https://buzztutor.com/images/solution_attachment/3218.pdf

1) Compare the energy released per kilogram of deuterium for D-T fusion to the energy released per kilogram of ^{235}U for ^{235}U fission.
Note: A gram of deuterium contains 3.01×10^{23} atoms.

Solution) Deuterium-Tritium (D-T) Fusion Reaction

It is the fusion of two hydrogen isotopes: deuterium ($_2H$) and tritium ($_3H$). The actual reaction involves a deuterium nucleus fusing with a tritium nucleus to form an alpha particle (4He nucleus) and a neutron. The products contain around 17.6 million electron volts (MeV) of released kinetic energy through the loss of mass in the fusion process.

Thus,

$_2H + {_3H} = {_4He} + n$ (Kinetic energy of the products = 17.6MeV)

A single deuterium-tritium fusion reaction releases 17.6 MeV

The D-T reaction is the easiest because the extra neutrons on the nuclei of the deuterium and tritium increase their size and thus the probability of a fusion reaction. They also each have the smallest possible positive charge (since hydrogen has only one proton), making it relatively easy to have the two nuclei overcome their repulsion and fuse together.

Now it is given that 1-gram of deuterium contains 3.01×10^{23} atoms.
Energy released due to fusion of 1 deuterium atom with tritium = 17.6MeV
Thus, energy released when 1g of deuterium atom undergoes fusion = $3.01 \times 10^{23} \times 17.6$
Finally energy released when 1kg (1000g) of deuterium undergoes fusion
$= 3.01 \times 10^{23} \times 17.6 \times 1000$ MeV $= 5.2976 \times 10^{27}$ MeV ...(1)

Now the fission of one atom of U-235 generates 200 MeV of energy
No. of atoms of U-235 in 235g of sample = 6.023×10^{23} atoms.
Thus no. of atoms of U-235 in 1kg of sample = $6.023 \times 10^{23} \times 1000/235$ atoms.
Hence the energy liberated when 1kg of U-235 undergoes fission
$= 200 \times 6.023 \times 10^{23} \times 1000/235$ MeV $= 5.125 \times 10^{26}$ MeV ...(2)

From (1) and (2) the ratio is given by

$$\frac{Enegy\ released\ when\ 1kg\ of\ Deuterium\ undergoes\ fusion\ with\ Tritium}{Energy\ released\ when\ 1kg\ of\ U-235\ undergoes\ fission} = \frac{5.298\times10^{27}}{5.125\times10^{26}} = 10.33$$

Thus in case of fusion reaction of D-T energy released is 10.33 times more than fission of U-235 corresponding to the mass of 1kg of each.

Question by H. Newton - Is the 10.33 factor relevant to proving the 50 kv EMP max voltage? - eg 6448 x 10.33 = about 66 kv

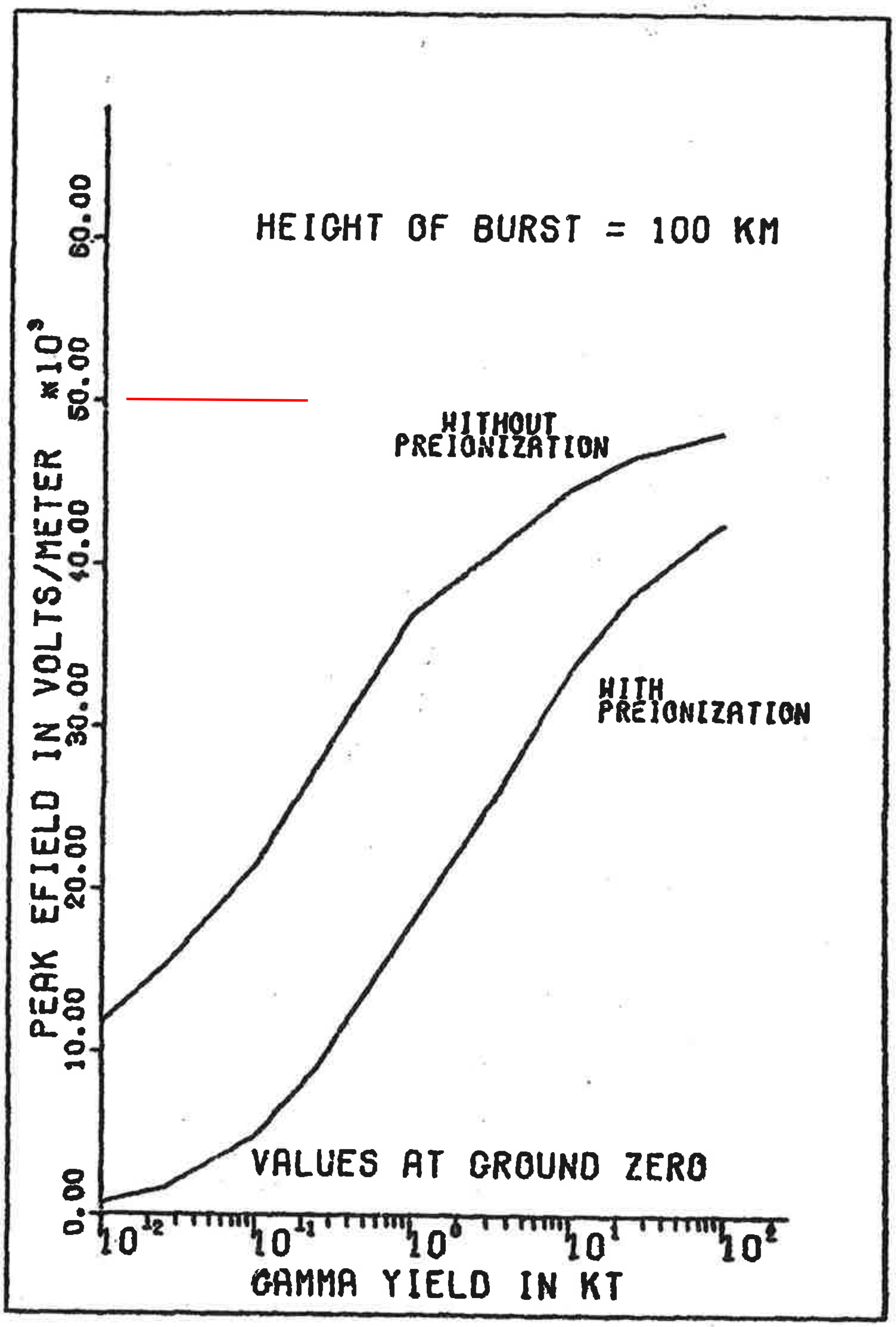

Fig. 8. Effect of a .03 Kt Gamma Yield Precursor Burst