Response to email dated May 22, 2000.

Question 1) Verify that the frequency range from the center frequency of the lowest channel to the center frequency of the highest channel is 2402-2480 MHz.

Response:
Please refer to Figure 3 of test report filed May 15. Figure 3 shows the 79 hopping channels with the spectrum plot centered on 2.442 GHz. Using the spectrum analyzer settings as shown, the lowest frequency accessed over a 200 sec period was 2402 MHz. The highest frequency accessed during this same period was 2480 MHz. The center frequency of lowest channel is 2402 MHz and the center frequency of the highest channel is 2480 MHz.

Question 2) Verify that the schematic is the only item to be held confidential. Provide a corrected confidential letter.

Response:
A modified confidentiality request letter can be submitted as part of the application file. This letter request confidentiality for only the schematic. This confirms the earlier email request submitted May 15 to modify the confidentiality request letter to specify that only the schematic should be held confidential.

Question 3) Indicate compliance with Section 15.207. Provide test data.

Response
See the file described as "Line Conducted Data" that has been submitted as part of the application package. The 450 kHz to 30 MHz plot provided was obtained using the Bluetooth test fixture powered from 115 VAC power using the spectrum analyzer settings below. In previous discussion with the FCC, this was considered acceptable. Only one plot is provided since the plots for both AC lines were identical.

Span 450 kHz to 30 MHz
RBW 10 kHz
VBW 10 kHz
Sweep - auto
Detector - peak
Trace - max hold

Question 4) Please verify the antenna used for testing. Provide an antenna list indicating the antenna specification(size, type, gain). Additional testing may be required for types of antennas not tested.

Response:
This module is only used with an omni-directional monopole antenna designed for 0dBi gain. The module was tested with an external antenna that was approximately 3 cm in length, monopole type, with a design gain of 0 dBi. The antenna was directly attached to the RF output port of the module during testing. If the product in which the module is installed requires the antenna to be mounted in a position that direct connection to the module is not possible, a shielded coax cable will be used to connect the module to the antenna. A design where the antenna will be a trace on a printed circuit board is not part of this filing.

Question 5) Please provide a few samples of a pseudorandom sequence in the data mode.

Response:

The following are two examples of possible 79 channel hopping sequences with channels identified as 1 through 79. The channel numbering scheme starts with channel 2 at 2402 MHz with the 79th channel then appearing at 2480 MHz as channel 80.

Sequence a:
2,17,68,55,4,77,56,27,70,80,22,33,57,34,29,79,44,50,3,71,66,36,78,20,67,30,24,11,37,69,
23,7,41,38,63,14,31,59,40,13,6,25,65,15,61,73,58,47,19,28,54,76,74,48,52,75,5,42,64,72,
62,51,60,18,45,53,16,39,46,32,49,43,8,21,9,12,10,26,35

Sequence b:
50,6,41,57,64,14,42,33,79,3,20,38,56,69,75,21,80,23,31,40,45,68,32,28,4,15,34,59,71,61,
70,5,72,13,48,70,39,54,78,7,77,62,30,2,8,55,10,63,12,16,37,11,43,66,25,51,58,74,17,47,
9,29,65,19,53,18,52,36,27,26,44,22,49,24,35,60,73,76,67

Question 6) Please state the receiver input bandwidth in the data mode.

Response:
The receiver bandwidth is 1 MHz in the data mode.

Question 7) Provide a plot showing the 20 dB bandwidth of the data signal at the maximum 1 Mbps rate.

Response:
Please refer to Figures 1, 2, and 3 of the file described as "Supplemental Test Report" which has been submitted as part of the application package. The channel numbering scheme starts at 2401 designated as channel number 1, 2402 as channel number 2, and so with the 79th channel occurring at 2480 MHz which is channel number 80.
These plots were taken with the following analyzer settings at the maximum data rate. On channel 2 at 2402 MHz the 20 dB bandwidth is 782 kHz. On channel 40 at 2440 MHz the 20 dB bandwidth is 835 kHz. On channel 80 at 2480 MHz the 20 dB bandwidth is 807 kHz.

The following spectrum analyzer settings were used.
Span = 3 MHz
Resolution Bandwidth = approximately 1% of the 20 dB bandwidth
Video bandwidth equal to or greater than the resolution bandwidth
Detector = peak
Trace = max hold
Data rate at maximum
Sweep = auto

Question 8) Provide the following information with regard to the device operating in the page/inquiry mode under the Spread spectrum Hybrid requirements in Section 15.247(f) and Section 15.247(a)1.
a) Average time of occupancy plot.

Response:
Please refer to Figures 4, 5, and 6 for Page Mode operation and Figures 7, 8, and 9 for Inquiry mode operation. These figures are part of the file described as "Supplemental Test Report" which has been forwarded and attached to the application filing for this equipment. An individual transmission on a channel in page mode is 182 microseconds long. During a 12.8 sec time period, the total dwell time on a given channel is 116.5 milliseconds in page mode. In inquiry mode, an individual transmission on a channel is 182 microseconds long. During a 12.8 second time period, the total dwell time on a given channel is 98.5 milliseconds in inquiry mode.

The following analyzer settings were used.
Span = 0 centered on hopping channel
Resolution Bandwidth = 1 MHz
Video Bandwidth ≥ Resolution Bandwidth
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector = peak
Trace = max hold

b) Power density plot.

Response:
Please refer to Figures 10 and 11 that are contained in the attachment described as "Supplemental Test Report" which has been submitted as part of the application package. The following analyzer settings were used. There is only one type of data packet in both the inquiry and page modes. The data packet consist of a 68 bit address code. These plots show a power spectral density level of –14.2 dBm/3kHz for page mode and – 15.1 dBm/3kHz for inquiry mode.

Span = 1 MHz
Resolution Bandwidth 3 kHz

Video bandwidth 3 kHz or greater
Sweep = auto
Detector = peak
Trace = max hold

c) 20 dB bandwidth plot.

Response:
Please refer to Figures 12 and 13 that are part of the file described as "Supplemental Test Report" which has been submitted as part of the application package. In page mode the 20 dB bandwidth is 529 kHz and in inquiry mode the 20 dB bandwidth is 535 kHz.

The following spectrum analyzer settings were used.
Span = 3 MHz
Resolution Bandwidth = approximately 1% of the 20 dB bandwidth
Video bandwidth equal to or greater than the resolution bandwidth
Detector = peak
Trace = max hold
Data rate at maximum available with unit in Page and Inquiry modes.
Sweep = auto

d) pseudorandom sequence examples and explanation of its derivation.

Sequence example a:
5,72,13,48,14,39,54,23,7,46,62,30,3,8,55,10,63,12,16,37,11,43,66,25,51,58,24,17,47,
9,29,65
Sequence example b:
41,38,63,14,31,59,40,13,6,25,65,15,61,67,58,47,19,28,54,55,8,48,52,11,5,42,64,17,62,
51,20,30

Response to explanation of derivation.
The pseudorandom sequence is generated in a nine-stage shift register whose 5^{th} and 9^{th} stage outputs are added in a modulo-two addition stage with the result fed back to the input of the first stage. This produces a pseudorandom sequence length of 31 bits for page and inquiry modes and provides for transition to a 511 bit pseudorandom sequence length for data mode of operation.

e) How the frequencies in the hybrid mode meets the equally used on average requirement.

Response
The FHS (frequency hop selection) packet is transmitted by a sending unit. It contains UAP (upper address part)/LAP (lower address part) as well as clock information which is

updated before retransmission in the inquiry state. When in hybrid substate, the UAP/LAP is used together with the clock to select the sequence. The output from the selection box constitutes a pseudo-random sequence covering 79 hops for US operation. For inquiry mode, the selection scheme chooses a segment of 32 hop frequencies from the 79 hops spanning about 64 MHz and visits these hops once in a random order. Next, a different 32-hop segment is chosen, etc. Refer to chapter 11 of the Bluetooth specification for a more through explanation of the hopping structure.

f) State the receiver Input bandwidth and synchronization requirement in the hybrid mode.

Responses:

Receiver bandwidth:
The receiver bandwidth in hybrid mode (32 hopping channels) is equal to the receiver bandwidth in the 79 hopping channel mode which is 1 MHz.

Synchronization:
Synchronization within a piconet uses a system of beacon channels generated by the master unit with the remaining slave units periodically waking up and listening on a beacon channel. Beacon channels are designated by the master unit in page mode to identify channels for slave units to listen to. The beacon channel packet also contains the synchronization information required for the slave to sync with the master unit. In page mode the same 32-hop segment is used all the time and the segment is selected by the address with different units having different paging segments. Although they are referred to as beacon channels, they are designated as beacons only for purpose of assisting the listening function for establishing a connection. The master unit is continually hopping through all 32 channels in the page mode. When two Bluetooth devices establish contact for the first time, one of the devices is sending out an inquiry access code, and the other party is scanning for this inquiry access code. If the two devices have been connected previously, and want to start a new session, a similar procedure takes place. The only difference being that instead of the inquiry access code, an access code derived from the paged unit's address is used. If the two Bluetooth devices have exchanged information during the last five hours, the typical time it takes to establish the connection is reduced considerably due to the ability of the paging unit to estimate at what frequency the other unit will perform the page scan. For further information see chapter 10 of the Bluetooth specification.

g) Spread rate/data rate of the direct sequence signal.

Response:
In both page and inquiry mode, there is only one bit of information, namely the absence or presence of the correct access code for a given system unit. Since the access codes

used in page and inquiry consist of 68 bits, this can be viewed as if one bit of information was transmitted by means of direct-sequence operation with the spreading function defined by the access code. This viewpoint, namely that Bluetooth can be regarded as a hybrid system when in inquiry or page mode with the access code defined as the spreading function with the 68 bits recognized as one bit of information has been shared by Ericsson and accepted by the FCC. This would produce a spread rate/date rate of 68 to 1. Further information can be found in the Processing gain report and in the FCC Letter to Ericsson's attorney, attachments filed with the application for certification, David Jatlow with the law firm of Young and Jatlow concerning Bluetooth processing gain. The FCC letter accepted the concepts presented above as meeting the spreading and information requirements for a hybrid system as they relate to processing gain requirements for a hybrid system.