Figure 1 shows sequence number vs. time for an experiment with three wixels; one wixel is a sender with two wixels (A and B) receiving on the same channel. 1000 packets were sent by the sender. In this particular run, the Receiver A lost 17 packets (1.7%) while Receiver B lost 101 Packets (10.1%). Running this same experiment many times showed that the packets lost by each receiver show no correlation between each other, suggesting that the error is not with the sender. It was found that the packet lost varies based on the environment they are in, and can vary slightly between channels. The packet loss ranged from 10 to 300 packets while sending out a 1000 packet burst.
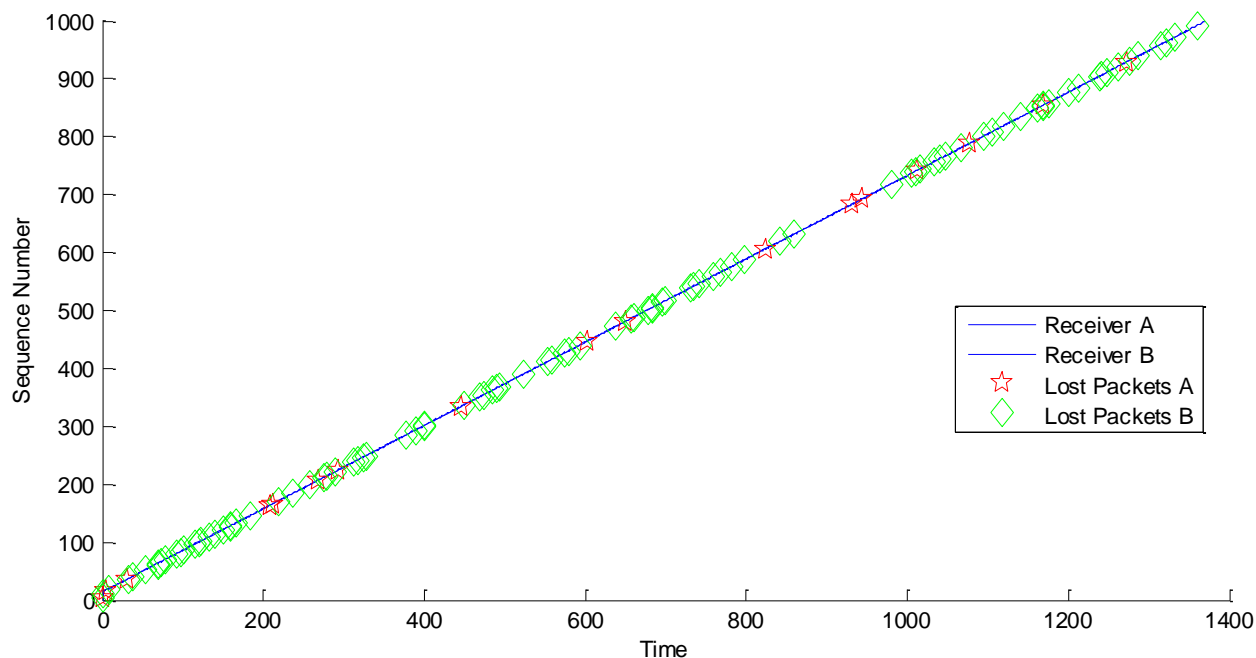

Figure 1: Sequence Number vs. Time with one wixel sending and two receiving

Bytes received were plotted vs. time in Figure 2 to get an estimate of the bit rate. Each packet sent was 18 bytes. By taking the slope of the figure, it can be seen that the bit rate is approximately 12730 bytes/second which is about 102 kbps.
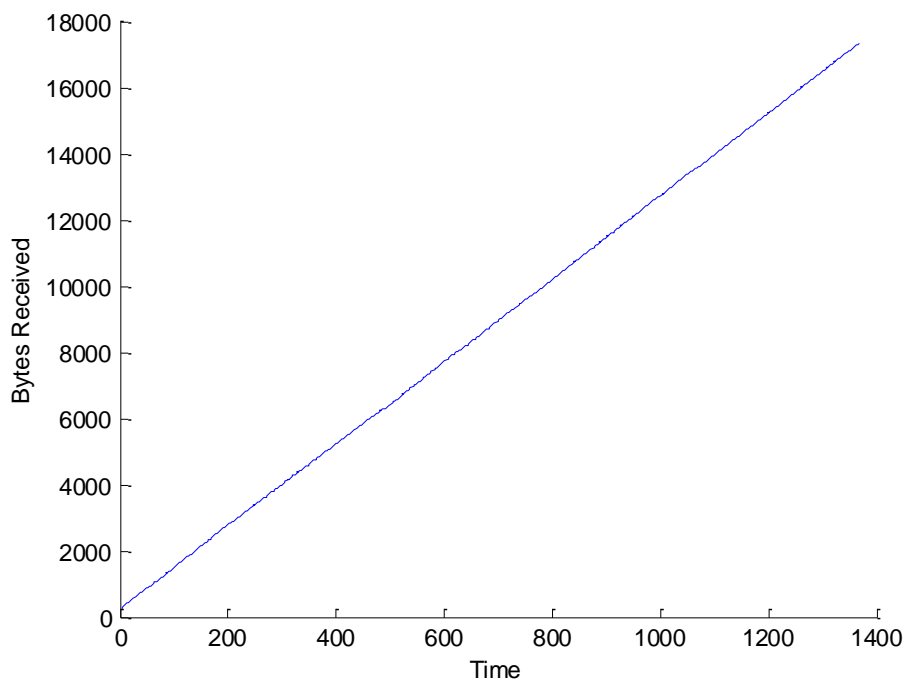
Figure 2: Bytes Received vs. Time for a single wixel sending and single wixel receiving

Experiments were performed to test the channel changing capabilities of the wixels. Two receiving wixels were setup; one on channel 128, another on channel 228. A single transmitting wixel was used to send out a burst of 1000 packets on channel 228 and then flip channels to 128 and send another 1000 packet burst. It was found that the last 15 packets of the first 1000 sent (Sequence #985 – 999) were instead received by the wixel on channel 228, and not the wixel on channel 128. This is believed to be due to the queue not being cleared before the channel is switched. Further programming could be done to the wixels to ensure that the radio queue is cleared before the channel is switched, causing no additional loss in packets, and preventing packets being received by one radio channel that were intended for another. The time delay caused by switching channels was less than 1 millisecond and not detectable in the data collected. Figure 3 shows one of the trials performed in which the sending radio channel was switched halfway through.
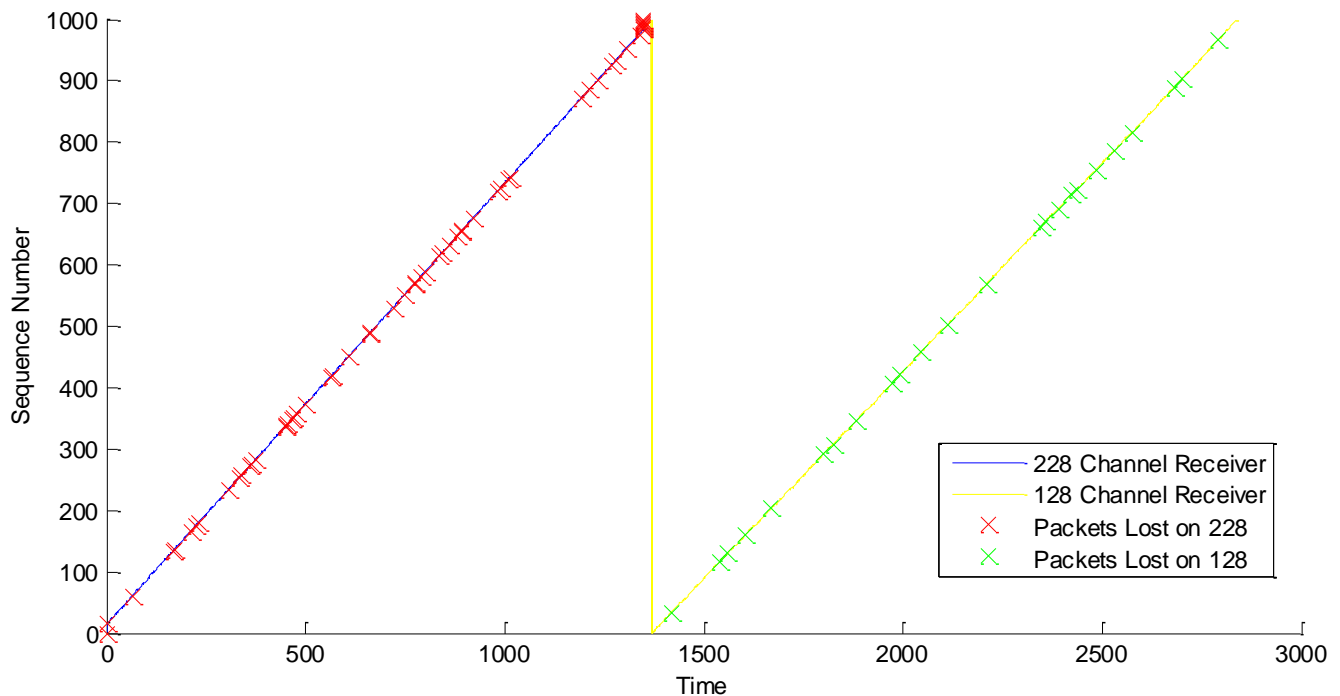
Figure 3: Transmitting channel switch test results

Tests were run using two transmitting wixels (one on channel 128, and the other on 228) with a single receiving wixel. The transmitters sent continuous streams of packets. The receiver would switch between the two channels. It was found that this switch resulted in a loss of approximately 3-5 packets and took roughly 4-5 milliseconds to occur. The change while receiving is longer than while sending because the radio has to be set to an idle state to stop receiving before the channel can be changed.

Table 1: Properties of the wixels

Packet Size	18 bytes (+ 1 byte header)
Typical Range	Up to 50 feet
Channels	256 (pairs should be at least 2 apart)