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Integrated Microsystems These systems have revolutionised control, communication and data processing. The ability of micro-devices to interface with the non-electronic world has been essential to this revolution.

Some examples of implantable Microsystems with wireless and by wire include:

implantable cardiac defibrillator

wireless implantable cortical Microsystems

eye pressure sensor for glaucoma

Implantable Microsystems uses wireless link such as antennas for data and inductively coupled coils for power transfer. Power transfer is however limited to the subcutaneous transfer where the power is carried through conducting leads to the actual implant site. However, on-chip integration with wireless front-end in requires;

Miniaturization of RF front-end for antennas and power transfer in passive environment.

Integration of miniaturized passive RF front-end to the microelectronics and MEMS circuits for communication and sensing

Some of the miniaturized off-chip components of wireless interface of implants include antennas, passive microwave filters and resonator, and coils and transformers. Of the three only the latter is fully integrated.

Quarter-wave antenna design requires an open circuit to terminate the slot line. Depending on the ground plane size, a moderate to high efficiency is achieved. The antenna has a small fraction bandwidth of around 1%. As the ground plane size decreases ohmic loss increases and the antenna become more similar to an isotropic radiator.

Symmetrically loaded miniaturized slot antenna applies boundary condition

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at both sides of the slot-line. Under this condition, re-configurability, selection of area with the peak current and variable miniaturization level is possible. Slot antenna uses inductive loadings to maintain the current level in the end of reduced size slot antenna.

Since small antennas are narrowband, it is important to increase the bandwidth without compromising efficiency. Comparison between the miniaturized slot and miniaturized folded slot impedances shows an increase by a factor of four in the radiation conductance. Therefore, slotted structures demonstrate higher efficiency and lower losses and are thus preferred whenever a ground plane is available.