TEST REPORT

FCC ID:	**PBWB200R36** **PBWB200R36H** (Above respectively for Base and Handset of Models SCD589, SCD588, SCD587, SCD 386 and SCD384)
IC:	**3842A-B200R36** (For Models SCD589, SCD588, SCD587, SCD 386 & SCD384)
Equipment Under Test: (EUT)	**1.9 GHz DECT Baby Monitor** S/N MS000552010012 S/N MS000552010013
In Accordance With:	**FCC Part 15, Subpart D / IC RSS-213** UPCS / LE-PCS Isochronous Device **ANSI C63.17 – 1998** (or 2005 Draft where applicable)
Tested By:	**Jeffrey Yang**
Reviewed By:	**Kevin Yau**
Date:	**February 10, 2006**

TEST EQUIPMENT LIST

ITEM	EQUIPMENT	MAKE	MODEL	S/N	LAST CAL.
1.	Spectrum Analyzer	AGILENT	8560E	3337A00704	07 April 2005
2.	Scope	TEKTRONIX	TDS-220	B051826	02 April 2004
3.	3-Port Combiner	MINI CIRCUITS	ZESC-2-11	15542	N/A
4.	Selectable Attenuator	KAY ELEMETRICS	839	20902-34	N/A
5.	Attenuator	In-house built	Fixed 33 dB	N/A	N/A
6.	Attenuator	In-house built	Fixed 22 dB	N/A	N/A

1 OVERVIEW

This report reviews the RF channel monitoring and access criteria employed in the subject DECT-based baby monitor models. Results indicate the subject models are meeting the requirements of FCC Part 15 Subpart D or Industry Canada specification RSS-213 for UPCS / LE-PCS Isochronous Devices. Details follow by sub-sections of the FCC rules or IC spec.

2 15.319 (c) / 6.5

The peak transmit power P is rated 20 dBm, within the limit of 100 μW x $\sqrt{B}$ under this clause and numerically derived in 15.323 (a). See Section 6 in another report for measured power.

3 15.319 (f) / 4.3.4 (a)

The device system will automatically discontinue transmission in case of either absence of information to transmit or operational failure. However, control and signaling information is transmitted every frame by the base even when there are no links established. This information is in broadcast during 1 time slot. This kind of control signaling is permitted under this clause. The information is also in broadcast on all transmit bearers from the base in duplex connections.

See paragraph 6 below for details of verification tests.

4 15.323 (a) / 6.5

The emission bandwidth B of the device is rated 1.5 MHz maximum, limiting the peak transmit power to

Pmax = 5 logB - 10 dBm = 20.8 dBm as per 15.319 (c).

See Section 5 in another report for measured emission bandwidth.

5 15.323 (e) / 4.3.4 (c)

The frame period for the device is 20 ms/2 = 10 ms. This 10 ms frame period is set by the protocol firmware according to the ETSI standard for DECT systems.

10 ms frame period was verified in Section 9 (on duty cycle) of a separate report.

6 15.323 (c) / 4.3.4 (b)

The device incorporates a mechanism for monitoring the transmission time and spectrum windows based on the following criteria:

(1) Immediately prior to initiating transmission, the handset, being the controlling part with respect to base for duplex connections, will monitor the last 10 ms combined windows (equivalent to a frame period) in time and spectrum in which the system intends to transmit. The base will also monitor the combined time and spectrum windows in which it intends to transmit the control and signaling information within the last 10 ms before initiating transmission.

Test: This was verified per ANSI PC63.17-2005 Clause 7.3.4 using an EUT having an EEPROM setting to limit operation to two channel frequencies. The same EUT was used in the monitoring threshold test (see Section 3 of a separate report).

(2) The least monitoring threshold used is -96 dBm, less than 30 dB above the thermal noise power for the emission bandwidth per ANSI C63.17 Clause 7.2.1:

Lower limit = 15 logB – 184 + 30 – P = 15 log(1.5M) – 184 + 30 – 20 = - 81.4 dBm.

However, this threshold level is not used because of the conditions in (5) below.

Test: Not required due to other applicable condition.

(3) The device system will monitor the time and spectrum windows by scanning the RF environment and storing the information in an RSSI table on a regular basis such that the data used from the RSSI table is never older than 10 seconds (30 s maximum per original DECT standard). Once the time slot / spectrum window is occupied in talk mode, monitoring continues at 10 ms interval on other criteria such as CRC (or BER), sync pulse and clock jitter instead of signal strength (per DECT MAC protocol EN 300 175-3). Information on the CRC errors detected by the base is transmitted to the handset and added to the error information already held there. Also, continuous 8-hour occupation of the same combined time and spectrum window is prevented. This is achieved by repeating access criteria of LBT (Listen Before Talk) &/or LIC (Least Interference Channel) after 4 hours of continuous occupation of the same combined time and spectrum windows.

Test: This was verified per ANSI PC63.17-2005 Clause 8.2.2 using an EUT placed in a semi-anechoic chamber. After initiating communications, channel frequency was monitored with a spectrum analyzer. Demodulated RX data for a frame was monitored from the base with a digital scope. At the end of 8-hour period, the channel frequency and/or data-carrying time slot in the frame had been changed.

(4) In standby mode, the handset will receive the control and signaling information from the base at regular intervals, depending on the reception quality and the type of information. However, the longest interval between receptions will not exceed 640 ms. When initiating talk mode, the handset makes a request to the base and will continue transmission only if it receives an acknowledgement from the base. The handset will determine within 1 second if talk mode can continue after obtaining access to specific combined time and spectrum windows. Once talk mode is operating, if certain identity information is not received from the companion unit within 5 seconds, transmissions are stopped. The base repeatedly performs access criteria on channels used exclusively for control and signaling information, requiring no acknowledgement. This repetition is done such that continuous transmission between access criteria evaluations never exceeds 30 seconds. This evaluation is performed within 5.12 seconds, and a maximum of 6 channel changes per minute.

Test: This was verified per ANSI PC63.17-2005 Clause 8.2.1 using an EUT having an EEPROM setting to limit operation to one channel frequency.

When initiating talk and the base powered down on purpose to send no acknowledgement, the handset terminated transmission in less than 1 second.

In talk mode when base powered down on purpose to send no more sync data (one of the forms of acknowledgement), the handset terminated transmission in 10 ms.

(5) The device system defines a total of 60 duplex access channels (5 carrier channels x 12 duplex time slots each). The RSSI scan table is the guide to make decision to choose the least interference channels. When no combined time and spectrum windows can be found below the “lower threshold” defined in (2), a monitoring threshold of –73 dBm will be used instead. This alternate threshold falls within the upper limit per ANSI 63.17 Clause 7.2.1:

Upper limit = 15 logB – 184 + 50 – P = 15 log(1.5M) – 184 + 50 – 20 = - 61.4 dBm.

The system monitors all access channels such that data referring to these channels is never older than 10 seconds when it is used. It verifies, within 10 ms immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value. The power measurement resolution for the comparison is within 6 dB derived from the equivalent of digital RSSI data.

The system supports up to 4 handsets. The communication links for these 4 handsets are by TDMA on a selected carrier. In the worst case, the system with multiple handsets occupies a maximum of 6 duplex slots per frame (4 links plus two attempting handover due to possible interference). Thus the worst-case channel usage is 6 out of a defined total of 60 and an aggregate bandwidth of no more than 6 MHz (emission bandwidth 1.5 MHz x 4 time slots).

Test: See Section 3 in another report for monitoring threshold measurements. It was also found in tests the measured values lied within 6 dB resolution.

(6) If the selected combined time and spectrum windows are unavailable, the device system will select different windows. The failing time and spectrum windows will be tried again after the next RSSI scan period and only if its determined level is measured as meeting the access criteria.

Test: This was verified per ANSI PC63.17-2005 Clause 8.1.3 using an EUT having an EEPROM setting to limit operation to one channel frequency.

It was found a previously occupied channel could be re-used again once vacant within 60 ms in accordance with ETSI MAC protocol, meeting the requirement of this clause in waiting for a duration between 10 and 150 ms.

(7) The monitoring bandwidth in the device system is equal to the emission bandwidth of the intended transmission. Based on emission bandwidth B, the reaction time limits t_1 and t_2 are as follows:

At threshold level,

$t_1 = 50\ \sqrt{1.25/B} = 50\ \sqrt{1.25/1.5} = 45.6\ \mu s < 50\ \mu s$ permitted

At 6 dB above threshold,

$t_2 = 35\ \sqrt{1.25/B} = 35\ \sqrt{1.25/1.5} = 31.9\ \mu s < 35\ \mu s$ permitted.

The device system in talk mode has a reaction time of 10 μs by software and an additional 2 μs in power amp ramp-on, making a total of 12 μs. This still falls below the limits above.

Test: Not required since timing has been guaranteed by chip maker in firmware. Verification per ANSI PC63.17-2005 Clause 7.5 is impracticable unless sync pulse for gating time slot is made available externally from the chip.

(8) The same antenna is used for monitoring and transmission. Base has diversity antennas but switched between time slots when required for the best reception. At any one time, only one base antenna is effectively in use. Handset has single antenna only.

Test: Not required for statement.

(9) Provision allowed for increasing monitoring threshold in this clause is not utilized.

Test: Not required for statement.

(10) The device system operates on TDD. Handset is the initiating device while base is the responding device in setting up communications between the two devices. The two devices communicate over a duplex connection. Based on the current RSSI table, the handset selects the best time and spectrum window with a power level below the high monitoring threshold from the table that is less than 10 seconds old. In the 10 ms period before transmission start, the intended transmit and receive time and spectrum windows are scanned and the power level compared with the previous value stored in the RSSI table. If the detected power level is no higher than the previously stored value, the handset starts transmitting an access message. This message is decoded by the base as a request for a duplex connection and within 1 second the base starts transmitting an acknowledge message on the same duplex connection.

Test: This was verified per ANSI PC63.17-2005 Clause 8.3 by conducted method using an EUT having an EEPROM setting to limit operation to one channel frequency. Start of the initiating device's transmit was used as slot timing reference.

It was found duplex connection could not be established when interference signal was applied to the whole frame period (i.e. all time slots) of the enabled carrier from the handset (the initiating device) while the base (the responding device) had one time slot interference free.

(11) The base or handset is not to be co-located or operating in conjunction with any other transmitter.

Test: Not required for statement.

(12) There is no provision made to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

Test: Not required for statement.