Damping Rings Area System Summary

Andy Wolski

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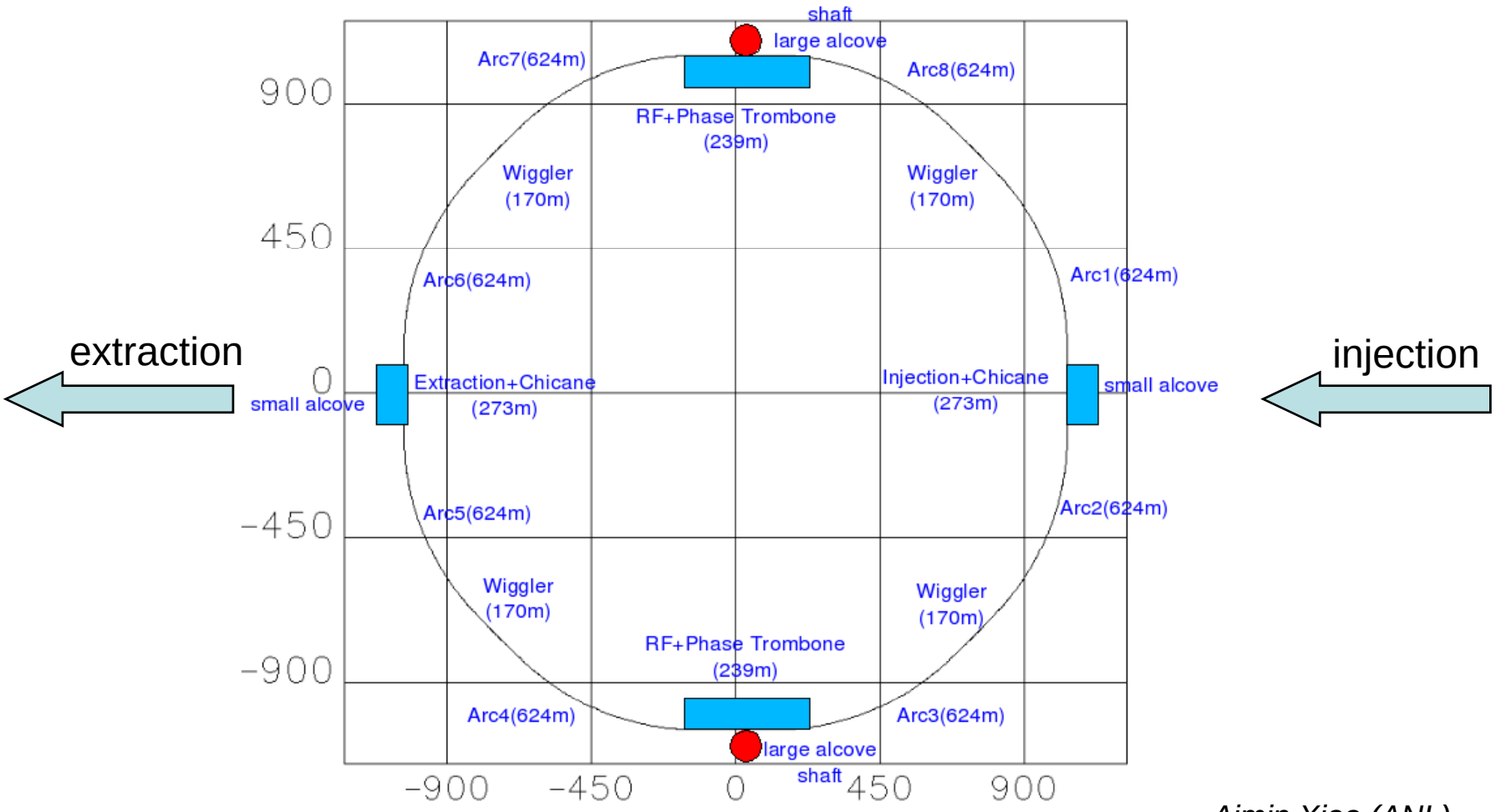
Latest “baseline” lattice: OCS8

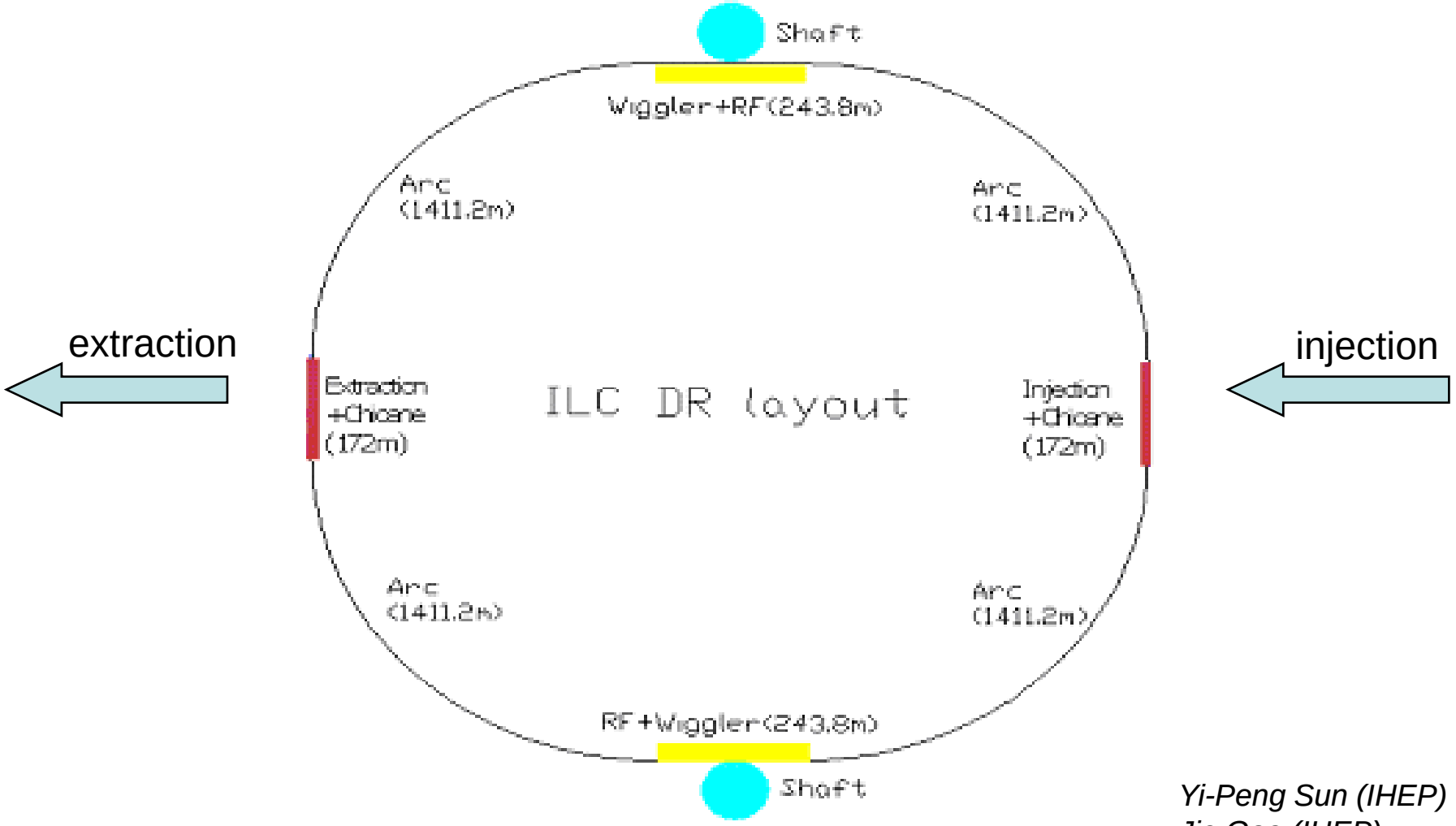


Aimin Xiao (ANL)
Louis Emery (ANL)

Latest “baseline” lattice: OCS8

- Modifications since RDR lattice (OCS6):
  - **Circumference adjusted to 6476.4395 m (h = 14042)**
  - **Injection and extraction on opposite sides of the ring**
  - **Modified injection/extraction optics to “lump” fast kickers (stacking may also be possible…)**
  - **Separated RF from wiggler sections**
  - **Includes circumference adjustment chicane (±7.5 mm)**
  - **Includes phase trombone for tune adjustments**
- Still to be completed:
  - **Optimisation of injection/extraction systems, to ease specifications on septum, and confirm capability for stacking**
  - **Design of injection/extraction lines to match new optics**
  - **Optimisation of dynamic aperture**

Possible “alternative” FODO lattice



Yi-Peng Sun (IHEP)
Jie Gao (IHEP)

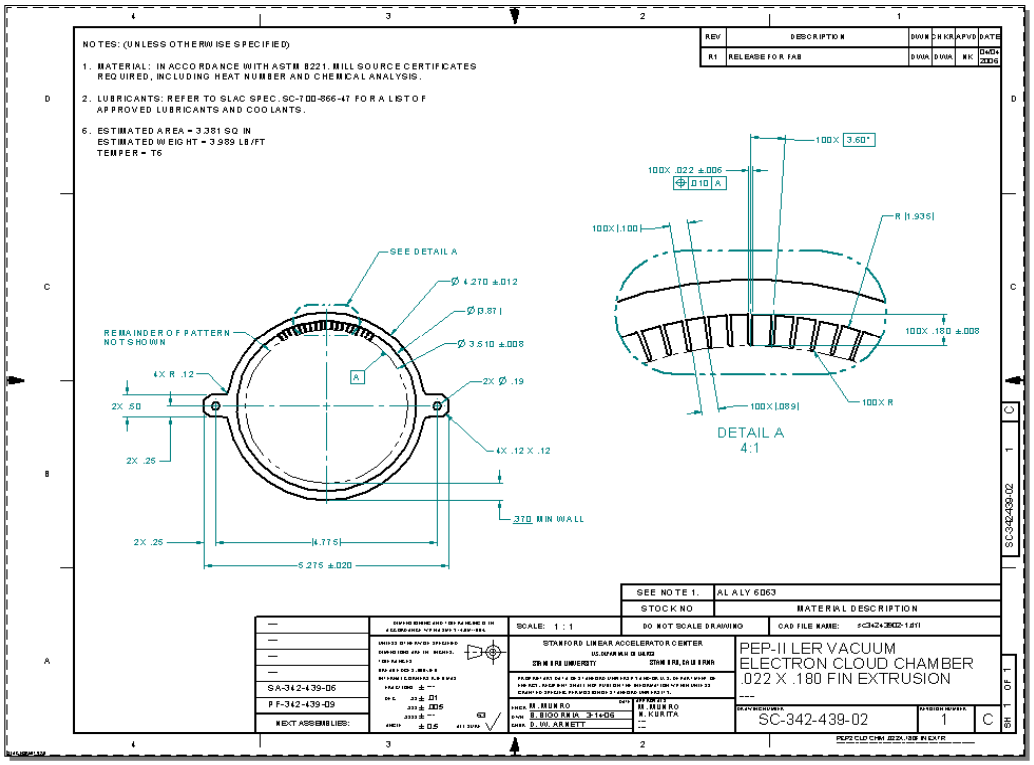
Possible “alternative” FODO lattice

- Potential advantages of the FODO alternative include:
  - **improved flexibility, from the ability to vary the momentum compaction factor (can play off bunch length against instability thresholds);**
  - **improved performance, from increased dynamic aperture;**
  - **reduced cost, from reduced number of magnets.**
- The OCS8 lattice is more mature, and the engineering design studies are more likely to proceed smoothly if based on this lattice.
- A systematic comparison is needed to decide whether the potential benefits of the FODO lattice could be realised in practice.
- Comparative studies of the OCS8 and FODO lattice are planned, and a decision on the lattice will be made by the end of 2007.

Progress with electron cloud R&D

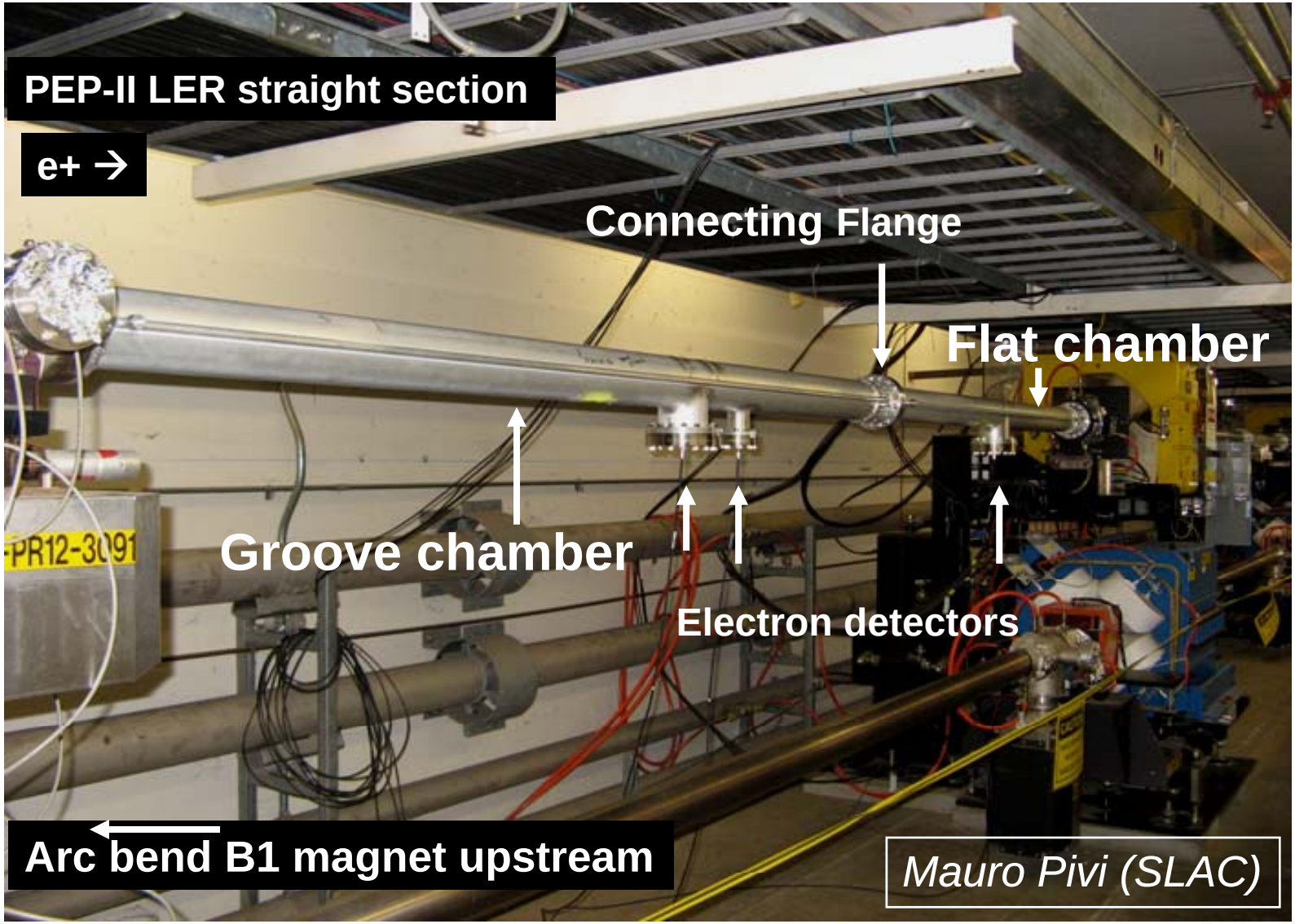
- The goals of the electron cloud R&D are:
  - **to determine with confidence the maximum tolerable cloud density in the positron damping ring;**
  - **to develop practical mitigation techniques that will keep the cloud density below the maximum tolerable density, without significant adverse side-effects.**
- Experimental studies to support ILC R&D are planned or in progress at:
  - **SLAC (PEP-II LER experiments now yielding data);**
  - **Cornell (plans for CesrTA);**
  - **Frascati (hopes to do some studies in DAΦNE);**
  - **KEK (discussions for studies in KEK-B).**

Electron cloud studies for ILC in PEP-II

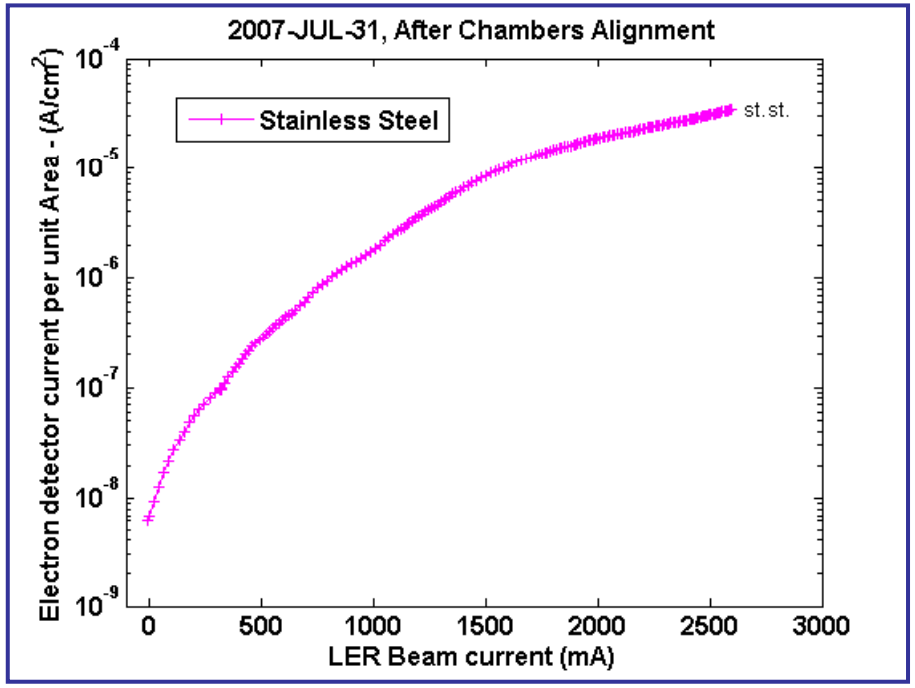


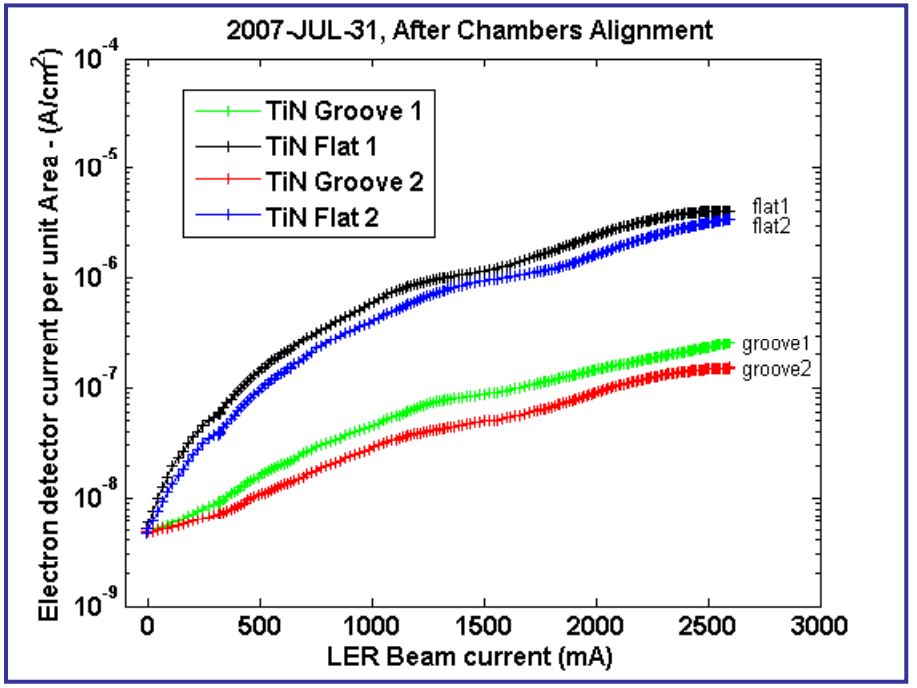
- Instrumented chambers have been manufactured and installed in a straight section in PEP-II LER.
  - **stainless steel, coated with titanium nitride**
  - **two chambers with flat surface; two with grooves**

Electron cloud studies for ILC in PEP-II



Electron cloud studies for ILC in PEP-II





Mauro Pivi (SLAC)

- Electron current at wall in flat, coated chamber reduced by roughly an order of magnitude compared to uncoated chamber.
- Electron current at wall in grooved, coated chamber reduced by roughly an order of magnitude compared to flat, coated chamber.

CesrTA

- It is hoped that CESR will be developed for experimental studies of electron cloud, to produce results on the timescale of the EDR.
- The goals include:
  - **studies of dynamical effects in a parameter regime (beam energy, bunch charge and dimensions) close to that of the ILC damping rings;**
  - **development and demonstration of practical mitigation techniques in strong-field regions (particularly, within the damping wigglers).**
- CesrTA would provide our best opportunity for achieving the goals of the electron cloud R&D for the ILC damping rings.

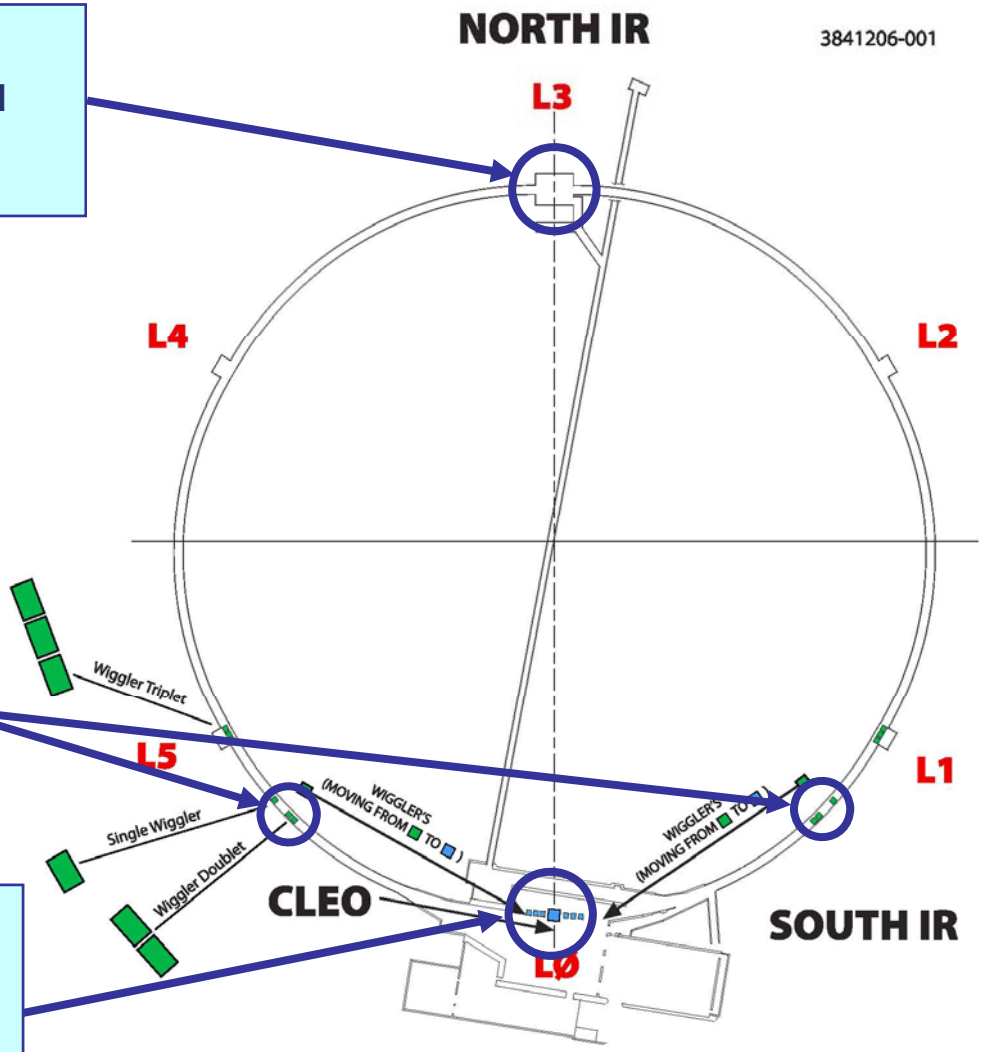
CesrTA

L3 Straight
Instrument large bore quadrupoles and adjacent drifts

Pressure bump capabilities planned for each instrumented region
Impact on ECE and FII

Arcs where wigglers removed
Instrumented dipoles and adjacent drifts

L0 Straight
Instrumented wiggler straight and adjacent sections



Mark Palmer et al (Cornell)

Development of Plans for the EDR

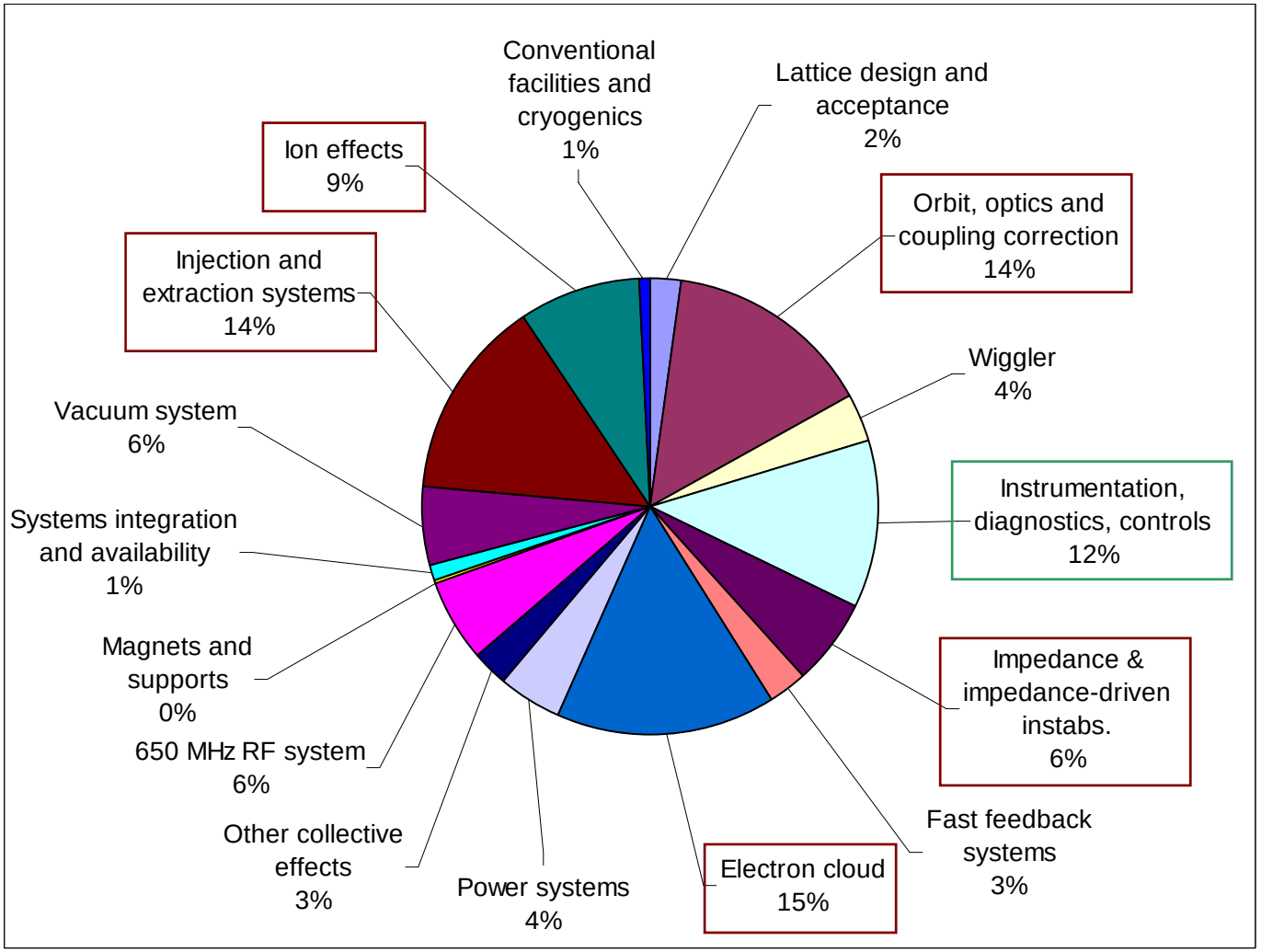
3 June 2007 (LCWS07)	Zeroth-order plan, including tentative work packages, tasks and deliverables.
16 August 2007	Call for Expressions of Interest in damping rings WPs.
9 October 2007	WebEx meeting held to discuss Expressions of Interest; Work Package Managers proposed.
18 October 2007	WP descriptions prepared and submitted to PMO.
23 October 2007 (GDE FNAL)	Selected Work Packages reviewed. The way forward discussed.
24 October 2007	Work Package Managers asked to provide descriptions of deliverables (see later slides).
Nov - Dec 2007	Review of planned deliverables, resources and schedule. Development of complete, consistent plan for EDR. *Comparison of OCS8 and FODO lattices.*
18-20 Dec 2007	**Damping Rings R&D Workshop, KEK.** (Ecloud; Kickers; Impedance) ***Baseline EDR lattice officially "released".*** **Launch of implementation phase.**

Damping Rings Work Packages

The following work packages are proposed for the damping rings engineering design phase:

WP#	WP Title	Proposed WP Leader
1	Lattice design and acceptance	Louis Emery
2	Orbit, optics and coupling correction	David Rubin
3	Wiggler	Mark Palmer
4	Instrumentation, diagnostics, controls	Manfred Wendt/Margaret Votava
5	Impedance & impedance-driven instabs.	Gennady Stupakov/Cho Ng
6	Fast feedback systems	John Fox
7	Electron cloud	Mauro Pivi
8	Power systems	Paul Bellomo
9	Other collective effects	Marco Venturini
10	650 MHz RF system	Derun Li
11	Magnets and supports	Steve Marks
12	Systems integration and availability	Andy Wolski
13	Vacuum system	Oleg Malyshev
14	Injection and extraction systems	Susanna Guiducci
15	Ion effects	Junji Urakawa
16	Conventional facilities and cryogenics	Tom Lackowski/Alan Jackson

Distribution of Effort (from EOI's)



Very high priority R&D topics

Experimental program support

15 Institutions Returned DR EOI's

WP Title	ANL	Cornell	FNAL	SLAC	LBNL	LANL	LLNL	UIUC	UM	CI	DESY	LNF	KEK	IHEP	KNU
Lattice design and acceptance	X	X			X				??			X		X	X
Orbit, optics and coupling correction	X	X		X	X				??	X		X	X		
Wiggler		X			X										
Instrumentation, diagnostics, controls		X	X		X								X	X	
Impedance & impedance-driven instabs.	X			X	X					X			X	X	
Fast feedback systems				X	X							X			
Electron cloud	X	X	X	X	X	??						X		X	X
Power systems		X		X											
Other collective effects		X	X	X	X							X		X	
650 MHz RF system		X		X	X										
Magnets and supports					X									X	
Systems integration and availability										??					
Vacuum system				X	X					X		X		X	
Injection and extraction systems		X	??	X	X		X	X				X	X		
Ion effects		X		X	X						X		X	X	X
Conventional facilities and cryogenics	X		X		X										

X Expression of Interest

Work Package Manager

Specifying the Deliverables

- Each Work Package Manager must specify a set of deliverables for their work package.
  - **The WP Manager must have ownership of the deliverables in his/her WP.**
  - **The WP Manager will be responsible for the completion of these deliverables by a specified date.**
- Deliverables will be of two types (though may not be formally distinguished):
  - **Providing some input for another work package, for example:**
    - specification of electron cloud mitigation techniques (WP7) to allow vacuum system design to be “finalised” (WP13);
    - technical design of a vacuum chamber component (from WP13) to allow impedance model to be developed (by WP5);
    - specification of alignment tolerances and stability (WP2) to support technical design of magnet girders/stands (WP11).
  - **Providing a contribution to the Engineering Design Report**
    - technical specifications/designs/costs (e.g. of magnets -- WP11; or vacuum system -- WP13);
    - evidence of ability to meet damping rings performance specifications (e.g. acceptance -- WP1; or orbit stability and low-emittance tuning -- WP2).
- Deliverables will be guided by the overall goals for the EDR, but will depend on the resources available: we must be realistic!

Managing the Interfaces will be Critical

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Lattice design and acceptance	1		op	ip		op	op	op		op	ip	io	io	op	io	op	op
Orbit, optics and coupling correction	2	ip			io							io	io				
Damping wiggler design	3	op						io	op				io	io			op
Instrumentation, diagnostics and controls	4		io										io	io			
Impedance and impedance-driven instabilities	5	ip					op				ip			ip	ip		
Fast Instability Control Feedback	6	ip				ip					ip			ip	ip		
Electron cloud	7	ip		io										io			
Power systems	8			ip								io	io				op
Other collective effects	9	ip															
650 MHz SRF cavity design	10	op				op	op						io				op
Magnets and supports	11	io	io						io				io	io	io		op
Systems integration and availability	12	io	io	io	io				io		io	io		io	io		io
Vacuum system	13	ip		io	io	op	op	io				io	io		io	io	op
Injection and extraction systems	14	io				op	op					io	io	io			
Ion effects	15	ip												io			
Conventional facilities and cryogenics	16	ip		ip					ip		ip	ip	io	ip			

ip: requires input from
op: provides output for
io: requires input from and provides output for

In an ideal world, the inputs and outputs are so clearly defined that the necessary exchange of information happens with complete reliability by direct communication between Work Package Managers, without any need for (intervention by) the Area System Manager.

Defining the Deliverables

- The proposed WP Managers have been asked to provide a list of deliverables for their work package.
- For each deliverable, there should be:
  - **a brief description (i.e. one or two sentences saying what the deliverable consists of);**
  - **whether the deliverable is an input for another work package, or is an "ultimate" deliverable for the Engineering Design Report;**
  - **a date by which the deliverable should be achieved;**
  - **the names of people responsible for doing the work for the deliverable (or a statement that the people are not yet identified), and their expected level of effort;**
  - **the information input required to achieve the deliverable, together with the work package that should be responsible for providing the information, and the date the information will be needed.**
- The specifications of the deliverables will be collated, and a complete, consistent plan developed through a series of WebEx meetings between WP Managers
  - **"consistency" means that all the inputs and outputs match between the various Work Packages.**

Launching the Implementation Phase

Once we have a complete, consistent set of deliverables, everyone should know what they have to do…

Space shuttle "Discovery" on its way to space with the Hubble Space Telescope.