Increasing the Capacity of Optical Nonlinear Interfering Channels: ICONIC

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Project Description

Optical fibers carry nearly all the world Internet traffic. However, the installed fibers are running out of capacity. This project will use communication information and coding theory to increase the capacity of these fibers, which will guarantee faster future broadband connections.

Research supported by the Netherlands Organisation for Scientific Research (NWO), VIDI Grant, project number 15685.

Industrial Partners (User Committee)

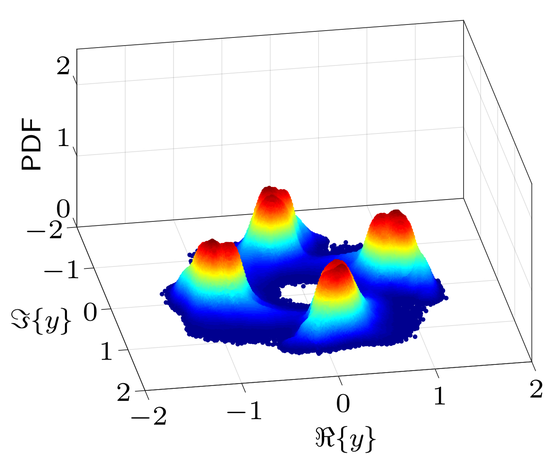
Dr. Karen Solis-Trapala

Dr. Hartmut Hafermann

Dr. David Millar

Dr. Laurent Schmalen (now with KIT)

New Channel Model for Optical Fibers



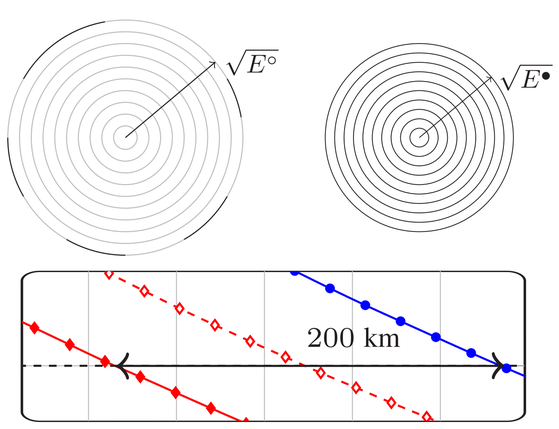
We developed a new model for the **highly-nonlinear** regime with low accumulated dispersion.

Possible Applications: Single-span transmission, low-dispersion fibers, PONs, O-band transmission.

Under review in nature COMMUNICATIONS

Preliminary results at ICTON 2019

Enumerative Sphere Shaping

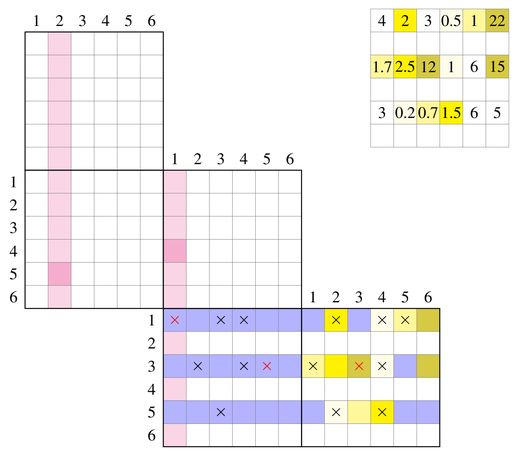


We have **pioneered** enumerative sphere shaping for optical communications. Reach gains up to **200 km** in comparison with previous methods are demonstrated.

JLT 2019 (to appear):

Experimental demonstration: (**post-deadline** OECC 20019)

Soft-aided Bit-marking Algorithm

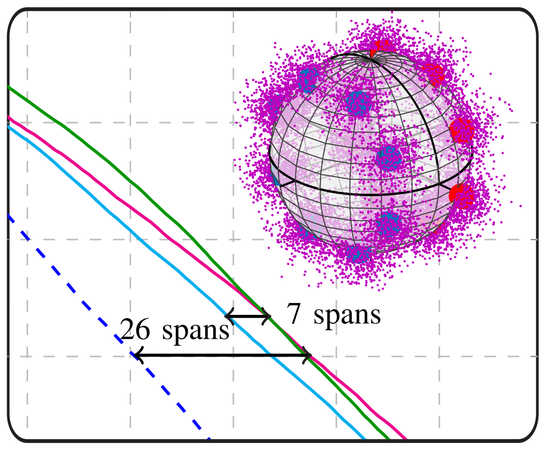


Hard-decision decoding of **staircase and product codes** is **low complexity**. We proposed a novel algorithm that uses **soft information** from the channel, while keeping **hard decision complexity** (patent pending). Reach increases of **240 km** were demonstrated.

TCOM 2019 (to appear):

Experimental demonstration:

8D Polarization-ring-switching (PRS)

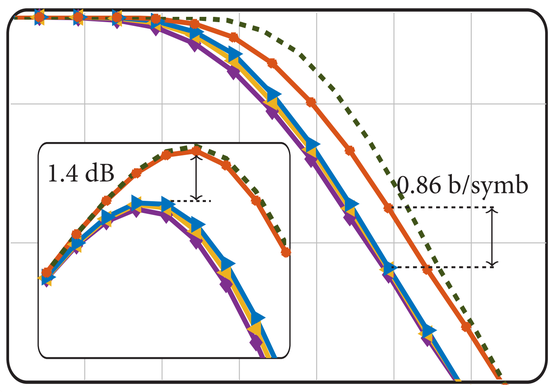


We have developed a **novel modulation format** (PRS) that exploits **8 dimensions** in optical transmission. **2000 km** reach increase in polarization-multiplexed transmission has been demonstrated.

PTL 2019 (to appear):

Experimental demonstration:

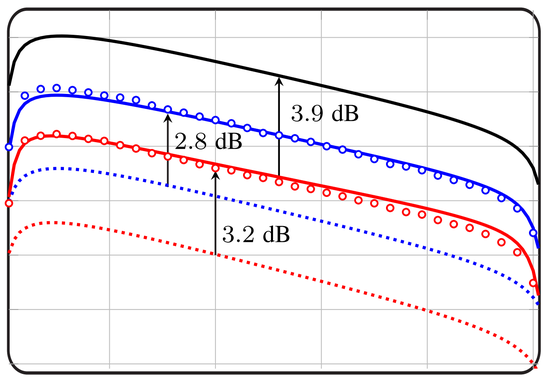
Complexity-constrained DBP



We used a **gradient-descent** algorithm to optimize **ultra low complexity** digital back propagation in single-span systems. Future work includes extending the method to multiple spans.

Munich Workshop on Information Theory of Optical Fiber 2018:

Ultrawideband Modelling



We developed a model that accounts for **stimulated Raman scattering** and provides an general and accurate prediction of the modulation format dependence of the **nonlinear interference**.

arXiv preprint:

Best Paper Award ACP 2018

Our work on **rate-adaptive** coded modulation and **geometrically-shaped** constellations received the **best paper award** at ACP 2018. Reach increases of **320 km** were reported.

ACP 2018 paper:

Best Paper Award OECC 2019

In collaboration with the **ECO** group at TU/e, we received the **best paper award** at OECC 2019. Transmisison over **11,700 km** at **4.8 bit/4D-sym** was demonstrated using our 4D PRS format.

OECC 2019 paper:

4D PRS Format: