

FCC and Industry Canada Testing of the
GamesOnTrack A/S
RadioMaster. Model: GT-XConnect
In accordance with FCC 47 CFR Part 15B and
ICES-003

Prepared for: GamesOnTrack A/S
Nygade 12 1st floor
DK-7500 Holstebro
Denmark

FCC ID: 2AK9NGTX17263X
IC: 22454GTX17263X



Product Service

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Date: June 2017
Document Number: 75937369-02 | Issue: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Steven White	3 October 2017	
Authorised Signatory	Simon Bennett	3 October 2017	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

FCC Accreditation 90987 Octagon House, Fareham Test Laboratory	Industry Canada Accreditation IC2932B-1 Octagon House, Fareham Test Laboratory
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EXECUTIVE SUMMARY

A sample of this product was tested and found to be in compliance with FCC 47 CFR Part 15B: 2016 and ICES-003: 2016.



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is a trading name of TÜV SÜD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TÜV SÜD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuv-sud.co.uk

TÜV SÜD Product Service
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom



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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	3 October 2017

Table 1

1.2 Introduction

Applicant	GamesOnTrack A/S
Manufacturer	GamesOnTrack A/S
Model Number(s)	GT-XConnect
Serial Number(s)	Not serialised (75937369-TSR0018)
Brand Name (s)	GT-XConnect and Faller Car System Digital Master
Hardware Version(s)	REV B date 2013-12-17
Software Version(s)	2.1.31
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2016 ICES-003: 2016
Order Number	pur order FCC TUV SUD
Date	16-December-2016
Date of Receipt of EUT	14-March-2017 and 15-June-2017
Start of Test	28-June-2017
Finish of Test	28-June-2017
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.4 (2014)

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15B	ICES-003			
Configuration: Idle					
2.1	15.107	6.1	AC Power Line Conducted Emissions	Pass	ANSI C63.4
2.2	15.109	6.2	Radiated Emissions	Pass	ANSI C63.4

Table 2



1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	GT-Xconnect
Part Number	1302630 / 161355
Hardware Version	REV B date 2013-12-17
Software Version	2.1.31
FCC ID (if applicable)	2AK9NGTX17263X
Industry Canada ID (if applicable)	22454GTX17263X
Technical Description (Please provide a brief description of the intended use of the equipment)	The GT-Xconnect runs our indoor position- and controlsystem for model trains, robots, modelcars, drones, etc.

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
FSK	915MHz	+24dBm	+2dBi	500kHz	FHSS		903.42	915.20	926.58

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	926.58

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
	N/A	N/A	N/A
External DC	Nominal Voltage		Maximum Current
	5V (USB)		400mA
Battery	Nominal Voltage		Battery Operating End Point Voltage
	N/A		N/A
Can EUT transmit whilst being charged?			Yes <input type="checkbox"/> No <input type="checkbox"/>

EXTREME CONDITIONS			
Maximum temperature	40	°C	Minimum temperature
			10 °C



Ancillaries
Please list all ancillaries which will be used with the device.

ANTENNA CHARACTERISTICS			
<input checked="" type="checkbox"/>	Antenna connector	State impedance	50 Ohm
<input type="checkbox"/>	Temporary antenna connector	State impedance	Ohm
<input type="checkbox"/>	Integral antenna	Type	
<input checked="" type="checkbox"/>	External antenna	Type	1/4 wave Dipole

I hereby declare that the information supplied is correct and complete.

Name: Niels Bo Theilgaard

Position held: CEO

Date: 23-02-2017

1.5 Product Information

1.5.1 Technical Description

The GT-Xconnect runs our indoor position- and control system for model trains, robots, model cars, drones, etc. The GT-Xconnect runs our indoor position- and control system for model trains, robots, model cars, drones, etc.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing. No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: Not serialised (75937369-TSR0012)			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: Not serialised (75937369-TSR0016)			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: Not serialised (75937369-TSR0018)			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration: Idle		
AC Power Line Conducted Emissions	Graeme Lawler	UKAS
Radiated Emissions	Graeme Lawler	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.107
ICES-003, Clause 6.1

2.1.2 Equipment Under Test and Modification State

GT-Xconnect, S/N: Not serialised (75937369-TSR0012) - Modification State 0

2.1.3 Date of Test

28-June-2017

2.1.4 Test Method

The test was performed in accordance with ANSI C63.4, clause 7.

2.1.5 Environmental Conditions

Ambient Temperature	20.6 °C
Relative Humidity	65.0 %

2.1.6 Test Results

Idle

Applied supply voltage: 60 Hz
Applied supply frequency: 120 Vac

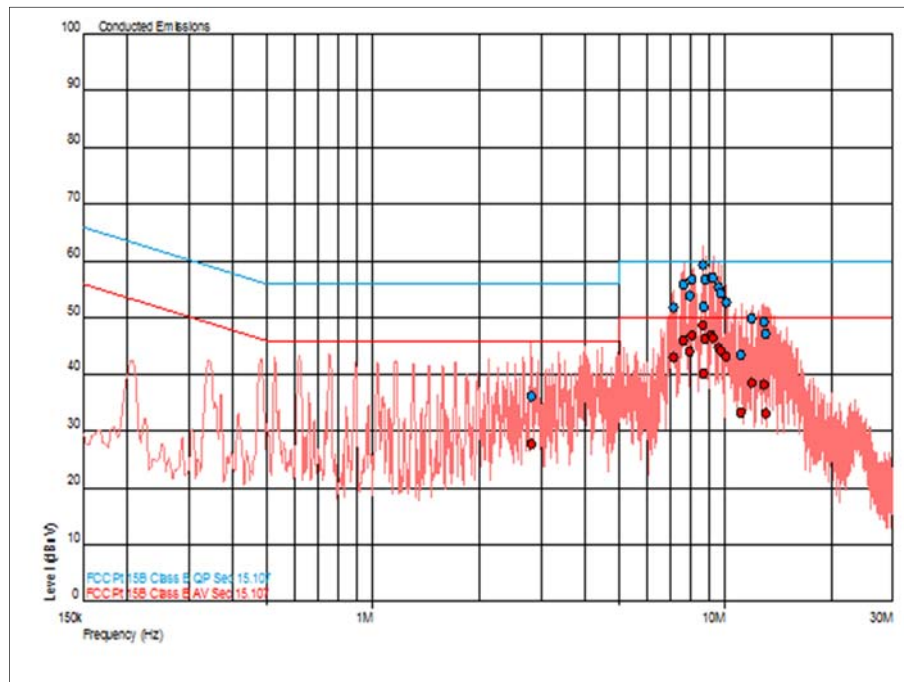


Figure 1 - Neutral Line

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
2.824	36.1	56.0	-19.9	27.7	46.0	-18.3
7.158	51.9	60.0	-8.1	42.9	50.0	-7.1
7.624	55.9	60.0	-4.1	46.0	50.0	-4.0
7.977	54.0	60.0	-6.0	44.0	50.0	-6.0
8.093	56.9	60.0	-3.1	46.9	50.0	-3.1
8.680	59.3	60.0	-0.7	48.8	50.0	-1.2
8.719	52.1	60.0	-7.9	40.0	50.0	-10.0
8.799	56.8	60.0	-3.2	46.4	50.0	-3.6
9.153	57.1	60.0	-2.9	46.9	50.0	-3.1
9.268	57.0	60.0	-3.0	46.5	50.0	-3.5
9.619	55.4	60.0	-4.6	44.7	50.0	-5.3
9.733	54.4	60.0	-5.6	44.1	50.0	-5.9
10.090	52.7	60.0	-7.3	43.1	50.0	-6.9
11.132	43.4	60.0	-16.6	33.2	50.0	-16.8
11.962	49.9	60.0	-10.1	38.5	50.0	-11.5
12.941	49.4	60.0	-10.6	38.2	50.0	-11.8
13.076	47.2	60.0	-12.8	33.1	50.0	-16.9

Table 5 - Neutral Line

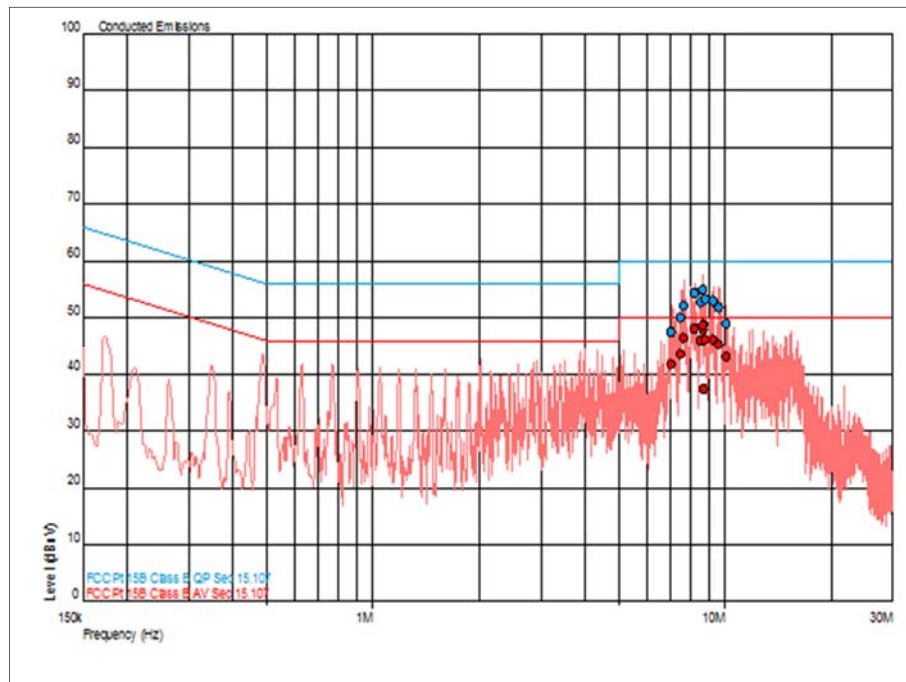


Figure 2 - Live Line

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
7.041	47.5	60.0	-12.5	41.8	50.0	-8.2
7.506	50.1	60.0	-9.9	43.5	50.0	-6.5
7.628	52.2	60.0	-7.8	46.5	50.0	-3.5
8.213	54.4	60.0	-5.6	48.2	50.0	-1.8
8.564	52.7	60.0	-7.3	46.1	50.0	-3.9
8.679	55.0	60.0	-5.0	48.0	50.0	-2.0
8.685	55.0	60.0	-5.0	48.7	50.0	-1.3
8.732	48.8	60.0	-11.2	37.3	50.0	-12.7
8.798	53.3	60.0	-6.7	46.2	50.0	-3.8
9.267	53.1	60.0	-6.9	46.1	50.0	-3.9
9.621	51.8	60.0	-8.2	45.3	50.0	-4.7
10.088	49.1	60.0	-10.9	43.1	50.0	-6.9

Table 6 - Live Line

FCC 47 CFR Part 15, Limit Clause 15.107

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 7

*Decreases with the logarithm of the frequency.

ICES-003, Limit Clause 6.1

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 8

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
LISN (1 Phase)	Chase	MN 2050	336	12	07-Apr-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Multimeter	Iso-tech	IDM 101	2118	12	07-Feb-2018
Hygrometer	Rotronic	A1	2138	12	02-Feb-2018
Transient Limiter	Hewlett Packard	11947A	2378	12	06-Jul-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	12-Nov-2017

Table 9

2.2 Radiated Emissions

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ICES-003, Clause 6.2

2.2.2 Equipment Under Test and Modification State

GT-Xconnect, S/N: Not serialised (75937369-TSR0012) - Modification State 0

2.2.3 Date of Test

28-June-2017

2.2.4 Test Method

The test was performed in accordance with ANSI C63.4, clause 8.

2.2.5 Environmental Conditions

Ambient Temperature 20.6 °C
Relative Humidity 65.0 %

2.2.6 Test Results

Radio Master

Highest frequency generated or used within the EUT: 926.58
Upper frequency test limit: 5 GHz

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
32.477	31.8	40.0	-8.2	24	3.70	Vertical
34.681	32.1	40.0	-7.9	171	3.55	Vertical
38.878	31.2	40.0	-8.8	360	1.78	Vertical
51.437	32.8	40.0	-7.2	142	1.00	Vertical
52.491	32.9	40.0	-7.1	191	1.00	Vertical
54.059	31.5	40.0	-8.5	133	1.00	Vertical
61.428	25.1	40.0	-14.9	128	1.00	Vertical
923.429	36.3	46.0	-9.7	360	1.00	Horizontal

Table 10 - 30 MHz to 1 GHz

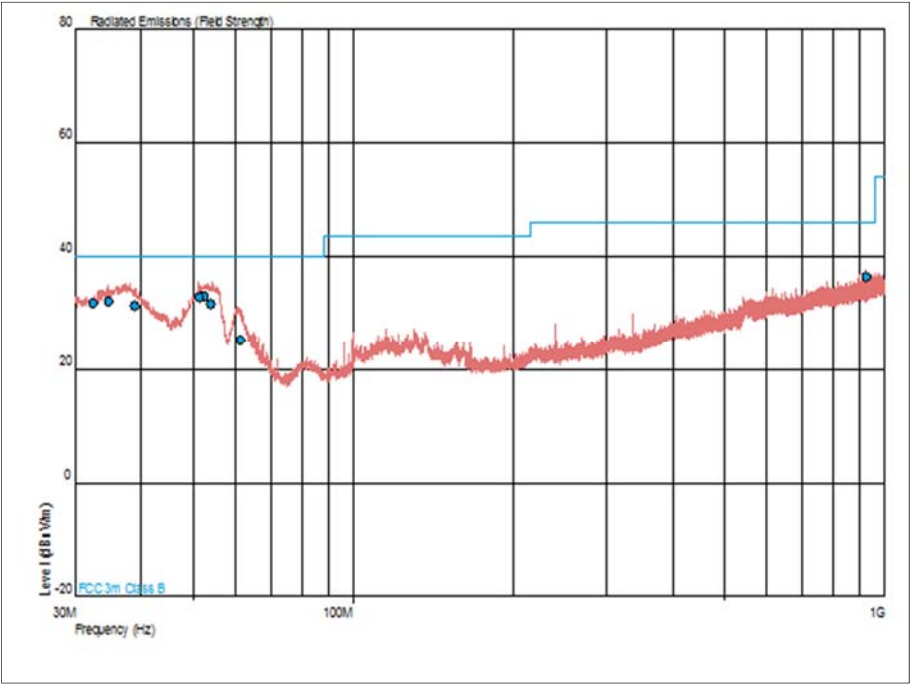


Figure 3 - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (µV/m)		Limit (µV/m)		Margin (µV/m)		Angle (°)	Height (m)	Polarisation
	Peak	Average	Peak	Average	Peak	Average			
*									

Table 11 - 1 GHz to 5 GHz

*No emissions were detected within 10 dB of the limit.

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Angle (°)	Height (m)	Polarisation
	Peak	Average	Peak	Average	Peak	Average			
*									

Table 12 - 1 GHz to 5 GHz

*No emissions were detected within 10 dB of the limit.

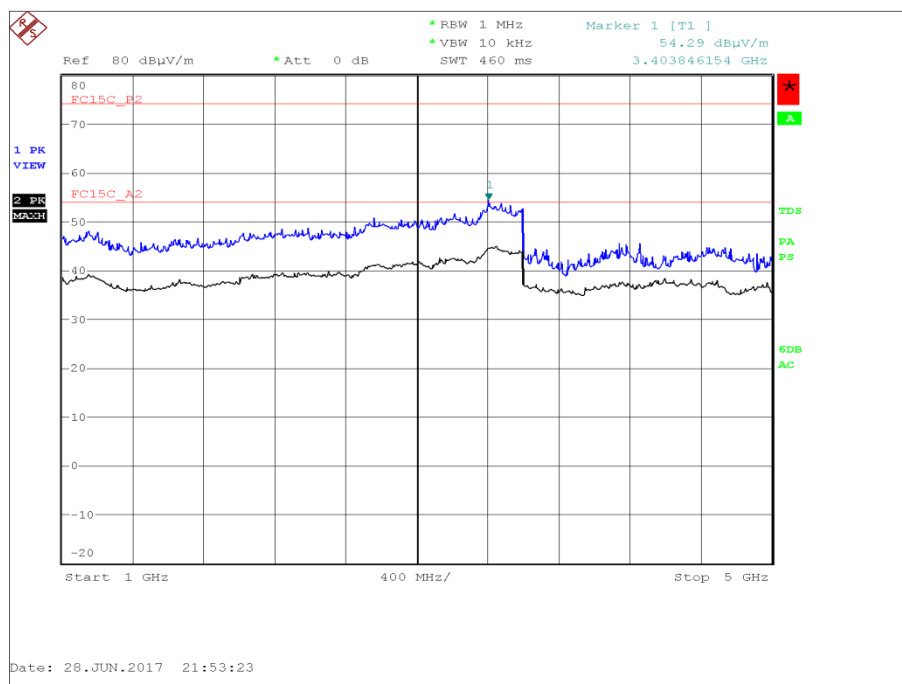


Figure 4 - 1 GHz to 5 GHz - Horizontal and Vertical

FCC 47 CFR Part 15, Limit Clause 15.109

Frequency of Emission (MHz)	Field Strength (μV/m)
30 to 88	100.0
88 to 216	150.0
216 to 960	200.0
Above 960	500.0

ICES-003, Limit Clause 6.2

Frequency of Emission (MHz)	Quasi-Peak (dBμV/m)
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 to 1000	54.0

Frequency of Emission (MHz)	Field Strength (dBμV/m)	
	Linear Average Detector	Peak Detector
Above 1000	54.0	74.0

2.2.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	12-Feb-2018
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Apr-2018
Pre-Amplifier	Phase One	PS04-0086	1533	12	29-Jul-2017
18GHz - 40GHz Pre-Amplifier	Phase One	PS04-0087	1534	12	23-Jan-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM 101	2118	12	07-Feb-2018
Hygrometer	Rotronic	A1	2138	12	02-Feb-2018
Comb Generator	Schaffner	RSG1000	3034	-	TU
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	12-Nov-2017
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	23-Jul-2017
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	6	04-Nov-2017
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 13

TU - Traceability Unscheduled



3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
AC Power Line Conducted Emissions	150 kHz to 30 MHz, LISN, ± 3.7 dB
Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB
	1 GHz to 40 GHz: ± 6.3 dB

Table 14