Report from LHC-CC09

3rd LHC Crab Cavity Workshop, jointly organized by CERN, EuCARD-ACCNET, US-LARP, KEK, & Daresbury Lab/Cockcroft Institute
CERN, 16-18 September 2009

Frank Zimmermann

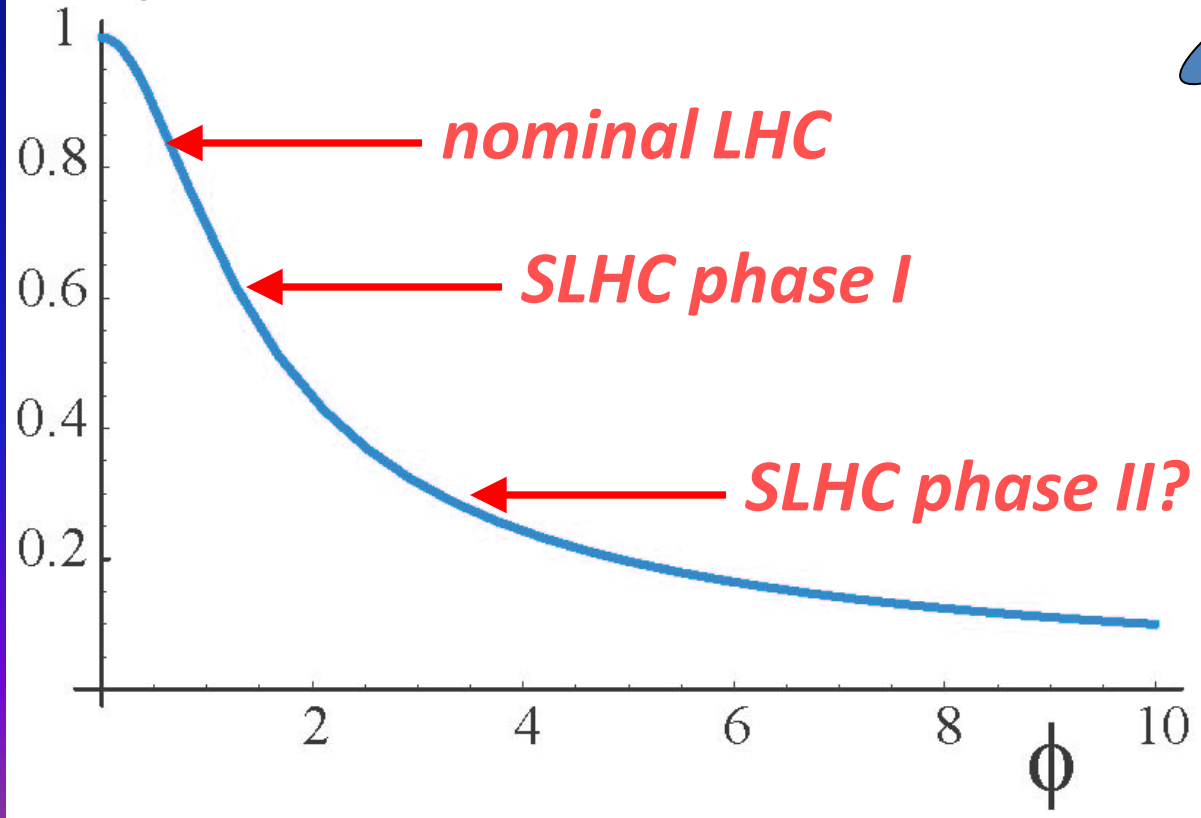
LCU Meeting
21 September 2009

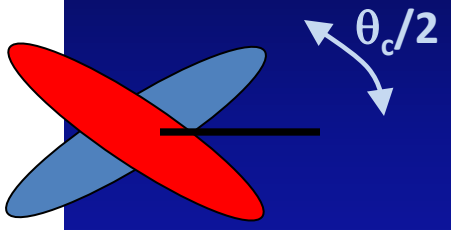
LHC crossing angle

$$R_\phi = \frac{1}{\sqrt{1+\phi^2}}; \quad \phi \equiv \frac{\theta_c \sigma_z}{2\sigma_x}$$

"Piwinski angle"

R_ϕ luminosity reduction factor





effective beam size $\sigma \rightarrow \sigma/R_\phi$

$\phi \sim 1/\beta^*$!

LHC-CC 09 workshop structure

Wednesday
Setting the scene
Layout, dynamics & potential
Cavity design
Cryomodule design

Thursday
Crab cavity integration
Cryomodule construction
Phase I, validation
Phase II, strategy

Friday
Planning & milestones
Down selection
Advisory board – closed session
Public close out

statistics & organization

- ~50 registered participants:

  ~25 CERN, 3 KEK, 4 CI/DL, 3 BNL, 1 SLAC, 2 FNAL, 1 Cornell, 1 JLAB, 1 INFN, 1 DESY,…
- 11+1 sessions, each w 30-60 min. discussion
- Advisory Board closed session

CC Advisory Board

1. Ilan Ben-Zvi, BNL
2. Georg Hoffstaetter, Cornell
3. Erk Jensen, CERN
4. Philippe Lebrun, CERN
5. D.K. Len, US-DOE
6. Steve Myers, CERN (**Chair**)
7. Marzio Nessi, CERN
8. Eric Prebys, LARP
9. Emmanuel Tsesmelis, CERN
10. Joel Butler, FNAL
11. Akira Yamamoto, KEK
12. Jean Delayen, JLAB

+ 3 excuses

LHC-CC09 Program Committee

1. Ralph Assmann (CERN)
2. Oliver Brüning (CERN)
3. Edmond Ciapala (CERN)
4. Paul Collier (CERN)
5. Jean Delayen (JLAB)
6. Wolfram Fischer (BNL)
7. Roland Garoby (CERN)
8. Kenji Hosayama (KEK)
9. Derun Li (LBL)
10. Peter McIntosh (DL/ASTec)
11. Katsunobu Oide (KEK)
12. Carlo Pagani (INFN)
13. Walter Scandale (CERN)
14. Andrei Seryi (SLAC)
15. Stefan Simrock (DESY)
16. Laurent Tavian (CERN)
17. Alessandro Variola (CNRS-IN2P3)

Thank You!

LHC-CC09 LOC

Rama Calaga
Jean-Pierre Koutchouk
Delphine Rivoiron (secretariat)
Rogelio Tomas
Joachim Tückmantel
Frank Zimmermann

CC-AB recommendations

- ✓ **KEKB success →"foolish" not to pursue crab cavities for LHC**
- ✓ **Demonstration experiments to focus on differences between electrons and protons** (e.g. effect of crab-cavity noise with beam-beam, impedance, beam loading) and on reliability & machine protection which are critical for LHC; beam test with (**KEKB?) crab cavity in another proton machine (SPS?)** useful and sufficient
- ✓ Future R&D focus: **compact cavities**
- ✓ **Modifications of Interaction Region 4** during the 2013/14 shutdown
- ✓ Crab cavity infrastructure **to be kept in mind for all other LHC upgrades**
- ✓ **Possible show-stopper: machine protection** - effect of cavity trip; another issue is **impedance**

possible LCU studies for CC

- IR4 anti-squeeze (started by Riccardo)
- effect of dispersion at crab cavity
- SPS crab-cavity experiments
- IR4 layout modifications, dogleg revision
- phase-II IR1&5 layouts with crab cavities
- global cavity scenario
- crab cavity specifications (inner & outer apertures, impedance)
- using crab cavities for off-momentum cleaning
- fractional tunes closer to integer, e.g. ~0.1

CC designs presented at LHC-CC09