



# Agenda

- **13:00**      **Scenarios (status)**      **Nick/Ewan**
- **13:15**      **Proposed parameters**      **Andrei**
- **13:30**      **Phys. & Detector Issues**      **Jim**
- **13:45**      **Cost impact**      **Peter**
- **14:00**      **Planning for BAWs**      **Marc**
- **14:15**      **Discussion**      **All**



# Configurations and Running Scenarios (status)

Nick Walker

Marc Ross

Ewan Paterson

Akira Yamamoto

A horizontal dotted line in a light yellow-green color runs across the bottom of the slide, mirroring the one at the top.

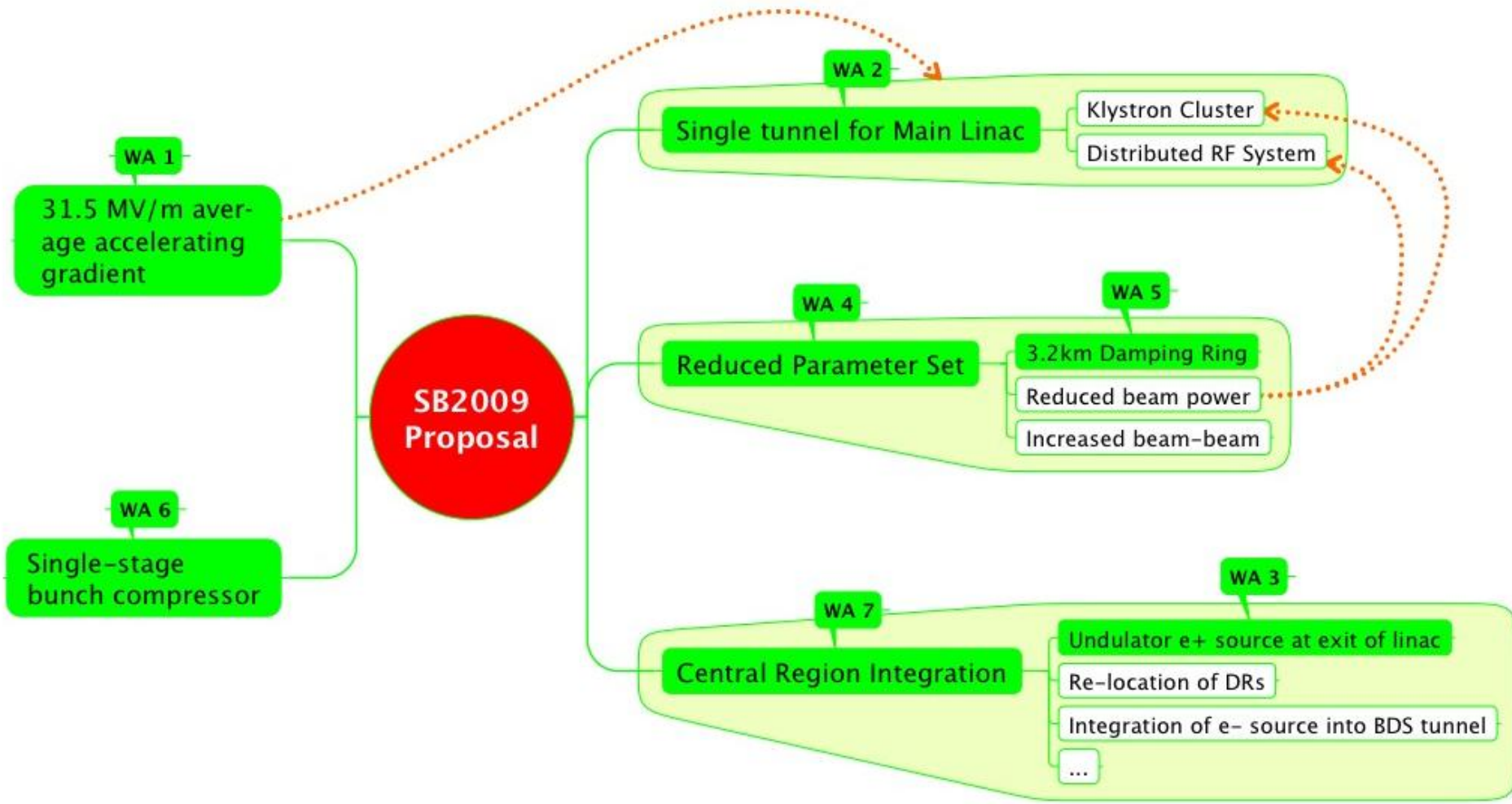


# Progress since January AAP Review

- **Significant change in TD Phase plans**
  - New baseline not established in Beijing → ALCPG (3.2011)
  - Further studies considered
  - More involvement and communication with ‘stake-holders’
- **Beijing Workshop (ILC10/LCWS10)**
  - Establishment of Top-Level Change Control process
  - Planning for Baseline Assessment Workshops
  - Further ideas and studies on low  $E_{cm}$  running
    - 10Hz ‘alternate pulse’ operation
    - Low-E final doublet configuration
- **GDE PAC review (May 2010, Valencia)**
  - overall positive reaction to cost-containment approach (with caveats)

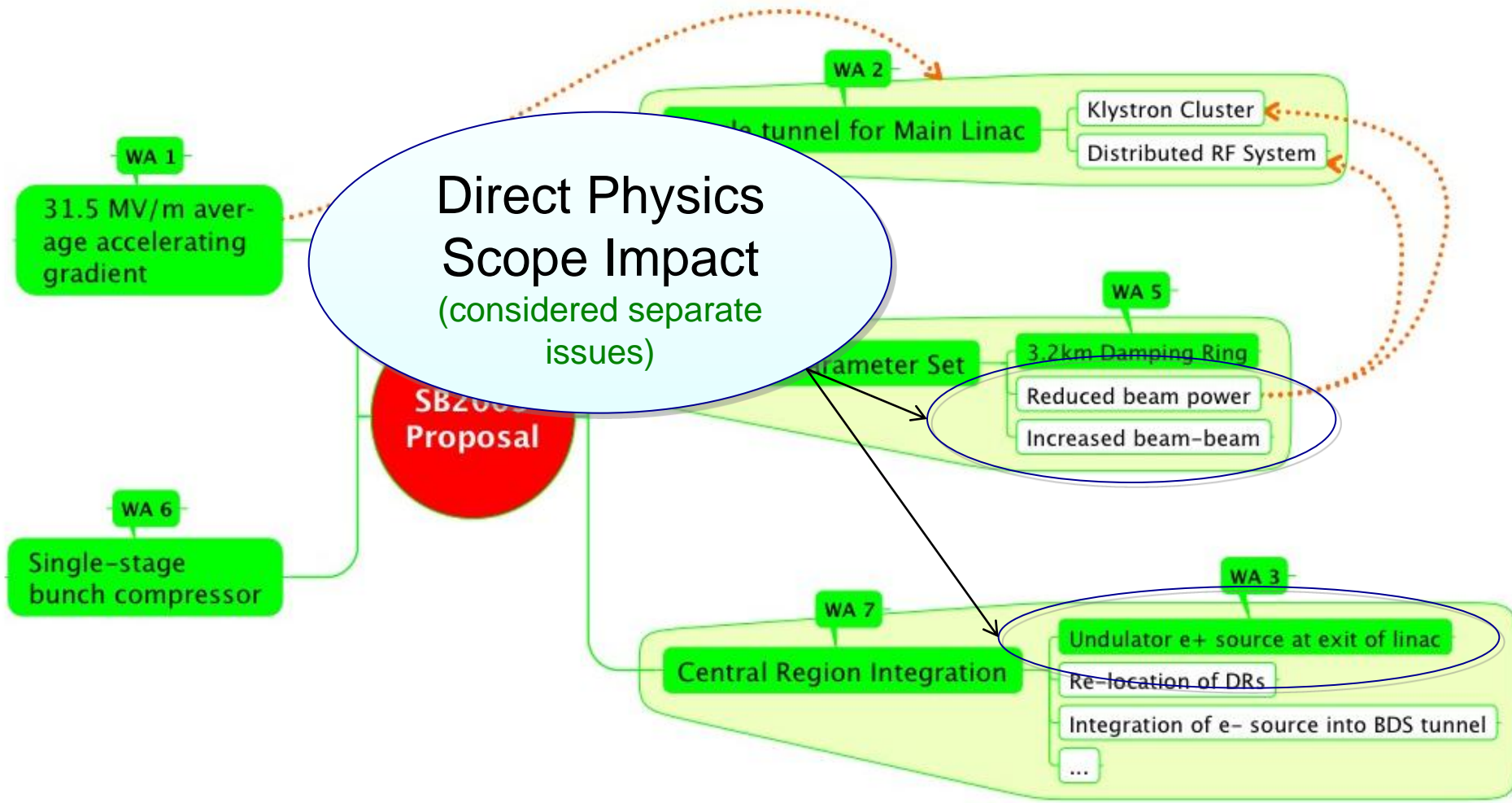


# AD&I (SB2009) Themes





# AD&I (SB2009) Themes





# Separation of Issues

Reduced Power impacts  
number of bunches  
(across  $E_{\text{cm}}$  range)

Re-location of  $e^+$  source  
impacts *charge per  
bunch* at lower  $E_{\text{cm}}$

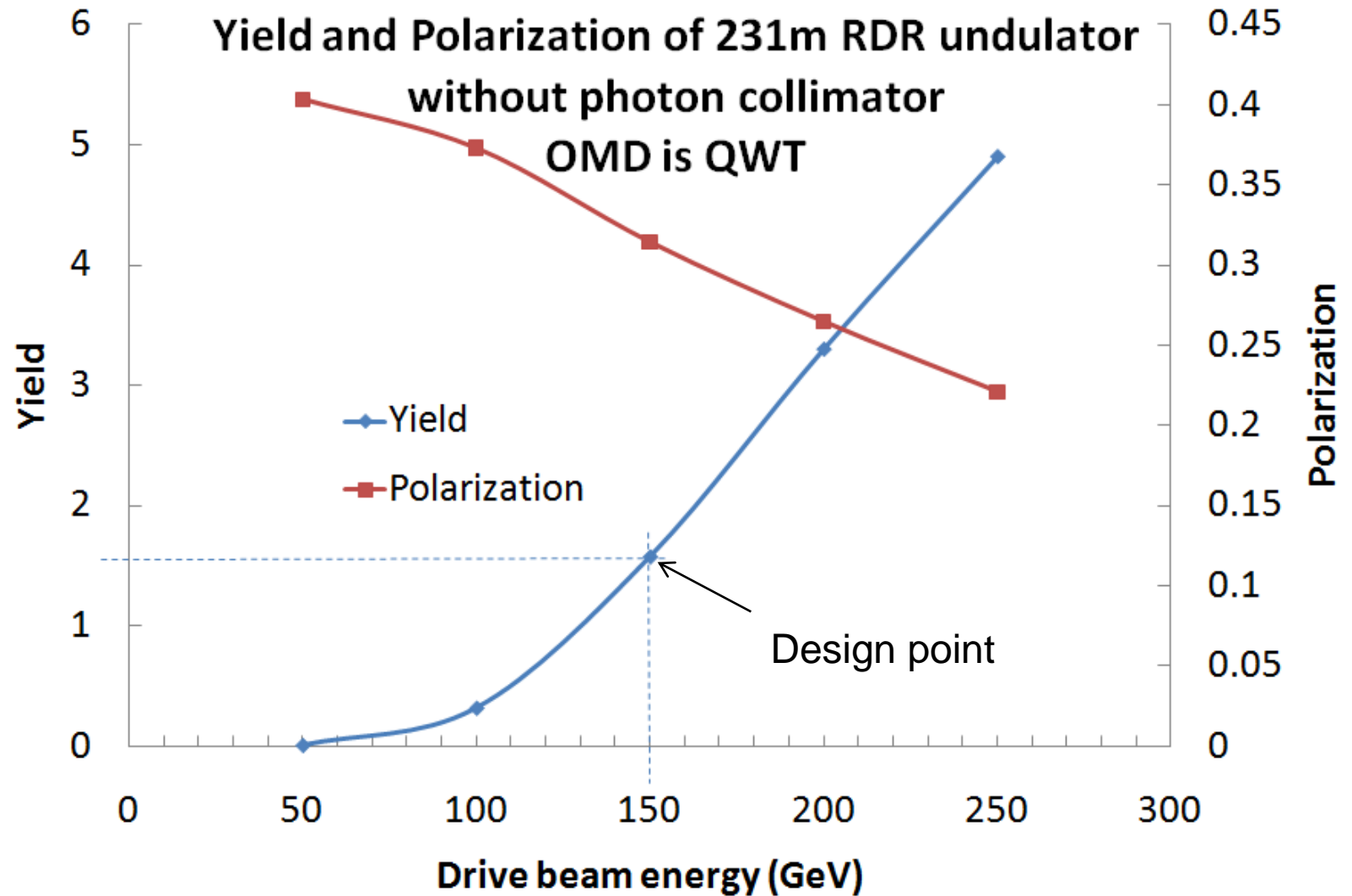
$$L \propto \frac{n_b N_+ N_-}{\sigma_x \sigma_y}$$

For  $e^+$  source issue:

- found solution that can maintain  $N_+$  from 200-500 GeV
  - 10Hz alternate pulse
- Source relocation is now a question of *technical risk* and no longer a physics performance issue
  - Effectively factored out
- Technical issues/challenges with 10Hz solution still remain (later)

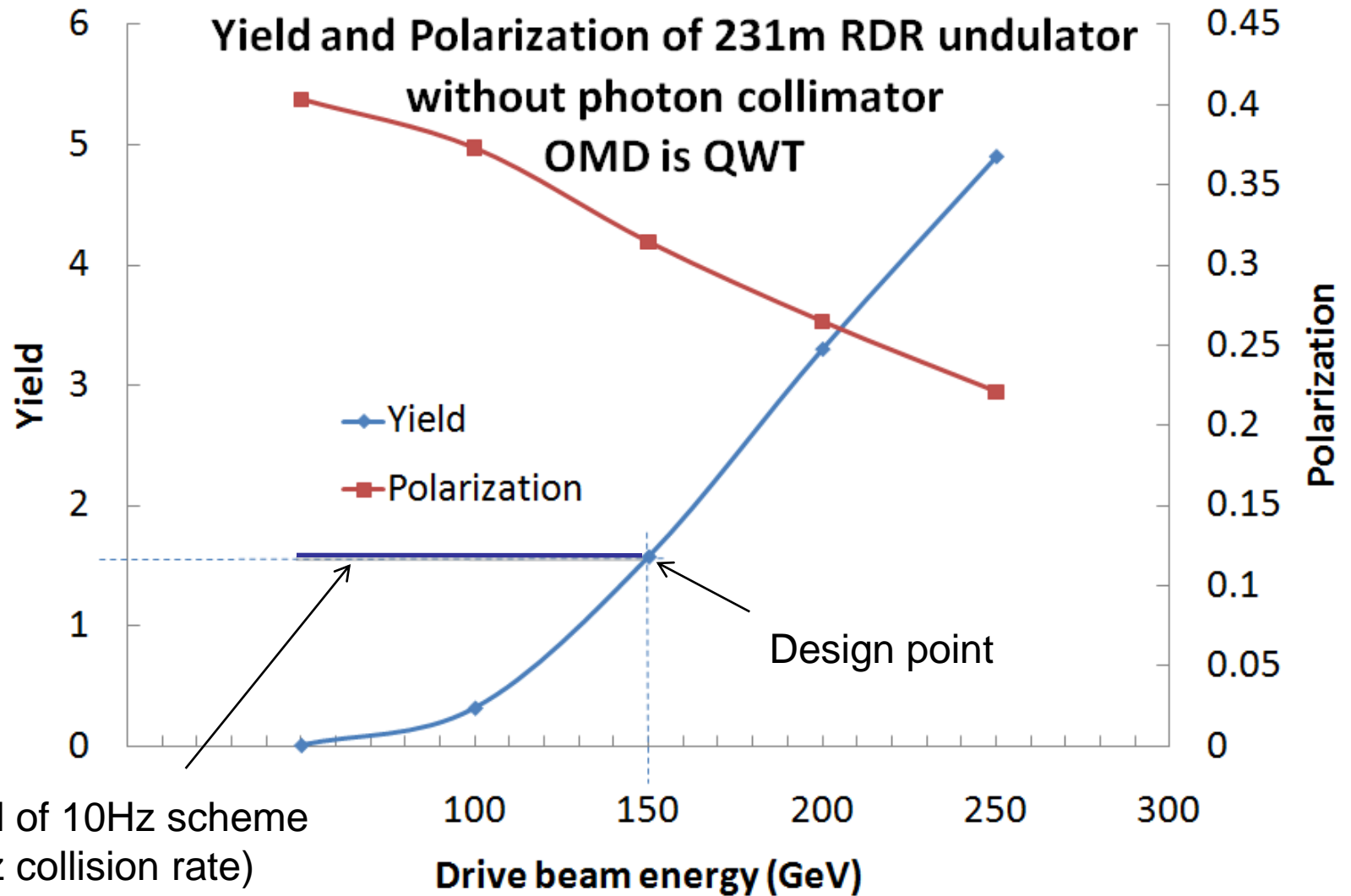


# Source Yield





# Source Yield







# 10Hz status summary

- **100ms for damping OK for DR 😊**
- **Main Linac RF (AC) power ~OK 😊**
- **Damping Ring 50% beam duty cycle ☹️**
  - Needs further study and possibly R&D
  - Final solution(s) not yet determined
- **Current (initial) cost increment high (1.9% TPC) ☹️☹️**
  - not for free!!
  - Costs need review and optimisation



# Reduced Parameter Set

- **Reduction of beam current (beam power)**

- Reduced peak RF power  $\Rightarrow$  Reduced klystron/modulator count



- **Reduce bunch number per pulse ( $n_b$ )**

- Increase bunch spacing  $\Rightarrow$  reduced current
- Charge per bunch (N) remains  $2 \times 10^{10}$

- **Reduced DR circumference**

- Scale as  $n_b$
- No change in DR beam current (collective effects)



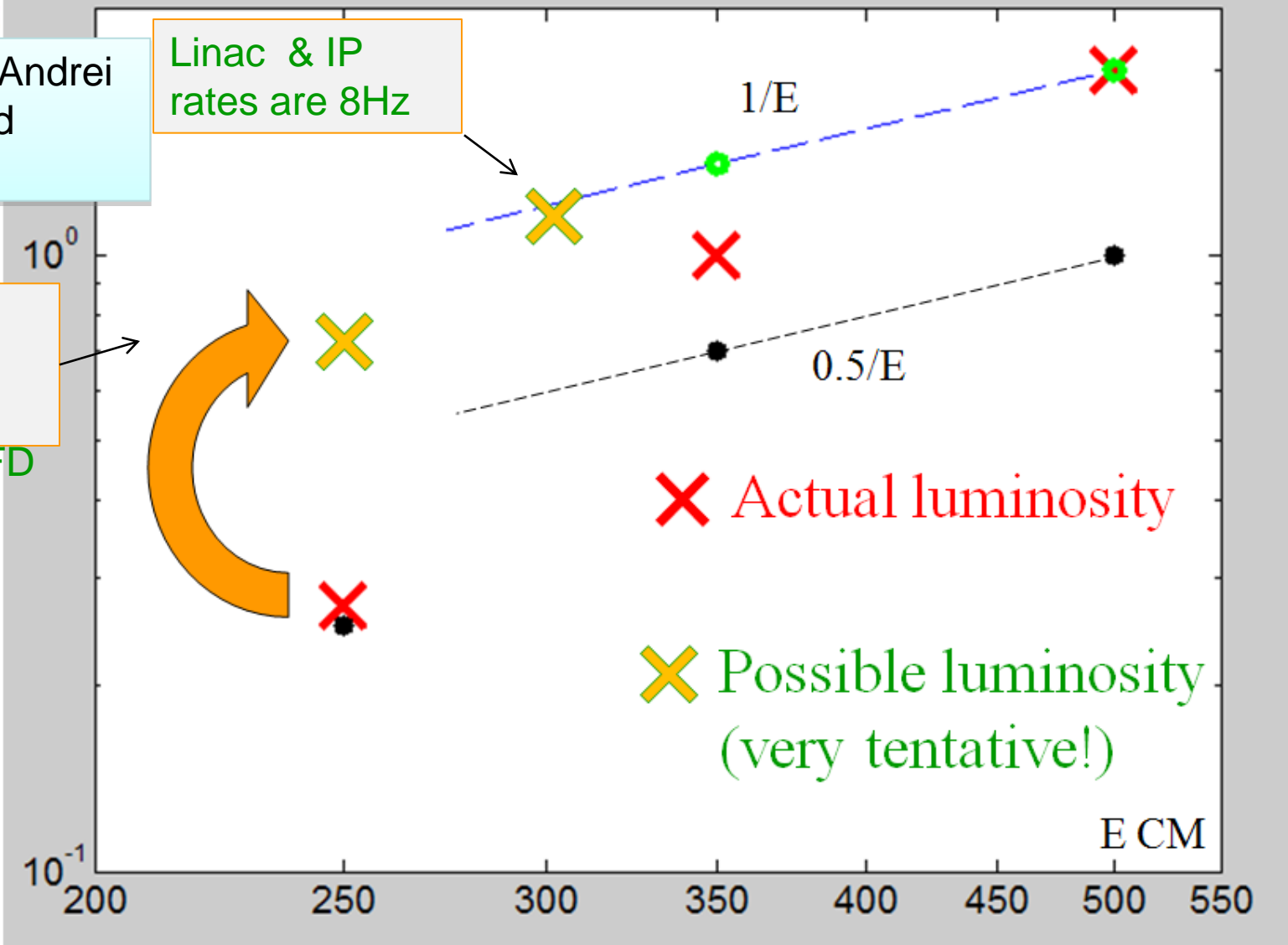
- Longer RF pulse length (fill time)
- Higher  $Q_{\text{ext}}$  (more control overhead)
- Lower RF-to-beam power efficiency
- More aggressive beam-beam parameters
- Higher disruption → stability
- Larger beamstrahlung
- However – no technical show stoppers

Travelling Focus  
requires further study  
(beam dynamics)

See talk by Andrei for proposed parameters

Linac & IP rates are 8Hz

Linac rate 10Hz (IP rate 5Hz) and special FD





# Risk & Recovery

- **PAC recommendation: keep beam-power recovery option open as *risk mitigation***
- **DR – many options:**

	#bunched	status	mitigation
3.2km e+ ring	1300	Believed OK (RDR spec)	
	2600	Aggressive	build second ring
3.2km e- ring	1300	Believed OK (RDR spec)	
	2600	OK? fast-ion needs study	build second ring



# Working Assumption

- **2x3.2km rings in tunnel capable of supporting 3**
  - e-cloud considered primary technical challenge
- **RF considerations (adding RF power)**
  - KCS: add klystrons on the surface
  - DRFS: installation in tunnel
  - Question: understanding level of CFS support at initial construction



# Question for Physics & Detectors

- **Is the doubling of the Higgs mass resolution, 43 to 93 MeV, of significance?**
  - Beamstrahlung in scenarios using a Travelling Focus.
- **Possible physics gain for lower e- energy spread (at  $E_{cm} < 300 \text{ GeV}$ )**
  - use of bypass for undulator in 10Hz scheme
- **New 'alternate' 4 or 5 year physics running scenarios based on today's limits?**
- **Higgs branching and 350 GeV spin-parity analysis**
- **Modification of final doublet for low  $E_{cm}$  running**
  - detector issues?



# Question for Physics & Detectors

- **What other parameter sets should be studied by a joint group?**
  - Are there any non- accelerator, detector, questions related to 10 Hz operation that have not been raised? Do we need to consider operation at energies say above 300 but less than 350 and different repetition rates? Can questions like these wait until the physics is known and can the machine design be optimized at a later date.
- **Can the increased sensitivity to jitter with the travelling focus be studied quantitatively?**
  - This would require some agreed upon scenarios for early running (1-2 years?) as this sensitivity is in itself coupled to having a strong beam-beam interaction which will increase with time. This can be argued to be both good and bad!





# Question for Physics & Detectors

- **Possible Physics running scenarios.**
- **For example one might consider the following:**
  - Run 2 to 3 years with the SB2009 low power parameters, presumably at 350 to 500 GeV?
  - Shutdown for N months (where  $N \leq 9-12$ ) Install more RF, new final doublet, system upgrades based on early operational experience (incl. detectors).
  - Start operation at any energy based what has been learned in physics and accelerator capability.
- **IS THIS A WORTHWHILE DISCUSSION IN THE NEAR FUTURE?**



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