

Company: Rockwell Collins.

Test of: SSR-7610

To: FCC CFR 47 Part 1.1310

Report No.: ROCK25-U7_MPE FCC Rev A

MPE/RF EXPOSURE TEST REPORT



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FROM



Test of: SSR-7610

To: FCC CFR 47 Part 1.1310

Test Report Serial No.: ROCK25-U7_MPE FCC Rev A

This report supersedes: NONE

Applicant: Rockwell Collins
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1. MAXIMUM PERMISSABLE EXPOSURE

Calculations for Maximum Permissible Exposure Levels

$$\text{Power Density} = P_d \text{ (mW/cm}^2\text{)} = \text{EIRP}/(4\pi d^2)$$

$$\text{EIRP} = P * G$$

$$P = \text{Peak output power (mW)}$$

$$G = \text{Antenna numeric gain (numeric)}$$

$$d = \text{Separation distance (cm)}$$

$$\text{Numeric Gain} = 10^G \text{ (dBi)/10}$$

The calculations in the table below use the highest conducted power values together with the lowest antenna gain specified for the EUT. These calculations represent worst case in terms of the exposure levels.

Maximum Permissible Exposure

Freq. Band (MHz)	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Power Density (mW/cm ²) @ 20cm	Power Density Limit (mW/cm ²)	Min Calculated safe distance for Limit (cm)	Calculated Power Density (mW/cm ²) @ Safe Distance
836.5 (LTE Band 5)	0	1.00	19.41	87.30	0.0173	0.5576	20	0.0173
2510 (LTE Band 7)	0	1.00	16.00	39.81	0.0079	1	20	0.0079
2501 (LTE Band 41)	0	1.00	16.85	48.42	0.0096	1	20	0.0096

Assessment for simultaneous operation in LTE Band 7 and WiFi Bands

The Rockwell Collins has two radio modules and can transmit simultaneously in the LTE Band 7 and WiFi 2.4 (GHz) bands. The following assessment is based on simultaneous operation in the LTE Band 7 and WiFi 2.4 (GHz) bands.

Freq. Band (MHz)	Total Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance for Summation (cm)	Power Density Limit (mW/cm ²) E _{ref}	Power Density (mW/cm ²) @20cm E _i	Summation E _i /E _{ref}
2510 (LTE Band 7)	0	1.00	16.00	39.81	20	1	0.0079	0.0079
2462 WiFi	0	1.00	20.0	100.00	20	1	0.0199	0.0199
Total Evaluation:								0.0278

The Total Evaluation was calculated using the formula:

$$\sum_{i=1}^n E_i / E_{ref} \leq 1$$

Where
 E_i: calculated E-field Strength for transmitter
 E_{ref}: E-field strength related limit

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Assessment for simultaneous operation in LTE Band 41 and WiFi Bands

The Rockwell Collins has two radio modules and can transmit simultaneously in the LTE Band 41 and WiFi 2.4 (GHz) bands. The following assessment is based on simultaneous operation in the LTE Band 41 and WiFi 2.4 (GHz) bands.

Freq. Band (MHz)	Total Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance for Summation (cm)	Power Density Limit (mW/cm ²) E _{ref}	Power Density (mW/cm ²) @20cm E _i	Summation E _i /E _{ref}
2501 (LTE Band 41)	0	1.00	16.85	48.42	20	1	0.0096	0.0096
2462 WiFi	0	1.00	20.0	100.00	20	1	0.0199	0.0199
Total Evaluation:								0.030

The Total Evaluation was calculated using the formula:

$$\sum_{i=1}^n \frac{E_i}{E_{ref}} \leq 1$$

Where
 E_i: calculated E-field Strength for transmitter
 E_{ref}: E-field strength related limit

Assessment for simultaneous operation in LTE Band 5 and WCDMA bands

The Rockwell Collins has two radio modules and can transmit simultaneously in the LTE and WCDMA bands. The following assessment is based on simultaneous operation in the LTE and WCDMA bands.

Freq. Band (MHz)	Total Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance for Summation (cm)	Power Density Limit (mW/cm ²) E _{ref}	Power Density (mW/cm ²) @20cm E _i	Summation E _i /E _{ref}
836.4 (WCDMA)	0	1.00	20.35	108.39	20	0.5576	0.0215	0.0387
836.5 (LTE Band 5)	0	1.00	19.41	87.30	20	0.5576	0.0173	0.0311
Total Evaluation:								0.070

The Total Evaluation was calculated using the formula:

$$\sum_{i=1}^n \frac{E_i}{E_{ref}} \leq 1$$

Where
 E_i: calculated E-field Strength for transmitter
 E_{ref}: E-field strength related limit

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Specification - Maximum Permissible Exposure Limits

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (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

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