An estimated five million people are currently diagnosed with congestive heart failure (CHF) in the United States, with over 400,000 new diagnoses annually. Almost one in two patients will be readmitted to the hospital within four to six months of discharge. Up to 50% of these early readmissions may be prevented if symptoms are recognized early enough. Bioimpedance measurements have been shown to be predictive of heart failure decompensation up to 14 days before an event occurs. We have developed a portable bioimpedance system that can measure body impedance from 1 kHz to 1 MHz. The system uses the magnitude ratio and phase difference detection method to calculate the magnitude and phase of the measured impedance (see Figure 1). The system is enclosed in an aluminum box (see Figure 2) and can be used with four coaxial cables to reduce the impact of stray capacitances. The device has been characterized with RC networks and is being tested with healthy volunteers.

Figure 1: A schematic overview of the magnitude ratio and phase difference detection method. A fixed sinusoidal current is driven through the body and a sense resistance. The voltage is amplified and measured by a gain phase detector chip (AD8302).

Figure 2: The portable bioimpedance spectroscopy measurement system inside the enclosure.