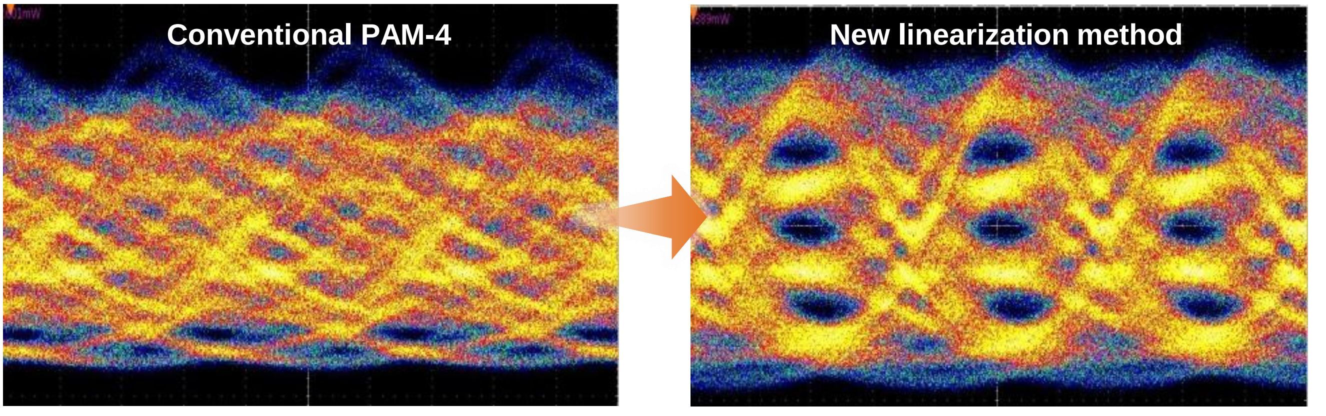
/Where ideas **thrive**

Enabling high data rate optical communications with directly-modulated lasers

Case Ref: Pen-7846-20



The problem - optical communication data rates are limited by laser non-linearities

As the demand for ever higher communication data rates increases, overcoming the performance limitations caused by the non-linear response of directly modulated lasers (DMLs) becomes more and more important.

Laser equalization methods have attempted to overcome the intrinsic high-frequency dynamic non-linearities of DMLs, including:

- non-linear equalizers;
- equalization using look-up tables; and
- machine learning algorithms.

These are either too complex or too power-hungry for use in low-cost transmitters.

The solution – modulate the drive current to linearize the laser output

Researchers at the University of Cambridge have created a linearization method that can significantly reduce the non-linearity of the optical output of DMLs, enabling higher data rate communications to be achieved.

By generating an approximation to the ideal modulation current that provides a linear optical output, performance very close to the ideal linear output can be achieved.

Benefits

1. Using lower cost lasers to reach equivalent performance
2. Higher data rates without non-linearity
3. Applicable to both analog and digital electronic schemes
4. Practical implementation due to large tolerance to parameter variations

Development stage and applications

Simulation studies and proof of principle demonstrations show that this innovative approach can achieve sufficient linearization at high rates (eg. PAM-4 at 100 Gb/s per wavelength) to significantly reduce the associated power penalties. Excellent parameter tolerances to make this approach viable in the real-world (pictured above).

Ideal applications include exploiting high-frequency DMLs that were previously limited by non-linearity, and lowering the cost of existing products by boosting performance of lower-frequency lasers.

Commercialisation

This technology is protected by priority patent application (GB2101011.1).

We are now looking for commercial partners interested in helping us develop this technology.

Professor Richard Penty

Richard Penty is Professor of Photonics in the Department of Engineering at the University of Cambridge. He specialises in short-reach photonic networks, working on ethernet standards and advanced modulation techniques for 100 Gbit/s photonic links.

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