



# ILC ML + Bunch Compressor

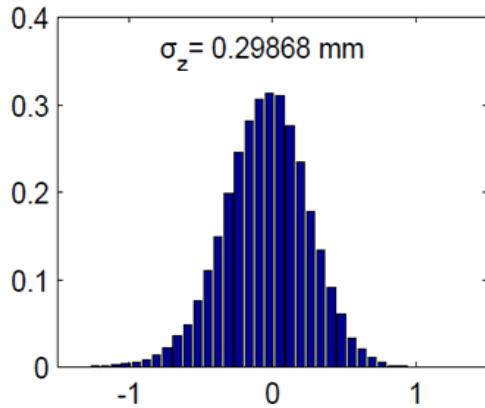
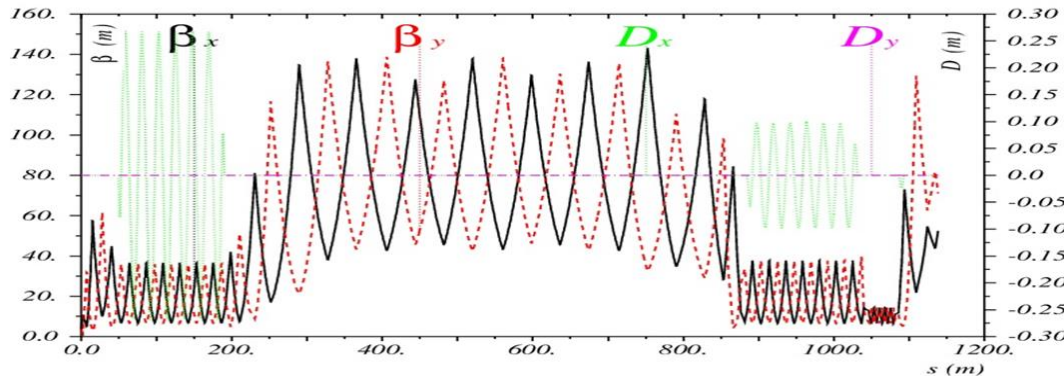
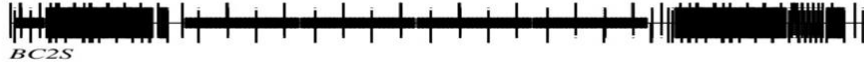
Nikolay Solyak, *Fermilab*

ADI fuze meeting, Oct. 30, 2014

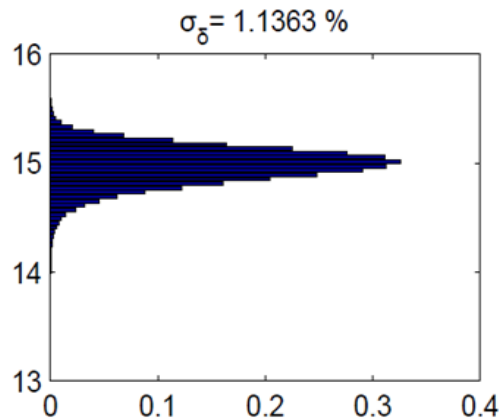
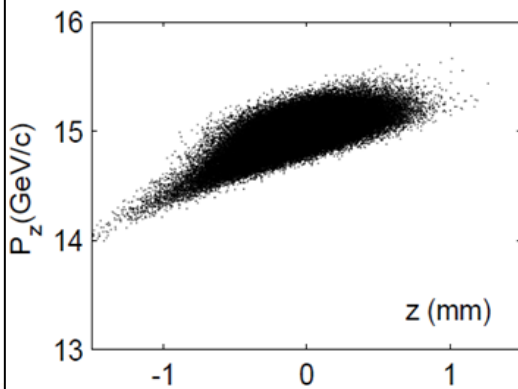
- Failure in BC and energy acceptance of Extraction Lines (*S.Seletskiy and A.Saini*)
- Simplify model for estimation of radiation level from full beam loss in ML (FLUKA) - *A.Saini*
- Radiation from Dark current in ML (CM FLUKA model built for LCLS-II, SLAC) - (*A.Saini with help of M.Santana?*)
- List of the Failure modes (*Arden Warren*)



# 2-stage Bunch Compressor (back to RDR design)



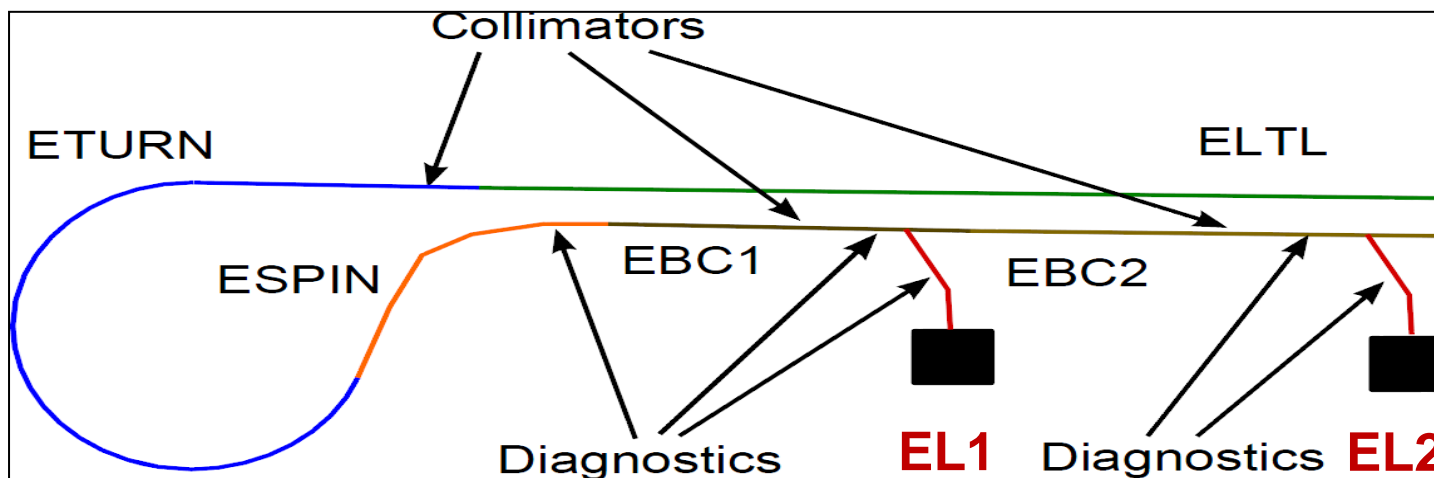
Final longitudinal phase space for bunch compression at nominal operation mode (5 Hz, Ecm = 500 GeV).



## Few modifications(CDR→ TDR):

- 3 CM's with quads for BC1 (ILC design instead of XFEL).
- 16 RF units in BC2 RF (48 CM's; 416 cavities) to reduce gradient.
- **New parameter optimization of BC wigglers (S. Seletskiy)**
- New output parameters from DR is used.
- New treaty point from RTML to ML

**Lattice files for BC and Extraction Lines are in EDMS (S. Seletskiy, A.Vivoli), but not checked yet by M.Woodly (?)**



- 2 Extraction lines in each side BC: BC1 end, BC2 end (In alcove with local radiation shielding)
- Failure modes in BC1 and BC2: wrong RF phasing; RF amplitude (limited by RF power)
- Energy acceptance of the extraction lines: EL1 and EL2 ?



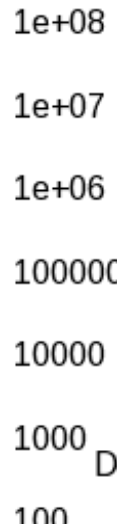
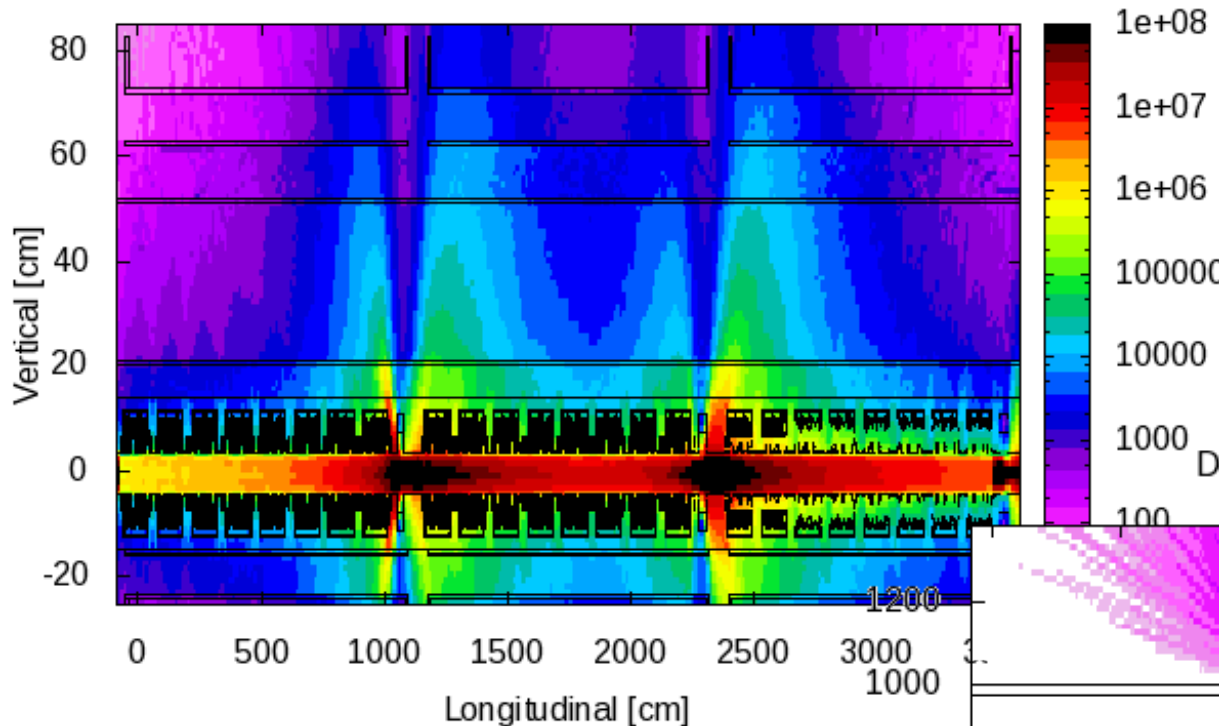
# Extraction lines energy acceptance for failure modes

- Extraction System can extract full beam for tune up or make fast bunch extraction. *BC1 extraction lines was re-designed based on ideas developed for BC1S (single stage BC)* For the renovated extraction lines we are combining the best features of both designs. (*LCWS' 2012, Albuquerque*).
- Extraction line in BC1 can dump entire beam (220 kW, @ 5 GeV), compressed and uncompressed beam ( $E=4.8-5$  GeV,  $s_E = 0.11-1.42\%$ ), have **large energy acceptance** (checked by S.Seletskiy).
- Extraction line in BC2 can only dump 1/3 of beam power (@ 15 GeV), Energy acceptance is poor, needs modifications for larger energy acceptance (**S.Seletskiy start working on improvement**)
- A.Saini (from India) is looking beam extraction for 2 failure modes:
  - **BC1: Wrong RF phasing in RF1 (3 CM's), beam extracted to EL1 with wrong energy ( $E_{min} \sim 4.6$  GeV,  $E_{max}=5.4$  GeV),  $\sim 300$  bunches.**
  - **BC2: Wrong phasing in one (or all) of the klystron. Looks no problem for one RF station, but for all phases might be a problem?**



# LCLS-II LINAC \ SCRF \ dose to KG and to components (M.Santana/SLAC)

Dose equivalent [mrem/h/10nA]



← Potential high dose to components, e.g. quads at 10 nA, however captured current is expected to be 50 times lower

Dose equivalent [mrem/h/10nA]

Low dose to Klystron Gallery even if penetrations are unshielded →

ILC: Model is close to ILC, but need modifications. Dark current model is in final stage.

Vertical [cm]

