Last tests performed with 16x16 matrix of 1 mm SiPM and 8 Alcors

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Light source

The source light system is made up of a Xe pulsed lamp at 5 W made by HAMAMATSU, to which is connected a monochromator that gives us the possibility to select a specific wavelength.

In the tests that we present today, we didn't select a specific wavelength.

As input to the lamp we give a pulse signal with a period of 2 ms.





Measurement conditions

- Tests at room temperature
- We set a threshold of 35 for all pixels in order to avoid dark signal during the tests using the Xenon light source
- Acquisitions were made by testing all chips, activating them one at a time

Last tests performed - summary

- Light on all pixels with fiber at 3 cm from the matrix
- Light focused on a side pixel with fiber at 2 mm from pixel 0
- Setup with black screen with a 0.7 mm hole in the center
 - 1. Measurements with light on and patched hole
 - 2. Measurements with light on and open hole

Light on all pixels

- The acquisition time set is 50 frames, where each frame lasts for 102.4 us
- To calculate the light signals detected by SiPMs, we look for signals that have a ToT between 400 and 1000 ns and are at an interval of 2 ms (i.e. the period of the Xenon source)
- Since the acquisition time lasts for 5.12 ms, we expect 3 light signals for each SiPM
- In this type of test we have a low reproducibility

Light signals recorded by the SiPMs



Chip U6, U7 and U8 not acquired acquisition not completed

111/160 pixels detected light

Improving the number of acquisitions we could have more reproducibility

Xenon light centered with respect to pixel 0

0)	2		4		6		8		10		12		14		16		0
	- 42	8	13	16	21	26	24	31	197	194	192	202	200	205	243	242		0
2	- 10	40	15	18	48	23	58	29	199	227	228	233	236	207	241	211		
	- 11	12	45	50	53	55	27	56	230	225	196	201	238	210	209	240		50
4	— 43	9	47	19	20	22	25	61	235	193	231	204	206	208	212	245		50
	-	44	14	17	52	54	59	28	198	195	229	232	239	244	246	247		
6	- 36	41	46	51	49	39	57	60	203	226	215	237	248	213	214	220		
	34	4	37	5	38	3	7	62	234	224	250	218	217	251	219	255		100
8	- 2	33	1	32	6	35	30	63	252	216	253	249	221	254	222	223		
	- 126	125	124	88	95	127	70	66	131	159	163	162	133	130	129	128		
10	- 93	121	92	77	115	94	100	99	164	156	185	165	166	161	167	160	_	150
	- 120	89	90	122	72	106	68	97	132	188	154	149	144	134	135	171		
12	- 91	87	86	110	74	71	103	67	151	158	152	145	137	139	138	169		
	- 123	117	119	78	108	105	101	65	183	190	186	181	173	170	168	172		200
14	- 118	85	84	116	76	69	64	98	150	157	153	148	177	140	136	141		
	— — 112	80	113	82	79	73	75	96	182	191	155	180	146	179	142	174		
16	— 114	81	83	111	109	104	107	102	187	189	184	176	178	147	175	143	_	250

isto_map

The fiber was centered with respect to the pixel of coordinates (0,4) and all the pixel was set to a threshold of 35

Xenon light focused on pixel 0



isto_signal

Even pixels far away from the fiber register 3 light signals

16

12

8

6

4

2

0

For each chip we took 7 10 acquisition files, although not all of them finished the acquisition

Setup with black screen with a 0.7 mm patched hole in the center



In this case, no pixel registers any light signal. Therefore, we can conclude that the black card does not let light through, even if the lamp is on.

Black screen with a 0.7 mm open hole in the center



isto_signal

The light is detected everywhere

For each chip we took 4 acquisition files, although not all of them finished the acquisition (chip U2 and U6 - 3 files)

Hole of the black screen

Conclusions and next steps

- The TPB could act as a light guide
- See papers:
 - "R&D of wavelength-shifting reflectors and characterization of the quantum efficiency of tetraphenyl butadiene and polyethylene naphthalate in liquid argon" (G. R. Araujo)
 - "Wavelength Shifters for Applications in Liquid Argon Detectors" (Marcin Ku´zniak)
 - "VUV-Vis optical characterization of Tetraphenyl-butadiene films on glass and specular reflector substrates from room to liquid Argon temperature" (R. Francini)
- More tests with the 3 mm SiPM matrix, again with TPB to see if there is the same effect
- Tests with the matrix without TPB