Report No.: 60.870.13.036.02F
Date: 2013-12-31

TEST REPORT

Applicant:	Cycle Parts GmbH Le Quartier Hornbach 13, D-67433 Neustadt, Germany
Description of Samples:	Model name: Wireless Cycle Computer (Speed Transmitter) Brand name: VDO Model no.: A1 SPD FCCID: TFO-13010
Date Samples Received:	2013-12-04
Date Tested:	2013-12-04 to 2013-12-30
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:

Ray Cheung
Project Engineer
Wireless & Telecom department

Approved by:-

Jeff Pong
Operation Manager
Wireless & Telecom department

CONTENT:

1.0 General Details

1.1 Test Laboratory

Global United Technology Services Co., Ltd.
1st Floor, Block No.2, Laodong Industrial Zone, Xixiang road Baoan District, Shenzhen, China
Registration Number: 600491
File Number: 9079A-1
Tested by:

John Zhi

1.2 Applicant Details

Applicant

Cycle Parts GmbH
Le Quartier Hornbach 13, D-67433 Neustadt, Germany.

Manufacturer

Sigma-Elektro (Hong Kong) Ltd
Room 2010, 20/F, No.1 Hung To Road, Kwun Tong, Kowloon, Hong Kong

1.3 Equipment Under Test [EUT]

Description of EUT

Model Name:	Wireless Cycle Computer (Speed Transmitter)
Brand Name:	VDO
Model Number:	A1 SPD
FCCID:	TFO-13010
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 Speed transmitter of Cycle 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.

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)	☒	☐
Spurious Radiated Emission	Part 15.209 (a), Part 15.205	☒	☐
Bandwidth Measurement	Part 15.215 (c)	☒	☐
Conducted Emission	Part 15.207	☐	☒

Note: N/A - Not Applicable

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:

FS = R + System Factor
System Factor = AF + CF + FA – 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 place 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.

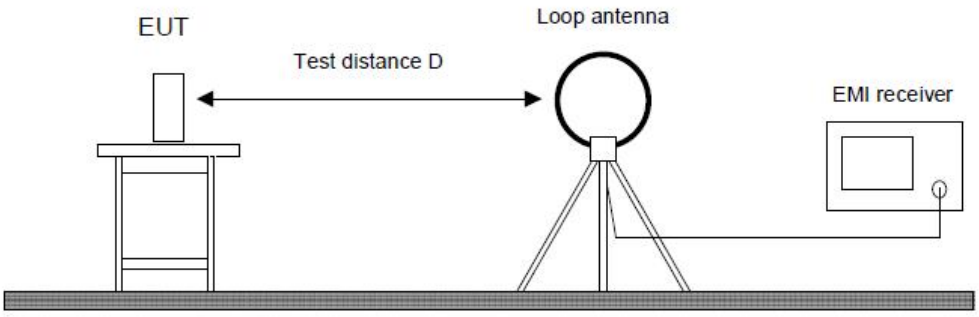
Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

4.0 Test Results

4.1 Field Strength of Fundamental and Harmonics

Test Requirement:	FCC part 15 section 15.209 (a) RSS-210 Issue 8 Section 2.2, 2.5 RSS-Gen Issue 3 Section 4.8
Test Method:	ANSI C63.4:2003
Test Date:	2013-12-30
Mode of Operation:	Transmitting mode.
Detector Function:	Average and Peak
Measurement BW:	200 Hz (RBW)

Test Setup:



Results: PASS

Field Strength of Fundamental and Harmonics					
Value	Emissions Frequency **kHz**	Field Strength (at 3m) **dBµV/m**	Limit Line (at 3m) **dBµV/m**	Delta to Limit **dBµV/m**	Remarks
PK	112.00	49.38	106.61	-57.23	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: ±5.0dB

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

Frequency (MHz)	Field Strength [µV/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

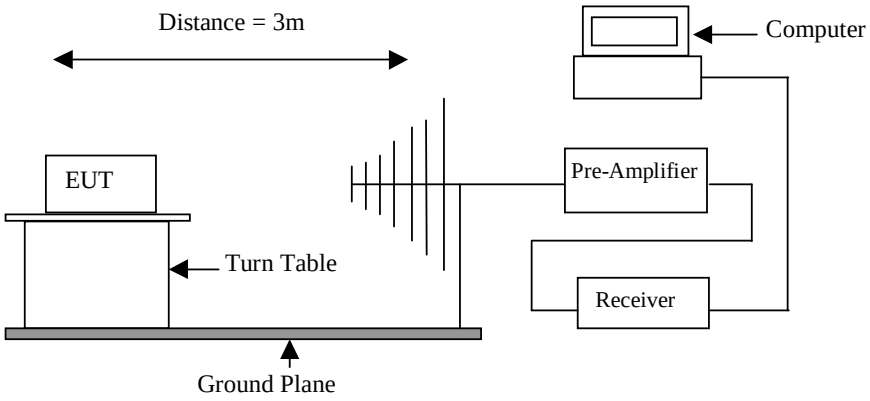
Note :
- Emission Level (dBµV/m) = 20 log Emission Level (µV/m)
- Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
- Limit line = specific limit (dBµV) + distance extrapolation factor.

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.

4.2 Spurious Radiated Emission

Test Requirement:	FCC part 15 section 15.209 (a) RSS-210 Issue 8 Section 2.2, 2.5 RSS-Gen Issue 3 Section 4.8
Test Method:	ANSI C63.4:2003
Test Date:	2013-12-30
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:



Results: PASS

Spurious Radiated Emissions (Below 30MHz)				
Value	Emissions Frequency	Field Strength (at 3m)	Limit Line (at 3m)	Delta to Limit
	MHz	**dBµV/m**	**dBµV/m**	**dBµV/m**
QP	0.02	40.68	69.54	-28.86

Spurious Radiated Emissions (Above 30MHz)							
Value	Emissions Frequency	E-Field Polarity	Reading	System Factor	Field Strength at 3m	Limit	Delta to Limit
	MHz		**dBµV/m**	**dB**	**dBµV/m**	**dBµV/m**	**dBµV/m**
QP	48.33	V	37.02	-15.88	21.14	40.00	-18.86
QP	60.70	V	36.20	-16.64	19.56	40.00	-20.44
QP	96.10	V	38.45	-15.69	22.76	43.50	-20.74
QP	155.91	V	39.84	-19.89	19.95	43.50	-23.55
QP	356.68	V	37.94	-12.97	24.97	46.00	-21.03
QP	962.16	V	35.90	-2.64	33.26	54.00	-20.74
QP	42.45	H	36.23	-15.77	20.46	40.00	-19.54
QP	58.82	H	36.75	-16.33	20.42	40.00	-19.58
QP	100.23	H	36.18	-15.46	20.72	43.50	-22.78
QP	187.75	H	37.98	-18.01	19.97	43.50	-23.53
QP	580.70	H	36.42	-7.35	29.07	46.00	-16.93
QP	972.34	H	35.84	-2.55	33.29	54.00	-20.71

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: ±5.0dB.

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

Frequency (MHz)	Field Strength [μV/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

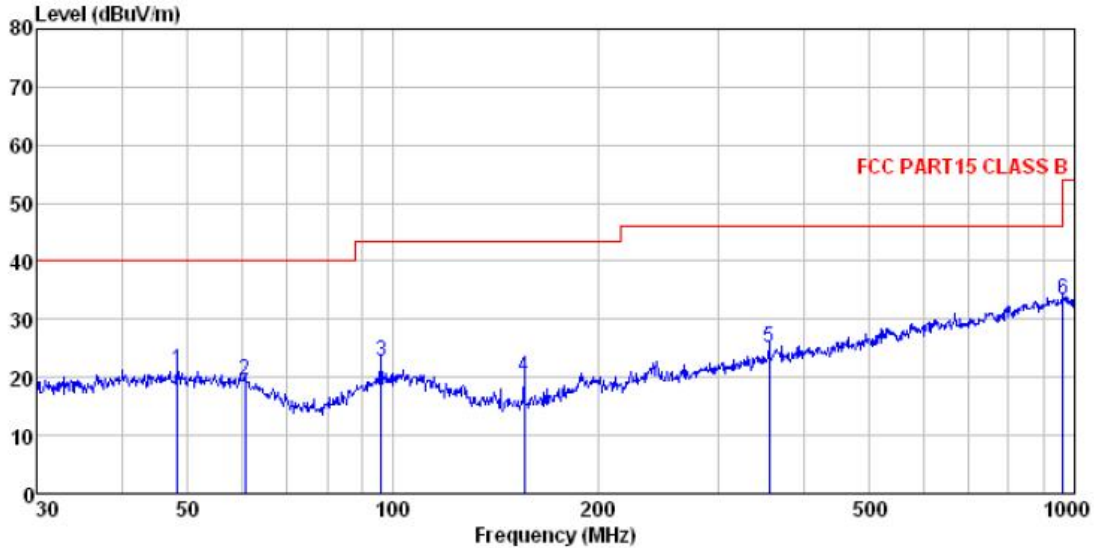
Note :

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

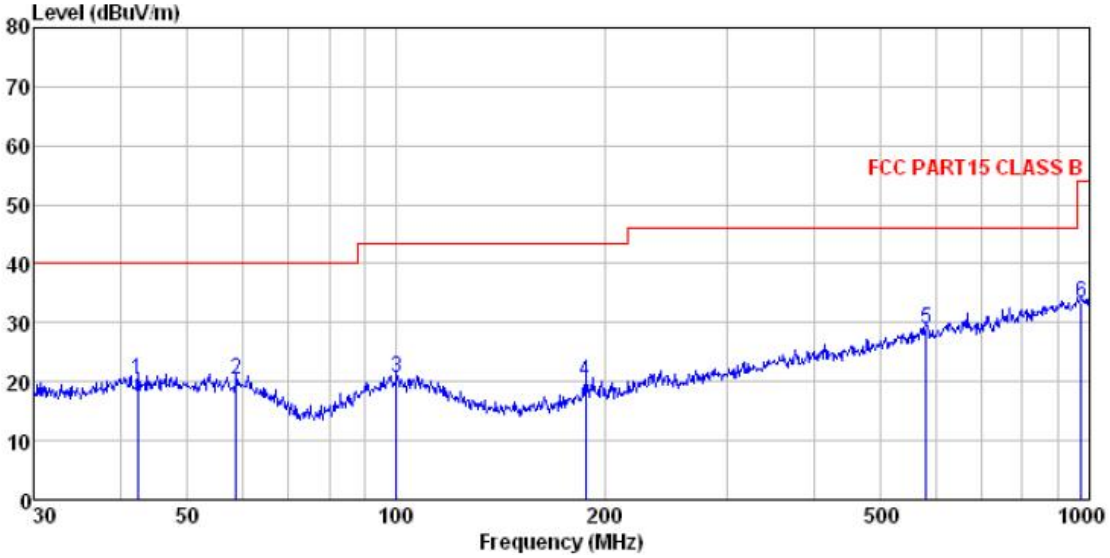
The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Vertical (30 to 1000MHz)



Remark: Only background noise was measured above 1GHz.

Horizontal (30 to 1000MHz)



Remark: Only background noise was measured above 1GHz.

4.3 Bandwidth Measurement

Test Requirement:	FCC part 15 section 15.215 (c) RSS-Gen Issue 3 Section 4.6
Test Method:	ANSI C63.4:2003
Test Date:	2013-12-30
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

Results: PASS

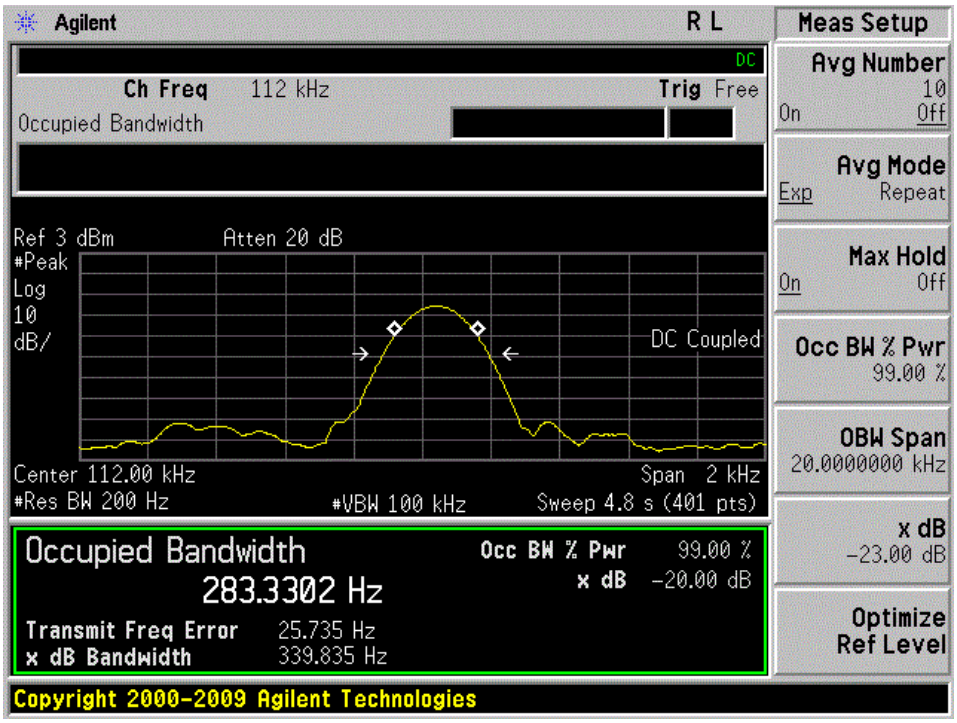
20 dB BW	99% OBW	Test Result
339.835 Hz	283.330Hz	Complies

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.

Bandwidth


Agilent
R L
Meas Setup
DC
Ch Freq 112 kHz
Trig Free
Occupied Bandwidth
Avg Number
10
On Off
Avg Mode
Exp Repeat
Ref 3 dBm
Atten 20 dB
#Peak
Log
10
dB/
Max Hold
On Off
DC Coupled
Occ BW % Pwr
99.00 %
OBW Span
20.0000000 kHz
Center 112.00 kHz
Span 2 kHz
#Res BW 200 Hz
#VBW 100 kHz
Sweep 4.8 s (401 pts)
x dB
-23.00 dB
Occupied Bandwidth
283.3302 Hz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 25.735 Hz
x dB Bandwidth 339.835 Hz
Optimize Ref Level
Copyright 2000-2009 Agilent Technologies

4.4 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC part 15 Section 15.207 Class B RSS-Gen Issue 3 Section 7.2.4
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 [dBμV]	Average Limit [dBμV]
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.

5.0 List of Measurement Equipment

Radiated Emission and Out of Band Emissions

Description	Manufacturer	Model no.	Serial no.	CAL due
3m Semi-Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)*6.0(H)	GTS250	29 Mar 2014
ESU EMI Test Receiver	R&S	ESU26	GTS203	06 Jul 2014
BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	09 Mar 2014
Double-ridged waveguide horn	SCHWARZBECK	9120D	GTS208	09 Mar 2014
RF Amplifier	HP	8347A	GTS204	06 Jul 2014
Preamplifier	HP	8349B	GTS206	06 Jul 2014

Remarks:
CM Corrective Maintenance
N/A Not Applicable or Not Available