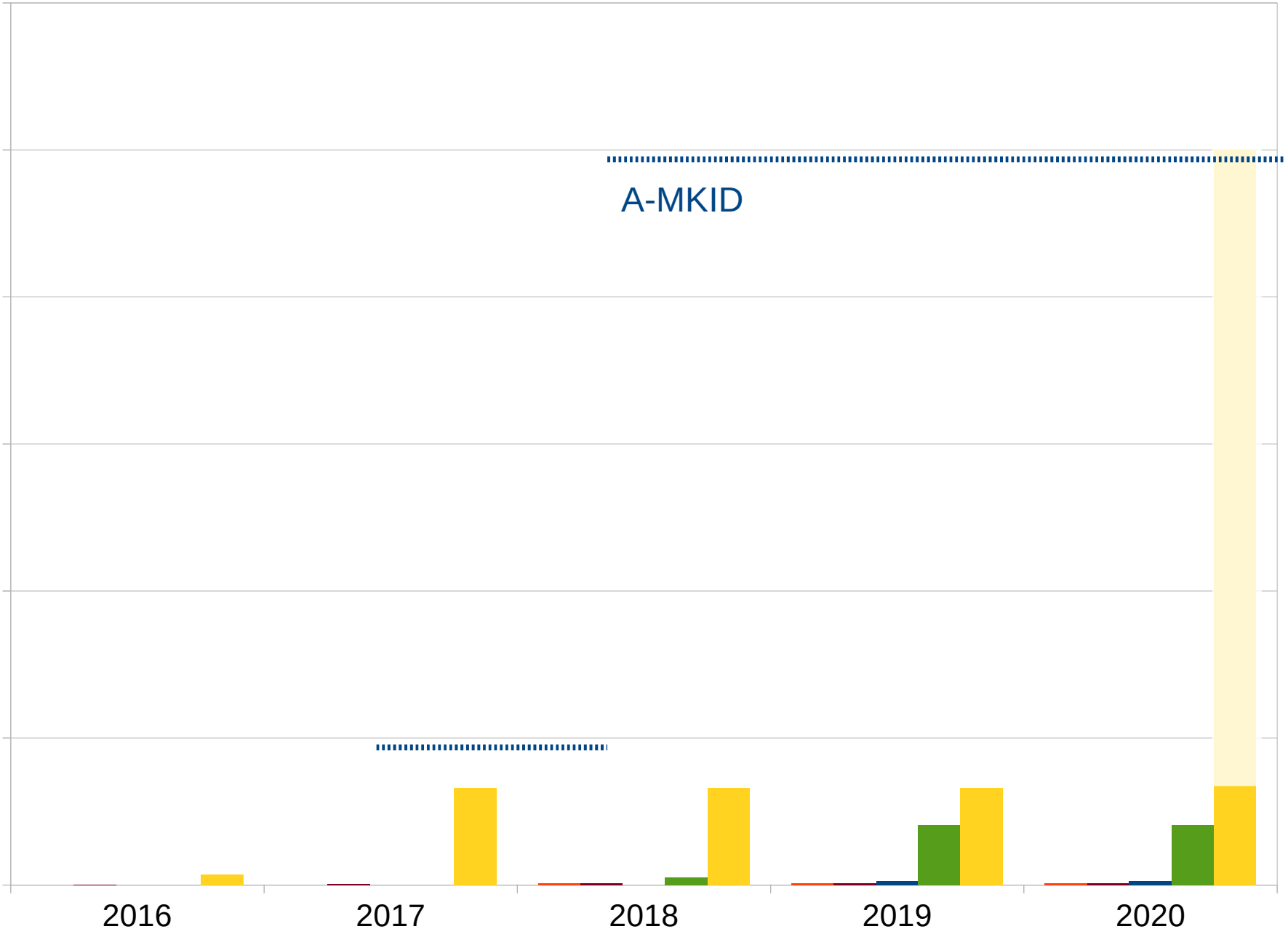
European CMB Coordination & the Future

France: Bouchet/Ganga
Germany: Komatsu/Mohr
Italy: Bersanelli/Vittorio
Spain: Martinez-Gonzalez/Rubiño-Martin
UK: Brown/Challinor

European Experiment Detector #s

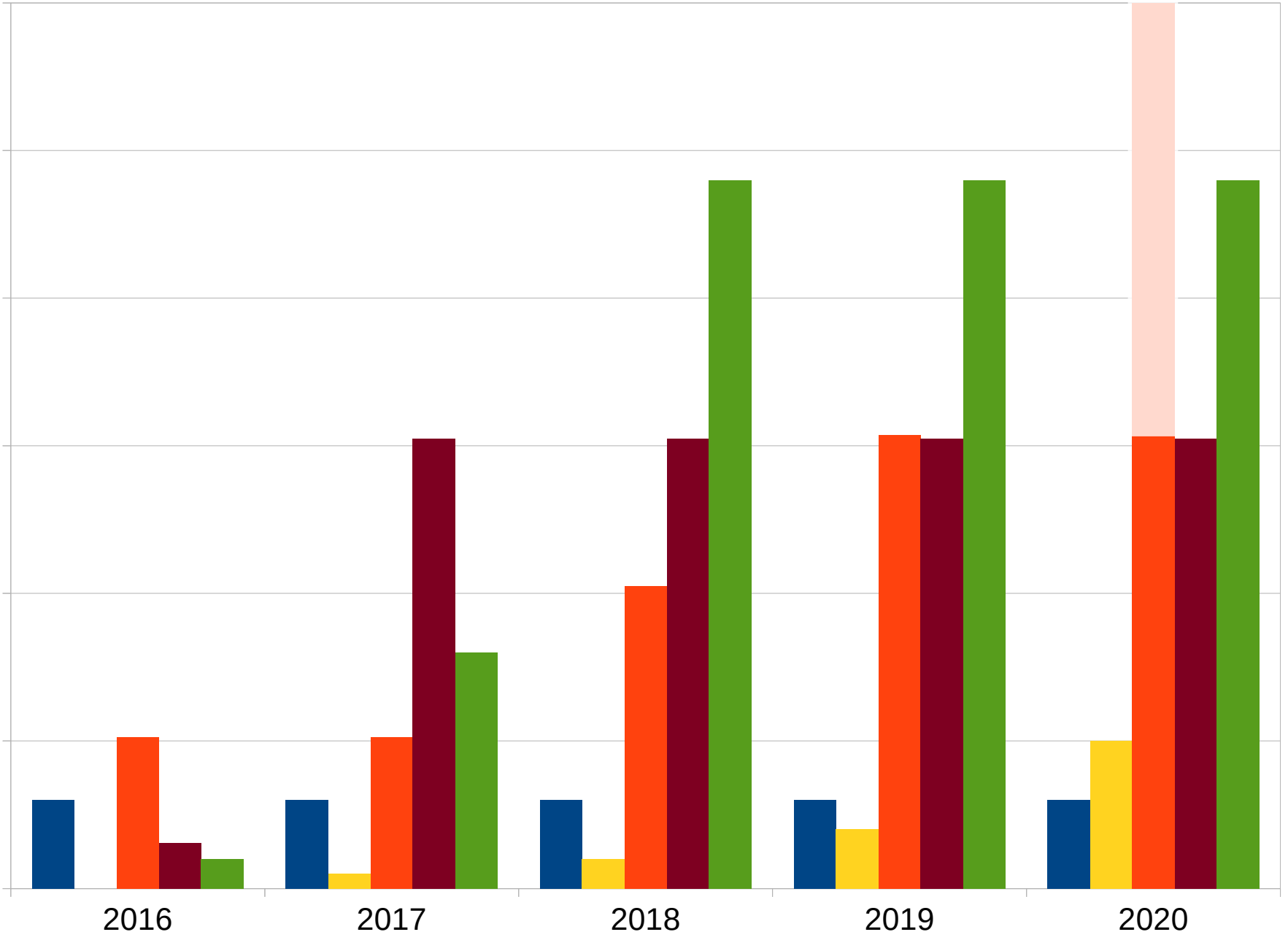


To set the scene: the European ground-based effort does not have the same level

- STRIP
- QUIJOTE
- Dome C
- QUBIC
- NIKA

of resources as do our American colleagues.

American Experiment Detector #s



To set the scene: the European ground-based effort does not have the same level

- ACT
- CLASS
- BICEP
- SPT
- Polarbear

of resources as do our American colleagues.

In the Last Year...

- We’ve set up the European CMB Coordinators
- We submitted the “E4” H2020 Infrastructure Design proposal
- Started a number of national-level initiatives
- “Followed” CMB-S4

Our Community

E4 People

http://wiki.e-cmb.org/index.php?n=Main.E4Contributors

This is a list of people participating in E4.

- ASDC-ASI (IT; *Roma-I*): G. Polenta
- **Athens Nat. Obs.** (GR): I. Georgantopoulos, **Manolis Plionis**
- Bonn (DE; *MPA*): F. Bertoldi
- **Cantabria** (ES): B. Aja, **E. Artal**, L. de la Fuente
- Cambridge (UK; *Cardiff*): R. Allison, A. Challinor, W. Handley, A. Lasenby, S. Withington
- **Cardiff** (UK): E. Calabrese, **P. Hargrave**, G. Pisano
- CEA (FR; *CNRS*): J.-B. Melin, V. Pettorino
- CEFCA (ES; *IAC*): Carlos Hernandez-Monteagudo
- Chalmers (SE): Serguei Cherednichenko, Leonid Kuzmin
- **CNRS** (FR)
  - APC: J. Bartlett, M. Bucher, J. Delabrouille, J. Errard, **K. Ganga**, J.C. Hamilton, S. Katsanevas, S. Loucatos, G. Patanchon, M. Piat, D. Prêle, R. Stompor, A. Tartari
  - CNRS/Université Grenoble Alpes (FR): F.-X. Désert, N. Ponthieu
  - IAP: K. Benabed, F. Bouchet, E. Di Valentino, S. Galli, E. Hivon, M. Lilley, T. Louis, M. Millea, B. Wandelt
  - IAS: N. Aghanim, J. Aumont, F. Boulanger, M. Douspis, G. Fabbian, J. Grain, B. Maffei
  - IN2P3 Headquarters: N. Moquet
  - Institut Neel: Martino Calvo, A. Monfardini
  - IRAP: A.J. Banday, J-P. Bernard, M. Giard, A. Mangilli, L. Montier, I. Ristorcelli
  - LAL: M. Tristram, O. Perdereau, S. Henrot-Versillé
  - LPSC: Olivier Bourrion, A. Catalano, J.-F. Macias-Perez
- **CSIC** (ES)
  - Centro de AstroBiología (CAB): J. Martin-Pintado, A. Gomez
  - IFCA: R.B. Barreiro, Biuse Casaponsa, F.J. Casas, J.M. Diego, Raul Fernandez-Cobos, D. Herranz, **E. Martinez-Gonzalez**, P. Vielva
- UGC-Granada (ES; *IAC*): Eduardo Battaner
- **IAC** (ES): R. Genova-Santos, R. Hoyland, Frederick Poidevin, R. Rebolo, **J.A. Rubiño-Martin**, Beatriz Ruiz-Granados, Flavien Vansyngel
- ICC-Barcelona (ES; *CSIC*): L. Verde
- **INFN** (IT):
  - Ferrara: M. Lattanzi, Paolo Natoli
  - Genova: M. Biasotti, F. Gatti
  - Padova: Nicola Bartolo, Michele Liguori, Sabino Matarrese
  - PISA: A. Baldini, L. Galli, **G. Signorelli**, F. Spinella, D. Vaccaro
  - Tor Vergata: Sandeep Haridasu, Vladimir Lukovich, Rocco d'Agostino, Nicola Vittorio
  - TIFPA: B. Margesin, R. Mezzena
- IFN Rome (IT; *Roma-I*): Gabriella Castellano
- Imperial College (UK; *Cardiff*): D. Clements, C. Contaldi, A. Heavens, A. Jaffe
- Instituto Argentino de Radioastronomía (Argentina): C. Medina
- LMU (DE; *MPA*): Sebastian Grandis, Matthias Klein, J. Mohr
- Manchester (UK; *Cardiff*): R. Battye, M. Brown, J. Chluba, C. Dickinson, P. Leahy, L. Piccirillo, M. Ramazeilles
- **Maynooth** (IE): M. Gradziel, Anthony Murphy, **C. O'Sullivan**, N. Trappe
- **Milan** (IT): P. Battaglia, **M. Bersanelli**, F. Cavaliere, C. Franceschet, F. Incardona, D. Maino, J. Martelli, D. Mennella, F. Pezzotta, M. Tomasi;
- Milano-Bicocca (IT; *Milan*): Mario Zannoni, Massimo Gervasi, Alessandro Baù, Andrea Passerini
- **MPA** (DE): **Eiichiro Komatsu**, Ryu Makiya, Fabian Schmidt
- Oviedo (ES; *CSIC*): Francisco Argüeso, Laura Bonavera, Joaquin Gonzalez-Nuevo, Luigi Toffolatti
- Oxford (UK; *Cardiff*): D. Alonso, P. Ferreira, M. Jones, A. Taylor
- RCAAM (GR; *NOA*): S. Basilakos
- **Roma I** (IT): E. Battistelli, A. Buzzelli, M. Castellano, I. Colantoni, **P. de Bernardis**, G. De Gasperis, M. De Petris, L. Lamagna, S. Masi, A. Paiella, E. Pascale, F. Piacentini
- USAL-Salamanca (ES; *IAC*): Fernando Atrio-Barandela, Kerstin Kunze
- Sissa (IT; *Milan*): C. Baccigalupi, N. Krachmalnicoff, F. Perrotta, D. Poletti
- Stockholm University (SE): Jón Gudmundsson, Martina Gerbino, Sunny Vagnozzi
- UCL (UK; *Cardiff*): T. Kitching, J. McEwen, H. Peiris
- UPV/EHU (ES; *CSIC*): Jose Juan Blanco-Pillado, Jon Urrestilla

Partner institutes, in the strict sense of the H2020 call name, are in bold. The Partner coordinators' names are also in bold. Non-partner collaboration members are associted with a Parther, given in italics after the country.

I know you can't read this, but these are the ~150 names of those interested in the 'E4' community from ~47 institutes in France, Germany, Greece, Ireland, Italy, Spain, Sweden, the UK & Argentina.

In the Last Year...

- But we've also seen a number of setbacks:
  - CORE not selected
  - PIXIE not selected
  - E4 not funded
  - Some national-level initiatives not selected

What's Next? Two *Suggestions*:

- Define the support the "European CMB Community" (defined by this process) should give to satellite proposals, and where the limit is: there is already a well developed space framework, and we want to "support", not step on peoples' toes
- There are many elements to the E4 proposal with merit: They should be extracted and developed into more coherent "subsets" that can be pursued and supported more easily than the entire E4.
  - The ECMB group should endeavor to foster a community and a "Project" that support these separate efforts. It should still be recognizable as "one project".

Near-Term

- Space vs. Ground: There are synergies to exploit & cultivate – how should they be ensured?
- Explore how “home-grown” European experiments such as LSPE, NIKA, QUBIC, QUIJOTE, etc., might be leveraged into larger experiments.
- E4 was not selected, but many of the elements are still valid.
  - We will continue searching for unified, European funding (E.g., Synergy Grants; others)
  - We will endeavour to get those elements that are valid financed by other means.
- Possibilities of analysis collaboration across the Atlantic and Europe.

Mid-Term

- Europe has cutting edge technologies to develop and “qualify”:
  - Kinetic Inductance Devices (KIDs)
  - Readouts
  - Telescopes
  - Others (cooling, ...)
- While world-wide collaboration is complicated on near-term time scales, there is a general openness on the part of individual CMB Stage-III experiments to collaborate with new groups
  - We will continue to explore opportunities for lab- & national-level collaboration to which those on both sides of the Atlantic seem amenable.

Long-Term

- There seems to be general agreement that Europe needs to be involved in the CMB Stage-IV process, though the contributions and degree of “integration” still varies.
- E4 was a difficult proposal in part because it tried to encompass all possibilities. I suggest we begin work on calls for ideas/white-papers for more targeted, long-term projects. For example (just examples!)
  - Delivering focal planes/”optics tubes” modules?
  - Delivering full telescopes?
  - Large, low-frequency experiment at Tenerife?
  - Upgrades of existing projects to 100k-detector class experiments?

Thanks

The E4 Review

We got 12.5 -- 4.5 for "Excellence", 4 for "Impact" and 4 for "Quality and efficiency of the implementation.

Comments were:

The objective to design a new infrastructure to measure the cosmic microwave background with stage 4 ground based observatories is clearly stated. The research program is at the state-of-the-art, however it is based on known technologies and does not demonstrate the innovation potential sufficiently.

The proposal is pertinent and it will reinforce the CMB community in Europe. The concept and the methodology are sound. However, results of other experiments and the research aim of a stage 4 CMB experiment are not explained in a very concrete manner.

This project will have an impact on European science and CMB community and addresses well the expected impacts of this topic. Moreover the development of a new site will have socio-economic impact. The envisaged collaborations with APPEC and AstroNet is commendable.

The dissemination of the results within the scientific community via specialized publications in scientific journals is adequate while dissemination effort through specialized conferences and schools for young scientists is rather limited.

The impact on similar global efforts is not sufficiently addressed. Also potential impact on industry has been insufficiently assessed.

The work plan is effective and it is in line with the objectives and the deliverables of the project. The timeline of the project is however described in an unclear and a confusing way.

The partners are complementary and have a vast expertise in CMB, having been part of the Planck collaboration. The consortium brings together the necessary expertise. The management structures are appropriate and the resources are well allocated. However an important shortcoming of the proposal is the underestimation of the potential risks.

Friday ECMB Session

Feuille de route futur des measures du CMB

Suite à la non-sélection de CoRE+ par l'ESA et face à la multiplication des propositions de nouvelles expériences soumises aux agences, il devient nécessaire de disposer d'une feuille de route dans ce domaine qui permettrait de définir une stratégie incluant les aspects sol et spatiaux (y compris le cas échéant ballon, la mesure de la polarisation des avant-plans étant un élément important de cette stratégie). Le mandat est donné par le CNES, l'INSU, l'IN2P3 et le CEA au Programme National Cosmologie et Galaxies d'établir les éléments de cette stratégie en s'appuyant sur la feuille de route des détecteurs millimétriques/submillimétriques et en intégrant la réflexion européenne en cours (http://indico.cern.ch/event/376392/overview). Il conviendra de traiter les points suivants:

- Etat des lieux, incluant une estimation de la taille de la communauté française concernée, panorama international des moyens existants, des projets décidés et proposés, au sol et spatiaux, ayant pour finalité la mesure du CMB, avec une indication du calendrier pour les projets
- Définition d'une stratégie scientifique : objectifs (avant-plans, CMB, échelles spatiales à atteindre, ...) avec des priorités et un calendrier cible de réalisation
- Identification des projets qui pourraient être portés par la France, ou dans lesquels la participation française pourrait être importante, à court (< 5 ans), moyen (5-10 ans), et long terme, et identification d'un ou plusieurs scénarios possibles
- Le cas échéant, actions préparatoires ou complémentaires à mener (R&D, organisation de la communauté, etc.).

I got this 2015/09/16 from François

Compte tenu de la forte compétition internationale et de la perspective d'un call M5 très prochainement, cette feuille de route doit être établie rapidement. Des premiers éléments devraient être disponibles début octobre pour que le contexte dans lequel seront prises les décisions sur la suite du programme PILOT (revol en Australie, modification du plan focal) soit quelque peu éclairci. Une version finale est attendue fin 2015.

Roadmap for CMB Measurements

Following ESA's non-selection of CoRE+ and the multiplication of proposals for new experiments submitted to the agencies, a roadmap is required in this discipline to make it possible to define a strategy including both ground and space aspects (including ballooning if necessary, the measurement of the polarization of foregrounds being an important element of this strategy). CNES, INSU, IN2P3 and CEA charge the National Cosmology and Galaxies Program to develop the elements of this strategy based on the millimeter/submillimeter detector roadmap and European reflection under way (http://indico.cern.ch/event/376392/overview). The following points should be addressed:

- The state of the art, including an estimate of the size of the French community concerned, an international panorama of the existing means, funded and proposed project, ground- and space-based, having as a goal the CMB measurements, with an indication of the timetable for the projects
- Definition of a scientific strategy: objectives (forecasts, CMBs, spatial scales, ...) with priorities and a target time frame
- Identification of projects that could be carried out by France, or in which French participation could be significant, short (<5 years), medium (5-10 years), and long term, and identification of one or more possible scenarios
- Where appropriate, preparatory or complementary actions to be carried out (R & D, community organization, etc.).

Given the strong international competition and the prospect of an M5 call soon, this roadmap needs to be established quickly. Initial elements are expected to be available in early October to clarify the context in which decisions on the follow-up of the PILOT program (second flight in Australia, changes to the focal plane) will be made. A final version is expected by the end of 2015.

- E4 did not succeed, but most of the elements are valid
- We will try to get more specific than was done in the E4 proposal. I will introduce the possibility of a call for more specific ideas. E.g., A BICEP copy? Contributions to Simons. QUBIC++ as a "partner" to S4? (sorry... these are very APC-specific ideas we have "thrown around". I know there are others, which I will endeavor to put in for "balance"
- We should make sure we use the CORE elements that are valid also.
- There should be near-, mid- and long-term elements (or thoughts...)
- Recent "setbacks" actually make the path clearer. LiteBIRD has to be complemented with something ground, high-resolution.
- The purpose of the conference is to define ECMB.