EMC
TEST REPORT

Report No. : TS10030158-EME
Model No. : TR5830IR, 15-333, 1500333
Issued Date : May 12, 2010

Applicant: **TRANS ELECTRIC CO., LTD.**
No. 765, Sec. 2, Zhongshan Rd., Huatan Township, Changhua County 503, Taiwan

Test Method/ Standard: **47 CFR FCC Part 15.231 & ANSI C63.4 2003**

Test By: **Intertek Testing Services Taiwan Ltd.**
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Summary of Tests

5.8GHz WIRELESS A/V SIGNAL RECEIVER - Model: TR5830IR
FCC ID: BY4TR5830IR

Test	Reference	Results
Periodic Operation test	15.231(a)	Pass
Radiated Emission test	15.231(b), 15.209	Pass
Measured bandwidth	15.231(c)	Pass
Conducted Emission of AC Power	15.207	Pass
Calculation of Average Factor	15.35	Pass

1. General information

1.1 Identification of the EUT

Product:	5.8GHz WIRELESS A/V SIGNAL RECEIVER
Model No.:	TR5830IR
FCC ID.:	BY4TR5830IR
Frequency Range:	433.92 MHz
Channel Number:	Single channel
Frequency of Each Channel:	433.92 MHz
Type of Modulation:	ASK
Rated Power:	DC 12 V from adapter model: CP130D0120V0250U, I/P Voltage: 120 Vac 60 Hz
Power Cord:	N/A
Sample Received:	Mar. 29, 2010
Test Date(s):	Mar. 31, 2010~ May 11, 2010
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 Additional information about the EUT

The EUT is a 5.8GHz WIRELESS A/V SIGNAL RECEIVER transmitted at 433.92 MHz and received at 5.8GHz.

The customer confirmed the models listed below are identical to model TR5830IR (EUT). Different brand serves as marking strategy.

Trade Name	Model No.	Differences
TRANS ELECTRIC CO., LTD.	TR5830IR	433 MHz Tx, 5 GHz Rx
Radio Shack	15-333	Same as TR5830IR, designed for marketing strategy.
Radio Shack	1500333	Same as TR5830IR, designed for marketing strategy.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna for 5.8 GHz

Antenna Gain: 8 dBi
Antenna Type: PCB printed antenna
Connector Type: N/A

Antenna for 433 MHz

Antenna Gain: -2 dBi
Antenna Type: Dipole antenna
Connector Type: N/A

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 2.1053 and the requirement in FCC Part 15 Subpart C Section 15.231.

2.2 Operation mode

The EUT was transmitted continuously during the test.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.
EMI Test Receiver	Rohde & Schwarz	9 kHz~2.75 GHz	ESCS 30
Spectrum Analyzer	Rohde & Schwarz	9 kHz~30 GHz	FSP 30
Spectrum Analyzer	Rohde & Schwarz	20 Hz~40 GHz	FSEK 30
Horn Antenna	EMCO	1 GHz~18 GHz	3115
Horn Antenna	SCHWARZBECK	14 GHz~40 GHz	BBHA 9170
Bilog Antenna	SCHWARZBECK	25 MHz~1.7 GHz	VULB 9160
Pre-Amplifier	MITEQ	100 MHz~26.5 GHz	919981
Pre-Amplifier	MITEQ	26 GHz~40 GHz	828825
Controller	HDGmbH	N/A	HD 100
Antenna Tower	HDGmbH	N/A	MA 240
Turn Table	HDGmbH	N/A	DS 420S
LISN	Rohde & Schwarz	9 kHz~30 MHz	ESH3-Z5

Note: The above equipments are within the valid calibration period.

3. Periodic Operation test

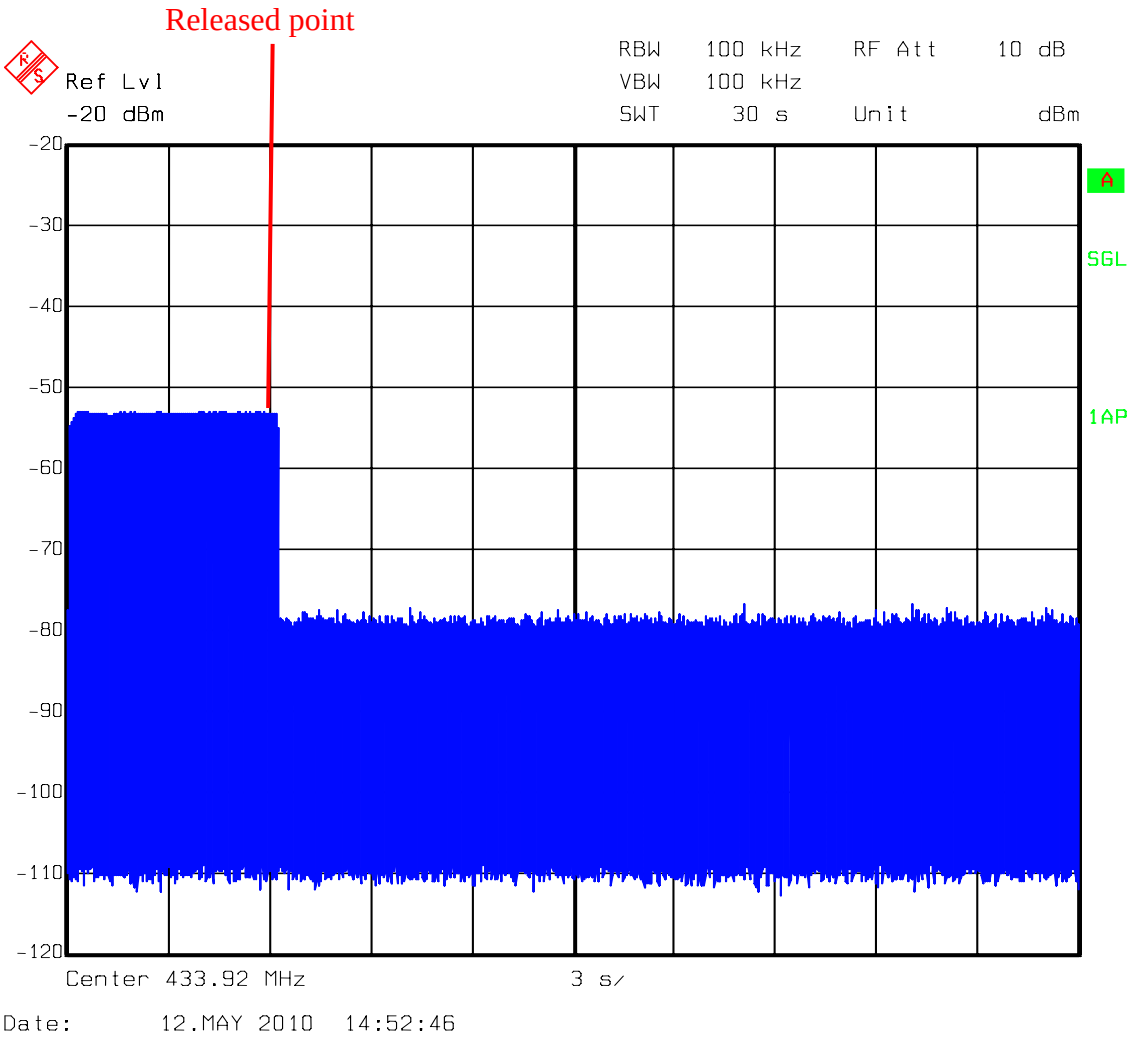
3.1 Test requirement

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

3.2 Test setup & procedure

Using the remote controller to deliver IR signal, it enables EUT to continue transmitting while manually operated remote controller that will automatically deactivate the transmitter within not more than 5 seconds of being released.

3.3 Test result



4. Radiated emission test FCC 15.231 (b)

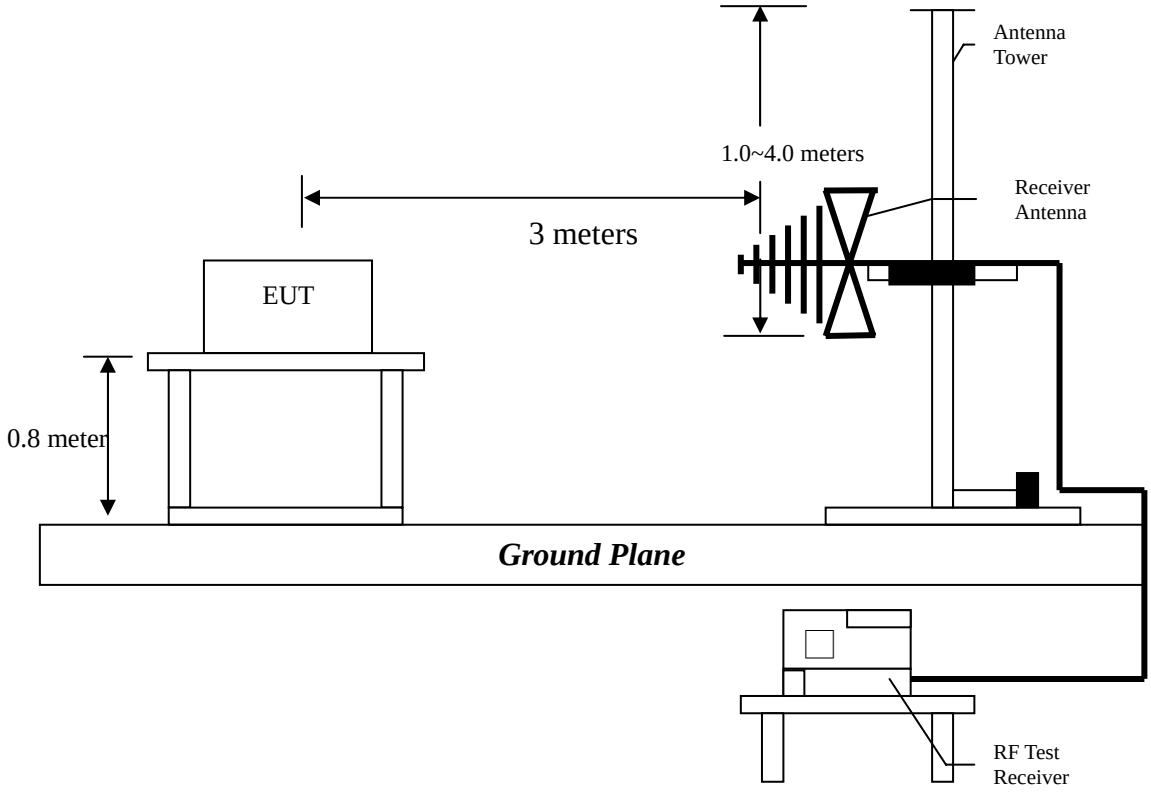
4.1 Operating environment

Temperature:	22	℃
Relative Humidity:	51	%
Atmospheric Pressure	1023	hPa

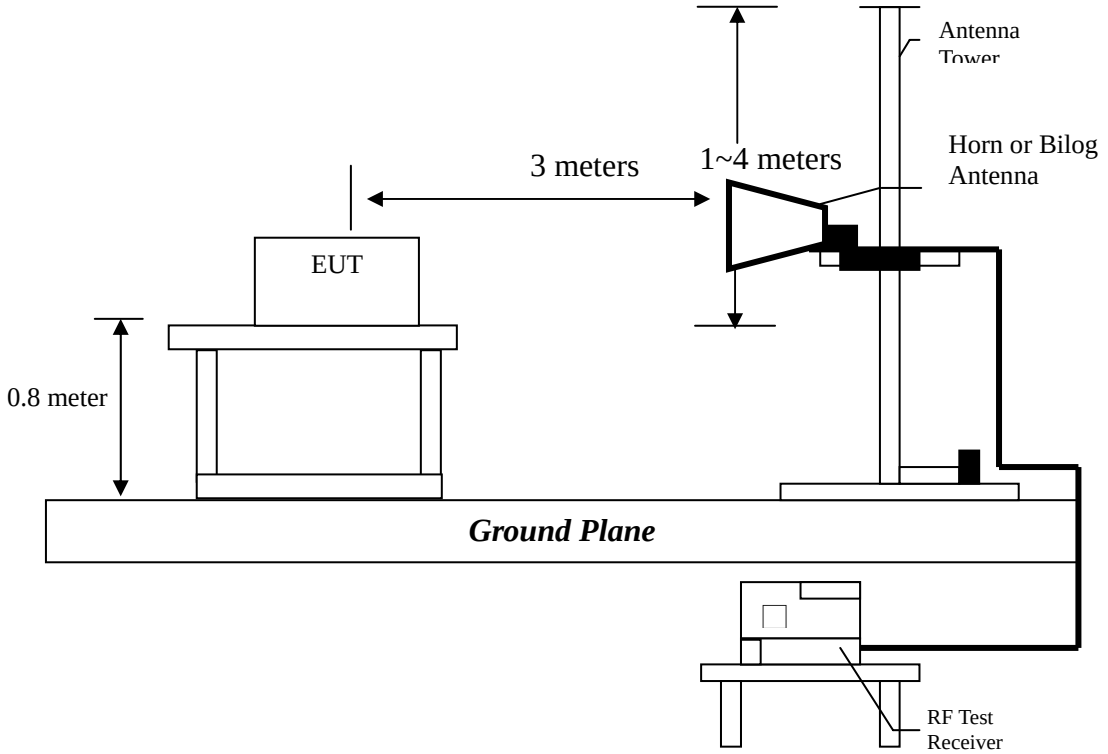
4.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.

The frequency spectrum from 30MHz to 1000MHz was investigated.



The frequency spectrum from over 1GHz was investigated.



The signal is maximized through rotation and placement in the three orthogonal axes. Radiated emission measurements were performed from 30 MHz to 25 GHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1 GHz, 1MHz – for frequencies above 1 GHz.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

4.3 Radiated emission limit

4.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(uV/m@3 m)	(dBuV/m@3 m)	(uV/m@3 m)	(dBuV/m@3 m)
433.92	10996.7	80.8	1099.7	60.8

4.3.2 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty
Radiated Emission	±5.056 dB
Conducted Emission	±2.786 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

4.4 Radiated emission test data FCC 15.231

4.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT: TR5830IR
Operating mode: Tx at 433.92 MHz

Polarization (circle)	Frequency (MHz)	Detector	Corr. Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Calculated dBuV/m	Limit (dBuV/m)	Margin (dB)
Vertical	433.92	PK	19.42	48.23	0.00	67.96	100.8	-32.84
Vertical	433.92	AV	19.42	48.23	-11.79	55.86	80.8	-24.94
Vertical	867.84	PK	26.47	19.62	0.00	46.37	80.8	-34.43
Vertical	867.84	AV	26.47	19.62	-11.79	34.30	60.8	-26.50
Horizontal	433.92	PK	19.42	47.75	0.00	67.37	100.8	-33.43
Horizontal	433.92	AV	19.42	47.75	-11.79	55.38	80.8	-25.42
Horizontal	867.84	PK	26.48	28.58	0.00	55.28	80.8	-25.52
Horizontal	867.84	AV	26.48	28.58	-11.79	43.27	60.8	-17.53

Remark:
1. Calculated = Reading + Corr. Factor
2. Correction Factor = Antenna Factor + Cable Loss
3. Margin= Calculated - Limit

4.4.2 Measurement results: frequencies above 1GHz

EUT: TR5830IR
Operating mode: Tx at 433.92 MHz

Polarization (circle)	Frequency (MHz)	Detector	Corr. Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Calculated dBuV/m	Limit (dBuV/m)	Margin (dB)
Vertical	1302.00	PK	29.28	24.17	0.00	54.71	74.00	-19.29
Vertical	1302.00	AV	29.28	24.17	-11.79	41.66	54.00	-12.34
Vertical	1736.00	PK	30.62	23.27	0.00	55.92	80.83	-24.91
Vertical	1736.00	AV	30.62	23.27	-11.79	42.10	60.83	-18.73
Horizontal	1302.00	PK	29.28	24.17	0.00	54.62	74.00	-19.38
Horizontal	1302.00	AV	29.28	24.17	-11.79	41.66	54.00	-12.34
Horizontal	1736.00	PK	30.62	23.27	0.00	56.11	80.83	-24.72
Horizontal	1736.00	AV	30.62	23.27	-11.79	42.10	60.83	-18.73

Remark:
1. Calculated = Reading + Corr. Factor – Average Factor
2. Correction Factor = Antenna Factor + Cable Loss
3. Margin= Calculated - Limit

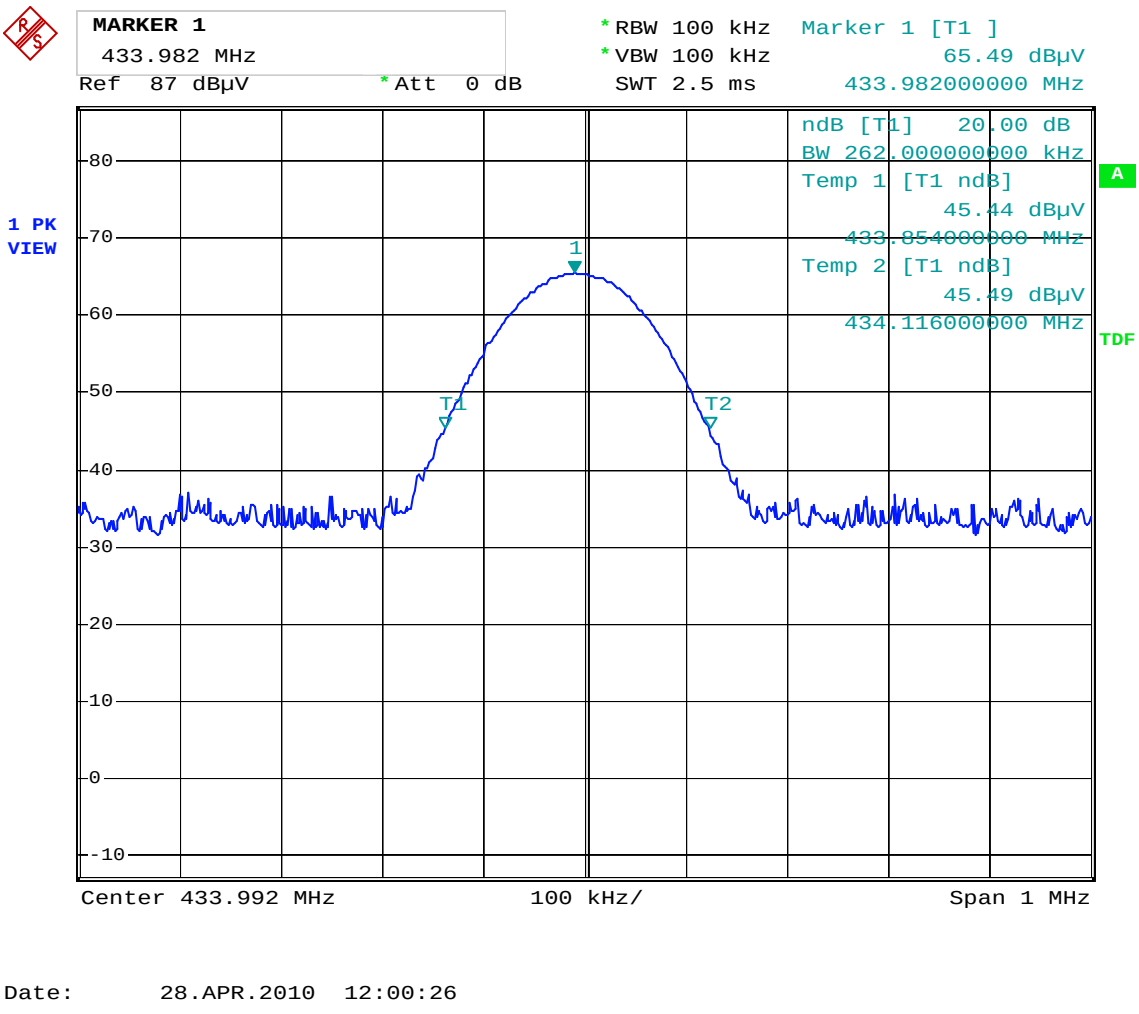
5. Measured bandwidth FCC 15.231(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

B.W(20dBc) Limit = 0.25% × f(MHz) = 0.25% × 433.92 MHz = 1.0848 MHz

From the plot, the bandwidth is observed to be 433.92 MHz, at 20dBc where the bandwidth limit is 1.0848 MHz.

Please see the plot below.

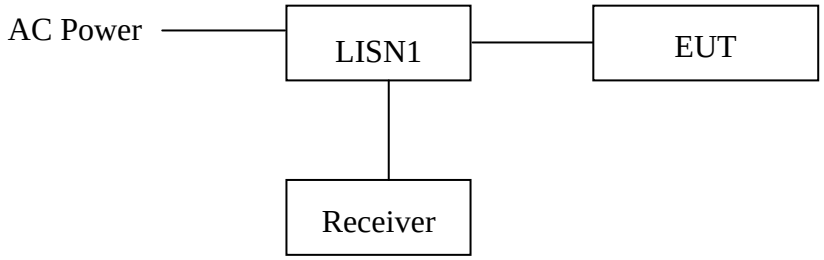


6. Conducted emission test FCC 15.207

6.1 Operating environment

Temperature:	23	℃
Relative Humidity:	61	%
Atmospheric Pressure	1023	hPa

6.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

6.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

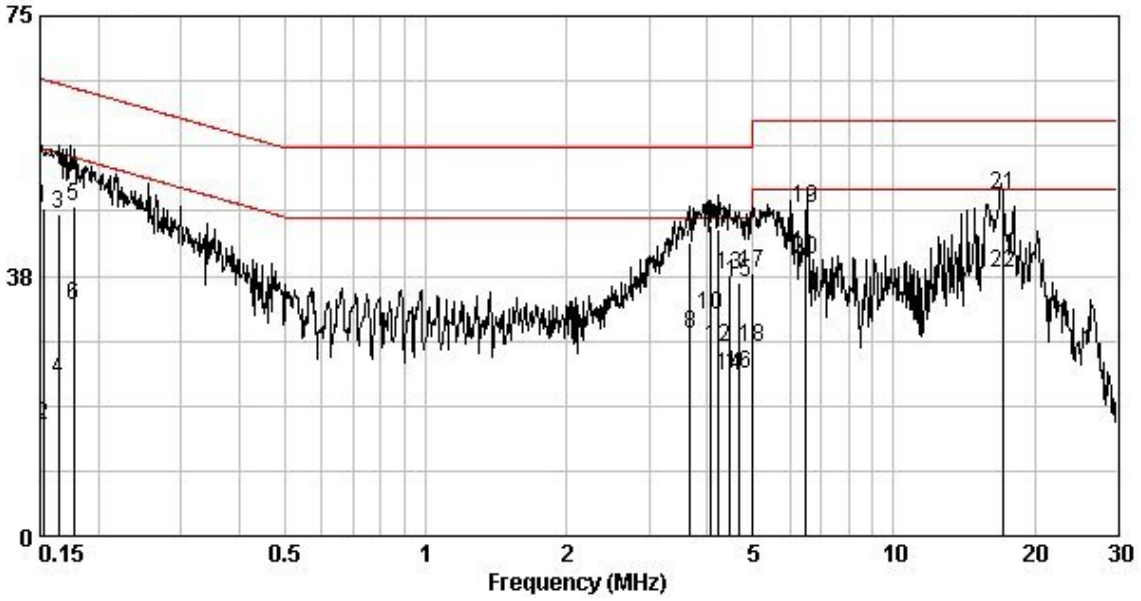
*Decreases with the logarithm of the frequency.

6.4 Conducted emission data FCC 15.207

Phase:	Line
Model No.:	TR5830IR
Operating mode:	Tx operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.15	0.81	47.15	65.87	15.86	55.87	-18.72	-40.01
0.16	0.81	46.37	65.25	22.54	55.25	-18.89	-32.72
0.18	0.81	47.40	64.64	33.38	54.64	-17.24	-21.26
3.68	0.23	42.39	56.00	29.12	46.00	-13.61	-16.88
4.05	0.25	44.78	56.00	31.75	46.00	-11.22	-14.25
4.20	0.26	44.33	56.00	27.11	46.00	-11.67	-18.89
4.45	0.27	37.76	56.00	22.97	46.00	-18.24	-23.03
4.67	0.28	36.61	56.00	23.23	46.00	-19.39	-22.77
5.00	0.30	38.01	60.00	27.17	50.00	-21.99	-22.83
6.50	0.37	47.12	60.00	39.74	50.00	-12.88	-10.26
17.11	0.85	49.16	60.00	37.90	50.00	-10.84	-12.10

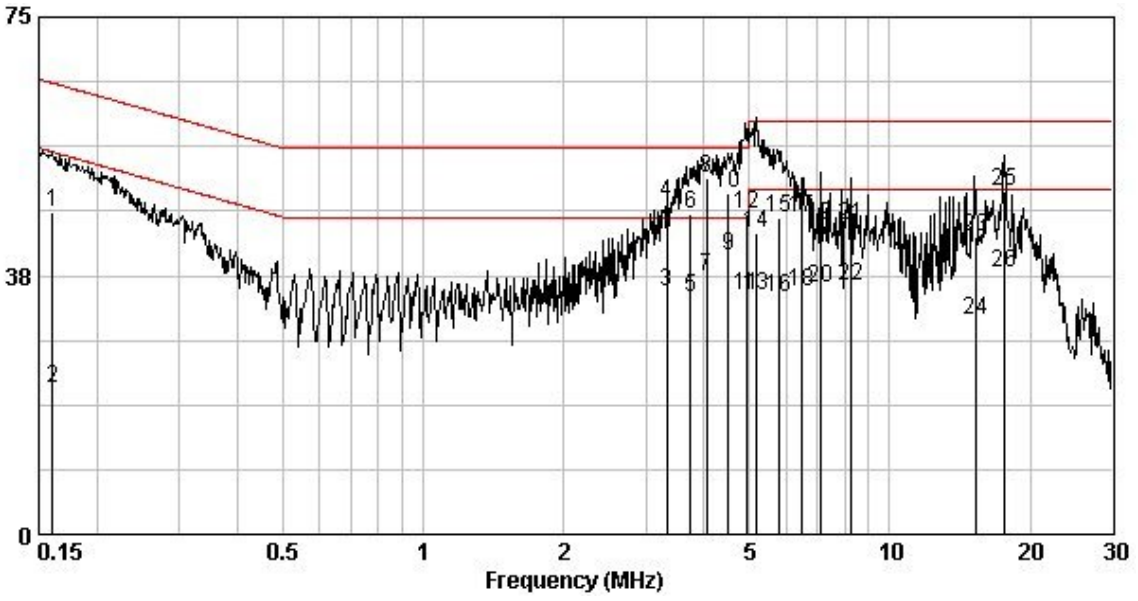
Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: TR5830IR
Operating mode: Tx operating mode

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Av
0.16	0.11	46.58	65.43	21.14	55.43	-18.85	-34.29
3.33	0.21	48.17	56.00	35.19	46.00	-7.83	-10.81
3.74	0.23	46.38	56.00	34.24	46.00	-9.62	-11.76
4.05	0.25	51.62	56.00	37.46	46.00	-4.38	-8.54
4.50	0.26	49.47	56.00	40.42	46.00	-6.53	-5.58
4.93	0.27	46.52	56.00	34.63	46.00	-9.48	-11.37
5.17	0.28	43.65	60.00	34.69	50.00	-16.35	-15.31
5.77	0.30	46.01	60.00	34.43	50.00	-13.99	-15.57
6.45	0.32	45.81	60.00	35.15	50.00	-14.19	-14.85
7.09	0.33	44.90	60.00	35.72	50.00	-15.10	-14.28
8.28	0.36	44.81	60.00	36.09	50.00	-15.19	-13.91
15.25	0.50	43.13	60.00	31.14	50.00	-16.87	-18.86
17.60	0.51	49.65	60.00	37.98	50.00	-10.35	-12.02

Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



7. Calculation of Average Factor

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured in 100 ms or the repetition cycle, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer in zero span mode at 100 resolution bandwidth.

Duty cycle correction factor in dB = 20log (duty cycle)

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 60.27 ms

The number of short pulses in each period (18) multiplied by the duration of each short pulses (0.418ms) =7.524 ms

The number of long pulses in each period (1) multiplied by the duration of each long pulses (7.97ms) = 7.97ms

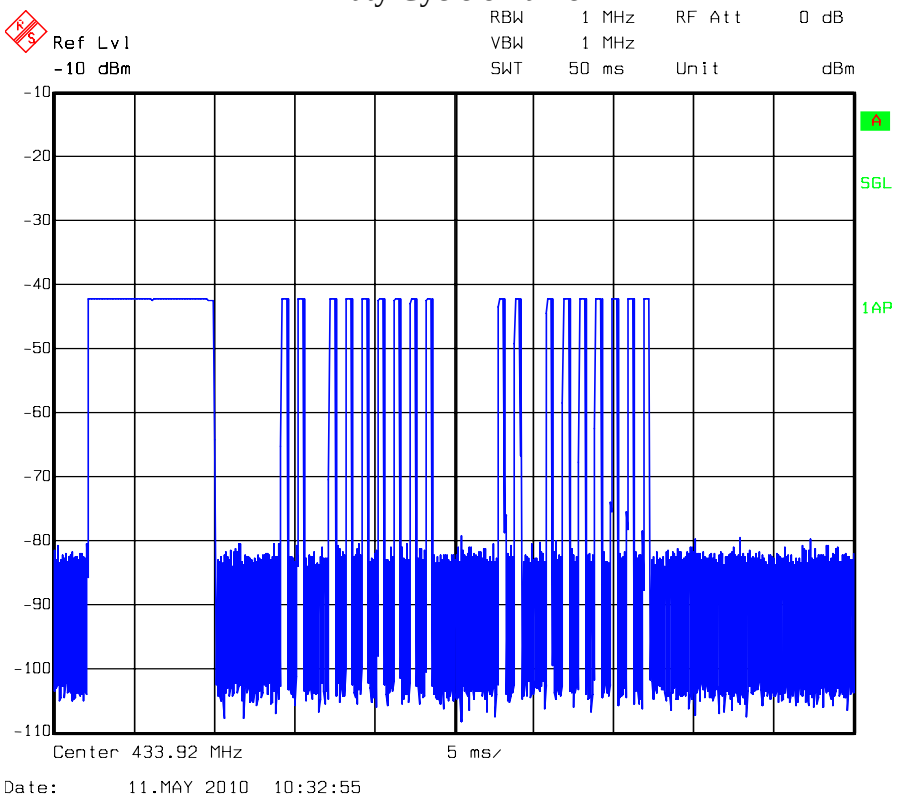
Effective period of the cycle = 7.524+7.97=15.494 ms

Duty Cycle = 15.494 ms / 60.27ms = 0.257076

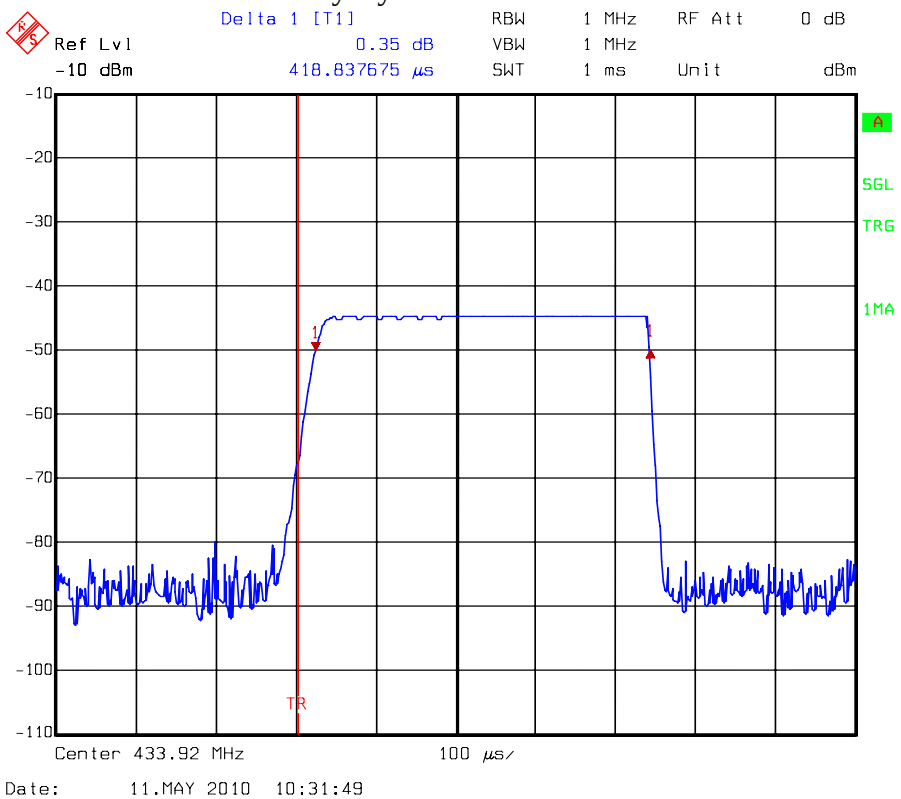
Therefore, the duty cycle correction factor will be 20 log10 0.257076 = -11.79 dB

Please see the plot below.

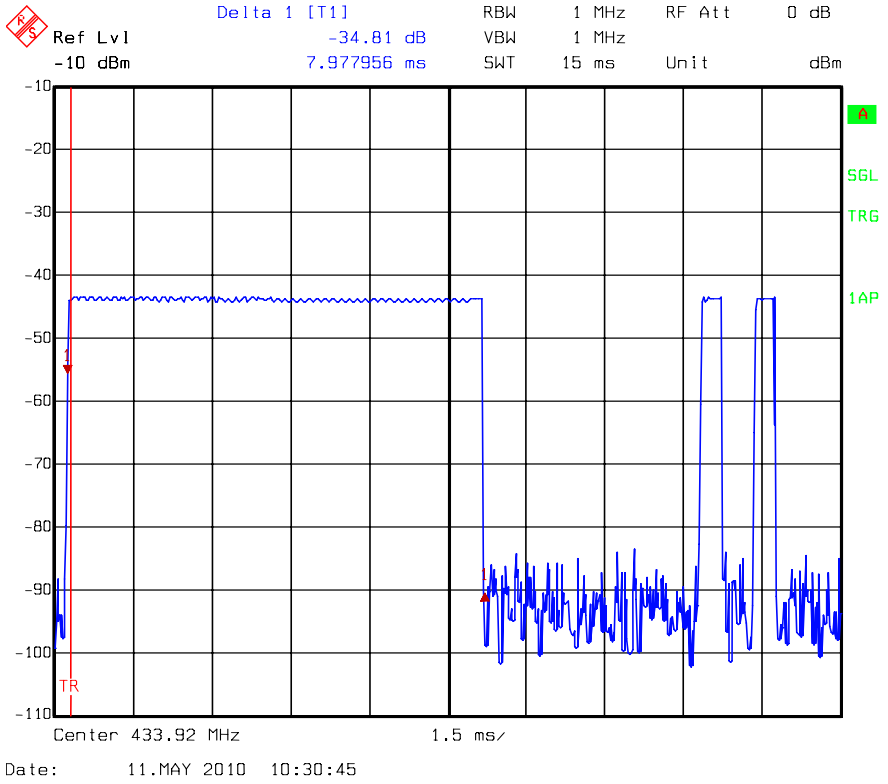
Duty Cycle on-time



Duty Cycle on time - short



Duty Cycle on time - long



Duty Cycle period