Gigabit Backscatter Modulator with Wireless Power Transmission Capabilities

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The rapid increase in the progress and development of wireless communications and identification has led to the increase of billions of devices figuring the Internet of Things (IoT). Low power wireless sensors, passive-backscatter radios such as passive RFIDs, RFID-enabled sensors and passive wireless sensors are seen as key-enabling technologies to realize the future ubiquitous IoT.

Our work presents a system composed of a backscatter modulator at 2.45 GHz with data rates up to gigabit which is shown in Figure 1. Moreover, a rectifier that is capable of converting the RF signal into DC power also composes the system. The proposed system enables low power consumption, while maintaining a high modulation bandwidth (16-QAM).

This system will improve the design of novel wireless communication techniques to achieve higher data rates while simultaneously minimize the energy consumption. The energy consumption per bit of this modulator can be as low as 0.33 pJ for a data rate of 960 Mb/s with an EVM of 12.8% as can be seen in Figure 2. The EVM can be decreased if the data rate is lower thereby increasing the energy consumption per bit. The system, due to the rectifier block has demonstrated some WPT capabilities. With all these features this system is suitable for providing high-bandwidth for future low power devices.

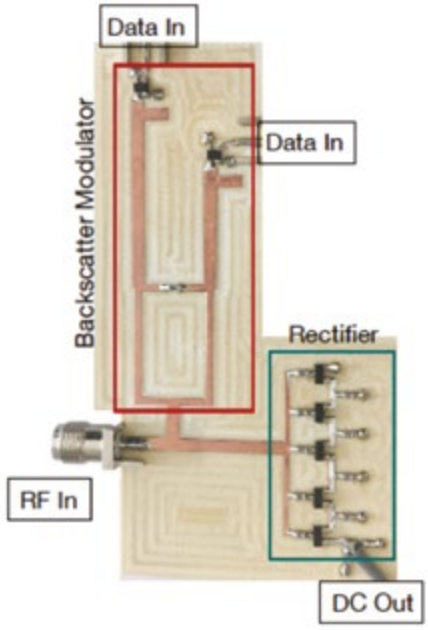

FIGURE 1
Photograph of the proposed system, composed by a 16-QAM modulator and a rectifier.

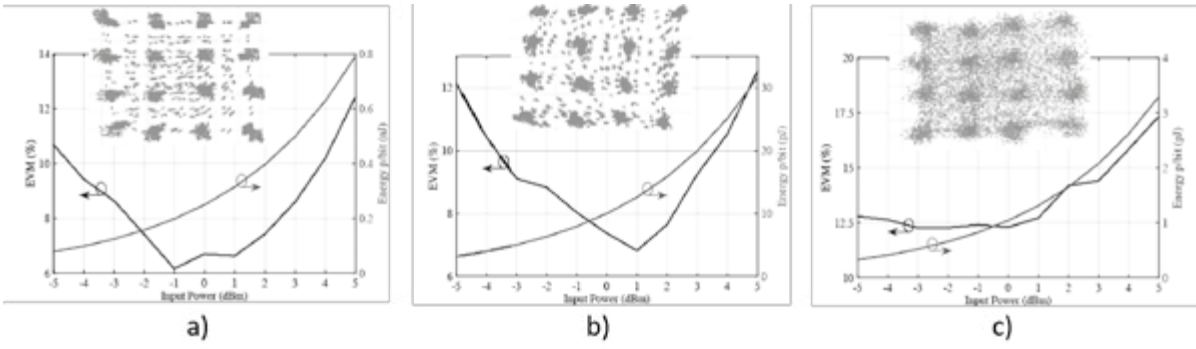

FIGURE 2
Received constellations with EVM and energy per bit consumption as function of input power for different data rates. (a) 4~Mb/s. (b) 100~Mb/s. (c) 960~Mb/s.