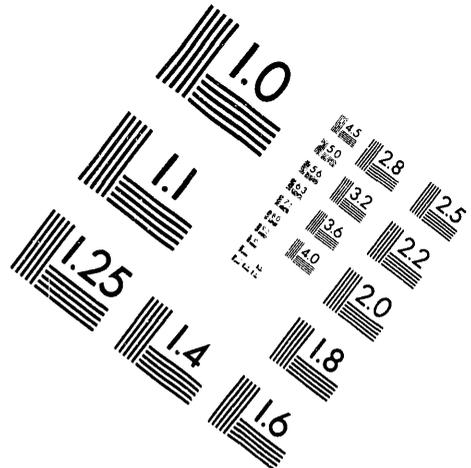
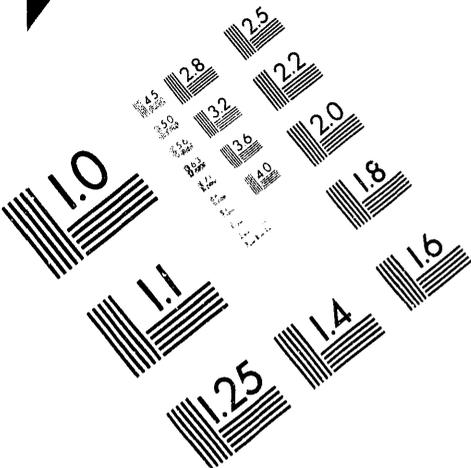




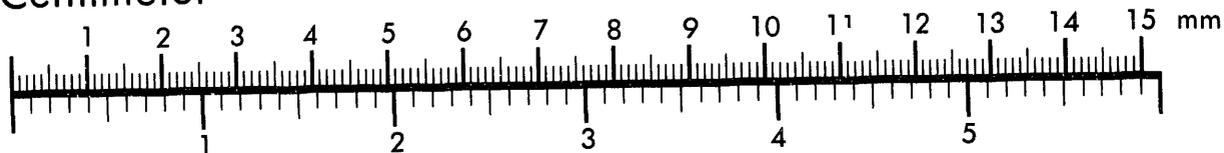
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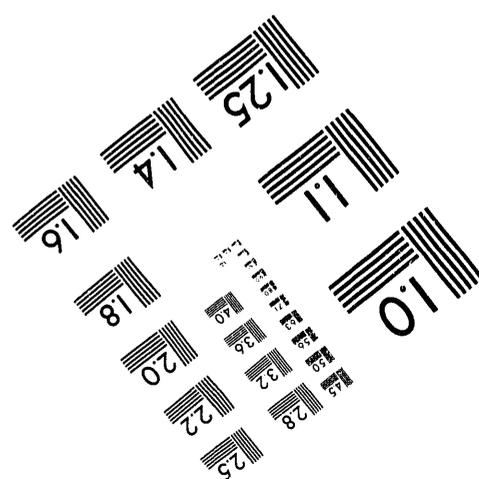
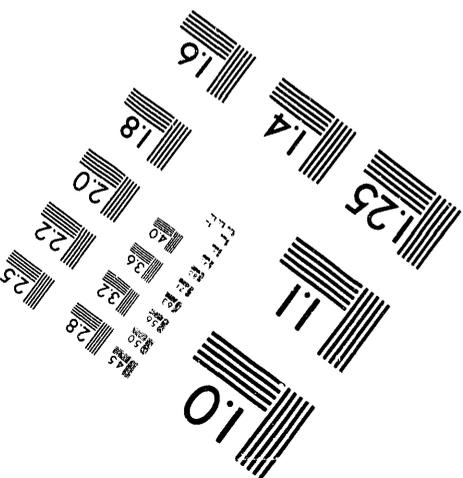
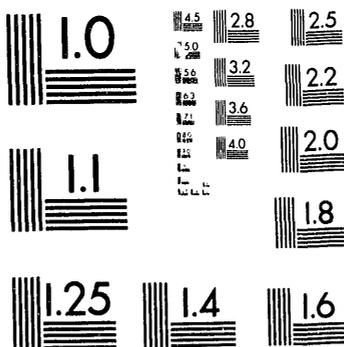
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DØ

A Search for Scalar Leptoquarks in DØ

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November 1992

MASTER

Presented at the *7th Meeting of the American Physical Society Division of Particles and Fields*,
Fermi National Accelerator Laboratory, November 10-14, 1992

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of a $Z^0 \rightarrow e^+e^-$, with 2 associated jets. This cut removed the one remaining event; it is consistent with the $Z^0 + 2$ jet hypothesis, having $m_{ee} = 82$ GeV. A Monte Carlo calculation had predicted 0.3 events of this type for this luminosity.

Other backgrounds which might be expected (Drell-Yan production of 2 electrons away from the Z resonance plus 2 jets; heavy quark decays to electrons) were calculated to be negligible in this sample.

With no events remaining after the 5 cuts, we can set a lower limit on the leptoquark mass. We use the KMRS-B0 structure functions in the ISAJET calculation of the production cross section for squark pairs, with the gluino mass raised to a very large value to suppress irrelevant diagrams. The efficiency for detection of a leptoquark decaying to electron plus jet was calculated from a full simulation of the detector and triggers. For an 80 GeV leptoquark, for example, it was calculated to be 9.7%, from the product of a 72% trigger efficiency and a 14% reconstruction efficiency. A substantial part of the inefficiency in reconstruction comes from the requirement of 4 objects in the event, each with $E_t \geq 20$ GeV, produced from two particles with mass 80 GeV each.

4. Conclusion

We estimate the errors on the luminosity to be 15%, on the cross section to be 20% (by varying the structure function choice), and on the efficiency calculation to be 20%. Note that this analysis is preliminary and will certainly be improved with time and more data. The limit on the leptoquark mass is calculated to be 74 GeV at a confidence level of 95%.⁵ This limit is comparable to limits set from SPS collider data and LEP data;^{6,7} but, of course, well below the limit CDF has quoted from its previous run of 4 pb^{-1} .⁸ We look forward to the acquisition of significantly more data in the remainder of this collider run. We also plan to investigate the other allowed decay mode of the first generation leptoquark ($\nu_e + \text{jet}$), and the signals from a second generation leptoquark ($\mu + \text{jet}$, $\nu_\mu + \text{jet}$).

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