

ILC-Asia-2005-03(J)  
April 18, 2005  
Review, Status, Design

## **WG1 (Overall Design) Status**

Presentation at the KEK LC Committee Meeting on April 18, 2005

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# ILC-WG1 状況報告

2005年4月18日 久保浄

### ( 1 ) Parameter

“Suggested ILC Beam Parameter Range” : International WG1 conveners + WGCC (Working Group Coordinating Committee) より発表。

今後の検討、議論に応じて随時修正。

各sub-systemはこのパラメーターが実現可能になるように設計。

各WGの活動がこれと整合して進められるよう、説明、情報交換。

### ( 2 ) 施設関係の検討

施設(Conventional Facility)は、国際的にはWG1の守備範囲であるが、KEKでは別に独立の検討グループが以前から存在しており、具体的な検討はそちらで行う。

### ( 3 ) 全体設計上の重要な検討項目

陽電子源の方式、ダンピングリングの長さはWG3、

主トンネルの数はWG2と施設検討G、で具体的な検討。

国内のグループの検討が国際的な全体設計上の課題と整合性を保てるよう情報交換に努めていく。

#### ( 4 ) 日本以外のアジアとの協力

1月のIHEP、PAL訪問以降、ILC-Asia (KEK、IHEP、PAL) TV meeting (はじめの3回はILC-Asia WG1 meeting) を5回。KEKの状況を報告し可能な共同研究を提案(要請)。ATF2での協力などが進行中(WG4)。

#### ( 5 ) ビームダイナミクス

国際的なILC beam dynamics groupの中で貢献できるよう。主ライナックのシミュレーションによる検討は進行中。

\*\*\* 多くの仕事は、WG1独自で進める課題でなく、他のグループとの協力。

# Suggested ILC Parameter Range

By International WG1 convener  
+ Working Group Coordinating Committee

Sub-system should be designed for this parameter range.

Will be updated.

Web Discussion Board was set up.

# *Luminosity*

Required integrated luminosity:

500 fb<sup>-1</sup> at 500 GeV in 1<sup>st</sup> 4 years of physics run.  
(after one year of commissioning run)

→ Design Luminosity:

2.0E34 /cm<sup>2</sup>/s at 500 GeV

# *Gradient*

- 30, 35, 40 MV/m are considered.
- 30 MV/m is chosen for the parameter sets.  
Should be reviewed in the future.  
No big impact to other beam parameters.

# *RF source*

- Klystron  
10 MW, 1.5 ms, (5 Hz)
- Number of Cavities/klystron depends on gradient  
(16, 20 or 24)

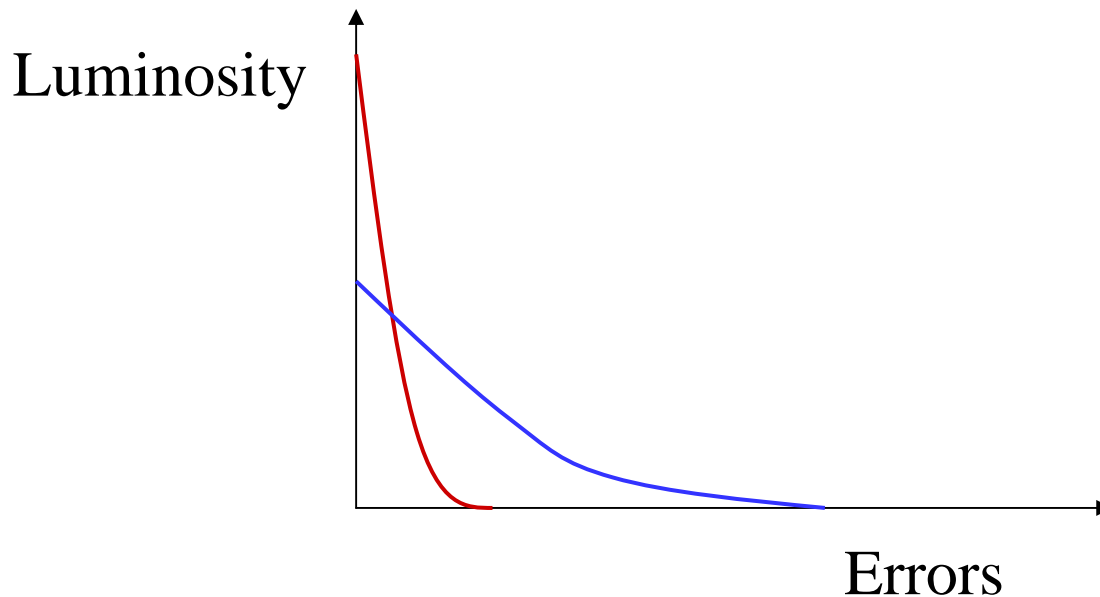


# *Energy upgrade*

- Require no modification of injectors.
- Assume the same gradient.  
If higher gradient is available, higher energy (than 1 TeV) will be possible.

# Why Beam Parameter “Range”

- Parameters for high luminosity without errors, luminosity tends to decrease rapidly with errors.
  - It may be better to choose parameters less sensitive to errors, even if they have lower luminosity without errors.
  - It is impossible to know exact errors.
- Design should allow us to try various (broad) parameters.



# Suggested Parameter sets

- Nominal
- Low Q (half charge/bunch)  
Double bunches/pulse, smaller beam size (x,y,z)  
**Relax space charge in DR, wakefield in ML, IP disruption.**
- Large Y (large vertical beam size at IP)  
Smaller horizontal size  
**Allow larger vertical emittance.**
- Low P (less bunches/pulse)  
Smaller beam size  
**Relax limitation of beam power, DR bunch spacing.**

All sets have similar luminosity ( $2E34$  /cm<sup>2</sup>/s)

- High Luminosity  
Combine most difficult parameters for high luminosity

## Parameters (selected) for 500 GeV Ecm

	Nominal	Low Q	Large Y	Low P
N/bunch	2E10	1E10	2E10	2E10
Nb/pulse	2820	5640	2820	1330
Tsep(ns)	307.7	153.8	307.7	461.5
I_b (mA)	10.4	10.4	10.4	6.9
$\gamma\epsilon_y$ (E-4m)	4.0	3.0	8.0	3.5
$\beta^*x$ (mm)	20	12	10	10
$\beta^*y$ (mm)	0.4	0.2	0.4	0.2
$\sigma_x$ (nm)	655	495	495	452
$\sigma_y$ (nm)	5.7	3.5	8.1	3.8
$\sigma_z$ (mm)	0.3	0.15	0.5	0.2
Dy	18.5	10.0	28.6	27.0
$\delta B$	0.022	0.018	0.024	0.057

# *Major Impacts to Sub-System*

- Damping Ring

“Low Q” need twice bunches/pulse.

Half N/bunch, total charge/pulse is the same.

Bunch spacing in the rings should be half.

Short rise-fall time of kickers is required.

- Bunch Compressors

Bunch length should be flexible (0.15 ~ 0.5 mm).

- BDS

“Low Q” and “Low P” require smaller  $\beta_y$  and  $\sigma_y$  at IP.

All non-“Nominal” sets require smaller  $\beta_x$  and  $\sigma_x$  at IP.

“Low Y” and “Low P” have larger  $D_y$ .

“Low P” has larger  $\delta B$ .

# References

[http://www-project.slac.stanford.edu/ilc/acceldev/beampar/Suggested ILC Beam Parameter Space.pdf](http://www-project.slac.stanford.edu/ilc/acceldev/beampar/Suggested%20ILC%20Beam%20Parameter%20Space.pdf)

Discussion Board for Parameters:

<http://www-project.slac.stanford.edu/ilc/discussion/Default.htm>