

LOPS® 20244th Edition of Annual Conference on**LASERS, OPTICS, PHOTONICS,
SENSORS, BIO PHOTONICS &
ULTRAFAST NONLINEAR OPTICS****JUNE 07-10, 2024**

Metaoptics offers fresh opportunities for structuring light as well as dark. The majority of research has so far mostly concentrated on one dimensional line singularities (optical vortices). Meta surfaces offer opportunities to engineer singularities in other dimensions as well. I will report on the realization of 2D phase and polarization singularities and the unique applications that they will open¹, along with recent results on the realization of an equally spaced linear array of 0D phase singularities using inverted designed cylindrically symmetric phase only meta surfaces. ² I will discuss complete, topologically protected polarization singularities; they are located in the 4D space spanned by the three spatial dimensions and the wavelength and are created in the focal region of a lens using a meta surface. ³ Our recent demonstration of a new kind of holography (Light sheet continuous depth)⁴ holography) has opened up the possibility of realizing volume singularities. Applications will be discussed.

1. Soon Wei Daniel Lim, Joon-Suh Park, Maryna L. Meretska, Ahmed H. Dorrah, & Federico Capasso Nature Communications, 12, 4190 (2021)
2. Soon Wei Daniel Lim, Joon-Suh Park, Dmitry Kazakov, Christina M Spaegele, Ahmed H Dorrah, Maryna L Meretska, and Federico Capasso, Nature Communications, 14, 3237 (2023)
3. Christina M. Spaegele, Michele Tamagnone, Soon Wei Daniel Lim, Marcus Ossiander, Maryna Meretska, Federico Capasso Science Advances, 9, 24 (2023)
4. A. H. Dorrah, P. Bordoloi, V. S. de Angelis, J. O. de Sarro, M. Zamboni-Rached, L. A. Ambrosio, and F. Capasso, Nature Photonics 17, 427, (2023).

Biography

Federico Capasso received the doctor of Physics degree, summa cum laude, from the University of Rome, Italy, in 1973 and after doing research in

**SINGULARITY ENGINEERING BY
META-OPTICS****Federico Capasso**

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fiber optics at Fondazione Bordini in Rome, joined Bell Labs in 1976. In 1984, he was made a Distinguished Member of Technical Staff and in 1997 a Bell Labs Fellow. In addition to his research activity Capasso has held several management positions at Bell Labs including Head of the Quantum Phenomena and Device Research Department and the Semiconductor Physics Research Department (1987–2000) and Vice President of Physical Research (2000–2002). He joined Harvard on January 1, 2003.

AWARDS:

Duddell Medal and Prize (2002)

Edison Medal (2004)

SPIE Gold Medal (2013)

Balzan Prize (2016)

Matteucci Medal (2019) Citations (Google Scholar): Over 100 000

H-index (Google Scholar): Over 150 Publications: Over 500 peer-reviewed

journals Patents: Over 70 US patents Key achievements: Bandstructure Engineering and Quantum Cascade Lasers (QCLs) Metasurfaces and Flat optics Casimir forces