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FCC Part 15 Report of Measurements

On

Unity Remote

Customer Name:	Deka Research and Development
Customer P.O:	DEKA 132937
Date of Report Rev:	June 18, 2020
Test Report No:	R-6508N-2, Rev. A
Test Start Date:	March 23, 2020
Test Finish Date:	March 24, 2020
Test Technician:	M. Seamans
Approved By:	T. Hannemann
Report Rev Prepared By:	T. Hannemann

Technical Information

Report Number:	R-6508N-2, Rev. A
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:	Unity Remote
Model Number:	DKPI-21088-001
Serial Number:	200130009
FCC ID Number:	2ATGA02
Antenna Type:	Planar Monopole Antenna Gain -10dB
Power Requirements:	5 VDC via one (1) Lithium Ion Battery, which is charged via a 120 VAC, 60 Hz USB power adapter
Frequency of Operation:	2.400 GHz to 2.4835 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: US5327

Tests Performed

The test methods performed on the EUT are shown below:

Testing Dates	Test Method	Test Results
March 23, 2020	15.249 (a) Fundamental & Harmonic Emissions	Complied
March 23, 2020	15.249 (d) Out of Band/Bandedge Emissions	Complied
March 23, 2020	15.249 (e) Peak Field Strength	Complied
March 24, 2020	15.207 (a) Conducted Emissions	Complied

Test Sample Description:
The Unity Remote provides a means of programming / controlling the insulin pump and viewing data logs. The Remote is powered by an operator chargeable – rechargeable battery. The Remote connects to a 120 VAC to 5VDC USB adapter for charging the battery. The Remote uses Bluetooth to communicate with the Pump, communication includes commands, status, configuration info, and history logs.

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

Support Equipment:

Description	Manufacturer	Part Number	Model Number	Serial Number
Laptop Computer	Compaq	N/A	Presario CQ62	N/A
AC Adapter	Deka / FOS Power	DKPI-40033-001	Aogek GPE161-050340-Z	ACEBW20200320

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 ATL-0255-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).

Revision History

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

Revision	Date	Pages Affected
-	June 9, 2020	Original Release
A	June 18, 2020	Global Changes: • Test Report No. R-6508N-1to R-6508N-1, Rev. A 7: • Added RF exposure calculations 17: • Added Conducted Emissions Test Setup Photo

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

FCC Part 15, Subpart C, Section 15.207(a), Conducted Emissions
The limits shown in Table 2 were used to determine compliance of the EUT.

Table 2 -Conducted Emissions, Test Limits

Frequency (MHz)	Quasi-Peak (dBµV)	Average (dBµV)
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

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 access 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 = 79.55 dBuV/M
d = Radiated test Measurement Distance = 3 Meters

EIRP Log = E + 20log(d) -104.7
EIRP Log= 79.55+ 20log(3) -104.7
EIRP Log = -15.61 dBm
EIRP Linear = 0.000027 W

Gain = Max Power Gain of Antenna = -10 dBi = 0.1 Numeric
Power = EIRP Linear / Gain Numeric
Power = 0.000027/0.1
Power = Max Power Input to Antenna = 0.03mW
D = Minimum Separation Distance in cm
S = Max allowed Power Density in mW/cmsq

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

$$1 \text{ mW/cmsq} = \frac{0.03 \times 0.1}{4 \times (3.14) \times D^2} = \frac{0.003}{12.56 \times D^2}$$

$$D^2 = \frac{0.003}{12.56 \times 1}$$

$$D = \sqrt{0.000239} = 0.015 \text{ cm}$$

Equipment Lists

Field Strength of Emissions

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1232	AGILENT / HP	PRE-AMPLIFIER	1 - 26.5 GHz	8449B	5/24/2019	5/31/2020
3258	ETS / EMCO	ANTENNA, DOUBLE RIDGED GUIDE	1 - 18 GHz	3115	12/2/2019	6/30/2021
4029B	RETLIF	OPEN AREA TEST SITE, ATTENUATION	3 / 10 Meters	RNH	9/30/2019	9/30/2021
5070	ROHDE & SCHWARZ	RECEIVER, EMI	20 Hz - 40 GHz	ESIB40	1/23/2020	1/31/2021
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1-036050U50U	11/6/2019	11/30/2020
5242	TELEDYNE MICROWAVE	CABLE, COAXIAL	10 kHz - 6 GHz	PR90-195-1275, 106'	9/12/2019	9/30/2020

Out of Band/Bandedge Emissions

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1232	AGILENT / HP	PRE-AMPLIFIER	1 - 26.5 GHz	8449B	5/24/2019	5/31/2020
3258	ETS / EMCO	ANTENNA, DOUBLE RIDGED GUIDE	1 - 18 GHz	3115	12/2/2019	6/30/2021
3427B	ETS / EMCO	ANTENNA, BICONICAL	20 - 200 MHz	3104	4/25/2019	10/31/2020
3430	MCS	ANTENNA, HORN	18 - 26.5 GHz	K-5039	No Calibration Required	
4029B	RETLIF	OPEN AREA TEST SITE, ATTENUATION	3 / 10 Meters	RNH	9/30/2019	9/30/2021
443	ELECTRO-METRICS	ANTENNA, LOG PERIODIC	200 MHz - 1000 MHz	LPA-25	12/13/2019	6/29/2021
5070	ROHDE & SCHWARZ	RECEIVER, EMI	20 Hz - 40 GHz	ESIB40	1/23/2020	1/31/2021
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1-036050U50U	11/6/2019	11/30/2020
5234	PASTERNACK	CABLE, COAXIAL	10 kHz - 18 GHz	PE302-230	8/14/2019	8/31/2020
5242	TELEDYNE MICROWAVE	CABLE, COAXIAL	10 kHz - 6 GHz	PR90-195-1275, 106'	9/12/2019	9/30/2020

Field Strength of Harmonics

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1232	AGILENT / HP	PRE-AMPLIFIER	1 - 26.5 GHz	8449B	5/24/2019	5/31/2020
3258	ETS / EMCO	ANTENNA, DOUBLE RIDGED GUIDE	1 - 18 GHz	3115	12/2/2019	6/30/2021
3430	MCS	ANTENNA, HORN	18 - 26.5 GHz	K-5039	No Calibration Required	
4029B	RETLIF	OPEN AREA TEST SITE, ATTENUATION	3 / 10 Meters	RNH	9/30/2019	9/30/2021
5070	ROHDE & SCHWARZ	RECEIVER, EMI	20 Hz - 40 GHz	ESIB40	1/23/2020	1/31/2021
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1-036050U50U	11/6/2019	11/30/2020
5229	FLORIDA RS TECHNOLOGY	CABLE, COAXIAL	DC - 40 GHz	FLRST-2.92 (102ö)	11/1/2019	11/30/2020
5234	PASTERNACK	CABLE, COAXIAL	10 kHz - 18 GHz	PE302-230	8/14/2019	8/31/2020

Conducted Emissions

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
5070	ROHDE & SCHWARZ	RECEIVER, EMI	20 Hz - 40 GHz	ESIB40	1/23/2020	1/31/2021
5134	NARDA MICROWAVE	ATTENUATOR, COAXIAL	10 dB, DC - 12.4 GHz, 2 W	757C-10	12/13/2019	12/31/2020
5209	SOLAR ELECTRONICS	LISN	50 uH, 150 kHz - 30 MHz	21106-50-BP-25-BNC	5/16/2019	5/31/2020
5210	SOLAR ELECTRONICS	LISN	50 uH, 150 kHz - 30 MHz	21106-50-BP-25-BNC	5/16/2019	5/31/2020
5218	COM-POWER	GENERATOR, COMB	100 kHz - 400 MHz	CGC-510E	8/20/2019	8/31/2020
5250	DIGI-SENSE	HYGROMETER	0 - 50 deg. c, 10 - 90 % RH	20250-30	10/7/2019	10/31/2020

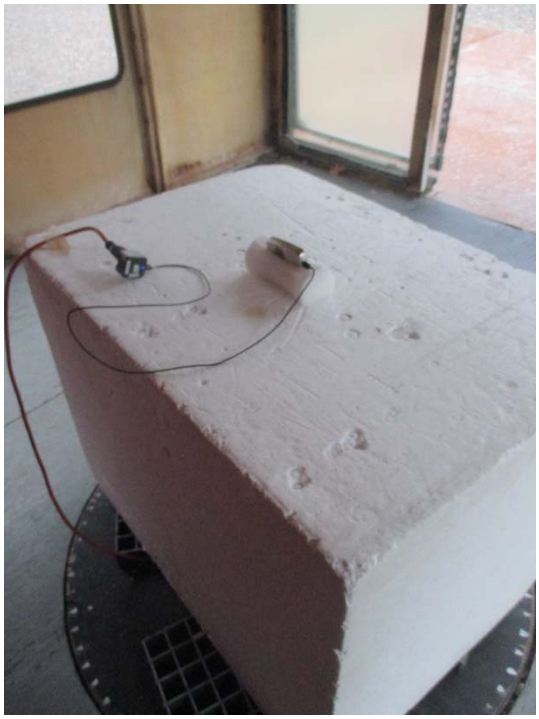
Test Setup Photographs

Test Setup Photographs
Field Strength of Emissions

Horizontal Antenna Polarization

Vertical Antenna Polarization

Test Setup Photographs
Field Strength of Spurious Emissions and Harmonics



EUT Configuration

Test Setup Photographs
Field Strength of Spurious Emissions and Harmonics

30 to 200 MHz, Horizontal Antenna Polarization

30 to 200 MHz, Vertical Antenna Polarization

Test Setup Photographs
Field Strength of Spurious Emissions and Harmonics

200 MHz to 1 GHz, Horizontal Antenna Polarization

200 MHz to 1 GHz, Vertical Antenna Polarization

Test Setup Photographs
Field Strength of Spurious Emissions and Harmonics

1 to 18 GHz, Horizontal Antenna Polarization

1 to 18 GHz, Vertical Antenna Polarization

Test Setup Photographs
Field Strength of Spurious Emissions and Harmonics

18 to 26.5 GHz, Horizontal Antenna Polarization

18 to 26.5 GHz, Vertical Antenna Polarization

Test Setup Photographs
Conducted Emissions

Test Setup

FCC Section 15.249(a)
Field Strength of Emissions
Test Data

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET	
Test Method	**Field Strength of Emissions - Fundamental Field Strength**
Customer	DEKA Research and Development
Job Number	R-6508N-2
Test Sample	Unity Remote
Part Number	DKPI-21088-001
Serial Number	200130009
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(a)
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	March 23rd, 2020

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	77.92	1.63	79.55	0.00	79.55	9.495	50
2440	V	73.12	2.56	75.68	0.00	75.68	6.081	50
2480	V	73.34	3.52	76.86	0.00	76.86	6.966	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	77.92	1.63	79.55			9.495	500
2440	V	73.12	2.56	75.68			6.081	500
2480	V	73.34	3.52	76.86			6.966	500

Peak Limit is 20dB higher than the Average limit.

FCC Section 15.249(a)
Field Strength of Harmonics
Test Data

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET	
Test Method	**Field Strength of Harmonics**
Customer	DEKA Research and Development
Job Number	R-6508N-2
Test Sample	Unity Remote
Part Number	DKPI-21088-001
Serial Number	200130009
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(a)
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	March 23rd, 2020

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	35.21	-	35.21		57.61	|
7206.00*	H	Y	39.27	-	39.27		91.94	|
9608.00*	H	Y	42.30	-	42.30		130.32	|
12010.00*	H	Y	46.06	-	46.06		213.80	|
14412.00*	H	Y	49.84	-	49.84		310.46	|
16814.00*	H	Y	50.65	-	50.65		340.80	|
19216.00*	H	Y	28.55	-	28.55		26.76	|
21618.00*	H	Y	28.41	-	28.41		26.33	|
24020.00*	H	Y	29.20	-	29.20		28.84	|
|	-	-	-	-	-		-	|
|	-	-	-	-	-		-	|
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)

FCC Section 15.249(d)
Out of Band/Bandedge Emissions
Test Data

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET	
Test Method	**Out of Band/Bandedge Emissions 30 MHz to 1 GHz**
Customer	DEKA Research and Development
Job Number	R-6508N-2
Test Sample	Unity Remote
Part Number	DKPI-21088-001
Serial Number	200130009
Test Specification	FCC Part 15, Subpart C Paragraph: 15.249(d), 15.209
Operating Mode	Transmitting Bluetooth Signal
Technician	M. Seamans
Date	March 23rd, 2020

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
|	-	-	-	-	-			|
38.00*	V-1m	0.0	11.75	12.35	24.10	*		|
|	-	-	-	-	-			|
88.00	-	-	-	-	-			40.0
88.00	-	-	-	-	-			43.5
|	-	-	-	-	-			|
115.00*	V-1m	0.0	8.34	14.56	22.90	*		|
130.00*	V-1m	0.0	6.53	14.67	21.20	*		|
170.00*	V-1m	0.0	8.24	17.26	25.50	*		|
|	-	-	-	-	-			|
216.00	-	-	-	-	-			43.5
216.00	-	-	-	-	-			46.0
|	-	-	-	-	-			|
611.00*	V-1m	0.0	6.81	23.49	30.30	*		|
|	-	-	-	-	-			|
960.00	-	-	-	-	-			46.0
960.00	-	-	-	-	-			54.0
|	-	-	-	-	-			|
975.00*	V-1m	0.0	7.89	29.71	37.60	*		|
|	-	-	-	-	-			|
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).

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET		
Test Method	**Out of Band/Bandedge Emissions 1 GHz to 25 GHz**	
Customer	DEKA Research and Development	
Job Number	R-6508N-2	
Test Sample	Unity Remote	
Part Number	DKPI-21088-001	
Serial Number	200130009	
Test Specification	FCC Part 15, Subpart C	Paragraph: 15.249(d), 15.209
Operating Mode	Transmitting Bluetooth Signal	
Technician	M. Seamans	
Date	March 23rd, 2020	

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
|	-	-	-	-	-			|
|	-	-	-	-	-			|
7206.00*	H	0.0	32.02	7.25	39.27	*		|
9608.00*	H	0.0	32.19	10.11	42.30	*		|
12010.00*	H	0.0	32.41	13.65	46.06	*		|
14412.00*	H	0.0	32.76	17.08	49.84	*		|
|	-	-	-	-	-			|
|	-	-	-	-	-			|
|	-	-	-	-	-			|
|	-	-	-	-	-			|
|	-	-	-	-	-			|
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).

Conducted Emissions
150 kHz to 30 MHz
Test Data

EMISSIONS TEST DATA SHEET

Test Specification:	FCC Part 15, Subpart C, Section 15.207(a), Conducted Emissions
Method:	ANSI C63.4, Section 7., AC power-line conducted emission measurements
Job Number/Customer:	R-6508N-2 / DEKA Research and Development
Test Sample:	Unity Remote
Part Number:	DKPI-21088-001
Serial Number:	200130009
Operating Mode:	Transmitting Bluetooth signal, AC Adapter charging Remote and two batteries
Technician:	M. Seamans
Date(s):	March 24th, 2020
Temperature:	21.4 ºC
Relative Humidity:	25.0 %
Lead Tested:	120 VAC 60 Hz

Frequency	Lead Tested	Peak Meter Reading	Quasi-Peak Meter Reading	Average Meter Reading	Quasi-Peak Limit	Average Limit
MHz		**dBuV**	**dBuv**	**dBuV**	**dBuV**	**dBuV**
0.228	Hot	35.67	34.80	31.10	62.56	52.56
0.150	Neutral	39.13	38.30	33.60	66.00	56.00
0.411	Hot	46.96	46.80	42.90	57.63	47.63
0.411	Neutral	44.89	43.60	38.80	57.63	47.63
0.538	Hot	35.44	34.20	30.50	56	46
0.506	Neutral	36.30	34.90	31.40	56	46
0.808	Hot	36.90	34.30	31.30	56	46
0.664	Neutral	35.80	32.60	28.70	56	46
1.184	Hot	34.80	33.40	29.20	56	46
9.748	Neutral	31.11	30.20	24.00	60	50
9.721	Hot	29.11	26.60	22.80	60	50
15.422	Neutral	27.57	25.10	20.10	60	50

The frequency range was scanned from 0.15 MHz to 30 MHz.
The six highest emissions relative to the limit are presented.
The emissions observed from the EUT do not exceed the specified limits.