

# Electronics and Cables around IMC Common Mode Servo Board

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# Scope

- List up electronics and cables around IMC Common Mode Servo Board
- References:
  - [JGW-D1402908](#) (IMC servo topology)
  - [LIGO-D1002416](#) (Common Mode Servo Block diagram)
  - [LIGO-D040180](#) (Common Mode Servo Board)
  - [JGW-D1402413](#) (Quad IQ Demodulator Board)
  - [JGW-D1201280](#) (RF PD)
  - [JGW-D1100425](#) (electronics racks layout)
  - [JGW-D1402831](#) (what's inside electronics racks)

# Common Mode Servo Board

- not designed yet for KAGRA
- [LIGO-D040180](#) (schematic)
- [LIGO-D0901784](#) (schematic of interface board)
- [LIGO-D0901846](#) (schematic of low noise power module)
- boards are modified for each servo (IMC, ALS, CARM)  
[LIGO-E1200177](#) , [awiki](#) (modification summary)

front panel

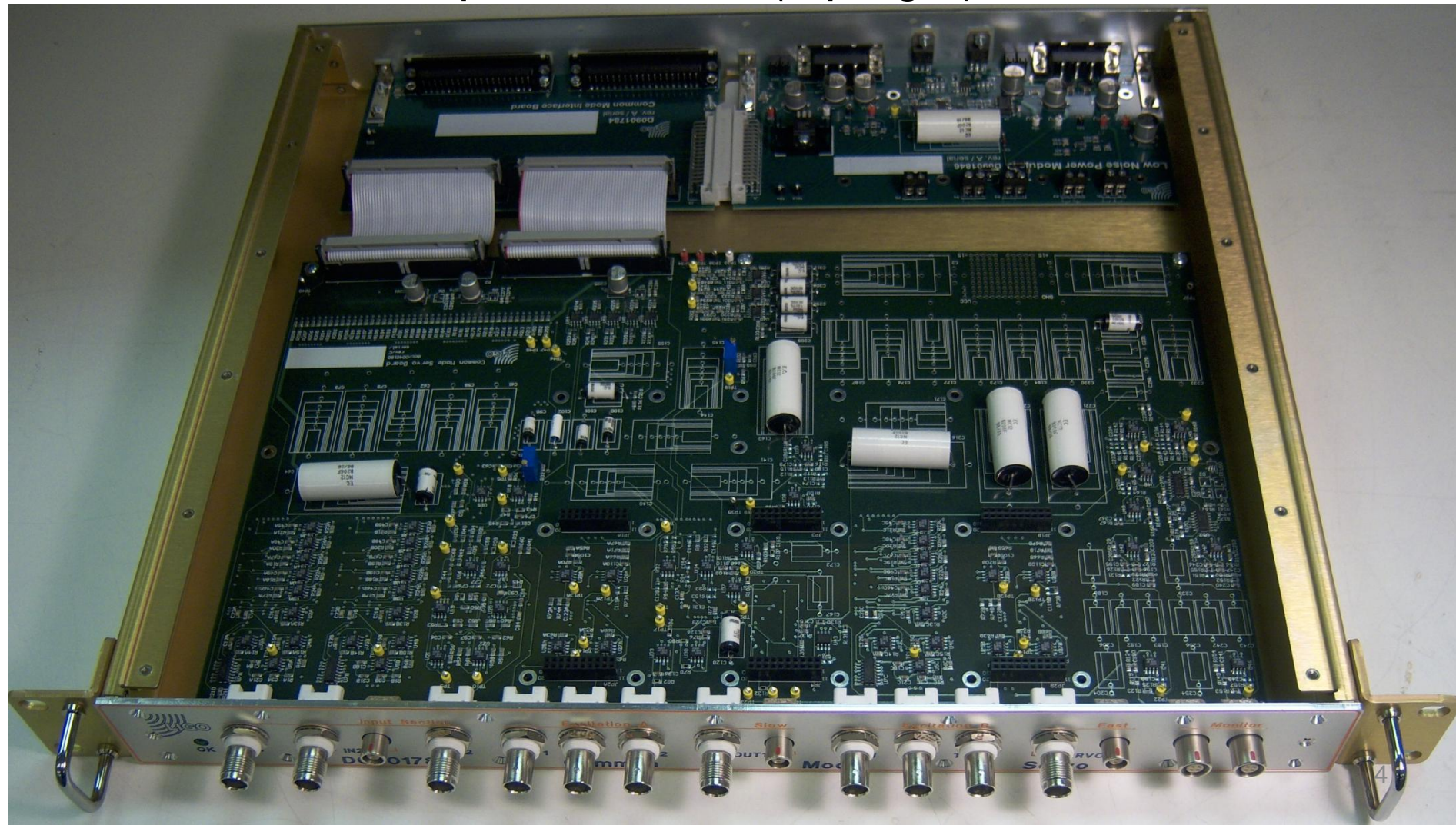


rear panel



# Common Mode Servo Board

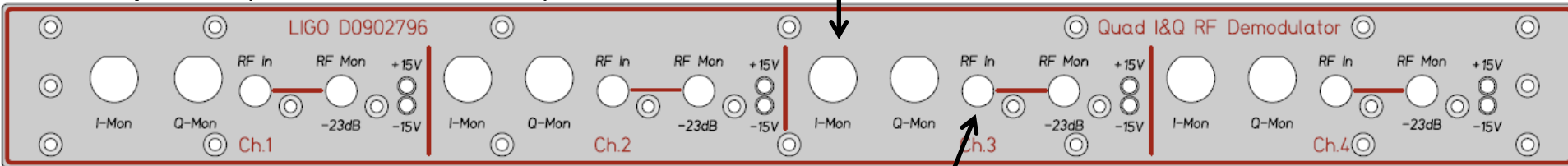
- consist from main board(bottom), interface board(top left), and low noise power module(top right)



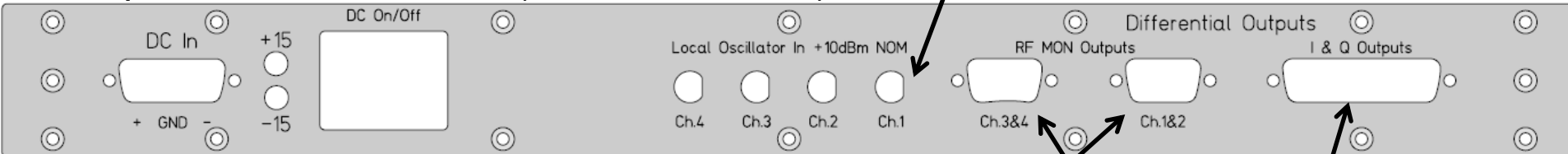
# Quad IQ Demod Board

- board being fabricated now
- [JGW-D1402413](#) (schematic)

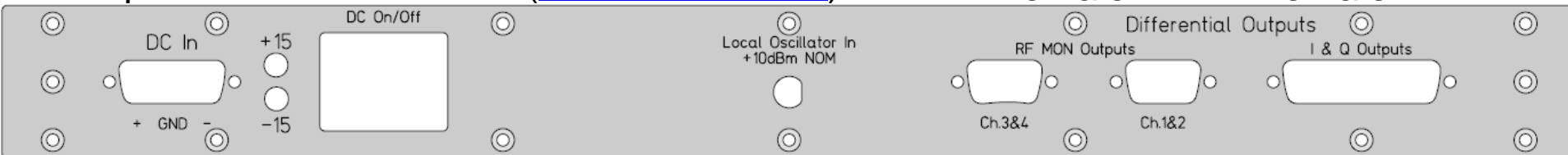
front panel ([LIGO-D1002030](#))



rear panel for LSC version ([LIGO-D1002032](#))



rear panel for WFS version ([LIGO-D1002031](#))



9pin Dsub female

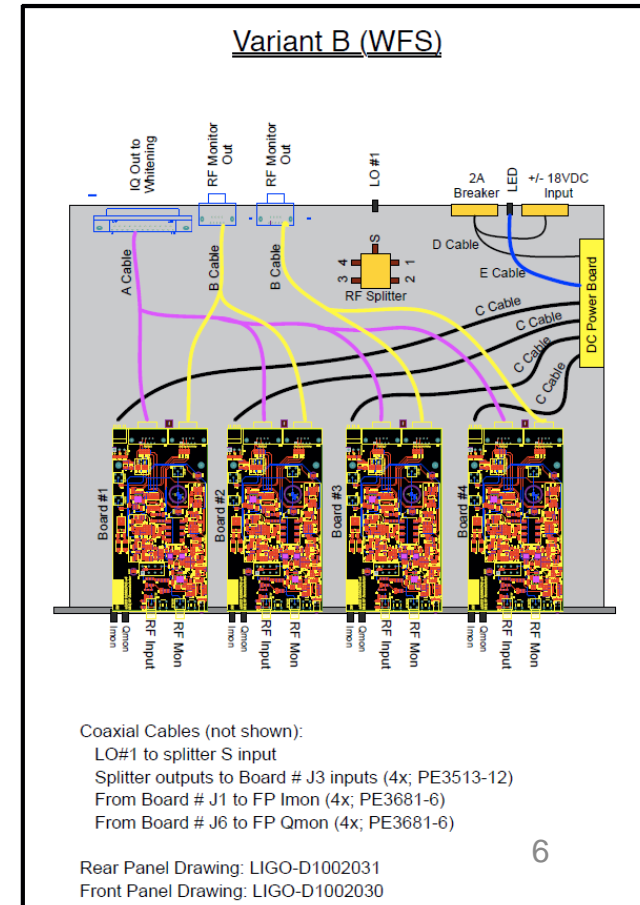
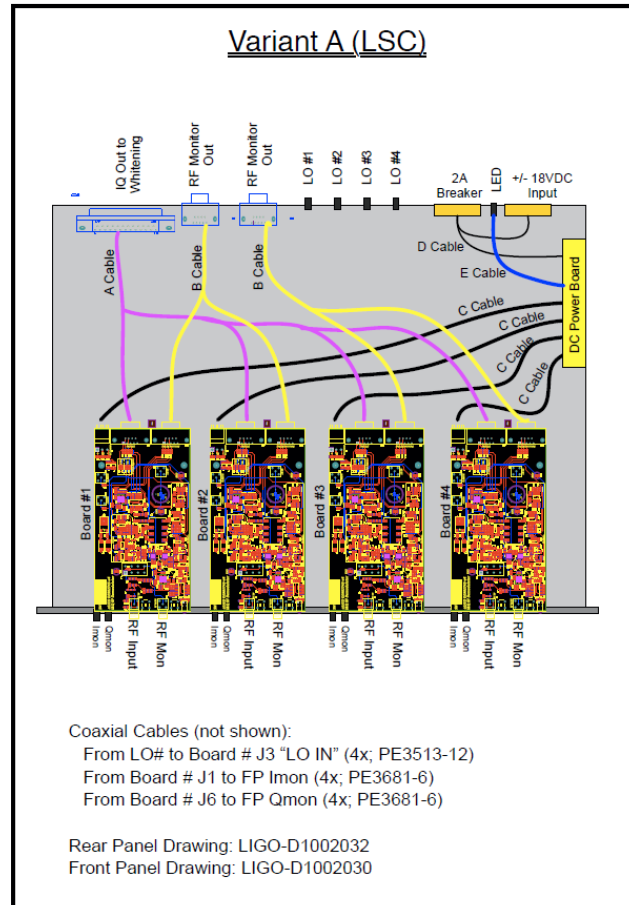
25pin Dsub female

# Quad IQ Demod Board

- 4 IQ Demod Boards are included in 1 chassis
- we can use Mini Circuits mixer/LPF if we cannot make chassis assembly on time

## Notes:

- a. A Cable detailed in LIGO-D1002028  
 b. B Cable detailed in LIGO-D1002029  
 c. C Cable detailed in LIGO-D1002034  
 d. D Cable detailed in LIGO-T1000453, Figure 2, Power Wiring  
 e. E Cable detailed in LIGO-D1002033  
 f. Printed Circuit Boards # 1, 2, 3, 4: LIGO-D0902745-v4  
 g. DC Power Board: LIGO-D1000217 (PCB supplied by customer)  
 h. Assembly Bill of Materials found on page 2 of this document  
 i. Assembly instructions are found in LIGO-T1000453  
 j. Coaxial cables not shown in drawing

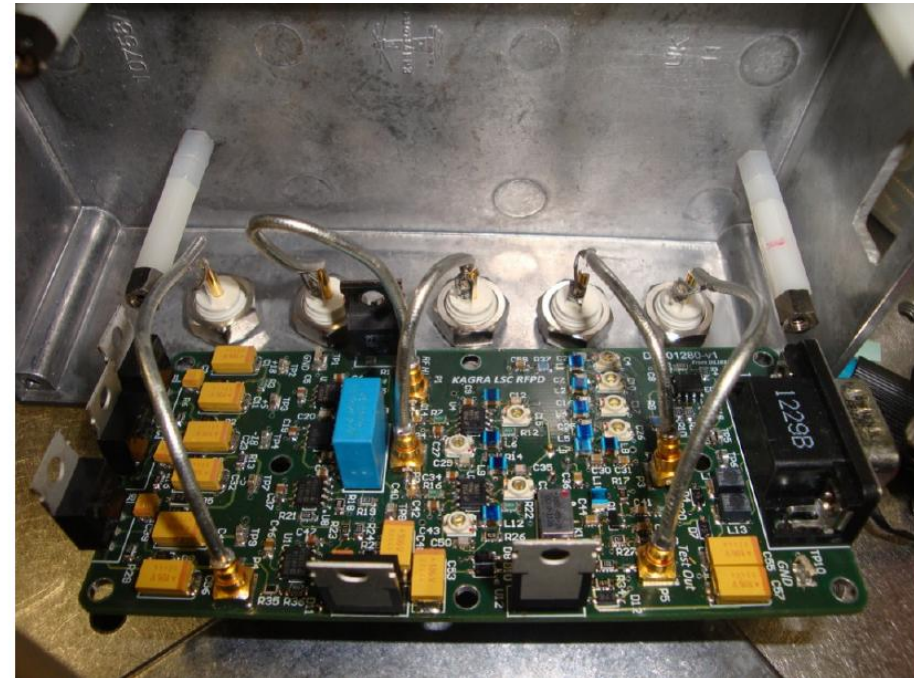
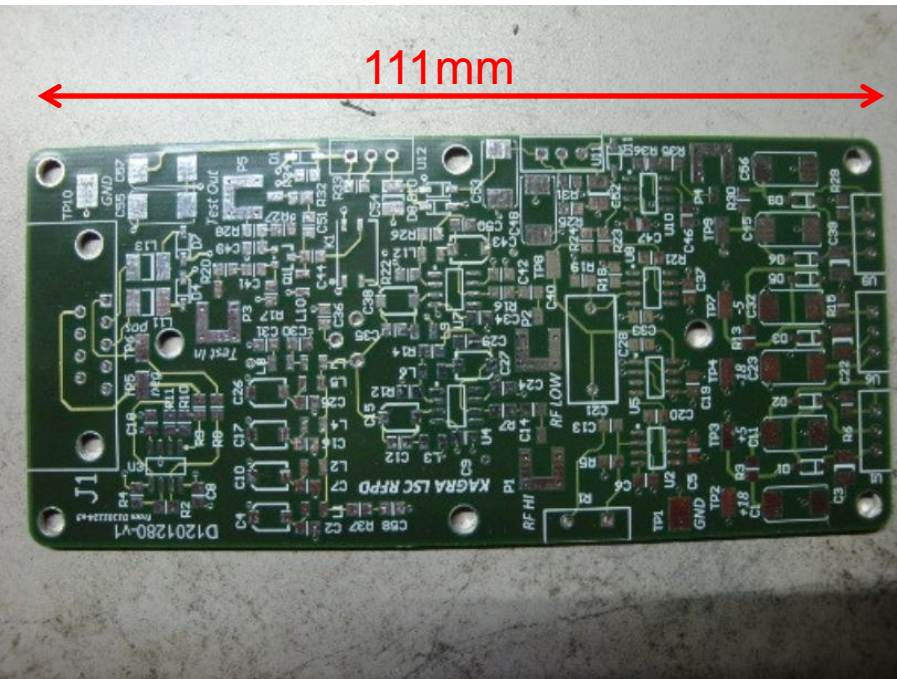


# Delay Line Phase Shifter

- we should make phase shifters for PMC, FRC, and IMC servo (adjusting cable length may be OK)
- maximum phase shift we need is 45 deg (if we are going to use IQ demodulator)
  - 45 deg is ~4 m for 15 MHz (FRC, IMC)
  - ~1 m for 52 MHz (PMC)
- [LIGO-D0900128](#) (Delay Line Phase Shifter Assembly)
- [LIGO-D050339](#) (Delay Line Phase Shifter)

# RF PD

- 7 PCB boards left, 1 in soldering process, some parts missing for further soldering
- [JGW-D1201280](#) (schematic)
- sideband frequency for IMC servo is 15 MHz  
→ resonant circuit should be modified



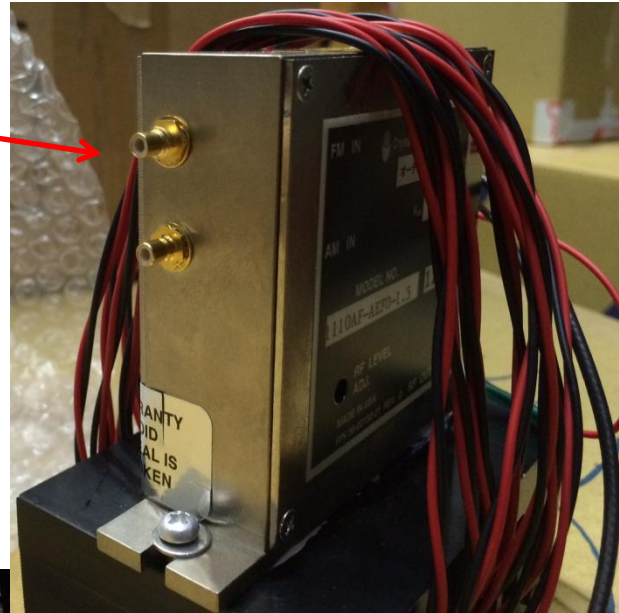
写真は坪野研4年生実験レポートより  
([石垣真史](#), [小林雅俊](#))



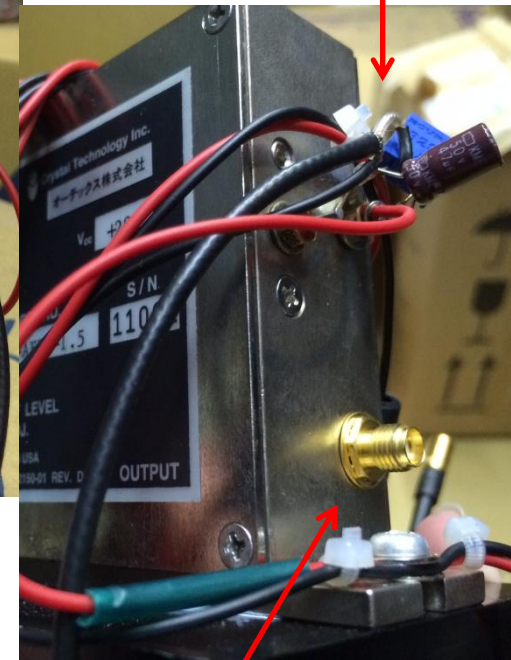
# AOM for Additive Offset

- Crystal Technology 3110-197 (driver: 1110AF-AEFO-1.5)

AOM driver  
(SMB for AM  
and FM input)

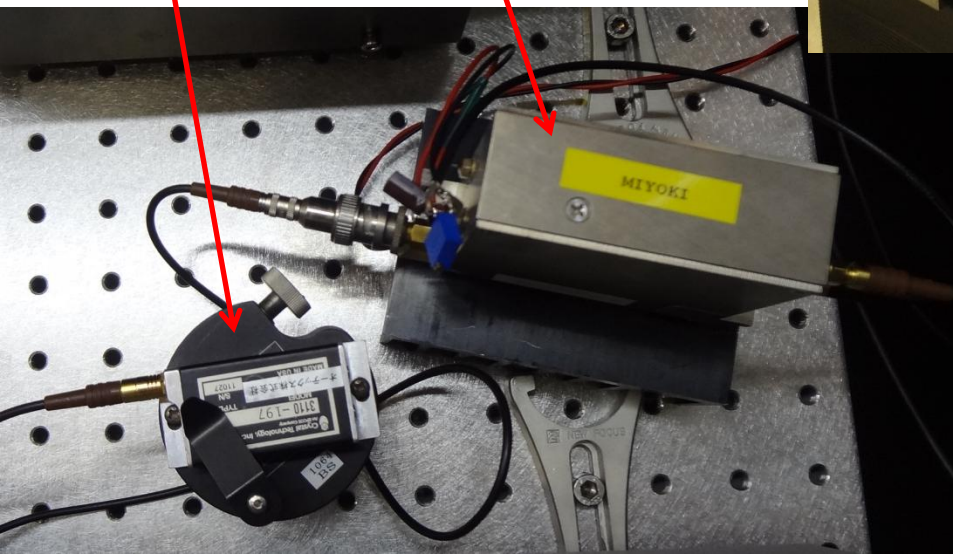


+28V power



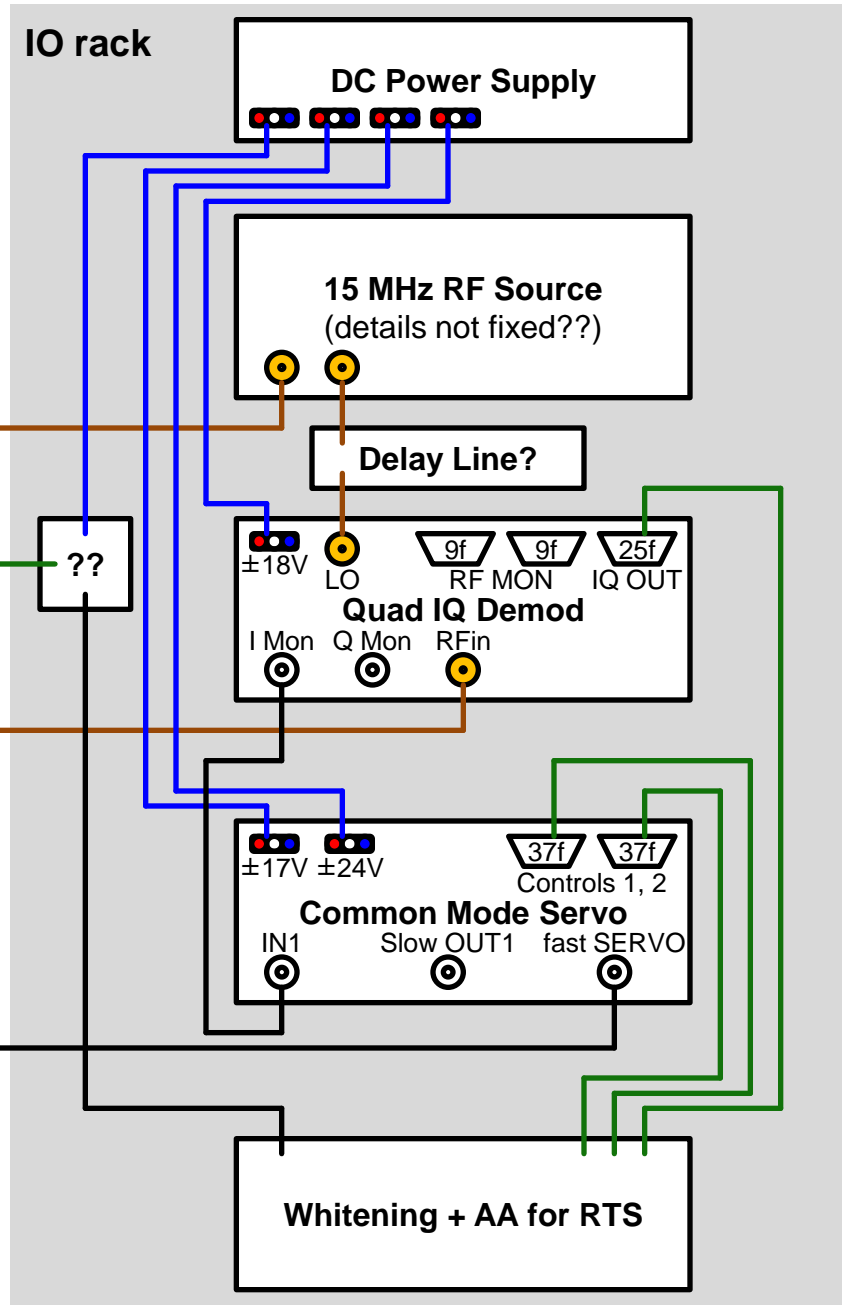
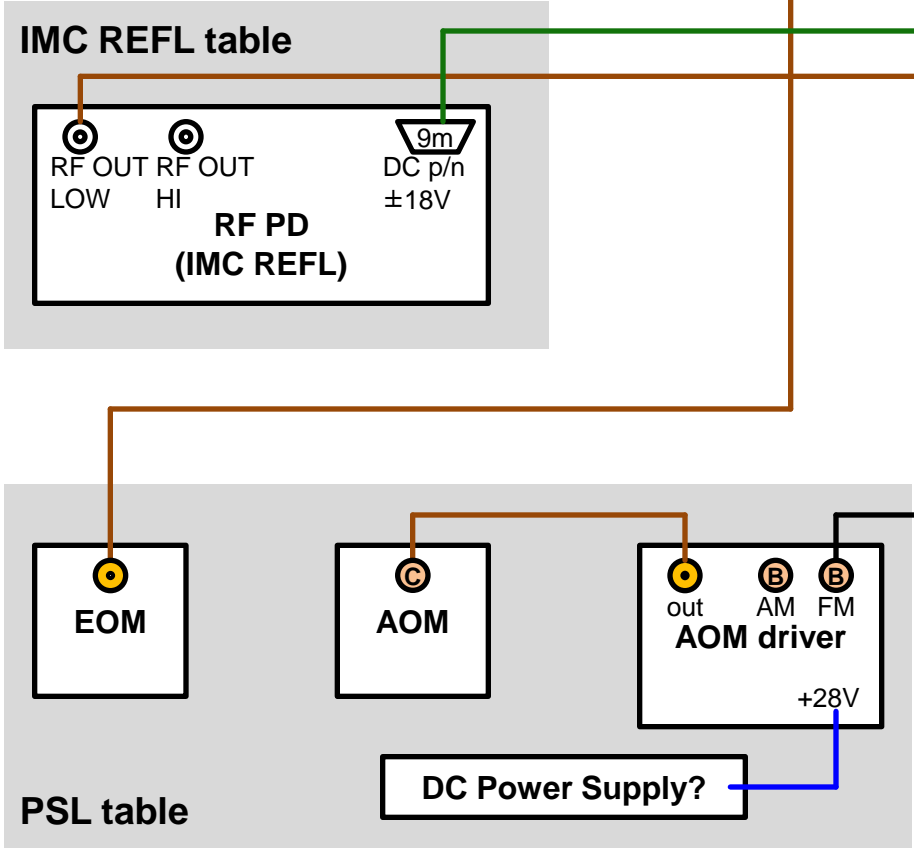
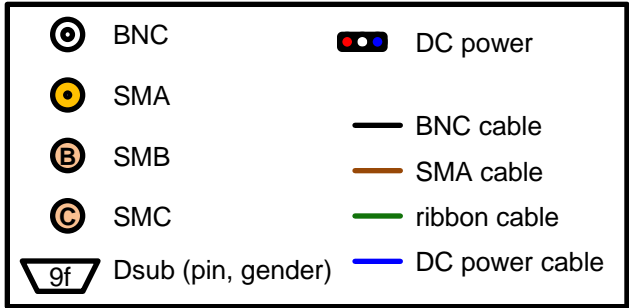
AOM  
(SMC for input)

AOM driver

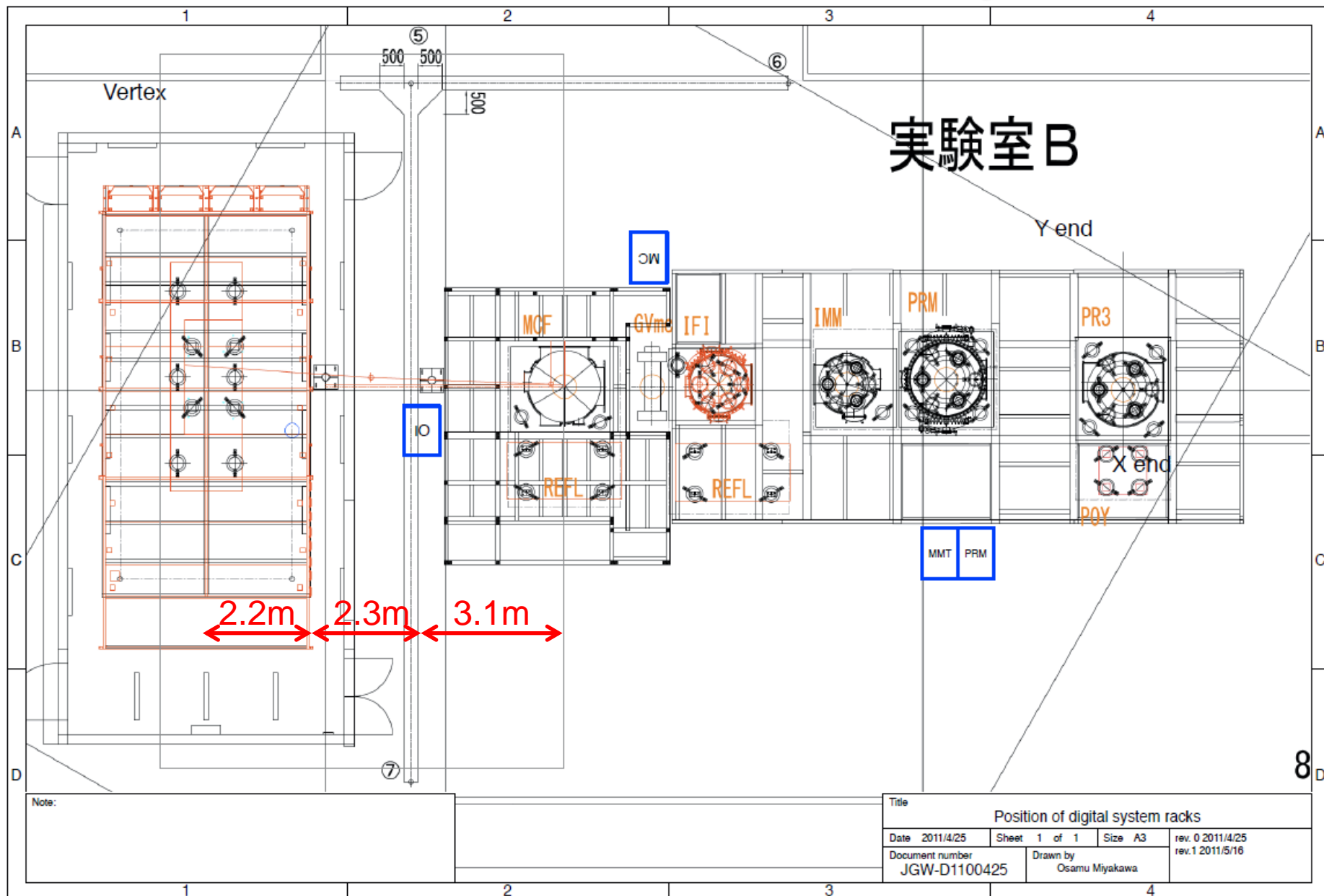


AOM driver  
(SMA for output)

# Cabling



# Rack & Chamber Layout



# Questions

- Why do we use BNC for RF PDs?
- What do we do with 9-pin D-sub on RF PDs?
- I'm not sure yet about the details of analog/digital interface
- Availability of DC power supplies
  - $\pm 18V$ ,  $\pm 12V$  by default
  - considering of adding  $\pm 24V$  now (Miyakawa)
- Details of RF source (splitter?)
- How do we connect cables between inside the PSL clean booth and outside?
  - There are holes for cables (Miyoki)
  - AC power is available inside the PSL booth (Miyoki)
- Any booth for output tables?
  - no (Aso)