Operations Directorate Issues
- Extended Straight Section
- Higher Current Issues

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TWG

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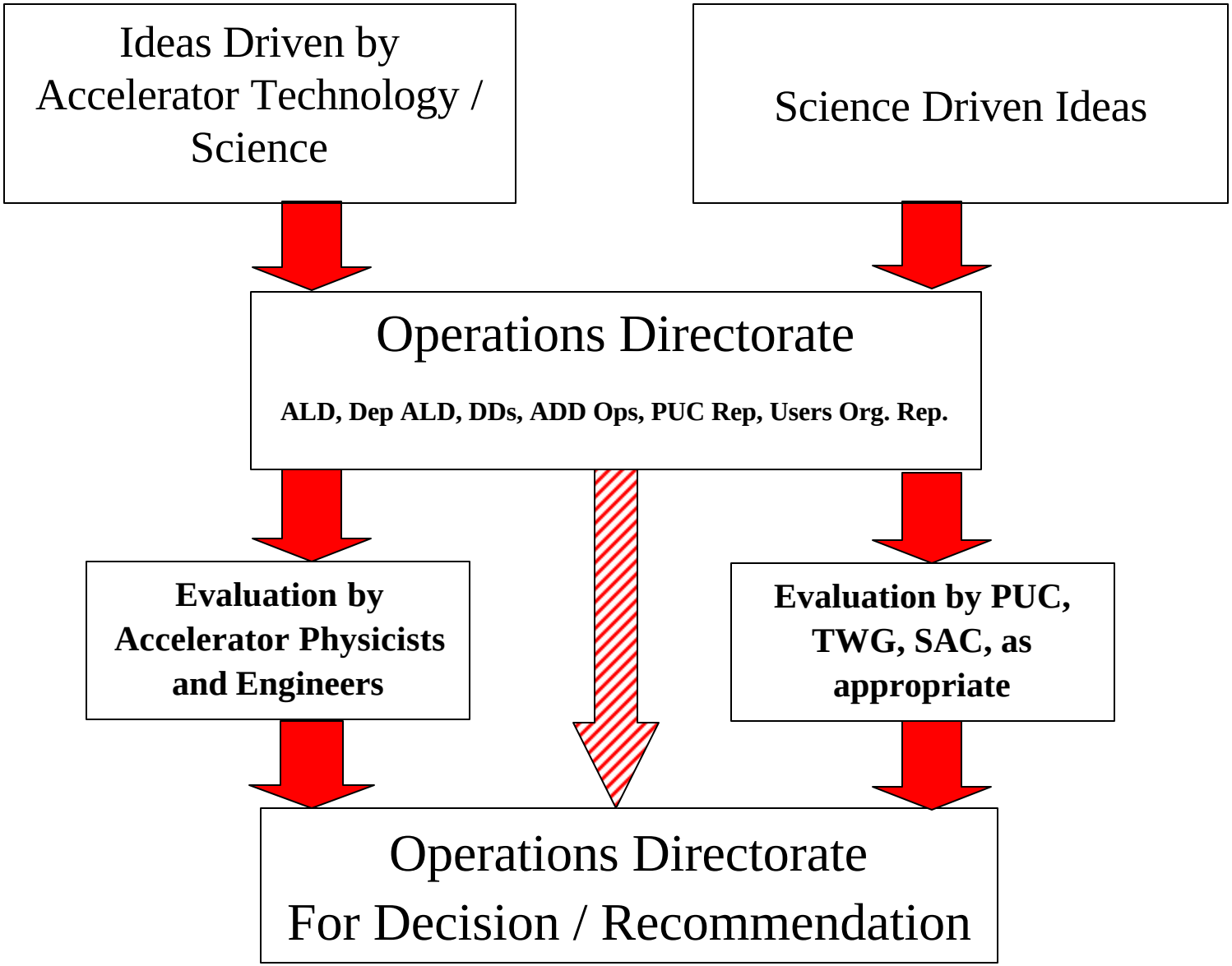

Ideas Driven by Accelerator Technology / Science
Science Driven Ideas
Operations Directorate
ALD, Dep ALD, DDs, ADD Ops, PUC Rep, Users Org. Rep.
Evaluation by Accelerator Physicists and Engineers
Evaluation by PUC, TWG, SAC, as appropriate
Operations Directorate For Decision / Recommendation

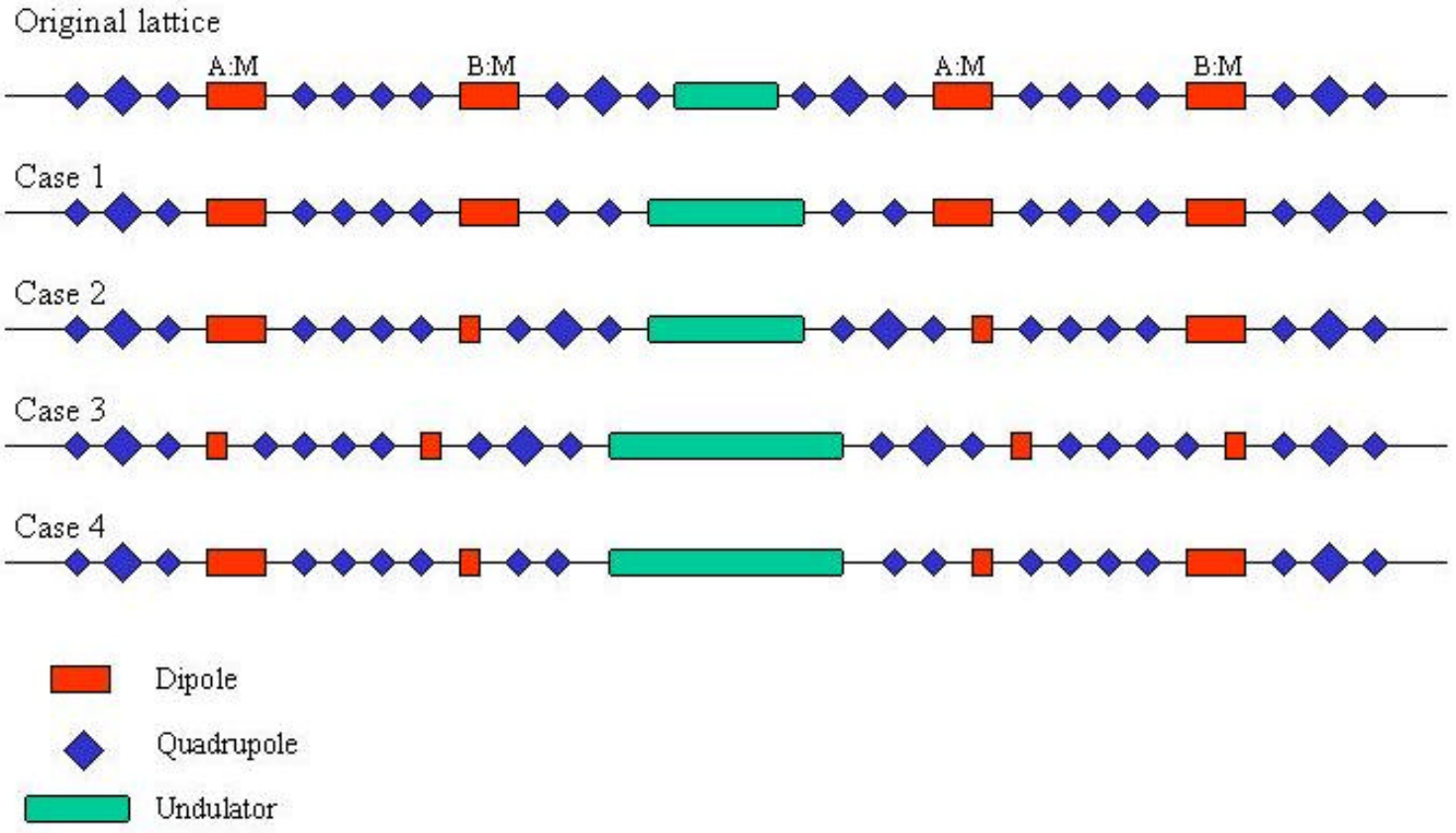
Enhancements Discussed

- **Extended Straight**
- **Pathway to higher current**
- **“Quiet” Injection**
- **Special Operating Modes**

Extended Straight Section Considerations

- **Imposed Constraints**
  - Inboard shift cannot exceed 70 mm.
  - Dipole Field cannot exceed 1.3 T (presently .6 T)
  - Superconducting Undulator should not be located at the limiting vertical aperture in accelerator
  - Accelerator performance not negatively impacted
  - Attempt to achieve requested length

Diagram showing two sectors



Two Cases Analyzed

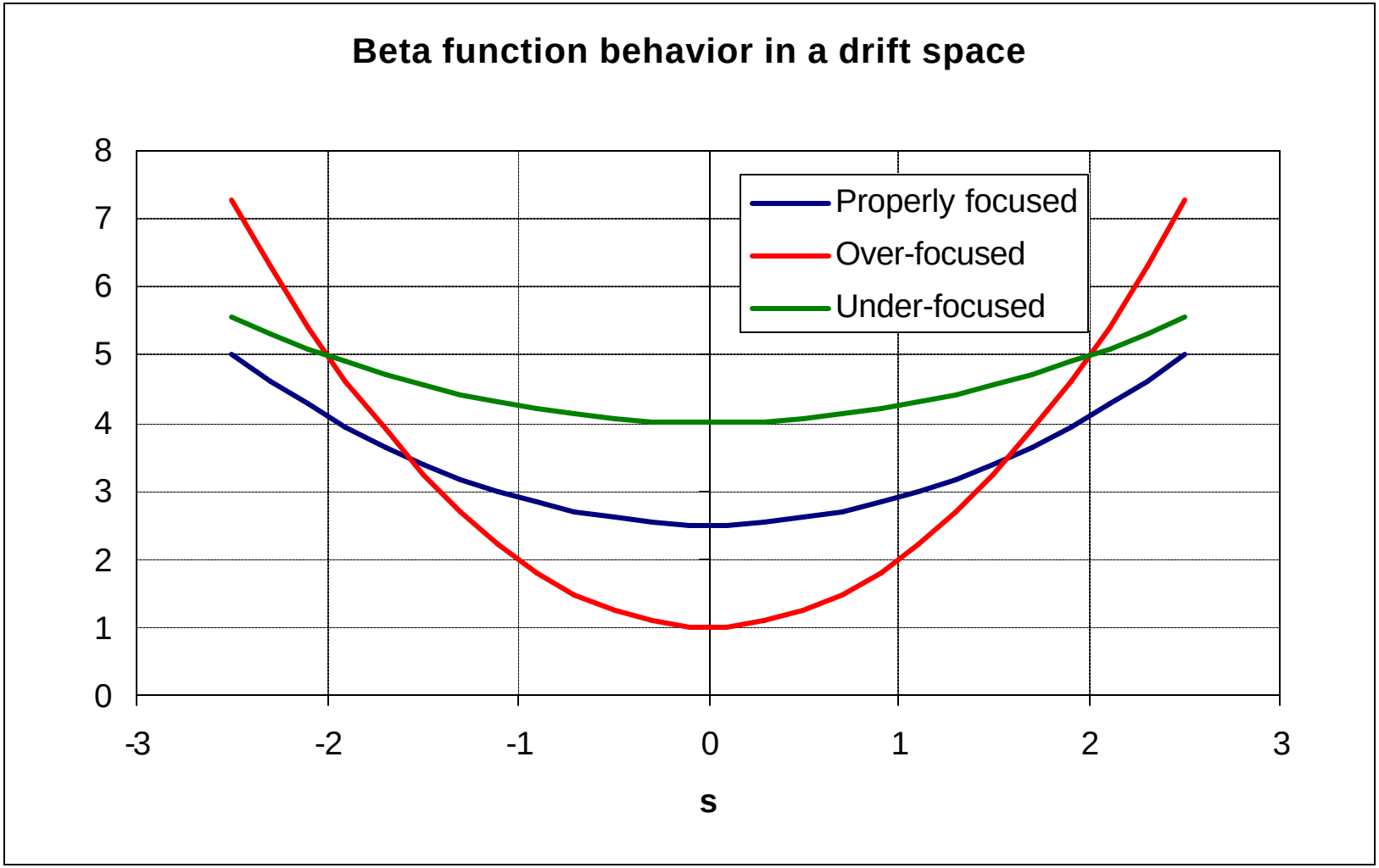
- **Case 1: The upstream and downstream quadrupole triplet would become a doublet. The insertion length would be 8.5 m (an extension of 2.9 m).**

- **Case 4: The upstream and downstream quadrupole triplet would become a doublet and the upstream BM dipole and the downstream AM dipole would be shortened. The insertion length would be 11.9 m (an extension of 6.3 m)**

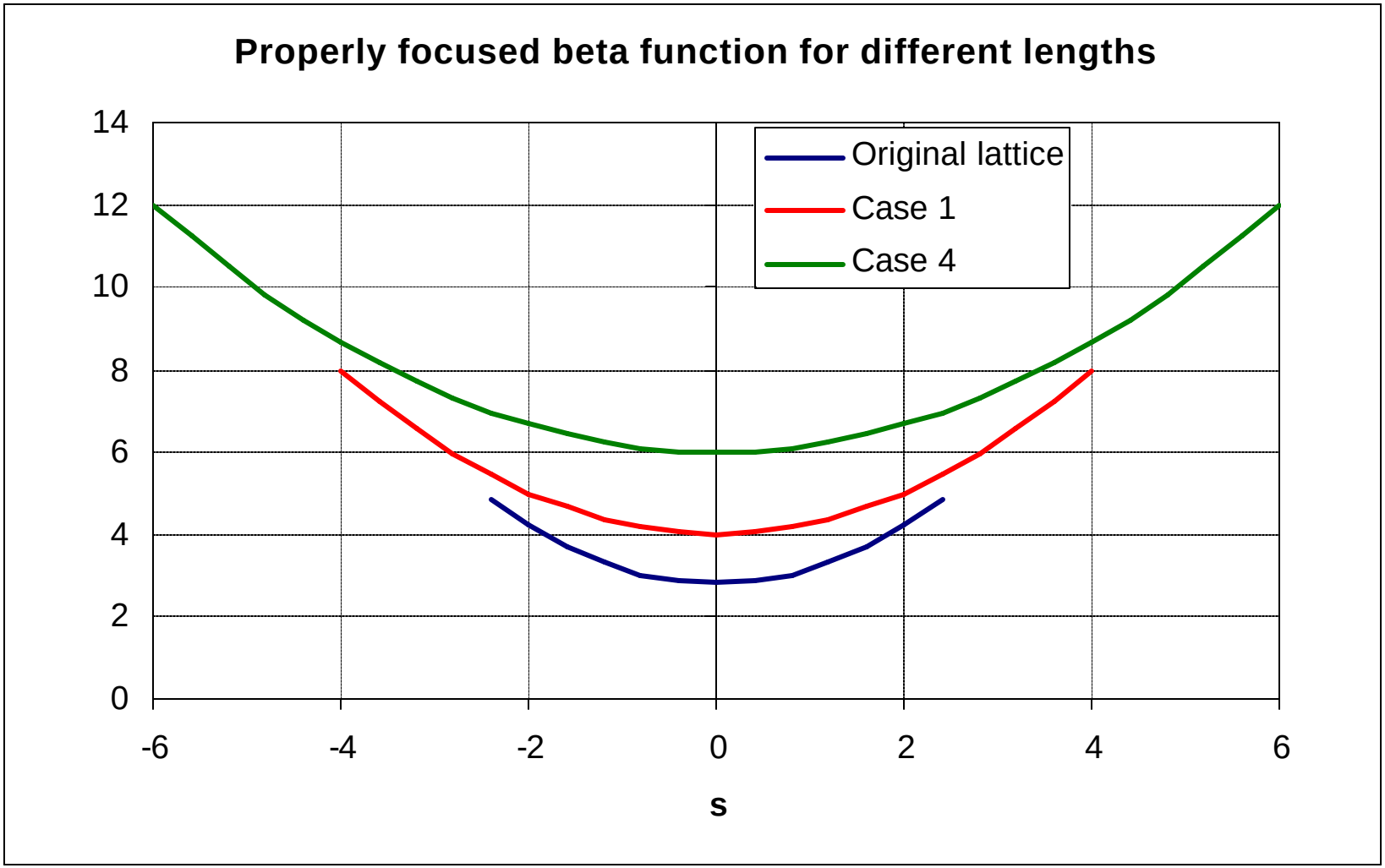
Accelerator Performance Prediction

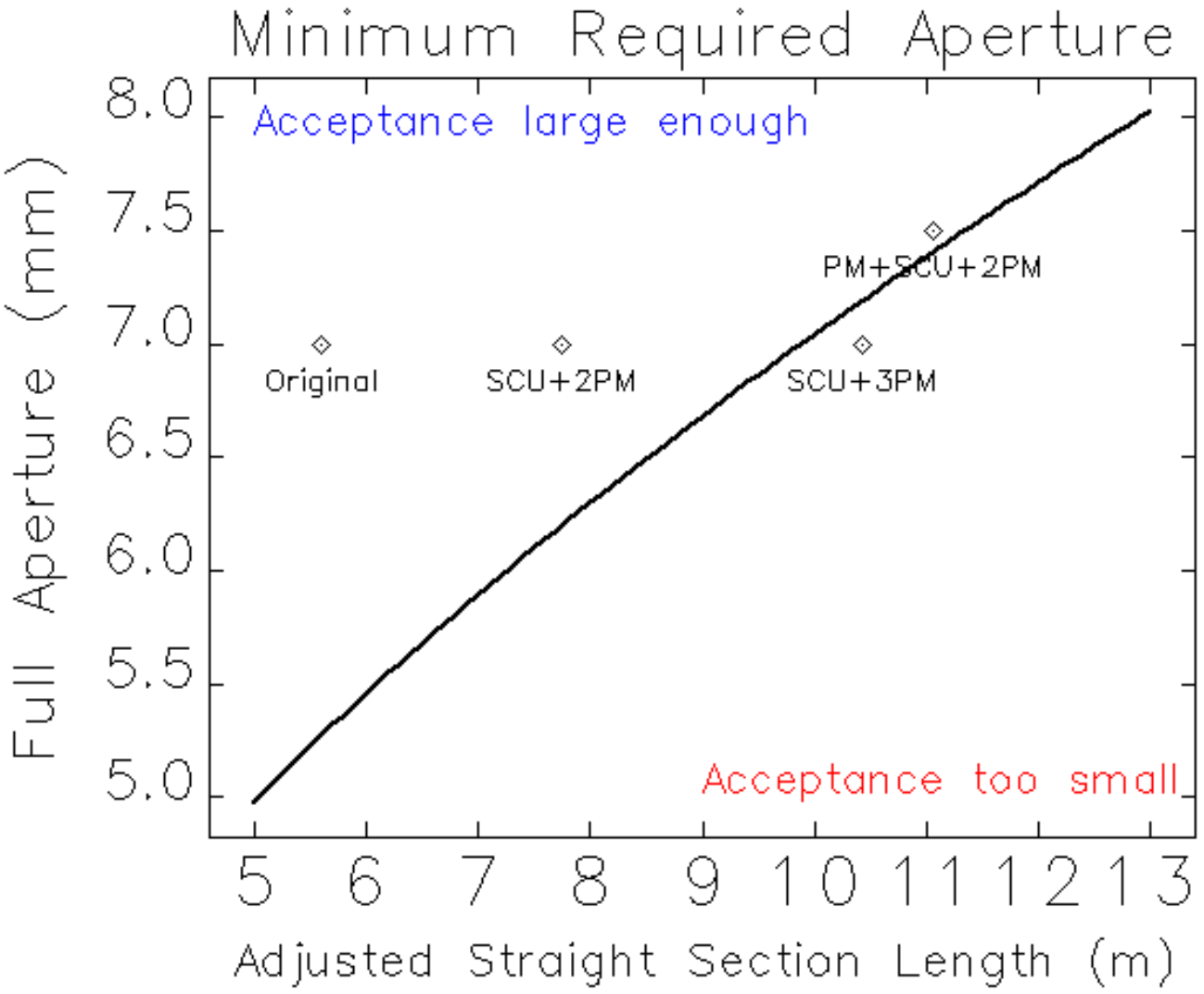
	Performance in SR	***Numerical simulation***
Ideal Lattice	Not available	Better than reference
Present (Reference) lattice (Ideal with errors included) (5.59 m)	Reference measurements of lifetime and efficiency	Reference momentum and dynamic apertures obtained
Case 1: Doublet with lattice errors (8.518 m)	As good as reference	Lifetime reduced by ~40% Aperture reduced slightly
Case 4: Short dipole and doublet with lattice errors (11.9 m)	*Measurement is not available*	Similar results to case 1.

There is a unique solution for minimum beamsize in a symmetric lattice



The minimum beam size occurs when entrance beta is equal to the drift space length




Minimum Required Aperture
Acceptance large enough
Acceptance too small
PM+SCU+2PM
Original
SCU+2PM
SCU+3PM
Full Aperture (mm)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
5 6 7 8 9 10 11 12 13
Adjusted Straight Section Length (m)

Cost Analysis for Extended Straight Cases

Costs for Case 1: 8.6 meter insertion length	
Chamber extrusion for S5 and S1	$65,000
Chamber welding, assembly	$30,000
S5 and S1 girders	$10,000
Pedestals, jacks, supports, stands	$20,000
Engineering and design	$100,000
Assembly and installation	$20,000
ID chamber	$188,000
Total case 1	**$433,000**

Costs for Case 4: 11.9 meter insertion length	
Chamber extrusions	$165,000
Chamber welding and assembly	$75,000
Dipole magnets	$380,000
Girders	$40,000
Pedestals, jacks, supports, stands	$22,000
Absorbers	$100,000
Bellows	$84,000
Engineering and design	$410,000
Assembly and installation	$40,000
ID chamber	$188,000
Total Case 4	**$1,504,000**

Physics Issues Still Under Consideration

- **What is the impact of multiple installations? (incremental emittance growth with each: Case 1- .007nm ; Case 4 - .08nm)**
- **Can two implementations be put on adjacent straights? (probably not)**
- **What is the impact on plans for future reduction in emittance? (not known, work underway)**

Accelerator High Current Study