John Adams Institute for Accelerator Science

Imperial College London

Royal Holloway University of London

UNIVERSITY OF OXFORD

DA studies and LHeC lattice options

Emilia Cruz-Alaniz

Special thanks to: R. Tomas, R. Martin and B. Parker

December 11th, 2018

Progress on the lattice this year

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- **ATS-scheme** implemented in 3 low-β* IRs
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  - Validated for version HLLHCV1.3 onwards.
  - Current lattice was integrated with HLLCHCV1.0. Even case for β*=10 cm has still to be validated.

- Solution: Rematch the whole lattice again, but now with new triplet for HL. Validate apertures on IR matchings and also useful to have LHeC lattice with an updated HL version… Loads of work though!

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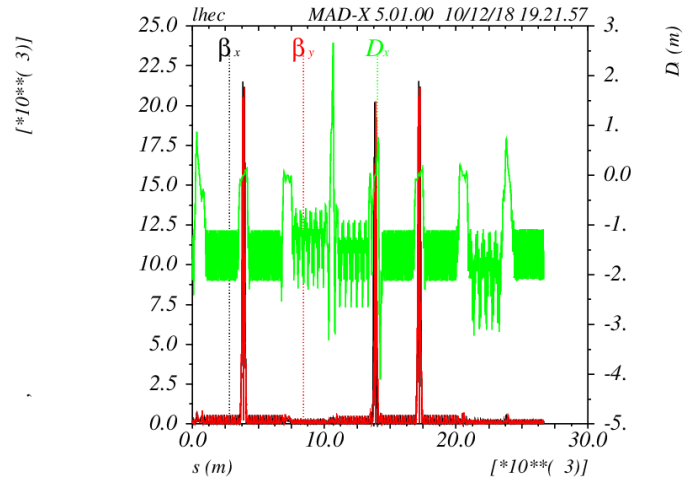
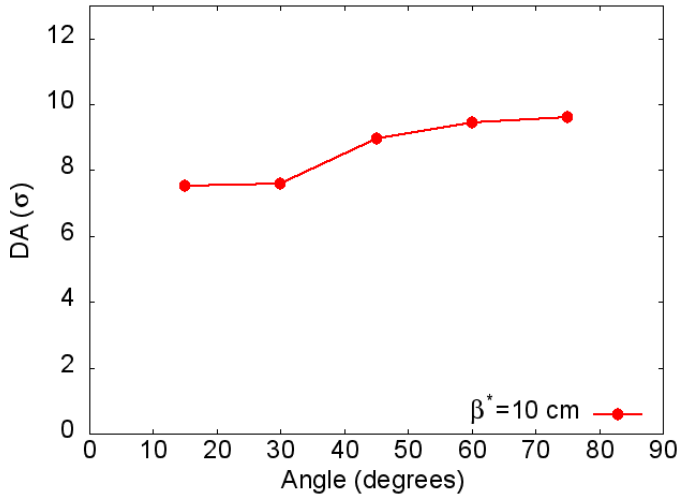


- After many tries finally we have a lattice that fulfils the 4 requirements:

1. Integrated to HLLHCV1.3 lattice ✓
2. New IR (Roman's matching and Brett design for triplet) ✓
3. ATS for 3 low-beta* (15 cm in IR1/5 and 10 cm in IR2) ✓
4. **New requirement**: Horizontal phase between kicker in IR6 and triplets < 30 degrees. ✓

New DA studies

- DA studies: 10^5 turns, 60 seeds, 5 angles, collision energy and errors in arcs.
- Initial DA around 7σ. Lower than previous cases 9.4σ and bellow 10σ required for HL.



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   - Horizontal phase restricted. Kicker->triplet (1,2, 5) < 30°
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2. **Non-linear correctors.**
   - Correctors in IR1 and IR5
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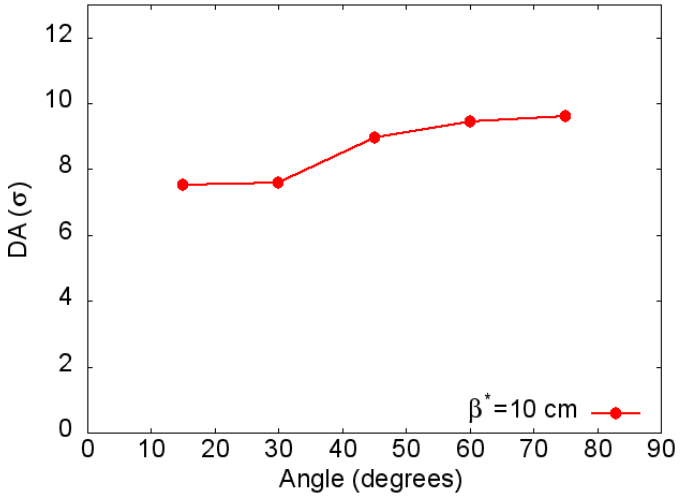

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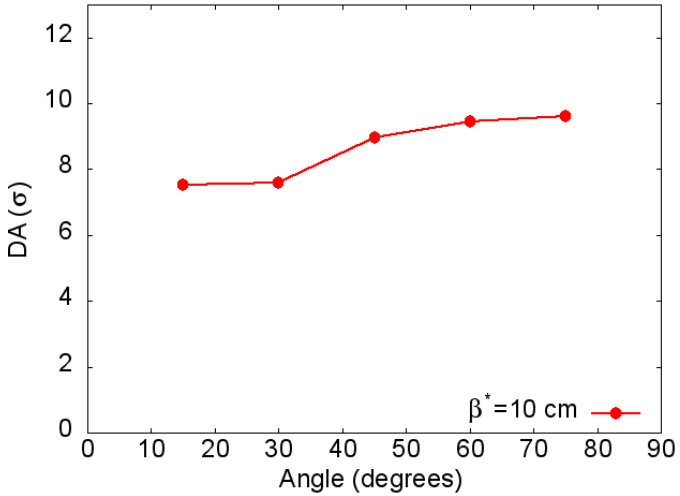

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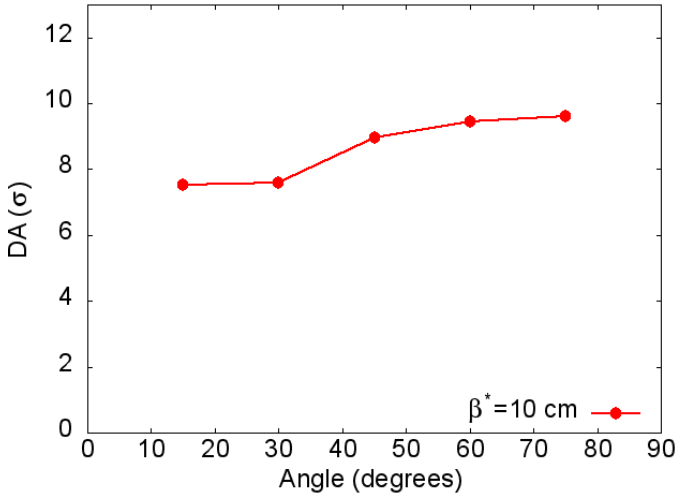

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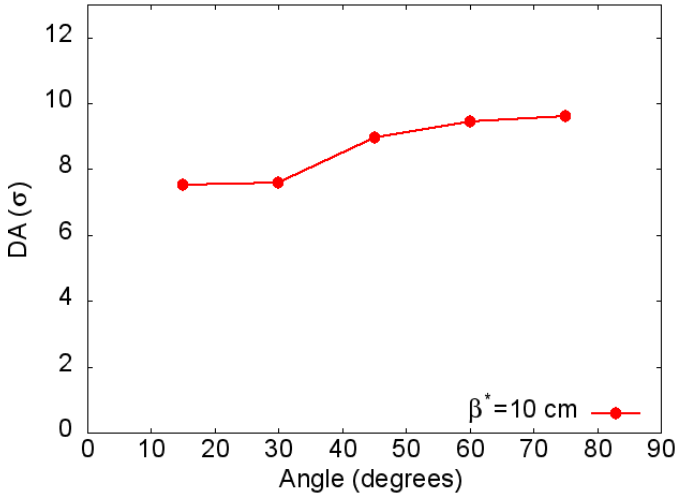

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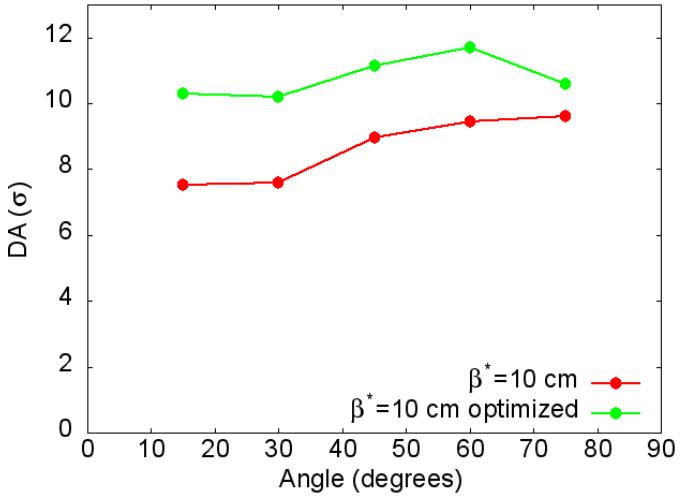

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- New min DA: **10.2** σ. Not huge increase but enough to get **HL target**

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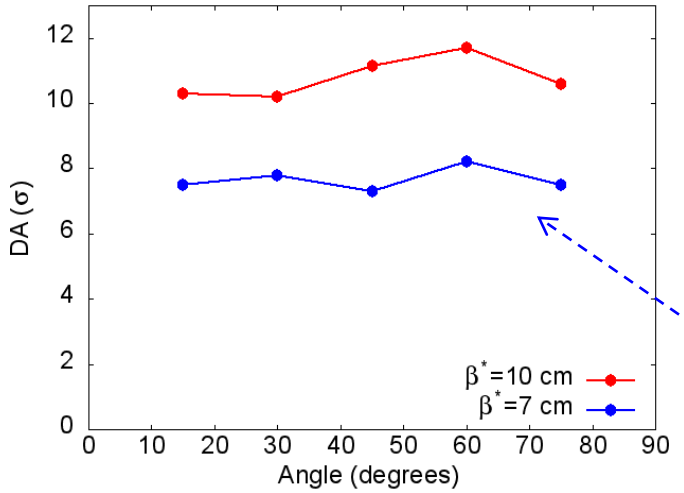

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- Manage to get a phase that works better:
  - Min DA=7.3σ for β*=7 cm

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