MicroChip Based High Throughput Small Footprint Wireless Vibration Sensors

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A high throughput vibration sensor for monitoring the integrity of container shipment processes, several large scale infrastructure and lifeline systems, as well as precision (e.g., semiconductor) manufacturing processes is being developed at Oklahoma State University. The designed sensor node consists of a Microchip processor (commercially available) and a Chipcon Zigbee wireless transceiver along with custom system software developed at OSU. Two alternative PCB layouts for the sensor have been implemented starting from ground up. The first layout uses a built-in Inverted-F antenna, while the second layout is without any antenna in order to accomodate future antenna designs. An optimal antenna is being designed by researchers at Ohio State University for the second PCB layout. The sensor nodes from our implementation have a reasonably small foot print of approximately 2 cm X 2cm in size. At present, sampling rates up to 800Hz continuous at 10bit accuracy can be achieved using the sensor. With 8 bit accuracy, data acquisition rates of up to 1.6k can be achieved. Currently, investigations are being carried out to realize data sampling rates as high as few thousands per second. The Zigbee protocol stack is being modified to sustain the high data transmission rates resulting from such sampling rates. As a part of this research, appropriate routing protocols to achieve efficient multi-hop data transfers will also be investigated. Software for the prototype sensor board is being developed using Assembly language and C for the afore-said monitoring applications. Results and experiences from this research will be shared during the conference.