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## Multi-Grid-Type MSGC with the Global-Local-Grouping Function for Neutron Scattering Applications

We are developing a multi-grid-type MSGC with the global-local-grouping (GLG) readout method for neutron scattering applications. In this method, avalanche charge is divided into two ways. A half charge is used for indicating the coarse position of the incident radiation. And the other half charge is used for locating the detailed position of the incident radiation. In this way, the position is determined by two-stage identification method. If we could discriminate 9 rough positions and 9 fine positions, 81 different positions are identified, whereas the readout line can be multiplexed to  $9 + 9 = 18$ . Therefore, the advantage of the method is to decrease the number of readout lines by less than  $1/4$  in this case. This is crucial for neutron scattering applications since the detector must be operated in a pressure vessel, as a result, the connection between the detector and the readout circuit placed outside the vessel is not so easy. The drawback of the GLG method is to decrease the charge by 50% and to increase the detector capacitance by 4 times in the above case. However, the total capacitance viewed by a preamplifier is not only the detector capacitance. Actually when the pressure vessel is used, the feedthrough connector adds a certain amount of the capacitance. Thus the drawback of the GLG method is somehow relieved. We have developed a 6.4cm x 6.4cm multi-layer GLG-MSGC plate with Toshiba's Au/Ti multi-layer layer technology. Anode pitch and cathode pitch were selected to be 0.8mm which is suitable for neutron applications. The plate was successfully operated and the local and the global position identification was ensured.

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