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VME Crate List and Location

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CHANGE RECORD

Issue/Rev	*Date*	*Section affected*	*Reason/ remarks*
issue 1	23/10/97		
issue 2	5/7/98	All sections	Update the list
issue 3	2/9/98	All sections	Update crate C12,17,21,22,23,25,39,57,63,73,78, add C56
Issue 4	2/4/99	All sections	Specify CPU type, Update crate C12, C25, C4 to 52. Add C0, Suppress C16. Reorganize the document.
Issue 5	8/5/99		Update C25, rack organization

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1. Introduction

It this work document we first try to summarized all the VME crates and their content. The goal is to check that there is no missing hardware or double count. This will be also very useful to cross check the interface between the crates and also the physical location of each crate. The workstations with their location and their first assignment are also presented. Please notice that since the exact design of each crate is not completely frozen this list will still evolve.

2. Standard Hardware

The following hardware is used in the VME crate:

- VME crate 21 slots 9U (basic package reference: 70-204-45 from ELMA). Power supplies 500W (+5V/80A; +12V;10A; +12V/2A; -12V/10A), Automatic daisy chain, J1 and J2. Cooling with 3 fans. (fuse : 4A on 240V)
- VME Crate 7 slots 4U (basic package reference: 70-204-25 from ELMA). Power supplies 250W (+5V/40A; +12V;6A; -12V/2.5A). Automatic daisy chain, J1 and J2. Cooling with 1 fan (fuse : 2.5A on 24V)
- CPU: 604 from CES (RIO2-8062FA) or CETIA (for Napoli crates)
- Timing: board from LAPP
- TTL/OPTO and OPTO/TTL: copper to fiber converter for timing signals
- GPS: BC637-VME from Bankcom
- DOL: board from LAPP
- ADC: ADC-4c: 4 channels ETEP-264 board: 2 slots
  ADC-16c: 16 channels ETEP-298 board: 2 slots
  ADC-P: board from PISA
  ADC-M: 8 channels M module from Orsay
- DAC: DAC-P: 8 channel board from PISA
  DAC-M: 8 channels M module from Orsay
  DAC-A: 4 channels DAC board 704 from ADAS with 32k FIFO
- DSP:DSP board from Pisa
- M-Module Mother board from xxx
- Rack: 42U rack from ATOS

3. Control Building

3.1. Crate List

C0: Code Development crate (7 slots) (Annecy)
1 CPU RIO8062 (300Mhz) (used to compile code)

C1: System Development crate (7 slots) (Annecy) (This is also a spare crate)
1 CPU RIO8061 (100Mhz) (used to test new system)

C2,3: Raw data archiving (7 slots)(Napoli)
n CPU (n from 1 to 6) + disk

3.2. Network Room

- W12: Data distribution: This workstation is located inside the computer room.
  It is a more powerful workstation with lot of disk space and special hardware.
- W13: Network analyzer
- W14: Software distribution

Two racks are reserved for the Data Archiving and Data Distribution

3.3. Computer Room

The cluster of workstations for the online processing will be installed in this room.

3.4. Control Room Organization

The Control room will contain two clusters of identical workstations. Even though they will be able to run any user interface they will be dedicated to one or two specific type of control. Two clusters will be used instead of one in order to do system maintenance without stopping VIRGO. Here is the list of the foreseen workstations:

- W1: Tube control & Tower control (vacuum)
- W2: Building control & Environment control
- W3: Supervisor & Timing control, Error Logger, Cm name server
- W4: Laser & input bench control
- W5: Non Linear Alignement & Beam Imaging
- W6: Suspension control
- W7: Global control and linear alignment
- W8: Detection bench control & Signal detection
- W9: Local Readout & Frame Builder
- W10: Data distribution control & Data archiving
- W11: Trigger control & Data Monitoring

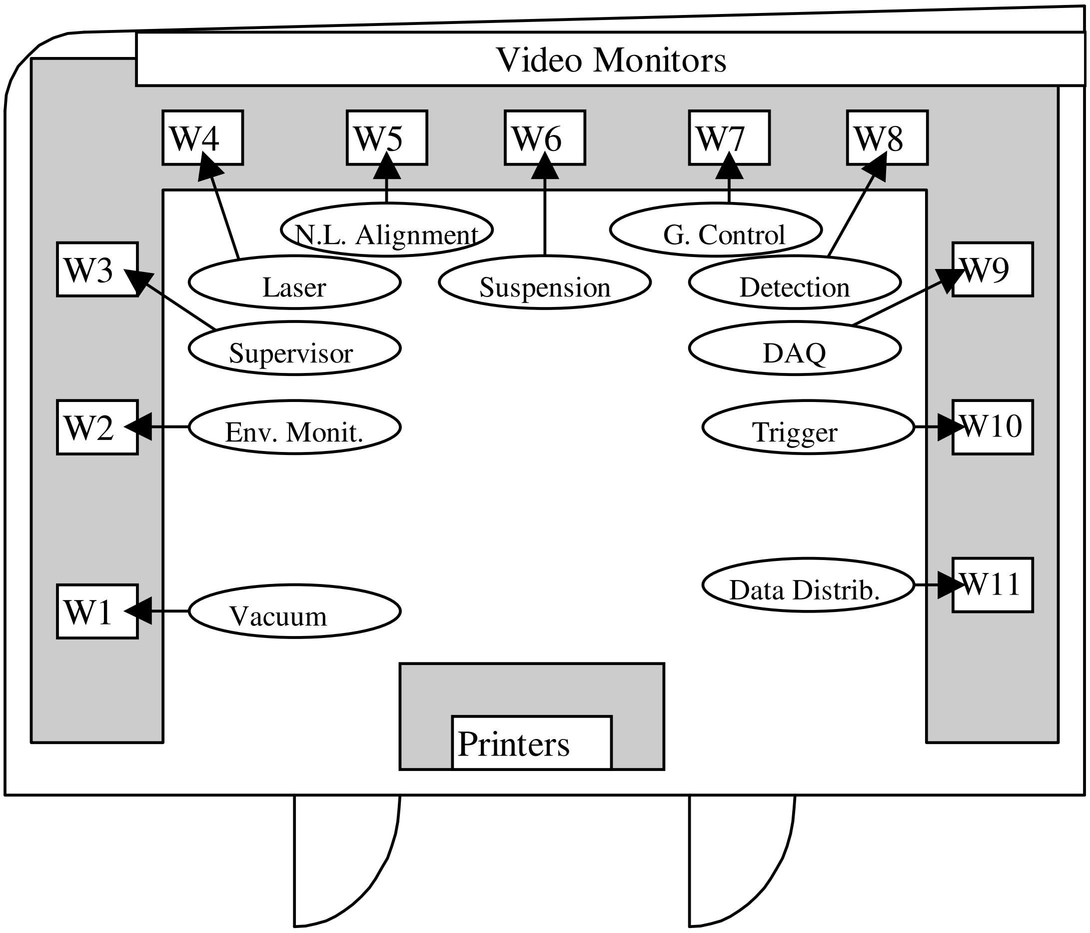

Figure 1 Control Room . The Video monitor (for beam imaging or for room survey) are installed above the workstation

4. Central building

4.1. Crate List

C11: Master Timing (21 slots, 21 used)(Annecy) (100MHz)
- 1 CPU-16M (slow control),
- 2 GPS,
- 6 Timing,
- 4 TTL/OPTO,
- 8 OPTO/TTL

C12: Local Timing (21 slots, 14 used, no VME signal used)(Annecy)
- 12 OPTO/TTL
- 1 TTL/OPTO: return to central timing
- 1 TTL/OPT for 6 MHz modulation signal

C13: OS9 Boot Processor
- 1 CPU

C14: Local Frame Builder for Longitudinal Photodiode (7 slots)(Annecy)
- 1 CPU-32M (300Mhz)(large memory; Fast Ethernet),
- 5 DOL from photodiode readout

C15: Local Frame Builder for Quadrant Photodiode (7 slots)(Annecy)
- 1 CPU-32M (300MHz)(large memory; Fast Ethernet),
- 3 DOL from quadrant readout,
- 1 DOL from Global Control
- 1 DOL from laser,

C17: Local Frame Builder for suspension (21 slots)(Annecy) (this crate may have to be split if there is too much load)
- 1 CPU-32M (300MHz)(large memory; Fast Ethernet),
- 18 DOL from 9 suspension controls,

Alternate option to reduce the fiber connections:

C14: Local Frame Builder for Central Photodiode (7 slots)(Annecy)
- 1 CPU-32M (300Mhz)(large memory; Fast Ethernet),
- 3 DOL from photodiode readout C27-29
- 1 DOL from quadrant readout C34
- 1 DOL from laser,

C17: Local Frame Builder for suspension (21 slots)(Annecy) (CPU's may be added if there is too much load)
- 1 CPU-32M (300MHz)(large memory; Fast Ethernet),
- 14 DOL from 7 suspension controls,
- 1 DOL from Global Control

C79 and C89: Local Frame Builder for end Arms
- 1 CPU-32M (100Mhz)(Fast Ethernet ?),
- 1 DOL from photodiode readout C70 or C80
- 1 DOL from quadrant readout C72 or C82
- 2 DOL for suspension readout C76 or C86

C21: Laser control (21 slots)(Orsay)
- 1 CPU-16M,

5 ADC,
1 DOL from Global Control
1 DOL to local Frame Builder
1 DAC (m), 2 Serial lines control (m), 1 Status register (m)
1 Command register(m), 2 Timer-Gate(m),
1 Timing

C22: A_MC (Mode Cleaner alignment) (7slots)(Orsay)
1 CPU-16M,
ADC M,
1 DOL (MMC→Clm)
1 DAC (m), 1 Timer-Gate(m), 1 Status register (m), 1 Command register(m)

C23: A_RC Auto Alignment RC(Ref. cavity alignment) (7slots)(Orsay)
1 CPU-16M,
ADC M,
1 DAC (m), 1 Timer-Gate(m), 1 Status register (m), 1 Command register(m)

C24: MEB: entry bench position (21 slots)(Orsay)
1 Timing
1 CPU-16M,
1 Camera,
1 DAC(m), 1 Timer-Gate(m), 1ADC, 1 Status register (m),
1 DOL to MMC-CLM,
1 DOL to local Suspension control for upper part control,

C40 Input Bench Suspension control (21 b.) (Pisa)(In this option the marionetta control is done by MEB)
Slot 1: CPU-32M (200Mhz)
Slot 2: Timing
Slot 3: ADC-P for vertical position
Slot 4 to 10: Free
VSB Slot 11: DSP for upper stage damping
Slot 12: VSB/VME dual port memory
Slot 13: DOL to Frame Builder
Slot 14: DAC-P to upper coils control
Slot 15: ADC-P for accelerometer readout
Slot 16: MDRV: Motor driver control
Slot 17: Free
VSB Slot 18 CPU-32M (300 MHz), (part TBC with Orsay)
Slot 19 Camera for local position measurement
Slot 20 Free
Slot 21 Free

C41: Suspension Analogic Electronic (Pisa).
We have 2 NIM crate (a and b) in the DAQ room crates per suspension

C25: Detection bench control (21 slots)(Annecy)
Task: Mode cleaner locking, photodiode control.
Slop 1: CPU-16M (100MHz) (mode cleaner locking, photodiodes, picomotor and fast shutter control)
RS232 used for picomotor control (New Focus 8732)
Slot 2: Free
Slot 3,4: 1 ADC-16C Diode Quadrant for picomotor alignment: 8 channels
Slot 5,6: 1 ADC-16C mode cleaner control
2 diodes before and after: Phase and DC: 4 channels
1 temperature: 1 channel

Slot 7: DAC-P mode cleaner temperature control: 1 channel
Slot 8: DAC-P shutter control: 4 channels (Merge with slot 7?)
Slot 9: DAC-P LO delay control: 8 channels (install in the calibration crate?)
Slot 10 to 13: 2 ADC-16V Photodiodes control: V bias, 26 channels
Slot 14: DAC-P bias voltage reset: 8 channels
Slot 15: Timing
VSB Slot 16: CPU-32M (300 MHz),
Slot 17 to 20: 4 Cameras for beam imaging
Slot 21: Free

C27: Photodiodes readout D1: (21 slots, 20 used)(Annecy)
1 Timing,
1 CPU-32M (300MHz)
1 DOL to local frame builder,
1 DOL to global control,
8 ADC-4c: 8 diodes D1 (DC, P. Q.) 2 diodes D1' (Dc, P, Q) 1 channel MC lock, 1 channel free

C28: Photodiodes readout D1 bis: (21 slots, 16 used)(Annecy)
1 Timing,
1 CPU-32M, (300MHz)
1 DOL to local frame builder,
1 DOL to global control,
8 ADC-4c: 8 diodes D1 (DC, P. Q.) 2 diodes D1'' (Dc, P, Q) 1 channel MC lock, 1 channel free

C29: Photodiodes readout D2: (21 slots, 18 used)(Annecy)
1 Timing,
1 CPU-32M, (300MHz)
1 DOL to local frame builder,
1 DOL to global control
5 ADC-4c:D5, D2, D2' (2 diodes, Ph, Quad, DC) = 18 channels

Note: C27,28 and 29 need a 3 U additional power supply

C30,31,32: Signal detection for detection bench (Annecy)
Analog electronic for photodiode

C33: Signal detection for detection bench (Annecy)
Detection Bench control

Note: C30 to 33 need a 3 U additional power supply

C34: Alignment readout (21 slots, 19 used)(Annecy/Frascati)
1 Timing, (100MHz)
1 CPU,
1 DOL to global control,
1 DOL to Frame Builder,
2 ADC-16c (4 quadrant diodes at 1 kHz)
1 ADC-16c (4x3=12 slow control channel)
1 DAC-P (4x2 slow control channels_)
4 Analogue modules (2 slots modules)
Remark: one quadrant need
8 1 kHz signal readout (4 DC signals, 4 Demodulated signal)
3 slow monitoring monitoring signals (1 read gain, 1 read bias, 1 translator tables)
2 slow control setting signal (1 set gain, 1 set bias)
Note : 2 times 2U of space has to be reserved for the XY tables control

C36: Global Control (21 slots) (LAL)
- 1 Timing,
- 2 CPU (control &signal processing),
- 1 Dual port Memory VME/VSB
- 1 VME spy board
- 1 Transparent Memory Board
- 8 DOL In : 5 from diodes readouts, 3 from quadrant readout
  Out : 6 to suspension, 1 to frame builder, 1 to laser.

C37: Calibration (7 slots, 5 used)(Annecy)
- 1 CPU-16M (100MHz)(control &signal processing),
- 1 GPS (to generate the clock and get the absolute timing of the generated signal)
- 1 DAC-A (2 signal at 20 kHz for laser diodes, 2 for coil control)
- 1 ADC-16c (to readout 2 quadrant diodes par mirror = 16 channels)

C38: Environment & building control (21 slots)(Napoli)
- 1 CPU-16M, dedicated network hardware

C39: Local readout (21 slots, 11 used)(Annecy)
- 1 Timing,
- 1 CPU-32M (300MHz, Fast ethernet),
- 1 DOL (to local frame builder),
- 4 ADC-16c: 8 acoustic noise, 8 em noise, 5 line voltage, 4 calibrations (@ 20kHz)
  8 x 3 seismic noise (@ 1kHz)
  x for laser data acquisition

C42: Suspension control : Power recycling (21 b.) (Pisa)
C44: Suspension control : Beam Splitter (21 b.) (Pisa)
C46: Suspension control : West Input (21 b.) (Pisa)
C48: Suspension control : North Input (21 b.) (Pisa)
C50: Suspension control : Detection Bench (21 b.) (Pisa)
C52: Suspension control : Signal Recycling (21 b.) (Pisa) (not in the initial design)

Slot 1: CPU-32M (200Mhz)
Slot 2: Timing
Slot 3: ADC-P for vertical position
VSB Slot 4: VSB/VME dual port memory for DSP communications
Slot 5: DSP for mirror control
Slot 6: DOL in from Global Control, out to Frame Builder
Slot 7: DAC-P to Marionetta control
Slot 8: DAC-P to lower bench control (only for the benches)
Slot 9: ADC for quadrant readout (only for the detection bench)
Slot 10: Free
VSB Slot 11: DSP for upper stage damping
Slot 12: VSB/VME dual port memory
Slot 13: DOL to Frame Builder
Slot 14: DAC-P to upper coils control
Slot 15: ADC-P for accelerometer readout
Slot 16: MDRV: Motor driver control
Slot 17: Free
VSB Slot 18 CPU-32M (300 MHz),
Slot 19 Camera for local position measurement
Slot 20 Free
Slot 21 Free

C41,43,45,47,49,51,53: Suspension Analog Electronic (Pisa).

We have 2 NIM crate (a and b) in the DAQ room crates per suspension

(41 is for the input bench; 43 for the power recycling; 45 for the beam splitter;
47 for the west input mirror 49 for the north input mirror 51 for the detection bench;
53 for the signal recycling)

For each Suspension, we will have near the tower (Pisa):

- 1 NIM crate
- 3U for the preamplifier
- 3U for the suspension motor control

For each suspension, we will have in the DAQ room 1 U for the marionatta motor control (Roma)

C54: Suspension auxiliary devices (21 slots)(Pisa)

1 CPU-32M
Boards needed for the suspension temperature control (TBD)

C55: Calibration and Modulation Frequency distribution Analog Electronic (6 U + 3 U Power supply)
C56: Input Camera readout (7 slots, 7 used)(Annecy)

1 CPU-32M (300MHz, Fast Ethernet)
1 Timing
5 Cameras : laser, reference cavity, MC input, MC output, Virgo out before MC and after MC

C57: Central Camera readout (7 slots, 6 used)(Annecy)

1 CPU-32M (300 MHz, Fast Ethernet)
1 Timing
4 Cameras : one for each input mirror, one for the recycling mirror, of back to the input bench (see CD thesis)

C58: Test bench for VME boards (7 slots, Annecy)(in the electronic lab).

1 CPU-16M (100 MHz)
1 VME display

4.2. Data acquisition room organization

A few workstations (or X terminal) will be available in the Data acquisition room to locally work on the control. They will be on the same cluster as those in the Control Room. Here is the list with the primary usage:

- W21: Vacuum contro
- W22: Laser and input bench control
- W23: For suspension control
- W24: For detection signal control

The space for 2 PC (RGA) will be reserved in that room (W25)

4.3. Racks in the Data acquisition room

The rack content is the following :
R11,12 : Network
R13: Upper part: LynxOS Boot (C0)
Lower part: Alignment readout (C34)
R14; Upper part: Local FB for photodiodes (C14, C15)
Lower part: Detection bench control (C25)
(remark : the crates C27 to C33 are located near the detection bench)
R15: Upper part: Global control (C36)
Lower part: Detection bench suspension control (C50, 50a and b)
R16 : Upper part: Master and local timing (C11,12),
Lower part: one optical fiber cable
R17 : Upper part: Env. & Building Ctrl (C38)

Lower part: Local Readout (C39)
R18 : Upper part: Patch panel for video
Middle part: Central Camera Readout (C57)
Lower part: 2 optical fiber for timing (Reserved for signal recycling suspension control.)
R19 : Upper part: Calibration (C37) + Analog crate for calibration and LO distribution
North Input Susp. Ctrl (C48, 49 a and b),
R20 : Lower part: West input Susp. Ctrl (C46, 47 a and b)
Suspension auxiliary devices (C54)
R21 : Upper part: Local Frame Builder for suspension (C17)
Lower part: Beam Split. Susp. Ctrl (C44, 45 a and b)
R22 : Power Recycling Susp. Ctrl. (C42, 43 a and b)
R23 : Upper part: Input Camera Readout (C56)
Lower part: Input Bench susp. Control (C40, 41 a and b)
R24 : Laser and input Bench control :C21,22,23,24 (=32U), OS9 boot (C13)
R25 : Patch Panel for laser and Input Bench control

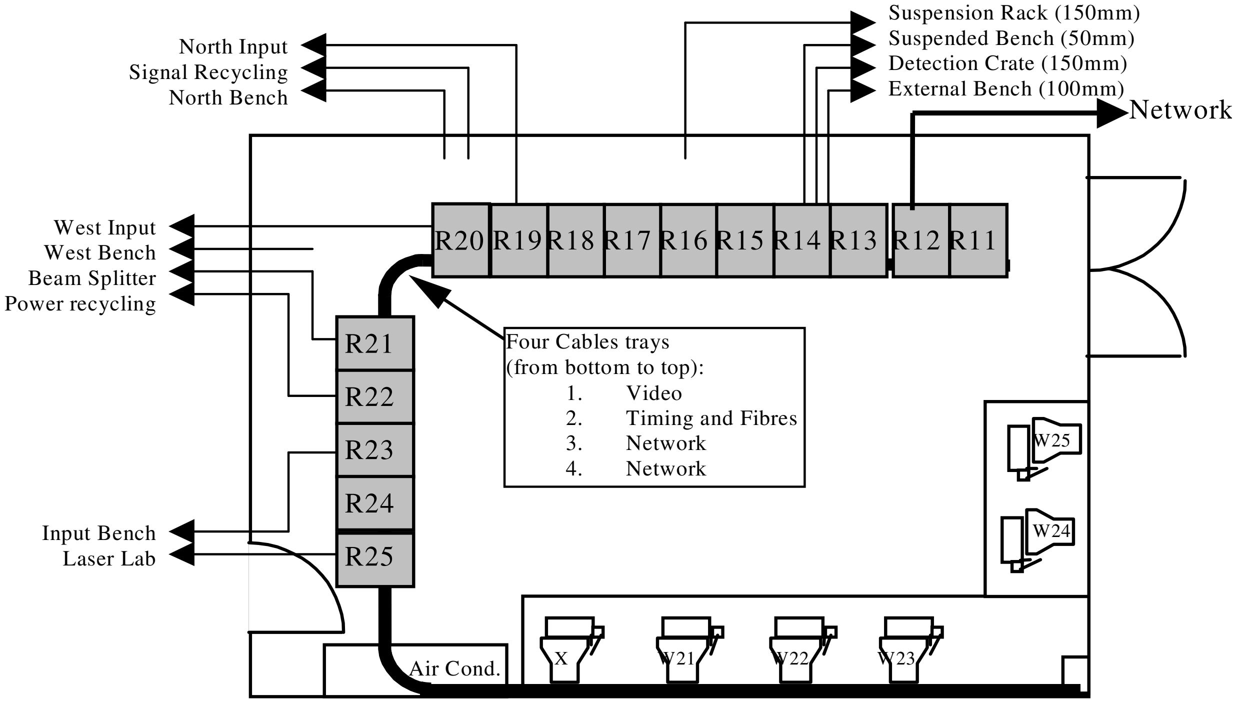

Figure 2 Control Room and Computer room. Video monitor (for beam imaging or for room survey) will be installed above the workstation. There will be one cable tray per tower to group all the cables (suspension, environment monitoring, calibration, camera, monitor, local ethernet)

In each rack the first top unit is reserved for the network patch panel, the second unit is reserved for the timing patch panel

The crate for the electronic of the end of arm for the central interferometer will be installed near each optical bench.

4.4. Cables tray length

Distances:

- Between bottom part of rack 14 and upper part of detection rack (in the det. Lab.): 14.7m
- Between bottom part of rack 14 and upper part of the external detection bench: 11.8 m
- Between the tower and upper part of detection rack (in the det. Lab.): 3.8m

5. Mode cleaner

5.1. Crate List

C61: Local readout (7slots, 5 used)(Annecy)
1 Timing,
1 CPU-32M (300MHz)
1 ADC-16c to read: 2 acoustic noise, 2 em noise, 2 line voltage (@ 20kHz) 2 x 3 seismic noise (@ 1kHz)

C62: MMC-CPM: mode cleaner mirror position (21 slots)(Orsay)
1 CPU-32M,
1 Camera,
1 Status-M, 1 Timer-Gate(m), 1 DAC ;
1 DOL to MMC-CLM
1 Timing

C63: MMC-CLM: mode cleaner mirror position (7 slots)(Orsay)
1 CPU-32M,
1 Logic-control-M, 1 Timer-Gate(m); 1 DAC
1 DOL from MMC-CPM and to Local Frame Builder
1 DOL from A_MC
1 DOL to Suspension control for upper part control

C64: Suspension control (21 slots)(Pisa) (In this solution the marionetta control is done by CLM)
Slot 1: CPU-32M (200Mhz)
Slot 2: Timing
Slot 3: ADC-P for vertical position
Slot 4 to 10: Free
VSB Slot 11: DSP for upper stage damping
Slot 12: VSB/VME dual port memory
Slot 13: DOL to Frame Builder
Slot 14: DAC-P to upper coils control
Slot 15: ADC-P for accelerometer readout
Slot 16: MDRV: Motor driver control
Slot 17: Free
VSB Slot 18 CPU-32M (300 MHz), (part TBC with Orsay)
Slot 19 Camera for local position measurement
Slot 20 Free
Slot 21 Free

C65 (a and b): Suspension coils drivers (Pisa) (NIM crates)
Analogic electronic

C66: Timing (7 slots, 5 used, no VME used)(Annecy)
4 OPTO/TTL
1 TTL/OPTO: return to central timing

5.2. Rack Content

Rack 1(on the tower structure): Suspension : C64, C65a and b
Rack 2 (on the floor): Front the top of the rack to the bottom:

- Video cables, Quadra vision + on monitor
- Timing (C66)
- Local Readout : C61
- C62,C63 (TBC)

6. End building:

6.1. Crate List

Crate number are given for the north arm. Add 10 to get crate numbers for the west arm.

C70: Photodiodes readout North Arm: (21 slots, 8 used)(Annecy)
- 1 Timing,
- 1 CPU-32M (300MHz)
- 1 DOL to local frame builder,
- 1 DOL to global control
- 2 ADC-4c(2 diodes, Ph, Quad, DC) = 6 channels

C71: Signal detection(Annecy) Analog electronic

C72: Quadrant readout and end mirror bench control: (21 slots)(Annecy)
- Slot 1: CPU-16M (100Mhz)(quadrant Readout)
- Slot 2: Free (for CPU cooling)
- Slot 3: DOL to local frame builder,
- Slot 4: DOL to local frame builder,
- Slot 5: Free (to protect the fiber connection)
- Slot 6: Timing
- Slot 7-8: ADC-16c(2 diodes) = 16 channels
- Slot 9: Free
- Slot 10-13: 2 Analogue modules (2 slots for each module)
- Slot 14: Free
- Slot 15-16: ADC-16V Photodiodes control: Vbias, 2 channels (+ 6 channels for quadrant Slow mon., TBC)
- Slot 17: DAC-P for diode control (Vbiais: 1 channels , LO tuning: 1 channel) (+2 channels for quadrant,TBC)
- VSB Slot 18 CPU-32M (100 MHz),
- Slot 19 Camera for beam shape control and initial alignment
- Slot 20 Free
- Slot 21 Timing camera

Note : 2U of space has to be reserved for the XY tables control

Old Solution:
C72: Quadrant readout North Arm: (7 slots)(Annecy)
- 1 Timing,
- 1 CPU-32M (100MHz)
- 1 DOL to local frame builder,
- 1 DOL to global control
- 1 ADC-16c(2 diodes) = 16 channels

+ 2 Analogue modules (2 slots for each module)

Note : 2U of space has to be reserved for the XY tables control

C73: End mirror bench control (long. signals & alignment)(7 slots)(Annecy)(to be merge with C72??)
- 1 CPU-32M (100MHz)(for beam imaging and photo diode monitoring
- 1 Cameras for beam shape control and initial alignment,
- 1 Timing
- 1 ADC-16V Photodiodes control: Vbias, 2 channels (+ 6 channels for quadrant Slow mon., TBC)
- 1 DAC-P for diode control (Vbiais: 1 channels , LO tuning: 1 channel) (+2 channels for quadrant,TBC)

C74: Environment & building control(Napoli)
1 CPU-16M (control), dedicated network hardware

C75: Local readout (7 slots)(Annecy)
1 Timing,
1 CPU-16M (300MHz, fast Ethernet??),
1 ADC-16c to read: 2 acoustic noise, 2 em noise, 2 line voltage (@ 20kHz)
3 x 3 seismic noise (@ 1kHz)

C76: Suspension control (21 b.)(Pisa)
Slot 1: CPU-32M (200Mhz)
Slot 2: Timing
Slot 3: ADC-P for vertical position
VSB Slot 4: VSB/VME dual port memory for DSP communications
Slot 5: DSP for mirror control
Slot 6: DOL in from Global Control, out to Frame Builder
Slot 7: DAC-P to Marionetta control
Slot 8: Free
Slot 9: Free
Slot 10: Free
VSB Slot 11: DSP for upper stage damping
Slot 12: VSB/VME dual port memory
Slot 13: DOL to Frame Builder
Slot 14: DAC-P to upper coils control
Slot 15: ADC-P for accelerometer readout
Slot 16: MDRV: Motor driver control
Slot 17: Free
VSB Slot 18 CPU-32M (300 MHz),
Slot 19 Camera for local position measurement
Slot 20 Free
Slot 21 Free

C77 a and b : Suspension Analogic Electronic (Pisa). 2 NIM crates

In addition, we will have near the tower (Pisa):
- 1 NIM crate
- 3U for the preamplifier
- 3U for the suspension motor control

We will also have 1 U for the marionetta motor control (Roma)

C78 Local Timing (7 slots, 6 used, no VME used)(Annecy)
4 OPTO/TTL
1 TTL/OPTO: return to central timing
1 OPT/TTL for 6 MHz modulation signal

6.2. Rack Content

Rack 1 (on the tower structure)
All the suspension crates
Rack2 (42 U): from top to bottom:

Content:	Space (U)
Patch Panel	1
Free	1
Local Timing (C78)	4

Free	1
Photodiode readout (C70)	9
Free	1
Power supply for C70	3
Free	1
Photodiode analog elec. (C71)	6
Free	1
Power supply for C71	3
Free	1
Quadrant readout, B ctrl (C72)	9
Free	1
Total	42

Rack 3: (not installed for the CITF)
Building monitoring and Local Readout

Two X Terminal, or PC's will be available next to the tower.