

**Search for heavy neutral leptons in events with three charged leptons in
proton-proton collisions at $\sqrt{s} = 13$ TeV:**

Expected and observed yields in the search regions

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TABLE I. Observed (expected) event yields in the low-mass search region. The uncertainties contain both the statistical and systematic components.

| Flavor | p_T^{leading} (GeV) | $M_{2\ell\text{OS}}^{\text{min}}$ (GeV) | | | | | | | |
|-------------------------|------------------------------|---|-------------------|-------|-------------------|-------|--------------------------------|------|--------------------------------|
| | | < 10 | | 10–20 | | 20–30 | | > 30 | |
| $e^\pm e^\pm \mu^\mp$ | < 30 | 1 | (0.61 \pm 0.44) | 0 | (0.45 \pm 0.48) | 0 | (0.14 \pm $^{0.25}_{0.14}$) | 3 | (0.27 \pm $^{0.50}_{0.27}$) |
| | 30–55 | 1 | (1.05 \pm 0.82) | 1 | (0.28 \pm 0.25) | 2 | (0.53 \pm 0.47) | 0 | (1.7 \pm 1.1) |
| $e^\pm \mu^\mp \mu^\mp$ | < 30 | 5 | (3.0 \pm 1.4) | 3 | (2.6 \pm 1.3) | 3 | (1.38 \pm 0.77) | 0 | (1.71 \pm 0.83) |
| | 30–55 | 3 | (2.5 \pm 1.2) | 2 | (2.4 \pm 1.2) | 2 | (2.6 \pm 1.2) | 3 | (1.0 \pm $^{1.9}_{1.0}$) |

TABLE II. Observed (expected) event yields in the high-mass search region for events with no OSSF lepton pair. The uncertainties contain both the statistical and systematic components.

| Flavor | $M_{3\ell}$ (GeV) | M_T (GeV) | $M_{2\ell\text{OS}}^{\text{min}}$ (GeV) | | | | | |
|-------------------------|-------------------|-------------|---|-------------------|---------|-------------------|-------|---------------------|
| | | | < 100 | | 100–200 | | > 200 | |
| $e^\pm e^\pm \mu^\mp$ | < 100 | < 100 | | | 1 | (1.45 \pm 0.63) | | |
| | | > 100 | | | 0 | (0.43 \pm 0.20) | | |
| | > 100 | < 100 | 16 | (12.4 \pm 2.7) | 2 | (1.31 \pm 0.34) | | |
| | | 100–150 | 4 | (4.1 \pm 10) | | | 1 | (0.54 \pm 0.16) |
| | | 150–250 | 2 | (1.99 \pm 0.55) | 1 | (1.16 \pm 0.29) | | |
| | > 250 | 1 | (0.70 \pm 0.43) | | | | | |
| $e^\pm \mu^\mp \mu^\mp$ | < 100 | < 100 | | | 2 | (0.88 \pm 0.32) | | |
| | | > 100 | | | 1 | (0.54 \pm 0.29) | | |
| | > 100 | < 100 | 12 | (10.9 \pm 2.3) | 1 | (1.93 \pm 0.60) | | |
| | | 100–150 | 5 | (4.1 \pm 1.1) | | | 0 | (0.160 \pm 0.093) |
| | | 150–250 | 2 | (2.72 \pm 0.73) | 0 | (0.64 \pm 0.24) | | |
| | > 250 | 0 | (0.44 \pm 0.19) | | | | | |

TABLE III. Observed (expected) event yields in the high-mass search region for events with an OSSF lepton pair. The uncertainties contain both the statistical and systematic components.

| Flavor | $M_{3\ell}$ (GeV) | M_T (GeV) | $M_{2\ell\text{OS}}^{\text{min}}$ (GeV) | | | | | |
|-------------|-------------------|-------------|---|-------------------|-------------------|---------------------|-------------------|-------------------|
| | | | < 100 | | 100–200 | | > 200 | |
| $\geq 2e$ | < 100 | < 100 | | | 10 | (12.3 \pm 1.7) | | |
| | | 100–200 | | | 3 | (1.67 \pm 0.35) | | |
| | | > 200 | | | 0 | (0.226 \pm 0.064) | | |
| | > 100 | < 100 | 127 | (131 \pm 14) | 31 | (38.2 \pm 4.3) | 6 | (4.56 \pm 0.94) |
| | | 100–200 | 34 | (40.9 \pm 4.9) | 8 | (12.7 \pm 1.8) | 0 | (2.37 \pm 0.50) |
| | | 200–300 | 3 | (5.28 \pm 0.78) | 1 | (1.81 \pm 0.29) | 0 | (0.57 \pm 0.13) |
| | | 300–400 | 1 | (1.20 \pm 0.24) | 0 | (0.86 \pm 0.17) | 0 | (0.61 \pm 0.14) |
| | > 400 | 1 | (0.87 \pm 0.24) | | | | | |
| $\geq 2\mu$ | < 100 | < 100 | | | 30 | (24.4 \pm 2.9) | | |
| | | 100–200 | | | 3 | (3.64 \pm 0.56) | | |
| | | > 200 | | | 1 | (0.63 \pm 0.22) | | |
| | > 100 | < 100 | 220 | (217 \pm 22) | 63 | (65.6 \pm 6.6) | 8 | (6.6 \pm 1.4) |
| | | 100–200 | 77 | (61.3 \pm 6.9) | 23 | (17.6 \pm 2.3) | 7 | (3.50 \pm 0.63) |
| | | 200–300 | 8 | (9.1 \pm 1.2) | 1 | (3.08 \pm 0.54) | 0 | (1.64 \pm 0.73) |
| | 300–400 | 1 | (2.10 \pm 0.44) | 1 | (1.34 \pm 0.24) | 0 | (0.62 \pm 0.59) | |
| | > 400 | 2 | (1.54 \pm 0.30) | | | | | |

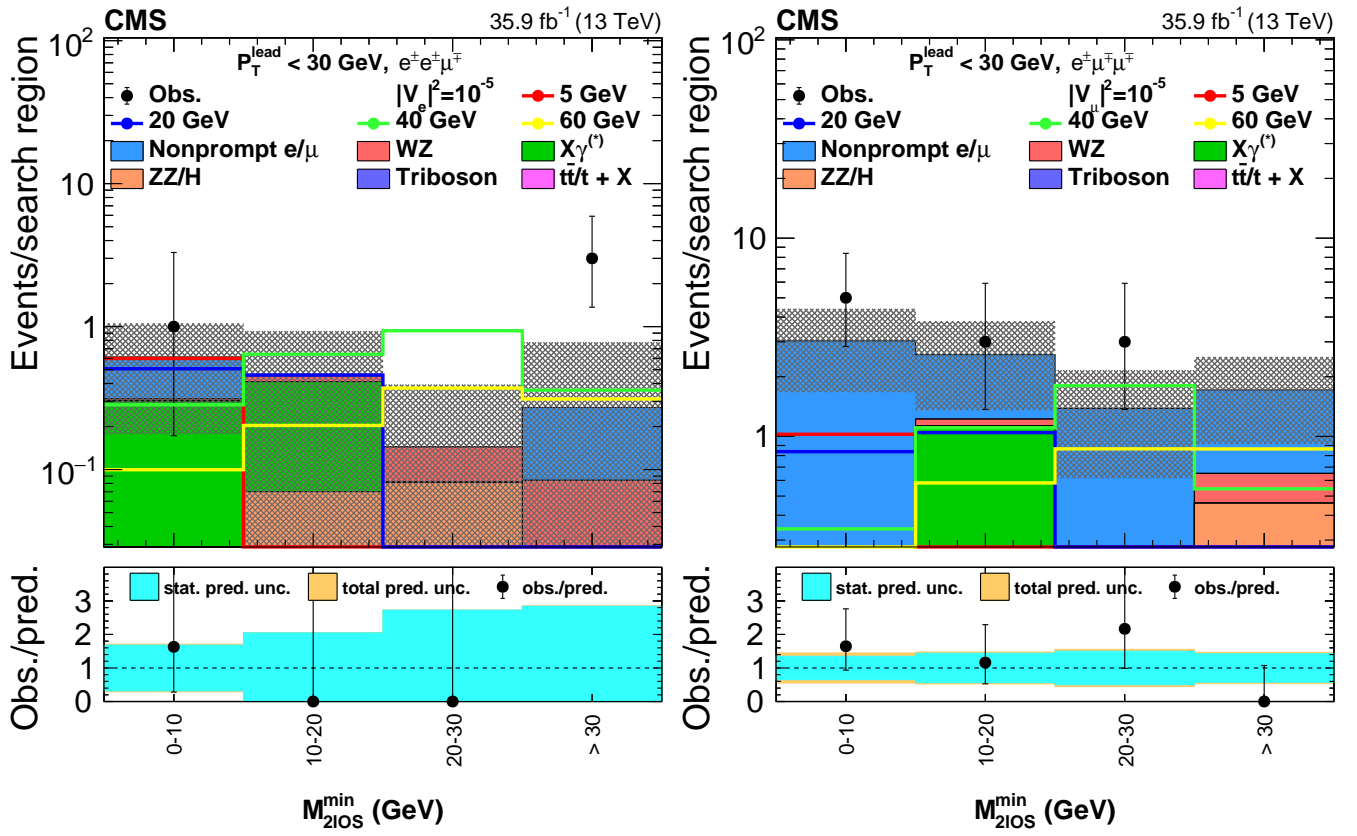


FIG. 1. Expanded version of Fig. 1 in the main document, showing the observed and expected event yields in the low-mass region with $p_T^{\text{leading}} < 30 \text{ GeV}$, for events with at least 2 electrons (left) and 2 muons (right). Contributions from various possible signals are shown for comparison.

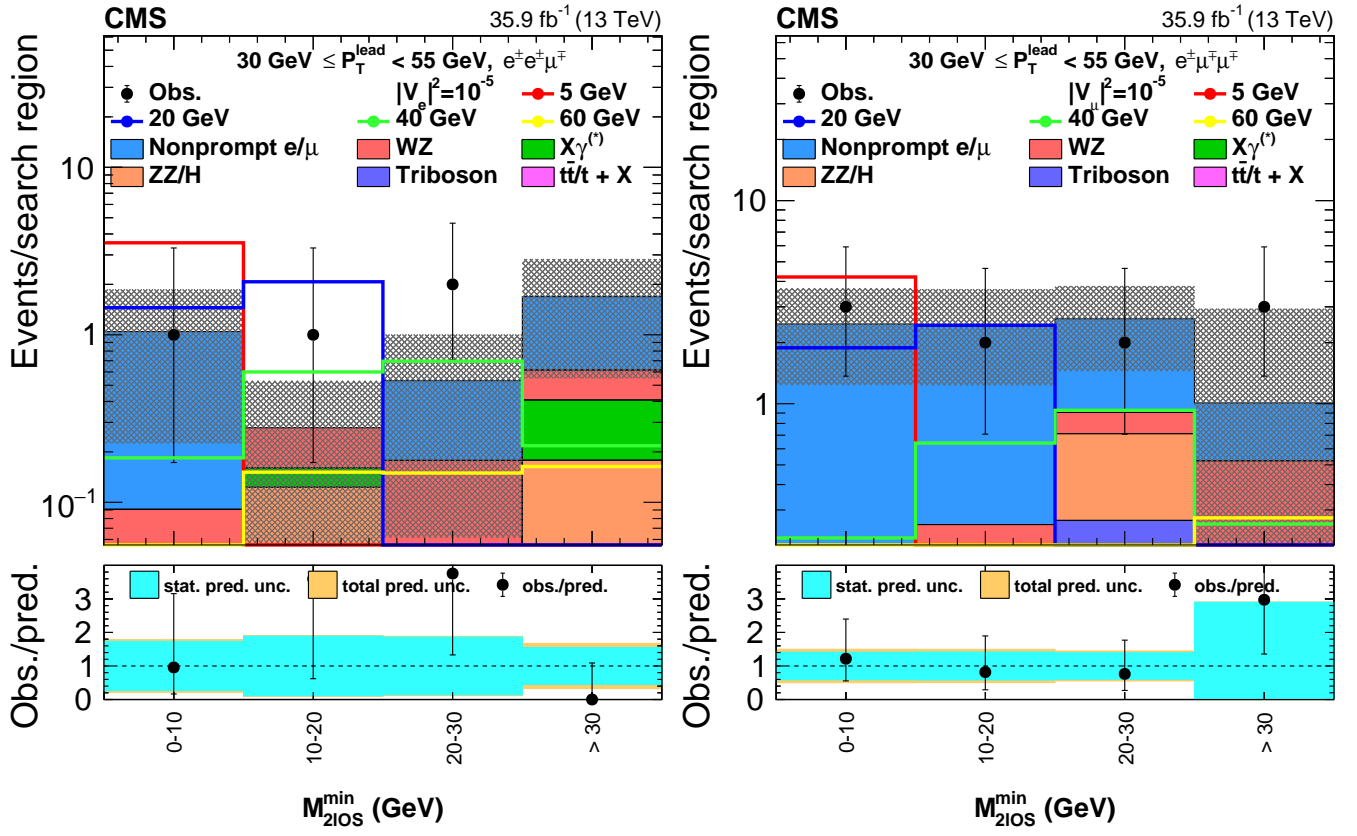


FIG. 2. Expanded version of Fig. 1 in the main document, showing the observed and expected event yields in the low-mass region with $30 \text{ GeV} \leq p_T^{\text{leading}} < 55 \text{ GeV}$, for events with at least 2 electrons (left) and 2 muons (right). Contributions from various possible signals are shown for comparison.

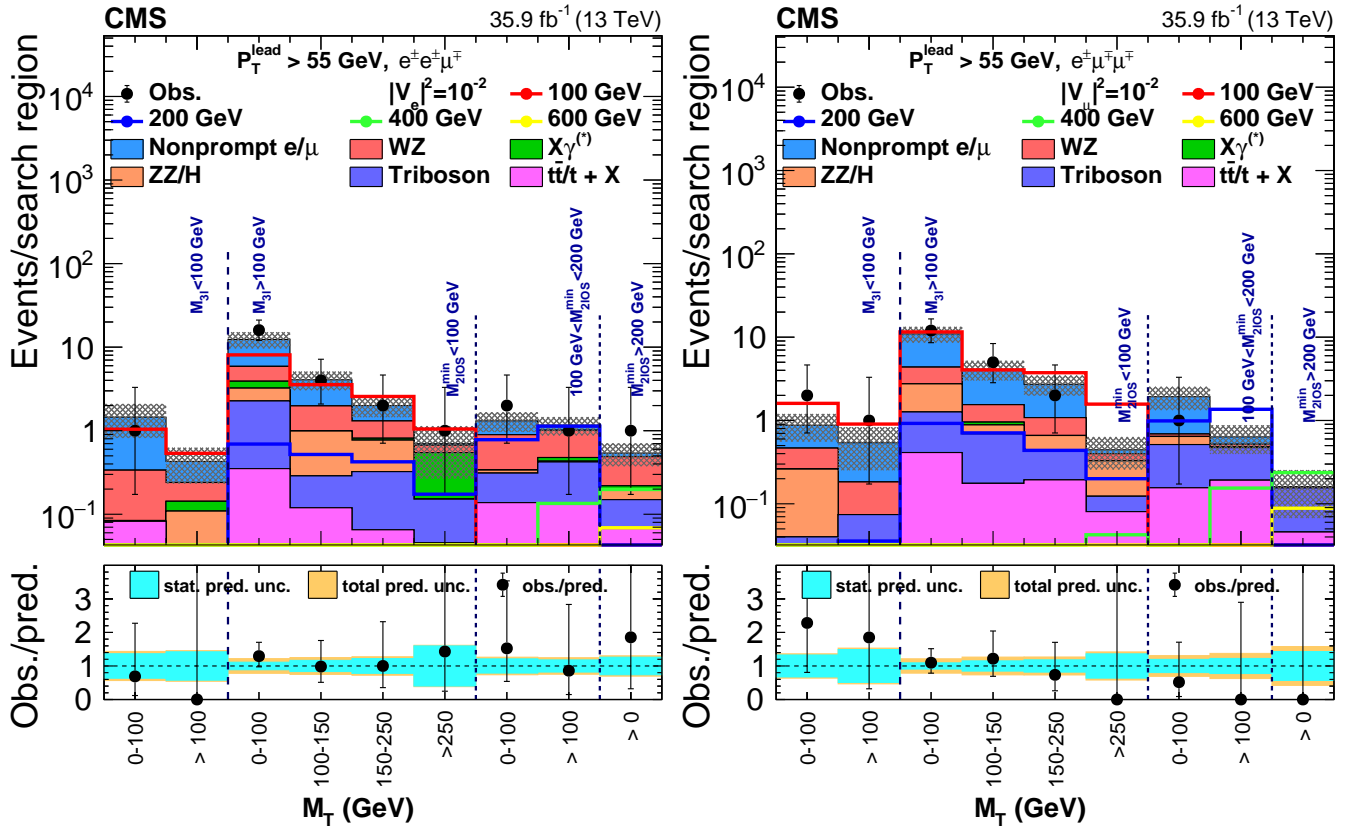


FIG. 3. Expanded version of Fig. 1 in the main document, showing the observed and expected event yields in the high-mass region without an OSSF pair, for events with at least 2 electrons (left) and 2 muons (right). Contributions from various possible signals are shown for comparison.

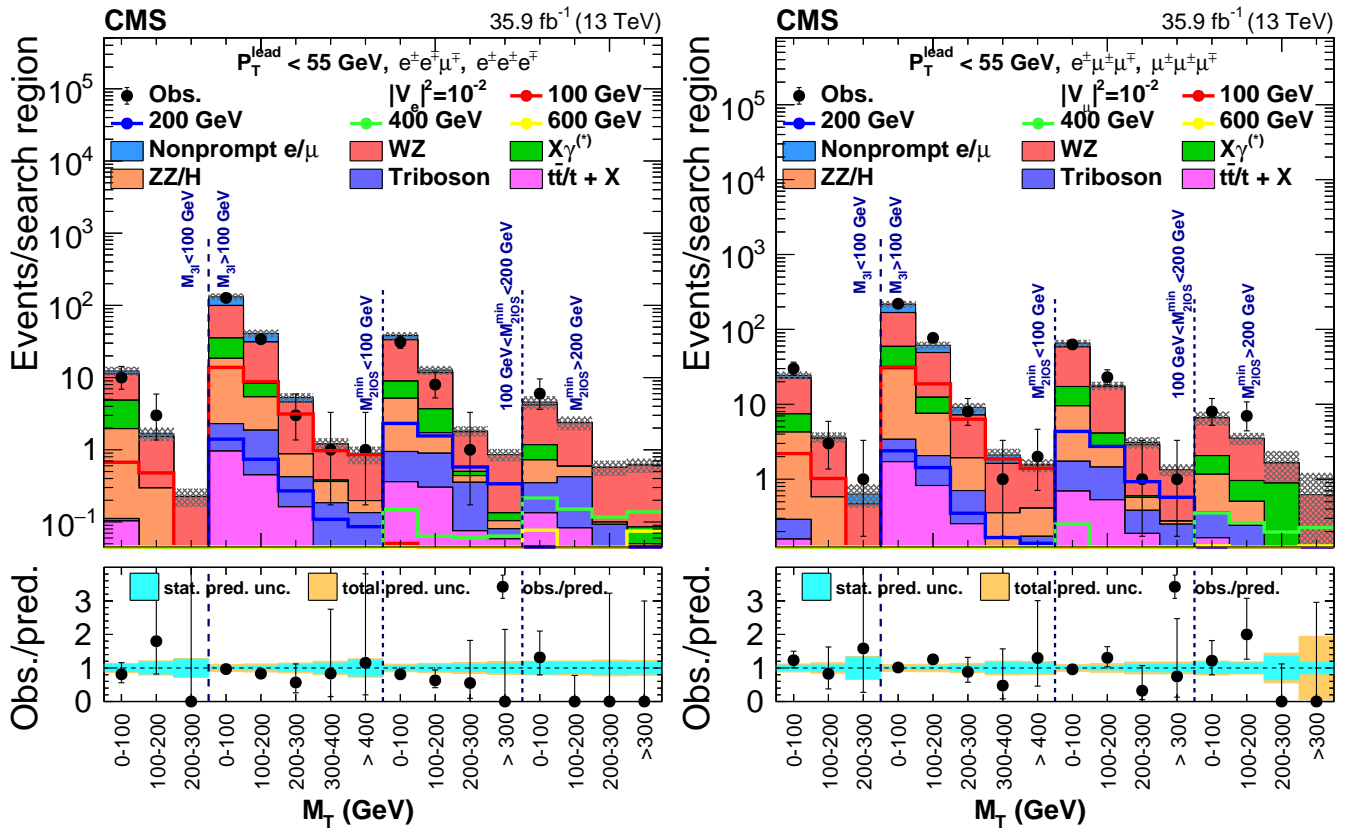


FIG. 4. Expanded version of Fig. 1 in the main document, showing the observed and expected event yields in the high-mass region with an OSSF pair, for events with at least 2 electrons (left) and 2 muons (right). Contributions from various possible signals are shown for comparison.