Terahertz Waveform Synthesis and Analysis Using Hybrid Photonic-Electronic Circuits

Fact Sheet

Project Information

TeraSHAPE

Grant agreement ID: 773248

Project website

DOI
10.3030/773248

Project closed

EC signature date
22 February 2018

Start date
1 May 2018

End date
30 April 2023

Funded under
EXCELLENT SCIENCE - European Research Council (ERC)

Total cost
€ 2 498 954,00

EU contribution
€ 2 498 954,00

Coordinated by
KARLSRUHER INSTITUT FUER TECHNOLOGIE
Germany

Objective

Generation, detection, and processing of electromagnetic waveforms is one the most important tech-nical foundations of modern society. Digital signal processing, in particular, has revolutionized many areas of science and engineering. By exploiting massively parallel processing with tens of billions of transistors at comparatively low internal clock speed, CMOS circuits can provide output data rates of hundreds of gigabit per second, corresponding to effective clock rates of several hundred GHz. In

contrast to that, the analog bandwidth of electronic circuits is much more difficult to scale due to limited switching speed of semiconductor devices, strongly increased transmission line losses at high frequencies, and the considerable complexity associated with high-speed circuit packaging and as-sembly.
TeraSHAPE aims at overcoming these limitations by establishing the foundations of novel signal processing concepts at T-wave frequencies between 100 GHz and 1 THz. Capitalizing on cutting-edge results in the fields of photonic integration and optical frequency comb generation, TeraSHAPE will combine massively parallel processing in digital electronic circuits with synthesis and analysis of broadband waveforms in the optical domain. To convert waveforms between optical and T-wave frequencies, TeraSHAPE will explore novel concepts for ultra-fast devices such as silicon-organic hybrid electro-optic modulators and silicon-plasmonic photodetectors with bandwidths of hundreds of GHz. Advances on the device level will be complemented by scalable assembly concepts, where TeraSHAPE will exploit 3D printing on the micro- and nanoscale both for hybrid photonic integration and for realizing sub-mm THz waveguides. The viability of the TeraSHAPE concepts will be experimentally demonstrated in applications of high relevance such as high-speed wireless communications at data rates of up to 1 Tbit/s or signal processing in high-field electron paramagnetic resonance (EPR) spectroscopy.

Fields of science (EuroSciVoc)

engineering and technology > electrical engineering, electronic engineering, information engineering > electronic engineering > sensors > **optical sensors**

natural sciences > physical sciences > electromagnetism and electronics > **semiconductivity**

natural sciences > physical sciences > optics > **spectroscopy**

Keywords

Integrated photonics | plasmonics | Terahertz technology

Programme(s)

H2020-EU.1.1. - EXCELLENT SCIENCE - European Research Council (ERC) MAIN PROGRAMME

Topic(s)

ERC-2017-COG - ERC Consolidator Grant

Call for proposal

ERC-2017-COG

See other projects for this call

Funding Scheme

ERC-COG - Consolidator Grant

Host institution

KARLSRUHER INSTITUT FUER TECHNOLOGIE

Net EU contribution

€ 2 498 954,00

Total cost

€ 2 498 954,00

Address

KAISERSTRASSE 12
76131 Karlsruhe
Germany

Region

Baden-Württemberg > Karlsruhe > Karlsruhe, Stadtkreis

Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

Beneficiaries (1)

KARLSRUHER INSTITUT FUER TECHNOLOGIE

Germany

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