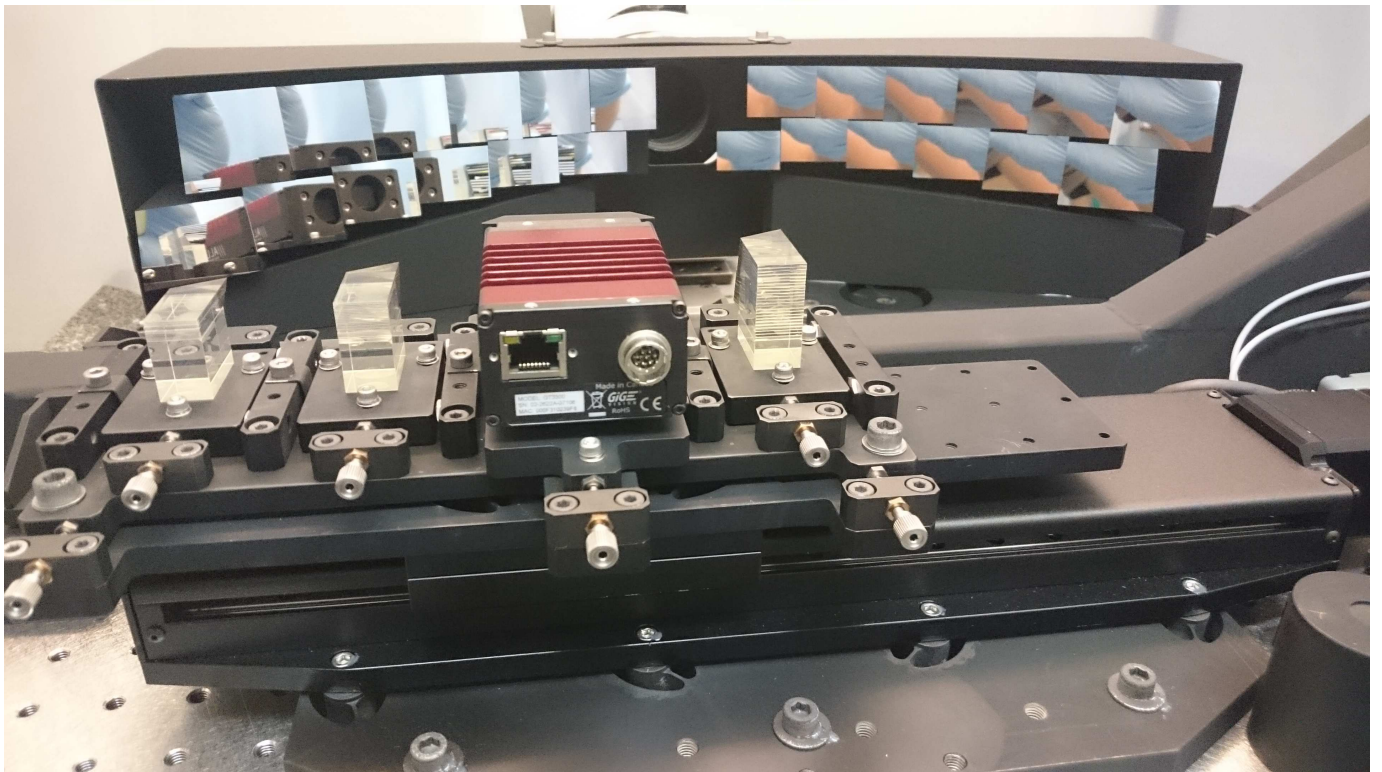
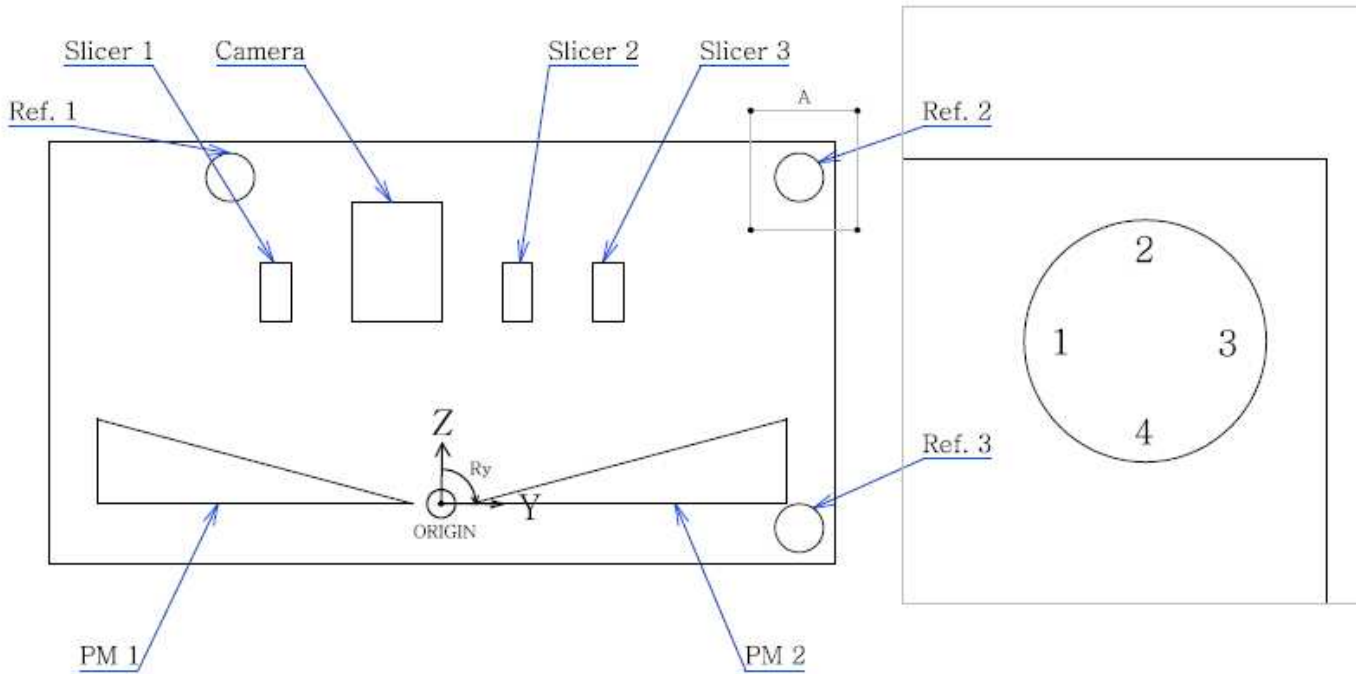


MECHANICAL MEASUREMENTS
Dated on July 27th and July 30th 2015



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Specifications:

- X = Slices and pupil mirrors decentering from a theoretical axis; +/-50µm in position and +/-11µm for repeatability
- Y = Slices and pupil mirrors decentering from a theoretical axis; +/-50µm in position and +/-11µm for repeatability
- Z = IFU vertex radius = 225.000 +/-0.06mm
 - The value has been translated to be measurable at the end.
 - We measure the distance from the rear surface of the pupil mirror array 1 to the apex of the slicers.
 - The distance becomes 249.813mm.
 - But due to the shape we touch the rear surface of the slicers and so we have to take into account the length of the slices

Origins of the measurement:

- X = Bottom side of the optical holder of the Pupil Mirror 1= 0.000mm
 - We took this reference because all the PMs have been integrated in reference of this side.
 - The Invar bench table top is not enough flat.
 - The averaged measured off-set 22.032mm to go to the Invar bench surface
- Y = Theoretical location of the IFU axis = 0.000mm
 - The PM1 side is -256.801mm far from the axis (256.921mm – 0.120mm due to the section of this mirror)
- Z = Rear surface of the Pupil Mirror 1 = 0.000mm
 - Real holder thickness 15.071mm

SLICERS AND PUPIL MIRRORS POSITIONING

PM2 positioning measurements:

Axis	Theoretical value	Measured values	Difference	
X Values	118.286mm (1)	118.301mm (Y-)	+15µm	
	118.311mm (1)	118.303mm (Y+)	-8µm	
Y Value	258.110mm (1)	258.141mm *	+31µm (2)	
Z Values	0.000mm	-0.004mm (Y+)	+4µm	
	0.000mm	-0.012mm (Y-)	-12µm	

(1) Coming from the metrology after PMs cementing

(2) This result means the axis of the IFU has to be located at +0.015mm on the Y axis

Slicer 1 positioning measurements:

Axis	Theoretical value	Measured values	Difference	
Y		440400 steps from the external reference switch		
X Values	112mm - 22.032mm (1) + 12.006mm (2) = 101.974mm	101.965mm (on the top of the slicer)	-9µm	
Y Value	+0.015mm	+ 0.016mm	+1µm	
Z Values	249.813mm +30.006mm (3) +0.071mm (4) +0.010mm (5) = 279.900mm	279.893mm	-7µm	

(1) Off-set for all the measures

(2) True thickness for 12 slices

(3) True length of the slices after stacking

(4) Delta thickness of the PMs holder

(5) Delta thickness of the 24 PMs

Slicer 2 positioning measurements:

Axis	Theoretical value	Measured values	Difference	
Y		134400 steps from the external reference switch		
X Values	112mm - 22.032mm (1) + 6.000mm (2) = 95.968mm	95.982mm (on the top of the slicer)	+14µm	
Y Value	+0.015mm	+ 0.004mm	-11µm	
Z Values	249.813mm +30.006mm (3) +0.071mm (4) +0.010mm (5) = 279.900mm	279.893mm	-7µm	

- (1) Off-set for all the measures
- (2) True thickness for 12 slices
- (3) True length of the slices after stacking
- (4) Delta thickness of the PMs holder
- (5) Delta thickness of the 24 PMs

Slicer 3 positioning measurements:

Axis	Theoretical value	Measured values	Difference	
Y		3050 steps from the external reference switch		
X Values	112mm - 22.032mm (1) + 3.006mm (2) = 92.974mm	95.973mm (on the top of the slicer)	-1µm	
Y Value	+0.015mm	+ 0.011mm	-4µm	
Z Values	249.813mm +30.000mm (3) +0.071mm (4) +0.010mm (5) = 279.894mm	279.889mm	-5µm	

- (1) Off-set for all the measures
- (2) True thickness for 12 slices
- (3) True length of the slices after stacking
- (4) Delta thickness of the PMs holder
- (5) Delta thickness of the 24 PMs

Camera positioning measurements:

Axis	Theoretical value	Measured values	Difference	
Y		287500 steps from the external reference switch		
Y Value	+0.015mm	-0.040mm	-55µm	
Z Values	249.813mm - 15.773mm (1) +0.071mm (2) =234.111mm	234.080mm	-35µm	

(1) Mechanical part and C mount

(2) True Delta thickness of the PMs holder

Reference 1 positioning measurements :

X Values	(1) 28.013mm (2) 28.008mm (3) 28.034mm (4) 28.042mm Average : 28.024mm // = 0.034mm
Y Value (Center)	-134.879mm
Z Value (Center)	371.335mm

Reference 2 positioning measurements :

X Values	(1) 27.976mm (2) 27.920mm (3) 27.887mm (4) 27.944mm Average : 27.932mm // = 0.089mm
Y Value (Center)	285.383mm
Z Value (Center)	370.348mm

Reference 3 positioning measurements :

X Values	(1) 27.938mm (2) 27.904mm (3) 27.889mm (4) 27.939mm Average : 27.917mm // = 0.050mm
Y Value (Center)	284.399mm
Z Value (Center)	-19.427mm

SLICERS AND PUPILS MIRRORS ORIENTATION

Origin = Slicer 2

Slicer 1	
Rx	0''
Ry	-10''
Slicer 3	
Rx	0''
Ry	-10''
PM 1	
Rx	+6''
Ry	+10''
PM 2	
Rx	+6''
Ry	-10''