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EXTENSION OF PHOTOMULTIPLIER QUANTUM SENSITIVITY BY WAVESHIFTING COVERING

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The method of extension of a photomultiplier spectral sensitivity by means of application of waveshifting coverings is developed. Some practical results on the Russian produced photomultipliers are given.

The investigation has been performed at the Laboratory of High Energy, JINR.

Расширение квантовой чувствительности фотоумножителей с помощью светосмещающих покрытий

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Развит метод расширения спектральной чувствительности фотоумножителей с помощью светосмещающих добавок. Представлены некоторые практические результаты для фотоумножителей российского производства.

Работа выполнена в Лаборатории высоких энергий ОИЯИ.

It is the well-known fact that the photomultiplier spectral sensitivity in ultraviolet region plays a crucial role for effective detection of the Cherenkov radiation produced by a relativistic particle. The present study was initiated by a possibility of application of Russian produced photomultipliers in the PHENIX Experiment at the RHIC Collider for the ring image Cherenkov detectors.

One of possible ways to extend sensitivity in the UV spectrum part is application of waveshifting coverings on a photomultiplier window. These coverings are produced on the basis of UV sensitive luminophors such as P-terphenil, PPD, POPOP and inflicted on a PMT window as a 5—10 micron film.

We carried out the study of an influence of the waveshifting covering on the PMT responce. For production of the covering a solution of polymethylmetacrylat (PMMA) in toluol is used with a luminophor dopping. The PMT window was lowered into the solution and after withering a thin film containing lumenscence doppings appeared on the surface. Thus, UV light can

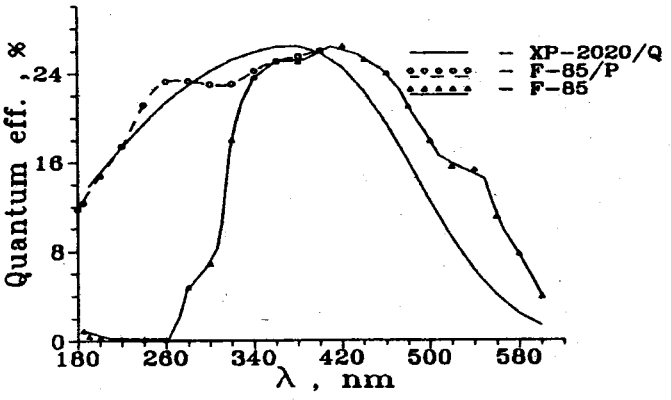

Fig.1

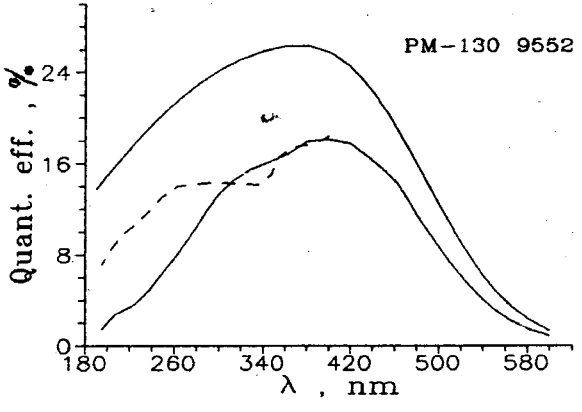

Fig.2

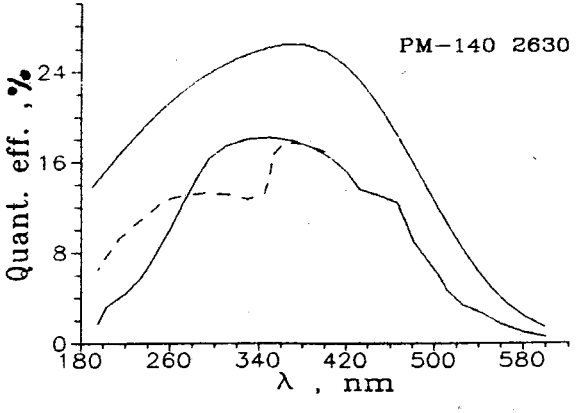

Fig.3

be absorbed in the 180—340 nm wave length region and irradiated in the 380—440 nm region, i.e. near PMT maximum sensitivity.

The measurements of the PMT quantum sensitivity are carried out on the SF-46 spectrophotometer. The method consists in comparison of a cathode current of tested photomultiplier with a current of XP2020/Q with the known spectral sensitivity. The last characteristic is presented in figures 1, 2, 3 as reference. In this case the PMT serves as a photodiode, i.e. all dynodes are short-circuited with the anode.

The quantum efficiency of a Russian produced photomultiplier FEU-85 with the 85 mm

diameter is shown in fig.1 with the covering (triangles) and without (circles). Application of the covering gives a 2—2.5 times higher signal for Cherenkov light. The value of effect magnitude is defined by the transparency of the window. The FEU-85 window is produced from usual glass; UV transparent glass (uviol) is used for FEU-130 (fig.2) and FEU-140 (fig.3).

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