the jet axis, and $E_{\rm jet}$ is the jet total energy. The reconstructed jet transverse energy is on average about 20% larger than the generated jet transverse energy, mostly because of the sharply decreasing jet yield with increasing transverse energy and the jet transverse energy resolution. The resolution has been studied by Monte Carlo simulation and by using transverse momentum balance in a sample of dijet events [12,17]. The reconstructed jet transverse energy has been corrected, and residual effects are accounted for in the systematic uncertainties. The distribution of z, after this correction, is shown in Fig. 3(a). The signal in this spectrum corresponds to 72 ± 25 counts. The uncertainties represented by the bars are statistical and the brackets indicate the contribution caused by combinatorial background subtraction. No corrections were made here for trigger effects and reconstruction efficiency. The average D^* p_T is $\sim$3 GeV/c for $0.2 < z < 0.5$, and $\sim$6 GeV/c for $z > 0.5$. The average D^* reconstruction efficiency from simulation, shown in Fig. 3(b), is found to increase with increasing z. The trigger efficiency largely cancels in the measurement of the production ratio $N(D^*)/N(\text{jet})$ of interest here. However, the JP trigger condition preferentially selects jets with large electromagnetic energy. It thus disfavors jets containing the hadronic decay products of the D^* mesons, in particular, for high z. The effects of this trigger bias were studied by comparing the simulated jet yields with and without the JP trigger condition. Their ratio is found to be constant below $z \sim 0.5$ and decreases rapidly for larger z, as expected. The green band in Fig. 3(a) was obtained by simulating only the direct charm flavor creation processes, $gg \to c\bar{c}$ and $q\bar{q} \to c\bar{c}$, in PYTHIA and passing the results through the STAR detector response simulation. The simulated data were analyzed in the same way as the real data and were normalized using the measured total charm production cross section [21]. Only a small fraction of the generated events containing D^* mesons with $z > 0.5$ satisfies the JP trigger condition. To within the large uncertainties, good agreement is found with the D^* data at high z, where the production of charmed hadrons is expected to be dominated by charm quark fragmentation. The excess observed in the data at smaller z can be ascribed to production processes that are not included in the simulation, such as gluon splitting.

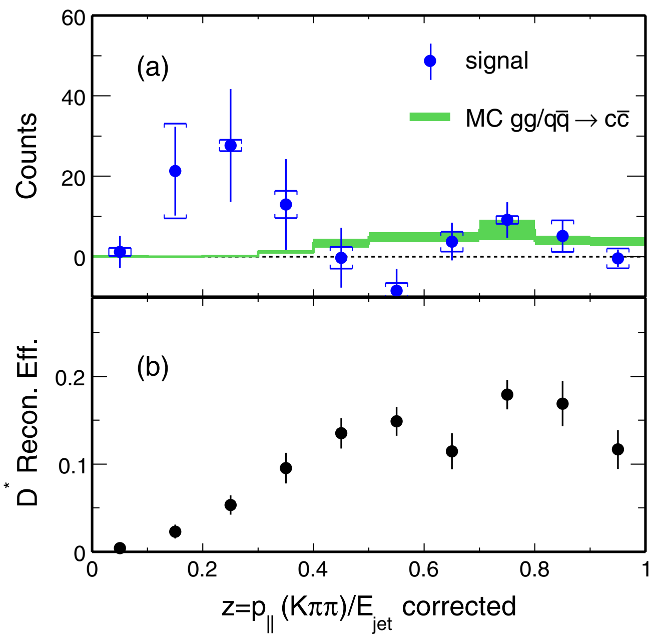

FIG. 3 (color online). (a) The distribution of the D^* longitudinal momentum fraction z in jets from JP triggered data. The size of the statistical uncertainties is indicated by the bars and the size of the background-subtraction systematic by the brackets. No corrections were applied for trigger effects and D^* reconstruction efficiency; however, the observed jet momenta and hence z were corrected for the detector response. The data at large z are compared with a Monte Carlo simulation of charm creation through $gg/q\bar{q} \to c\bar{c}$. (b) The average D^* reconstruction efficiency versus z.

The ratio $N(D^*)/N(\text{jet})$ was determined for the region $0.2 < z < 0.5$. For $z < 0.2$, the D^* reconstruction efficiency is low, and for $z > 0.5$, the JP trigger is strongly biased against jets with D^* mesons that decay into charged hadrons. After correcting for the D^* reconstruction efficiency, shown in Fig. 3(b), and the decay branching ratio of $(67.7 \pm 0.5)\%$ for $D^{*+} \to D^0 \pi_s^+$ and of $(3.89 \pm 0.05)\%$ for $D^0 \to K^- \pi^+$ [14], we obtain $N(D^{*+} + D^{*-})/N(\text{jet}) = 0.015 \pm 0.008(\text{stat}) \pm 0.007(\text{sys})$ for $0.2 < z < 0.5$ and a mean jet transverse energy of $\langle E_T \rangle = 11.5$ GeV. The estimated statistical uncertainty includes the statistical uncertainty in the simulations. The main contributions to the systematic uncertainty are estimated to originate from the jet definition and selection ($\sim 35\%$), from trigger bias ($\sim 18\%$), from D^* combinatorial background ($\sim 10\%$), and from the D^* reconstruction efficiency ($\sim 10\%$). The uncertainties associated with the jet definition and selection were estimated by varying the accepted primary vertex range, the jet η range, and the criteria used to reduce the effects of event pileup and beam background. The effects from trigger bias were assessed by Monte Carlo simulation. The size of the background uncertainty was estimated by comparing the results obtained with the different background-subtraction methods. The uncertainty in the D^* reconstruction efficiency was estimated by varying the daughter particle track quality criteria. The contributions were combined in quadrature to obtain the total systematic uncertainty estimate.

To estimate the rate of gluon splitting into charm pairs, $R_{g\to c\bar{c}}$, from the ratio $N(D^*)/N(\text{jet})$, one needs to correct for the unmeasured z region, the fraction of charm quarks that fragment into D^*, and the fraction of gluon jets in the sample. The fraction of gluon jets in the data was estimated to be 60% from PYTHIA simulations and from next-to-leading-order pQCD evaluation [22]. A 10% uncertainty is included as a systematic contribution in $R_{g\to c\bar{c}}$. The $c \to D^{*+}$ and $\bar{c} \to D^{*-}$ fraction is taken to be $(22.4 \pm 2.8)\%$