



**RETLIF
TESTING
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FCC Part 15 Report of Measurements

On

Twist Pump
FCC ID: 2ATGA03

Customer Name: Deka Research and Development

Customer P.O.: DEKA 183304

Date of Report: May 23, 2024

Test Report No.: R-6894H-1

Test Start Date: April 11, 2024

Test Finish Date: April 15, 2024

Test Technician: M. Seamans

Approved By: T. Hannemann

Report Prepared By: J. Kennedy



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Technical Information

Report Number: R-6894H-1

Customer: Deka Research and Development

Address: 340 Commercial St.
Manchester, NH 03101

Manufacturer: Deka Research and Development

Manufacturer Address: 340 Commercial St.
Manchester, NH 03101

Test Sample: Twiist Pump

Part Number: DKPI-21055-007 CONFIG. PI7F

Serial Number: 24020011M

Antenna Type: 1/2 Wave Slot Antenna, -4.2 dBi

Power Requirements: 3.7 VDC via one (1) Lithium Ion Battery

Frequency of Operation: 2.402 GHz to 2.480 GHz

Tested Frequencies: (3) Lowest channel, mid-band channel and highest channel

Test Specification:

FCC Rules and Regulations Part 15, Subpart C, Section 15.249

Test Procedure:

ANSI C63.4:2014
ANSI C63.10:2013

Test Facility:

Retlif Testing Laboratories
101 New Boston Road
Goffstown, NH 03045

FCC Designation Number: US2320



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Tests Performed

The test methods performed on the EUT are shown below:

Testing Dates	Test Method	Test Results
April 11 - 15, 2024	15.249 (a)(e) Field Strength of Emissions (Fundamental)	Complied
April 11 - 15, 2024	15.249 (a)(e) Field Strength of Emissions (Harmonics)	Complied
April 11 - 15, 2024	15.249(d), 15.205/209: Spurious Emissions \ Out Of Band \ Band-Edge Emissions	Complied

Test Sample Description:

The Pump is designed to infuse a fluid subcutaneously into the patient based on an individualized software programmed schedule. The Pump is powered by an operator changeable, rechargeable battery. The pump communicates with a remote interface via Bluetooth.

The Twiist Pump was manufactured by Deka Research & Development Corporation of Manchester, NH 03101.

Software

Radio Processor Software:

- Oreo Pump Radio Direct Test Mode Build 2.2.42-0

Support Equipment:

Description	Manufacturer	Part Number	Model Number	Serial Number
Laptop PC	Dell	Not Applicable	Latitude 5490	6VV6VP2
Pump Interface (Test PCB)	Deka	DKPI-50098-001	DKPI-50098-001	Not Applicable
Battery Breakout	Deka	DKPI-50054-090	DKPI-50054-090	Not Applicable
Battery	Fullymax	DKPI-70009-001	DKPI-70009-001	FL202004000247



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Certification and Signatures

We certify that this report is a true representation of the results obtained from the tests of the equipment stated. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.



Todd Hannemann
EMC Test Engineer
iNARTE Certified Technician EMC-49191-T



Scott Wentworth
Branch Manager

Non-Warranty Provision

The testing services have been performed, findings obtained and reports prepared in accordance with generally accepted laboratory principles and practices. This warranty is in lieu of all others, either expressed or implied.

Non-Endorsement

This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement or certification of the product or material tested. This report must not be used by the client to claim product endorsement by ANSI National Accreditation Board (ANAB).



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Revision History

Revisions to this document are listed below; the latest revised document supersedes all previous issues of this document.

Revision	Date	Pages Affected
-	May 9, 2024	Original Release



Retlif Testing Laboratories

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Measurement Procedures:

15.249 (a/d) Field Strength of Fundamental, Harmonic and Out of Band/Band Edge Emissions (Radiated Emissions)

The field strength of the fundamental, harmonic and out of band/bandedge emissions were measured in the frequency range of 30 MHz to 25 GHz. The EUT was placed on a 80cm high wooden test stand located 3 meters from the test antenna on a FCC listed open area test site. Emissions from the EUT were maximized and the field strength of each observed emission was measured, recorded and compared to the specified limits of 15.249 (a)/(d)/(e)/15.209 as appropriate. Peak field strength of emissions were measured, recorded and verified to meet the specified limit (limit corresponds to 20dB above the maximum permitted average limit). When necessary, the marker/delta method was used to verify bandedge compliance.

Table 1 - Field Strength of Emissions, Limits

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
2400 – 2483.5 MHz	50	500

Results:

The EUT was operated in the 2400 to 2483.5 MHz frequency band. The field strength of the fundamental did not exceed 50 mV/M. The field strength of the harmonics did not exceed 500 μ V/M.

FCC Section 15.249(d): Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Results:

Emissions radiated at the Band Edges and outside the specified frequency band were attenuated in accordance with the general radiated emissions limits of 15.209.



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RF Exposure Limits

Transmitters operating under 15.249 must be operated in a manner that ensures the public is not exposed to RF energy levels in excess of the commission's guidelines. Based on the transmitter power and maximum antenna gain (see calculation below) the minimum separation distance was calculated to determine the distance for acceptable MPE power density levels to meet both the Occupational/Controlled Exposure and the General Population/Uncontrolled Exposure requirements of FCC Part 1.1310. The calculation below uses the more stringent General Population MPE Limits.

Field strength to power calculations from ANSI C63.10

E = Measured Electric Field Strength = 93.2 dBuV/M *
d = Radiated test Measurement Distance = 3 Meters

EIRP Log = E + 20log(d) - 104.7
EIRP Log = 93.2 + 20log(3) - 104.7
EIRP Log = -1.96 dBm
EIRP Linear = 0.000637 W

Gain = Max Power Gain of Antenna = -4.2 dBi = 0.38 Numeric
Power = EIRP Linear / Gain Numeric
Power = 0.000637 / 0.38
Power = Max Power Input to Antenna = 0.0017 mW
D = Minimum Separation Distance in cm
S = Max allowed Power Density in mW/cm²

Per 1.1310 For the Frequency of 2400 MHz S = 1 mW/cm²

$$1 \text{ mW/cm}^2 = \frac{0.0017 \times 0.38}{4 \times (3.14) \times D^2} = \frac{0.000646}{12.56 \times D^2}$$

$$D^2 = \frac{0.000646}{12.56 \times 1}$$

$$D = \sqrt{0.000051} = 0.007 \text{ cm}$$

* Field strength used is the maximum measured peak value



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Equipment Lists

Field Strength of Emissions (Fundamental)

EN	Manufacturer	Model No.	Description	Serial No.	Due Date
1232	AGILENT / HP	8449B	PRE-AMPLIFIER, 1 - 26.5 GHz	3008A02451	3/31/2025
4029D	RETLIF	RNH	OPEN AREA TEST SITE, SVSWR, 3 Meter, 1 - 18 GHz	3 Meter VSWR	10/31/2025
5195	ETS / EMCO	3117	ANTENNA, DOUBLE RIDGED GUIDE, 1 - 18 GHz	00166762	1/31/2025
5274	ROHDE & SCHWARZ	ESW44	RECEIVER, EMI, 1 Hz - 44 GHz	103158	12/31/2024
5276	KOAXIS	AR11-KF210J-NR11-72.	CABLE, COAXIAL, DC - 18 GHz	NSN	12/31/2024
5277	KOAXIS	NR11-KF210J-NR11-240	CABLE, COAXIAL, DC - 18 GHz	NSN	12/31/2024
5288	GOVEE	H5075	HYGROMETER, 0 - 50 deg. C, 0 - 99 %RH	SY51D31404670	12/31/2024

Field Strength of Emissions (Harmonics)

EN	Manufacturer	Model No.	Description	Serial No.	Due Date
1232	AGILENT / HP	8449B	PRE-AMPLIFIER, 1 - 26.5 GHz	3008A02451	3/31/2025
3430	MCS	K-5039	ANTENNA, HORN, 18 - 26.5 GHz	14765	No Calibration Required
4029D	RETLIF	RNH	OPEN AREA TEST SITE, SVSWR, 3 Meter, 1 - 18 GHz	3 Meter VSWR	10/31/2025
5195	ETS / EMCO	3117	ANTENNA, DOUBLE RIDGED GUIDE, 1 - 18 GHz	00166762	1/31/2025
5259	DYNAWAVE	DT-NS-072	CABLE, COAXIAL, DC - 26.5 GHz	16322213	3/31/2025
5274	ROHDE & SCHWARZ	ESW44	RECEIVER, EMI, 1 Hz - 44 GHz	103158	12/31/2024
5276	KOAXIS	AR11-KF210J-NR11-72.	CABLE, COAXIAL, DC - 18 GHz	NSN	12/31/2024
5277	KOAXIS	NR11-KF210J-NR11-240	CABLE, COAXIAL, DC - 18 GHz	NSN	12/31/2024
5280	PASTERNAK	SCK0951-60	CABLE, COAXIAL, DC - 40 GHz	NSN	5/31/2024
5281	PASTERNAK	SCK0951-60	CABLE, COAXIAL, DC - 40 GHz	NSN	5/31/2024
5288	GOVEE	H5075	HYGROMETER, 0 - 50 deg. C, 0 - 99 %RH	SY51D31404670	12/31/2024

Spurious Emissions \ Out Of Band \ Band-Edge Emissions

EN	Manufacturer	Model No.	Description	Serial No.	Due Date
1232	AGILENT / HP	8449B	PRE-AMPLIFIER, 1 - 26.5 GHz	3008A02451	3/31/2025
3427B	ETS / EMCO	3104	ANTENNA, BICONICAL, 20 - 200 MHz	2315	5/31/2025
3430	MCS	K-5039	ANTENNA, HORN, 18 - 26.5 GHz	14765	No Calibration Required
4029B	RETLIF	RNH	OPEN AREA TEST SITE, ATTENUATION, 3 / 10 Meters	001	10/31/2025
4029D	RETLIF	RNH	OPEN AREA TEST SITE, SVSWR, 3 Meter, 1 - 18 GHz	3 Meter VSWR	10/31/2025
443	ELECTRO-METRICS	LPA-25	ANTENNA, LOG PERIODIC, 200 MHz - 1000 MHz	1014	7/31/2024
5195	ETS / EMCO	3117	ANTENNA, DOUBLE RIDGED GUIDE, 1 - 18 GHz	00166762	1/31/2025
5211	COM-POWER	CGO-501	GENERATOR, COMB, 1 MHz - 1 GHz	271123	5/31/2024
5242	TELEDYNE MICROWAVE	PR90-195-1275, 106'	CABLE, COAXIAL, 10 kHz - 6 GHz	N/A	9/30/2024
5259	DYNAWAVE	DT-NS-072	CABLE, COAXIAL, DC - 26.5 GHz	16322213	3/31/2025
5274	ROHDE & SCHWARZ	ESW44	RECEIVER, EMI, 1 Hz - 44 GHz	103158	12/31/2024
5276	KOAXIS	AR11-KF210J-NR11-72.	CABLE, COAXIAL, DC - 18 GHz	NSN	12/31/2024
5277	KOAXIS	NR11-KF210J-NR11-240	CABLE, COAXIAL, DC - 18 GHz	NSN	12/31/2024
5280	PASTERNAK	SCK0951-60	CABLE, COAXIAL, DC - 40 GHz	NSN	5/31/2024
5281	PASTERNAK	SCK0951-60	CABLE, COAXIAL, DC - 40 GHz	NSN	5/31/2024
5288	GOVEE	H5075	HYGROMETER, 0 - 50 deg. C, 0 - 99 %RH	SY51D31404670	12/31/2024



Retlif Testing Laboratories

Report No. R-6894H-1

**Field Strength of Emissions - Fundamental Field Strength
Test Data**



Retlif Testing Laboratories

Report No. R-6894H-1

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET

Test Method	Field Strength of Emissions - Fundamental Field Strength
Customer	DEKA Research & Development Corporation
Job Number	R-6894H-1
Test Sample	Twist Pump
Part Number	DKPI-21055-007 Config. P17F
Serial Number	24020011M
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(a)
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	April 15 th , 2024

Notes: Test Distance: 3 meters Detector: Peak Resolution BW: 1MHz
 No Duty Cycle Correction applied to the Peak Reading, EUT unable to transmit single pulse train at a defined Frequency.

TEST PARAMETERS

Frequency	Antenna Position	Measured level	Correction Factor	Corrected Peak Reading	Duty Cycle Factor	Peak Reading	Converted Peak Reading	Average Limit at 3m
MHz	H/V	dBuV	dB	dBuV/m	dB	dBuV/m	mV/m	mV/m
2402	V	93.07	0.13	93.20	0.00	93.20	45.71	50
2440	H	92.80	0.20	93.00	0.00	93.00	44.67	50
2480	V	92.12	0.28	92.40	0.00	92.40	41.69	50

TEST PARAMETERS

Frequency	Antenna Position	Measured level	Correction Factor	Corrected Peak Reading			Converted Peak Reading	Peak Limit at 3m
MHz	H/V	dBuV	dB	dBuV/m			mV/m	mV/m
2402	V	93.07	0.13	93.20			45.71	500
2440	H	92.80	0.20	93.00			44.67	500
2480	V	92.12	0.28	92.40			41.69	500

Peak Limit is 20dB higher than the Average limit.



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**Field Strength of Harmonics
Test Data**



Retlif Testing Laboratories

Report No. R-6894H-1

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET

Test Method	Field Strength of Harmonics
Customer	DEKA Research & Development Corporation
Job Number	R-6894H-1
Test Sample	Twist Pump
Part Number	DKPI-21055-007 Config. P17F
Serial Number	24020011M
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(a)
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	April 15 th , 2024

Notes: Test Distance: 3 meters Detector: Peak (Ambient Measurements use Average Detector)
 No Duty Cycle Correction applied to the Peak Reading, EUT unable to transmit single pulse train at a defined Frequency.

TEST PARAMETERS

Test Frequency	Antenna Position	EUT Orientation	Peak Reading	Duty Cycle Correction	Corrected Reading		Converted Peak Reading	Average Limit at 3M
MHz	(H/V)	X/Y/Z	dBuV	dB	dBuV/m		uV/m	uV/m
1000.00	-	-	-	-	-		-	500.00
	-	-	-	-	-		-	
	-	-	-	-	-		-	
4804.00*	H	Y	32.20	-	32.20		40.74	
7440.00	V	X	51.10	-	51.10		358.92	
9608.00*	H	Y	38.40	-	38.40		83.18	
12010.00*	H	Y	42.20	-	42.20		128.83	
14412.00*	H	Y	44.40	-	44.40		165.96	
16814.00*	H	Y	48.60	-	48.60		269.15	
19216.00*	H	Y	39.80	-	39.80		97.72	
21618.00*	H	Y	40.60	-	40.60		107.15	
24020.00*	H	Y	41.90	-	41.90		124.45	
	-	-	-	-	-		-	
	-	-	-	-	-		-	
25000.00	-	-	-	-	-		-	500.00

EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. *Indicates Ambient Reading (Average Detector)



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**Field Strength of Spurious Emissions \ Out Of Band \ Band-Edge Emissions
30 MHz to 25 GHz
Test Data**



Retlif Testing Laboratories

Report No. R-6894H-1

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET

Test Method	Field Strength of Spurious Emissions 30 MHz to 1 GHz
Customer	DEKA Research & Development Corporation
Job Number	R-6894H-1
Test Sample	Twist Pump
Part Number	DKPI-21055-007 Config. P17F
Serial Number	24020011M
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(d), 15.209
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	April 15 th , 2024

Notes: Test Distance: 3 meters Detector: Quasi-Peak

TEST PARAMETERS

Frequency	Antenna Position	EUT Orientation	Meter Reading	Correction Factor	Corrected Reading			Limit at 3M
MHz	(H/V) / Height	Degrees	dBuV	dB	dBuV/m			dBuV/m
30.00	-	-	-	-	-			40.0
	-	-	-	-	-			
35.00	V-1m	0.0	7.16	12.34	19.50	*		
	-	-	-	-	-			
88.00	-	-	-	-	-			40.0
88.00	-	-	-	-	-			43.5
	-	-	-	-	-			
110.00	V-1m	0.0	8.25	14.35	22.60	*		
195.00	V-1m	0.0	9.34	19.36	28.70	*		
205.00	H-1m	0.0	4.65	18.05	22.70	*		
	-	-	-	-	-			
216.00	-	-	-	-	-			43.5
216.00	-	-	-	-	-			46.0
	-	-	-	-	-			
600.00	H-1m	0.0	9.36	23.54	32.90	*		
	-	-	-	-	-			
960.00	-	-	-	-	-			46.0
960.00	-	-	-	-	-			54.0
	-	-	-	-	-			
995.00	H-1m	0.0	9.79	30.71	40.50	*		
	-	-	-	-	-			
1000.00	-	-	-	-	-			54.0

EUT emissions within 10 dB of the specified test limit were evaluated at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).



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RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET

Test Method	Field Strength of Spurious Emissions 1 GHz to 25 GHz
Customer	DEKA Research & Development Corporation
Job Number	R-6894H-1
Test Sample	Twist Pump
Part Number	DKPI-21055-007 Config. P17F
Serial Number	24020011M
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(d), 15.209
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	April 15 th , 2024

Notes: Test Distance: 3 meters Detector: Average

Emissions at the band edges were measured to be more than 10 dB below the specified limit in 15.209.

TEST PARAMETERS

Frequency	Antenna Position	EUT Orientation	Meter Reading	Correction Factor	Corrected Reading			Average Limit at 3M
MHz	(H/V) / Height	Degrees	dBuV	dB	dBuV/m			dBuV/m
1000.00	-	-	-	-	-			54.0
	-	-	-	-	-			
	-	-	-	-	-			
1350.00*	V	0.0	31.95	-3.95	28.00	*		
5400.00*	V	0.0	28.52	4.78	33.30	*		
12200.00*	V	0.0	31.15	11.25	42.40	*		
15800.00*	V	0.0	32.43	13.97	46.40	*		
	-	-	-	-	-			
	-	-	-	-	-			
	-	-	-	-	-			
	-	-	-	-	-			
	-	-	-	-	-			
25000.00	-	-	-	-	-			54.0

EUT emissions within 10 dB of the specified test limit were evaluated at the specified test distance throughout the given frequency spectrum. *This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).



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