SAR TEST REPORT

The following samples were submitted and identified on behalf of the client as:

Equipment Under Test	Integrated personal safety and site security device
Marketing Name	Romware One
Brand Name	Romware
Model No.	Romware One
Company Name	Rombit NV
Company Address	Meir 30, 2000 Antwerpen, Belgium
Standards	IEEE/ANSI C95.1-1992, IEEE 1528-2013, KDB865664D01v01r04,KDB865664D02v01r02, KDB941225D05v02r05,KDB447498D01v06, KDB941225D05Av01r02
FCC ID	2AVTBRW01U1
Date of Receipt	Nov. 12, 2020
Date of Test(s)	Dec. 11, 2020
Date of Issue	Mar. 05, 2021

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Ltd. Central RF Lab or testing done by SGS Taiwan Ltd. Central RF Lab in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Ltd. Central RF Lab in writing.

Signed on behalf of SGS

Clerk / Ruby Ou	Engineer / Jay Tseng	Asst. Manager / John Yeh
Ruby Ou	Jay Tseng	John Yeh

Date: Mar. 05, 2021

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Revision History

Report Number	Revision	Description	Issue Date
ES/2020/30003	Rev.00	Initial creation of document	Aug. 27, 2020
ES/2020/30003-01	Rev.01	Add LTE Band 13	Mar. 05, 2021

Note:

Measurement results in the original test report ES/2020/30003 are fully leveraged in this test report ES/2020/30003-01.

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0. Guidance applied

The SAR testing method and procedure for this device is in accordance with the following standards:

IEEE/ANSI C95.1-1992

IEEE 1528-2013

KDB865664D01v01r04

KDB865664D02v01r02

KDB941225D05v02r05

KDB447498D01v06

KDB941225D05Av01r02

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1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. Central RF Lab	
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan	
FCC Designation Number	TW0027
Tel	+886-2-2299-3279
Fax	+886-2-2298-0488
Internet	http://www.tw.sgs.com/

1.2 Details of Applicant

Company Name	Rombit NV
Company Address	Meir 30, 2000 Antwerpen, Belgium

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1.3 Description of EUT

Equipment Under Test	Integrated personal safety and site security device			
Marketing Name	Romware One			
Brand Name	Romware			
Model No.	Romware One			
FCC ID	2AVTBRW01U1			
Mode of Operation	☒LTE FDD Cat.M1			
Duty Cycle	LTE FDD Cat.M1	1		
TX Frequency Range (MHz)	LTE FDD Band 2 Cat.M1	1850	–	1910
	LTE FDD Band 4 Cat.M1	1710	–	1755
	LTE FDD Band 12 Cat.M1	699	–	716
	LTE FDD Band 13 Cat.M1	777	–	787
Channel Number (ARFCN)	LTE FDD Band 2 Cat.M1	18607	–	19193
	LTE FDD Band 4 Cat.M1	19957	–	20393
	LTE FDD Band 12 Cat.M1	23017	–	23173
	LTE FDD Band 13 Cat.M1	23205	–	23255
Mode of Operation	☒UWB			
Operating Band	3993.6MHz, 6489.6MHz			

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Body

Max. SAR (1 g) (Unit: W/Kg)				
Band	Measured	Reported	Channel	Position
LTE FDD Band 2 Cat.M1	0.90	1.20	19100	Bottom side
LTE FDD Band 4 Cat.M1	0.36	0.48	20175	Front side
LTE FDD Band 12 Cat.M1	0.36	0.48	23060	Front side
LTE FDD Band 13 Cat.M1	0.23	0.32	23230	Front side

Extremity

Max. SAR (10 g) (Unit: W/Kg)				
Band	Measured	Reported	Channel	Position
LTE FDD Band 2 Cat.M1	0.36	0.48	19100	Back side
LTE FDD Band 4 Cat.M1	0.21	0.28	20175	Back side
LTE FDD Band 12 Cat.M1	0.18	0.24	23060	Back side
LTE FDD Band 13 Cat.M1	0.07	0.10	23230	Back side

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LTE FDD Band 2 / Band 4 / Band 12 / Band 13 Cat.M1 power table:

FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1860	18700	20.67	22	0
				1880	18900	20.71	22	0
				1900	19100	20.76	22	0
			2	1860	18700	20.62	22	0
				1880	18900	20.55	22	0
				1900	19100	20.56	22	0
			5	1860	18700	20.66	22	0
				1880	18900	20.62	22	0
				1900	19100	20.52	22	0
		3 RB	0	1860	18700	20.62	22	0
				1880	18900	20.50	22	0
				1900	19100	20.52	22	0
			2	1860	18700	20.52	22	0
				1880	18900	20.63	22	0
				1900	19100	20.52	22	0
			3	1860	18700	20.58	22	0
				1880	18900	20.64	22	0
				1900	19100	20.53	22	0
		6RB	0	1860	18700	20.50	22	0
				1880	18900	20.59	22	0
				1900	19100	20.64	22	0
	16-QAM	1 RB	0	1860	18700	20.52	22	0
				1880	18900	20.57	22	0
				1900	19100	20.49	22	0
			2	1860	18700	20.64	22	0
				1880	18900	20.63	22	0
				1900	19100	20.47	22	0
			4	1860	18700	20.62	22	0
				1880	18900	20.49	22	0
				1900	19100	20.56	22	0
		3 RB	0	1860	18700	20.47	22	0
				1880	18900	20.52	22	0
				1900	19100	20.51	22	0
			2	1860	18700	20.62	22	0
				1880	18900	20.64	22	0
				1900	19100	20.47	22	0
			3	1860	18700	20.52	22	0
				1880	18900	20.52	22	0
				1900	19100	20.58	22	0
		5RB	0	1860	18700	20.58	22	0
				1880	18900	20.62	22	0
				1900	19100	20.49	22	0

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1857.5	18675	20.66	22	0
				1880	18900	20.57	22	0
				1902.5	19125	20.51	22	0
			2	1857.5	18675	20.55	22	0
				1880	18900	20.53	22	0
				1902.5	19125	20.58	22	0
			5	1857.5	18675	20.66	22	0
				1880	18900	20.49	22	0
				1902.5	19125	20.55	22	0
		3 RB	0	1857.5	18675	20.53	22	0
				1880	18900	20.49	22	0
				1902.5	19125	20.62	22	0
			2	1857.5	18675	20.65	22	0
				1880	18900	20.66	22	0
				1902.5	19125	20.51	22	0
			3	1857.5	18675	20.50	22	0
				1880	18900	20.58	22	0
				1902.5	19125	20.54	22	0
		6RB	0	1857.5	18675	20.55	22	0
				1880	18900	20.48	22	0
				1902.5	19125	20.53	22	0
	16-QAM	1 RB	0	1857.5	18675	20.65	22	0
				1880	18900	20.53	22	0
				1902.5	19125	20.56	22	0
			2	1857.5	18675	20.49	22	0
				1880	18900	20.59	22	0
				1902.5	19125	20.53	22	0
			4	1857.5	18675	20.55	22	0
				1880	18900	20.63	22	0
				1902.5	19125	20.53	22	0
		3 RB	0	1857.5	18675	20.57	22	0
				1880	18900	20.59	22	0
				1902.5	19125	20.65	22	0
			2	1857.5	18675	20.47	22	0
				1880	18900	20.59	22	0
				1902.5	19125	20.53	22	0
			3	1857.5	18675	20.55	22	0
				1880	18900	20.58	22	0
				1902.5	19125	20.52	22	0
		5RB	0	1857.5	18675	20.50	22	0
				1880	18900	20.52	22	0
				1902.5	19125	20.50	22	0

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1855	18650	20.60	22	0
				1880	18900	20.61	22	0
				1905	19150	20.64	22	0
			2	1855	18650	20.47	22	0
				1880	18900	20.52	22	0
				1905	19150	20.54	22	0
			5	1855	18650	20.48	22	0
				1880	18900	20.50	22	0
				1905	19150	20.62	22	0
		3 RB	0	1855	18650	20.65	22	0
				1880	18900	20.50	22	0
				1905	19150	20.66	22	0
			2	1855	18650	20.53	22	0
				1880	18900	20.61	22	0
				1905	19150	20.63	22	0
			3	1855	18650	20.60	22	0
				1880	18900	20.59	22	0
				1905	19150	20.49	22	0
		6RB	0	1855	18650	19.61	21	0-1
				1880	18900	19.56	21	0-1
				1905	19150	19.54	21	0-1
	16-QAM	1 RB	0	1855	18650	20.62	22	0
				1880	18900	20.53	22	0
				1905	19150	20.65	22	0
			2	1855	18650	20.50	22	0
				1880	18900	20.52	22	0
				1905	19150	20.51	22	0
			4	1855	18650	20.50	22	0
				1880	18900	20.52	22	0
				1905	19150	20.62	22	0
		3 RB	0	1855	18650	20.56	22	0
				1880	18900	20.58	22	0
				1905	19150	20.58	22	0
			2	1855	18650	20.61	22	0
				1880	18900	20.56	22	0
				1905	19150	20.59	22	0
			3	1855	18650	20.52	22	0
				1880	18900	20.61	22	0
				1905	19150	20.49	22	0
		5RB	0	1855	18650	19.49	21	0-1
				1880	18900	19.61	21	0-1
				1905	19150	19.59	21	0-1

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1852.5	18625	20.61	22	0
				1880	18900	20.48	22	0
				1907.5	19175	20.56	22	0
			2	1852.5	18625	20.57	22	0
				1880	18900	20.65	22	0
				1907.5	19175	20.47	22	0
			5	1852.5	18625	20.62	22	0
				1880	18900	20.63	22	0
				1907.5	19175	20.59	22	0
		3 RB	0	1852.5	18625	19.66	21	0-1
				1880	18900	19.57	21	0-1
				1907.5	19175	19.50	21	0-1
			2	1852.5	18625	19.49	21	0-1
				1880	18900	19.51	21	0-1
				1907.5	19175	19.53	21	0-1
			3	1852.5	18625	19.53	21	0-1
				1880	18900	19.53	21	0-1
				1907.5	19175	19.62	21	0-1
		6RB	0	1852.5	18625	19.54	21	0-1
				1880	18900	19.59	21	0-1
				1907.5	19175	19.59	21	0-1
	16-QAM	1 RB	0	1852.5	18625	20.66	22	0
				1880	18900	20.50	22	0
				1907.5	19175	20.47	22	0
			2	1852.5	18625	20.63	22	0
				1880	18900	20.58	22	0
				1907.5	19175	20.61	22	0
			4	1852.5	18625	20.60	22	0
				1880	18900	20.54	22	0
				1907.5	19175	20.51	22	0
		3 RB	0	1852.5	18625	19.56	21	0-1
				1880	18900	19.48	21	0-1
				1907.5	19175	19.50	21	0-1
			2	1852.5	18625	19.53	21	0-1
				1880	18900	19.57	21	0-1
				1907.5	19175	19.65	21	0-1
			3	1852.5	18625	19.51	21	0-1
				1880	18900	19.63	21	0-1
				1907.5	19175	19.58	21	0-1
		5RB	0	1852.5	18625	18.53	20	0-2
				1880	18900	18.54	20	0-2
				1907.5	19175	18.54	20	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	1851.5	18615	20.62	22	0
				1880	18900	20.54	22	0
				1908.5	19185	20.54	22	0
			2	1851.5	18615	20.55	22	0
				1880	18900	20.62	22	0
				1908.5	19185	20.49	22	0
			5	1851.5	18615	20.51	22	0
				1880	18900	20.55	22	0
				1908.5	19185	20.64	22	0
		3 RB	0	1851.5	18615	19.64	21	0-1
				1880	18900	19.58	21	0-1
				1908.5	19185	19.56	21	0-1
			2	1851.5	18615	19.53	21	0-1
				1880	18900	19.58	21	0-1
				1908.5	19185	19.54	21	0-1
			3	1851.5	18615	19.57	21	0-1
				1880	18900	19.54	21	0-1
				1908.5	19185	19.60	21	0-1
		6RB	0	1851.5	18615	18.66	20	0-2
				1880	18900	18.66	20	0-2
				1908.5	19185	18.51	20	0-2
	16-QAM	1 RB	0	1851.5	18615	19.52	21	0-1
				1880	18900	19.60	21	0-1
				1908.5	19185	19.52	21	0-1
			2	1851.5	18615	19.47	21	0-1
				1880	18900	19.52	21	0-1
				1908.5	19185	19.57	21	0-1
			4	1851.5	18615	19.54	21	0-1
				1880	18900	19.49	21	0-1
				1908.5	19185	19.53	21	0-1
		3 RB	0	1851.5	18615	18.59	20	0-2
				1880	18900	18.55	20	0-2
				1908.5	19185	18.54	20	0-2
			2	1851.5	18615	18.50	20	0-2
				1880	18900	18.65	20	0-2
				1908.5	19185	18.53	20	0-2
			3	1851.5	18615	18.64	20	0-2
				1880	18900	18.49	20	0-2
				1908.5	19185	18.47	20	0-2
		5RB	0	1851.5	18615	18.54	20	0-2
				1880	18900	18.52	20	0-2
				1908.5	19185	18.48	20	0-2

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FDD Band 2								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	1850.7	18607	20.50	22	0
				1880	18900	20.59	22	0
				1909.3	19193	20.62	22	0
			2	1850.7	18607	20.55	22	0
				1880	18900	20.50	22	0
				1909.3	19193	20.51	22	0
			5	1850.7	18607	20.56	22	0
				1880	18900	20.54	22	0
				1909.3	19193	20.48	22	0
		3 RB	0	1850.7	18607	19.60	21	0-1
				1880	18900	19.54	21	0-1
				1909.3	19193	19.60	21	0-1
			2	1850.7	18607	19.59	21	0-1
				1880	18900	19.59	21	0-1
				1909.3	19193	19.62	21	0-1
			3	1850.7	18607	19.61	21	0-1
				1880	18900	19.52	21	0-1
				1909.3	19193	19.59	21	0-1
		6RB	0	1850.7	18607	18.59	20	0-2
				1880	18900	18.64	20	0-2
				1909.3	19193	18.66	20	0-2
	16-QAM	1 RB	0	1850.7	18607	19.52	21	0-1
				1880	18900	19.56	21	0-1
				1909.3	19193	19.59	21	0-1
			2	1850.7	18607	19.60	21	0-1
				1880	18900	19.60	21	0-1
				1909.3	19193	19.65	21	0-1
			4	1850.7	18607	19.55	21	0-1
				1880	18900	19.66	21	0-1
				1909.3	19193	19.65	21	0-1
		3 RB	0	1850.7	18607	18.65	20	0-2
				1880	18900	18.56	20	0-2
				1909.3	19193	18.51	20	0-2
			2	1850.7	18607	18.54	20	0-2
				1880	18900	18.58	20	0-2
				1909.3	19193	18.61	20	0-2
			3	1850.7	18607	18.52	20	0-2
				1880	18900	18.49	20	0-2
				1909.3	19193	18.56	20	0-2
		5RB	0	1850.7	18607	18.54	20	0-2
				1880	18900	18.57	20	0-2
				1909.3	19193	18.52	20	0-2

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
20	QPSK	1 RB	0	1720	20050	20.66	22	0
				1732.5	20175	20.81	22	0
				1745	20300	20.56	22	0
			2	1720	20050	20.62	22	0
				1732.5	20175	20.49	22	0
				1745	20300	20.63	22	0
			5	1720	20050	20.62	22	0
				1732.5	20175	20.56	22	0
				1745	20300	20.50	22	0
		3 RB	0	1720	20050	20.61	22	0
				1732.5	20175	20.59	22	0
				1745	20300	20.62	22	0
			2	1720	20050	20.59	22	0
				1732.5	20175	20.48	22	0
				1745	20300	20.49	22	0
			3	1720	20050	20.61	22	0
				1732.5	20175	20.58	22	0
				1745	20300	20.49	22	0
		6RB	0	1720	20050	20.57	22	0
				1732.5	20175	20.47	22	0
				1745	20300	20.64	22	0
	16-QAM	1 RB	0	1720	20050	20.56	22	0
				1732.5	20175	20.51	22	0
				1745	20300	20.59	22	0
			2	1720	20050	20.48	22	0
				1732.5	20175	20.53	22	0
				1745	20300	20.64	22	0
			4	1720	20050	20.65	22	0
				1732.5	20175	20.51	22	0
				1745	20300	20.56	22	0
		3 RB	0	1720	20050	20.52	22	0
				1732.5	20175	20.64	22	0
				1745	20300	20.51	22	0
			2	1720	20050	20.54	22	0
				1732.5	20175	20.51	22	0
				1745	20300	20.62	22	0
			3	1720	20050	20.62	22	0
				1732.5	20175	20.60	22	0
				1745	20300	20.62	22	0
		5RB	0	1720	20050	20.60	22	0
				1732.5	20175	20.55	22	0
				1745	20300	20.58	22	0

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
15	QPSK	1 RB	0	1717.5	20025	20.61	22	0
				1732.5	20175	20.55	22	0
				1747.5	20325	20.62	22	0
			2	1717.5	20025	20.64	22	0
				1732.5	20175	20.58	22	0
				1747.5	20325	20.65	22	0
			5	1717.5	20025	20.60	22	0
				1732.5	20175	20.53	22	0
				1747.5	20325	20.54	22	0
		3 RB	0	1717.5	20025	20.52	22	0
				1732.5	20175	20.54	22	0
				1747.5	20325	20.56	22	0
			2	1717.5	20025	20.60	22	0
				1732.5	20175	20.64	22	0
				1747.5	20325	20.58	22	0
			3	1717.5	20025	20.65	22	0
				1732.5	20175	20.50	22	0
				1747.5	20325	20.56	22	0
		6RB	0	1717.5	20025	20.56	22	0
				1732.5	20175	20.52	22	0
				1747.5	20325	20.47	22	0
	16-QAM	1 RB	0	1717.5	20025	20.48	22	0
				1732.5	20175	20.57	22	0
				1747.5	20325	20.61	22	0
			2	1717.5	20025	20.58	22	0
				1732.5	20175	20.64	22	0
				1747.5	20325	20.46	22	0
			4	1717.5	20025	20.58	22	0
				1732.5	20175	20.63	22	0
				1747.5	20325	20.55	22	0
		3 RB	0	1717.5	20025	20.53	22	0
				1732.5	20175	20.53	22	0
				1747.5	20325	20.61	22	0
			2	1717.5	20025	20.56	22	0
				1732.5	20175	20.47	22	0
				1747.5	20325	20.52	22	0
			3	1717.5	20025	20.54	22	0
				1732.5	20175	20.59	22	0
				1747.5	20325	20.54	22	0
		5RB	0	1717.5	20025	20.59	22	0
				1732.5	20175	20.61	22	0
				1747.5	20325	20.58	22	0

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	1715	20000	20.50	22	0
				1732.5	20175	20.47	22	0
				1750	20350	20.51	22	0
			2	1715	20000	20.51	22	0
				1732.5	20175	20.51	22	0
				1750	20350	20.53	22	0
			5	1715	20000	20.47	22	0
				1732.5	20175	20.59	22	0
				1750	20350	20.55	22	0
		3 RB	0	1715	20000	20.60	22	0
				1732.5	20175	20.63	22	0
				1750	20350	20.61	22	0
			2	1715	20000	20.57	22	0
				1732.5	20175	20.64	22	0
				1750	20350	20.51	22	0
			3	1715	20000	20.49	22	0
				1732.5	20175	20.57	22	0
				1750	20350	20.54	22	0
		6RB	0	1715	20000	19.54	21	0-1
				1732.5	20175	19.65	21	0-1
				1750	20350	19.47	21	0-1
	16-QAM	1 RB	0	1715	20000	20.60	22	0
				1732.5	20175	20.65	22	0
				1750	20350	20.52	22	0
			2	1715	20000	20.63	22	0
				1732.5	20175	20.57	22	0
				1750	20350	20.64	22	0
			4	1715	20000	20.65	22	0
				1732.5	20175	20.58	22	0
				1750	20350	20.65	22	0
		3 RB	0	1715	20000	20.62	22	0
				1732.5	20175	20.47	22	0
				1750	20350	20.55	22	0
			2	1715	20000	20.61	22	0
				1732.5	20175	20.59	22	0
				1750	20350	20.47	22	0
			3	1715	20000	20.52	22	0
				1732.5	20175	20.59	22	0
				1750	20350	20.49	22	0
		5RB	0	1715	20000	19.65	21	0-1
				1732.5	20175	19.58	21	0-1
				1750	20350	19.51	21	0-1

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	1712.5	19975	20.46	22	0
				1732.5	20175	20.58	22	0
				1752.5	20375	20.57	22	0
			2	1712.5	19975	20.50	22	0
				1732.5	20175	20.46	22	0
				1752.5	20375	20.65	22	0
			5	1712.5	19975	20.60	22	0
				1732.5	20175	20.47	22	0
				1752.5	20375	20.50	22	0
		3 RB	0	1712.5	19975	19.50	21	0-1
				1732.5	20175	19.47	21	0-1
				1752.5	20375	19.54	21	0-1
			2	1712.5	19975	19.61	21	0-1
				1732.5	20175	19.59	21	0-1
				1752.5	20375	19.56	21	0-1
			3	1712.5	19975	19.46	21	0-1
				1732.5	20175	19.51	21	0-1
				1752.5	20375	19.46	21	0-1
		6RB	0	1712.5	19975	19.51	21	0-1
				1732.5	20175	19.53	21	0-1
				1752.5	20375	19.47	21	0-1
	16-QAM	1 RB	0	1712.5	19975	20.58	22	0
				1732.5	20175	20.62	22	0
				1752.5	20375	20.62	22	0
			2	1712.5	19975	20.54	22	0
				1732.5	20175	20.57	22	0
				1752.5	20375	20.52	22	0
			4	1712.5	19975	20.53	22	0
				1732.5	20175	20.50	22	0
				1752.5	20375	20.60	22	0
		3 RB	0	1712.5	19975	19.50	21	0-1
				1732.5	20175	19.56	21	0-1
				1752.5	20375	19.59	21	0-1
			2	1712.5	19975	19.46	21	0-1
				1732.5	20175	19.49	21	0-1
				1752.5	20375	19.49	21	0-1
			3	1712.5	19975	19.54	21	0-1
				1732.5	20175	19.63	21	0-1
				1752.5	20375	19.59	21	0-1
		5RB	0	1712.5	19975	18.53	20	0-2
				1732.5	20175	18.58	20	0-2
				1752.5	20375	18.60	20	0-2

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	1711.5	19965	20.59	22	0
				1732.5	20175	20.49	22	0
				1753.5	20385	20.47	22	0
			2	1711.5	19965	20.65	22	0
				1732.5	20175	20.52	22	0
				1753.5	20385	20.48	22	0
			5	1711.5	19965	20.61	22	0
				1732.5	20175	20.61	22	0
				1753.5	20385	20.47	22	0
		3 RB	0	1711.5	19965	19.52	21	0-1
				1732.5	20175	19.53	21	0-1
				1753.5	20385	19.53	21	0-1
			2	1711.5	19965	19.48	21	0-1
				1732.5	20175	19.64	21	0-1
				1753.5	20385	19.48	21	0-1
			3	1711.5	19965	19.55	21	0-1
				1732.5	20175	19.49	21	0-1
				1753.5	20385	19.59	21	0-1
		6RB	0	1711.5	19965	18.64	20	0-2
				1732.5	20175	18.52	20	0-2
				1753.5	20385	18.53	20	0-2
	16-QAM	1 RB	0	1711.5	19965	19.53	21	0-1
				1732.5	20175	19.58	21	0-1
				1753.5	20385	19.61	21	0-1
			2	1711.5	19965	19.60	21	0-1
				1732.5	20175	19.50	21	0-1
				1753.5	20385	19.63	21	0-1
			4	1711.5	19965	19.57	21	0-1
				1732.5	20175	19.50	21	0-1
				1753.5	20385	19.58	21	0-1
		3 RB	0	1711.5	19965	18.63	20	0-2
				1732.5	20175	18.52	20	0-2
				1753.5	20385	18.61	20	0-2
			2	1711.5	19965	18.47	20	0-2
				1732.5	20175	18.63	20	0-2
				1753.5	20385	18.58	20	0-2
			3	1711.5	19965	18.56	20	0-2
				1732.5	20175	18.64	20	0-2
				1753.5	20385	18.55	20	0-2
		5RB	0	1711.5	19965	18.63	20	0-2
				1732.5	20175	18.65	20	0-2
				1753.5	20385	18.61	20	0-2

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FDD Band 4								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	1710.7	19957	20.57	22	0
				1732.5	20175	20.54	22	0
				1754.3	20393	20.58	22	0
			2	1710.7	19957	20.55	22	0
				1732.5	20175	20.56	22	0
				1754.3	20393	20.59	22	0
			5	1710.7	19957	20.50	22	0
				1732.5	20175	20.51	22	0
				1754.3	20393	20.51	22	0
		3 RB	0	1710.7	19957	19.50	21	0-1
				1732.5	20175	19.60	21	0-1
				1754.3	20393	19.60	21	0-1
			2	1710.7	19957	19.52	21	0-1
				1732.5	20175	19.52	21	0-1
				1754.3	20393	19.64	21	0-1
			3	1710.7	19957	19.61	21	0-1
				1732.5	20175	19.56	21	0-1
				1754.3	20393	19.54	21	0-1
		6RB	0	1710.7	19957	18.46	20	0-2
				1732.5	20175	18.64	20	0-2
				1754.3	20393	18.49	20	0-2
	16-QAM	1 RB	0	1710.7	19957	19.61	21	0-1
				1732.5	20175	19.57	21	0-1
				1754.3	20393	19.49	21	0-1
			2	1710.7	19957	19.51	21	0-1
				1732.5	20175	19.57	21	0-1
				1754.3	20393	19.52	21	0-1
			4	1710.7	19957	19.64	21	0-1
				1732.5	20175	19.65	21	0-1
				1754.3	20393	19.57	21	0-1
		3 RB	0	1710.7	19957	18.52	20	0-2
				1732.5	20175	18.53	20	0-2
				1754.3	20393	18.65	20	0-2
			2	1710.7	19957	18.52	20	0-2
				1732.5	20175	18.56	20	0-2
				1754.3	20393	18.52	20	0-2
			3	1710.7	19957	18.52	20	0-2
				1732.5	20175	18.61	20	0-2
				1754.3	20393	18.64	20	0-2
		5RB	0	1710.7	19957	18.47	20	0-2
				1732.5	20175	18.54	20	0-2
				1754.3	20393	18.50	20	0-2

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FDD Band 12								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
10	QPSK	1 RB	0	704	23060	20.73	22	0
				707.5	23095	20.49	22	0
				711	23130	20.29	22	0
			2	704	23060	20.11	22	0
				707.5	23095	20.27	22	0
				711	23130	20.11	22	0
			5	704	23060	20.17	22	0
				707.5	23095	20.24	22	0
				711	23130	20.19	22	0
		3 RB	0	704	23060	20.11	22	0
				707.5	23095	20.24	22	0
				711	23130	20.19	22	0
			2	704	23060	20.16	22	0
				707.5	23095	20.11	22	0
				711	23130	20.26	22	0
			3	704	23060	20.21	22	0
				707.5	23095	20.22	22	0
				711	23130	20.19	22	0
		6RB	0	704	23060	19.20	21	0-1
				707.5	23095	19.20	21	0-1
				711	23130	19.12	21	0-1
	16-QAM	1 RB	0	704	23060	20.18	22	0
				707.5	23095	20.25	22	0
				711	23130	20.16	22	0
			2	704	23060	20.16	22	0
				707.5	23095	20.21	22	0
				711	23130	20.19	22	0
			4	704	23060	20.11	22	0
				707.5	23095	20.24	22	0
				711	23130	20.10	22	0
		3 RB	0	704	23060	20.26	22	0
				707.5	23095	20.11	22	0
				711	23130	20.28	22	0
			2	704	23060	20.24	22	0
				707.5	23095	20.13	22	0
				711	23130	20.09	22	0
			3	704	23060	20.21	22	0
				707.5	23095	20.25	22	0
				711	23130	20.15	22	0
		5RB	0	704	23060	19.28	21	0-1
				707.5	23095	19.20	21	0-1
				711	23130	19.20	21	0-1

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FDD Band 12								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
5	QPSK	1 RB	0	701.5	23035	20.25	22	0
				707.5	23095	20.26	22	0
				713.5	23155	20.22	22	0
			2	701.5	23035	20.20	22	0
				707.5	23095	20.21	22	0
				713.5	23155	20.12	22	0
			5	701.5	23035	20.18	22	0
				707.5	23095	20.16	22	0
				713.5	23155	20.17	22	0
		3 RB	0	701.5	23035	19.13	21	0-1
				707.5	23095	19.15	21	0-1
				713.5	23155	19.24	21	0-1
			2	701.5	23035	19.19	21	0-1
				707.5	23095	19.21	21	0-1
				713.5	23155	19.10	21	0-1
			3	701.5	23035	19.16	21	0-1
				707.5	23095	19.22	21	0-1
				713.5	23155	19.15	21	0-1
		6RB	0	701.5	23035	19.19	21	0-1
				707.5	23095	19.22	21	0-1
				713.5	23155	19.18	21	0-1
	16-QAM	1 RB	0	701.5	23035	19.28	21	0-1
				707.5	23095	19.25	21	0-1
				713.5	23155	19.18	21	0-1
			2	701.5	23035	19.19	21	0-1
				707.5	23095	19.10	21	0-1
				713.5	23155	19.16	21	0-1
			4	701.5	23035	19.18	21	0-1
				707.5	23095	19.09	21	0-1
				713.5	23155	19.17	21	0-1
		3 RB	0	701.5	23035	19.13	21	0-1
				707.5	23095	19.24	21	0-1
				713.5	23155	19.28	21	0-1
			2	701.5	23035	19.17	21	0-1
				707.5	23095	19.11	21	0-1
				713.5	23155	19.16	21	0-1
			3	701.5	23035	19.17	21	0-1
				707.5	23095	19.15	21	0-1
				713.5	23155	19.20	21	0-1
		5RB	0	701.5	23035	18.12	20	0-2
				707.5	23095	18.13	20	0-2
				713.5	23155	18.10	20	0-2

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FDD Band 12								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
3	QPSK	1 RB	0	700.5	23025	20.25	22	0
				707.5	23095	20.12	22	0
				714.5	23165	20.28	22	0
			2	700.5	23025	20.10	22	0
				707.5	23095	20.26	22	0
				714.5	23165	20.11	22	0
			5	700.5	23025	20.16	22	0
				707.5	23095	20.17	22	0
				714.5	23165	20.22	22	0
		3 RB	0	700.5	23025	19.16	21	0-1
				707.5	23095	19.13	21	0-1
				714.5	23165	19.09	21	0-1
			2	700.5	23025	19.14	21	0-1
				707.5	23095	19.10	21	0-1
				714.5	23165	19.19	21	0-1
			3	700.5	23025	19.20	21	0-1
				707.5	23095	19.20	21	0-1
				714.5	23165	19.25	21	0-1
		6RB	0	700.5	23025	18.28	20	0-2
				707.5	23095	18.23	20	0-2
				714.5	23165	18.10	20	0-2
	16-QAM	1 RB	0	700.5	23025	19.25	21	0-1
				707.5	23095	19.12	21	0-1
				714.5	23165	19.09	21	0-1
			2	700.5	23025	19.15	21	0-1
				707.5	23095	19.16	21	0-1
				714.5	23165	19.13	21	0-1
			4	700.5	23025	19.12	21	0-1
				707.5	23095	19.10	21	0-1
				714.5	23165	19.25	21	0-1
		3 RB	0	700.5	23025	18.14	20	0-2
				707.5	23095	18.16	20	0-2
				714.5	23165	18.25	20	0-2
			2	700.5	23025	18.09	20	0-2
				707.5	23095	18.18	20	0-2
				714.5	23165	18.14	20	0-2
			3	700.5	23025	18.21	20	0-2
				707.5	23095	18.17	20	0-2
				714.5	23165	18.21	20	0-2
		5RB	0	700.5	23025	18.10	20	0-2
				707.5	23095	18.28	20	0-2
				714.5	23165	18.12	20	0-2

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FDD Band 12								
BW(Mhz)	Modulation	RB Size	RB Offset	Frequency (MHz)	Channel	Conducted power (dBm)	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
1.4	QPSK	1 RB	0	699.7	23017	20.26	22	0
				707.5	23095	20.15	22	0
				715.3	23173	20.12	22	0
			2	699.7	23017	20.16	22	0
				707.5	23095	20.18	22	0
				715.3	23173	20.13	22	0
			5	699.7	23017	20.10	22	0
				707.5	23095	20.25	22	0
				715.3	23173	20.23	22	0
		3 RB	0	699.7	23017	19.22	21	0-1
				707.5	23095	19.17	21	0-1
				715.3	23173	19.11	21	0-1
			2	699.7	23017	19.17	21	0-1
				707.5	23095	19.11	21	0-1
				715.3	23173	19.24	21	0-1
			3	699.7	23017	19.27	21	0-1
				707.5	23095	19.23	21	0-1
				715.3	23173	19.24	21	0-1
		6RB	0	699.7	23017	18.12	20	0-2
				707.5	23095	18.19	20	0-2
				715.3	23173	18.20	20	0-2
	16-QAM	1 RB	0	699.7	23017	19.22	21	0-1
				707.5	23095	19.22	21	0-1
				715.3	23173	19.27	21	0-1
			2	699.7	23017	19.22	21	0-1
				707.5	23095	19.17	21	0-1
				715.3	23173	19.11	21	0-1
			4	699.7	23017	19.17	21	0-1
				707.5	23095	19.12	21	0-1
				715.3	23173	19.11	21	0-1
		3 RB	0	699.7	23017	18.26	20	0-2
				707.5	23095	18.22	20	0-2
				715.3	23173	18.10	20	0-2
			2	699.7	23017	18.28	20	0-2
				707.5	23095	18.28	20	0-2
				715.3	23173	18.21	20	0-2
			3	699.7	23017	18.16	20	0-2
				707.5	23095	18.20	20	0-2
				715.3	23173	18.27	20	0-2
		5RB	0	699.7	23017	18.25	20	0-2
				707.5	23095	18.12	20	0-2
				715.3	23173	18.20	20	0-2

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LTE Band 13								
BW(Mhz)	Modulation	RB Size	RB Offset	Conducted power (dBm)			Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
Frequency (MHz)				782	782	782		
Channel				23230	23230	23230		
10	QPSK	1	0	20.64			22.00	0
		1	2	20.41			22.00	0
		1	5	20.21			22.00	0
		3	0	19.18			21.00	0-1
		3	2	19.17			21.00	0-1
		3	3	19.14			21.00	0-1
		6	0	19.09			21.00	0-1
	16-QAM	1	0	20.11			21.00	0-1
		1	2	20.08			21.00	0-1
		1	5	20.04			21.00	0-1
		3	0	18.57			20.00	0-2
		3	2	18.62			20.00	0-2
		3	3	18.47			20.00	0-2
		5	0	18.62			20.00	0-2
Frequency (MHz)				779.5	782	784.5	Target Power + Max. Tolerance (dBm)	MPR Allowed per 3GPP(dB)
Channel				23205	23230	23255		
5	QPSK	1	0	20.21	20.23	20.17	22.00	0
		1	2	20.17	20.21	20.14	22.00	0
		1	5	20.14	20.17	20.11	22.00	0
		3	0	19.02	19.06	19.01	21.00	0-1
		3	2	19.05	19.11	19.06	21.00	0-1
		3	3	19.01	19.02	19.00	21.00	0-1
		6	0	19.04	19.05	19.02	21.00	0-1
	16-QAM	1	0	19.14	19.21	19.11	21.00	0-1
		1	2	19.04	19.18	19.13	21.00	0-1
		1	5	19.11	19.14	19.08	21.00	0-1
		3	0	18.27	18.44	18.34	20.00	0-2
		3	2	18.33	18.42	18.27	20.00	0-2
		3	3	18.26	18.39	18.31	20.00	0-2
		5	0	18.23	18.34	18.16	20.00	0-2

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UWB power table:

Test Channel	Test Frequency (MHz)	EIRP Peak Power dBm/50MHz	Maximum Out Power (dBm)
Low	3995	-25.20	-27.93
Low	3992	-28.29	-31.02
High	6489	-13.98	-18.14
High	6488	-16.45	-20.61

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1.4 Test Environment

Ambient Temperature: 22±2° C
Tissue Simulating Liquid: 22±2° C

1.5 Operation Description

For LTE Cat.M1, the EUT is controlled by using a Radio Communication Tester, and the communication between the EUT and the tester is established by air link.

Per FCC guidance, the device was tested as below.

Body SAR

Test for 1-g SAR on all surfaces and side edges with the transmitting antenna located at ≤ 25 mm from that surface or edge, at 0 mm separation from a flat phantom using head tissue

Extremity SAR

SAR for wrist exposure is evaluated with the back of the device positioned in direct contact against a flat phantom filled with head tissue-equivalent medium. The wrist bands should be unstrapped and touching the phantom.

Note:

1. During the SAR testing, the DASY 5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.
2. LTE modes test according to **KDB 941225D05v02r05.**
   a. Per Section 5.2.1, the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation.
   - Using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.

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- When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.
- When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

b. Per Section 5.2.2, the largest channel bandwidth and measure SAR for QPSK with 50% RB allocation

- The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

c. Per Section 5.2.3, the largest channel bandwidth and measure SAR for QPSK with 100% RB allocation

- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg.
- Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

d. Per Section 5.2.4, Higher order modulations

- For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 5.2.1, 5.2.2 and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

e. Per Section 5.3, other channel bandwidth standalone SAR test requirements

- For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 5.2 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the

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equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation etc. is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth.

3. According to KDB447498D01v06, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.

4. According to KDB865664D01v01r04, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 0.8 W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)

5. For UWB, their maximum output power is very low. For UWB operating below 6GHz, standalone SAR test is excluded based on KDB447498D01 4.3.1. For UWB operating above 6GHz, RF exposure test is excluded based on 2019-11 RF exposure policy updates (test exclusion based on maximum time-averaged power 1mW).

		UWB 3995 MHz	UWB 6489 MHz
MaxImum output power (dBm)		-27.93	-18.14
All edges	Test separation distance (mm)	5	5
	Test exclusion threshold (dBm)	8.750	0.000
	Require SAR/RF exposure testing?	**NO**	**NO**

6. For LTE Cat.M1, follow KDB941225D05 and FCC guidance to proceed power and SAR measurements.

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1.7 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 5 professional system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY 5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

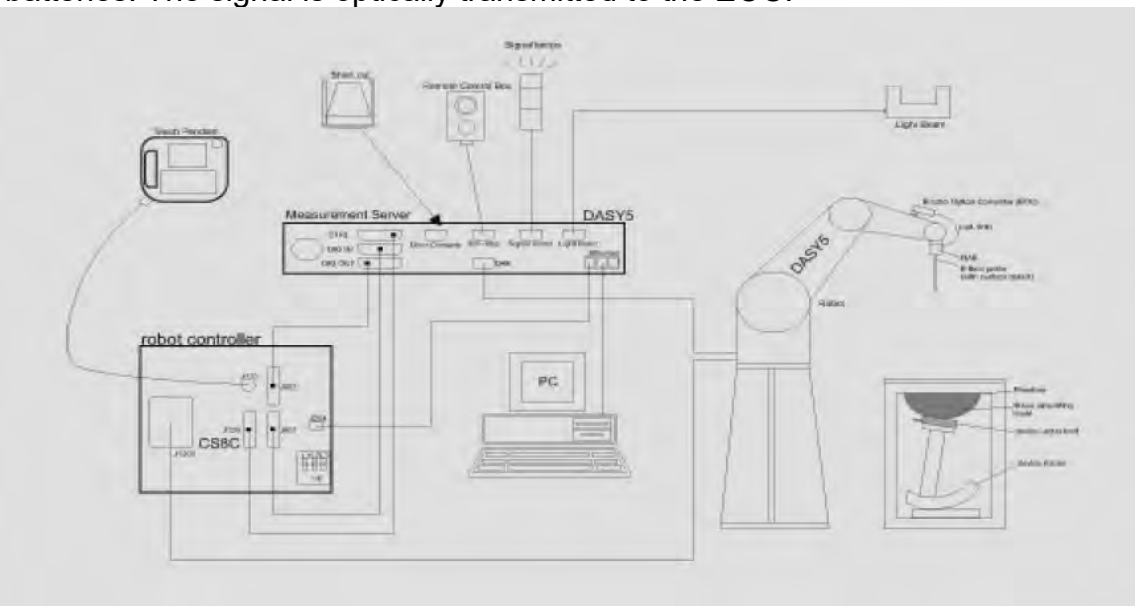

Fig. a The block diagram of SAR system

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4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
7. A computer operating Windows 7.
8. DASY 5 software.
9. Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
13. Validation dipole kits allowing to validate the proper functioning of the system.

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1.8 System Components

EX3DV4 E-Field Probe

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 750/1750/1900 MHz Additional CF for other liquids and frequencies upon request	
Frequency	10 MHz to > 6 GHz	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)	
Dimensions	Tip diameter: 2.5 mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

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PHANTOM

Model	ELI
Construction	The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 30 liters
Dimensions	Major axis: 600 mm Minor axis: 400 mm

DEVICE HOLDER

Construction	The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin) , which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks.	 Device Holder

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1.9 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 750/1750/1900MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 5 mm (frequency > 3 G Hz) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

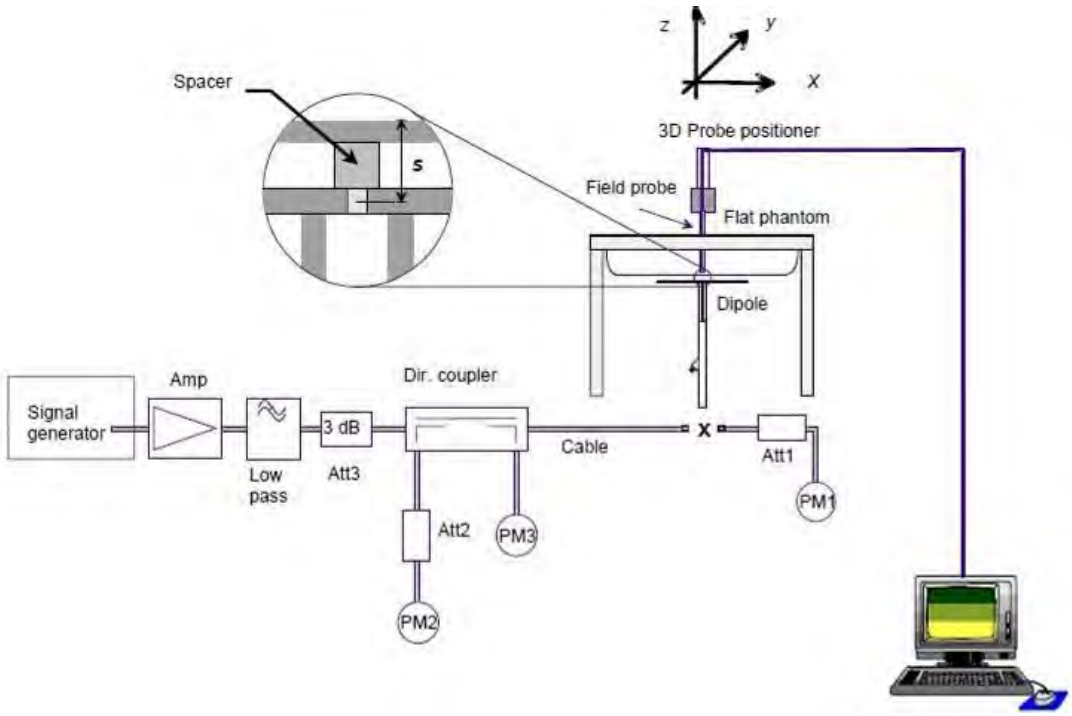

Fig. b The block diagram of system verification

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Report No.: ES/2020/30003

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	pin=250mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D750V3	1015	750	Head	8.6	2.17	8.68	0.93%	Mar. 12, 2020
D1750V2	1008	1750	Head	36.8	8.94	35.76	-2.83%	Mar. 13, 2020
D1900V2	5d173	1900	Head	40.2	9.79	39.16	-2.59%	Mar. 14, 2020
Validation Kit	S/N	Frequency (MHz)		1W Target SAR-10g (mW/g)	pin=250mW Measured SAR-10g (mW/g)	Measured SAR-10g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D750V3	1015	750	Head	5.66	1.46	5.84	3.18%	Mar. 12, 2020
D1750V2	1008	1750	Head	19.4	4.75	19.00	-2.06%	Mar. 13, 2020
D1900V2	5d173	1900	Head	21	5.05	20.20	-3.81%	Mar. 14, 2020

Report No.: ES/2020/30003-01

Validation Kit	S/N	Frequency (MHz)		1W Target SAR-1g (mW/g)	pin=250mW Measured SAR-1g (mW/g)	Measured SAR-1g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D750V3	1015	750	Head	8.48	2.13	8.52	0.47%	Dec. 11, 2020
Validation Kit	S/N	Frequency (MHz)		1W Target SAR-10g (mW/g)	pin=250mW Measured SAR-10g (mW/g)	Measured SAR-10g normalized to 1W (mW/g)	Deviation (%)	Measured Date
D750V3	1015	750	Head	5.53	1.43	5.72	3.44%	Dec. 11, 2020

Table 1. Results of system verification

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1.10 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Network Analyzer.
All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The measured conductivity and permittivity are all within ± 5% of the target values.

Report No.: ES/2020/30003

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ
Head	Mar. 12, 2020	704.00	42.181	0.890	43.459	0.876	3.03%	-1.55%
		707.50	42.162	0.890	43.436	0.879	3.02%	-1.24%
		711.00	42.144	0.890	43.421	0.881	3.03%	-1.05%
		750.00	41.942	0.893	42.587	0.889	1.54%	-0.49%
	Mar. 13, 2020	1720.00	40.126	1.354	41.020	1.327	2.23%	-1.97%
		1732.50	40.107	1.361	40.984	1.329	2.19%	-2.35%
		1745.00	40.087	1.368	40.980	1.332	2.23%	-2.64%
		1750.00	40.079	1.371	40.921	1.338	2.10%	-2.41%
	Mar. 14, 2020	1860.00	40.000	1.400	40.893	1.355	2.23%	-3.21%
		1880.00	40.000	1.400	40.864	1.358	2.16%	-3.00%
		1900.00	40.000	1.400	40.820	1.361	2.05%	-2.79%

Report No.: ES/2020/30003-01

Tissue Type	Measurement Date	Measured Frequency (MHz)	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	% dev εr	% dev σ
Head	Dec. 11, 2020	750.00	41.942	0.893	43.545	0.907	3.82%	1.52%
		782.00	41.775	0.896	42.471	0.938	1.67%	4.70%

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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The composition of the body tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
750	Head	—	532.98 g	18.3 g	2.4 g	3.2 g	766 g	1.3L(Kg)
1750	Head	444.52 g	552.42 g	3.06 g	—	—	—	1.0L(Kg)
1900	Head	444.52 g	552.42 g	3.06 g	—	—	—	1.0L(Kg)

Table 3. Recipes for Tissue Simulating Liquid

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1.11 Evaluation Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements.

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The measured volume of 30x30x30mm contains about 30g of tissue.
The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.12 Probe Calibration Procedures

For the calibration of E-field probes in lossy liquids, an electric field with an accurately known field strength must be produced within the measured liquid. For standardization purposes it would be desirable if all measurements which are necessary to assess the correct field strength would be traceable to standardized measurement procedures. In the following two different calibration techniques are summarized:

1.12.1 Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field (E) and the temperature gradient ($\delta T / \delta t$) in the liquid.

$$SAR = \frac{\sigma}{\rho}|E|^2 = c\frac{\delta T}{\delta t}$$

whereby σ is the conductivity, ρ the density and c the heat capacity of the liquid.

Hence, the electric field in lossy liquid can be measured indirectly by measuring the temperature gradient in the liquid. Non-disturbing temperature probes (optical probes or thermistor probes with resistive lines) with high spatial resolution (<1-2 mm) and fast reaction time (<1 s) are available and can be easily calibrated with high precision [1]. The setup and the exciting source have no influence on the calibration; only the relative positioning uncertainties of the standard temperature probe and the E-field probe to be calibrated must be considered. However, several problems limit the available accuracy of probe calibrations with temperature probes:

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1. The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.
2. The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.
3. The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures (~ 2% for c; much better for ρ) , there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
4. Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about ±10% (RSS) [2]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in [3]. The estimated uncertainty of the setup is ±5% (RSS) when the same liquid is used for the calibration and for actual measurements and ±7-9% (RSS) when not, which is in good agreement with the estimates given in [2].

1.12.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.
When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

1. The setup must enable accurate determination of the incident power.
2. The accuracy of the calculated field strength will depend on the

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assessment of the dielectric parameters of the liquid.

3. Due to the small wavelength in liquids with high permittivity, even small setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

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3. K. Jokela, P. Hyysalo, and L. Puranen, \Calibration of specific absorption rate (SAR) probes in waveguide at 900 MHz", *IEEE Transactions on Instrumentation and Measurements*, vol. 47, no. 2, pp. 432{438, Apr. 1998.

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1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (‘‘SAR’’) in Section 4.2 of ‘‘IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,’’ ANSI/IEEE C95.1, By the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in ‘‘Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,’’ NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

1. Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).
2. Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.
3. Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the

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spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section. (Table 4.)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR (Brain)	1.60 W/Kg	8.00 W/Kg
Spatial Average SAR (Whole Body)	0.08 W/Kg	0.40 W/Kg
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 W/Kg	20.00 W/Kg

Table 4. RF exposure limits

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

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2. Summary of Results

2.1 Decision rules

Reported measurement data comply with IEEE 1528-2013:

Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.2 Summary of Results

LTE FDD Band 2

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
Body	20MHz	QPSK	1 RB	0	Back side	0	19100	1900	22	20.76	133.05%	0.520	0.692	-
					Top side	0	19100	1900	22	20.76	133.05%	0.017	0.023	-
					Bottom side	0	18700	1860	22	20.67	135.83%	0.873	1.186	-
					Bottom side	0	18900	1880	22	20.71	134.59%	0.882	1.187	-
					Bottom side	0	19100	1900	22	20.76	133.05%	0.898	1.195	53
					Bottom side*	0	19100	1900	22	20.76	133.05%	0.833	1.108	-
					Right side	0	19100	1900	22	20.76	133.05%	0.040	0.053	-
					Left side	0	19100	1900	22	20.76	133.05%	0.374	0.498	-
					Front side	0	19100	1900	22	20.76	133.05%	0.547	0.728	-
			3 RB	0	Bottom side	0	18700	1860	22	20.62	137.40%	0.852	1.171	-
				3	Back side	0	18900	1880	22	20.64	136.77%	0.496	0.678	-
					Top side	0	18900	1880	22	20.64	136.77%	0.015	0.021	-
					Bottom side	0	18900	1880	22	20.64	136.77%	0.868	1.187	-
					Bottom side	0	19100	1900	22	20.53	140.28%	0.841	1.180	-
					Right side	0	18900	1880	22	20.64	136.77%	0.036	0.049	-
					Left side	0	18900	1880	22	20.64	136.77%	0.362	0.495	-
					Front side	0	18900	1880	22	20.64	136.77%	0.543	0.743	-
			6 RB		Back side	0	19100	1900	22	20.64	136.77%	0.483	0.661	-
					Top side	0	19100	1900	22	20.64	136.77%	0.012	0.016	-
					Bottom side	0	18700	1860	22	20.50	141.25%	0.811	1.146	-
					Bottom side	0	18900	1880	22	20.59	138.36%	0.827	1.144	-
					Bottom side	0	19100	1900	22	20.64	136.77%	0.847	1.158	-
					Right side	0	19100	1900	22	20.64	136.77%	0.031	0.042	-
					Left side	0	19100	1900	22	20.64	136.77%	0.355	0.486	-
					Front side	0	19100	1900	22	20.64	136.77%	0.536	0.733	-

＊ - repeated at the highest SAR measurement according to the KDB 865664 D01

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 10g (W/kg)		Plot page
												Measured	Reported	
Limb	20MHz	QPSK	1 RB	0	Back side	0	18700	1860	22	20.67	135.83%	0.342	0.465	-
					Back side	0	18900	1880	22	20.71	134.59%	0.348	0.468	-
					Back side	0	19100	1900	22	20.76	133.05%	0.357	0.475	54
			3 RB	3	Back side	0	18900	1880	22	20.64	136.77%	0.343	0.469	-
			6 RB		Back side	0	19100	1900	22	20.64	136.77%	0.339	0.464	-

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LTE FDD Band 4

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
Body	20MHz	QPSK	1 RB	0	Back side	0	20175	1732.5	22	20.81	131.52%	0.343	0.451	-
					Top side	0	20175	1732.5	22	20.81	131.52%	0.030	0.039	-
					Bottom side	0	20175	1732.5	22	20.81	131.52%	0.344	0.452	-
					Right side	0	20175	1732.5	22	20.81	131.52%	0.043	0.057	-
					Left side	0	20175	1732.5	22	20.81	131.52%	0.057	0.075	-
					Front side	0	20050	1720	22	20.66	136.14%	0.349	0.475	-
					Front side	0	20175	1732.5	22	20.81	131.52%	0.362	0.476	55
				2	Front side	0	20300	1745	22	20.63	137.09%	0.345	0.473	-
			3 RB	0	Back side	0	20300	1745	22	20.63	137.09%	0.332	0.455	-
					Top side	0	20300	1745	22	20.63	137.09%	0.027	0.037	-
					Bottom side	0	20300	1745	22	20.63	137.09%	0.337	0.462	-
					Right side	0	20300	1745	22	20.63	137.09%	0.038	0.052	-
					Left side	0	20300	1745	22	20.63	137.09%	0.052	0.071	-
					Front side	0	20300	1745	22	20.63	137.09%	0.345	0.473	-
			6 RB		Back side	0	20300	1745	22	20.64	136.77%	0.325	0.445	-
					Top side	0	20300	1745	22	20.64	136.77%	0.022	0.030	-
					Bottom side	0	20300	1745	22	20.64	136.77%	0.329	0.450	-
					Right side	0	20300	1745	22	20.64	136.77%	0.035	0.048	-
					Left side	0	20300	1745	22	20.64	136.77%	0.045	0.062	-
					Front side	0	20300	1745	22	20.64	136.77%	0.339	0.464	-

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 10g (W/kg)		Plot page
												Measured	Reported	
Limb	20MHz	QPSK	1 RB	0	Back side	0	20050	1720	22	20.66	136.14%	0.203	0.276	-
					Back side	0	20175	1732.5	22	20.81	131.52%	0.212	0.279	56
				2	Back side	0	20300	1745	22	20.63	137.09%	0.201	0.276	-
			3 RB	0	Back side	0	20300	1745	22	20.63	137.09%	0.193	0.265	-
			6 RB		Back side	0	20300	1745	22	20.64	136.77%	0.188	0.257	-

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LTE FDD Band 12

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
Body	10MHz	QPSK	1 RB	0	Back side	0	23060	704	22	20.73	133.97%	0.280	0.375	-
					Top side	0	23060	704	22	20.73	133.97%	0.029	0.039	-
					Bottom side	0	23060	704	22	20.73	133.97%	0.338	0.453	-
					Right side	0	23060	704	22	20.73	133.97%	0.042	0.056	-
					Left side	0	23060	704	22	20.73	133.97%	0.056	0.075	-
					Front side	0	23060	704	22	20.73	133.97%	0.355	0.476	57
					Front side	0	23095	707.5	22	20.49	141.58%	0.332	0.470	-
					Front side	0	23130	711	22	20.29	148.25%	0.316	0.468	-
			3 RB	2	Back side	0	23130	711	22	20.26	149.28%	0.275	0.411	-
					Top side	0	23130	711	22	20.26	149.28%	0.026	0.039	-
					Bottom side	0	23130	711	22	20.26	149.28%	0.317	0.473	-
					Right side	0	23130	711	22	20.26	149.28%	0.039	0.058	-
					Left side	0	23130	711	22	20.26	149.28%	0.051	0.076	-
					Front side	0	23130	711	22	20.26	149.28%	0.316	0.472	-
			6 RB		Back side	0	23060	704	21	19.21	151.01%	0.257	0.388	-
					Top side	0	23060	704	21	19.21	151.01%	0.023	0.035	-
					Bottom side	0	23060	704	21	19.21	151.01%	0.314	0.474	-
					Right side	0	23060	704	21	19.21	151.01%	0.036	0.054	-
					Left side	0	23060	704	21	19.21	151.01%	0.048	0.072	-
					Front side	0	23060	704	21	19.21	151.01%	0.313	0.473	-

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 10g (W/kg)		Plot page
												Measured	Reported	
Limb	10MHz	QPSK	1 RB	0	Back side	0	23060	704	22	20.73	133.97%	0.179	0.240	58
					Back side	0	23095	707.5	22	20.49	141.58%	0.168	0.238	-
					Back side	0	23130	711	22	20.29	148.25%	0.157	0.233	-
			3 RB	2	Back side	0	23130	711	22	20.26	149.28%	0.159	0.237	-
			6 RB		Back side	0	23060	704	21	19.21	151.01%	0.154	0.233	-

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LTE FDD Band 13

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 1g (W/kg)		Plot page
												Measured	Reported	
Body	10MHz	QPSK	1 RB	0	Back side	0	23230	782	22	20.64	136.77%	0.146	0.200	-
					Top side	0	23230	782	22	20.64	136.77%	0.044	0.060	-
					Bottom side	0	23230	782	22	20.64	136.77%	0.152	0.208	-
					Right side	0	23230	782	22	20.64	136.77%	0.027	0.037	-
					Left side	0	23230	782	22	20.64	136.77%	0.036	0.049	-
					Front side	0	23230	782	22	20.64	136.77%	0.234	0.320	59
				2	Front side	0	23230	782	22	20.41	144.21%	0.201	0.290	-
				5	Front side	0	23230	782	22	20.21	151.01%	0.174	0.263	-

Mode	Bandwidth (MHz)	Modulation	RB Size	RB start	Position	Distance (mm)	CH	Freq. (MHz)	Max. Rated Avg.Power + Max. Tolerance (dBm)	Measured Avg. Power (dBm)	Scaling	Averaged SAR over 10g (W/kg)		Plot page
												Measured	Reported	
Limb	10MHz	QPSK	1 RB	0	Back side	0	23230	782	22	20.64	136.77%	0.074	0.102	60
				2	Back side	0	23230	782	22	20.41	144.21%	0.065	0.094	-
				5	Back side	0	23230	782	22	20.21	151.01%	0.054	0.082	-

Note:

Scaling = $\frac{\text{reported SAR}}{\text{measured SAR}} = \frac{P2(mW)}{P1(mW)} = 10^{\left(\frac{P_2-P_1}{10}\right)}(dBm)$

Reported SAR = measured SAR * (scaling)

Where P2 is maximum specified power, P1 is measured conducted power

2.3 Reporting statements of conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

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3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenarios:

Simultaneous Transmit Configurations	Body	Extremity
LTE Cat.M1 + UWB channel number 2	Yes	Yes
LTE Cat.M1 + UWB channel number 5	Yes	Yes

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3.1 Estimated SAR calculation

According to KDB447498 D01v06 – When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$$\text{Estimated SAR} = \frac{\text{Max. tune up power (mW)}}{\text{Min. test separation distance(mm)}} \times \frac{\sqrt{f(\text{GHz})}}{7.5}$$

If the minimum test separation distance is < 5mm, a distance of 5mm is used for estimated SAR calculation. When the test separation distance is >50mm, the 0.4W/kg is used for SAR-1g.

	Estimated 1g-SAR	Estimated 10g-SAR
UWB channel number 2	0.00068 W/Kg	0.00027 W/Kg

3.2 SPLSR evaluation and analysis

Per KDB447498D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR sum to peak location separation ratio(SPLSR).

The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion.

The ratio is determined by **(SAR1 + SAR2)^1.5/Ri**, rounded to two decimal digits, and must be **≤ 0.04** for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

SAR1 and SAR2 are the highest reported or estimated SAR for each antenna in the pair, and Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna.

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LTE Cat.M1 + UWB channel number 2

Band	Mode	Position	WWAN	UWB	SAR Sum	SPLSR
LTE Band 2 Cat.M1	Body	Back side	0.692	0.00068	0.693	ΣSAR<1.6, Not required
		Top side	0.023	0.00068	0.024	ΣSAR<1.6, Not required
		Bottom side	1.195	0.00068	1.196	ΣSAR<1.6, Not required
		Right side	0.053	0.00068	0.054	ΣSAR<1.6, Not required
		Left side	0.498	0.00068	0.499	ΣSAR<1.6, Not required
		Front side	0.743	0.00068	0.744	ΣSAR<1.6, Not required
	Limb	Back side	0.475	0.00027	0.475	ΣSAR<4, Not required
LTE Band 4 Cat.M1	Body	Back side	0.455	0.00068	0.456	ΣSAR<1.6, Not required
		Top side	0.039	0.00068	0.040	ΣSAR<1.6, Not required
		Bottom side	0.462	0.00068	0.463	ΣSAR<1.6, Not required
		Right side	0.057	0.00068	0.058	ΣSAR<1.6, Not required
		Left side	0.075	0.00068	0.076	ΣSAR<1.6, Not required
		Front side	0.476	0.00068	0.477	ΣSAR<1.6, Not required
	Limb	Back side	0.279	0.00027	0.279	ΣSAR<4, Not required
LTE Band 12 Cat.M1	Body	Back side	0.411	0.00068	0.412	ΣSAR<1.6, Not required
		Top side	0.039	0.00068	0.040	ΣSAR<1.6, Not required
		Bottom side	0.453	0.00068	0.454	ΣSAR<1.6, Not required
		Right side	0.058	0.00068	0.059	ΣSAR<1.6, Not required
		Left side	0.076	0.00068	0.077	ΣSAR<1.6, Not required
		Front side	0.476	0.00068	0.477	ΣSAR<1.6, Not required
	Limb	Back side	0.240	0.00027	0.240	ΣSAR<4, Not required
LTE Band 13 Cat.M1	Body	Back side	0.200	0.00068	0.201	ΣSAR<1.6, Not required
		Top side	0.060	0.00068	0.061	ΣSAR<1.6, Not required
		Bottom side	0.208	0.00068	0.209	ΣSAR<1.6, Not required
		Right side	0.037	0.00068	0.038	ΣSAR<1.6, Not required
		Left side	0.049	0.00068	0.050	ΣSAR<1.6, Not required
		Front side	0.320	0.00068	0.321	ΣSAR<1.6, Not required
	Limb	Back side	0.102	0.00027	0.102	ΣSAR<4, Not required

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LTE Cat.M1 + UWB channel number 5

Band	Mode	Position	WWAN Exposure ratio (SAR/SARlimit)	UWB Exposure ratio	Total exposure ratio (TER<1)
LTE Band 2 Cat.M1	Body	Back side	0.433	-	0.433
		Top side	0.014	-	0.014
		Bottom side	0.747	-	0.747
		Right side	0.033	-	0.033
		Left side	0.311	-	0.311
		Front side	0.464	-	0.464
	Limb	Back side	0.119	-	0.119
LTE Band 4 Cat.M1	Body	Back side	0.284	-	0.284
		Top side	0.024	-	0.024
		Bottom side	0.289	-	0.289
		Right side	0.036	-	0.036
		Left side	0.047	-	0.047
		Front side	0.298	-	0.298
	Limb	Back side	0.070	-	0.070
LTE Band 12 Cat.M1	Body	Back side	0.257	-	0.257
		Top side	0.024	-	0.024
		Bottom side	0.283	-	0.283
		Right side	0.036	-	0.036
		Left side	0.048	-	0.048
		Front side	0.298	-	0.298
	Limb	Back side	0.060	-	0.060
LTE Band 13 Cat.M1	Body	Back side	0.200	-	0.200
		Top side	0.060	-	0.060
		Bottom side	0.208	-	0.208
		Right side	0.037	-	0.037
		Left side	0.049	-	0.049
		Front side	0.320	-	0.320
	Limb	Back side	0.102	-	0.102

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4. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	3770	Apr.29,2019	Apr.28,2020
SPEAG	System Validation Dipole	D750V3	1015	Aug.23,2019	Aug.22,2020
		D1750V2	1008	Aug.23,2019	Aug.22,2020
		D1900V2	5d173	Apr.23,2019	Apr.22,2020
SPEAG	Data acquisition Electronics	DAE4	1260	Sep.11,2019	Sep.10,2020
SPEAG	Software	DASY 52 V52.10.4	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	ELI	N/A	Calibration not required	Calibration not required
Agilent	Network Analyzer	E5071C	MY46100433	Dec.13,2019	Dec.12,2020
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY52180142	Aug.30,2019	Aug.29,2020
		778D	MY52180302	Aug.30,2019	Aug.29,2020
Agilent	RF Signal Generator	N5181A	MY50141235	Apr.22,2019	Apr.21,2020
Agilent	Power Meter	ML2496A	1337004	Sep.19,2019	Sep.18,2020
Agilent	Power Sensor	MA2411B	1306052	Sep.19,2019	Sep.18,2020
TECPEL	Digital thermometer	DTM-303A	TP130074	Mar.26,2019	Mar.25,2020
Anritsu	Radio Communication Test	MT8820C	6201061049	Dec.08,2019	Dec.07,2020
Anritsu	Radio Communication Test	MT8821C	6262094291	Feb.06,2020	Feb.05,2021

Note:
Instruments List of the original test report ES/2020/30003.

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Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
SPEAG	Dosimetric E-Field Probe	EX3DV4	7509	Mar.25,2020	Mar.24,2021
SPEAG	System Validation Dipole	D750V3	1015	Aug.13,2020	Aug.12,2021
SPEAG	Data acquisition Electronics	DAE4	877	Mar.17,2020	Mar.16,2021
SPEAG	Software	DASY 52 V52.10.4	N/A	Calibration not required	Calibration not required
SPEAG	Phantom	ELI	N/A	Calibration not required	Calibration not required
Agilent	Network Analyzer	E5071C	MY46100433	Dec.13,2019	Dec.12,2020
Agilent	Dielectric Probe Kit	85070E	MY44300677	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	772D	MY46151242	Aug.17,2020	Aug.16,2021
		778D	MY48220468	Aug.17,2020	Aug.16,2021
Agilent	RF Signal Generator	N5181A	MY50141235	May.04,2020	May.03,2021
Agilent	Power Meter	E4417A	MY51410006	Mar.09,2020	Mar.08,2021
Agilent	Power Sensor	E9301H	MY51470001	Mar.09,2020	Mar.08,2021
			MY51470002	Mar.09,2020	Mar.08,2021
TECPEL	Digital thermometer	DTM-303A	TP130074	Apr.10,2020	Apr.09,2021
Anritsu	Radio Communication Test	MT8820C	6201061014	Arp.28,2020	Apr.27,2021
Anritsu	Radio Communication Test	MT8821C	6262094291	Feb.06,2020	Feb.05,2021

Note:
Instruments List of the test report ES/2020/30003-01.

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5. Measurements

Date: 2020/3/14

Report No. :ES/2020/30003

LTE Band 2 (20MHz)_Body_Bottom side_CH 19100_QPSK_1-0_0mm

Communication System: LTE; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.361 S/m; ε_r = 40.82; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.8°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(8.23, 8.23, 8.23);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x61x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.43 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.95 V/m; Power Drift = 0.07 dB

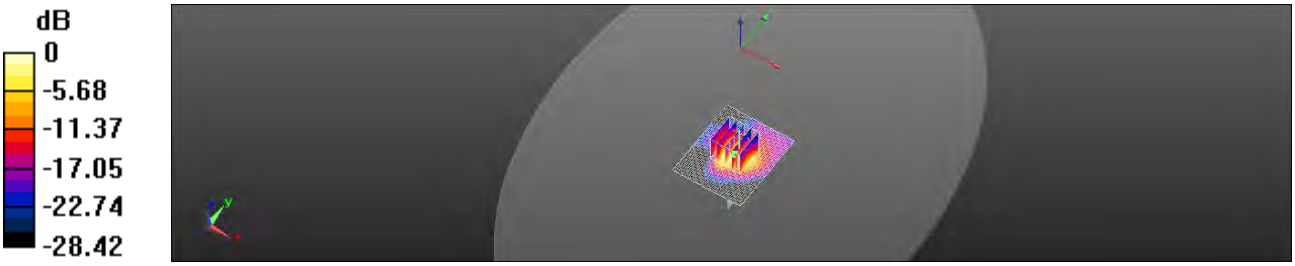
Peak SAR (extrapolated) = 2.34 W/kg

SAR(1 g) = 0.898 W/kg; SAR(10 g) = 0.358 W/kg

Smallest distance from peaks to all points 3 dB below = 8.8 mm

Ratio of SAR at M2 to SAR at M1 = 30%

Maximum value of SAR (measured) = 1.56 W/kg



0 dB = 1.56 W/kg = 1.94 dBW/kg

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Date: 2020/3/14

Report No. :ES/2020/30003

LTE Band 2 (20MHz)_Wrist mode_Back side_CH 19100_QPSK_1-0_0mm

Communication System: LTE; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.361 S/m; ε_r = 40.82; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.8°C; Liquid temperature: 22.1°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(8.23, 8.23, 8.23);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 1.05 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.88 V/m; Power Drift = 0.12 dB

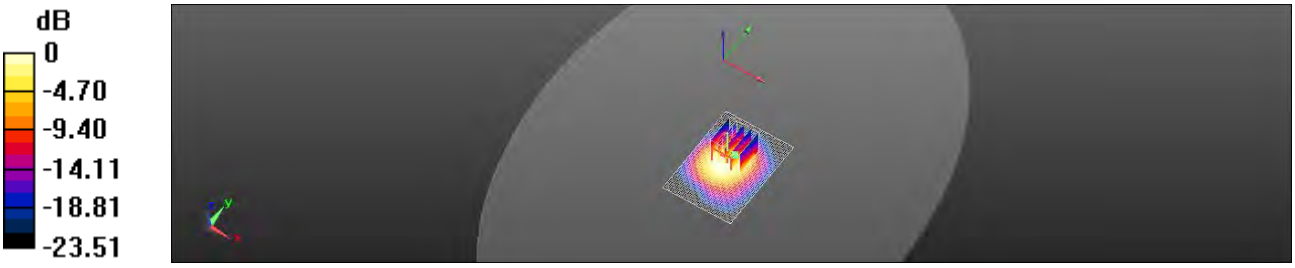
Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.659 W/kg; SAR(10 g) = 0.357 W/kg

Smallest distance from peaks to all points 3 dB below = 9.1 mm

Ratio of SAR at M2 to SAR at M1 = 42%

Maximum value of SAR (measured) = 0.985 W/kg



0 dB = 0.985 W/kg = -0.07 dBW/kg

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Date: 2020/3/13

Report No. :ES/2020/30003

LTE Band 4 (20MHz)_Body_Front side_CH 20175_QPSK_1-0_0mm

Communication System: LTE; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1732.5 MHz; σ = 1.329 S/m; ε_r = 40.984; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.6°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(8.44, 8.44, 8.44);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (61x61x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.638 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.480 V/m; Power Drift = 0.16 dB

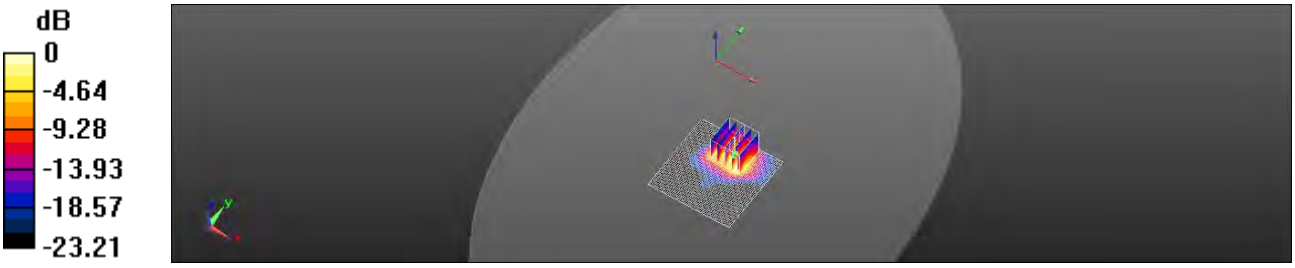
Peak SAR (extrapolated) = 0.862 W/kg

SAR(1 g) = 0.362 W/kg; SAR(10 g) = 0.165 W/kg

Smallest distance from peaks to all points 3 dB below = 8.1 mm

Ratio of SAR at M2 to SAR at M1 = 43.2%

Maximum value of SAR (measured) = 0.562 W/kg



0 dB = 0.562 W/kg = -2.51 dBW/kg

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Date: 2020/3/13

Report No. :ES/2020/30003

LTE Band 4 (20MHz)_Wrist mode_Back side_CH 20175_QPSK_1-0_0mm

Communication System: LTE; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1732.5 MHz; σ = 1.329 S/m; ε_r = 40.984; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.6°C; Liquid temperature: 21.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(8.44, 8.44, 8.44);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (61x61x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.597 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.25 V/m; Power Drift = -0.00 dB

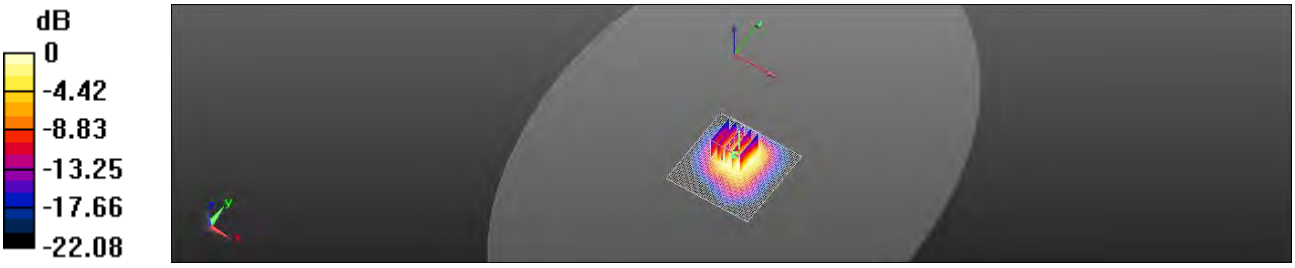
Peak SAR (extrapolated) = 0.729 W/kg

SAR(1 g) = 0.376 W/kg; SAR(10 g) = 0.212 W/kg

Smallest distance from peaks to all points 3 dB below = 12.9 mm

Ratio of SAR at M2 to SAR at M1 = 51.2%

Maximum value of SAR (measured) = 0.531 W/kg



0 dB = 0.531 W/kg = -2.75 dBW/kg

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Date: 2020/3/12

Report No. :ES/2020/30003

LTE Band 12 (10MHz)_Body_Front side_CH 23060_QPSK_1-0_0mm

Communication System: LTE; Frequency: 704 MHz; Duty Cycle: 1:1

Medium parameters used: f = 704 MHz; σ = 0.876 S/m; ε_r = 43.459; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.5°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(9.68, 9.68, 9.68): 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.597 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.87 V/m; Power Drift = 0.02 dB

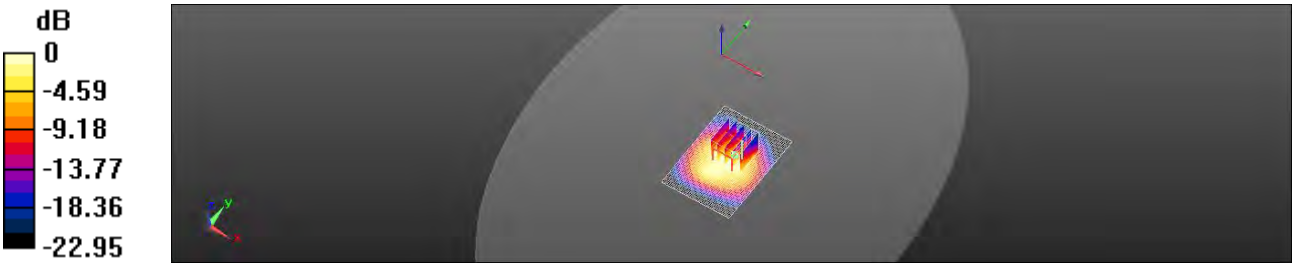
Peak SAR (extrapolated) = 0.905 W/kg

SAR(1 g) = 0.355 W/kg; SAR(10 g) = 0.197 W/kg

Smallest distance from peaks to all points 3 dB below = 6.4 mm

Ratio of SAR at M2 to SAR at M1 = 34.7%

Maximum value of SAR (measured) = 0.527 W/kg



0 dB = 0.527 W/kg = -2.78 dBW/kg

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Date: 2020/3/12

Report No. :ES/2020/30003

LTE Band 12 (10MHz)_Wrist mode_Back side_CH 23060_QPSK_1-0_0mm

Communication System: LTE; Frequency: 704 MHz; Duty Cycle: 1:1

Medium parameters used: f = 704 MHz; σ = 0.876 S/m; ε_r = 43.459; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.5°C; Liquid temperature: 21.7°C

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(9.68, 9.68, 9.68);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.601 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.04 V/m; Power Drift = 0.04 dB

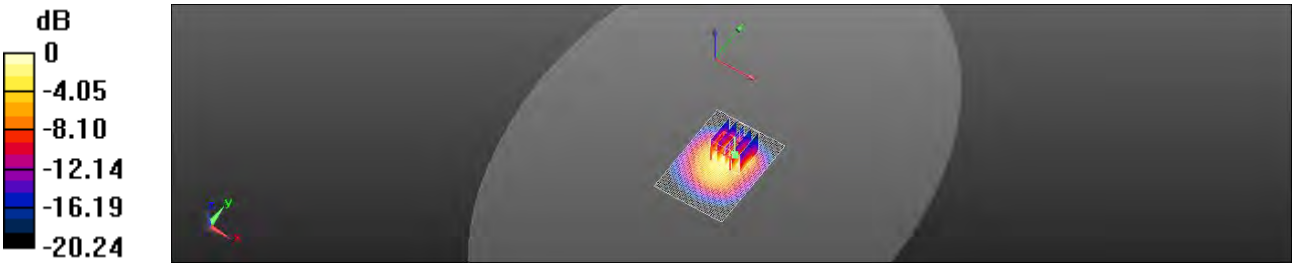
Peak SAR (extrapolated) = 0.854 W/kg

SAR(1 g) = 0.356 W/kg; SAR(10 g) = 0.179 W/kg

Smallest distance from peaks to all points 3 dB below = 9.2 mm

Ratio of SAR at M2 to SAR at M1 = 42.1%

Maximum value of SAR (measured) = 0.587 W/kg



0 dB = 0.587 W/kg = -2.31 dBW/kg

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Date: 2020/12/11

Report No. : ES/2020/30003-01

LTE Band 13 (10MHz)_Body_Front side_CH 23230_QPSK_1-0_0mm

Communication System: LTE; Frequency: 782 MHz; Duty cycle= 1:1

Medium parameters used: f = 782 MHz; σ = 0.938 S/m; ε_r = 42.471; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 23.0°C; Liquid temperature: 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(9.94, 9.94, 9.94) @ 782 MHz; Calibrated: 2020/03/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn877; Calibrated: 2020/03/17
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (61x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.415 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.07 V/m; Power Drift = 0.04 dB

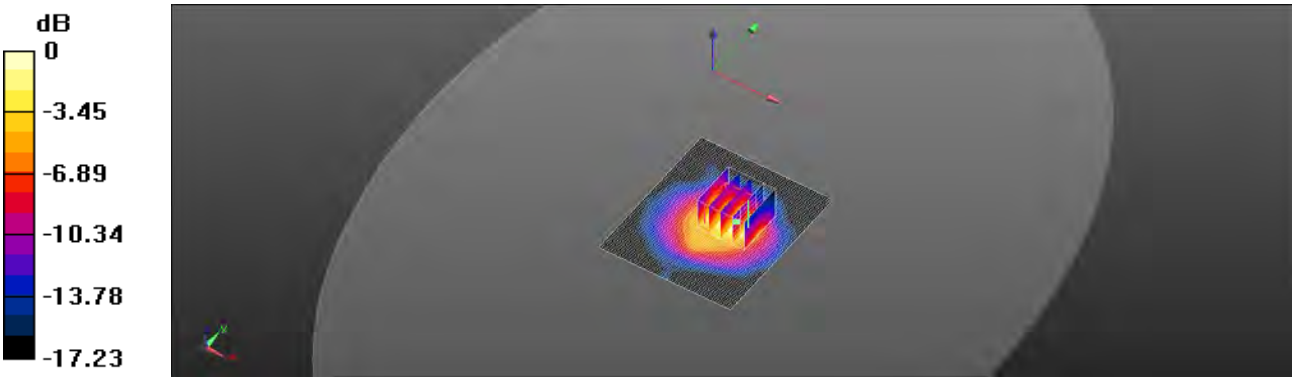
Peak SAR (extrapolated) = 0.559 W/kg

SAR(1 g) = 0.234 W/kg; SAR(10 g) = 0.125 W/kg

Smallest distance from peaks to all points 3 dB below = 8.8 mm

Ratio of SAR at M2 to SAR at M1 = 48.1%

Maximum value of SAR (measured) = 0.367 W/kg



0 dB = 0.367 W/kg = -4.35 dBW/kg

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Date: 2020/12/11

Report No. : ES/2020/30003-01

LTE Band 13 (10MHz)_Wrist mode _Back side_CH 23230_QPSK_1-0_0mm

Communication System: LTE; Frequency: 782 MHz; Duty cycle= 1:1

Medium parameters used: f = 782 MHz; σ = 0.938 S/m; ε_r = 42.471; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 23.0°C; Liquid temperature: 22.5°C

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(9.94, 9.94, 9.94) @ 782 MHz; Calibrated: 2020/03/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn877; Calibrated: 2020/03/17
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.216 W/kg

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.673 V/m; Power Drift = -0.06 dB

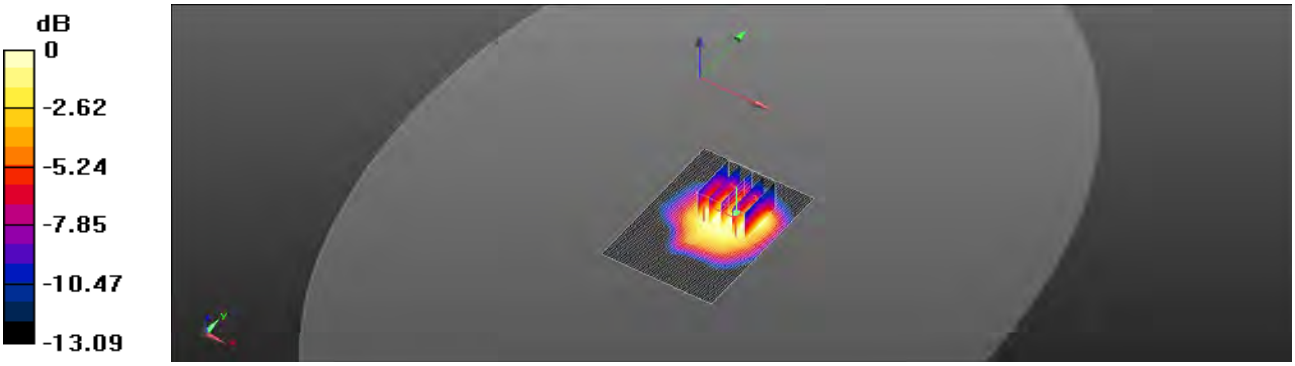
Peak SAR (extrapolated) = 0.200 W/kg

SAR(1 g) = 0.118 W/kg; SAR(10 g) = 0.074 W/kg

Smallest distance from peaks to all points 3 dB below = 8.9 mm

Ratio of SAR at M2 to SAR at M1 = 65.8%

Maximum value of SAR (measured) = 0.151 W/kg



0 dB = 0.151 W/kg = -8.21 dBW/kg

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6. SAR System Performance Verification

Date: 2020/3/12

Report No. :ES/2020/30003

Dipole 750 MHz_SN:1015

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 750 MHz; σ = 0.889 S/m; ε_r = 42.587; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.5°C; Liquid temperature: 21.7℃

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(9.68, 9.68, 9.68): 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x71x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 2.68 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.98 V/m; Power Drift = 0.06 dB

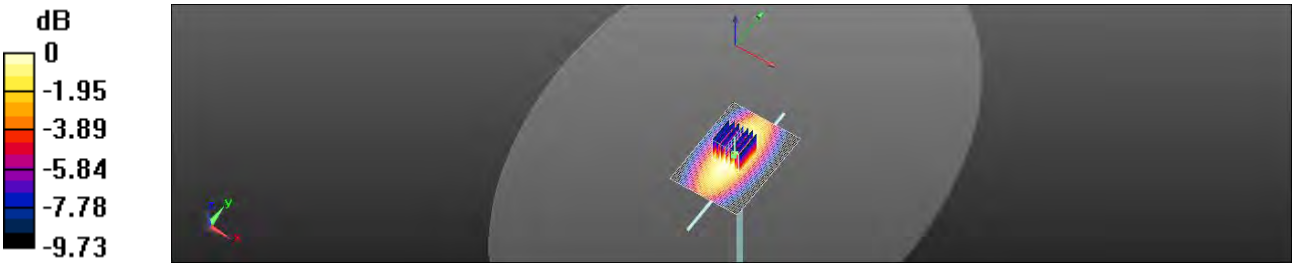
Peak SAR (extrapolated) = 3.18 W/kg

SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.46 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 68.4%

Maximum value of SAR (measured) = 2.73 W/kg



0 dB = 2.73 W/kg = 4.36 dBW/kg

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Date: 2020/12/11

Report No. : ES/2020/30003-01

Dipole 750 MHz_SN:1015

Communication System: CW; Frequency: 750 MHz; Duty cycle= 1:1

Medium parameters used: f = 750 MHz; σ = 0.907 S/m; ε_r = 43.545; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 23.0°C; Liquid temperature: 22.5℃

DASY5 Configuration:

- Probe: EX3DV4 - SN7509; ConvF(9.94, 9.94, 9.94) @ 750 MHz; Calibrated: 2020/03/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn877; Calibrated: 2020/03/17
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Pin=250mW/Area Scan (41x141x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 2.63 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.78 V/m; Power Drift = 0.02 dB

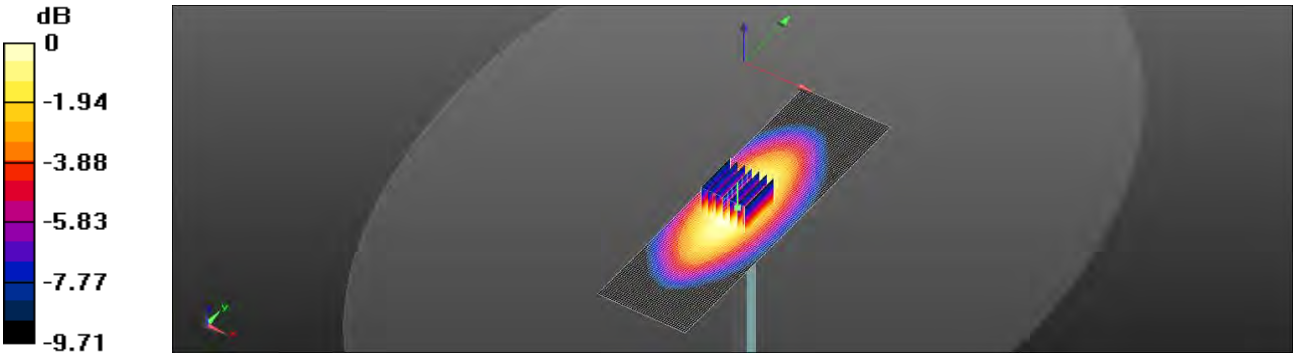
Peak SAR (extrapolated) = 3.12 W/kg

SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.43 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 68.4%

Maximum value of SAR (measured) = 2.67 W/kg



0 dB = 2.67 W/kg = 4.27 dBW/kg

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Date: 2020/3/13

Report No. :ES/2020/30003

Dipole 1750 MHz_SN:1008

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; σ = 1.338 S/m; ε_r = 40.921; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.6°C; Liquid temperature: 21.5℃

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(8.44, 8.44, 8.44);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x81x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 12.2 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.20 V/m; Power Drift = -0.00 dB

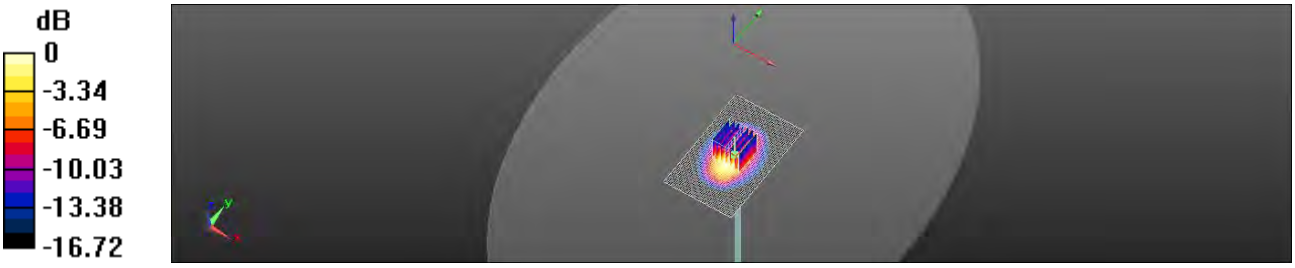
Peak SAR (extrapolated) = 15.3 W/kg

SAR(1 g) = 8.94 W/kg; SAR(10 g) = 4.75 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 55.5%

Maximum value of SAR (measured) = 12.0 W/kg



0 dB = 12.0 W/kg = 10.79 dBW/kg

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Date: 2020/3/14

Report No. :ES/2020/30003

Dipole 1900 MHz_SN:5d173

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1900 MHz; σ = 1.361 S/m; ε_r = 40.82; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient temperature: 21.8°C; Liquid temperature: 22.1℃

DASY5 Configuration:

- Probe: EX3DV4 - SN3770;ConvF(8.23, 8.23, 8.23);Calibrated: 2019/4/29
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1260; Calibrated: 2019/9/11
- Phantom: ELI
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

Area Scan (51x91x1): Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 15.2 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.6 V/m; Power Drift = -0.13 dB

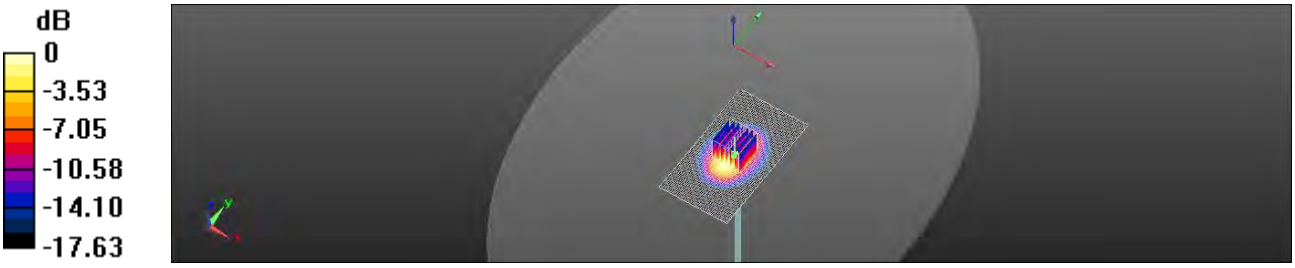
Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 9.79 W/kg; SAR(10 g) = 5.05 W/kg

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 54.3%

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.51 dBW/kg

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7. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test (0.3-3G)

A	c	D	e		f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty	Probability	Div	Div Value	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
Measurement system									
Probe calibration	6.00%	N	1	1	1	1	6.00%	6.00%	∞
Isotropy , Axial	3.50%	R	√3	1.732	1	1	2.02%	2.02%	∞
Isotropy, Hemispherical	9.60%	R	√3	1.732	1	1	5.54%	5.54%	∞
Modulation Response	2.40%	R	√3	1.732	1	1	1.40%	1.40%	∞
Boundary Effect	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Linearity	4.70%	R	√3	1.732	1	1	2.71%	2.71%	∞
Detection Limits	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Readout Electronics	0.30%	N	1	1	1	1	0.30%	0.30%	∞
Response time	0.80%	R	√3	1.732	1	1	0.46%	0.46%	∞
Integration Time	2.60%	R	√3	1.732	1	1	1.50%	1.50%	∞
Measurement drift (class A evaluation)	1.75%	R	√3	1.732	1	1	1.01%	1.01%	∞
RF ambient condition - noise	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
RF ambient conditions - reflections	3.00%	R	√3	1.732	1	1	1.73%	1.73%	∞
Probe positioner Mechanical restrictions	0.40%	R	√3	1.732	1	1	0.23%	0.23%	∞
Probe Positioning with respect to phantom	2.90%	R	√3	1.732	1	1	1.67%	1.67%	∞
Post-processing	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Max SAR Eval	1.00%	R	√3	1.732	1	1	0.58%	0.58%	∞
Test Sample related									
Test sample positioning	2.90%	N	1	1	1	1	2.90%	2.90%	M-1
Device Holder Uncertainty	3.60%	N	1	1	1	1	3.60%	3.60%	M-1
Drift of output power	5.00%	R	√3	1.732	1	1	2.89%	2.89%	∞
Phantom and Setup									
Phantom Uncertainty	4.00%	R	√3	1.732	1	1	2.31%	2.31%	∞
Liquid permittivity (mea.)	3.82%	N	1	1	0.64	0.43	2.44%	1.64%	M
Liquid Conductivity (mea.)	4.70%	N	1	1	0.6	0.49	2.82%	2.30%	M
Combined standard uncertainty		RSS					12.01%	11.75%	

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Appendixes

Refer to separated files for the following appendixes.

ES202030003-01 SAR_Appendix A Photographs

ES202030003-01 SAR_Appendix B DAE & Probe Cal. Certificate

ES202030003-01 SAR_Appendix C Phantom Description & Dipole Cal. Certificate

- End of Report -

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