

## **Field Validation Of A Compact Martlet Wireless Ultrasonic Thickness Measurement System**

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Towards achieving autonomous structural health monitoring, this paper reports on recent developments and a field validation of the ultrasonic thickness measurement feature on the Martlet wireless sensing system. The ultrasonic device developed in this paper is designed to attain better thickness measurement accuracy and is more compact in size than the previous design. The ultrasonic daughter board includes filtering and amplification circuits for conditioning the ultrasonic signal, and a high-speed analog-to-digital-converter that is capable of a maximum 80 MHz sampling frequency. For a better signal-to-noise ratio, the new pulser board is developed to provide a high-amplitude and short-pulse excitation signal. Contrary to a previous pulser board that was separate from the Martlet wing, the new pulser board is designed to stack on top of the ultrasonic daughter board to make the system more compact. The measurement fidelity of the proposed ultrasonic setup is corroborated by field validation on the web and flange of a steel bridge girder. The developed compact wireless ultrasonic device has been designed to be readily integrated with a steel-climbing mobile robot in the future for performing autonomous structural inspections.