ABSTRACT

The role of a radar (Radio Detection and Ranging) to detect the objects behind the wall is needed for unexpected cases, especially the evacuation process. It is related to the decision-making that must be fast when the process takes place, e.g. when fire, earthquake, or robbery happened. In its function of detecting objects, radar requires good accuracy and sensitivity in order to obtain the radio image of the target. To achieve this case, the emitted bandwidth must be wide so that an antenna that accommodates it, is required. The desired transmit pattern of a through wall radar antenna is unidirectional, whose function is to detect objects just behind the wall.

This study designs the Vivaldi Ultra Wide-Band (UWB) microstrip antenna, because in its use the radar requires a low profile antenna. UWB technology plays a very important role in through wall radar, because with wide bandwidth, the narrow UWB pulse characteristics will support high resolution. An antipodal patch configuration will support microstrip line feeding, while the addition of circular load on each Vivaldi arm will increase the bandwidth, especially at lower frequency.

The design of the antenna is done by simulation using software, and realized with Rogers Duroid 5880 dielectric substrate with 2,2 dielectric constant and thickness of 1,575 mm. The antenna simulation works from range of 3.1 – 10.6 GHz frequency, so the antenna is categorized as ultra wide bandwidth with a gain of 9.98 dB. At the realized and measured antenna, the return loss and VSWR are less than -10 dB and 2 respectively along range of 3.1 – 10.6 GHz frequency, thus it makes sufficients for the permitted UWB radar operation.

Keywords: Vivaldi antenna, antipodal circular, UWB, through wall radar