FROM RESEARCH TO INDUSTRY





Operational Multilayer MLO

CEA-Saclay Team:

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- proof of concept
- gluing & metrology process to reach the desired specifications
- ...a good idea to show that we can do it in a small version...
- raise issues on the alignment procedure between 2 successive layers
- will help us to pinpoint problems that we will encounter for the large version

Layout - use a standard PCB plate - 1200 x 600mm active surface (~900 x 450mm) - XY strips + resistive layer materials: G10 frames / honeycomb / FR4....and some glue



Layout contd. - key idea: every readout layer is interchangeable rasmaks + copper strips deposited at the same time with other positioners (crosshair like)



Layout contd. – piling sequence



Layout contd. - Gas services



Gluing procedure - Tests



Vaccum bagging: evenly distributed pressure over the entire surface regardless of the type or quantity of material being laminated.

At each step we will perform a careful metrology:

- pitch, resistive layer, thickness, planeity...

quadruplet assembly:

- doublet mounting
- alignment of 2 doublets to one another
- kinematical mounting between the 2 doublets





Alignment

- using rasmasks placed at each corner of the PCB
- use of an optical head on a CMM machine
- rasmasks can be seen on 2 successive layers back to back by thinning [Tested by Rui at the moment] the FR4 underneath the rasmasks
- if it is not accurate enough we replace the rasmaks by "glass rasmaks" seach layer has a calibration coeff. in order to readjust to every other one layer



Operational Tests

- cosmic bench
- DAQ > SRS system using the APV elx cards
- beam test

So the MLO...

- Effective layout (XY resist)
- Services [Elx Gas and all associated parts]
- mechanical assembly via screws for simplicity and be able to swap/change any part
- this is not a attempt to a solution but a working concept of a quadruplet to be able to do some physics with!!!
- Custom alignement hardware will be needed
-raising the issue of space...and many others...

...Timeline...

Titre	Q4 / 2012 Q	01 / 2013	Q2 / 2013	Q3 / 2013	Q4 / 2013
	12 01	02 03	04 05 06	07 08 09	10 11 12
Multi-Layer Opérationnel	Multi-Layer Opérationnel	*			
Réunion de lancement	Réunion de lancement	◇ 1			
Définition système alignement	Définition système alignemen	t 1,5 mois ?	1		
Définition du layout		Définition du layout	2sert?		
▼ Fabrication circuits imprimé		Fabrication circuits imprim	és 🔽		
▼Suivi fab readout et métrol		Suivi fab readout et métrolog	ie 🔽		
Fab PCB nu		Fab PCB	nu Zsem?		
Métrologie tri-dim		Métrolo	gie tri-dim <mark>→ 1se</mark> -		
Fab pistes Y			Fab pistes Y 2sem?		
Métrologie radio X (?)			Metrologie radio X (?)		
Fab pistes X résistives			Fab pistes X résistives 2sem?		
Métrologie (tri-dim, radio)			Métrologie (tri-dim, radio X?) [2sem?]		
Fab plots			Fab plots	m?	
Fab dérives		Fab déri	ves 2sem?		
▼ Mécanique		Mécaniq	ue 4 🗸 🗸		
▼ Détecteur		Détecte	ur 🖵 🗸		
Fab cadre grille		Fab cadre gr	ille Zsem		
Assemblage grille+dérive+		Assemblage grille+de	rive-cadre +1se		
Corps de chambre		Corps de cham	bre 2sem?		
Alignement		Alignem	ent 2 mois ?		
Définition de la procédure de ce	Définition de la procédure de collage	e 5 mois ?			
▼Assemblage des doublets			Assemblage des doublets		
Collage sur raidisseur			Collage sur raidisseur	2sem?	
Métrologie tri-dim			Métrologie	e tri-dim 2sem?	
Banc de tests (élec, gaz, cosmi	Banc de tests (élec, gaz, cosmiques) 6 mois ?		-	
▼Tests des doublets			Tes	sts des doublets	
Intégration des doublets			Intégrati	ion des doublets	
Métrologie optique				Métrologie optique	
Mesures fonctionnelles				Mesures fonctionnelles	
▼Assemblage du quadruplet				Assemblage du quadruplet	-
Montage et alignement				Montage et alignement	1
Métrologie optique				Métrologie optique	se
Tests du quadruplet				Tests du quadruplet	2,5 mois ?

Perspectives

Institutes who wants to join are more than welcome -

Goal is to have this MLO in the ATLAS pit in December 2014