 802.11 b IEEE 802.11 g IEEE 802.11 n (20 MHz)			
Radio chip: * ¹	Murata LBEE5CJ1XK			
Antenna type: * ¹	Dipole antenna			
Antenna name: * ¹	Taoglas GW.40			
Antenna gain: * ²	Peak: 3.15 dBi			
Antenna connector: * ¹	RP SMA			
Supply voltage WLAN module: * ¹	$U_{nom} = 3 V_{DC}$		$U_{min} = 2.7 V_{DC}$	$U_{max} = 3.3 V_{DC}$
Type of modulation: * ¹	IEEE 802.11b	DSSS (1 Mbps DSSS (2 Mbps DSSS (5.5/11 Mbps		DBPSK) DQPSK) CCK)
	IEEE 802.11g	OFDM (6/9 Mbps OFDM (12 / 18 Mbps OFDM (24/36 Mbps OFDM (48/54 Mbps		BPSK) QPSK) 16-QAM) 64-QAM)
	IEEE 802.11n 20 MHz (SISO 1x1:1)	MCS0 MCS1/2 MCS3/4 MCS5/6/7	OFDM (7 Mbps OFDM (14 – 22 Mbps OFDM (28 – 43 Mbps OFDM (58 - 72 Mbps	BPSK) QPSK) 16-QAM) 64-QAM)
Operating frequency range: * ¹	IEEE 802.11b		2412 – 2462 MHz	
	IEEE 802.11g		2412 – 2462 MHz	
	IEEE 802.11n 20 MHz		2412 – 2462 MHz	
Number of channels: * ¹	IEEE 802.11b		11 (5 MHz channel spacing)	
	IEEE 802.11g		11 (5 MHz channel spacing)	
	IEEE 802.11n 20 MHz		11 (5 MHz channel spacing)	

*¹ declared by the applicant

*² based on the antenna data sheet provided by the applicant

2 Evaluation Methods

2.1 RF exposure test exemptions for single sources

2.1.1 General Exemption CFR 47 §1.1307(b)(3)(i)(A)

The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in [paragraph \(b\)\(3\)\(ii\)\(A\)](#) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

2.1.2 SAR Based Exemption CFR 47 §1.1307(b)(3)(i)(B)

The available maximum time-averaged power of effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz inclusive.

For the following separation distances [d] and frequency ranges P_{th} is given by the following formulas

	0.5 cm ≤ d ≤ 20cm	20 cm < d ≤ 40 cm
0.2 GHz ≤ f < 1.5 GHz	$P_{th}(mW) = ERP_{20cm} \left(\frac{d}{20} \right)^x$ $ERP_{20cm}(mW) = 2040f$ $x = -\log_{10} \left(\frac{60}{ERP_{20cm}\sqrt{f}} \right)$	$P_{th}(mW) = ERP_{20cm}$ $ERP_{20cm}(mW) = 2040f$
1.5 GHz ≤ f ≤ 6 GHz	$P_{th}(mW) = ERP_{20cm} \left(\frac{d}{20} \right)^x$ $ERP_{20cm}(mW) = 3060$ $x = -\log_{10} \left(\frac{60}{ERP_{20cm}\sqrt{f}} \right)$	$P_{th}(mW) = ERP_{20cm}$ $ERP_{20cm}(mW) = 3060$

2.1.3 MPE Based Exemption CFR 47 §1.1307(b)(3)(i)(C)

By using Table 1 and the minimum separation distance (d in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, d must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

RF Source frequency [MHz]	Threshold ERP [W]
0.3 -1.34	1920 d ²
1.34 – 30	3450 d ² /f ²
30 – 300	3.83 d ²
300 – 1500	0.0128 d ² /f
1500 - 100000	19.2 d ²

d: Minimal separation distance from antenna to the user

2.1.4 Stand alone MPE evaluation limits

The human exposure to RF emissions from such devices could be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and / or power density. The limits for General Population / Uncontrolled Exposure are given in the following table from CFR 47 §1.1310(e)1:

Frequency range [MHz]	Electric field strength (E) [V/m]	Magnetic field strength (H) [A/m]	Power density (S) [mW/cm ²]	Averaging time [min]
(i)Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	*(100)	≤6
3.0 – 30	1842/f	4.89/f	*(900/f ²)	<6
30 – 300	61.4	0.163	1.0	<6
300 – 1,500			f/300	<6
1,500 – 100,000			5	<6
(ii)Limits for General Population / Uncontrolled Exposure				
0.3 – 1.34	614	1.63	*(100)	< 30
1.34 – 30	824/f	2.19/f	*(180/f ²)	< 30
30 – 300	27.5	0.073	0.2	< 30
300 – 1500			f/1500	< 30
1500 – 100,000			1.0	< 30

Note: f = frequency in MHz; * Plane – wave equivalent power density

The power density is calculated as follows:

$$S = \frac{P \cdot G \cdot D}{4 \cdot \pi \cdot d^2}$$

Where:

P: conducted power

G: Antenna gain (linear)

D: Duty Cycle

d: Minimal separation distance from antenna to the user

2.2 RF exposure test exemptions for simultaneous transmission sources

2.2.1 1 mW Test Exemption for simultaneous transmission sources

As discussed in CFR 47 §1.1307(b)(3)(ii)(A) [1] the 1 mW exemption intended for single transmitters may be also applied to simultaneous transmission conditions, within the same host device, according one of the following criteria:

- When the maximum available power each individual transmitting antenna with the same time averaging period is ≤ 1 mW, and the nearest parts of the antenna structures of the simultaneously operating transmitters are separated by at least 2 cm
- When the aggregate maximum available power of all transmitting antennas is ≤ 1 mW in the same time-averaging period

This exemption may not be combined with any other exemption.

2.2.2 Simultaneous transmission SAR based and MPE based test exemptions

Although this is not a module integration in the sense of product approval, the procedure for simultaneous transmission specified in KDB 447498 D04 Interim General RF Exposure Guidance v01 [3] in chapter 2.2 was taken into account:

According to the RF exposure KDB 447498 D04 General RF Exposure Guidance v01 [3] in chapter 2.2.2: This case is described in detail in CFR 47 §1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of the following formular is satisfied.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

For these test exemptions to apply, the maximum output power, duty factor, and other applicable parameters used in the standalone ERP determination tests, must be the same, or corresponding to a more conservative choice, than those required for simultaneous transmission.

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modelled, or measured field strengths or power density. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to the MPE limit at the test frequency.

2.2.3 Test exemption based on the SAR to Peak Location Separation Ratio

When the ERP-based condition in the previous section does not apply, a test exemption may be still applicable based on the SAR to peak location separation ratio (SPLSR) procedure.

In this case, the simultaneously transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SPLSR that qualifies for the additional test exemption.

This ratio is defined as:

$$SPLSR = (SAR_1 + SAR_2)^{\frac{1.5}{R_i}}$$

Where: SAR_1 and SAR_2 = highest reported SAR or estimated SAR values for the two sources in the pair i , and R_i is their distance in mm.

When $SPLSR \leq 0.0.4$ (rounded to two decimal digits), for all antenna pairs in the configuration, then the device qualifies for 1 g SAR test exemption.

When 10 g SAR applies (e.g. for extremities) the corresponding test exemption condition is $SPLSR \leq 0.10$.

If any antenna pair does not qualify for simultaneous transmission SAR test exemption, then the device must be tested for SAR compliance, according to the enlarged zoom scan and volume scan post-processing procedures in KDB Pub. 865664 D01.

3 Results of evaluation

3.1 Used evaluation methods

RF Exposure test exemptions for single sources			
Used	Method	See sub-clause	Comment
☐	General Exemption acc. CFR 47 §1.1307(b)(3)(i)(A)	2.1.1	-
☒	SAR Based Exemption acc. CFR 47 §1.1307(b)(3)(i)(B)	2.1.2	-
☐	MPE Based Exemption acc. CFR 47 §1.1307(b)(3)(i)(C)	2.1.3	-
☐	MPE Calculation	2.1.4	-

RF Exposure test exemptions for simultaneous transmission sources			
Used	Method	See sub-clause	Comment
☒	Not applicable		-
☐	1 mW test Exemption acc. 2.2.1 [3]	2.2.1	-
☐	SAR Based Exemption acc. 2.2.2 [3]	2.2.2	-
☐	MPE Based Exemption acc. 2.2.2 [3]	2.2.2	-
☐	SAR to Peak location separation ratio acc. 2.2.3 [3]	2.2.3	-

3.2 Evaluation Distance

According to the CFR47 §2.1091 the device, as declared by the applicant, is a fixed device which is used at least with the following separation distances between the device and the users.

Antenna	Min separation distance as declared by the applicant
Antenna 0	20 cm

3.3 WLAN 2.4 GHz Emissions

The following information are based on Test-Report **F251885E6** by **NMI TESTLAB GmbH**. The test report contains the maximum average output power.

The maximum average conducted output power in the report is **13.6 dBm**

As declared by the applicant, the EUT's output power varies by **±1.0 dB**.

Antenna 0 SAR Based Exemption CFR 47 §1.1307(b)(3)(i)(B)

P _{con} (AV) [dBm]	Tune up range +/- [dB]	P _{con} [mW] incl. Tuneup	Ant. Gain [dBi]	Cable Antenuation [dB]	P _{e.i.r.p} [dBm]	P _{e.i.r.p} [mW]	P _{e.r.p} [dBm]	P _{e.r.p} [mW]
13.60	1.00	28.84	3.15	0	17.75	59.57	15.60	36.32
Frequency [GHz]		d [cm]	ERP _{20cm}	x	P _{th} [mW]	P _{e.r.p.} [mW]	Result	
2.437		20	3060	1.901	3060.00	36.32	exempted	
for 0.5 cm ≤ d ≤ 20 cm and 1.5 GHz ≤ f ≤ 6 GHz								

4 Conclusion

The EUT complies in all operational modes to the limits given in CFR 47 §1.1307(b)(3)(i)(B) in a separation distance of 20 cm for antenna 0.

5 Report History

Report Number	Date	Comment
F251885E8	29.06.2026	Initial evaluation report
-	-	-
-	-	-

----- end of evaluation report -----