Probing Exotic Structure of Short-Lived Nuclei by Electron Scattering

TRENTO

July 16 - 20, 2018

ECT* workshop on "*Probing exotic structure of short-lived nuclei by electron scattering*"

July 16-20, 2018

	Monday	Tuesday	Wednesday	Thursday	Friday
	Registration (9:00-9:30)				
9:30-10:10	Welcome speech (Suda)	Tsukada	Gales	Verney	Shatunov
	Wakasugi (9:50-10:30)				
10:10-10:50	Simon (10:30-10:50)	Sokhan	Somà	Neff	Carbone
Foffee					
11:20-12:00	Giusti	Bertulani	Otsuka	Kimura	Pederiva
Lunch					
14:00-14:40	Garcia Ruiz	Corsi	Roca Maza	Leideman	
14:40-15:20	Andreyev	Dickhoff	Duguet	Raimondi	
Coffee					
16:00-16:40	Grigorenko	Aumann	Ren	Nakatsukasa	
16:40-17:20	Ryckebusch	Leviatan	Nakada	Dong	
Dinner at Green Tower (Sunday night 20:00)	*Reception* at the ECT* (18:45)	Dinner at La Baracca (19:00)	Dinner at Antico Pozzo (20:00)	Conference dinner at the Orso Grigio (20:00)	Dinner at Green Tower (20:00)

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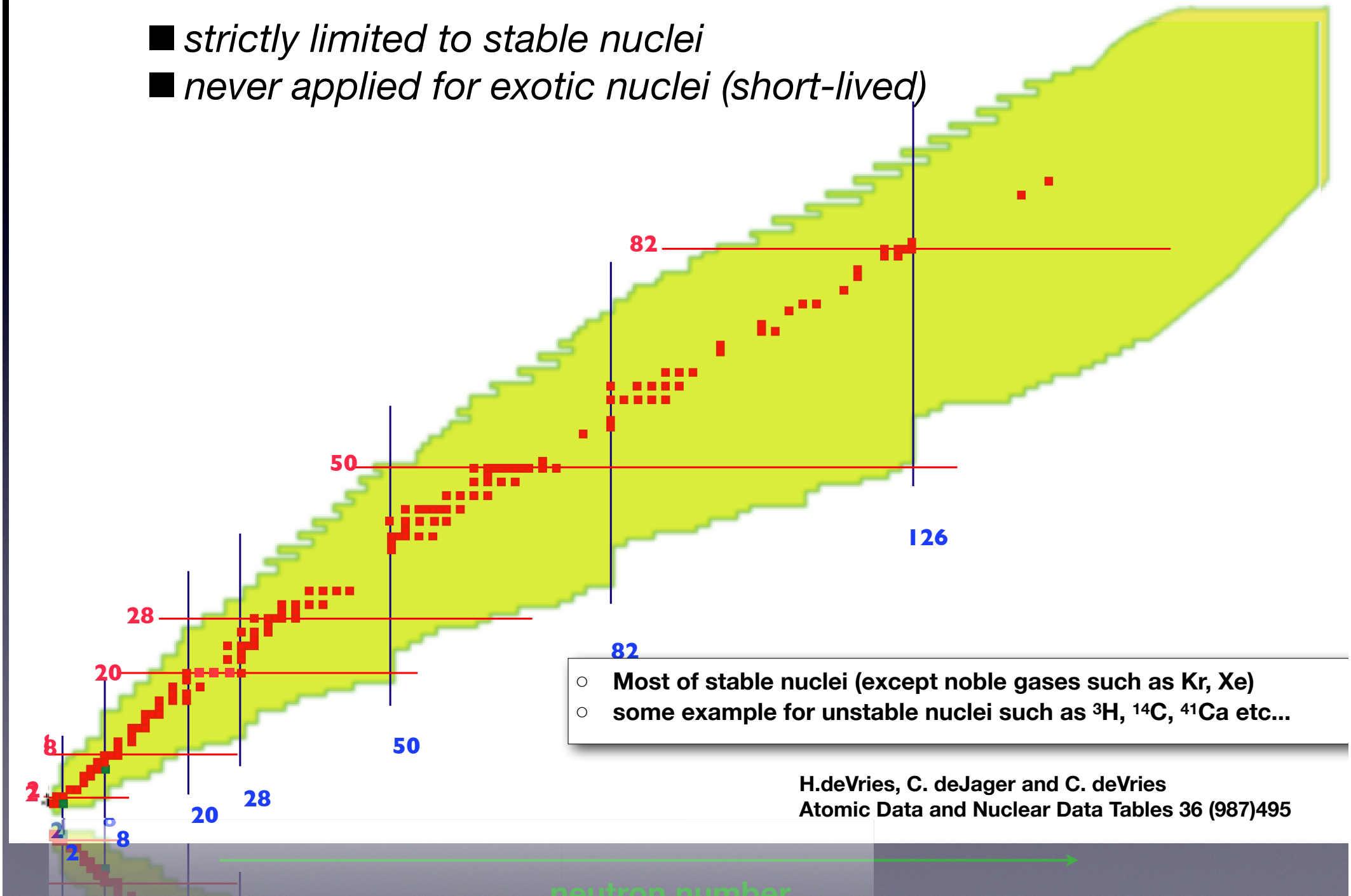
[central questions]

1. Charge form factor of exotic nuclei and nuclear structure theories
2. Identifying exotic nuclei to be targeted
   for elastic electron scattering
3. Physics case of electron scattering
   beyond elastic electron scattering
4. Total photo-absorption of exotic nuclei covering GDR
   at an upgraded electron-scattering facilities
5. Future prospects

Nuclei studied by electron scattering

- *strictly limited to stable nuclei*
- *never applied for exotic nuclei (short-lived)*

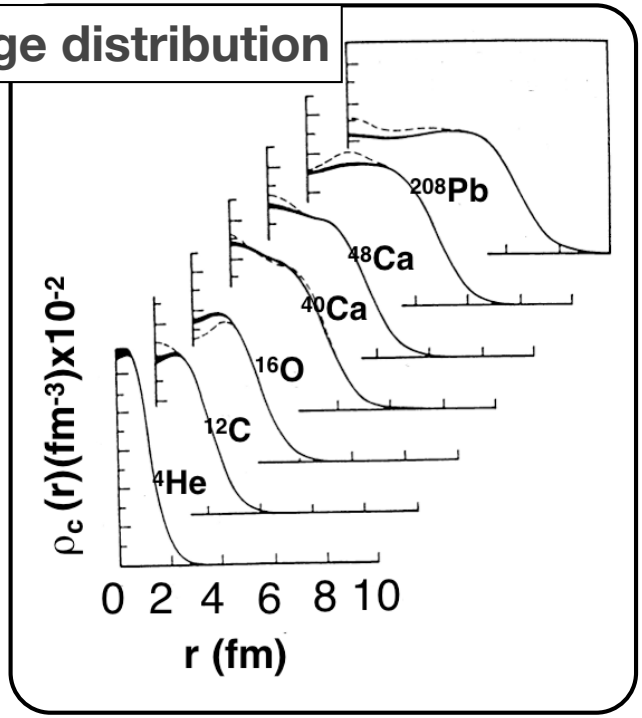


- Most of stable nuclei (except noble gases such as Kr, Xe)
- some example for unstable nuclei such as ^{3}H, ^{14}C, ^{41}Ca etc...

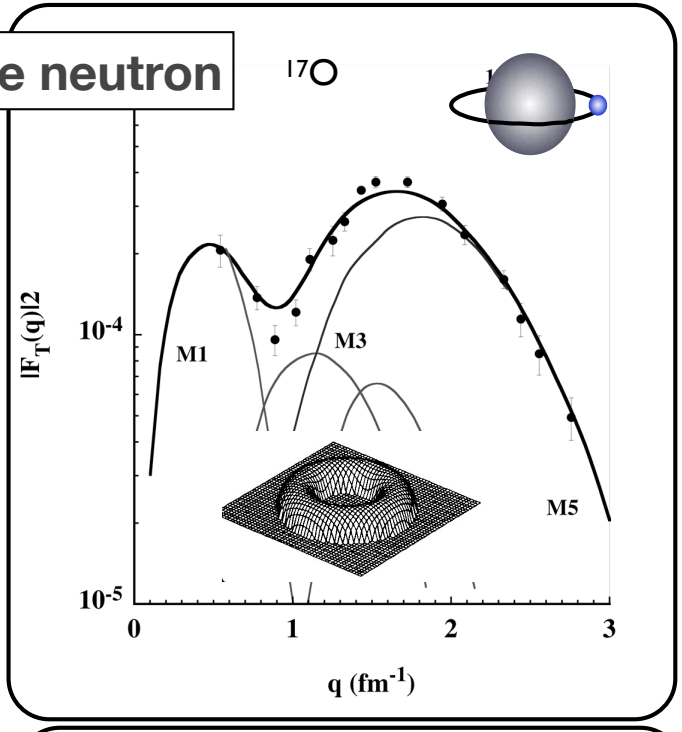
H.deVries, C. deJager and C. deVries
Atomic Data and Nuclear Data Tables 36 (987)495

Electron scattering for stable nuclei

charge distribution

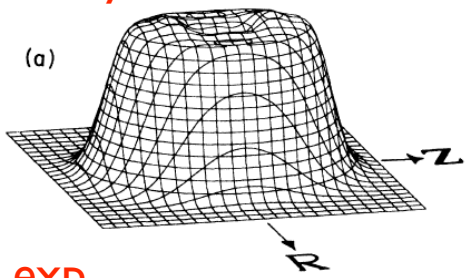


valence neutron

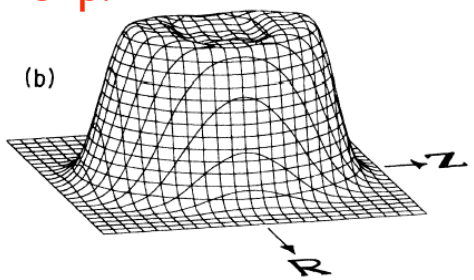


deformation ^{154}Gd

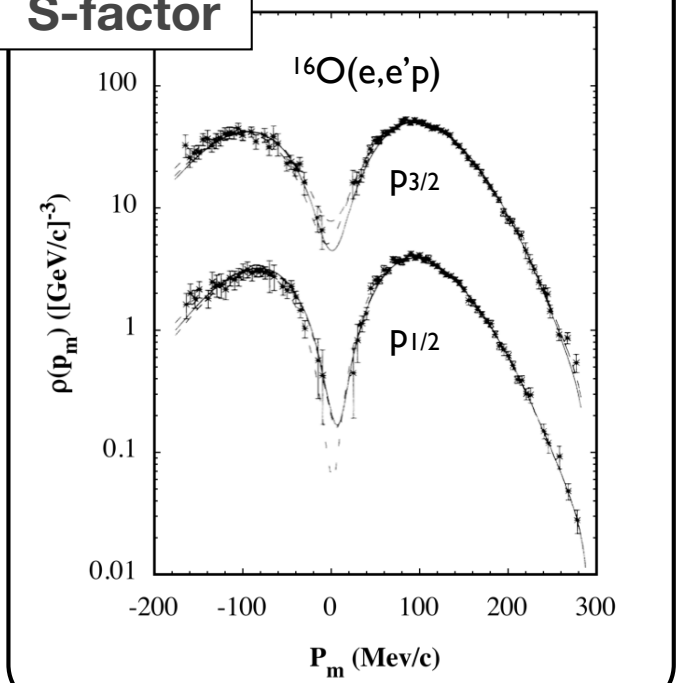
theory



exp.

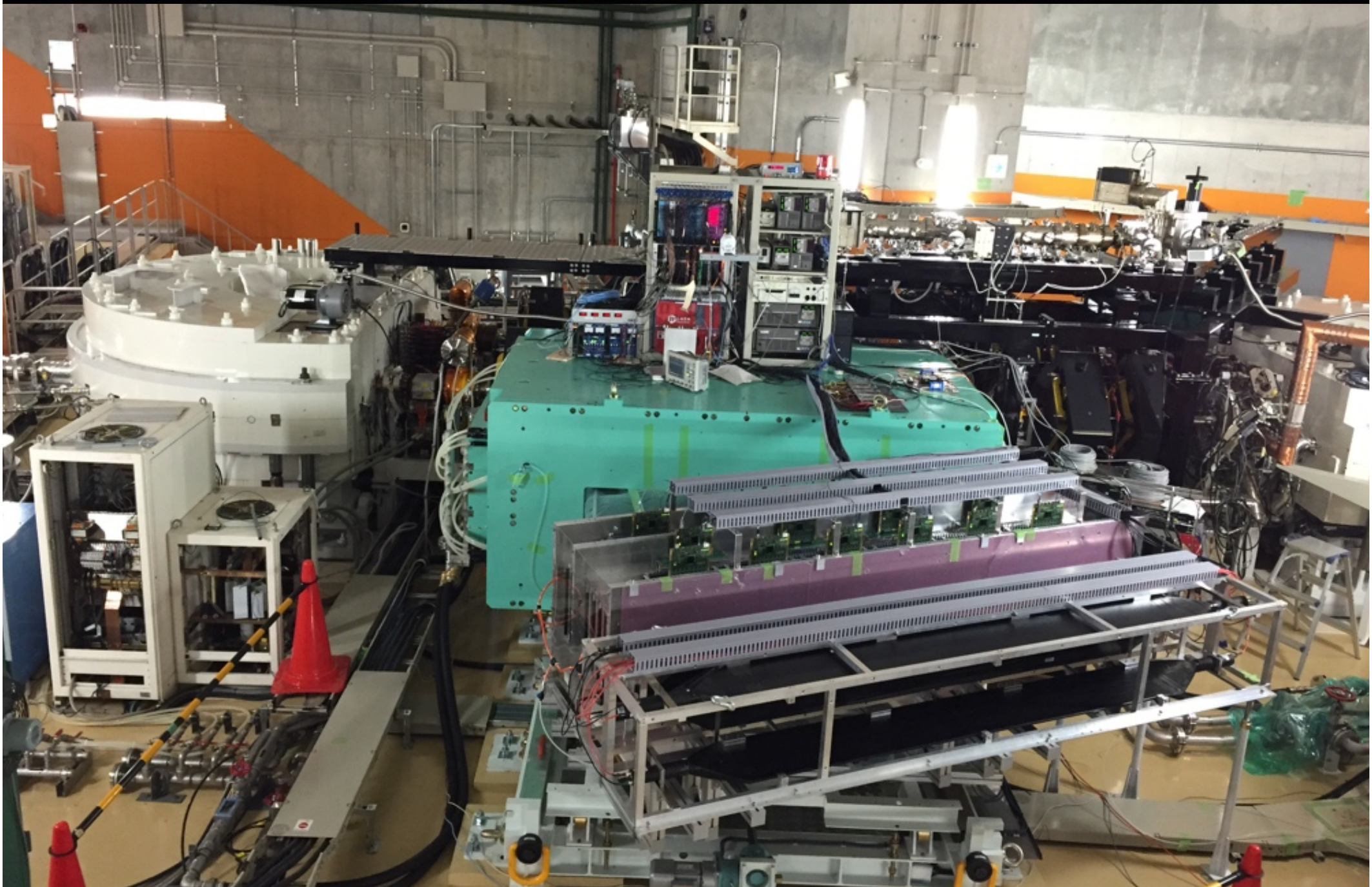


|Φ(p)|², S-factor



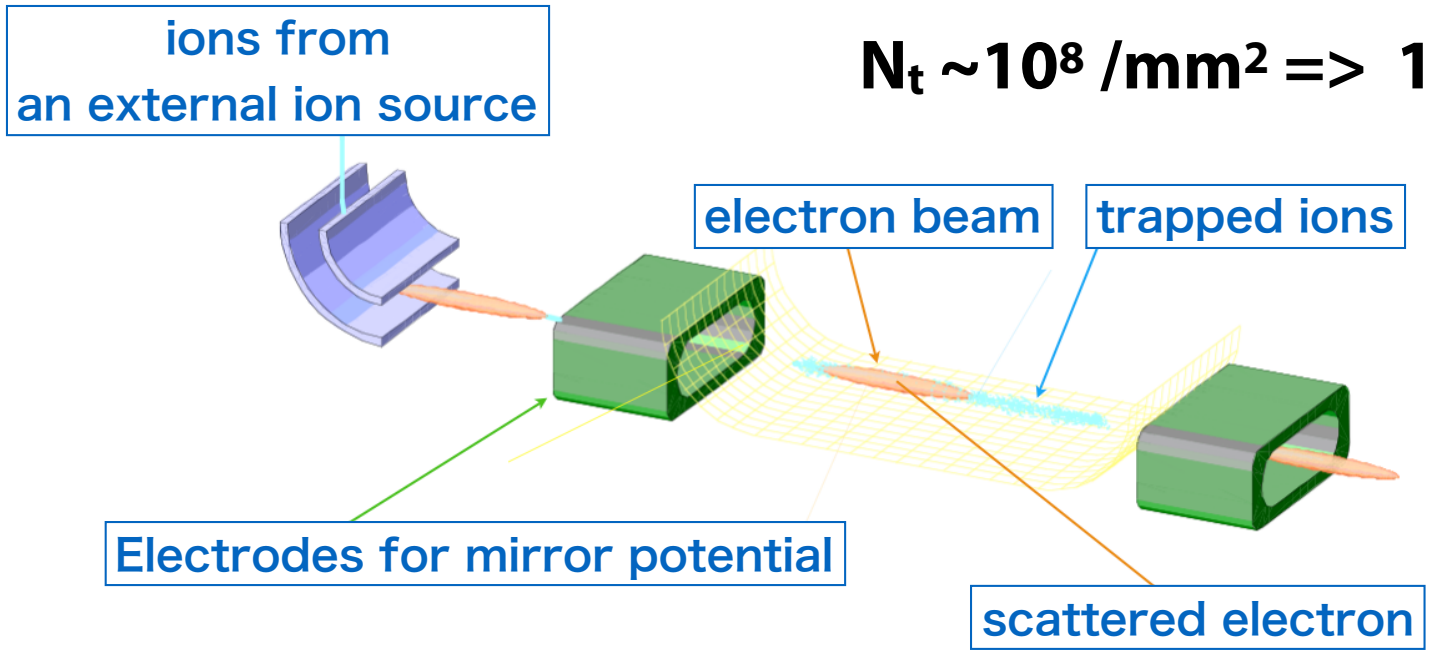
SCRIT facility in RIKEN/RI Beam Factory

world's first electron scattering facility for exotic nuclei



SCRIT scheme

(Self-Confining Radioactive isotope Ion Target)



N_t ~10^8 /mm^2 => 10^{10} /cm^2

	Ee	N_{beam}	ρ・t	L
Hofstadter's era (1950s)	150 MeV	~ 1nA (~10^9 /s)	~10^{19} /cm^2	~10^{28} /cm^2/s
JLAB	6 GeV	~100μA (~10^{14} /s)	~10^{22} /cm2	~10^{36} /cm^2/s
SCRIT	**150 - 300 MeV**	**~200 mA (~10^{18} /s)**	**~ 10^{10} /cm^2**	**~10^{27} /cm^2/s**

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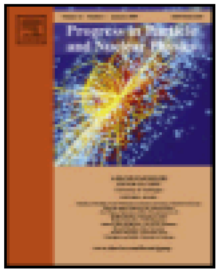

Review

Prospects for electron scattering on unstable, exotic nuclei

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Charge radii
Electromagnetic excitations
(Soft) dipole modes

ABSTRACT

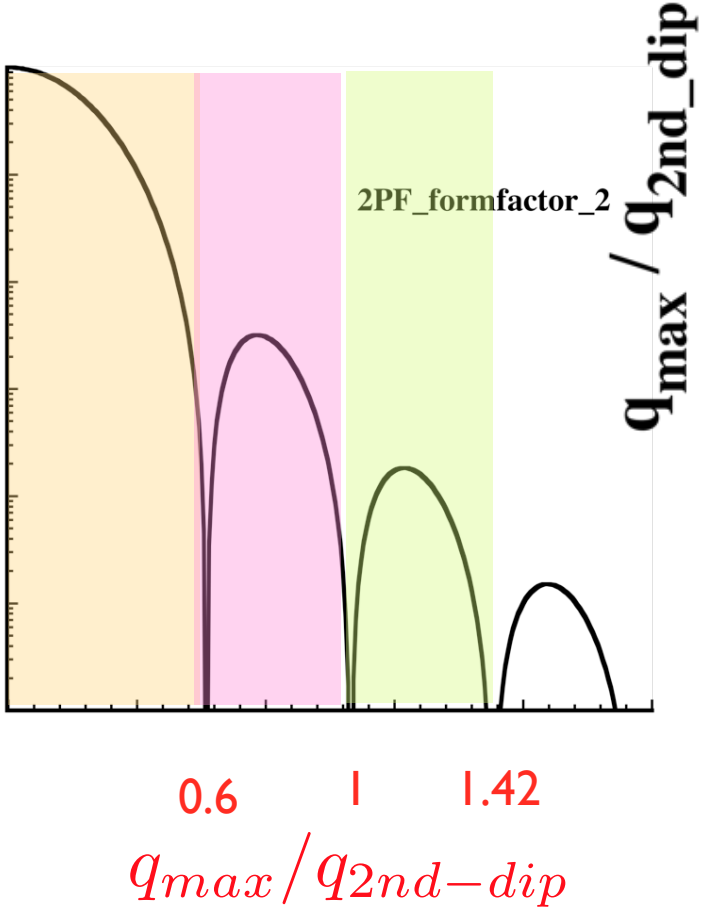
Electron scattering off radioactive ions becomes feasible for the first time due to advances in storage ring and trapping techniques in conjunction with intense secondary beams from novel beam facilities. Using a point-like purely leptonic probe enables the investigation of charge distributions and electromagnetic excitations in β-unstable exotic nuclei with an enhanced overshoot in proton and neutron numbers and the use of QED, one of the most precisely studied theories, for describing the scattering process.

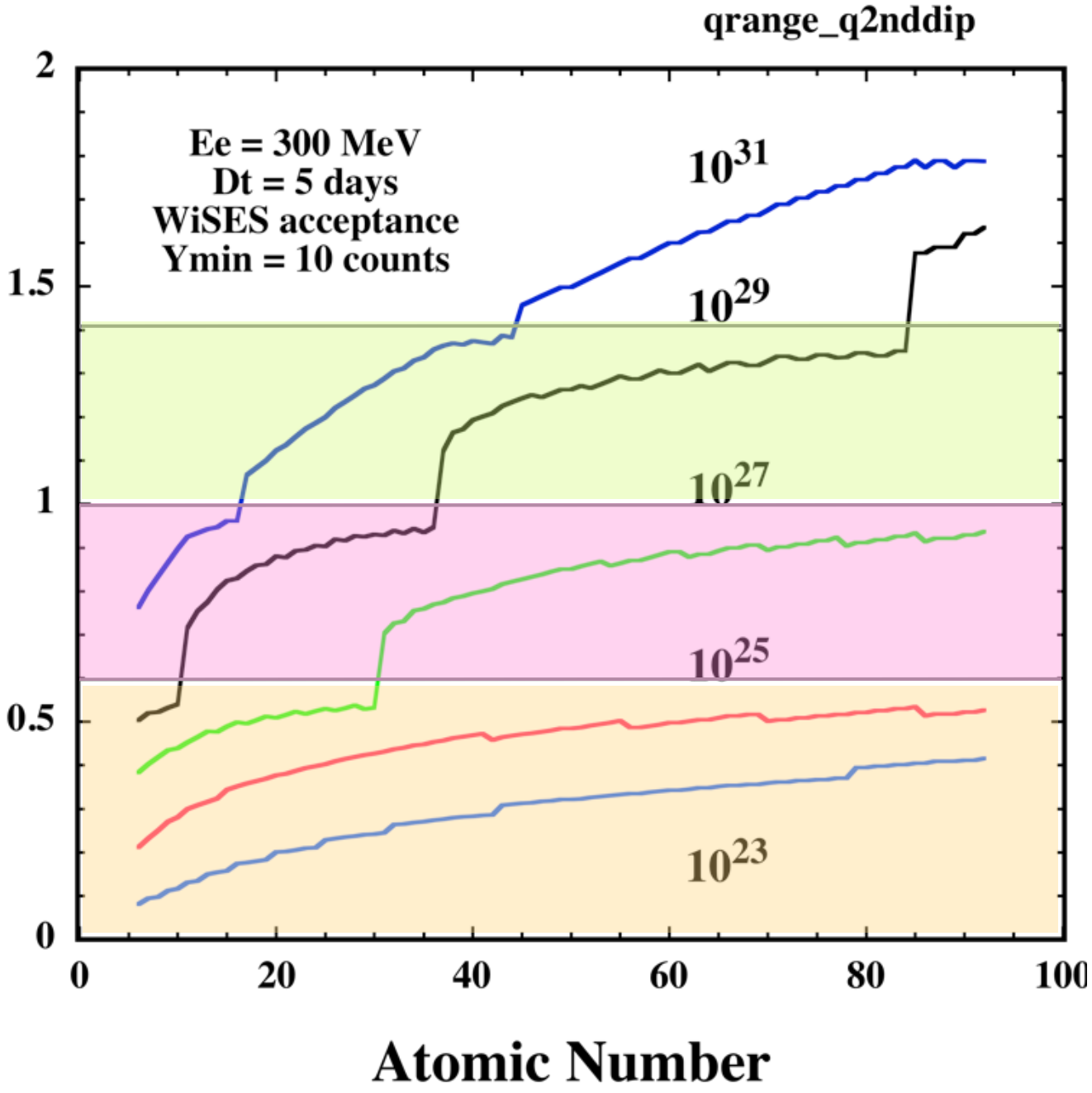
Contents

Luminosities and accessible q ranges for elastic scattering

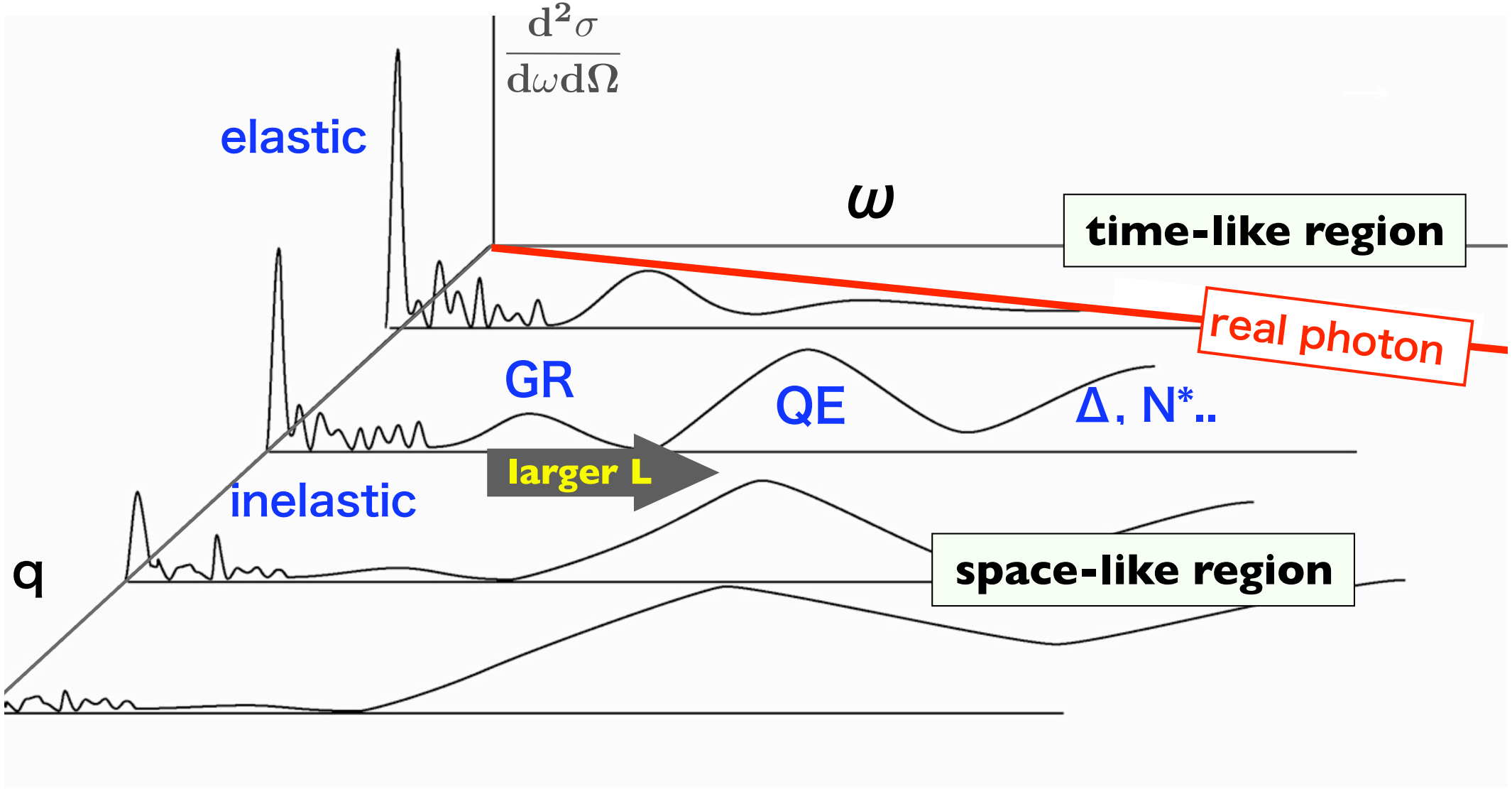
$$\sigma \propto Z^2$$

$$\sigma \propto 1/q^4$$





Nuclear response in (ω,q) plane



Enjoy the meeting !