INTRODUCTION TO THE WORKSHOP

- The rationale of EuTuCHe
- Some relevant figures about EuTuCHe
- EuTuCHe: instructions for use

GENESIS OF A LONG-TERM PROJECT

In the past few years the group of laboratories active in Grenoble and ICTP independently approached CERN with different kind of collaboration proposals in the field of the study of turbulence phenomena in Cryogenic Helium.

Starting its operation at the end of the year, the LHC will incorporate the largest cryogenic installation in the world:

•CERN will permanently have on site the world's largest quantity of cryogenic helium;

•CERN owns and operates a large amount of unique cryogenic equipment;

•CERN has significant specialized expertise in cryogenic plant design, engineering and operation;

In early 2006 these contacts generated a preliminary discussion among CERN, a small groups of external laboratories and some EC institutions. This discussion focused on a deeper understanding of the scientific problem at stack and of the general situation of the research in this particular field, with the purpose of analysing the possible role of CERN and the potential contribution from EC.

RESULT OF PRELIMINARY DISCUSSIONS: A TWO-STEP APPROACH

LONG TERM

…a **large multi-purpose cryogenic Facility, designed to be adapted to host in time different kind of experiments responding to the needs of the scientific community and shared in use among different research collaborations.** Such a facility would provide the needed continuity of activity and largely improve the synergy of complementary approaches. It would also allow for a focused approach to technical and measurement problems, facilitating the involvement of external partners with specialised skills in cryogenics and electronics, which have up to now only been marginally exploited.✸

⋮

MEDIUM TERM

The first step required in order to reach such an ambitious goal **is to create a real Network among the existing European facilities** through an Integrated Infrastructure Initiative (I3) activity. This would be the most efficient way to gather together all the European competences in the field and to build a large and strong community of users for the future Large Facility.

We propose **the creation of a multi-site integrated infrastructure, regrouping the laboratories** of CEA and CNRS in Grenoble, ICTP in Trieste, Charles University in Prague and CERN in Geneva (where the GReC and the HePipe experiments could find a more stable exploitation), **and involving all other European institutes interested in the application of Cryogenic Helium to turbulence research.** This would provide the required critical mass to **tackle the technical challenges posed by the conception of the Large Facility, while already allowing for important steps forward towards a deeper and more complete understanding of turbulence.**✸

✸Extracts from a preliminary working document favourably received by EC-DGR (*Directorate-General for research*) and ESFRI (*European Strategy Forum for Research Infrastructures*)

STEP ZERO: THE WORKSHOP

Ideally this international workshop should start to provide answers (or good hints) to a few fundamental questions:

- Does the project gather the convinced support of a large and widespread scientific community?
- Does it actually present high potential benefits for different research areas?

- Which scientific lines of investigation should be pursued in priority and possibly combined into a new multi-purpose cryogenic helium facility?
- What should be measured? Why? And how?
- Which technical developments are needed for the present measurement techniques to be reliable and suited for the task? Are there new techniques to be envisaged?
- Which synergies with “non-cryogenic” communities should be better exploited and how?
- What will be the technical challenges to be solved to successfully design and build such a large cryogenic facility?

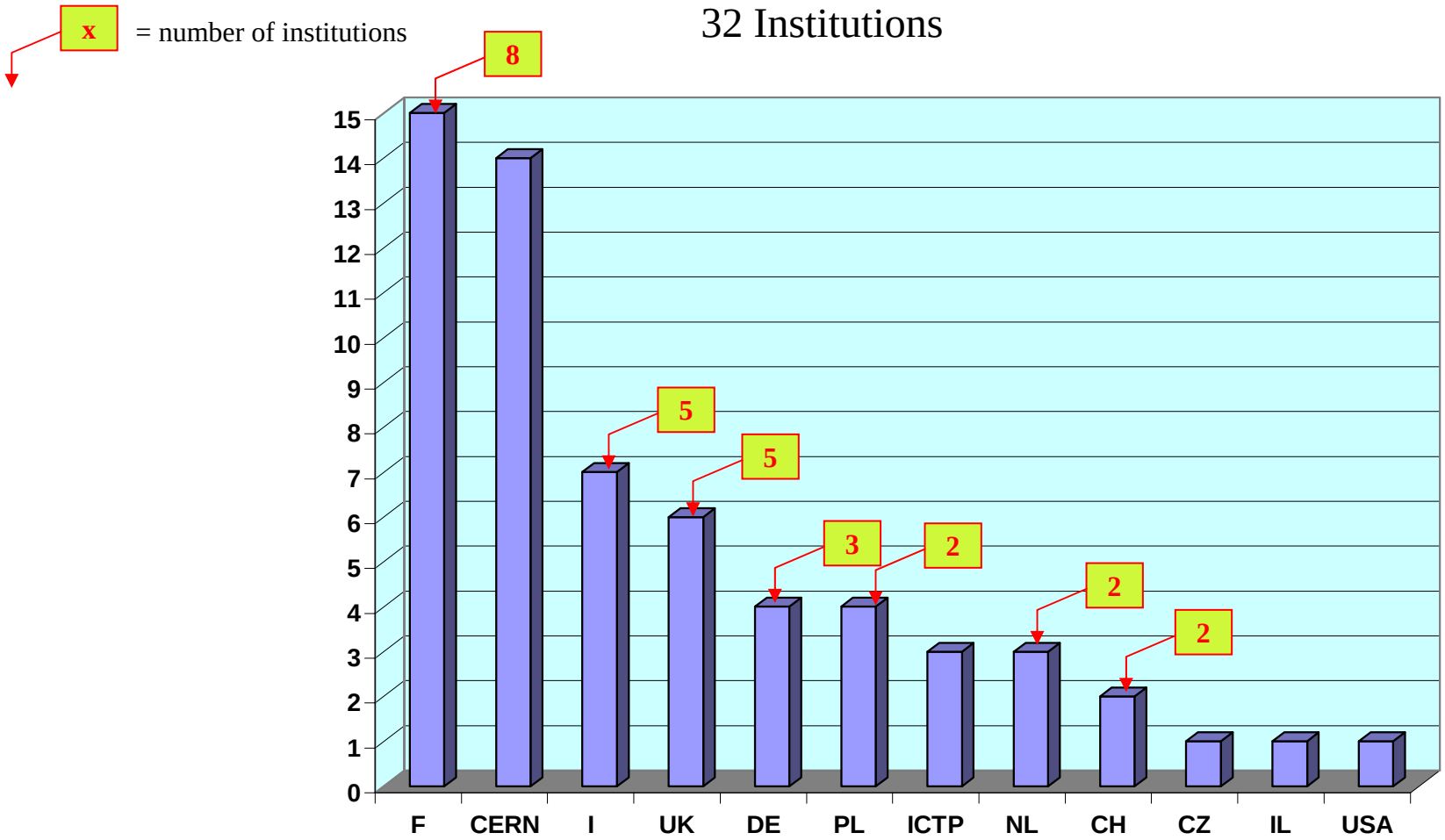
- How to proceed towards an FP7 funding proposal?
- How to start the community structuring?
- Who would be ready to participate?

ATTENDANCE: 61 Researchers (~ 33% of invitations)

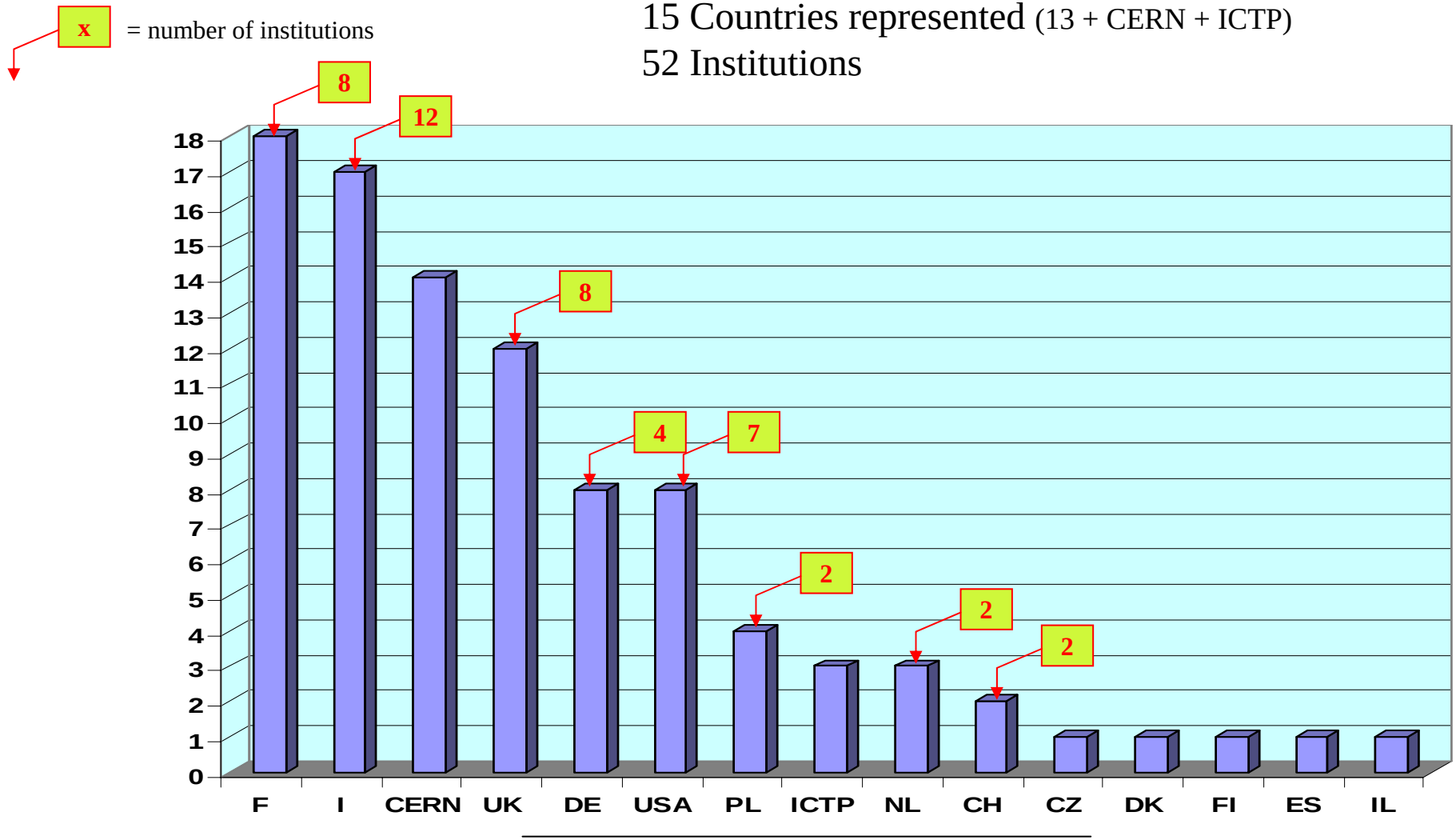
12 Countries represented (10 + CERN + ICTP)

32 Institutions

Note: 1st invitations only sent on Feb 19th!



"ADHERENTS": 93 Researchers (~ 50% of invitations)
15 Countries represented (13 + CERN + ICTP)
52 Institutions



GUIDE TO EUTUCHE: DAY #1

Funding schemes in FP7 and the characteristics of a "good" collaboration

A relevant precedent of a similar project in USA

A relevant precedent of a global approach to the multi-field character of turbulence studies

Where do we stand with the knowledge of turbulence phenomena?

Why cryogenic Helium?

Monday, 23 April 2007— Room 40-S2-B01

09:00 *Welcome* (R. Aymar, CERN, Director General)

09:10 *Introduction to the workshop* (P. Petagna, CERN)

09:20 ***Opportunities, rules (and tricks) in the EC FP7 programme*** (G. Guignard, CERN)

10:00 Coffee break + registration formalities

10:30 Talk: ***The Brookhaven Project: programme, achievements, show-stoppers*** (K.R., ICTP Trieste)

11:00 Talk: ***Experience coming from the Year-long Warwick Symposium*** (S.Nazarenko, Warwick Univ.)

11:30 Discussion chaired by E. Bodenschatz (MPI): ***Is it possible (and how) to better exploit synergies between the different «Communities»?***

How to create a better synergy between the different "souls" of turbulence research

12:30 Sandwich lunch

13:30 Talk: ***The state of the Art in Hydrodynamic Turbulence: Past successes and Future Challenges*** (I. Procaccia, The Weizmann Inst. of Science)

14:10 Talk: ***Applications of Cryogenics to Classical and Quantum Fluid Dynamics*** (R. Donnelly, Univ. of Oregon)

14:50 Discussion chaired by D. Lohse (Twente Univ.): ***1) What are the open problems that turbulence research should address? 2)are the "dream" experiments that one would ask from a new large multi-purpose facility?***

Tentative "operational specification" for an hypothetical Large-scale Permanent Cryogenic Facility as seen by the theorists and the users

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Introduction to the Workshop

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GUIDE TO EUTUCHE: DAY #2

Tuesday, 24 April 2007— Room 40-S2-B01

Present opportunities of research with cryogenic Helium

08:30 Talk: ***Fluid mechanics with cryogenic Helium: a few examples*** (B. Castaing, ENS Lyon)

09:00 Talk: ***Exotic opportunities with superfluid Helium*** (C. Barenghi, Univ. of Newcastle, L. Skrbek, Charles Univ.)

Large scale cryogenic facilities presently available in Europe

09:40 Talk: ***Presentation of present large scale He hydrodynamic facilities in CEA*** (B. Rousset, CEA Grenoble) *and ICTP* (J. Niemela, ICTP Trieste)

10h30 Coffee break

11:00 Talk: ***Presentation of large scale He hydrodynamic facilities used and in preparation at CERN*** (O. Pirotte, CERN; Ph-E.Roche, Inst. NEEL)

11:30 Discussion chaired by Ph.E-Roche: ***Which general problems can be tackled with the exiting facilities and how could they be enhanced if funds were available?***

Actions required for the best possible exploitation of the research infrastructures presently available

13:00 Sandwich lunch

Lagrangian measures: facts and recent developments

14:00 Talk (prepared by S. Van Sciver): ***PIV techniques in superfluid helium*** (C.Barenghi, Univ. of Newcastle)

14:30 Discussion chaired by J.C.Vassilicos (I.C.London): ***What contribution from non-cryogenic experimentalists and from numerical community?***

The fundamental role of the non-cryogenic communities (experimentalists and CFD)

16:00 Coffee break

18:00 Discussion chaired by P.Petagna: ***Preparation of the work packages to be included in a IA proposal***

Definition of a global strategy towards one (or more…) FP7 proposal(s)

Introduction to the Workshop

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GUIDE TO EUTUCHE: DAY #3

Wednesday, 25 April 2007— Room 40-S2-B01

08:30 Discussion chaired by P.: ***Preparation of the work packages to be included in a IA proposal***

General lines of the IA proposal: Networking, Access, JRA's, participation, roles

10h30 Coffee break

11h00 Resume discussion chaired by P. Petagna

13:00 Sandwich lunch

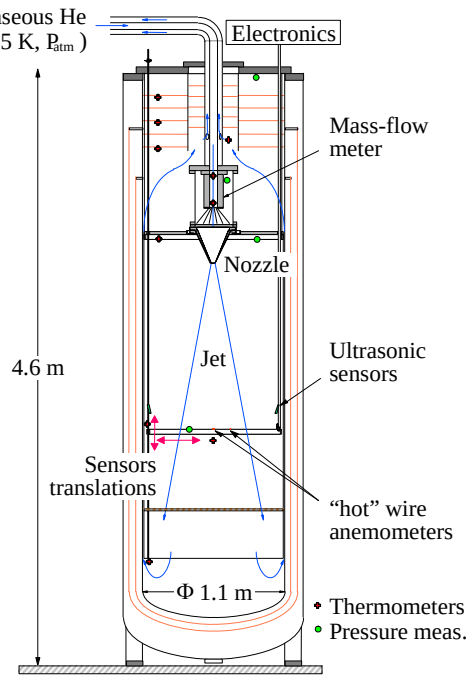
CERN unique potentiality for in-kind contributions

14:00 Talks: ***Cryogenics at CERN*** (F. Haug, CERN)

15:00 ***Visit to cryogenic installations of interest***

16:30 Conclusions

A CLOSING REMARK: THE GENEVA "JET D'EAU" VS. GReC



Water
Jet height ~ 140 m
U = 56 m/s
D = 10 cm
Re_D ~ 5 x 10^6
Re_λ (@ x = 50D) ~ 1000 (rough estimation)
Power consumption = 10 MW

He (gas @ 4.8 K)
Cryostat dimensions = 4.6 m x 1.4 m
U = 32.3 m/s
D = 2.5 cm
Re_D ~ 1x 10^7
Re_λ (@ x = 50D) ~ 6000
Power consumption = ? Question for the experts…

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