Design & Simulation of Zigbee Transceiver System Based on MSK and QPSK Using Matlab

Kapil Dev Jha and Mohit Kumar Srivastava

Abstract: ZigBee technology was developed for special wireless networks where Bluetooth & wi-fi technologies are not showing where we need to transmit low data rate information in comparatively large area (10-100 m) [1]. We can use Zigbee transceiver system instead of other technologies. As the functionality of SimpliciTI and Zigbee Technology is similar still we are preferring Zigbee system. So this paper will show that how Zigbee technology is different from SimpliciTI and other wireless networking technologies and what are basic advantages of Zigbee technology over other systems. To design the Zigbee transceiver system different modulation techniques can be used. In this paper, the design methodology and simulation results of ZigBee transceiver at physical layer are presented using MSK modulation technique [6].

Keywords- IEEE 802.15.4, SimpliciTI, MSK, Zigbee.

I. INTRODUCTION

ZigBee is a home-area network designed specifically to replace the proliferation of individual remote controls. ZigBee was created to satisfy the market need for a cost-efficient, standards-based wireless network that supports low data rates, low power consumption, security, and reliability. To address this need, the ZigBee Alliance, an industry working group is developing standardized application software on top of the IEEE 802.15.4 wireless standard. Zigbee standard is basically design for low cost, low power consuming & low data rate required system. Zigbee standard is placed in Physical and Medium Access Layer (MAC). As Zigbee is an standard of Zigbee Alliance. Higher layer specified in the Zigbee standard is for industry alliance.

The application of Zigbee Technology can be seen in home monitoring system, climate sensors communication, collection of data in small area in research field & industrial control etc. The major application of Zigbee transceiver is shown in wireless sensor networking and automatic control system such as home controlling, biotelemetry, personal caring (for senior citizens) etc. Home, industry and other organization automation is the major application of Zigbee transmission. Light (Power) control, Light machinery control, SCADA networking etc are some more.

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Here a comparatively analysis of Zigbee, Bluetooth and Wi-Fi technology is also present that will help us that how

Zigbee is different than other wireless networking technologies [3]:

TABLE 1: COMPARISON OF ZIGBEE WITH OTHER NETWORKING SYSTEMS

System	Zigbee	Bluetooth	Wi-fi
Application	Monitoring & Control	Cable Replacement	Internet
System Resources	4-32 KB	250 KB	1 MB+
Battery Life (Days)	100s-1000	1-7	Hours
Node in Network	255/65K	7	32
Baseband (kb/s)	20-250	720	11 Mbps
Distance	1-100m	1-10m	100m
Key Characteristics	Stability low Consumption low cost	Price, Easy use, High Data Rate	Very High Speed Large Network

II. COMPARISON WITH SIMPLICITI

SimpliciTI is Texas Instruments proprietary network protocol for low-power radio frequency wireless communication. Main properties of SimpliciTI are, Low cost which means that SimpliciTI network protocol can be implemented in systems with small memory capacity. Flexibility is achieved by multiple network topologies namely star and peer-to-peer. The basic Application Programmers Interface (API) makes SimpliciTI simple to be used. Wide selection of transceiver chips made to work with SimpliciTI operating in sub-1GHz frequencies and in 2.4 GHz band makes this protocol versatile. Finally very low current consumption in sleep state makes SimpliciTI very well suited for battery powered applications. SimpliciTI and ZigBee modules have slightly different characteristics. ZigBee has greater range but power consumption in sleep state is higher than SimpliciTI module. Both modules can be battery powered and both are small in size. However ZigBee has more peripherals, so in complicated personal area network zigbee module is more preferable than any o ther technology [4].

III. CONSTRUCTION OF TRANSCEIVER

The implementation was built on Matlab/Simulink usingfundamental components in Simulink to demonstrate how reliably complex modulation schemes can be built, cost effectively and efficiently [5]. The design of ZigBee

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