there $\sqrt{s}$ is the mass center energy of the e^+e^- collisions. In practical measurement and calculation, one does not know which pair of particles with opposite charge have fractional charge. The momenta and mass of any one pair of particles with opposite charge can be adjusted so that the event satisfies the conservation law of momentum and energy. It should be noted that $\vec{P}_{\rm r}({\rm tot})$ is a vector with three components, one cpmponent can be used to derive q, the two others can be used to suppress events from the first case because they can not satisfy the conservation law of three components simultaneously while events with fractional charge particles can. The procedure is repeated for all events in the data sample and the parameter set of $(q,\ m_f)$ is obtained. Then the parameter set is plotted into a two dimension distribution. For the first case, $(q,\ m_f)$ are a set of random numbers, but for the latter case, they should concentrate at one or more points if there are one or more fractional charge particles in the data sample. If fractional charge particles carry continuum masses, they should concentrate along one or more lines.

To suppress the contribution to $(q,\ m_f)$ from the first case further, the velocity v_m of each of the pair of particles, which is measured by the detector, can be compared with the derived velocity $v_{\rm r} = qP_{\rm n}/\sqrt{m_f^2+(qP_{\rm n})^2}$. They should be consistent, i.e. $v_{\rm r} - v_{\rm m} = 0$ if it is a real fractional charge particle. If the parameter set of $(q,\ v_{\rm r} - v_{\rm m})$ is plotted into two dimension distribution, the points corresponding to fractional charge particles should concentrate along q axis.

To search for events containing a pair of quarks $f1$ and $\overline{f}2$ with opposite charge qe and different masses m_{f1} and $m_{\overline{f}2}$ such $d\overline{s}$, the events are required to have even number of charged tracks. The total momentum, energy and one of the velocities

$$\vec{P}_{\rm r}({\rm tot}) = q\vec{P}_{\rm n}(f1) + q\vec{P}_{\rm n}(\overline{f}2)\ +\ {\rm others}\ = 0,$$

$$E_{\rm r}({\rm tot}) = \sqrt{(qP_{\rm n})^2(f1)+m_{f1}^2} + \sqrt{(qP_{\rm n})^2(\overline{f}2)+m_{\overline{f}2}^2}\ +\ {\rm others} = \sqrt{s},$$

$$v_{\rm r}(f1) = qP_{\rm n}/\sqrt{m_{f1}^2+(qP_{\rm n})^2(f1)} = v_{\rm m}(f1)$$

are used to derive q, m_{f1} and $m_{\overline{f}_2}$. Another velocity $v_{\rm r}(\overline{f}2) = qP_{\rm n}/\sqrt{m_{\overline{f}2}^2+(qP_{\rm n}/c)^2(\overline{f}2)} = v_{\rm m}(\overline{f}2)$ is used to suppress the contribution from the first case.

To search for events containing a pair of quarks $f1$ and $f2$ with same sign charge qe and $(1-q)e$ and different masses m_{f1} and m_{f2} such as $u\overline{d}$ and $u\overline{s}$, the events are required to