

## **Design of Camera-integrated 2.4-GHz Loop Antenna for Wireless Endoscope**

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Recently, several studies have proposed the application of wireless body area network (WBAN) in monitoring body functions using implantable devices. Capsule endoscopy enables recording of images for the endoscopic evaluation of the digestive tract. A radio-frequency antenna should be located at the outermost portion of the capsule endoscope to avoid unwanted interference from internal components. However, the antenna can interrupt a camera located on the same side. Therefore, it is impossible to shoot organs at various angles because the camera is only placed on that side of the existing capsule endoscopes where the antenna is not located.

In this paper, a loop antenna is placed on the same side as the camera and they can be integrated. In order to avoid interference with the imaging of the camera, the antenna is fabricated on a ring-shaped substrate.

The structure of the feeding antenna, which uses capacitive coupling, was designed to ensure easy integration with the camera. The data rate of the existing capsule endoscope with antenna is only 400 MHz. The proposed antenna has been designed to have an improved data rate of 2.4 GHz. The proposed antenna with a diameter of 10 mm has a peak antenna gain of more than 4 dBi and a return loss of less than -10 dB at 2.4 GHz.

The proposed antenna of a capsule endoscope does not interfere with the operation of the camera. Accordingly, an additional camera can be installed in the space occupied by the antenna in existing capsule endoscopes. Therefore, the camera-integrated 2.4 GHz loop antenna can be used for two-way imaging. Furthermore, the designed antenna can provide an exact diagnosis using multi-angle imaging.

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