Welcome – Hoşgeldiniz

Prof. Emmanuel Tsesmelis
Deputy Head of International Relations
CERN

Accelerating Science and Innovation
The Mission of CERN

- **Push back** the frontiers of knowledge
  
  E.g. the secrets of the Big Bang …what was the matter like within the first moments of the Universe’s existence?

- **Develop** new technologies for accelerators and detectors
  
  Information technology - the Web and the GRID
  Medicine - diagnosis and therapy

- **Train** scientists and engineers of tomorrow

- **Unite** people from different countries and cultures
CERN: founded in 1954: 12 European States “Science for Peace”
Today: 21 Member States

~ 2500 staff
~ 1300 other paid personnel
~ 12100 scientific users
Budget (2015) ~1000 MCHF

**Member States:** Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom

**Associate Member States:** Pakistan, Turkey

**States in accession to Membership:** Romania, Serbia

**Applications for Membership or Associate Membership:** Azerbaijan, Brazil, Croatia, Cyprus, India, Russia, Slovenia, Ukraine

**Observers to Council:** India, Japan, Russia, United States of America; European Union, JINR and UNESCO
Today: >2500 PhD students in LHC experiments
Next Scientific Challenge:
to understand the very first moments of our Universe
after the Big Bang

13.8 Billion Years

Today
Study physics laws of first moments after Big Bang and increasing Symbiosis between Particle Physics, Astrophysics and Cosmology.
2010: a New Era in Fundamental Science

Exploration of a new energy frontier in p-p and Pb-Pb collisions

LHC ring: 27 km circumference
The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider".
CERN: Particle Physics and Innovation

- **Interfacing** between fundamental science and key technological developments

- **CERN Technologies and Innovation**
  - Accelerating particle beams
  - Detecting particles
  - Large-scale computing (Grid)
Medical Application as an Example of Particle Physics Spin-off
Combining Physics, ICT, Biology and Medicine to fight cancer

**Hadron Therapy**
- Accelerating particle beams
  - ~30,000 accelerators worldwide
  - ~17,000 used for medicine
- Leadership in Ion Beam Therapy now in Europe and Japan
- >100,000 patients treated worldwide (45 facilities)
- >50,000 patients treated in Europe (14 facilities)

**Imaging**
- Detecting particles
- PET Scanner
  - Clinical trial in Portugal, France and Italy for new breast imaging system (ClearPEM)
  - Brain Metabolism in Alzheimer's Disease: PET Scan
The Worldwide LHC Computing Grid

Tier-0 (CERN&Wigner): data recording, reconstruction and distribution

Tier-1: permanent storage, re-processing, analysis

Tier-2: Simulation, end-user analysis

Nearly 170 sites, 40 countries

~350’000 cores

500 PB of storage

> 2 million jobs/day

10-100 Gb links

WLCG: An International collaboration to distribute and analyse LHC data

Integrates computer centres worldwide that provide computing and storage resource into a single infrastructure accessible by all LHC physicists
CERN Education Activities

Scientists at CERN
Academic Training Programme

Young Researchers
CERN School of High Energy Physics
CERN School of Computing
CERN Accelerator School

Physics Students
Summer Students Programme

CERN Teacher Schools
International and National Programmes
Turkey and CERN

- Turkey had **Observer Status** at CERN since 1961
- International Cooperation Agreement signed in 2008
- Application to join CERN made in 2009
- Turkey became an **Associate Member State** on 6 May 2015

Involvements of **Turkish Physicists** in CERN Programme

- **Participation in experiments at CERN:**
  - LHC: ATLAS, CMS, ALICE
  - non-LHC: involvements in OPERA, ISOLDE, CAST
- **Collaboration in advanced accelerator R&D** for CLIC and FCC.
Strong involvement in the LHC experiments ATLAS and CMS

**ATLAS**
2 Institutions
Ankara University¹
Bogazici University²

**CMS**
4 Institutes
Cukurova University, Adana
Middle-East Technical Univ., Ankara
Bogazici University, Istanbul
Istanbul Technical Univ., Istanbul

Innovative technologies developed

1 includes also physicists from Dumlupinar University, Gazi University, TOBB University of Economy and Technology, TAEA Ankara
2 includes also physicists from Dogus University Istanbul, Gaziantep University, Istanbul Technical Univ.
Thank You!
Teşekkürler!

Accelerating Science and Innovation