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MOCCA: A 4k-pixel molecule camera for the position and energy resolving detection of neutral molecule fragments at the Cryogenic Storage Ring CSR

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The MOCCA detector is a high-resolution, large-area molecule camera based on metallic magnetic calorimeters and read out with SQUIDs. Its array of 64×64 quadratic pixels with a side length of $700\mu\text{m}$ covers a total detection area of over $4.5\text{cm} \times 4.5\text{cm}$ with a filling factor of 99.5%. It will be deployed at the Cryogenic Storage Ring CSR at the Max Planck Institute for Nuclear Physics in Heidelberg, a storage ring built to prepare and store molecular ions in their rotational and vibrational ground states, enabling studies on electron-ion interactions. To reconstruct the reaction kinematics, MOCCA is able to measure the energy and position of multiple incident particles hitting the detector simultaneously.

We present the readout principles used to read out the complete detector using only 32 two-stage SQUIDs, the fabrication of the free-hanging $700\mu\text{m} \times 700\mu\text{m}$ absorbers and the thermalization using Through-wafer Vias. We will show latest measurements with a full-scale MOCCA detector at 10 mK using a 6 keV photon source, exhibiting an energy resolution of less than 200 eV, and the very low cross-talk between columns and rows of the detector.

Less than 5 years of experience since completion of Ph.D

Y

Student (Ph.D., M.Sc. or B.Sc.)

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