White paper

“Hadron Physics at GSI and FAIR: Prospects for the Next Decade”

(Tentative title)

The white paper should …

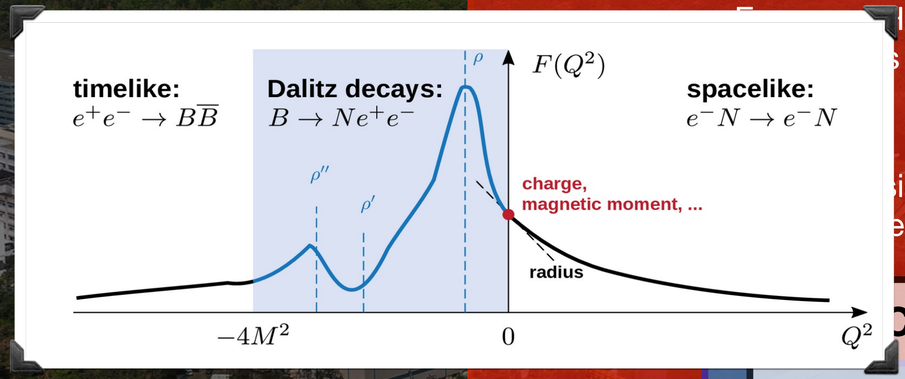
- Motivate a *viable* **hadron-physics** program.
- Emphasise on the overarching aspects in **NP+HP+HI** physics.
- Connect **state-of-the-art theory** with FAIR **experiments**.
- Address perspectives for the “**Early/First Science**” phase(s) at FAIR.
- Focus on topics exploiting **pion/proton/deuteron** SIS18/100 beams.
- Demonstrate the **feasibility** on few key channels.
- Concentrate on FAIR’s **common facilities**, e.g. HADES, CBM, …
- Highlight the **competitiveness/complementary** w.r.t. other international facilities, e.g. JPARC, JLAB, CERN, …

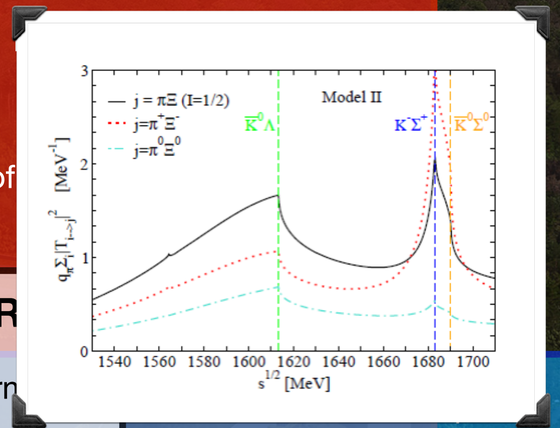
A comprehensive QCD program at GSI/FAIR!

Composition of hadrons

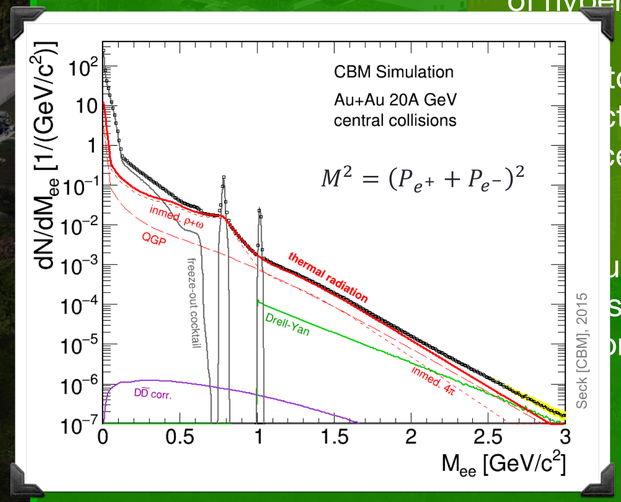
Hadron structure

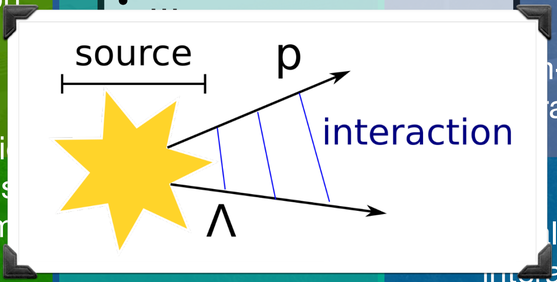
Hadron spectroscopy

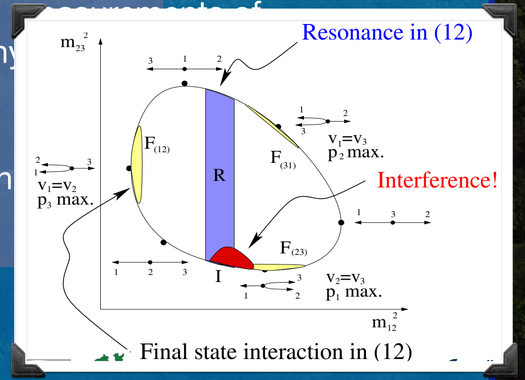




- Strange and charm
- High intensity
- Versatile detectors
- High-rate capabilities
- ...







Reference **measurements for p+A,A+A**

Heavy-ion dynamics

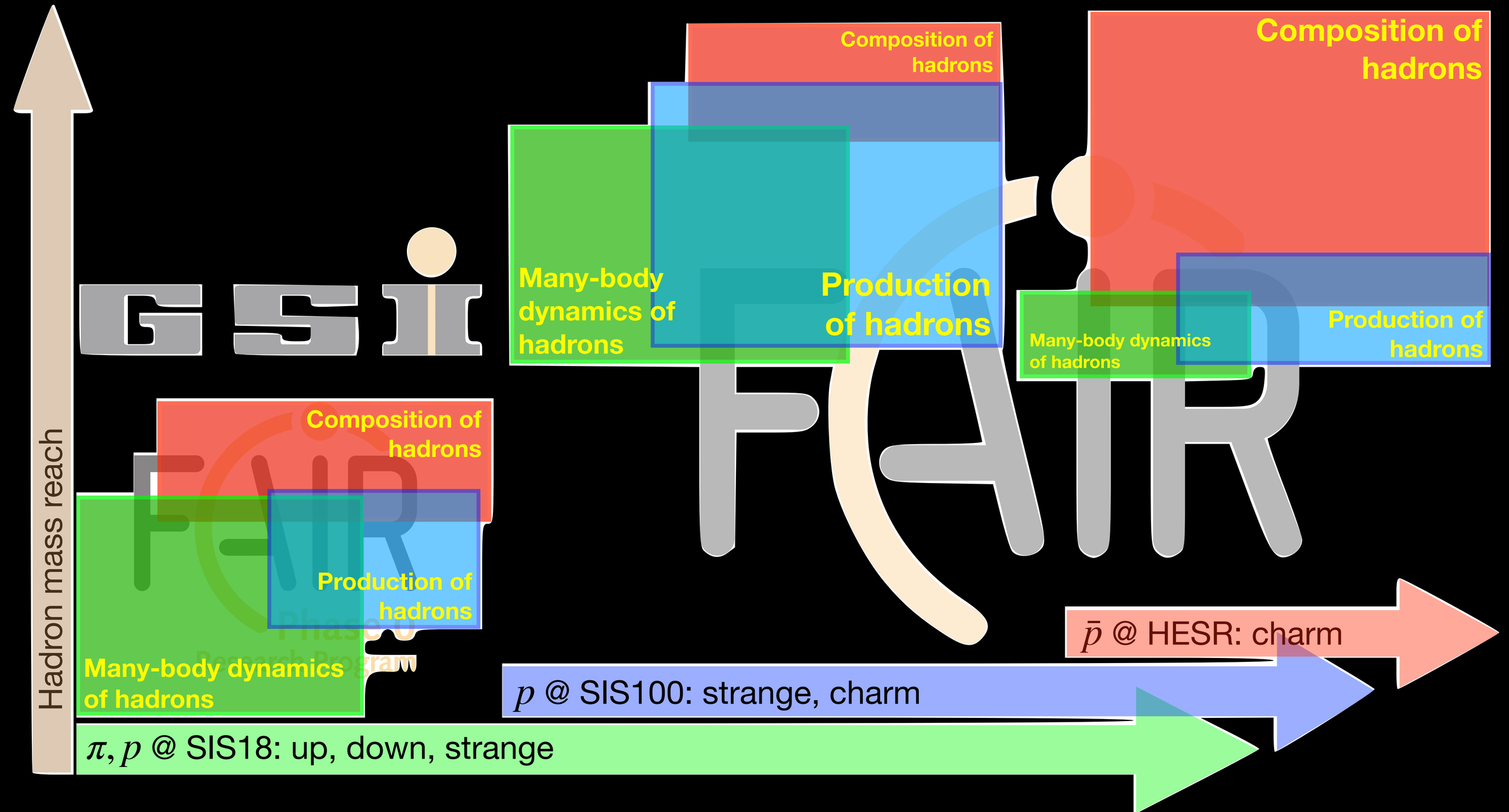
Few-body interactions

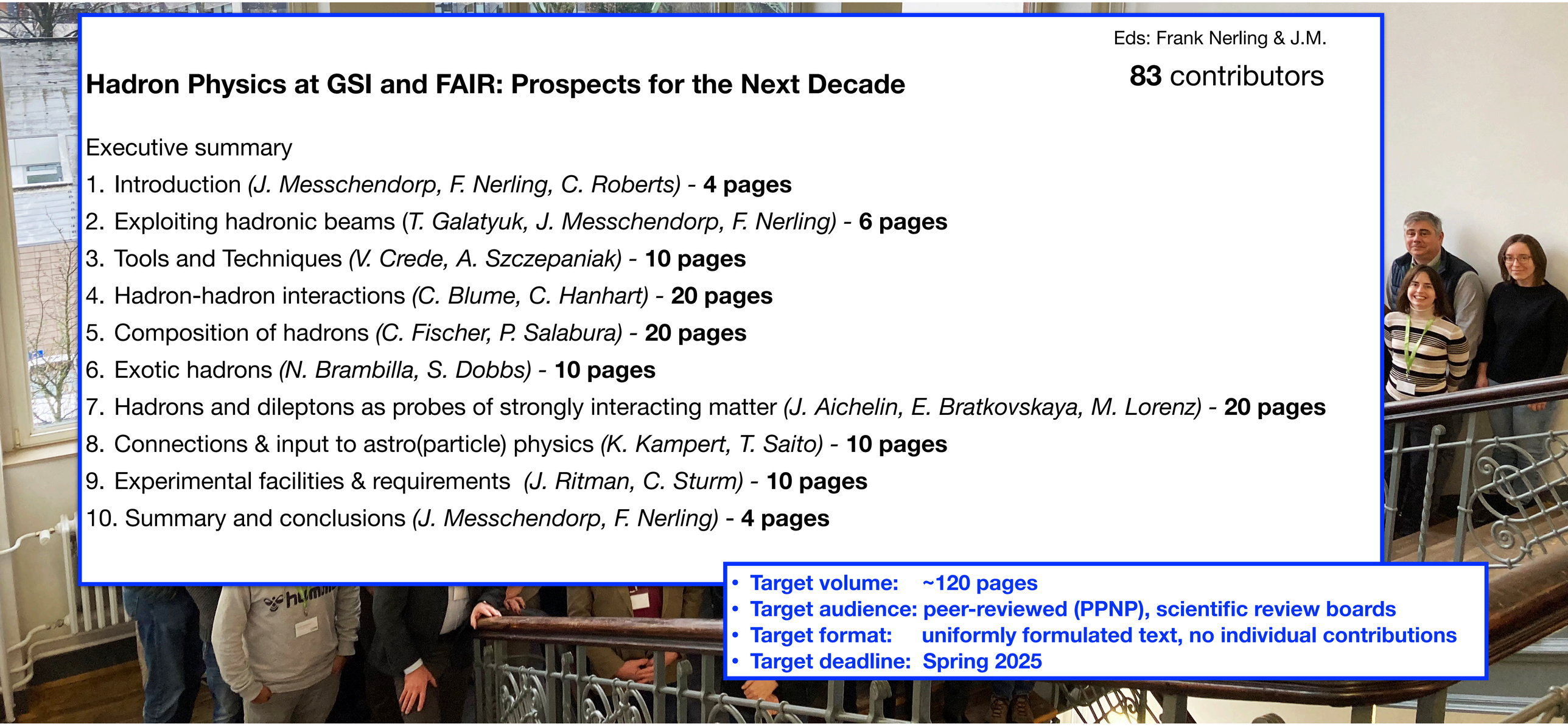
Microscopic **study of hadron-hadron interactions**

Hadron production

Production *mechanisms* of hadrons

A roadmap towards a QCD program at FAIR!





Hadron Physics at GSI and FAIR: Prospects for the Next Decade

Eds: Frank Nerling & J.M.

83 contributors

Executive summary

1. Introduction *(J. Messchendorp, F. Nerling, C. Roberts)* - **4 pages**
2. Exploiting hadronic beams (*T. Galatyuk, J. Messchendorp, F. Nerling)* - **6 pages**
3. Tools and Techniques *(V. Crede, A. Szczepaniak)* - **10 pages**
4. Hadron-hadron interactions *(C. Blume, C. Hanhart)* - **20 pages**
5. Composition of hadrons *(C. Fischer, P. Salabura)* - **20 pages**
6. Exotic hadrons *(N. Brambilla, S. Dobbs)* - **10 pages**
7. Hadrons and dileptons as probes of strongly interacting matter *(J. Aichelin, E. Bratkovskaya, M. Lorenz)* - **20 pages**
8. Connections & input to astro(particle) physics *(K. Kampert, T. Saito)* - **10 pages**
9. Experimental facilities & requirements *(J. Ritman, C. Sturm)* - **10 pages**
10. Summary and conclusions *(J. Messchendorp, F. Nerling)* - **4 pages**

- **Target volume: ~120 pages**
- **Target audience: peer-reviewed (PPNP), scientific review boards**
- **Target format: uniformly formulated text, no individual contributions**
- **Target deadline: Spring 2025**

White paper, collaborative tools

- **Overleaf:**
  - https://www.overleaf.com/project/66140e0765cd108e2b9f6365
  - File “*contributors+emails.txt*” (see overleaf) contains overview of convenors+contributors for each chapter
- **Email-lists:**
  - Global list: **QCDatFAIR@gsi.de**
  - Separate lists for each chapter: **QCDatFAIR_ChapX@gsi.de**
- **Indico event manager:**
  - On request available via GSI

QCD@FAIR workshop at GSI

	Monday, November 11	Tuesday, November 12	Wednesday, November 13	Thursday, November 14
Morning	Travel to GSI	Open plenary II + **Status reports convenors**	Open plenary III	Open plenary IV + **Summary working group meetings**
Afternoon	Open plenary I	**Parallel working group meetings I**	Seminar C. Hanhart + **Parallel working group meetings II**	Visit FAIR-site & Departure GSI

https://indico.gsi.de/event/20301/overview

Closed sessions

- **Status reports convenors (Tuesday morning)**
  - Where are we with the organisation/write-up of chapter?
- **Parallel working groups I (Tuesday afternoon)**
  - Organised by convenors of each chapter
- **Parallel working groups II (Wednesday afternoon)**
  - Cont'd, combine chapters, "special" sessions, …
- **Summary reports convenors (Thursday morning)**
  - What have we concluded from the working group meetings?

White paper

Chapter 1+2

“Introduction”
+
“Exploiting hadron beams”

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1.1 Key Questions in Strong Interaction Physics 3
1.2 Context and objectives . . . . . 5 —> To be done

2 Exploiting hadronic beams **~6 pages** **5**
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2.4 Hadron production mechanisms . . . . . 8 —> To be done