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CERAMICS ANTENNA THE FUTURE OF WIRELESS TECHNOLOGY

PENANG, December 2015 – The rapid development in wireless technology has currently forced the research on antenna technology to look into the techniques and design of antennas of various sizes to suit the existing technological advancements.

An expert in Micro Wave Engineering from Universiti Sains Malaysia (USM) Professor Dr. Mohd Fadzil Ain, found that ceramics which is widely used in the production of food utensils such as plates and cups now has the potential to be used as a high-performance dielectric antenna for wireless telecommunications.

According to Mohd Fadzil, the dielectric resonator antenna which is roughly the size of a button is applicable to any frequency and different systems such as WiFi, Wireless Bridge, WiMax, Radar and wireless sensors.

“Dielectric ceramic materials are suitable for various types of radio frequency, in high-powered microwave applications from commercial AM/FM radio transmitters to frequency filters used in wireless cellular systems, antenna products, dielectric resonators and microwave radar systems,” he stated.

Explaining in his Professorial Appointment Public Lecture here recently, Mohd Fadzil stated that the dielectric resonator antenna which utilises ceramics is capable of replacing conventional metal-based materials used in the production of antennas.

Others who attended the Public Lecture were the Director of the Engineering Campus USM, Professor Dr. Zainal Arifin Mohd Ishak and Dean of the School of Electrical and Electronics Engineering USM, Professor Dr. Mohd Zaid Abdullah.

The ceramics is produced from basic materials such as titanium oxide, copper oxide and calcium carbonate, which were produced in the laboratory before being installed on the circuit board with a copper band feeder to become an antenna.

“The construction of the antenna too is fairly simple. The ceramic antenna is fixed on a printed circuit board (PCB), while the copper wiring would connect the flow from the antenna to the connector head,” he said.

Mohd Fadzil added, the trans-disciplinary research has been conducted by combining the expertise from the School of Electrical and Electronics Engineering and the School of Materials and Mineral Resources Engineering, to seek for materials with the potential to be used for the current wireless systems.

He added, although it is small compared to a metal antenna, this product has proven to be able to extend the transmission range of existing products and having broad bandwidth capacity as well as a highly-efficient radiation rate.

"Tests carried out on the WLAN system operating at the frequency of 2.5 GHz and the Wireless Bridge system operating at 5.8 GHz, showed an increase in the transmission range by 25 metres as compared to an ordinary antenna," he explained.

In his lecture entitled "Ceramics Antenna: Antenna for the Future" (Antena Seramik: Antena Masa Hadapan), Mohd Fadzil stated that one advantage of the dielectric resonator antenna was that it was highly-adaptable, allowing it to fulfil various physical or electrical requirements for communication systems applications.

"Other than the ceramics antenna being a totally localised research product, other factors which would contribute to its advantages to the users would be the low manufacturing cost of the dielectric resonator.

"It has the potential to be used in various wireless communications systems and this would allow the telecommunication service providers to offer services without the need for the construction of telecommunication towers as the current practice," stressed Mohd Fadzil who hailed from Baling, Kedah.

According to him, there is a plan in the future to increase the capability of the ceramics antenna for a high powered transmission, for instance in replacing the current metal dish used by paid television stations at present.

The research which began in 2006 and funded by the Fundamental Research Grant Scheme (FRGS) from the Ministry of Higher Education has won seven invention and innovation awards locally and abroad.

Among them were Gold Medal at the Malaysia Technology Expo 2008, Seoul International Invention Fair 2008 in Korea (Gold), International Trade Fair IENA 2009 in Germany (Gold) and Silver Medal at the Pecipta Innovation 2009 Exhibition in Kuala Lumpur.

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