

Efficiency and resolution studies of photon measurement for STAR

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Results are presented for inclusive photon yields from Au+Au collisions at RHIC in the recent Quark Matter 2001 conference¹, photons in the energy range from 50 MeV to 4 GeV have been detected by reconstructing conversion pairs in the STAR TPC. Energy resolution and detection efficiency are discussed in the poster.

GEANT² simulations, which include the full STAR detector geometry and material layout, were used to obtain these efficiency corrections.

The input photon distribution was flat in transverse momentum (p_T) and rapidity.

The p_T range stretches from $0 < p_T < 4$ GeV/c and the rapidity range is from $-2 < y < 2$. In the simulations, we applied the same cut with experiment for the track selection of electron and positrons, geometrical cut for photon reconstructed, and beam vertex cut.

The Fig. 1 illustrates the efficiency in a two-dimensional contour of p_T versus rapidity. The efficiency shows a drop around mid-rapidity due to shot pass length of electron and positron tracks.

The Fig. 2 displays the efficiency as a function of p_T within $|y| < 1.5$ and has not extrapolated to 4. The reconstruct efficiency shows p_T and rapidity dependences clearly. At low p_T , the electron and positron pair reconstruction efficiencies are dominant. Since low momentum track makes small spiral, the tracking efficiency is lower than high momentum tracks. Therefore, the efficiency of finding electron and positron pair is small.

Resolution studies were obtained by using the same GEANT simulations with the efficiency study. In the Fig. 3, p_{TMC} is input transverse momentum and p_{Trec} is reconstructed transverse momentum. The figure shows the resolution as a root mean square in each provided p_T bin. The p_T resolution is 3% up to 1GeV/c and less than 10% at 4GeV/c. The Fig. 4 shows rapidity resolution and the resolution is 0.0033 for $|y| < 1.5$.

Footnotes and References

1. Quark Matter 2001 Proceedings, Stony Brook, January 15-20, 2001.
2. GEANT 3.21 manual, CERN.

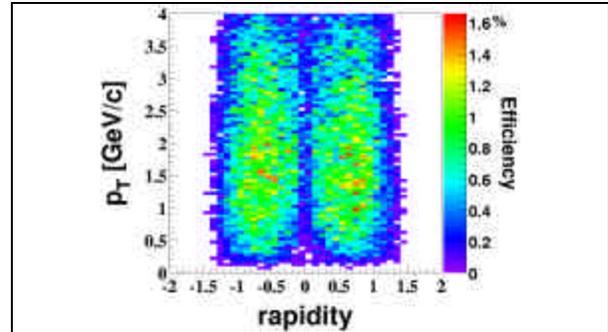


Fig. 1. The photon reconstruction efficiency as a function of p_T and rapidity.

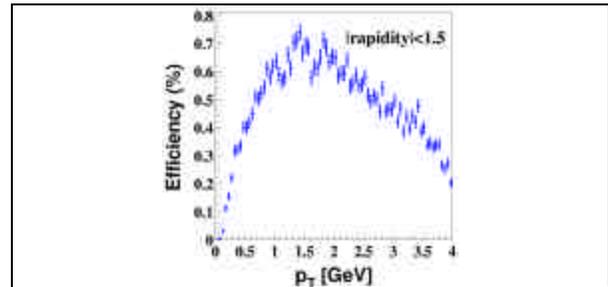


Fig. 2. The photon reconstruction efficiency as a function of p_T .

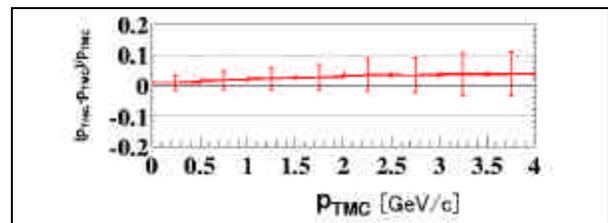


Fig. 3. The transverse momentum resolution of reconstructed photon.

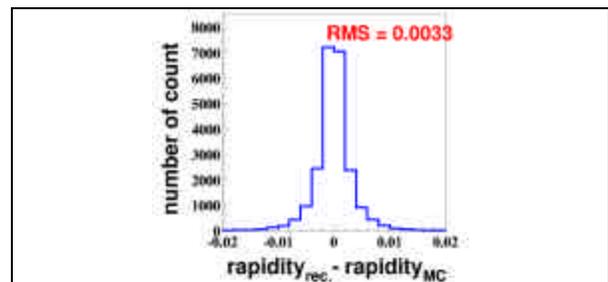


Fig. 4. The rapidity resolution of reconstructed photon.