JGW-T2416103

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Updated PD list on Oct 30, 2024

In-vac PD and QPD Layout Brainstorming

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References

- LIGO HAM6 (OMC) Assembly LIGO-D1000342
- LIGO HAM3 (POP) Assembly LIGO-D1000339
- LIGO HAM1 (REFL) Assembly LIGO-D1000313
- LIGO ISC QPD Sled Assembly LIGO-D1002042
- LIGO ISC In-vac Gouy Phase Telescopes LIGO-T1000247
- LIGO List of PDs LIGO-T1000264
- List of KAGRA photodetectors JGWwiki/KAGRA/Subgroups/MIF/AEL/Photodetectors
- Wiki page from in 2012 JGWwiki/KAGRA/Subgroups/MIF/PDVac

Updated List of In-vac IR PD/QPDs

v20241030

- **REFL**
  2x RF PD (for 1f and f3-related), 4x RF QPD (for 1f and maybe for f3-f2;see JGW-G2315529)
- **POP**
  2x RF PD (for 1f and 2f for normalization), 2x RF QPD
  (In LIGO, only DC QPDs, but for KAGRA, RF needed JGW-T190359)
- **AS**
  2x RF QPD
- **TRX**
  DC PD, 2x DC QPD (already included in in-vac TMS design JGW-P1807768)
- **TRY**
  DC PD, 2x DC QPD (already included in in-vac TMS design)
- **IMC TRANS (and/or IMMT1T?)**
  2x DC QPD (1x for LIGO; not urgent?)
- **IMC REFL**
  1x RF PD, 2x RF QPD (not urgent?)
- **OMC REFL**
  2x RF QPD (for beacon WFS)
- **OMC TRANS**
  2x DC PD, 2x DC QPD (already there)

In total, excluding OMC ones
- 5 RF PDs (1x DB9, 1x 5xSMP)
- 12 RF QPDs (1x DB15, 2x 5xSMP)
- 2 more DC PDs (to be designed?)
- 6 more DC QPDs (to be designed?)

Number of Connectors to Purchase

- **Enclosures to make**
  10 RF PD (5 at max needed) (LIGO-D1101992 equivalent)
  15 RF QPD (12 at max needed) (LIGO-D1102002 equivalent)
- **PD 3 pin Custom Connector (LIGO-D2400093)**
  15 (5 at max needed)
- **QPD 12 pin Custom Connector (LIGO-D2400094)**
  15 (12 at max needed)
- **DB9 feedthrough for PD (WIHSD501-9-D1)**
  10 (5 at max needed)
- **DB15 feedthrough for QPD (WIHSD501-15-D1)**
  15 (12 at max needed)
- **5xSMP feedthrough for PD/QPD (SRISD5009)**
  35 (5+12*2 at max needed)

List of In-vac IR PD/QPDs

Need to check how many necessary

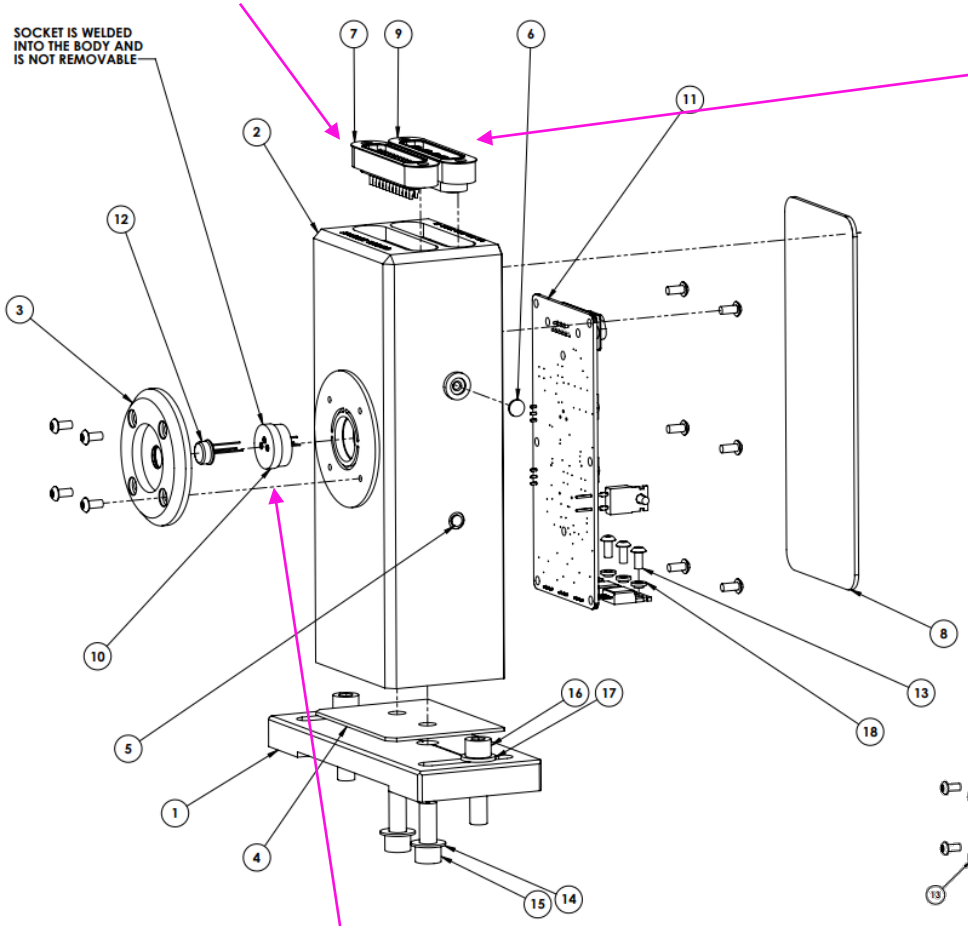
- **REFL**
  RF PD, 2x RF QPD
  (2 more REFL RF QPD for f3-f2 might be needed JGW-G231552, also, there are currently 4x RF PD for in air REFL)
- **POP**
  RF PD, 2x RF QPD
  (In LIGO, there are no RF QPDs but only DC QPDs in-vac (not used in ASC). But in KAGRA ASC design, I used POP RF QPD as well JGW-T190359)
- **AS**
  RF PD, 2x RF QPD (currently 2x RF PD for in air AS)
- **TRX**
  DC PD, 2x DC QPD (already included in in-vac TMS design JGW-P1807768)
- **TRY**
  DC PD, 2x DC QPD (already included in in-vac TMS design)
- **IMC TRANS (and/or IMMT1T?)**
  2x DC QPD (1x for LIGO; not urgent?)
- **OMC REFL**
  2x RF QPD (for beacon WFS)

  OMC TRANS
  2x DC PD, 2x DC QPD (already there)

In total, excluding OMC ones
- 3 RF PDs (1x DB9, 1x 5xSMP)
- 6 RF QPDs (1x DB15, 2x 5xSMP)
- 8 DC QPDs (to be designed?)

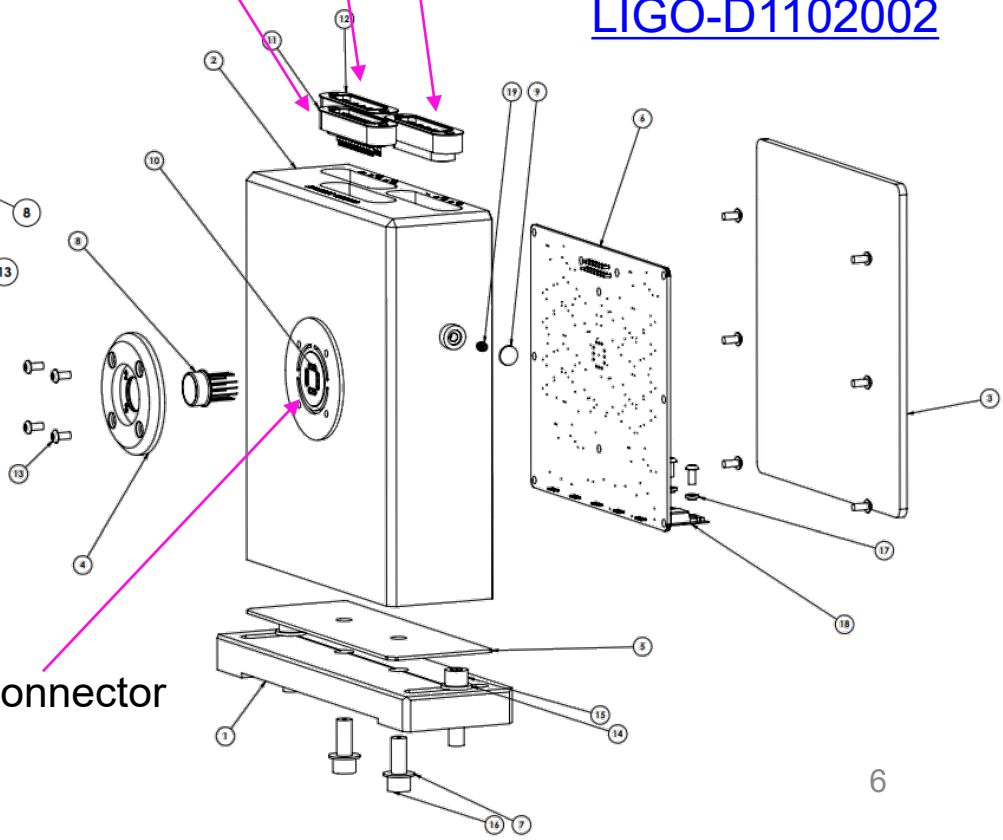
LIGO In-Vac Enclosures

DB9 for KAGRA



5xSMP connectors

DB15 for KAGRA



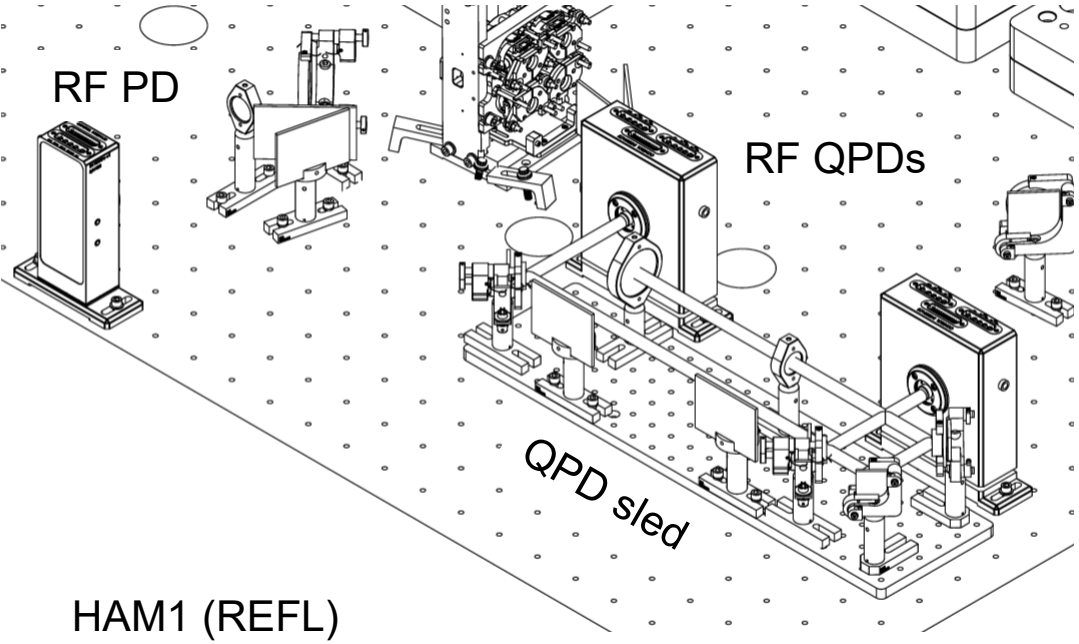
[LIGO-D1102002]

PD 3 pin Custom Connector ([LIGO-D2400093])

[LIGO-D1101992]

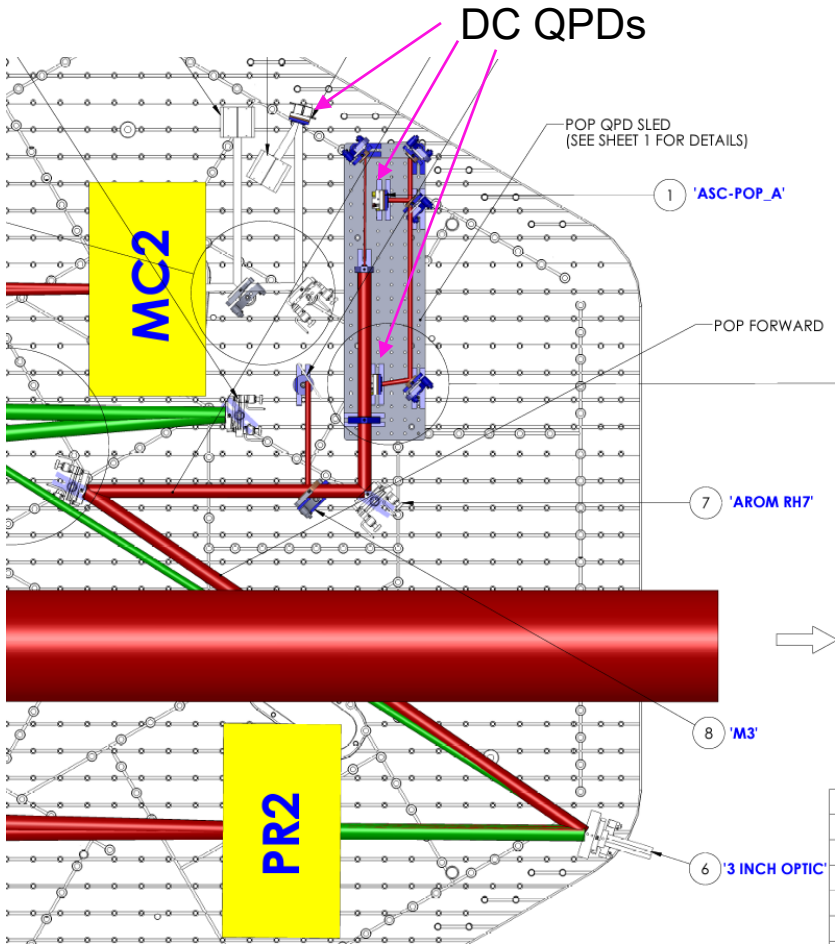
QPD 12 pin Custom Connector ([LIGO-D2400094])

LIGO Example

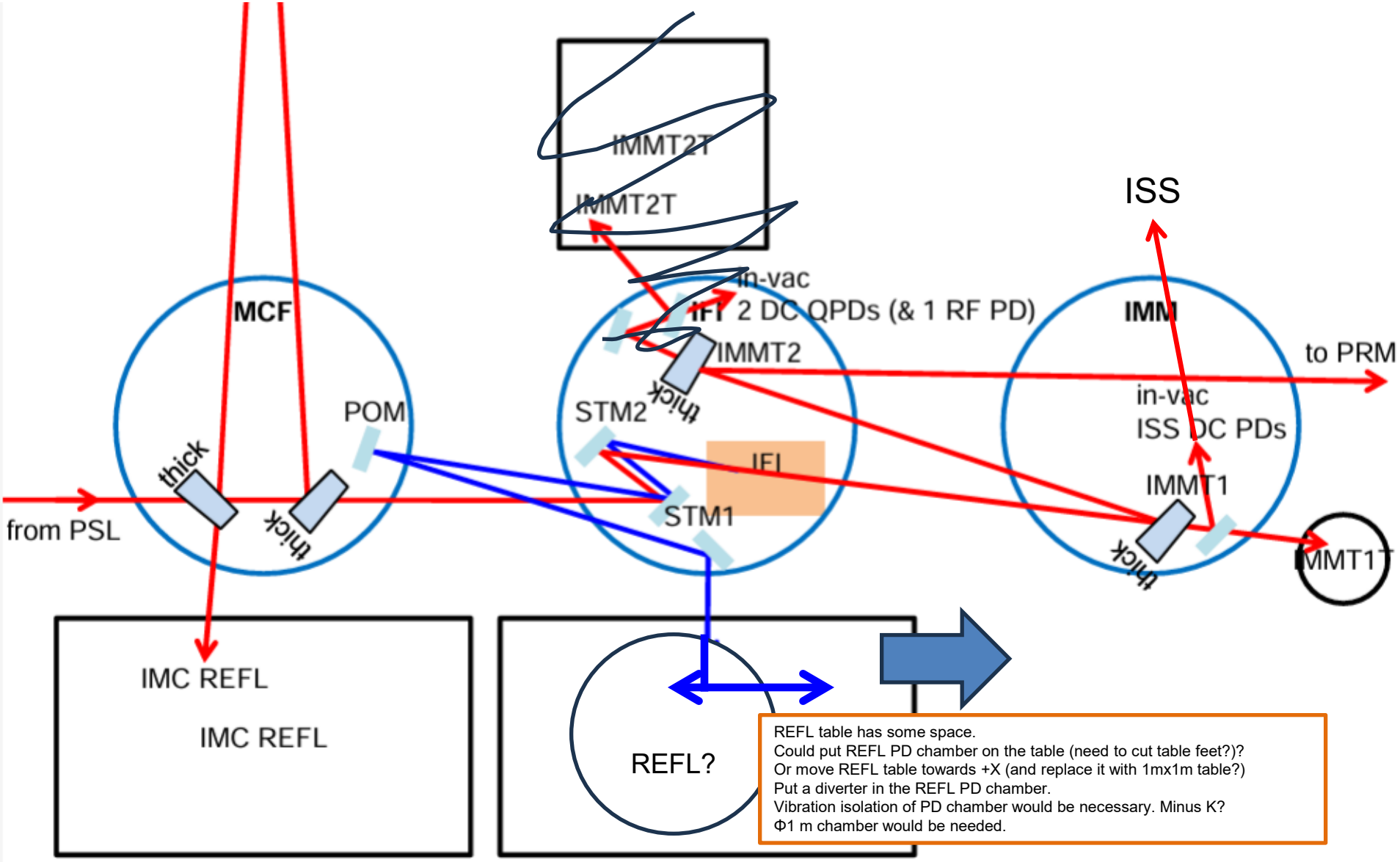


HAM1 (REFL)

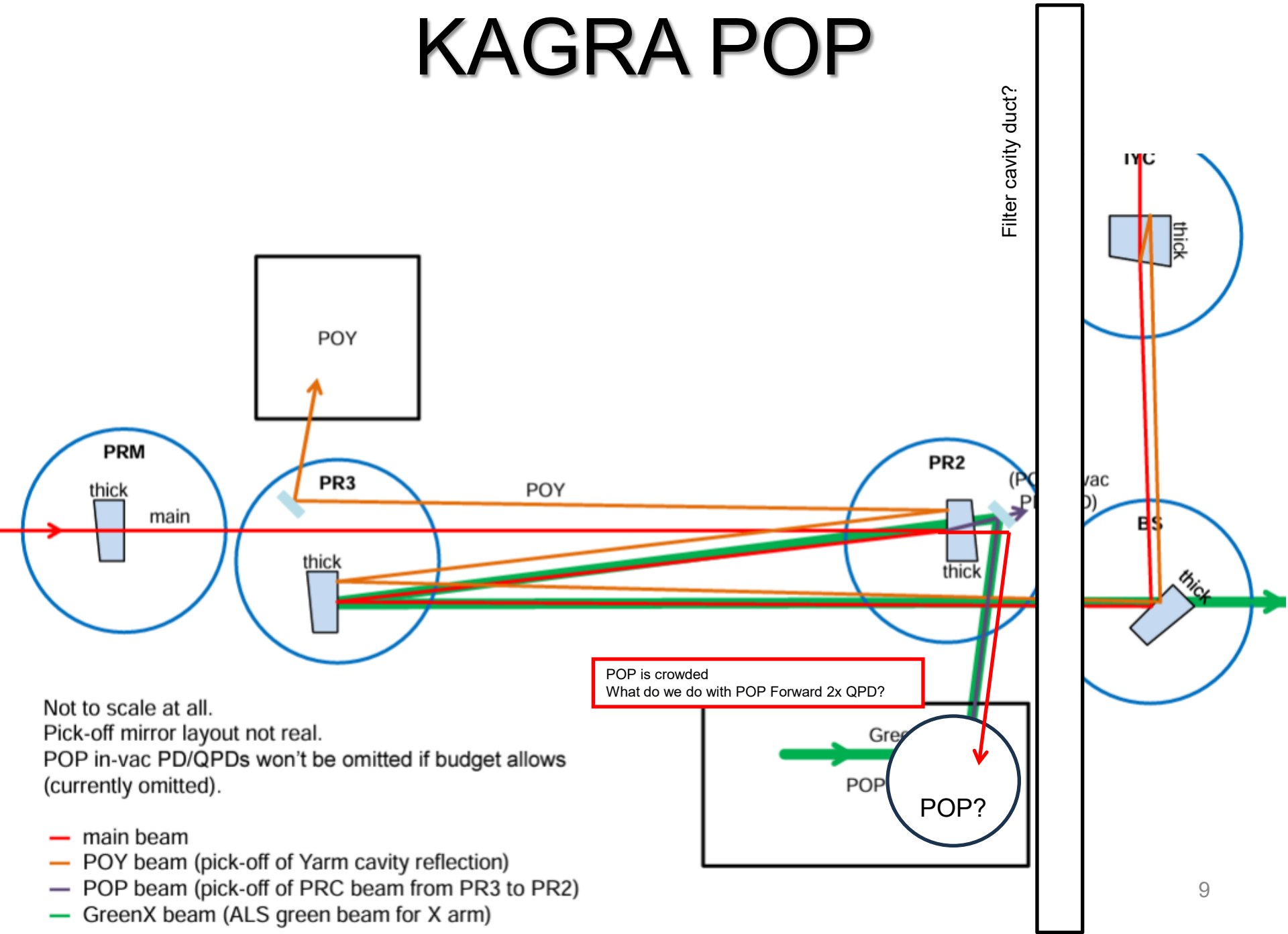
HAM4 (POP/ MC2TRANS)



KAGRA REFL


IMMT2T
IMMT2T
ISS
in-vac
2 DC QPDs (& 1 RF PD)
MCF
IMMT2
to PRM
POM
STM2
thick
in-vac
ISS DC PDs
IFI
IMMT1
thick
from PSL
thick
thick
STM1
IMMT1T
IMC REFL
IMC REFL
REFL?
REFL table has some space.
Could put REFL PD chamber on the table (need to cut table feet?)?
Or move REFL table towards +X (and replace it with 1mx1m table?)
Put a diverter in the REFL PD chamber.
Vibration isolation of PD chamber would be necessary. Minus K?
Φ1 m chamber would be needed.

KAGRA POP


Filter cavity duct?
POY
PRM
thick
main
PR3
thick
POY
PR2
thick
thick
BS
thick
POP is crowded
What do we do with POP Forward 2x QPD?
POP?
Not to scale at all.
Pick-off mirror layout not real.
POP in-vac PD/QPDs won't be omitted if budget allows (currently omitted).
main beam
POY beam (pick-off of Yarm cavity reflection)
POP beam (pick-off of PRC beam from PR3 to PR2)
GreenX beam (ALS green beam for X arm)

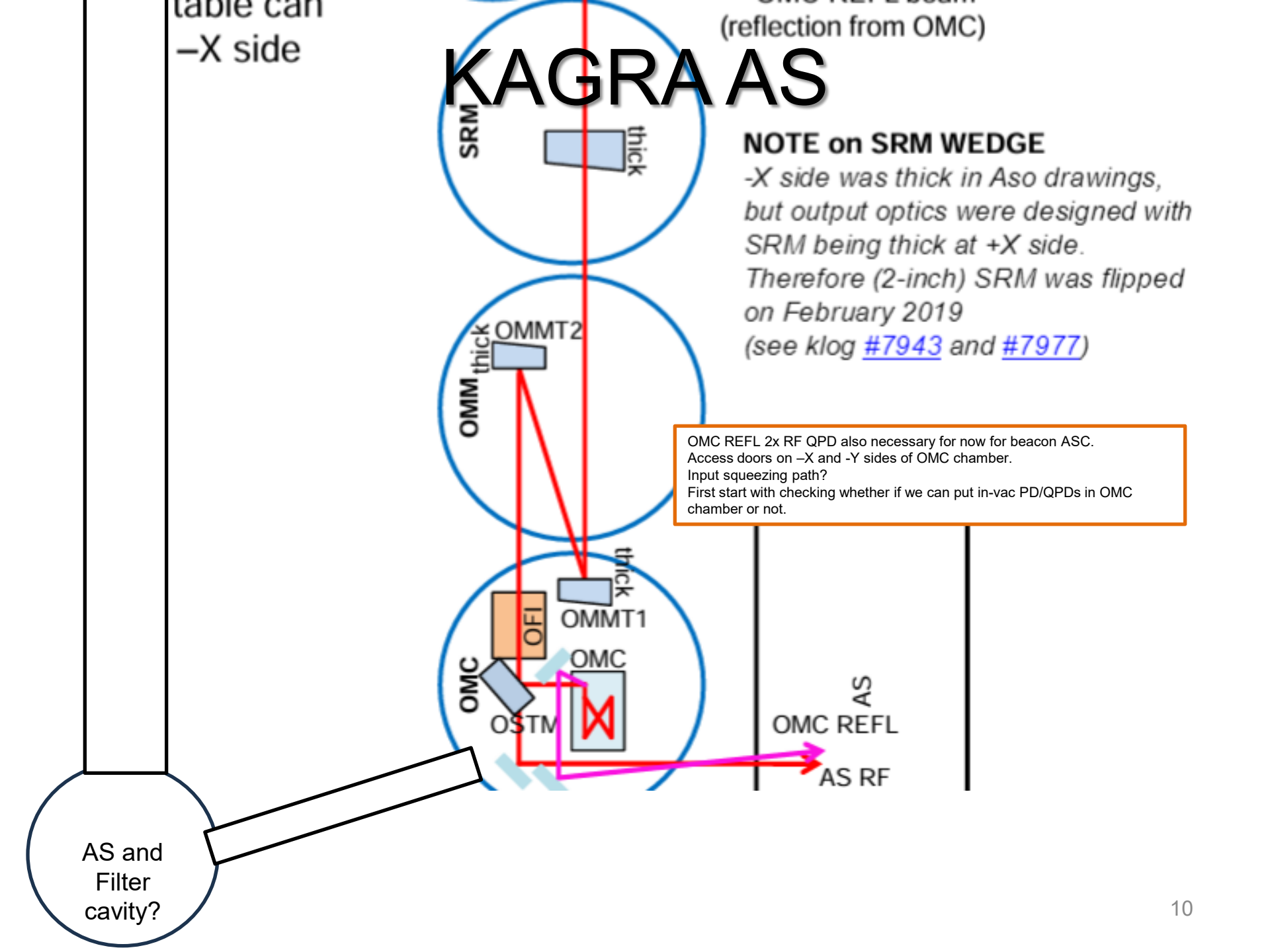


table can
–X side
(reflection from OMC)
KAGRA AS
SRM
thick
NOTE on SRM WEDGE
-X side was thick in Aso drawings,
but output optics were designed with
SRM being thick at +X side.
Therefore (2-inch) SRM was flipped
on February 2019
(see klog #7943 and #7977)
OMM
thick
OMMT2
OMC REFL 2x RF QPD also necessary for now for beacon ASC.
Access doors on –X and -Y sides of OMC chamber.
Input squeezing path?
First start with checking whether if we can put in-vac PD/QPDs in OMC chamber or not.
thick
OMMT1
OFI
OMC
OMC
OSTM
AS
OMC REFL
AS RF
AS and
Filter
cavity?