

# **Summary of the Muon Linac and RLAs Design for the EUROnu Report**

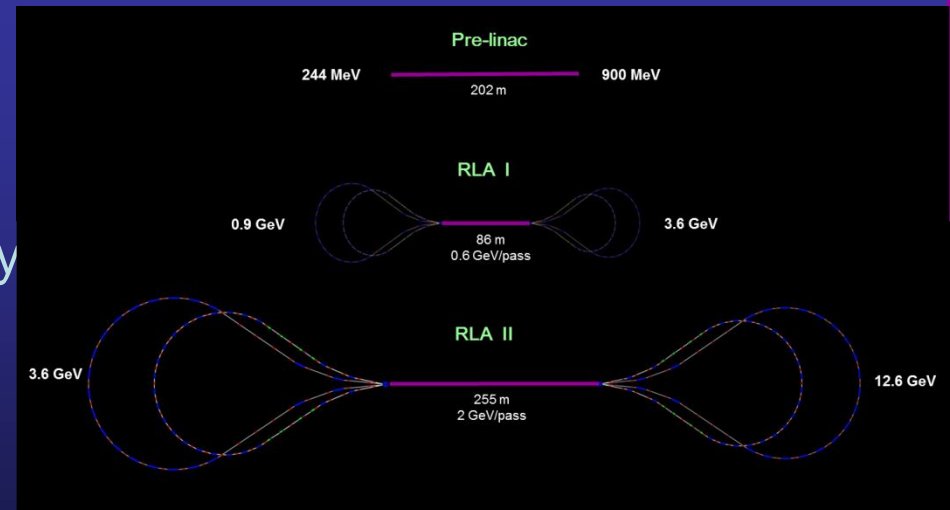
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**4<sup>th</sup> Annual EUROnu Meeting  
13<sup>th</sup> June 2012**

**Imperial College  
London**

## Introduction

- Summarize work done on the linac and RLAs design.
  - i.e. what will go in the EUROnu report.
  - US: Lattice design and tracking studies
    - A. Bogacz, K. Beard, V.S. Morzov and Y.R. Roblin
  - UK: Tracking studies and technology design
    - M. Aslaninejad, C. Bontoiu, A. Kurup and J. Pozimski
- Some of this was presented in the IDS-NF Interim Design Report.
  - Lattices have been redesigned.
    - Linac modules.
    - RLA arcs.
  - No major changes to technology
- Cost estimate.

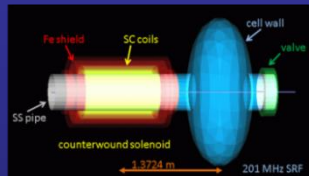
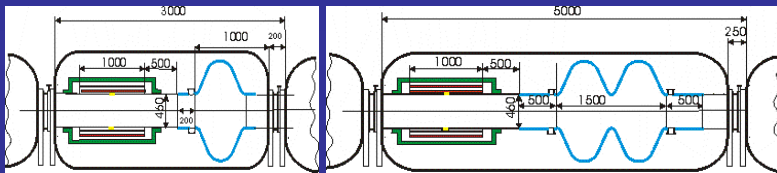


## Linac

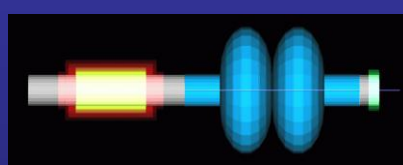
### Pre-linac

244 MeV ————— 900 MeV  
202 m

- New 2 cryomodule design.
  - 15 MV/m.
  - 0.23m radius aperture.

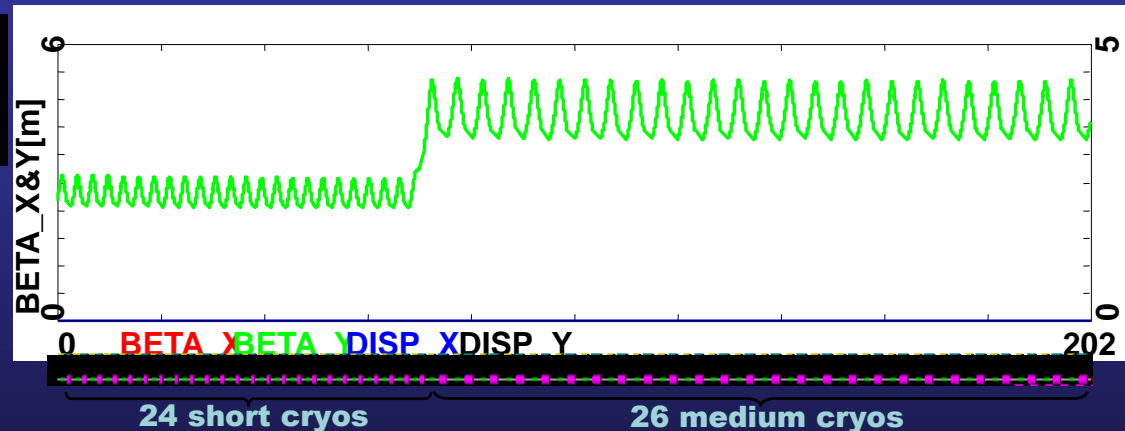


1.5T Solenoid



2T Solenoid

	Linac Section	Cell Length	No. Solenoids	No. RF Cavities
Old Design	Short	3m	6	6
	Medium	5m	8	16
	Long	8m	20	44
New Design	Short	3m	24	24
	Medium	5m	26	52

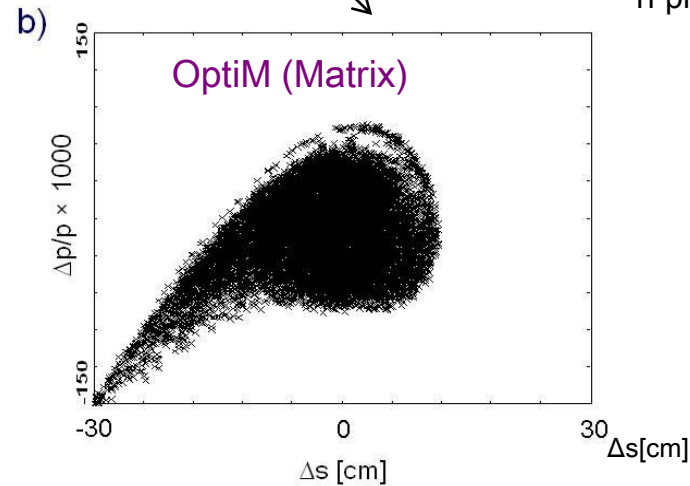
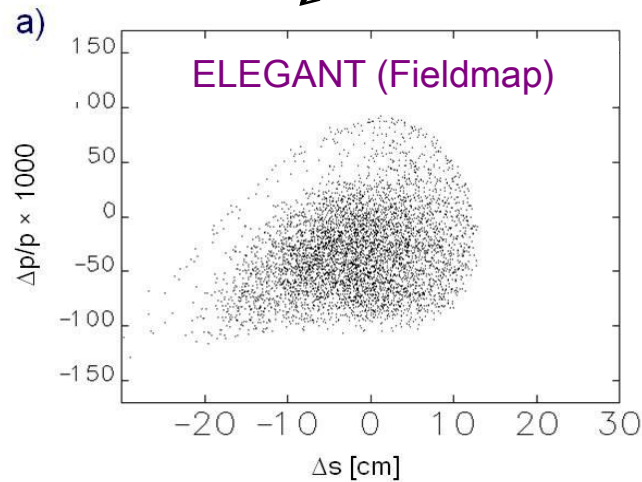
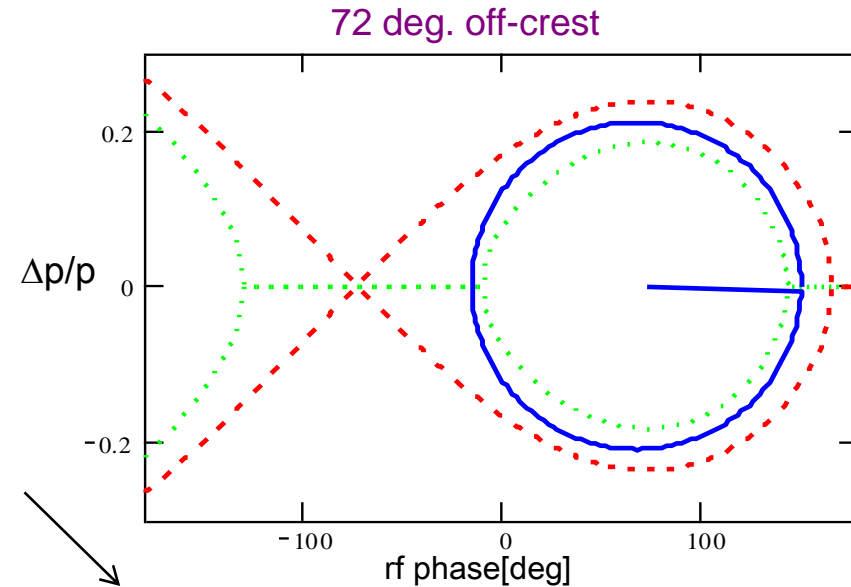
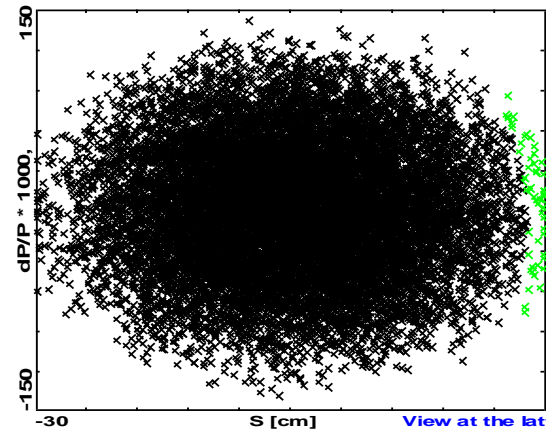


# Pre-linac - Longitudinal compression

Initial distribution

$$\varepsilon_x/\varepsilon_y = 4.8 \text{ mm rad}$$

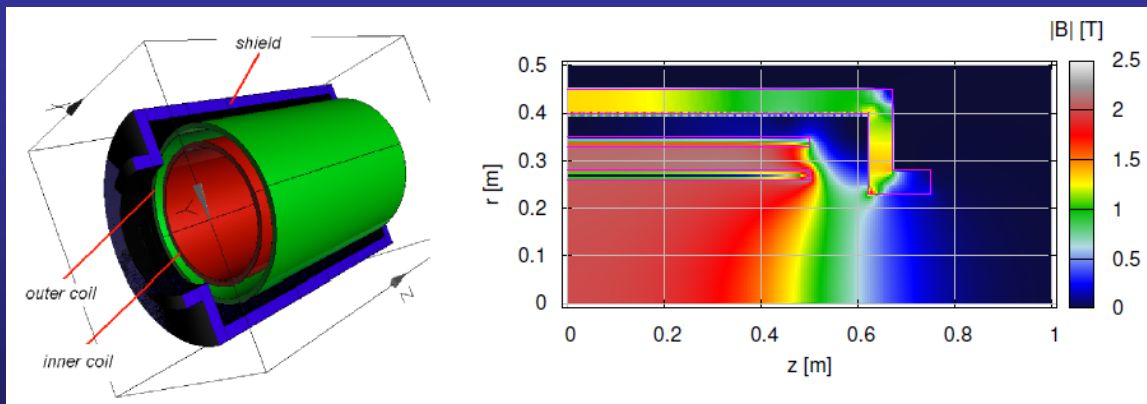
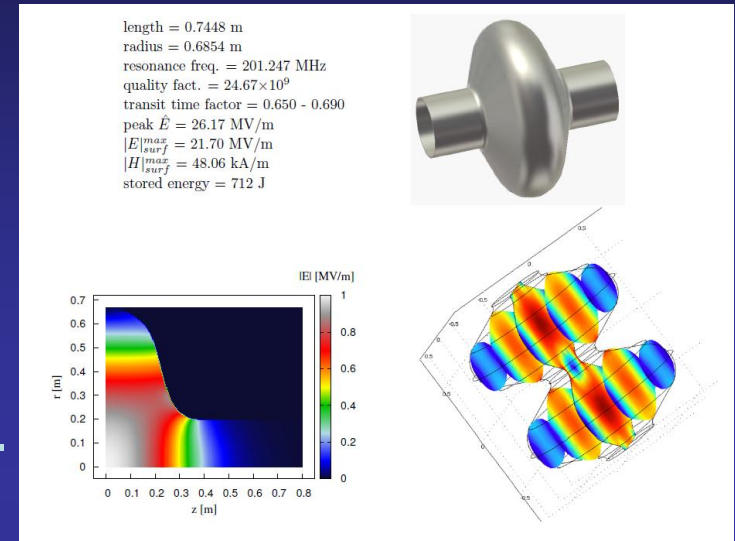
$$\varepsilon_l = \sigma_{\Delta p} \sigma_z / m_\mu c = 24 \text{ mm}$$



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## Technology

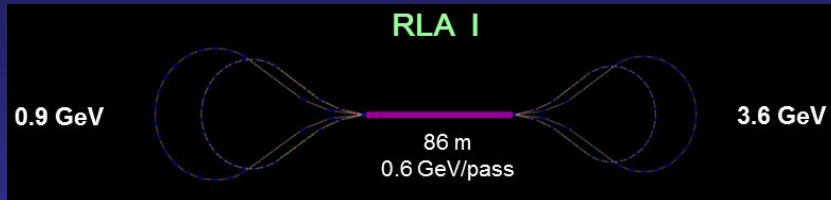
- Cavity design
  - Optimise for  $0.9 \leq \beta \leq 0.99$
- Solenoid design
  - Minimise field leakage into cavity.



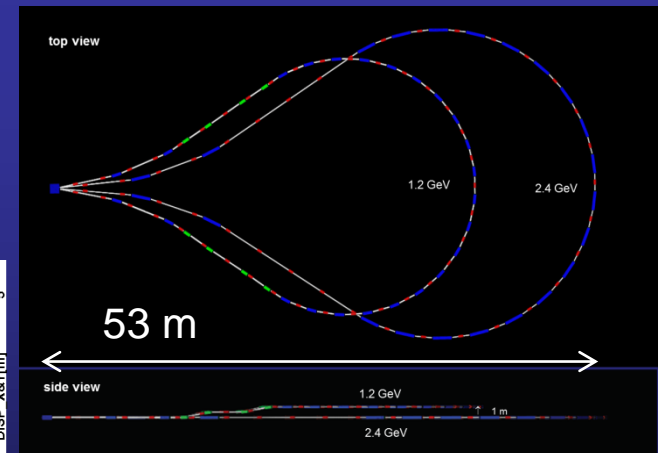
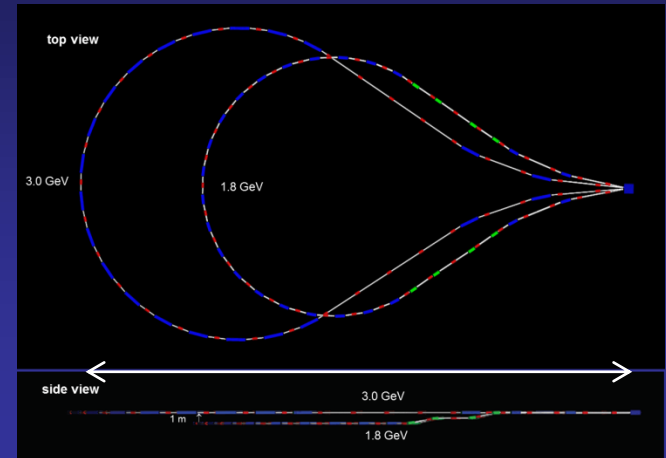
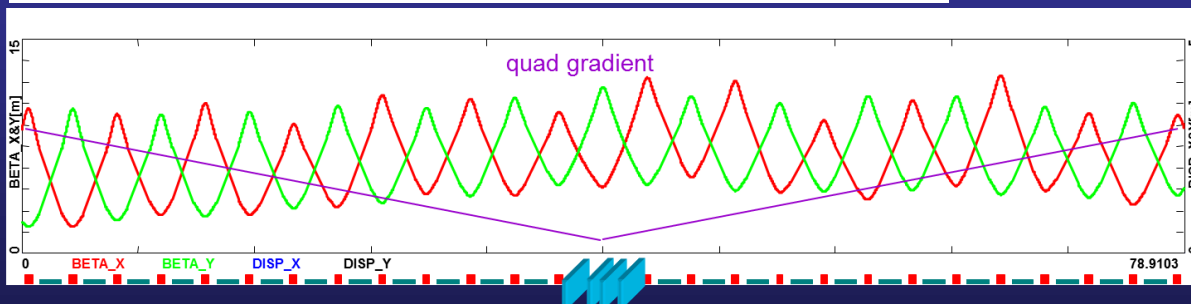
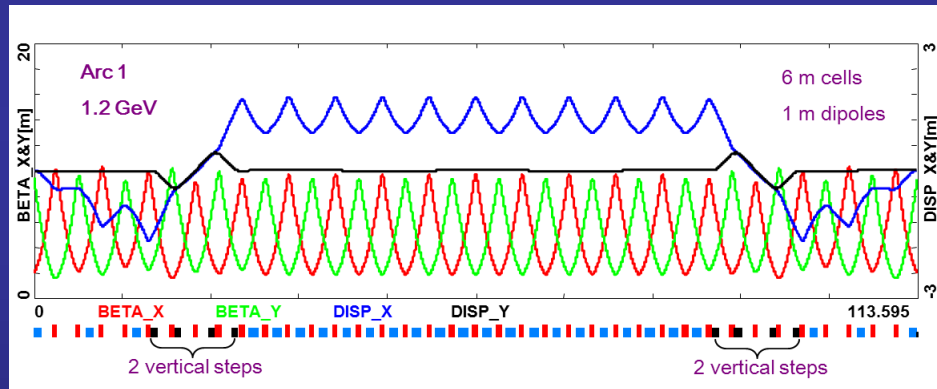
Layout of the shielded superconducting solenoid (left) and its 2D magnetic field map across the axial plane (right) for a peak magnetic field of 2 T.

Superconducting RF cavity design and electric field distribution.

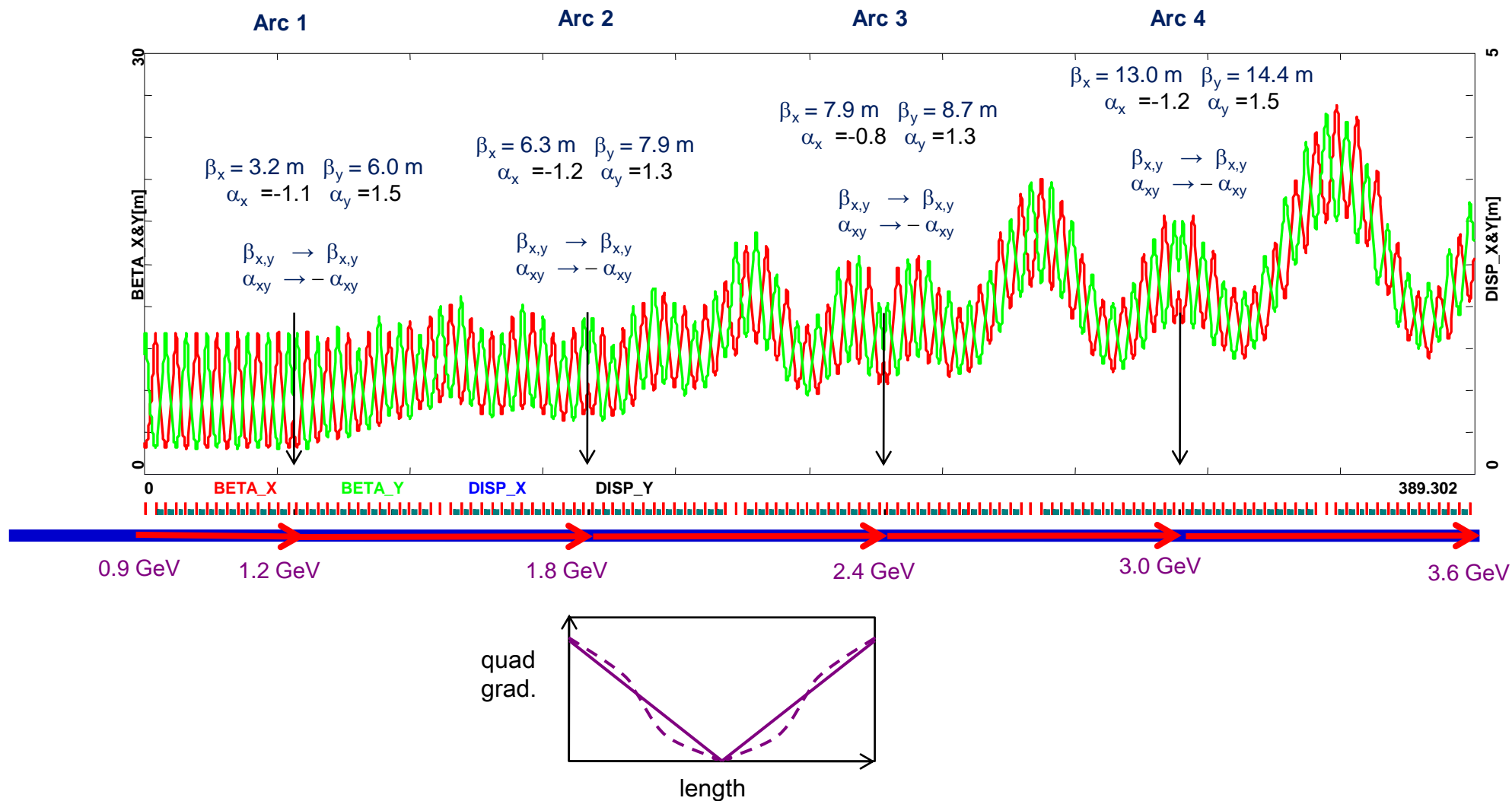
## RLA 1



- Lattice redesign of the arcs.



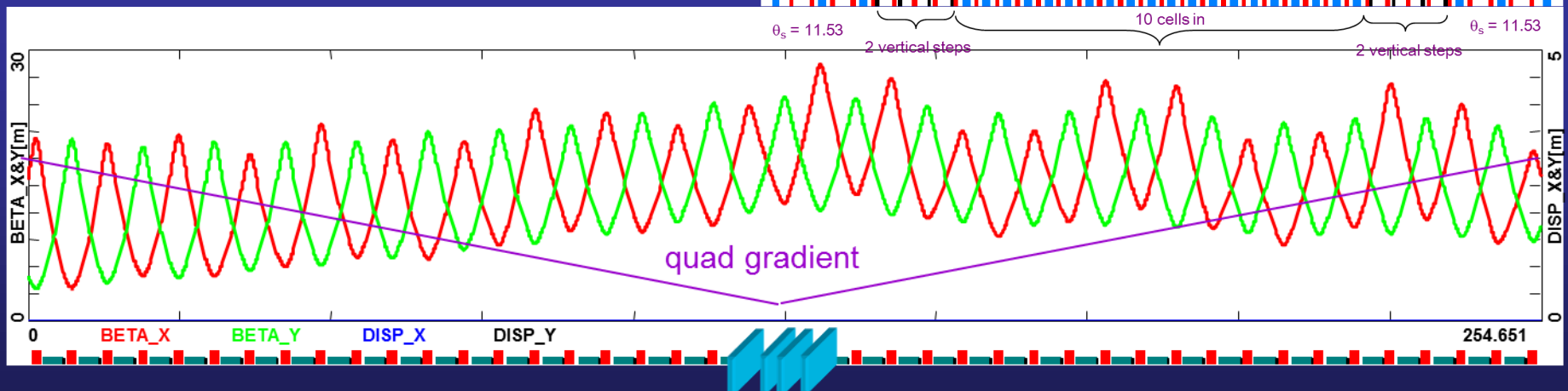
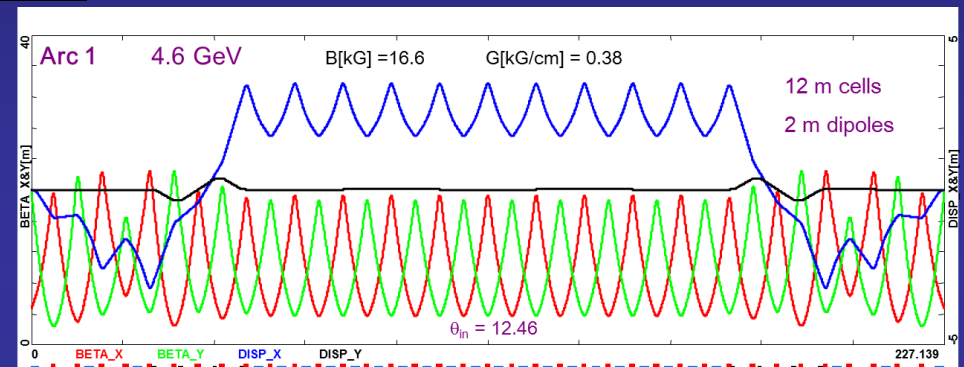
# Multi-pass bi-sected linac Optics



## RLA 2



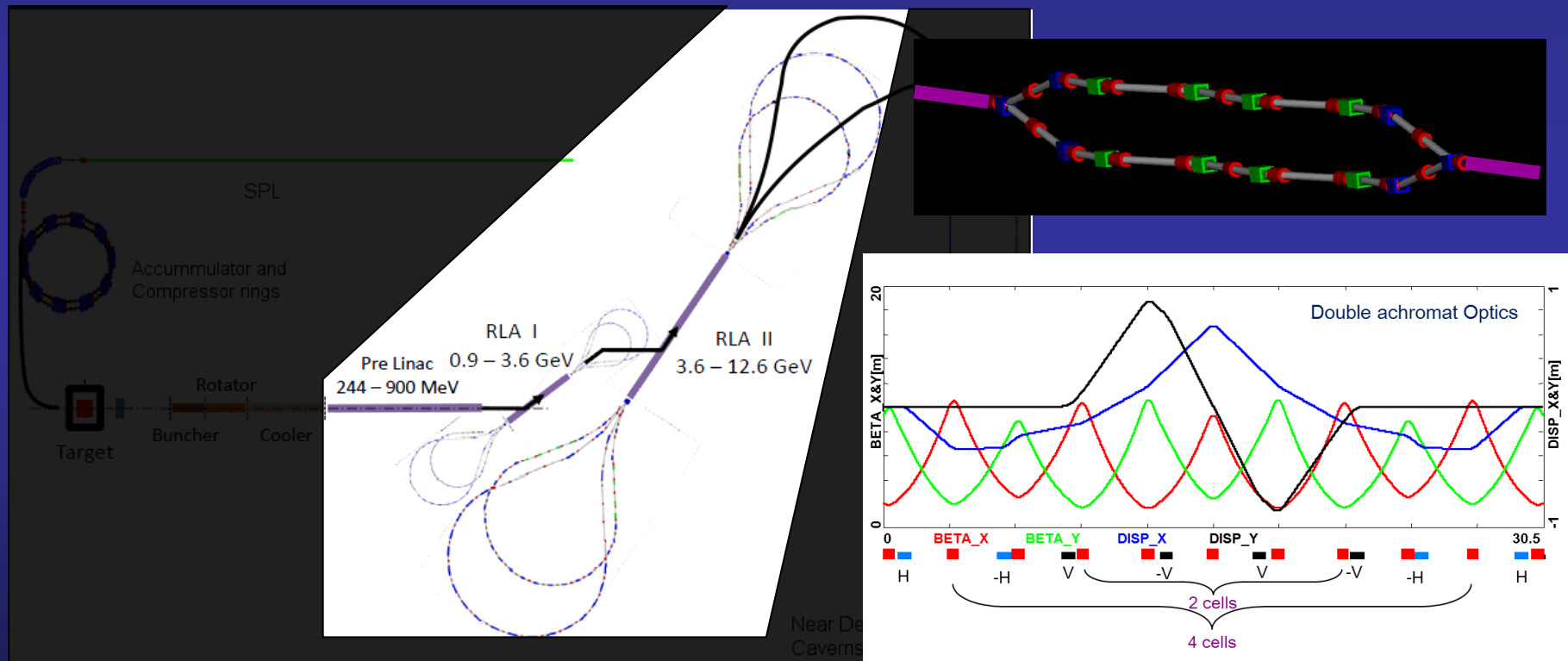
- Lattice redesign of arcs.
  - Very similar to RLA1.





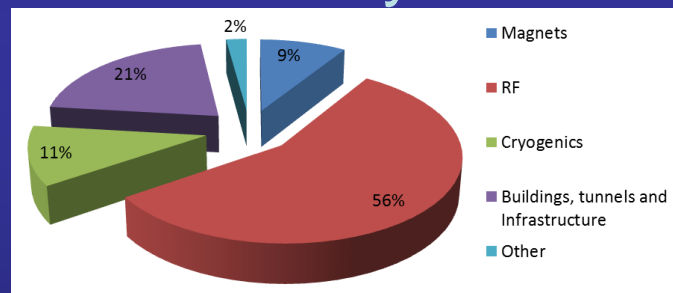
## Injection and Extraction

- Chicanes are now horizontal to allow for “near-surface” layout.
  - More cost effective.

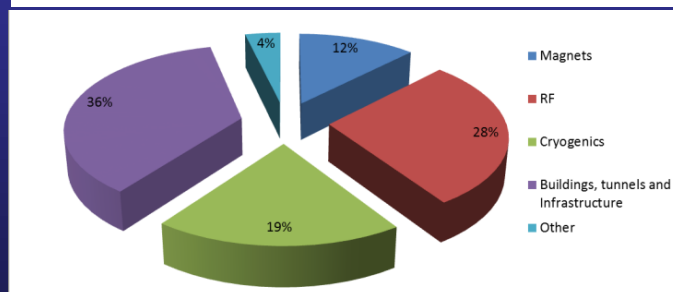


## Cost Model

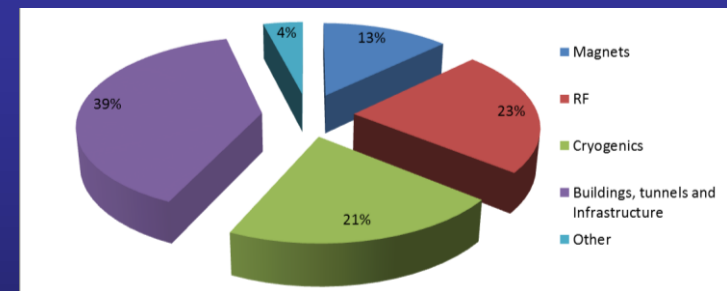
- Linac solenoids based on capture solenoids costs.
- Other magnets based on ILC magnet costs.
- RF based on scaling from light-source technology.
- Other costs (e.g. civil, cryogenics, etc.) scaled from detailed study for next-generation light source.



Linac relative costs.



RLA 2 relative costs.



RLA 1 relative costs.

## **Summary of the Summary**

- Lattices of the Linac and RLAs have been redesigned.
- Tracking results for the linac.
- Simulations of the solenoid and rf cavity have been done.
- Piece-wise optics of multi-pass linac.
- Schematic drawing of layout.
- Cost model has been developed.