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FCC Test Firm Registration	409640			
IC Site Registration	IE0001			
Date	15 th Mar 2021			
EUT Description	HUBA			
FCC ID	2ATIMHUBA			
IC ID	25094-HUBA			
Authorised by	Paul Reilly			
Authorised Signature:	Part Rug			

TEST SUMMARY

The equipment complies with the requirements according to the following standards.

FCC 15.247 Section	RSS-247 Section	TEST PARAMETERS	Test Result
15.247 (a)2	RSS-247 5.2a	6dB bandwidth	Pass
15.247 (e)	RSS-247 5.2b	Power Spectral Density	Pass
15.247 (b)3	RSS-247 5.4d	Output power Conducted	Pass
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Pass
15.205	RSS Gen 8.9	Radiated Spurious Emissions	Pass
15.209	RSS Gen 8.10		
	RSS Gen 6.7	99% bandwidth	Pass

RSS 247-2 (Feb 2017) RSS Gen Issue5 Amd 2 (Mar 2021)

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF COMPLIANCE ENGINEERING IRELAND LTD

Exhibit A – Technical Report

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This report contains Appendices C,D,E and F

Please review in conjunction with main report for remaining items above "Sensata Technologies 20E8928-2b HUBA Wifi FCCIC"

1.0 EUT Description

Model:	HUBA
Туре:	Wireless Gateway
Type of radio:	Stand-alone
Transmitter Type:	802.15.4 (Thread), 802.11G 802.11N Wifi
Operating Frequency Range(s):	2.405 GHz - 2.480GHz Thread
	2.412-2.462GHz Wifi
Number of Channels:	16 Thread
	11 Wifi
Antenna:	Integral
Power configuration:	12 v Battery.
Ports:	None
Classification:	DTS, CYY
HVIN:	HUBA
PMN:	HUBA
Test Standards:	15.247 RSS-247
Test Methodology:	Measurements performed according to the procedures in
	ANSI C63.10-2013
	KDB 558074 V5 R02

The EUT was a Gateway for use in the vehicles. Its purpose was to relay packets received on the 433MHz band using a transmitter in the 2.4GHz band.

The EUT contained transmitters using Wifi and Thread technology and also a 433MHz receiver.

For Wifi it was possible to switch between 2 internal antennas, one an internal module antenna and the other one a printed pcb antenna.

The Thread radio had its own dedicated pcb antenna.

This report details test carried out on the Wifi transmitter.

This report contains Appendices C, D,E and F

Please review in conjunction with main report "Sensata Technologies 20E8928-2a HUBA Wifi FCCIC"

Appendix C

Radiated Spurious Emissions PCB Antenna

Pad	e	6	of	22
I QU	0	υ.	UI.	~~

Spectrum	Sp	ectrur	n 2	× P	eceiver	X	ſ	
	RBW 10	D kHz 🏼	МТ	100 ms			871_3mx	
Input 1 AC	Att	O dB I	Preamp) ON	Step TE) Scan		
Scan O1Pk	Max							
					1	100 M	1HZ	
90 dBµV				1				
80 dBµV								
70 dBµV								
60 dBµV					1			
50 dBµV								
40 dBµV								
30 dBµV			-	M.		y .		
20 dBuy Ada	hermony	North	7	w W	WYM,	Ma W	water the the	and water and
10 dBµV		1						
								TF
Start 30.0 M	/Hz							Stop 300.0 MHz
	Fig C'	l Hiah	Chan	nel Rad	iated Em	nissio	ns 30MHz -300MHz_Vertical 3	metres

Spectrum	γ	Spectri	um 2	🗶 R	eceiver	X	
)	RBW :	100 kHz	MT	100 ms			871_3mx
Input 1 AC	Att	0 dB	Preamp	ON	Step TD	Scan	·
Scan O1Pk M	Max		,			,	
	1	I I	1	1	I I	100 M	MHz
90 dBµV					1		
80 dBµV	- - - -						
70 dBµV							
60 dBµV			1 				
50 dBµV							
40 dBµV		1 1 1 1 1 1					
30 dBµV							ma.
20 dBµV		1					when the trade
munition	when	manner	monne	month	min	Inner	www.
10 dBµV					my		
Start 30.0 Mi	i Hz				i		TF Stop 300.0 MHz
	Fig C	2 High	Channe	el Radia	ted Emis	ssions	s 30MHz -300MHz Horizontal 3metres

				Page 7	of 22
Spectrum	Spectrum 2	X Receiver (x)		
R	BW 100 kHz MT	100 ms			
Input 1 AC 🖷 A	tt 🛛 0 dB 🖷 Prean	np ON Step TD S	can		
Scan O1Pk Ma	×	· · · ·		· · ·	
	1				
	i I I				
90 UBHV	1				
80 авµv					
	I I I				
70 dBµV					
60 dBµV					
50 dBµV	1		1	1 1	
40 dBµV	1	1	1		
6					
30 dBuV	1				
50 GDP1		the set of		Ala han an and the second	100 million (100 million)
ee dewy	1 . Audelsonnes	molitum mole harrow	handrand		
124 MARAY WILLIAM					
то авћл	1				
					TE
Start 300.0 MH	lz	T	i	S	top 1.0 GHz

Fig C3 High Channel Radiated Emissions 300MHz -1GHz Vertical 3metres

Spectrum 2 🗵 Receiver 🛞
RBW 100 kHz MT 100 ms 609_3mx
Input 1 AC 🖷 Att 🛛 D dB 🖷 Preamp 🛛 ON 🛛 Step TD Scan
Scan O1Pk Max
90 dBµV
30 dBµV
7D dBuV
i0 dBµV
50 dBµV
10 dBµV
10 dBpv-
20 dBuy - muhand man hurt the share and a second second
Start 300.0 MHz Stop 1.0 GHz
Fig C4 High Channel Radiated Emissions 300MHz -1GHz Horizontal 3metros

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Spectrum Receiver 🗵		
RBW 1 MHz MT 100 ms	655Rx	`
Input 1 AC Att 0 dB Preamp ON Step TD Scan		
Scan O1Pk Max		
110 dBµV		
100 aBhA	~	
90 dBuV		
80 dBµV	+ <u>+</u> +	
70 dBµV		
60 dBuV		
50 dBµV		man and a same should be
and a second	menumenter have the moment	
140 dBUV		
30 dBuV		
20 dBµV		
10 dBµV		
		TF
Start 1.0 GHz		Stop 3.6 GHz

Fig C5 High Channel Radiated Emissions 1GHz -3.6GHz Vertical 3metres

Spectrum Receiver 🗵	
RBW 1 MHz MT 100 ms 655Rx	
Input 1 AC 🖷 Att – 0 dB – Preamp – ON – Step TD Scan	
Scan O1Pk Max	
110 dBµV	
100 dBµV	
90 dBµV	
80 dBµV	
60 dBuV	
50 dBµV	a data alla
a manual langer week and	
40 dBUV	
30 dBµV	
10 dBut	
	TF
Start 1.0 GHz Stop 3.	6 GHz



Fig C7 High Channel Radiated Emissions 3.6GHz -12.75GHz Vertical 3metres











Appendix D Radiated tests for Band Edges /Restricted band Module antenna

Page	13	of	22

Spectrum	Re	ceive	r 🗷	Spec	ctrum	2	X Spec	ctrum 3	3 X	ר		
R	BW 1	MHz I	MT 1	100 ms			655Rx					
Input 1 AC 👄 A	tt (D dB I	Preamp	ON	Step	TD Sca	n					
Scan O1Pk MaxO2Av Max												
M3[1] 41.80 dBµV							.80 dBµV					
100 dBuV							0.	000 s			2.19975	0000 GHZ
100 000							M	1[1]			93	.62 dBµW
90 dBµV							0.	000 s			2.41200	0000 GHz
(2.0.0												
80 dBµV												1/
70 dBuV												
												N
60 dBµV												Ma
												7 / I
50 dBµV			MЗ	}							~	
	mana	mm	monto	mm		men		minin	monten	mm	mound	M4
			M5									
30 dBµV	-			-								
20 dBµV												
10 dB/0/												
	TE											
start 2.1 GHz											stop 2.	412 GHz
Marker												
DiagrType	Ref	Trc	Sti	mulus		Re	sponse	Fune	ction	F	unction Res	ult
Scan N1		1		2.412	GHz	9	3.62 dBµV			17		
Scan N2		1		2.39	GHz	5	5.16 dBµV					
Scan N3		1		2.19975	GHz	4	1.80 dBµV					
Scan N4		2		2.39	GHz	3	7.71 dBµV					
Scan N5		2		2.19975	GHz	2	9.81 dBµV					
F	ig D1	Lo	w Chan	nel E	Band I	Edge	Vertical	peak ar	nd avei	rage at	3 metres	

Spectrum	Re	eceive	r 🗷 Spe	ctrum 2	2 🗴 Spe	ectrum 3	X	
R	BW 1	MHz M	MT 100 ms		655Rx			
Input 1 AC 🖷 A	tt i	D dB F	Preamp ON	Step T	D Scan			
Scan 😑 1Pk Ma	ix <mark>⊝</mark> 2A\	/ Мах						
M1[1] 96.4						96.45 dBµV		
100 dBuV	100 dBuV				0	.000 s		2.412000000 GHM
					IM	12[1]		58.81 dBµV
90 dBµV					0	.000 s		2.390000000 GHz
00 00 00								J
70 dBµV	_							
								M2
60 dBµV								
50 dBuV								C (
	8.16		IM 3	A	and the family	4	monum	MAY MAY
40 dBµV	ann	manter		a web-she			2.000 TX 1.000 10 100	
DO HOUND			M5					
90 neha		N-125						
20 dBµV								
10 dBµV								
								TF
Start 2.1 GHz			-					Stop 2.412 GHz
Marker								
Diagr Type	Ref	Trc	Stimulus		Response	Function	Func	tion Result
Scan N1		1	2.412	2 GHz	96.45 dBµ∨			
Scan N2		1	2,39	9 GHz	58.81 dBµ∨			
Scan N3		1	2,1997	5 GHz	42.92 dBµV			
Scan N4		2	2.39	9 GHz	42.09 dBµ∨			
Scan N5		2	2,1997	5 GHz	29.86 dBµ∨			
Fi	g D2	Low	Channel Ba	and Edg	ge Horizonta	al peak and a	average at 3	metres

-	-			
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Spectrum	Rec	eiver	Spectrum	12 🗴	Spec	trum 3 (X	
RB	W 1 M	Hz MT	100 ms		655Rx			
Input 1 AC 👄 Att	t O	dB Prea	mp ON Step	TD Scan				
Scan O1Pk Max	O2AV I	Max						
					M5	[2]		31.60 dBµV
100 dBµV					0.0	000 s	2.5	00000000 GHz
	~				M1	.[1]	2.4	95.23 dBµV
90 ивµv	1	2			U.U	100 S	2.4	
80 dBµV	-	<u> </u>						
	1	1						
70 αΒμV Ι				M2				
60 dBuV		1						
		1						MO
50 dBµV								M3
40 dBuV				M4				
				-				M5
30 dBµV								-
20 авру I	ŝ							
10 dBµV	2				ê			
				TE				
Start 2.462 GHz							St	op 2.505 GHz
Marker								
Diagr Type	Ref '	Trc	Stimulus	Respo	nse	Function	Functio	n Result 🔡
Scan N1		1	2.46225 GHz	95.2	з dBµV			
Scan N2		1	2.4835 GHz	60.6	3 dBµV			
Scan N3		1	2.5 GHz	46.7	2 dBµV			
Scan N4		2	2.4835 GHz	36.5	6 dBµV			
Scan N5		2	2.5 GHz	31.6	u dBµV			
Fig	g D3	High (Channel Band	Edge V	ertical	peak and av	verage at 3 met	res

Spectru	ım	Re	eceive	er 🗶	Spectrum	12 🗴	Spec	trum 3	X		
	RI	5w 1	MHz	MT 100) ms		655Rx				<u>`</u>
Input 1	AC 🔵 AI	t	0 dB	Preamp	ON Step	TD Scan					
Scan C	1Pk Max	< <u>0</u> 2A	v Max								
4100 dBμV ▼						M5[2] 0.000 s M1[1]				31.47 dBµV 2.500000000 GHz 93.47 dBµV	
80 dBµV-		-	1								
70 dBµV- 60 dBµV- 			f			M2					
50 dBµV- 40 dBµV-						M4				Ma	
 30 dBµV- 										¥	
20 dBµV-											
Start 2.	462 GH:	z			1				1	Stop	2.505 GHz
Marker											í
Diagr	Type	Ref	Trc	Stim	ulus	Respo	nse l	Function	1	Function R	esult l
Scan	N1		1	2.4	46225 GHz	93.4	7 dBµV				
Scan	N2		1	2.	.4835 GHz	59.30	5 dBµV				
Scan	NЗ		1		2.5 GHz	44.83	2 dBµV				
Scan	N4		2	2	.4835 GHz	35.1:	2 dBµV				
Scan	N5		2		2.5 GHz	31.4	7 dBµV				
	Fia	D4	Hia	h Channel	Band E	dae Ho	rizonta	l peak and	average	at 3 metr	es

Appendix E

Radiated Spurious Emissions Module Antenna

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Spectrum	Υ	Spectr	um 2	X	Receiver	X			₽
	RBW	100 kHz	MT	100 m	IS		871_3mx		
Input 1 AC	Att	0 dB	Prear	np O	N Step TE) Scan			
Scan O1Pk	Max				,				
	1				I I I	: 100 M : I	Hz		
90 dBµV		1			1 1 1 1				
80 dBµV		1							
70 dBµV									
60 dBµV									
50 dBµV									
40 dBµV								٥	
30 dBµV	1 1 1 1	1.M			AL INC.	and	, n mil	1	
20 dвµу <u>М</u> и	man	M	man	and A	N.M.M	mm	with V"	- Urthe	muntum
~~~~ 10 dBµV								2	
61						1			TF
Start 30.0 M	/IHz								Stop 300.0 MHz

Spectrum	Ĩ	Spectro	um 2	× R	eceiver	X			
	RBW	100 kHz	MT	100 ms			871_3mx		
Input 1 AC	Att	0 dB	Preamp	ON	Step TD	Scan			
🛛 Scan  O1Pk	Max								
			1		1	100 M	IHz		
		1	1		1	1			
90 dBµV	1 1 1	1	1		1	I			
	-								
80 dBµV	-				1				
	1	I I I	1	l.	I I I	l L			
70 dBuV					1				
, o dop.	l	1	1	ł	1	1			
and in the		1	1		1	1			
60 авµ∨——	1								
					I I I				
50 dBµV									
	i i				I I I				
40 dBµV	-	1			1				
					1				
30 dBiV	1	I I I	1	l l	I I I	1			
					1		n Mr		
				1	I I I		~ MAN		
20 авру——		110			1	L.	W Manuna a		
announter	- Armany	a manufacture of the second	many	and the second	mon	hanth	market when the		
10 dBµV									
					i I I				
Start 20.0 M	<u>ן</u> אנוק	l.	1	l	I	l.	Eton 200 0 MHz		
			<u> </u>						
	Fig E2 High Channel Radiated Emissions 30MHz -300MHz Horizontal 3metres								

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r auc	5 17	υı	<u> </u>

Spectrum	Spectrum 2	× Receiver	×			
RBW	100 kHz <b>MT</b>	100 ms	609_3	mx		
input 1 AC 🖷 Att	0 dB 🖷 Pream	p ON Step	TD Scan			
Scan 😑 1Pk Max						
						1
	1	1			1	1
ю dBµV				1		1
						1
0 dBµV						1
						1
'0 dBµV	1	1	1		1	1
o de vi	i.	I I	i I	1		
				1		
				1	1	1
ю dBµV						1
		i I				I I
0 dBµV			1			
			i I	1	1	
:0 dBµV				1 1 24		We want when
		And the star	1 amendbales	Muhammuhan	Prove in the	
HUB Wet Hornen Man	man alla have and	Mulmuniana	Man and a state	1	1	1
0 dp.0/			1	1	1	I I I
.υ ασμν						
				1	1	TE
Start 300.0 MHz	1	1	1	I	Sto	p 1.0 GHz

Spectrum 2 🛞	Receiver 🛞 🕎
<b>RBW</b> 100 kHz <b>MT</b> 100	0 ms 609_3mx
Input 1 AC  Att 0 dB  Preamp	ON Step TD Scan
Scan O1Pk Max	
90 UBHA	
80 dBµV	
70 dBµV	
60 dBµV	
50 dBµV	
40 dBµV	
	h h h h h h h h h h h h h h h h h h h
to him to a fill to the	I a more presenting long to the third to and the
20 de av	our here all and here and
10 -0.42	
10 aBhA	
Start 300.0 MHz	Stop 1.0 GHz
Fig E4 High Channel Ra	diated Emissions 300MHz -1GHz Horizontal 3metres

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Spectrum Receiver 🗵	
RBW 1 MHz MT 100 ms	655Rx
Input 1 AC 🖷 Att 0 dB Preamp ON Step TD Scan	
Scan O1Pk Max	
110 dBuV	
100 dBµV	
90 dBµV	
80 dBµV	
70 dBµV	
60 d0.4/	
00 0644	
50 dBuV	
	and have many minutes and the second
140 dBµV	al al and the second and the
President for the second s	
30 dBµV	
20 dBµV	
10 dBµV	
	TF
Start 1.0 GHz	Stop 3.6 GHz
Fig EF High Channel Dedicted Emissio	and AOU - 0 COU - Mantical Organization

Fig E5 High Channel Radiated Emissions 1GHz -3.6GHz Vertical 3metres

Spectrum Receiver 🛞	
RBW 1 MHz MT 100 ms	655Rx
Input 1 AC 🖷 Att 0 dB Preamp ON Step TD Scan	
Scan O1Pk Max	· · · · · · · · · · · · · · · · · · ·
110 dBµV	
100 dBµV	6
00 dDut/	
90 UDHA-	
80 dBµV	
70 dBµV	
оо авно	
50 dBuV	
	a a compared have a compared with the second
40 dBUV	
30 dBµV	
20 dBuV	
10 dBµV	
	те
Start 1.0 GHz	Stop 3.6 GHz
Fig E6 High Channel Radiated Emissio	ns 1GHz -3.6GHz Horizontal 3metres



Fig E7 High Channel Radiated Emissions 3.6GHz -12.75GHz Vertical 3metres













## Appendix F



Orientations for Radiated Emissions

End of Report