what do you mean by plateau curve in gamma ray?

When a gamma-ray enters the crystal, instead of ejecting an electron from an atom, it may collide with a (more or less) free electron giving up only a part of its energy to the electron. If the scattered gamma ray escapes from the crystal then only part of the energy of the original gamma ray is left with the electron in the crystal. This results in a smaller amount of light and it is as if a gamma ray of smaller energy were completely absorbed in the crystal. Simple kinematics (conservation of energy and momentum) forbids the electron from receiving more kinetic energy than

$$E_{\max} = \frac{2 \cdot E_\gamma}{m_0 \cdot c^2 + 2 \cdot E_\gamma}$$

This is called the Compton edge. *E_* is the energy of the gamma-ray and m_0c^2 is the rest energy of the electron. This maximum energy transfer corresponds to an angle of scattering of the gamma-ray through 180^o. A 0^o scatter transfers no energy. Compton scattering is a fairly slowly varying

function of angle and so there will be a distribution of Compton events of energy less than the Compton edge. As a result of the photoelectric effect and the Compton effect, an idealized gammaray spectrum should have the :

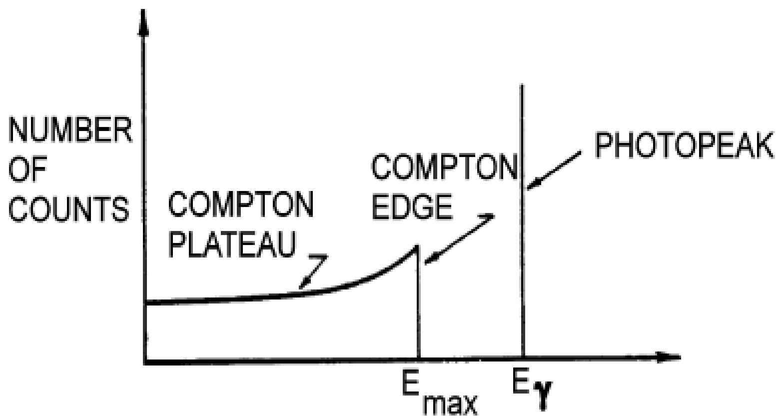

Figure 2. - Idealization of gamma-ray spectrum showing photopeak and compton plateau

what is the mass absorption coefficient of gamma rays?

For a narrow beam of mono-energetic photons, the change in x-ray beam intensity at some distance in a material can be expressed in the form of an equation as:

$$dI(x) = -I(x) \cdot n \cdot \sigma \cdot dx$$

Where:	dI	=	the change in intensity
	I	=	the initial intensity
	n	=	the number of atoms/cm^3
	σ	=	a proportionality constant that reflects the total probability of a photon being scattered or absorbed
	dx	=	the incremental thickness of material traversed

When this equation is integrated, it becomes:

$$I = I_0 e^{-n\sigma x}$$

The number of atoms/cm^3 (n) and the proportionality constant (s) are usually combined to yield the linear attenuation coefficient (m). Therefore the equation becomes:

$$I = I_0 e^{-\mu x}$$

Where:

I = the intensity of photons transmitted across some distance x

I_0= the initial intensity of photons

μ = the linear attenuation coefficient

x = distance traveled

Since a linear attenuation coefficient is dependent on the density of a material, the mass attenuation coefficient is often reported for convenience. Consider water for example. The linear attenuation for water vapor is much lower than it is for ice because the molecules are more spread out in vapor so the chance of a photon encounter with a water particle is less. Normalizing μ by dividing it by the density of the element or compound will produce a value that is constant for a particular element or compound. This constant (μ /ρ) is known as the mass attenuation coefficient and has units of cm^2/gm.

To convert a mass attenuation coefficient (μ /ρ) to a linear attenuation coefficient (μ), simply multiply it by the density (ρ) of the material.

what is the half value thickness?

This is the thickness of the material which is needed to reduce the intensity (I) of the X ray beam to one half the intensity of the incident radiation (I_o).

$$I / I_o = e^{-\mu x} = 1/2$$

$$-\mu x = \ln(1/2)$$

$$\mu x = \ln(2)$$

$$x = \frac{\ln(2)}{\mu} = \frac{0.693}{\mu}$$