

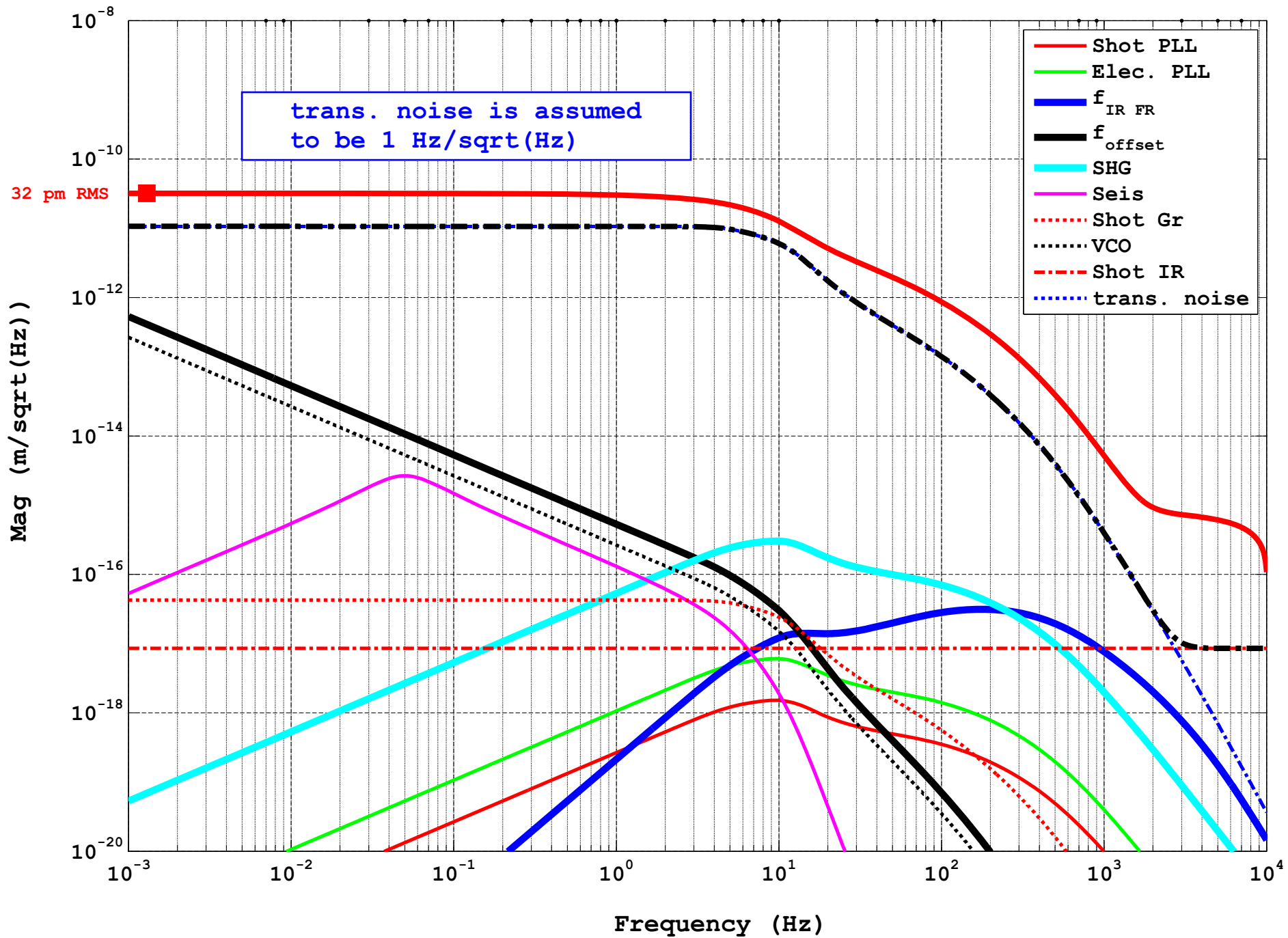
1. Fiber induced frequency noises

前回のおさらい

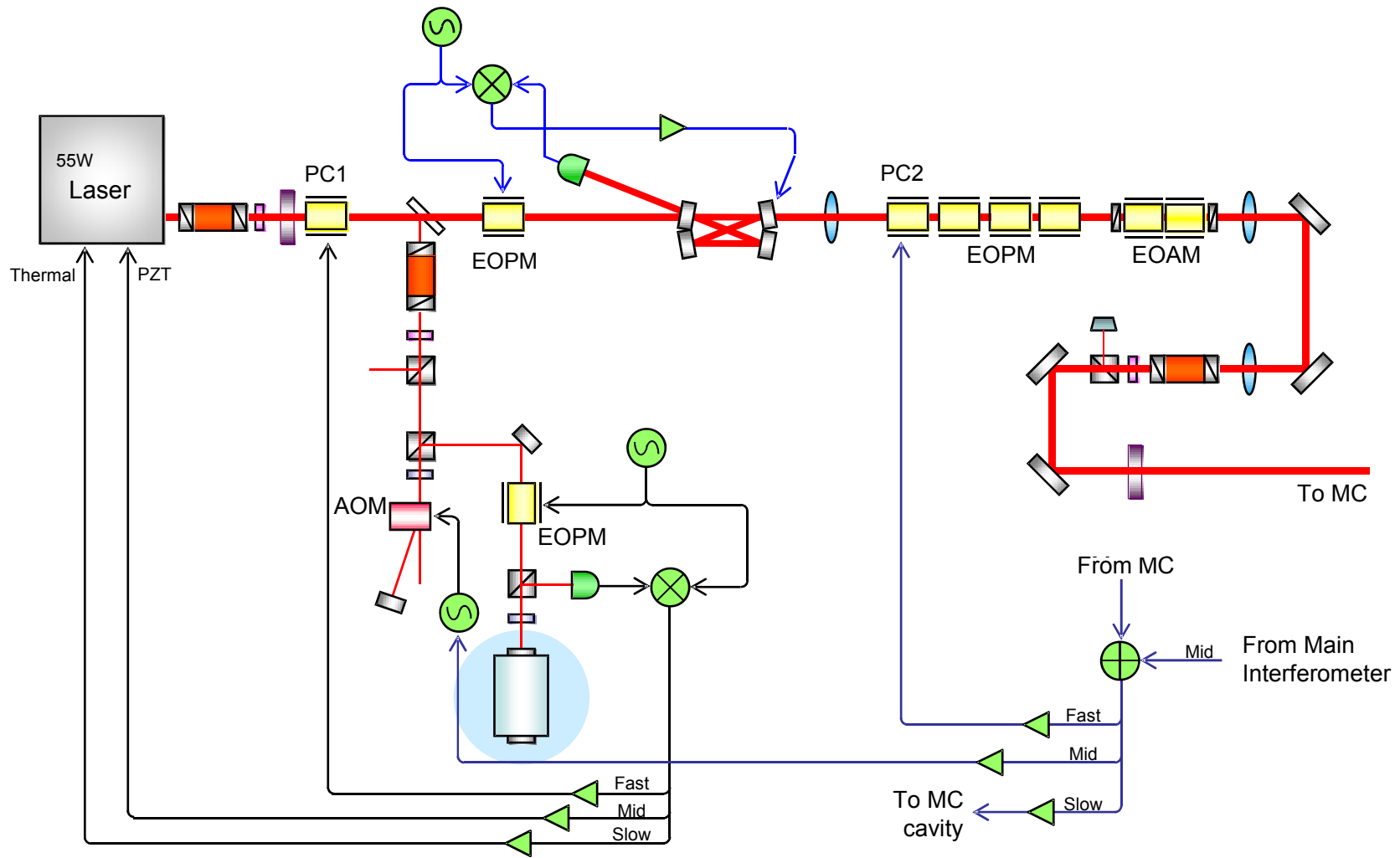
Green Lock に必要な周波数基準として、Pre-Stabilized Laser から optical fiber により Green 光源へ 1064 nm 光を送る。
この時生ずる frequency noise に対する要求値はざっと $1 \text{ Hz}/\sqrt{\text{Hz}}$ であった。

この要求を満たせるか？

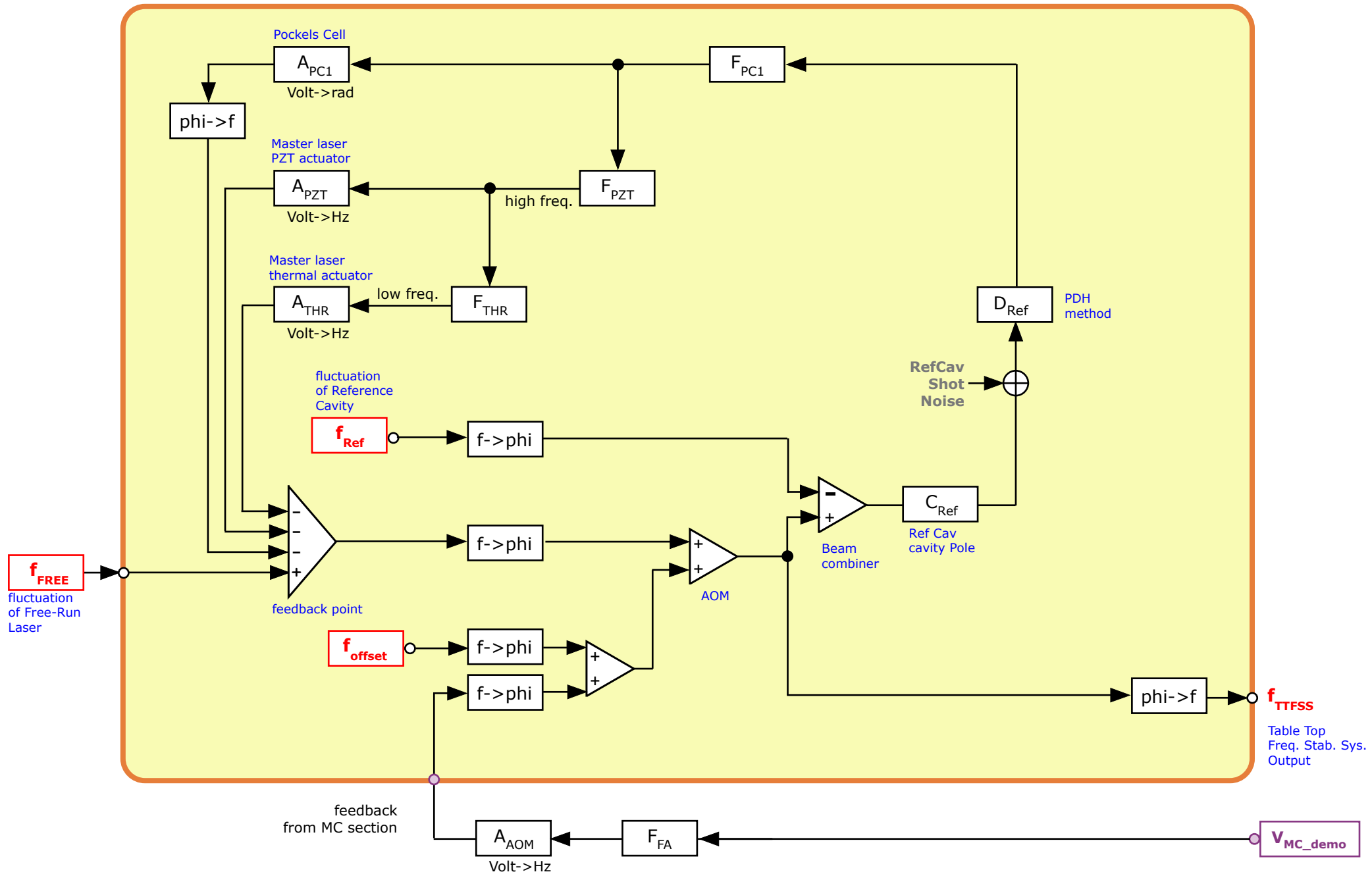
Displacement noises at IR Error



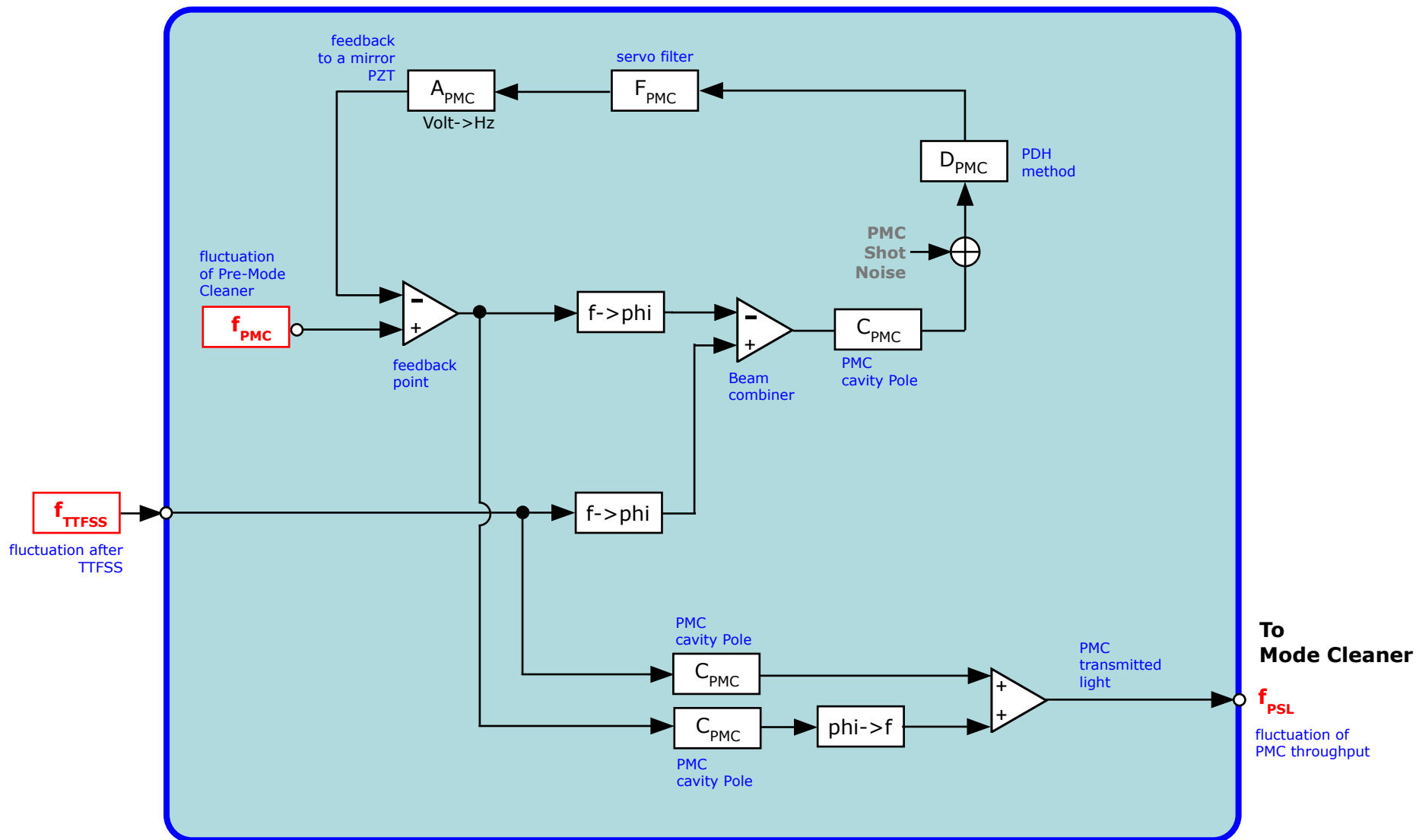
2. Servo topology of the Frequency Stabilization System



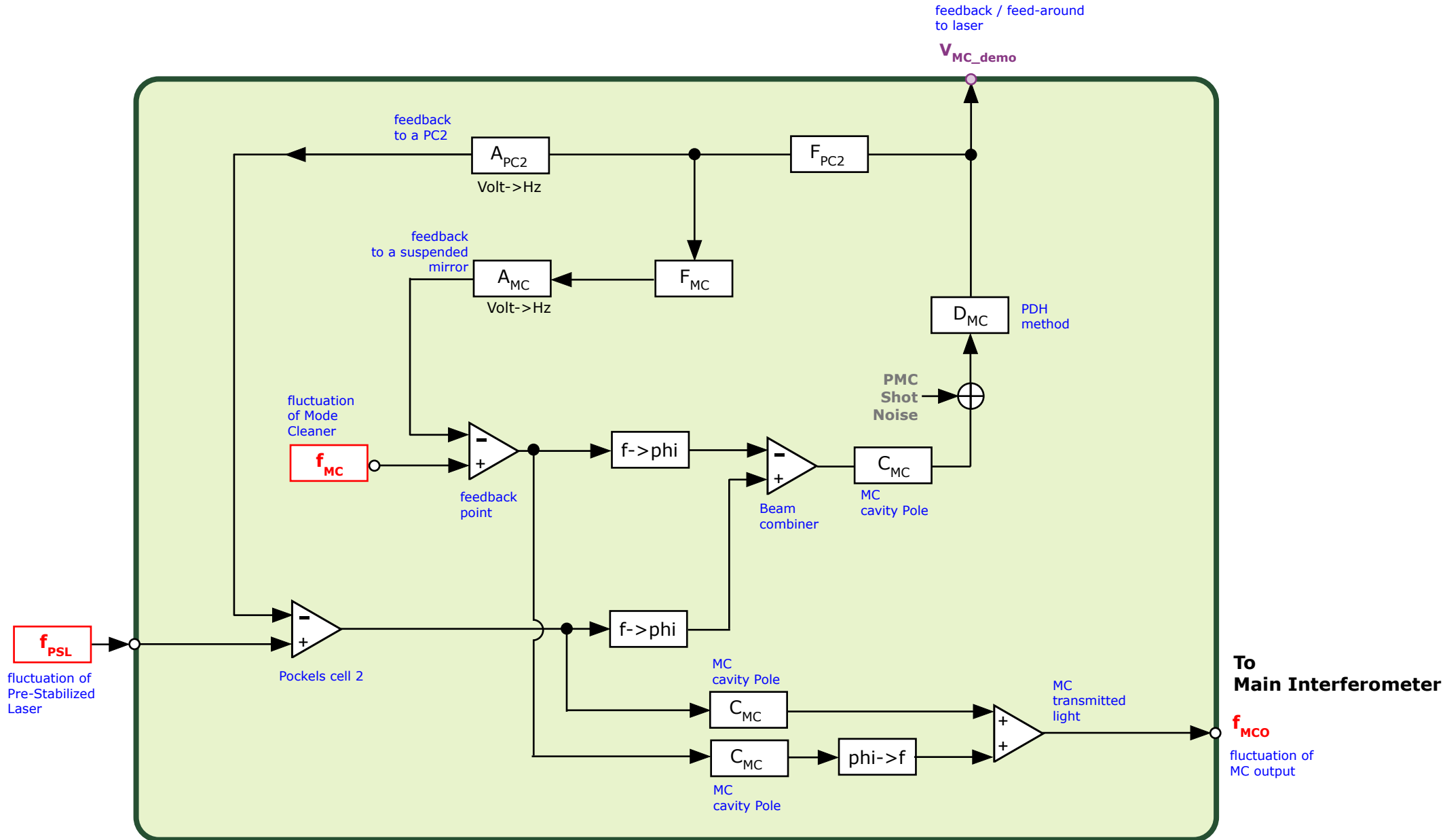
Reference Cavity section



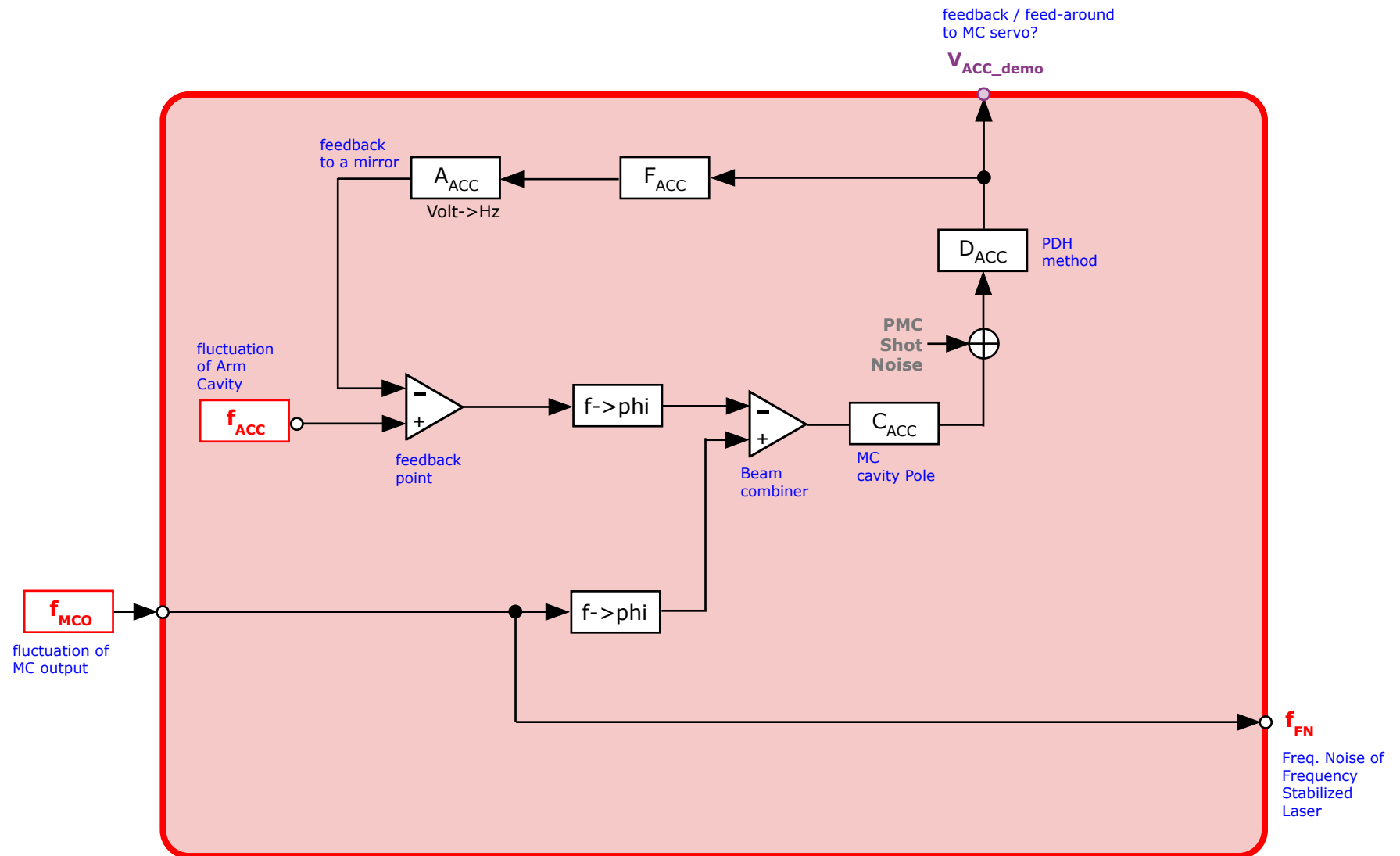
Pre Mode Cleaner section



Mode Cleaner section



Arm Cavity Common section

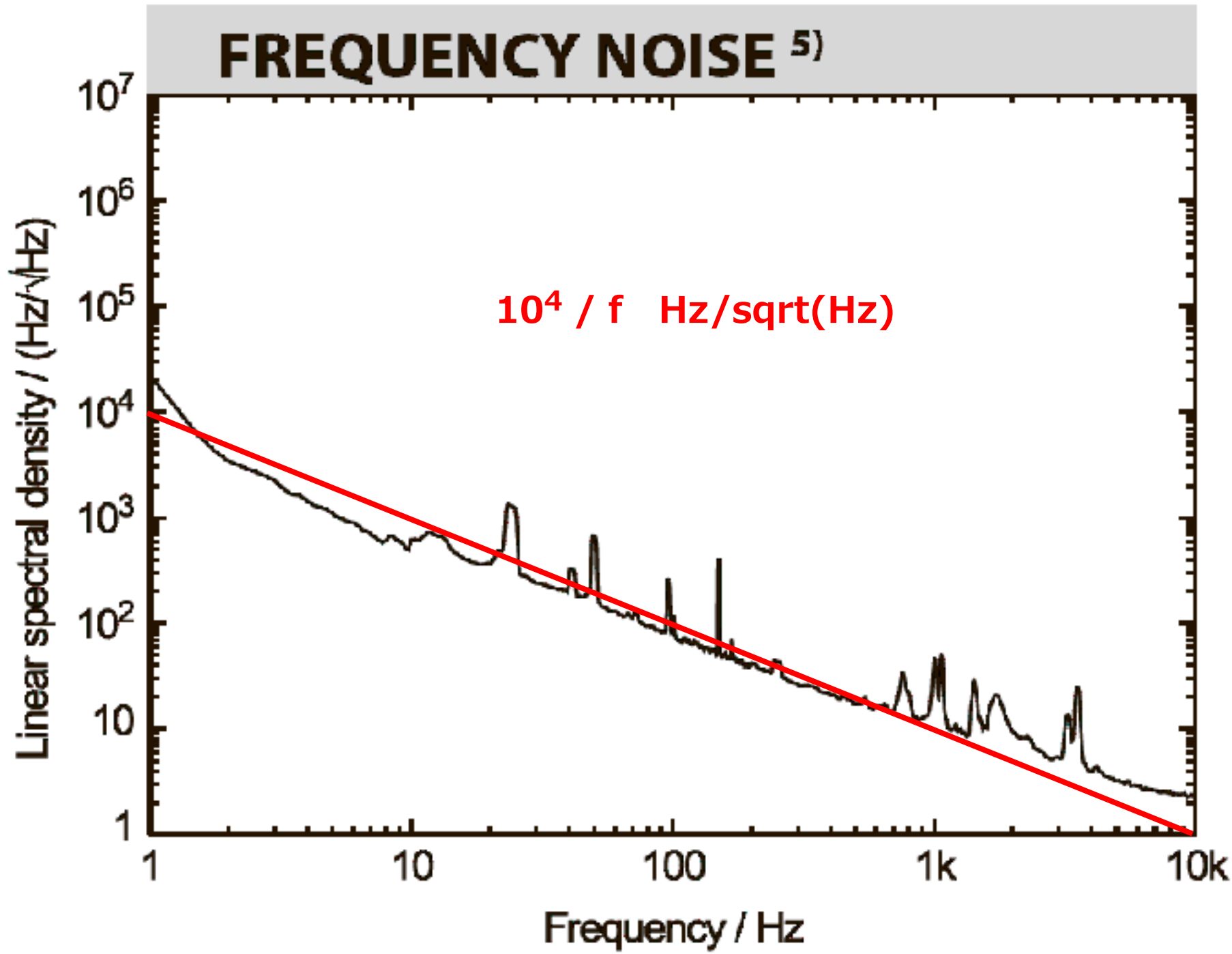


3. 各種の周波数雑音の推定／モデル化

Frequency noise modeling for servo designs

-- Laser source --

Master Laser : Innolight Mephisto



Ohmae's Doctor Thesis (p.58)

三尾研 100W Laser

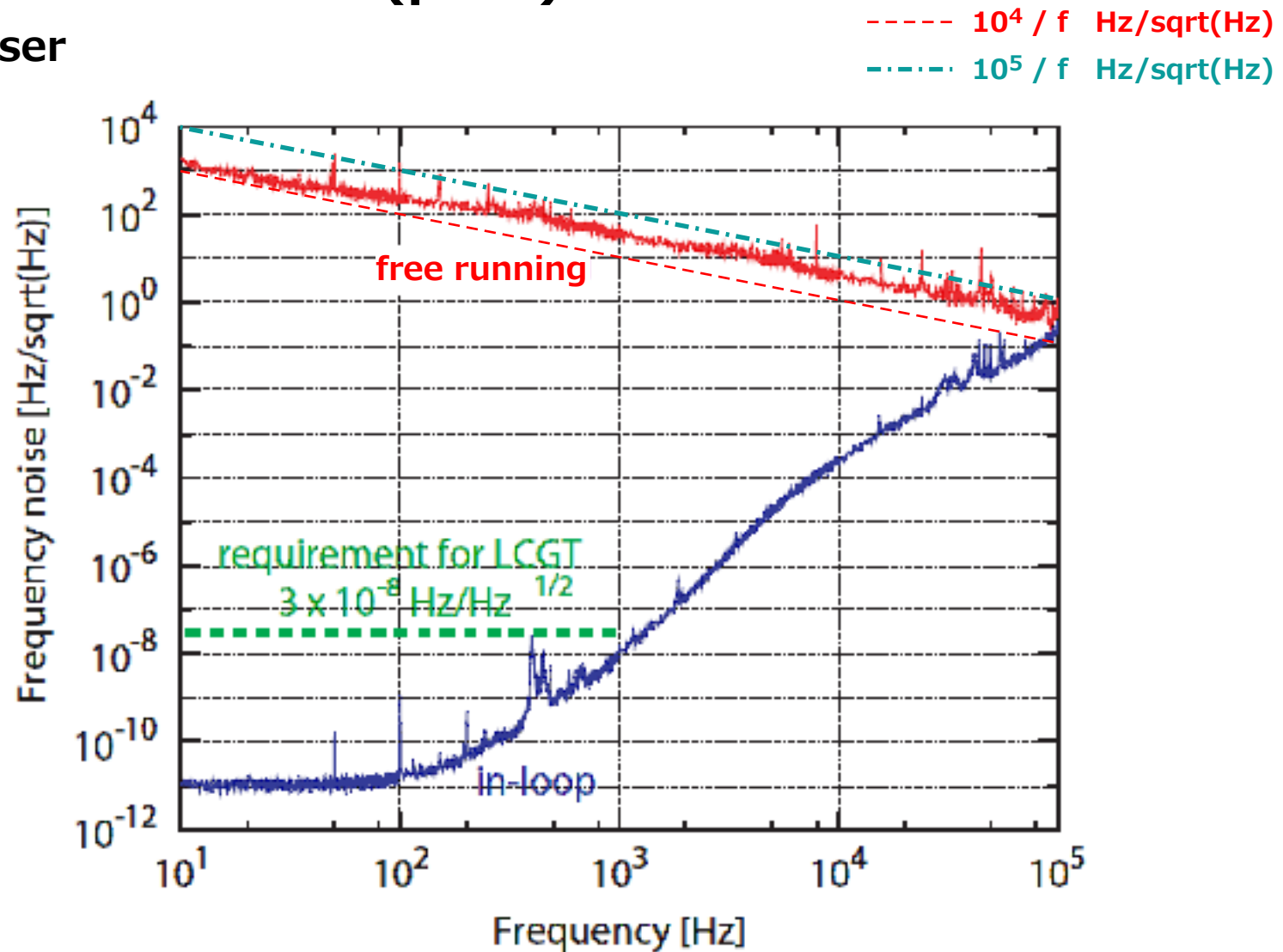


Figure 3.18: Measured frequency noise spectra of free-running injection-locked laser and laser stabilized relative to a reference cavity obtained by an in-loop measurement (final state).

aLIGO prototype 200W Laser

LIGO-T0900649-v4

----- $10^5 / f$ Hz/sqrt(Hz)

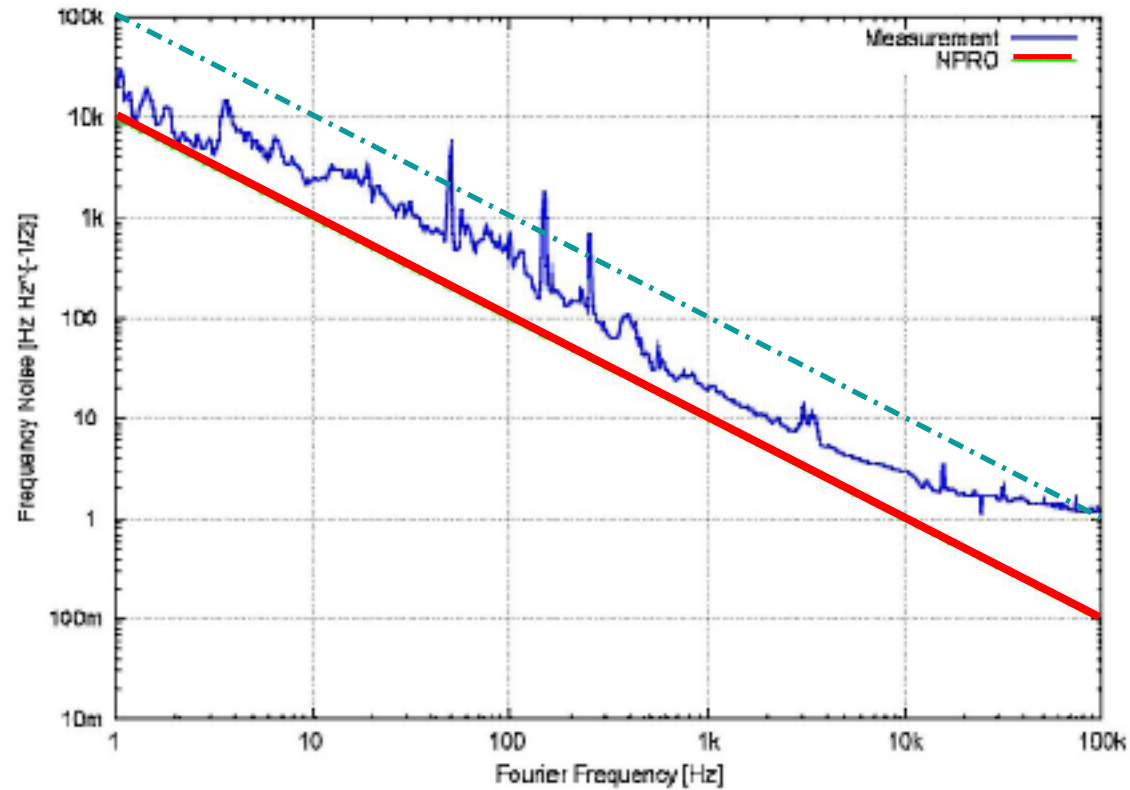


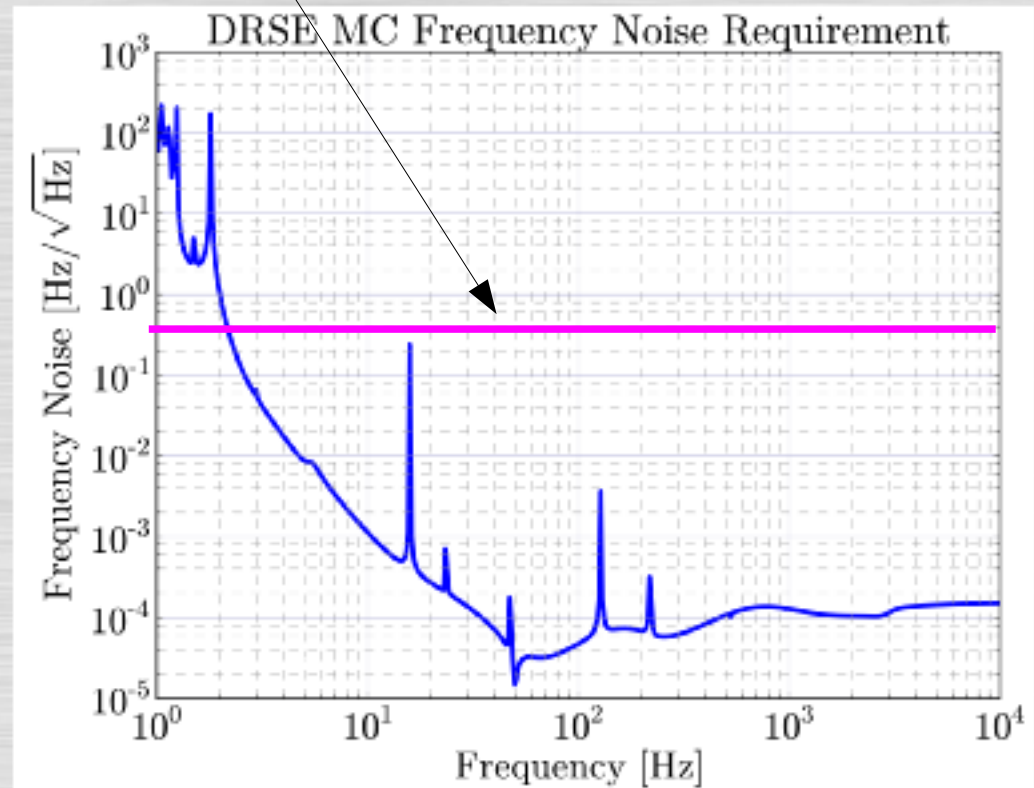
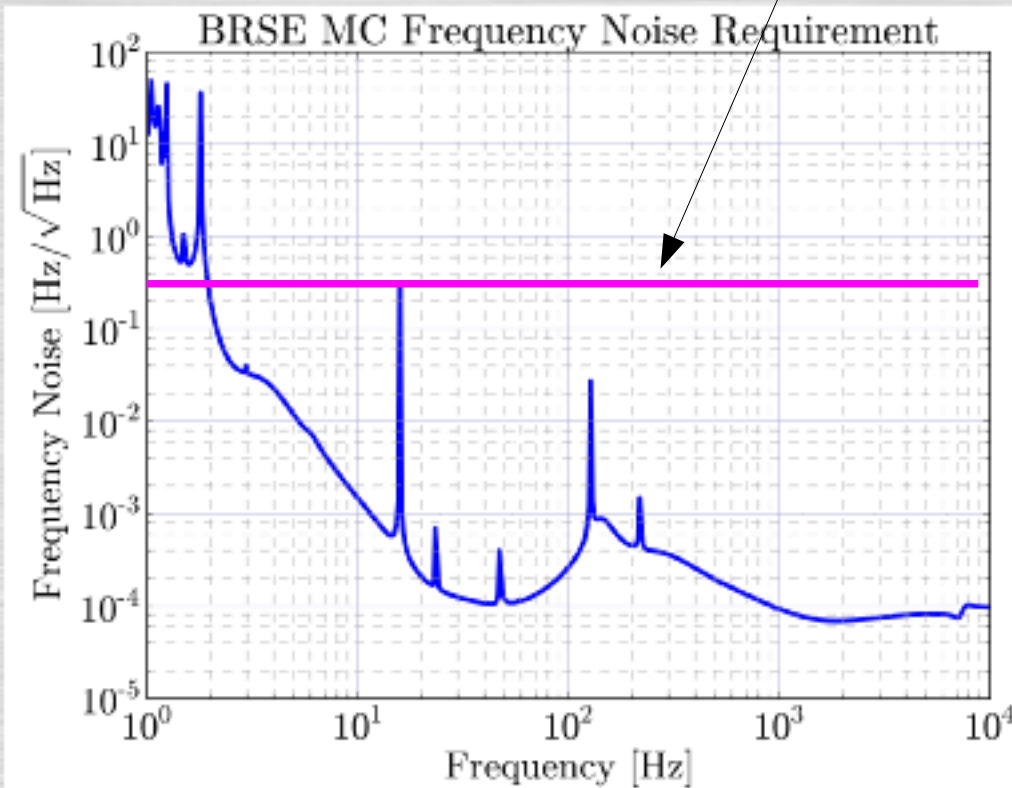
Figure 16 Measured free-running frequency noise of the 200-W oscillator. The frequency noise is about 5 dB above the noise estimate for the NPRO alone.

Frequency noise modeling for servo designs

-- Reference Cavity --

レーザー周波数雑音要求値

Reference Cavity 安定度



Frequency modeling of the reference cavity

LIGO-T0900649-v4

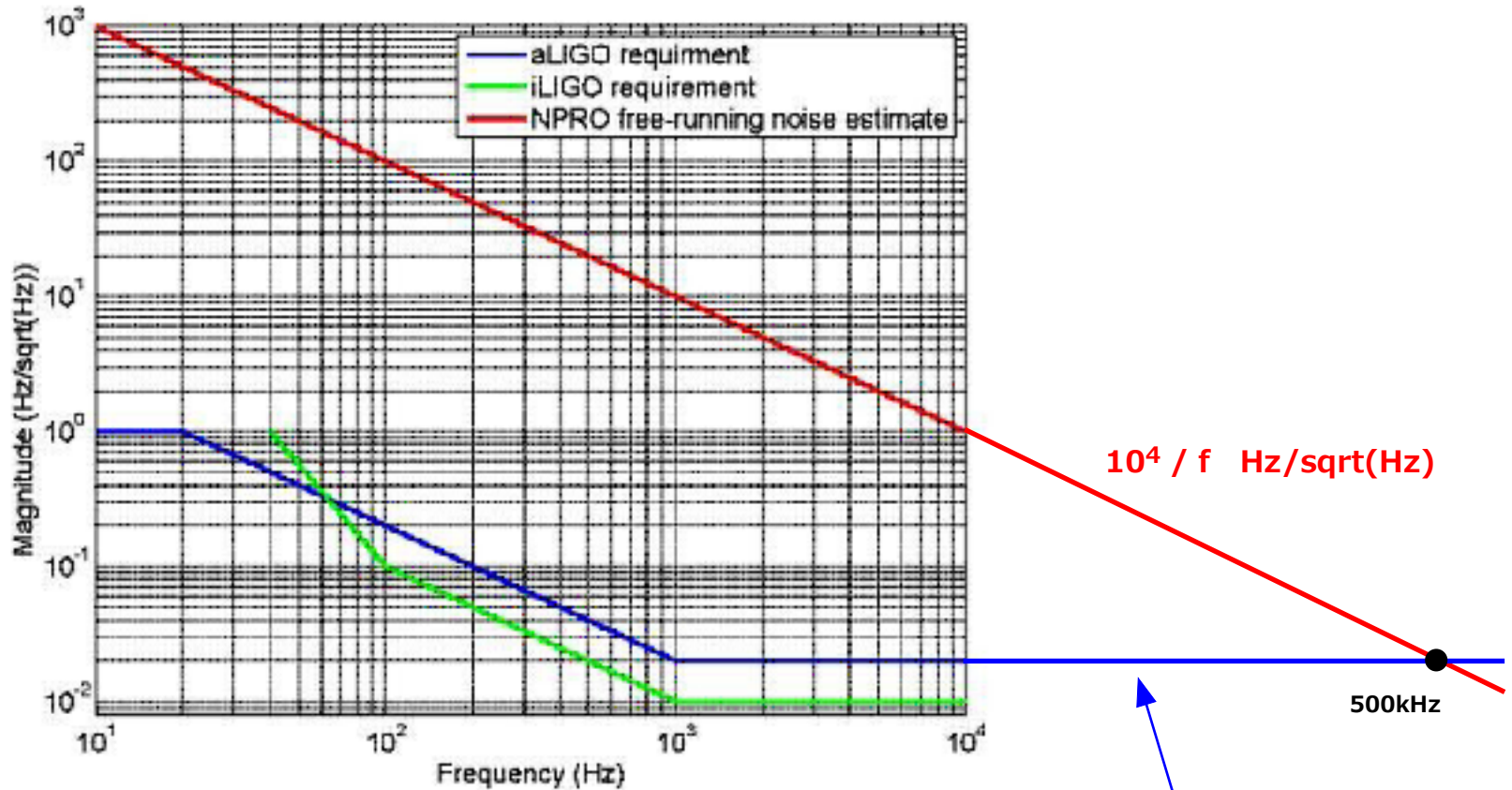


Figure 15. PSL free-running NPRO frequency noise estimate and Advanced LIGO and Initial LIGO frequency noise requirements.

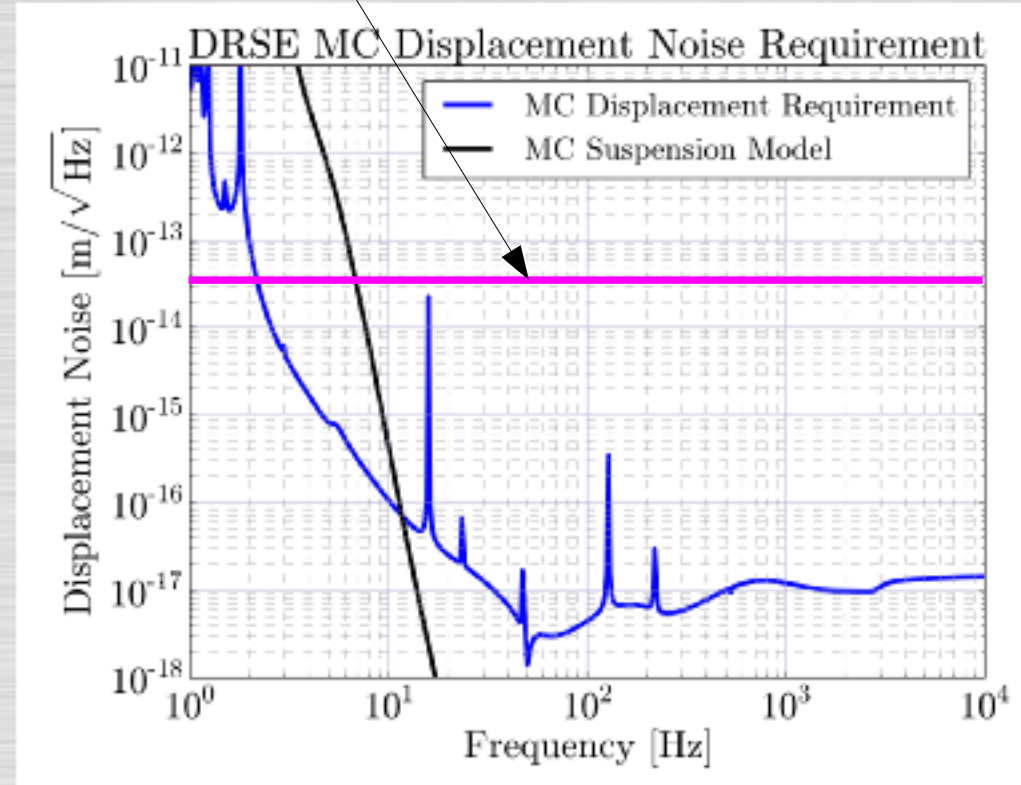
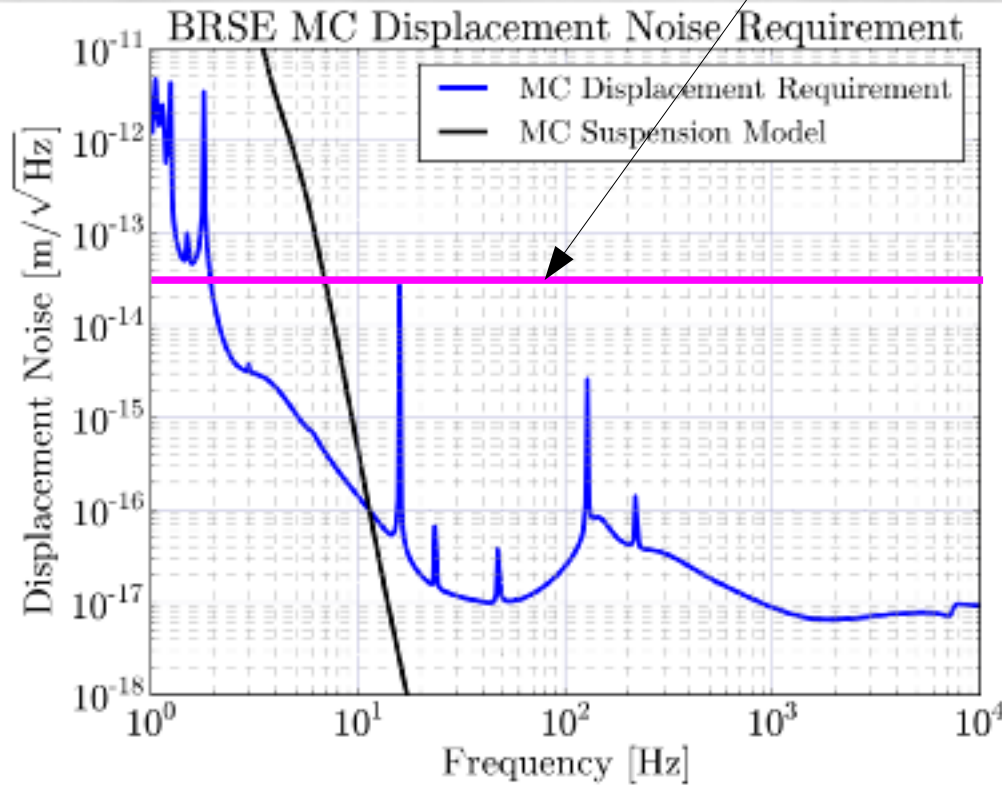
えいやつと
これを Reference Cavity の
目標値に設定。

Frequency noise modeling for servo designs

-- Mode Cleaner --

MC変位雑音に焼き直すと

Reference Cavity 安定度



2012年3月24日 日本物理学会春季大会

KAGRAの主干渉計設計II

麻生洋一