Printed, flexible wireless temperature logging system

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Abstract:
The internet of things (IoT) has resulted in accelerated development of intelligent and connected devices. Important modules include those for monitoring of environmental parameters and sensors for health diagnostic applications. Flexible, low-cost implementations are desirable towards free-form, customizable and disposable solutions for sensing and wireless connectivity. This work presents a flexible, low-cost, printed wireless temperature logger, utilizing a sensing radio frequency identification (RFID) integrated circuit (IC). The temperature logger devices were screen printed and assembled on low-cost, flexible vinyl adhesive substrates for ease of mounting on to a variety of surfaces and objects, and were tested with both coin cell batteries and screen printed primary batteries designed and manufactured in-house. The SL900A RFID IC (AMS, Austria) has internal features to monitor temperature and battery voltage. The chip was set up to log the battery voltage and the temperature over different time frames in controlled temperature environments to test the reliability of the temperature readouts. In addition, logging of the battery voltage levels enabled the performance of the printed batteries to be assessed. The results showed accurate readings over 4 days for both coin cell and printed batteries without limiting the data logging capabilities. The printed wireless temperature logger shows promise towards all-printed, low-cost solutions for environmental monitoring using an integrated and connected device approach with on-board power.