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Cryogenic surface-electrode ion trap apparatus TIMKO DUBIELZIG, Leibniz University Hannover, Germany, MARTINA CARSJENS, MATTHIAS KOHNEN, Leibniz University Hannover and PTB Braunschweig, Germany, SEBASTIAN GRONDKOWSKI, Leibniz University Hannover, Germany, CHRISTIAN OSPELKAUS, Leibniz University Hannover and PTB Braunschweig, Germany — In this talk we describe the infrastructure necessary to operate a surface-electrode ion trap with integrated microwave conductors for near-field quantum control of $^9Be^+$ in a cryogenic environment. These traps are promising systems for analog quantum simulators and for quantum logic applications. Our group recently developed a trap with an integrated meander-like microwave guide for driving motional sidebands on an $^9Be^+$ ion [1]. The trap will be operated in a cryogenic vacuum chamber. We will discuss the vibrational isolated closed cycle cryostat and the design of the vacuum chamber with all electrical supplies necessary to apply two different microwave currents, dc voltages and three independent rf supplies to generate a reconfigurable rf trapping potential. We will also discuss the used hyperfine qubit and the laser systems required to cool and repump. Furthermore we will present the cryogenic, high aperture and fully acromatic imaging system.

[1] Carsjens *et al.*, Applied Physics B - 10.1007/s00340-013-5689-6 (2013)

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