

# A SIMPLE SYSTEM OF THE SHORT-WAVE SYNCHROTRON RADIATION PREVENTION IN THE 30 Å TO 180 Å WAVELENGTH RANGE

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A simple preventer of the short-wave SR light is described. This block, based on two rotatable plane-parallel mirrors, with constant direction of the exit beam is operated in the SR beam line on VEPP-2M storage ring. The prevention efficiency of this system is not worse than 0.6%, the transmission efficiency being not less than 85%.

A standard and important problem for SR users in spectral research is the necessity to prevent the short-wave synchrotron light. There are different methods to prevent short-wave SR light in the ultrasoft X-region<sup>1-3</sup>). The most widespread method is the utilization of filters and mirrors. The above-mentioned problem is similar to that of the prevention of the short-wavelength side of the brake spectrum of an X-ray tube in the grazing incidence spectrometer. But in this case it is necessary to take into consideration that a source of SR and spectrometer entrance slit are fixed.

In this paper a simple design of the prevention system especially for SR use is described. The optical scheme of this system is shown in fig. 1. Two plane-parallel mirrors are rotated around an axis laid on the reflection plane of the mirror II. By using the long mirror I we can have constant direction of the exit beam while the reflection angle is varied in a wide range. If the length of the mirror II is  $l$  and the angle range is  $\alpha_{\min}-\alpha_{\max}$ , it is easy to calculate the distance between mirrors:

$$d = \frac{l \operatorname{tg} \alpha_{\max}}{2}$$

and the length of the mirror I

$$L \geq \frac{d}{\sin \alpha_{\min}} - \frac{l}{2}.$$

Moreover the SR used beam width is the quantity of the second order with respect to the angle throughout the angular range  $\alpha \approx 10^{-1}$ . In fact

$$h = \frac{d}{\sin \alpha} \sin 2\alpha = 2d \cos \alpha,$$

hence

$$\Delta h = -2d \sin \alpha \Delta \alpha$$

So, the width of the used SR beam is determined by the length of the mirror II and angle  $\alpha$ .

The main part of the mirror block is a rotatable plate with two mirror holders. Each holder has needed adjustment gears for mirror alignments and for shifting the reflection plane of the mirror II on the rotation axis. The plate rotation in the range of angles from  $\alpha_{\min} = 1.5^\circ$  to  $\alpha_{\max} = 12^\circ$  is provided by a micrometer screw with constant clearance compensation in one direction. The precision of the rotation is not worse than  $2 \times 10^{-4}$  provided the proper arm length are chosen. The plate rotation axis is installed in a fine slide bearing, clearance compensation along the axis improves the accuracy and operation stability. The block is operated in the vacuum of  $10^{-7}$  torr but without reconstruction can be transformed for installation in an ultrahigh vacuum system.

The described system is used in the SR beam line on VEPP-2M storage ring<sup>4</sup>). The mirrors have two sorts of coating: an aluminium one for 30–60 Å range and polystyrene one for 50–180 Å range. The sort of coating chosen depends on wavelength  $\lambda_{cr}$ , corresponding to the prevention boundary and on the angular range given<sup>5</sup>).

The results of the test are as follows:

a) when grazing angle is varied from  $3^\circ$  to  $9^\circ$  the

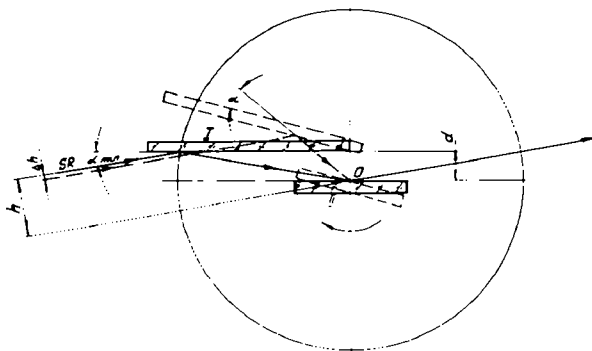


Fig. 1. The optical scheme of the system.

short-wavelength boundary moves smoothly from 30 Å to 90 Å,

b) the prevention efficiency is

$$\frac{I_{\lambda < \lambda_{cr}}}{I_{\lambda > \lambda_{cr}}} \leq 0.6\%,$$

the transmission efficiency is not less than 85%.

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