**ABSTRACT**

The A-jet families of the Brazil-Japan Collaboration on Chacaltaya Emulsion Chamber Experiments are analyzed by the study of jets which are reconstructed by a grouping procedure. It is demonstrated that large-$E_{JR}$ events are characterized not only by small number of jets and two-jet like asymmetric shape, i.e. the binocular events, but also by the other type. This type has a larger number of jets and more symmetrical shape in the $p_t$ plane.

**INTRODUCTION**

Event shape is examined by using the following two quantities:

a) energy-weighted distance from the center of a family of reconstructed jet, $E_j R_j$(TeVcm),

b) symmetry coefficient $b_j$ of jet, as defined

$$b_j = \frac{\langle \sum E_{j1} Y_{j1} \rangle_{\min}}{\langle \sum E_{j1} X_{j1} \rangle_{\max}}.$$ 

The symmetry coefficient measures azimuthal symmetry, which will have a value of 0 for the case of in-line event and of 1 for the completely symmetrical azimuthal distribution. All the quantities with a letter of $J$ are obtained after a grouping procedure to reconstruct jets. The energy weighted distance used is defined as $X_{ij} = R_{ij} E_i E_j/(E_i + E_j)$ and the cut-off value $X = 25$ TeVcm as usual. For this grouping procedure cascades with $E > 2$ TeV are used, $\gamma$-ray and hadronic components are treated equally and energies of hadronic cascades are used without correction of $K_{\gamma}$.

**RESULT**

To grasp gross features of the A-jet families, are used all the 218 A-jet families including hadron-rich and exotic events. After the jet-grouping, 215 events have more than one jet. Then $E_j R_j$ and the symmetry coefficient are calculated for each event.

We can see from Fig.1 that $E_j R_j$ distribution has a peak at around 20 TeVcm and a very long tail over 300 TeVcm. On the other hand the $b_j$ distribution is almost flat with a sharp peak at around $b_j \approx 0$. This sharp peak should include the contributions of the binocular events and some excess
of the experimental data can be seen at $b_J$ near to 1, comparing with the tendency of the Monte-Carlo simulation. While we can see the correlation between $b_J$ and $E_R$ exists, the dependence of $b_J$ on $E_R$ is shown clearly in Fig. 2, in which $b_J$ distributions are given separately for three intervals of $E_R$. As increasing $E_R$, the fraction of $b_J=0$ is rising. It means that large $E_R$ is realized by two-jet like events, i.e. binocular-type events. We note that inspite of the very rapid decreasing of the fraction towards larger $b_J$'s there exist non-zero experimental data at $b_J$ near to 1 even at the highest-$E_R$ group.

The correlation between number of jet $N_J$ and $E_R$ as given in Fig. 3 shows that larger $E_R$'s are shared by less number of jets. That is large $E_R$ region is occupied by binocular-type events. And also some events are found to have very large $N_J$ even at the highest-$E_R$ group.

It may be concluded that there exist those A-jet families which have large and comparable $E_R$, with the binocular events, but which contain many jets so as to give rise to very symmetrical azimuthal distribution. The reconstructed jets with the use of the cut-off value $\chi_c=25$ TeVcm seem to have a jet-size less than the actual size of the two clumps, because the $N_J$ distribution of the group $E_R>80$ TeVcm has a rather broad peak between 2 and 10.

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REFERENCES

Fig. 1 The scatter plot of symmetry coefficient $b_j/1/2$ of jet vs. $E_jR_j$ of the A-jet families.

Fig. 2 The symmetry coefficient $b_j$ distribution.

Fig. 3 The distribution of number of jet.