DEVELOPMENT OF A MULTI-CAMERA SYSTEM FOR NON-INVASIVE INTENSE ION BEAM INVESTIGATIONS

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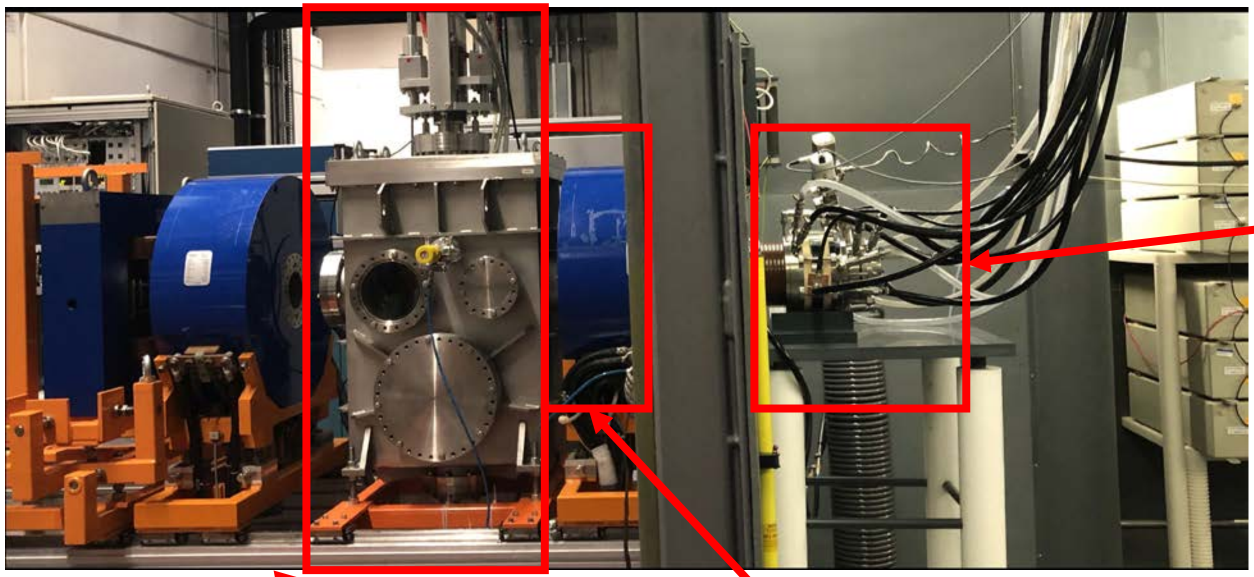
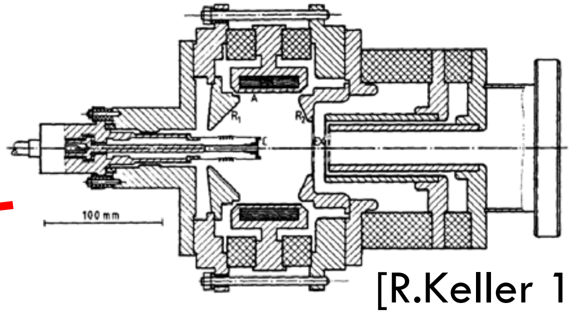
Experimental Set up



Diagnostic Chamber 1 including
- 1900 l/s Turbomolecular Pump
- 24kW Movable Faraday Cup
- 6 embedded Cameras

Solenoid 1

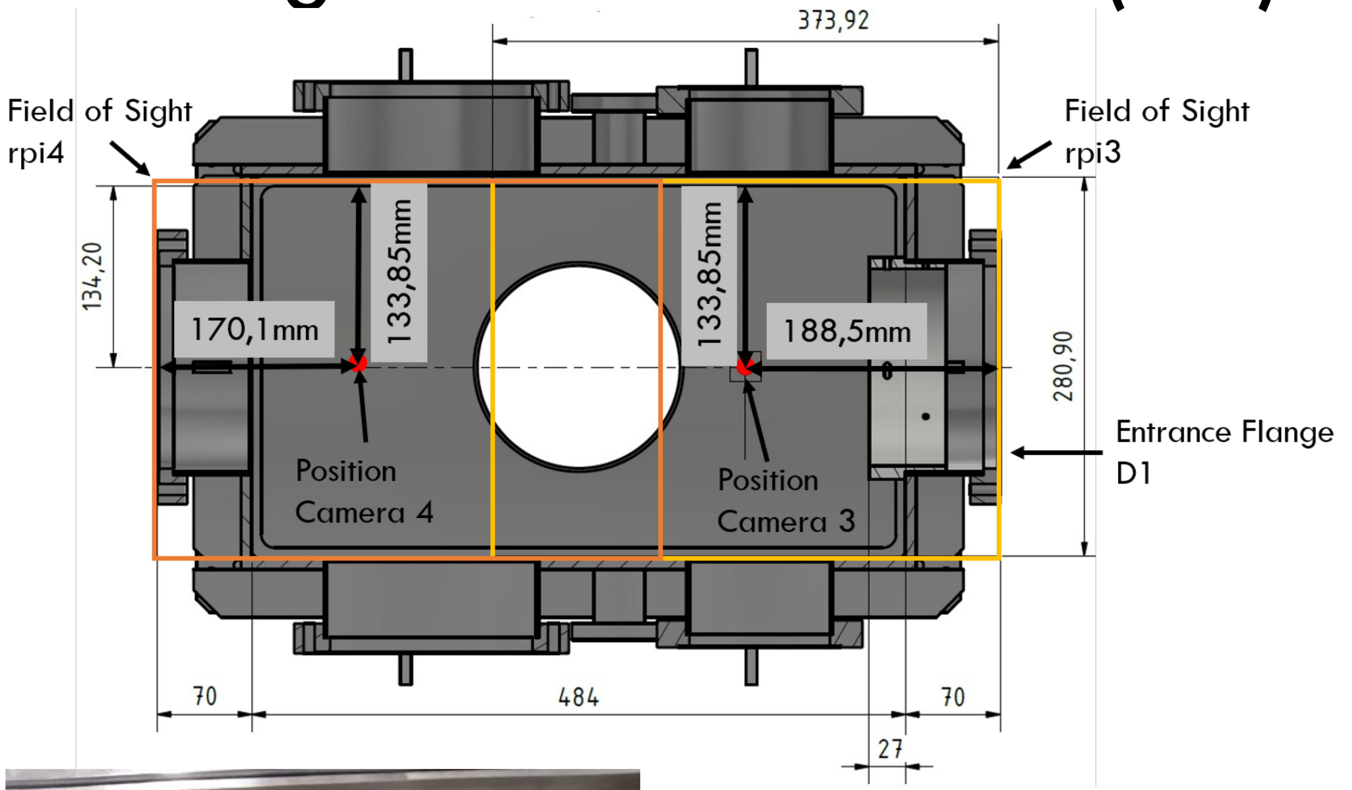


[R.Keller 1984]

CHORDIS-Ion Source
Cold or Hot Reflex Discharge Ion Source

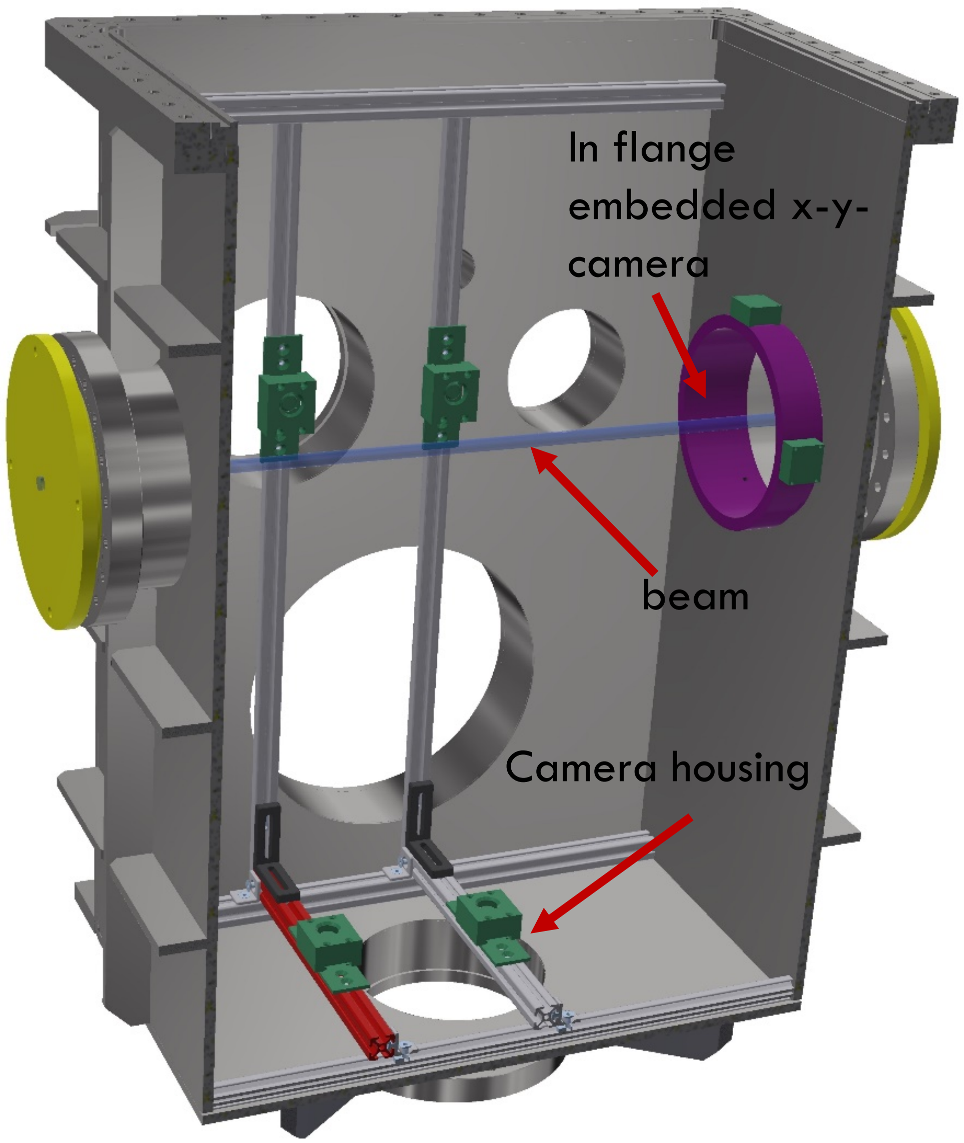
- One Filament holder with 6 spiral filaments
- Confining Multi-Cusp field with 1.8T
- Triode
- Pulsed operation
- Filament heating (I_Fil [A] up to 210A)
- Discharge Voltage (U_Bog [V] up to 200V)
- Extraction Voltage (U_ex [kV] up to 35kV)
- Gas pressure (0.5 – 1.5 mbar)
- Pulse length (5-10Hz @ 0.5 – 1ms)

Diagnostic Chamber 1 (D1)



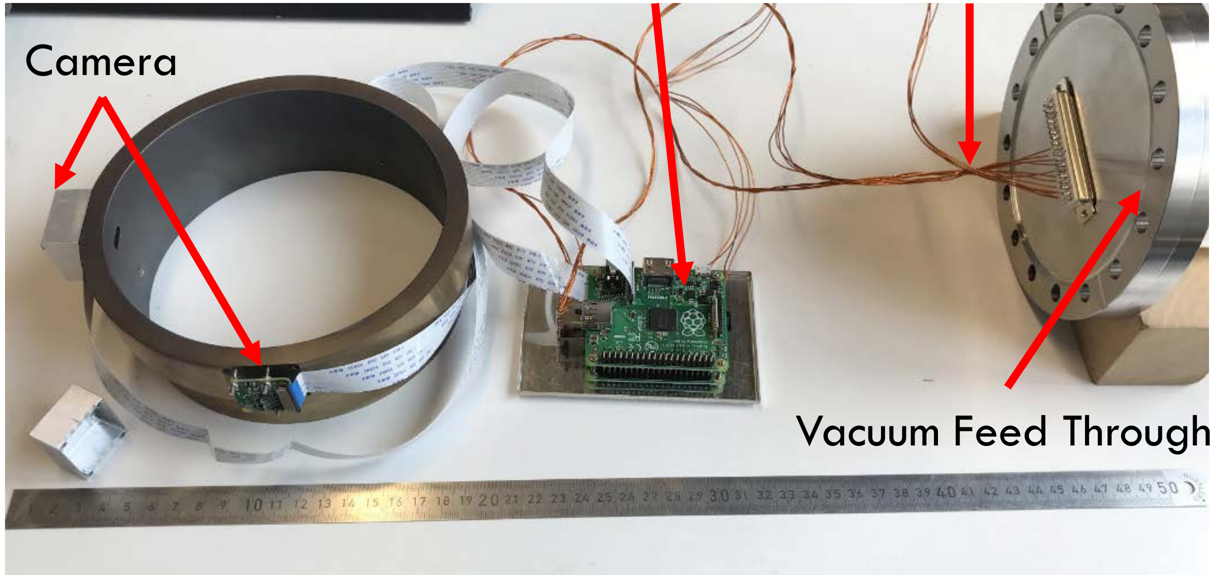
Positioning of six Cameras into the diagnostic chamber

- 484 mm field of view along s-axis
- Vacuum tested up to $9 * 10^{-8}\ mbar$



Raspberry Pi with Camera v2

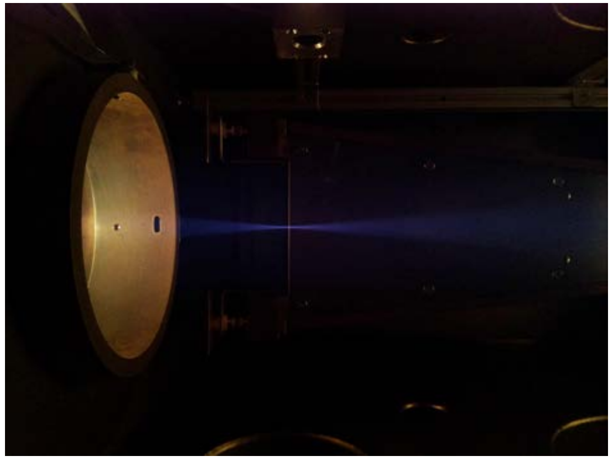
Single Board Camera and Computer
- Sony IMX219 CMOS image sensor
- Sensor Size: 5.095 x 4.930 mm
- Pixel size : 1.12 µm x 1.12 µm
- Camera Size: 25 x 24 x 9 mm

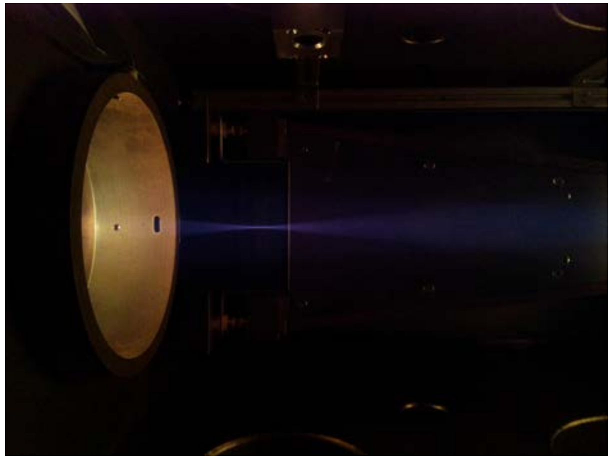


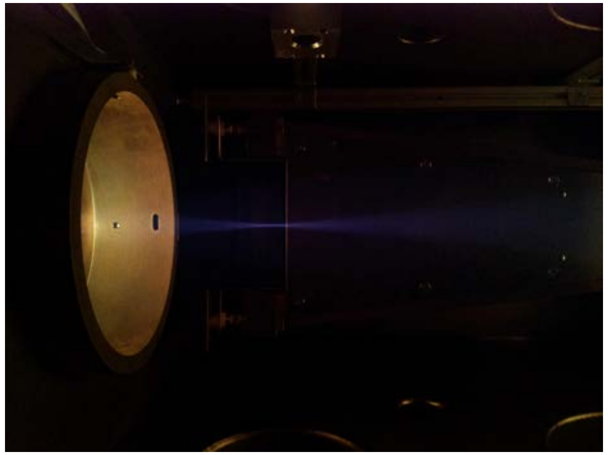
Single Board Camera and Computer are placed within vacuum.
Only need of power supply and USB data interface (5 pins total).

p , H_2^+ , H_3^+ Transport and Solenoid Focusing

X





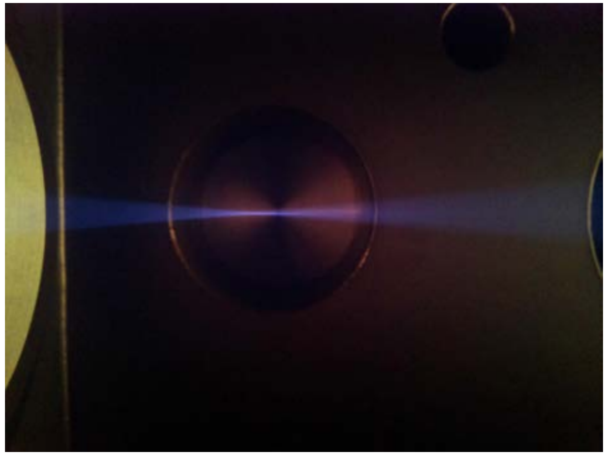


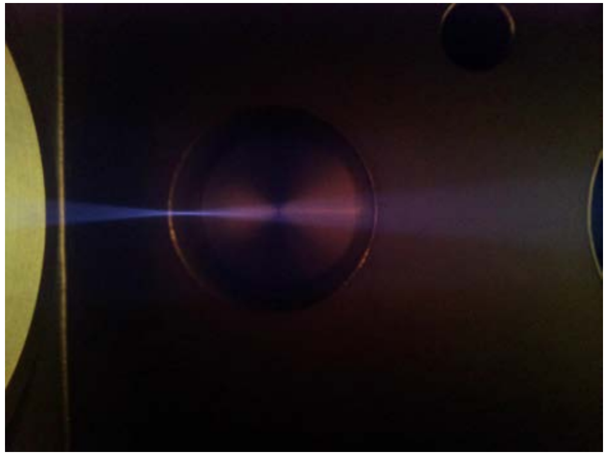
p at 264 mT

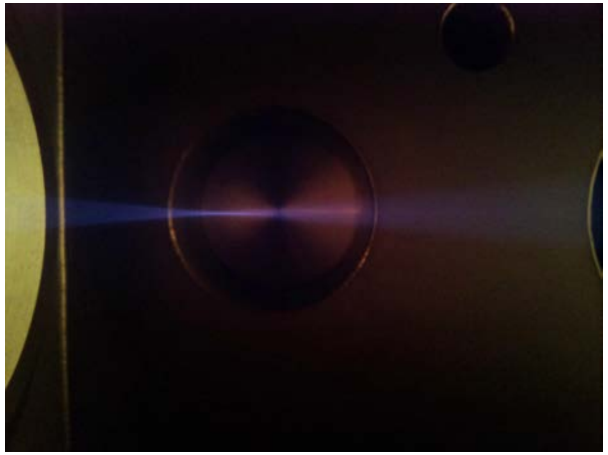
H_2^+ at 380 mT

H_3^+ at 461mT

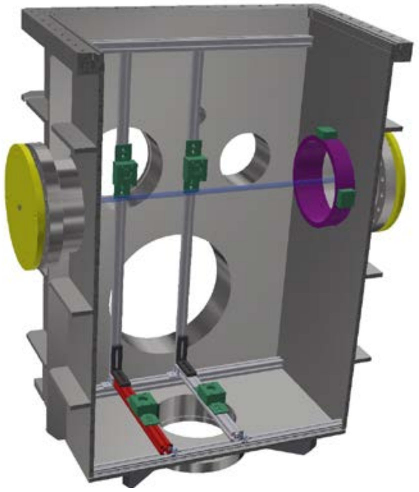
Y



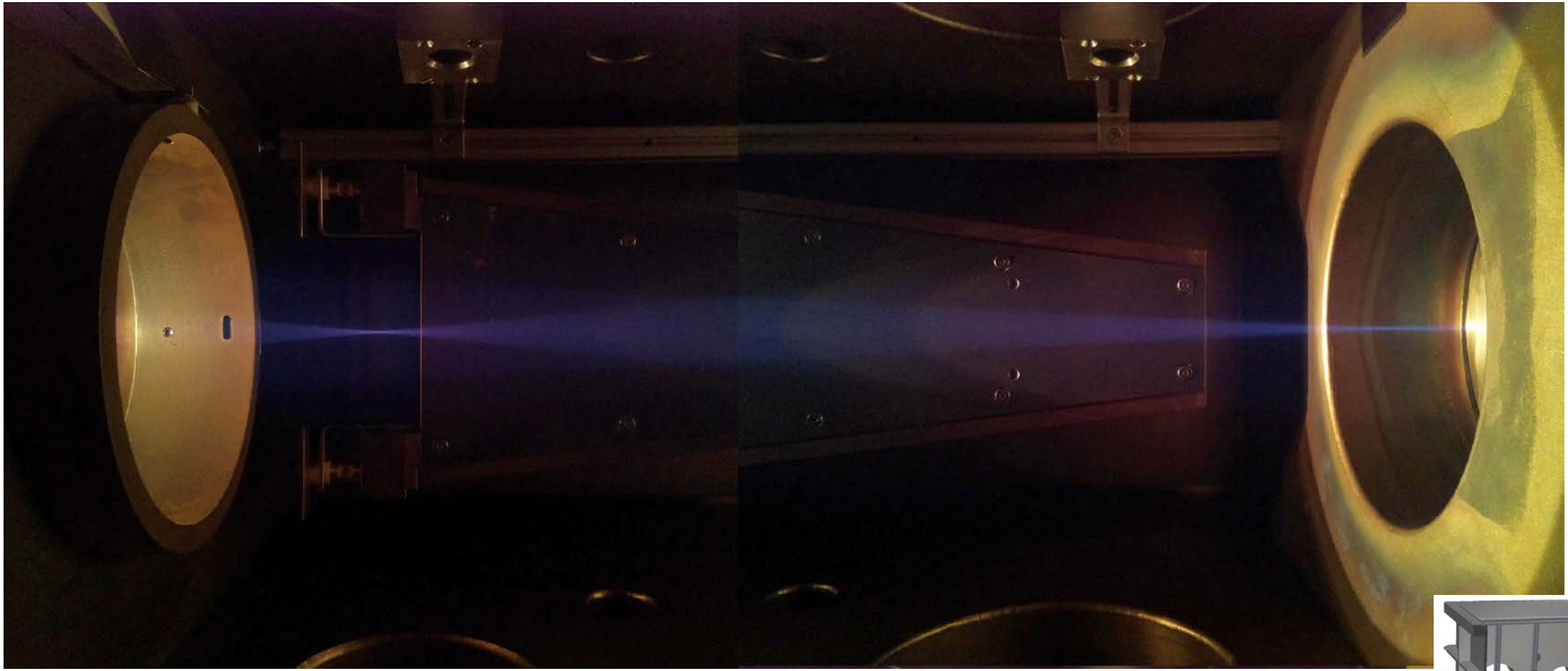




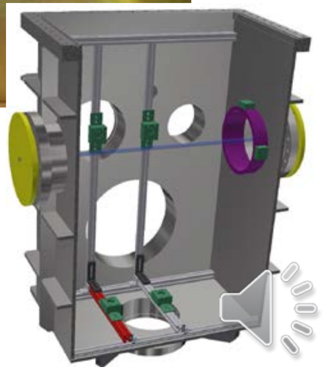
I_Fil = 215A
U_Bog = 200V
P_Q = 0,8mbar (Argon)
P_D1 = 1E-4mbar
U_Ex = 35kV
I_Cup = 45mA
Dutycycle = 5Hz@0,5ms



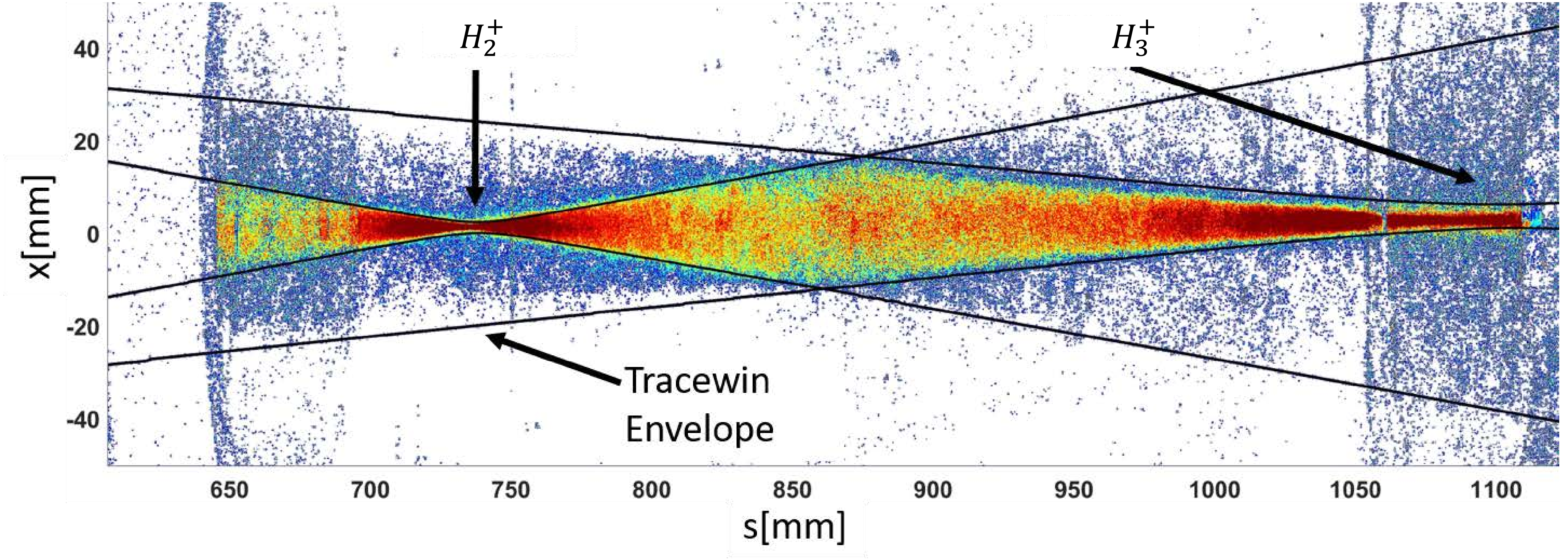
Real Image of Two Focal Points



Merged image consists of images of camera 3 and 4. You can see focal point of H_2^+ and H_3^+.



Fitting of Tracewin Simulation Data onto the False Color Image Data



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