

# LCGT's sensitivity in room temperature

Kentaro Somiya

May 20, 2009

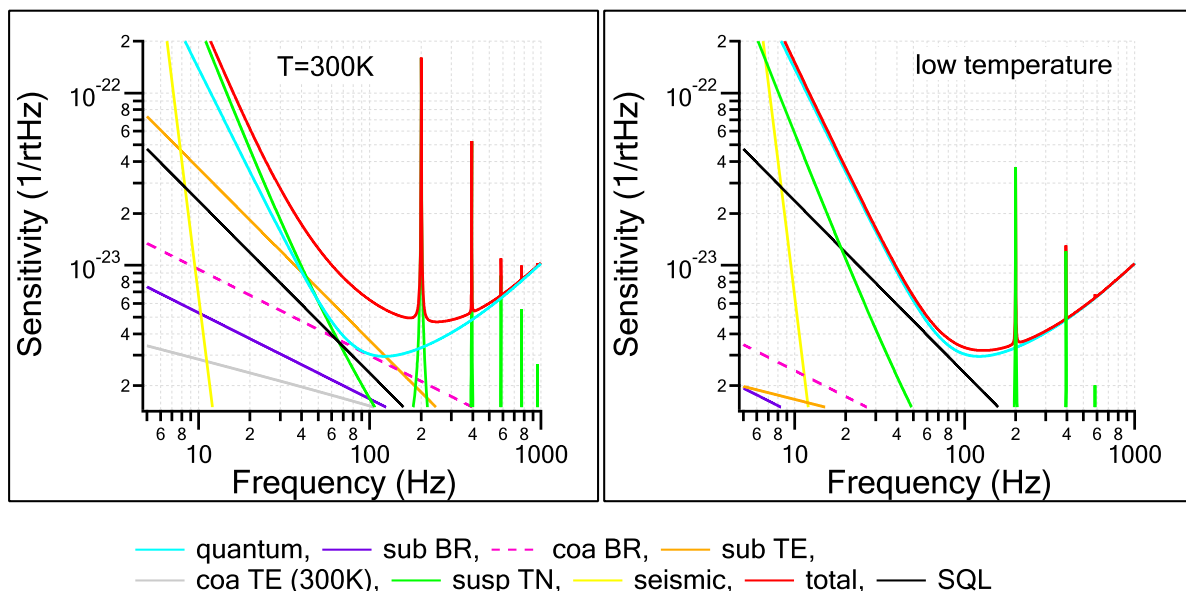


Figure 1: *Left panel:* LCGT in the room temperature operation. *Right panel:* LCGT in the low temperature operation.

Let me show how the noise spectrum of LCGT would look like if we operate the interferometer in the room temperature. This may be the one to be used in the first science run of LCGT.

Due to the high thermal conductivity of Sapphire in the room temperature (15700 in 20 K, 40 in 300 K), substrate thermoelastic noise limits the sensitivity at around 100 Hz. Here we assume DC readout and tuned RSE. The temperature of the test mass is 20 K and the temperature of suspension wires is 16 K. The room temperature here is 300 K.

The observable distance of the NS-NS binaries with SN=10 is 130 Mpc, while it is 210 Mpc in the low-temperature operation (the observable distance in the same definition for AdLIGO with SN=10 would be 247 Mpc for the tuned-RSE operation). The question would be if it is worth keeping for a while for a science run. We need some more discussions.