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VEUILLEZ S.V.P. TRANSMETTRE CE MESSAGE A: DR. Gary SANDERS (LIGO)
PLEASE DELIVER THIS MESSAGE TO:

DE LA PART DE: Dr. Nary MAN (VIRGO)
FROM:

NOMBRE DE PAGES (Première page incluse):
NUMBER OF PAGES (First page included): 2

OBJET: Comments on "laser Nd Yag vs Argon" draft.
SUBJECT:

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On the report : "Evaluation of Nd:YAG ...." by Abramovici and Shoemaker

To our knowledge the comparison between YAG's and Argon lasers is essentially correct and up to date. There are only a few details with which we do not agree completely, or to which we may add some information ;

- the InGaAs photodetectors are somewhat better than is reported. We use 3 mm diameter detectors, with a quantum efficiency of about 90%, and will get new ones with an AR coating at 1.06μm and a guaranteed efficiency of 95%. They are linear up to 100 mA, for modulation frequencies inferior to ≈20 MHz. They have been tested in vacuum in these conditions.

- in our experience, the frequency where YAG's intensity noise meets shot-noise is typically 5 MHz, rather than 3 MHz

- The fast frequency modulation available on the Lightwave master laser allows for a bandwidth of 30 kHz at most, not a few hundred kHz. We have added an external phase control with an EOM, to increase the bandwidth to 1 MHz.

- When we looked at the problem some time ago, we had not arrived to the conclusion that Mg-doped lithium niobate would be better than standard Lithium Niobate for use as a phase modulator. If you have got new information about it, please tell us.

- the relative power fluctuations observed on a free-running laser is rather 10^{-6} $Hz^{-1/2}$, above 100 Hz (master laser alone or/and injection-locked high power laser).

- we have measured Faraday crystals power standing of more than 600 $W.cm^{-2}$ presenting no apparent beam distorsion and no extra birefringence. Besides that, larger aperture xtals can be found at the cost of lower optical isolation (attenuation).

- the prestabilization level that we have obtained so far with our ULE reference cavity is 10^{-2} $Hz/Hz^{1/2}$ at 100 Hz and reaches the shot noise of 2.10^{-4} $Hz/Hz^{-1/2}$ at 20 kHz. Between 4Hz and 200 Hz, our measurements (done on a second cavity) were mainly limited by the relative motions of the cavities (Doppler and Sagnac effects).

- we like to express the conclusion of the comparison saying that *all other aspects of the interferometer being unequal*, a YAG laser and an Argon laser having the same power will give about the same sensitivity.

A reason for waiting a little bit more could be the hope that other crystals, like YLF, will provide better beam quality and better polarized beams than YAG does.

Orsay, 15/08/95

Nary Man