World's first tunable broadband RF device emerges

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A team of researchers from the Universitat Politecnica de Valencia's iTEAM in Spain has created the first, tunable broadband radio frequency (RF) photonic phase shifter. Because it is based on a single semiconductor element, the device will be cheap to manufacture and help save up to 80% on energy consumption. The findings of the study are published in the journal *Optics Express*.

José Capmany, the head of UPV's iTEAM, says there are two key significant factors of this contribution. 'The relevance of this contribution is twofold,' Dr Capmany says. 'First, a 75% reduction - in comparison with previous designs - in the number of components needed will make it possible to save some of the space that the phase shifter occupies when it is integrated into a chip, and, consequently, to save in the production cost too. Moreover, reducing the number of active elements from 5 to 1 means a saving in energy consumption of up to 80%.'

Experts say optical phase shifters for RF signals are important components for the installation of hybrid broadband telecommunication systems. They combine optic fibre transmission and radio transmission. They are the basis of convergence between networks, a required step for either accessing the Internet or swapping the orientation of radar and satellite antennas.

According to the researchers, there are several applications of the phase shifter, including radio astronomy and terrestrial satellites, as well as

radar antennas, ultra wideband communications, radio link systems and RF applications for automobiles. These applications help boost the flow of information transmission, effectively mitigating traffic and guaranteeing the best performance of the entire communication system.

Writing in the paper, the researchers say: 'In our particular case, within a bandwidth greater than 1 gigahertz can be achieved. Narrower filters would allow operating at lower frequencies but at the cost of using less frequency bandwidth. Investigations are being conducted to achieve broadband operation and provide output power equalisation.'

Commenting on the results, iTEAM researcher Salvador Sales says: 'Traditional phase shifters, based on microwave technologies, are limited in bandwidth and the possibility of tuning is also limited. By using photonic technology instead, we have been able to overcome both limitations.'

More information: Sancho, J., et al. (2011) 'Fully tunable 360° microwave photonic phase shifter based on a single semiconductor optical amplifier'. *Optics Express*, 19 (18): 17421. DOI: 10.1364/OE.19.017421

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