Monitoring laser

Contents :

I   Situation

17 Nov 03 -> 15 April 04: no chilled water, no laser

Laser1: used during test beam (440nm). Ok but constant degradation.

Laser2: not used because of problem on YLF (440/495nm)

Laser3: 800nm: used during test beam. OK

Actions: - visit of Quantronix expert,
           - Caltech engineers : check and fix lasers, install new
                               hardware & software

II Lasers status

<u>Laser1:</u>

Degradation of ~4.7% / day   →   - *Pockel Cell* of Ti:S laser damaged
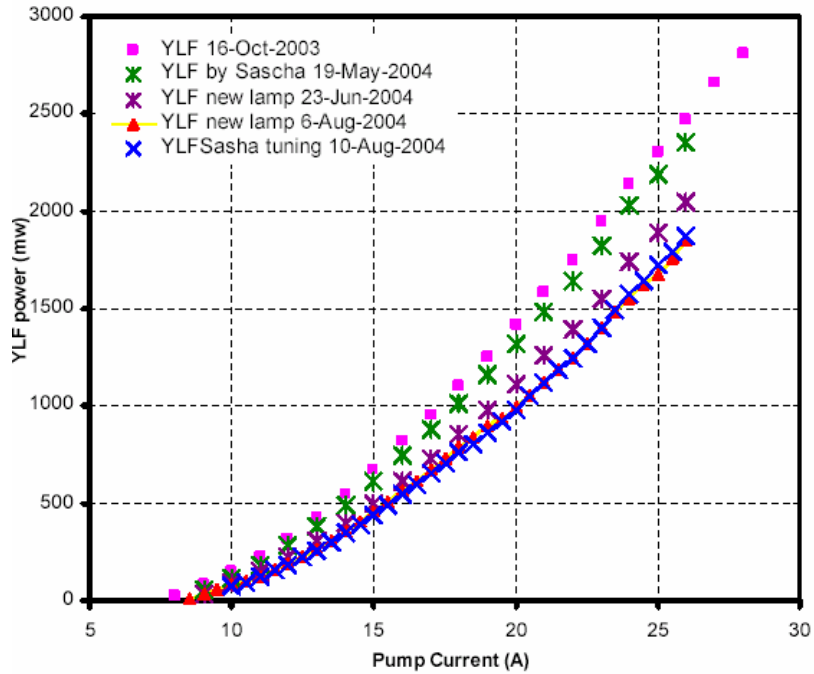   - YLF: low power → crystal damaged

⇩

Pockel Cell replaced, 440 nm OK.
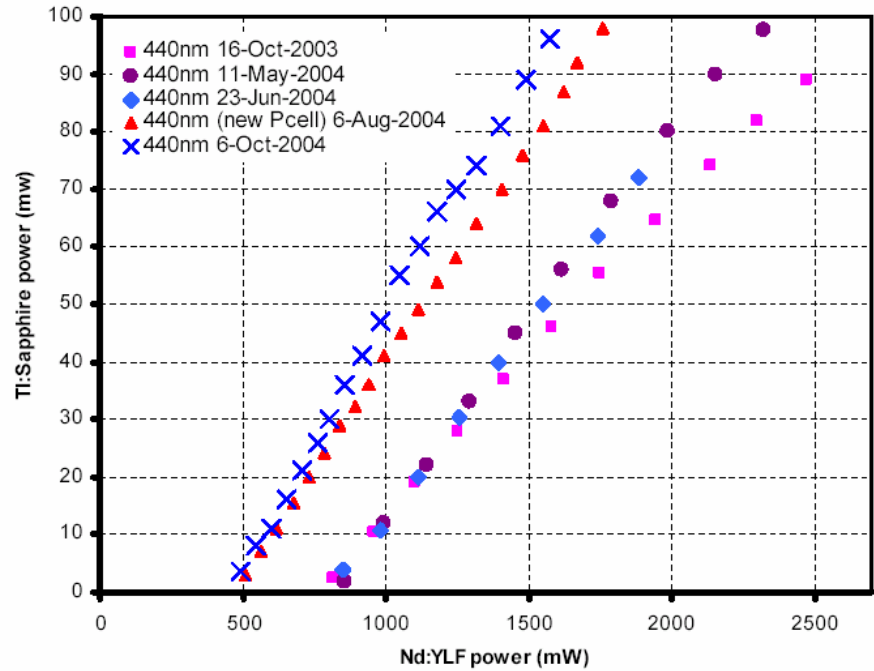YLF:Nd crystal damaged, 495 nm not OK. Will be replaced.
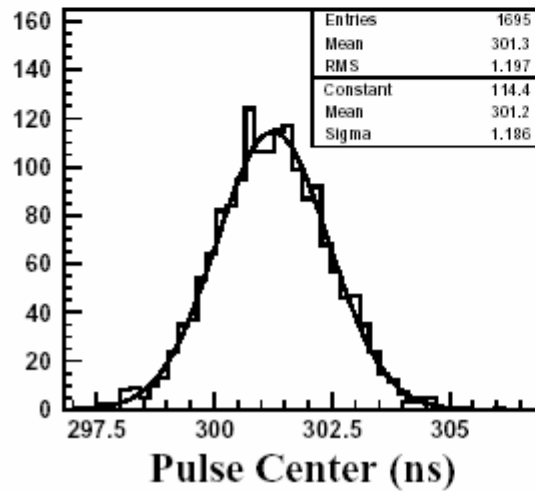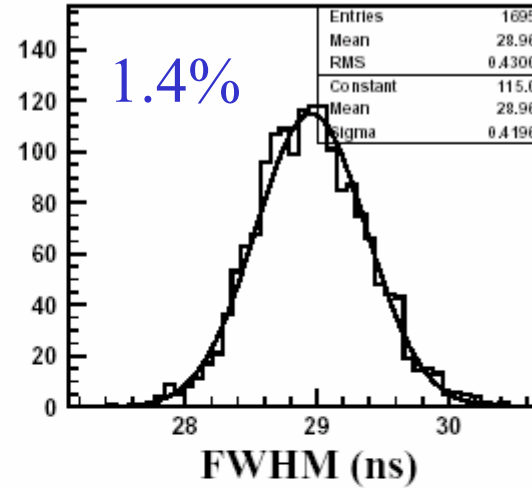
Monitoring laser

Nd:YLF LASERS 1

Legend:
- YLF 16-Oct-2003
- YLF by Sascha 19-May-2004
- YLF new lamp 23-Jun-2004
- YLF new lamp 6-Aug-2004
- YLFSasha tuning 10-Aug-2004

Nd:YLF LASER PUMPED TI:S LASERS 1

Legend:
- 440nm 16-Oct-2003
- 440nm 11-May-2004
- 440nm 23-Jun-2004
- 440nm (new Pcell) 6-Aug-2004
- 440nm 6-Oct-2004

Ti:S Laser1

2%

Entries	1695
Mean	0.9516
RMS	0.2003E-01
Constant	126.9
Mean	0.9517
Sigma	0.1940E-01

Energy (mJ)

1.4%

Entries	1695
Mean	28.96
RMS	0.4300
Constant	115.0
Mean	28.96
Sigma	0.4196

FWHM (ns)

Entries	1695
Mean	301.3
RMS	1.197
Constant	114.4
Mean	301.2
Sigma	1.186

Pulse Center (ns)
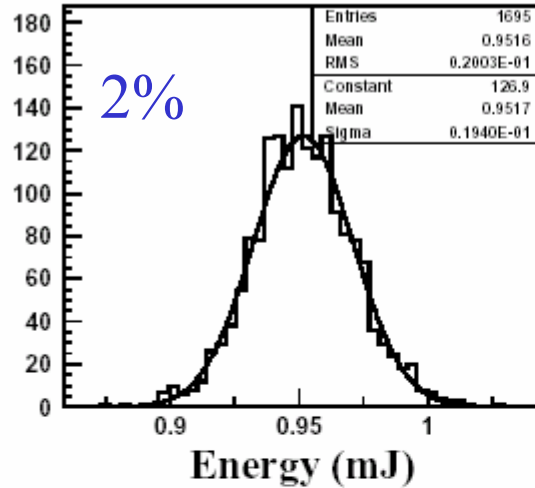
440 nm, 24.2A

Laser2:

→ 19 May: 1st intervention of Quantronix
    - YLF crystal replaced
    - lamp jacket replaced.
    - 1 lens damaged

YLF energy Laser2

27 MAY   2 JUNE

11 JUNE
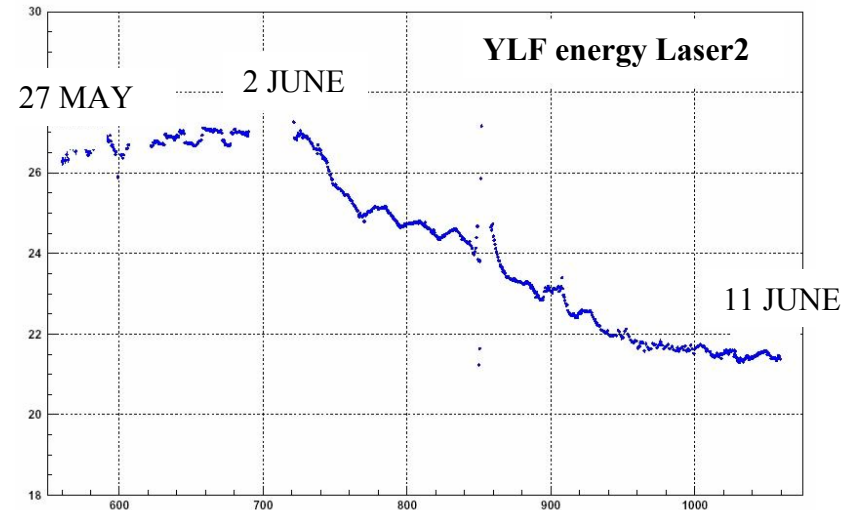
→ 28 June: laser2 out of order: water leakage. Crystal assembly burnt, lamp jacket broken.

→10 August: 2nd intervention of Quantronix:
    - new crystal housing, lamp jacket,
    - found scratches on the new YLF crystal installed in May.

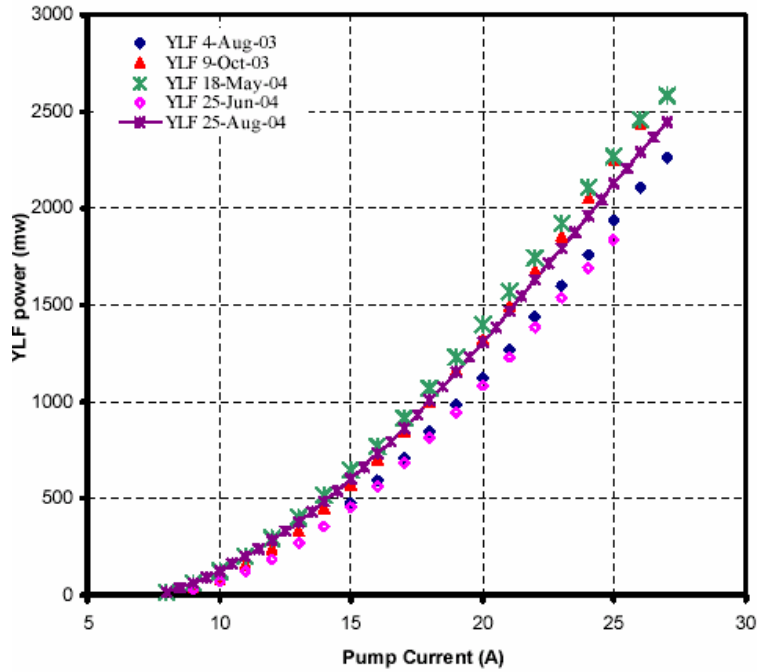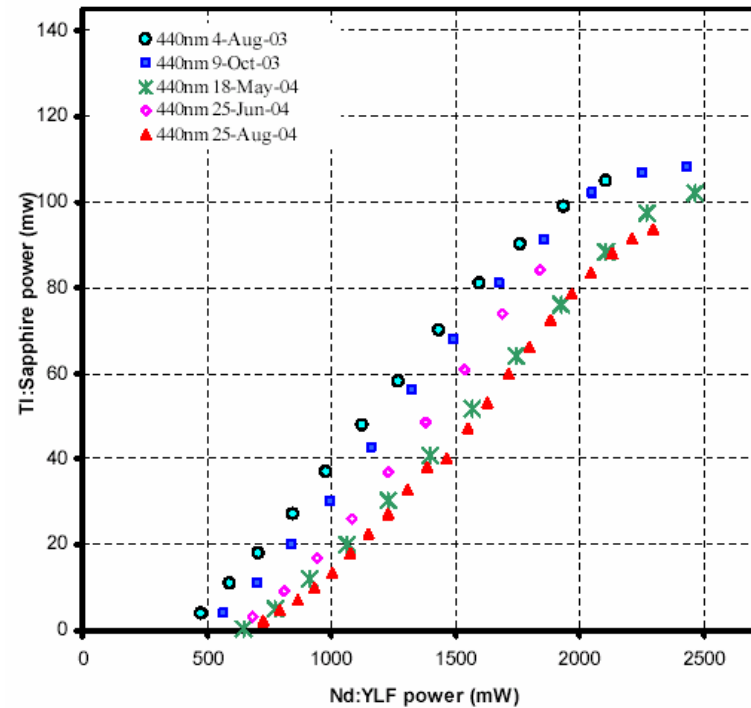→22 August: YLF crystal replaced by *Liyuan Zhang from Caltech.*
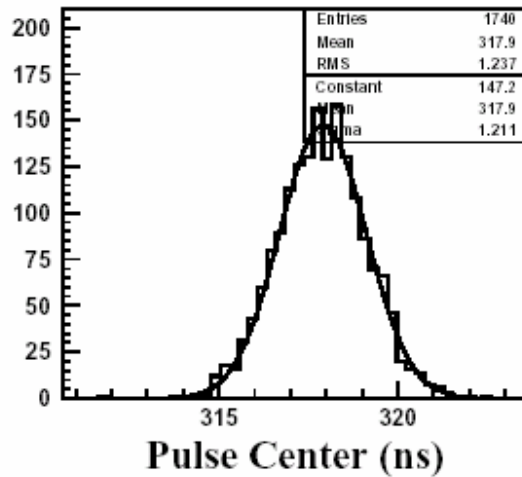
⇩

Laser2 ok

Monitoring laser

1.3%

1%
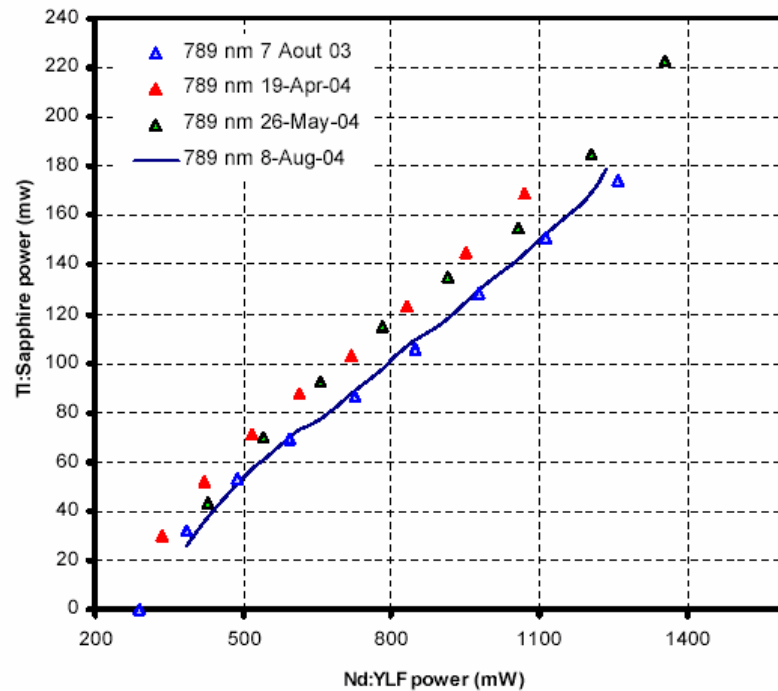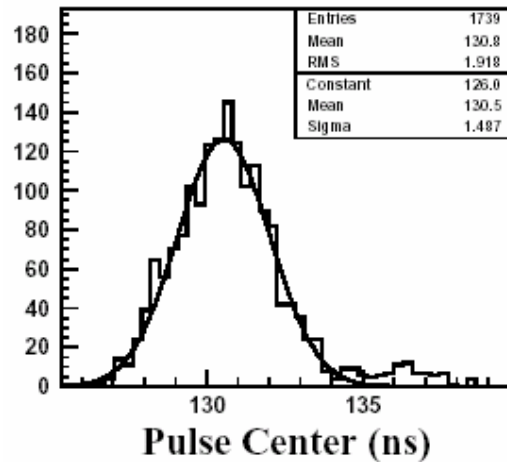
440 nm, 24A

Nd:YLF LASERS 3
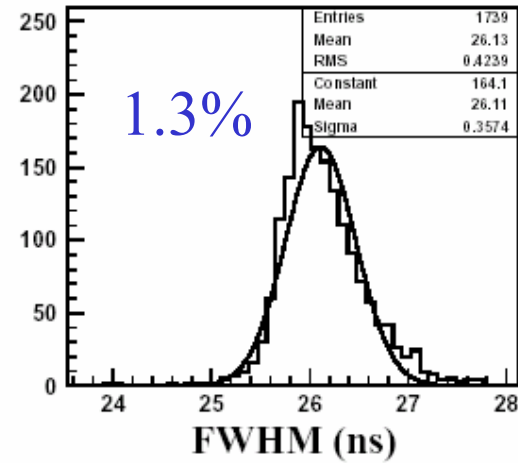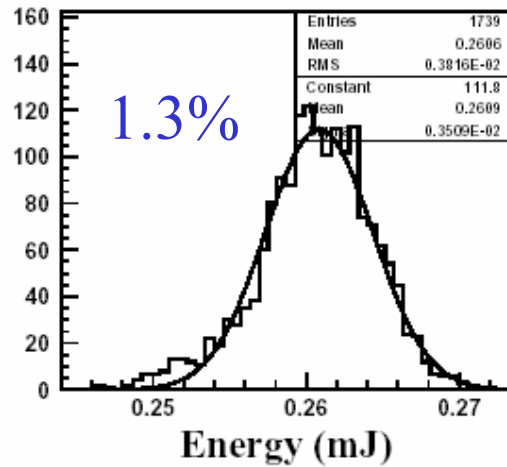
Laser3:

Nd:YLF LASER PUMPED TI:S LASERS 3
789 nm

789 nm, 20A

Other measurements:

- Total loss of system has been checked

  →Eliminated 3dB extra loss : 2 FC connectors in the 2x1 $O.switch$ burned.

  Total loss: 10.5 dB $^{+/-\,0.5}$ @ 440 nm
                        9.0 dB $^{+/-\,0.5}$ @ 800 nm

- Test laser with trigger frequency:
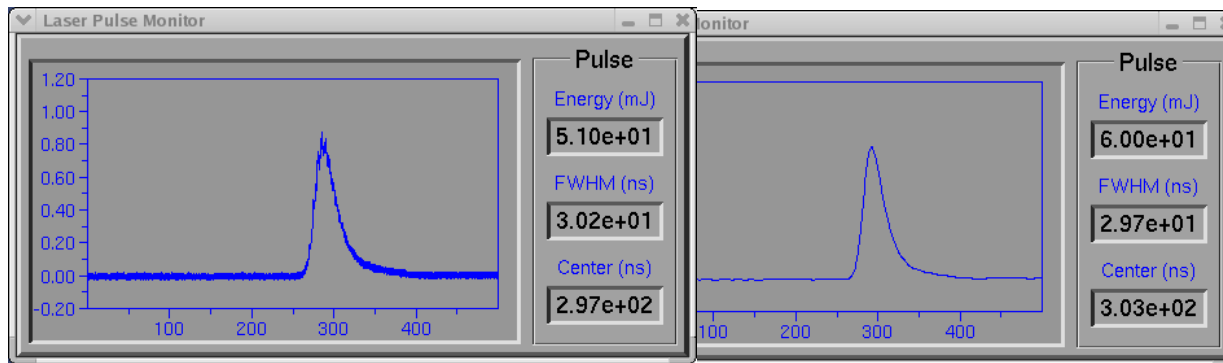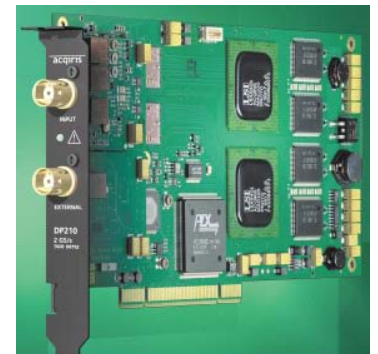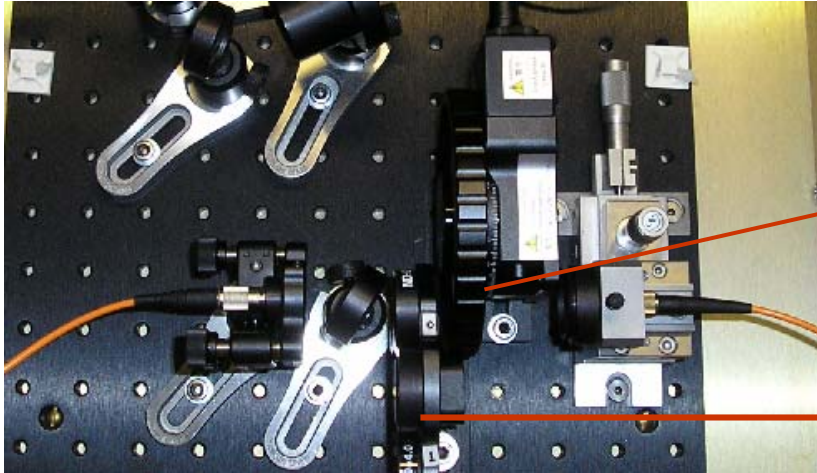   0.01-0.1-1-10-100 Hz: pulse energy degradation < 2%.

III   New hardware

1) Attenuation box: add a remote controlled neutral density filter.

⤷ It is placed between 2x1 and 1x80 optical switches, and controlled by DAQ

Attenuators in 3 Ti:S lasers will no longer be accessed by the H4 DAQ

2) Fast (2 GS/s) sampling ADC installed: will record all Ti:S pulses

Option: filter 60MHz available

Variable Reflective Neutral Density Filters
Optical Density from 0.04 - 2.7

$+$

neutral density filters: 0-10-20-30-40-50 dB

Software modification for attenuation mode:
   0-100% with Ti:S regulator → variable density filter

   0%   = max. attenuation (27 dB loss)
   100% = min. attenuation (0.4 dB)

III   Conclusion

➢ Lasers ready for test beam.
- laser1 : blue OK as spare laser. YLF crystal to be replaced.
- laser2: blue and green OK
- laser3: IR and red OK

➢ All Ti:S laser pulses sent to detector will be recorded.

➢ Accurate attenuation control *(0.08dB)*

➢ Cleanroom investigation for H4 and USC55:
- cleanroom (class <10.000) with softwall
- humidity control (<60%)
- temperature control (+/- 1 C)