**SASER-ADVAntage-Net**

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## Partners:

ADVA Optical Networking SE, Germany

Christian-Albrechts-University Kiel, Germany

Fraunhofer-Gesellschaft Heinrich-Hertz-Institut (HHI), Germany

Helmut-Schmidt-University Hamburg, Germany

VPIphotonics, Germany

TU Dortmund, Germany

University Ulm, Germany

## Co-ordinator:

Michael Eiselt

ADVA Optical Networking SE

E-mail: meiselt@advaoptical.com

## Project Website

www.celticplus.eu/project-saser-advantage-net

# Safe and Secure European Routing

SASER - ADVAntage-Net is one of the three sub-projects of the CELTIC Plus umbrella project SASER. The project investigates novel technologies for **flexible and secure optical metro and enterprise networks**, where flexibility is realized mostly in the optical domain: by software-based adaptation of electro-optical interfaces and by optical routing.

## Main focus

The SASER - ADVAntage-NET cluster will work on solutions for flexible and secure optical metro and company networks. In these networks, a flexible adaptation of electro-optic interfaces with respect to data rate and bandwidth will help improve future capacity and security requirements. Making the network more flexible and adaptive will improve the robustness against instantaneous increases in data traffic. This, in turn, will help preventing network outages from denial-of-service attacks.

During the course of the project, network and node architectures will be developed supporting flexible channel interfaces, and new concepts for optical layer encryption will be investigated.

## Approach

The project will investigate networking layer aspects of flexible networks, including network planning and operation considering multiple network layers. Furthermore, physical layer aspects will be considered, taking into account adaptive interfaces and flexible optical routing. Using an adaptive approach to optical modulation, the bandwidth of an optical signal carrying a fixed data rate can be adapted to the required link length by a software-initiated change of the modulation format. For instance, the currently standard modulation format of dual-polarization quadrature phase-shift keying (DP-QPSK), carrying 4 bits in each transmitted optical symbol, can be changed to a dual-polarization 16-level quadrature amplitude modulation (DP-16QAM) modulation format. This doubles the information content per symbol to 8 bits, but comes at the cost of reducing the transmission reach by a factor of four.
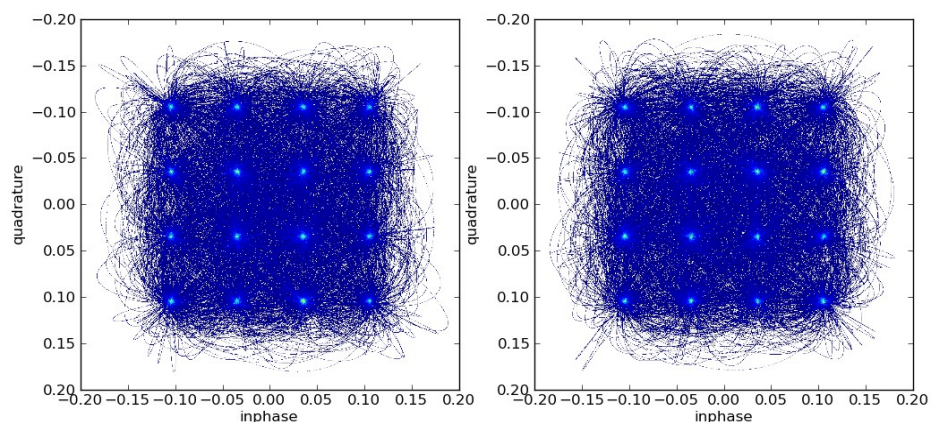


**Figure**: Constellation diagram with transitions of a dual-polarization 16-QAM signal. This modulation format is one of the options for adaptive rate transmission.

The constellation diagram of a DP-16QAM signal example is shown in the Figure.

An important aspect in metro and enterprise networks, supporting the requirements of business customers, are security considerations. Here, the project will investigate new approaches to improve network security on the physical layer. As an example, the non-interceptable transmission of a secret encryption key will be investigated.

The various aspects of the project will be demonstrated in laboratory and field test environments, and project results will be disseminated to be included in new standards and presented to potential customers.

## Main results

SASER-ADVAntage-NET will

♦ Develop new multi-layer concepts for routing in flexible networks,

♦ Investigate new methods for low-noise amplification in dynamic networks,

♦ Develop novel ways to introduce data security in the optical layer,

♦ Demonstrate rate-adaptive transmission in flexible networks to optimize bandwidth utilization.

## Impact

Results of the project SASER-ADVAntage-NET will be the basis to provide flexible and secure networking to companies and network operators worldwide. In cooperation with other SASER projects, ADVA Optical Networking as the main partner will work on exploitation of the results and on incorporation in the product portfolio. Scientific results will, via the academic partners, be used in students' education and publications. By introducing the project results into standardization groups, a wider dissemination and the basis for lower-cost high-volume technology will be achieved.

## About Celtic–Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World" paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies

or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to joine a Celtic-Plus project under certain conditions.

## Celtic Office

c/o Eurescom, Wieblinger Weg 19/4

69123 Heidelberg, Germany

Phone: +49 6221 989 210
E-mail: office@celticplus.eu
www.celticplus.eu

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