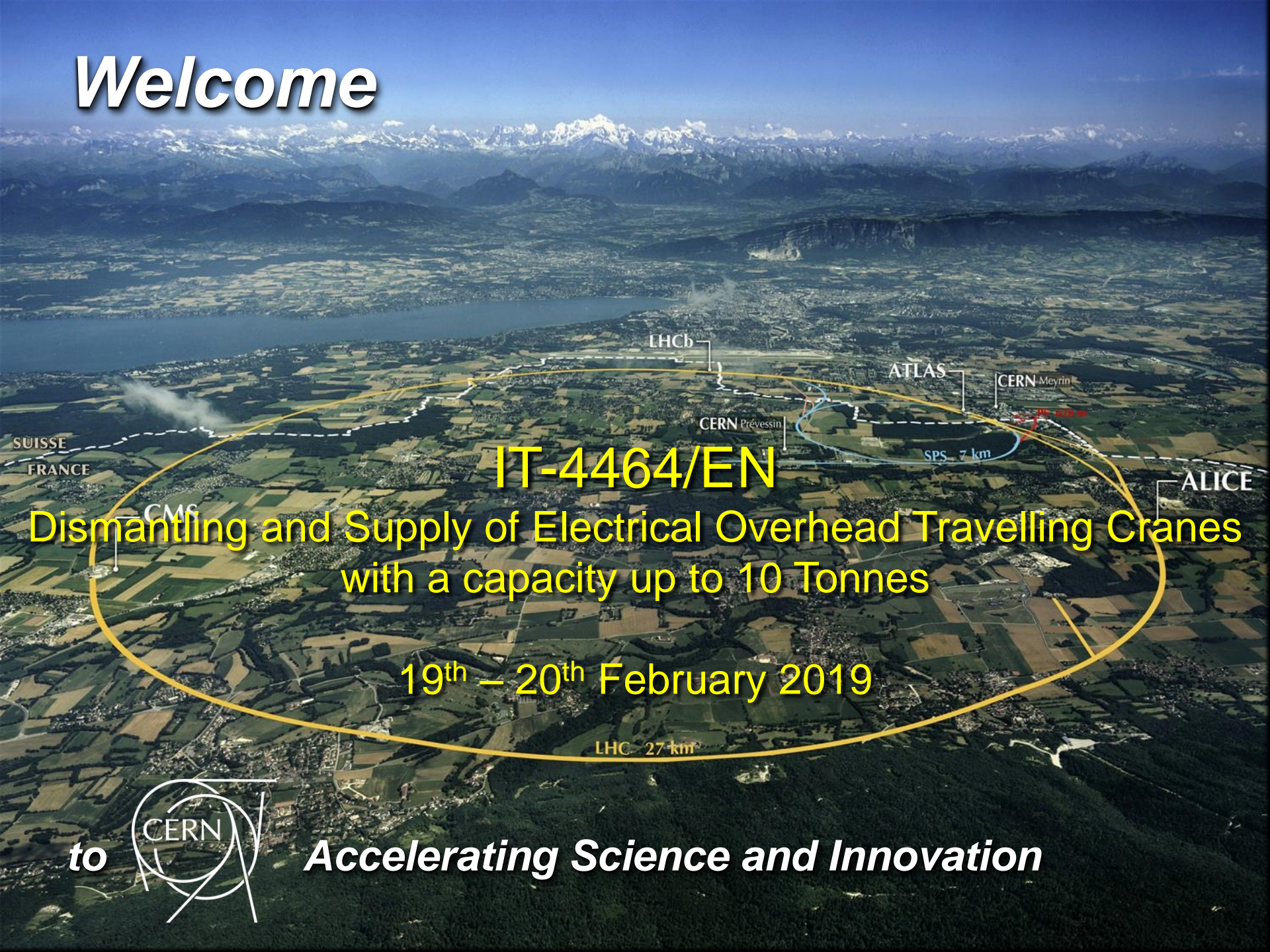


Welcome



IT-4464/EN

Dismantling and Supply of Electrical Overhead Travelling Cranes
with a capacity up to 10 Tonnes

19th – 20th February 2019

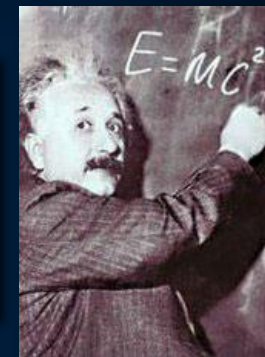
to  Accelerating Science and Innovation



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?

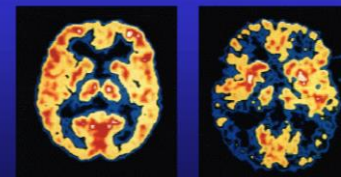


❑ Develop new technologies for accelerators and detectors

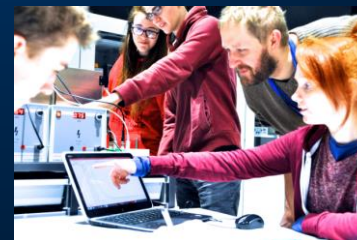
Information technology - the Web and the GRID
Medicine - diagnosis and therapy



Brain Metabolism in Alzheimer's Disease: PET Scan



❑ Train scientists and engineers of tomorrow



❑ Unite people from different countries and cultures



CERN: founded in 1954: 12 European States

“Science for Peace”

Today: 22 Member States

~ 2600 staff

~ 1800 other paid personnel

~ 13000 scientific users

Budget (2018) ~ 1150 MCHF

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

Associate Members in the Pre-Stage to Membership: Cyprus, Serbia, Slovenia

Associate Member States: India, Lithuania, Pakistan, Turkey, Ukraine

Applications for Membership or Associate Membership:

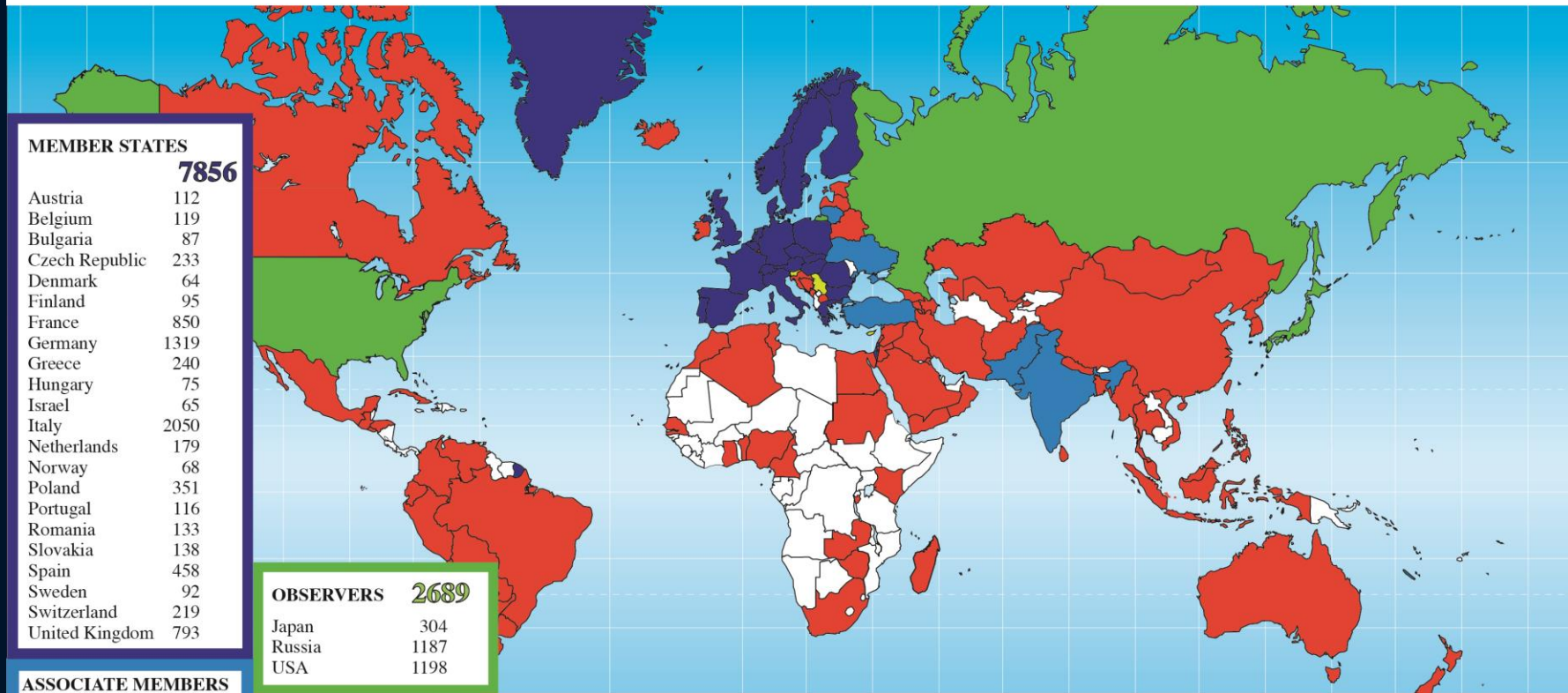
Brazil, Croatia, Estonia

Observers to Council: Japan, Russia, United States of America;
European Union, JINR and UNESCO



Science is getting more and more global

Distribution of All CERN Users by Nationality on 28 January 2019



MEMBER STATES

7856

Austria	112
Belgium	119
Bulgaria	87
Czech Republic	233
Denmark	64
Finland	95
France	850
Germany	1319
Greece	240
Hungary	75
Israel	65
Italy	2050
Netherlands	179
Norway	68
Poland	351
Portugal	116
Romania	133
Slovakia	138
Spain	458
Sweden	92
Switzerland	219
United Kingdom	793

OBSERVERS

2689

Japan	304
Russia	1187
USA	1198

ASSOCIATE MEMBERS

India	376	757
Lithuania	37	
Pakistan	77	
Turkey	154	
Ukraine	113	

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

108

Cyprus	23
Serbia	52
Slovenia	33

OTHERS

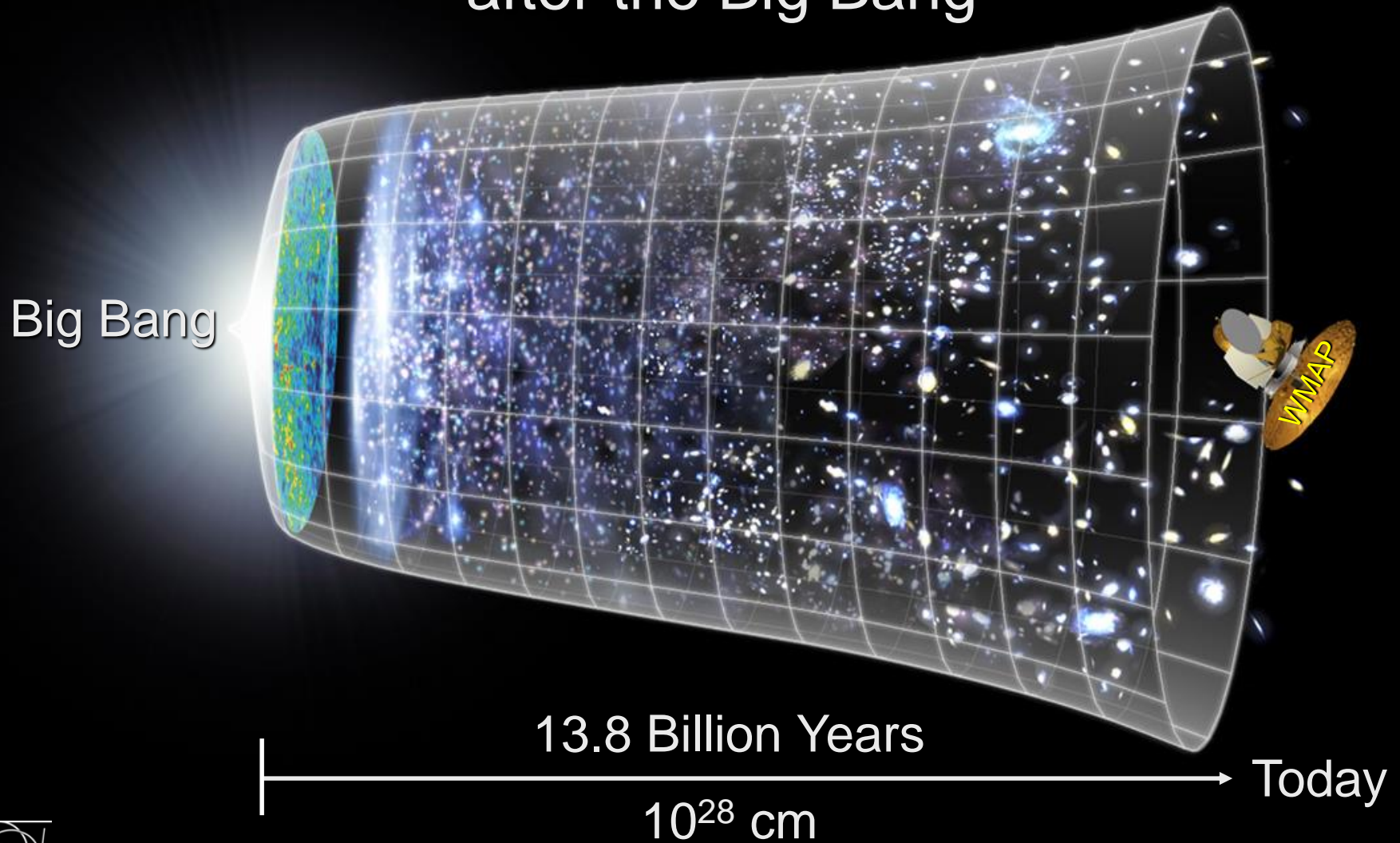
1930

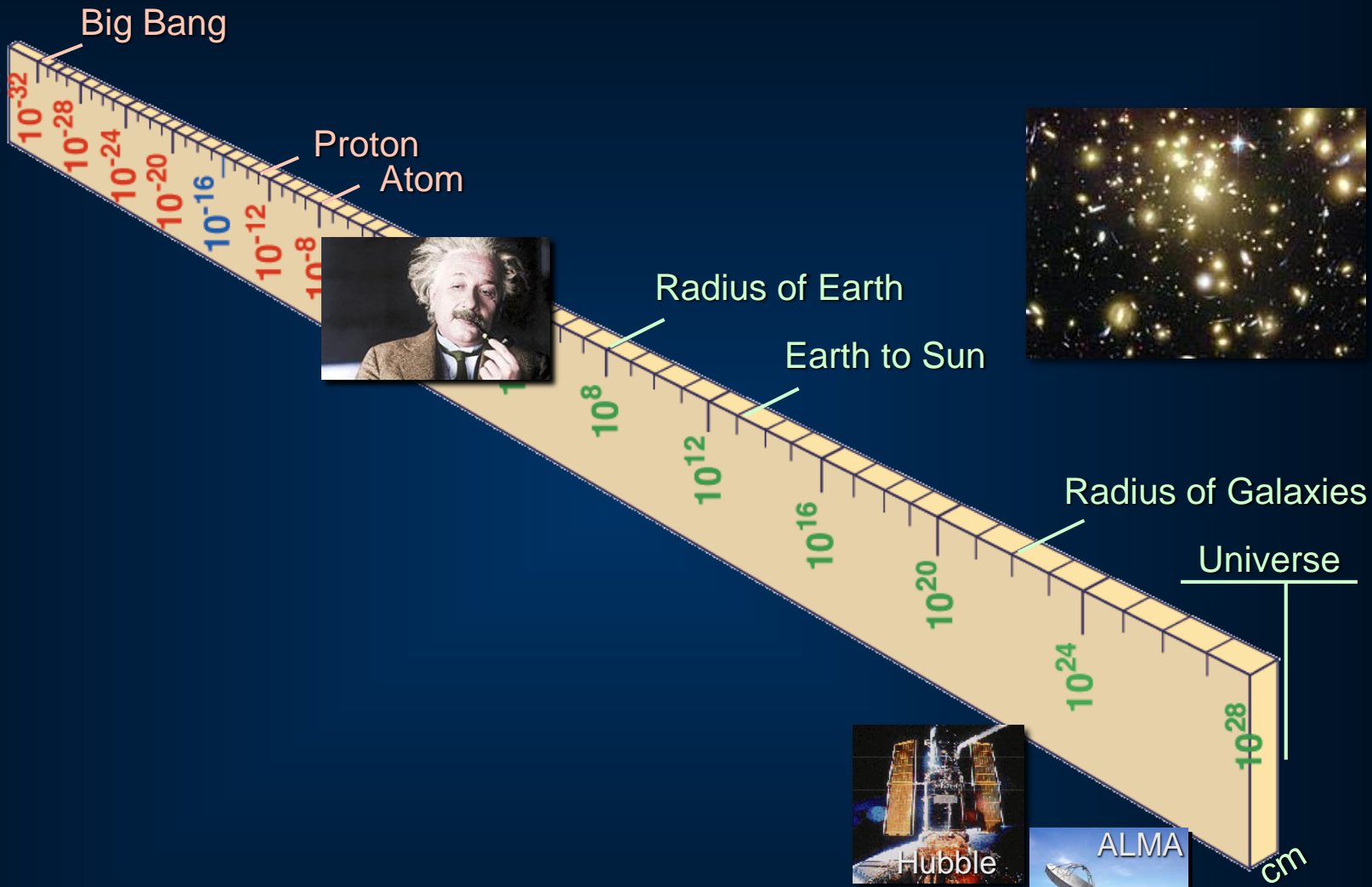
Bosnia & Herzegovina	3	El Salvador	1	Jordan	2	Montenegro	11	Saint Kitts and Nevis	1	T.F.Y.R.O.M.	3
Brazil	126	Estonia	15	Kazakhstan	10	Morocco	22	Tunisia	3	Uruguay	1
Argentina	3	Georgia	49	Kenya	1	Myanmar	2	San Marino	1	Uzbekistan	3
Algeria	14	Ghana	1	Korea	174	Nepal	7	Saudi Arabia	4	Venezuela	10
Cameroon	1	Guatemala	1	Latvia	3	New Zealand	5	Senegal	1	Viet Nam	12
Canada	168	Hong Kong	1	Lebanon	24	Nigeria	3	Singapore	5	Zambia	1
Chile	21	Honduras	1	Luxembourg	4	North Korea	3	South Africa	48	Zimbabwe	2
Australia	34	Iceland	4	Madagascar	1	Oman	3	Sri Lanka	10		
Azerbaijan	10	Indonesia	11	Malaysia	20	Palestine	7	Sudan	1		
Bangladesh	8	Iran	51	Malta	8	Paraguay	1	Syria	1		
Belarus	46	Ecuador	8	Mexico	86	Peru	6	Taiwan	56		
Belin	1	Egypt	24	Ireland	14	Mongolia	2	Philippines	3	Thailand	26



Next Scientific Challenge:

to understand the very first moments of our Universe
after the Big Bang





Discovery 2012, Nobel Prize in Physics 2013



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"*.

Future of particle physics

High Luminosity LHC until 2035

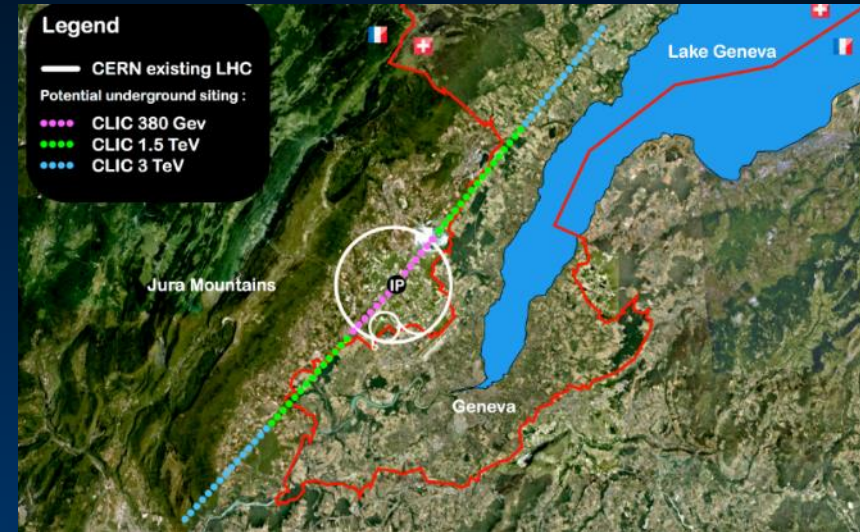
- Ten times more collisions than the original design

Studies in progress:

Compact Linear Collider (CLIC)

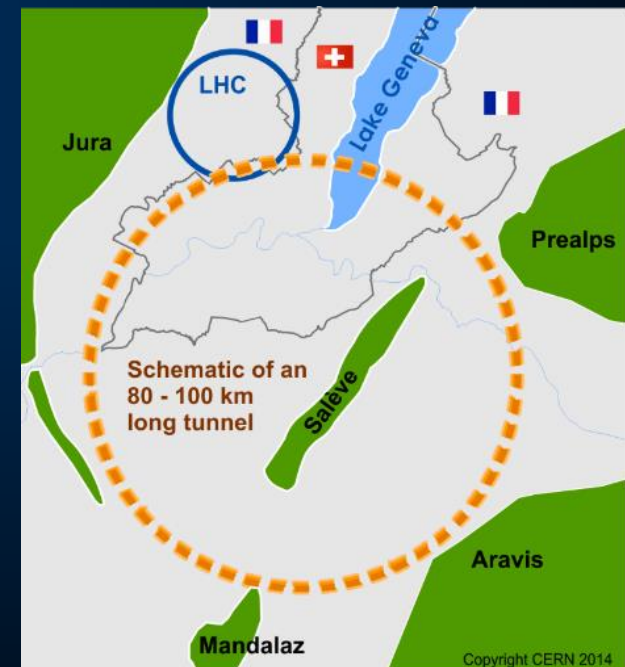


- Linear e^+e^- collider \sqrt{s} up to 3 TeV



Future Circular Collider (FCC)

- New technology magnets \rightarrow 100 TeV pp collisions in 100km ring
- e^+e^- collider (FCC-ee) as 1st step?
- HE-LHC in the present LHC tunnel with FCC-hh technology?



European Strategy for Particle Physics

- Preparing next update in 2020





CERN: Particle Physics and Innovation

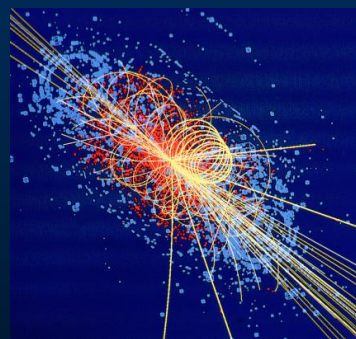
- **Interfacing** between fundamental science and key technological developments



- **CERN Technologies and Innovation**



Accelerating particle beams



Detecting particles



Large-scale computing (Grid)

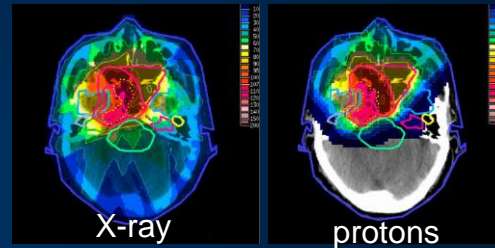
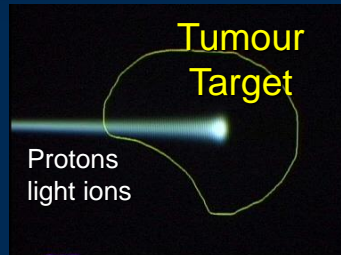
Medical Application as an Example of Particle Physics Spin-off

Combining Physics, ICT, Biology and Medicine to fight cancer



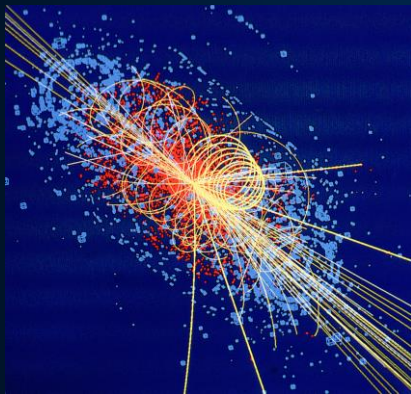
Hadron Therapy

Accelerating particle beams
~30'000 accelerators worldwide
~17'000 used for medicine



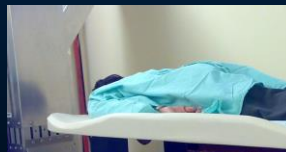
Leadership in Ion Beam Therapy now in Europe and Japan

>100'000 patients treated worldwide (45 facilities)
>50'000 patients treated in Europe (14 facilities)

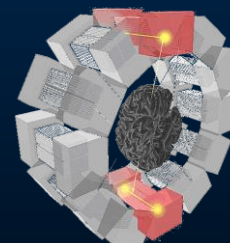


Imaging

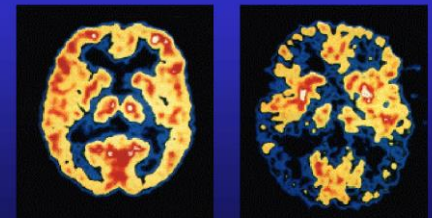
Clinical trial in Portugal, France and Italy for new breast imaging system (ClearPEM)



PET Scanner



Brain Metabolism in Alzheimer's Disease: PET Scan



Detecting particles

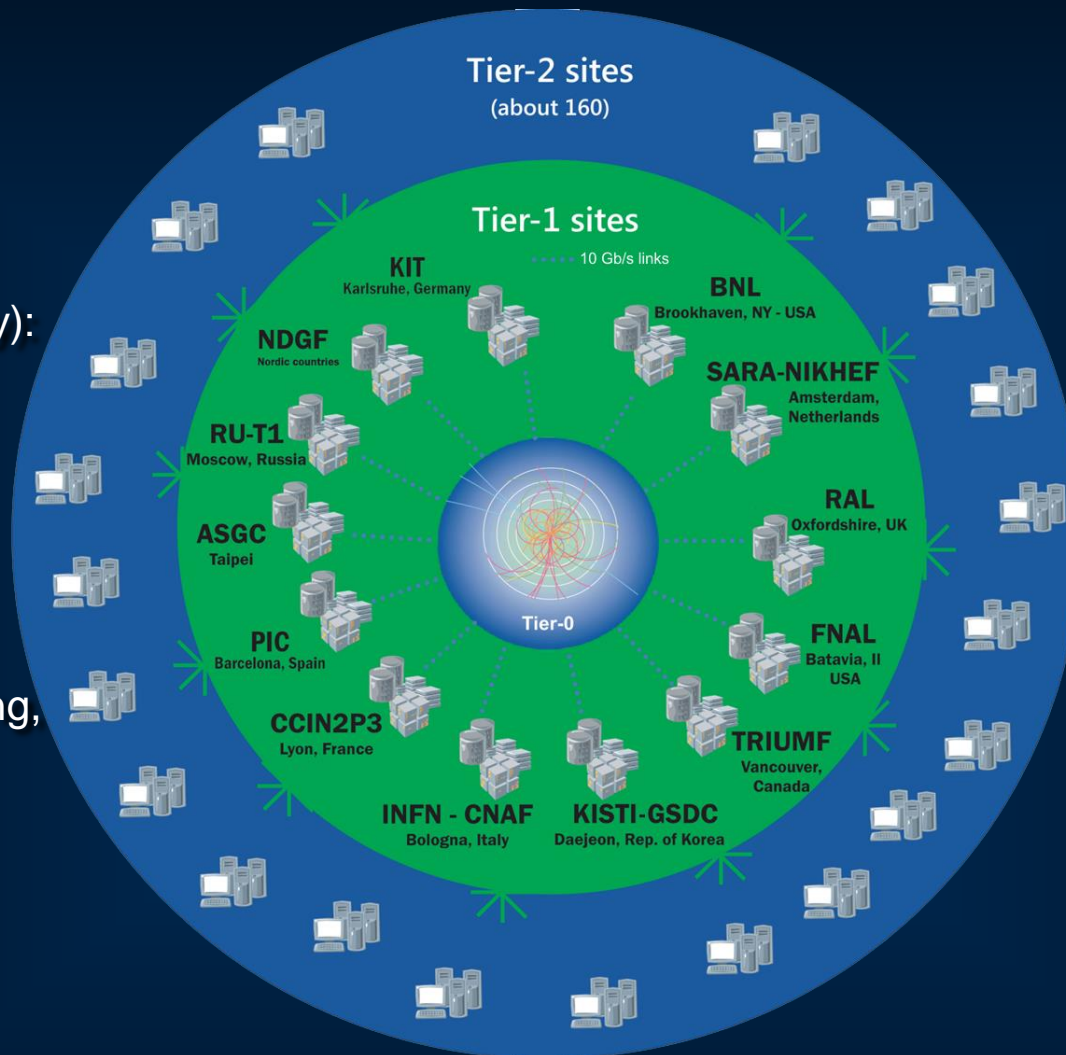


The Worldwide LHC Computing Grid

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

Tier-1: permanent
storage, reprocessing,
analysis

Tier-2: simulation,
end-user analysis



>170 sites in,
42 countries

750k CPU cores

800 PB of storage

> 2 million jobs/day

35 GB/s global
transfers

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





Thank You!



Accelerating Science and Innovation