ABSTRACT

This paper discusses about estimation of glucose concentration in blood using a Triple pole Complementary split ring resonator (TP-CSRR) antenna. Glucose concentration in blood is the direct indicator of Diabetes disease. The designed microstrip antenna operates in range of 2-5 Ghz and has a resonance frequency of 3.35 Ghz when simulated. When the antenna is excited, blood acts as dielectric load to it. Hence the glucose concentration of blood affects the resonant frequency and amplitude at resonant frequency of the s21 parameter of the antenna. Using this information, we can estimate the glucose concentration of blood sample. Debye model was used to model the blood. It is effective in detecting glucose concentration of Type-2 diabetes (70-120 mg/dL). The amplitude sensitivity is 0.58 dB(mg/ml) and frequency sensitivity is 583 Mhz/(mg/ml**).**

1. INTRODUCTION

Diabetes is a growing disease across the world [2]. With changing lifestyles this disease is spreading its arms into the younger generation too, taking a toll to their happiness. Over 422 million are suffering from diabetes across the world and the rate at which the numbers are rising is baffling. Diabetes is considered as metabolic disorder of hormone insulin production by pancreas gland. This hormone helps cells absorb glucose in blood. So, due to lack of this hormone the glucose level in blood rises making it an apt indicator to test for.

The blood glucose concentration is clinically measured to in mg/dL units i.e., milligrams of glucose in per decilitre of blood sample. In fasting glucose concentration of 100-125 mg/dL is considered normal and more than 126 mg/dL is considered as Hyperglycaemia. A concentration less than 100 mg/dL is considered as Hypoglycaemia and this too need medical attention.

The current prevalent method of glucose testing involves BGL measurements and can't be used to test the glucose levels in live time. Making Glucose concentration testing easier and chemical free is an hour of need with rising number of patients. The test must be made easier. This paper is one step towards that attempt.

The primary objective of this antenna is to detect blood glucose level around 80-180 mg/dL. The dielectric permittivity of blood changes with varying glucose levels. This blood acts as a dielectric load to the antenna and causes change in amplitude at resonance frequency of s21. The blood container shown in figure is made of Pexaglass material and it along with blood in it acts as dielectric load. The paper organized as follows: Chapter 2 discusses about proposed biosensor and its measurements. Chapter 3 extensively tells how blood was modelled using the Debye model and MATLAB code to find the blood concentrations where we need it. Chapter 4,5,6 discusses about the Performance and sensitivity calculation of the given sensor and we conclude the paper in chapter 7.