

WG3a Sources Summary Update

Jim Clarke

on behalf of

John Sheppard, Masao Kuriki, Philippe Piot
and all the contributors to WG3a

Joint Session WG3a/3b

- Acceptance for DR increased
 - Larger physical aperture because assume SC wigglers instead of PM
- Beam Losses in DR
 - 1% = 3.6 kW
 - Suggested tolerable loss of 10 to 100 W/m
- Stacking in DR requiring large energy acceptance major concern
 - present compton stacking scheme needs to be revised

ILC Source Requirements:

All 3 Proposals Meet Design Intensity Specs;
Conv. Needs Replacement for Polarization

Parameter	Symbol	Value	Units
Particles per bunch	n_b	$2 \times 10^{10} (1 \times 10^{10})^\dagger$	e^+
Bunches per pulse	N_b	2820 (5600) [†]	number
Bunch Spacing	T_b	$\sim 300 (\sim 150)^\dagger$	ns
Pulse Repetition Rate	f_{rep}	5	Hz
Energy	E_0	5	GeV
DR Transverse Acceptance	$A=2J$	0.09	m-rad
DR Energy Acceptance	$\Delta E/E$	1	%,FW
Overhead Factor	Fc	1.5	number
Positron Polarization (option)	P_p	~ 60	%

[†]Lo Q Parameter

Layouts

- Undulator
 - needs keep alive source for independent commissioning and high availability (GG3 study)
 - (For fair comparison of costs look at non-Polarised e^+ then changes needed for Polarised e^+)
- Conv
 - needs polarization upgrade scheme
- Compton
 - Could be its own keep alive source (needs to be designed in)

Polarization Scenarios

- Conv –to- Compton
- Conv –to- Undulator
- Undulator –to- More Undulator
- Compton
- Undulator

Operations & Availability

Topic	Conv.	Und.	Compton
GG3 study	80%	78% (with keep alive source)	Not yet assessed

Details in last Fridays GG3 summary

COST

- Quick assessment made by WG3a + experience from US & TESLA
- Conventional similar to undulator scheme
- Compton more expensive ?

Risks & Concerns

ITEM	Conventional	Undulator	Compton	Comment
L-band warm structure 1ms operation	1	1	1	It is likely to be safe according to the calculation.
Target thermal damage	1	0	0	It can be relieved by multi-targets.
Target radiation damage	0	1	0	It can be controlled by periodic maintenance.
Thermal load to the capture section	1	0	0	75kW/m acceptable?
Damage or failure by fast ion instability in the undulator.	0	1	0	Estimates look ok but more investigation needed
Field quality of helical undulator	0	1	0	Helical prototype. Can be solved with the planar undulator.
Positron Stacking in DR	0	0	2	Need investigation
e beam stability in Compton Ring	0	0	2	Need investigation
Vacuum pumping	0	1	0	Needs vacuum specification to check if problem
Stability of integration of optical cavities	0	0	2	It is going to be demonstrated experimentally with 2 cavities.
Mechanical failure on the rotation target	2	1	0	Need investigation/demonstration
Kicker difficulty	1	1	0	Undulator scheme need special care for the injection kicker.

Margins

Topic	Conv.	Und.	Compton
DR acceptance	Small margin	High margin	?
Target Safety factor	At fatigue & speed limit	Half fatigue limit	Ok
Intensity	spec x1.5	spec x1.5 to 4.5	Spec x1 at present ?
Beam size on target	Yield x0.5 if spot x2	insensitive	insensitive