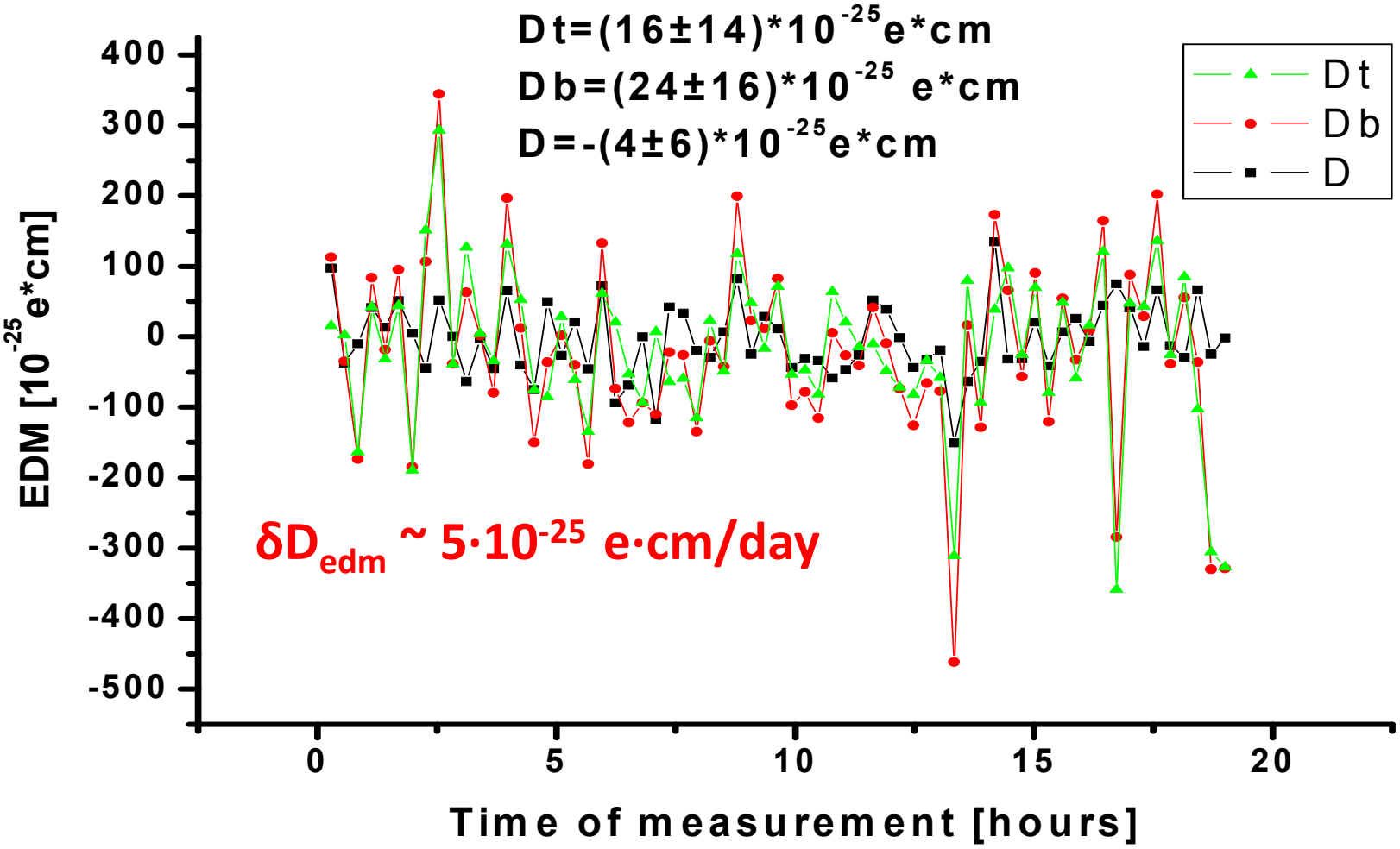
PNPI-ILL-PTI collaboration at ILL reactor in Grenoble

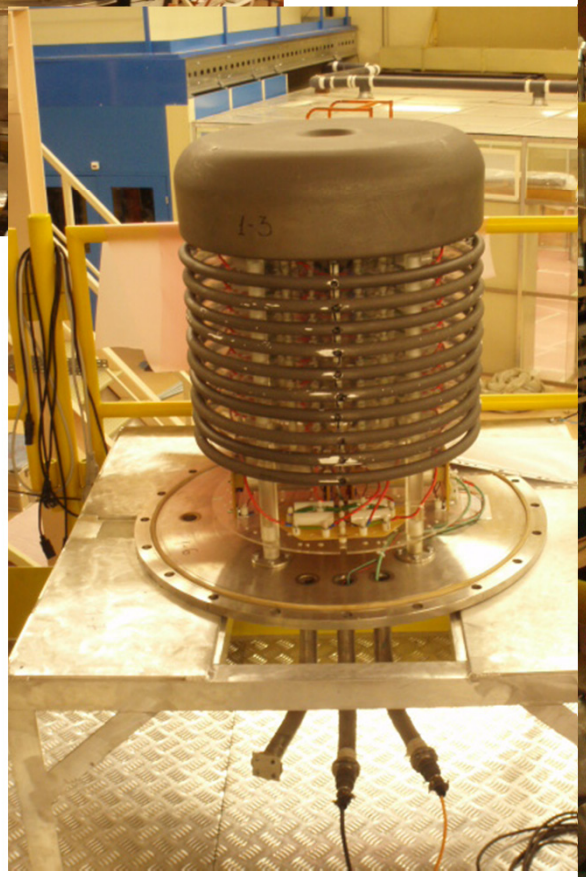
Present status
and
future prospects of
“Gatchina double chamber EDM spectrometer”

September 2008 - **Assembly and testing of detectors, magnetometers and electronics.**
October 2008 - Start of the first measurements with the neutrons

Direct measurement of sensitivity of EDM spectrometer with UCN density 3-4 ucn/cm^3 (MAM position) with electric field 10 kV/cm and T(hold) = 65 s



New result with HV
(+_)175kV/ 8.7cm = 20kV/cm



Corrected measurement of sensitivity of EDM spectrometer with UCN density 3-4 ucn/cm^3 (MAM position) with new electric field 20 kV/cm and T(hold) = 65 s

$\rho_{ucn\ at\ entrace} \sim 3\text{-}4$ ucn/cm^3,

$\delta D_{edm} \sim 2.5 \cdot 10^{-25}$ e·cm/day

Upper limit of sensitivity :

$2.5 \cdot 10^{-26}$ e·cm/100 days

Prospects to increase UCN density and sensitivity of EDM measurements at ILL {with electric field 20 kV/cm and T(hold) = 65 s}

2013 - 2014. **New position at PF2 (EDM instead of MAM) Factor in UCN density is about 3 – 4 times in respect to MAM position.**

$\rho_{ucn\ at\ entrace} \sim 20$ ucn/cm^3, $\delta D_{edm} \sim 1 \cdot 10^{-25}$ e·cm/day

Upper limit of sensitivity : $1 \cdot 10^{-26}$ e·cm/100 days

2015. **New position at H172B, UCN source with superfluid He at ILL. Factor in UCN density is about 10 times in respect to PF2 EDM position.**

$\rho_{ucn\ at\ entrace} \sim 200$ ucn/cm^3, $\delta D_{edm} \sim 3.5 \cdot 10^{-26}$ e·cm/day

Upper limit of sensitivity : $3.5 \cdot 10^{-27}$ e·cm/100 days

PNPI-ILL-PTI collaboration at Gatchina UCN supersource at PNPI WWR-M reactor

future prospects

Prospects to increase UCN density and sensitivity of EDM measurements at PNPI with supper UCN source {at with electric field 20 kV/cm and T(hold) = 65 s}

2016. New facilities at PNPI, UCN source with superfluid He. **Factor in UCN density is about 60 times with respect to H172B ILL facility.**

$\rho_{ucn\ at\ entrace}$ ~ 12000 ucn/cm^3, δD_{edm} ~ $5 \cdot 10^{-27}$ e·cm/day

Upper limit of sensitivity : $5 \cdot 10^{-28}$ e·cm/100 day

2017 -2018. New facilities at PNPI, UCN source with superfluid He. Multichamber EDM spectrometer.

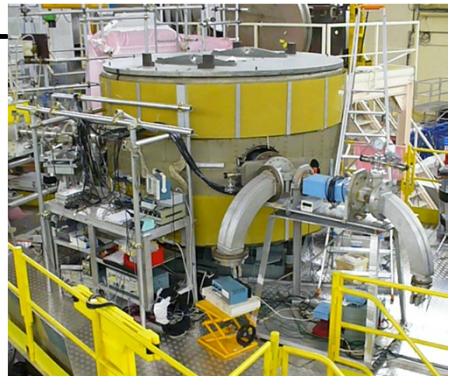
$\rho_{ucn\ at\ entrace}$ ~ 12000 ucn/cm^3, δD_{edm} ~ $3 \cdot 10^{-27}$ e·cm/day

Upper limit of sensitivity : $3 \cdot 10^{-28}$ e·cm/100 day

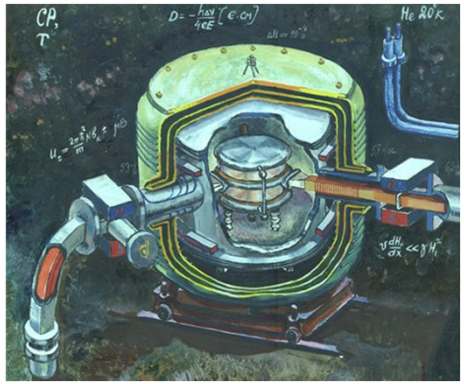
PNPI-ILL-PTI collaboration

Prospects to increase sensitivity of EDM measurements

Gatchina EDM spectrometer at ILL



Gatchina EDM spectrometer 1975



Neutron EDM Experimental limit, e·cm

10^{-25}

10^{-26}

10^{-27}

10^{-28}

double-chamber @ **ILL** MAM position

double-chamber @ **ILL** EDM position

double-chamber @ **ILL** UCN source with superfluid He

double-chamber @ **PNPI super UCN source**

multi-chamber @ **PNPI super UCN source**

2011 2012 2013 2014 2015 2016 2017 2018

Year