

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)

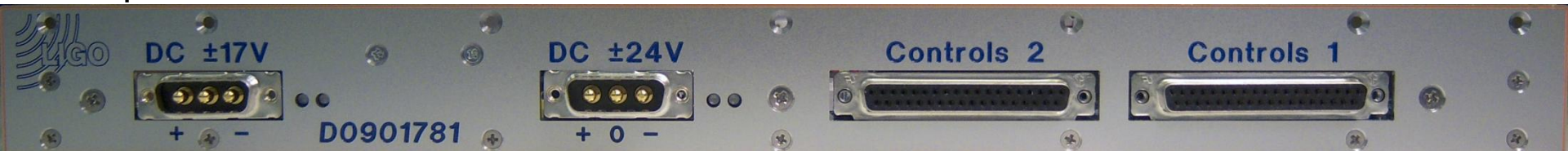
Common Mode Servo Board

- 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

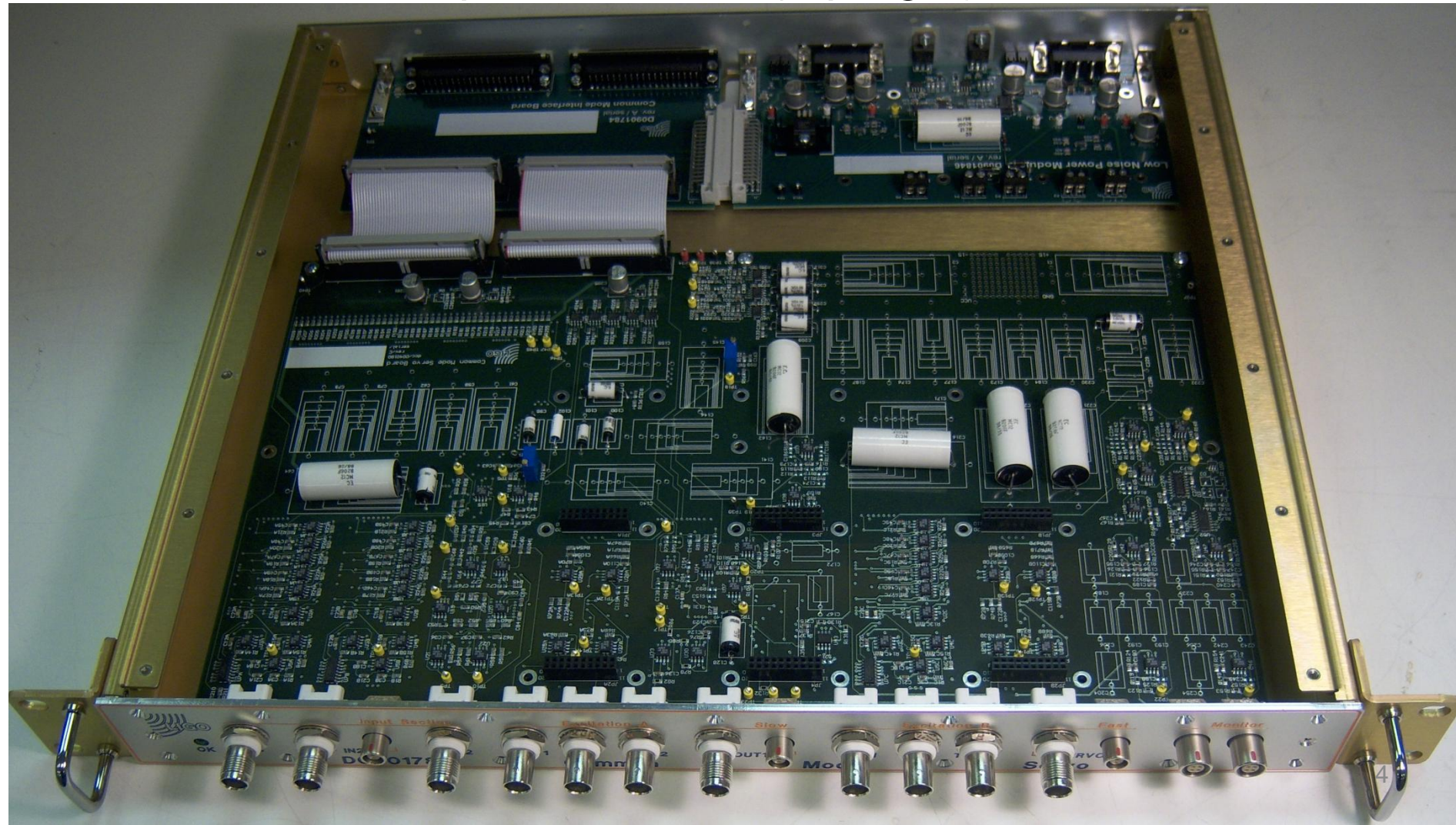


rear panel



Common Mode Servo Board

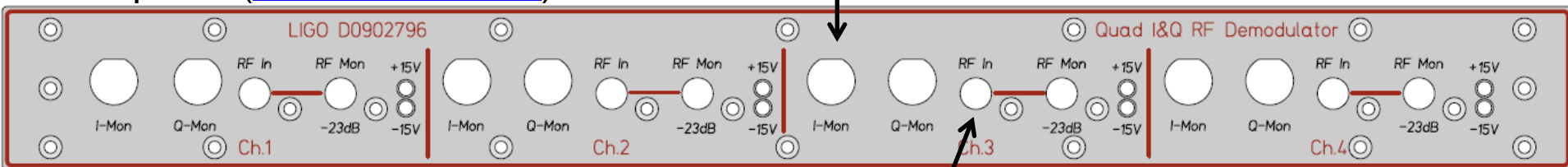
- consist from main board(bottom), interface board(top left), and low noise power module(top right)



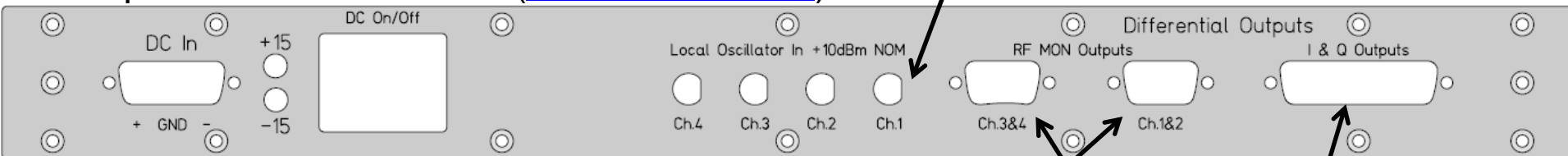
Quad IQ Demod Board

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

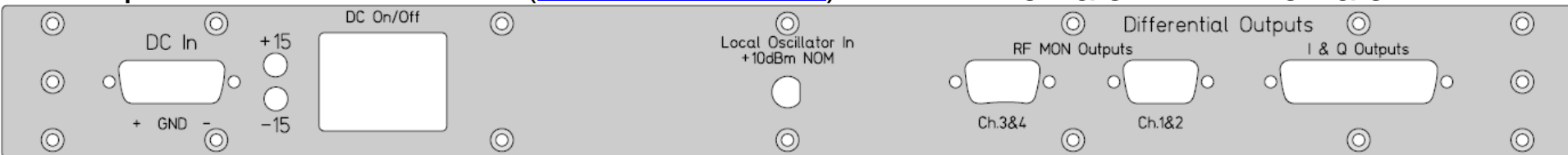
front panel ([LIGO-D1002030](#))



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



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



9pin Dsub female

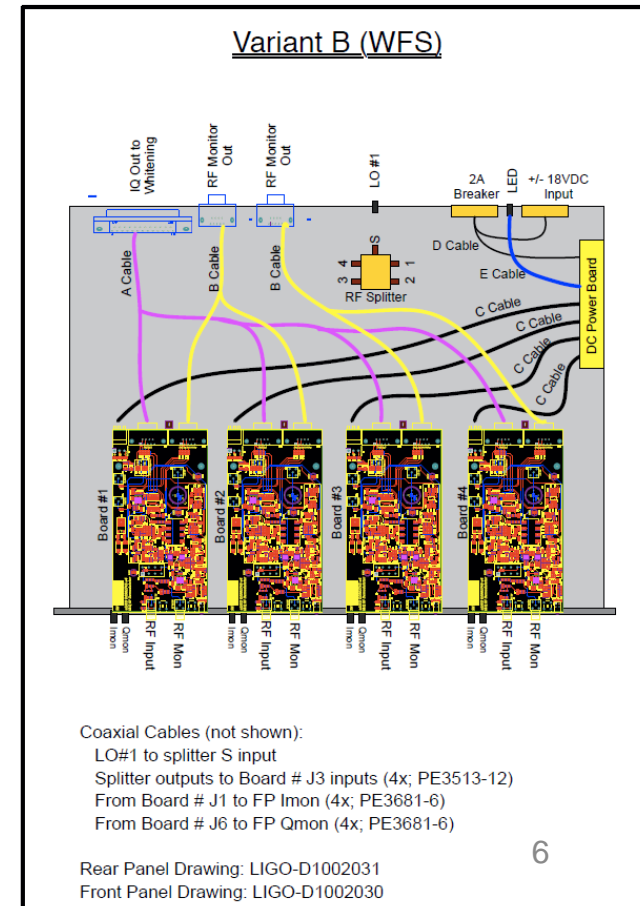
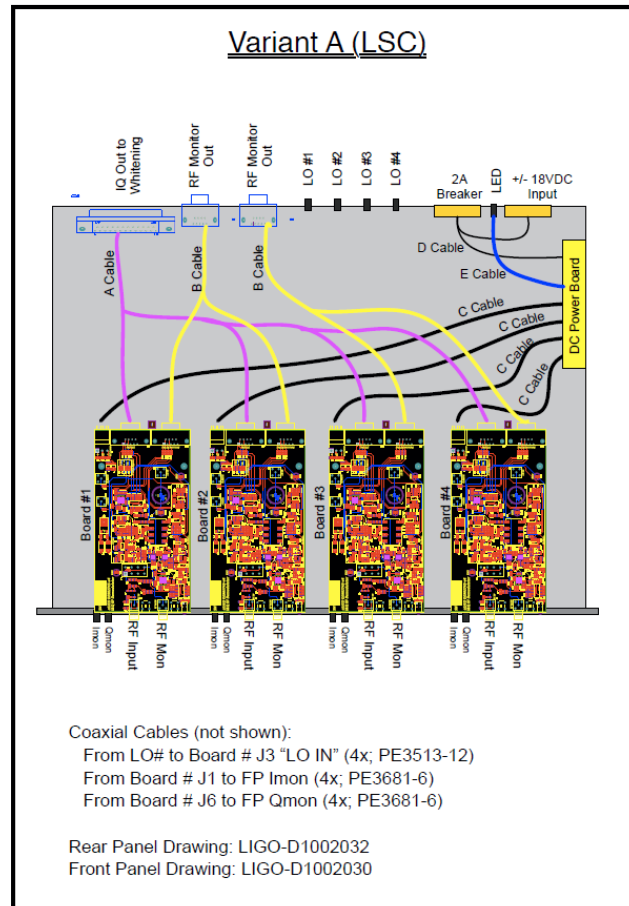
25pin Dsub female

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

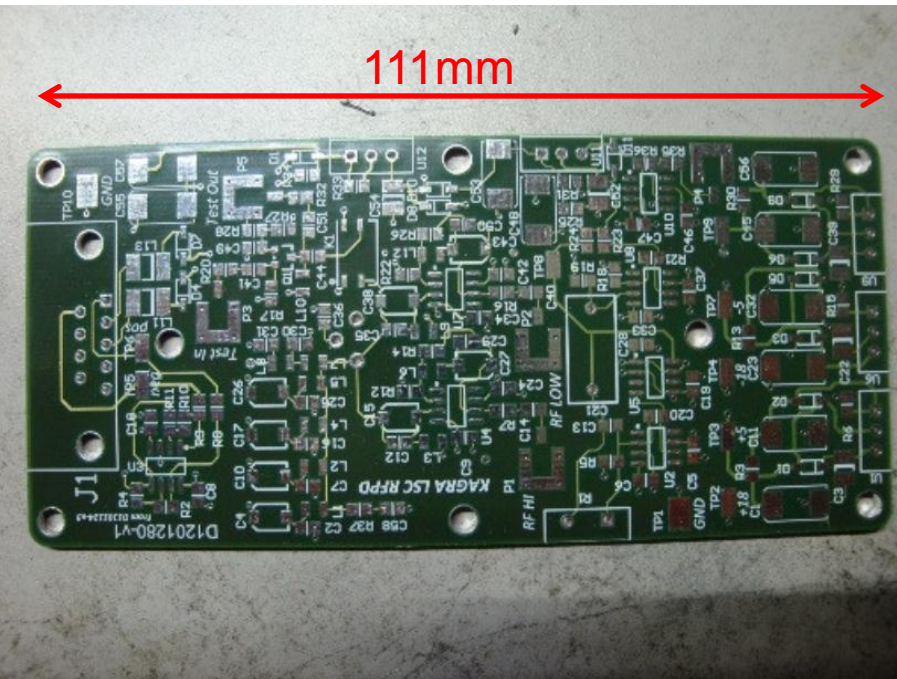


Delay Line Phase Shifter

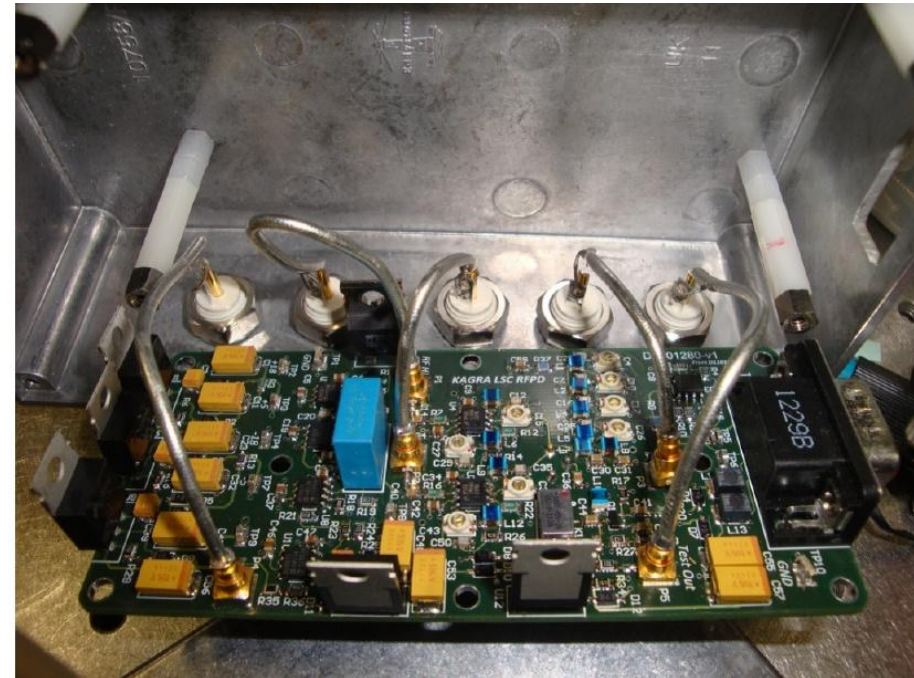
- we should make phase shifters for PMC, FRC, and IMC servo (adjusting cable length may be OK)
- maximum phase shift we need is 45 deg (if we are going to use IQ demodulator)
 - 45 deg is ~4 m for 15 MHz (FRC, IMC)
 - ~1 m for 52 MHz (PMC)
- [LIGO-D0900128](#) (Delay Line Phase Shifter Assembly)
- [LIGO-D050339](#)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



51mm

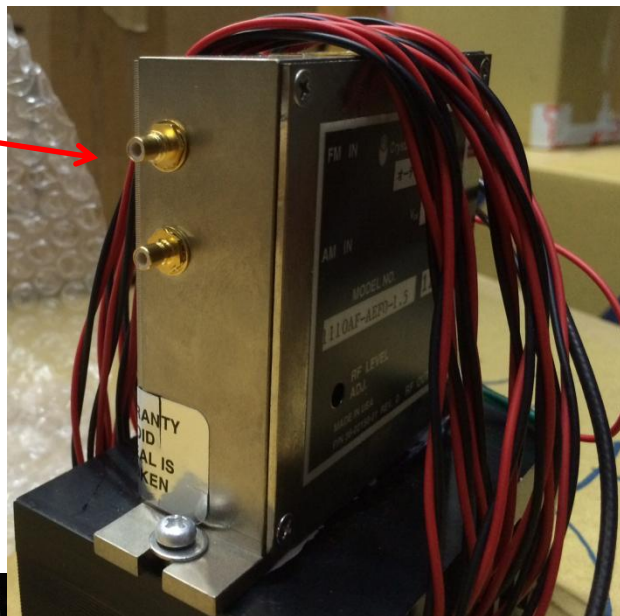


写真は坪野研4年生実験レポートより
([石垣真史](#), [小林雅俊](#))

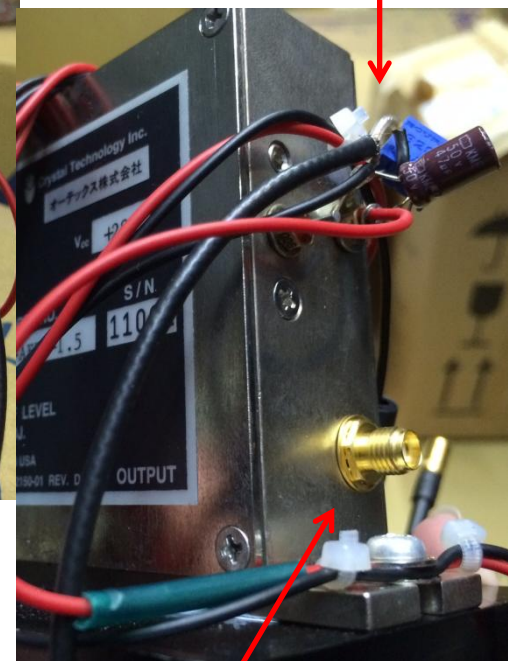
AOM for Additive Offset

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

AOM driver
(SMB for AM
and FM input)

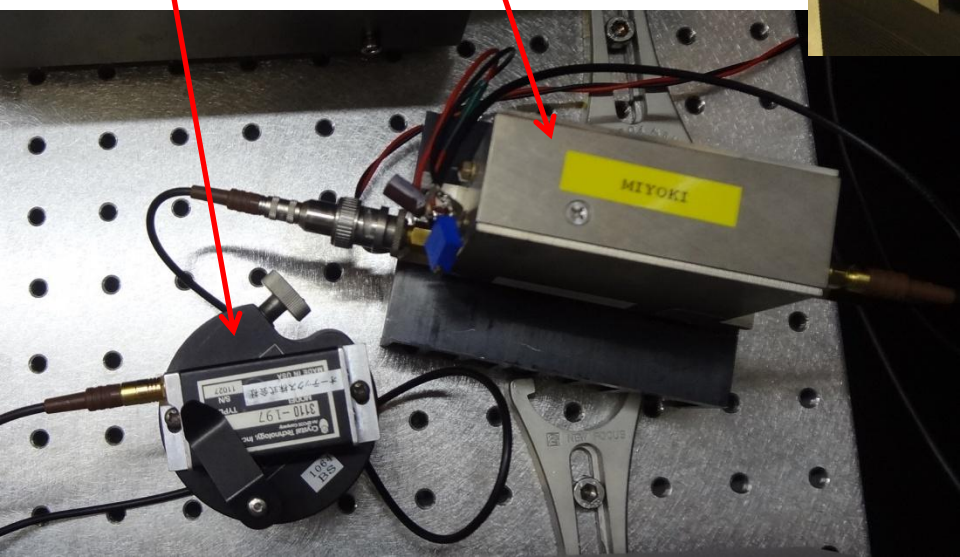


+28V power



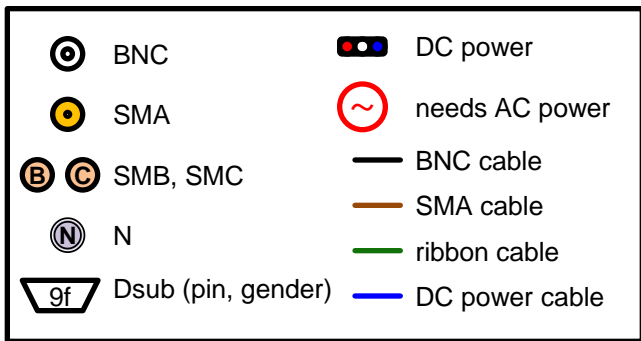
AOM
(SMC for input)

AOM driver

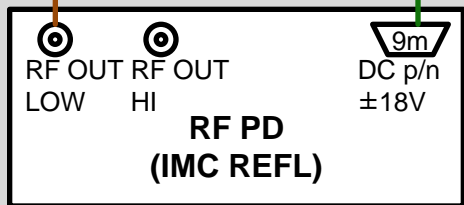


AOM driver
(SMA for output)

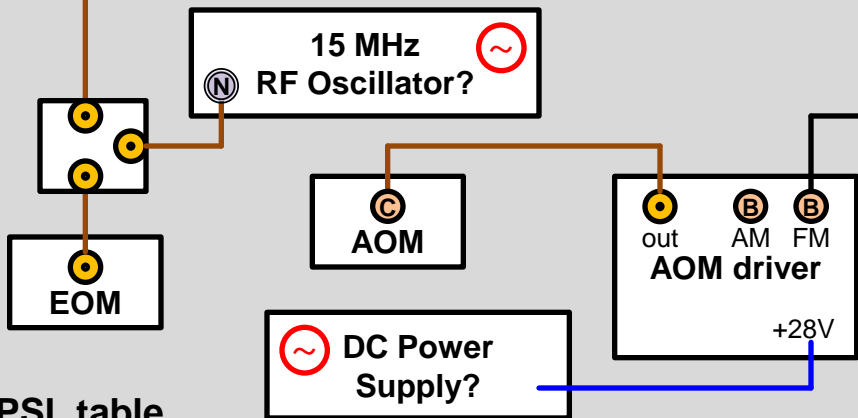
Cabling



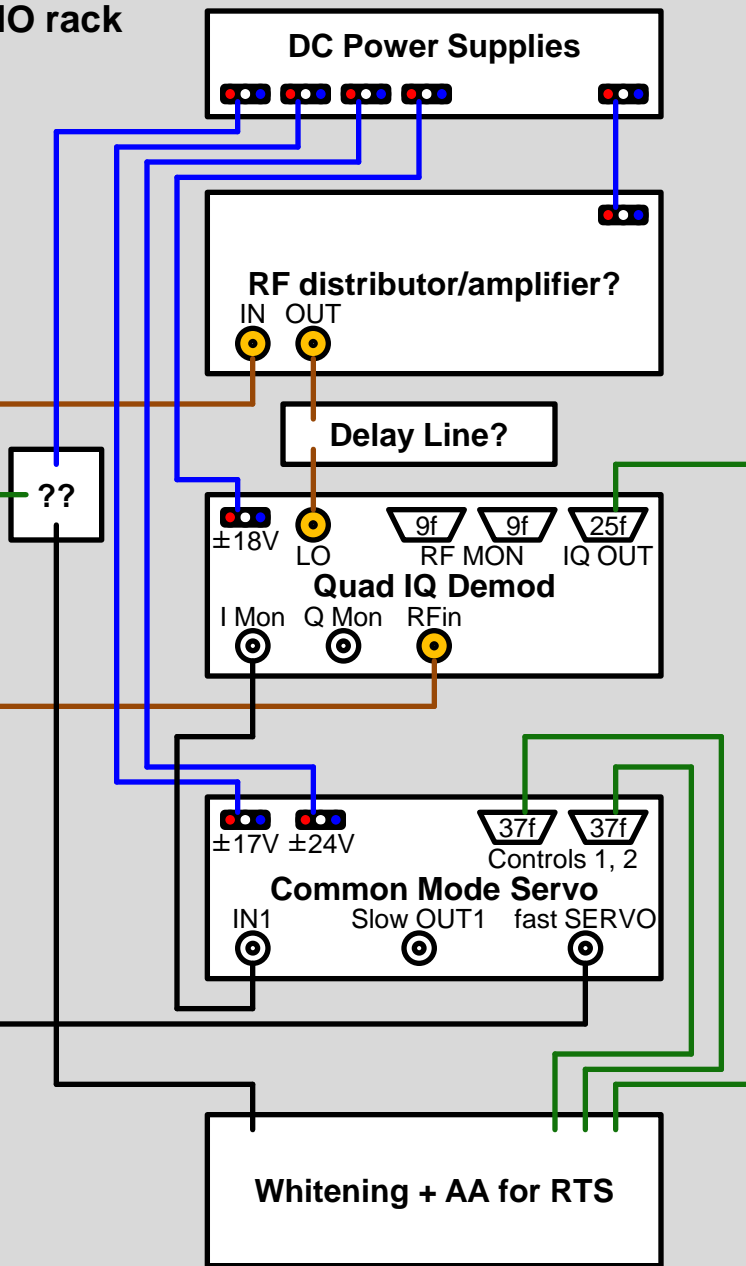
IMC REFL table



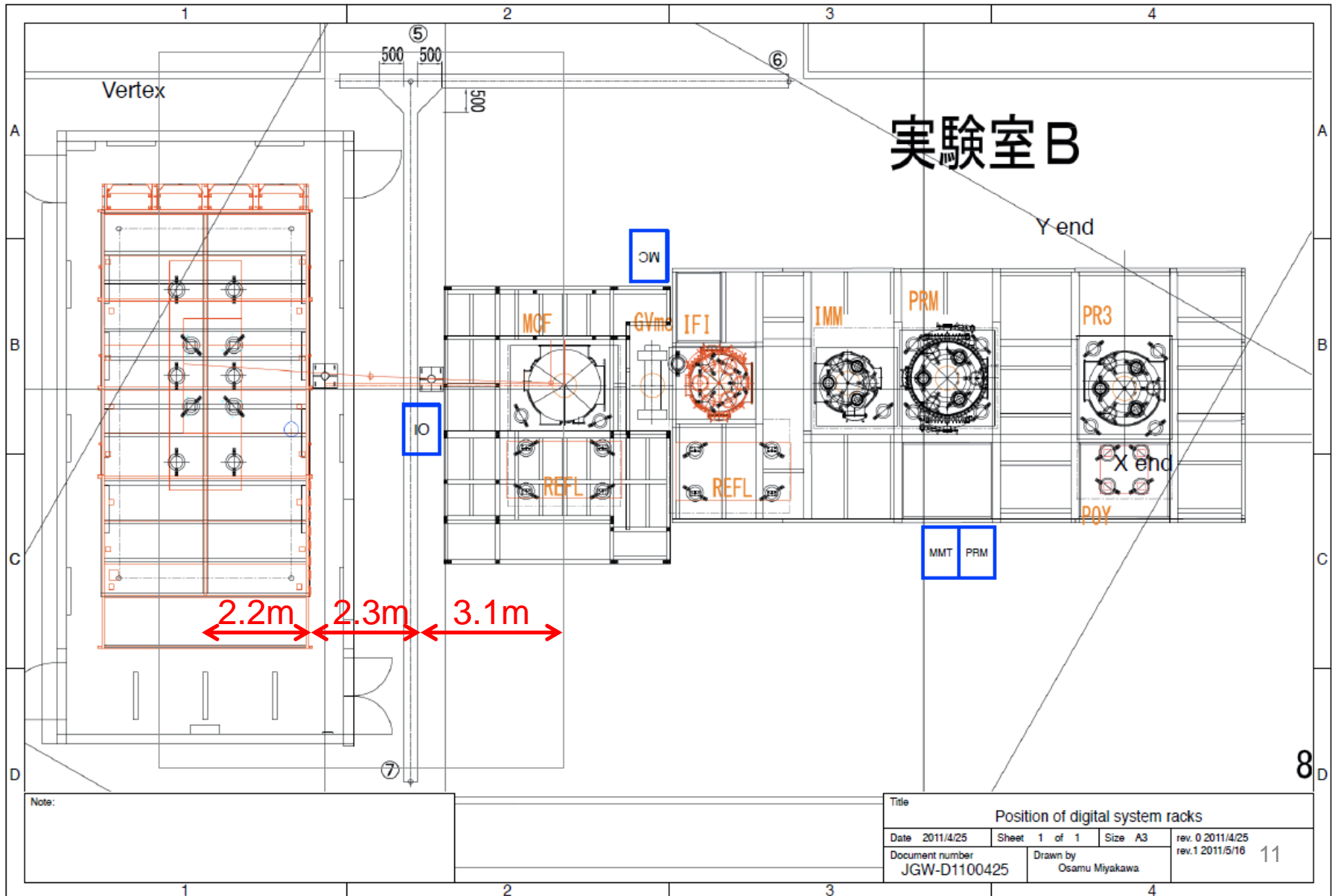
PSL table



IO rack



Rack & Chamber Layout



Questions

- Why do we use BNC for RF PDs?
→ easier to plug/unplug for testing [Aso]
- What do we do with 9-pin D-sub on RF PDs?
→ needs some interface circuit at some point [Aso]
- I'm not sure yet about the details of analog/digital interface
- Availability of DC/AC power supplies at the racks
→ $\pm 18V$, $\pm 12V$ by default ($\pm 17V$ is equivalent to $\pm 18V$)
considering of adding $\pm 24V$ now
AC power is not available [Miyakawa]
- Details of RF oscillator and splitter/amplifier
→ place RF oscillators (need AC power) at PSL and place splitter/amplifier at each rack where demodulators are put??
- How do we connect cables between inside the PSL clean booth and outside?
→ there are holes for cables
AC power is available inside the PSL booth [Miyoki]
DC power is not available inside the PSL booth at this point [Miyakawa]
- Any booth or cover for output tables?
→ not at this point [Aso]