

 MOTOROLA SOLUTIONS	    SMM 826 CERTIFICATE 2518.05																																																		
DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2																																																			
Motorola Solutions Inc. EME Test Laboratory Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD 11900 Bayan Lepas Penang, Malaysia.	Date of Report: 02/04/2025 Report Revision: B																																																		
<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Responsible Engineer:</td> <td>Yeng Yee Yeong (EME Engineer)</td> </tr> <tr> <td>Report Author:</td> <td>Yeng Yee Yeong (EME Engineer)</td> </tr> <tr> <td>Date/s Tested:</td> <td>9/24/2024-9/26/2024</td> </tr> <tr> <td>Test Location:</td> <td>Penang EME Laboratory</td> </tr> <tr> <td>Manufacturer:</td> <td>Motorola Solutions Malaysia Sdn. Bhd.</td> </tr> <tr> <td>Manufacturer Location:</td> <td>Plot 2A, Medan Bayan Lepas Mukim, 12 SWD, 11900 Bayan Lepas, Penang, Malaysia</td> </tr> <tr> <td>DUT Description:</td> <td>Portable – V200 Body Worn Camera</td> </tr> <tr> <td>Test TX mode(s):</td> <td>FHSS (Bluetooth / Bluetooth LE), 802.11b/g/n (WLAN 2.4GHz)</td> </tr> <tr> <td>Max. Power output:</td> <td>Refer Table 3 & Table 3a</td> </tr> <tr> <td>Tx Frequency Bands:</td> <td>Refer Table 3 & Table 3a</td> </tr> <tr> <td>Signaling type:</td> <td>Refer Table 3 & Table 3a</td> </tr> <tr> <td>Model(s) Tested:</td> <td>B20CJMBE2AN</td> </tr> <tr> <td>Model(s) Certified:</td> <td>Refer 1.0 Introduction</td> </tr> <tr> <td>(HVIN/PMN)</td> <td></td> </tr> <tr> <td>Serial Number(s):</td> <td>663EAS0004, 663EAS0003</td> </tr> <tr> <td>Classification:</td> <td>Occupational/Controlled Environment</td> </tr> <tr> <td>Applicant Name:</td> <td>Motorola Solutions Inc.</td> </tr> <tr> <td>Applicant Address:</td> <td>Plot 2A, Medan Bayan Lepas Mukim, 12 SWD, 11900 Bayan Lepas, Penang, Malaysia</td> </tr> <tr> <td>Firmware Version (FVIN):</td> <td>PSS fs2-ARMV7A_PTF V24.4-ptf-V200-1.8-1-g501bb5026c</td> </tr> <tr> <td>FCC ID:</td> <td>AZ499FT7183</td> </tr> <tr> <td></td> <td>This report contains results that are immaterial for FCC equipment approval, which are clearly identified.</td> </tr> <tr> <td>FCC Test Firm Registration Number:</td> <td>823256</td> </tr> <tr> <td>IC:</td> <td>109U-99FT7183</td> </tr> <tr> <td></td> <td>This report contains results that are immaterial for ISED equipment approval, which are clearly identified.</td> </tr> <tr> <td>ISED Test Site registration:</td> <td>24843</td> </tr> </table> The test results clearly demonstrate compliance with Occupational/Controlled Environment RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of FCC 47 CFR § 2.1093 and RSS-102 (Issue 6) Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 4.0 of this report (no deviation from standard methods). This report shall not be reproduced without written approval from an officially designated representative of the Motorola Solutions Inc EME Laboratory. I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements. The results and statements contained in this report pertain only to the device(s) evaluated.		Responsible Engineer:	Yeng Yee Yeong (EME Engineer)	Report Author:	Yeng Yee Yeong (EME Engineer)	Date/s Tested:	9/24/2024-9/26/2024	Test Location:	Penang EME Laboratory	Manufacturer:	Motorola Solutions Malaysia Sdn. Bhd.	Manufacturer Location:	Plot 2A, Medan Bayan Lepas Mukim, 12 SWD, 11900 Bayan Lepas, Penang, Malaysia	DUT Description:	Portable – V200 Body Worn Camera	Test TX mode(s):	FHSS (Bluetooth / Bluetooth LE), 802.11b/g/n (WLAN 2.4GHz)	Max. Power output:	Refer Table 3 & Table 3a	Tx Frequency Bands:	Refer Table 3 & Table 3a	Signaling type:	Refer Table 3 & Table 3a	Model(s) Tested:	B20CJMBE2AN	Model(s) Certified:	Refer 1.0 Introduction	(HVIN/PMN)		Serial Number(s):	663EAS0004, 663EAS0003	Classification:	Occupational/Controlled Environment	Applicant Name:	Motorola Solutions Inc.	Applicant Address:	Plot 2A, Medan Bayan Lepas Mukim, 12 SWD, 11900 Bayan Lepas, Penang, Malaysia	Firmware Version (FVIN):	PSS fs2-ARMV7A_PTF V24.4-ptf-V200-1.8-1-g501bb5026c	FCC ID:	AZ499FT7183		This report contains results that are immaterial for FCC equipment approval, which are clearly identified.	FCC Test Firm Registration Number:	823256	IC:	109U-99FT7183		This report contains results that are immaterial for ISED equipment approval, which are clearly identified.	ISED Test Site registration:	24843
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Part 1 of 2

1.0	Introduction.....	5
2.0	FCC SAR Summary	5
3.0	Abbreviations / Definitions	5
4.0	Referenced Standards and Guidelines.....	6
5.0	SAR Limits	6
6.0	Description of Device Under Test (DUT)	7
7.0	Optional Accessories and Test Criteria	9
7.1	Antenna	9
7.2	Battery.....	9
7.3	Body worn Accessories	9
7.4	Audio Accessories	10
8.0	Description of Test System.....	11
8.1	Descriptions of Robotics/Probes/Readout Electronics	11
8.2	Description of Phantom(s)	12
8.3	Description of Simulated Tissue	12
9.0	Additional Test Equipment.....	13
10.0	SAR Measurement System Validation and Verification.....	14
10.1	System Validation	14
10.2	System Verification	14
10.3	Equivalent Tissue Test Results	14
11.0	Environmental Test Conditions	15
12.0	DUT Test Setup and Methodology	15
12.1	Measurements.....	15
12.2	DUT Configuration(s).....	16
12.3	DUT Positioning Procedures.....	16
12.3.1	Body	16
12.3.2	Head.....	16

12.3.3	Face	17
12.4	DUT Test Channels	17
12.5	SAR Result Scaling Methodology.....	17
12.6	DUT Test Plan.....	17
13.0	DUT Test Data for WLAN	18
13.1	WLAN 2.4GHz assessments at the Body for 802.11b/g/n (2412-2462MHz)	18
14.0	Assessment at the Bluetooth band	20
15.0	Shortened Scan Assessment	20
16.0	Simultaneous Transmission	21
16.1	Simultaneous Transmission Exclusion for BT	22
17.0	Results Summary	22
18.0	Variability Assessment	23
19.0	System Uncertainty	23

APPENDICES

- A Measurement Uncertainty Budget
- B Probe Calibration Certificates
- C Dipole Calibration Certificates

Part 2 of 2

APPENDICES

- D System Verification Check Scans
- E DUT Scans
- F Shorten Scan of Highest SAR Configuration
- G DUT Test Position Photos
- H DUT, Body worn and audio accessories Photos

Report Revision History

Date	Revision	Comments
01/09/2025	A	Initial release
02/04/2025	B	To update Firmware Version (FVIN) at Cover page

1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the Motorola Solutions Inc. EME Test Laboratory for handheld portable model number B20CJMBE2AN. These devices are classified as Occupational/Controlled Environment and models certified are listed as below:

Model	Hardware Version ID Number (HVIN)	Product Marketing Name (PMN)	Description
B20CJMBE2AN	B20CJMBE2AN	V200	V200 BODY WORN CAMERA (BWC), BLACK
B20CJMBE2AN	PMMN2001A	V200	V200 BODY WORN CAMERA (BWC), YELLOW

2.0 FCC SAR Summary

Table 1

Equipment Class	Frequency band (MHz)	Max Calc at Body (W/kg)
		1g-SAR
DTS	2412-2462MHz (WLAN 2.4GHz)	0.436
*DSS	2402-2480MHz (Bluetooth)	NA
Simultaneous Results		**NA

*Results not required per KDB (refer to sections 14.0 & 16.1)

**Not applicable, refer to section 16.0 & 16.1.

3.0 Abbreviations / Definitions

BT:	Bluetooth
CNR:	Calibration Not Required
DSS	Part 15 Spread Spectrum Transmitter
DSSS:	Direct Sequence Spread Spectrum
DUT:	Device Under Test
EME:	Electromagnetic Energy
FHSS:	Frequency Hopping Spread Spectrum
NA:	Not Applicable
OFDM:	Orthogonal Frequency Division Multiplexing
SAR:	Specific Absorption Rate
WLAN:	Wireless Local Area Network

Audio accessories: These accessories allow communication while the DUT is worn on the body.

Body worn accessories: These accessories allow the DUT to be worn on the body of the user.

Maximum Power: Defined as the upper limit of the production line final test station

4.0 Referenced Standards and Guidelines

This product is designed to comply with the following applicable national and international standards and guidelines.

- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, FCC, Washington, D.C.: 1997.
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2019
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2020
- Ministry of Health (Canada) Safety Code 6 (2015), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- RSS-102 (Issue 6) – Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard (2014)
- ANATEL, Brazil Regulatory Authority, Resolution No 700 of September 28, 2018 "Approves the Regulation on the Assessment of Human Exposure to Electric, Magnetic and Electromagnetic Fields Associated with the Operation of Radio communication Transmitting Stations.
- IEC/IEEE 62209-1528-2020- Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)
- FCC KDB – 643646 D01 SAR Test for PTT Radios v01r03
- FCC KDB – 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB – 865664 D02 RF Exposure Reporting v01r02
- FCC KDB – 447498 D01 General RF Exposure Guidance v06
- FCC KDB – 248227 D01 802.11 Wi-Fi SAR v02r02

5.0 SAR Limits

Table 2

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average - ANSI - (averaged over the whole body)	0.08	0.4
Spatial Peak - ANSI - (averaged over any 1-g of tissue)	1.6	8.0
Spatial Peak – ICNIRP/ANSI - (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Spatial Peak - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

6.0 Description of Device Under Test (DUT)

This portable device operates in WLAN technology for data applications and Bluetooth technology for short range wireless devices.

This device also incorporates a GFSK Bluetooth device which is a Frequency Hopping Spread Spectrum (FHSS) technology. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. The maximum duty cycle for BT is 76% and BTLE is 60%.

This device included WLAN 2.4GHz 802.11b/g/n operate using Direct Sequence Spread Spectrum(DSSS) and Orthogonal Frequency-Division Multiplexing(OFDM) with channel bandwidth of 20MHz. The maximum duty cycle for WLAN 2.4GHz is 99%.

Table 3 below summarizes the technologies, bands, maximum duty cycles and maximum output powers. Maximum output powers are defined as upper limit of the production line final test station.

Table 3

Technology	Transmit Band (MHz)	Transmission	Duty Cycle (%)	Conducted (Average Detector) Maximum Power (W)
WLAN 2.4GHz 802.11b	2412-2462	DSSS	99	0.0708
WLAN 2.4GHz 802.11g	2412-2462	OFDM	97	0.0316
WLAN 2.4GHz 802.11n	2412-2462	OFDM	97	0.0251
Bluetooth	2402-2480	FHSS	76	0.0089
Bluetooth LE (1M)			60	0.0071

The intended operating positions are “at the body” by means of the offered body worn accessories.

To meet the RTTE requirement in RF test, the maximum power WLAN 2.4GHz 802.11b was reduced as shown in Table 3a. SAR test was already conducted at the higher power level, hence it was not impacted. After final production, the maximum power will be the same as Table 3a.

Table 3a

Technology	Transmit Band (MHz)	Transmission	Duty Cycle (%)	Conducted (Average Detector) Maximum Power (W)
WLAN 2.4GHz 802.11b	2412-2462	DSSS	99	0.0251
WLAN 2.4GHz 802.11g	2412-2462	OFDM	97	0.0316
WLAN 2.4GHz 802.11n	2412-2462	OFDM	97	0.0251
Bluetooth	2402-2480	FHSS	76	0.0089
Bluetooth LE (1M)			60	0.0071

7.0 Optional Accessories and Test Criteria

This device is offered with optional accessories. All accessories were individually evaluated during the test plan creation to determine if testing was required per the guidelines outlined in “SAR Test Reduction Considerations for Occupational PTT Radios” FCC KDB 643646 to assess compliance of this device. The following sections identify the test criteria and details for each accessory category. Refer to Exhibit 7B for antenna separation distances.

7.1 Antenna

Table 4

Antenna No.	Antenna Models	Description	Selected for test	Tested	Comments
1	AN000474A03	2.4GHZ WIFI/BT CHIP ANTENNA BT/BTLE: 2400-2483.5MHz, ¼ wave, 1.5dBi WLAN 2.4GHz: 2400-2485MHz, ¼ wave, 1.5dBi	Yes	Yes	Internal Antenna

7.2 Battery

Table 5

Battery No.	Battery Models	Description	Selected for test	Tested	Comments
1	PMNN4578A	BATTERY PACK,BATTERY PACK, BATT LIION 2500T	Yes	Yes	Default battery for body testing

7.3 Body worn Accessories

Table 6

Body worn No.	Body worn Models	Description	Selected for test	Tested	Comments
1	AC-LANYARD-05	Lanyard	Yes	Yes	Tested with i). PMLN8121A ii). PMLN8475A w/ KF-MAGMOUNT2
2	PMLN8121A	Low-profile swivel clip	Yes	Yes	Tested with AC-LANYARD-05
3	PMLN8475A	KF-Stud	Yes	Yes	Tested with AC-LANYARD-05 w/ KF-MAGMOUNT2
4	KF-MAGMOUNT2	KF-MAGMOUNT2	Yes	Yes	Tested with AC-LANYARD-05 w/ PMLN8475A

7.4 Audio Accessories

Not Applicable.

8.0 Description of Test System

DASY5™ Test System



8.1 Descriptions of Robotics/Probes/Readout Electronics

Table 7

Dosimetric System type	System version	DAE type	Probe Type
Schmid & Partner Engineering AG SPEAG DASY 5	52.10.4.1527	DAE4	EX3DV4 (E-Field)

The **DASY5™** is operated per the instructions in the DASY5™ Users Manual. The complete manual is available directly from SPEAG™. All measurement equipment used to assess SAR compliance was calibrated according to ISO/IEC 17025 A2LA guidelines. Section 9.0 presents additional test equipment information. Appendices B and C present the applicable calibration certificates.

8.2 Description of Phantom(s)

Table 8

Phantom Type	Phantom(s) Used	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
Triple Flat	NA	200MHz -6GHz; Er = 3-5, Loss Tangent = ≤ 0.05	280x175x175	2mm +/- 0.2mm	Wood	< 0.05
SAM	NA	300MHz -6GHz; Er = < 5, Loss Tangent = ≤ 0.05	Human Model			
Oval Flat	√	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = ≤ 0.05	600x400x190			

8.3 Description of Simulated Tissue

The sugar based simulate tissue is produced by placing the correct measured amount of De-ionized water into a large container. Each of the dried ingredients are weighed and added to the water carefully to avoid clumping. If the solution has a high sugar concentration the water is pre-heated to aid in dissolving the ingredients. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in Table 9. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at each of the tested frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

Simulated Tissue Composition (percent by mass)

Table 9

Ingredients	2.45GHz ⁽¹⁾
	Head
Sugar	NA
Diacetin	NA
De ionized-Water	NA
Salt	NA
HEC	NA
Bact.	NA

Note: (1) SPEAG provides Motorola proprietary stimulant ingredients for the 2.45GHz band.

9.0 Additional Test Equipment

The Table below lists additional test equipment used during the SAR assessment.

Table 10

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
SPEAG PROBE	EX3DV4	7486	01/19/2024	01/19/2027
SPEAG DAE	DAE4	684	02/22/2022	02/22/2025
AMPLIFIER	5S1G4	312988	CNR	CNR
POWER METER	E4417A	GB41292245	12/09/2023	12/09/2024
POWER METER	E4419B	GB42420608	12/10/2023	12/10/2024
POWER SENSOR	E9301B	MY41495594	11/02/2023	11/02/2024
VECTOR SIGNAL GENERATOR	E4438C	MY47272101	11/25/2023	11/25/2024
BI-DIRECTIONAL COUPLER	3022	81640	06/13/2024	06/13/2025
POWER SENSOR	E4412A	US38488023	05/31/2024	05/31/2025
DATA LOGGER	DSB	16326820	11/26/2023	11/26/2024
DATA LOGGER	DSB	16326831	11/26/2023	11/26/2024
DIGITAL THERMOMETER	1523	3492108	01/23/2024	01/23/2025
TEMPERATURE PROBE	PR-10L-4-100-1/4-6-BX	WNWR037791	01/26/2024	01/26/2025
DATA LOGGER	DSB	16398306	12/31/2023	12/31/2024
THERMOMETER	HH202A	35881	01/17/2024	01/17/2025
TEMPERATURE PROBE	80PK-22	05032017	12/28/2023	12/28/2024
DIELECTRIC ASSESSMENT KIT	DAK-12	1069	04/08/2024	04/08/2025
NETWORK ANALYZER	E5071B	MY42403147	06/06/2024	06/06/2025
SPEAG DIPOLE	D2450V2	781	10/13/2021	10/13/2024

10.0 SAR Measurement System Validation and Verification

DASY output files of the probe/dipole calibration certificates and system verification test results are included in Appendices B, C & D respectively.

10.1 System Validation

The SAR measurement system was validated according to procedures in KDB 865664. The validation status summary Table is below.

Table 11

Dates	Probe Calibration Point		Probe SN	Measured Tissue Parameters		Validation		
				σ	ϵ_r	Sensitivity	Linearity	Isotropy
CW								
04/07/2024	Head	2450	7486	1.83	42.90	Pass	Pass	Pass
WLAN								
04/07/2024	Head	2450	7486	1.83	42.90	Pass	Pass	Pass

10.2 System Verification

System verification checks were conducted each day during the SAR assessment. The results are normalized to 1W. Appendix D includes DASY plots with the largest deviation from the qualified source SAR target for each dipole (bolded). The Table below summarizes the daily system check results used for the SAR assessment.

Table 12

Probe Serial #	Tissue Type	Dipole Kit / Serial #	Ref SAR @ 1W (W/kg)	System Check Results Measured (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date	Deviation (%)
7486	IEEE/IEC Head	SPEAG D2450V2 / 781	52.7 ± 10%	13.00	52.00	09/24/24@	-1.3
7486	IEEE/IEC Head	SPEAG D2450V2 / 781	52.7 ± 10%	1.59	50.32	09/25/24	-4.5

Note: '@' indicates that system verification result covers next test day (within 24 hours)

10.3 Equivalent Tissue Test Results

Simulated tissue prepared for SAR measurements is measured daily and within 24 hours prior to actual SAR testing to verify that the tissue is within +/- 5% & +/-10% of target

parameters at the center of the transmit band. This measurement is done using the applicable equipment indicated in section 9.0. The Table below summarizes the measured tissue parameters used for the SAR assessment.

Table 13

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
2412	IEEE/ IEC Head	1.77 (1.68-1.86)	39.3 (35.3-43.2)	1.602	38.931	09/24/2024@
2437	IEEE/ IEC Head	1.79 (1.7-1.88)	39.2 (35.3-43.1)	1.658	37.506	09/25/2024
2462	IEEE/ IEC Head	1.81 (1.72-1.9)	39.2 (35.3-43.1)	1.677	37.459	09/25/2024

Note: '@' indicates that tissue test result covers next test day (within 24 hours)

11.0 Environmental Test Conditions

The EME Laboratory's ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within $\pm 2^{\circ}\text{C}$ of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was at least 15cm. Additional precautions are routinely taken to ensure the stability of the simulated tissue such as covering the phantoms when scans are not actively in process in order to minimize evaporation. The lab environment is continuously monitored. The Table below presents the range and average environmental conditions during the SAR tests reported herein:

Table 14

	Target	Measured
Ambient Temperature	18 – 25 °C	Range: 20.8 – 23.0°C Avg. 21.9 °C
Tissue Temperature	18 – 25 °C	Range: 21.5-22.7°C Avg. 22.1°C

Relative humidity target range is a recommended target

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results, if such unwanted signals are discovered the SAR scans are repeated.

12.0 DUT Test Setup and Methodology

12.1 Measurements

SAR measurements were performed using the DASY system described in section 8.0

using zoom scans. Oval flat phantoms filled with applicable simulated tissue were used for body testing.

The Table below includes the step sizes and resolution of area and zoom scans per KDB 865664 requirements.

Table 15

Description		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location		30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$		≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
		When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			

12.2 DUT Configuration(s)

The DUT is a portable device operational at the body as described in section 6.0 while using the applicable accessories listed in section 7.0. All accessories listed in section 7.0 of this report were considered when implementing the guidelines specified in KDB 643646.

12.3 DUT Positioning Procedures

The positioning of the device for each body location is described below and illustrated in Appendix G.

12.3.1 Body

The DUT was positioned in normal use configuration against the phantom with the offered body worn accessory as well as without the offered audio accessory.

12.3.2 Head

Not applicable.

12.3.3 Face

Not applicable.

12.4 DUT Test Channels

The number of test channels was determined by using the following IEEE 1528 equation. The use of this equation produces the same or more test channels compared to the FCC KDB 447498 number of test channels formula.

$$N_c = 2 * \text{roundup}[10 * (f_{\text{high}} - f_{\text{low}}) / f_c] + 1$$

Where

N_c = Number of channels

F_{high} = Upper channel

F_{low} = Lower channel

F_c = Center channel

12.5 SAR Result Scaling Methodology

The calculated 1-gram averaged SAR results indicated as “Max Calc. 1g-SAR” in the data Tables is determined by scaling the measured SAR to account for power leveling variations and drift. Appendix F includes a shortened scan to justify SAR scaling for drift. For this device the “Max Calc. 1g-SAR are scaled using the following formula:

$$\text{Max_Calc} = \text{SAR_meas} \cdot 10^{\frac{-\text{Drift}}{10}} \cdot \frac{P_{\text{max}}}{P_{\text{int}}} \cdot \text{DC}$$

P_{max} = Maximum Power (W)

P_{int} = Initial Power (W)

Drift = DASY drift results (dB)

SAR_meas = Measured 1-g

DC = Transmission mode duty cycle in % where applicable

50% duty cycle is applied for PTT operation

Note: for conservative results, the following are applied:

If $P_{\text{int}} > P_{\text{max}}$, then $P_{\text{max}}/P_{\text{int}} = 1$.

Drift = 1 for positive drift

Additional SAR scaling was applied using the methodologies outlined in FCC KDB 865664 using tissue sensitivity values. SAR was scaled for conditions where the tissue permittivity was measured above the nominal target and for tissue conductivity that was measured below the nominal target. Negative or reduced SAR scaling is not permitted.

12.6 DUT Test Plan

The guidelines and requirements outlined in section 4.0 were used to assess compliance

of this device. All modes of operation identified in section 6.0 were considered during the development of the test plan.

Standalone and simultaneous BT testing were assessed in sections 14.0, 16.0 & 16.1 per the guidelines of KDB 447498.

13.0 DUT Test Data for WLAN

SAR test reduction is applied using the following criteria according to KDB 248227 D01:

- a. For 2.4GHz 802.11 g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by ratio of OFDM to DSSS specified maximum output power and adjusted SAR is ≤ 1.2 W/kg.
- b. U-NII-1 SAR testing not required when U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg.
- c. For all positions/configurations, when reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test positions/configurations are tested

13.1 WLAN 2.4GHz assessments at the Body for 802.11b/g/n (2412-2462MHz)

Output Power Data

Battery PMNN4578A was selected as the default battery for assessments at the Body because it is the default battery (refer to Exhibit 7B for battery illustration). The default battery was used during conducted power measurements for all test channels within FCC allocated frequency range (2412-2462MHz) which are listed in Table 16. These power measurements were used to determine the necessary modes for SAR testing according to KDB 248227 D01.

Table 16

Band	802.11	Ch. BW	Ch.	Freq. (MHz)	Measured conducted power (W)
2.4 GHz	b	20	1	2412	0.0670
			6	2437	0.0644
			11	2462	0.0621
	g	20	1	2412	0.0304
			6	2437	0.0295
			11	2462	0.0287
	n	20	1	2412	0.0235
			6	2437	0.0231

			11	2462	0.0225
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Assessments at the Body for WLAN 2.4GHz (2412-2462MHz)

DUT assessment with WLAN internal antenna, offered batteries and without any cable accessory attached against the phantom with the offered body worn accessories. Refer to Table 28 for highest output power channel. SAR plots of the highest results per Table (bolded) are presented in the Appendix E.

Table 17

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
802.11b, 20MHz BW									
AN000474A03	PMNN4578A	AC-LANYARD-05 w/ PMLN8121A	None	2412.0000	0.067	-0.76	0.343	0.436	DAN(ABE)-AB-240925-07@
AN000474A03	PMNN4578A	AC-LANYARD-05 w/ PMLN8475A w/ KF-MAGMOUNT2	None	2412.0000	0.067	0.31	0.072	0.077	DAN(ABE)-AB-240925-09@

Assessments for ISED Canada

Based on the assessment results for body per KDB643646 D01, additional tests were not required for the Industry Canada frequency range (2412-2462MHz) as the testing performed is in compliance with Industry Canada frequency range.

As per ISED Notice 2016-DRS001, additional tests were required for the low, mid and high frequency channels for the configuration with the highest SAR value. The SAR results are in Tables below. SAR plots of the highest results per Tables (bolded) are presented in Appendix E.

Table 18

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
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802.11b, 20MHz BW									
Body									
AN000474A03	PMNN4578A	AC-LANYARD-05 w/ PMLN8121A	None	2412.0000	0.067	-0.76	0.343	0.436	DAN(ABE)- AB-240925- 07@
AN000474A03	PMNN4578A	AC-LANYARD-05 w/ PMLN8121A	None	2437.0000	0.064	-0.22	0.242	0.283	MHN-AB- 240925-15
AN000474A03	PMNN4578A	AC-LANYARD-05 w/ PMLN8121A	None	2462.0000	0.062	0.02	0.181	0.208	MHN-AB- 240925-16

14.0 Assessment at the Bluetooth band

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion for standalone Bluetooth transmitter;

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] * [\sqrt{F_{(\text{GHz})}}] = 2.1, \text{ which is } \leq 3 \text{ for 1-g SAR}$$

Where:

Max. Power = 6.77mW (8.91mW*76.0% duty cycle)

Min. test separation distance = 5mm for actual test separation < 5mm

F(GHz) = 2.48 GHz

Per the result from the calculation above, the standalone SAR assessment was not required for Bluetooth band. Therefore, SAR results for Bluetooth are not reported herein.

15.0 Shortened Scan Assessment

A “shortened” scan using the highest SAR configuration overall from above was performed to validate the SAR drift of the full DASY5™ coarse and zoom scans. Note that the shortened scan represents the zoom scan performance result; this is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, a zoom scan only was performed. The results of the shortened cube scan presented in Appendix D demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid. The SAR result from the Table below is provided in Appendix F.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Run#
AN000474A03	PMNN4578A	AC-LANYARD-05 w/ PMLN8121A	None	2412.0000	0.067	-0.09	0.328	0.357	DAN(ABE)- AB-240925- 08@

16.0 Simultaneous Transmission

Simultaneous Transmission assessments is not required as this device operates as follows:

1. WLAN 2.4GHz and BT are sharing the same antenna, only one technology to transmit at one time.
2. WLAN 2.4GHz + BT cannot be simultaneous transmit but will be time multiplexed.

16.1 Simultaneous Transmission Exclusion for BT

Per guidelines in KDB 447498, the following formula was used to determine the test exclusion to an antenna that transmits simultaneously with other antennas for test distances $\leq 50\text{mm}$:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] * [\sqrt{F(\text{GHz})/X}] = 0.3\text{W/kg, which is } \leq 0.4\text{ W/kg (1g)}$$

Where:

X = 7.5 for 1g-SAR; 18.75 for 10g

Max. Power = 6.77mW (8.91mW*76.0% duty cycle)

Min. test separation distance = 5mm for actual test separation < 5mm

F(GHz) = 2.48 GHz

Per the result from the calculation above, simultaneous exclusion is applied and therefore SAR results are not reported herein.

17.0 Results Summary

The test results are based on the test guidelines from section 4.0 and satisfying frequencies within FCC bands and ISED Canada Frequency bands, the highest Operational Maximum Calculated 1-gram average SAR values found for this filing:

Table 20

Designator	Frequency band (MHz)	Max Calc at Body (W/kg)
		1g-SAR
FCC US		
WLAN 2.4 GHz	2412 - 2462	0.436
BT	2402 - 2480	NA
Highest Simultaneous Transmission SAR	Sum of SAR (W/kg)	*NA
ISED Canada		
WLAN 2.4 GHz	2412 - 2462	0.436
BT	2402 - 2480	NA
Highest Simultaneous Transmission SAR	Sum of SAR (W/kg)	*NA

All results are scaled to the maximum output power.

*Not applicable, refer to Section 16.0 and 16.1 Simultaneous Transmission.

The test results clearly demonstrate compliance with FCC/ISED Occupational/Controlled Environment RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of FCC 47 CFR § 2.1093 and RSS-102 (Issue 6).

18.0 Variability Assessment

Per the guidelines in KDB 865664 SAR variability assessment is not required because SAR results are below 0.8 W/kg (Occupational).

19.0 System Uncertainty

A system uncertainty analysis is not required for this report per KDB 865664 because the highest report SAR value for Occupational exposure is less than 1.5 W/kg.

Per the guidelines of ISO/IEC 17025 a reported system uncertainty is required and therefore measurement uncertainty budget is included in Appendix A.

Appendix A

Measurement Uncertainty Budget

Uncertainty Budget for System Validation (dipole & flat phantom) for 800 MHz to 3 GHz

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	$e = f(d,k)$	<i>f</i>	<i>g</i>	$h = \frac{c \times f}{e}$	$i = \frac{c \times g}{e}$	<i>k</i>
Uncertainty Component	IEEE 1528 section	Tol. (± %)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	1 g u_i (±%)	10 g u_i (±%)	v_i
Measurement System									
Probe Calibration	E.2.1	6.0	N	1.00	1	1	6.0	6.0	□
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	□
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	□
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	□
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	□
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	□
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	□
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	□
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	□
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	□
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	□
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	□
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	□
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	□
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	□
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	□
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	□
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	□
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	□
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	□
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	□
Combined Standard Uncertainty			RSS				9	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			$k=2$				18	17	

Notes for uncertainty budget Tables:

- a) Column headings *a-k* are given for reference.
- b) Tol. - tolerance in influence quantity.
- c) Prob. Dist. – Probability distribution
- d) N, R - normal, rectangular probability distributions
- e) Div. - divisor used to translate tolerance into normally distributed standard uncertainty
- f) c_i - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
- g) u_i – SAR uncertainty
- h) v_i - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty

Uncertainty Budget for Device Under Test, for 800 MHz to 3 GHz

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i> = <i>f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h</i> = <i>c x f / e</i>	<i>i</i> = <i>c x g / e</i>	<i>k</i>
Uncertainty Component	IEEE 1528 section	Tol. (± %)	Prob Dist	Div.	<i>c_i</i> (1 g)	<i>c_i</i> (10 g)	1 g <i>u_i</i> (±%)	10 g <i>u_i</i> (±%)	<i>v_i</i>
Measurement System									
Probe Calibration	E.2.1	6.0	N	1.00	1	1	6.0	6.0	□
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	□
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	□
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	□
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	□
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	□
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	□
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	□
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	□
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	□
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	□
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	□
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	□
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	□
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	□
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	□
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	□
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	□
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	□
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	□
Combined Standard Uncertainty			RSS				11	11	419
Expanded Uncertainty (95% CONFIDENCE LEVEL)			<i>k</i> =2				22	22	

Notes for uncertainty budget Tables:

- Column headings *a-k* are given for reference.
- Tol. - tolerance in influence quantity.
- Prob. Dist. – Probability distribution
- N, R - normal, rectangular probability distributions
- Div. - divisor used to translate tolerance into normally distributed standard uncertainty
- c_i* - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
- u_i* – SAR uncertainty
- v_i* - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty