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Report On

Specific Absorption Rate Testing of the A2941

Covering FCC 47CFR 2.1093, RSS 102 Issue 5

FCC ID: BCGA2941

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COMMERCIAL-IN-CONFIDENCE

Document 75958013 Report 01 Issue 1

March 2023



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COMMERCIAL-IN-CONFIDENCE

REPORT ON

Specific Absorption Rate Testing of the
A2941 Laptop Computer

Document 75958013 Report 01 Issue 1

March 2023

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31 March 2023



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SECTION 1

REPORT SUMMARY

Specific Absorption Rate Testing of the A2941



1.1 REPORT MODIFICATION RECORD

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	31-March-2023



1.2 INTRODUCTION

The information contained in this report is intended to show verification of the Specific Absorption Rate testing of the A2941 to the requirements of FCC 47CFR 2.1093

Objective	To perform Specific Absorption Rate Testing to determine the Equipment Under Test's (EUT's) compliance with the requirements specified of FCC 47CFR 2.1093, for the series of tests carried out.
Applicant	Apple Inc
Manufacturer	Apple Inc
Manufacturing Description	Laptop Computer
Model Number	A2941
Serial/IMEI Number(s)	GQDT22P02D radiated sample FG3PJ7XGGX conducted sample
Number of Samples Tested	2
Hardware Version	REV 1.0
Software Version	22E11180t
Test Specification/Issue/Date	FCC 47CFR 2.1093
Start of Test	21-February-2023
Finish of Test	10-march-2023
Related Document(s)	KDB 865664 – D01 v01r04 KDB 865664 – D02 v01r02 KDB 648474 – D04 v01r03 KDB 447498 – D01 v06 IEEE 1528-2013 KDB 248227 – D01 v02r02
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1.3 BRIEF SUMMARY OF RESULTS (FCC)

The measurements shown in this report were made to the requirements of FCC 47CFR 2.1093

The maximum 1g volume averaged stand-alone SAR found during this Assessment:

Max 1g SAR (W/kg)	0.862 (Measured)	1.065 (Scaled)
The maximum 1g volume averaged SAR level measured for all the tests performed did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg.		

The maximum 1g volume averaged stand-alone SAR found during this Assessment for each supported mode:

RAT	Band	Test Configuration	Max Reported SAR (W/kg)
Bluetooth (5GHz WLAN OFF)	2450 MHz	Body	0.374
Bluetooth (5GHz WLAN ON)	2450 MHz	Body	0.297
WLAN	2450 MHz	Body	1.065
WLAN	5200 MHz	Body	0.501
WLAN	5300 MHz	Body	0.625
WLAN	5500 MHz	Body	0.816
WLAN	5800 MHz	Body	0.988
The maximum 1g volume averaged SAR level measured for all the tests performed (including simultaneous transmission analysis results) did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg.			

Simultaneous Transmission

Position	Bluetooth (5GHz WLAN ON) 1g SAR (W/kg)	5GHz WLAN 1g SAR (W/kg)	Sum of 1g SAR (W/Kg)	Peak Location Separation Ratio required?	Peak Location Separation Ratio
Bottom Edge	0.297	0.988	1.285	No	N/A

Each antenna is separated to the extent that the SAR distributions do not overlap, however Bluetooth and 5GHz WLAN can operate on the same antenna. Bluetooth operates at a lower power level when the 5 GHz WLAN is active. The highest overall 5GHz WLAN and Bluetooth (5 GHz WLAN ON) results were used for the summation of the simultaneous transmission as shown in the table above.

KDB 447498 D01 - Section 4.3.2: Simultaneous test exclusion is applicable as the sum of 1g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit.



1.4 BRIEF SUMMARY OF RESULTS (ISED)

The measurements shown in this report were made to the requirements specified in RSS 102 Issue 5.

The maximum 1g volume averaged stand-alone SAR found during this Assessment:

Max 1g SAR (W/kg)	0.862 (Measured)	0.896 (Scaled)
The maximum 1g volume averaged SAR level measured for all the tests performed did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg.		

The maximum 1g volume averaged stand-alone SAR found during this Assessment for each supported mode:

RAT	Band	Test Configuration	Max Reported SAR (W/kg)
Bluetooth (5GHz WLAN OFF)	2450 MHz	Body	0.374
Bluetooth (5GHz WLAN ON)	2450 MHz	Body	0.297
WLAN	2450 MHz	Body	0.896
WLAN	5200 MHz	Body	0.381
WLAN	5300 MHz	Body	0.525
WLAN	5500 MHz	Body	0.687
WLAN	5800 MHz	Body	0.831
The maximum 1g volume averaged SAR level measured for all the tests performed (including simultaneous transmission analysis results) did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg.			

Simultaneous Transmission

Position	Bluetooth (5GHz WLAN ON) 1g SAR (W/kg)	5GHz WLAN 1g SAR (W/kg)	Sum of 1g SAR W/Kg)	Peak Location Separation Ratio required?	Peak Location Separation Ratio
Bottom Edge	0.297	0.831	1.128	No	N/A

Each antenna is separated to the extent that the SAR distributions do not overlap, however Bluetooth and 5GHz WLAN can operate on the same antenna. Bluetooth operates at a lower power level when the 5 GHz WLAN is active. The highest overall 5GHz WLAN and Bluetooth (5 GHz WLAN ON) results were used for the summation of the simultaneous transmission as shown in the table above.

KDB 447498 D01 - Section 4.3.2: Simultaneous test exclusion is applicable as the sum of 1g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit.



1.5 TEST RESULTS SUMMARY

1.5.1 System Performance / Validation Check Results

Prior to formal testing being performed a System Check was performed in accordance with KDB 865664 and the results were compared to the dipole target from the calibration certificates. The following results were obtained: -

System performance / Validation results

Date	Frequency (MHz)	Fluid Type	Measured Max 1g SAR (W/kg)*	Max 1g SAR Target (W/kg)*	Percentage Deviation from Target 1g (%)
21/02/2023	2450 MHz	HBBL/B1	50.68	50.50	0.36
25/02/2023	2450 MHz	HBBL/B1	50.88	50.50	0.75
06/03/2023	2450 MHz	HBBL/B1	51.48	50.50	1.94
22/02/2023	5200 MHz	HBBL/B1	77.62	78.20	1.46
07/03/2023	5200 MHz	HBBL/B1	81.81	78.20	4.61
22/02/2023	5300 MHz	HBBL/B1	79.21	80.30	1.16
23/02/2023	5300 MHz	HBBL/B1	79.61	80.30	-0.86
10/03/2023	5300 MHz	HBBL/B3	78.81	80.30	-1.85
10/03/2023	5500 MHz	HBBL/B3	86.39	84.70	2.00
22/02/2023	5600 MHz	HBBL/B1	82.40	84.20	-2.13
23/02/2023	5600 MHz	HBBL/B1	79.61	84.20	-5.45
24/02/2023	5800 MHz	HBBL/B1	80.21	80.50	-0.36

*Normalised to a forward power of 1W



1.5.2 Results Summary Tables (FCC)

Bluetooth 2.4GHz (5GHz WLAN OFF) - EDR – 3-DH5 (ePA) – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.45	16.50	0.080	0.102	-
0mm Bottom Edge	39	2441.0	15.45	16.50	0.294	0.374	C.1
0mm Bottom Edge	0	2402.0	15.38	16.50	0.250	0.324	-
0mm Bottom Edge	78	2480.0	15.24	16.50	0.269	0.360	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

Bluetooth 2.4GHz (5GHz WLAN OFF) - EDR – 3-DH5 (ePA) – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.32	16.50	0.064	0.084	-
0mm Bottom Edge	39	2441.0	15.32	16.50	0.241	0.316	C.2
0mm Bottom Edge	0	2402.0	15.35	16.50	0.197	0.257	-
0mm Bottom Edge	78	2480.0	15.37	16.50	0.190	0.246	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



Bluetooth 2.4GHz (5GHz WLAN ON) - EDR – 3-DH5 (ePA) – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.45	15.50	0.080	0.081	-
0mm Bottom Edge	39	2441.0	15.45	15.50	0.294	0.297	C.1
0mm Bottom Edge	0	2402.0	15.38	15.50	0.250	0.257	-
0mm Bottom Edge	78	2480.0	15.24	15.50	0.269	0.286	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) *Bluetooth operates at lower power when the 5GHz WiFi is enabled.							

Bluetooth 2.4GHz (5GHz WLAN ON) - EDR – 3-DH5 (ePA) – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.32	15.50	0.064	0.067	-
0mm Bottom Edge	39	2441.0	15.32	15.50	0.241	0.251	C.2
0mm Bottom Edge	0	2402.0	15.35	15.50	0.197	0.204	-
0mm Bottom Edge	78	2480.0	15.37	15.50	0.190	0.196	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) the *Bluetooth operates at lower power when the 5GHz WiFi is enabled.							



WLAN 2.4GHz - 802.11b – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	6	2437.0	18.72	19.50	0.188	0.225	-
0mm Bottom Edge	6	2437.0	18.72	19.50	0.656	0.785	C.3
0mm Bottom Edge	1	2412.0	18.73	19.50	0.577	0.689	-
0mm Bottom Edge	11	2462.0	18.64	19.50	0.631	0.769	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

WLAN 2.4GHz - 802.11b – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	6	2437.0	18.61	19.50	0.182	0.223	-
0mm Bottom Edge	6	2437.0	18.61	19.50	0.703	0.863	-
0mm Bottom Edge	1	2412.0	18.64	19.50	0.670	0.817	-
0mm Bottom Edge	11	2462.0	18.47	19.50	0.732	0.928	C.4
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN 2.4GHz - 802.11n – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	6	2437.0	18.49	19.50	0.199	0.251	-
0mm Rear of Display Core 1	6	2437.0	18.63	19.50	0.151	0.184	
0mm Bottom Edge Core 0	6	2437.0	18.49	19.50	0.841	1.061	-
0mm Bottom Edge Core 1	6	2437.0	18.63	19.50	0.729	0.891	
0mm Bottom Edge Core 0	2	2417.0	18.45	19.50	0.651	0.829	-
0mm Bottom Edge Core 1	2	2417.0	18.63	19.50	0.708	0.865	
0mm Bottom Edge Core 0	10	2457.0	18.58	19.50	0.862	1.065	C.5
0mm Bottom Edge Core 1	10	2457.0	18.72	19.50	0.753	0.901	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-1 - 802.11n – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	38	5190.0	14.76	15.00	0.134	0.142	-
0mm Bottom Edge	38	5190.0	14.76	15.00	0.435	0.460	-
0mm Rear of Display	46	5230.0	15.00	15.00	0.133	0.133	-
0mm Bottom Edge	46	5230.0	15.00	15.00	0.501	0.501	C.6
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-1 - 802.11n – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	38	5190.0	15.34	15.50	0.092	0.095	-
0mm Bottom Edge	38	5190.0	15.34	15.50	0.334	0.347	C.7
0mm Rear of Display	46	5230.0	15.48	15.50	0.101	0.101	-
0mm Bottom Edge	46	5230.0	15.48	15.50	0.344	0.346	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-1 - 802.11n – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	38	5190.0	14.98	15.00	0.110	0.111	-
0mm Rear of Display Core 1	38	5190.0	14.94	15.00	0.074	0.075	
0mm Bottom Edge Core 0	38	5190.0	14.98	15.00	0.336	0.338	-
0mm Bottom Edge Core 1	38	5190.0	14.94	15.00	0.255	0.259	
0mm Rear of Display Core 0	46	5230.0	14.90	15.00	0.118	0.121	-
0mm Rear of Display Core 1	46	5230.0	14.98	15.00	0.080	0.080	
0mm Bottom Edge Core 0	46	5230.0	14.90	15.00	0.367	0.376	C.8
0mm Bottom Edge Core 1	46	5230.0	14.98	15.00	0.232	0.233	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-2A - 802.11n – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	54	5270.0	13.97	14.75	0.105	0.126	-
0mm Bottom Edge	54	5270.0	13.97	14.75	0.391	0.468	-
0mm Rear of Display	62	5310.0	13.78	14.75	0.103	0.129	-
0mm Bottom Edge	62	5310.0	13.78	14.75	0.426	0.533	C.12
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-2A - 802.11n – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	54	5270.0	14.73	15.50	0.096	0.115	-
0mm Bottom Edge	54	5270.0	14.73	15.50	0.385	0.460	-
0mm Rear of Display	62	5310.0	14.47	15.00	0.089	0.101	-
0mm Bottom Edge	62	5310.0	14.47	15.00	0.426	0.481	C.13
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-2A - 802.11n – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	54	5270.0	14.00	14.75	0.124	0.147	-
0mm Rear of Display Core 1	54	5270.0	13.87	14.75	0.089	0.109	
0mm Bottom Edge Core 0	54	5270.0	14.00	14.75	0.476	0.566	-
0mm Bottom Edge Core 1	54	5270.0	13.87	14.75	0.345	0.422	
0mm Rear of Display Core 0	62	5270.0	13.87	14.75	0.127	0.156	-
0mm Rear of Display Core 1	62	5270.0	13.54	14.75	0.091	0.120	
0mm Bottom Edge Core 0	62	5310.0	13.87	14.75	0.510	0.625	C.14
0mm Bottom Edge Core 1	62	5310.0	13.54	14.75	0.393	0.519	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-2C - 802.11ac – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	122	5610.0	13.44	14.50	0.126	0.161	-
0mm Bottom Edge	122	5610.0	13.44	14.50	0.528	0.674	-
0mm Bottom Edge	106	5530.0	13.61	14.50	0.465	0.571	-
0mm Bottom Edge	138	5690.0	13.72	14.50	0.619	0.741	C.15
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-2C - 802.11ac – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	122	5610.0	13.74	14.50	0.099	0.118	-
0mm Bottom Edge	122	5610.0	13.74	14.50	0.360	0.429	-
0mm Bottom Edge	106	5530.0	13.54	14.50	0.332	0.414	-
0mm Bottom Edge	138	5690.0	13.71	14.50	0.375	0.450	C.16
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-2C - 802.11ac – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	122	5610.0	13.64	14.50	0.162	0.197	-
0mm Rear of Display Core 1	122	5610.0	13.22	14.50	0.110	0.148	
0mm Bottom Edge Core 0	122	5610.0	13.64	14.50	0.583	0.711	-
0mm Bottom Edge Core 1	122	5610.0	13.22	14.50	0.423	0.568	
0mm Bottom Edge Core 0	106	5530.0	13.75	14.50	0.515	0.612	-
0mm Bottom Edge Core 1	106	5530.0	13.41	14.50	0.413	0.531	
0mm Bottom Edge Core 0	138	5690.0	13.45	14.50	0.641	0.816	C.17
0mm Bottom Edge Core 1	138	5690.0	13.52	14.50	0.468	0.586	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-3 - 802.11ac – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	155	5775.0	12.99	13.75	0.152	0.181	-
0mm Bottom Edge	155	5775.0	12.99	13.75	0.763	0.909	C.18
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-3 - 802.11ac – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	155	5775.0	12.55	13.75	0.118	0.156	-
0mm Bottom Edge	155	5775.0	12.55	13.75	0.591	0.779	C.19
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-3 - 802.11ac – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	155	5775.0	12.85	13.75	0.178	0.219	-
0mm Rear of Display Core 1	155	5775.0	12.77	13.75	0.146	0.183	
0mm Bottom Edge Core 0	155	5775.0	12.85	13.75	0.803	0.988	C.20
0mm Bottom Edge Core 1	155	5775.0	12.77	13.75	0.718	0.900	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



1.5.3 Results Summary Tables (ISED)

Bluetooth 2.4GHz (5GHz OFF) - EDR – 3-DH5 (ePA) – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.45	16.50	0.080	0.102	-
0mm Bottom Edge	39	2441.0	15.45	16.50	0.294	0.374	C.1
0mm Bottom Edge	0	2402.0	15.38	16.50	0.250	0.324	-
0mm Bottom Edge	78	2480.0	15.24	16.50	0.269	0.360	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

Bluetooth 2.4GHz (5GHz OFF) - EDR – 3-DH5 (ePA) – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.32	16.50	0.064	0.084	-
0mm Bottom Edge	39	2441.0	15.32	16.50	0.241	0.316	C.2
0mm Bottom Edge	0	2402.0	15.35	16.50	0.197	0.257	-
0mm Bottom Edge	78	2480.0	15.37	16.50	0.190	0.246	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



Bluetooth 2.4GHz (5GHz ON) - EDR – 3-DH5 (ePA) – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.45	15.50	0.080	0.081	-
0mm Bottom Edge	39	2441.0	15.45	15.50	0.294	0.297	C.1
0mm Bottom Edge	0	2402.0	15.38	15.50	0.250	0.257	-
0mm Bottom Edge	78	2480.0	15.24	15.50	0.269	0.286	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) *Bluetooth operates at lower power when the 5GHz WiFi is enabled.							

Bluetooth 2.4GHz (5GHz ON) - EDR – 3-DH5 (ePA) – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	39	2441.0	15.32	15.50	0.064	0.067	-
0mm Bottom Edge	39	2441.0	15.32	15.50	0.241	0.251	C.2
0mm Bottom Edge	0	2402.0	15.35	15.50	0.197	0.204	-
0mm Bottom Edge	78	2480.0	15.37	15.50	0.190	0.196	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) *Bluetooth operates at lower power when the 5GHz WiFi is enabled.							



WLAN 2.4GHz - 802.11b – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	6	2437.0	18.72	18.75	0.188	0.189	-
0mm Bottom Edge	6	2437.0	18.72	18.75	0.656	0.661	C.3
0mm Bottom Edge	1	2412.0	18.73	18.75	0.577	0.58	-
0mm Bottom Edge	11	2462.0	18.64	18.75	0.631	0.647	-
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN 2.4GHz - 802.11b – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	6	2437.0	18.61	18.75	0.182	0.188	-
0mm Bottom Edge	6	2437.0	18.61	18.75	0.703	0.726	-
0mm Bottom Edge	1	2412.0	18.64	18.75	0.670	0.687	-
0mm Bottom Edge	11	2462.0	18.47	18.75	0.732	0.781	C.4
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN 2.4GHz - 802.11n – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	6	2437.0	18.49	18.75	0.199	0.211	-
0mm Rear of Display Core 1	6	2437.0	18.63	18.75	0.151	0.155	
0mm Bottom Edge Core 0	6	2437.0	18.49	18.75	0.841	0.893	-
0mm Bottom Edge Core 1	6	2437.0	18.63	18.75	0.729	0.749	
0mm Bottom Edge Core 0	2	2417.0	18.45	18.75	0.651	0.698	-
0mm Bottom Edge Core 1	2	2417.0	18.63	18.75	0.708	0.728	
0mm Bottom Edge Core 0	10	2457.0	18.58	18.75	0.862	0.896	C.5
0mm Bottom Edge Core 1	10	2457.0	18.72	18.75	0.753	0.758	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-1 - 802.11ax – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	42	5210.0	13.67	13.75	0.107	0.109	-
0mm Bottom Edge	42	5210.0	13.67	13.75	0.374	0.381	C.9
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-1 - 802.11ax – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	42	5210.0	13.74	13.75	0.067	0.067	-
0mm Bottom Edge	42	5210.0	13.74	13.75	0.284	0.285	C.10
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-1 - 802.11ac – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	42	5210.0	11.38	11.50	0.049	0.050	-
0mm Rear of Display Core 1	42	5210.0	11.45	11.50	0.033	0.033	
0mm Bottom Edge Core 0	42	5210.0	11.38	11.50	0.188	0.193	C.11
0mm Bottom Edge Core 1	42	5210.0	11.45	11.50	0.144	0.146	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-2A - 802.11n – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	54	5270.0	13.97	14.00	0.105	0.106	-
0mm Bottom Edge	54	5270.0	13.97	14.00	0.391	0.394	-
0mm Rear of Display	62	5310.0	13.78	14.00	0.103	0.108	-
0mm Bottom Edge	62	5310.0	13.78	14.00	0.426	0.448	C.12
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-2A - 802.11n – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	54	5270.0	14.73	14.75	0.097	0.097	-
0mm Bottom Edge	54	5270.0	14.73	14.75	0.385	0.387	-
0mm Rear of Display	62	5310.0	14.47	14.75	0.089	0.095	-
0mm Bottom Edge	62	5310.0	14.47	14.75	0.426	0.454	C.13
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-2A - 802.11n – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	54	5270.0	14.00	14.00	0.124	0.124	-
0mm Rear of Display Core 1	54	5270.0	13.87	14.00	0.089	0.092	
0mm Bottom Edge Core 0	54	5270.0	14.00	14.00	0.476	0.476	-
0mm Bottom Edge Core 1	54	5270.0	13.87	14.00	0.345	0.355	
0mm Rear of Display Core 0	62	5310.0	13.87	14.00	0.127	0.131	-
0mm Rear of Display Core 1	62	5310.0	13.54	14.00	0.091	0.101	
0mm Bottom Edge Core 0	62	5310.0	13.87	14.00	0.51	0.525	C.14
0mm Bottom Edge Core 1	62	5310.0	13.54	14.00	0.393	0.437	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-2C - 802.11ac – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	122	5610.0	13.44	13.75	0.126	0.135	-
0mm Bottom Edge	122	5610.0	13.44	13.75	0.528	0.567	-
0mm Bottom Edge	106	5530.0	13.61	13.75	0.465	0.480	-
0mm Bottom Edge	138	5690.0	13.72	13.75	0.619	0.623	C.15
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-2C - 802.11ac – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	122	5610.0	13.74	13.75	0.099	0.099	-
0mm Bottom Edge	122	5610.0	13.74	13.75	0.360	0.361	-
0mm Bottom Edge	106	5530.0	13.54	13.75	0.332	0.348	-
0mm Bottom Edge	138	5690.0	13.71	13.75	0.375	0.378	C.16
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-2C - 802.11ac – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	122	5610.0	13.64	13.75	0.162	0.166	-
0mm Rear of Display Core 1	122	5610.0	13.22	13.75	0.110	0.124	
0mm Bottom Edge Core 0	122	5610.0	13.64	13.75	0.583	0.598	-
0mm Bottom Edge Core 1	122	5610.0	13.22	13.75	0.423	0.478	
0mm Bottom Edge Core 0	106	5530.0	13.75	13.75	0.515	0.515	-
0mm Bottom Edge Core 1	106	5530.0	13.41	13.75	0.413	0.447	
0mm Bottom Edge Core 0	138	5690.0	13.45	13.75	0.641	0.687	C.17
0mm Bottom Edge Core 1	138	5690.0	13.52	13.75	0.468	0.493	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



WLAN - U-NII-3 - 802.11ac – SISO Core 0
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	155	5775.0	12.99	13.00	0.152	0.152	-
0mm Bottom Edge	155	5775.0	12.99	13.00	0.763	0.765	C.18
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-3 - 802.11ac – SISO Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display	155	5775.0	12.55	13.00	0.118	0.131	-
0mm Bottom Edge	155	5775.0	12.55	13.00	0.591	0.656	C.19
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							

WLAN - U-NII-3 - 802.11ac – MIMO Core 0 & Core 1
Body Specific Absorption Rate (SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
0mm Rear of Display Core 0	155	5775.0	12.85	13.00	0.178	0.184	-
0mm Rear of Display Core 1	155	5775.0	12.77	13.00	0.146	0.154	
0mm Bottom Edge Core 0	155	5775.0	12.85	13.00	0.803	0.831	C.20
0mm Bottom Edge Core 1	155	5775.0	12.77	13.00	0.718	0.757	
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g)							



1.5.4 Technical Description

The equipment under test (EUT) was an Apple laptop computer with Bluetooth®, Bluetooth® Low Energy and IEEE 802.11 a/b/ g/n/ac/ax Wi-Fi capabilities in the 2.4GHz and 5GHz bands. A full technical description can be found in the manufacturer's documentation.

1.5.5 Test Configuration and Modes of Operation

The testing was performed with an integral battery supplied by Apple Inc.

Supported technologies are Bluetooth (BDR/EDR/HDR/LE-1M/LE-M2), 2.4 GHz WLAN (802.11b/g/n/ax) and 5 GHz WLAN (802.11a/n/ac/ax). 2x2 MIMO is supported for WLAN.

Bluetooth operates at lower power when the 5GHz WLAN is enabled. The report makes references to Bluetooth (5GHz Wi-Fi ON) and Bluetooth (5GHz Wi-Fi OFF). Testing was performed with the Bluetooth and Wi-Fi transmitters working independently, the ON or OFF references are relating to Bluetooth power levels only.

WLAN and Bluetooth testing were achieved using the device's internal software, scripts and settings supplied by the customer. For each scan, the device was configured into a continuous transmission test mode at a maximum power defined by the customer. Testing was performed in each position at the frequency that gave the highest output power for each band. Some SAR levels were found to be higher than the thresholds set in KDB 447498 D01 therefore additional testing was required at the relevant frequencies / channels of the bands.

Conducted power measurements were performed on a modified device (accessible conducted port) and the measured SAR results were power scaled to the maximum declared tune-up level. Power measurements were only performed for the test configurations, which were determined by the client.

For each antenna, the bottom surface and the rear of the EUT display were assessed for SAR.

For the 5GHz frequency bands the transmission mode used for testing was determined by the 802.11 configuration with the highest declared output power in each frequency band. Where multiple 802.11 configurations have the same specified output power, testing was performed using the mode with the largest channel bandwidth with the lowest order modulation and lowest data rate.

For SAR assessment, the relevant surfaces of the device were placed against an Elliptical phantom with a 0mm separation distance.

The Elliptical Flat Phantom dimensions are 600mm major axis and 400mm minor axis with a shell thickness of 2mm. The phantom was filled to a minimum depth of 150mm with the appropriate simulant liquid. The dielectric properties were measured and found to be in accordance with the requirements specified in KDB 865664.

Included in this report are descriptions of the test method; the equipment used and an analysis of the test uncertainties applicable and diagrams indicating the locations of maximum SAR for each test position along with photographs indicating the positioning of the EUT against the elliptical phantom as appropriate.



1.5.6 Deviations from Standard

Initially, area scans were completed covering the whole of the bottom surface of the EUT to determine that there were no other RF radiators (unintentional) other than the antennas. The actual SAR measurements were completed using smaller area scans covering the antenna locations only.



1.6 FCC POWER TABLES (TUNE UP VALUES)

Note: All values in dBm

NS= Not Supported

2.4 GHz Bluetooth (5 GHz WLAN off)

BT Core	PA	Channel	BDR (dBm)	EDR (dBm)	LE Data (dBm)	HDR4 (dBm)	HDR8 (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	16.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	16.5	N/A	15	15

Bluetooth – TXBF

BT Core	PA	Channel	BDR TXBF (dBm)	EDR TXBF (dBm)	LE TXBF (dBm)	HDR4 TXBF (dBm)	HDR8 TXBF (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	13.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	13.5	N/A	15	15

2.4 GHz Bluetooth (5 GHz WLAN on)

BT Core	PA	Channel	BDR (dBm)	EDR (dBm)	LE Data (dBm)	HDR4 (dBm)	HDR8 (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	15.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	15.5	N/A	15	15

Bluetooth – TXBF

BT Core	PA	Channel	BDR TXBF (dBm)	EDR TXBF (dBm)	LE TXBF (dBm)	HDR4 TXBF (dBm)	HDR8 TXBF (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	13.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	13.5	N/A	15	15



2.4 GHz WLAN – SISO Core 0 & Core 1

Channel	Centre Frequency (MHz)	b (SISO)	g (SISO) Low Rate	11n/11ac HT20 (SISO) Low Rate	11ax HE20 (SISO) Low Rate	11ax HE20 RU106 (SISO)	11ax HE20 RU52 (SISO)	11ax HE20 RU26 (SISO)
1	2412	19.5	18.50	17.50	16.50	17.50	17.50	14.50
2	2417	19.5	19.50	19.50	19.50	19.50	17.50	14.50
3	2422	19.5	19.50	19.50	19.50	19.50	17.50	14.50
4	2427	19.5	19.50	19.50	19.50	19.50	17.50	14.50
5	2432	19.5	19.50	19.50	19.50	19.50	17.50	14.50
6	2437	19.5	19.50	19.50	19.50	19.50	17.50	14.50
7	2442	19.5	19.50	19.50	19.50	19.50	17.50	14.50
8	2447	19.5	19.50	19.50	19.50	19.50	17.50	14.50
9	2452	19.5	19.50	19.50	19.50	19.50	17.50	14.50
10	2457	19.5	19.50	19.50	19.50	19.50	17.50	14.50
11	2462	19.5	17.50	17.50	16.00	17.25	17.00	14.50
12	2467	18.5	15.50	15.50	14.00	14.25	15.00	14.00
13	2472	17	6.00	6.00	4.50	2.00	0.50	-3.50

2.4 GHz WLAN – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	b (2Tx, DSSS)	11n/11ac HT20 (2Tx, nonTXBF) Low Rate	11ax HE20 (2Tx, nonTXBF) Low Rate	11ax HE20 RU106 (2Tx, nonTxBF)	11ax HE20 RU52 (2Tx, nonTxBF)	11ax HE20 RU26 (2Tx, nonTxBF)	11ax HT20 (2Tx, TxBF) Low Rate
1	2412	NS	16.50	15.50	17.25	17.50	14.50	13.50
2	2417	NS	19.50	19.50	18.75	17.50	14.50	17.75
3	2422	NS	19.50	19.50	19.50	17.50	14.50	19.00
4	2427	NS	19.50	19.50	19.50	17.50	14.50	19.50
5	2432	NS	19.50	19.50	19.50	17.50	14.50	19.50
6	2437	NS	19.50	19.50	19.50	17.50	14.50	19.50
7	2442	NS	19.50	19.50	19.50	17.50	14.50	19.50
8	2447	NS	19.50	19.50	19.50	17.50	14.50	19.00
9	2452	NS	19.50	19.50	19.50	17.50	14.50	18.00
10	2457	NS	19.50	18.50	19.50	17.50	14.50	16.50
11	2462	NS	16.00	14.50	17.25	17.00	14.50	12.50
12	2467	NS	13.50	12.00	14.25	15.00	14.00	10.00
13	2472	NS	3.50	2.00	-0.50	0.00	-5.00	NS

**5 GHz WLAN – 20 MHz BW – SISO Core 0**

Channel	Centre Frequency (MHz)	a (SISO) Low Rate	11n/11ac HT20 (SISO) Low Rate	11ax HE20 (SISO) Low Rate	11ax HE20 RU106 (SISO)	11ax HE20 RU52 (SISO)	11ax HE20 RU26 (SISO)
36	5180	15.00	15.00	15.00	15.00	12.75	9.75
40	5200	15.00	15.00	15.00	15.00	12.75	9.75
44	5220	15.00	15.00	15.00	15.00	12.75	9.75
48	5240	15.00	15.00	15.00	15.00	12.75	9.75
52	5260	14.75	14.75	14.75	14.75	12.75	NS
56	5280	14.75	14.75	14.75	14.75	12.75	NS
60	5300	14.75	14.75	14.75	14.75	12.75	NS
64	5320	14.75	14.75	14.75	14.00	10.00	NS
100	5500	14.50	14.50	14.50	14.50	13.50	NS
104	5520	14.50	14.50	14.50	14.50	13.50	NS
108	5540	14.50	14.50	14.50	14.50	13.50	NS
112	5560	14.50	14.50	14.50	14.50	13.50	NS
116	5580	14.50	14.50	14.50	14.50	13.50	NS
120	5600	14.50	14.50	14.50	14.50	13.50	NS
124	5620	14.50	14.50	14.50	14.50	13.50	NS
128	5640	14.50	14.50	14.50	14.50	13.50	NS
132	5660	14.50	14.50	14.50	14.50	13.50	NS
136	5680	14.50	14.50	14.50	14.50	13.50	NS
140	5700	14.50	14.50	14.50	14.50	13.50	NS
144	5720	14.50	14.50	14.50	14.50	13.50	NS
149	5745	13.75	13.75	13.75	13.75	13.75	13.00
153	5765	13.75	13.75	13.75	13.75	13.75	13.00
157	5785	13.75	13.75	13.75	13.75	13.75	13.00
161	5805	13.75	13.75	13.75	13.75	13.75	13.00
165	5825	13.75	13.75	13.75	13.75	13.75	13.00

**5 GHz WLAN – 20 MHz BW – SISO Core 1**

Channel	Centre Frequency (MHz)	a (SISO) Low Rate	11n/11ac HT20 (SISO) Low Rate	11ax HE20 (SISO) Low Rate	11ax HE20 RU106 (SISO)	11ax HE20 RU52 (SISO)	11ax HE20 RU26 (SISO)
36	5180	15.50	15.50	15.50	15.00	12.75	9.75
40	5200	15.50	15.50	15.50	15.50	12.75	9.75
44	5220	15.50	15.50	15.50	15.50	12.75	9.75
48	5240	15.50	15.50	15.50	15.50	12.75	9.75
52	5260	15.50	15.50	15.50	15.50	12.75	NS
56	5280	15.50	15.50	15.50	15.50	12.75	NS
60	5300	15.50	15.50	15.50	15.50	12.75	NS
64	5320	15.50	15.50	15.50	14.00	10.00	NS
100	5500	14.50	14.50	14.50	14.50	13.50	NS
104	5520	14.50	14.50	14.50	14.50	13.50	NS
108	5540	14.50	14.50	14.50	14.50	13.50	NS
112	5560	14.50	14.50	14.50	14.50	13.50	NS
116	5580	14.50	14.50	14.50	14.50	13.50	NS
120	5600	14.50	14.50	14.50	14.50	13.50	NS
124	5620	14.50	14.50	14.50	14.50	13.50	NS
128	5640	14.50	14.50	14.50	14.50	13.50	NS
132	5660	14.50	14.50	14.50	14.50	13.50	NS
136	5680	14.50	14.50	14.50	14.50	13.50	NS
140	5700	14.50	14.50	14.50	14.50	13.50	NS
144	5720	14.50	14.50	14.50	14.50	13.50	NS
149	5745	13.75	13.75	13.75	13.75	13.75	13.00
153	5765	13.75	13.75	13.75	13.75	13.75	13.00
157	5785	13.75	13.75	13.75	13.75	13.75	13.00
161	5805	13.75	13.75	13.75	13.75	13.75	13.00
165	5825	13.75	13.75	13.75	13.75	13.75	13.00


5 GHz WLAN – 20 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT20 (2Tx, CDD, nonTxBF) Low Rate	11ax HE20 (2Tx, CDD, nonTxBF) Low Rate	11ax HE20 RU106 (2Tx, CDD, nonTxBF)	11ax HE20 RU52 (2Tx, CDD, nonTxBF)	11ax HE20 RU26 (2Tx, CDD, nonTxBF)	11ax HT20 (2Tx, TxBF) Low Rate
36	5180	12.00	12.00	10.00	7.00	4.00	12.00
40	5200	12.00	12.00	10.00	7.00	4.00	12.00
44	5220	12.00	12.00	10.00	7.00	4.00	12.00
48	5240	12.00	12.00	10.00	7.00	4.00	12.00
52	5260	12.25	12.25	10.25	7.25	NS	12.25
56	5280	12.25	12.25	10.25	7.25	NS	12.25
60	5300	12.25	12.25	10.25	7.25	NS	12.25
64	5320	12.25	12.25	10.25	7.25	NS	12.25
100	5500	13.25	13.25	11.25	8.25	NS	13.25
104	5520	13.25	13.25	11.25	8.25	NS	13.25
108	5540	13.25	13.25	11.25	8.25	NS	13.25
112	5560	13.25	13.25	11.25	8.25	NS	13.25
116	5580	13.25	13.25	11.25	8.25	NS	13.25
120	5600	13.25	13.25	11.25	8.25	NS	13.25
124	5620	13.25	13.25	11.25	8.25	NS	13.25
128	5640	13.25	13.25	11.25	8.25	NS	13.25
132	5660	13.25	13.25	11.25	8.25	NS	13.25
136	5680	13.25	13.25	11.25	8.25	NS	13.25
140	5700	13.25	13.25	11.25	8.25	NS	11.25
144	5720	13.25	13.25	11.25	8.25	NS	13.25
149	5745	13.75	13.75	13.75	13.75	13.00	13.75
153	5765	13.75	13.75	13.75	13.75	13.00	13.75
157	5785	13.75	13.75	13.75	13.75	13.00	13.75
161	5805	13.75	13.75	13.75	13.75	13.00	13.75
165	5825	13.75	13.75	13.75	13.75	13.00	13.75


5 GHz WLAN – 20 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT20 (2Tx, SDM, nonTxBF) Low Rate	11ax HE20 (2Tx, SDM, nonTxBF) Low Rate	11ax HE20 RU106 (2Tx, SDM, nonTxBF)	11ax HE20 RU52 (2Tx, SDM, nonTxBF)	11ax HE20 RU26 (2Tx, SDM, nonTxBF)	11n/11ac HT20 (2Tx, TxBF) Low Rate
36	5180	15.00	15.00	13.00	10.00	7.00	12.00
40	5200	15.00	15.00	13.00	10.00	7.00	12.00
44	5220	15.00	15.00	13.00	10.00	7.00	12.00
48	5240	15.00	15.00	13.00	10.00	7.00	12.00
52	5260	14.75	14.75	13.25	10.25	NS	12.25
56	5280	14.75	14.75	13.25	10.25	NS	12.25
60	5300	14.75	14.75	13.25	10.25	NS	12.25
64	5320	14.75	14.75	12.50	10.25	NS	12.25
100	5500	14.50	14.50	14.00	11.25	NS	13.25
104	5520	14.50	14.50	14.25	11.25	NS	13.25
108	5540	14.50	14.50	14.25	11.25	NS	13.25
112	5560	14.50	14.50	14.25	11.25	NS	13.25
116	5580	14.50	14.50	14.25	11.25	NS	13.25
120	5600	14.50	14.50	14.25	11.25	NS	13.25
124	5620	14.50	14.50	14.25	11.25	NS	13.25
128	5640	14.50	14.50	14.25	11.25	NS	13.25
132	5660	14.50	14.50	14.25	11.25	NS	13.25
136	5680	14.50	14.50	14.25	11.25	NS	13.25
140	5700	14.50	13.75	14.25	11.25	NS	13.25
144	5720	14.50	14.50	14.25	11.25	NS	13.25
149	5745	13.75	13.75	13.75	13.75	13.00	13.75
153	5765	13.75	13.75	13.75	13.75	13.00	13.75
157	5785	13.75	13.75	13.75	13.75	13.00	13.75
161	5805	13.75	13.75	13.75	13.75	13.00	13.75
165	5825	13.75	13.75	13.75	13.75	13.00	13.75

**5 GHz WLAN – 40 MHz BW – SISO Core 0**

Channel	Centre Frequency (MHz)	11n/11ac HT40 (SISO) Low Rate	11ax HE40 (SISO) Low Rate	11ax HE40 RU106 (SISO)	11ax HE40 RU52 (SISO)	11ax HE40 RU26 (SISO)
38	5190	15.00	14.50	15.00	12.50	9.75
46	5230	15.00	15.00	15.00	12.75	9.75
54	5270	14.75	14.75	14.75	12.75	NS
62	5310	14.75	14.50	14.00	9.00	NS
102	5510	14.50	14.50	14.50	13.25	NS
110	5550	14.50	14.50	14.50	13.50	NS
118	5590	14.50	14.50	14.50	13.50	NS
126	5630	14.50	14.50	14.50	13.50	NS
134	5670	14.50	14.50	14.50	13.50	NS
142	5710	14.50	14.50	14.50	13.50	NS
151	5755	13.75	13.75	13.75	13.75	13.00
159	5795	13.75	13.75	13.75	13.75	13.00

5 GHz WLAN – 40 MHz BW – SISO Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT40 (SISO) Low Rate	11ax HE40 (SISO) Low Rate	11ax HE40 RU106 (SISO)	11ax HE40 RU52 (SISO)	11ax HE40 RU26 (SISO)
38	5190	15.50	14.50	15.50	12.50	9.75
46	5230	15.50	15.50	15.50	12.75	9.75
54	5270	15.50	15.50	15.50	12.75	NS
62	5310	15.00	14.50	14.00	9.00	NS
102	5510	14.50	14.50	14.50	13.25	NS
110	5550	14.50	14.50	14.50	13.50	NS
118	5590	14.50	14.50	14.50	13.50	NS
126	5630	14.50	14.50	14.50	13.50	NS
134	5670	14.50	14.50	14.50	13.50	NS
142	5710	14.50	14.50	14.50	13.50	NS
151	5755	13.75	13.75	13.75	13.75	13.00
159	5795	13.75	13.75	13.75	13.75	13.00


5 GHz WLAN – 40 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT40 (2Tx, CDD, nonTxBF) Low Rate	11ax HE40 (2Tx, CDD, nonTxBF) Low Rate	11ax HE40 RU106 (2Tx, CDD, nonTxBF)	11ax HE40 RU52 (2Tx, CDD, nonTxBF)	11ax HE40 RU26 (2Tx, CDD, nonTxBF)	11ax HT40 (2Tx, TxBF) Low Rate
38	5190	14.50	14.00	10.00	7.00	4.00	12.00
46	5230	14.50	14.50	10.00	7.00	4.00	14.50
54	5270	14.75	14.75	10.25	7.25	NS	14.75
62	5310	14.75	13.50	10.25	7.25	NS	11.50
102	5510	14.50	14.50	11.25	8.25	NS	12.75
110	5550	14.50	14.50	11.25	8.25	NS	14.50
118	5590	14.50	14.50	11.25	8.25	NS	14.50
126	5630	14.50	14.50	11.25	8.25	NS	14.50
134	5670	14.50	14.50	11.25	8.25	NS	14.00
142	5710	14.50	14.50	11.25	8.25	NS	14.50
151	5755	13.75	13.75	13.75	13.75	13.00	13.75
159	5795	13.75	13.75	13.75	13.75	13.00	13.75

5 GHz WLAN – 40 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT40 (2Tx, SDM, nonTxBF) Low Rate	11ax HE40 (2Tx, SDM, nonTxBF) Low Rate	11ax HE40 RU106 (2Tx, SDM, nonTxBF)	11ax HE40 RU52 (2Tx, SDM, nonTxBF)	11ax HE40 RU26 (2Tx, SDM, nonTxBF)	11n/11ac HT40 (2Tx, TxBF) Low Rate
38	5190	15.00	14.00	13.00	10.00	7.00	14.50
46	5230	15.00	15.00	13.00	10.00	7.00	14.50
54	5270	14.75	14.75	13.25	10.25	NS	14.75
62	5310	14.75	13.75	12.00	8.00	NS	12.75
102	5510	14.50	14.50	14.00	11.25	NS	14.50
110	5550	14.50	14.50	14.25	11.25	NS	14.50
118	5590	14.50	14.50	14.25	11.25	NS	14.50
126	5630	14.50	14.50	14.25	11.25	NS	14.50
134	5670	14.50	14.50	14.25	11.25	NS	14.50
142	5710	14.50	14.50	14.25	11.25	NS	14.50
151	5755	13.75	13.75	13.75	13.75	13.00	13.75
159	5795	13.75	13.75	13.75	13.75	13.00	13.75



5 GHz WLAN – 80 MHz BW – SISO Core 0

Channel	Centre Frequency (MHz)	11ac VHT80 (SISO) Low Rate	11ax HE80 (SISO) Low Rate	11ax HE80 RU106 (SISO)	11ax HE80 RU52 (SISO)	11ax HE80 RU26 (SISO)
42	5210	13.50	13.75	10.00	9.00	7.00
58	5290	13.25	13.00	10.00	7.00	NS
106	5530	14.50	14.50	12.00	11.00	NS
122	5610	14.50	14.50	14.50	13.50	NS
138	5690	14.50	14.50	14.50	13.50	NS
155	5775	13.75	13.75	13.75	13.75	13.00

5 GHz WLAN – 80 MHz BW – SISO Core 1

Channel	Centre Frequency (MHz)	11ac VHT80 (SISO) Low Rate	11ax HE80 (SISO) Low Rate	11ax HE80 RU106 (SISO)	11ax HE80 RU52 (SISO)	11ax HE80 RU26 (SISO)
42	5210	13.50	13.75	10.00	9.00	7.00
58	5290	13.25	13.00	10.00	7.00	NS
106	5530	14.50	14.50	12.00	11.00	NS
122	5610	14.50	14.50	14.50	13.50	NS
138	5690	14.50	14.50	14.50	13.50	NS
155	5775	13.75	13.75	13.75	13.75	13.00

5 GHz WLAN – 80 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11ac VHT80 (2Tx, CDD, nonTXBF) Low Rate	11ax HE80 (2Tx, CDD, nonTxBF) Low Rate	11ax HE80 RU106 (2Tx, CDD, nonTxBF)	11ax HE80 RU52 (2Tx, CDD, nonTxBF)	11ax HE80 RU26 (2Tx, CDD, nonTxBF)	11ax VHT80 (2Tx, TxBF) Low Rate
42	5210	13.50	12.50	10.00	7.00	4.00	10.50
58	5290	12.25	11.75	8.50	5.50	NS	9.75
106	5530	14.00	14.00	9.00	7.00	NS	12.00
122	5610	14.50	14.50	11.25	8.25	NS	14.50
138	5690	14.50	14.50	11.25	8.25	NS	14.50
155	5775	13.75	13.75	13.75	13.75	11.00	13.75


5 GHz WLAN – 80 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11ac VHT80 (2Tx, SDM, nonTxBF) Low Rate	11ax HE80 (2Tx, SDM, nonTxBF) Low Rate	11ax HE80 RU106 (2Tx, SDM, nonTxBF)	11ax HE80 RU52 (2Tx, SDM, nonTxBF)	11ax HE80 RU26 (2Tx, SDM, nonTxBF)	11ac VHT80 (2Tx, TxBF) Low Rate
42	5210	13.50	12.50	11.00	8.00	7.00	12.00
58	5290	12.75	11.75	8.50	5.50	NS	11.25
106	5530	14.50	14.50	9.00	7.00	NS	14.00
122	5610	14.50	14.50	14.25	11.25	NS	14.50
138	5690	14.50	14.50	14.25	11.25	NS	14.50
155	5775	13.75	13.75	13.75	13.75	11.00	13.75



1.7 ISED POWER TABLES (TUNE UP VALUES)

Note: All values in dBm

NS= Not Supported

2.4 GHz Bluetooth (5 GHz WLAN off)

BT Core	PA	Channel	BDR (dBm)	EDR (dBm)	LE Data (dBm)	HDR4 (dBm)	HDR8 (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	16.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	16.5	N/A	15	15

Bluetooth – TXBF

BT Core	PA	Channel	BDR TXBF (dBm)	EDR TXBF (dBm)	LE TXBF (dBm)	HDR4 TXBF (dBm)	HDR8 TXBF (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	13.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	13.5	N/A	15	15

2.4 GHz Bluetooth (5 GHz WLAN on)

BT Core	PA	Channel	BDR (dBm)	EDR (dBm)	LE Data (dBm)	HDR4 (dBm)	HDR8 (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	15.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	15.5	N/A	15	15

Bluetooth – TXBF

BT Core	PA	Channel	BDR TXBF (dBm)	EDR TXBF (dBm)	LE TXBF (dBm)	HDR4 TXBF (dBm)	HDR8 TXBF (dBm)
0	iPA	All	13	9.5	5	6	6
0	ePA		N/A	13.5	N/A	15	15
1	iPA		13	9.5	5.5	6	6
1	ePA		N/A	13.5	N/A	15	15



2.4 GHz WLAN – SISO Core 0 & Core 1

Channel	Centre Frequency (MHz)	b (SISO)	g (SISO) Low Rate	11n/11ac HT20 (SISO) Low Rate	11ax HE20 (SISO) Low Rate	11ax HE20 RU106 (SISO)	11ax HE20 RU52 (SISO)	11ax HE20 RU26 (SISO)
1	2412	18.75	18.50	17.50	16.50	17.50	17.50	14.50
2	2417	18.75	18.75	18.75	18.75	18.75	17.50	14.50
3	2422	18.75	18.75	18.75	18.75	18.75	17.50	14.50
4	2427	18.75	18.75	18.75	18.75	18.75	17.50	14.50
5	2432	18.75	18.75	18.75	18.75	18.75	17.50	14.50
6	2437	18.75	18.75	18.75	18.75	18.75	17.50	14.50
7	2442	18.75	18.75	18.75	18.75	18.75	17.50	14.50
8	2447	18.75	18.75	18.75	18.75	18.75	17.50	14.50
9	2452	18.75	18.75	18.75	18.75	18.75	17.50	14.50
10	2457	18.75	18.75	18.75	18.75	18.75	17.50	14.50
11	2462	18.75	17.50	17.50	16.00	17.25	17.00	14.50
12	2467	18.50	15.50	15.50	14.00	14.25	15.00	14.00
13	2472	17.00	6.00	6.00	4.50	2.00	0.50	-3.50

2.4 GHz WLAN – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	b (2Tx, DSSS)	11n/11ac HT20 (2Tx, nonTXBF) Low Rate	11ax HE20 (2Tx, nonTXBF) Low Rate	11ax HE20 RU106 (2Tx, nonTxBF)	11ax HE20 RU52 (2Tx, nonTxBF)	11ax HE20 RU26 (2Tx, nonTxBF)	11ax HT20 (2Tx, TxBF) Low Rate
1	2412	NS	16.50	15.50	17.25	17.50	14.50	13.50
2	2417	NS	18.75	18.75	18.75	17.50	14.50	17.75
3	2422	NS	18.75	18.75	18.75	17.50	14.50	18.75
4	2427	NS	18.75	18.75	18.75	17.50	14.50	18.75
5	2432	NS	18.75	18.75	18.75	17.50	14.50	18.75
6	2437	NS	18.75	18.75	18.75	17.50	14.50	18.75
7	2442	NS	18.75	18.75	18.75	17.50	14.50	18.75
8	2447	NS	18.75	18.75	18.75	17.50	14.50	18.75
9	2452	NS	18.75	18.75	18.75	17.50	14.50	18.00
10	2457	NS	18.75	18.50	18.75	17.50	14.50	16.50
11	2462	NS	16.00	14.50	17.25	17.00	14.50	12.50
12	2467	NS	13.50	12.00	14.25	15.00	14.00	10.00
13	2472	NS	3.50	2.00	-0.50	0.00	-5.00	NS

**5 GHz WLAN – 20 MHz BW – SISO Core 0**

Channel	Centre Frequency (MHz)	a (SISO) Low Rate	11n/11ac HT20 (SISO) Low Rate	11ax HE20 (SISO) Low Rate	11ax HE20 RU106 (SISO)	11ax HE20 RU52 (SISO)	11ax HE20 RU26 (SISO)
36	5180	10.75	10.75	10.75	8.75	5.75	2.75
40	5200	10.75	10.75	10.75	8.75	5.75	2.75
44	5220	10.75	10.75	10.75	8.75	5.75	2.75
48	5240	10.75	10.75	10.75	8.75	5.75	2.75
52	5260	14.00	14.00	14.00	14.00	12.75	NS
56	5280	14.00	14.00	14.00	14.00	12.75	NS
60	5300	14.00	14.00	14.00	14.00	12.75	NS
64	5320	14.00	14.00	14.00	14.00	10.00	NS
100	5500	13.75	13.75	13.75	13.75	13.50	NS
104	5520	13.75	13.75	13.75	13.75	13.50	NS
108	5540	13.75	13.75	13.75	13.75	13.50	NS
112	5560	13.75	13.75	13.75	13.75	13.50	NS
116	5580	13.75	13.75	13.75	13.75	13.50	NS
120	5600	13.75	13.75	13.75	13.75	13.50	NS
124	5620	13.75	13.75	13.75	13.75	13.50	NS
128	5640	13.75	13.75	13.75	13.75	13.50	NS
132	5660	13.75	13.75	13.75	13.75	13.50	NS
136	5680	13.75	13.75	13.75	13.75	13.50	NS
140	5700	13.75	13.75	13.75	13.75	13.50	NS
144	5720	13.75	13.75	13.75	13.75	13.50	NS
149	5745	13.00	13.00	13.00	13.00	13.00	13.00
153	5765	13.00	13.00	13.00	13.00	13.00	13.00
157	5785	13.00	13.00	13.00	13.00	13.00	13.00
161	5805	13.00	13.00	13.00	13.00	13.00	13.00
165	5825	13.00	13.00	13.00	13.00	13.00	13.00

**5 GHz WLAN – 20 MHz BW – SISO Core 1**

Channel	Centre Frequency (MHz)	a (SISO) Low Rate	11n/11ac HT20 (SISO) Low Rate	11ax HE20 (SISO) Low Rate	11ax HE20 RU106 (SISO)	11ax HE20 RU52 (SISO)	11ax HE20 RU26 (SISO)
36	5180	10.75	10.75	10.75	8.75	5.75	2.75
40	5200	10.75	10.75	10.75	8.75	5.75	2.75
44	5220	10.75	10.75	10.75	8.75	5.75	2.75
48	5240	10.75	10.75	10.75	8.75	5.75	2.75
52	5260	14.75	14.75	14.75	14.75	12.75	NS
56	5280	14.75	14.75	14.75	14.75	12.75	NS
60	5300	14.75	14.75	14.75	14.75	12.75	NS
64	5320	14.75	14.75	14.75	14.00	10.00	NS
100	5500	13.75	13.75	13.75	13.75	13.50	NS
104	5520	13.75	13.75	13.75	13.75	13.50	NS
108	5540	13.75	13.75	13.75	13.75	13.50	NS
112	5560	13.75	13.75	13.75	13.75	13.50	NS
116	5580	13.75	13.75	13.75	13.75	13.50	NS
120	5600	13.75	13.75	13.75	13.75	13.50	NS
124	5620	13.75	13.75	13.75	13.75	13.50	NS
128	5640	13.75	13.75	13.75	13.75	13.50	NS
132	5660	13.75	13.75	13.75	13.75	13.50	NS
136	5680	13.75	13.75	13.75	13.75	13.50	NS
140	5700	13.75	13.75	13.75	13.75	13.50	NS
144	5720	13.75	13.75	13.75	13.75	13.50	NS
149	5745	13.00	13.00	13.00	13.00	13.00	13.00
153	5765	13.00	13.00	13.00	13.00	13.00	13.00
157	5785	13.00	13.00	13.00	13.00	13.00	13.00
161	5805	13.00	13.00	13.00	13.00	13.00	13.00
165	5825	13.00	13.00	13.00	13.00	13.00	13.00


5 GHz WLAN – 20 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT20 (2Tx, CDD, nonTxBF) Low Rate	11ax HE20 (2Tx, CDD, nonTxBF) Low Rate	11ax HE20 RU106 (2Tx, CDD, nonTxBF)	11ax HE20 RU52 (2Tx, CDD, nonTxBF)	11ax HE20 RU26 (2Tx, CDD, nonTxBF)	11ax HT20 (2Tx, TxBF) Low Rate
36	5180	5.00	5.00	3.00	0.00	-3.00	5.00
40	5200	5.00	5.00	3.00	0.00	-3.00	5.00
44	5220	5.00	5.00	3.00	0.00	-3.00	5.00
48	5240	5.00	5.00	3.00	0.00	-3.00	5.00
52	5260	12.25	12.25	10.25	7.25	NS	12.25
56	5280	12.25	12.25	10.25	7.25	NS	12.25
60	5300	12.25	12.25	10.25	7.25	NS	12.25
64	5320	12.25	12.25	10.25	7.25	NS	12.25
100	5500	13.25	13.25	11.25	8.25	NS	13.25
104	5520	13.25	13.25	11.25	8.25	NS	13.25
108	5540	13.25	13.25	11.25	8.25	NS	13.25
112	5560	13.25	13.25	11.25	8.25	NS	13.25
116	5580	13.25	13.25	11.25	8.25	NS	13.25
120	5600	13.25	13.25	11.25	8.25	NS	13.25
124	5620	13.25	13.25	11.25	8.25	NS	13.25
128	5640	13.25	13.25	11.25	8.25	NS	13.25
132	5660	13.25	13.25	11.25	8.25	NS	13.25
136	5680	13.25	13.25	11.25	8.25	NS	13.25
140	5700	13.25	13.25	11.25	8.25	NS	11.25
144	5720	13.25	13.25	11.25	8.25	NS	13.25
149	5745	13.00	13.00	13.00	13.00	13.00	13.00
153	5765	13.00	13.00	13.00	13.00	13.00	13.00
157	5785	13.00	13.00	13.00	13.00	13.00	13.00
161	5805	13.00	13.00	13.00	13.00	13.00	13.00
165	5825	13.00	13.00	13.00	13.00	13.00	13.00


5 GHz WLAN – 20 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT20 (2Tx, SDM, nonTxBF) Low Rate	11ax HE20 (2Tx, SDM, nonTxBF) Low Rate	11ax HE20 RU106 (2Tx, SDM, nonTxBF)	11ax HE20 RU52 (2Tx, SDM, nonTxBF)	11ax HE20 RU26 (2Tx, SDM, nonTxBF)	11n/11ac HT20 (2Tx, TxBF) Low Rate
36	5180	8.00	8.00	6.00	3.00	0.00	5.00
40	5200	8.00	8.00	6.00	3.00	0.00	5.00
44	5220	8.00	8.00	6.00	3.00	0.00	5.00
48	5240	8.00	8.00	6.00	3.00	0.00	5.00
52	5260	14.00	14.00	13.25	10.25	NS	12.25
56	5280	14.00	14.00	13.25	10.25	NS	12.25
60	5300	14.00	14.00	13.25	10.25	NS	12.25
64	5320	14.00	14.00	12.50	10.25	NS	12.25
100	5500	13.75	13.75	13.75	11.25	NS	13.25
104	5520	13.75	13.75	13.75	11.25	NS	13.25
108	5540	13.75	13.75	13.75	11.25	NS	13.25
112	5560	13.75	13.75	13.75	11.25	NS	13.25
116	5580	13.75	13.75	13.75	11.25	NS	13.25
120	5600	13.75	13.75	13.75	11.25	NS	13.25
124	5620	13.75	13.75	13.75	11.25	NS	13.25
128	5640	13.75	13.75	13.75	11.25	NS	13.25
132	5660	13.75	13.75	13.75	11.25	NS	13.25
136	5680	13.75	13.75	13.75	11.25	NS	13.25
140	5700	13.75	13.75	13.75	11.25	NS	13.25
144	5720	13.75	13.75	13.75	11.25	NS	13.25
149	5745	13.00	13.00	13.00	13.00	13.00	13.00
153	5765	13.00	13.00	13.00	13.00	13.00	13.00
157	5785	13.00	13.00	13.00	13.00	13.00	13.00
161	5805	13.00	13.00	13.00	13.00	13.00	13.00
165	5825	13.00	13.00	13.00	13.00	13.00	13.00

**5 GHz WLAN – 40 MHz BW – SISO Core 0**

Channel	Centre Frequency (MHz)	11n/11ac HT40 (SISO) Low Rate	11ax HE40 (SISO) Low Rate	11ax HE40 RU106 (SISO)	11ax HE40 RU52 (SISO)	11ax HE40 RU26 (SISO)
38	5190	13.25	13.25	8.75	5.75	2.75
46	5230	13.25	13.25	8.75	5.75	2.75
54	5270	14.00	14.00	14.00	12.75	NS
62	5310	14.00	14.00	14.00	9.00	NS
102	5510	13.75	13.75	13.75	13.25	NS
110	5550	13.75	13.75	13.75	13.50	NS
118	5590	13.75	13.75	13.75	13.50	NS
126	5630	13.75	13.75	13.75	13.50	NS
134	5670	13.75	13.75	13.75	13.50	NS
142	5710	13.75	13.75	13.75	13.50	NS
151	5755	13.00	13.00	13.00	13.00	13.00
159	5795	13.00	13.00	13.00	13.00	13.00

5 GHz WLAN – 40 MHz BW – SISO Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT40 (SISO) Low Rate	11ax HE40 (SISO) Low Rate	11ax HE40 RU106 (SISO)	11ax HE40 RU52 (SISO)	11ax HE40 RU26 (SISO)
38	5190	13.25	13.25	8.75	5.75	2.75
46	5230	13.25	13.25	8.75	5.75	2.75
54	5270	14.75	14.75	14.75	12.75	NS
62	5310	14.75	14.50	14.00	9.00	NS
102	5510	13.75	13.75	13.75	13.25	NS
110	5550	13.75	13.75	13.75	13.50	NS
118	5590	13.75	13.75	13.75	13.50	NS
126	5630	13.75	13.75	13.75	13.50	NS
134	5670	13.75	13.75	13.75	13.50	NS
142	5710	13.75	13.75	13.75	13.50	NS
151	5755	13.00	13.00	13.00	13.00	13.00
159	5795	13.00	13.00	13.00	13.00	13.00


5 GHz WLAN – 40 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT40 (2Tx, CDD, nonTxBF) Low Rate	11ax HE40 (2Tx, CDD, nonTxBF) Low Rate	11ax HE40 RU106 (2Tx, CDD, nonTxBF)	11ax HE40 RU52 (2Tx, CDD, nonTxBF)	11ax HE40 RU26 (2Tx, CDD, nonTxBF)	11ax HT40 (2Tx, TxBF) Low Rate
38	5190	7.50	7.50	3.00	0.00	-3.00	7.50
46	5230	7.50	7.50	3.00	0.00	-3.00	7.50
54	5270	14.00	14.00	10.25	7.25	NS	14.00
62	5310	14.00	13.50	10.25	7.25	NS	11.50
102	5510	13.75	13.75	11.25	8.25	NS	12.75
110	5550	13.75	13.75	11.25	8.25	NS	13.75
118	5590	13.75	13.75	11.25	8.25	NS	13.75
126	5630	13.75	13.75	11.25	8.25	NS	13.75
134	5670	13.75	13.75	11.25	8.25	NS	13.75
142	5710	13.75	13.75	11.25	8.25	NS	13.75
151	5755	13.00	13.00	13.00	13.00	13.00	13.00
159	5795	13.00	13.00	13.00	13.00	13.00	13.00

5 GHz WLAN – 40 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11n/11ac HT40 (2Tx, SDM, nonTxBF) Low Rate	11ax HE40 (2Tx, SDM, nonTxBF) Low Rate	11ax HE40 RU106 (2Tx, SDM, nonTxBF)	11ax HE40 RU52 (2Tx, SDM, nonTxBF)	11ax HE40 RU26 (2Tx, SDM, nonTxBF)	11n/11ac HT40 (2Tx, TxBF) Low Rate
38	5190	10.50	10.50	6.00	3.00	0.00	7.50
46	5230	10.50	10.50	6.00	3.00	0.00	7.50
54	5270	14.00	14.00	13.25	10.25	NS	14.00
62	5310	14.00	13.75	12.00	8.00	NS	12.75
102	5510	13.75	13.75	13.75	11.25	NS	13.75
110	5550	13.75	13.75	13.75	11.25	NS	13.75
118	5590	13.75	13.75	13.75	11.25	NS	13.75
126	5630	13.75	13.75	13.75	11.25	NS	13.75
134	5670	13.75	13.75	13.75	11.25	NS	13.75
142	5710	13.75	13.75	13.75	11.25	NS	13.75
151	5755	13.00	13.00	13.00	13.00	13.00	13.00
159	5795	13.00	13.00	13.00	13.00	13.00	13.00

**5 GHz WLAN – 80 MHz BW – SISO Core 0**

Channel	Centre Frequency (MHz)	11ac VHT80 (SISO) Low Rate	11ax HE80 (SISO) Low Rate	11ax HE80 RU106 (SISO)	11ax HE80 RU52 (SISO)	11ax HE80 RU26 (SISO)
42	5210	13.50	13.75	8.75	5.75	2.75
58	5290	13.25	13.00	10.00	7.00	NS
106	5530	13.75	13.75	12.00	11.00	NS
122	5610	13.75	13.75	13.75	13.50	NS
138	5690	13.75	13.75	13.75	13.50	NS
155	5775	13.00	13.00	13.00	13.00	13.00

5 GHz WLAN – 80 MHz BW – SISO Core 1

Channel	Centre Frequency (MHz)	11ac VHT80 (SISO) Low Rate	11ax HE80 (SISO) Low Rate	11ax HE80 RU106 (SISO)	11ax HE80 RU52 (SISO)	11ax HE80 RU26 (SISO)
42	5210	13.50	13.75	8.75	5.75	2.75
58	5290	13.25	13.00	10.00	7.00	NS
106	5530	13.75	13.75	12.00	11.00	NS
122	5610	13.75	13.75	13.75	13.50	NS
138	5690	13.75	13.75	13.75	13.50	NS
155	5775	13.00	13.00	13.00	13.00	13.00

5 GHz WLAN – 80 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11ac VHT80 (2Tx, CDD, nonTXBF) Low Rate	11ax HE80 (2Tx, CDD, nonTxBF) Low Rate	11ax HE80 RU106 (2Tx, CDD, nonTxBF)	11ax HE80 RU52 (2Tx, CDD, nonTxBF)	11ax HE80 RU26 (2Tx, CDD, nonTxBF)	11ax VHT80 (2Tx, TxBF) Low Rate
42	5210	8.50	8.50	3.00	0.00	-3.00	8.50
58	5290	12.25	11.75	8.50	5.50	NS	9.75
106	5530	13.75	13.75	9.00	7.00	NS	12.00
122	5610	13.75	13.75	11.25	8.25	NS	13.75
138	5690	13.75	13.75	11.25	8.25	NS	13.75
155	5775	13.00	13.00	13.00	13.00	11.00	13.00


5 GHz WLAN – 80 MHz BW – MIMO Core 0 & Core 1

Channel	Centre Frequency (MHz)	11ac VHT80 (2Tx, SDM, nonTxBF) Low Rate	11ax HE80 (2Tx, SDM, nonTxBF) Low Rate	11ax HE80 RU106 (2Tx, SDM, nonTxBF)	11ax HE80 RU52 (2Tx, SDM, nonTxBF)	11ax HE80 RU26 (2Tx, SDM, nonTxBF)	11ac VHT80 (2Tx, TxBF) Low Rate
42	5210	11.50	11.50	6.00	3.00	0.00	8.50
58	5290	12.75	11.75	8.50	5.50	NS	11.25
106	5530	13.75	13.75	9.00	7.00	NS	13.75
122	5610	13.75	13.75	13.75	11.25	NS	13.75
138	5690	13.75	13.75	13.75	11.25	NS	13.75
155	5775	13.00	13.00	13.00	13.00	11.00	13.00



1.8 POWER MEASUREMENTS

1.8.1 Method

Conducted power measurements were made using a spectrum analyser

1.8.2 Conducted Power Measurements

Bluetooth (5 GHz Wi-Fi OFF) – EDR

(BT Core 0 - ePA)

Technology	Channel	Modulation	Packet Type	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
EDR	0	PSK	3-DH5	2402	15.38	16.50	16.50
EDR	39	PSK	3-DH5	2441	15.45	16.50	16.50
EDR	78	PSK	3-DH5	2480	15.24	16.50	16.50

(BT Core 1 - ePA)

Technology	Channel	Modulation	Packet Type	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
EDR	0	PSK	3-DH5	2402	15.35	16.50	16.50
EDR	39	PSK	3-DH5	2441	15.32	16.50	16.50
EDR	78	PSK	3-DH5	2480	15.37	16.50	16.50

Bluetooth (5 GHz Wi-Fi ON) – EDR

(BT Core 0 - ePA)

Technology	Channel	Modulation	Packet Type	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
EDR	0	PSK	3-DH5	2402	15.38	15.50	15.50
EDR	39	PSK	3-DH5	2441	15.45	15.50	15.50
EDR	78	PSK	3-DH5	2480	15.24	15.50	15.50

**(BT Core 1 - ePA)**

Technology	Channel	Modulation	Packet Type	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
EDR	0	PSK	3-DH5	2402	15.35	15.50	15.50
EDR	39	PSK	3-DH5	2441	15.32	15.50	15.50
EDR	78	PSK	3-DH5	2480	15.37	15.50	15.50

2.4 GHz WLAN – SISO Core 0

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11b	1	BPSK	100	1	2412	18.73	19.50	18.75
802.11b	6	BPSK	100	1	2437	18.72	19.50	18.75
802.11b	11	BPSK	100	1	2462	18.64	19.50	18.75

2.4 GHz WLAN – SISO Core 1

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11b	1	BPSK	100	1	2412	18.64	19.50	18.75
802.11b	6	BPSK	100	1	2437	18.61	19.50	18.75
802.11b	11	BPSK	100	1	2462	18.47	19.50	18.75



2.4 GHz WLAN – 2x2 MIMO

(2.4GHz Core 0)

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11ac HT20	2	BPSK	100	6.50	2417	18.45	19.50	18.75
802.11ac HT20	6	BPSK	100	6.50	2437	18.49	19.50	18.75
802.11ac HT20	10	BPSK	100	6.50	2457	18.58	19.50	18.75

(2.4GHz Core 1)

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11ac HT20	2	BPSK	100	6.50	2402	18.63	19.50	18.75
802.11ac HT20	6	BPSK	100	6.50	2437	18.63	19.50	18.75
802.11ac HT20	10	BPSK	100	6.50	2462	18.72	19.50	18.75

5 GHz WLAN – SISO Core 0

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11ac VHT40	38	BPSK	100	13.50	5190	14.76*	15.00	13.25
802.11ax HE80	42	BPSK	100	29.30	5210	13.67**	13.50	13.75
802.11ac VHT40	46	BPSK	100	13.50	5230	15.00*	15.00	13.25
802.11ac VHT40	54	BPSK	100	13.50	5270	13.97	14.75	14.00
802.11ac VHT40	62	BPSK	100	13.50	5310	13.78	14.75	14.00
802.11ac VHT80	106	BPSK	100	29.30	5530	13.61	14.50	13.75
802.11ac VHT80	122	BPSK	100	29.30	5610	13.44	14.50	13.75
802.11ac VHT80	138	BPSK	100	29.30	5690	13.72	14.50	13.75
802.11ac VHT80	155	BPSK	100	29.30	5775	12.99	13.75	13.00
* Tested at FCC Power setting , therefore measured power is greater than ISED Tune Up, Channels 38 and 46 did not require testing for ISED. **Tested at ISED Power setting , therefore measured power is greater than FCC Tune Up, Channel 42 did not require testing for FCC								



5 GHz WLAN – SISO Core 1

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11ac VHT40	38	BPSK	100	13.50	5190	15.34*	15.50	13.25
802.11ax HE80	42	BPSK	100	29.30	5210	13.74**	13.50	13.75
802.11ac VHT40	46	BPSK	100	13.50	5230	15.48*	15.50	13.25
802.11ac VHT40	54	BPSK	100	13.50	5270	14.73	15.50	14.75
802.11ac VHT40	62	BPSK	100	13.50	5310	14.47	15.00	14.75
802.11ac VHT80	106	BPSK	100	29.30	5530	13.54	14.50	13.75
802.11ac VHT80	122	BPSK	100	29.30	5610	13.74	14.50	13.75
802.11ac VHT80	138	BPSK	100	29.30	5690	13.71	14.50	13.75
802.11ac VHT80	155	BPSK	100	29.30	5775	12.55	13.75	13.00
* Tested at FCC Power setting , therefore measured power is greater than ISED Tune Up, Channels 38 and 46 did not require testing for ISED. **Tested at ISED Power setting , therefore measured power is greater than FCC Tune Up, Channel 42 did not require testing for FCC								

5 GHz WLAN – 2x2 MIMO

(5GHz Core 0)

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11ac VHT40	38	BPSK	100	13.50	5190	14.98*	15.00	10.50
802.11ac VHT80	42	BPSK	100	29.30	5210	11.38**	13.50	13.75
802.11ac VHT40	46	BPSK	100	13.50	5230	14.90*	15.00	10.50
802.11ac VHT40	54	BPSK	100	13.50	5270	14.00	14.75	14.00
802.11ac VHT40	62	BPSK	100	13.50	5310	13.87	14.75	14.00
802.11ac VHT80	106	BPSK	100	29.30	5530	13.75	14.50	13.75
802.11ac VHT80	122	BPSK	100	29.30	5610	13.64	14.50	13.75
802.11ac VHT80	138	BPSK	100	29.30	5690	13.45	14.50	13.75
802.11ac VHT80	155	BPSK	100	29.30	5775	12.85	13.75	13.00
* Tested at FCC Power setting , therefore measured power is greater than ISED Tune Up, Channels 38 and 46 did not require testing for ISED. **Tested at ISED Power setting , therefore measured power is greater than FCC Tune Up, Channel 42 did not require testing for FCC								



(5GHz Core 1)

Technology	Channel	Modulation	Duty Cycle (%)	Rate (Mbps)	Frequency (MHz)	Measured Power (dBm)	FCC Tune Up (dBm)	ISED Tune Up (dBm)
802.11ac VHT40	38	BPSK	100	13.50	5190	14.94	15.00	10.50
802.11ac VHT80	42	BPSK	100	29.30	5210	11.45	13.50	11.50
802.11ac VHT40	46	BPSK	100	13.50	5230	14.98	15.00	10.50
802.11ac VHT40	54	BPSK	100	13.50	5270	13.87	14.75	14.00
802.11ac VHT40	62	BPSK	100	13.50	5310	13.54	14.75	14.00
802.11ac VHT80	106	BPSK	100	29.30	5530	13.41	14.50	13.75
802.11ac VHT80	122	BPSK	100	29.30	5610	13.22	14.50	13.75
802.11ac VHT80	138	BPSK	100	29.30	5690	13.52	14.50	13.75
802.11ac VHT80	155	BPSK	100	29.30	5775	12.77	13.75	13.00
* Tested at FCC Power setting , therefore measured power is greater than ISED Tune Up, Channels 38 and 46 did not require testing for ISED. **Tested at ISED Power setting , therefore measured power is greater than FCC Tune Up, Channel 42 did not require testing for FCC								



SECTION 2

TEST DETAILS

Specific Absorption Rate Testing of the A2941

2.1 DASY5 MEASUREMENT SYSTEM

2.1.1 System Description

The DASY6 system for performing compliance tests consists of the following items:

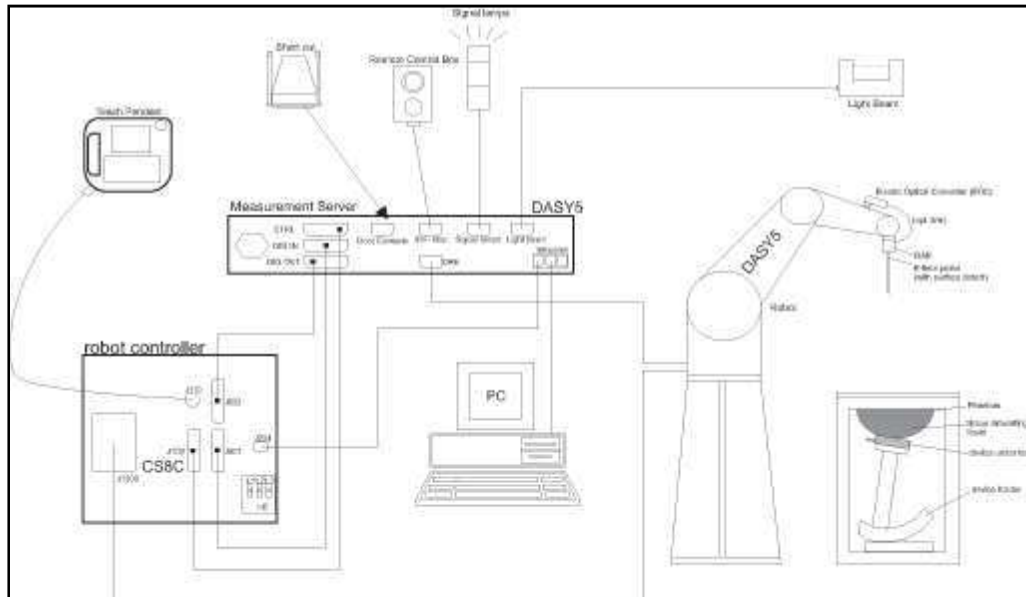


Figure 1 System Description Diagram

A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).

An isotropic field probe optimized and calibrated for the targeted measurement.

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.

The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.

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.

The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.

A computer running the DASY6 software.

Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

The phantom, the device holder and other accessories according to the targeted measurement.



2.1.2 Probe Specification

The probes used by the DASY system are isotropic E-field probes, constructed with a symmetric design and a triangular core. The probes have built-in shielding against static charges and are contained within a PEEK enclosure material. These probes are specially designed and calibrated for use in liquids with high permittivities. The frequency range of the probes are from 6 MHz to 6 GHz.

2.1.3 Data Acquisition Electronics

The data acquisition electronics (DAE4 or DAE3) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

2.1.4 SAR Evaluation Description

The cDASY6 software includes all numerical procedures necessary to evaluate the spatial peak SAR values.

Fast Area Scan:

The Fast Area Scan provides an easy, time efficient and accurate way to define the optimal power reference location. The location of the power reference and power drift measurements for the subsequent Area, Fast Volume and Zoom Scans will be automatically set at the maximum of the Fast Area Scan.

Area Scan:

Area Scans are used to determine the peak location of the measured field before doing a finer measurement around the hotspot. Peak location can be found accurately even on coarse grids using the advanced interpolation routines implemented in cDASY6 Module SAR. Area Scans measure a two dimensional volume covering the full device under test area. cDASY6 Module SAR uses Fast Averaged SAR algorithm to compute the 1g and 10g of simulated tissue from the Area Scan.

Fast Volume Scans:

Fast Volume Scans are 3D scans used to assess the peak spatial SAR values within an averaging volume containing 1g and 10g of simulated tissue. It is compatible with any phantom. For regular phantoms, the measurement grid is generated by projecting a plane onto the phantom surface as for Area and Zoom scans. For specific phantoms, the measurement grid is generated by a conformal offset to the phantom surface at the desired distances. The grid extents can be set by the end user to cover the DUT dimensions or the whole measurable area of the phantom.

**Zoom Scan:**

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. Zoom scans measure a three dimensional volume (cube). The bottom face of the cube is centered on the maximum of the preceding Area Scan in the same measurement group. For maxima at border of the phantom, the zoom scan can be enabled to automatically extend in order to ensure correct evaluation of peak spatial SAR.

Zoom Scans can be performed in two different modes:

Smart Mode: the grid settings are adjusted on the fly based on the distribution being measured to fulfill to the IEC 62209-2 Amendment 1 criteria on grid resolution.

Custom Mode: the user specifies the grid settings to be used. In both modes, Zoom Scans are always anchored to the peak location of the preceding Fast Area / Area / Fast Volume Scan.



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

The following test equipment was used at TÜV SÜD:

Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
Thermometer	LKM Electronics	n/a	4697	12	14-Jul-2023
Hygrometer	Rotronic	HP21 Hygropalm	5264	12	23-Jul-2023
SAR phone holder	Speag	SD000H01KA	NA	-	TU
Measurement server	Speag	DASY 6 Measurement Server	5337	-	TU
Measurement server	Speag	DASY 6 Measurement Server	4692	-	TU
Mounting Platform TX90XL Robot & Phantoms	Speag	MP6C-TX90XL Mounting Platform Extended	5338	-	TU
Mounting Platform TX90XL Robot & Phantoms	Speag	MP6C-TX90XL Mounting Platform Extended	4702	-	TU
Robot	Speag	TX90 XL Stäubli Robot	5340	-	TU
Robot	Speag	TX90 XL Stäubli Robot	4704	-	TU
Power Source for SAR system validation	Speag	POWERSOURCE1-SE UMS 160 BA	5371	12	14-Dec-2023
Body Phantom	Speag	ELI V8.0	4833	-	TU
Body Phantom	Speag	ELI V8.0	5332	-	TU
Dielectric Assessment Kit	Speag	DAK 200MHz to 20GHz	4690	-	Cal before use
Dielectric Probe Stand	Speag	Stand	4691	-	TU
Signal Analyser	Keysight Technologies	N9020B	5528	24	21-Mar-2024
Signal Conditioning Unit	TUV SUD	SPECTRUM SCU002	5759	12	05-Jul-2023
Power Sensor A	Boonton	RTP5008	5830	12	07-Jul-2023
Power Sensor B	Boonton	RTP5008	5832	12	07-Jul-2023
Validation Dipole 2450MHz	Speag	D2450V2	3875	12	08-Dec-2023



Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
Validation Dipole 5000MHz	Speag	D5GHzV2	4309	12	14-Dec-2023
Power Meter	Rohde & Schwarz	NRVD	2979	12	15-Jun-2023
Power Sensor	Rohde & Schwarz	NRV- Z5	2878	12	15-Jun-2023
Power Sensor	Rohde & Schwarz	NRV-Z1	3563	12	15-Jun-2023
ENA Series network analyser	Keysight Technologies	E5080A	5247	12	22-Feb-2023
ENA Series network analyser	Keysight Technologies	E5080A	5247	12	22-Feb-2024
Data Acquisition Electronics	Speag	DAE 4 - SD 000 D04 BN	6155	12	09-Mar-2023
Data Acquisition Electronics	Speag	DAE 4 - SD 000 D04 BN	4689	12	13-Dec-2023
Dosimetric SAR Probe	Speag	EX3DV4	4700	12	15-Dec-2023
Dosimetric SAR Probe	Speag	EX3DV4	5330	12	17-Jun-2023
Tissue Simulant Liquid	Speag	HBBL 600-10000	Batch 1	Weekly	Note 1
Tissue Simulant Liquid	Speag	HBBL 600-10000	Batch 3	Weekly	Note 1

TU - Traceability Unscheduled

Note 1, the calibration dates for the relevant batches of TSL can be found in the fluid parameter tables within this report.



3.2 TEST SOFTWARE

The following software was used to control the TÜV SÜD DASY System.

Instrument	Version Number
DASY system	cDASY6 – V16.2



3.3 DIELECTRIC PROPERTIES OF SIMULANT LIQUIDS

The fluid properties of the simulant fluids used during routine SAR evaluation meet the dielectric properties required KDB 865665.

The dielectric properties of the tissue simulant liquids used for the SAR testing at TÜV SÜD are as follows:-

Fluid Type and Frequency	Relative Permittivity ϵ' Target	Relative Permittivity ϵ' Measured	Conductivity σ (S/m) Target	Conductivity σ (S/m) Measured	Date	Fluid Temperature °C
HBBL/B1 - 2450MHz	39.20	39.85	1.80	1.87	20-02-2023	21.30
HBBL/B1 - 2450MHz	39.20	39.24	1.80	1.87	02-03-2023	21.00
HBBL/B1 - 5200MHz	35.99	33.52	4.66	4.49	20-02-2023	21.30
HBBL/B1 - 5300MHz	35.87	33.34	4.76	4.58	20-02-2023	21.30
HBBL/B3 - 5300MHz	35.87	36.99	4.76	4.63	07-03-2023	20.06
HBBL/B1 - 5500MHz	35.64	32.99	4.96	4.78	20-02-2023	21.30
HBBL/B3 - 5500MHz	35.64	36.62	4.96	4.86	07-03-2023	20.06
HBBL/B1 - 5800MHz	35.30	32.48	5.27	5.08	20-02-2023	21.30
HBBL/B3 - 5800MHz	35.30	36.06	5.27	5.21	07-03-2023	20.06

3.4 TEST CONDITIONS

3.4.1 Test Laboratory Conditions

Ambient temperature: Within +15°C to +35°C.

The actual temperature during the testing ranged from 21.4°C to 24.0°C.

The actual humidity during the testing ranged from 22.8% to 58.4% RH.

3.4.2 Test Fluid Temperature Range

Frequency	Body / Head Fluid	Min Temperature °C	Max Temperature °C
2450 MHz	Head	20.4	22.3
5200 MHz	Head	20.6	20.7
5300 MHz	Head	20.6	20.8
5500 MHz	Head	20.9	21.9
5800 MHz	Head	21.9	21.9



3.5 MEASUREMENT UNCERTAINTY

Body, Full SAR Measurements, 300 MHz to 3 GHz

Source of Uncertainty	Uncertainty $\pm$ %	Probability distribution	Div	C_i (1g)	Standard Uncertainty $\pm$ % (1g)
Measurement System Errors					
Probe Calibration	12.0	Normal	2.00	1.00	6.0
Probe Calibration Drift	1.7	Rectangular	1.73	1.00	1.0
Probe Linearity	4.7	Rectangular	1.73	1.00	2.7
Broadband Signal	3.0	Rectangular	1.73	1.00	1.7
Probe Isotropy	7.6	Rectangular	1.73	1.00	4.4
Data Acquisition	0.3	Normal	1.00	1.00	0.3
RF Ambient	1.8	Normal	1.00	1.00	1.8
Probe Positioning	0.2	Normal	1.00	0.14	0.0
Data Processing	1.2	Normal	1.00	1.00	1.2
Phantom and Device errors					
Liquid Conductivity Meas.	2.5	Normal	1.00	0.78	2.0
Liquid Conductivity Temp	3.3	Rectangular	1.73	0.78	1.5
Phantom Permittivity	14.0	Rectangular	1.73	0.00	0.0
Distance DUT - TSL	2.0	Normal	1.00	2.00	4.0
Device Positioning ($\pm 0.5\text{mm}$)	1.0	Normal	1.00	1.00	1.0
Device Holder	3.6	Normal	1.00	1.00	3.6
Device Modulation	2.4	Rectangular	1.73	1.00	1.4
Time-average SAR	2.6	Rectangular	1.73	1.00	1.5
DUT Drift	5.0	Normal	1.00	1.00	5.0
Correction to the SAR results					
Deviation to Target	1.9	Normal	1.00	1.00	1.9
SAR Scaling	0.0	Rectangular	1.73	1.00	0.0
Combined Standard Uncertainty		RSS			11.8
Expanded Standard Uncertainty		K=2			23.7



Body, Full SAR Measurements, 3 GHz to 6 GHz

Source of Uncertainty	Uncertainty $\pm$ %	Probability distribution	Div	c_i (1g)	Standard Uncertainty $\pm$ % (1g)
Measurement System Errors					
Probe Calibration	14.0	Normal	2.00	1.00	7.0
Probe Calibration Drift	1.7	Rectangular	1.73	1.00	1.0
Probe Linearity	4.7	Rectangular	1.73	1.00	2.7
Broadband Signal	2.6	Rectangular	1.73	1.00	1.5
Probe Isotropy	7.6	Rectangular	1.73	1.00	4.4
Data Acquisition	0.3	Normal	1.00	1.00	0.3
RF Ambient	1.8	Normal	1.00	1.00	1.8
Probe Positioning	0.2	Normal	1.00	0.33	0.1
Data Processing	2.3	Normal	1.00	1.00	2.3
Phantom and Device errors					
Liquid Conductivity Meas.	2.5	Normal	1.00	0.78	2.0
Liquid Conductivity Temp	3.4	Rectangular	1.73	0.78	1.5
Phantom Permittivity	14.0	Rectangular	1.73	0.25	2.0
Distance DUT - TSL	2.0	Normal	1.00	2.00	4.0
Device Positioning ($\pm 0.5\text{mm}$)	1.0	Normal	1.00	1.00	1.0
Device Holder	3.6	Normal	1.00	1.00	3.6
Device Modulation	2.4	Rectangular	1.73	1.00	1.4
Time-average SAR	2.6	Rectangular	1.73	1.00	1.5
DUT Drift	5.0	Normal	1.00	1.00	5.0
Correction to the SAR results					
Deviation to Target	1.9	Normal	1.00	1.00	1.9
SAR Scaling	0.0	Rectangular	1.73	1.00	0.0
Combined Standard Uncertainty		RSS			12.7
Expanded Standard Uncertainty		K=2			25.3

Decision Rule - Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2007, Clause 4.4.3 and 4.5.1. (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8."



SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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ANNEX A

PROBE CALIBRATION REPORT



Calibration Laboratory of
Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **TÜV SÜD UK**

Certificate No **EX-3759_Dec22**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3759**

Calibration procedure(s) **QA CAL-01.v10, QA CAL-12.v10, QA CAL-14.v7, QA CAL-23.v6,
QA CAL-25.v8
Calibration procedure for dosimetric E-field probes**

Calibration date **December 15, 2022**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
OCP DAK-3.5 (weighted)	SN: 1249	20-Oct-22 (OCP-DAK3.5-1249_Oct22)	Oct-23
OCP DAK-12	SN: 1016	20-Oct-22 (OCP-DAK12-1016_Oct22)	Oct-23
Reference 20 dB Attenuator	SN: CC2552 (20x)	04-Apr-22 (No. 217-03527)	Apr-23
DAE4	SN: 660	10-Oct-22 (No. DAE4-660_Oct22)	Oct-23
Reference Probe ES3DV2	SN: 3013	27-Dec-21 (No. ES3-3013_Dec21)	Dec-22

Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-22)	In house check: Jun-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-22)	In house check: Jun-24
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

	Name	Function	Signature
Calibrated by	Jeton Kastrati	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	
Issued: December 16, 2022			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

Certificate No: EX-3759_Dec22

Page 1 of 23



**Calibration Laboratory of
Schmid & Partner
Engineering AG**

Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
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Accreditation No.: SCS 0108

Glossary

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices – Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(*f*)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal. DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).



EX3DV4 - SN:3759

December 15, 2022

Parameters of Probe: EX3DV4 - SN:3759**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k = 2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.51	0.47	0.51	$\pm 10.1\%$
DCP (mV) ^B	98.8	99.9	100.7	$\pm 4.7\%$

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Max dev.	Max Unc ^E k = 2
0	CW	X	0.00	0.00	1.00	0.00	162.5	$\pm 2.7\%$	$\pm 4.7\%$
		Y	0.00	0.00	1.00		155.7		
		Z	0.00	0.00	1.00		156.6		
10352	Pulse Waveform (200Hz, 10%)	X	60.00	106.00	25.00	10.00	60.0	$\pm 3.1\%$	$\pm 9.6\%$
		Y	20.00	90.79	20.60		60.0		
		Z	20.00	92.14	21.63		60.0		
10353	Pulse Waveform (200Hz, 20%)	X	20.00	93.93	20.98	6.99	80.0	$\pm 1.8\%$	$\pm 9.6\%$
		Y	20.00	91.80	20.19		80.0		
		Z	20.00	93.65	21.18		80.0		
10354	Pulse Waveform (200Hz, 40%)	X	20.00	96.67	20.80	3.98	95.0	$\pm 1.0\%$	$\pm 9.6\%$
		Y	20.00	94.72	20.39		95.0		
		Z	20.00	97.08	21.27		95.0		
10355	Pulse Waveform (200Hz, 60%)	X	20.00	96.83	19.43	2.22	120.0	$\pm 1.1\%$	$\pm 9.6\%$
		Y	20.00	97.70	20.53		120.0		
		Z	20.00	99.49	20.80		120.0		
10387	QPSK Waveform, 1 MHz	X	1.47	64.12	13.54	1.00	150.0	$\pm 2.9\%$	$\pm 9.6\%$
		Y	1.57	64.74	14.09		150.0		
		Z	1.66	66.53	15.01		150.0		
10388	QPSK Waveform, 10 MHz	X	1.95	65.80	14.33	0.00	150.0	$\pm 1.1\%$	$\pm 9.6\%$
		Y	2.06	66.52	14.80		150.0		
		Z	2.25	68.56	15.86		150.0		
10396	64-QAM Waveform, 100 kHz	X	2.81	69.07	17.97	3.01	150.0	$\pm 0.8\%$	$\pm 9.6\%$
		Y	3.08	71.15	19.10		150.0		
		Z	2.86	69.56	18.45		150.0		
10399	64-QAM Waveform, 40 MHz	X	3.31	66.06	15.06	0.00	150.0	$\pm 2.4\%$	$\pm 9.6\%$
		Y	3.40	66.45	15.31		150.0		
		Z	3.54	67.47	15.91		150.0		
10414	WLAN CCDF, 64-QAM, 40 MHz	X	4.73	65.09	15.14	0.00	150.0	$\pm 4.1\%$	$\pm 9.6\%$
		Y	4.80	65.28	15.26		150.0		
		Z	4.92	65.97	15.70		150.0		

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of Norm X,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 to 7).

^B Linearization parameter uncertainty for maximum specified field strength.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



EX3DV4 - SN:3759

December 15, 2022

Parameters of Probe: EX3DV4 - SN:3759**Sensor Model Parameters**

	C1 fF	C2 fF	α V^{-1}	T1 $ms V^{-2}$	T2 $ms V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
x	45.1	340.04	35.95	13.08	0.22	5.10	0.78	0.38	1.01
y	46.9	350.37	35.41	20.47	0.00	5.10	1.51	0.23	1.01
z	46.0	344.77	35.86	15.05	0.48	5.10	0.17	0.51	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle	-70.2°
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3–4 mm for an Area Scan job.



EX3DV4 - SN:3759

December 15, 2022

Parameters of Probe: EX3DV4 - SN:3759**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) ^C	Relative Permittivity ^F	Conductivity ^F (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k = 2)
30	55.0	0.75	15.75	15.75	15.75	0.00	1.00	±13.3%
64	54.2	0.75	13.77	13.77	13.77	0.00	1.00	±13.3%
128	52.8	0.76	12.39	12.39	12.39	0.00	1.00	±13.3%
150	52.3	0.76	12.13	12.13	12.13	0.00	1.00	±13.3%
220	49.0	0.81	11.74	11.74	11.74	0.00	1.00	±13.3%
300	45.3	0.87	11.57	11.57	11.57	0.09	1.00	±13.3%
450	43.5	0.87	10.83	10.83	10.83	0.16	1.30	±13.3%
750	41.9	0.89	9.64	9.64	9.64	0.58	0.91	±12.0%
835	41.5	0.90	9.50	9.50	9.50	0.33	1.10	±12.0%
900	41.5	0.97	9.25	9.25	9.25	0.53	0.80	±12.0%
1300	40.8	1.14	8.99	8.99	8.99	0.36	1.09	±12.0%
1450	40.5	1.20	8.84	8.84	8.84	0.42	0.80	±12.0%
1640	40.2	1.31	8.73	8.73	8.73	0.32	0.86	±12.0%
1750	40.1	1.37	8.67	8.67	8.67	0.36	0.86	±12.0%
1810	40.0	1.40	8.51	8.51	8.51	0.35	0.86	±12.0%
1900	40.0	1.40	8.24	8.24	8.24	0.39	0.86	±12.0%
1950	40.0	1.40	8.23	8.23	8.23	0.35	0.86	±12.0%
2000	40.0	1.40	8.20	8.20	8.20	0.34	0.86	±12.0%
2100	39.8	1.49	8.16	8.16	8.16	0.40	0.86	±12.0%
2300	39.5	1.67	8.10	8.10	8.10	0.30	0.90	±12.0%
2450	39.2	1.80	7.76	7.76	7.76	0.35	0.90	±12.0%
2550	39.1	1.91	7.60	7.60	7.60	0.34	0.90	±12.0%
2600	39.0	1.96	7.50	7.50	7.50	0.34	0.90	±12.0%
3300	38.2	2.71	7.18	7.18	7.18	0.35	1.30	±13.1%
3500	37.9	2.91	7.15	7.15	7.15	0.35	1.35	±13.1%
3700	37.7	3.12	6.90	6.90	6.90	0.35	1.35	±13.1%
4100	37.2	3.53	6.63	6.63	6.63	0.40	1.60	±13.1%
5200	36.0	4.66	5.75	5.75	5.75	0.40	1.80	±13.1%

^C Frequency validity above 300 MHz of ±100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for frequencies between 3–6 GHz at any distance larger than half the probe tip diameter from the boundary.



EX3DV4 - SN:3759

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Parameters of Probe: EX3DV4 - SN:3759**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) ^C	Relative Permittivity ^F	Conductivity ^F (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k = 2)
5300	35.9	4.76	5.58	5.58	5.58	0.40	1.80	±13.1%
5500	35.6	4.96	5.20	5.20	5.20	0.40	1.80	±13.1%
5600	35.5	5.07	5.10	5.10	5.10	0.40	1.80	±13.1%
5800	35.3	5.27	5.12	5.12	5.12	0.40	1.80	±13.1%

^C Frequency validity above 300 MHz of ±100 MHz only applies for DASV v4.4 and higher (see Page 2), else it is restricted to ±50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ±10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4–9 MHz, and ConvF assessed at 13 MHz is 9–19 MHz. Above 5 GHz frequency validity can be extended to ±110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz and below ±2% for frequencies between 3–6 GHz at any distance larger than half the probe tip diameter from the boundary.



EX3DV4 - SN:3759

December 15, 2022

Parameters of Probe: EX3DV4 - SN:3759**Calibration Parameter Determined in Head Tissue Simulating Media**

f (MHz) ^C	Relative Permittivity ^F	Conductivity ^F (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k = 2)
6500	34.5	6.07	5.50	5.50	5.50	0.20	2.50	±18.6%

^C Frequency validity at 6.5 GHz is -600/+700 MHz, and ±700 MHz at or above 7 GHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies 6–10 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ±1% for frequencies below 3 GHz; below ±2% for frequencies between 3–6 GHz; and below ±4% for frequencies between 6–10 GHz at any distance larger than half the probe tip diameter from the boundary.

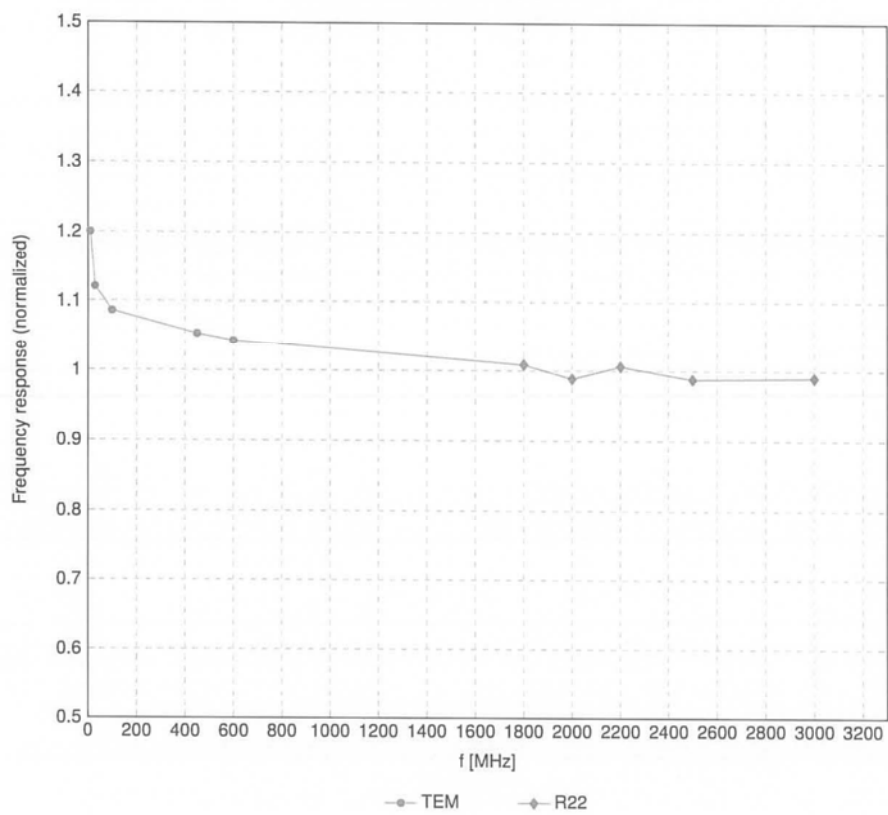


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Frequency Response of E-Field

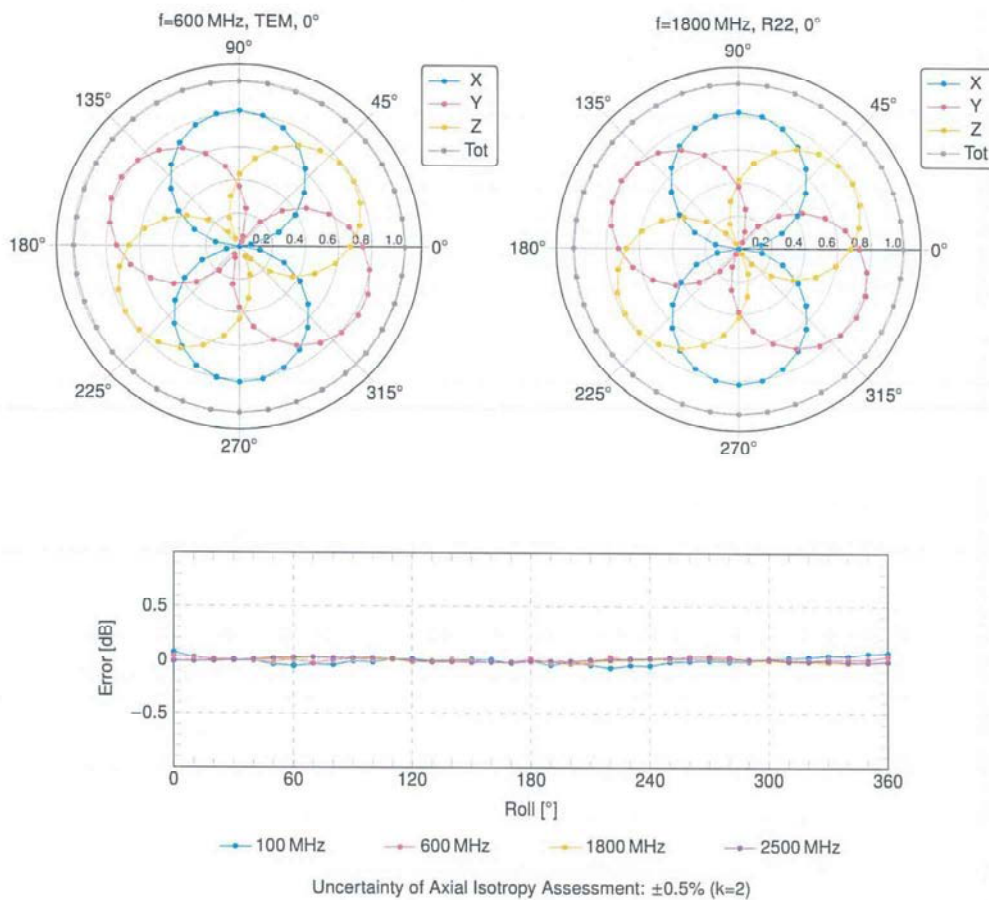
(TEM-Cell:ifi110 EXX, Waveguide:R22)

Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)



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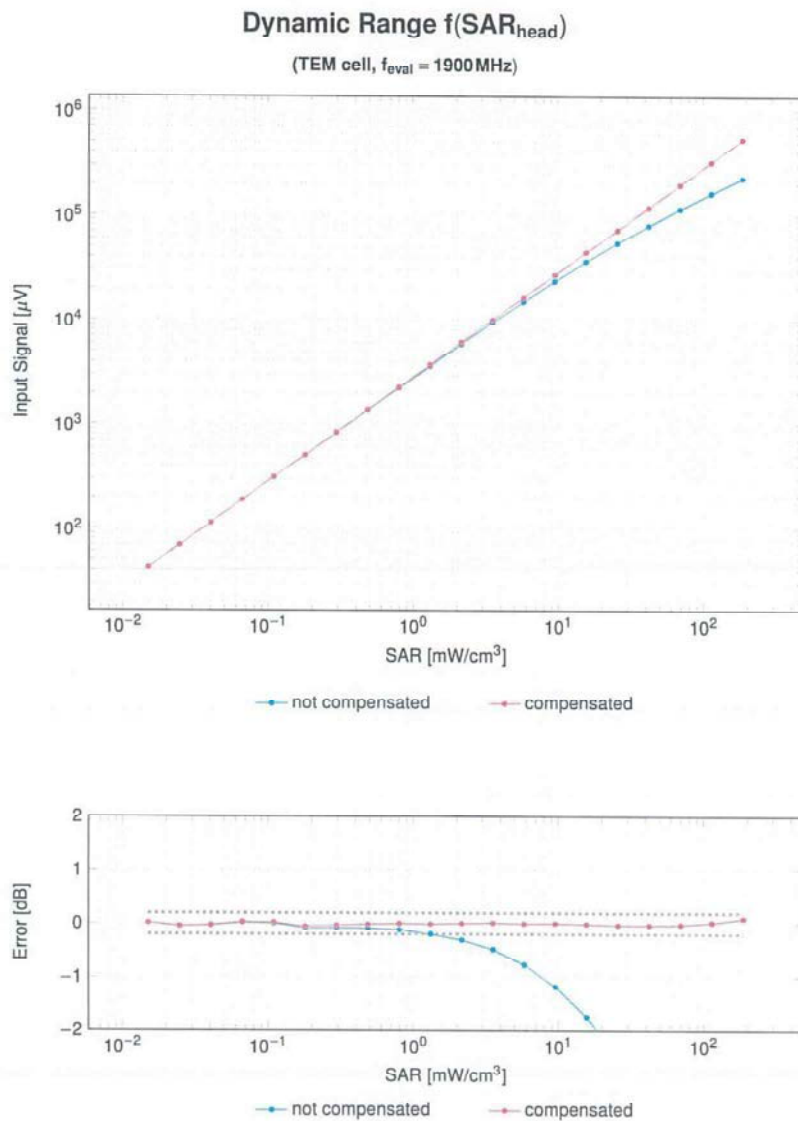
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Receiving Pattern (ϕ), $\vartheta = 0^\circ$ 



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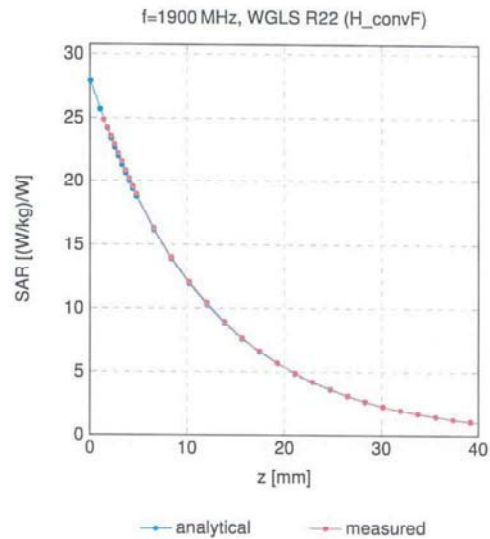




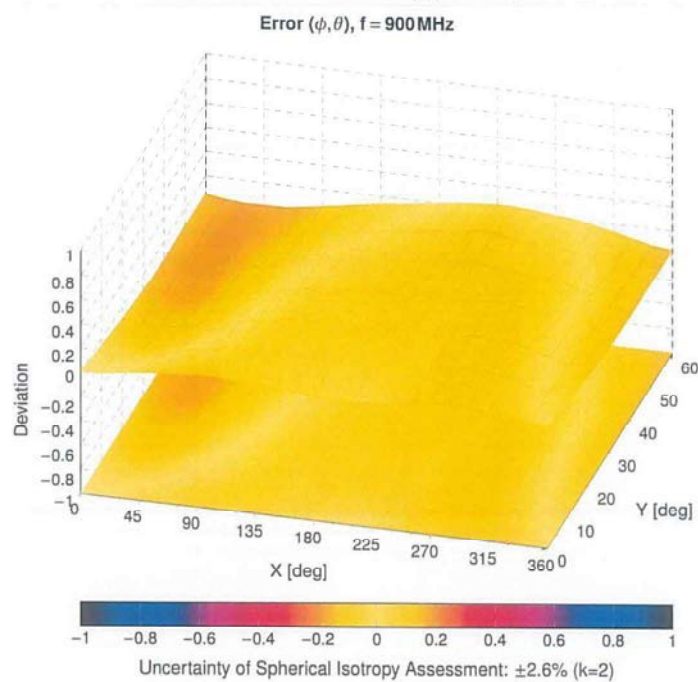
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Conversion Factor Assessment



Deviation from Isotropy in Liquid





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Appendix: Modulation Calibration Parameters

UID	Rev	Communication System Name	Group	PAR (dB)	Unc ^F $k = 2$
0		CW	CW	0.00	±4.7
10010	CAB	SAR Validation (Square, 100 ms, 10 ms)	Test	10.00	±9.6
10011	CAC	UMTS-FDD (WCDMA)	WCDMA	2.91	±9.6
10012	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	WLAN	1.87	±9.6
10013	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	WLAN	9.46	±9.6
10021	DAC	GSM-FDD (TDMA, GMSK)	GSM	9.39	±9.6
10023	DAC	GPRS-FDD (TDMA, GMSK, TN 0)	GSM	9.57	±9.6
10024	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	GSM	6.56	±9.6
10025	DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	GSM	12.62	±9.6
10026	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	GSM	9.55	±9.6
10027	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	GSM	4.80	±9.6
10028	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	GSM	3.55	±9.6
10029	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	GSM	7.78	±9.6
10030	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	Bluetooth	5.30	±9.6
10031	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	Bluetooth	1.87	±9.6
10032	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	Bluetooth	1.16	±9.6
10033	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	Bluetooth	7.74	±9.6
10034	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	Bluetooth	4.53	±9.6
10035	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	Bluetooth	3.83	±9.6
10036	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	Bluetooth	8.01	±9.6
10037	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	Bluetooth	4.77	±9.6
10038	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	Bluetooth	4.10	±9.6
10039	CAB	CDMA2000 (1xRTT, RC1)	CDMA2000	4.57	±9.6
10042	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	AMPS	7.78	±9.6
10044	CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	AMPS	0.00	±9.6
10048	CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	DECT	13.80	±9.6
10049	CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	DECT	10.79	±9.6
10056	CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	TD-SCDMA	11.01	±9.6
10058	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	GSM	6.52	±9.6
10059	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	WLAN	2.12	±9.6
10060	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	WLAN	2.83	±9.6
10061	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	WLAN	3.60	±9.6
10062	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	WLAN	8.68	±9.6
10063	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	WLAN	8.63	±9.6
10064	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	WLAN	9.09	±9.6
10065	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	WLAN	9.00	±9.6
10066	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	WLAN	9.38	±9.6
10067	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	WLAN	10.12	±9.6
10068	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	WLAN	10.24	±9.6
10069	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	WLAN	10.56	±9.6
10071	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	WLAN	9.83	±9.6
10072	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	WLAN	9.62	±9.6
10073	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	WLAN	9.94	±9.6
10074	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	WLAN	10.30	±9.6
10075	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	WLAN	10.77	±9.6
10076	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	WLAN	10.94	±9.6
10077	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	WLAN	11.00	±9.6
10081	CAB	CDMA2000 (1xRTT, RC3)	CDMA2000	3.97	±9.6
10082	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	AMPS	4.77	±9.6
10090	DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	GSM	6.56	±9.6
10097	CAC	UMTS-FDD (HSDPA)	WCDMA	3.98	±9.6
10098	CAC	UMTS-FDD (HSPA, Subtest 2)	WCDMA	3.98	±9.6
10099	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	GSM	9.55	±9.6
10100	CAF	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-FDD	5.67	±9.6
10101	CAF	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	±9.6
10102	CAF	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	±9.6
10103	CAH	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-TDD	9.29	±9.6
10104	CAH	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-TDD	9.97	±9.6
10105	CAH	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-TDD	10.01	±9.6
10108	CAH	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-FDD	5.80	±9.6
10109	CAH	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	±9.6
10110	CAH	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-FDD	5.75	±9.6
10111	CAH	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-FDD	6.44	±9.6

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UID	Rev	Communication System Name	Group	PAR (dB)	Unc ^k k = 2
10112	CAH	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-FDD	6.59	±9.6
10113	CAH	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-FDD	6.62	±9.6
10114	CAD	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	WLAN	8.10	±9.6
10115	CAD	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	WLAN	8.46	±9.6
10116	CAD	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	WLAN	8.15	±9.6
10117	CAD	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	WLAN	8.07	±9.6
10118	CAD	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	WLAN	8.59	±9.6
10119	CAD	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	WLAN	8.13	±9.6
10140	CAF	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-FDD	6.49	±9.6
10141	CAF	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-FDD	6.53	±9.6
10142	CAF	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-FDD	5.73	±9.6
10143	CAF	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-FDD	6.35	±9.6
10144	CAF	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-FDD	6.65	±9.6
10145	CAG	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-FDD	5.76	±9.6
10146	CAG	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.41	±9.6
10147	CAG	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.72	±9.6
10149	CAF	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	±9.6
10150	CAF	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	±9.6
10151	CAH	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-TDD	9.28	±9.6
10152	CAH	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-TDD	9.92	±9.6
10153	CAH	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-TDD	10.05	±9.6
10154	CAH	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-FDD	5.75	±9.6
10155	CAH	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	±9.6
10156	CAH	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-FDD	5.79	±9.6
10157	CAH	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-FDD	6.49	±9.6
10158	CAH	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-FDD	6.62	±9.6
10159	CAH	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-FDD	6.56	±9.6
10160	CAF	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-FDD	5.82	±9.6
10161	CAF	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-FDD	6.43	±9.6
10162	CAF	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-FDD	6.58	±9.6
10166	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-FDD	5.46	±9.6
10167	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.21	±9.6
10168	CAG	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.79	±9.6
10169	CAF	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-FDD	5.73	±9.6
10170	CAF	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10171	AAF	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-FDD	6.49	±9.6
10172	CAH	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-TDD	9.21	±9.6
10173	CAH	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-TDD	9.48	±9.6
10174	CAH	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-TDD	10.25	±9.6
10175	CAH	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-FDD	5.72	±9.6
10176	CAH	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10177	CAJ	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-FDD	5.73	±9.6
10178	CAH	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10179	CAH	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10180	CAH	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10181	CAF	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-FDD	5.72	±9.6
10182	CAF	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10183	AAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10184	CAF	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-FDD	5.73	±9.6
10185	CAF	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-FDD	6.51	±9.6
10186	AAF	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10187	CAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-FDD	5.73	±9.6
10188	CAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.52	±9.6
10189	AAG	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.50	±9.6
10193	CAD	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	WLAN	8.09	±9.6
10194	CAD	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	WLAN	8.12	±9.6
10195	CAD	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	WLAN	8.21	±9.6
10196	CAD	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	WLAN	8.10	±9.6
10197	CAD	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	WLAN	8.13	±9.6
10198	CAD	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	WLAN	8.27	±9.6
10219	CAD	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	WLAN	8.03	±9.6
10220	CAD	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	WLAN	8.13	±9.6
10221	CAD	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	WLAN	8.27	±9.6
10222	CAD	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	WLAN	8.06	±9.6
10223	CAD	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	WLAN	8.48	±9.6
10224	CAD	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	WLAN	8.08	±9.6

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UID	Rev	Communication System Name	Group	PAR (dB)	Unc [®] k = 2
10225	CAC	UMTS-FDD (HSPA+)	WCDMA	5.97	±9.6
10226	CAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.49	±9.6
10227	CAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.26	±9.6
10228	CAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-TDD	9.22	±9.6
10229	CAE	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-TDD	9.48	±9.6
10230	CAE	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-TDD	10.25	±9.6
10231	CAE	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-TDD	9.19	±9.6
10232	CAH	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-TDD	9.48	±9.6
10233	CAH	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-TDD	10.25	±9.6
10234	CAH	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-TDD	9.21	±9.6
10235	CAH	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-TDD	9.48	±9.6
10236	CAH	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-TDD	10.25	±9.6
10237	CAH	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-TDD	9.21	±9.6
10238	CAG	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-TDD	9.48	±9.6
10239	CAG	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-TDD	10.25	±9.6
10240	CAG	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-TDD	9.21	±9.6
10241	CAC	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.82	±9.6
10242	CAC	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-TDD	9.86	±9.6
10243	CAC	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-TDD	9.46	±9.6
10244	CAE	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-TDD	10.06	±9.6
10245	CAE	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-TDD	10.06	±9.6
10246	CAE	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-TDD	9.30	±9.6
10247	CAH	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-TDD	9.91	±9.6
10248	CAH	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-TDD	10.09	±9.6
10249	CAH	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-TDD	9.29	±9.6
10250	CAH	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-TDD	9.81	±9.6
10251	CAH	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-TDD	10.17	±9.6
10252	CAH	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-TDD	9.24	±9.6
10253	CAG	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-TDD	9.90	±9.6
10254	CAG	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-TDD	10.14	±9.6
10255	CAG	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-TDD	9.20	±9.6
10256	CAC	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.96	±9.6
10257	CAC	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.08	±9.6
10258	CAC	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-TDD	9.34	±9.6
10259	CAE	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-TDD	9.98	±9.6
10260	CAE	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-TDD	9.97	±9.6
10261	CAE	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-TDD	9.24	±9.6
10262	CAH	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-TDD	9.83	±9.6
10263	CAH	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-TDD	10.16	±9.6
10264	CAH	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-TDD	9.23	±9.6
10265	CAH	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-TDD	9.92	±9.6
10266	CAH	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-TDD	10.07	±9.6
10267	CAH	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-TDD	9.30	±9.6
10268	CAG	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-TDD	10.06	±9.6
10269	CAG	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-TDD	10.13	±9.6
10270	CAG	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-TDD	9.58	±9.6
10274	CAC	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	WCDMA	4.87	±9.6
10275	CAC	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	WCDMA	3.96	±9.6
10277	CAA	PHS (QPSK)	PHS	11.81	±9.6
10278	CAA	PHS (QPSK, BW 884 MHz, Rolloff 0.5)	PHS	11.81	±9.6
10279	CAA	PHS (QPSK, BW 884 MHz, Rolloff 0.38)	PHS	12.18	±9.6
10290	AAB	CDMA2000, RC1, SO55, Full Rate	CDMA2000	3.91	±9.6
10291	AAB	CDMA2000, RC3, SO55, Full Rate	CDMA2000	3.46	±9.6
10292	AAB	CDMA2000, RC3, SO32, Full Rate	CDMA2000	3.39	±9.6
10293	AAB	CDMA2000, RC3, SO3, Full Rate	CDMA2000	3.50	±9.6
10295	AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	CDMA2000	12.49	±9.6
10297	AAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-FDD	5.81	±9.6
10298	AAE	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-FDD	5.72	±9.6
10299	AAE	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-FDD	6.39	±9.6
10300	AAE	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-FDD	6.60	±9.6
10301	AAA	IEEE 802.16e WiMAX (29:18, 5 ms, 10 MHz, QPSK, PUSC)	WiMAX	12.03	±9.6
10302	AAA	IEEE 802.16e WiMAX (29:18, 5 ms, 10 MHz, QPSK, PUSC, 3 CTRL symbols)	WiMAX	12.57	±9.6
10303	AAA	IEEE 802.16e WiMAX (31:15, 5 ms, 10 MHz, 64QAM, PUSC)	WiMAX	12.52	±9.6
10304	AAA	IEEE 802.16e WiMAX (29:18, 5 ms, 10 MHz, 64QAM, PUSC)	WiMAX	11.86	±9.6
10305	AAA	IEEE 802.16e WiMAX (31:15, 10 ms, 10 MHz, 64QAM, PUSC, 15 symbols)	WiMAX	15.24	±9.6
10306	AAA	IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 64QAM, PUSC, 18 symbols)	WiMAX	14.67	±9.6

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UID	Rev	Communication System Name	Group	PAR (dB)	Unc ^E k = 2
10307	AAA	IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, QPSK, PUSC, 18 symbols)	WiMAX	14.49	±9.6
10308	AAA	IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 16QAM, PUSC)	WiMAX	14.46	±9.6
10309	AAA	IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, 16QAM, AMC 2x3, 18 symbols)	WiMAX	14.58	±9.6
10310	AAA	IEEE 802.16e WiMAX (29:18, 10 ms, 10 MHz, QPSK, AMC 2x3, 18 symbols)	WiMAX	14.57	±9.6
10311	AAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-FDD	6.06	±9.6
10313	AAA	iDEN 1:3	iDEN	10.51	±9.6
10314	AAA	iDEN 1:6	iDEN	13.48	±9.6
10315	AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	WLAN	1.71	±9.6
10316	AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	WLAN	8.36	±9.6
10317	AAD	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	WLAN	8.36	±9.6
10352	AAA	Pulse Waveform (200Hz, 10%)	Generic	10.00	±9.6
10353	AAA	Pulse Waveform (200Hz, 20%)	Generic	6.99	±9.6
10354	AAA	Pulse Waveform (200Hz, 40%)	Generic	3.98	±9.6
10355	AAA	Pulse Waveform (200Hz, 60%)	Generic	2.22	±9.6
10356	AAA	Pulse Waveform (200Hz, 80%)	Generic	0.97	±9.6
10387	AAA	QPSK Waveform, 1 MHz	Generic	5.10	±9.6
10388	AAA	QPSK Waveform, 10 MHz	Generic	5.22	±9.6
10396	AAA	64-QAM Waveform, 100 kHz	Generic	6.27	±9.6
10399	AAA	64-QAM Waveform, 40 MHz	Generic	6.27	±9.6
10400	AAE	IEEE 802.11ac WiFi (20 MHz, 64-QAM, 99pc duty cycle)	WLAN	8.37	±9.6
10401	AAE	IEEE 802.11ac WiFi (40 MHz, 64-QAM, 99pc duty cycle)	WLAN	8.60	±9.6
10402	AAE	IEEE 802.11ac WiFi (80 MHz, 64-QAM, 99pc duty cycle)	WLAN	8.53	±9.6
10403	AAB	CDMA2000 (1xEV-DO, Rev. 0)	CDMA2000	3.76	±9.6
10404	AAB	CDMA2000 (1xEV-DO, Rev. A)	CDMA2000	3.77	±9.6
10406	AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	CDMA2000	5.22	±9.6
10410	AAH	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4)	LTE-TDD	7.82	±9.6
10414	AAA	WLAN CCDF, 64-QAM, 40 MHz	Generic	8.54	±9.6
10415	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	WLAN	1.54	±9.6
10416	AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	WLAN	8.23	±9.6
10417	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	WLAN	8.23	±9.6
10418	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)	WLAN	8.14	±9.6
10419	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble)	WLAN	8.19	±9.6
10422	AAC	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	WLAN	8.32	±9.6
10423	AAC	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	WLAN	8.47	±9.6
10424	AAC	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	WLAN	8.40	±9.6
10425	AAC	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	WLAN	8.41	±9.6
10426	AAC	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	WLAN	8.45	±9.6
10427	AAC	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	WLAN	8.41	±9.6
10430	AAE	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	LTE-FDD	8.28	±9.6
10431	AAE	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	LTE-FDD	8.38	±9.6
10432	AAD	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	LTE-FDD	8.34	±9.6
10433	AAD	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	LTE-FDD	8.34	±9.6
10434	AAB	W-CDMA (BS Test Model 1, 64 DPCH)	WCDMA	8.60	±9.6
10435	AAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	±9.6
10447	AAE	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.56	±9.6
10448	AAE	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.53	±9.6
10449	AAD	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.51	±9.6
10450	AAD	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.48	±9.6
10451	AAB	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	WCDMA	7.59	±9.6
10453	AAE	Validation (Square, 10 ms, 1 ms)	Test	10.00	±9.6
10456	AAC	IEEE 802.11ac WiFi (160 MHz, 64-QAM, 99pc duty cycle)	WLAN	8.63	±9.6
10457	AAB	UMTS-FDD (DC-HSDPA)	WCDMA	6.62	±9.6
10458	AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	CDMA2000	6.55	±9.6
10459	AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	CDMA2000	8.25	±9.6
10460	AAB	UMTS-FDD (WCDMA, AMR)	WCDMA	2.39	±9.6
10461	AAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	±9.6
10462	AAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.30	±9.6
10463	AAC	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.56	±9.6
10464	AAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	±9.6
10465	AAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	±9.6
10466	AAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.57	±9.6
10467	AAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	±9.6
10468	AAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	±9.6
10469	AAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.56	±9.6
10470	AAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	±9.6
10471	AAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	±9.6

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