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The coordinate sensitive detector based on the MA-20 multianode PMT with high space and time resolution

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The work is dedicated to the discussion of the possibility of creating a position-sensitive detector with both high coordinate reconstruction and time resolution. The work is presented the simulation results and the experimentally obtained data for a prototype detector on the basis of a multianode PMT MA-20 and a linear assembly of scintillating crystal or plastic strips.

The multianode position-sensitive PMT MA-20 has a semitransparent bi-alkaline photocathode with the size of the sensitive area of $10 \times 200\ mm^2$, 20 evaporated type bi-alkaline dynodes of the same length and 20 separate anodes.

An assembly of scintillating strips made of GSO (gadolinium orthosilicate) crystals with an element size of $3 \times 10 \times 50\ mm^3$, or of BGO (bismuth germanate) crystals with an element size of $5 \times 15 \times 40\ mm^3$ also, and finally set of plates made of a plastic scintillator were used for experimental measurement of a coordinate resolution of the detector prototype. Coordinate resolution was determined by the position of the center of gravity of charges from neighboring dynodes.

The use of a multi-anode photomultiplier in combination with the array of crystal or plastic scintillators allows one to get the detector with a high performance in both spatial and time resolution and also a low level of intrinsic noise in comparison, for example, with silicon PMT's. An ideal resolution simulation was performed for a system consisting of a one-dimensional array of scintillation strips. The experimental dependencies of the signal value versus position of optical fiber with a diameter of 1 mm on the photocathode of the 20 anode PMT were also measured. As a result of processing the collected data, space resolution was obtained at level of $\pm 0.7\ mm$, with a time resolution of around $\pm 1.0\ ns$.

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