Maximum Permissible Exposure Report

1. Product Information

FCC ID:	2ADPC-SDL400
Product name	Digital radio
Model number	SDL400
Power supply	DC 7.4V
Modulation Type	GMSK
Channel Separation	12.5KHz & 25KHz
Emission Designator	7K65G1D for GMSK Modulation at 12.5KHz Channel Separation 15K9G1D for GMSK Modulation at 12.5KHz Channel Separation
Antenna Type	External Antenna
Antenna Gain	From 0 dBi to 10 dBi
Hardware version	1.2
Software version	20170418
Operation frequency	410 MHz – 470 MHz
Exposure category	General population/Uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Device

2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3. 1 Refer evaluation method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz
*=Plane-wave equivalent power density

4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

Calculation Method of RF Safety Distance

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where: S=power density
P=power input to antenna
EIRP=Equivalent (effective) isotropic radiated power.
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

$$r = \sqrt{\frac{PG}{4\pi \cdot S}} = \sqrt{\frac{EIRP}{4\pi \cdot S}}$$

5. Antenna Information

SDL400 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Antenna gain
Antenna 0	External Antenna	410 MHz – 470 MHz	0 – 10 dBi

6. Measurement Results

6.1 Evaluation of Standalone RF Exposure Compliance Requirements

Maximum RF Power conducted, $P_{conducted}$ [dBm]*:	35.8	
Antenna Gain, G[dBi]:	10	0
Maximum EIRP, P_{EIRP}[dBm]:	45.8	35.8
Duty Cycle	100%	
Maximum ERP Limit, P_{ERP}[dBm]:	**57.0**	
MPE Limit for General Population/Uncontrolled Exposure, $S_{uncontrolled}$ [mW/cm^2]:	**0.2733**	
Calculated RF Safety Distance for General Population/Uncontrolled Exposure, $r_{safety\_uncontrolled}$[cm]:	105.23	33.28

Remark:
1. Maximum RF power including tune-up tolerance.

Evaluation of Standalone RF Exposure Compliance at difference power setting, Antenna gain and Duty cycle.

Tx output power [dBm] / [W]	Antenna system gain [dBi / numeric]	Tx duty cycle [%], 6 min. average	Frequency [MHz]	Minimum safe distance [cm]
35.8/3.80	10 / 10	100%	410 / 470	105.23/98.29
		50%		74.41/6.50
	0/1.0	100%		33.28/31.08
		50%		23.53/21.98
34.8/3.02	10 / 10	100%	410 / 470	93.79/87.60
		50%		66.32/61.94
	0/1.0	100%		29.66/27.70
		50%		20.97/19.59
33.8/2.40	10 / 10	100%	410 / 470	83.59/78.07
		50%		59.11/55.21
	0/1.0	100%		26.43/24.69
		50%		18.69/17.46
34.0/2.51	10 / 10	100%	410 / 470	85.54/78.89
		50%		60.48/56.49
	0/1.0	100%		27.05/25.26
		50%		19.13/17.86
33.0/2.00	10 / 10	100%	410 / 470	76.24/71.20
		50%		53.91/50.35
	0/1.0	100%		24.11/22.52
		50%		17.05/15.92
32.0/1.58	10 / 10	100%	410 / 470	67.95/63.46
		50%		48.04/44.87
	0/1.0	100%		21.49/20.07
		50%		15.19/14.19
31.0/1.26	10 / 10	100%	410 / 470	60.56/56.56
		50%		42.82/39.99
	0/1.0	100%		19.15/17.89
		50%		13.54/12.65
30.0/1.00	10 / 10	100%	410 / 470	53.97/50.41
		50%		38.16/35.64
	0/1.0	100%		17.07/15.94
		50%		12.07/11.27
29.0/0.79	10 / 10	100%	410 / 470	48.10/44.93
		50%		34.01/31.77
	0/1.0	100%		15.21/14.21
		50%		10.76/10.05

6.2 Evaluation of Simultaneous Transmission RF Exposure Compliance Requirements

The sample only support one antenna, no need consider simultaneous transmission;

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

----------THE END OF REPORT----------