PS2 Design Report Update

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Post-Chamonix 2010

- CERN decided to not pursue the PS2 upgrade
  - Report to be written summarizing effort so far.
    - to be published as CERN Yellow Report
  - W. Bartmann, editor
  - 17 Chapters. O(10) pages ea. (not a limit)
  - Each chapter has a writer and/or sub-editor.
- LARP contribution as planned
  - but adjusted extent and effort to match new time line

Preparation of PS2 CDR

- CERN yellow report as template
- One person responsible per chapter – see list
- Aim to send chapters until 30th September 2010 to Michael and Wolfgang
- Meeting to discuss how detailed the subjects should be described - to be announced

People in charge…

1. **Introduction**
2. **Optics, beam dynamics and operation aspects**
3. Technical Systems
4. Site aspects, buildings and technical infrastructure

Responsible	Chapter
Michael Benedikt	Introduction, basics design choices and general parameters
Yannis Papaphilippou	Ring lattice, linear and non-linear optics & corrections, dynamic aperture
Brennan Goddard	Injection, extraction and transfer lines
Steven Hancock	Longitudinal dynamics
Uli Wienands	Beam stability, collective effects, impedances
Thomas Otto	Beam loss management and radiation protection aspects

People in charge…

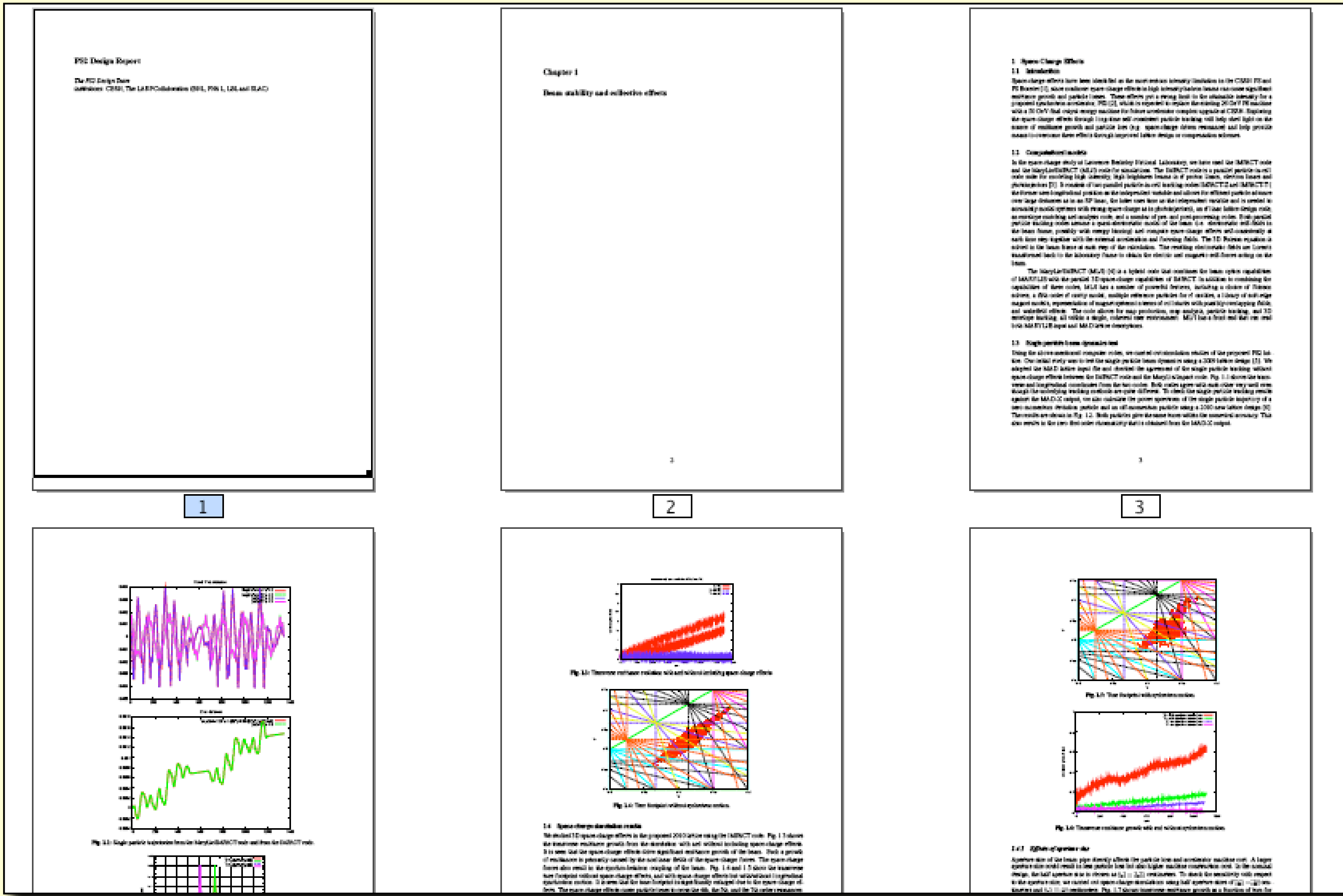
1. Introduction
2. Optics, beam dynamics and operation aspects
3. **Technical Systems**
4. **Site aspects, buildings and technical infrastructure**

Responsible	Chapter
Erk Jensen	RF system
Gijs de Rijk	Magnet systems
Brennan Goddard	Beam transfer systems
Edgar Mahner	Vacuum system
Vasilis Vlachoudis/Yacine Kadi	Collimators and dumps
Rhodri Jones	Beam instrumentation
Hugues Thiesen	Power converters
?	Controls
Michael Poehler	Civil Engineering, site aspects and buildings
?	Electrical infrastructure
?	Cooling and ventilation

The LARP Contribution:

- 24 pages have been written
  - Space-charge (12)
  - e-cloud (5)
  - Impedance (5)
  - Bibliography (2)
- These are ≈90% done except for the editing

LARP Section Pages (first)


PS2 Design Report

Chapter 1

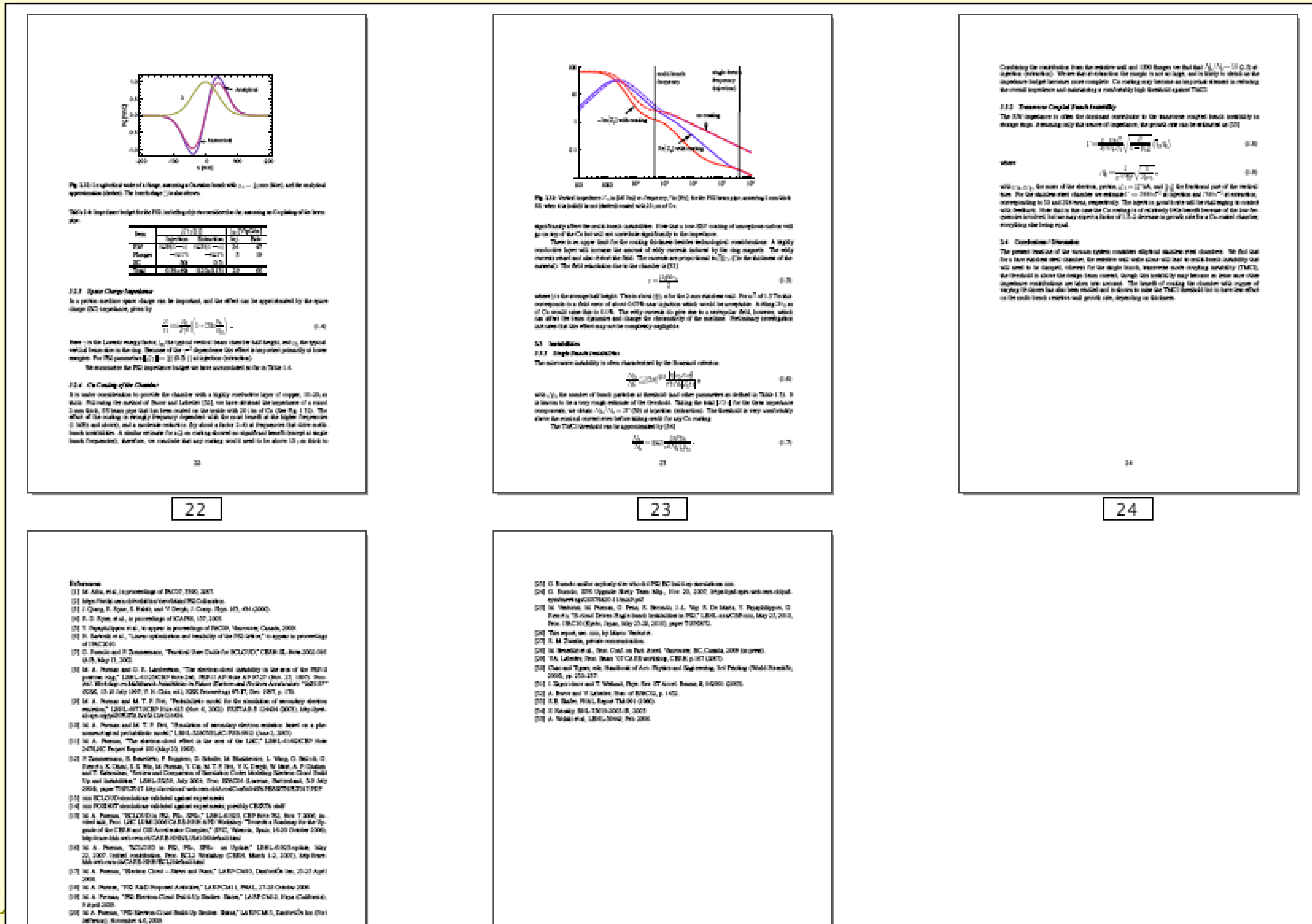
Beam stability and collective effects

1 Space Charge Effects

1.1 Introduction

1 2 3

… and last



Some Highlight Conclusions

- Space-Charge causes 5…6% emittance growth
  - LHC beam with nominal rf program
    - details of the rf program matter
  - 3μm emittance can be met @ 4×10^{11} ppb, but not with overly large margin
- Highest SEY tolerable for 25 ns (LHC nominal) beam ≈ 1.2
  - coatings and/or other mitigation likely necessary (and foreseen)
- Resistive wall will likely need transverse multibunch feedback system
  - but ≈10μm coating helpful against TMCI
  - unshielded ConFlat gaps unlikely to pose a significant problem

Remaining Scope

- Add Venturini's sec. on e-cloud effect on the beam
  - written, I have the pdf
- We'd like to expand some on the Impedance section
- Some sections still need a summary
- The chapter still needs a summary.
- Integration of whole chapter with the rest.
  - incl. consolidation of bibliography
- Expected effort is consistent with plan
  - but time phasing is slightly later

Follow-on work

- There is considerable interest in maintaining the collaboration for the space-charge work
  - PSB at 150 MeV injection with Linac 4
  - PS at 2 GeV injection from upgraded PSB
- Qiang (LBL) and Carli (CERN) working on the scope
  - study the emittance growth driven by the space-charge effects
  - study the particle losses and beam halo formation

PSB

An additional topic, we are interested in is a better understanding of the behavior of high brilliance beams experiencing significant direct space charge effects in the PS. The aim is to better understand limitations in the PS, which are a prerequisite to optimising an upgraded LHC injector chain. Furthermore, triggered by a proposal by Roland Garoby, we started discussions on RF gymnastics to increase beam brilliance by batch compression (after acceleration to an appropriate energy). I could well imagine very significant LARP contributions to the simulation and optimization of this process. (*C. Carli*)

Conclusion

- LARP Contributions to PS2 Design Report are mostly in hand
- Editing of the chapter is in progress
- The whole Report is making progress
  - but final completion may spill into 2011
- 4 Papers on PS2 topics presented at iPAC10.
- There is significant interest in continuing the space-charge work
  - likely with more direct LBL-CERN interaction