

## A Flexible Skin-mounted Wireless Acoustic Device for Bowel Sounds Monitoring and Evaluation

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### Abstract

Conventional methods of intestinal inspection play an essential role in the assessment of the bowel disease and other relevant health issues, yet fail to obtain intestinal conditions in real time because of radiation limit and operation inconvenience. Here, a flexible skin-mounted device is developed for long-term, real-time monitoring and evaluation of bowel sounds by integration of a 3D-printed elastomeric resonator with flexible electronics (Figure 1). It is capable of being mechanically invisible attached to abdominal surface without performance degradation during breathing. Clinical tests conducted in patients with mechanical intestinal obstruction or paralytic ileus and a normal subject illustrate utility in capturing the characteristics of bowel sounds. Furthermore, a demonstration of collecting and classifying bowel sounds by the flexible device based on machine learning methods serves as a reference for possible applications of the system in auxiliary diagnosis of bowel problems.

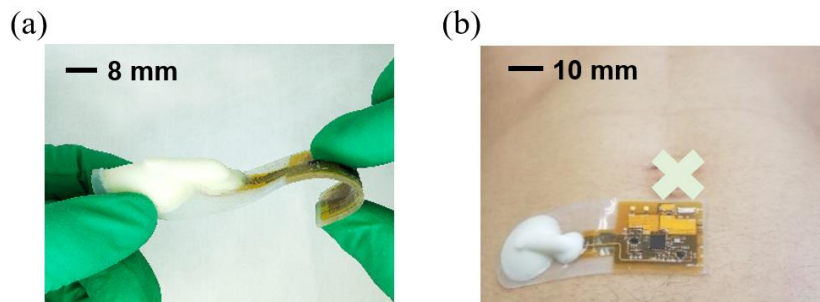


Figure 1: A flexible acoustic device for bowel sound monitoring. (a) Device bent by fingers. (b) Device mounted on curved abdominal surface.