



# BlueCoreä01

## BlueTest Instruction Manual

**AN047**

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**Bluetooth® Qualified**

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# Introduction

BlueTest is a program that controls the on-chip built-in-self-test (BIST) software for RF testing. This document explains the facilities offered by the BIST. BlueTest does not execute any of these tests. It sends commands to **BlueCore01** and/or enables the on-chip BIST, then reports any results.

The tests fall into six categories:

- Simple RF tests; used for PCB de-bug and optimisation
- Quantitative tests for transmit and receive; used to establish the performance of the Bluetooth device.
- Loopback test modes; used for qualification and regulatory testing
- Configuration commands to set parameters for other tests
- Built-in self-test routines
- Miscellaneous test routines

Further details about commands, parameters and packet types are included in the appendices following the tests.

## Running a Test

In a BlueTest dialog select the **Standard** button to display the entire test. This applies to all of the tests except for the BIT ERR1 and BIT ERR2 tests. Click on **Bit Error** to display these results in a column format.

When running the tests, the results display in a dialog box.

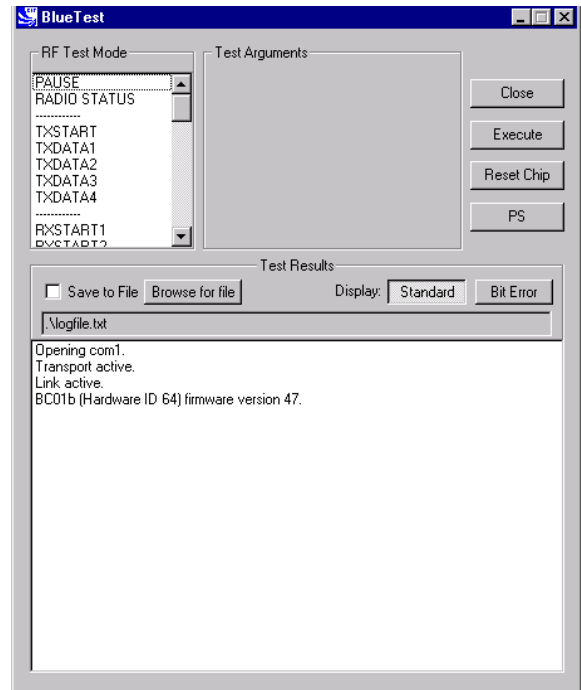
The default file name is `logfile.txt`. It is located in the current directory in which the program resides. Select **Browse for File** to create your own file name and path (using test examples provided).

To save test results to a file, tick **Save to File**.

**Note:** Some of these tests require two Bluetooth modules to function correctly. The PCM External Loopback test has notes specifically for use with CSR's Casira development kit.

All of the following tests are designed to run with CSR's firmware versions Beta 10.4 and above.

Several tests include entries for **Related Test Spec Name**. These refer to tests in the Bluetooth Special Interest Group (SIG) Test Specification for RF document, rev. 0.9r, dated 31 January 2000.



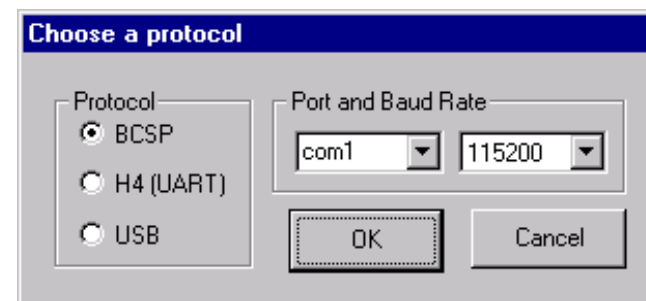
BlueTest Example Display

## Getting Started

Run **Bluetest.exe**.

Select a Protocol (Default **BCSP**).

Select **Port and Baud Rate** (Default com1, 115200).

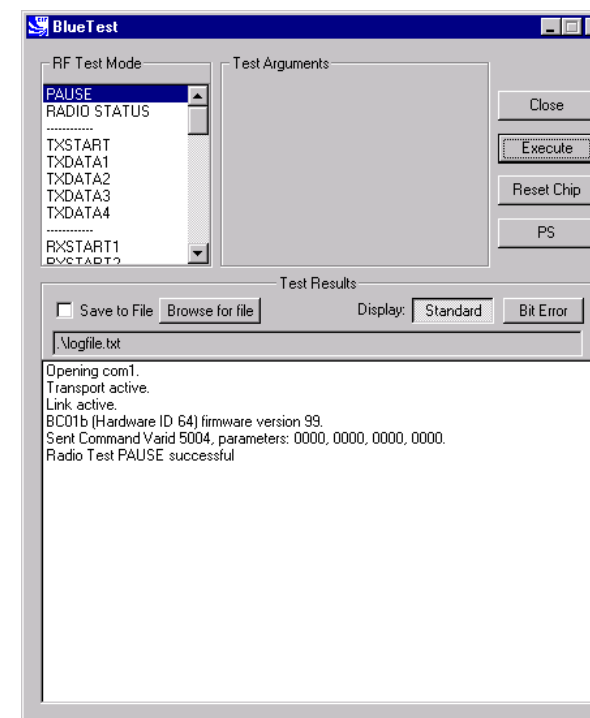




# Simple Tests

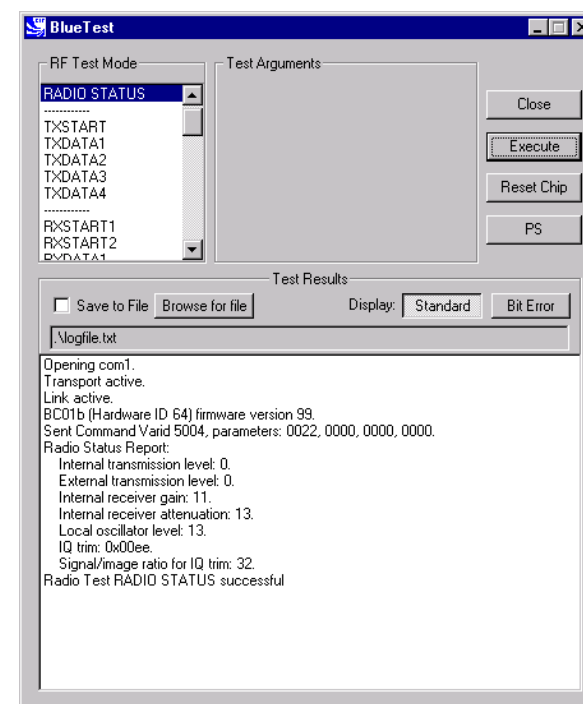
## RF Test Mode

<b>Title</b>	<b>PAUSE</b>
<b>Summary</b>	Halts the current test and stops any radio activity.
<b>Test Arguments</b>	None
<b>Return Data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> or enter a new command.

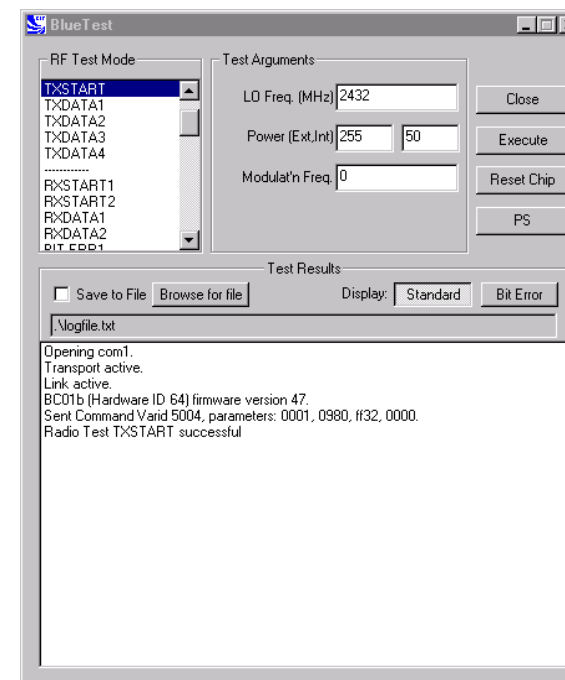


**PAUSE Example Display**

<b>Title</b>	<b>RADIO STATUS</b>
<b>Summary</b>	Returns the values from the radio control registers.
<b>Test Arguments</b>	None
<b>Return Data</b>	Internal transmission level External transmission level Internal receiver gain Internal receiver attenuation Local oscillator level IQ trim Signal/image ratio for IQ trim
<b>Exit</b>	Click on <b>Reset Chip</b> .

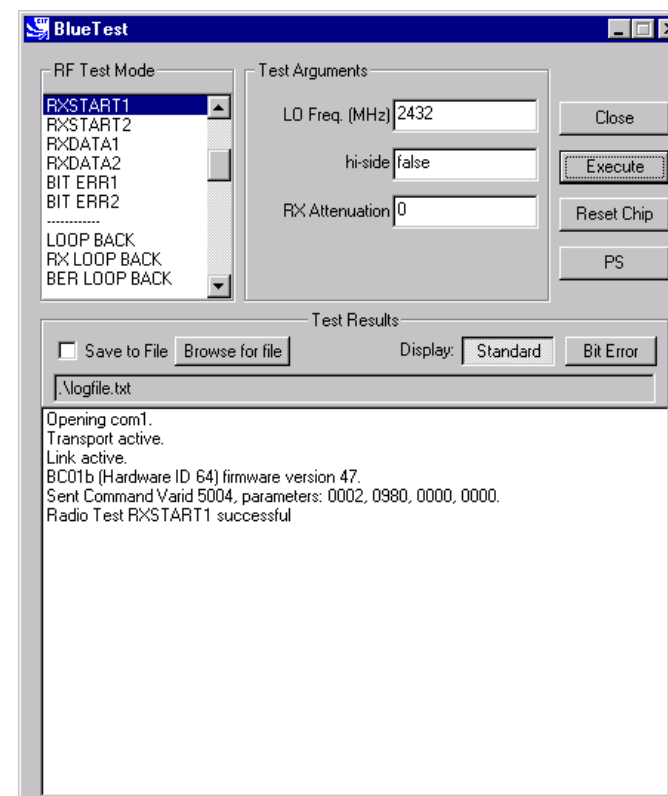

**RADIO STATUS Example Display**

<b>Title</b>	<b>TXSTART</b>
<b>Summary</b>	Enables the transmitter in continuous transmission at a designated frequency ( <b>LO Freq</b> ) with a designated output <b>Power (Ext, Int)</b> and designated tone modulation frequency ( <b>Modulat'n Freq</b> ) .
<b>Test Arguments</b>	<p><b>LO Freq</b> (Carrier Frequency in MHz) = 2402 to 2480</p> <p><b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50)</p> <p><b>Modulat'n Freq</b> = -32768 to 32767 in units of 1/4096MHz</p>
<b>Return Data</b>	<p>None</p> <p>Use RF Analyser to check carrier output.</p>
<b>Exit</b>	Click on <b>Reset Chip</b> .



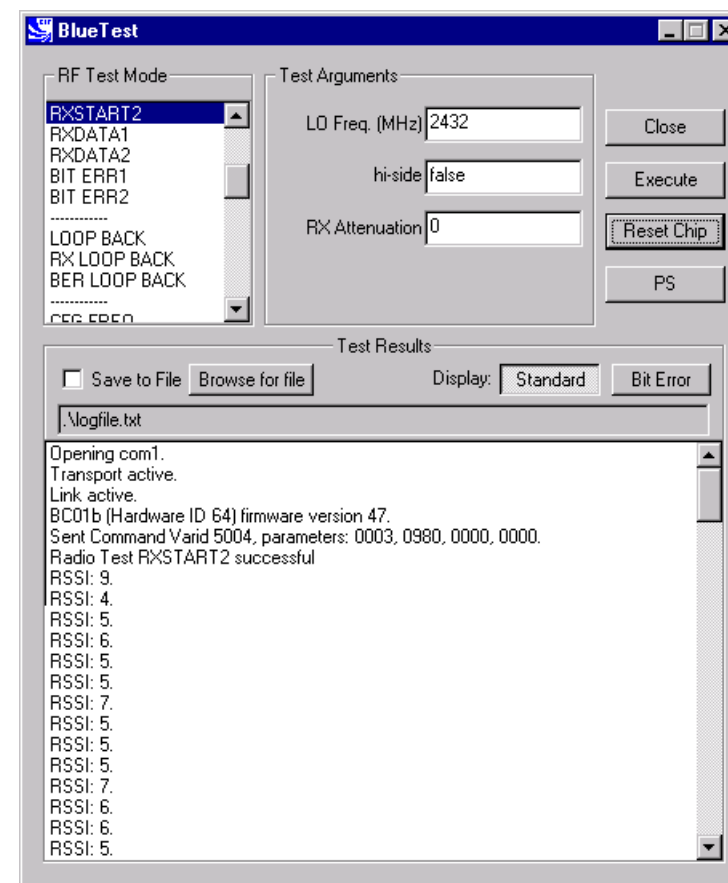
TXSTART Example Display

<b>Title</b>	<b>RXSTART1</b>
<b>Summary</b>	<p>Enables the receiver in continuous reception at a designated frequency ( <b>LO Freq</b> ) with a choice of low or high side modulation ( <b>hi-side</b> ) and with a designated attenuation setting ( <b>RX Attenuation</b> ). Requires a second unit to be running <b>TXSTART</b>.</p> <p>Routes final IF to TEST_A pin.</p>
<b>Test Arguments</b>	<p><b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480</p> <p><b>hi-side</b> (default = False) set 0 or 1</p> <p><b>RX Attenuation</b> = 0 to 15 (Default = 0 )</p>
<b>Return Data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> .



RXSTART1 Example Display

<b>Title</b>	<b>RXSTART2</b>
<b>Summary</b>	Enables the receiver in continuous reception, at a designated frequency ( <b>LO Freq</b> ), with a choice of low or high side modulation ( <b>hi-side</b> ) and with a designated attenuation setting ( <b>RX Attenuation</b> ). Digitises the RSSI and sends report regularly to host. Requires a second unit to be running <b>TXSTART</b> .
<b>Test Arguments</b>	<b>LO Freq</b> (Carrier Frequency MHz) = 2402 to 2480 <b>hi-side</b> (default = false) set 0 or 1 <b>RX Attenuation</b> = 0 to 15 (Default = 0 )
<b>Return Data</b>	RSSI values, as a uint16, sent over BCSP channel 3 at a rate of about 10 per second. Can be saved to log file. H4 and USB use manufacturer's extensions.
<b>Exit</b>	Click on <b>Reset Chip</b> .



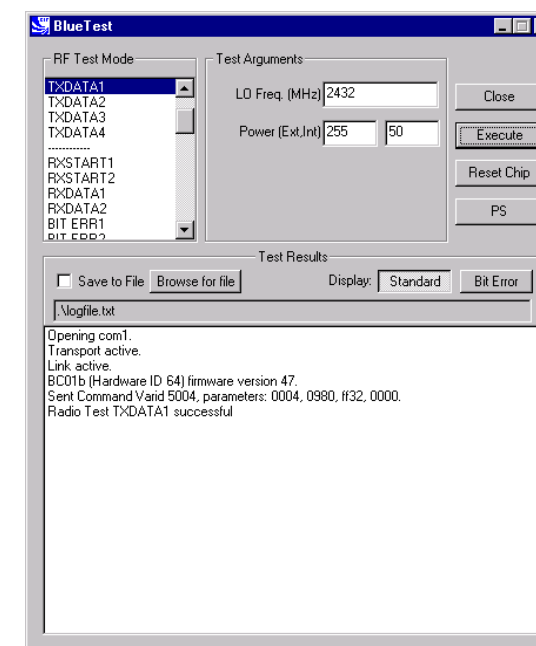
RXSTART2 Example Display

# Quantitative Tests

## Transmitter Only

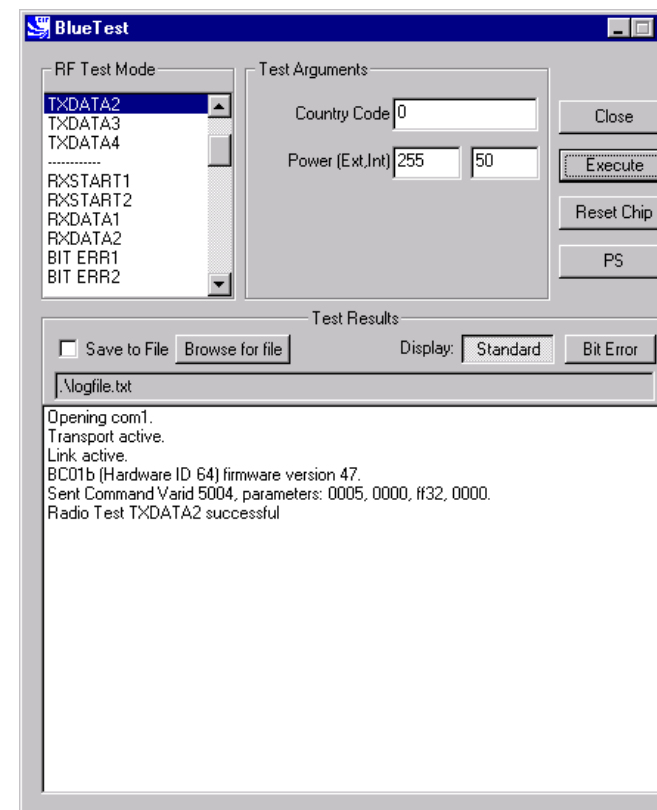
<b>Title</b>	<b>TXDATA1</b>
<b>Summary</b>	<p>Enables the transmitter, with a designated frequency (<b>LO Freq</b>) and output <b>Power (Ext, Int)</b>.</p> <p>Payload is PRBS9 data.</p> <p>Receiver is not operating.</p> <p>Packet type and duty cycle can be configured. Refer to Configuration Commands section.</p>
<b>Related Test Spec Name</b>	TRM/CA/03/C (power control), TRM/CA/04/C (Tx output spectrum – frequency range), TRM/CA/05/C (Tx output spectrum – 20dB bandwidth), TRM/CA/06/C (Adjacent channel power), TRM/CA/08/C (Initial carrier frequency tolerance), TRC/CA/01/C (Out-of-band spurious emissions).
<b>Test Arguments</b>	<p><b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480</p> <p><b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. <b>Ext</b> value is specific to the design and <b>Int</b> value is 0 to 63 (Default = 50).</p>
<b>Return Data</b>	<p>None</p> <p>Use an RF Analyser to check carrier output.</p>
<b>Exit</b>	Click on <b>Reset Chip</b> or select another <b>TXDATA</b> command.

**Note:** **TXDATA** and **RXDATA** require the same Bluetooth address in each module for **RXDATA** to receive data transmitted by **TXDATA**. Use **CFG\_UAP\_LAP** to set the address used by the BIST.



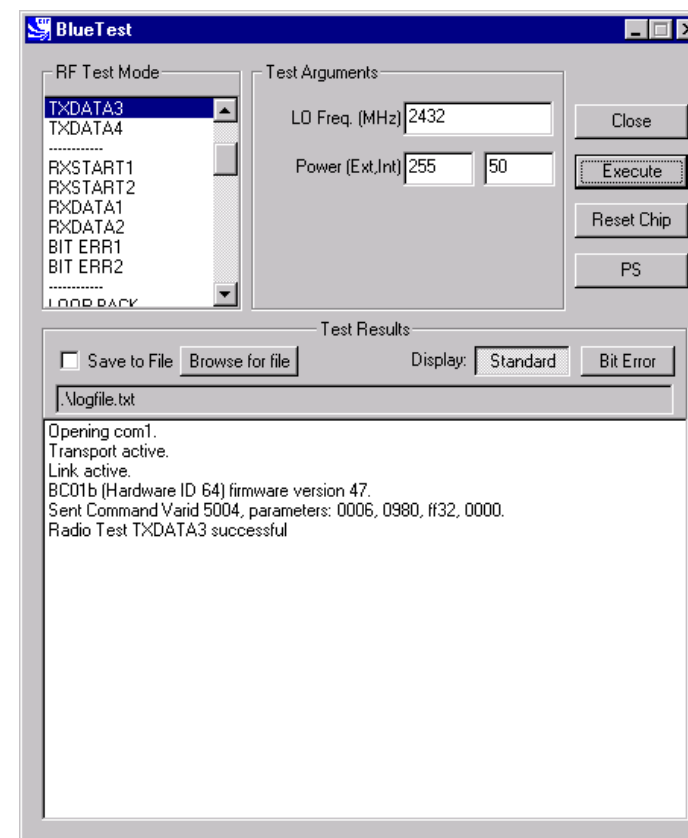
TXDATA1 Example Display

<b>Title</b>	<b>TXDATA2</b>
<b>Summary</b>	<p>Enables the transmitter, with a simplified hop sequence designated by <b>Country Code</b> and sets output <b>Power (Ext, Int)</b>.</p> <p>Payload is PRBS9 data (Default DH1).</p> <p>Receiver is not operating.</p> <p>Packet type and duty cycle can be configured. Refer to Configuration Commands section.</p>
<b>Related Test Spec Name</b>	TRM/CA/01/C (output power), TRM/CA/02/C (power density)
<b>Test Arguments</b>	<b>Country Code</b> = 0 to 3 (Default = 0 )
<b>Return Data</b>	<p>None</p> <p>Use RF Analyser to check carrier output.</p>
<b>Exit</b>	Click on <b>Reset Chip</b> or select another <b>TXDATA</b> command.



TXDATA2 Example Display

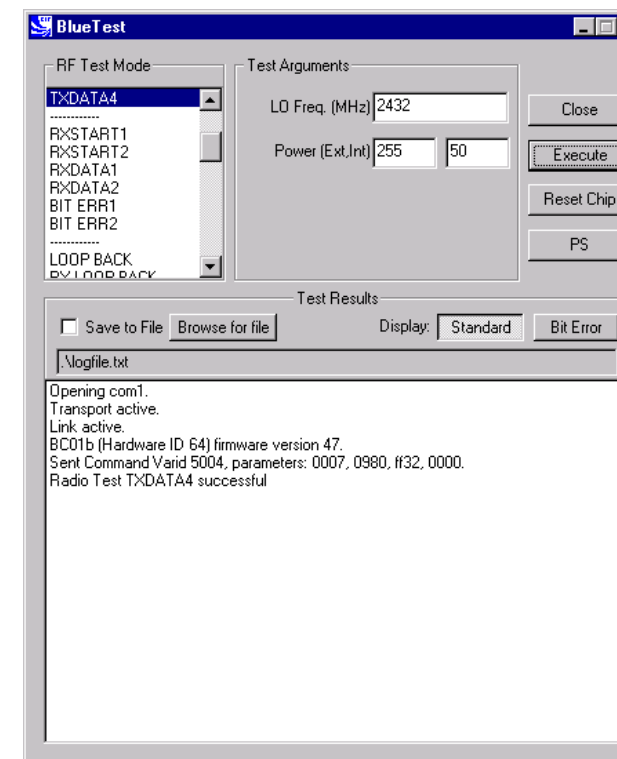
<b>Title</b>	<b>TXDATA3</b>
<b>Summary</b>	<p>Enables the transmitter, with a designated frequency ( <b>LO Freq</b> ) and output <b>Power (Ext, Int)</b>.</p> <p>Payload is sequence 101010....</p> <p>Receiver is not operating.</p> <p>Packet type and duty cycle can be configured. Refer to Configuration Commands section.</p>
<b>Related Test Spec Name</b>	TRM/CA/07/C (modulation characteristic), TRM/CA/09/C (carrier frequency drift)
<b>Test Arguments</b>	<p><b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480</p> <p><b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).</p>
<b>Return Data</b>	<p>None</p> <p>Use RF Analyser to check out carrier</p>
<b>Exit</b>	Click on <b>Reset Chip</b> or select another <b>TXDATA</b> command.



TXDATA3 Example Display



<b>Title</b>	<b>TXDATA4</b>
<b>Summary</b>	<p>Enables the transmitter with a designated frequency (<b>LO Freq</b>) and output <b>Power (Ext, Int)</b>.</p> <p>Payload is sequence 1111000011110000....</p> <p>Receiver is not operating.</p> <p>Packet type and duty cycle can be configured. Refer to Configuration Commands section.</p>
<b>Related Test Spec Name</b>	TRM/CA/07/C (modulation characteristic), TRM/CA/09/C (carrier frequency drift)
<b>Test Arguments</b>	<p><b>LO Freq</b> (Carrier Frequency MHz) = 2402 to 2480</p> <p><b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).</p>
<b>Return Data</b>	<p>None</p> <p>Use an RF Analyser to check out carrier.</p>
<b>Exit</b>	Click on <b>Reset Chip</b> or select another <b>TXDATA</b> command.

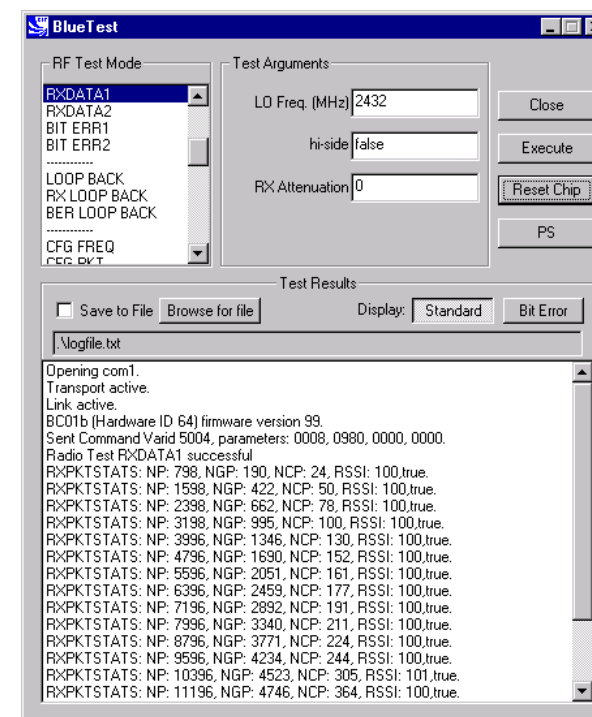


TXDATA4 Example Display

## Receiver Only

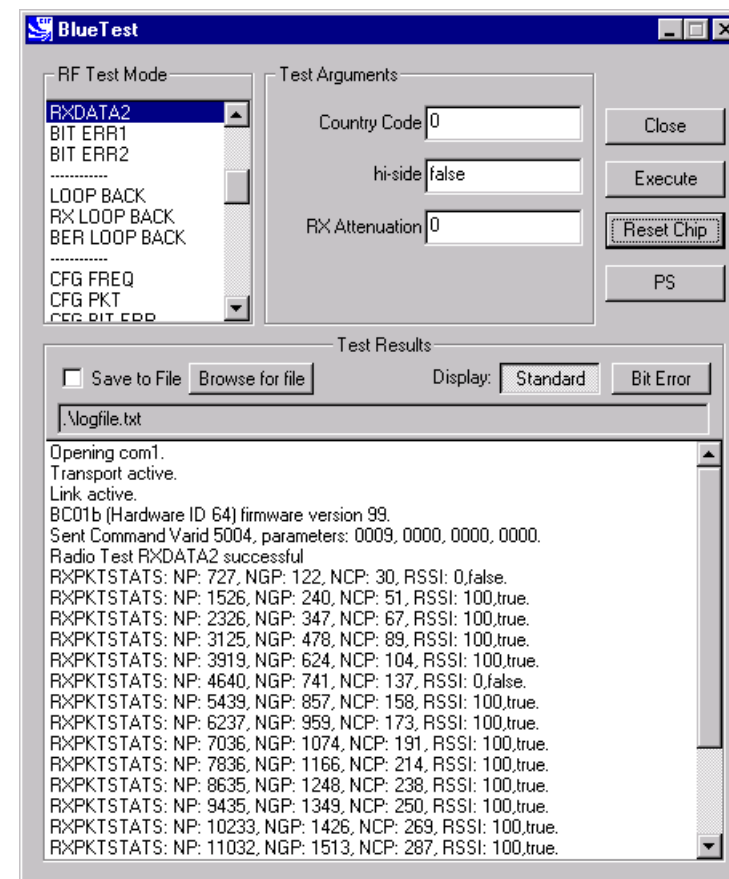
<b>Title</b>	<b>RXDATA1</b>
<b>Summary</b>	<p>Enables the receiver, at a designated frequency (<b>LO Freq</b>) with a choice of low or high side modulation (<b>hi-side</b>), and with a designated attenuation setting ( <b>RX Attenuation</b> ).</p> <p>The software counts the number of received packet and the number of payloads with correctable errors.</p> <p>The payload itself is thrown away. The time between receive slots and report frequency can be set. Refer to Configuration Commands section.</p>
<b>Test Arguments</b>	<p><b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480</p> <p><b>hi-side</b> = 0 or 1 (default = 0)</p> <p><b>RX Attenuation</b> = 0 to 15 (default = 0 )</p>
<b>Return data</b>	<p>NP = number of packets</p> <p>NP = number of good packets,</p> <p>NCP = number of corrected packets</p> <p>RSSI = value as shown</p> <p>True = RSSI is reliable, otherwise false</p> <p>The numbers wrap, rather than being reset to 0.</p>
<b>Exit</b>	Click on <b>Reset Chip</b> .

**Note:** TXDATA and RXDATA require the same Bluetooth address in each module for RXDATA to receive data transmitted by TXDATA. Use **CFG\_UAP\_LAP** to set the address used by the BIST.



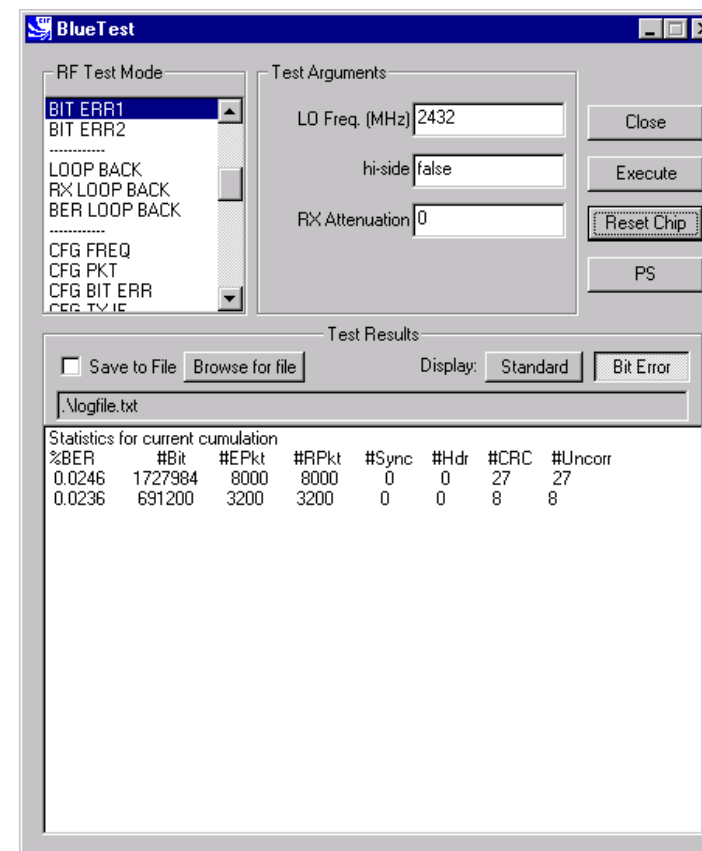
**RXDATA1 example display**

<b>Title</b>	<b>RXDATA2</b>
<b>Summary</b>	<p>Enables the receiver with a simplified hop sequence designated by <b>Country Code</b>, with a choice of low or high side modulation ( <b>hi-side</b> ) and with a designated attenuation setting ( <b>RX Attenuation</b> ).</p> <p>The software counts the number of received packets and the number of payloads with correctable errors.</p> <p>The payload itself is thrown away. The time between receive slots and report frequency can be set. Refer to Configuration Commands Section.</p>
<b>Related Test Spec Name</b>	Standby mode spurious emissions (FCC test)
<b>Test Arguments</b>	<p><b>Country Code</b> = 0 to 3 (default = 0)</p> <p><b>hi-side</b> = 0 or 1 (default = 0)</p> <p><b>RX Attenuation</b> = 0 to 15 (default = 0)</p>
<b>Return Data</b>	<p>NP = number of packets</p> <p>NG = number of good packets</p> <p>NCP = number of corrected packets</p> <p>RSSI = value as shown</p> <p>True = RSSI is reliable, otherwise false</p> <p>The numbers wrap, rather than being reset to 0.</p>
<b>Exit</b>	Click on <b>Reset Chip</b> .



RXDATA2 Example Display

Title	BIT ERR1
Summary	<p>Enables the receiver at a designated frequency (<b>LO Freq</b>) with a choice of low or high side modulation (<b>hi-side</b>) and with a designated attenuation setting (<b>RX Attenuation</b>).</p> <p>Returns a set of reports to the host:</p> <ul style="list-style-type: none"> <li>■ Number of data bits received (payload excluding FEC and CRC)</li> <li>■ Number of data bits that were in error. Assumes PRBS9 data starting with 1FF in each packet</li> <li>■ Number of packets received</li> <li>■ Number of packets expected, based on <code>txrx_freq</code> (default 12500)</li> <li>■ Number of packets with header errors as reported by hardware</li> <li>■ Number of packets with CRC errors</li> <li>■ Number of packets with uncorrected errors (currently same as CRC errors)</li> <li>■ Number of sync timeouts. Note that until a transmission is received a long timeout is used, so this does not reflect the number of packets expected</li> </ul> <p>Each report has two uint32 values. First is value since last report, second is summed over the last <code>bits_count</code> (default = 1.6Mbits).</p> <p>Reports are sent according to <code>report_freq</code> set (default = 1 second). The times between receive slots and report frequency can be set, and the count reset. Refer to Configuration Commands section.</p>

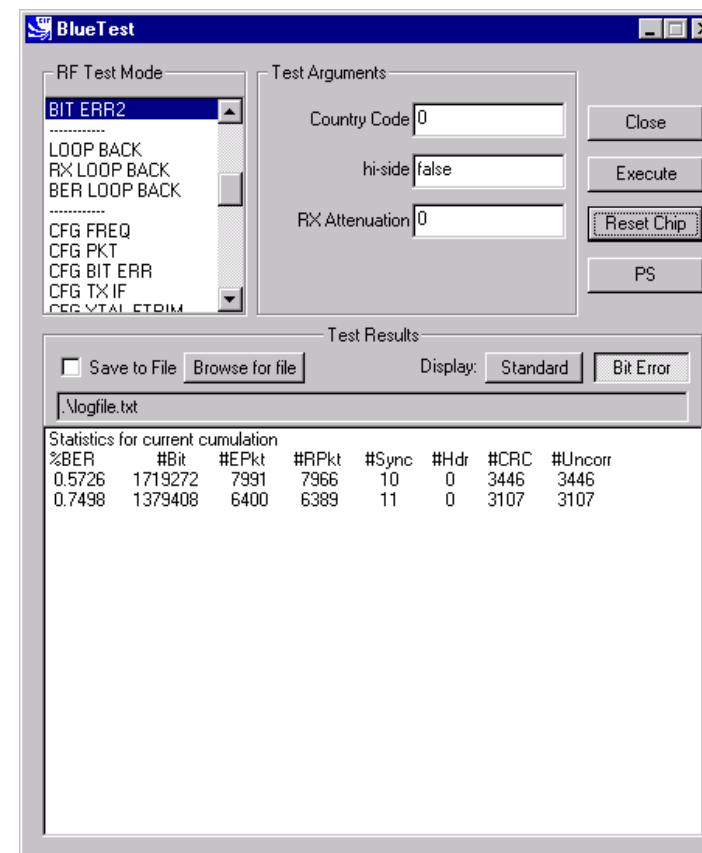


BIT ERR1 Example Display



<b>Title</b>	<b>BIT ERR1 (Continued)</b>
<b>Related Test Spec Name</b>	RCV/CA/01/C and RCV/CA/02/C (sensitivity), RCV/CA/03/C (C/I performance), RCV/CA/04/C (blocking performance), RCV/CA/05/C (intermodulation performance), RCV/CA/06/C (maximum input level)
<b>Test Arguments</b>	<b>LO Freq</b> (Carrier Frequency MHz) = 2402 to 2480  <b>hi-side</b> = 0 or 1 (default = 0 )  <b>RX Attenuation</b> = 0 to 15 (default = 0 )
<b>Note</b>	With a second unit, execute <b>CFG UAP/LAP</b> to set the Bluetooth address. Execute <b>TXDATA1</b> then execute <b>CFG UAP/LAP</b> to set the same Bluetooth address on the Equipment Under Test (EUT) before executing <b>BIT ERR1</b> .
<b>Return Data</b>	Eight reports, each two uint32 values (refer to BIT ERR1 Summary).
<b>Exit</b>	Click on <b>Reset Chip</b> .

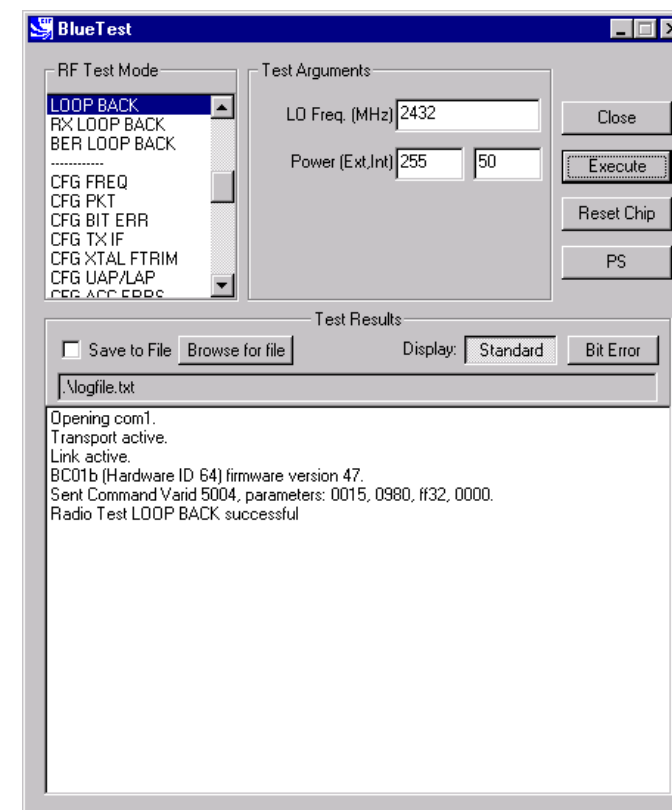
<b>Title</b>	<b>BIT ERR2</b>
<b>Summary</b>	<p>Enables the receiver with simplified hopping defined by <b>Country Code</b> with a choice of low or high side modulation (<b>hi-side</b>), and with a designated attenuation setting ( <b>RX Attenuation</b>) as for <b>RXDATA2</b>.</p> <p>Returns information on bit errors to the host as those given for <b>BIT ERR1</b>.</p>
<b>Related Test Spec Name</b>	None, but note that this test allows (as in <b>BIT ERR1</b> ) the tests RCV/CA/01/C and RCV/CA/02/C (sensitivity), RCV/CA/04/C (blocking performance) to be performed with hopping on. This is a more thorough test than that possible with the 7 Layers equipment.
<b>Test Arguments</b>	<p><b>Country Code</b> = 0 to 3 (default 0 )</p> <p><b>hi-side</b> = 0 or 1 (default = 0)</p> <p><b>RX Attenuation</b> = 0 to 15 (default = 0 )</p>
<b>Note</b>	With a second unit, execute <b>CFG UAP/LAP</b> to set BT address then execute <b>TXDATA2</b> , then execute <b>CFG UAP/LAP</b> to set the same BT address on the Equipment under Test (EUT) before executing <b>BIT ERR2</b> .
<b>Return Data</b>	Nine reports, each two uint32 values as for <b>BIT ERR1</b> .
<b>Exit</b>	Click on <b>Reset Chip</b> .



BIT ERR2 Example Display

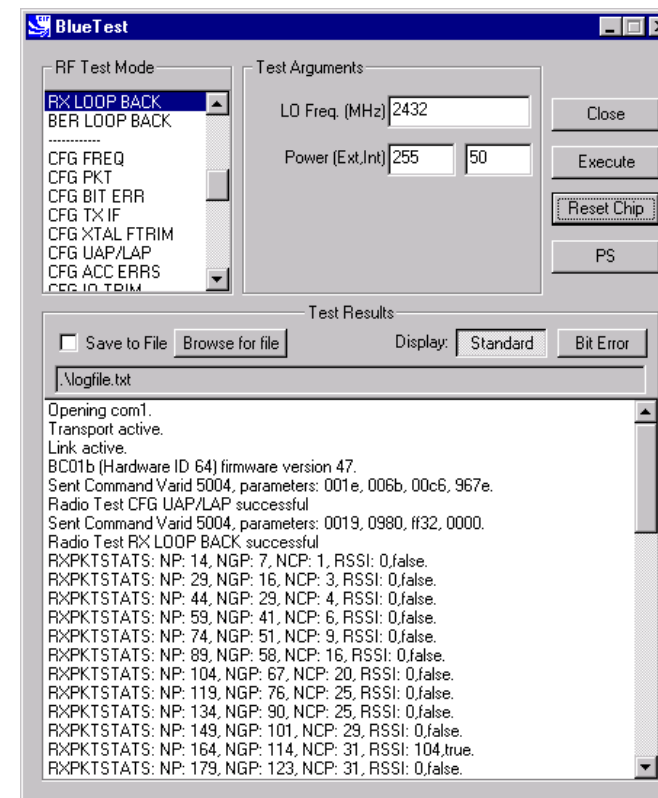
## Loopback Test Mode

Title	LOOP BACK
Summary	Receives data on <b>LO Frequency</b> for data packets and then retransmits this data on the same channel at transmit level 'lv1'. Highside reception is off and attenuation is set to 0. Expected reception frequency, <code>txrx_freq</code> (default = 12500 microsecs) with single slot packets returned <code>lb_offs</code> after receipt (default = 1875 microsecs). Defaults can be changed. See Configuration Commands section.
Related Test Spec Name	None, but note that this test RCV/CA/01/C to RCV/CA/06/C to be performed in loopback without using the LMP commanded loopback test mode.  RCV/CA/01/C to RCV/CA/06/C to be performed in loopback, but without using the LMP commanded loopback test mode.
Test Arguments	<b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480 (default = 2432)  <b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).
Return Data	None
Exit	Click on <b>Reset Chip</b> .



LOOP BACK Example Display

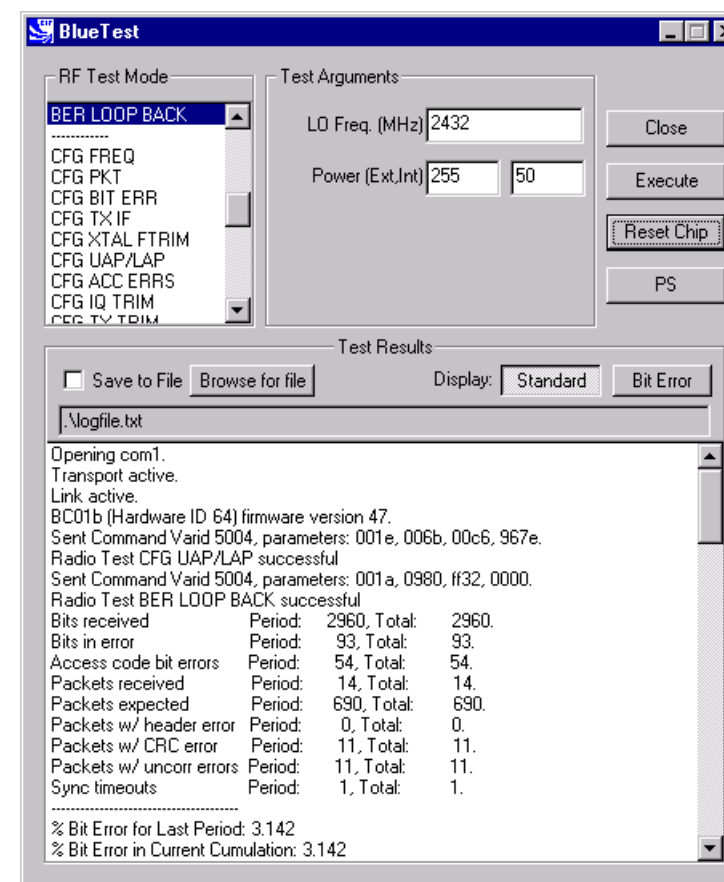
<b>Title</b>	<b>RX LOOP BACK</b>
<b>Summary</b>	Transmit PRBS9 data on <b>LO Frequency</b> at transmit level and listen for transmissions in the next slot but one. Sends reports as <b>RXDATA1</b> back to the host once per second (configurable). Highside reception is off and attenuation is set to 0. Default is single-slot packets (configurable with <code>config_freq</code> ). This is designed to be used with a second unit in <code>LOOP_BACK</code> test mode.
<b>Related Test Spec Name</b>	None, but note that this test allows transmission to and reception from Implementation under Test (IUT) in <code>LOOP_BACK</code> test mode with RSSI and BER calculated from FEC.
<b>Test Arguments</b>	<b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480 <b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).
<b>Note</b>	With a second unit execute <b>CFG UAP/LAP</b> to set the Bluetooth address. Execute <b>LOOP BACK</b> then execute <b>CFG UAP/LAP</b> to set the same BT address on the Equipment under Test (EUT) before executing <b>RX LOOP BACK</b> .
<b>Return Data</b>	NP = Number of packets NGP = Number of good packets NCP = Number of corrected packets RSSI = Received Signal Strength Indication True = RSSI is reliable, otherwise false
<b>Exit</b>	Click on <b>Reset Chip</b> .



RX LOOP BACK Example Display



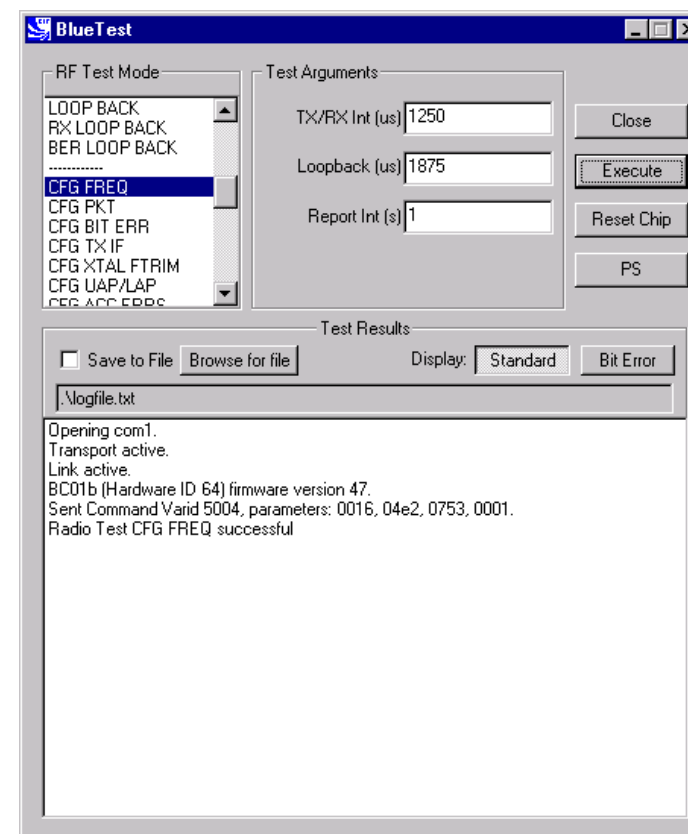
<b>Title</b>	<b>BER LOOP BACK</b>
<b>Summary</b>	Transmit PRBS9 data on LO Frequency at transmit level and listen for transmissions in the next slot but one. Sends reports as BIT ERR1 back to the host once per second (configurable). Highside reception is off and attenuation is set to zero Default is single slot packets (configurable with <code>config_freq</code> ). Designed to be used with a second unit in <code>loop_back</code> test mode.
<b>Related Test Spec Name</b>	None, but note that this test allows transmission to and reception from IUT in loopback test mode, with calculation of BER to BT specification.
<b>Called via</b>	BCSP channel 2
<b>Test Arguments</b>	<b>LO Freq</b> (Carrier Frequency MHz)= 2402 to 2480  <b>Power (Ext, Int)</b> = gain of external amplifier (if present) and internal amplifier. Ext value is specific to the design and Int value is 0 to 63 (Default = 50).
<b>Note</b>	With a second unit execute <b>CFG UAP/LAP</b> to set BT address then execute <b>LOOP BACK</b> , then execute <b>CFG UAP/LAP</b> to set the same BT address on the EUT before executing <b>BER LOOP BACK</b> .
<b>Return Data</b>	Nine reports as for <b>BIT ERR1</b> .
<b>Exit</b>	Click on <b>Reset Chip</b> .



BER LOOP BACK Example Display

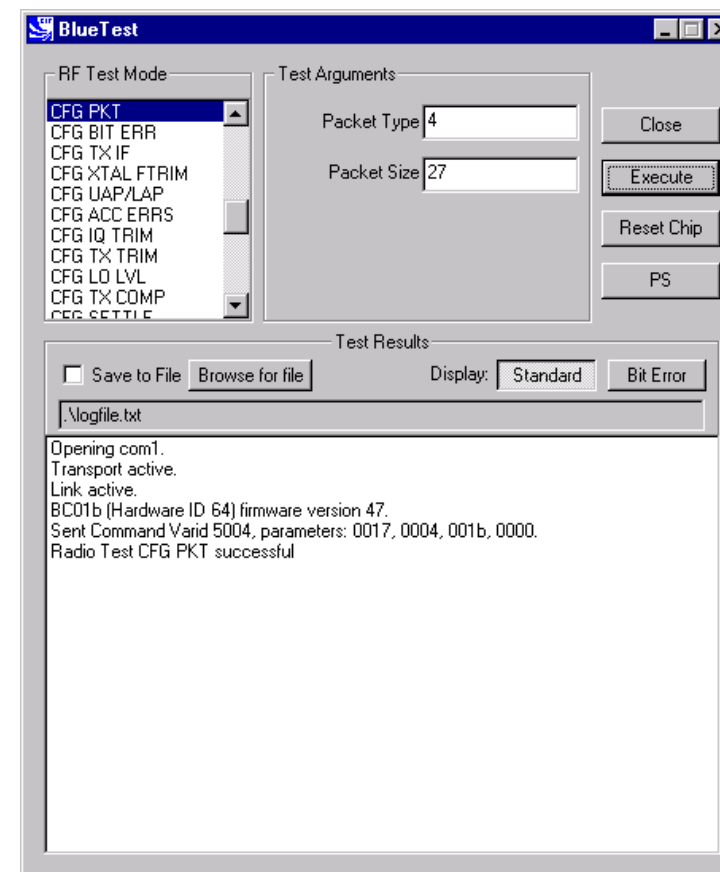
## Configuration Commands

Title	CFG FREQ
Summary	<p>Sets three values used in deciding timing details of tests.</p> <p><b>Tx/Rx Int</b> (<code>txrx_freq</code>) sets the period in microseconds between TX and RX events in RXDATA, TXDATA, BIT ERR and LOOP BACK test modes. Default is 1250 (20 slots), maximum 65536. If passed as 0, current value unchanged.</p> <p><b>Loopback</b> (<code>lb_offs</code>) sets the offset in microseconds between a reception event and retransmission of the data in loopback. Default is 1875 (two slots later), must be less than TX/Rx Int (<code>txrx_freq</code>). If passed as zero current value unchanged.</p> <p><b>Report Int</b> (<code>report_freqs</code>) sets the time in seconds between reports to host sent by RXDATA and BIT ERR functions. Default 1, if passed as 0 current value unchanged.</p>
Related Test Spec Name	None
Test Arguments	<p><b>TX/RX Int (μS)</b> = 1 to 65535 (default = 1250)</p> <p><b>Loopback (μS)</b> = 1 to 65535 (default = 1875)</p> <p><b>Report Int (S)</b> = 1 to 65535 (default = 1)</p>
Return Data	None.
Exit	Click on <b>Reset Chip</b> .



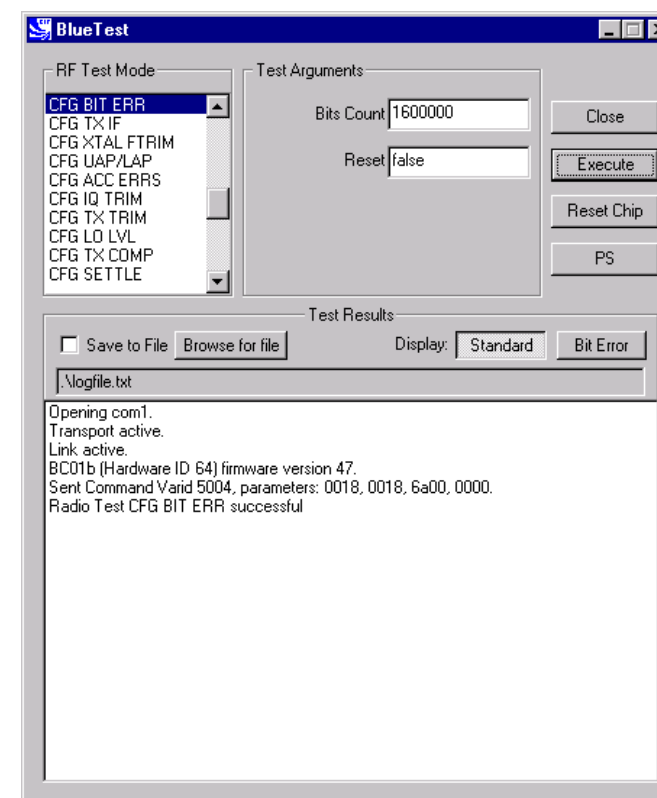
CFG FREQ Example Display

Title	CFG PKT
Summary	<p>Sets packet type and size for transmitter tests. It has no effect on RX or LOOP BACK tests.</p> <p><b>Packet Type</b> (pkt-type) is the standard Bluetooth packet type, 0-15 (12-13 not allowed). Any other number sets default: DM5 for <b>TXDATA1/2</b>, DH5 for <b>TXDATA3/4</b>.</p> <p><b>Packet Size</b> (pkt_size) is the size of data in packet, from one to maximum for type. If zero sets default: 20 bytes for <b>TXDATA1/2</b>, 192 bytes for <b>TXDATA3/4</b>.</p> <p>Since the two values are connected both values must be set – no default is inferred.</p>
Related Test Spec Name	None
Test Arguments	<p><b>Packet Type</b> = 0 to 15 (default = 4 ) (see Appendix 5)</p> <p><b>Packet Size</b> = 0 to 339 (default = 27 )</p>
Return data	None
Exit	Click on <b>Reset Chip</b> .



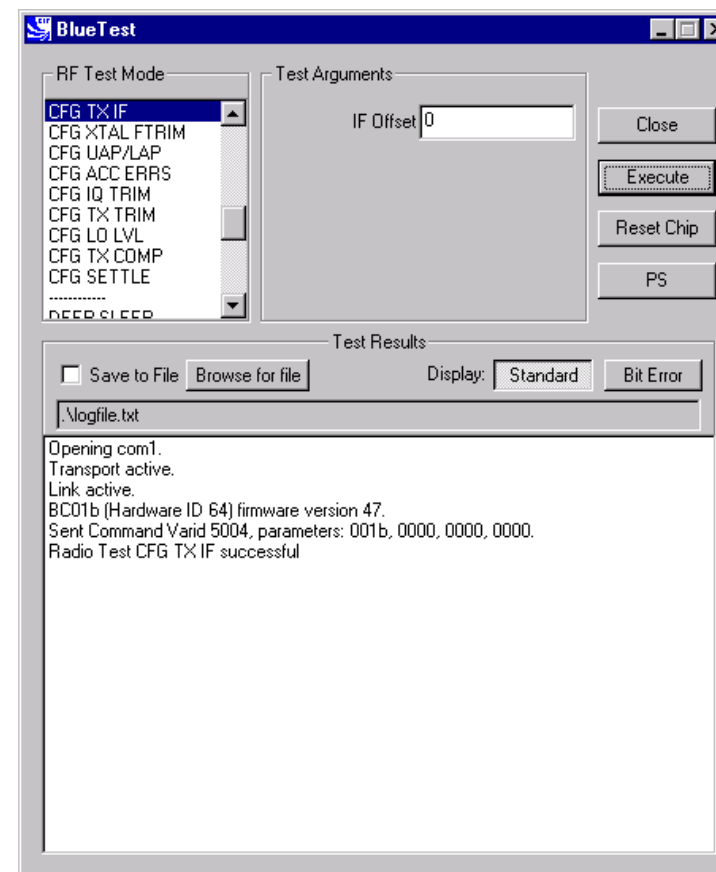
CFG PKT Example Display

<b>Title</b>	<b>CFG BIT ERR</b>
<b>Summary</b>	<p>Sets two values used in bit error measurements.</p> <p>If <b>Bits Count</b> (<code>bits_count</code>) is non-zero, the target for total counters is set to this and total count resets at this value. If passed as 0 current value, unchanged.</p> <p>If <b>Reset</b> is not <code>false</code> and <b>BIT ERR/2</b> is active, immediately resets the counters for the total statistics, but not over the last report period.</p>
<b>Related Test Spec Name</b>	None
<b>Test Arguments</b>	<p><b>Bits Count</b> = 1 to <math>4.2 \times 10^9</math> (default = 1600000 Bit)</p> <p><b>Reset</b> = <code>false</code> (0) or <code>true</code> (1) (default = <code>false</code>)</p>
<b>Return Data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> .



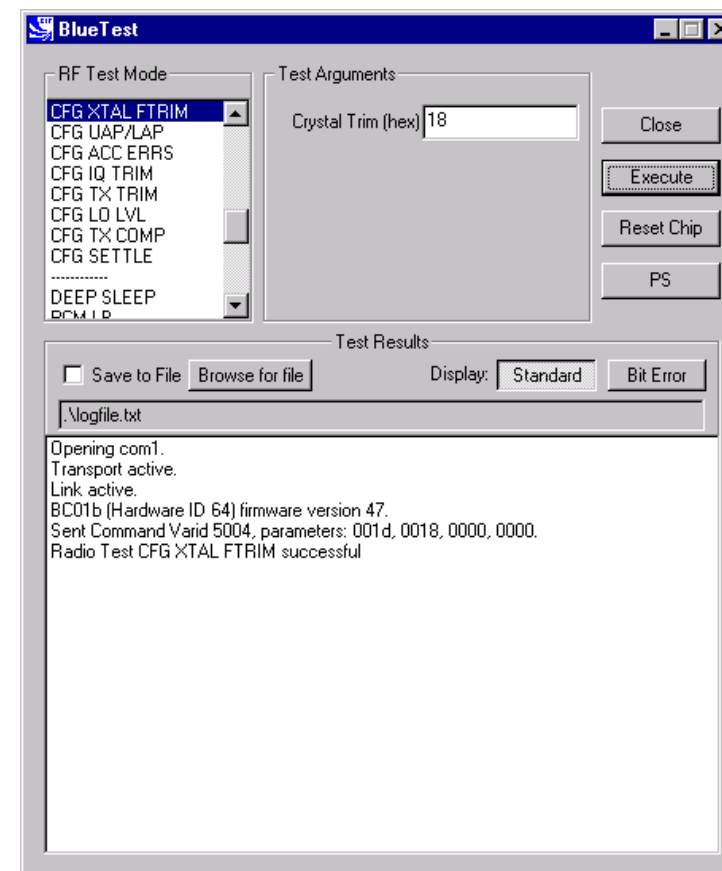
CFG BIT ERR Example Display

<b>Title</b>	<b>CFG TX IF</b>
<b>Summary</b>	<p>Sets the IF frequency used in transmit test modes. The target is zero, but the stack currently uses a default of <math>-1\text{MHz}</math>.</p> <p>Offset is a signed integer with a range from <math>+5</math> to <math>-5</math>, in units of <math>0.5\text{MHz}</math>.</p>
<b>Related Test Spec Name</b>	None
<b>Test Arguments</b>	<b>IF Offset</b> = $-5$ to $+5$ (default = $0$ )
<b>Return data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> .

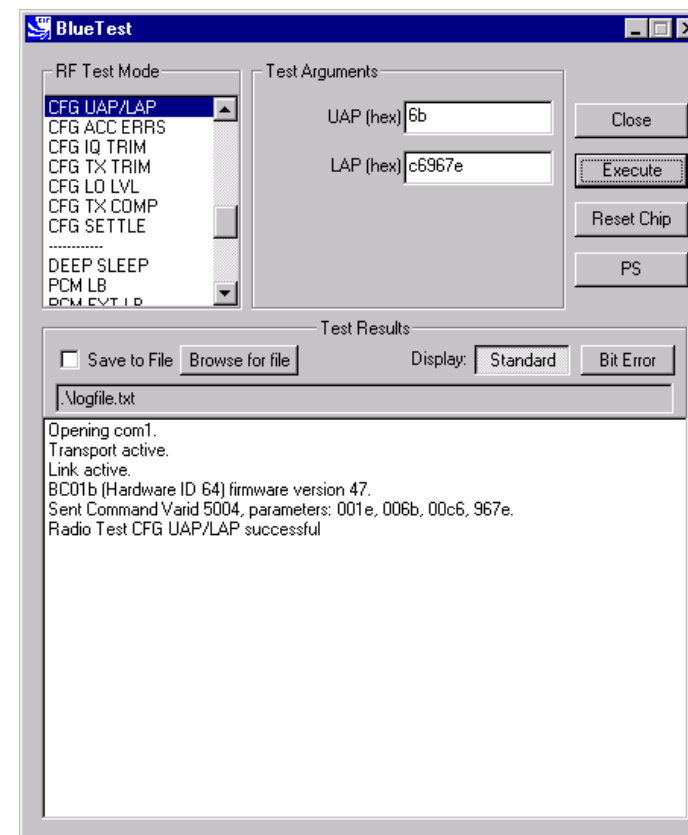


CFG TX IF Example Display

<b>Title</b>	<b>CFG XTAL FTRIM</b>
<b>Summary</b>	<p>Timing for <b>BlueCore01</b> is controlled by a crystal. This requires trimming for new hardware. This command can be used to set a new trim value either before a radiotest command is started or while a test is already in operation; the change takes effect immediately.</p> <p><b>Crystal Trim</b> (xtal_ftrim) is a number between 0 and 63 inclusive. This is not a permanent change.</p>
<b>Related Test Spec Name</b>	None
<b>Test Arguments</b>	<b>Crystal Trim</b> = 0 to 63 (typical = 27 )
<b>Note</b>	With <b>Crystal Trim</b> set to 0, the current settings will not change.
<b>Return data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> .

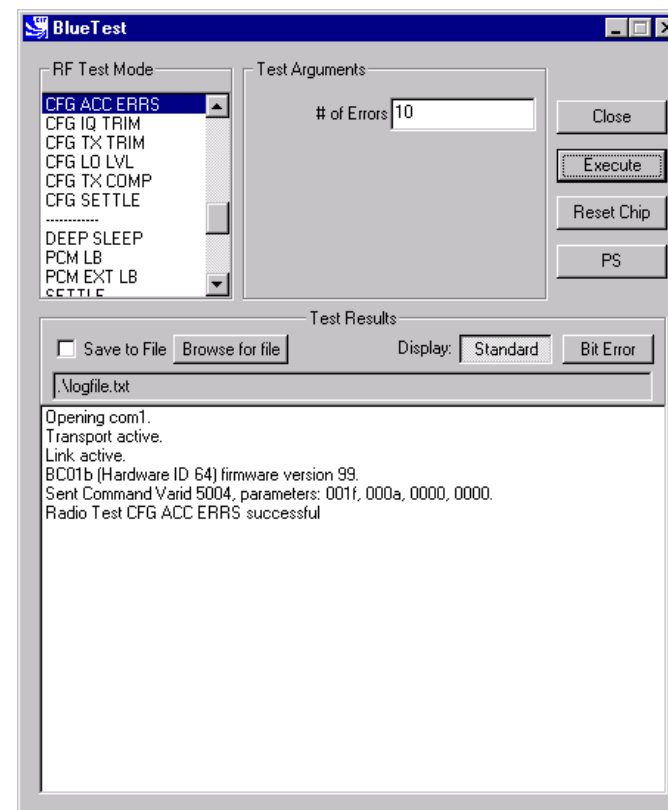

**CFG XTAL FTRIM Example Display**

Title	<b>CFG UAP/LAP</b>
Summary	Sets the UAP and LAP to be used in tests. <b>BlueCore01</b> usually uses its own Bluetooth Device address to determine the access sync code, as if it is master of a piconet. The UAP and LAP are the only parts used. This command allows a special UAP and LAP to be used only in the test modes.
Related Test Spec Name	None
Test Arguments	Bluetooth Address:  <b>UAP</b> = 0 to FF (Default = 6b)  <b>LAP</b> = 0 to FFFFFFFF (Default = c6967e)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



CFG UAP/LAP Example Display

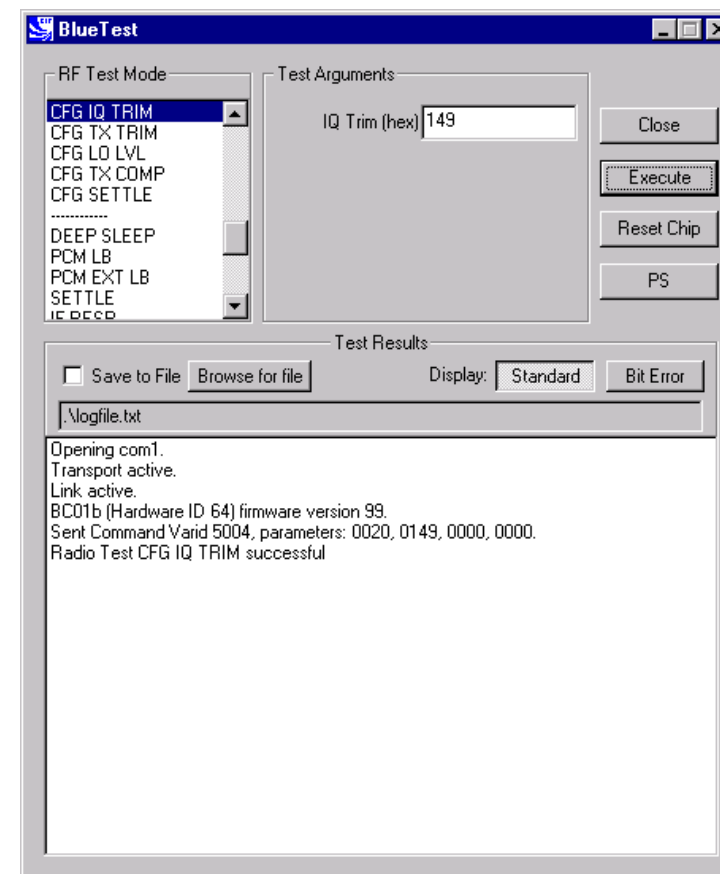
Title	<b>CFG ACC ERRS</b>
Summary	The receiver uses a sliding correlator to determine that it has matched the start of a packet. The receiver allows up to <b># of errors</b> (n_errs) before a match is rejected.
Related Test Spec Name	None
Test Arguments	<b># of errors</b> = 0 to 15 (default = 10)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



**CFG ACC ERRS Example Display**

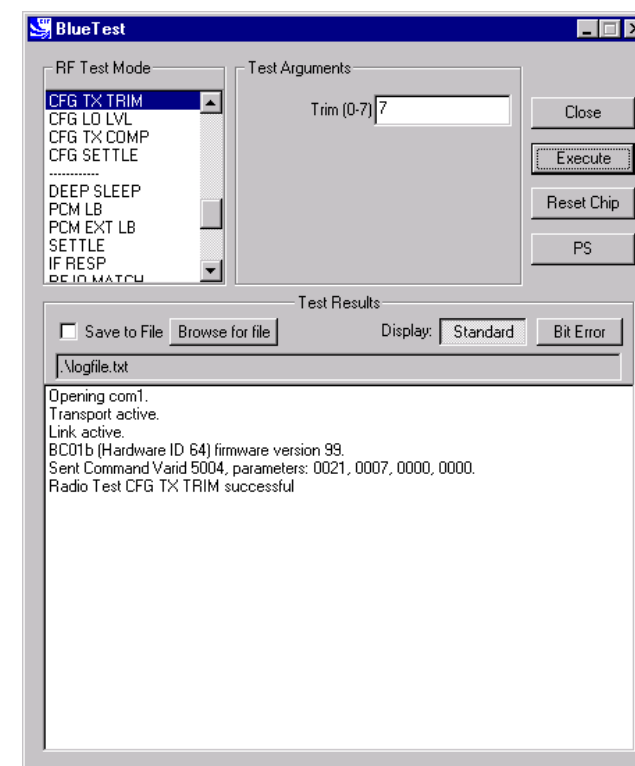


Title	<b>CFG IQ TRIM</b>
Summary	Sets the IQ Trim ( <code>trim</code> ) value overriding the value calculated by the internal calibration algorithm. This command is not executed in normal use.
Related Test Spec Name	None
Test Arguments	<b>IQ Trim</b> = 0 to 511 (default 149 (hex))
Return Data	None
Exit	Click on <b>Reset Chip</b> .



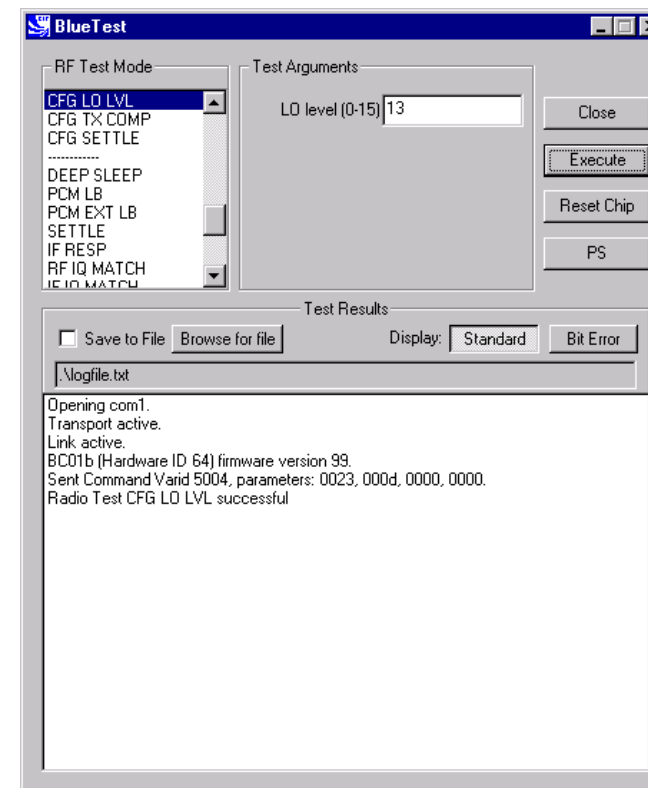
**CFG IQ TRIM Example Display**

<b>Title</b>	<b>CFG TX TRIM</b>
<b>Summary</b>	Sets the Active Member Address (am_addr) for the device to be used in the header of all test transmissions to am_addr. If the transmitter and receiver are used for the same test, both devices will normally have to be set to the same am_addr.
<b>Related Test Spec Name</b>	None
<b>Test Arguments</b>	Trim (am_addr) = 0 to 7, Default = 7
<b>Return Data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> .



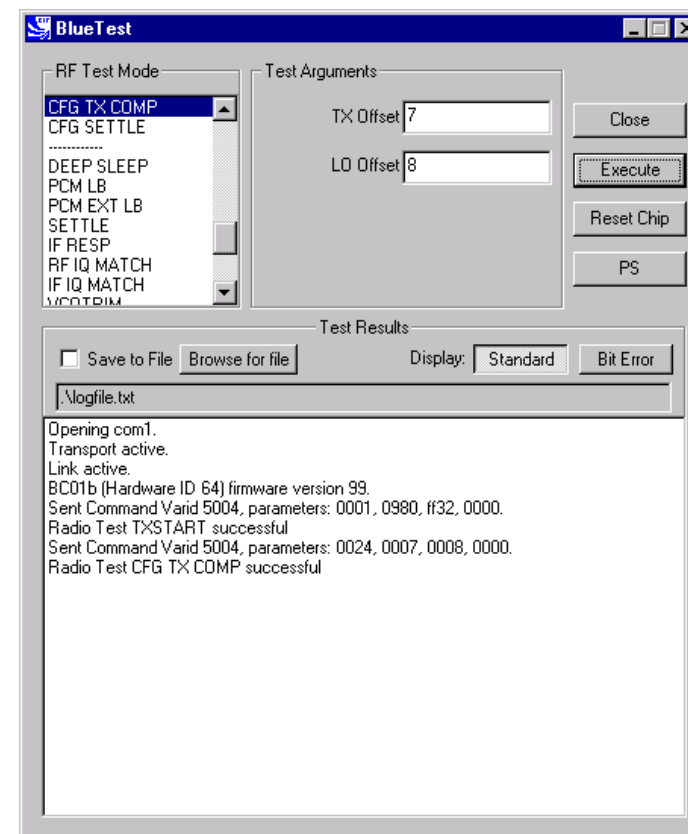
CFG TX TRIM Example Display

Title	CFG LO LVL
Summary	Sets the value of the Analogue Local Oscillator output level to <b>LO level</b> (1v1), overriding the value calculated by the internal calibration algorithm. This command is not executed in normal use.
Related Test Spec Name	None
Test Arguments	LO level = 0 to 15 (default = 13)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



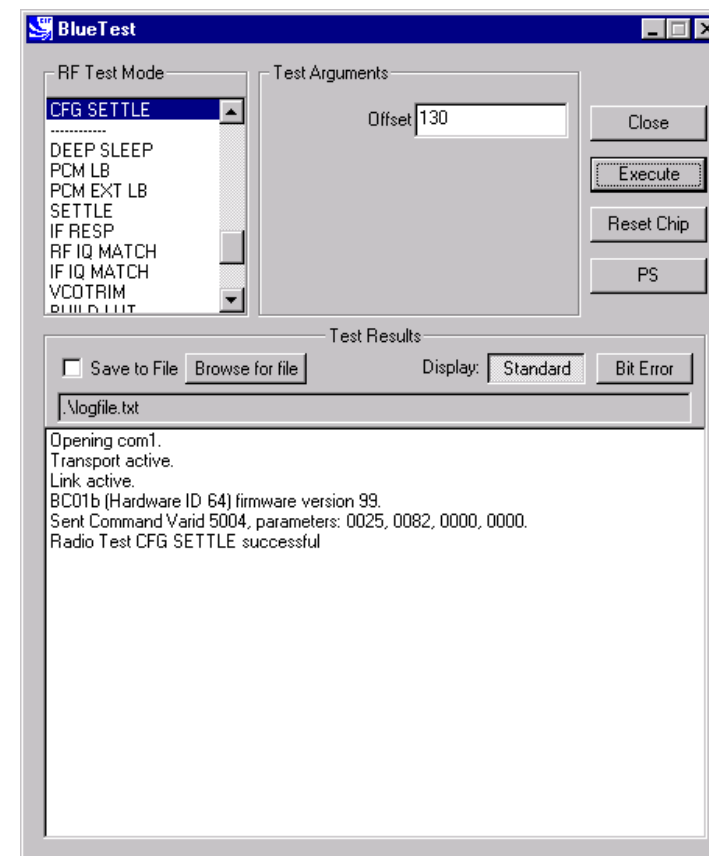
CFG LO LVL Example Display

Title	<b>CFG TX COMP</b>
Summary	Sets TX Offset (tx_offset) and <b>LO Offset</b> (lo_offset) for the firmware's algorithm, which sets the maximum power. Run <b>TXSTART</b> before executing <b>CFG TX COMP</b> , otherwise there is no transmit power to set.
Related Test Spec Name	None
Test Arguments	<b>TX Offset</b> , minimum = 0 (default = 7) <b>LO Offset</b> , minimum = 0 (default = 8)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



**CFG TX COMP Example Display**

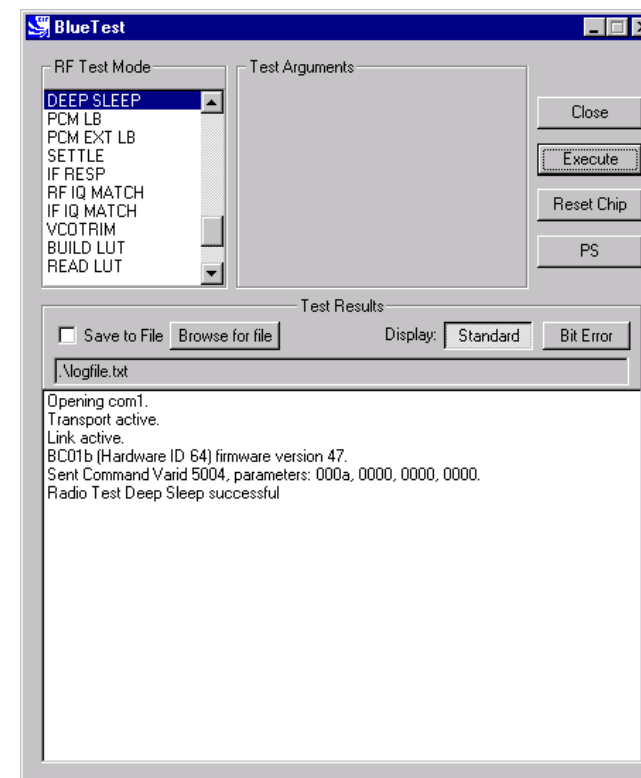
Title	<b>CFG SETTLE</b>
Summary	Sets the period ( radio_on_offset ) in microseconds between turning the radio on and starting to transmit.
Related Test Spec Name	None
Test Arguments	<b>Offset</b> , minimum = 0 (default = 130)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



CFG SETTLE Example Display

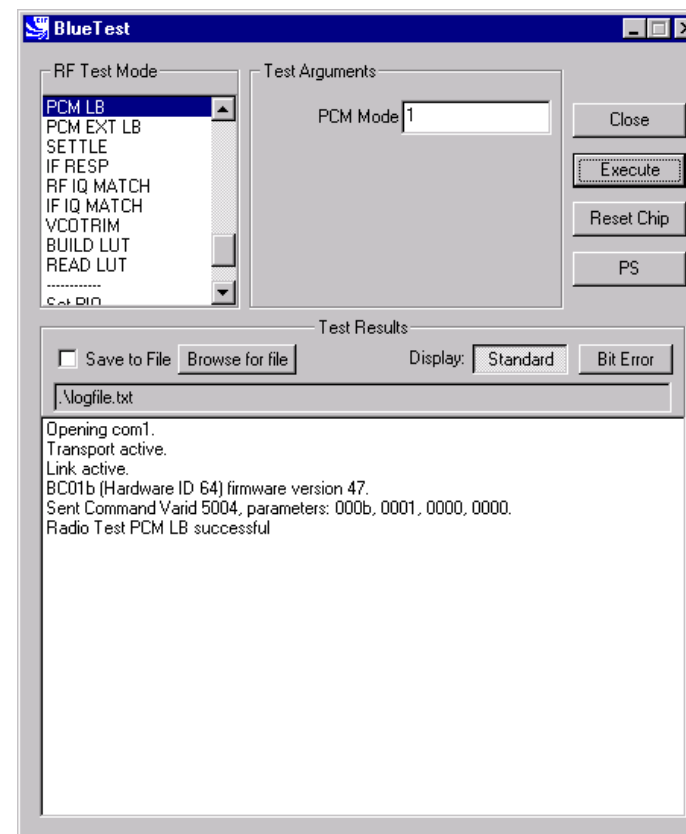
## Built-in-Self Test (BIST) Routines

<b>Title</b>	<b>Deep Sleep</b>
<b>Summary</b>	Puts the chip into deep-sleep after a delay of half a second until woken by reset or any activity on USB or UART interface.
<b>Return Data</b>	None
<b>Exit</b>	Click on <b>Reset Chip</b> or another routine being called.



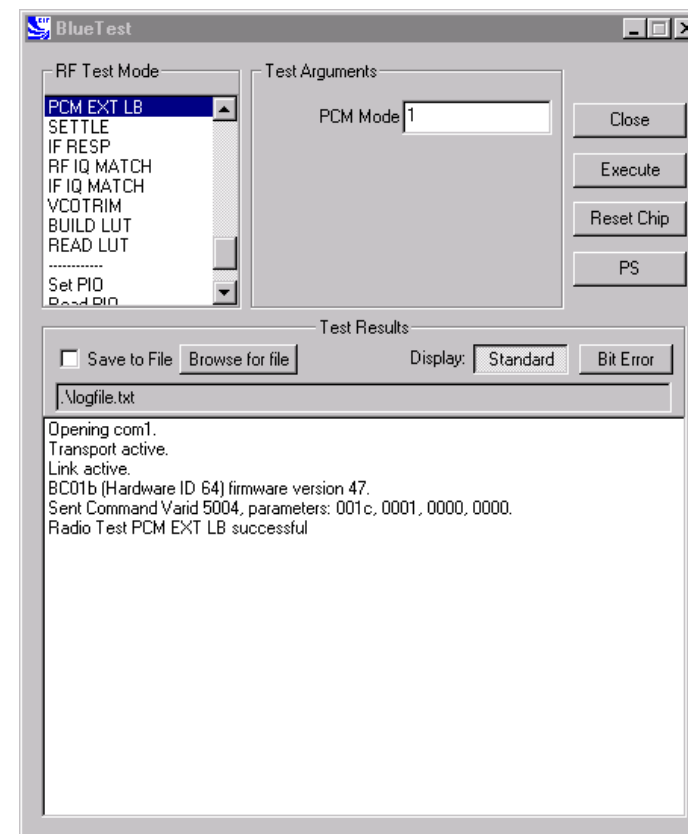
**Deep Sleep Example Display**

Title	PCM LB
Summary	<p>Sets the PCM into LOOP BACK mode, whereby the data read from the PCM input is output again on the PCM out pin. The LOOP BACK is via software and the buffers so there is a pipeline delay. The PCM port mode is selectable.</p> <p>If <b>PCM Mode</b> = 0, <b>BlueCore01</b> is slave in normal 4-wire configuration</p> <p>If <b>PCM Mode</b> = 1, <b>BlueCore01</b> is master in normal 4-wire configuration</p> <p>If <b>PCM Mode</b> = 2, <b>BlueCore01</b> is master in Manchester encoded, 2-wire configuration.</p>
Test Arguments	<b>PCM Mode</b> = 0 to 2 (default = 1)
Return Data	None
Exit	Click on <b>Reset Chip</b> or another routine being called.



PCM LB Example Display

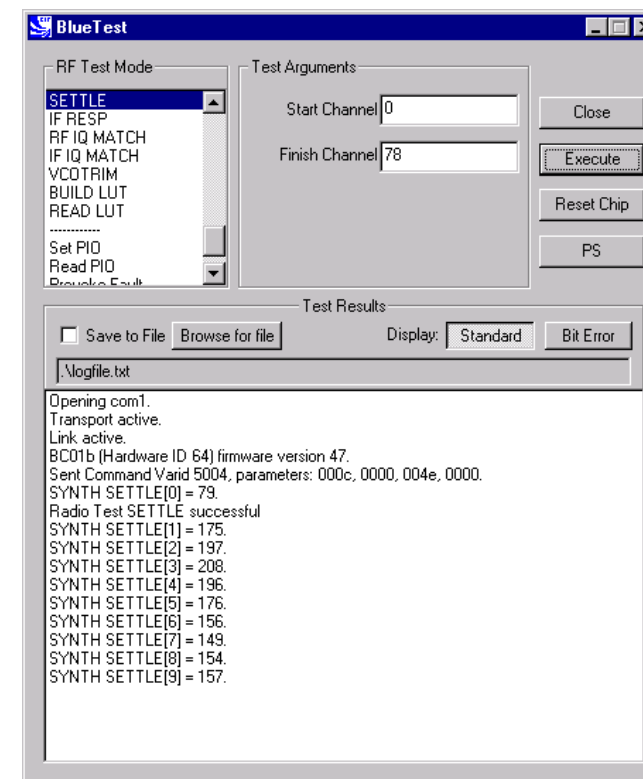
Title	PCM EXTERNAL LOOPBACK
Summary	<p>Sets the PCM into external LOOPBACK mode, whereby the data written to the PCM output is read again on the input pin. A check is made that the data read back is the same (up to usual codec transformations) as that written. The LOOP BACK consists of 512 bytes of random data.</p> <p>The PCM port mode is selectable as <b>PCM Mode</b> (pcm_mode), which is the same as for <b>PCM LB</b> (radiotest_pcm_loop_back)</p> <p>The external LOOP BACK may be a simple wire.</p>
Related Test Spec Name	None
Note	On the Casira under test, set CN8 jumper to Codec BYP and on header CN12 link pins 10 and 11.
Test Arguments	<b>PCM Mode</b> = 0 to 2 (default = 1)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



PCM EXT LB Example Display

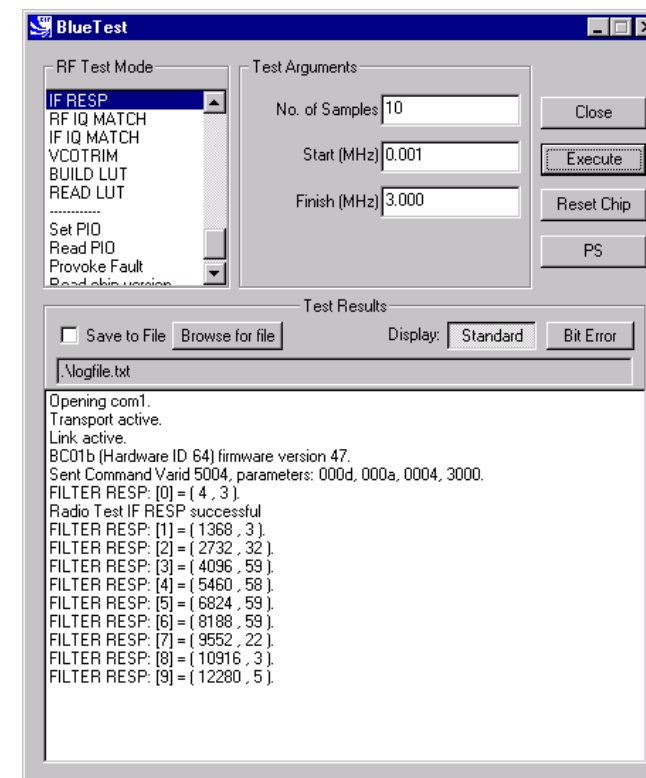


Title	SETTLE
Summary	Builds the LUT as normal, then does a step from <b>Start Channel</b> (chan1) to <b>Finish Channel</b> (chan2), while the synthesiser is running. It digitises the synthesiser (LO_TUNE) error voltage at intervals of 10 – 20µs over the next 200µs and writes the results to an array.
Test Arguments	<b>Start Channel</b> (chan1) = 0 to 78 (default 0) <b>Finish Channel</b> (chan2) = 0 to 78 (default 78)
Return Data	A sequence of ten reports of the synthesiser (LO_TUNE) error voltage over the next 200µs.
Exit	Click on <b>Reset Chip</b> or another routine being called.



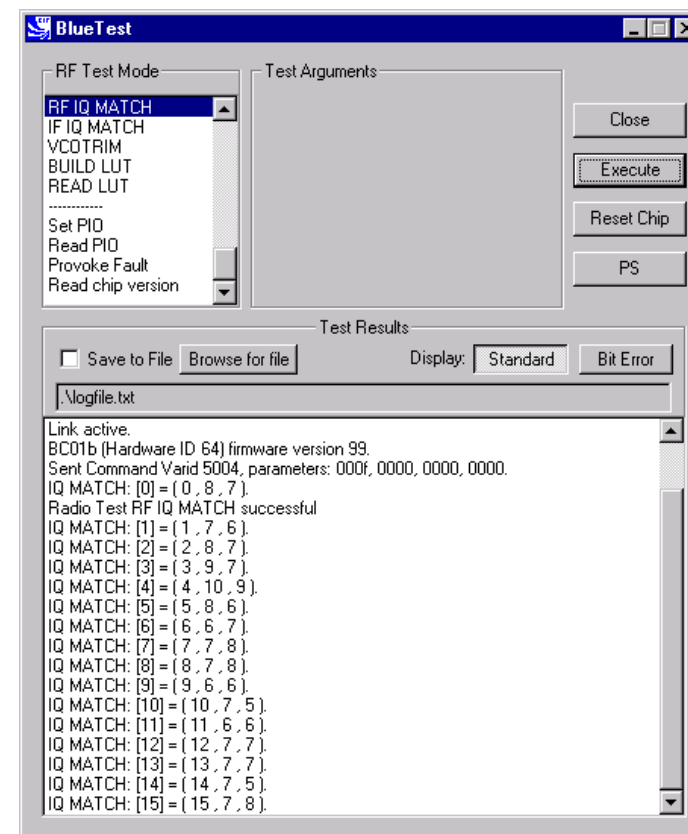
SETTLE Example Display

Title	IF RESP
Summary	Sweeps transmit IF carrier frequency over designated number of samples ( <code>n_samples</code> ) within range (0-3MHz maximum) and measures RSSI. Returns table of RSSI value against frequency offset to characterise IF filter response.
Test Arguments	<b>No. of Samples</b> ( <code>n_samples</code> ) = 0 to 65535 (default = 10) <b>Start</b> ( <code>lo_offset</code> ) = 0 to 3MHz (default 0.001 MHz) <b>Finish</b> ( <code>hi_offset</code> ) = 0 to 3 MHz (default = 3.000 MHz. Must be greater than <code>lo_offset</code> )
Return Data	A sequence of reports of RSSI and frequency offset.
Exit	Click on <b>Reset Chip</b> .



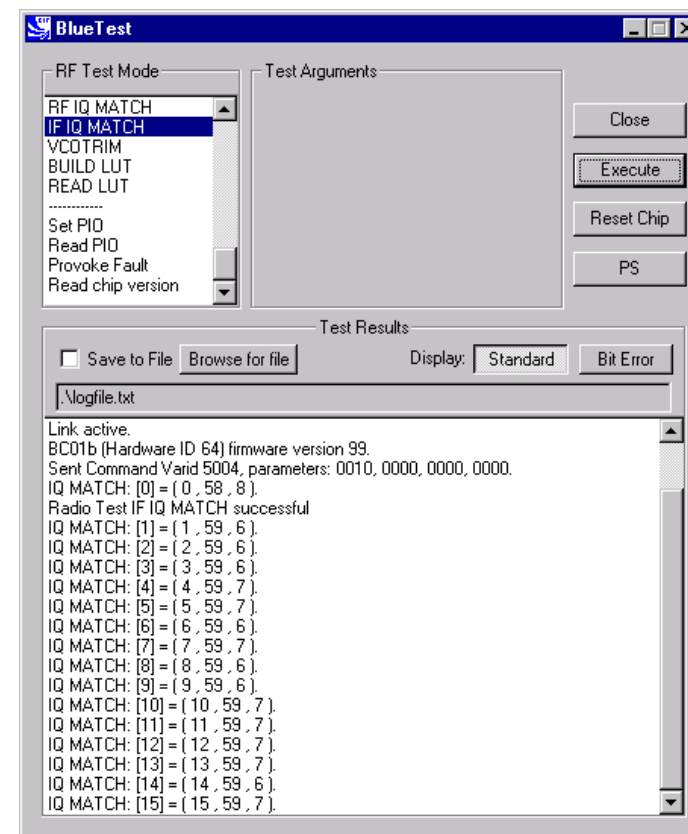
IF RESP Example Display

<b>Title</b>	<b>RF IQ MATCH</b>
<b>Summary</b>	Measures RF IQ match by injecting test signal, sweeping IQ trim and measuring RSSI for on-channel and image. Returns array of IQ measurements against IQ trim.
<b>Return Data</b>	An array of 16 IQ measurements against IQ trim.
<b>Exit</b>	Click on <b>Reset Chip</b> .



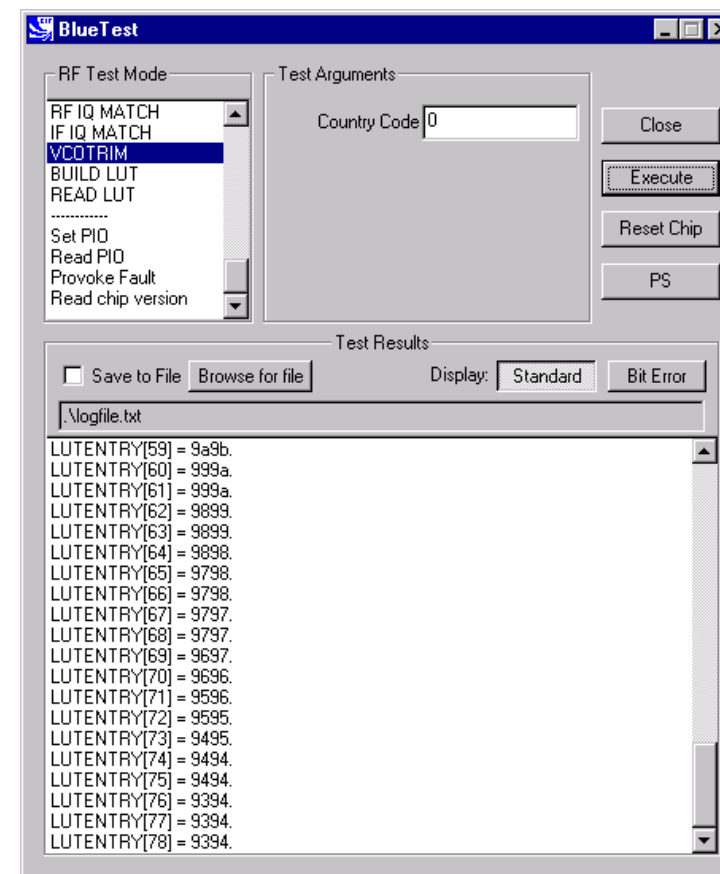
RF IQ MATCH Example Display

<b>Title</b>	<b>IF IQ MATCH</b>
<b>Summary</b>	Measures IF IQ match by injecting test signal, sweeping IQ trim and measuring RSSI for on-channel and image. Returns array of IQ measurements against IQ trim.
<b>Return Data</b>	An array of 16 IQ measurements against IQ trim.
<b>Exit</b>	Click on <b>Reset Chip</b> .



**IF IQ MATCH Example Display**

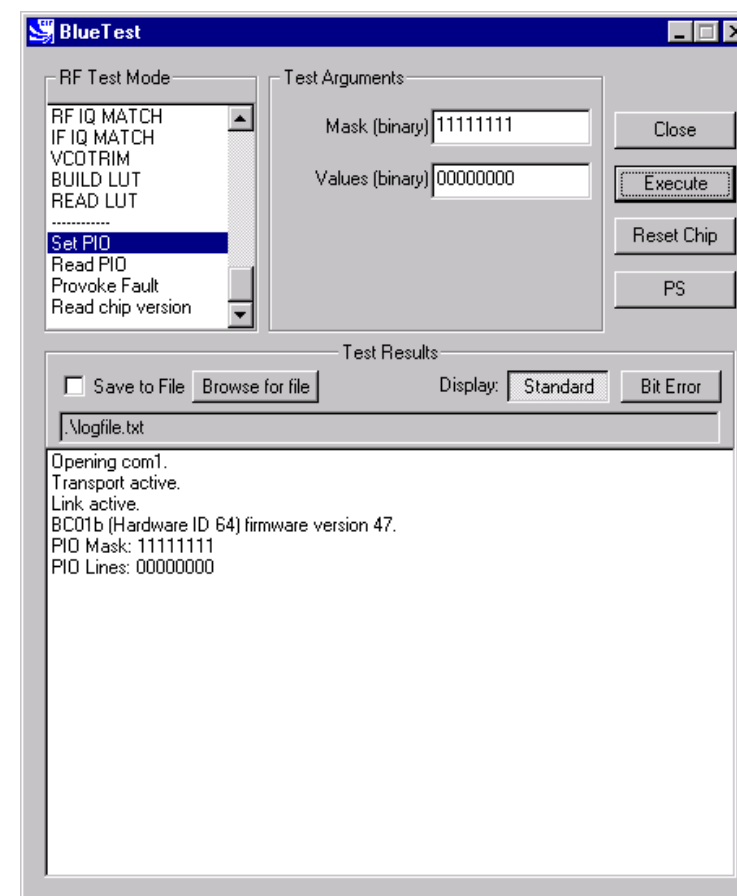
<b>Title</b>	<b>VCO TRIM</b>
<b>Summary</b>	Produces look up table of VCO trim versus hop frequencies for a designated country hop sequence.
<b>Test Arguments</b>	<b>Country Code</b> (cc) = 0 to 3 (default = 0)
<b>Return Data</b>	An array of 79 values for VCO trim if <b>Country Code</b> is 0 otherwise 23 values.
<b>Exit</b>	Click on <b>Reset Chip</b> .



VCO TRIM Example Display

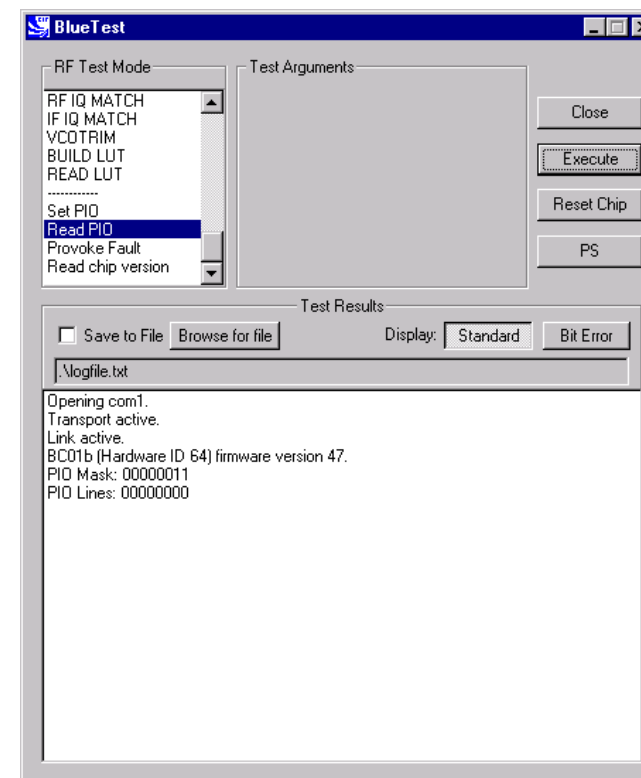
## Miscellaneous Test Routines

Title	Set PIO
Summary	Enables designated PIO lines as outputs and sets them as desired. To be used with caution since it over-rides previous settings. Bit 0 corresponds to PIO[0], and a logic one enables it as an output.
Test Arguments	<b>Mask</b> (default = 11111111) <b>Values</b> (default = 00000000)
Return Data	None
Exit	Click on <b>Reset Chip</b> .



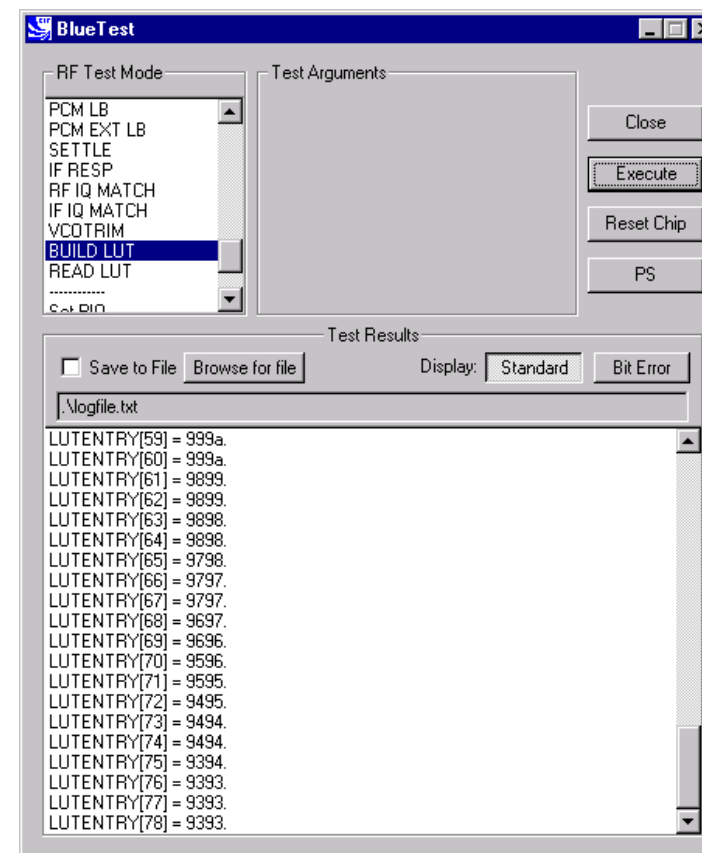
Set PIO Example Display

<b>Title</b>	<b>Read PIO</b>
<b>Summary</b>	Reads the logic state of the PIO pins. Valid whether they are inputs or outputs.
<b>Return Data</b>	PIO Lines (uint8) sent over BCSP channel 3, giving the logic level at each of the pins.
<b>Exit</b>	Click on <b>Reset Chip</b> .



**READ PIO Example Display**

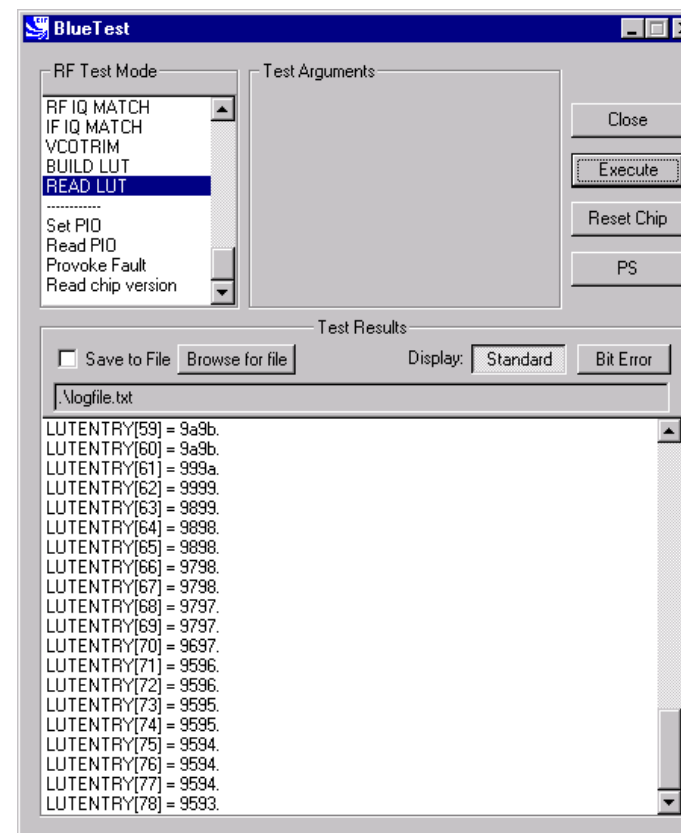
<b>Title</b>	<b>BUILD LUT</b>
<b>Summary</b>	Builds the radio's channel LO_TRIM frequency look-up table then returns it to the host.
<b>Return Data</b>	A sequence of 79 uint16 numbers, containing the calibration data just generated.
<b>Exit</b>	Click on <b>Reset Chip</b> .



**BUILD LUT Example Display**

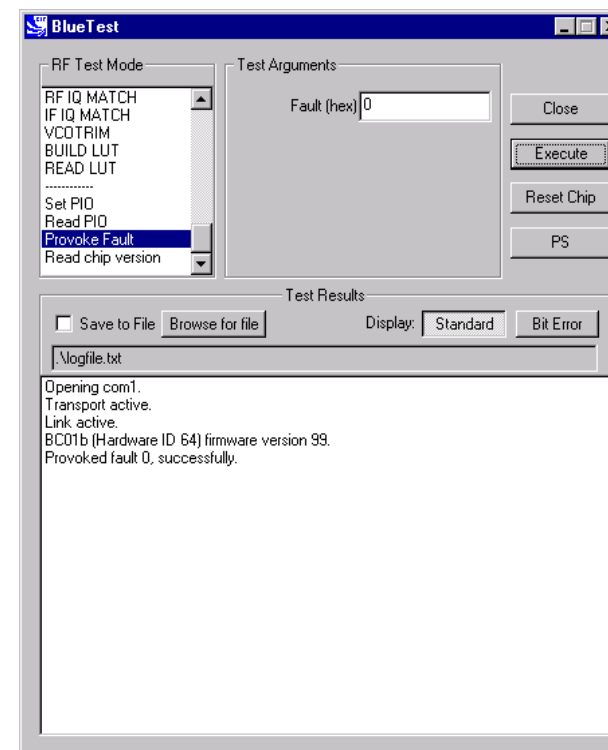


<b>Title</b>	<b>READ LUT</b>
<b>Summary</b>	Reports the radio's channel LO_TRIM frequency look-up-table (LUT) to the host.
<b>Return Data</b>	A sequence of 79 (uint16) numbers containing the contents of the look up table (LUT) for Europe and North America or a sequence of 23 (uint16) numbers for other countries. The upper byte contains the transmitter trim and the lower byte contains the receiver trim.
<b>Exit</b>	Click on <b>Reset Chip</b> .



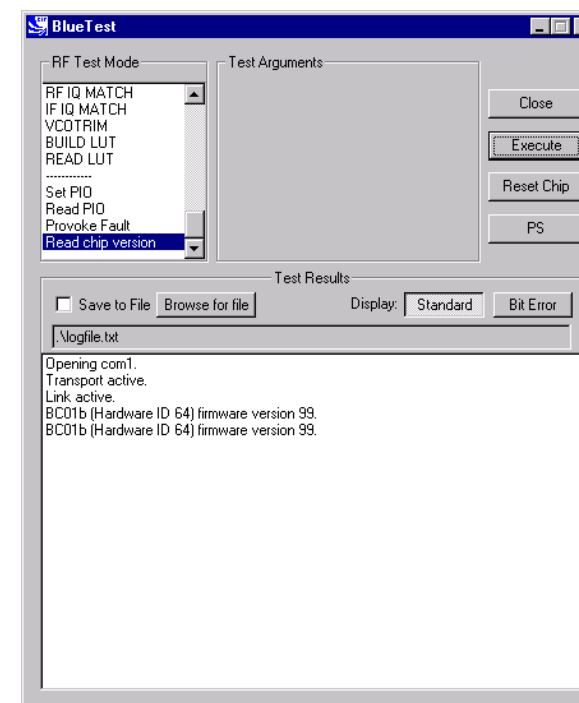
**READ LUT Example Display**

<b>Title</b>	<b>PROVOKE FAULT</b>
<b>Summary</b>	Provokes a fault mode in the on-chip processor.
<b>Return Data</b>	None
<b>Test Arguments</b>	<b>Fault (hex)</b> = 0 to 2b (default = 0) <b>Note:</b> Contact CSR for more information about using fault modes.
<b>Exit</b>	Click on <b>Reset Chip</b> .



**PROVOKE FAULT Example Display**

<b>Title</b>	<b>READ CHIP VERSION</b>
<b>Summary</b>	Reads the hardware ID and firmware version of device.
<b>Return data</b>	Hardware ID and firmware version.



**READ CHIP VERSION Example Display**

## Persistent Store Keys

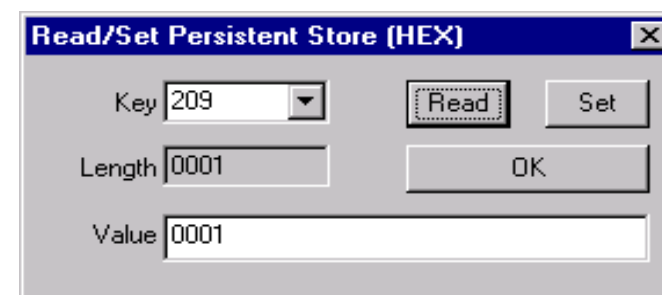
Select **PS** from the main menu.

Enter a **Key** number.

To read a PS Key value, click on **Read**. The setting displays in the **Value** field.

To change a **PS** key setting, enter a different value in the **Value** field and click on **Set**.

To exit, click on **OK**.



**PERSISTENT STORE KEY Example Display**

# Appendix 1

## BIST Parameters

Name	Type	Min	Max	Meaning
lo_freq	uint16	2402	2480	Bluetooth channel frequency in MHz
lxlvl	uint16	0	63	Internal amplifier power setting. Use 50 for maximum power
mod_freq	uint16	0	65535	Modulation frequency for modulated carrier transmit test in units of 1/4096 MHz
highside	bool	0	Non-zero	Receive IF setting, use false (0)
rx_attn	uint16	0	15	Initial attenuation setting, overwritten by AGC
country_code	uint16	0	3	Simplified hop sequence code, use country_code 0 for 79 hops
txrx_freq	uint16	1	65535	Period in microseconds between RX and TX events; default 12500 (20 slots)
lb_offs	uint16	1	65535	Offset in microseconds between receive and transmit in loopback
report_freq	uint16	1	65535	Time in seconds between reports to host, default 1
pkt_type	uint16	0	15	Standard Bluetooth packet type (12-13 disallowed. 0, 1, 2 not useful)
pkt_size	uint16	0	339	Size of payload for packet type
bits_count	uint32	1	$4.2 \times 10^9$	Target for total bits used in BER measurement; default 1.6 M bit
Reset	bool	0	1	1 resets total count for BER measurement
offset_half_mhz	int16	-5	+5	Transmit IF offset; default -2
pcm_mode	uint16	0	2	PCM loopback mode; 0 = 4-wire slave, 1 = 4-wire master, 2 = 2-wire slave

Name	Type	Min	Max	Meaning
chan1	uint16	0	78	Bluetooth channel number
chan2	uint16	0	78	Bluetooth channel number
n_samples	uint16	0	65535	Number of samples in range from min to max for IF filter response test
lo_offset	uint16	0	65535	Min offset in 1/4096MHz for IF filter response test
hi_offset	uint16	0	65535	Max offset in 1/4096MHz for IF filter response test
output_mask	UInt8	0	FF	Bit mask for PIO; 0=input, 1=output
output	UInt8	0	FF	Bit values for PIO output
xtal_trim	UInt16	0	63	Crystal trim value
uap	UInt16	0	FF	Bluetooth address; Upper Address Part
Lap		0	FFFFFF	Bluetooth address; Lower Address Part
Trim	UInt16	0	511	Value for configuring IQ trim
n_errs	UInt16	0	15	Number of errors
Lvl	UInt16	0	15	Local oscillator output level
tx_offset	UInt16	0		Transmitter offset
lo_offset	UInt16	0		Local oscillator offset
radio_on_offset	UInt16	0		Time between turning radio on and starting to transmit in microseconds

## Appendix 2

### Known Software Issue(s) in BlueTest Version 1.4

- (a) Pressing the **Reset Chip** button on the GUI while data is being transmitted sends a hardware reset command to the chip and restarts the serial stack software.

Closing the GUI sends a hardware reset command to the chip.

If the link fails, the connection can only be recreated by manually resetting the chip (power off/on) and by clicking on **Reset Chip** or closing down and restarting the GUI (both of which will restart the serial stack software).

The above will not occur if no data is visibly scrolling in the window.

The tests concerned are:

- VCOTRIM
  - BUILD LUT
  - READ
  - LUT
- (b) There is a race between command responses indicating that a test has started and the first data relating to that test. This does not affect the test results.
- (c) It is not possible to rouse the chip from Deep Sleep except by powering down the chip and restarting.

## Appendix 3

### Combining Tests Using a Second Unit

Several tests require a second **BlueCore01** unit to be operating to provide a test signal for the equipment under test. The following table provides a quick reference guide to tests that use a second unit.

	SECOND UNIT																															
	PAUSE	RADIO STATUS																														
		TXSTART																														
		TXDATA1																														
		TXDATA2																														
		TXDATA3																														
		TXDATA4																														
		RXSTART																														
		RXSTART2																														
		RXDATA1																														
		RXDATA2																														
		BIT ERR1																														
		BIT ERR2																														
		LOOP BACK																														
		RX LOOP BACK																														
		BER LOOP BACK																														
		DEEP SLEEP																														
		PCM LB																														
		PCM EXT LB																														
		SETTLE																														
		IF RESP																														
		RF IQ MATCH																														
		IF IQ MATCH																														
		VCO TRIM																														
		BUILD LUT																														
		READ LUT																														
		SET PIO																														
		READ PIO																														
		PROVOKE FAULT																														
		READ CHIP VERSION																														
EQUIPMENT UNDER TEST																																
PAUSE																																
RADIO STATUS																																
TXSTART																																
TXDATA1																																
TXDATA2																																
TXDATA3																																
TXDATA4																																
RXSTART1																																
RXSTART2																																
RXDATA1																																
RXDATA2																																
BIT ERR1																																
BIT ERR2																																
LOOP BACK																																
RX LOOP BACK																																
BER LOOP BACK																																
DEEP SLEEP																																
PCM LB																																
PCM EXT LB																																
SETTLE																																
IF RESP																																
RF IQ MATCH																																
IF IQ MATCH																																
VCO TRIM																																
BUILD LUT																																
READ LUT																																
SET PIO																																
READ PIO																																
PROVOKE FAULT																																
READ CHIP VERSION																																



## Appendix 4

### Configuration Commands Available During Tests

Particular configuration commands are appropriate to use during certain tests. The following table is a quick reference guide to which configuration commands can be used during which tests.

Configuration Commands	CFG FREQ	CFG PKT	CFG BIT ERR	CFG TXIF	CFG XTAL FTRIM	CFG UAP/LAP	CFG ACC ERRS	CFG IQ TRIM	CFG TX TRIM	CFG LO LVL	CFG TX COMP	CFG SETTLE
EQUIPMENT UNDER TEST												
PAUSE												
RADIO STATUS												
TXSTART				X	X						X	
TXDATA1		X		X	X	X			X			
TXDATA2		X		X	X	X			X			
TXDATA3		X		X	X							
TXDATA4		X		X	X							
RXSTART1					X							
RXSTART2					X							
RXDATA1					X							
RXDATA2					X							
BIT ERR1			X		X	X	X		X			
BIT ERR2			X		X	X	X		X			
LOOP BACK					X	X						
RX LOOP BACK					X	X						
BER LOOP BACK					X	X						
DEEP SLEEP												
PCM LB												
PCM EXT LB												
SETTLE												
IF RESP												
RF IQ MATCH												
IF IQ MATCH												
VCO TRIM												
BUILD LUT												
READ LUT												
SET PIO												
READ PIO												
PROVOKE FAULT												

## Appendix 5

### Bluetooth Packet Types

Use the **CFG FREQ** command to set the frequency as appropriate to the size of the packet type being used in the test.

Segment	TYPE code $b_3b_2b_1b_0$	Slot occupancy	SCO link	ACL link
1	0000	1	NULL	NULL
	0001	1	POLL	POLL
	0010	1	FHS	FHS
	0011	1	DM1	DM1
2	0100	1	undefined	DH1
	0101	1	HV1	undefined
	0110	1	HV2	undefined
	0111	1	HV3	undefined
	1000	1	DV	undefined
	1001	1	undefined	AUX1
3	1010	3	undefined	DM3
	1011	3	undefined	DH3
	1100	3	undefined	undefined
	1101	3	undefined	undefined
4	1110	5	undefined	DM5
	1111	5	undefined	DH5

Extracted from Packet Types section of Specification of the Bluetooth System, v1.1, dated 1 December 2000.

### CSR's Life Support Policy and Use in Safety-Critical Applications

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For further information, refer to the following document(s):

Document	Reference
Bluetooth (SIG) Test Specification - RF	Rev 0.9r, dated 31 January 2000
Specification of the Bluetooth System, v1.1	Rev 1.1, dated 01 December 2000

## Record of Changes

Date:	Revision:	Reason for Change:
13 SEP 00	a	Original publication of this document (CSR reference: bc01-an-047a).
16 JUL 01	b	Revision and addition of tests and appendices

## BlueTest Instruction Manual

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