



GRAPHENE FLAGSHIP

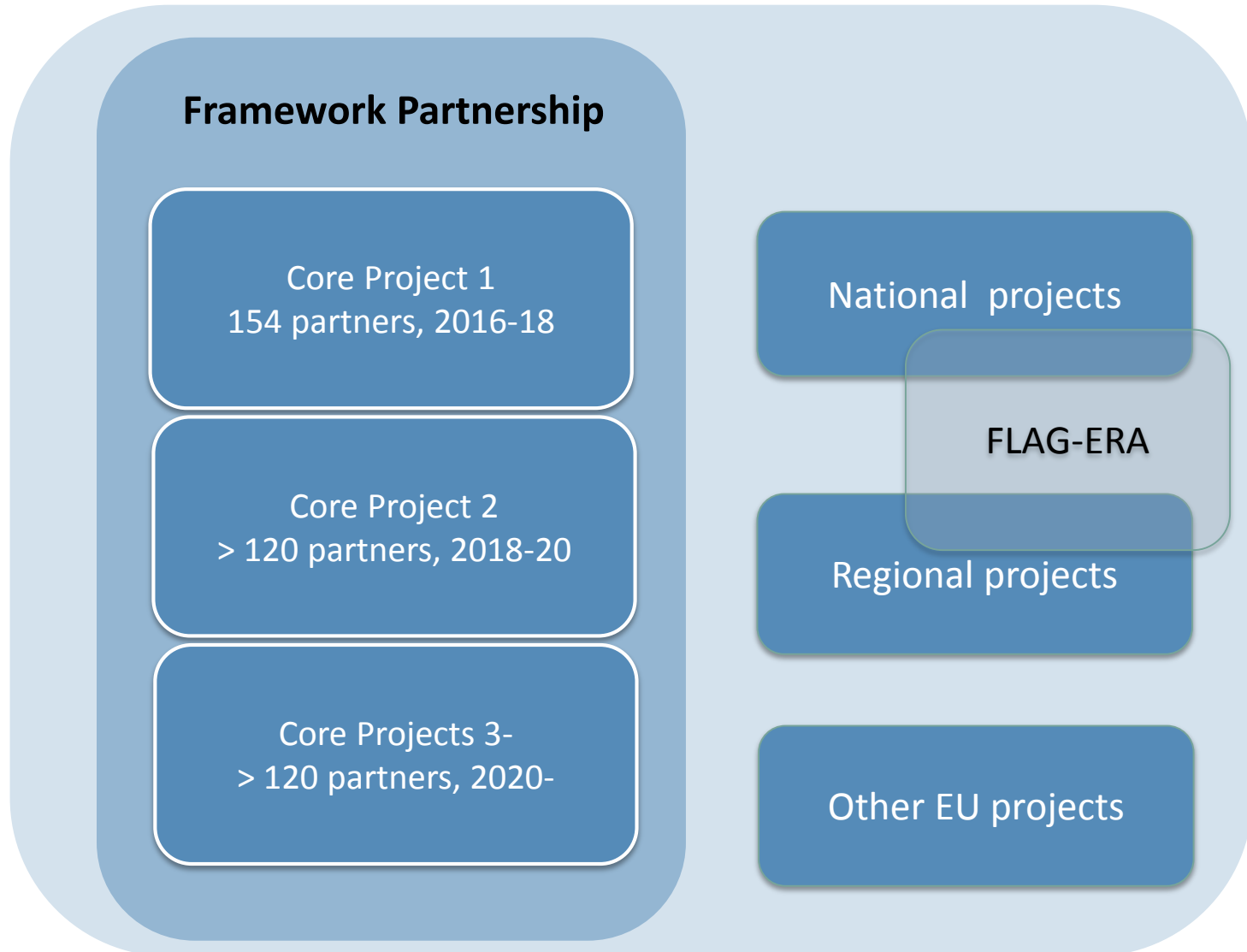
PREPARATION FOR CORE 2

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CHALMERS

Flagship in H2020



Evolution of the Flagship

| Year | Partners | Academic | Industrial | Other | Budget/yr | Cumulative |
|------|----------|----------|------------|-------|-----------|-------------------|
| 2013 | 75 | 48 | 16 | 8 | 18 M€ | 0 M€ (start) |
| 2014 | 142 | 76 | 41 | 25 | 24 M€ | |
| 2016 | 154 | 75 | 53 | 26 | 44.5 M€ | 54 M€ (inc. FP7) |
| 2018 | >120 | ? | ? | ? | 44 M€ | 143 M€ (inc. C1) |
| 2020 | ? | ? | ? | ? | > 45 M€ | 231 M€ (inc. C2) |
| ? | ? | ? | ? | ? | ? | 500 M€ (flagship) |

Clear trend towards more industrial involvement, as planned

Involve new partners as needs arise and resources become available (*Expression of Interest* mechanism).

So far, about 15% of the total EC funding has been spent, by the end of Core 1 the number will be about 29% and by the end of Core 2 about 46%.

Evolution of the research plan and the consortium

- Defined in the FPA: *“The adjustment of the research plan of the flagship will be based on four main ingredients: the input from expertise within the Flagship that arises from the analyses and considerations during Science and Technology Forums, the input from the Technology and Innovation Roadmap which takes into account global academic and industrial developments and trends, and the inter[natio]nal and external review processes carried out by the Flagship and the European Commission. Based on these inputs, the EB may decide that the research plan needs be adjusted by either initiating or strengthening some activities, or by de-emphasizing by or discontinuing others. These adjustments may imply a need to adjust the Flagship consortium.”*
- Approved by the entire consortium and communicated repeatedly to them since, at least, June 2015

Core 2 plans

- Continue moving towards higher technology readiness levels but keeping the fundamental science component as well
- Focus the activities: combine technology push (*what is doable?*) and market pull (*what is worth doing?*)
- Focusing decisions based on four input streams as outlined in the Framework Agreement:
 - EC reviews (backward-looking)
 - Our internal assessments (forward-looking)
 - Our technology and innovation roadmap
 - Our Science and Technology Forum
- Focusing involves identifying the best areas in terms of industrial impact/technological uncertainty, but it is likely to have a side effect that some groups and partners will not have roles in Core 2
- Some decisions were taken by the Executive Board 10 days ago, not yet published, and the implementation plans have not been fixed yet

EC Review

- Full report (58 pages) of the final review of the FP7 phase is available to all flagship partners on our intranet Onboard
- While the review is supposed to be a review, *i.e.* look back in time, it also contains some forward-looking statements that serve as inputs for Core 2 planning

Technology and innovation roadmap

- Draft version (499 pages) available for internal use on Onboard
- Lot of judgement on industrial relevance in Europe, compiled by Fraunhofer Institute through well-attended workshops, interviews with companies inside and outside the flagship consortium, and literature studies
- WP leaders can comment within a few weeks; an edited version of the roadmap will be published in 2017

Internal assessments

- Forward-looking, will take place in Nov – Dec 2016
- Each WP will be represented by WP leader, WP deputy, and up to 2 people they invite
- Four reviewers: one internal (leader of a different WP), one from Strategic Advisory Council, and two external (1 industry, 1 academia)
- Specific questions, *e.g.* SWOT analysis, goals for Core 2, how to handle a 20% cut in tasks or funding, how to use a 20% budget increase
- Reviewers will assess S&T uncertainty and technological impact in 4 and 10 years' time, comment on SWOT and goals, and the "20% adjustments"

Science and technology forum

- February 15-17, Madingley Hall, Cambridge
- WP leaders and deputies, Strategic Advisory Council, other members of the Executive Board, *ca.* 50 attendees in total
- Will recommend final plans for Core 2 that the EB will decide upon
- The STF cannot start from an empty sheet but needs "a baseline document", collecting all recommendations from the different sources; how this document will be produced is not yet decided

What is known:

- Increased focus on innovation, *e.g.* technology transfer officers or similar for each S&T WP
- 10% of budget reserved for spearhead projects
 - Application-oriented, market motivated, aiming at a significant breakthrough, one person in charge
 - Either within one WP or across several
 - Strong industrial support; possibly an EoI call
 - Not yet known when we can have the first suggestions
- Increased emphasis on cross-WP actions
- The Core 2 proposal must clearly describe realistic target, in a realistic relation to budget, with clear responsibilities (who is in charge of a task, which partner does what), typically no more than 6 tasks per WP (often divided in subtasks)
- SAC advise emphasizes the importance of fundamental research as the field is still quite young
- Submission date probably in June, 2017 → *text must be finalized in May*

Spearhead projects

New for Core 2, closest approximants in Core 1 include

- Task 15.4 Aerostructure manufacturing: Wing leading edge with graphene related materials:

Produce and test resin compositions doped with graphene related materials (GRM), test the materials developed, and select the most promising one. Design and manufacture a piece of the leading edge of a horizontal tail from the AIRBUS A350 incorporating the GRM in resin. Test the produced aerostructures to determine if GRMs have enhanced their mechanical performance specifically with respect to bird impacts.

- Task 8.7 Prototype transceiver bank realised on SOI in 300mm CMOS 65nm line or on SiN 150mm on Si CMOS compatible line:

Two prototypes will be demonstrated and based on the outcome of task 1 (detectors) and task 4 (modulators): 1) single wavelength, parallel optics (4x28 Gbit/s), and 2) 4 wavelength (wavelength-division multiplexing) transceiver (4x28 Gbit/s), both operating in the C band. The outcome will be a back-to-back system test of non-return-to-zero modulated signals. This will be compared with existing Si photonics based devices in terms of system performance at room temperature and at 80 °C. Other evaluations will consider the impact of packaging on the uniformity of system performances in the different channels.



**Graphene disruptive
technologies**
*- from academic
laboratories to society*