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## Fast-response, active gas-gap heat switches for low temperature applications

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Heat switches are critical to many low temperature applications, where control of heat flow and selective thermal isolation are required. Their designs tend to be driven by the need for the lowest possible off-state conductance, while meeting requirements for on-state conduction. As a result, heat switches tend to be designed as close as possible to the limits of material strength and machinability, using materials that have the lowest thermal conductivity to strength ratio. In addition, switching speed is important for many applications, and many designs and switch types require a compromise between the power used for actuation and on/off transition times. We present a design for an active gas-gap heat switch, developed for the Soft X-ray Spectrometer instrument on the Japanese Astro-H mission, that requires less than 0.5 mW of power to operate, has on/off transition times of <1 minute, and that achieves a conductance of >50 mW/k at 1 K with a heat leak of <0.5  $\mu$ W from 1 K to very low temperature. Details of the design and performance will be presented.

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