IEEE P802.15
Wireless Personal Area Networks

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Source	[Abbie Mathew (for Ken Wood)] [NewLANS, Inc.] [238 Littleton Road, Westford, MA 1886, U.S.A.]	Voice: Fax: E-mail:	[+1-617-283-1363] [+1-978-692-1619] [amathew@newlans.com]
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Aim

The aim of these measurements is to determine the effects of various home environments on the transmission and reflection of a circularly polarized 60 GHz signal. The tests will be conducted in various homes ranging in size from 2,000 square feet to 8,000 square feet. Two basic set ups are considered;

1. Line of sight links between a typical home theater equipment rack and a wall mounted TV display.
2. Angular measurements of a received signal of the home environment at various locations.

Measurement Technique

This set of measurements is based on a 60 GHz pulsed configuration. The tests are conducted at a single frequency around 60 GHz. A, two nano-second, 60 GHz signal is transmitted into the environment. A receiver detects the effect of the environment on this transmitted pulsed signal. The direct path having the shortest delay followed by any reflected signals. By measuring the differential between the direct path and the reflected paths the reflecting surfaces can be identified. Circular polarization is used to minimize the effects of single bounce reflections within the home. The relative amplitude between any reflected signals and the direct path can be used to determine the effect of multi-path on any high data rate PAN system.

In the first set of measurements potential line of sight links (millimeter line of sight) are selected with in the various homes. The selection of the links is based on the typical positions of the home theater equipment tower and the TV monitor. The transmit antenna is set to a height of 5 ft above the floor, the receive antenna is set to a height of 6 ft above the floor. The primary spaces measured will be the living room, family room and bedrooms.

In the second set of measurements, the receiver above is mounted on a rotational positioner. The received signal is recorded as a function of angle from the line of sight direct path.

Measurement Set-up

The measurement system consists of a 2 ns pulsed transmitter with a circularly polarized directional antenna and a receiver with the same antenna. The pulsed data is recorded using an Agilent 86100A digital storage oscilloscope connected to a laptop computer. Figure 1 shows the test set up.

The received signal can be recorded as a single event or multiple received signals can be recorded with a preset time interval between them. This latter test configuration can be used for a dynamic test environment, for example a person moving within the environment.

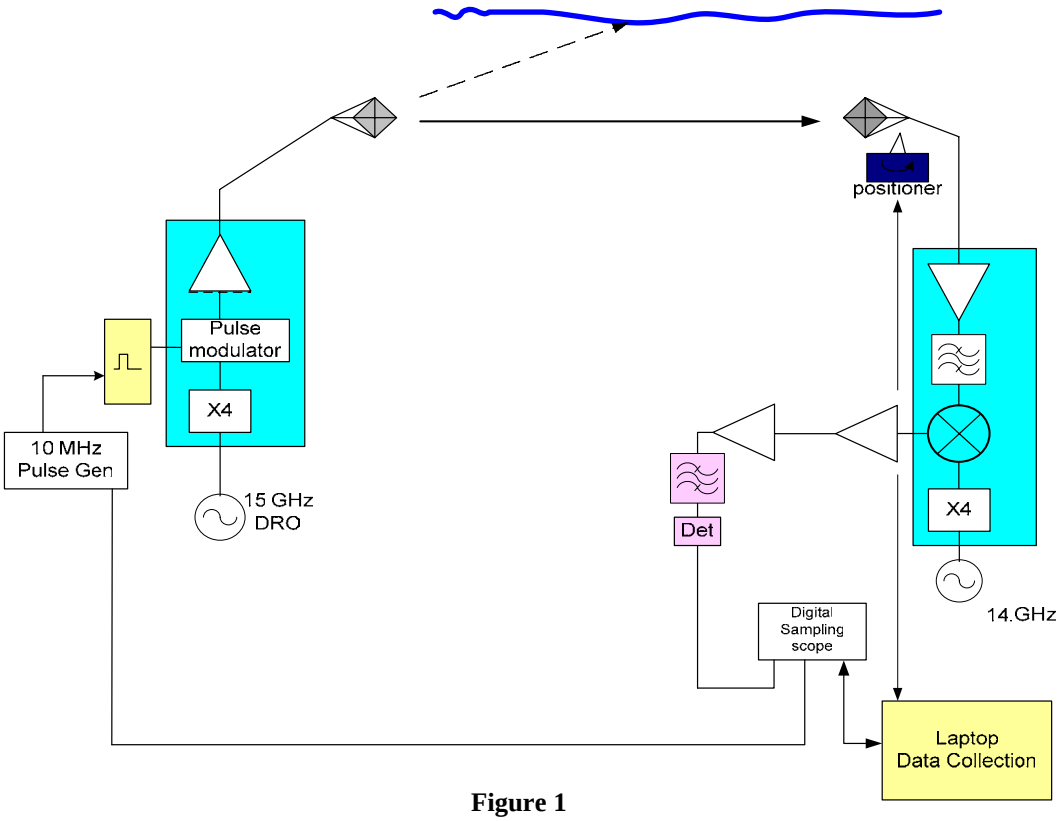

Figure 1
60 GHz Pulsed Measurement Test Set-up

For the second set of measurements the same basic data acquisition system is used. The receiver is mounted on the positioner. The data is now recorded as a function of the positioner angle. The data will be presented as polar plots of the various environments. A measurement in an anechoic chamber will also be performed to serve as a reference for these measurements.

The Results

The results will presented for the first set of measurements as a consolidated plot showing the amplitude and relative time delay for each received pulse for each set of measurements. The data will be reduced to show these in incremental 1 ns bins.

In the case of the second set of measurements the results will be presented in two formats;

1. Overlaid polar plots showing the amplitude of the various returns as a function of angle.
2. As a two dimensional plot showing the amplitude of the returns on the y axis and the position of the returning pulses on the z x plane.