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REPORT

Test Report

of

Otiom-brik

according to the selected parts of

EN 301 489-1 V2.1.1
EN 301 489-17 V3.1.1

Performed by

Peter Baastrup
Senior Test Engineer

Examined by

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Report no.:	P20-0001	**Report date:**	2020-01-24
Test started:	2019-01-08	**Test ended:**	2019-01-08
Test laboratory:	EKTOS TRS A/S Peter Bangs Vej 17 7600 Struer Denmark	**Client:**	Otiom A/S Alfred Nobels vej 21 A 9220 Aalborg Ø Denmark
Contact person:	Henrik Brosbøl	**Contact person:**	Eigil Myrhøj Nielsen

Test specimens:	Model: Otiom-brik S/N.: 4087, 4088
Test specifications:	EN 301 489-1 V2.1.1: “ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU”. EN 301 489-17 V3.1.1: “ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU”. The tests relevant for the test specimens are listed in *section 1.1*.
Documentation:	This test report shall not be reproduced except in full, without written approval of the laboratory. The complete test documentation is archived for 10 years at the testing laboratory.
Test results:	The test specimen complies with relevant parts of the test specifications. The test results relate only to the specimen tested.
Test personnel:	Peter Baastrup

CONTENTS

1 SUMMARY

1.1 Test plan

The test plan is made according to the selected parts of the following standards:

EN 301 489-1 V2.1.1
EN 301 489-17 V3.1.1

Test method	Name of the test	Test	Result
EN 55032:2015, Class B	Radiated emission	NR	-
EN 55032:2015, Class B	Conducted emission	NR	-
EN 61000-4-3:2006+A1+A2	Radio frequency electromagnetic field	X	PASSED
EN 61000-4-2:2009	Electrostatic discharge	X	PASSED
EN 61000-4-4:2012	Fast transients	NR	-
EN 61000-4-5:2014	Surge	NR	-
EN 61000-4-6:2014	Radio frequency common mode	NR	-
EN 61000-4-8:2010	Power frequency magnetic field	NR[1]	-
EN 61000-4-9: 1993+A1:2001	Pulse magnetic field test	NR	-
EN 61000-4-11:2004	Voltage dips and interruptions	NR	-
EN 61000-3-2:2014	Harmonic current	NR	-
EN 61000-3-3:2013	Voltage fluctuations and flicker	NR	-

PASSED	The test specimen complies with the essential requirements in the standard.
FAILED	The test specimen does not comply with the essential requirements in the standard.
REF	The test is covered by a test in another report and/or on a similar test specimen.
NR	The test is not relevant for the test specimen or has been waived by the manufacturer.
X	The test is performed.

Note 1: The test specimen has no magnetisable parts and is not susceptible to magnetic fields.

1.2 Test Specimens

1.2.1 Test specimen 1

Manufacturer	Otiom
Model	Otiom-brik
Serial no.	4088
Part no.	0E:5C
Software	6.25
HW-version	3.0
Details	Radio frequency electromagnetic field
Supply voltage	Internal li-po Battery 3,7V (HW832826)
Operational mode	Running mode with BLE transmitting

1.2.2 Test specimen 2

Manufacturer	Otiom
Model	Otiom-brik
Serial no.	4087
Part no.	0A:E1
Software	6.25
HW-version	3.0
Details	Electrostatic discharge
Supply voltage	Internal li-po Battery 3,7V (HW832826)
Operational mode	Running mode with BLE transmitting

Photo 1. Test specimen 1.

Photo 2. Test specimen 2.

1.3 Auxiliary Equipment

1.3.1 Smartphone with Otiom app

Manufacturer	Motorola
Model	Motorola moto e5 play
Serial no.	-
Details	Otiom App-version: 1.0.27
Supply voltage	Battery
Operational mode	Otiom app used for function test of Otiom-brik. The App calculate distance to the EUT by the power from BLE signal. The App is updated every 15 sec.

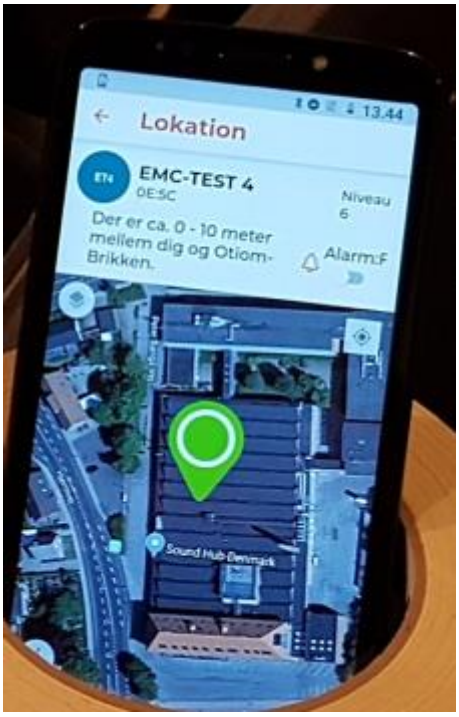

Photo 3. Smartphone to monitor BLE performance.

1.4 I/O ports / cables to test specimens

No cables are intended to be connected to the product.
The product is a stand/alone portable device.

1.5 Test set-up

The product is tested as a stand-alone equipment.
The product is charged by a QA wireless charger.
The product is only tested in normal operation mode. Not in charge mode
Otiom app on smartphone used for function test of Otiom-brik.
It was impossible to put the product into the stand-by mode without BLE radio module transmitting, as the product is not intended to be used without radio communication. Thus, unintended transmitting mode has not been tested.

Figure 1. Test set-up.

1.6 Functional test procedure

Otiom app on smartphone used for function test of Otiom-brik
The App calculate distance to the Devise Under Test (DUT) by the power from BLE signal.
The App is updated every 15 sec.

Just after test DUT is placed outside lab near a NB-IOT antenna, to check that the DUT automatic will do following:

1. Do GNSS position and call a TDC NB-IOT network
2. Transmit position data to the Otiom server
3. Use Smartphone from test to get data from server and show the position for the otiom-brik that have been tested.

1.7 Performance criteria

General performance criteria by the client:

Performance criteria at RF immunity test of Otiom Tag:

1. The Otiom Tag must transmit beacon signals on BLE minimum every 30 seconds, so an Otiom App installed on a Smartphone can calculate a proximity distance between the Otiom Tag and the smartphone at least every minute
2. After testing, the Otiom Tag must be able to obtain a GNSS position and report it to the Otiom Server through the NB-IOT network, enabling the Otiom Server to present the position of the Otiom Tag on the Otiom App

Performance criteria at ESD test of Otiom Tag:

1. The Otiom Tag must transmit beacon signals on BLE minimum every 30 seconds, so an Otiom App installed on a Smartphone can calculate a proximity distance between the Otiom Tag and the smartphone at least every minute. Under the ESD test, it is acceptable that the beacon signals on BLE is up to 60 seconds.
2. After testing, the Otiom Tag must be able to obtain a GNSS position and report it to the Otiom Server through the NB-IOT network, enabling the Otiom Server to present the position of the Otiom Tag on the Otiom App

The generic performance criteria for compliance from EN 301 489-17 V3.1.1

Performance criterion	Description during test	Description after test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if
used as intended.

2 TESTS

2.1 Radio frequency electromagnetic field

Test specimen	Otiom-brik
Test specification	EN 301 489-1 V2.1.1 EN 301 489-17 V3.1.1
Test method	EN 61000-4-3:2006+A1+A2
Performance criterion	A
Frequency range	80 MHz to 1000 MHz and 1000 MHz to 6000 MHz
Field strength	80 MHz to 1000 MHz: 10V/m – extended severity. 1000 MHz to 6000 MHz: 3 V/m
Modulation	80% AM, 1000 Hz sine wave
Step size / dwell time	1% / 1 s
Comments	Tested at 10V/m as requested from customer. App on smartphone for performance under test is watched by a camera in the chamber. The test specimen is tested in normal operational mode only.
Temperature / Humidity	25°C / 37%RH
Date of measurements	2020-01-08
Test personnel	Peter Baastrup

2.1.1 Test setup

The tests were performed in a semi anechoic chamber with absorbers on the floor. The test specimen was placed on a non-conductive foam table.

The auxiliary equipment was positioned near the wall.

The distance between the antenna and test specimens was 2 m in the frequency range 80 MHz to 1000 MHz and the height was 1.55 m.

The distance between the antenna and test specimens was 2.5 m in the frequency range 1000 MHz to 6000 MHz and the height was 1.30 m.

The immunity field was applied to 3 sides of the test specimens.

Functional tests were performed before, during and after testing.

Photo 4. Radio frequency electromagnetic field test setup. 80 MHz – 1000 MHz.

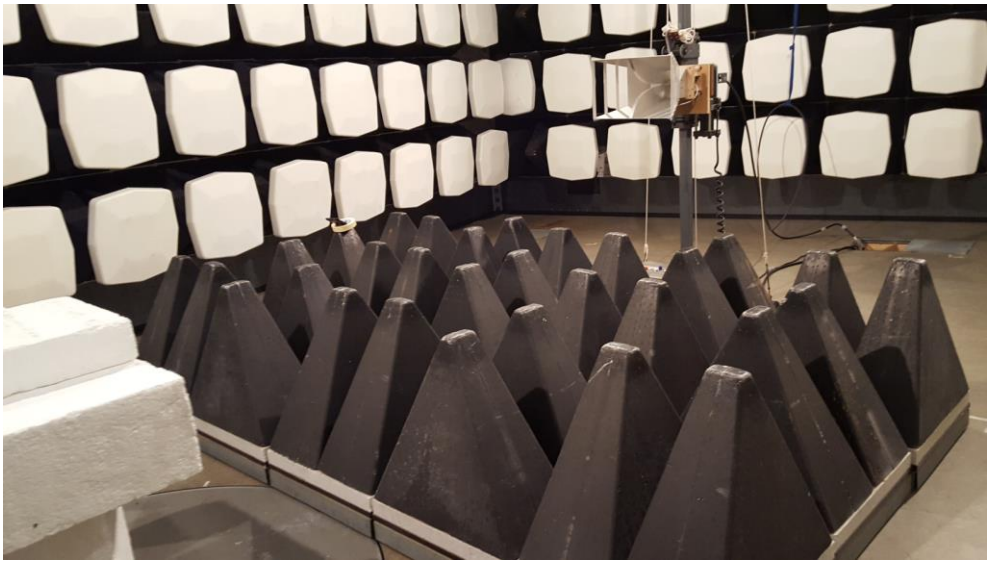

Photo 5. Radio frequency electromagnetic field test setup. 1.0 GHz – 6.0 GHz.

2.1.2 Test results

No change in actual operating state or stored data was observed. The test specimen continued to operate as intended before, during and after the test.

Position 1

Position 2

Position 3

Frequency [MHz]	Specimen side facing antenna	Horizontal		Vertical	
		V/m	Result	V/m	Result
80-1000	Position 1	10	PASSED	10	PASSED
80-1000	Position 2	10	PASSED	10	PASSED
80-1000	Position 3	10	PASSED	10	PASSED
1000-6000	Position 1	3	PASSED	3	PASSED
1000-6000	Position 2	3	PASSED	3	PASSED
1000-6000	Position 3	3	PASSED	3	PASSED

Table 1. Radio frequency electromagnetic field test results.

2.1.3 Test equipment

Description	Supplier	Model	Tag no.
Amplifier 80-1000 MHz	Bonn Amplifiers	BLWA 0810-160/75D	30090179
Amplifier 1 GHz - 6 GHz	Rfenable	RFe-700-6000	30090410
Power Meter Digital	Rohde&Schwarz	NRVD	30114078
Power Probe 10 MHz-18 GHz	Rohde&Schwarz	NRV-Z1	30114079
Power Probe 10 MHz-18 GHz	Rohde&Schwarz	NRV-Z1	30113491
Signal generator 10 kHz – 20 GHz	Rohde&Schwarz	SMP02	30113357
Antenna Horn 1-6 GHz	Rfenable	LB-660-NF	30090411
Antenna Ultra Broadband 30 MHz – 3 GHz	Rohde&Schwarz	HL562	30090226

Table 2. Radiated radio frequency interference test equipment.

2.2 Electrostatic discharge

Test specimen	Otiom-brik
Test specification	EN 301 489-1 V2.1.1 EN 301 489-17 V3.1.1
Test method	EN 61000-4-2:2009
Performance criterion	B
Discharges	Cont. discharge: ±4 kV, (±8KV – extended severity) Air discharge: ±2 kV, ±4 kV, ±8 kV, (±15KV – extended severity)
Comments	Test request from customer Indirect contact up to ±8 kV Air discharge up to ±15 kV The test specimen is tested in normal operational mode only.
Temperature / Humidity	24°C / 37%RH
Atmospheric pressure	1013 hPa
Date of measurements	2020-01-08
Test personnel	Peter Baastrup

2.2.1 Test setup

Indirect discharges were performed on the vertical and horizontal coupling planes.
Non-conductive parts were investigated with an air discharge tip at the specified levels.
Conductive parts were investigated with an contact discharge tip at the specified levels.
The applied charge was removed with a conductive brush between each discharge.
Only surfaces accessible during normal use was investigated.

Functional tests were performed before, during and after testing.

Photo 6. Electrostatic discharge test setup.

2.2.2 Test results

Direct contact discharges were not possible to any of the conductive parts of the test specimen.

Air discharges were not possible at any of the non-conductive parts of the test specimen at any of the test levels.

Photo 7. Discharge points for electrostatic discharge tests.

Direct contact discharge		Indirect contact discharge		Air discharge	
Voltage	**Result**	**Voltage**	**Result**	**Voltage**	**Result**
-	PASSED	±8 kV	PASSED	±8 kV	PASSED
				±15 kV	PASSED

Table 3. Electrostatic discharge test results.

2.2.3 Test equipment

Description	Supplier	Model	Tag no.
ESD Simulator	Schaffner	NSG 438	30090242

Table 4. Electrostatic discharge test equipment.

3 MEASURING UNCERTAINTIES

Compliancy evaluation is based on a shared risk principle with respect to the measurement uncertainty.

3.1 EMC

	Frequency	Polarization	Expanded
Radiated Immunity	80-6000	H, V	**1.92**
Electrostatic discharge	Ipeak, ±10 % I at 30 ns, ±30 % I at 60 ns, ±30 %		