



Beam Instrumentation Working Group R&D Report

DoE Linear Collider R&D Meeting

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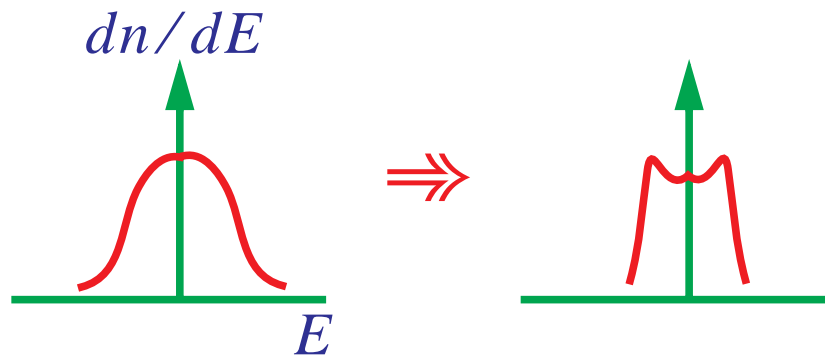
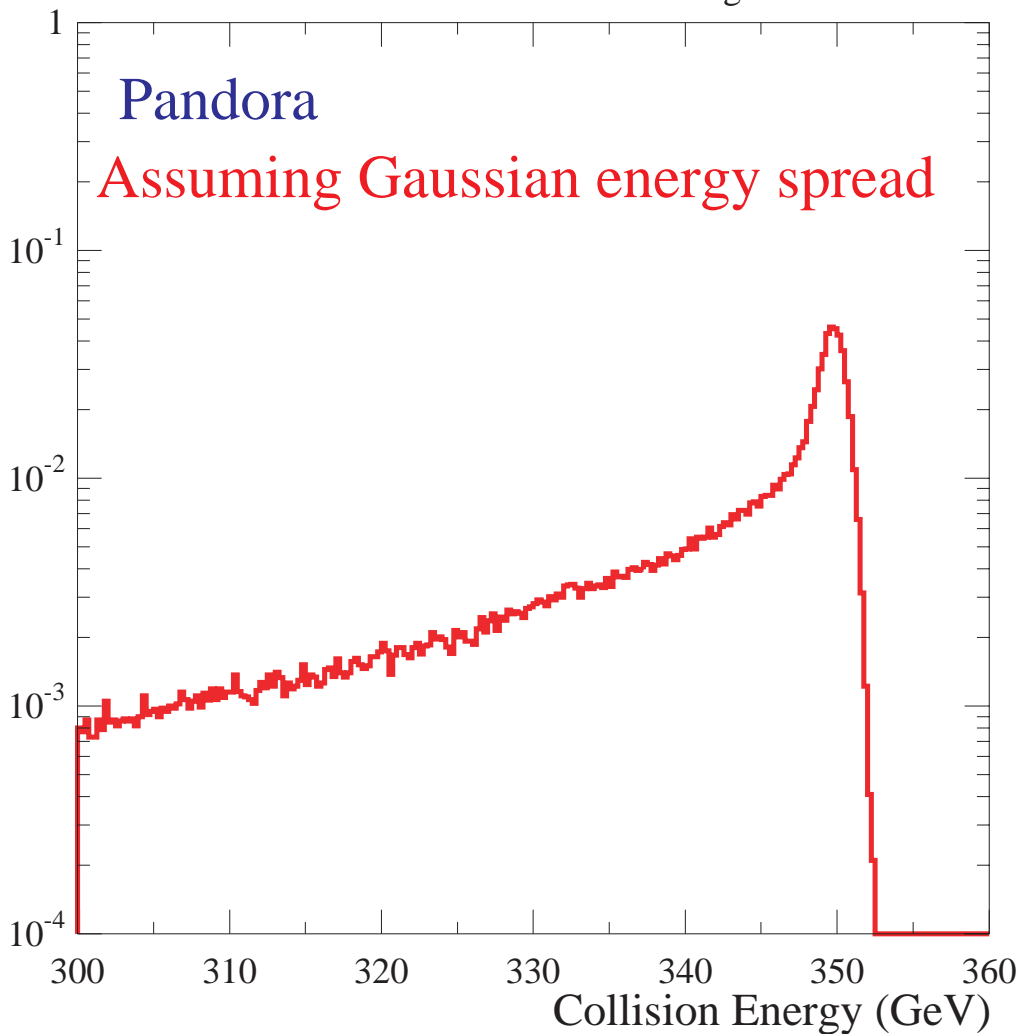
- Brief Motivation
- R&D Interests
- Where does this belong?



Luminosity



350 GeV Machine + ISR + Beamstrahlung + 0.3% Linac



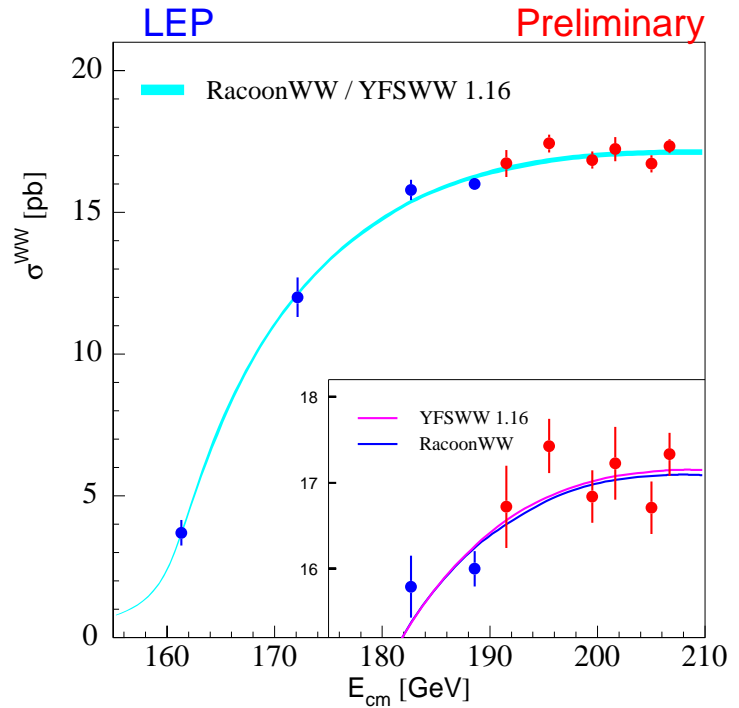
Luminosity spectrum highly dynamic!



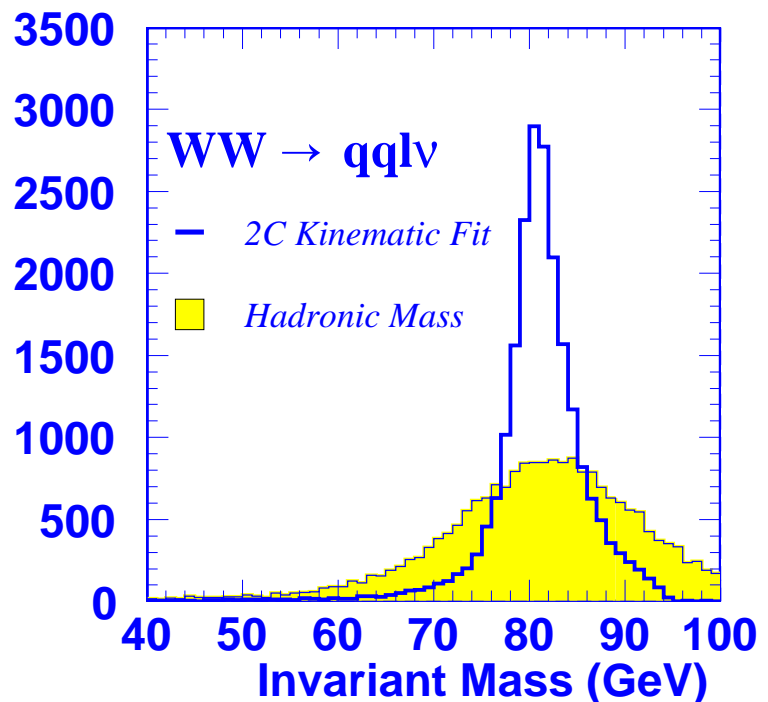
Beam Energy



Production
Threshold



Kinematic Fits



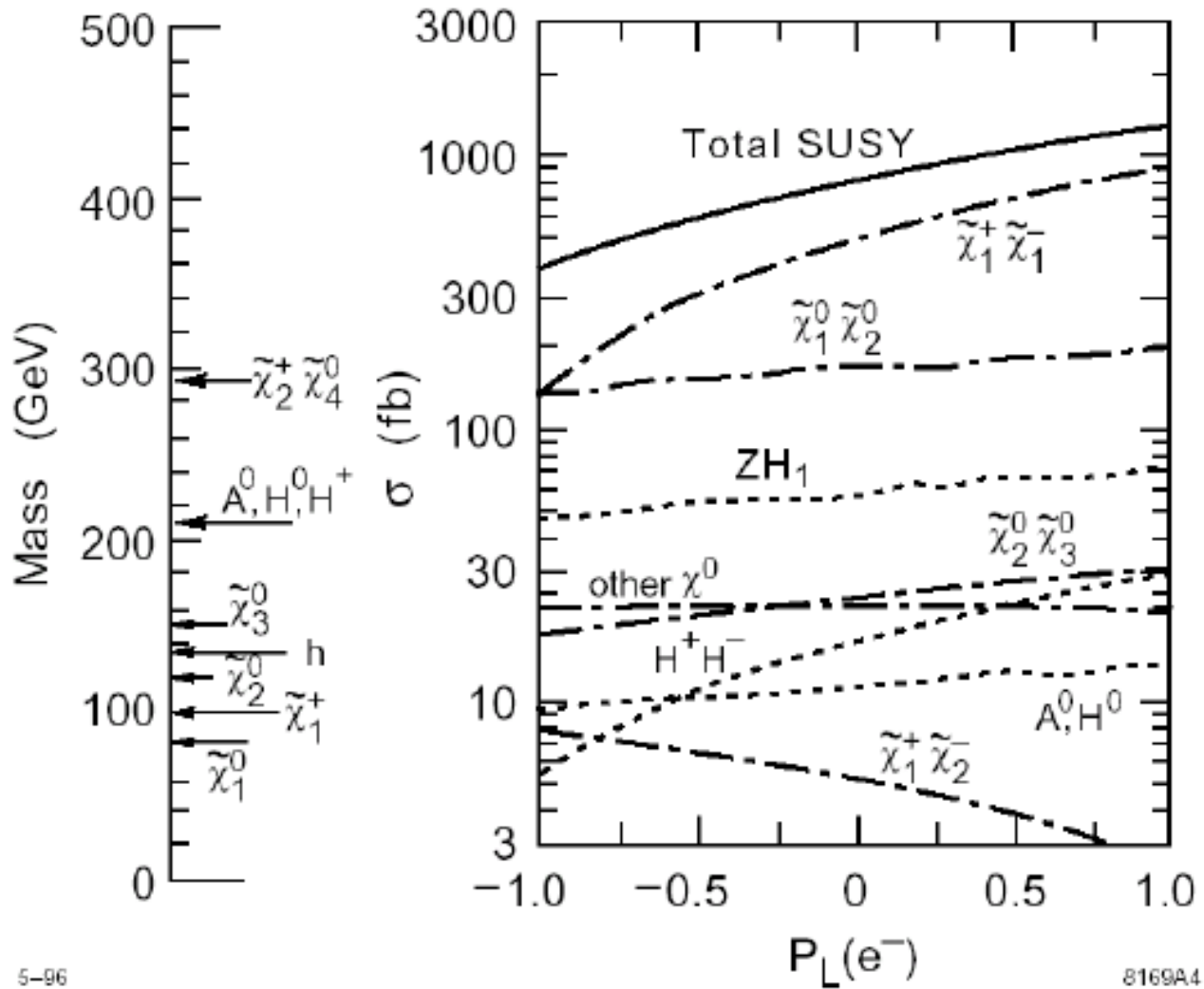
Common Scale Uncertainty $\frac{\delta M_W}{M_W} \approx \frac{\delta E_{Beam}}{E_{Beam}}$



Polarization



SUSY Asymmetries



5-96

8169A4

Unique sensitivity using helicity manipulation

$$P_e^- = 80\%$$

$$P_e^+ = 0 - 60\%$$



Target Requirements



Luminosity

- Target dL/dE precision at 1%
 - Recognize desire for absolute $\int L dt \sim 1\%$
- \Rightarrow Strong desire for RT (relative) lumi

Beam Energy

- Target 200 ppm from $2m_t < \sqrt{s} < 1 TeV$

$$\Delta m_t, \Delta m_H \sim 50 \text{ MeV}$$

- Recognize desire for 50 ppm at $2m_W \dots$

Polarization

- Target $\delta P/P = 0.25\%$ per beam
- SM, SUSY, other asymmetries
- Recognize desire for $\delta P_{eff}/P_{eff} = 0.1\%$

\Rightarrow Positron Polarization



Current State of Working Group

- Many fundamental issues still need work
- Physics studies in particular need effort
- Current emphasis on studies not hardware
- Not all groups will submit R&D proposals

⇒ Many more items identified than subscribed...



Luminosity R&D



Physics Issues

- Identify dL/dE requirements

(Wayne State)*

Detector Issues

- Čerenkov calorimeter technology

(Iowa State)

Machine Development

- Pair Luminosity Monitor

(Tohoku)*

- Beamstrahlung beam monitor
- Coherent synchrotron bunch length

(Wayne State)*

Many Uncovered Topics

- Bhabha counter development (and needs)
- Forward tracking studies/design
- Fast luminosity monitor (radiative bhabha)



Physics Issues

- Physics processes (eg: $\mu\mu\gamma$) for $\langle \sqrt{s} \rangle$
(Kansas)

Instrumentation Design

- WISRD-style spectrometer
(Oregon, U.Mass)
- BPM-style spectrometer
(Notre Dame*, Berkeley)

Uncovered Topics

- Forward tracking studies/design
- Higher precision techniques (WW threshold)
- Other possible physics processes (eg: WW)



Instrumentation Design

- Downstream Čerenkov detector
(SLAC, Tennessee)

Spin Issues

- Spin diffusion and transport
 - Beam-beam depolarization
- (SLAC)

Positron Polarization Demonstration

- Positron/Photon polarimetry
(South Carolina, Tennessee)

Uncovered Topics

- Upstream polarimeter
- WW t-channel Polarimetry



⇒ Where does this belong?

Option 1: All detector-related

Option 2: All machine-related

Option 3: Divide by individual topic

Option 3 makes the most intuitive sense

BUT by definition this is stuff which machine people put at a low (or zero) priority...

Ex: Beam simulations for precision energy spect.