

X7 BEAM RATE AND PARTICLE COMPOSITION MEASUREMENTS

Pb target, COLL1 slit ± 5 mm, COLL2 slit ± 20 mm

| p(X7) (GeV/c) | Trig-1 rate per burst | 0 mm absorber | | 3 mm absorber | | 8 mm absorber | | Rate per 10^7 on Tr1 | Fraction of electrons |
|------------------|--------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------|--------------------------|
| | | Trig 4.5 | Trig 8 | Trig 4.5 | Trig 8 | Trig 4.5 | Trig 8 | | |
| -100 | $2.042 \cdot 10^7$ | $7.1 \cdot 10^4$ | $9.573 \cdot 10^4$ | $4.8 \cdot 10^4$ | $7.012 \cdot 10^4$ | $4.6 \cdot 10^4$ | $6.612 \cdot 10^4$ | $1.5 \cdot 10^4$ $+ 3 \cdot 10^4$ - | 0.32 (0.68) |
| -70 | $2.011 \cdot 10^7$ | $2.087 \cdot 10^4$ | $2.710 \cdot 10^4$ | $9.0 \cdot 10^3$ | $1.134 \cdot 10^4$ | $7.45 \cdot 10^3$ | $9.126 \cdot 10^3$ | $1.3 \cdot 10^4$ $+ 8.4 \cdot 10^3$ - | 0.66 (0.34) |
| -50 | $1.976 \cdot 10^7$ | $9.5 \cdot 10^3$ | $1.262 \cdot 10^4$ | $1.050 \cdot 10^3$ | $1.583 \cdot 10^3$ | $0.140 \cdot 10^3$ | $0.373 \cdot 10^3$ | $5.8 \cdot 10^3$ | 0.99 |
| -30 | $2.00 \cdot 10^7$ | $7.0 \cdot 10^3$ | $9.277 \cdot 10^3$ | $0.67 \cdot 10^3$ | $1.042 \cdot 10^3$ | $0.065 \cdot 10^3$ | $0.302 \cdot 10^3$ | $4.3 \cdot 10^3$ | > 0.99 |
| -20 | $1.94 \cdot 10^7$ | $5.1 \cdot 10^3$ | $6.82 \cdot 10^3$ | $0.50 \cdot 10^3$ | $0.874 \cdot 10^3$ | $0.04 \cdot 10^3$ | $0.338 \cdot 10^3$ | $3.1 \cdot 10^3$ | > 0.99 |
| -10 | $1.95 \cdot 10^7$ | $3.0 \cdot 10^3$ | $3.638 \cdot 10^3$ | $0.22 \cdot 10^3$ | $0.475 \cdot 10^3$ | $0.02 \cdot 10^3$ | $0.307 \cdot 10^3$ | $1.6 \cdot 10^3$ | > 0.99 |
| -5 | $1.94 \cdot 10^7$ | $1.6 \cdot 10^3$ | $1.944 \cdot 10^3$ | $0.08 \cdot 10^3$ | $0.292 \cdot 10^3$ | $0.008 \cdot 10^3$ | $0.314 \cdot 10^3$ | 770 | > 0.99 |
| +5 | $2.03 \cdot 10^7$ | $0.72 \cdot 10^3$ | $1.063 \cdot 10^3$ | $0.07 \cdot 10^3$ | $0.300 \cdot 10^3$ | $0.008 \cdot 10^3$ | $0.350 \cdot 10^3$ | 350 | > 0.99 |
| +10 | $1.50 \cdot 10^7$ | $1.29 \cdot 10^3$ | $1.62 \cdot 10^3$ | 92 | $0.332 \cdot 10^3$ | 8 | $0.27 \cdot 10^3$ | 900 | 0.98 |
| +30 | $1.58 \cdot 10^7$ | $1.29 \cdot 10^3$ | $1.85 \cdot 10^3$ | 130 | $0.324 \cdot 10^3$ | 16 | $0.29 \cdot 10^3$ | 900 | 0.97 |
| +50 | $1.52 \cdot 10^7$ | $8.16 \cdot 10^2$ | $1.25 \cdot 10^3$ | 86 | $0.12 \cdot 10^3$ | 20 | $0.32 \cdot 10^3$ | 600 | 0.95 |
| +100 | $1.58 \cdot 10^7$ | $1.58 \cdot 10^2$ | $0.37 \cdot 10^3$ | 38 | $0.08 \cdot 10^3$ | 25 | $0.34 \cdot 10^3$ | 80 | ≈ 0.70 |

- Trig-8 has 'dark current' of 320 counts for $2 \cdot 10^7$ on Trig-1, to be subtracted from the raw count rates listed
- XDWC efficiency $> 92\%$, hence Trig-8 rate reliable and Coinc Trig 4.5 undercounts. Use 95% of (Trig-8-300 counts) as total flux.
- The absorber reduces flux by factor 10 from 3 to 8 mm, therefore 1 mm gives a factor 0.63. Therefore 3 mm gives factor 4; 8 mm a factor 40 reduction in electron content
- The muon flux at high negative momenta is essentially independent of collimator openings.

Cu target, COLL1 slit ± 20 mm, COLL2 slit ± 20 mm

| p(X7) (GeV/c) | Trig-1 rate per burst | 0 mm absorber | | 3 mm absorber | | 8 mm absorber | | Rate per 10^7 on Tr1 | Fraction of pions |
|------------------|--------------------------|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|----------------------------------------|----------------------|
| | | Trig 4.5 | Trig 8 | Trig 4.5 | Trig 8 | Trig 4.5 | Trig 8 | | |
| -100 | $1.53 \cdot 10^7$ | $2.01 \cdot 10^4$ | $2.741 \cdot 10^4$ | $2.04 \cdot 10^4$ | $2.74 \cdot 10^4$ | $1.98 \cdot 10^4$ | $2.69 \cdot 10^4$ | $6.0 \cdot 10^3$ $+ 1.2 \cdot 10^4$ | 0.33 (0.67) |
| -70 | $1.57 \cdot 10^7$ | $4.53 \cdot 10^3$ | $5.69 \cdot 10^3$ | $4.48 \cdot 10^3$ | $5.58 \cdot 10^3$ | $4.15 \cdot 10^3$ | $5.17 \cdot 10^3$ | $2.9 \cdot 10^3$ $+ 1.0 \cdot 10^3$ | 0.75 (0.25) |
| -50 | $1.62 \cdot 10^7$ | $1.70 \cdot 10^3$ | $2.13 \cdot 10^3$ | $1.69 \cdot 10^3$ | $2.12 \cdot 10^3$ | $1.48 \cdot 10^3$ | $1.84 \cdot 10^3$ | $1.32 \cdot 10^3$ | ≥ 0.98 |
| -30 | $1.60 \cdot 10^7$ | $1.01 \cdot 10^3$ | $1.37 \cdot 10^3$ | $0.90 \cdot 10^3$ | $1.07 \cdot 10^3$ | $0.77 \cdot 10^3$ | $0.89 \cdot 10^3$ | $8.6 \cdot 10^2$ | 0.85-0.90 |
| -20 | $1.64 \cdot 10^7$ | $6.96 \cdot 10^2$ | $8.81 \cdot 10^2$ | $5.53 \cdot 10^2$ | $5.83 \cdot 10^2$ | $4.02 \cdot 10^2$ | $4.86 \cdot 10^2$ | $5.4 \cdot 10^2$ | 0.70-0.75 |
| -10 | $1.60 \cdot 10^7$ | $3.81 \cdot 10^2$ | $4.86 \cdot 10^2$ | $1.85 \cdot 10^2$ | $2.23 \cdot 10^2$ | $0.86 \cdot 10^2$ | $0.54 \cdot 10^2$ | $2.8 \cdot 10^2$ | 0.60-0.65 |
| -5 | $1.56 \cdot 10^7$ | $2.30 \cdot 10^2$ | $3.09 \cdot 10^2$ | $0.41 \cdot 10^2$ | $0.33 \cdot 10^2$ | - | - | $1.8 \cdot 10^2$ | ≤ 0.5 |
| +5 | $1.40 \cdot 10^7$ | $1.83 \cdot 10^2$ | $1.00 \cdot 10^2$ | $0.32 \cdot 10^2$ | $0.87 \cdot 10^2$ | - | - | $0.5 \cdot 10^2$ | ≤ 0.5 |
| +10 | $1.38 \cdot 10^7$ | $2.58 \cdot 10^2$ | $3.60 \cdot 10^2$ | $1.25 \cdot 10^2$ | $0.62 \cdot 10^2$ | $0.66 \cdot 10^2$ | $0.05 \cdot 10^2$ | $2.5 \cdot 10^2$ | 0.55-0.65 |
| +30 | $1.42 \cdot 10^7$ | $5.46 \cdot 10^2$ | $7.36 \cdot 10^2$ | $4.76 \cdot 10^2$ | $5.86 \cdot 10^2$ | $4.08 \cdot 10^2$ | $5.55 \cdot 10^2$ | $5.0 \cdot 10^2$ | ≥ 0.85 |
| +50 | $1.42 \cdot 10^7$ | $5.40 \cdot 10^2$ | $7.76 \cdot 10^2$ | $5.21 \cdot 10^2$ | $6.73 \cdot 10^2$ | $5.18 \cdot 10^2$ | $5.96 \cdot 10^2$ | $5.0 \cdot 10^2$ | ≥ 0.95 |
| +100 | $1.40 \cdot 10^7$ | $7.00 \cdot 10^2$ | $8.80 \cdot 10^2$ | $6.90 \cdot 10^2$ | $9.20 \cdot 10^2$ | $6.40 \cdot 10^2$ | $7.89 \cdot 10^2$ | $4.5 \cdot 10^2$ | ≥ 0.95 |

- Trig-8 has 'dark current' of 320 counts for $2 \cdot 10^7$ on Trig-1, to be subtracted from the raw count rates listed.
- The absorber scatters the pions and reduces therefore the flux measured at the end. The difference between 3 and 8 mm absorber is used to disentangle the pion losses from the electron content of the beam.
- The fraction of pions applies to the beam without absorber.
- The muon flux at high negative momenta is essentially independent of collimator openings.