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SAR Test Report

Report Number: M150814_FCC_8260NGW_SAR_2.4

Test Sample:	Portable T SERIES LIFEBOOK CONVERTIBLE Computer
Radio Modules:	WLAN and Bluetooth INTEL SNOWFIELD PEAK 8260NGW
Host PC Model Number:	T936
FCC ID:	EJE-WB0096
IC ID:	337J-WB0096
Date of Issue:	17th September 2015

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SAR TEST REPORT

Report Number: M150814_FCC_8260NGW_SAR_2.4

FCC ID: EJE-WB0096,

IC ID: 337J-WB0096,

1.0 GENERAL INFORMATION

Test Sample:	Portable T SERIES LIFEBOOK CONVERTIBLE Computer
Model Name:	T936
Radio Modules:	WLAN and Bluetooth 8260NGW
Interface Type:	M.2 Wireless LAN Module
Device Category:	Portable Transmitter
Test Device:	Pre-Production Unit
FCC ID:	EJE-WB0096
IC ID:	337J-WB0096
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Fujitsu Limited

Test Standard/s:

1. KDB 248227 D01 SAR measurements for 802 11 a b g v02r01
   KDB 447498 D01 General RF Exposure Guidance v05r02
   KDB 616217 D04 SAR for laptop and tablets v01r01
   KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
   KDB 865664 D02 RF Exposure Reporting v01r01
2. Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), RSS-102
3. **EN 62209-2:2010**
   Human exposure to radio frequency fields from hand-held and bodymounted wireless communication devices. Human models, instrumentation, and procedures.
   Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)
4. **IEEE 1528: 2013**
   Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

Statement Of Compliance:	The Fujitsu T SERIES LIFEBOOK CONVERTIBLE Computer T936 with Wireless LAN and Bluetooth model 8260NGW complied with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d). It also complied with IC RSS-102 requirements.
Highest Reported SAR:	2450 MHz WLAN Band : 0.359 mW/g
Test Dates:	24th August 2015

Test Officer:

Peter Jakubiec

Authorised Signature:

Chris Zombolas
Technical Director

SAR TEST REPORT
Portable T SERIES LIFEBOOK CONVERTIBLE Computer Model: T936
Report Number: M150814_FCC_8260NGW_SAR_2.4

Table 1

Table of Revisions				
Report Number	Revision Number	Description	Pages affected	Date
M150814_FCC_8260NGW_SAR_2.4	1	Original	N/A	11th September 2015

2.0 INTRODUCTION

Testing was performed on the Fujitsu T SERIES LIFEBOOK CONVERTIBLE PC, Model: T936 with M.2 integrated Wireless LAN & Bluetooth Module (INTEL SNOWFIELD PEAK 802.11a/b/g/n/ac), Model: 8260NGW. The 8260NGW WLAN module was originally certified by INTEL Corporation as a modular approval under FCC ID: PD98260NG. The INTEL SNOWFIELD PEAK module is an OEM product was tested in the dedicated host – LIFEBOOK T SERIES, Model T936. The system tested will be referred to as the DUT throughout this report.

The Wireless LAN Module incorporates Bluetooth Transmitter, which can only transmit via Antenna B (2), the Bluetooth maximum power was 7dBm (including tune-up) therefore it did not require SAR testing as a stand-alone transmitter. This is in accordance with KDB 447498 section 4.3.1 exemption formula:
The shortest distance between the BT antenna (Antenna 2) and the user is 5.37mm. The closest distance between WLAN 1 and WLAN2 antennas was 268 mm

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR Result - [(5.01)/(5.37mm)] ·[√f(2.45GHz)]=1.46

The measurement test results mentioned hereon only apply to the 2450MHz frequency band; an additional report titled “M150814_FCC_8260NGW_SAR_5.6” applies to the 5GHz range.

Table 2

Applicable Head Configurations	: None
Applicable Body Configurations	: Lap Held Position : Edge On Position : Bystander

3.0 TEST SAMPLE TECHNICAL INFORMATION

(Information supplied by the client)

3.1 DUT (WLAN) Details

Table 3

Transmitter:	M.2 Wireless LAN Module (WLAN parts)
Wireless Module:	WLAN 2x2 IEEE802.11ac/abgn
Model Number:	8260NGW
Manufacturer:	Intel Corporation
Wi-Fi standard	802.11ac 2x2
Wi-Fi TX/RX chains	2x2 chains
Supported Bands	2.4GHz, 5GHz
Antenna Allocation	Main: Wi-Fi only, Aux: Shared Wi-Fi, BT
Wi-Fi TX/RX Throughput	660 Mbps
Bluetooth Core	BT4.1(BDR/EDR/AFH/BLE)
Antenna Types:	Nissei Inverted F antenna Model: refer to WLAN antenna data Location: refer to Antenna location file For BT: use Aux(2: left side connect on module)
Power Supply:	3.3 VDC from PCI bus

Table 4 Channels and Output power setting

2.4 GHz (802.11b, 802.11g and 802.11n/ac)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)			Power Control		Average Power Measured (dBm)	
					Ch A		Ch B	Power Control Tx A	Power Control Tx B	Tx A	Tx B
802.11 b 2.4 GHz	1	2412	CCK 1	20MHz 99%DC	15.0		15.0	**15.375**	**15.500**	15.01	15.05
	6	2437						**15.375**	**15.375**	15.07	15.01
	7	2442						**15.250**	**15.625**	15.01	15.05
	11	2462									
	12	2467						**15.250**	**15.125**	15.01	15.07
	13	2472			12.0		10.0	**12.375**	**10.125**	12.01	10.02
802.11 g 2.4 GHz	1	2412	OFDM 6	20MHz 99%DC	**15.0**		**15.0**	-	-	-	-
	2	2417						-	-	-	-
	6	2437						-	-	-	-
	10	2457						-	-	-	-
	11	2462						-	-	-	-
	12	2467			**13.5**		**13.5**	-	-	-	-
	13	2472			**2.0**		**1.0**	-	-	-	-
802.11 n 2.4 GHz	3F	2422	CCK HT0	40 98%DC	15.0		15.0	**15.250**	**15.375**	15.04	15.04
	4F	2427									
	5F	2432									
	6F	2437						**15.250**	**15.375**	15.06	15.09
	7F	2442						**15.250**	**15.250**	15.08	15.02
	8F	2447									
	9F	2452									
	10F	2457						**15.250**	**15.375**	15.09	15.01
	11F	2462			**12.0**		**10.0**				
	3F	2422	OFDM HT0	40 98%DC	**14.0**		**15.0**	-	-	-	-
	4F	2427			**15.0**		**15.0**	-	-	-	-
	5F	2432						-	-	-	-
	6F	2437						-	-	-	-
	7F	2442						-	-	-	-
	8F	2447						-	-	-	-
	9F	2452						-	-	-	-
	10F	2457			**12.5**		**12.5**	-	-	-	-
	11F	2462			**1.0**		**0.0**	-	-	-	-

5 GHz (802.11a)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)			Power Control		Average Power Measured (dBm)	
					Ch A		Ch B	Power Control Tx A	Power Control Tx B	Tx A	Tx B
802.11a	5.2 GHz		OFDM 6	20 99%DC							
	36	5180			13.5		13.5	-	-	-	-
	40	5200						-	-	-	-
	44	5220						-	-	-	-
	48	5240						-	-	-	-
	5.3 GHz										
	52	5260			13.5		13.5	-	-	-	-
	56	5280						-	-	-	-
	60	5300						-	-	-	-
	64	5320						-	-	-	-
	5.6 GHz										
	100	5500			13.5		13.5	-	-	-	-
	104	5520						-	-	-	-
	108	5540						-	-	-	-
	112	5560						-	-	-	-
	116	5580						-	-	-	-
	120	5600						-	-	-	-
	124	5620						-	-	-	-
	128	5640						-	-	-	-
	5.65 to 5.835 GHz	132	5660					-	-	-	
		136	5680					-	-	-	
		140	5700					-	-	-	
		5.8 GHz									
		149	5745		13.5		13.5	-	-	-	-
		153	5765					-	-	-	-
		157	5785					-	-	-	-
		161	5805					-	-	-	-
		165	5825					-	-	-	-

5 GHz (802.11n)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)			Power Control		Average Power Measured (dBm)	
					Ch A		Ch B	Power Control Tx A	Power Control Tx B	Tx A	Tx B
802.11n	5.2 GHz		OFDM HT0	20 99%DC							
	36	5180			13.5		13.5	-	-	-	-
	40	5200						-	-	-	-
	44	5220						-	-	-	-
	48	5240						-	-	-	-
	5.3 GHz										
	52	5260			13.5		13.5	-	-	-	-
	56	5280						-	-	-	-
	60	5300			13.5			**13.250**	-	13.50	-
	64	5320			13.5			**13.125**	-	13.57	-
	5.6 GHz										
	100	5500			13.5		13.5	**13.750**	**13.375**	13.53	13.54
	104	5520						-	-	-	-
	108	5540						-	-	-	-
	112	5560						-	-	-	-
	116	5580						-	-	-	-
	120	5600						**13.875**	**13.375**	13.50	13.53
	124	5620						-	-	-	-
	128	5640						-	-	-	-
	5.65 to 5.835 GHz	132	5660					-	-	-	
		136	5680					-	-	-	
		140	5700					**13.375**	**13.500**	13.54	13.53
		5.8 GHz									
		149	5745		13.5		13.5	-	-	-	-
		153	5765					-	-	-	-
		157	5785					-	-	-	-
		161	5805					-	-	-	-
		165	5825					-	-	-	-
	5.2 GHz										
	38	5190		40 98%DC	13.5		13.5	-	-	-	-
	46	5230						-	-	-	-
	5.3 GHz										
	54	5270			13.5		13.5	**13.750**	**13.625**	13.56	13.57
	62	5310			**13.0**		13.5		**13.500**		13.58
	5.6 GHz										
	102	5510			13.5		13.5	**13.625**	**13.375**	13.50	13.59
	110	5550			13.5			**13.375**	**13.500**	13.57	13.60
	118	5590			13.5		13.5	-	-	-	-
	126	5630						-	-	-	-
	5.65 to 5.835 GHz	134	5670					-	-	-	-
		142	5710					-	-	-	-
		5.8 GHz									
		151	5755		**13.5**		**13.5**	-	-	-	-
		159	5795					-	-	-	-

5 GHz (802.11ac)

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tx BW (MHz)	Average Power Target (dBm)			Power Control		Average Power Measured (dBm)	
					Ch A		Ch B	Power Control Tx A	Power Control Tx B	Tx A	Tx B
802.11 ac	**5.2 GHz**		HT0	80 95%DC							
	42	5210			13.5		13.5	**13.625**	**13.875**	13.53	13.58
	5.3 GHz										
	58	5290			**12.0**		**10.0**	-	-	-	-
	5.6 GHz										
	106	5530			**13.0**		13.5	-	**13.625**	13.05	13.52
	122	5610			13.5		13.5	**13.875**	**13.500**	13.52	13.56
	5.65 to 5.835 GHz: 138	5690			13.5		13.5	**13.500**	**13.500**	13.50	13.61
	5.8 GHz										
	155	5775			13.5		13.5	**13.875**	**13.625**	13.57	13.59

NOTE: For 5GHz SAR results refer to report titled “M150814_FCC_8260NGW_SAR_5.6”.

3.2 DUT (Bluetooth) Details

Table 5

Transmitter:	WLAN / BT Combo Module
Network Standard:	Bluetooth™ RF Test Specification
Modulation Type:	Frequency Hopping Spread Spectrum (FHSS)
Frequency Range:	2402 MHz to 2480 MHz
Number of Channels:	79
Carrier Spacing:	1.0 MHz
Antenna Types:	Nissei Inverted F antenna BT: Antenna B (2)
Max. Output Power:	7 dBm
Reference Oscillator:	16 MHz (Built-in)
Power Supply:	3.3 VDC from host.

Table 6

Channel Number	Frequency (MHz)	Bluetooth Utility power setting
1	**2402**	7 dBm
2	2403	
-	-	
39	2440	
40	**2441**	
41	2442	
-	-	
78	2479	
79	**2480**	

3.3 DUT (T series LifeBook Convertible PC) Details

Table 7

Host Notebook :	LifeBook T series
Model Name:	T936
Serial Number:	Pre-production Sample
Manufacturer:	FUJITSU LIMITED
CPU Type and Speed:	Core i7 2.6GHz
LCD	**13.3"QHD: LQ133T1JW17, FHD: LQ133M1JW01**
Graphics chip	**Non**
Wired LAN:	**Intel I219LM : 10 Base-T/100 Base-TX/1000Base-T**
Modem:	Non
Port Replicator Model:	FPCPR245xx
AC Adapter Model:	90W: A13-090P1A(Chicony), A13-090P2A(Chicony) ADP-90BE D(Delta), ADP-90BE C(Delta) 80W: ADP-80SB A(Delta), ADP-80SB B(Delta) 65W: ADP-65MD B(Delta), ADP-65MD C(Delta) A13-065N2A(Chicony), A13-065N3A(Chicony)
Voltage:	19 V
Current Specs:	4.74A / 4.22A / 3.42A
Watts:	90W / 80W / 65W
Battery type	Li-Polymer
Brand	FUJITSU
Manufacturer	Sony
Rating	3150mAh, 14.4Vdc, 45Wh

3.4 Test Sample Accessories

3.4.1 Battery Types

One type of Fujitsu Lithium Ion battery is used to power the DUT.

Table 8 Battery Details

Model	FPCBP425
V/mAh	14.4V/3150mAh

4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

INTEL's DRTU test tool was used to configure the WLAN for testing. The DUT Wireless LAN operates in 2 modes, OFDM and DSSS. For the SAR measurements the device was operating in continuous transmit mode using programming codes supplied by Fujitsu.

The test results mentioned in this report only apply to the 2450MHz frequency range. An additional report titled *"*M150814_FCC_8260NGW_SAR_5.6*"* is specific to the 5GHz range.

The DUT is capable of using two antennas transmitting simultaneously however in this mode; the power level is 3dB lower (50%) than if a single antenna was transmitting, there were no wires or other connections to the DUT during the SAR measurements.

At the beginning of the SAR tests, the conducted power of the device was measured after temporary modification of antenna connector inside the device's TX RX compartment. Measurements were performed with a calibrated Power Meter, and the result of the measurements includes the tune up tolerance of 1 dB. The Transmitter power was set to be equal or higher than power specified by the manufacturer including tune-up.

Table 9 Frequency and Conducted Power Results Bluetooth

Channel	Channel Frequency MHz	Data Rate (Mbps)	Maximum Conducted Output Power Measured (dBm)
Channel 40	2441	N/A	6.4

4.1 Battery Status

The device battery was fully charged prior to commencement of measurement. The battery condition was monitored by measuring the RF field at a defined position inside the phantom before the commencement of each test and again after the completion of the test. It was not possible to perform conducted power measurements at the output of the device, at the beginning and end of each scan due to lack of a suitable antenna port. The uncertainty associated with the power drift was less than 5% and was assessed in the uncertainty budget.

5.0 DETAILS OF TEST LABORATORY

5.1 Location

EMC Technologies Pty Ltd
176 Harrick Road
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Australia 3042

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email: melb@emctech.com.au
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5.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA).
NATA Accredited Laboratory Number: 5292

EMC Technologies Pty Ltd is NATA accredited for the following standards:

AS/NZS 2772.2 2011:	RF and microwave radiation hazard measurement
ACMA:	Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2014
EN 50360: 2001	Product standard to demonstrate the compliance of Mobile Phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)
EN 62209-1:2006	Human exposure to radio frequency fields from hand-held and body-mounted devices-Human models, instrumentation and procedures. **Part 1:** Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range 300 MHz to 3 GHz)
EN 62209-2:2010	Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures **Part 2:** Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz
IEEE 1528: 2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

Refer to NATA website www.nata.asn.au for the full scope of accreditation.

5.3 Environmental Factors

The measurements were performed in a shielded room with no background RF signals. The temperature in the laboratory was controlled to within 21±1°C, the humidity was 40%. The liquid parameters are measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. DASY5 SAR measurement system using either the ET3DV6 E-field probe is less than 5μV in both air and liquid mediums.

6.0 CALIBRATION AND VERIFICATION PROCEDURES AND DATA

6.1 System verification

6.1.1 System verification Results @ 2450MHz

The following table lists the results of the System Verification. The forward power into the reference dipole for SAR System Verification was adjusted to 250 mW.

Currently no IEEE Std 1528-2013 OR EN 62209-2 SAR reference values are available in 5.6 GHz band, as a consequence all system verification results were compared against the SPEAG calibration reference SAR values.

The SPEAG calibration reference SAR value is the SAR system verification result obtained in a specific dielectric liquid using the validation dipole (D2450V2) during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table below (2450MHz) below.

Table 10 Deviation from reference system verification values @ 2450MHz

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG Reference 1g (%)	Last Validation Date
2450MHz 24th August 2015	13.4	53.60	51.5	4.08	26/03/2015

NOTE: All reference system verification values are referenced to 1W input power.

6.1.2 Liquid Temperature and Humidity

The humidity and dielectric/ambient temperatures were recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

Table 11 Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
24th August 2015	21.0	20.5	40

7.0 SAR MEASUREMENT PROCEDURE USING DASY5

The SAR evaluation was performed with the SPEAG DASY5 system. A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the DUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.

b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 4 mm from the inner surface of the shell. The area covers the entire dimension of the DUT and the horizontal grid spacing is 12 mm x 12 mm. The actual Area Scan has dimensions of 60mm x 90mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

(i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 4 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

(ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

(iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

(iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

8.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2013 for both device SAR tests and System verification uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95% confidence level) must be less than 30%.

Table 12 Uncertainty Budget for DASY5 Version 52 – DUT SAR test 2450MHz

Error Description	Uncert. Value	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i	10g u_i	v_i
Measurement System								
Probe Calibration	6	N	1.00	1	1	6.00	6.00	∞
Axial Isotropy	4.7	R	1.73	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.6	R	1.73	0.7	0.7	3.88	3.88	∞
Boundary Effects	2	R	1.73	1	1	1.15	1.15	∞
Linearity	4.7	R	1.73	1	1	2.71	2.71	∞
System Detection Limits	1	R	1.73	1	1	0.58	0.58	∞
Modulation response	2.4	R	1.73	1	1	1.39	1.39	∞
Readout Electronics	0.3	N	1.00	1	1	0.30	0.30	∞
Response Time	0.8	R	1.73	1	1	0.46	0.46	∞
Integration Time	2.6	R	1.73	1	1	1.50	1.50	∞
RF Ambient Noise	3	R	1.73	1	1	1.73	1.73	∞
RF Ambient Reflections	3	R	1.73	1	1	1.73	1.73	∞
Probe Positioner	0.8	R	1.73	1	1	0.46	0.46	∞
Probe Positioning	6.7	R	1.73	1	1	3.87	3.87	∞
Post Processing	4	R	1.73	1	1	2.31	2.31	∞
Test Sample Related								
Power Scaling	0	R	1.73	1	1	0.00	0.00	∞
Test Sample Positioning	2.9	N	1.00	1	1	2.90	2.90	145
Device Holder Uncertainty	3.6	N	1.00	1	1	3.60	3.60	5
Output Power Variation – SAR Drift Measurement	4.50	R	1.73	1	1	2.60	2.60	∞
Phantom and Setup								
Phantom Uncertainty	7.6	R	1.73	1	1	4.39	4.39	∞
SAR Correction	1.9	R	1.73	1	0.84	1.10	0.92	∞
Liquid Conductivity – Measurement uncertainty	2.5	N	1.00	0.64	0.71	1.60	1.78	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.6	0.26	1.50	0.65	∞
Temp.unc. - Conductivity	3.4	R	1.73	0.78	0.71	0.77	0.70	∞
Temp. unc. - Permittivity	0.4	R	1.73	0.23	0.26	0.04	0.05	∞
Combined standard Uncertainty (u_c)						12.19	12.12	
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=	2		24.38	24.25	

Estimated total measurement uncertainty for the DASY5 measurement system was ±12.19%. The extended uncertainty (K = 2) was assessed to be ±24.38% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 13 Uncertainty Budget for DASY5 Version 52 – DUT SAR test 2450MHz

IEC 62209-2 UNCERTAINTY FOR RSS-102

Error Description	Uncert. Value	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i	10g u_i	v_i
Measurement System								
Probe Calibration	6	N	1	1	1	6	6	∞
Axial Isotropy	4.7	R	1.73	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.6	R	1.73	0.7	0.7	3.88	3.88	∞
Linearity	4.7	R	1.73	1	1	2.71	2.71	∞
Modulation Response	2.4	R	1.73	1	1	1.39	1.39	∞
System Detection Limits	1	R	1.73	1	1	0.58	0.58	∞
Boundary Effects	2	R	1.73	1	1	1.15	1.15	∞
Readout Electronics	0.3	N	1.00	1	1	0.30	0.30	∞
Response Time	0.8	R	1.73	1	1	0.46	0.46	∞
Integration Time	2.6	R	1.73	1	1	1.50	1.50	∞
RF Ambient Noise	3	R	1.73	1	1	1.73	1.73	∞
RF Ambient Reflections	3	R	1.73	1	1	1.73	1.73	∞
Probe Positioner	0.8	R	1.73	1	1	0.46	0.46	∞
Probe Positioning	6.7	R	1.73	1	1	3.87	3.87	∞
Post Processing	4	R	1.73	1	1	2.31	2.31	∞
Test Sample Related								
Device Holder	3.6	N	1.00	1	1	3.60	3.60	5
Test Sample Positioning	2.9	N	1.00	1	1	2.90	2.90	145
Power Scaling	0	R	1.73	1	1	0.00	0.00	∞
Power Drift	4.71	R	1.73	1	1	2.72	2.72	∞
Phantom and Setup								
Phantom Uncertainty	7.6	R	1.73	1	1	4.39	4.39	∞
SAR Correction	1.9	R	1.73	1	0.84	1.10	0.92	∞
Liquid Conductivity – Measurement uncertainty	2.5	N	1.00	0.78	0.71	1.95	1.78	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.26	0.26	0.65	0.65	∞
Temp.unc. - Conductivity	3.4	R	1.73	0.78	0.71	1.53	1.39	∞
Temp. unc. - Permittivity	0.4	R	1.73	0.23	0.26	0.05	0.06	∞
Combined standard Uncertainty (u_c)						12.27	12.21	748
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=	2		24.53	24.42	

Estimated total measurement uncertainty for the DASY5 measurement system was ±12.27%. The extended uncertainty (K = 2) was assessed to be ±24.53% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 14 Uncertainty Budget for DASY5 Version 52– System verification 2450MHz

Error Description	Uncert. Value	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i	10g u_i	v_i
Measurement System								
Probe Calibration	5.5	N	1.00	1	1	5.50	5.50	∞
Axial Isotropy	4.7	R	1.73	1	1	2.71	2.71	∞
Hemispherical Isotropy	9.6	R	1.73	0	0	0.00	0.00	∞
Boundary Effects	1	R	1.73	1	1	0.58	0.58	∞
Linearity	4.7	R	1.73	1	1	2.71	2.71	∞
System Detection Limits	1	R	1.73	1	1	0.58	0.58	∞
Readout Electronics	0.3	N	1.00	1	1	0.30	0.30	∞
Response Time	0	R	1.73	1	1	0.00	0.00	∞
Integration Time	0	R	1.73	1	1	0.00	0.00	∞
RF Ambient Noise	1	R	1.73	1	1	0.58	0.58	∞
RF Ambient Reflections	1	R	1.73	1	1	0.58	0.58	∞
Probe Positioner	0.8	R	1.73	1	1	0.46	0.46	∞
Probe Positioning	6.7	R	1.73	1	1	3.87	3.87	∞
Max. SAR Eval.	2	R	1.73	1	1	1.15	1.15	∞
Dipole Related								
Deviation of exp. dipole	5.5	R	1.73	1	1	3.18	3.18	∞
Dipole Axis to Liquid Dist.	2	R	1.73	1	1	1.15	1.15	∞
Input power & SAR drift	5.00	R	1.73	1	1	2.89	2.89	∞
Phantom and Setup								
Phantom Uncertainty	4	R	1.73	1	1	2.31	2.31	∞
SAR Correction	1.9	R	1.73	1	0.84	1.10	0.92	∞
Liquid Conductivity (meas.)	2.5	N	1.00	0.78	0.71	1.95	1.78	∞
Liquid Permittivity (meas.)	2.5	N	1.00	0.26	0.26	0.65	0.65	∞
Temp.unc. - Conductivity	1.7	R	1.73	0.78	0.71	0.77	0.70	∞
Temp. unc. - Permittivity	0.3	R	1.73	0.23	0.26	0.04	0.05	∞
Combined standard Uncertainty (u_c)						9.7	9.6	
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k= 2			19.4	19.3	

Estimated total measurement uncertainty for the DASY5 measurement system was ±9.7%. The extended uncertainty (K = 2) was assessed to be ±19.4% based on 95% confidence level. The uncertainty is not added to the System verification measurement result.

9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 15 SPEAG DASY5 Version 52

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	✓
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	✓
SAM Phantom	SPEAG	N/A	1260	Not applicable	
SAM Phantom	SPEAG	N/A	1060	Not applicable	
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	
Flat Phantom	SPEAG	ELI 4.0	1101	Not Applicable	✓
Data Acquisition Electronics	SPEAG	DAE3 V1	359	06-June-2015	
Data Acquisition Electronics	SPEAG	DAE3 V1	442	03-Dec-2015	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	11-Dec-2015	✓
Probe E-Field	SPEAG	ET3DV6	1377	10-June-2015	
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	
Probe E-Field	SPEAG	EX3DV4	3956	13-June-2015	
Probe E-Field	SPEAG	EX3DV4	3657	11-Dec-2015	
Validation Source 150 MHz	SPEAG	CLA150	4003	3-Dec-2016	
Antenna Dipole 300 MHz	SPEAG	D300V3	1012	11-Dec-2015	
Antenna Dipole 450 MHz	SPEAG	D450V3	1074	11-Dec-2015	
Antenna Dipole 750 MHz	SPEAG	D750V2	1051	13-Dec-2016	
Antenna Dipole 900 MHz	SPEAG	D900V2	047	09-Dec-2017	
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	05-Dec-2017	
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	05-Dec-2017	
Antenna Dipole 1950 MHz	SPEAG	D1950V3	1113	6-Dec -2015	
Antenna Dipole 2300 MHz	SPEAG	D2300V2	1032	22-Aug-2016	
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	04-Dec-2015	✓
Antenna Dipole 2600 MHz	SPEAG	D2600V2	1044	13-Dec-2016	
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	13-July-2013	
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	16-Dec-2016	
RF Amplifier	EIN	603L	N/A	*In test	
RF Amplifier	Mini-Circuits	ZHL-42	N/A	*In test	✓
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	*In test	
Synthesized signal generator	Hewlett Packard	86630A	3250A00328	*In test	
RF Power Meter	Hewlett Packard	437B	3125012786	*In test	✓
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	02-Sept-2015	✓
RF Power Meter	Rohde & Schwarz	NRP	101415	30-Sept-2015	
RF Power Sensor	Rohde & Schwarz	NRP - Z81	100174	30-Sept-2015	
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*In test	✓
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*In test	✓
Network Analyser	Hewlett Packard	8714B	GB3510035	14-Oct-2015	
Network Analyser	Hewlett Packard	8753ES	JP39240130	10-Nov-2015	✓
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	*In test	
Dual Directional Coupler	NARDA	3022	75453	*In test	✓

* Calibrated during the test for the relevant parameters.

10.0 TEST METHODOLOGY

T series LifeBook Convertibles should be evaluated in normal use positions, typical for lap-held bottom-face only. However the number of positions will depend on the number of configurations the laptop can be operated in. The “LIFEBOOK T SERIES” can be used in either a conventional laptop position (see Appendix A) or a Tablet configuration. The antenna location in the “LIFEBOOK T SERIES” is closest to the top of the screen when used in a conventional laptop configuration and due to the separation distances involved between the phantom and the laptop antenna, testing is not required in this position.

10.1 Positions

10.1.1 “Lap Held” Position Definition (0mm spacing)

The DUT was tested in the 2.00 mm flat section of the ELI4 Flat phantom for the “Lap Held” position. The Transceiver was placed at the bottom of the phantom and suspended in such way that the back of the DUT was touching the phantom. This device orientation simulates the PC’s normal use – being held on the lap of the user. A spacing of 0mm ensures that the SAR results are conservative and represent a worst-case position.

10.1.2 “Edge On” Position (Portrait or Landscape)

The DUT was tested in the (2.00 mm) flat section of the ELI4 Flat phantom for the “Edge On” position. The Antenna edge of the Transceiver was placed underneath the flat section of the phantom and suspended until the edge touched the phantom. *Refer to Appendix A for photos of measurement positions.*

10.1.3 “Bystander” Position (25mm spacing)

The DUT was tested in the 2.00 mm flat section of the ELI4 Flat phantom for the “Bystander” position. The Transceiver was placed at the bottom of the phantom and suspended in such way that the back of it’s LCD screen was parallel to phantom and at 25mm distance. This orientation simulates use of the device in a way that allows occasional RF exposure of the nearby person (Bystander).

10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

The DUT has fixed antennas. Depending on the measured SAR level up to three test channels with the test sample operating at maximum power were recorded. The following table represents the matrix used to determine what testing was required. All relevant provisions of KDB 447498 are applied for SAR measurements of the host system.

Table 16 Testing configurations

Phantom Configuration	Device Mode	Antenna	Test Configurations		
			Channel (Remaining)	Channel (Highest)	Channel (Remaining)
Lap Held	DSSS 2.4GHz	A		X	
		B		X	
Bystander	DSSS 2.4GHz	A		X	
		B		X	
Edge On	DSSS 2.4GHz	A		X	
		B		X	

Legend

X	Testing Required in this configuration
	Testing required in this configuration only if SAR of middle channel is more than 3dB below the SAR limit or it is the worst case.

NOTE: Throughout this report, Antenna A and B refer to Tx1 and Tx2 in the host respectively.

11.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1g tissue masses were determined for the sample DUT for all test configurations listed in section 10.2.

11.1 2450MHz SAR Results

There are two modes of operation within the 2450MHz band, they include OFDM and DSSS modulations. Refer to section 10.2 for selection of all device test configurations. Table below displays the SAR results.

Table 17 SAR MEASUREMENT RESULTS

Test Position	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR icluding tune up (1g) mW/g	Drift (dB)	∈r (target 52.7 ±5% 50.1 to 55.3)	σ (target 1.95 ±5% 1.85 to 2.05)	Tune Up and DC SAR (mW/g)
Body Bystander ANT 1 (DSSS) 24-Aug-2015	1.	DSSS 2450 MHz 1Mbs	7	2442	0.021	-0.20	52.01	1.937	0.021
Body Bystander ANT 2 (DSSS) 24-Aug-2015	2.	DSSS 2450 MHz 1Mbs	7	2442	0.013	0.09	52.01	1.937	0.013
Body Lap Held ANT 1 (DSSS) 24-Aug-2015	3.	DSSS 2450 MHz 1Mbs	1	2412	0.074	-0.11	52.2	1.89	0.075
Body Lap Held ANT 1 (DSSS) 24-Aug-2015	4.	DSSS 2450 MHz 1Mbs	6	2437	0.073	-0.06	52.04	1.929	0.074
Body Lap Held ANT 1 (DSSS) 24-Aug-2015	5.	DSSS 2450 MHz 1Mbs	7	2442	0.061	-0.06	52.01	1.937	0.062
Body Lap Held ANT 1 (DSSS) 24-Aug-2015	6.	DSSS 2450 MHz 1Mbs	12	2467	0.057	-0.14	51.86	1.97	0.057
Body Lap Held ANT 1 (DSSS) 24-Aug-2015	7.	DSSS 2450 MHz 1Mbs	13	2472	0.016	0.08	51.83	1.973	0.016
Body Lap Held ANT 2 (DSSS) 24-Aug-2015	8.	DSSS 2450 MHz 1Mbs	1	2412	0.098	-0.03	52.2	1.89	0.099
Body Lap Held ANT 2 (DSSS) 24-Aug-2015	9.	DSSS 2450 MHz 1Mbs	6	2437	0.127	-0.08	52.04	1.929	0.128
Body Lap Held ANT 2 (DSSS) 24-Aug-2015	10.	DSSS 2450 MHz 1Mbs	7	2442	0.131	-0.07	52.01	1.937	0.132
Body Lap Held ANT 2 (DSSS) 24-Aug-2015	11.	DSSS 2450 MHz 1Mbs	12	2467	0.147	-0.15	51.86	1.97	0.148
Body Lap Held ANT 2 (DSSS) 24-Aug-2015	12.	DSSS 2450 MHz 1Mbs	13	2472	0.046	0.18	51.83	1.973	0.046
Body Edge 1 ANT 1 (DSSS) 24-Aug-2015	13.	DSSS 2450 MHz 1Mbs	1	2412	**0.355**	-0.08	52.2	1.89	**0.359**
Body Edge 1 ANT 1 (DSSS) 24-Aug-2015	14.	DSSS 2450 MHz 1Mbs	6	2437	0.345	-0.04	52.04	1.929	0.348
Body Edge 1 ANT 1 (DSSS) 24-Aug-2015	15.	DSSS 2450 MHz 1Mbs	7	2442	0.312	0.03	52.01	1.937	0.315
Body Edge 1 ANT 1 (DSSS) 24-Aug-2015	16.	DSSS 2450 MHz 1Mbs	12	2467	0.303	0.00	51.86	1.97	0.306
Body Edge 1 ANT 1 (DSSS) 24-Aug-2015	17.	DSSS 2450 MHz 1Mbs	13	2472	0.069	0.07	51.83	1.973	0.069
Body Edge 1 ANT 2 (DSSS) 24-Aug-2015	18.	DSSS 2450 MHz 1Mbs	1	2412	0.146	-0.01	52.2	1.89	0.147
Body Edge 1 ANT 2 (DSSS) 24-Aug-2015	19.	DSSS 2450 MHz 1Mbs	6	2437	0.165	0.01	52.04	1.929	0.167
Body Edge 1 ANT 2 (DSSS) 24-Aug-2015	20.	DSSS 2450 MHz 1Mbs	7	2442	0.162	-0.04	52.01	1.937	0.164

Body Edge 1 ANT 2 (DSSS) 24-Aug-2015	21.	DSSS 2450 MHz 1Mbs	12	2467	0.174	0.04	51.86	1.97	0.176
Body Edge 1 ANT 2 (DSSS) 24-Aug-2015	22.	DSSS 2450 MHz 1Mbs	13	2472	0.052	-0.03	51.83	1.973	0.053
Body Edge 2 ANT 1 (DSSS) 24-Aug-2015	23.	DSSS 2450 MHz 1Mbs	7	2442	0.205	-0.10	52.01	1.937	0.207
Body Edge 4 ANT 2 (DSSS) 24-Aug-2015	24.	DSSS 2450 MHz 1Mbs	1	2412	0.244	0.03	52.2	1.89	0.246
Body Edge 4 ANT 2 (DSSS) 24-Aug-2015	25.	DSSS 2450 MHz 1Mbs	6	2437	0.308	0.01	52.04	1.929	0.311
Body Edge 4 ANT 2 (DSSS) 24-Aug-2015	26.	DSSS 2450 MHz 1Mbs	7	2442	0.303	0.16	52.01	1.937	0.306
Body Edge 4 ANT 2 (DSSS) 24-Aug-2015	27.	DSSS 2450 MHz 1Mbs	12	2467	0.338	0.00	51.86	1.97	0.341
Body Edge 4 ANT 2 (DSSS) 24-Aug-2015	28.	DSSS 2450 MHz 1Mbs	13	2472	0.106	0.01	51.83	1.973	0.107
System Check 24-Aug-2015	29.	CW	1	2450	13.400	-0.10	51.96	1.949	-

NOTE: The measurement uncertainty of 24.53% for 2.45GHz was not added to the result.

12.0 COMPLIANCE STATEMENT

The Fujitsu T SERIES LIFEBOOK CONVERTIBLE PC, Model: T936 with INTEL M.2 integrated Wireless LAN and Bluetooth Module (INTEL SNOWFIELD PEAK 802.11a/b/g/n/ac), Model: 8260NGW was found to comply with the FCC and RSS-102 SAR requirements.

The highest Measured SAR level was 0.355 mW/g for a 1g cube. The manufacturer's duty cycle is 99%. Scaling the SAR value, the maximum Reported SAR value is 0.359 **mW/g.** This value was measured at 2412 MHz (channel 1) in the "Body Edge 1 " position in DSSS modulation mode at the antenna 1. This was below the limit of 1.6 mW/g for uncontrolled exposure, even taking into account the measurement uncertainty of 24.53 %.

13.0 MULTIBAND EVALUATION CONSIDERATIONS

Fujitsu **T SERIES LIFEBOOK CONVERTIBLE** PC, Model: **T936** Worst case WLAN SAR was recorded in 5GHz frequency range, report titled “M150814_FCC_8260NGW_SAR_5.6” contains section that describes multiband evaluation.

Diagram Showing WLAN Antenna Positions