

Summary of iKAGRA Test Run Mar 25-31, 2016

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Quick Facts

- 3 km Michelson, mid-fringe lock
- input power to BS ~ 220 mW
- power at detection port (REFL) ~ 8 mW
- duration: Mar 25 9:00 JST - Mar 31 17:00 JST
- acquired data length: ??? hours
- duty cycle: ??? %
- longest lock: ??? hours (but typically ~ ??? minutes)
- strain sensitivity: $\sim 3e-15$ /rtHz @ 100 Hz
(~ 1 pc for NS-NS binary range)

Interferometer Configuration

- 3 km Michelson, mid-fringe lock, UGF ~8 Hz
- suspended mirrors DC alignment controlled with oplevs

IMC

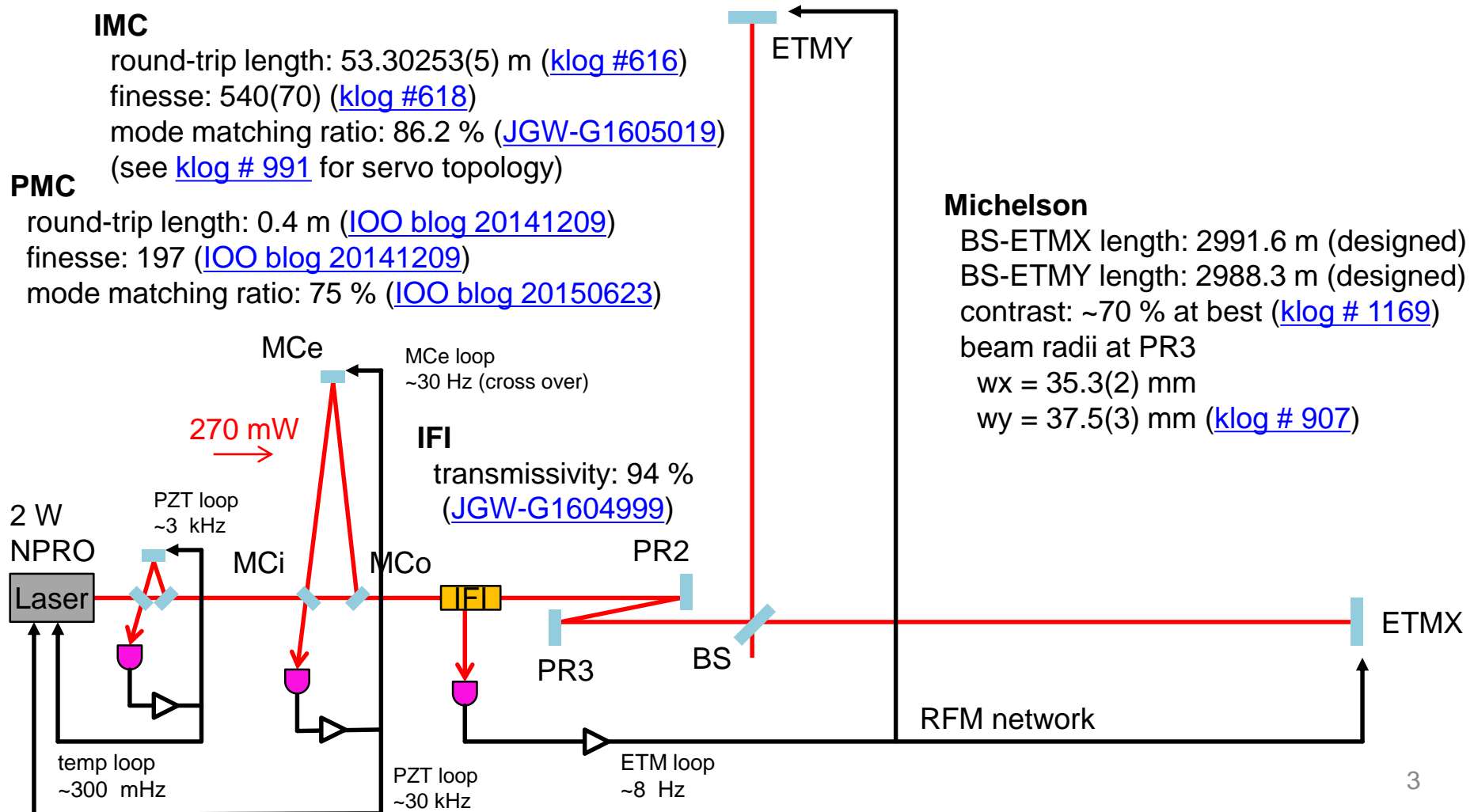
round-trip length: 53.30253(5) m ([klog #616](#))
 finesse: 540(70) ([klog #618](#))
 mode matching ratio: 86.2 % ([JGW-G1605019](#))
 (see [klog # 991](#) for servo topology)

PMC

round-trip length: 0.4 m ([IOO blog 20141209](#))
 finesse: 197 ([IOO blog 20141209](#))
 mode matching ratio: 75 % ([IOO blog 20150623](#))

Michelson

BS-ETMX length: 2991.6 m (designed)
 BS-ETMY length: 2988.3 m (designed)
 contrast: ~70 % at best ([klog # 1169](#))
 beam radii at PR3
 $w_x = 35.3(2)$ mm
 $w_y = 37.5(3)$ mm ([klog # 907](#))



Suspensions and Mirrors

- fused silica, room temperature

MCI, MCo, MCE

Type-C (double pendulum; x config magnets)

95.95 mm dia, 29.5 mm thick

RoC = 37.33(9) m ([klog #711](#))

PR3

Type-Bp' (double pendulum)

ϕ 250 mm, 100 mm thick

RoC = 24.92 m

TM stage was fixed

IM stage has 6 OSEMs

ETMX, ETMY (TAMA PRM)

Type-C (double pendulum; + config magnets)

(wire dia 100 μ m for X, 50 μ m for Y)

100 mm dia, 60 mm thick

RoC = 9 km

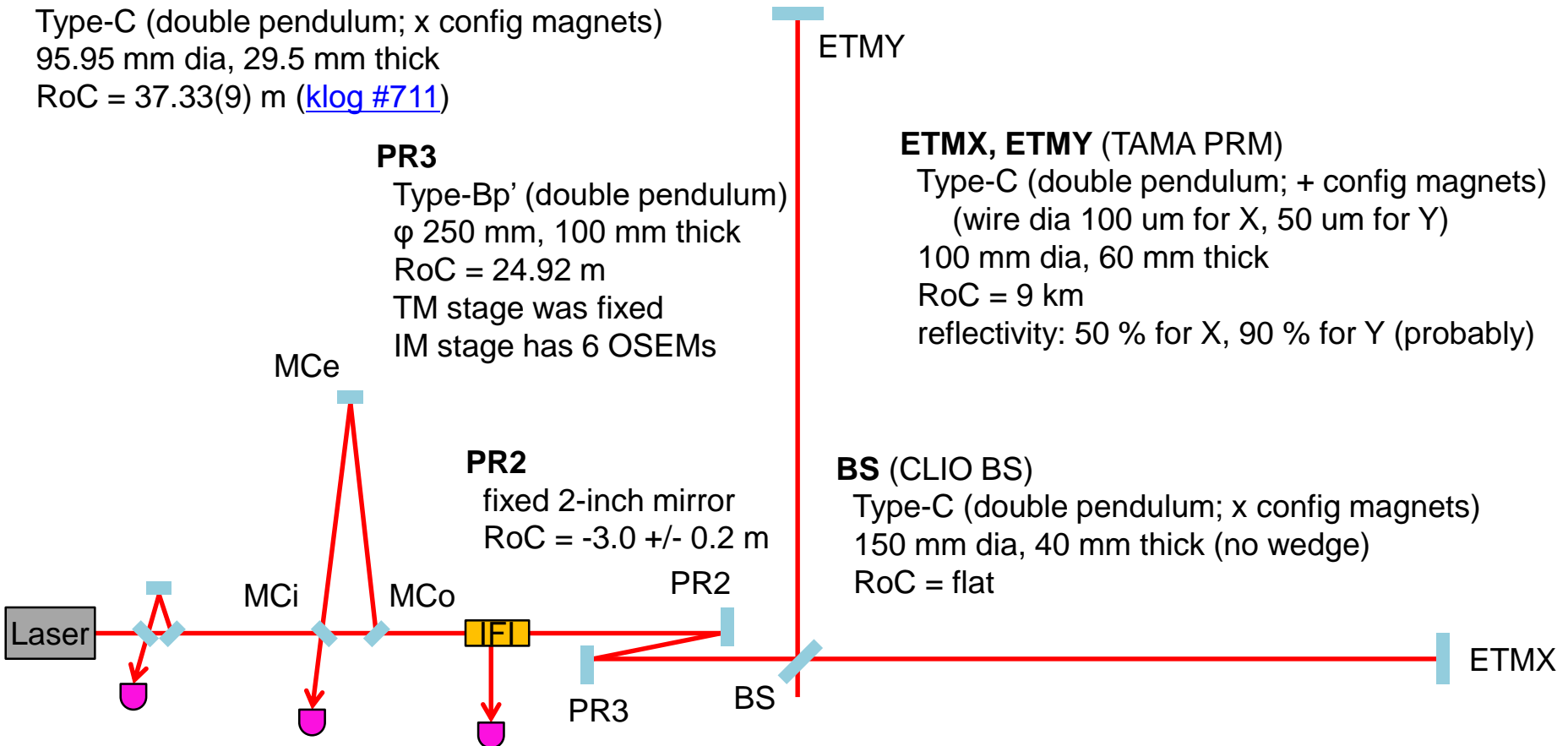
reflectivity: 50 % for X, 90 % for Y (probably)

BS (CLIO BS)

Type-C (double pendulum; x config magnets)

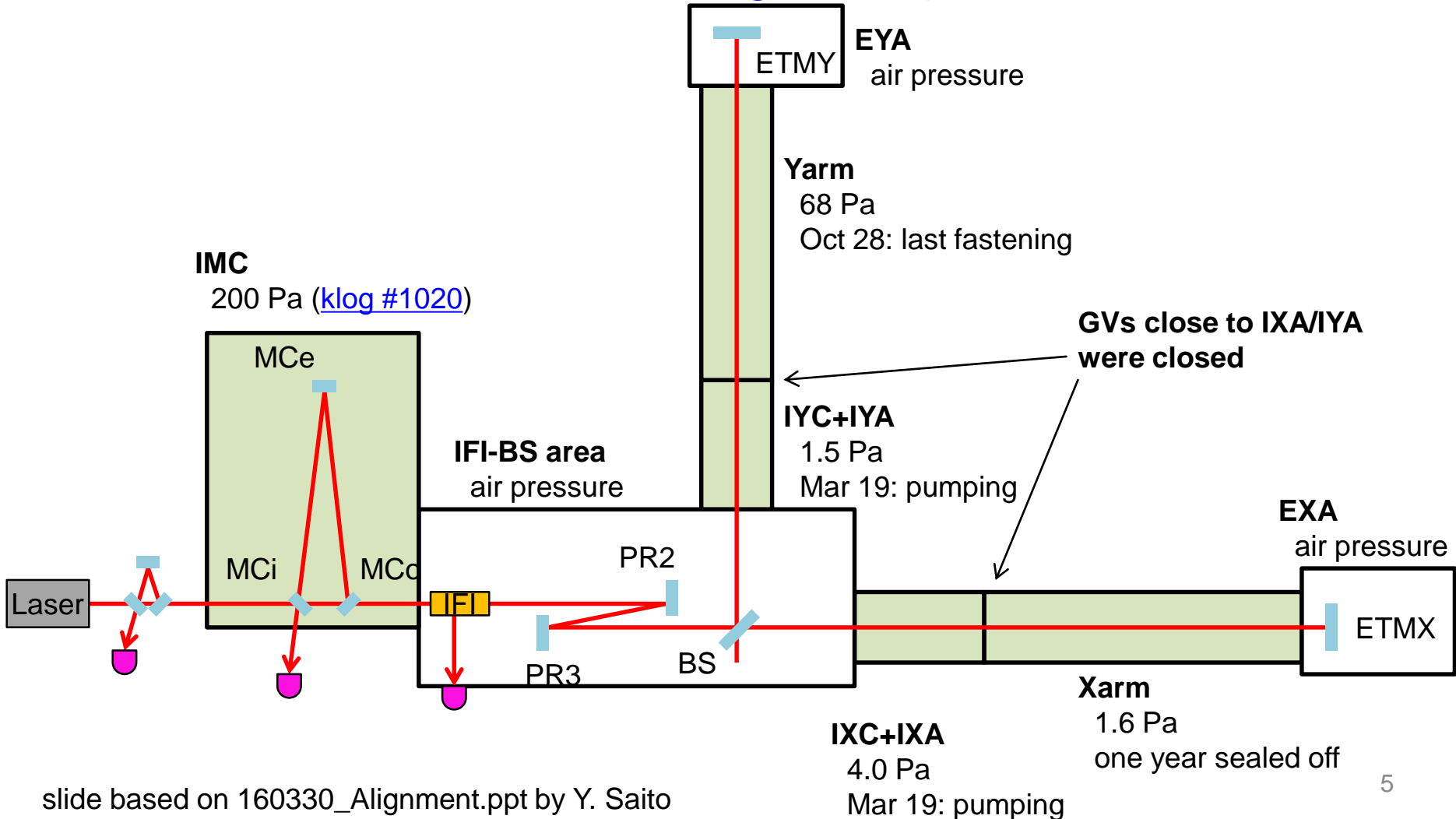
150 mm dia, 40 mm thick (no wedge)

RoC = flat



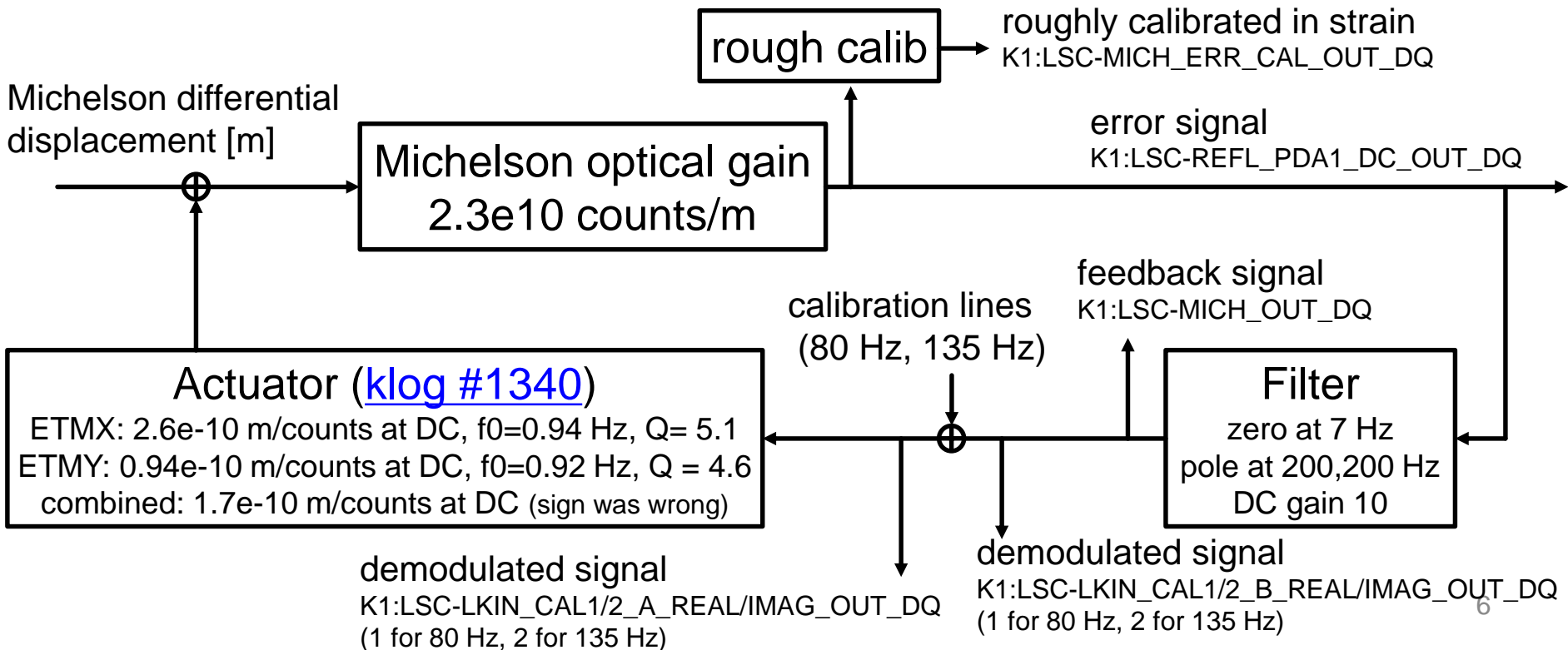
Vacuum

- central part and both ends were at air (PR2-BS was not connected, but covered; [klog #1078](#))



Calibration

- calibration of error signal (optical gain)
2.3e10 counts/m ([klog #1169](#))
- calibration of feedback signal (actuator efficiency)
1.8e-14 m/counts @ 80 Hz ([klog #1169](#))
- calibration lines at 80 Hz and 135 Hz to monitor loop gain



Detector Characterization

- SOME PLOTS BY HAYAMA-SAN, SASAKI-KUN
- duty cycle (for Michelson and IMC)
- lock duration (for Michelson and IMC)
- Michelson drift vs tidal effect
- open loop gain drift

Issues in March Test Run

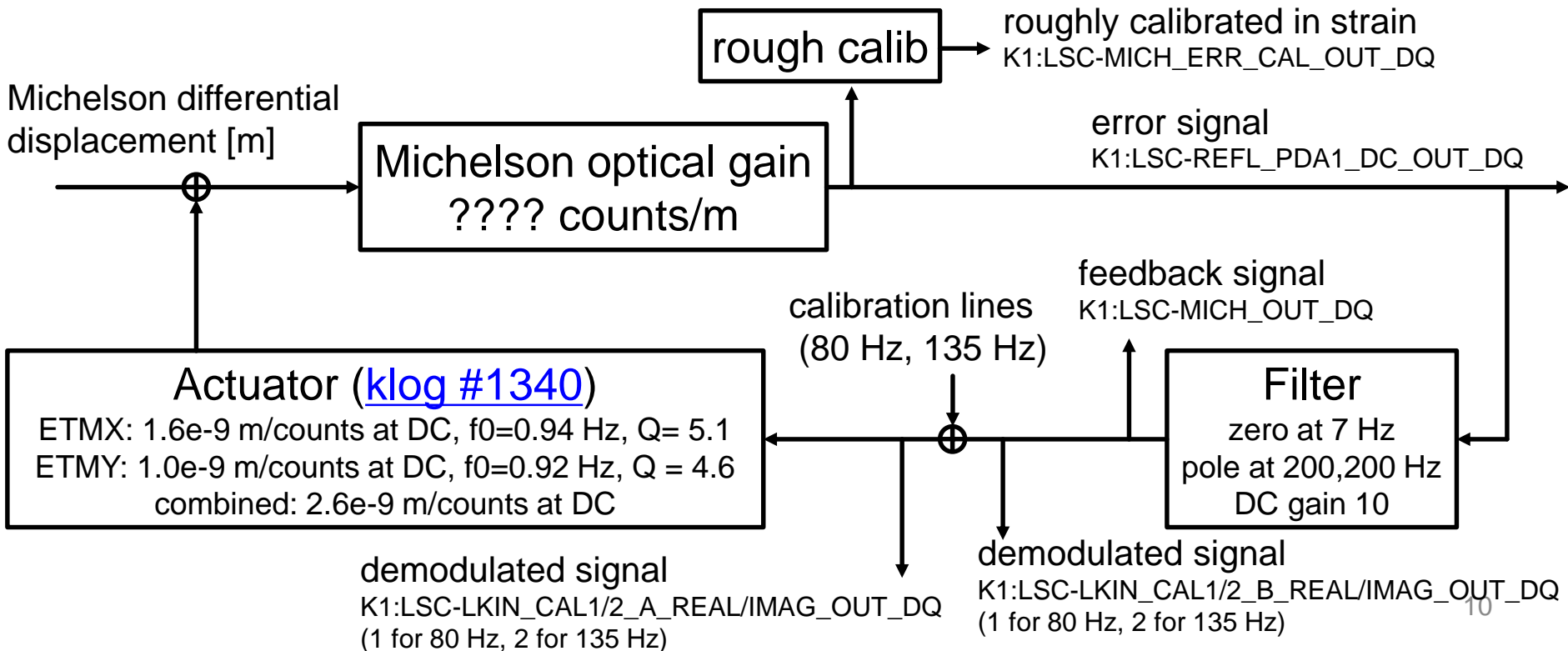
- Michelson lock was lost every ~30 minutes
- Alignment was adjusted manually ~ once per day
- Calibration was done offline
- PMC was re-locked manually
- GVs close to IXA/IYA was closed
- PR2-BS duct was not connected
- Some unsafe issues left unaddressed

What's New in April Test Run

- Michelson lock was lost every ~30 minutes
-> improved to ~~????~~(x16 ?)
new actuation efficiency (ETM differential): 2.6e-9 m/C at DC
([klog #1340](#))
- Alignment was adjusted manually ~ once per day
- Calibration was done offline
- PMC ~~was re-locked manually~~ remote control restored
([klog #1351](#))
- GVs close to IXA/IYA was ~~closed~~ opened ([klog #1338](#))
- PR2-BS duct was ~~not connected~~ connected
- Some unsafe issues ~~left unaddressed~~ partially addressed

Calibration for April Test Run (TO BE UPDATED)

- calibration of error signal (optical gain)
???? counts/m
- calibration of feedback signal (actuator efficiency)
2.6(1)e-10 m/counts @ 80 Hz ([klog #1340](#))
- calibration lines at 80 Hz and 135 Hz to monitor loop gain



What To Do After April Test Run

- evacuate center area and both ends
 - to open all GVs
 - to investigate alignment change during evacuation
- PR3 height check
- oplev stability, noise measurements with fixed mirror
- investigate scattering noise from vibration of ducts
- what else?