

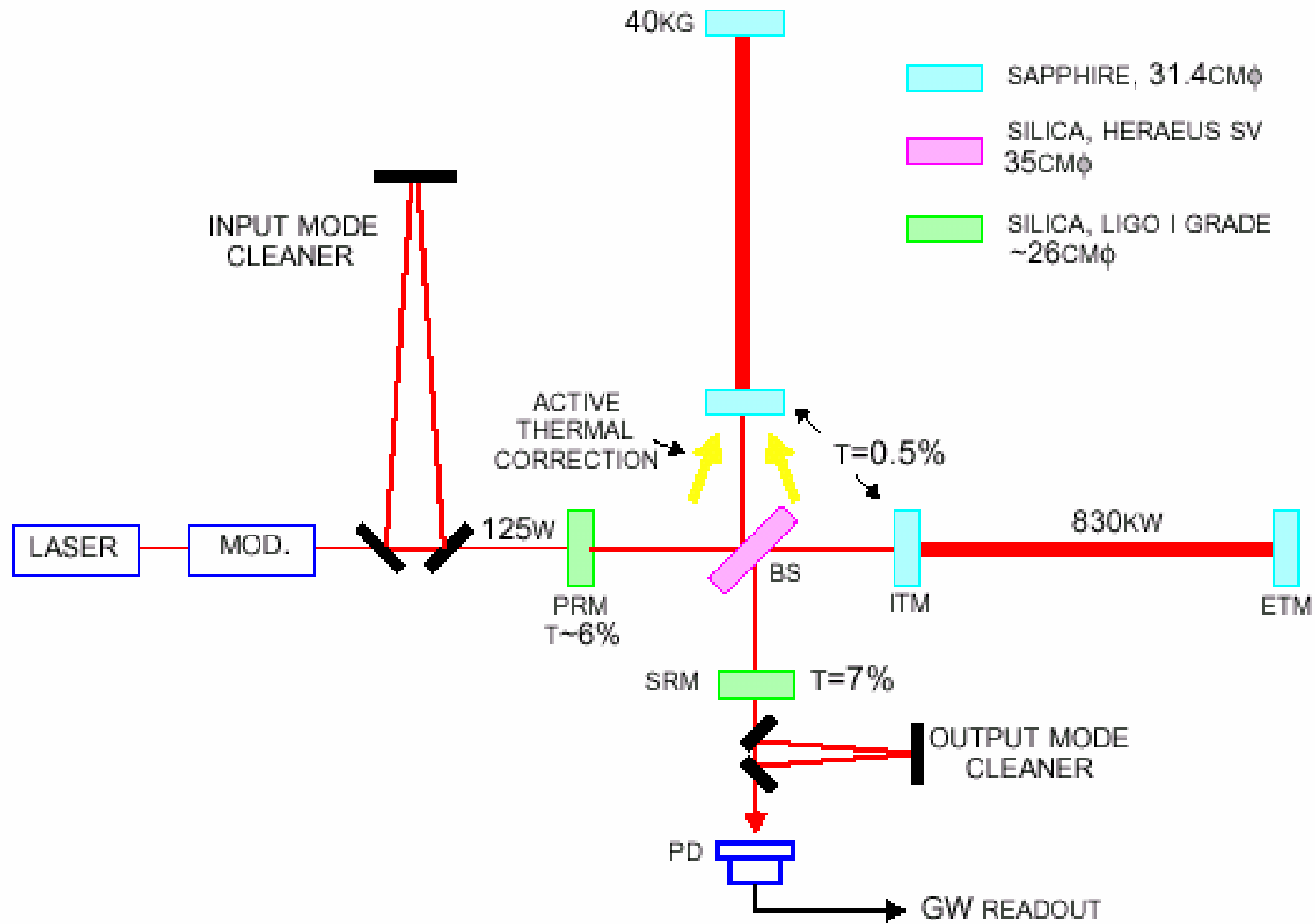


# Advanced LIGO Prestabilized Laser System - conceptual design proposal -

Benno Willke

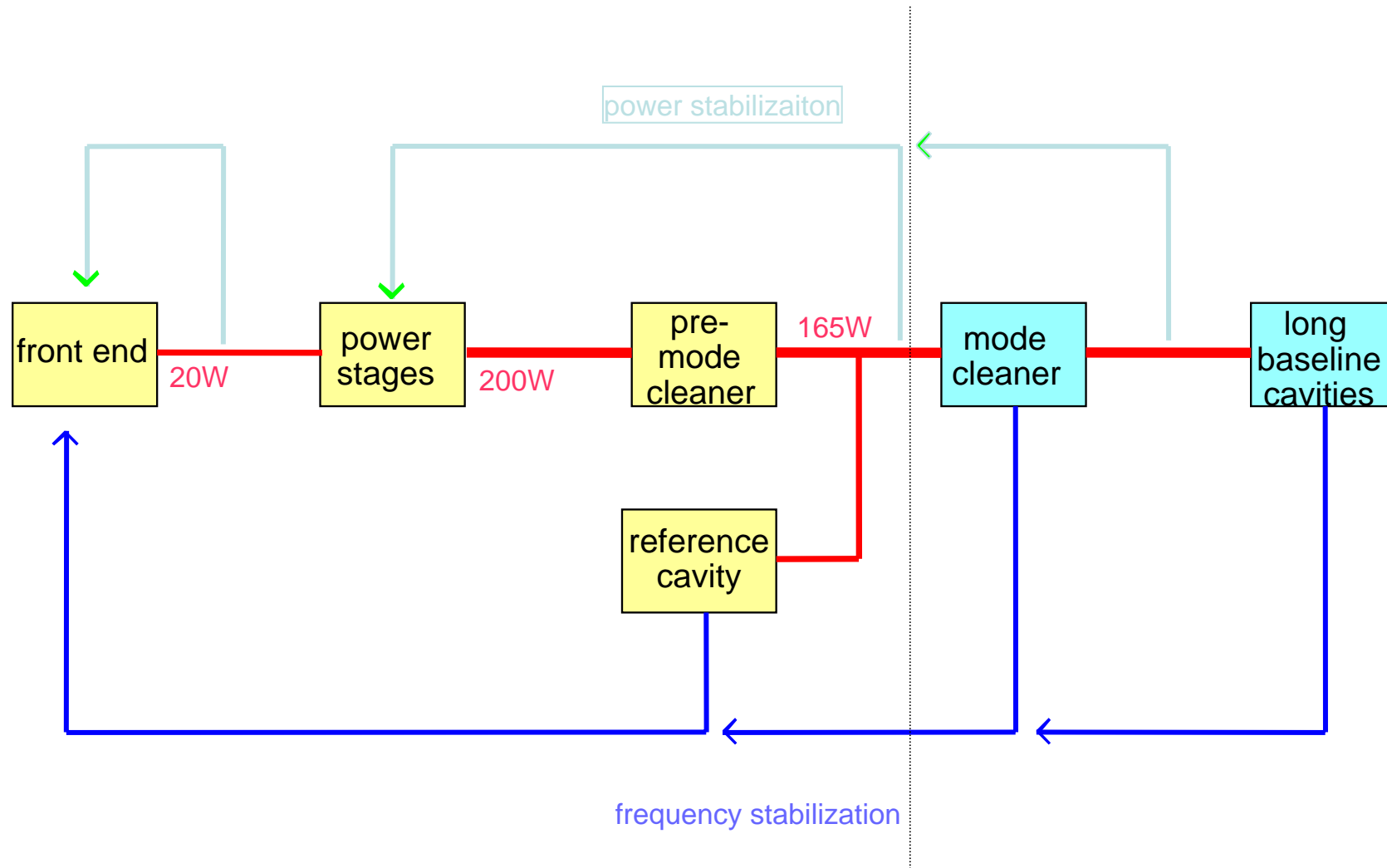
LSC Meeting  
Livingston, March 2004

LIGO-G040181-00-Z





# AdvLIGO PSL – subsystem layout





**LIGO**

# Advanced LIGO PSL – requirements



## *Power / Beamprofile:*

- 165W in gaussian TEM<sub>00</sub> mode
- less than 5W in non- TEM<sub>00</sub> modes

## *Drift:*

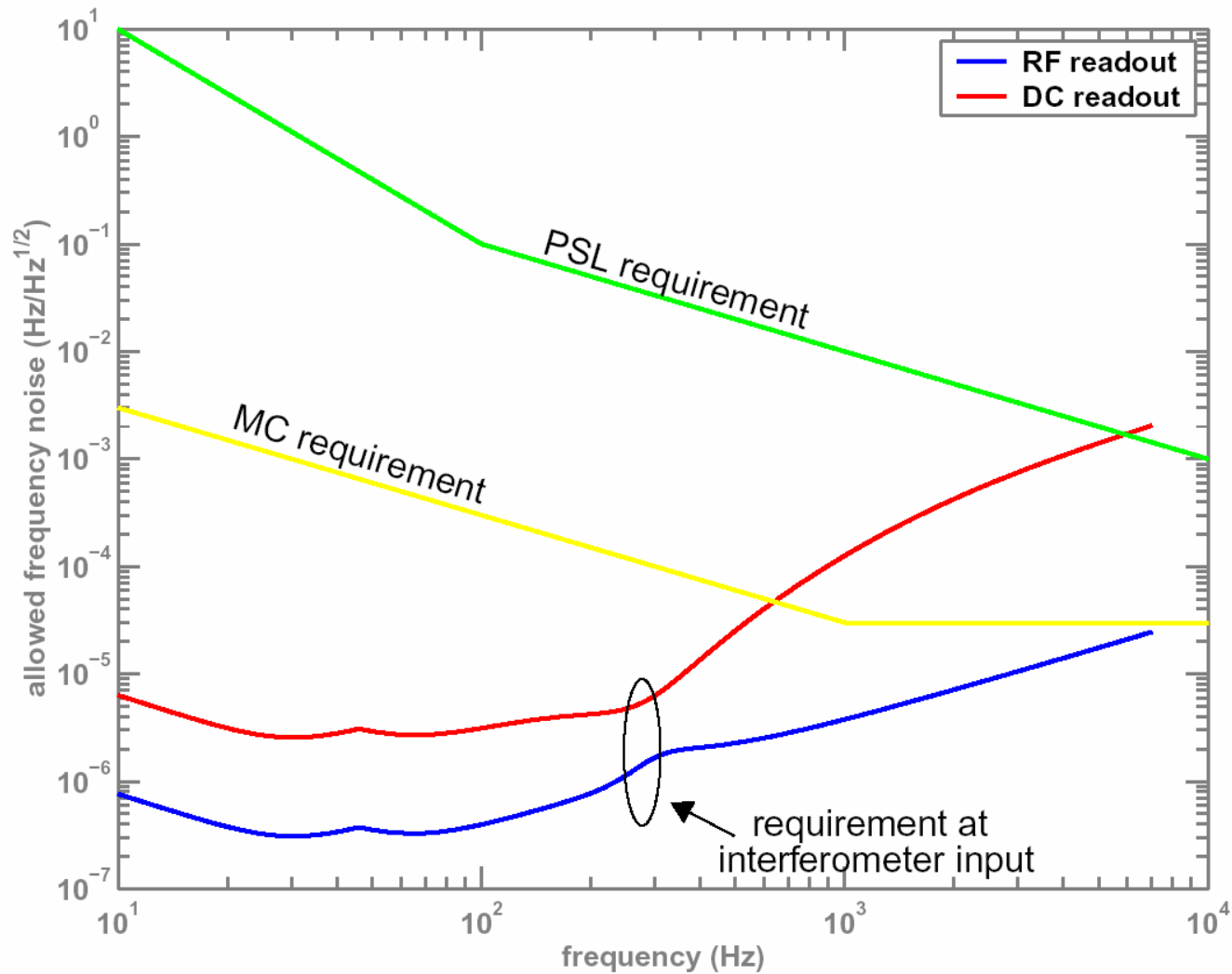
- 1% power drift over 24hr.
- 2% pointing drift

## *Control:*

- tidal frequency acuator: +/- 50 MHz range,  
time constant < 30min
- power actuator: BW 10kHz  
+/-1% range
- frequency actuator BW: <20° lag at 100kHz  
range: 1MHz [DC - 1 Hz],  
10kHz [1Hz-100kHz]

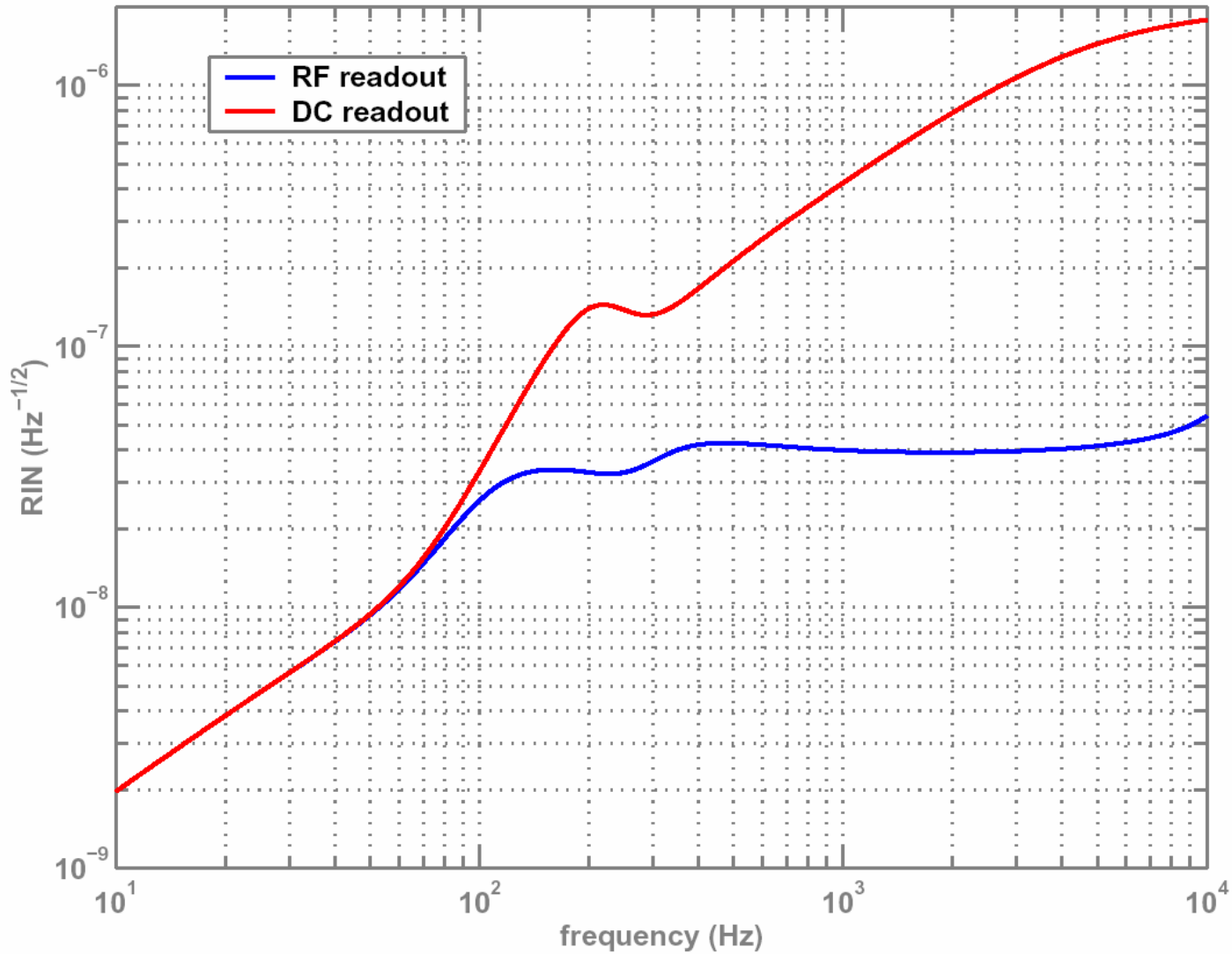


# frequency noise requirement





# intensity noise requirement





# further PSL requirements

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## *interfaces:*

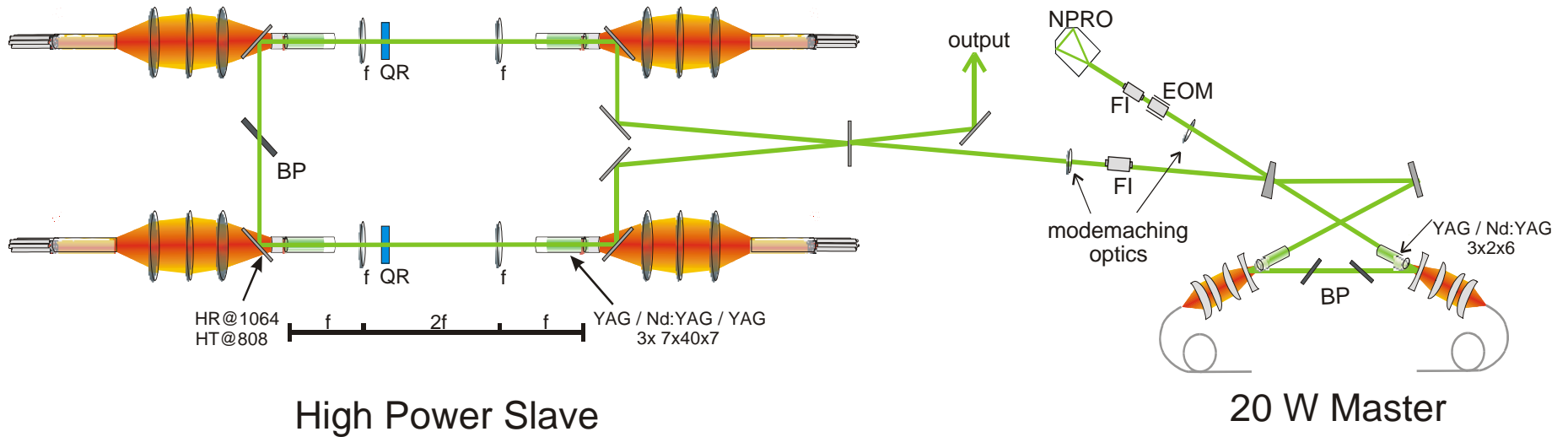
- detector control software ( EPICS)
- data acquisition system
- electrical power and cooling

## *environment:*

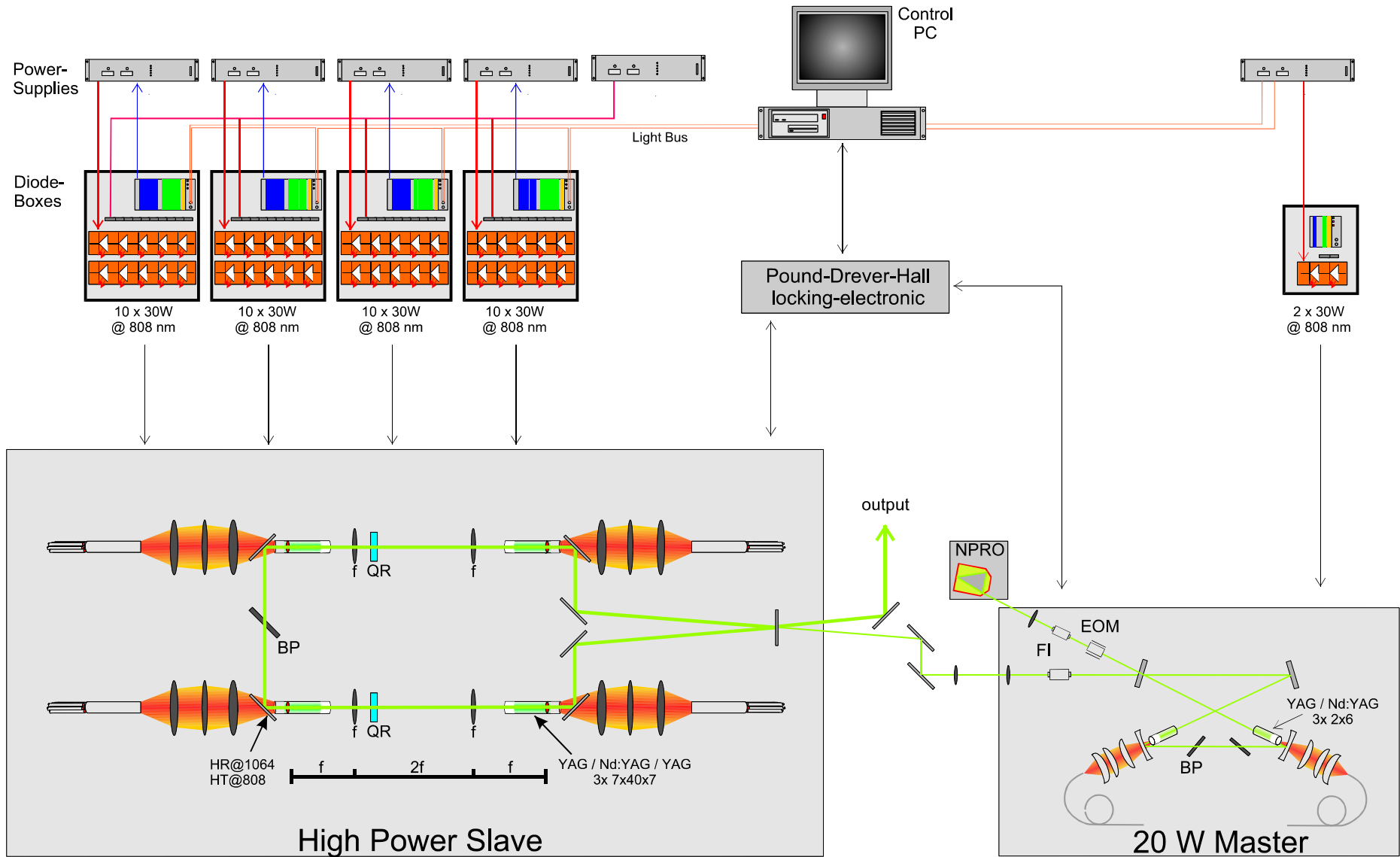
- size limit
- electro-magnetic disturbances
- laser safety requirements

## *reliability:*

- meantime between failure
- maintenance intervals and duration

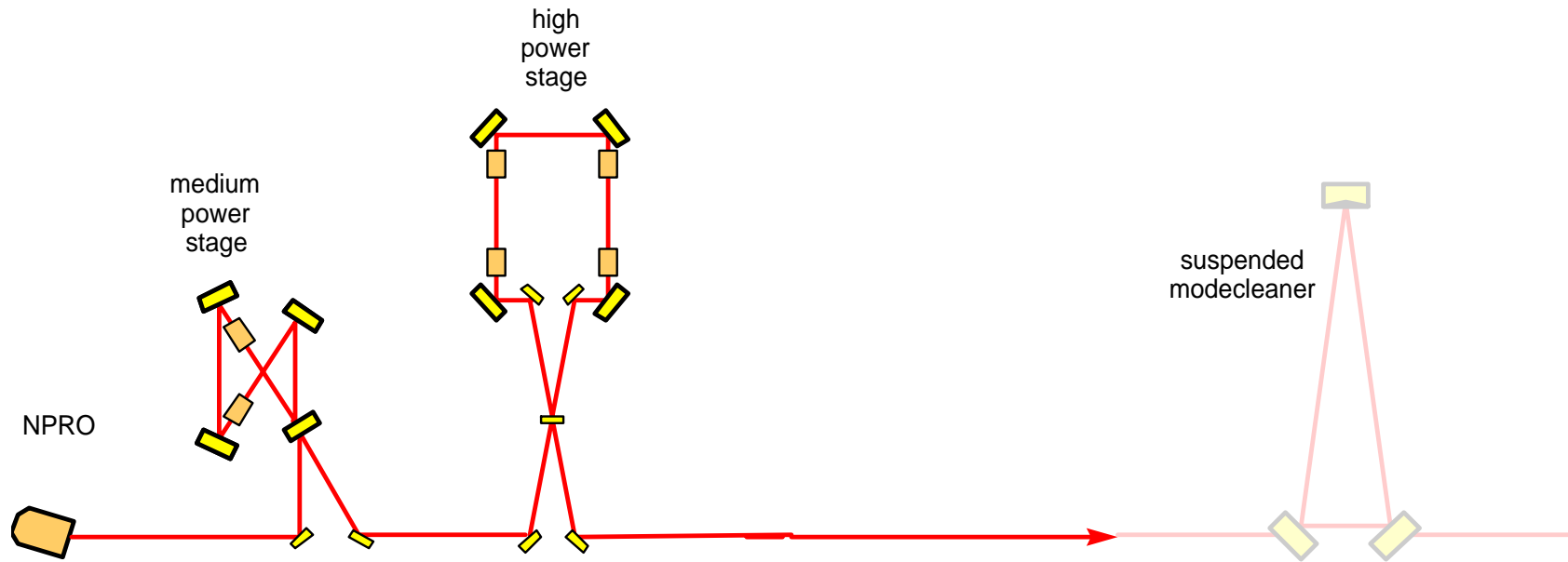


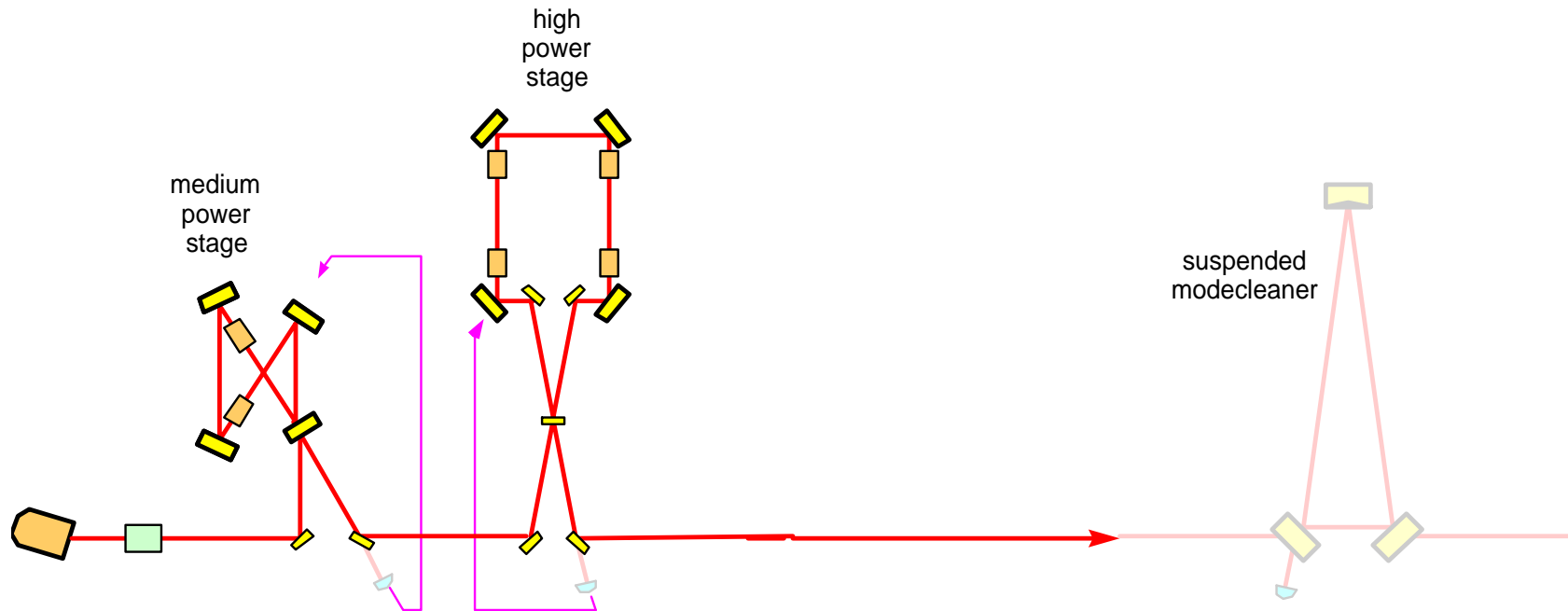




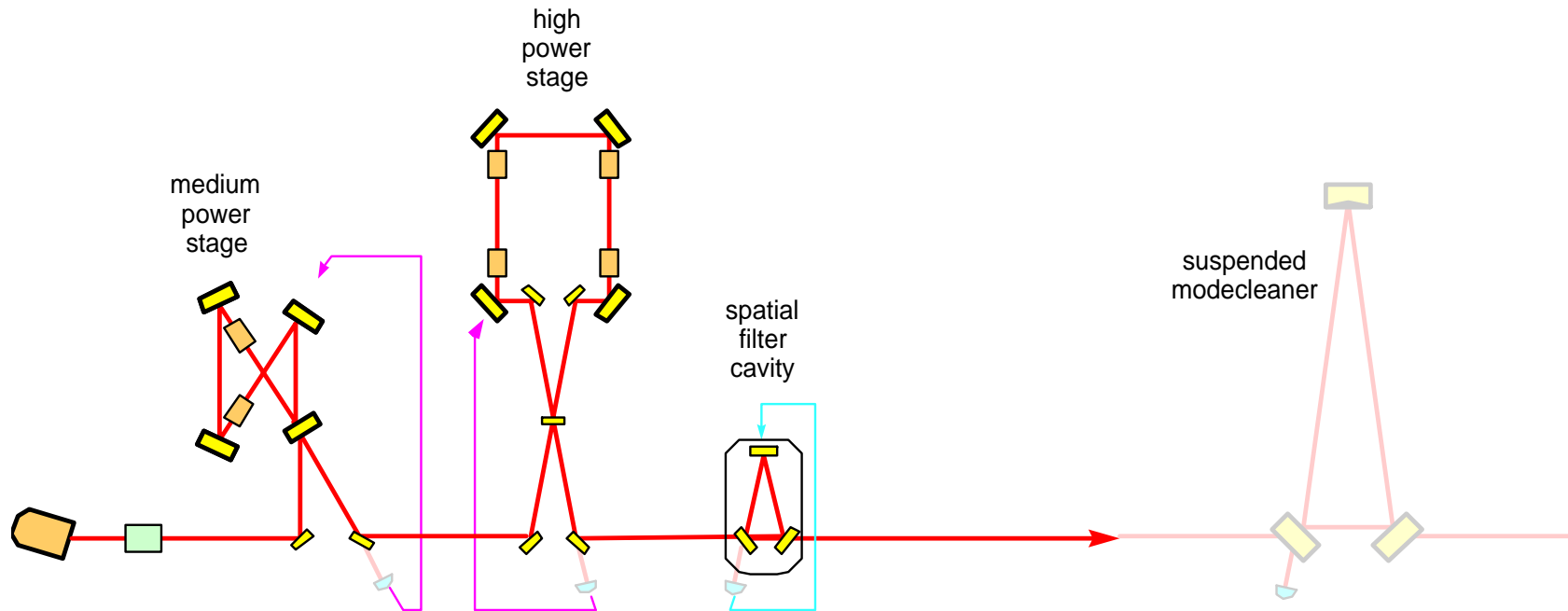


# PSL – stabilization scheme

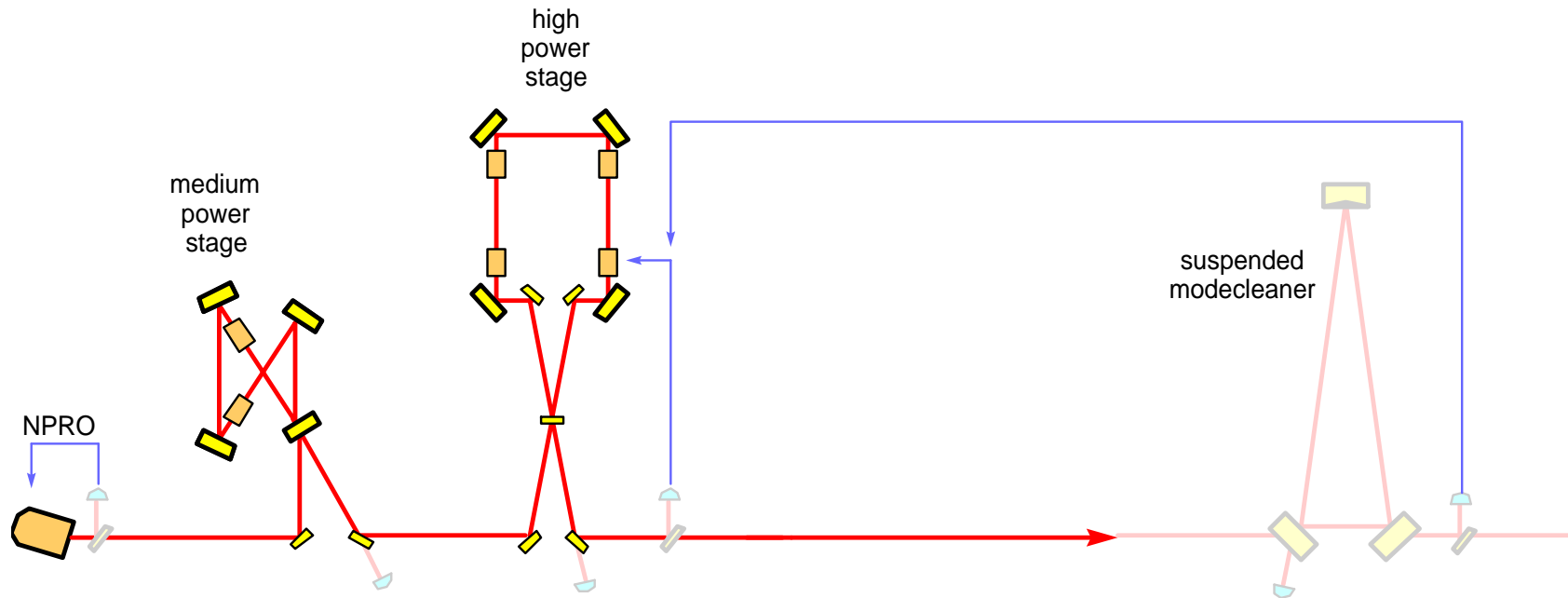




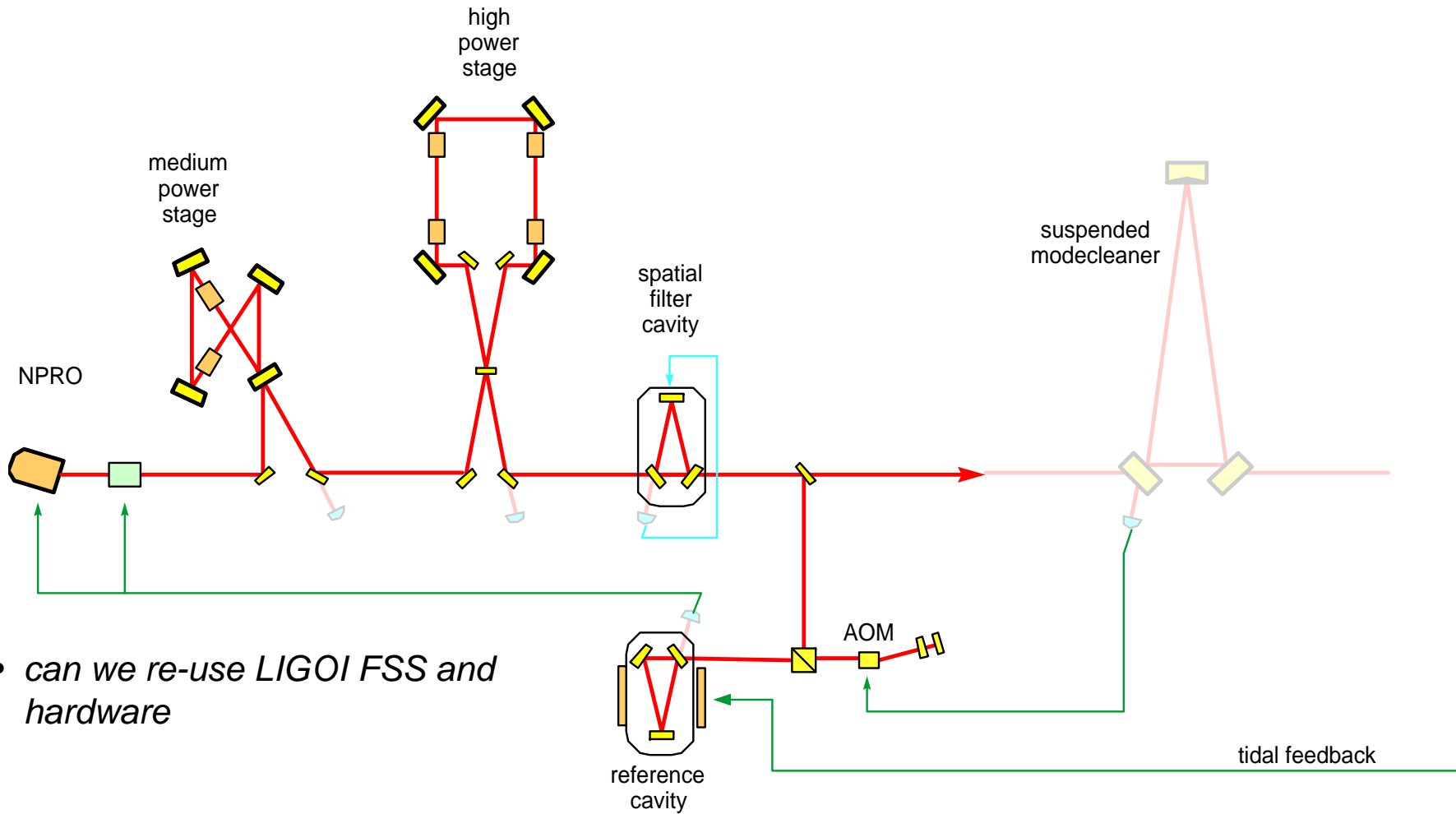
- *do we need intermediate power stage*
- *same rf sidebands for both injection locking stage*
- *required bandwidth of injection locking loops*
- *how much isolation is needed between different stages*

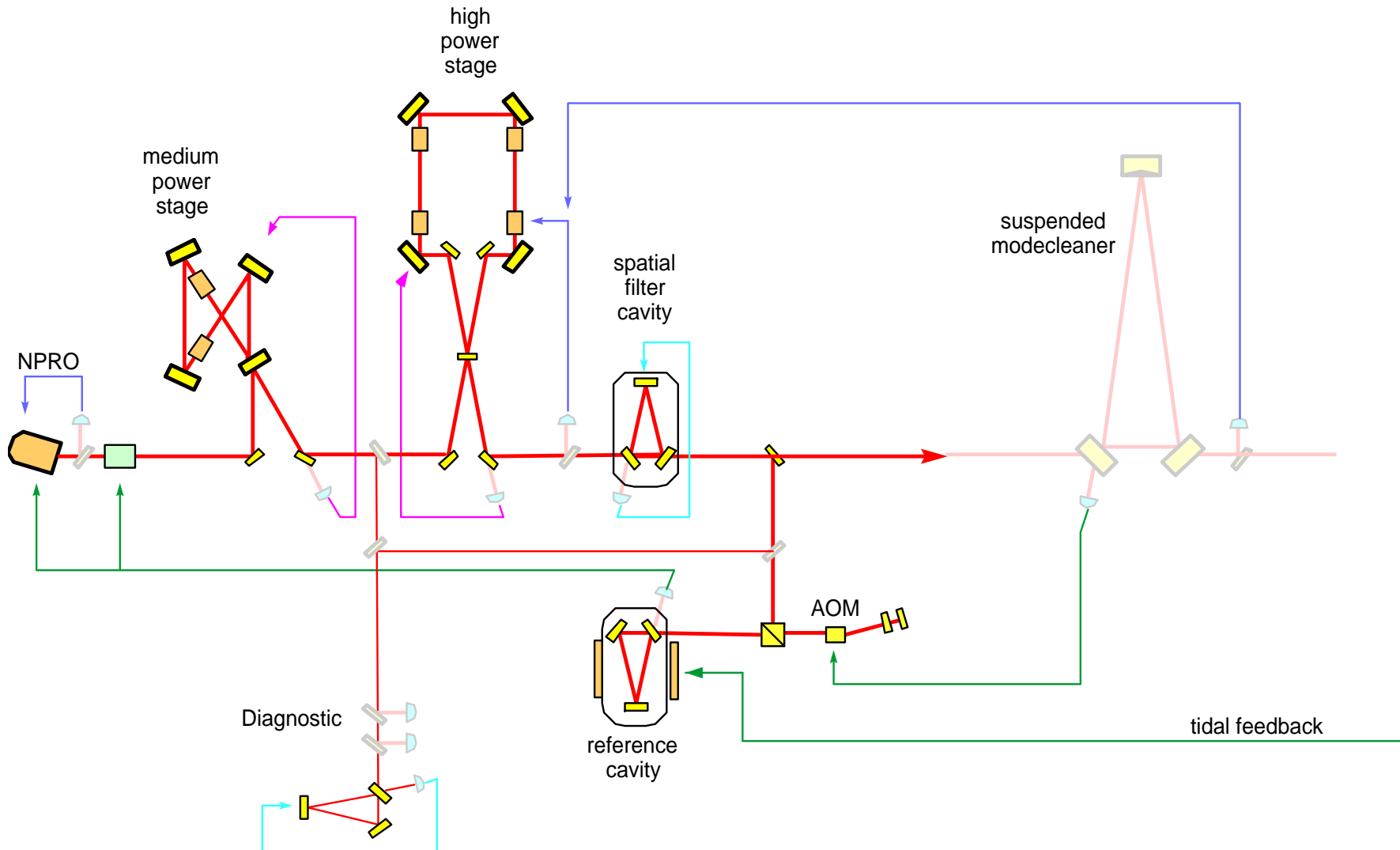


- *vacuum required*
- *loop bandwidth / actuator range*
- *use injection locking sideband*
- *thermal loading / finesse / transmission*
- *do we want to investigate into active beam shaping system*



- *sensing before or behind PMC*
- *actuator at high power stage*
- *bandwidth / range needed*







## who does what ?



- which group would like to contribute hardware / simulations
- what do we need to do for the design requirement document (due date: 8 April 04)
- who will help to finalize conceptual design
- how much detail do we need in the conceptual design phase
  - characterize the high power laser
  - define and specify actuators for different control loops
  - define and specify sensors for different control loops
  - Simulink models of control loops ??
  - Detailed optical layout (AutoCAD, OptoCAD) ??
  - Interface description (electrical, acoustic, optical)
- who will help in writing the conceptual design document (due date: Jan 05)