

Run 310000, Event 268765999,

$\mu = 98.5$ ,  $N_{\text{PV}} = 41$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(92.6, 250, 1.41)

(89.8, 243.7, 1.41)

$\Delta\phi(\text{ll}, \text{j1}) = -3.01$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.01$

**2 truth muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(153.7, 1.48, -2.29)

(111.5, 1.30, -2.99)

**2 reco muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(154.4, 1.48, -2.29)

(104.3, 1.30, -2.99)

**5 truth jets**,  $p_{\text{T}} > 5$

(25.9, 0.13, 0.44)

(22.5, -0.54, 1.05)

(21.9, -1.72, -0.64)

(17.6, 0.67, 0.32)

(14.8, 0.48, 0.77)

**5 reco jets**,  $p_{\text{T}} > 5$

(21.5, 0.12, 0.44)

(21.3, -0.54, 1.06)

(17.8, 0.67, 0.32)

(17.8, -1.69, -0.60)

(15.4, 0.47, 0.78)

**71 charged truth hadrons**

(13.5, 0.67, 0.32),  $K^-$

(7.1, -0.59, 1.11),  $K^+$

(5.6, 0.44, 0.74),  $\pi^-$

(5.3, -0.01, 0.46),  $\pi^+$

(4.7, 0.51, 0.74),  $\pi^-$

(4.5, 0.16, 0.43),  $\pi^-$

(3.6, -1.80, -0.85),  $\pi^+$

(3.5, -1.68, -0.46),  $\pi^+$

(3.5, 0.65, 0.27),  $\pi^+$

(3.3, -0.42, 1.03),  $\pi^+$

(3.3, 0.08, 0.44),  $K^-$

(3.3, 0.18, 0.58),  $\pi^+$

(3.0, -0.62, 1.05),  $\pi^-$

(2.7, -0.67, 0.94),  $\pi^+$

(2.5, 1.32, -3.06),  $\pi^-$

(2.3, 0.14, 0.41),  $K^+$

(2.3, -1.83, -0.92),  $\pi^-$

(2.2, -0.22, 1.02),  $\pi^+$

(2.1, -1.39, -0.49),  $\pi^-$

**67 tracks**, showing  $p_{\text{T}} > 2 \text{ GeV}$

(13.7, 0.67, 0.32), matched to  $K^-$

(7.0, -0.60, 1.11), matched to  $K^+$

(5.5, 0.44, 0.75), matched to  $\pi^-$

(5.3, -0.01, 0.46), matched to  $\pi^+$

(4.7, 0.52, 0.74), matched to  $\pi^-$

(3.5, 0.65, 0.27), matched to  $\pi^+$

(3.5, -1.68, -0.46), matched to  $\pi^+$

(3.3, -0.41, 1.03), matched to  $\pi^+$

(3.3, 0.09, 0.44), matched to  $K^-$

(3.2, 0.18, 0.57), matched to  $\pi^+$

(3.0, -0.62, 1.05), unmatched

(2.7, -0.67, 0.94), matched to  $\pi^+$

(2.6, 1.31, -3.06), matched to  $\pi^-$

(2.4, 0.14, 0.41), matched to  $K^+$

(2.4, -0.22, 1.02), matched to  $\pi^+$

(2.4, -1.83, -0.92), matched to  $\pi^-$

(2.2, -1.56, -0.47), matched to  $\pi^-$

(2.1, -1.39, -0.49), matched to  $\pi^-$

**10 j1 tracks**

(5.3, -0.01, -0.01, 0.46), matched to  $\pi^+$

(3.3, 0.09, 0.09, 0.44), matched to  $K^-$

(3.2, 0.18, 0.18, 0.57), matched to  $\pi^+$

(2.4, 0.14, 0.14, 0.41), matched to  $K^+$

(2.0, 0.27, 0.27, 0.49), matched to  $\pi^+$

(1.5, 0.09, 0.09, 0.31), matched to  $\pi^+$

(1.5, 0.31, 0.31, 0.41), matched to  $\pi^-$

(0.9, 0.18, 0.18, 0.32), matched to  $\pi^-$

(0.8, 0.10, 0.10, 0.29), matched to  $\pi^+$

(0.6, 0.24, 0.25, 0.41), matched to  $\pi^+$

**11 j1 charged hadrons**

(5.3, -0.01, -0.01, 0.46),  $\pi^+$

(4.5, 0.16, 0.16, 0.43),  $\pi^-$

(3.3, 0.08, 0.08, 0.44),  $K^-$

(3.3, 0.18, 0.18, 0.58),  $\pi^+$

(2.3, 0.14, 0.14, 0.41),  $K^+$

(2.0, 0.27, 0.28, 0.49),  $\pi^+$

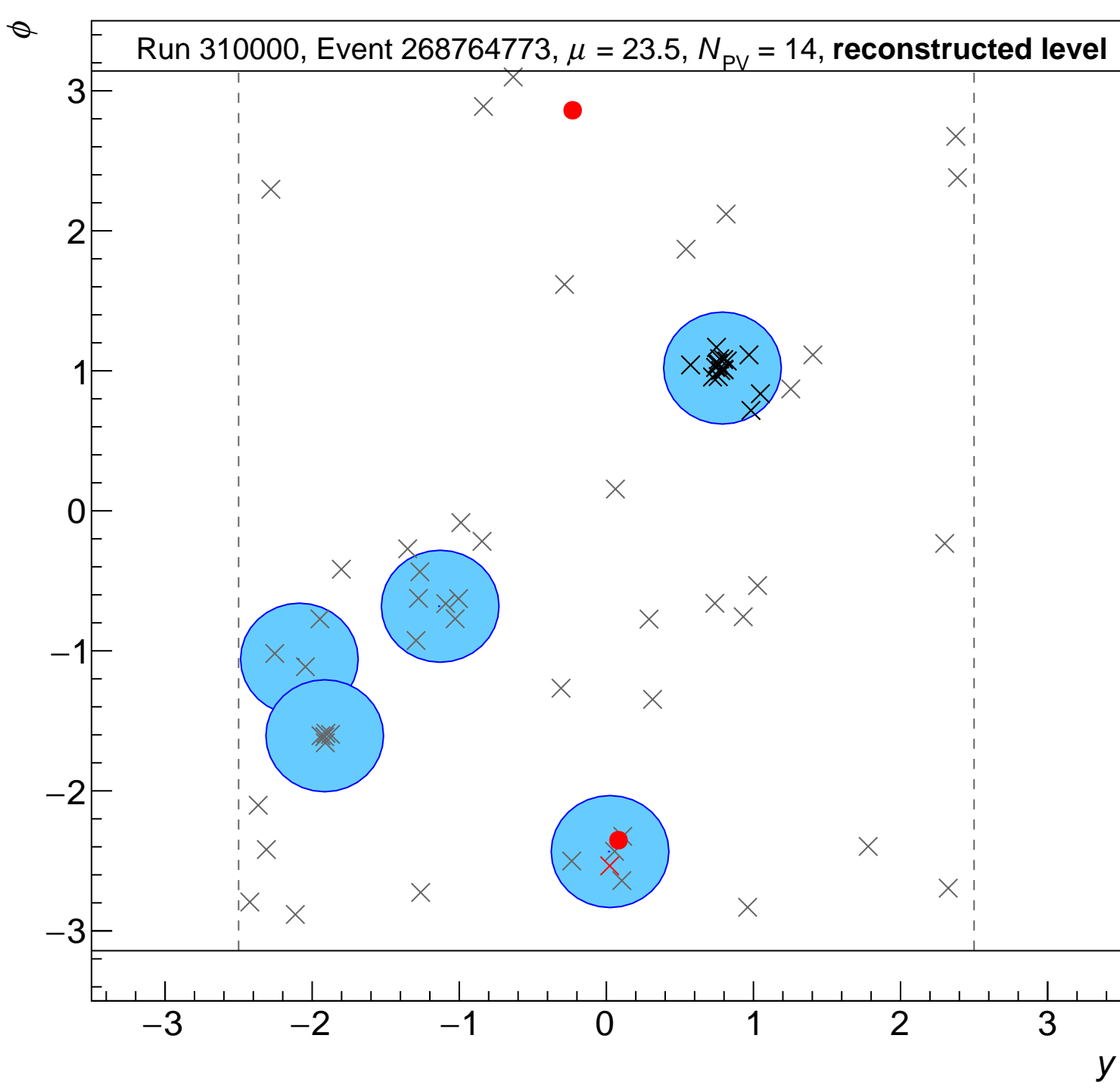
(1.6, 0.31, 0.31, 0.41),  $\pi^-$

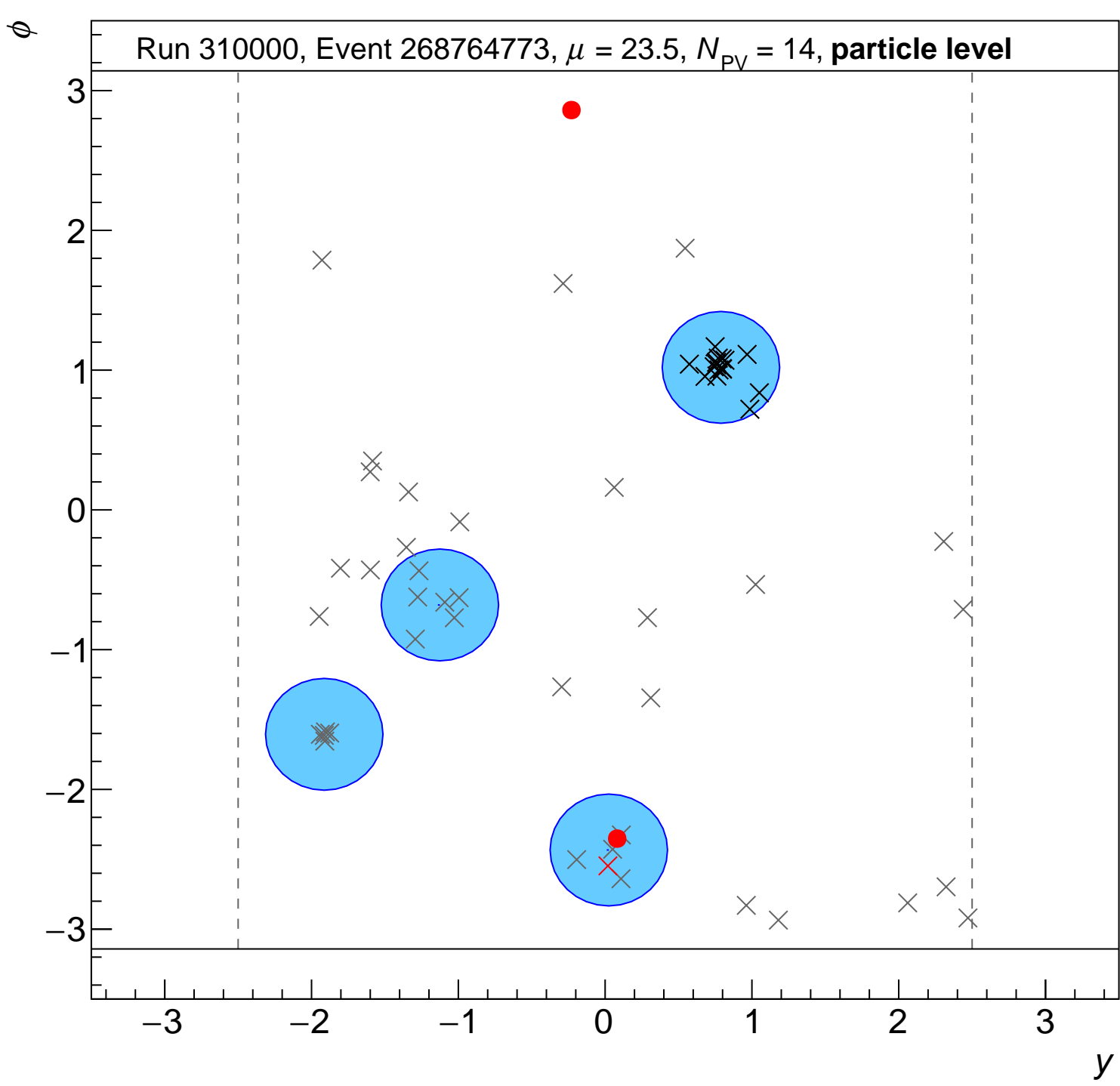
(1.6, 0.09, 0.09, 0.31),  $\pi^+$

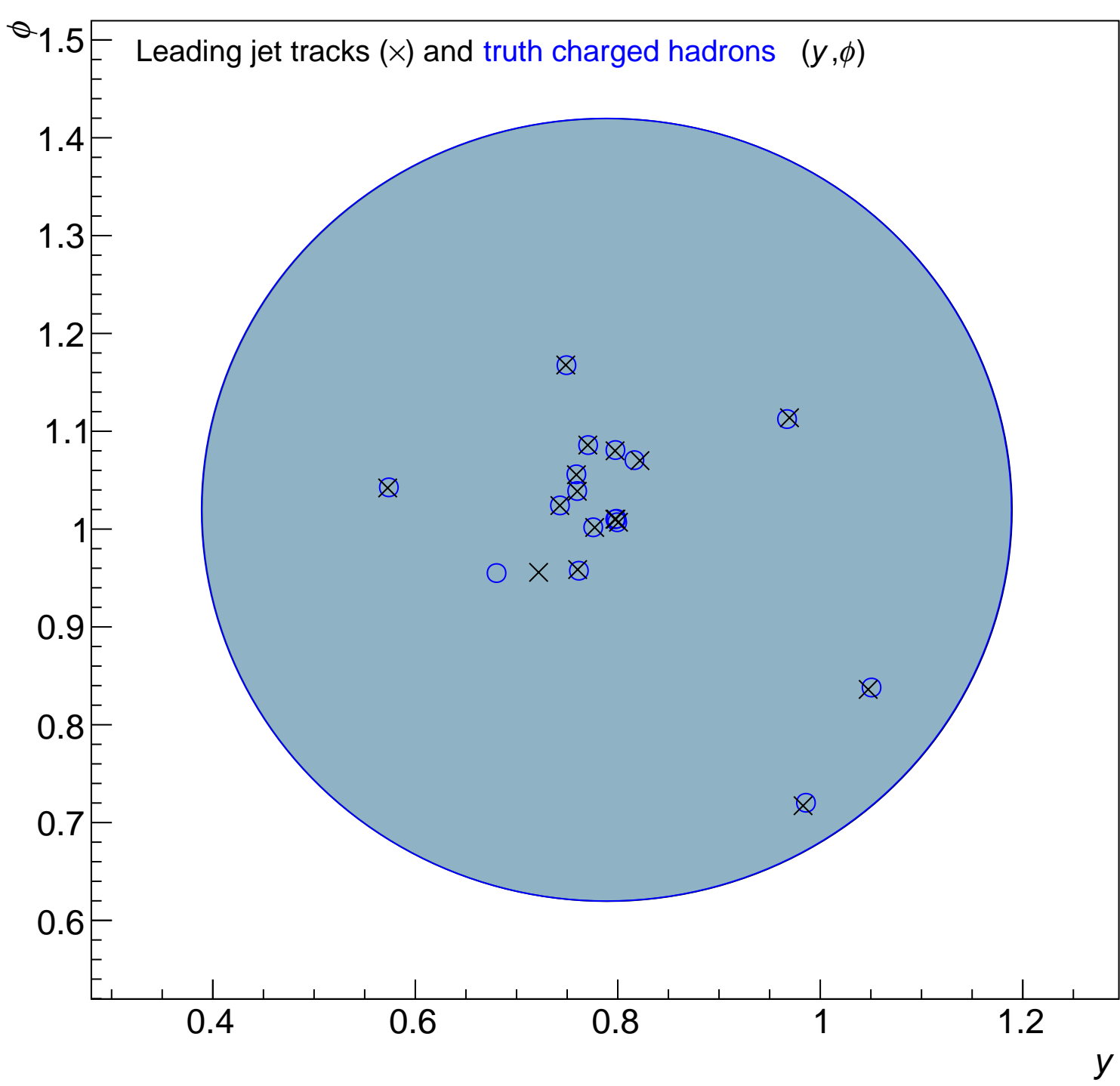
(0.9, 0.19, 0.19, 0.32),  $\pi^-$

(0.8, 0.10, 0.10, 0.28),  $\pi^+$

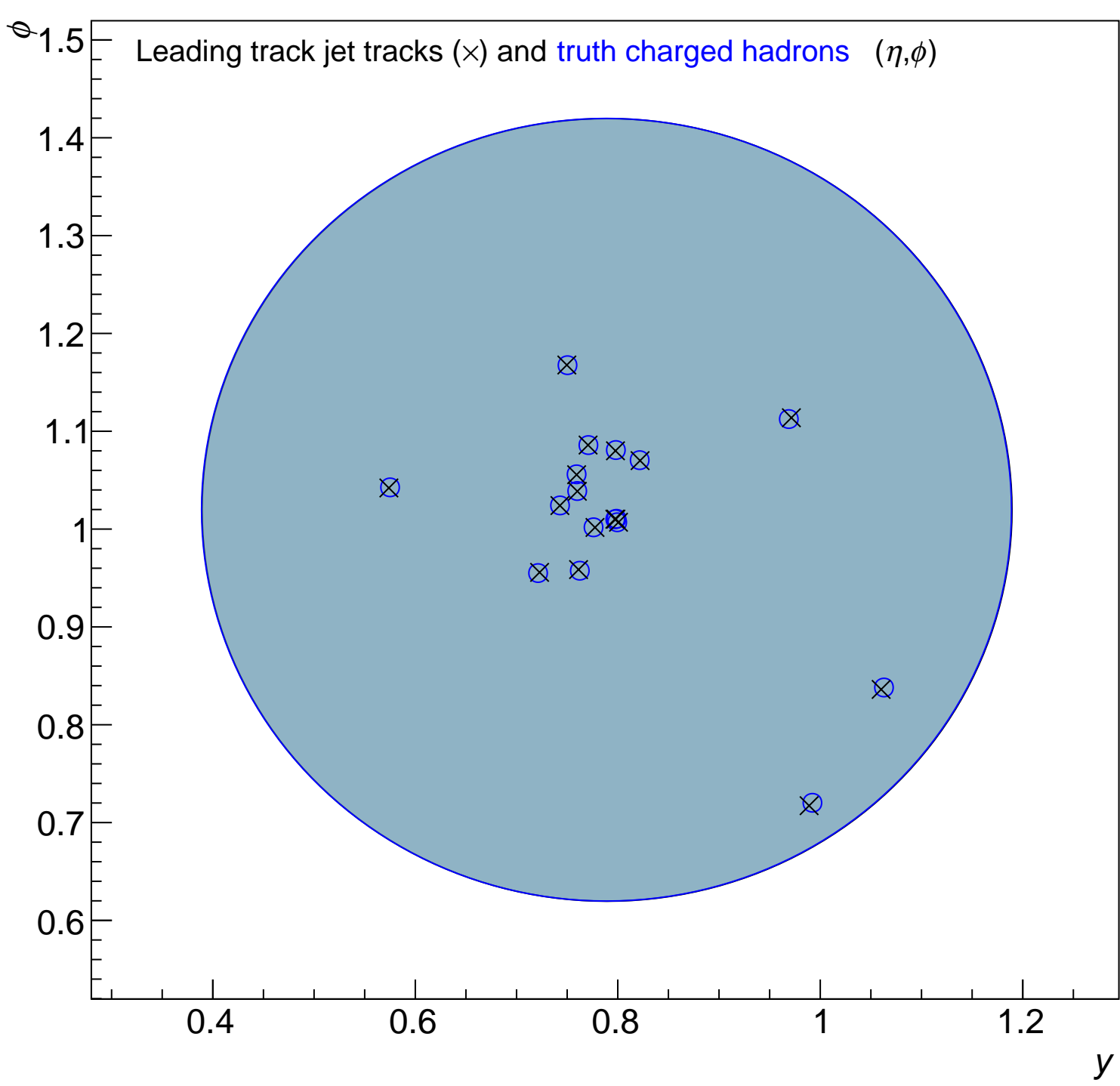
(0.6, 0.23, 0.24, 0.41),  $\pi^+$











Run 310000, Event 268764773,

$\mu = 23.5$ ,  $N_{\text{PV}} = 14$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(89.7, 191, 0.02)

(94.9, 207.5, 0.02)

$\Delta\phi(\text{ll}, j1) = 2.73$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(167.4, 0.08, -2.35)

(42.3, -0.23, 2.86)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(183.3, 0.08, -2.35)

(43.1, -0.23, 2.86)

**4 truth jets**,  $p_{\text{T}} > 5$

(185.0, 0.79, 1.02)

(43.6, -1.91, -1.61)

(13.4, -1.13, -0.68)

(6.4, 0.03, -2.43)

**5 reco jets**,  $p_{\text{T}} > 5$

(183.3, 0.79, 1.02)

(42.2, -1.91, -1.61)

(13.4, -1.13, -0.68)

(6.4, 0.03, -2.43)

(6.1, -2.09, -1.06)

**55 charged truth hadrons**

(69.4, 0.80, 1.01),  $\pi^-$

(27.8, 0.80, 1.01),  $\pi^+$

(22.3, 0.80, 1.01),  $\pi^-$

(14.7, 0.76, 1.04),  $\pi^+$

(13.8, -1.91, -1.61), p

(13.1, -1.91, -1.59),  $K^+$

(10.9, 0.74, 1.02),  $\pi^+$

(9.9, -1.94, -1.61),  $\pi^-$

(7.5, 0.82, 1.07),  $\bar{p}$

(5.5, 0.76, 1.06),  $\pi^-$

(4.9, 0.77, 1.09),  $\pi^-$

(4.5, 0.78, 1.00),  $\pi^+$

(4.0, 0.80, 1.08),  $\pi^+$

(3.6, -1.88, -1.60),  $\pi^+$

(3.3, -1.03, -0.77),  $\pi^+$

(3.2, -1.91, -1.65),  $\pi^-$

(3.1, 0.11, -2.33),  $\pi^-$

(2.8, -0.99, -0.63),  $K^-$

(2.6, 0.76, 0.96),  $\pi^-$

(2.5, 0.68, 0.96), p

(2.4, 0.75, 1.17),  $\pi^-$

(2.4, -1.09, -0.66),  $\pi^-$

(2.2, -1.27, -0.44),  $\pi^+$

(2.1, 0.57, 1.04),  $\pi^+$

(2.0, 0.97, 1.11),  $\pi^+$

**65 tracks**, showing  $p_{\text{T}} > 2$  GeV

(65.7, 0.80, 1.01), matched to  $\pi^-$

(30.0, 0.80, 1.01), matched to  $\pi^+$

(21.9, 0.80, 1.01), matched to  $\pi^-$

(14.8, 0.76, 1.04), matched to  $\pi^+$

(13.4, -1.91, -1.61), matched to p

(12.3, -1.91, -1.59), matched to  $K^+$

(11.0, 0.74, 1.02), matched to  $\pi^+$

(9.9, -1.94, -1.61), matched to  $\pi^-$

(7.3, 0.82, 1.07), matched to  $\bar{p}$

(5.6, 0.76, 1.06), matched to  $\pi^-$

(5.0, 0.77, 1.09), matched to  $\pi^-$

(4.8, 0.78, 1.00), matched to  $\pi^+$

(4.1, -2.05, -1.11), unmatched

(4.0, 0.80, 1.08), matched to  $\pi^+$

(3.3, -1.88, -1.60), matched to  $\pi^+$

(3.3, -1.91, -1.66), matched to  $\pi^-$

(3.3, -1.03, -0.77), matched to  $\pi^+$

(3.1, 0.11, -2.33), matched to  $\pi^-$

(2.8, -1.00, -0.63), matched to  $K^-$

(2.7, 0.76, 0.96), matched to  $\pi^-$

(2.5, 0.72, 0.96), matched to p

(2.4, 0.75, 1.17), matched to  $\pi^-$

(2.4, -2.31, -2.42), unmatched

(2.3, -1.09, -0.66), matched to  $\pi^-$

(2.3, -1.27, -0.44), matched to  $\pi^+$

(2.1, -1.29, -0.93), matched to  $\pi^+$

(2.1, 0.57, 1.04), matched to  $\pi^+$

**17 j1 tracks**

(65.7, 0.80, 0.80, 1.01), matched to  $\pi^-$

(30.0, 0.80, 0.80, 1.01), matched to  $\pi^+$

(21.9, 0.80, 0.80, 1.01), matched to  $\pi^-$

(14.8, 0.76, 0.76, 1.04), matched to  $\pi^+$

(11.0, 0.74, 0.74, 1.02), matched to  $\pi^+$

(7.3, 0.82, 0.82, 1.07), matched to  $\bar{p}$

(5.6, 0.76, 0.76, 1.06), matched to  $\pi^-$

(5.0, 0.77, 0.77, 1.09), matched to  $\pi^-$

(4.8, 0.78, 0.78, 1.00), matched to  $\pi^+$

(4.0, 0.80, 0.80, 1.08), matched to  $\pi^+$

(2.7, 0.76, 0.76, 0.96), matched to  $\pi^-$

(2.5, 0.72, 0.72, 0.96), matched to p

(2.4, 0.75, 0.75, 1.17), matched to  $\pi^-$

(2.1, 0.57, 0.57, 1.04), matched to  $\pi^+$

(2.0, 0.97, 0.97, 1.11), matched to  $\pi^+$

(1.1, 0.98, 0.99, 0.72), matched to  $\pi^-$

(0.8, 1.05, 1.06, 0.84), matched to  $\pi^-$

**17 j1 charged hadrons**

(69.4, 0.80, 0.80, 1.01),  $\pi^-$

(27.8, 0.80, 0.80, 1.01),  $\pi^+$

(22.3, 0.80, 0.80, 1.01),  $\pi^-$

(14.7, 0.76, 0.76, 1.04),  $\pi^+$

(10.9, 0.74, 0.74, 1.02),  $\pi^+$

(7.5, 0.82, 0.82, 1.07),  $\bar{p}$

(5.5, 0.76, 0.76, 1.06),  $\pi^-$

(4.9, 0.77, 0.77, 1.09),  $\pi^-$

(4.5, 0.78, 0.78, 1.00),  $\pi^+$

(4.0, 0.80, 0.80, 1.08),  $\pi^+$

(2.6, 0.76, 0.76, 0.96),  $\pi^-$

(2.5, 0.68, 0.72, 0.96), p

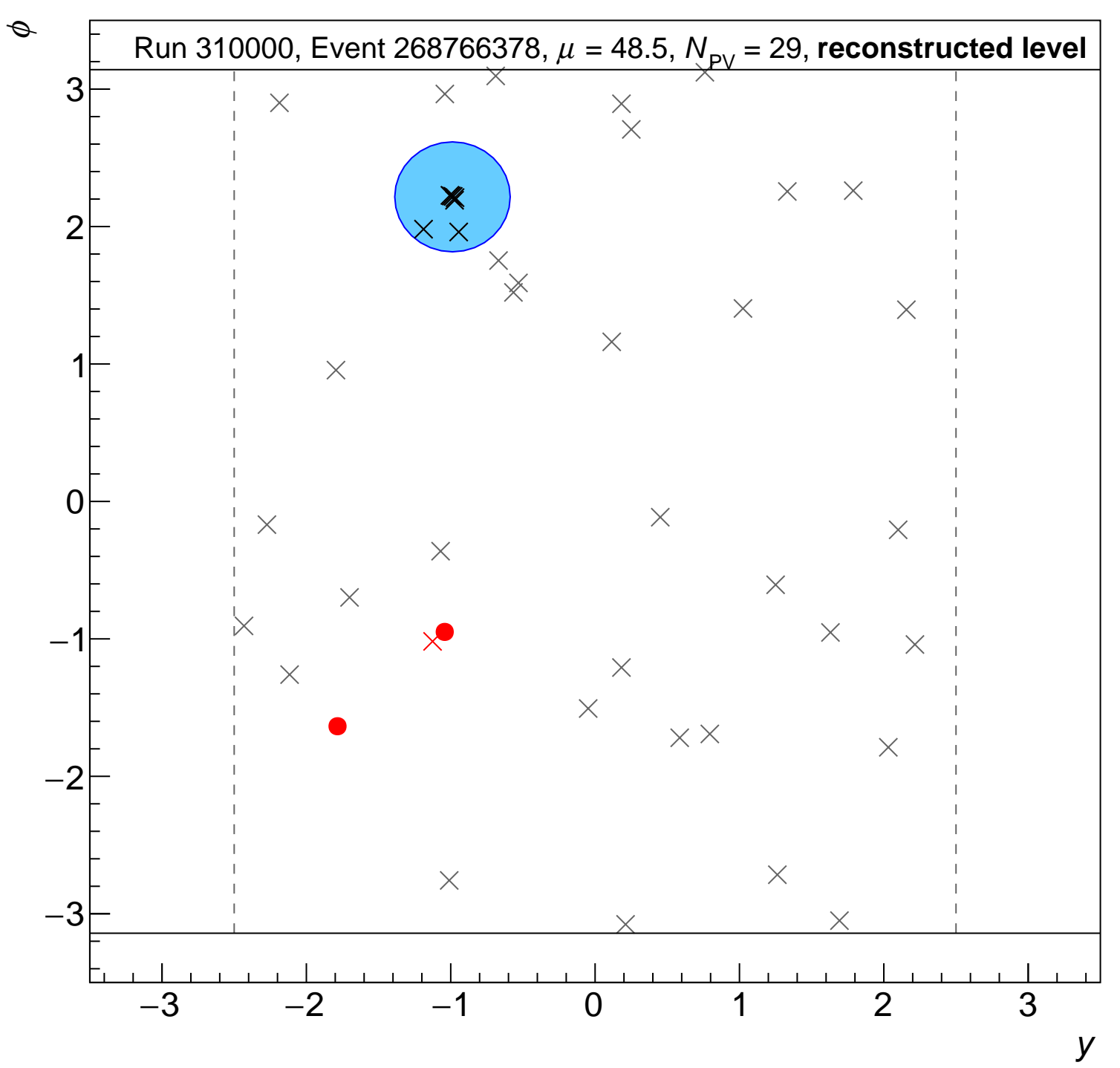
(2.4, 0.75, 0.75, 1.17),  $\pi^-$

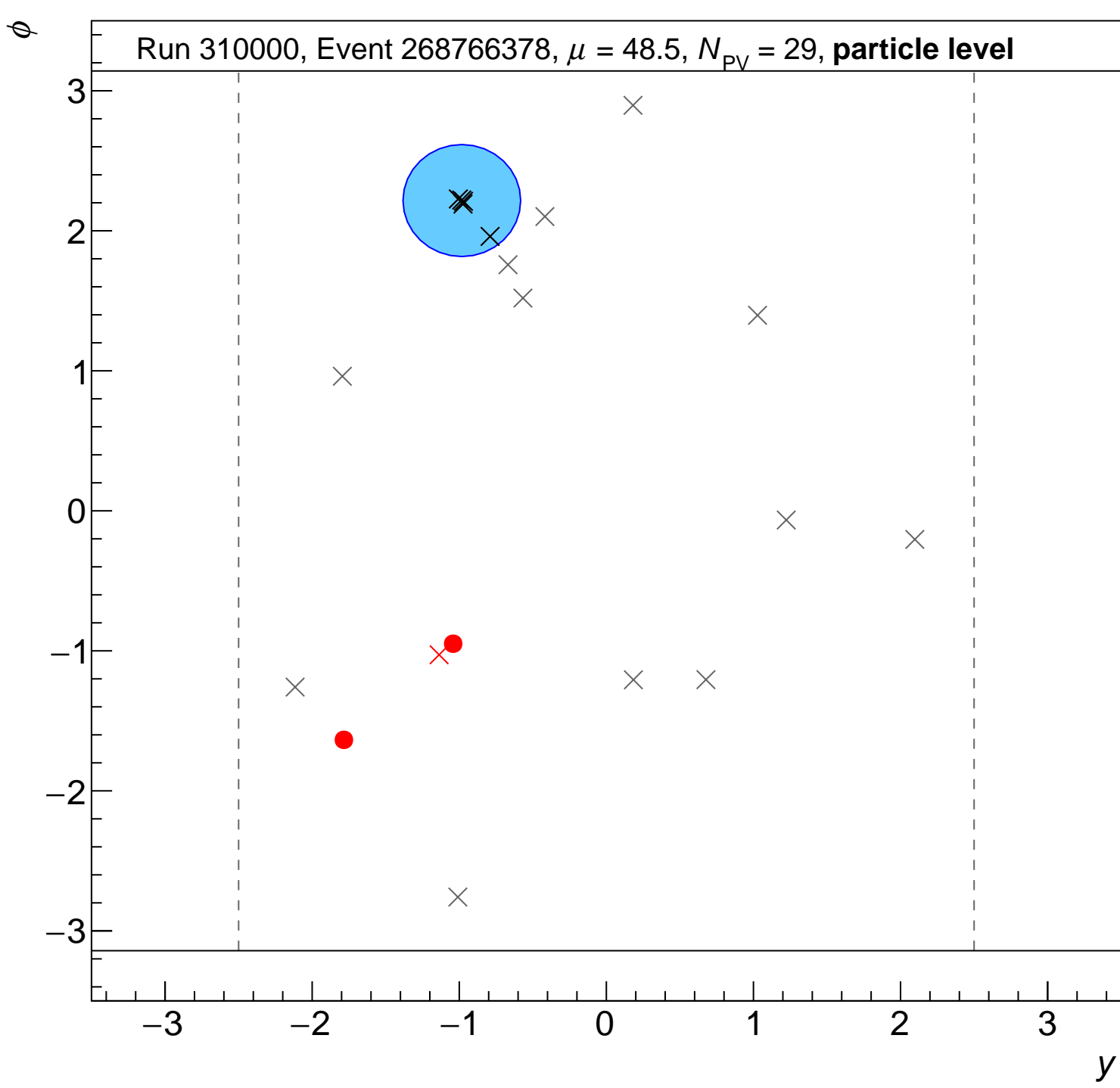
(2.1, 0.57, 0.58, 1.04),  $\pi^+$

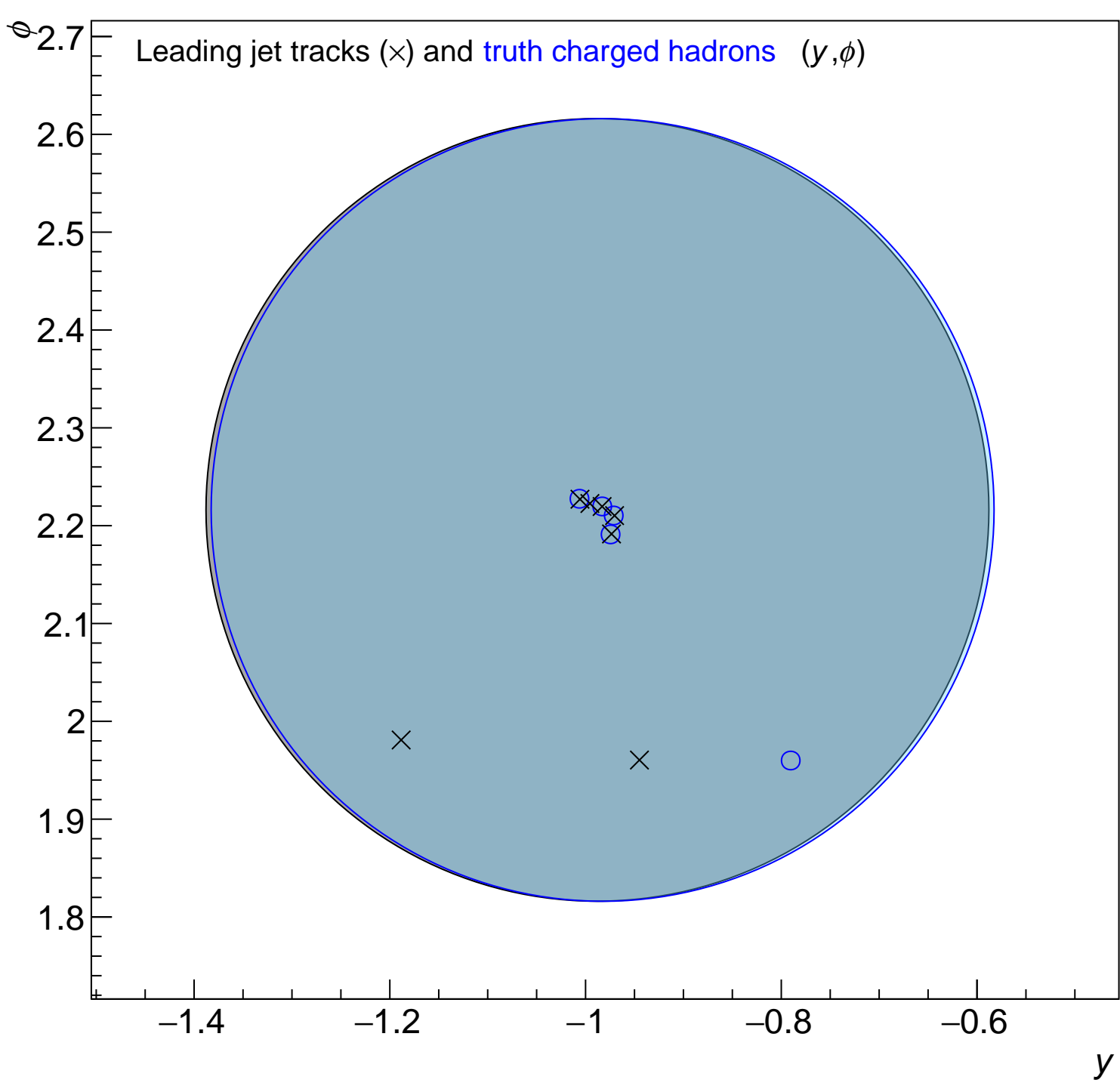
(2.0, 0.97, 0.97, 1.11),  $\pi^+$

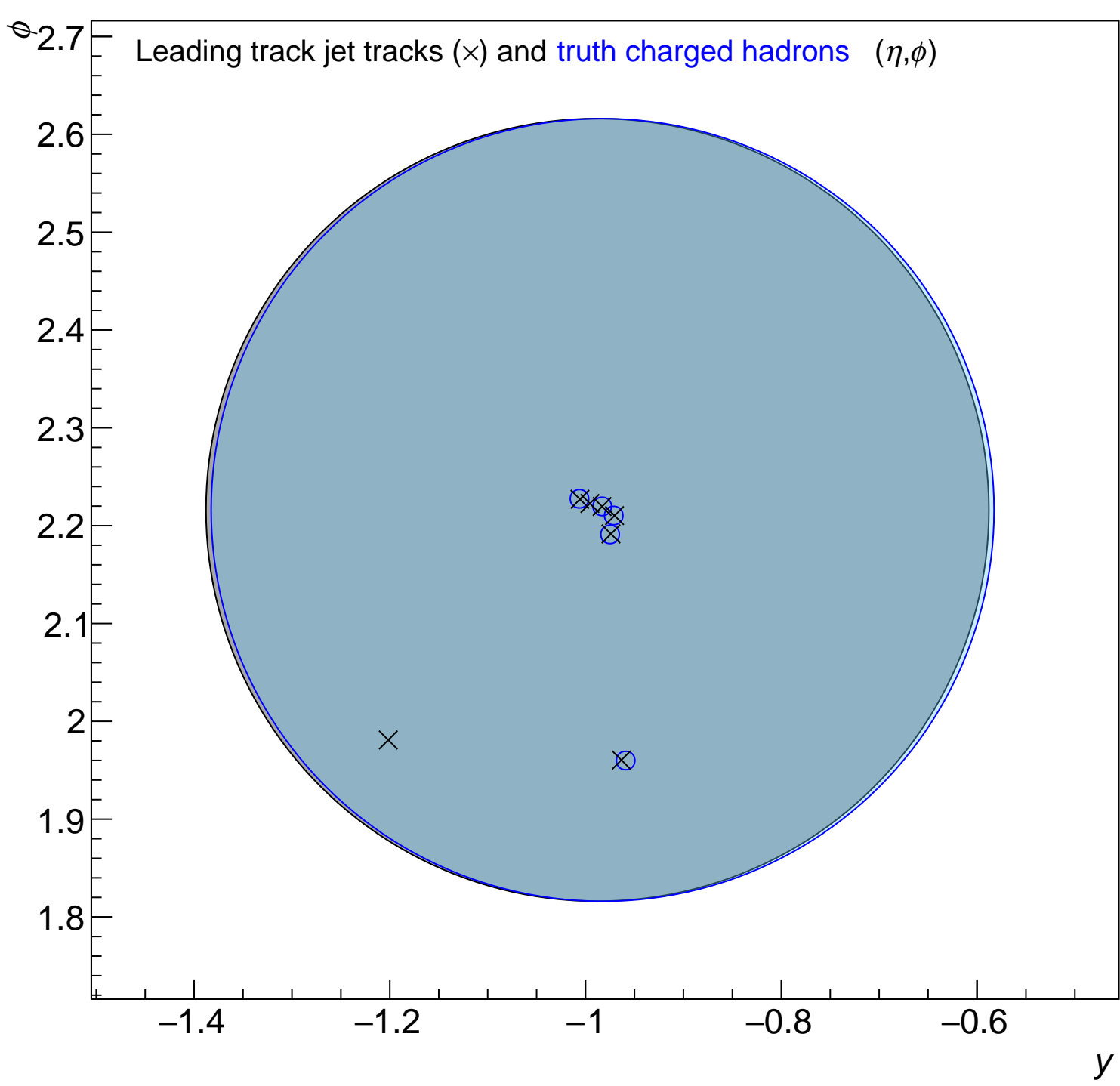
(1.1, 0.99, 0.99, 0.72),  $\pi^-$

(0.8, 1.05, 1.06, 0.84),  $\pi^-$









Run 310000, Event 268766378, (21.7, -0.97, -0.97, 2.21),  $\pi^+$   
 $\mu = 48.5$ ,  $N_{\text{PV}} = 29$  (17.4, -1.01, -1.01, 2.23),  $\pi^+$   
**Truth/reco** ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ ) (3.8, -0.97, -0.97, 2.19),  $\pi^+$   
(93.3, 275, -1.14) (0.6, -0.79, -0.96, 1.96),  $K^+$

(93.3, 291.5, -1.13)  
 $\Delta\phi(\text{ll}, j1) = 3.05$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )  
(247.3, -1.04, -0.95)  
(34.1, -1.78, -1.64)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )  
(266.3, -1.04, -0.95)  
(31.7, -1.78, -1.64)

**1 truth jets**,  $p_{\text{T}} > 5$   
(92.6, -0.98, 2.22)

**1 reco jets**,  $p_{\text{T}} > 5$   
(123.5, -0.99, 2.22)

**17 charged truth hadrons**

(49.1, -0.98, 2.22),  $\pi^-$   
(21.7, -0.97, 2.21),  $\pi^+$   
(17.4, -1.01, 2.23),  $\pi^+$   
(3.8, -0.97, 2.19),  $\pi^+$

**41 tracks**, showing  $p_{\text{T}} > 2$  GeV

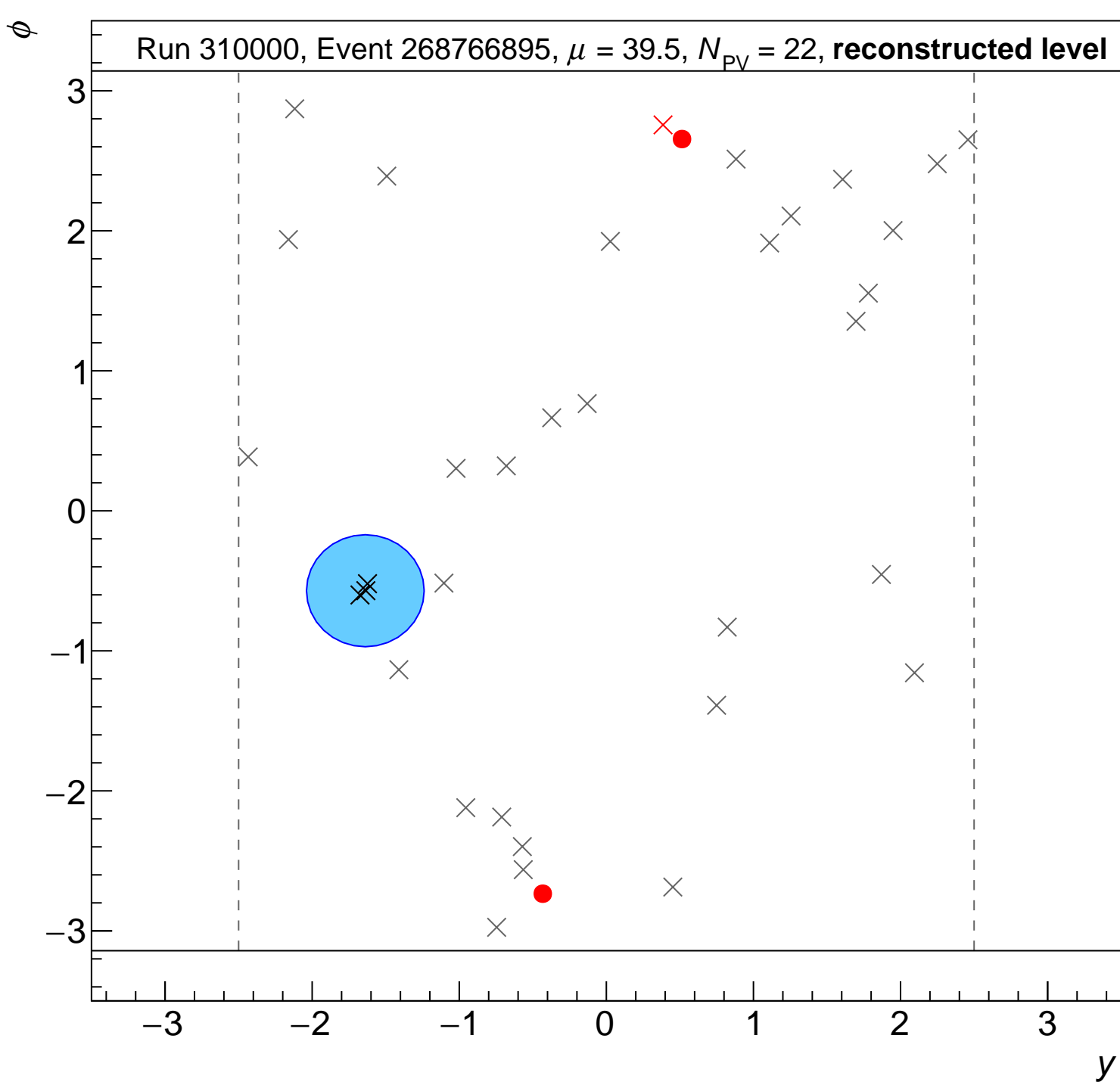
(49.1, -0.98, 2.22), matched to  $\pi^-$   
(30.3, -1.00, 2.22), unmatched  
(22.1, -0.97, 2.21), matched to  $\pi^+$   
(17.2, -1.01, 2.23), matched to  $\pi^+$   
(3.6, -0.97, 2.19), matched to  $\pi^+$   
(2.3, 0.12, 1.16), unmatched

**7 j1 tracks**

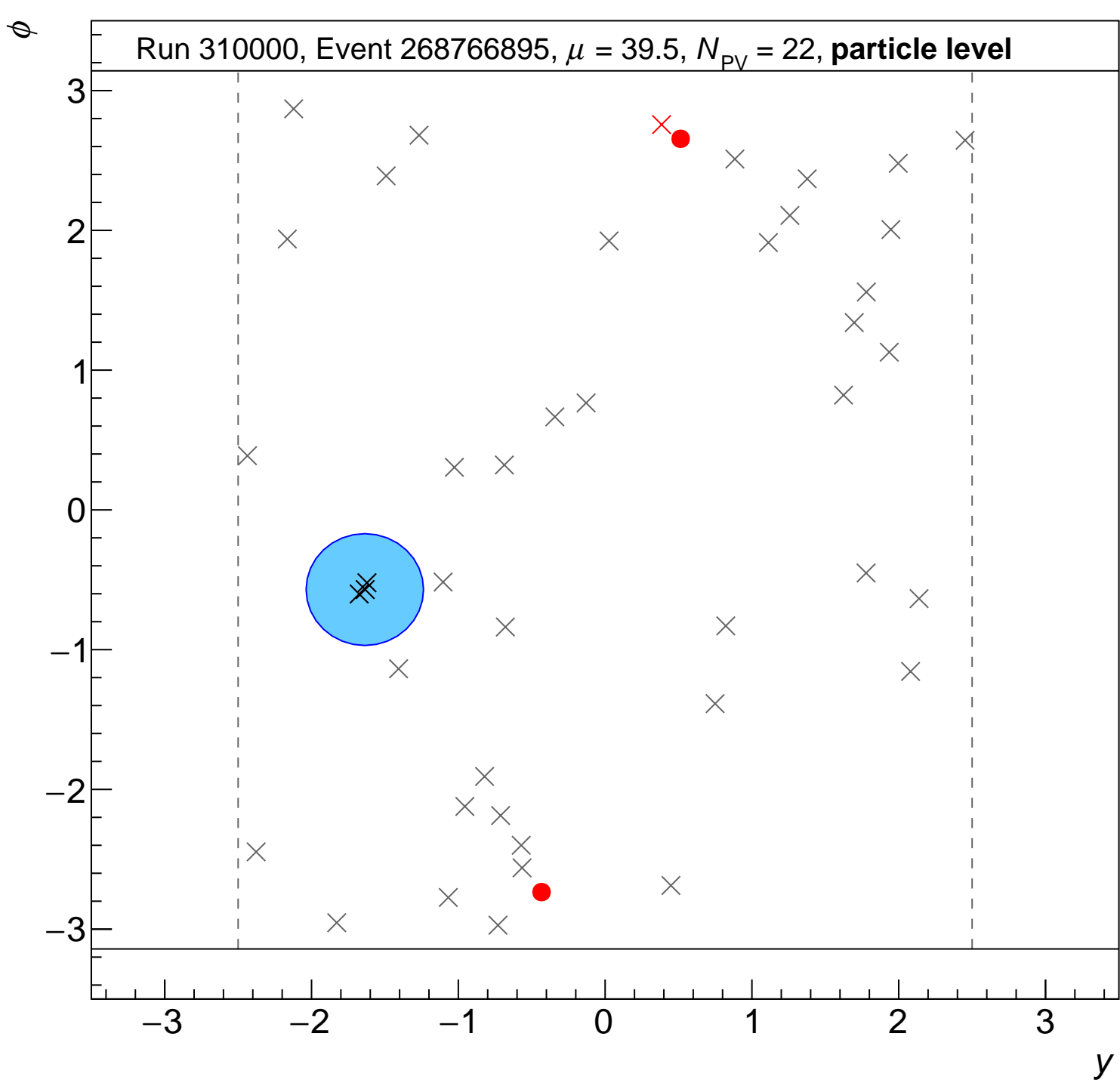
(49.1, -0.98, -0.98, 2.22), matched to  $\pi^-$   
(30.3, -1.00, -1.00, 2.22), unmatched  
(22.1, -0.97, -0.97, 2.21), matched to  $\pi^+$   
(17.2, -1.01, -1.01, 2.23), matched to  $\pi^+$   
(3.6, -0.97, -0.97, 2.19), matched to  $\pi^+$   
(0.8, -1.19, -1.20, 1.98), unmatched  
(0.6, -0.94, -0.96, 1.96), matched to  $K^+$

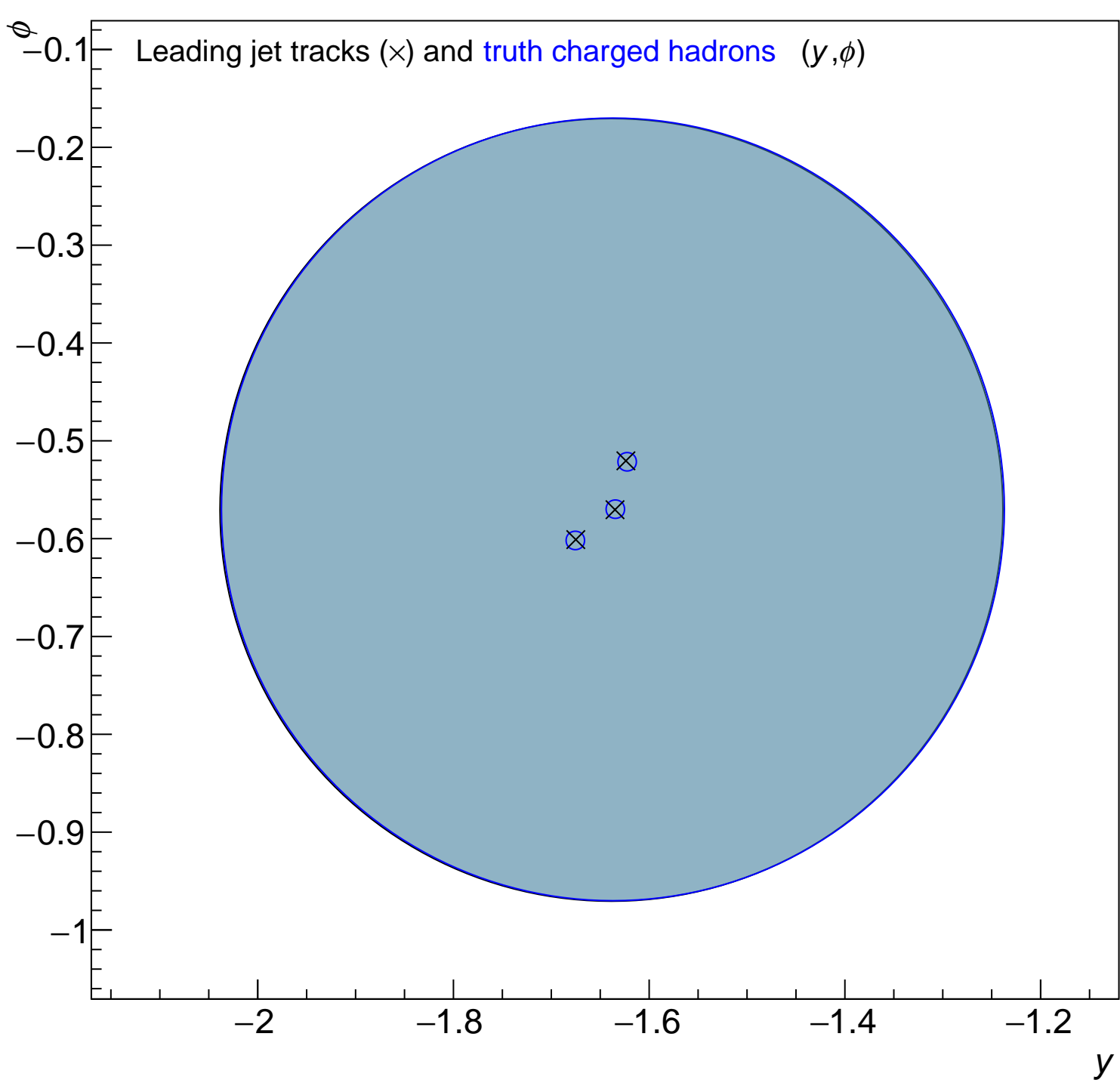
**5 j1 charged hadrons**

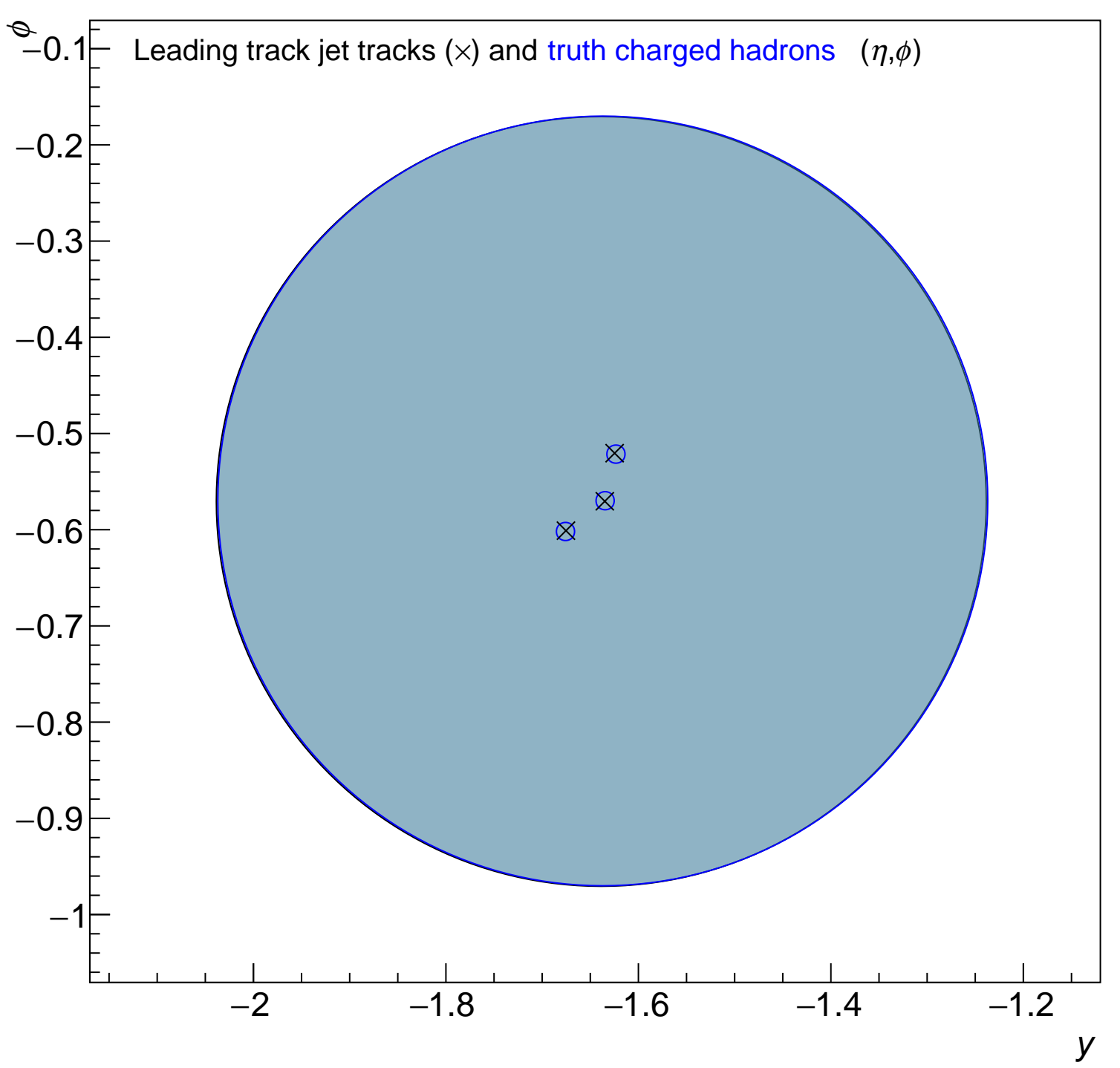
(49.1, -0.98, -0.98, 2.22),  $\pi^-$











Run 310000, Event 268766895,

$\mu = 39.5$ ,  $N_{\text{PV}} = 22$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(94.4, 209, 0.38)

(99.2, 220.2, 0.39)

$\Delta\phi(\text{ll}, \text{j1}) = -2.96$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(190.9, 0.51, 2.66)

(27.2, -0.43, -2.73)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(201.2, 0.51, 2.66)

(28.6, -0.43, -2.73)

**1 truth jets**,  $p_{\text{T}} > 5$

(74.9, -1.64, -0.57)

**1 reco jets**,  $p_{\text{T}} > 5$

(50.2, -1.64, -0.57)

**42 charged truth hadrons**

(66.2, -1.63, -0.57),  $e^+$

(5.5, -1.68, -0.60),  $\pi^+$

(3.3, -1.62, -0.52),  $\pi^-$

(3.1, -2.44, 0.39),  $\pi^+$

(2.6, -1.49, 2.39),  $\pi^-$

(2.2, -1.10, -0.52),  $\pi^+$

(2.1, -0.82, -1.91),  $\Sigma^+$

(2.1, -0.34, 0.67),  $\bar{p}$

(2.1, 0.75, -1.39),  $\pi^+$

(2.0, -0.73, -2.97),  $K^+$

**33 tracks**, showing  $p_{\text{T}} > 2$  GeV

(41.7, -1.63, -0.57), matched to  $e^+$

(5.4, -1.67, -0.60), matched to  $\pi^+$

(4.1, -2.43, 0.39), matched to  $\pi^+$

(3.1, -1.62, -0.52), matched to  $\pi^-$

(2.6, -1.49, 2.39), matched to  $\pi^-$

(2.1, 0.75, -1.39), matched to  $\pi^+$

(2.1, -1.10, -0.52), matched to  $\pi^+$

(2.1, -0.75, -2.97), matched to  $K^+$

(2.0, -0.37, 0.66), matched to  $\bar{p}$

**3 j1 tracks**

(41.7, -1.63, -1.63, -0.57), matched to  $e^+$

(5.4, -1.67, -1.68, -0.60), matched to  $\pi^+$

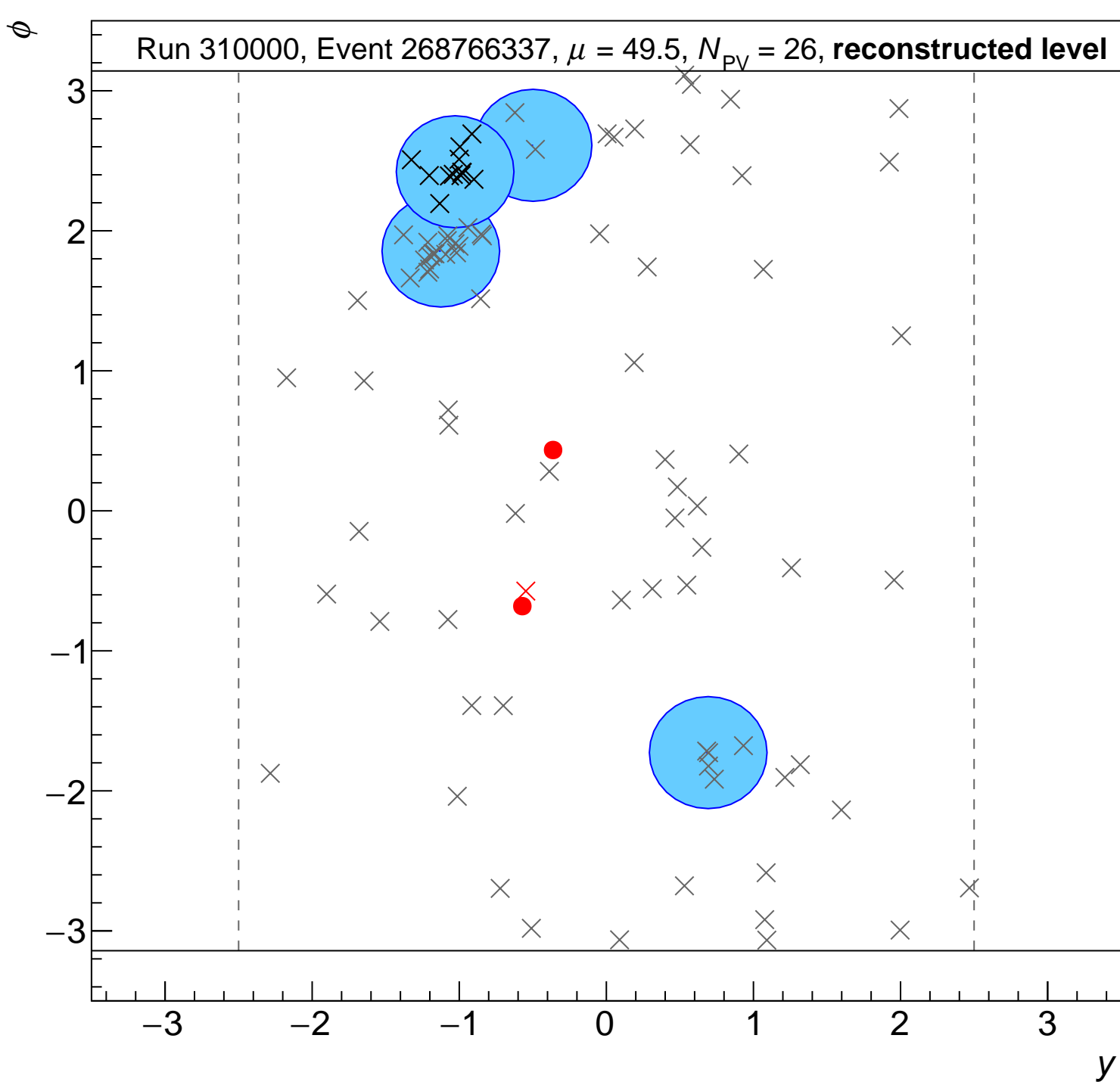
(3.1, -1.62, -1.62, -0.52), matched to  $\pi^-$

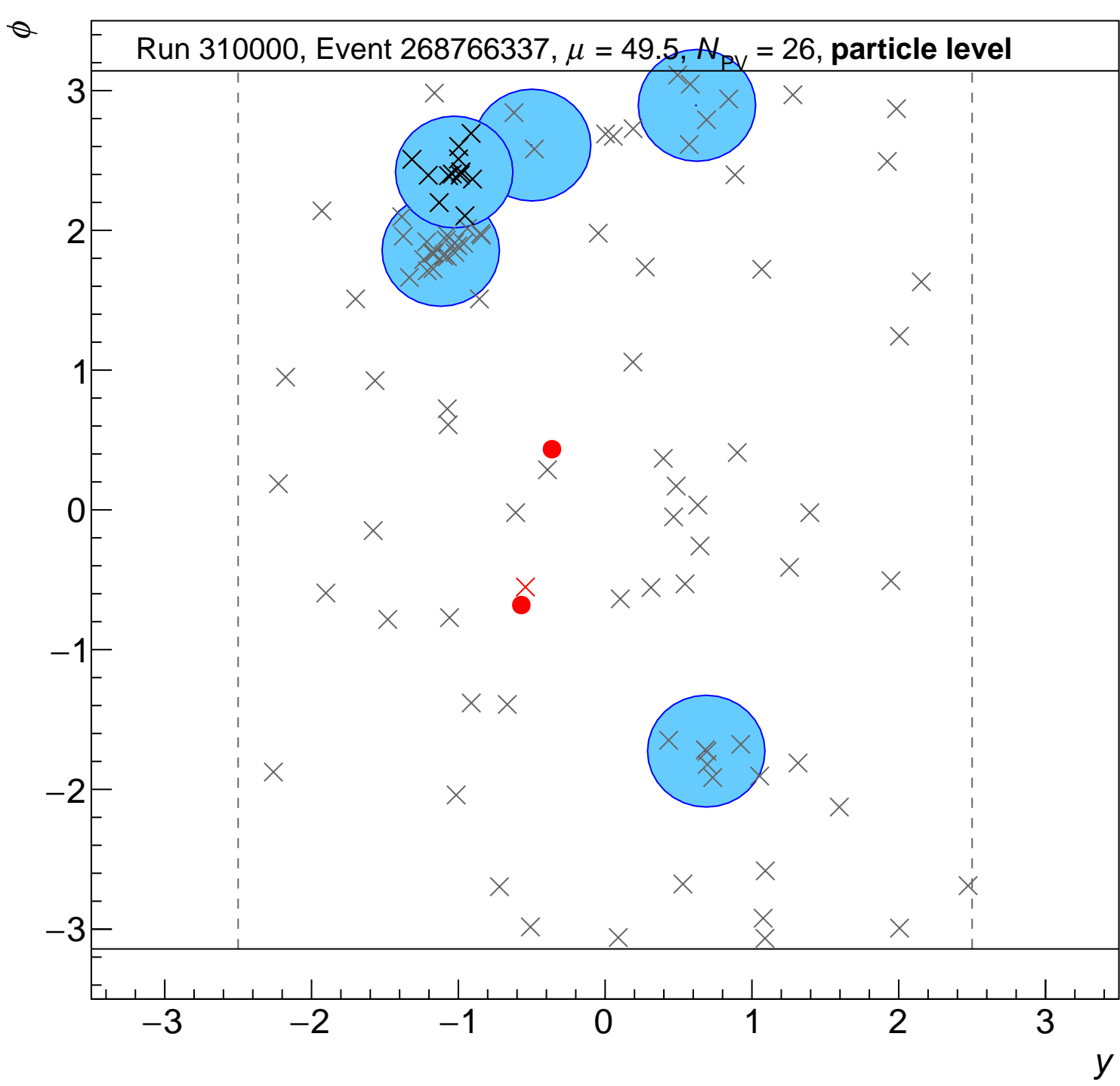
**3 j1 charged hadrons**

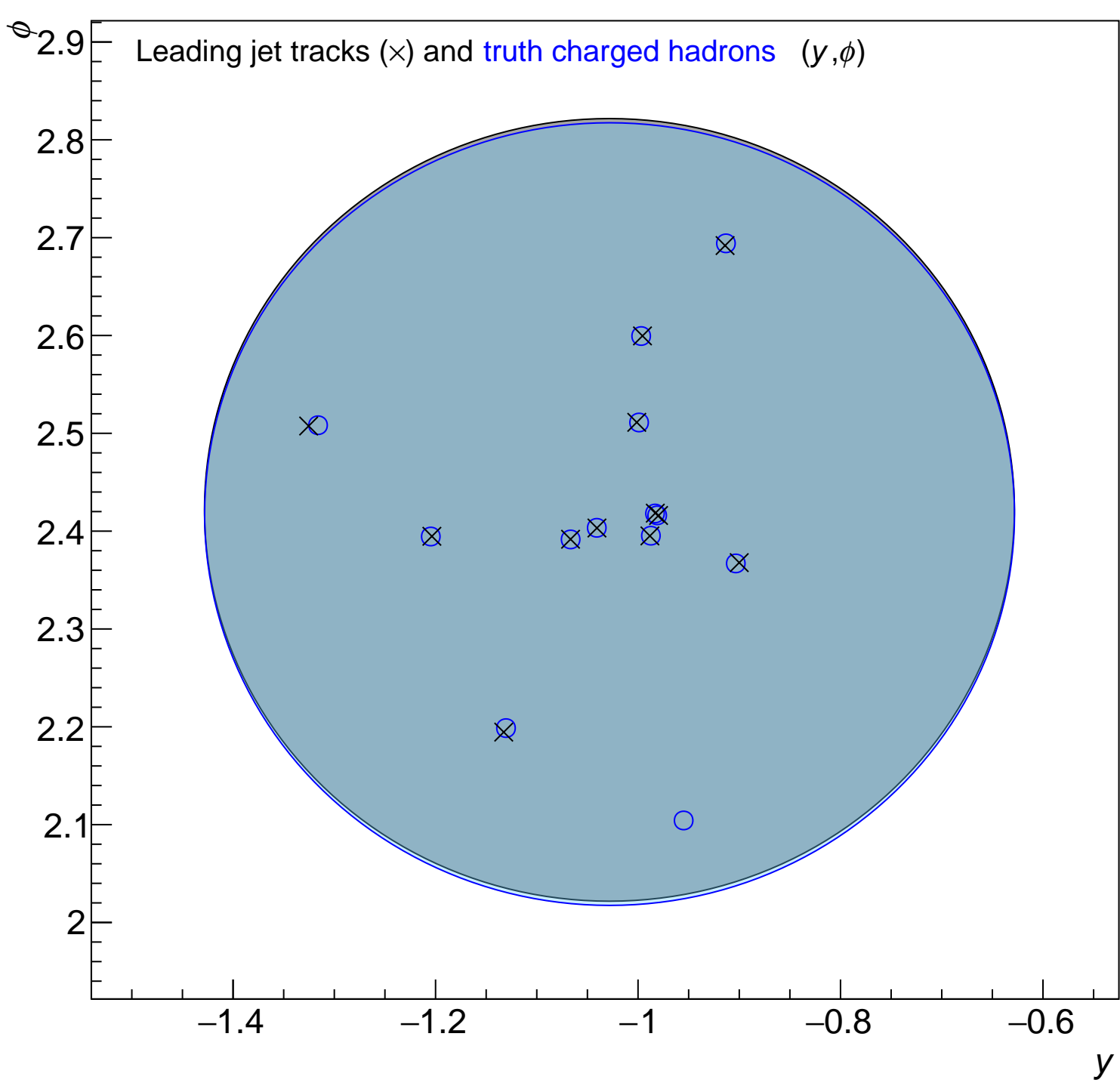
(66.2, -1.63, -1.63, -0.57),  $e^+$

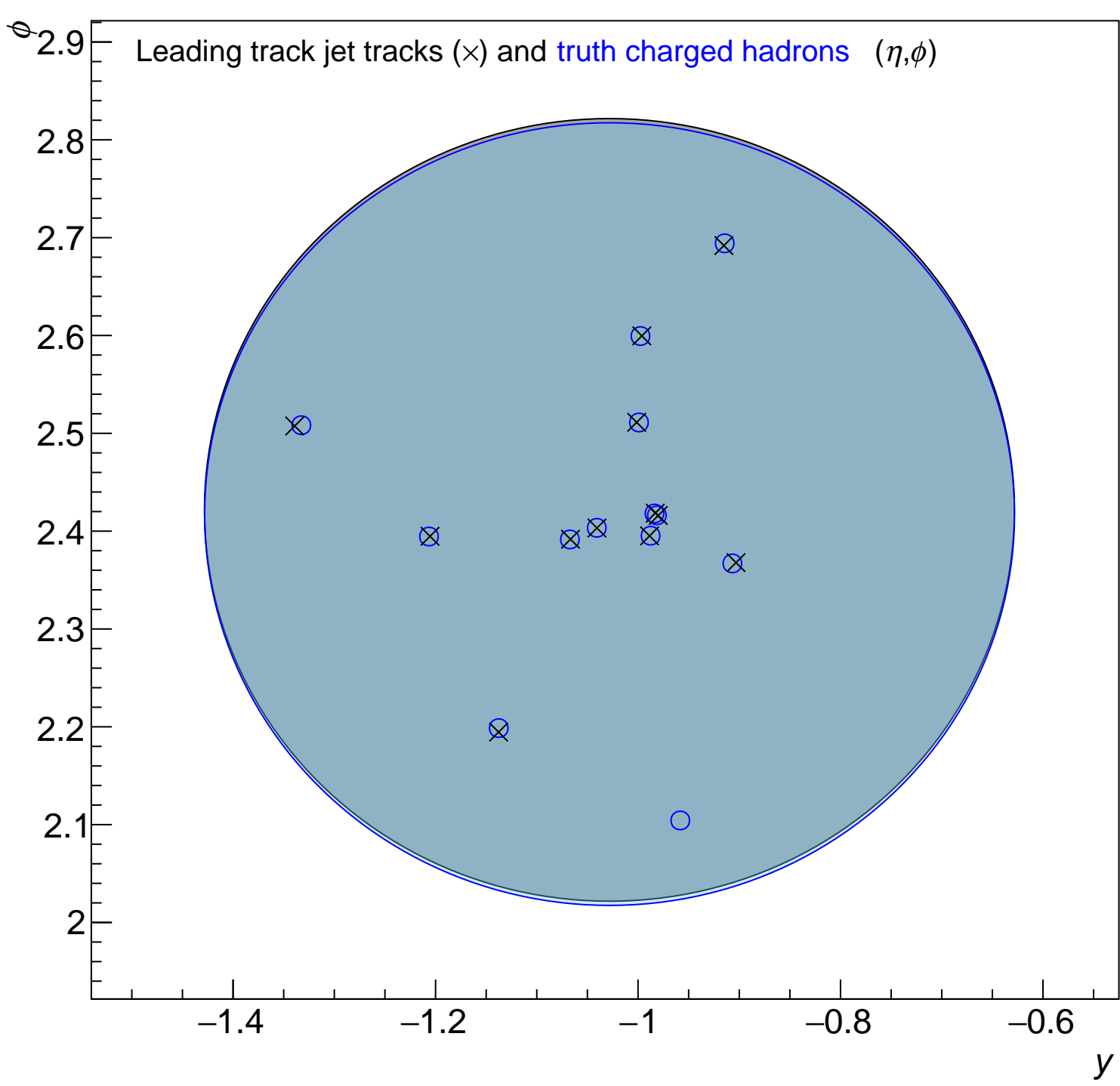
(5.5, -1.68, -1.68, -0.60),  $\pi^+$

(3.3, -1.62, -1.62, -0.52),  $\pi^-$











Run 310000, Event 268766337,

$\mu = 49.5$ ,  $N_{\text{PV}} = 26$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(86.7, 220, -0.54)

(95.7, 264.4, -0.55)

$\Delta\phi(\text{ll}, j_1) = -2.99$ ,  $\Delta R_{j_1}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(204.7, -0.57, -0.68)

(31.5, -0.36, 0.43)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(249.0, -0.57, -0.68)

(31.6, -0.36, 0.43)

**5 truth jets**,  $p_{\text{T}} > 5$

(118.1, -1.03, 2.42)

(70.4, -1.12, 1.86)

(39.8, 0.69, -1.73)

(8.0, 0.63, 2.89)

(6.4, -0.50, 2.61)

**4 reco jets**,  $p_{\text{T}} > 5$

(113.6, -1.03, 2.42)

(67.4, -1.13, 1.86)

(39.3, 0.69, -1.73)

(6.3, -0.50, 2.61)

**103 charged truth hadrons**

(62.7, -1.04, 2.40),  $\pi^-$

(28.6, 0.68, -1.72),  $\pi^+$

(15.2, -1.16, 1.84),  $\pi^+$

(13.3, -0.98, 2.42),  $K^-$

(11.7, -1.07, 2.39),  $K^+$

(9.0, -1.24, 1.79),  $\pi^+$

(8.3, -1.00, 2.51),  $\pi^-$

(6.9, 0.69, -1.73),  $\pi^+$

(6.0, -1.09, 1.83),  $\pi^+$

(5.7, -0.48, 2.58),  $K^+$

(5.2, -1.08, 1.93),  $\pi^+$

(5.0, -0.98, 2.42),  $\pi^-$

(4.9, -0.99, 2.40),  $\pi^+$

(3.8, -2.26, -1.88), p

(3.7, -1.00, 1.89),  $\pi^+$

(3.4, -1.17, 1.73),  $\bar{p}$

(3.3, -1.00, 2.60),  $\pi^-$

(3.2, -1.08, 1.96),  $\pi^-$

(3.2, -1.06, -0.77),  $K^-$

(2.9, -1.18, 1.84),  $\pi^-$

(2.8, -1.90, -0.59),  $\pi^-$

(2.6, 1.92, 2.49),  $\pi^+$

(2.6, -1.21, 1.71),  $\pi^-$

(2.6, 0.31, -0.56),  $\pi^+$

(2.6, 0.69, 2.79), PDG = -3222

(2.6, -1.03, 1.91),  $\pi^+$

(2.5, -0.85, 1.98),  $\pi^-$

(2.4, -1.21, 1.92),  $\pi^-$

(2.4, -1.48, -0.78),  $\bar{p}$

(2.4, -0.61, -0.02),  $K^+$

(2.4, -0.91, 2.69),  $\pi^-$

(2.3, -0.05, 1.98),  $K^+$

(2.2, 0.49, 3.11), p

(2.2, -0.84, 1.96),  $\pi^+$

(2.1, -1.20, 2.39),  $\pi^+$

(2.1, -1.57, 0.92),  $\bar{p}$

**91 tracks**, showing  $p_{\text{T}} > 2$  GeV

(58.1, -1.04, 2.40), matched to  $\pi^-$

(28.6, 0.68, -1.72), matched to  $\pi^+$

(15.5, -1.17, 1.84), matched to  $\pi^+$

(14.7, -0.98, 2.42), matched to  $K^-$

(11.6, -1.07, 2.39), matched to  $K^+$

(8.8, -1.24, 1.79), matched to  $\pi^+$

(8.0, -1.00, 2.51), matched to  $\pi^-$

(6.9, 0.70, -1.73), matched to  $\pi^+$

(5.9, -1.09, 1.83), matched to  $\pi^+$

(5.6, -0.48, 2.58), matched to  $K^+$

(5.4, -1.08, 1.93), matched to  $\pi^+$

(5.2, -0.98, 2.42), matched to  $\pi^-$

(4.7, -0.99, 2.40), matched to  $\pi^+$

(4.0, -1.00, 1.89), matched to  $\pi^+$

(3.8, -2.28, -1.87), matched to p

(3.5, -1.00, 2.60), matched to  $\pi^-$

(3.4, -1.20, 1.73), matched to  $\bar{p}$

(3.1, -1.08, 1.96), matched to  $\pi^-$

(3.1, -1.08, -0.78), matched to  $K^-$

(3.0, 1.92, 2.49), matched to  $\pi^+$

(2.8, -1.18, 1.84), matched to  $\pi^-$

(2.8, -1.90, -0.59), matched to  $\pi^-$

(2.7, -1.65, 0.93), matched to  $\bar{p}$

(2.6, 0.31, -0.56), matched to  $\pi^+$

(2.5, -1.03, 1.91), matched to  $\pi^+$

(2.5, -1.21, 1.70), matched to  $\pi^-$

(2.4, -0.85, 1.98), matched to  $\pi^-$

(2.4, -1.21, 1.92), matched to  $\pi^-$

(2.4, -0.91, 2.69), matched to  $\pi^-$

(2.4, -0.62, -0.02), matched to  $K^+$

(2.3, -0.05, 1.98), matched to  $K^+$

(2.3, 0.53, 3.11), matched to p

(2.1, -0.84, 1.96), matched to  $\pi^+$

(2.1, -1.20, 2.39), matched to  $\pi^+$

**12 j1 tracks**

(58.1, -1.04, -1.04, 2.40), matched to  $\pi^-$

(14.7, -0.98, -0.98, 2.42), matched to  $K^-$

(11.6, -1.07, -1.07, 2.39), matched to  $K^+$

(8.0, -1.00, -1.00, 2.51), matched to  $\pi^-$

(5.2, -0.98, -0.98, 2.42), matched to  $\pi^-$

(4.7, -0.99, -0.99, 2.40), matched to  $\pi^+$

(3.5, -1.00, -1.00, 2.60), matched to  $\pi^-$

(2.4, -0.91, -0.92, 2.69), matched to  $\pi^-$

(2.1, -1.20, -1.21, 2.39), matched to  $\pi^+$

(1.5, -0.90, -0.90, 2.37), matched to  $\pi^+$

(1.2, -1.13, -1.14, 2.19), matched to  $\pi^+$

(0.8, -1.33, -1.34, 2.51), matched to  $\pi^-$

**13 j1 charged hadrons**

(62.7, -1.04, -1.04, 2.40),  $\pi^-$

(13.3, -0.98, -0.98, 2.42),  $K^-$

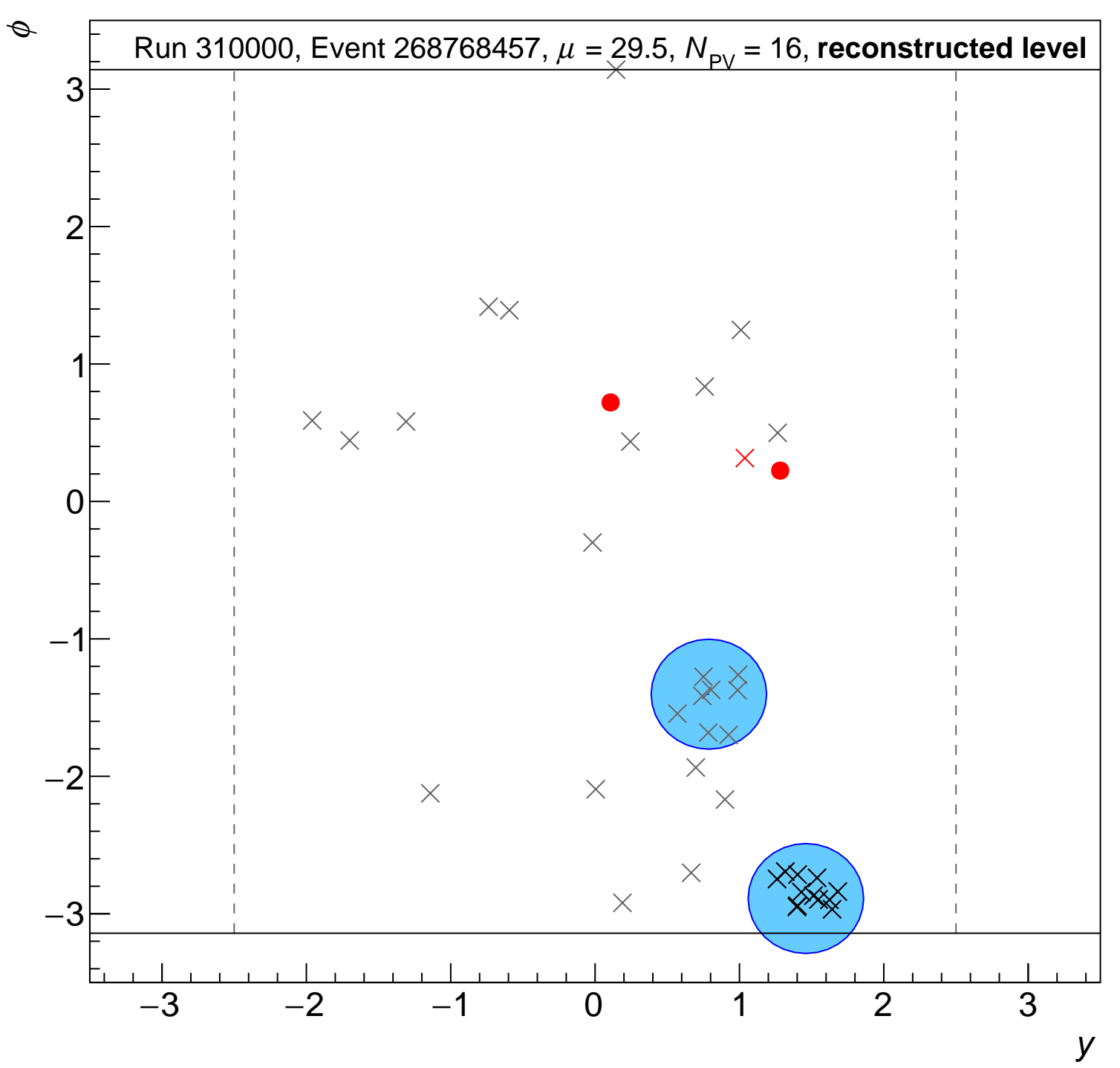
(11.7, -1.07, -1.07, 2.39),  $K^+$

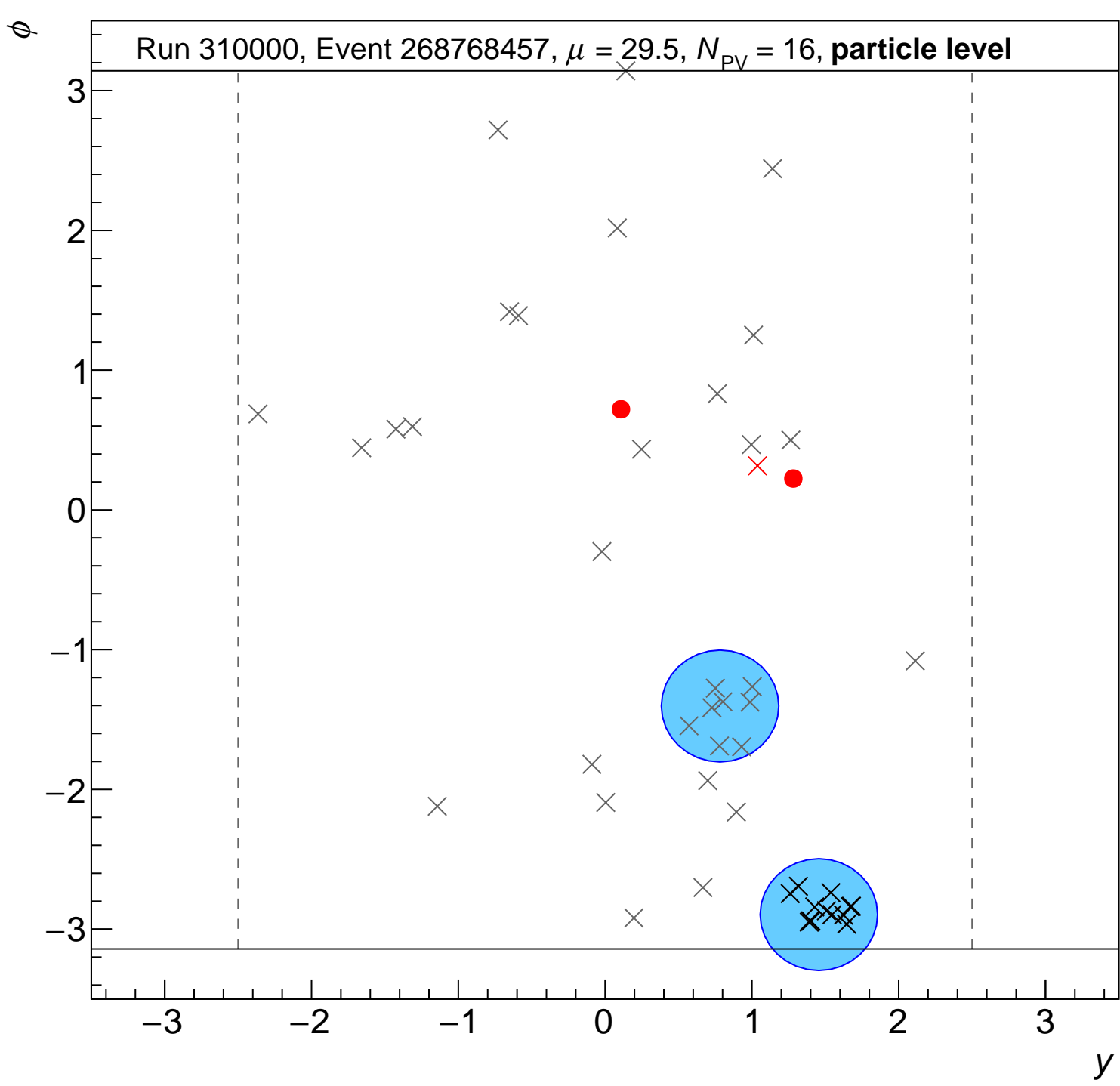
(8.3, -1.00, -1.00, 2.51),  $\pi^-$

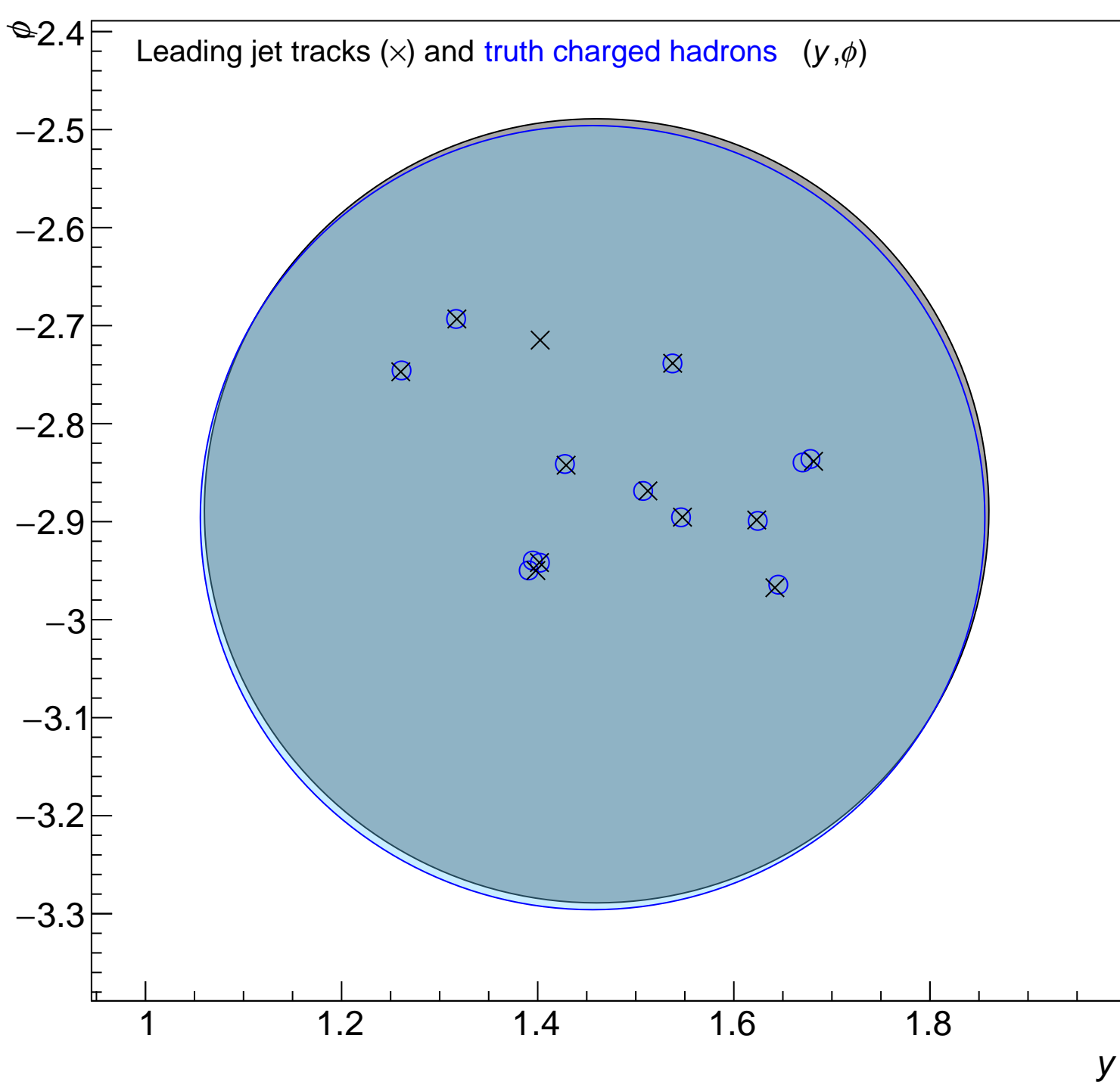
(5.0, -0.98, -0.98, 2.42),  $\pi^-$

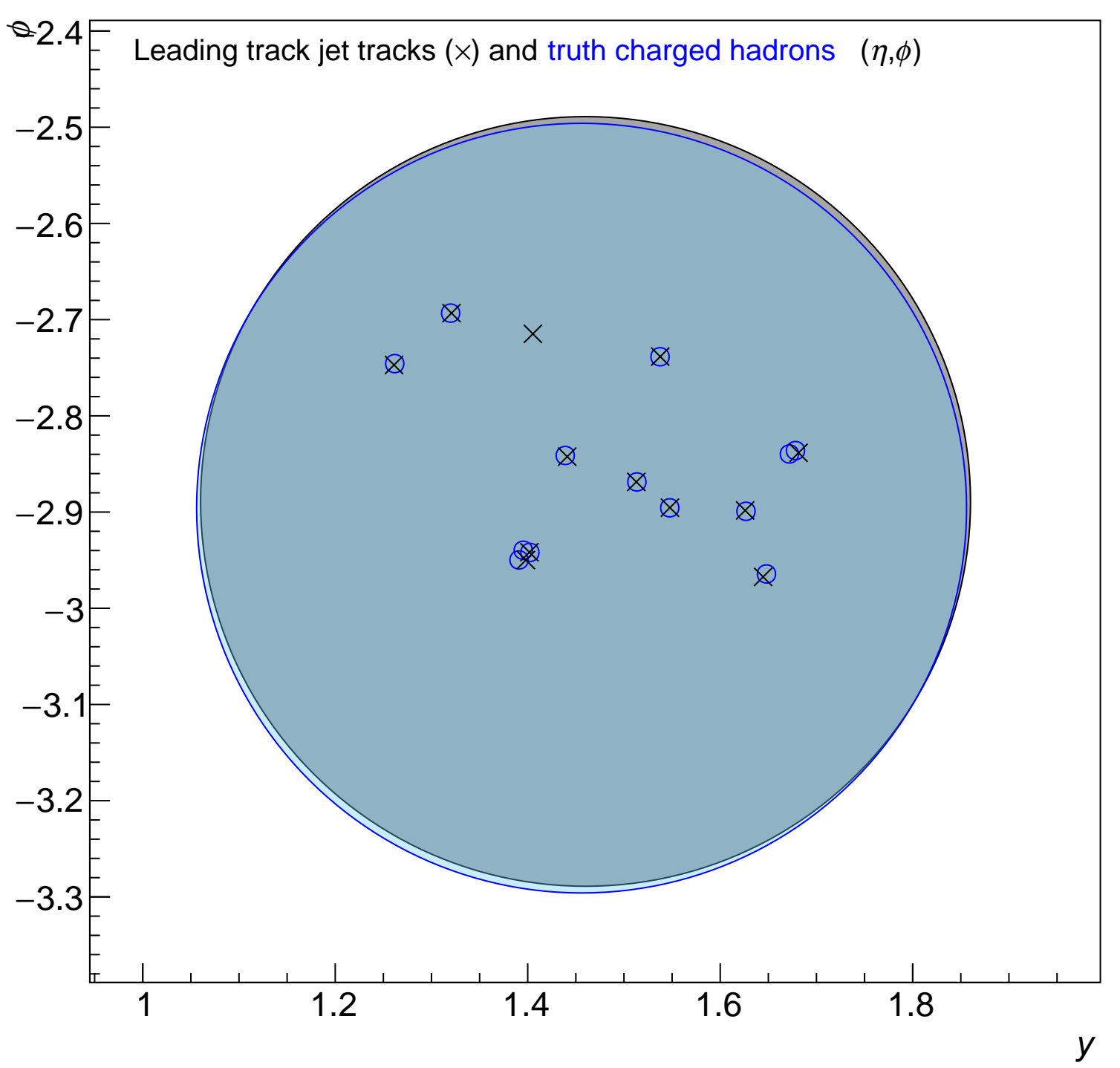
(4.9, -0.99, -0.99, 2.40),  $\pi^+$

(3.3, -1.00, -1.00, 2.60),  $\pi^-$









Run 310000, Event 268768457,

$\mu = 29.5$ ,  $N_{\text{PV}} = 16$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(90.6, 171, 1.04)

(90.2, 169.5, 1.04)

$\Delta\phi(\text{ll}, j1) = -3.08$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.01$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(141.3, 1.28, 0.22)

(32.6, 0.11, 0.72)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(140.3, 1.28, 0.22)

(32.4, 0.11, 0.72)

**2 truth jets**,  $p_{\text{T}} > 5$

(112.0, 1.46, -2.90)

(12.3, 0.78, -1.40)

**2 reco jets**,  $p_{\text{T}} > 5$

(108.7, 1.46, -2.89)

(12.4, 0.79, -1.40)

**45 charged truth hadrons**

(37.8, 1.40, -2.94),  $\pi^+$

(24.9, 1.39, -2.95),  $K^+$

(11.5, 1.54, -2.74),  $\pi^-$

(8.8, 1.55, -2.90),  $K^+$

(7.9, 1.68, -2.84),  $\pi^+$

(4.9, 1.39, -2.94),  $\pi^-$

(4.3, 1.51, -2.87),  $K^-$

(4.3, 0.73, -1.42), p

(3.5, 1.26, -2.75),  $\pi^-$

(3.0, 0.75, -1.28),  $\pi^+$

(2.2, 1.67, -2.84),  $\pi^-$

(2.1, 0.00, -2.09),  $\pi^+$

**37 tracks**, showing  $p_{\text{T}} > 2$  GeV

(37.9, 1.40, -2.94), matched to  $\pi^+$

(24.4, 1.40, -2.95), unmatched

(13.2, 1.54, -2.74), matched to  $\pi^-$

(9.7, 1.68, -2.84), matched to  $\pi^+$

(8.2, 1.55, -2.90), matched to  $K^+$

(4.4, 0.74, -1.42), matched to p

(4.3, 1.51, -2.87), matched to  $K^-$

(3.5, 1.26, -2.75), matched to  $\pi^-$

(2.9, 0.75, -1.28), matched to  $\pi^+$

(2.1, 0.00, -2.09), matched to  $\pi^+$

**12 j1 tracks**

(37.9, 1.40, 1.40, -2.94), matched to  $\pi^+$

(24.4, 1.40, 1.40, -2.95), unmatched

(13.2, 1.54, 1.54, -2.74), matched to  $\pi^-$

(9.7, 1.68, 1.68, -2.84), matched to  $\pi^+$

(8.2, 1.55, 1.55, -2.90), matched to  $K^+$

(4.3, 1.51, 1.51, -2.87), matched to  $K^-$

(3.5, 1.26, 1.26, -2.75), matched to  $\pi^-$

(1.9, 1.62, 1.63, -2.90), matched to  $\pi^+$

(1.8, 1.64, 1.64, -2.97), matched to  $\pi^-$

(1.7, 1.40, 1.41, -2.71), unmatched

(1.6, 1.32, 1.32, -2.69), matched to  $\pi^+$

(0.8, 1.43, 1.44, -2.84), matched to  $\pi^+$

**13 j1 charged hadrons**

(37.8, 1.40, 1.40, -2.94),  $\pi^+$

(24.9, 1.39, 1.39, -2.95),  $K^+$

(11.5, 1.54, 1.54, -2.74),  $\pi^-$

(8.8, 1.55, 1.55, -2.90),  $K^+$

(7.9, 1.68, 1.68, -2.84),  $\pi^+$

(4.9, 1.39, 1.40, -2.94),  $\pi^-$

(4.3, 1.51, 1.51, -2.87),  $K^-$

(3.5, 1.26, 1.26, -2.75),  $\pi^-$

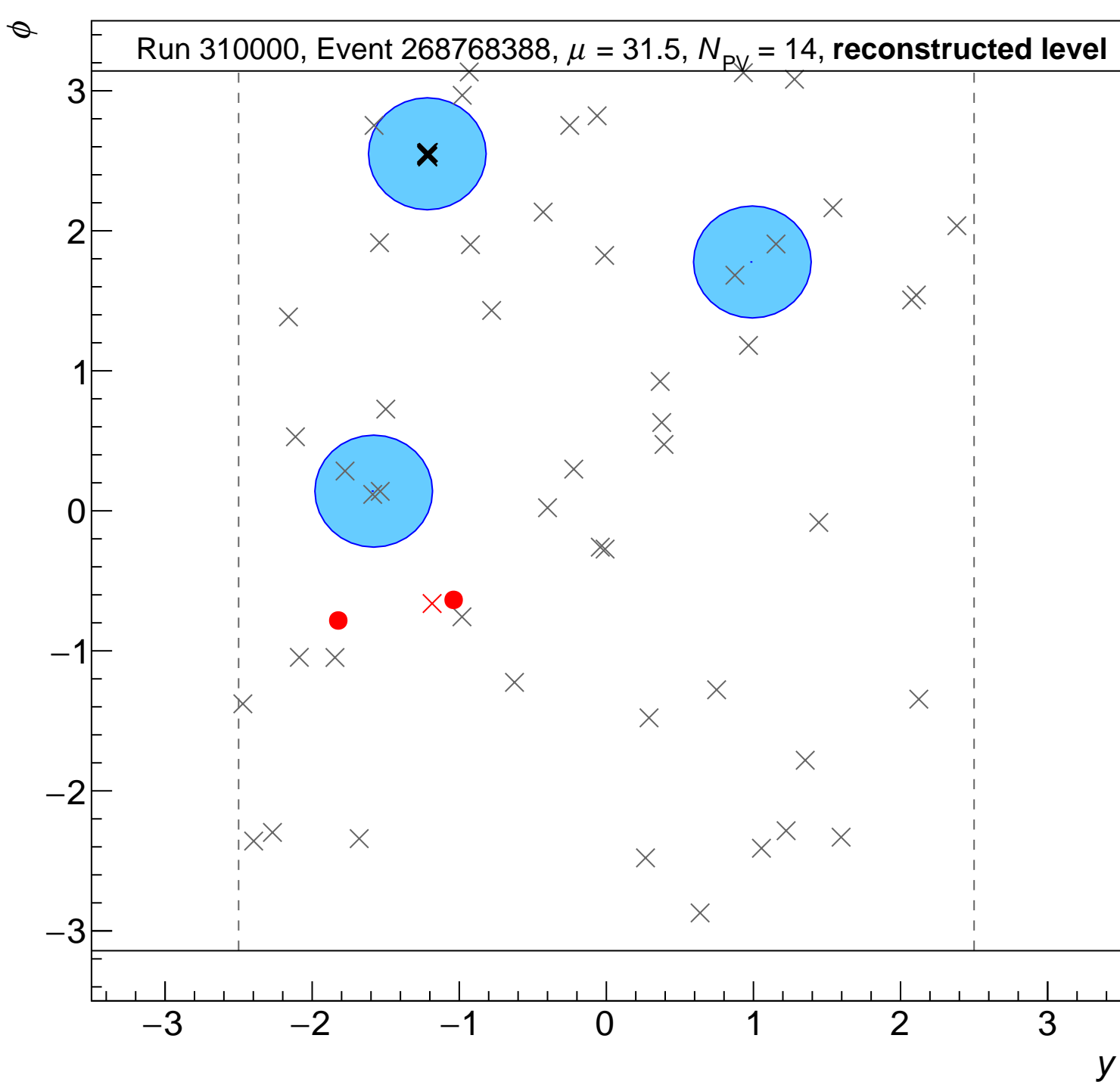
(2.2, 1.67, 1.67, -2.84),  $\pi^-$

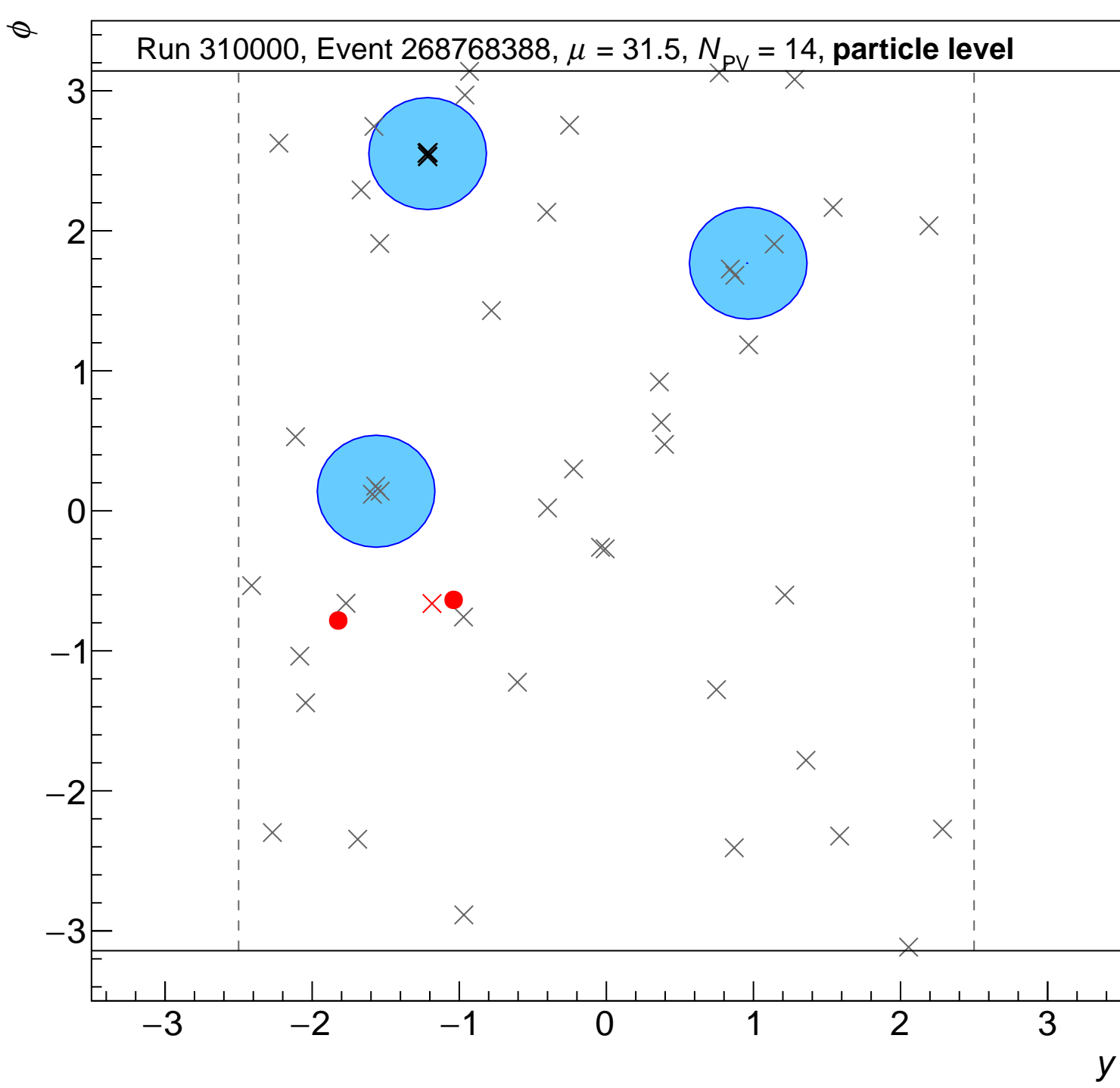
(1.9, 1.62, 1.63, -2.90),  $\pi^+$

(1.8, 1.65, 1.65, -2.96),  $\pi^-$

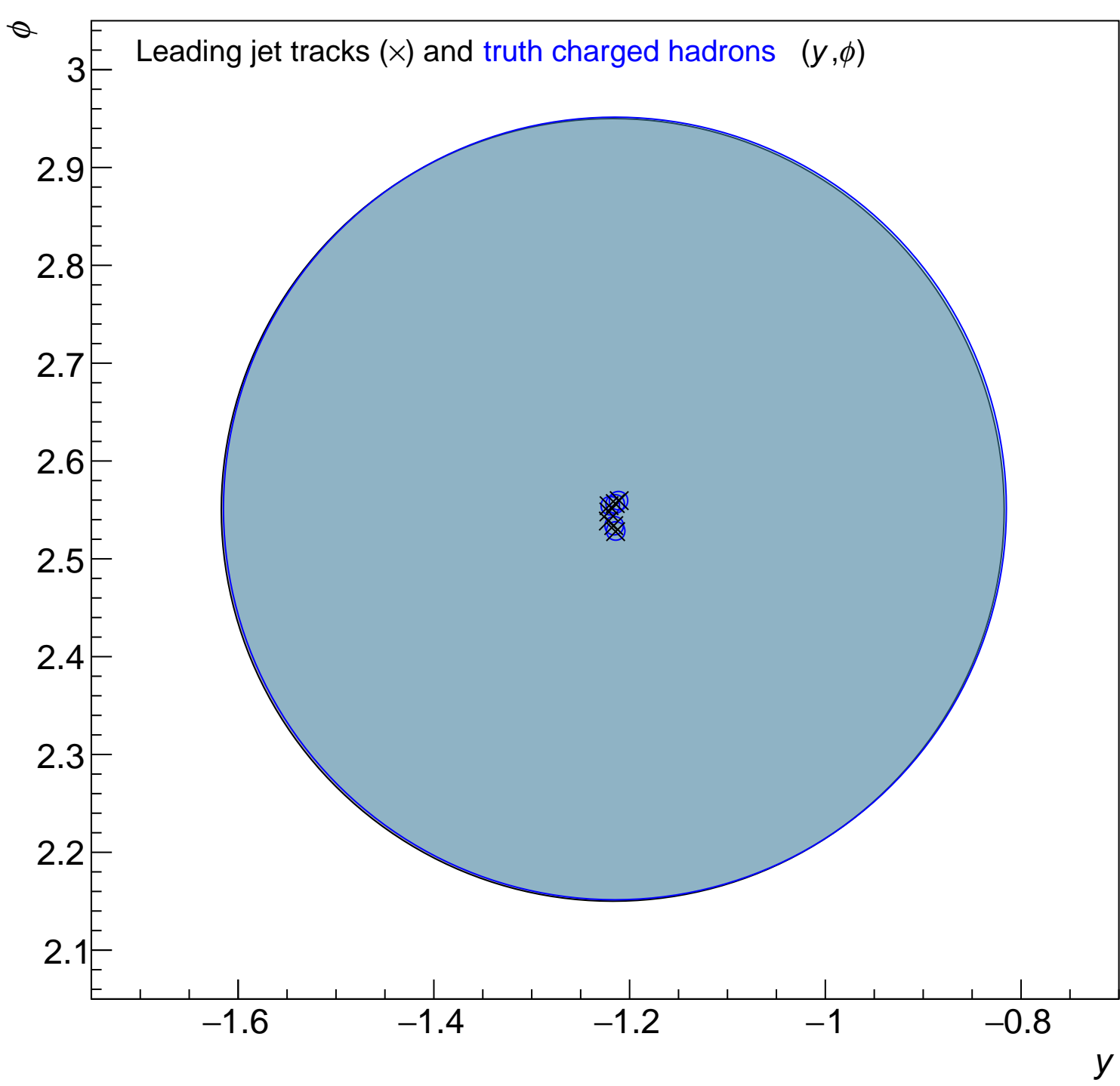
(1.6, 1.32, 1.32, -2.69),  $\pi^+$

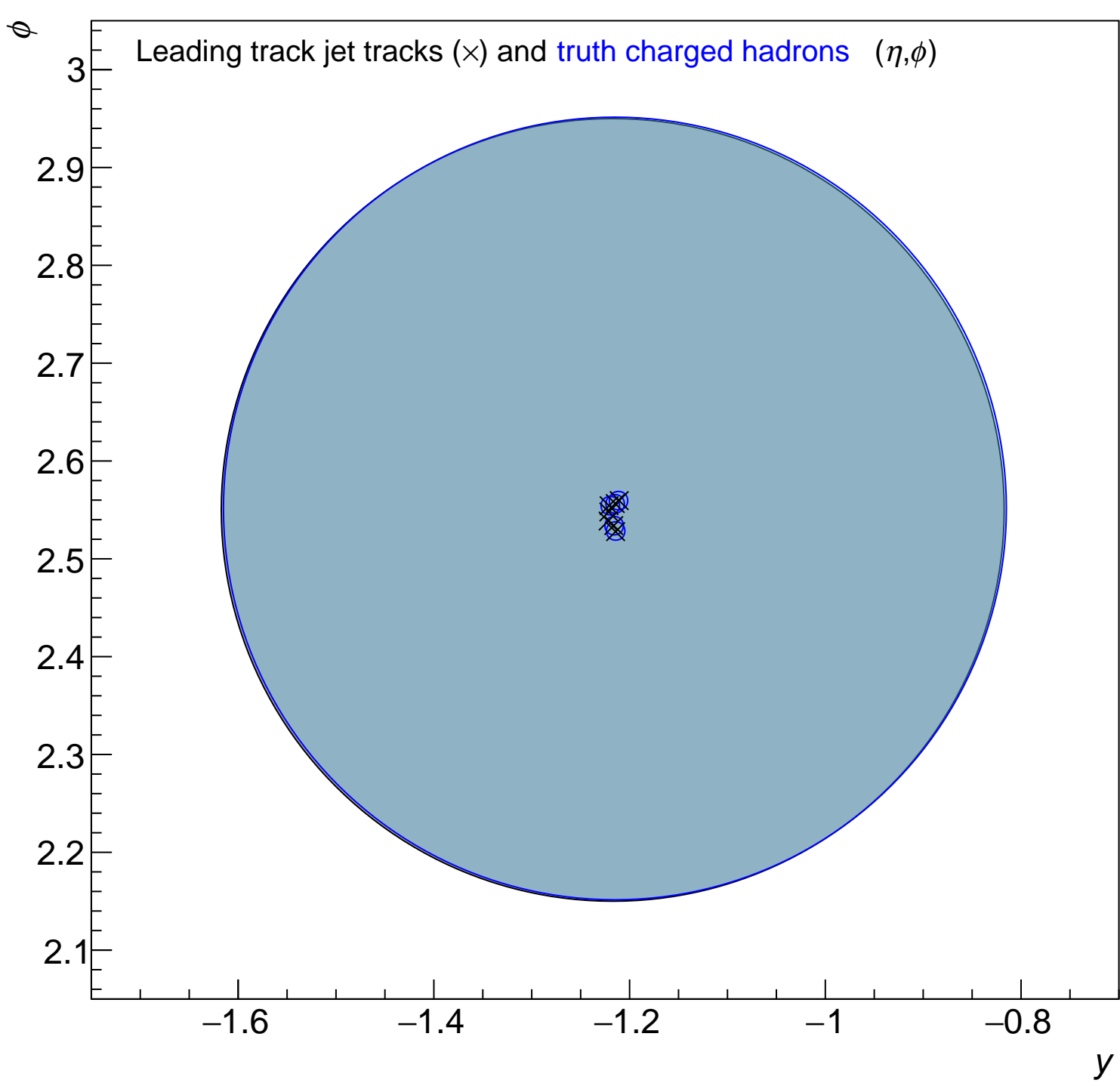
(0.9, 1.43, 1.44, -2.84),  $\pi^+$











Run 310000, Event 268768388,

$\mu = 31.5$ ,  $N_{\text{PV}} = 14$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(93.7, 299, -1.19)

(98.2, 314.0, -1.18)

$\Delta\phi(\text{ll}, \text{j1}) = 3.07$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(246.3, -1.04, -0.64)

(53.3, -1.82, -0.78)

**2 reco muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(258.8, -1.04, -0.64)

(55.7, -1.82, -0.78)

**3 truth jets**,  $p_{\text{T}} > 5$

(234.4, -1.21, 2.55)

(11.0, -1.57, 0.14)

(8.1, 0.96, 1.77)

**3 reco jets**,  $p_{\text{T}} > 5$

(355.9, -1.22, 2.55)

(9.4, -1.58, 0.14)

(6.9, 0.99, 1.78)

**49 charged truth hadrons**

(73.0, -1.21, 2.56),  $\pi^+$

(55.6, -1.22, 2.55),  $\pi^+$

(54.0, -1.21, 2.56),  $\pi^+$

(36.8, -1.22, 2.53),  $\pi^-$

(15.0, -1.21, 2.53),  $\pi^-$

(4.3, -1.59, 0.12),  $\pi^+$

(4.2, -1.54, 0.14),  $\pi^-$

(3.9, 0.87, 1.68),  $\pi^-$

(3.1, 0.37, 0.63),  $K^+$

(2.9, 1.14, 1.91),  $K^+$

(2.5, -1.57, 0.18),  $\pi^-$

(2.5, 2.29, -2.27),  $\bar{p}$

(2.3, -2.23, 2.63),  $\bar{p}$

(2.1, -0.96, 2.97),  $K^+$

**57 tracks**, showing  $p_{\text{T}} > 2 \text{ GeV}$

(117.2, -1.22, 2.55), unmatched

(75.3, -1.21, 2.56), matched to  $\pi^+$

(56.5, -1.22, 2.55), matched to  $\pi^+$

(47.5, -1.21, 2.56), matched to  $\pi^+$

(39.3, -1.22, 2.53), matched to  $\pi^-$

(14.1, -1.21, 2.53), matched to  $\pi^-$

(6.0, -1.22, 2.54), unmatched

(4.5, -1.59, 0.12), matched to  $\pi^+$

(4.1, -1.54, 0.14), matched to  $\pi^-$

(4.0, 0.87, 1.68), matched to  $\pi^-$

(3.0, 0.38, 0.63), matched to  $K^+$

(2.9, 1.15, 1.91), matched to  $K^+$

(2.2, -0.98, 2.97), matched to  $K^+$

**7 j1 tracks**

(117.2, -1.22, -1.22, 2.55), unmatched

(75.3, -1.21, -1.21, 2.56), matched to  $\pi^+$

(56.5, -1.22, -1.22, 2.55), matched to  $\pi^+$

(47.5, -1.21, -1.21, 2.56), matched to  $\pi^+$

(39.3, -1.22, -1.22, 2.53), matched to  $\pi^-$

(14.1, -1.21, -1.21, 2.53), matched to  $\pi^-$

(6.0, -1.22, -1.22, 2.54), unmatched

**5 j1 charged hadrons**

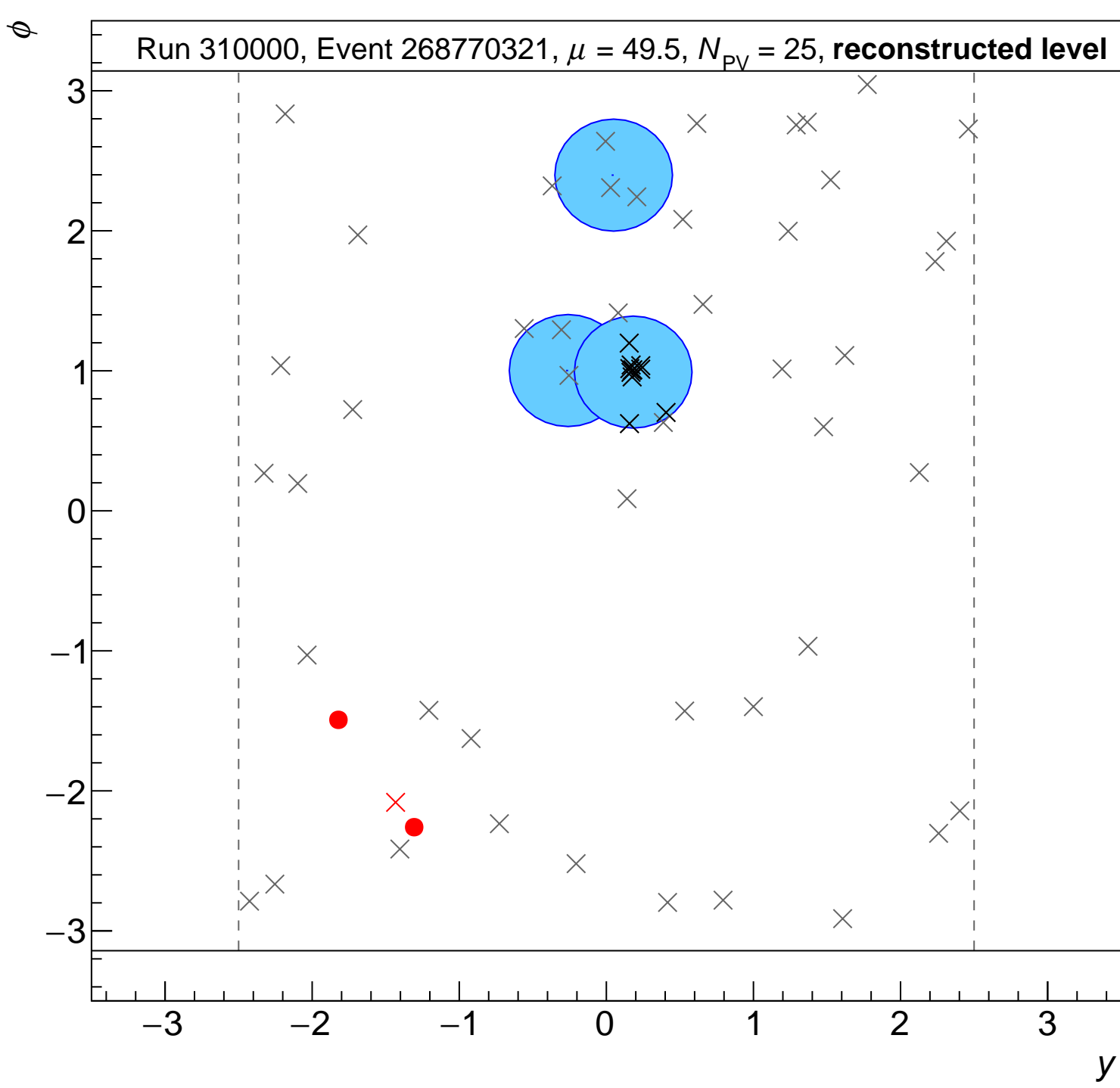
(73.0, -1.21, -1.21, 2.56),  $\pi^+$

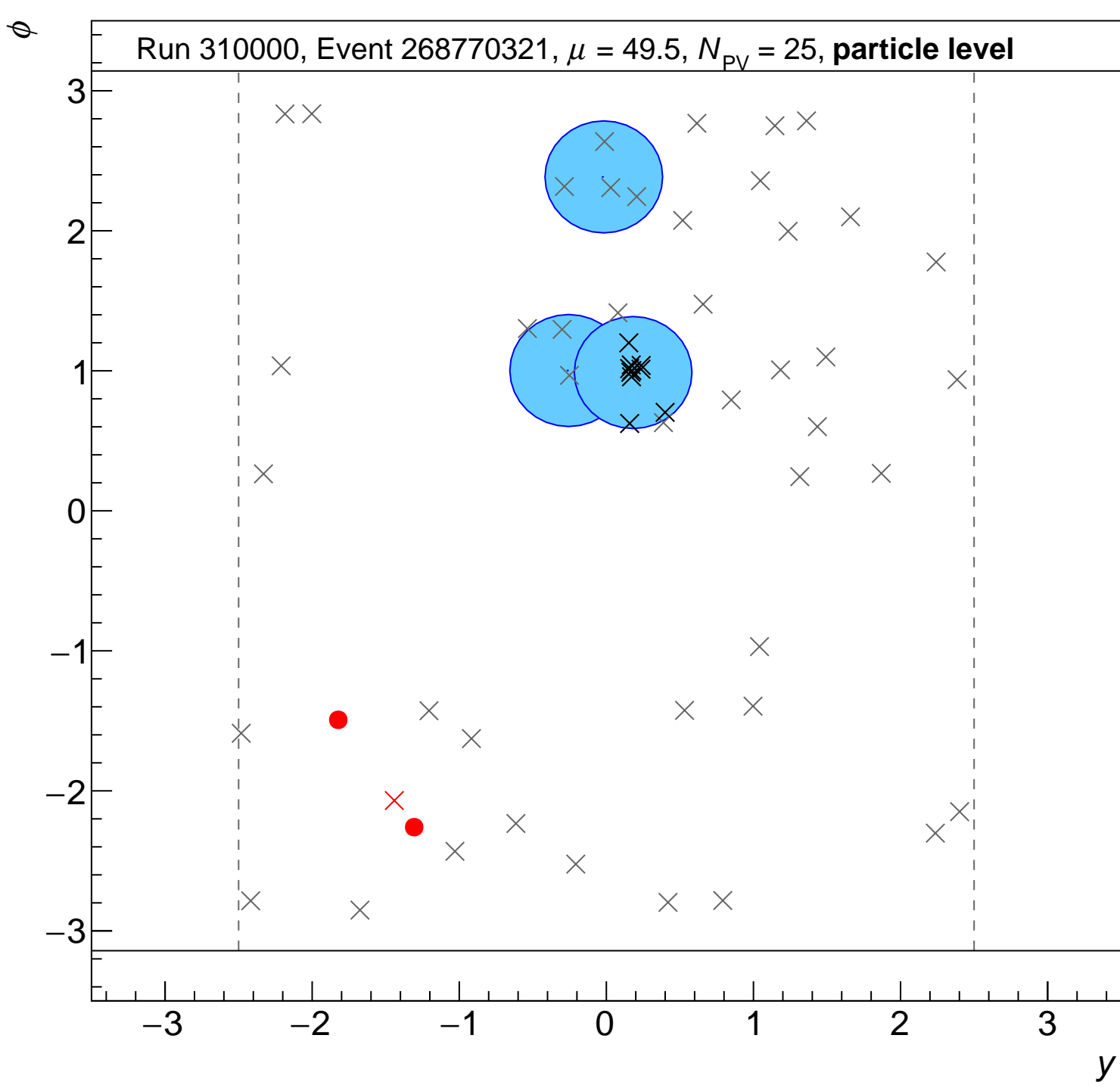
(55.6, -1.22, -1.22, 2.55),  $\pi^+$

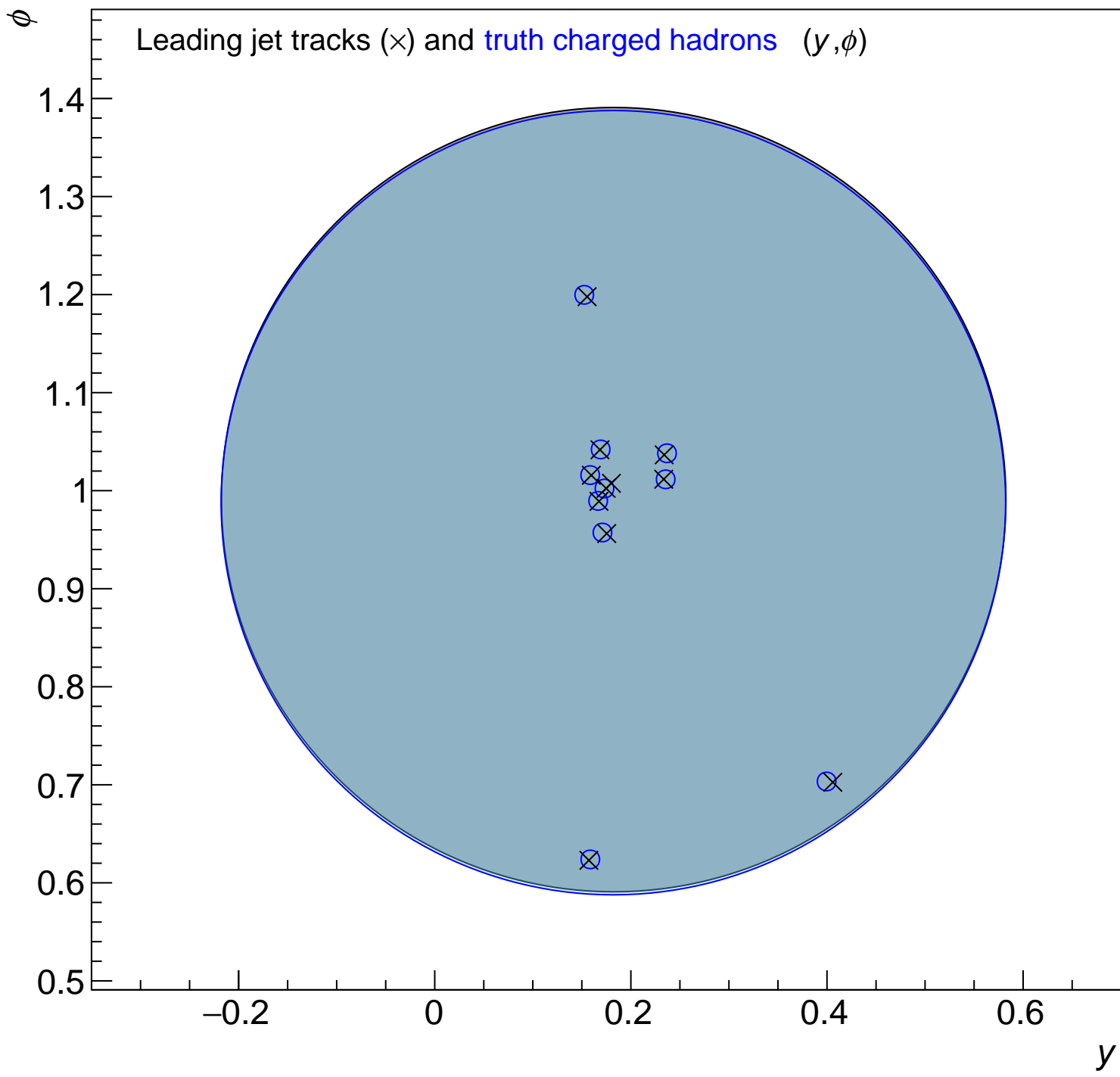
(54.0, -1.21, -1.21, 2.56),  $\pi^+$

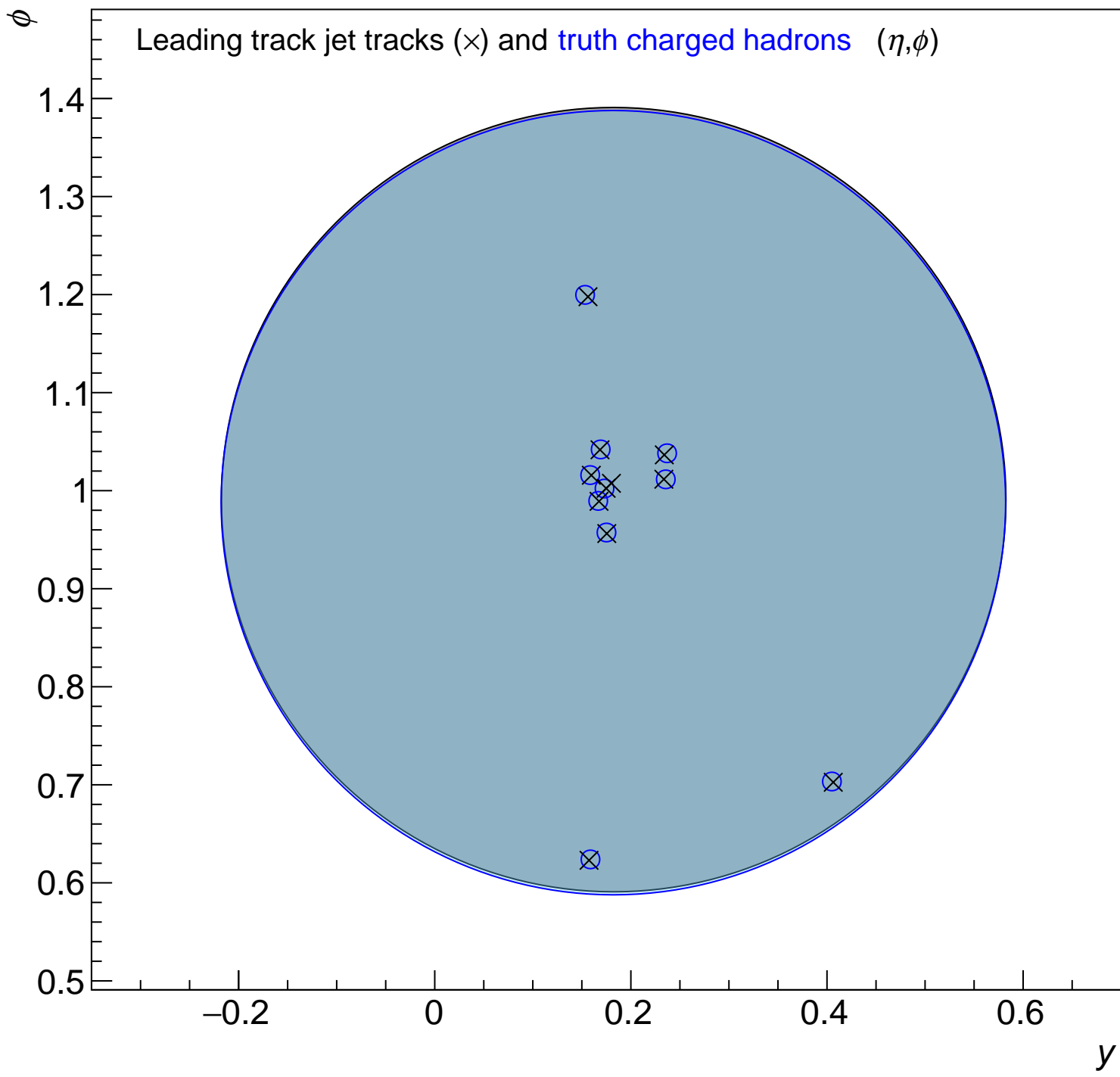
(36.8, -1.22, -1.22, 2.53),  $\pi^-$

(15.0, -1.21, -1.21, 2.53),  $\pi^-$









Run 310000, Event 268770321,

$\mu = 49.5$ ,  $N_{\text{PV}} = 25$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(90.3, 214, -1.44)

(91.0, 221.3, -1.43)

$\Delta\phi(\text{ll}, \text{j1}) = -3.07$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(168.1, -1.31, -2.26)

(58.3, -1.82, -1.49)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(177.3, -1.31, -2.26)

(56.3, -1.82, -1.49)

**3 truth jets**,  $p_{\text{T}} > 5$

(71.4, 0.18, 0.99)

(6.8, -0.02, 2.39)

(6.2, -0.26, 1.00)

**3 reco jets**,  $p_{\text{T}} > 5$

(87.1, 0.18, 0.99)

(6.2, -0.26, 1.00)

(5.6, 0.05, 2.40)

**54 charged truth hadrons**

(29.7, 0.16, 1.02),  $\pi^-$

(8.6, 0.17, 1.04),  $\pi^-$

(7.6, 0.17, 1.00),  $\pi^+$

(5.6, -0.25, 0.97),  $\bar{p}$

(5.4, 0.17, 0.99),  $\pi^+$

(4.7, 0.24, 1.04),  $\pi^-$

(4.3, 0.17, 0.96),  $p$

(4.2, 0.24, 1.01),  $\pi^-$

(3.3, -1.68, -2.85),  $K^+$

(3.1, 0.16, 0.62),  $\pi^+$

(3.0, 0.03, 2.31),  $\pi^-$

(2.9, 0.40, 0.70),  $K^+$

(2.9, -2.18, 2.83),  $\pi^-$

(2.6, 0.39, 0.63),  $\pi^-$

(2.3, 0.08, 1.41),  $\pi^+$

(2.1, 2.24, -2.30),  $K^-$

(2.0, 0.42, -2.80),  $\pi^-$

**58 tracks**, showing  $p_{\text{T}} > 2$  GeV

(29.4, 0.16, 1.02), matched to  $\pi^-$

(16.3, 0.18, 1.01), unmatched

(8.7, 0.17, 1.04), matched to  $\pi^-$

(7.5, 0.17, 1.00), matched to  $\pi^+$

(5.6, -0.25, 0.97), matched to  $\bar{p}$

(5.3, 0.17, 0.99), matched to  $\pi^+$

(4.6, 0.23, 1.04), matched to  $\pi^-$

(4.3, 0.18, 0.96), matched to  $p$

(4.2, 0.23, 1.01), matched to  $\pi^-$

(3.1, 0.16, 0.62), matched to  $\pi^+$

(3.0, 0.03, 2.31), matched to  $\pi^-$

(2.9, -2.18, 2.83), matched to  $\pi^-$

(2.9, 0.41, 0.70), matched to  $K^+$

(2.7, 0.39, 0.63), matched to  $\pi^-$

(2.3, 0.08, 1.41), matched to  $\pi^+$

(2.0, 2.26, -2.30), matched to  $K^-$

**11 j1 tracks**

(29.4, 0.16, 0.16, 1.02), matched to  $\pi^-$

(16.3, 0.18, 0.18, 1.01), unmatched

(8.7, 0.17, 0.17, 1.04), matched to  $\pi^-$

(7.5, 0.17, 0.17, 1.00), matched to  $\pi^+$

(5.3, 0.17, 0.17, 0.99), matched to  $\pi^+$

(4.6, 0.23, 0.23, 1.04), matched to  $\pi^-$

(4.3, 0.18, 0.18, 0.96), matched to  $p$

(4.2, 0.23, 0.23, 1.01), matched to  $\pi^-$

(3.1, 0.16, 0.16, 0.62), matched to  $\pi^+$

(2.9, 0.41, 0.41, 0.70), matched to  $K^+$

(1.3, 0.16, 0.16, 1.20), matched to  $\pi^-$

**10 j1 charged hadrons**

(29.7, 0.16, 0.16, 1.02),  $\pi^-$

(8.6, 0.17, 0.17, 1.04),  $\pi^-$

(7.6, 0.17, 0.17, 1.00),  $\pi^+$

(5.4, 0.17, 0.17, 0.99),  $\pi^+$

(4.7, 0.24, 0.24, 1.04),  $\pi^-$

(4.3, 0.17, 0.18, 0.96),  $p$

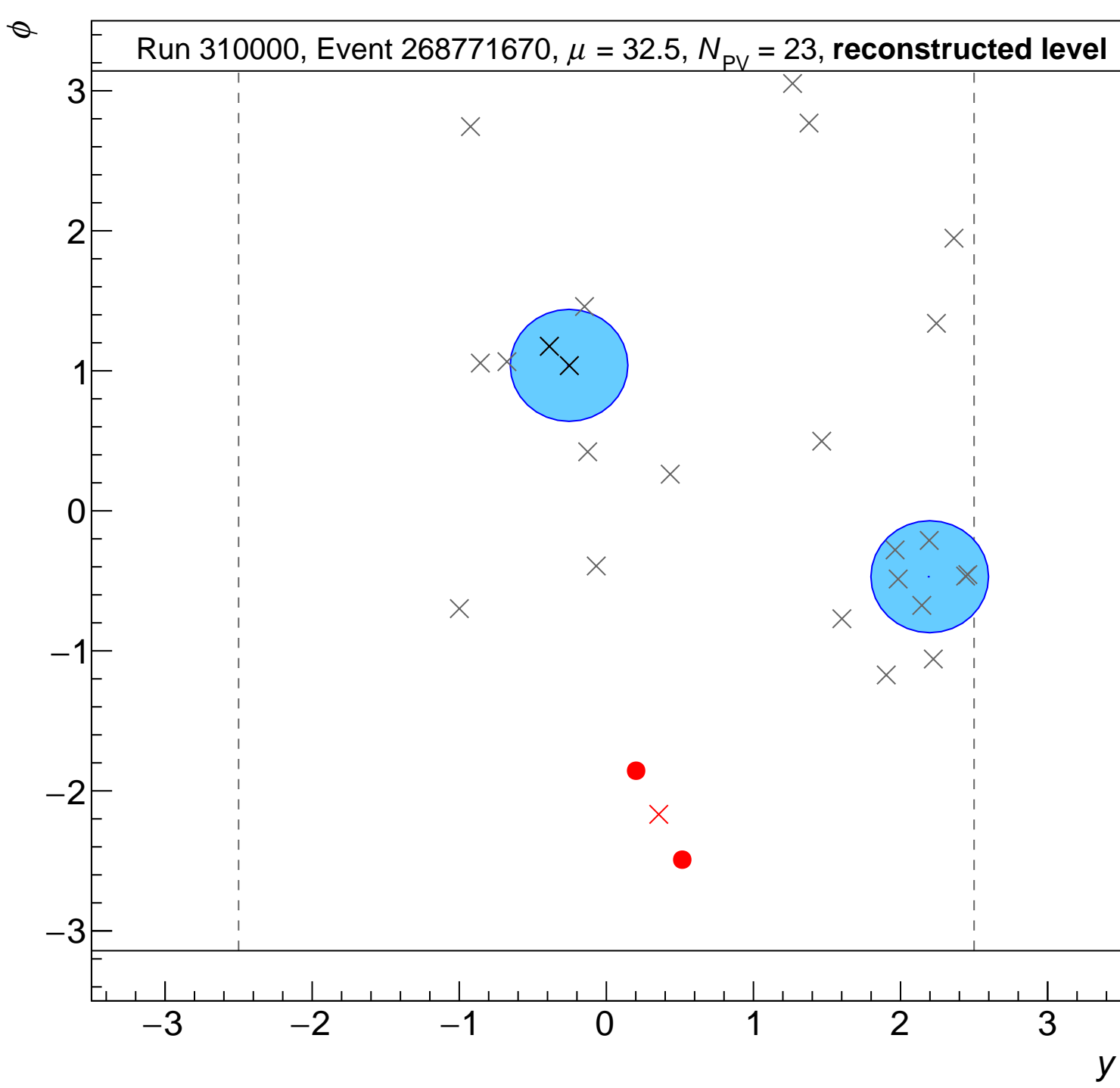
(4.2, 0.24, 0.24, 1.01),  $\pi^-$

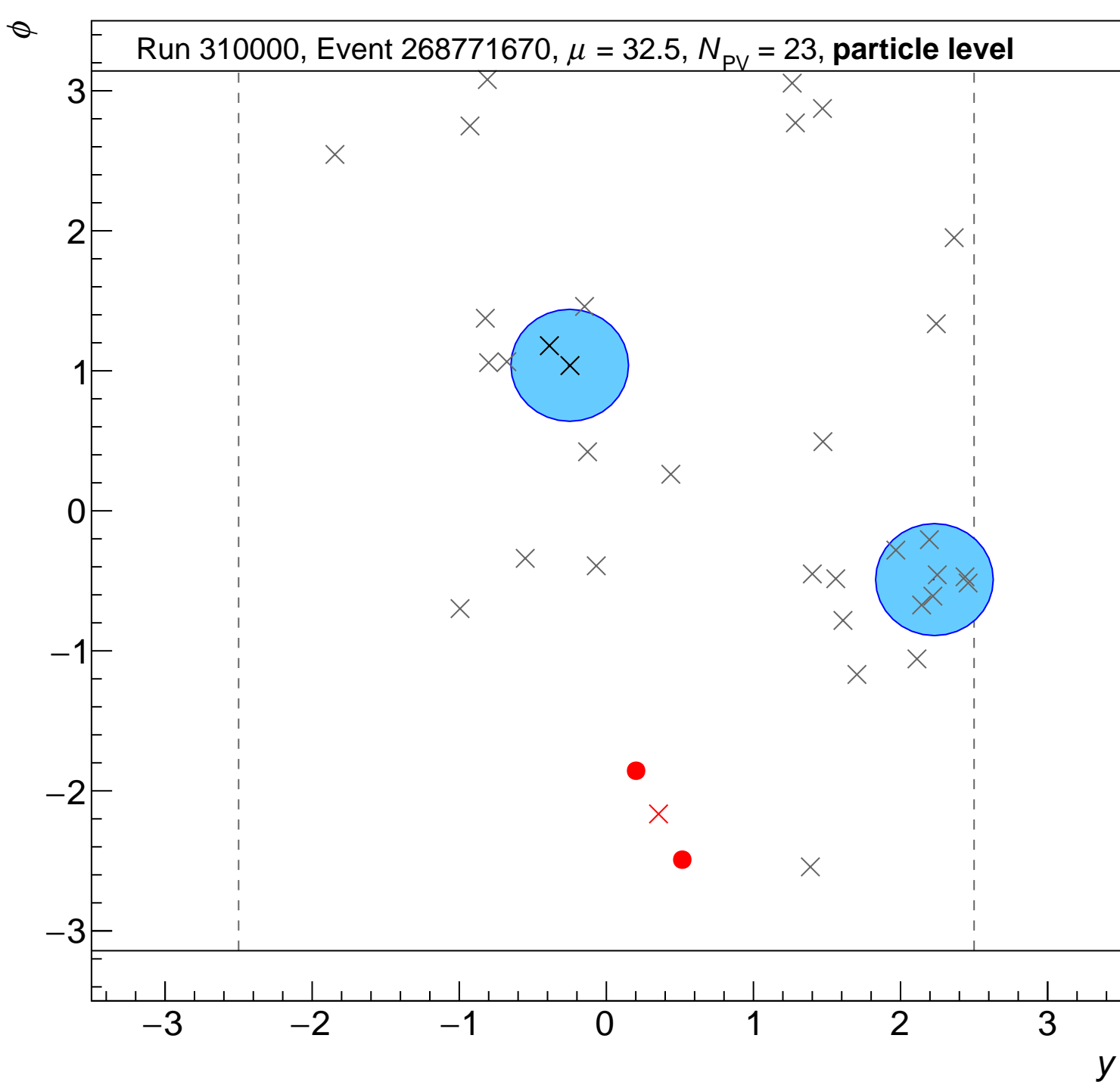
(3.1, 0.16, 0.16, 0.62),  $\pi^+$

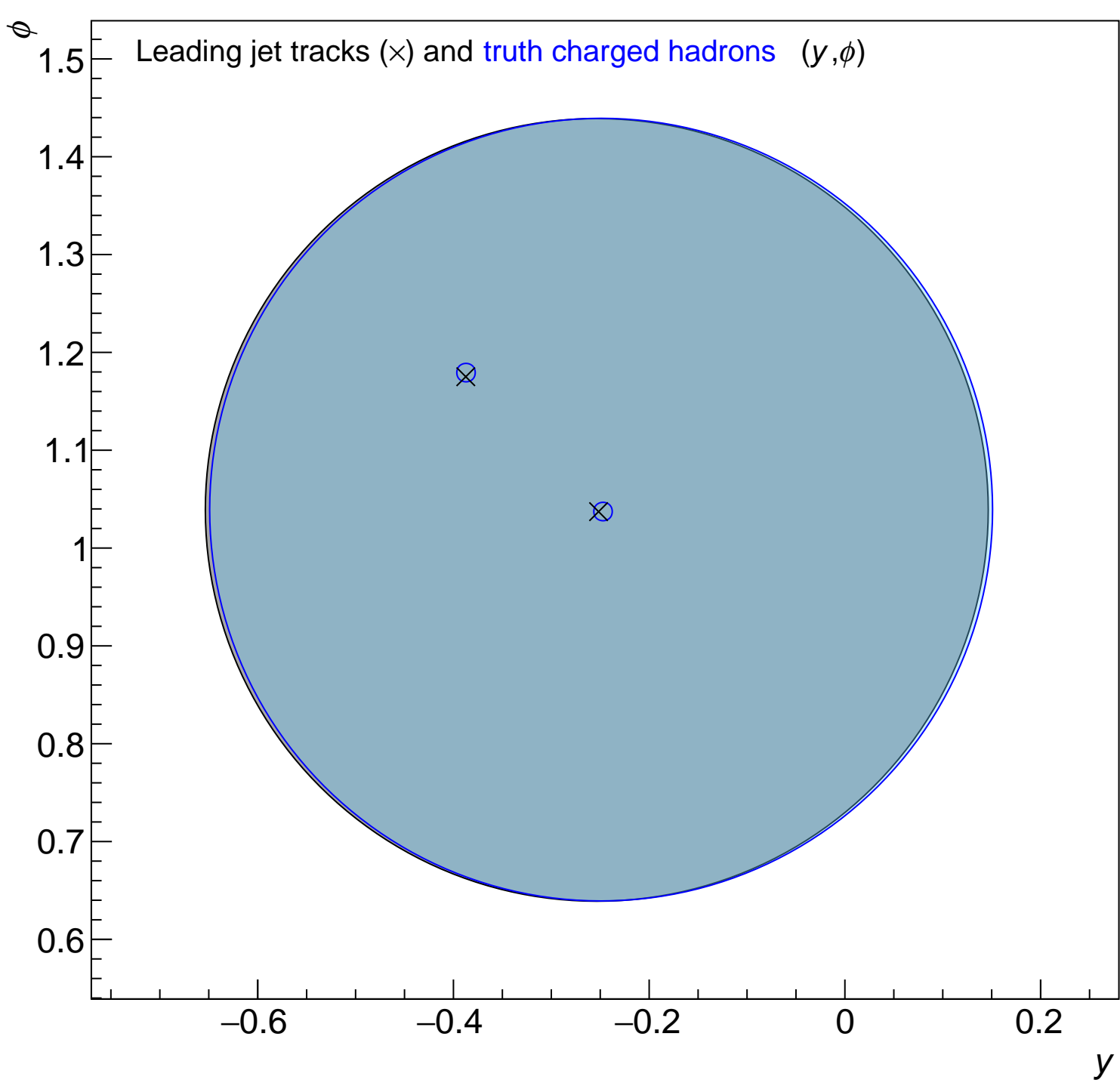
(2.9, 0.40, 0.40, 0.70),  $K^+$

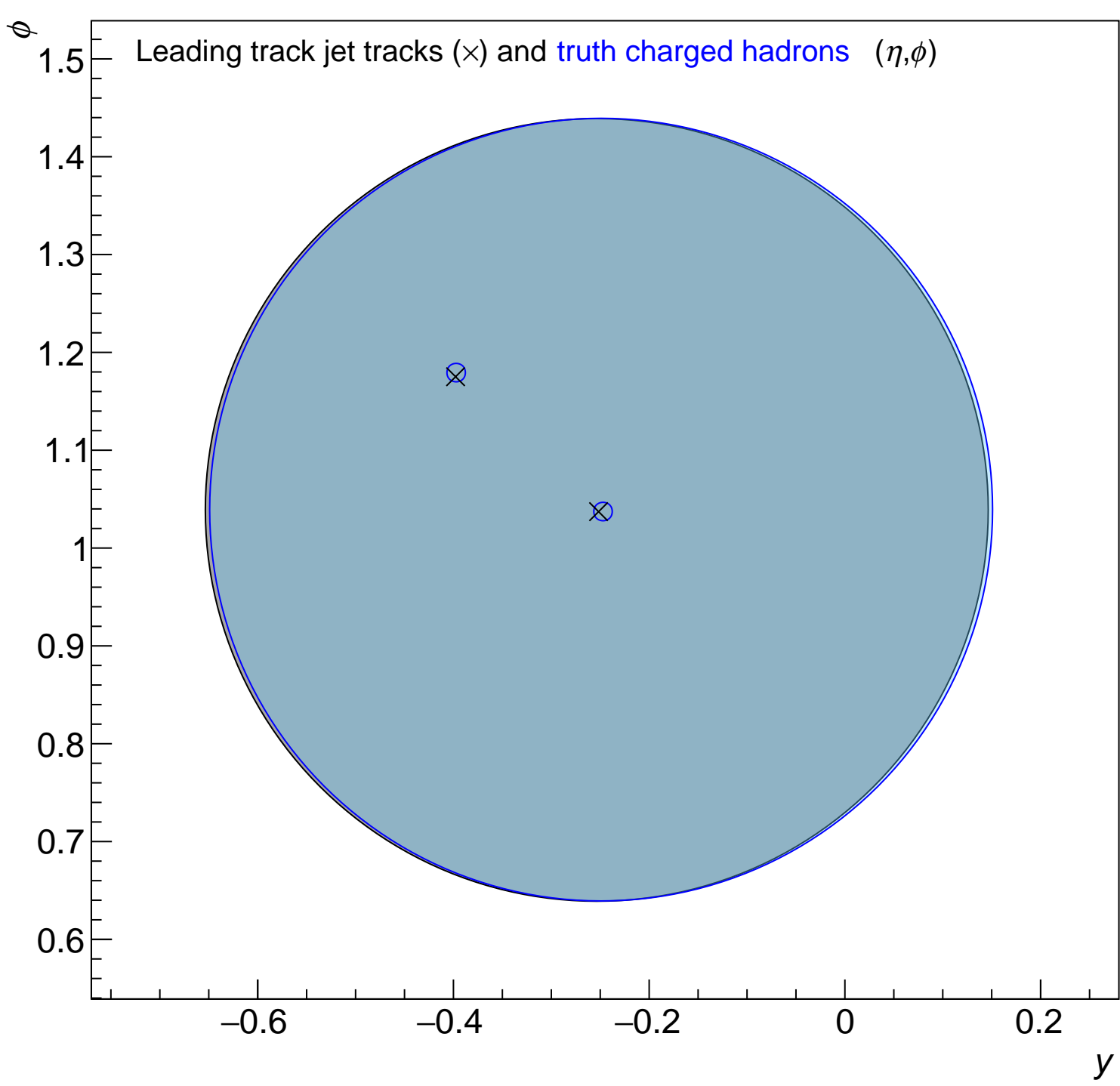
(1.3, 0.15, 0.15, 1.20),  $\pi^-$











Run 310000, Event 268771670,

$\mu = 32.5$ ,  $N_{\text{PV}} = 23$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(89.0, 242, 0.35)

(88.2, 239.6, 0.36)

$\Delta\phi(\text{ll}, \text{j1}) = 3.08$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(130.8, 0.20, -1.86)

(123.7, 0.52, -2.49)

**2 reco muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(128.4, 0.20, -1.86)

(123.8, 0.52, -2.49)

**2 truth jets**,  $p_{\text{T}} > 5$

(43.7, -0.25, 1.04)

(5.9, 2.23, -0.49)

**2 reco jets**,  $p_{\text{T}} > 5$

(44.5, -0.25, 1.04)

(5.0, 2.20, -0.47)

**33 charged truth hadrons**

(43.1, -0.25, 1.04),  $\pi^-$

(2.9, -1.85, 2.55),  $K^-$

**24 tracks**, showing  $p_{\text{T}} > 2 \text{ GeV}$

(44.0, -0.25, 1.04), unmatched

**2 j1 tracks**

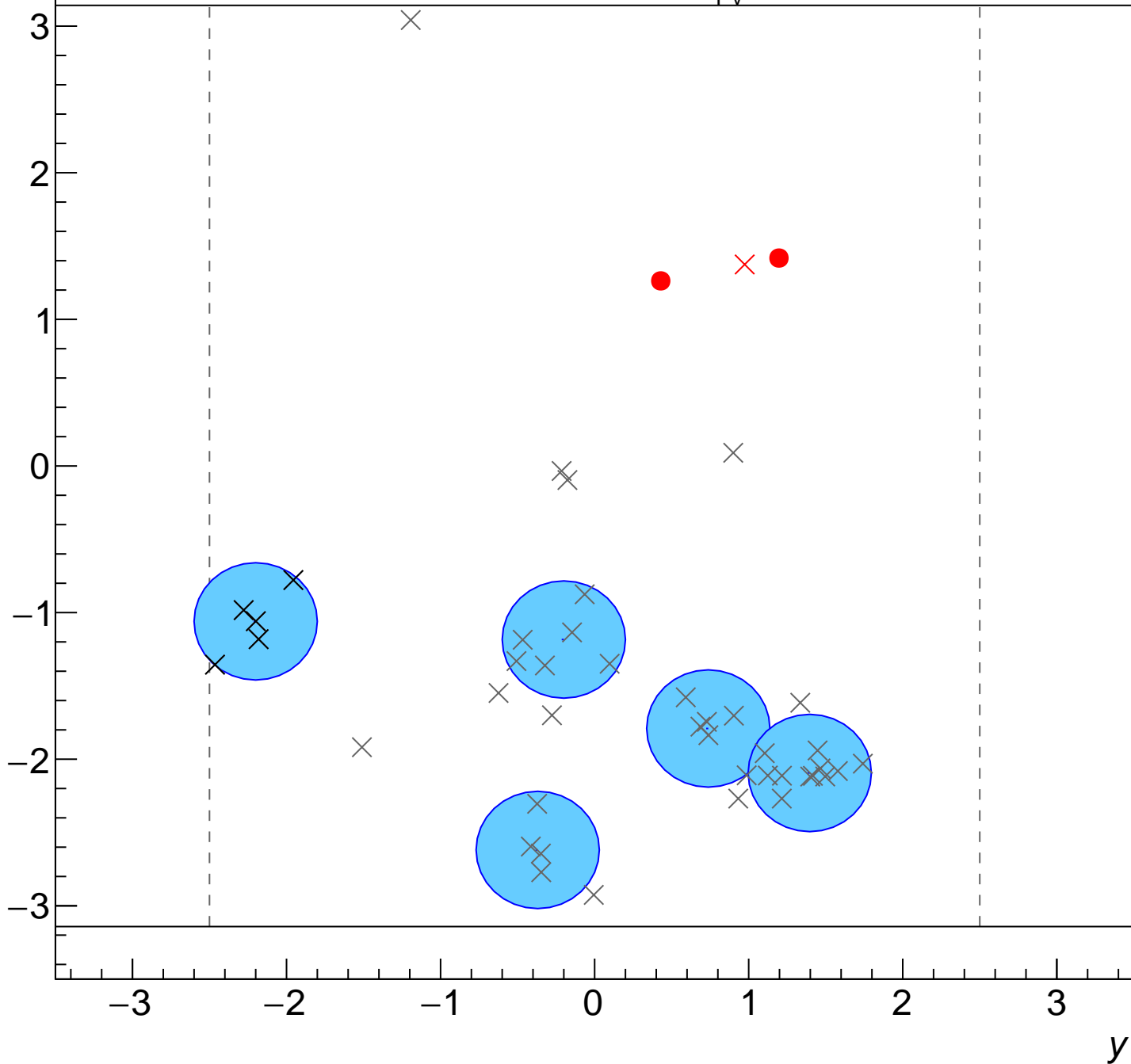
(44.0, -0.25, -0.25, 1.04), unmatched

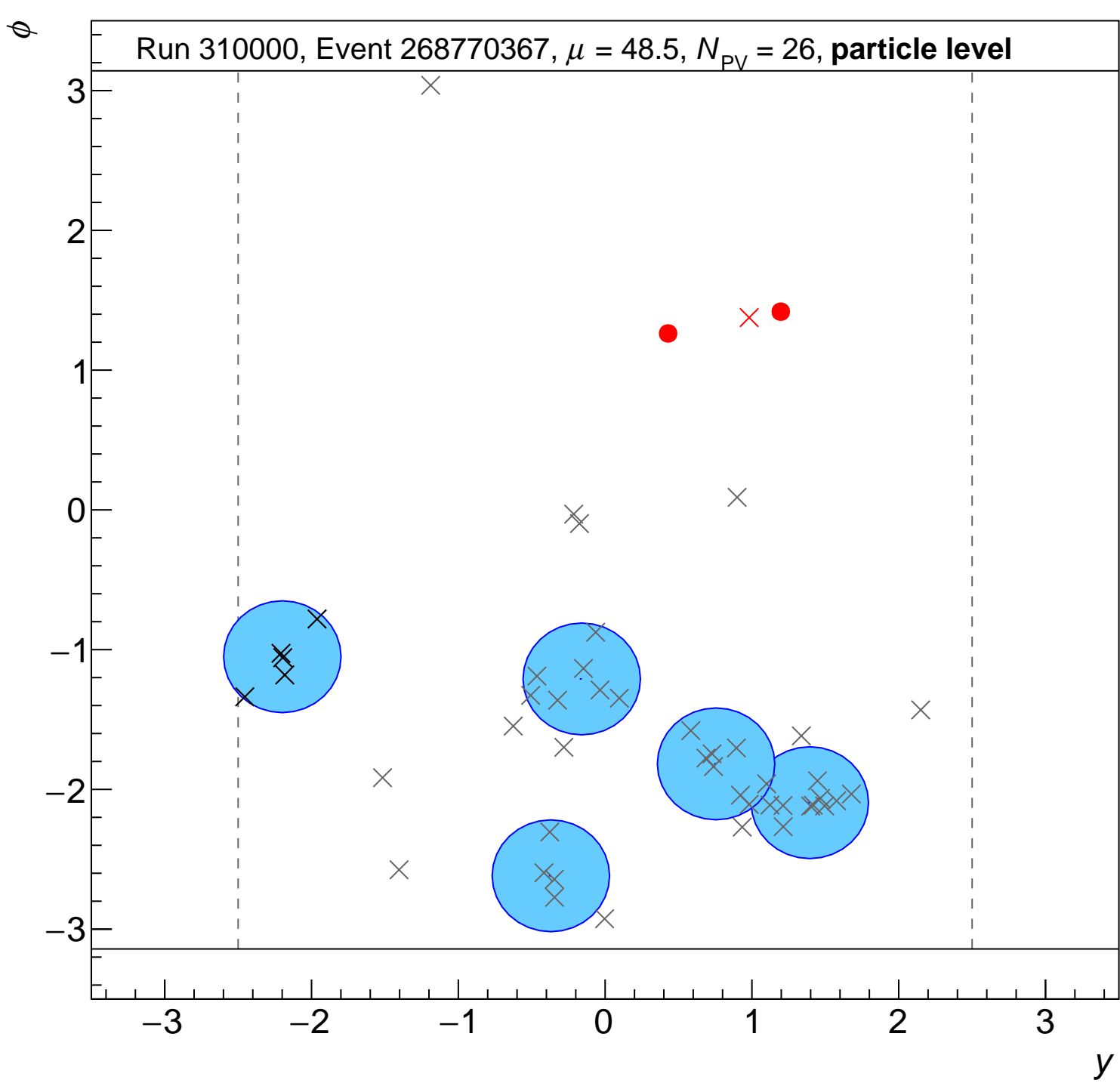
(0.6, -0.39, -0.40, 1.18), matched to  $\pi^-$

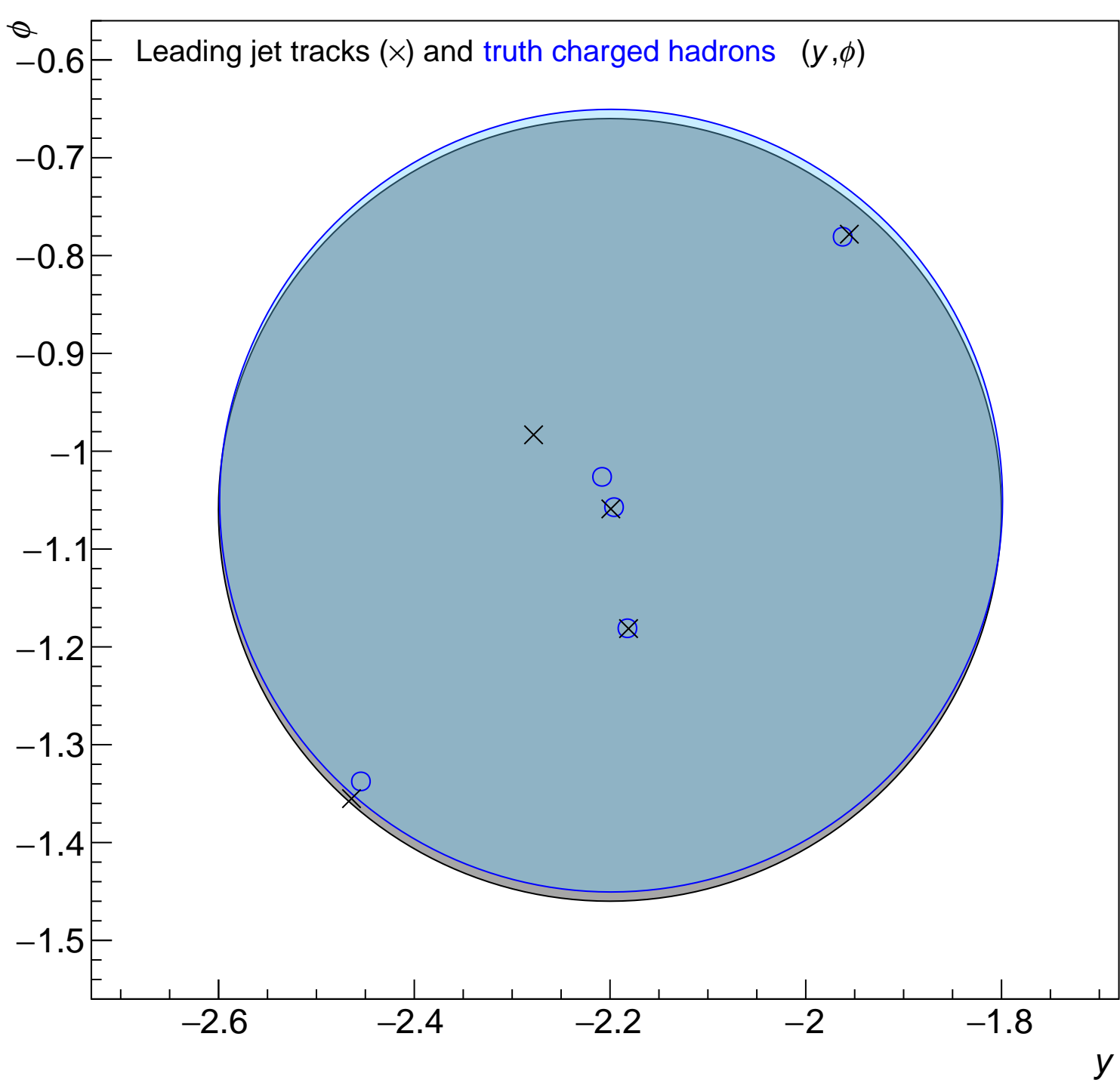
**2 j1 charged hadrons**

(43.1, -0.25, -0.25, 1.04),  $\pi^-$

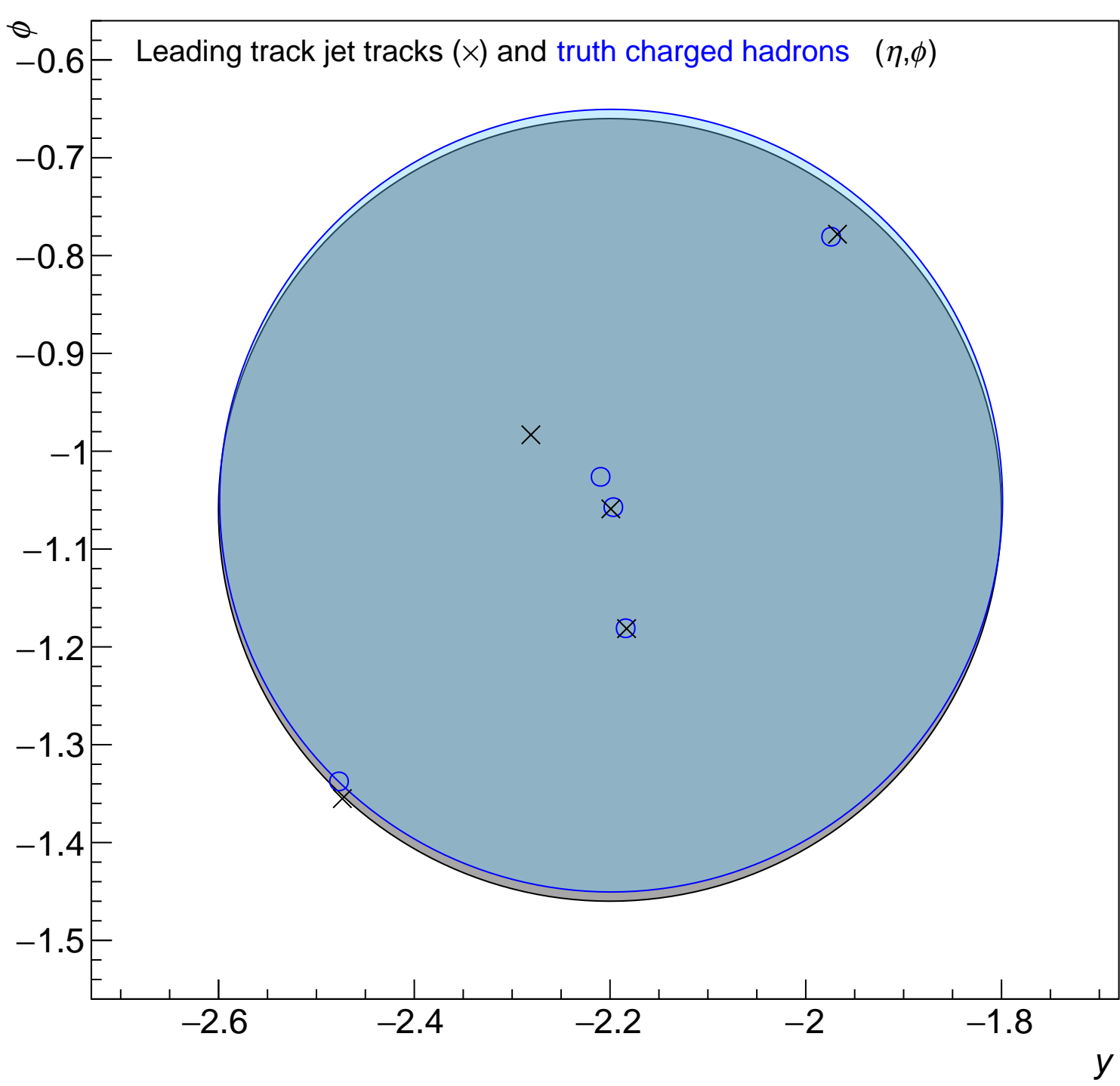
(0.6, -0.39, -0.40, 1.18),  $\pi^-$

$\phi$ Run 310000, Event 268770367,  $\mu = 48.5$ ,  $N_{\text{PV}} = 26$ , **reconstructed level**









Run 310000, Event 268770367,

$\mu = 48.5$ ,  $N_{\text{PV}} = 26$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(91.5, 256, 0.98)

(90.3, 249.8, 0.97)

$\Delta\phi(\text{ll}, \text{j1}) = 2.43$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.01$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(186.8, 1.20, 1.42)

(69.7, 0.43, 1.26)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(179.9, 1.20, 1.42)

(70.5, 0.43, 1.26)

**5 truth jets**,  $p_{\text{T}} > 5$

(45.3, -2.20, -1.05)

(36.4, 0.76, -1.82)

(35.5, 1.39, -2.09)

(8.1, -0.16, -1.21)

(7.6, -0.37, -2.62)

**5 reco jets**,  $p_{\text{T}} > 5$

(177.4, -2.20, -1.06)

(35.3, 1.40, -2.09)

(33.1, 0.74, -1.79)

(7.6, -0.37, -2.62)

(6.1, -0.20, -1.18)

**46 charged truth hadrons**

(24.7, -2.20, -1.06), p

(22.2, 0.74, -1.84),  $K^-$

(16.9, -2.21, -1.03),  $\bar{p}$

(6.6, 1.40, -2.12),  $\pi^-$

(6.5, 1.50, -2.12),  $K^+$

(4.4, 1.42, -2.11),  $\pi^-$

(3.7, 1.47, -2.06),  $\pi^+$

(3.4, 0.73, -1.75),  $\pi^+$

(3.2, 1.21, -2.12),  $\pi^+$

(3.0, -0.35, -2.64),  $K^+$

(2.9, 0.89, -1.70),  $K^+$

(2.9, 1.58, -2.08),  $\pi^+$

(2.6, -0.15, -1.13),  $\pi^-$

(2.5, 0.58, -1.58),  $K^+$

(2.4, 1.12, -2.11),  $\pi^+$

(2.4, 0.93, -2.27),  $\pi^-$

(2.3, -2.18, -1.18),  $\pi^-$

(2.2, -0.63, -1.55),  $\pi^-$

(2.2, -0.42, -2.60),  $\pi^-$

(2.1, 0.69, -1.78),  $\pi^-$

(2.1, -0.03, -1.29),  $\pi^-$

**42 tracks**, showing  $p_{\text{T}} > 2$  GeV

(171.6, -2.20, -1.06), matched to p

(21.8, 0.74, -1.84), matched to  $K^-$

(6.8, 1.40, -2.12), matched to  $\pi^-$

(6.3, 1.50, -2.12), matched to  $K^+$

(4.3, 1.42, -2.11), matched to  $\pi^-$

(3.8, 0.73, -1.75), matched to  $\pi^+$

(3.5, 1.47, -2.06), matched to  $\pi^+$

(3.1, 1.22, -2.11), matched to  $\pi^+$

(3.0, -0.35, -2.64), matched to  $K^+$

(3.0, 0.90, -1.70), matched to  $K^+$

(3.0, 1.58, -2.08), matched to  $\pi^+$

(2.6, -0.15, -1.14), matched to  $\pi^-$

(2.5, 0.59, -1.58), matched to  $K^+$

(2.4, 0.93, -2.27), matched to  $\pi^-$

(2.4, 1.12, -2.11), matched to  $\pi^+$

(2.2, -0.62, -1.55), matched to  $\pi^-$

(2.2, -2.18, -1.18), matched to  $\pi^-$

(2.1, -0.41, -2.60), matched to  $\pi^-$

(2.1, 0.69, -1.78), matched to  $\pi^-$

(2.0, 1.10, -1.96), matched to  $\pi^-$

**5 j1 tracks**

(171.6, -2.20, -2.20, -1.06), matched to p

(2.2, -2.18, -2.18, -1.18), matched to  $\pi^-$

(1.9, -2.28, -2.28, -0.98), unmatched

(1.0, -2.46, -2.47, -1.36), matched to  $\pi^+$

(0.9, -1.96, -1.97, -0.78), matched to  $\pi^+$

**5 j1 charged hadrons**

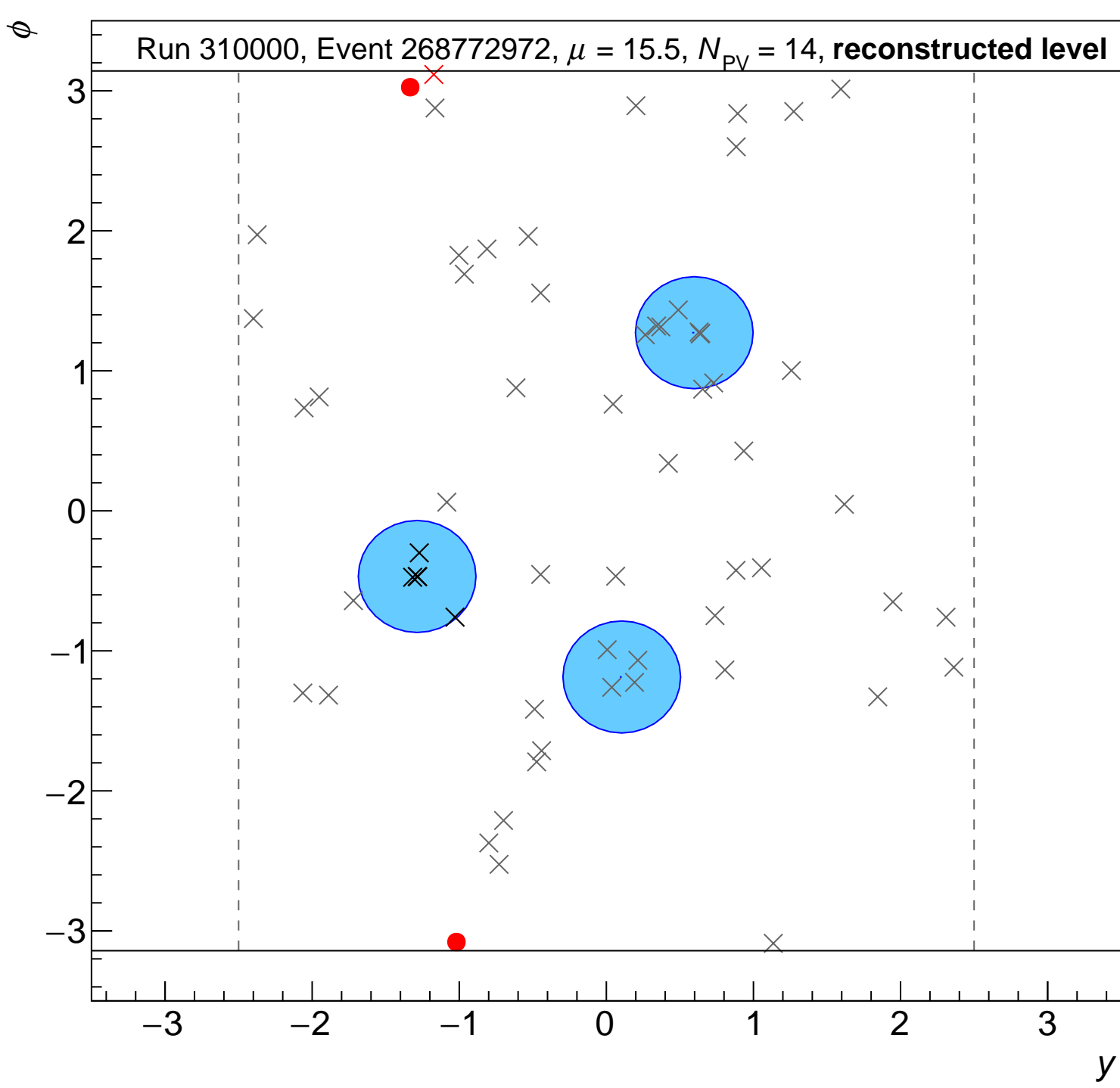
(24.7, -2.20, -2.20, -1.06), p

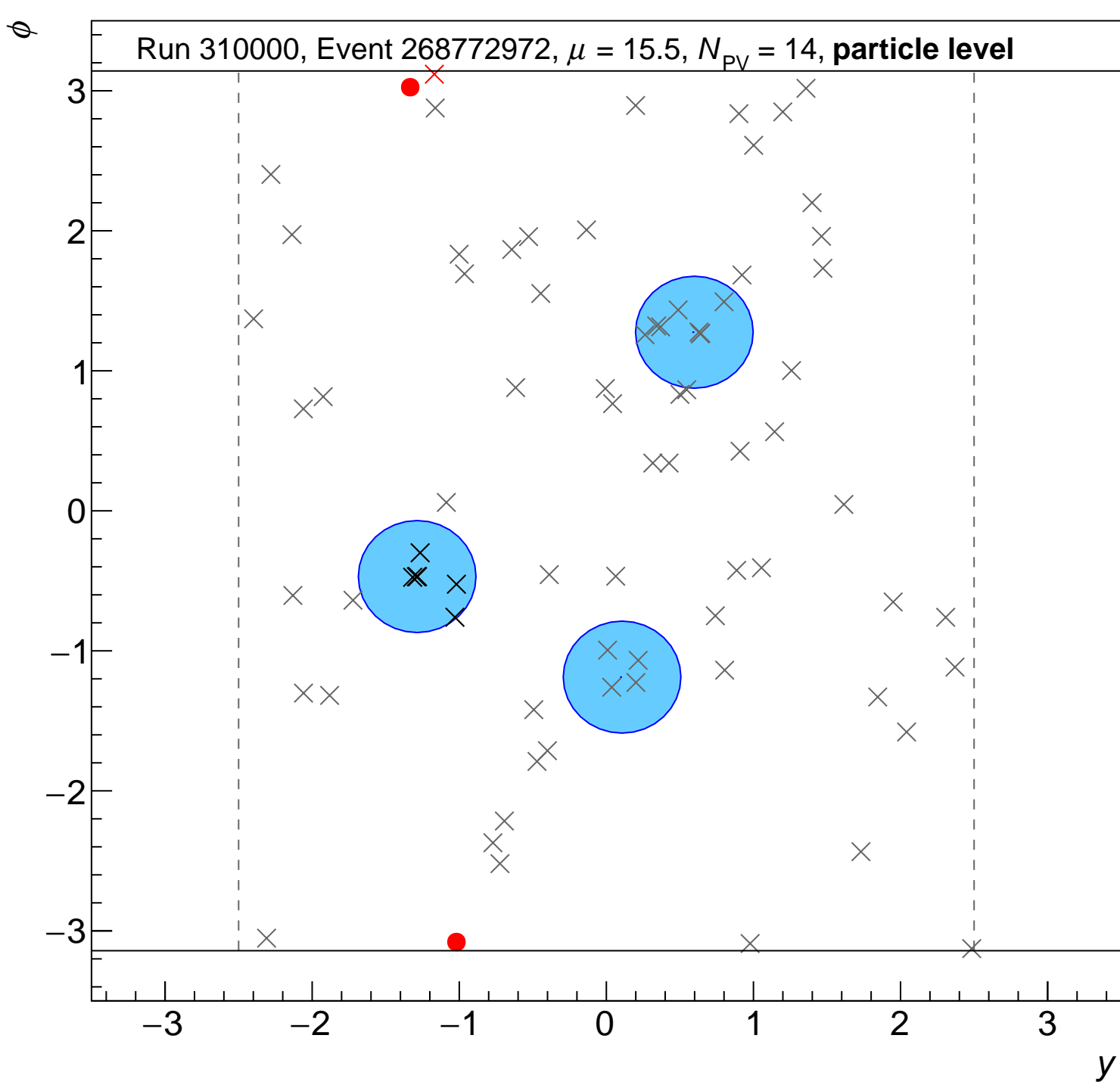
(16.9, -2.21, -2.21, -1.03),  $\bar{p}$

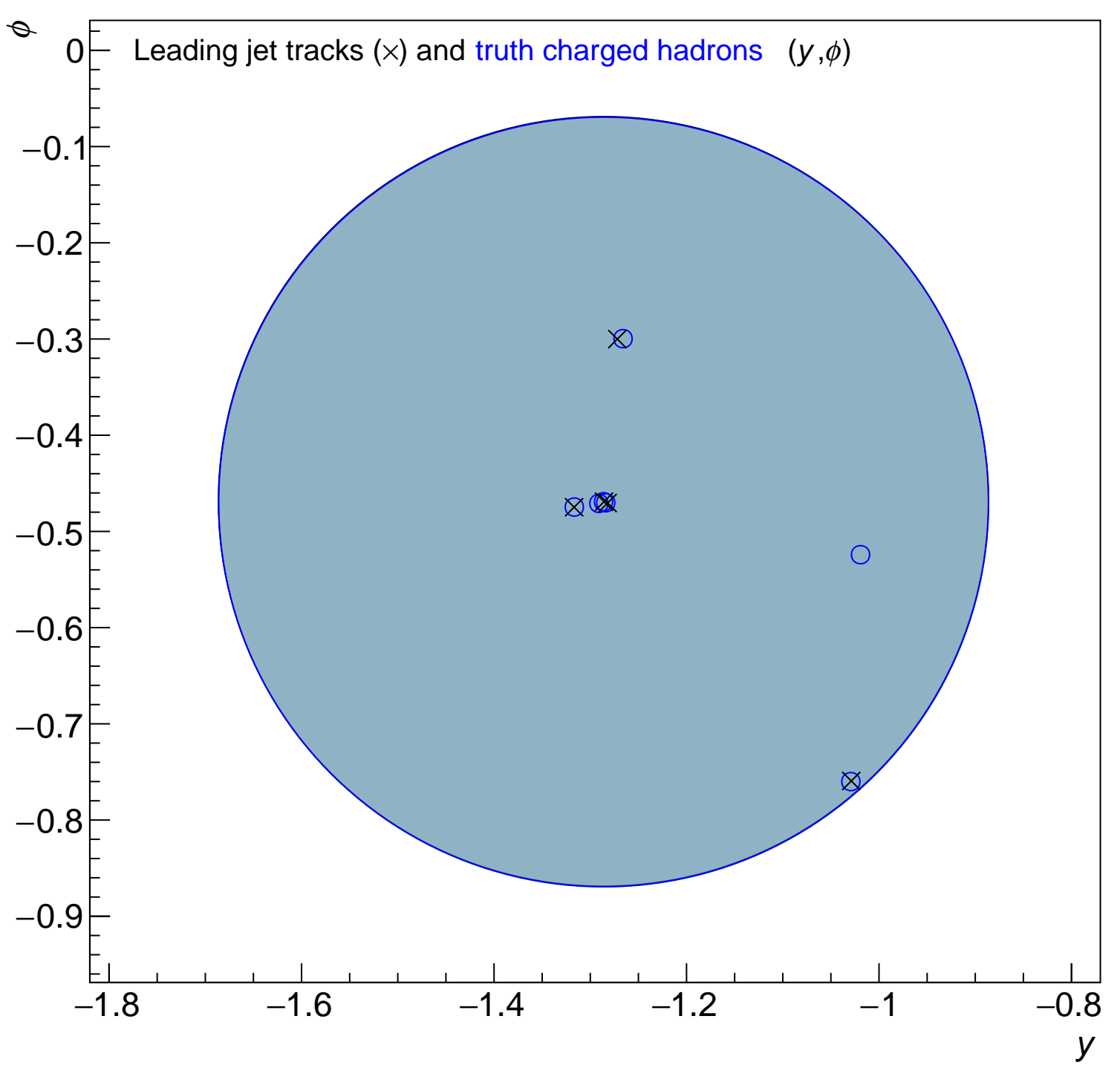
(2.3, -2.18, -2.18, -1.18),  $\pi^-$

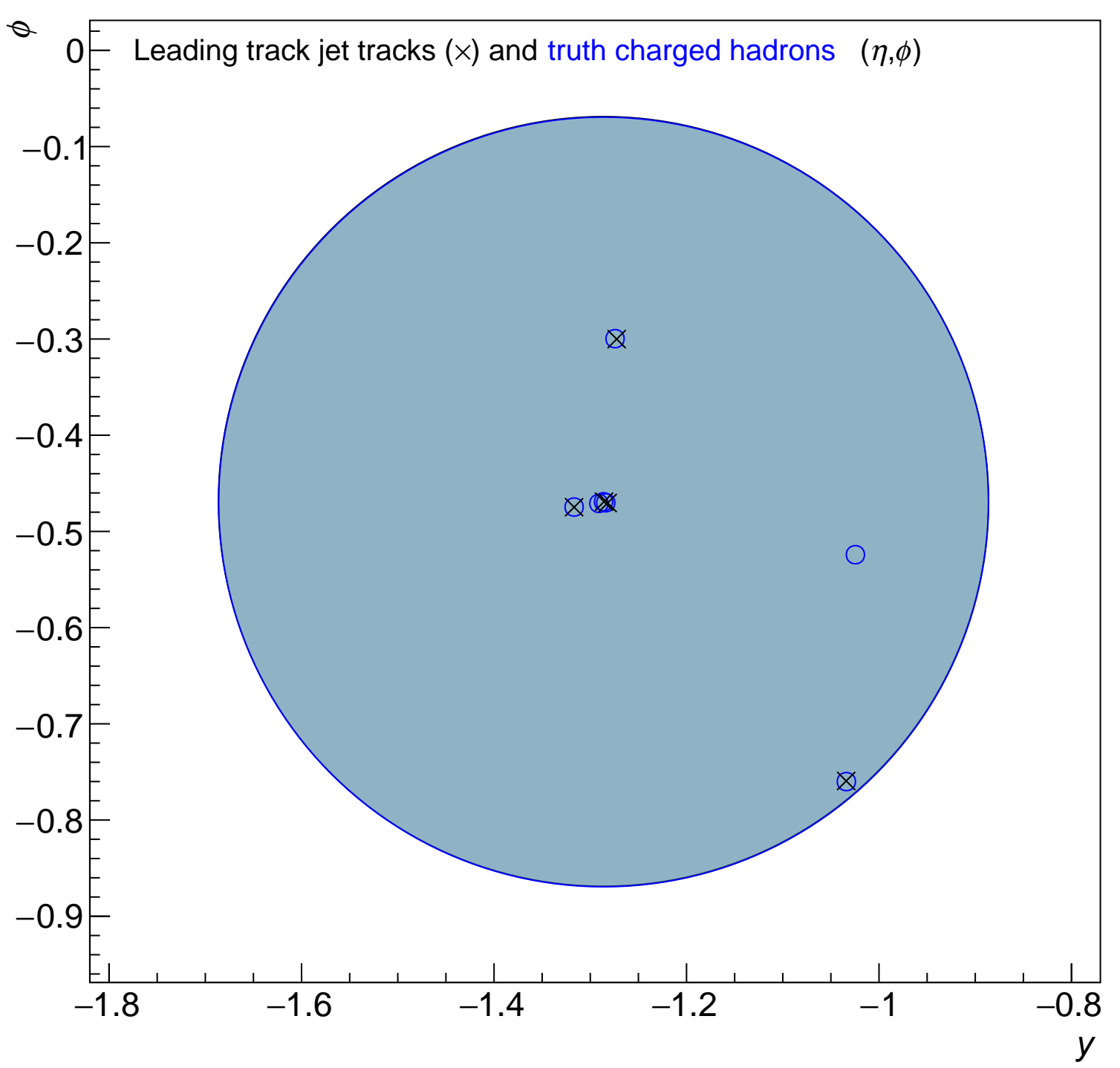
(0.9, -1.96, -1.97, -0.78),  $\pi^+$

(0.6, -2.45, -2.48, -1.34),  $\pi^+$









Run 310000, Event 268772972,

$\mu = 15.5$ ,  $N_{\text{PV}} = 14$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(93.3, 514, -1.17)

(93.3, 513.3, -1.17)

$\Delta\phi(\text{ll}, \text{j1}) = -2.70$ ,  $\Delta R_{\text{j1}}^{\text{tru-reco}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(269.7, -1.02, -3.08)

(246.3, -1.33, 3.03)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(263.0, -1.02, -3.08)

(252.3, -1.33, 3.03)

**3 truth jets**,  $p_{\text{T}} > 5$

(272.4, -1.29, -0.47)

(166.4, 0.60, 1.28)

(7.2, 0.11, -1.19)

**3 reco jets**,  $p_{\text{T}} > 5$

(249.6, -1.29, -0.47)

(165.3, 0.60, 1.27)

(7.2, 0.10, -1.19)

**77 charged truth hadrons**

(166.0, -1.29, -0.47),  $\pi^-$

(72.3, 0.64, 1.27),  $\pi^-$

(53.5, -1.28, -0.47),  $\pi^+$

(42.5, 0.64, 1.26),  $\pi^+$

(27.5, 0.63, 1.28),  $K^-$

(23.8, -1.29, -0.47),  $\pi^-$

(23.3, -1.32, -0.47),  $K^+$

(12.2, 0.37, 1.31),  $K^-$

(5.5, 0.34, 1.32),  $\pi^+$

(4.0, 0.26, 1.26),  $K^+$

(3.5, -1.27, -0.30),  $K^+$

(3.5, 0.04, -1.26),  $\pi^-$

(2.7, 2.37, -1.12),  $\pi^+$

(2.3, -2.40, 1.37),  $\pi^+$

(2.0, 0.80, -1.14),  $\pi^+$

(2.0, 1.20, 2.85),  $\bar{p}$

**60 tracks**, showing  $p_{\text{T}} > 2$  GeV

(168.1, -1.29, -0.47), matched to  $\pi^-$

(69.6, 0.64, 1.27), matched to  $\pi^-$

(53.5, -1.28, -0.47), matched to  $\pi^+$

(44.3, 0.64, 1.26), matched to  $\pi^+$

(26.4, 0.63, 1.28), matched to  $K^-$

(23.4, -1.32, -0.47), matched to  $K^+$

(12.5, 0.37, 1.31), matched to  $K^-$

(5.7, 0.34, 1.32), matched to  $\pi^+$

(4.0, 0.26, 1.26), matched to  $K^+$

(3.6, -1.27, -0.30), matched to  $K^+$

(3.5, 0.04, -1.26), matched to  $\pi^-$

(2.5, 2.36, -1.12), matched to  $\pi^+$

(2.4, -2.40, 1.37), matched to  $\pi^+$

(2.1, 1.27, 2.85), matched to  $\bar{p}$

(2.1, 0.81, -1.14), matched to  $\pi^+$

**5 j1 tracks**

(168.1, -1.29, -1.29, -0.47), matched to  $\pi^-$

(53.5, -1.28, -1.28, -0.47), matched to  $\pi^+$

(23.4, -1.32, -1.32, -0.47), matched to  $K^+$

(3.6, -1.27, -1.27, -0.30), matched to  $K^+$

(1.2, -1.03, -1.03, -0.76), matched to  $\pi^+$

**7 j1 charged hadrons**

(166.0, -1.29, -1.29, -0.47),  $\pi^-$

(53.5, -1.28, -1.28, -0.47),  $\pi^+$

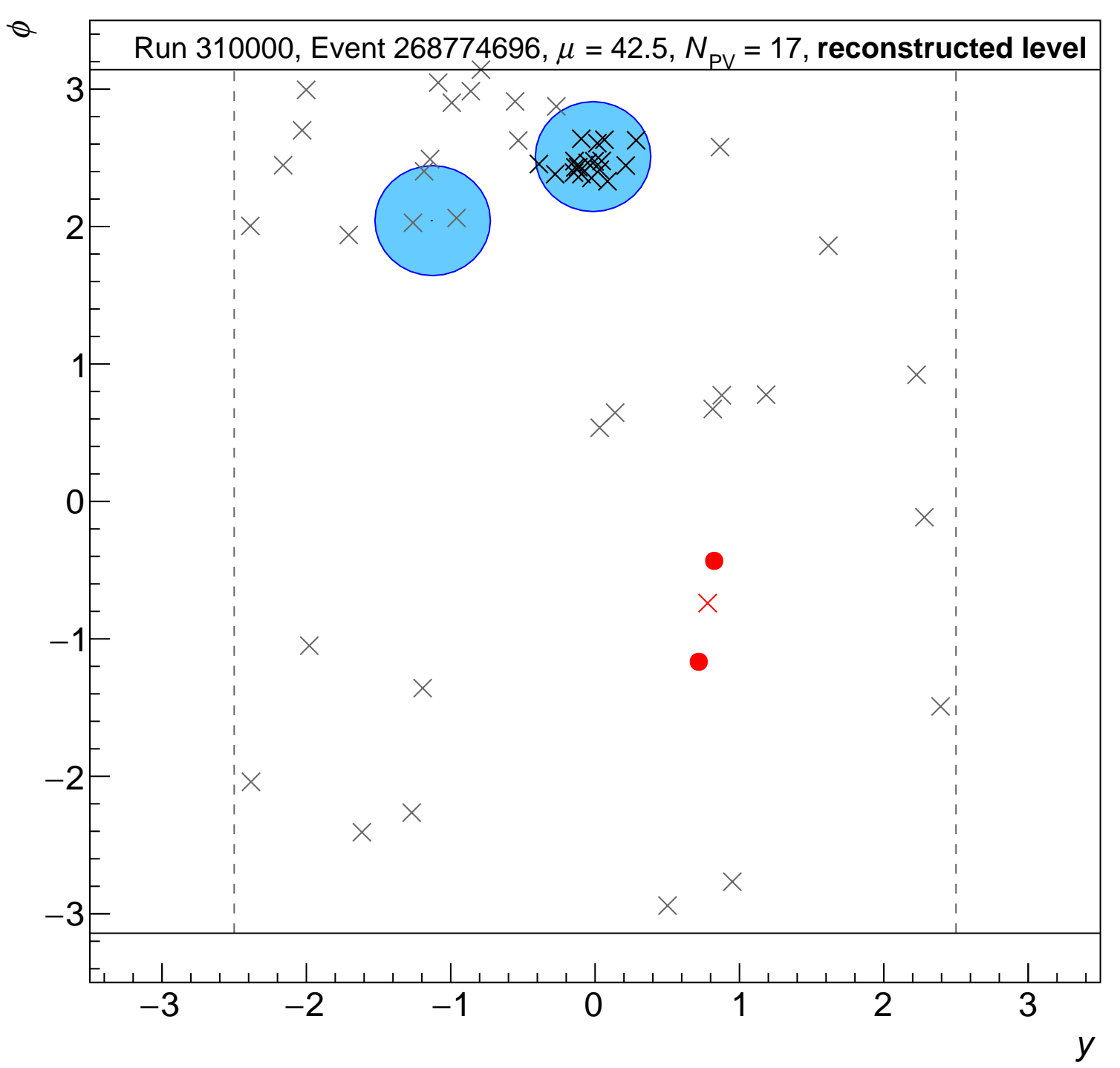
(23.8, -1.29, -1.29, -0.47),  $\pi^-$

(23.3, -1.32, -1.32, -0.47),  $K^+$

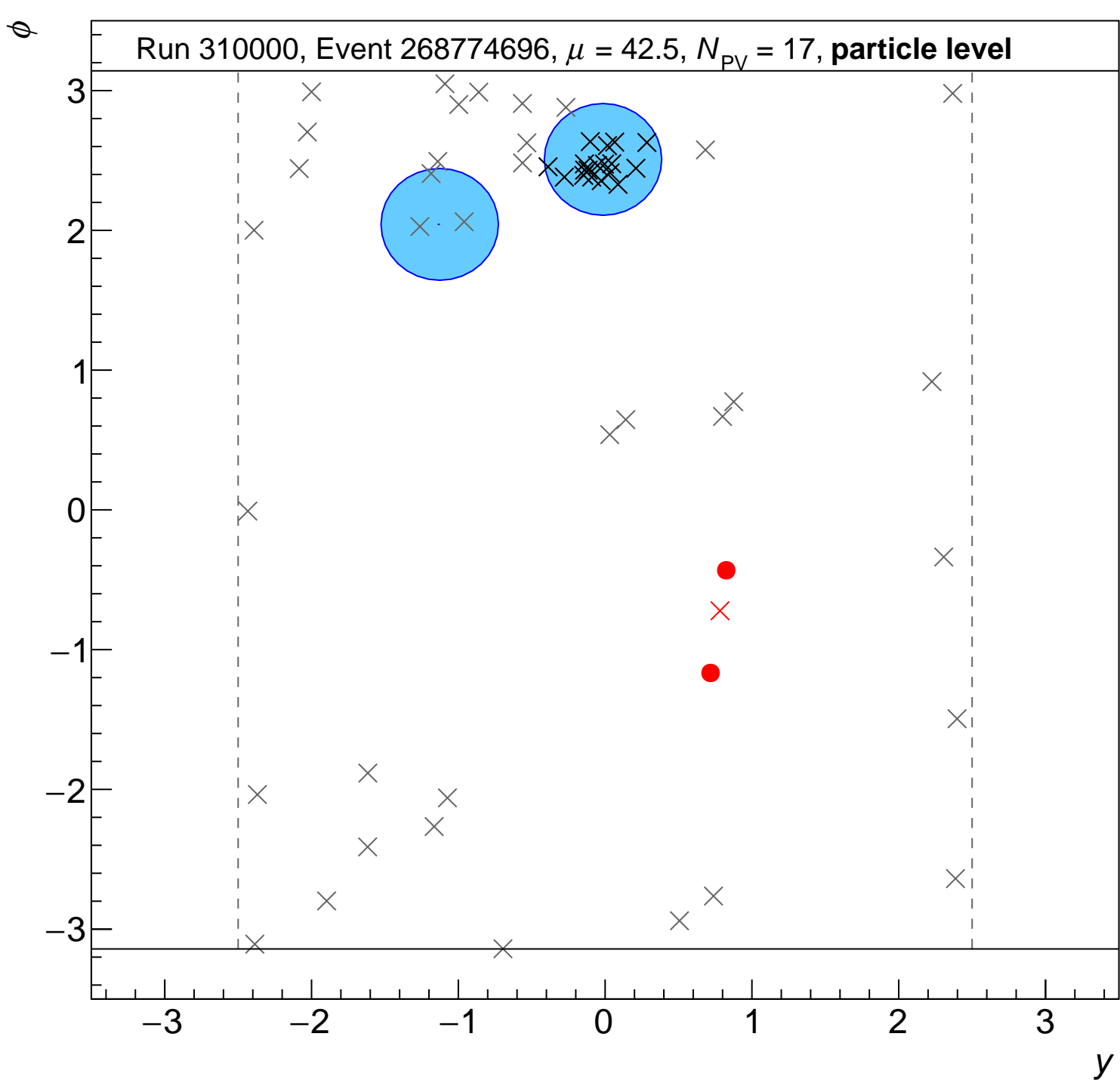
(3.5, -1.27, -1.27, -0.30),  $K^+$

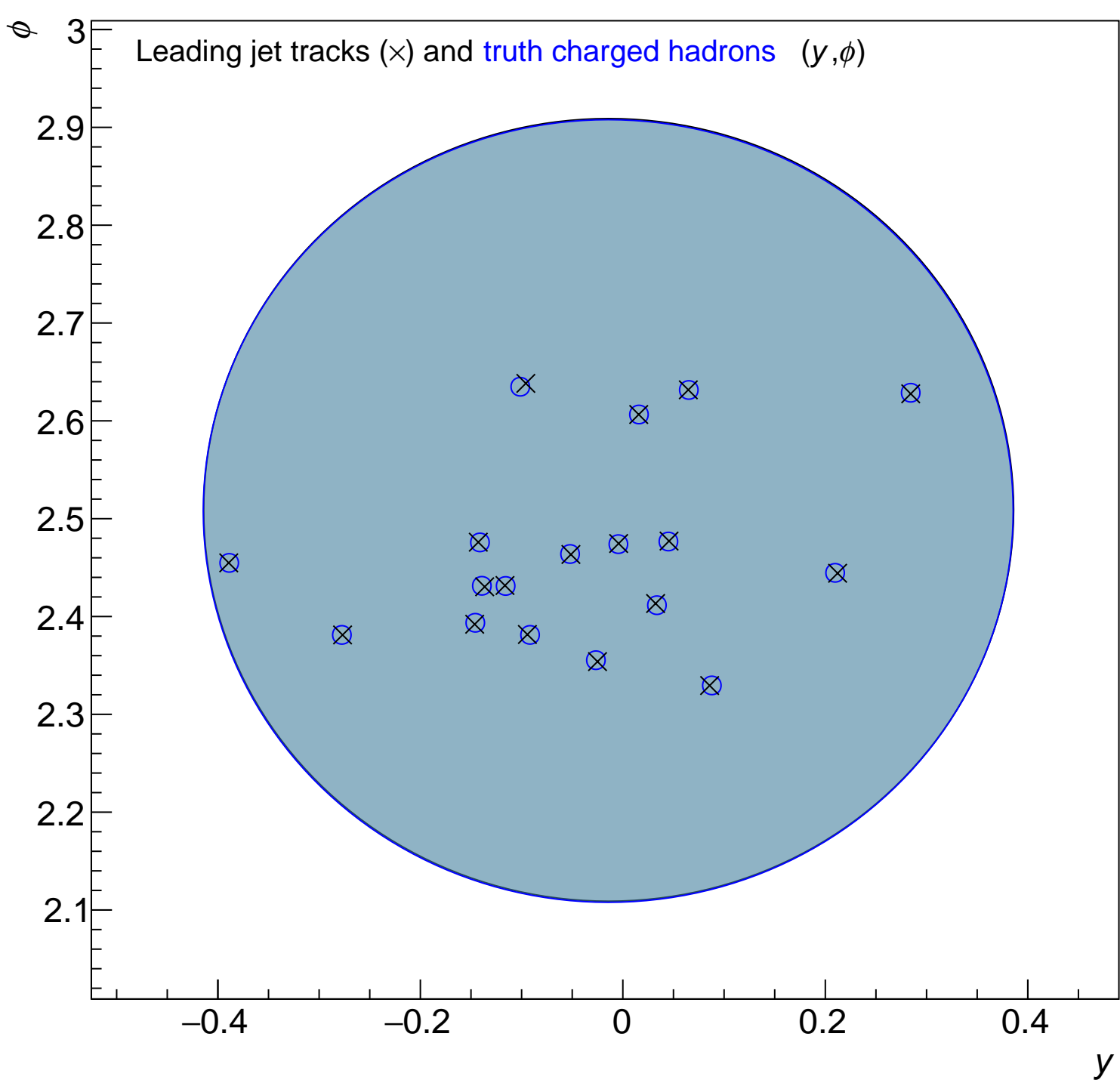
(1.3, -1.03, -1.03, -0.76),  $\pi^+$

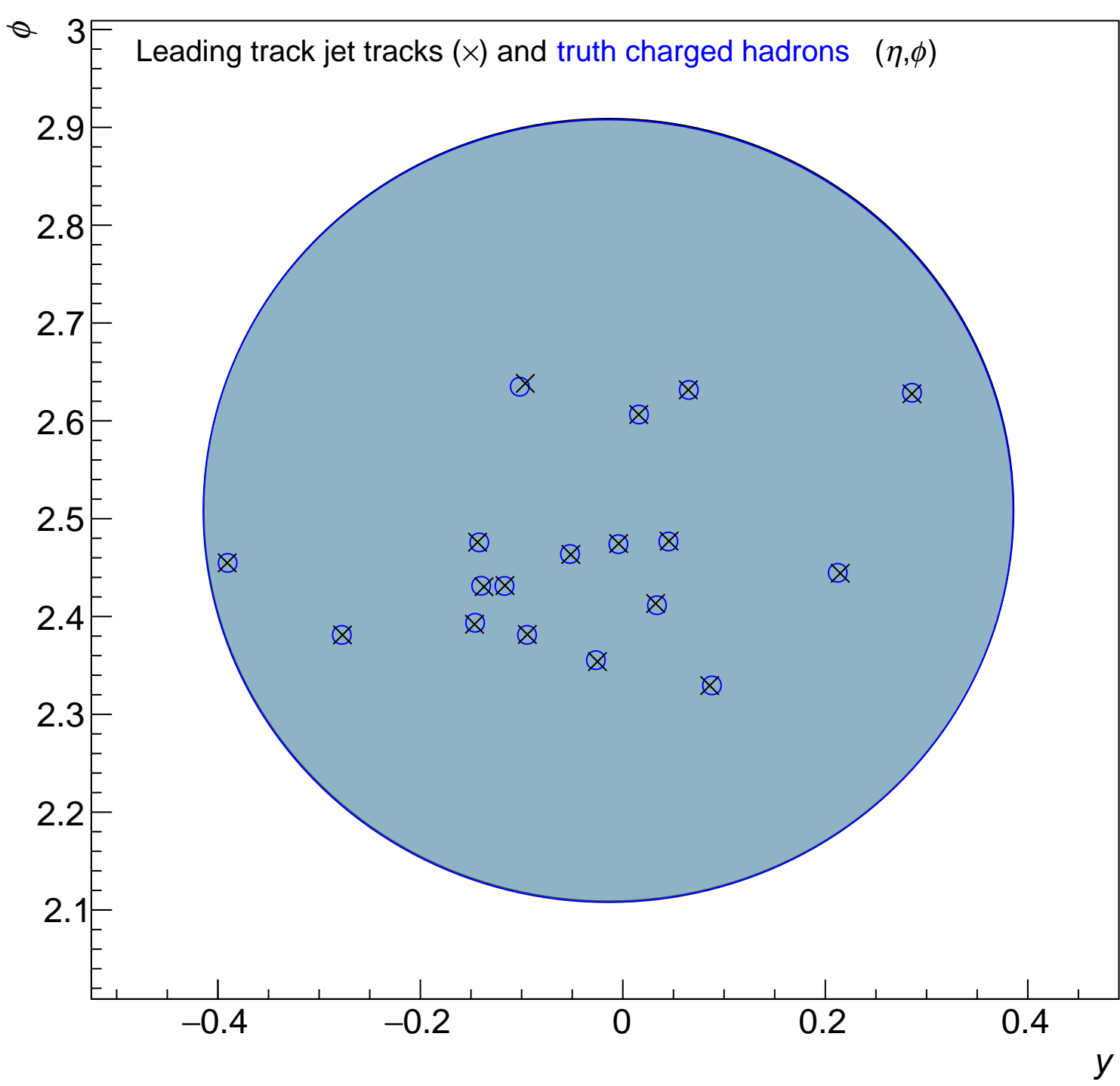
(1.2, -1.02, -1.02, -0.52),  $\pi^-$











Run 310000, Event 268774696,

$\mu = 42.5$ ,  $N_{\text{PV}} = 17$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(91.5, 241, 0.78)

(91.7, 239.0, 0.78)

$\Delta\phi(\text{ll}, j1) = 3.03$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(154.7, 0.83, -0.43)

(102.7, 0.72, -1.17)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(147.6, 0.83, -0.43)

(108.0, 0.72, -1.17)

**2 truth jets**,  $p_{\text{T}} > 5$

(112.8, -0.01, 2.51)

(5.2, -1.13, 2.04)

**2 reco jets**,  $p_{\text{T}} > 5$

(115.4, -0.01, 2.51)

(5.2, -1.13, 2.04)

**54 charged truth hadrons**

(29.5, 0.02, 2.61),  $K^+$

(16.3, 0.04, 2.48),  $\pi^+$

(14.0, 0.07, 2.63),  $\pi^-$

(12.2, -0.00, 2.47),  $\pi^-$

(6.7, -0.28, 2.38),  $\pi^+$

(6.6, -0.12, 2.43),  $\bar{p}$

(4.3, 0.03, 2.41),  $\pi^+$

(3.6, -0.09, 2.38), p

(3.5, 0.09, 2.33),  $\pi^-$

(3.2, -0.03, 2.36),  $\pi^+$

(2.9, -1.26, 2.03),  $\pi^-$

(2.8, -0.15, 2.39),  $\pi^+$

(2.7, -2.37, -2.04),  $K^-$

(2.4, -0.05, 2.46),  $\pi^-$

(2.3, -0.96, 2.06),  $\pi^+$

(2.2, -1.90, -2.80),  $\pi^-$

**51 tracks**, showing  $p_{\text{T}} > 2$  GeV

(30.9, 0.02, 2.61), matched to  $K^+$

(15.7, 0.05, 2.48), matched to  $\pi^+$

(14.2, 0.06, 2.63), matched to  $\pi^-$

(13.8, -0.00, 2.47), matched to  $\pi^-$

(6.7, -0.28, 2.38), matched to  $\pi^+$

(6.6, -0.12, 2.43), matched to  $\bar{p}$

(4.3, 0.03, 2.41), matched to  $\pi^+$

(3.6, -0.09, 2.38), matched to p

(3.6, 0.09, 2.33), matched to  $\pi^-$

(3.3, -0.03, 2.35), matched to  $\pi^+$

(2.9, -1.26, 2.03), matched to  $\pi^-$

(2.8, -0.15, 2.39), matched to  $\pi^+$

(2.4, -0.96, 2.06), matched to  $\pi^+$

(2.4, -2.38, -2.04), matched to  $K^-$

(2.3, -0.05, 2.46), matched to  $\pi^-$

**18 j1 tracks**

(30.9, 0.02, 0.02, 2.61), matched to  $K^+$

(15.7, 0.05, 0.05, 2.48), matched to  $\pi^+$

(14.2, 0.06, 0.06, 2.63), matched to  $\pi^-$

(13.8, -0.00, -0.00, 2.47), matched to  $\pi^-$

(6.7, -0.28, -0.28, 2.38), matched to  $\pi^+$

(6.6, -0.12, -0.12, 2.43), matched to  $\bar{p}$

(4.3, 0.03, 0.03, 2.41), matched to  $\pi^+$

(3.6, -0.09, -0.09, 2.38), matched to p

(3.6, 0.09, 0.09, 2.33), matched to  $\pi^-$

(3.3, -0.03, -0.03, 2.35), matched to  $\pi^+$

(2.8, -0.15, -0.15, 2.39), matched to  $\pi^+$

(2.3, -0.05, -0.05, 2.46), matched to  $\pi^-$

(1.5, -0.39, -0.39, 2.45), matched to  $\pi^-$

(1.5, 0.28, 0.29, 2.63), matched to  $\pi^+$

(1.4, -0.14, -0.14, 2.48), matched to  $\pi^+$

(1.4, -0.14, -0.14, 2.43), matched to  $\pi^-$

(1.3, -0.10, -0.10, 2.64), matched to  $\pi^+$

(0.9, 0.21, 0.21, 2.44), matched to  $\pi^-$

**18 j1 charged hadrons**

(29.5, 0.02, 0.02, 2.61),  $K^+$

(16.3, 0.04, 0.04, 2.48),  $\pi^+$

(14.0, 0.07, 0.07, 2.63),  $\pi^-$

(12.2, -0.00, -0.00, 2.47),  $\pi^-$

(6.7, -0.28, -0.28, 2.38),  $\pi^+$

(6.6, -0.12, -0.12, 2.43),  $\bar{p}$

(4.3, 0.03, 0.03, 2.41),  $\pi^+$

(3.6, -0.09, -0.09, 2.38), p

(3.5, 0.09, 0.09, 2.33),  $\pi^-$

(3.2, -0.03, -0.03, 2.36),  $\pi^+$

(2.8, -0.15, -0.15, 2.39),  $\pi^+$

(2.4, -0.05, -0.05, 2.46),  $\pi^-$

(1.5, -0.39, -0.39, 2.45),  $\pi^-$

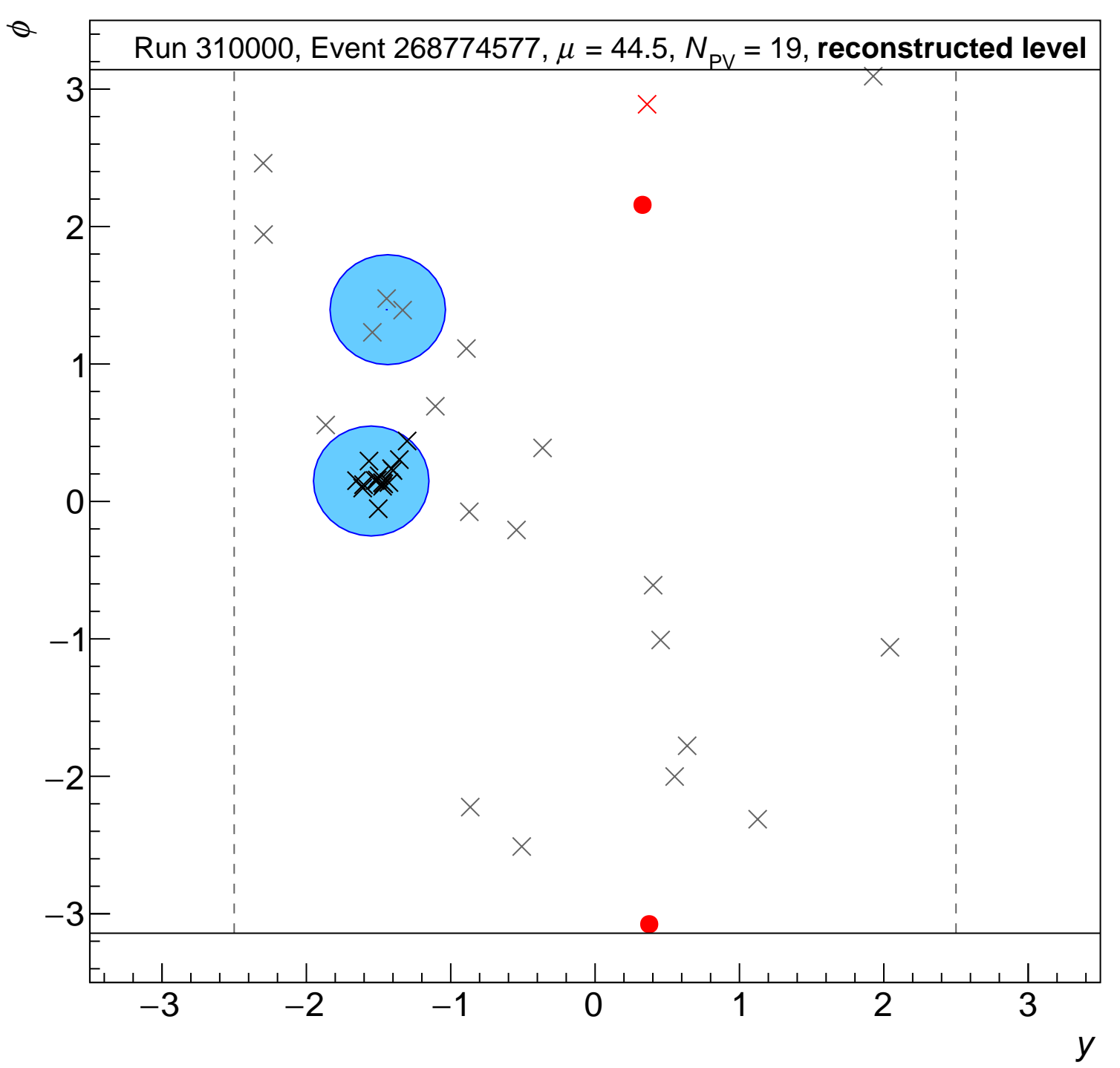
(1.5, 0.28, 0.29, 2.63),  $\pi^+$

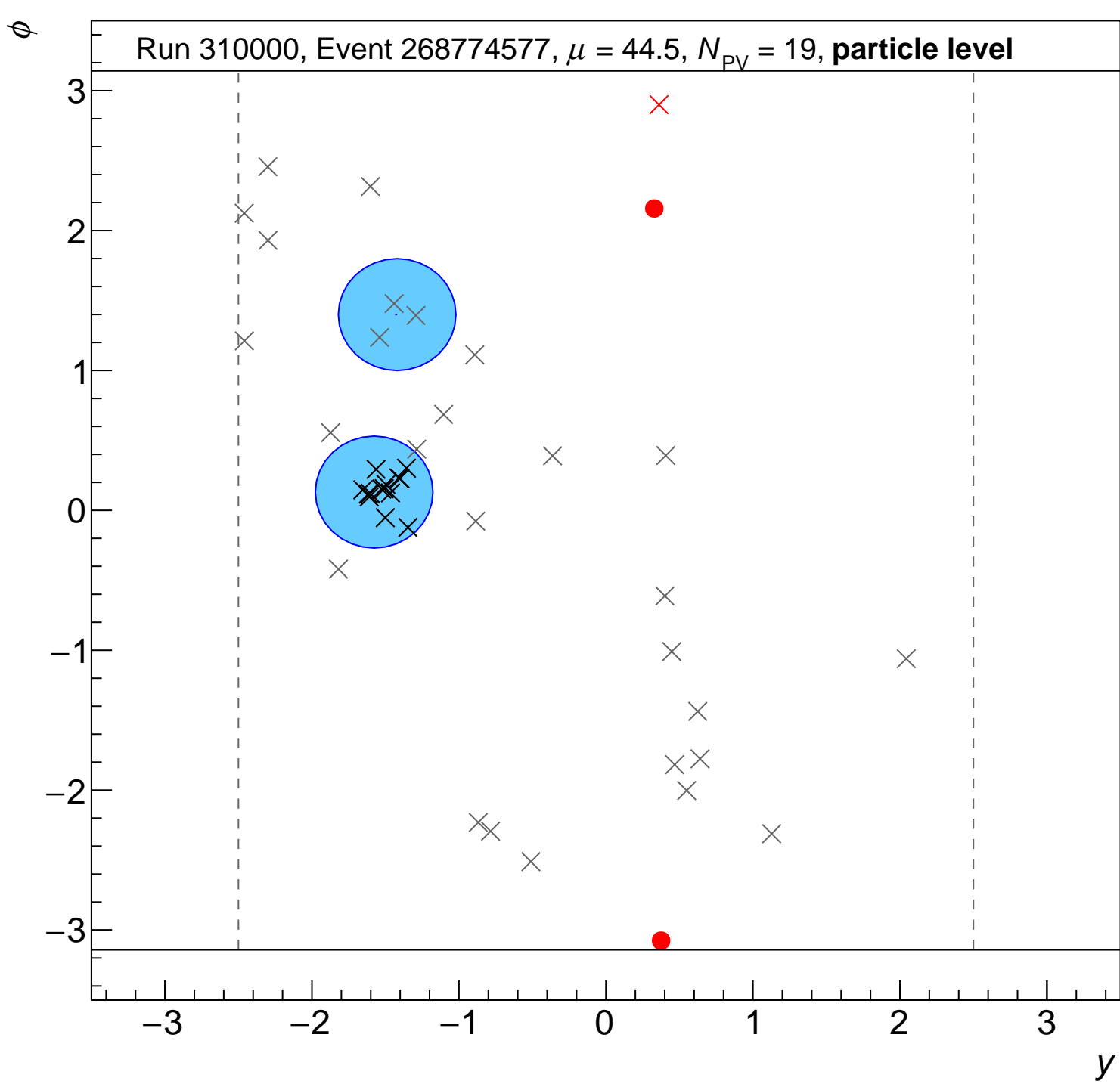
(1.4, -0.14, -0.14, 2.48),  $\pi^+$

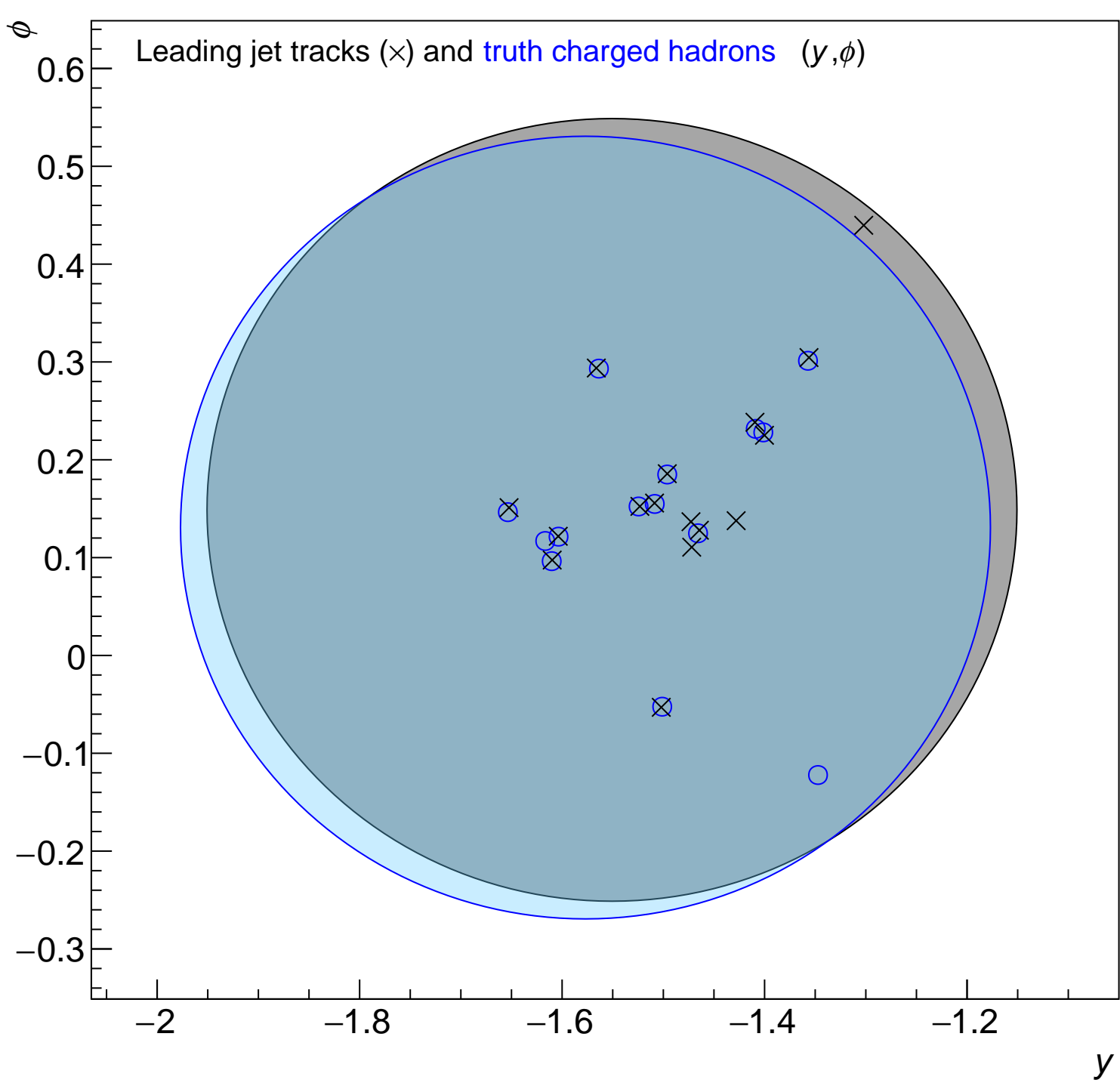
(1.4, -0.14, -0.14, 2.43),  $\pi^-$

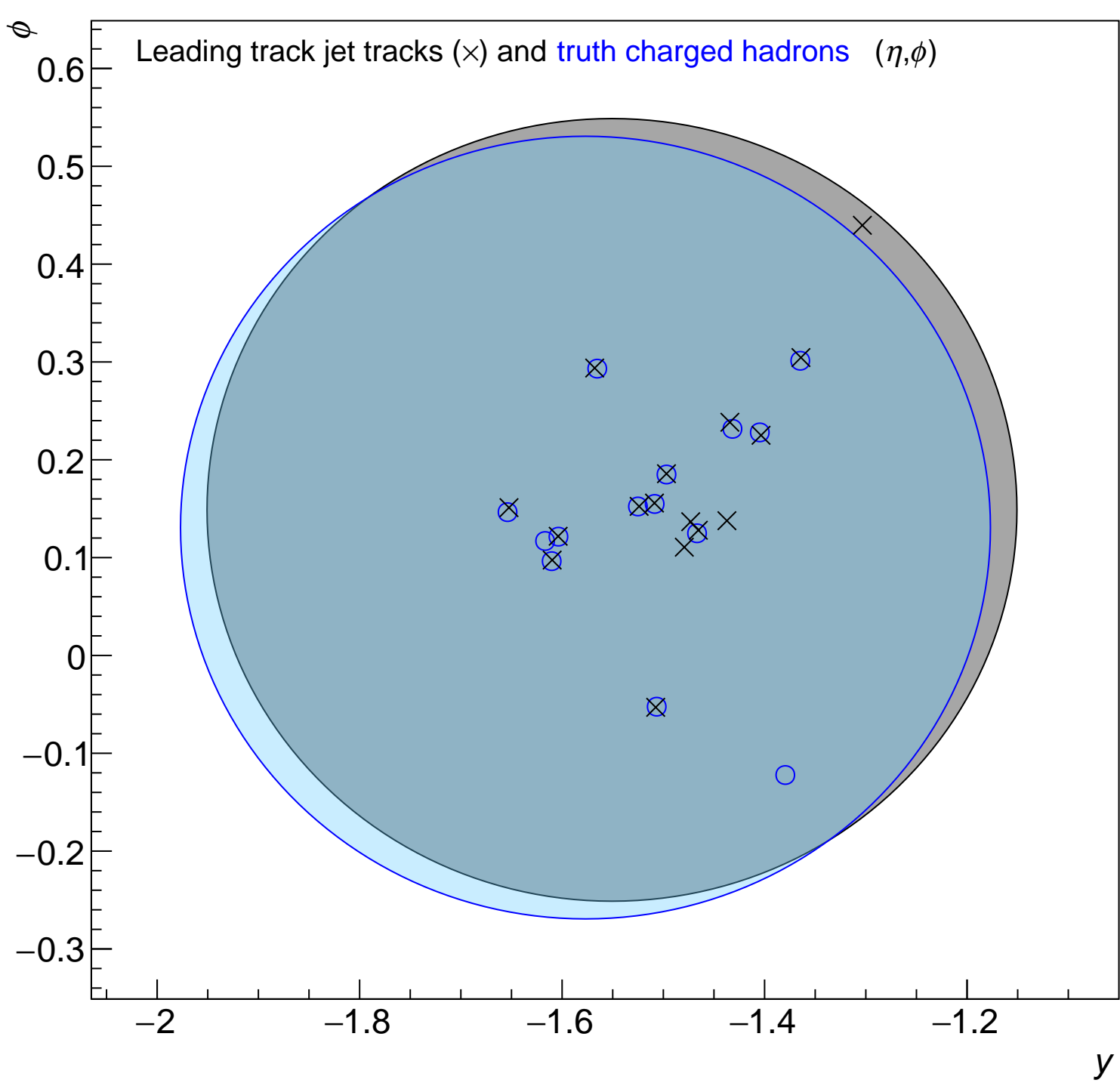
(1.4, -0.10, -0.10, 2.63),  $\pi^+$

(0.9, 0.21, 0.21, 2.44),  $\pi^-$











Run 310000, Event 268774577,

$\mu = 44.5$ ,  $N_{\text{PV}} = 19$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(90.7, 173, 0.36)

(91.2, 172.7, 0.36)

$\Delta\phi(\text{ll}, \text{j1}) = 2.74$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.03$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(135.2, 0.38, -3.08)

(60.5, 0.33, 2.16)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(133.1, 0.37, -3.08)

(62.2, 0.33, 2.16)

**2 truth jets**,  $p_{\text{T}} > 5$

(88.3, -1.58, 0.13)

(5.0, -1.42, 1.40)

**2 reco jets**,  $p_{\text{T}} > 5$

(76.7, -1.55, 0.15)

(5.0, -1.44, 1.40)

**41 charged truth hadrons**

(30.7, -1.62, 0.12),  $K^+$

(14.4, -1.61, 0.10),  $\pi^-$

(10.4, -1.51, 0.15),  $\pi^-$

(9.6, -1.60, 0.12),  $\pi^-$

(5.6, -1.65, 0.15),  $\pi^-$

(3.8, -1.52, 0.15),  $\pi^+$

(3.5, -1.50, 0.18),  $\pi^+$

(3.0, -1.47, 0.12),  $\pi^+$

(2.7, 0.62, -1.44),  $\Sigma^+$

(2.5, -1.44, 1.48),  $\pi^+$

(2.4, -1.29, 0.44),  $K^-$

(2.3, -1.56, 0.29),  $\pi^-$

**36 tracks**, showing  $p_{\text{T}} > 2$  GeV

(18.1, -1.61, 0.10), matched to  $\pi^-$

(11.9, -1.65, 0.15), matched to  $\pi^-$

(10.5, -1.51, 0.16), matched to  $\pi^-$

(9.7, -1.60, 0.12), matched to  $\pi^-$

(5.6, -1.47, 0.14), unmatched

(3.5, -1.52, 0.15), matched to  $\pi^+$

(3.3, -1.50, 0.19), matched to  $\pi^+$

(2.9, -1.46, 0.13), matched to  $\pi^+$

(2.5, -1.30, 0.44), matched to  $K^-$

(2.5, -1.44, 1.48), matched to  $\pi^+$

(2.4, -1.57, 0.29), matched to  $\pi^-$

**16 j1 tracks**

(18.1, -1.61, -1.61, 0.10), matched to  $\pi^-$

(11.9, -1.65, -1.65, 0.15), matched to  $\pi^-$

(10.5, -1.51, -1.51, 0.16), matched to  $\pi^-$

(9.7, -1.60, -1.60, 0.12), matched to  $\pi^-$

(5.6, -1.47, -1.47, 0.14), unmatched

(3.5, -1.52, -1.52, 0.15), matched to  $\pi^+$

(3.3, -1.50, -1.50, 0.19), matched to  $\pi^+$

(2.9, -1.46, -1.47, 0.13), matched to  $\pi^+$

(2.5, -1.30, -1.30, 0.44), matched to  $K^-$

(2.4, -1.57, -1.57, 0.29), matched to  $\pi^-$

(1.6, -1.40, -1.40, 0.23), matched to  $\pi^-$

(1.3, -1.50, -1.51, -0.05), matched to  $\pi^+$

(1.1, -1.47, -1.48, 0.11), unmatched

(1.0, -1.36, -1.36, 0.30), matched to  $\pi^+$

(1.0, -1.43, -1.44, 0.14), unmatched

(0.6, -1.41, -1.43, 0.24), matched to  $\pi^+$

**14 j1 charged hadrons**

(30.7, -1.62, -1.62, 0.12),  $K^+$

(14.4, -1.61, -1.61, 0.10),  $\pi^-$

(10.4, -1.51, -1.51, 0.15),  $\pi^-$

(9.6, -1.60, -1.60, 0.12),  $\pi^-$

(5.6, -1.65, -1.65, 0.15),  $\pi^-$

(3.8, -1.52, -1.53, 0.15),  $\pi^+$

(3.5, -1.50, -1.50, 0.18),  $\pi^+$

(3.0, -1.47, -1.47, 0.12),  $\pi^+$

(2.3, -1.56, -1.57, 0.29),  $\pi^-$

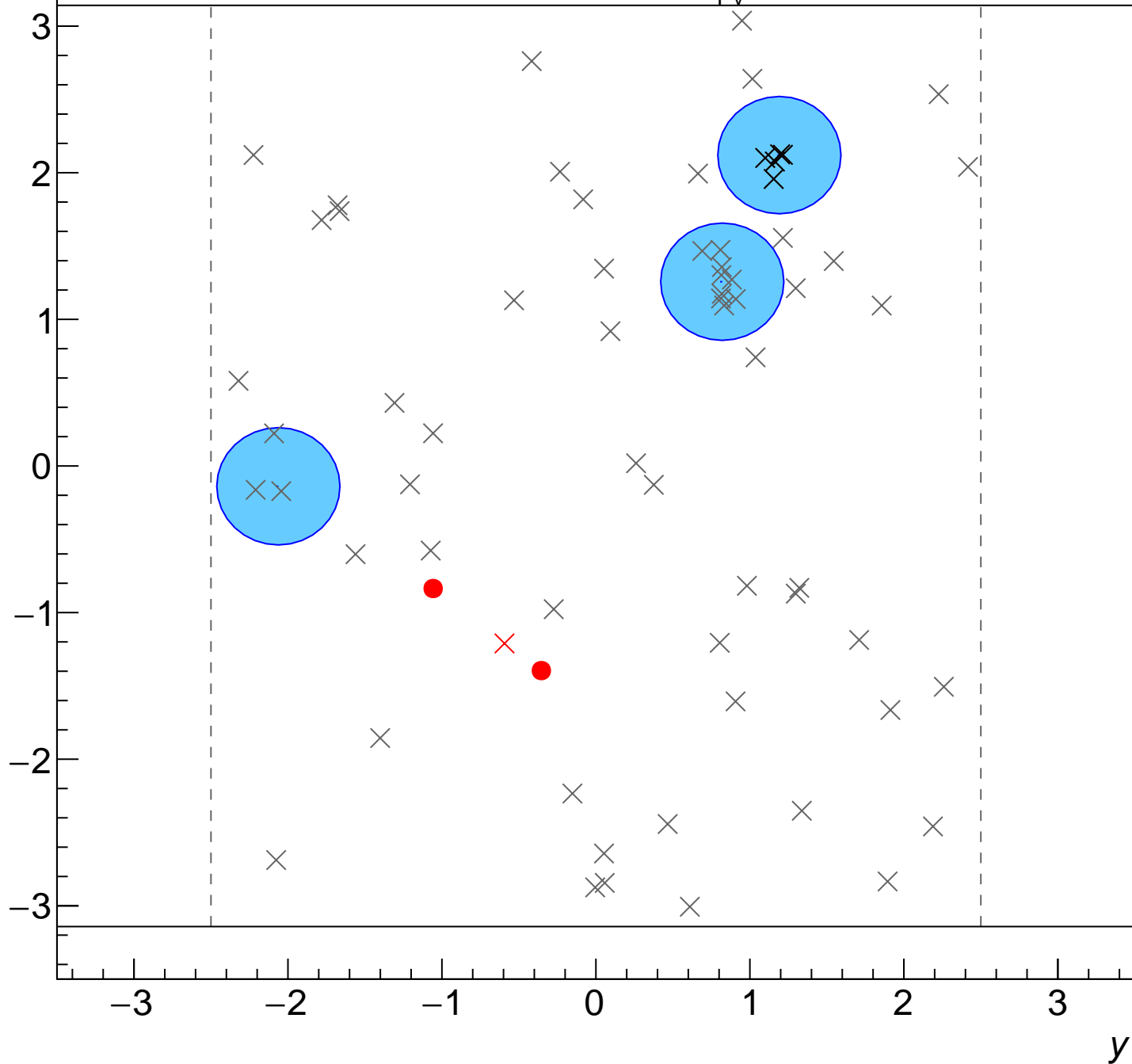
(1.6, -1.40, -1.40, 0.23),  $\pi^-$

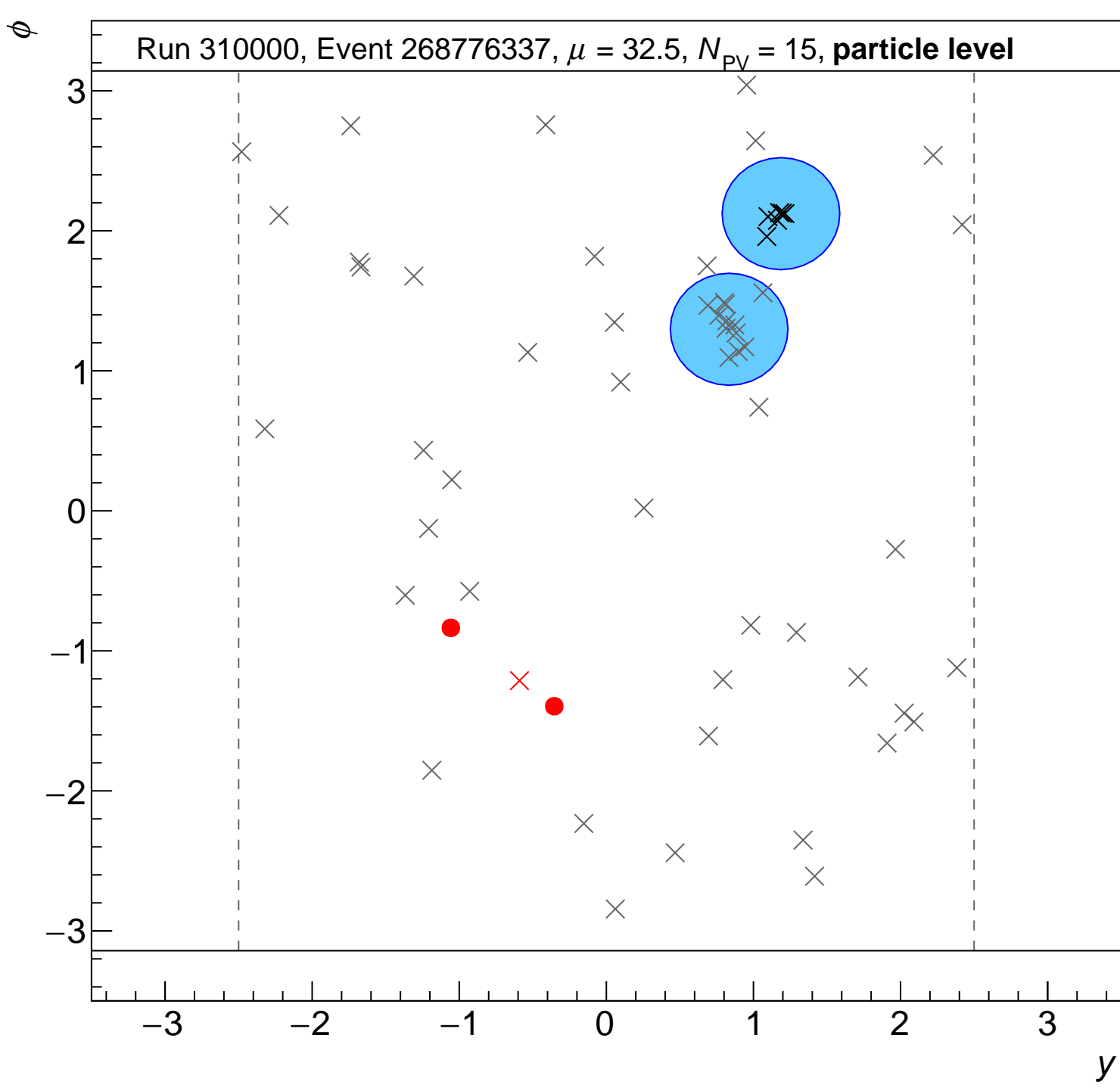
(1.3, -1.50, -1.51, -0.05),  $\pi^+$

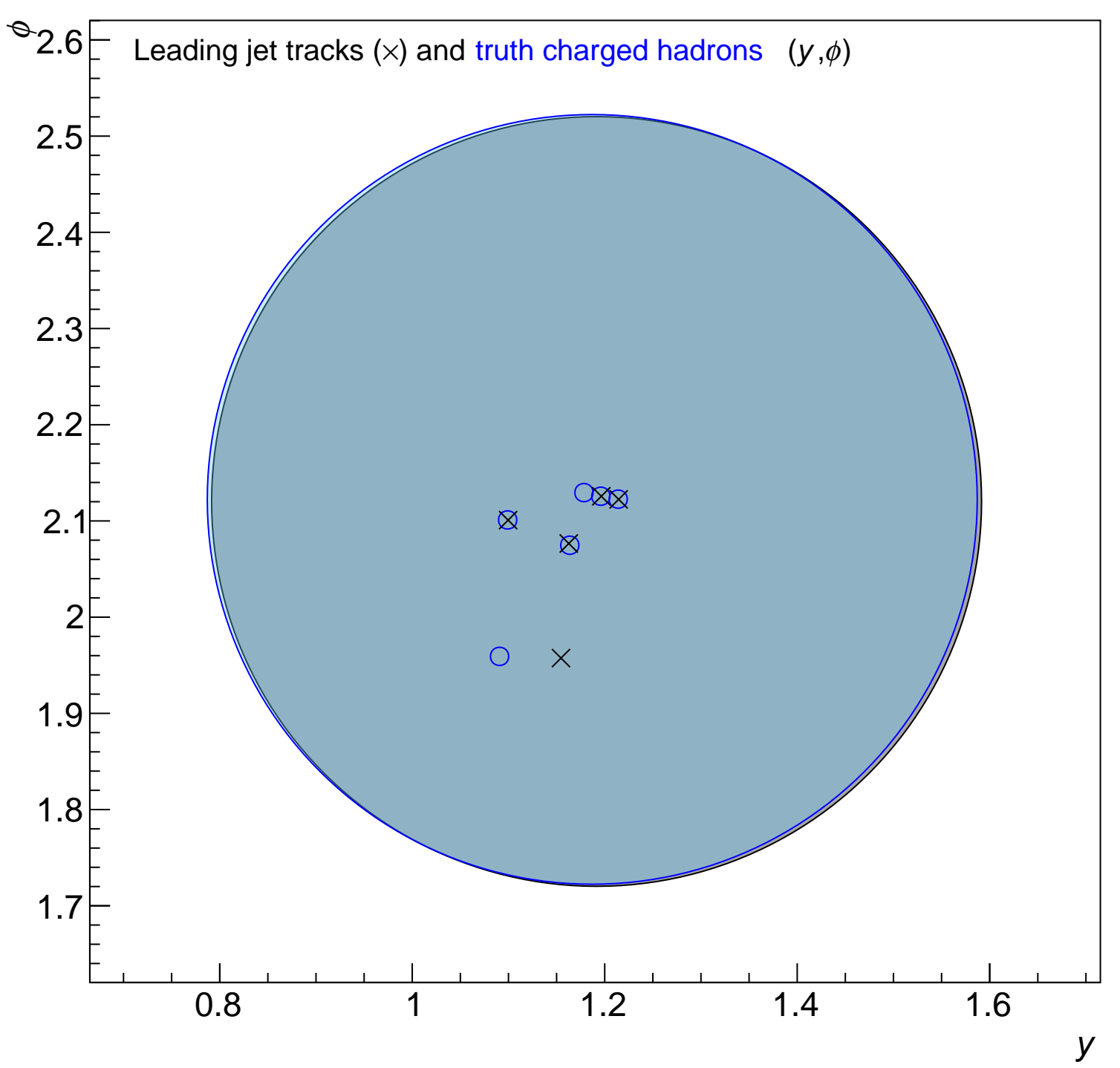
(1.1, -1.36, -1.36, 0.30),  $\pi^+$

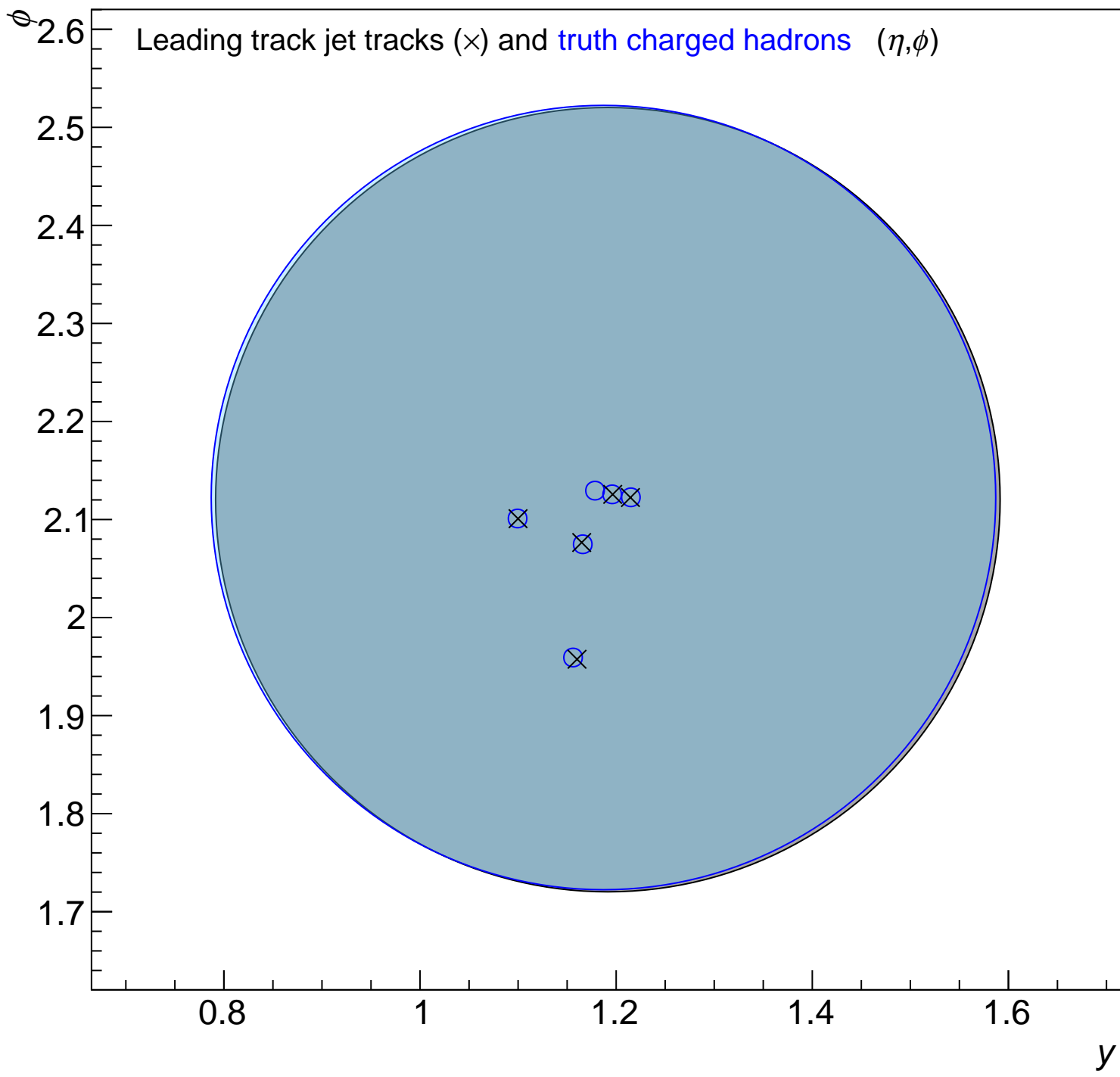
(0.6, -1.41, -1.43, 0.23),  $\pi^+$

(0.5, -1.35, -1.38, -0.12),  $\pi^+$

$\phi$ Run 310000, Event 268776337,  $\mu = 32.5$ ,  $N_{\text{PV}} = 15$ , **reconstructed level**







Run 310000, Event 268776337,

$\mu = 32.5$ ,  $N_{\text{PV}} = 15$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(92.8, 210, -0.59)

(93.7, 211.6, -0.59)

$\Delta\phi(\text{ll}, \text{j1}) = 2.95$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(145.9, -0.35, -1.40)

(71.9, -1.06, -0.84)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(145.8, -0.35, -1.40)

(73.4, -1.06, -0.84)

**2 truth jets**,  $p_{\text{T}} > 5$

(104.9, 1.19, 2.12)

(51.6, 0.83, 1.30)

**3 reco jets**,  $p_{\text{T}} > 5$

(83.8, 1.19, 2.12)

(29.6, 0.82, 1.26)

(6.4, -2.06, -0.14)

**58 charged truth hadrons**

(61.2, 1.20, 2.13),  $\pi^-$

(25.8, 1.18, 2.13),  $\pi^+$

(10.1, 1.21, 2.12),  $K^-$

(9.6, 0.76, 1.40), PDG = -3112

(9.5, 0.83, 1.10),  $\pi^-$

(8.7, 0.94, 1.17),  $\Sigma^-$

(4.9, 1.10, 2.10),  $\pi^+$

(4.3, 0.81, 1.47),  $\pi^-$

(4.2, 0.80, 1.49),  $\Sigma^-$

(3.5, 0.69, 1.47),  $\pi^+$

(3.5, 0.88, 1.27),  $\pi^+$

(3.4, 1.34, -2.35),  $\pi^-$

(2.5, 0.90, 1.14),  $K^-$

(2.4, 0.82, 1.36),  $\pi^-$

(2.3, -1.21, -0.13),  $\pi^+$

(2.3, -1.24, 0.43),  $\bar{p}$

(2.0, 0.81, 1.30),  $\pi^+$

**65 tracks**, showing  $p_{\text{T}} > 2$  GeV

(65.5, 1.20, 2.13), matched to  $\pi^-$

(10.3, 1.21, 2.12), matched to  $K^-$

(9.2, 0.83, 1.09), matched to  $\pi^-$

(5.4, -2.04, -0.17), unmatched

(5.0, 1.10, 2.10), matched to  $\pi^+$

(4.3, 0.81, 1.47), matched to  $\pi^-$

(3.5, 0.69, 1.47), matched to  $\pi^+$

(3.4, 1.34, -2.35), matched to  $\pi^-$

(3.3, 0.88, 1.27), matched to  $\pi^+$

(2.5, 0.82, 1.36), matched to  $\pi^-$

(2.5, 0.91, 1.14), matched to  $K^-$

(2.3, -1.21, -0.13), matched to  $\pi^+$

(2.2, -1.31, 0.43), matched to  $\bar{p}$

(2.0, 0.81, 1.30), matched to  $\pi^+$

(2.0, 1.54, 1.40), unmatched

**5 j1 tracks**

(65.5, 1.20, 1.20, 2.13), matched to  $\pi^-$

(10.3, 1.21, 1.21, 2.12), matched to  $K^-$

(5.0, 1.10, 1.10, 2.10), matched to  $\pi^+$

(1.9, 1.16, 1.16, 2.08), matched to  $\pi^-$

(1.2, 1.15, 1.16, 1.96), matched to  $K^-$

**6 j1 charged hadrons**

(61.2, 1.20, 1.20, 2.13),  $\pi^-$

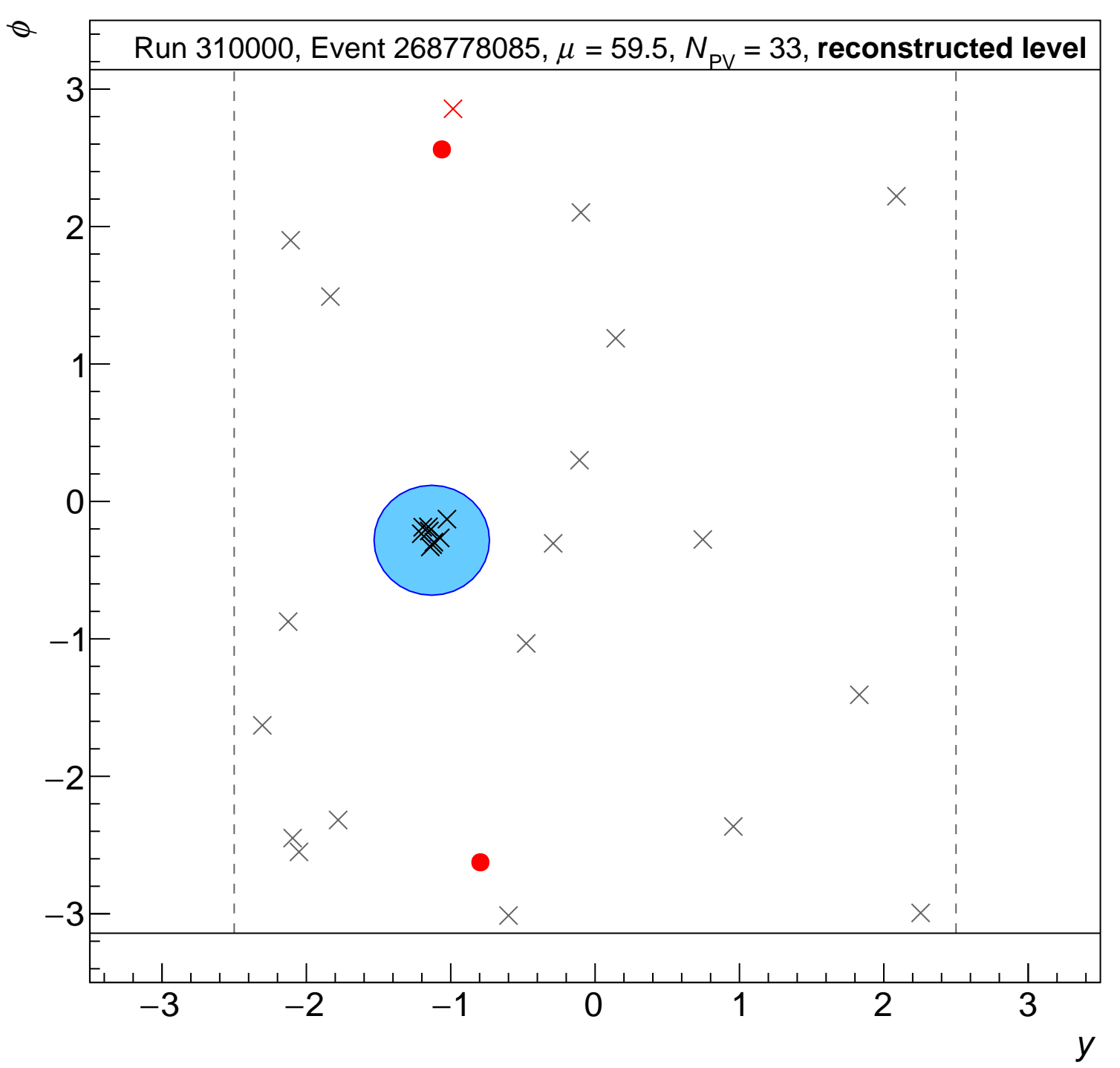
(25.8, 1.18, 1.18, 2.13),  $\pi^+$

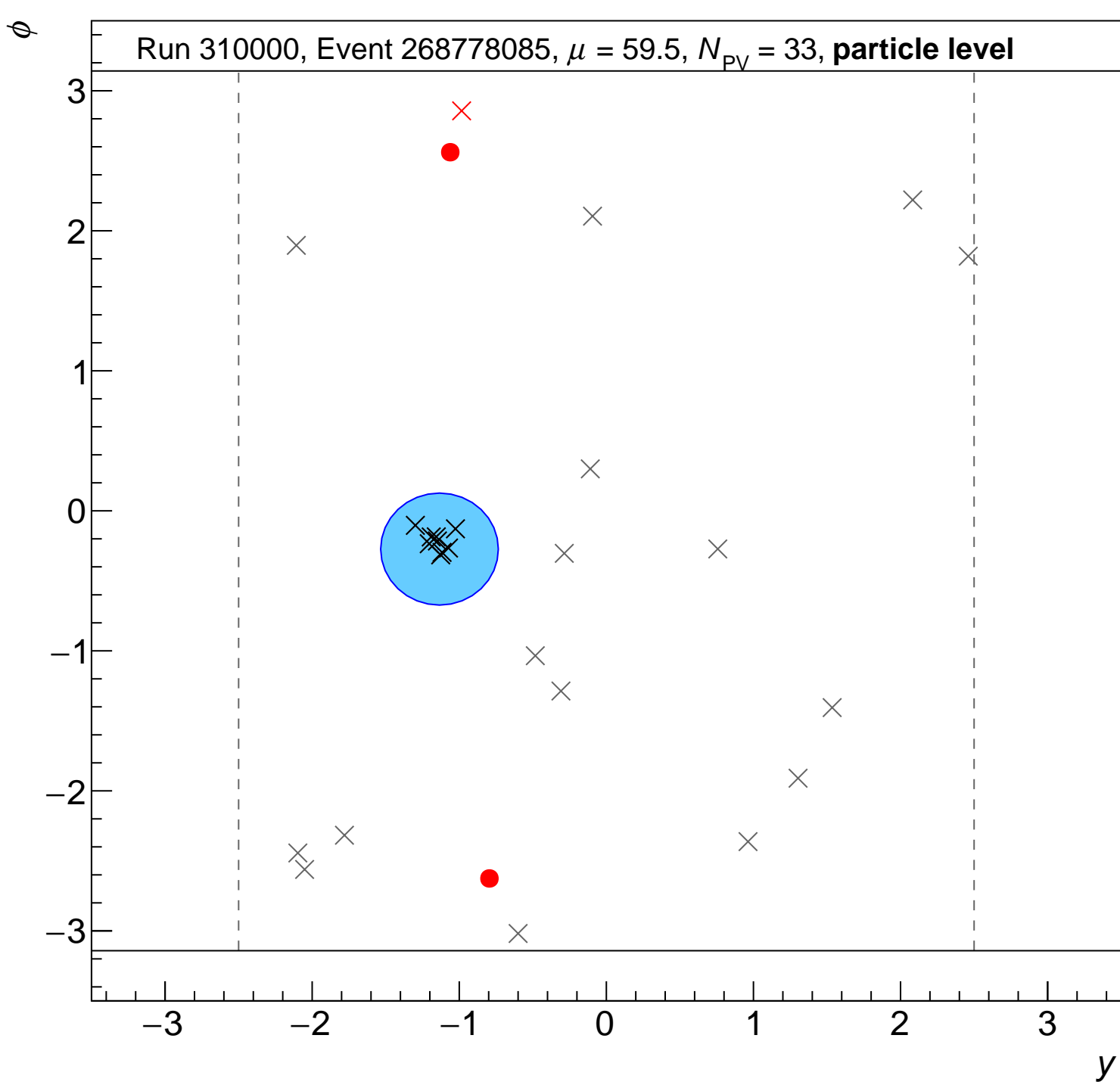
(10.1, 1.21, 1.21, 2.12),  $K^-$

(4.9, 1.10, 1.10, 2.10),  $\pi^+$

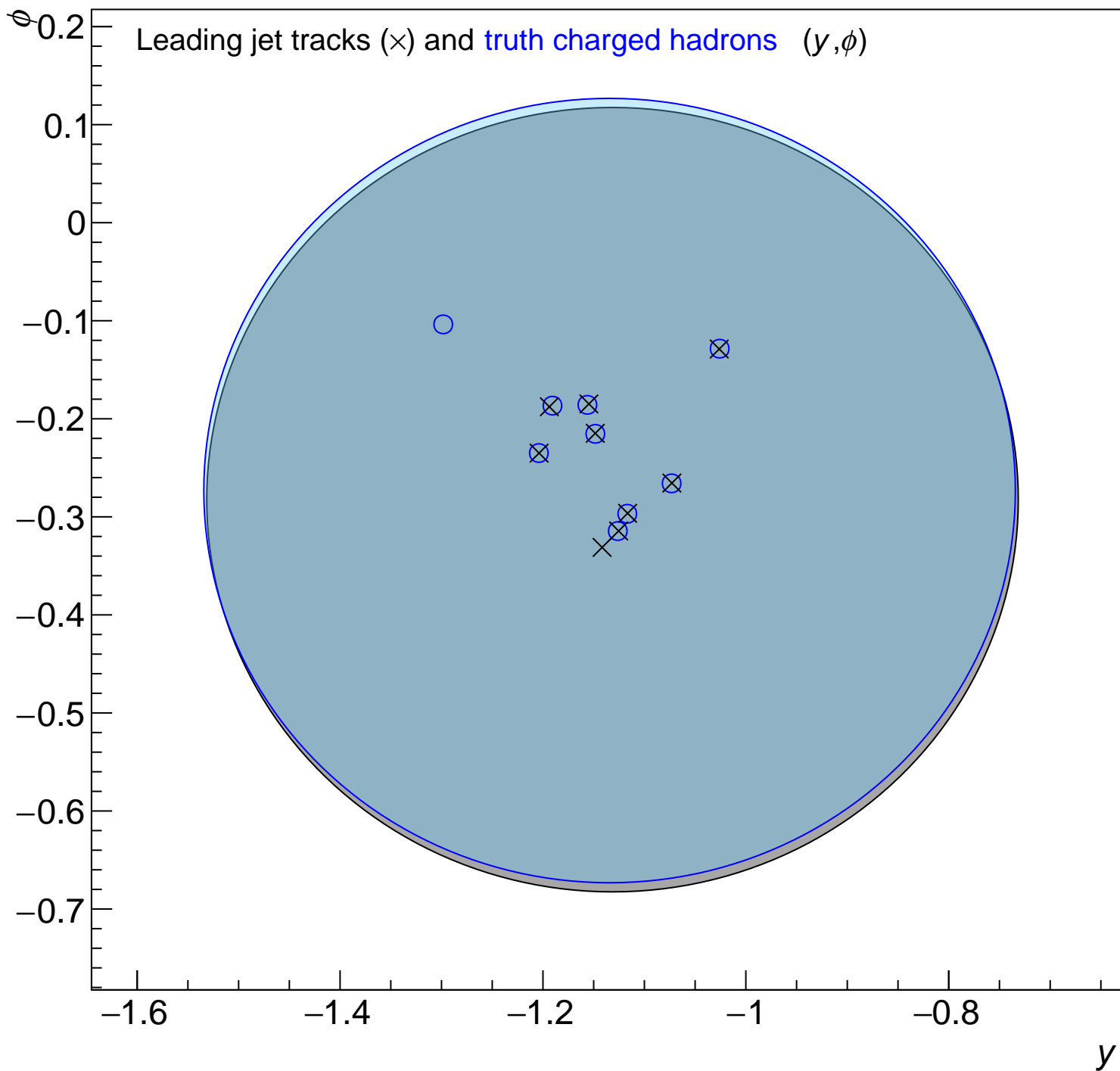
(1.9, 1.16, 1.17, 2.07),  $\pi^-$

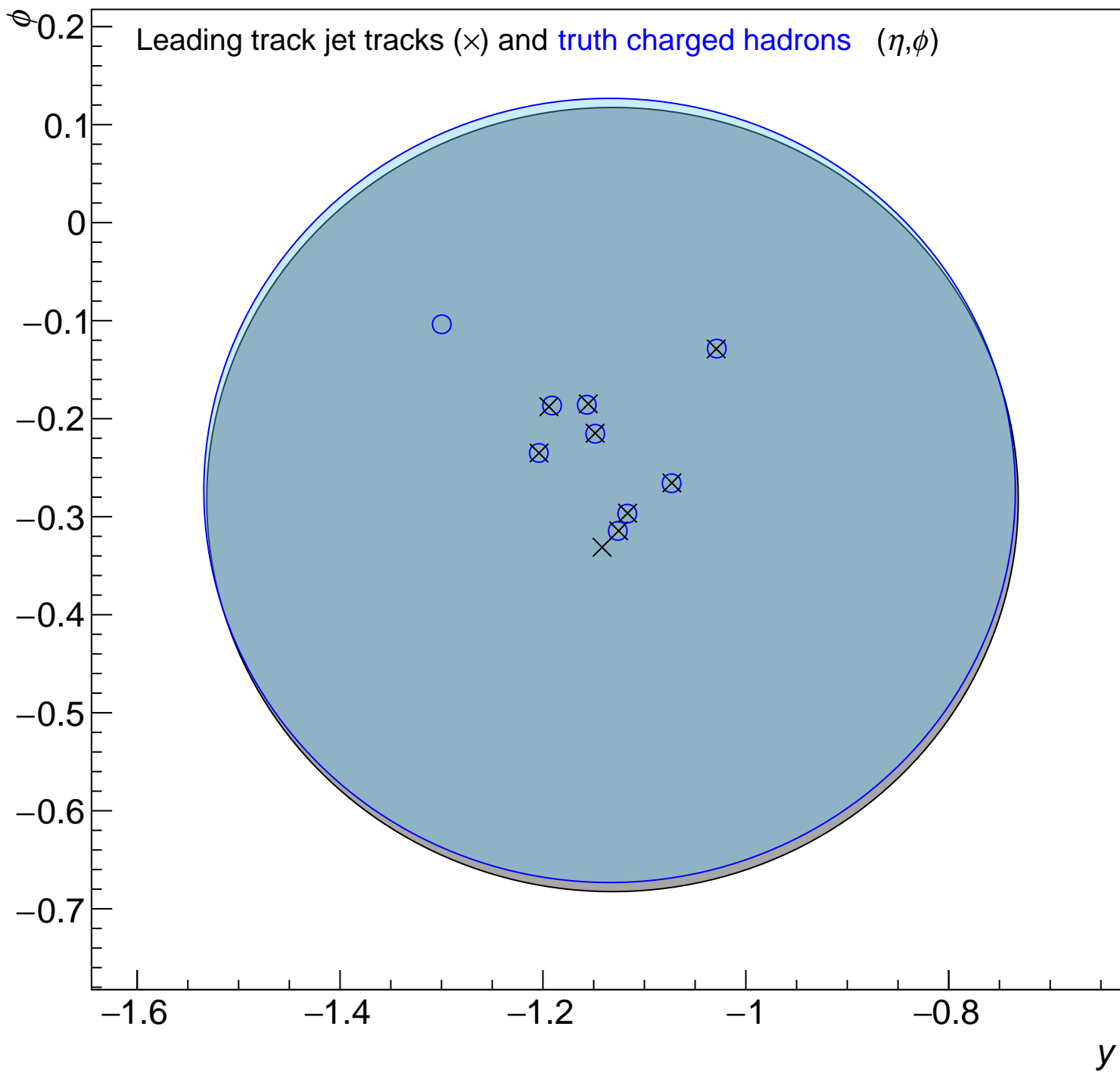
(1.2, 1.09, 1.16, 1.96),  $K^-$











Run 310000, Event 268778085,

$\mu = 59.5$ ,  $N_{\text{PV}} = 33$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(92.6, 167, -0.98)

(91.5, 165.4, -0.98)

$\Delta\phi(\text{ll}, j1) = 3.14$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.01$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(135.1, -1.06, 2.56)

(54.8, -0.79, -2.63)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(133.4, -1.06, 2.56)

(54.1, -0.79, -2.63)

**1 truth jets**,  $p_{\text{T}} > 5$

(109.9, -1.13, -0.27)

**1 reco jets**,  $p_{\text{T}} > 5$

(120.0, -1.13, -0.28)

**25 charged truth hadrons**

(50.1, -1.13, -0.31),  $\mu^+$

(14.4, -1.07, -0.27),  $\pi^-$

(13.1, -1.12, -0.30),  $\pi^+$

(12.2, -1.20, -0.23),  $\pi^+$

(8.2, -1.15, -0.22),  $\pi^-$

(4.5, -1.19, -0.19),  $\pi^+$

(3.6, -1.16, -0.19),  $\pi^-$

(2.4, -1.30, -0.10),  $\pi^+$

**27 tracks**, showing  $p_{\text{T}} > 2$  GeV

(49.8, -1.13, -0.31), matched to  $\mu^+$

(14.5, -1.07, -0.27), matched to  $\pi^-$

(13.1, -1.14, -0.33), unmatched

(12.6, -1.12, -0.30), matched to  $\pi^+$

(12.0, -1.20, -0.24), matched to  $\pi^+$

(8.3, -1.15, -0.21), matched to  $\pi^-$

(4.4, -1.19, -0.19), matched to  $\pi^+$

(3.7, -1.15, -0.18), matched to  $\pi^-$

**9 j1 tracks**

(49.8, -1.13, -1.13, -0.31), matched to  $\mu^+$

(14.5, -1.07, -1.07, -0.27), matched to  $\pi^-$

(13.1, -1.14, -1.14, -0.33), unmatched

(12.6, -1.12, -1.12, -0.30), matched to  $\pi^+$

(12.0, -1.20, -1.20, -0.24), matched to  $\pi^+$

(8.3, -1.15, -1.15, -0.21), matched to  $\pi^-$

(4.4, -1.19, -1.19, -0.19), matched to  $\pi^+$

(3.7, -1.15, -1.16, -0.18), matched to  $\pi^-$

(1.6, -1.03, -1.03, -0.13), matched to  $\pi^+$

**9 j1 charged hadrons**

(50.1, -1.13, -1.13, -0.31),  $\mu^+$

(14.4, -1.07, -1.07, -0.27),  $\pi^-$

(13.1, -1.12, -1.12, -0.30),  $\pi^+$

(12.2, -1.20, -1.20, -0.23),  $\pi^+$

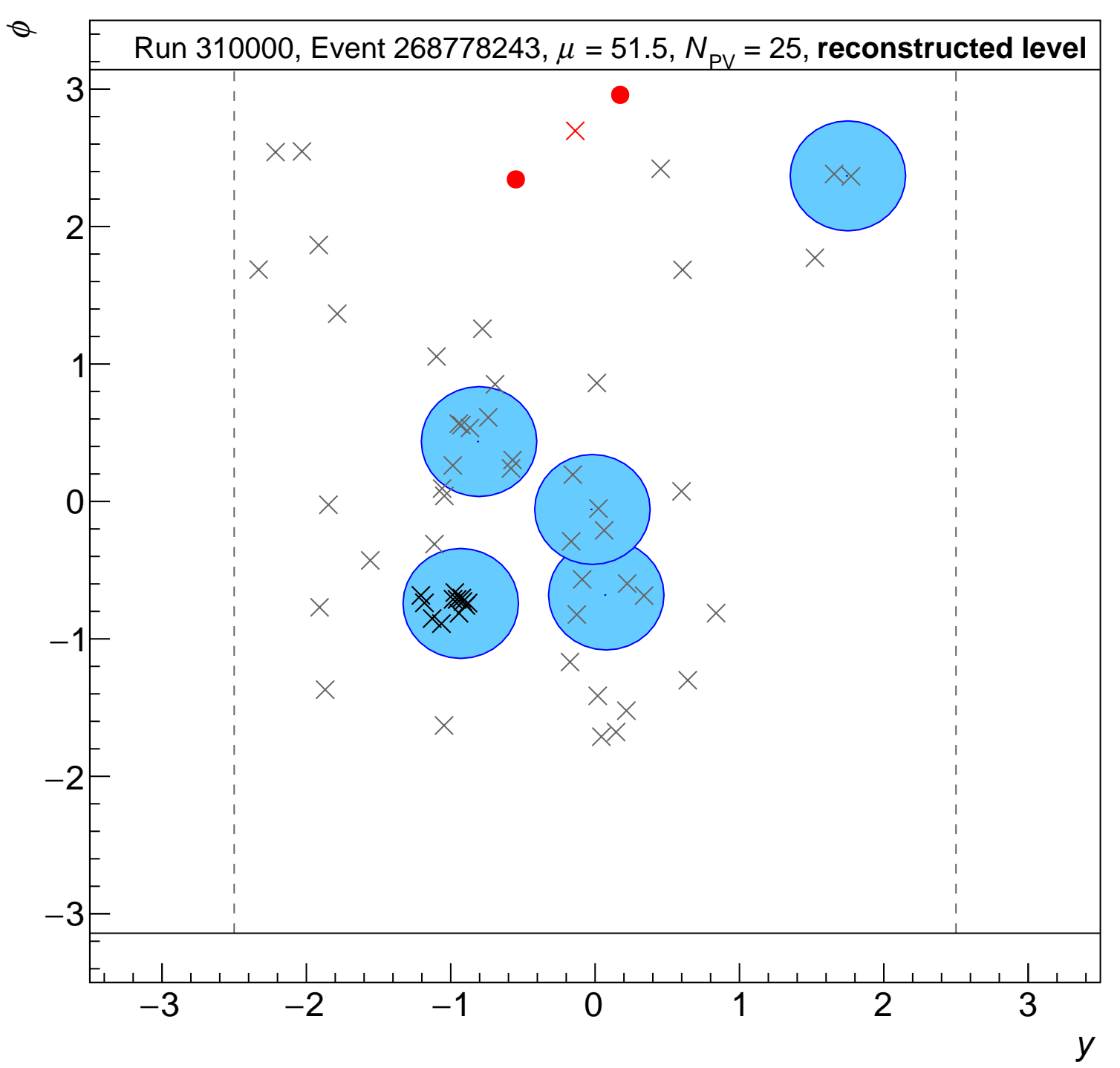
(8.2, -1.15, -1.15, -0.22),  $\pi^-$

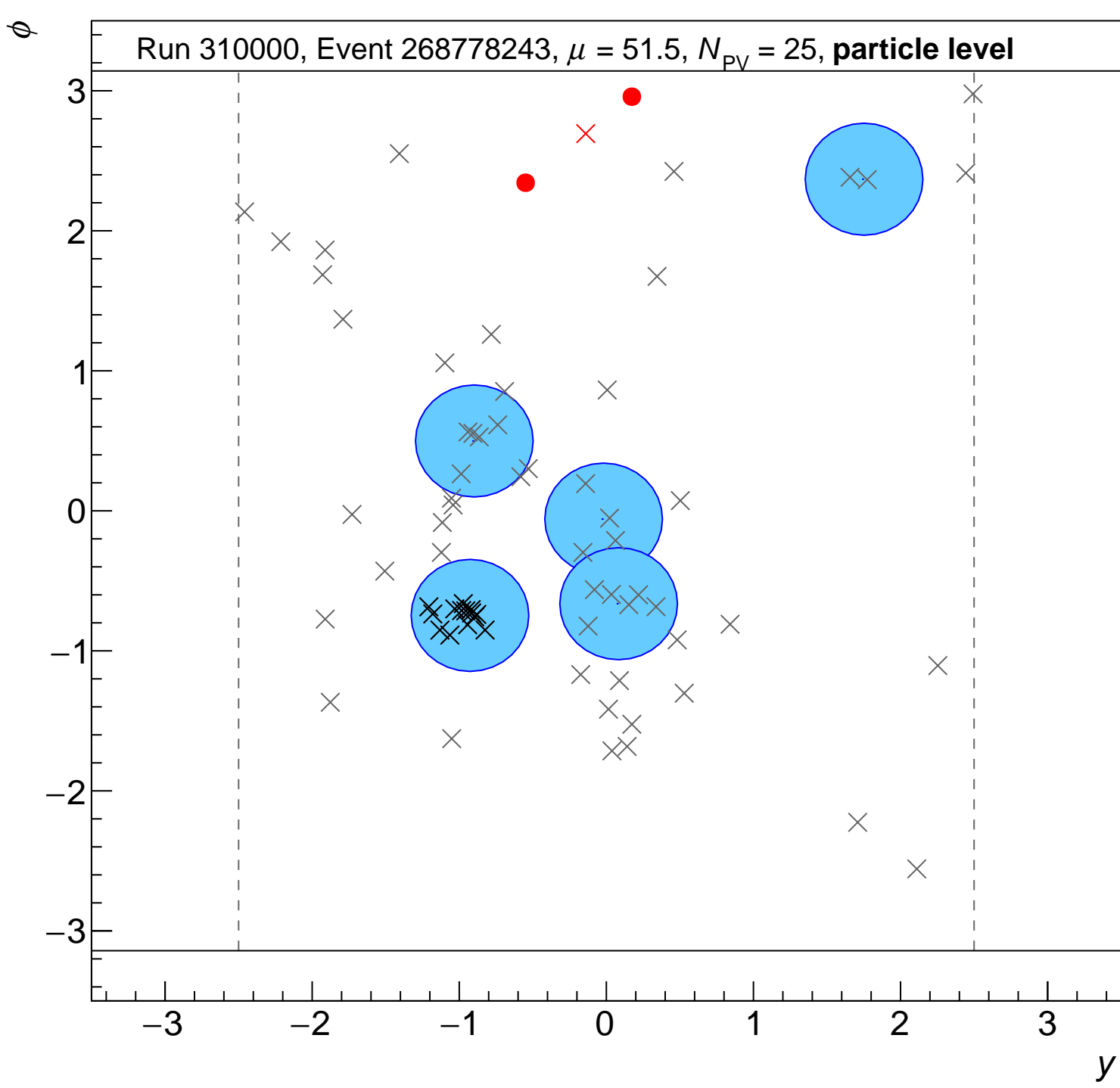
(4.5, -1.19, -1.19, -0.19),  $\pi^+$

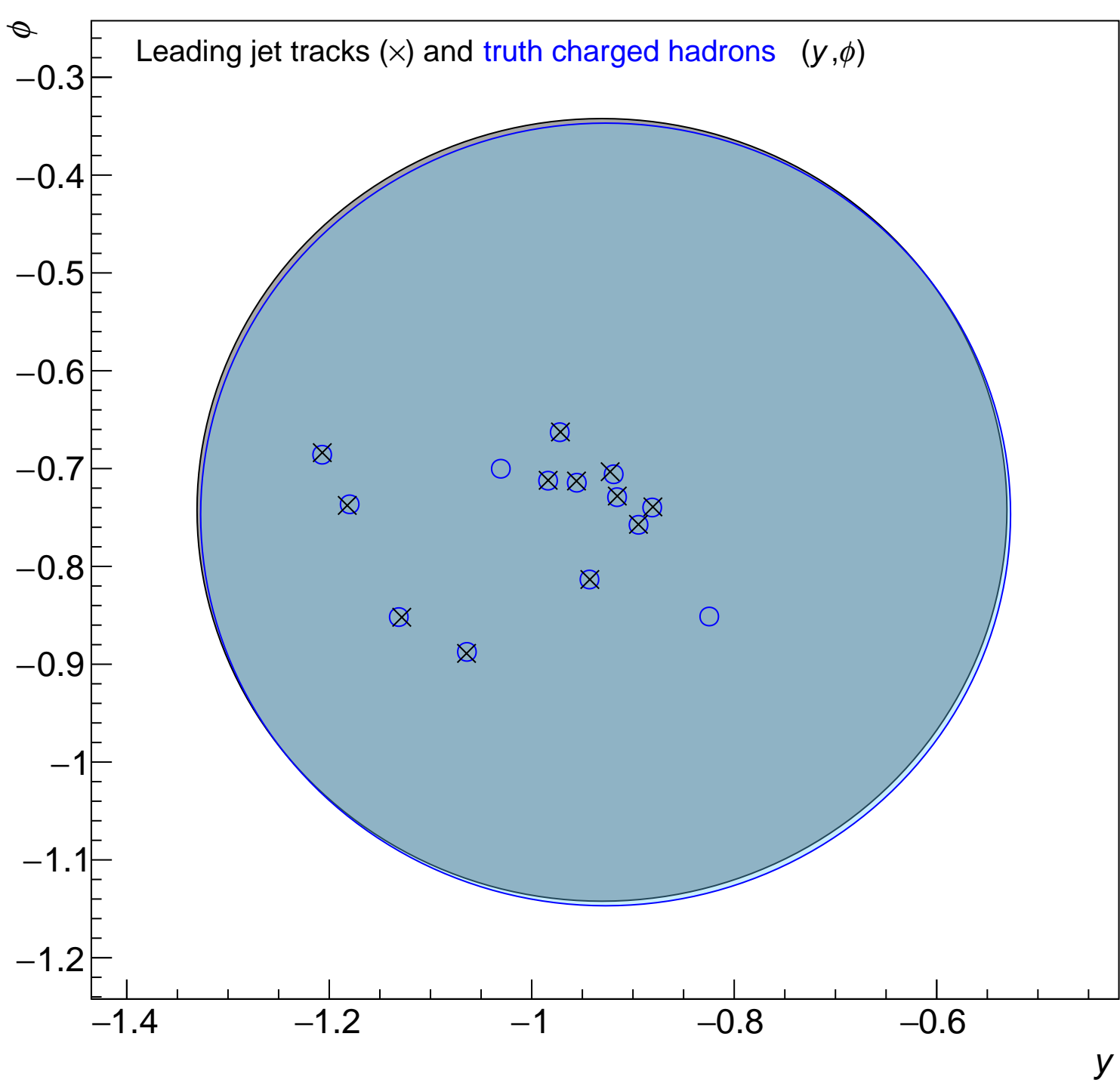
(3.6, -1.16, -1.16, -0.19),  $\pi^-$

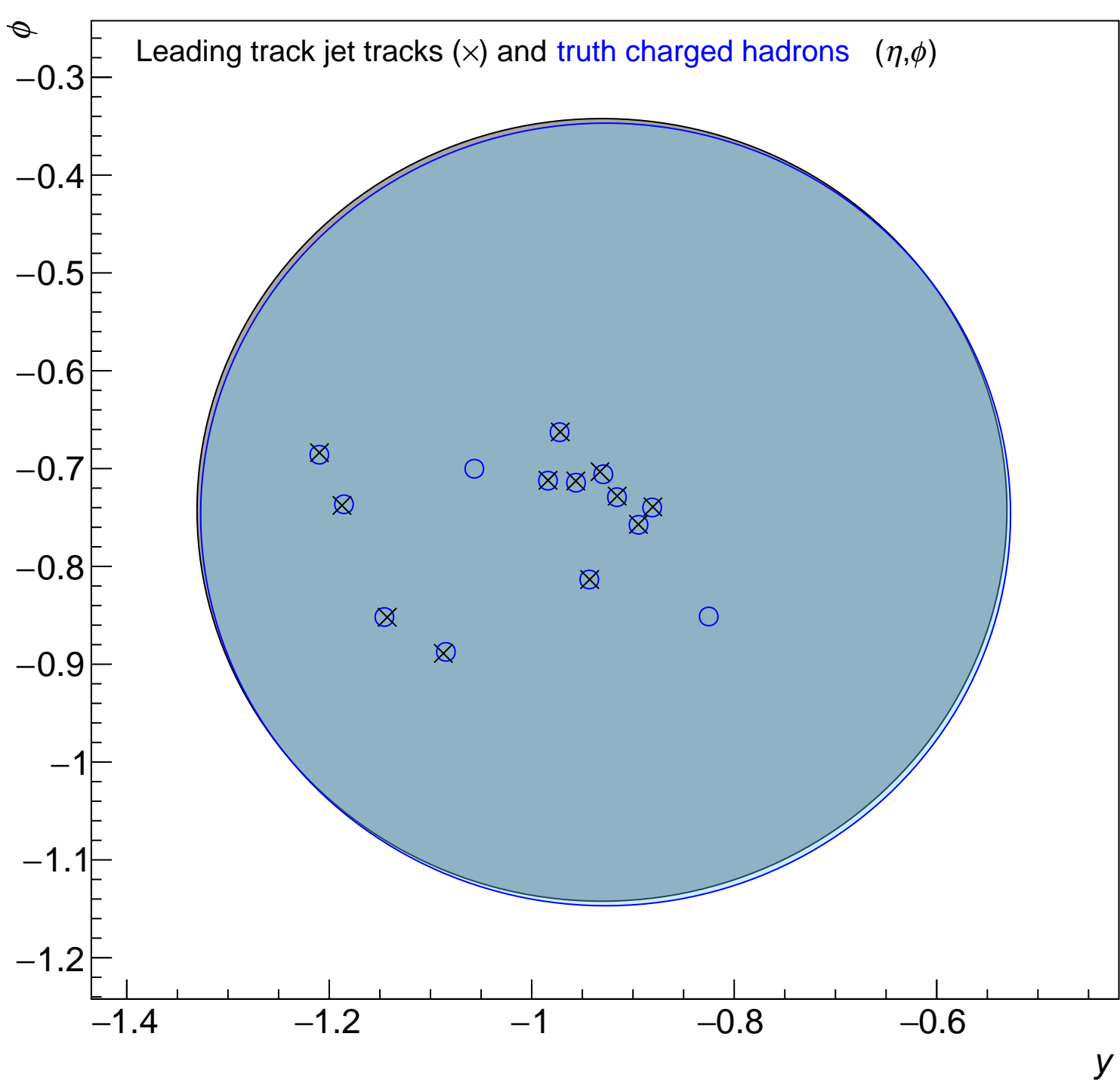
(2.4, -1.30, -1.30, -0.10),  $\pi^+$

(1.6, -1.03, -1.03, -0.13),  $\pi^+$









Run 310000, Event 268778243,

$\mu = 51.5$ ,  $N_{\text{PV}} = 25$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(92.1, 186, -0.14)

(92.0, 185.9, -0.14)

$\Delta\phi(\text{ll}, \text{j1}) = -2.84$ ,  $\Delta R_{\text{j1}}^{\text{tru-rec}} = 0.01$

**2 truth muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(110.8, 0.17, 2.96)

(84.1, -0.55, 2.34)

**2 reco muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(111.5, 0.17, 2.96)

(83.3, -0.55, 2.34)

**5 truth jets**,  $p_{\text{T}} > 5$

(82.3, -0.93, -0.75)

(15.3, 1.75, 2.37)

(9.6, 0.08, -0.66)

(9.1, -0.02, -0.06)

(6.7, -0.90, 0.50)

**5 reco jets**,  $p_{\text{T}} > 5$

(77.2, -0.93, -0.74)

(15.5, 1.75, 2.37)

(9.6, -0.80, 0.44)

(9.0, -0.02, -0.06)

(5.7, 0.08, -0.68)

**69 charged truth hadrons**

(30.2, -0.89, -0.76),  $\pi^+$

(12.6, 1.77, 2.37),  $\pi^+$

(12.2, -0.88, -0.74),  $\pi^-$

(7.7, -0.98, -0.71),  $\pi^-$

(7.5, -0.92, -0.73),  $\pi^-$

(6.5, -0.94, -0.81),  $\pi^-$

(6.1, -0.97, -0.66),  $\pi^+$

(3.6, 0.02, -0.05),  $\pi^-$

(3.5, -0.82, -0.85),  $\pi^+$

(3.1, -0.96, -0.71),  $\pi^-$

(2.8, 0.06, -0.21),  $\pi^+$

(2.8, 1.66, 2.38),  $\pi^-$

(2.2, -0.53, 0.30),  $\bar{p}$

(2.2, 0.15, -0.67),  $\pi^+$

(2.2, -0.14, 0.19),  $p$

(2.1, -0.91, 0.55),  $K^+$

(2.1, -0.69, 0.85),  $\pi^-$

**57 tracks**, showing  $p_{\text{T}} > 2 \text{ GeV}$

(29.4, -0.89, -0.76), matched to  $\pi^+$

(12.6, 1.77, 2.37), matched to  $\pi^+$

(12.3, -0.88, -0.74), matched to  $\pi^-$

(7.8, -0.92, -0.73), matched to  $\pi^-$

(7.2, -0.98, -0.71), matched to  $\pi^-$

(6.5, -0.94, -0.81), matched to  $\pi^-$

(5.8, -0.97, -0.66), matched to  $\pi^+$

(3.6, 0.02, -0.05), matched to  $\pi^-$

(3.2, -0.96, -0.71), matched to  $\pi^-$

(2.9, 1.66, 2.38), matched to  $\pi^-$

(2.8, 0.06, -0.21), matched to  $\pi^+$

(2.3, -0.57, 0.30), matched to  $\bar{p}$

(2.2, -0.15, 0.19), matched to  $p$

(2.1, -0.69, 0.85), matched to  $\pi^-$

(2.1, -0.93, 0.56), matched to  $K^+$

**12 j1 tracks**

(29.4, -0.89, -0.89, -0.76), matched to  $\pi^+$

(12.3, -0.88, -0.88, -0.74), matched to  $\pi^-$

(7.8, -0.92, -0.92, -0.73), matched to  $\pi^-$

(7.2, -0.98, -0.98, -0.71), matched to  $\pi^-$

(6.5, -0.94, -0.94, -0.81), matched to  $\pi^-$

(5.8, -0.97, -0.97, -0.66), matched to  $\pi^+$

(3.2, -0.96, -0.96, -0.71), matched to  $\pi^-$

(1.7, -1.21, -1.21, -0.68), matched to  $\pi^+$

(1.2, -1.18, -1.19, -0.74), matched to  $\pi^+$

(0.8, -0.92, -0.93, -0.70), matched to  $\pi^-$

(0.7, -1.13, -1.14, -0.85), matched to  $\pi^-$

(0.6, -1.06, -1.09, -0.89), matched to  $\pi^+$

**14 j1 charged hadrons**

(30.2, -0.89, -0.89, -0.76),  $\pi^+$

(12.2, -0.88, -0.88, -0.74),  $\pi^-$

(7.7, -0.98, -0.98, -0.71),  $\pi^-$

(7.5, -0.92, -0.92, -0.73),  $\pi^-$

(6.5, -0.94, -0.94, -0.81),  $\pi^-$

(6.1, -0.97, -0.97, -0.66),  $\pi^+$

(3.5, -0.82, -0.83, -0.85),  $\pi^+$

(3.1, -0.96, -0.96, -0.71),  $\pi^-$

(1.7, -1.21, -1.21, -0.69),  $\pi^+$

(1.2, -1.18, -1.19, -0.74),  $\pi^+$

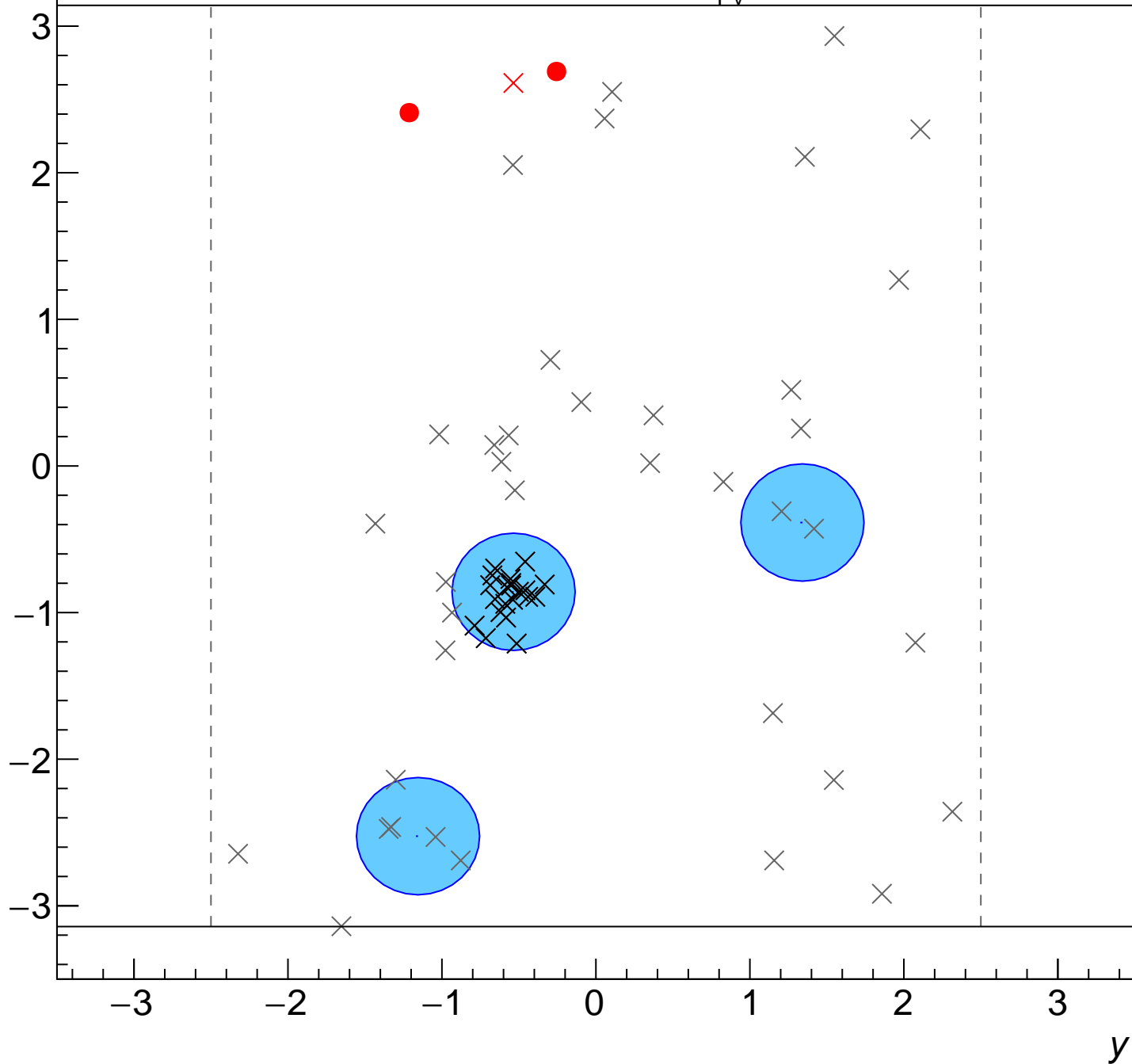
(0.8, -0.92, -0.93, -0.71),  $\pi^-$

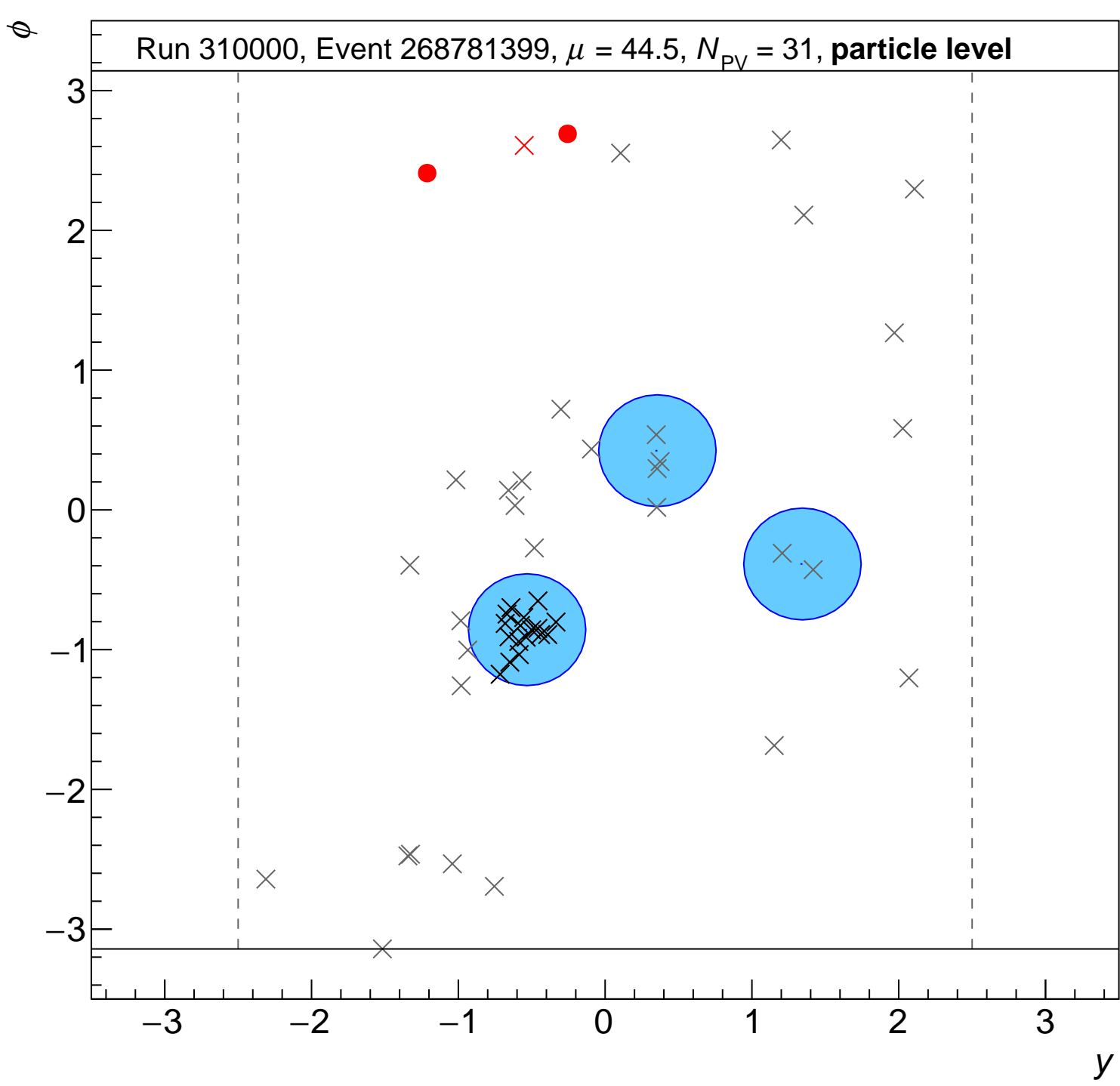
(0.7, -1.13, -1.15, -0.85),  $\pi^-$

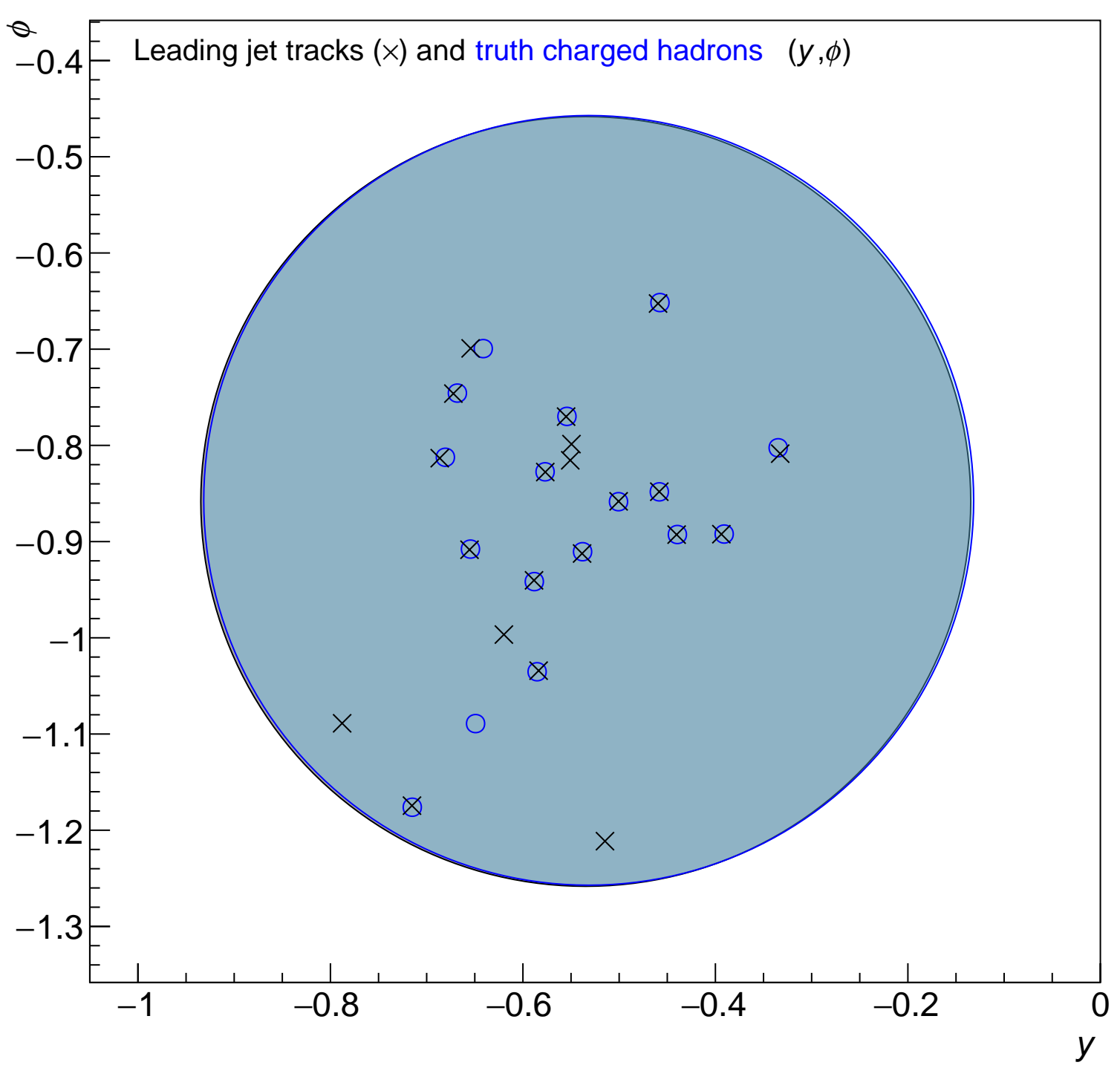
(0.6, -1.06, -1.08, -0.89),  $\pi^+$

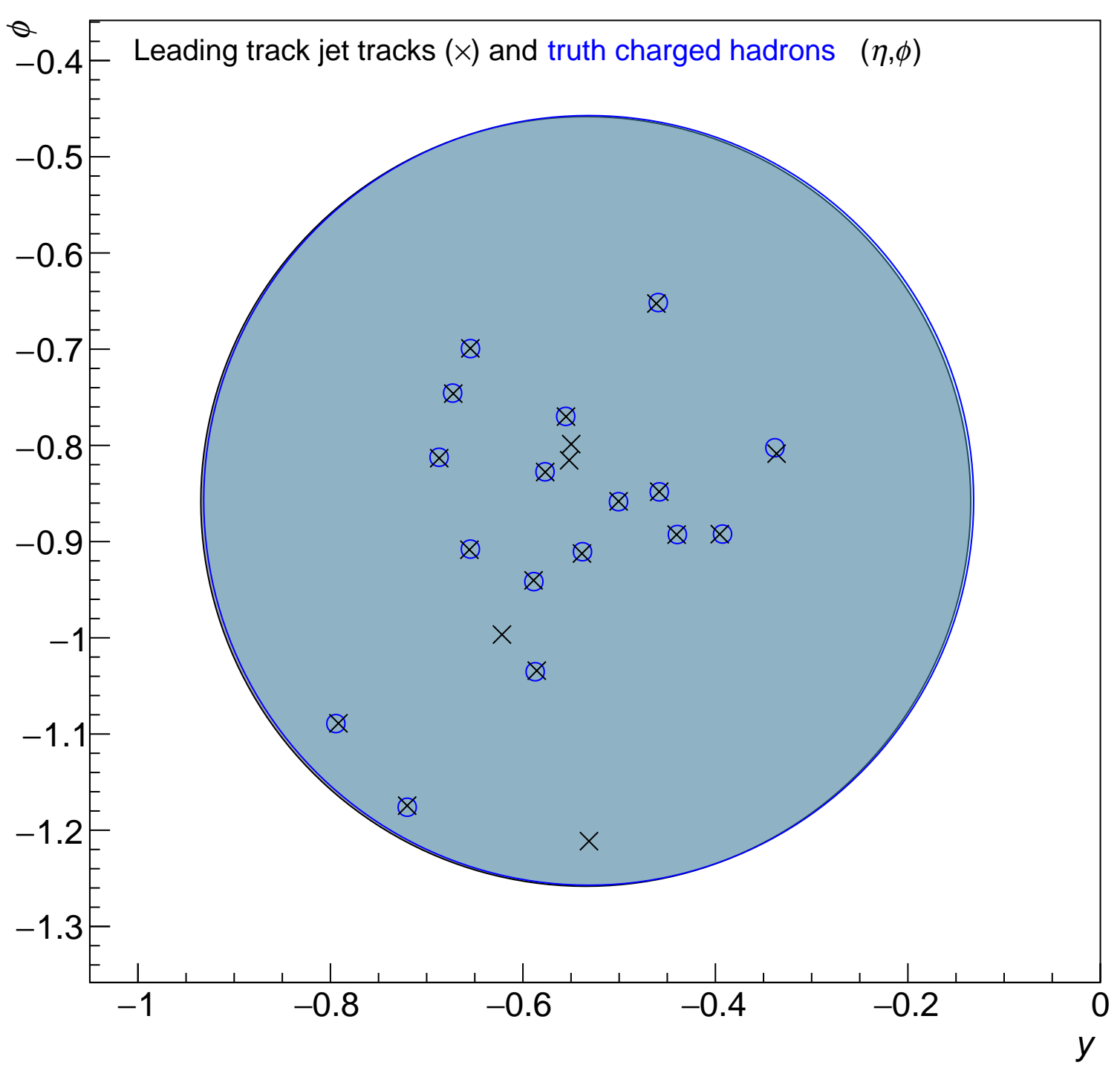
(0.5, -1.03, -1.06, -0.70),  $\pi^+$



$\phi$ Run 310000, Event 268781399,  $\mu = 44.5$ ,  $N_{\text{PV}} = 31$ , **reconstructed level**







Run 310000, Event 268781399,

$\mu = 44.5$ ,  $N_{\text{PV}} = 31$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(90.4, 190, -0.55)

(94.2, 201.5, -0.54)

$\Delta\phi(\text{ll}, j1) = -2.81$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(134.9, -0.26, 2.69)

(56.9, -1.21, 2.41)

**2 reco muons**, ( $p_{\text{T}}/\text{GeV}$ ,  $y$ ,  $\phi$ )

(146.2, -0.26, 2.69)

(57.0, -1.21, 2.41)

**3 truth jets**,  $p_{\text{T}} > 5$

(112.1, -0.53, -0.86)

(9.7, 1.34, -0.39)

(8.6, 0.36, 0.42)

**3 reco jets**,  $p_{\text{T}} > 5$

(120.0, -0.53, -0.86)

(9.8, 1.34, -0.39)

(5.1, -1.16, -2.52)

**48 charged truth hadrons**

(26.0, -0.44, -0.89),  $\pi^+$

(18.1, -0.50, -0.86),  $\pi^-$

(10.7, -0.46, -0.85),  $\pi^+$

(9.5, -0.58, -0.83),  $\pi^-$

(8.1, -0.65, -0.91),  $\pi^-$

(7.2, -0.67, -0.75), p

(7.2, -0.54, -0.91),  $\pi^-$

(6.9, -0.55, -0.77),  $K^+$

(6.4, 1.42, -0.43),  $\pi^+$

(4.3, -0.64, -0.70),  $\bar{p}$

(4.2, 0.35, 0.54),  $\Sigma^-$

(3.4, 1.21, -0.31),  $\pi^-$

(3.3, -0.59, -0.94),  $\pi^+$

(3.3, -0.68, -0.81),  $K^-$

(2.8, 0.35, 0.02),  $\pi^+$

(2.4, 0.35, 0.30), PDG = -3112

(2.1, -1.04, -2.53),  $\pi^-$

(2.1, 0.37, 0.35),  $\pi^-$

**59 tracks**, showing  $p_{\text{T}} > 2 \text{ GeV}$

(26.6, -0.44, -0.89), matched to  $\pi^+$

(18.7, -0.50, -0.86), matched to  $\pi^-$

(10.5, -0.46, -0.85), matched to  $\pi^+$

(9.2, -0.58, -0.83), matched to  $\pi^-$

(7.5, -0.66, -0.91), matched to  $\pi^-$

(7.0, -0.67, -0.75), matched to p

(6.8, -0.54, -0.91), matched to  $\pi^-$

(6.7, -0.56, -0.77), matched to  $K^+$

(6.3, 1.42, -0.43), matched to  $\pi^+$

(4.4, -0.65, -0.70), matched to  $\bar{p}$

(4.2, -0.55, -0.80), unmatched

(3.6, 1.86, -2.92), unmatched

(3.5, 1.21, -0.31), matched to  $\pi^-$

(3.3, -0.69, -0.81), matched to  $K^-$

(3.3, -0.59, -0.94), matched to  $\pi^+$

(2.7, 0.35, 0.02), matched to  $\pi^+$

(2.1, -1.04, -2.53), matched to  $\pi^-$

(2.1, -1.30, -2.14), unmatched

(2.1, -0.55, -0.82), unmatched

(2.0, 0.37, 0.35), matched to  $\pi^-$

**21 j1 tracks**

(26.6, -0.44, -0.44, -0.89), matched to  $\pi^+$

(18.7, -0.50, -0.50, -0.86), matched to  $\pi^-$

(10.5, -0.46, -0.46, -0.85), matched to  $\pi^+$

(9.2, -0.58, -0.58, -0.83), matched to  $\pi^-$

(7.5, -0.66, -0.66, -0.91), matched to  $\pi^-$

(7.0, -0.67, -0.67, -0.75), matched to p

(6.8, -0.54, -0.54, -0.91), matched to  $\pi^-$

(6.7, -0.56, -0.56, -0.77), matched to  $K^+$

(4.4, -0.65, -0.65, -0.70), matched to  $\bar{p}$

(4.2, -0.55, -0.55, -0.80), unmatched

(3.3, -0.69, -0.69, -0.81), matched to  $K^-$

(3.3, -0.59, -0.59, -0.94), matched to  $\pi^+$

(2.1, -0.55, -0.55, -0.82), unmatched

(1.6, -0.62, -0.62, -1.00), unmatched

(1.6, -0.58, -0.59, -1.03), matched to  $\pi^-$

(1.5, -0.46, -0.46, -0.65), matched to  $\pi^+$

(1.5, -0.39, -0.40, -0.89), matched to  $\pi^+$

(1.3, -0.79, -0.79, -1.09), matched to  $\bar{p}$

(1.1, -0.72, -0.72, -1.17), matched to  $\pi^+$

(0.9, -0.33, -0.34, -0.81), matched to  $\pi^-$

(0.5, -0.51, -0.53, -1.21), unmatched

**17 j1 charged hadrons**

(26.0, -0.44, -0.44, -0.89),  $\pi^+$

(18.1, -0.50, -0.50, -0.86),  $\pi^-$

(10.7, -0.46, -0.46, -0.85),  $\pi^+$

(9.5, -0.58, -0.58, -0.83),  $\pi^-$

(8.1, -0.65, -0.65, -0.91),  $\pi^-$

(7.2, -0.67, -0.67, -0.75), p

(7.2, -0.54, -0.54, -0.91),  $\pi^-$

(6.9, -0.55, -0.56, -0.77),  $K^+$

(4.3, -0.64, -0.65, -0.70),  $\bar{p}$

(3.3, -0.59, -0.59, -0.94),  $\pi^+$

(3.3, -0.68, -0.69, -0.81),  $K^-$

(1.6, -0.59, -0.59, -1.04),  $\pi^-$

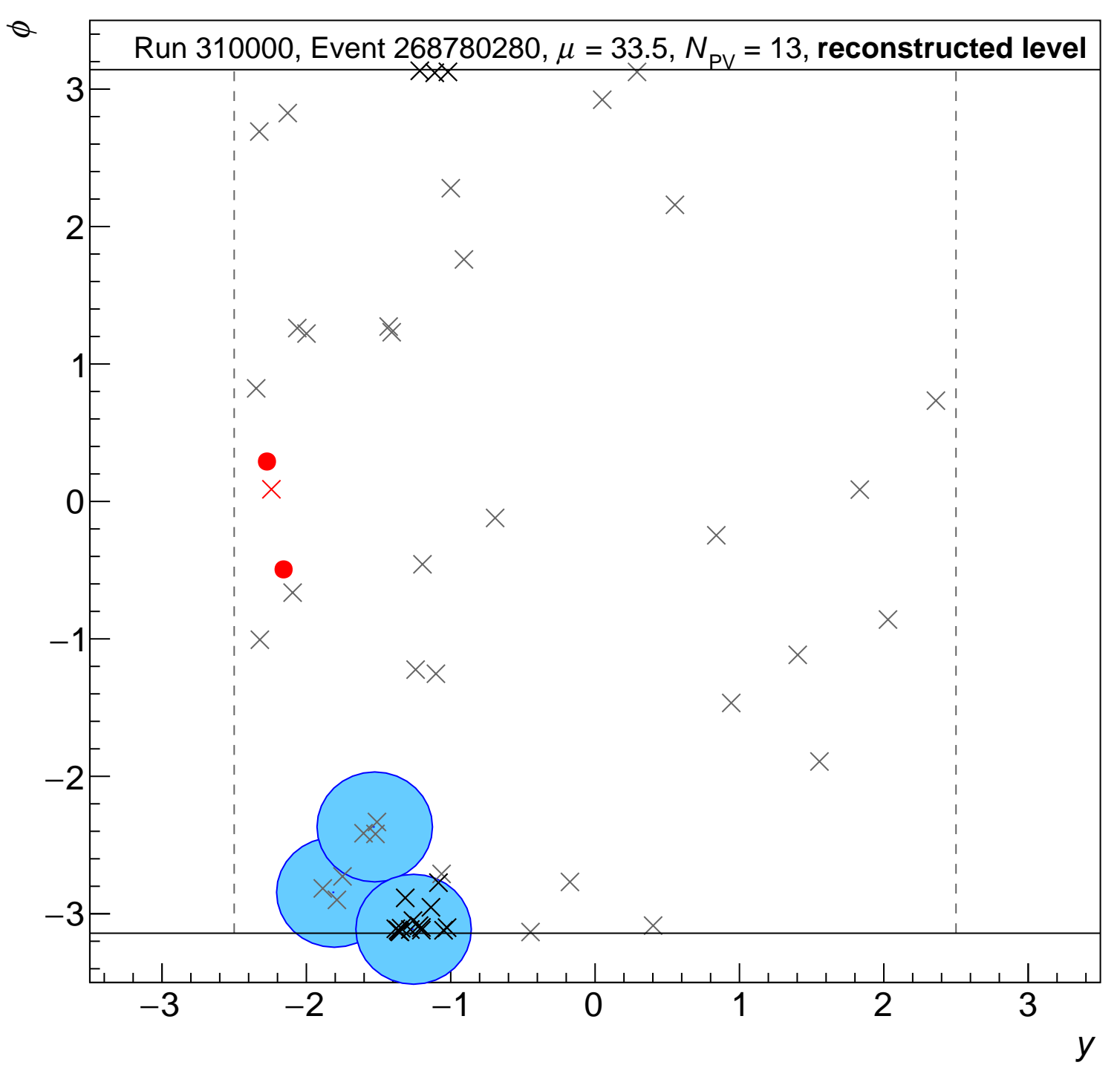
(1.5, -0.46, -0.46, -0.65),  $\pi^+$

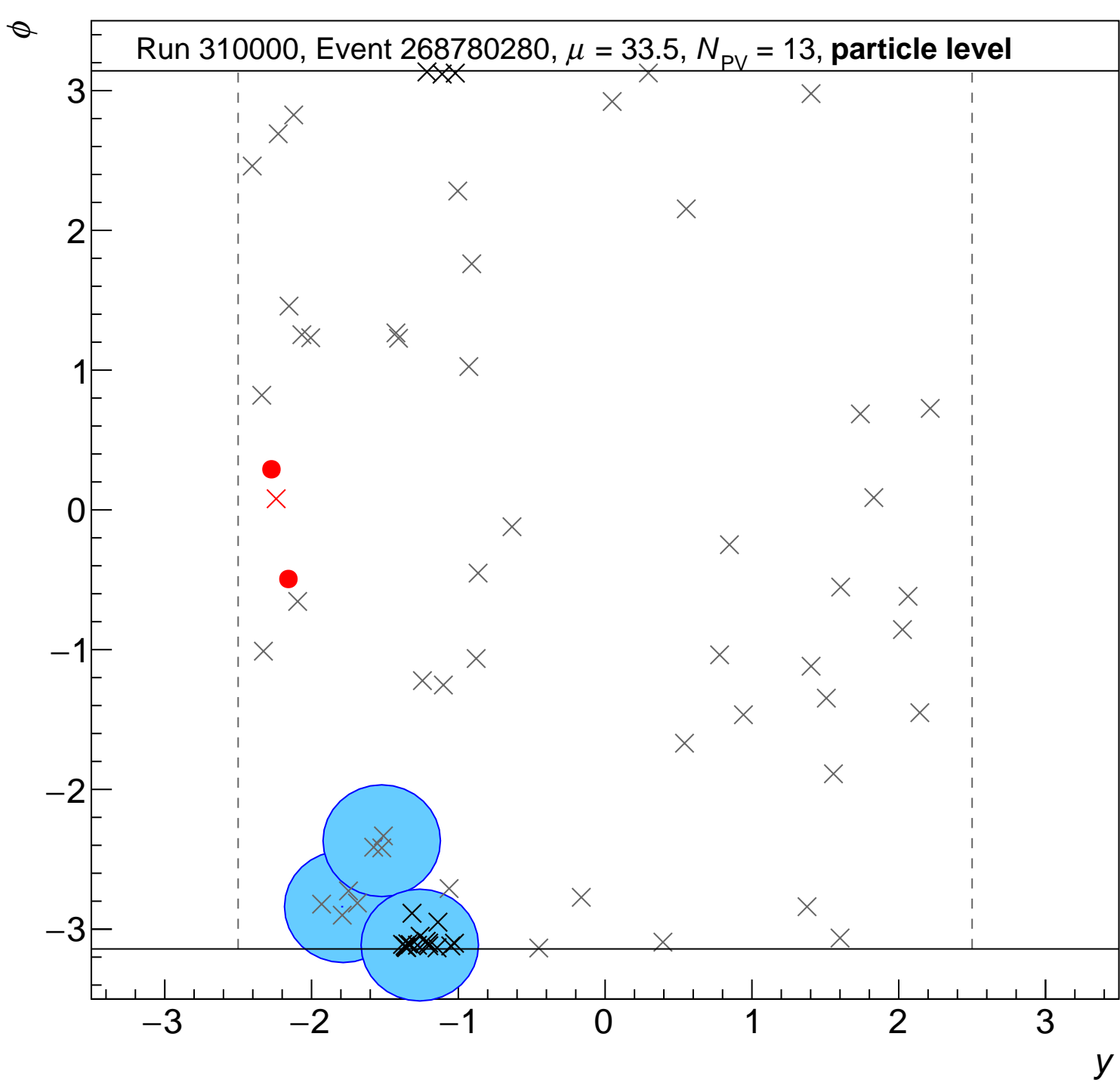
(1.5, -0.39, -0.39, -0.89),  $\pi^+$

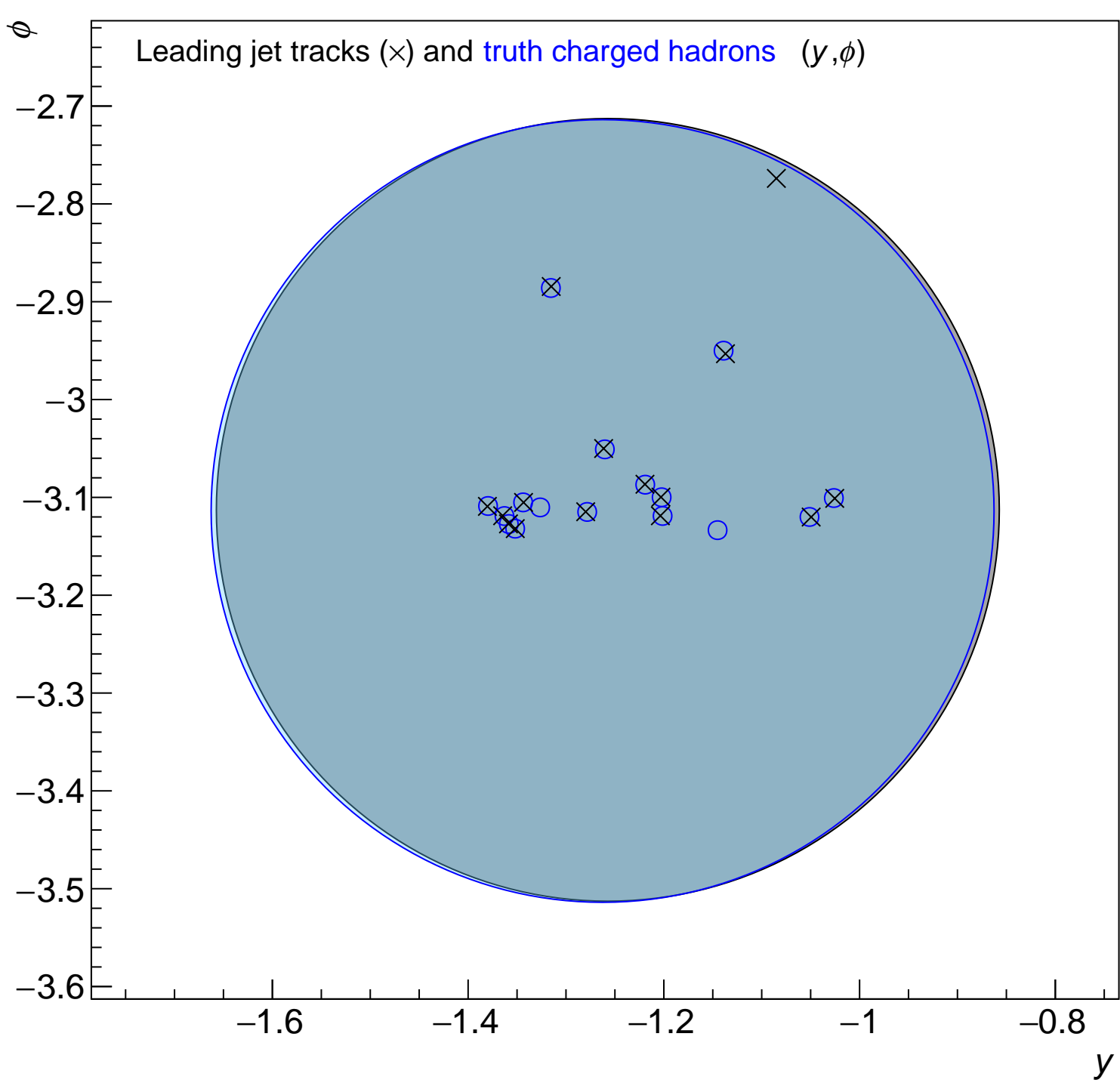
(1.2, -0.65, -0.79, -1.09),  $\bar{p}$

(1.1, -0.71, -0.72, -1.18),  $\pi^+$

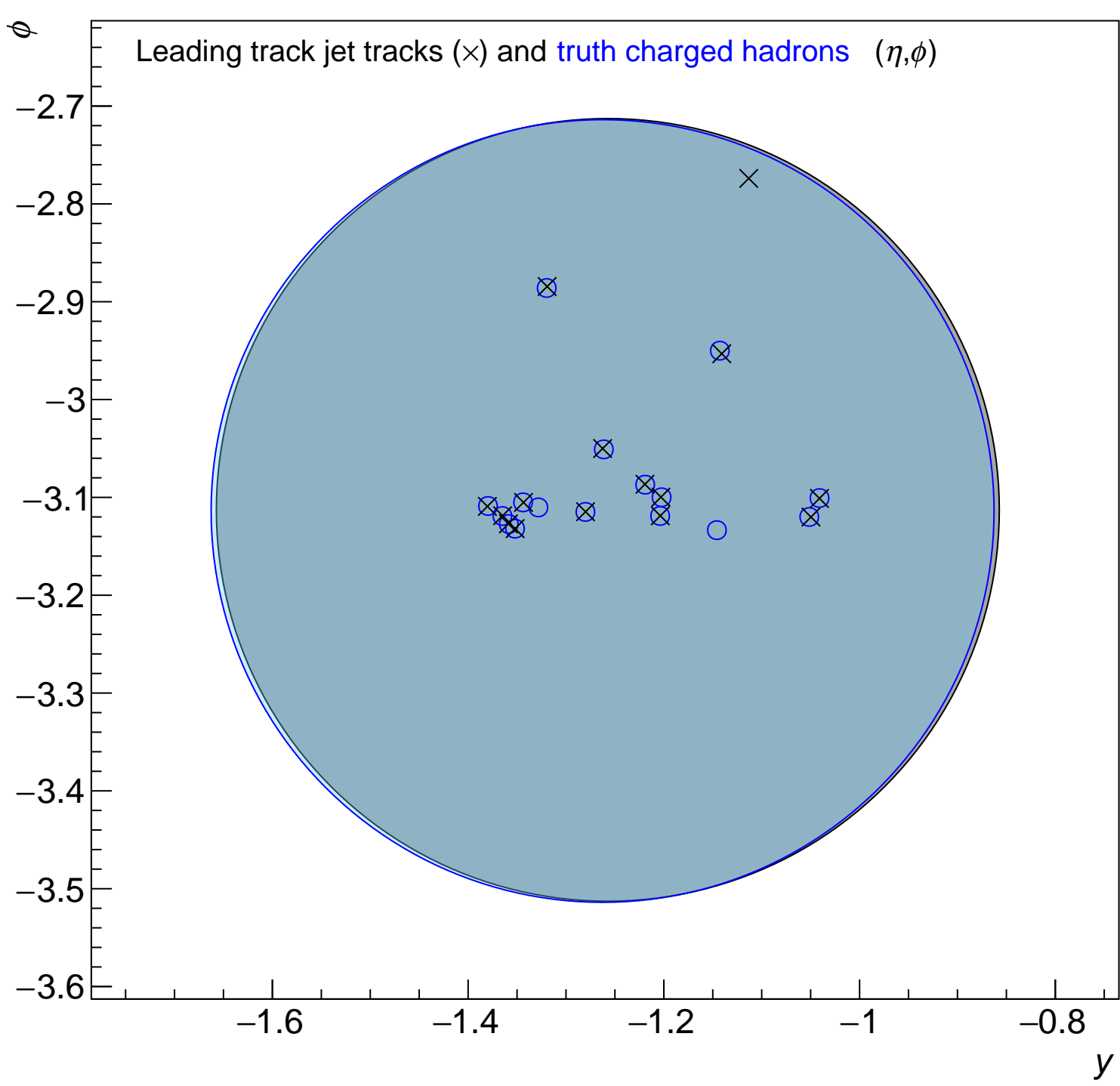
(1.0, -0.33, -0.34, -0.80),  $\pi^-$











Run 310000, Event 268780280,

$\mu = 33.5$ ,  $N_{\text{PV}} = 13$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(93.0, 252, -2.24)

(95.8, 263.3, -2.24)

$\Delta\phi(\text{ll}, j1) = -3.08$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.01$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(193.5, -2.27, 0.29)

(74.6, -2.16, -0.49)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(205.1, -2.27, 0.29)

(74.8, -2.16, -0.49)

**3 truth jets**,  $p_{\text{T}} > 5$

(171.7, -1.26, -3.11)

(15.3, -1.52, -2.37)

(6.0, -1.78, -2.84)

**3 reco jets**,  $p_{\text{T}} > 5$

(153.5, -1.26, -3.11)

(15.4, -1.53, -2.37)

(5.0, -1.81, -2.84)

**69 charged truth hadrons**

(18.6, -1.20, -3.10),  $\pi^-$

(18.1, -1.33, -3.11), PDG = -3222

(16.1, -1.38, -3.11),  $\pi^+$

(14.5, -1.21, 3.13),  $\pi^+$

(13.6, -1.36, -3.12), p

(13.3, -1.22, -3.09),  $\pi^-$

(12.1, -1.20, -3.12), p

(11.8, -1.36, -3.13),  $\pi^-$

(11.6, -1.34, -3.11),  $\pi^-$

(9.1, -1.51, -2.33),  $\pi^+$

(7.6, -1.28, -3.11),  $K^+$

(7.4, -1.11, 3.12),  $\pi^-$

(7.2, -1.35, -3.13),  $\pi^+$

(5.8, -1.05, -3.12),  $\pi^+$

(4.3, -1.52, -2.42),  $\pi^-$

(4.3, -1.02, 3.13),  $\pi^-$

(3.4, -1.15, -3.13),  $\pi^-$

(2.8, -1.26, -3.05),  $\pi^+$

(2.7, -1.79, -2.90),  $\pi^-$

**53 tracks**, showing  $p_{\text{T}} > 2$  GeV

(19.4, -1.20, -3.10), matched to  $\pi^-$

(15.9, -1.38, -3.11), matched to  $\pi^+$

(14.6, -1.21, 3.13), matched to  $\pi^+$

(14.4, -1.36, -3.12), matched to p

(13.2, -1.22, -3.09), matched to  $\pi^-$

(12.3, -1.20, -3.12), matched to p

(12.2, -1.34, -3.11), matched to  $\pi^-$

(12.0, -1.36, -3.13), matched to  $\pi^-$

(8.9, -1.51, -2.33), matched to  $\pi^+$

(7.5, -1.28, -3.11), matched to  $K^+$

(7.4, -1.11, 3.12), matched to  $\pi^-$

(7.2, -1.35, -3.13), matched to  $\pi^+$

(5.9, -1.05, -3.12), matched to  $\pi^+$

(4.7, -1.02, 3.13), matched to  $\pi^-$

(4.4, -1.52, -2.42), matched to  $\pi^-$

(2.9, -1.26, -3.05), matched to  $\pi^+$

(2.8, -1.79, -2.90), matched to  $\pi^-$

(2.0, -1.60, -2.41), matched to  $K^+$

**18 j1 tracks**

(19.4, -1.20, -1.20, -3.10), matched to  $\pi^-$

(15.9, -1.38, -1.38, -3.11), matched to  $\pi^+$

(14.6, -1.21, -1.21, 3.13), matched to  $\pi^+$

(14.4, -1.36, -1.36, -3.12), matched to p

(13.2, -1.22, -1.22, -3.09), matched to  $\pi^-$

(12.3, -1.20, -1.20, -3.12), matched to p

(12.2, -1.34, -1.34, -3.11), matched to  $\pi^-$

(12.0, -1.36, -1.36, -3.13), matched to  $\pi^-$

(7.5, -1.28, -1.28, -3.11), matched to  $K^+$

(7.4, -1.11, -1.11, 3.12), matched to  $\pi^-$

(7.2, -1.35, -1.35, -3.13), matched to  $\pi^+$

(5.9, -1.05, -1.05, -3.12), matched to  $\pi^+$

(4.7, -1.02, -1.02, 3.13), matched to  $\pi^-$

(2.9, -1.26, -1.26, -3.05), matched to  $\pi^+$

(1.4, -1.14, -1.14, -2.95), matched to  $\pi^+$

(1.4, -1.32, -1.32, -2.88), matched to  $\pi^-$

(0.7, -1.03, -1.04, -3.10), matched to  $\pi^-$

(0.5, -1.09, -1.11, -2.77), matched to  $\pi^-$

**19 j1 charged hadrons**

(18.6, -1.20, -1.20, -3.10),  $\pi^-$

(18.1, -1.33, -1.33, -3.11), PDG = -3222

(16.1, -1.38, -1.38, -3.11),  $\pi^+$

(14.5, -1.21, -1.21, 3.13),  $\pi^+$

(13.6, -1.36, -1.36, -3.12), p

(13.3, -1.22, -1.22, -3.09),  $\pi^-$

(12.1, -1.20, -1.20, -3.12), p

(11.8, -1.36, -1.36, -3.13),  $\pi^-$

(11.6, -1.34, -1.34, -3.11),  $\pi^-$

(7.6, -1.28, -1.28, -3.11),  $K^+$

(7.4, -1.11, -1.11, 3.12),  $\pi^-$

(7.2, -1.35, -1.35, -3.13),  $\pi^+$

(5.8, -1.05, -1.05, -3.12),  $\pi^+$

(4.3, -1.02, -1.02, 3.13),  $\pi^-$

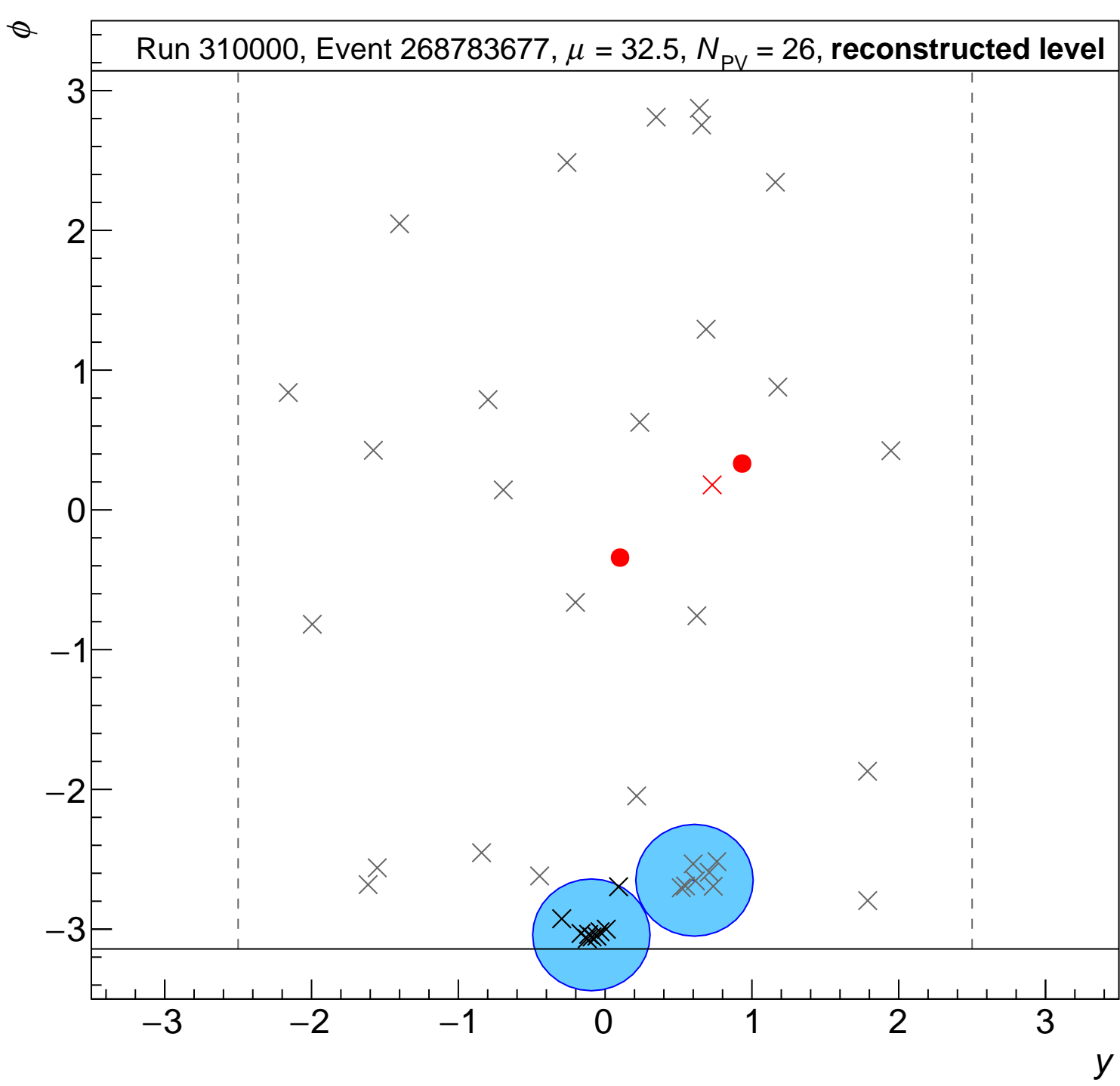
(3.4, -1.15, -1.15, -3.13),  $\pi^-$

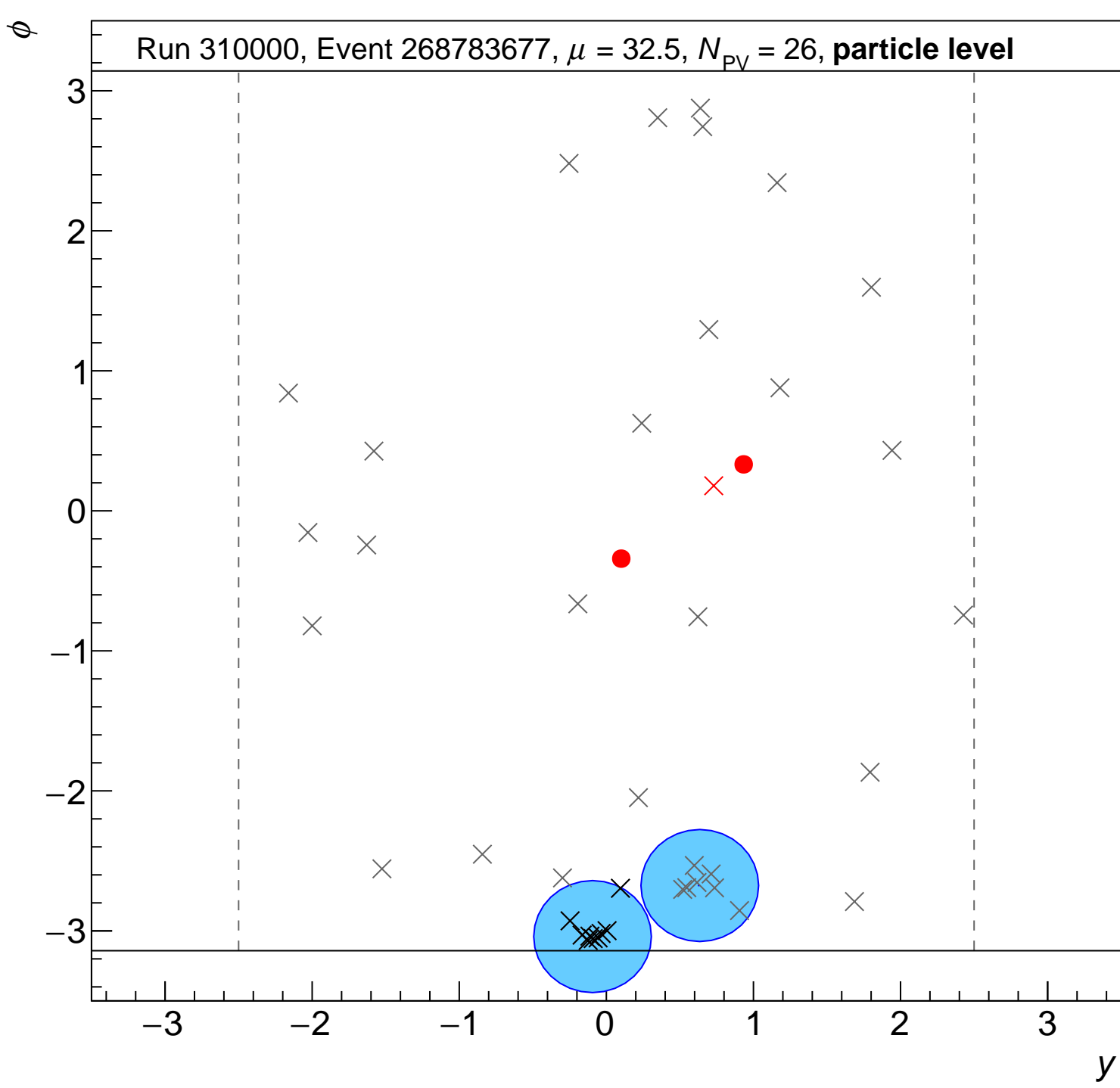
(2.8, -1.26, -1.26, -3.05),  $\pi^+$

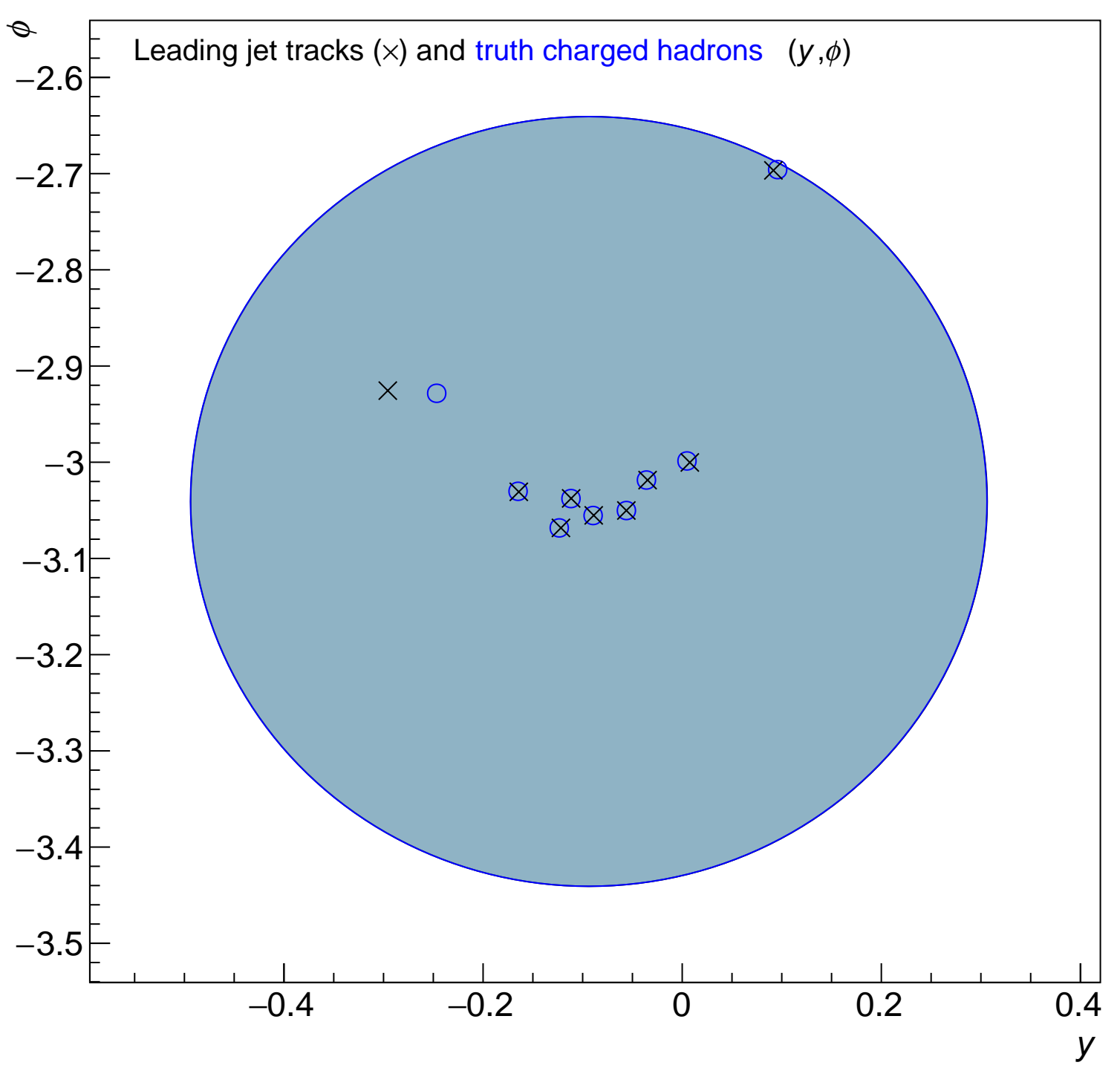
(1.4, -1.14, -1.14, -2.95),  $\pi^+$

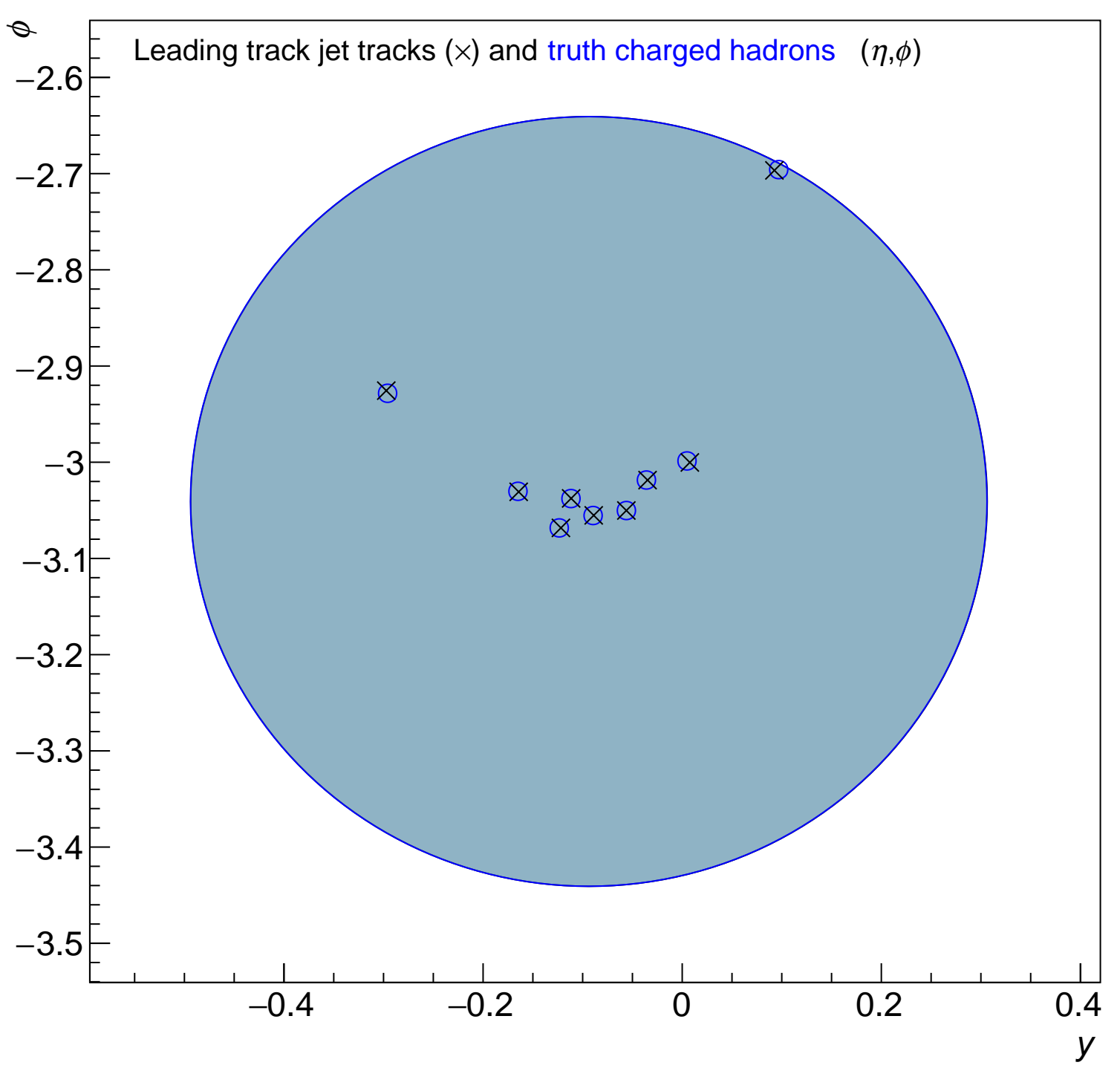
(1.4, -1.32, -1.32, -2.89),  $\pi^-$

(0.7, -1.03, -1.04, -3.10),  $\pi^-$









Run 310000, Event 268783677,

$\mu = 32.5$ ,  $N_{\text{PV}} = 26$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(90.3, 189, 0.73)

(91.3, 191.5, 0.73)

$\Delta\phi(\text{ll}, j1) = -3.06$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.00$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(151.2, 0.93, 0.33)

(46.2, 0.10, -0.34)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(152.7, 0.93, 0.33)

(46.8, 0.10, -0.34)

**2 truth jets**,  $p_{\text{T}} > 5$

(81.9, -0.09, -3.04)

(24.1, 0.64, -2.68)

**2 reco jets**,  $p_{\text{T}} > 5$

(82.6, -0.09, -3.04)

(22.4, 0.61, -2.65)

**40 charged truth hadrons**

(22.5, -0.11, -3.04),  $\pi^-$

(21.2, -0.09, -3.06),  $\pi^+$

(14.7, -0.06, -3.05),  $\pi^+$

(11.2, -0.12, -3.07),  $\pi^-$

(6.2, 0.55, -2.69),  $\pi^+$

(4.4, -0.04, -3.02),  $\pi^+$

(3.9, -0.16, -3.03),  $\pi^+$

(3.9, 0.74, -2.69),  $\pi^+$

(3.8, 0.60, -2.53),  $\pi^+$

(3.8, 0.52, -2.70),  $\pi^-$

(2.5, 0.91, -2.86),  $\pi^+$

(2.5, 0.62, -2.65),  $\pi^-$

(2.1, -1.53, -2.56),  $K^+$

**40 tracks**, showing  $p_{\text{T}} > 2$  GeV

(23.0, -0.11, -3.04), matched to  $\pi^-$

(20.9, -0.09, -3.06), matched to  $\pi^+$

(15.1, -0.06, -3.05), matched to  $\pi^+$

(11.3, -0.12, -3.07), matched to  $\pi^-$

(6.3, 0.55, -2.69), matched to  $\pi^+$

(4.4, -0.03, -3.02), matched to  $\pi^+$

(3.9, -0.16, -3.03), matched to  $\pi^+$

(3.8, 0.60, -2.53), matched to  $\pi^+$

(3.8, 0.52, -2.70), matched to  $\pi^-$

(3.8, 0.74, -2.69), matched to  $\pi^+$

(3.3, -1.40, 2.05), unmatched

(2.6, 0.61, -2.65), matched to  $\pi^-$

(2.2, -1.55, -2.56), matched to  $K^+$

**9 j1 tracks**

(23.0, -0.11, -0.11, -3.04), matched to  $\pi^-$

(20.9, -0.09, -0.09, -3.06), matched to  $\pi^+$

(15.1, -0.06, -0.06, -3.05), matched to  $\pi^+$

(11.3, -0.12, -0.12, -3.07), matched to  $\pi^-$

(4.4, -0.03, -0.03, -3.02), matched to  $\pi^+$

(3.9, -0.16, -0.16, -3.03), matched to  $\pi^+$

(1.8, 0.01, 0.01, -3.00), matched to  $\pi^-$

(1.4, -0.30, -0.30, -2.93), matched to p

(0.9, 0.09, 0.09, -2.70), matched to  $\pi^+$

**9 j1 charged hadrons**

(22.5, -0.11, -0.11, -3.04),  $\pi^-$

(21.2, -0.09, -0.09, -3.06),  $\pi^+$

(14.7, -0.06, -0.06, -3.05),  $\pi^+$

(11.2, -0.12, -0.12, -3.07),  $\pi^-$

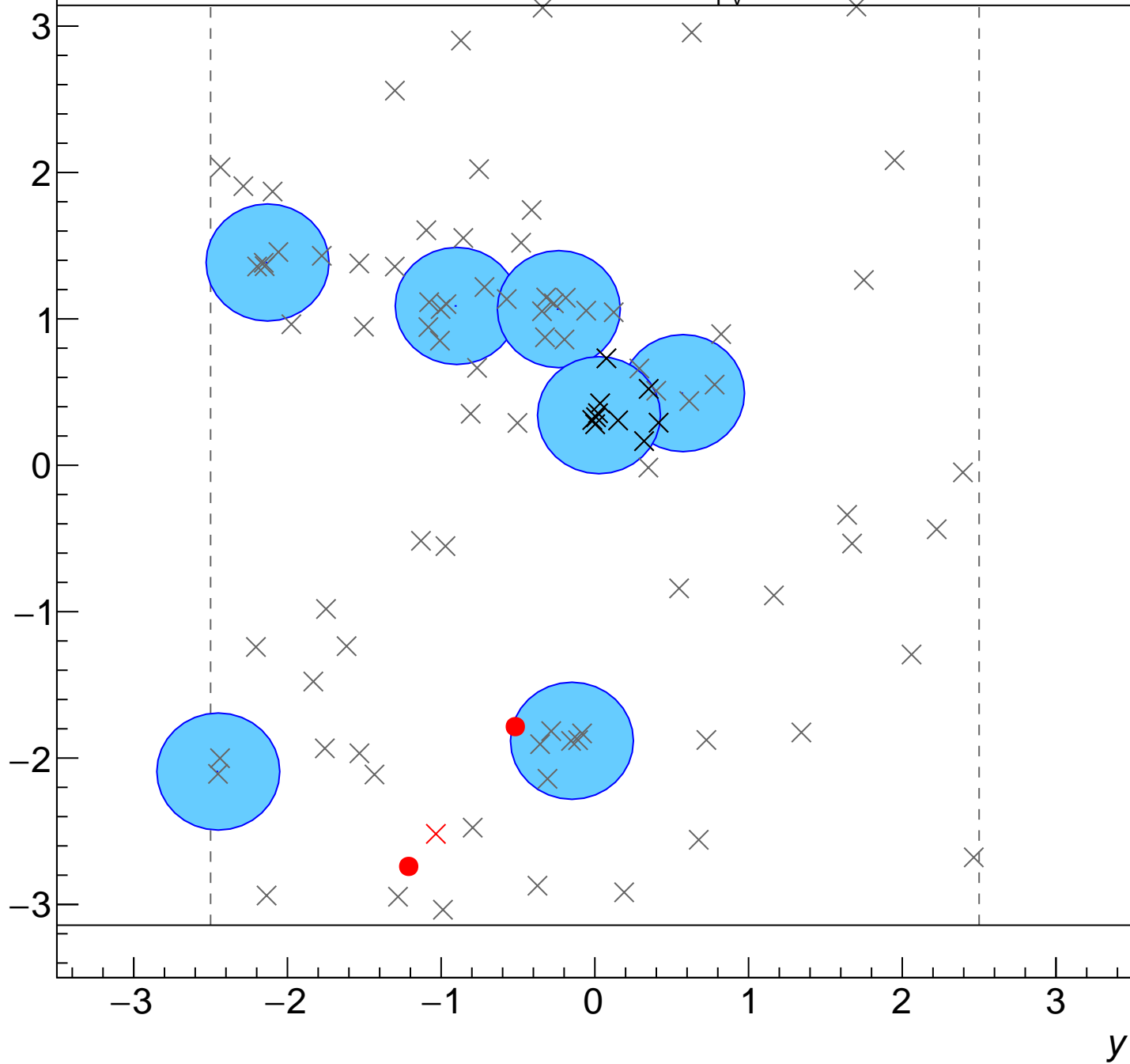
(4.4, -0.04, -0.04, -3.02),  $\pi^+$

(3.9, -0.16, -0.16, -3.03),  $\pi^+$

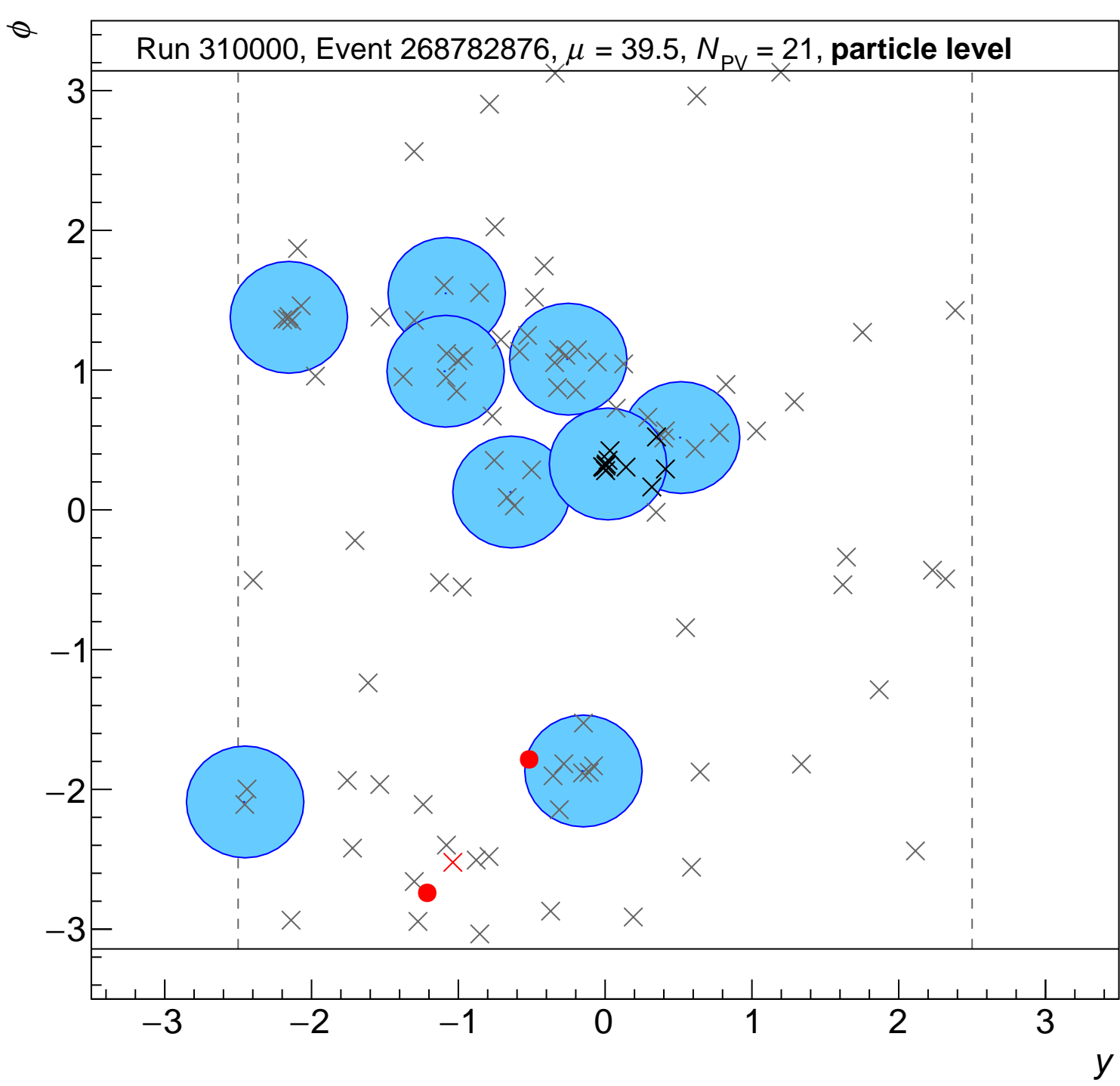
(1.8, 0.00, 0.00, -3.00),  $\pi^-$

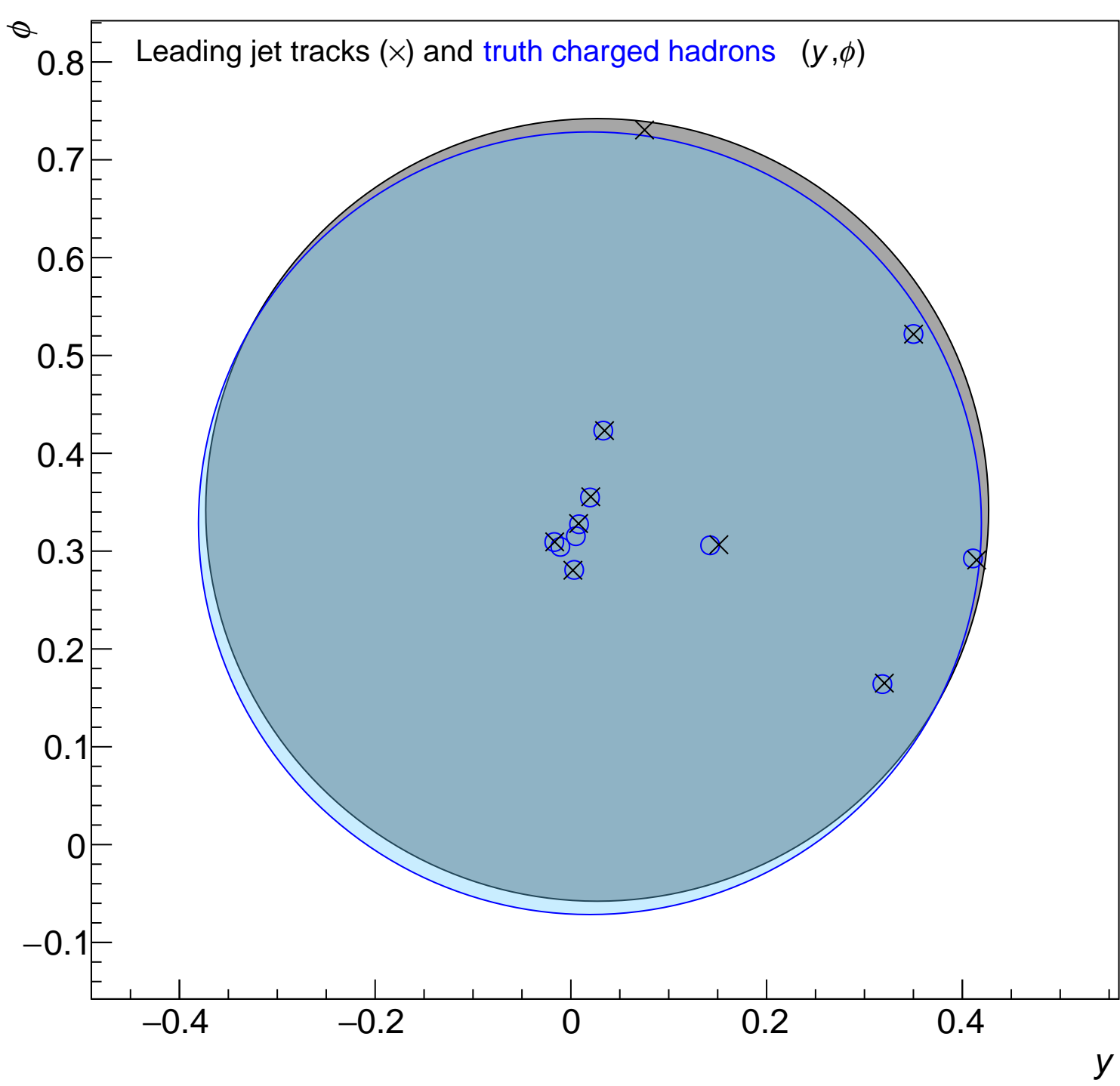
(1.4, -0.25, -0.30, -2.93), p

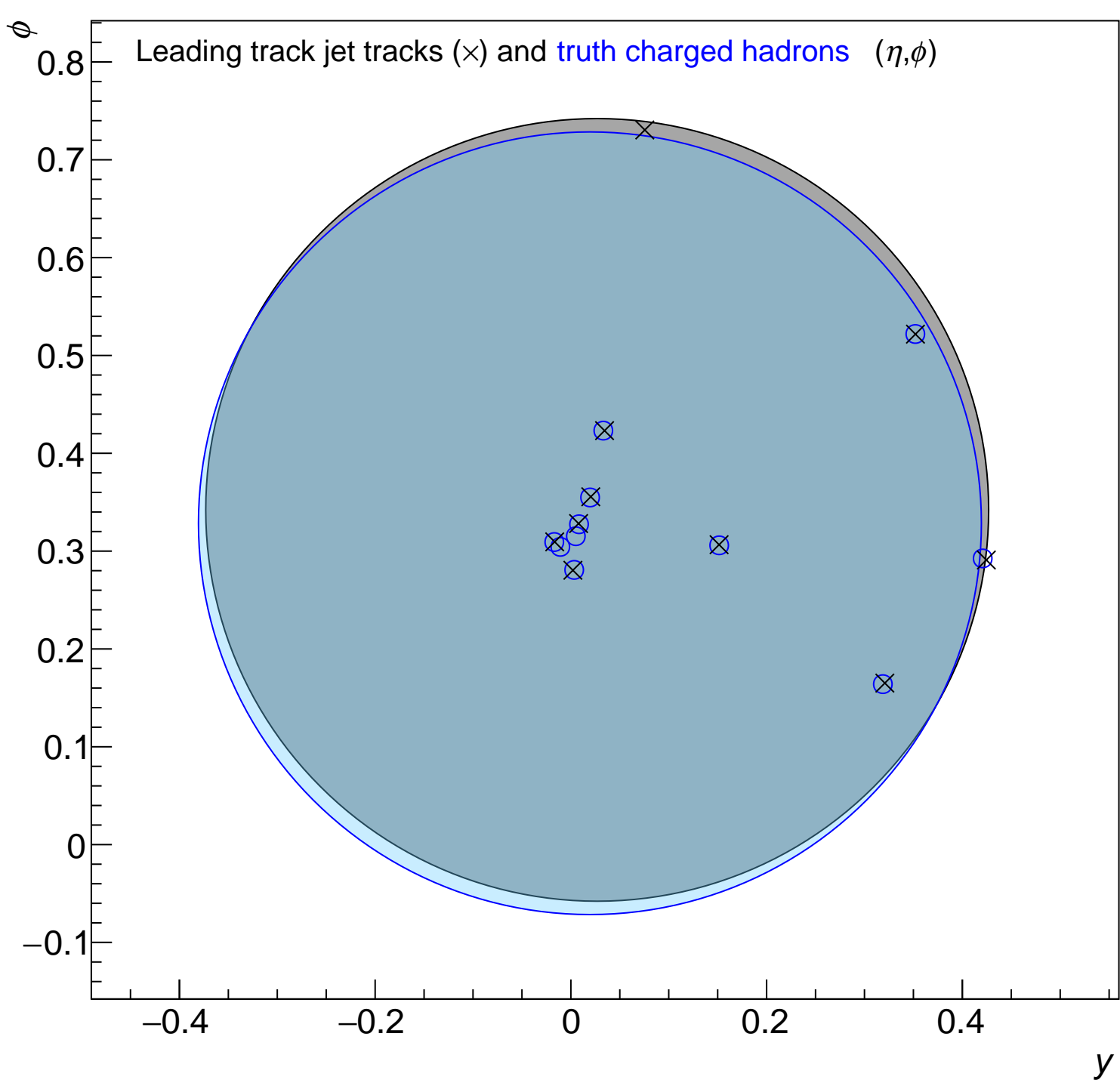
(0.9, 0.10, 0.10, -2.70),  $\pi^+$

$\phi$ Run 310000, Event 268782876,  $\mu = 39.5$ ,  $N_{\text{PV}} = 21$ , **reconstructed level**









Run 310000, Event 268782876,

$\mu = 39.5$ ,  $N_{\text{PV}} = 21$

Truth/reco ( $m_{\parallel}$ ,  $p_{\text{T},\parallel}$ ,  $y_{\parallel}$ )

(94.3, 174, -1.04)

(91.7, 168.0, -1.03)

$\Delta\phi(\text{ll}, j1) = -2.86$ ,  $\Delta R_{j1}^{\text{tru-rec}} = 0.02$

**2 truth muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(143.2, -1.21, -2.74)

(46.2, -0.52, -1.79)

**2 reco muons**, ( $p_{\text{T}}$ /GeV,  $y$ ,  $\phi$ )

(137.7, -1.21, -2.74)

(45.4, -0.52, -1.79)

**9 truth jets**,  $p_{\text{T}} > 5$

(134.1, 0.02, 0.33)

(19.2, -0.25, 1.08)

(19.2, -0.15, -1.87)

(15.3, -2.15, 1.38)

(9.3, 0.52, 0.52)

(6.3, -0.64, 0.13)

(6.1, -2.45, -2.09)

(5.2, -1.09, 0.99)

(5.0, -1.08, 1.55)

**7 reco jets**,  $p_{\text{T}} > 5$

(106.4, 0.03, 0.34)

(18.6, -0.15, -1.88)

(18.1, -0.23, 1.07)

(13.8, -2.13, 1.39)

(7.4, -0.90, 1.09)

(6.4, -2.45, -2.09)

(6.3, 0.57, 0.49)

**101 charged truth hadrons**

(37.7, 0.01, 0.33),  $\pi^-$

(24.1, 0.01, 0.32),  $\pi^-$

(19.3, -0.02, 0.31),  $\pi^+$

(14.3, 0.03, 0.42),  $\bar{p}$

(13.6, -0.01, 0.30), p

(11.0, 0.02, 0.35), p

(7.5, -0.19, 1.14),  $\pi^-$

(7.3, 0.00, 0.28),  $\pi^+$

(7.3, -0.11, -1.88),  $K^-$

(6.7, -0.15, -1.88),  $K^+$

(5.3, -2.15, 1.38),  $\pi^-$

(5.1, -2.45, -2.11),  $\pi^-$

(4.5, -2.20, 1.36),  $\pi^+$

(3.6, 0.61, 0.44),  $\pi^-$

(3.3, -0.62, 0.03),  $K^-$

(3.1, 0.41, 0.57),  $\Sigma^+$

(3.0, -1.10, 1.61),  $\pi^-$

(2.9, -0.71, 1.22),  $K^+$

(2.9, -0.20, 0.86),  $\pi^-$

(2.9, -2.14, 1.35),  $e^-$

(2.5, 0.14, 0.31),  $\bar{p}$

(2.5, 0.32, 0.16),  $\pi^+$

(2.5, -1.61, -1.24),  $\pi^-$

(2.3, -0.08, -1.83),  $K^+$

(2.2, -1.53, 1.38),  $\pi^+$

(2.2, -0.97, -0.55),  $\pi^+$

(2.1, -0.34, 1.05),  $\pi^+$

(2.0, 1.64, -0.34),  $\pi^-$

(2.0, -2.14, -2.94),  $\pi^-$

**92 tracks**, showing  $p_{\text{T}} > 2$  GeV

(46.4, 0.01, 0.33), matched to  $\pi^-$

(18.9, -0.02, 0.31), matched to  $\pi^+$

(14.6, 0.03, 0.42), matched to  $\bar{p}$

(10.9, 0.02, 0.36), matched to p

(7.4, -0.19, 1.14), matched to  $\pi^-$

(7.2, -0.11, -1.88), matched to  $K^-$

(7.0, 0.00, 0.28), matched to  $\pi^+$

(6.8, -0.15, -1.88), matched to  $K^+$

(5.4, -2.15, 1.38), matched to  $\pi^-$

(5.4, -2.45, -2.11), matched to  $\pi^-$

(4.9, -2.20, 1.36), matched to  $\pi^+$

(3.6, 0.61, 0.44), matched to  $\pi^-$

(3.1, -0.72, 1.22), matched to  $K^+$

(3.0, -0.20, 0.86), matched to  $\pi^-$

(3.0, -1.10, 1.61), matched to  $\pi^-$

(2.6, 0.15, 0.31), matched to  $\bar{p}$

(2.5, -1.62, -1.24), matched to  $\pi^-$

(2.5, 0.32, 0.17), matched to  $\pi^+$

(2.3, -0.08, -1.83), matched to  $K^+$

(2.2, -1.53, 1.38), matched to  $\pi^+$

(2.2, -0.97, -0.55), matched to  $\pi^+$

(2.0, -0.34, 1.05), matched to  $\pi^+$

(2.0, -2.14, -2.94), matched to  $\pi^-$

(2.0, 0.35, -0.02), matched to  $\pi^+$

**10 j1 tracks**

(46.4, 0.01, 0.01, 0.33), matched to  $\pi^-$

(18.9, -0.02, -0.02, 0.31), matched to  $\pi^+$

(14.6, 0.03, 0.03, 0.42), matched to  $\bar{p}$

(10.9, 0.02, 0.02, 0.36), matched to p

(7.0, 0.00, 0.00, 0.28), matched to  $\pi^+$

(2.6, 0.15, 0.15, 0.31), matched to  $\bar{p}$

(2.5, 0.32, 0.32, 0.17), matched to  $\pi^+$

(1.9, 0.08, 0.08, 0.73), matched to  $\pi^-$

(1.3, 0.35, 0.35, 0.52), matched to  $\pi^+$

(0.6, 0.41, 0.42, 0.29), matched to  $\pi^+$

**11 j1 charged hadrons**

(37.7, 0.01, 0.01, 0.33),  $\pi^-$

(24.1, 0.01, 0.01, 0.32),  $\pi^-$

(19.3, -0.02, -0.02, 0.31),  $\pi^+$

(14.3, 0.03, 0.03, 0.42),  $\bar{p}$

(13.6, -0.01, -0.01, 0.30), p

(11.0, 0.02, 0.02, 0.35), p

(7.3, 0.00, 0.00, 0.28),  $\pi^+$

(2.5, 0.14, 0.15, 0.31),  $\bar{p}$

(2.5, 0.32, 0.32, 0.16),  $\pi^+$

(1.3, 0.35, 0.35, 0.52),  $\pi^+$

(0.6, 0.41, 0.42, 0.29),  $\pi^+$