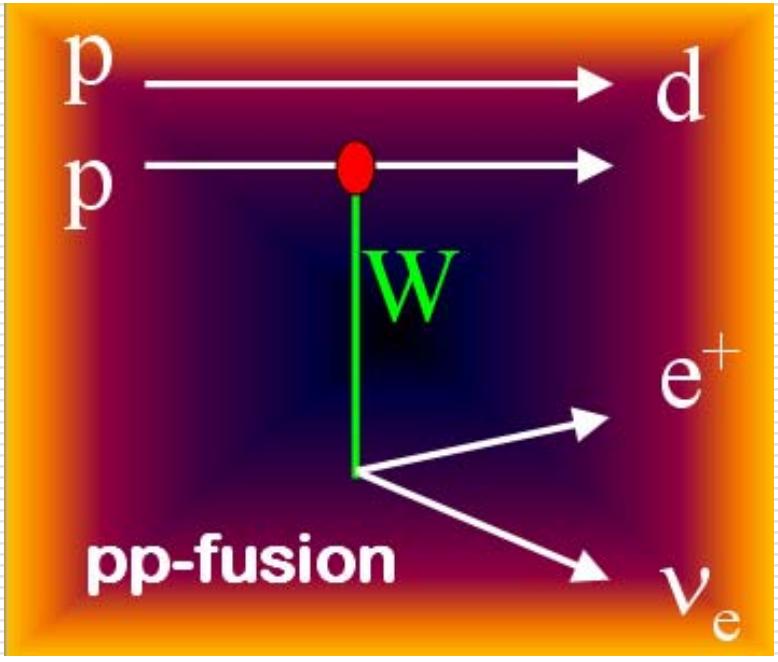
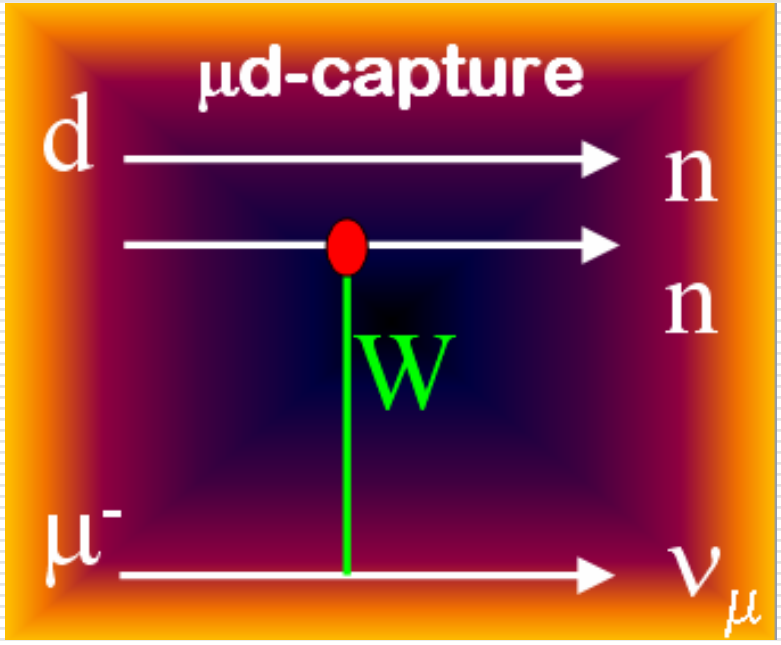
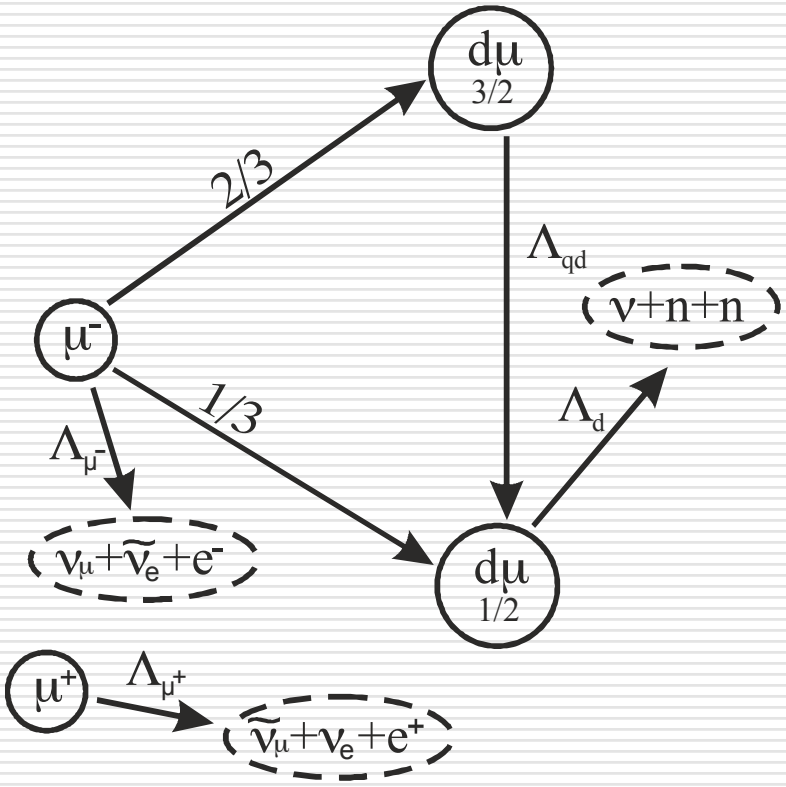
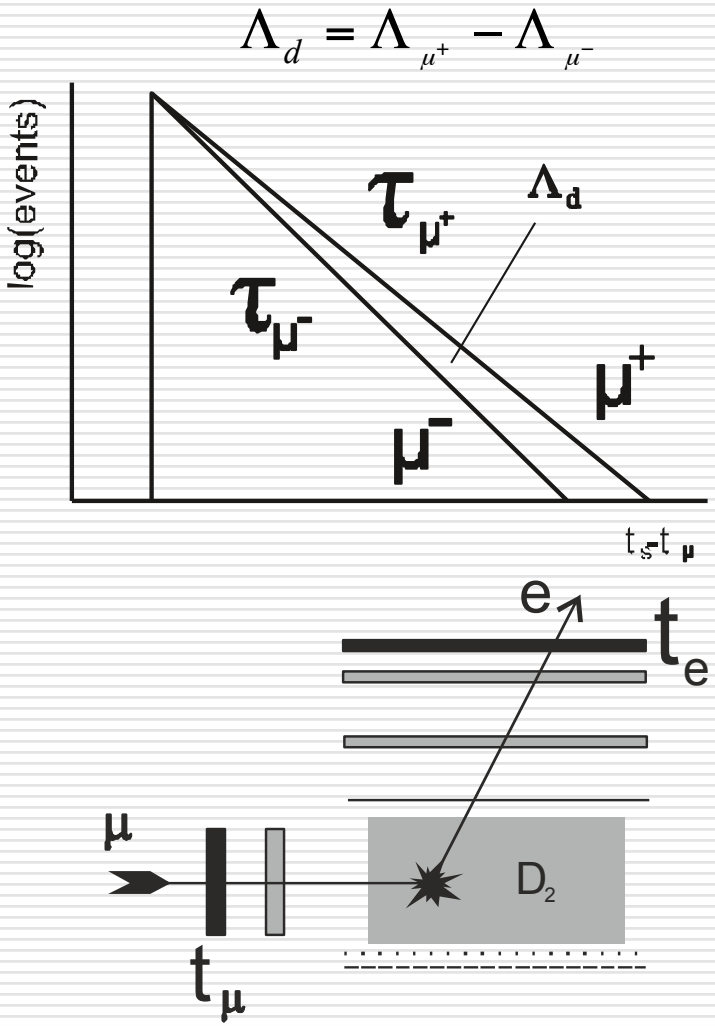
Development and creation of an experimental setup for precision measurement of the capture rate of a muon by a deuteron



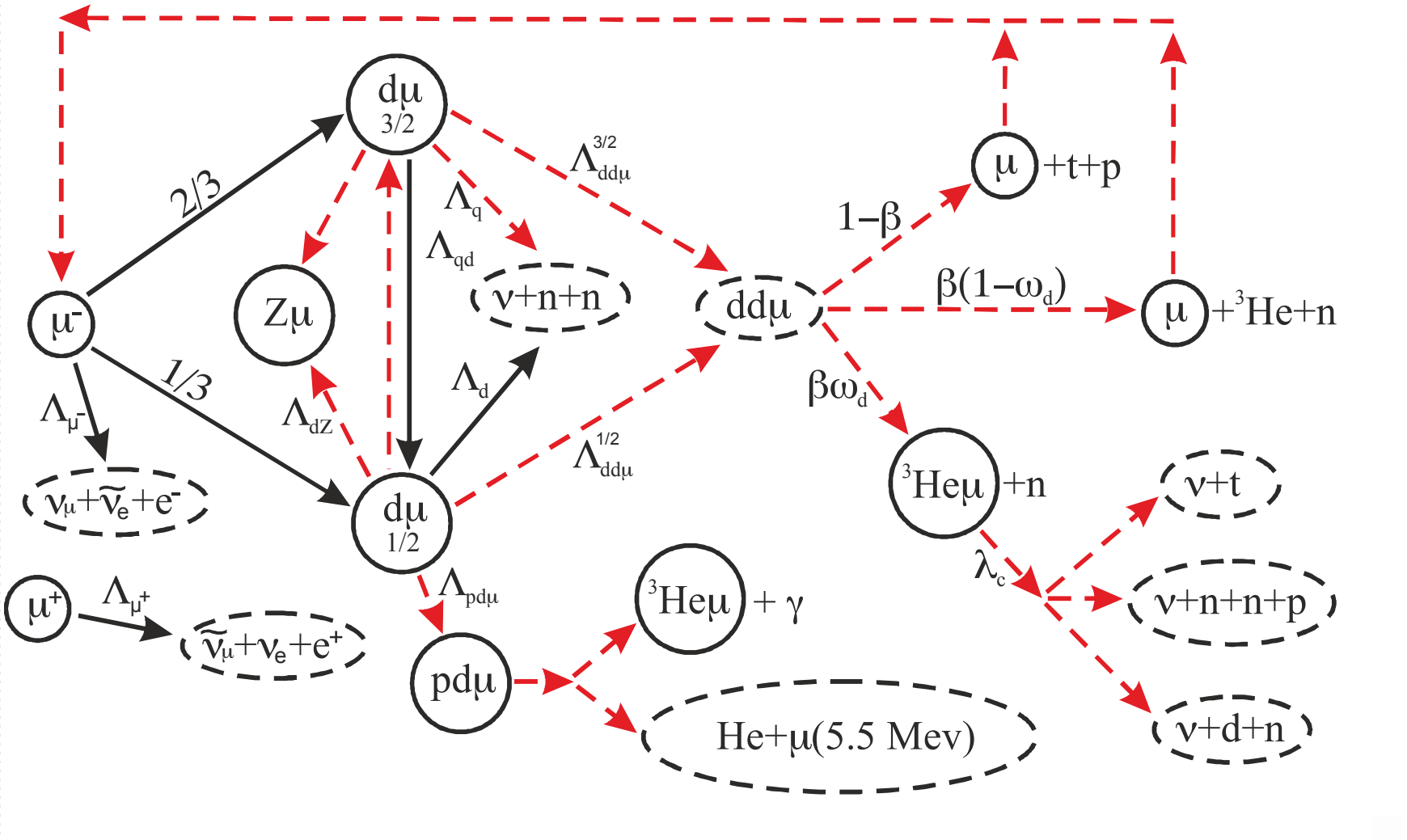


Experimental method

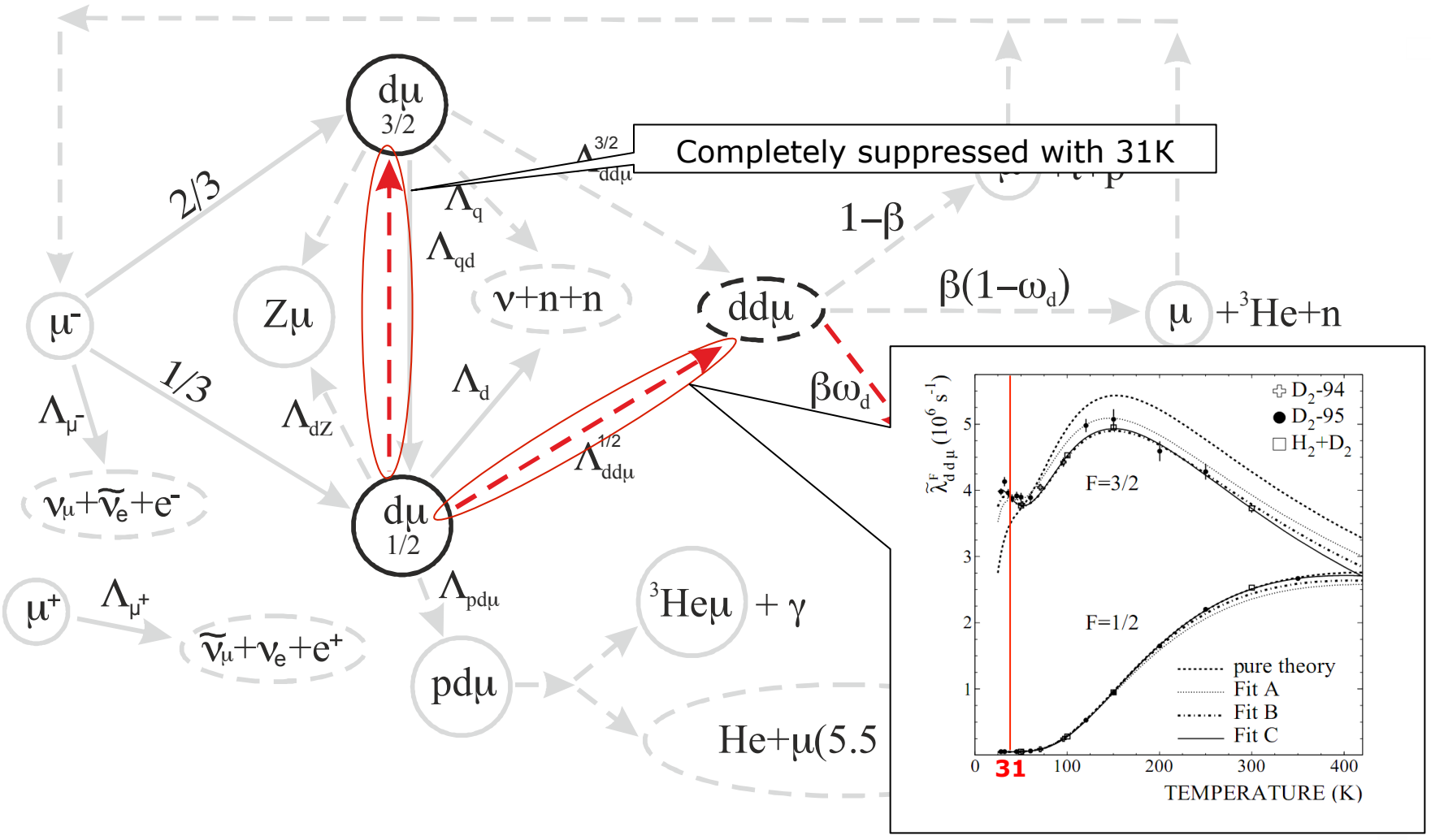




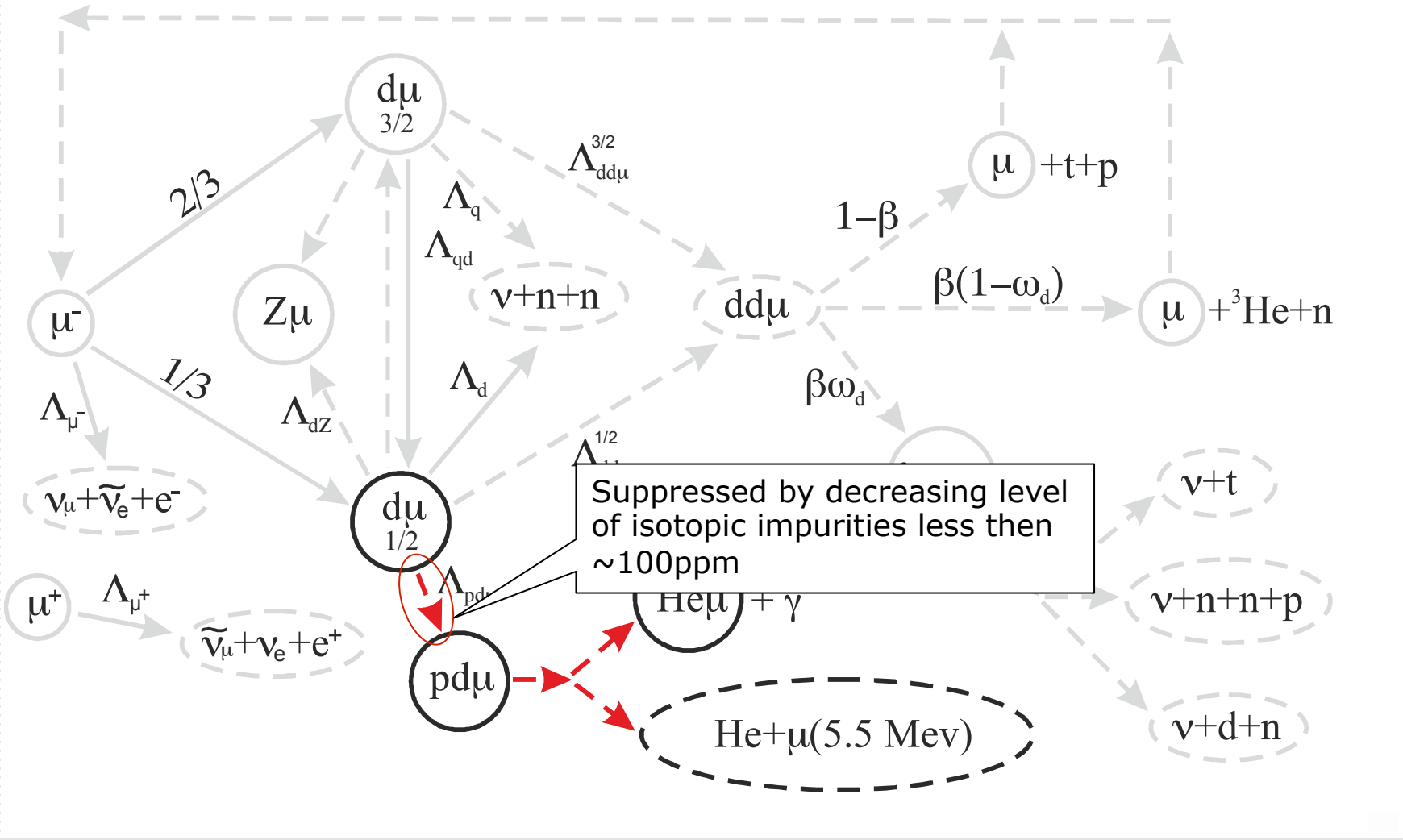
Kinetic of reactions



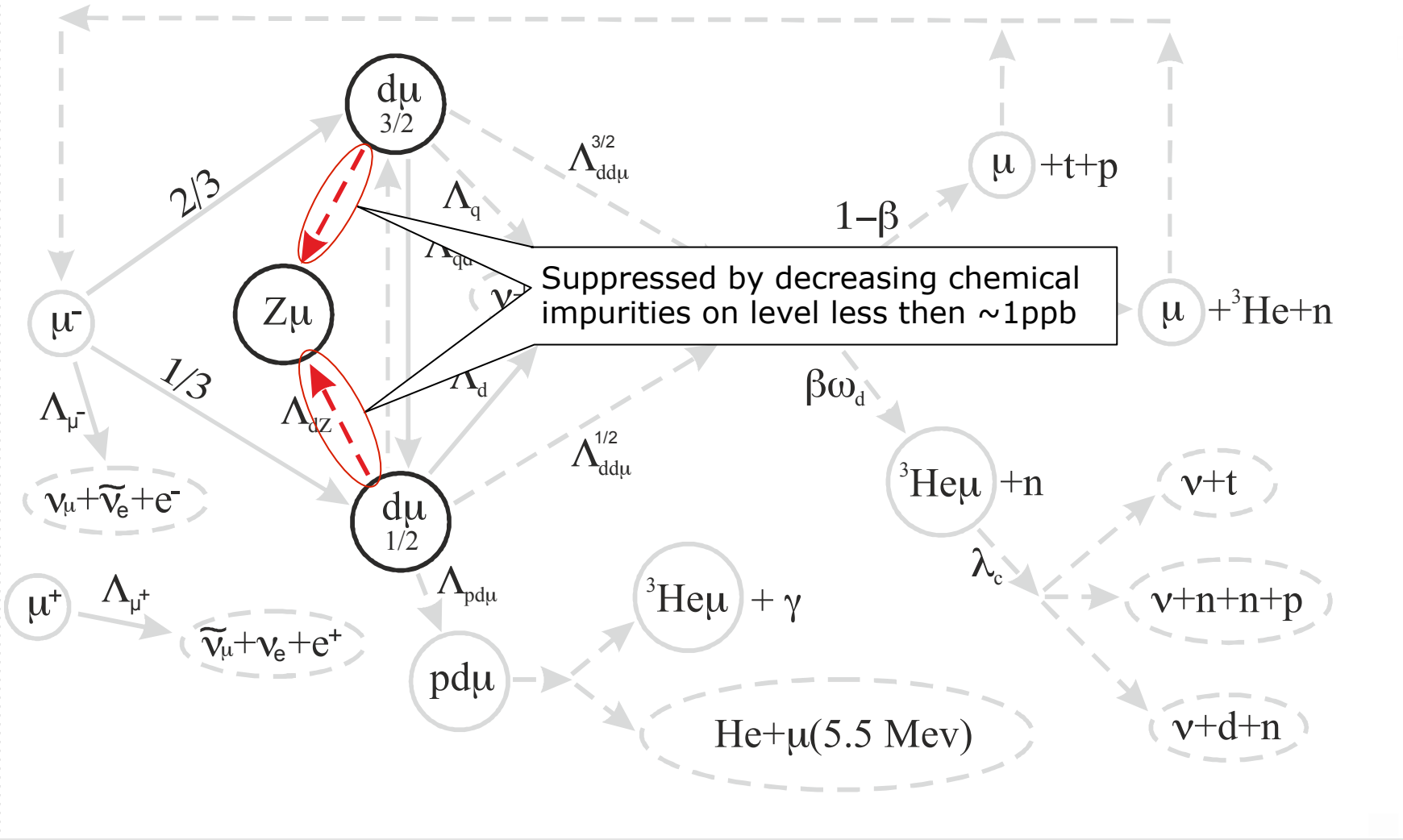
Kinetic of reactions



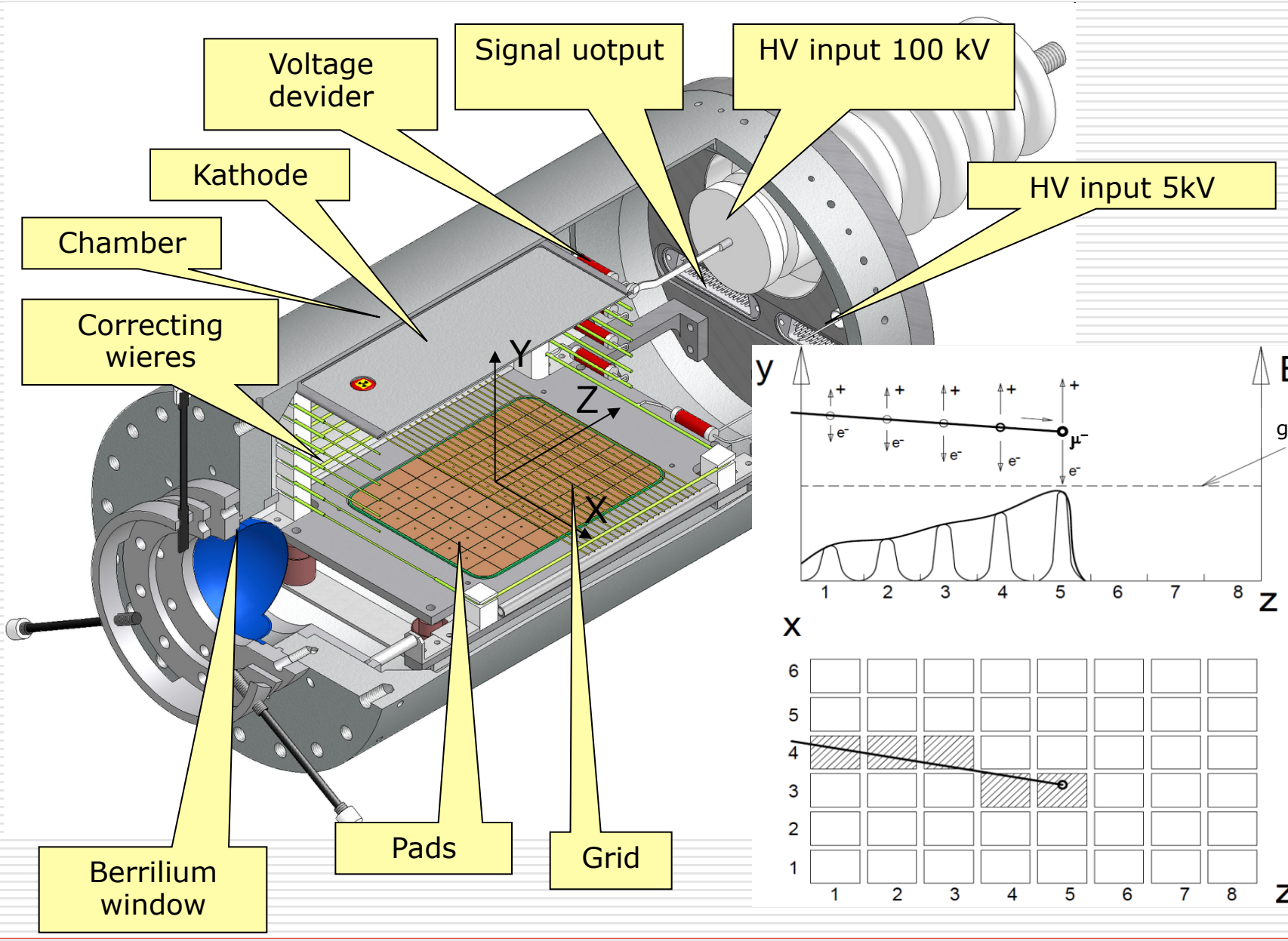
Kinetic of reactions



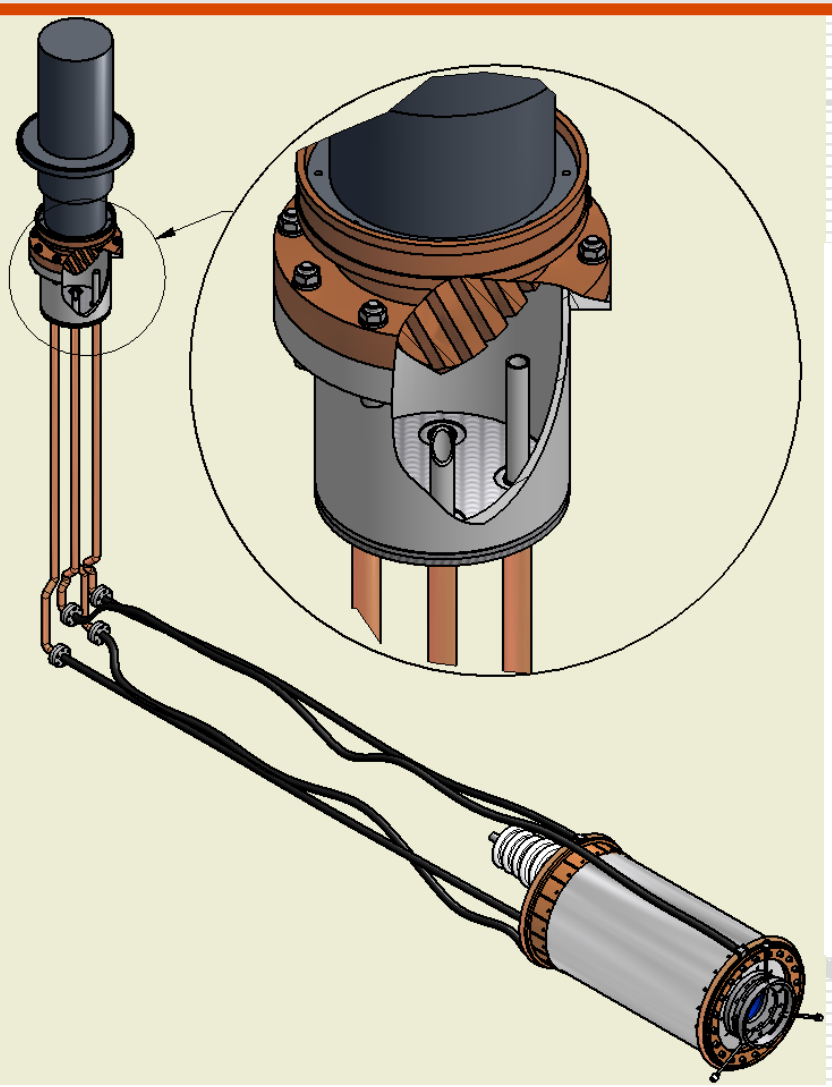
Kinetic of reactions

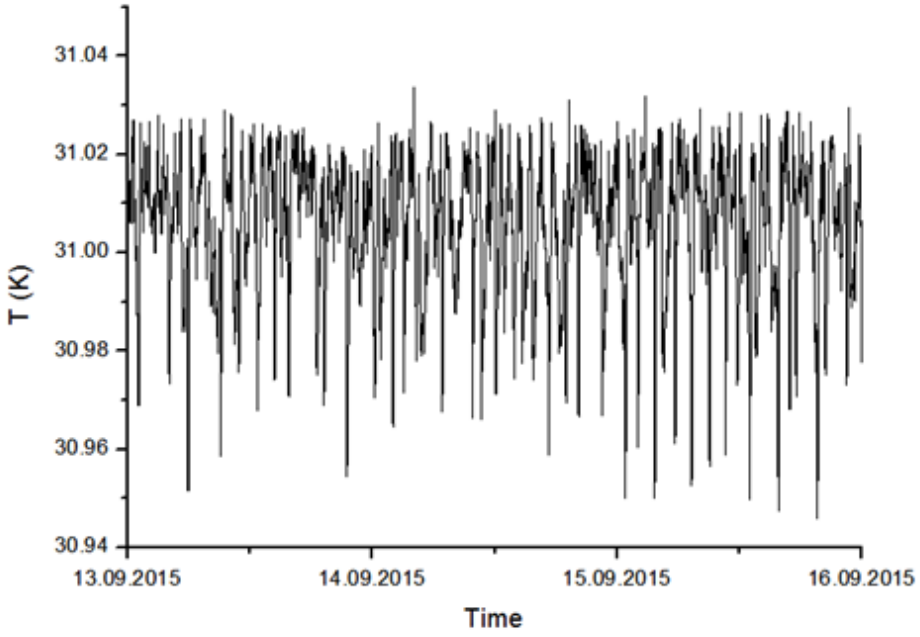


Layout of CryoTPC



Cooling system

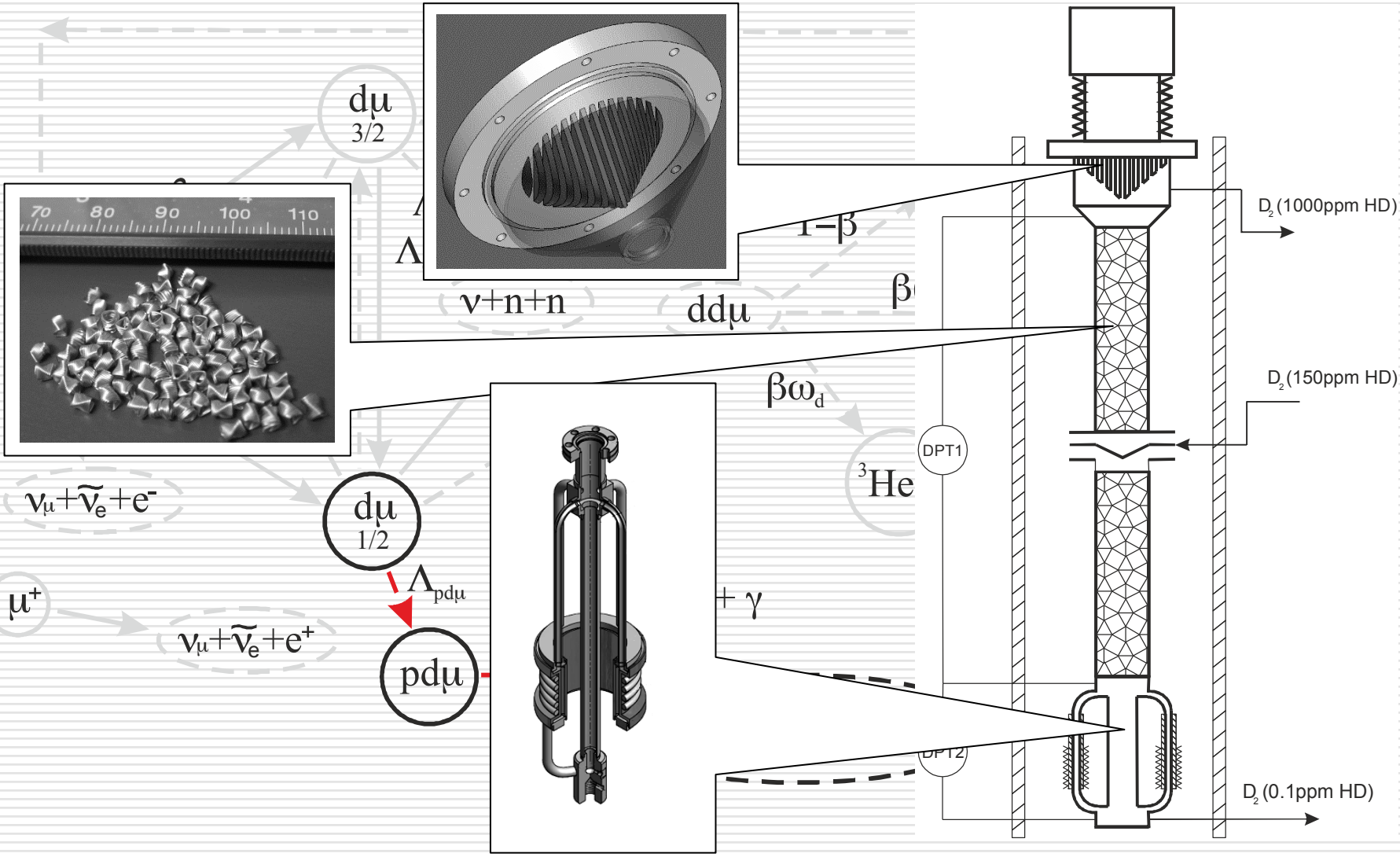




He+μ(5.5 Mev)

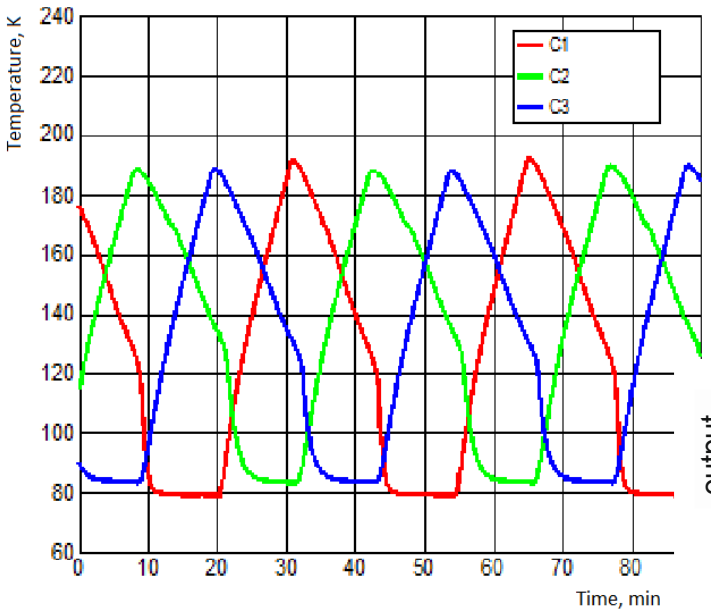
ν+d+n

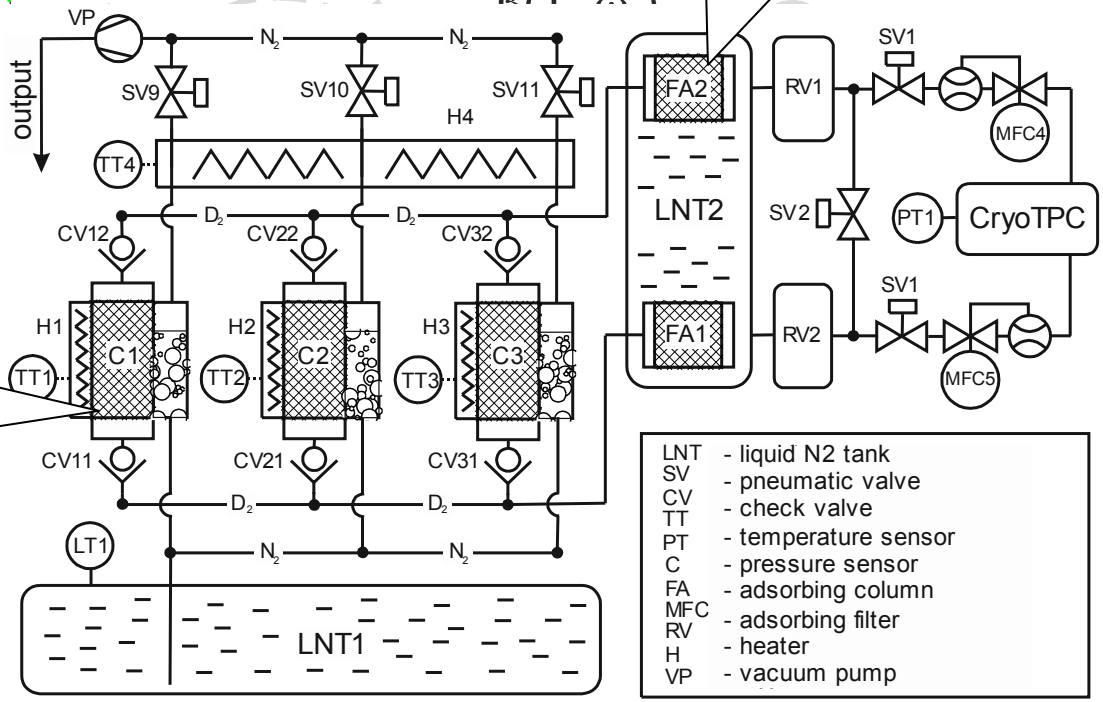
Isotopic purification system



Isotopic purification on level ~100ppb completely reduce channel of pdμ- sintezis.

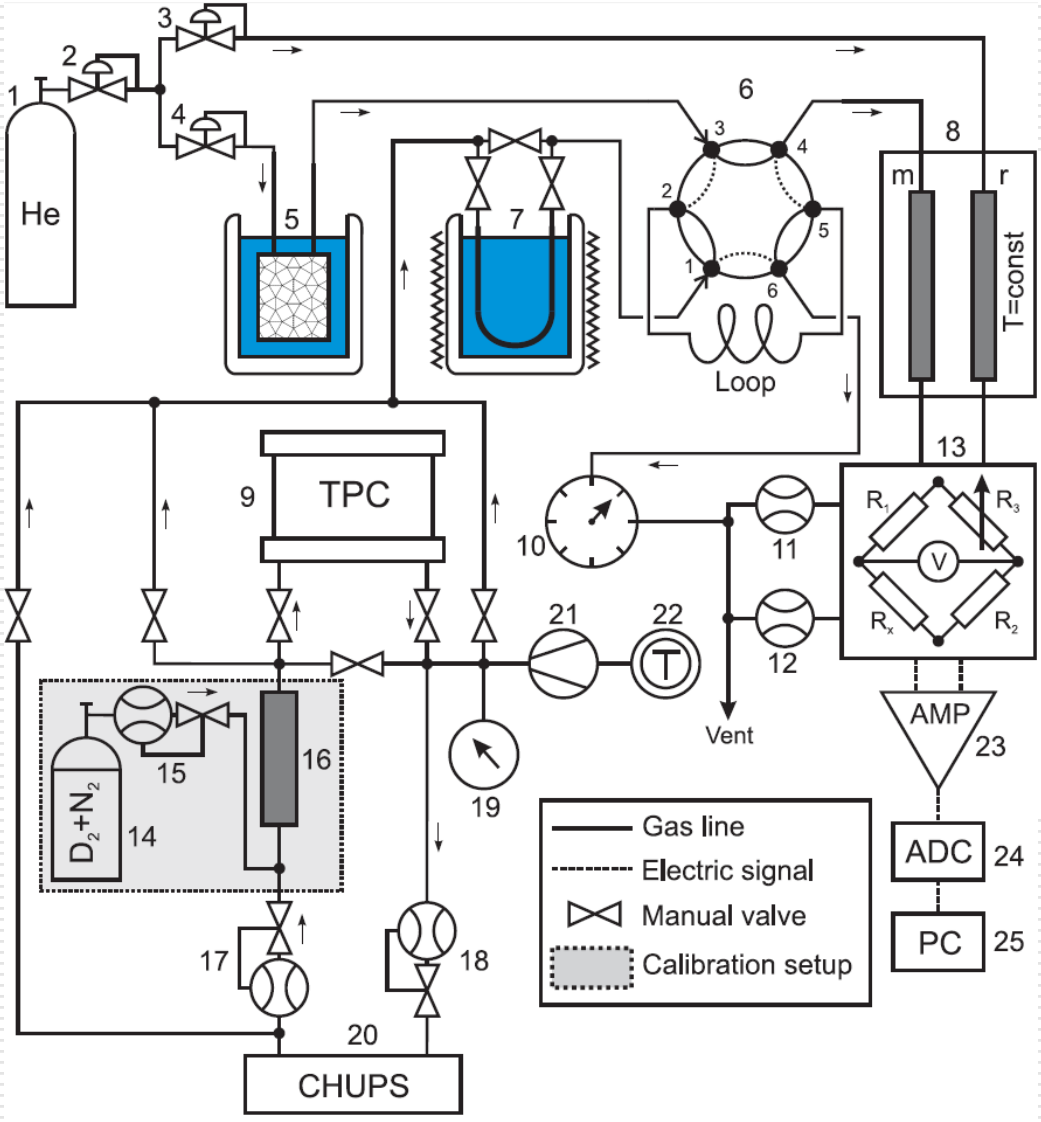
Cryogenic hydrogen ultra high purification system

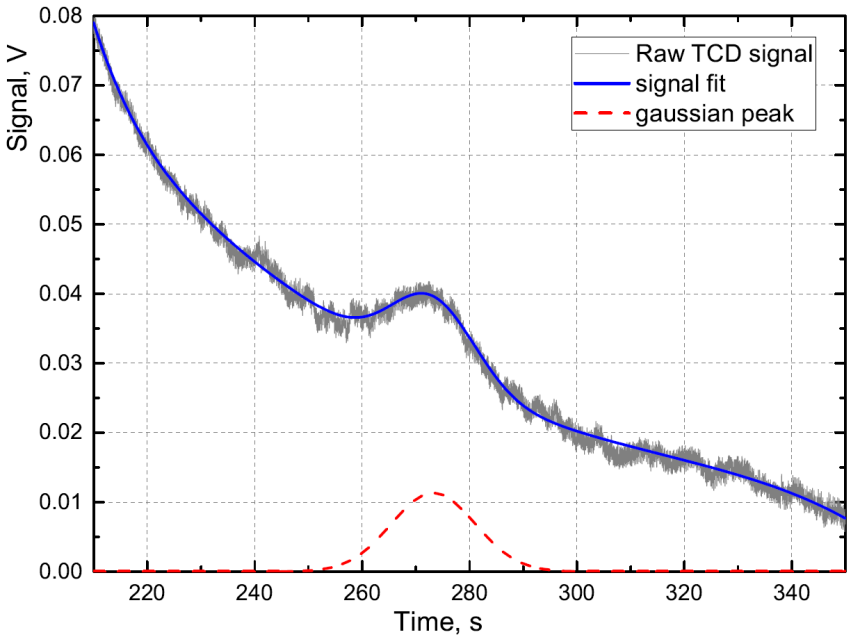




The chemical purification of Deuterium on level ~1ppb totally neglect muon capture Impurities with charge number Z>1.

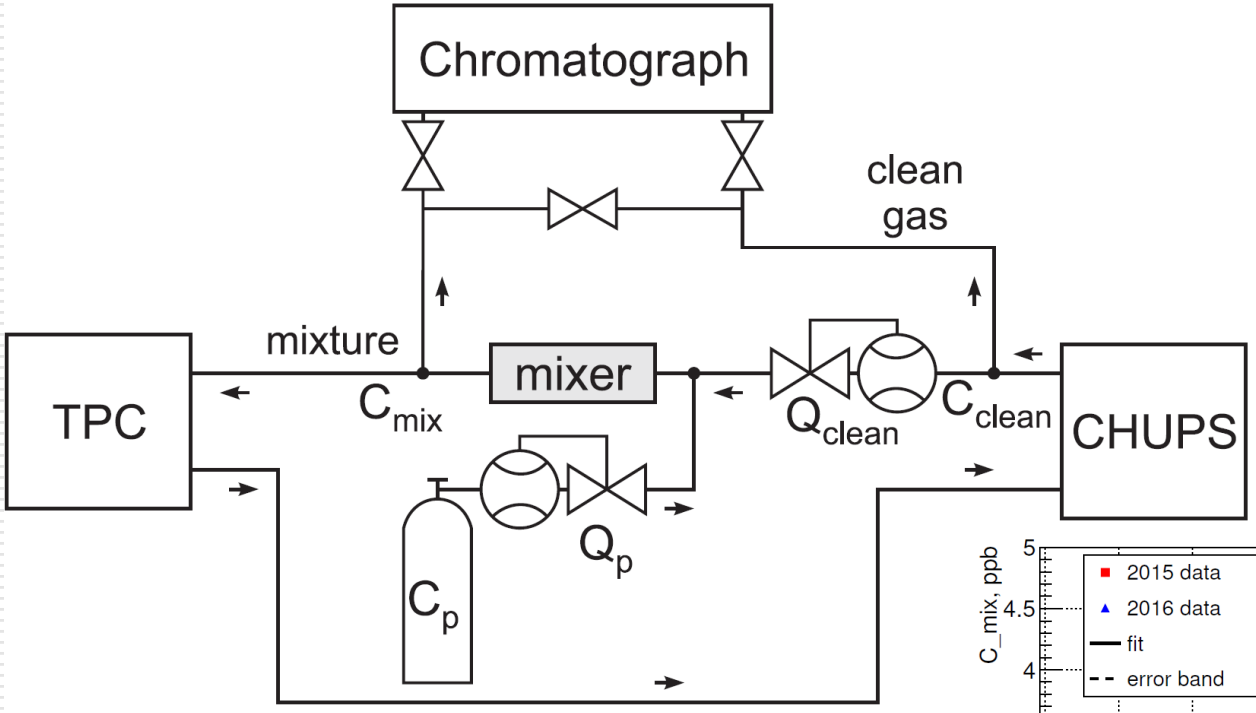
Chromatography

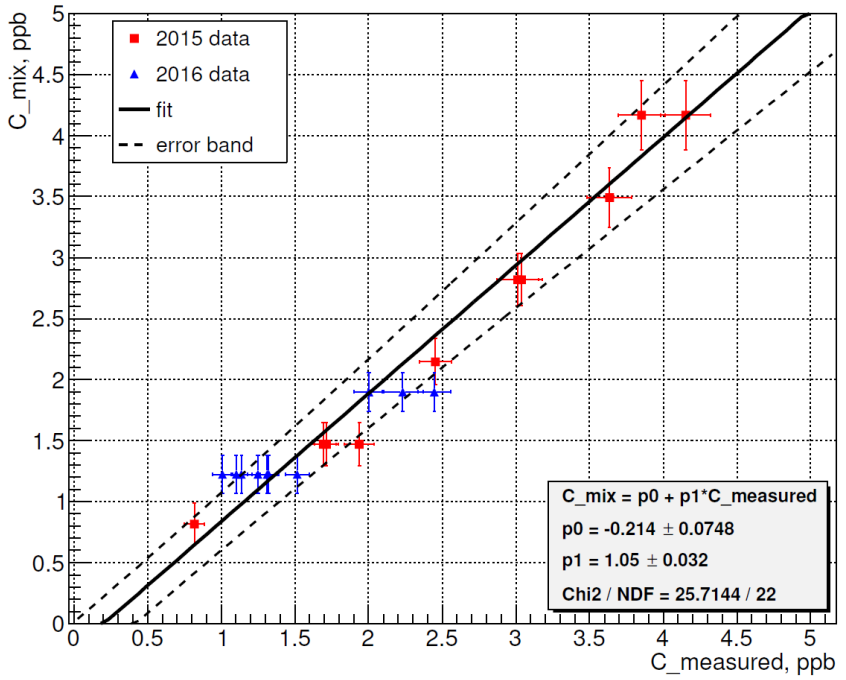




With new impurity accumulating system accuracy of chromatography method raised up to ~0,6ppb.

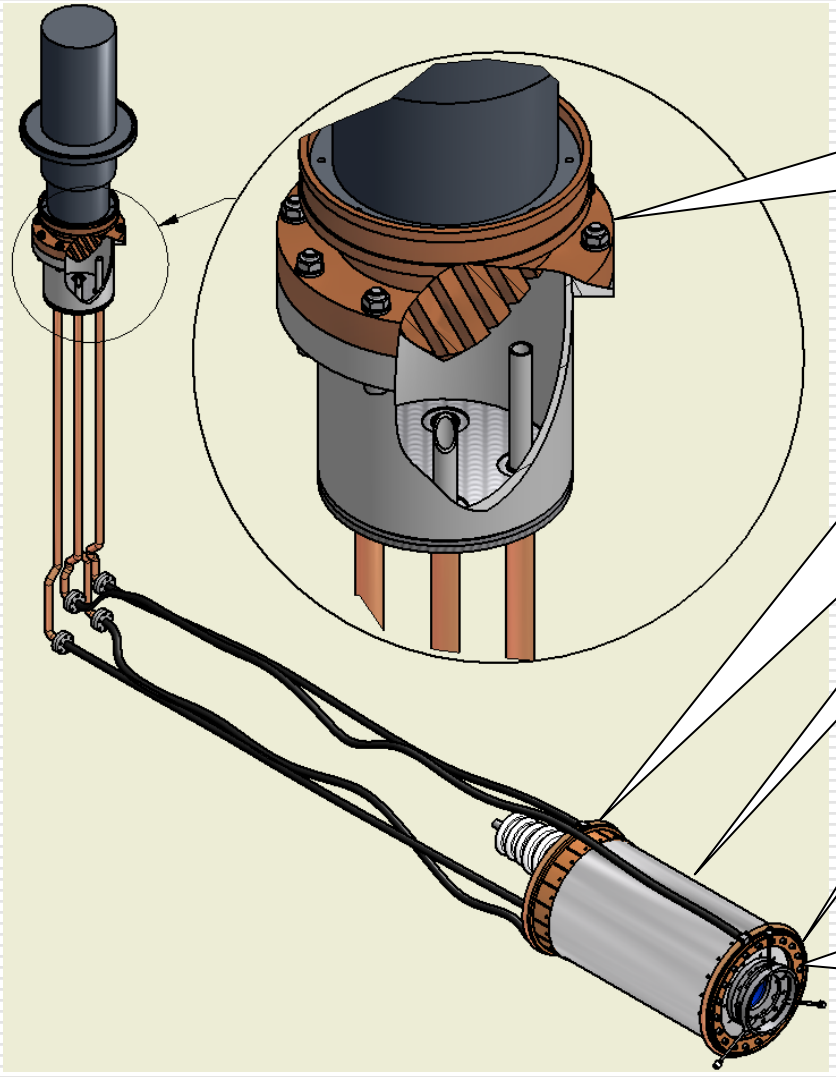
Chromatography calibration

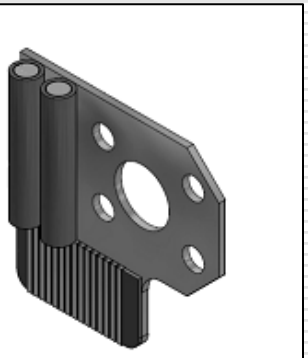




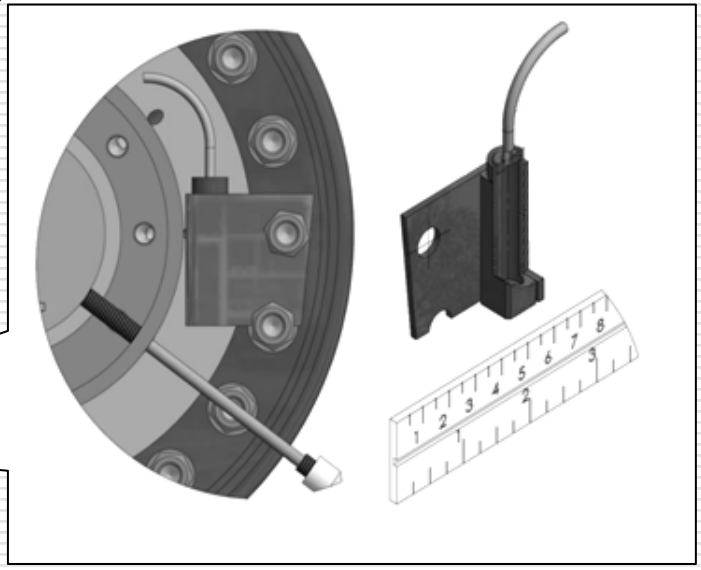
Calibration of chromatography method was made with error ±0,5ppb

Thermometry of CryoTPC



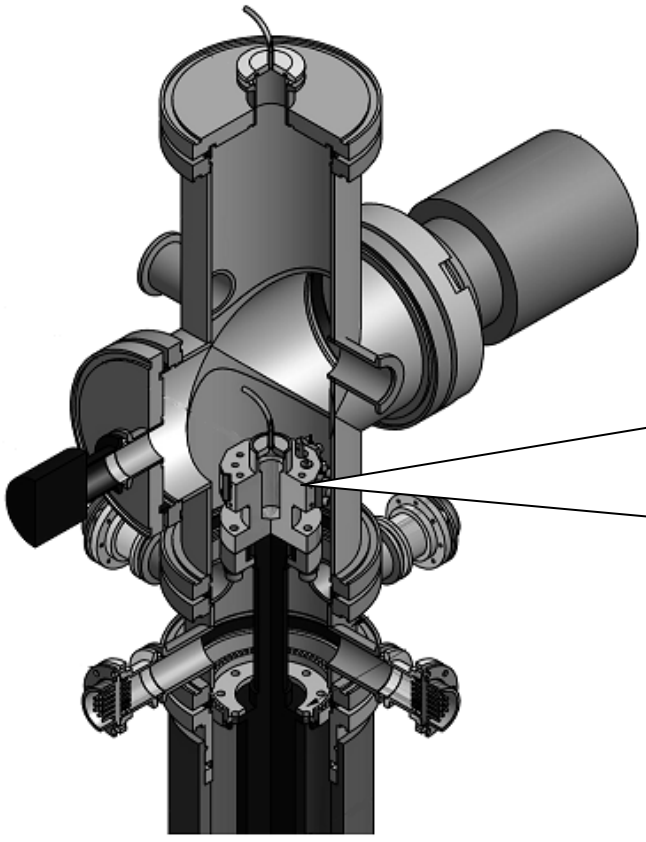


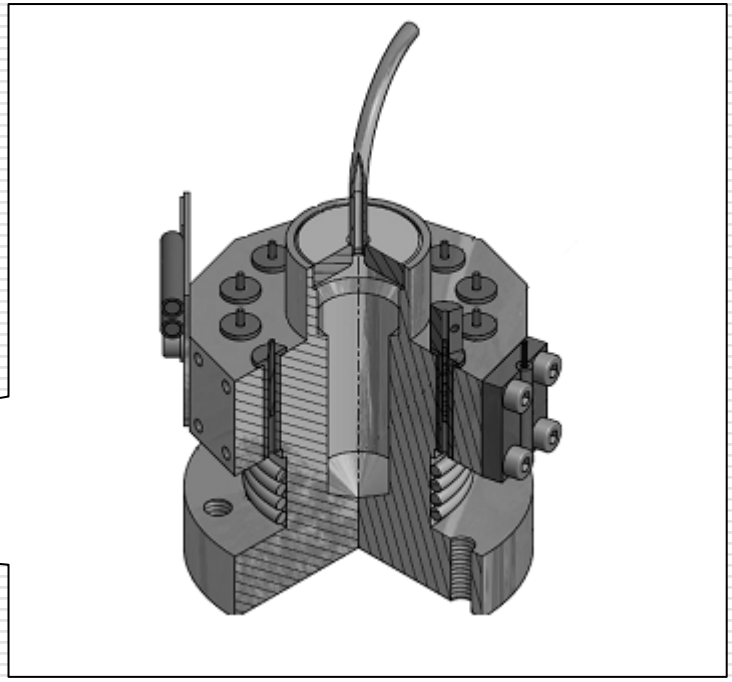
Platinum thermometer
PT-100



Neon condensing thermometer

Thermometry calibrating facility





Callibrating Gas	Temperature range
Hydrogen (H2)	20–30 K
Neon (Ne)	25–36 K
Argon (Ar)	81–104 K
Xenon (Xe)	164–212 K

Calibration of PT-100 thermometers was made in range 20-212K

Collaboration

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Boston University, Boston, USA

Universite Catholique de Louvain, Belgium

Regis University, Denver, USA

University of South Carolina, Columbia, USA

Thank you for attention.

MuSUN weblinks

http://lkst.pnpi.nw.ru/projects/musun/ - PNPI page;
http://www.npl.illinois.edu/exp/musun/ - international page