

Test Report of FCC Part 15 C for FCC Certificate

On Behalf of

Shenzhen Aodee Electronic Co., Ltd

Product Description: **Wireless Bell**

Brand Name: **Aodee**

Model No.: **AT199**

FCC ID: **WWKAODEE0AT199**

Prepared for: **Shenzhen Aodee Electronic Co., Ltd**

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: **Shenzhen Aodee Electronic Co., Ltd**
Address of applicant: 17th Floor, Luban Building, Hongli West Road, Shenzhen City, PRC.
Manufacturer: **Shenzhen Aodee Electronic Co., Ltd (Dongguan Factory)**
Address of manufacturer: Weichuang Industrial Park, Roman Road, Qingxi Town, Dongguan City, PRC.

General Description of E.U.T

Items	Description
EUT Description:	Wireless Bell
Trade Name:	N/A
Model No.:	AT199
Supplementary Model No.:	N/A
Rated Voltage	DC 12V Battery
Frequency range	315MHz
Number of channels	1
Antenna Type:	Built-in Antenna
Channel Separation	None
Product Class:	Low Power Communication Device Transmitter

* The test data gathered are from the production sample provided by the manufacturer.

1.2 Test Standards

The following Declaration of Conformity report of EUT is prepared in accordance with

FCC Rules and Regulations Part 15 Subpart C Section 15.231

The objective of the manufacturer is to demonstrate compliance with the described above standards.

1.3 Test Summary

For the EUT described above. The standards used were FCC Part 15 Subpart C Section 15.231 for Emissions

Tests Carried Out Under FCC Part 15 Subpart C

Standard	Test Items	Status	Application
Part 15 Subpart C Section 15.231	Disturbance Voltage at The Mains Terminals	x	N/A, without AC power supply
	Radiation Emission	√	
	20dB Bandwidth	√	
	Duty Cycle	√	

√ Indicates that the test is applicable
x Indicates that the test is not applicable

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

The maximum emission levels emanating from the device are compared to the Part 15 Subpart C Section 15.231 limits for radiation emissions and the measurement results contained in this test report show that EUT is to be technically compliant with FCC requirements.

1.5 Test Facility

All measurement required was performed at laboratory of Bontek Compliance Testing Laboratory Ltd at 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The test facility is recognized, certified, or accredited by the following organizations:

FCC – Registration No.: 338263

Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 338263, March 24, 2008.

IC Registration No.: 126111

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 126111 on March, 2008.

1.6 Test Equipment List and Details

Items	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Calibration Period
1	EMI Test Receiver	R&S	ESCI	100687	2008-2-22	1 Year
2	EMI Test Receiver	R&S	ESPI	100097	2008-2-22	1 Year
3	Amplifier	HP	8447D	1937A024 92	2008-2-22	1 Year
4	3 phase Artificial Mains (L.I.S.N)	SCHWARZBECK	NSLK 8128	8128247	2008-3-31	1 Year
5	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2008-2-22	1 Year
6	Horn Antenna	SCHWARZBECK	BBHA9120A	D69250	2008-2-27	1 Year
7	High Field Biconical Antenna	ELECTRO-METRICS	EM-6913	166	2008-9-04	1 Year
8	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	811	2008-9-04	1 Year
9	Remote Active Vertical Antenna	ELECTRO-METRICS	EM-6892	304	2008-9-04	1 Year
10	Power Clamp	SCHWARZBECK	MDS-21	3812	2008-2-22	1 Year

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software offered by manufacturer, can let the EUT being normal operation.

2.3 Equipment Modifications

The EUT tested was not modified by Bontek.

2.4 Basic Test Setup Block Diagram

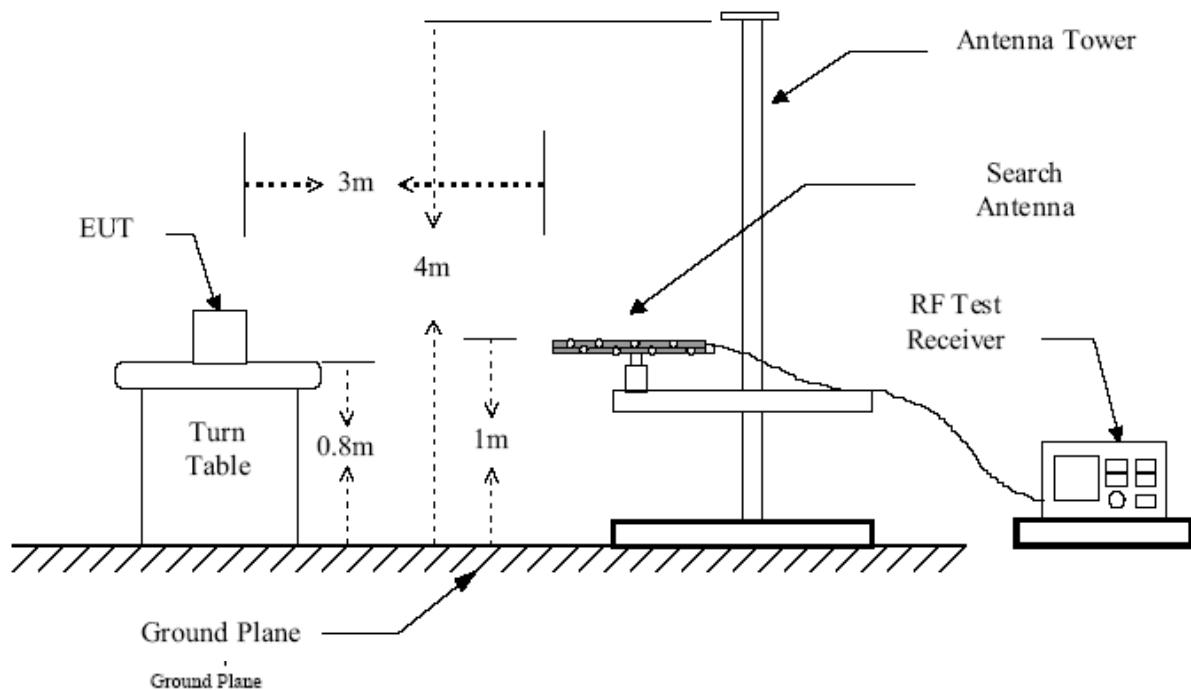


Figure 1 : Frequencies measured below 1 GHz configuration

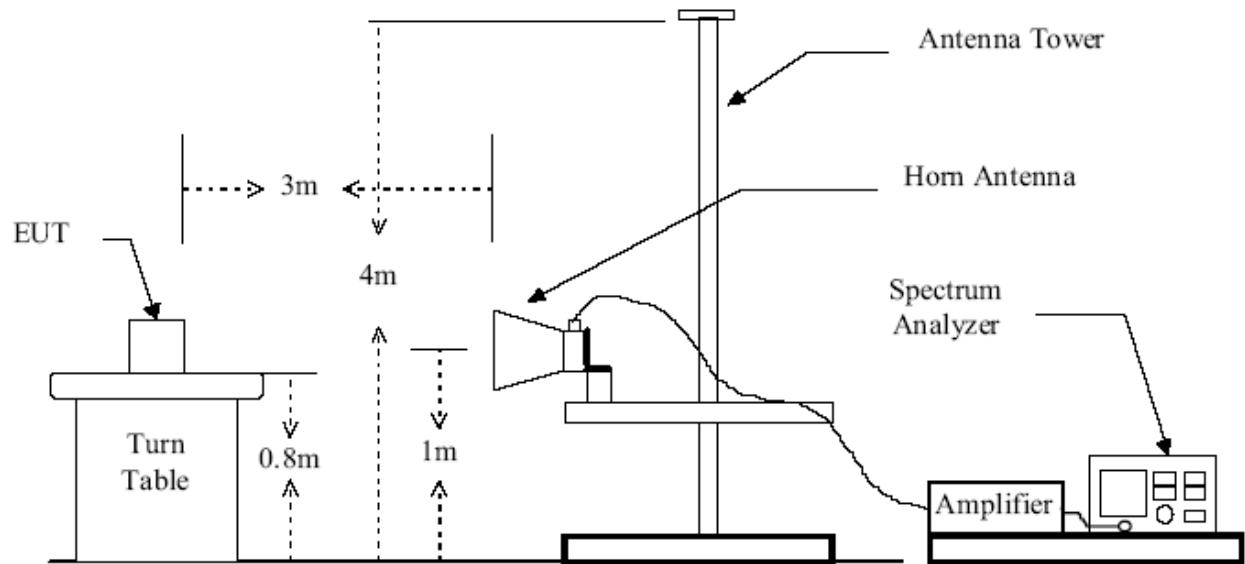


Figure 2 : Frequencies measured above 1 GHz configuration

3 – DISTURBANCE VOLTAGE AT THE MAINS TERMINALS

3.1 Measurement Uncertainty

All test results complied with Section 15.207 requirements. Measurement Uncertainty is 2.4 dB.

3.2 Applicable Standard

Section 15.207: For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150~0.500	66~56	56~46
0.500~5.000	56	46
5.000~30.00	60	50

3.3 Test Description

The EUT is excused from investigation of Disturbance Voltage at The Mains Terminals, for it is powered by a DC 12V battery. According to the Section 15.207(d), measurement to demonstrate compliance with the limits of Disturbance Voltage at The Mains Terminals are not required to the devices which only employed battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

4- RADIATED DISTURBANCES

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is 4.0 dB.

4.2 Limit of Radiated Disturbances

According to 15.231(b), the field strength of emissions from Intentional Radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strengths of Fundamental		Field Strengths of Spurious	
	(dB μ V/m)	(μ V/m)	(dB μ V/m)	(μ V/m)
40.66-40.70	67.04	2250	47.04	225
70-130	61.94	1250	41.94	125
130-174	*61.94-71.48	*1250-3750	*41.94-51.48	*125-375
174-260	71.48	3750	51.48	375
260-470	*71.48-81.94	*3750-12500	*51.48-61.94	*375-1250
Above 470	81.94	12500	61.94	1250

4.3 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part 15 Subpart B limits.

The EUT was placed on the center of the test table. In the frequency range below 1 GHz, Ultra-Broadband Antenna horn-antenna is used. In the frequency range above 1 GHz horn-antenna is used. Test setup refer to **Section 2.5 Basic Test Setup Block Diagram** of this report.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

4.4 Test Receiver Setup

According to FCC Part 15 rule, the frequency was investigated from 30 to 4000 MHz. During the radiated emission test, the test receiver was set with the following configurations:

Test Receiver Setting for frequency range below 1000MHz:

Detector.....Peak & Quasi-Peak
IF Band Width.....100KHz
Frequency Range.....30MHz to 1000MHz
Turntable Rotated.....0 to 360 degrees

Test Receiver Setting for frequency range above 1000MHz:

Detector.....Peak
IF Band Width.....1MHz
Frequency Range.....1000MHz to 4000MHz
Turntable Rotated.....0 to 360 degrees

Antenna Position:

Height.....1m to 4m
Polarity.....Horizontal and Vertical

4.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

- 1). Configure the EUT according to ANSI C63.4:2003.
- 2). The EUT was placed on the top of the turntable 0.8 meter above ground.
- 3). The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 4). Power on the EUT and all the supporting units.
- 5). The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 6). The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
- 7). For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- 8). Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode. Then all data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -10 dB μ V of specification limits), and are distinguished with a "QP" in the data plots.

4.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude Indicated reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Transd.}$$

$$\text{Transd.} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-7\text{dB}\mu\text{V}$ means the emission is $7\text{dB}\mu\text{V}$ below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

4.7 Radiated Emissions Test Result

Temperature (°C) : 22~23	EUT: Wireless Bell
Humidity (%RH) : 50~54	M/N: AT199
Barometric Pressure (mbar) : 950~1000	Operation Condition: Manual triggered

Test plots see following pages

315 MHz Tx in operation							
Maximum Frequency (MHz)	Emission Position and Level					Limit	Margin
	Polarity	m	Deg°	Transd	dB μ V/m		
34.241	V	1.10	109.0	20.4	22.67	40.00	17.33
50.540	V	1.85	79.0	21.5	25.74	40.00	14.26
98.255	V	1.20	72.0	23.2	28.38	41.94	13.56
315.000	V	1.25	72.0	23.2	56.24	74.22	17.98
630.007	V	1.00	125.0	23.6	41.35	61.94	20.59
945.010	V	1.40	74.0	24.1	38.33	61.94	23.61
1260.010	V	---	---	---	---	61.94	---
1575.014	V	---	---	---	---	61.94	---
1891.216	V	---	---	---	---	61.94	---
2205.008	V	---	---	---	---	61.94	---
2520.001	V	---	---	---	---	61.94	---
2835.000	V	---	---	---	---	61.94	---
3150.000	V	---	---	---	---	61.94	---
Maximum Frequency (MHz)	Emission Position and Level					Limit	Margin
	Polarity	m	Deg°	Transd	dB μ V/m		
34.241	H	1.15	109.0	20.4	25.12	40.00	14.88
54.460	H	1.75	179.0	21.5	20.43	40.00	19.57
98.255	H	1.10	62.0	23.2	25.12	41.94	16.82
315.000	H	1.25	32.0	23.2	50.37	74.22	23.85
630.007	H	1.00	125.0	23.6	35.98	61.94	25.96
945.010	H	1.30	24.0	24.1	38.62	61.94	23.32
1260.010	H	1.00	82.0	24.1	34.55	61.94	27.39
1575.014	H	---	---	---	---	61.94	---
1890.016	H	---	---	---	---	61.94	---
2205.008	H	---	---	---	---	61.94	---
2520.001	H	---	---	---	---	61.94	---
2835.000	H	---	---	---	---	61.94	---
3150.000	H	---	---	---	---	61.94	---
Remark:							
--- Means that The emission level of the rest measuring harmonic up to 5GHz are so low below applicable limit in operation mode, so the result were not recorded.							

5- 20dB BANDWIDTH

5.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±4.0 dB.

5.2 Limit of 20dB Bandwidth

In accordance with Part15.231(c), the fundamental frequency bandwidth was kept within 0.25% of the center frequency for devices operating >70MHz and <900MHz.

Fundamental Frequency (MHz)	Limit of 20dB Bandwidth (kHz)
314.998	314998x0.0025=787.49

5.3 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

5.4 Test Procedure

- 1) Turn on the transmitter, and set it to transmit the pulse train continuously.
- 2) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 100kHz and video bandwidth(VBW) to 100kHz, then select Peak function to scan the channel frequency.
- 3) The 20dB bandwidth was measured and recorded.

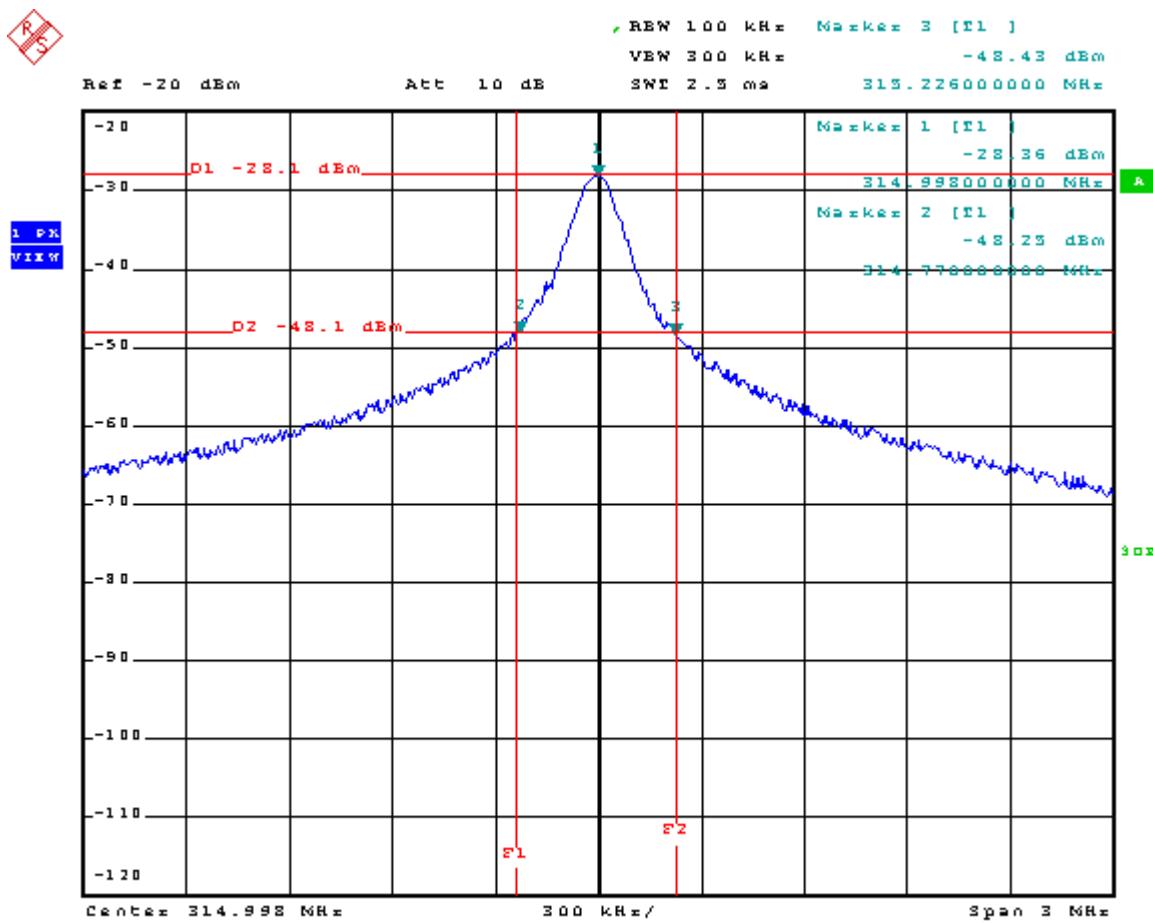
Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

5.5 Emissions within Band Edges Test Result

Temperature (°C) : 22~23	EUT: Wireless Bell
Humidity (%RH) : 50~54	M/N: AT199
Barometric Pressure (mbar) : 950~1000	Operation Condition: Manual triggered

Test plots see following pages

Fundamental Frequency (MHz)	20dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/Fail
314.998	456	787.49	Pass



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6- Duty Cycle

6.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is 4.0 dB.

6.2 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

6.3 Test Procedure

- 1) The EUT was placed on a turntable which is 0.8m above ground plane.
- 2) Set EUT operating in continuous transmitting mode
- 3) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.
- 4) The Duty Cycle was measured and recorded.

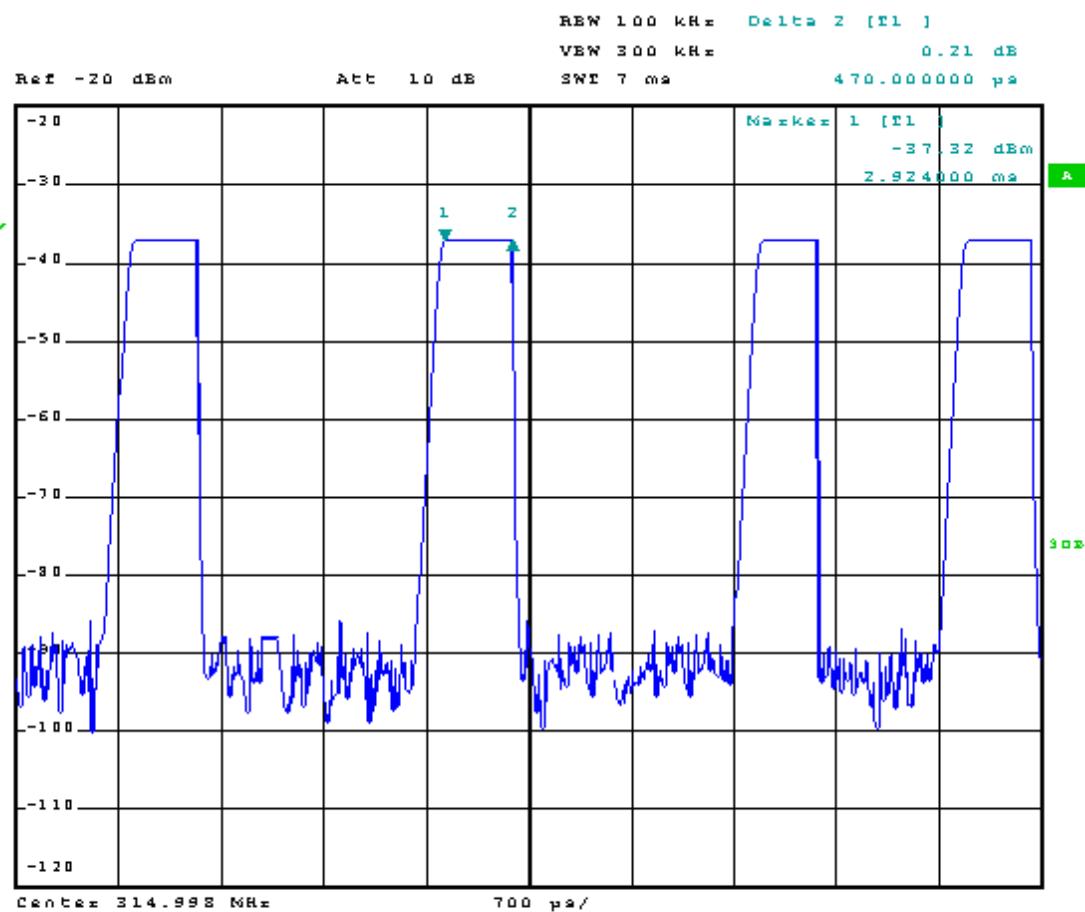
6.4 Measurement Result

Temperature (°C) : 22~23	EUT: Wireless Bell
Humidity (%RH): 50~54	M/N: AT199
Barometric Pressure (mbar): 950~1000	Operation Condition: Manual triggered

Test plots see following pages

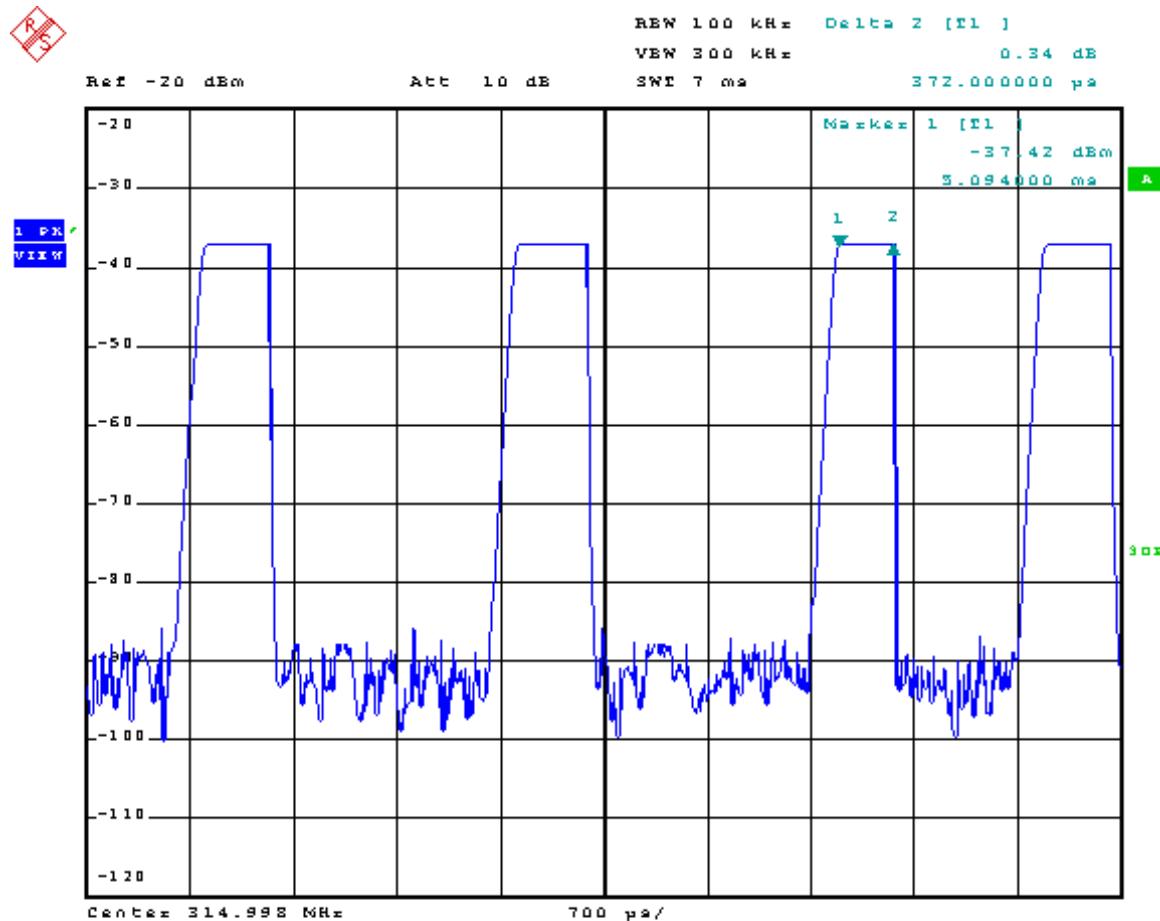
Total Pulse Time of Transmitter = $0.47 \text{ msec} \times 7 + 0.372 \text{ msec} \times 9 = 6.638 \text{ msec}$

The Duty Cycle= $6.638/24.2 = 27.43\%$



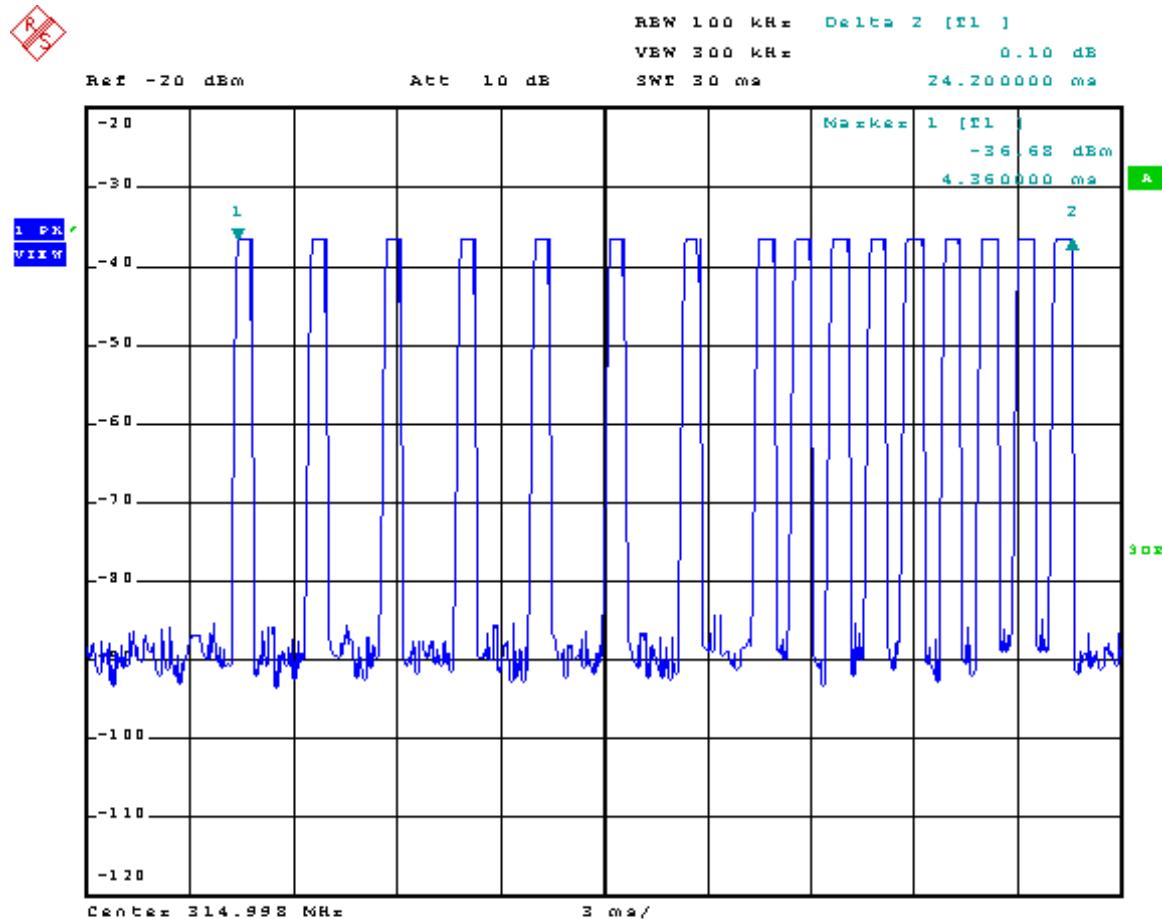
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