SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For
WCDMA Band V, II and Bluetooth Smart Watch

Model: M061
FCC ID: EP9-TMXM061

Report Number: 14U17447-S4A
Issue Date: 9/23/2014

Prepared for
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REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	9/18/2014	Initial Issue	--
A	9/23/2014	Section 12.2 – Corrected ratio values to 1.2	Dave Weaver

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1. Attestation of Test Results

Applicant Name	Timex Group USA, INC.	
Application Purpose	☒ Original Grant ☐ Class II Permissive Change	
FCC ID	EP-TMXM061	
DUT Description	WCDMA Band V, II and Bluetooth Smart Watch	
Exposure Category	General Population/Uncontrolled Exposure (10g SAR limit: 4 W/kg)	
The Highest Reported SAR	RF Exposure Conditions	Equipment Class
		Licensed
	Extremity (Wrist)	2.031 W/kg
Applicable Standards	FCC 47 CFR § 2.1093 KDB publications IEEE Std 1528-2013	
Test Results	Pass	
Date tested	9/9/2014 – 9/12/2014	

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
	
Dave Weaver Program Manager UL Verification Services Inc.	Nathan Sousa Laboratory Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2003 & 2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

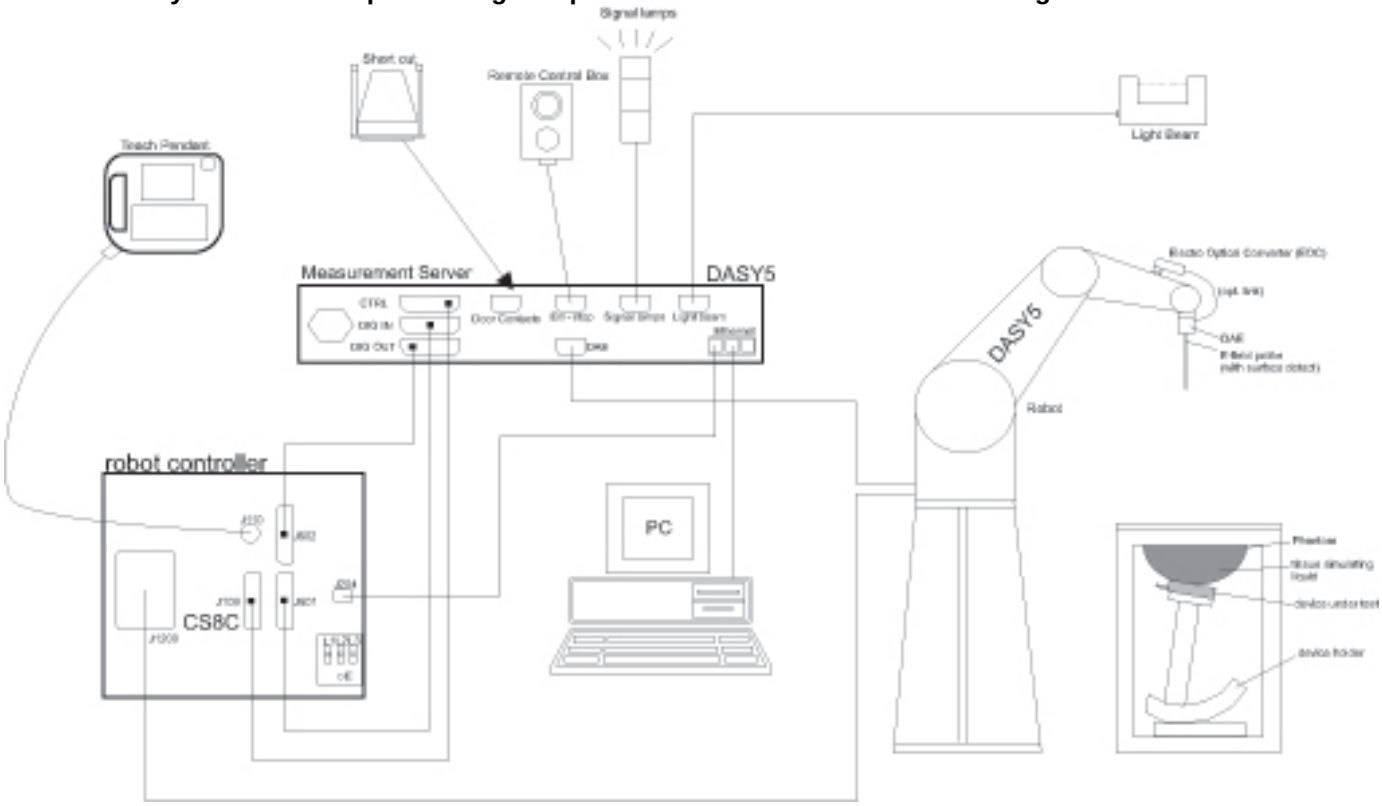
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot 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 WinXP or Win7 and the DASY5 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.

4.2. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	ENA Series/E5071B	MY42100131	2/24/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	11/13/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529163	9/19/2014
Thermometer	EXTECH	445703	CCS-200	3/24/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Agilent Signal Generator	Agilent	8665B	3438A0063	7/10/2015
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	Agilent	8481A	2237A31744	10/2/2014
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	Sorensen Ametek	XT15-4	1319A02778	N/A
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	438A	3513U04320	10/2/2014
Power Sensor	Agilent	8481A	2702A66876	9/30/2014
Power Sensor	Agilent	8481A	3318A95392	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/21/2015
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2015
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R&S	CMW 500	132909-bd	6/6/2015
Base Station Simulator	R&S	CMW 500	135393-VQ	7/3/2015

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 & 2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Model: M061	
Device Dimension	Overall (Length x Width): 50 mm x 60 mm Overall Diagonal: 78 mm Display Diagonal: 70 mm Overall With Antenna Strap: 142 mm

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
WCDMA (UMTS)	Band V, II and I	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 7, CAT 14)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	N/A

6.3. Nominal and Maximum Output Power

Upper limit (dB): 1.0 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
W-CDMA Band V	R99	22.7	**23.7**
	HSDPA	22.7	**23.7**
W-CDMA Band II	R99	22.7	**23.7**
	HSDPA	22.7	**23.7**

The maximum Bluetooth power is 8.5dBm

6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Extremity	1. WCDMA Band 2/5 + BT

6.5. Testing Rationale

Refer to Appendix 14.7 Duty Cycle Calculation for information on how the duty cycle was calculated that is used for the Timed Based Averaged SAR Results in Section 11 of this SAR Report.

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Extremity (Wrist)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Extremity	0 mm	Yes	

7.2. Additional Test Considerations

The DUT is wrist-worn. Testing on the flat phantom, in accordance with KDB 447498, was not possible due to the curvature of the DUT.

Following a KDB enquiry it was agreed testing would be performed using the neck portion of the SAM phantom.

8. Conducted Output Power Measurements

8.1. WCDMA Band V and II

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.5
		4183	836.6	23.5
		4233	846.6	23.4
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.2
		9400	1880.0	23.2
		9538	1907.6	23.2

HSDPA

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	12/15 or 11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs=βhs/βc	30/15			

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	0	23.6
		4183	836.6	0	23.5
		4233	846.6	0	23.5
	Subtest 2	4132	826.4	0	23.6
		4183	836.6	0	23.6
		4233	846.6	0	23.5
	Subtest 3	4132	826.4	0.5	22.6
		4183	836.6	0.5	22.6
		4233	846.6	0.5	22.5
	Subtest 4	4132	826.4	0.5	21.6
		4183	836.6	0.5	21.6
		4233	846.6	0.5	21.6
W-CDMA Band II	Subtest 1	9262	1852.4	0	23.2
		9400	1880.0	0	23.3
		9538	1907.6	0	22.9
	Subtest 2	9262	1852.4	0	23.1
		9400	1880.0	0	23.3
		9538	1907.6	0	23.0
	Subtest 3	9262	1852.4	0.5	22.7
		9400	1880.0	0.5	23.0
		9538	1907.6	0.5	22.7
	Subtest 4	9262	1852.4	0.5	21.9
		9400	1880.0	0.5	21.9
		9538	1907.6	0.5	21.9

8.2. Bluetooth

Maximum tune-up tolerance limit is 8.5 dBm. This power level qualifies for exclusion of SAR testing. Refer to Standalone SAR Test Exclusion Section.

9. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

9.1. Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
750	*41.9*	*0.89*
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1500	*40.4*	*1.23*
1640	*40.2*	*1.31*
1750	*40.1*	*1.37*
1800	40.0	1.40
1900	40.0	1.40
2000	40.0	1.40
2100	*39.8*	*1.49*
2300	*39.5*	*1.67*
2450	39.2	1.80
2600	*39.0*	*1.96*
3000	38.5	2.40
3500	*37.9*	*2.91*
4000	*37.4*	*3.43*
4500	*36.8*	*3.94*
5000	*36.2*	*4.45*
5200	*36.0*	*4.66*
5400	*35.8*	*4.86*
5600	*35.5*	*5.07*
5800	35.3	5.27
6000	*35.1*	*5.48*

NOTE—For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

9.2. Dielectric Property Measurements Results

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

SAR Lab 1

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/9/2014	Body 835	e'	53.0300	Relative Permittivity (ϵ_r):	53.03	55.20	-3.93	5
		e''	21.8500	Conductivity (σ):	1.01	0.97	4.58	5
	Body 820	e'	53.1800	Relative Permittivity (ϵ_r):	53.18	55.28	-3.79	5
		e''	21.9200	Conductivity (σ):	1.00	0.97	3.20	5
	Body 850	e'	52.8600	Relative Permittivity (ϵ_r):	52.86	55.16	-4.16	5
		e''	21.8000	Conductivity (σ):	1.03	0.99	4.37	5
9/10/2014	Body 1900	e'	52.0700	Relative Permittivity (ϵ_r):	52.07	53.30	-2.31	5
		e''	14.9600	Conductivity (σ):	1.58	1.52	3.98	5
	Body 1850	e'	52.2200	Relative Permittivity (ϵ_r):	52.22	53.30	-2.03	5
		e''	14.9500	Conductivity (σ):	1.54	1.52	1.17	5
	Body 1910	e'	52.0400	Relative Permittivity (ϵ_r):	52.04	53.30	-2.36	5
		e''	14.9600	Conductivity (σ):	1.59	1.52	4.53	5

10. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

10.1. Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8

10.2. System Check Results

The 1g and 10g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR Lab 1

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			
9/9/2014	D835V2	4d002	Body	1g	1.05	1.02	10.2	9.43	8.17	1, 2
				10g	0.699	0.671	6.7	6.21	**8.05**	
9/10/2014	D1900V2	5d043	Body	1g	3.85	3.90	39.0	39.00	0.00	3, 4
				10g	1.960	2.010	20.1	20.8	**-3.37**	

11. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1g or 10g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1g or 10g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1g or 10g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1g or 10g respectively, when the transmission band is ≥ 200 MHz

KDB 941225 D01 SAR test for 3G devices:

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

11.1. WCDMA Band V Measured SAR Results: Pre-Duty Cycle

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Extremity	Rel 99 RMC	0	Neck	4132	826.4	23.7	23.5	2.320	2.429	
				4183	836.6	23.7	23.5	2.830	2.963	1
				4233	846.6	23.7	23.4	2.210	2.368	

11.2. WCDMA Band V Results with Time Based Averaging Applied

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Interim SAR Result	Final Reported SAR	Plot No.
Extremity	Rel 99 RMC	0	Neck	4132	826.4	2.429	1.013	
				4183	836.6	2.963	1.236	1
				4233	846.6	2.368	0.987	

Note(s):

- A Duty Cycle of 41.7% was used to determine SAR with Time Based Average

11.3. WCDMA Band II Measured SAR Results: Pre-Duty cycle

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Extremity	Rel 99 RMC	0	Neck	9262	1852.4	23.7	23.2	4.050	4.544	
				9400	1880.0	23.7	23.2	4.340	4.870	2
				9538	1907.6	23.7	23.2	3.440	3.860	

11.4. WCDMA Band II Results with Time Based Averaging Applied

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Interim SAR Result	Final Reported SAR	Plot No.
Extremity	Rel 99 RMC	0	Neck	9262	1852.4	4.544	1.895	
				9400	1880.0	4.870	**2.031**	2
				9538	1907.6	3.860	1.610	

Note(s):

- A Duty Cycle of 41.7% was used to determine SAR with Time Based Average

11.5. Bluetooth

11.5.1. Standalone SAR Test Exclusion Considerations

In accordance with KDB 447498 § 4.3 the 1g and 10g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1g SAR and ≤ 7.5 for 10g extremity SAR, where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Extremity Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
8.5	7	5	2.480	2.2

Conclusion:

The computed value is < 7.5; therefore, Bluetooth qualifies for Standalone SAR test exclusion. (Extremity 10g SAR)

11.5.2. Estimated SAR

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- *(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√$f_{(GHz)}$/x]* W/kg for test separation distances ≤ 50 mm;
  where x = 7.5 for 1g SAR, and x = 18.75 for 10g SAR.
- 0.4 W/kg for 1g SAR and 1.0 W/kg for 10g SAR, when the test separation distances is > 50 mm.

Estimated SAR Result for Extremity Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 10g SAR (W/kg)
Extremity	7	5	2.480	0.118

12. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 2 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 2 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.2 or when the original or repeated measurement is ≥ 3.625 W/kg (~ 10% from the 10g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥3.75 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.2.

12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Extremity (W/kg)	Repeated SAR (Yes/No)
850	WCDMA Band V	2.830	Yes
1900	WCDMA Band II	4.340	Yes

12.2. Repeated Measurement Results

Extremity

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
W-CDMA	Neck	Band V	4183	836.6	2.830	2.740	1.03	1
W-CDMA	Neck	Band II	9400	1880.0	4.340	4.320	1.00	1

Note(s):

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.2.

13. Simultaneous Transmission SAR Analysis

13.1. Sum of the SAR for WCDMA Band V & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 10-g SAR (mW/g)	SPLSR (Yes/ No)
		W-CDMA Band V	Bluetooth		
Extremity	Neck	1.236	0.118	1.354	No

13.2. Sum of the SAR for WCDMA Band II & BT

RF Exposure conditions	Test Position	Simultaneous Transmission Scenario		∑ 10-g SAR (mW/g)	SPLSR (Yes/ No)
		W-CDMA Band II	Bluetooth		
Extremity	Neck	2.031	0.118	2.149	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 10g SAR is < 4 W/kg or the SPLSR is < 0.1 for all circumstances that require SPLSR calculation.

14. Appendixes

Refer to separated files for the following appendixes.

14.1. Photos and Antenna Locations

14.2. System Performance Check Plots

14.3. Highest SAR Test Plots

14.4. Calibration Certificate for E-Field Probe EX3DV3 - SN 3902

14.5. Calibration Certificate for D835V2 - SN 4d002

14.6. Calibration Certificate for D1900V2 - SN 5d043

14.7. Duty Cycle Calculation

END OF REPORT