

bandwidth. Figure 2 shows the effects of the slots and blending edge on the ground plane towards the reflection coefficients.

According to Figure 2, the initial coplanar waveguide (CPW) ground plane without any slot gives some band rejections. However, while the two symmetrical slots at the side of the ground plane are added, there is improvement of reflection coefficients for the frequency lower than 4 GHz. Furthermore, with the addition of slots at the top side of the ground plane, this enhances the bandwidth for the entire frequency from 1.57 GHz up to 6 GHz. Even though there is slight improvement by having the blending ground plane, it is however improve the reflection coefficient to the lower values and helps the antenna to operate from 1.46 GHz to 6 GHz.

3. RESULT AND DISCUSSION

The antenna is observed on its reflection coefficient and gain. Based on the previous section, it has been determined that the antenna may operates from 1.46 GHz to 6 GHz which covers 4540 MHz bandwidth. The gain of the antenna increases with the frequency from 1.5 to 7 dBi, except at 4 GHz as presented in Figure 3. However, the gain of the antenna is acceptable for microwave imaging purpose.

In addition, radiation patterns of the wideband textile antenna have been simulated and the results are shown in Figure 4. The simulated radiation patterns at $\phi = 90$ (E -plane) and $\phi = 0$ (H -plane) for 2, 4, and 6 GHz are presented. All the results show bi-directional radiation patterns

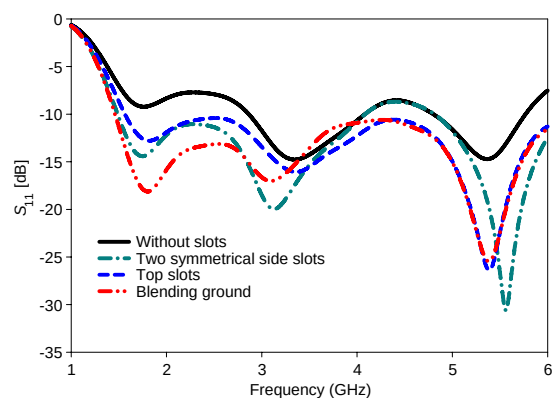


Figure 2: The implementation effects of slots and blending edges on the ground plane.

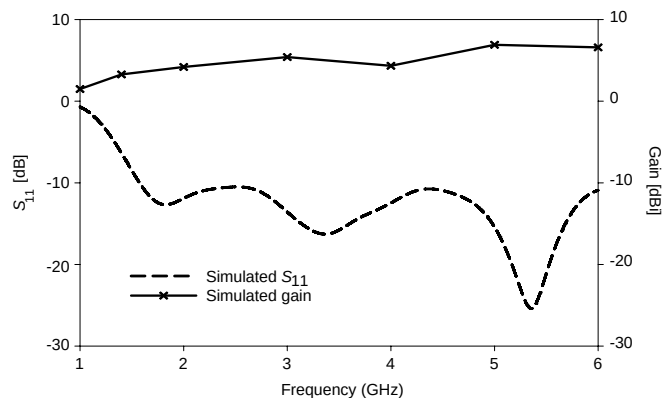


Figure 3: Simulated gain and reflection coefficient magnitudes of the wideband antenna.

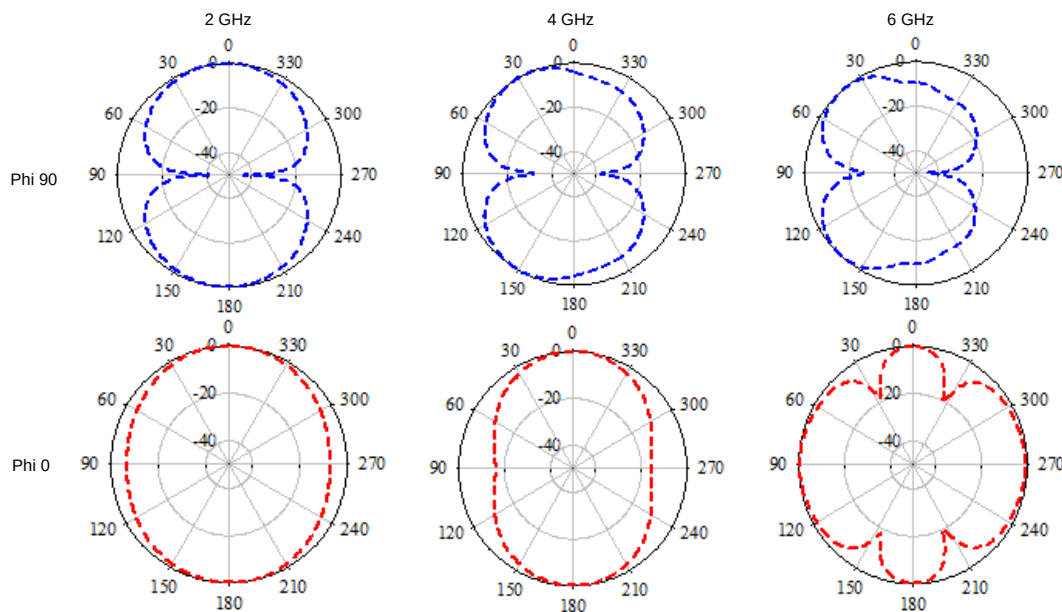


Figure 4: Simulated radiation patterns of the wideband antenna.

at $\Phi = 90^\circ$, while it shows nearly omni-directional at $\Phi = 0^\circ$ at 2 GHz. At the frequency of 4 GHz and 6 GHz, the radiation patterns are different as shown in Figure 4. Moreover, the efficiencies of the antenna changes between 73% and 90% throughout the frequencies.

4. CONCLUSION

Antenna which based on textile material is proposed for microwave imaging. The antenna may operate from as low as 1.46 GHz to 6 GHz, provided with the acceptable gain values. The antenna which is textile based material provides flexibility features of microwave imaging. This will benefit to various shapes and parts of human body microwave imaging application.

ACKNOWLEDGMENT

The authors would like to thank the Ministry of Science, Technology An Innovation (MOSTI) under Science Fund (Vote 4S056: Development of Head Monitoring System Using Array Transceiver for Microwave Imaging Application), Minister of Higher Education (MOHE) and Universiti Teknologi Malaysia for funding this project under GUP Grant (Vote 00M21, Vote 00M22, Vote 04H36 and Vote 05H34). Besides, thanks to the members of Wireless Communication Center (WCC), UTM for helping and providing resources to enable this work to be completed. Authors also would like to thanks to Universiti Tun Hussein Onn Malaysia for the sponsor.

REFERENCES

1. Pastorino, M., *Microwave Imaging*, John Wiley & Sons, 2010.
2. Mahalakshmi, N., N. Indira, and P. Vasikaran, "Design and development of stacked patch antenna for breast cancer detection," *Int. Conf. Work. Emerg. Trends Technol. (ICWET 2011)*, 1150–1152, 2011.
3. Yu, J., M. Yuan, and Q. H. Liu, "A wideband half oval patch antenna for breast imaging," *Progress In Electromagnetics Research*, Vol. 98, 1–13, 2009.
4. Yang, F. and A. Mohan, "Microwave imaging for breast cancer detection using Vivaldi antenna array," *2012 International Symposium on Antennas and Propagation (ISAP)*, 479–482, 2012.
5. Zhang, H. and A. El-Rayis, "A smart antenna array for brain cancer detection," *2011 Loughborough Antennas and Propagation Conference (LAPC)*, 1–4, Nov. 2011.
6. Zhang, H. and B. Flynn, "Microwave imaging for brain tumour detection using an UWB Vivaldi antenna array," *2012 Loughborough Antennas and Propagation Conference (LAPC)*, 1–4, Nov. 2012.
7. Mohammed, B. and A. Abbosh, "Wideband antenna for microwave imaging of brain," *International Conference Series on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP)*, 17–20, 2011.
8. Kamarudin, M. R., Y. I. Nechayev, and P. S. Hall, "Onbody diversity and angle of arrival using a pattern switching antenna," *IEEE Transactions on Antenna and Propagation*, Vol. 57, No. 4, 964–971, Apr. 2009.