Cryogenic session

GWADW 2016 @ Elba

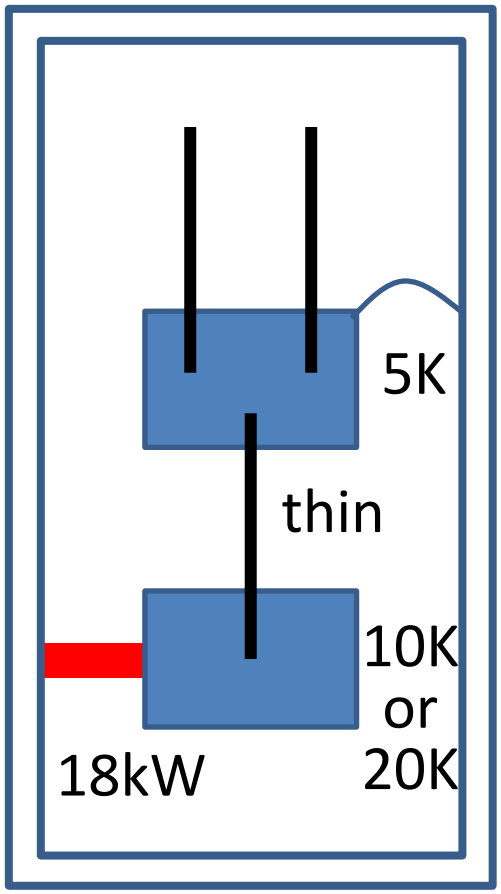
Panelists of the discussion

- Giles Hammond (Glasgow)
- Kazuhiro Yamamoto (ICRR)
- Chris Wipf (LIGO)
- Ronny Nawrodt (Jena)
- Rana Adhikari (Caltech)

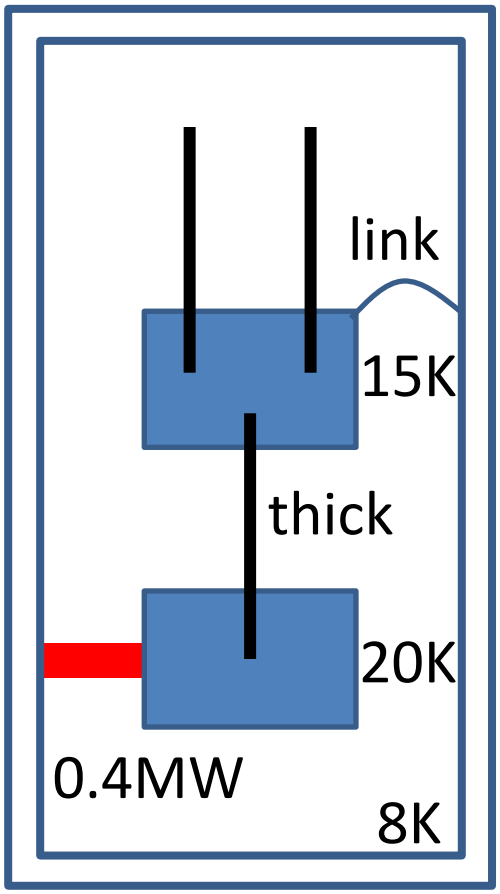
Chair of the session: Kentaro Somiya (Tokyo Tech)

Quick overview

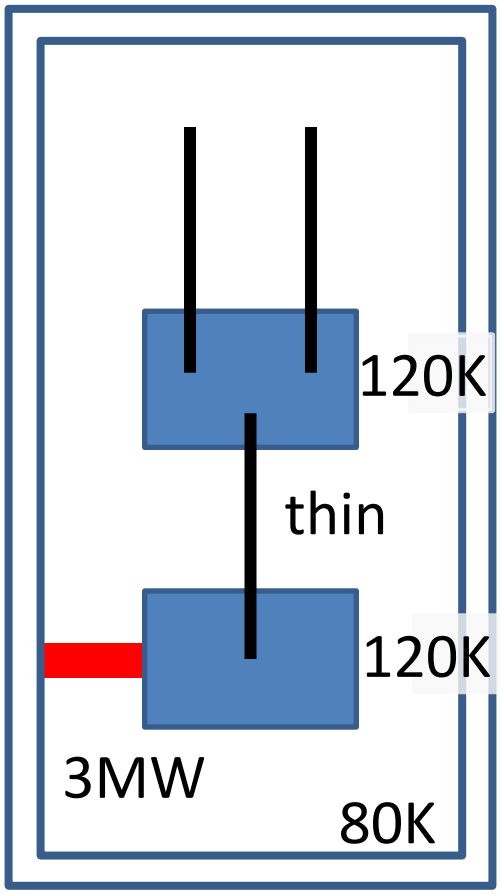
20K low power
(ET-LF)



20K high power
(KAGRA)



120K cold susp.
(Voyager)



Figures of merit

	20K (ET-LF)	20K (KAGRA)	120K	comments (before discussion)
Easy to cool				20K takes longer
High-power operation				1W for KAGRA
Temperature tuning				How serious is this?
Coating thermal noise				20K is cooler but mechanical loss may have a peak at 20K
Suspension thermal noise				thick for high power
Thermal lensing				Seems OK for all
wavelength				

* the green face means either not-too-happy or under-consideration

Discussions 1

	Opinions during the discussion
Easy to cool	• With radiation only, it takes 2 weeks for 120K • But Voyager plans to use a heat switch • KAGRA takes 20 days to cool the mirrors down
High-power operation	• ET-LF does not plan to do the high power • 45cm Si has 0.56m^2 side area -> 5W • Acktar has been used for cryogenics, though it is not in 120K
Temperature tuning	• Temperature tuning is not so serious for 120K; even if it differs by 1K, it does not matter
Coating thermal noise	• There is a peak at 20K but it is not so steep with a proper annealing • ET temperature may be also 20K • Coating design is actually undecided

Discussions 2

	Opinions during the discussion
Suspension thermal noise	• KAGRA mass is light so that the dilution is low • Yet it does not limit the design sensitivity
Thermal lensing	• It is ok for all cryogenic interferometers
Wavelength	• 2.1um laser and optics are not well developed as super-stable 1064nm optics • For 120K, the face is somewhere between yellow and green
Other opinions	• KAGRA should be done in 2 yrs, Voyager should be done in 5 yrs, and ET should be done in 10 yrs; the seriousness is different (KAGRA's red face should be more red).