

# Modification of the nuclear lifetime

Il-Tong Cheon

*The Korean Academy of Science and Technology*

It was observed by the Moessbauer method [1] that the lifetime of Cs-133 first excited state(81 keV) increased when the gamma-ray source was placed between two parallel silicon plates.

In this paper, we understand this result by interpreting that the gamma-ray emitted from the source returns after reflected by the plates and excites the nucleus again by being reabsorbed. Through such a process, the population of the Cs-133 nuclei being in the excited state increases. Thus, the lifetime increases. All these processes should occur with no energy loss.

We calculate the process described above in a parameter free manner. The elastic photon scattering on the plate surfaces can be given by the Thomson scattering cross section and the photon absorption is described by the well known gamma absorption cross section. The temperature dependence is due to the Debye-Waller factor.

Our theoretical analysis gives 8.5 about 4K when the source is placed at the center of two parallel plates separated by 1mm. This result is in excellent agreement with the measured one.

[1] Il-T. Cheon, J.Phys.Soc.Japan, Vol.70, 3193(2001).