



# High Precision and High Speed Movers

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KEK

High Precision and High Speed Movers



**- Two stage mover**

**Rough mover stage --> Cam movers**

**Precision mover stage --> Piezo movers**

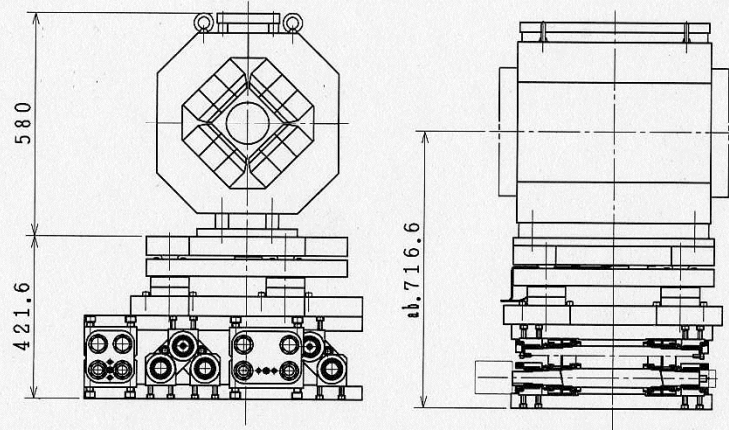
## Specification

	<u>Range</u>	<u>Resolution</u>	<u>Speed</u>
Rough movers	$\pm 1.5$ mm	0.1 $\mu$ m	> 0.1 mm/sec
Precision movers	$\pm 0.2$ $\mu$ m	1 nm	> 0.5 $\mu$ m/sec

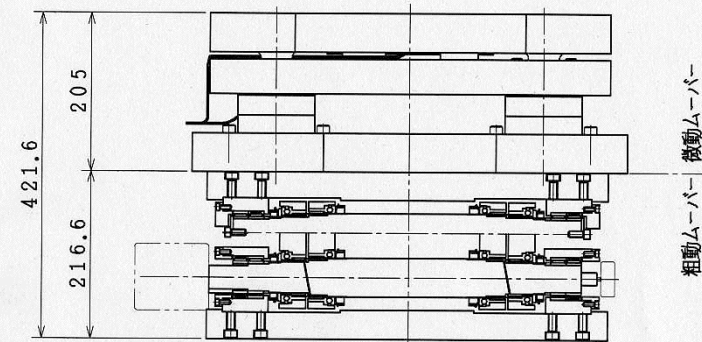
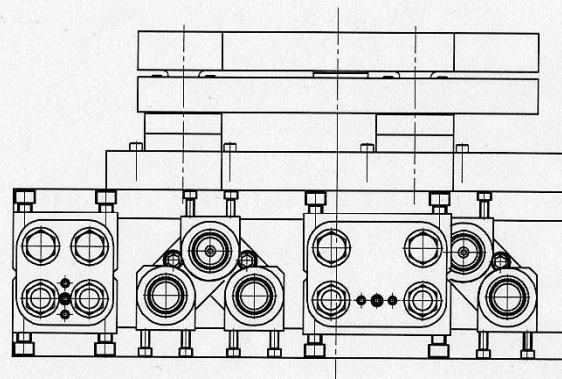
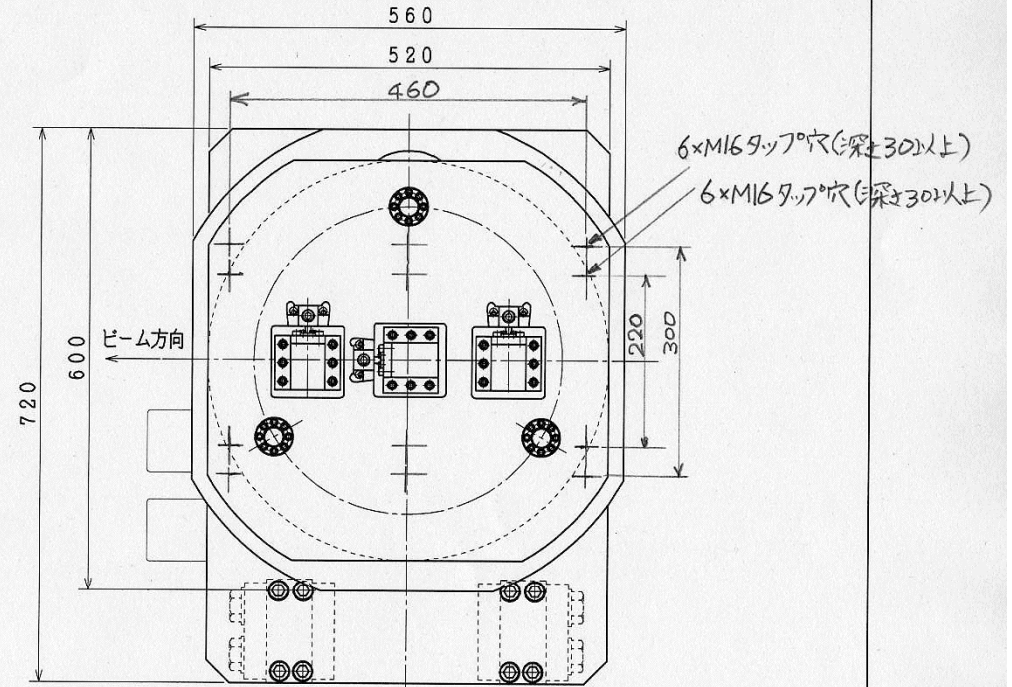
**Need 5 directions (X, Y,  $\Theta_x$ ,  $\Theta_y$ ,  $\Theta_z$ )**

**Max. weight of load is 2 tons**

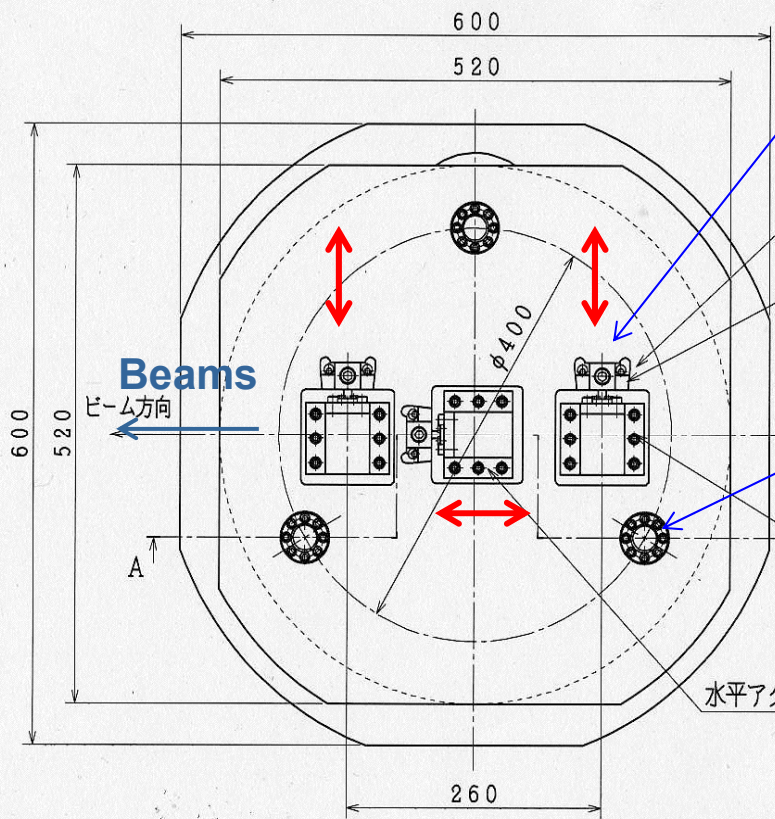
**Size of table      600  $\square$  x  $\tilde{\square}$   $\square$  x  $\tilde{\square}$  H**



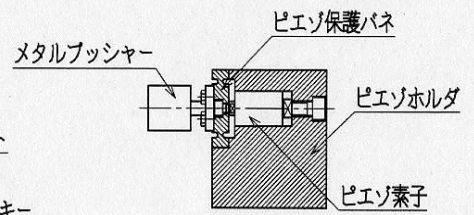
マグネット搭載図 S:1/12



No.	目次 DATA	内容 CONTENTS	承認 APP	製図 DWN	加藤	日付 DATE	05-12-26	次世代加速器用超精密ムーバー	御納入先 Client	東京大学 殿
				検図 CKD	潘	日付 DATE	05-12-26			
				承認 APP	安田	日付 DATE	05-12-26	尺度 Scale.	1/5	NO. TDC-S090-014
									E2 特許機器株式会社	

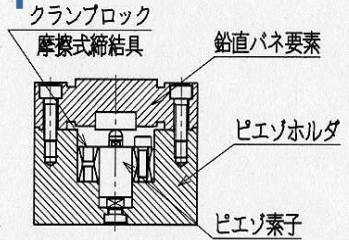


### Horizontal piezo actuator



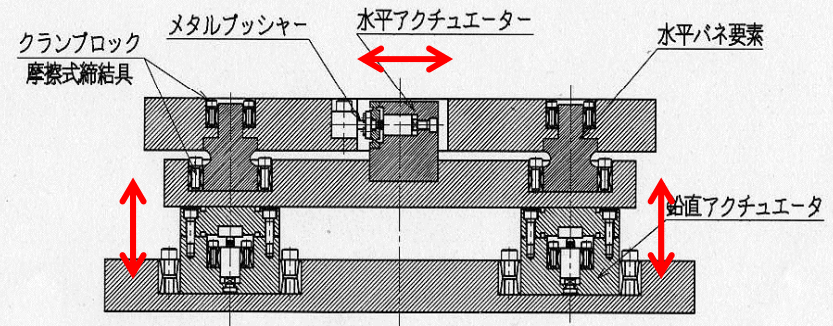
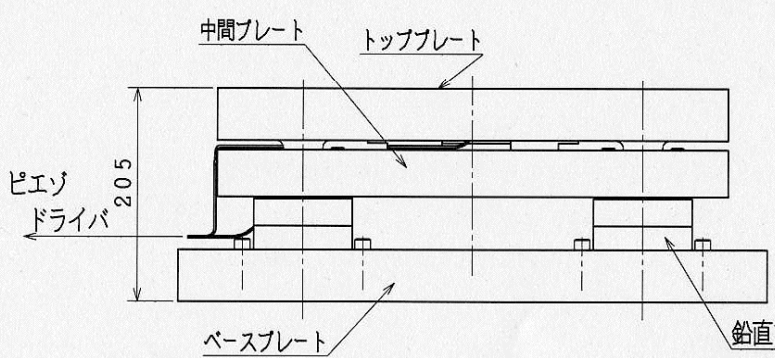
水平アクチュエータ断面図 S:1/3

### Vertical piezo actuator



鉛直アクチュエータ断面図 S:1/3

精密ムーバー 仕様	
装置質量	約310 kg
装置材質	SUS303
搭載対象物	ATF2最終収束電磁石
搭載質量	約700 kg
調整機構	ピエゾアクチュエーター
位置検出センサー	取付部のみ



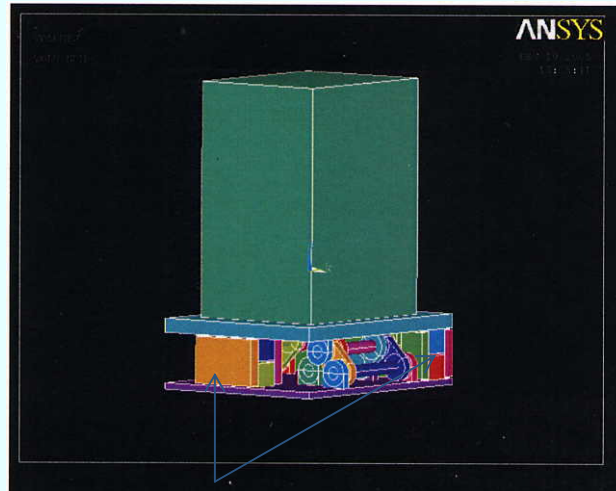
A-A断面図 S:1/5

No.	DATE	内容 CONTENTS	変更 MOD	申請 APP	製図 DWN	加藤	日付 DATE	05.12.26	次世代加速器用超精密ムーバー	御納入先 Client	東京大学 殿
					検図 CKD	潘	日付 DATE	05.12.26	微動機構部		
					承認 APP	安田	日付 DATE	05.12.26	尺度 Scale	1/5	NO. TDC-S090-013

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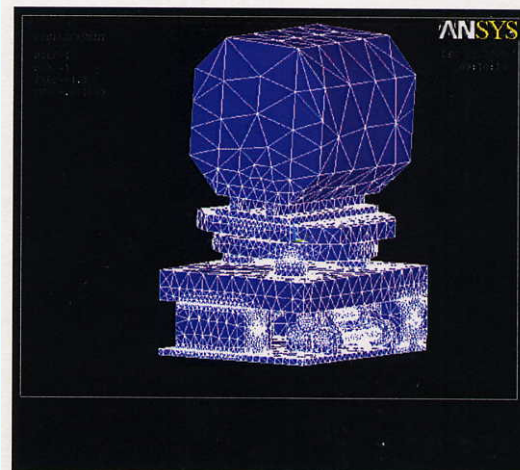
According to ANSYS calculation,  
rough mover stage is weak!  
--> Stopper is installed



Stoppers

	<u>w/o stoppers</u>	<u>With stoppers</u>
Primary mode	45.1 Hz	187.6 Hz
Secondary mode	65.5	304.5
Third	148.6	635.5

Total system -->

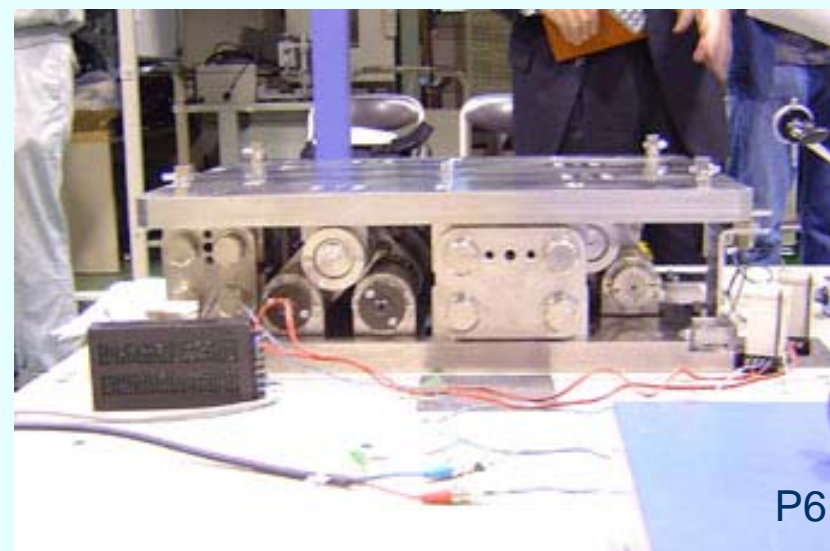
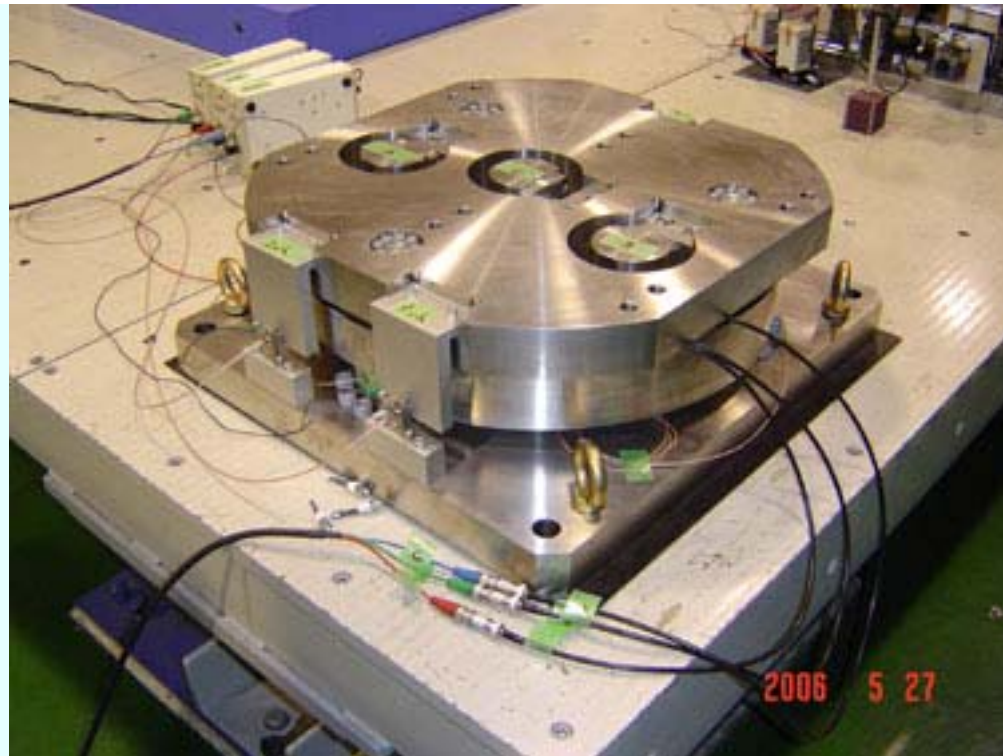


第1次	<b>84.500Hz</b>
第2次	120.27Hz
第3次	248.69Hz
第4次	302.45Hz
第5次	412.62Hz

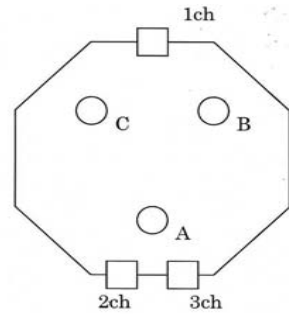
Primary mode  
Secondary mode  
Third



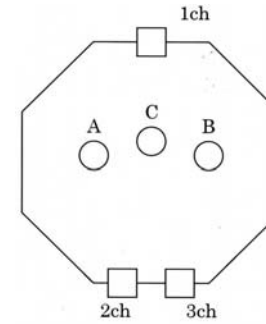
ATF2 Project  
Meeting  
May 30 - June 1, 2006



P6



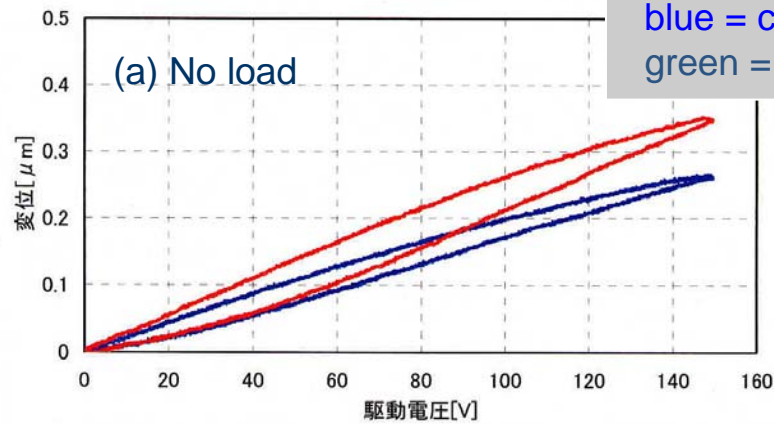
□ Sensor position  
○ Actuator position



### Vertical movement

(Three actuators are activated in the same way)

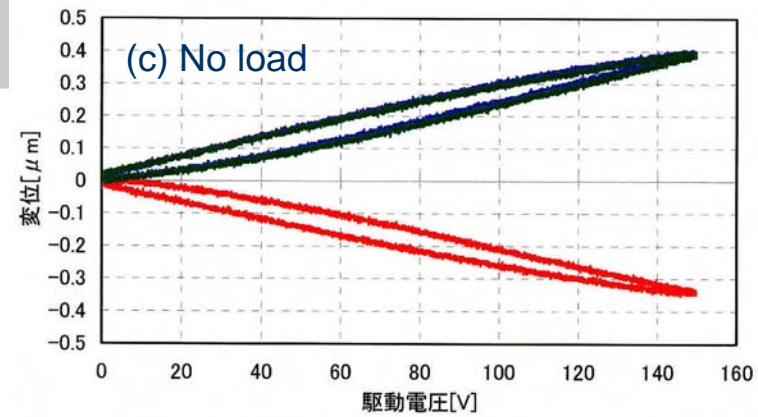
鉛直方向特性 無負荷



### Horizontal movement

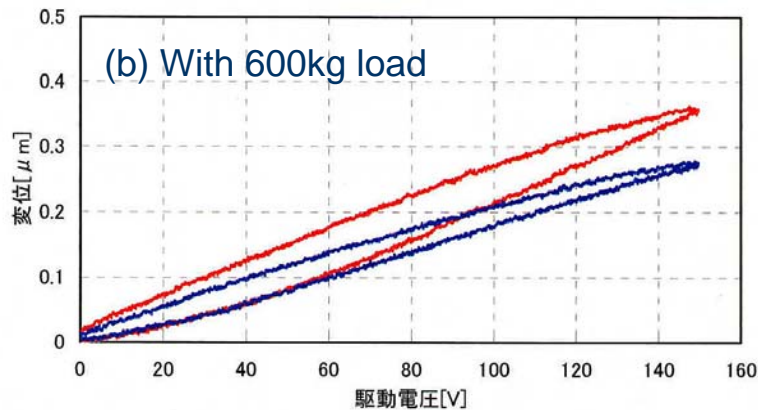
(A and B actuators are activated in the same way)

水平方向特性 無負荷

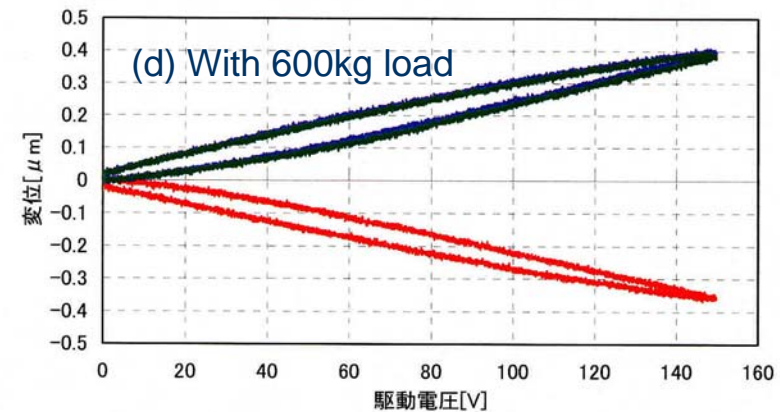


Displacement (μm)

鉛直方向特性 600kg負荷



水平方向特性 600kg荷重





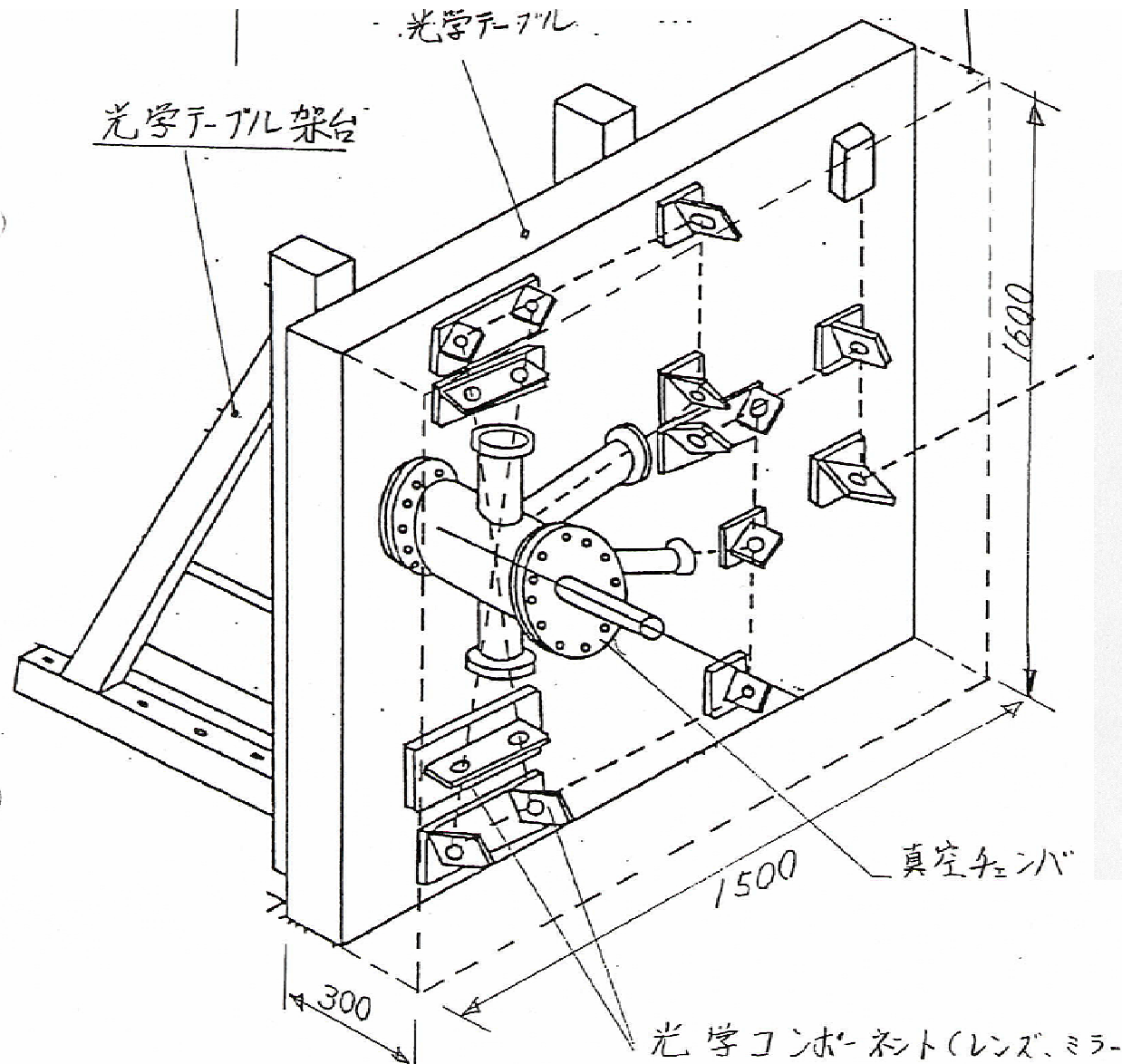
**Can we use this HP&HS mover  
as a support for the Shintake monitor?**



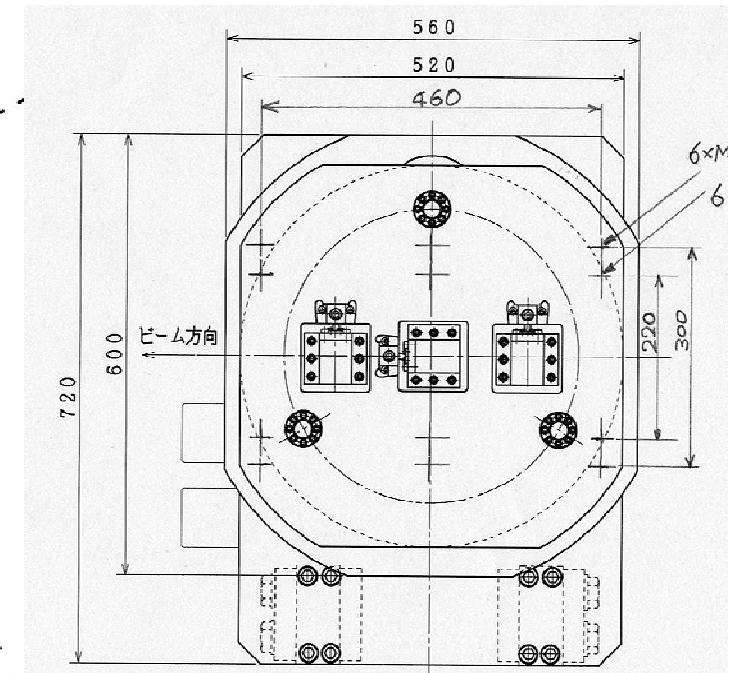


# Shintake monitor

ATF2 Project Meeting  
May 30 - June 1, 2006



## HP&HS mover





## Summary

- **HP&HS mover looks having movement resolution better than 10nm and speed faster than 30Hz**
- **High precision position monitor system will be developed this year**
- **More detailed performance test will be executed after the mover is delivered to KEK in June**
- **It looks unsuitable to use this mover as a support for the Shintake monitor**