Ring to Main Linac

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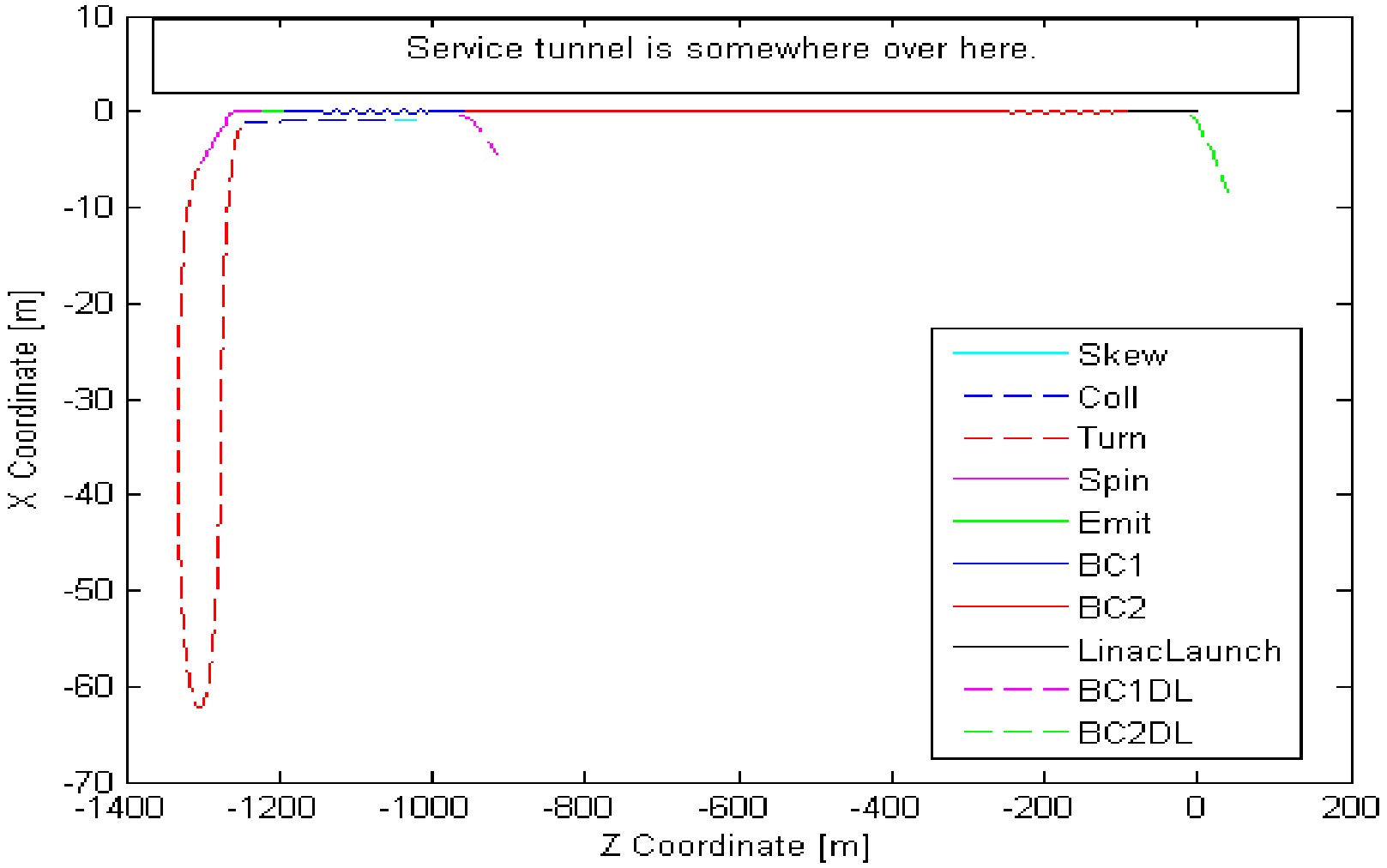
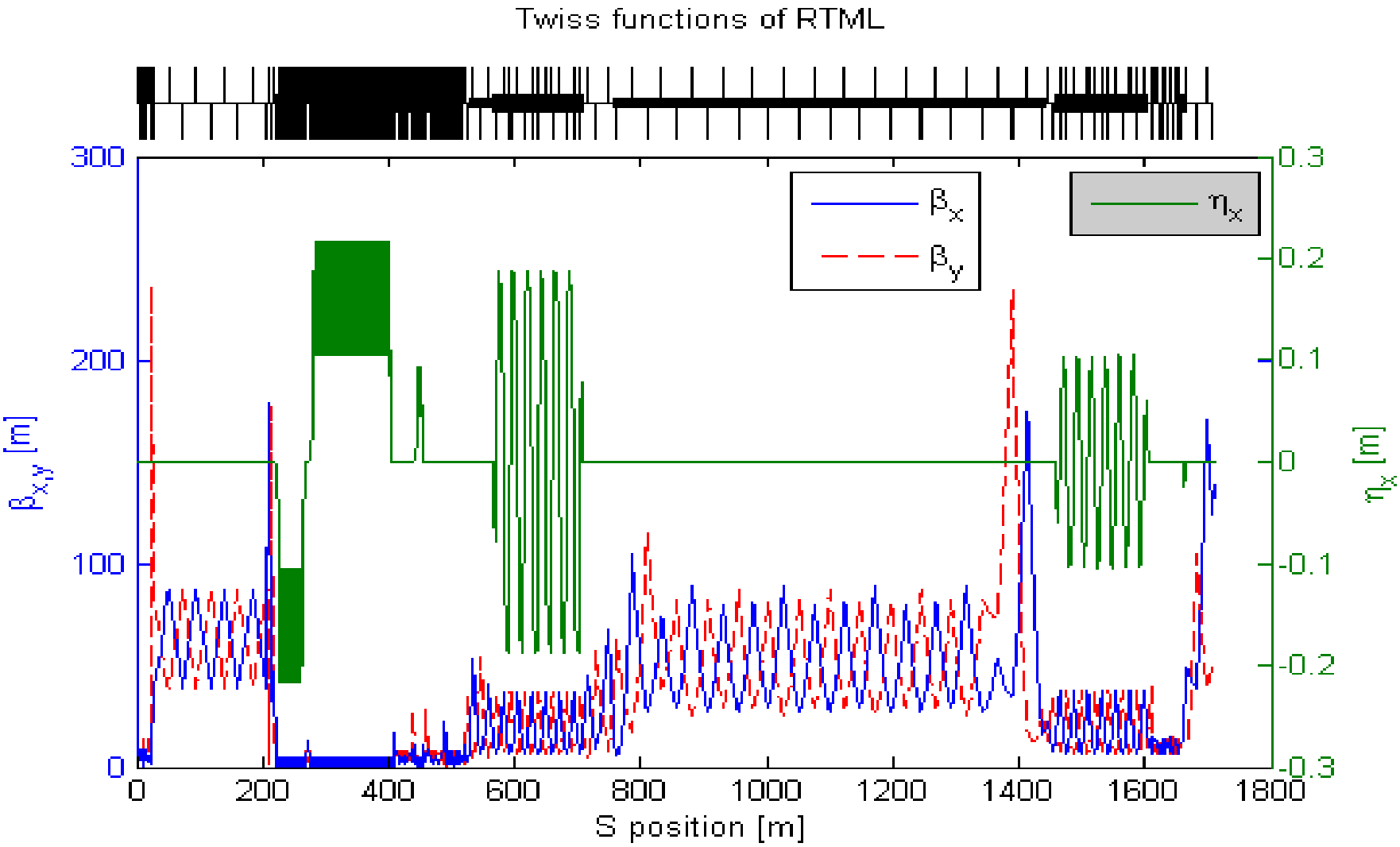
Design Status

- A complete first version of the RTML is in hand
  - **Complete lattices in MAD8 (“xsif”) format released to RDR wiki site**
    - All subsections present including pulsed off-axis extraction lines
    - Many parts of design not well optimized
      - Example: BC1 pulsed extraction line probably too short and at too small an angle wrt main line
      - Example: Linac launch matched for 1 Q / 4 CM lattice, not 1 Q / 3 CM lattice
  - **No decisions are still pending, but…**
  - **Many decisions will be revisited now with new information ($$, technical feasibility) available**

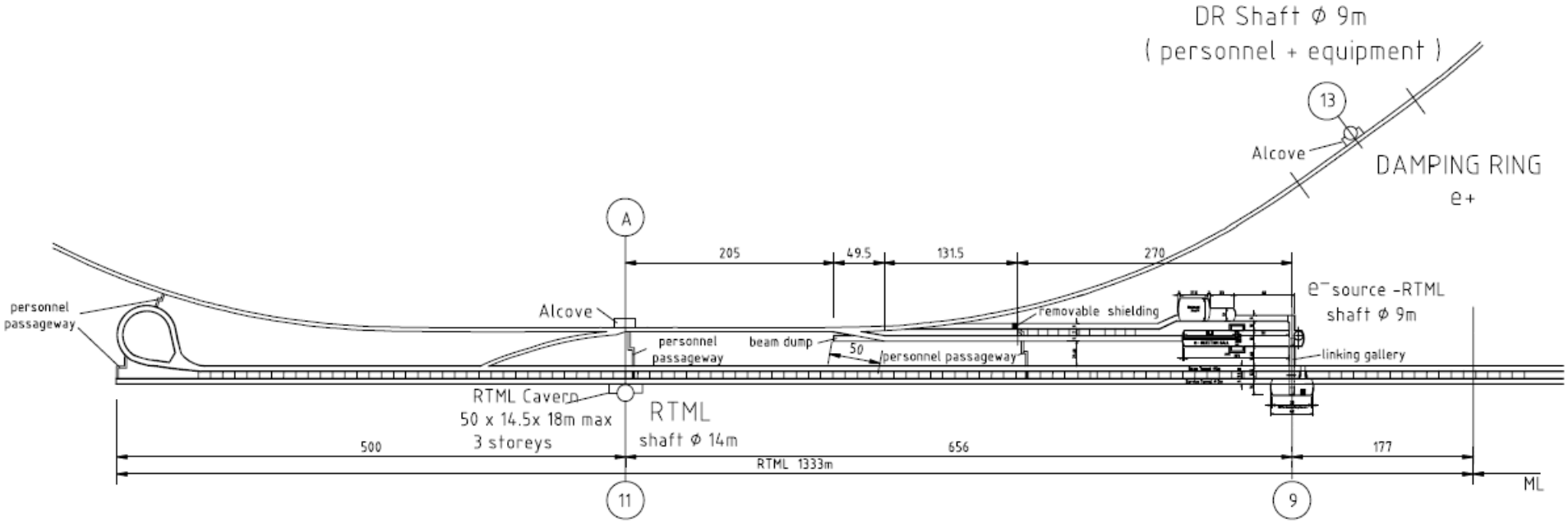
RTML Footprint



RTML Twiss


Twiss functions of RTML
300
200
100
0
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
0
200
400
600
800
1000
1200
1400
1600
1800
S position [m]
β_x,y [m]
η_x [m]
β_x
β_y
η_x

RTML and DR Overview

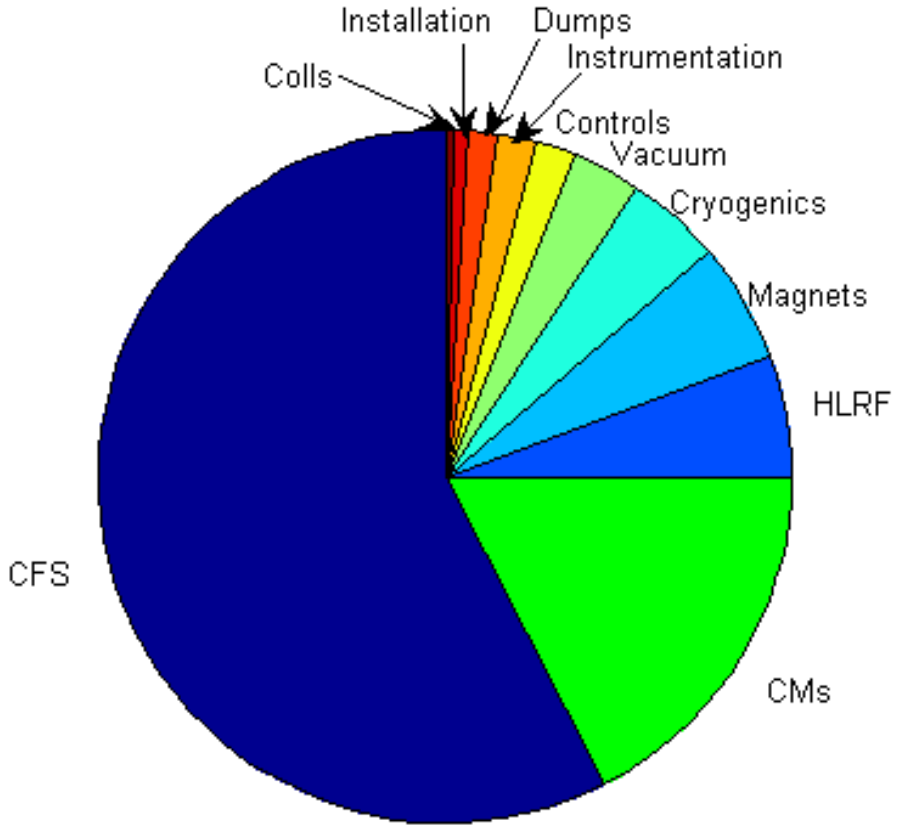


Cost Roll-Up Status

- As of this writing (2006 14 July 16:27 PDT), RTML is *missing* the following costs:
  - **Magnet power supplies and cables**
  - **A few magnets associated with pulsed extraction lines**
  - **RF switches**
  - **A minor amount of instrumentation**
  - **A minor amount of vacuum stuff associated with the cold regions**
- Cost impact is a few percent

Major Cost Drivers

- Costs:
  - **CFS 58%**
  - **CMs 17%**
  - **HLRF 5.7%**
  - **Magnets 5.6%**
  - **Cryo 4.5%**
  - **Vacuum 3.1%**
  - **Controls 1.9%**
  - **Instrumentation 1.9%**
  - **Dumps 1.3%**
  - **Installation 0.7%**
  - **Collimators 0.3%**



BC RF plus CFS = 85% of RTML costs!

Possibilities for Cost Reductions

- Go from 2 shafts to 1 shaft per RTML
  - **About 12% of RTML costs**
- Revert to 1-stage BC
  - **About 6.5% of RTML costs (reduce length + amount of RF + magnets), but has performance cost**
    - Bunch lengths < 300 μm RMS impossible
      - Thus, a decision above my pay grade!
    - Increased emittance dilution
- Eliminate turnaround
  - **About 3.5% of RTML costs, but has luminosity impact**
    - Feed-forward becomes impossible, so DR kicker jitter and collimator wakefield jitter amplification incurable
- Reoptimize DRX/Turnaround/BC1 geometry to eliminate drill + blast tunnel
  - **About 2.6% of RTML costs plus some incidental reduction in vacuum**
  - **Actually captures almost all the benefits of eliminating the turnaround without any performance sacrifice**
- Ultra-short bunch compressor?
  - **About 2.0% of RTML costs**
  - **Still don't have a solution which includes necessary emittance tuning controls**
- Rearrange high-power dumps – replace full-power dump @ 15 GeV with 10% power dump, replace 10% power dump @ 5 GeV with full-power dump
  - **About 1.2% of RTML costs**
  - **Dump costs so small compared to everything else, might be better to have full power dumps at 5 GeV *and* 15 GeV!**

Items in RED will be pursued at this workshop unless management gives us different guidance.

Plans and Goals

- Goals for this workshop:
  - **Converge on good configuration for area from DRX to turnaround**
    - RTML design, DR/DRX design, CFS
  - **Improve understanding of CFS costs**
    - Major area for cost improvement
    - Can we eliminate the 9 meter shafts?
- Goals for Vancouver-to-Valencia period
  - **Iterate lattice design**
    - Include any changes from activities this week
    - Eliminate mechanical conflicts now that we have better estimate of element overall sizes (may mean modest increase in lengths)
    - Insert WBS numbers into lattice files
    - Fix a few mistakes
  - **Write RDR draft**
  - **More serious progress on static-level emittance tuning**
- RTML AS remains open to suggestions about how we can best make use of time between now and Valencia
  - **Since everyone will give us suggestions regardless**

Towards the TDR

- A few things to work on between now and the end of the TDR
  - **Final decision on turnaround / feedforward**
    - Need to understand whether emittance dilution from turnaround eliminates gain from orbit feedforward
    - Not really a cost item but a performance item
  - **Determine which parts of RTML, if any, need more complete engineering effort for TDR**
  - **Implement that effort!**

Note: if you get the idea we haven't thought at all about the TDR, then you are paying attention!

Any Questions?

"We're going to stay awake
For as long as it takes
To correct all the silly mistakes we have made."
-Love and Rockets