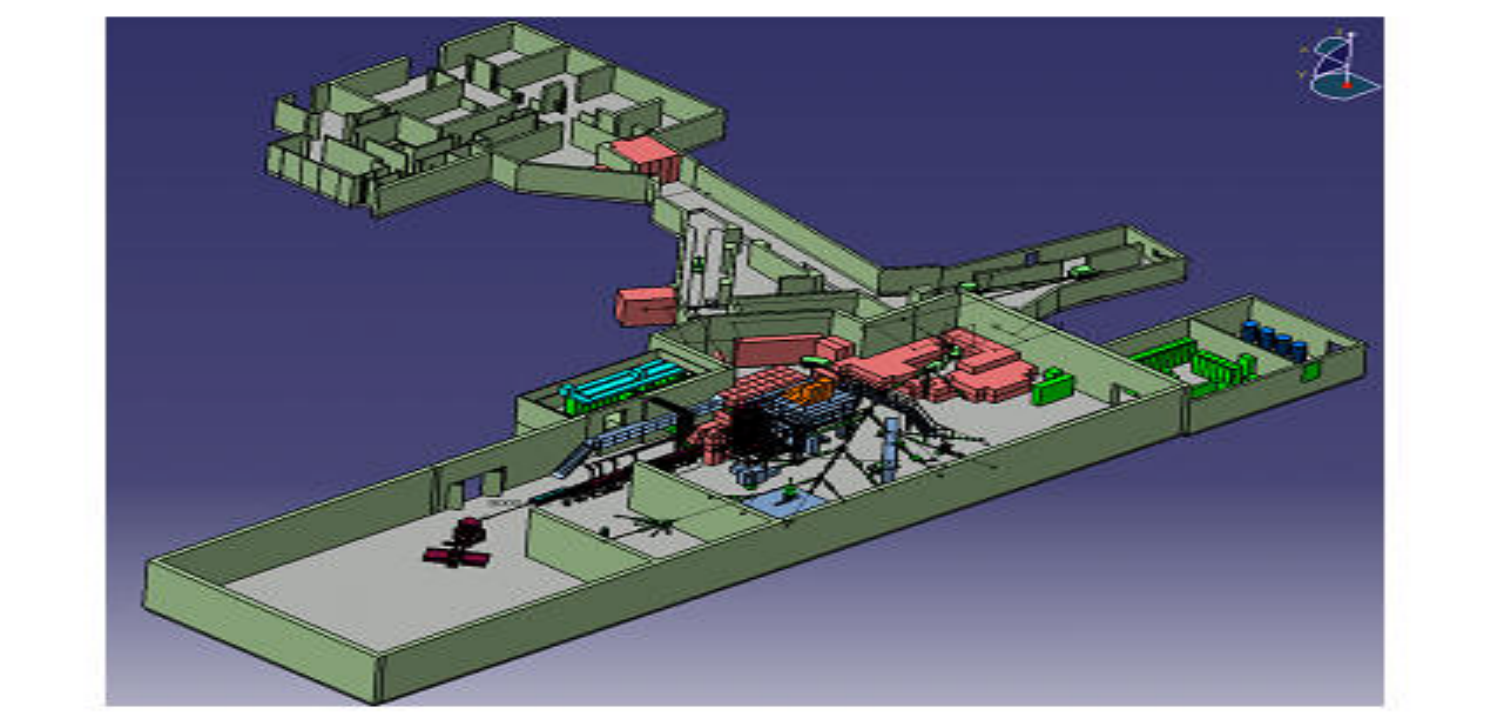
ISOLDE

On-Line Isotope Mass Separator

Macey Ruble

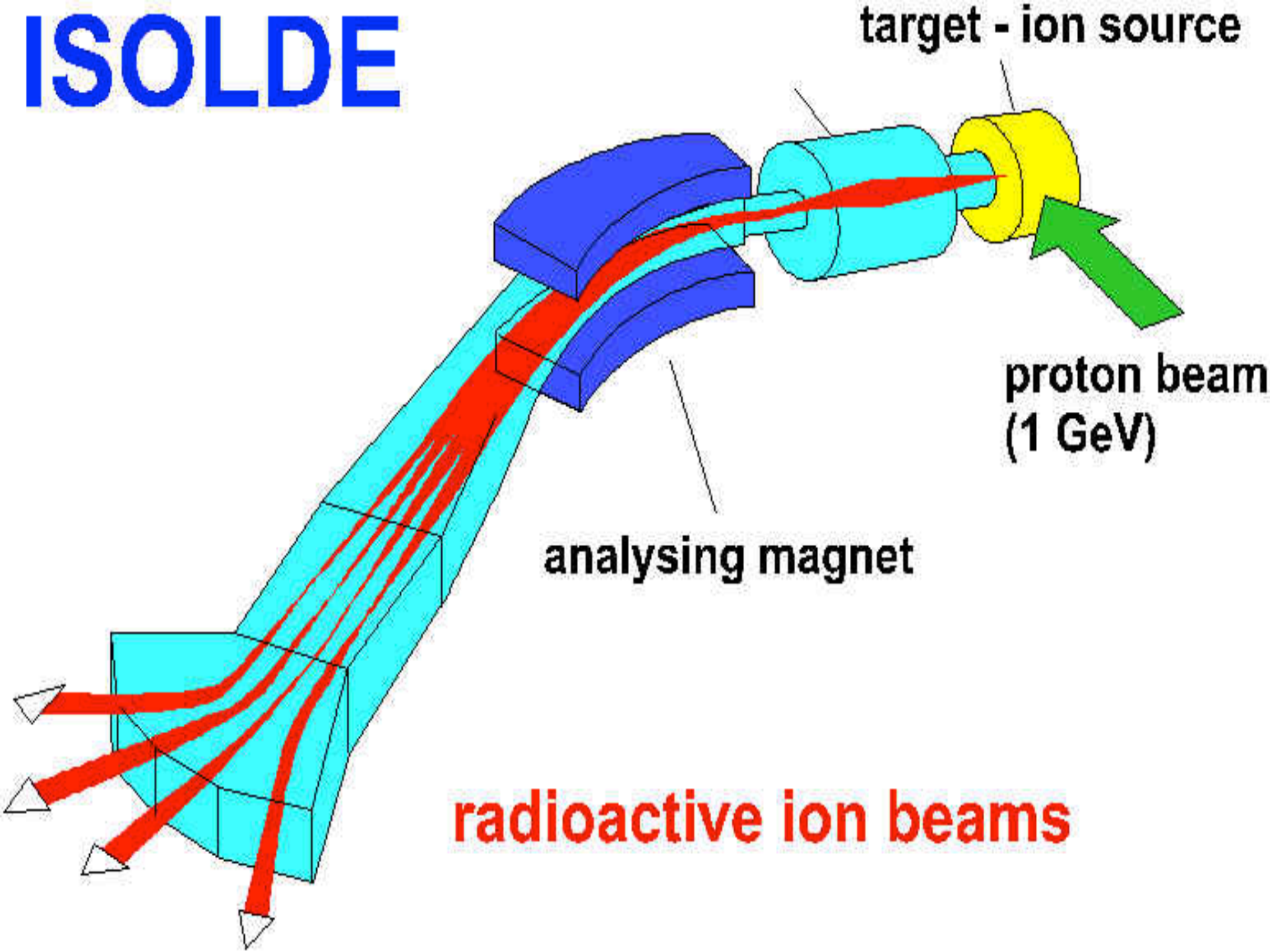
2011 CERN REU MICH

- 1967-First experiments began
- 1992-Attached to PSB
- Access to radioactive ion-beams



http://ns.ph.liv.ac.uk/~esp/nuclear/isolde.jpg

ISOLDE

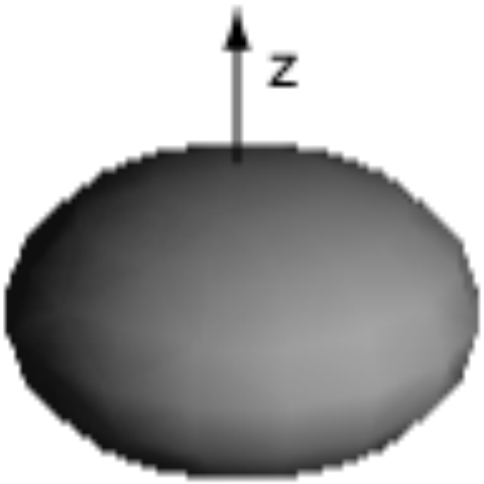

target - ion source
proton beam
(1 GeV)
analysing magnet
radioactive ion beams

- 600 isotopes created
- Half life: 3 ms to 3 days
- Experiments in nuclear spectroscopy, surface studies, solid state physics, and biophysics

PAC- Perturbed Angular Correlation

- Radioactive isotope probes
- Extract Magnetic Hyperfine Field and Electric Field Gradient
- Used in condensed matter physics, chemistry, biology

Q > 0
Prolate



Q < 0
Oblate

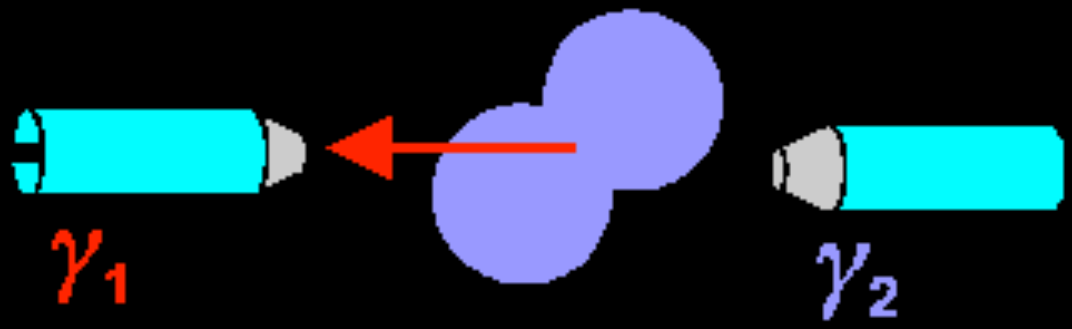
Classical definition

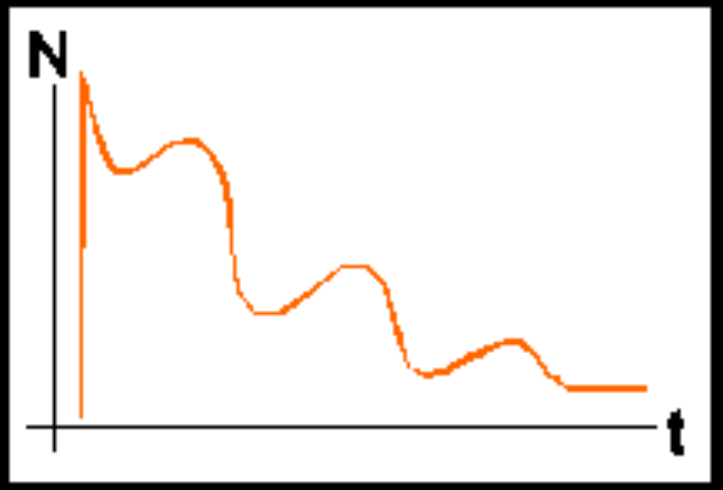
$$Q_0 = \int \rho(3z^2 - r^2)dV$$

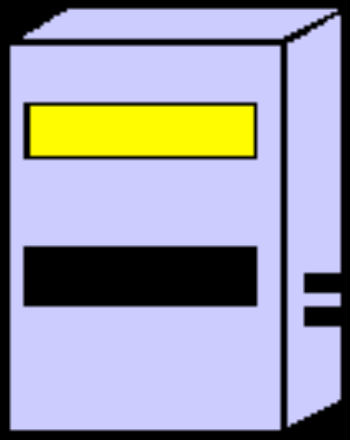
$$Q = \frac{3K^2 - I(I+1)}{(I+1)(2I+3)} Q_0$$

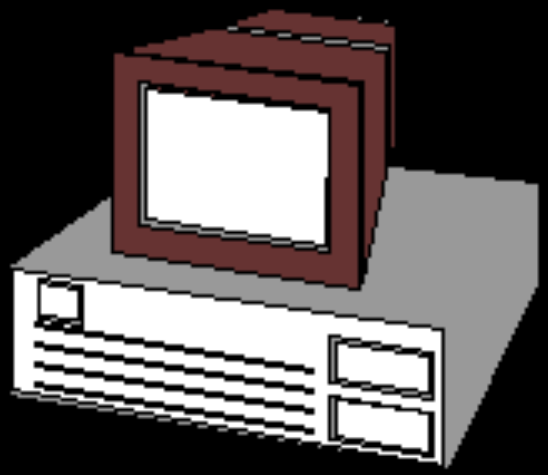
Quantum measurement

http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/elequad.html

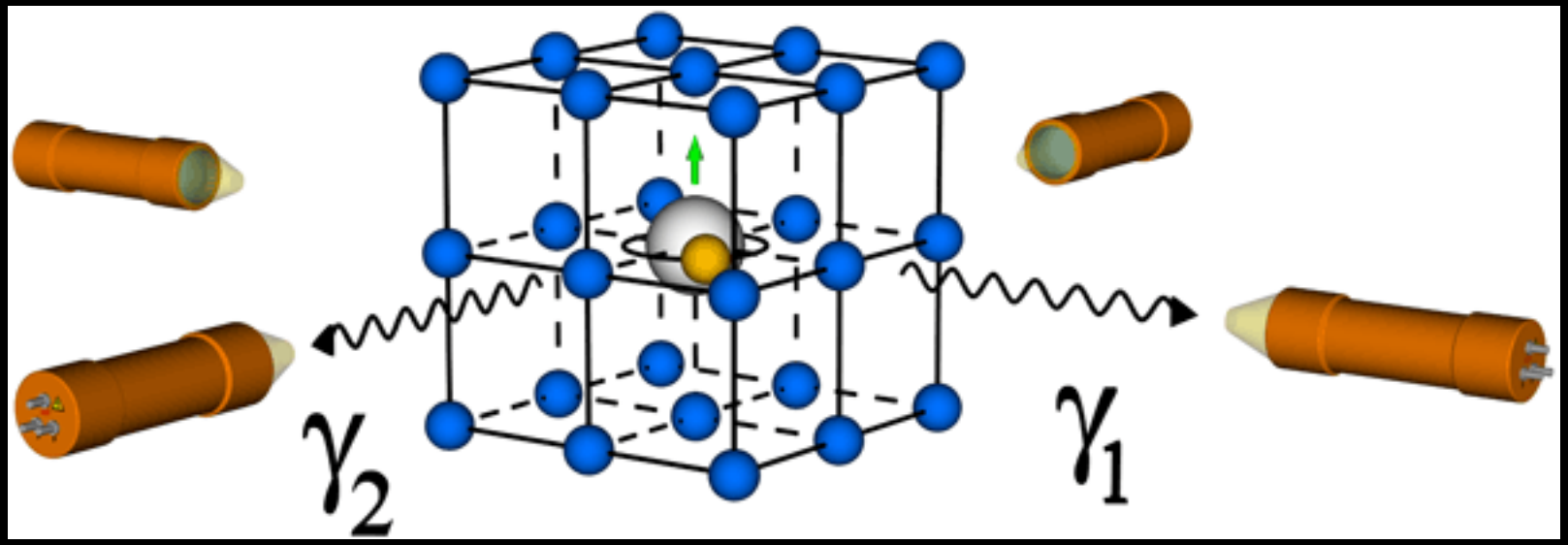

γ_1
γ_2


N
t





- Attenuation Factors



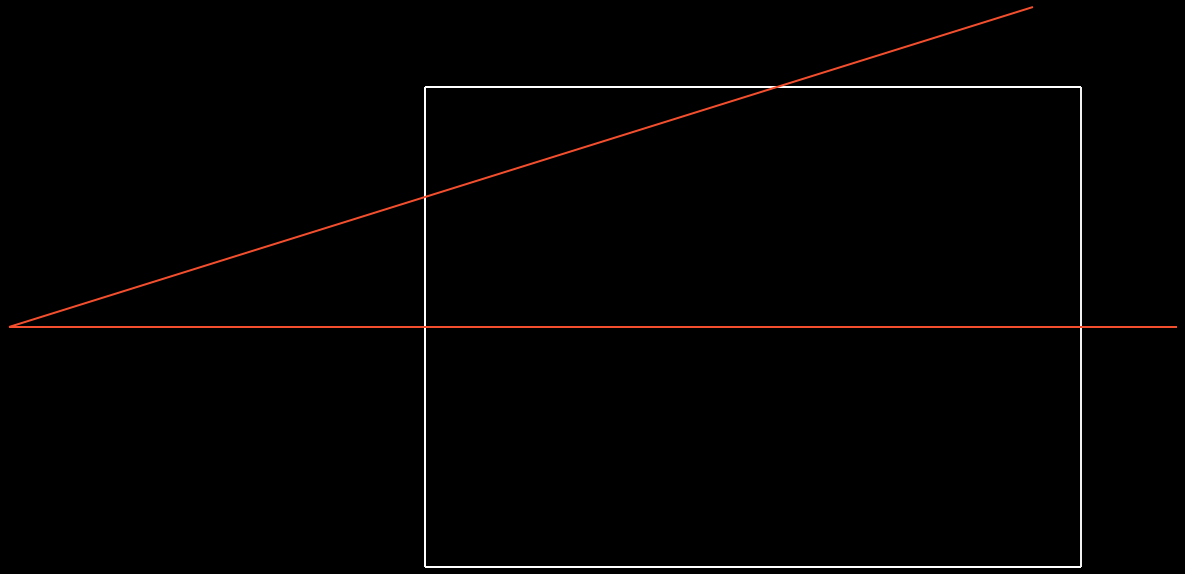


TABLE I. Attenuation coefficients J_l/J_0 for angular distribution measurements. For angular correlation measurements these coefficients should be squared or a product of two coefficients should be taken.

	$l=2$		$l=4$	
τ (cm^{-1})	$h=7$	$h=10$	$h=7$	$h=10$
0.123	0.95931	0.97823	0.86873	0.92865
0.130	0.95927	0.97821	0.86862	0.92863
0.150	0.95917	0.97818	0.86833	0.92850
0.200	0.95887	0.97808	0.86758	0.92818
0.300	0.95851	0.97790	0.86620	0.92759
1.00	0.95565	0.97672	0.85737	0.92383
2.00	0.95311	0.97567	0.84938	0.92049
3.00	0.95172	0.97510	0.84508	0.91863
5.00	0.95039	0.97457	0.84096	0.91695
10.0	0.94925	0.97410	0.83746	0.91551
40.0	0.94830	0.97373	0.83457	0.91432