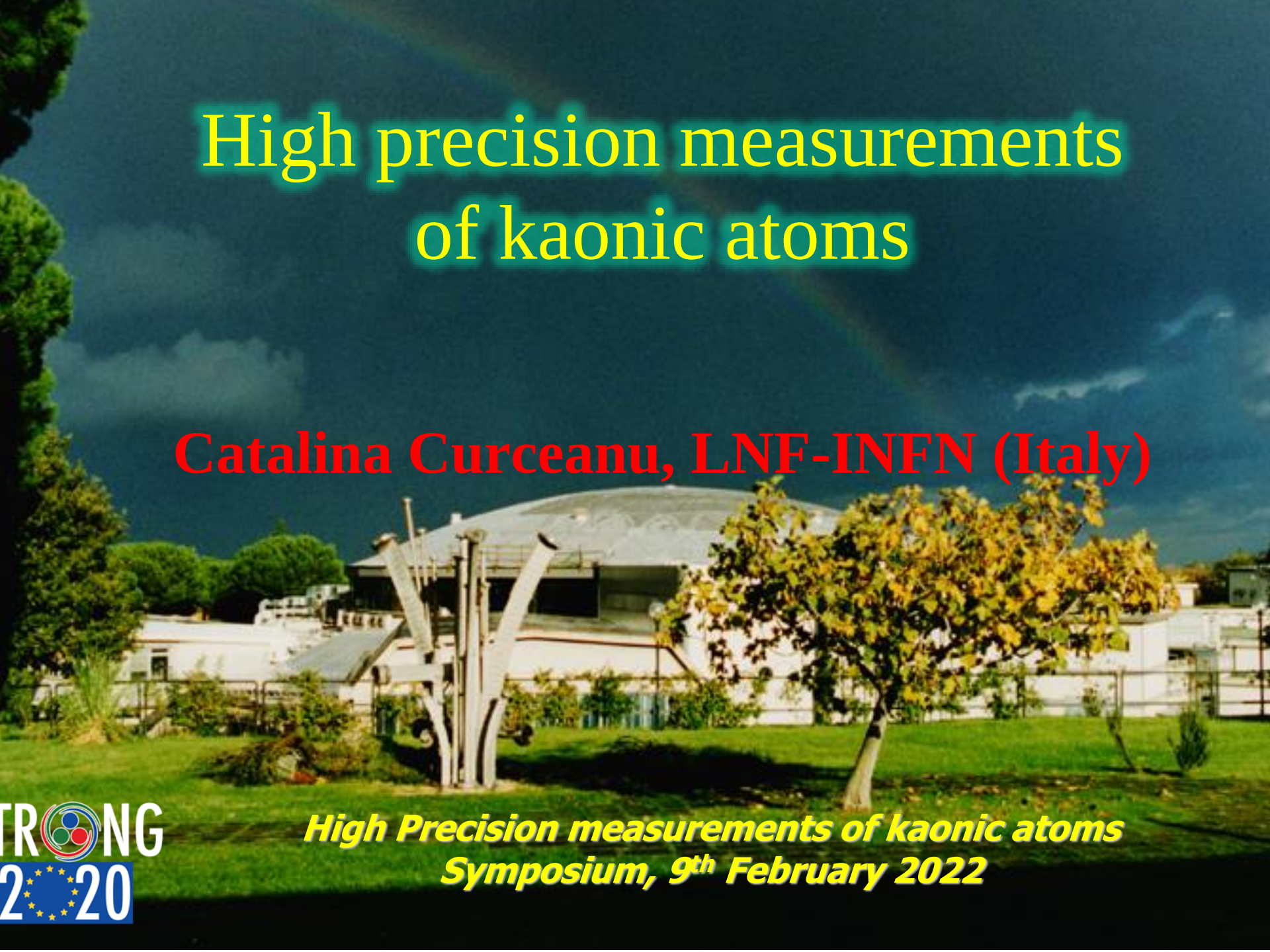


High precision measurements of kaonic atoms

Catalina Curceanu, LNF-INFN (Italy)

George Beer (1933-2022)

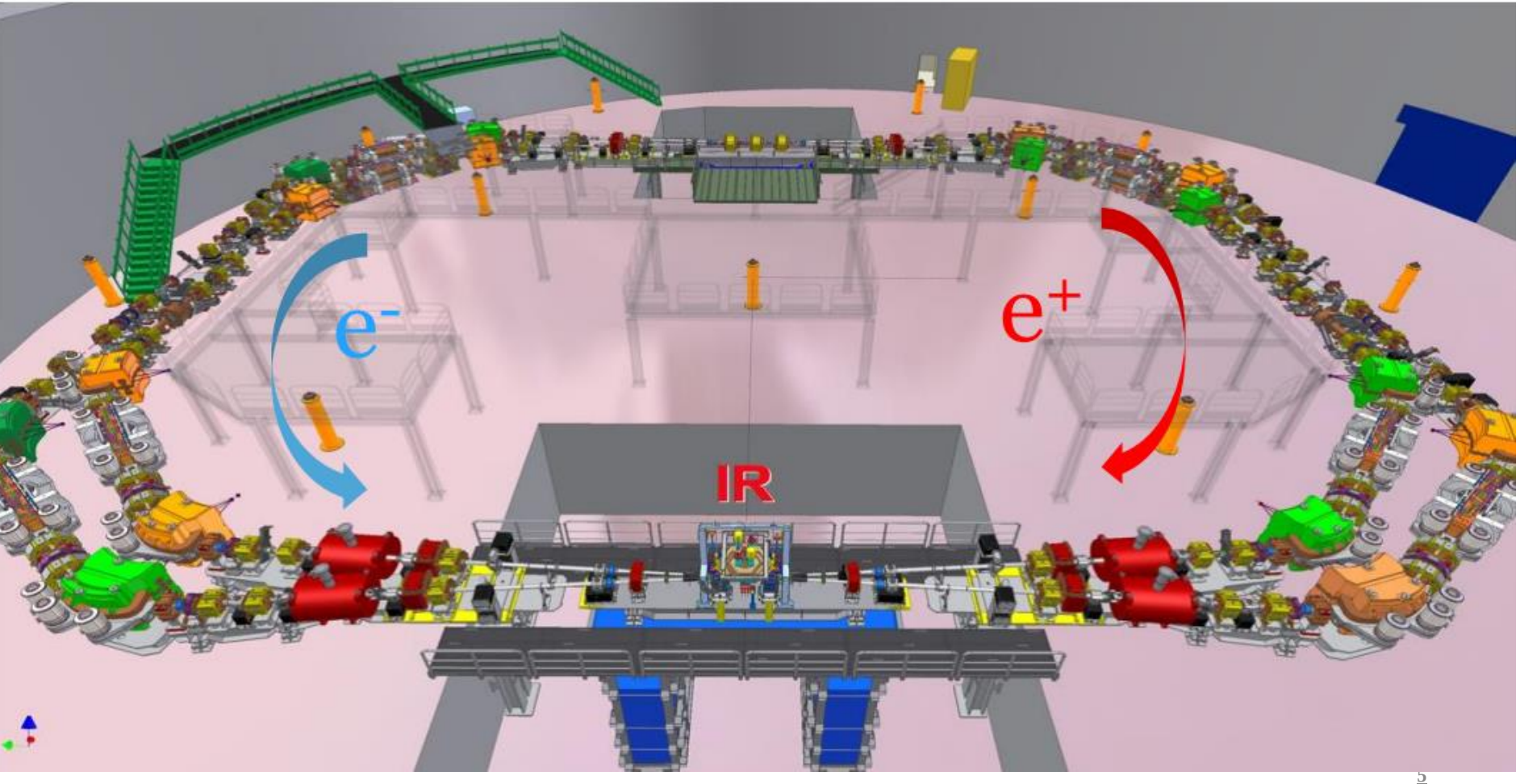
Photo: J Marton

Simon Eidelman (1948-2021)

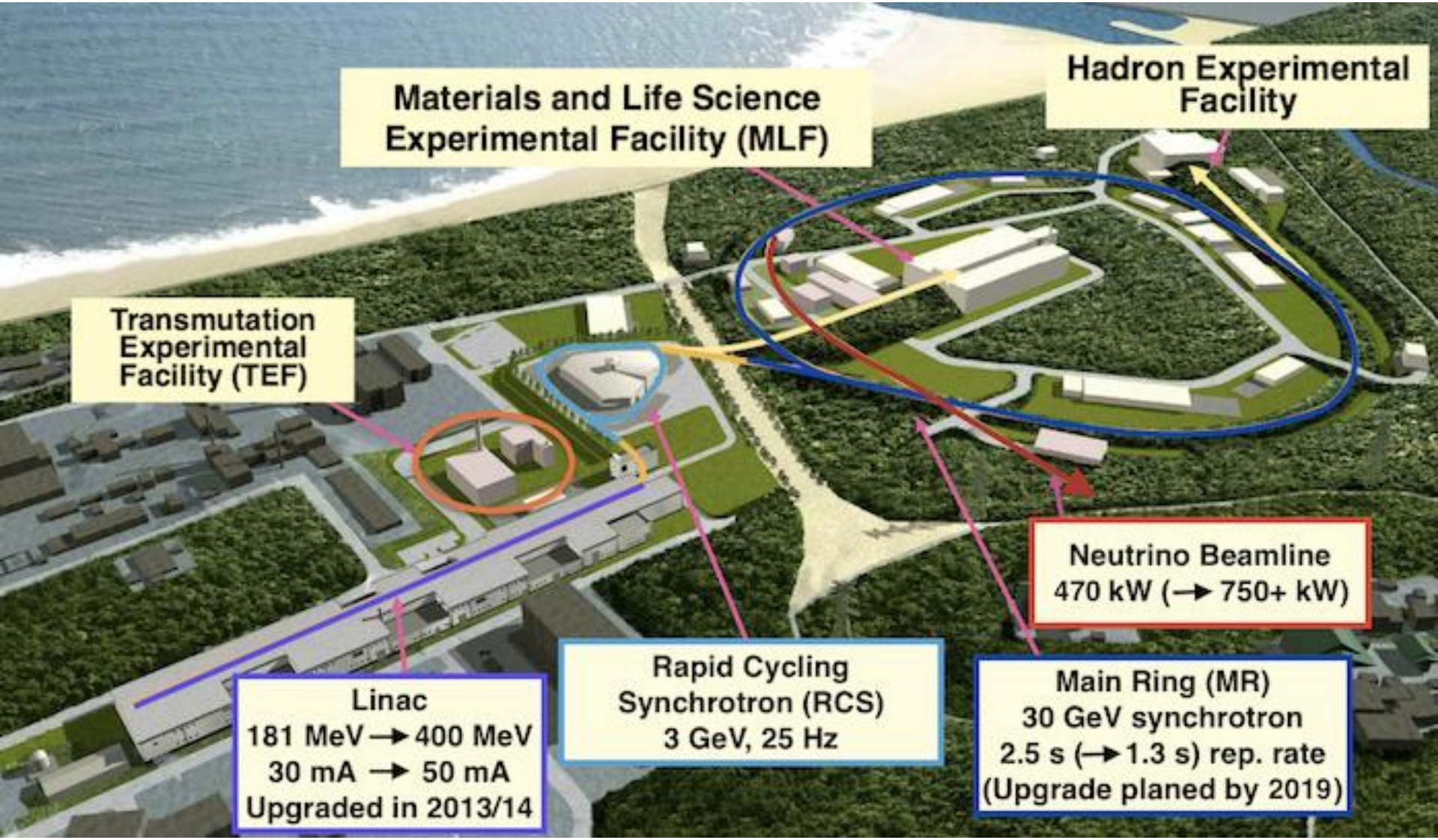

WELCOME and thank you for being here!
LNF-INFN, DAFNE Collider
(S. Dabagov)

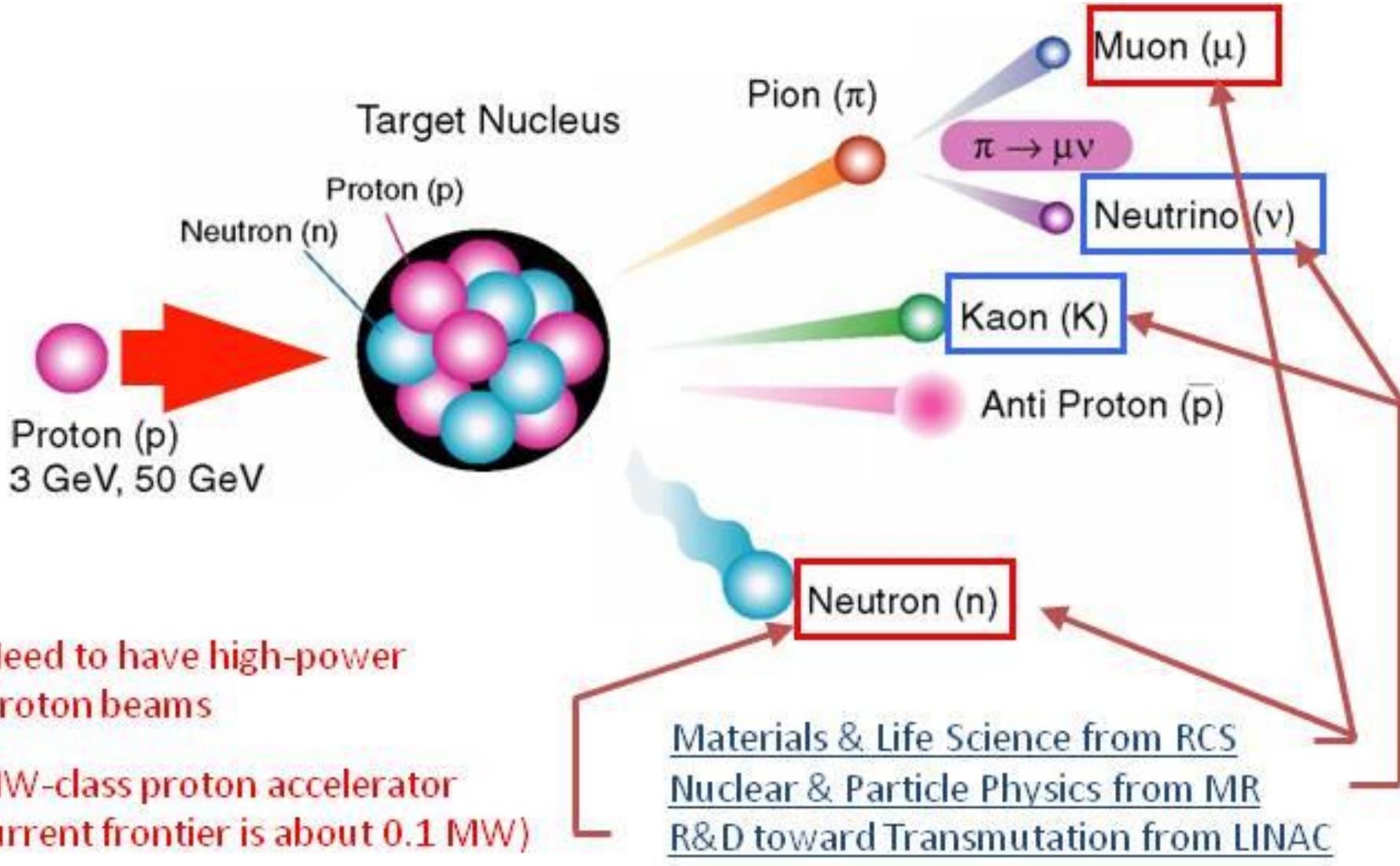
Laboratori Nazionali di Frascati (LNF-INFN)

- $\Phi \rightarrow K^- K^+$ (49.1%)
- Monochromatic low-energy K^- (~127 MeV/c ; $\Delta p/p = 0.1\%$)

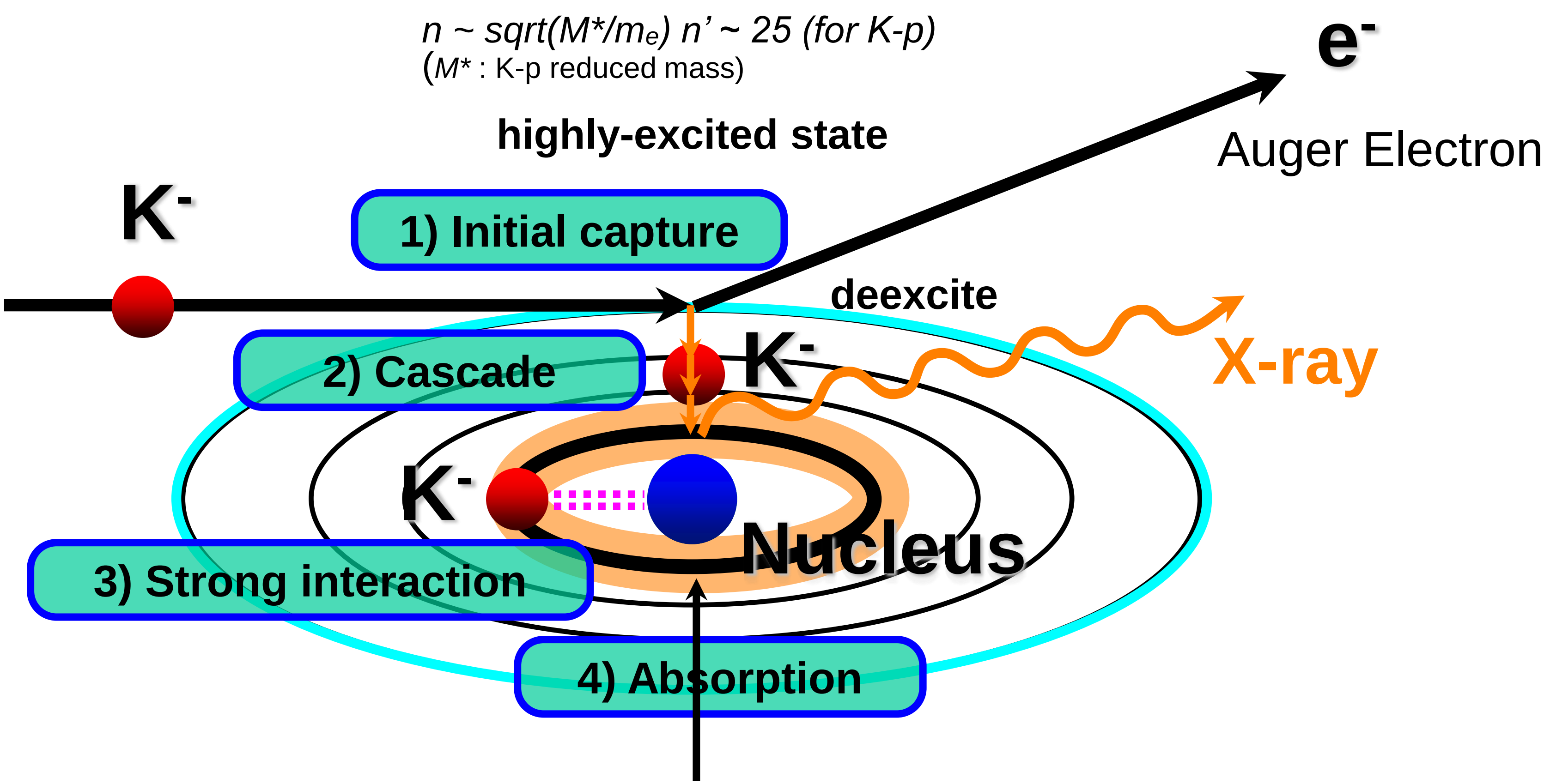


J-PARC


Materials and Life Science Experimental Facility (MLF)
Hadron Experimental Facility
Transmutation Experimental Facility (TEF)
Neutrino Beamline
470 kW (→ 750+ kW)
Linac
181 MeV → 400 MeV
30 mA → 50 mA
Upgraded in 2013/14
Rapid Cycling Synchrotron (RCS)
3 GeV, 25 Hz
Main Ring (MR)
30 GeV synchrotron
2.5 s (→ 1.3 s) rep. rate
(Upgrade planed by 2019)


Target Nucleus
Proton (p)
Neutron (n)
Proton (p)
3 GeV, 50 GeV
Pion (π)
π → μν
Muon (μ)
Neutrino (ν)
Kaon (K)
Anti Proton (p̄)
Neutron (n)
Need to have high-power proton beams
→ MW-class proton accelerator (current frontier is about 0.1 MW)
Materials & Life Science from RCS
Nuclear & Particle Physics from MR
R&D toward Transmutation from LINAC

Kaonic atom formation



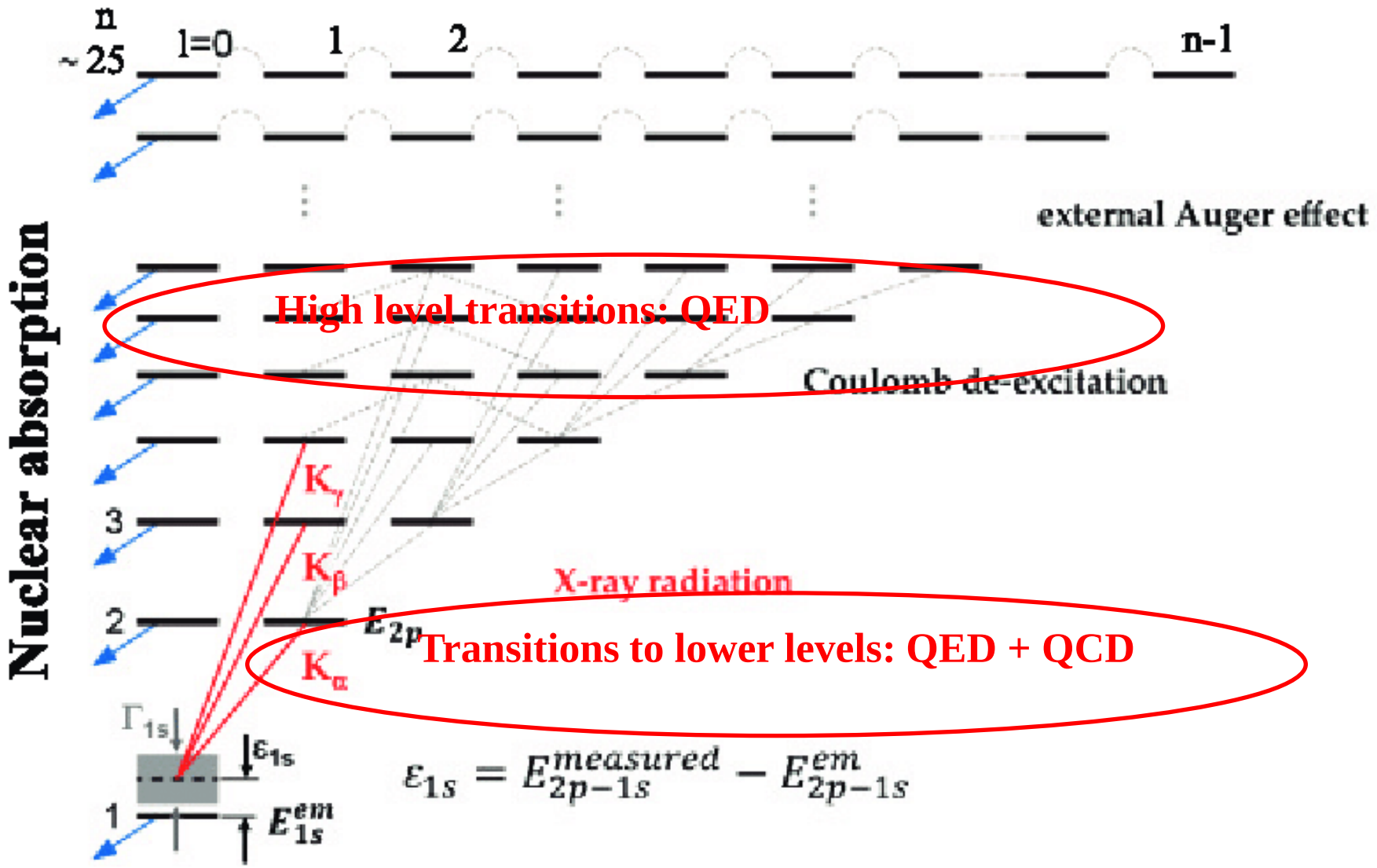
Shift and Width of last orbit

stopped in a target medium

The strong int. width

· **1s** for K-p, K-d
· **2p** for K-He

Kaonic cascade



On self-gravitating strange dark matter halos around galaxies
Phys.Rev.D 102 (2020) 8, 083015

Dark Matter studies ?

Fundamental physics
New Physics?

The modern era of light kaonic atom experiments
Rev.Mod.Phys. 91 (2019) 2, 025006

High Precision measurements of Kaonic atoms (QED, QCD)

Kaonic Atoms to Investigate Global Symmetry Breaking
Symmetry 12 (2020) 4, 547

Part. and Nuclear physics
QCD @ low-energy limit
Chiral symmetry, Lattice

Merger of compact stars in the two-families scenario
Astrophys.J. 881 (2019) 2, 122

Astrophysics
EOS Neutron Stars

The equation of state of dense matter: Stiff, soft, or both?
Astron.Nachr. 340 (2019) 1-3, 189