

FCC TEST REPORT No. 09/241/09-179	12 June 2009
for 47 CFR Part 15 Subpart C	date of issue

Model name: Call Bell model B020102

Product description: Transmitter of the radio-electronic calling system

FCC ID: W9L-B020102

Applicant: Tweedell's RECS (4337 S.Starkey Dr., Marion, IN 46953, USA)

Manufacturer: Tweedell's RECS (4337 S.Starkey Dr., Marion, IN 46953, USA)

The results in this report apply only to the samples tested.

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1 EQUIPMENT UNDER TEST**1.1 Basic description**

Equipment Category	Transmitter
Destination	A push-for service transmitter used for wireless signaling as a component of Radio Electronic Calling System (RECS) with application in restaurants, clinics, etc.
Model name	Call Bell model B020102
Serial numbers	410

1.2 Technical characteristics declared by manufacturer

Frequency	433,92 MHz
Channel width	150 kHz
Transmission time	less than 4 sec
Antenna type	internal
Supply voltage	from 7.5 V to 9.5 V DC (PP3 internal battery)



Figure 1.1 – Transmitter of model B020102. Front view.

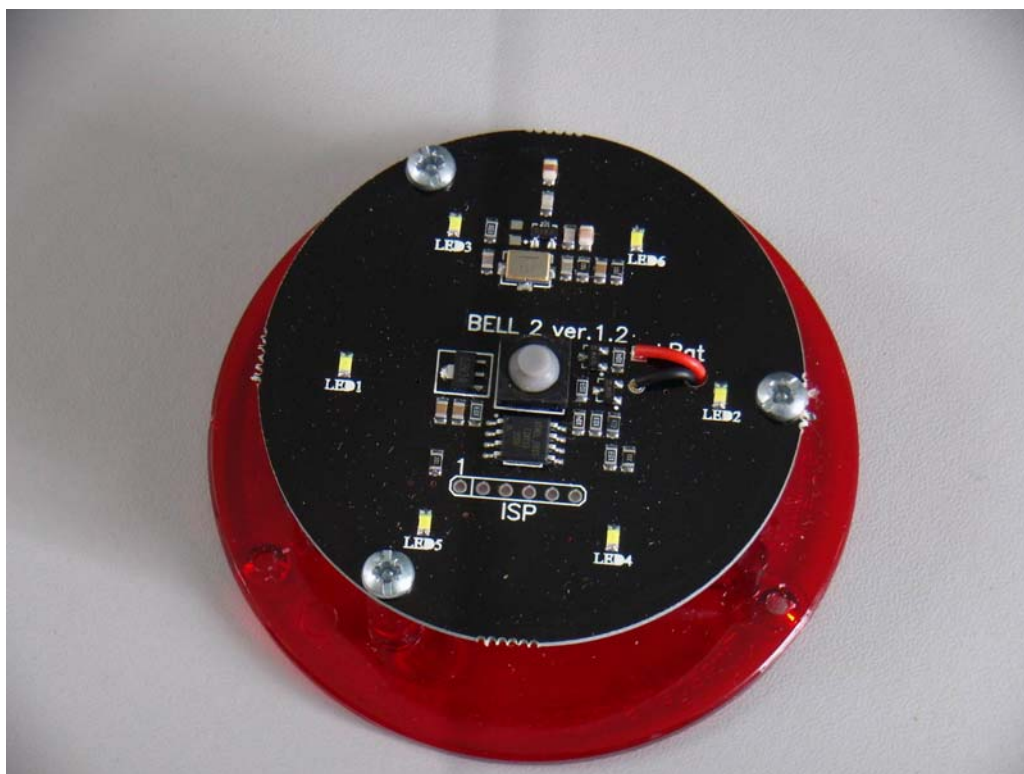


Figure 1.2 – Transmitter of model B020102. Front view without cover.



Figure 1.3 – Transmitter of model B020102. Rear view.



Figure 1.4 – Transmitter of model B020102. Marking.

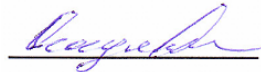
2 GENERAL INFORMATION ABOUT TESTS

2.1 Test program and results of the tests

Number of test	FCC rule	Description of test	Result (Pass, Fail, N/A)
1.	47 CFR 15.231(a)(1)	Transmitting Time	Pass
2.	47 CFR 15.231(b)	Field Strength of Fundamental and Spurious Emissions	Pass
3.	47 CFR 15.231(c)	Bandwidth of Emissions	Pass
4.	47 CFR 15.109, Class B	Radiated Emissions	Pass

Tested by:

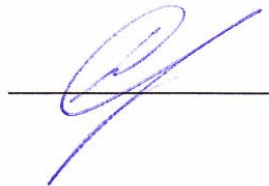
tests No. 1-4: Laboratory engineer



Vladimir Osaulko

Checked by:

Laboratory manager



Alexander Spektor

2.2 Test manner

The test distance of radiated emission from antenna to EUT is 3 m.
Methods of measurement are according to ANSI C63.4:2003.

2.3 Test conditions and test modes

Normal temperature and humidity:

- temperature: from +15 °C to +35 °C;
- relative humidity: from 20 % to 75 %

Normal power source:

- $U_{nom} = 9 \text{ V DC}$.

The frequency for the testing: 433,92 MHz.

Operating modes of the EUT

No.	Description
1.	Mode of transmission at single pressure of the call button
2.	

No.	Type of equipment	Model	Serial or inventory number
1.	Spectrum analyzer	HP8593E	3831U02306
2.	Attenuator	HP8498A	7781
3.	Barometer	M67	25870
4.	Psychrometer	БИТ-2	Г224
5.	Test site	EMI Semi Anechoic Chamber "DON"	
6.	Test receiver	ESPC ROHDE & SCHWARTZ	84855/024
7.	Measurement log-periodic antenna	VULB 9163 SCHWARZBECK	9163244
8.	Double Ridge Horn Antenna	HP11966E модель 3115 ROHDE & SCHWARTZ	5701
9.	Loop Antenna	APA-CP	101142

All listed above test equipment is calibrated and certified in accordance with established procedure. The equipment has certificates currently in force.

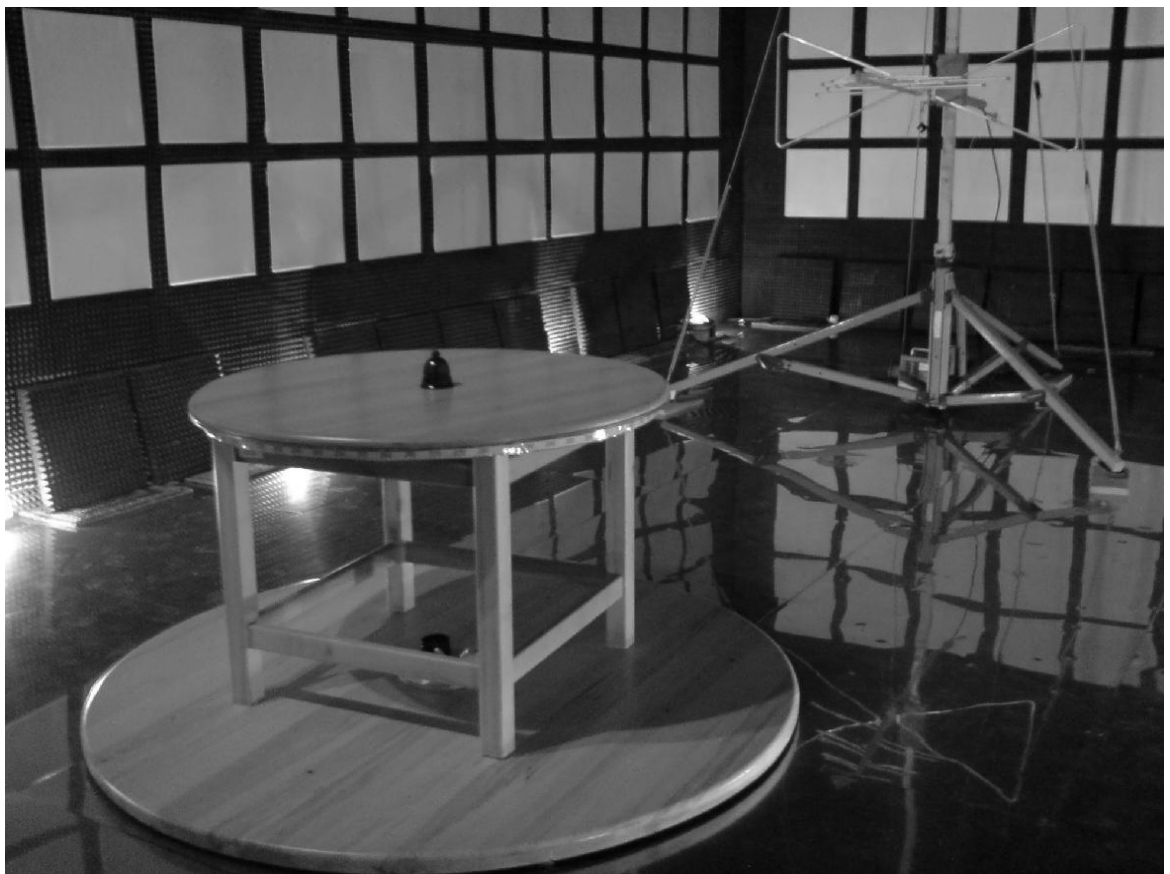
The preliminary estimation of spectrum of radiated emission was measured with the spectrum analyzer HP8593E with peak detector. Measuring of QP values was made with the receiver ESPC.

2.5 Measurement uncertainty

Parameter	Maximum uncertainty
Frequency range	$\pm 6 \times 10^{-7}$
Radiated emissions	± 5.2 dB
Spurious emissions	± 2.7 dB

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

Measurement uncertainty complies with the requirements of the normative documents and is guaranteed by the test procedures and test equipment.

2.6 Photo of test site**Figure 2.1 - Set-up 1****Figure 2.2 - EMI Radiated interference field strength measurement**

3.1 Transmitting Time, FCC 15.231(b)

3.1.1 Test procedure

The transmitter transmitted continuously while the activation button was pressed. According to FCC Part 15.231(a)(1) a manually operated transmitter should stop transmitting within 5 sec after release the activation button.

3.1.2 Test setup layout

3.1.3 Test result

Temperature: 22 °C

Relative humidity: 65 %

The transmitter was deactivated automatically after 2.5875 sec.

Test results (Pass, Fail, N/A): **PASS.**

3.1.4 Plots

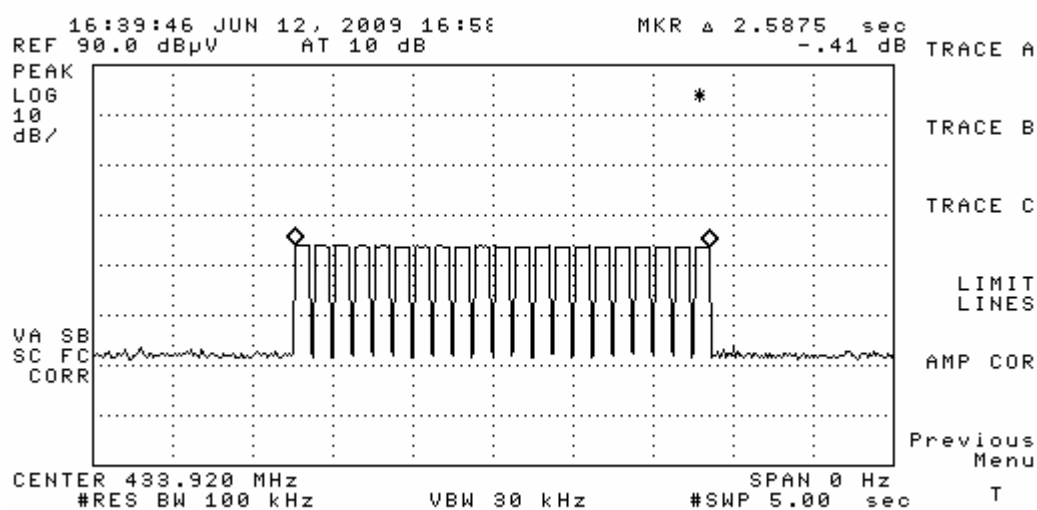


Figure 3.1 Transmitting time.

3.2 Field Strength of Fundamental and Spurious Emissions

3.2.1 Test procedure

- 1) The EUT was placed on a rotatable table top 0.8 m above the floor.
- 2) The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- 3) The table was rotated 360 degrees to determine the position of the highest radiation.
- 4) The antenna is a broadband antenna and its height is varied between 1 meter and 4 meters above the floor to find the maximum value of the shield strength for both horizontal polarization and vertical polarization of the antenna.
- 5) For each suspected emission, the EUT was arranged to its worst case.
- 6) The test-receiver was set to Peak or Quasi-peak detect function with specified bandwidth with maximum hold mode.
- 7) For testing below 1 GHz, if the emission level of EUT in peak mode was 3 dB lower than the specified limit, the testing stopped and peak values of EUT were noted, otherwise, the emissions were repeating one by one using the quasi-peak method and noted.
- 8) For testing above 1 GHz, if the emission level of EUT in peak mode was 20 dB lower than average limit (it means the emission level in average mode also complies with the limit in average mode), then testing was stopped and peak values of EUT were noted, otherwise, the emissions were measured in average mode again and noted.

3.2.2 Test setup layout

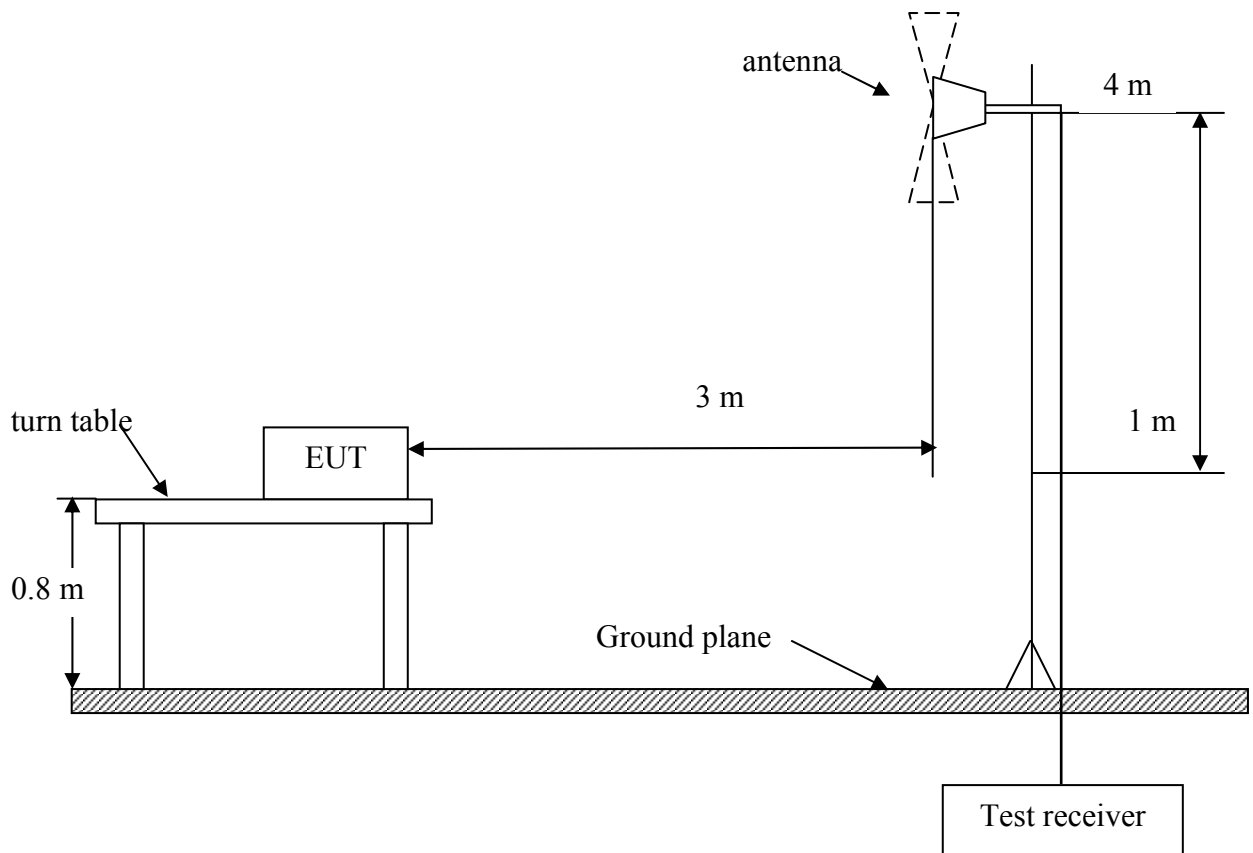


Figure 3.2 - EMI Radiated interference field (test setup)

Temperature: 22 °C

Relative humidity: 65 %

3.2.3.1 Field Strength of Fundamental Radiation

Table 3.1 - Field Strength of Fundamental Radiation

Frequency, MHz	Polarization	Average Value, dB	Reading, dBμV/m	Total at 3 m, dBμV/m	Limit, dBμV/m	Delta to limit, dB
433.92	H	2.37	72.0	74.37	80.82	8.82

Remark 1. The maximum value is shown at the table from the received values during Vertical and Horizontal polarisation.

Remark 2. The Limit for 433.92 MHz devices is 80.82 dBμV/m for field strength of fundamental. Calculation:

Formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz, μV/m at 3 meters = $41.6667(F) - 7083.3333$.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

L_s = Specification Limit in dBuV/m;

$L_s = 20 * \text{LOG}_{10} (41.6667 * 433.92 - 7083.3333) = 80.82 \text{ dB}\mu\text{V/m}$, dBμV/m.

Remark 3. Calculation of the Average Value Factor (see Figures 3.1, 3.3):

$$\text{Average Factor} = 20\text{Log}(\text{On air/Pulse Train}) = 20\text{Log}\left(\frac{21 * 93.75 * 10^{-3}}{2.5875}\right) = 20\text{Log}0.7608 = -2.37 \text{ dB}$$

Pulse train = 2.5875 sec (see Graph 1)

“pulses”: 21 each of 93.75 msec = $93.75 * 10^{-3}$ sec (see Graphs 2)

Test results (Pass, Fail, N/A): **PASS.**

3.2.3.2 Field Strength of Spurious Emissions**Table 3.2** - Field Strength of Spurious Emissions

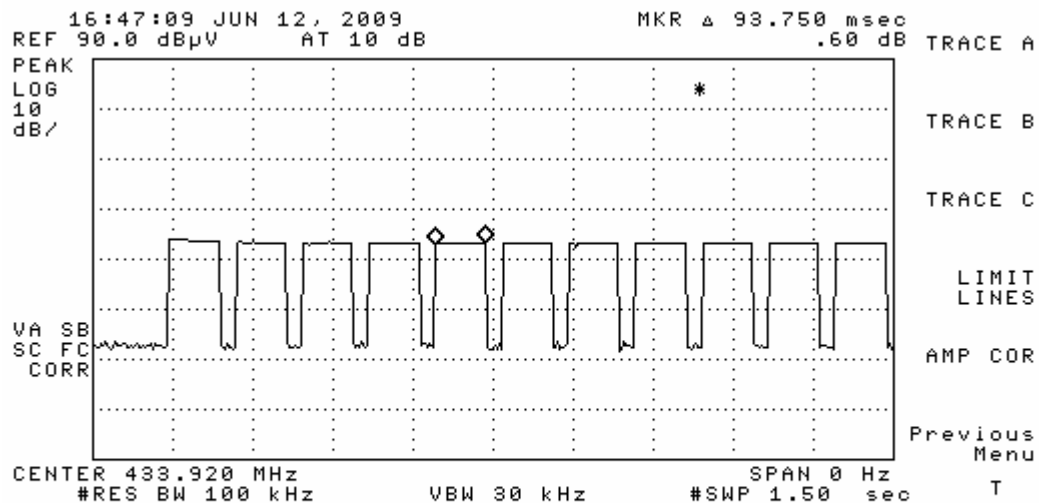
Polarization	Frequency, MHz	Corrected value, dB μ V/m			Limit, dB μ V/m			Delta to limit, dB	
		QP	Peak	AV	QP	Peak	AV	QP	AV
H	867.84	31.1			N/A			N/A	
V	1301.76			31.0			60.82	29.82	
V	1735.68			33.9			N/A	N/A	
H	2169.60			37.0			N/A	N/A	
H	2606.52			38.2			N/A	N/A	
V	3037.44			40.1			N/A	N/A	
V	3471.36			43.0			N/A	N/A	
H	3905.28			41.3			60.82	19.52	
V	4339.20			42.5			60.82	18.32	

Remark 1. On other frequencies of the range from 30 MHz to 4339.20 MHz spurious emissions level is 20 dB below the limit.

Remark 2. The Limit for 433.92 MHz devices is 60.82 dB μ V/m for field strength of Spurious Emissions.

Remark 3. There is N/A it means that frequency outside restricted bands of operation per FCC Part 15.205.

Test results (Pass, Fail, N/A): **PASS.**

3.2.4 Plots**Figure 3.3** Duration of the pulses.

3.3 Bandwidth of Emissions

3.3.1 Test procedure

Bandwidth of Emissions measurements was made for frequency of 433.92 MHz.
The maximum allowed level is $433.92\text{MHz} \times 0.25\% = 1084.8\text{ kHz}$.

3.3.2 Test setup layout

3.3.3 Test result

Temperature: 22 °C

Relative humidity: 65 %

Bandwidth of Emissions at minus 20dB level is 38.8 kHz.

Test results (Pass, Fail, N/A): **PASS.**

3.3.4 Plots

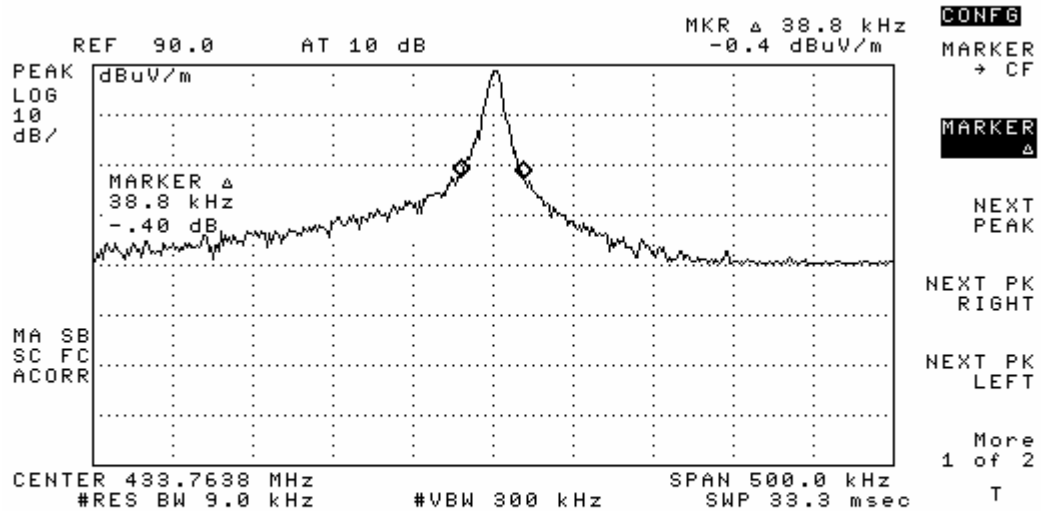


Figure 3.1 Bandwidth of Emissions at minus 20dB level.

3.4.1 Test procedure

The EUT is a digital device was tested according to FCC Part 15.109, Class B in frequency range from 30MHz to 2GHz; emissions at transmitter fundamental frequency and 2nd harmonic were excluded from the Table.

The EUT is battery operated device, therefore Line Conducted Emissions testing is inappropriate and therefore unnecessary.

3.4.2 Test setup layout

3.4.3 Test result

Temperature: 22 °C

Relative humidity: 65 %

Table 3.3 - Radiated Emissions

Polarization	Frequency, MHz	Corrected value, dBμV/m	Limit, dBμV/m	Delta to limit, dB
H	366.01	17.3	46	28.7
V	562.24	19.0	46	27.0
V	838,70	23.1	46	22.9
H	1301,20	29.5	54	34.5
H	2411.15	37.3	54	16.7

Remark 1. Radiated emissions on other frequencies that are shown at this table are equal to the noises of the measuring equipment.

Test results (Pass, Fail, N/A): **PASS.**

3.4.4 Plots