ABSTRACT

Health is important for everyone. However, it is undeniable that everyone has experienced pain, ranging from mild to severe illness. Considering Indonesia's geographical conditions to date, there are still some areas that are difficult to reach by health services such as health centers or hospitals because they are constrained by road access which is extreme and far, so it takes quite a long time to reach health services. Therefore, we need a biomedical technology that is combined with textile antennas so that it can be accessed over long distances to reach people who need health services in the area.

The textile antenna in this final project uses two different types of substrates, namely silk and cordura. The two fabrics were chosen as the antenna substrate material because they are affordable, light, and are the types of fabric used daily by people in rural areas. In the manufacture of the substrate, each type of fabric is stacked to increase the thickness of the substrate in order to increase the gain and bandwidth of the antenna, while the radiating element uses copper threads, which are sewn directly on the substrate manually, so that the resulting textile antenna is more flexible.

Both types of textile antennas work at Industrial, Scientific, and Medical (ISM) frequencies with the dimensions of each antenna being 35 mm × 35 mm × 1.5 mm. The difference in the dimensions of the two textile antennas lies in the patch size, while the other antenna dimensions have the same size. This aims to facilitate the process of comparing the two textile antennas. The antenna with silk substrate has a dielectric constant (ε_r) of 1.75, while the antenna with a cordura substrate has a relative permittivity (ε_r) of 1.9. In this final project, the antenna is simulated and fabricated, then measured in free space and on-body conditions. The antenna is also tested for flexibility to determine the antenna's performance when it is bent. In addition, a Specific Absorption Rate (SAR) simulation was also carried out to determine the safety of the antenna when used on the forearm. Based on the simulation results and measurements under various conditions described above, the two textile antennas have a VSWR $\leq$ 2, a gain $\geq$ 2 dBi, a

unidirectional radiation pattern, a SAR ≤ 1.6 W/kg, and operate at a frequency of 5.8 GHz. Therefore, both textile antennas have good performance in conditions of free space, on-body, and bending and are safe to use on the forearm of the human body.

Keywords: Textile antenna, fabric substrate, copper yarn, ISM, SAR, biomedical