

Regulating Thermal Control for the Scintillating Bubble Chamber Experiment

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The Scintillating Bubble Chamber experiment (SBC) at Queen's requires a balance between extremes of temperature and pressure, and sensitive detection equipment that needs to be protected from damage as well as background signals throughout the operation of the experiment. The active volume of SBC is cooled by a cryocooler to 90K (-180°C) within synthetic quartz jars that are sensitive to cracking if the cooling process is uneven or too fast. Ensuring the robustness of the cooling systems has been at the heart of our work this summer with temperature detectors and cryo-cooler vibration analysis. This motivates our ongoing work developing a system of resistance temperature detectors. The cryocooler introduces vibrations to a system sensitive to any kind of energy input, so we performed a characterization of those vibrations to confirm that they are not at risk of causing damage to equipment or nucleating bubbles in the active volume. Going forward, these projects will help ensure that SBC is kept safe and minimize backgrounds in the experiment.

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