Maximum Permissible Exposure

FCC ID	**:**	**QISLYA-L0C**
Equipment	**:**	**Smartphone**
Brand Name	**:**	**HUAWEI**
Model Name	**:**	**LYA-L0C**
Applicant / Manufacturer	**:**	**Huawei Technologies Co., Ltd. Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C**
Standard	**:**	**47 CFR Part 2.1091**

The product was received on Aug. 13, 2018, and testing was started from Aug. 24, 2018 and completed on Aug. 24, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in KDB680106 D01 RF Exposure Wireless Charging Apps v03 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of United States government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FA882905	01	Initial issue of report	Sep. 11, 2018
FA882905	02	Update Multiple Listing and Accessories Information	Sep. 17, 2018
FA882905	03	1. Update model name 2. Add Verification Data	Sep. 19, 2018

Reviewed by: Sam Tsai

Report Producer: Ann Hou

1 Human Exposure Assessment

1.1 Maximum Permissible Exposure

1.1.1 Limit of Maximum Permissible Exposure

Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/ cm²)**	**Averaging Time |E|²,|H|² or S (minutes)**
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
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6
Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/ cm²)**	**Averaging Time |E|²,|H|² or S (minutes)**
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 1: f = frequency in MHz ; *Plane-wave equivalent power density Note 2: For the applicable limit, see FCC 1.1310				

1.2 Table for Multiple Listing

The brand/model names in the following table are all refer to the identical product.

<table>
<tr><th>Model</th><th>LYA-L29</th><th>LYA-L0C</th></tr>
<tr><td>PCB</td><td>The same</td><td>The same</td></tr>
<tr><td>Frequency-GSM</td><td>The same</td><td>The same</td></tr>
<tr><td>Frequency-WCDMA</td><td>The same</td><td>The same</td></tr>
<tr><td>Frequency-LTE</td><td>Different
B2/4/5/7/12/17/38/40/41(2545~2655MHz，support AXGP)</td><td>Different B2/4/5/7/12/17/38/40/41(2545~2655MHz，support AXGP)/B66</td></tr>
<tr><td>4*4 Mimo</td><td>Different
Support B3、B7、B1</td><td>Different
Support B2、B7、B66(B4)
Replace TRI SAW filters of B1/B3/B7 with SAW filters of B2/B66/B7.
Replace</td></tr>
<tr><td>SIM Card</td><td>Dual</td><td>Single</td></tr>
<tr><td>RF NV parameters</td><td>Different</td><td>Different
The power of LYA-L0C is different from LYA-L29 by change RF NV parameters.
• Down antenna（Primary）
① 0mm body Scenario
<table>
<tr><td></td><td>WB2</td><td>WB4</td><td>LTEB2</td><td>LTEB4</td></tr>
<tr><td>reduce</td><td>0.5dB</td><td>0.5dB</td><td>0.5dB</td><td>1.5dB</td></tr>
</table>
② 10mm hotspot Scenario
<table>
<tr><td></td><td>LTEB4</td></tr>
<tr><td>reduce</td><td>0.5dB</td></tr>
</table>
• Up antenna (Secondary)
Head Scenario
<table>
<tr><td></td><td>WB2</td><td>WB4</td><td>LTEB2</td></tr>
<tr><td>rise</td><td>1dB</td><td>1dB</td><td>1dB</td></tr>
</table></td></tr>
<tr><td>Hardware</td><td>Different
Location ID: Z4102, Z4302, Z4401
Description:B1/3/7 Tri saw filter,2140MHz.

Location ID: Z4103
Description: SAW filter -1960MHz</td><td>Different
1) Replace TRI SAW filters of B1/B3/B7 with SAW filters of B2/B66/B7.
Replace
Location ID: Z4102,Z4302,Z4401
Description:B2/B66/B7 Tri saw filter ,2655MHz.
2)Delete some chip inductors in Peripheral RF Matching circuits of the diversity circuit, MIMO main circuit, and MIMO diversity circuit.
Delete
Location ID: L4126 L4127 L4130 L3506
Description: Chip inductor 0.018uH/0.001uH/0.0022uH/0.0039uH
3) Delete The circuits related to the B32 frequency band.
Delete:
Location ID: Z3502,Z4104
Description: B32 saw filter 1474MHz
Location ID: C3512,C5401,C5405
Description: Ceramic capacitor 0.033nF
Location ID: Z5403
Description: Ceramic filter -1710MHz
Location ID: U3503,U4101
Description: RF low noise amplifier -1559~1610MHz
4)Replace B3 SAW filter with B2 SAW filter and slight change of Peripheral RF matching circuits.
Replace:
Location ID: Z4103
Description: SAW filter -1842.5MHz
Delete:
Location ID:L3502 L3516 L4129
Description: Chip inductor 0.0056uH/0.002uH/0.0075uH
Location ID:C3514,C4110
Description: Ceramic capacitor 0.018nF</td></tr>
</table>

Model	**LYA-L29**	**LYA-L0C**
Software	Different	Different
Dimensions	The same	The same
Appearance	The same	The same
main antenna	The same	The same
BT/Wi-Fi antenna	The same	The same
DIV antenna	The same	The same
Supported CA configurations for DL CA	Different support:CA_1A-3A CA_1C-3A CA_1A-3C CA_1A-3A-3A CA_1C-3C CA_1A-3D CA_1C-3D CA_1A-7A-7A CA_1A-32A CA_1A-38A CA_1A-38C CA_1A-40A CA_1A-40C CA_1A-41A CA_1A-41C CA_3A-3A-7A CA_3A-7A-7A CA_3A-3A-7A-7A CA_3A-3A-8A CA_3A-32A CA_3C-32A CA_3A-38A CA_3C-38A CA_3A-38C CA_3C-38C CA_3A-40A CA_3A-40C CA_3A-40D CA_3A-41A CA_7A-7A-8A CA_7A-32A CA_8A-32A CA_20A-32A CA_1A-3A-5A CA_1A-3C-5A CA_1A-3A-7A CA_1C-3A-7A CA_1A-3C-7A CA_1A-3A-3A-7A CA_1A-3A-7C CA_1A-3A-7A-7A CA_1C-3C-7A CA_1A-3A-3A-7A-7A CA_1A-3A-8A CA_1A-3C-8A CA_1A-3A-19A CA_1A-3A-20A CA_1A-3C-20A CA_1A-3A-26A CA_1A-3A-28A CA_1A-3C-28A CA_1A-3A-32A CA_1A-3A-38A CA_1A-3C-38A CA_1A-3A-38C CA_1A-3C-38C CA_1A-28A-40C CA_3A-3A-7A-8A CA_3A-7A-7A-8A CA_3A-3A-7A-7A-8A CA_3A-3A-7A-20A CA_3A-7A-32A CA_3C-7A-32A CA_3A-8A-38A CA_3C-8A-38A CA_3A-20A-32A CA_3A-28A-40A CA_3A-28A-40C CA_3A-28A-40D CA_7A-8A-32A CA_7A-20A-32A CA_1A-3A-7A-8A CA_1A-3C-7A-8A CA_1A-3A-7A-20A CA_1A-3C-7A-20A CA_1A-3A-7A-28A CA_1A-3A-7C-28A CA_1A-3A-7A-32A CA_1A-3A-8A-38A CA_1A-3A-20A-32A CA_1A-3A-28A-40A CA_1A-3A-28A-40C CA_1A-7A-20A-32A CA_3A-7A-20A-32A CA_1A-3A-7A-20A-32A unsupport:CA_66B CA_66C CA_66D CA_2A-2A CA_4A-4A CA_12A-12A CA_66A-66A CA_2A-4A CA_2C-4A CA_2A-4A-4A CA_2A-5A CA_2A-7A CA_2A-7C CA_2A-7A-7A CA_2A-12A CA_2A-2A-12A CA_2A-12B CA_2A-12A-12A CA_2A-17A CA_2A-28A CA_2A-66A CA_2A-2A-66A CA_4A-5A CA_4A-4A-5A CA_4A-7A CA_4A-4A-7A CA_4A-7C CA_4A-7A-7A CA_4A-12A CA_4A-4A-12A CA_4A-12B CA_4A-12A-12A CA_4A-17A CA_4A-28A CA_7A-12A CA_7A-12B CA_7A-12A-12A CA_7A-66A CA_7C-66A CA_7A-66A-66A CA_7C-66A-66A CA_12A-66A CA_12B-66A CA_12A-66A-66A CA_2A-4A-5A CA_2A-4A-7A CA_2A-4A-7C CA_2A-4A-7A-7A CA_2A-4A-12A CA_2A-4A-12A-12A CA_2A-4A-28A CA_2A-7A-12A CA_2A-7A-12B CA_2A-7A-12A-12A CA_2A-7A-66A CA_2A-12A-66A CA_2A-2A-12A-66A CA_2A-12B-66A CA_4A-5A-7A CA_4A-7A-12A CA_4A-7A-12B CA_4A-7A-12A-12A CA_7A-12A-66A CA_7A-12B-66A CA_2A-4A-7A-12A CA_2A-7A-12A-66A CA_2A-7A-12B-66A	Different unsupport:CA_1A-3A CA_1C-3A CA_1A-3C CA_1A-3A-3A CA_1C-3C CA_1A-3D CA_1C-3D CA_1A-7A-7A CA_1A-32A CA_1A-38A CA_1A-38C CA_1A-40A CA_1A-40C CA_1A-41A CA_1A-41C CA_3A-3A-7A CA_3A-7A-7A CA_3A-3A-7A-7A CA_3A-3A-8A CA_3A-32A CA_3C-32A CA_3A-38A CA_3C-38A CA_3A-38C CA_3C-38C CA_3A-40A CA_3A-40C CA_3A-40D CA_3A-41A CA_7A-7A-8A CA_7A-32A CA_8A-32A CA_20A-32A CA_1A-3A-5A CA_1A-3C-5A CA_1A-3A-7A CA_1A-3C-7A CA_1A-3A-3A-7A CA_1A-3A-7C CA_1A-3A-7A-7A CA_1C-3C-7A CA_1A-3A-3A-7A-7A CA_1A-3A-8A CA_1A-3C-8A CA_1A-3A-19A CA_1A-3A-20A CA_1A-3C-20A CA_1A-3A-26A CA_1A-3A-28A CA_1A-3C-28A CA_1A-3A-32A CA_1A-3A-38A CA_1A-3C-38A CA_1A-3A-38C CA_1A-3C-38C CA_1A-28A-40C CA_3A-3A-7A-8A CA_3A-7A-7A-8A CA_3A-3A-7A-7A-8A CA_3A-3A-7A-20A CA_3A-7A-32A CA_3C-7A-32A CA_3A-8A-38A CA_3C-8A-38A CA_3A-20A-32A CA_3A-28A-40A CA_3A-28A-40C CA_3A-28A-40D CA_7A-8A-32A CA_7A-20A-32A CA_1A-3A-7A-8A CA_1A-3C-7A-8A CA_1A-3A-7A-20A CA_1A-3C-7A-20A CA_1A-3A-7A-28A CA_1A-3A-7C-28A CA_1A-3A-7A-32A CA_1A-3A-8A-38A CA_1A-3A-20A-32A CA_1A-3A-28A-40A CA_1A-3A-28A-40C CA_1A-7A-20A-32A CA_3A-7A-20A-32A CA_1A-3A-7A-20A-32A support:CA_66B CA_66C CA_66D CA_2A-2A CA_4A-4A CA_12A-12A CA_66A-66A CA_2A-4A CA_2C-4A CA_2A-4A-4A CA_2A-5A CA_2A-7A CA_2A-7C CA_2A-7A-7A CA_2A-12A CA_2A-2A-12A CA_2A-12B CA_2A-12A-12A CA_2A-17A CA_2A-28A CA_2A-66A CA_2A-2A-66A CA_4A-5A CA_4A-4A-5A CA_4A-7A CA_4A-4A-7A CA_4A-7C CA_4A-7A-7A CA_4A-12A CA_4A-4A-12A CA_4A-12B CA_4A-12A-12A CA_4A-17A CA_4A-28A CA_7A-12A CA_7A-12B CA_7A-12A-12A CA_7A-66A CA_7C-66A CA_7A-66A-66A CA_7C-66A-66A CA_12A-66A CA_12B-66A CA_12A-66A-66A CA_2A-4A-5A CA_2A-4A-7A CA_2A-4A-7C CA_2A-4A-7A-7A CA_2A-4A-12A CA_2A-4A-12A-12A CA_2A-4A-28A CA_2A-7A-12A CA_2A-7A-12B CA_2A-7A-12A-12A CA_2A-7A-66A CA_2A-12A-66A CA_2A-2A-12A-66A CA_2A-12B-66A CA_4A-5A-7A CA_4A-7A-12A CA_4A-7A-12B CA_4A-7A-12A-12A CA_7A-12A-66A CA_7A-12B-66A CA_2A-4A-7A-12A CA_2A-7A-12A-66A CA_2A-7A-12B-66A CA_2A-7A-7A-66A-66A CA_2A-7A-7A-66A CA_2A-7A-66A-66A CA_7A-7A-66A CA_7A-7A-66A-66A CA_2A-66A-66A
Supported CA configurations for UL CA	Different support:CA_3A-20A CA_7A-20A	Different Unsupport:CA_3A-20A CA_7A-20A
Others	NA	NA

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 2.1091
- KDB680106 D01 RF Exposure Wireless Charging Apps v03

1.4 Testing Location Information

Testing Location					
☒	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973			
Test site Designation No. TW1190 with FCC.					
Test Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
RF Conducted		TH01-HY	Andy	24.7°C / 63.8%	24/Aug/2018

1.5 Accessories

Accessories Information				
AC Adapter 1	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HW-100400A00
	Manufacturer	Huawei Technologies Co., Ltd.		
	Power Rating	I/P: 100 - 240Vac~50/60Hz, 1.2 A; O/P: 5V ⎓ 2A or 9V ⎓ 2A or 10V ⎓ 4A		
AC Adapter 2	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HW-100400U00
	Manufacturer	Huawei Technologies Co., Ltd.		
	Power Rating	I/P: 100 - 240Vac~50/60Hz, 1.2 A; O/P: 5V ⎓ 2A or 9V ⎓ 2A or 10V ⎓ 4A		
AC Adapter 3	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HW-100400E00
	Manufacturer	Huawei Technologies Co., Ltd.		
	Power Rating	I/P: 100 - 240Vac~50/60Hz, 1.2 A; O/P: 5V ⎓ 2A or 9V ⎓ 2A or 10V ⎓ 4A		
AC Adapter 4	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HW-100400B00
	Manufacturer	Huawei Technologies Co., Ltd.		
	Power Rating	I/P: 100 - 240Vac~50/60Hz, 1.2 A; O/P: 5V ⎓ 2A or 9V ⎓ 2A or 10V ⎓ 4A		
Battery 1	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HB486486ECW
	Power Rating	Nominal Voltage: ⎓ +3.82Vdc Charging Voltage: ⎓ +4.4V Rated capacity: 4100mAh	**Type**	Li-ion Polymer
Battery 2	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HB486486ECW
	Power Rating	Nominal Voltage: ⎓ +3.82Vdc Charging Voltage: ⎓ +4.4V Rated capacity: 4100mAh	**Type**	Li-ion Polymer

Battery 3	**Brand Name**	Huawei Technologies Co., Ltd.	**Model Name**	HB486486ECW
	Power Rating	Nominal Voltage: ⎓ +3.82Vdc Charging Voltage: ⎓ +4.4V Rated capacity: 4100mAh	**Type**	Li-ion Polymer
Earphone 1	**Brand Name**	Jiangxi Lianchuang Hongsheng Electronic Co. ,LTD.		
	Model Name	MEND1632B729003	**Number**	22040325
Earphone 2	**Brand Name**	GoerTek Inc.		
	Model Name	Windy-S	**Number**	22040325
Earphone 3	**Brand Name**	Boluo County Quancheng Electronic Co.,ltd.		
	Model Name	1331-3301-6001-TC-088	**Number**	22040325
Earphone 4	**Brand Name**	Foster Electric Co.,(GuangZhou)LTD.Sales Dep.		
	Model Name	630276	**Number**	22040325
USB Cable1	**Brand Name**	Ningbo Broad Telecommunication Co., Ltd.		
	Model Name	WA0009	**Number**	4071722
USB Cable2	**Brand Name**	LUXSHARE Precision Industry Co., Ltd.		
	Model Name	L99UC117-CS-H	**Number**	4071722
USB Cable3	**Brand Name**	HUIZHOU DEHONG TECHNOLOGY CO.,LTD.		
	Model Name	330-50465	**Number**	4071722

Note: Regarding to more detail and other information, please refer to user manual.

1.6 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Mobile phone	HUAWEI	LYA-L0C	QISLYA-L0C

Note: Support equipment No.1 was provided by customer.

1.7 The Worst Condition

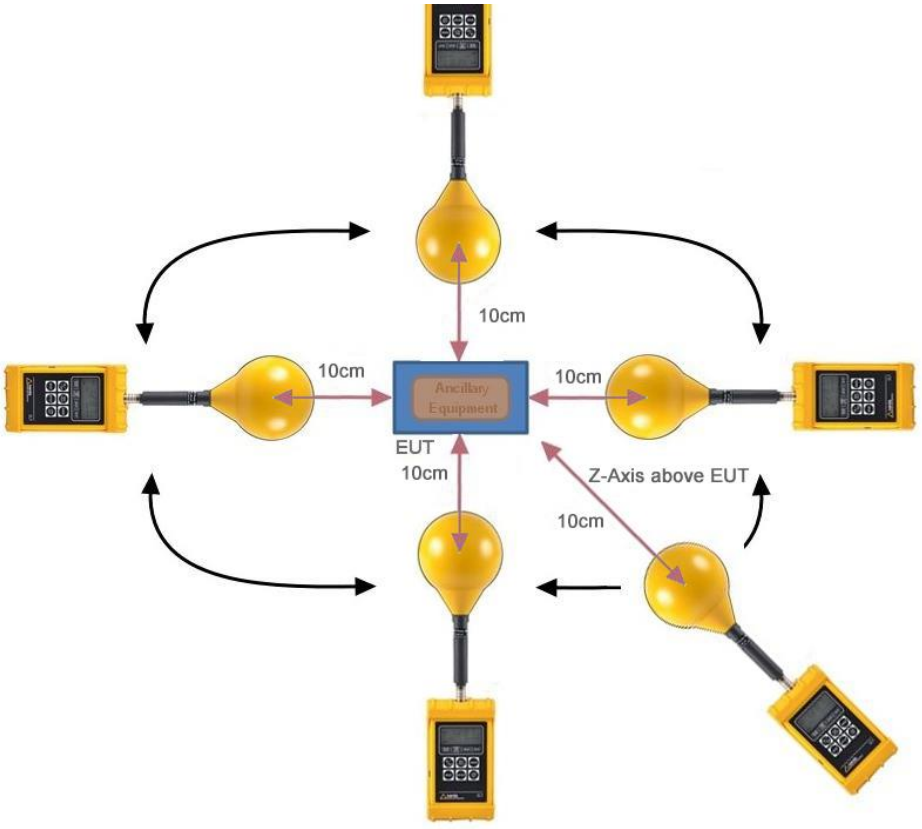
Ancillary Equipment	Charging Condition	Worst Charging Condition
Mobile phone	Charging Mode	battery capacity 90%

1.8 Test Method

Test Method	
☒	Performed aggregate both leakage E-field and H-field at surrounding the device from all simultaneous transmitting coils.
☒	During testing, the EUT was placed on a non-conductive table top and the ancillary equipment (e.g., mobile phone) was placed on the EUT for charging. Maximum E-field and H-field measurements were tested 10cm from each side of the EUT. Along the side of the EUT to center of E-field probe and H-field probe were positioned at the location to search maximum field strength.
☒	E-field transfer to H-field
-	E-field = Z_0 × H-field H-field = E-field ÷ Z_0 Where Z_0 = Free Space Impedance = 377Ω

1.9 Test Setup

E-field and H-field Measurement



Note1 : find worst position for each axis.
Note2 : This shall be measured as the distance from the edge of the device to the center of the measurement probe.

1.10 Result of Maximum Permissible Exposure

The data refer to FA880926.

2 Test Equipment and Calibration Data

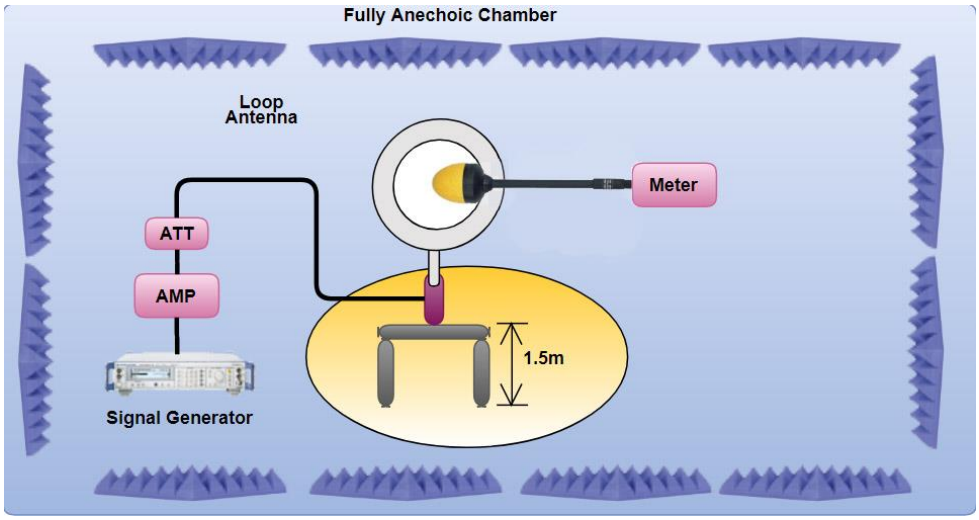
Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Probe EF	Narda Safety Test Solutions GmbH	0391 E-Field	D-0667	0.1MHz ~ 3GHz	25/Jul/2018	24/Jul/2020
Broadband Field Meter	Narda Safety Test Solutions GmbH	NBM-550	E-0847	0.1MHz ~ 3GHz	25/Jul/2018	24/Jul/2020
Vector Signal Generator	Keysight	N5171B	MY53051240	9 kHz ~ 6GHz	05/Nov/2017	04/Nov/2018
LOOP	ETS-Lindgren	6509	00213895	1 kHz ~ 30MHz	28/Jun/2017	27/Jun/2018
Amplifier	Instruments For Industry	SCCXL150	V2214-0167	9 kHz ~ 30MHz	14/Sep/2017	13/Sep/2018

Appendix A. System Validation

A1. Test Setup

Validation of measure



A2. Test Result of validation

Test Engineer	Lisa Chen	**Test Date**	24/Aug/2018

NBM-550 + 0391 E-Field				
SG setting (dBm)	**Ref. (V/m)**	**Meas. (V/m)**	**Result of Deviation (%)**	**Deviation range (%)**
-6	1.68	1.63	2.98	±10
-9	1.18	1.25	-5.93	
-12	1	0.98	2.00	

Appendix B. Calibrate of Calibration

Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7 - 72793 Pfullingen - Germany
Phone: +49 7121 9732 0 - Fax: +49 7121 9732 790

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

DAkkS Deutsche Akkreditierungsstelle D-K-17726-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

Kalibrierschein *Calibration certificate*	Kalibrierzeichen *Calibration mark*

D00317
D-K-17726-01-00
2018-07

Gegenstand *Object*	**Probe EF 0391, E-Field with Basic Unit NBM-550**
Hersteller *Manufacturer*	**Narda Safety Test Solutions**
Typ *Type*	**2402/01B** **2401/01B**
Fabrikat/Serien-Nr. *Serial number*	**D-0667** **E-0847**
Auftraggeber *Customer*	**Sporton International INC.** **6F,No.106-B, Sec.1,Sintai 5th Rd.** **Sijhih Dist.** **231 New Taipei City** **TAIWAN (R.O.C.)**
Auftragsnummer *Order No.*	
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**7**
Datum der Kalibrierung *Date of calibration*	**2018-07-25**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	*Leiter des Kalibrierlaboratoriums* *Head of the calibration laboratory*	*Bearbeiter* *Person in charge*
2018-07-26	*J. v. Freeden*	*Chr. May*

Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7 - 72793 Pfullingen - Germany
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Calibration Certificate

Narda Safety Test Solutions hereby certifies that the object referenced to this certificate has been calibrated by qualified personnel using Narda's approved procedures. The calibration was carried out in accordance with a certified quality management system which conformed to ISO 9001.

OBJECT	**Broadband Field Meter NBM-550**
MANUFACTURER	Narda Safety Test Solutions GmbH
PART NUMBER (P/N)	**2401/01B**
SERIAL NUMBER (S/N)	**E-0847**
CUSTOMER	
CALIBRATION DATE (YYYY-MM-DD)	2018-07-20
RESULT ASSESSMENT	within specifications
AMBIENT CONDITIONS	Temperature: (23 ± 3) °C Relative humidity: (20 to 60) %
CALIBRATION PROCEDURE	2401-8700-00A

ISSUE DATE: 2018-07-20
(YYYY-MM-DD)

CALIBRATED BY
C.Wiechert

AUTHORIZED SIGNATORY

Quality Management
ISO 9001:2015

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Method of Measurement

The device under test (DUT) represents a three-channel voltage meter offering high accuracy and high resolution. The DUT is calibrated by applying a known DC voltage to each of the inputs.

Uncertainty of Measurement

The measurement uncertainty stated in this document is the expanded uncertainty with a coverage factor of 2 (corresponding, in the case of normal distribution, to a confidence probability of 95 %).

The uncertainty analysis for this calibration was done in accordance with the ISO/TAG-Guide (Guide to the expression of uncertainty in measurement). The measurement uncertainties are derived from contributions from the measurement of power, reflection, attenuation and frequency, mismatch, stability of instrumentation and repeatability of handling.

This statement of uncertainty applies to the measured values only and does not include effects like temperature response and long term stability of the calibrated device.

Traceability of Measuring Equipment

The calibration results are traceable to SI-units according to ISO/IEC 17025. Physical units, which are not included in the list of accredited measured quantities such as field strength or power density, are traced to the basic units via approved measurement and computational methods.

The equipment used for this calibration is traceable to the reference listed below and the traceability is guaranteed by ISO 9001 Narda internal procedure.

Reference- / Working- Standard	Manufacturer	Model	Serial Number	Certificate Number	Cal Due Date	Trace
Digital Multimeter	Agilent	34401A	US36121450	1-8704086599-1	2019-03	UKAS 0147

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Results

Voltage display uncertainty

Channel	Input voltage applied	Specified voltage display	Meas. Uncertainty	Meas. voltage display
X	2.400 V	(2.376+/-0.024) V	+/-0.007 V	2.371 V
Y	2.400 V	(2.376+/-0.024) V	+/-0.007 V	2.371 V
Z	2.400 V	(2.376+/-0.024) V	+/-0.007 V	2.371 V

Note: Because of an internal voltage divider the nominal indication is 2.376 V.

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OBJECT

The calibration object is a broadband field meter with an isotropic probe for measuring electric field strength.

CALIBRATION PROCEDURE

The measurement was based upon procedures described in the standard IEEE Std 1309-2013 [1]: The selection and extent of parameters evaluated in a calibration are as follows:

Characteristic	Description		
Calibration type	frequency domain (no modulation, CW field used)		
Frequency response	0.1 MHz to 3.0 GHz		
Amplitude response	1.0 V/m to 150 V/m		
Isotropy	rotational response		
Frequency	0.1 MHz to 300 MHz	433 MHz to 1400 MHz	1.8 GHz to 3.0 GHz
Field generation setup	Crawford type TEM cell	Double-Ridged Horn Antenna / Anechoic chamber	Standard Gain Horn Antenna / Anechoic chamber
Illumination [2]	PI	FI	FI
Distance to antenna	n/a	1.5 m	1.0 m

[1] IEEE: *Institute of Electrical and Electronics Engineers, Inc. (http://www.ieee.org/)*

[2] PI - Partial illumination for sensor head only
FI - Full illumination of sensor head, resistive feed lines, monitor electronics

The calibration results were calculated from the maximum and minimum response (E_{max}, E_{min}) obtained during the full revolution about the ortho-axis of the probe. Each sensor is successively aligned with the incident field vector while the other sensors are cross-polarized.

- Frequency response

  The correction factor is defined as $CF = \frac{E_{cal}}{E_{mean}}$

  E_{cal} ..... actual field strength applied (empty field generator)

  $E_{mean} = \sqrt{E_{max}\, E_{min}}$ ..... mean of the indicated field strength

- Isotropy

  The anisotropy is defined as $A = 20 \log_{10}\left(E_{max} / \sqrt{E_{max}\, E_{min}}\right) \text{dB}$

MEASURING CONDITIONS

Status

- The items have been visually inspected and a self test had been completed successfully.

Probe

- The probe was directly plugged into the basic unit.
- The scaling factor(s) stored in the memory chip were used automatically: k0 = 0.963
- The rotational speed was set to nominal 24 s (for full revolution) to allow the field probe response to stabilize during the response is recorded.

Basic unit (settings)

- Result type: ACT (Actual)
- Firmware: V02.00.00
- Apply Correction Frequency: OFF (NBM-550 only)
- Operated from internally fitted batteries without any conductive connection to the external environment.

ENVIRONMENTAL CONDITIONS

Frequency range	0.1 MHz to 300 MHz	433 MHz to 1400 MHz	1.8 GHz to 3.0 GHz
Ambient temperature:	(23.1 ± 1) °C	(23.0 ± 1) °C	(22.4 ± 1) °C
Relative humidity:	(42 ± 4) %	(43 ± 4) %	(46 ± 4) %

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RESULTS

The following results describe the uncorrected frequency response of the object.

Probe orientation during calibration:
Maximum reception alignment (ortho-angle, 54.7°)

f MHz	E_{cal} V/m	E_{mean} V/m	CF	W %	A dB
0.1	6.05	3.93	1.54	7.1	0.31
0.15	6.12	4.54	1.35	7.1	0.20
0.25	6.12	5.00	1.23	7.1	0.17
1	6.11	5.55	1.10	7.1	0.10
3	6.10	5.80	1.05	7.1	0.08
10	6.10	5.98	1.02	7.1	0.06
27.12	6.09	6.09	1.00	7.1	0.06
40	6.09	6.16	0.99	7.1	0.05
75	6.10	6.36	0.96	9.1	0.05
100	6.11	6.45	0.95	9.1	0.05
170	6.10	6.31	0.97	9.1	0.07
300	6.10	6.23	0.98	9.1	0.04
433	6.09	6.87	0.89	12.3	0.09
750	6.10	6.40	0.95	12.3	0.13
835	6.10	6.14	0.99	12.3	0.18
1000	6.10	6.55	0.93	12.3	0.31
1400	6.10	6.36	0.96	13.2	0.27
1800	1.00	1.08	0.92	15.0	0.46
1800	1.19	1.26	0.94	15.0	0.15
1800	1.49	1.59	0.94	15.0	0.19
1800	2.00	2.12	0.94	11.3	0.11
1800	2.50	2.66	0.94	11.3	0.13
1800	2.99	3.18	0.94	11.3	0.11
1800	3.96	4.21	0.94	11.3	0.11
1800	5.00	5.30	0.94	11.3	0.09
1800	6.09	6.41	0.95	11.3	0.12
1800	7.98	8.41	0.95	11.3	0.08
1800	9.98	10.48	0.95	11.3	0.08
1800	12.42	12.98	0.96	11.3	0.08
1800	14.92	15.57	0.96	11.3	0.08
1800	19.96	20.77	0.96	11.3	0.10
1800	24.94	25.95	0.96	11.3	0.12

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f	E_{cal}	E_{mean}	CF	W	A
MHz	V/m	V/m		%	dB
1800	29.93	31.20	0.96	11.3	0.13
1800	39.64	41.51	0.95	11.3	0.16
1800	49.93	52.54	0.95	11.3	0.17
1800	59.79	63.27	0.95	11.3	0.18
1800	79.81	85.06	0.94	11.3	0.17
1800	99.84	106.93	0.93	11.3	0.17
1800	125.05	134.33	0.93	11.3	0.13
1800	149.99	161.68	0.93	11.3	0.12
2100	6.11	5.75	1.06	11.3	0.26
2450	6.10	5.77	1.06	11.3	0.30
3000	6.09	4.61	1.32	11.3	0.42

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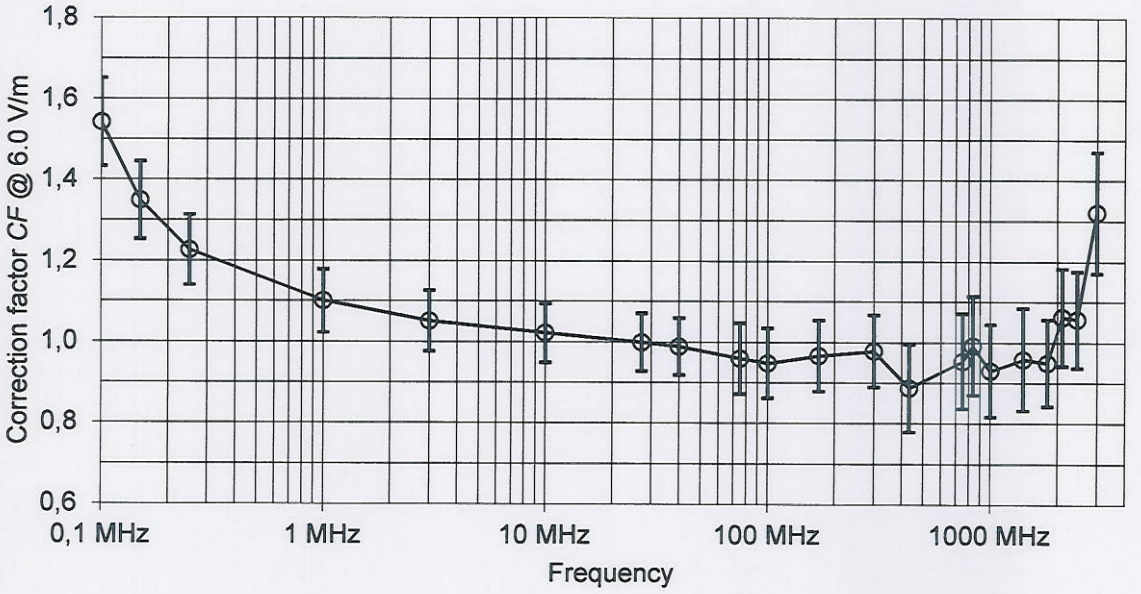

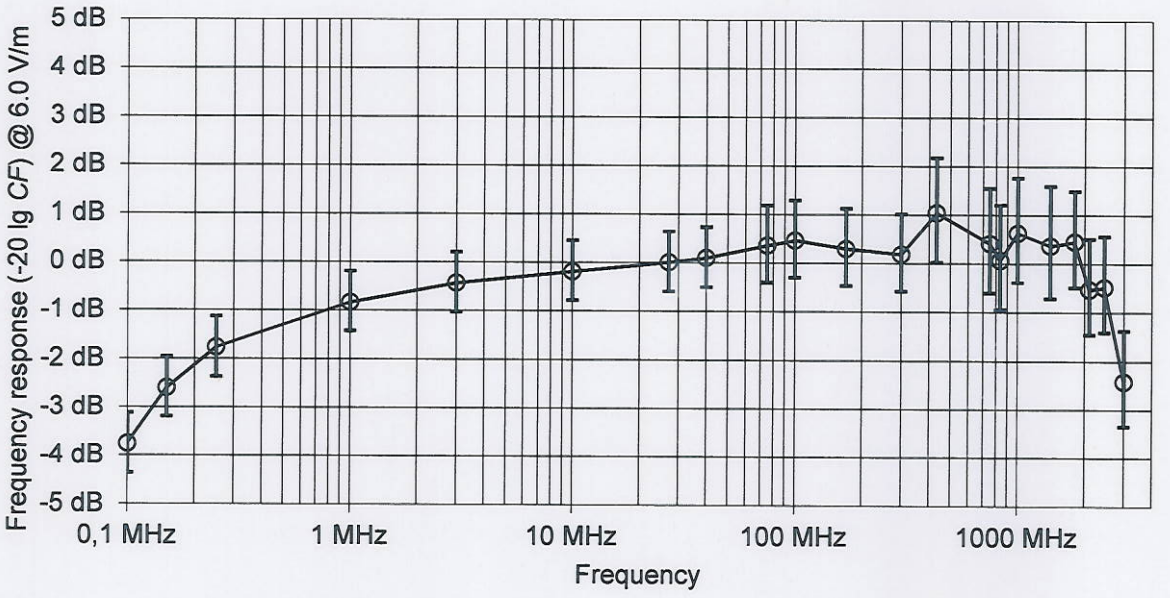

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MEASUREMENT UNCERTAINTY

The expanded measurement uncertainty calculated by multiplying the standard measurement uncertainty by the coverage factor $k = 2$ is reported. The value W is relative to the value of the correction factor. The uncertainty was determined in accordance with DAkkS-DKD-3. The value of the measurand is within the assigned value interval with a probability of 95 %.

This statement of uncertainty applies to the measured values and includes no estimation for drift or for other measurement conditions.

RESULT INTERPRETATION

Because of the fundamental effect of measuring instruments on the field being measured, the indication will depend on the orientation of the field probe to the direction of the field vector. When measuring electromagnetic fields where the orientation is unknown, the user should vary the alignment of the probe during the measurement and where appropriate take any variation in the indication into account as measurement uncertainty. This applies in particular when the measurement is intended to demonstrate adherence to a maximum permissable exposure with respect to human exposure to electromagnetic fields.

ANNEX

- The reported correction factors were not stored in the object's memory chip after calibration.
- The calibration date had been updated in the memory chips of both, the probe and the basic unit.