# Laser Monitoring System

**History**
**Lasers at pt5**
**EB commissioning**
**Laser sequence**


*- ECAL week 15 April 2008 -*

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***US CMS on behalf of Caltech group***

# History

***August 2001*:** **Blue laser in zone control area, H4.**
Test with M0' module

***July 2003*:** **New laser room behind test beam area.**
**2 new lasers: one more BLUE, one RED.**
Test with SM0-SM1 module

***April 2005*:** **Clean room installation for the 3 lasers (Class <1000).**

***June 2006*:** **Upgrade of the laser system**

➢ New hardware:
- an 1 x 5 switch + 1X100 switch
- a new attenuation box with logarithmic and linear attenuators.

➢ New software:
- feedback on current to compensate YLF lamp aging
- remote control of both logarithmic and linear attenuators,
- separate processing for hardware and data acquisition.

***March 2007*:** **Move RED and one BLUE laser (laser2) to pt5.**
**Start EMTC installation in June.**

***Feb. 2008*:** **Stop laser1 at H4**

***March 2008*:** **Move the second BLUE laser (laser1) to pt5.**

➢ Upgraded software: 3 lasers on-line

→ **All 3 lasers operational**

# Lasers at pt5

***March 2007:***

| | |
|---|---|
| Laser 2 | - New crystal *(endcap no glue anymore, leak),*<br>- New flow tube,<br>- New lamp. |
| Laser 3 | - New YLF LBO *(water cooled, leak)*<br>- New YLF Q-Switch *(in May)* |

***March 2008:***

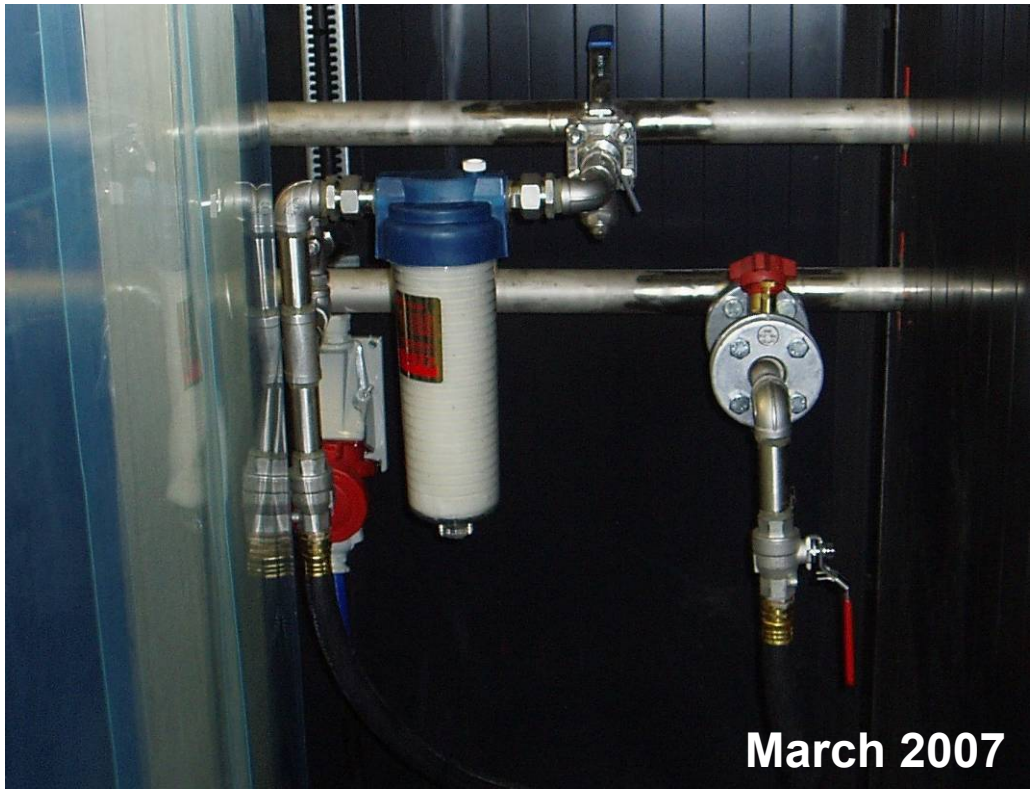
| | |
|---|---|
| Laser 1 | - New Ti:S HV pulser before moving to pt5 *(Xmas break)*<br>- New YLF Q-Switch *(unstable pulse)*<br>- New RF driver *(compatibility)* |

***Laser PCs:***

| | |
|---|---|
| Ecal-laser-room-01.cms | → laser hardware control, slow monitoring |
| Ecal-laser-room-02.cms | → .Fast monitoring (Acqiris PCI board).<br>.VME control for ***Matacq and EMTC*** |
| Ecal-laser-room-04.cms | → laser PC supervisor for Matac and EMTC not yet ready |

# Mixed water pt5

**Laser requirement:**
particules size ~30 µm (max 70 µm)
**Mixed water**: unknown





From now –> change filter quite often but after 1-2hrs filters are brown.
Can't estimate the effect on the laser heat exchanger after long time.

# Mixed water pt5

## Laser room in USC55 → Mixed water 16ºC *(18ºC max for laser)*

The laser filters are filtering the entire volume of water (very large) in the RACKS circuit.
**25 or 50um filter → same visual effect on filter.**

**Experimental solutions (7 months):**

**1) Settling Tank**
The sediments found in the RACK circuit → metallic particles.
→ No improvement (filter still becoming clogged rapidly) after 2 months.

**2) Cyclone Filter**
Centrifugal forces to separate out particles from the fluid and have no moving parts.
→No effect at all.

**UP TO NOW:**
**closed circuit with mixed water not possible because of temperature specification.**

**FROM LAST WEEK :**
**seems in fact there is no problem to use CHILLED WATER !**
**TO BE CONFIRMED**
*(meeting with B.Pirrolet, TS CV)*

**Closed circuit with pump and heat exchanger from H4**
- Dismounted , moved and installed in pt5 *(ZEC)*
- Buy a new pump as spare

# EB commissioning

## Laser fibers installation for Barrel:

**18 cables**

1 cable = 6 ribbons = 2 SMs → 1 spare for each SM

→ Protection tube for fibers cables from EB to laser barracks

→ All EB fibers OK:
no damage *(no spare fiber used)*

# EB commissioning

Commissioning from Nov to Dec 2007:

**Laser2 setting during commissioning:**

**-10dB and 50% attenuation**

Up to now → only one laser used for EB

Optical switch mapping:

| EB- | Side | Laser ribbons | Channel optical switch |
|---|---|---|---|
| 1 | A | 1 | 1 |
| | B | 2 | 2 |
| 2 | A | 3 | 3 |
| | B | 4 | 4 |
| 3 | A | 1 | 5 |
| | B | 2 | 6 |
| 18 | A | 3 | 35 |
| | B | 4 | 36 |

| EB+ | Side | Laser ribbons | Channel optical switch |
|---|---|---|---|
| 1 | A | 1 | 37 |
| | B | 2 | 38 |
| 2 | A | 3 | 39 |
| | B | 4 | 40 |
| 3 | A | 1 | 41 |
| | B | 2 | 42 |
| 18 | A | 3 | 71 |
| | B | 4 | 72 |

# EB commissioning

| EB + | side | Run number | Date1 | ADC counts | Date2 |
|---|---|---|---|---|---|
| 1 | A(L) | run 28217 | 20-Nov | 2000 | 12Dec |
| | B(I) | | | 1800 | |
| 2 | A(L) | | | 2200 | 12Dec |
| | B(I) | | | 2100 | |
| 3 | A(L) | run 28213 | 20-Nov | 1800 | 29-Nov |
| | B(I) | | | 2000 | |
| 4 | A(L) | | | 2000 | 14 Dec |
| | B(I) | | | 1800 | |
| 5 | A(L) | 2000 | 29-Nov | 2000 | 28-Nov |
| | B(I) | 2200 | | 2300 | |
| 6 | A(L) | | | 2100 | 29-Nov |
| | B(I) | | | 2100 | |
| 7 | A(L) | | | 2000 | 13 Dec |
| | B(I) | | | 1700 | |
| 8 | A(L) | | | 2400 | 13 Dec |
| | B(I) | | | 2400 | |
| 9 | A(L) | | | 1800 | 13 Dec |
| | B(I) | | | 3000 | |
| 10 | A(L) | | | 2400 | 13 Dec |
| | B(I) | | | 2500 | |
| 11 | A(L) | | | 2000 | 13 Dec |
| | B(I) | | | 2000 | |
| 12 | A(L) | | | 2000 | 13 Dec |
| | B(I) | | | 2000 | |
| 13 | A(L) | | | 1700 | 12Dec |
| | B(I) | | | 1800 | |
| 14 | A(L) | run 28611 | 23-Nov | 2300 | 12 Dec |
| | B(I) | | | 2300 | |
| 15 | A(L) | 2000 | 28-Nov | 2000 | 29-Nov |
| | B(I) | 2000 | | 2100 | |
| 16 | A(L) | | | 2000 | 12Dec |
| | B(I) | | | 1800 | |
| 17 | A(L) | | 9-Nov | 2500 | 14 Dec |
| | B(I) | | | 1900 | |
| 18 | A(L) | | 10-Nov | 2500 | 28-Nov |
| | B(I) | | | 1800 | |

| EB - | side | Run number | Date1 | ADC counts | Date2 |
|---|---|---|---|---|---|
| 1 | A(L) | run 27881 | 19-Nov | 1900 | 30-Nov |
| | B(I) | run 27884 | | 1900 | |
| 2 | A(L) | | | 1700 | 13 Dec |
| | B(I) | | | 2300 | |
| 3 | A(L) | | | 2600 | 30-Nov |
| | B(I) | | | 2050 | |
| 4 | A(L) | | | 1700 | 29-Nov |
| | B(I) | | | 2000 | |
| 5 | A(L) | run 28188 | 20-Nov | 1900 | 1 Dec |
| | B(I) | | | 1500 | |
| 6 | A(L) | run 28545 | 23-Nov | | 1 Dec |
| | B(I) | | | | |
| 7 | A(L) | 1600 | 28-Nov | 1700 | 30-Nov |
| | B(I) | 1800 | | 1800 | |
| 8 | A(L) | 1200 | 28-Nov | 2500 | 29-Nov |
| | B(I) | 2200 | | 2100 | |
| 9 | A(L) | 2200 | 28-Nov | 2200 | 30-Nov |
| | B(I) | 2200 | | 2100 | |
| 10 | A(L) | 2300 | 28-Nov | 2000 | 30-Nov |
| | B(I) | 2000 | | 2200 | |
| 11 | A(L) | | | 2000 | 12 Dec |
| | B(I) | | | 2500 | |
| 12 | A(L) | | | | |
| | B(I) | | | | |
| 13 | A(L) | | 15-Nov | 2000 | 30-Nov |
| | B(I) | | | 2100 | |
| 14 | A(L) | | | | 1Dec |
| | B(I) | | | | |
| 15 | A(L) | | 15-Nov | | 1 Dec |
| | B(I) | | | | |
| 16 | A(L) | | 10-Nov | 1900 | 29-Nov |
| | B(I) | | | 2000 | |
| 17 | A(L) | | 7-Nov | | |
| | B(I) | | | | |
| 18 | A(L) | run 27808 | 19-Nov | | |
| | B(I) | run 27811 | | | |

# Laser sequence

**Switching time issue for monitoring sequence:**
→ from one region to another we need reliable delay
**≤ 4 sec.**

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Refining laser software to meet this maximum

**Under consideration:**
- GPIB communication failure → resynchronization – not reported on DAQ
- Laser device failure → error on laser software but not reported on DAQ

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Call expert

**Laser status for DAQ:** Color, switch position, attenuation

*Laser status to be added:*
*- laser current ?*
*- shutter position?*
*- main trigger delay?*

# Room temperature monitoring

During commissioning : breakdown of air conditioning

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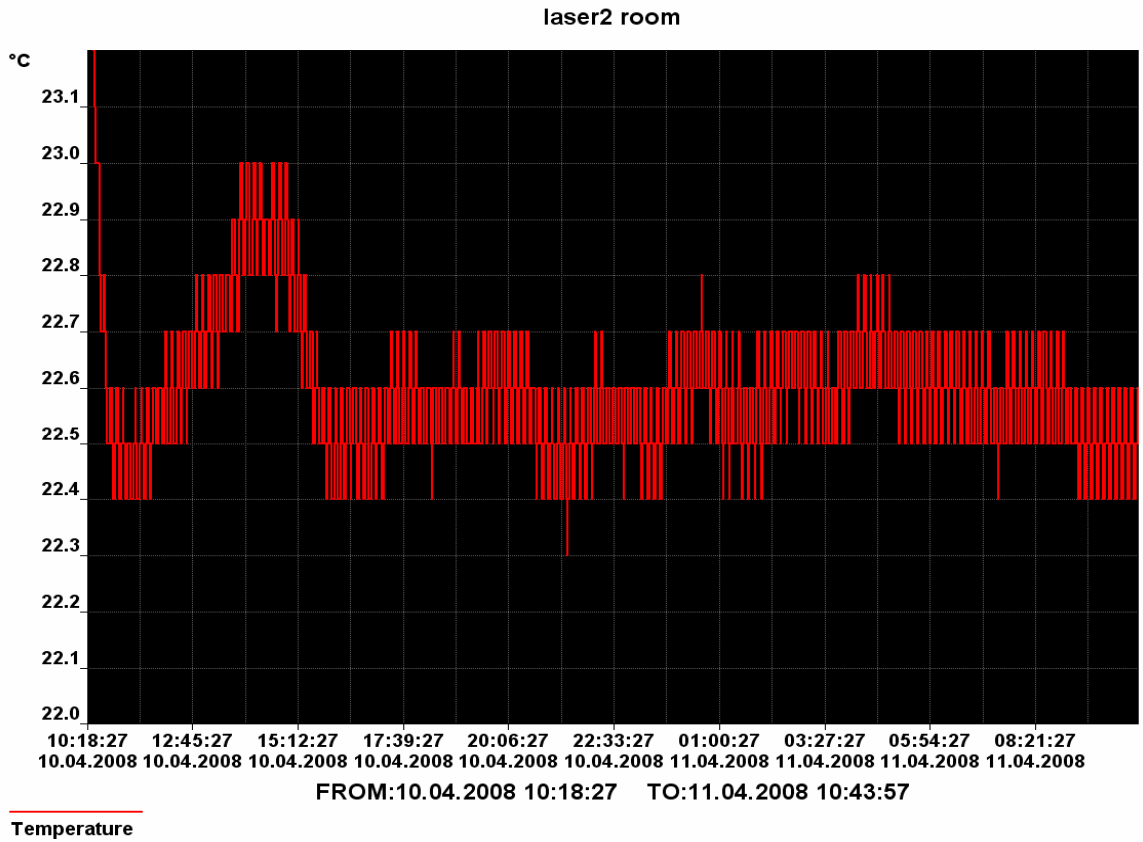
No control of laser stability

In January : installation of 1 air conditioning in laser2 room as spare
*(used only if main unit stopped)*




**+/- 0.3°C**

# summary

→ Having closed water circuit as soon as possible
→ Fixing switching time sequence
→ Running blue laser regularly to check SMs good health