Irradiations at PTB

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NEUDOS12
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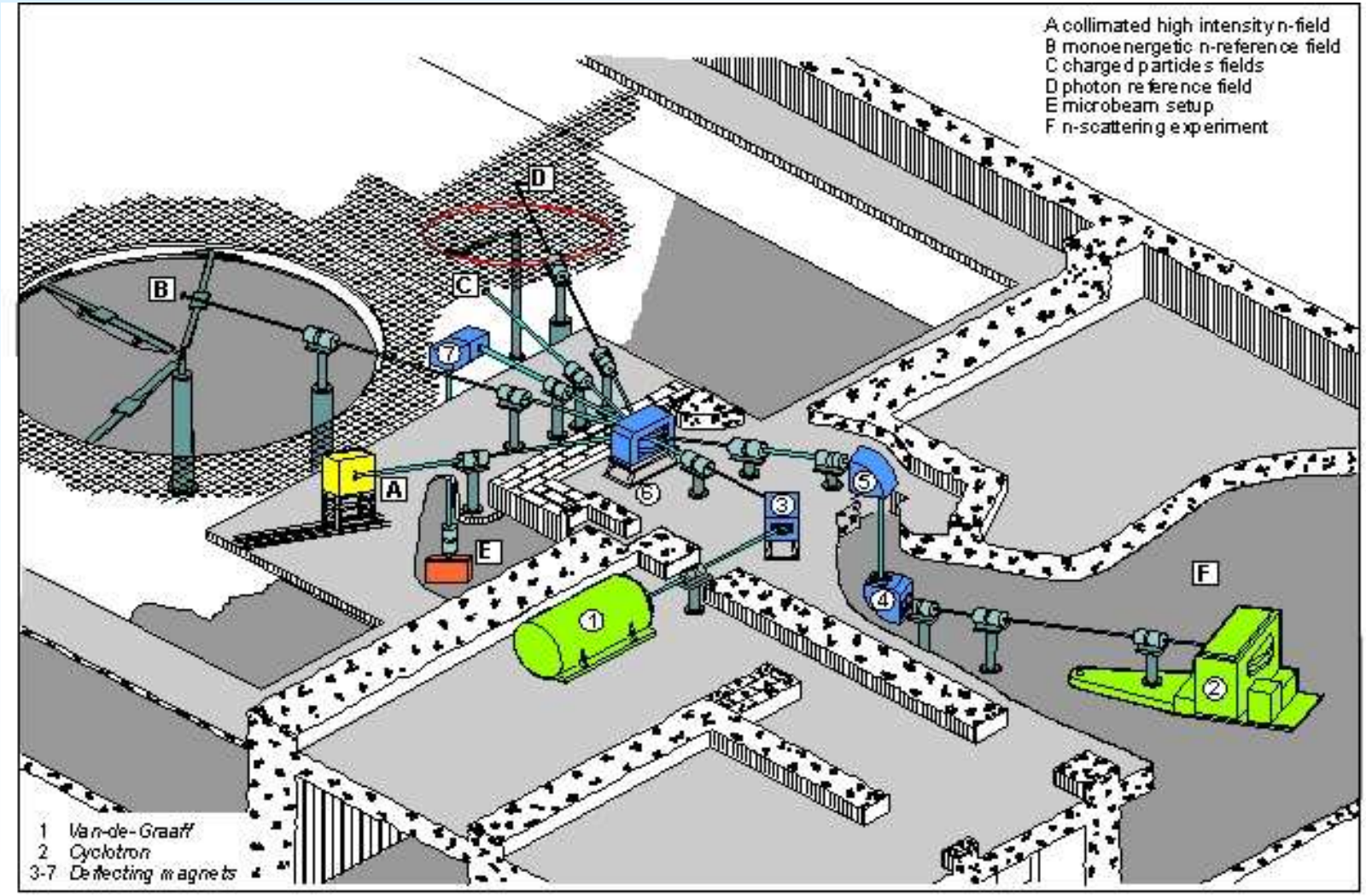
Ion accelerators at PTB



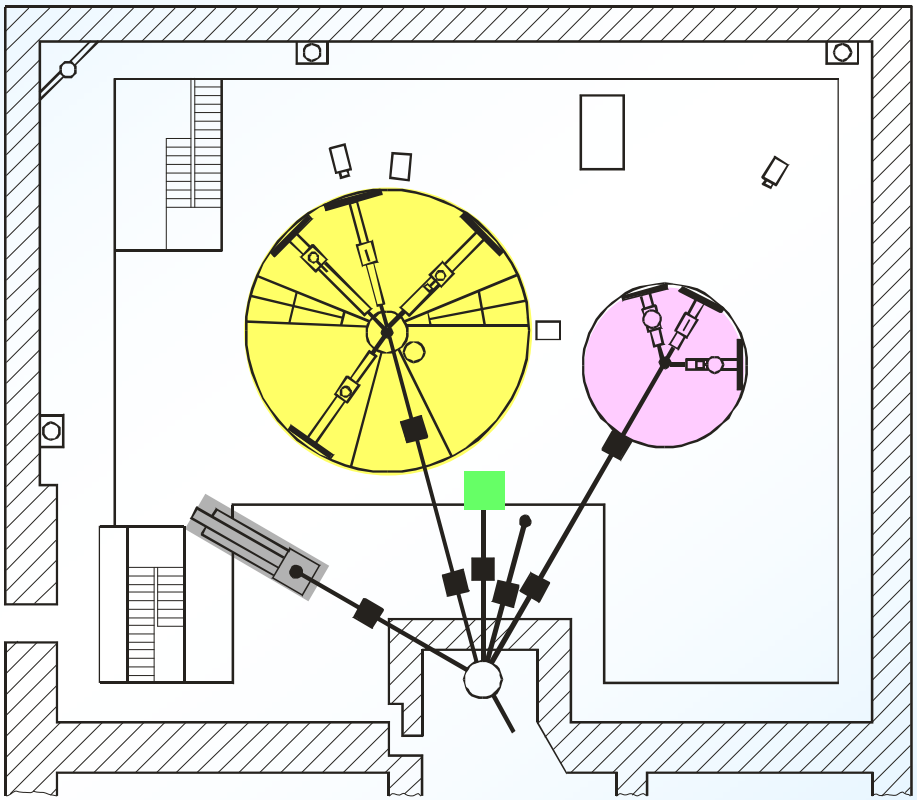
Reference radiation fields

hall: 24 m x 30 m x 14 m

Monoenergetic neutrons:
1.2 keV to
19 MeV

High-intense collimated neutron beams:
Be + d (13 MeV)
Be + p (21 MeV)

High-energy photons:
4.4 MeV to
7.1 (17.2) MeV



External accelerators (i.e. NAC):

high energy neutrons (60 - 200 MeV)

accelerators

Radionuclide sources

Room size: 6 m x 6 m x 7 m

Neutron and photon sources:

$^{241}Am/^{9}Be$,
$^{252}Cf(sf)$, $^{252}Cf(sf, D_2O\text{-mod.})$
^{137}Cs

Tasks:

- calibration of neutron area monitors
- regular intercomparison of neutron personal dosimeters
- investigation and calibration of spectrometers and other devices

IC2012n irradiations

4 dosemeters with 250 keV monoenergetic neutrons

- Use of metallic lithium targets to save time and money
- 4 dosemeters irradiated simultanously on ISO water phantom
- (2 x 2) dosemeters for cross checking
- One irradiation ($H_p(10) \approx 1$ mSv) took roughly 1.5 hours

2 dosemeters with ^{252}Cf source behind shadow cone

- Irradiation of 8 dosemeters simultanously (4 x 2) on PMMA phantom
- One irradiation ($H_p(10) = 2$ mSv) took roughly three days

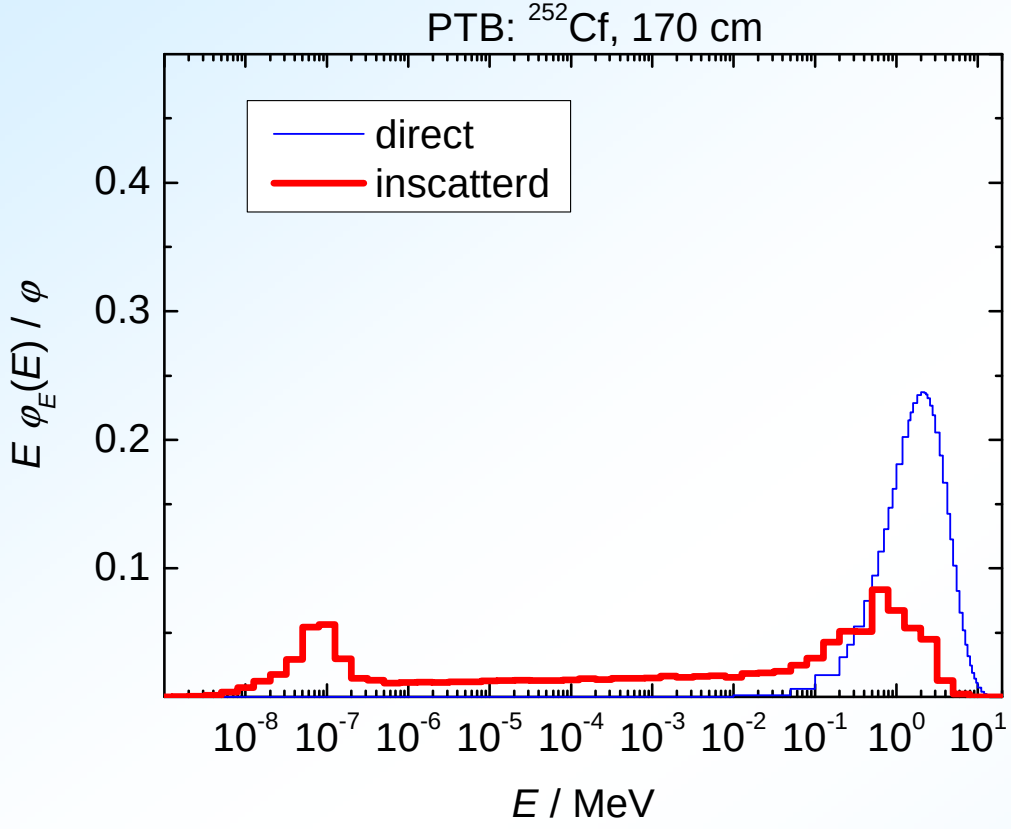
No problems during irradiations

- Management of dosemeter irradiations
  - by providing pictures and guide lines
  - Irradiated dosemeters stayed with tapes

^{252}Cf behind shadow cone

- Isotropic field of inscattered neutrons
- 5° cone (20 cm iron and 30 cm polyethylene)
- PMMA phantom with 8 dosemeters
- Phantom to source distance 170 cm

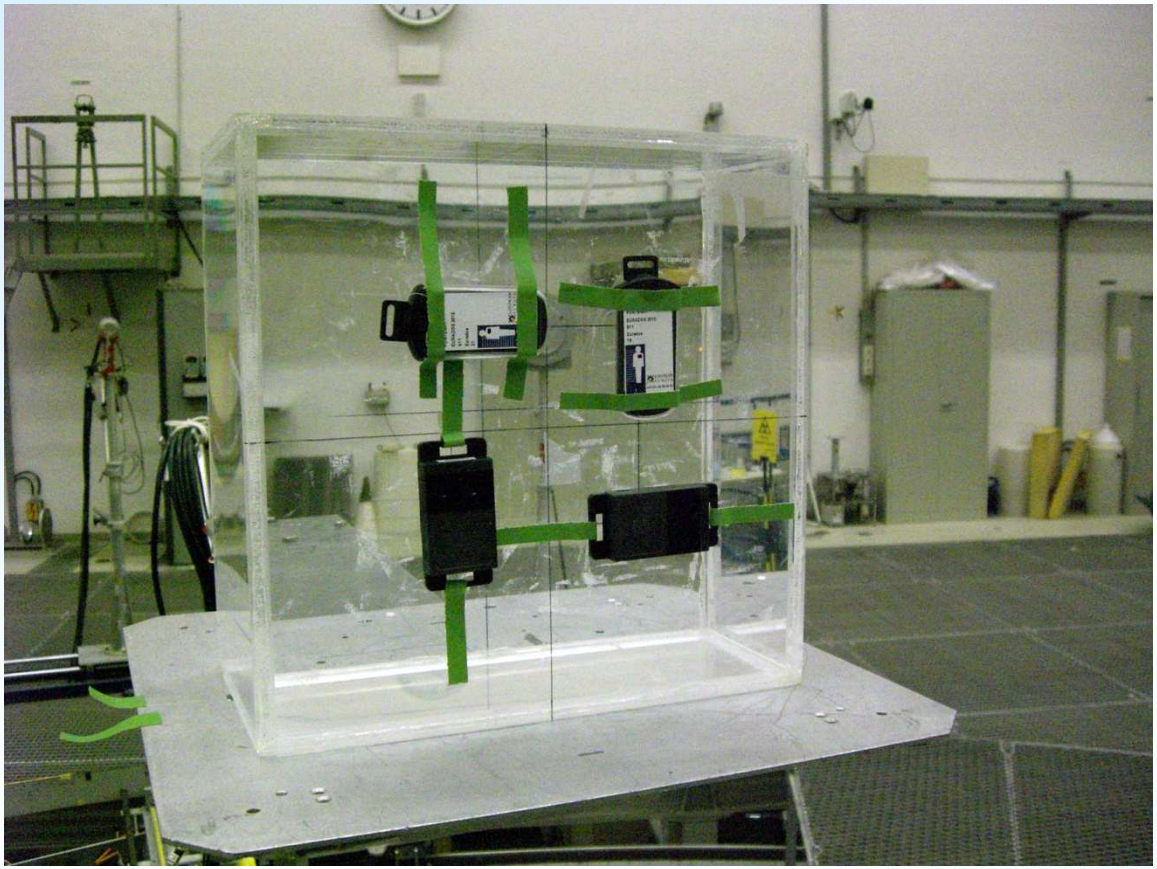
^{252}Cf behind shadow cone



Source	*d* cm	$h_{p,\Phi,ins}$(10;isotrope) pSv cm²
^{252}Cf	170	50. ± 7

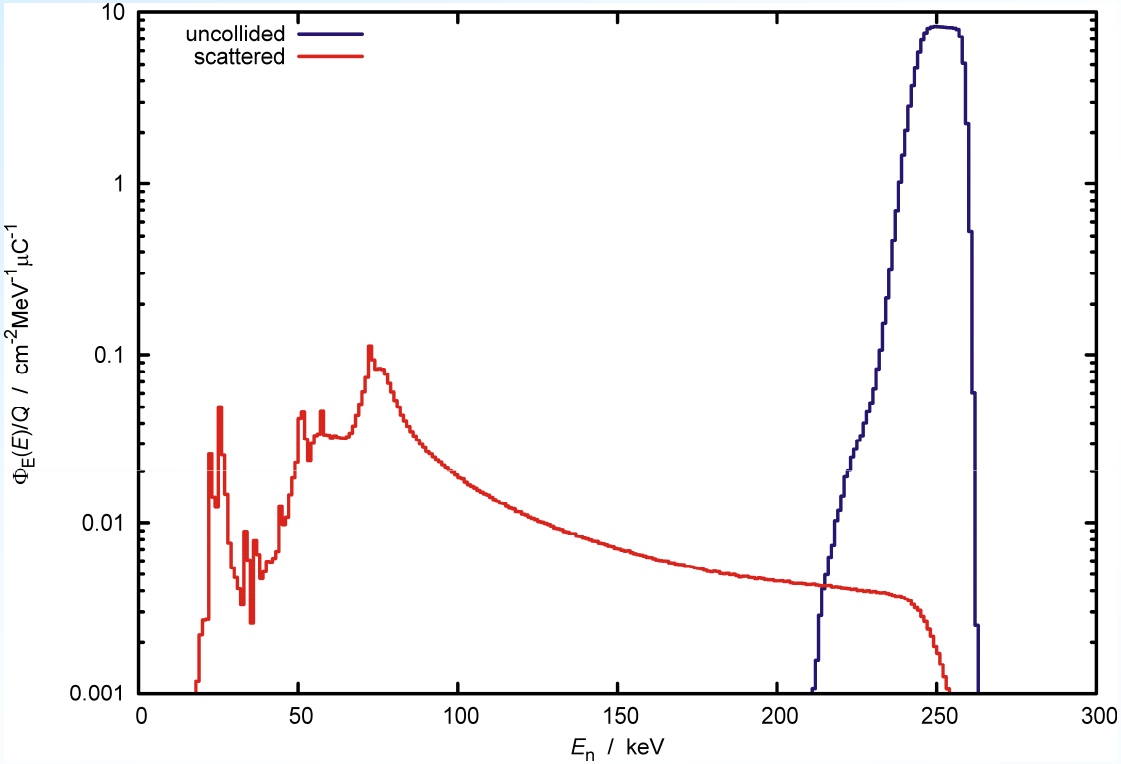
- Isotropic field of inscattered neutrons
- Spectral fluence determined with PTB Bonner sphere spectrometer
- Significant fluence contribution of low-energy neutrons
- Used in Germany to simulate calibration factors for Albedo dosemeters (fields at transport casks with spent fuel)
- Uncertainty of $H_p(10)$ values : 15 % (k=2)

250 keV monoenergetic neutrons



- ISO water phantom with 4 dosemeters
- Normal incidence
- Phantom to source distance 75 cm

250 keV monoenergetic neutrons



reaction	target	E_n MeV	ΔE_n MeV	(Φ_{sc} / Φ_{dir})	$h_{p,\Phi,dir}(10)$ pSv cm²	$h_{p,\Phi,sc}(10)$ pSv cm²
^{7}Li(p,n)^{7}Be	Li	0.248(10)	0.017	0.0259(26)	212.9(32)	81.1(18)

- ^{7}Li(p,n)^{7}Be, Li metal target (100 µg/cm²)
- Direct neutrons measured using a recoil proton proportional counter
- Target scattered neutrons calculated by the Monte Carlo Code “TARGET”
- Mean neutron energy measured with a ^{3}He counter
- Long-Counters used for monitoring
- Uncertainty of $H_p(10)$ values : 7 % (k=2)

THANKS TO STAFF OF PTB

THANK YOU FOR ATTENTION