Enabling Virtualized Wireless and Optical Coexistence for 5G and Beyond

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DC4: Optical transceiver design for 5/6G with configurable Multiplexing/Modulation

DC4 Project Description:

The key objective of this doctoral project is to enable flexible multi-flow Software-defined Transceiver (SDT) operation for high spectral efficiency and versatile optical resource virtualization.
5G remote radio-heads are fed with the optical Mobile Front-Haul network while higher radio frequencies and bandwidths are standardized; cost-effective flexible solutions are to be developed for their effective deployment, as their convergence with FTTH access passive optical networks.
Upon defining state-of-the-art scenarios using existing toolsets, innovation will be pursued via numerical/experimental design of novel configurable modular architectures relying on carrier/modulator pooling, to form a versatile pool of multi-flow, bandwidth variable SDTs. Simultaneous subcarrier multiplexing and modulator seeding can be effectively combined to generate hierarchical modulation formats (m-PAM, m-QAM), enabling pre-compensation, pulse shaping, high bandwidth granularity and efficient resource virtualization. Novel millimeter wave generation schemes will be considered for flexibility, capacity and reach enhancements under EWOC scenario.
Both direct and spectrally efficient coherent schemes will be considered, whereas novel penalty (crosstalk, dispersion, phase noise, etc.) mitigation methods will be pursued via methodology and data integration with remaining work packages in later stages. Cost/performance analysis and experimental tests will be performed modularly for each configuration.

Eligibility Conditions:

- Master's degree in the areas of Telecommunications and/or Electrical Engineering.
- The candidates are eligible if they have not resided in Spain for more than 12 months within the period of past 3 years.

Required Skills:

- Strong basis on modern digital transmission systems, signal theory, digital signal processing, advanced modulation formats, and on radio and optical communications.
- Research experience through Master thesis or research internships on the topics of optical or radio transmission systems, architectures and components will be considered an advantage.
- Expertise on system, component and impairment simulation in Matlab or Phyton, and experimental testing.

EWOC project is funded by the European Union's Horizon Europe research and innovation programme (HORIZON-MSCA-2021-DN-0) under the Marie Skłodowska-Curie grant agreement No 101073265.

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- Experience with FPGA programming, PCB design, microwave testing, equipment control and network management are considered as a plus.
- English language proficiency as well as good oral and written communication skills.
- Great teamwork ability and motivation to pursue new knowledge in specific advanced areas of optical telecommunications.

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