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TEST REPORT

Report Number	200500063SEL-TEL2
Applicant Name / Address	Sungshin Hasco, Ltd.
	65, Gongdan 7-ro, Jillyang-eup, Gyeongsan-si, Gyeongbuk-do, South Korea, 38465
Test Sample Description	
- Product name	Digital Manifold Gauge
- Model and/or Brand name	MDM008A
- FCC ID.....	2AWRJMDM008A
- Manufacturer Name	Sungshin Hasco, Ltd.
- Manufacturer Address	65, Gongdan 7-ro, Jillyang-eup, Gyeongsan-si, Gyeongbuk-do, South Korea, 38465
- Variant model Name	N/A
Date of receipt of sample(s)	12 May. 2020
Date of Test	01 Jul. 2020 - 02 Jul. 2020
Test standard(s)	CFR 47 Part 2.1091
Test Results & uncertainty	See Summary
Issue date	07 Jul. 2020

Note 1. The results shown in this test report refer only to the sample(s) tested.

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Tested by

Name : Criss.Lee
RF Engineer

Approved by

Name : Bran.Ko
RF Technical Manager

Intertek ETL SEMKO Korea Ltd.

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SECTION 2 GENERAL DESCRIPTION

1. Laboratory Information

Name	Intertek ETL SEMKO Korea Ltd.
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2. Applicant Information

Name	Sungshin Hasco, Ltd.
Address	65, Gongdan 7-ro, Jillyang-eup, Gyeongsan-si, Gyeonbuk-do, South Korea, 38465
Contact Person	Shin Kyong Seob
Phone No.	+82 10 8788 0922

3. Description of EUT

Product name	Digital Manifold Gauge
Model name	MDM008A
Serial No.	-
Manufacturer	Sungshin Hasco, Ltd.
Country of Manufacture	Republic of Korea
Rated Voltage	DC 6.0 V (Battery)
Approved RF Module	Model: BMD-300
Approved Module FCC ID	2AA9B04(**Note**[1])
Frequency Range	2 402 MHz ~ 2 480 MHz (GFSK 1 Mbps, 2 Mbps)
Modulation Technique	GFSK
Number of Channel	40 CH
Antenna Type	Integral Antenna
Antenna Gain	-3.30 dBi (BMD-300)
Transmit Power	90.62 dBuV/m (Peak)
H/W Version	-
S/W Version	-
RF Power Setting Parameter	Default (0 dBm)

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4. Test Instrument

Control No.	Equipment	Manufacturer	Model	Serial No.	Cal. Due.
EMC001	EMI Test Receiver	Rohde & Schwarz	ESU40	100478	2021/1/3
EMC002	EMI Test Receiver	Rohde & Schwarz	ESU26	100590	2021/1/2
EMC003	Open Switch and Control Platform	Rohde & Schwarz	OSP130	101467	N/A
EMC009	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100465	2021/1/9
EMC025	Biconilog (Type7)	ETS-Lindgren	3142E	00203547	2021/12/6
EMC028	DRG Horn (Medium)	ETS-Lindgren	3117	00201915	2020/11/15
EMC031	Standard Gain Horn	ETS-Lindgren	3160-09	LM9860	2021/5/12
EMC074	AMP	Rohde & Schwarz	SCU-01D	1904843	2021/6/22
EMC077	AMP	Rohde & Schwarz	SCU-18D	1952128	2021/6/22
EMC079	AMP	Rohde & Schwarz	SCU-26D	1879069	2021/6/22
EMC122	Programmable controller	PACIFIC smartsource	UPC12	N/A	2021/6/24
RF003	VECTOR SIGNAL GENERATOR	Rohde & Schwarz	SMBV100A	261569	2021/6/22
RF004	SIGNAL GENERATOR	Rohde & Schwarz	SMB100A	178493	2021/1/3
RF005	SPECTRUM ANALYZER	Rohde & Schwarz	FSW43	103893	2021/6/23
RF010	ATTENUATOR	WEINSCHEL	10 dB	TEMPNO.4824	2021/6/22
RF018	Notch Rf filter	Micro-Tronics	BRM50702-02	G043	2021/6/23
RF022	System DC Power Supply	KEYSIGHT	N5747A	US16D4132P	2021/6/22
41	Softwarer	Rohde & Schwarz	EMC32	Ver10.30.00	N/A

5. Support Equipment

Description	Manufacturer	Model	Serial No.
Note-PC	Samsung Electronics Co., Ltd.	NT500R5Q	0HV991BH500176W

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6. Channel List

Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
0	2 402	20	2 442
1	2 404	21	2 444
2	2 406	22	2 446
3	2 408	23	2 448
4	2 410	24	2 450
5	2 402	25	2 452
6	2 414	26	2 454
7	2 416	27	2 456
8	2 418	28	2 458
9	2 420	29	2 460
10	2 422	30	2 480
11	2 424	31	2 464
12	2 426	32	2 466
13	2 428	33	2 468
14	2 430	34	2 470
15	2 432	35	2 472
16	2 434	36	2 474
17	2 436	37	2 476
18	2 438	38	2 478
19	2 440	39	2 480

7. Test Condition

Mode	Test Frequency(MHz)		
	Lowest	Middle	Highest
GFSK	2 402	2 440	2 480

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SECTION 3 SUMMARY

1. Summary of test results

Requirements	FCC Rule	IC Rule	Compliance
RF Exposure evaluation	1.1310 2.1091	RSS-102 Issue5	Complied

2. Measurement Uncertainty

Parameters	Uncertainty (k = 2)	
Maximum Peak Conducted Output Power	1.66 dB	
Power Spectral Density	1.32 dB	
Channel Bandwidth	4.69 kHz	
Spurious Emissions (Conducted)	1.32 dB	
Spurious Emissions (Radiated)	9 kHz to 30 MHz	4.5 dB
	30 MHz to 1 GHz	4.6 dB
	1 GHz to 6 GHz	5.6 dB
	6 GHz to 18 GHz	5.8 dB
	18 GHz to 26 GHz	4.5 dB

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SECTION 4 TEST RESULT

1. MPE Evaluation of Mobile Device

1.1 Rule

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure		
300-1,500	f/300	6
1,500-100,000	5	6
(B) Limits for General Population/Uncontrolled Exposure		
300-1,500	f/1500	30
1,500-100,000	1.0	30

Note) f = Frequency in MHz

IC RSS-102 Issue5 Limit

Frequency range (MHz)	Power density (W/m^2)	Averaging time (minutes)
RF Field Strength Limits for Controlled Use Devices (Controlled Environment)		
100-6000	$0.6455f^{0.5}$	6
6000-15000	50	6
RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)		
300-6000	$0.02619f^{0.6834}$	6
6000-15000	10	6

Note) f = Frequency in MHz

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4*pi*r^2)

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 mW/cm^2. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

1.2 Average Power

Test Mode	Test Frequency	Average Output Power (dBm)			
GFSK 2Mpbs	2 440 MHz	P	=	-2.62	dBm

Note: Average Output Power (dBm) = Measured Output Power (dBm) + D.C.C.F(dB)

Duty Cycle = 0.33 %, D.C.C.F = 4.81 dB

Average Output Power (dBm) = -7.43 dB + 4.81 dB = -2.62 dB

1.3 Test Results - Complied

- Calculation Result of RF Exposure

Frequency (MHz)	Target Power (dBm)	Tune up Tolerance (dB)	Max Tune up Power (dB)	Max Tune up Power (mW)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm^2)	Limit (mW/cm^2)
2 440	-2.00	±1.0	-1.00	0.794	-3.30	0.000 074	1

Note: Antenna Gain(mW) = 1.0 mW

- Target power and Tolerance, Max tune up power

Mode	Frequency (MHz)	Target Power (dBm)	Tolerance (dB)	Max Tune up Power (dBm)	Average Power (dBm)
GFSK 2Mbps	2 440	-2.00	±1.0	-1.00	-2.62

SECTION 5 REVISION HISTORY

REVISION HISTORY			
Revision	Report No.	Issue Date	Description
0	200500063SEL-TEL2	07 Jul. 2020	Initial
1	200500063SEL-TEL2(R1)	07 Aug. 2020	FCCID and FCC Rule revised

- End -