An overview of Neutron Wall Experiments performed at GANIL

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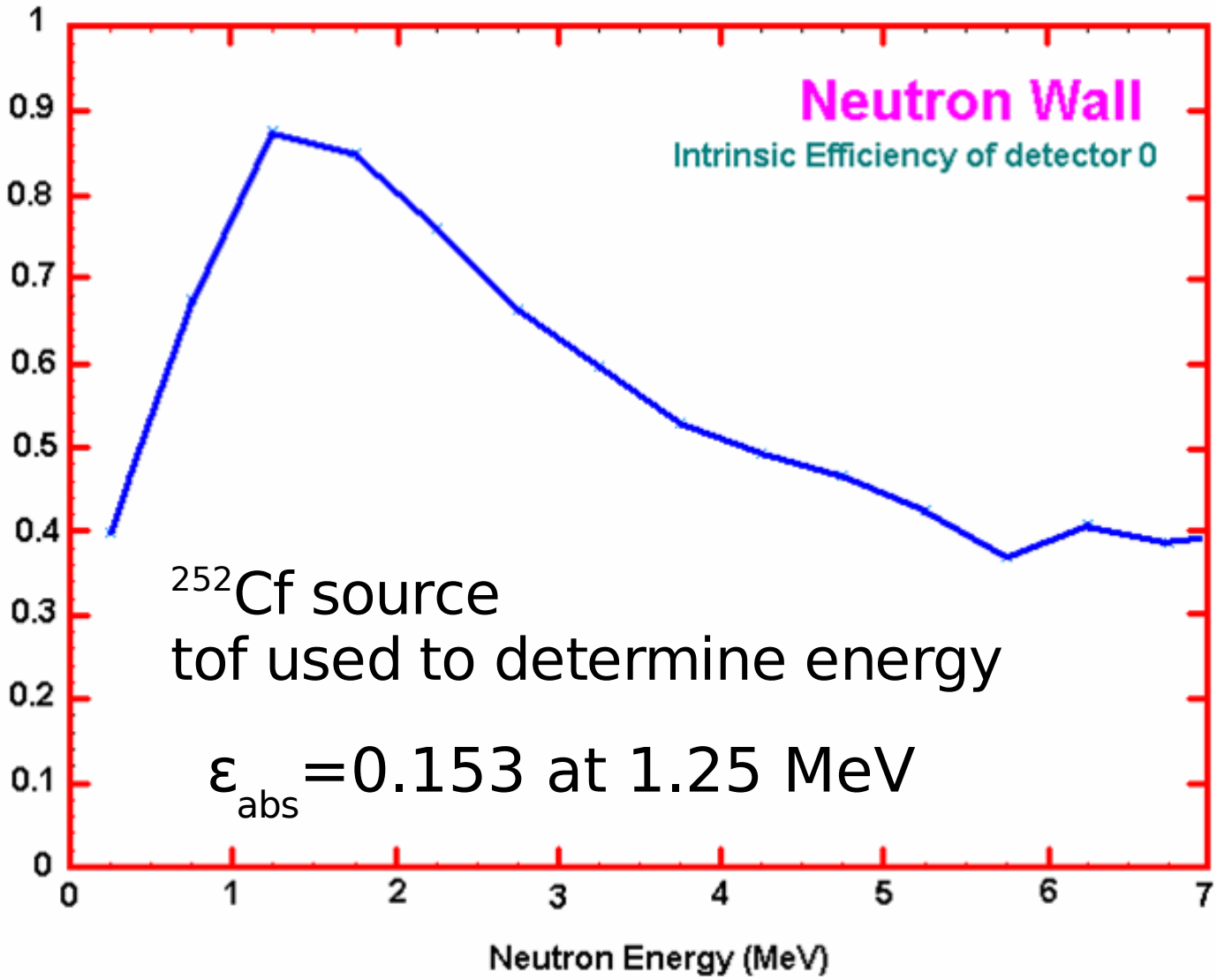
NWall experiments run at GANIL

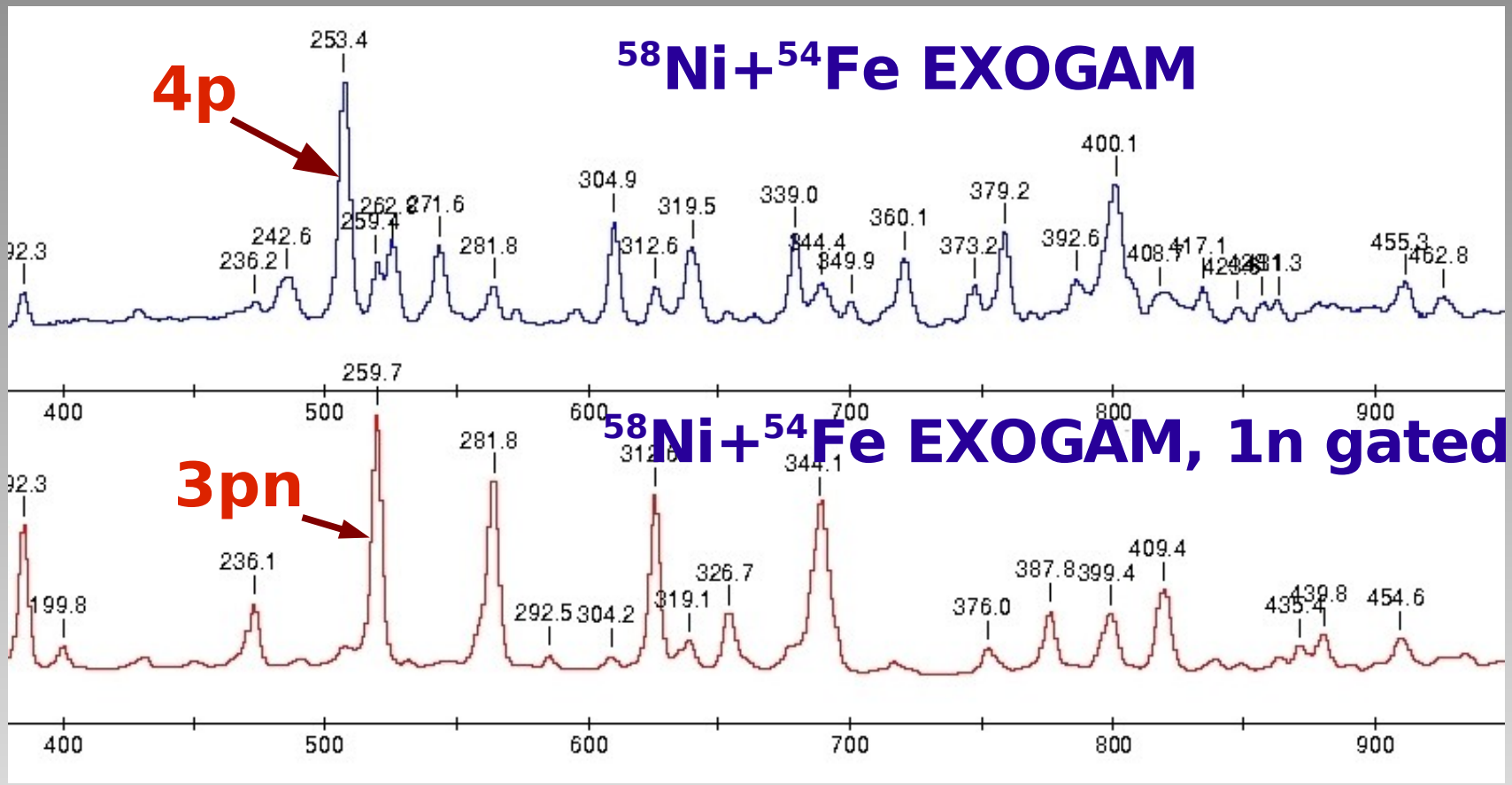
Spokeperson	Title of proposal	Detectors	
G. de France (GANIL)	Neutron Wall Commissioning	EXOGAM + NWall + SiCD	
N. Alahari (GANIL)	Complete reaction studies with Borromean nuclei near the Coulomb barrier	EXOGAM + NWall + SiCD	
S.J.Williams (Univ. Surrey)	High-spin states in the T_z=-3/2 nucleus ^{37}Ca - mirror symmetry at the largest values of isospin.	EXOGAM + NWall + DIAMANT	
A. Gadea (LNL)	Mirror energy differences in the A=58, T=1 mass triplet and charge symmetry breaking terms in the nuclear effective interaction above ^{56}Ni.	EXOGAM + NWall + DIAMANT	**2005**
B.Cederwall (KTH Stockholm), R.Wadsworth (Univ. York)	Search for T=0 pairing and a new coupling scheme in ^{92}Pd and ^{88}Ru	EXOGAM + NWall + DIAMANT	
G. de Angelis (LNL)	Electromagnetic decay properties of the T_z=1/2, A=67 mirror pair: Isospin symmetry from E1 amplitudes.	EXOGAM + NWall + DIAMANT	
M. Palacz (HIL Warsaw), J.Nyberg (IKP Uppsala)	Single-particle energies and proton-shell gap in ^{100}Sn extracted from high-spin states in ^{103}Sn.	EXOGAM + NWall + DIAMANT	**2006**
J-A. Scarpaci (IPN Orsay)	Neutron correlation in ^{6}He studied through its nuclear breakup.	Neutron Wall + EDEN + Si det.	

Neutron Wall Efficiency

A.Chatterjee

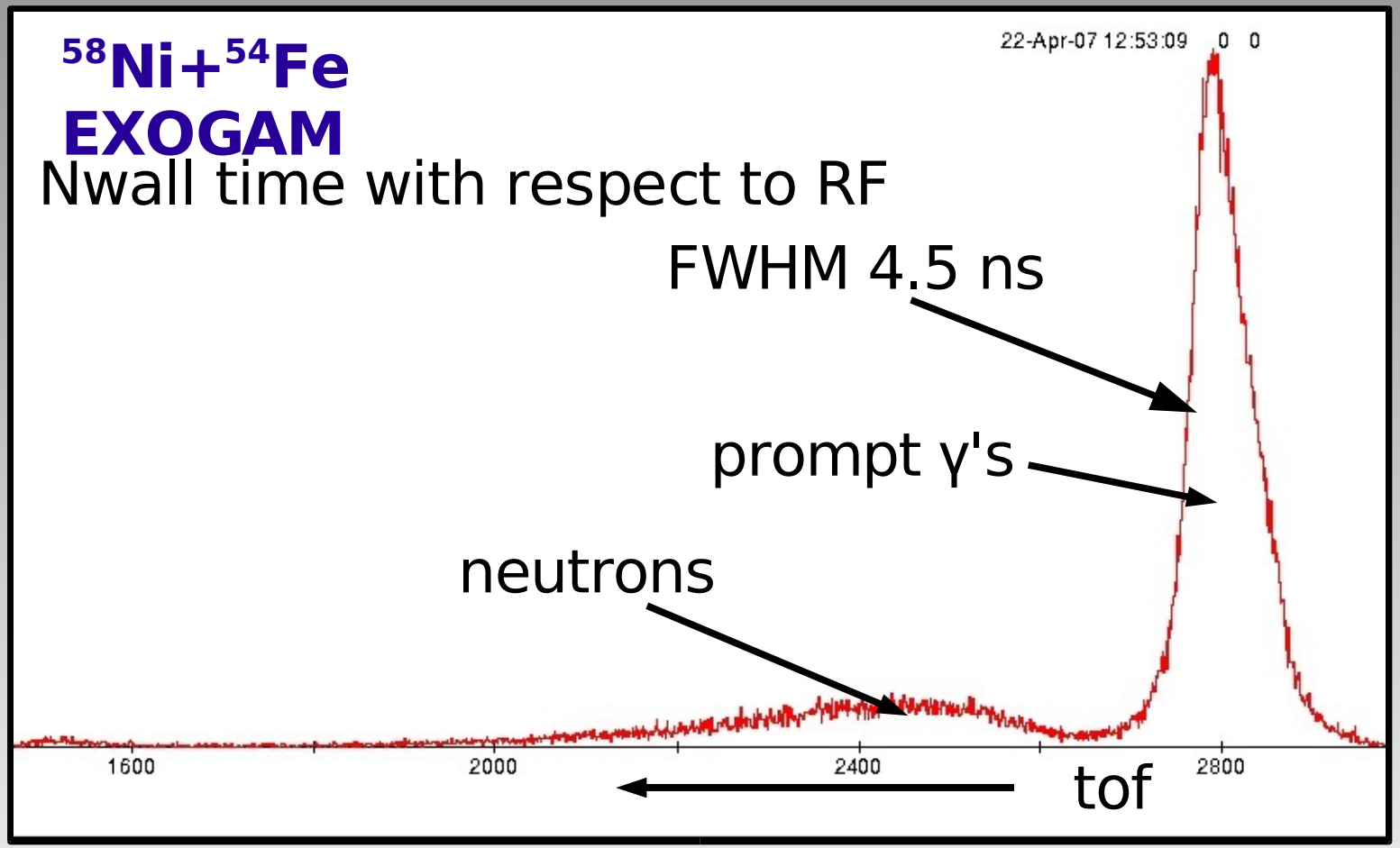


Efficiency in fusion-evaporation reactions



$$\varepsilon_n \approx 0.21$$

Time resolution and time reference



Time ref. resolution crucial!

E403aS: Complete reaction studies with Borromean nuclei near the Coulomb barrier

N.Alahari A.Chatterjee

Beam: ^{6}He 2*10^{7} pps, 23MeV Target: ^{65}Cu 2.7 mg/cm^{2}
Detectors: EXOGAM+NWall+SiCD

Coincidences (α,n,γ) used to distinguish between 1n and 2n transfer reactions in the ^{6}He+^{65}Cu system and to measure differential cross sections

⇒ insight into neutron correlations in ^{6}He

RIB used with NWall for the first time.

E498S: High-spin states in the T_z=-3/2 nucleus ^{37}Ca - mirror symmetry at the largest values of isospin.

S.Williams

Beam: ^{18}Ne 65 MeV (^{16}O 65MeV 5pnA)
Target: ^{24}Mg 0.5 mg/cm^2
Detectors: EXOGAM+NWALL+DIAMANT
Aiming at: ^{37}Ca + αn

^{18}Ne beam - expected: 10^7pps
- obtained: 10^5pps, contaminated ^{18}O

Aim changed: high spin states in ^{38}Ca,
^{16}O beam, 2n reaction channel

E482: Mirror energy differences in the A=58, T = 1 mass triplet and charge symmetry breaking terms in the nuclear effective interaction above ^{56}Ni

A.Gadea, F.Della Vedova

- ^{36}Ar (85MeV) + ^{24}Mg → ^{58}Zn + 2n
- Target: Au (70 μg/cm^2), ^{60}Zn(0.5 mg/cm^2), ^{90}Zr (5.4 mg/cm^2)

Severe technical problems:

- **Target Installation → strong oxygen contamination,** buildup of oxygen during the run, beam intensity 10 to 4 pnA. **More than 70% of the reaction rate from the reaction on ^{16}O**
- **Backing not optimized to stop the unexpected reaction products with ^{16}O**
  Consequence: in-flight transitions -not Doppler corrected- together with the stopped ones→ sensitivity reduced
- Reduced Nwall efficiency

E482: Search for T=0 pairing and a new coupling scheme in ^{92}Pd and ^{88}Ru

B.Cederwall, R.Wadsworth, K.Andgren

- ^{36}Ar (111MeV) + ^{58}Ni (6 mg/cm^2) → ^{94}Pd(CN) →^{92}Pd +2n
  → ^{88}Ru +2α2n
- Identification of 2n channels not possible due to unexpectedly low neutron detection efficiency (about 10%)
- Analysed: ^{86}Mo + 2α and ^{88}Mo + 1α2p
  (Nwall only providing veto)
- **See talk by Bob Wadsworth**

E505: Electromagnetic decay properties of the Tz=1/2 A=67 mirror pair: Isospin symmetry from E1 amplitudes

G. De Angelis, R.Orlandi

- ^{36}Ar (111MeV, 3pn) + ^{40}Ca → ^{94}Pd(CN) → ^{67}Se +2αn
- Target: ^{40}Ca (1 mg/cm^2), ^{90} Zr(6 mg/cm^2), protected by thin front layer of Bismuth
- Oxidation of the target made the observation of ^{67}Se impossible
- Analysis of lifetimes for products of reactions on ^{16}O perhaps possible

E514: Single-particle energies and proton-shell gap in ^{100}Sn extracted from high-spin states in ^{103}Sn (1/2)

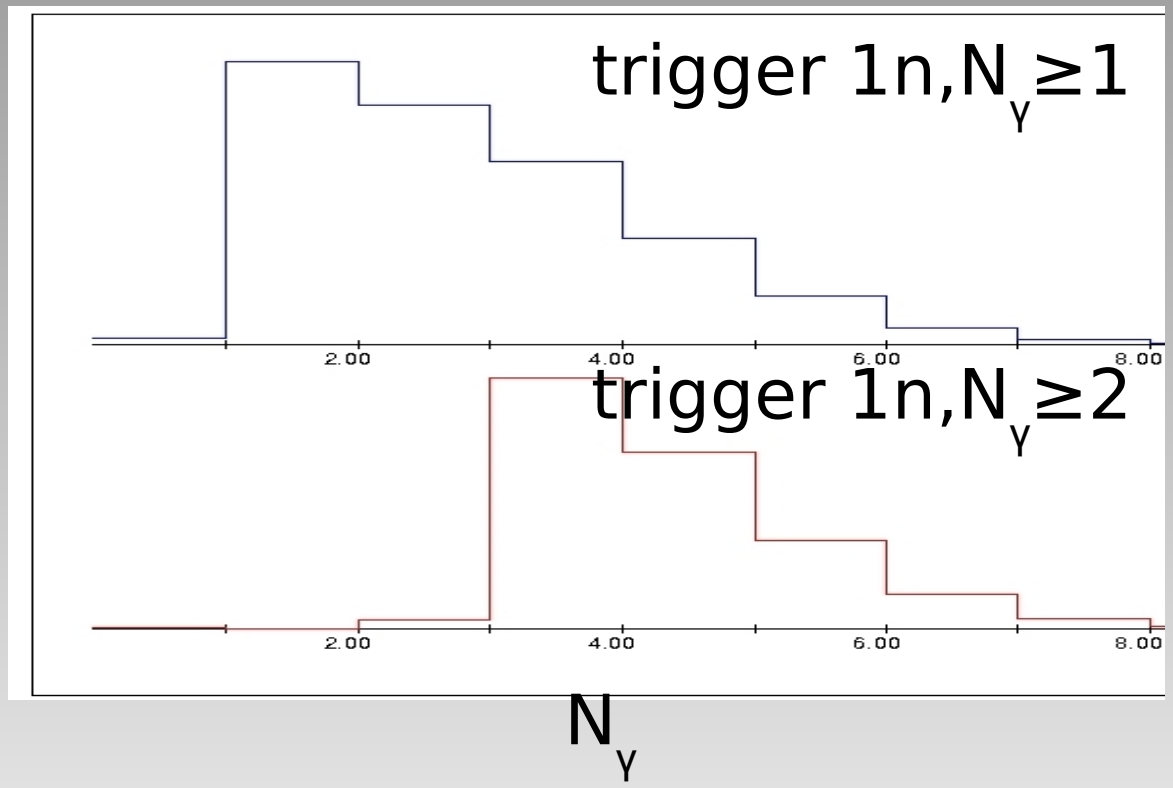
M.Palacz, J.Nyberg, G. de France

- ^{58}Ni(240MeV) + ^{54}Fe(8mg/cm^2) □ ^{112}Xe(CN) □ ^{103}Sn + 2αn
- $\varepsilon_n \approx 0.21$ (assumed 0.3), $\varepsilon_{2\alpha} \approx 0.15$ (0.4), $\varepsilon_p \approx 0.50$, $\varepsilon_\gamma \approx 0.059$ (0.07)
- beam current unexpectedly limited to 1.7 pnA (assumed 3 pnA) by single Ge count rate (10 kHz) estimated rates: fusion-evaporation ≈5 kHZ, Coulex ≥ 2 kHz
- beam time requested: 30UTS, effective: 18.4 UTS (good data: 12.2 UTS)
- combined $\varepsilon_n, \varepsilon_\gamma^2$, $\varepsilon_{2\alpha}$, beam current and time effect reduced number of events collected with respect to proposal by a factor 0.11 (good data 0.08)
- **severe trigger problem**

E514: Single-particle energies and proton-shell gap in ^{100}Sn extracted from high-spin states in ^{103}Sn (2/2)

M.Palacz, J.Nyberg, G. de France

trigger problem



low γ multiplicity channels suppressed due to additional γ required!

E514: Neutron correlation in ^{6}He studied through its nuclear breakup (1/2)

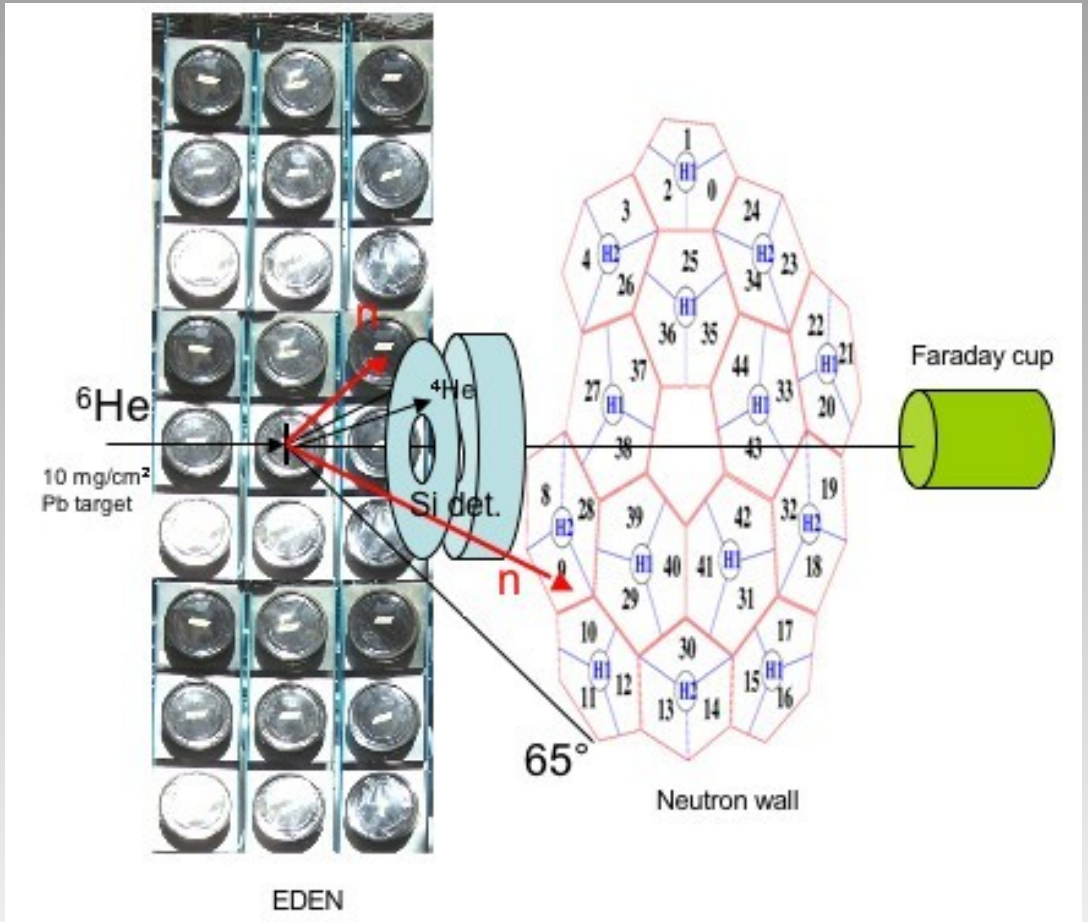
J.-A. Scarpaci, M.Assié

Beam: ^{6}He 2*10^7 pps, 23 MeV

Target: 10 mg/cm^2

Neutrons detected in NWall and EDEN

see talk by J.-A. Scarpaci



Summary and conclusions:

- 7 experiments:
  - 5 fusion-evaporation (1 RIB attempt)
  - 2 ^{6}He breakup (1 without EXOGAM)
- Nwall efficiency:
  low eff. problem solved before the 2006 campaign- **21%**
  could be ~ 26 % with pentagon and no shadowing
- 2 experiments suffered from ^{16}O contamination
- efficiency assumptions too optimistic
  (NWall, EXOGAM, DIAMANT)
- beam current limited by EXOGAM if run
  (relatively) high above the Coulomb barrier
- better on-line monitoring needed