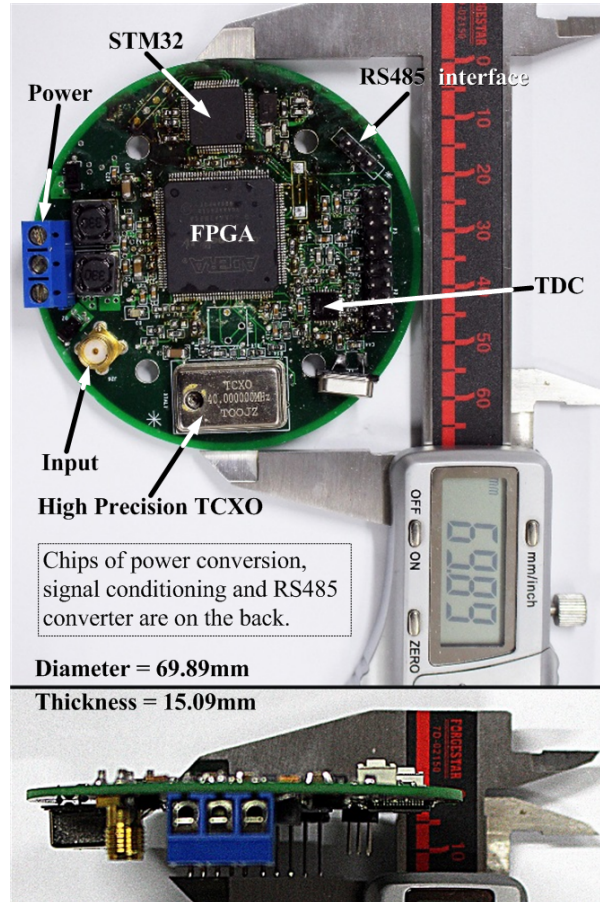


# A Miniature Frequency Meter for Atomic Magnetometer Based on Precise Time Measurement

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Instead of measuring more precise counting values in equal-precision frequency measurement, this frequency meter obtains the converted frequency indirectly by accurately measuring the time of multiple signal cycles. It has better accuracy performance than previous works according to the error analysis and significantly improves the accuracy of the frequency meter in atomic magnetometer. The method is capable of eliminating the  $\pm 1$  error of reference signal counting in equal precision frequency measurement method, as well as avoiding the limitation that the measurement range of TDC cannot reach 0. Because the frequency meter must be integrated with the cylindrical probe of magnetometer, thus, the frequency meter into a circular sheet was designed with a diameter of 7 cm and a thickness of 2 cm. A finished frequency meter is shown in Figure 1. Tests show that the prototype achieved 0.0042 Hz precision and 0.00056 Hz standard deviation in the frequency range of 70 kHz to 350 kHz at the output rate of 10 Hz.



**Figure 1.** Top view and side view of frequency meter.