

RF Exposure / SAR Information – FCC KDB 447498

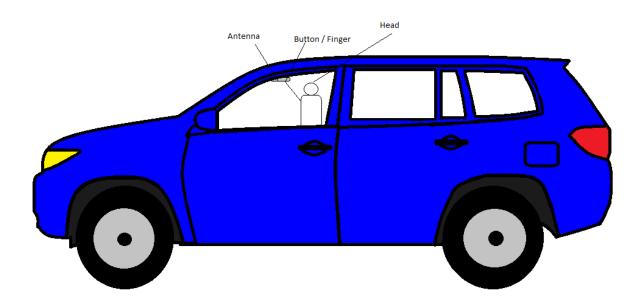
FCC ID: CB2775AHL5 Applicant: Johnson Controls, Inc. Model: 775AHL5

The following describes the use case, user separation for the extremities and head, and conducted power of the 775AHL5 model. Per KDB 447498 section 4.3.1, the module was under the test exclusion thresholds for all bands.

This device is designed to be used while in a seated position inside of a vehicle. The operational condition is shown in the diagram below. It operates while a button is pressed, therefore the finger would be the closest part of the body to the antenna while it is transmitting. This distance is approximately 35mm due to the separation between the button surface and the antenna. The antenna to head distance would conservatively be 200mm away during the transmission.



Antenna - Button Separation: Approximately 35mm Antenna - Head Separation: Conservatively 200mm



Calculations:

As the finger would be inside of the 50mm test separation distance, the following formula would be used for calculating the extremity exclusion threshold:

[(max power in mW) / (min test separation in mm)] * [(f(GHz))^1/2]

The head conservatively would not be closer than 200mm away, which would put it outside of the 50mm test separation distance. Thus the following formulas would be used for calculating the head exclusion threshold:



Step 1 threshold = $\{3 / [(f(GHz))^{1/2}]\}*(50)$

then the limit in mW is given by

[Step 1 threshold + (test separation distance – 50mm) * (f(MHz)/150]mW

Frequency – 288MHz

Measured Conducted Power – 14.88dBm Converting to mW – 14.88dBm = 31mW Extremity Test Separation – 35mm Head Test Separation – 200mm



Conducted Measurement

Agilent. 14:02:24 Apr 19, 2013 R Т Freq/Channel Mkr1 288.00000 MHz Ref 20 dBm Atten 30 dB 14.88 dBm Center Freq #Peak 288.000000 MHz Log 10 Start Freq dB/ 287.250000 MHz Stop Freq 288.750000 MHz CF Step 150.000000 kHz Man <u>Auto</u> M1 S2 Freq Offset **S3 FC** 0.00000000 Hz AA Signal Track On <u>Off</u> Scale Type Center 288 MHz Span 1.5 MHz Log <u>Lin</u> #Res BW 300 kHz Sweep 5 ms (401 pts) #VBW 1 MHz

10-g Extremity:

 $[(31\text{mW}) / (35\text{mm})] * [(0.288(\text{GHz}))^{1/2}] = 0.475$

Which is less than the 7.5 for 10-g SAR

1-g Head:

 $\{3 / [(0.288(GHz))^{1/2}]\}*(50) = 280$

[280 + (200mm - 50mm) * 288/150]mW = 568mW



31mW max output is less than the 568mW limit for test separation distances > 50mm

Frequency – 310MHz

Measured Conducted Power - 14.83dBm

Converting to mW - 14.83 dBm = 30 mW

Extremity Test Separation – 35mm

Head Test Separation - 200mm

Conducted Measurement

🔆 Agile	ent 14:04:	04 Apr 19, 20	13	R	T Peak Search
Ref 20 d #Peak Log	Bm	Atten 30 d		Mkr1 309.99625	
10 dB/					Next Peak
-					Next Pk Right
-					Next Pk Left
M1 S2 S3 FC - AA					Min Search
_					Pk-Pk Search
	310 MHz V 300 kHz		#VBW 1 MHz	Span 1.5 Sweep 5 ms (401 p	



10-g Extremity:

 $[(30 \text{mW}) / (35 \text{mm})] * [(0.310(\text{GHz}))^{1/2}] = 0.477$

Which is less than the 7.5 for 10-g SAR

1-g Head:

 $\{3 / [(0.310(GHz))^{1/2}]\}*(50) = 269$

[269 + (200 mm - 50 mm) * 310/150]mW = 579 mW

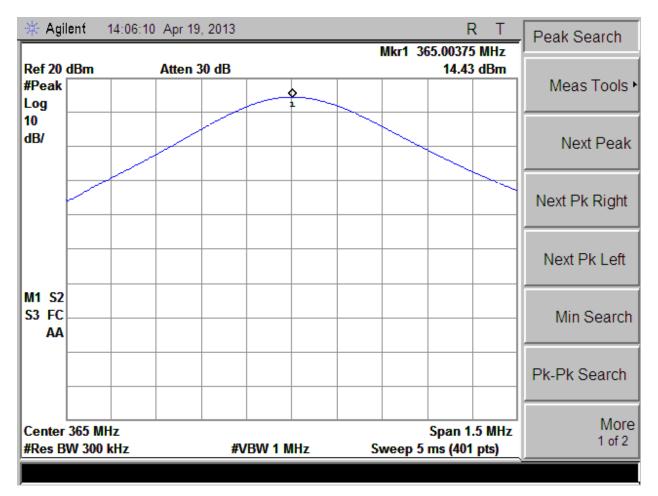
30mW max output is less than the 579mW limit for test separation distances > 50mm

Frequency – 365MHz

Measured Conducted Power – 14.43dBm Converting to mW – 14.43dBm = 28mW Extremity Test Separation – 35mm Head Test Separation – 200mm



Conducted Measurement





10-g Extremity:

 $[(28mW) / (35mm)] * [(0.365(GHz))^{1/2}] = 0.483$

Which is less than the 7.5 for 10-g SAR

1-g Head:

 $\{3 / [(0.365(GHz))^{1/2}]\}*(50) = 248$

[248 + (200mm - 50mm) * 365/150]mW = 613mW

28mW max output is less than the 613mW limit for test separation distances > 50mm

Frequency – 433MHz

Measured Conducted Power – 13.47dBm Converting to mW – 13.47dBm = 22mW Extremity Test Separation – 35mm Head Test Separation – 200mm



Conducted Measurement

Agilent 14:26:41 Apr 19, 2013 R Peak Search Mkr1 433.00375 MHz Ref 20 dBm Atten 30 dB 13.47 dBm #Peak Meas Tools < Ŧ Q Log 10 dB/ Next Peak Next Pk Right Next Pk Left M1 S2 S3 FC Min Search AA Pk-Pk Search More Center 433 MHz Span 1.5 MHz 1 of 2 #Res BW 300 kHz #VBW 1 MHz Sweep 5 ms (401 pts)

10-g Extremity:

 $[(22mW) / (35mm)] * [(0.433(GHz))^{1/2}] = 0.413$

Which is less than the 7.5 for 10-g SAR



1-g Head:

 $\{3 / [(0.433(GHz))^{1/2}]\}*(50) = 228$

[228 + (200mm - 50mm) * 433/150]mW = 661mW

22mW max output is less than the 661mW limit for test separation distances > 50mm

Frequency – 902.25MHz

Measured Conducted Power – 11.2dBm Converting to mW – 11.2dBm = 13mW Extremity Test Separation – 35mm Head Test Separation – 200mm



Conducted Measurement

08:58:52 Apr 19, 2013 Agilent R Т Marker Mkr1 902.19750 MHz Ref 20 dBm Atten 30 dB Ext PG -0.274 dB 11.2 dBm Select Marker #Peak ı 1 2 3 <u>4</u> Log ٥ 10 dB/ Normal Delta Delta Pair (Tracking Ref) Ref <u>Delta</u> M1 S2 Span Pair S3 FC Span Center AA Off More Center 902.2 MHz Span 1.5 MHz 1 of 2 #Res BW 300 kHz #VBW 1 MHz Sweep 5 ms (401 pts)

10-g Extremity:

 $[(13mW) / (35mm)] * [(0.90225(GHz))^{1/2}] = 0.353$

Which is less than the 7.5 for 10-g SAR



1-g Head:

4/24/2013

 $\{3 / [(0.90225(GHz))^{1/2}]\}*(50) = 158$

[158 + (200 mm - 50 mm) * 902.25/150]mW = 1060 mW

13mW max output is less than the 1060mW limit for test separation distances > 50mm

Frequency – 914.75MHz

Measured Conducted Power – 11.19dBm Converting to mW – 11.19dBm = 13mW Extremity Test Separation – 35mm Head Test Separation – 200mm



🔆 Agi	lent 09:	19:19 Apr 19,	2013	Mkr1	R T 914.70125 MHz	Marker
Ref 20		Atten 30	dB Ext PG -0.2		11.19 dBm	Select Marker
#Peak Log						<u>1 2 3</u>
10 dB/						Norma
						Delta
						Delta Pair (Tracking Ref) Ref <u>Delta</u>
M1 S2 S3 FC AA						Span Pair _{Span Center}
						Off
	914.8 MH		#VBW 1 MHz	Sweep	Span 1.5 MHz 5 ms (401 pts)	More 1 of 2

Conducted Measurement

10-g Extremity:

 $[(13mW) / (35mm)] * [(0.91475(GHz))^{1/2}] = 0.355$

Which is less than the 7.5 for 10-g SAR



1-g Head:

- $\{3 / [(0.91475(GHz))^{1/2}]\}*(50) = 157$
- [157 + (200 mm 50 mm) * 914.75/150]mW = 1072 mW

13mW max output is less than the 1072mW limit for test separation distances > 50mm

Frequency – 926.75MHz

Measured Conducted Power – 11.09dBm

Converting to mW - 11.09dBm = 13mW

Extremity Test Separation – 35mm

Head Test Separation – 200mm



🔆 Agi	lent 09:	26:38 Ap	r 19, 2013			Mkr1 9	F 26.72750		N	larker
Ref 20	dBm	Att	en 30 dB	Ext PG -	0.215 dB			dBm	Color	ct Marker
#Peak Log									1 <u>2</u>	
10 dB/										Norma
										Delta
										Delta Pair icking Ref) <u>Delta</u>
M1 S2 S3 FC AA									Span	Span Paiı <u>Center</u>
										Off
	926.8 MH W 300 kH		#	VBW 1 MH		Sweep 5	Span 1. ms (401			More 1 of 2

10-g Extremity:

 $[(13mW) / (35mm)] * [(0.92675(GHz))^{1/2}] = 0.358$

Which is less than the 7.5 for 10-g SAR



1-g Head:

4/24/2013

 $\{3 / [(0.92675(GHz))^{1/2}]\}*(50) = 156$

[156 + (200 mm - 50 mm) * 926.75/150]mW = 1083 mW

13mW max output is less than the 1083mW limit for test separation distances > 50mm