A beta source emits beta particles (**) with energies from zero to the characteristic maximum energy for that isotope. The penetrating power of β particles depends on:

* The energy of the β-particle,
* The density of the absorbing material.

At the University, the common β emitters and their maximum energies are

3H 0.018 MeV 32P 1.7 MeV 35S 0.17 MeV

14C 0.16 MeV 33P 0.25 MeV 45Ca 0.26 MeV

Beta particles in the energy range of 1-10 MeV can be easy shielded but may give rise to X- rays called **Bremsstrahlung** (*Braking Radiation*), when they are stopped by shielding. To estimate the bremsstrahlung hazard, the following approximate relationship may be used:

F= 3.5 x 10-4 ZE

Where,

F= the fraction of the incident beta energy converted into photons;

Z= atomic number of the absorber; and

E= maximum energy of the beta particle, MeV.

Shielding constructed of materials of low mass number (e.g. aluminium or plastic) produce less bremsstrahlung. A shield of 10 mm-thick Perspex or 3 mm-thick aluminium provides excellent absorption for our common beta emitters. If a lead container were to be used to store 32P (1.7 MeV) approximately 4.6% of the energy would reappear as bremsstrahlung compared to less than 1% of aluminium or less than 0.5% for Perspex. Although it should be noted that a large thicknesses of lead will absorb the bremsstrahlung produced – but this adds costs and weight to the storage container.

The ease with which beta sources may be shielded sometimes leads to the erroneous impression that they are not as dangerous as gamma sources and that large open beta sources can be handled directly. This would be an extremely dangerous practice. For instance, the dose rate to the skin at a distance of 3 mm from a typical beta source of 1 MBq is about 1 Sv/h.

**Conclusion: The primary storage container for beta emitting materials and waste should be of plastic (Perspex) or aluminium to effectively reduce emissions of primary and secondary radiation. Perspex is generally the material of choice as it is easier to clean and transparent.**