New Method For Design Of Microwave Filters To Improve Communications And Wireless Detection Systems

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What does a microwave oven have in common with radar, satellite communications, mobile telephony or wireless systems? They all use microwaves and millimetric waves for their functioning. In his PhD thesis, "New techniques for the synthesis of microwave devices based on mode-coupling theory", Mr Israel Arnedo Gil, a telecommunications engineering graduate from the Public University of Navarre (UPNA), proposed a new method for the design of microwave filters, essential devices for controlling the quantity of energy and time needed to go from one point of the system to another. His research work has enabled the enhancement of specific applications and obtaining an international patent for exploitation rights.

Microwave circuits and millimetric waves are used to generate, process and detect electromagnetic signals within a specific frequency range - between 1GHz and 300 GHz. Their applications are very diverse: radar (location of persons, weather forecast, air traffic or ground control); transmission of information (telephony, television, internet and data transfer) through terrestrial microwave links (booster station systems) and space links (satellite communications); wireless communications systems, heating of food and goods, and high-sensitivity receptors for radio-astronomy.

All these applications require a fundamental element: microwave filters. Their function, basically, is to allow certain electromagnetic waves pass through and block others. The goal of Mr Arnedo's PhD thesis was to enhance certain applications and he has achieved this by improving the tools used to design these filters.

Drawing a parallel with television, it can be said that, if to date the Makinde techniques for making filters have been in black and white, the synthesis technique developed by this engineer has brought us colour. Amongst the advantages of his method compared to the classical techniques is the fact that solutions, unavailable to date, have been found for problems; thes solutions are more robust as regards manufacturing and mass production and provide greater flexibility in the design of the filters.

Successful results for key devices

The synthesis tools designed by Mr Arnedo were used successfully in three groups of applications: in Ultra-Wideband (UWB) technology, in the space sector and in the processing of radar signals.

UWB technology is an evolution of wireless communications, providing much more

flexibility in use and service. It is also key to implementing advanced security systems (radio monitoring) and below earth detection (persons buried due to earthquakes, antipersonnel mines, etc). This is why it is of utmost importance that the design of emitters and receptors is optimum. In collaboration with the Institute National de la Recherche Scientifique (INRS-EMT) and McGill University in Montreal, Canada, Mr Arnedo has designed two devices that could be key for the generation (emitter) and reception (receptor) of UWB signals.

As regards the space sector, the way in which the Earth stations and satellites communicate with each other has to be optimum for the quality of the signal received (for example the television in our homes) to be high. In this vein, a robust technique for the design of filters has been put forward, providing improvements over the techniques currently used, both from the point of view of service as well as cost.

Finally, for wideband radar applications, the tools proposed have enabled designing an optimum device for the analogical processing of high-speed signals, thus extending the possibilities of this technology from a practical perspective.

SOURCE [1]

Links:
[1] http://www.eurekalert.org/pub_releases/2010-05/ef-nmf052410.php