Performance Studies of the Vibration Wire Monitor on the Test Stand with Low Energy Electron Beam

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In the high intensity proton accelerator as the J-PARC accelerators, serious radiation and residual dose is induced by a small beam loss such a beam halo. Therefore, diagnostics of the beam halo formation is one of most important issue to control the beam loss. For the beam halo monitor, the vibration wire monitor (VWM) has a potential for investigating the beam halo and weak beam scanning [1].

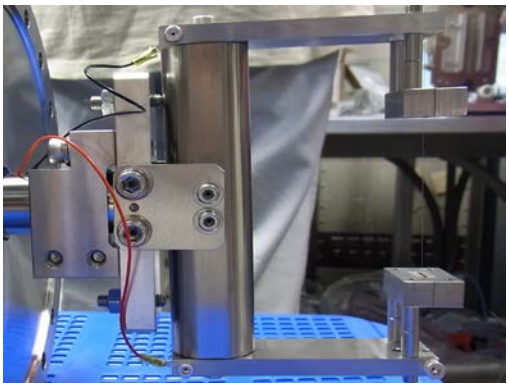

Fig. 1 Picture of the vibration wire monitor which is attached movable arm [2].

The principle of the VWM is to pick up the frequency shift of the vibration wire which is irradiated by a beam. The novelty of the method is that temperature shift of the wire provides information about the number of particles that interact with the wire. The VWM has a wide dynamic range, high resolution and the VWM is not susceptible to secondary electrons and electric noises.

We have studied the VWM futures as a new beam-halo monitor on the test stands with low energy electron gun. The frequency shift of the irradiated vibration wire was conformed about various wire materials and the electron beam profile measured by using the VWM was consistent with the results of the faraday cup measurement. Also we calculated a temperature distribution on the vibration wire which is irradiated by the electron beam with the numerical simulation. The simulations have been fairly successful in reproducing the transient of the irradiated vibration wire frequency measured by test stands experiments. In this presentation, we will report a result of performance evaluation study for the VWM on the test stands and discuss about the VWM for beam halo diagnostic.

References

[1] S. G. Arutunian, et al., PRST-AB, 2, 122801 (1999).

[2] Begoz Instrumentation, home page “http://www.bergoz.com/”.