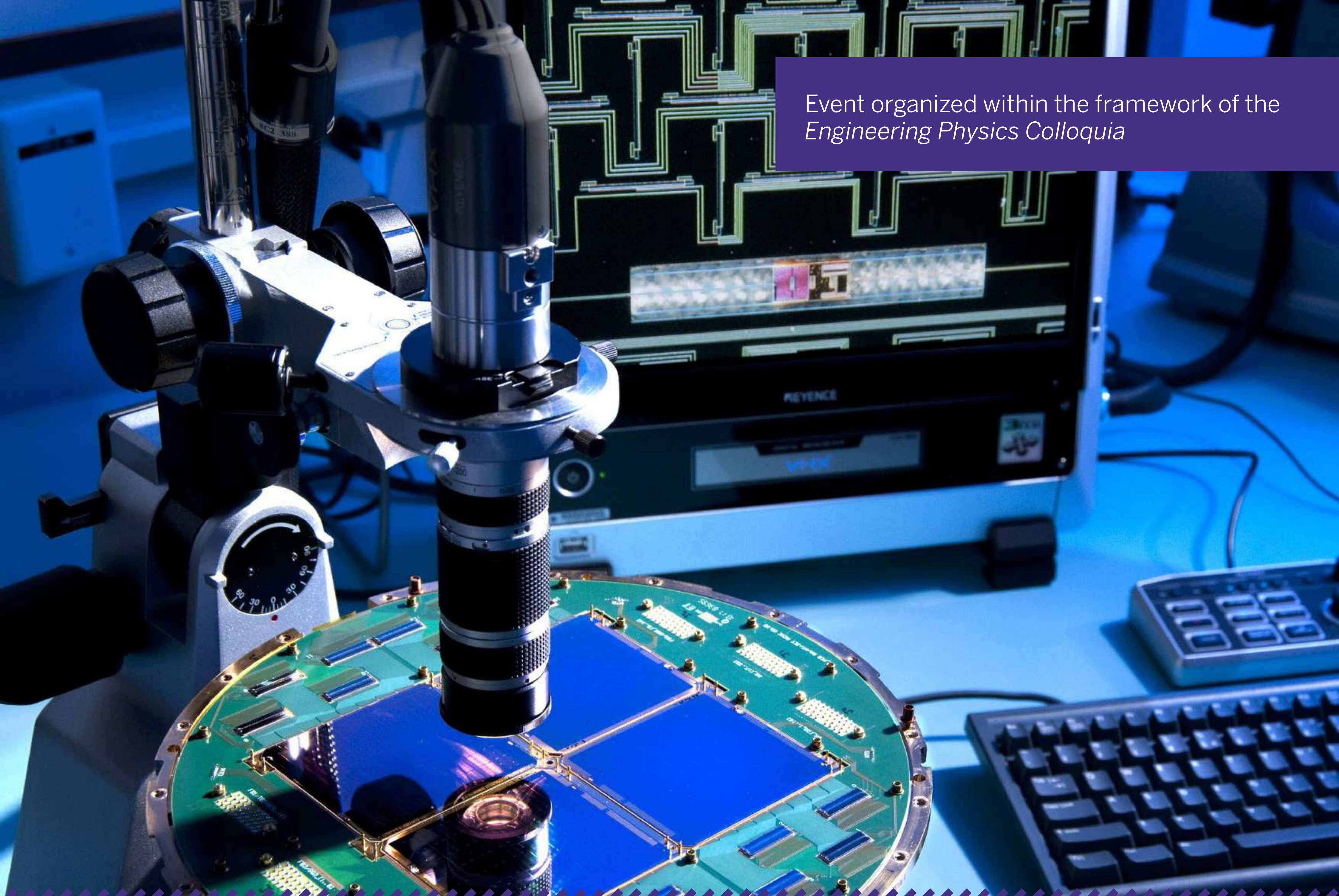
Event organized within the framework of the *Engineering Physics Colloquia*



Ca' Foscari University of Venice
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Nanoscale YBCO Devices for Quantum Sensors and Detectors

20th February 2026, 12.00
Conference Room Orio Zanetto, Alfa Building

The seminar will also be accessible remotely via the following link: **https://unive.zoom.us/j/84738358126**
Password: seminar1

Organized by
Domenico De Fazio
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Recent advances in nano-patterning of high critical-temperature (high-Tc) superconductors have enabled simpler, more versatile, and highly sensitive quantum devices, such as SQUID magnetometers, THz mixers, and single photon detectors. Conventional approaches using bicrystal and step-edge Josephson junctions, developed in the 1980s and 1990s, rely on complex epitaxy and multilayer structures that limit performance and design flexibility. Our nanoscale Dayem bridges and novel grooved Dayem-bridge process address these limitations, offering an effective alternative. We present SQUID magnetometers based on GDBs that match or exceed the low-noise performance of conventional SQUIDs at moderate temperatures (~77 K). This enables applications like magnetoencephalography (MEG) with sensor placement within 1 mm of the scalp, capturing stronger neuromagnetic signals and improving imaging resolution. Additionally, we demonstrate THz harmonic frequency mixing using a YBCO nanobridge with cross section 70 × 50 nm² integrated with a spiral broadband antenna. At 1.2 THz (x12 mixing), with ~1 μW input and operating at 77 K and 60 K, the device achieved a 20 dB SNR at 1 Hz bandwidth. These results highlight the suitability of nanowire-based devices for high-frequency detection. Finally, we report dark count observation in ultra-thin (10 nm) YBCO nanowire single photon detectors below 20K. The high critical current density leads to hysteretic current voltage characteristics (IVCs), enabling bistable switching and revealing fluctuation-induced dark pulses. This marks a milestone toward developing YBCO-based quantum detectors for high-temperature operation.