Rancang bangun antena tekstil magnetik untuk aplikasi komunikasi telemedis nirkabel = Design of magnetic textile antenna for wireless medical communication applications / Rofan Aziz

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Abstrak

ABSTRAK
Penggunaan peralatan telemedis memiliki kelebihan karena kebutuhan daya yang kecil dan dapat digunakan secara portabel. Salah satu alternatif pemilihan bahan antena untuk sistem wearable applications adalah dengan menggunakan antena tekstil. Pada tesis ini dilakukan rancang bangun antena tekstiltipe magnetik pada frekuensi 2,45GHz dengan menggunakan desain yang terinspirasi dari motif batik mega mendung (batik Cirebon), serta penggunaan model tubuh manusia berupa phantom untuk mengetahui pengaruh tubuh manusia terhadap kinerja antena yang diletakkan di dekatnya. Dalam tesis ini, dirancang dua tipe antena yang bersifat magnetik yaitu microstrip spiral antenna (tipe-1) dan microstrip spiral slot antenna (tipe-2) menggunakan metode finite integration technique (FIT).Berdasarkan analisis dari hasil simulasi, antena tipe-1 dantipe-2 memilikikecenderungan sebagai antena magnetik, dimana hal ini dapat dilihat dari besaranintensitas medan listrik (E) dan medan magnet (H) pada area di sekitar medan dekat (near field) antena. Hasil simulasi dan pengukuran menunjukkan hasil unjuk kerja antena tipe-1 memiliki frekuensi resonansi di 2,45 GHz,dengan nilai|S11|berturut-turut24,15 dB dan12,09 dBdi udara bebas.Bandwidth impedansi (VSWR  2)sebesar 27,10 MHz (1,1%) dan 40 MHz (1,6%) berturut-turut untuk simulasi dan pengukuran.Gain antena didapatkan 0,96 dBi (simulasi) dan 0,42 dBi (pengukuran).Ketika antena tipe-1 ini diletakkan di dekat model tubuh manusia (phantom) didapatkan nilai specific absorption rate (SAR) sebesar 0,00083 W/Kg pada standar 10g rata-rata jaringan tubuhdengan daya masukan 1 mW. Pada antena tipe-2, hasil simulasi dan pengukuran menunjukkan unjuk kerja |S11| berturut-tutut sebesar -21,61 dB dan -24,19 dB. Bandwidth impedansi sebesar 52,90 MHz (2,1%) dan 43 MHz (1,76%) berturut-turut untuk simulasi dan pengukuran. Gain antena pada simulasi 10,68 dBi, sedangkan hasil pengukuran didapatkan 12,73 dBi karena fabrikasi antena dikerjakan secara manual. Simulasi SAR memperlihatkan nilai 0,03029 W/Kg (10g rata-rata jaringan tubuh) jika diberikan daya masukan 1 mW.
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ABSTRACT
Currently, the use of wireless telemedicine equipment is greatly developed due to some advantages such as low power and its portability. To be used for wearable applications, telemedicine requires a suitable device that is comfortable for attaching on the human body. To do that, textile-type device is usually proposed, of which a textile antenna is required. This thesis proposes a magnetic-type textile antenna at 2.45 GHz, where the antenna design is basically inspired by traditional Cirebon batik style called mega mendung. The proposed antenna is put in the proximity of the human body model (called a phantom), in order to investigate the body effect on the antenna performances. In this thesis, two structures of magnetic antenna, namely a microstrip spiral antenna as an antenna type-1 and a microstrip spiral slot antenna as type-2, are numerically analyzed by the use of finite integration technique (FIT). According to the simulation results, both of the proposed antennas tend to have magnetic properties as the magnetic-type antenna has, which it

can be seen from the electric and magnetic fields intensity within the near field region. The simulated and measured results show that the antenna type-1 resonates at 2.45 GHz in free space with |S11| is -24.15 dB and -12.09 dB, respectively. The impedance bandwidth is 27.10 MHz (1.1%) and 40 MHz (1.6%) for simulated and measured result, respectively. The antenna gain is 0.96 dBi (simulation) and 0.42 dBi (measurement) without any human body is present. When the human body model is put in proximity to the antenna and 1 mW of input power is given to the antenna, very small value of specific absorption rate (SAR) by 0.00083 W/Kg is obtained for 10g-tissue averaged standard. As for antenna type-2, the simulated and measured results show that it resonates at 2.45 GHz in free space with |S11| is -21.61 dB and -24.19 dB, respectively. The impedance bandwidth is 52.90 MHz (2.1%) and 43 MHz (1.76%) for simulated and measured result, respectively. The antenna gain is 10.68 dBi for simulation and 12.73 dBi for measurement since the fabricated antenna is manually manufactured. The simulated SAR value by 0.03029 W/Kg (10g-tissue averaged standard) is obtained when the input power of 1 mW is given