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DATE: 24 November 2016

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Orpak Systems Ltd.

Equipment under test:

Outdoor Payment Terminal

OrPAY1000
(125kHz Transceiver)

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

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This report relates only to items tested.

Measurement/Technical Report for

Orpak Systems Ltd.

Outdoor Payment Terminal

OrPAY1000

FCC ID: W8F800927850

This report concerns:	Original Grant:	X
	Class I Change:	
	Class II Change:	

Equipment type: Part 15 Low Power Transmitter Below 1705 kHz

Limits used: 47CFR15 Section 15.209

Measurement procedure used ANSI C.63.10 2013

Application for Certification prepared by:

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1. General Information

1.1 Administrative Information

Manufacturer:	Orpak Systems Ltd.
Manufacturer's Address:	31 Lechi St. P.O.B. 1461 Bnei-Brak, 51114 Israel Tel: +972-3-577-6868 Fax: +972-3-579-6310
Manufacturer's Representative:	Yair Elul
Equipment Under Test (E.U.T):	Outdoor Payment Terminal
Equipment Model No.:	OrPAY1000
Equipment Part No.:	1021266
Date of Receipt of E.U.T:	07.08.2016
Start of Test:	07.08.2016
End of Test:	18.08.2016
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Bat Sheva St., LOD 7120101 ISRAEL
Test Specifications:	FCC Part 15, Subpart C, Section 15.209

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Sites No. IC 4025A-1, 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The OrPAY 1000 is a cost-effective outdoor payment terminal installed directly onto the dispenser or wall mounted next to it for both attended and unattended activities.

The terminal's unique features have been designed to suit both retail and commercial fleet markets as an impeccable pay-at-the-pump solution for fuel card purchases, forecourt promotions, local accounts, loyalty schemes, attendant management, and much more.

In addition, OrPAY1000 has a built-in 'pump interface', allowing it to control the dispenser as well as interface directly with Orpak's forecourt controller over LAN, eliminating the need for dedicated pump interface hardware.

The OrPAY 1000 terminal is small enough to fit in any standard pump head or pedestal, yet provides an efficient and advanced user interface with its 4.3" multimedia color LCD display, 4 addressable screen keys, and a full alphanumeric vandal proof 40-key keyboard. Furthermore, the novel terminal can be part of Orpak's ForeFuel solution with its built-in WGT (Wireless Gateway).

Model name	Orpay 1000
Working voltage	12.0-24.0V DC via AC/DC adapter Manufactory: mean well Order num: GS40A24-P1j s/n : EB58E77878
Mode of operation	Transceiver
Assigned Frequency Range	N/A
Operation Frequency Range	125kHz

1.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation No. IL1005.

1.6 Measurement Uncertainty

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):
± 4.98 dB

2. System Test Configuration

2.1 Justification

The E.U.T was transmitting continuously at 125kHz with modulation in installation position as described by the customer.

2.2 EUT Exercise Software

No special exercise software was needed.

2.3 Special Accessories

No accessories were used.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

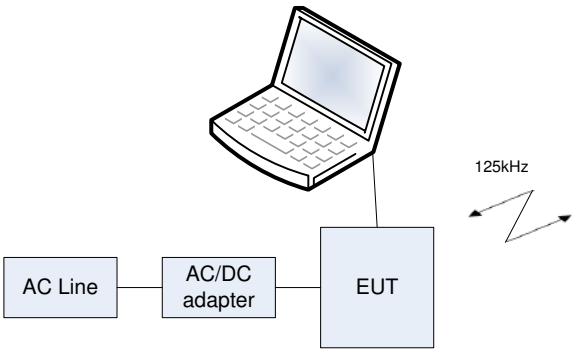

Figure 1. Configuration of Tested System

3. Conducted & Radiated Measurement Test Setup Photos

Figure 2. Conducted Emission from AC Mains Test Setup

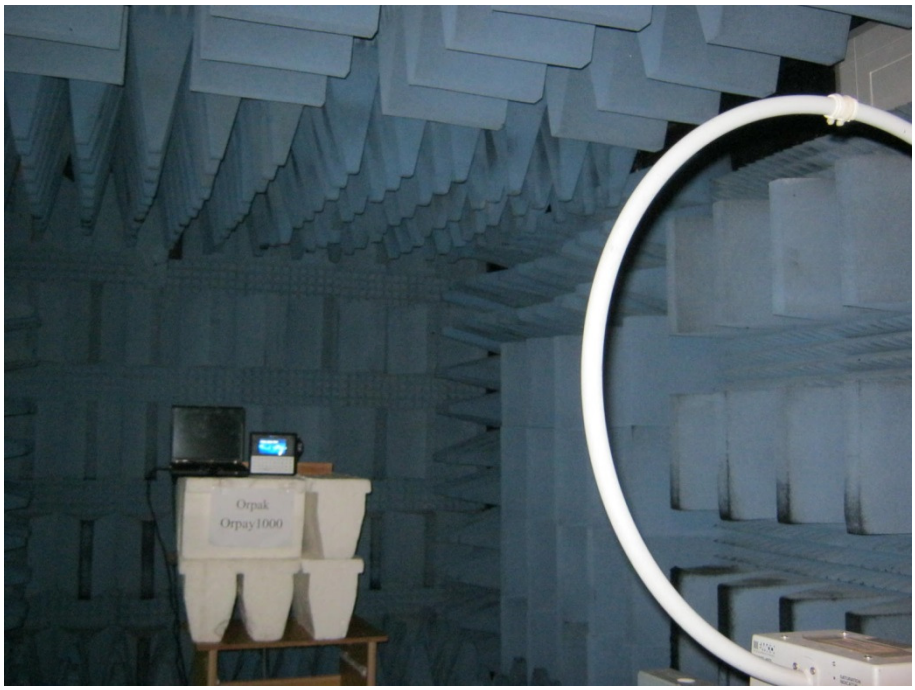

Figure 3. Radiated Emission Test Setup 125 kHz

4. Conducted Emission From AC Mains

4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207

4.2 Test Procedure

(Temperature (22°C)/ Humidity (60%RH))

The E.U.T operation mode and test setup are as described in Section 2 of this report. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on a 0.8 meter high wooden table, 0.4 meter from the room's vertical wall. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in the photograph, *Figure 2. Conducted Emission from AC Mains Test Setup.*

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver and are displayed on the receiver's spectrum display.

The E.U.T was tested while transmitting simultaneously at ZIGBEE, 125 kHz and 13.56 MHz.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Test Limit

Frequency of emission (MHz)	**Conducted limit (dBµV)**	
	Quasi-peak	Average
0.15-0.5	66.0 to 56.0*	56.0 to 46.0*
0.5-5.0	56.0	46.0
5.0-30.0	60.0	50.0

* Decreases with the logarithm of the frequency.

4.4 Test Results

JUDGEMENT: Passed by 2.76 dB

The margin between the emission levels and the specification limit is, in the worst case, 2.8 dB for the phase line at 0.41 MHz and 3.8 dB at 0.41 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 4* to *Figure 7*.

Conducted Emission

E.U.T Description	Outdoor Payment Terminal
Type	OrPAY1000
Serial Number:	1021266

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors: :	Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2	Average	206 kHz	44.40	-8.95
1	Quasi Peak	210 kHz	52.44	-10.76
1	Quasi Peak	410 kHz	54.88	-2.76
2	Average	410 kHz	43.09	-4.55
1	Quasi Peak	450 kHz	49.74	-7.13
2	Average	454 kHz	35.50	-11.30
2	Average	1.13 MHz	29.69	-16.30
1	Quasi Peak	1.146 MHz	40.79	-15.20
1	Quasi Peak	1.554 MHz	39.13	-16.86
2	Average	1.666 MHz	28.93	-17.06
2	Average	2.178 MHz	26.10	-19.89
1	Quasi Peak	2.878 MHz	30.83	-25.16
1	Quasi Peak	4.13 MHz	30.00	-25.99
2	Average	4.182 MHz	25.84	-20.15
2	Average	10.322 MHz	26.54	-23.45
1	Quasi Peak	10.358 MHz	30.16	-29.83
1	Quasi Peak	13.57 MHz	32.22	-27.77
2	Average	13.57 MHz	27.10	-22.89
2	Average	17.682 MHz	25.95	-24.04
1	Quasi Peak	18.55 MHz	29.13	-30.86

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Figure 4. Detectors: Peak, Quasi-peak, Average

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	Outdoor Payment Terminal
Type	OrPAY1000
Serial Number:	1021266

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Average

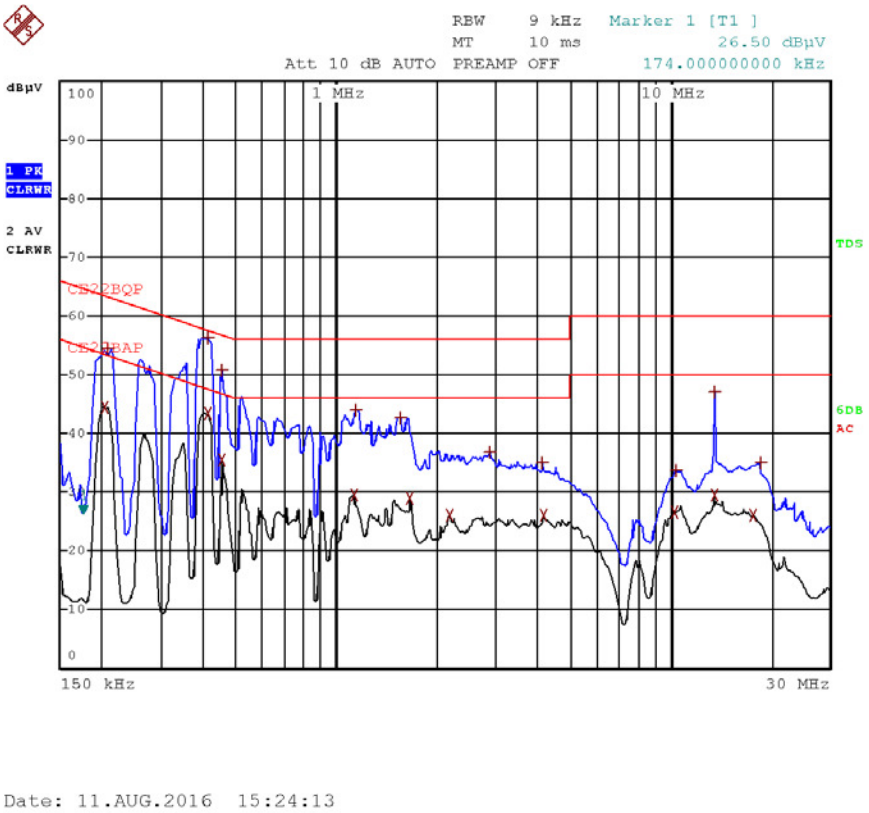

Figure 5. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description	Outdoor Payment Terminal
Type	OrPAY1000
Serial Number:	1021266

Specification:	FCC Part 15, Subpart C
Lead:	Neutral
Detectors:	Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2	Average	202 kHz	43.66	-9.86
1	Quasi Peak	214 kHz	50.58	-12.46
2	Average	394 kHz	42.48	-5.49
1	Quasi Peak	410 kHz	53.88	-3.75
1	Quasi Peak	450 kHz	48.80	-8.07
2	Average	454 kHz	34.58	-12.22
2	Average	1.13 MHz	28.61	-17.38
1	Quasi Peak	1.162 MHz	39.92	-16.07
1	Quasi Peak	1.554 MHz	38.05	-17.94
2	Average	1.666 MHz	27.79	-18.21
2	Average	2.178 MHz	25.20	-20.79
1	Quasi Peak	2.338 MHz	32.25	-23.75
1	Quasi Peak	4.126 MHz	30.44	-25.55
2	Average	4.25 MHz	25.47	-20.53
2	Average	10.354 MHz	26.98	-23.01
1	Quasi Peak	10.394 MHz	30.88	-29.11
1	Quasi Peak	13.566 MHz	44.56	-15.43
2	Average	13.566 MHz	30.38	-19.61
2	Average	17.746 MHz	26.22	-23.77
1	Quasi Peak	18.342 MHz	30.49	-29.51

Date: 11.AUG.2016 15:20:22

Figure 6. Detectors: Peak, Quasi-peak, Average

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	Outdoor Payment Terminal
Type	OrPAY1000
Serial Number:	1021266

Specification:	FCC Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Average

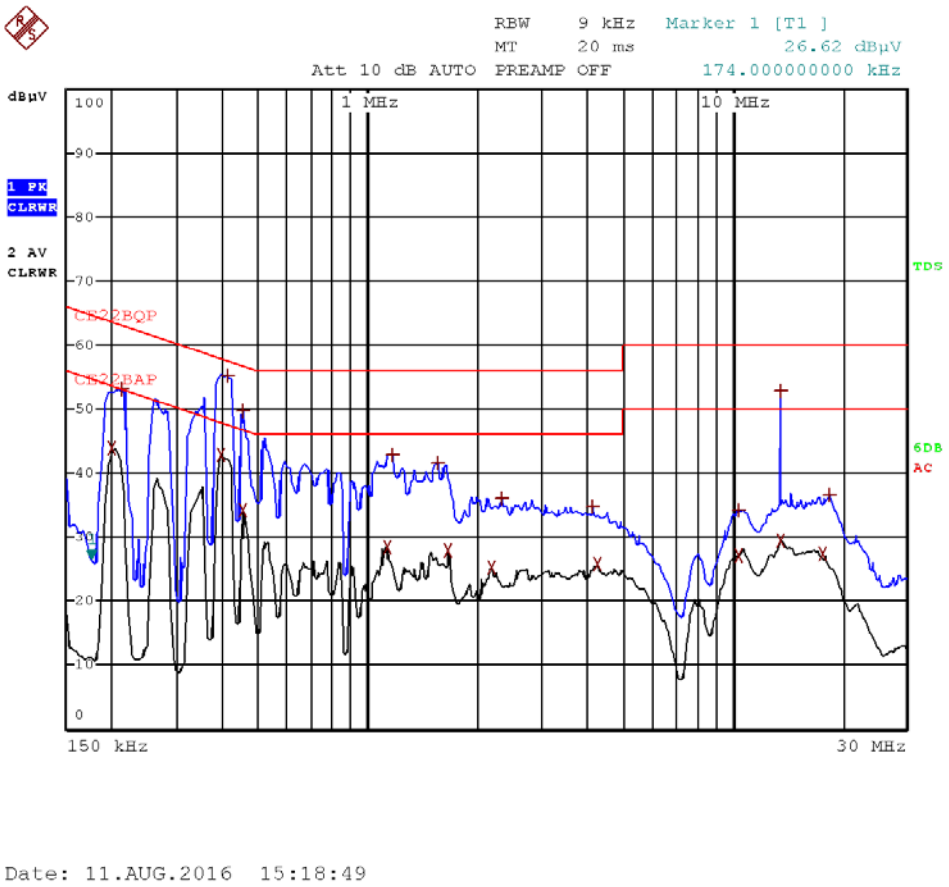

Figure 7 Detectors: Peak, Quasi-peak, Average

4.5 Test Equipment Used; Conducted Emission

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
LISN	Fischer	FCC-LISN-25A	127	June 23, 2016	June 23, 2017
Transient Limiter	HP	11947A	3107A03041	June 15, 2016	June 15, 2017
EMI Receiver	Rohde & Schwarz	ESCI7	100724	February 29, 2016	March 1, 2017

Figure 8 Test Equipment Used

5. Field Strength of Fundamental

5.1 Test Specification

Part 15, Subpart C, Section 15.209(a)

5.2 Test Procedure

(Temperature (22°C)/ Humidity (57%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 1.5 meters above the ground.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna polarity were adjusted for maximum level reading on the EMI receiver.

5.3 Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBµV/m)	Field strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

5.4 Test Results

Frequency	Pol	Peak Reading	Avg Limit	Margin
(kHz)	(V/H)	(dBµV/m)	(dBµV/m)	(dB)
125.2	V	70.5	105.6	-35.1
125.2	H	73.9	105.6	-31.7

Figure 9. Field Strength of Fundamental Test Results

JUDGEMENT: Passed by 31.7 dB

The EUT met the FCC Part 15, Subpart C, Section 15.209 requirements.

The details of the highest emissions are given in *Figure 10* to *Figure 11*.

Field Strength of Fundamental

E.U.T Description	Outdoor Payment Terminal
Model Number	OrPAY1000
Part Number:	1021266

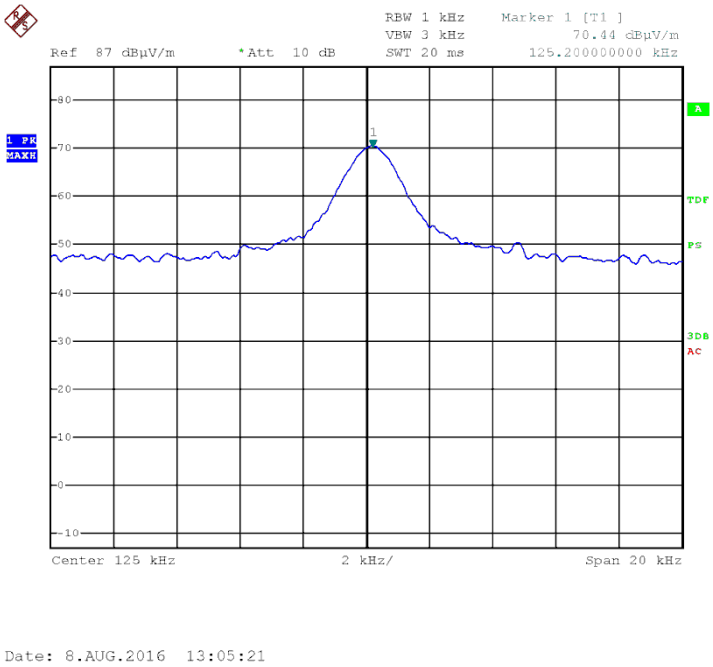

Figure 10. Field Strength of Fundamental, Vertical

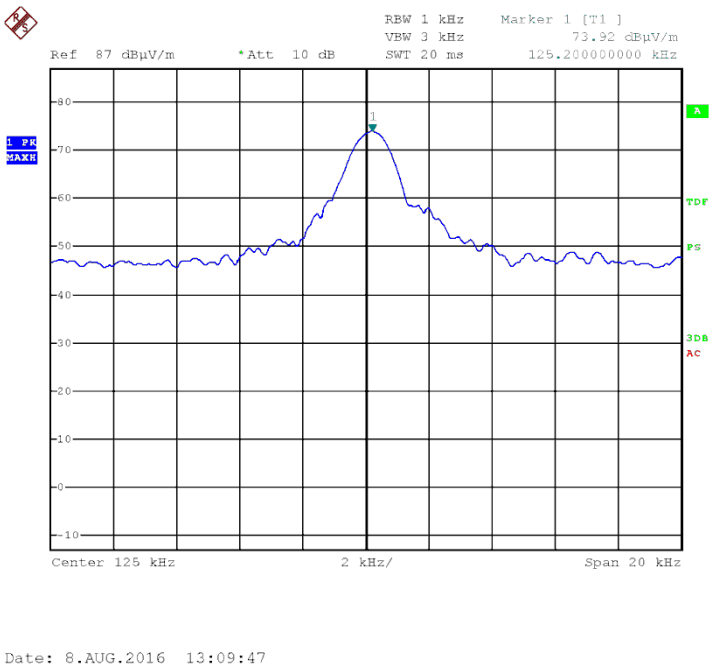

Figure 11. Field Strength of Fundamental, Horizontal

5.5 Test Instrumentation Used; Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	2950	November 5, 2015	November 30, 2016
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 12. Test Equipment Used

6. Radiated Emission, 9 kHz – 30 MHz

6.1 Test Specification

Part 15, Subpart C, Section 209(c)

6.2 Test Procedure

(Temperature (22°C)/ Humidity (58%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 1.5 meters above the ground.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna polarity were adjusted for maximum level reading on the EMI receiver.

The frequency range 9 kHz-30 MHz was scanned.

6.3 Test Limit

The level of any unwanted emissions from an intentional radiator shall not exceed the level of the fundamental emission .in addition the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBµV/m)	Field strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

6.4 Test Results

JUDGEMENT: Passed by 28.1 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

See additional information in *Figure 13*.

Radiated Emission 9 kHz – 30 MHz

E.U.T Description Outdoor Payment Terminal
Model Number OrPAY1000
Part Number: 1021266

Specification: FCC, Part 15, Subpart C;

Antenna Polarization: Horizontal/Vertical
Frequency range: 9 kHz to 30.0 MHz
Test Distance: 3 meters
Detector: Peak
Operation Frequencies: 125kHz

Frequency	Polarity	Peak Reading	Limit	Margin
(kHz)	(V/H)	(dBµV/m)	(dBµV/m)	(dB)
250.0	V	43.4	99.6	-56.2
	H	44.4	99.6	-55.2
375.0	V	47.8	96.1	-48.3
	H	49.9	96.1	-46.2
625.0	V	43.6	71.7	-28.1
	H	42.4	71.7	-29.3

Figure 13. Radiated Emission

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

6.5 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	2950	November 5, 2015	November 30, 2016
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 14. Test Equipment Used

6.6 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dBμv/m]
RA: Receiver Amplitude [dBμv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dBμV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBμV

No external pre-amplifiers are used.

7. Bandwidth for 125 kHz Transmitter

7.1 Test Specification

Part 2, Section 2.1049

7.2 Test Procedure

(Temperature (23°C)/ Humidity (58%RH))
The EUT was set up as shown in *Figure 1*.
The transmitter unit was operated with normal modulation. The spectrum analyzer span was set to ~ 3 times the OBW. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 26dBc points.

7.3 Test Limit

N/A

7.4 Test Results

FREQUENCY	READING
(kHz)	(kHz)
125.2	2.9

Figure 15. Bandwidth Test Results

JUDGEMENT: Passed

See additional information in *Figure 16*.

Bandwidth for 125 kHz

E.U.T Description	Outdoor Payment Terminal
Model Number	OrPAY1000
Part Number:	1021266

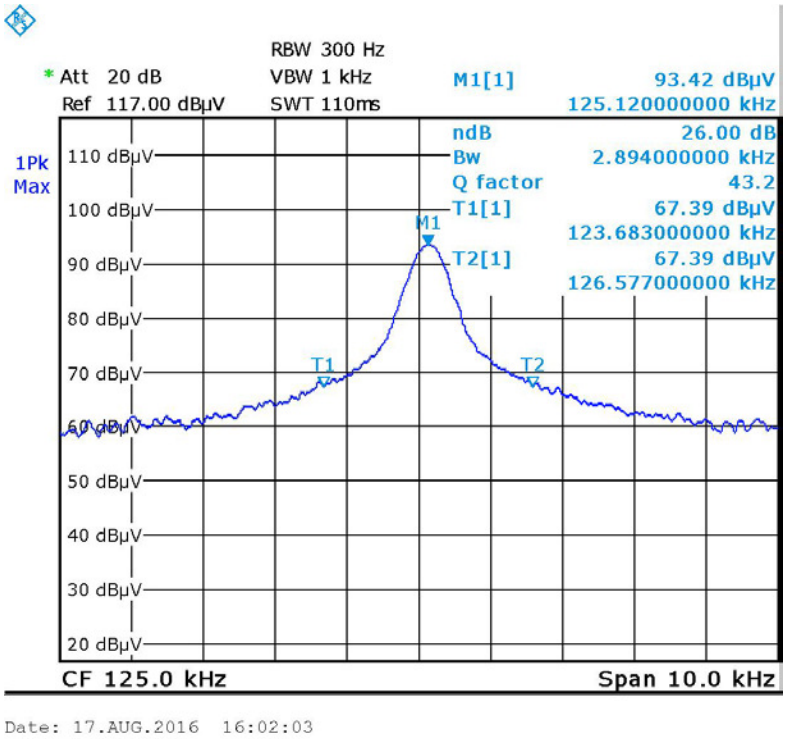

Figure 16 Bandwidth Test Results

7.5 Test Equipment Used; Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	2950	November 5, 2015	November 30, 2016
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 17 Test Equipment Used

8. APPENDIX A - CORRECTION FACTORS

8.1 Correction factors for for RF CABLE for Semi Anechoic Chamber

ITL # 1841

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

8.2 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

f(MHz)	MAF(dBs/m)	AF(dB/m)
0.01	-33.1	18.4
0.02	-37.2	14.3
0.03	-38.2	13.3
0.05	-39.8	11.7
0.1	-40.1	11.4
0.2	-40.3	11.2
0.3	-40.3	11.2
0.5	-40.3	11.2
0.7	-40.3	11.2
1	-40.1	11.4
2	-40	11.5
3	-40	11.5
4	-40.1	11.4
5	-40.2	11.3
6	-40.4	11.1
7	-40.4	11.1
8	-40.4	11.1
9	-40.5	11
10	-40.5	11
20	-41.5	10
30	-43.5	8