Layout of the Virgo Video System

C. Drezen, J.C. Lacotte, B. Mours

1. Introduction

In this note we described the list of the needed cameras and associat foreseen for Virgo. The needed cabling is presented and a cost estimate is also g

The requirement for the video system will evolved with the time, from the mirror installation to the control of the smooth running of the interferomete video system should be easily reconfigurable. This means that we will have cameras, monitors, cables and plugs.

We described here a reference solution where most of the monitors will be control room. Since we have a large number of cameras, we will have few ch control room to decide which cameras are displayed. We will also use 'quadrav four cameras in one monitor. It will be possible to forward the image of few sel to the data acquisition room or near the optical benches to help for their tunin always possible to insert locally a monitor near the corresponding camera. A ta be available in the control room to keep track of some installation proced interferometer start up for instance.

2. List of the needed cameras

2.1 Human activity control

The purpose of these cameras is to monitor the various rooms, the bench installation and to survey their operations. The corresponding monitors will be i Building control workstations. Colour cameras will be used to survey the halls t visual resolution (cameras V1 to V8). During the mirror installation inside the use the alignment cameras to monitor the operations. We should foreseen a lenses to increase their field. The list of cameras is the following:

V1	Clean Room	(colour)
V2,3	Gallery 1 ang 2	(colour)
V4,5	Hall 1 and 2	(colour)
V6	Data Acquisition Room	(colour)
V7	Mode Cleaner Hall	(colour)
V8	Laser room	(colour)
V9	Laser Bench	(black & white)
V10	outside Input Bench	(black & white)
V11	outside Detection Bench	(black & white)
V12	North End Mirror Hall	(black & white)
V13	West End Mirror Hall	(black & white)
V14	North End Mirror Gallery	(black & white)
V15	West End Mirror Gallery	(black & white)

V16	North End Mirror Bench	(black & white)
V17	West End Mirror Bench	(black & white)
V18,19	Central building views	(black & white)

To reduce the cost of the 3.2km transmission, the cameras signals from tl building will be grouped together with a "quadravision", with a monitor in the e another one in the control room.

2.2 Mirrors and Benches position measurements

The position of each suspended object is monitored with two camera, one one whiteout lens (see alignment section of the FD). These are high precision cai VME board. The purpose of the analogic monitors is to have a fast check for the beams and for the cameras operations and also to survey the mirror using the c with lens. During the running of the interferometer, we will mostly display in tl the cameras imaging a mirror (6 cameras).

V21	Input Bench Positioning	V31	(camera with lens)
V22	Mode Cleaner Mirror Positioning	V32	(camera with lens)
V23	Recycling Mirror Positioning	V33	(camera with lens)
V24	Beam Splitter Positioning	V34	(camera with lens)
V25	Detection Bench Positioning	V35	(camera with lens)
V26	Signal Recycling Positioning	V36	(camera with lens)
V27	Input North Positioning	V37	(camera with lens)
V28	Input West Positioning	V38	(camera with lens)
V29	End North Positioning	V39	(camera with lens)
V30	End West Positioning	V40	(camera with lens)

2.3 Beam Imaging:

A set of high precision cameras read by a VME board is installed to image various positions in the interferometer. They are used to align the benc interferometer and also to monitor the running conditions. The purpose of the a is to have a fast check in addition to the digital images.

V41,V42,V43,V44	Laser & Input Bench
V45	Recycling mirror screen
V46	Mode Cleaner
V47	End of north arm bench
V48	End of west arm bench
V50,51,52,53	Detection Bench

2.4 Tower separating roof position measurements

The position of suspension wire inside the conductance will be monitc camera. A mirror located near the conductance will provide a side view of the These cameras will be used when we will adjust the tower components and will l time to time. Therefore we will use a set of black and white cameras and their displayed in the control room. When we will move the separating room we additional monitors near the tower .

V61	Recycling Mirror separating roof positioning
V62	Beam Splitter separating roof positioning
V63	Input North separating roof positioning
V64	Input West separating roof positioning
V65	End North separating roof positioning
V66	End West separating roof positioning

3. Digital treatment of the signals

In order to get a fast treatment for the position measurements we wi processor for each couple of cameras looking at one mirror or beach (10 CPU). processors will be dedicated to the beam imaging. One for the cameras located input bench. one at the end of the mode cleaner, one at the end of each ar recycling mirror screen and one for the cameras located on the detection benc need one VME interface for each camera. Most of the image processing is don VME processor. But the image presentation and the global non linear alignment performed on various workstation and especially on the imaging workstation.

4. Monitors installation in the Control room

Two colour monitors will be reserved in the control room to view the v (cameras V1 to V8). A chosser will select 2 of the 8 inputs. These monitors wil near the building control workstation. One of this input will be forward to a located in the data acquisition room.

The bench monitors and the end mirror building survey will be send to a also located near the building control workstation. The separating roof position be send to the same chooser. For the end mirror, the separating roof positionin gallery camera in the quadravision during the permanent operations.

The signals coming from the alignment cameras (V21 to 28 and V31 to 36 to a chooser (16 inputs, 2 outputs) located near the alignment workstation.

Four monitors will display the more useful information for the interferom the signals coming from the input and output benches (V41 to 44 and V50 t images of the transmitted beam (V45 to 49) group in on images and the ima mirror cavities (V37 to 40) also grouped in one image.

The figure 1 summarises all the components of the system. Few additional be available for temporary installation during the installation of the interferomet

5. Cabling:

We foreseen 4 cameras in the mode cleaner, 33 in the central building anc mirror building. Taking into account few cables to send back images (1 to the building and 6 to the central building) and adding some spear cables we nee cables starting from the control room (in fact from the computer room):

- 3 optical fibers to each end mirror building (4 cameras are grouped by a
- 8 coaxial cables (150m of KX6) to the mode cleaner building
- 40 coaxial cables (150m of KX6) to the central building

The optical fibers are from the standard cabling. Dedicated patch panel f cables will be installed in the data acquisition room, computer room and mod near the network patch panels

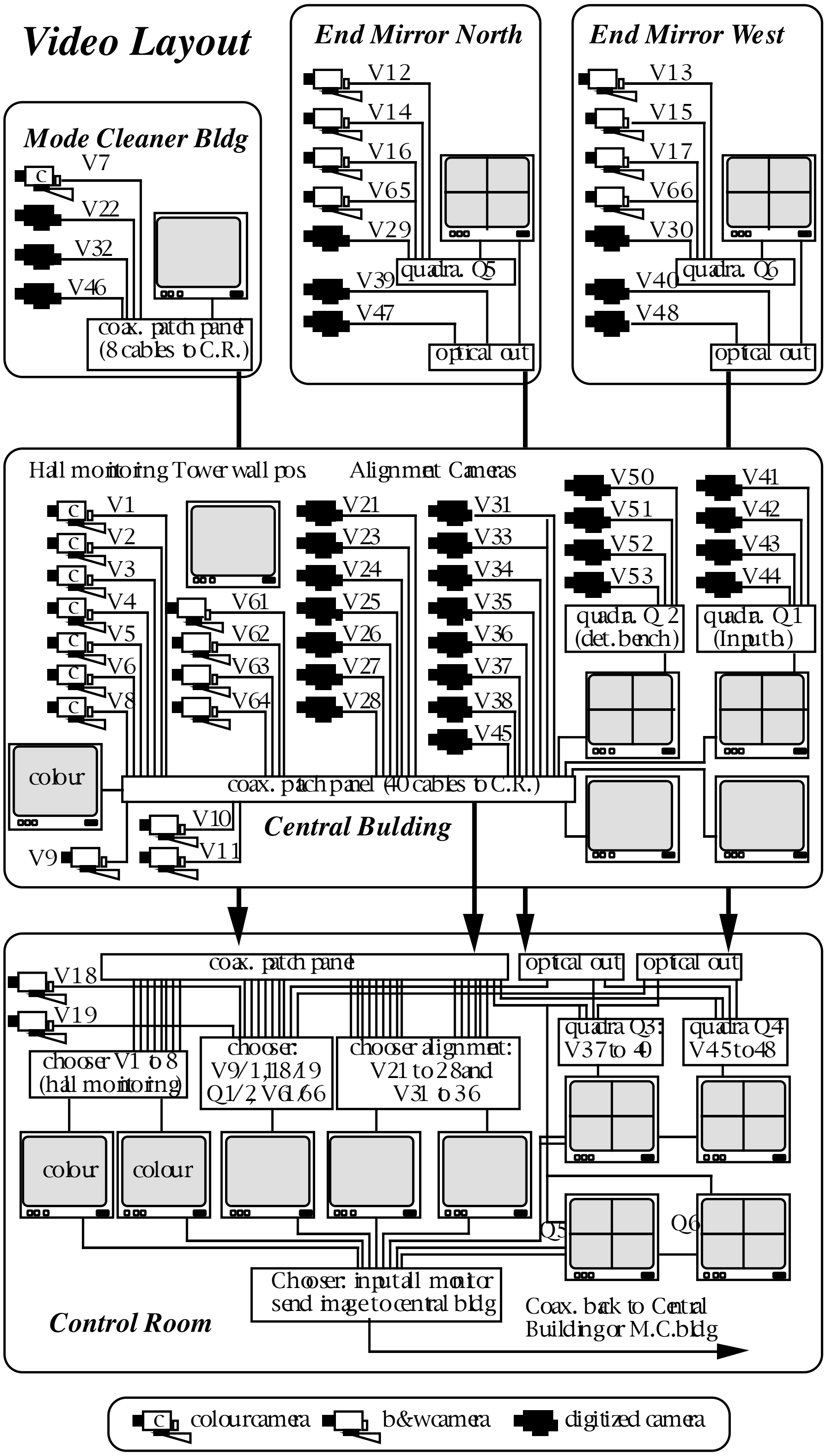

Figure 1. Schematic view of the Virgo Video system. The digital part of the system (VME interfaces, processors) is not presented.

6. Cost estimate

The video system described here will be paid by the standardized compone Electronic and software budget (line 5200).

Analogic part:

8 Colour Cameras (V1 to V8) with lens (Philips LDH0280/00 + 899389121051)	8 x 6 kF =	48 kF
17 B&W Cameras (V9 to 19, 61 to 66) with lens (Philips LDH0255/00 + 899389121051)	17 x 3 kF =	51 kF
3 Colour monitors (LDH2180/10)	3 x 6 kF =	18 kF
20 B&W monitors (LDH2135/10 and LDH2154)	20 x 4 kF =	80 kF
Optical transmitters for 6 connections (6 VBS2010TX850, 6 VBS2010RX850, 4 LC03)		65 kF
Coaxial Cabling (48 x 150m of KX6) (4Fr/m + (100Fr connector/ + 300Frs labour) per cable)		48 kF
100 short cables (2 to 20 m)	100 x .2 kF =	20 kF
6 Quadravision (LDH2504 + LDH4465)	6 x 6 kF =	36 kF
2 Choosers (LDH5606: 16 inputs x 2 outputs)	4 x 8 kF =	32 kF

Total		398 kF

Digital part:

32 + 2 spears high resolution Cameras (V21 to V53) (Hitachi KP-M1)	34 x 10 kF =	340 kF
32 + 2 spears VME interfaces (LAPP boards)	34 x 15 kF =	510 kF
16 VME processors	16 x 40 kF =	640 kF

Total		1490 kF

NB.:
- The cables trays are not included in this cost estimate.
- The cost of the VME crate is not included
- The choice of Hitachi camera has to be confirmed
- This estimate is based on Philips hardware. The final choice of factory ma