



STATUS OF TOP DILEPTON ANALYSIS  
JAN 21, 1995  
CDF COLLABORATION MEETING

- PEOPLE & THINGS
- Analysis Overview
- The Data
  - Shipped for analysis
  - TABLES
  - PLOTS
  - EVENT LISTINGS
  - These in shipping
- Work in Progress

PEOPLE & THINGS: NEW CHANGES: GREAT DILEPTON MANY THANKS TO ASSISTANTS!

- EVENT SELECTION
  - M. BRESS, A. MARIN, P. YEN, T. UONIDA = TRAILS STUDENTS
  - M. CONTRERAS, J. KOWALSKO, D. ZELLIKMAN
  - OP. YEN, CHKA, A. RAJER
  - LEPTON EFFICIENCIES: M. RAJER, A. RUTIMAN, D. K.
  - MC RECOGNITION: A. MARIN, CHKA, M. RAJER
- LEPTON ISOLATION
  - CASIA G.P., G. ZELLIKMAN, CHKA
- QF STUDIES
  - T. UONIDA, D.K.
- D-TAGGING
  - A. MARIN, T. UZI, R. ROJER, A. CONTRERAS
  - G. ZELLIKMAN, C.H. WANG, CAL(CHEUNG)
- MASS STUDIES
  - K. KIM, S. KIM, J. SOMANO, A. CONTRERAS
  - K. SAHRA, K. RAJE, D.K.
- E-CHARACTERIS
  - SALMA, M. RAJER, M. SCHULMANN, M. SCHLIERER
  - T. RAJAMANN, J.K., SAHARA

PEOPLE & THINGS: NEW CHANGES: GREAT DILEPTON MANY THANKS TO ASSISTANTS!

- EVENT SELECTION
  - M. BRESS, A. MARIN, P. YEN, T. UONIDA = TRAILS STUDENTS
  - M. CONTRERAS, J. KOWALSKO, D. ZELLIKMAN
  - OP. YEN, CHKA, A. RAJER
  - LEPTON EFFICIENCIES: M. RAJER, A. RUTIMAN, D. K.
  - MC RECOGNITION: A. MARIN, CHKA, M. RAJER
- LEPTON ISOLATION
  - CASIA G.P., G. ZELLIKMAN, CHKA
- QF STUDIES
  - T. UONIDA, D.K.
- D-TAGGING
  - A. MARIN, T. UZI, R. ROJER, A. CONTRERAS
  - G. ZELLIKMAN, C.H. WANG, CAL(CHEUNG)
- MASS STUDIES
  - K. KIM, S. KIM, J. SOMANO, A. CONTRERAS
  - K. SAHRA, K. RAJE, D.K.
- E-CHARACTERIS
  - SALMA, M. RAJER, M. SCHULMANN, M. SCHLIERER
  - T. RAJAMANN, J.K., SAHARA

Analysis Overview

FOR COLLAB. MEETING 1

REPEAT OF QA ANALYSIS OF NEW CHANGES:

- Flatter dist-<sup>2</sup> in invariant mass
- Flatter mass-<sup>2</sup> on invariant mass
- More conservative general
- $|Z_{cut}| < 60$  cm

IDENTICAL TO LEPTON + jets

THE REST IS SAME:

- $9/E_{jet} > 20$  GEV, TRK (Invariant)  $(\Sigma p_T) < 1.5$  GeV
- $E_T > 25$  GEV (removed for jets - because same)
- $|\Delta\phi_{jet, top}| < 20^\circ$  if  $p_T < 50$  GeV
- 22 jets  $E_T > 20$  GEV,  $|\eta| < 2.4$  (same as)

DATA SET:

- From inclusive analysis: Good/Very Good
- die's for ALL events up to  $\sqrt{s} = 41 \text{ pb}^{-1}$
- BACKGROUND: removed via  $\sqrt{s} = 38 \text{ pb}^{-1}$

$1A+B \sim 57 \text{ pb}^{-1}$  !

# Dilepton Group presentation at the CDF collaboration meeting on Jan 21st, 1995

## One step to the Top...

Run 1B data ( $28 \text{ pb}^{-1}$ ), using 1B lepton selection cuts

| Category       | Signal | Background | 2-Lepton | Missing E | 3-jet |
|----------------|--------|------------|----------|-----------|-------|
| TCR-TCR        | 675    | 668        | 662      | 108       | 2     |
| TCR-ACE        | 104    | 101        | 100      | 18        | 0     |
| TCR-FUL        | 217    | 207        | 206      | 18        | 0     |
| $e^+e^-$       | 1100   | 1090       | 1070     | 141       | 2     |
| TCR-TCR        | 800    | 800        | 801      | 75        | 7     |
| TCR-ACE        | 618    | 618        | 617      | 66        | 0     |
| TCR-FUL        | 386    | 384        | 386      | 27        | 0     |
| $\mu^+\mu^-$   | 1100   | 1101       | 1100     | 100       | 0     |
| TCR-TCR        | 18     | 18         | 9        | 8         | 4     |
| TCR-ACE        | 4      | 4          | 3        | 2         | 0     |
| TCR-FUL        | 4      | 4          | 3        | 2         | 0     |
| (TCR-ACE)      | 4      | 3          | 3        | 1         | 0     |
| TCR-FUL        | 2      | 1          | 1        | 1         | 0     |
| CHS-FUL        | 0      | 0          | 0        | 0         | 0     |
| CHS-FUL        | 0      | 0          | 0        | 0         | 0     |
| $(\mu^+\mu^-)$ | 30     | 22         | 19       | 19        | 4     |
| $e^+e^-$       | 10     | 20         | 10       | 10        | 4     |

1  $q\bar{q}$  candidate  
2  $\mu\mu$  candidates

Run 1A + 1B data ( $57 \text{ pb}^{-1}$ ), using 1B lepton selection cuts

| Category       | Signal | Background | 2-Lepton | Missing E | 3-jet |
|----------------|--------|------------|----------|-----------|-------|
| TCR-TCR        | 1300   | 1292       | 1283     | 144       | 2     |
| TCR-ACE        | 151    | 149        | 148      | 18        | 0     |
| TCR-FUL        | 306    | 304        | 303      | 21        | 0     |
| $e^+e^-$       | 1100   | 1091       | 1070     | 141       | 2     |
| TCR-TCR        | 800    | 799        | 799      | 101       | 7     |
| TCR-ACE        | 618    | 618        | 618      | 66        | 0     |
| TCR-FUL        | 400    | 400        | 401      | 34        | 2     |
| $\mu^+\mu^-$   | 1100   | 1099       | 1099     | 100       | 0     |
| TCR-TCR        | 18     | 18         | 11       | 8         | 4     |
| TCR-ACE        | 4      | 4          | 4        | 2         | 0     |
| TCR-FUL        | 4      | 3          | 3        | 2         | 0     |
| (TCR-ACE)      | 4      | 3          | 3        | 1         | 0     |
| TCR-FUL        | 2      | 1          | 1        | 1         | 0     |
| CHS-FUL        | 0      | 0          | 0        | 0         | 0     |
| CHS-FUL        | 0      | 0          | 0        | 0         | 0     |
| $(\mu^+\mu^-)$ | 30     | 22         | 19       | 19        | 4     |
| $e^+e^-$       | 10     | 20         | 10       | 10        | 4     |

FROM AN ASSISTANT

BACKGROUNDS etc.

|                        | Without $E_T$ and lepton cuts | Without lepton cut | All cuts  |
|------------------------|-------------------------------|--------------------|-----------|
| $W^+W^-$               | 1.1                           | 0.11               | 0.20±0.13 |
| $Z \rightarrow \nu\nu$ | 10.7                          | 0.64               | 0.20±0.08 |
| $t\bar{t}$             | 2.5                           | 0.29               | 0.12±0.09 |
| Fake                   | 3.5                           | 0.35               | 0.03±0.09 |
| Total background       | 30.1                          | 3.43               | 0.73±0.17 |
| CDF Data               | -                             | -                  | 2         |

|                        | Without $E_T$ and lepton cuts | Without lepton cut | All cuts  |
|------------------------|-------------------------------|--------------------|-----------|
| $W^+W^-$               | 1.7                           | 1.25               | 0.17±0.08 |
| $Z \rightarrow \nu\nu$ | 6.7                           | 0.58               | 0.17±0.08 |
| $t\bar{t}$             | 4.6                           | 0.35               | 0.15±0.09 |
| Fake                   | 4.9                           | 0.72               | 0.12±0.09 |
| Dist-Yuk               | 3.8                           | 0.81               | 0.20±0.11 |
| Total background       | 34.8                          | 3.71               | 0.20±0.15 |
| CDF Data               | -                             | -                  | 2         |

Number of background events expected in  $37 \text{ pb}^{-1}$  and the number of events observed in the data.

| Model  | cont.  | $\sigma_{\text{eff}}$ | $N_{\text{exp}}$ | $N_{\text{observed}}$ |
|--------|--------|-----------------------|------------------|-----------------------|
| $(10)$ | 0.0049 | 38.3                  | 6.4              | 10.7                  |
| $(10)$ | 0.0066 | 16.9                  | 2.8              | 6.4                   |
| $(10)$ | 0.0078 | 5.2                   | 2.3              | 2.3                   |
| $(10)$ | 0.0086 | 4.2                   | 1.2              | 2.3                   |

Table 1: Detection efficiency,  $\epsilon_{\text{eff}} = B \cdot \epsilon_{\text{reco}}$ , the predicted central value of  $\sigma_{\text{eff}}$  production cross section, and the number of events expected in  $37 \text{ pb}^{-1}$ , as functions of top mass.

BOTTOM LINE:

- $N_{\text{obs}} = 1.6$
- $N_{\text{exp}} = 2.3$
- $N_{\text{obs}} = 5 \text{ (fit)}$
- $N_{\text{exp}} = 1.6$
- $N_{\text{obs}} = 1.6$
- $N_{\text{exp}} = 2.10$
- $N_{\text{obs}} = 5 \text{ (fit)}$

$P[1.6 > 2.3] = 4.5\%$   
 $P[1.6 > 2.10] = 11\%$   
 $P[1.6 > 5] = 12\%$

TOP X-SECTION FROM DILEPTONS

$$\sigma = \frac{\sigma_{\text{eff}}}{\epsilon_{\text{eff}}}$$

$$\epsilon_{\text{eff}}(M_{\text{top}}) = 0.78 \cdot 0.89\% \quad \text{for } E_T < 60 \text{ GeV}$$

$$(M_{\text{top}} = 170) \rightarrow \epsilon_{\text{eff}} = 0.89\%$$

$\kappa = 5$     $\tilde{\sigma} = 1.6$

| $M_{\text{top}}$ | $\sigma_{\text{eff}}$ | $\sigma_{\text{eff}} / \epsilon_{\text{eff}}$ |
|------------------|-----------------------|---|
| 170              | 0.89%                 | 9.6 $\text{pb}$                               |
| 170              | 0.89%                 | 8.9 $\text{pb}$                               |
| 170              | 0.89%                 | 7.3 $\text{pb}$                               |
| 170              | 0.89%                 | 6.6 $\text{pb}$                               |

\*  $Z \rightarrow \nu\nu$  expect  $\sigma_{\text{eff}}$  in  $10 \text{ pb}^{-1}$   $\kappa_{\text{eff}} = 10$

