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## Proposal for VEPP-4M beam energy measurement using magnetic spectrometer with Compton calibration and photon detector

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### Content

A method for circular  $e^-/e^+$  accelerator beam energy measurement is proposed. Coordinate of an electron (or positron) in a focussing magnetic spectrometer built in a circular accelerator depends on its energy  $E$ , spectrometer parameters  $A$ ,  $B$ , and circulating beam energy  $E_0$ :  $X = AE_0/E + B$ . To define parameter  $A$ , Compton backscattering with two wavelengths can be applied, which produces two scattered electron energies strictly coupled with the beam energy. Parameter  $B$  is defined using coordinate detector for Compton backscattered photons. This detector should be calibrated in the coordinate frame of the spectrometer electron detector using precisely measured beam energy or precision geometry measurements. Thus, the beam energy can be defined with expected uncertainty better than  $10^{-4}$ . Built-in focussing magnetic spectrometer is an essential part of VEPP-4M collider, it is intended for two-photon processes study at KEDR detector. It has Compton calibration system with two lasers. Also photons scattered from interaction point can be registered by coordinate detector. Thus, the the technique proposed could be implemented here with minimum efforts, test of the technique is planned with the present equipment. To measure VEPP-4M beam energy in whole energy range 1.5-5.0 GeV (which is essential for future precision experiments at KEDR detector in  $\Upsilon$  mesons energy range) the installation needs an extra equipment and optimisation, they are also planned after the test.

### Summary

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