



R&D
on EXPERIMENTAL TECHNOLOGIES

CERN's Experimental Physics department has launched a process to define its R&D programme on new Experimental Technologies. The R&D work would span a 5-year period from 2020 onwards (with a possible extension by another 5 years), and cover detector hardware, electronics and software for new experiments and detector upgrades beyond LHC Phase II.

1st Workshop
16 March 2018 (full day)
CERN, main auditorium

Please register!
<http://indico.cern.ch/e/EP-RD-Workshop1>

8 working group sessions
Special R&D proposals

- Silicon detectors
- Gas detectors
- Calorimetry and light based detectors
- Detector Mechanics
- IC technologies
- High Speed Links
- Software
- Detector Magnets

Experimental Physics Department
R&D on Experimental Technologies

Update on the CERN EP R&D Program on Experimental Technologies

<https://ep-dep.web.cern.ch/rd-experimental-technologies>



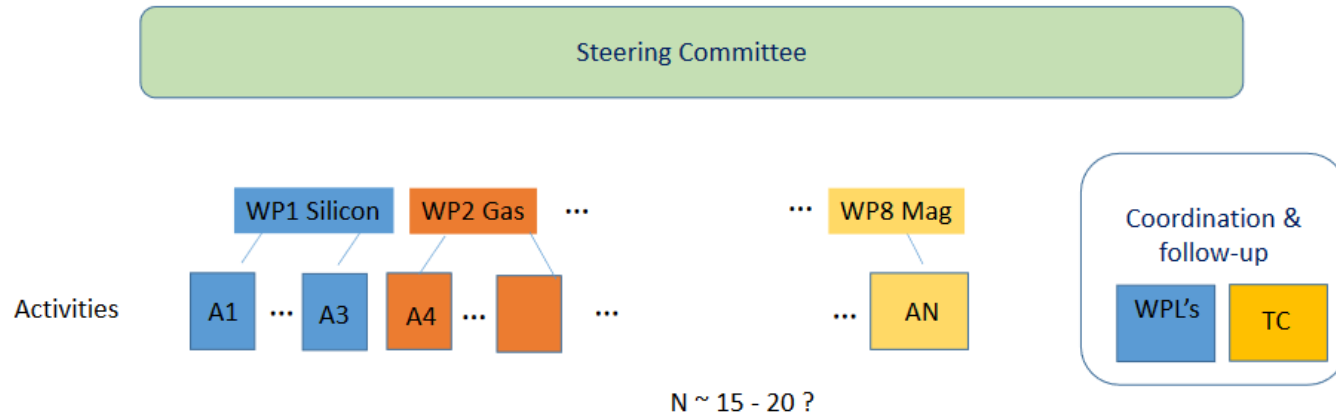


Working Groups	Convenors	Mailing Lists	WG site *)
Silicon detectors	Heinz Pernegger, Luciano Musa, Petra Riedler, Dominik Dannheim	EP-RDET-WG1-Si	WG1-Si
Gas detectors	Christoph Rembser, Eraldo Oliveri	EP-RDET-WG2-Gas	WG2-Gas
Calorimetry and light based detectors	Martin Aleksa, Carmelo d'Ambrosio	EP-RDET-WG3-Cal-Light	WG3-Cal-Light
Detector Mechanics	Corrado Gargiulo, Antti Onnela	EP-RDET-WG4-Mech	WG4-Mech
IC technologies	Federico Faccio, Michael Campbell	EP-RDET-WG5-IC	WG5-IC
High Speed Links	Paolo Moreira, Francois Vasey	EP-RDET-WG6-Links	WG6-Links
Software	Graeme Stewart, Jakob Blomer	EP-RDET-WG7-Software	WG7-Software
Detector Magnets	Herman Ten Kate, Benoit Cure	EP-RDET-WG8-Magnets	WG8-Magnets



- Kick-off meeting - R&D on experimental technologies
 - <https://indico.cern.ch/event/677108/>
- CERN EP Department - R&D on experimental technologies - Workshop 1
 - <https://indico.cern.ch/event/696066/>

Ideas for an R&D implementation model



Activity A1

- Activity leader
- Work plan
- Deliverables & milestones
- Resources
- Follow-up / reporting

fractions of experts (existing staff)
as supervisors and activity leaders



Fellows and students

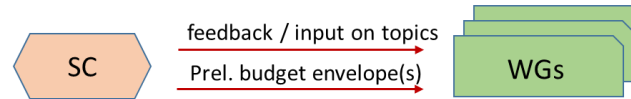
Towards Workshop 2

Everything to be ready for the second workshop in September (25th)

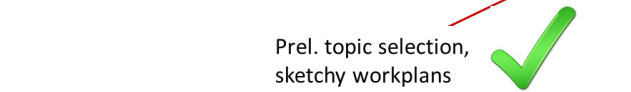


Workshop 1

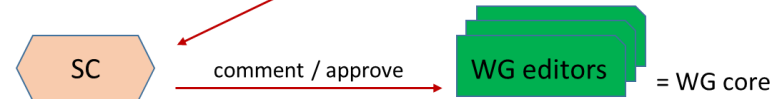
16 March



Mid-April

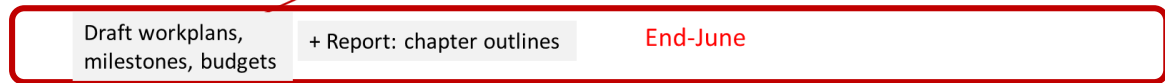


Mid-May

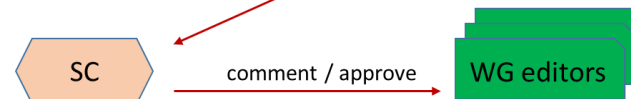


15 June

NOW

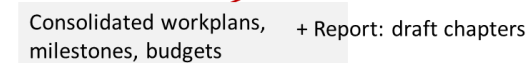


End-June

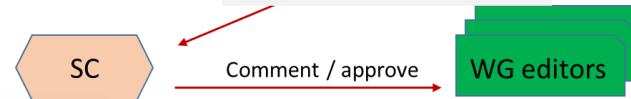


Mid-July

First version of the text (for European strategy group) by mid July



End-August



Mid-September

Workshop 2

25 September



Proposed Activities in the gaseous detector technologies

The slide features a blue header with the EP logo and 'Experimental Physics Department' text. The main content is centered on a white background, displaying the title 'WG2 Gaseous Detector Technologies Proposed R&D Activities' in a large, black, sans-serif font. Below the title, it states 'Joint convenors and steering committee meeting' and '23rd May 2018, CERN'. The bottom left corner has a blue box with 'EP R&D' and the bottom right corner has the CERN logo.

EP Experimental Physics Department

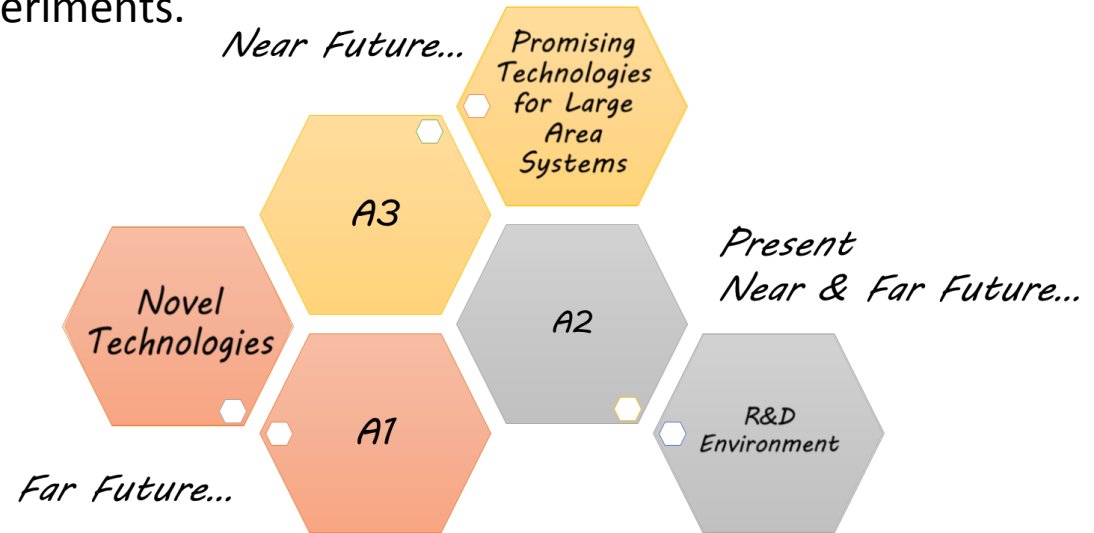
WG2 Gaseous Detector Technologies Proposed R&D Activities

Joint convenors and steering committee meeting
23rd May 2018, CERN

EP R&D



- inspiring future detectors and building up expertise in new fields;
- granting an excellent and stimulating research environment;
- supporting developments for future experiments.



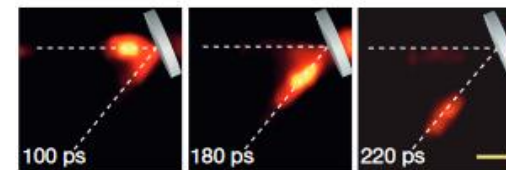
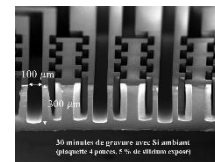
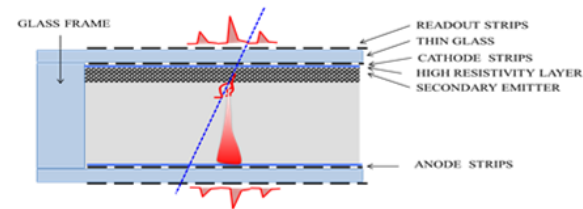
- A1: Novel Technologies
- A2: R&D Environment
- A3: Promising Technologies for Large Area Systems

Few examples will be given for each activity, just to make more clear the proposal content. Changes are expected following steering committee comments and future discussion with experts in each field.

A1: Novel Technologies

- Ambitious R&D activities to explore the future in gaseous detector technologies.
- Bringing at CERN new technologies is considered and it will be properly evaluated.
- Synergies within EP and more generally with other CERN groups (beam and vacuum groups as examples).

- **New materials** with customized properties can be built (material science)... **Solid Converters** (photocathodes, secondary emitters).
- **New techniques** are offering unprecedented capabilities on building structures... a new way of **prototyping**.
- **New technologies** on imaging are pushing performances to limit... **fast optical readout** can be seriously considered.

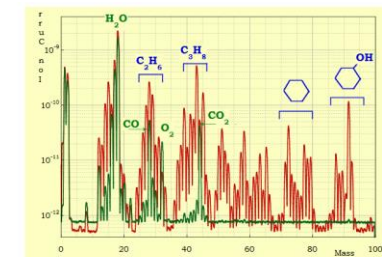
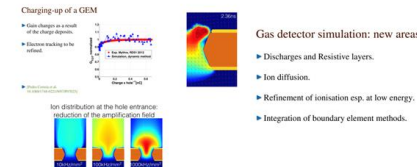
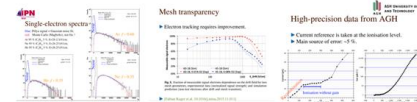


A2: R&D Environment

- Strengthening the existing CERN R&D environment and enlarge our patrimony.
- Simulation and Modeling, Electronics and Instrumentation, Gas Studies/Analysis.
- Cooperation with collaborations (RD51 as an example), experiments, laboratory and institutes.

- **Simulation and Modeling**
- **Electronics**
- **Gas**

Modelling of Physics Processes and Software Tools



Analysis of outgassed components of a 2-component Polyurethane
 1. Green: sample treated correctly
 2. Red: one component expired

Electronics for detectors

<p>multichannel readout systems</p> <p>SRS (RD51) scalable readout system from table-top to full experiment > 100 SRS systems world wide</p> <p>APV SRS frontends 2009-2018</p>	<p>Single channel test & trigger</p> <p>Single-channel & HV mesh trigger CSA, Shaper, Pulser, Trigger, HV bias</p> <p>Sub-ns LED pulser 2014-2018</p>	<p>Scalable picosec frontends</p> <p>Pre-amplifiers WBA, CSA, TIA, OTA time & amplitude in sub-ns range</p> <p>2018+ R&D pSRS picosec Frontend for SRS</p>
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Promising Technologies for Large Area System

- focus on novel development with the capabilities of being applied in large area systems.
 - in synergy with future experiments to efficiently focus on crucial aspects and share the efforts.
 - Links with industry taken into account – define the proper approach.
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- Explore **(detector/mechanics/electronics)** novel solutions for future large area systems (muons, calorimetry, ...) : modularity, size
 - **Resistive layers** (DLC as an example) linked to single amplification stages (simple) devices (mm, μ well,...)
 - **Embedded Electronics** for large high granularity system



Micro-Pattern Technologies



Strategy towards Reduced R&D Budget

The R&D report will contain the full program and flag the tasks to be dropped because of budget constraints

Reduced Budget Expected compared to the current CERN RD Budget