Hardware Specs, RTML Sessions Summary (questions/comments)

2007.12 LET Workshop@SLAC

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Information for simulations, hardware specs

Purpose: Make a common set of data base, for assumptions and input parameters of simulations.

- This can be used as “standard” assumptions in simulations.
- This can be used as suggested specifications of hardware.

- Contact person is assigned for each item (responsible for gathering information, but not for creating information)

Presentations

- Laser Wire : Grahame Blair
- Ground motion and vibration model: P. Lebrun
- Alignment model: Kiyoshi Kubo
- RF error Model: Daniel Schulte
- Lattice design of all areas : Peter Tenenbaum
- Wakefield: Roger Barlow (in Wake session not in this summary)

Laser wire (beam size monitors), G.Blair -1

- Ongoing technical work in this area and Plans for the future.
  - Very active, international programme:
    - Hardware, Optics design, Advanced lasers, Emittance extraction techniques, Data taking + analysis, Simulation

- Some discussions on how to detect signals of ML LW.

Laser wire (beam size monitors) -Model

A useful model will include effects:

- Laser pointing
- M2 monitoring
- Low-f optics
- Fast scanning
- High precision BPMs

BDSIM already contains a simple LW generator

[Question]

Is one parameter, “resolution”, good enough for most of tuning simulations.?

- Accurate number must depend on various conditions.
- But isn’t it possible to give reasonable number for each diagnostic section?

Vibration and Ground motion, P.Lebrun -1

Quad vibration in cryomodule

Preliminary measurement result was shown but need more works to make such data useful.

GM:

[Question] Aren’t the existing models, e.g. by Seryi et.al. (model A, B, C: ATL + waves), good enough?

[Answer] No.

Some evidences were shown.

Vibration and Ground motion -2

Paul's Conclusion:

- Interesting Analysis to do...
  - Worth doing ? Only if we have a better idea on the time scale of tuning/retuning the LET systems..
- Not sure what the priority for this effort really is..

[Comments/Question]

How poor the existing models? is not clear.

We need a model now, or very soon.

- We cannot have better one soon.
- Use existing model until we have new one.

Alignment model, K.Kubo

- Report on a “realistic” alignment model.
  - Basically the same as reported at FNAL in October
- Modeling of survey lines (long range errors)
  - How to use “primary references” (marker at every shaft, about 2.5 km spacing.) is not clear. Simple usage turned out to be bad.
  - The model does not necessarily follow actal survey procedure. But can be good enough.
- The survey line model was applied to beam simulations in ML
  - Tolerances look tight (?)

Need a little more simulations to test the model.

Need more input from experts!

RF error model, D.Schulte -1

First Proposal for a Model

- We can express all tolerances in amplitude and phase
- RF phase and cavity error have a static and a dynamic contribution
- Static error is independent from RF unit to RF unit
- Dynamic contribution is independent from bunch to bunch (pessimistic)
  - correlated along machine
  - independent for each RF unit
  - independent for each cavity (the vector sum is used for feedback)

RF error model -2

- The work has just started. more to come

- Physics experiments put a strong constraint on the main linac energy stability
- we can use these as simple tolerance
  - tightest dynamic tolerances 1% and 1 degree (incohberent)
- The requirements for the bunch compressor are only slightly tighter
- The cavity tilts put a constraint on the stability in each cavity
  - better understanding required
  - feedback and error source are important (cavity act as a filter)

- Start to write a document
  - perform some simulations to check numbers

BPM model -no presentation

- Resolution
  - We have some (reliable) numbers.
- Scale error
  - 1% or 20%? Very important but no reliable numbers.
- Drift of electronics, etc.
  - Can be significant but no standard models.

Contact person has not been assigned.

Any Volunteers?

Lattice design, PT -1

Compiled Lattices are not satisfactory as a starting point for ED phase

- Geometry mismatches
- Missing pieces
- Out of date
- Unfeasible design choices

System Integration group convened a task force of the deckmasters

Collaboration tools

- Website for EDR lattices: http://www.slac.stanford.edu/accel/ilc/lattice/edr
- Lattice files “punch list”
  - **Lists all of the known problems in the lattices**
  - http://www.slac.stanford.edu/accel/ilc/lattice/edr/doc/LatticeFilesPunchList.html
- Regular meeting
- Website on ILCAgenda

Lattice design -2

Implication for LET Studies

- RTML optics will be changing over the next several weeks
- Probably will be some changes to the linac lattice as well
- Lattice files for all areas are available at a public web site

Lattice format, PT

AML (Accelerator Markup Language) project

- Till Summer 2008
  - XSIF is “official” format of ILC lattices
  - AML development, get approval, , ,
- Summer 2008
  - Duplicated decks in XSIF and AML
- Fall 2008 to Spring 2010
  - Moving from to AML
- Summer 2010
  - AML will be the only official format

This plan has not been approved.

RTML

Presentations

- Review of RTML tuning studies, J.Smith
- Status of RTML studies using Lucretia, S.Molloy
- Update of Bunch Compressor DFS studies, K.Kubo
- Alternative (short) bunch compressors, ES.Kim

Review of RTML tuning, J.Smith

- Not there yet... Budget just 4 nm

Region	BBA method	Dispersive or Chromatic mean Emittance Growth	Coupling mean emittance Growth
Return Line	Kick Minimization and feed-forward to remove beam jitter	0.15 nm	2 nm (without correction)
Turnaround and spin rotator	Kick Minimization and Skew Coupling Correction	1.52 nm (mostly chromatic)	0.4 nm (after correction)
Bunch Compressor	KM or DFS and Dispersion bumps	greater than 4.9 nm (KM + bumps) 2.68 nm (DFS and bumps)	0.6 nm (without correction)
Total		~5 nm almost all from BC	3 nm (without complete correction)

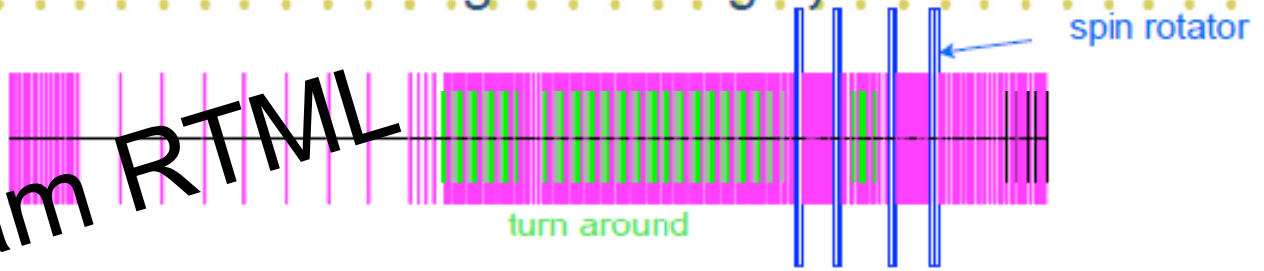
Work still to be done

- We are way past the 4 nm budget!
  - **But we really haven't worked on it much yet and have more things to try.**
- Upstream of the Bunch compressor no serious problems apparent
  - **Well, provided stray fields in return line are no greater than 2 nTesla**
  - **...and we can measure coupling with the wire scanners.**
  - **Vertically displaced bends?**
- Need to address cavity pitches in Bunch Compressor.
  - **DFS may work if tweaked for BC #2 but BC #1 cannot be DF steered.**
  - **There's only three cryomodules in BC #1 perhaps we can treat these with extra care when aligning, or place them on movers.**
- **Phase errors/stability in BC**
- Coupling Correction (Which is critical in Spin Rotator) dependent on how well we can measure coupling parameters and/or x/y projected emittance
  - **Requires more work on accurately modeling laser wires.**
- Virtical displacement of bends in turnaround?
- Steal some of the Main Linac emittance budget. We need it more than they do!

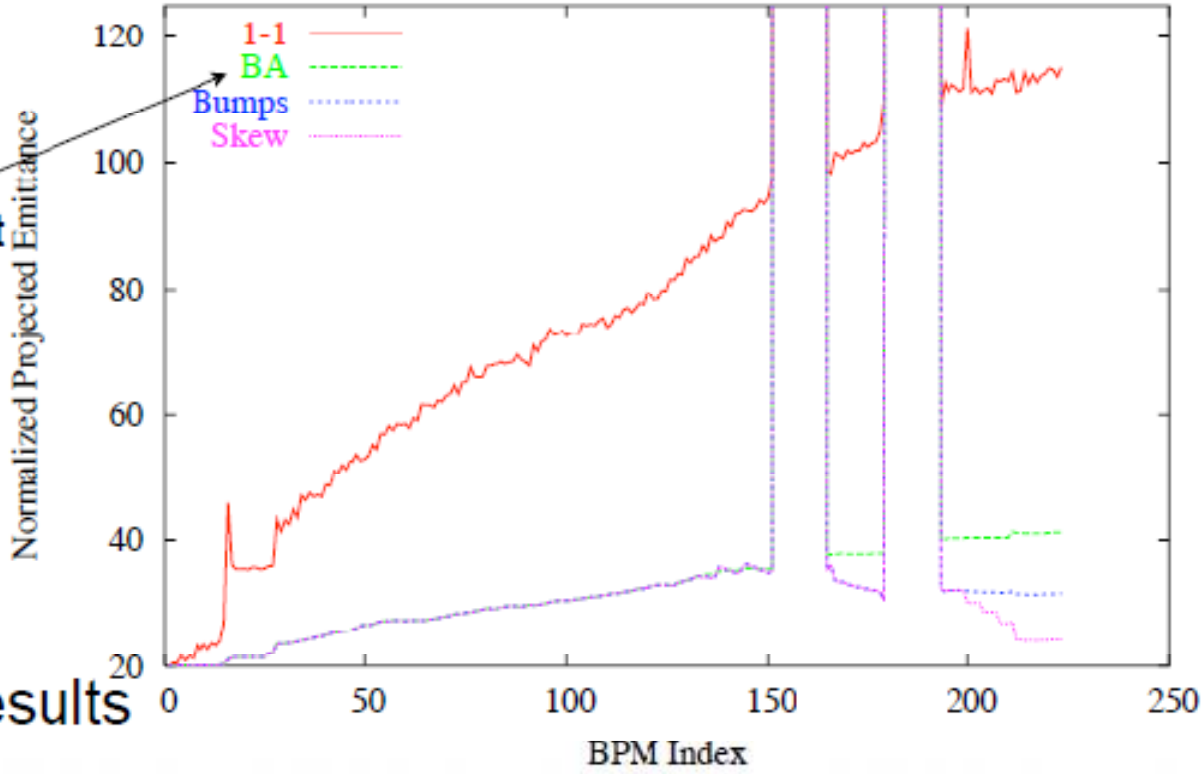
Review of RTML tuning, J.Smith

A bit of statuc tuning studies upstream of BC not good enough yet!

Upstream RTML



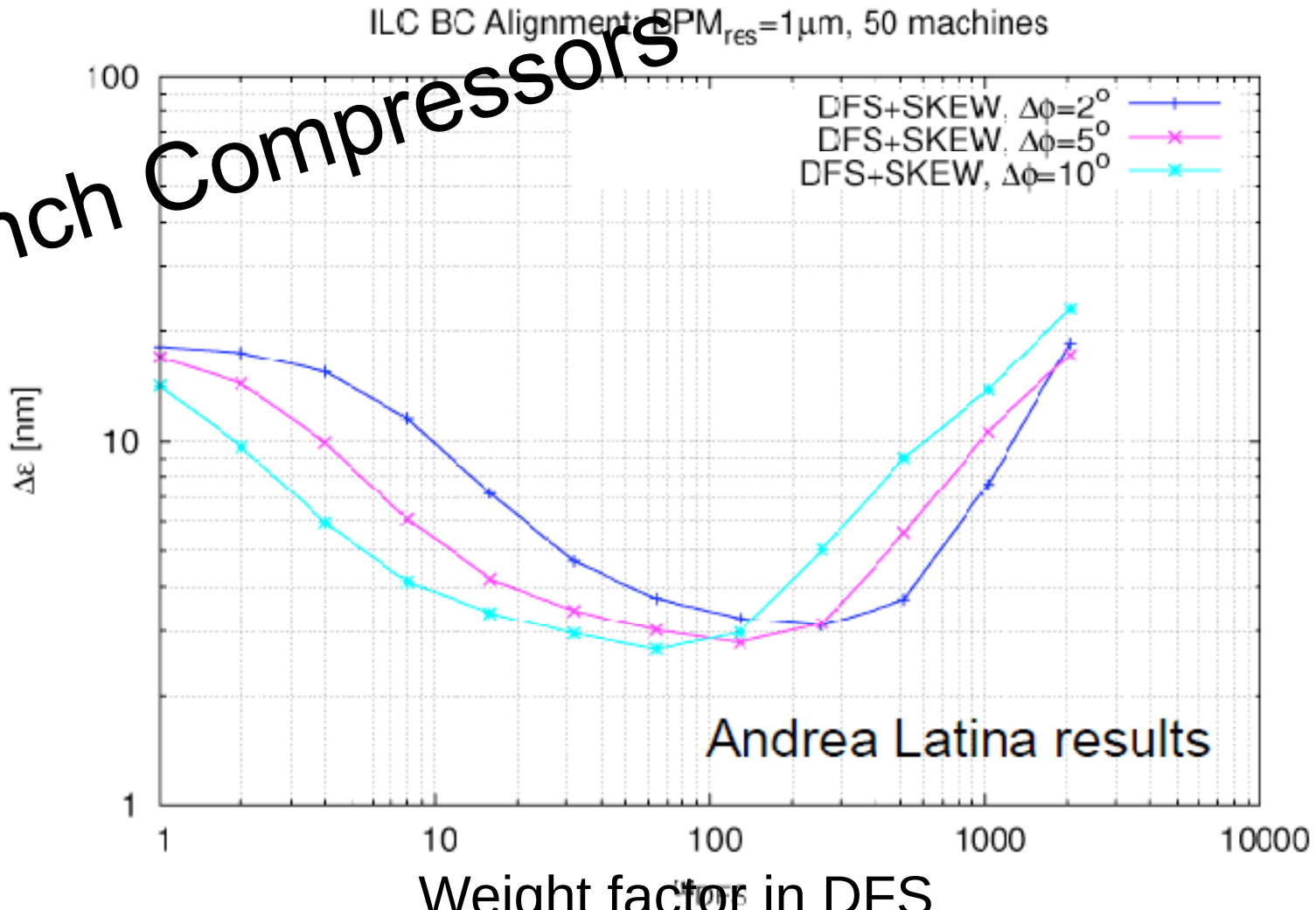
RTML: 1-1, BA, bumps, skew LM, BA, bumps, skew LM LOCALSKEW 20060824



KM works ~about the same as BA, A little better

Jeff Smith results

DFS in BC by adjusting RF phase
Looks promising



Bunch Compressors

Status of RTML studies using Lucretia
S.Molloy

Developed one-to-one, KM tuning algorithms in Lucretia

- Results look consistent with past works (?)
- Other tuning techniques will come (soon?)

Proposed test at LCLS

- This month, LCLS will begin work on their linac + BC2
- Apply 1-to-1, KM, DFS, etc., to LCLS to test and develop our techniques
  - Many details needed to be worked out
  - Simulations will show feasibility
- [This is very interesting and important !!]

DFS simulation in Bunch Compressors, K.Kubo

- A little updated studies of DFS in BCs
  - Change RF phase for dispersion measurement
  - Useful comments were given to the speaker.

Alternative (short) bunch compressors, E.S.Kim

Results of performance studies of short BCs (about 700 m. Base line: about 1100 m) were shown

- Longitudinal and transverse (emittance preservation)

- Performance looks similar to the Base Line design (?)
  - Need more realistic simulations

- Cornell group will work on both the Base Line and the alternative design

[Question: Change configuration is still acceptable?

When we need the conclusion?]

Any comments?

Any important things I missed?