

Antenna Gain

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Transmitting Bluetooth GFSK modulation, DH5, Mid Channel

POWER SETTINGS INVESTIGATED

Battery

FREQUENCY RANGE INVESTIGATED								
Start Frequency	2400 MHz	Stop Frequency	2483.5 MHz					

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT									
Description	Manufacturer	Model	ID	Last Cal.	Interval				
EV01 Cables		Double Ridge Horn Cables	EVB	1/3/2008	13				
Spectrum Analyzer	Agilent	E4407B	AAU	12/7/2007	13				
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2007	13				
Antenna, Horn	EMCO	3115	AHC	8/24/2006	24				

MEASUREMENT BANDWIDTHS									
	Frequency Range	Peak Data	Quasi-Peak Data	Average Data					
	(MHz)	(kHz)	(kHz)	(kHz)					
	0.01 - 0.15	1.0	0.2	0.2					
	0.15 - 30.0	10.0	9.0	9.0					
	30.0 - 1000	100.0	120.0	120.0					
	Above 1000	1000.0	N/A	1000.0					
Measurements were made using the bandwidths and detectors, specified. No video filter was used.									

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The EUT antenna gain was derived from taking the radiated EiRP measurement and subtracting out the direct connect output power measurement:

The peak output power was determined by measuring using a direct connection between the RF output of the EUT and a spectrum analyzer. The test cable and attenuator were calibrated and an offset entered into the analyzer to compensate for the loss. with the EUT set to the same mid channel frequency data rate. The EUT was made to transmit in a no hop mode at the mid channel at the only available modulation type for the Bluetooth Basic mode of GFSK and the DH5 data rate.

The radiated fundamental emission from the EUT was maximized by rotating the EUT, adjusting the measurement antenna height (1-4 meters) and polarization. The EUT was set to the same mid channel, modulation type, and data rate as the direct connected output power measurement. Three orthogonal orientations were investigated to determine the maximum fundamental emission.

11.8 dBm (Radiated EiRP) - 9.1 dBm (conducted at 8.23 mW) = 2.7 dBi

NORTHWEST								PSA 2007.05.07
EMC				EININA	GAIN			EIMI 2006. 11.28
EUT	WaferSense AGS-	300					Work Order:	CYBR0072
Serial Number:	Unknown						Date	10/29/07
Customer	CyberOptics Semi	conductor, Inc					Temperature	20°C
Project	None						Barometric Pres	34% 1023 3 mb
Tested by:	Rod Peloquin			Po	wer: Batterv		Job Site:	EV06
TEST SPECIFICAT	IONS				Test Met	hod		1
TEST PARAMETER	RS							
Antenna Height(s)	(m) N/A			Test D	Distance (m)	N/A		
EUT OPERATING I Transmit Bluetootl DEVIATIONS FROI	MODES h GFSK modulation M TEST STANDARI	, Mid channel						
No deviations.								
Run #	5						R.C. I. P.	l
Configuration #	3						ingu in	- man
Results	Evaluation					Signature	5	V
Ref 15 dBm	10.20.03 00	t 24, 200 #Att	, en 20 dE	3			Mkr1 a	2.440 902 GHz 9.14 dBm
#Feak								
Log				1				
5			······	<u> </u>		<u></u>		
dB/	- Carlore	NATION AND A STREET					the second secon	
Offst	The second second							Manhat Man
21.8 mmm								and the second sec
LgAv								
111 00								
S3 FC								
£ (f):								
FTUN								
SMb								
Center 2.441	. 000 GHz							Span 5 MHz
#Res BW 3 M	Hz			₩VBW 3 MI	Ηz	<	Sweep 1.066 m	ns (1000 pts)

		Effec	tive R	adiate	ed Po	ower (EIRP			F	PSA 2007.05.07 EMI 2006.11.29
EMIC	AGS200							W	ork Order:	CVBR007	77
Serial Number	: none							vv	Date:	02/18/08	1
Customer	: CyberOptics Ser	miconductor, li	nc.					Ter	nperature:	24	
Attendees	: Greg Huntzinger	r						_	Humidity:	23%	
Project Tested by	: Pod Peloguin				Power:	Battory		Barome	etric Pres.:	30.07 EV01	
TEST SPECIFICAT	TIONS				Power.	Test Metho	d		Job Sile.		
N/A		ANSI C63.4:2003									
TEST PARAMETE	RS										
Antenna Height(s)	(m) 1 - 4				Test Dista	nce (m)	3				
EUT OPERATING Transmitting Blue DEVIATIONS FRO No deviations. Run # Configuration #	MODES tooth GFSK modu M TEST STANDAR 1 1	ulation, DH5, Mi RD	id Channel								
Results	Evaluation						Signature				
20.0											
15.0				•							
10.0											
5.0 — E											
- 0.0											
-5.0											_
-10.0											
-15.0											_
-20.0 ⊥							I			1	
1000.000 10000.000 MHz											
Freq (MHz)		Azimuth (degrees)	Height (meters)			Polarity	Detector	EIRP (Watts)	EIRP (dBm)		