A SUSPENDED SOLAR PATCH ARRAY FED OFFSET REFLECTOR ANTENNA

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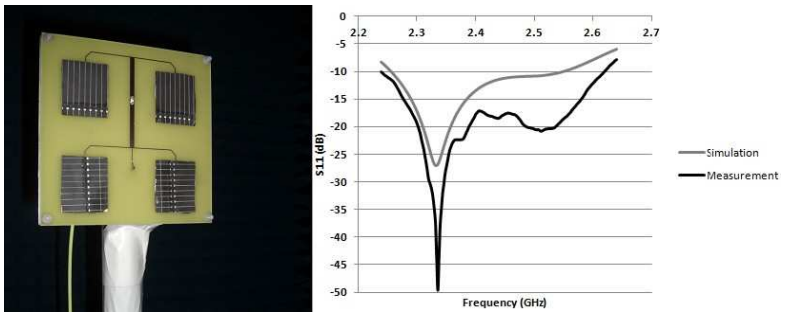
With the increasing demands for renewable energy sources, as a sustainable carbon-free alternative to fossil fuels, the technological development of photovoltaic systems has resulted in a significant increase in the number and quality of scientific research conducted within the area of solar energy, which is one of the most eco-friendly renewable energy sources in the world.

Microstrip antennas, on the other hand, have drawn much attention in terrestrial and satellite communication systems and are widely used at microwave frequencies as they bring various kinds of advantages together, like being in low profile and low-cost to manufacture, and having a simple design process.

A considerable amount of research has been undertaken recently to combine solar cells with microwave antennas, mostly with microstrip patches, into a single compact design, which is capable of receiving and transmitting RF / microwave signals whilst providing some DC power output at the same time. The idea behind the incorporation of solar cells with microwave antennas is to overcome the difficulties caused by the use of autonomous communication systems, in which solar cells and antennas are two separate devices, and to create cost effective and low-profile designs.

In this work, an offset parabolic reflector antenna fed by a suspended solar patch array is presented. The fabricated solar feed antenna has an FR4 substrate, which has been raised up by 5mm over the ground plane, and an array of 4 solar cells, which have been swapped with traditional copper patches within the design. The solar feed antenna with the measured S11pattern is shown in Fig. 1.

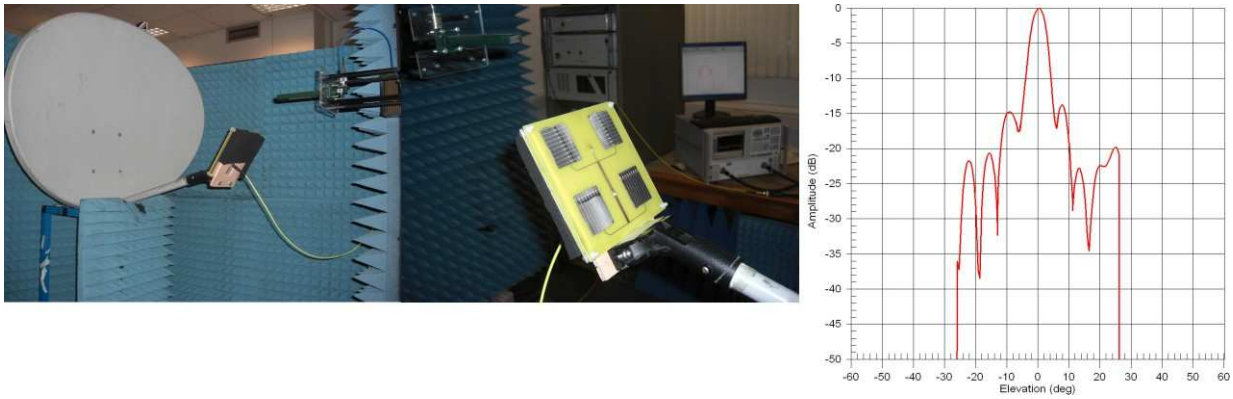


(a) (b)

Fig. 1. (a) The fabricated suspended solar patch antenna (b) Simulated and measured S11 patterns

As can be seen in Fig. 1, the solar patch feed antenna has got a measured bandwidth of 380MHz, starting from 2.24GHz up to 2.62GHz, enabling the antenna to operate at the frequencies of 2.3GHz and 2.45GHz, required for 2.3GHz band Wimax and 2.45GHz band WLAN applications.

Fig. 2 illustrates the dish fed by using the fabricated solar patch antenna and the far-field measurement result of the reflector antenna taken at the centre frequency of 2.45GHz.



(a) (b) (c)

Fig. 2. (a) The overall view of the reflector antenna fed by solar patch (b) Solar patch feed antenna (c) Measured radiation pattern