High transverse momentum direct photons in p+Au collisions in PbGl
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Introduction
High transverse momentum (p_T) direct photons are penetrated
probes in relativistic heavy ion collisions: once produced, they leave the collision region virtually unaffected, even if a hot, dense partonic medium was formed. This is also the reason why direct photons are immune to the suppression observed for high p_T hadrons and jets in heavy ion collisions. The nuclear modi-
fication factor of high p_T photons is unity in Au+Au collisions if the p+p yields are scaled by the number of nucleons-nucleons collisions calculated from the Glauber-model [1]. We assume that high transverse momentum direct photons are a "standard candle" for initial hard scattering, and, per extension, for col-

lision geometry not only for p+p and Au+Au, but also for small-

ond collisions. If true, comparing the centrality dependence of direct photon and hadron production in p+Au is a robust test of the applicability of the Glauber model in such systems. The first measurement of high p_T photons in asymmetric collisions (d+Au) is shown in Fig. 1.

Figure 3: Nuclear modification factor for photons in d+Au collisions (R_{dAu}). The closed and open symbols show the results from the virtual- and real-photon measurements, respectively. Figure taken from [2].

In this poster we report on the status of the analysis of high transverse momentum direct photons in p+Au collisions at various centralities as well as of the direct photon / hadron ratios in large collisions. If true, comparing the centrality dependence of direct photon and hadron production in p+Au is a robust test of the applicability of the Glauber model in such systems. The first measurement of high p_T photons in asymmetric collisions (d+Au) is shown in Fig. 1.

Figure 4: Two-dimensional distribution of R_{dAu} at <3σ. The percentage in each box shows the percentage of e^+e^- in each box compared to the black box [15]. % bias and % dependent cut.

Timing calibration
Accurate timing information in the EMCal is important for two reasons: it helps to suppress contamination of the photon sample by hadrons, and to eliminate pile-up events. The time-of-flight (ToF) is calculated as

T_{ToF} = T_{DC}/T_{PID} = \sum_{i=1}^{n} \frac{E_{i}}{\gamma_{i}i} \cdot \frac{(1 - \gamma_{i}^2)}{2} \cdot \frac{1}{\gamma_{i}^2}.

where T_{DC} is the raw ToF, T_{PID} is the corrected ToF, and \gamma is the Lorentz factor of the particles. The first correction takes into account the position of the beam-beam counter (BBC). After all corrections, ToF is shifted to 0 for photons in order to simplify the analysis. The widths per sector of the ToF distributions before and after calibration are tabulated in Table 1 and a typical distribution is shown in Fig. 3.

Figure 5: Invariant mass of real (blue) and scaled mixed (red) events (top). Energy from the residual background (middle). The net (red) peak (bottom).

Conclusions
We reported on the status of the analysis of high p_T direct pho-

tons - along a re-analysis of neutral pions - in p+p and Au+Au collisions at RHIC. The timing calibration has been improved and the PID cuts tightened, because inclusive photons are more sensitive to detector effects than γ-s. So far only raw yields are available, the necessary corrections are work in progress. The irre-

ducible (statistical) uncertainties alone would allow to test the isospin effect as well as the applicability of the Glauber-model up to at least 17 GeV/c.

References