Uniformities

18/10/24

Reminder: Conventions



- X-Y convention derived from the drift chambers
- Propagated to the Xm-Ym variables
- Blue square is the drift chamber blind zone

Reminder: Conventions



- X-Y convention derived from the drift chambers
- Gravity and GRAiNITA door (for inserting the grains) added

Looking at GRAiNITA

- Increase the field of view
- Compute the centre M as the middle of the 4 center fibres
- Add boundaries at ±1.4 cm

Detector boundaries are not where they are expected.



Centering (by eye):

- ▶ -600 µm in X
- ▶ +150 µm in Y
- Still a bit more on the right (door ?)
- Fibres shifted to the left (door pushing ?)

Seems to have a door effect (break on through to the other side).



Troll 1 - Muons

Looking at GRAiNITA



- No differences between the Pions and Muons run with heavy water
- It seems that the fibres moved during the cleaning-refilling of the grain procedure.
- The 4Sq are distorted by the fibre positions

III. UNIFORMITY MAP

Geometry



4Sq definition

4Sq 0	4Sq 1	4Sq 2
4Sq 3	4Sq 4	4Sq 5
4Sq 6	4Sq 7	4Sq 8

4Sq position

- Space in a 4-fibre square (4Sq) cut in 49x1 mm² squares
- Landau x Gaussian fit in each
- 9 (4Sq) can be built
- MPV map can be produced for each
- Fit error in the 1-2% range, can rise to 4% in the corners
- Mean value of each map took as a reference
- Fit with $\chi^2 > 1.1$ are discarded

Uniformity maps 1 out of 5





Uniformity maps 2 out of 5





Uniformity maps 3 out of 5





Uniformity maps 4 out of 5





Uniformity maps 5 out of 5



- The 9 maps are showing departure from uniformity consistently
- Border effect that are likely the explanation
- Maximum of the order of 35 % (in the corners)
- Select region which we think are not plagued by border effect

									20
•									15
					0.7	2.6	9.1		10
2		-4,4	-5.7	-3.1	0.9	8.4	11.6		5
m					-0.4		9.5		0
4				13	3.7	11.5	15.6		-5
5	6.8	-3.4	-3.3	-1.1	4.3	15.8	20.5		-10
9	-100.0	7.3	3.1	-0.0	3.5	-100.0	-100.0		-15
	ò	i	ż	à	4	5	6		-20
			10	~ ^ (oorn	or)			
			40	4 V (COLLI	ei)			

Selection :

- Avoid the clear fibre and minimize the border effects
- Choice of the half blocs located at the vicinity of the center 4Sq 4.



Position of the selected blocs

Uniformity maps 1 out of 2

ч.							-100.0	
m -							-100.0	
ų .	4.7	0.0			4.5	-2.5	0.8	
<u>.</u>	7.9	4.6			-3.6	5.2	2.1	
<u>.</u> .		10.3		-3.6	-2.5	0.5	-100.0	
1	ò	i	ż	3	4	5	6	

- 20

- -10 - -15 - -20

									- 20	
•		12.2	4.1							
									- 15	1
-	14.7						5.3		- 10	,
2	11.1						4.9		- 5	
m									• 0	
4										2
									1	10
5										
									1	15
9										
	ò	i	ź	3	4	ś	6			20
				40						
	4Sq /									

Uniformity maps 2 out of 2

	-20											
0.				-3.6	-0.1	7.2			- 15			
1					1.1	5.8	13.4		- 10			
2					-3.2	2.3	9,4		- 5			
m -					-2.5	3.5	4,3		- 0			
4						0.2	8.3		5			
5					-4.8	3.4	8.0		10			
9				73	-5.9	-100.0	-100.0		15			
	ò	i	2	ż	4	5	6		20			
				10	~ ^							
				400	40							

									- 20	
•										
									- 15	
									- 10	
2										
									.,	
m									-0	
4									5	
	10.6								-10	
	-100.0			-100.0	-100.0	-100.0	-100.0		15	
1									-30	
	ó	1	2	3	4	5	6		20	
	4Sa 5									
					•					

- Is there a way to present this result in a unique way to input into Denys simulation.
- Our proposal : merge the previous plot

Final result ?





IV. UNIFORMITY MAP 2

Geometry



4Sq definition

4Sq 0	4Sq 1	4Sq 2
4Sq 3	4Sq 4	4Sq 5
4Sq 6	4Sq 7	4Sq 8

4Sq position

- Space in a 4-fibre square (4Sq) cut in 49x1 mm² squares
- In the last map, the lower left corner was took as a reference and a 7x7 mm square was built
- In the next slides, took each of the four corner to have an idea of the sys. errors associated
- One can think at others methods (take the middle for ex.)
- Fit with $\chi^2 > 1.2$ are discarded

	- 20											
0		-1.6				-5.5			- 15			
1						-1.8			- 10			
2	4.4	4.6	-0.8	-2.8		-4,4	1.3		-5			
m	8.9	1.9	1.7	4.9	-4.6	-0,4	3.0		•0			
4	12.2	9.1	1.5	-0.2	1.0	9.2	7.7		· -5			
5	-100.0	15.6	7.7	0.7	0.5	8.0	6.6		10			
9		15.3	6.4	3.8	5.6	4.2	-100.0		15			
	ò	i	ź	3	4	5	6		-20			
				100	EO							
				439	гз							

9		18.0		25				11
5	18.2	15.2	7.7	15	0.1	7.5	7.6	1
4.	10.9	9.5	1.9	-1.6	-0.2	8.0	7.6	5
m								•0
2	6.1	6.2		-1.6			0.9	- 5
1	6.7	3.5		-5.1		-1.1	-0.4	- 10
0	-100.0	-1.1	-4.8			-7.8	-100.0	- 15

									- 15
									- 10
~	7.3	5.3	-2.9	-4.7		-2.7	2.8		- 5
m									- 0
4	10.2						6.1		5
									10
5	13.6	10.1	4.7	-1.3	1.5	10.7	7.5		
9		16.2	4.9						15
	ö	i	2	à	4	ś	ó		-20
4Sa F7									

	-100.0	-1.9	-5.2	.9.7	-10.3	-8.8	-100.0			- 20
-										- 15
1										- 10
2	6.3	6.4	-0.6	-1.4	-6.4	-4.7	1.0			- 5
m	6.1	0.6	1.3				0.3			0
4	10.4	9.4	2.5	-2.9	-0.7	6.9	7.7			5
5	18.4	14.2	7.0	2.6	0.1	7.9	6.8			-10
9	-100.0	18.9	7.3	15	3.8	6.5				-15
	ò	i	ż	3	4	ś	6			20
	4Sa F4									

								- 20										
0.		9.3	-1.4	-2.1	-2.8	-1.1		- 15	5									
-	12.6	12.9	-0.3	-3.3	-5.3	-2.7	0.4	- 10	0									
2	6.1	3.6	0.6		-2.4		-1.2	• 5										
m								•0										
4.	8.1	4.7	-1.0	-4.2	-5.1				5									
5	12.6	4.0	-1.3	4.8	-6.1	0.7	-0.8	1	10									
9	-100.0	9.0	-0.0	-1.8	-3.7	2.2	-100.0	1	15									
	ò	i	ż	3	4	5	6		20									
				150	ES													
				400	10			40Y F3										

- -10

- -15



	ò	i	ź	ż	4	ś	6	-20
9	-100.0	8.0	0.6	-3.1	-1.4	3.6		-15
5	15.6	6.0	-2.2			2.2	2.5	10
4	8.2	3.6	1.3	-4.0	-5.0		-5.0	· -5
m -	8.0	1.2	-3.2	-2.8	-3.9	-4.9		-0
2	6.1	3.8	-0.8	-5.7	4.3		-2.6	- 5
1	11.2	10.4	1.0	-3.7	-5.2	-4.2	-0.4	- 10
0		8.9	-2.1	-2.0	-3.1	-2.1		- 15
								- 20

- -10

- -15



								- 20
•		-0.7	-0.7	-1.9	1.8	6.6	-100.0	- 15
1					3.8	9.8	15.6	- 10
2	1.5	-2.3	0.1	-2.5	-0.8	9.2	13.1	- 5
m -	-6.4	-1.6	-5.3	45	0.8	3.7	9.1	-0
4	-1.4	-1.9	-6.1	-7.1	-3.3	2.0	8.3	5
5	0.7	-4.1	-7.6	7.0	-4.5	6.4	13.2	10
9	2.5	-1.5	-5.7	-6.2	-4.7	-0.2	-100.0	15
	ò	i	ź	ż	4	ś	ó	20
				400	ГС			
				430	סחן			



								- 20
0.		1.6	-0.9	-2.2	1.3	8.8		- 15
r -					2.6		15.1	- 10
2		-2.8	4.3	4.1	-1.8	3.8	11.0	- 5
m	4.8	-2.4	-5.2	-5.8	-1.1	5.0	5.8	-0
4.	-0.8	-2.4	-7.1	-7.9	-5.7	1.6	9.9	5
5	3.3	-3.6	-5.4	-5.7	-3.4	5.0	9.6	10
9	-100.0	-1.4	-8.8	5.9	-4.5	-4.7	-100.0	15
	ò	i	ż	3	4	5	ó	-20
				100	E10			
				43q	10			



								- 20
•	-100.0	11.3	3.1	-2.1	-6.0	3.0		- 15
1	16.1	10.2	0.4	4.8	-2.9	3.7	9.1	· 10
2	15.6	8.2	-2.6	-2.6	-5.0	1.7	4.1	•5
m	6,4	2.1		4.8			6.7	•0
4								5
5	43	-0.1					5.1	10
9	6.4	2.1				-3.0		15
	ò	i	2	ŝ	4	5	6	-20
				4.Sa	F11			
				- Oq				

- -10

- -15



28/33

									- 20
0		13.8	5.5	-2.7		3.5			- 15
1	16.3	10.8					6.8		- 10
2	12.7	6.2	-3.0	-2.9		-3.8	6.4		- 5
m	4.4	3.0	-2.7				1.9		• 0
4.	4.0	1.7	-7.8	5.9	-5.4	-5.2	-1.0		5
5	8.0	3.5	-4.1	9.2	-8.4	-4.3	0.7		10
9	-100.0	2.4	-8.7		-14.0	-4.5	-100.0		15
	ò	i	2	3	4	5	6		-20
				100	E10				
4Sq ⊢10									

									- 20
0		11.6	3.6						
									- 15
	17.2	10.4	1.9				9.0		
									- 10
N	16.0								
m							6.1		-0
9.									5
									-10
									-15
9							-100.0		
	ò	i	ź	à	4	5	6		-20
				4Sa	F11				

Systematics

Defined as :

$$S = \frac{\min - \max}{\max} \tag{1}$$

0		0.8	3.7	2.2		9.3	0.0	
1	9.7	5.0	1.4	5.2	3.9		15.4	
2	2.8	1.6	2.5	3.3	1.5	2.5	1.9	
m	3.9	13	3.6	1.4	2.6	3.3	2.6	
4	1.8	3.9	2.9	2.7	1.7	6.1	1.5	
in .	0.0	4.9	2.8	3.9	1.4	3.0	1.0	
ø.	٥٥	3.1	2.4	23	2.9	2.3	0.0	
	Ó	i	2	3	4	5	6	



- 4

-2

-4

Systematics

Defined as :

$$S = \frac{\min - \max}{\max}$$
(2)

- 4

-2

-4

0	٥٥	0.5	2.1	0.8	0.3	2.3	0.0	
1		2.6	2.1		0.7	2.8		
2	0.6	0.9	2.2	15	2.5	0.8	1.4	
m		1.6	1.4		1.4	0.9	1.0	
4	0.8	1.4	2.3	1.8	1.3	1.0	0.8	
in -	3.8	2.5	1.6	0.9	0.7	1.7	3.9	
÷.	٥٥	1.0	1.7	1.3	2.4	2.1	0.0	
	ó	i	ż	3	4	ś	6	



4Sq 5

Selection :

- A few % difference with the choice of the definition on the fibre (syst. error)
- New uniformities map can be produced, as an example :
- Using quarters and selecting the nearest fibre
- Arbitrary choose one quarter in the middle squares



Position of the selected blocs

Not so-final result 2



