

# Optical/Electrical Components Needed for iKAGRA IMC Servo

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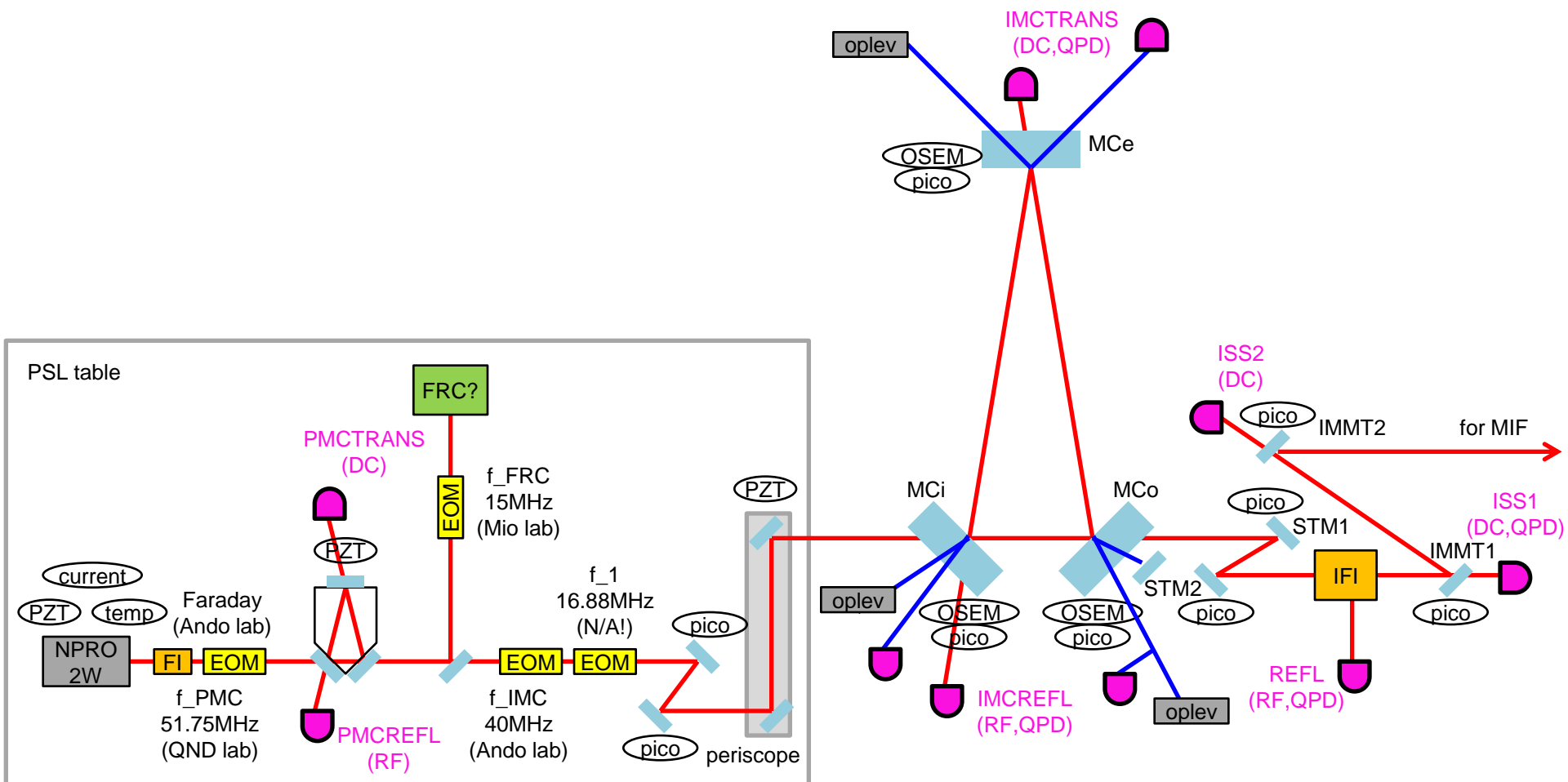
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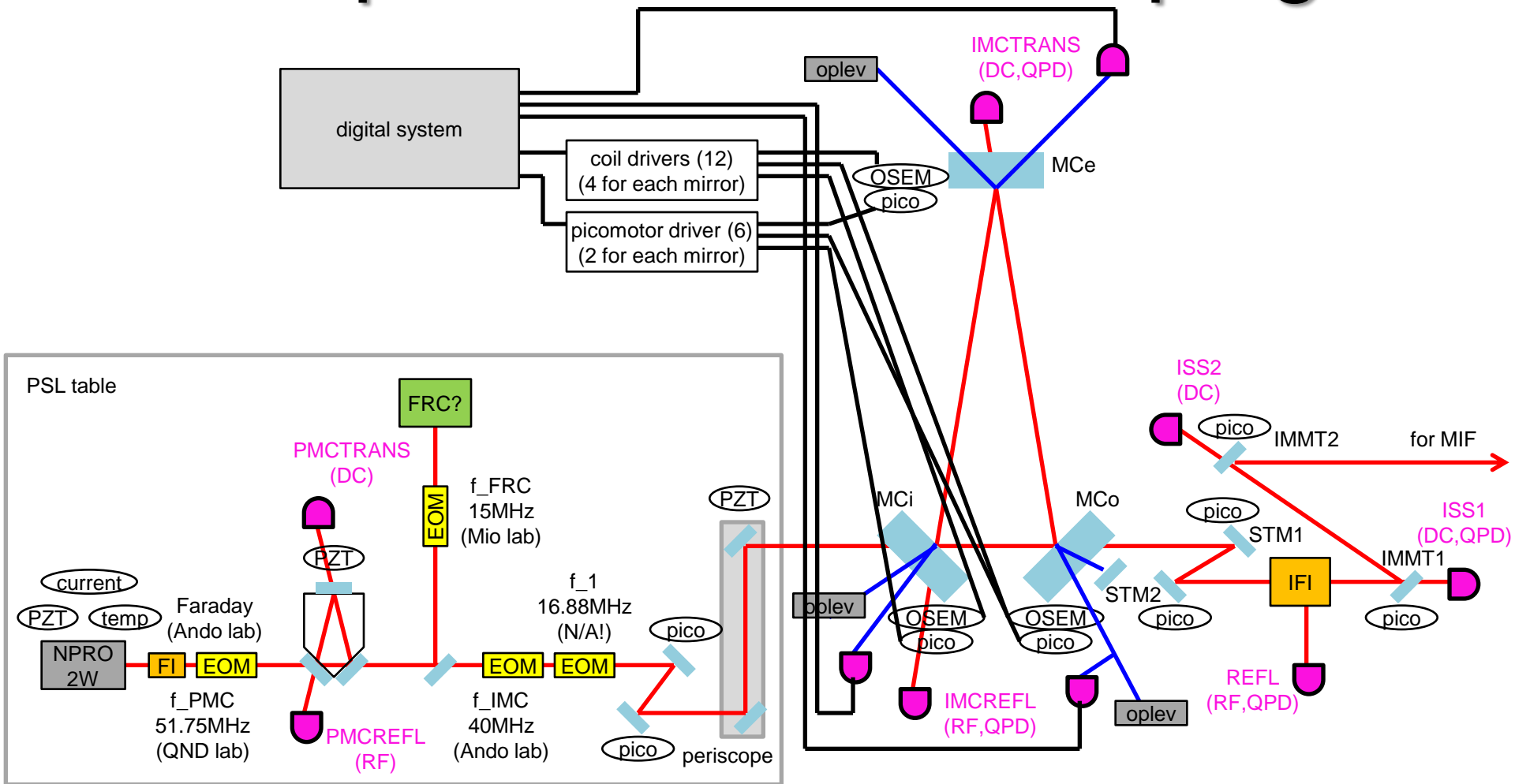
# Scope

- Start discussion on listing up what we need for iKAGRA IMC (and PSL) servo
- Focus mainly on optical and electrical components
- References:
  - [JGW-T1402349](#) (iKAGRA PMC study)
  - [JGW-G1402302](#) (FSS modeling)
  - (GWADW2014 IOO poster by Nakano)
  - [JGW-D1402507](#) (IOO 3D drawing)
  - [JGW-T1302068](#) (layout around IMMT)
  - [JGW-D1402492](#) (IMC suspension cabling)
- Acronyms:
  - FSS: frequency stabilization servo
  - ISS: intensity stabilization servo

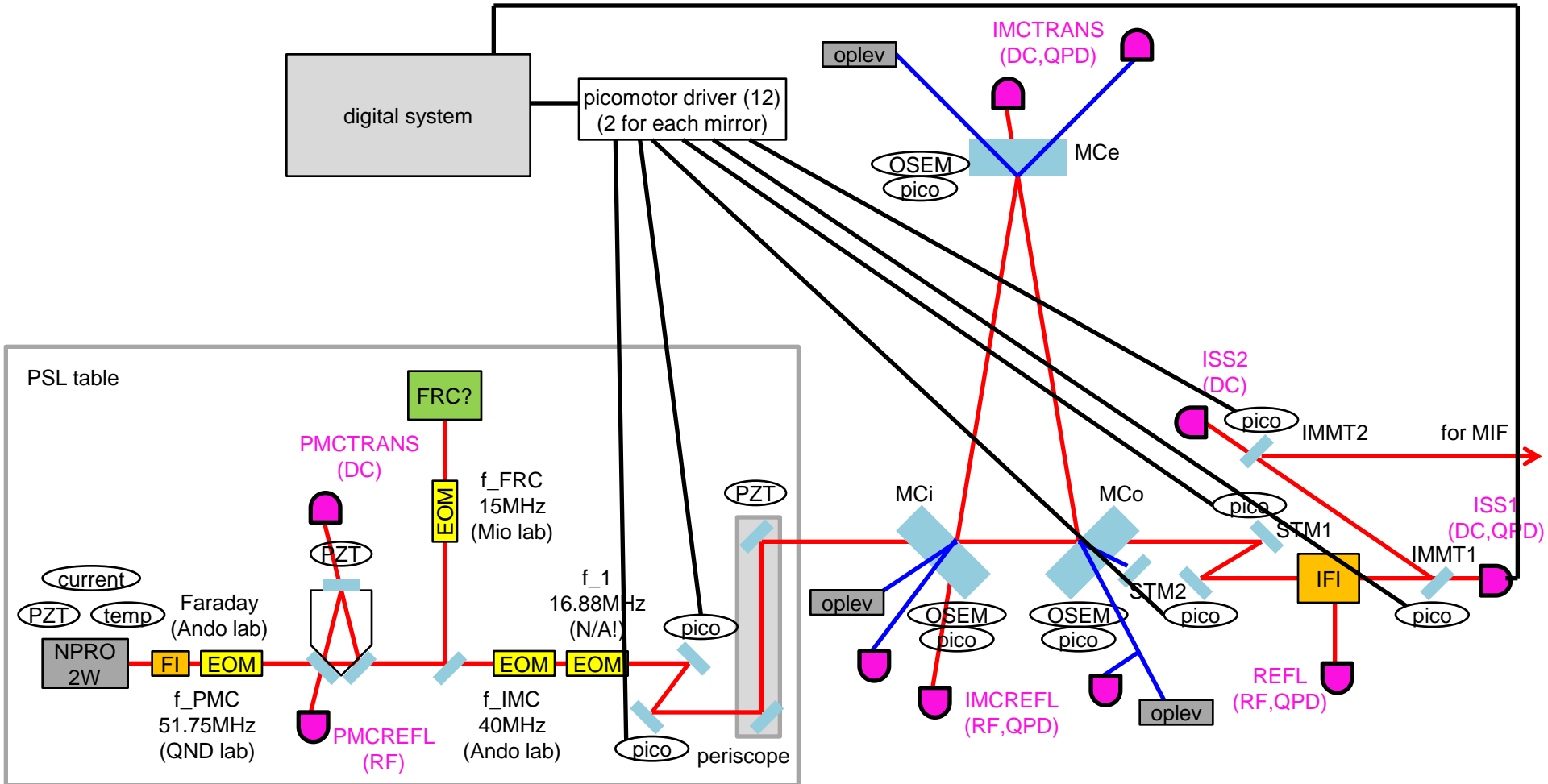
# Optical Configuration



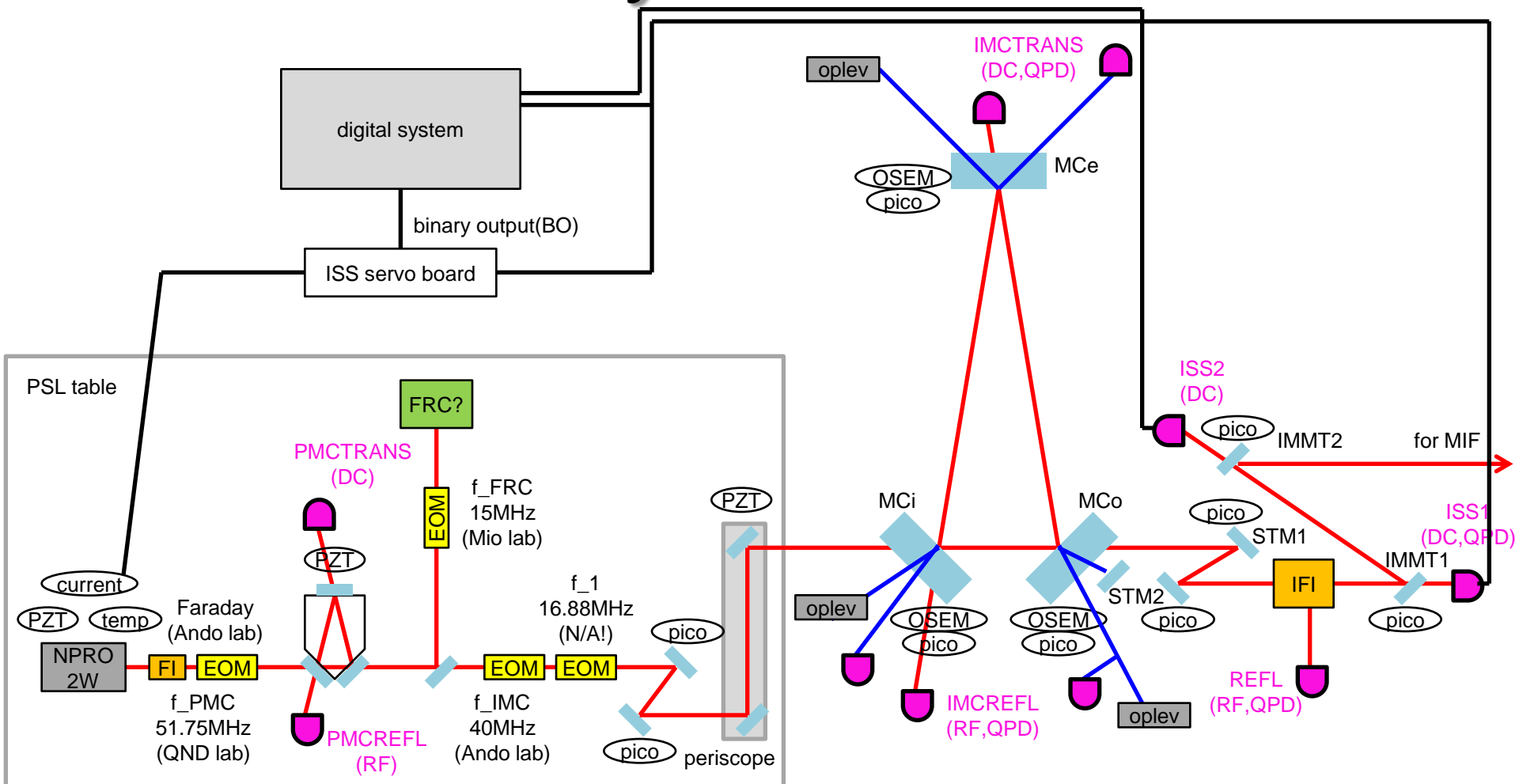
# Suspension Local Damping



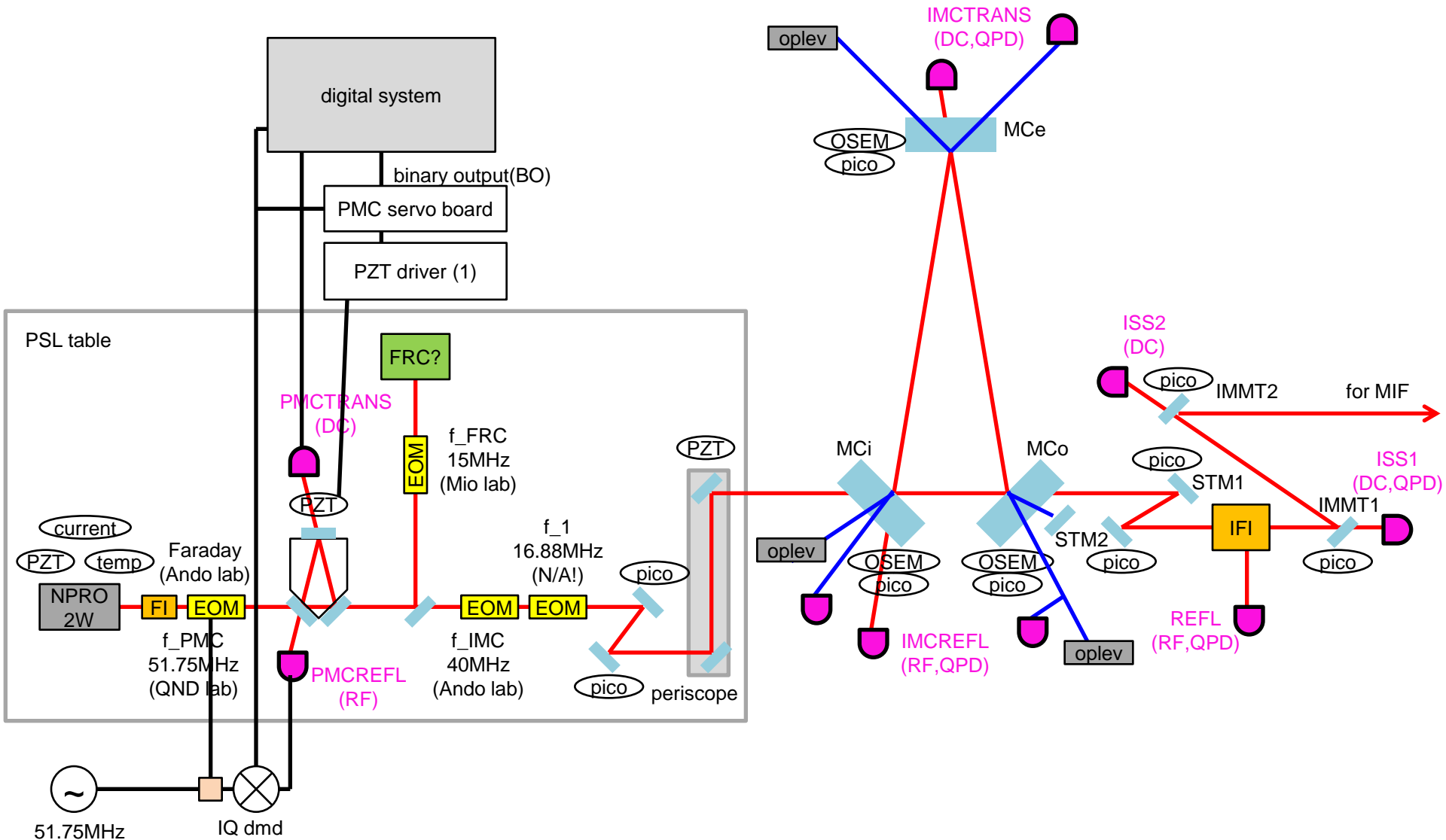
# Initial Alignment



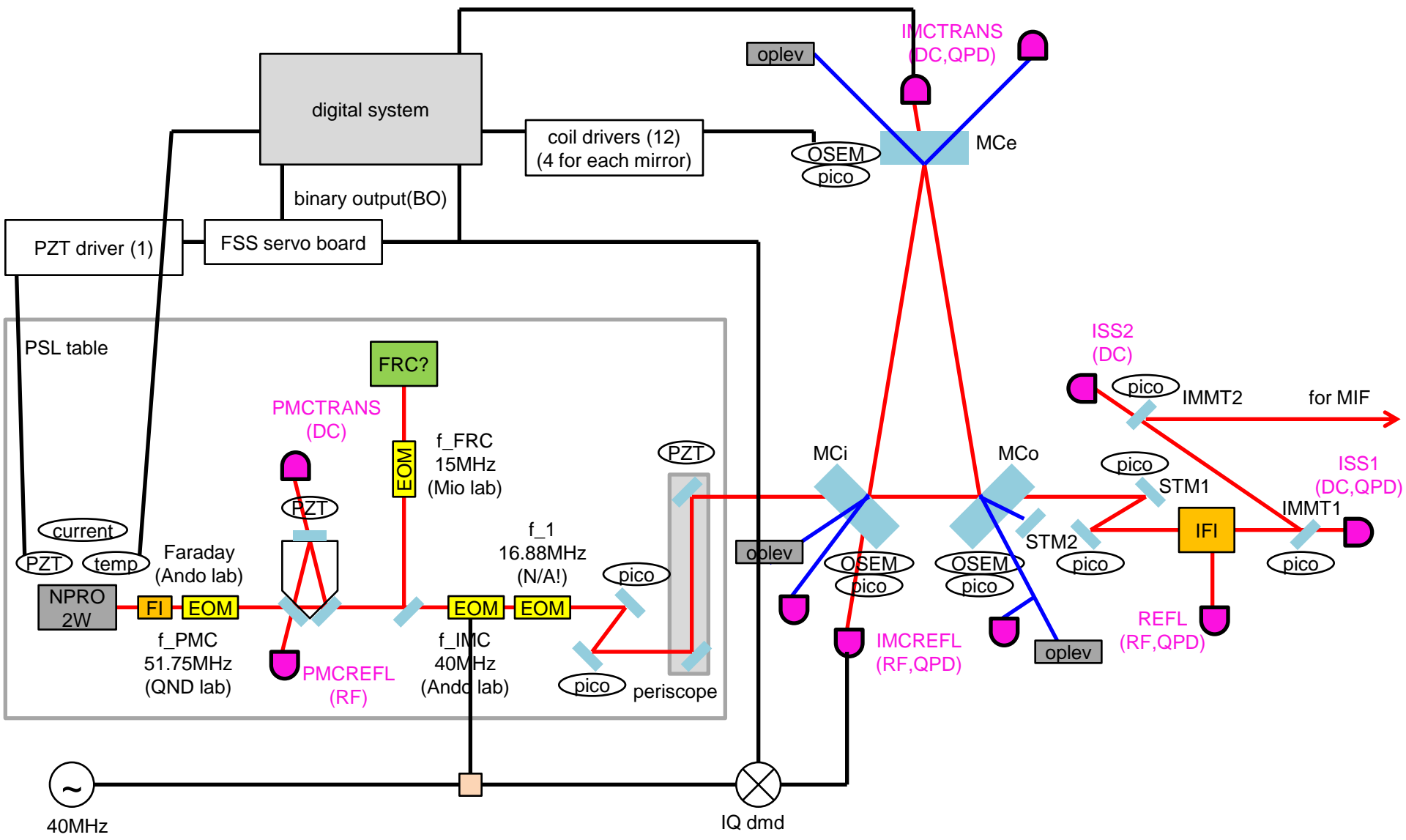
# Intensity Stabilization



# PMC Servo



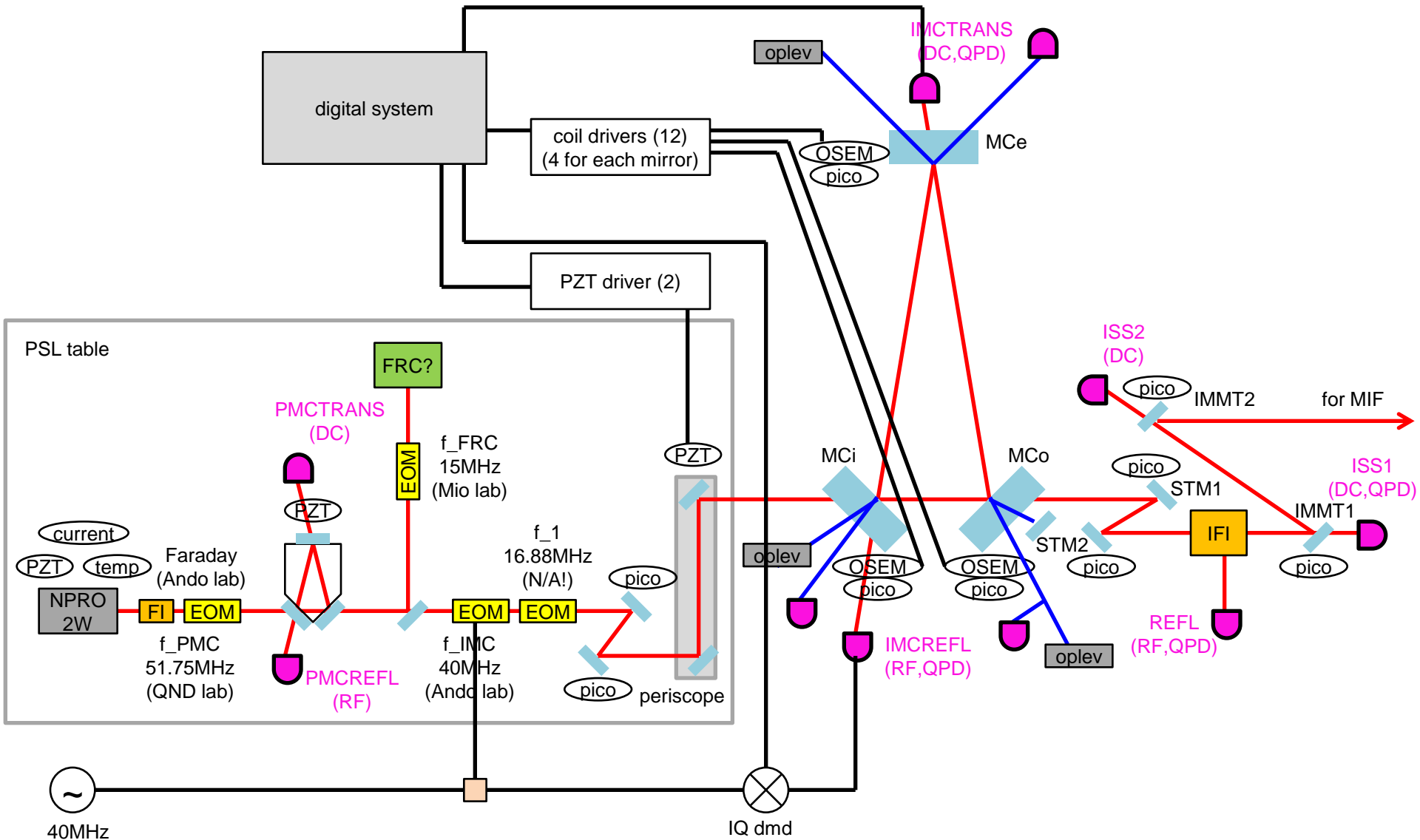
# Frequency Stabilization



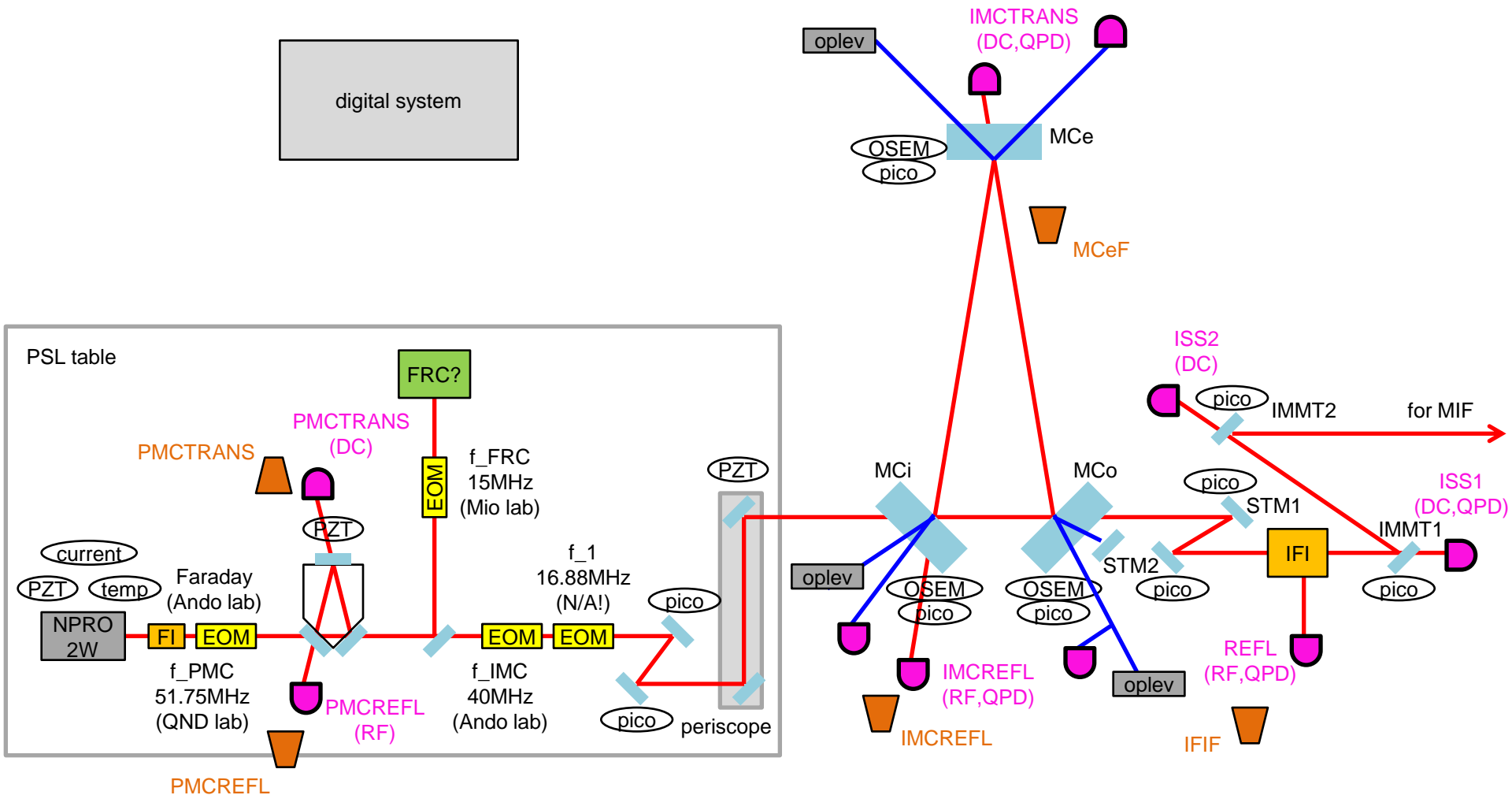
FRC is not included in this FSS diagram



# Alignment Sensing and Control



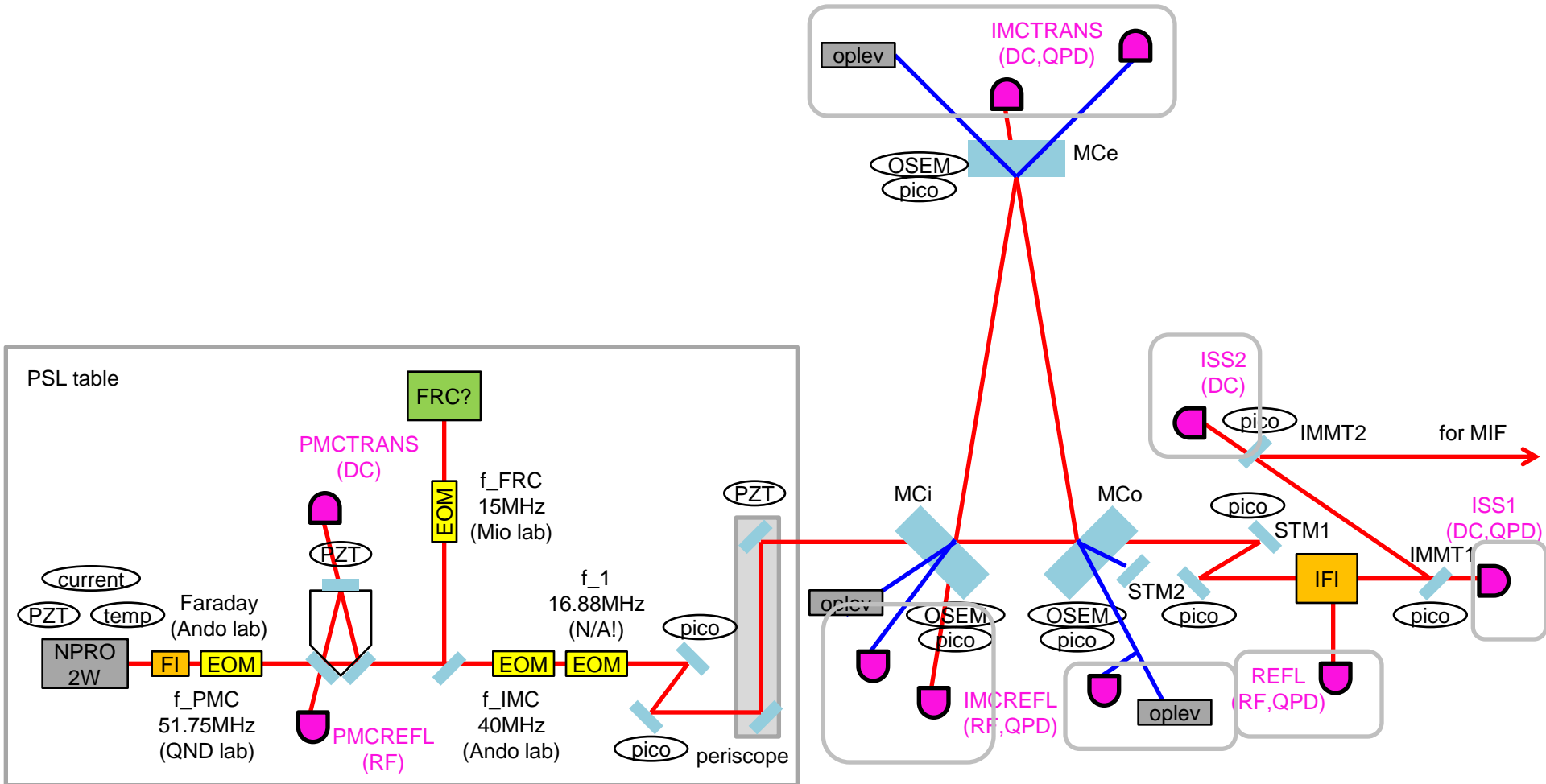
# Cameras



5 cameras?

How do we put their signals in the digital system?

# Optical Tables and Pylons



Where and how many do we have them?  
 What are the sizes of the tables?  
 Do we need periscopes for them?

# Gouy Phase Telescopes

- We need two QPDs for each port we want to monitor the beam alignment
- It would be nice to have standardized Gouy phase telescopes for each port

- Below is an example aLIGO one (~ 15 cm x 55 cm)  
[LIGO-T1000247](#)

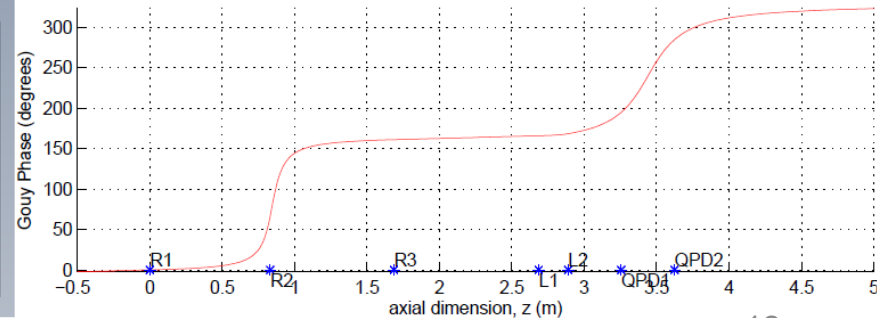
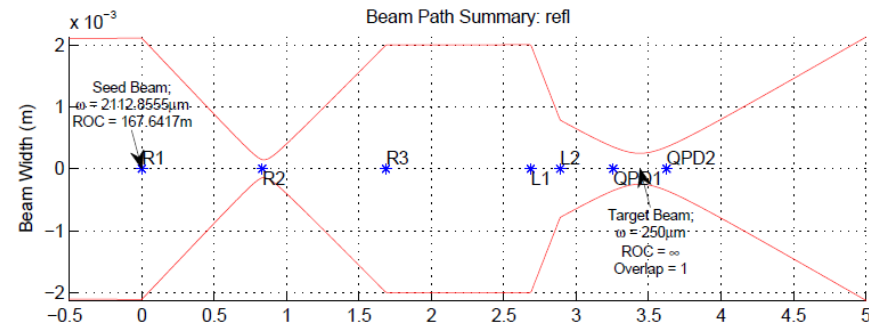


Figure 2: The REFL port QPD layout.

Figure 1: The REFL port telescope beampath.

# DGS Related

- standalone digital system is needed by Nov 2014
- it is not considered as a baseline DGS schedule
  - full digital system with networks will be available only from Jan 2015
- VIS will also need a standalone for IMC suspensions
  - maybe one standalone will do for VIS & IOO

# AEL Related (FRC not fully included)

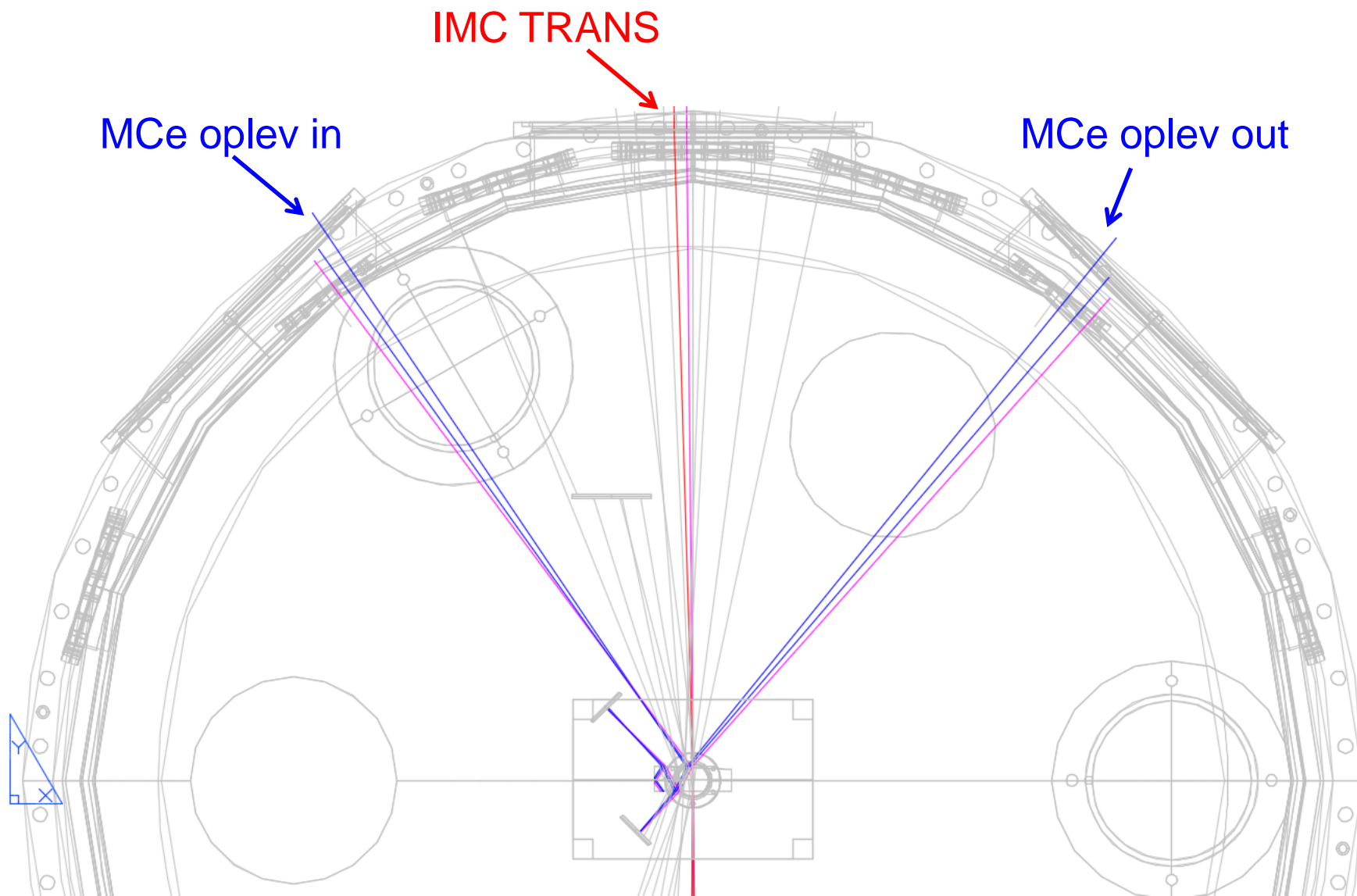
- PMC(1) / FRC(1) / IMC(1) / ISS(1) servo circuits  
 IOO already got one for FRC?
- RF PD(3) / RF QPD(4) / DC PD(4) / DC QPD(4) (at least!)  
 PMCREFL  
 IMCREFL  
 REFL  
 IMCREFL A/B  
 REFL A/B  
 PMCTRANS  
 IMCTRANS  
 ISS1  
 ISS2  
 IMCTRANS A/B  
 ISS1 A/B  
 (it would be nice to have 2 more at PSL table for incident beam monitor)
- IQ demodulators(19ch) 1 for each RF PD, 4 for each RF QPD
- RF distributors f\_PMC: split into 2 (EOM, PMCREFL)  
 f\_IMC: split into 10 (EOM, IMCREFL, 4xIMCREFLA/B)
- RF source(3) f\_1: split into 21? (EOM, REFL, 4xREFLA/B, AS, 4xASA/B, POX?, POY?)
- picomotor driver interfaces ?  
 2 for each mirror  
 PSLSTM1/2  
 STM1/2  
 IMMT1/2
- picomotor drivers(18ch, at least!) MCi/e/o (top stage)  
 (it would be nice to have 2 for each PD/QPD for aligning the beam into them)
- PZT drivers(4ch) 2 for periscope mirror  
 1 for laser  
 1 for PMC
- coil drivers(12ch) 4 for each MC mirror

# Cables

- TBD
- [JGW-D1402492](#) (IMC suspension cabling)

# Beams around MCE

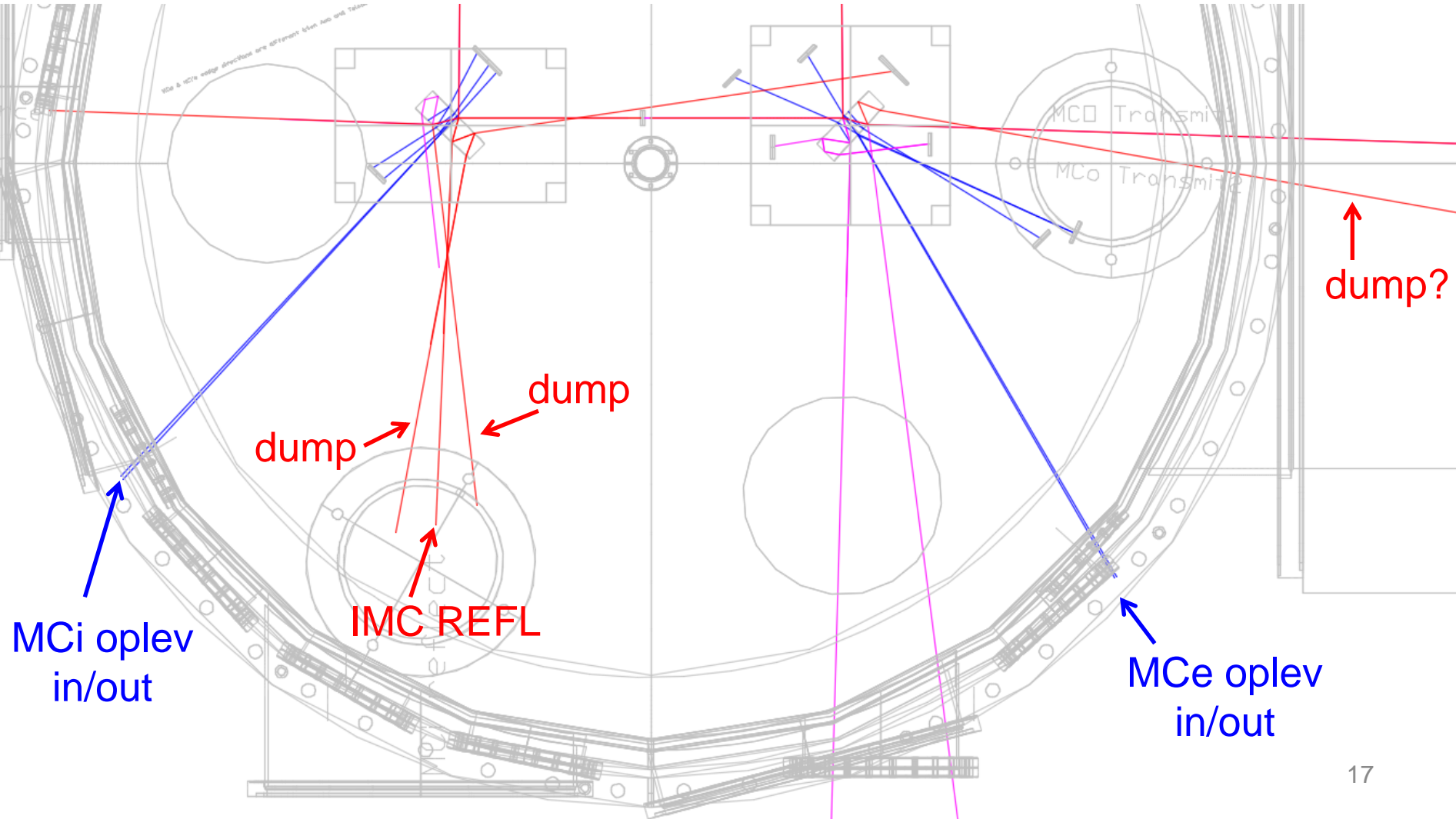
[JGW-D1402507](#)





# Beams around MCo and MCo

[JGW-D1402507](#)



# Some Important Info (for iKAGRA)

- Suspended optics from laser to PRM chamber are just IMC mirrors
  - we don't suspend IFI nor IMMTs
  - oplevs only for IMC mirrors (no oplevs for IMMTs)
- IMMTs are flat and have picomotors

# Questions

- Are we going to use IMMTs as actuators for ASC of FPMI?
- Are there PDs/QPDs which should be in vacuum?
  - only MIF REFL?
- What are we going to do with MCo AR reflected beam?
  - I don't think it is essential for ISC point of view
- How many standalone digital system will be needed by Nov 2014?
- What's the situation about FRC servo circuit?
  - Miyakawa-san said he delivered to IOO on Sep 2013
- Are we really going to use FRC? Is it a default plan?
- How many picomotors for a MC mirror?
- What do we need for digital system to picomotor driver interfaces? Do we need some interface circuits?
- What's the camera situation? How do we put them in the digital system?
- Where and how many do we have optical tables and pylons? What are the sizes of them? Do we need periscopes for them?