

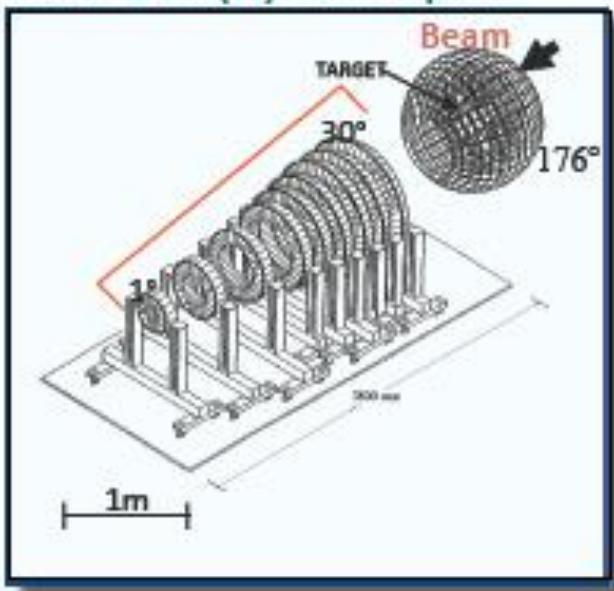
**A tentative proposal for measuring energetic Neutrons at
FARCOS/CHIMERA
A.Pagano
for EXOCHIM collaboration**

NEDENSAA NuPNET Collaboration Meeting 2013

20-22 February 2013
San Biagio Resort (www.sanbiagioresort.com)

Chimera @ INFN-LNS

1192 Si-CsI(Tl) Telescopes



18 rings in the range $1^\circ \leq \theta \leq 30^\circ$

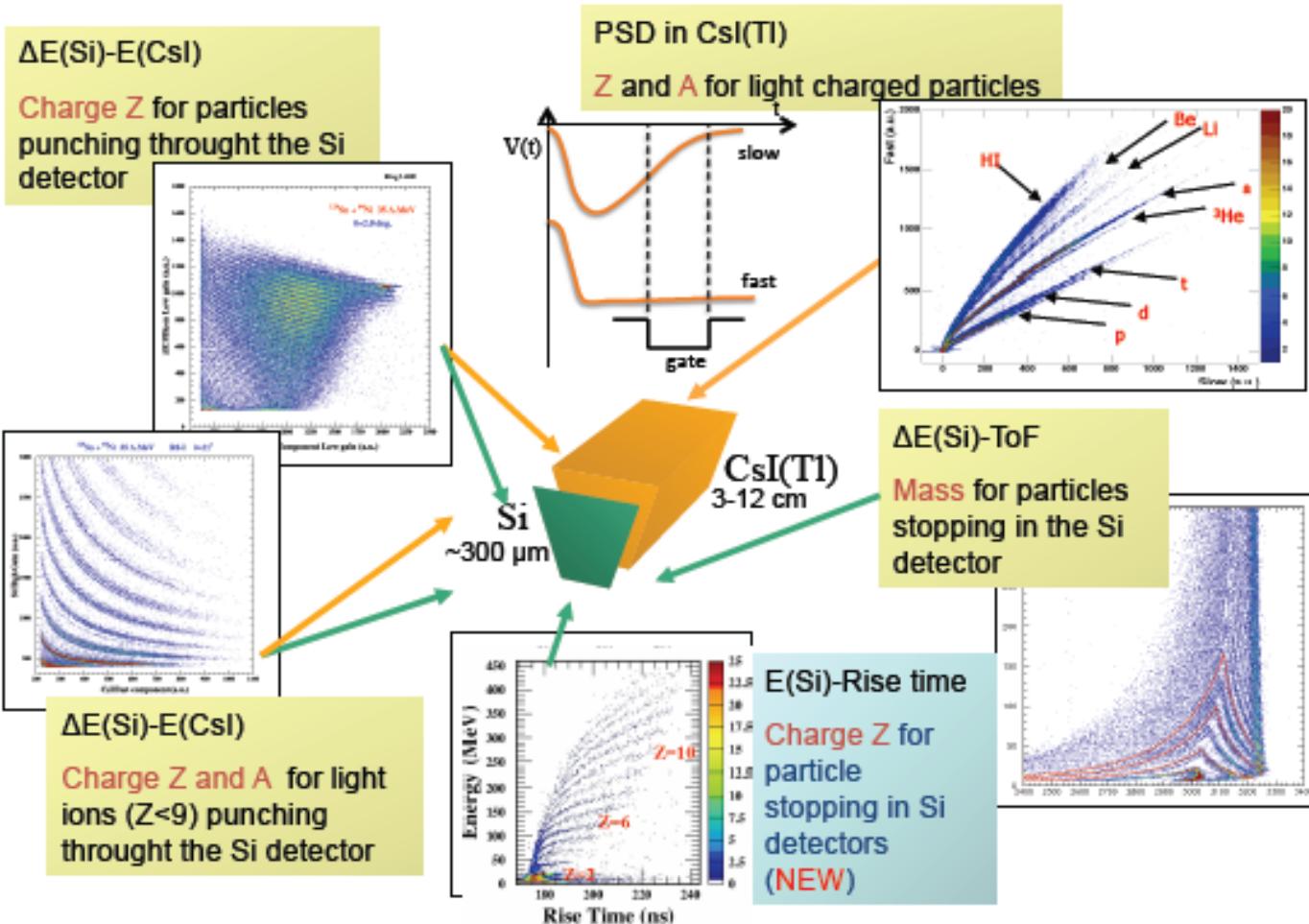
17 rings in the range $30^\circ \leq \theta \leq 176^\circ$ (sphere)

High granularity and efficiency up to 94% 4π

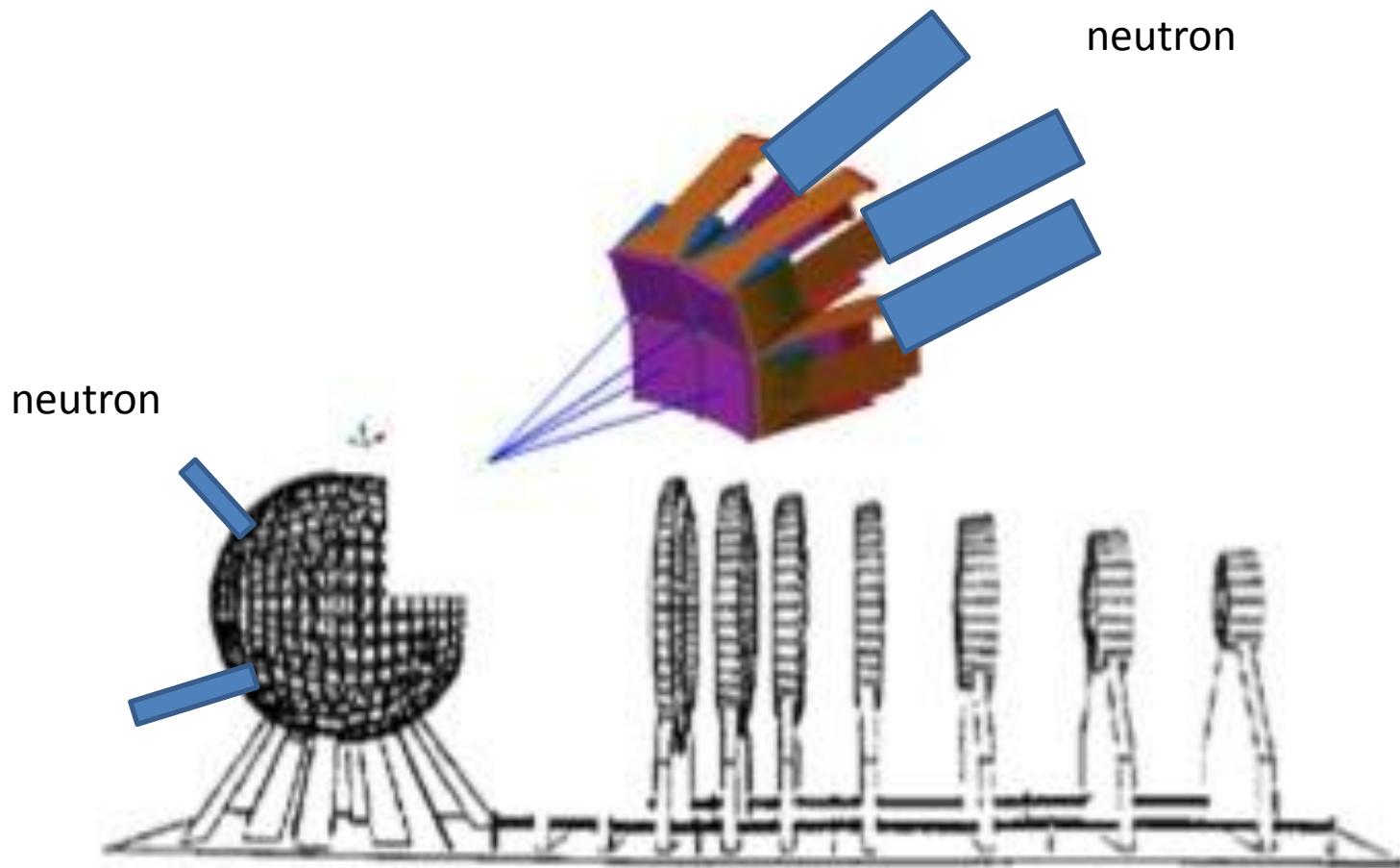


- Z identification up to beam charge ($\Delta E-E$)
- Z and A identification by $\Delta E-E$ up to $Z \leq 9$
- Z and A identification in CsI up to $Z \leq 4$
- Mass identification with low energy threshold (< 0.3 MeV/u) by ToF
- Z identification for particles stopping in Si (pulse shape)

Particle identification in Chimera



Not in scale



Basic Idea: (conversion of neutron in proton : measuring kinematics of the recoiling proton)

(OPEN problems)

Options:

Using Plastic with H_n, n>9,10 atoms/molecule es, C₉H₁₀, PVT as main converter
(coupled with PD (avalanche?)

Or a simple material (amorphous ?? No scintillation first test) assuming Thresholds E_n> 15MeV (first phase)

Mandatory : Using TOF technique for complementary Energy evaluation within < 1ns resolution (Silicon, Plastic, Gas filled detector (E_n+PPAC+Wires),

Mandatory: New mechanics for CHIMERA in order to clean from re.scattering and activations, (chamber, Room, reducing back scattering)

Possible compromise (quite mandatory):

Specialize CHIMERA as neutron selector (multiplicity) with reduced energy resolution (10%) in 2/3 π (spherical configuration)

High resolution implementation of neutron detection in Farcos in order to allow n,p coincidence data for correlations in a given solid angle (<< 4 π)

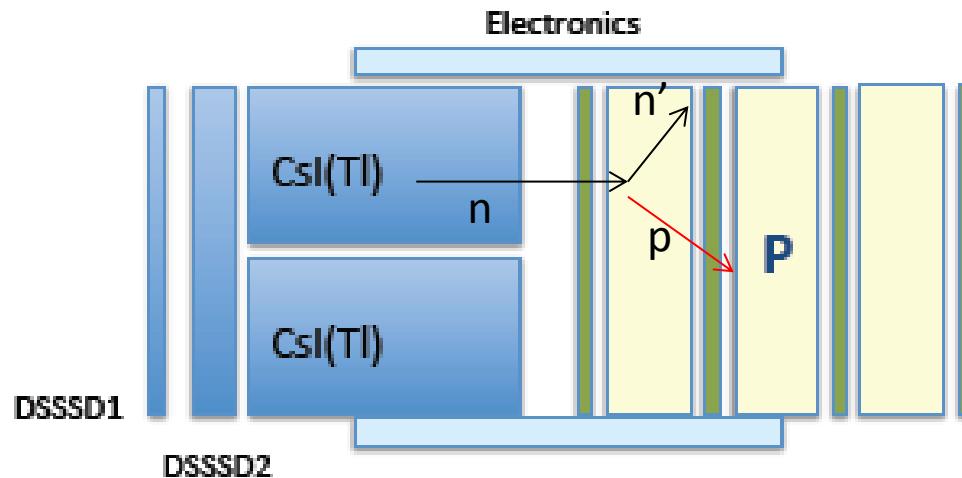
Request: preparatory phase- simple basic prototype , 1 year (2013-2014)

Possible extention 2015-2016

Extension to neutron detection by n,p conv. interaction

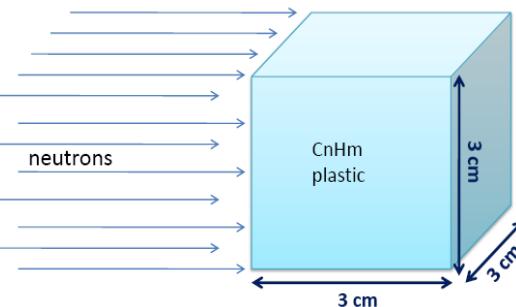
- Working group formed (L.Francalanza et al. ,EXOCHIM (CT-Gruppo coll.Me-LNS,Kolkata Univ.)
- Simulations and tests for integration into Chimera and Farcos telescopes

...just a schematic example:



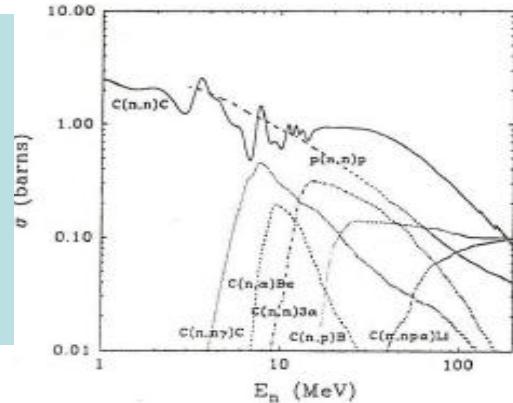
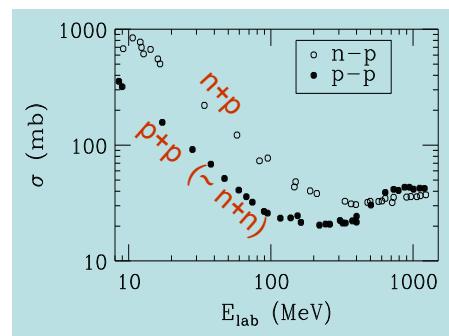
...under study

First simulation :

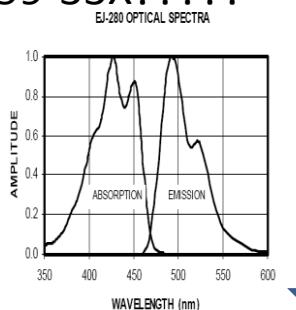


**Plastic of the type
C₉H₁₀ PVT?????**

Decay time < 3ns
Eff. > 5 %
Dt < 0.5 ns per TOF ?



Of the type: BC-428, EJ-280, UPS-974,.....?76°76/3M-E1-Ej2999-33X?????

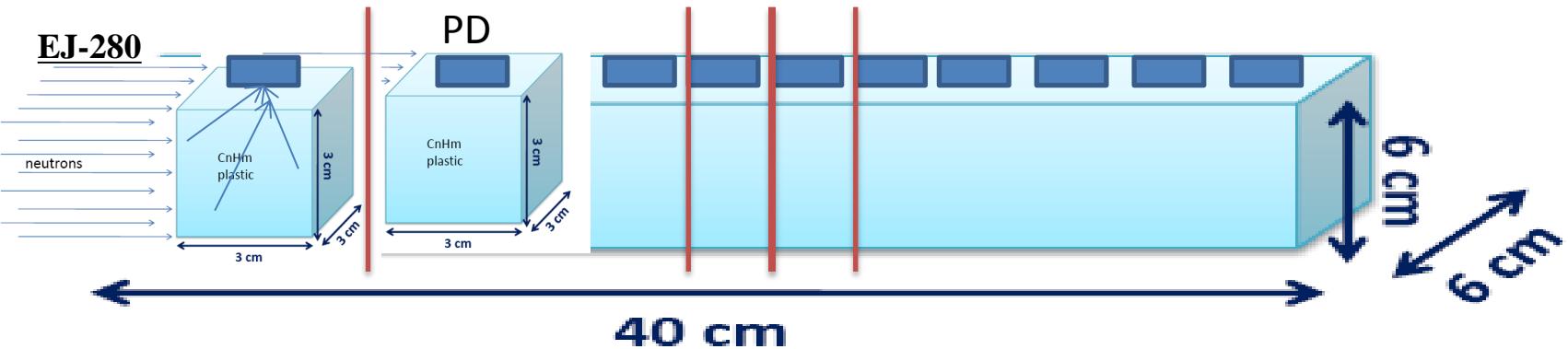
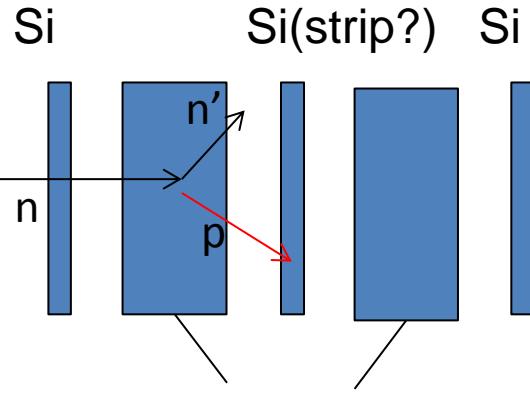


+ WLS

Table 1
Physical characteristics of the polyvinyltoluene scintillator

Monomer	C ₉ H ₁₀
Effective mass number	0.542
Density (g/cm ³)	1.032
Maximum light emission (nm)	423
Refraction index	1.58
Attenuation length (cm)	250
Specific heat (J/g °C)	1.7
Softening temperature (°C)	70

Coupled mode (proton recoil method)



Not in Scale

