Progress of Shintake Monitor (IP-BSM) Work

KEK site meeting

2009/6/17

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Damage Threshold of Mirrors

Comparison of laser output and damage threshold of optical coating

assume Gaussian profile for space and time FWHM=3.5 mm

	Pulse Energy [J]	FWHM Pulse Duration [ns]	Peak Power [MW]	Energy/Area [J/cm2]	Peak Power/Area [MW/cm2]
IP-BSM Laser	400	8	46.9	2.08	244
EXT LW Laser	200 (400)	0.3	266	1.04	2500
Sigma Koki Damage Threshold (1)		10		5	406
Sigma Koki Damage Threshold (2)		0.3		1	
LEO Damage Threshold (1)		10		10-20	
LEO Damage Threshold (2)		0.3		5-8	
CVI Damage Threshold		20		15-20	

Damage Threshold of Mirrors

- UK group uses CVI optics
  - Damage thresholds of CVI and LEO are similar.
  - LEO optics used in IP-BSM can be used.
- EXT LW laser output may exceed Sigma Koki optics damage threshold.
  - Is it need to replace all the Sigma Koki optics?
  - Fukuda-san (who used that laser at Polarized Gamma ray experiment) used Sigma Koki optics and there were no damages to the optics.
  - It is possible to increase the tolerance by expanding laser width.

Value Estimation of CVI optics

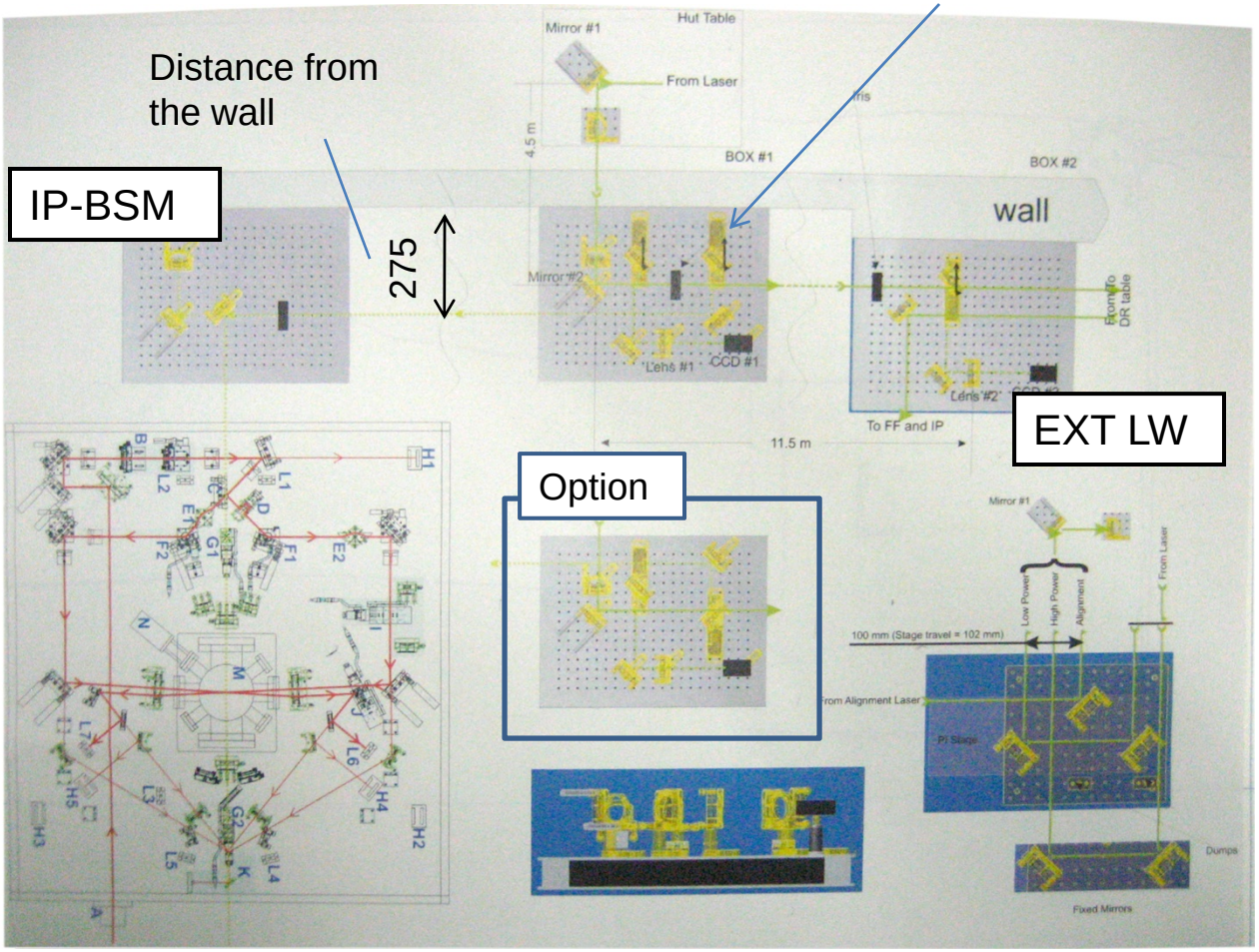
Product	Model	Price($)	Pieces	Total	Note
Right Angle Prism	RAP-157-C	140	1	140	Uncoated
	RAP-118-C	113	1	113	Uncoated
180 folding Prisim	P-180-090-532-UV	275	1	275	Fused Silica, 532nm AR Coat
Dove Prism	DPE-100-C-532	520	2	1040	
Spherical Plano-Convex	PLCX-50.8-51.5-UV	270	1	270	
	PLCX-50.8-130.8-UV	295	2	590	
	PLCX-50.8-257.5-UV	295	1	295	
	PLCX-50.8-154.5-UV	295	2	590	
	PLCX-50.8-515.1-UV	300	1	300	
	PLCX-25.4-51.5-UV	220	1	220	
	PLCX-100-125-UV	?	2		
Spherical Plane-Concave	PLCC-25.4-51.5-UV	220	2	440	
	PLCC-25.4-77.3-UV	220	1	220	
	PLCC-25.4-128.8-UV	220	1	220	

Total($)	4713
Total(\)	471,300

- Estimation by using catalog price
- In practice it costs twice of this because of charge of service

Laser Transport Line from the upstream

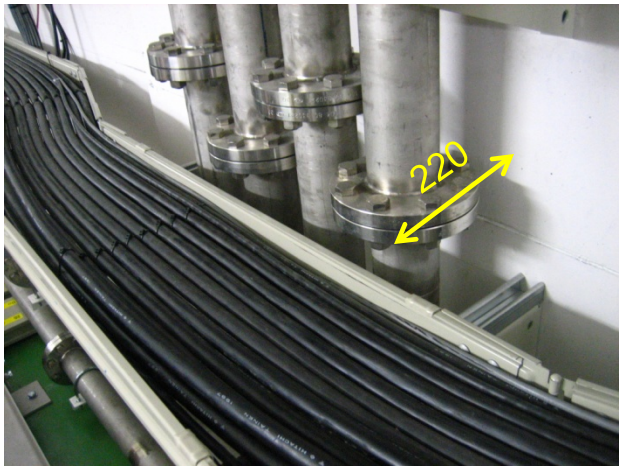
- Aryshev's idea



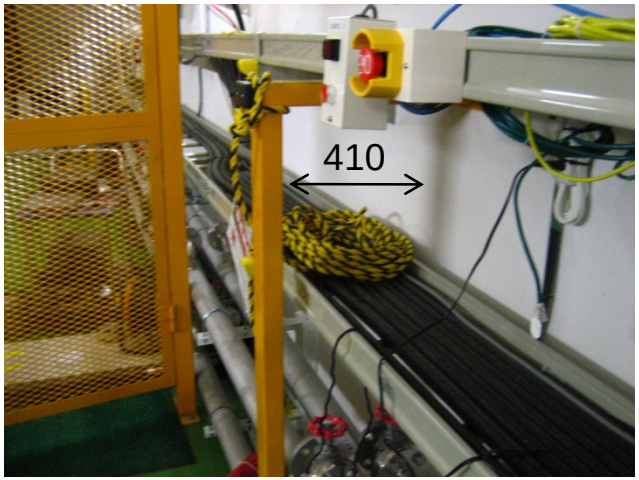
- Laser line goes the beam height.
- Laser width in the transport line is 12-14 mm (FWHM).
  - 7 mm for IP-BSM transport
  - 3.5 mm for IP-BSM optical table => Laser beam reducer is needed somewhere.

Laser Transport Line

View from the point beneath the ceiling hole



Water pipe



Fence

- Transport pipe can barely pass through assuming 100 mm diameter.
- Farther distance from the wall is desired, if possible.

Injection to the Vertical Table

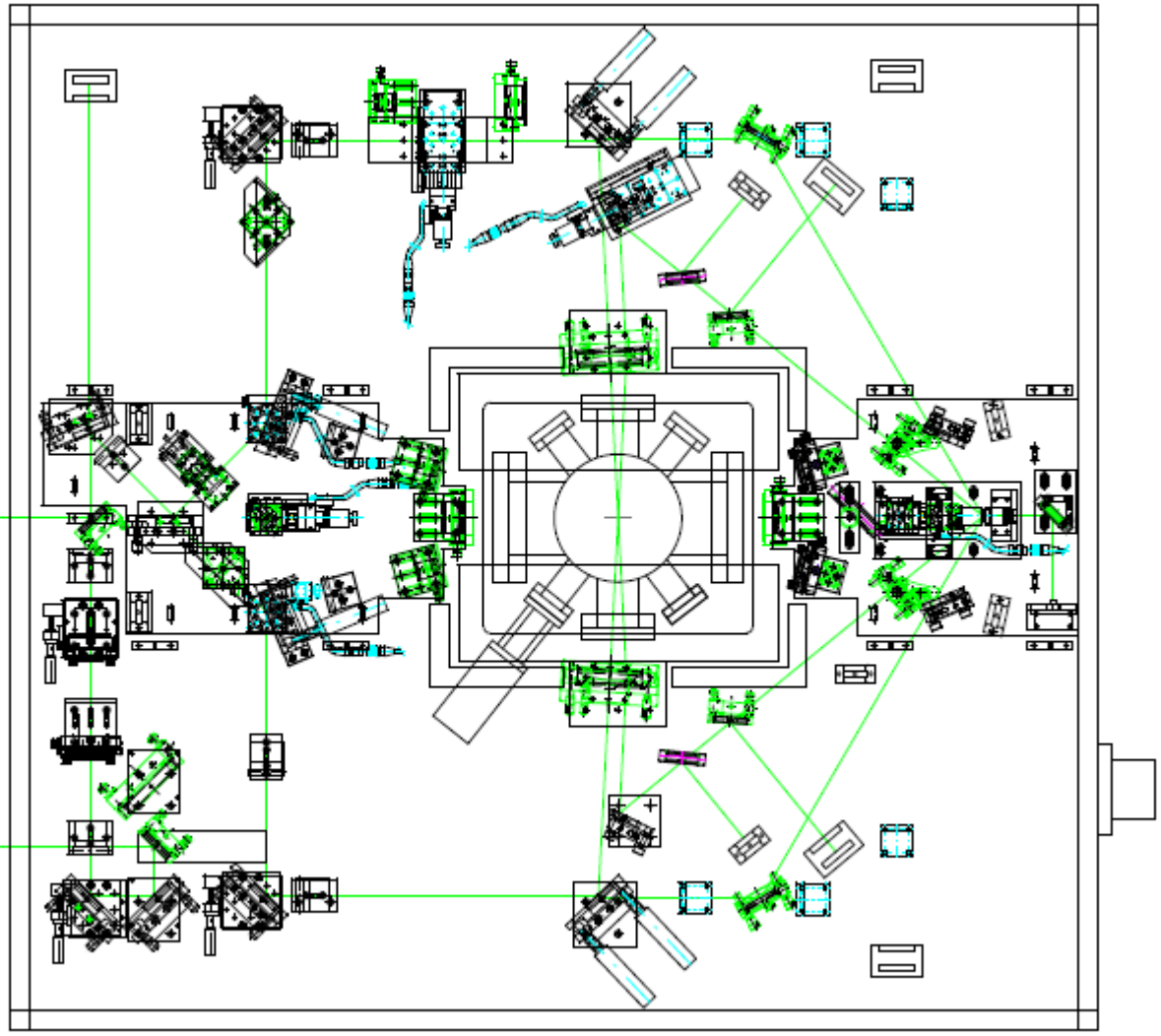
- A pole stands just the side of the table

- How to inject the laser to the table?
  - Is it O.K. to pass directly in beam height?
  - Or pass on the floor

Laser Injection Path

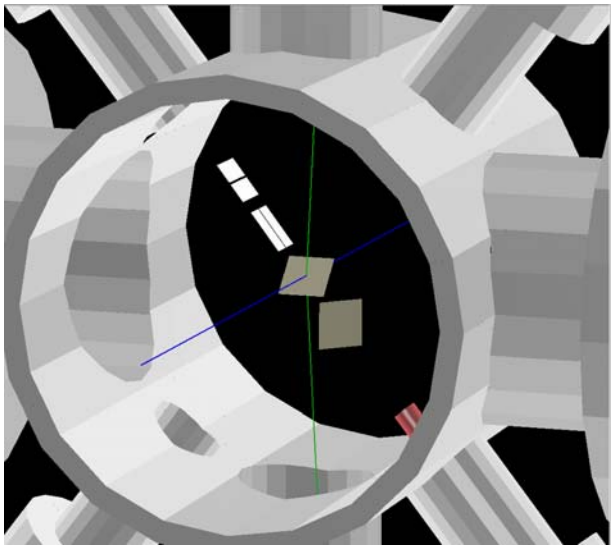
1. Pass directly from the transport line (beam height)

2. Once drop the laser line to the floor and raise



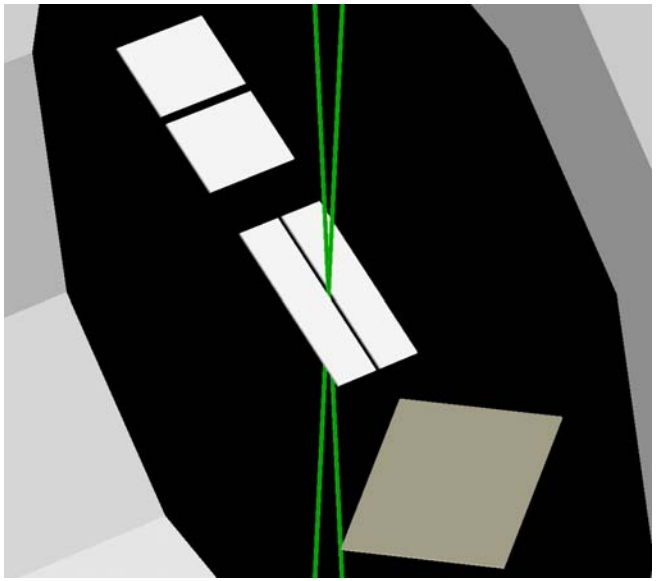
Screen Monitor & Knife Edge

- use two screens
  - for 2-30 degree and for 174 degree mode
- align screens and knife edge target in line
  - move them by motorized actuator
  - 100 mm stroke and 1 um resolution is supposed



Knife Edge Target

- make slit by using two knife edge
  - use for calibration of laser light movement at IP
  - roughness of edge can be 1 um easily by sandpaper (Seino-san, Seiwa Seisakujo)



Screen Grind

- 100 um thickness is possible (Seino-san)
  - have tried 60 um but process yield was bad
  - if 100 um, almost 100 % yield
- Surface condition of the screen after the grind was almost as same as the original