

ET Sensitivity Curve update

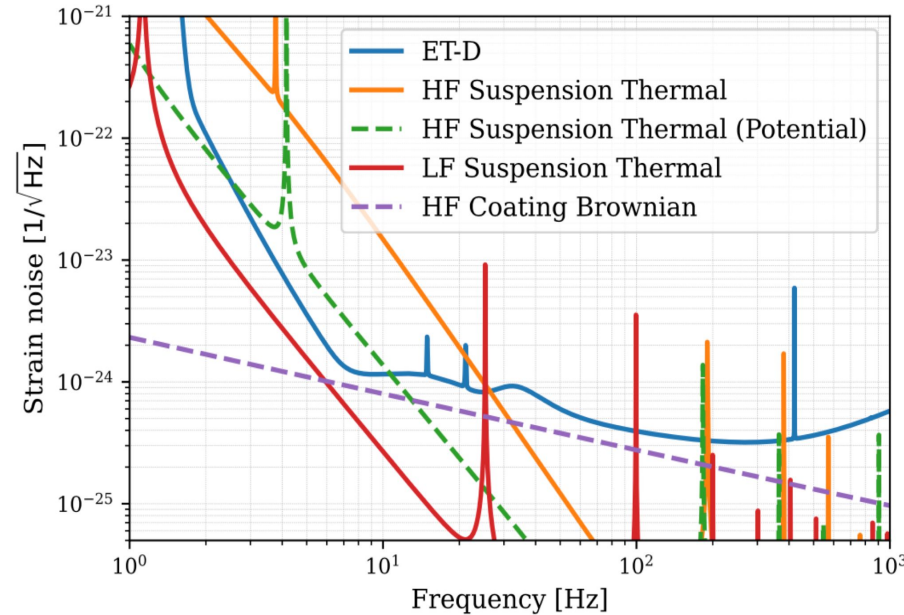
Results of the Thursday parallel session

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Suggestion for discussion topics

- ❖ Approach to global optimisation of the ET sensitivity
 - What figures of merit shall we use?
 - Hierarchy of optimisations, e.g. thermal noise first and then quantum, or try all at once?
- ❖ **Suspension TN improvement for ETHF and ensuing broadening of bandwidth**
 - What does it take to replace current ET HF steel-wire suspension model with monolithic ones?
 - What modification of QN is possible with reduced STN?
- ❖ How can the LF sensitivity curve be optimised in view of the wider HF one?
- ❖ More technical issues:
 - **Length of ETLF filter cavities and possible solutions**
 - HOM mode effect on QN
 - Optimise arm cavities finesse
 - Plenty of work! Other suggestions ...

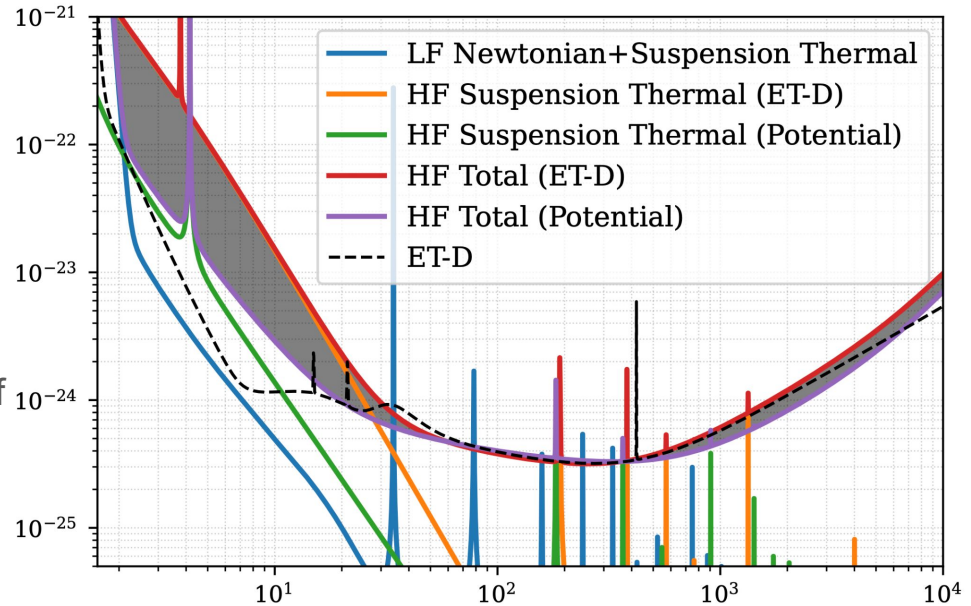


Discussion on HF STN

- ❖ We can safely replace steel wires (ET-D design) with monolithic fused silica suspensions in ET-HF, which is totally feasible with current technology
- ❖ Significant improvement in STN \Rightarrow plenty of space for QN improvement
- ❖ Better sensitivity $<30\text{Hz}$ and $>400\text{Hz}$

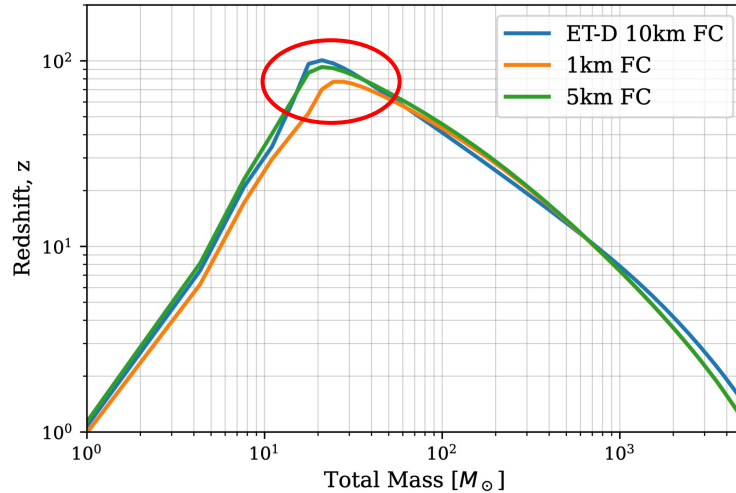
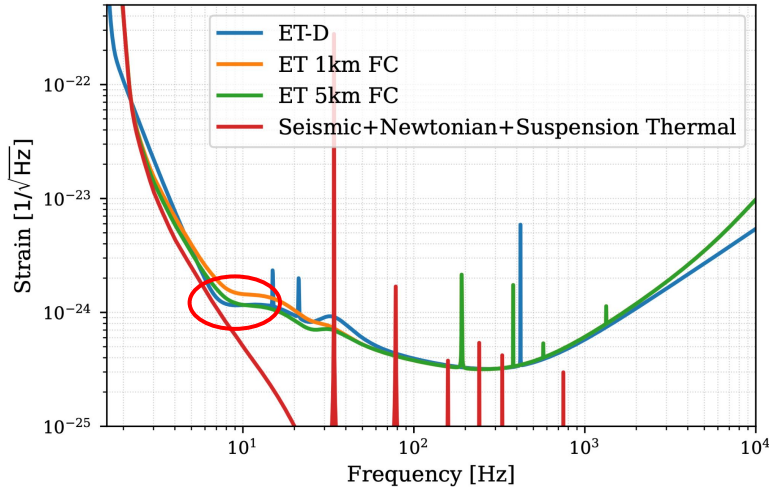


Needs checking
by SUS division!



Parameters	ET-D	Proposed
FC length [m]	300	1000
SEC loss [ppm]	1000	500
SEM transmissivity	0.1	0.05

Discussion on filter cavities



- ❖ FC length of ET-LF strongly affects sensitivity region around 8 Hz
- ❖ Degradation of sensitivity is caused by the imbalance of squeezed light sidebands upon reflection from detuned lossy cavities
- ❖ 1 km FCs lead to **loss of ~20% peak horizon reach as compared to ET-D design**, whereas for **5 km FCs we lose only ~5%**
- ❖ Inconclusive discussion on possible solution to use folded 3-mirror FCs and utilise available 900m space at the ends of the ET triangle tunnels