

**SHORT BIO**

Dr. Juan Capmany (PhD. in Physics) was born in Madrid, Spain. Presently, he is a Professor at the Communications Engineering Department (Universidad Miguel Hernández, Elche, Spain), where he founded and leads the Photonic Systems Group.

He worked for ten years in the Spanish Naval Research Center (CIDA) and the Spanish National Research Council (CSIC) in the development of image intensifier tubes for night vision, and in Laser Spectroscopy of Solid-State laser materials, Solid-State lasers, Crystal Growth, and Nonlinear Optics at Universidad Autónoma de Madrid.

His main research activity has focused for the last decades on intracavity nonlinear frequency conversion in solid-state lasers and range-gated systems.

He has authored or coauthored more than 150 research publications in peer-reviewed journals and conference papers and has lead over 15 research projects. He is a Senior Member of OSA and IEEE.

**ABSTRACT**

**Title: Real-time upconversion to the visible of 2D infrared images**

Real time video of infrared images lacks presently some attractive features as compared to their VIS/NIR counterpart based on silicon CCD and CMOS Focal Plane Array (FPA) imaging sensors, with a typical response cutoff wavelength around 1 μm. Presently, although FPA image sensors based on InGaAs or InSb cover most of the infrared spectral range, they suffer from operational characteristics limitations in terms of uncooled operation, speed, noise, and resolution.

A way to circumvent these limitations in IR imaging, is through real-time nonlinear optical frequency upconversion of infrared images to the spectral detection range of silicon-based FPA imaging sensors. The 2D Fourier components of the infrared image are mixed with a pump laser wave in a nonlinear crystal to shift their spectrum by sum-frequency mixing (heterodyning) their optical frequency with the frequency of a pump laser. This technique allows for visualization with standard silicon CCD video cameras of images at virtually any infrared region extending even up to the THz range and multispectral IR imaging.

In this talk, the present status and foreseen trends of nonlinear image upconversion will be reviewed, including the work presently being realized in our lab, that pursues miniaturization down to quasi-monolithic diode-pumped image upconversion systems. To boost upconversion efficiency, we use nonlinear crystals based on poled ferroelectric crystals placed inside the cavity of a diode pumped solid-state laser, where the intense intracavity laser beam acts as the pump wave for the upconversion.