

Virgo Viewport use

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Survey of planned Virgo viewport use, with information from E. Majorana (MSC), E. Genin (ISYS), E. Tournefier (Det.), J. Marque (YAG cameras, IB-PR Brewster), V. Dattilo (Operation), Loic Rolland (calibration), D. Huet+M.Ciardelli (Lighting), D. Huet (TCS).

Local control

tower	Position side, corner, vert. position	Use (V,V+MS)	Version	AR Coating	N incremental	Protect. cover possible
PR	S,W,U	LASER	V	HeNe	1	No
PR	S,E,U	PSD	V	HeNe	2	No
PR	E,S,U	LASER	V+MS	HeNe	3	No
PR	E,N,D	PSD	V+MS	HeNe	4	No
PR	N,E,U	Cam, LASER,halogen	V	HeNe	5	No
PR	N,W,D	PSD	V	HeNe	6	No
BS	S,W,U	Cam, LASER,halogen	V	HeNe	7	No
BS	W,S,D	PSD	V	HeNe	8	No
BS	S,E,D	LASER	V+MS	HeNe	9	Yes
BS	E,S,U	PSD	V+MS	HeNe	10	Yes
BS	E,N,U	LASER	V	HeNe	11	No
BS	N,E,U	PSD	V	HeNe	12	No
NI	S,W,U	PSD	V	HeNe	13	No
NI	S,E,U	LASER	V	HeNe	14	No
NI	W,N,U	LASER	V+MS	HeNe	15	No
NI	W,S,D	PSD	V+MS	HeNe	16	No
NI	N,E,U	Cam, LASER,halogen	V	HeNe	17	No
NI	N,W,D	PSD	V	HeNe	18	No
WI	E,S,U	PSD	V	HeNe	19	No
WI	E,N,U	LASER	V	HeNe	20	No
WI	N,E,U	LASER	V+MS	HeNe	21	No
WI	N,W,D	PSD	V+MS	HeNe	22	No
WI	W,N,U	Cam, LASER,halogen	V	HeNe	23	No
WI	W,S,D	PSD	V	HeNe	24	No
NE	N,E,U	PSD	V	HeNe	25	No
NE	N,W,U	LASER	V	HeNe	26	No
NE	W,N,U (TBC)	LASER	V+MS	HeNe	27	Yes
NE	W,S,D (TBC)	PSD	V+MS	HeNe	28	Yes
NE	S,W,U	Cam, LASER,halogen	V	HeNe	29	No
NE	S,E,D	PSD	V	HeNe	30	No
WE	W,N,U	PSD	V	HeNe	31	No
WE	W,S,U	LASER	V	HeNe	32	No
WE	S,W,U (TBC)	LASER	V+MS	HeNe	33	Yes
WE	S,E,D (TBC)	PSD	V+MS	HeNe	34	Yes
WE	E,S,U	Cam, LASER,halogen	V	HeNe	35	No
WE	E,N,D	PSD	V	HeNe	36	No

Total =36 HeNe

Total – V+MS = 36-2x6 =24 (note that the two windows to be used are already installed, in case of not using them we can put a safety plexiglass or other solution to protect the windows) In the case of NI one window has been removed to install a TCS flange for connectors, but it was foreseen to install that window on the opposite side for xDamp meant for V+MS. AR Coating HeNe: optimal 0.1 %, actual 0.2-0.5 %. V = Virgo as it is; V+MS = Virgo + monolithic suspensions.

Lighting of long towers during works

2 viewports, one lower and typically one upper (ideally on the opposite side) are occasionally used for lighting of each tower. Illuminators with cold light (24 W) will be permanently installed at each tower. A transparent plastic protection will be included. No AR coating is needed. IB and MC towers will be illuminated with the local control lights. NI and WI towers can get two lamps after the photon calibration has migrated to the end towers.

1 viewport is needed on SR for baffle installation.

tower	Position side, corner, vertical position	Use	AR Coating	Protection cover possible
PR	N,W,U	Illuminator	None	Permanent
PR	S,W,D	Illuminator	None	Permanent
BS	N,W,D	Illuminator	None	Permanent
BS	S,E,U	Illuminator	None	Permanent
NI	E,S,D	Illuminator	None	Permanent
NI	N,W,U	Illuminator, future	None	Permanent
WI	S,E,D	Illuminator	None	Permanent
WI	W,S,U	Illuminator, future	None	Permanent
NE	N,E,D	Illuminator	None	Permanent
NE	W,S,D	Illuminator	None	Permanent
WE	N,E,D	Illuminator	None	Permanent
WE	W,N,D	Illuminator	None	Permanent
DB	E,N,D	Illuminator	None	Permanent
DB	W,S,D	Illuminator	None	Permanent
SR	E,N,D	Illuminator	None	Permanent
SR	W,S,U	Illuminator	None	Permanent

Total = 14 UC (future: 16)

Observing YAG beams on mirrors

1 viewport per tower is used for observing the YAG beam on the mirror with a camera (=> control room monitor).

tower	Position side, corner, vertical position	Use	AR Coating	Protection cover possible
PR	S,E,D	YAG beam camera	None	No
BS	E,N,D	YAG beam camera	None	No
NI	S,W,D	YAG beam camera	None	No
WI	E,S,D	YAG beam camera	None	No
NE	S,W,D	YAG beam camera	None	No
WE	E,S,D	YAG beam camera	None	No

Total = 6 UC

TCS

1 ZnSe viewport per input tower is used for sending the CO2 beam to the mirror. No protection cover is possible.

tower	Position side, corner, vertical position	Use	AR Coating	Protection cover possible
NI	W,M,M	CO2 laser beam	(ZnSe)	No
NI	E,N,D	Cable feed-through	---	---
WI	N,M,M	CO2 laser beam	(ZnSe)	No
WI	S,W,D	Cable feed-through	---	---

Total = 2 ZnSe, 2 feed-through

Local controls and monitoring for Injection and Mode-cleaner towers

tower	Position side, corner, vertical position	Use	AR Coating	Protection cover possible
IB	S,E,U	View of the bench (Cam)	None	Yes
IB	S,W,D	RFC waveplate alignment checks	None	Yes
IB	N,E,U	View of the bench (Cam)	None	Yes
IB	N,W,U	View of the bench (Cam)	None	Yes
IB	N,W,D	RFC waveplate alignment checks	None	Yes
IB	W,N,M	IB LC laser 1	HeNe	No
IB	W,N,U	LC halogen lamps	None	No
IB	W,S,M	IB LC laser 2	HeNe	No
IB	S,M,D	RFC refl/transm.	YAG	No
MC	W,N,U	LC halogen lamps	None	No
MC	E,N,M	View of IMC end mirror front face	None	No
MC	N,W,D	View of mario magnet centering (<i>temporary</i>)	None	Yes
MC	W,N,M	MC LC laser 1	HeNe	No
MC	W,W,M	IMC alignment laser	YAG	No
MC	W, S,M	MC LC laser 2	HeNe	No

3 other windows are used for Nd-YAG beam in the injection tower.

2 big rectangular windows for the main beam with AR coating for 1064nm and one window (same dimension as a viewport, included in the table above) with AR coating for 1064 nm used to collect RFC reflection and transmission beams.

Total = 4 (HeNe), 8+1 temporary (UC), 2 (YAG)

IB-PR Brewster link

tower	Position	Use	AR Coating	Protection cover possible
IB-PR	upper	Avoid scattered light	YB	Yes
IB-PR	lower	Avoid scattered light	YB	Yes

Until arrival of broadband YAG windows (YB), one bad quality YAG window (lower) and one UC window (upper) will be used.

Total = 2 YB

Detection tower

1. Used viewports of the detection:

At bench level

- lower part: 2 on north (LC leds), 2(*) on east for light,
- upper part: 4 on east+west (2 LC leds+2(*) camera),
1(*) on south (west side) for camera/visual inspection
- intermediate: 1 used for the camera LC, 1 (*) for visual inspection
- for the output beams: 1 custom window (rectangular)+1 circular standard viewport, YAG coated.

2. Not used viewports (at present):

At bench level

- lower part: 1 (*) on south (east side)

Platform level

- 3 (*) for checking if suspension is touching. These could be important when new cables for 'photodiodes under vacuum' will be installed but these could be removed now and replaced later. 2 already equipped with Lexan

=> 4 viewports could be removed now out of which 3 might need to be put back later.

(*)= can be protected with Lexan

tower	Position side, corner, vertical position	Use	AR Coating	Protection Cover possible
DT	N,E,D	LC LEDs	NO	NO
DT	N,W,D	LC LEDs	NO	NO
DT	E,N,D	Light	NO	YES
DT	E,S,D	Light	NO	YES
DT	E,N,U	LC LEDs	NO	NO
DT	E,S,U	Camera	NO	YES
DT	W,N,U	LC LEDs	NO	NO
DT	W,S,U	Camera	NO	YES
DT	S,W,U	Camera/visual insp.	NO	YES
DT	N, center	Camera LC	NO	
DT	N, center low	Visual inspection	NO	YES
DT	E,center,center	B5 YAG beam	YAG	NO
<i>DT</i>	<i>Platform</i>	<i>Check if cables touching (temporary)</i>	<i>NO</i>	<i>YES exists</i>
<i>DT</i>	<i>Platform</i>	<i>Check if cables touching (temporary)</i>	<i>NO</i>	<i>YES exists</i>
<i>DT</i>	<i>Platform</i>	<i>Check if cables touching (temporary)</i>	<i>NO</i>	<i>YES</i>

Total 11 + 3 temporary (UC), 1 (YAG)

Photon calibration

Input tower viewports

Tower	Detector	Position side, corner, vertical position	Equipment	Reason for use	Protec. possible	AR
NI	V, V+	N,W,U	Optical bench	Beam injection	No	YB
NI	V, V+	S,E,D	Optical bench	Power calibration	No	YB
NI	V, V+	N,E,D	Optical bench	Power calibration	No	YB
NI	V+	N,E,U	LC camera	Beam centering	No	HeNe
WI	V, V+	W,S,U	Optical bench	Beam injection	No	YB
WI	V, V+	E,N,D	Optical bench	Power calibration	No	YB
WI	V, V+	W,N,D	Optical bench	Power calibration	No	YB
WI	V+	W,N,U	LC camera	Beam centering	No	HeNe

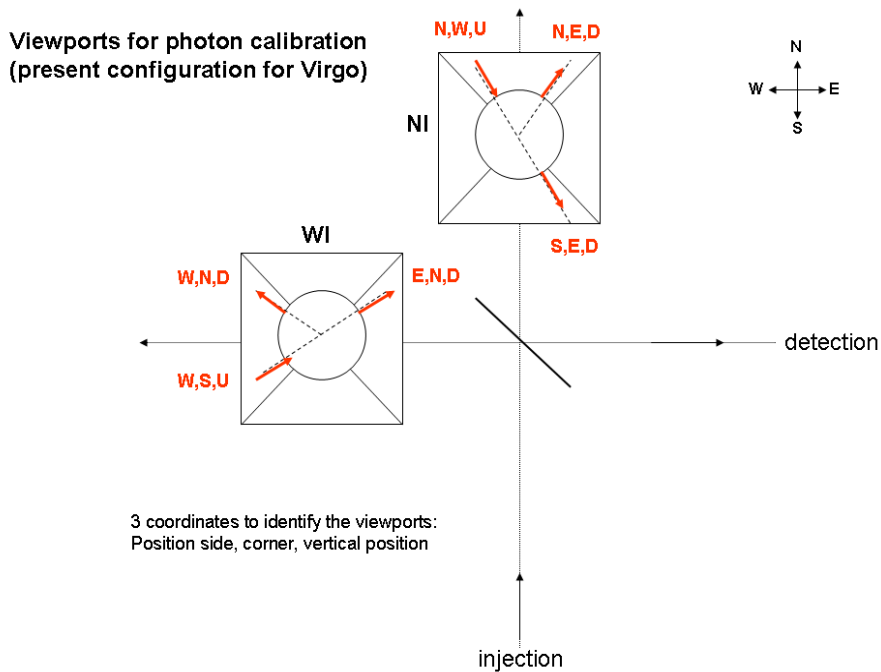
Number of used viewports for Virgo (V) photon calibrators: 6

Number of used viewports for Virgo+ (V+) photon calibrators at input towers: 8

YB = YAG broadband coating. The HeNe viewports are already included in the LC count; they are used only occasionally by the photon calibration.

The viewports are used to inject or measure the photon calibration laser beam at 915 nm, with power up to 2 W. The incidence angles are close to 0°. All the viewports must be available permanently.

The design of the pcal for Virgo+ has still to be worked out. Since we want to split the beam into two beams and hit the mirror symmetrically around its center, we will need a viewport for camera checks. It must be possible to use the cameras used for the local controls (NI, N, E, U and WI, W, N, U).



End tower viewports

It is possible that we will move the pcal to the NE and WE towers. In this case, we will free the viewports from the input towers, but we will need the viewports given in the table as shown in the next figure.

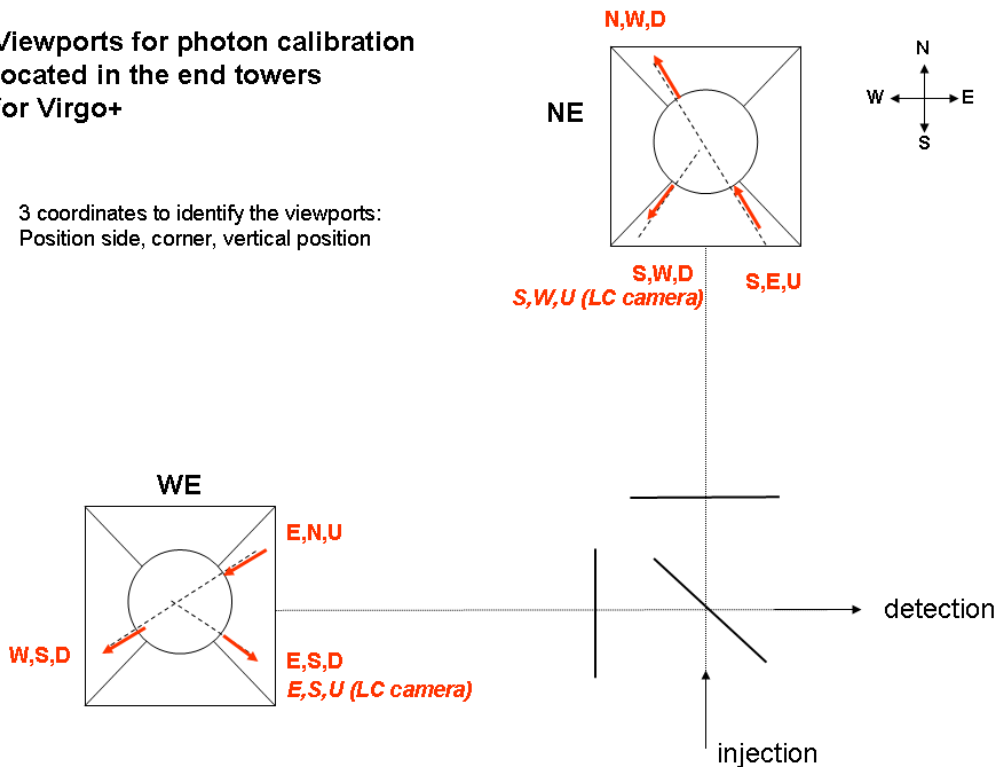
Tower	Detector	Position side, corner, vertical position	Material	Reason for use	Protect. possible	A/R
NE	V+	S,E,U	Optical bench	Beam injection	No	YB
NE	V+	N,W,D	Optical bench	Power calibration	No	YB
NE	V+	S,W,D	Optical bench	Power calibration	No	YB
NE	V+	S,W,U	LC camera	Beam centering	No	HeNe
WE	V+	E,N,U	Optical bench	Beam injection	No	YB
WE	V+	W,S,D	Optical bench	Power calibration	No	YB
WE	V+	E,S,D	Optical bench	Power calibration	No	YB
WE	V+	E,S,U	LC camera	Beam centering	No	HeNe

Number of used viewports for Virgo+ (V+) photon calibrators at end towers: 8

YB = YAG broadband coating. The HeNe viewports are already included in the LC count; they are used only occasionally by the photon calibration system.

Viewports for photon calibration located in the end towers for Virgo+

3 coordinates to identify the viewports:
Position side, corner, vertical position



Total (supposing that input + end towers will be equipped simultaneously): 12 YB

Total number of requested viewports in Virgo

	HeNe	Uncoated	YAG	YAG broadb.	ZnSe
LC	36	---	---	---	---
Light	---	14	---	---	---
Cam	---	6	---	---	---
TCS	---	---	---	---	2
ISYS	4	8 + 1	2	---	---
Det	---	11+3	1	---	---
Phot.Cal.	---	---	---	14	---
Total	40	39 + 4	3	14	2

Total number of viewports: **97** glass + 2 ZnSe

“+ X”: temporary needs

Viewport delivery status

as of 11/12/2008

status	Date	HeNe	Uncoated	YAG	YAG br.	ZnSe
arrived	long ago					2
arrived	14/08/2008		20			
arrived	05/09/2008	24		3		
arrived	16/09/2008	8	10	1		
arrived	10/10/2008	20	14			
to arrive	25/11/2008		1		16	
Total glass	20+97	52	45	4	16	2

Distribution and use of viewport flanges: plan as of 25/9/2008

- ▲ upper
- ▼ lower
- ▶ central
- ▲ feedthrough
- ▲ YAG camera/Visual control
- ▲ LC
- ▲ Calib
- △ not used
- ▲ TCS
- ▲ YAG beam
- ▲ Lighting
- ▲ LC for MS
- ▲ Final calib position

