

ECLLOUD'02: Welcome and Goals of the Workshop

WELCOME to ECLLOUD'02!

Mini-Workshop on Electron-Cloud **SIMULATIONS**

for Proton and Positron Beams

WORKSHOP \implies short presentations and a lot of **DISCUSSION**

In 1888 Henri-Lewis Le Chatelier, a French industrial chemist, made the following observation: ”Any change in one of the variables that determines the state of a system in equilibrium causes a shift in the position of equilibrium in a direction that tends to counteract the change in the variable under consideration.”

In our accelerators we try to accumulate more and more intense, positive beams. Nature reacts by the fast build-up of negative electron clouds that tend to neutralize the system.

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Beam induced multipacting, instabilities, and beam blow-up driven by the electron cloud are observed, e.g., with the LHC proton beam in the SPS, in the PS, at PEP-II and KEKB. Impact on beam diagnostics and, for LHC, the heat load on the cold bore are further concerns. For future linear collider damping rings or proton drivers the density of the electron cloud may be 10-100 times higher.

The electron cloud induces betatron tune shifts, tune spread, and transverse single and multi-bunch instabilities. Various theoretical and simulation approaches have addressed these possibilities. **The predictions are not always consistent.** Also a variety of simulation codes have been developed using different approximations and including different physics. Longitudinal effects and plasma phenomena have not yet been included in most of the analyses or simulations. Another unsolved question is the possibility of a ‘magnetron effect’.

This workshop is devoted to:

- Simulations of electron cloud build up, decay time, minimum size of clearing gap
- Effective transverse and longitudinal wake fields induced by the cloud
- Simulations and analytical treatments of transverse instabilities driven by the electrons
- Coherent tune shift and incoherent tune spread
- Simulations of possible cures or remedies
- Plasma approaches to the electron-cloud problem
- Synergies between electron cloud, regular impedance, space charge and/or beam-beam interaction

The following goals should guide the workshop:

- **Benchmark simulations against beam observations and against each other**
- Determine which simulation approaches best represent reality
- Document the present understanding and determine the important open questions
- Develop a programme for future research and development
- **Strengthen and expand international collaborations for this work**

- I. **Experimental Observations at Existing Accelerators and Concerns for Future Machines** (Monday morning, chair: R. Macek, secretary: G. Arduini)
- II. **Further Observations, Laboratory Measurements, and Modelling** (Monday afternoon, chair: O. Gröbner, secretary: M. Jimenez)
- III. **Simulations of Electron-Cloud Build-Up** (Tuesday morning, chair: M. Furman, secretary: G. Rumolo)
- IV. **Simulations of Electron-Cloud Instabilities** (Tuesday afternoon, chair: T. Raubenheimer, secretary: F. Zimmermann)
- V. **Specific Comparisons and Plasma Approaches** (Wednesday morning, chair: T. Katsouleas, secretary: R. Assmann)
- VI. **Discussions of Future Studies, Collaborations, and Possible Solutions** (Wednesday afternoon, chair: W. Chou, secretary: O. Brüning)
- VII. **Summary Talks** (Thursday morning, chair: S. Myers, secretary: F. Ruggiero)

We encourage the participants to submit their contributions for publication in a special Conference Edition of [Physical Review Special Topics–Accelerators and Beams](#).

A complete collection of papers presented at the workshop will be edited by G. Rumolo and F. Zimmermann, posted on the workshop WWW site and published as a CERN report without any further review and will be distributed to all participants shortly after the workshop.

**DEADLINE FOR CONTRIBUTIONS TO THE PROCEEDINGS:
END OF APRIL 2002.**

SESSION I: Experimental Observations

at Existing Accelerators and Concerns for Future Machines

Chairman: R. Macek, Scientific Secretary: G. Arduini

MONDAY 15 APRIL

08:45-13:00

Welcome and Goals of the Workshop

F. Ruggiero

08:45-09:00

Electron Cloud Effects at KEKB

H. Fukuma

09:00-09:30

Electron Cloud Effects at PEP-II

F.-J. Decker

09:30-10:00

Electron-Cloud Instability in the SPS

K. Cornelis

10:00-10:30

COFFEE BREAK

10:30-11:00

Electron-Cloud Observations in the SPS

M. Jimenez

11:00-11:30

E-Cloud Effects in High-Intensity Proton Machines

J. Wei

11:30-12:00

Electron Cloud in Linear Collider Damping Rings

A. Wolski

12:00-12:30

Electron Cloud in the LHC

F. Zimmermann

12:30-13:00

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Monday morning

E-CLOUD'02, 15-18 April 2002

SESSION II: Further Observations, Lab Meas, and Modelling

Chairman: O. Gröbner, Scientific Secretary: M. Jimenez

MONDAY 15 APRIL

14:00-18:30

E-Cloud build-up and related instability in the CERN PS	E. Metral	14:00-14:20
New Observations of the E-Cloud at the Los Alamos PSR	R. Macek	14:20-14:40
Electron cloud simulations and measurements for RHIC	W. Fischer	14:40-15:00
Simulations of E-Cloud Build-up and Saturation in the APS	K. Harkay	15:00-15:20
Microscopic phenomenological model of SE and applications	M. Furman	15:20-15:40

COFFEE BREAK

15:45-16:15

The variation of the SEE with surface modifications	N. Hilleret	16:20-16:50
SPS e-cloud heat load meas with WAMPAC and simulation	V. Baglin	16:50-17:10
PE from LHC vac chamber materials: e^- en distr curves	R. Cimino	17:10-17:30
An. of e^- stim EE spectra from LHC beam screen material	I.R. Collins	17:30-17:50
DISCUSSION		17:50-18:30

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Monday afternoon

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SESSION III: Simulations of Electron-Cloud Build-Up

Chairman: M. Furman, Scientific Secretary: G. Rumolo

TUESDAY 16 APRIL

09:00-13

Adiabatic theory of e^- oscill. and appl. to SIS-100/200

P. Zenkevich

09:00-09

E-Cloud Simulations: Build Up and Related Effects

F. Zimmermann

09:20-09

3D Particle in Cell Program for Electron Cloud

L. Wang

09:40-10

DISCUSSION

10:00-10

COFFEE BREAK

10:30-11

A Sim. Study of E-Cloud in the Exp Regions of the LHC

A. Rossi

11:00-11

Qualitative Analysis of the e-Cloud Formation

S. Heifets

11:20-11

E-Cloud Updtd Sim. Results for PSR, SNS, and NLC DR

M. Pivi

11:40-12

DISCUSSION

12:00-13

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Tuesday morning

E-CLOUD'02, 15-18 April 2002

SESSION IV: Simulation of Electron-Cloud Instabilities

Chairman: T. Raubenheimer, Scientific Secretary: F. Zimmermann

TUESDAY 16 APRIL

14:00-18:30

Emit. Growth due E-Cloud in e^+ Ring

Y. Cai

14:00-14:20

E-Cloud Beam Instabilities & Wakes

G. Rumolo

14:20-14:40

ep Instability in High Intensity p Ring

T. Toyama

14:40-15:00

Head-Tail Instability Caused by E-Cloud

E. Perevedentsev

15:00-15:20

Wake Field of E-Cloud and PEP-II Upgrade

S. Heifets

15:20-15:45

COFFEE BREAK

15:45-16:20

E-Cloud in the PSR and SNS

M. Blaskiewicz

16:20-16:40

E-Cloud and Bunch Oscillations in KEKB LER

S.S. Win

16:40-17:00

E-Cloud Effect in JLC Damping Ring

K. Ohmi

17:00-17:20

Effect of σ_z , ξ , κ on E-Cloud TMCI Inst.

E. Metral

17:20-17:40

Discussion

17:40-18:30

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Tuesday afternoon

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SESSION V: Specific Comparisons and Plasma Approaches

Chairman: T. Katsouleas, Scientific Secretary: R. Assmann

WEDNESDAY 17 APRIL

9:0

Build-Up and Instability: Comparisons for CERN PS

G. Rumolo

9:

Complex Phenomena: Beam-Beam and E-Cloud

K. Ohmi

9:

Simulation of ECI for BEPC and BEPCII

J. Xing

9:4

Plasma modelling of Collective Wakes in E-Clouds

T. Katsouleas

10:0

COFFEE BREAK

10:3

Transparency of the E-Cloud to Synchr. Radiation

D. Kaltchev

11:0

Kinetic Theory of Periodic Holes in Debunched Beams

H. Schamel

11:2

E-Cloud in Intense Ion Linacs, Theory & Exp. Planning for HIF

M. Furman

11:4

DISCUSSION

12:0

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Wednesday morning

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SESSION VI: Discussion of Future Studies, Collaborations, and Possible Solutions

Chairman: W. Chou, Scientific Secretary: O. Bruning

WEDNESDAY 17 APRIL

14:00-18:30

Possible Cures to the E-Cloud Problem

R. Macek

14:00-14:30

Driving the E-Cloud Instability by E-Cooler

G. Rumolo

14:30-14:50

RF Test Benches for E-Cloud Studies

U. Iriso Ariz

14:50-15:10

‘Stealth’ Clearing Electrodes

F. Caspers and A. Poncet

15:10-15:30

Future E-Cloud Studies at CERN

F. Ruggiero

15:30-15:45

COFFEE BREAK

15:45-16:20

DISCUSSION

16:20-18:30

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Wednesday afternoon

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SESSION VII: Summary Talks by Chairmen

Chairman: S. Myers, Scientific Secretary: F. Ruggiero

THURSDAY 18 APRIL 9:00-12:30

Summary Session I R. Macek 9:00-9:30

Summary Session II O. Grobner 9:30-10:00

Summary Session III M. Furman 10:00-10:30

COFFEE BREAK 10:30-11:00

Summary Session IV A. Wolski 11:00-11:30

Summary Session V R. Assmann 11:30-12:00

Summary Session VI W. Chou 12:00-12:30

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Thursday morning

E-CLOUD'02, 15-18 April 2002