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The Structure, Assembly and Optimization Test of a Small Gas Electron Multiplier (GEM) Detector for Medical Radiotracers YVONNE NG, JOSHUA MEDFORD, JAEHOON YU, ANDREW WHITE, MINGWU JIN, University of Texas at Arlington, UTA ADVANCE DETECTOR TEAM, UTA MEDICAL PHYSICS TEAM — High energy physics research produces advanced hardware that is capable of precise readout, and many of these technologies have spun off applications in other fields like medical physics, telecommunications and national defense. The advanced detector team and medical physics group in University of Texas at Arlington recently started collaborating on a project that would enable detection and imaging of occult peritoneal cancer tumors using the Gas Electron Multiplier (GEM) hadron calorimeter technology. GEM is a technology that utilizes the avalanche effect of charged particles in high electric field to magnify hadron signals produced in collision for precise and accurate energy interpretation in high energy physics experiments. This technology can be effectively applied on detection of peritoneal cancer cells bound with radiotracers labeled with Cu-64 and F-18. In this study, we assembled a prototype 2cmx2cm single channel GEM detector and optimize the running conditions of the GEM chamber, such as air pressure, operating high voltage and their effect to the detector's gain. Detailed structural and testing results for each part of the hardware assembly will also be shown. This study will lay a foundation for the next stage of development of a multichannel detector with high spatial resolution imaging and ultimately lead to a low cost, fast response, and portable imaging device for the treatment of peritoneal cancer.

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