



# BlueCoreä01

## BlueTest Instruction Manual

AN047

July 2001



**CSR**

Unit 400 Cambridge Science Park  
Milton Road  
Cambridge CB4 0WH

UK

Registered in UK 3665875

Tel: +44 (0)1223 692000

Fax: +44 (0)1223 692001

<http://www.csr.com>

 **Bluetooth** Qualified

# Contents

<b>Contents</b> .....	<b>2</b>
<b>Introduction</b> .....	<b>3</b>
<b>Getting Started Simple Tests</b> .....	<b>4</b>
<b>Simple Tests</b> .....	<b>5</b>
<b>Quantitative Tests</b> .....	<b>10</b>
Transmitter Only .....	10
Receiver Only.....	14
Loopback Test Mode .....	16
Configuration Commands .....	22
Built-in-Self Test (BIST) Routines.....	22
Miscellaneous Test Routines .....	42
<b>Persistent Store Keys</b> .....	<b>49</b>
<b>Appendix 1</b> .....	<b>49</b>
BIST Parameters .....	49
<b>Appendix 2</b> .....	<b>51</b>
Known Software Issue(s) in BlueTest Version 1.4 .....	51
<b>Appendix 3</b> .....	<b>52</b>
Combining Tests Using a Second Unit .....	52
<b>Appendix 4</b> .....	<b>52</b>
Configuration Commands Available During Tests.....	53
<b>Appendix 5</b> .....	<b>54</b>
Bluetooth Packet Types .....	54

# 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.

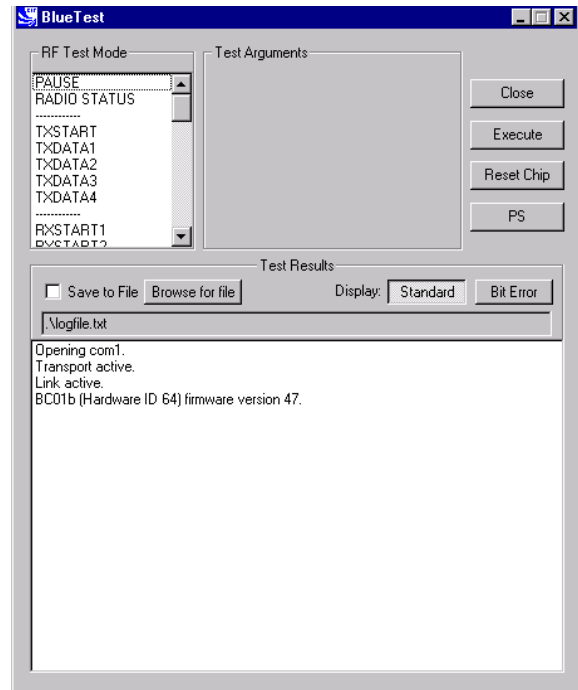
The default file name is `logfile.txt`. It is located in the current directory in which the program resides. Select **Browse for File** to create your own file name and path (using test examples provided).

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.



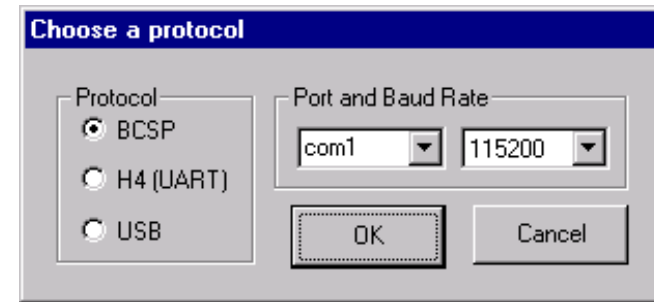
BlueTest Example Display

## Getting Started

Run **Bluetest.exe**.

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

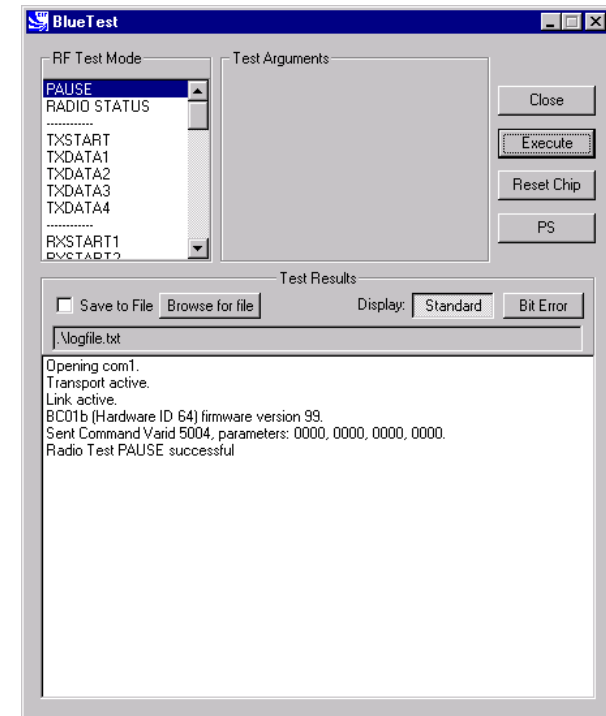
Select **Port and Baud Rate** (Default com1, 115200).



# Simple Tests

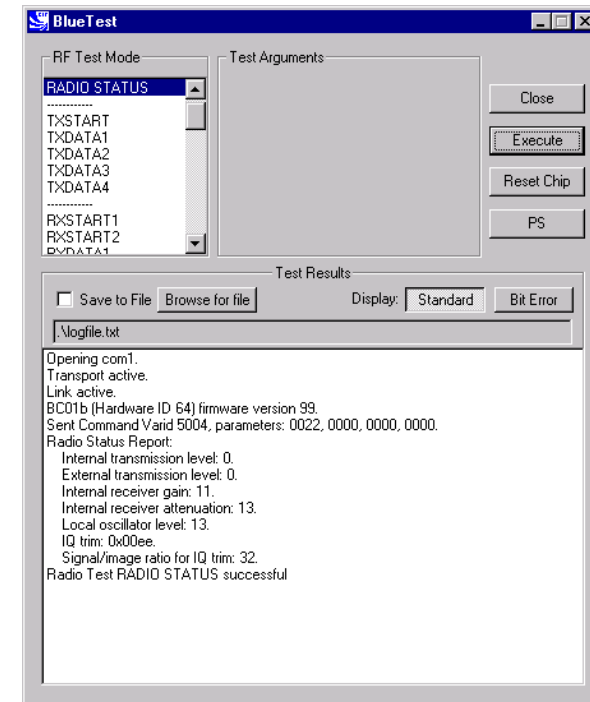
## RF Test Mode

<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.



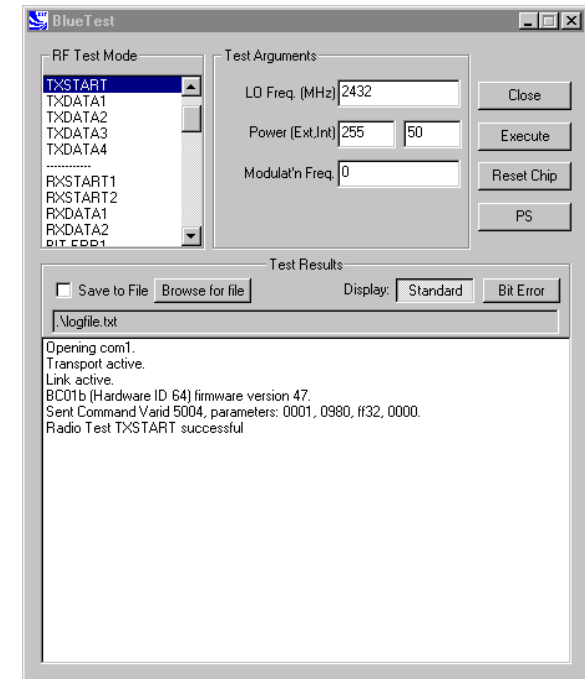
**PAUSE Example Display**

<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>	<ul style="list-style-type: none"> <li>Internal transmission level</li> <li>External transmission level</li> <li>Internal receiver gain</li> <li>Internal receiver attenuation</li> <li>Local oscillator level</li> <li>IQ trim</li> <li>Signal/image ratio for IQ trim</li> </ul>
<b>Exit</b>	Click on <b>Reset Chip</b> .



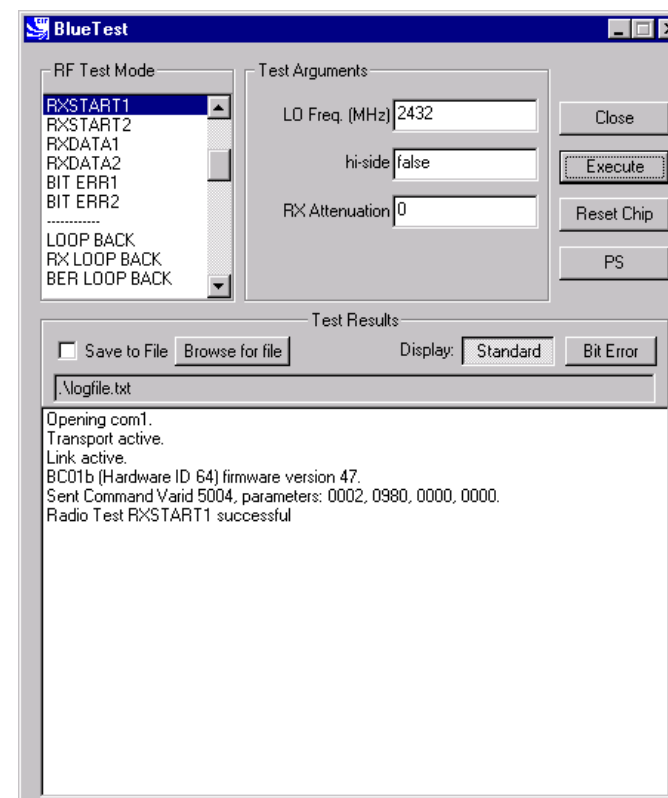
**RADIO STATUS Example Display**

<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>	None Use RF Analyser to check carrier output.
<b>Exit</b>	Click on <b>Reset Chip</b> .



**TXSTART Example Display**

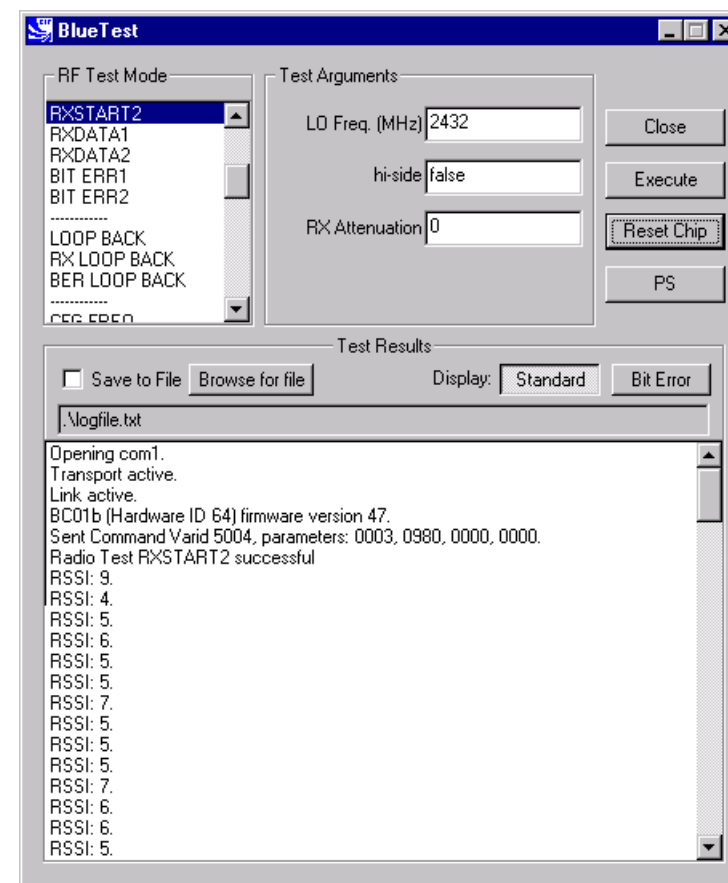
<b>Title</b>	<b>RXSTART1</b>
<b>Summary</b>	<p>Enables the receiver in continuous reception at a designated frequency ( <b>LO Freq</b> ) with a choice of low or high side modulation ( <b>hi-side</b> ) and with a designated attenuation setting ( <b>RX Attenuation</b> ). Requires a second unit to be running <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> .



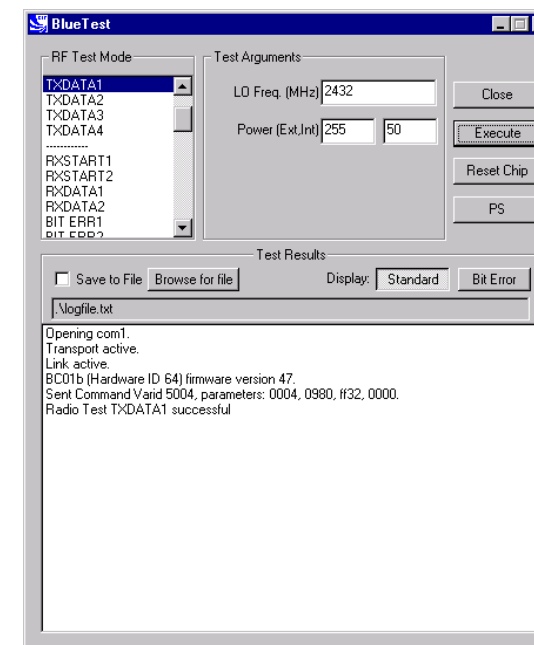
RXSTART2 Example Display

# Quantitative Tests

## Transmitter Only

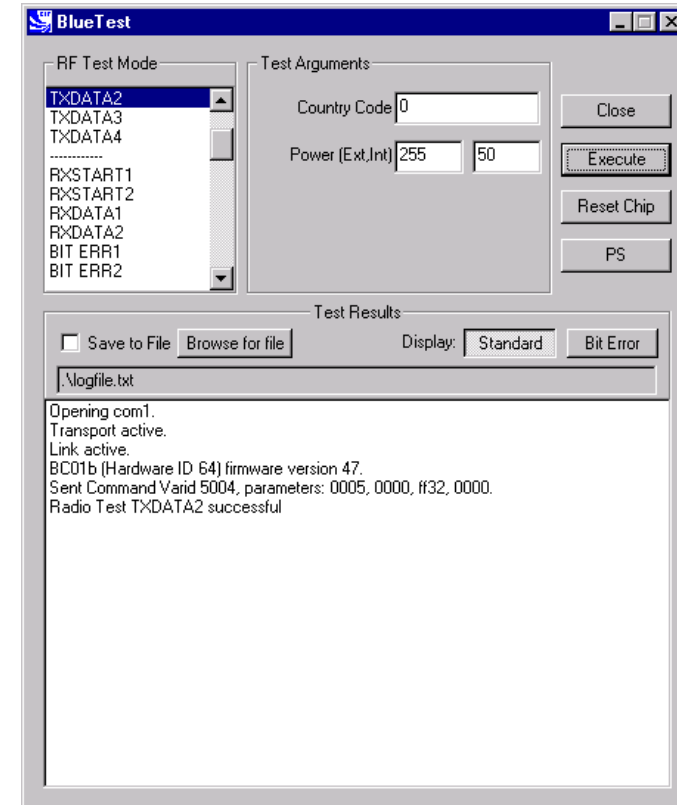
<b>Title</b>	<b>TXDATA1</b>
<b>Summary</b>	<p>Enables the transmitter, with a designated frequency (<b>LO Freq</b>) and output <b>Power (Ext, Int)</b>.</p> <p>Payload is PRBS9 data.</p> <p>Receiver is not operating.</p> <p>Packet type and duty cycle can be configured. Refer to Configuration Commands 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.



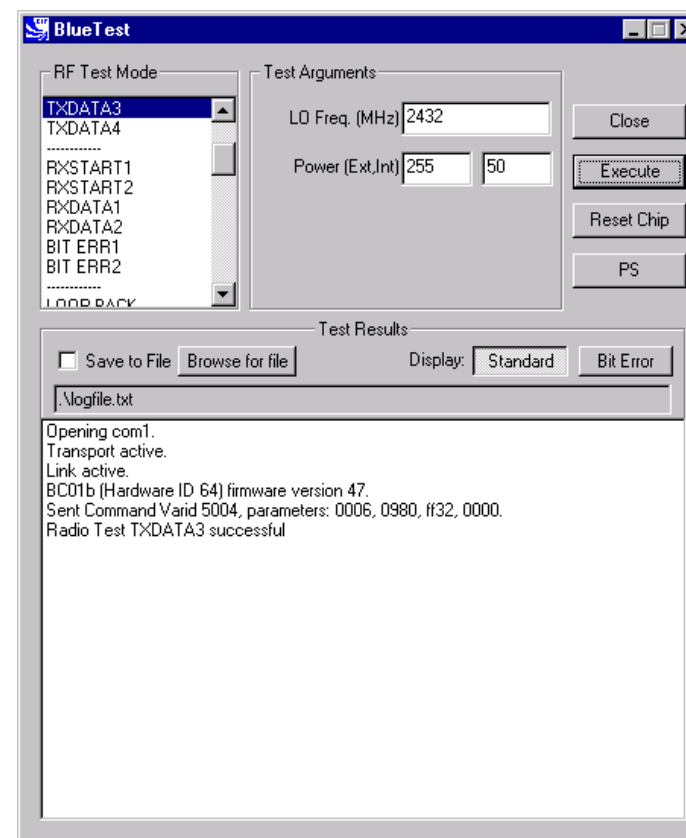
TXDATA1 Example Display

<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.



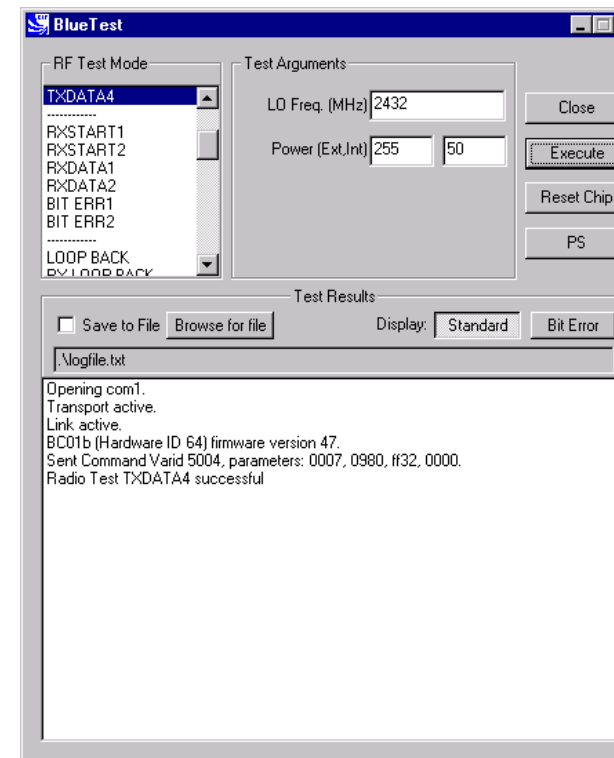
**TXDATA2 Example Display**

<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.

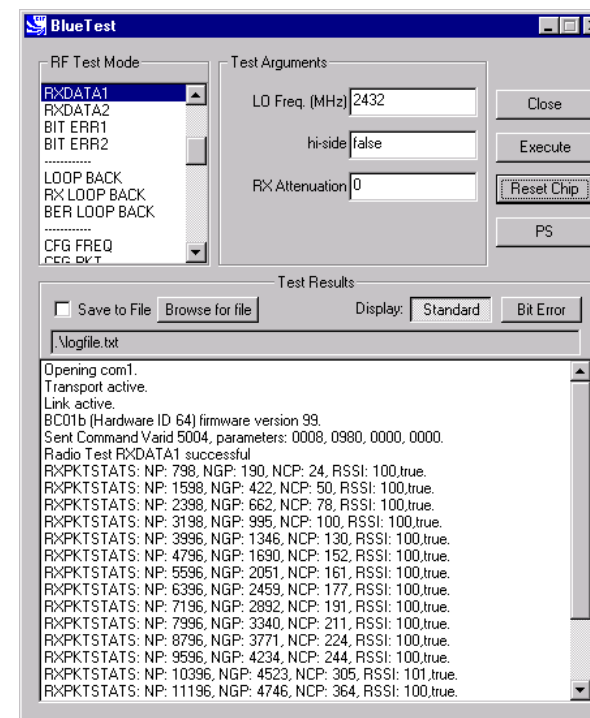


TXDATA4 Example Display

## Receiver Only

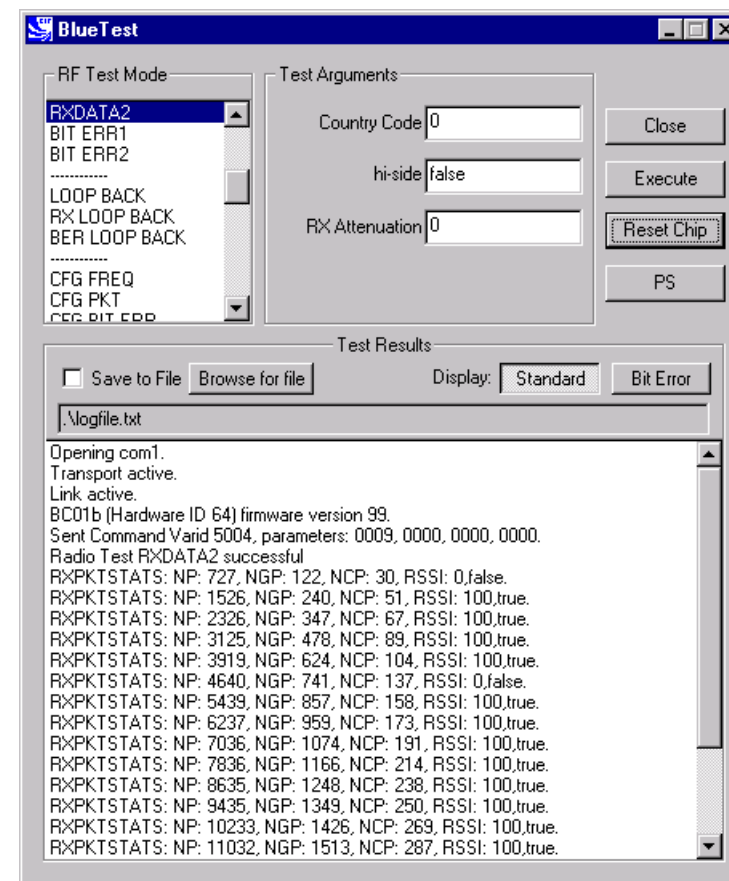
<b>Title</b>	<b>RXDATA1</b>
<b>Summary</b>	<p>Enables the receiver, at a designated frequency (<b>LO Freq</b>) with a choice of low or high side modulation (<b>hi-side</b>), and with a designated attenuation setting ( <b>RX Attenuation</b> ).</p> <p>The software counts the number of received packet and 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.



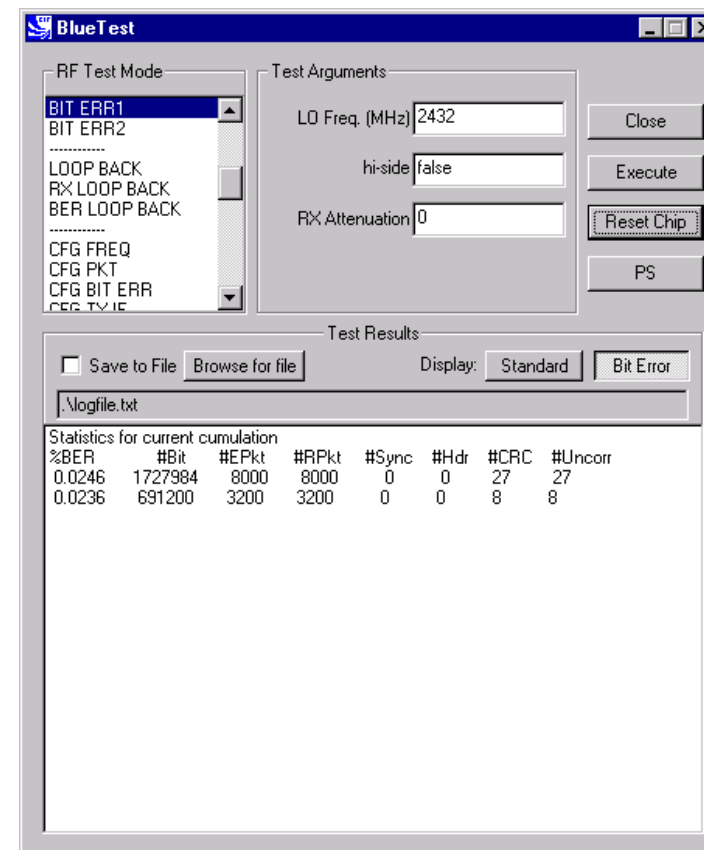
**RXDATA1 example display**

<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
<p><b>Summary</b></p>	<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> .