Un prototipo de m'odulo para el SCT de ATLAS

- Introducción

  El acelerador LHC

  El detector ATLAS

  El detector de trazas de Silicio

- El módulo VAL-2

  Construcción

  Test con fuente radiactiva

  Test en haz

- Conclusiones

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Pagina WWW: http://ific.uv.es/sct/

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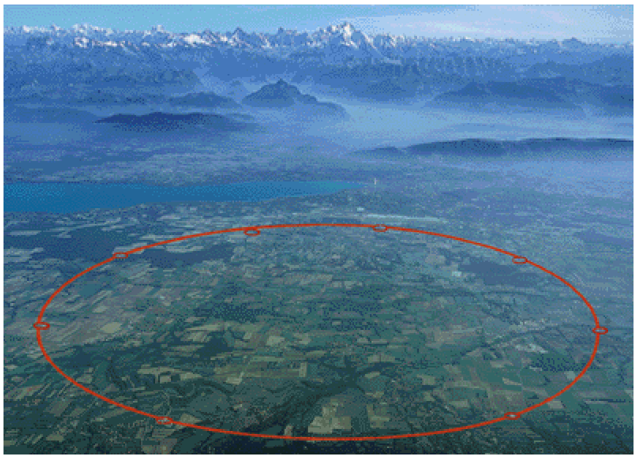
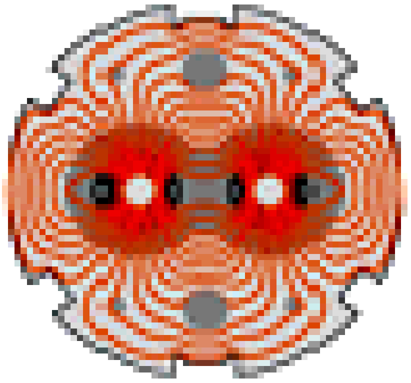
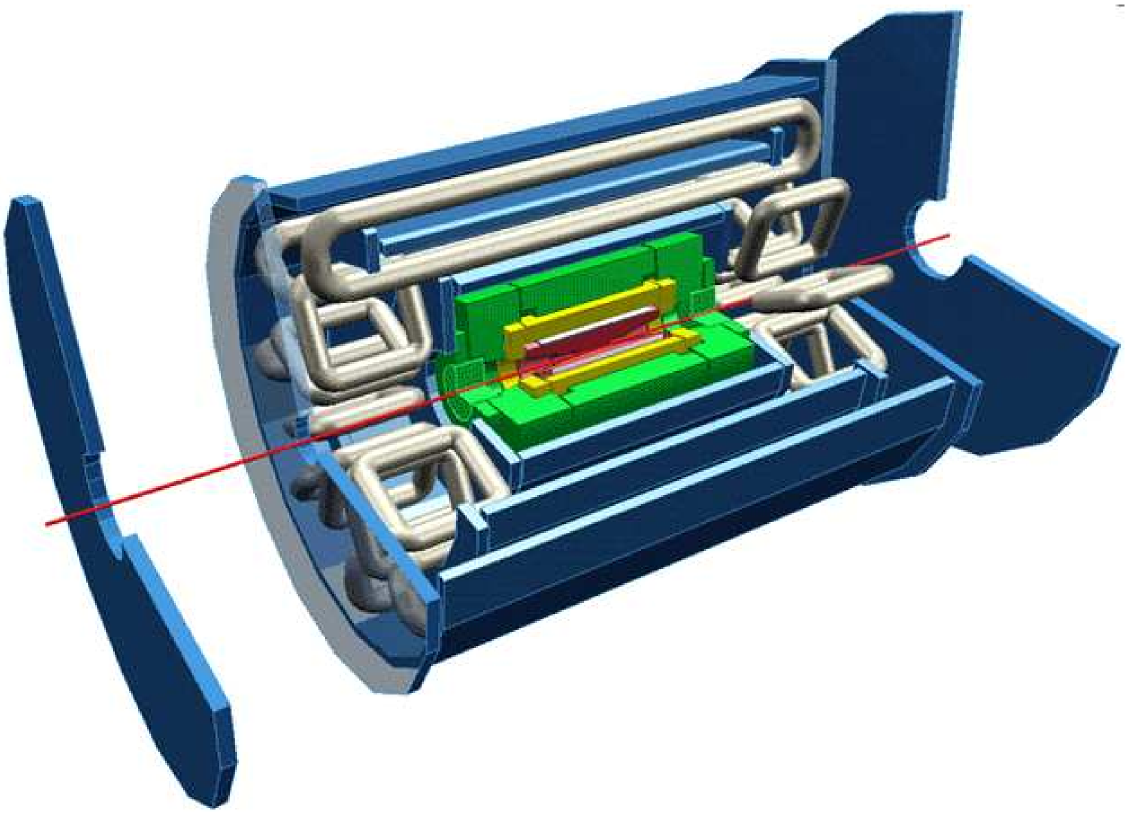
Introducción LHC

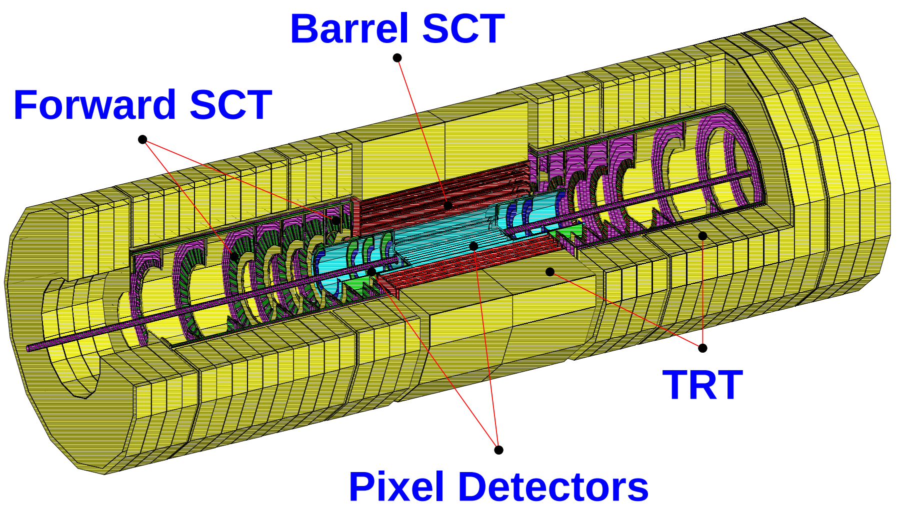




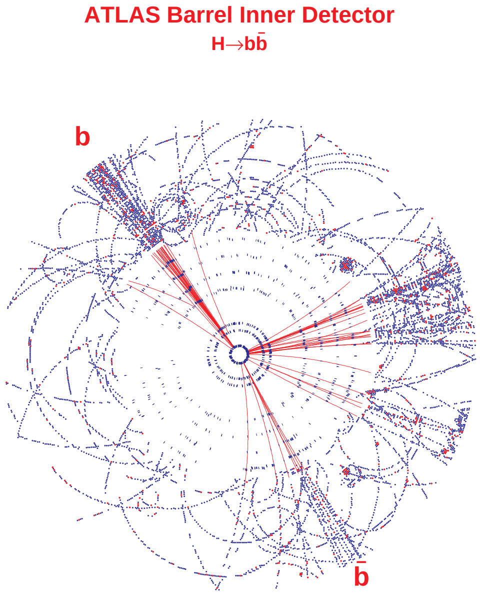
Colisiones	$p-p$
Circunferencia	$27km$
Campo del dipolo	$8.4Tesla$
Energ'ia por haz	$7.0TeV$
Luminosidad	$10^{34}cm^{-2}s^{-1}$
Espacio entre paquetes	$25ns$

Introducción ATLAS

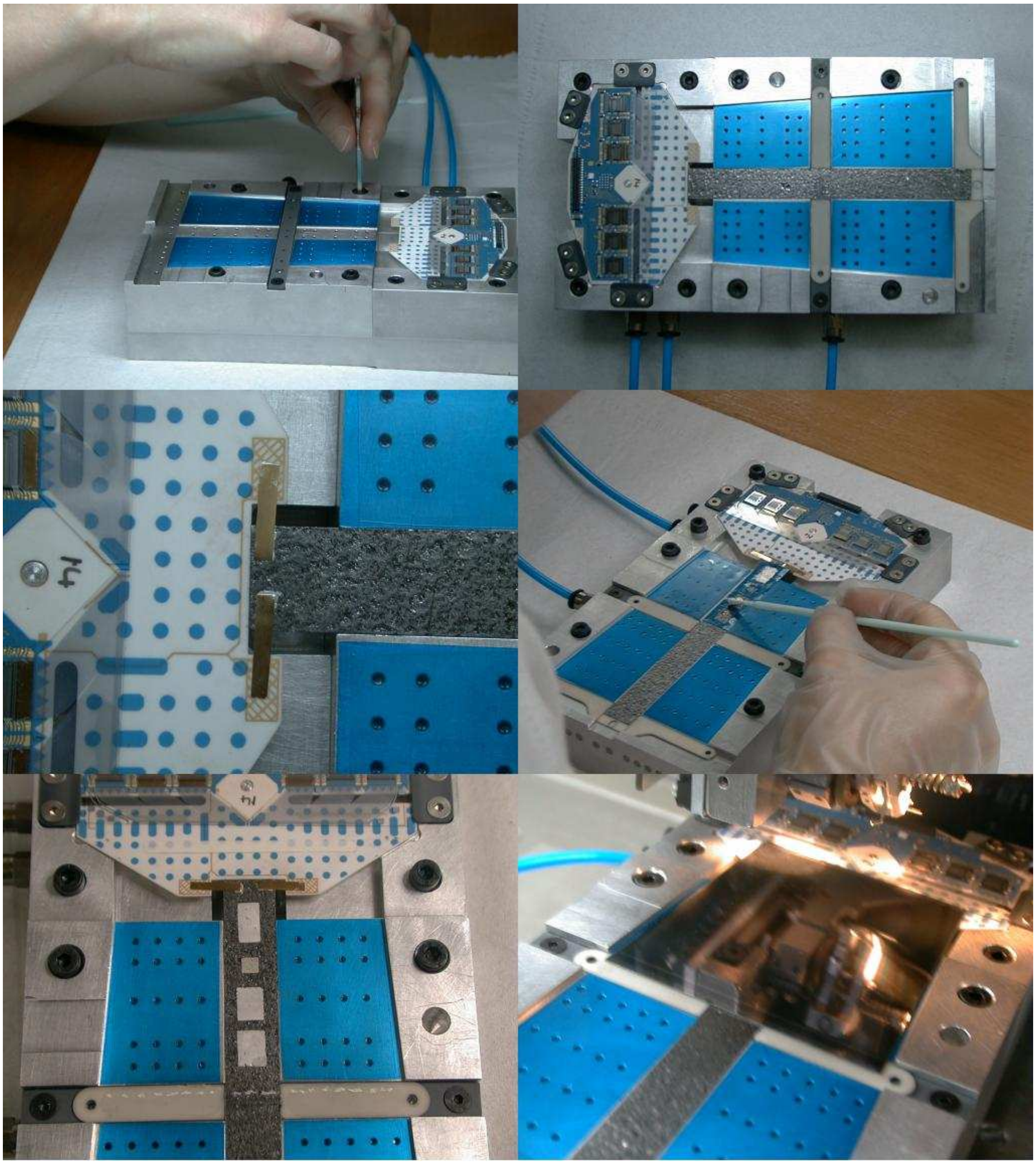




ATLAS Inner Detector



VAL-2: pasos de ensamblaje



BeO Liverpool hybrid

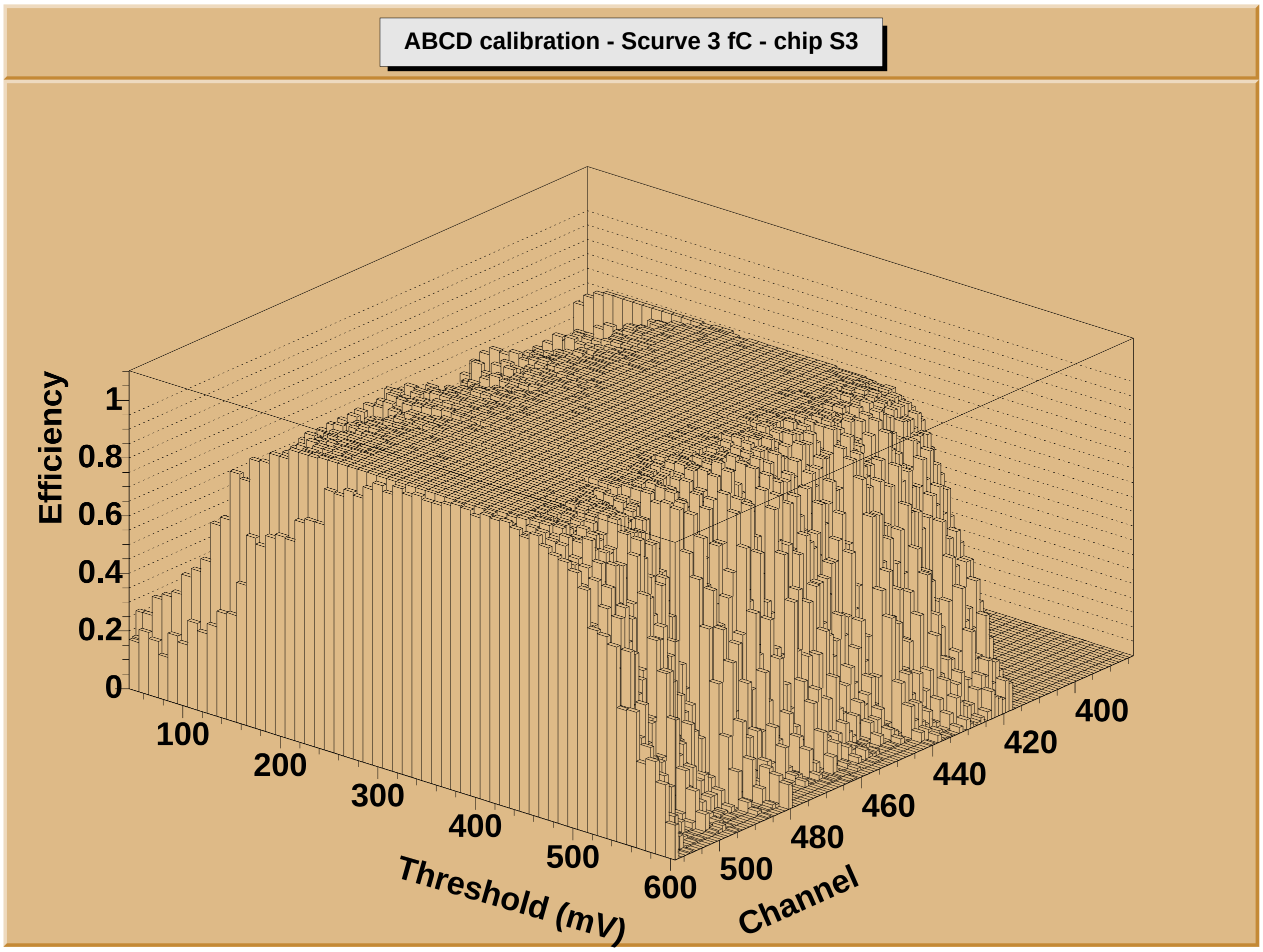
4 detectores n^+n Hamamatsu de geometría trapezoidal

cable de Kapton forward

Melbourne support card

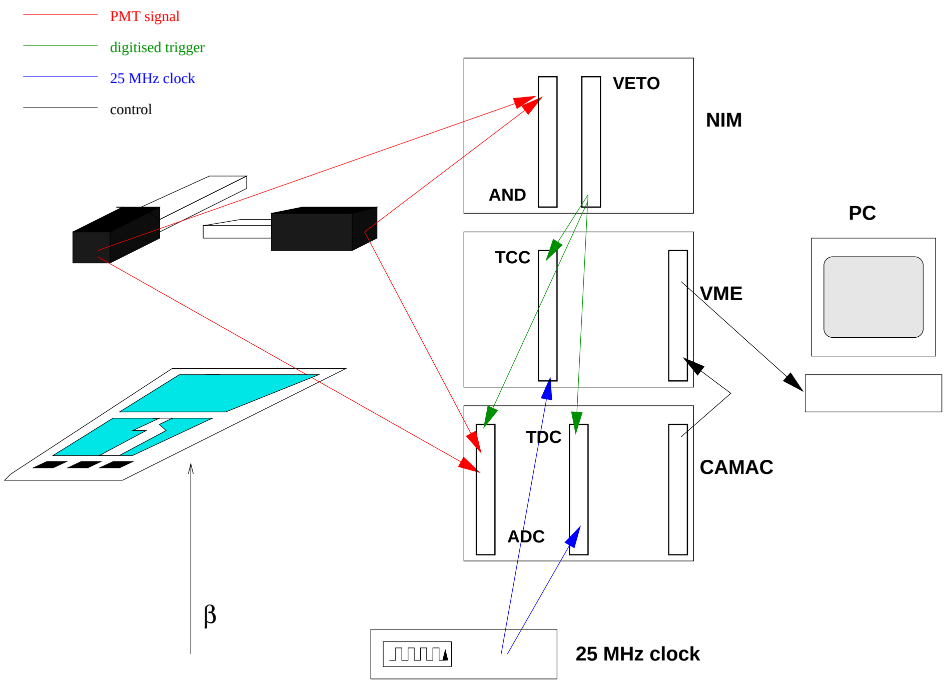
12 ABCD FE chips, tipo n

	Generación	*Lamina de oro*	*Bondado*
M0	ABCD-2	n	sin bondar
S1	ABCD-2	n	sin bondar
S2	ABCD-2	y	12 cm
S3	ABCD-2	y	6 cm
S4	ABCD-2	y	6 cm
S5	ABCD-2	n	sin bondar
M8	ABCD-1	n	sin bondar
S9	ABCD-1	n	6 cm
S10	ABCD-1	n	6 cm
S11	ABCD-1	n	sin bondar
S12	ABCD-1	n	sin bondar
E13	ABCD-2	y	sin bondar

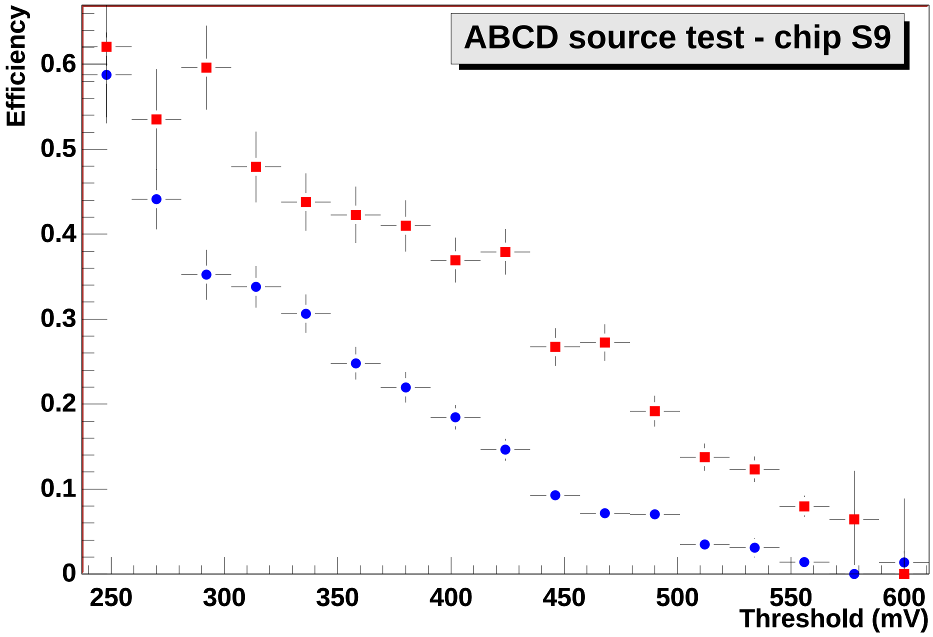


	Gain (mV/fC)	*Offset (mV)*	*ENC at 3 fC*
S2	77 ± 33	120 ± 90	~ 2500
S3	115 ± 3	130 ± 13	1322 ± 100
S4	111 ± 8	83 ± 12	2000 ± 250
S9	~ 95	~ 100	> 3000
S10	89 ± 43	~ 40	> 3000

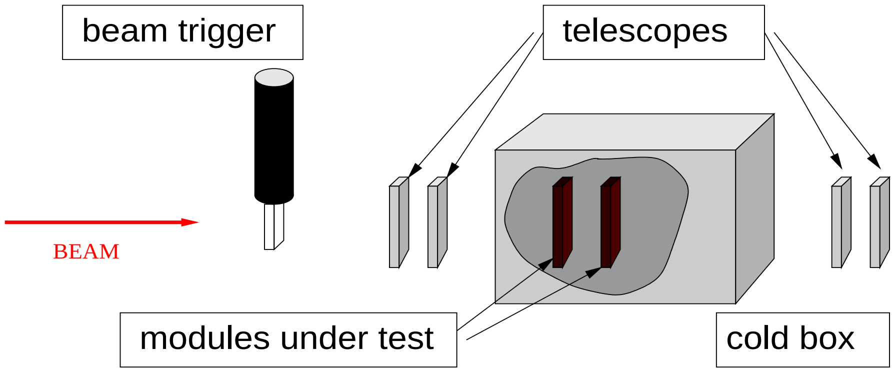
Test con fuente radiactiva

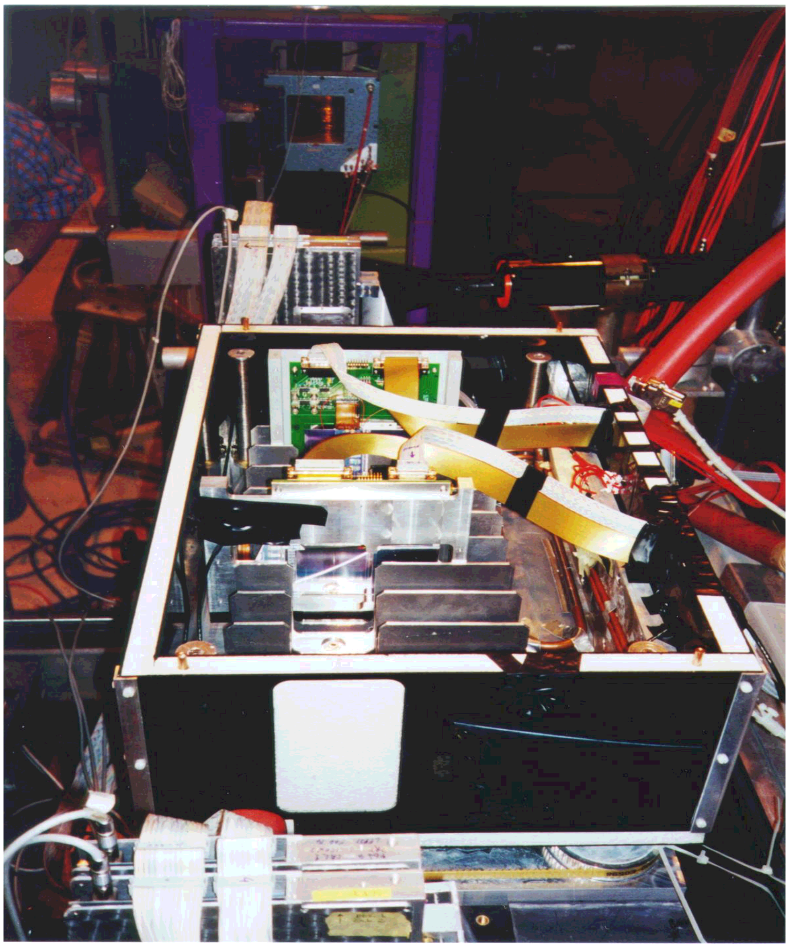


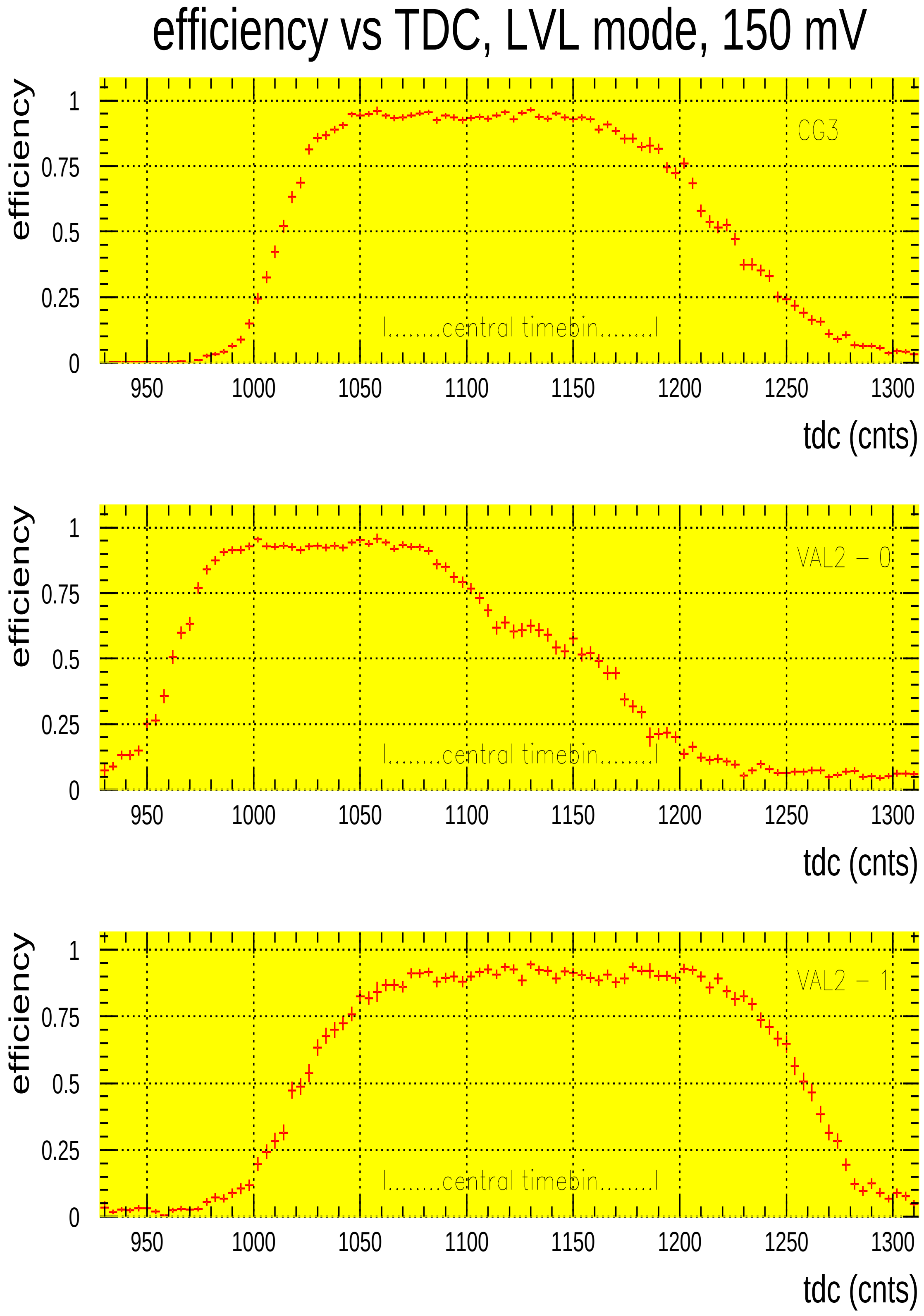
$$^{90}_{38}Sr \rightarrow \sim 2MeV \;\; \beta$$



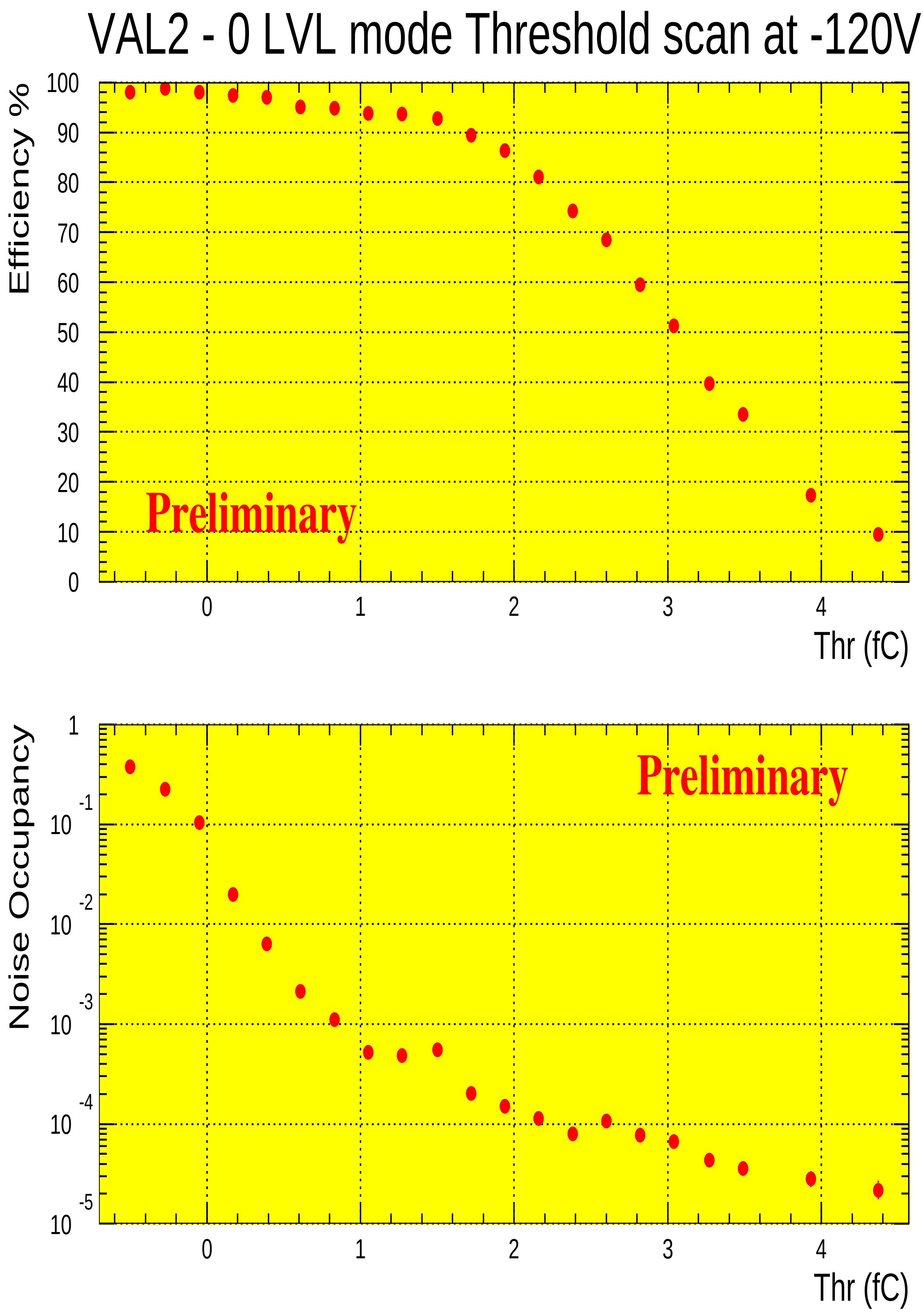
TESTBEAM SETUP

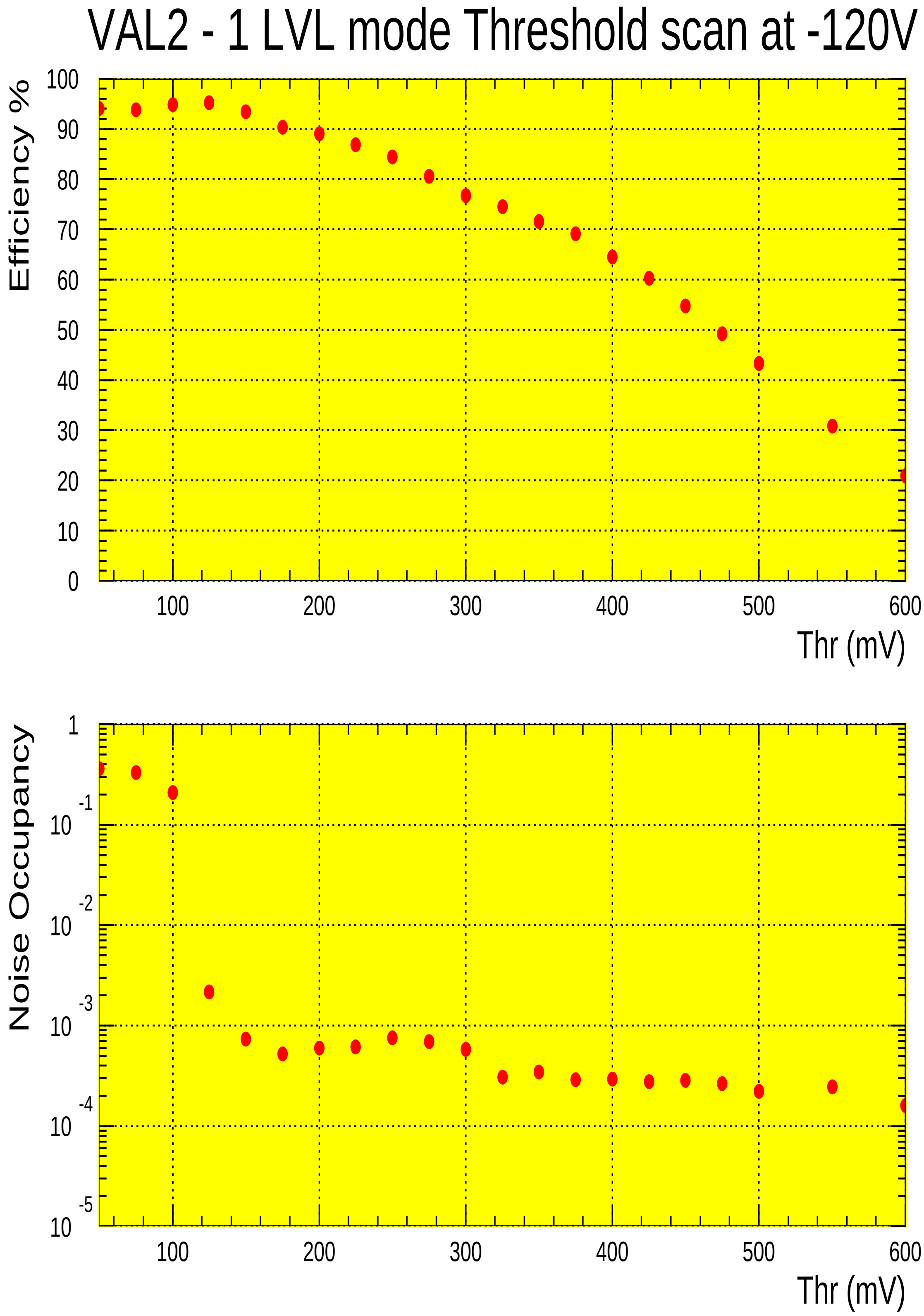




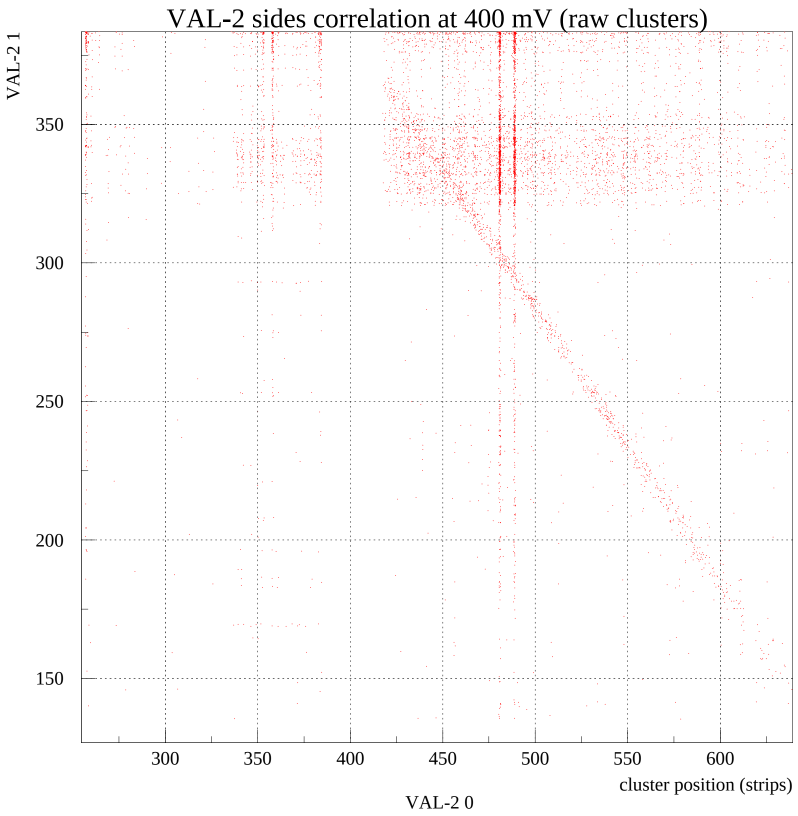

efficiency vs TDC, LVL mode, 150 mV
efficiency
1
0.75
0.5
0.25
0
950
1000
1050
1100
1150
1200
1250
1300
tdc (cnts)
CG3
I.......central timebin.......I
VAL2 – 0
VAL2 – 1

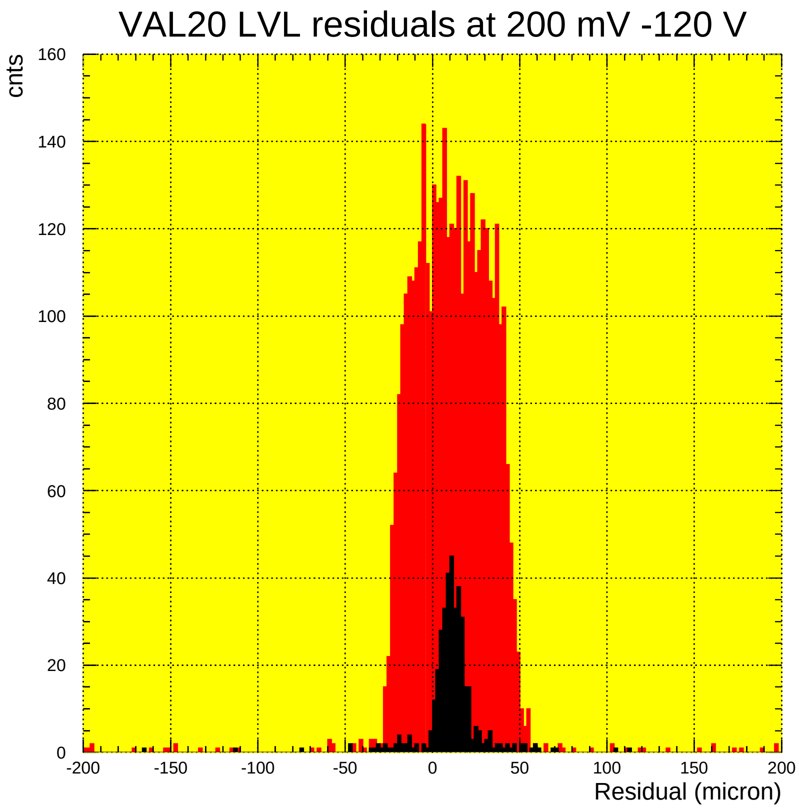
IFIC

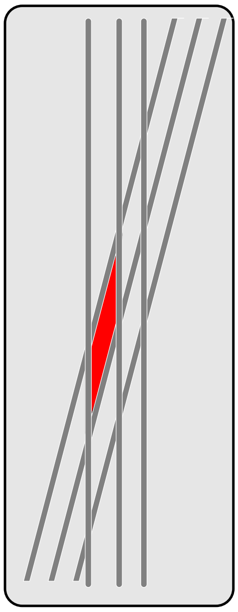

VAL2 - 0 LVL mode Threshold scan at -120V
Efficiency %
100
90
80
70
60
50
40
30
20
10
0
Preliminary
0
1
2
3
4
Thr (fC)
Noise Occupancy
1
10 -1
10 -2
10 -3
10 -4
10 -5
Preliminary
0
1
2
3
4
Thr (fC)

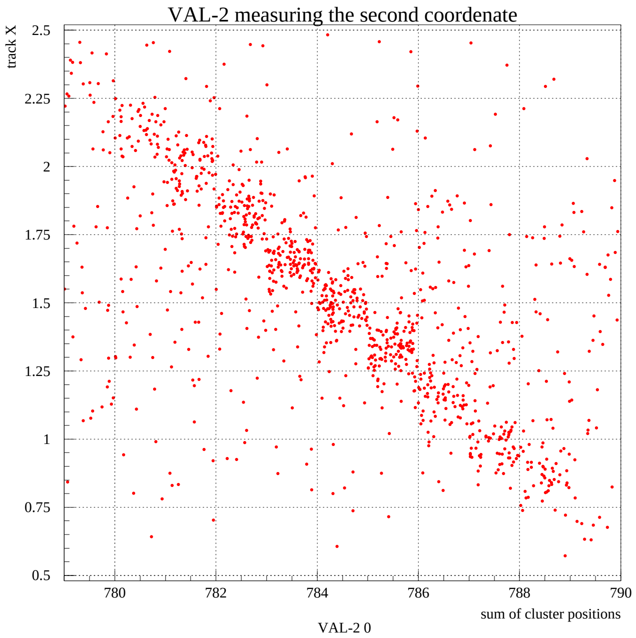

VAL2 - 1 LVL mode Threshold scan at -120V
Efficiency %
Thr (mV)
Noise Occupancy
Thr (mV)

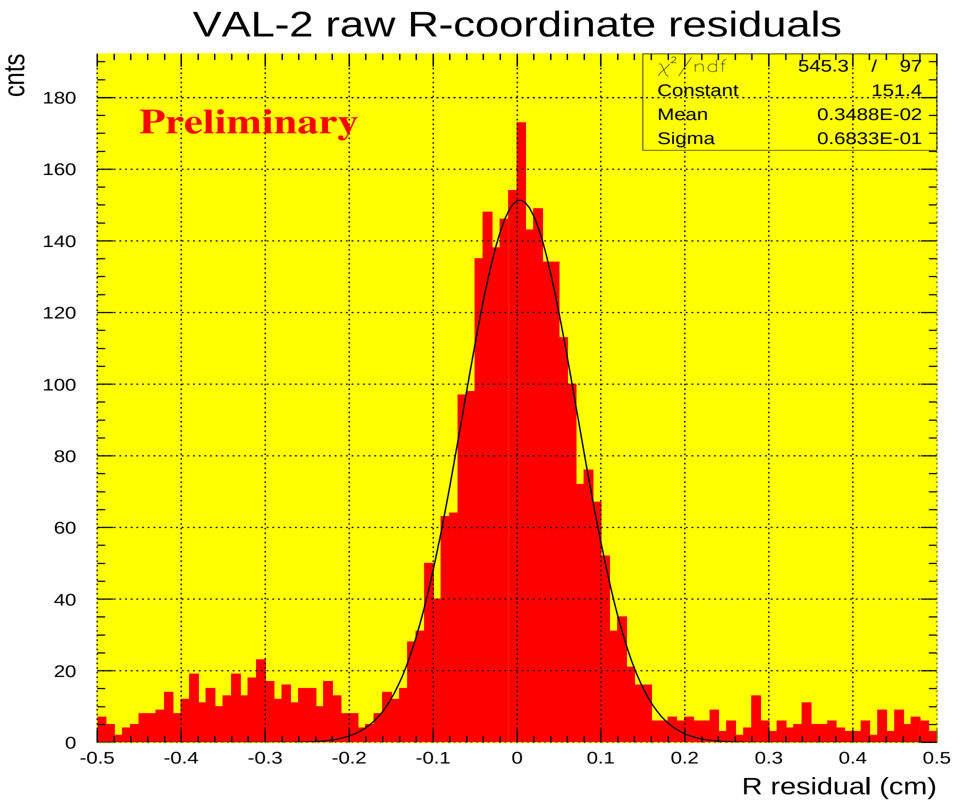
IFIC

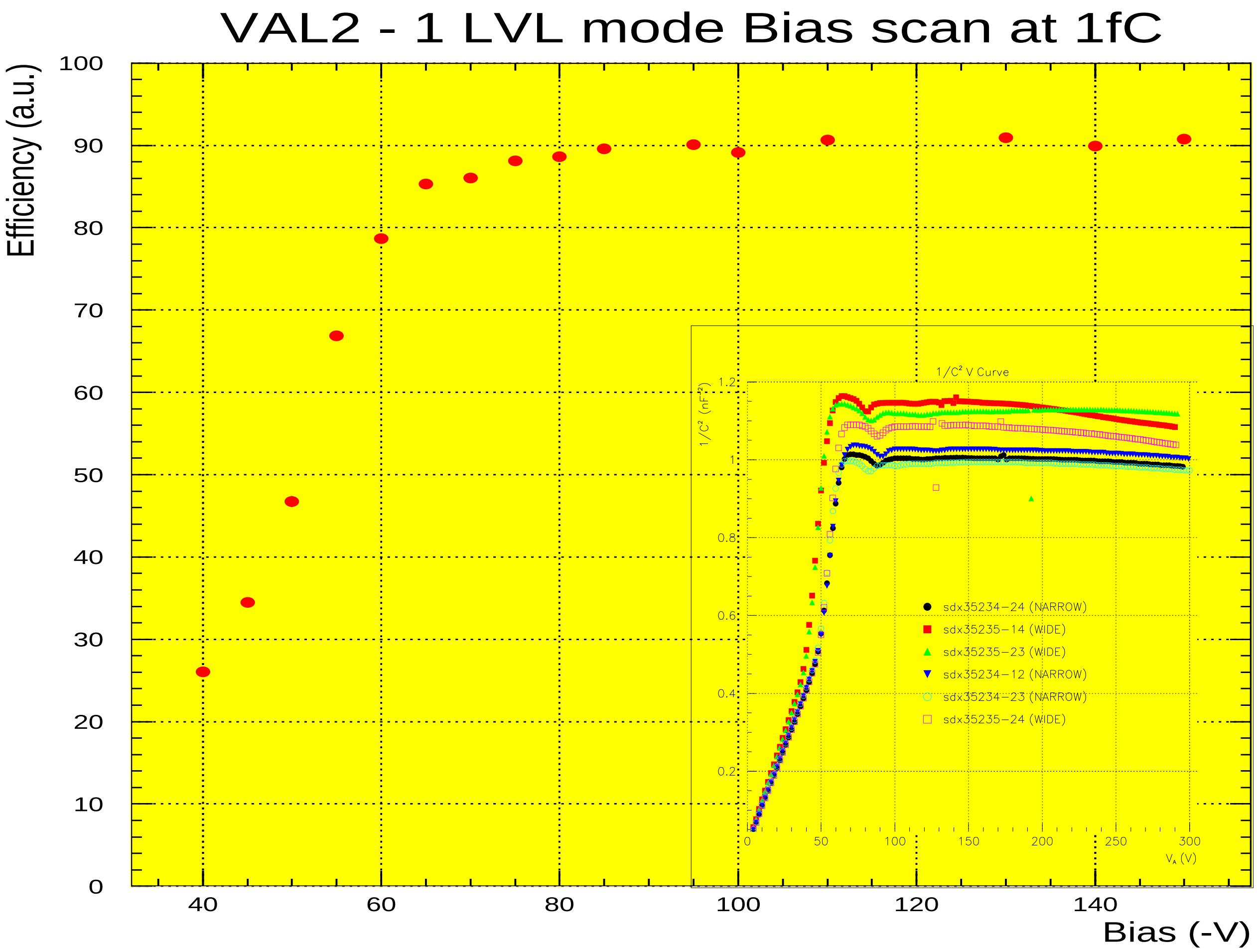

VAL-2 sides correlation at 400 mV (raw clusters)
VAL-2 1
350
300
250
200
150
300
350
400
450
500
550
600
cluster position (strips)
VAL-2 0


VAL20 LVL residuals at 200 mV -120 V
cnts
160
140
120
100
80
60
40
20
0
-200
-150
-100
-50
0
50
100
150
200
Residual (micron)




VAL-2 measuring the second coordenate
track X
sum of cluster positions
VAL-2 0


VAL-2 raw R-coordinate residuals
cnts
Preliminary
χ^2/ndf 545.3 / 97
Constant 151.4
Mean 0.3488E-02
Sigma 0.6833E-01
R residual (cm)


VAL2 - 1 LVL mode Bias scan at 1fC
Efficiency (a.u.)
Bias (-V)
1/C² V Curve
sdx35234-24 (NARROW)
sdx35235-14 (WIDE)
sdx35235-23 (WIDE)
sdx35234-12 (NARROW)
sdx35234-23 (NARROW)
sdx35235-24 (WIDE)
V_A (V)

Conclusiones

- IFIC Valencia ha construido el primer módulo de geometría forward completamente poblado con ABCD FE chips
- El estado de la electronica FE no permite trabajar con 12 cm de detector
- Bondando a 6 cm, el comportamiento del módulo es como se espera
- Resultados de los chips de segunda generación

	VAL-2	Especificación
Eficiencia en $1fC$	0.95	0.99
Ruido en $1fC$	5×10^{-4}	5×10^{-4}
Resolución ϕ	$20.5\mu m$	$23\mu m$
Resolución R	$690\mu m$	$700\mu m$