Some Thoughts on WBS for ILC Damping Ring Collective Effect Studies

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Goals and Requirements

The collective effect studies are necessary to provide beams stable in all three directions and to preserve beam quality in terms of emittance, energy spread, bunch length and shape etc. In addition, damage of vacuum components due to high circulating current should be avoided.

Much work has been done during the TDR phase. However, now the collective effects should be evaluated for the damping rings with the updated beam optics that aims at the horizontal emittance reduction and at improving luminosity of ILC250. The studies should take into account new technologies and novel design solutions developed after TDR preparation and experience gained during the recent years.

WP13 (Technical Preparation Document)
Most critical issues, MEXT's ILC Advisory Panel suggestions

System Coordinator	(Area Systems)	Items	Deliverables	Resource
Representative of WP-13	WP-13	Ion trapping and fast ion instability	Performance specification	TP-WP13
		Electron cloud instability	Performance specification	TP-WP13
		Fast feedback system design	System design; costing	TP-WP13
		Fast feedback system test	Performance specification	TP-WP13
		Vacuum chamber to reduce SEY in the positron DR	Performance specification	TP-WP13

EDR Oriented Work
(Important but less critical)

1. Impedance related effects and instabilities
2. Space charge effects
3. Intrabeam scattering
4. Transient beam loading
5. other

Other issues (?)

1. Longitudinal bunch-by-bunch feedback
2. Fast orbit feedback
3. Other

Impedance related effects and instabilities

Single bunch instabilities and effects

a) Bunch lengthening and microwave instability in the longitudinal plane
b) The turbulent mode coupling instability (TMCI) in the transverse plane

Multibunch instabilities and effects

a) Resistive wall instability
b) Instabilities due to beam interaction with higher order modes (HOM) trapped in the vacuum chamber componens, both transverse and longitudinal
c) Shift of betatron frequencies due to quadrupolar resistive wall wake fields
d) Transient beam loading effects of non-uniform beam pattern/gaps
e) Overheating of the vacuum chamber components/hardware

Possible deliverables: DR impedance model, design specification of the low impedance vacuum chamber components, performance specification

WBS: work item oriented versus work package oriented

(A) Workpackage oriented

Damping Rings

System cordinator (Area systems)		Items	Deliverables	Resource
Group Leader	Optics design System design Beam dynamics Beam tuning System integration	DR straight section optics design (for WP-14)	Beam optics design	EDR
		System design of the beam diagnostics	Beam optics design	EDR
		ILC lattice integration	Beam optics design	EDR
		Small emittance tuning	Performance specification	EDR
		Tolerance evaluation for each device	Performance specification	EDR
		Space charge effects	Performance specification	EDR
		Impedance driven instability	Performance specification	EDR
		Tune shift by quadrupole wake for E-driver PS	Performance specification	EDR
		Integration of the hardware components in DR	Component counts; costing; power, cooling water estimation	EDR
		Contact part with ADI for the beam optics issues	Beam optics design	EDR
		Contact part with ADI for the beam dynamics and tuning	Performance specification	EDR
Representative for WP-12	WP-12	DR coil design, based on present ILC optics (WP-12)	Beam optics design	TP-WP12
		DR coil design (further small emittance) (WP-12)	Beam optics design	TP-WP12
		Dynamic aperture survey (WP-12)	Beam optics design; Performance specification	TP-WP12
		SC wiggler magnets (WP-12)	Component design; costing; power, cooling water	TP-WP12
		Design of PM (WP-12)	Component design; costing; power, cooling water	TP-WP12
		PM prototyping (WP-12)	Performance specification	TP-WP12
		NC magnets (WP-12)	Component design; costing; power, cooling water	TP-WP12
Representative for WP-13	WP-13	Ion trapping and fast ion instability (WP-13)	Performance specification	TP-WP13
		Electron cloud instability (WP-13)	Performance specification	TP-WP13
		Fast FB system design (WP-13)	System design; costing	TP-WP13
		Fast FB test (WP-13)	Performance specification	TP-WP13
		Vacuum chambers to reduce SEY for positrin DR (WP-13)	Performance specification	TP-WP13

I am strongly in favor of the Work Oriented WBS. The Work Package oriented WBS seems to be a bit artificial since the people studying the collective effects (often the same) are separated in two different groups

Proposed Work Oriented WBS

System coordinator	Area systems	Item	Deliverables	Resource
Representative of WP13, Group Leader	WP13 Beam Dynamics	Ion trapping and fast ion instability	Performance specification	TP-WP13
		Electron cloud instability	Performance specification	TP-WP13
		Fast feedback system design	System design; coasting	TP-WP13
		Fast feedback system test	Performance specification	TP-WP13
		Vaccum chamber to reduce SEY in positron DR	Design specificaion	TP-WP13
		Impedance related effects and instabilities	DR impedance model; design of low impedance components; performance specification	EDR
		Space charge effects	Performance specification	EDR
		Intrabeam scattering	Performance specification	EDR
		Transient beam loading	Perfomance specification	EDR

Collaboration and intercommunication with WPs and Technical Area systems