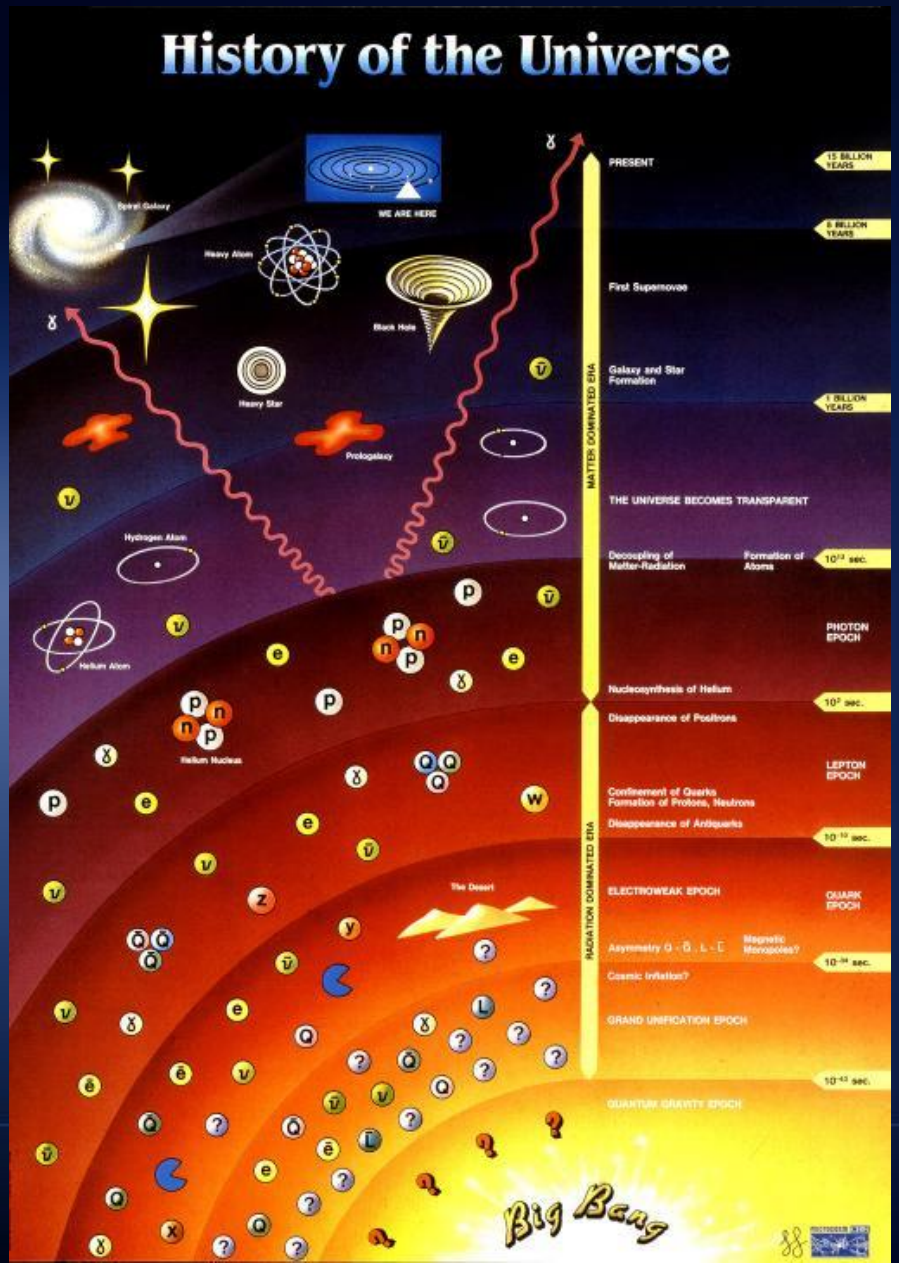
What Makes CERN Special?

– A Journey to the Heart of Matter

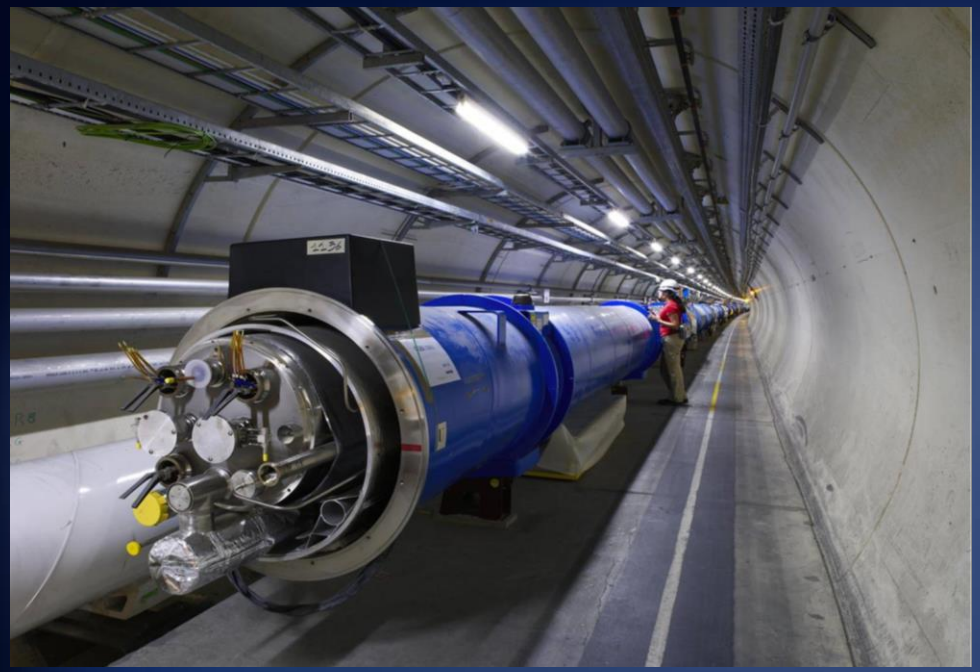
IED at IdeaSquare, June 12, 2019

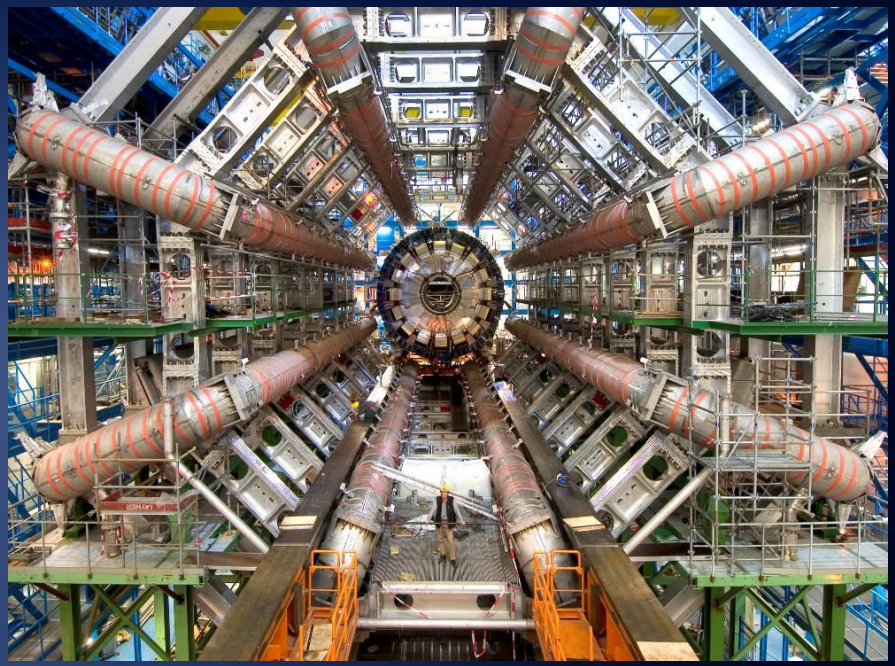
Markus Nordberg (CERN)

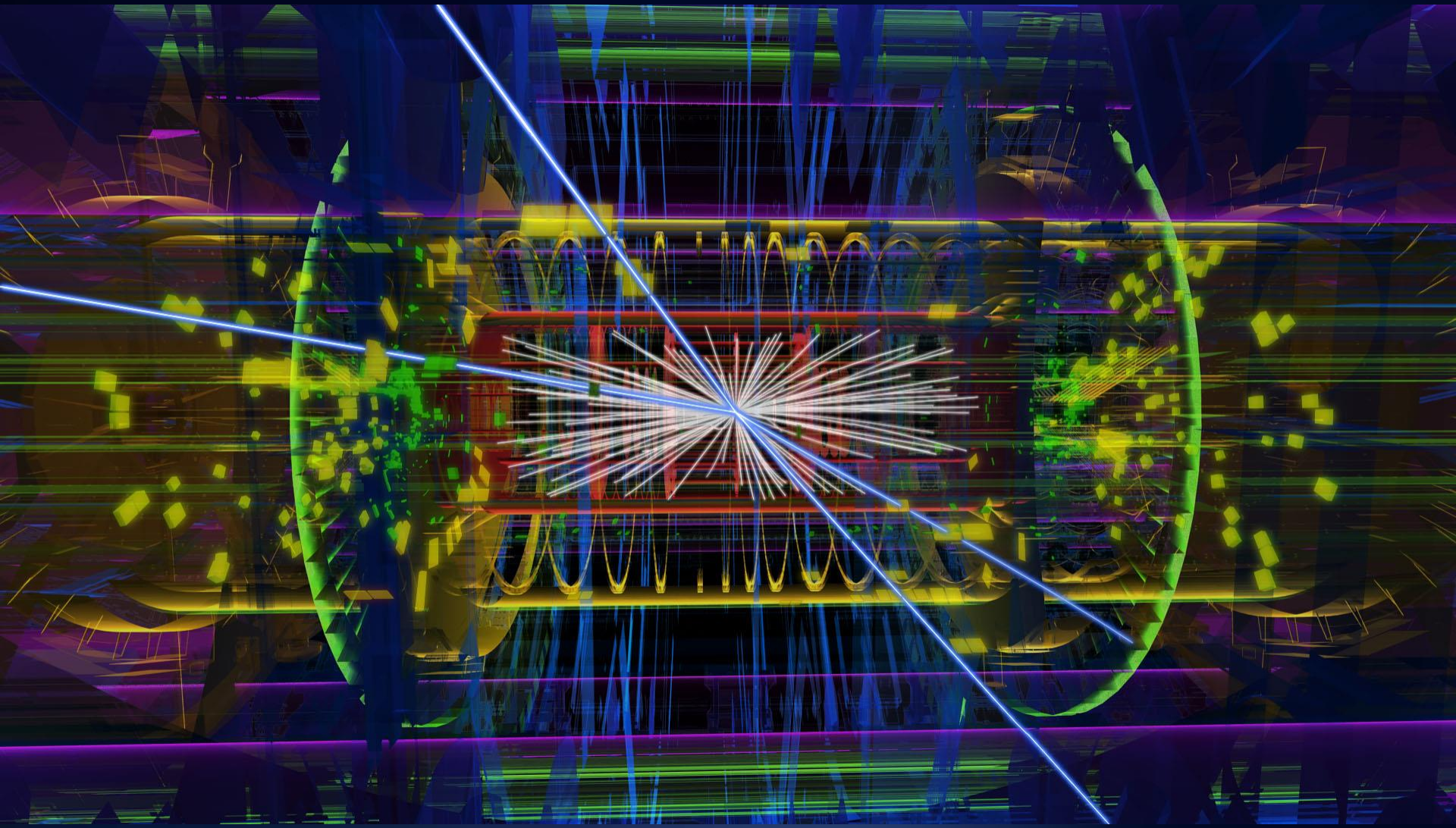
Time Machine



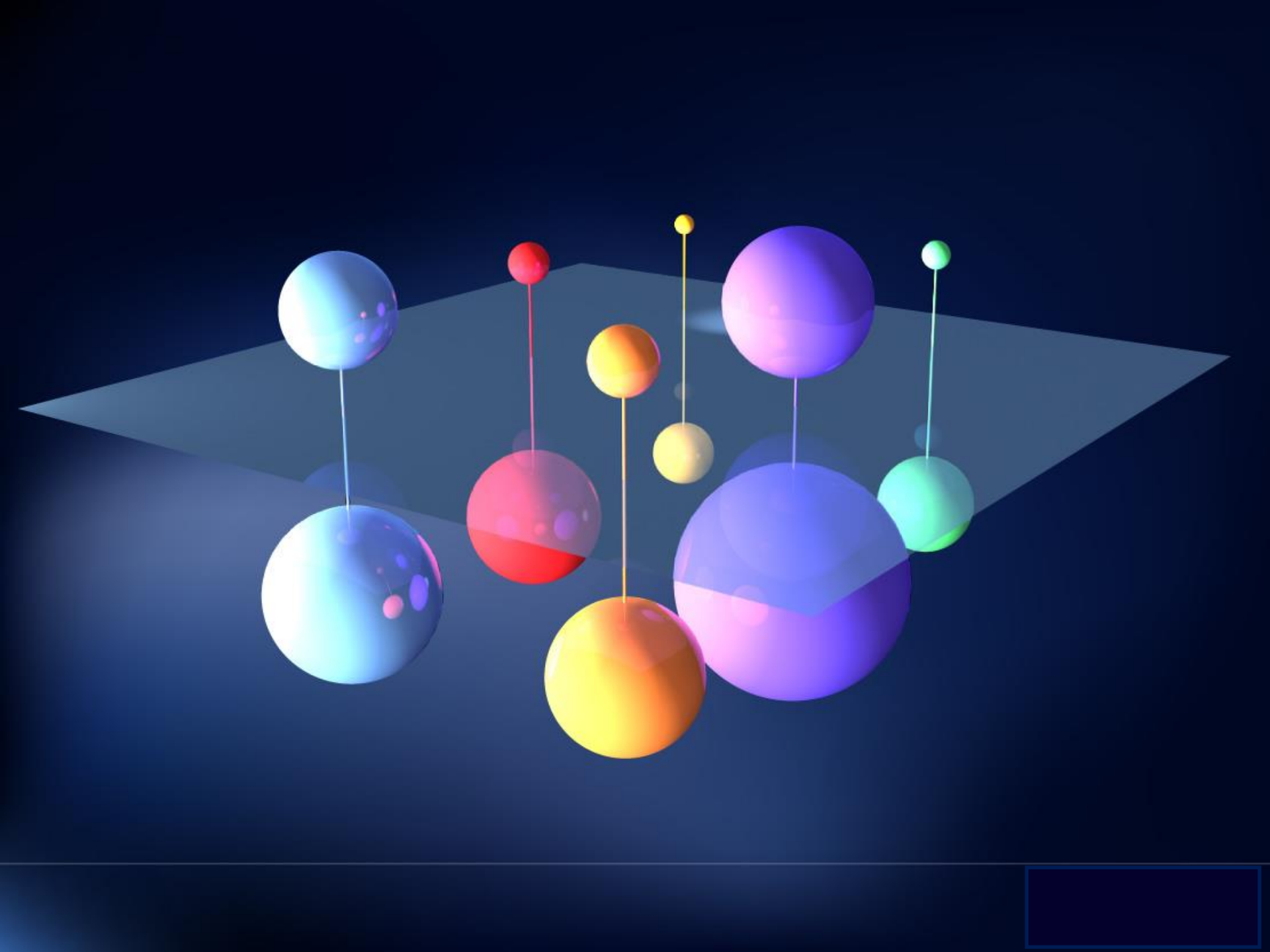
Turning the Invisible Visible





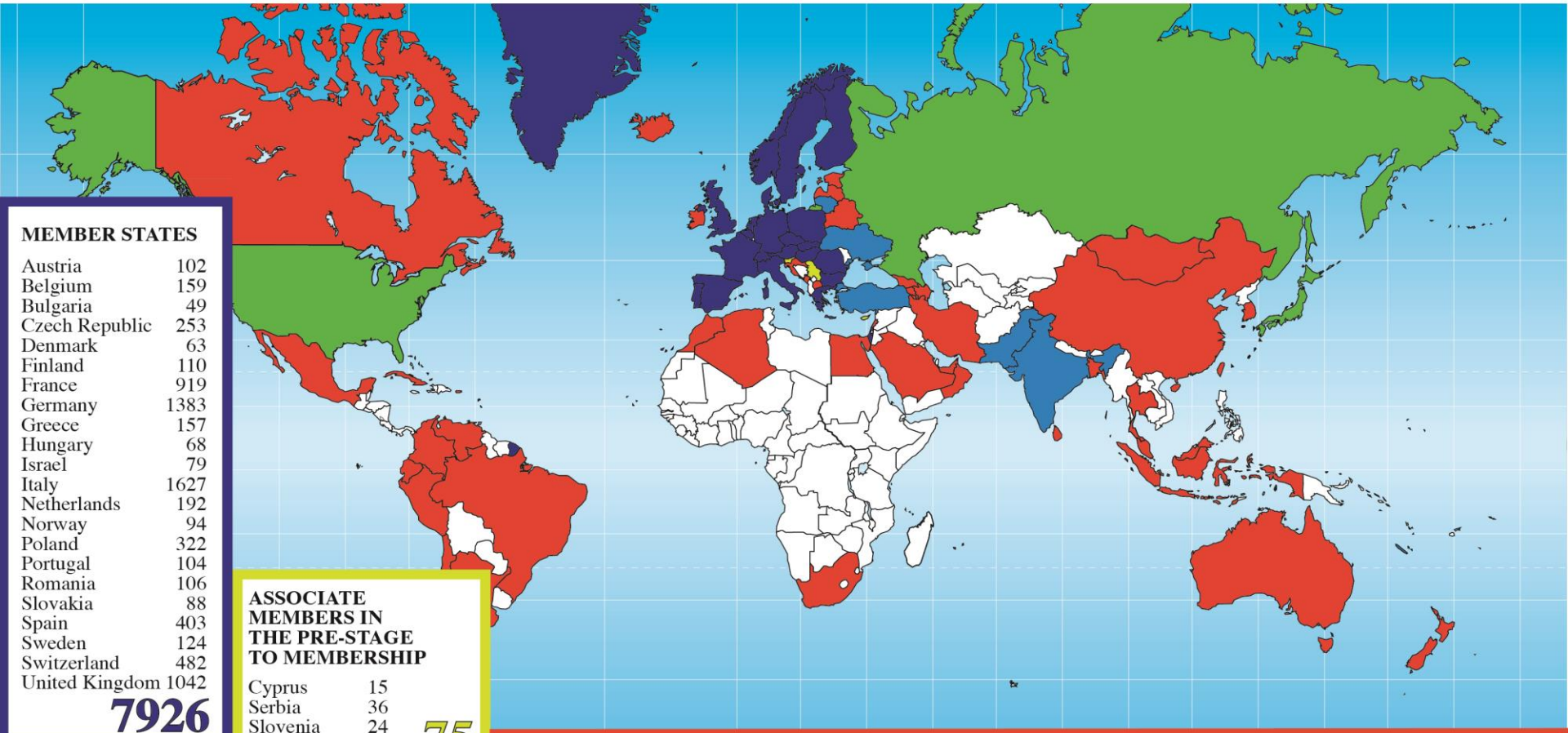


What is Wrong with this Picture?



Global

Distribution of All CERN Users by Location of Institute on 28 January 2019



MEMBER STATES

Austria	102
Belgium	159
Bulgaria	49
Czech Republic	253
Denmark	63
Finland	110
France	919
Germany	1383
Greece	157
Hungary	68
Israel	79
Italy	1627
Netherlands	192
Norway	94
Poland	322
Portugal	104
Romania	106
Slovakia	88
Spain	403
Sweden	124
Switzerland	482
United Kingdom	1042

7926

ASSOCIATE MEMBERS 444

India	218
Lithuania	24
Pakistan	48
Turkey	120
Ukraine	34

ASSOCIATE MEMBERS IN THE PRE-STAGE TO MEMBERSHIP

Cyprus	15
Serbia	36
Slovenia	24

75

OBSERVERS

Japan	270
Russia	1110
USA	2053

3433

OTHERS

Algeria	3	Chile	19	Iceland	3	Mongolia	2	Sri Lanka	8
Argentina	18	China	331	Indonesia	6	Montenegro	7	T.F.Y.R.O.M.	1
Armenia	16	Colombia	26	Iran	23	Morocco	14	Taiwan	59
Australia	32	Croatia	39	Ireland	11	New Zealand	8	Thailand	18
Azerbaijan	5	Cuba	4	Korea	161	Oman	4	U.A.E.	1
Bangladesh	2	Ecuador	4	Latvia	2	Peru	3	Venezuela	1
Belarus	21	Egypt	17	Lebanon	16	Puerto Rico	1		
Brazil	121	Estonia	18	Malaysia	12	Saudi Arabia	1		
Canada	207	Georgia	32	Malta	7	Singapore	5		
		Hong Kong	20	Mexico	58	South Africa	75		

1442

Recognition

Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC ☆,☆☆

ATLAS Collaboration

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ABSTRACT

The first measurements from proton–proton collisions recorded with the ATLAS detector at th
are presented. Data were collected in December 2009 using a minimum-bias trigger during col
at a centre-of-mass energy of 900 GeV. The charged-particle multiplicity, its dependence on tran
momentum and pseudorapidity, and the relationship between mean transverse momentum and ch
particle multiplicity are measured for events with at least one charged particle in the kinematic
$|\eta| < 2.5$ and $p_T > 500$ MeV. The measurements are compared to Monte Carlo models of proton–
collisions and to results from other experiments at the same centre-of-mass energy. The charged-p
multiplicity per event and unit of pseudorapidity at $\eta = 0$ is measured to be 1.333 ± 0.003(s
0.040(syst.), which is 5–15% higher than the Monte Carlo models predict.

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1. Introduction

Inclusive charged-particle distributions have been measured in pp and $p\bar{p}$ collisions at a range of different centre-of-mass energi
13]. Many of these measurements have been used to constrain phenomenological models of soft-hadronic interactions and to p
properties at higher centre-of-mass energies. Most of the previous charged-particle multiplicity measurements were obtained by sel
data with a double-arm coincidence trigger, thus removing large fractions of diffractive events. The data were then further correc
remove the remaining single-diffractive component. This selection is referred to as non-single-diffractive (NSD). In some cases, desig
as inelastic non-diffractive, the residual double-diffractive component was also subtracted. The selection of NSD or inelastic non-diffr
charged-particle spectra involves model-dependent corrections for the diffractive components and for effects of the trigger selecti
events with no charged particles within the acceptance of the detector. The measurement presented in this Letter implements a dif
strategy, which uses a single-arm trigger overlapping with the acceptance of the tracking volume. Results are presented as incl
inelastic distributions, with minimal model-dependence, by requiring one charged particle within the acceptance of the measureme

This Letter reports on a measurement of primary charged particles with a momentum component transverse to the beam dire

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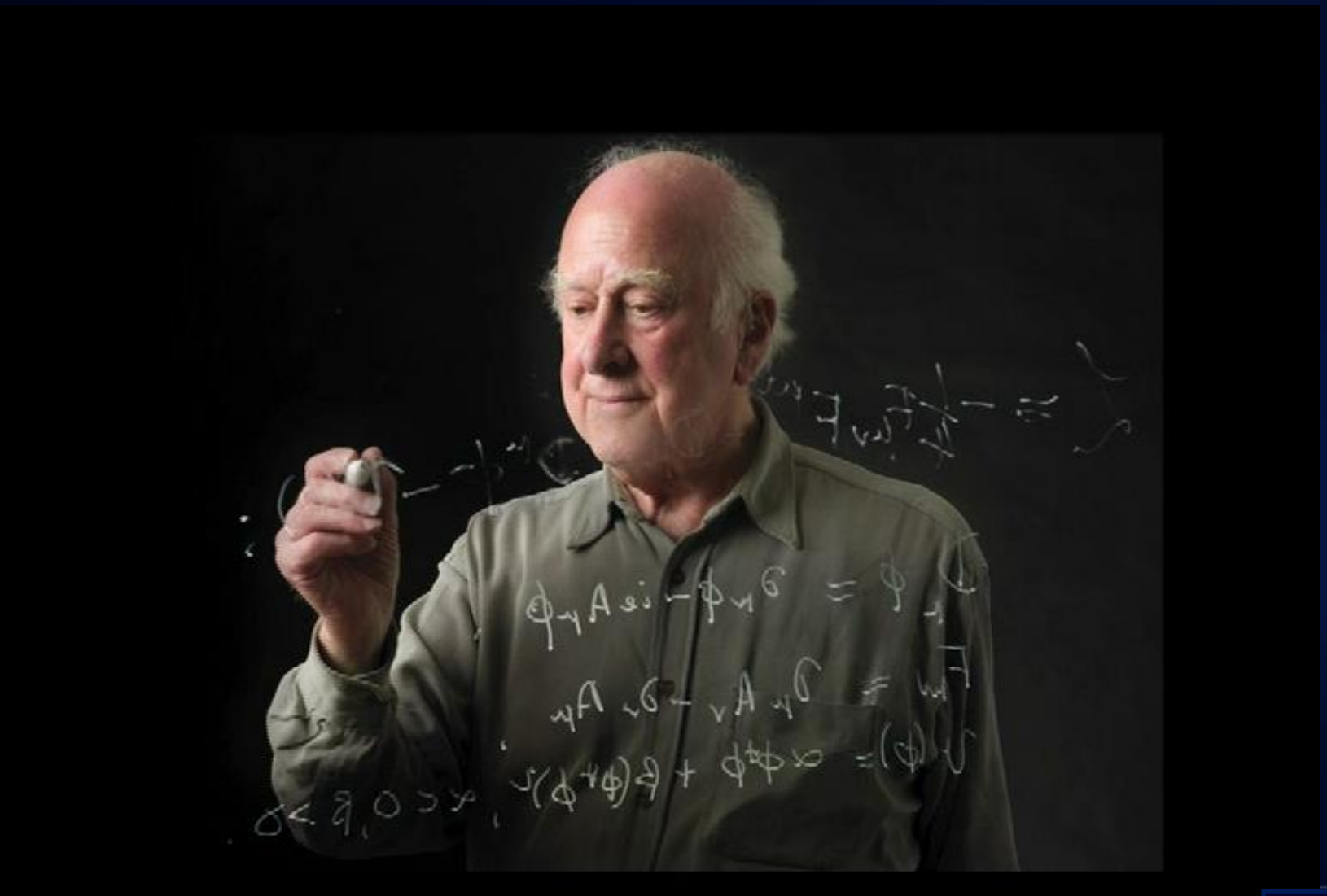
The Process

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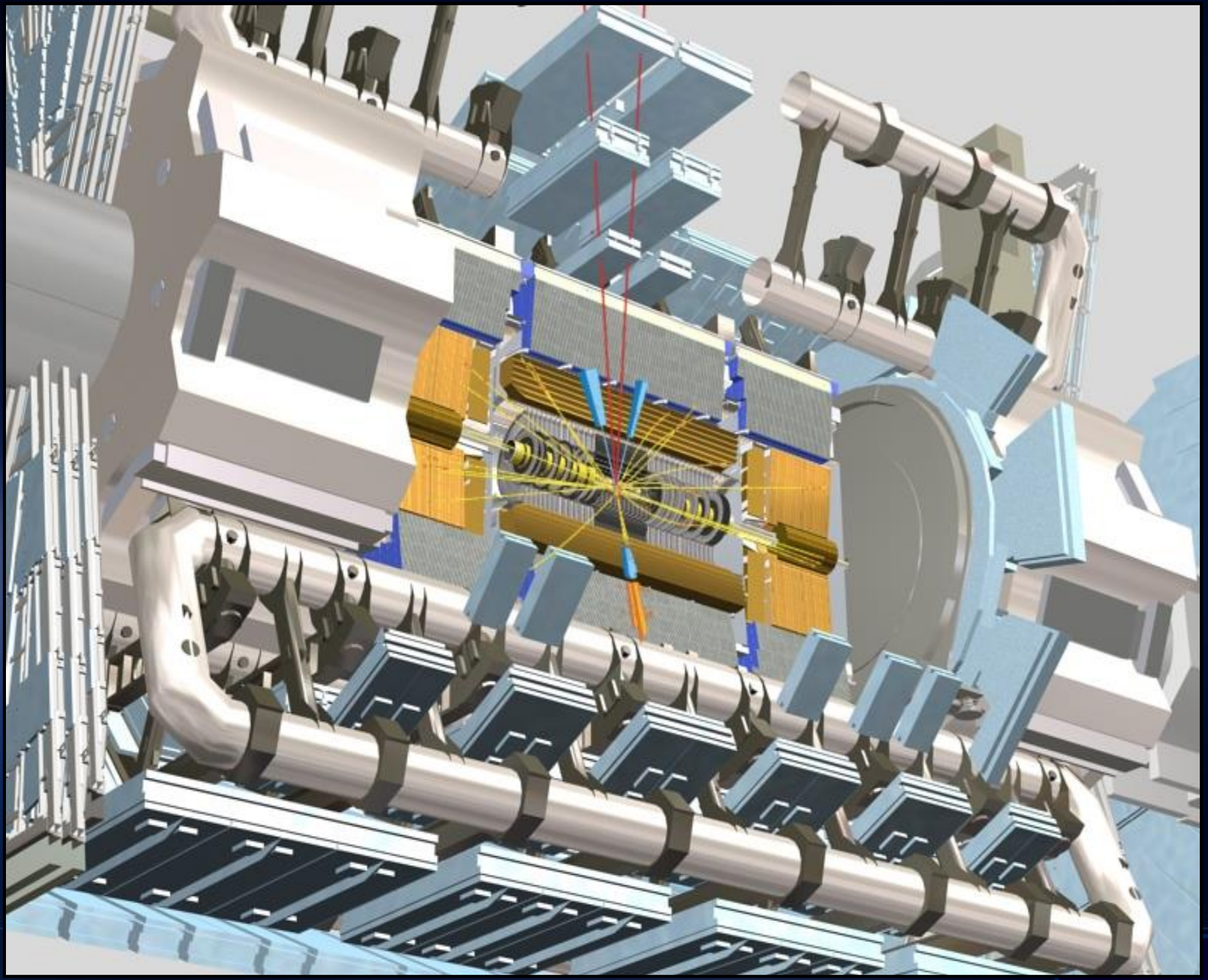

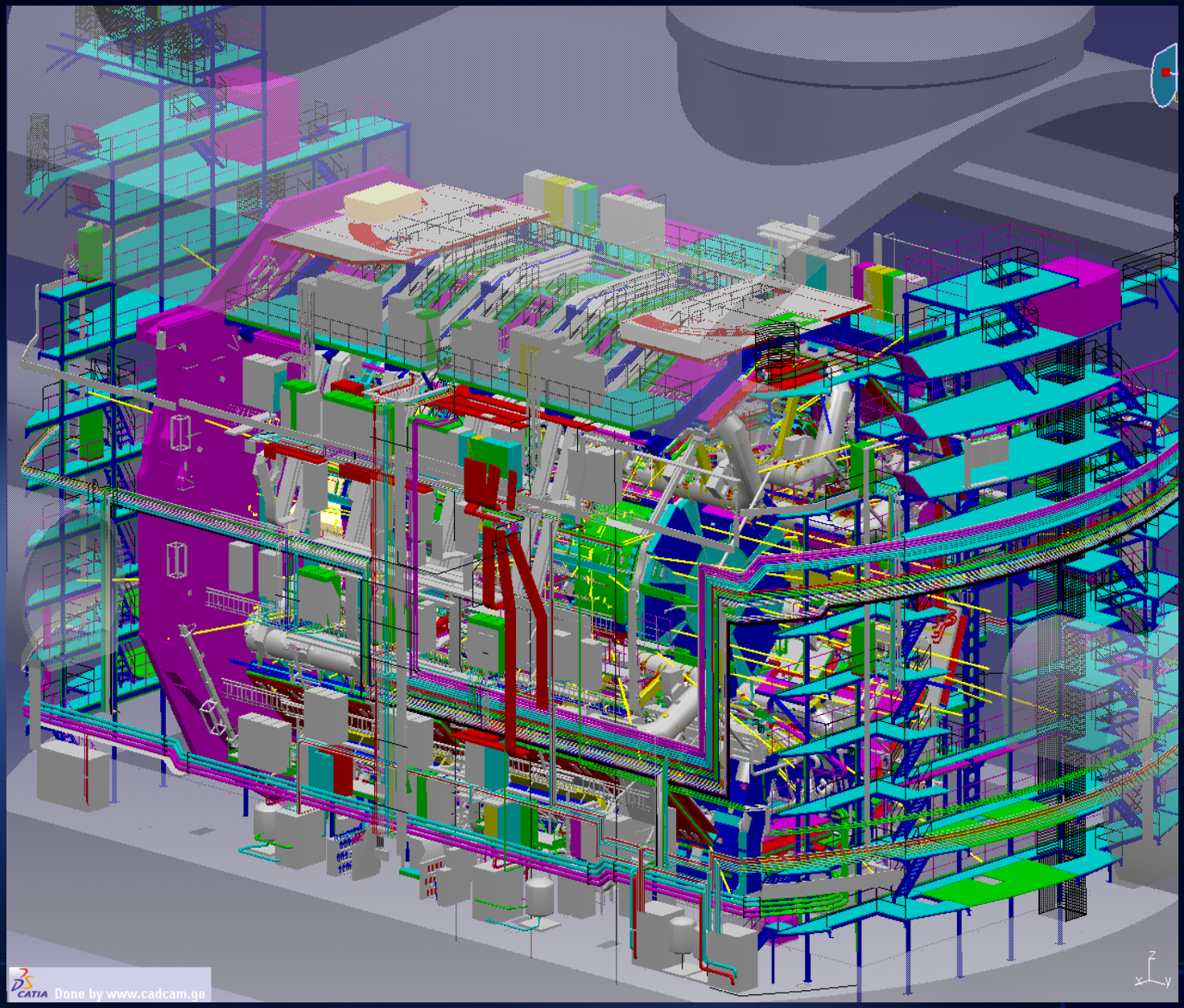
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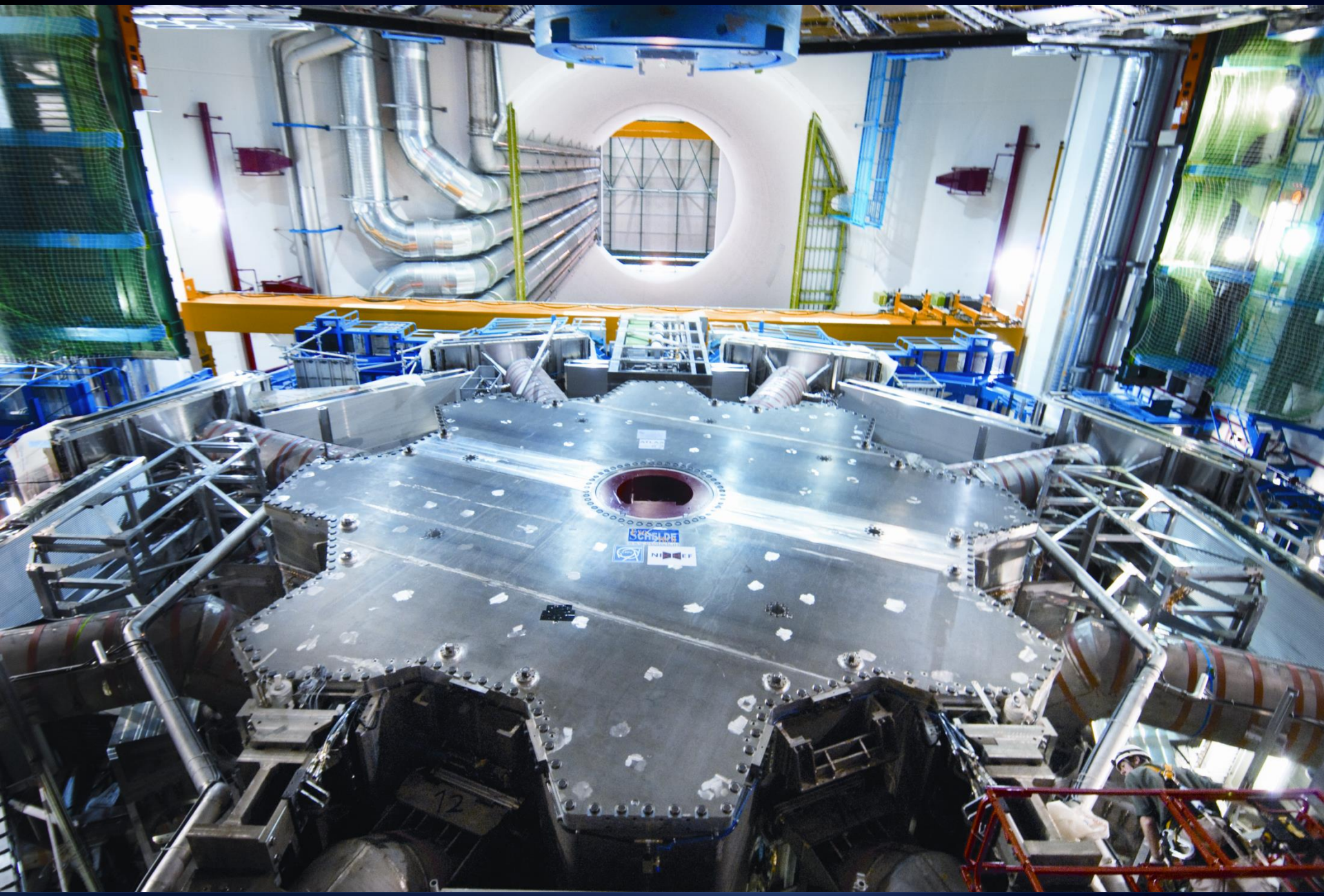

ATLAS
EXPERIMENT

How We Manage

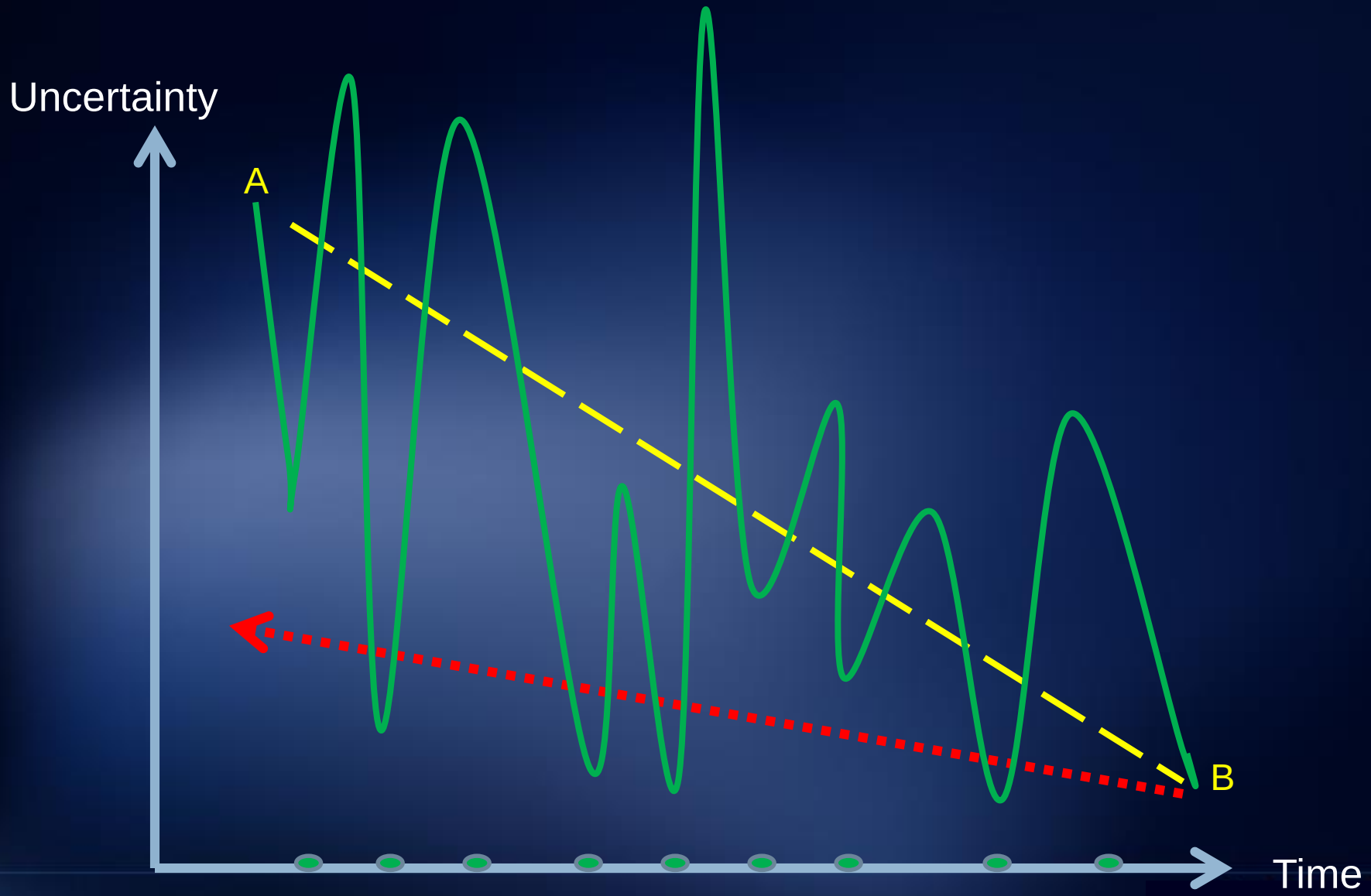
Simple Micro Rules

- Allow people to dream (5% makes already a difference)
- Tolerate diversity
- Let the physics decide, not the hierarchy
- Collaborate and compete
- Question and justify – Respect the Dukes of Doubt rather than Kings of Truth


C
D
ATLAS
EXPERIMENT

Implementing Strategy is Not Linear

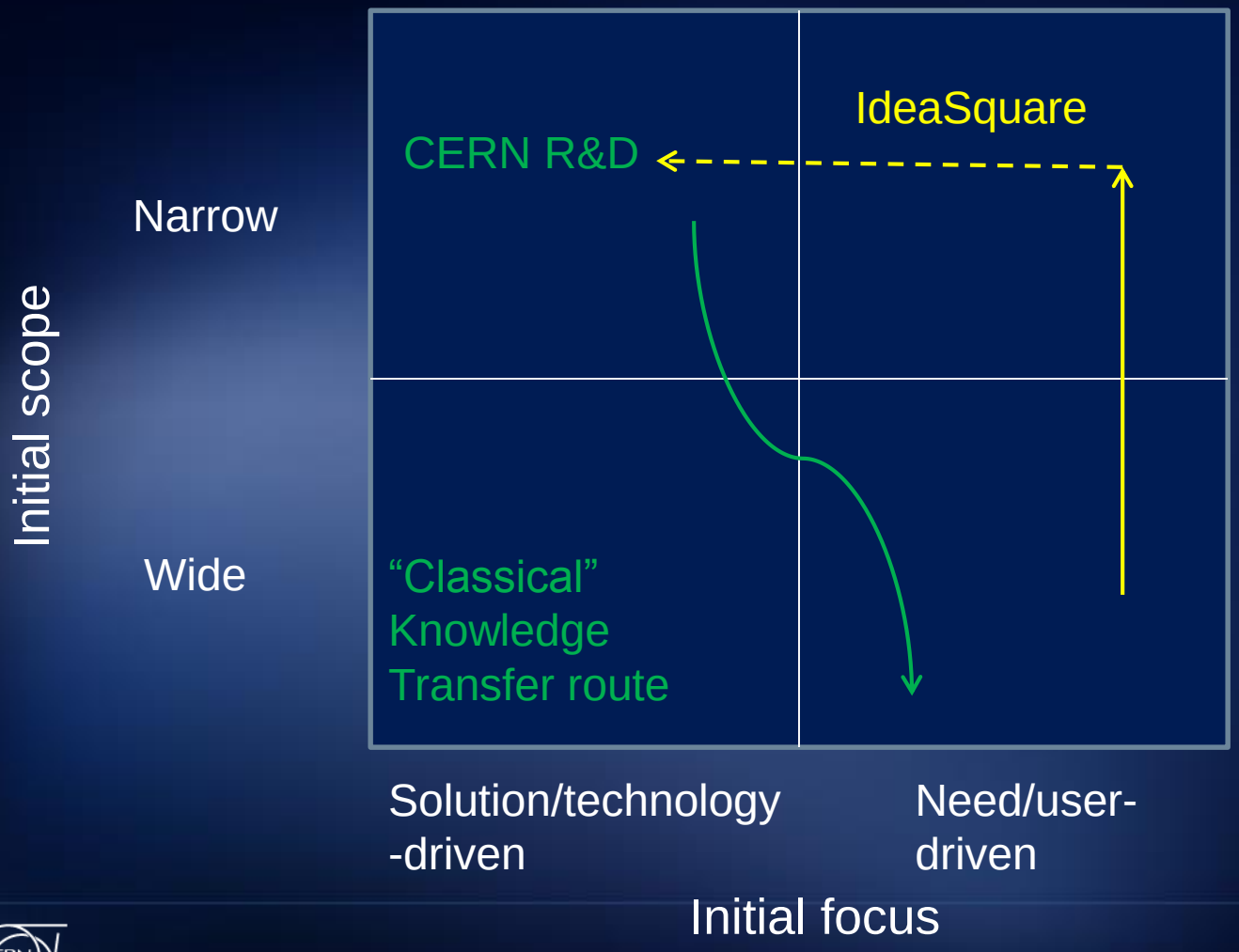
Absorbing vs. Reducing Uncertainty



Can Science And Industry Driven Cycles Coexist?

Students Connecting

Experimenting Innovation at IdeaSquare@CERN



Open Science, Open Innovation

Thank you