

2020

29

VAMOS STAND ALONE

22/01/2020

- Run 100 → First run with ϕ source
 - MWFP (TDC stop FAG)
 - DC

MWFP - Threshold -

Ch: 1) 29,78 mV	8) 19,97 mV	15) 19,90 mV
2) 20,00 mV	9) 21,80 mV	16) 19,85 mV
3) 30,03 mV	10) 29,80 mV	17) 20,24 mV
4) 20,02 mV	11) 24,47 mV	18) 27,10 mV
5) 19,99 mV	12) 31,79 mV	19) 12,39 mV
6) 20,00 mV	13) 31,70 mV	20) 21,51 mV
7) 20,02 mV	14) 23,77 mV 25,58 mV	21) 88,43 mV

DC Wires Threshold

DC1 → 1) 149,7 mV
 → 2) 150,0 mV

DC2 → 1) 151,5 mV
 → 2) 149,5 mV

DSP DC Wires

$$Z = 15 \mu s$$

$$G = 16$$

$$K = 1300 ns$$

$$M = 1300 ns$$

$$Q = 1900 ns$$

$$N = 320 ns$$

23/01/2020

- Run 101 → Run for merger test with new Numexo Modules Config

Registers NUMEXO 2-60-62.

V6

→ CONFIG_V6 → Not common trigger = 3404
 → Common trigger = 3406

→ TRIGGER-1 → a2090 (leading edge + threshold)

- Run 102 → Drift Chamber Pedestal

- Run 103 →  Source (placed at  Right FP)
 NUMEXO Modules: 60-62 inside for
 test

(individual triggers)

HV Detectors (tension)

MUF

FP_Cat S0 540,0 V
 1 μ A
 FP_Cat S1 530,0 V
 1 μ A
 FP_Cat S4 540,0 V
 1 μ A

FP_Cat S2 530,0 V
 1 μ A
 FP_Cat S3 540,0 V
 1 μ A
 FP_Cat S5 540,0 V

DC
Cathodes

FP_DC 1 cat 500,0 V

FP_DC 2 cat 500,0 V

Wires

FP_DC W1 550 V

FP_DC W2 550 V

FP_DC W3 550 V

FP_DC W4 550 V

24/01/2020

here is again the problem with signals below thresholds 31
in the DC tracking NUMEXO in the first 64 channels.

↳ we shift the NUMEXO inputs

NUMEXO 61

DC Pads 0-63 — cho —→ ch1

DC Pads 64-95 — ch1 —→ ch2

DC Pads 96-159 — ch2 —→ ch3

DC Pads 0-63 — ch3 —→ ch4

DC Pads 64-95 — ch4 —→ ch5

DC Pads 96-159 — ch5 —→ ch6

NUMEXO 63

DC2 Pads 0-63 — cho —→ ch1

DC2 Pads 64-95 — ch1 —→ ch2

DC2 Pads 96-159 — ch2 —→ ch3

DC3 Pads 0-63 — ch3 —→ ch4

DC3 Pads 64-95 — ch4 —→ ch5

DC3 Pads 96-159 — ch5 —→ ch6

Run 104 → DC pedestals

Run 105 → DC pulser alignment.

x1

x1 x 2

x1 x 2 x 1.4

x1 x 2 x 2 x 1.4

⇒ Problem with Background introduced by PUESER switching the amplifiers

Run 106 → DC pulser alignment

x1

x1 x 1.4

x1 x 1.4

x1 x 2

↓ cont

→ switching amplifiers extremely wide one by one

32

$X_1 \times X_2 \times 1, 2$

~~XXXX~~ $X_1 \times X_2 \times 1, 19$

$X_1 \times X_2 \times 2 \times 1, 1, 1, 2$

$X_1 \times X_2 \times 5$

Run 107 → Cf source; DC MW ~~IC~~ Calibration

time: 20:10 !!
Friday

~~Later~~ → Sunday ⇒ We detected a Problem with IC ⇒ We are not taking data
We have good data from DC and MW due a problem with adquisition NUMEXO ST

27/01/2020

DAQ tests

NUMEXO TRACKING Tests

Run 108 → Cf source; DC, MW, IC Calibration

time: 19:46 !!
Monday

28/01/2020

MW Pattern NUMEXO: 60

NUMEXO: 62

Problem with a noise



Values in GECO:

Herold

{	old:	a4030	Discriminator leading edge:	Ø
			Discriminator Death Time:	100 ns
	new:	284200 284200	Discriminator Threshold:	Ø
				400 ns
			160	

Run 109 - 111

Ter Pulser

33

1 MW PAC 12 with pulse

pl with NUGAST Pulser and

Swing Signal -

MW CF output width < 20 ns.

Run 112 is lost?
(empty)

Run ~~112~~ 113 → Pulser in MW odd-channels,
check of MW pattern.

16:05

(starts in zero)

30/01/2020

Run 115 → Pulser in MW → channel 14 only

New MW thresholds → ~ 100 mV

→ There is not noise anymore since NUGAST chamber was closed!

Run 117 → cf source during the night - Trigger on fragments

NuMex 60
62 config Register

3404 / 3405 - Individual
AdS
stop AdS
 running

External
Validation
(if connected)

3406 / 3407 → common trigger

34

Energy loss calculationsBeam ^{19}O 8 MeV/u ^{19}O @ target $\rightarrow 7.89$ MeV/u ^{19}O after backing $\rightarrow 6.42$ MeV/u ^{19}O @ VAMOS (1 Target DG) $\rightarrow 6.27$ MeV/u
 ^{19}O @ IC (100 uBar) ± 10 | ± 1 |
 $\Delta E \rightarrow$ ~~5.2 MeV~~ | ~~2.43 MeV~~ |
 (MeV) 8 MeV 8.5
Straggling in Au-backing (10 μm)Energy (sigma) $\rightarrow 15$ KeV/uAngular (sigma) $\rightarrow 16$ μrad CDZ

$$\rho = 0.79867 \text{ g/cm}^3$$

$$C \rightarrow 12.011$$

$$D \rightarrow 2.015$$

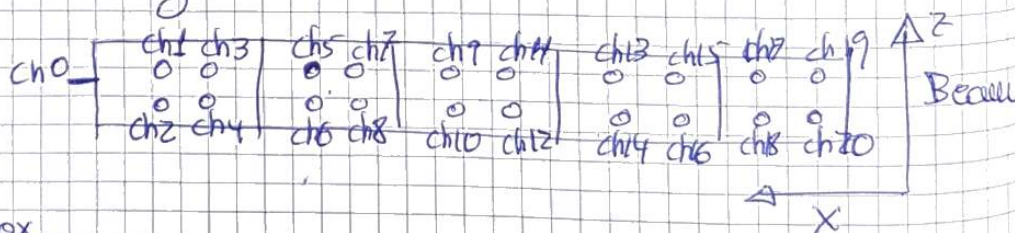
$$^{20}\text{O} \rightarrow (5 \text{ MeV} \cdot \text{Er})$$

Run 11331/01/2020

CP source for MWPPAC cabling check

14:23 | $\Rightarrow$ small run.to
15:03 |

MWPPAC cabling scheme:

HV box

FP_CATS0	—	Ch0	Ch1	—	Ch9	(-530V)
FP_CATS1	—	Ch1	Ch2	Ch3	Ch4	(530V)
FP_CATS2	—	Ch5	Ch6	Ch7	Ch8	(530V)
FP_CATS3	—	Ch10	Ch11	Ch12		(530V)
FP_CATS4	—	Ch13	Ch14	Ch15	Ch16	(530V)
FP_CATS5	—	Ch17	Ch18	Ch19	Ch20	(530V)

2/02/2020

35

6 μ s merger window $\rightarrow$ only $\frac{1}{2}$ Day merged.
12 μ s merger window $\rightarrow$ full Day properly merged

5/02/2020

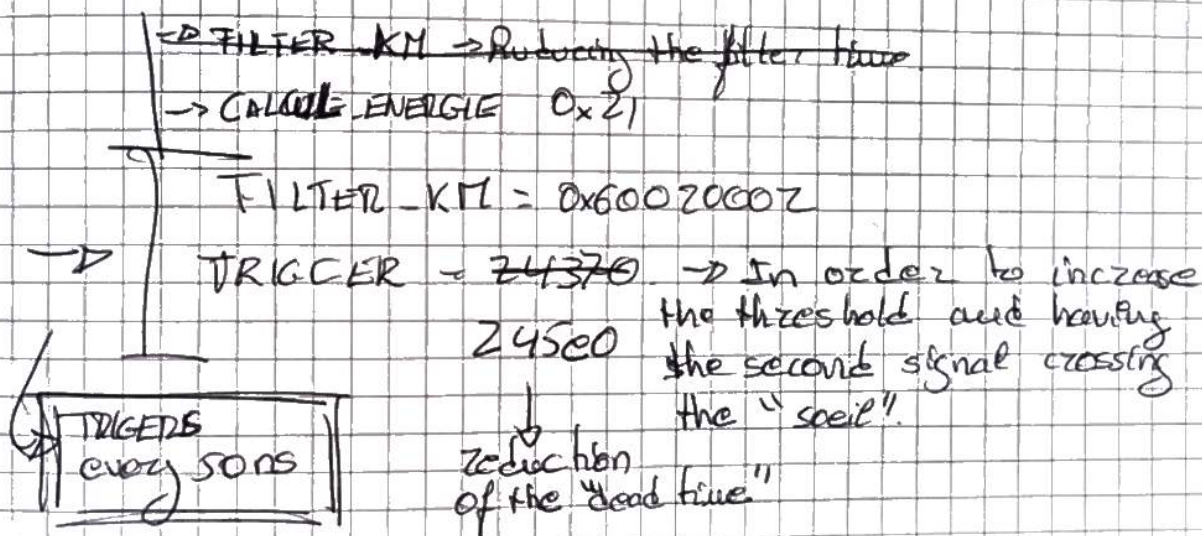
TESTS on the MW pattern with NUMEXO.

~~Run 124~~ ~~using 2 channels during the 30s~~

$\rightarrow$ MW channel = 2 with 2 signals delayed ~ 200 ns each other.

$\rightarrow$ In inspection Numexo is able to create 2 trigger request.

FILTER ADAPTATION:



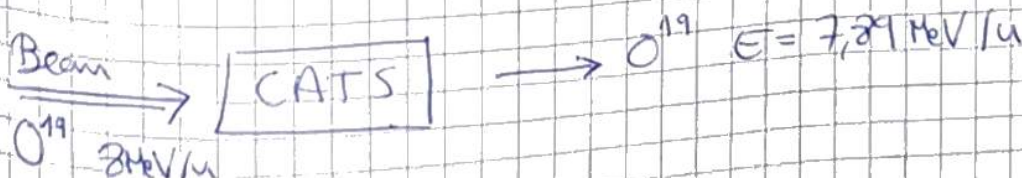
$\rightarrow$ Run 124

For each trigger there is 1 signal in MW Nz = 21 and 2 signals in MW Nz = 2, with a delay between them of 50 ns

$\rightarrow$ Run 125 $\rightarrow$ delay between signals of ~ 100 ns

6/02/2020

LISE Calculation



7/02/2020

LISE++ Calculations

Energy
Bp

After CAS

$$^{19}\text{O} \quad E = 7,89 \text{ MeV/u}$$

$$E(^{19}\text{O} (1/2 \text{ target})) = 7,86 \text{ MeV/u}$$

$$\downarrow$$

$$\text{@VAMOS} \quad E = 6,2195 \text{ MeV/u}$$

$$\left\{ \begin{array}{l} 8+ \quad ^{19}\text{O} \quad B_p = 0,8511 \text{ Tm} \\ 7+ \quad ^{19}\text{O} \quad B_p = 0,9762 \text{ Tm} \end{array} \right.$$

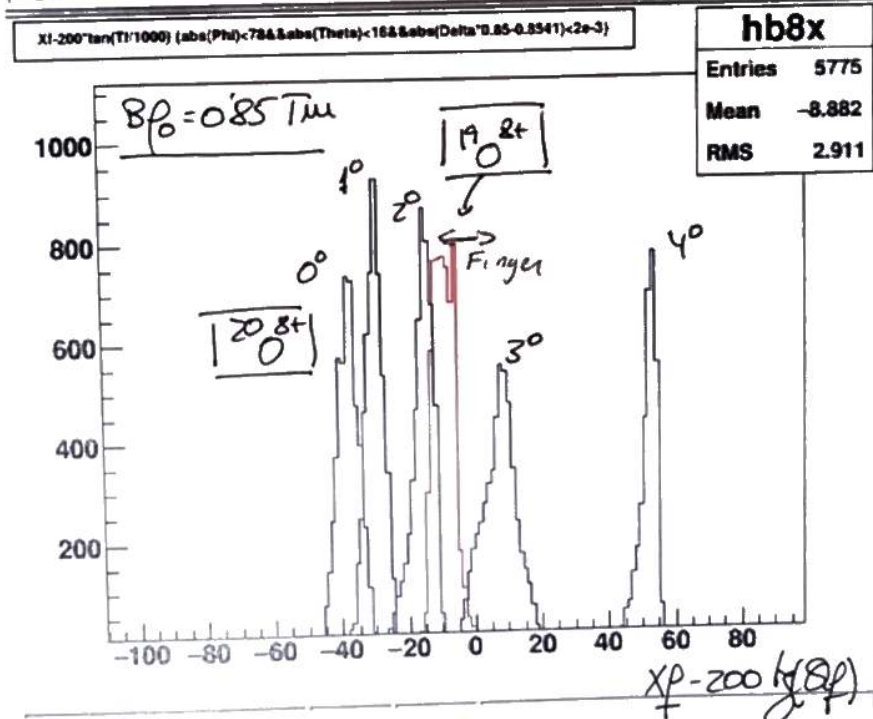
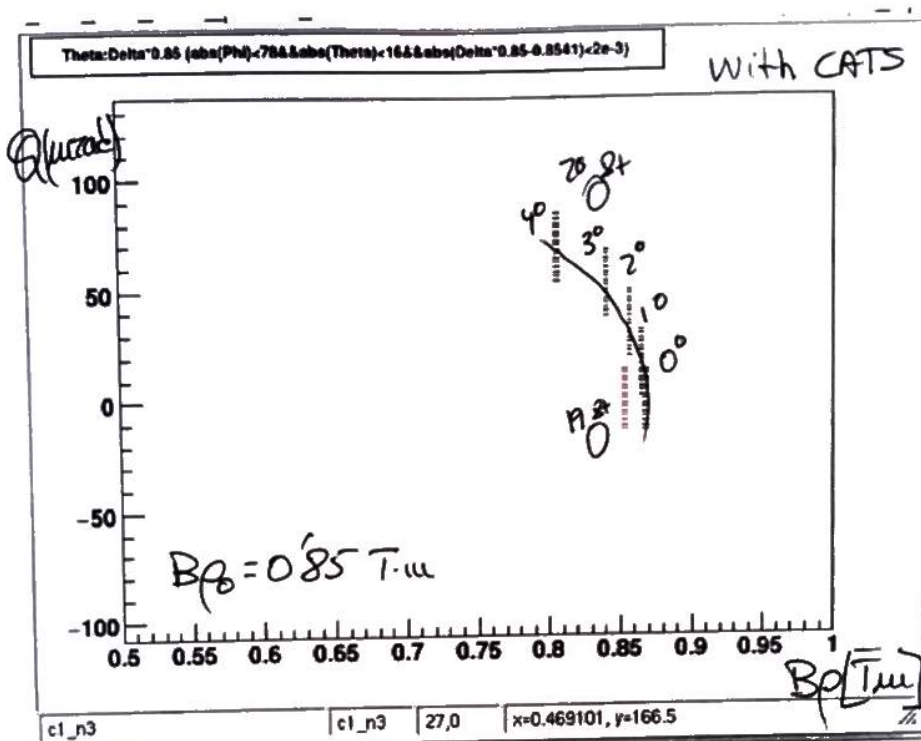
1/2 Target Reaction $\Rightarrow ^{20}\text{O}$
(LBE target H₂ only)

Maximum Angle θ^{20} is $4,25^\circ$

^{20}O	E_1	E_2	$E_1 \text{@VAMOS}$	$E_2 \text{@VAMOS}$
0°	7,415	5,503	5,8035	3,3506
1°	7,381	5,526	5,7681	3,579
2°	7,286	5,60	5,6561	3,6705
3°	7,1	5,747	5,4132	3,8502
4°	6,72	6,072	5,0042	4,2421

^{20}O	$B_p(E_1) \text{@VAMOS}$	$B_p(E_2) \text{@VAMOS}$	LAB ^{20}O P E_p (MeV)	CM($^\circ$)	σ (mb/sr)
0°	8+ 0,86844	0,67886	0° 120 1,412	0°	1,5
0°	7+ 0,99253	0,77586	1° 150,25 2,026	14,61	0,1
1°	8+ 0,86578	0,68158	2° 125,129 3,969	30,04	0,07
1°	7+ 0,98948	0,77897	3° 87,922 7,669	47,92	<
2°	8+ 0,8573	0,69025	4° 66,705 15,205	71,64	<
2°	7+ 0,97998	0,78898	$4,25^\circ$ 54,102 21,04		
3°	8+ 0,84097	0,70698			
3°	7+ 0,96113	0,808			
4°	8+ 0,80625	0,74217			
4°	7+ 0,92145	0,8821			

Te 775 s



(mb/sr)

5

1

07

So no CATS // no RUST2 // no 30°
 and finger on 19 0
 Right tail 2°
 1st selling varos %
 an RUST

10/02/2020

Run 127

of source, test TDC

Small run wire one position not working

(11:44)

Run 128

test TWIRE

Small run

Time Calibrator

(15:34)

period 0,08 μ sec
range 5,12 μ sec

Problems with module
TAN in TAN out

We moved to another module $\Rightarrow$ new run.Run 129

test TWIRE

Small run

Time Calibrator

(15:55)

TWIRE 0-1-2-3

period 0,08 μ sec
range 5,12 μ sec

Run 130

Small run

(16:40)

test

Time Calibrator

MUGAST HF $\rightarrow$ ~~CATS2 HF~~
MUGAST FPMW
FPMW CATS2 $\rightarrow$ ~~FPMW HF~~
FPMW HF $\rightarrow$ ~~FPMW HF~~

period 0,02 μ sec
range 2,56 μ sec

TACSB3 $\rightarrow$ ch5 $\rightarrow$ R = 1 μ sB3 $\rightarrow$ ch6 $\rightarrow$ R = 500 nsB3 $\rightarrow$ ch7 $\rightarrow$ R = 1 μ sB3 $\rightarrow$ ch8 $\rightarrow$ R = 2 μ s

(Labels)

- MUGAST-HF

- MUGAST-FPMW

- FPMW-CATS2

- FPMW-HF

(Analysis)

- T-CATS2-HF $\leftarrow$ to be checked

- T-MUGAST-FPMW

- T-FPMW-CATS2

- T-FPMW-HF

11/02/2020

41

Run 131

test

TDC

EWIRE 1.1 → Silicon at target

small run

11:35

Run 133

equal to Run 131 without validation window

11:52

Run 134

equal to Run 133 with Quadrupole field
550 A

12/02/2020

LISE++ Calculations

Energy

Bp

1/2 target of

CD₂ ⇒⇒ 0,15 mg/cm²Witost CATS

019 E = 8 MeV/u

$E(^{19}\text{O} \text{ (1/2 target)}) = 7,97558 \text{ MeV/u}$

@ VAMOS E = 6,3782 MeV/u

$$^{19}\text{O} \begin{cases} 0^{8+} & B_p = 0,86501 \text{ Tm} \\ 0^{7+} & B_p = 0,98861 \text{ Tm} \end{cases}$$

1/2 target reaction ⇒ ^{20}O
(like target H₂ m = 2.045 only)

Maximum angle 0^{20} is 4,25° ^{20}O with 5 MeV excitation energy

^{20}O	E_1	E_2	$E_1 @ \text{VAMOS}$	$E_2 @ \text{VAMOS}$
0°	7,496	5,548	5,9231	3,644
1°	7,464	5,571	5,8869	3,6723
2°	7,365	5,647	5,7746	3,7653
3°	7,175	5,797	5,5579	3,9463
4°	6,787	6,128	5,1127	4,3427

^{20}O	$B_p (E_1) @ \text{VAMOS}$	$B_p (E_2) @ \text{VAMOS}$	$\omega(p)$	$E_p (\text{MeV})$	$\phi (0^{20})$	$\sigma (\text{b/s})$
0° 8+	0,87737	0,68775				
0° 7+	1,00273	0,78602	180°	1,391	0°	1,5
1° 8+	0,87467	0,69042				
1° 7+	0,99965	0,78907	138,488°	2,015	14,619°	0,1
2° 8+	0,86626	0,69913				
2° 7+	0,99004	0,79902	109,958°	3,979	30,089°	0,1
3° 8+	0,84981	0,71577				
3° 7+	0,97123	0,81804	88,898°	7,311	47,912°	<
4° 8+	0,81796	0,75094				
4° 7+	0,93141	0,85824	66,674°	15,431	74,141°	<

13/02/2020

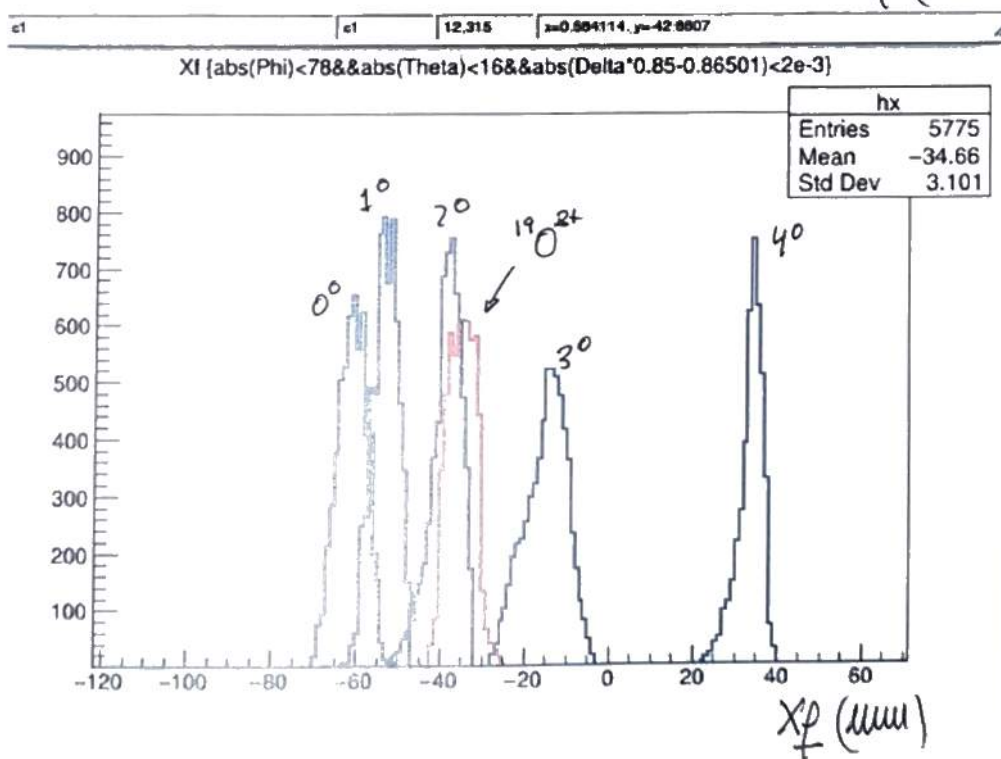
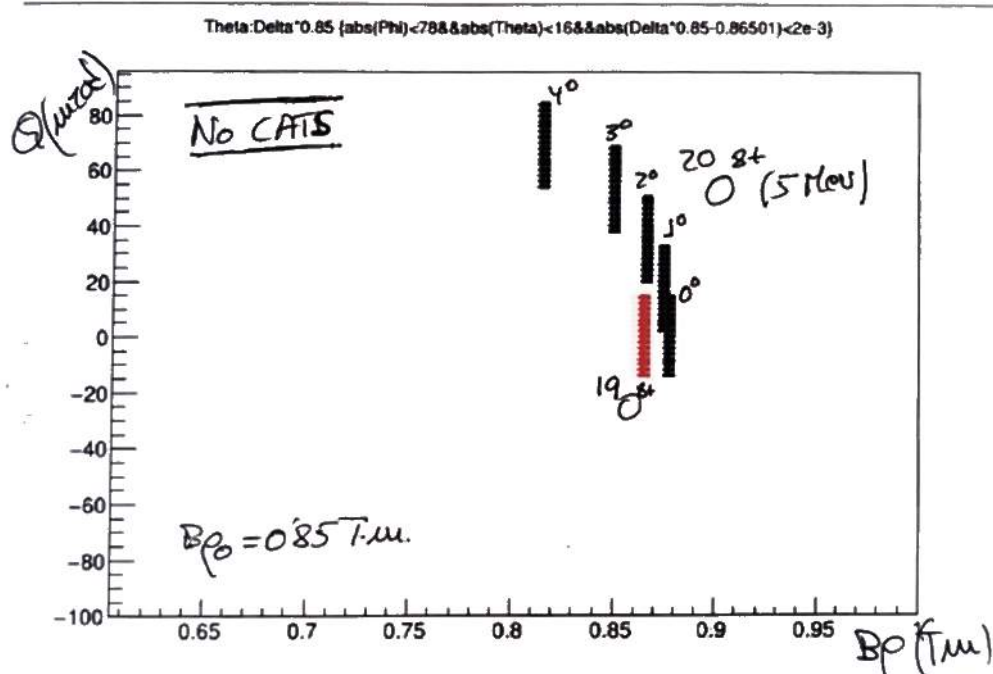
43

MUGAST

e775s

Run 11Source Target DC, ϕ source trigger in Silicon

12:26



Run 12 equal to Run 11

13mbars } TDC
545V

INSPECTION Bloch

61-63

57-58-59

60-62

TDC
ADC

L11	L11	A1	FAG	PPACS VALID	CATS2	or 8
L12	L12	L11	TRIGGER VANDS	HF-VALID	x	x
A11	A11	L12	DT-TGV-VANDS	WIRE1	x	HF-not valid
A12	A12	LT	DT-TGV-ACAP	DT-VANDS ALL	MUGABT @TACS	HF @TACS

17/02/2020

Run 13 Pedestal DC focal plane

11:59

Run 14

Pulses on DC focal plane alignment

~~12:52~~ 12:52

x1

(10)

x1 x 1, 2, 4

(14)

~~x1 x 2~~

x1 x 2

(22)

x1 x 1, 2 x 2

(24)

x1 x 1, 2 x 1, 4 x 2

(36)

x1 x 1, 4 x 2

(28)

~~x1 x 5~~ x1 x 5

x1 x 5 x 1, 2

x1 x 5 x 2

~~x1 x 5 x 2~~

46

Run 15

Pulsar IC

→ alignment

station
x10 x1.4

x1

x1 x 2

x1 x 1.2 x 2

x1 x 2.5 x 1.2 x 2

x1 x 2.5 x 1.2 x 2 x 2

18/07/2020

Run 22 → TRIGGER → OR-X → for individual crystals alignment.→ All crystals within 200 ns (AGATA) in the OR-XRun 26 → Trigger → SP @ Target (50 x 80 mm) after large DC (~15 cm away).

→ No Magnetic field

DC @ Target HV → +526 V | Pressure 13 mbar
-225 VRun 27 → Trigger → SP @ Target→ Magnetic field 230 ADC @ Target HV → +526 V | pressure 13 mbar
-225 VEfficiency X 2.4 DC target → 95%
(Global)

19/02/2020

47

Run 35

CP Source at Focal Plane (FP)
Finger at the middle of FP

New thresholds DCs:

DC0 $\rightarrow$ -200 mVDC1 $\rightarrow$ -200 mVDC2 $\rightarrow$ -200 mVDC3 $\rightarrow$ -200 mV

$\rightarrow$ Wrong DCY
Bad Muxero.
TAC config.

Run 36 $\rightarrow$ CP source @ Focal Plane
Finger polarized

Running during the
night (Reference Run)

FP MWnew Thresholds (* $\equiv$ old value)

0 1) 151,1 mV	2 8) 103,2 mV *	14 15) 159,9 mV
1 2) 150,4 mV	8 9) 97,82 mV *	15 16) 99,11 mV #
2 3) 151,7 mV	9 10) 119,4 mV	16 17) 103,14 mV #
3 4) 152,8 mV	10 11) 98,56 mV *	17 18) 95,20 mV #
4 5) 153,7 mV	11 12) 570,8 mV (maximum)	18 19) 94,04 mV # $\uparrow \rightarrow 150$
5 6) 150,0 mV	12 13) 150,3 mV $\downarrow 120$	19 20) 94,26 mV # $\uparrow \rightarrow 150$
6 7) 152,3 mV $\downarrow 120$	13 14) 150,5 mV	20 21) 576,4 mV (maximum)

Run 38

$\rightarrow$ CP source @ Focal Plane
(Without Finger)

Testing for channels of FP MW
with the new thresholds

Running during the
night

21/02/2020

Run 39

of source to check APAC Thresholds

New Thresholds MW/PPAC

1) 571,0 mV	8) 74,67 mV	15) 71,65 mV
2) 78,57 mV	9) 65,22 mV	16) 73,00 mV
3) 73,58 mV	10) 65,54 mV	17) 75,91 mV
4) 61,43 mV → 82,23 mV	11) 65,60 mV	18) 72,85 mV
5) 61,95 mV	12) 570,8 mV	19) 73,6 mV
6) 63,03 mV	13) 61,45 mV	20) 74,38 mV
7) 63,87 mV	14) 74,46 mV	21) 576,2 mV

Run 40 of source to check MW/PPAC New Thresholds