

# IQSE AMO QO Seminar Series

Tuesday, August 22<sup>nd</sup> 2023, 11:30 am ZOOM &  
IQSE seminar room (MPHY 578)

Pizza will be served for IQSE members at 11:00 am. The talk will start around 11:30 am

## Dr. Euclides Marega Junior

(University of Sao Paulo)

### Controlling the optical properties of matter by using Metasurfaces

**ABOUT THE SPEAKER:** Euclides Marega Jr is currently an Associate Professor at the University of Sao Paulo -Brazil. He received his Ph.D. in Atomic Physics in 1993. He is the head of Nanofabrication Laboratories at the Physics Institute in Sao Carlos. He co-authors over 150 scientific papers on semiconductor growth, optical properties of semiconductor quantum dots, and light-matter interaction at the nanoscale. In addition, he has contributed to disseminating scientific knowledge in the Brazilian Physical Society for 15 years as a member of the coordination of the Brazilian Physics Olympiad. This event involves over 200 thousand elementary and high school students annually.

**EVENT DETAILS:** Metasurfaces have emerged as a remarkable platform for finely controlling light-matter interactions at the quantum level. Composed of subwavelength nanostructures, these engineered surfaces empower precise manipulation of quantum emitters' behavior by effectively modulating incident light's phase, polarization, and intensity. This unparalleled degree of control allows for tailoring resonant modes, dispersion properties, and radiation patterns, culminating in heightened emission rates, directionality, and coherence of quantum emitters. By exploiting plasmonic and photonic resonances within metasurfaces, researchers unlock a range of effects, including Purcell enhancement, efficient photon extraction, and even the alteration of vacuum fluctuations governing quantum processes. This revolutionary capacity to engineer light-emitter interaction on metasurfaces promises to advance our fundamental comprehension of quantum phenomena and sets the stage for quantum communication, sensing, and information processing breakthroughs. This presentation will show our recent research in quantum optics by using metasurfaces to control light-matter interaction at the nanoscale. Our findings encompass diverse materials interacting with metasurfaces, such as semiconductor quantum dots, rare earth atoms, and biomolecules. Ultimately, we will delve into the prospective landscape of quantum optics with metasurfaces, offering a glimpse into the exciting future.

**ZOOM information:**

<https://tamu.zoom.us/j/98156251523?pwd=QVdSdGxtL1UyY0g1L083SU5QR0QrUT09>

Meeting ID: 981 5625 1523

Passcode: 297578

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