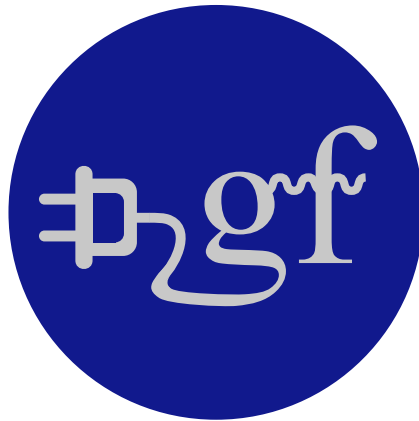


Summary of Yellow Report Progress



LAL-Orsay Gamma Factory workshop

June 2019

Mieczyslaw Witold Krasny

LPNHE, CNRS-IN2P3 and University
Paris Sorbonne, CERN BE-ABP division,

The role of the Gamma Factory **Yellow Report**

Writing the GF YR is a very crucial “consolidation step” of our activities -- a kind of a “maturity test” required to enter the path which can take us from the “GF studies” to “GF project” phase.

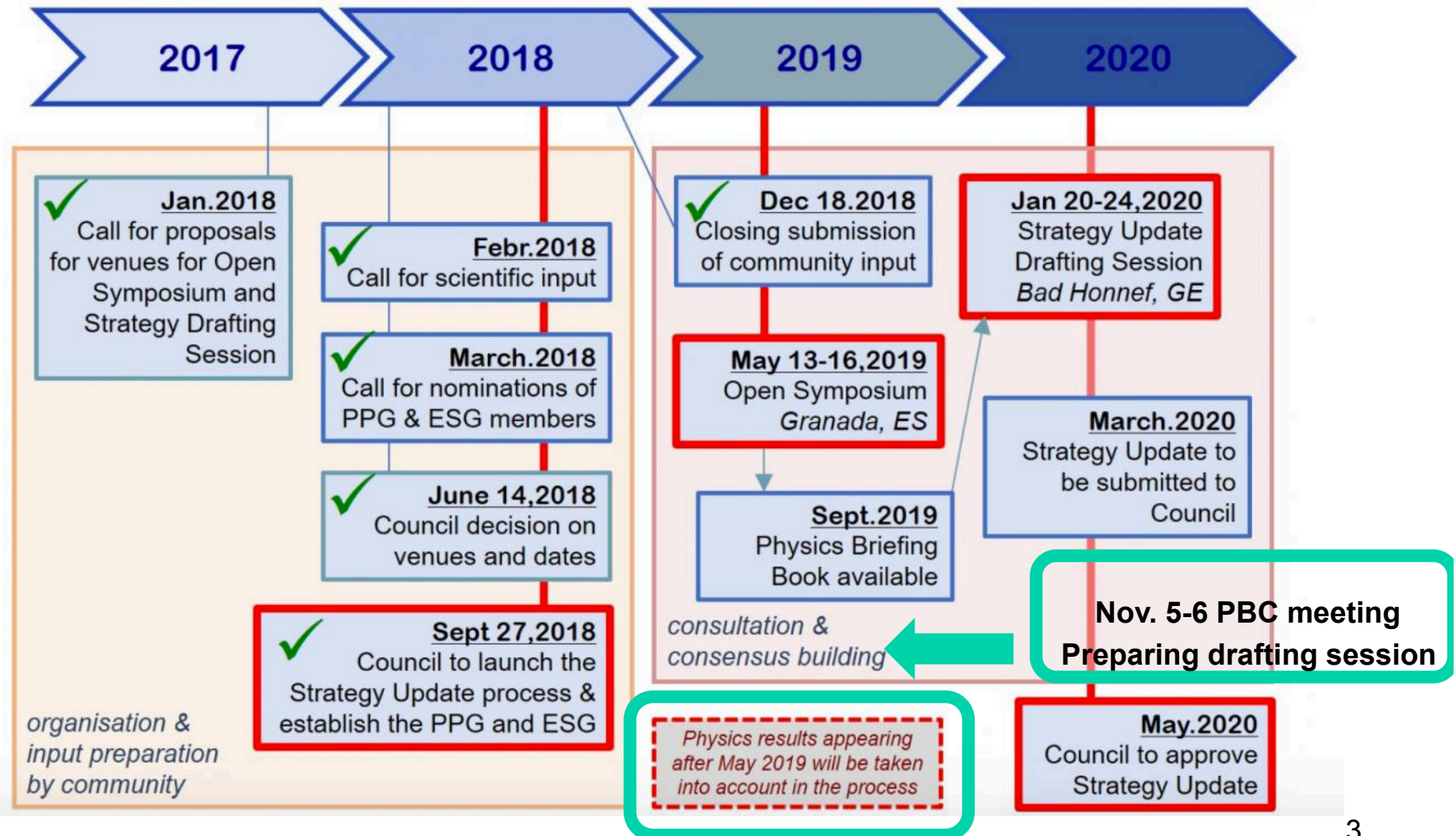
The primary goal of the Yellow Report is to summarise our work done so far. Its main purpose is to serve as a reference document which reports opening of a new research domain. It will be useful for:

- applying for grants,*
- preparing our conference contributions,*
- preparing the Lol for the GF proof-of-principle experiment*
- the visibility of our work - a “sine qua non” condition: (1) to trigger the quantitative studies of the GF research highlights, and (2) to be endorsed by the EPPSU process and to be supported by CERN*

Process



European Particle Physics Strategy Update





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SPS and PS Experiments Committee (SPSC)

Dates for 2019

Tuesday and Wednesday, 2-3 April

Thursday and Friday, 13-14 June

Tuesday and Wednesday, 15-16 October

Another important constraint...



This page is maintained by [CERN Scientific Committees](#)
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The document history and deadlines

- *September, the 6th 2018* - document structure proposed and the overleaf framework implemented
- *December, the 18th 2018* – initial contributions deadline
- *February, the 14th 2019* -- splitting of the Initial document into two volumes to facilitate its quick finalization 
- *March, the 24th 2019* -- CERN overview meeting – the second deadline for the contributions
- *June, the 3rd 2019* -- LAL-Orsay workshop – the status presented below...

The Gamma Factory Yellow Report

1. **Production, acceleration and storage of “atomic beams” at CERN accelerator complex.**
2. **Proof-of-Principle (PoP) experiment in the SPS tunnel.**
3. **Development “ab nihilo” the requisite Gamma Factory software tools.**

-
4. **Realistic assessment of Gamma Factory performance figures.**
 5. **Physics highlights of Gamma Factory based research programme.**
 6. **Gamma Factory TDR.**

At present 64 authors

Gamma Factory for CERN

Vol. 1



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At present: 141 pages (2/3) ~ 70-90 pages missing

Overleaf framework

<https://fr.overleaf.com/project/5c52c7d598873812604174ce>

The screenshot shows the Overleaf web editor interface. The left sidebar contains a navigation menu with items like 'Chapters', 'BeamTests', 'CERNbeamsGF', 'Conclusions', 'ExecutiveSummary', 'GammaRaySource', 'Introduction', 'LaserCooling', 'PoPatSPS', 'ProjectOverview', 'PSIatCERN', 'SimulationTools', and 'StabilityOfPSIbeams'. The main editor area displays LaTeX source code for a document section on cross sections. The code includes references to 'Okuno_2011' and 'Okuno_2012', and a figure command. The right-hand pane shows a preview of the document, featuring two plots. The top plot, titled 'Au^{q+} + Au at 1 GeV/u', shows the calculated EL and EC cross sections in cm² as a function of ion charge q (from 62 to 78). The bottom plot shows the evolution of charge-state fractions (F₇₉, F₇₈, F₇₇) as a function of Au foil thickness in mg/cm² (log scale from 10⁰ to 10³). The figure caption explains that the left plot compares experimental data (triangles and circles) with theoretical results (EL1, EC1) from RICODE-M and CAPTURE codes, and the right plot compares experimental data (symbols) with calculations from the GLOBAL code (dashed) and BRET code (solid).

```
\ref{U-He},
left, as a function of charge state  $q = 40 - 92$  in
comparison
with experimental data at  $q = 60 - 70$ , Ref.
\cite{okuno_2011}.
\begin{figure}[tbh]
\begin{center}
\includegraphics[width=0.99\textwidth]{Chapters/StabilityOfPSIbeams/slava_1.png}
\caption{Left: Single-electron EL1, and EC1 + EC2 cross
sections
(see text) for collisions of 11-MeV/u  $U^{q+}$  ions
with a
molecular He target. Experiment: triangles and circles
- EL and EC
cross sections for  $q = 60 - 70$ , respectively, Ref.
\cite{okuno_2012}. Theory: EL1 and EC1 - results of
RICODE-M and
CAPTURE codes, respectively, at a gas pressure of  $P = 20$  mbar,
EC2 - estimated by the semi-empirical formula of Ref.
\cite{shevelko_2014}. Right. three figures:
```


Present status chapter-by-chapter

Chapter 1

Executive Summary

First draft written

Initial draft – Witek

Chapter 2

Introduction

Explaining of the concept **by Dima**
The remaining part to be written by **Witek**,
once the full draft is ready

Chapter 3

Project overview

First draft written

Initial draft – Witek

Present status chapter-by-chapter

Chapter 4

Acceleration and storage of ion beams in CERN accelerator complex

Coordination and coherence of this section - Reyes

First draft of section 4.1.1 (sources) written by Detlef (3 pages)
– other sections of this chapter are missing ~90% (Django?)

Chapter 5

Stability aspects of PSI beams

Coordination and coherence of this section – Witek

Drafts all all sections
(except the one one on the intra-beam stripping (initially assigned to John, discussions with Davide Gamba)

Chapter 6

Machine studies with Partially Stripped Ion beams in CERN accelerator complex

Coordination and coherence of this section – Reyes

Drafts of all sections (90%) exist – most recent by Michaela of the LHC runs. Editorial work by Reyes needed to assure consistency between contributions.

Present status chapter-by-chapter

Chapter 7

Partially Stripped Ion Beams – Gamma Factory requirements

Coordination and coherence of this section - Reyes

90% missing. Most recent contribution by **Arek**. Ion sources in preparation by **Detlef and Witek**. Ion stripping infrastructure pending a meeting with **Simone**. Vacuum: nothing written yet. Operational aspects: nothing written yet.

Chapter 8

Gamma-ray source

Coordination and coherence of this section - Alexey

80-90% missing. Overview section promised by **Luca**. First partial draft on the FEL option by **Vittoria** written. waiting for two sections by **Alexey, Dima, Szymon and Evgueni**.

Chapter 9

Laser cooling of PSI beams

Coordination and coherence of this section - Alexey

60% missing. First draft by **Dima** on cooling in Atomic Physics in place. Waiting for the contribution by **Alexey/Evguen.i**

Present status chapter-by-chapter

Chapter 10

Software tools – development status

Coordination and coherence of this section - Alexey

Missing ~40%: Beam background simulation tools, Stripper optimisation tools, Beam dynamics tools. Secondary beam gen. tools. Recently included: **Camilla's, Wiesiek's** And **Slava's** contributions

Chapter 11

Proof-of-Principle (PoP) experiment at SPS

Coordination and coherence of this section - Bren/Yann

Most of the sections in place ~ 70 % Thanks to the work of **Bren, Yann, Aurelien, Kevin, Jacek**. Missing: Simulations, Photon Detectors: observables and instrumentations, Schedule/Resources

Chapter 12

Conclusions

To be written once the first drafts Of all the chapters are in place

The way forward

- *An important progress have been made since our January meeting -- by now we have about 60-70% of the necessary material in the form of initial drafts.*
- *For the work done on purely voluntary basis this is quite impressive. Many thanks for all of us who, **in their spare time**, on top of their mainstream activities, prepared and submitted their contributions!*
- *To finalize our document still a substantial additional effort is needed -- to draft the missing sections of the document and, subsequently, for the final editorial process assuring the overall coherence of the document.*

The way forward

- *The sections which are, at the moment our main concerns are **the missing sections in chapters 4 and 7 (PSI beams) and chapters 8 and 9 (Gamma ray source fundamentals and cooling)***
- ***We are looking forward to the contributions of our Atomic Physics colleagues to help Alexey in finalizing soon the chapters 8 and 9 of the Yellow report!***
- *Another subject of concern is the Photon Detector System sections of Chapter 11. Here, contrary to all the other sections where the ideas and the study results exists and need to be put on paper, the conceptual development and the corresponding studies are missing – I hope the discussions at this meeting will lead to a breakthrough in this domain....*

**All hands on board to finalize
Our GF Yellow Report**