Laser - news

Manar AMER and Ronic CHICHE

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Introduction

- In March: found a laser provider with the necessary phase noise performance.
- However:
  - Do not provide 40MHz natively.
  - 160MHz ok + pulse picking at 40MHz.
- Further validation steps are needed:
  - Lock on R&D optical cavity
  - High power tests with R&D amplifier and cavity if possible
R&D cavity

- Menhir Photonics agreed to leave us more time with demo laser since mid-march
- R&D cavity configured to 216.662MHz
Setup – Finesse measurement

Iris
S3
S4
PD
Ma
60 cm
30 cm
fiber + collimator

Beam Profiler
~ 40 cm
P2
P1

PDH
Iris
\( \lambda/2 \)

Photodiode

PD

Diffuser

Fiber

EOM
1
EOM
2

AOM

~ 40 cm
60 cm

30 cm

\( \lambda/2 \)
Finesse measurement

F~19000 at 216MHz still working on improving (with new mirrors would expect ~40000)

For phase noise, equivalent to a 3500 finesse on a 40MHz cavity (1/3 of GFPoP design)
Setup – MENHIR test

- Beam Profiler
- ~ 40 cm
- P2, P1
- Iris
- PD
- S4, S3
- Photodiode
- PDH
- Diffuser
- Fiber + collimator
- Fiber
- EOM
- λ/2
- Fiber + collimator
- Fiber
- Isolator
- Pulsed MENHIR

λ/2

30 cm

60 cm

~ 40 cm
Lock test

Example of (very) bad laser

Error signal

Cavity mode
Lock test

“Clap” test
Conclusion

• Excellent performance of the MENHIR laser, as expected from the phase noise measurements

• Unfortunately still not fully representative of GF PoP cavity
  • Will be difficult w/o 40Mhz laser and 40MHz cavity (££ !)

• Next steps:
  • buy 40MHz laser (PBC budget) → proposed specs in attachment, please have a look
    • Tuning frequency range 40.0757MHz - 40.0807MHz, OK ?
    • GFPop: 40.076799MHz (gamma=96.3)
  • Amplification tests w/ R&D amplifier once 40Mhz received