Abstract
Diboson production provides a sensitive test of the Standard Model. We present an analysis of Wγ events, using 128 pb⁻¹ of Run 2 CDF data, produced in pbeam collisions at the Tevatron with \( \sqrt{s} = 1.96 \text{ TeV} \). Both electron and muon channels of the W boson are analyzed and compared to the Standard Model expectation.

1. Introduction
The Standard Model γ, W and Z gauge bosons are fundamental particles having no internal structure. The gauge symmetry for W and Z bosons severely constrains their couplings to each other. Measuring processes that are sensitive to these couplings provides a test of the gauge theory.

At a pbeam collider, these processes can produce a W and γ in the final state.

The s-channel diagram contains the trilinear gauge couplings or vector boson self couplings, Δκ and λ.

2. Analysis
Event Selection
W selection
- Isolated electron with \( E_T > 25 \text{ GeV} \) and \( |\eta| < 1.1 \)
- Isolated muon with \( P_T > 20 \text{ GeV} \) and \( |\eta| < 0.6 \)
- Large Missing \( E_T > 25(20 \text{ for } \mu) \text{ GeV} \)

γ selection
- Isolated photon with \( E_{T\gamma} > 7 \text{ GeV} \) and \( |\eta| < 1.1 \)
- Quality cuts to reject π⁰ background

Wγ selection
- Separation between lepton and photon, \( \Delta R(l, \gamma) > 0.7 \)

Backgrounds to Wγ events
- QCD background : jet fakes to photon (67%)
- Γ<sub>ZZ</sub>, Γ<sub>WW</sub> : one lepton is misidentified (29%)
- Γ<sub>Wγ</sub>, Γ<sub>Wγ→τν</sub>, Γ<sub>γ→πτ</sub> (4%)

3. CDF Run2 Preliminary Results
The number of expected and observed events of Wγ combining both electron and muon channels using integrated luminosity 128 pb⁻¹. The major source of background is the misidentification of a jet as a photon.

<table>
<thead>
<tr>
<th>Standard Model Wγ signal</th>
<th>98.9 ± 1.5 (stat.) ± 5.6 (sys.)</th>
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<tbody>
<tr>
<td>QCD background</td>
<td>28.1 ± 0.1 (stat.) ± 9.4 (sys.)</td>
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<tr>
<td>Γ&lt;sub&gt;Γ&lt;/sub&gt;, Γ&lt;sub&gt;WW&lt;/sub&gt; background</td>
<td>12.0 ± 0.34 (stat.) ± 0.69 (sys.)</td>
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<tr>
<td>Wγ, Γ&lt;sub&gt;Wγ→τν&lt;/sub&gt;, Γ&lt;sub&gt;γ→πτ&lt;/sub&gt; background</td>
<td>1.74 ± 0.16 (stat.) ± 0.14 (sys.)</td>
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<td>Signal + Background</td>
<td>140.7 ± 1.6 (stat.) ± 11.0 (sys.) ± 6.8 (lum.)</td>
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<tr>
<td>Data</td>
<td>133</td>
</tr>
</tbody>
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\( \sigma(Wγ) \times Br(W→lνγ) = 17.2 ± 2.2 \text{ (stat.)} ± 2.0 \text{ (sys.)} ± 1.1 \text{ (lum.) \ [pb]} \)

\( \sigma(Wγ) \times Br(W→eγ) = 18.0 ± 3.3 \text{ (stat.)} ± 2.5 \text{ (sys.)} ± 1.2 \text{ (lum.) \ [pb]} \)

\( \sigma(Wγ) \times Br(W→μγ) = 16.1 ± 3.4 \text{ (stat.)} ± 1.7 \text{ (sys.)} ± 1.1 \text{ (lum.) \ [pb]} \)

( \( E_T(\gamma) > 7 \text{ GeV} \) and \( \Delta R(l, \gamma) > 0.7 \) )

4. Conclusion
We measured Wγ production cross section in \( E_T(\gamma) > 7 \text{ GeV} \) and \( \Delta R(l, \gamma) > 0.7 \) both electron and muon channels, and found it consistent with the Standard Model prediction.

Theoretical prediction : \( \sigma(Wγ) \times Br(W→lνγ) = 18.6 ± 1.3 \text{ (sys.) \ [pb]} \)

\( E_T(\gamma) > 7 \text{ GeV} \) and \( \Delta R(l, \gamma) > 0.7 \)

Kinematical distributions of photon \( E_T(\text{up, left}) \), \( \Delta R(l, \gamma) \) (up, right), cluster transverse mass (down, right) and cluster transverse mass versus transverse mass (down, right)