

# **DZero's View: Run II and the Upgrades**

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**On behalf of the DØ Collaboration  
for the  
Board of Overseers**

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# DZero Strongly Supports an Upgrade

- The DZero collaboration strongly believes that the silicon and trigger upgrades are essential to maintain the discovery potential of the Tevatron program.
- The case for the DZero silicon upgrade is strong and stands by itself:
  - The sensitivity and physics gains from the upgraded detector are real and demonstrable.
  - The upgraded silicon can be installed within the time constraints of an accelerator shutdown - having no affect on the delivered luminosity.
  - The physics case remains compelling.
  - There is a full discovery menu for SUSY, ED, and other new phenomena. Recent work reaffirms that a low-mass Higgs remains in reach.
- The silicon upgrade is consistent with the Director's stated goal to maximize the Run II physics output.



# Sensitivity Measure

- The Physic Advisory Committee chose double b-tagging as a measure of a detector's physics potential.
  - Essential for the detection of top-antitop and Higgs.
  - Enhances access to a number of SUSY production channels.
- We have simulated and continue to simulate our double tagging efficiency for the current and upgraded silicon detector at various luminosity conditions.

Detector	Double Tagging Efficiency for Higgs Signal + 0 minimum bias events (low luminosity)	Double Tagging Efficiency for Higgs Signal + 7.4 minimum bias events ( $L = 2E32 \text{ cm}^{-2} \text{ s}^{-1}$ )
Current	0.23	0.19
Current with Radiation Exposure (no inner layer)	0.14	In progress
Upgraded	-	0.32

- The upgraded detector has about three times the sensitivity of the current detector after radiation exposure
  - A factor of 1.7 due to a better detector, specifically a greater number of silicon layers (from 4 to 6), closer proximity of the inner layers to the beam pipe, increased acceptance.
  - A factor of 1.4 due to amelioration of radiation damage.

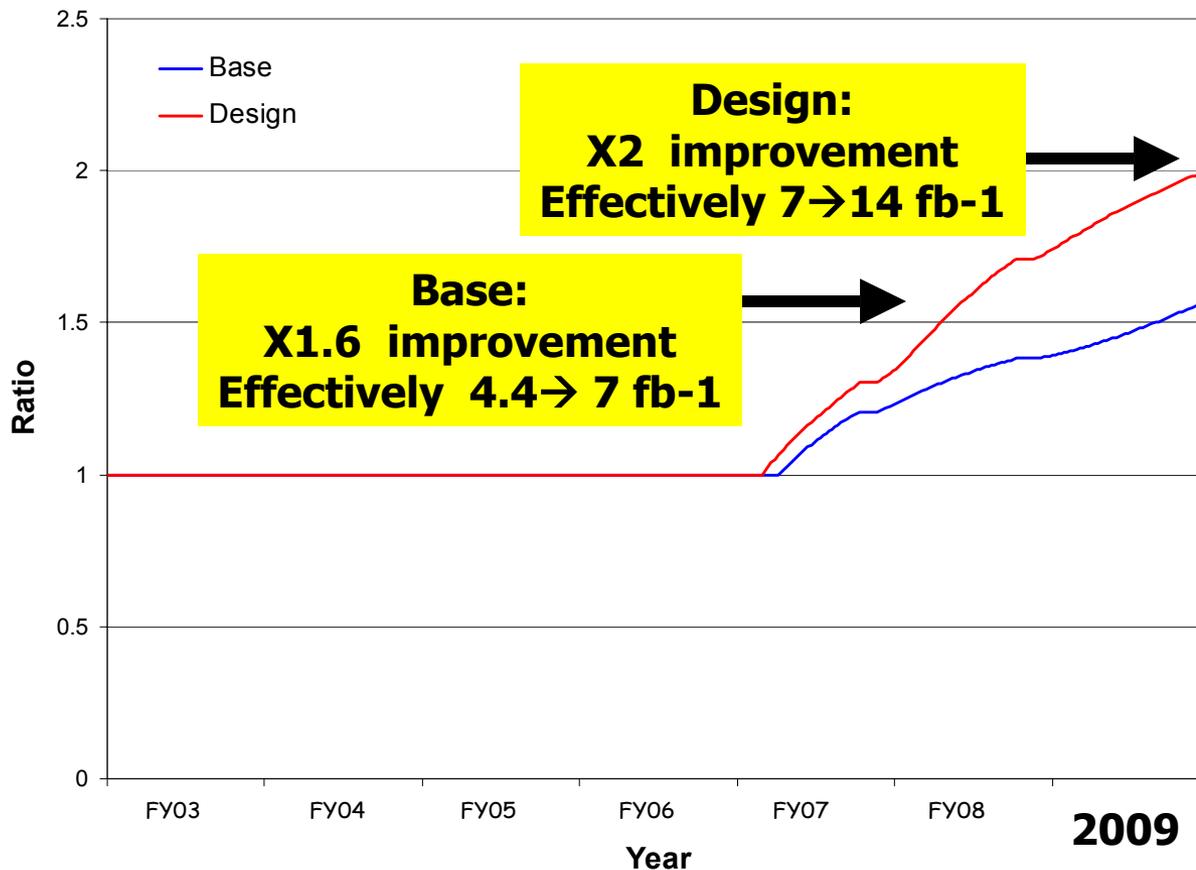


# Sensitivity Increase

- These efficiencies can be folded into the projected luminosity profile
  - Radiation damage: onset at 3.6 falling linearly to 60% by 4.9 fb<sup>-1</sup>.
  - 14 week shutdown, 14 week commissioning

## Efficiency Weighted Integrated Luminosity Ratio

Si Upgrade / No Si Upgrade



**The Silicon Upgrade Significantly Increases Discovery Potential Independent of Machine Performance**



# Commitment and Morale

- **Based on an all-hands meeting we had last Thursday and a Q&A session with the Director Friday we can say the experiment is strongly, even unanimously, behind the silicon and trigger upgrades.**
- **Morale is extremely high as we successfully prepare for LP2003, nearly 40 papers will be presented with luminosities matching or exceeding Run I luminosities**
- **The collaboration continues to grow. The prospect for large data sets with improved sensitivity is attractive. (We've heard the flip-side: demise of the upgrades will make it very difficult to convince funding agencies both at home and abroad to continue support of DZero.**



# Comments

- In any scenario the integrated sensitivity for DZero is greatly increased due to a robust and better detector coupled with a short shutdown.
  - The overall Run II program (CDF+D0) will see 25-50% increase.
- The remaining cost to achieve this luminosity increase is modest
  - \$7.3M or 46% of the \$16.0M base silicon project already spent or obligated. (There is also \$4.9M contingency.)
  - Surely for a 25% or greater increase in accelerator luminosity this would be considered a bargain
- The collaboration is solidly behind the upgrade and wishes to move forward.
- We urge the BoO to recommend to the Director completion of the DZero silicon and trigger upgrades, and maximize the discovery reach of Run II.



# Efficiency Weighted Luminosity Profile

- Nominal radiation damage

## Efficiency Weighted Luminosity Profile

Luminosity profile weighted by double b-tag efficiency

