

NuPECC 2007 / 2008

Trento 16,17 March 07
Munich 22, 23 June 07
Bucharest 26, 27 October 07
Madrid 7,8 March 08
Zagreb 13, 14 June 08
Glasgow 3, 4 October 08

- Friday morning devoted to Nuclear Physics in host country
- Fr/Sa board meeting

Chair: Brian Fulton (York -> 2008)

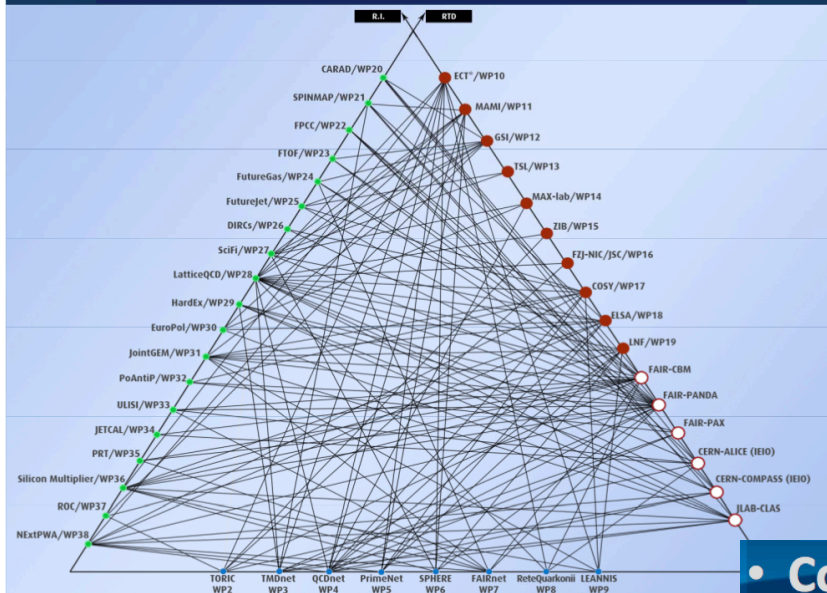
1) Workshop on small-scale accelerator facilities, Crete, September 7-8, Nuclear Astrophysics, Nuclear Structure

- ions 10 keV to 100 MeV, ENSF and SPIRIT
- 11 partners, e.g. ETHZ (AMS people)

2) FP7: Hadron Physics 2: follows FP6 programme

Jülich (COSY), GSI, LNF, TSL, ELSA, MAMI, ...ECT* (Theory)
Detector developments e.g. diamond sensors, Cerenkov, GEM
Software developments
Lattice QCD

INTERCONNECTIONS AMONG DIFFERENT TYPES OF ACTIVITIES



- **Coordinator: INFN, Italy**
- **Project Coordinator: Carlo Guaraldo (INFN-LNF)**
- **Consortium: 54 European Organizations**
- **Other involved Institutions: 122**
- **Involved researchers: more than 2.500**
- **Involved Countries: 36**
- **EC requested contribution: 22.8 M€**
- **Contract duration: 48 months**

2) **FP7: ENSA**

Nuclear structure studies using GSI, GANIL, KVI, ISOLDE etc
40 Participants, 14 MEuros

3) **FP7: FUNDAMENTAL**

(E. Widmann)



Fundamental Physics at Accelerators and Reactors e.g.

- Non V-A contributions
- Fundamental symmetries (CPT e.g. antihydrogen, T i.e. n edm, t-dependence of constants, etc.)

TNA1 - AD-CERN low-energy antiproton

TNA2 - ESR/HITRAP - GSI cooled highly charged ions with highest charge state

TNA3 - TSR/CSR MPI-K cryogenic storage ring

TNA4 - TRI μ P - KVI trapped radioactive ions

TNA5 - UCN - ILL currently strongest UCN source

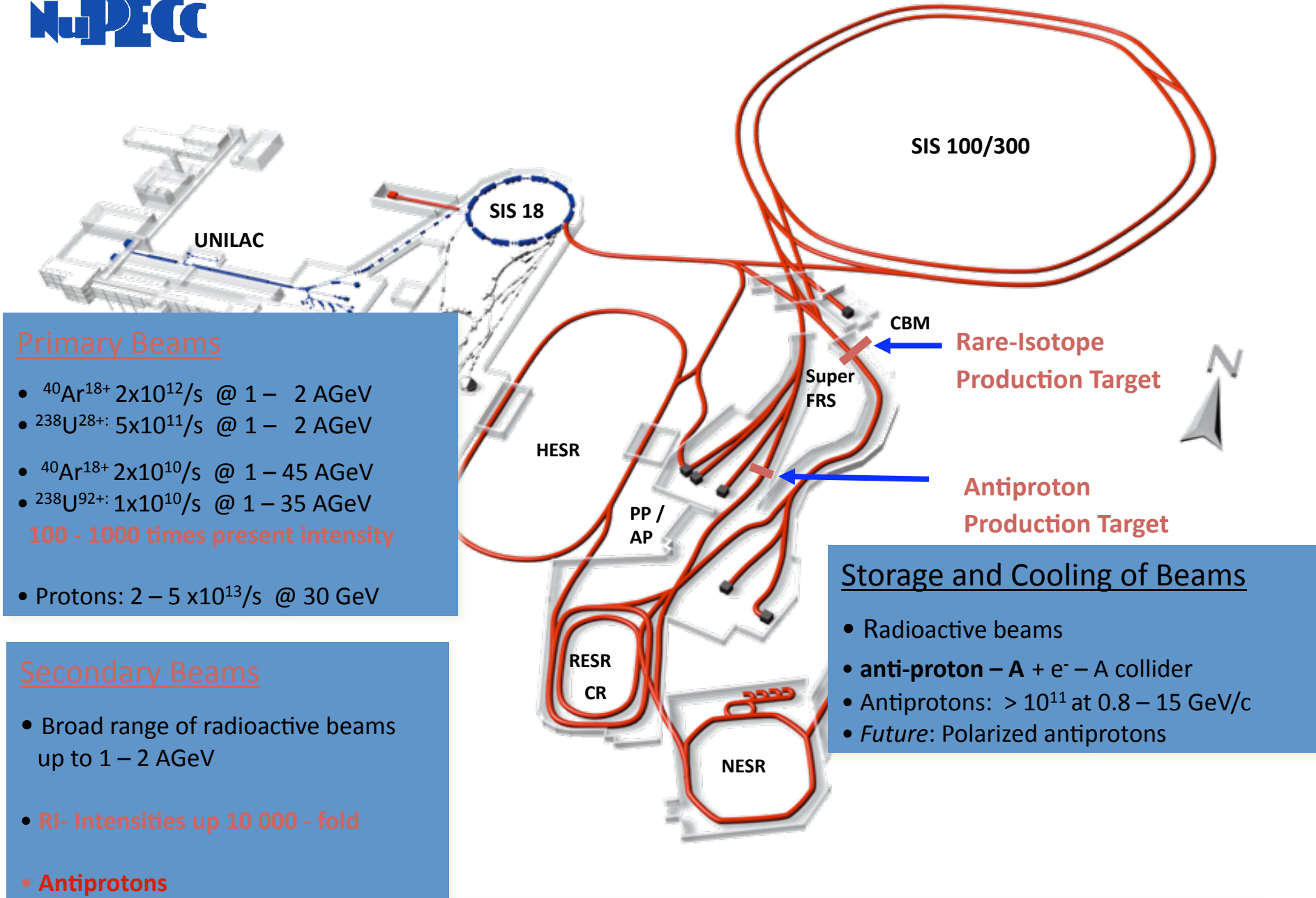
TNA6 - UCN - PSI will become most intense UCN source

TNA7 - TRIGA-UCN Uni Mainz high intensitiy pulsed UCNs

- 4) Status report following
Recommendations by NuPECC (Roadmap):
I) FAIR facility next to GSI
Facility for Antiproton and Ion Research



Swiss participation in the Panda programme (Uni Basel)
Antiprotons will be available in 2013



Primary Beams

- $^{40}\text{Ar}^{18+}$ $2 \times 10^{12}/\text{s}$ @ 1 – 2 AGeV
- $^{238}\text{U}^{28+}$: $5 \times 10^{11}/\text{s}$ @ 1 – 2 AGeV
- $^{40}\text{Ar}^{18+}$ $2 \times 10^{10}/\text{s}$ @ 1 – 45 AGeV
- $^{238}\text{U}^{92+}$: $1 \times 10^{10}/\text{s}$ @ 1 – 35 AGeV
- **100 - 1000 times present intensity**
- Protons: $2 - 5 \times 10^{13}/\text{s}$ @ 30 GeV

Secondary Beams

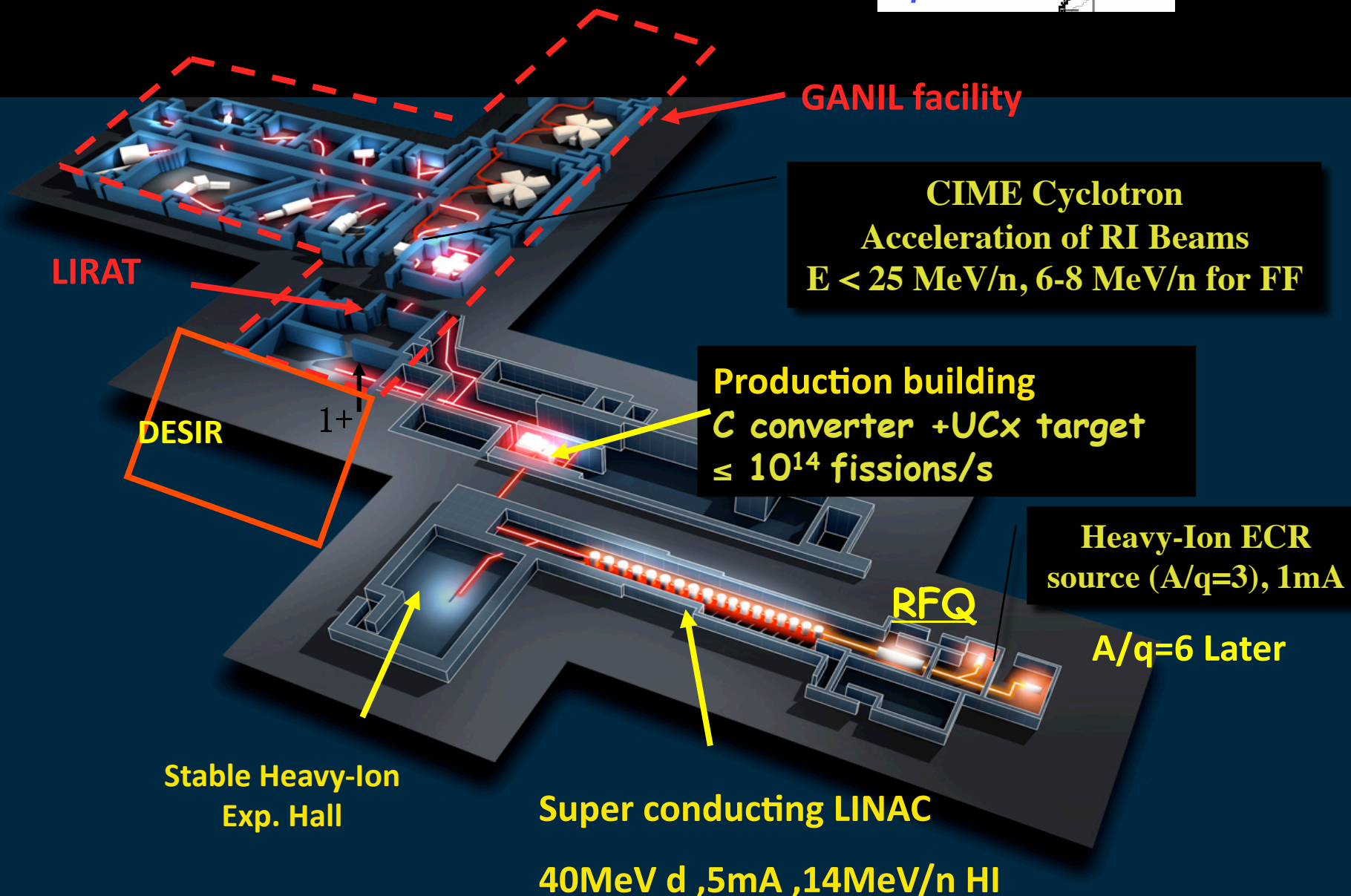
- Broad range of radioactive beams up to 1 – 2 AGeV
- **RI- Intensities up 10 000 - fold**
- **Antiprotons**

- ### Storage and Cooling of Beams
- Radioactive beams
 - **anti-proton – A + e⁻ – A collider**
 - Antiprotons: $> 10^{11}$ at 0.8 – 15 GeV/c
 - *Future: Polarized antiprotons*

CBM
Rare-Isotope Production Target
 Super FRS
Antiproton Production Target

SPIRAL 2@GANIL – Next generation of ISOL Facility

II) SPIRAL II facility at CAEN, radioactive beams



CIME Cyclotron
Acceleration of RI Beams
 $E < 25 \text{ MeV/n}$, 6-8 MeV/n for FF

Heavy-Ion ECR source
source ($A/q=3$), 1mA

Stable Heavy-Ion Exp. Hall

Super conducting LINAC
40MeV d ,5mA ,14MeV/n HI

SPIRAL II is precursor to **EURISOL**:

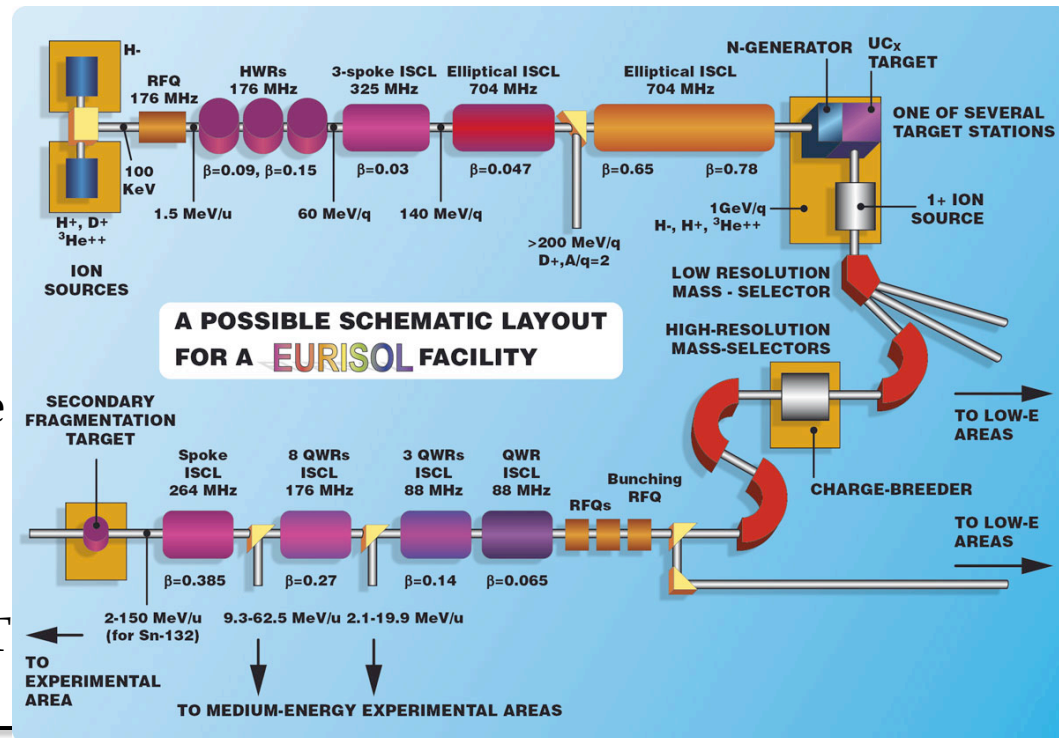
Study of nuclei far from stability line:

- Mostly relevant to astrophysics (neutron rich nuclei and r-processes -> heavy elements)
- Superheavy elements, island of stability
- Opportunity for so-called beta-beams for electron neutrinos

EURISOL
Design Study

20 participants from Europe, 21 from outside Europe
Currently financed by FP6

Will seek support of NuPECC
Collaboration through NuPNET



Future lepton scattering facilities

NuPECC working group

Tullio Bressani, INFN, Torino Univ.

Jens Jørgen Gaardhøje, Niels Bohr Inst.

Günther Rosner, Glasgow Univ. (chair)

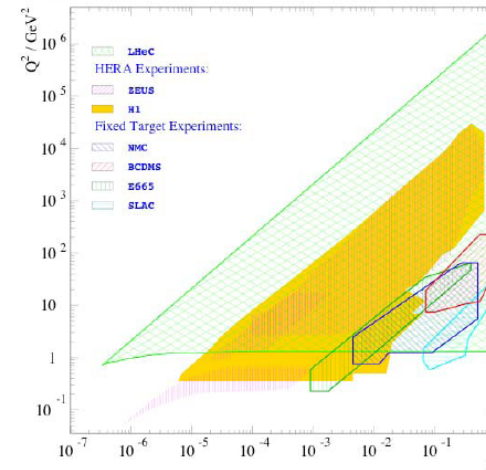
Hans Ströher, FZ Juelich

LHeC roadmap

- Feasibility study endorsed by CERN and ECFA
- First ECFA-CERN Workshop on the LHeC in Divonne, 1-3/9/08
- Goal: Conceptual Design Report by end of 2009, early 2010, on:
 - Accelerator
 - Interaction regions
 - Detector
 - Infrastructure
 - Physics
 - New Physics
 - High Precision QCD + electroweak
 - High parton densities (low x + eA)

<http://www.lhec.org.uk>

LHeC Inclusive Kinematics



$$E_e = 70 \text{ GeV}$$

$$E_p = 7 \text{ TeV}$$

$$\sqrt{s} = 1.4 \text{ TeV}$$

(5 x HERA)

• Extension to higher Q^2 in x range covered By HERA

• Extension of low x (high W) frontier

$$W \leq 1.4 \text{ TeV}$$

$$x \geq 5 \cdot 10^{-7} \text{ at } Q^2 \leq 1 \text{ GeV}^2$$

- Unprecedented lumi = $10^{33} \text{ cm}^{-2} \text{ s}^{-1}$!!!
- eA mode possible using LHC ion beam