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1.0 Maximum Permissible Exposure Evaluation (Supplements the test report.)

The measured power is considered for the intended use of the device and resulting RF exposure to the user.

1.2 Criteria

Section Reference	Date
447498 D01 General RF Exposure Guidance v06 // RSS-102 Issue 5	21 Oct 2021

1.3 Procedure

Using measurement of peak power and considering the intended application, determine the permissible exposure level, applicability of exclusion, or whether additional exposure tests (SAR) are indicated. When applicable justify conclusion for selected exposure level and separation distance.

This transmitter is remote controlled irrigation valve. User contact with the device is not required for operation. The device is actuated remotely by the accompanying Bridge transmitter. 20mm is assumed as a worst-case user proximity considering the chip antenna is mounted inside the chassis.

Duty Cycle Correction Factor Measurement:

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

Continuous packet transmission mode was used for the duty cycle measurement, which would represent a worst-case operating scenario. Duty Cycle measurement was performed on 19 Oct, 2021.

Duty Cycle - Conducted Test Data												
Environmental Conditions:		Temperature		°C	Humidity		RH	Barometric Pressure		in Hg		
Measurement Parameters:		RBW		100 kHz	VBW		100 kHz	Span		1 MHz	Detector	Peak
Measured On Time (ms)		Max On Time Allowed (ms)		On Time Result	Measured Time Interval (ms)		Duty Cycle Factor (dB) (20 * Log(On time/Interval))			Duty Cycle Factor Allowed (dB)		
2.113		100		Pass	4.231		-6.03			-6.03		
RF Exposure Allowable Duty Cycle Reduction (10*Log(On time/Interval):										-3.02		

Agilent		Marker	
Ref 0 dBm		Atten 10 dB	
*Peak		Mkr1 2.113 ms	
Log		0.54 dB	
dB/		Select Marker	
1		2 3 4	
Normal			
Delta			
Delta Pair			
(Tracking Ref)			
Ref			
Span Pair			
Span		Center	
Off			
More		1 of 2	
Center 2.440 000 GHz			
Res BW 1 MHz			
VBW 3 MHz			
Sweep 4.019 ms (8001 pts)			
File Operation Status: A:\SCREN034.0IF file saved			

Agilent		Trace	
Ref 0 dBm		Atten 10 dB	
*Peak		Mkr1 4.231 ms	
Log		0.04 dB	
dB/		Trace	
1		2 3	
Clear Write			
Max Hold			
Min Hold			
View			
Blank			
More		1 of 2	
Center 2.440 000 GHz			
Res BW 1 MHz			
VBW 3 MHz			
Sweep 11.2 ms (8001 pts)			
File Operation Status: A:\SCREN035.0IF file saved			

Transmit Event Time	Time Interval (Return to channel time)
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Duty Cycle Measurement

1.4 Power to Exposure Calculation

For 2.4 GHz radio power is determined by conducted measurement. Safe exposure distance was calculated for the allowed maximum uncontrolled public exposure limit.

Table 1.4.1 Power Calculation for Exposure, 2.4 GHz Radio (Highest frequency 2.480 GHz)				
Measured Conducted Peak Power dBm	Source Duty Cycle Factor dB	Antenna Gain dBi	Calculated EIRP dBm	EIRP In Linear Terms mW
13.0	-3.02	0.5	10.48	11.17

1.5 SAR Exemption Calculation – FCC

Applicable requirement: KDB 447498 Clause 4.3.1 Section 1

Calculated power (max power including tune up tolerance = 11.17 mW):

$$[(11.17 \text{ mW})/(20 \text{ mm})] \cdot [\sqrt{2.4 \text{ (GHz)}}] = 0.87$$

$$0.87 \leq 6.0 \text{ (Limb exposure)}$$

$$0.87 \leq 3.0 \text{ (Non-Limb exposure)}$$

1.6 SAR Exemption Calculation – IC

Applying Table 1 of clause 2.5.1 applying 2cm (or 20mm) spacing column and row 2450 MHz. The exemption limit is 30 mW.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance ^{4,5}					
Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

$$11.17 \text{ mW} < 30 \text{ mW}$$

1.7 Conclusion

The exposure limit is satisfied.

Signed:



Larry Finn
