New Folder Name Status of Experiment

Status of the fixed-mass interferometer coupled cavity experiment

DHS, PF, RW 8 Oct 90

Alignment

- fixed some problems with HV amplifiers, got some more practice
- with very good alignment ($< 3\mu$rad error)
  - sensitivity to beam motion diminishes
  - locking cavities (starting with AC (arm cavity)) gets easier
  - cavities about 4 times more sensitive to misalignment when recycling

Recycling gain

- can measure losses, matching by looking at visibility of fringes from FPs
- A coherent set of figures emerges
  - $M = 0.9$ for each cavity
  - 8 % loss in RC, 8 % loss in AC (on resonance) (same by coincidence)
  - T_{RC}=28%

  $\rightarrow G_{rec} = 5.4$ calculated, 5.2 measured.

Arm cavity error signal at 15 MHz

- works when very well aligned
- crosses 0 when cavities at maximum of power
- locking loop using 15 MHz error signal works fine
  - gives offset if not well aligned, but
  - still holds cavity well (but away from max. power)

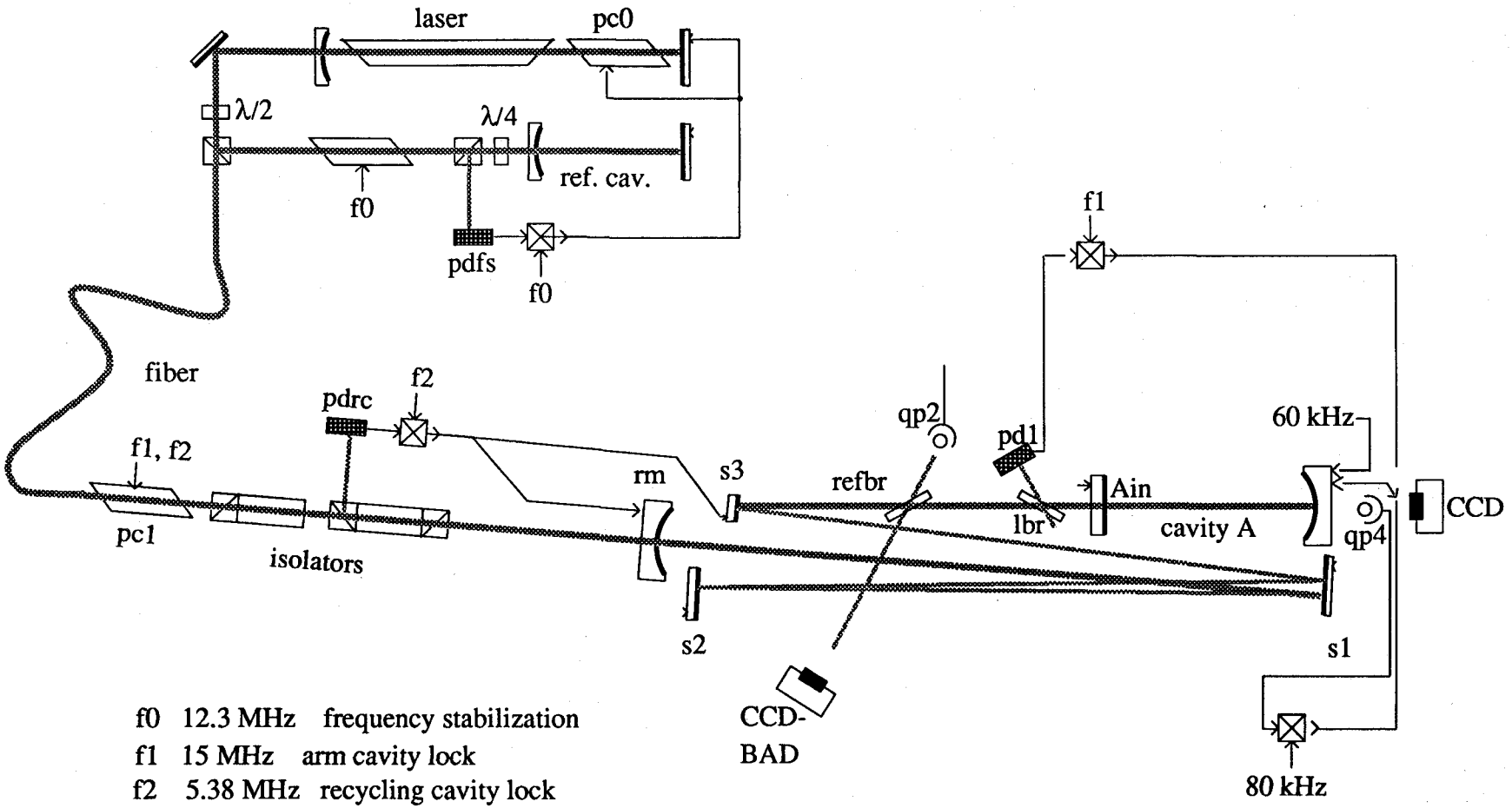
Cavity narrowing

- can measure transfer functions for mirror motions up to 1 MHz
  - use 15 MHZ or 5.38 MHz error signals well above UGF of servos
- see rolloff in phase and amplitude,
  - $f_{3\mathrm{dB}} \approx$80 kHz,
  - phase shows drop and levels off at about 60°
- predicted combined cavity FWHM is 170 kHz ($\rightarrow f_{3\mathrm{dB}} = 85$ kHz)
  - irrelevant for our servos of UGF$\approx$1...10 kHz

Plans

- mismatch input beam to system, measure 'mode cleaning'
- make deliberate mode mismatch to AC
  - change length of AC
  - measure recycling gain
- put in 'new' old mirrors for AC; get back to 2.8% loss?
- form short RC to demonstrate 'reasonable' recycling factor
  - new mirrors for AC ordered
  - eliminate folding mirrors
  - eliminate pickoffs temporarily
  - sacrifice 15 MHz locking
- install second arm, with short or long RC
  - use (at least initially) lf (80 kHz) lock for arms

Coupled cavity schematic diagram 5 Oct 90 DHS



f0 12.3 MHz frequency stabilization
f1 15 MHz arm cavity lock
f2 5.38 MHz recycling cavity lock