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Cylindrical SDBD of well-defined expansion area for standardized studies



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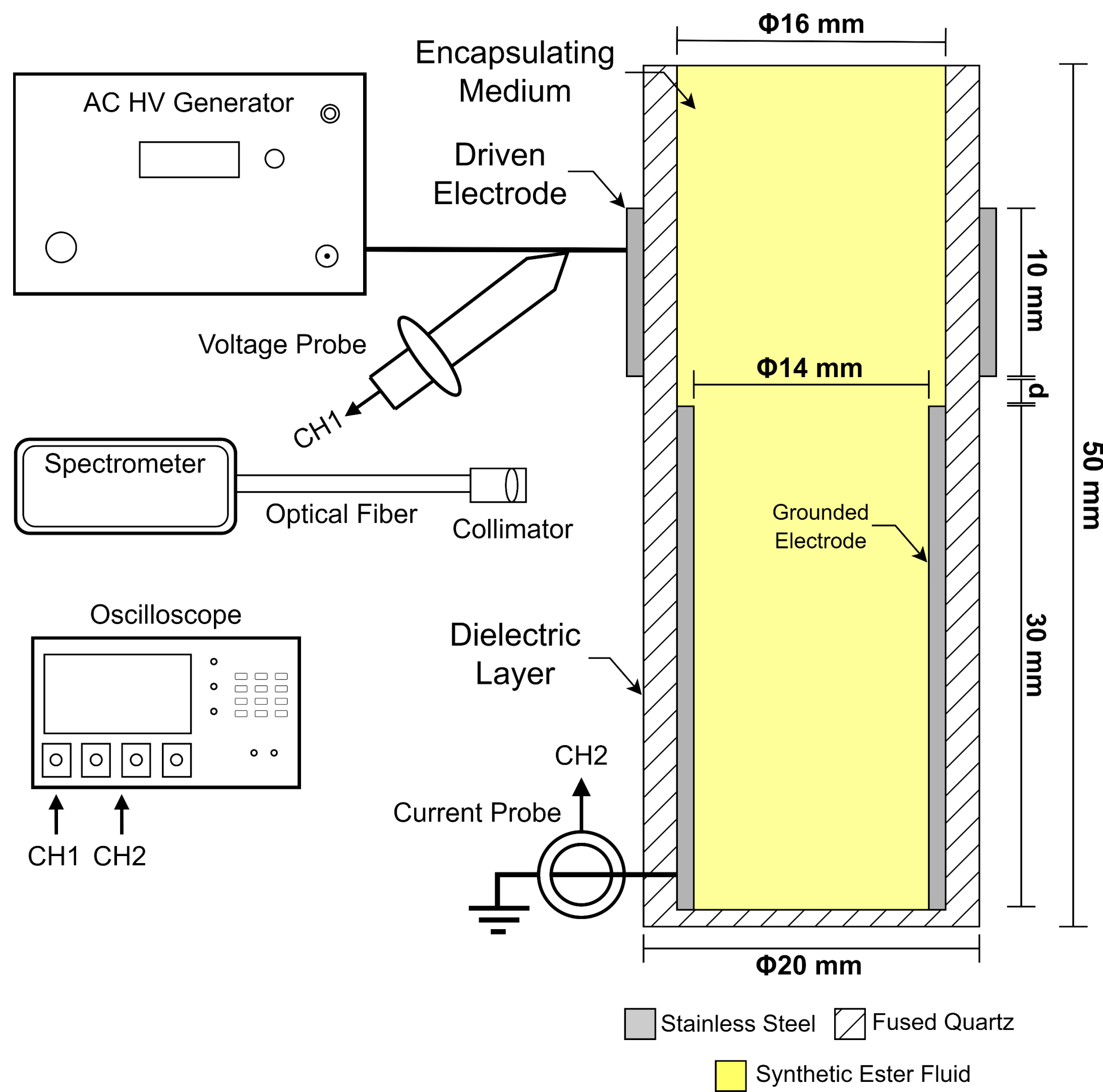
The present work lies in the field of atmospheric-pressure surface dielectric-barrier discharges (SDBDs).

A tailored experimental cylindrical setup is presented, by which the SDBD expansion area is well defined, avoiding any underside discharge. Preliminary electrical and optical emission results are reported.



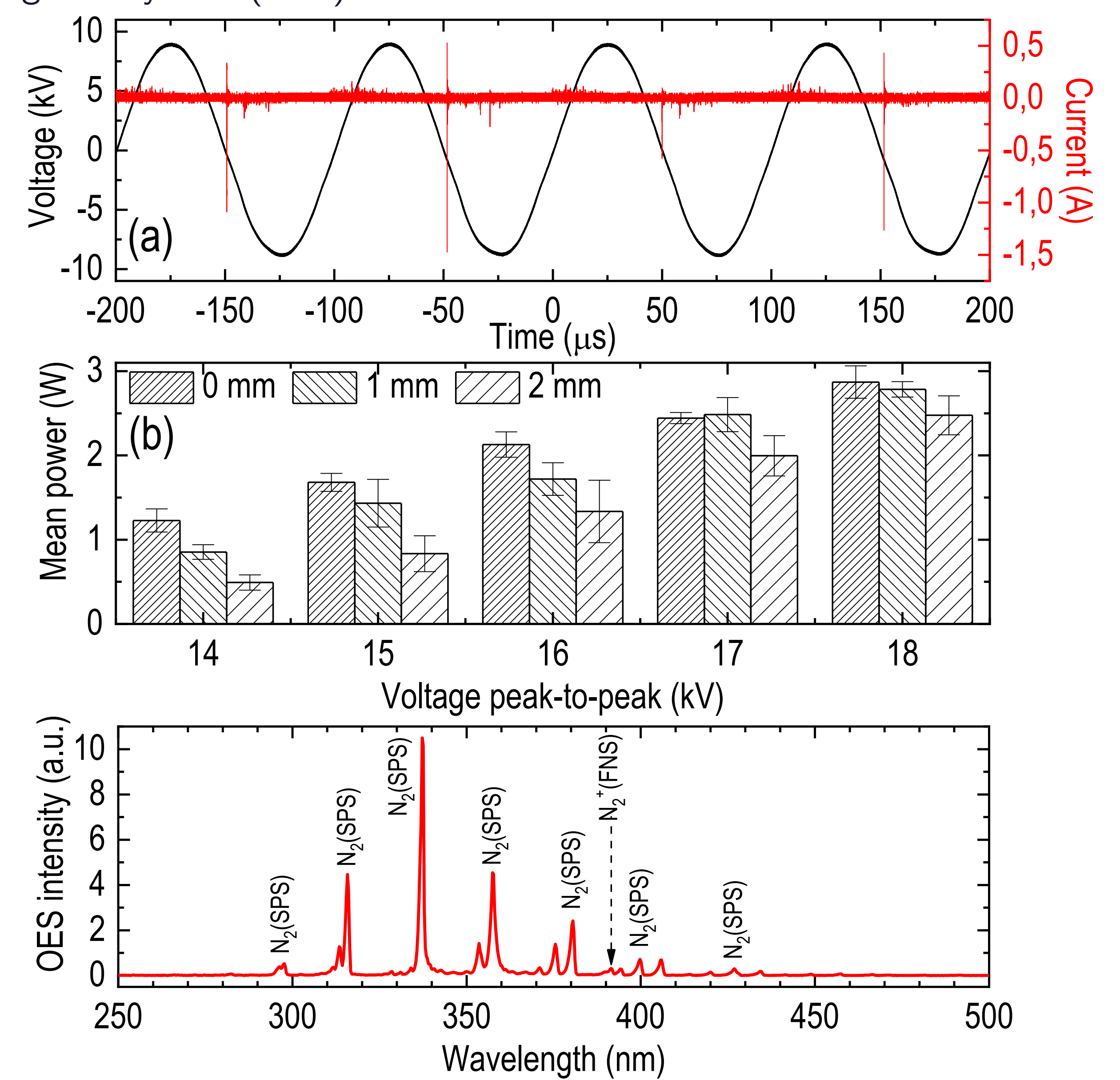
Experimental Setup

- SDBD reactor designed in a cylindrical configuration.
- The use of oil with high dielectric strength fully encapsulates the grounded electrode and an underside-discharge-free SDBD is considered.
- Appropriate for fundamental and standardized studies.
- Power measurements based on the mean value of current and voltage product.
- Relative calibrated UV-NIR optical emission spectroscopy (OES) for species investigation.

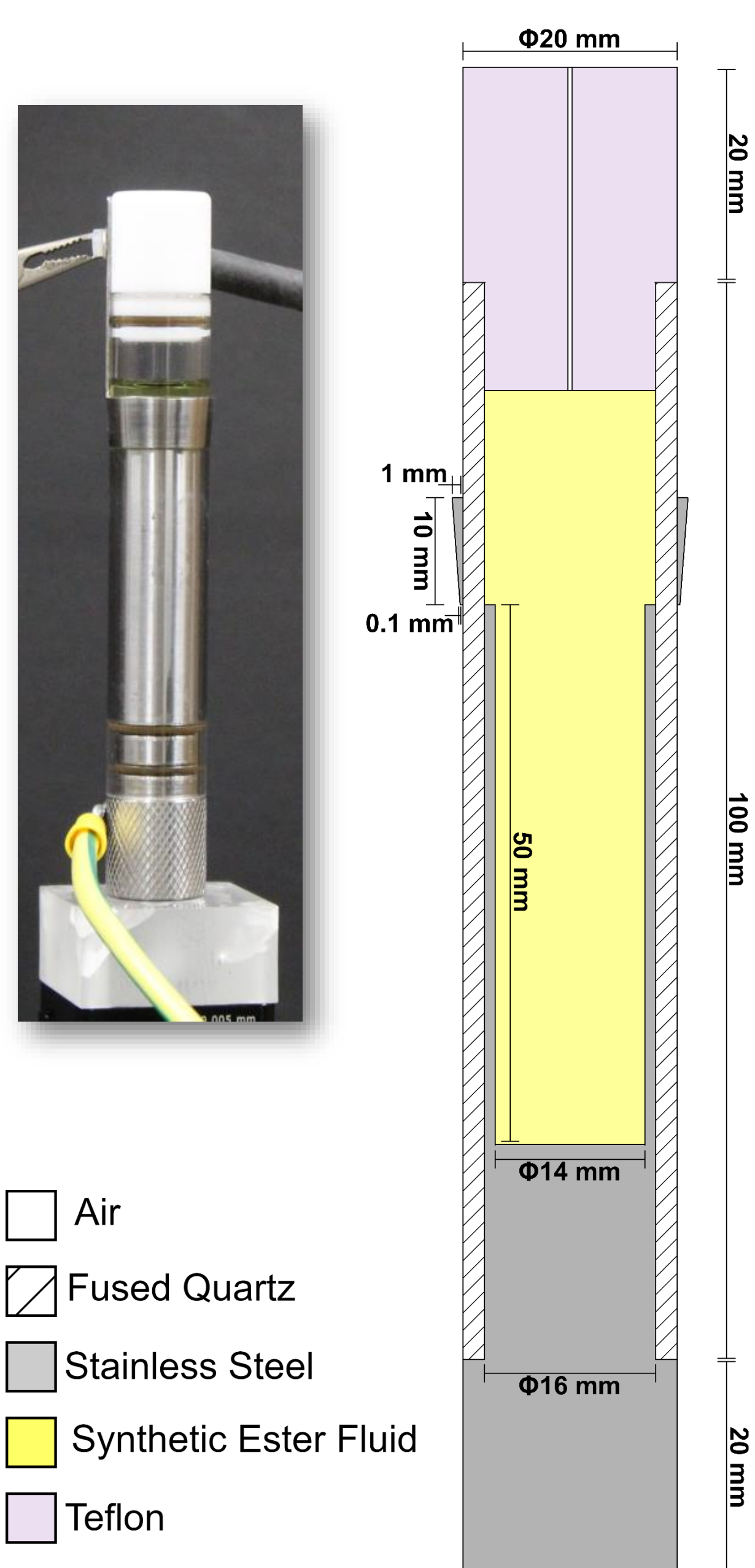


Results

- The mean power increases non-linearly as a function of the voltage level.
- Wider gap weakens the discharge for a given applied voltage, and lower power is thus consumed.
- Detected emissive species: N₂ second positive system (SPS) and N₂⁺ first negative system (FNS).

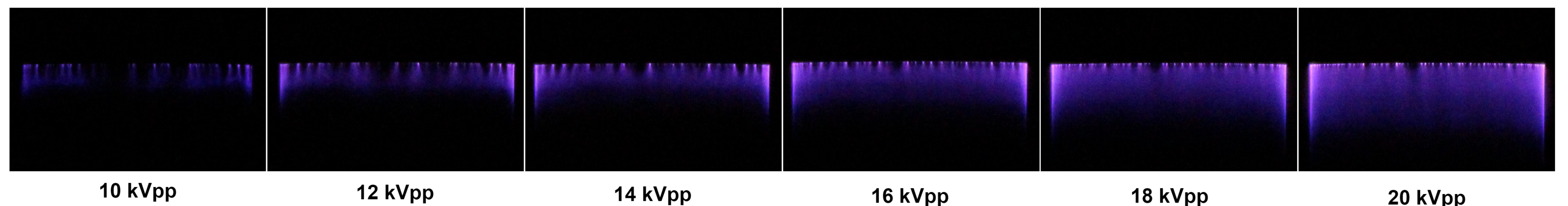


Ongoing Research

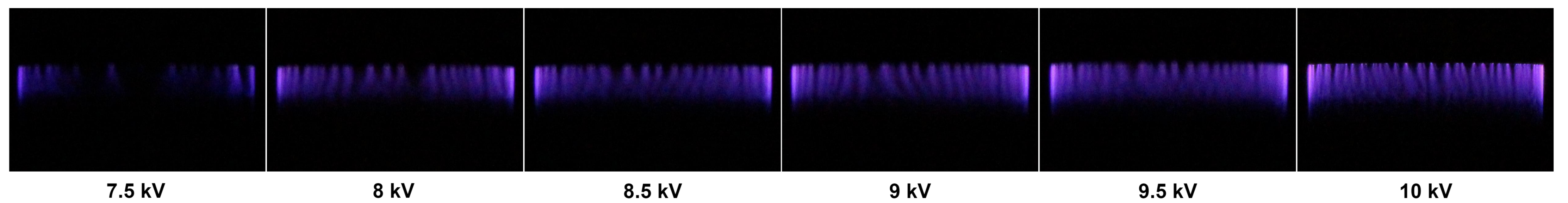


- Air
- Fused Quartz
- Stainless Steel
- Synthetic Ester Fluid
- Teflon

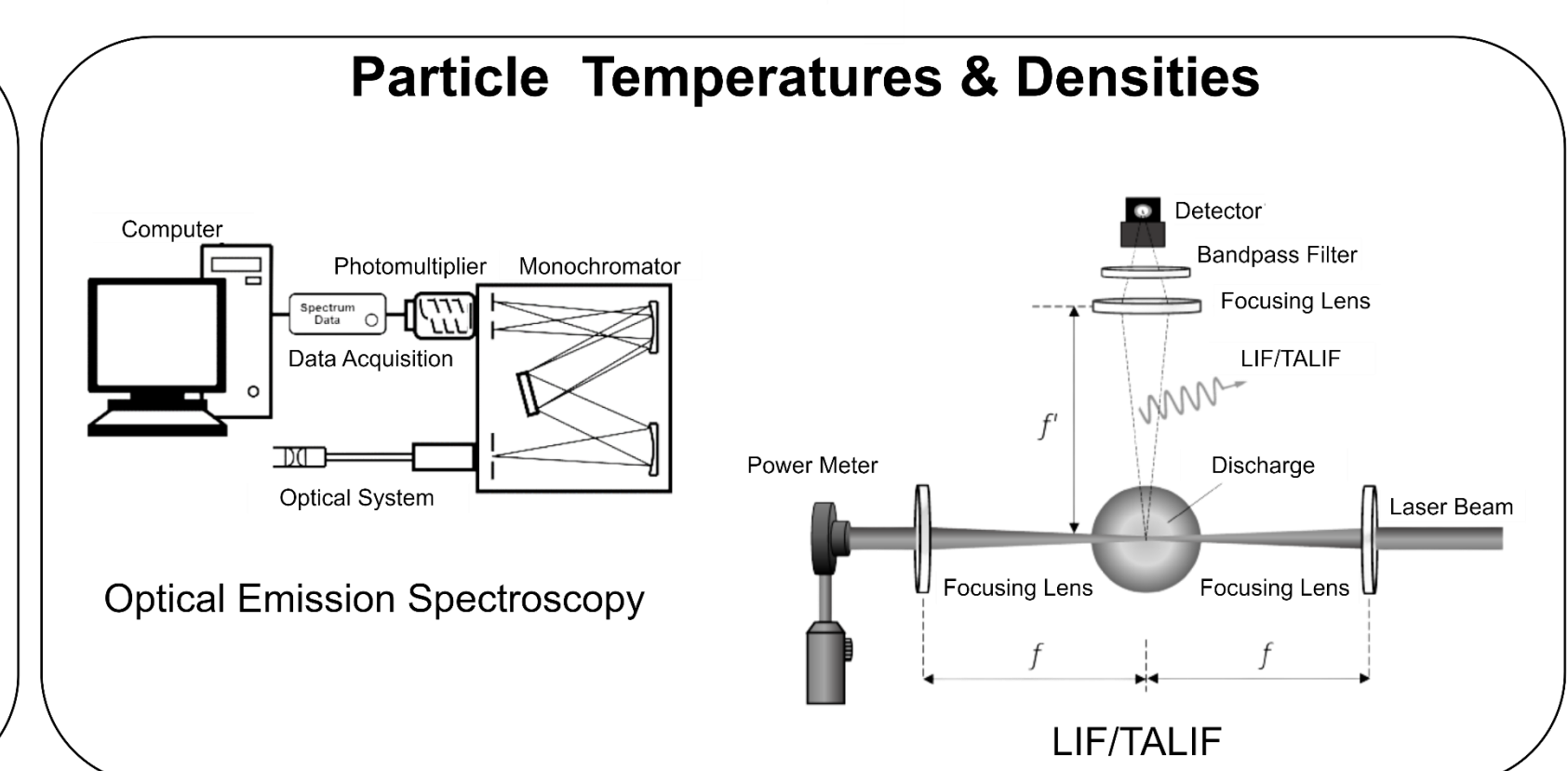
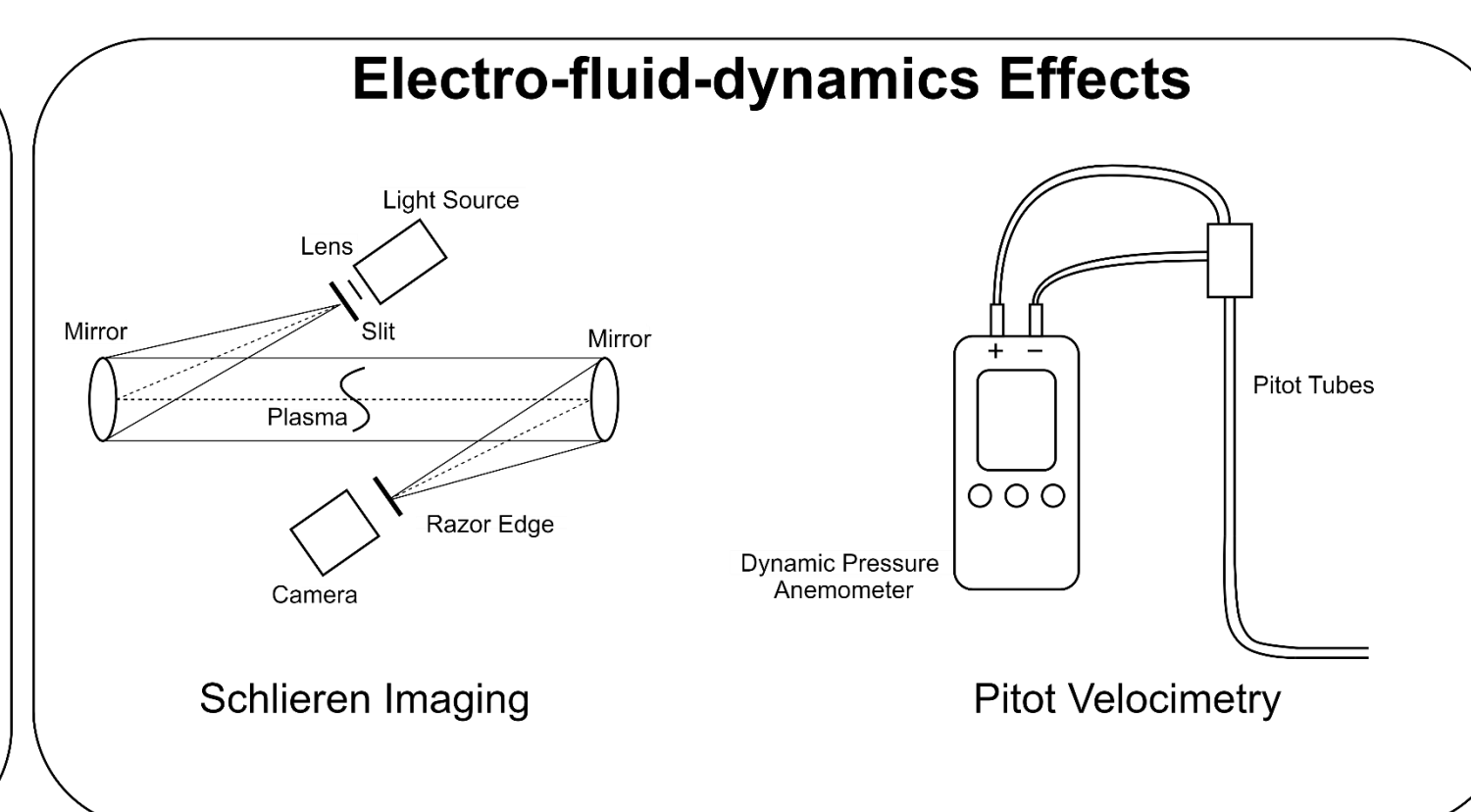
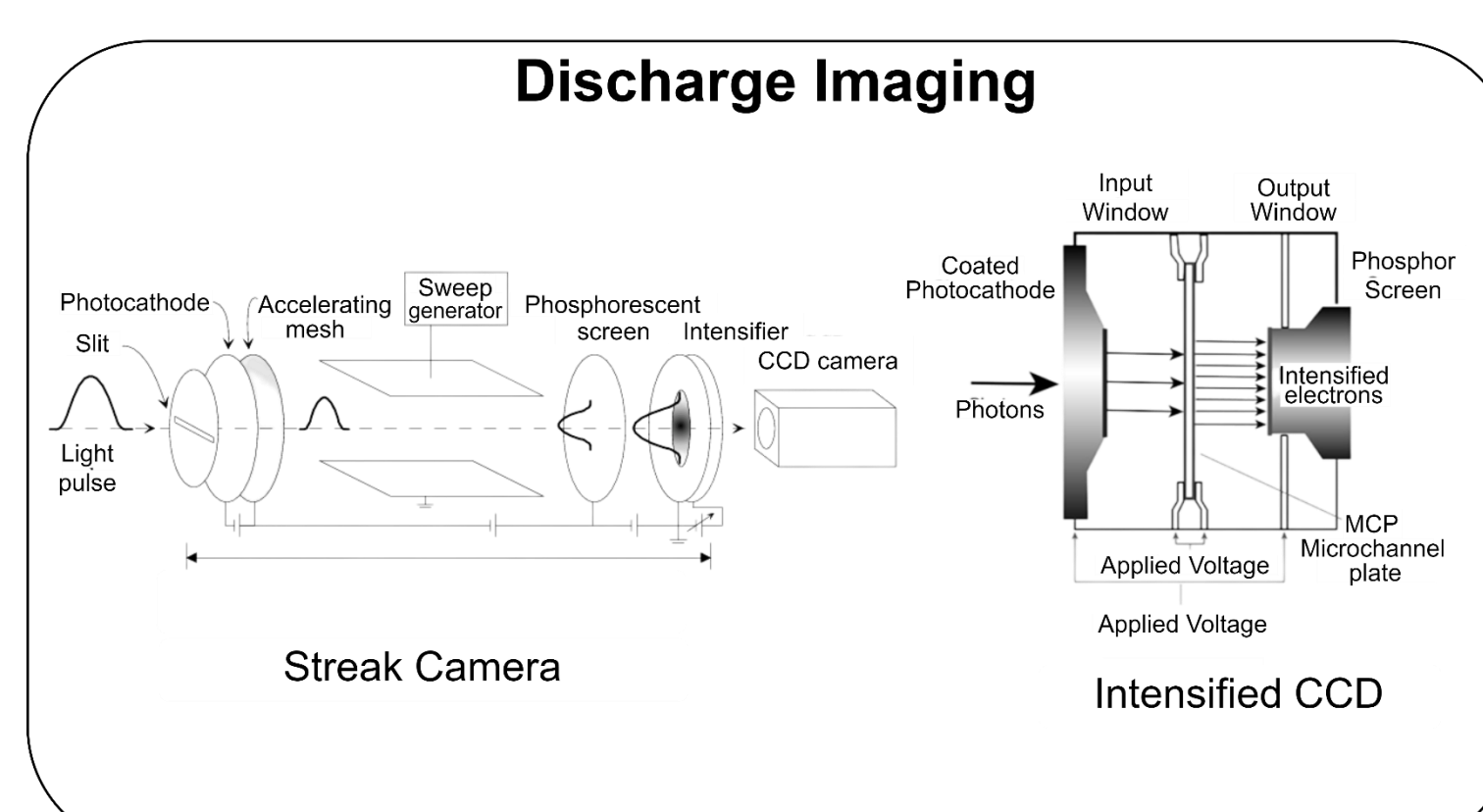
AC Sinusoidal; 10 kHz



Positive Squared Pulsed; 10 kHz; 1 μs



AC vs Pulsed



References:

- [1] Leonov S. B. et al. Plasma Sources Sci. Technol. **25**, 063001 (2016).
- [2] Laurentie J.-C. et al. J. Electrostat. **67**, 93 (2009).
- [3] Giotis K. et al. Plasma Sci. Technol. In press (2023).
- [4] Gazeli K. et al. Plasma **4**(1), 145-171 (2021).



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