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### Acousto-magneto-plasmonics for future applications in nano photonics


**A**cousto-magneto-plasmonics deals with experimental and theoretical investigations of interactions between the acoustic, magnetic and plasmonic transients in hybrid metal ferromagnet multilayer structures excited by ultra-short laser pulses. The main focus is on understanding the novel aspects of acoustic dynamics in materials as well as the peculiarities in the nonlinear optical and magneto-optical response in nano-scaled structures. For example, the nonlinear optical detection is illustrated in details by probing the static magneto-optical second harmonic generation in gold-cobalt-silver tri-layer structures in Kretschmann geometry. Furthermore, we show experimentally how the nonlinear reshaping of giant ultra-short acoustic pulses propagating in gold can be quantified by time-resolved plasmonic interferometry and how these ultra-short optical pulses dynamically modulate the optical nonlinearities. An effective medium approximation for the optical properties of hybrid multilayers enables the understanding of novel optical detection techniques. Exploring acousto-magneto-plasmonic functionalities at the nano-scale provide the experimental platform for

designing the next-generation ultrafast nano photonic devices. As the next step, functionalizing hybrid metal-ferromagnet multilayer structures with solid-state nano-scale light emitters will allow for detailed quantum-optical studies of magneto-plasmonic interactions at the nano-scale using nonlinear optical and quantum-optical techniques. From an even more fundamental perspective, combining graphene-based plasmonic nanostructures with optical metamaterials may shed light on the mysteries of topological plasmonics.

### Biography

Vasily Temnov has obtained his PhD from University Duisburg-Essen in 2004. After Post-doctoral studies at Dortmund Technical University and Massachusetts Institute of Technology, he became a CNRS Researcher at Institut des Molécules et Matériaux du Mans in Le Mans in 2011, where he also obtained a Habilitation degree in 2012. Being the recipient of numerous academic awards by the CNRS, DAAD and the Humboldt Foundation, he served as a Coordinator of an international network on the nonlinear nano photonics “NNN-Telecom” as well as several French-German ANR-DFG and French-Russian CNRS-RFBR collaborative research projects.

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