RF Exposure Evaluation Declaration

Product Name : Compact

Model No. : Compact 1.0

FCC ID : 2AHR8-COMPACT01

IC: 21405-COMPACT01

Applicant : Octo Telematics S.P.A

Address : Via lamaro 51, 00173 Rome, Italy

Date of Receipt : 08-12-2016

Test Date : 08-15-2016~09-12-2016

Issued Date : 09-13-2016

Report No. : UL32620160812FCC002-3

RF Exposure Evaluation Declaration

Issued Date : 09-13-2016
Report No. : UL32620160812FCC002-3

Product Name :	Compact
Applicant :	Octo Telematics S.P.A
Address :	Via lamaro 51, 00173 Rome, Italy
Manufacturer :	Octo Telematics S.P.A
Address :	Via lamaro 51, 00173 Rome, Italy
Model No. :	Compact 1.0
EUT Voltage :	MIN: 6V, NOR:12/24V, MAX: 32V
Brand Name :	OCTO
FCC ID :	2AHR8-COMPACT01
IC:	21405-COMPACT01
Applicable Standard :	FCC's Rules (47 C.F.R. §1.1310 and 2.1091) Industry Canada RSS-102, Issue 5
Test Result :	Complied
Performed Location :	Unilab (Shanghai) Co.,Ltd. FCC 2.948 register number is 714465 No.1350, Lianxi Road, Pudong New District, Shangha, China TEL:+86-21-5027-5125 FAX:+86-21-5027-7862

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Reviewed by : Forest Cao
(Senior Engineer: Forest Cao)

Approved by : Eva Wang
(Supervisor Engineer: Eva Wang)

1. EUT Description

Product Name:	Compact
Model Name:	Compact 1.0
Hardware Version:	A03
Software Version:	1.0
RF Exposure Environment:	Uncontrolled
GSM / GPRS	
Support Band:	GSM850/PCS1900
GPRS Class:	12
Tx Frequency Range:	GSM 850: 824.2MHz to 848.8MHz PCS 1900: 1850.2MHz to 1909.8MHz
Rx Frequency Range:	GSM 850: 869.2MHz to 893.8MHz PCS 1900: 1930.2MHz to 1989.8MHz
Type of modulation:	GMSK for GSM/GPRS
Antenna Type:	Internal
Antenna Peak Gain:	GSM 850: 1.18 dBi PCS 1900: 3.48 dBi
BT 4.1 LE	
Frequency Range:	2402MHz-2480MHz
Type of modulation:	GFSK
Antenna Type:	Internal
Channel Number:	40
Antenna Peak Gain:	2.5dBi

2. RF Exposure Evaluation

2.1 Limits

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

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Reference Period (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/*f*	4.89/*f*	*900/f^2	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	*f*/300	6
1,500-100,000	-	-	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/*f*	2.19/f	*180/f^2	30
30-300	27.5	0.073	0.2	30
300-1,500	-	-	*f*/1500	30
1,500-100,000	-	-	1.0	30
f = frequency in MHz * = Plane-wave equivalent power density				

According to RSS-102:

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	0.73 / f	-	6**
1.1-10	87 / $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07 / $f^{0.25}$	0.1540/ $f^{0.25}$	8.944 / $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619$f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000 / $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10^{-4} $f^{0.5}$	6.67 x 10^{-5} f	616000 / $f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10	170	180	-	Instantaneous*
1-10	-	1.6/ f	-	6**
1.29-10	193/ $f^{0.5}$	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ $f^{0.25}$	0.3444/ $f^{0.25}$	44.72/ $f^{0.5}$	6

48-100	49.33	0.1309	6.455	6
100-6000	15.60 $f^{0.25}$	0.04138 $f^{0.25}$	0.6455$f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ $f^{1.2}$
150000-300000	0.354 $f^{0.5}$	9.40 x 10^{-4} $f^{0.5}$	3.33 x 10^{-4} f	616000/ $f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

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.

2.2.Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 22 ℃ and 53 %RH.

2.3.Test Result of RF Exposure Evaluation

This device is evaluated by mobile device with general population/uncontrolled exposure condition
For this device, the calculation is using the most conservative values, and the results are as follows:

Test Mode	Antenna Gain (dBd)	Antenna Gain (dBi)	Maximum Output Power (dBm)	Average Power (dBm)	Average EIRP (mW)	Calculated RF Exposure at d = 20cm (mW/cm^2)	FCC MPE Limit (mW/cm^2)	IC MPE Limit (mW/cm^2)
GSM 850	-0.97	----	33	25.15	327.34	0.06	0.55	0.2576
GPRS 850,1Tx Slot	-0.97	----	33	25.15	327.34	0.06	0.55	0.2576
GPRS 850,2Tx Slot	-0.97	----	31	26.16	413.05	0.08	0.55	0.2576
GPRS 850,3Tx Slot	-0.97	----	30	26.92	492.04	0.10	0.55	0.2576
GPRS 850,4Tx Slot	-0.97	----	28	26.17	414.00	0.08	0.55	0.2576
PCS 1900	----	3.48	31	25.45	350.75	0.07	1.00	0.4476
GPRS 1900,1Tx Slot	----	3.48	31	25.45	350.75	0.07	1.00	0.4476
GPRS 1900,2Tx Slot	----	3.48	28	25.46	351.56	0.07	1.00	0.4476
GPRS 1900,3Tx Slot	----	3.48	27	26.22	418.79	0.08	1.00	0.4476
GPRS 1900,4Tx Slot	----	3.48	25	25.47	352.37	0.07	1.00	0.4476

The averaged power calculated method are shown as below:
1 Tx Slot: Averaged power=Maximum burst averaged power - (10lg(1/8))dB, Duty cycle =12.5%
2 Tx Slot: Averaged power=Maximum burst averaged power - (10lg(2/8))dB, Duty cycle =25.0%
3 Tx Slot: Averaged power=Maximum burst averaged power - (10lg(3/8))dB, Duty cycle =37.5%
4 Tx Slot: Averaged power=Maximum burst averaged power - (10lg(4/8))dB, Duty cycle =50.0%
Average EIRP Power=Average Power + Antenna Gain

Test Mode	Peak ERP (dBm)	Peak EIRP (dBm)	Average EIRP (dBm)	Peak EIRP (mW)	Average EIRP (mW)	Calculated RF Exposure at d = 20cm (mW/cm^2)	FCC MPE Limit (mW/cm^2)	IC MPE Limit (mW/cm^2)
GSM 850	33.28	35.43	26.40	3491.40	436.52	0.09	0.55	0.2576
GPRS 850,1Tx Slot	33.26	35.41	26.38	3475.36	434.51	0.09	0.55	0.2576
GPRS 850,2Tx Slot	32.09	34.24	28.22	2654.61	663.74	0.13	0.55	0.2576
GPRS 850,3Tx Slot	30.20	32.35	28.09	1717.91	644.17	0.13	0.55	0.2576
GPRS 850,4Tx Slot	28.32	30.47	27.46	1114.29	557.19	0.11	0.55	0.2576
PCS 1900	----	31.85	22.82	1531.09	191.43	0.04	1.00	0.4476
GPRS 1900,1Tx Slot	----	31.78	22.75	1506.61	188.36	0.04	1.00	0.4476
GPRS 1900,2Tx Slot	----	28.14	22.12	651.63	162.93	0.03	1.00	0.4476
GPRS 1900,3Tx Slot	----	27.37	23.11	545.76	204.64	0.04	1.00	0.4476
GPRS 1900,4Tx Slot	----	24.72	21.71	296.48	148.25	0.03	1.00	0.4476
BT 4.1 LE	----	9.05	9.05	8.04	8.04	0.0016	1.00	0.5351

The averaged EIRP calculated method are shown as below:
1 Tx Slot: Average EIRP=Peak EIRP - (10lg(1/8))dB, Duty cycle =12.5%
2 Tx Slot: Average EIRP=Peak EIRP - (10lg(2/8))dB, Duty cycle =25.0.%
3 Tx Slot: Average EIRP=Peak EIRP - (10lg(3/8))dB, Duty cycle =37.5%
4 Tx Slot: Average EIRP=Peak EIRP - (10lg(4/8))dB, Duty cycle =50.0%

WWAN + BT 4.1LE simultaneously transmission - RF exposure

WWAN Band	Max WWAN RF exposure (Calculated by turn up value)	Max WWAN RF exposure (Calculated by measurement value)	Max BT4.1LE RF exposure	Max RF exposure summation	FCC MPE Limit (mW/cm^2)	IC MPE Limit (mW/cm^2)
GSM 850	0.06	**0.09**	0.0016	0.0916	0.55	0.2576
GPRS 850,1Tx Slot	0.06	**0.09**		0.0916	0.55	0.2576
GPRS 850,2Tx Slot	0.08	**0.13**		0.1316	0.55	0.2576
GPRS 850,3Tx Slot	0.10	**0.13**		0.1316	0.55	0.2576
GPRS 850,4Tx Slot	0.08	**0.11**		0.1116	0.55	0.2576
PCS 1900	**0.07**	0.04		0.0716	1.00	0.4476
GPRS 1900,1Tx Slot	**0.07**	0.04		0.0716	1.00	0.4476
GPRS 1900,2Tx Slot	**0.07**	0.03		0.0716	1.00	0.4476
GPRS 1900,3Tx Slot	**0.08**	0.04		0.0816	1.00	0.4476
GPRS 1900,4Tx Slot	**0.07**	0.03		0.0716	1.00	0.4476

This device can pass RF exposure limit.

---END OF THE REPORT---