

Understanding the characteristics of low-power wireless links and radios is an essential step towards building robust, efficient and reliable wireless sensor networks. In this project we study and evaluate the fidelity of the Received Signal Strength Indication (RSSI), which the low-power radios use to measure the power of the wireless signal. This value is heavily utilized in many wireless sensor network protocols and applications, such as localization, topology control, link scheduling, and link quality estimation. With extensive experiments, we show that inaccuracies in the RSSI values reported by widely used 802.15.4 radios, such as the CC2420 and the AT86RF230, have profound impact on these protocols and applications. Therefore, we also developed a calibration scheme to effectively minimize the adverse effects associated with inaccurate RSSI values.

Stepping up to the link layer, we note that packet loss and energy consumption in sensor networks depend critically on the quality of the network's wireless links. Experimental results have shown that a low-power wireless link can be in one of three states or 'regions', as the inter-node distance increases: connected, transitional (gray), and disconnected. Moreover, the transitional region spans a significant portion and is likely to be even larger than the connected region. Therefore, in this project we explore the characteristics of the transitional region and study the possibility of picking reliable links within this region.

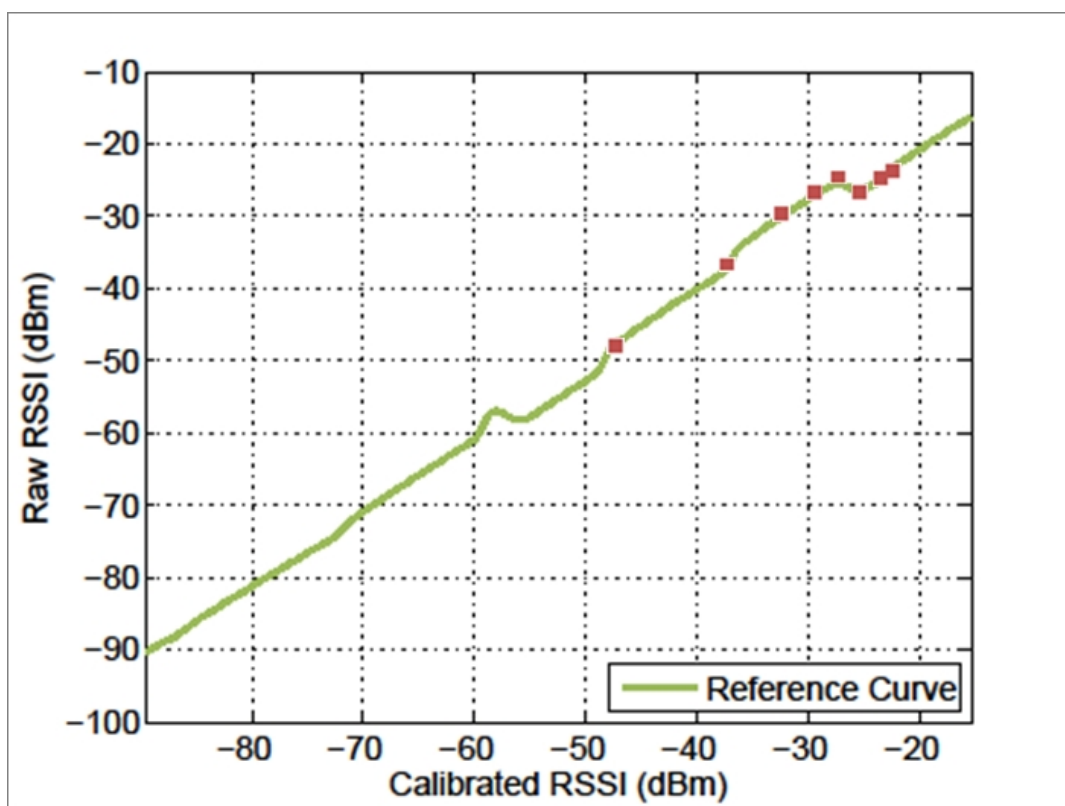
Calibrating RSSI Values Reported by 802.15.4 Radios

IEEE 802.15.4 standard specifies that a radio's PHY layer must provide an 8-bit integer value as an RSSI measurement.

In this project we examine two 802.15.4 compliant radios, the widely used Chipcon/TI CC2420 and Atmel AT86RF222.

The data and instructions for calibrating RSSI measurements provided by the CC2420 radio chip are available [on this page](#).

This work appeared in [Download PDF](#) of ICWSN 2010: [Slides](#)



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Spatial Characteristics of the Gray Region for 802.15.4 Radios

Packet loss and energy consumption in sensor networks depend critically on the quality of the network.

The graph on the right shows the measured variations in Packet Reception Ratio (PRR) over a two-dimensional area.

A preliminary version of [Download PDF](#) appeared as a poster at IPSN 2009:

The whole dataset is available [on this page](#).

