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Parque Tecnológico de Andalucía,
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C.I.F. A29 507 456

Nº 51/LE147

Test report No:
NIE: 62016RRF.002

Test report
ETSI EN 300 328 v 2.1.1 (2016-11)

(*) Identification of item tested	Scalextric Advance controller
(*) Trademark	SCALEXTRIC - SCX
(*) Model and /or type reference tested	SD02103
Other identification of the product	HW version: V1.4 SW version: M-10.14
(*) Features	Proprietary 2.4 GHz (nRF24L01)
Manufacturer	SCALE COMPETITION XTREME, S.L.
Test method requested, standard	ETSI EN 300 328 v2.1.1 (2016-11): Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Jose Carlos Luque RF Lab. Supervisor 74841983Y JOSE CARLOS LUQUE (C:A29507456) Firmado digitalmente por 74841983Y JOSE CARLOS LUQUE (C:A29507456) Fecha: 2020.02.04 13:45:09 +01'00'
Date of issue	2020-02-04
Report template No	FDT08_22 (*) "Data provided by the client"

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Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a toy controller powered with 3V through batteries and connected to a toy car by 2.4GHz wireless transmission.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: the client.

- Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Reception
62016/003	Scalextric Advance Controller	SD02103	--	2020/01/02

Sample S/01 has undergone the following test(s): RADIATED tests on low channel for transmitter unwanted emissions indicated in Appendix B.

- Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Reception
62016/004	Scalextric Advance Controller	SD02103	--	2020/01/02

Sample S/02 has undergone the following test(s): RADIATED tests on high channel for transmitter unwanted emissions indicated in Appendix B.

- Sample S/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Reception
62016/008	Scalextric Advance Controller	SD02103	--	2020/01/02

Sample S/03 has undergone the following test(s): RADIATED tests for receiver spurious emissions indicated in Appendix B.

- Sample S/04 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
62016/009	Scalextric Advance Controller	SD02103	--	2020/01/02
62016/010	Scalextric Advance Car	SD02177	--	2020/01/02
62016/016	Scalextric track	SCX	--	2020/01/02

Sample S/04 has undergone the following test(s): All CONDUCTED tests indicated in Appendix B.

Test sample description

Ports…… :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)		
			☐	☐	☐		
Supplementary information to the ports…… :							
Rated power supply .....:	Voltage and Frequency			Reference poles			
				L1	L2	L3	N	PE
	☐	AC:		☐	☐	☐	☐	☐
	☒	DC: 3 Vdc						
Rated Power .....:	3 V							
Clock frequencies.....:	16 MHz							
Other parameters .....:								
Software version .....:	M-10.14							
Hardware version .....:	V1.4							
Dimensions in cm (W x H x D) ....:	95x150x20 cm (aprox.)							
Mounting position .....:	☐	Table top equipment						
	☐	Wall/Ceiling mounted equipment						
	☐	Floor standing equipment						
	☒	Hand-held equipment						
	☐	Other:						
Modules/parts.....:	Module/parts of test item		Type		Manufacturer		
Accessories (not part of the test item) .....:	Description		Type		Manufacturer		
Documents as provided by the applicant.....:	Description		File name		Issue date		

(3) Only for Medical Equipment

Identification of the client

SCALE COMPETITION XTREME, S.L.

c/ Camps I Fabres 3, 2º 2ª, 08006 Barcelona (Spain)

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-01-02
Date (finish)	2020-01-03

Document history

Report number	Date	Description
62016RRF.002	2020-02-04	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 35 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Nicolas Salguero and Cristina Calle.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	DC power supply R&S NGPE 40/40	2018/02	2021/02
2.	Signal and Spectrum Analyzer 10Hz – 40GHz ROHDE AND SCHWARZ FSV40	2019/10	2021/10
3.	Vector Signal Generator 100 kHz-6GHz ROHDE AND SCHWARZ SMU200A	2018/10	2020/10
4.	Open Switch and Control Platform ROHDE & SCHWARZ OSP-B157W8	2018/05	2020/05
5.	Signal Generator 9 kHz-6GHz ROHDE AND SCHWARZ SMB100A	2019/10	2021/10
6.	Climatic chamber HERAEUS VM 04/35	2018/06	2020/06
7.	DC Agilent 8496B attenuator / 110dB	2018/04	2020/04

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N/A	N/A
2.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
3.	RF Pre-amplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/02
4.	Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2017/09	2020/09
5.	Spectrum analyser Rohde & Schwarz FSW50	2018/02	2020/02
6.	RF Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/04	2020/04
7.	Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

1. Proprietary Protocol 2.4 GHz

ETSI EN 300 328			
	Requirement – Test case	**Verdict**	**Remark**
4.3.2.2	Transmitter. RF Output Power	P	
4.3.2.3	Transmitter. Power Spectral Density	P	
4.3.2.4	Transmitter. Duty cycle, Tx-Sequence, Tx-gap	N/A	(1)
4.3.2.5	Medium Utilisation	N/A	(1)
4.3.2.6	Adaptivity	N/A	(1)
4.3.2.7	Occupied Channel Bandwidth	P	
4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	P	
4.3.2.9	Transmitter unwanted emissions in the spurious domain (conducted)	N/A	
4.3.2.9	Transmitter unwanted emissions in the spurious domain (radiated)	P	
4.3.2.10	Receiver spurious emissions (conducted)	N/A	
4.3.2.10	Receiver spurious emissions (radiated)	P	
4.3.2.11	Receiver blocking	P	
4.3.2.12	Geo-location capability	N/A	(2)

Supplementary information and remarks:

(1) The equipment is declared as non-adaptive equipment using other forms of modulation than FHSS. The maximum declared RF Output power level is less than 10 dBm e.i.r.p. Integral antenna.

(2) The equipment does not implement geo-location capability as defined in clauses 4.3.1.13.2 and 4.3.2.12.2.

Appendix A: Application form for Proprietary Protocol 2.4 GHz.

Information as required by EN 300 328 V2.1.1, clause 5.4.1

In accordance with EN 300 328, clause 5.4.1, the following information is provided by the manufacturer.

a) The type of modulation used by the equipment:

☐ FHSS

☒ other forms of modulation

b) In case of FHSS modulation:

- In case of non-Adaptive Frequency Hopping equipment:

  The number of Hopping Frequencies: ……..

- In case of Adaptive Frequency Hopping Equipment:

  The maximum number of Hopping Frequencies: ……..

  The minimum number of Hopping Frequencies: ……..

- The (average) Dwell Time: ……..

c) Adaptive / non-adaptive equipment:

☒ non-adaptive Equipment

☐ adaptive Equipment without the possibility to switch to a non-adaptive mode

☐ adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The maximum Channel Occupancy Time implemented by the equipment: ..... ms

☐ The equipment has implemented an LBT based DAA mechanism

- In case of equipment using modulation different from FHSS:

  ☐ The equipment is Frame Based equipment

  ☐ The equipment is Load Based equipment

  ☐ The equipment can switch dynamically between Frame Based and Load Based equipment

  The CCA time implemented by the equipment: ..... µs

☐ The equipment has implemented a non-LBT based DAA mechanism

☐ The equipment can operate in more than one adaptive mode

☐ The equipment has implemented Short Control Signalling Transmissions

e) In case of non-adaptive Equipment:

The maximum RF Output Power: …0……. dBm

The maximum RF Output Power (e.i.r.p.): …0……. dBm

The maximum (corresponding) Duty Cycle: …… %

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

.....

.....

.....

f) The worst case operational mode for each of the following tests:

- RF Output Power

  0 dBm e.i.r.p.....

- Power Spectral Density

  Below the limit.....

- Duty cycle, Tx-Sequence, Tx-gap

  N/A (below 10 dBm e.i.r.p.).....

- Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment)

  N/A (not FHSS) .....

- Hopping Frequency Separation (only for FHSS equipment)

  N/A (not FHSS).....

- Medium Utilization

  N/A (below 10 dBm e.i.r.p.).....

- Adaptivity & Receiver Blocking

  Receiver Blocking Class 3.....

- Nominal Channel Bandwidth

  1 MHz.....

- Transmitter unwanted emissions in the OOB domain

  Below the limit.....

- Transmitter unwanted emissions in the spurious domain

  Below the limit.....

- Receiver spurious emissions

  Below the limit.....

g) The different transmit operating modes (tick all that apply):

☒ Operating mode 1: Single Antenna Equipment

☒ Equipment with only one antenna

☐ Equipment with two diversity antennas but only one antenna active at any moment in time

☐ Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

☐ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming

☐ Single spatial stream / Standard throughput / (e.g. IEEE 802.11™[i.3] legacy mode)

☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming

☐ Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)

☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

- The number of Receive chains: .....
- The number of Transmit chains: .....

☐ symmetrical power distribution

☐ asymmetrical power distribution

In case of beam forming, the maximum (additional) beam forming gain: ..... dB

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

- Operating Frequency Range 1: …2401…… MHz to …2479……. MHz
- Operating Frequency Range 2: …….. MHz to …….. MHz
- NOTE: Add more lines if more Frequency Ranges are supported.

j) Nominal Channel Bandwidth(s):

- Nominal Channel Bandwidth 1: …1……. MHz
- Nominal Channel Bandwidth 2: ……... MHz

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

☒ Stand-alone

☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)

☐ Plug-in radio device (Equipment intended for a variety of host systems)

☐ Other .....

l) The normal and the extreme operating conditions that apply to the equipment:

Normal operating conditions (if applicable):

Operating temperature: …25…… ° C

Other (please specify if applicable): …… ° C

Extreme operating conditions:

Operating temperature range: Minimum …0…..° C Maximum …45.….° C

Other (please specify if applicable): Minimum …… ° C Maximum ……° C

Details provided are for the: ☒ stand-alone equipment

☐ combined (or host) equipment

☐ test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:

- Antenna Type:

☒ Integral Antenna

Antenna Gain: …0……. dBi

If applicable, additional beamforming gain (excluding basic antenna gain): ..... dB

☐ Temporary RF connector provided

☐ No temporary RF connector provided

☐ Dedicated Antennas (equipment with antenna connector)

☐ Single power level with corresponding antenna(s)

☐ Multiple power settings and corresponding antenna(s)

Number of different Power Levels: .....

Power Level 1: ..... dBm

Power Level 2: ..... dBm

Power Level 3: ..... dBm

NOTE 1: Add more lines in case the equipment has more power levels.

NOTE 2: These power levels are conducted power levels (at antenna connector).

- For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: ..... dBm

Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: ..... dBm

Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: ..... dBm

Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:

Details provided are for the: ☒ stand-alone equipment

☐ combined (or host) equipment

☐ test jig

Supply Voltage ☐ AC mains State AC voltage …….. V

☒ DC State DC voltage …3….. V

In case of DC, indicate the type of power source

☒ Internal Power Supply

☐ External Power Supply or AC/DC adapter

☐ Battery

☐ Other:

o) Describe the test modes available which can facilitate testing:

.....

.....

.....

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™[i.3], IEEE 802.15.4™[i.4], proprietary, etc.):

……..Proprietary (nRF24L01).....

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

☐ Yes

☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user.

☒ No

t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):

.....

.....

.....

Appendix B: Test results. Proprietary Protocol 2.4 GHz.

INDEX

TEST CONDITIONS

POWER SUPPLY (V):

Vn:	3 Vdc
Type of power supply:	Internal batteries.

TEMPERATURE (ºC):

Tn:	+15 to +35
Tmin:	0 (*)
Tmax:	+45 (*)

The subscript ‘n’ indicates normal test conditions.

The subscripts min and max indicates extreme test conditions (minimum and maximum respectively).

(*): Declared by applicant.

TEST FREQUENCIES FOR CONDUCTED TESTS:

Low Channel:	2401 MHz
Middle Channel:	2440 MHz
High Channel:	2479 MHz

TEST FREQUENCIES FOR RADIATED TESTS:

Low Channel:	2401 MHz
High Channel:	2479 MHz

PRODUCT INFORMATION

The following information is provided by the supplier, in accordance with clause 5.4.1:

Information	Description
Modulation:	Other than FHSS
Adaptivity:	Non-adaptive
Maximum RF Output Power (e.i.r.p.):	0 dBm
Operation mode 1: Single Antenna Equipment:	Equipment with only one antenna.
- Operating Frequency Range:	2401 – 2479 MHz
- Nominal Channel Bandwidth:	1 MHz
Extreme Operating Conditions:	
- Temperature Range:	0 to +45 ºC
Type of Antenna:	Integral.
Antenna Gain:	0 dBi
Nominal Voltage:	
- Supply Voltage:	3 Vdc
- Type of Power Source:	Battery
Type of Equipment:	Proprietary 2.4 GHz (nRF24L01)
Geo-location capability:	No

Test modes available:

- Continuous modulated carrier at 2401 MHz, 2440 MHz and 2479 MHz.
- Continuous reception at 2401 MHz, 2440 MHz and 2479 MHz.

TEST 4.3.2.2: Transmitter. RF Output Power.

LIMITS:

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the manufacturer and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the manufacturer.

This limit shall apply for any combination of power level and intended antenna assembly.

RESULTS:

Type of Equipment: Non-adaptive.

Maximum Declared RF Output Power (e.i.r.p.): 0 dBm

Maximum Declared Assembly Antenna Gain: 0 dBi

		P - Transmitter power e.i.r.p. (dBm)		
TEST CONDITIONS		Low Channel	Middle Channel	High Channel
T_n	V_n	-5.2	-4.5	-4.3
T_{min}	V_n	-5.8	-4.7	-4.1
T_{max}	V_n	-5.9	-4.8	-4.3
Measurement uncertainty		<±0.66 dB		

Note: P is the e.i.r.p. as defined in clause 5.4.2.2.1.2, step 6.

Verdict: PASS

TEST 4.3.2.3: Transmitter. Power Spectral Density.

LIMITS:

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

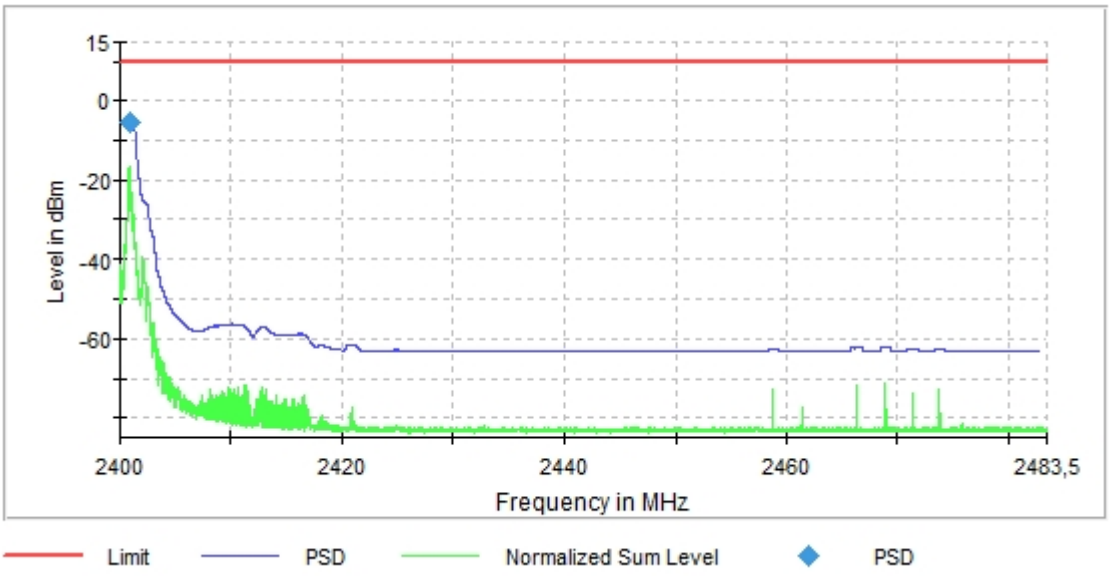
RESULTS:

Maximum Declared Assembly Antenna Gain: 0 dBi

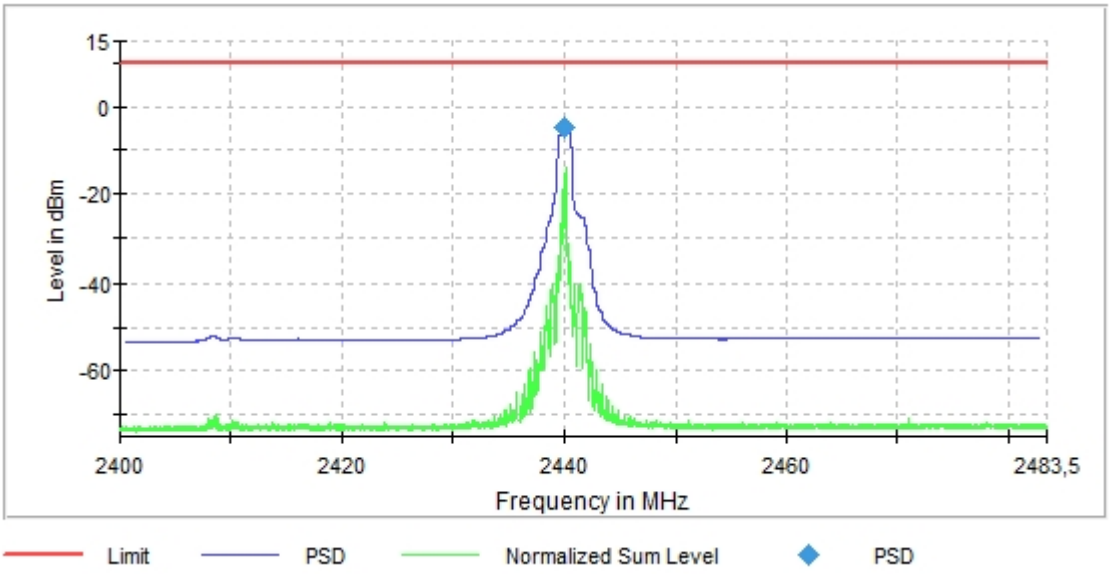
	Lowest frequency 2400.914890 MHz	Middle frequency 2439.870225 MHz	Highest frequency 2478.815561 MHz
Measured Power Spectral Density	-5.258 dBm/1 MHz	-4.617 dBm/1 MHz	-4.39 dBm/1 MHz
Measurement uncertainty	<±0.95 dB		

Verdict: PASS

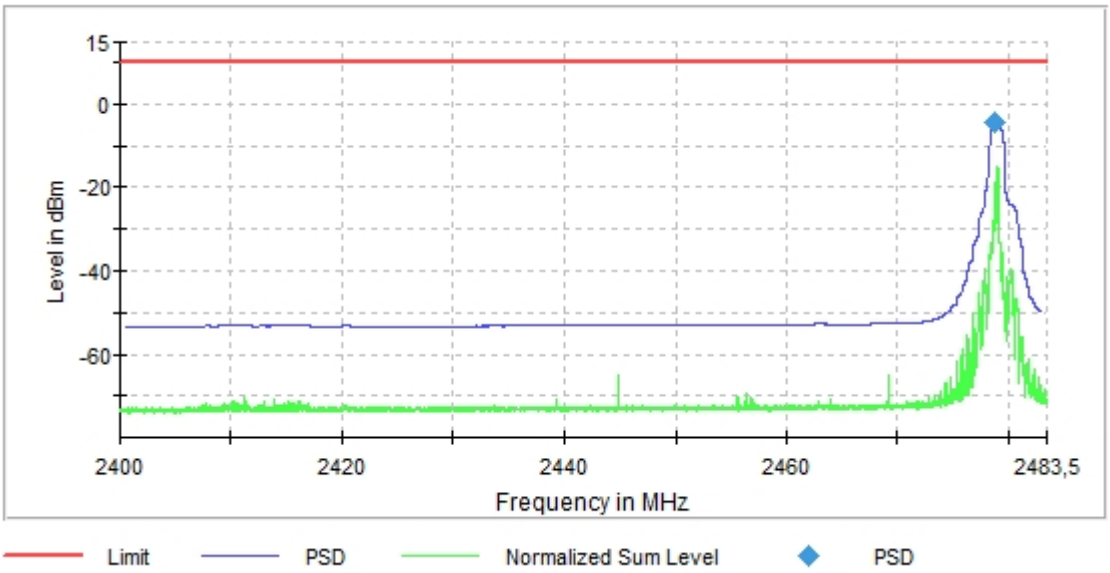
- Low Channel:



- Middle Channel:



- High Channel:



Verdict: PASS

TEST 4.3.2.7: Occupied Channel Bandwidth.

LIMITS:

The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band.

In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

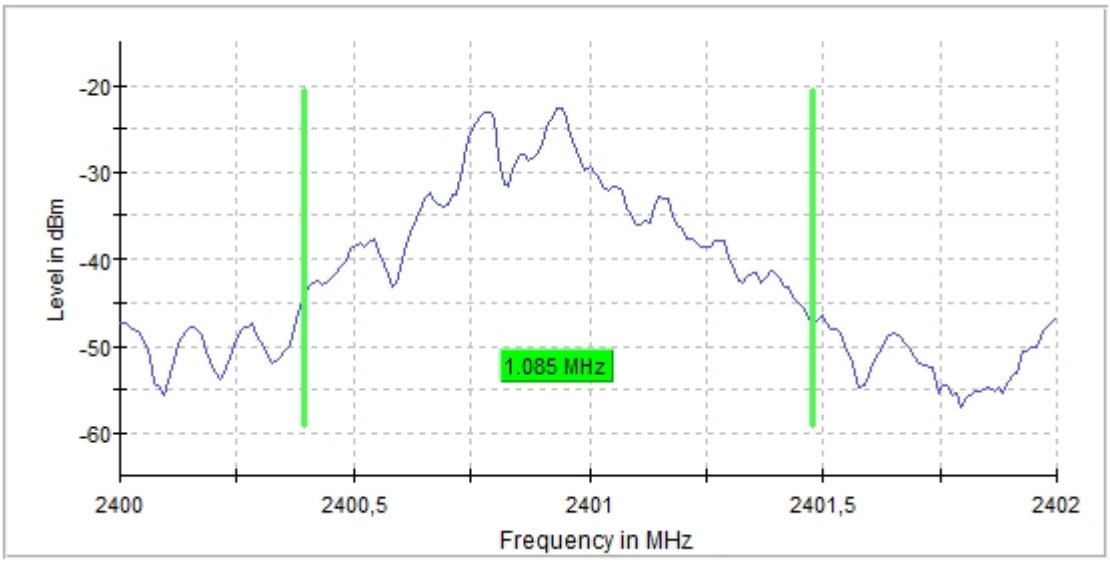
RESULTS:

Type of Equipment: Non-adaptive.

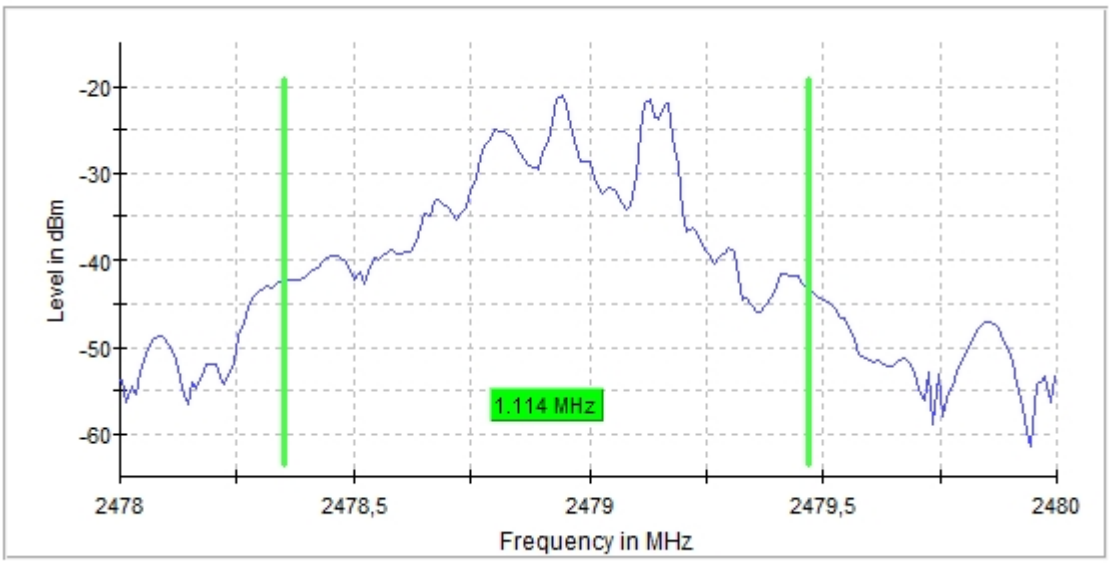
Maximum Declared RF Output Power (e.i.r.p.): 0 dBm

Channel	Channel Center Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Band Edge (MHz)
Low	2401.00000	1.084577	2400.393035
High	2479.00000	1.114428	2479.467662
Measurement uncertainty		<±1.31 kHz	

- Low Channel:



- High Channel:

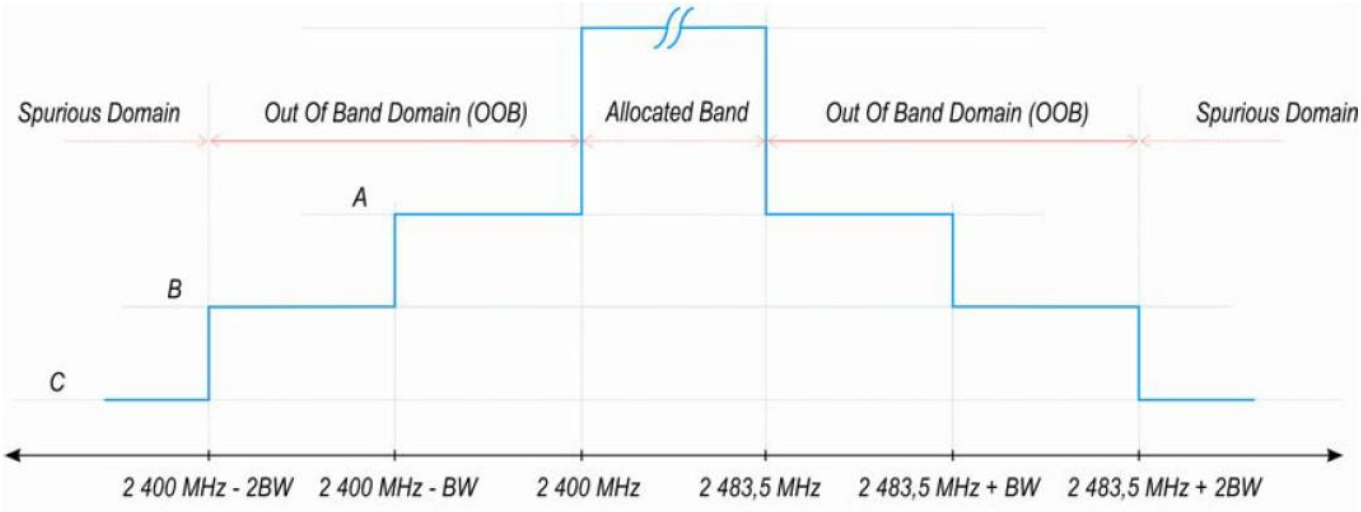


Verdict: PASS

TEST 4.3.2.8: Transmitter unwanted emissions in the out-of-band (OOB) domain.

LIMITS:

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided in the next mask:



RESULTS:

Temperature (ºC)	Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
Normal	Low	2398.330846	-66.3	-20.0
Normal	Low	2398.415423	-68.7	-20.0
Normal	Low	2399.415423	-67.5	-10.0
Normal	Low	2399.500000	-68.1	-10.0
Normal	Low	2484.000000	-66.7	-10.0
Normal	Low	2484.084577	-64.6	-10.0
Normal	Low	2485.084577	-67.3	-20.0
Normal	Low	2485.169154	-67.3	-20.0
Normal	High	2398.271144	-57.4	-20.0
Normal	High	2398.385572	-58.5	-20.0
Normal	High	2399.385572	-55.5	-10.0
Normal	High	2399.500000	-58.3	-10.0
Normal	High	2484.000000	-42.5	-10.0
Normal	High	2484.114428	-41.9	-10.0
Normal	High	2485.114428	-43.8	-20.0
Normal	High	2485.228856	-44.5	-20.0

Measurement uncertainty	<±0.95 dB

Verdict: PASS

TEST 4.3.2.9: Transmitter unwanted emissions in the spurious domain.

LIMITS:

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the next table:

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

RESULTS:

The level of spurious emissions was measured as their effective radiated power when radiated by cabinet and antenna.

RADIATED:

Frequency range 30 MHz – 1 GHz

The spurious frequencies detected do not depend on the operating channel.

No spurious frequencies detected at less than 6 dB below the limit.

Measurement uncertainty: <±3.81 dB

Frequency range 1 – 12.75 GHz

- LOW CHANNEL (2401 MHz):

Spurious frequency (GHz)	E.I.R.P. (dBm)	Detector	Polarization	Measurement Uncertainty (dB)
7203.01666	-37.06	RMS	V	<± 4.72

- HIGH CHANNEL (2479 MHz):

Spurious frequency (GHz)	E.I.R.P. (dBm)	Detector	Polarization	Measurement Uncertainty (dB)
7437.41958	-38.13	RMS	V	<± 4.72

Verdict: PASS

TEST 4.3.2.10: Receiver spurious emissions.

LIMITS:

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Frequency Range	Maximum power	Measurement bandwidth
30 MHz - 1 GHz	-57 dBm	100 kHz
1 - 12.75 GHz	-47 dBm	1 MHz

RESULTS:

The level of spurious emissions was measured as their effective radiated power when radiated by cabinet and antenna.

RADIATED:

Frequency range 30 MHz – 1 GHz

The spurious frequencies detected do not depend on the operating channel.

No spurious frequencies detected at less than 6 dB below the limit.

Measurement uncertainty: <±3.81 dB

Verdict: PASS

Frequency range 1 – 12.75 GHz

The spurious frequencies detected do not depend on the operating channel.

Spurious frequencies detected at less than 6 dB below the limit.

Spurious frequency (GHz)	E.I.R.P. (dBm)	Detector	Polarization	Measurement Uncertainty (dB)
2.765437	-47.68	RMS	H	<± 4.72

Verdict: PASS

TEST 4.3.2.11: Receiver blocking.

LIMITS:

The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see application form section t)).

The blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table 14, table 15 or table 16.

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Table 15: Receiver Blocking parameters receiver category 2 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-57	CW
P_{min} + 6 dB	2 300 2 583,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Table 16: Receiver Blocking parameters receiver category 3 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 12 dB	2 380 2 503,5	-57	CW
P_{min} + 12 dB	2 300 2 583,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

RESULTS:

Receiver Category: 3

Maximum Declared Assembly Antenna Gain: 0 dBi

According to the standard ETSI EN 300 328 V2.1.1 (2016-11), this test has been performed on lowest and highest channels of Proprietary Protocol 2.4 GHz.

The EUT does not allow to monitor the PER. The correct communication between the remote controller and its auxiliary receiver was monitored. The wheels of the scalextric advance car SD02177 start spinning when the button of the EUT is pushed.

- Low Channel (2401 MHz).

Wanted Signal Power DUT (Pmin): -67.15 dBm.

Low channel (2401 MHz)	Blocking frequency (MHz)	Blocking Signal Power corrected by the antenna assembly gain (dBm)	INDICATION OF CORRECT RECEPTION	Verdict
Proprietary protocol	2380	-57	YES	PASS
	2503.5	-57	YES	PASS
	2300	-47	YES	PASS
	2583.5	-47	YES	PASS

- High Channel (2479 MHz).

Wanted Signal Power DUT (Pmin): -65.25 dBm.

HIGH CHANNEL (2479 MHz)	Blocking frequency (MHz)	Blocking Signal Power corrected by the antenna assembly gain (dBm)	INDICATION OF CORRECT RECEPTION	Verdict
Proprietary protocol	2380	-57	YES	PASS
	2503.5	-57	YES	PASS
	2300	-47	YES	PASS
	2583.5	-47	YES	PASS

Measurement uncertainty	<±0.95 dB

Verdict: PASS

Appendix C: Photographs.

EQUIPMENT FOR RADIATED MEASUREMENTS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EQUIPMENT FOR CONDUCTED MEASUREMENTS