Casira Operational Description

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Distribution

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FCC	Casira FCC Application

Change History

Version	Date	Author	Comment
1.0	17 Nov 00	Flittner	First draft
1.1	07 Mar 01	MBE	Application Issue

CONTENTS

1 PRODUCT DESCRIPTION

The Casira Bluetooth Development Kit is a spread spectrum transmitter using frequency hopping to the Bluetooth standard operating in the unlicensed 2.4 GHz ISM band. The device is intended to be sold to manufacturers of Bluetooth products for test purposes only. It is not intended to be sold to the general public. Equipment manufacturers who intend to make products incorporating Bluetooth technology will use the kit in design and test laboratories for hardware and software development. The manufacturers will be responsible for making applications to the FCC for any such equipment that they may produce. No form of Modular Approval is being sought for the Casira kit.

Reference F (FCC exhibit type User's manual, file Casira.pdf) contains general operating instructions for the kit. Reference E (FCC exhibit type Operational Description, file bc01_spec_00-05-09.pdf) contains application information for the BlueCore01 device that implements the Bluetooth functionality of the kit.

Please note references to other documents in the application are by reference letter, FCC exhibit type and file name as listed in the cover letter. References to FCC 47 CFR part 15 are abbreviated to paragraph 15 section only.

2 TECHNICAL DESCRIPTION OF SPREAD SPECTRUM SYSTEM

The Bluetooth standard describes a frequency hopping spread spectrum system (FHSS). The frequency hopping sequence is governed by one unit known as the master in any group of units communicating together. The group is known as a piconet, and all units other than the master are known as slaves. The master determines the pseudo random hopping sequence and slave devices follow this sequence. As the master unit generates the hopping sequence internally and without reference to any external information, there is no co-ordination with any other Bluetooth or other FHSS systems to avoid simultaneous occupancy of hopping channels. Bluetooth uses re-transmission, interleaving and coding techniques to mitigate against lost transmissions when simultaneous occupancy of a channel cause loss of data. The pseudo random hopping sequence is initialised at the start of a new connection between master and slave to a random frequency (hopping channel), and the hopping sequence is generated such that an equal time is spent in each of 79 channels throughout the duration of the connection. A detailed description of the frequency bands, frequency-hopping system, and modulation scheme are included in reference D, type Operational Description, file BT_Spec_extracts.pdf which contains extracts from Bluetooth Core Specification 1.0B. Measurements to confirm the FHSS operation are contained in reference I (FCC exhibit type Test Report, file 2000_1533.pdf) which contains a test report by CTMS.

During the normal connection state in the Bluetooth protocol as described above, the operation meets the description of a FHSS system under 15.247(a)(1) as the number of hopping frequencies is greater than 75. However, in two specific modes (inquiry and page) of the Bluetooth protocol, 32 frequencies only are used. These two modes are used for short periods only to search for and connect to other devices in range. However during these

modes fixed access codes are used in the header part of the transmitted packet, and other devices which are available for connection (in modes inquiry scan and page scan) search for these codes using correlation techniques. Therefore, during inquiry and page modes the system operation can be viewed as part Direct Sequence Spread Spectrum (DSSS) and part FHSS (as hopping is still occurring over 32 hops). These modes meet the description of a Hybrid system under 15.247(f). To qualify as a hybrid system additional DSSS and FHSS measurements for inquiry and page modes are presented in reference I (FCC exhibit type Test Report, file 2000_1533.pdf). There is an additional requirement for hybrid systems, to establish a minimum processing gain for the combined DSSS and FHSS operation as described in 15.247(e). The measurement method and results are contained in reference K (FCC exhibit type Test Report, file Casira_PG_v1.0.pdf).

To support both DS and FH operation spurious emissions measurements, conducted under 15.247(c) and radiated as required under parts 15.205(a) and 15.209(a) are included in reference J (FCC exhibit type Test Report, file 5BT_CSR_CCL_CON_FCCa_LOGO.pdf).

3 ANTENNA DESCRIPTION

The antenna supplied with the kit is a short monopole of 1/4 wavelength with a gain of 0 dBi. A photograph of the antenna is shown below (Fig 1).

The peak power of the Casira kit is approximately 0 dBm, and therefore the maximum EIRP is below the de facto EIRP limit of +36 dBm as defined in 15.247(b)(1-3).

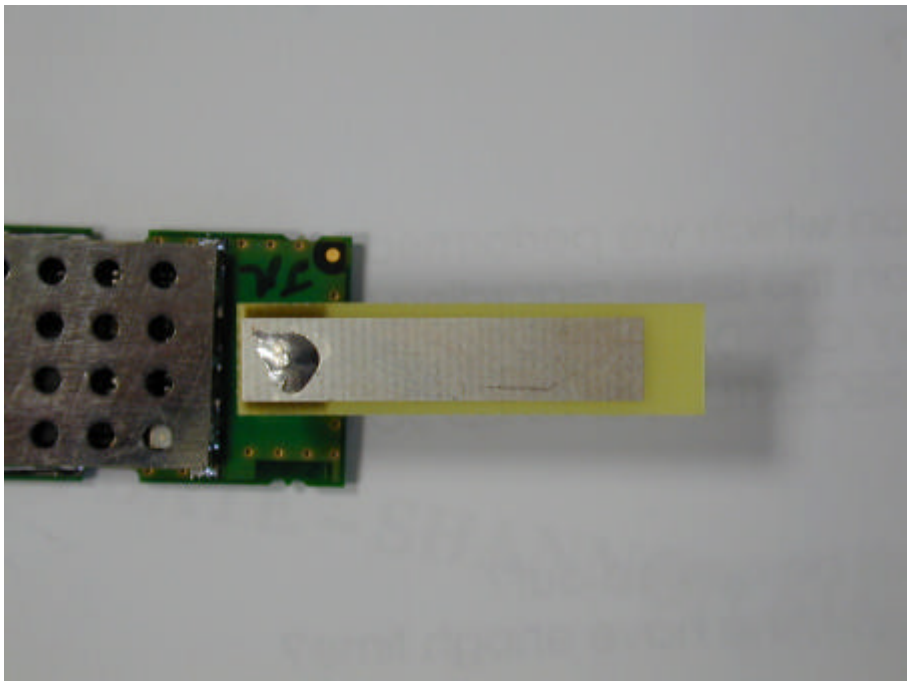

Fig 1.
Antenna

4 RF EXPOSURE COMPLIANCE REQUIREMENT

Table 1 0f 47 CFR 1.1310 defines the maximum permissible exposure (MPE) for the general population as 1 mW/cm^2. The distance from the transmitting antenna where the exposure level reaches the maximum permitted level is calculated using the equation:

$$S = (PG)/4\pi R^2$$

Where: S = Power density

P = Power input to the antenna

G = linear power gain relative to an isotropic antenna

R = Distance to the centre of the radiation of the antenna

Solving for R, the limit is reached at approximately 2.8cm (0.09 feet) from the antenna. Therefore no warning labels, no RF exposure warnings in the manual or other protection measures are required for the Casira kit.