



Report No.: 60.870.11.022.01F
Date: 2011-12-09

TEST REPORT

Applicant: SIGMA Elektro GmbH.
Dr. Julius Leber Str.15,
Neustadt 67433, Germany

Description of Samples: Model name: Baseline Speed Transmitter
Brand name: SIGMA
Model no.: TX
FCCID: M5LBL09TX

Date Samples Received: 2011-11-15

Date Tested: 2011-11-15 to 2011-12-04

Investigation Requested: FCC Part 15, Section 15.209

Conclusions: The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remarks: ----

Checked by:

Approved by:-

Nicolas Cheng
Project Manager
Wireless & Telecom department

Jeff Pong
Operation Manager
Wireless & Telecom department



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5.0 List of Measurement Equipments

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Appendix A

Photos of Test Setup

Appendix B

External EUT Photos

Appendix C

Internal EUT Photos



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1.0 General Details

1.1 Test Laboratory

Neutron Engineering Inc.
B1, No.37, Lane 365, Yang-quang St, Nei-hu Distrist,
Taipei, 114, Taiwan.
Registration Number: 538587

1.2 Applicant Details
Applicant

SIGMA ELEKTRO GmbH.
Dr. Julius Leter Str. 15, Neustadt 67433, Germany.

Manufacturer

Lead Smart Electonics (HK) Limited
Units A-C, 25/F., Seabright Plaza, 9-23 Shell Street, North
Point, Hong Kong



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1.3 Equipment Under Test [EUT]

Description of EUT

Model Name:	Baseline Speed Transmitter
Brand Name:	SIGMA
Model Number:	TX
FCCID:	M5LBL09TX
Rating:	DC 3.0V (CR 2032 battery)
Antenna Type:	Integral
Operated Frequency:	112 kHz
No. of Channel:	1
Accessories and Auxiliary Equipment:	None
EUT Exercising Software:	None

General Operation of EUT

The Equipment Under Test (EUT) is a transmitter of Bike Computer operated at 112 kHz.

1.4 Equipment Modification

No modification was made to the tested unit by TÜV SÜD Hong Kong Ltd.

1.5 Related Submittal(s) Grants

This is a single application of certification for this transmitter.



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2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with

CFR 47, Part 15 and ANSI C63.4: 2003.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary			
Test Condition	Test Requirement	Test Result	
		Pass	N/A
Field Strength of Fundamental and Harmonics	Part 15.209 (a)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spurious Radiated Emission	Part 15.209 (a), Part 15.205	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Bandwidth Measurement	Part 15.215 (c)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Conducted Emission	Part 15.207	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Note: N/A - Not Applicable



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3.0 Test Methodology

3.1 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

3.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$\text{FS} = \text{R} + \text{System Factor}$$
$$\text{System Factor} = \text{AF} + \text{CF} + \text{FA} - \text{PA}$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

3.3 Conducted Emissions

The EUT was placed on a non-metallic table 0.8m above the horizontal metal reference plane and 0.4m from a vertical ground plane which is connected to the horizontal metal ground plane. Meanwhile, the AC main of EUT was connected to the distance of 0.8m line impedance stabilization network (LISN) during measurement.

Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

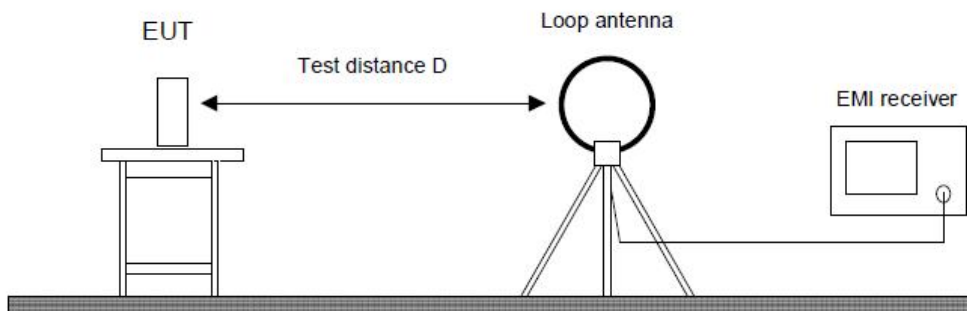
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4.0 **Test Results**

4.1 **Field Strength of Fundamental and Harmonics**

Test Requirement:	FCC part 15 section 15.209 (a)
Test Method:	ANSI C63.4:2003
Test Date:	2011-12-04
Mode of Operation:	Transmitting mode.
Detector Function:	Average and Peak
Measurement BW:	200 Hz (RBW)

Test Setup:





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Results: PASS

Field Strength of Fundamental and Harmonics					
Value	Emissions Frequency	Field Strength (at 3m)	Limit Line (at 3m)	Delta to Limit	Remarks
	kHz	dB μ V/m	dB μ V/m	dB μ V/m	
PK	112.50	63.23	106.58	-43.35	Fund.
AV	112.50	63.23	106.58	-43.35	Fund.

Remark : - (*) Radiated emissions which fall in the restricted bands as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2.

- Calculated measurement uncertainty: ± 5.0 dB

Limit for Radiated Emission [Part 15 Section 15.209, RSS-Gen Section 7.2.5]:

Frequency (MHz)	Field Strength [μ V/m]	Measurement Distance (Meter)
0.009 – 0.490	2400/F (kHz)	300
0.049 – 1.705	24000/F (kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Note :

- Emission Level (dB μ V/m) = 20 log Emission Level (μ V/m)
- Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
- Limit line = specific limit (dB μ V) + distance extrapolation factor.

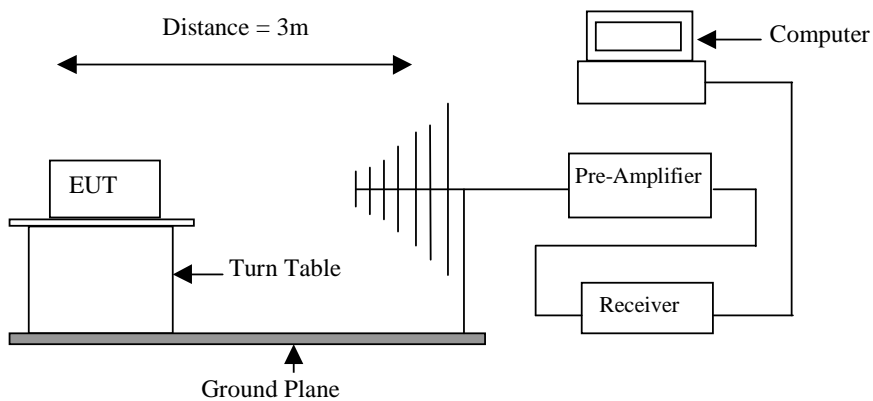
Radiated emissions, which fall in the restricted bands, as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2, must also comply with the radiated emission limits as above.

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4.2 Spurious Radiated Emission

Test Requirement:	FCC part 15 section 15.209 (a)
Test Method:	ANSI C63.4:2003
Test Date:	2011-12-04
Mode of Operation:	Transmitting Mode
Detector Function:	Quasi-peak, Average and Peak
Measurement BW:	200 Hz (Below 150 kHz) 9 kHz (150kHz to 30 MHz) 120 kHz (30MHz to 1000 MHz) 1 MHz (Above 1000 MHz)

Test Setup:





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Results: PASS

Spurious Radiated Emissions (Below 30MHz)				
Value	Emissions Frequency	Field Strength (at 3m)	Limit Line (at 3m)	Delta to Limit
	MHz	dB μ V/m	dB μ V/m	dB μ V/m
QP	5.52	31.52	69.54	-38.02
QP	6.51	32.96	69.54	-36.58
QP	8.51	32.50	69.54	-37.04
QP	13.19	31.76	69.54	-37.78
QP	22.12	32.73	69.54	-36.81
QP	24.15	31.52	69.54	-38.02

Spurious Radiated Emissions (Above 30MHz)							
Value	Emissions Frequency	E-Field Polarity	Reading	System Factor	Field Strength at 3m	Limit	Delta to Limit
	MHz		dB μ V/m	dB	dB μ V/m	dB μ V/m	dB μ V/m
QP	36.79	V	34.30	-14.20	20.10	40.00	-19.90
QP	100.81	V	40.63	-23.52	17.11	43.50	-26.39
QP	216.24	V	33.13	-22.33	10.80	46.00	-35.20
QP	298.69	V	32.05	-17.16	14.89	46.00	-31.11
QP	362.71	V	37.71	-16.47	21.24	46.00	-24.76
QP	487.84	V	42.71	-12.84	29.87	46.00	-16.13
QP	127.97	H	42.83	-24.35	18.48	43.50	-25.02
QP	174.53	H	42.74	-21.90	20.84	43.50	-22.66
QP	216.24	H	37.59	-22.33	15.26	46.00	-30.74
QP	362.71	H	38.36	-16.47	21.89	46.00	-24.11
QP	416.06	H	40.47	-14.10	26.37	46.00	-19.63
QP	486.87	H	36.17	-12.87	23.30	46.00	-22.70

Note: - No further spurious emissions found between 150 kHz and lowest internal used / generated frequency.
- Result data graph is shown at the following pages for reference.

Remark : - (*) Radiated emissions which fall in the restricted bands as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2.
- Calculated measurement uncertainty: ± 5.0 dB.



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Limit for Radiated Emission [Part 15 Section 15.209]:

Frequency (MHz)	Field Strength [$\mu\text{V}/\text{m}$]	Measurement Distance (Meter)
0.009 – 0.490	2400/F (kHz)	300
0.049 – 1.705	24000/F (kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Note :

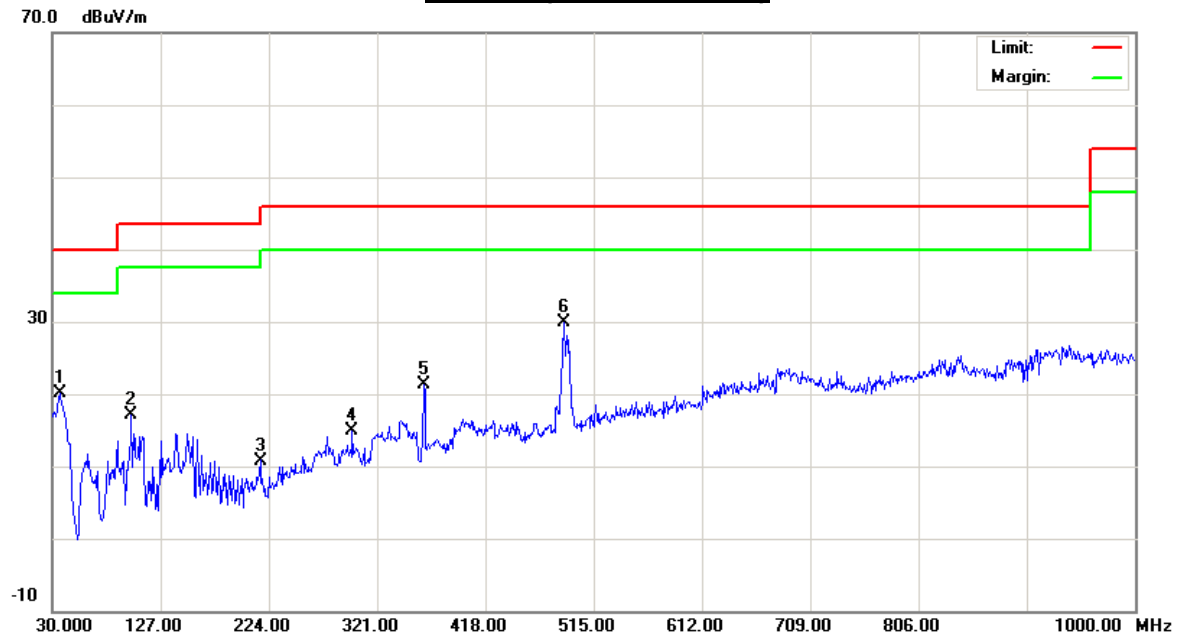
- Emission Level ($\text{dB}\mu\text{V}/\text{m}$) = $20 \log$ Emission Level ($\mu\text{V}/\text{m}$)
- Distance extrapolation factor = $40 \log$ (specific distance / test distance) (dB)
- Limit line = specific limit ($\text{dB}\mu\text{V}$) + distance extrapolation factor.

Radiated emissions, which fall in the restricted bands, as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2, must also comply with the radiated emission limits as above.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

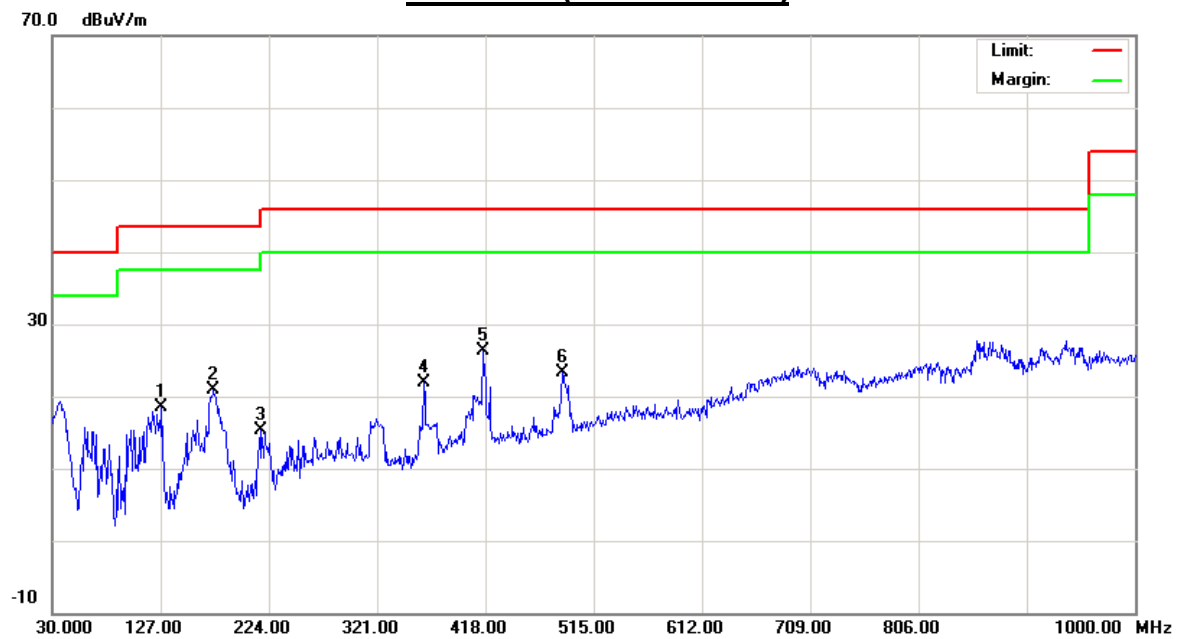
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Vertical (30 to 1000MHz)



Remark: Only background noise was measured above 1GHz.

Horizontal (30 to 1000MHz)



Remark: Only background noise was measured above 1GHz.



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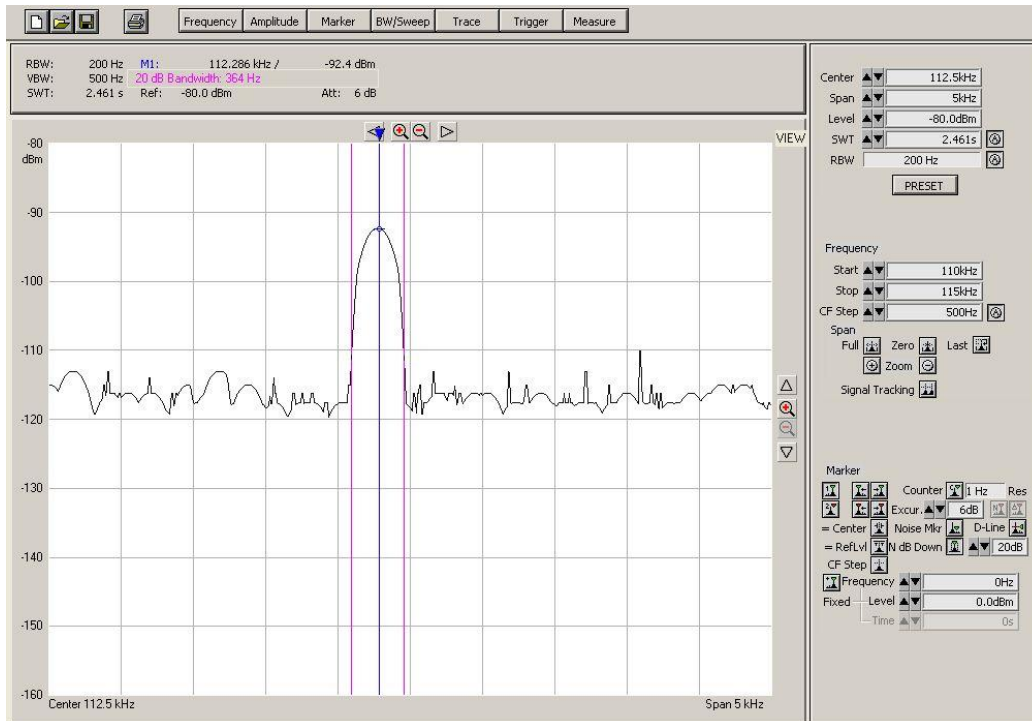
4.3 Bandwidth Measurement

Test Requirement:	FCC part 15 section 15.215 (c)
Test Method:	ANSI C63.4:2003
Test Date:	---
Mode of Operation:	---
Detector Function:	---

Results: PASS

20 dB BW	Test Result
364 Hz	Complies

Remarks: Result data graph is shown at the following pages for reference.



Limit for Bandwidth

The 20dB bandwidth of the emission shall be within the frequency band designated in the rule section under which the equipment is operated.



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4.4 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement: FCC part 15 Section 15.207 Class B
Test Method: ANSI C63.4:2003
Test Date: ---
Mode of Operation: ---
Detector Function: ---
Measurement BW: ---

Result : N/A

Note : This testing is not applicable for the battery operated EUT.

Limits for Conducted Emission [FCC Part 15.207 and RSS-Gen table 2]:

Frequency Range [MHz]	Quasi-Peak Limit [dB μ V]	Average Limit [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.



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5.0 List of Measurement Equipment

Radiated Emission and Bandwidth Measurement

Description	Manufacturer	Model no.	Serial no.	CAL due
Antenna	Schwarbeck	VULB9160	9160-3232	04 Jun 2012
Amplifier	HP	8447D	2944A09673	26 May 2012
Test Receiver	R & S	ESCI	100382	26 May 2012
Spectrum Analyzer	R & S	FS300	101335	04 Aug 2012
Test Cable	N/A	C-01_CB03	N/A	01 Jul 2012
Antenna	ETS	3115	00075789	26 May 2012
Amplifier	Agilent	8449B	3008A02274	26 May 2012
Spectrum	Agilent	E4408B	US39240143	26 Nov 2012
Test Cable	HUBER + SUHNER	C-45	N/A	04 May 2012

Remarks:

CM Corrective Maintenance

N/A Not Applicable or Not Available