

## **Instrument for Measurements of HEB Receiver Noise Temperature with Cold and Hot Loads Internal to the Cryostat**

Ric Zannoni, Sigfrid Yngvesson  
Department of Electrical and Computer Engineering  
University of Massachusetts, Amherst MA

A significant obstacle to the accurate measurement of detector noise temperature is the effect of optical losses. Attenuation in warm components such as beamsplitters, focusing elements, and the laboratory atmosphere adds to the measured noise temperature. Traditionally these losses have been accepted as part of the measurement or estimated so a corrected value can be used. However, as detector performance improves, the contribution of optical losses becomes a significant part of the measured value. Thus, a new instrument that suppresses optical loss is needed. SwitCHLE, a device under development, addresses these concerns.

Most of SwitCHLE's components are located in the interior of the cryostat. The LO source is the only exterior component which enters through a 300K window on the cryostat wall. The LO then passes through a 4K attenuator. The RF originates from one of two sources within the cryostat, a 300K source on the wall or a 4K source at the cold plate. An electromechanically-actuated mirror switches between the sources. The RF and LO are combined in a 4K beamsplitter and then go on to the detector. The detector is housed within its own 4K shield, which is fitted with a 4K filter. The full SwitCHLE design has an integral controller for chopped measurements up to 1 hertz. Presented here is a prototype using manual control and a preliminary comparison of SwitCHLE measurements to those obtained using an external measurement system.