LCGT Electronics Subsystem

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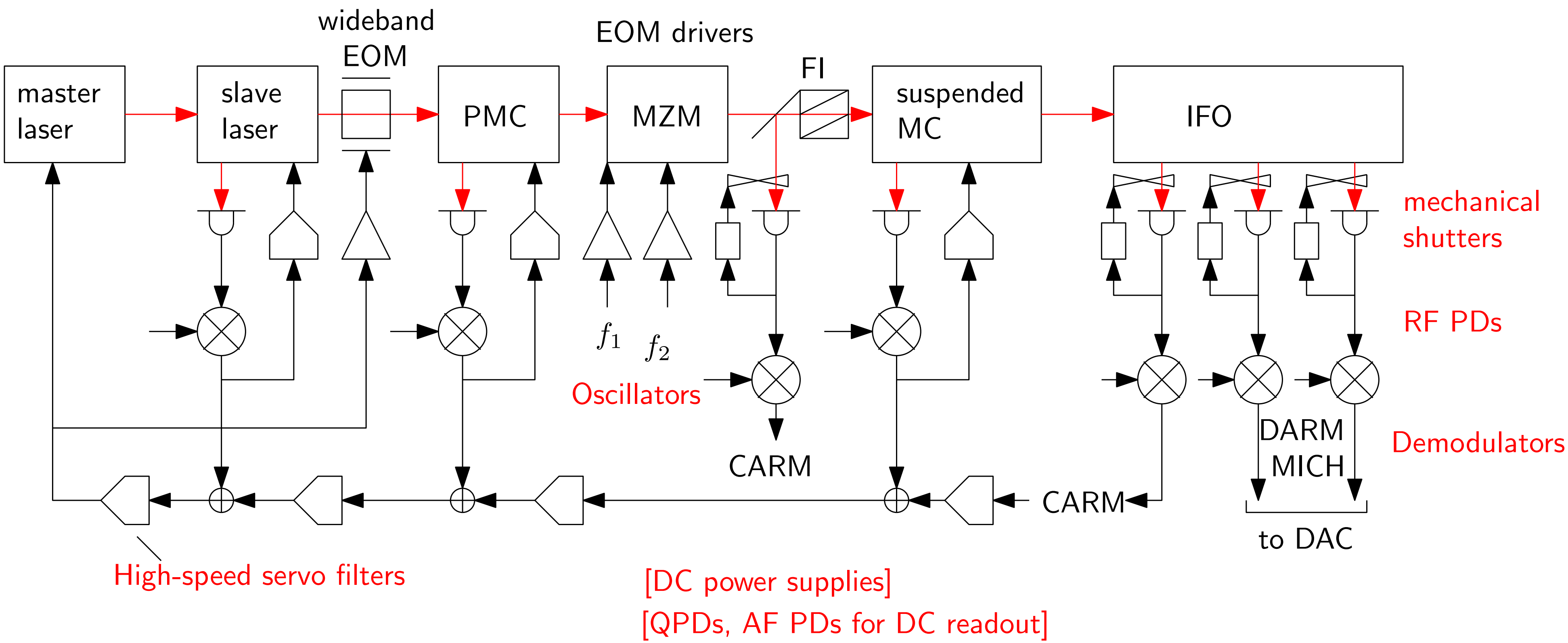
Contents

- Photodetectors
- RF odulation-demodulation system
- Electronic and mechanical interfaces

Relation with other subsystems



Electronics subsystem: titely related with Digital control subsystem

- DARM Calibration signal generator → Digital control subsystem
- Actuators for the test masses → Suspension subsystem
- Cooling system, CCD monitors → Facility support subsystem

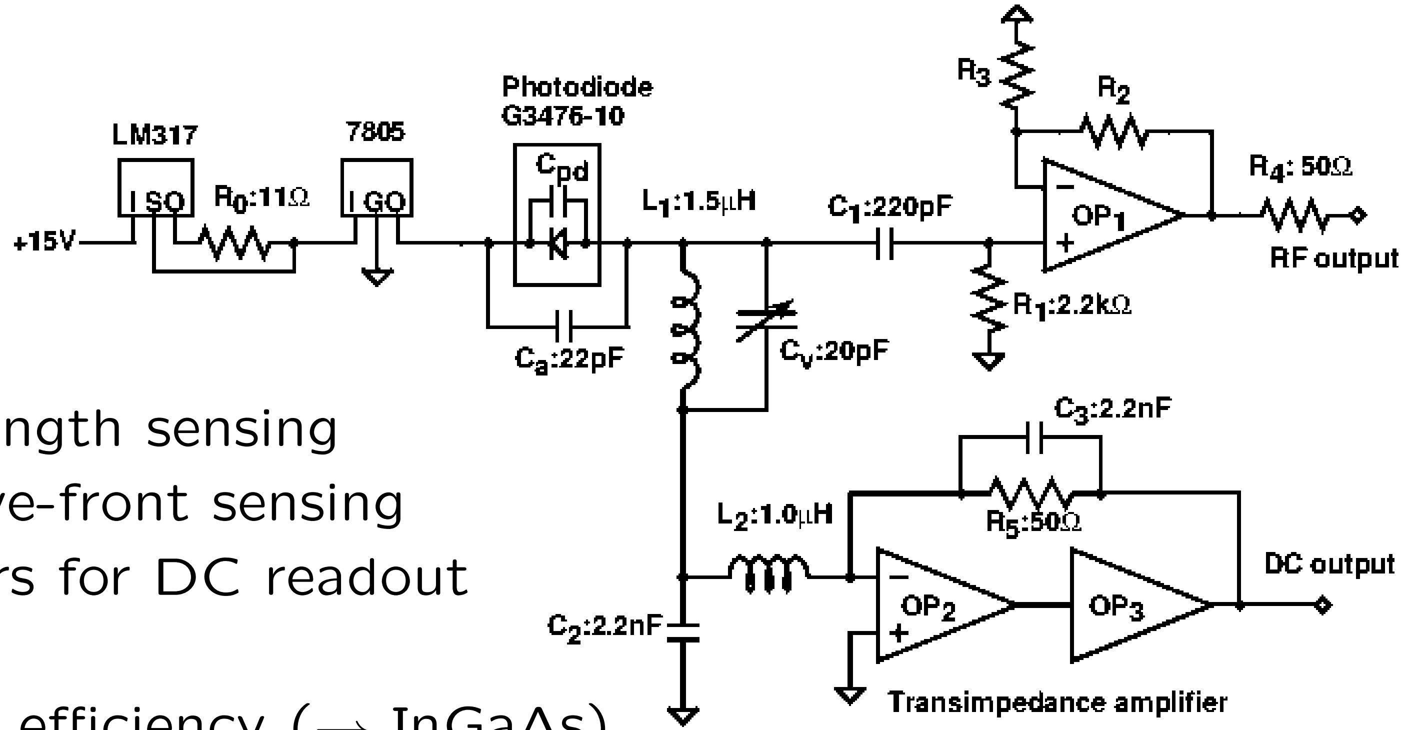
current task list of electronics subsystem

- Electromechanical interfaces:
  DC power supplies, signal transmission lines, NIM
- Fabrication and evaluation of photodetectors
- Design and fabrication of EOM drivers
- Procurement of RF signal source and distribution system
- non-digital servo filters:
  frequency and intensity stabilization of the laser

Photodetectors

Example: TAMA300 RF PD

N. Mio et al., Jpn. J. Appl. Phys. **40**, p.426 (2001)



types:

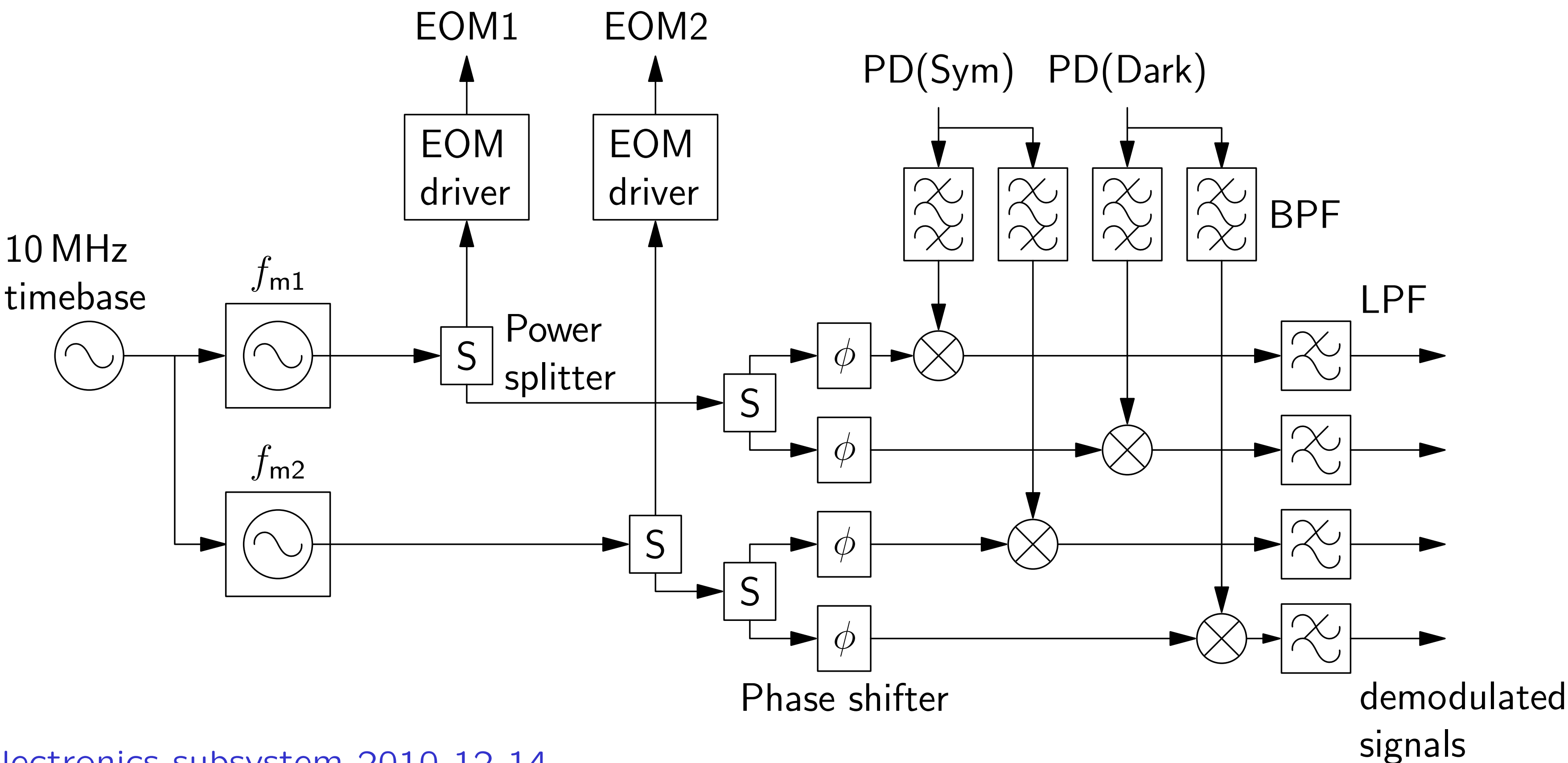
- RF PDs for length sensing
- QPDs for wave-front sensing
- Photodetectors for DC readout

Requirements:

- high qnantum efficiency (→ InGaAs)
- Wider aperture than TAMA ϕ1 mm diode: → 2 mm? (TBD)
- Mechanical shutter for photodiode protection
- Vacuum compatibility

EOM drivers, RF oscillators and demodulators

- Low-noise oscillators
  - 11.25 MHz and 45 MHz PM (or AM, SSB...) for main IFO
  - 10-50MHz PM for MC
- Distributors with low phase jitter
- Demodulators with phase tuning interface for digital controll



Common mechanical/electronic interfaces

To avoid Electromagnetic noise...

Circuit modules:

- NIM crates, NIM modules

  Hot plugging is possible!

  Custom crates with ± 24 V enhancement and separated transformers

- General 19 inch rack modules with DSUB power supply

  Dsub 3W3 high-current connectors, ± 24 V (and ± 18 V ?)

Signal cabling:

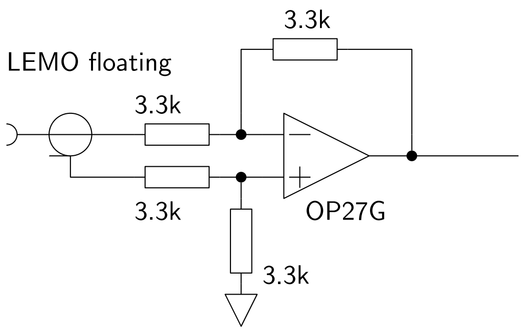
- BNC connectors for AF single-end signals
- DSUB connectors for AF differential signals
- BNC or SMA connectors for RF signals

DC Power supply:

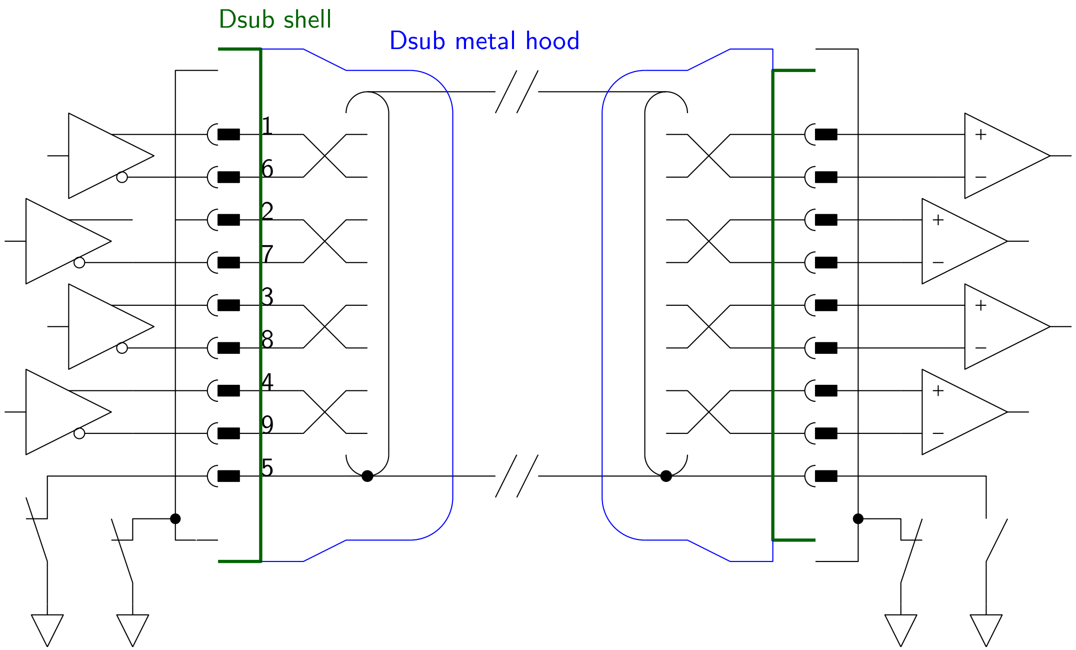
- Linear (Dropper type) regulators
- Switching-mode power supply

AF signal transmission

- Differential reciever for coaxial cable used in TAMA300



- LCGT case: adopted to LIGO digital control system



Summary

Components to be provided:

- Photodetectors
  - RF PD
  - QPD for wave-front sensing
- EOM drivers
- RF oscillators, distribution system and demodulators
- High-speed servo control filters

Electronic/mechanical interfaces:

- Mechanical form of modules:
  simplified NIM, 19-inch rack system
- DC power supplies:
  $\pm$ 24 V via Dsub 3W3 connector
- Signal transmission lines:
  Dsub 9pin STP for AF, BNC/SMA for RF