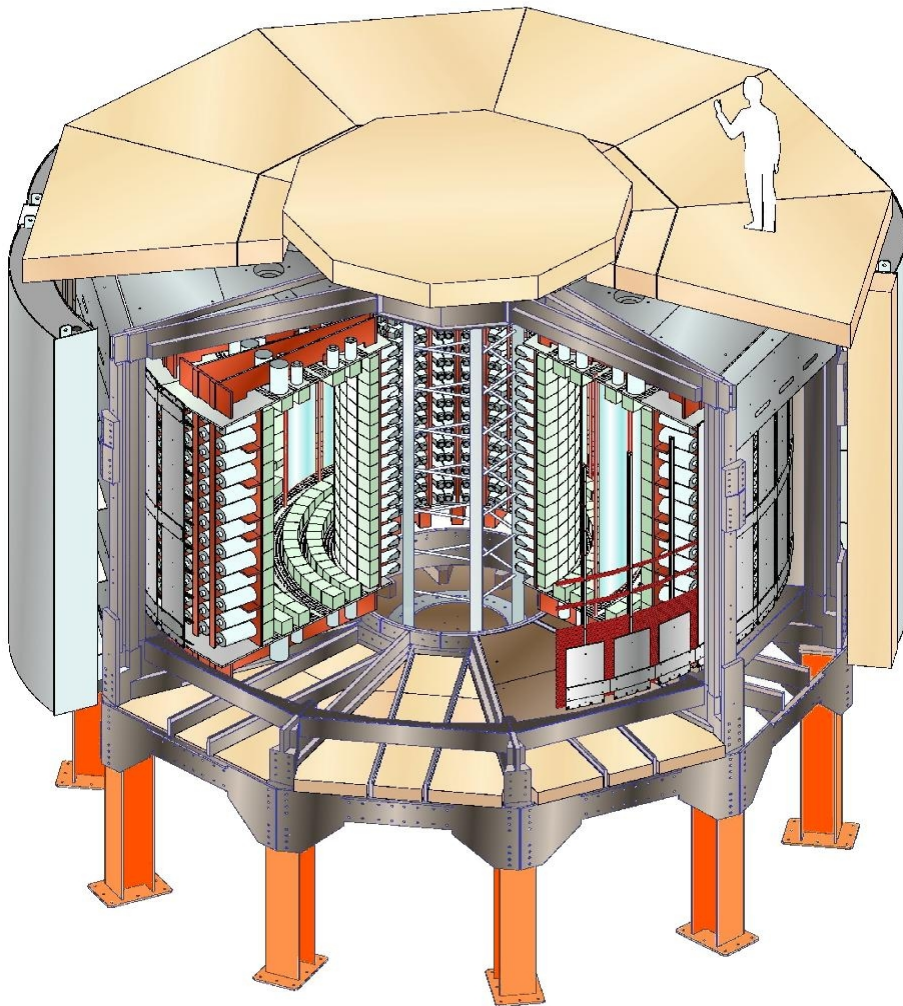

Czech contribution to neutrino experiments

J. Kaspar
NPI Rez near Prague

kaspar@ujf.cas.cz
Prague, May 11, 2007

-
- > NEMO 3
 - > TGV II
 - > PICASSO
 - > Daya Bay
 - > KATRIN
-
-

NEMO 3



> transparency by I. Stekl, IEAP CTU

0 $\nu\beta\beta$ and 2 $\nu\beta\beta$ experiment <
located at Frejus Underg. Lab. <
several isotopes <
 ^{100}Mo , ^{82}Se , ^{130}Te , ^{116}Cd , ^{96}Zr , ^{48}Ca , ^{150}Nd <
operated all 2004 <
from Oct. 2004 with radon free air

IEAP CTU Prague <
I. Stekl, L. Vala, J. Jerie (phd)
P. Benes (phd), F. Mamedov (phd)
V. Bocanov (phd)
Charles University Prague <
V. Vorobel

NEMO 3

Czech group responsible for <
data processing for <
 ^{116}Cd , ^{100}Mo ($2\nu\beta\beta$)
 ^{100}Mo excited states ($0\nu\beta\beta$)
radon program <
measurement, spectrometer devel.
theory <

2008 - 2009

6914 g of ^{100}Mo $T_{1/2}(\beta\beta0\nu) > 4 \cdot 10^{24}$ y (90% C.L.)

$\langle m_\nu \rangle < 0.20 - 0.35$ eV

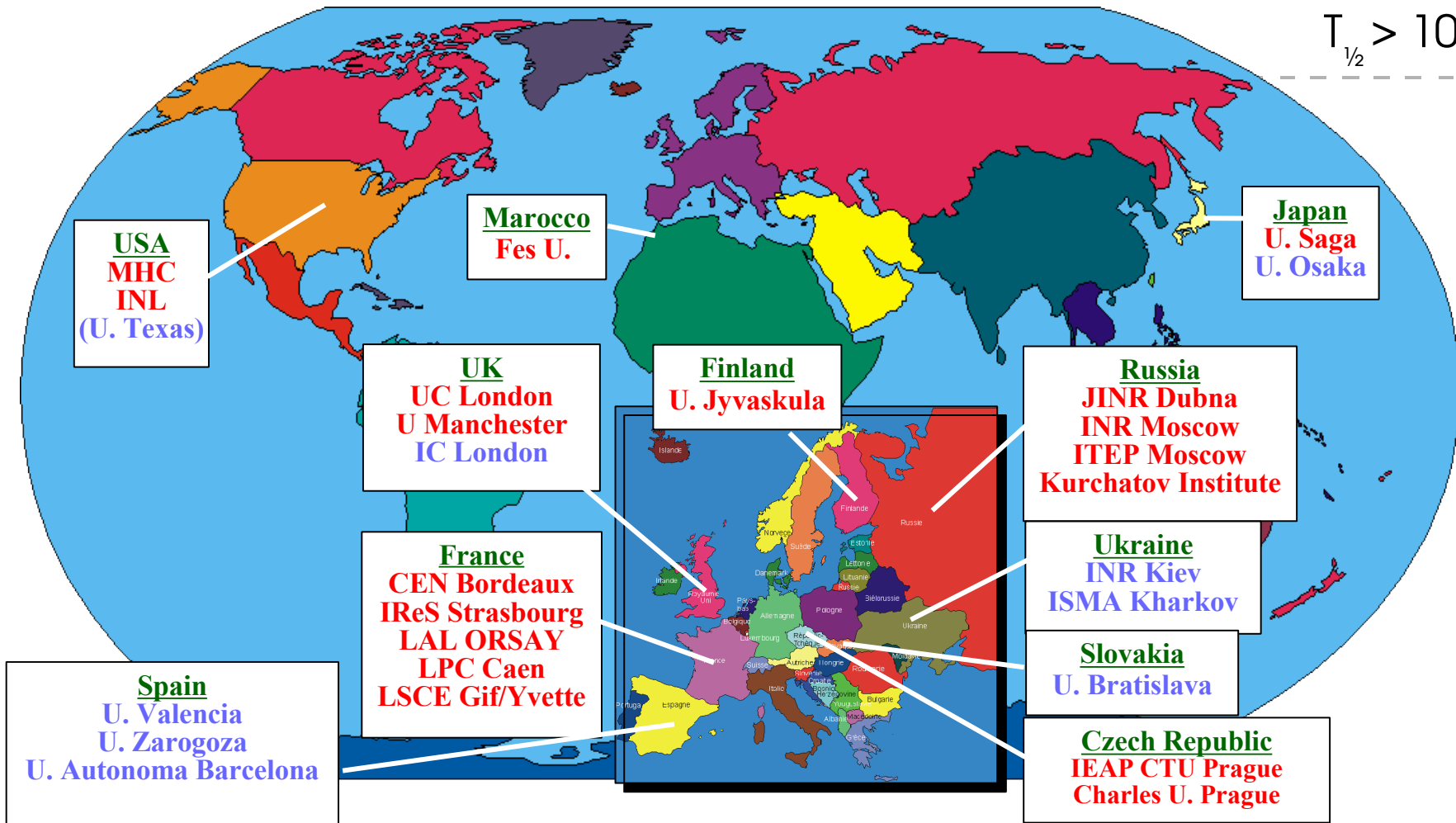
932 g of ^{82}Se $T_{1/2}(\beta\beta0\nu) > 8 \cdot 10^{23}$ y (90% C.L.)

$\langle m_\nu \rangle < 0.65 - 1.8$ eV

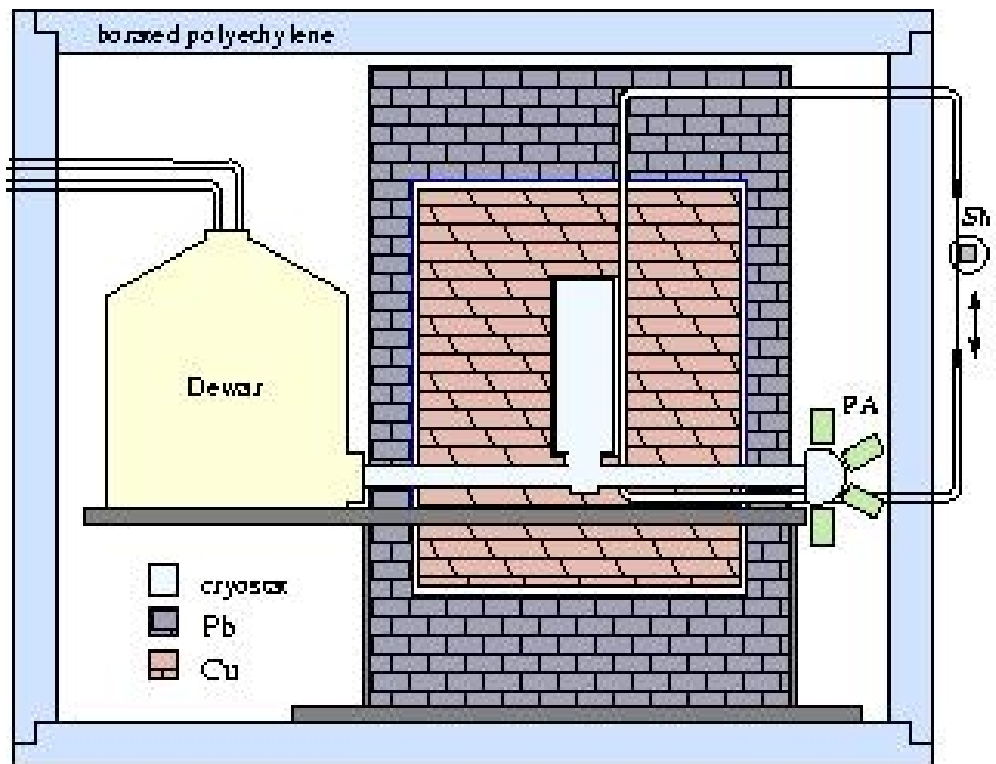
> transparency by I. Stekl, IEAP CTU

SuperNEMO

NEMO collab. & new labs <
 $^{116}\text{Cd}, ^{82}\text{Se}$ <
 $\langle m_\nu \rangle \leq 30 - 50 \text{ meV}$ <
 $T_{1/2} > 10^{26} \text{ y}$



TGV II



multi-detector telesc. spectrometer <
 $\beta\beta$ process in ^{106}Cd (EC/EC), ^{48}Ca <
located at Modane Underg. Lab. <
32 HPGe detectors <
in a common cryostat

> transparency by I. Stekl, IEAP CTU

IEAP CTU Prague <
I. Stekl, P. Cermak, P. Benes (phd)

TGV II

Czech group responsible for <
data processing & evaluation <
DAQ development <

Present status:

- we finished measurement with enriched ^{106}Cd (one year)
- data processing
- TGV II runs with foils made of natural Cd (background measurement)

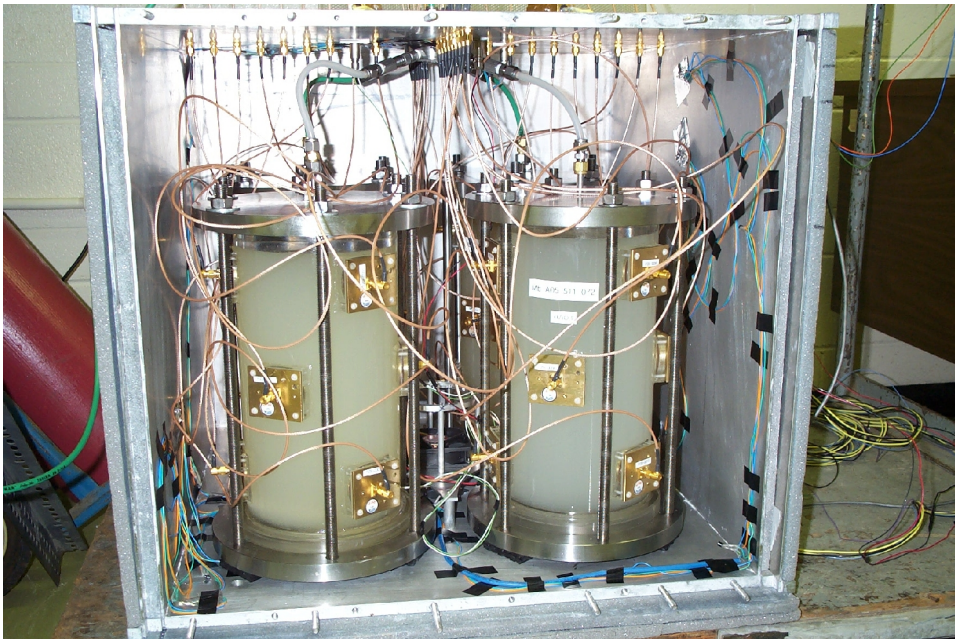
Result of measurement $T_{1/2} \geq 2 \times 10^{20}$ years (three theoretical results - 10^{20} , 8.7×10^{20} , 4.4×10^{21})

Improvement – more materials (2x); more time of measurement (2-3 years)
decrease background (cleaning of detectors, cryostat)

Factor 20 is reasonable, new start of measurement – April 2007

> transparency by I. Stekl, IEAP CTU

PICASSO

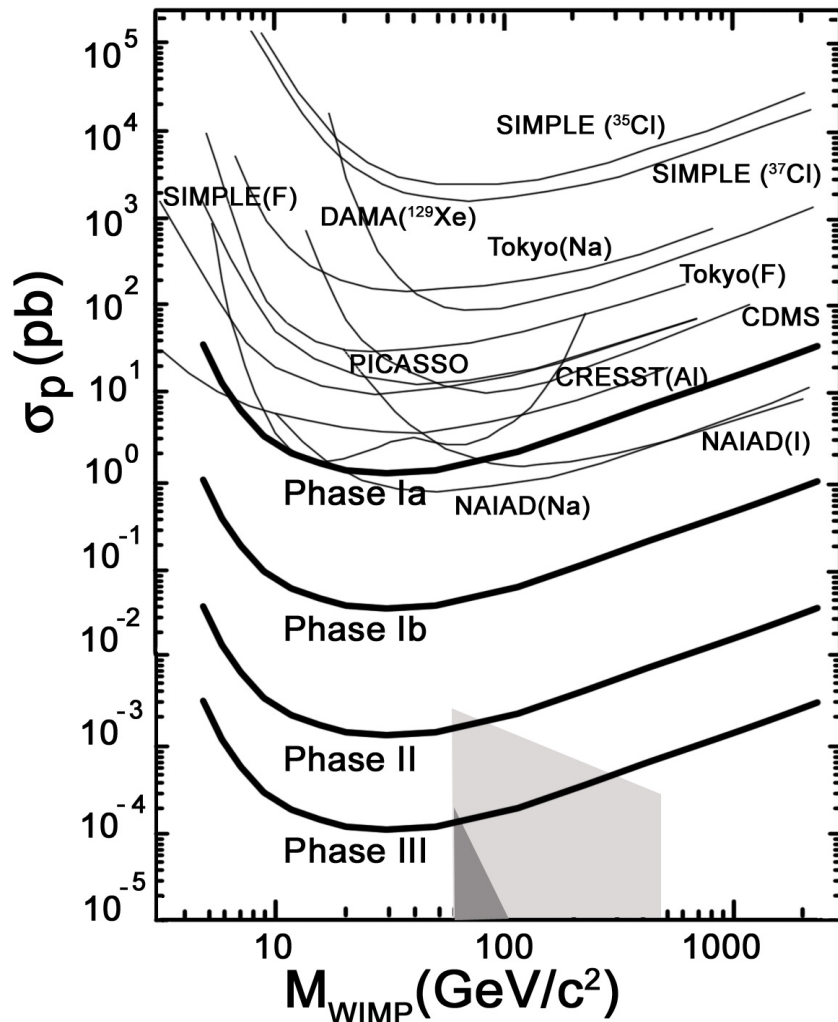


> transparency by I. Stekl, IEAP CTU

dark matter experiment <
neutralino detection <
located at SNO <
superheated droplets detectors <
elastic nuclear scattering <

IEAP CTU Prague <
S. Pospisil, I. Stekl, J. Sodomka

PICASSO



> transparency by I. Stekl, IEAP CTU

 Czech group responsible for <
 production of 32 detectors <
 new bigger (4.5 l) ones
 radon background <
 R&D of a portable radon detector
 removing of radon

 future plans <
 to be involved in data processing <
 a phd student
 detector installation in IEAP <
 detector testing
 shielding <

NEMO 3 & TGV II & PICASSO

Grant support of IEAP group:

1. Project INGO „Non-Accelerated astroparticle physics in international underground laboratories“ (2007-2010)
2. Project VC „Center of exp. nuclear astrophysics and nuclear physics“ (2007-2011)
3. EU project ILIAS „Integrated Large Infrastructures for Astroparticle Physics“ (2005-2009, representative of CR in project I. Štekl)
4. Research program MEYS VZ29 (2006-2010, headed by S. Pospíšil)

Recent publications:

- R.Arnold, ... I.Štekl et al., Nucl. Instr. Meth. in Phys. Research A 536 (1-2), 2005, 79-122.
- R. Arnold, ... I.Štekl, ...L.Vála et al., Phys.Rev.Lett. 95, 182302 (2005).
- R.Arnold, ... I.Štekl, L.Vála et al., Nucl. Phys. A 765 (2006) 483-494.
- P.Čermák et al., Nucl. Instr. and Meth. in Phys. Research A 569 (2006) 737-742.
- R.Arnold, ... J.Jerie, I.Štekl, L.Vála et al. (54 authors), Nucl. Phys. A vol. 781, issues 1-2, (2007), 209-226.
- F.Aubin et al., The PICASSO direct dark matter search experiment, CP828, Multiparticle Dynamics, American Institute of Physics, 2006, 0-7354-0320-1/06, 265-270.
- F.Aubin et al., ISBN 981-256-798-4, World Scientific (2006), 253-261.
- Yu.A. Shitov et al., Phys. of Atomic Nuclei, 2006, Vol. 69, No. 12, pp. 2090-2095 (ISSN 1063-7788).

> transparency by I. Štekl, IEAP CTU

Daya Bay



reactor oscillation experiment <
optimized for Θ_{13} measurement <

sensitivity of 0.01 @ 90% c.l.

located at Daya Bay, China <

4 reactor cores, 2 more in 2011 <

17.4 GW in total

starting in 2010 with a full detector <

> transparency by R. Leitner, Ch. Uni.

Charles University Prague <

R. Leitner, V. Vorobel, Z. Dolezal

V. Pec (dip. st.), P. Nevidansky (bc.)

Daya Bay

Czech group responsible for <
Monte Carlo of background <
R&D veto detector <



> transparency by R. Leitner, Ch. Uni.

KATRIN

beta decay experiment <
to measure neutrino mass
in model independent way

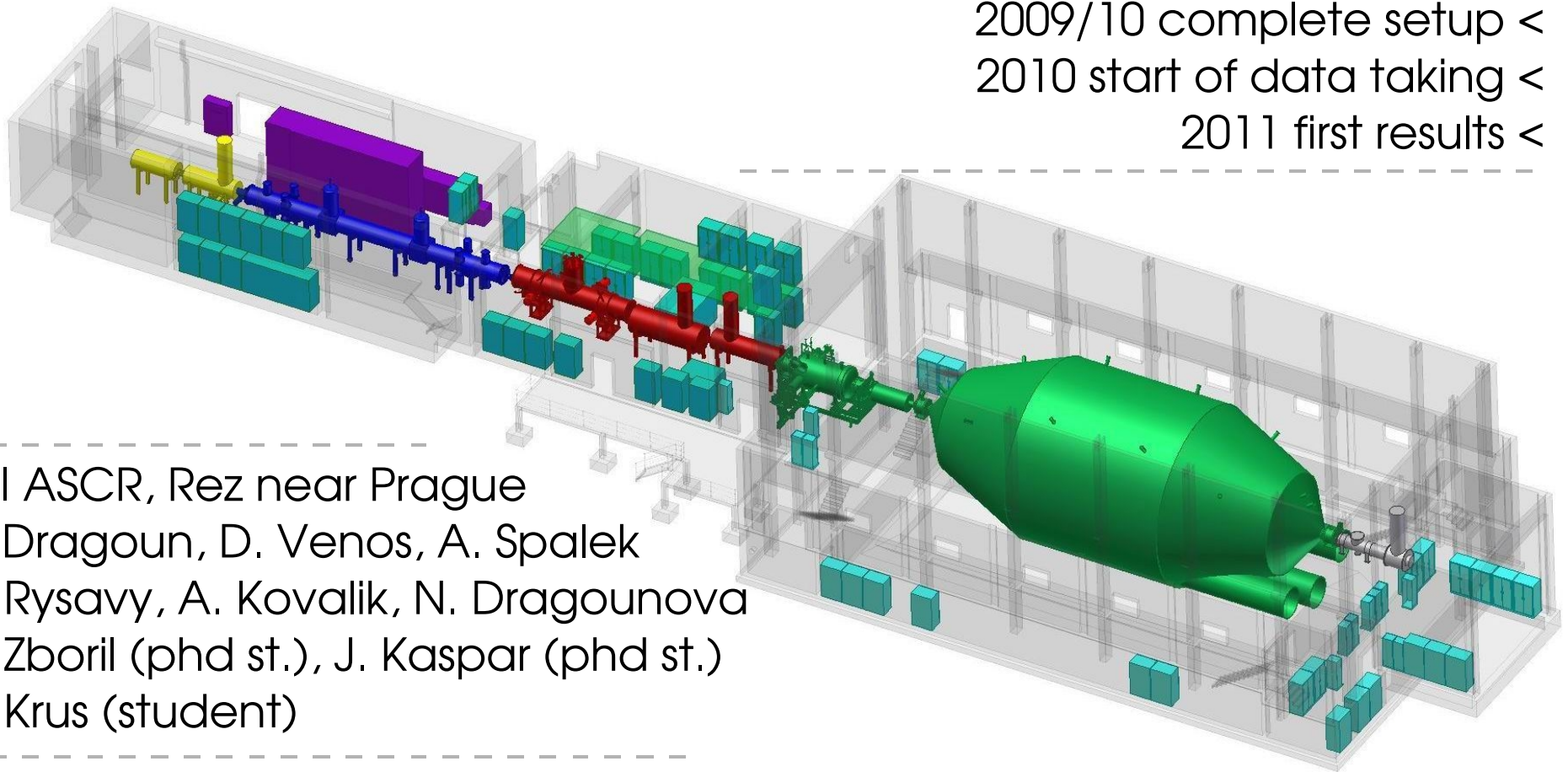
CERN recognized experiment <
build & operated mostly by <
Helmholtz soc.



Leopoldshafen, 25.10.06

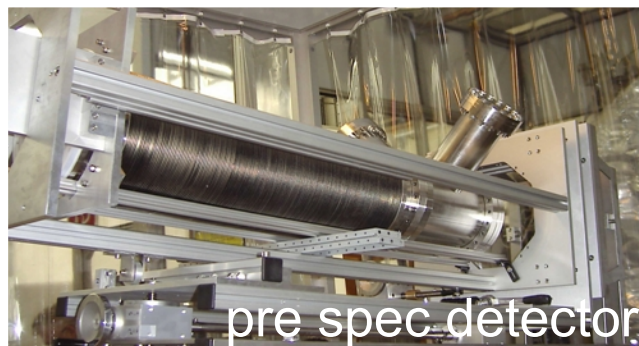
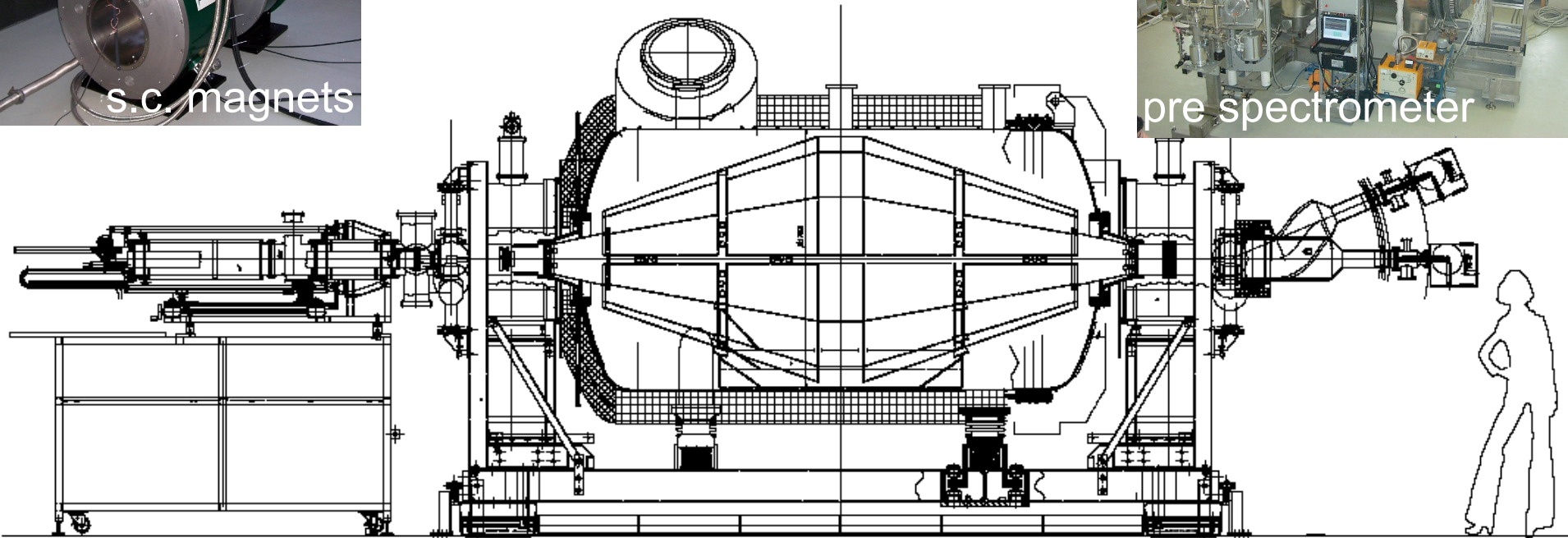
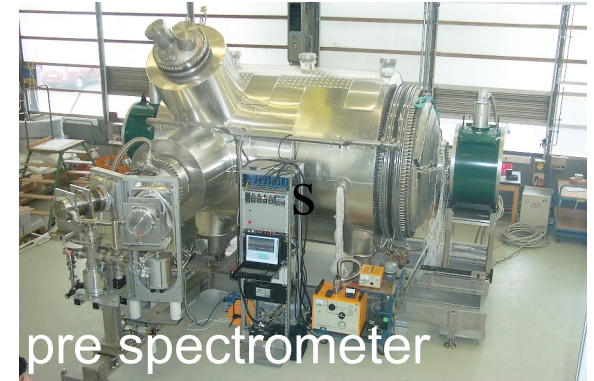
KATRIN

the next generation tritium exp. <
sensitivity 0.2 eV (90% c.l.) (no signal) <
discovery potential 0.35 eV (5σ) <
2009/10 complete setup <
2010 start of data taking <
2011 first results <



> NPI ASCR, Rez near Prague
O. Dragoun, D. Venos, A. Spalek
M. Rysavy, A. Kovalik, N. Dragounova
M. Zboril (phd st.), J. Kaspar (phd st.)
M. Krus (student)

KATRIN



KATRIN



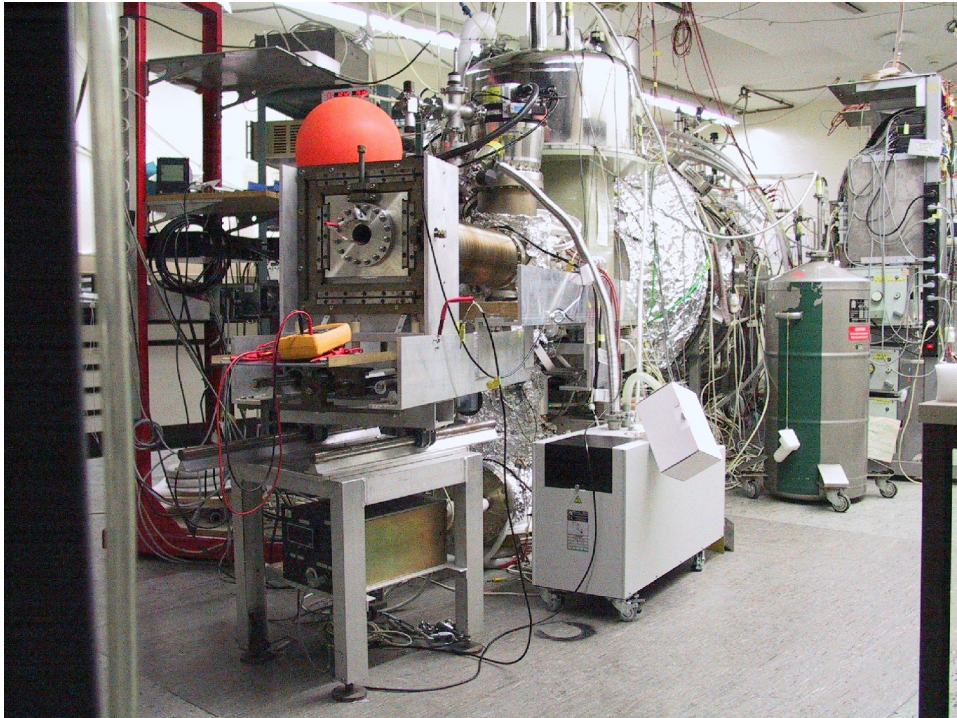
August 2006:

- construction of main spectrometer vessel has been finished
 - vessel has passed leak test successfully !
- ⇒ world`s biggest XHV vessel ever been build !

KATRIN

Czech group responsible for <
calibration & monitoring task <
1 – 3 ppm for 5 years
R&D of nuclear standards of
monoenergetic electrons
Am/Co, Rb/Kr (NPI Rez)
CKrS (Uni Muenster)

and contributing by <
optimized distrib. of meas. time <
MC simulations of el. scattering <
gamma spectroscopy <



KATRIN

- > NPI group is supported by
 - > Min. of Edu., Youth, and Sports
Project INGO LA 318
Research Center LC 07050
 - > Grant Agency of CR
contract No. 202/06/0002
 - > German BMBF, DFG
-



Czech contribution to neutrino experiments

Czech neutrino groups <
in a good shape <
and well motivated <
to accept responsibilities <
in highly challenging <
great experiments <

-
- > NEMO 3
 - > TGV II
 - > PICASSO
 - > Daya Bay
 - > KATRIN
-
-