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/ Where ideas thrive

# Low-loss High-speed Data Transmission

For PCBs, ribbon cables and other applications

Case Ref: MOL-7671-20

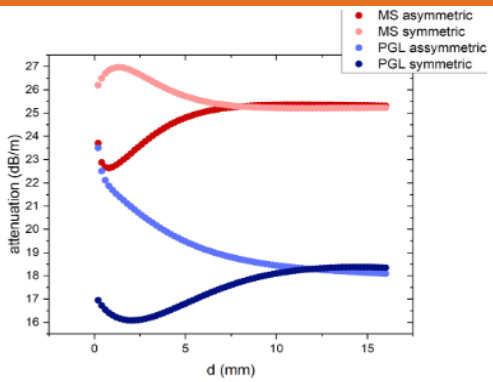


Fig 1

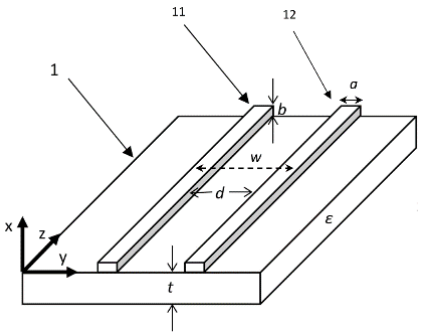


Fig 2

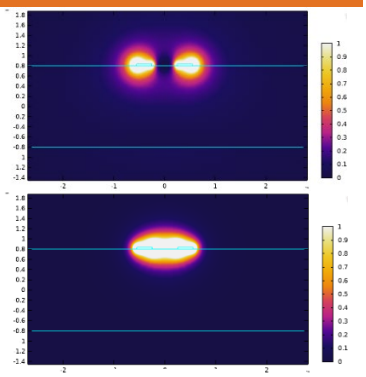

Fig 3

**The problem – increasing transmission losses as data rates increase (GHz and beyond)**

As data rates increase, performance limitations caused by high-frequency transmission losses become increasingly problematic. This is particularly relevant for traditional Micro Strip Line (MS) technology (see Fig 1), which uses ground planes.

Optical fibres are a solution for long-distance transmission but are not yet viable for data transmission on PCB or between near PCBs. There is a need for a technology to reduce transmission losses in and between existing PCB devices, such as servers, buses and integrated circuits, or to enable device performance to be extended to higher data rates, but also increased efficiencies to be realised at lower data rates.

**The solution – a pair of "Goubau" transmission lines**

Professor Mike Payne and his team at the University of Cambridge have developed a new data transmission design based on a pair of Goubau Lines – metallic tracks or wires with a carefully defined separation, tailored to the frequency of the transmitted data (see Fig 2). By using an appropriate antenna as a "launcher" and tailoring the design of the conductors, a new propagation mode with unexpectedly low transmission losses has been achieved.

**Benefits**

1. Extending use of PCBs and ribbon cables to higher data rate applications (multi-gigabit per second data) with reduced losses.
2. More efficient PCB designs without using ground plane, reducing power losses – eg. 7dB improvement shown in Fig 1 could correspond to power savings of up to 80%.
3. Simple fabrication, just requires use of carefully defined design parameters.

**Example data**

The conductors form a shared field with very low radiation outside the conductor pair (see Fig 3). For 10GHz data transmission, the optimum separation of the conductors is 2.5mm (see Fig 1) and achieve an attenuation of 15dB/m. Scaling is linear so optimum separation for 20GHz would be 1.25mm with attenuation of 15dB/0.5m; for 100GHz separation would be 0.25mm with attenuation of 15dB/10cm.

**Potential Applications**

PCBs, ribbon cables and others. Possible application within integrated circuits is under investigation.

**Commercialisation**

This technology has been published and is protected by GB patent application GB2101300.8.

We are looking for collaboration with commercial partners interested in working with us to develop this technology.

**Professor Mike Payne**

Professor Payne is Chair of Computational Physics at the University of Cambridge. The commercialisation of his CASTEP and ONETEP atomic modelling software via DS have made him one of Cambridge University's most commercially successful academics.

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