# Separate signals through optical fibres for ultrafast home network

**Dutch-sponsored researcher Christos Tsekrekos has investigated how a small network for at home or in a company can function optimally. His research analyses the MGDM technique (Mode Group Diversity Multiplexing) of the Eindhoven University of Technology.**

This technique transmits each TV, telephone and Internet signal via a separate group of light rays through the optical fibre cable. Such a technology has not yet been marketed. Yet in the ideal situation it could be applied in a glass or polymer fibre, has the potential of being cheap, and transmits all information without disruption.

Existing systems for small networks at home or in a company make use of multimode glass fibres or multimode polymer optical fibres (POF). The latter are relatively thick cables (about 1 mm thick, thus thicker than the glass fibre which is 0.125 um thick). Multimode fibre cables can conduct many light rays and can operate free of disruption and with a greater bandwidth than a wireless connection. However, due to a slight variation in the speed of the light rays through the multimode fibre, a signal transmitted by all of these rays becomes spread out. Consequently, the signals become broader and therefore fewer signals fit in the fibre, limiting the transmission capacity.

**Independent channels**

Tsekrekos investigated how the MGDM technique can increase the capacity of a multimode fibre network. He created independent channels by dividing the total group of light rays into groups of closely related light rays (or modes). Using special optical and electrical techniques, Tsekrekos investigated how the crosstalk between these groups could be eliminated so as to render these groups independent of each other.

This step allows several groups to be used in parallel, thereby increasing the fibre's capacity. Moreover, each group can transport its own type of signal, which means that TV, telephone and Internet signals can be transmitted though the same fibre.

Using this approach the researcher constructed a simple yet stable MGDM system. The system works well up to distances of 1 km of multimode glass fibre with a core diameter of 62.5 um. Tsekrekos invented a new mode-selective spatial filter (MSSF), based on lenses with specific characteristics, to make the system reliable and to allow a large number of channels to be realised. This can result in a stable and transparent five-channel MGDM system.

Philips, Draka Fibre, TNO-ICT, and several electrical contractors are supervising this project in the Technology Foundation STW users' committee. Philips and TNO-ICT are very interested in home networks that can flexibly transport a wide range of signals.

The MGDM technology together with thick multimode glass or polymer fibres will soon make it possible for consumers to simply install a universal and high capacity broadband network at home. Draka Fibre (in Eindhoven) considers the MGDM technology to be a highly promising means of obtaining even more capacity and possible applications out of this type of fibre. Further research should lead to a greater increase of the multiplex factors in more complex network structures.

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