Development of a Circularly Polarized Conformal Antenna Array for RF Energy Harvesting at 2.4 GHz for IoT Powered Smart Indoor Applications

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The abstract proposes the development of an energy-efficient IoT-powered smart-indoor platform that uses a Conformal Circularly Polarized Microstrip Patch Antenna Array (CCP-MSPA) for rectenna applications. The platform is intended for harvesting ambient indoor electromagnetic energy available at 2.4 GHz. The RF sources for indoor energy harvesting typically include Wi-Fi routers/WLAN Access points and Bluetooth devices capable of transmitting nearly 10-20 dBm power at 2.4 GHz. In indoor scenarios, the received power by the rectenna module can be maximized by placing the receiver and transmitter modules at an optimal distance *d* thereby reducing the Free Space Path Loss (FSPL) effect to some extent in non-uniform indoor scenarios.

The main focus of the antenna design novelty is to develop a miniaturized CCP MSPA with high gain and an appropriate amplitude taper in the ISM band (2.4 - 2.5 GHz), which would be capable of harvesting sufficient power from any direction, thus improving the battery life in IoT systems. An affordable power management and voltage regulation unit will be introduced to boost up the low rectified DC output (typically of the order of mV) to the order of usable 3-4V. The rectified output will then be utilized to power IoT enabled sensor nodes such as temperature, humidity, ambient light, motion detectors etc. for smart indoor applications. as shown in Fig.1.

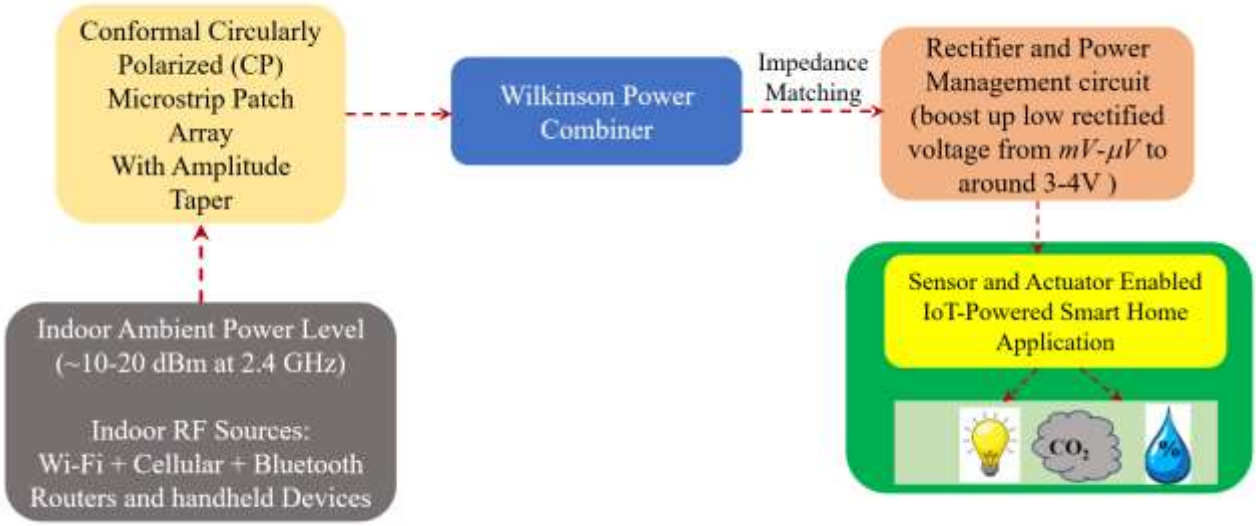

Figure 1. Block diagram of the 2.4 GHz Energy Efficient Indoor RF Harvesting System for IoT-Powered Smart Indoor Applications