First measurement of an infrared dielectric bolometer with microwave readout and possible extension to a large scale format X-ray microcalorimeter.

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This work is mostly based on the paper we accepted in JLTD.

Article Title: DIELECTRIC RESONATORS AS RADIATION DETECTORS AT LOW TEMPERATURES.
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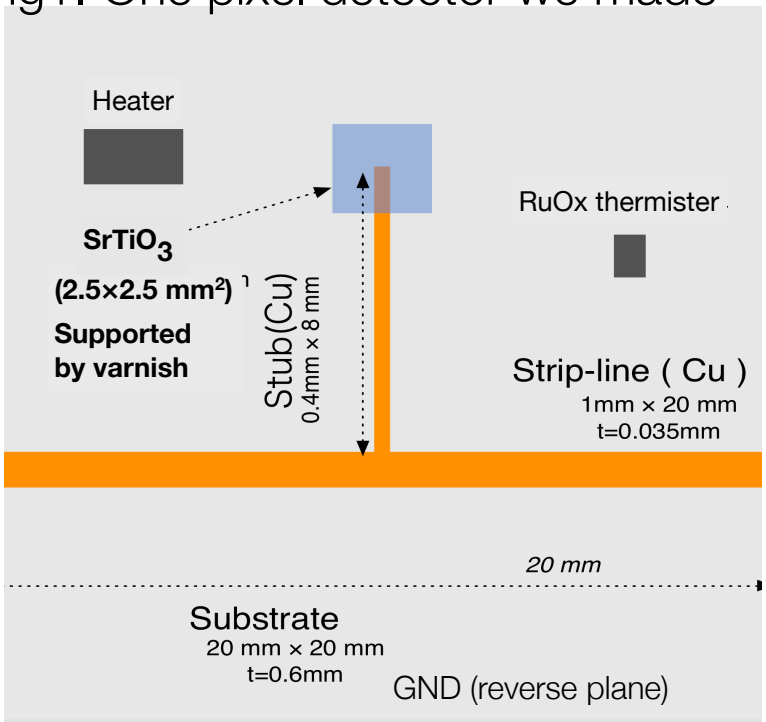
What is the Dielectric Micro Carolimeter ?

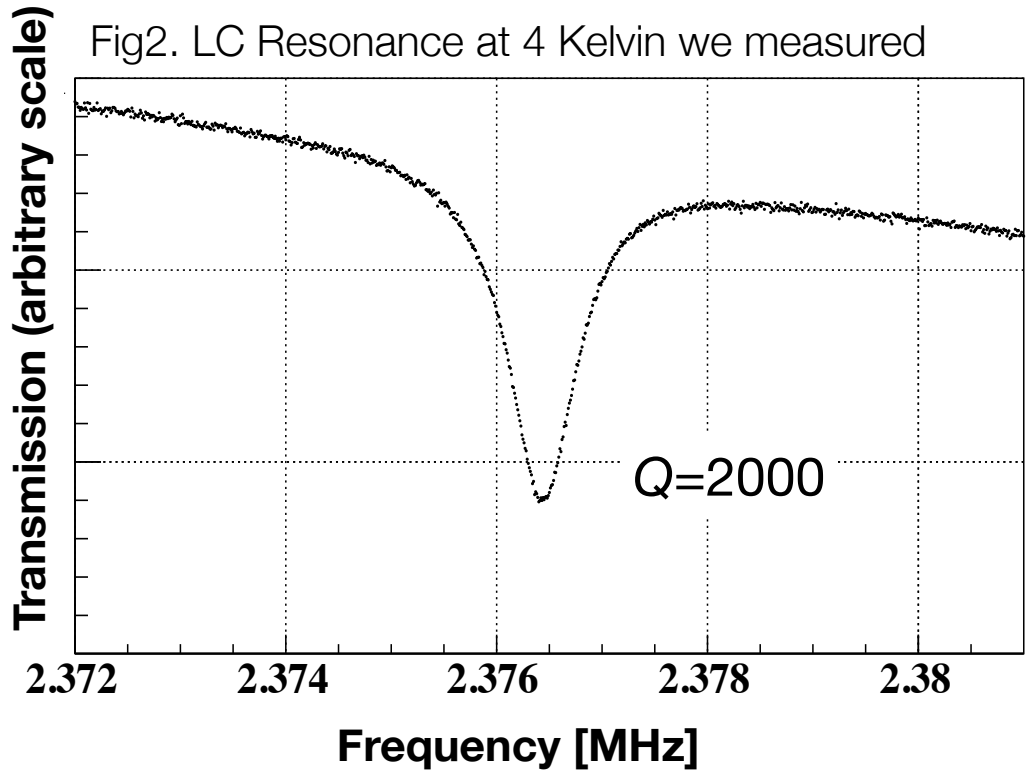
- DMC uses change of dielectric constant of materials as a thermometer.
- DMC detect an LC resonance shift like MKIDs.
- Less Johnson noise, Expected phonon noise would be ~1 eV @100 mK

Fig1. One pixel detector we made



For measuring response function, heater and thermometer are mounted.

Fig2. LC Resonance at 4 Kelvin we measured



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LED Irradiation Test results

Before using DMC as X-ray calorimeter to check the thermal properties,

1. We detect the bias power and phase shift, corresponding to the LED light.
2. Pulse intensities are proportional to the LED power.
3. The rise and decay constant are 20 +/-1 ms and 6 +/-1 ms for 4K and 2K

Fig3. Read out circuit

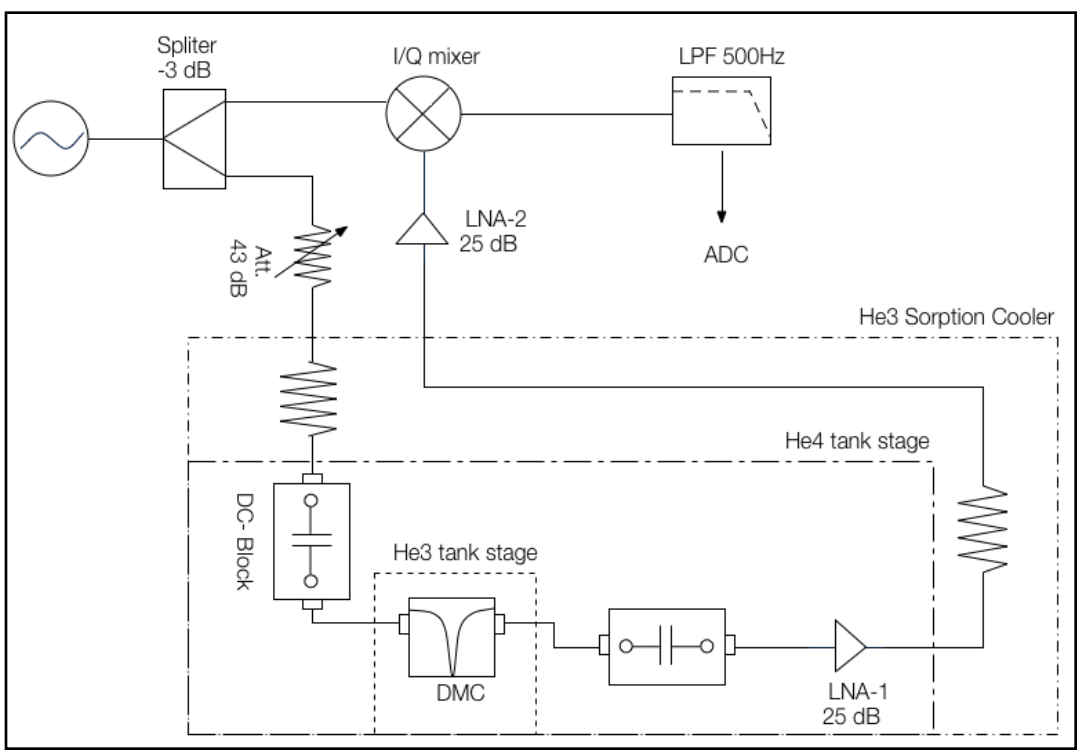
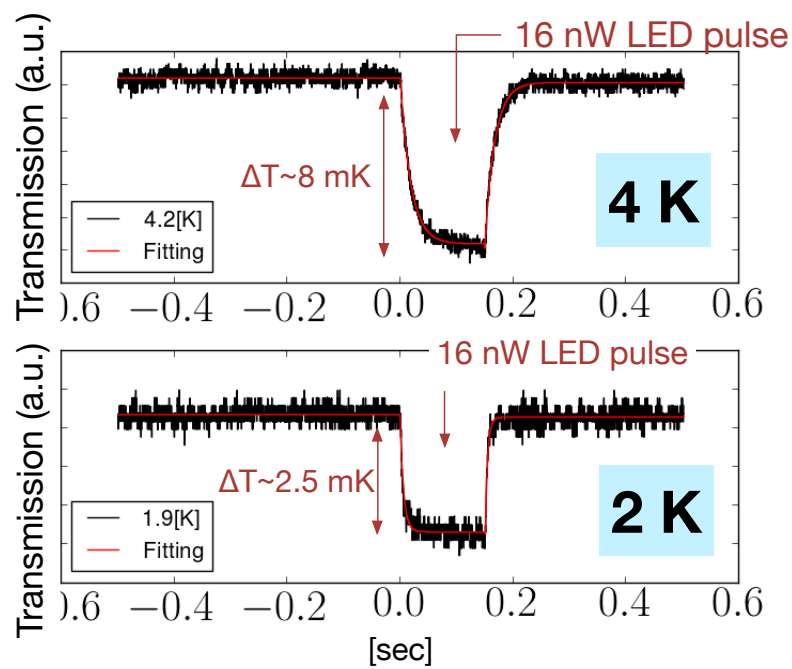


Fig4. Single Pulse from same LED input at 4 and 2 K



Confirmation of the DMC performance

- Assuming the heat capacitance of the STO crystal ($\propto T^3$), the power input ($G\Delta T$) for 4K and 2K are consistent, (16nW respectively)
- Absolute value and temperature dependence of the conductance (G) are consistent with a 100 μm varnish.

	***4.2* K**	***1.9* K**
Temprature rise (ΔT) [mK]	2.5 (5 %)	8 (18 %)
Conductance (G) [μW/K]	6.3 (10 %)	2 (10 %)

Errors in ( )

In poster G1.54,
Expected performances as an X-ray micro calorimeter at 100mK are reported.

- More sensitive material: $SrTi(^{18}O_{1-x}{}^{16}O_x)_3$ or $KTa_xNb_{1-x}O_3$.
- Simulation for X-ray detection with one pixel

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