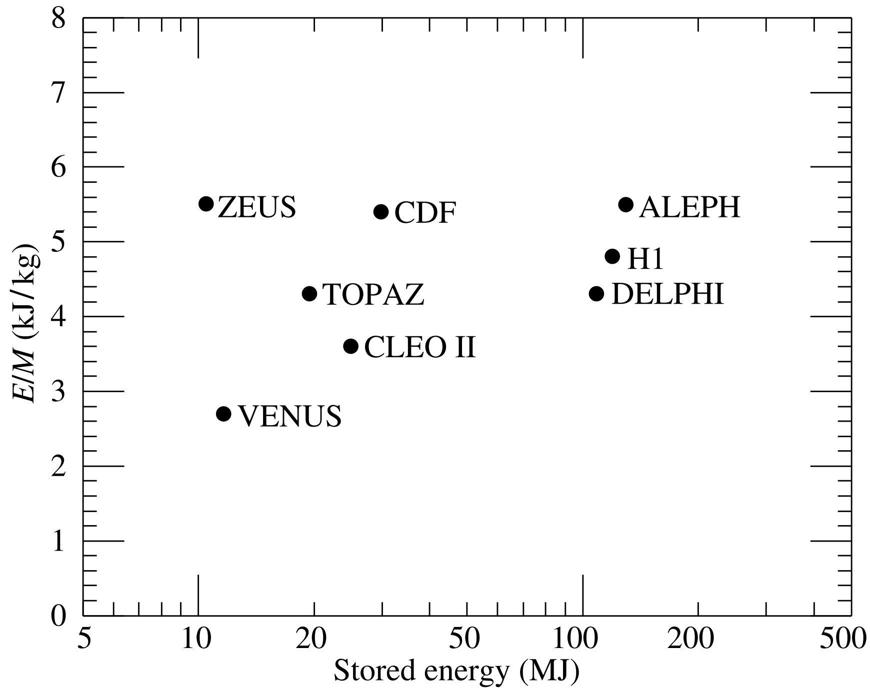


**Figure 12.3:** Ratio of stored energy to cold mass for existing thin detector solenoids.

The ratio of stored energy to cold mass ($E/M$) is a useful performance measure. One would like the cold mass to be as small as possible to minimize the thickness, but temperature rise during a quench must also be minimized. Ratios as large as 8 kJ/kg may be possible (final temperature of 80 K after a fast quench with homogenous energy dump), but some contingency is desirable. This quantity is shown as a function of total stored energy for some major collider detectors in Fig. 12.3.

## 12.10. Radiation levels in detectors at hadron colliders

An SSC Central Design Group task force made a study of radiation levels to be expected in SSC detectors [50]. For $\sqrt{s} = 40$ TeV and an intersection rate of $10^8$/s or $10^{15}$/"yr," the dose due to charged particles directly from the interaction point is estimated to be

$$\dot{D} = \frac{0.4 \text{ MGy yr}^{-1}}{(r_\perp/1 \text{ cm})^2} . \tag{12.28}$$

If a magnetic field is present, "loopers" may increase this dose rate by a factor of two.

In a medium in which cascades can develop, the ionizing dose or neutron fluence can be written approximately as

$$\text{Dose or fluence}^* = \frac{A}{r^2} \cosh^{2+\alpha} \eta = \frac{A}{r^2 \sin^{2+\alpha} \theta} . \tag{12.29}$$

The neutron fluence inside a central cavity also scales as $1/r^2$, where this time $r$ is a characteristic dimension. Under all conditions so far