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TEST REPORT #: 316191
LSR Job #: C-2496

Compliance Testing of:
W1001

Prepared For:
ThermoFisher Scientific
Attn: David Perez
2 Radcliff Road
Tewksbury, MA 1876

This Test Report is issued under the Authority of:
John Johnston, EMC Engineer

Signature:

Date: 1/26/16

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EXHIBIT 1 INTRODUCTION

1.1 Client Information

Manufacturer Name:	ThermoFisher Scientific
Address:	2 Radcliff Road, Tewksbury, MA 1876
Contact Name:	David Perez

1.2 Equipment Under Test (EUT) Information

Product Name:	W1001
Model Number:	W1001
Serial Number:	3-016181, 3-016205, and 3-016245

1.3 Product Description

The W1001 is comprised of an LSR TiWi-BLE module and 2.4 GHz FlexPIFA antenna. The 2.4 GHz FlexPIFA antenna is flexible planar inverted-f antenna (PIFA) exhibiting a peak gain of +2 dBi. The 2.4 GHz FlexPIFA antenna includes a 001-0014 Rev. 3 U.FL connector. The W1001 is exempt from SAR testing when a 60 mm minimum separation distance is established.

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EXHIBIT 2 SAR Minimum Separation Distance

2.1 Bluetooth Transmitter

The EUT was evaluated against the SAR test exclusion threshold listed in FCC KDB 447498 D01 General RF Exposure Guidance v06 Section 4.3 (1).

Channel Frequency (MHz)	Max Peak Conducted Output Power (dBm)
2402	9.698
2441	9.633
2480	9.834

Frequency = 2.480 GHz

Output Power = 9.834 dBm

Tune-up Tolerance = 0.6 dB

P_{out} including tune-up tolerance = 10.434 dBm = 11.051 mW

Separation Distance = 60 mm

2.1.1 1-g Head/Body Threshold

1-g Threshold = 50 mm $(3/\sqrt{2.480}) = 95.2$ mW

Note: See KDB 447498 D01 for separation distances greater than 50 mm

2.1.2 1-g Head/Body Compliance Threshold

1-g Threshold + [(Test Separation Distance – 50 mm)*10] = 1-g Compliance Threshold

95.2 mW + [(60mm-50mm)*10] = 195.2 mW

P_{out} < 1-g Compliance Threshold since 11.1 mW < 195.2 mW

2.1.3 10-g Extremity Threshold

10-g Threshold = 50 mm $(7.5/\sqrt{2.480}) = 238.1$ mW

Note: See KDB 447498 D01 for separation distances greater than 50 mm

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2.1.4 10-g Extremity Compliance Threshold

10-g Threshold + [(Test Separation Distance – 50 mm)*10] = 10-g Compliance Threshold

238.1 mW + [(60mm-50mm)*10] = 338.1 mW

Pout < 10-g Compliance Threshold since 11.1 mW < 338.1 mW

Thus, SAR testing excluded when separation distance is maintained at 60 mm.

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2.2 BLE Transmitter

The EUT was evaluated against the SAR test exclusion threshold listed in FCC KDB 447498 D01 General RF Exposure Guidance v06 Section 4.3 (1).

Channel Frequency (MHz)	Max Peak Conducted Output Power (dBm)
2402	9.076
2441	9.173
2480	9.272

Frequency = 2.480 GHz

Output Power = 9.272 dBm

Tune-up Tolerance = 0.6 dB

Pout including tune-up tolerance = 9.872 dBm = 9.710 mW

Separation Distance = 60 mm

2.2.1 1-g Head/Body Threshold

1-g Threshold = 50 mm ($3/\sqrt{2.480}$) = 95.2 mW

Note: See KDB 447498 D01 for separation distances greater than 50 mm

2.2.2 1-g Head/Body Compliance Threshold

1-g Threshold + [(Test Separation Distance – 50 mm)*10] = 1-g Compliance Threshold

95.2 mW + [(60mm-50mm)*10] = 195.2 mW

Pout < 1-g Compliance Threshold since 9.7 mW < 195.2 mW

2.2.3 10-g Extremity Threshold

10-g Threshold = 50 mm ($7.5/\sqrt{2.480}$) = 238.1 mW

Note: See KDB 447498 D01 for separation distances greater than 50 mm

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2.2.4 10-g Extremity Compliance Threshold

10-g Threshold + [(Test Separation Distance – 50 mm)*10] = 10-g Compliance Threshold

238.1 mW + [(60mm-50mm)*10] = 338.1 mW

Pout < 10-g Compliance Threshold since 9.7 mW < 338.1 mW

Thus, SAR testing excluded when separation distance is maintained at 60 mm.

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2.3 WLAN Transmitter

The EUT was evaluated against the SAR test exclusion threshold listed in FCC KDB 447498 D01 General RF Exposure Guidance v06 Section 4.3 (1).

Channel Frequency (MHz)	Data Rate	Max Peak Conducted Output Power (dBm)
2412	6 MBPS	21.1
2437	54 MBPS	21.1
2462	6 MBPS	21.5

Frequency = 2.462 GHz

Output Power = 21.5 dBm

Tune-up Tolerance = 1 dB

Pout including tune-up tolerance = 22.5 dBm = 177.827 mW

Separation Distance = 60 mm

2.3.1 1-g Head/Body Threshold

1-g Threshold = 50 mm $(3/\sqrt{2.462}) = 95.6$ mW

Note: See KDB 447498 D01 for separation distances greater than 50 mm

2.3.2 1-g Head/Body Compliance Threshold

1-g Threshold + [(Test Separation Distance – 50 mm)*10] = 1-g Compliance Threshold

95.6 mW + [(60mm-50mm)*10] = 195.6 mW

Pout < 1-g Compliance Threshold since 178 mW < 195.6 mW

2.3.3 10-g Extremity Threshold

10-g Threshold = 50 mm $(7.5/\sqrt{2.462}) = 239.0$ mW

Note: See KDB 447498 D01 for separation distances greater than 50 mm

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2.3.4 10-g Extremity Compliance Threshold

10-g Threshold + [(Test Separation Distance – 50 mm)*10] = 10-g Compliance Threshold

239 mW + [(60mm-50mm)*10] = 339 mW

Pout < 10-g Compliance Threshold since 178 mW < 339 mW

Thus, SAR testing excluded when separation distance is maintained at 60 mm.

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EXHIBIT 3 RSS 102 Compliance

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤ 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥ 50 mm
≤ 300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Note: Table 1 from RSS 102. The exemption limits represented in this table apply to 1-gram tissue, head and body, evaluation (uncontrolled). For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5

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3.1 Bluetooth Transmitter

Frequency = 2.480 GHz
Output Power = 9.834 dBm
Antenna Gain = 2 dBi
Tune-up Tolerance = 0.6 dB
EIRP = 12.434 dBm = 17.515 mW

3.1.1 1-g SAR Exemption:

Interpolating between 2450 MHz and 3500 MHz for 2480 MHz at a separation distance of **20 mm** yields the exemption limit of 30.1 mW

When evaluated against RSS 102 issue 5 section 2.5, table 1:

$$\underline{17.515 \text{ mW} \leq 30.1 \text{ mW}}$$

SAR Evaluation Not Necessary If Used at a Separation Distance Greater than 20 mm

3.1.2 10-g Extremity SAR Exemption:

Interpolating between 2450 MHz and 3500 MHz for 2480 MHz at a separation distance of **15 mm** yields the exemption limit of 37.6 mW

When evaluated against RSS 102 issue 5 section 2.5, table 1:

$$\underline{17.515 \text{ mW} \leq 37.6 \text{ mW}}$$

SAR Evaluation Not Necessary If Used at a Separation Distance Greater than 15 mm

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3.2 BLE Transmitter

Frequency = 2.480 GHz
Output Power = 9.272 dBm
Antenna Gain = 2 dBi
Tune-up Tolerance = 0.6 dB
EIRP = 11.872 dBm = 15.230 mW

3.2.1 1-g SAR Exemption:

Interpolating between 2450 MHz and 3500 MHz for 2480 MHz at a separation distance of **20 mm** yields the exemption limit of 30.1 mW

When evaluated against RSS 102 issue 5 section 2.5, table 1:

$$\underline{15.230 \text{ mW} \leq 30.1 \text{ mW}}$$

SAR Evaluation Not Necessary If Used at a Separation Distance Greater than 20 mm

3.2.2 10-g Extremity SAR Exemption:

Interpolating between 2450 MHz and 3500 MHz for 2480 MHz at a separation distance of **10 mm** yields the exemption limit of 17.4 mW

When evaluated against RSS 102 issue 5 section 2.5, table 1:

$$\underline{15.230 \text{ mW} \leq 17.4 \text{ mW}}$$

SAR Evaluation Not Necessary If Used at a Separation Distance Greater than 10 mm

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3.3 WLAN Transmitter

Frequency = 2.462 GHz
Output Power = 21.5 dBm
Antenna Gain = 2 dBi
Tune-up Tolerance = 1 dB
EIRP = 24.5 dBm = 281.828 mW

3.3.1 1-g SAR Exemption:

Interpolating between 2450 MHz and 3500 MHz for 2462 MHz at a separation distance of **50 mm** yields the exemption limit of 308.5 mW

When evaluated against RSS 102 issue 5 section 2.5, table 1:

$$\underline{281.828 \text{ mW} \leq 308.5 \text{ mW}}$$

SAR Evaluation Not Necessary

3.3.2 10-g Extremity SAR Exemption:

Interpolating between 2450 MHz and 3500 MHz for 2462 MHz at a separation distance of **35 mm** yields the exemption limit of 307.6 mW

When evaluated against RSS 102 issue 5 section 2.5, table 1:

$$\underline{281.828 \text{ mW} \leq 307.6 \text{ mW}}$$

SAR Evaluation Not Necessary

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