

APPLICANT

Chamberlain
2111 Lakeland Avenue
Ronkonkoma, NY 11779

MANUFACTURER

Chamberlain
2111 Lakeland Avenue
Ronkonkoma, NY 11779

TEST SPECIFICATION: FCC Rules and Regulations Part 15, Subpart C, Para. 15.231

TEST PROCEDURE: ANSI C63.4:1992

TEST SAMPLE DESCRIPTION

BRANDNAME: Chamberlain

MODEL: Tricode Tx 1(Two Button) / Tricode Tx 4 (4 Button)

TYPE: 300/310 MHz Pulsed RF Transmitter

POWER REQUIREMENTS: 9 VDC derived Alkaline Battery

FREQUENCY OF OPERATION: 300/310 MHz

TESTS PERFORMED

Para. 15.231(a), Radiated Emissions, Fundamental and Harmonics

Para. 15.231(c), Occupied Bandwidth

Duty Cycle Determination

REPORT OF MEASUREMENTS

Applicant: Chamberlain

Device: 300/310 MHz Pulsed RF Transmitter

Applicable Rule Section: Part 15, Subpart C, Section 15.231



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REPORT OF MEASUREMENTS (continued)

TEST RESULTS

- 15.231 (a) - The device is used as a transmitter for remote control purposes.
- 15.231 (a)(1) & - The transmitter is manually operated and ceases transmission within 5
15.231(2) seconds after deactivation.
- 15.231 (a)(3) - The transmitter does not perform periodic transmissions.
- 15.231 (a)(4)- Not applicable
- 15.231 (b) - The fundamental field strength did not exceed 5420/5835 $\mu\text{V/M}$ (Average) at a test distance of 3 meters. In addition, the requirements of section 15.35 for averaging pulsed emissions and for limiting peak emissions were met.
- The field strength of harmonic and spurious emissions did not exceed 542/583 $\mu\text{V/M}$ (AVERAGE).
- 15.231 (c) - The device operates 300/310 MHz. The bandwidth of emissions did not exceed 0.25% of the operating frequency (750/775 kHz).

DETERMINATION OF FIELD STRENGTH LIMITS

The field strength limits shown below are found in Section 15.231.

	Frequency		Limit
F1	=	260	3750 = L1
Fo	=	300/310	Lo
F2	=	470	12500 = L2

The formula below was utilized to determine the limits:

$$\text{Limit} = L1 + [(Fo-F1)(L2-L1)/(F2-F1)]$$

Solving yields:

$$\text{Fundamental Limit} = 5420/5833 \mu\text{V/M (AVERAGE) @ 3 Meters}$$

$$\text{Harmonic Limit} = 542/583 \mu\text{V/M (AVERAGE) @ 3 Meters}$$



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REPORT OF MEASUREMENTS (continued)

DETERMINATION OF DUTY CYCLE

The unit's RF output was directly coupled to the input of the spectrum analyzer. The analyzer was set for a frequency span of 0Hz. The sweep time was then adjusted in order to display one full pulse train. The transmitter on time was then summed and compared to the time for one full cycle in order to obtain the duty cycle. (See plots for additional information)

Transmitter On Time	=	8.8 milliseconds (maximum- worst case per cycle)
Transmitter Cycle Time	=	38.5 milliseconds, (2.6 cycles/100 msec)
Transmitter Duty Cycle	=	23.5 %

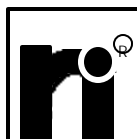
CALCULATION:

3 x 1.58 msec	=	4.74 milliseconds
4 x 580 μ s (small pulse)	=	4.06 milliseconds
(4.74 + 4.06) x 2.6	=	23.5 milliseconds
Duty Cycle	=	23.5 %
Correction Factor = 20 log(0.248)	=	-12.6

SPECTRUM ANALYZER DESENSITIZATION CONSIDERATIONS

Due to the nature of the emissions being measured, care was taken to ensure that the resolution bandwidth of the spectrum analyzer was adequate to provide accurate measurements. The following formula was utilized:

Setting pulse desensitization equal to zero and utilizing the minimum observed pulse width of 580 μ s yields a minimum required bandwidth of 1150 Hz. FCC specified bandwidths of 100kHz and 1MHz were utilized below and above 1GHz, respectively.



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REPORT OF MEASUREMENTS (continued)

GENERAL NOTES

1. All readings were taken utilizing a peak detector function at a test distance of 3 meters.
2. The duty cycle was applied to the peak readings in order to determine the average value of the emissions.
3. All measurements were made with a new 9VDC Alkaline Battery.
4. The device was tested twice, once at 300 MHz and once at 310 MHz.
5. The frequency range was scanned from 30 MHz to 3.1 GHz. All emissions not reported were more than 20 dB below the specified limit.



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EQUIPMENT LIST

FCC15.231(b) Radiated Emissions, 30MHz to 3100MHz

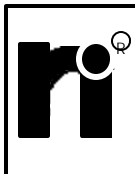
EN	Type	Manufacturer	Description.	Model No.	Cal Date	Due Date
062	High Gain Horn Antenna	Microlab/FXR	1.7 GHz - 2.6 GHz	R638A	01/25/2000	01/25/2001
063	High Gain Horn Antenna	Microlab/FXR	2.6 GHz-3.95 GHz	S638A	01/26/2000	01/26/2001
067	Open Area Test Site	Retlif	3 Meter	RNY	10/15/1997	10/15/2000
133	Broadband Pre-Amplifier	Electro-Metrics	10 kHz - 1 GHz, 26dB	BPA-1000	06/22/1999	06/22/2000
141	Spectrum Analyzer	Hewlett Packard	100 Hz - 40 GHz	8566B	03/20/2000	09/20/2000
141A	Graphics Plotter	Hewlett Packard	N/A	7470A	03/08/2000	03/08/2001
141B	Quasi-Peak Adaptor	Hewlett Packard	100 Hz - 1 GHz	85650A	03/20/2000	09/20/2000
206B	6.0 dB Attenuator	Texscan	0 - 1.0 GHz	FP-50 - 6 dB	06/22/1999	06/22/2000
523	Biconilog	Electro-Mechanics	26 - 2000 MHz	3142B	10/22/1998	05/22/2000
543	Preamplifier	Hewlett Packard	1.0 GHz - 26.5 GHz	8449B	06/16/1999	06/16/2001



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FCC 15.231(b)
RADIATED EMISSIONS
(Please see separate e-file attachment named RE Data.doc)



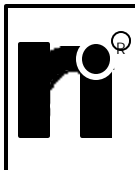
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FCC 15.231(c)

OCCUPIED BANDWIDTH

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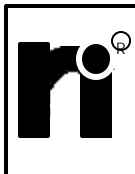


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DUTY CYCLE PLOTS

(Please see separate e-file attachment named Dutycycle.pdf)



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