INTEGRAL Spectrometer

Minutes of SPI Scientific Team Meeting
MPE - Garching, June 20-21, 2002

SPI-CR-0-4275-CESR

Minutes

SPI Scientific Team Meeting

MPE Garching - June 20-21, 2002

PARTICIPANTS:

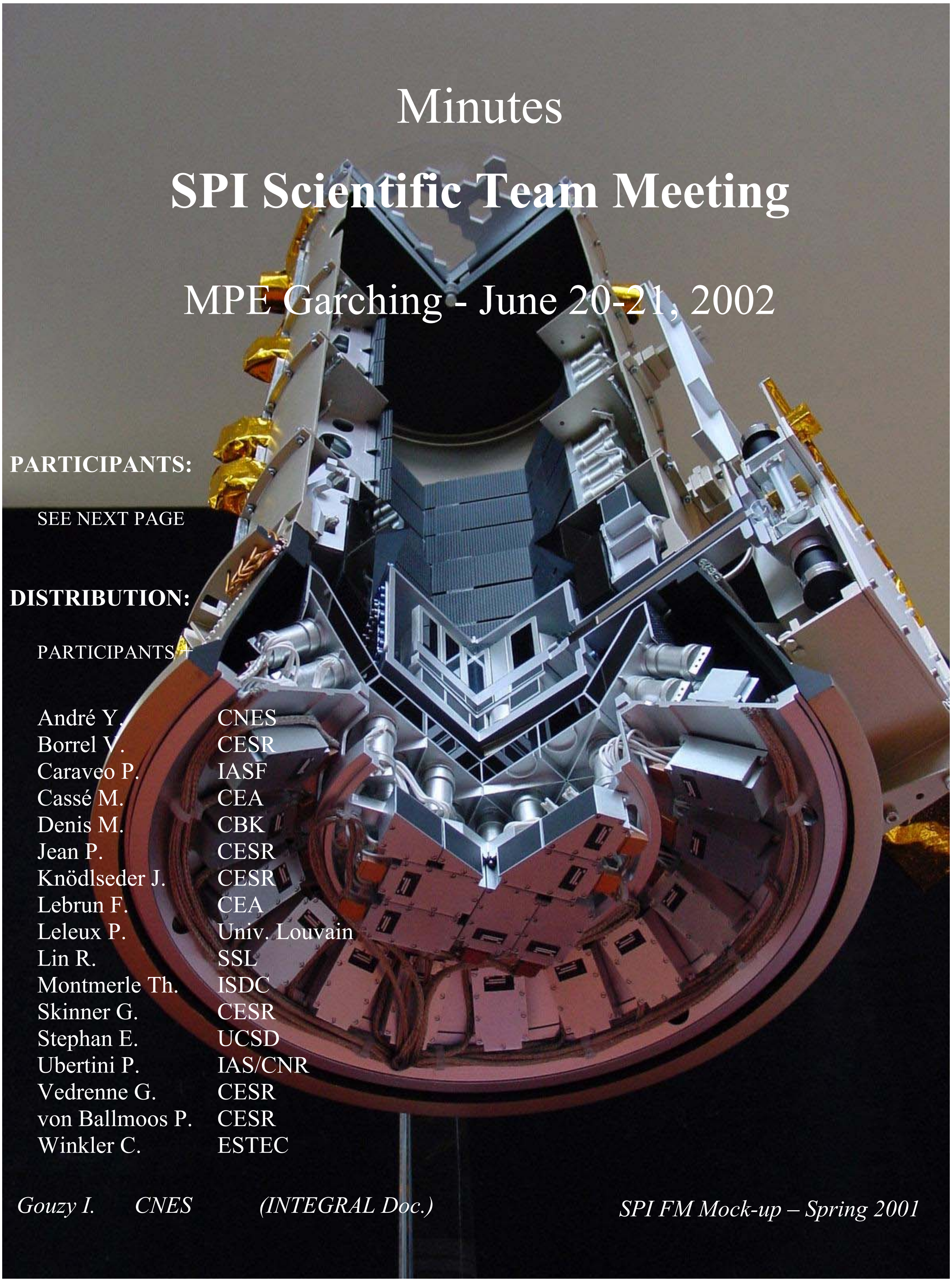
SEE NEXT PAGE

DISTRIBUTION:

PARTICIPANTS +

André Y.	CNES
Borrel V.	CESR
Caraveo P.	IASF
Cassé M.	CEA
Denis M.	CBK
Jean P.	CESR
Knödlseder J.	CESR
Lebrun F.	CEA
Leleux P.	Univ. Louvain
Lin R.	SSL
Montmerle Th.	ISDC
Skinner G.	CESR
Stephan E.	UCSD
Ubertini P.	IAS/CNR
Vedrenne G.	CESR
von Ballmoos P.	CESR
Winkler C.	ESTEC

Gouzy I. CNES (INTEGRAL Doc.)



SPI FM Mock-up – Spring 2001

LIST OF PARTICIPANTS

NAME	LABORATORY	TELEPHONE	FAX	E-MAIL
ATTIE D.	CEA	(33) 1 69 08 15 47	(33) 1 69 08 65 77	attie@cea.fr
BACHEM E.	DLR	(49) 228 447 560	(49) 228 447 739	eberhard.bachem@dlr.de
BLAG P.	GACE	(34) 96 398 36 08	(34) 96 398 32 61	pere.blag@uv.es
CARAVEO P.	IASF*	(39) 02 23699 326	(39) 02 2666 017	pat@ifctr.mi.cnr.it
CORDIER B.	CEA	(33) 1 69 08 27 92	(33) 1 69 08 65 77	bcordier@cea.fr
DIEHL R.	MPE	(49) 89 30000 3850	(49) 89 30000 3569	rod@mpe.mpg.de
DUBATH P.	ISDC	(41) 22 950 9124	(41) 22 950 9133	dubath@obs.unige.ch
DUROUCHOUX Ph.	CEA	(33) 1 69 08 33 76	(33) 1 69 41 84 68	durouchoux@discovery.saclay.cea.fr
LICHTI G.	MPE	(49) 89 30000 3536	(49) 89 30000 3606	grl@mpe.mpg.de
MANDROU P.	CESR	(33) 5 61 55 66 42	(33) 5 61 55 66 51	mandrou@cesr.fr
MATTESON J.	UCSD	(1) 858 534 4429	(1) 858 534 2294	jmatteson@ucsd.edu
PAUL Ph.	CESR	(33) 5 61 55 77 80	(33) 5 61 55 66 51	philippe.paul@cesr.fr
REIG P.	GACE	(30) 810 394 248		pablo@physics.uoc.gr
ROQUES J.P.	CESR	(33) 5 61 55 64 53	(33) 5 61 55 66 51	roques@sigma-0.cesr.cnes.fr
SANCHEZ F.	Univ. Valencia	(34) 96 398 3501	(34) 96 398 3488	filomeno@ific.uv.es
SCHANNE S.	CEA	(33) 1 69 08 91 21	(33) 1 69 08 31 47	schanne@hep.saclay.cea.fr
SCHÖNFELDER V.	MPE	(49) 89 30000 3578	(49) 89 30000 3606	vos@mpe.mpg.de
STRONG A.	MPE	(49) 89 30000 3575	(49) 89 30000 3606	aws@mpe.mpg.de
STURNER S.	GSFC	(1) 301 286 8447	(1) 301 286 1684	sturner@swati.gsfc.nasa.gov
TEEGARDEN B.	GSFC	(1) 301 286 5277	(1) 301 286 1684	bonnard@lheamail.gsfc.nasa.gov
VON KIENLIN A.	MPE	(49) 89 30000 3514	(49) 89 30000 3606	azk@mpe.mpg.de
WUNDERER C.	MPE	(49) 89 30000 3858	(49) 89 30000 3606	cow@mpe.mpg.de

__RAMON P.__ INTEGRAL Secretary (CESR) (33) 5 61 55 66 88 (33) 5 61 55 66 51 ramon@cesr.fr

* P. Caraveo in Roma : Tel: (39) 06 4993 2835 - Fax: (39) 06 4993 2837 - Email: p.caraveo@rm.cnr.it

AGENDA

◆ **THURSDAY 20 - Starting 9.30 am**

***** Upon R. Diehl's request, we start with some "ISDAG" topics of general interest*****

9h30- 10h20	SPI Performance including Analysis Software (results, next steps of overall Science Validation) - Spectral resolution vs. E, angle (10 min) - Effective Obs Time, Efficiency vs. E, angle (10 min) - Imaging resolution vs. E and angle and event type(20 min) - Sensitivity Estimates (10 min)	*All*
10h20	*Coffee break*	
10h35	PV phase and Mission Preparations	
	- OSM at ISDC and SPI Sites (20 min)	*S. Schanne*
	- IFC at ISDC and SPI Sites (10 min)	*R. Diehl*
	- Std Processing & Analyses at ISDC & SPI Sites (10 min)	*R. Diehl*
	- Simulations and Testing (10 min)	*A. Strong*
11h25	Summary of SPI tests at satellite level	*Y. André*
11h55	SPI schedule	*Y. André*
12h05	Hardware status of the ACS	*A. von Kienlin*
12h20	STM PSAC transmission measurements	*F. Sanchez*
12h35	PSAC energy threshold	*G. Lichti*
12h45	*Lunch*	
14h00	Camera performances during thermal vacuum tests	*J.P. Roques*
14h20	SPI Timing Test Results from the ESTEC Thermal Vacuum Test	*S. Schanne*
14h50	Evaluation of the ACS performance at BLC	*C. Wunderer*
15h00	News from the SPI Imaging Test Setup: Point source location accuracy with SPITS using spiros and spiskymax	*C. Wunderer*
15h10	Absolute flux accuracy from calibration data analysis	*A. Strong*

15h20	BLC short-distance sources efficiencies (synthesis, single events)	*D. Attie, Ph. Paul*
15h35	SPI Efficiency	*S. Sturner*
16h05	*Coffee break*	
16h20	Assessment of the status of SPI Imaging Software and Spectral Extraction (20 min) + Discussion (20 min) (combined with discussion of similar presentations -by Bonnard, for ex.)	*G. Skinner*
17h00 - 17h20	SPI Activation from Trapped Radiation	*B. Teegarden*

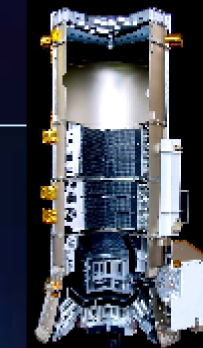
◆ **FRIDAY 21 - Starting 9.30**

9h30 - 10h35	Commissioning phase :	
	- Instrument tuning (30 min)	*Y. Andre, J.P. Roques, All*
	- Hardware organization (10 min) + Inputs from SPI consortium institutes (10 min)	*J.P. Roques*
	- Management (15 min)	*Y. André, J.P. Roques*
10h35	Coffee Break	

Status of scientific topics	*V. Schönfelder, J.P. Roques*
Definition parameters of the Scientific Topic (5 min) 5.3.10.3 "Black Holes in Quiescence" + list of targets	*V. Reglero*
Launch campaign	G. Lichti, General discussion

12h00 *End of meeting*

Integral Spectrometer



SCHEDULE OF THE LAUNCH CAMPAIGN

First Antonov arrival
↓ 17/08/2002
↓ 19/08/2002 EGSE deployment (and installation in Pad), office installation & link set-up

Second Antonov arrival with S/C
↓ 23/08/2002
↓ 26/08/2002 Global leak test

Mating (1 day)

PLM stand alone (2 days)

Additional integration, MLI finalization (4 days)

Electrical connection and finalization (2 days)

AFT (7 days) 05–11/09/2002

|-| ← AFT (SPI)

S/C + MLI final. |-| ← (SPI MLI + Camera config. & GN_2 purging)

Count down rehearsal (2 days)

Battery connection (2 days)

N_3H_4 filling operation (7 days)

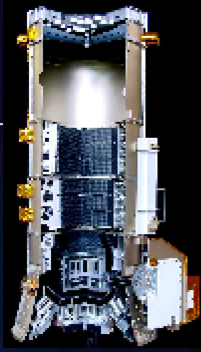
Margin (6 days)

Combined operations (17 days)

Alenia - Removal of SPI purging + MLI finalization +Y (L - 13) → |-|

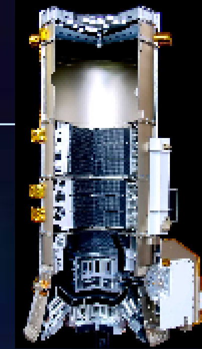
Launch (17th Oct. 2002) ↓

From GN_2 purging removal until Launch ≈ 13 days.



RESULT OF THE LAST S/C TESTS

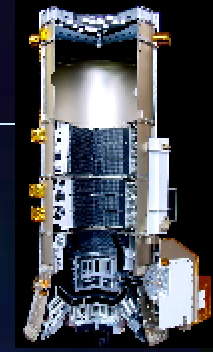
- 1 - TV TESTS
- 2 - SVT - F
- 3 - TESTS AFTER DPE PROM EXCHANGE
- 4 - Conclusion



S/C TV TESTS

19 th of April - 8 th May 2002 at ESTEC

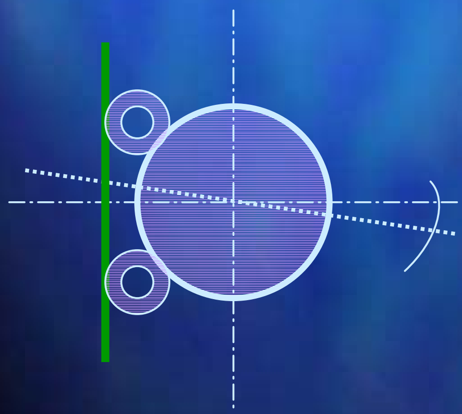
Integral Spectrometer



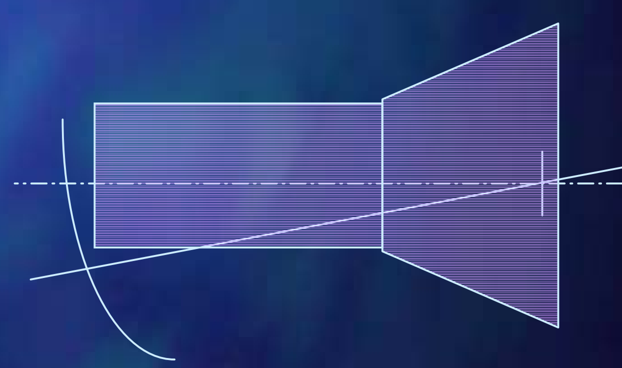
S/C TV TESTS

SPI TB/TV test configuration:

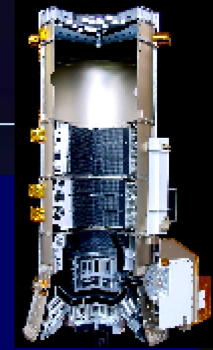
- Flight configuration with:
  - Radiation source revolver mounted (9 different sources).
  - GN_2 Purging line installed (i.e. cryostat purging).
  - Heat pipe flatness checked (requirement: < 5.0 mm/m)



Measured: 0.4 mm / m



Measured: 3.8 mm / m



SPI TV tests objectives:

Thermal

1. Validating the SPICO performances in nominal and back-up modes with 2 and 3 compressors, characterization of the stroke TM/TC, validation of the compensation heater control and the eclipse phase management.
2. Validation of the replaced AFEE1 and DFEE LTP thermostats

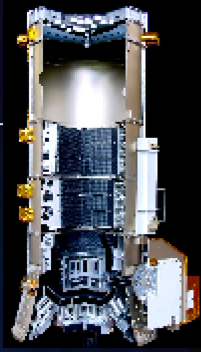
Functional

- Preparing and rehearsing elements of the commissioning phase.
- Validating further the new IASW 4.0.0 (closure of NCRs and up-grade to CSSW1.9b) software through dedicated tests.

Performances

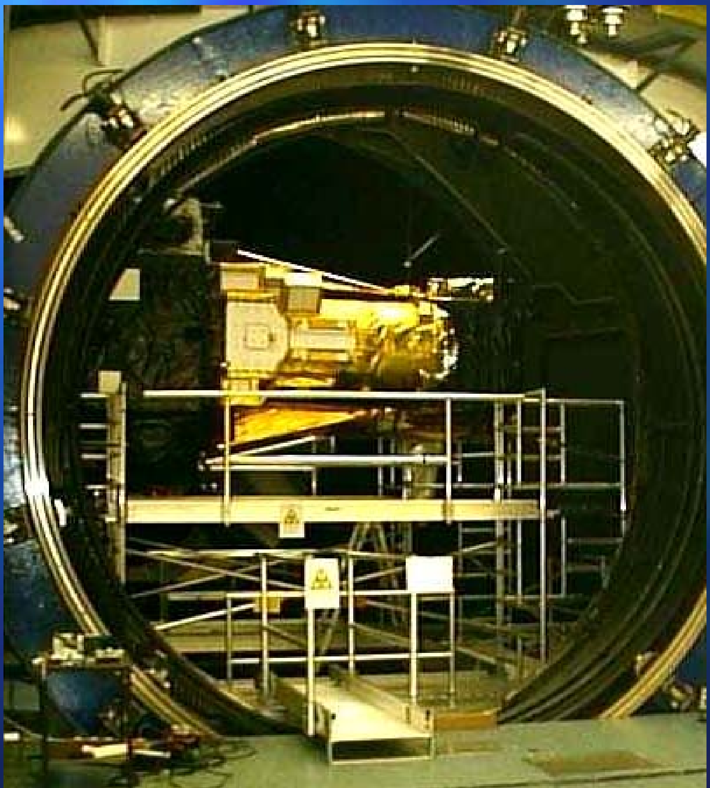
- Calibration of the PSD after repair activity (with PA2 operating at nominal temperature, i.e. 200K)
- Further characterizing the performances of the spectrometer with 9 radioactive sources.

Integral Spectrometer



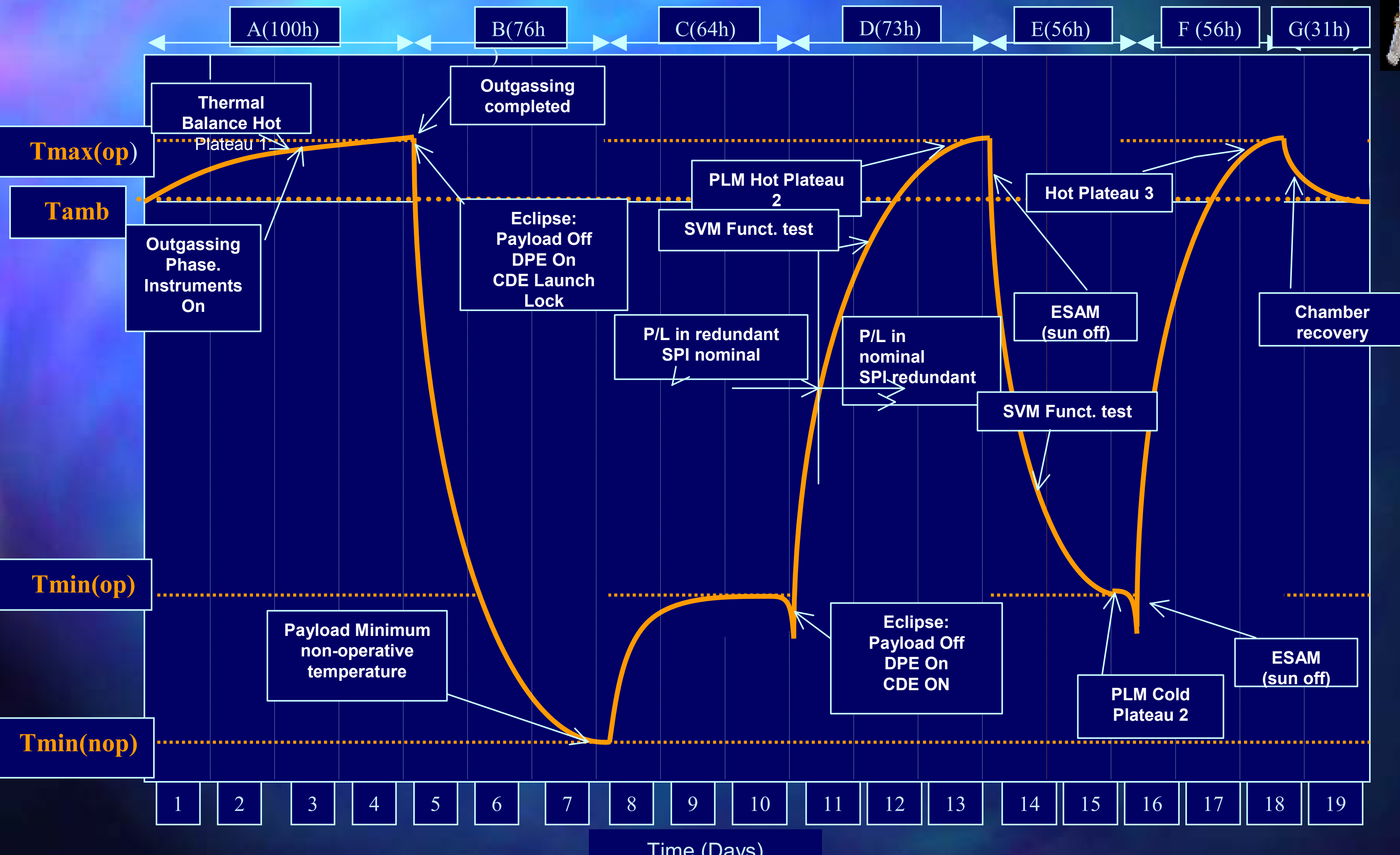
S/C TV TESTS

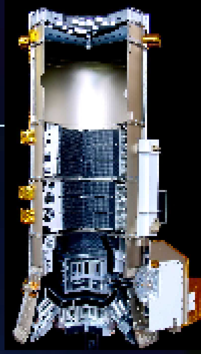
- TV TESTS PROFILE
- MAIN RESULTS
- CONCLUSION



Integral Spectrometer

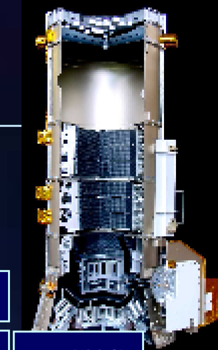
S/C TV TESTS PROFILE

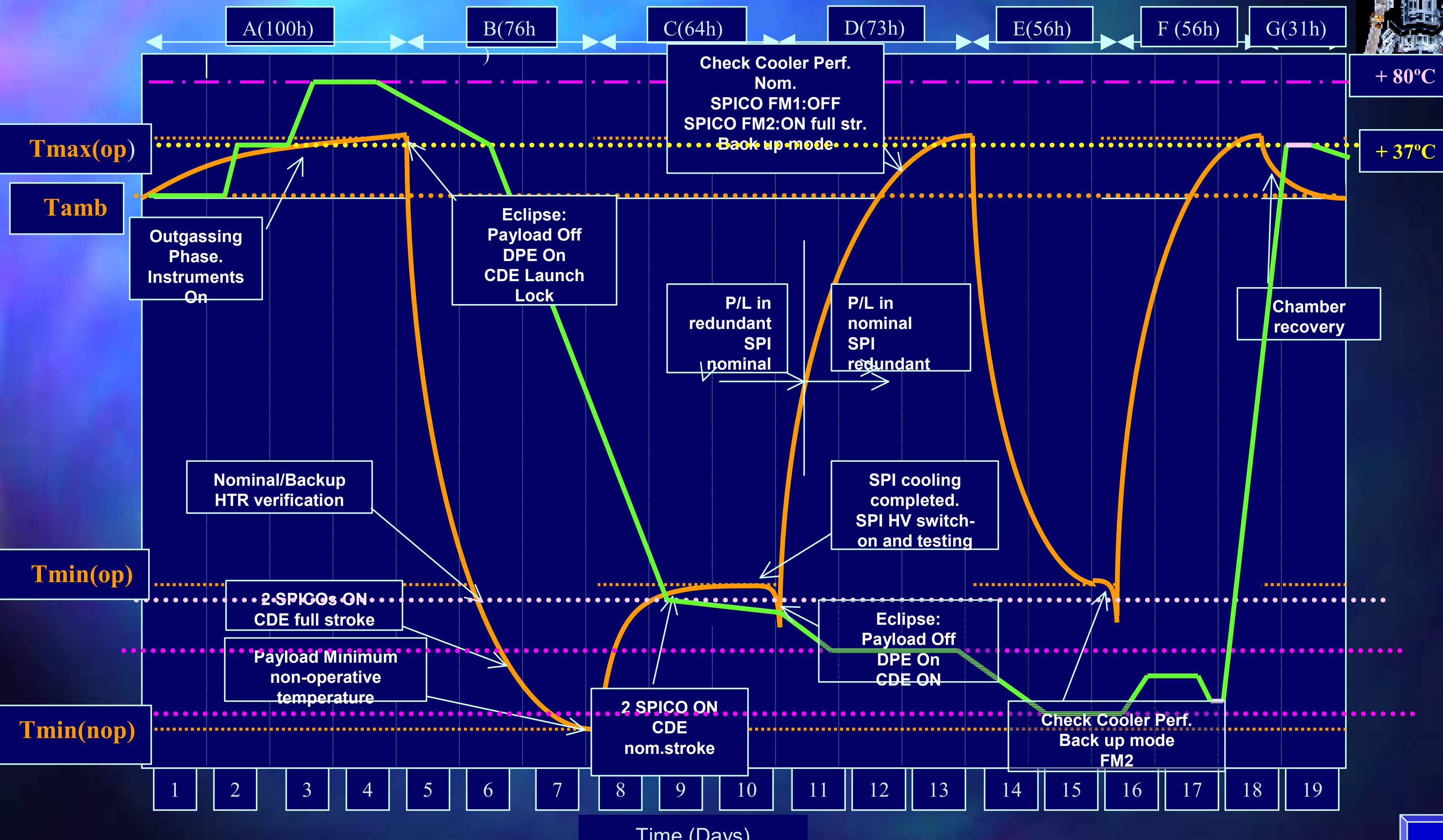




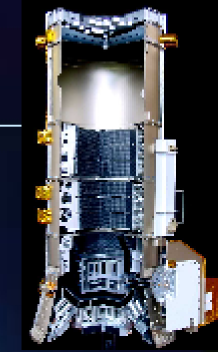
Integral Spectrometer

S/C TV TESTS PROFILE





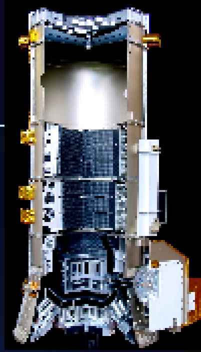
Integral Spectrometer



MAIN RESULTS

SPI TV Tests Thermal Results:

Thermal tests	Nominal Chain	Redundant Chain	Remarks	NCR
Detector temperature SPICO-2 back-up mode 102K – 106K (in hot environment).		99.1K 101.9K	Stroke = 8.7mm	
AFEE1 LTP DFEE LTP		Y N		
Detector temperature Nominal mode 90K with 4.6 mm < stroke < 4.86 mm		90.5K	35 "raw"	
Detector temperature 3 coolers 90K with 3 × 7 mm (136W mean CDE consumption).		91K	3 x 54 "raw", 1 x 0 "raw", Coolers B/C/D, mean I/F temperature	
Eclipse power consumption and temperatures (i.e. in budget) [see DM 497]	OK		4 x 32 "raw"	
RTU calibration: temperature measurement accuracy about 2 K (see CNES DM 392 dated 17/07/00)	OK	OK	Offset varies with Temperature from 9 K to 5 K. Accuracy is 1bit (± 1.67K)	



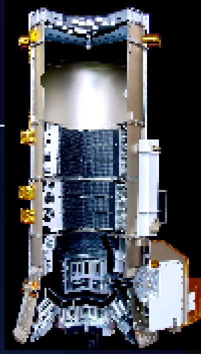
MAIN RESULTS

SPI TV Tests Functional Results:

Functional Tests	Nominal Chain	Redundant Chain	Remarks	NCR
BCPK Dithering spectra	Spectra OK	Spectra OK		
BCPK TM emergency Spectra	Spectra OK	Spectra OK		
Diagnostic Mode			Comparison with OBSMS images to be performed	
SPI Timing tests	OK	OK	Validated the "In Flight" timing verification	
PSD calibration: availability, number and validity of acquired curves.		OK		
			Unknown telemetry packet generation	# 391

Go-Ahead for PROM Burning given!

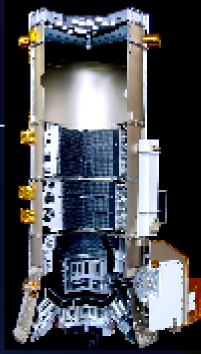
Integral Spectrometer



MAIN RESULTS

SPI TV Tests Performance Results:

Performance tests	Nominal Chain	Redundant Chain	Remarks	NCR
GeD noise High Temperature	OK			
ACS				
Even trigger threshold	OK			
Calibration	OK			
Count rate monitoring	OK		Temporary anomalous behaviour of FEE25 & PSAC	# 388
GeD resolution Nominal and Redundant chain: less than 2.5 keV at 1332 keV (^{60}Co) at T = __K with HV = 4000V	— — — 2.32 keV"	2.44keV 2.43 keV 2.39 keV —	T = 89.4K T = 99.0K T = 106K T = 115K	GeD #15 polluted
Scientific acquisition with sources in Revolver		OK	^{54}Mn, ^{22}Na, ^{85}Sr, ^{241}Am, ^{137}Cs, ^{88}Y, ^{57}Co, ^{60}Co, Bkgd	



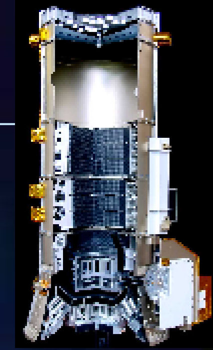
S/C TV TESTS CONCLUSION

<u>Overall very successful</u>

- thermal,
- functional,
- performance

verification of the SPI instrument at S/C level.

Thanks to the Alenia/CNES/CESR/SPITOG teams !!!



INTEGRAL SVT-F

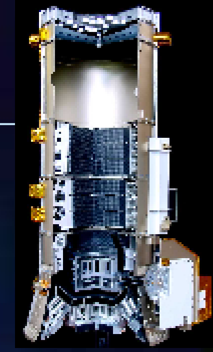
System Validation Tests F:
End to end tests driven by MOC
3rd to 5th of June 2002

Test objectives for SPI:

The aim was to validate:

- TPF (Task Parameter Files) I/F
- PSD library up-link process
- ACS calibration process
- DFEE SW maintenance
- Reference Orbit

INTEGRAL SVT-F



Test main results:

- **TPF (Task Parameter Files) I/F:**

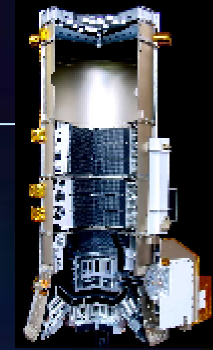
With this mechanism no configuration error occurs.

The procedure is OK from outside the PI network.

=> From the PI network, validation to be done before the commissioning phase.

Few minor problems have been identified:

- timing of some commands need to be corrected.
- some TC parameters shall be corrected in the database.
- Few TM displays shall be improved.



INTEGRAL SVT-F

Test main results:

• **PSD library up-link process:**

The procedure is OK.

• **ACS calibration process:**

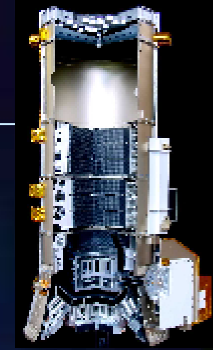
Clarifications of the procedure have been provided by CNES.

The timing of the procedure is correct.

• **DFEE SW maintenance:**

Patch and dump via OBSM (On Board Software Maintenance) format are OK.

=> but this format was corrected by CNES and CEA shall correct its format



INTEGRAL SVT-F

Test main results:

• **Reference orbit:**

This test is OK, with the following minor problems:

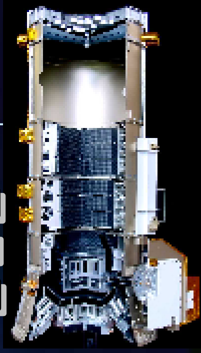
Some SPI parameter default values shall be updated.

The spectra management using the OEM (On Event Message) shall be reviewed.

Some default values in TM Emergency mode shall be corrected

The procedure for utilisation of the TM Emergency mode shall be clarified.

The TM validity criteria shall implemented in ISDC.

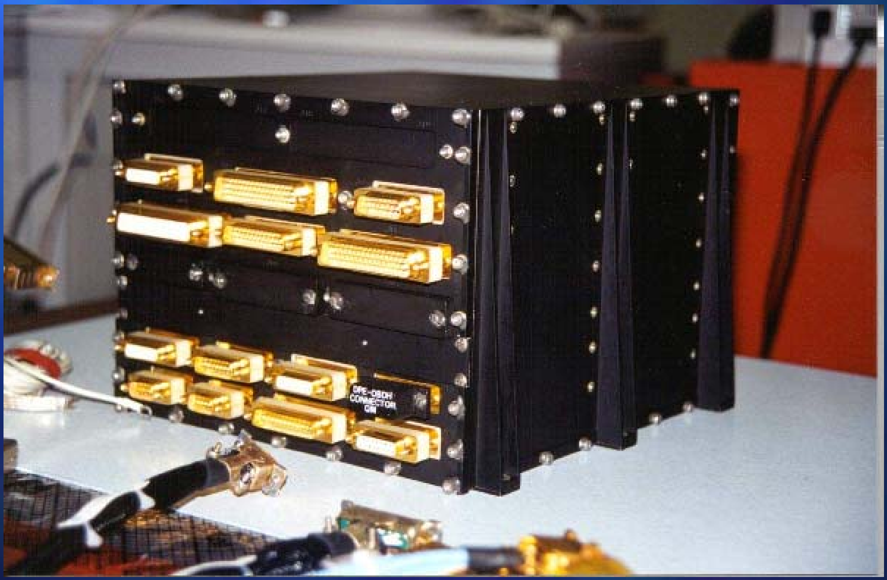


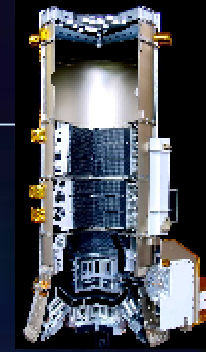
SPI DPEs PROMs EXCHANGE

The PROMs of the main and redundant DPE have been exchanged the 10th of June 2002.

IASW 4.0 and upgraded CSSW 1.9b have been used with patch since the Abbreviated Functional Tests before the S/C TV test .

Both SPI DPEs have been successfully tested after PROMs exchange.





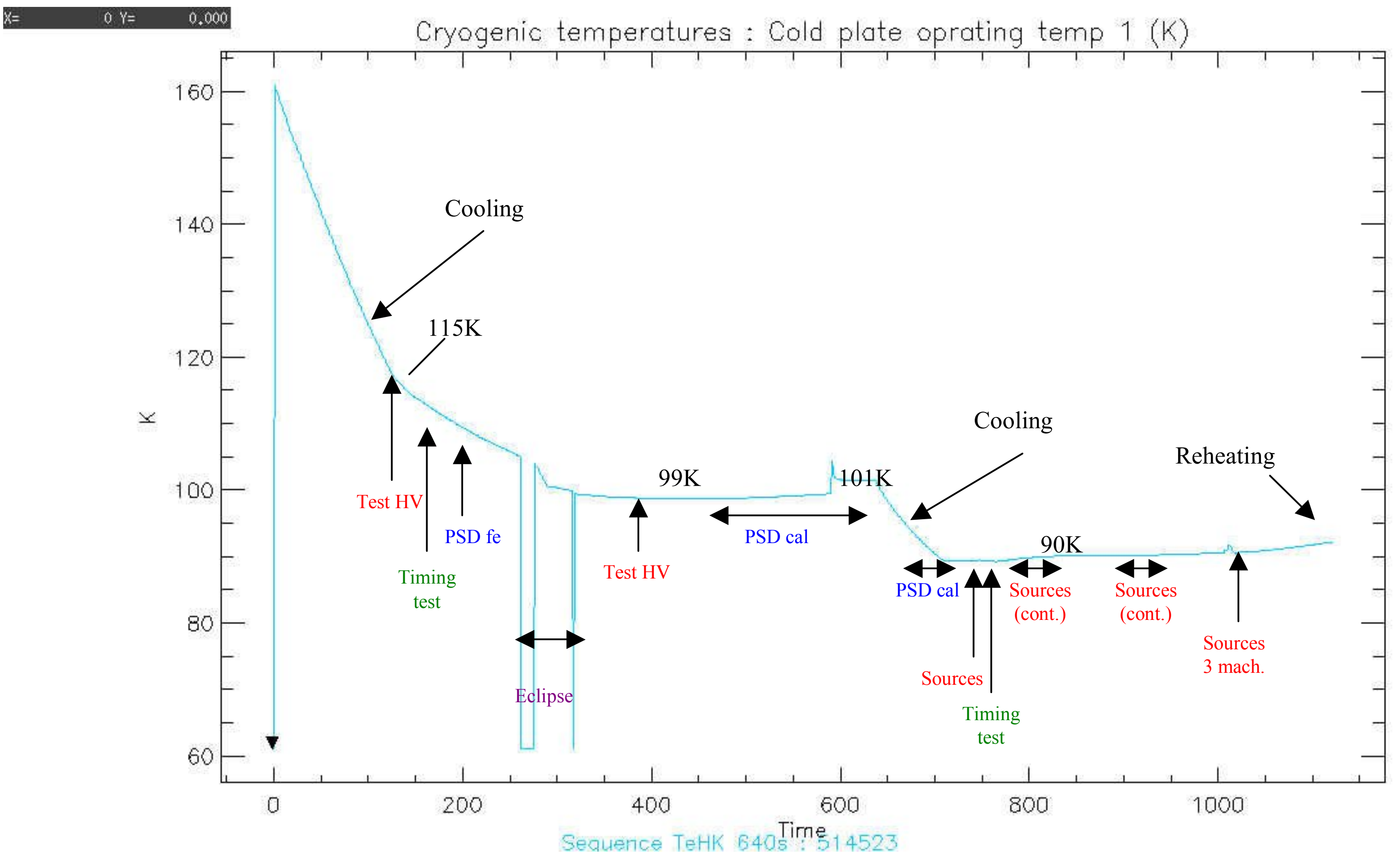
TESTS CONCLUSION

THE SPECTROMETER

IS READY

FOR THE LAUNCH CAMPAIGN

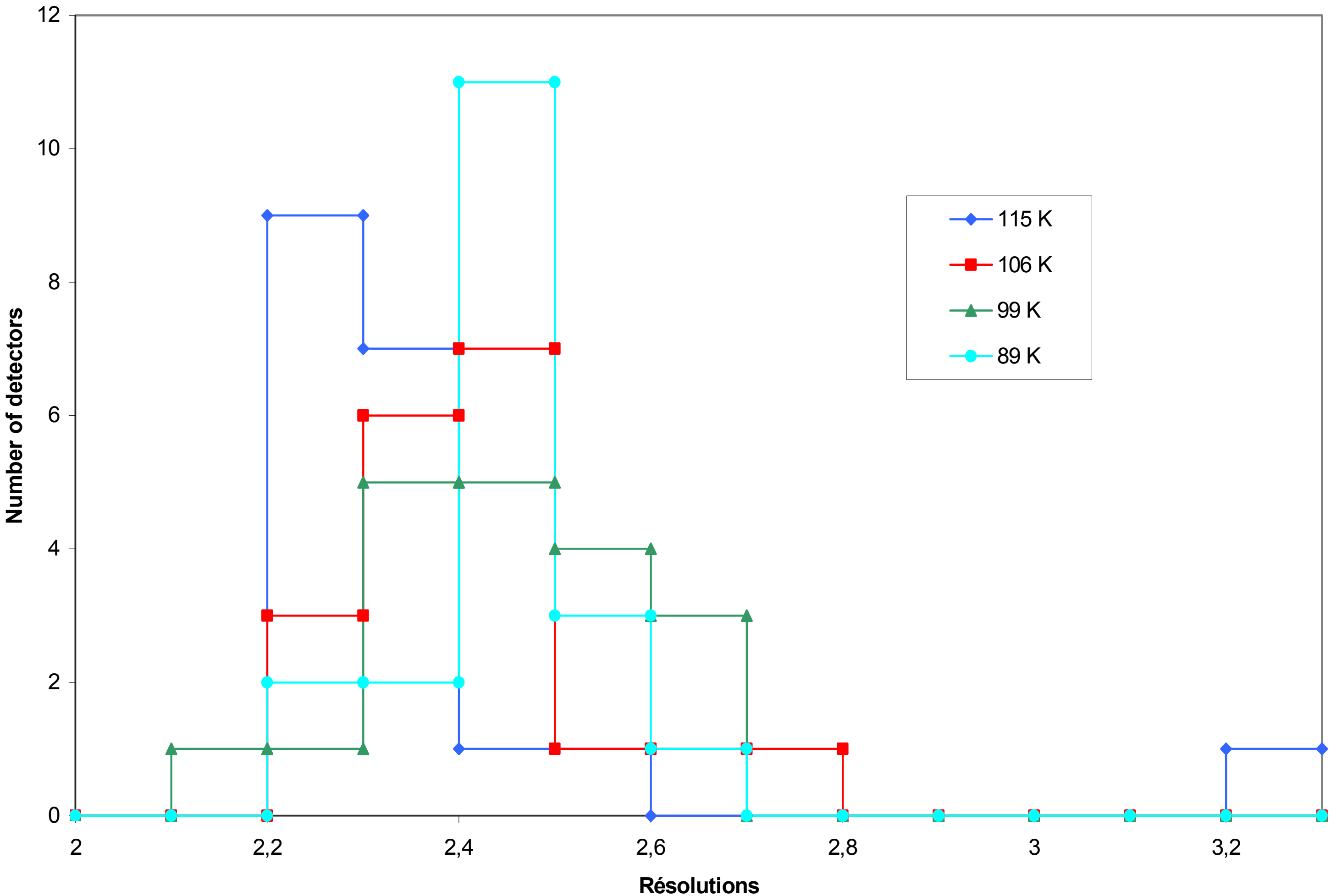
Temperature profile



Resolutions of each detector obtained for the Co 60 with HV=4KV

	4 coolers				3 coolers
	115,5K	106K	99K	89,3K	90,8K
0	2,34	2,41	2,44	2,45	2,49
1	2,24	2,27	2,22	2,29	2,3
2	2,38	2,45	2,4	2,46	2,46
3	2,26	2,34	2,36	2,4	2,35
4	2,52	2,59	2,62	2,57	2,61
5	2,24	2,37	2,53	2,43	2,47
6	2,37	2,44	2,5	2,5	2,5
7	2,25	2,28	2,37	2,38	2,36
8	2,37	2,42	2,6	2,52	2,48
9	2,31	2,42	2,39	2,43	2,45
10	2,27	2,36	2,44	2,4	2,4
11	2,33	2,39	2,37	2,44	2,39
12	2,22	2,25	2,18	2,27	2,28
13	2,27	2,43	2,4	2,4	2,4
14	2,35	2,42	2,52	2,49	2,5
15	3,2	2,7	2,54	2,47	2,46
16	2,29	2,32	2,47	2,4	2,38
17	2,28	2,31	2,36	2,37	2,33
18	2,46	2,61	2,63	2,63	2,55

Number of detector by resolution intervals at 4KV



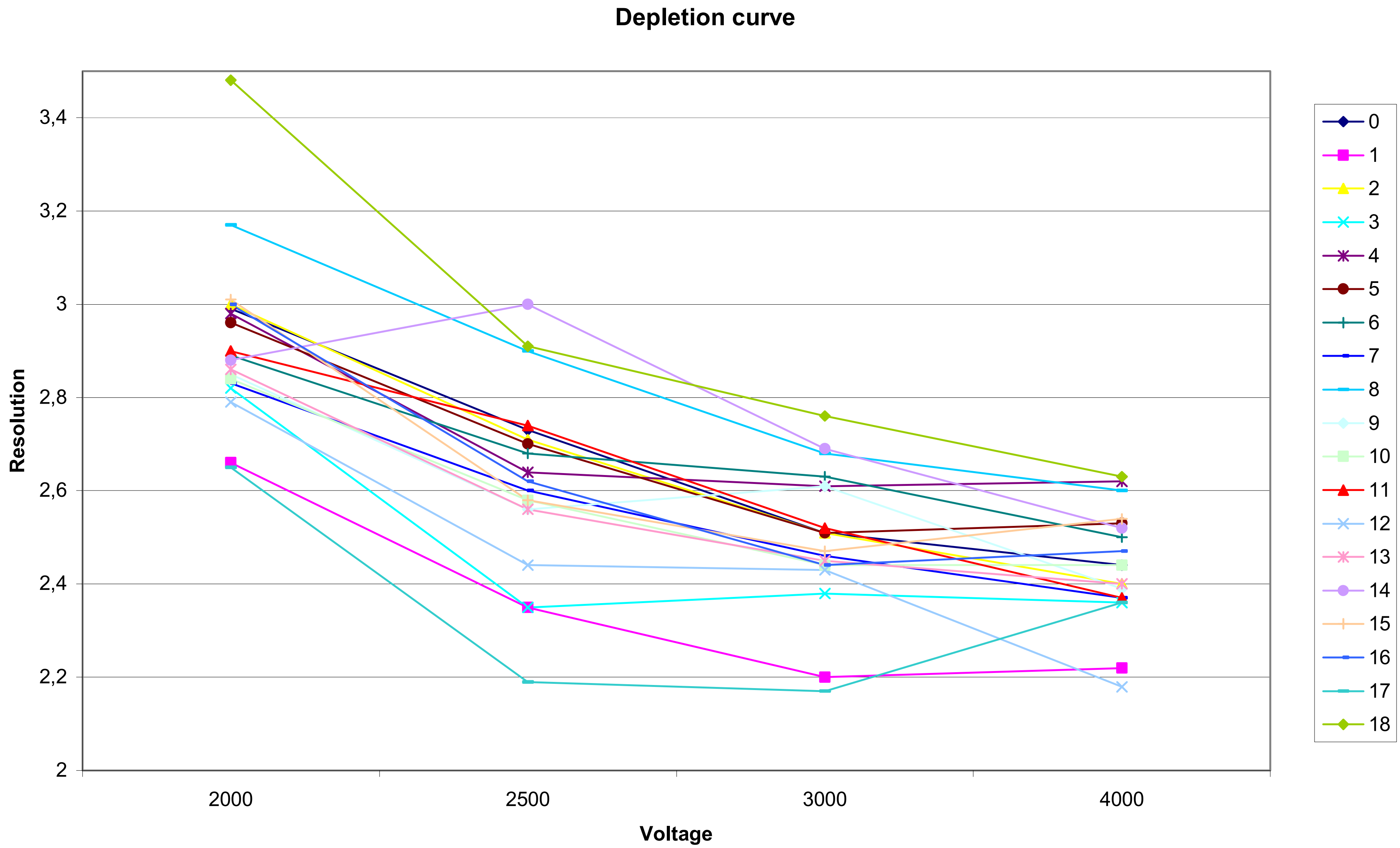
Resolutions of each detector obtained for different temperatures and different HV for the Co 60.

	116,5 K	115,2	106 K	99 K	99 K	99 K	99 K	89 K
	2000 V	4000 V	4000 V	2000 V	2500 V	3000 V	4000 V	4000 V
0	2,68	2,34	2,41	2,99	2,73	2,51	2,44	2,45
1	2,47	2,24	2,27	2,66	2,35	2,22	2,22	2,29
2	2,66	2,38	2,45	3	2,71	2,51	2,4	2,46
3	2,52	2,26	2,34	2,82	2,35	2,38	2,36	2,4
4	2,47	2,52	2,59	2,98	2,64	2,61	2,62	2,57
5	2,6	2,24	2,37	2,96	2,7	2,51	2,53	2,43
6	2,48	2,37	2,44	2,89	2,68	2,63	2,5	2,5
7	2,72	2,25	2,28	2,83	2,6	2,46	2,37	2,38
8	2,6	2,37	2,42	3,17	2,9	2,68	2,6	2,52
9	2,53	2,31	2,42	2,85	2,56	2,61	2,39	2,43
10	2,65	2,27	2,36	2,84	2,58	2,44	2,44	2,4
11	2,58	2,33	2,39	2,9	2,74	2,52	2,37	2,44
12	2,61	2,22	2,25	2,79	2,44	2,43	2,18	2,27
13	2,47	2,27	2,43	2,86	2,56	2,45	2,4	2,4
14	2,67	2,35	2,42	2,88	3	2,69	2,52	2,49
15	2,67	3,2	2,7	3,01	2,58	2,47	2,54	2,47
16	2,47	2,29	2,32	3	2,62	2,44	2,47	2,4
17	2,26	2,28	2,31	2,65	2,19	2,17	2,36	2,37
18	2,85	2,46	2,61	3,48	2,91	2,76	2,63	2,63

Resolution at 99K for different HV value

	2000 V	2500 V	3000 V	4000 V
0	2,99	2,73	2,51	2,44
1	2,66	2,35	2,2	2,22
2	3	2,71	2,51	2,4
3	2,82	2,35	2,38	2,36
4	2,98	2,64	2,61	2,62
5	2,96	2,7	2,51	2,53
6	2,89	2,68	2,63	2,5
7	2,83	2,6	2,46	2,37
8	3,17	2,9	2,68	2,6
9	2,85	2,56	2,61	2,39
10	2,84	2,58	2,44	2,44
11	2,9	2,74	2,52	2,37
12	2,79	2,44	2,43	2,18
13	2,86	2,56	2,45	2,4
14	2,88	3	2,69	2,52
15	3,01	2,58	2,47	2,54
16	3	2,62	2,44	2,47
17	2,65	2,19	2,17	2,36
18	3,48	2,91	2,76	2,63

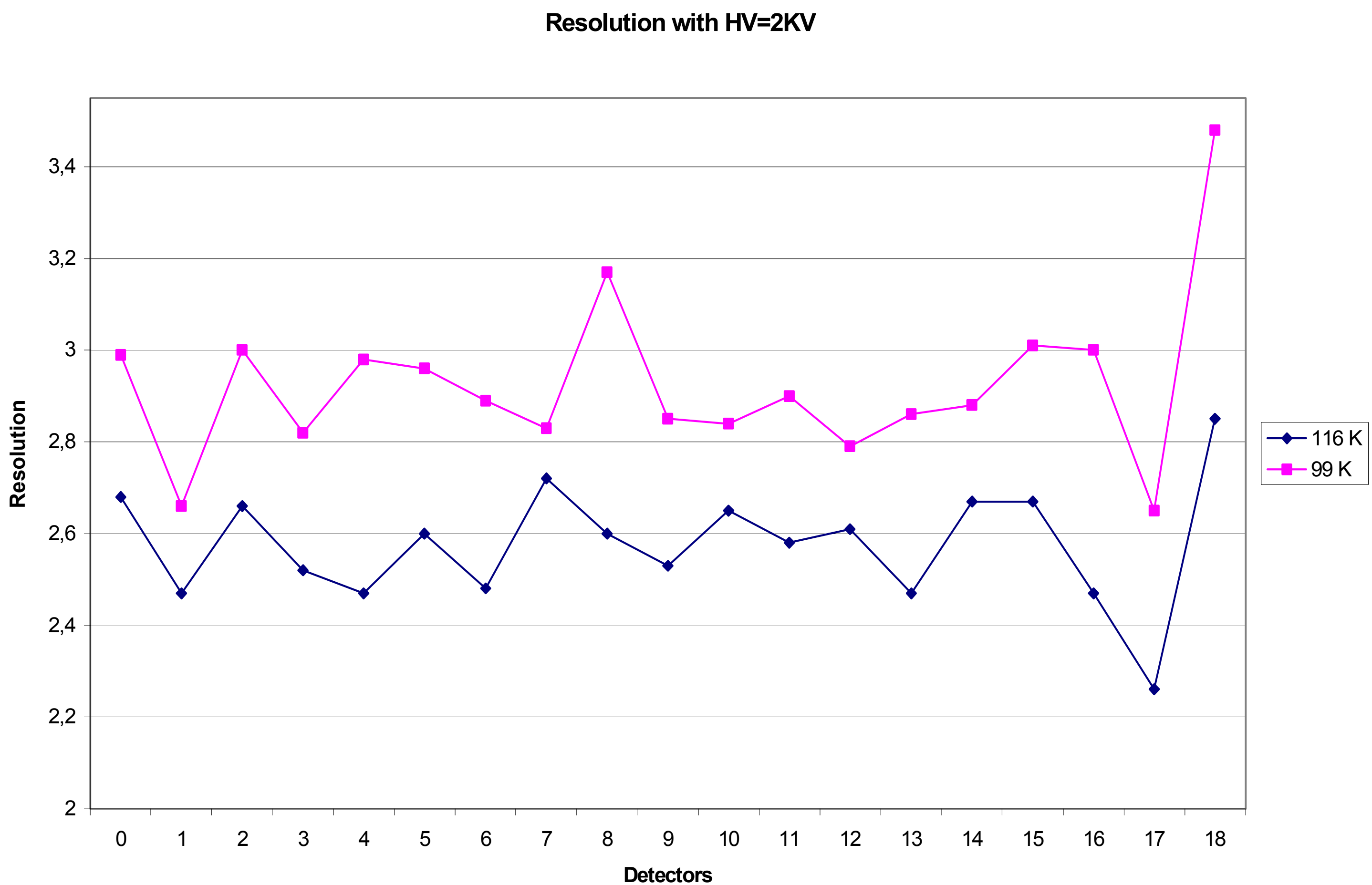
Depletion at 99K



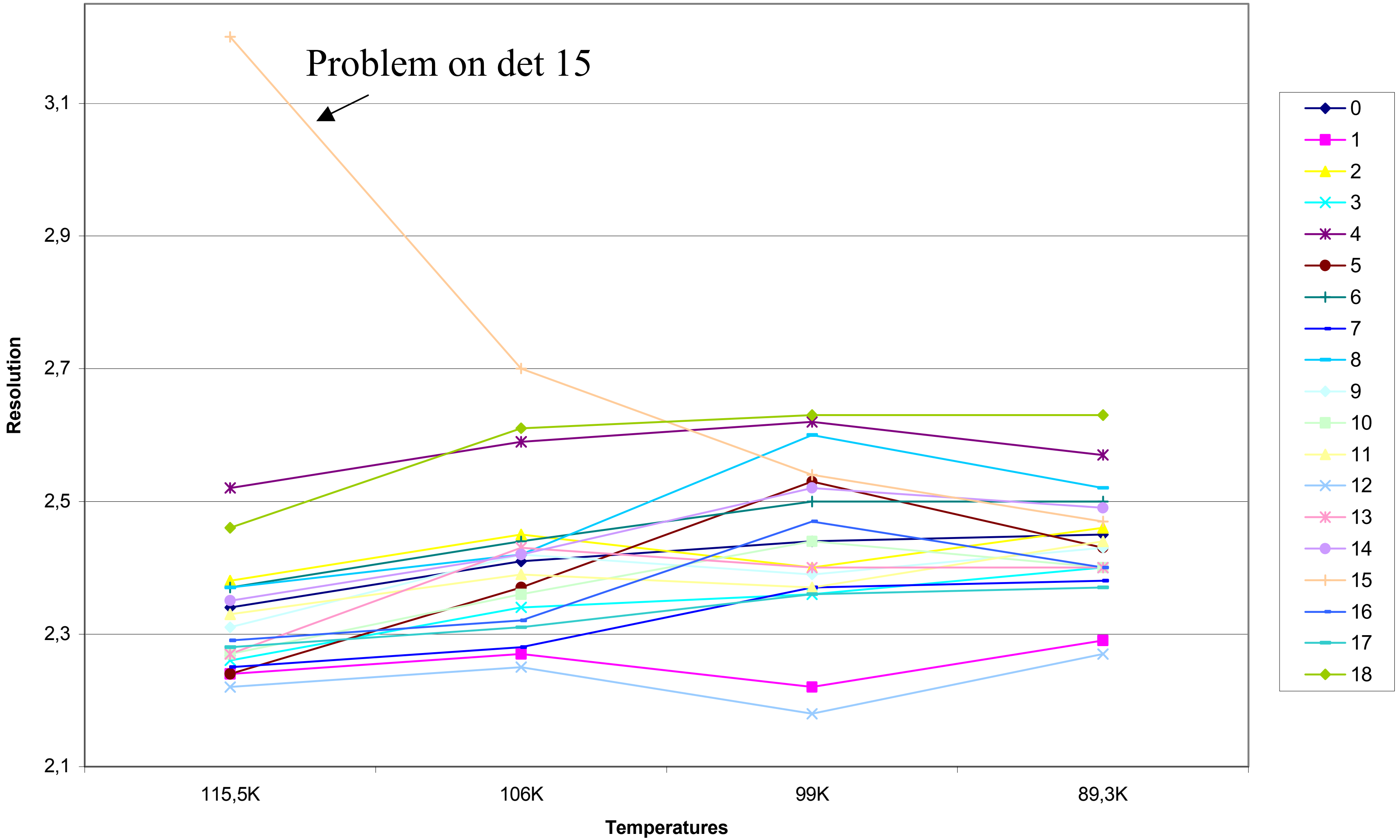
Comparison between the “4 and 3 coolers” configurations for the Co60

	4 machines (89,3K)	3 machines (90,8K)	Difference
Det 0	2,45	2,49	-0,04
Det 1	2,29	2,3	-0,01
Det 2	2,46	2,46	0
Det 3	2,4	2,35	0,05
Det 4	2,57	2,61	-0,04
Det 5	2,43	2,47	-0,04
Det 6	2,5	2,5	0
Det 7	2,38	2,36	0,02
Det 8	2,52	2,48	0,04
Det 9	2,43	2,45	-0,02
Det 10	2,4	2,4	0
Det 11	2,44	2,39	0,05
Det 12	2,27	2,28	-0,01
Det 13	2,4	2,4	0
Det 14	2,49	2,5	-0,01
Det 15	2,47	2,46	0,01
Det 16	2,4	2,38	0,02
Det 17	2,37	2,33	0,04
Det 18	2,63	2,55	0,08

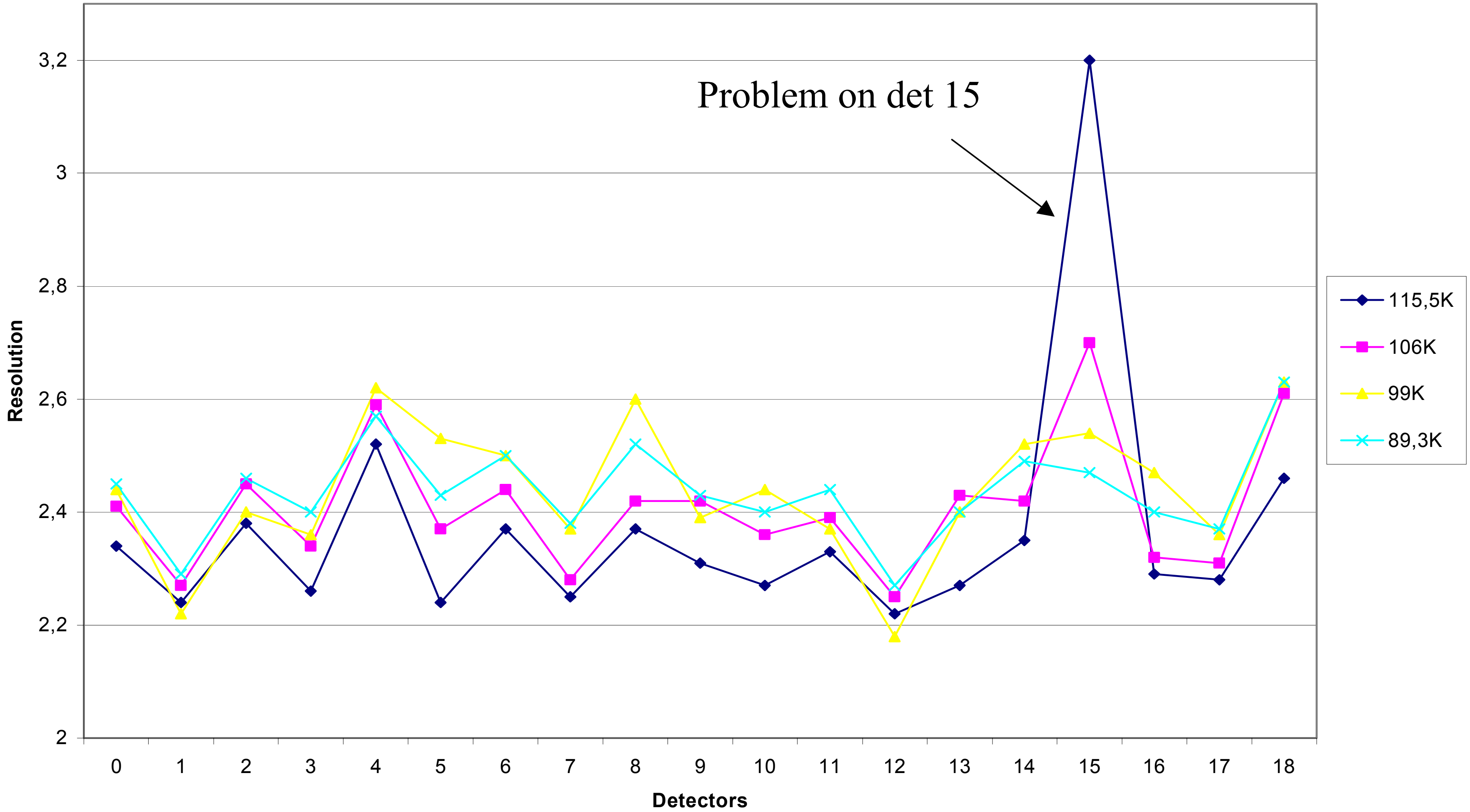
Resolution for each detector for two different temperatures with HV=2KV



Resolution for each detector (HV=4KV)



Resolution for each temperature (HV=4KV)



List of radioactive sources

- Co60
- Co57
- Sr85
- Mn54
- Na22
- Am241
- CS137
- Y88
- Co60 (3 coolers)
- Am241 (3 coolers)
- Mn54 (3 coolers)

Status of ACS

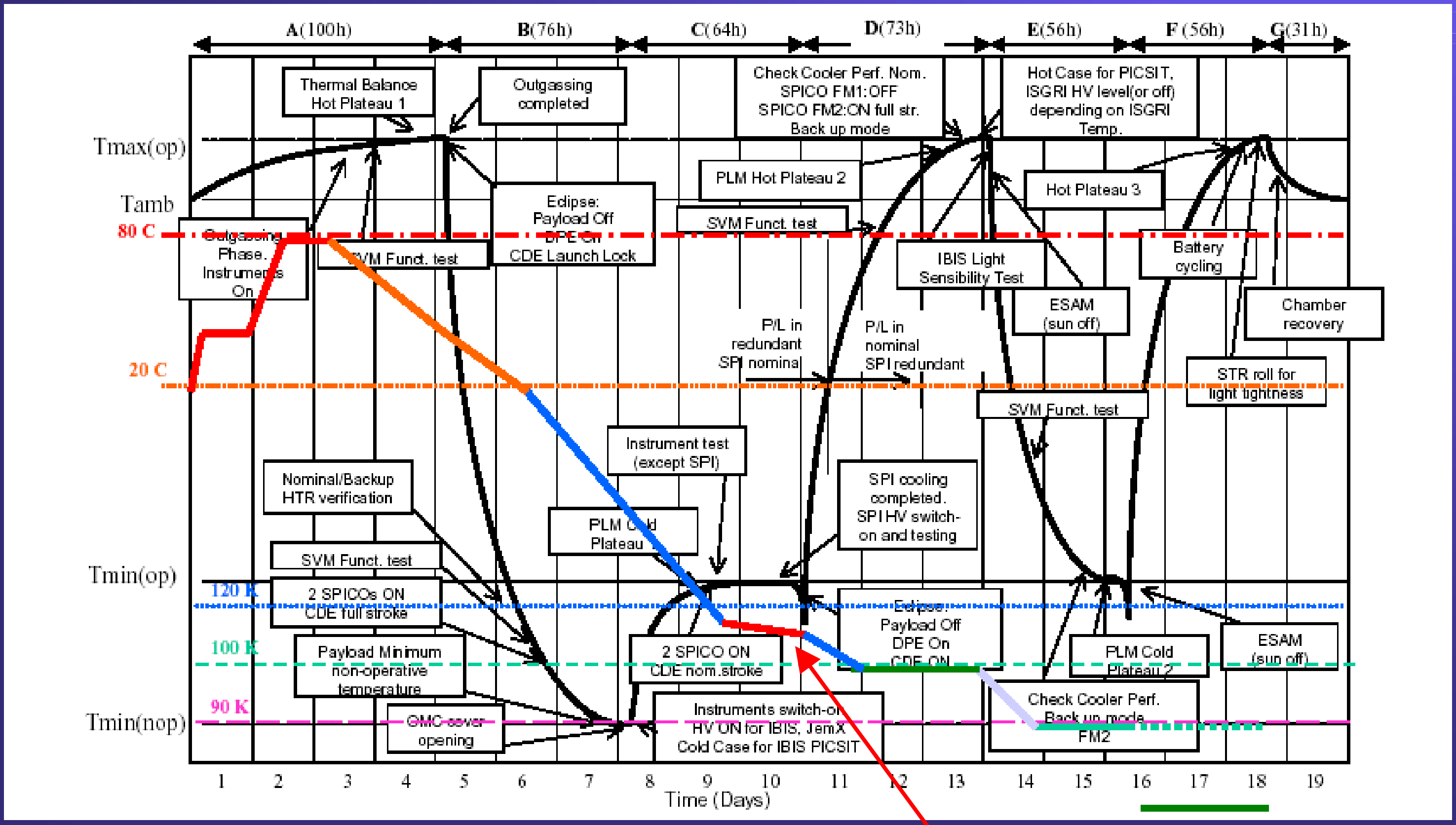
→ after TV-Test and SVT-F

SPI Co-Is Meeting - MPE Garching

Andreas von Kienlin MPE

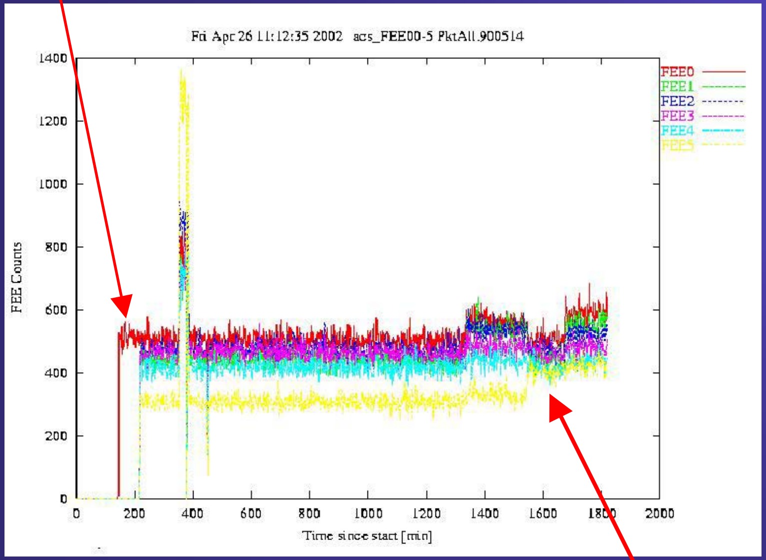
TV-Test at Alenia (April/May 2002)

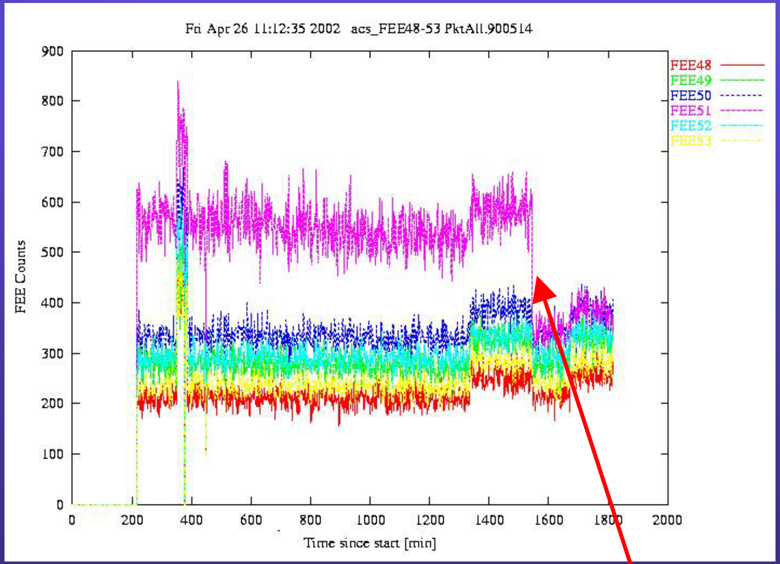
- Monitoring of ACS-count rates during TV-Test:
  - after first thermal cycle at T_{min} (op): ACS HV ON April,27 20:00



TV-Test at Alenia (April/May 2002)

- First switch on test with a single FEE (FEE 0)
- For two FEEs new “100-keV” thresholds were chosen
  - Energy discriminator of FEE 5 changed from level 8 to 3 (702 mV to 312 mV)
  - Energy discriminator of FEE 51 changed from level 0 to 9 (78 mV to 780 mV)
  - But first the commanded levels of event trigger level and energy discriminator were mixed up!





wrong setting of FEE5

now correct !

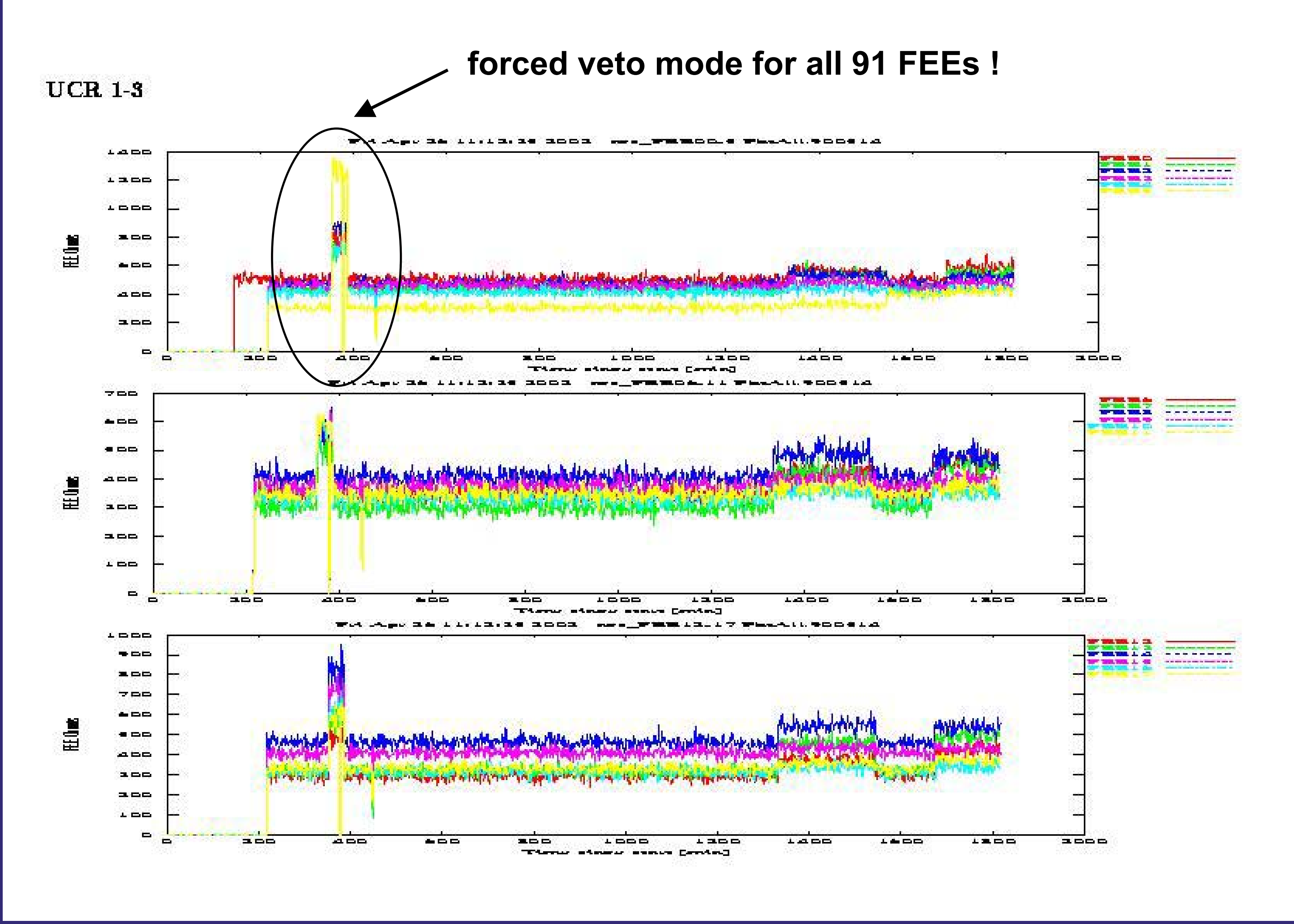
wrong setting of FEE51

now correct !

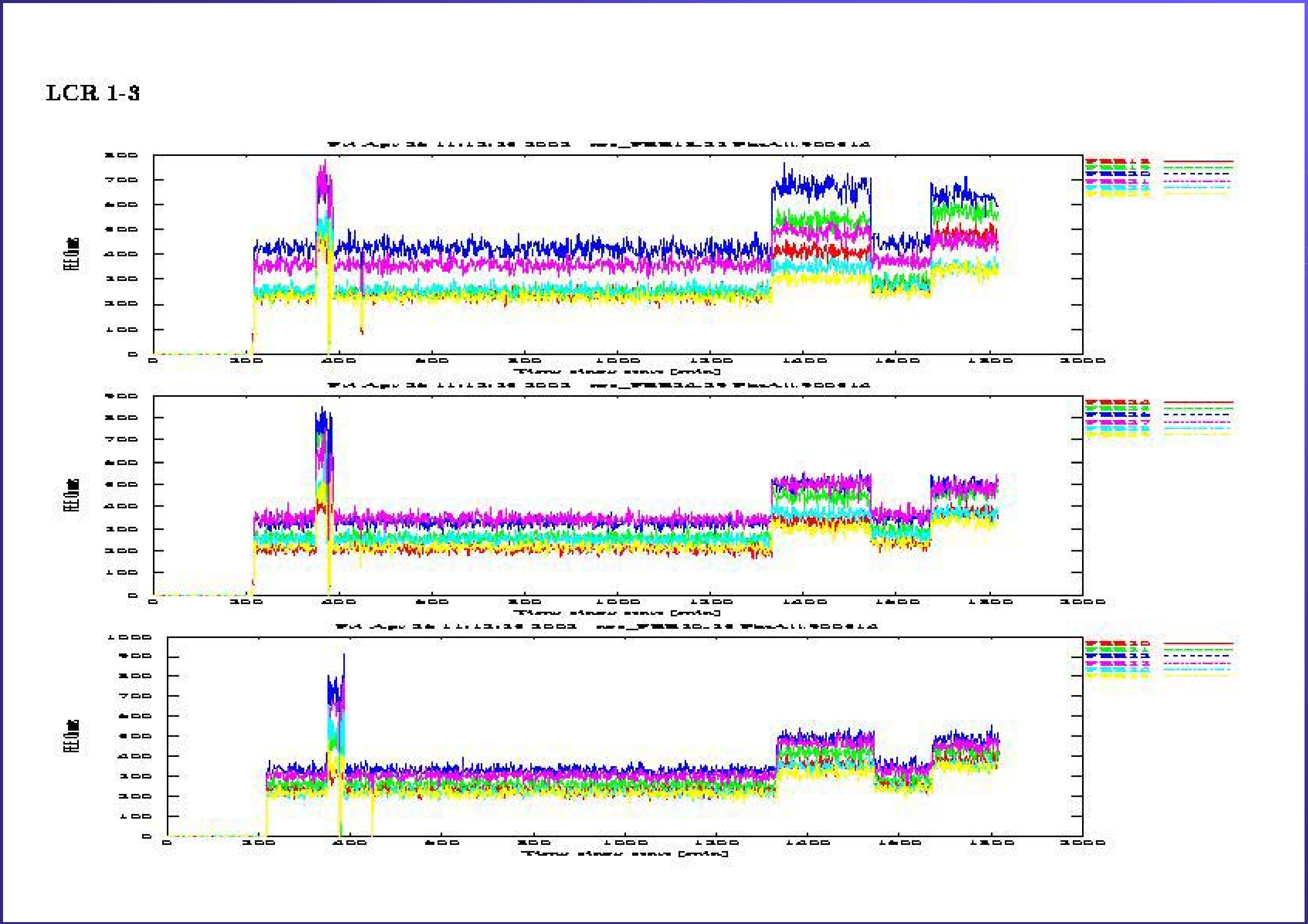
TV-Test at Alenia (April/May 2002)

- The next 6 viewgraphs are showing FEE count rates of the first 25 hours after ACS HV switch on.
  - ➢ After ~ 1 hour all FEEs were switched into forced veto mode.
  - ➔ All count rates increased as expected to a large value
  - ➔ In this case: PSAC energy threshold is inhibited → PSAC is triggering on noise !
- Observed FEE count rate anomalies !
  - ➢ FEE 25 showed several times the well known “spiky behaviour”
  - ➢ FEE 83 showed one time the well known count rate increase after switch on
  - ➢ PSAC showed later an unexpected strong count rate increase → NCR
- ACS calibration procedure performed successful !
- No major change in medium count rate level due to temperature change (T_{min}/T_{max} operational) observed.
  - ➢ A more detailed investigation will be performed !

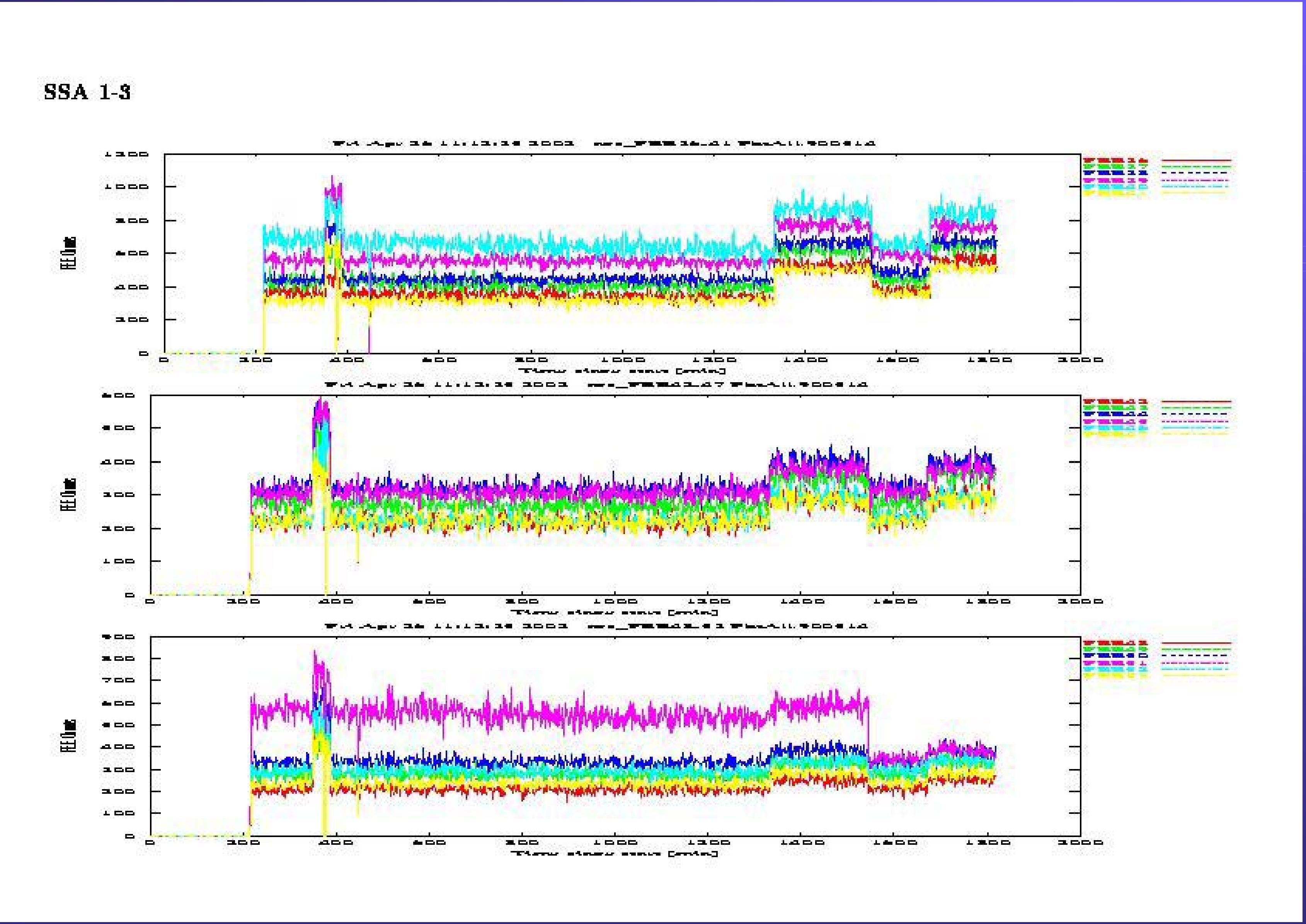
TV-Test ACS HV ON PktAll.000514: 26 April 11:13 –… / UCR



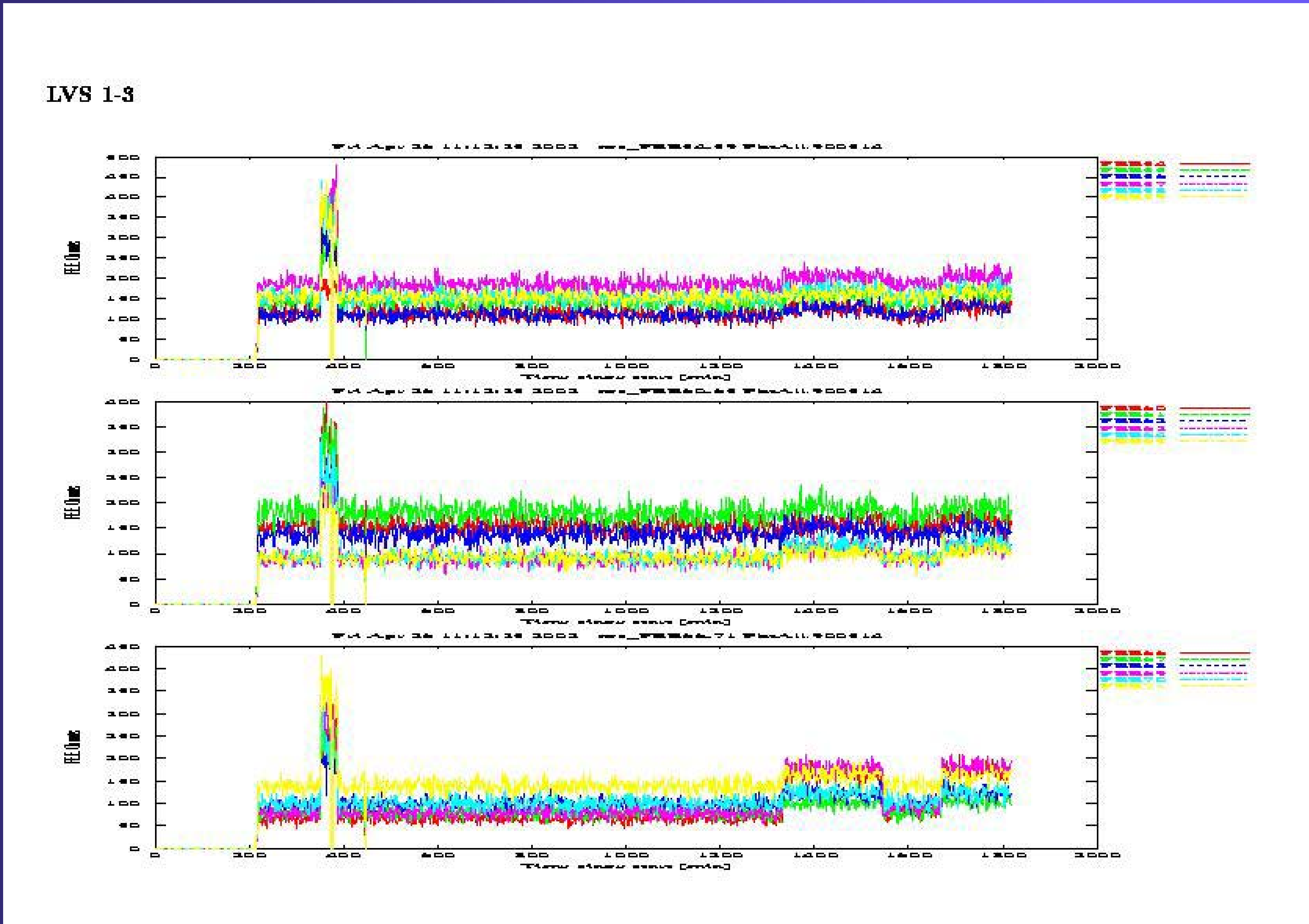
TV-Test ACS HV ON PktAll.000514: 26 April 11:13 –… / LCR



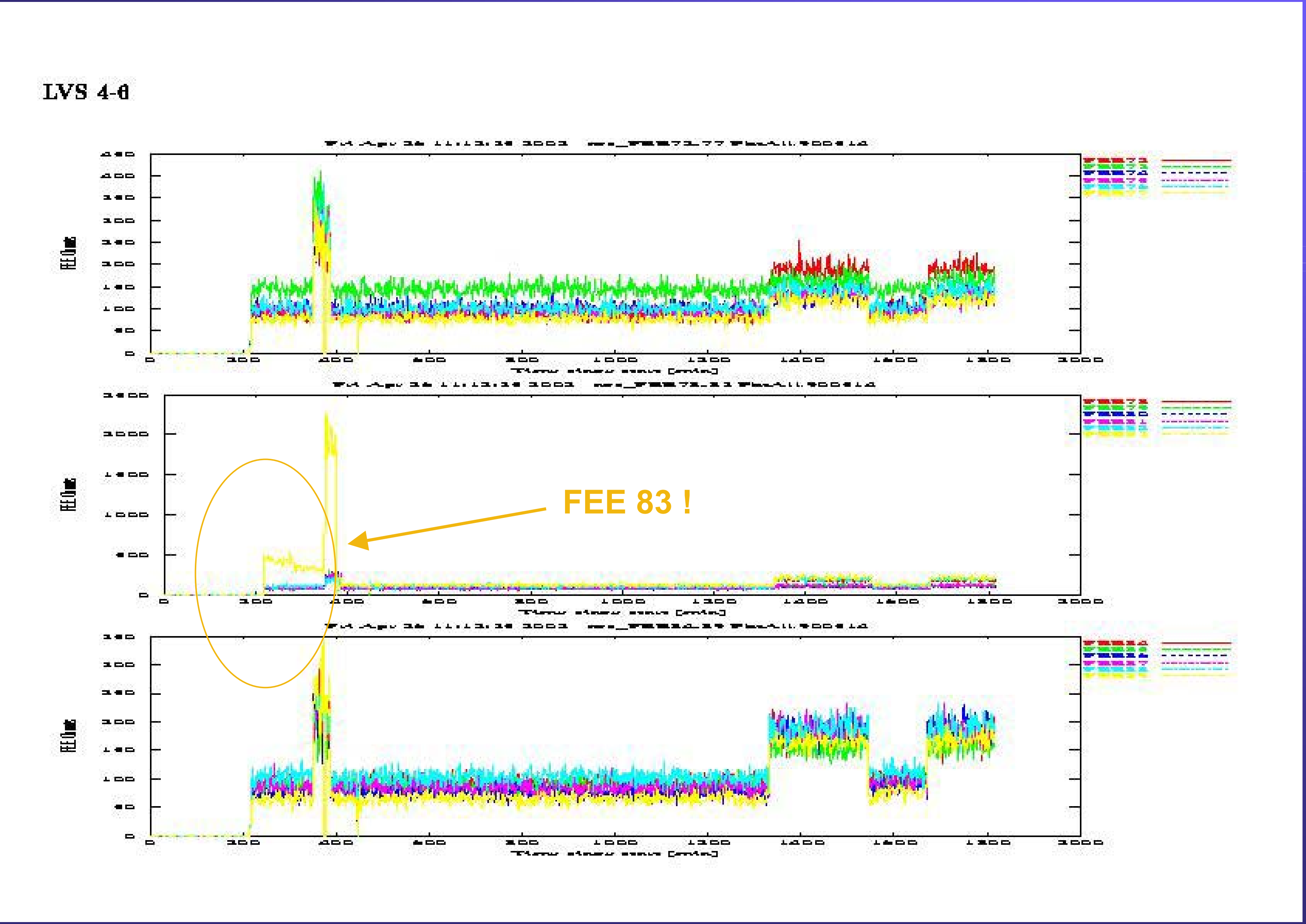
TV-Test ACS HV ON PktAll.000514: 26 April 11:13 –… / SSA



TV-Test ACS HV ON PktAll.000514: 26 April 11:13 –… / LVS1

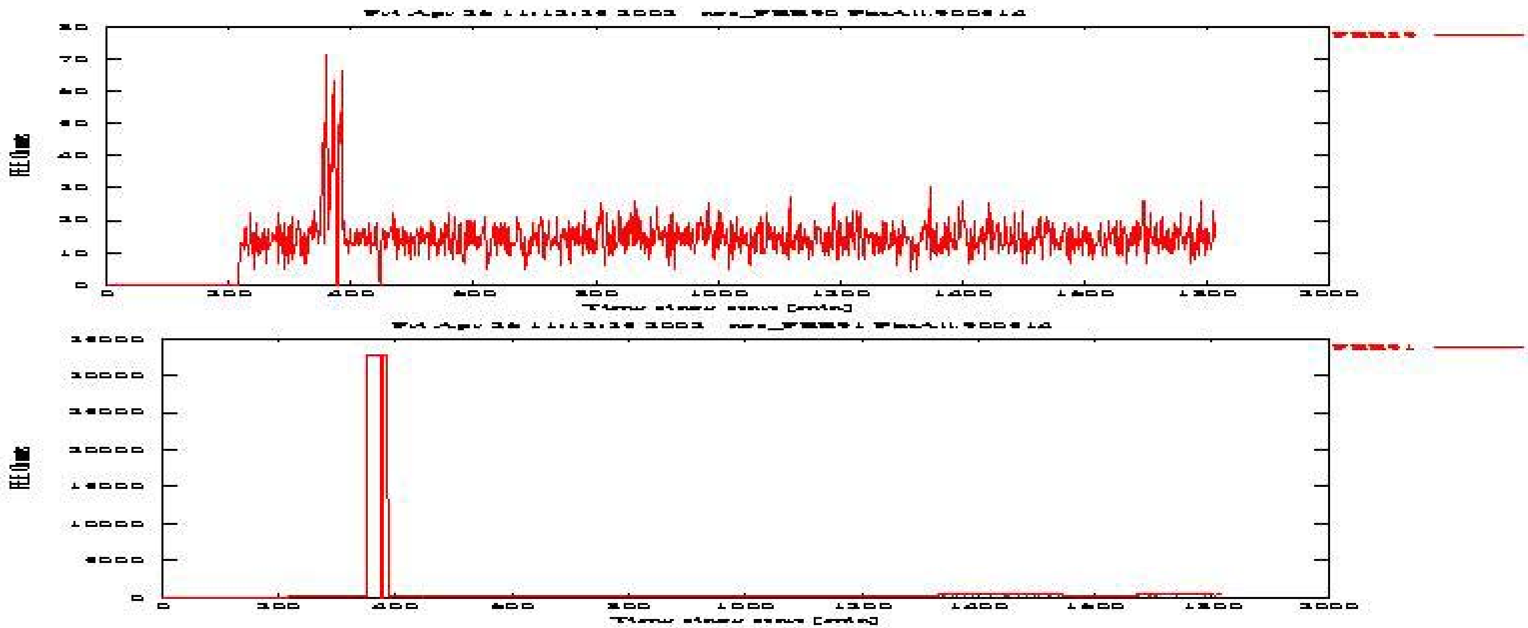


TV-Test ACS HV ON PktAll.000514: 26 April 11:13 –… / LVS2

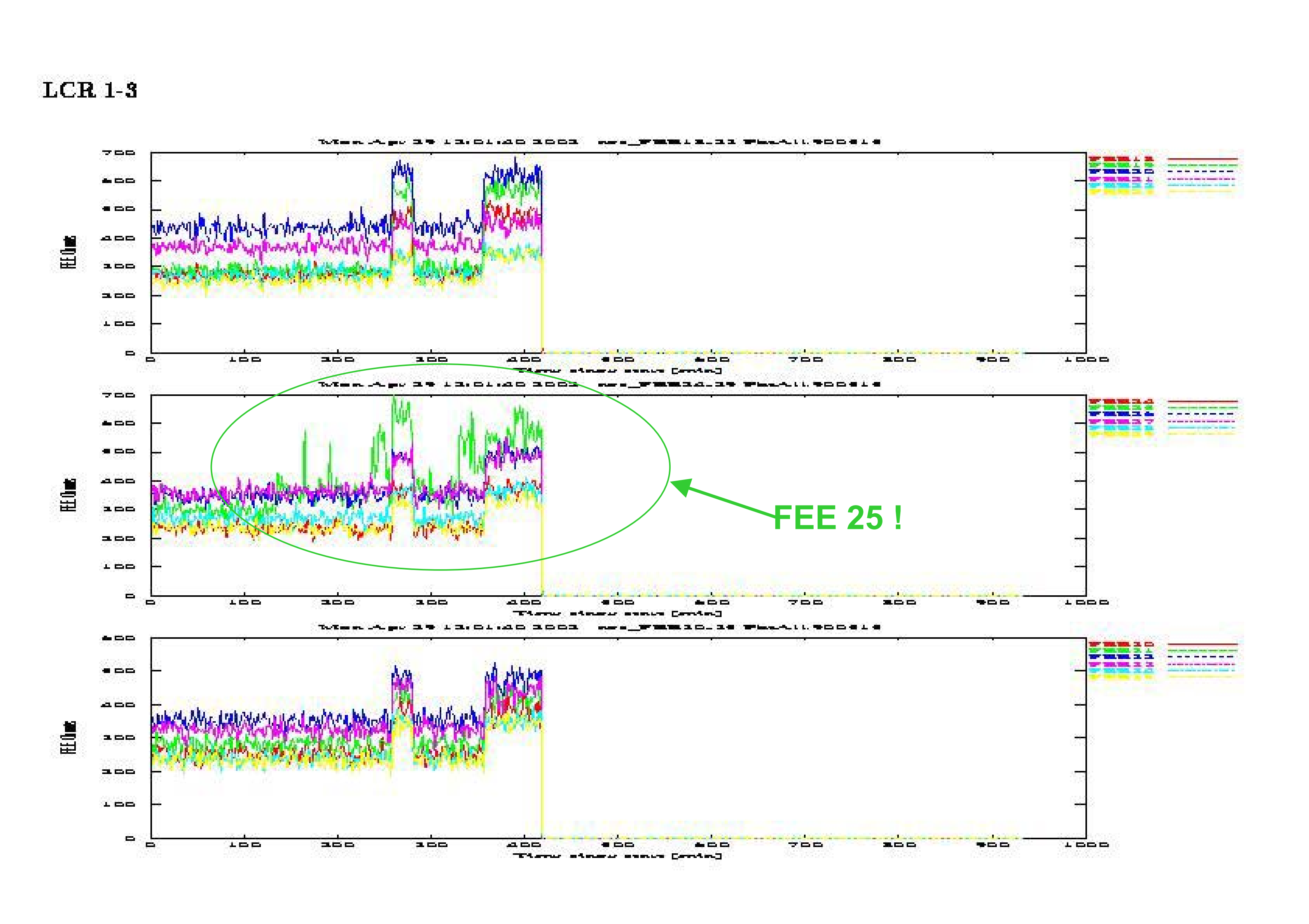


TV-Test ACS HV ON PktAll.000514: 26 April 11:13 –…, /SCS/PSAC

SCS+PSAC

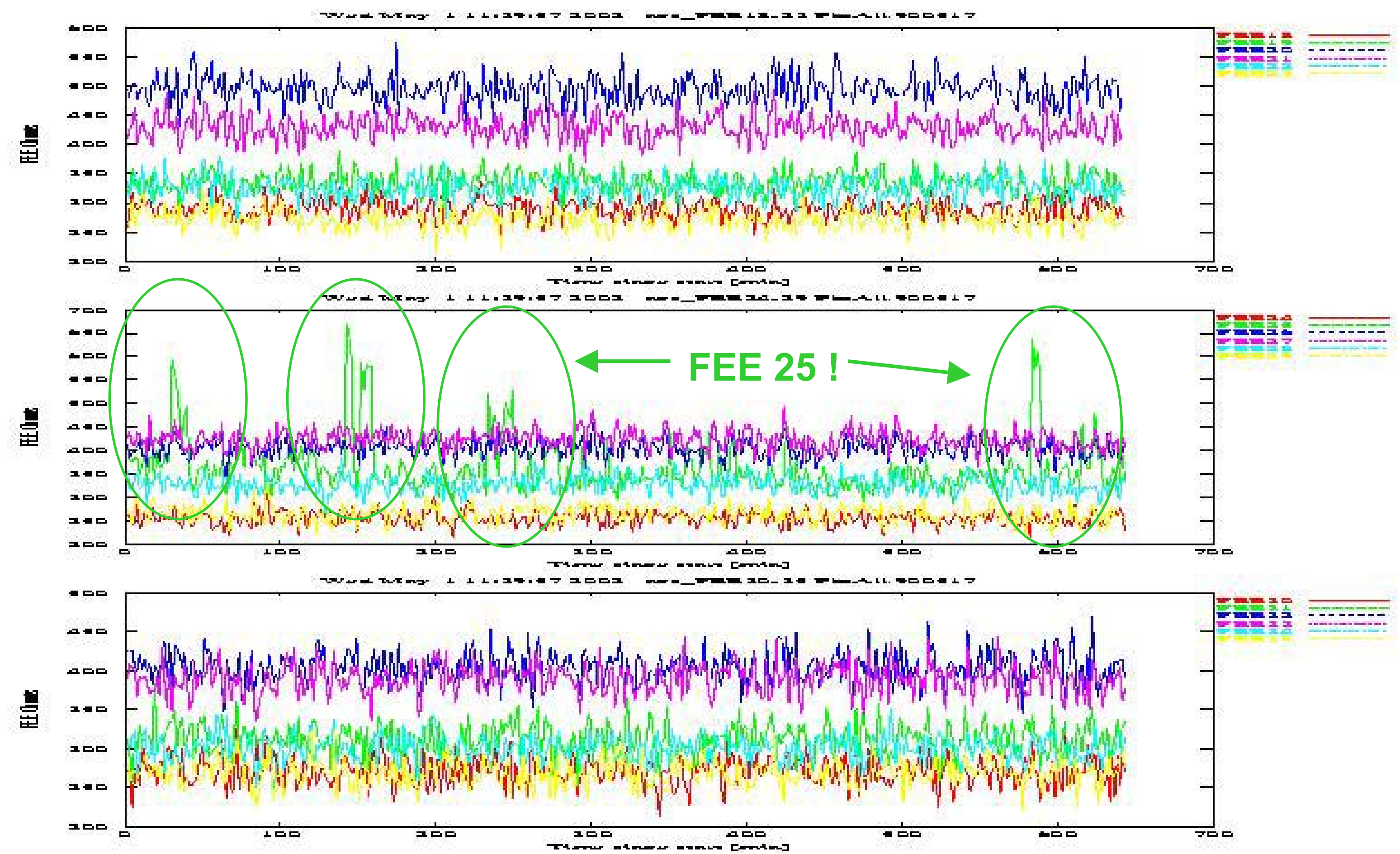


TV-Test ACS PktAll.000515: 29 April 12:02 – 1 May 11:16 / LCR



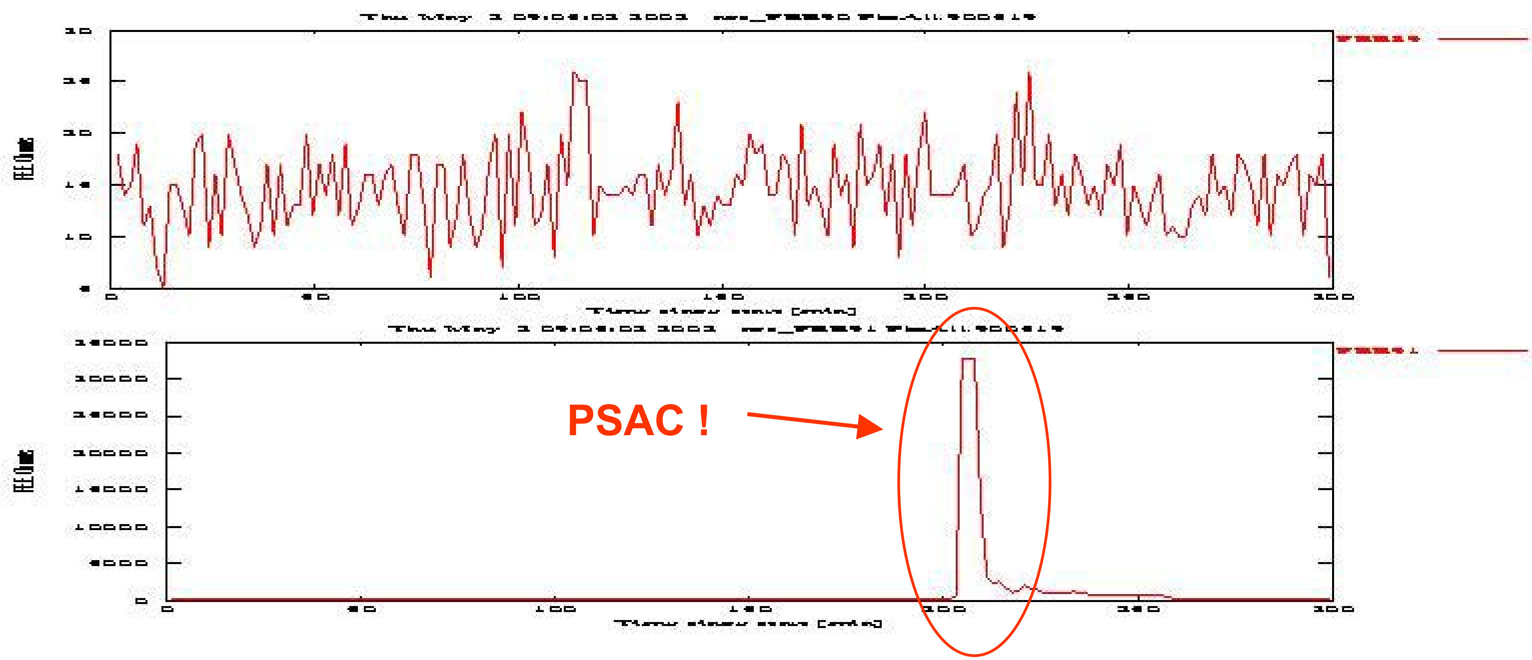
TV-Test ACS PktAll.000517: 1 May 11:40 – 22:22 / LCR

LCR 1-3

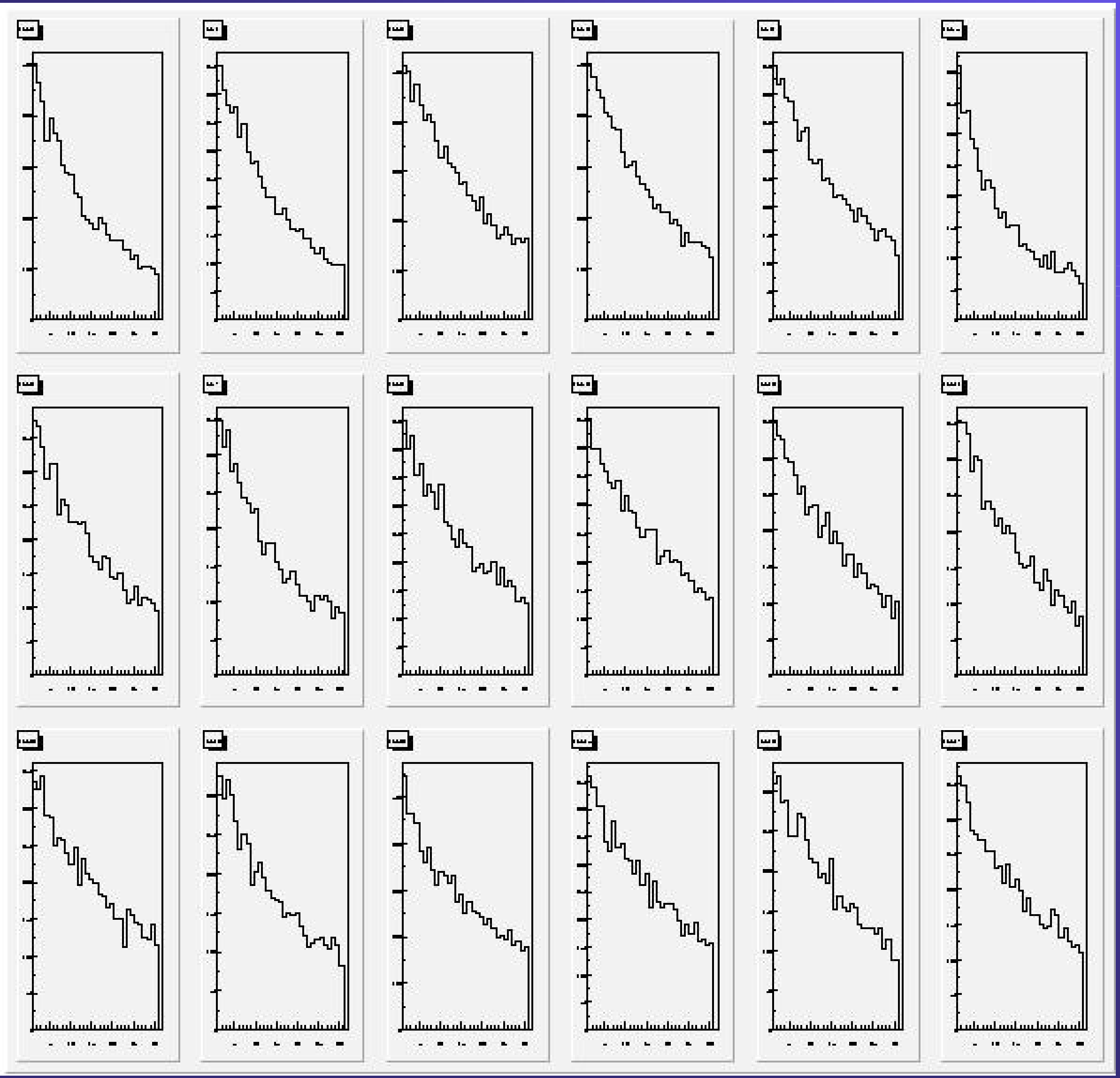


TV-Test ACS PktAll.000519: 2 May 9:05 – 23:30 / SCS/PSAC

SCS+PSAC



TV-Test: ACS calibration



UCR !

SVT-F / Status ACS-GSE

- During SVT-F ACS-GSE was tested at ISDC
- New OSM version
  - using Root 3.02.07 (old version: 3.00.06)
- Preproc 1.9 (newest Preproc version of ISDC – not released)
  - still one bug on Linux: SPI events are not processed !
- The ACS-pipeline is working
  - Reprocessing of SVT-E2E fits -TM
    - All HK-data can be viewed
    - without processing of SPI events
  - Several Linux-bugs of SCW-pipeline programs detected and eliminated
- Preparation for PV phase:
  - SCREW for modified mocsimul (sequence readout of PktAll-files)
  - Always actual auxiliary data (time-correlation.fits, …) are needed
    - during PV from ISDC via ftp ?

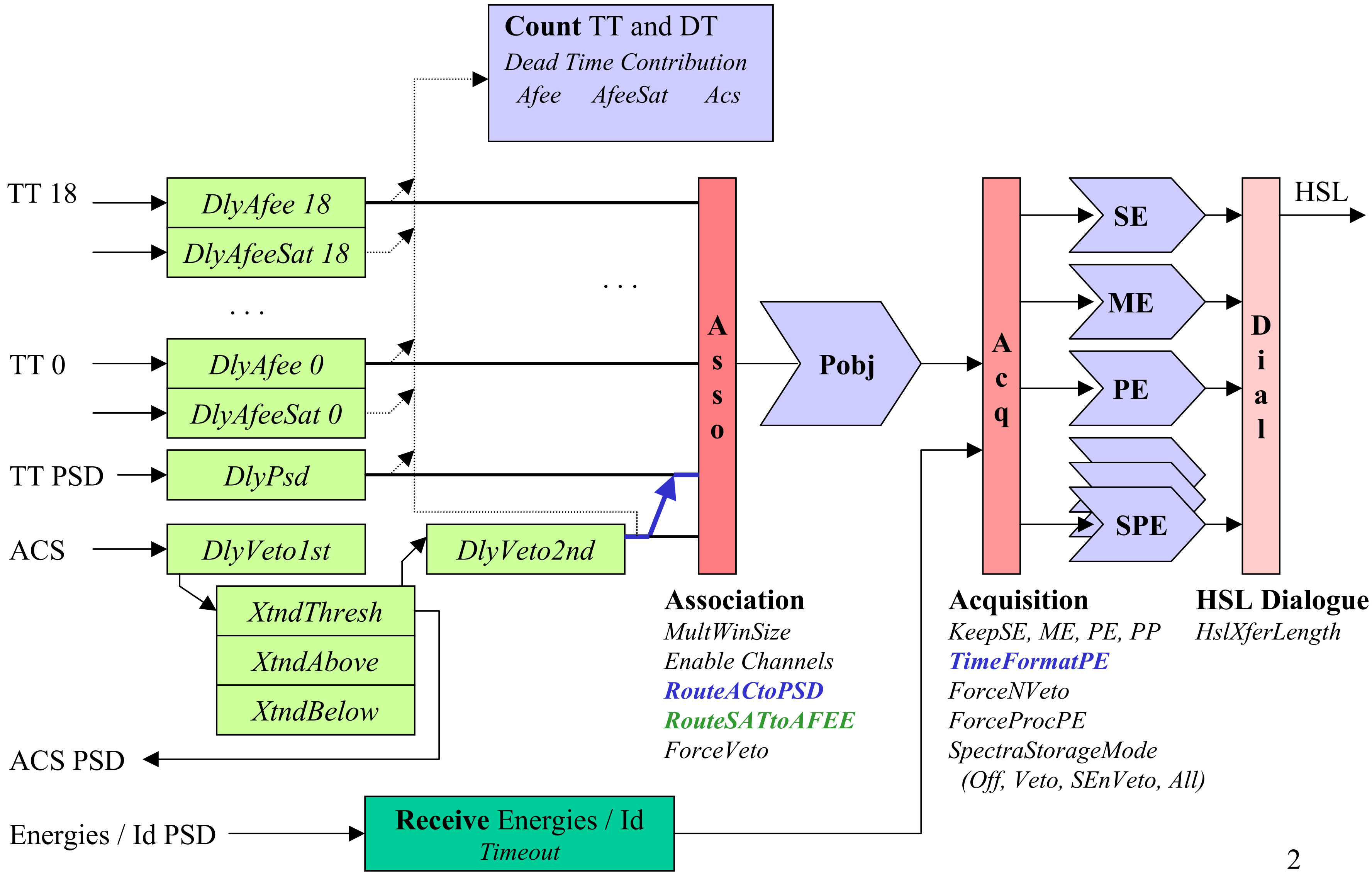
SPI Scientific Team Meeting

held in Munich, June 20-21, 2002

Timing Test Results
from the
INTEGRAL-FM Thermal Vacuum Test campaign
(ESTEC, 1st week of Mai 2002)

Stéphane Schanne
CEA Saclay / DAPNIA / Bât. 709, F-91191 Gif sur Yvette

Main DFEE configuration parameters



Summary of the nominal timing parameters presented at the DRB

DFEE parameters

Parameters		Nominal		Redundant	
E7820	DelayAfeeTT 0	0	0 ns	0	0 ns
E7821	DelayAfeeTT 1	1	50 ns	1	50 ns
E7822	DelayAfeeTT 2	1	50 ns	1	50 ns
E7823	DelayAfeeTT 3	0	0 ns	0	0 ns
E7824	DelayAfeeTT 4	1	50 ns	1	50 ns
E7825	DelayAfeeTT 5	1	50 ns	1	50 ns
E7826	DelayAfeeTT 6	0	0 ns	**1**	**50 ns**
E7827	DelayAfeeTT 7	0	0 ns	0	0 ns
E7828	DelayAfeeTT 8	0	0 ns	0	0 ns
E7829	DelayAfeeTT 9	0	0 ns	0	0 ns
E7830	DelayAfeeTT 10	0	0 ns	0	0 ns
E7831	DelayAfeeTT 11	0	0 ns	0	0 ns
E7832	DelayAfeeTT 12	0	0 ns	0	0 ns
E7833	DelayAfeeTT 13	0	0 ns	0	0 ns
E7834	DelayAfeeTT 14	0	0 ns	0	0 ns
E7835	DelayAfeeTT 15	0	0 ns	0	0 ns
E7836	DelayAfeeTT 16	0	0 ns	0	0 ns
E7837	DelayAfeeTT 17	1	50 ns	1	50 ns
E7838	DelayAfeeTT 18	0	0 ns	0	0 ns

Parameters		Nominal		Redundant	
E7800	DelayAfeeSat 0	11	550 ns	11	550 ns
E7801	DelayAfeeSat 1	12	600 ns	12	600 ns
E7802	DelayAfeeSat 2	12	600 ns	12	600 ns
E7803	DelayAfeeSat 3	11	550 ns	11	550 ns
E7804	DelayAfeeSat 4	12	600 ns	12	600 ns
E7805	DelayAfeeSat 5	11	550 ns	11	550 ns
E7806	DelayAfeeSat 6	10	500 ns	**11**	**550 ns**
E7807	DelayAfeeSat 7	11	550 ns	11	550 ns
E7808	DelayAfeeSat 8	10	500 ns	**11**	**550 ns**
E7809	DelayAfeeSat 9	7	350 ns	7	350 ns
E7810	DelayAfeeSat 10	11	550 ns	11	550 ns
E7811	DelayAfeeSat 11	9	450 ns	9	450 ns
E7812	DelayAfeeSat 12	7	350 ns	7	350 ns
E7813	DelayAfeeSat 13	10	500 ns	10	500 ns
E7814	DelayAfeeSat 14	10	500 ns	10	500 ns
E7815	DelayAfeeSat 15	11	550 ns	11	550 ns
E7816	DelayAfeeSat 16	10	500 ns	10	500 ns
E7817	DelayAfeeSat 17	12	600 ns	**13**	**650 ns**
E7818	DelayAfeeSat 18	10	500 ns	10	500 ns

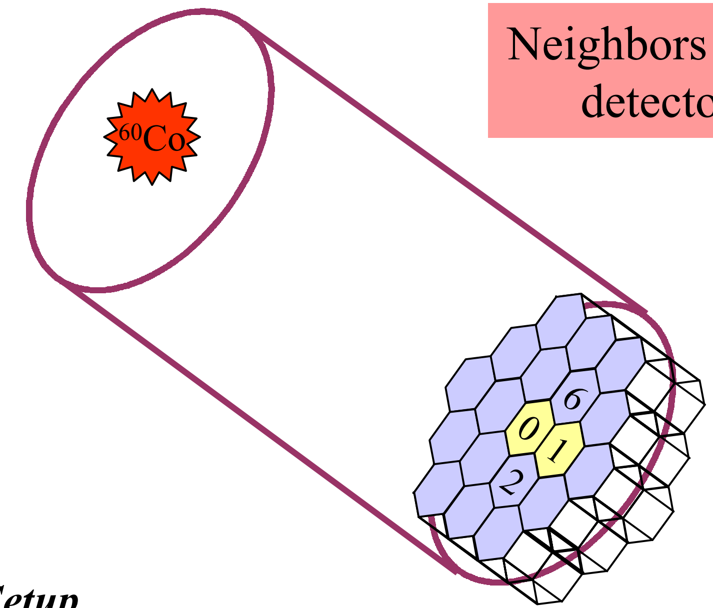
E7840	DelayVetoFrst	000100	5
E7841	DelayVetoScnd	010100	**24**
E7842	XtndThresh	00101000	40 (2100 ns)
E7843	DlyPsd	11110	**12 (600 ns)**
E7844	XntGateAbove	00001111	15 (2.95 µs)
E7845	XntGateBelow	00001011	**12 (550 ns)**

ACS parameters

E6898	VetoWinWidth	9 (d)	175 ns
E6491	1st PSAC delay	0	0
E6492	2nd PSAC delay	1	1

AFEE Time Tag alignment check for nominal module

Neighbors of detector 0

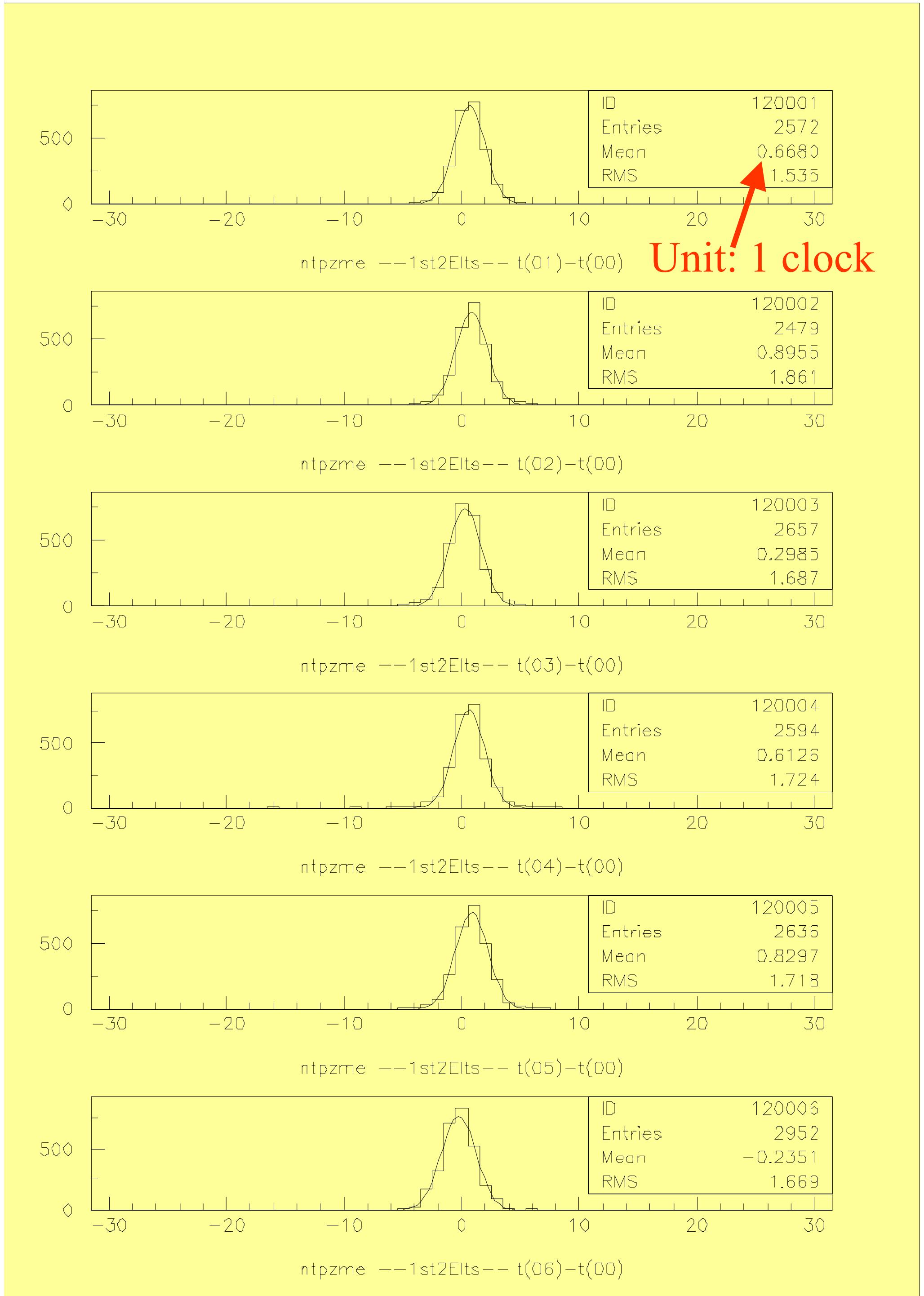


Setup

- SPI in Thermal Vacuum chamber at ESTEC
- Pierre Mandrou's source revolver on mask
- ^{60}Co source shines through a mask hole

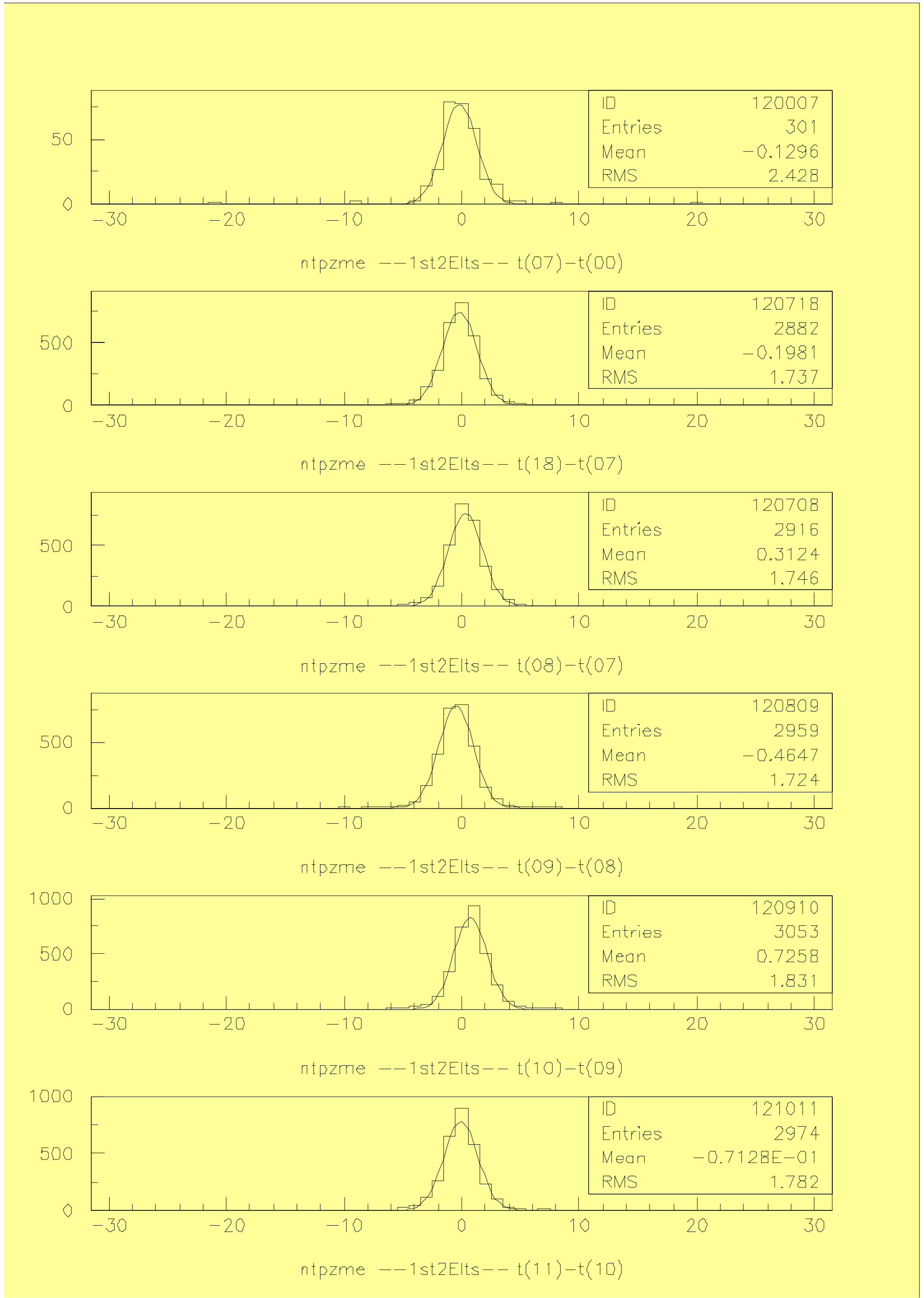
Data & config

- Nominal timing alignment configuration
- Check inside ME timing differences between detector i and j : $\Delta t(i,j)$



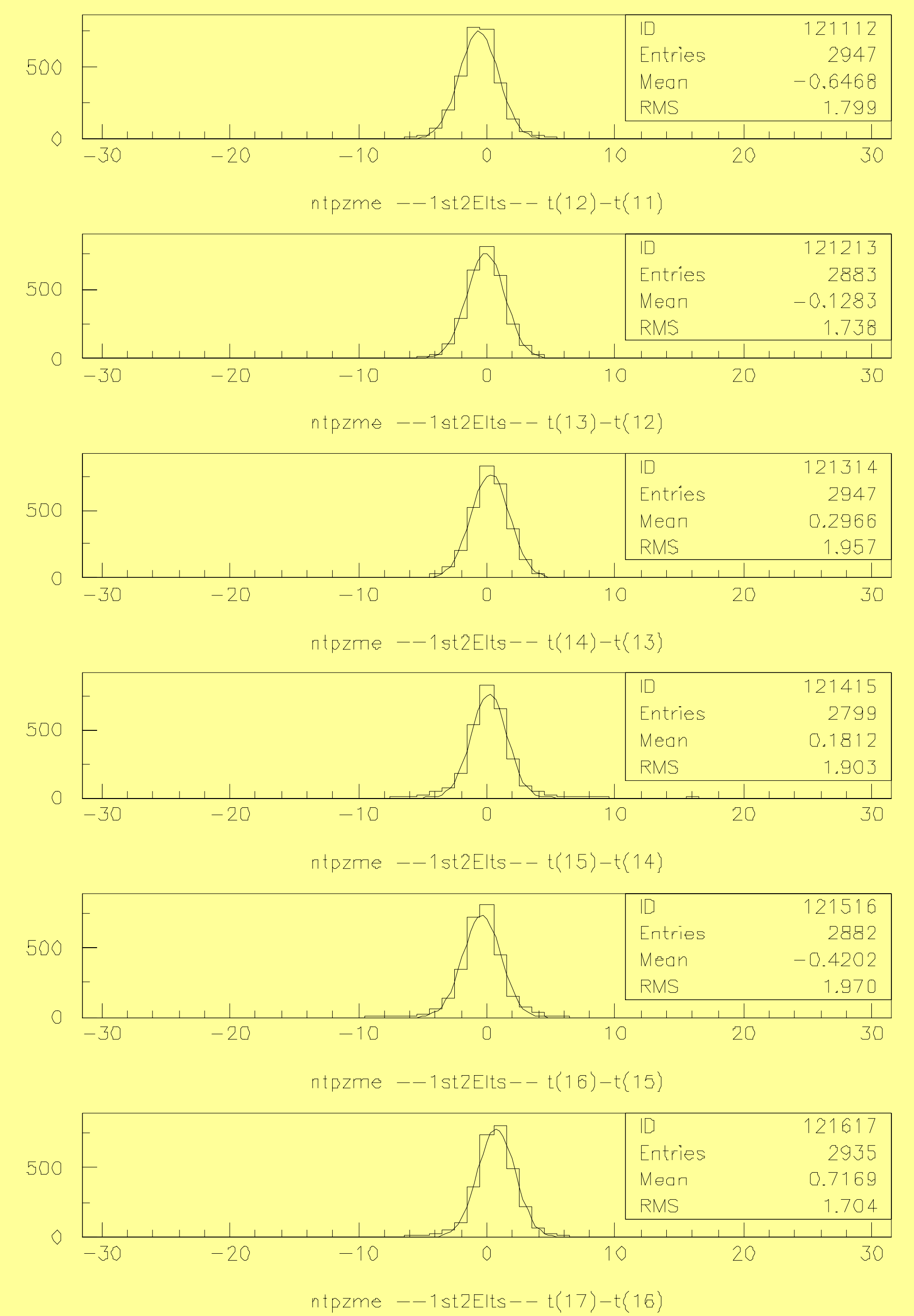
AFEE Time Tag alignment check for nominal module

Neighbors of detectors 7,8,9,10



AFEE Time Tag alignment check for nominal module

Neighbors of detector 11,12,13,14,15,16



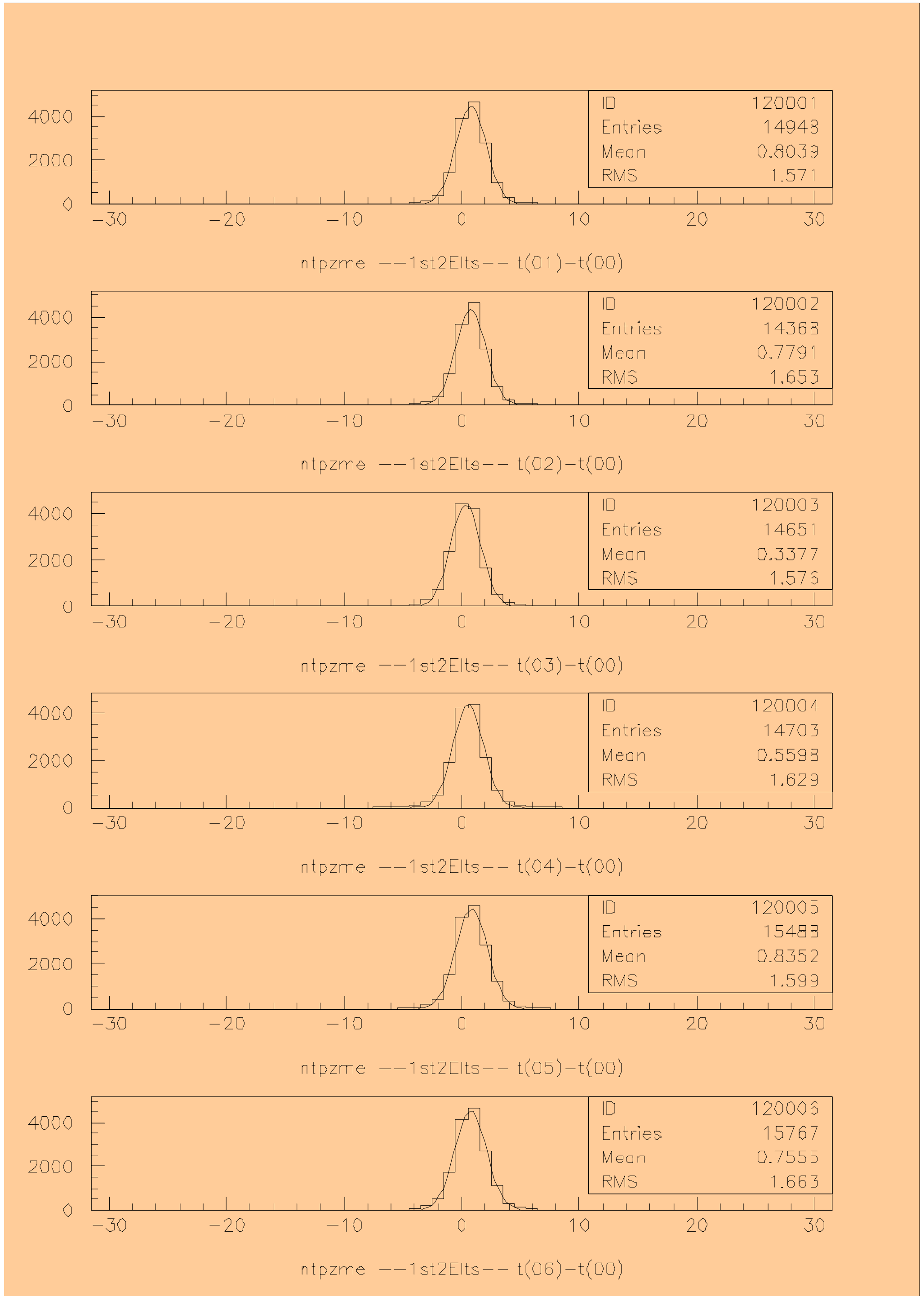
Conclusion

- All detectors aligned within 1 ASIC clock (50 ns)

Run : 001
RunId : R1
AcqNum : 514

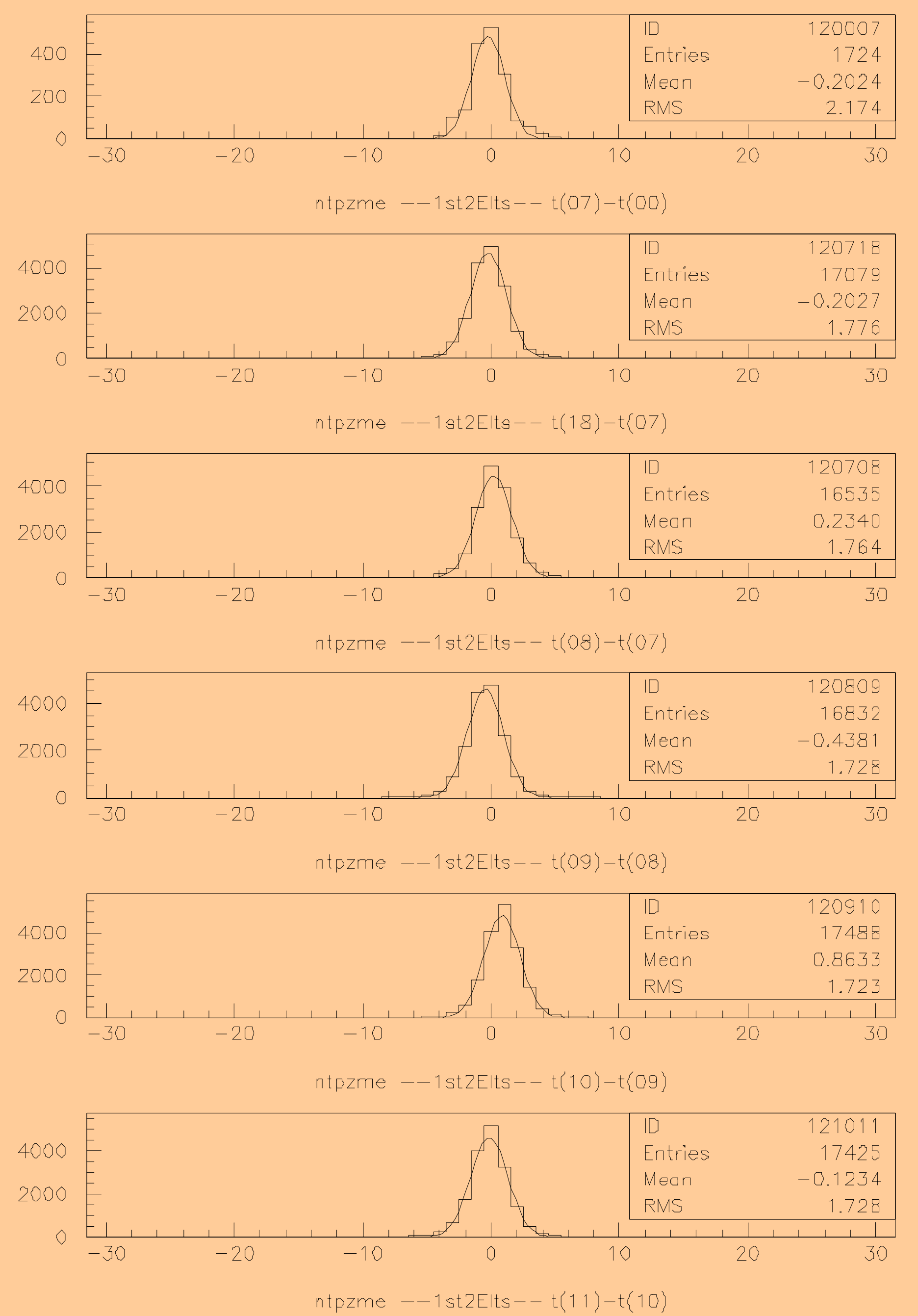
AFEE Time Tag alignment check for redundant module

Neighbors of detector 0



AFEE Time Tag alignment check for redundant module

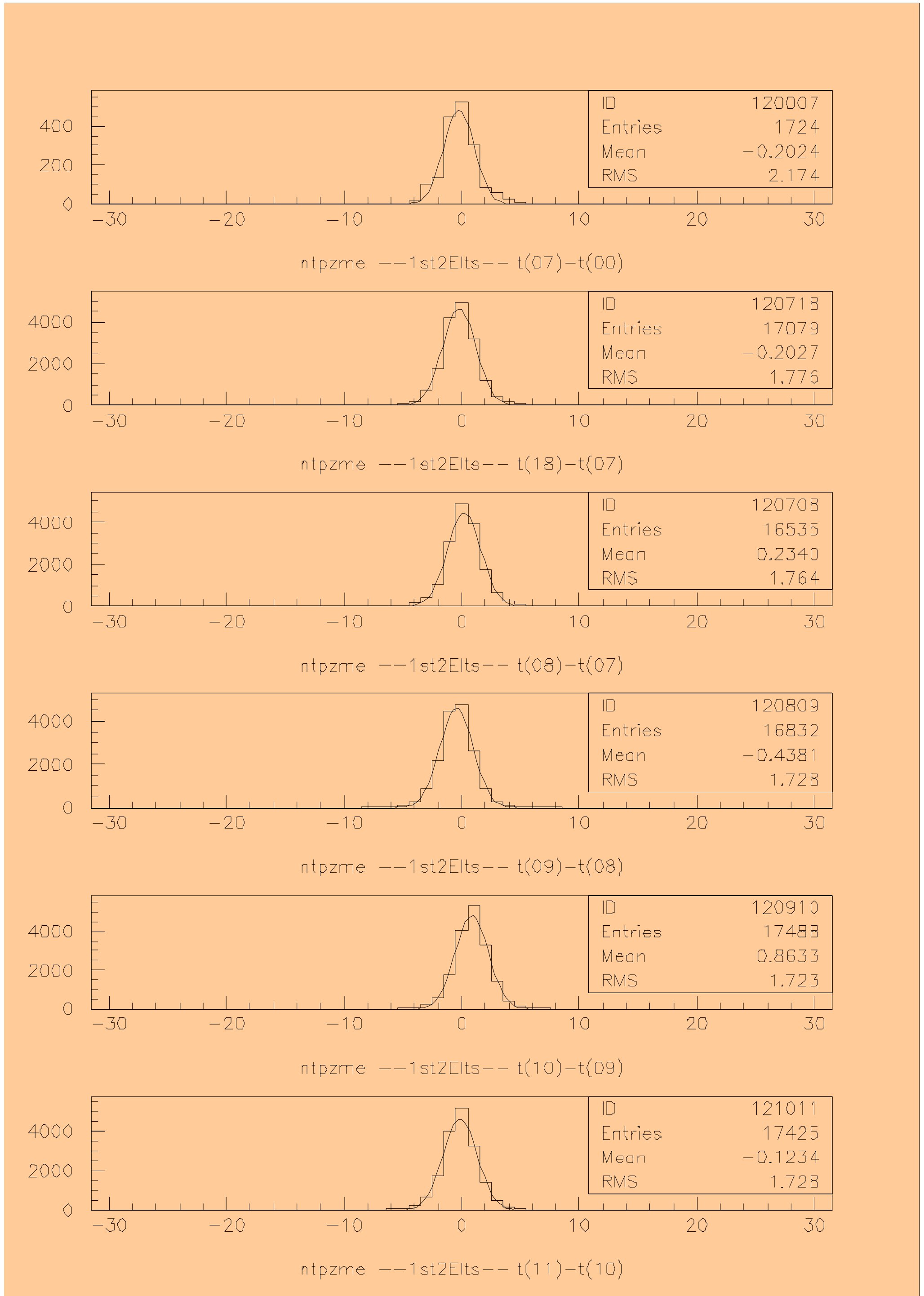
Neighbors of detectors 7,8,9,10



S.Schanne@cea.fr

AFEE Time Tag alignment check for redundant module

Neighbors of detector 11,12,13,14,15,16



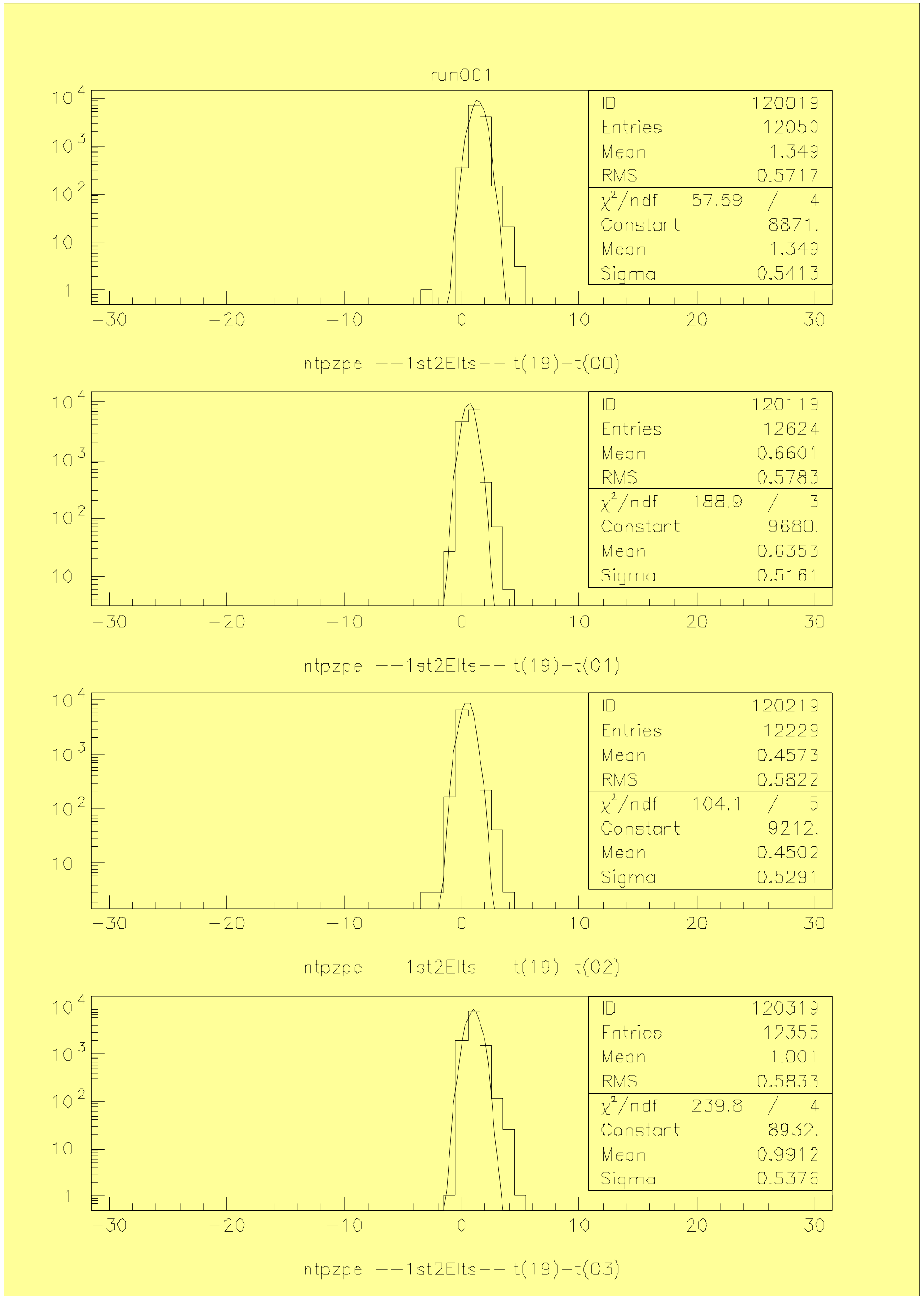
Conclusion

- All detectors aligned within 1 ASIC clock (50 ns)

Run : 001
RunId : R1
AcqNum : 522

PSD / AFEE alignment check for nominal module

detectors 0,1,2,3



Setup

- SPI in Thermal Vacuum chamber at ESTEC
- Pierre Mandrou's source revolver on mask
- ^{60}Co source shines through a mask hole

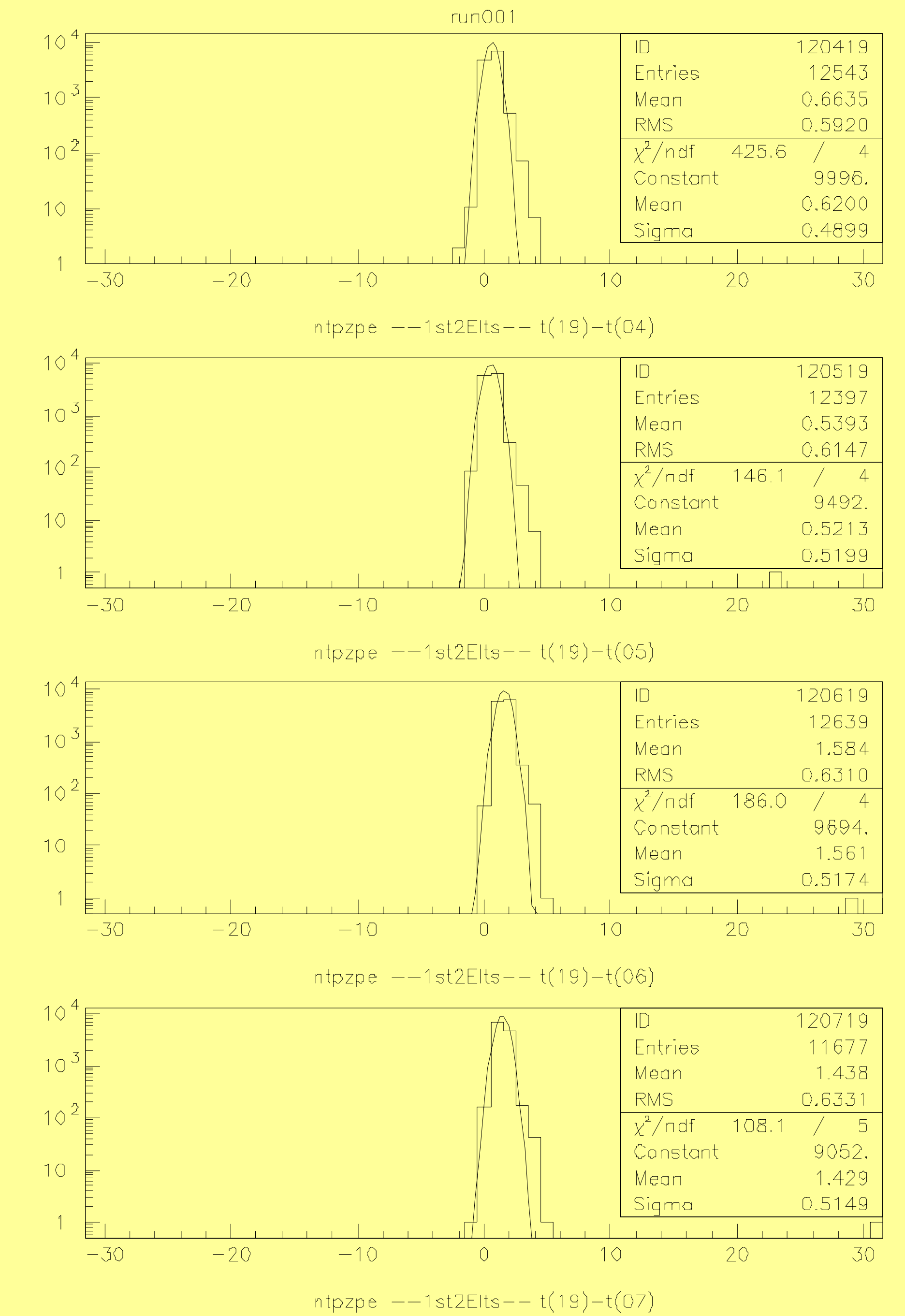
Data & config

- Nominal timing alignment configuration
- activate TimeFormatPE in DFEE
- deactivate correlationPE in DPE
- Check inside PE timing differences between PSD and detector : Δt(19,i)

20 June 2002 S.Schanne@cea.fr

PSD / AFEE alignment check for nominal module

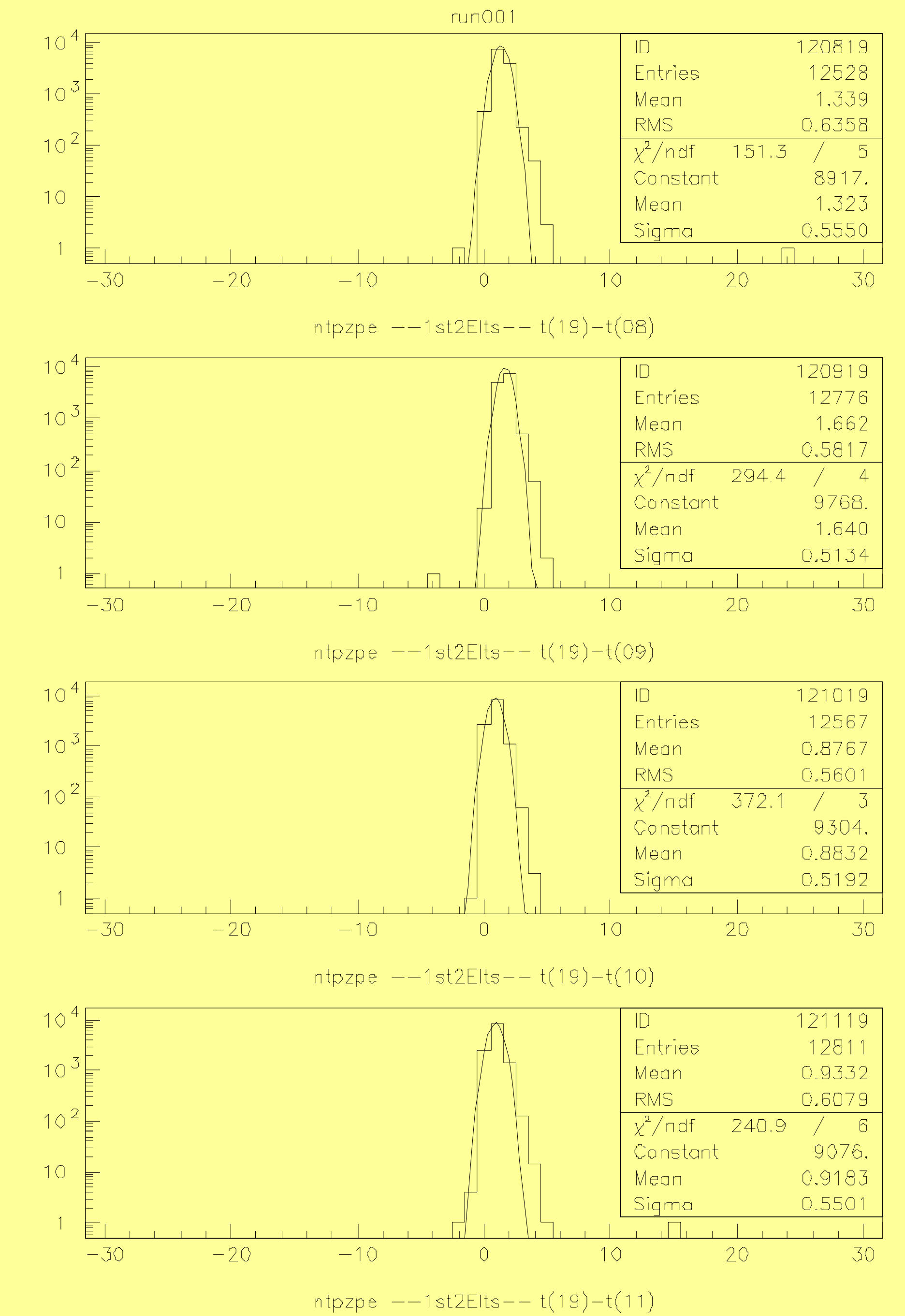
detectors 4,5,6,7



 S.Schanne@cea.fr

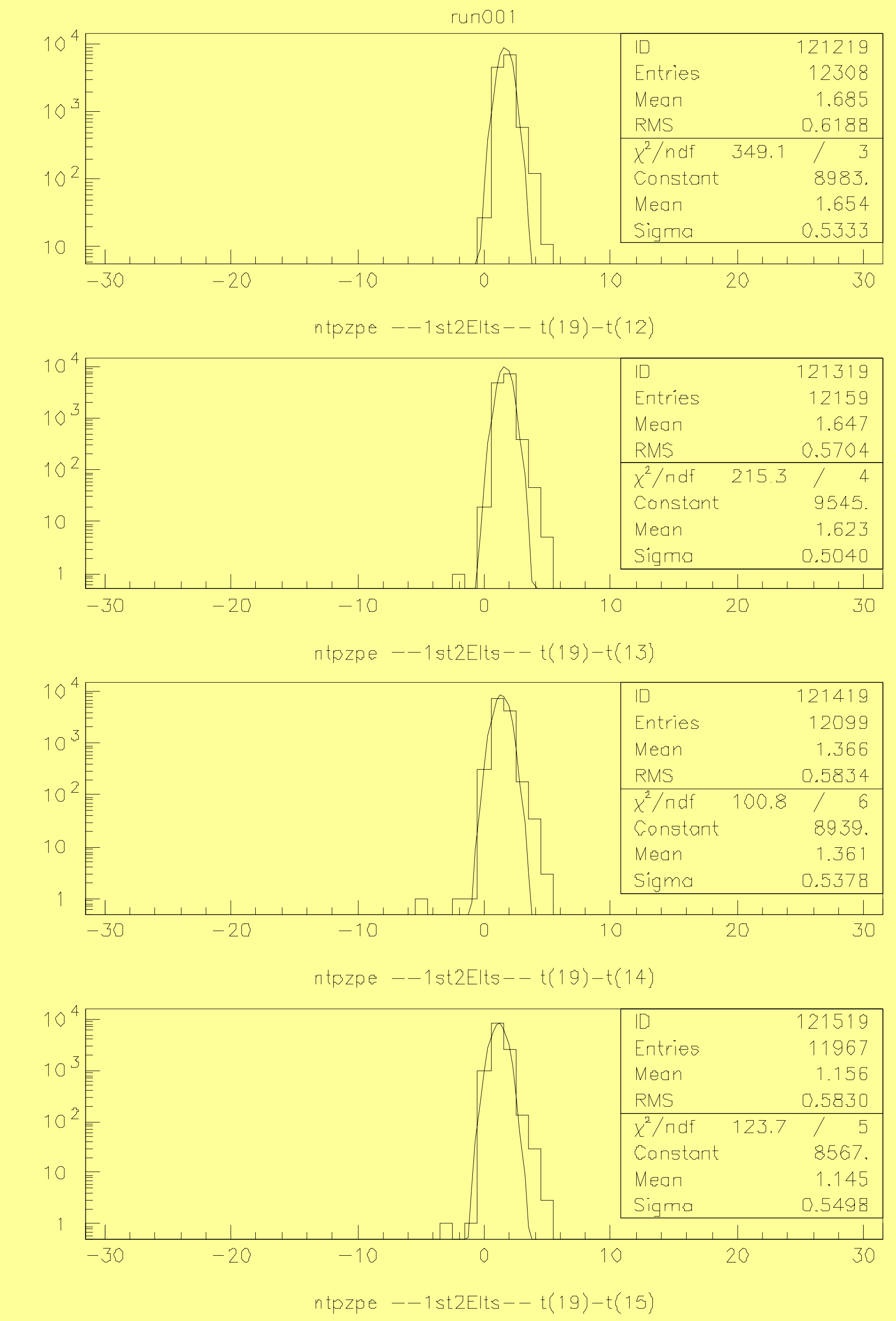
PSD / AFEE alignment check for nominal module

detectors 8,9,10,11



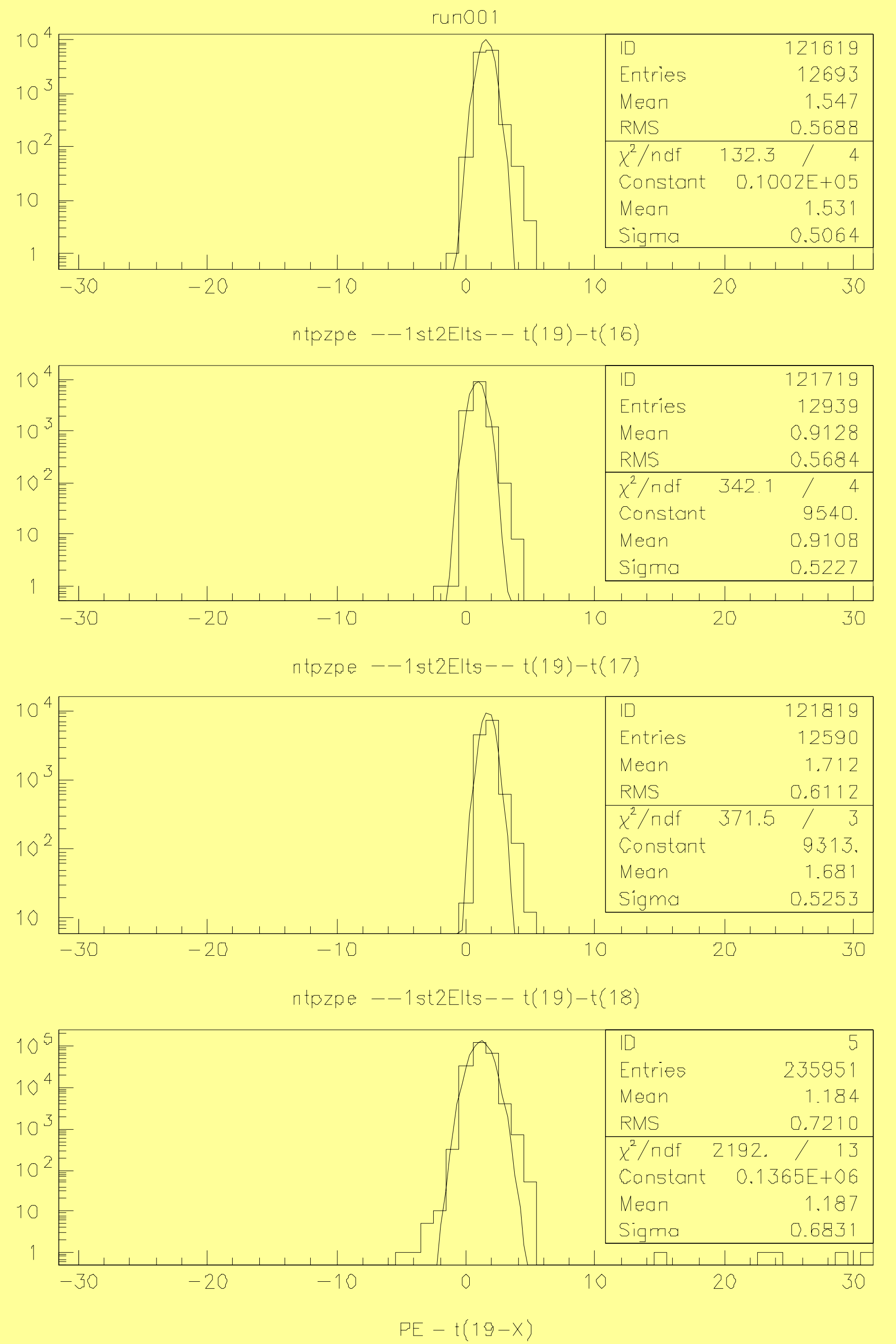
PSD / AFEE alignment check for nominal module

detector 12,13,14,15



PSD / AFEE alignment
check for nominal module

detector 16,17,18
all detectors together



Conclusion

- PSD TT is misaligned by 1 clock with respect to all detector Time Tags !
- PSD arrives 1 clock to late.
- PSD delay is set by :
  PsdDelay = 12
- Should now be set to = 11

Run : 001
RunId : T1
AcqNum : 514

20 June 2002 S.Schanne@cea.fr

PSD / AFEE alignment check for redundant module

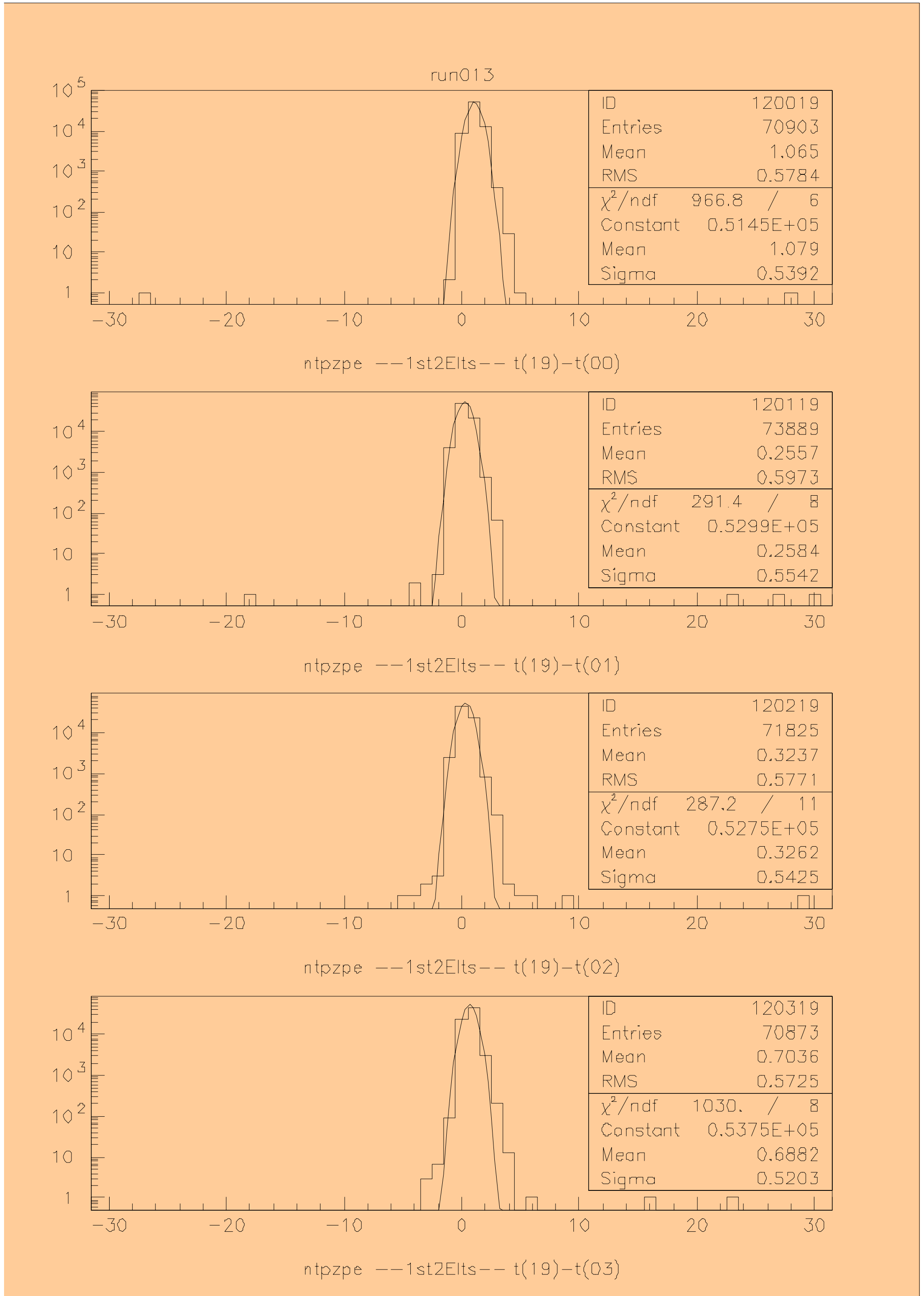
detectors 0,1,2,3

Setup

- SPI in Thermal Vacuum chamber at ESTEC
- Pierre Mandrou's source revolver on mask
- ^{60}Co source shines through a mask hole

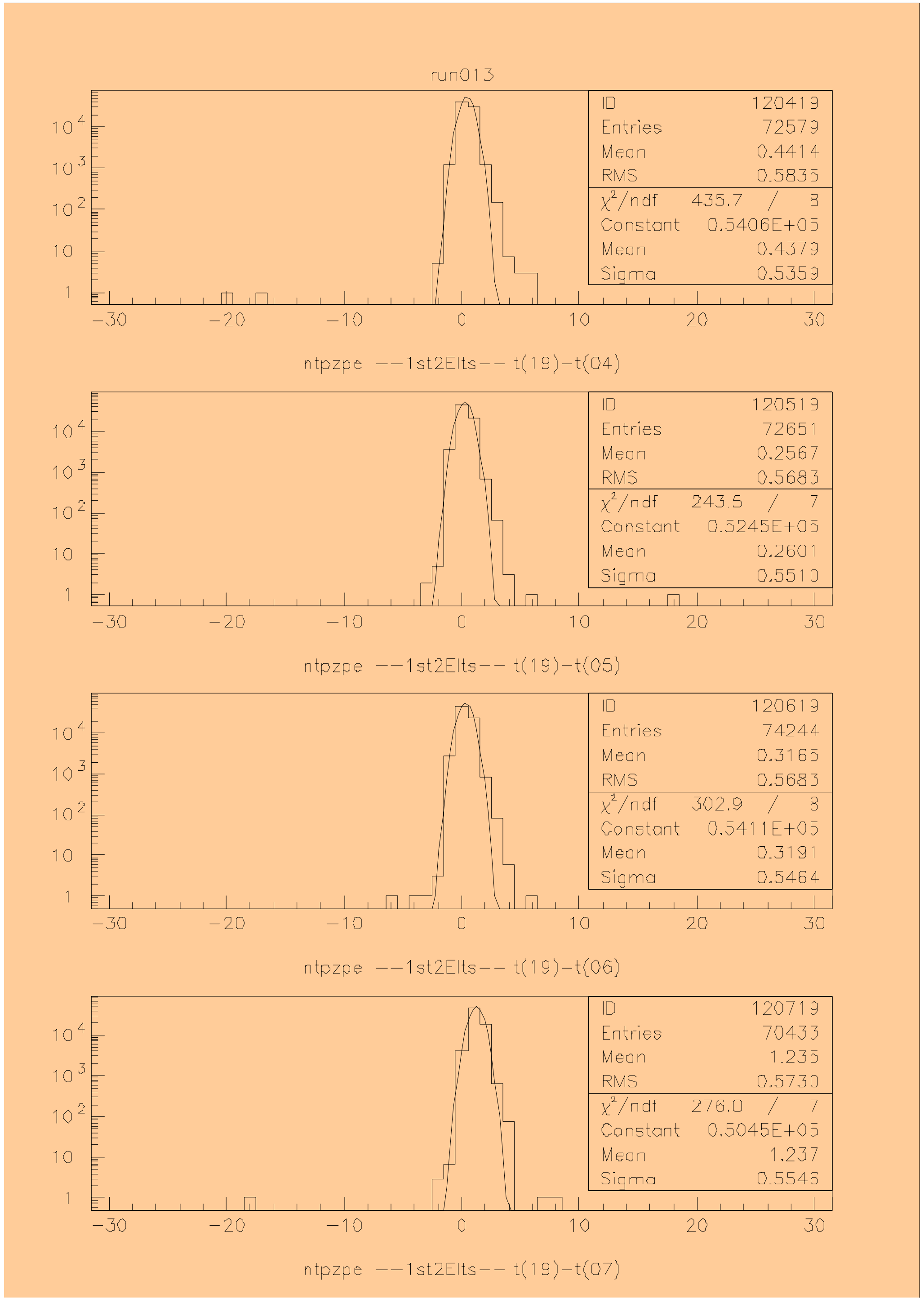
Data & config

- Nominal timing alignment configuration
- activate TimeFormatPE in DFEE
- deactivate correlationPE in DPE
- Check inside PE timing differences between PSD and detector : $\Delta t(19,i)$



PSD / AFEE alignment check for redundant module

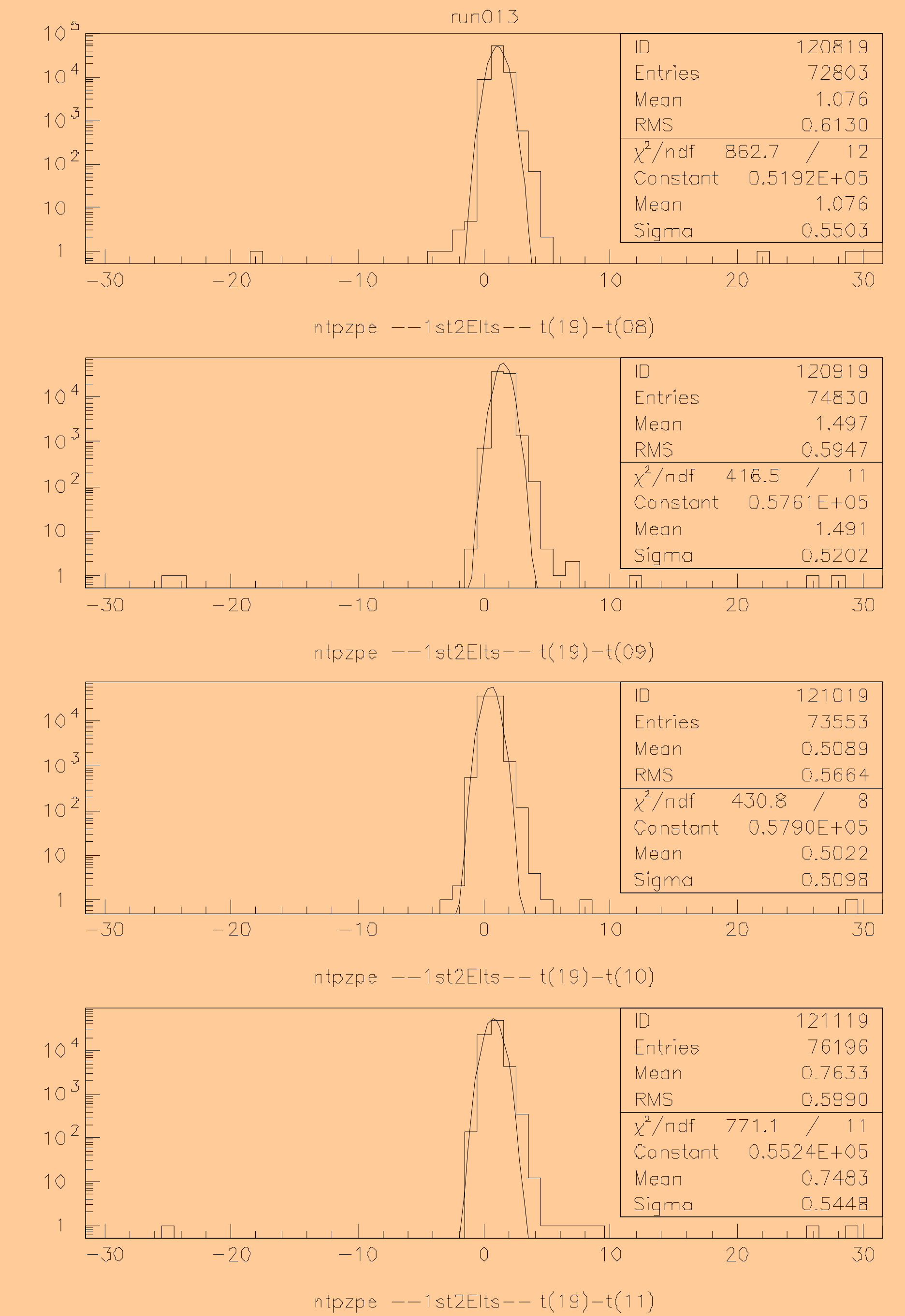
detectors 4,5,6,7



S.Schanne@cea.fr

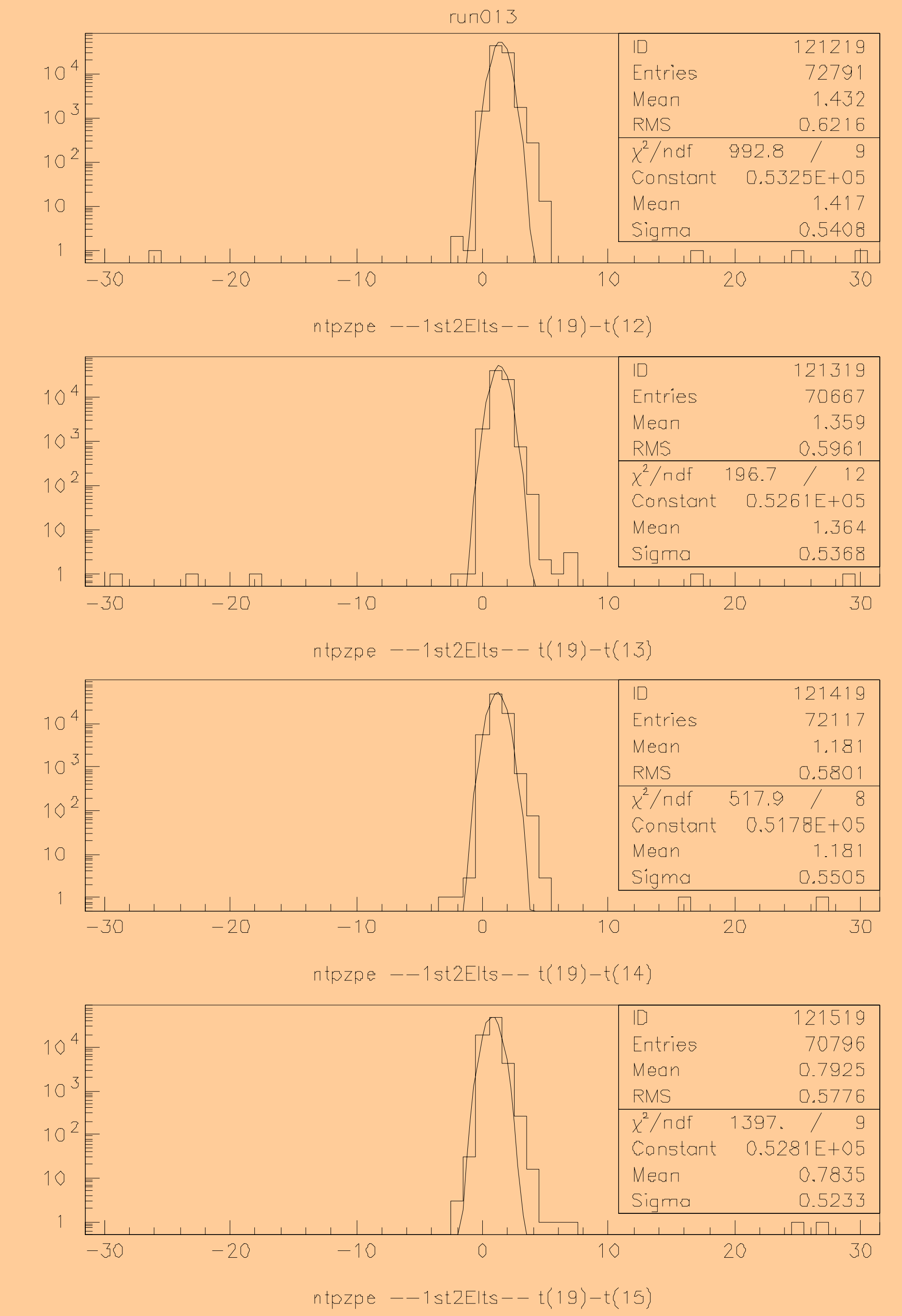
PSD / AFEE alignment check for redundant module

detectors 8,9,10,11



PSD / AFEE alignment check for redundant module

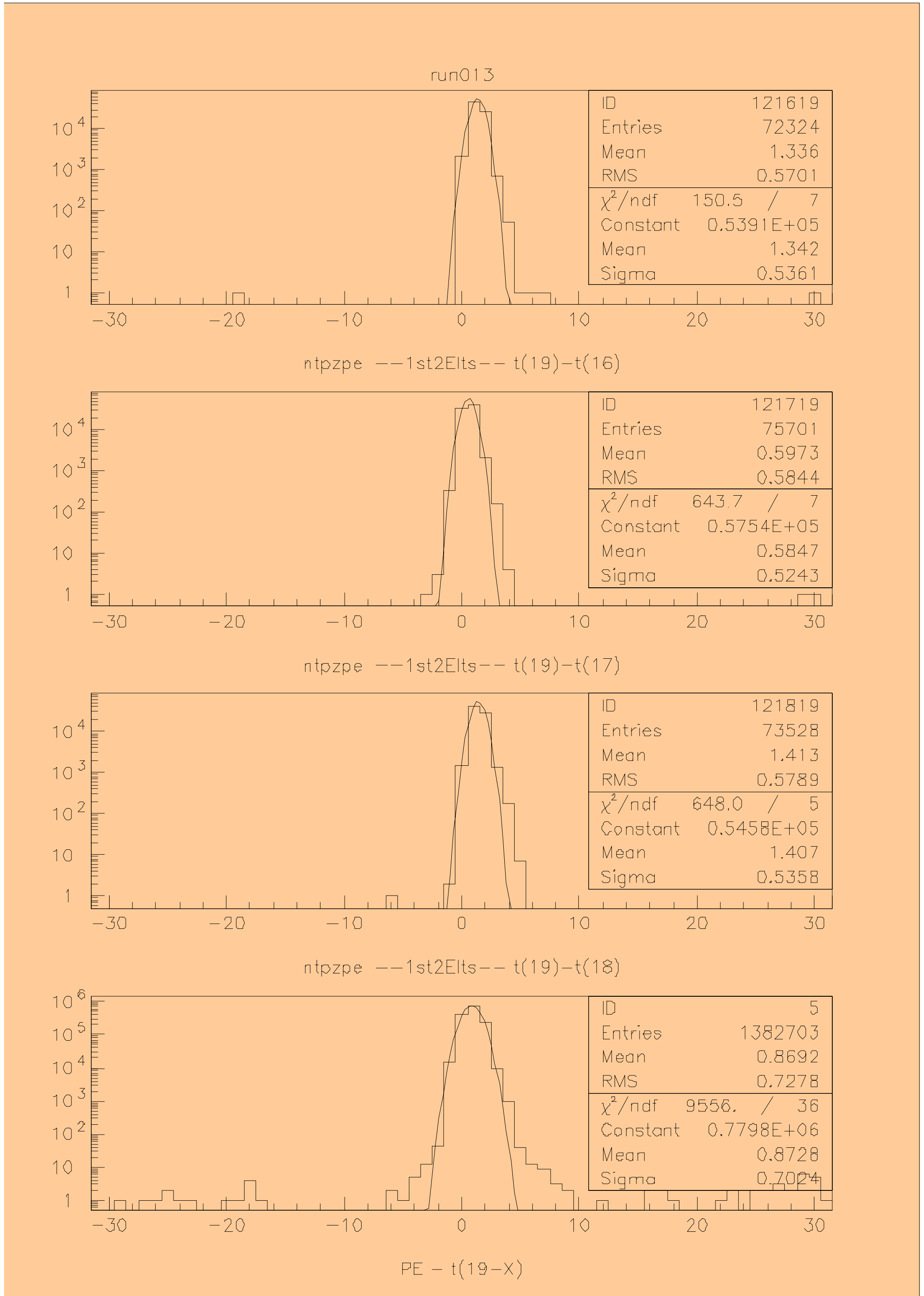
detector 12,13,14,15



S.Schanne@cea.fr

PSD / AFEE TT alignment check for redundant module

detector 16,17,18
all detectors together



Conclusion

- PSD TT is misaligned by 1 clock with respect to all detector Time Tags !
- PSD arrives 1 clock to late.
- PSD delay is set by : PsdDelay = 12
- Should now be set to = 11

Run : 013
RunId : R1
AcqNum : 522

ACS / AFEE TT alignment check for nominal module

Setup

- SPI in Thermal Vacuum chamber at ESTEC
- Pierre Mandrou's source revolver on mask
- background mode (no source over hole)

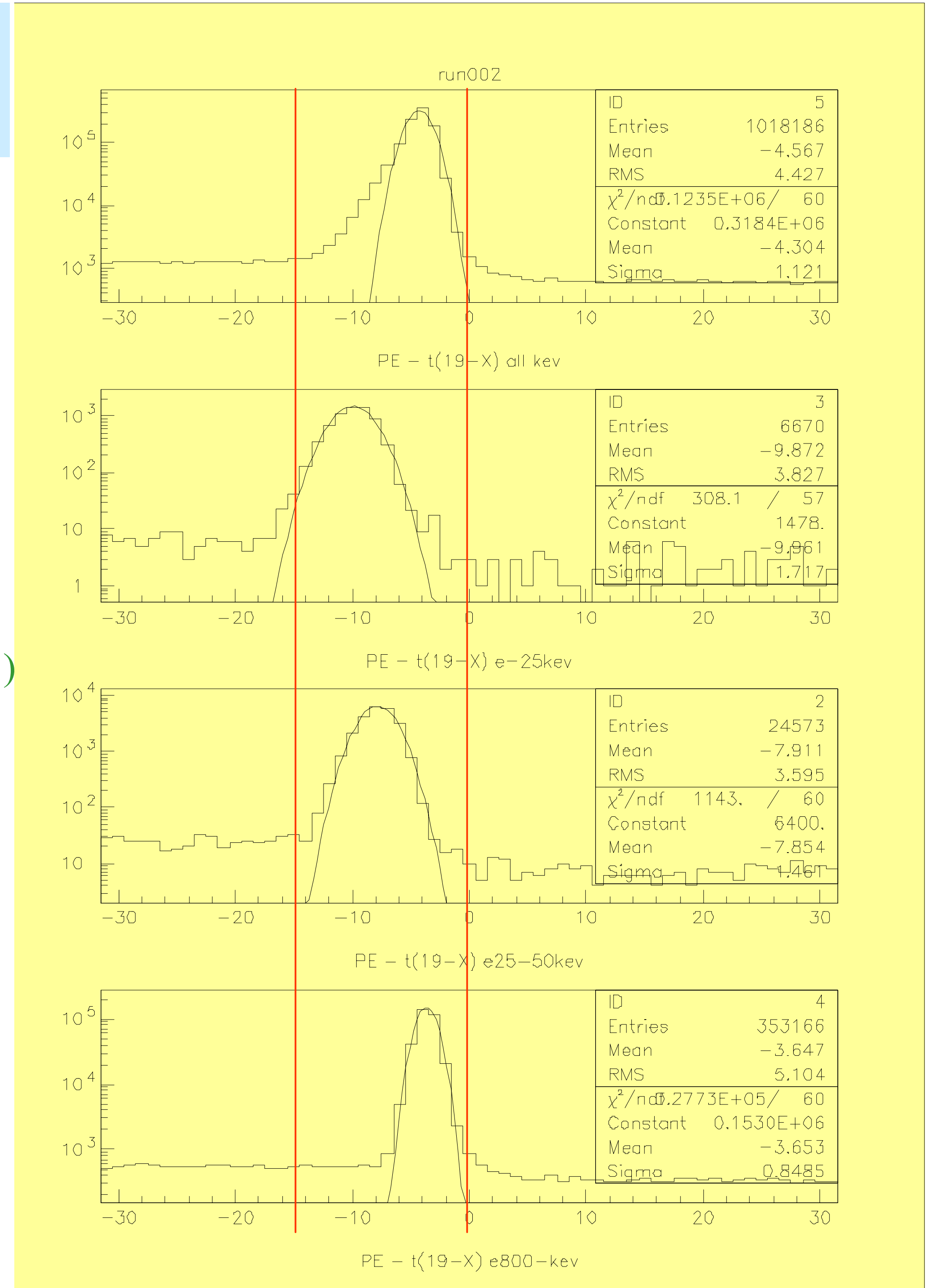
Data & config

- Nominal timing alignment configuration
- Route ACS to PSD channel inside DFEE
- TimeFormatPE & no correlationPE
- Check inside PE timing differences between 'PSD' (=ACS) and detector i : $\Delta t(19,j)$

Conclusion

- ACS well aligned / AFEE
- ACS width set to 725 ns = 14 clocks this is ok for all energies

Run : 002
RunId : T2
AcqNum : 514



ACS / AFEE TT alignment check for redundant module

Setup

- SPI in Thermal Vacuum chamber at ESTEC
- Pierre Mandrou's source revolver on mask
- background mode (no source over hole)

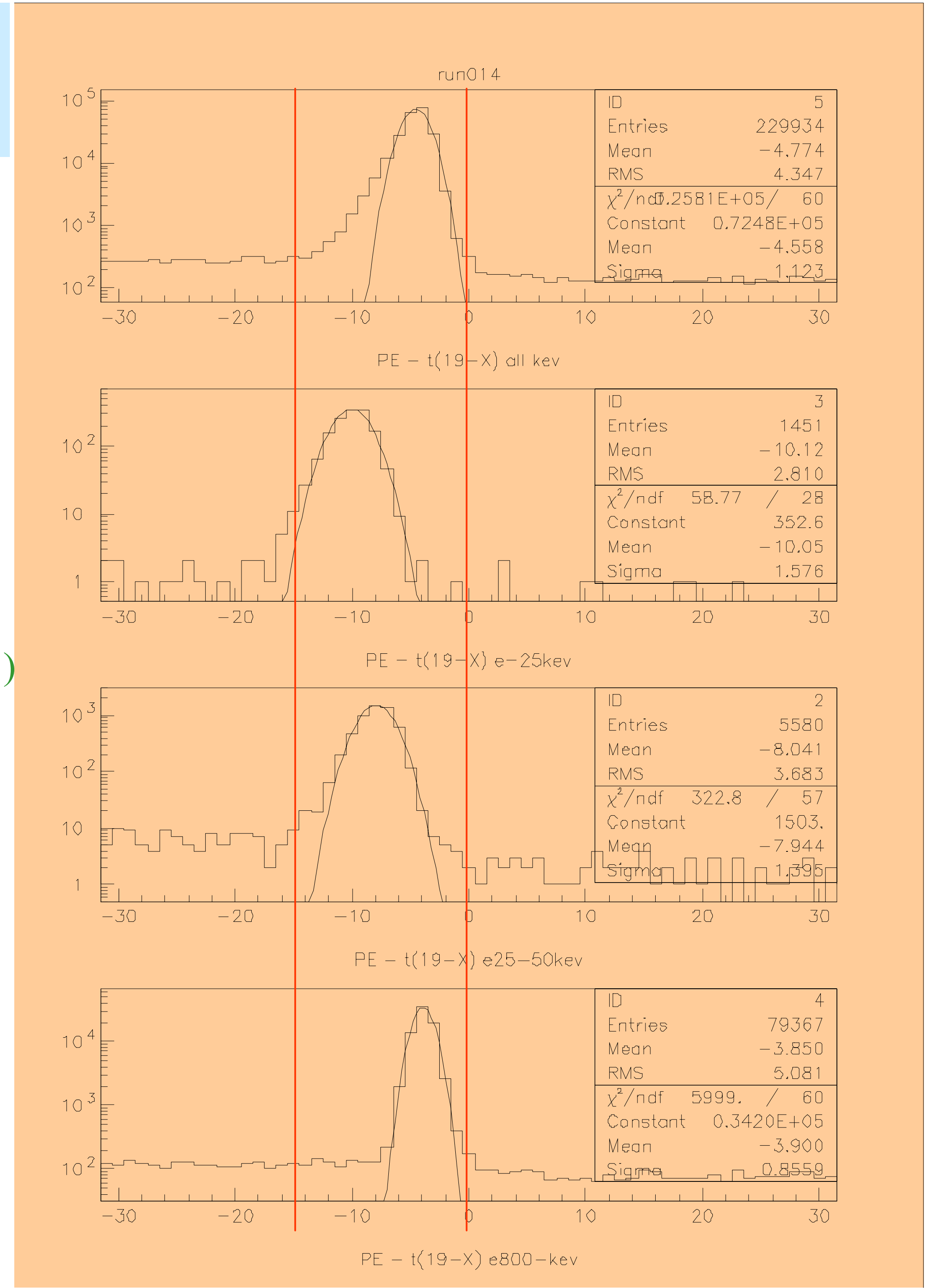
Data & config

- Nominal timing alignment configuration
- Route ACS to PSD channel inside DFEE
- TimeFormatPE & no correlationPE
- Check inside PE timing differences between 'PSD' (=ACS) and detector i : Δt(19,j)

Conclusion

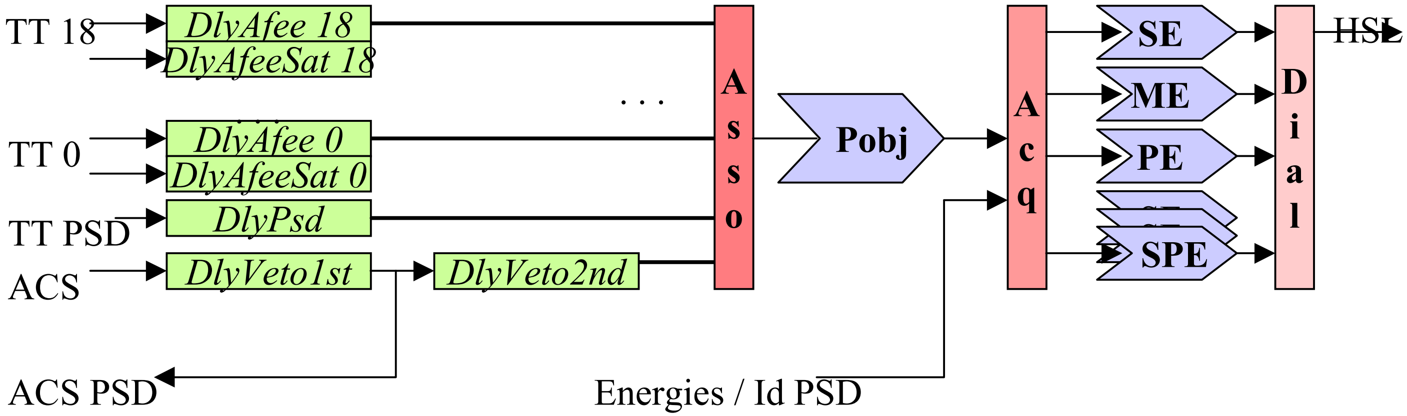
- ACS well aligned / AFEE
- ACS width set to 725 ns = 14 clocks this is ok for all energies

Run : 014
RunId : R2
AcqNum : 522



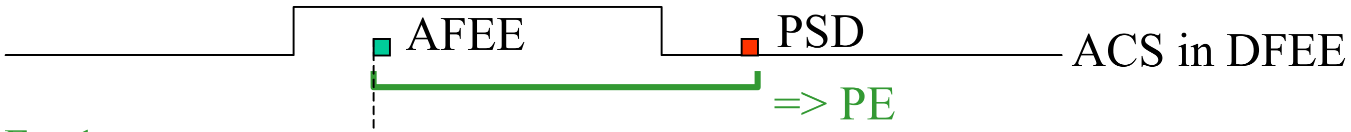
20 June 2002 S.Schanne@cea.fr

Alignment of the ACS gate sent to the PSD (never done before)



Measurement method

- AssoVetoMode = 10 veto inverted: reject all events with TT outside veto gate, whose width is 725 ns
  this way, select events falling together with veto only.

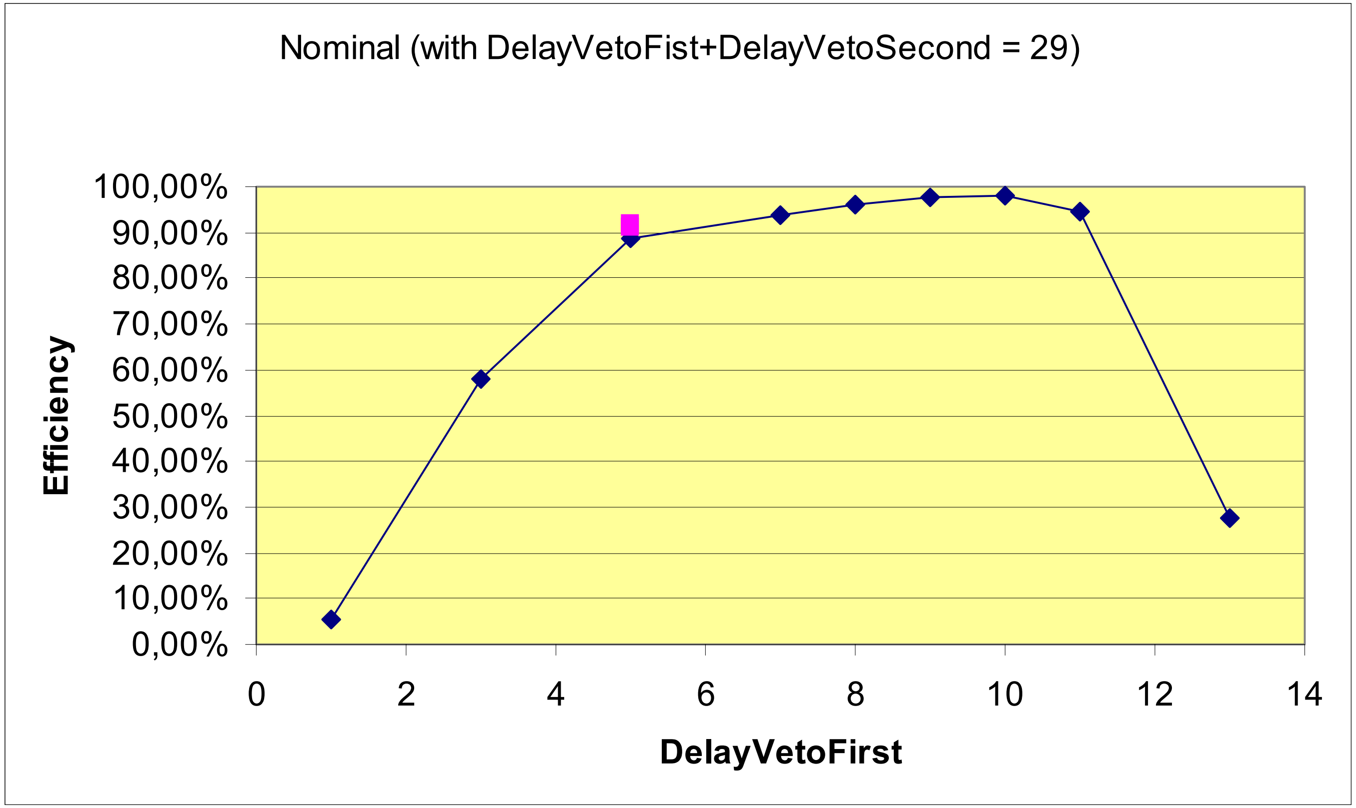


- KeepPE = 1
- EvtForceProcPE = 1 all PSD TT are classified as PE, none will be an SE if PSD says not processed).
- keep constant : DlyVeto1+DlyVeto2 (veto gate inside DFEE stays at the same place)
- vary : DlyVeto1 (veto gate sent to PSD arrives earlier/later)

- => for PE : if the ACS gate to the PSD is well aligned, the veto is active in the PSD,
  the PSD should not send time tags anymore, the PSD Time Tag counter and the PE should disappear.

Alignment of the ACS gate sent to the PSD (nominal module)

Run	Run-ID	DlyVeto1	DlyVeto2	Bin0	BinAll	Bin0/BinAll
3	T3.1	1	28	281	5062	5,55%
4	T3.2	3	26	3163	5452	58,02%
5	T3.3	5	24	4197	4729	88,75%
6	T3.4	7	22	5281	5625	93,88%
11	T3.4A	8	21	5021	5233	95,95%
7	T3.5	9	20	5586	5729	97,50%
12	T3.5A	10	19	5925	6032	98,23%
8	T3.6	11	18	4526	4786	94,57%
10	T3.7B	13	16	2100	7599	27,64%



BinAll :
number of Time Frames
Bin0 :
number of TF without PE

Conclusion

- from ACS/AFEE alignment we have seen that we must satisfy: DlyVet1+DlyVet2 = 29

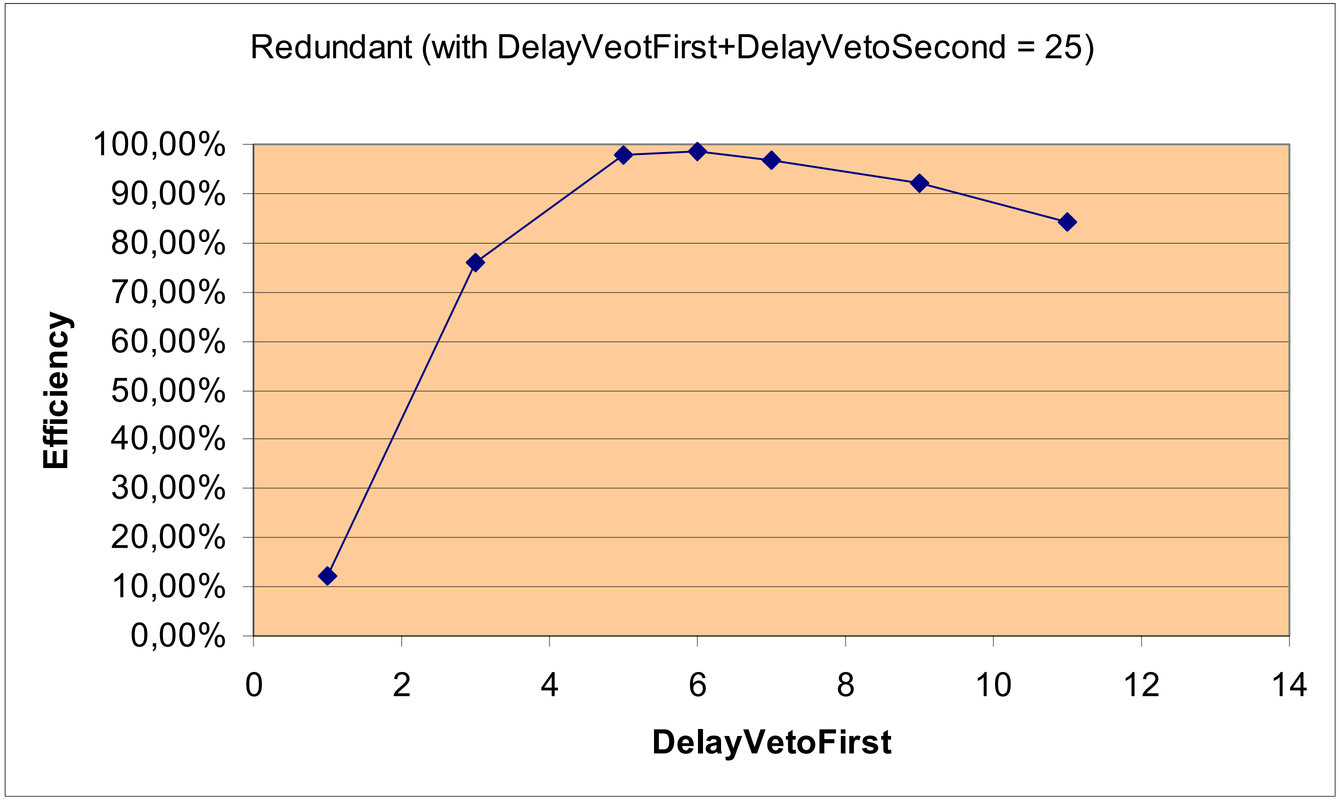
- in order to maximise the efficiency of the ACS gate sent to the PSD, we must chose:

DlyVeto1 =
between 6 and 10

- one point done with redundant module in correct configuration (purple box)

Alignment of the ACS gate sent to the PSD (redundant module)

Run	Run-ID	DlyVeto1	DlyVeto2	Bin0	BinAll	Bin0/BinAll
15	R3.0	5	24	4624	5042	91,71%
16	R3.0A	5	24	3899	4286	90,97%
17	R3.1	1	24	534	4424	12,07%
18	R3.2	3	22	2144	2816	76,14%
19	R3.3	5	20	2916	2980	97,85%
23	R3.3A	6	19	2997	3045	98,42%
20	R3.4	7	18	2912	3006	96,87%
21	R3.5	9	16	2815	3059	92,02%
22	R3.6	11	14	2427	2876	84,39%



Conclusion

- from ACS/AFEE alignment we have seen that we must satisfy: DlyVet1+DlyVet2 = 29

[but we have set = 25]

- in order to maximise the efficiency of the ACS gate sent to the PSD, we must chose:

DlyVeto1 =
between 6 and 10

ACS / AFEE TT alignment for redundant in wrong config.

Data & config

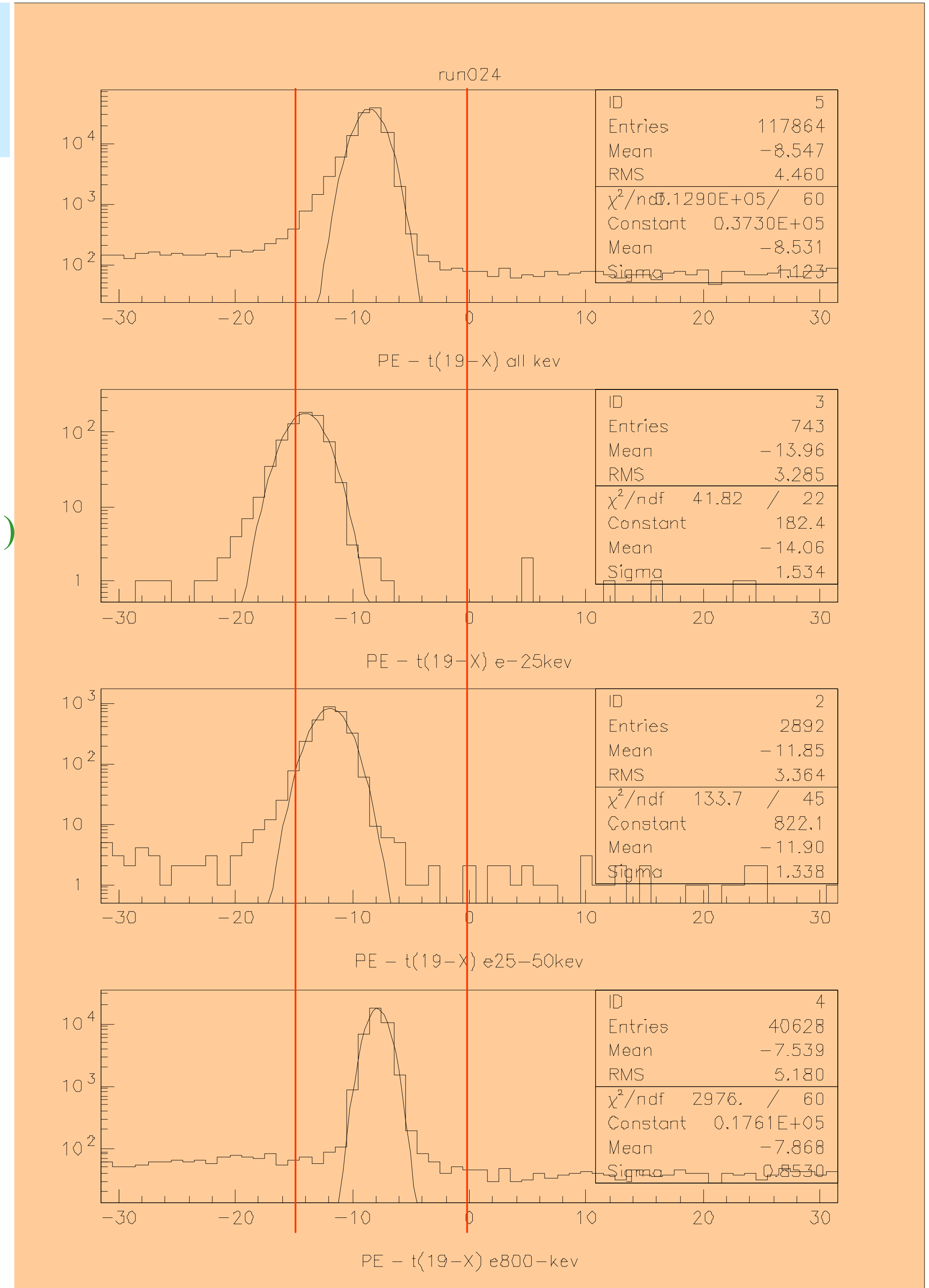
- the DelayVetoFirst+Second = 25
  (ACS arrives 4 clocks earlier than foreseen in normal configuration and the CNES spec)
- Route ACS to PSD channel inside DFEE
- TimeFormatPE & no correlationPE
- Check inside PE timing differences between 'PSD' (=ACS) and detector i : Δt(19,j)

Conclusion

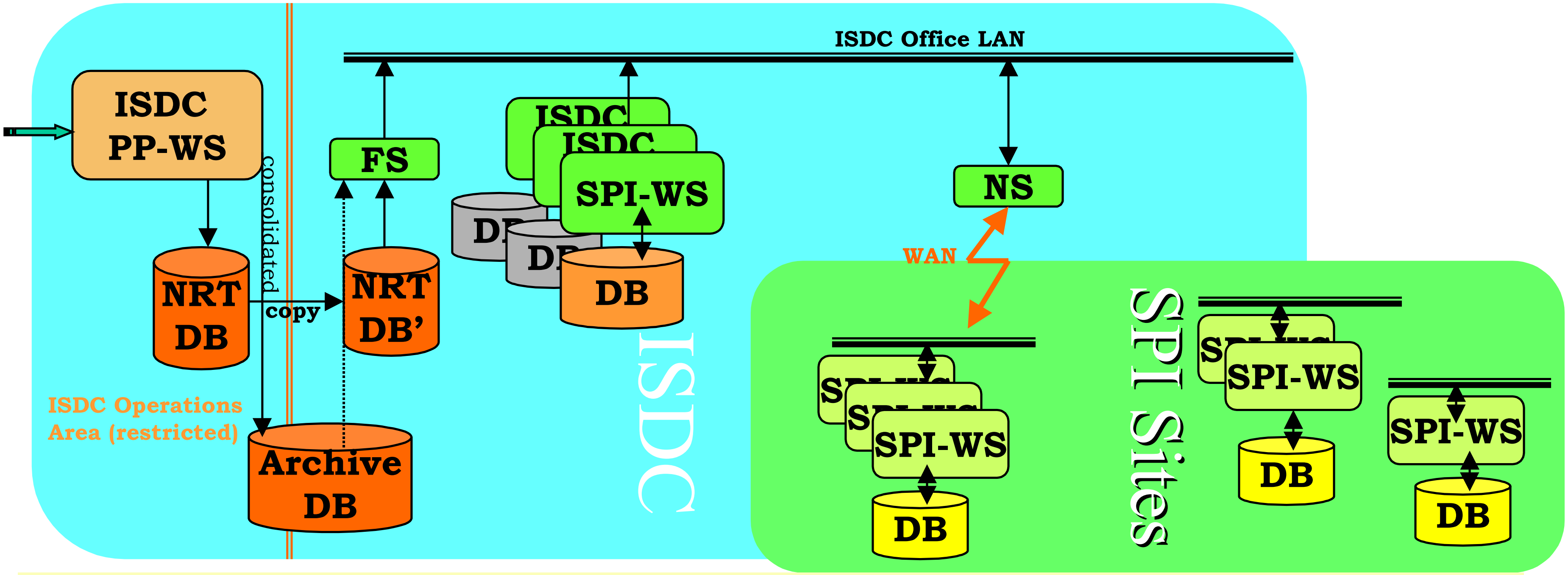
- ACS misaligned / AFEE by 4 clocks
- ACS width set to 725 ns = 14 clocks
  the low energies are out of the ACS window, ACS rejection gets inefficient at low E.

This setting was performed because the of a mistake (the CNES spec was right!) We should not alter the nominal setting !

Run : 024
RunId : R2
AcqNum : 522



SPI Connection to Ground Segment / Routine Data



Operations by SPI Team Members:

- **@ ISDC:**
  - ~3 People (remote access)
  - 1 Workstation, ~500 Gbyte Storage (+ for PV: Terminals / Notebooks)
  - Tasks: Processing Support & SPI Checkout, ISDC/IT Interactions, Centralized SPI Team Data Preparations (offline)
- **@ SPI Sites:**
  - ~3-5 People per Site
  - ~2-5 Workstations per Site, >> 100 GBytes Storage
  - Tasks: Deep Scientific Performance Checkout of SPI & Subsystems, Science Analysis (offline)

SPI Support for Routine Data Processing & Analysis

- **Support of Routine State-of-Health Monitoring**
  - **Maintenance of Limit Files & Point-of-Contact**
    - **Support for MOC @ ESOC**
    - **Support for Routine Operators @ ISDC**
- **Routine Near-Realtime Performance Monitoring**
  - **for SPI Components, on ISDC Near-Realtime Data; Remote Work at/on ISDC NRT Database (~days)**
    - **Ge Camera** -> gain corrections for ISDC processing
    - **ACS**
    - **Electronics** -> deadtime corrections for ISDC processing
    - **Thermal**
- **Deep Performance Monitoring**
  - **Analysis of SPI Components and Telescope; off-line; ~monthly**
    - **energy calibration and spectral performance**
    - **imaging performance**
    - **background characteristics & sensitivity**
- **Maintenance of Instrument Response Database at ISDC**

Ground Segment Open Issues (re: Data Processing)

- **Connectivity**
    - Configure SPI-specific Workstation and Database at ISDC — *ISDC*
    - Configure Data Access (Near-Realtime Data; Archive Obs Groups) — *ISDC*
    - Exercise File Exchanges for Routine Work — *SPI*
    - Ensure MOC/GSE and ISDC/ISSW Tool& Data Consistency — *SPI*
- **ISDC Analysis Tool Homogeneity & User Friendliness**
    - User's Interface
        - Re-Work User Manuals, *.par Files, help — *SPI*
    - Higher-Level User Support & Tools
        - Generate Scripts & GUI's for Processing/Analysis Steps — *ISDC*
        - Install/Configure Display&Edit Tools for SPI Data Types — *ISDC*
- **Maintenance of Tools, Management of Data & Controls**
    - Obtain & Maintain ISSW Specification (Functions & Interfaces)
        - "ICD" Bi-Lateral Approval & CR's — *ISDC*
        - SCCB Adjustment for ISSW Maintenance — *ISDC*
        - Inclusion of ISDC Scripts & Utilities (where SPI-specific)? — *ISDC*
    - Configure Scripts & Tools for SPI Team Work on
        - Performance Monitoring — *SPI*
        - Performance Analyses — *SPI*
        - Science Data Preparations — *SPI*

ID	software function	SW for:	Developmnt Site	Status, Prob's, Change Plans
	SPI ISSW Software Work Package Overview			
				19-Jun-02
1.1	raw data decomposition support	ISDC	ISDC	completed; non-normal mode support pending
1.2	inflight calibration analysis	ISDC	CESR	completed V1; verification enhancement pending; not for bgd study details (?)
1.3	performance validation (OSM support)	ISDC	CESR	completed V1; tuning & enhancements from routine PA procedures
1.4	performance validation (deep SPI PerfAn)	SPI	CESR	completed V0; OSM clone for ACS completed; PSD PA completed; DPE PA tbd; Ge camera PA at CESR
1.5	performance validation (data quality tags)	ISDC	CESR	V1 completed ; SPIHIST incompatibility prob.
2.1	response simulation	SPI	GSFC	done, E response validated, spatial response to be validated; PSD sim
2.2	response matrix generation	ISDC	GSFC	done V1; outer fov response to be generated; Inflight correction S/W to be added;
3.1	event binning	ISDC	GSFC	completed V2; PSD update pending; multiple/large no. of datasets-combination problem?
3.2	deadtime determination	ISDC	CEA&ISDC	completed V1; PSD handling, filled--buffer handling pending
3.4	skymap convolution	ISDC	MPE	completed
3.5	background model preparation	ISDC	UBham	completed (V1); AUX & Orbital parameter support & energy dependent bgds & adjacent-energy reference pending; otherwise adequate for early mission
4.1	deconvolution of spatial&spectral sky	ISDC	UBham	on hold
4.2	imaging point sources	ISDC	UBham	V3.4 completed; errors incorrect for multiple sources; unstable/critical to user parameters; results display in development
4.3	imaging diffuse emission & surveys	ISDC	MPE	V23 completed
4.4	data extraction for XSPEC spectral analysis	ISDC	UBham	completed (for XSPEC11); data export/reformatting to be made; XSPEC12 changes/adaption Dec 2002
4.5	spectral deconvolution for diffuse em.& surveys	ISDC	UBham	completed (subfunction of 4.2); full response support pending/unclear
4.6	source model fitting (image space)	ISDC	CESR	being implemented (several alternative packages)
4.7	source model fitting (spectral domain, XSPEC)	ISDC	GSFC	baseline solution w.XSPEC11 ~80% complete; XSPEC12 expected Dec 2002 (b Version Apr 2002)
4.8	source model fitting (im.&spec simultaneously)	SPI	CESR	on hold / abandoned
5.1	source timing analysis	ISDC	IFCTR	exploring spatial-analysis tools beyond ISDC's generic XCHRONOS
6.1	background exploration	SPI	GSFC	OSM enhancements being reviewed ; prototype ok (line fitting); interface exploration
6.2	background simulation	SPI	GSFC	Method explored (TGRS); CGOD Enhancements in progress
7.1	transient detection	ISDC	UBham	awaiting ISDC's generic transient analysis tools; catalogue handling & error evaluation to be validated
7.2	burst detection	ISDC	MPE	ACS part completed; camera imaging part completed; Ge detector rate part pending
8.1	general libraries and utilities	ISDC	SPI	some delivered, more in development; full response access pending; OSM specialization tbd; support for interactive analyses inadequate

Open Actions for SPI Data Analysis Tools

Deficiency

Source Flux Errors (SPIROS; multiple sources)
Spectral Analysis Error Correction (SPIROS-XSPEC11)
Quicklook Validation for SPI
Source Flux Error Assessment / Science Validation
Field-of-View Performance Validation
Verification of Energy Calibration (SPILINE fits of corrected data)
Response Access Routines (IRF non-diagonal part; SPIBHAM lib)
Program Parameter Graphical User Interface
Program Parameter Graphical User Interface Support (*.par file interpreter commar
PSD Support for Analysis (new datastructure to be used; response det./sim)
Good-Time Interval Editor & Merge & Manipulate Utility
Background Modelling for Imaging
Background Modelling for Spectral Analysis
Alternative Access to Detector Spectra (OSM: dump pre-selected spectra)
Burst Search with Ge countrates (IBAS enhancement based on ACS module)
Support for non-standard modes (emergency mode: spectra as std data)
Data Selection from Archive Browser, feed into *.par files
Support LINUX platforms for all applications / ISDC
Slew Data Processing
Enhancement of Gain Determination Tools for Bgd Analysis (Response; Line Lib)

SPI Scientific Team Meeting

held in Munich, June 20-21, 2002

Impressions from the INTEGRAL-FM System Validation Test-F and End To End Test-F (ISDC, 1st week of June 2002)

Stéphane Schanne
CEA Saclay / DAPNIA / Bât. 709, F-91191 Gif sur Yvette

SVT-F and E2E-F at ISDC and HK packet corruption

- Test performed first week of June 2002.
- Data came in real-time from the instrument (playback session foreseen mid July 2002).
- Detectors were not cooled and not on the vacuum pumps.
- Ge-High-Voltages set to 0 V, trigger only on noise.

- Data checked with i-OSM.
- Count rates observed ~ 20-50 counts/s/detector, except detector 17 which counted ~ 500/s.
- Pulse heights in channels 0-128 (lo/hi energy baseline subtraction) and some counts above.
- Count rate on ACS has standard value ~ 11000/s.

- Data cross-checked with private telemetry decoder 'dtm.c' (available on the SPITOG page) (possibility of main HK parameters check and scientific data extraction for histogramming).

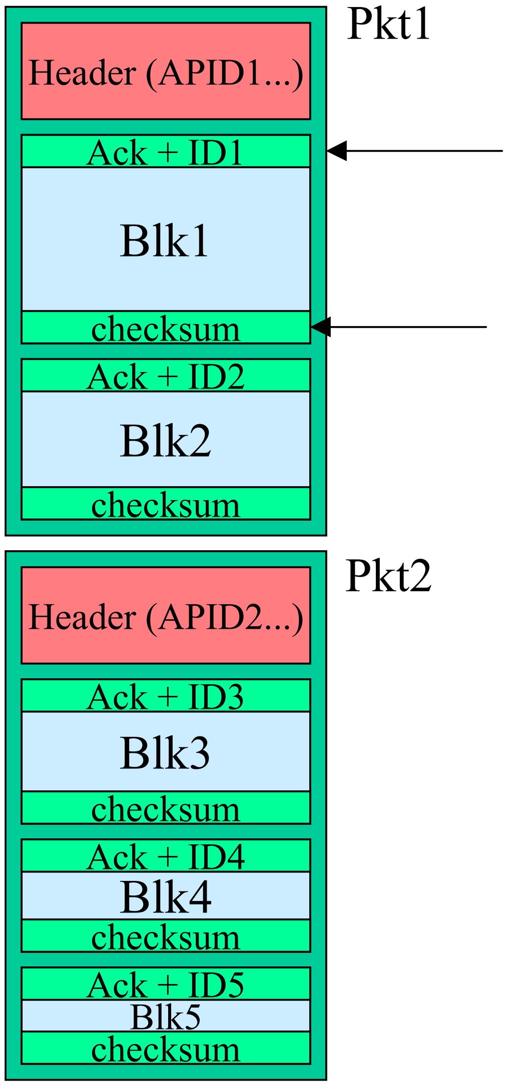
- Found that ACS house-keeping blocks (FEE and Overall count rates)

- have a corrupt structure in case of mode=2 (standby level 2) (corrupt structure definition: Ack, ID or checksum incorrect)
- it seams not to be a problem in this mode

- Not seen at ISDC (nor at MOC, nor by Alenia-tools) an avalanche of mails exchanged on this subject.
- Need for a check in the standard pipeline

SPI House-Keeping Packets Checks

Checks are needed in the early data processing stage



- subsystem filling in a block in a HK-Pkt
  - gives the Acknowledge code (Ack)
  - sends the ID of the block
  - computes the checksum of the data in the block (Blk) (xor of all the bytes in Blk, including Ack and ID)

- the data inside any HK block are only valid if the Ack, ID and checksum are correct.

- data should not be used further in the pipeline, if the block structure is not valid

- under some circumstances (e.g. certain instrument modes) a corrupt block structure inside a packet is to be ignored, because in this modes some subsystems do not send a block, while the packet they are in is sent anyway.
- error messages should be generated
- MOC and SPITEAM should be informed in case of error (TBD)

SVT-F and E2E-F at ISDC and online status monitoring (OSM)

• Data analyzed via i-OSM (presence of A.v.Kienlin & S.Schanne)
• Near real time analysis (delay of ~ 2 h with respect to real-time)
• This makes the test a bit hard to follow

• We missed the fact that no scientific data arrived during 2 h during test, due to a configuration mismatch: the 'HSL length' parameter specifying the dialog length between DFEE and DPE is specified once for DPE and once for DFEE, if they do not correspond, as in our case, no data sent from DFEE to DPE).

• Here a systematic surveillance of the DFEE status and the scientific output is necessary. Problem could have been detected :
- in bit 'HslErrActDone' in HK 0 checked by MOC, and
- in bits 'HslErr' in HK 4 to be checked by ISDC

• Need to define the i-OSM windows to be used by the ISDC operators
  - reproducing on i-OSM the displays available on the SPI-ESGE
  - possibly extending the basic i-OSM features with derived parameters
  - job started, help needed from other SPI experts
  - tool to be used at ISDC starting in December, after MOC/ISDC hand-over (+overlap!)
• Need to write the document '*ISDC interactions with the SPI team*' (with Nami Mowlavi).
  - definitions of all routine operations to be performed (object, frequency, responsibility...).
  - need to have a discussion on this document & on presence philosophy of SPI team at ISDC

Software installation help from ISDC (during SVT-F)

For CEA/Saclay, visit to ISDC in June 2002 was also a success for ISDC pipeline installation
ISDC analysis software installed on Linux PC laptop

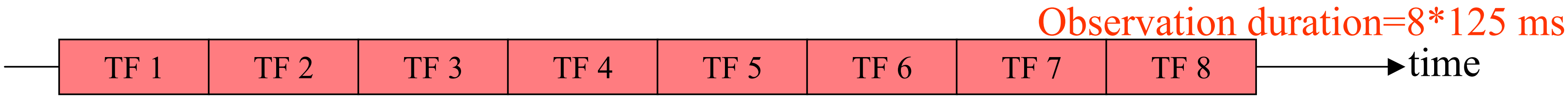
- need for gnu C++, correct Root version, Lahey/Fujitsu F95 compiler, naglib for Linux
- need for energy calibration file, and IRF's
- complete software bundle tar file prepared by Volker Beckmann
- compilation via 'make global_install' works (some 'makeisdc1.in' adapted to local machine)
- complete 'scw' data structure for BLC (7 GB) transferred via 'ftp' to Sacaly (few hours).
- need to modify some 'par' files for the programs
- 'blc_sa' crashes, but individual programs work :
  og_create, spi_gain_corr, blc_spipoint, spi_git_creation, spidead,
  spibounds, spihists, spiback, spiros and spiskymax.
- first image obtained for Saclay (ouf!)

First images on Saclay Linux PC (installation help from ISDC)

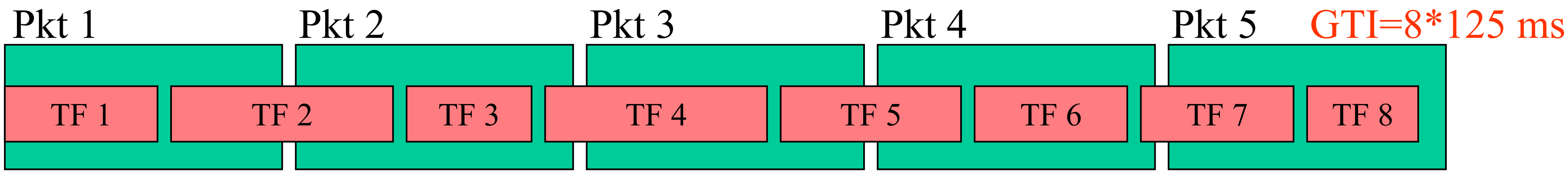
^{60}Co Long Distance source from BLC, high energy line, runs 31 and 32 (0° and 359,9584°).

SPI Good-Time

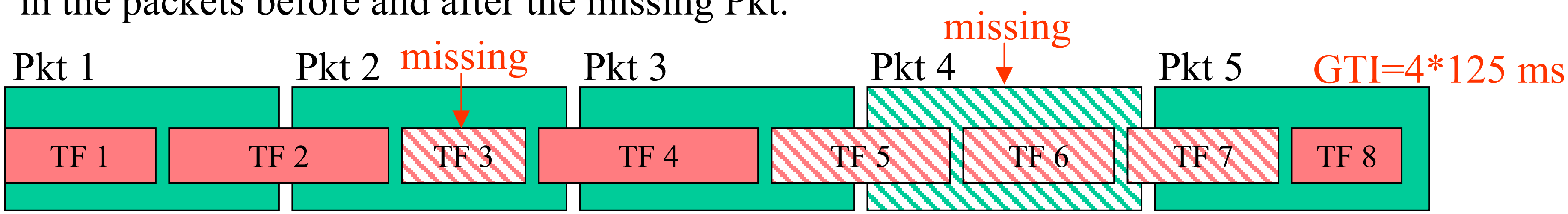
- Real-time continuous data stream is divided by DFEE in time frames (TF), chunks of 125 ms



- Data sent by DPE are divided in packets (Pkt) of 440 Bytes containing data of successive TF

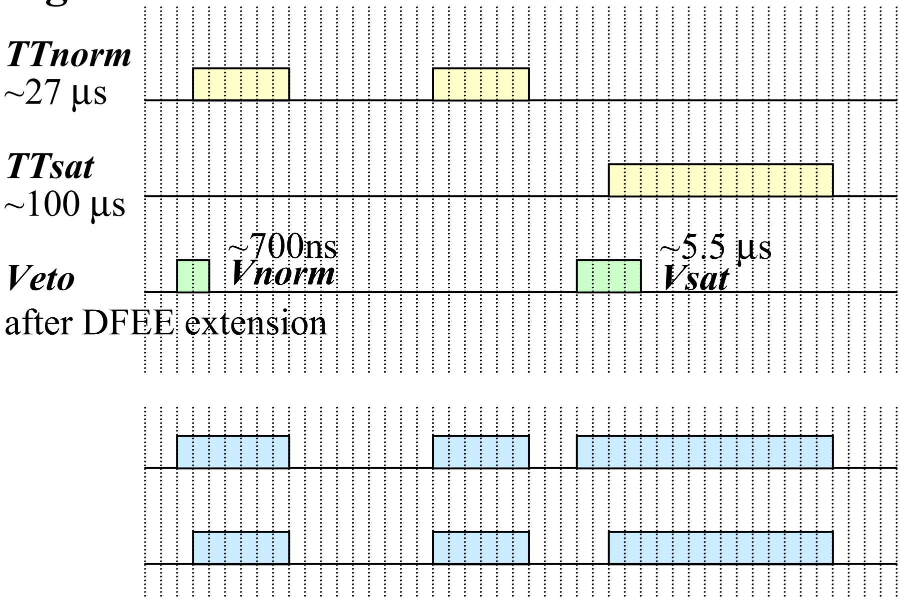


- For each missing or corrupted TF data chunk, do not use its data, and reduce the good time interval (GTI) of the observation by 125 ms.
- For each missing Pkt, reduce the GTI by the 125 ms times the number of TF which are absent (contained in the missing Pkt) or whose data are partially available only in the packets before and after the missing Pkt.



SPI Counts and Dead-Time measured in DFEE

Signals



NUMBERS AVAILABLE EACH Second :

- Counts for AFEE channel i=0..18 :

CntTT(i) =2   CntTTnonVeto(i) =1
CntTTsat(i) =1

- Counts & DeadTime for Veto :

CntVeto =2   CntVetoAbove =1   CntVetoBelow =1
DTveto =6ticks

- DeadTime for AFEE channel i=0..18:

DTttv(i) = DT[TTnorm(i) OR TTsat(i) OR Veto] =27ticks

DTtt(i) = DT[TTnorm(i) OR TTsat(i)] =24ticks
↘ ↙
exclusive signals

$$\text{Ninput} \sim \text{Nmeasured} * \frac{T}{T - DT}$$

T = observation period
Ninput = events at detector 0 input (in-flux)
Nmeasured = Σ[CntTT(0) + CntTTsat(0)]
DT = Σ[DTtt(0)]

NUMBERS AVAILABLE EACH TimeFrame :

SE → CntSE(i)
ME → + CntME(..,i,..) ≤ CntTTnonVeto(i) ≤ CntTT(i)
PE → + CntPE(i)
(SPECTRA)

CntSE(i) & CntPE(i) can be enriched by real ME with
missing hit (j) due to detector-j-DeadTime or photon escaping
and systematic effects due to SE/ME/PE classification
CntME(i,j) has a combined detector-i&j-DeadTime dependence [DT{ME(i,j)} ~ max{DTtt(i),DTtt(j)}]

How to extract input fluxes for events CntSE(i), CntME(..,i,…), CntPE(i) ?

SPI Scientific Performance Maintenance: Work Distribution within SPI Team

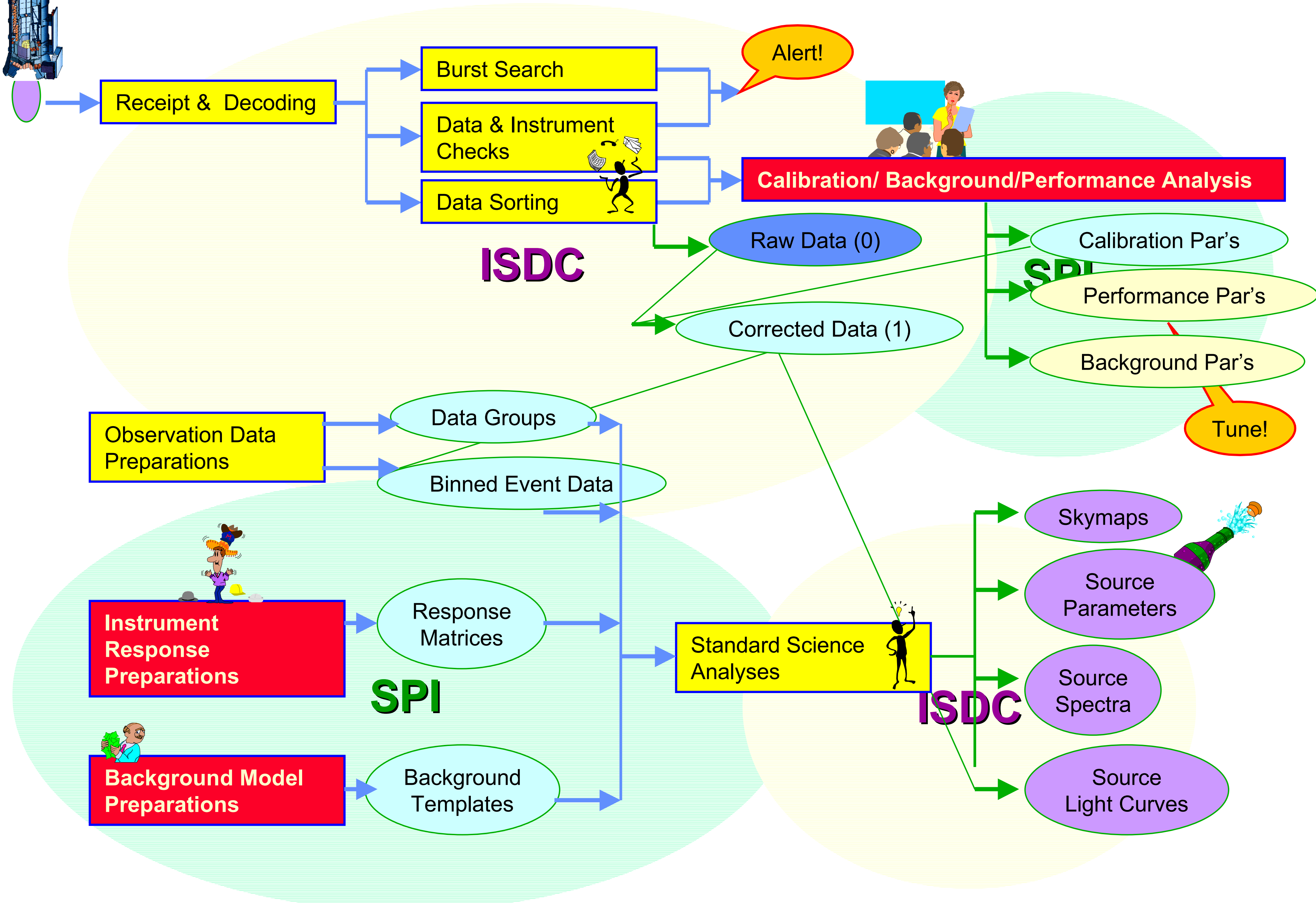
• **Instrument Subsystem Performance Analyses**	
• Thermal System	CNES
• Ge Detectors	CESR
• ACS System	MPE
• Electronics	CEA
• **Deep Full-Instrument Performance Analyses**	
• Spectral Performance: Broad-Band	CESR
• Spectral Performance: Line Shape Detail	GSFC
• Imaging Performance: Point Sources	UBham
• Imaging Performance: Extended & Diffuse	MPE
• Background Treatment	
• Background Type Study	GSFC
• Background Suppression	CESR
• Background Modeling	MPE
• Data Selection Optimization	CESR
• Operational Mode Optimization	CEA
• Instrument Response Optimization	GSFC
• Timing and Transient Analysis	MPE
• **Survey Compositions**	MPE, UBham
• **Anomaly Follow-Up Analyses**	(see Weekly PA)

SPI Inflight Calibration: Subtask Work Distribution

- **Ge Camera IFC**
  - **Gain Corrections** — **ISDC; CESR**
  - **Efficiency Monitoring** — **CESR**
  - **Resolution Monitoring** — **CESR**
  - **Threshold Monitoring** — **CESR**
  - **PSD Curve Fit Monitoring** — **ISDC; CESR**
- **ACS IFC**
  - **Detection Efficiency Monitoring** — **ISDC; MPE**
  - **Rejection Efficiency Monitoring** — **MPE**
  - **Threshold Monitoring** — **MPE**
- **Electronics IFC**
  - **Deadtime Monitoring** — **ISDC; CEA**
- **Telescope IFC**

  (see previous slide)

SPI Data Preparation Work Share



Roland Diehl

Products from SPI Performance / IFC Analysis

- **Calibration Parameters**
  - **Purpose:**
    - Gain Correction of Ge Dectector Pulseheights (–> keV)
    - Definition of PSD Event Classification (bgd/signal)
    - Determination of Instrument Deadtime
  - **Tools:**
    - Spectral Fitting of Known Instrumental-Background Lines
    - On-Ground Assessment of PSD Libraries
    - Evaluation of Detector and Electronics Countrates
- **Performance Parameters**
  - **Purpose:**
    - Measure Science Performance Characteristics
  - **Tools:**
    - OSM System & Tailored Displays/Components (–> ACS Performance)
    - Spectral Fitting Software (SPILINE) (–> Ge Camera Performance)
- **Background Parameters**
  - **Purpose:**
    - Explore Instrumental-Background Characteristics (–> Bgd Simulations and Models)
  - **Tools:**
    - Spectral Fitting Software (OSM,SPILINE; GASPAN) (–> Bgd Line Intensities)
    - ROOT Line Correlation with other Parameters (OSM) (–> Bgd Models)

IFC Operations

- **Routine IFC Operations by Science Window / Pointing**
  - **Ge Camera Gain Corrections**
    - Identification of Key Lines by SPI During CP Phase
    - Parameter Files Prepared by SPI During CP Phase / Tuning
    - Routine Precision Energy Calibration up to 2 MeV After ESOC/ISDC Handover
    - Routine Full-Range Precision Energy Calibration at End of CP Phase
  - **Routine Performance Checks (PSD; ACS; Electronics)**
    - Identification of Subset of Deep-Performance Before Launch
    - Preparation of Parameter Files & Instructions by SPI During CP Phase (Tuning)
    - Routine Operations After ESOC/ISDC Handover
- **Routine Weekly/Monthly Operations**
  - **Response / Deep Performance Analysis**
    - Off-Line by SPI
  - **Background Analysis**
    - Off-Line by SPI
- **Re-Calibrations**
    - *tbd*

Gain Correction and Energy Calibration

- Tools:
  - SPIHISTO -> histograms
  - SPILINE -> fits line position, width, and intensity
  - SPICALI -> energy calibration curve.
- Routine operations:
  - near-realtime data files to derive gain corrections guiding
  - routine processing at ISDC on consolidated data
  - backup: full IFC at CESR, gain & cal files to ISDC
- Validation: re-run line fitting on corrected data
- GUI & grafics software system for interactive work

IFC Procedures: Routine Ge Camera Calibration

Draft RoD March 2002

- **Tools**
  - **ISDC Tools SPIHISTO, SPILINE, SPICALI**
  - **Parameter Templates from PV Phase: Line Locations, etc.**
- **Data**
  - **Events from a Science Window**
- **Operation**
  - **Personell**
    - **ISDC Routine Operators, Support by ISDC's SPI Expert**
  - **Tasks & Schedule**
    - **Generation of Gain Correction Files**
    - **Maintenance of Performance Parameter Database**
    - **Daily Routine, per Science Window**
  - **Anomaly Handling**
    - **Consult Ge Camera Expert at CESR (through SPI Rep @ ISDC)**
- **Results**
  - **Gain Correction Parameter Files**
  - **Performance Parameter Result Files**
    - E Calib Curve
    - Resolution
    - Efficiency
    - Peak/total Ratio
- **Success Criteria**
  - **Convergence of Line Fit ($\chi^2 < 1.5$ *(tbd)*)**
  - **Performance Parameters within 3σ of History**

SPI Workstation at ISDC

- **Purpose**

  SPI Team Hardware for
  - **Deep Performance Analyses**
  - **Data Preparations for Science Analysis within SPI Team**
    - SPI-internal Standard Analyses (SPIHIST)
    - Massive (~Survey) Data Preparation
- **Arrangements**
  - ISDC Installs and Maintains SPI Workstation
  - SPI Institutes Purchase Hardware
  - Cost Sharing Among SPI Sites
  - Installation ~Before Summer 2002
- **Hardware Options**
  - **SunFire 280R, 2 CPU, 750/900 MHz, xGB Memory, x36GB Disk**
  - MPE:
    - Workstation (Basics)
    - 1 CPU
  - CESR:
    - 1 CPU
    - Diskspace

Source flux accuracy from BLC analysis

A. Strong
MPE

June 2002

Evaluation of absolute flux determination accuracy

BLC long−distance runs
ISDC system
spiros 3.3
IRFs from GSFC (old: isdc ‘7’, new ‘11’)
singles+multiples
various source angles

compared to new beam monitor fluxes

Details: http://www.mpe.mpg.de/~aws

^{60}Co 1173 keV

angle=0 run 31

previous result (Dec 2001): fluxes too low by factor ~0.74
Several factors in same direction now improve this:

	old IRF	new IRF
1170−1180 keV	1.555	1.704
1163−1183 keV	1.612	1.769

so extending energy range and new IRF gives 13.7% increase
Following corrections were not done before:
correction for monitor (mask)−camera 1.71 m = 2.7%
correction for divergence of beam ~ 2.7%

New beam monitor analysis (David Attie): ~10%
so combined factors increase factor from 0.74 to 0.97

i.e. Improvement, better consistency than expected from GSFC photopeak efficiency results from Dec 2001 meeting.

^{60}Co 1173 keV

1163−1183 keV

run	angle	spiros/monitor
31	0.0	0.965
35	0.5	0.973
36	1.0	0.981
41	10.0	0.980

1332 keV

1322−1342 keV

31	0.0	0.917
41	10.0	0.935

^{241}Am 59 keV

effect of IRF:

58−62 keV

run	angle	spiros flux	
134	0	0.350	old IRF
		0.3665	new IRF

angular dependence:

55−63 keV

new IRF

run	angle	spiros/monitor
134	0	0.902
144	−2	0.919
145	−6	0.596(?)
146	−8	0.847
147	−12	0.828

Low fluxes, consistent with GSFC photopeak efficiencies from Dec 2001 meeting

^{137}Cs 662 keV

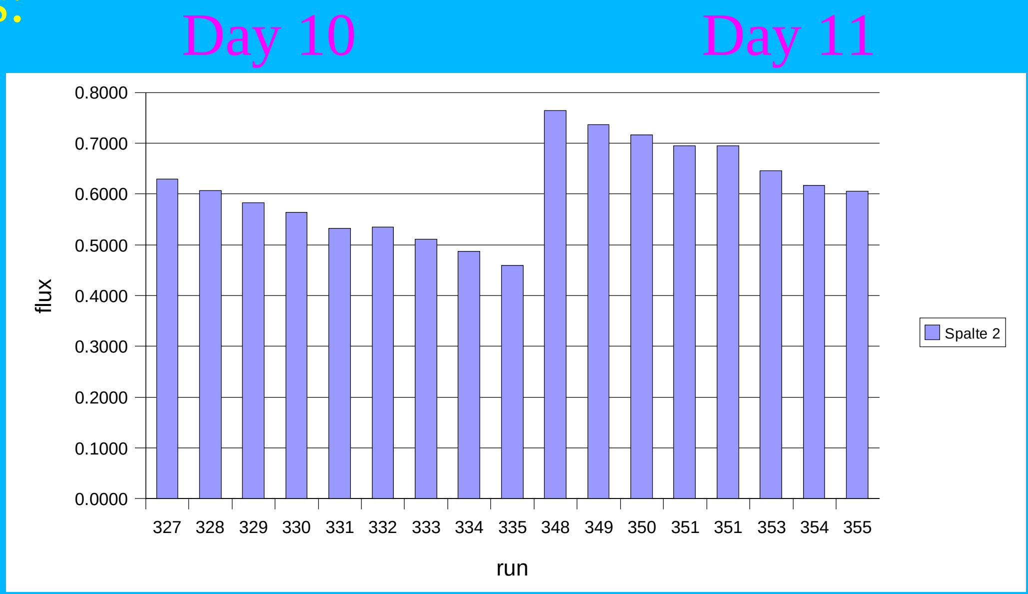
659−665 keV

Run	angle	spiros flux	monitor	spiros/monitor (a)	spiros/monitor (b)
65	0	1.541	1.8+−.07	0.88	0.90

a= with monitor mask−camera distance factor 1.0274
b= with also spiros beam divergence factor 1.0274

^{24}Na 2754 keV

spiros fluxes:



2700−2800 keV

run	angle	spiros	monitor	spiros/monitor (a)	spiros/monitor (b)
327	0	0.629	0.58+−0.11	1.11	1.15

a= with monitor mask−camera distance factor 1.0274

b= with also spiros beam divergence factor 1.0274

Properties of the ACS - Evaluation of the BLC (Ge) data

Follow-up of the MPE BLC measurement procedures

"Self-Veto Effect" and "ACS Efficiency"

Overview

- Self–Veto Effect
  –> Reduction of Compton Continuum
- Cold Finger Investigation
- “ACS Efficiency”
- Field of View – Limitation by the ACS

Self-Veto Effect - Definition

- Reduction of “useful” events in the Ge detector by veto from the ACS generated by the same photon
- Concerns “Ge–first” (– “ACS second” –) Compton Scatter events
  - contain information useful for imaging
  - not part of photopeak
- Different from “ACS–first” scatters which do not carry image information

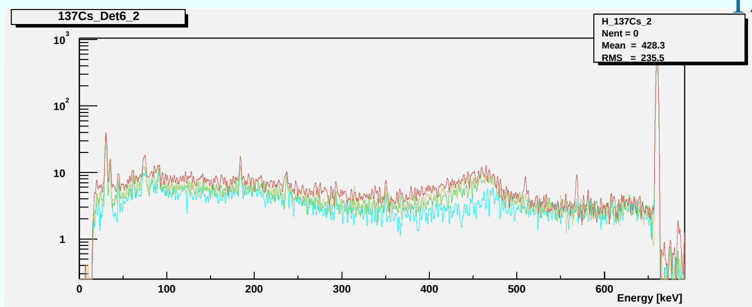
Self-Veto Effect - Measurements

- Sources at 8 m from SPI on-axis
- different ACS energy thresholds
  (100 keV, 200 keV, 300 keV, 500 keV, ACS off)

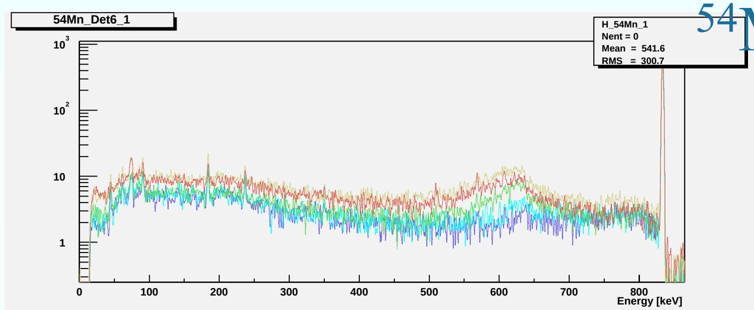
- From the measurement data, only the total reduction of the continuum count rate (as a function of energy range and ACS threshold) can be determined
- MGEANT simulations needed to disentangle ACS-first and Ge-first hits

Method: Select 6 energy bands

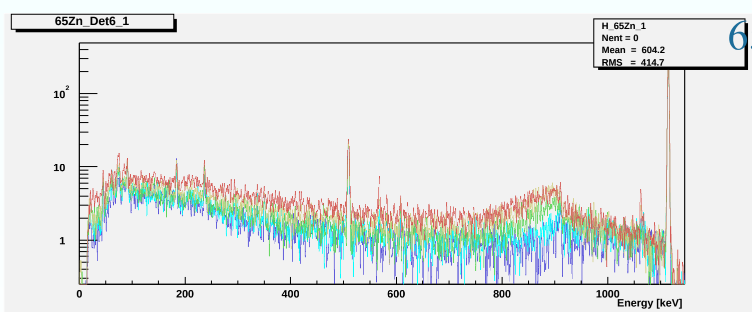
^{137}Cs



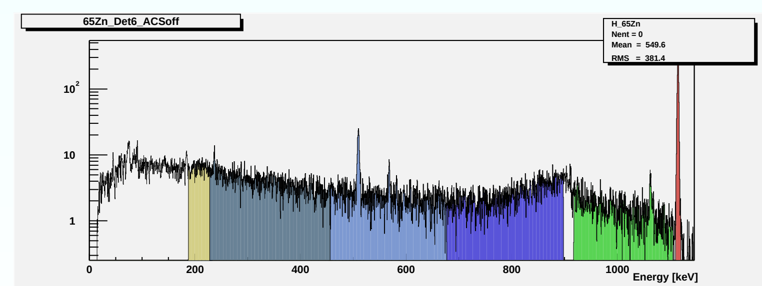
^{54}Mn



^{65}Zn



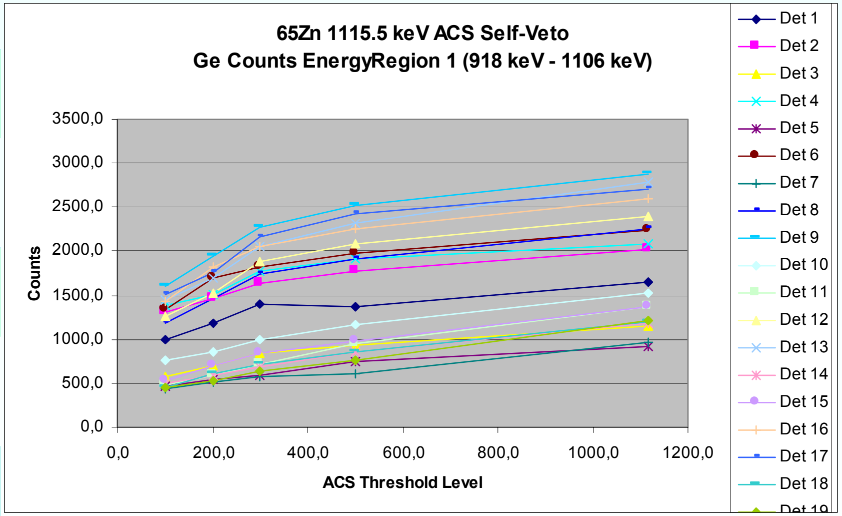
- Photopeak (0)
- Multiple Scatters (1)
- Compton Continuum in 3 parts (2–4)
- Backscatter peak (5)

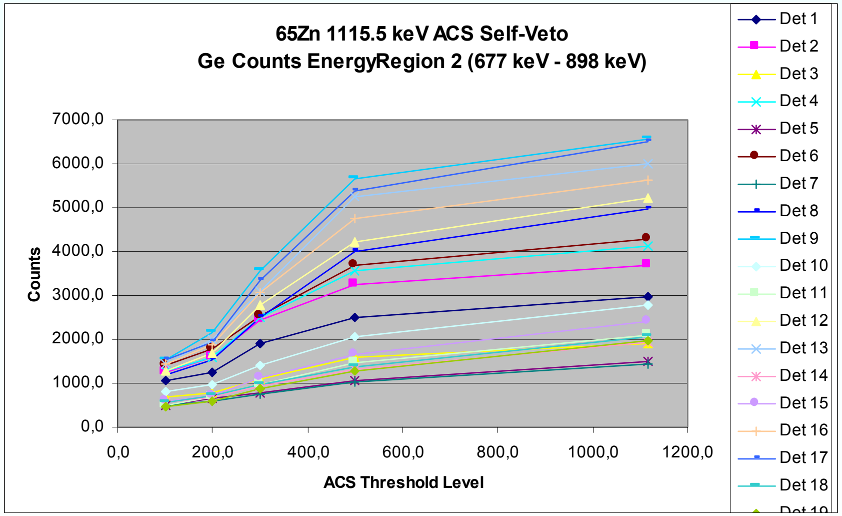


Compton Continuum Reduction - e.g. ^{65}Zn (1115 keV)

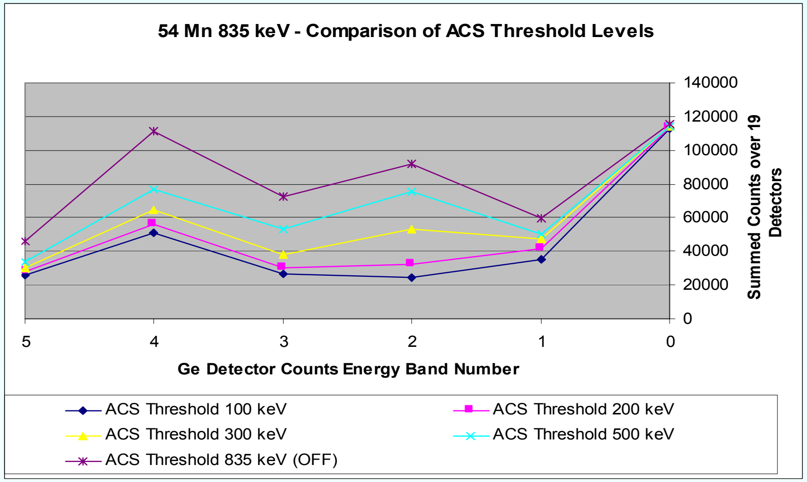
- Ge energy deposit in region 1 (918 keV – 1106 keV) ⇒ max. ACS deposit 197 keV
- Ge energy deposit in region 2 (677 keV – 898 keV) ⇒ max. ACS deposit 438 keV

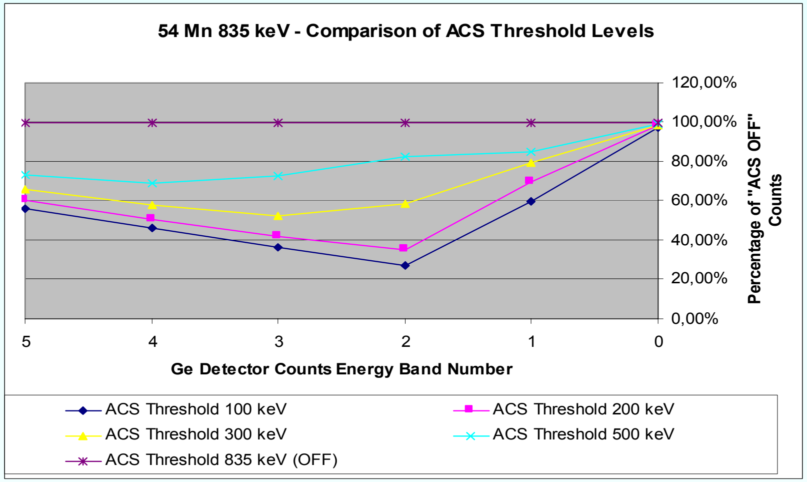
⇨ this results in “humps” in the following plots

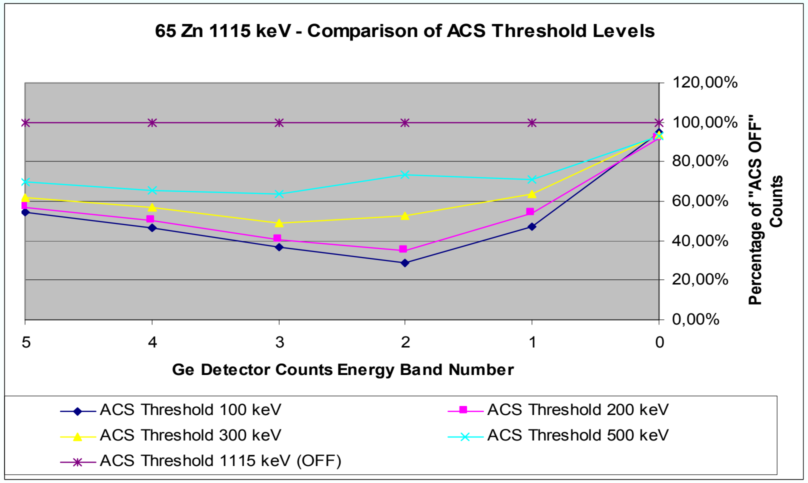


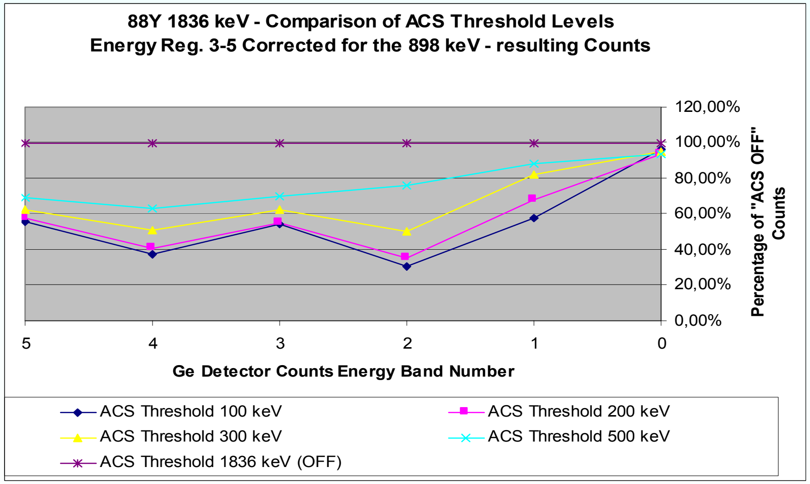


Compton Continuum Reduction - Summary Results



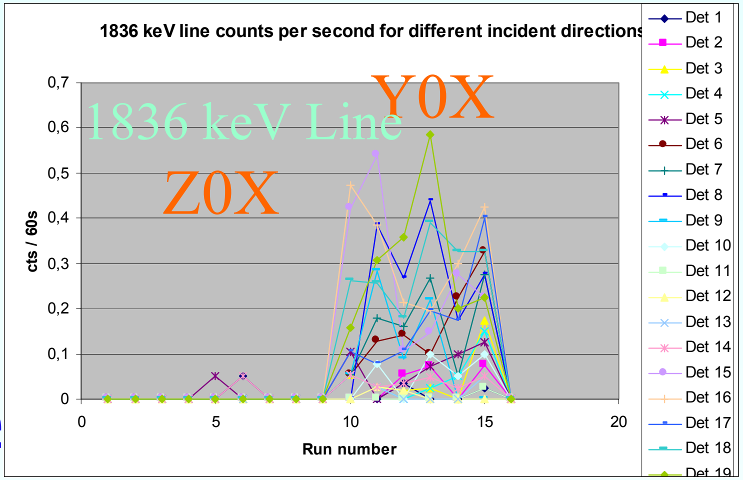


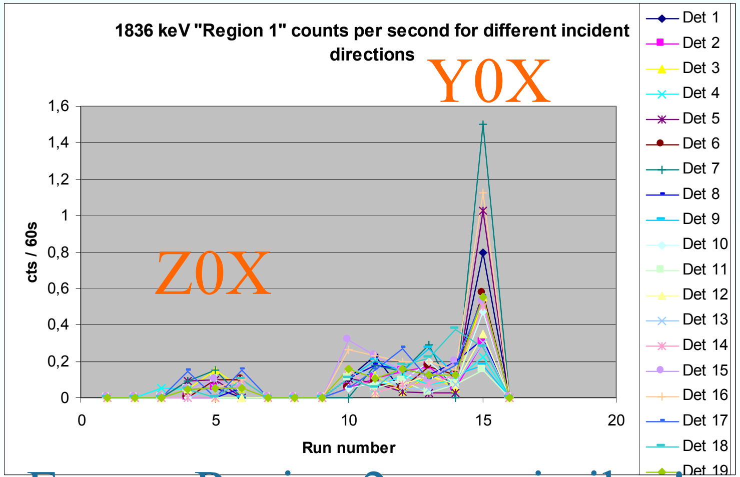


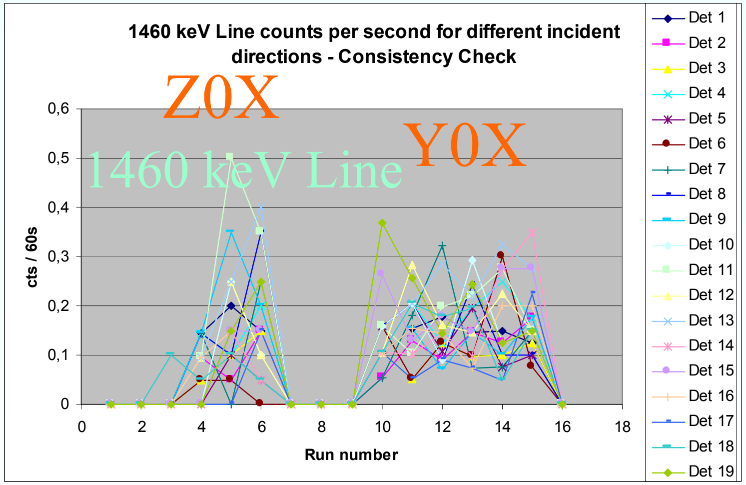


Cold Finger Investigation I

- Several incident directions (Y0X and Z0X) around the cold finger – ^{88}Y source
- Energy Bands as before



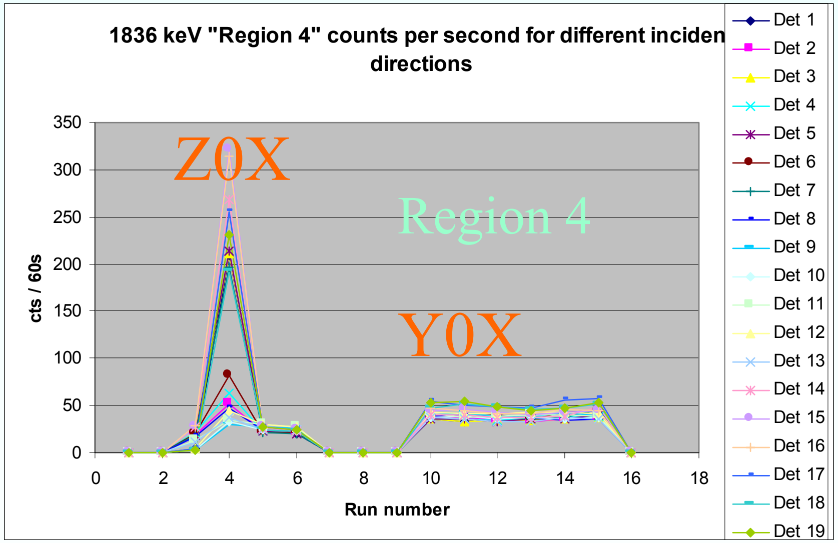


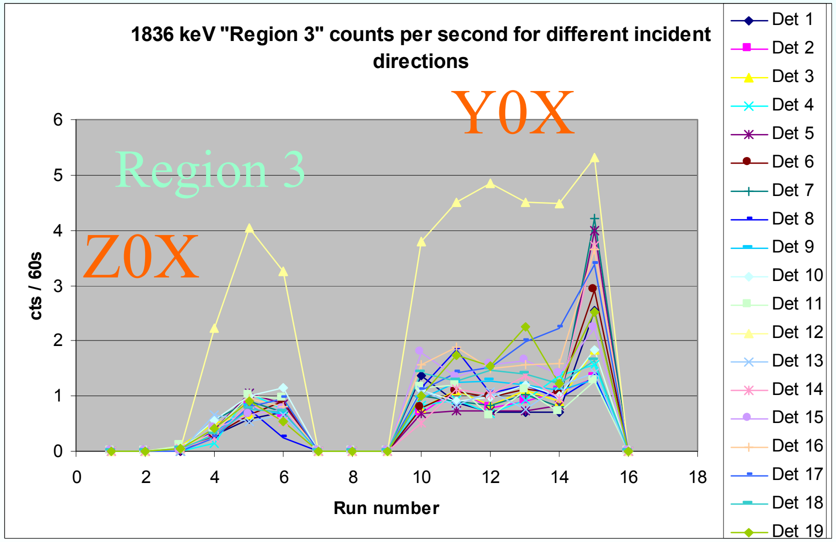


Energy Region 2 very similar !

Cold Finger Investigation II

- For energy region 3, clear excess in detector 12 (1-19) for all incident directions. Explanation could be a "selective scattering" or pipeline problems or ....



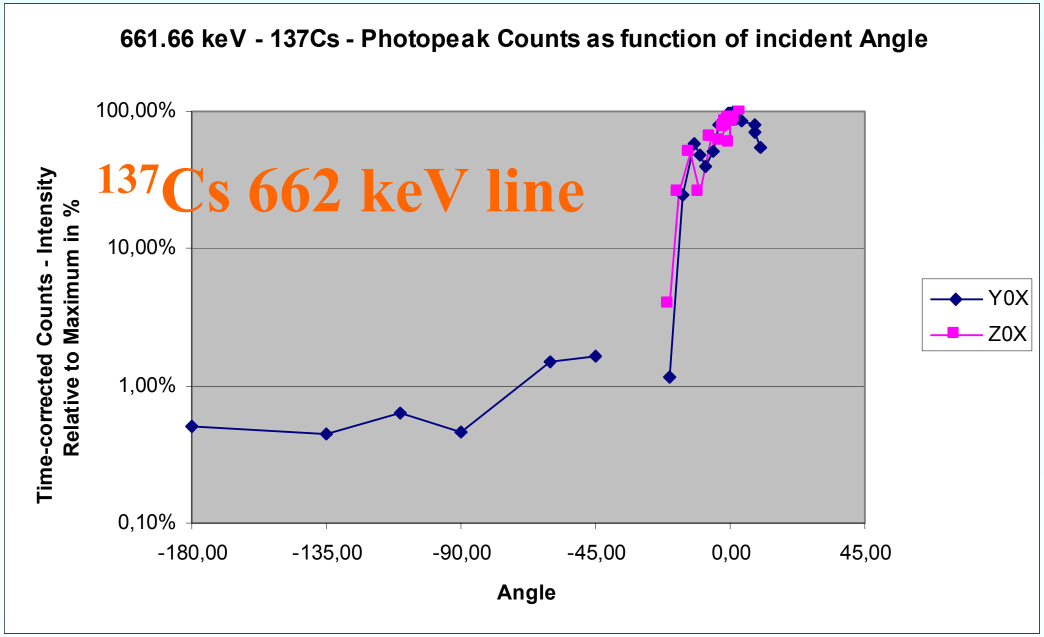


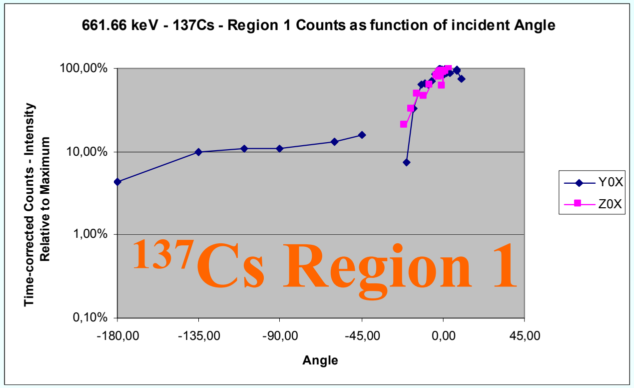
Energy Region 5 very similar !

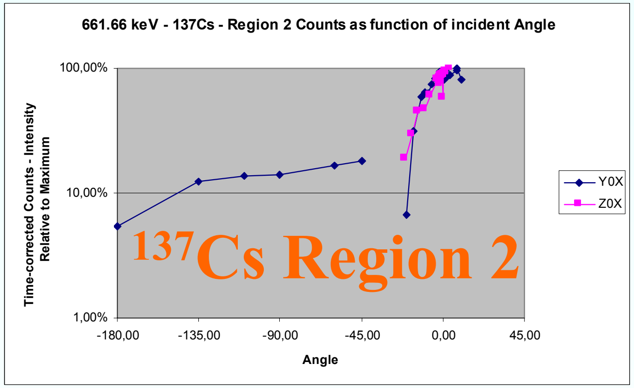
"ACS Efficiency Investigation"

- 54Mn and 22Na sources incident from −90°, −105°, and −125° (Y0X and Z0X)
- Qualitative behavior of continuum for the different ACS thresholds used similar to the "Self−Veto"−measurements
- Some excesses in single detectors:
  - for Y0X −125°: det 17−19: ~ factor of 2
  - for Z0X −125°: det 17 :
    line ~factor of 10, continuum ~factor of 3

ACS-limited FoV - ^{137}Cs long distance







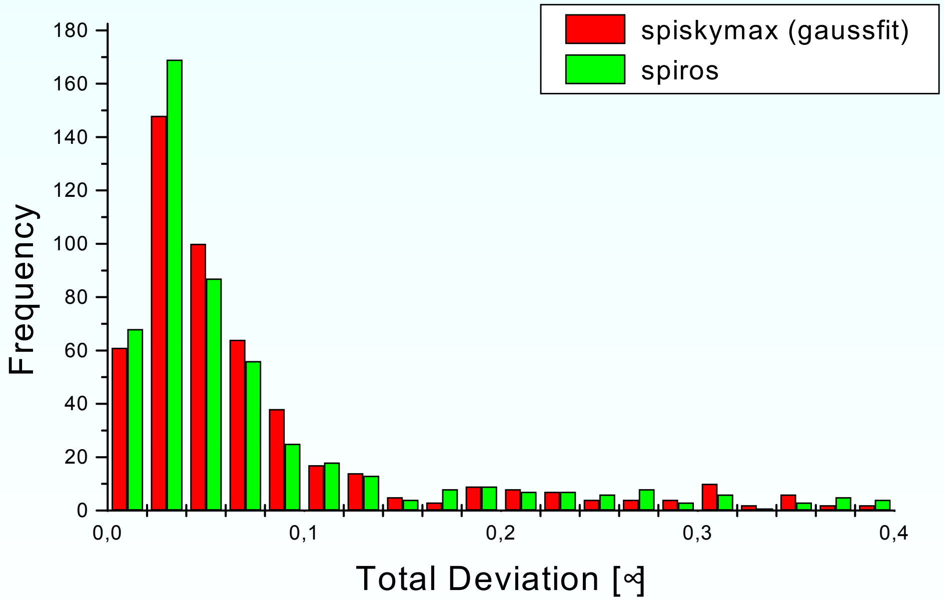
MPE-Report is in the making - you can have a draft now!

News from SPITS - Point Source Location Accuracy

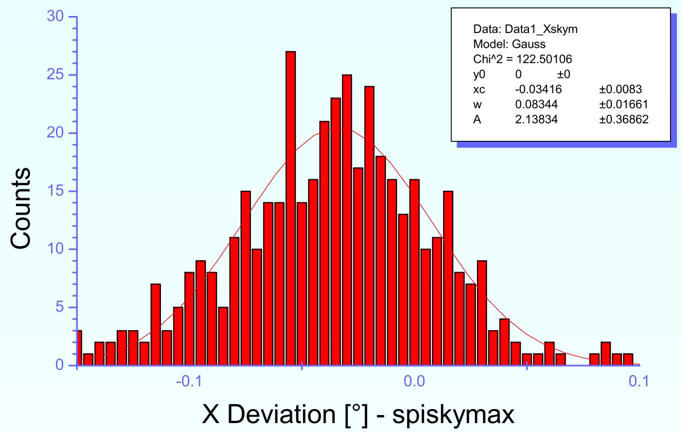
Point Source Location Accuracy
with and without dithering
with spiskymax and spiros
high signal-to-background ratios

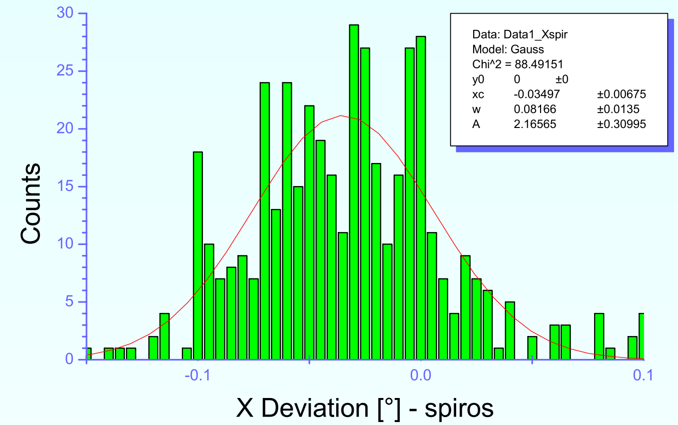
Location Accuracy - measurements with lab sources

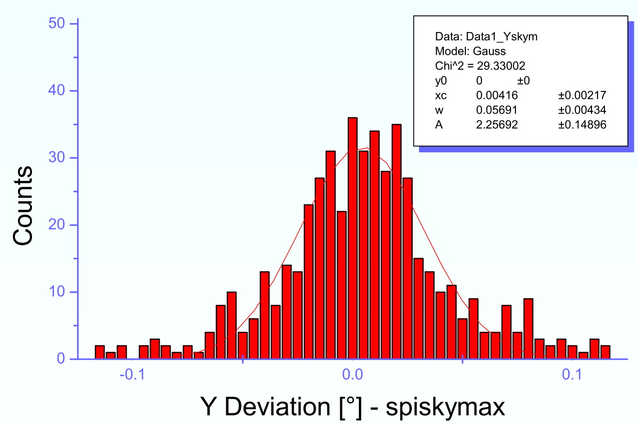
- All source locations (out to 8.5° longitude)
- All energies (60 keV – 1.8 MeV)
- no dithering
- Location accuracy (obviously) dependent on source intensity / significance

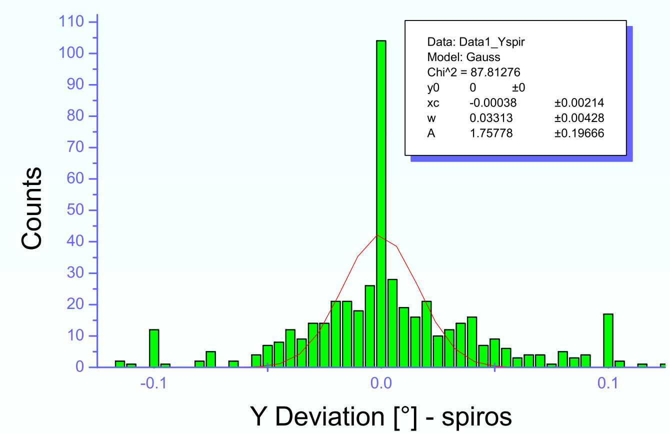


Location Accuracy in x and y

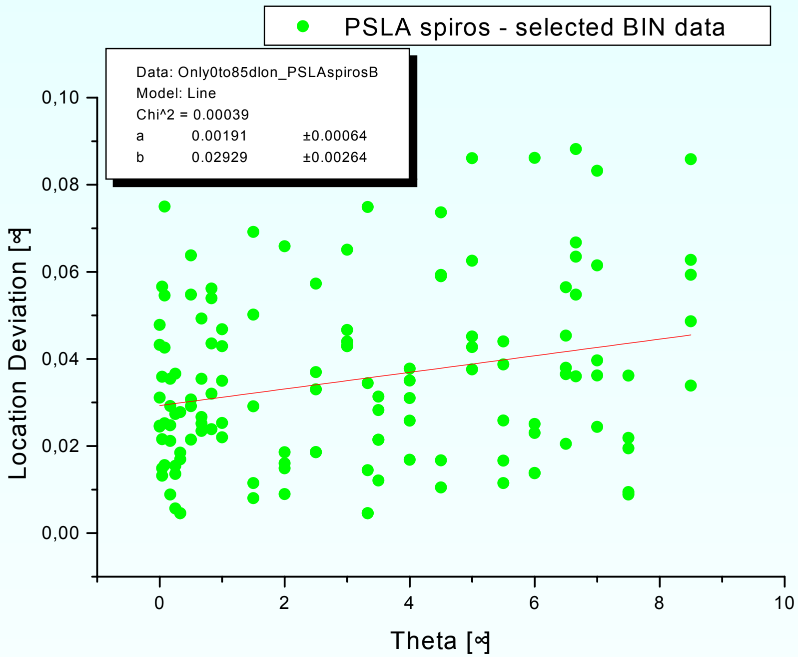


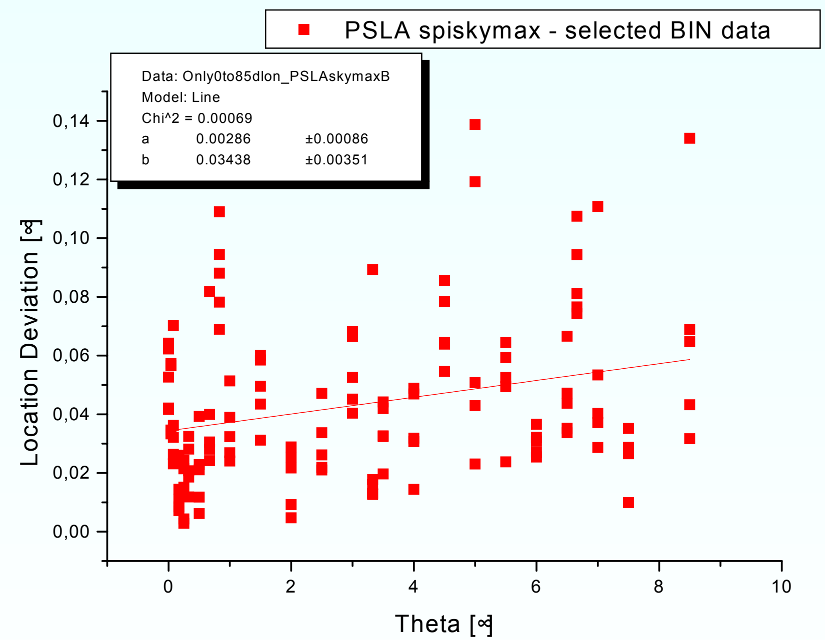






Location Accuracy as a function of azimuth angle





Introducing Dithering

- Without dithering, the location deviation is on average equal to 0.09°
- With 7-point dither (and equal total exposure time), the location deviation is 0.013° on average
  (however, only 6 such measurements are available)

More to come soon ...

SPI Calibration

Bruyères-le-Châtel,

Short-distance sources efficiencies : Synthesis (single events)

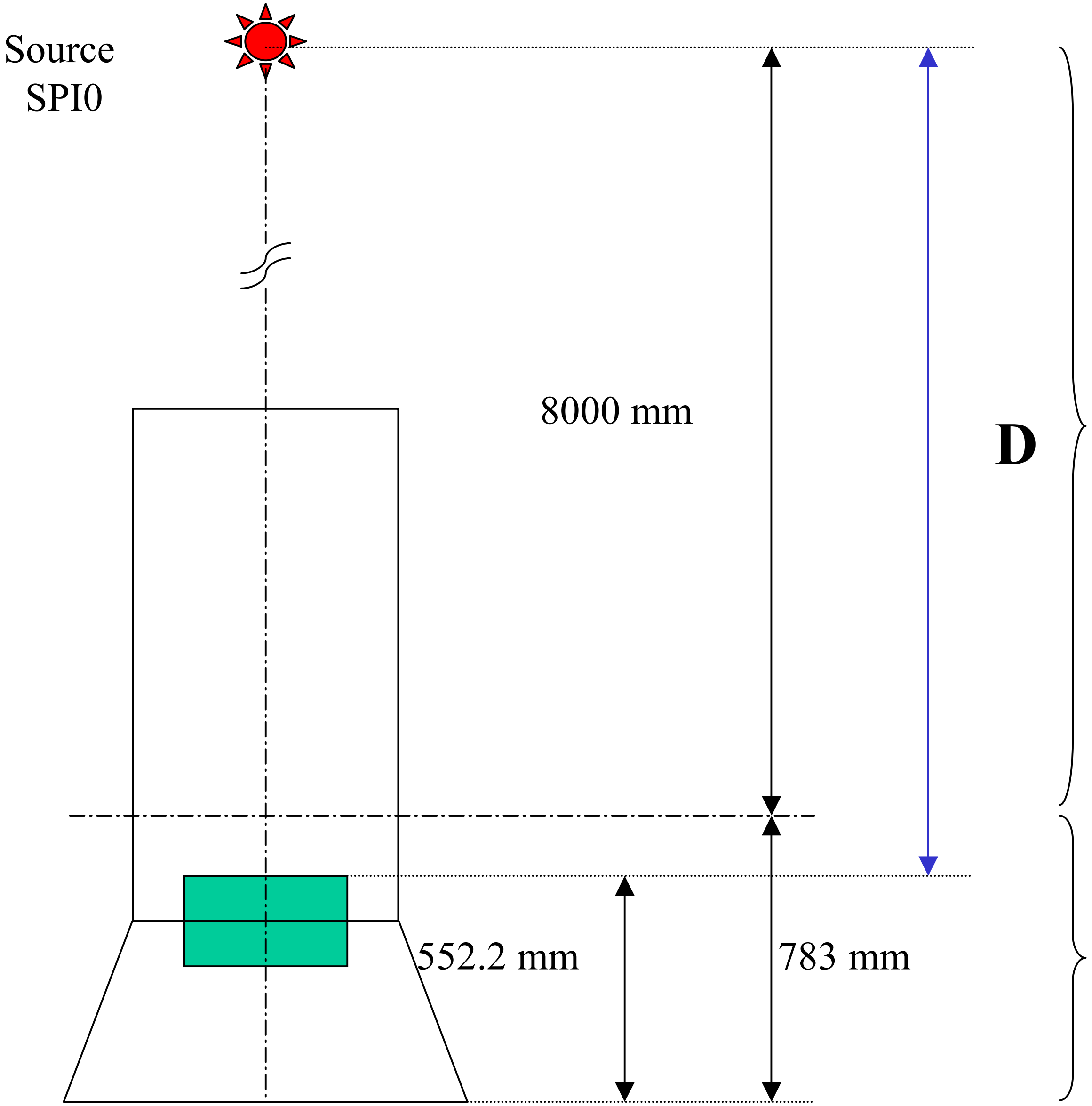
David Attié & Philippe Paul

Munich - Thursday 20 june 2002

Summary

- SPI setup : configuration and distance
- Run setup
- Source Setup
- Data reduction approach
  - efficiency calculation
  - background
  - fit method
- Calculation of the solid angle
  - detector surface
  - angle solid
- Comparison results
  - dispersion
  - efficiencies
- **Conclusion**

SPI setup



Distance of source to detection array used :

D = 8231 ± 100 mm

Measurement
by the CNES team
(J.F. VEGA)

CNES documents
(L. GOSSET)

Sources setup

Source Number	Energy Line (keV)	Source Name	A0 (kBq)	Err (%)	$T_{1/2}$ (Days)	Err (Days)	A0 date	I_{abs} (%)	Err (%)	Distance (mm)	Err (mm)
70842	59,54	^{241}Am	3513	3	158040	183	15/11/00	35.9	0.4	8231	100
733741	80,99	^{133}Ba	8384	3	3862	3	16/11/00	34.3	0.6	8231	100
763162	122,063	^{57}Co	7507	3	271.77	0.1	01/05/01	85.54	0.25	8231	100
687911	165,85	^{139}Ce	49.8	3	137.6	0.3	15/04/01	80.1	0.3	8231	100
733741	276,397	^{133}Ba	8384	3	3862	3	16/11/00	7.12	0.07	8231	100
733741	302,845	^{133}Ba	8384	3	3862	3	16/11/00	18.3	0.2	8231	100
733741	356,006	^{133}Ba	8384	3	3862	3	16/11/00	63.7	0.8	8231	100
763167	513,99	^{85}Sr	10790	3	64.73	0.2	01/05/01	99.28	0.04	8231	100
733742	661,646	^{137}Cs	7026	3	11012	22	15/11/00	85	0.2	8231	100
763151	834,81	^{54}Mn	6786	3	312.15	0.08	01/05/01	99.975	0.0012	8231	100
763164	898,042	^{88}Y	6845	3	106.62	0.025	01/05/01	94	0.3	8231	100
733744	1173,22	^{60}Co	7170	3	1925	3	19/11/00	99.87	0.06	8231	100
733744	1332,51	^{60}Co	7170	3	1925	3	19/11/00	99.98	0.06	8231	100
763164	1836,064	^{88}Y	6845	3	106.62	0.025	01/05/01	99.33	0.03	8231	100

Run setup

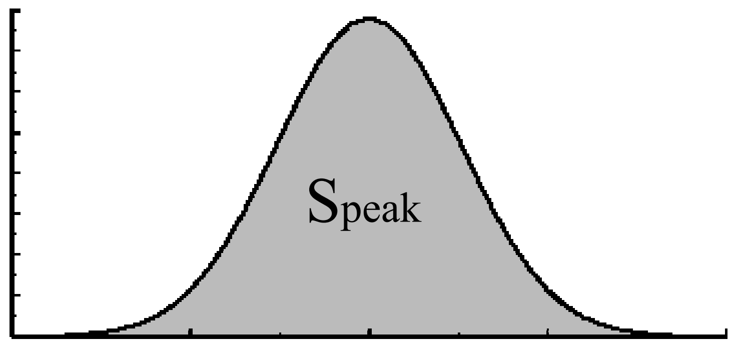
RUN Number						
SOURCE	Background Reduction	Energy Line (keV)	Source Name	Run date	Aire absorption (cm^{-1})	Average Dead Time (τ)
370	376	59,54	^{241}Am	04/24/01-01:48:00	0.00021641000	0.98744000
372	376	80,99	^{133}Ba	04/23/01-07:11:00	0.00019480000	0.98500000
371	376	122,063	^{57}Co	04/23/01-05:58:00	0.00010396000	0.98640000
409	408	165,85	^{139}Ce	04/29/01-01:48:00	0.00012200000	0.98500000
372	376	276,397	^{133}Ba	04/23/01-07:11:00	0.00013000000	0.98500000
372	376	302,845	^{133}Ba	04/23/01-07:11:00	0.00013000000	0.98500000
372	376	356,006	^{133}Ba	04/23/01-07:11:00	0.00016100000	0.98500000
373	376	513,99	^{85}Sr	04/23/01-10:09:00	0.00010396000	0.98330000
374	376	661,646	^{137}Cs	04/23/01-12:24:00	9.3300000e-05	0.98510000
375	376	834,81	^{54}Mn	04/23/01-14:38:00	8.2590000e-05	0.98450000
378	376	898,042	^{88}Y	04/24/01-21:59:00	8.2590000e-05	0.98010000
377	376	1173,22	^{60}Co	04/23/01-14:38:00	7.3380000e-05	0.98450000
377	376	1332,51	^{60}Co	04/23/01-14:38:00	6.2340000e-05	0.98450000
378	376	1836,064	^{88}Y	04/24/01-21:59:00	5.3590000e-05	0.98010000

Correction of Dead time : $\phi_{corrected} = \phi_{measured} / \tau$

Efficiency : principle of calculation

Calculation of the absolute full-energy peak efficiency

$$\varepsilon(E) = \frac{S_{peak}}{N_\gamma}$$



The parameters used for the estimation of the counts expected which called N_γ are :

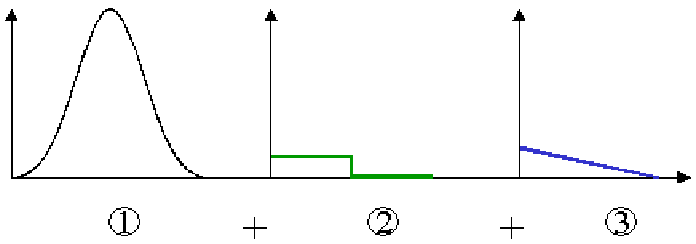
- distance detector-source : L
- detector radius : R
- source activity : A
- air absorption : A_{abs}
- branch ratio : B_r
- solid angle : Ω
- time : t

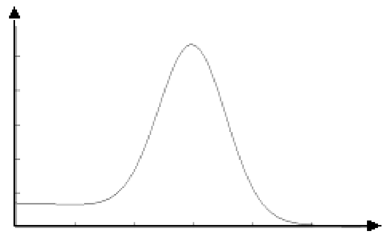
$$N_\gamma = \mathcal{A} \times A_{abs} \times B_r \times t \times \Omega$$

Data reduction approach

- Background substracted
  - David : sum of runs 369-376-381-408
  - Philippe : the closed background run

- Fit by
  - gauss + heavyside (Philippe)
  - gauss + heavyside + line (David)





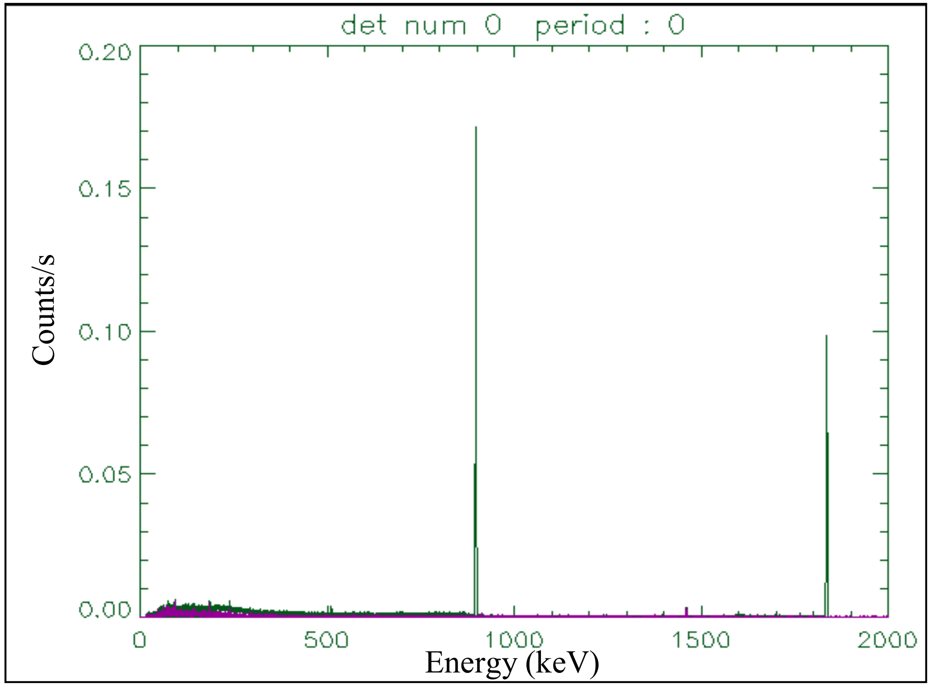
Composed function

① Gaussian : model

② Function erfc : asymmetrical peak

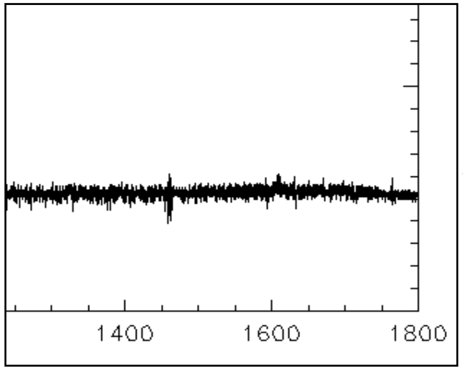
③ Function : background

Background reduction

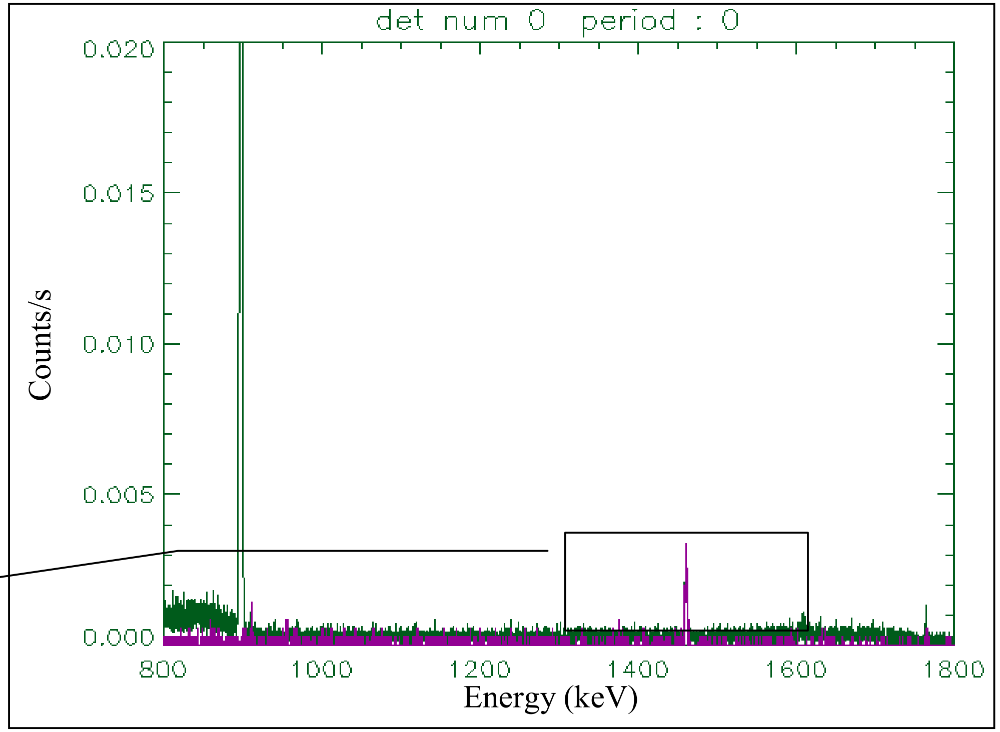


PROCESSING OF SINGLE EVENT EFFICENCIES :

Background reduction



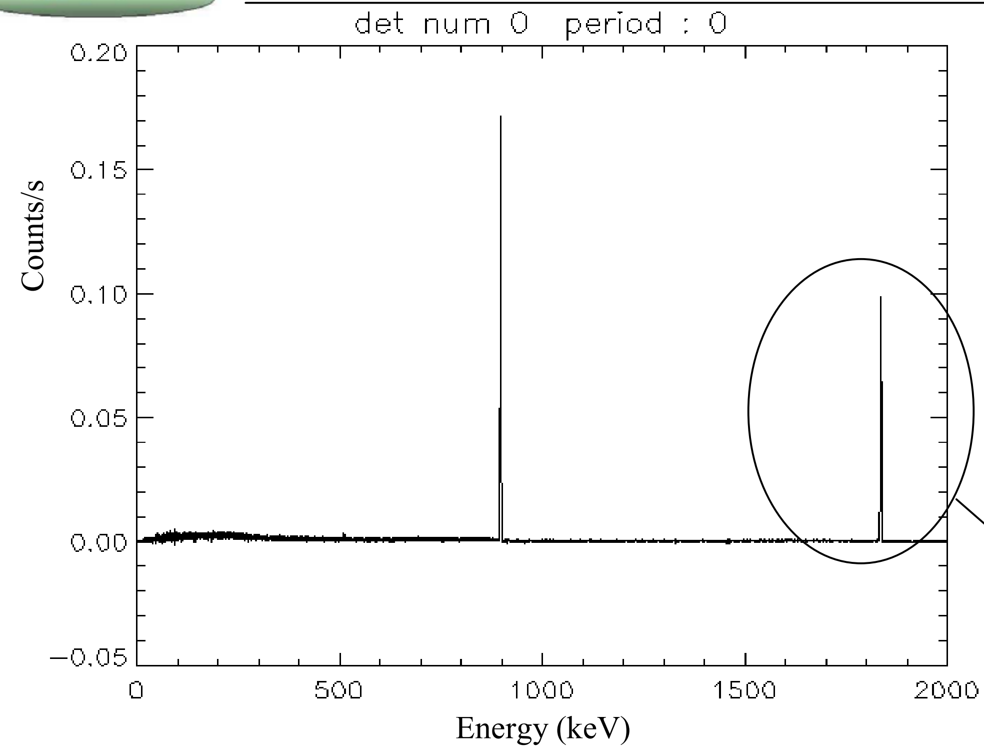
Reduced Spectra



Background adjustment

Y88 Source (BRUYERES LE CHATEL)

Fitting process

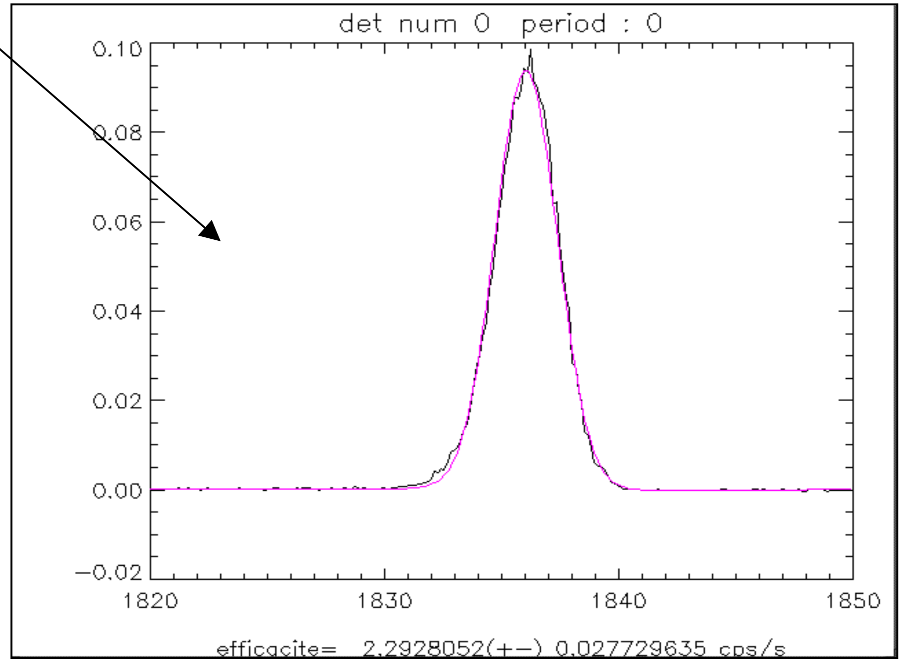


Spectra with background reduction

PROCESSING OF SINGLE EVENT EFFICENCIES :

FULL ENERGY PEAK FITTING

Y88 Source (BRUYERES LE CHATEL)



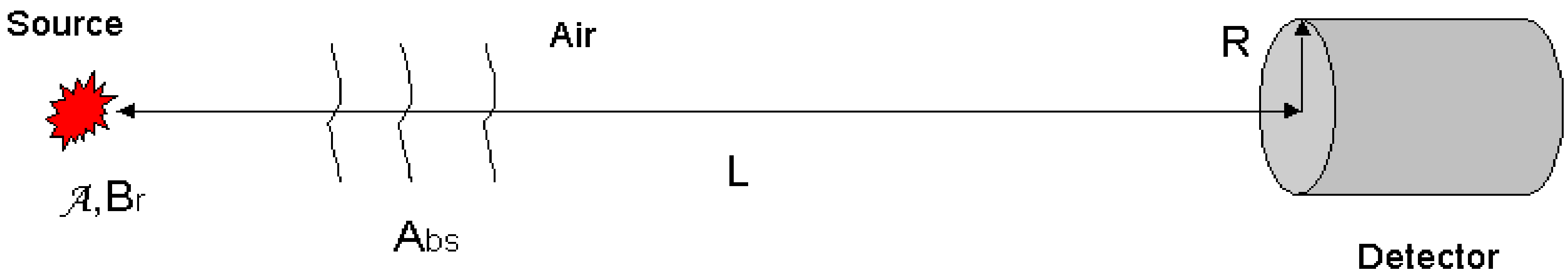
FIT TYPE :

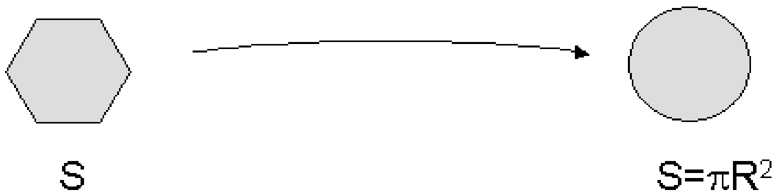
+ Step function :

$$f(E) = \frac{1}{2}\left[1 - err\_erf\left(\frac{E - E_0}{\sqrt{2}\,\sigma}\right)\right]$$

+ Gaussian curve (FWHM not fixed)

Calculation of the solid angle





David : $\Omega = 2\pi(1 - \cos\theta)$

$$\theta = A\tan\left(\frac{R}{L}\right)$$

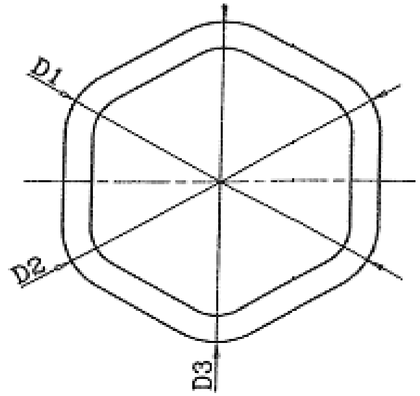
Philippe : Solid Angle calculation is based on analytical formulas of [Gardner et Verghese, 1971] and [Verghese et al., 1972]

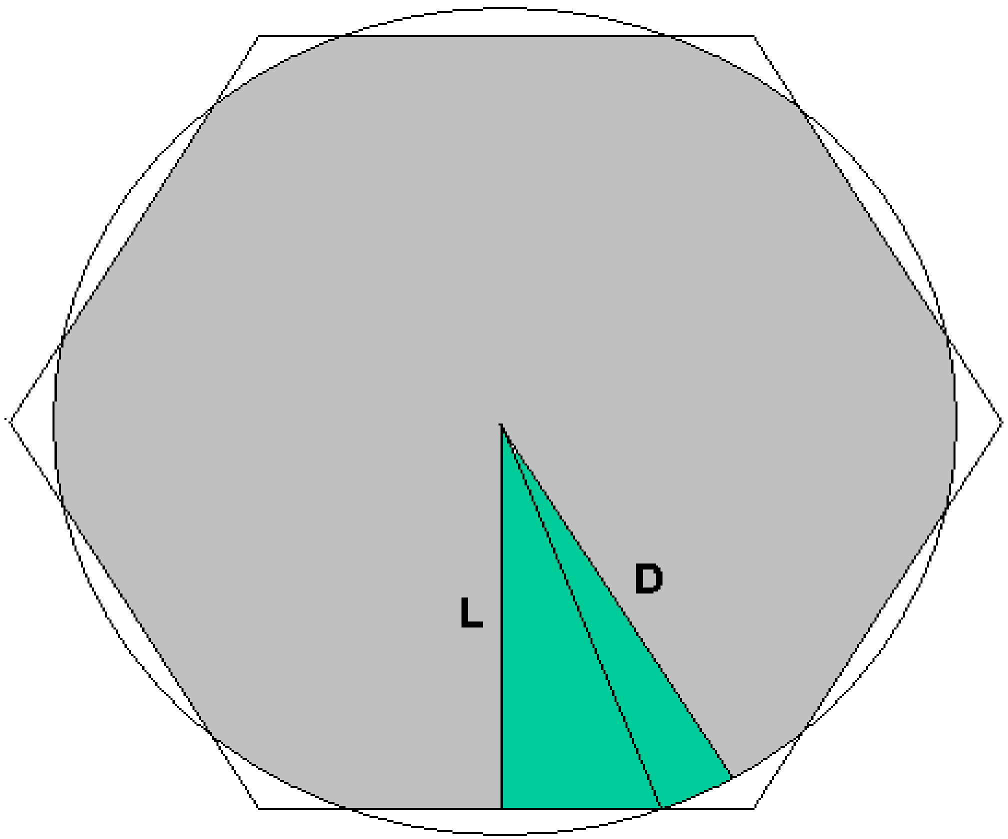
Calculation of the solid angle

Calculation the geometric area S of a SPI detector

- L1, L2,L3, D1, D2 & D3 measured
- we took the average : D = 30.363 mm

  L = 28.014 mm

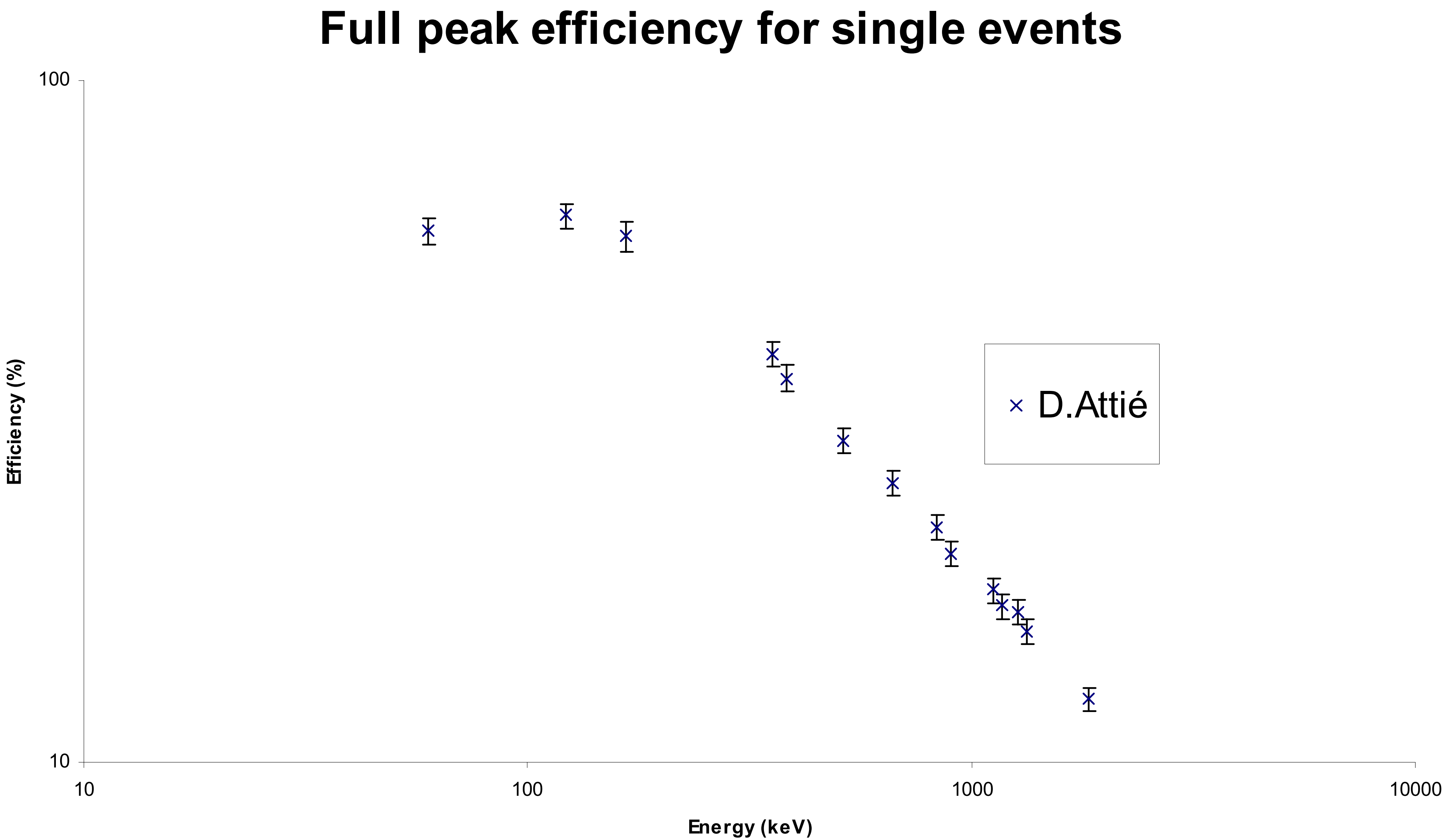




Philippe :

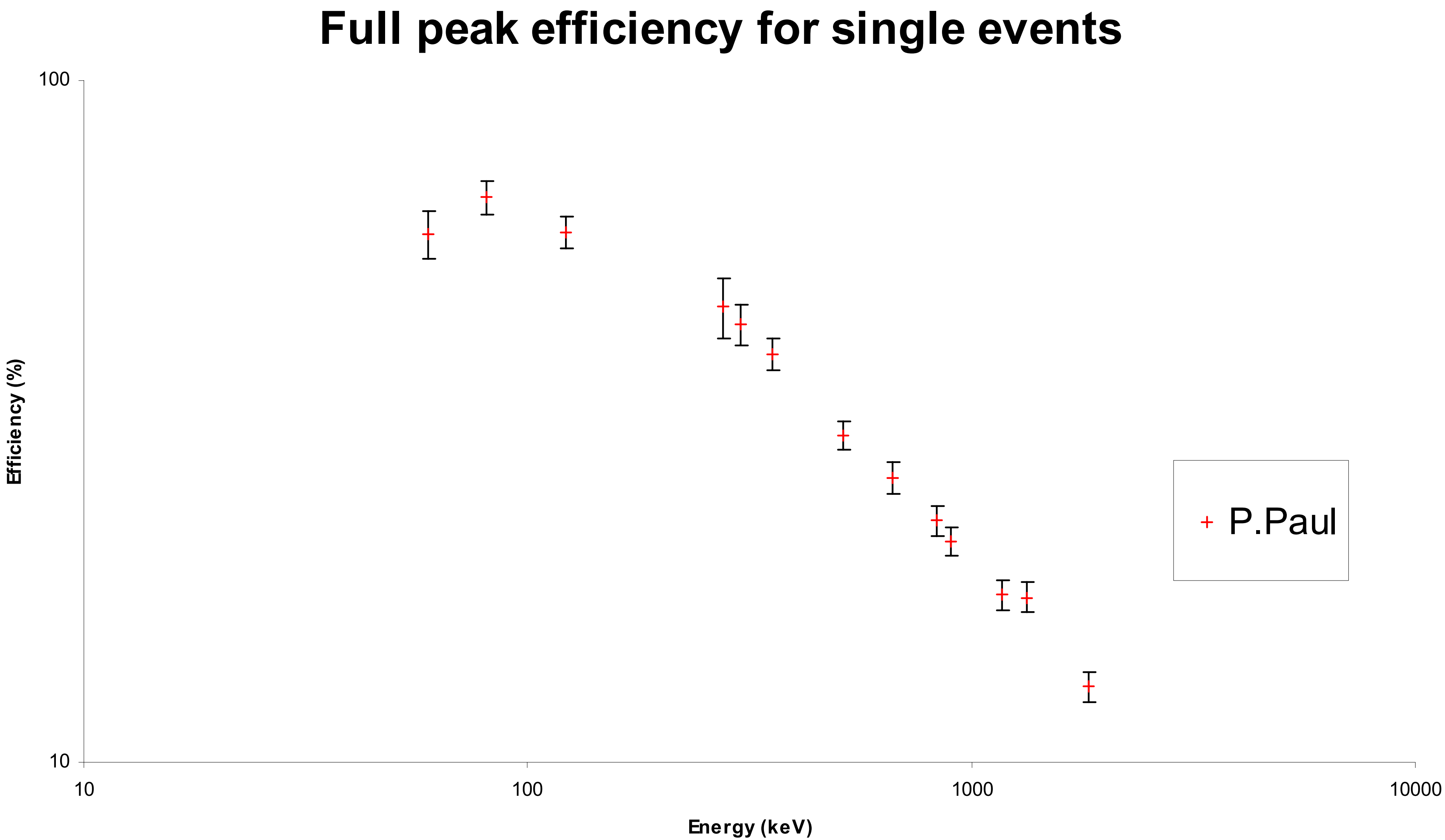
S = 26.81 cm² (err : 2 %)

Average efficiency



Average efficiency (without detector 0)

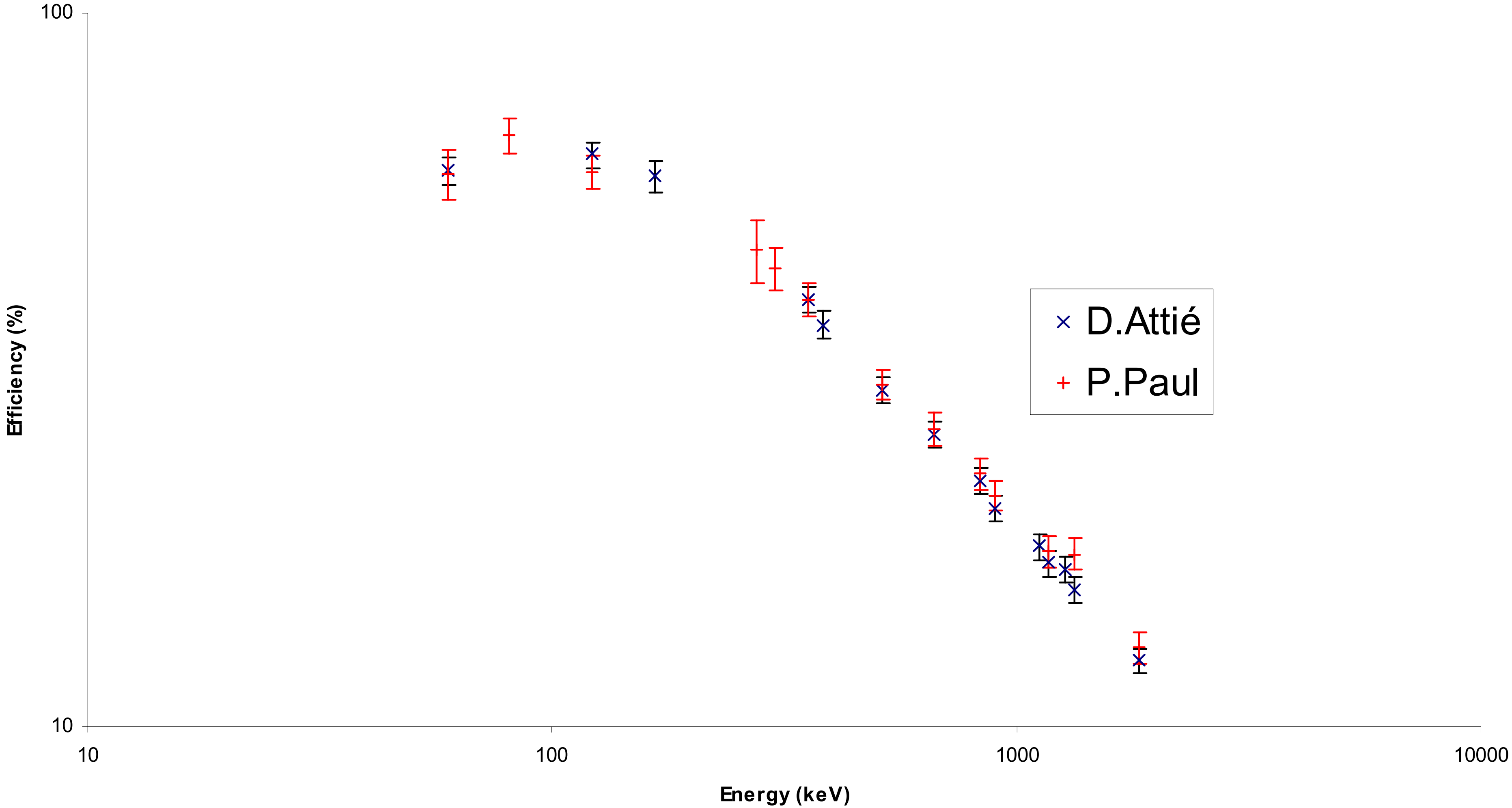
Average efficiency



Average efficiency (without detector 0)

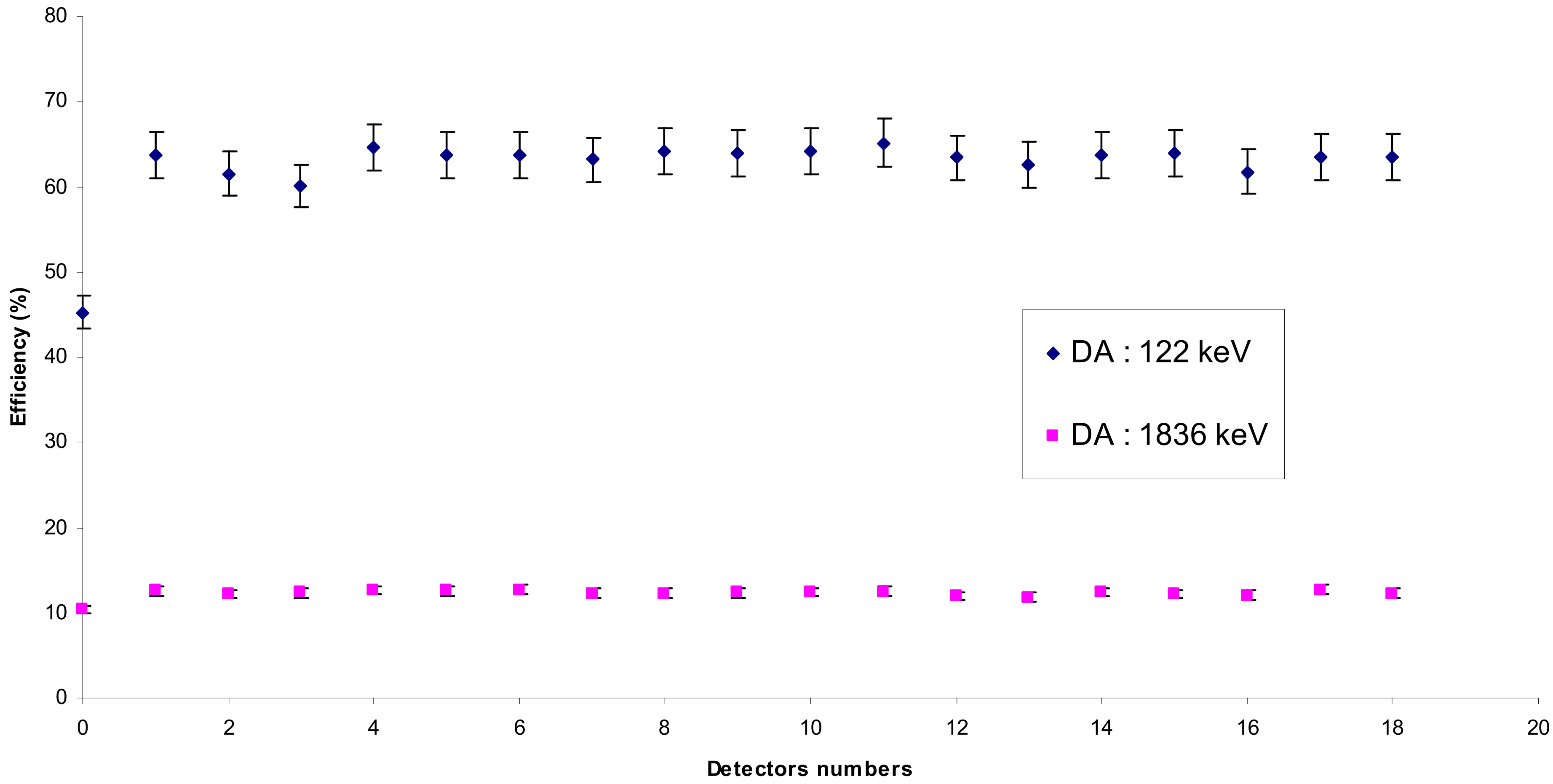
Average efficiency

Comparison between the efficiency curves



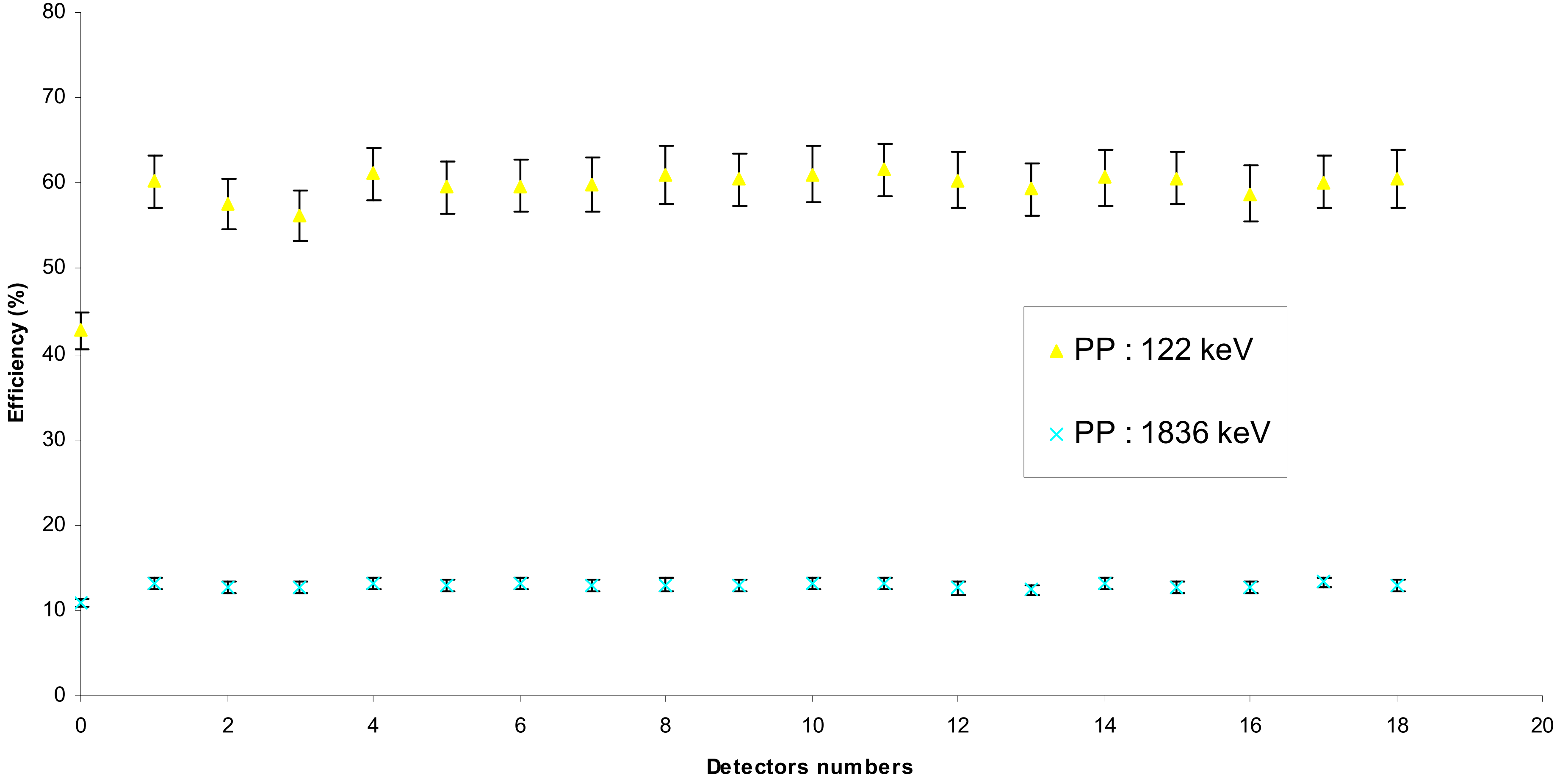
Average efficiency (without detector 0)

Dispersion for the 122 keV and 1836 keV lines

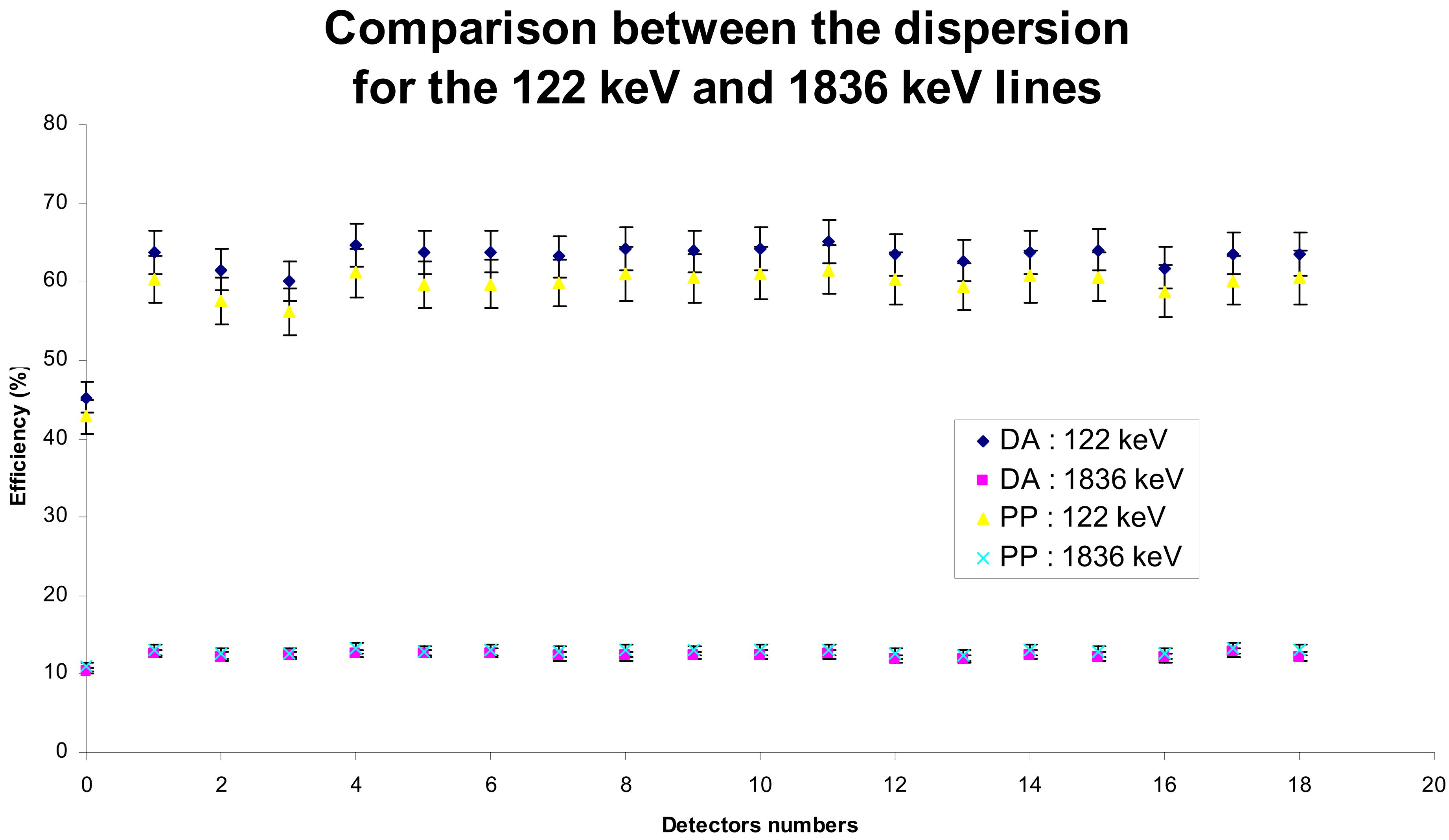


Dispersion

Dispersion for the 122 keV and 1836 keV lines



Dispersion


Comparison between the dispersion for the 122 keV and 1836 keV lines
Efficiency (%)
Detectors numbers
0
10
20
30
40
50
60
70
80
0
2
4
6
8
10
12
14
16
18
20
DA : 122 keV
DA : 1836 keV
PP : 122 keV
PP : 1836 keV

Conclusion

This is the end ...

... of the short-distance sources efficiencies
for singles events.

Bonus : tables results (3 σ)

SPI Calibration

Bruyères-le-Châtel,

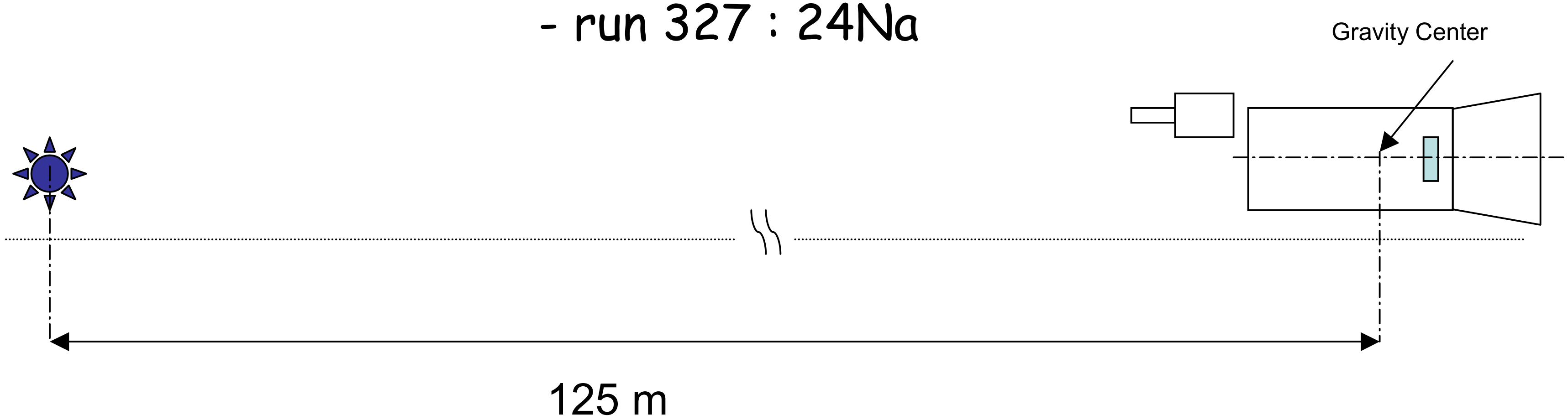
Long-distance sources : Fluxes with the monitor

David Attié

Munich - June 2002

Long-distance configuration

Run long-distance used : - run 60 : 241Am
- run 65 : 137Cs
- run 134 : 60Co
- run 327 : 24Na



Distance source-GC SPI : 125000 mm
Distance source-monitor : 122593 mm
Distance source-spi : 125233 mm
SPI detector area : 26.74 cm²
Monitor area : 25.25 cm²

Monitor & SPI detectors plan fluxes

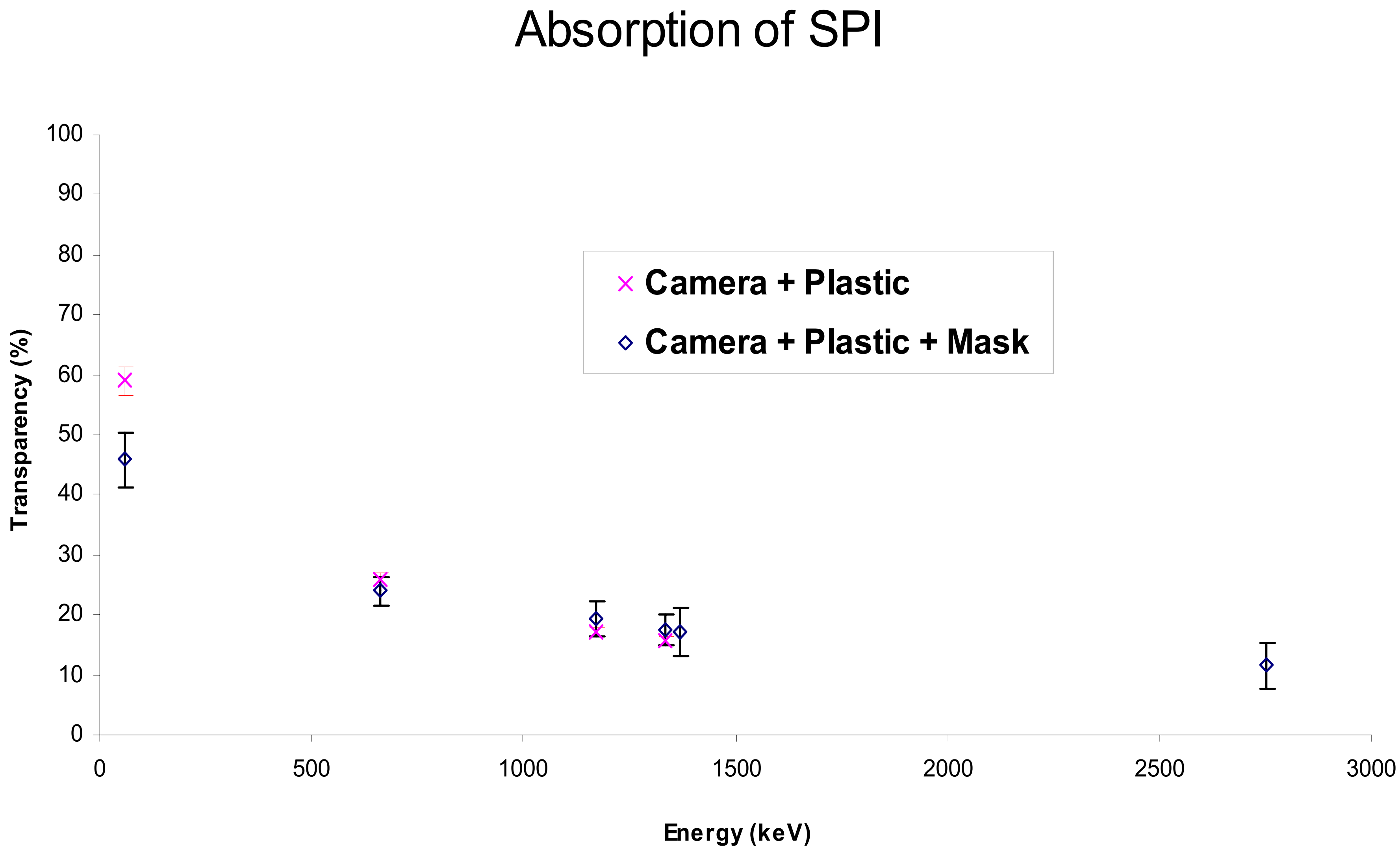
- Measurement : - flux in front of the monitor
  - flux in front of SPI detector plan with the mask (open pixels)

  -> Estimation of the SPI detector plan without mask

Source	E(keV)	Counts	Time (s)	Efficiencies (%) Monitor	±	efficiency SPI Plan (%)	±
241Am	59	6688	603,3	**91**	3,4	58,98	2,51
137Cs	661	7953	650,3	**26,9**	0,7	25,83	1,07
60Co	1173	4969	606,5	**16,9**	0,6	17,03	0,7
60Co	1332	4615	606,5	**14,5**	0,5	15,7	0,65
24Na	1368	2038	1053,2	**14,1**	0,5		
24Na	2754	1346	1053,2	**8,8**	1,5		

		Fluxes (ph/cm²/s)					
		Measured				Estimation	
Source	**E(keV)**	**Monitor**	±	**SPI Plan**	±	**SPI Plan**	±
241Am	59	0,48	0,02	**0,19**	0,02	**0,44**	0,02
137Cs	661	1,80	0,07	**0,38**	0,04	**1,63**	0,07
60Co	1173	1,92	0,10	**0,33**	0,05	**1,74**	0,10
60Co	1332	2,08	0,10	**0,32**	0,05	**1,88**	0,10
24Na	1368	0,54	0,03	**0,08**	0,02	**0,49**	0,03

Mask absorption



Mask absorption

-> absorption of the sandwich panel

+ comparison with the test results made by GACE

Energy (keV)	Absorption (%)	Absorption (GACE)(%)
60	15.5	18
511	-	12
661	2.5	-

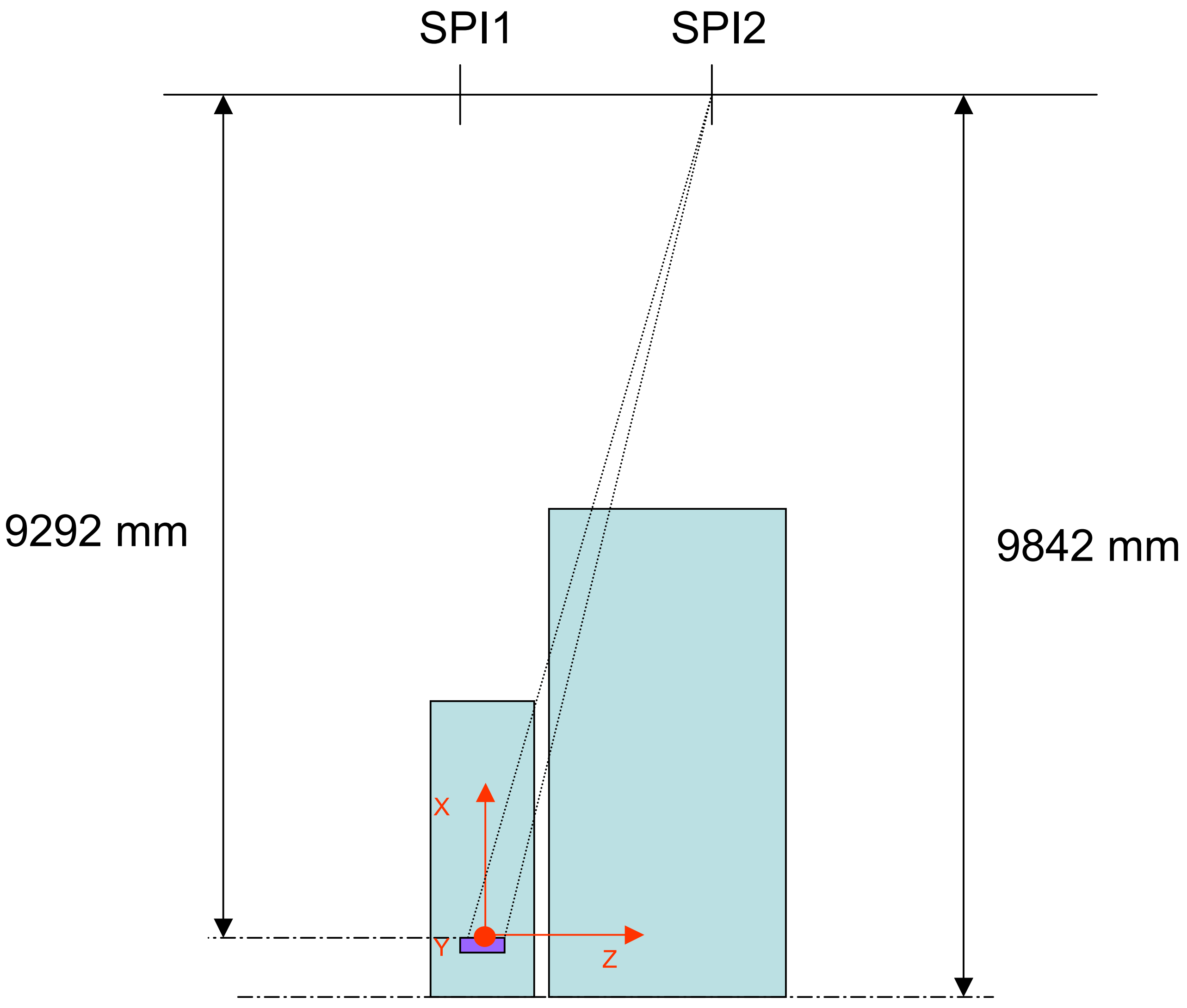
SPI Calibration

ESTEC data analysis

David Attié

Munich - June 2002

ESTEC Configuration



ESTEC Configuration

The positions SPI1 & SPI2 are well-known to the millimeter.

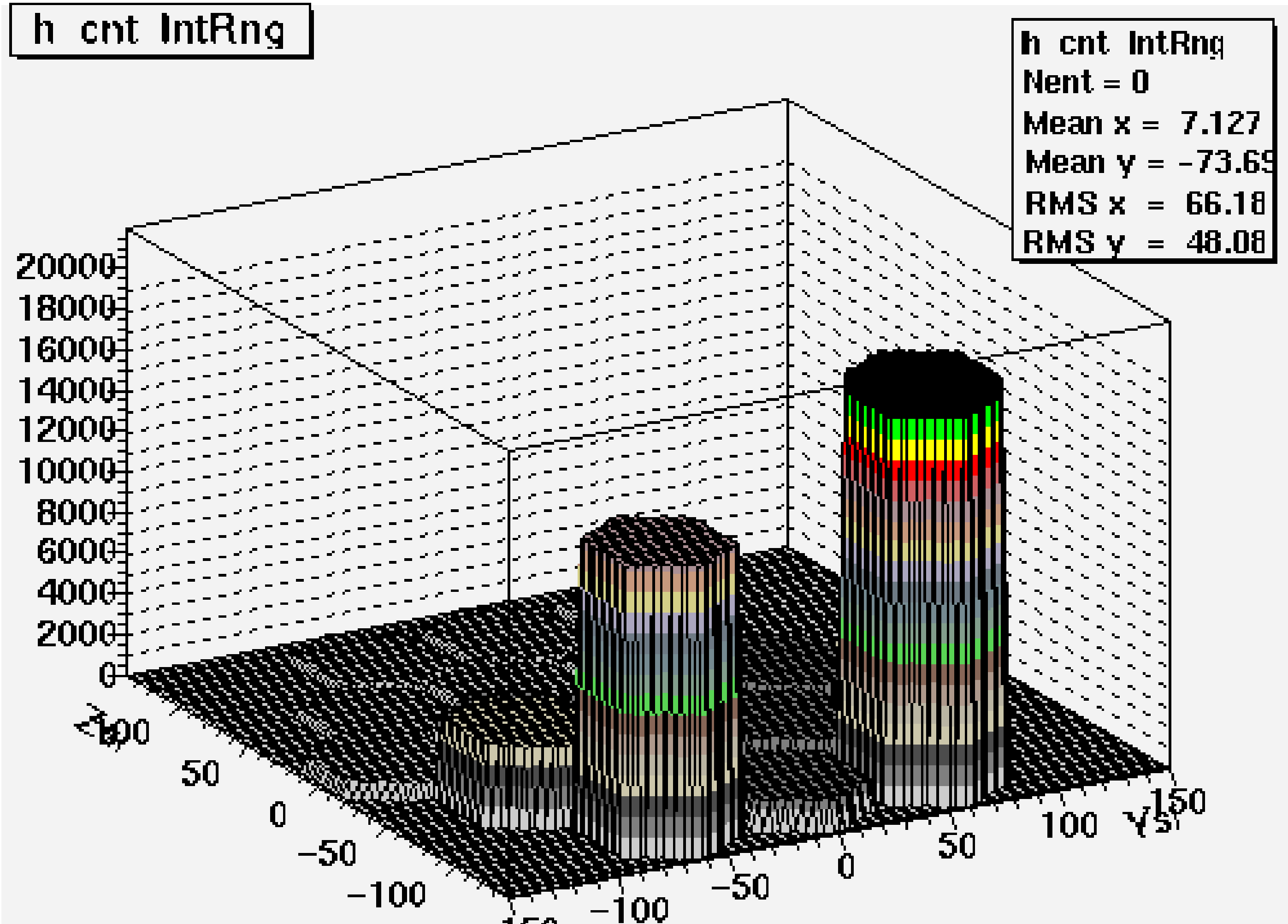
But two difficulties :

- How to used the datas to compared with BLC datas : the projections for the short-distances sources are not identical
- influence of the spacecraft : absorption, diffusion…

Positions	X	Y	Z
SPI1	9292	-18	1
SPI2	9292	-20	1002

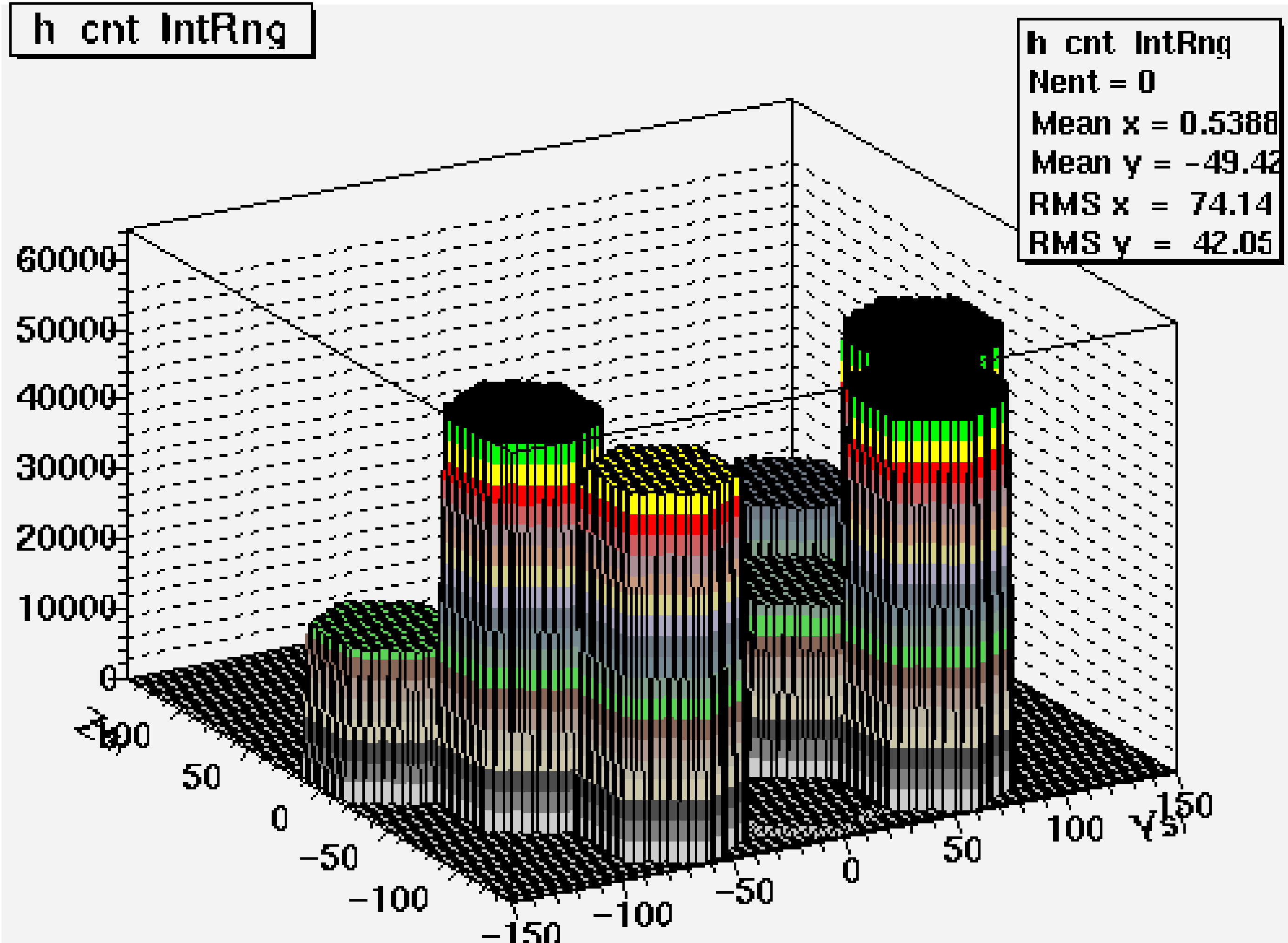
ESTEC analysis

^{241}Am at SPI2 : 59 keV



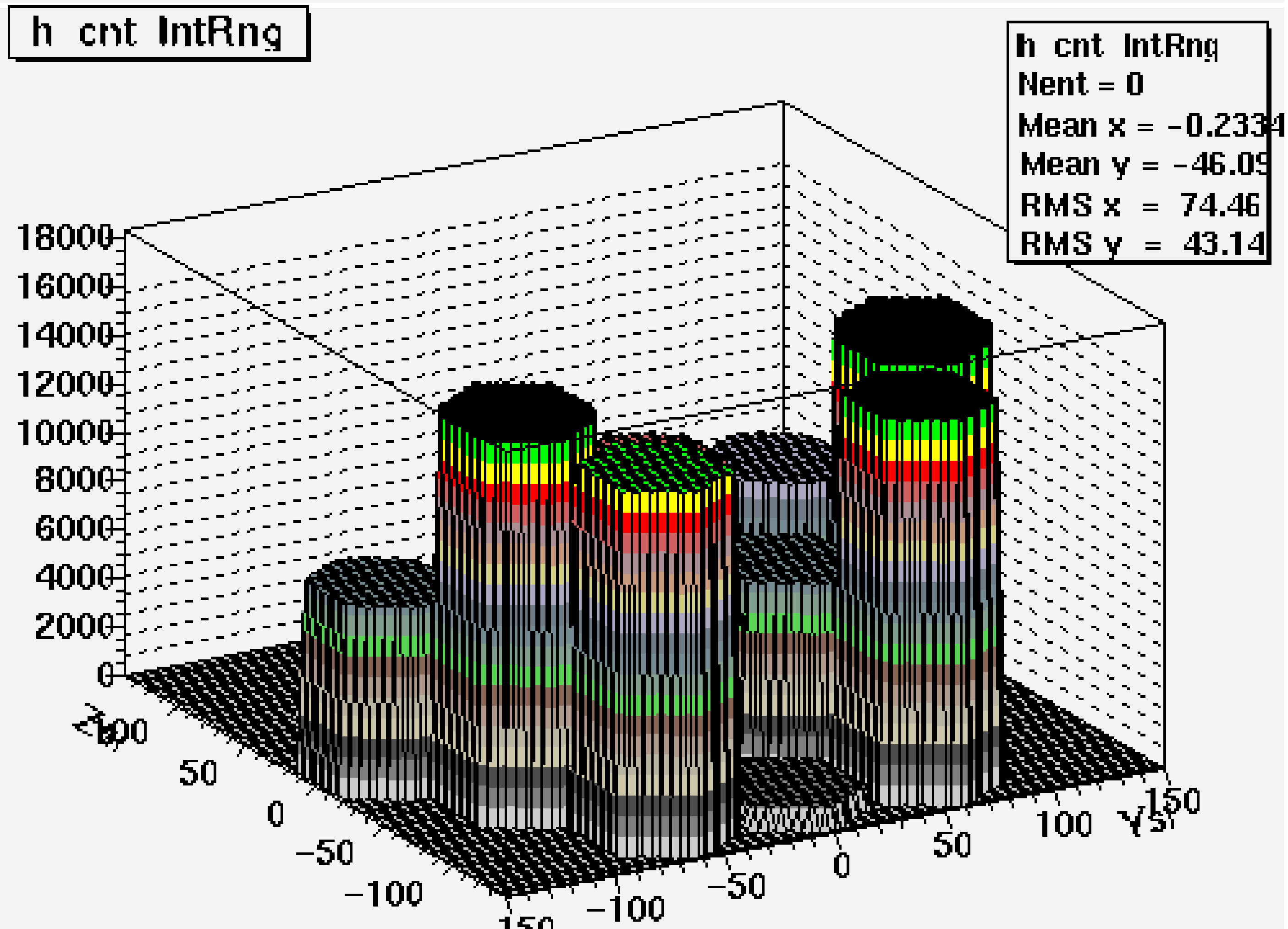
ESTEC analysis

^{137}Cs at SPI2 : 661 keV



ESTEC analysis

^{60}Co at SPI2 : 1332 keV



Conclusion

Spacecraft absorption :

-> difficult to analyze the datas

-> comparison with the BLC result ?

but we have to know the influence

I need some GEANT simulation …

… to be continued …

Status of SPI Efficiency Calculations

Steve Sturner

Georg Weidenspointner

Introduction

- Our purpose was to compare the results of various efforts to determine the efficiency of SPI within the SPI team.

- To this end, we have been soliciting information/results from various members of the SPI team.

- We have checked on some of this work and compared their results with our own.

- We have thus far concentrated on comparing our results with those of David Attié and Philippe Paul.

Short Summary of Analysis Efforts

- Use of BLC 8 m data to:
  - Determine photopeak efficiency of individual detectors
  - Examine efficiency variations across the array
  - Look at variations in efficiency to determine the BLC source offset
- Use of BLC 125 m data to:
  - Test imaging software and spectral extraction
- Use of camera and SPI BLC calibration data to:
  - Determine the transmission factors for the mask, PSAC, and cryostat and compare those results with measurements at GACE and theoretical values from GSFC

Determination of Efficiency

- We have concentrated on soliciting information on efficiency calculations based on the BLC 8 m data.

- Determining the origin of any discrepancies requires access to all parameters used in the calculations:

Efficiency = $$\varepsilon_i = \frac{C_i(t)}{\left(\frac{I_i(t)\, R_i\, T_i}{4\pi D^2}\right) A_{geo}}$$

$C_i(t)$ = count rate in line i
$I_i(t)$ = source decay rate
R_i = branching ratio for line i
T_i = air transmission for line i
D = distance to source
A_{geo} = detector geometric area

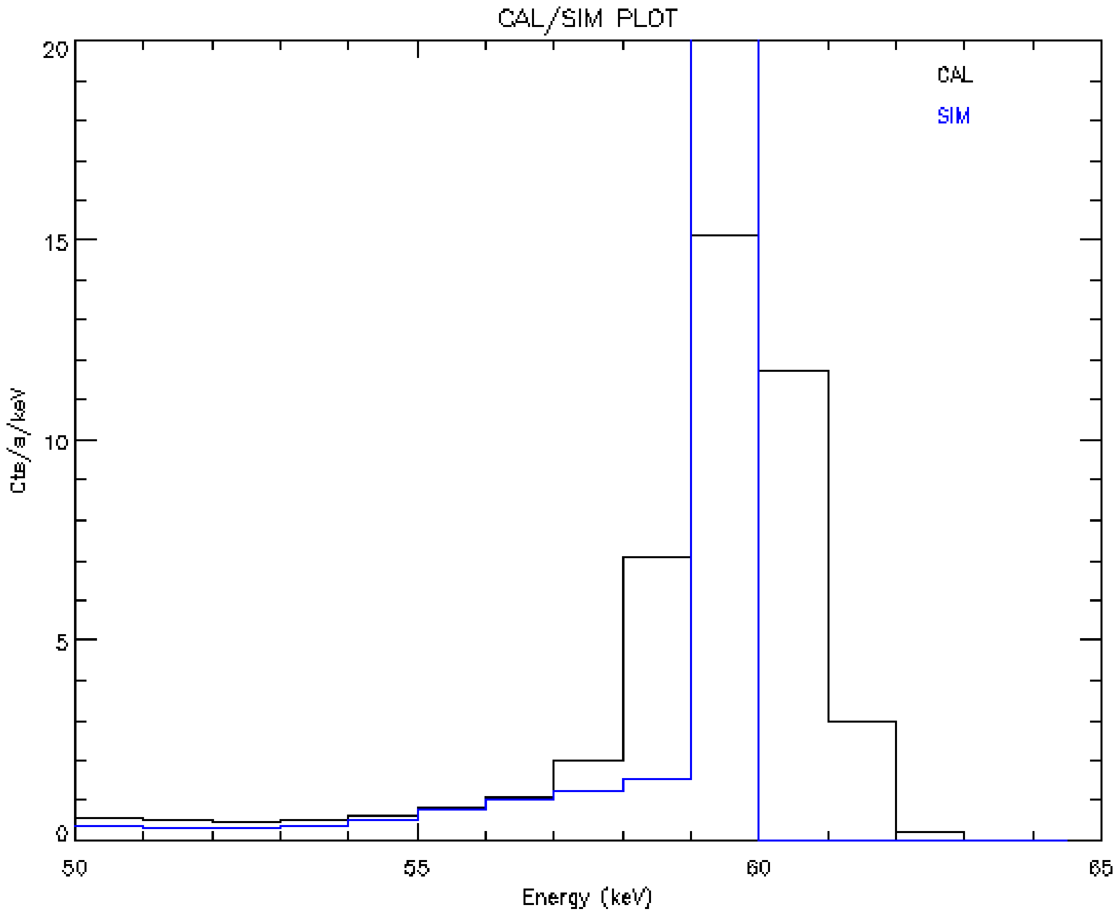
- We suggest that effective area, $\varepsilon{*}A_{geo}$, rather than efficiency be quoted. This eliminates discrepancies due to uncertainties in calculating the geometric area of a detector.

Determination of Counts in Line

- We do not currently fit the line to determine the count rate.
  - Total counts in ~ ±4 keV interval about line centroid determined.
  - Continuum estimated on either side of line and subtracted.
- Line shape varies with energy and during mission with radiation damage.
  - At low energies (e.g. 60 keV) there is a significant tail from scattering)
- What functions should be used for fitting?
  - The fit function in GASPAN (gaussian+step+tail) offers sufficient flexibility to parameterize the line shapes for both calibration and in-flight data.
  - How to define the photo-peak? As gaussian+tail?
  - Range of integration?

60 KeV Line Profile

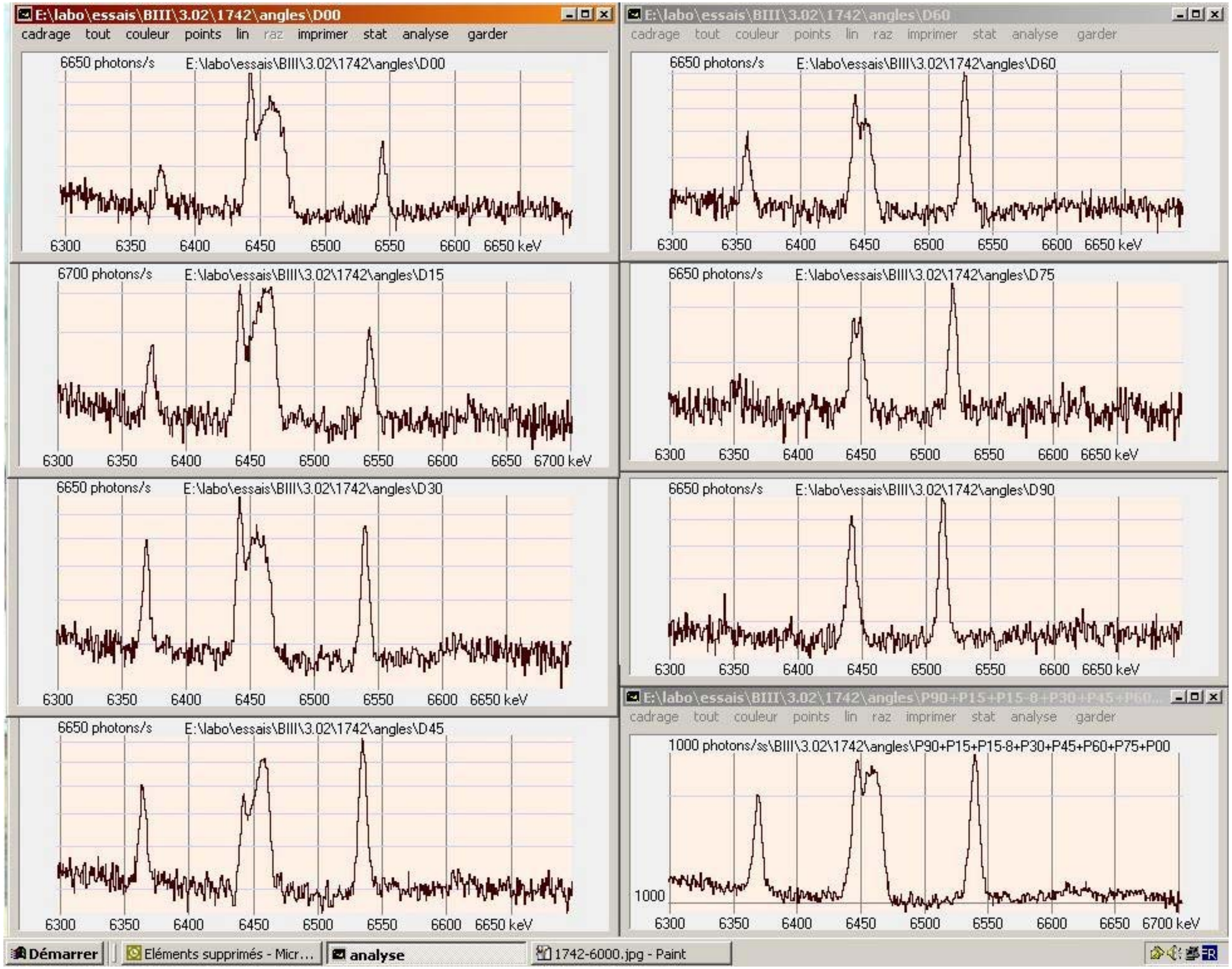
- We currently determine photopeak count rates by integrating the counts over a specified energy range about the line of interest. Underlying continuum count rates in the region are estimated using simulations.



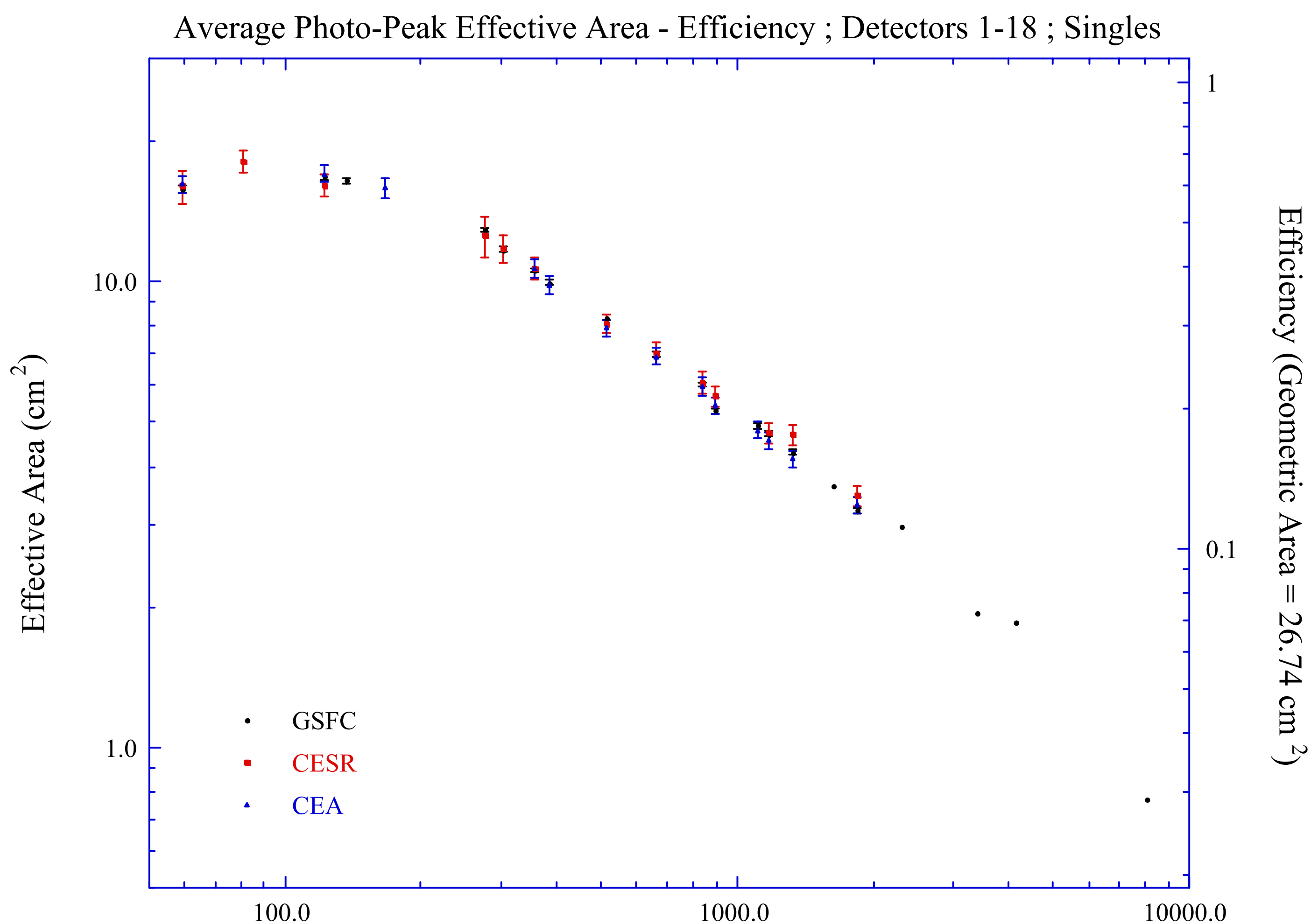
BLC Accelerator Data Analysis

- Analysis of BLC accelerator data is proving more complex than initially anticipated.
- Maurice Gros & Jürgen Kiener are working on the problem. We will keep in contact with them for updates.
- New data was collected March 02 to help better interpret the BLC monitor data.
- They have provided us with a detailed drawing of the carbon target so we can do improved simulations of the accelerator runs.

Angular Dependence of Line Shape/Ratio

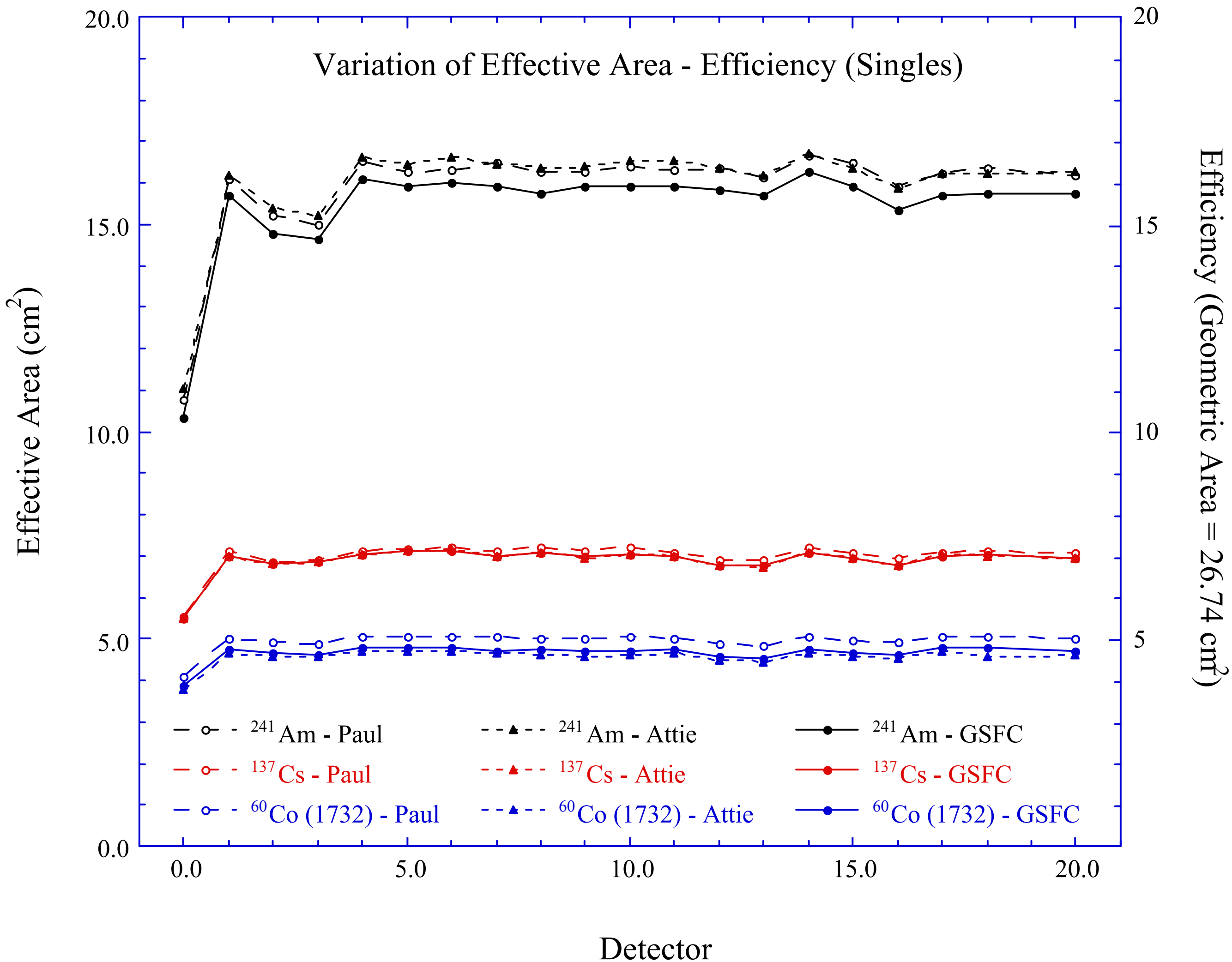


Average Photo-Peak Effective Area



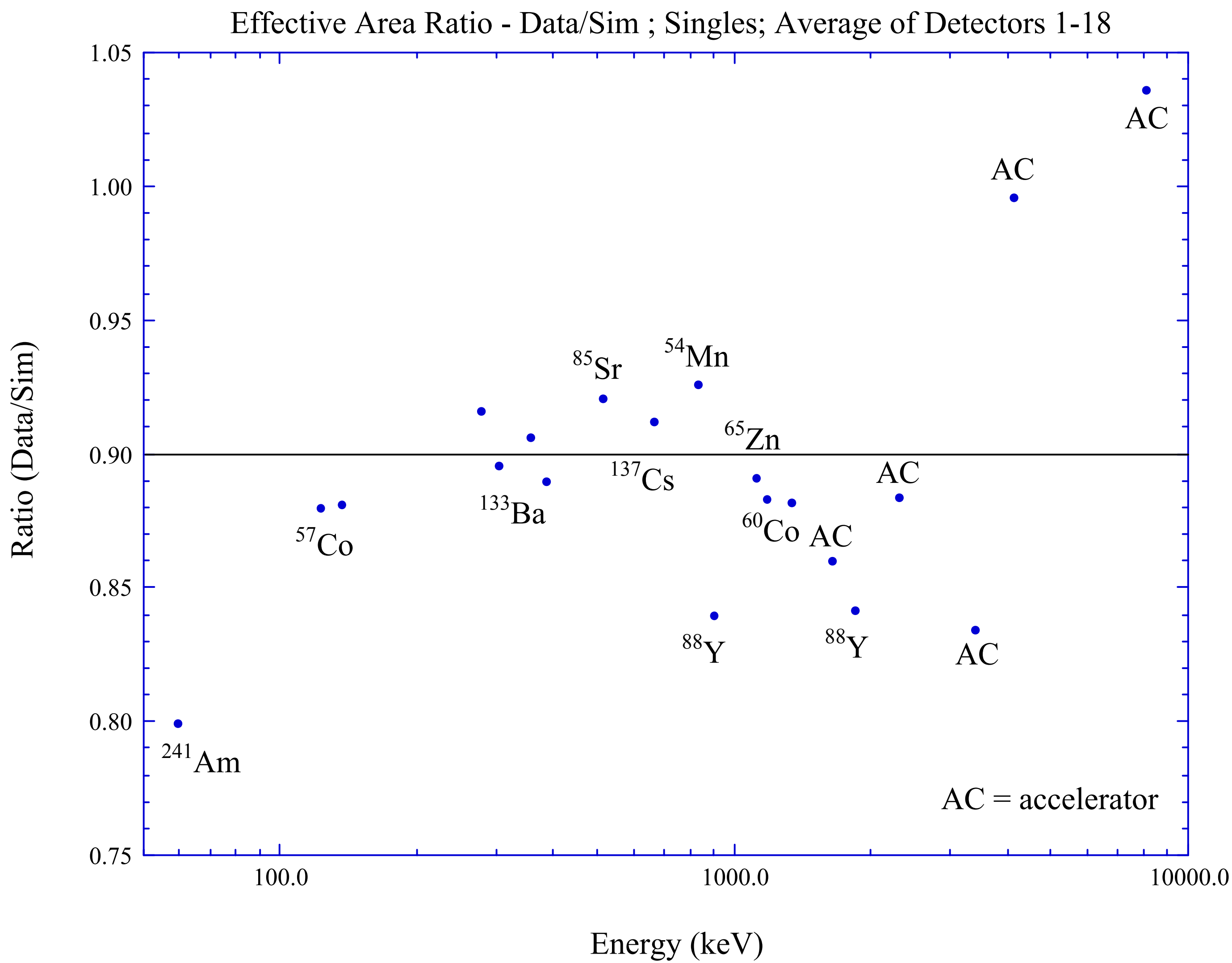
- Differences generally ≤ 4%, possibly due to differences in measuring count rates.

Variation of Efficiency Across Array



- Variations from detector to detector are reproduced even when curves are offset.

Effective Area Ratio - Data/Sim.



Mask Transparency - Central Zones

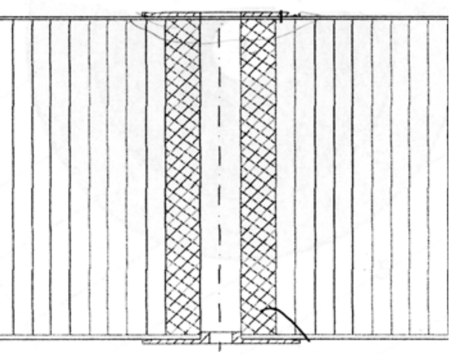
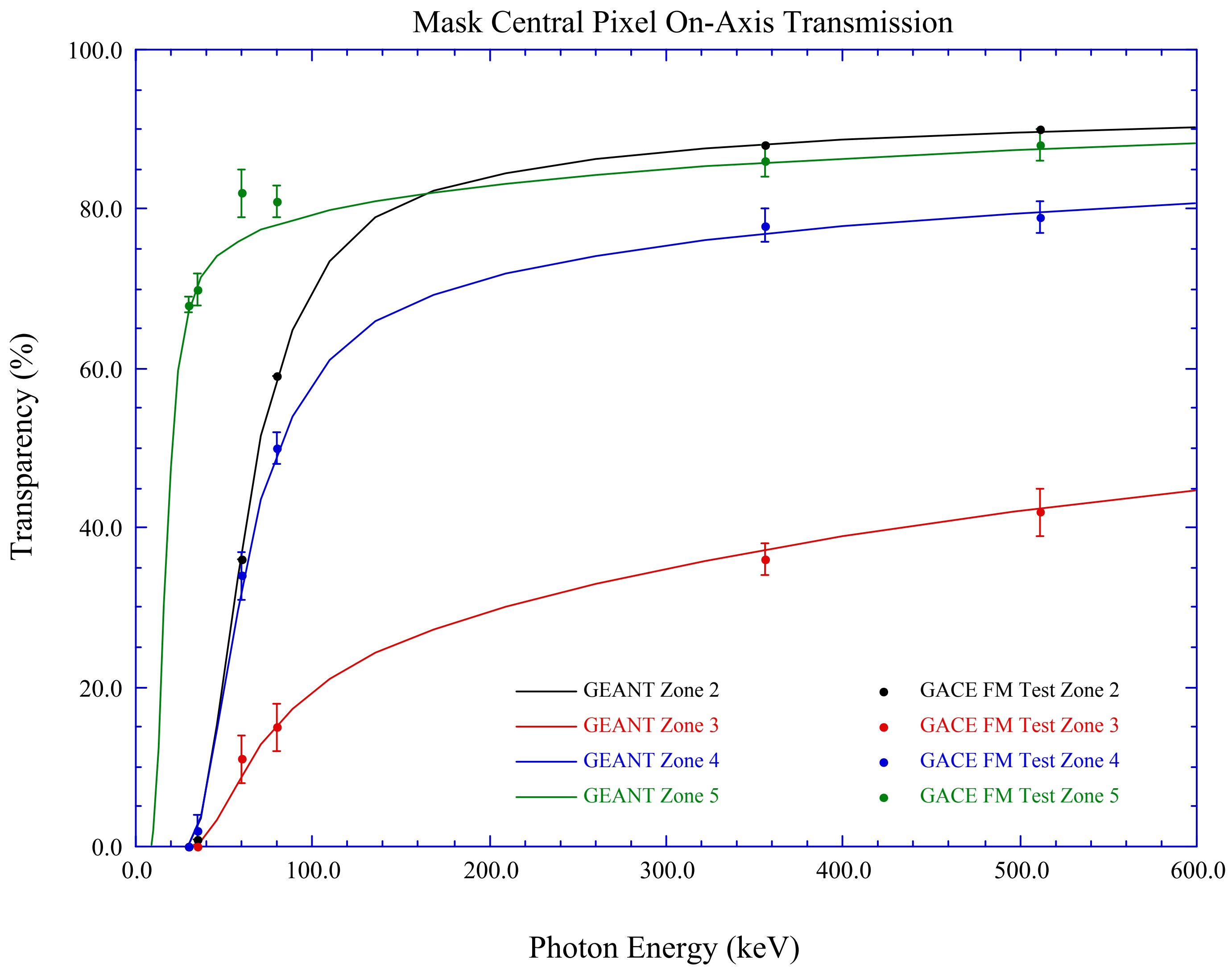


Table 1 shows the 5 different areas composing the Central Pixel with indication of the different materials used and dimensions:

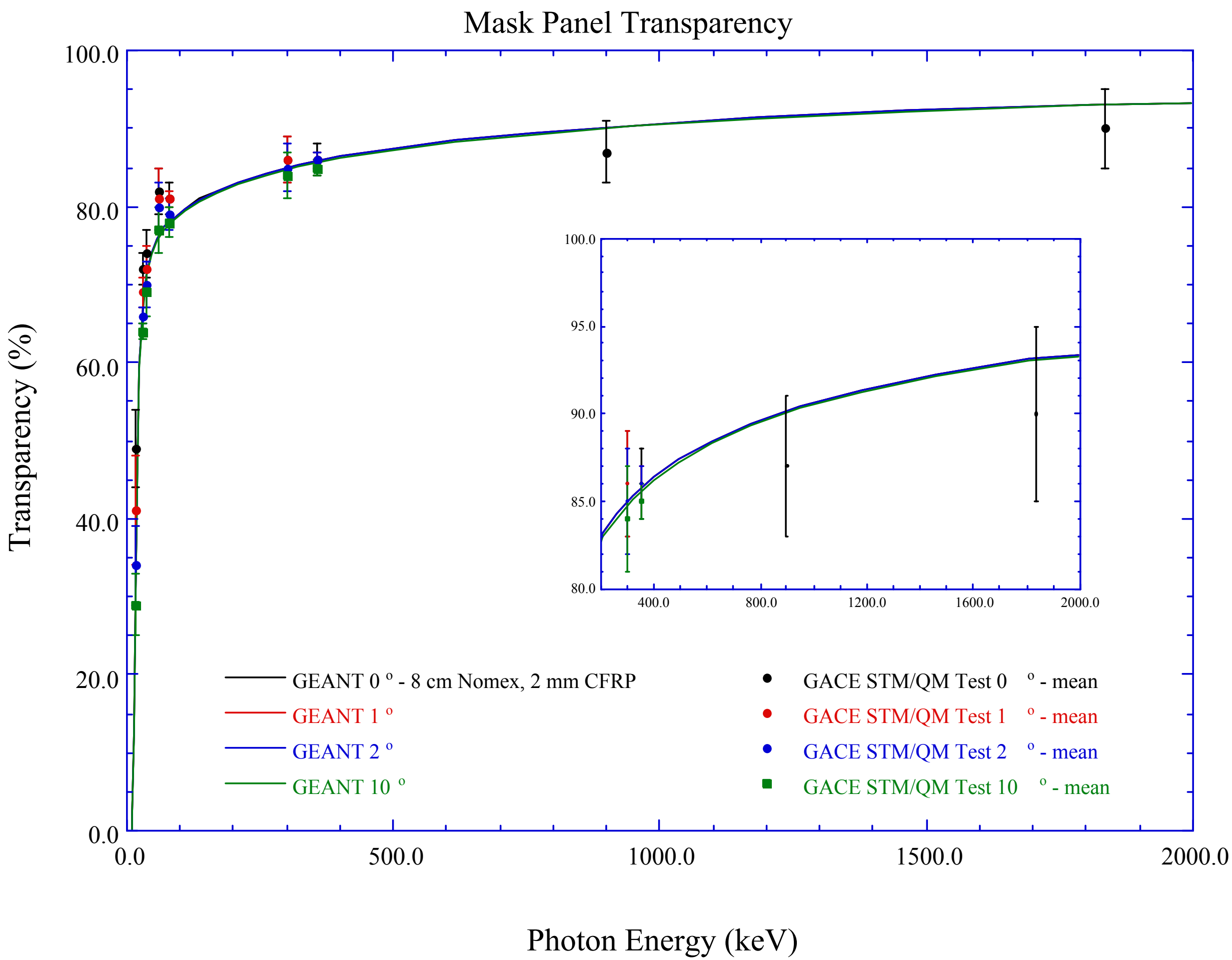
ZONE	Material Composition	Area (mm^2)	Area / Total Pixel Area	Inner Dimension (mm)	Outer Dimension (mm)
1	Central hole (Ø 6mm)	~ 28.3	0.9%	Ø 0	Ø 6
2	Ti washer 3 mm thick	~ 50.3	1.6%	Ø 6	Ø 10
3	Panel (2 skins and honeycomb), Potting and 2 Ti washers 1.3mm thick each	~ 537.1	17.2%	Ø 10	Ø 28
4	Panel and 2 Ti washers 1.3mm thick each	~ 640.9	20.6%	Ø 28	Ø 40
5	Panel	~ 1861.1	59.7%	Ø 40	*Hexagonal 60mm side to side*

- We have used MGEANT and our SPI mass model to calculate the transparency of the mask central pixel.
- We have compared this transparency with that measured at GACE.

Mask Transparency - Central Zones

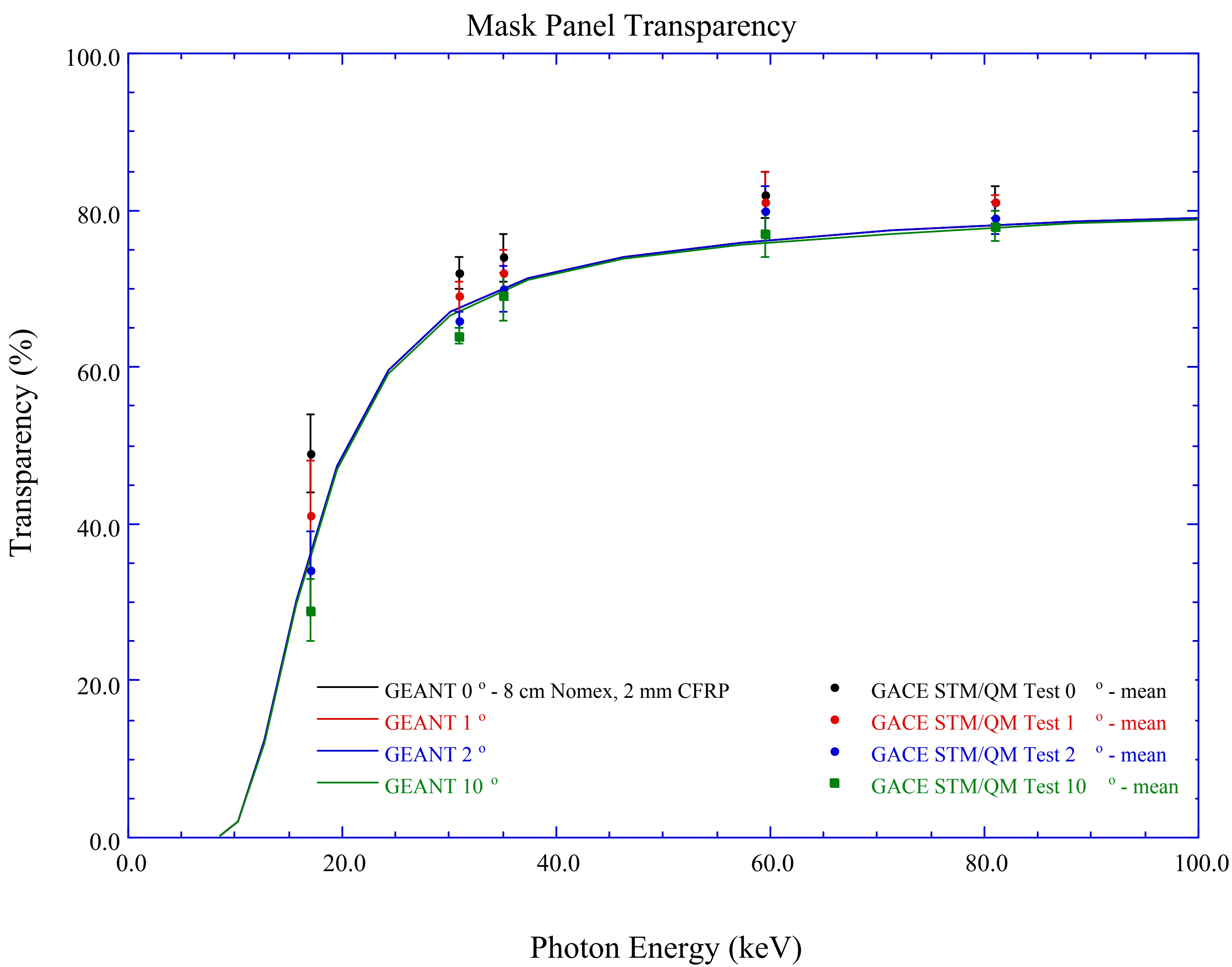


Mask Transparency - Open Pixels



- There is good agreement between measurement and model except that the variation with angle is significantly smaller for the model.

Mask Transparency - Open Pixels



Conclusions

- Work is continuing.
- Singles efficiencies now show generally good agreement. We have found and eliminated some sources of differences.
- We must isolate the source(s) of the remaining discrepancies.
  - Detailed comparison of input parameters
  - Implementation of line fitting at GSFC
- Perform similar analysis for multiples.
- Use BLC and camera data to determine PSAC and mask transparencies and compare with GACE measurements and simulations.

Spiros Imaging -status

Objectives of this presentation :-

- Report on recent testing and evaluation work
- Give an idea to potential users of what is/will be available and of capabilities and limitations
- Note known defficiencies; seek feedback on wishes and priorities

Spiros Modes

Mode	Outputs
Imaging (IROS - iterative removal of sources)	List of intensities of catalogued sources List of new sources Image from residuals
Extended source imaging	List of intensities of catalogued sources Image (with sources given in input catalogue fitted)
Spectra extraction	Raw (imaged) counts spectrum of all sources in catalogue
Time history	Raw (imaged) counts spectrum of all sources in catalogue

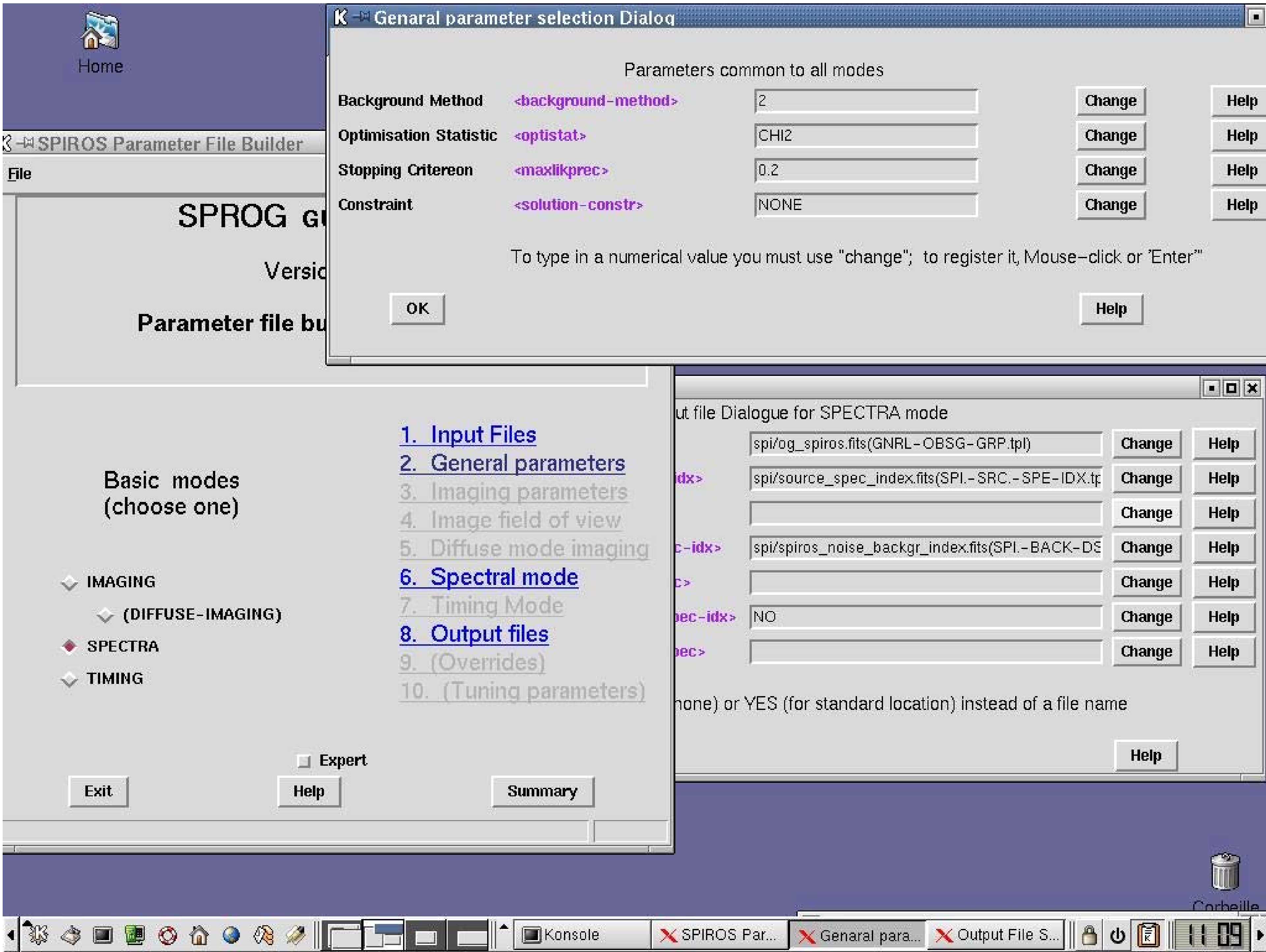
One way or another, a GUI will be available
to help the user set up the rather complicated
.par file for SPIROS.

The following slides show

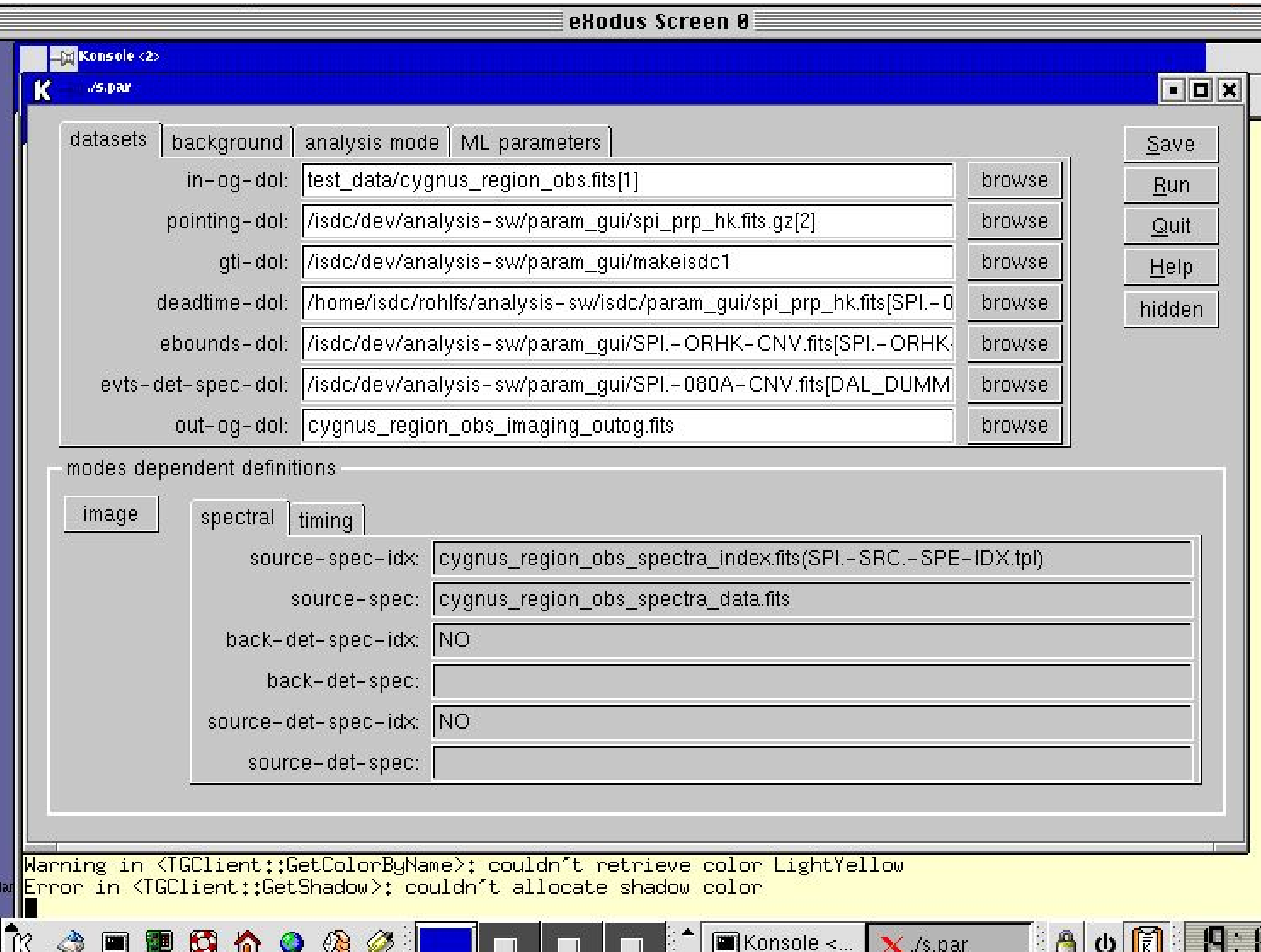
1) A prototype GUI using TCL/Tk put together
by me - available for use if necessary

2) A Root version under development at the ISDC,
applicable more generally but tailored
to provide most of the functionality in (1).

If the latter system cannot be made available, the
former will be



Home
Genaral parameter selection Dialog
Parameters common to all modes
Background Method <background-method> 2 Change Help
Optimisation Statistic <optistat> CHI2 Change Help
Stopping Critereon <maxlikprec> 0.2 Change Help
Constraint <solution-constr> NONE Change Help
To type in a numerical value you must use "change"; to register it, Mouse-click or 'Enter'"
OK
Help
SPIROS Parameter File Builder
File
SPROG GU
Versio
Parameter file bu
ut file Dialogue for SPECTRA mode
spi/og_spiros.fits(GNRL-OBSG-GRP.tpl) Change Help
idx> spi/source_spec_index.fits(SPI.-SRC.-SPE-IDX.tp Change Help
Change Help
c-idx> spi/spiros_noise_backgr_index.fits(SPI.-BACK-DS Change Help
c> Change Help
pec-idx> NO Change Help
pec> Change Help
none) or YES (for standard location) instead of a file name
Help
Basic modes
(choose one)
IMAGING
(DIFFUSE-IMAGING)
SPECTRA
TIMING
1. Input Files
2. General parameters
3. Imaging parameters
4. Image field of view
5. Diffuse mode imaging
6. Spectral mode
7. Timing Mode
8. Output files
9. (Overrides)
10. (Tuning parameters)
Expert
Exit
Help
Summary
Corbeille
Konsole
SPIROS Par...
Genaral para...
Output File S...


eXodus Screen 0
Konsole <2>
./s.par
datasets
background
analysis mode
ML parameters
in-og-dol: test_data/cygnus_region_obs.fits[1]
pointing-dol: /isdc/dev/analysis-sw/param_gui/spi_prp_hk.fits.gz[2]
gti-dol: /isdc/dev/analysis-sw/param_gui/makeisdc1
deadtime-dol: /home/isdc/rohlfs/analysis-sw/isdc/param_gui/spi_prp_hk.fits[SPI.-0
ebounds-dol: /isdc/dev/analysis-sw/param_gui/SPI.-ORHK-CNV.fits[SPI.-ORHK-
evts-det-spec-dol: /isdc/dev/analysis-sw/param_gui/SPI.-080A-CNV.fits[DAL_DUMM
out-og-dol: cygnus_region_obs_imaging_outog.fits
browse
Save
Run
Quit
Help
hidden
modes dependent definitions
image
spectral
timing
source-spec-idx: cygnus_region_obs_spectra_index.fits(SPI.-SRC.-SPE-IDX.tpl)
source-spec: cygnus_region_obs_spectra_data.fits
back-det-spec-idx: NO
back-det-spec:
source-det-spec-idx: NO
source-det-spec:
Warning in <TGClient::GetColorByName>: couldn't retrieve color LightYellow
Error in <TGClient::GetShadow>: couldn't allocate shadow color
Konsole <...
./s.par

Testing

Input data:

Simulated data from Chris Shrader

BLC long beam calibration data

Reduce S/N ratio:

Make random selections from the events, progressively reducing the number of photons used in the analysis

Add increasing levels of random noise

Study:

source positions
source intensities
} found by Spiros

Accuracy of source positioning as a function of S/N ratio

Simple guideline for source positioning accuracy of a coded mask telescope :-

Take characteristic angle $\theta_{Mask} = m/l$ where m is mask pixel size, l length

Take characteristic angle $\theta_{Det} = d/l$ where d is detector pixel size

Form the Pythagorean combination $\theta_{FWHM} = ((\theta_{Mask}^2 + \theta_{Det}^2)^{1/2}$

Estimate the idealised signal to noise ratio from $\sigma_0 = N_{Phot} /(N_{Phot} + N_{BG})^{1/2}$

$\sigma_0 =$

Correct for the loss in sensitivity due to finite detector size

$\sigma = \sigma_0 / (1-d/3m)$ (the formula for $d<m$ (Skinner, 1995))

Error circle radius $= \theta_{FWHM} / \sigma$

For SPI this gives $2.88° / \sigma_0$ or $3.98° / \sigma$

Accuracy of source positioning - continued

Objective - testing Spiros with realistic S/N likely to be encountered in flight

Testing using BLC data: -

^{137}Cs long beam test data

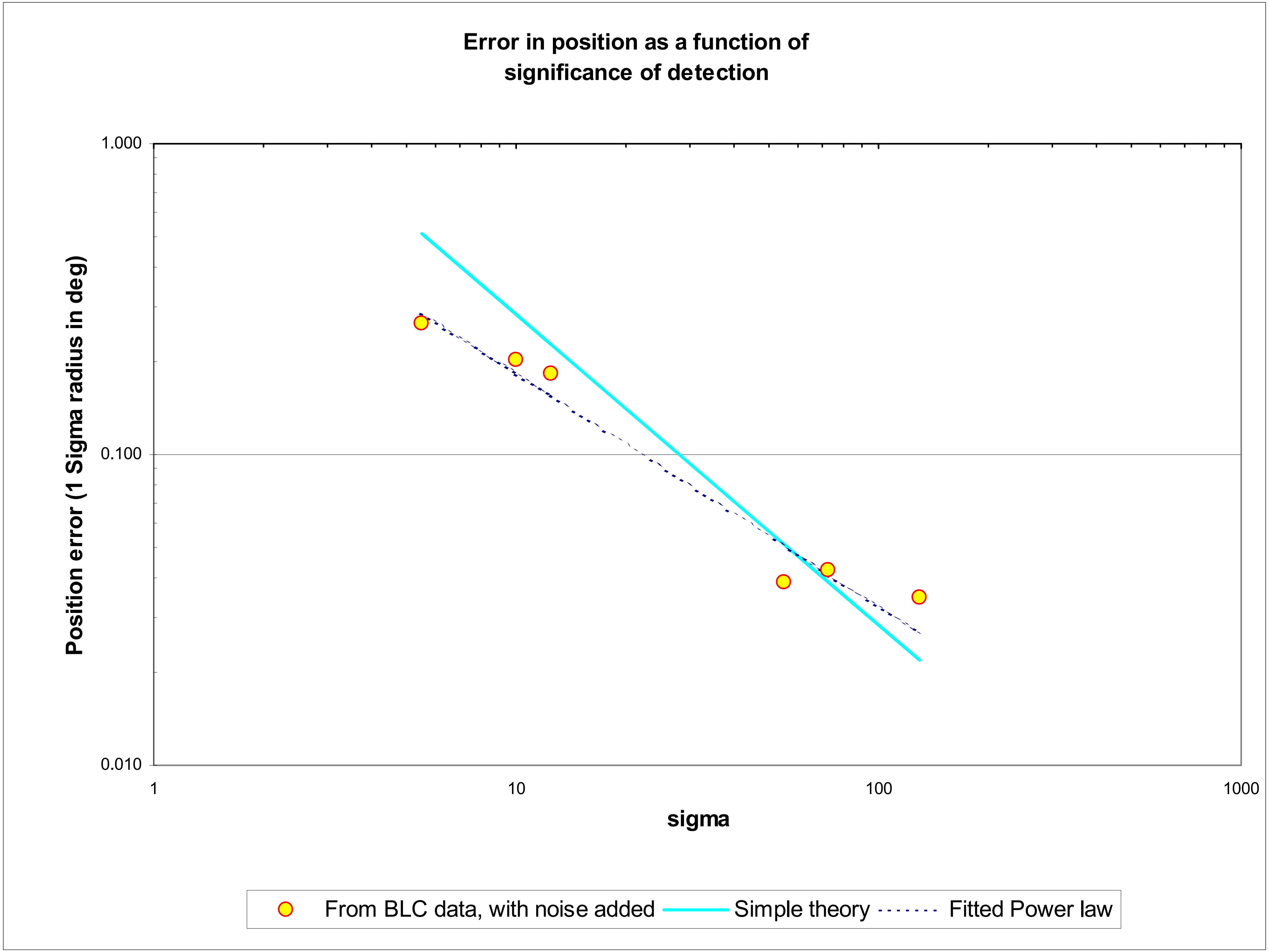
Number of events reduced by selecting small percentage at random

Random noise events added

Testing using simulated data: -

Chris Shrader 's Cygnus Monte Carlo data used

Again, the mumber of events was reduced by selecting a small percentage at random and varying levels of random noise events were added



Error in position as a function of
significance of detection
Position error (1 Sigma radius in deg)
1.000
0.100
0.010
1
10
100
1000
sigma
From BLC data, with noise added
Simple theory
Fitted Power law

Accuracy of source positioning -findings

- BLC data and Monte Carlo data lead to consistent conclusions

- The error estimates given by Spiros are 1 sigma errors on each coordinate independently. Regarded as such, they correctly reflect the actual uncertainties for single sources, at least when these exceed 0.02°

- The proposed simple law gives a reasonable guideline, though it seems pessimistic for low sigma

But:-

1) The true source direction at BLC is not known with enough precision to allow verification of absolute positioning capability

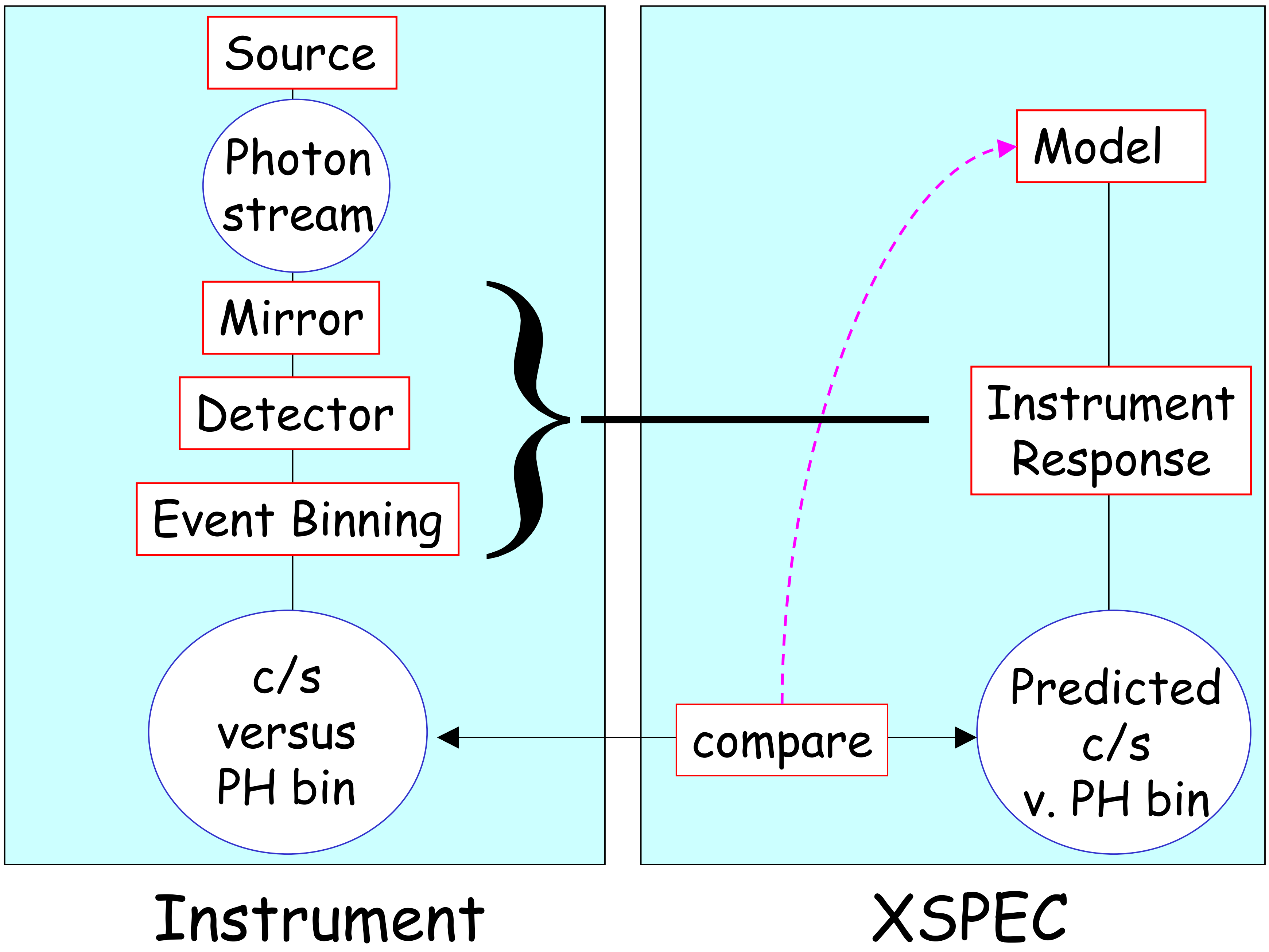
2) When multiple sources are present the uncertainties on the positions of weak sources are grossly underestimated. This is at least partly because the exploration of chi-squared space does not include allowing all of the source positions to vary

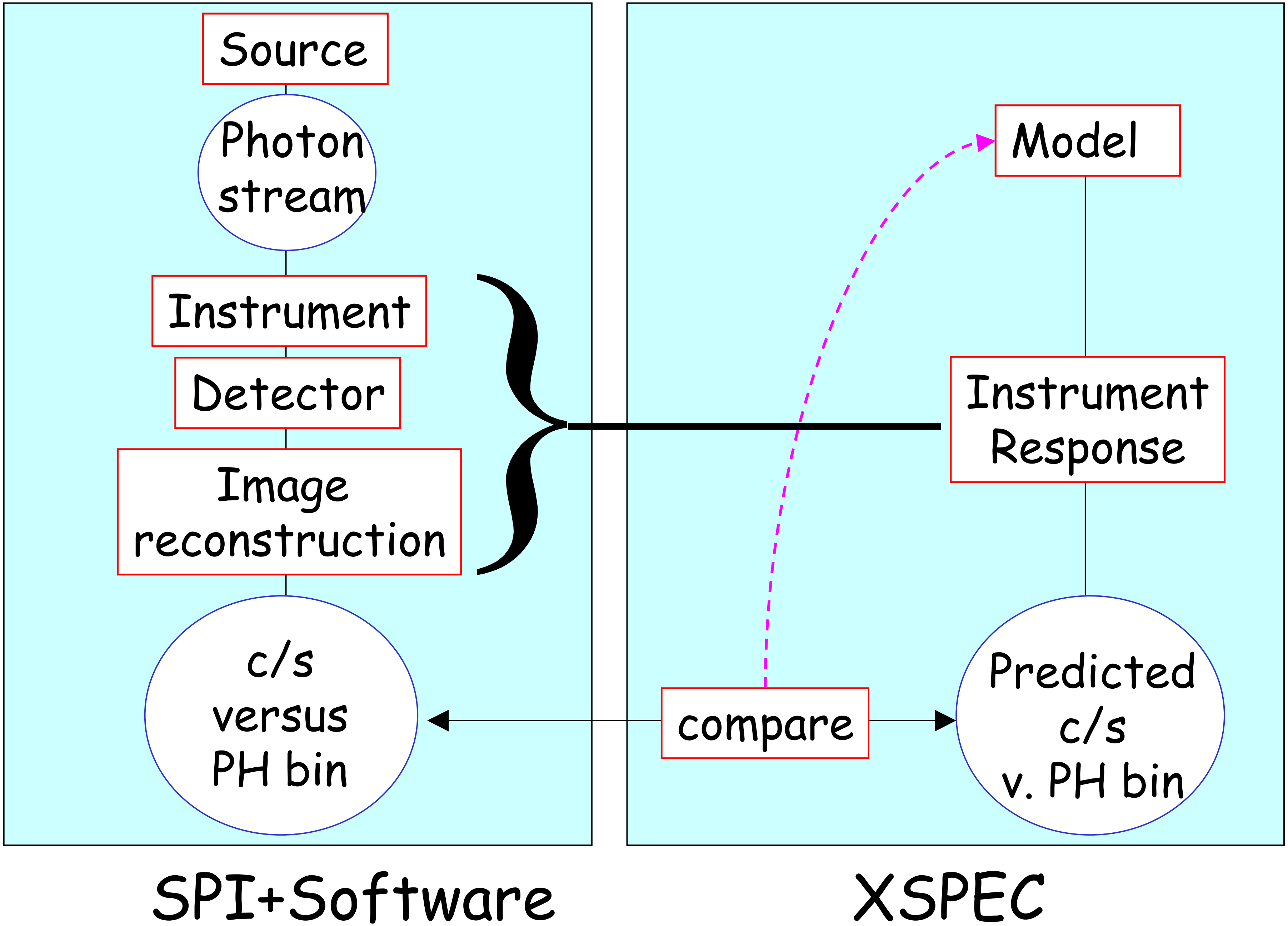
Spectral extraction

- Spiros works independently in each energy bin to extract the intensities of all of the sources given in an input catalogue

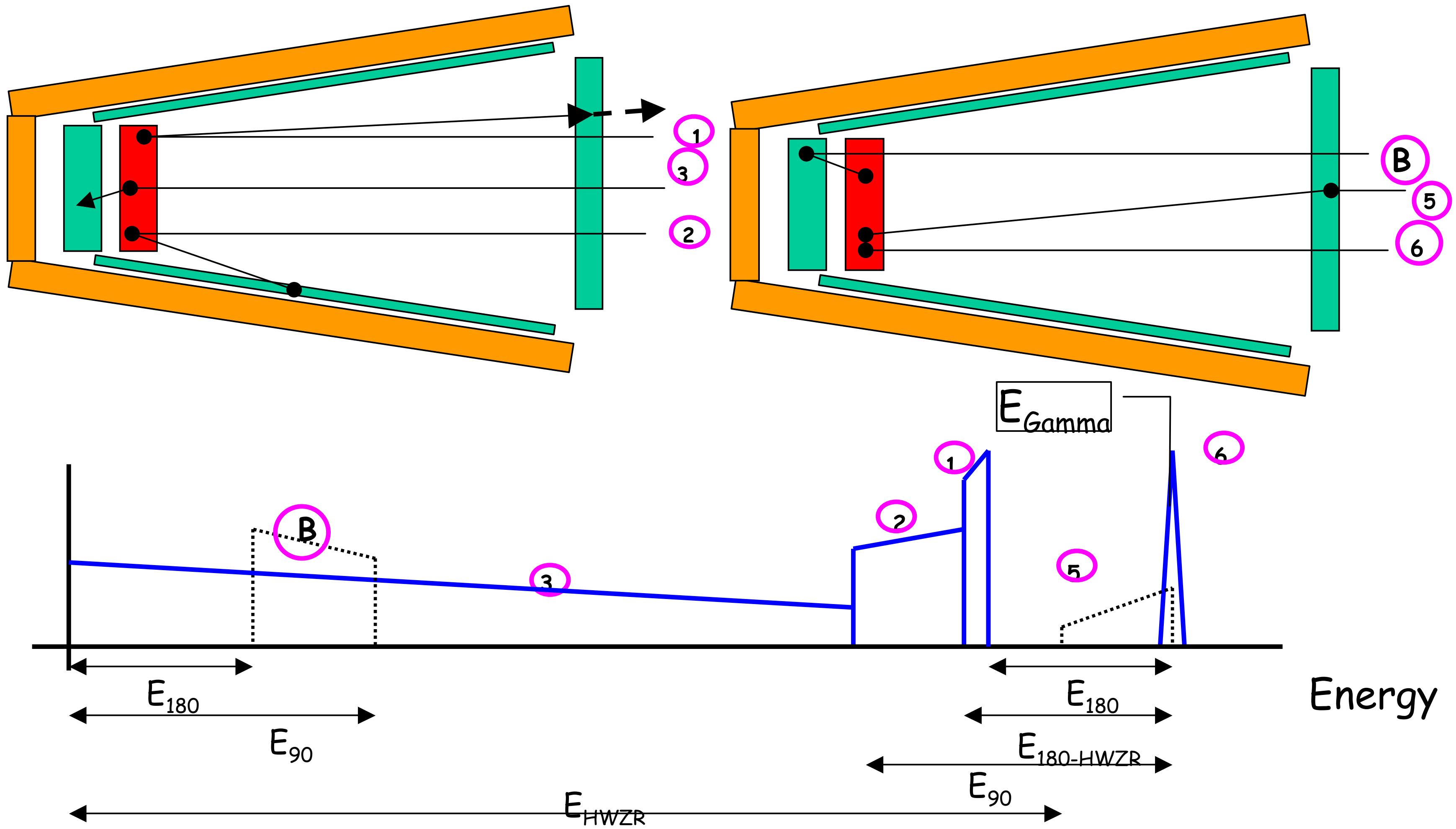
- It solves for the intensities of these sources, and the background component amplitudes, which best match the data.

- The fact that the backgrounds in different energy bins are probably closely related, one with another, is not used. In principle this could be used to reduce the uncertainties

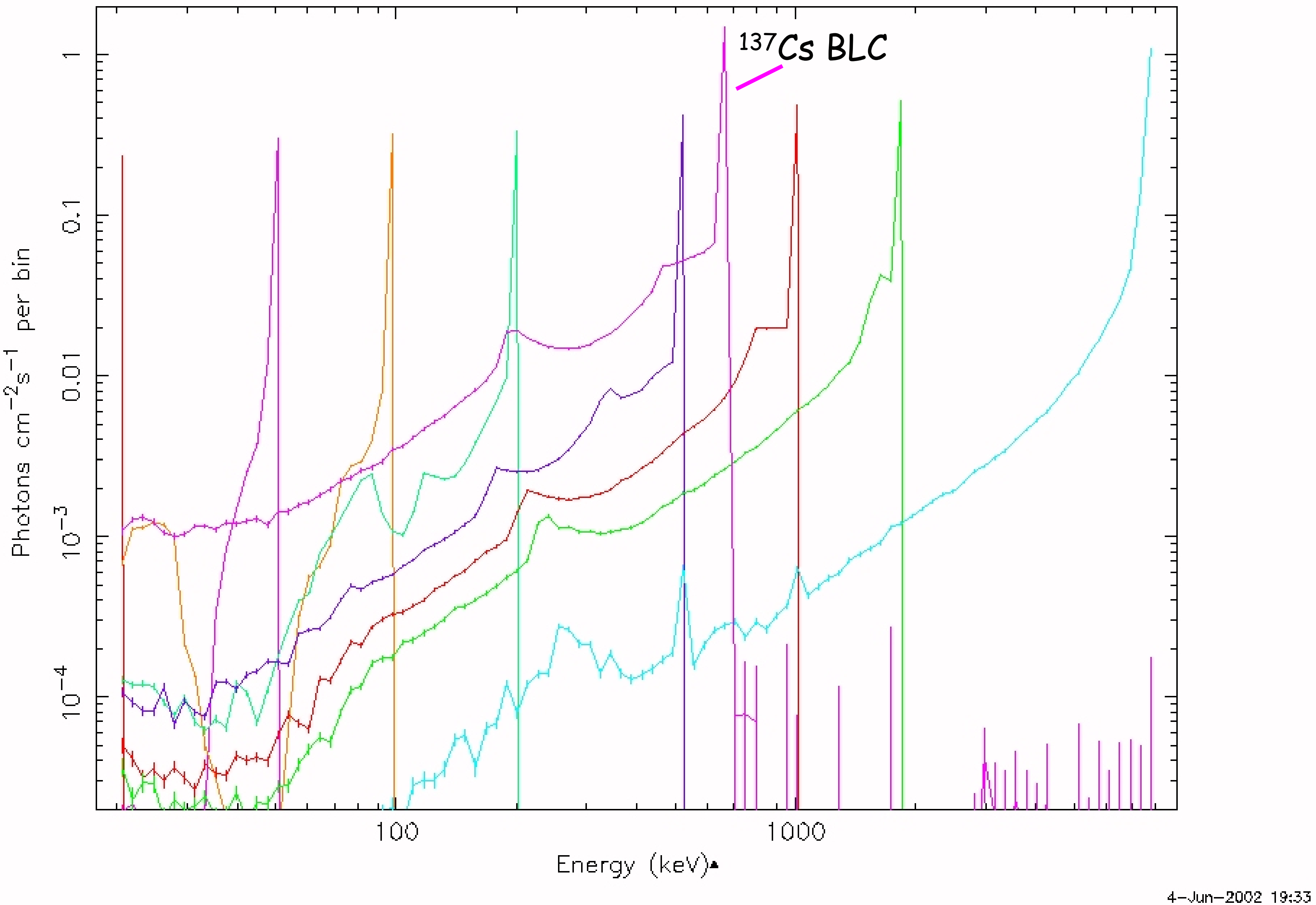

Source
Photon stream
Mirror
Detector
Event Binning
c/s versus PH bin
Model
Instrument Response
compare
Predicted c/s v. PH bin
Instrument
XSPEC


Source
Photon stream
Instrument
Detector
Image reconstruction
c/s versus PH bin
Model
Instrument Response
compare
Predicted c/s v. PH bin
SPI+Software
XSPEC

In imaging mode the off-diagonal response is expected to be reduced because for some mechanisms leading to loss of part of the energy (e.g. B and 5) the shadow of the maskis blurred or destroyed.



Spiros Spectra from Mono-Energetic Monte Carlo Runs (7.5 deg off axis) + BLC data

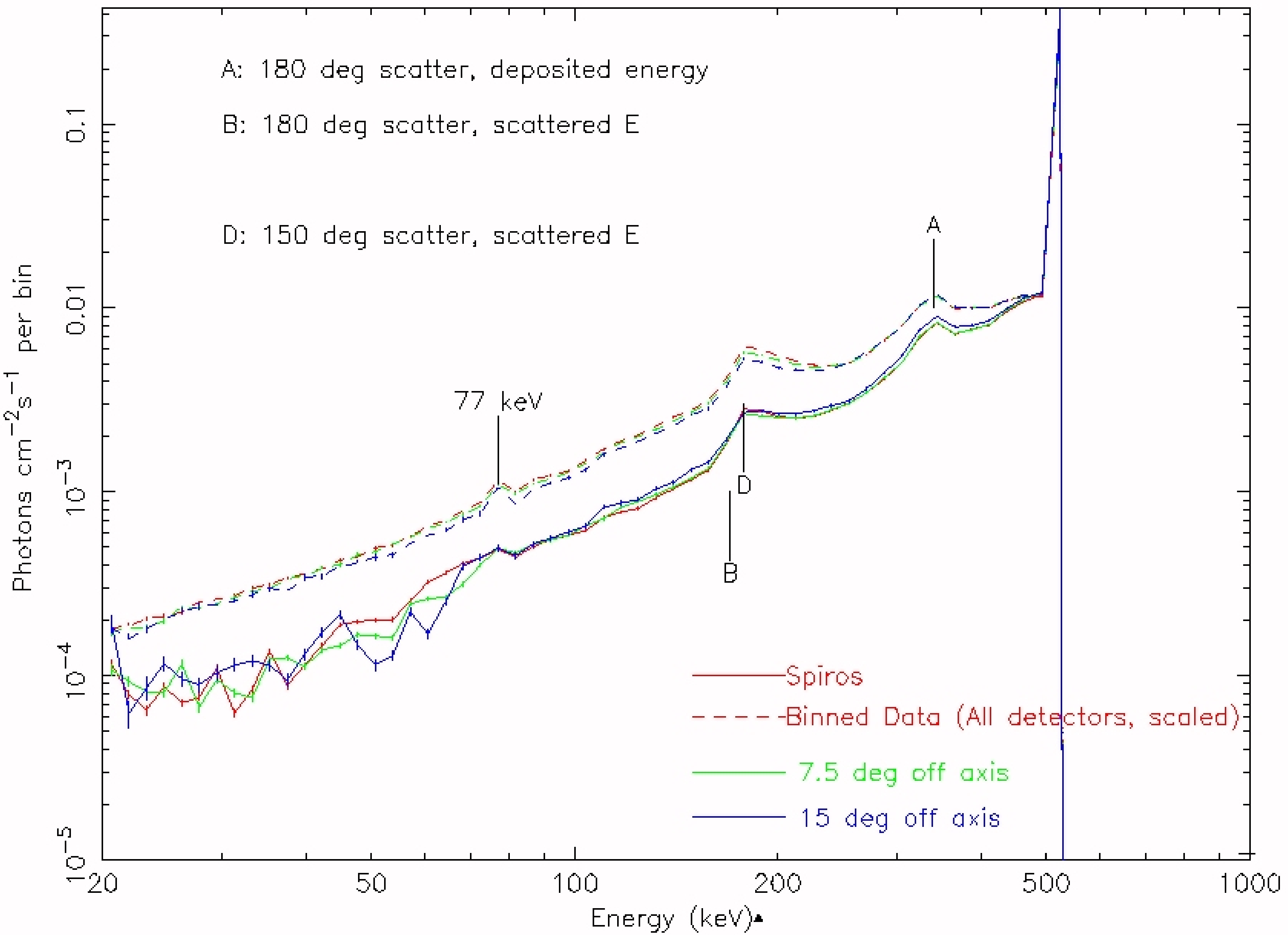


The spectra obtained in non-imaging mode and in imaging mode are indeed different as one would expect.

In both cases they are relatively independent of off-axis angle

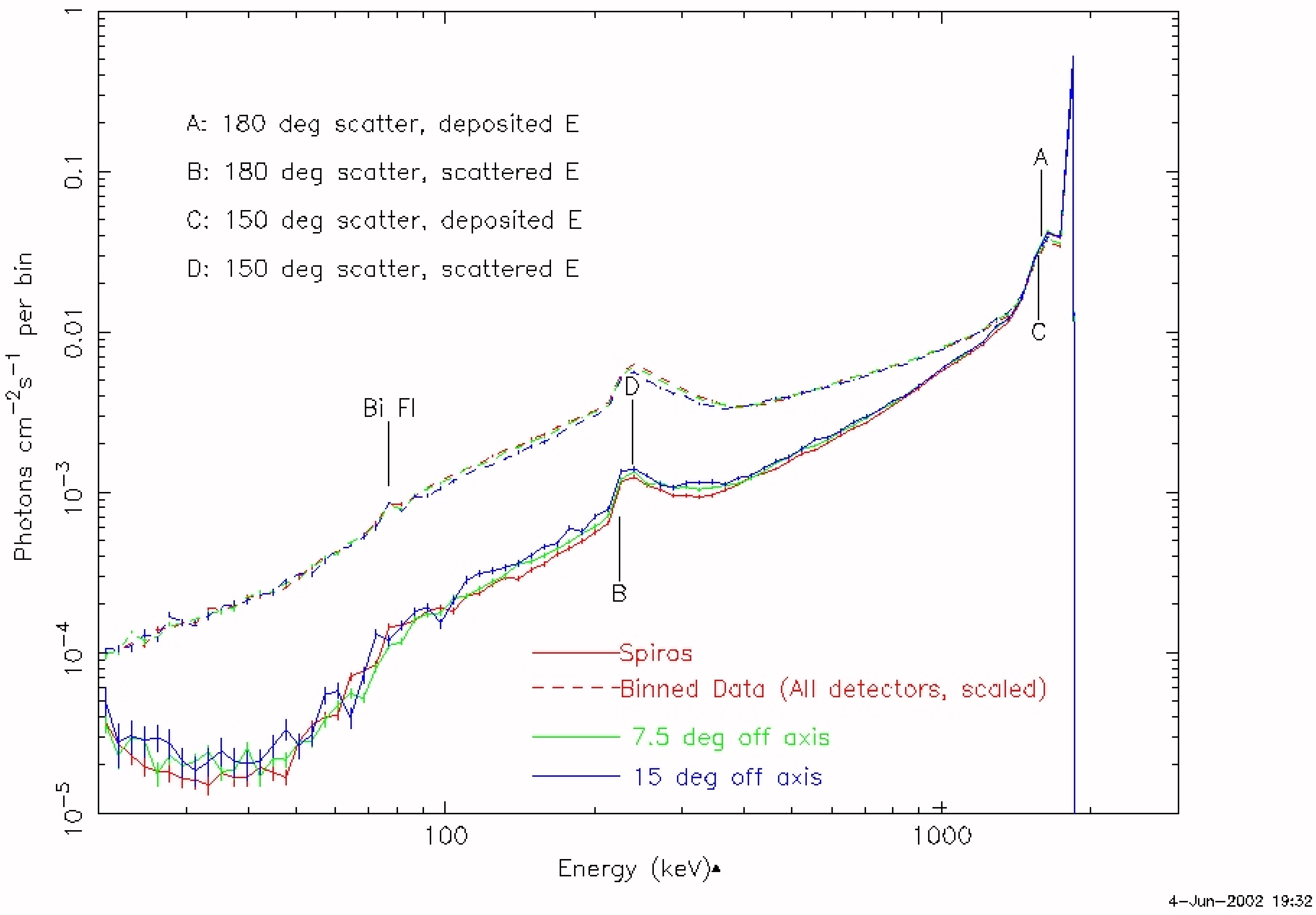
Suprisingly the spectral features that one might expect not to be present in imaging mode spectra are still visible. Not all the spatial information is lost when a photon does a back-scatter in passive material behind the detectors giving rise to peak B-D, for example.

511 keV Mono Energetic Simulations
Effect of off-axis angle and difference of image/non-imaged spectra

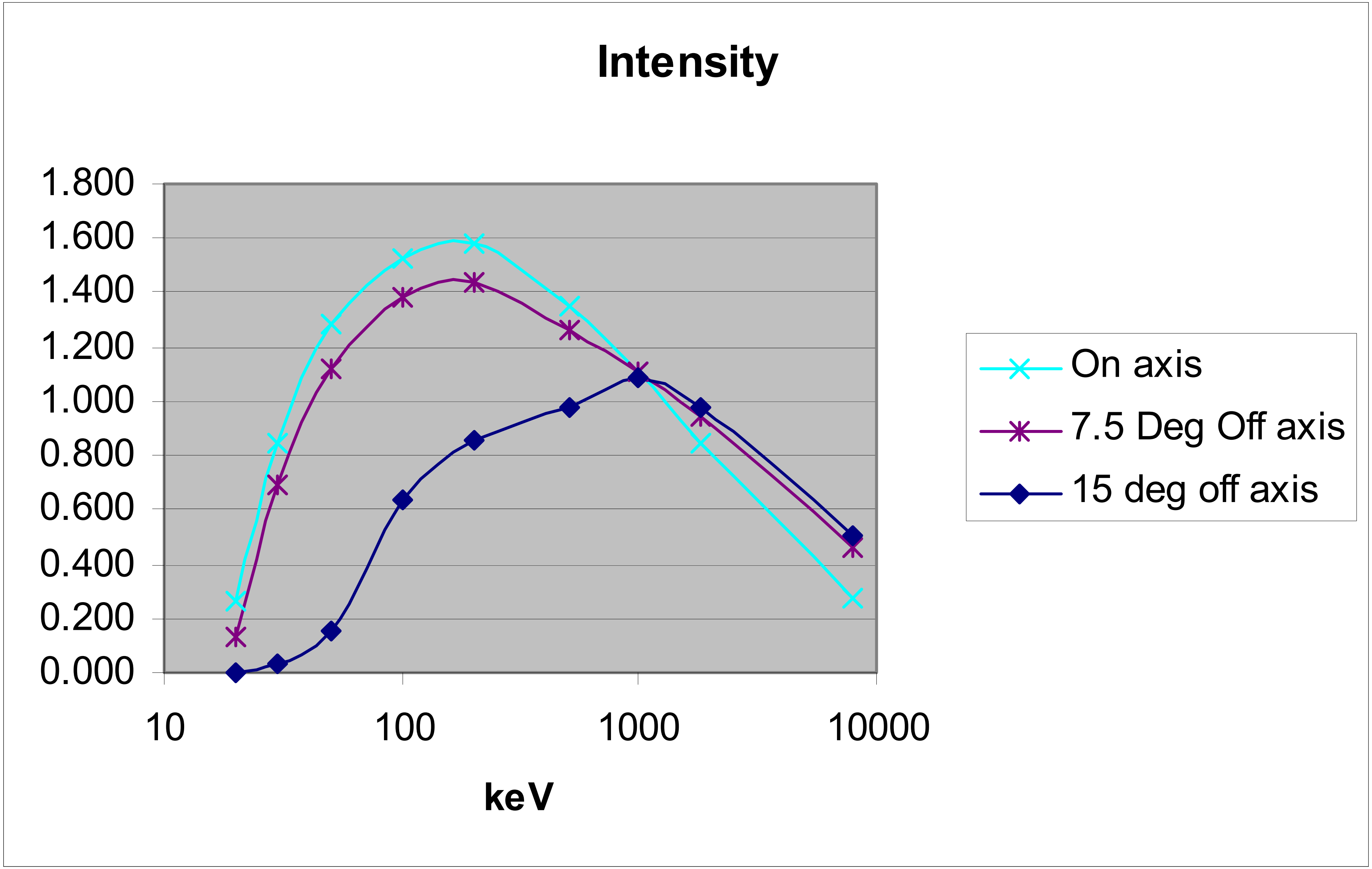


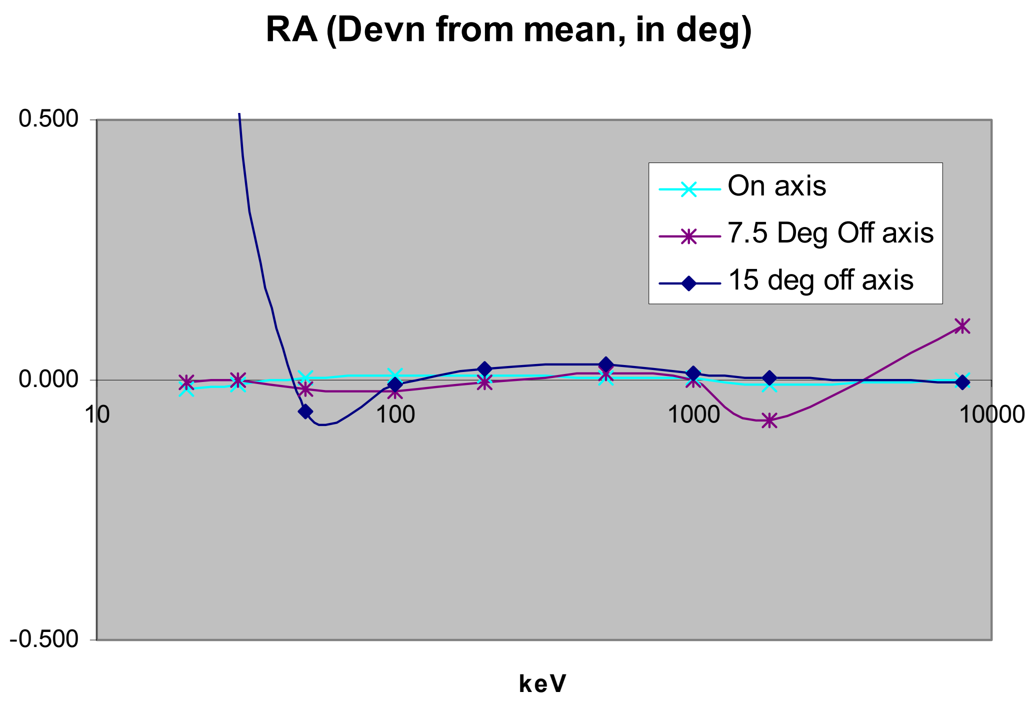
4-Jun-2002 19:31

1809 keV Mono Energetic Simulations
Effect of off-axis angle and difference of image/non-imaged spectra

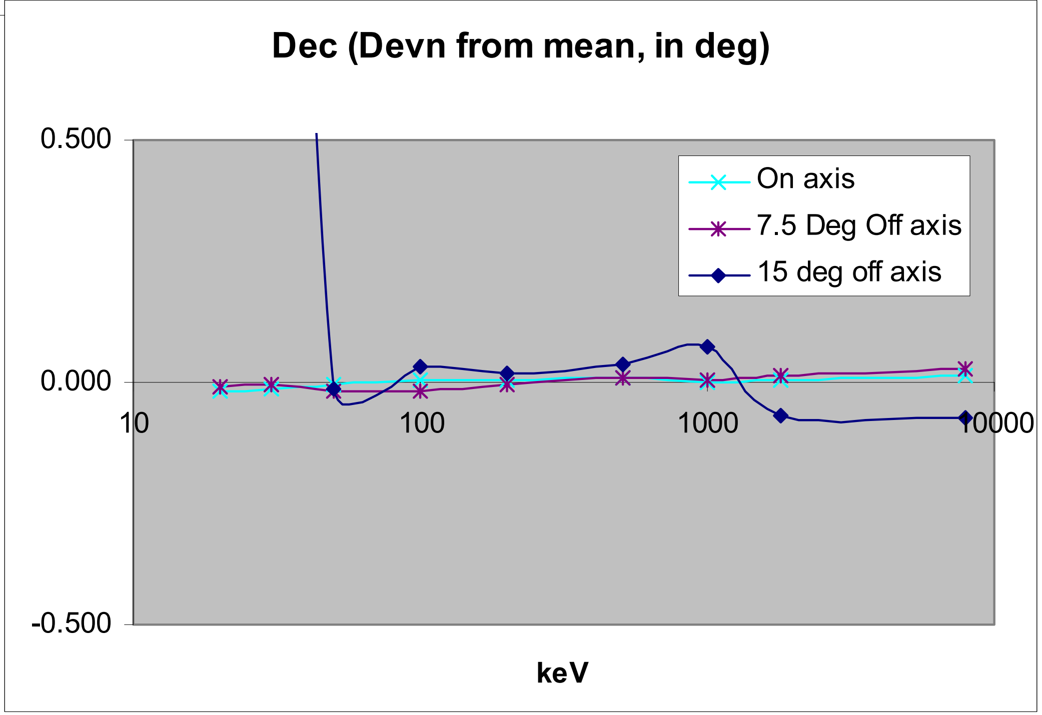


Something funny seems to happen to intensity of far off-axis sources - probably not a real effect - needs investigating





RA (Devn from mean, in deg)
0.500
0.000
-0.500
10
100
1000
10000
On axis
7.5 Deg Off axis
15 deg off axis
keV



Dec (Devn from mean, in deg)
0.500
0.000
-0.500
10
100
1000
10000
On axis
7.5 Deg Off axis
15 deg off axis
keV

Not really explored yet:

- Source width fitting
- Diffuse imaging mode
- Timing mode

Limitations

- BG is treated independently in each energy bin
- BG is treated independently in each time bin
- Processing time will in practice limit the combination of :
  - number of energy bins
  - size of region to be imaged
  - number of science windows in data set
- Slew data cannot be handled at present
- PSD information yet to be effectively used
- Errors do not fully take into account the interactions with other sources of unknown position

Developments and improvements

- Provision for PSD

- BG based on other energy bins

- Further improvements to error handling

(e.g. at present analysis is done even if input files have inconsistent dimensions !)

- Spectral deconvolution

- Diffuse model fitting ?

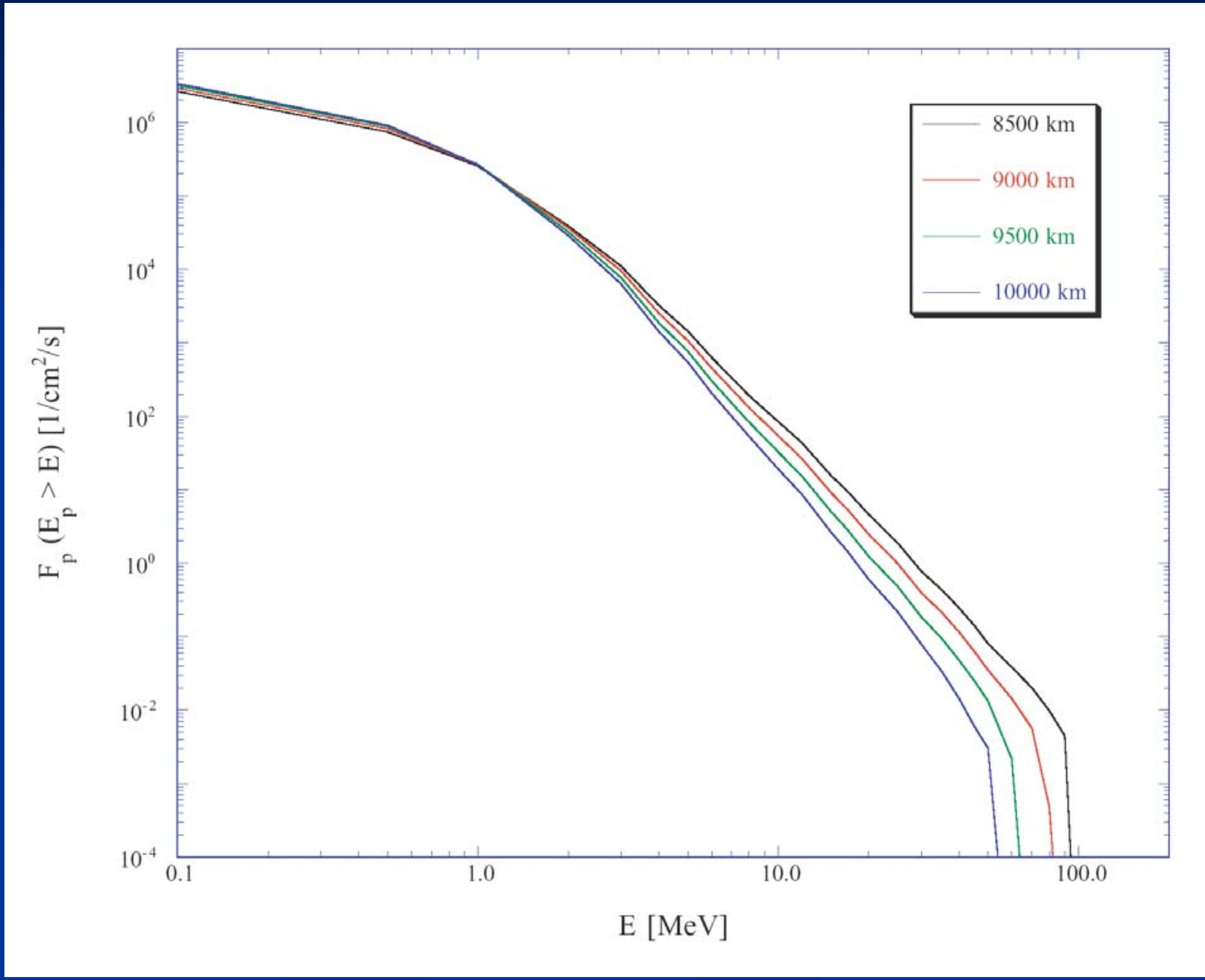
prioritization needed

SPI Activation from Trapped Radiation

G. Weidenspointner

Radiation Belt Spectra

- Provided by A. Parmar - ESTEC
- Worst case orbits used for each perigee altitude.



Simulations

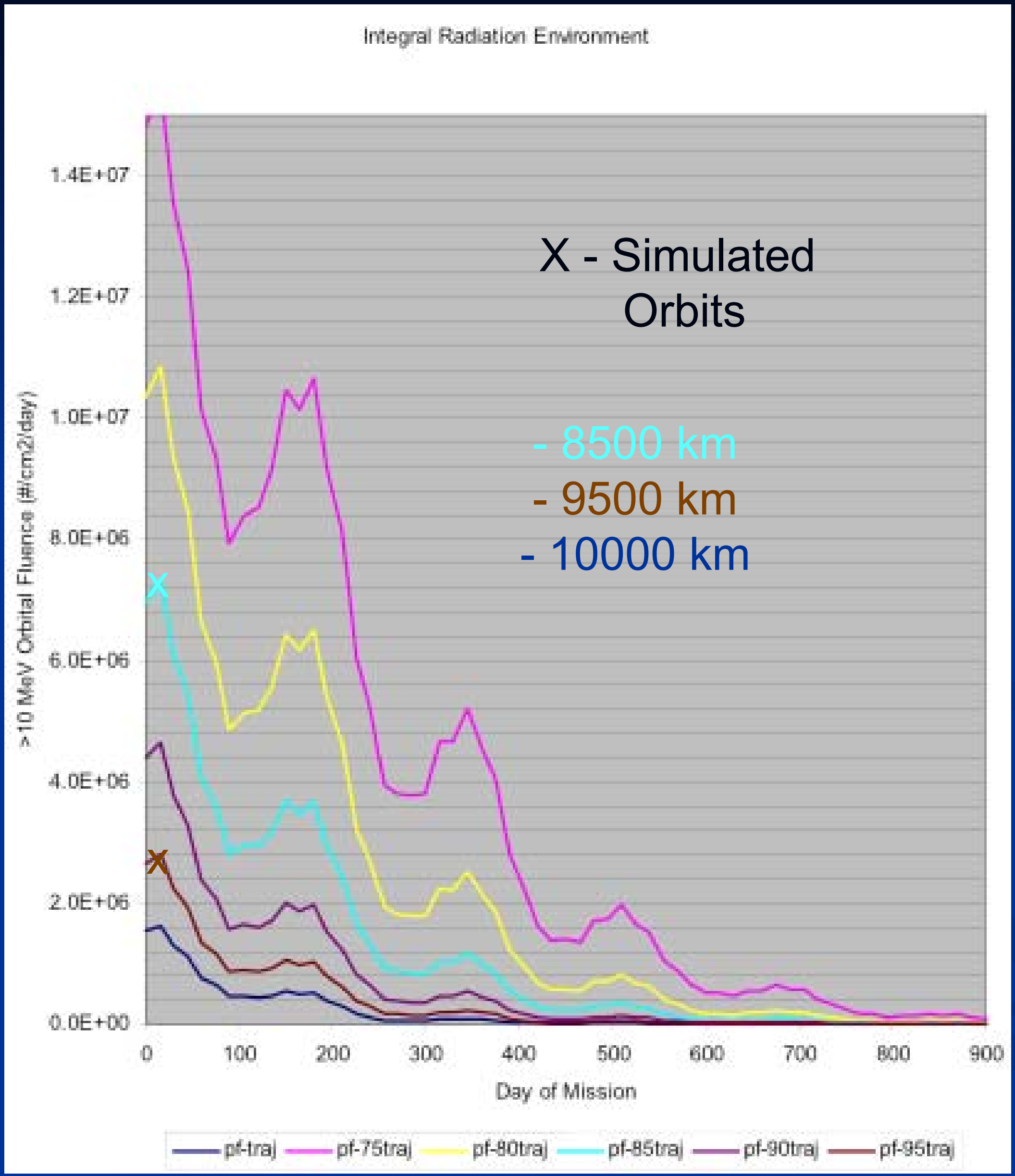
- GEANT3 used.
  - GGOD code for lines (Southampton).
  - Configuration similar but not identical to Southampton.
- Assumed 1 hr radiation belt passage.
  - Constant isotropic flux
- Two perigees simulated: 8500 and 9500 km
- Activation background determined at 1 min, 1 hr, 3 hr, 6 hr, 12 hr and 1 day after exit from belts.
- Quiescent simulation includes: diffuse cosmic photons, prompt background from cosmic rays, activation within cryostat.
- Activation simulation includes all of SPI (but not spacecraft).

Simulations (cont.)

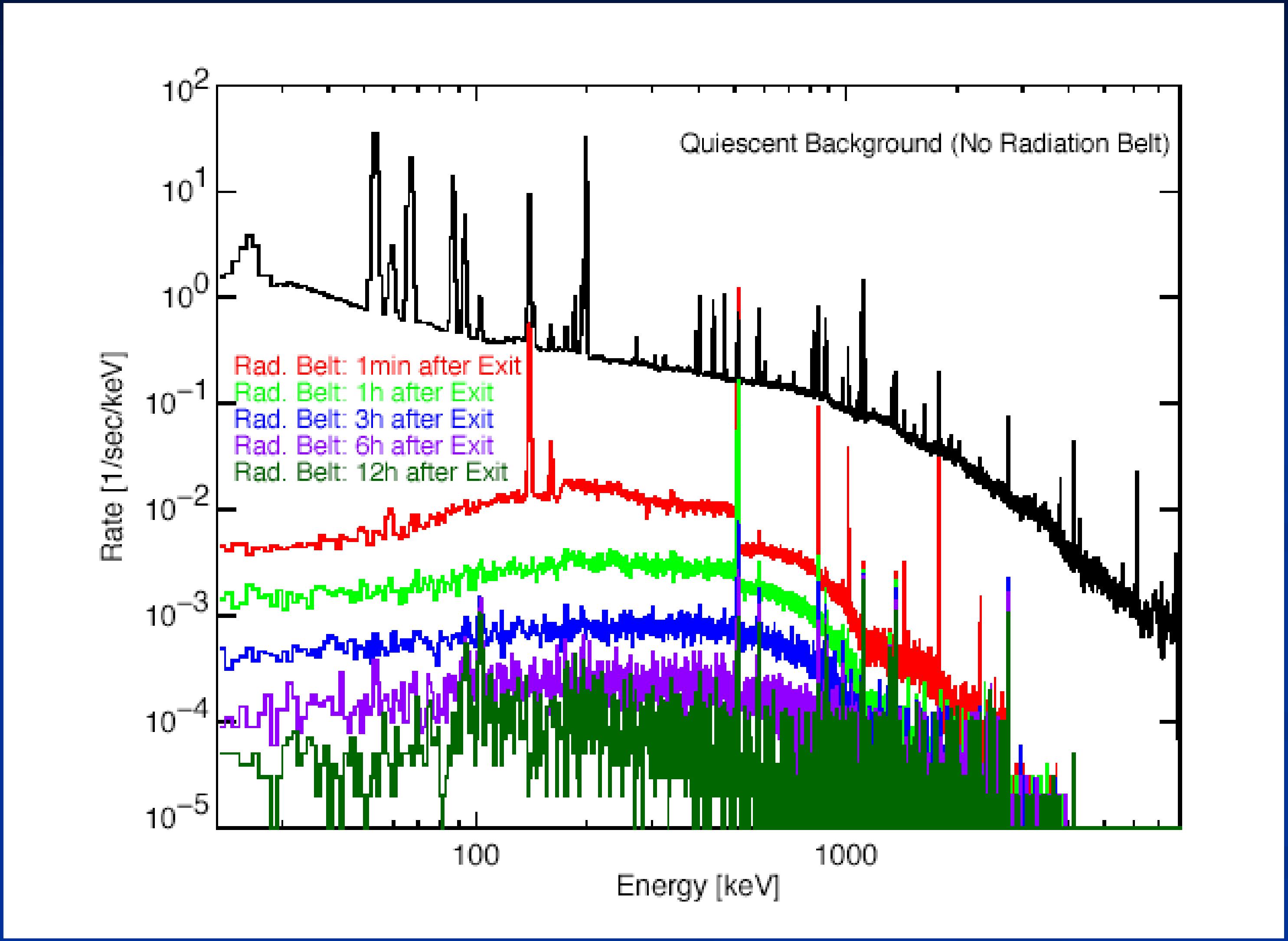
- Only > 10 MeV protons simulated.
  - Activation from< 10 Mev protons found to be unimportant

Orbit Evolution of > 10 MeV Fluence

From INTEGRAL Radiation Environment (Evans, 4/15/02)



Spectra - 8500 km Perigee

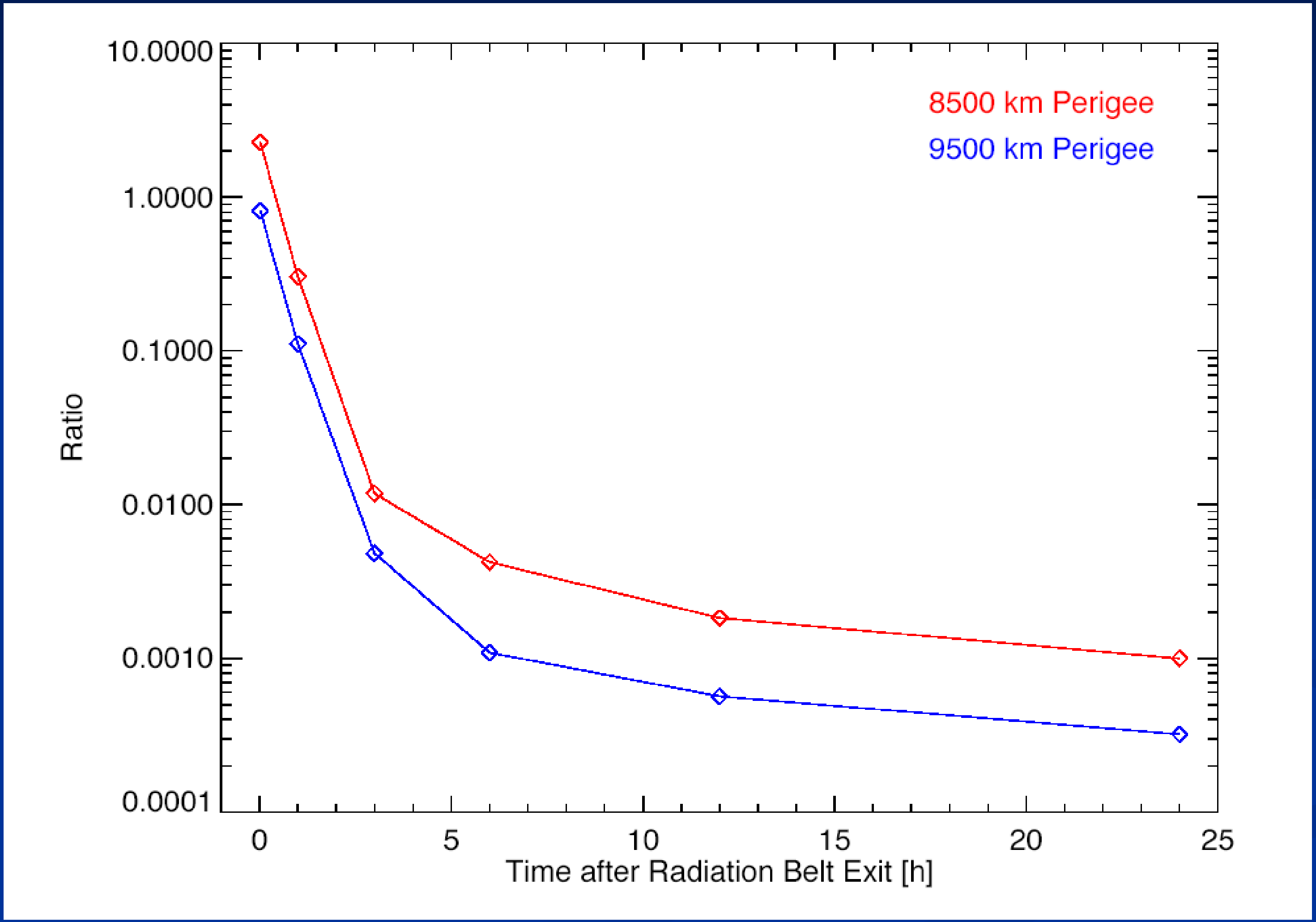


Results

- Worst case activation continuum (1 min after exit) < ~1% of quiescent background.
  - Continuum results in general agreement with Southampton.
- Two astrophysically important lines show significant activation.
  - 511 keV
  - 847 keV

511 keV Activation

Activation/Quiescent Ratio

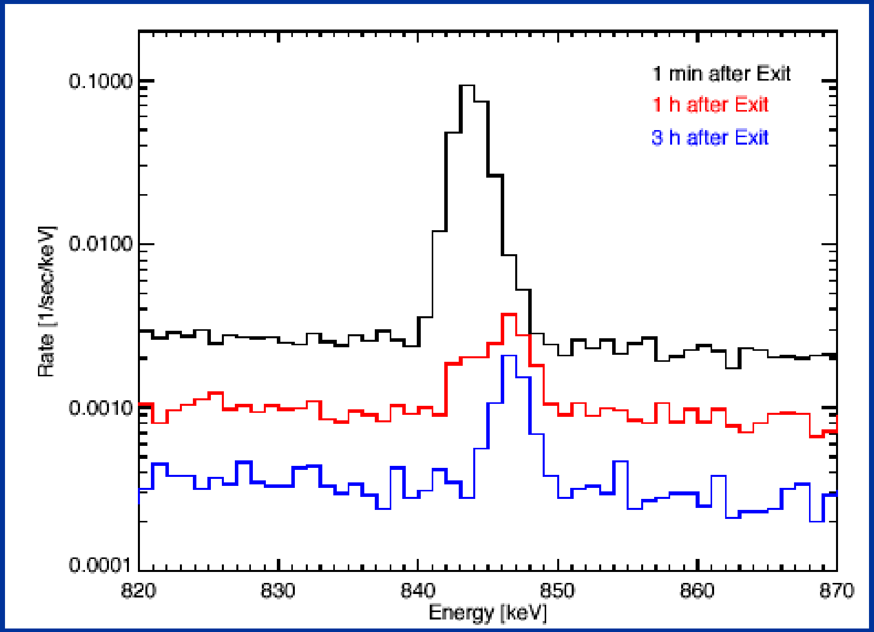


Sites of 511 keV Production from Activation

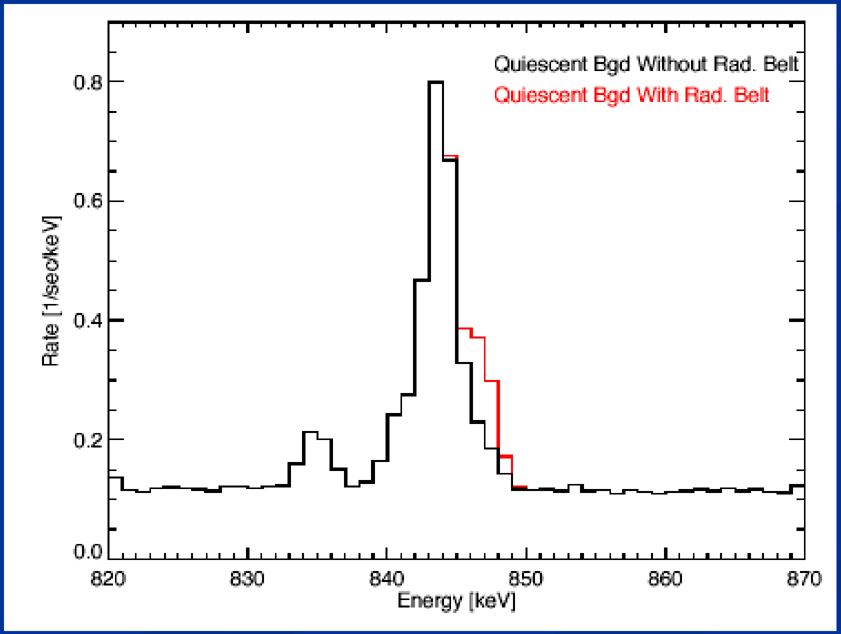
Decay	Half-Life	Production Site
$^{69}Ge(EC)^{69}Ga$	39 h	inside and outside Ge crystals
$^{11}C(\beta^+)^{11}B$	20.4 m	C in carbon fiber, honeycombs, "plastics", ...
$^{13}N(\beta^+)^{13}C$	9.97 m	C (as ^{11}C) and O in BGO
$^{44}Sc(EC)^{44}Ca$	3.97 h	Ti in Ti alloy used for mask support, brackets, screws, ...
$^{45}Ti(EC)^{45}Sc$	3.1 h	Ti and V in Ti alloy as above
$^{47}V(EC)^{47}Ti$	32.6 m	Ti and V in Ti alloy as above
$^{48}V(EC)^{48}Ti$	16 d	Ti and V in Ti alloy as above
$^{64}Cu(EC)^{64}Ni$	12.7 d	Cu in electronics, wiring, Al alloy, ...

844 & 847 keV Lines
8500 km Perigee

Immediately After Radiation Belt Exit (activation only)



Steady-State



Background Exploration

Proposed Use of Core,Open Program Data:

- We request to access the following data segments (from "scientific data" segments only, e.g. excluding radiation belt passages):
  - ~4 hr spectra continuously (including both Core and Open Program) during the first 3 months after start of science operations.
    - After evaluation of data we will determine future needs and make an appropriate request.
  - ~4 hr spectra from all observations with gal. lat. > 50^o
  - short (time tbd) spectral accumulations after radiation belt passages

STM PSAC TRANSMISION MEASUREMENTS

Filomeno Sánchez

SPI Scientific Team Meeting

Garching 20-21 June 2002

-A complete set on PSAC STM-O Model Transmission Measurements have been done in order to complete/confirm preliminary values reported during last SPI Scientific Team meeting. (see minutes SPI Scientific Team Meeting Toulouse March 21-22 2002).

-Experimental set-up now is almost equivalent to that we used for SPI Mask measurements:

MAIN ADVANTAGE:

1) Possibility to measure PSAC transmission at pitch angles different to 0 ("off-axis" data).

2) Accurate definition of experimental set-up geometry.

Test equipment used for **PRELIMINARY** STM PSAC transmission measurements

Test equipment used for **FINAL** STM PSAC transmission measurements

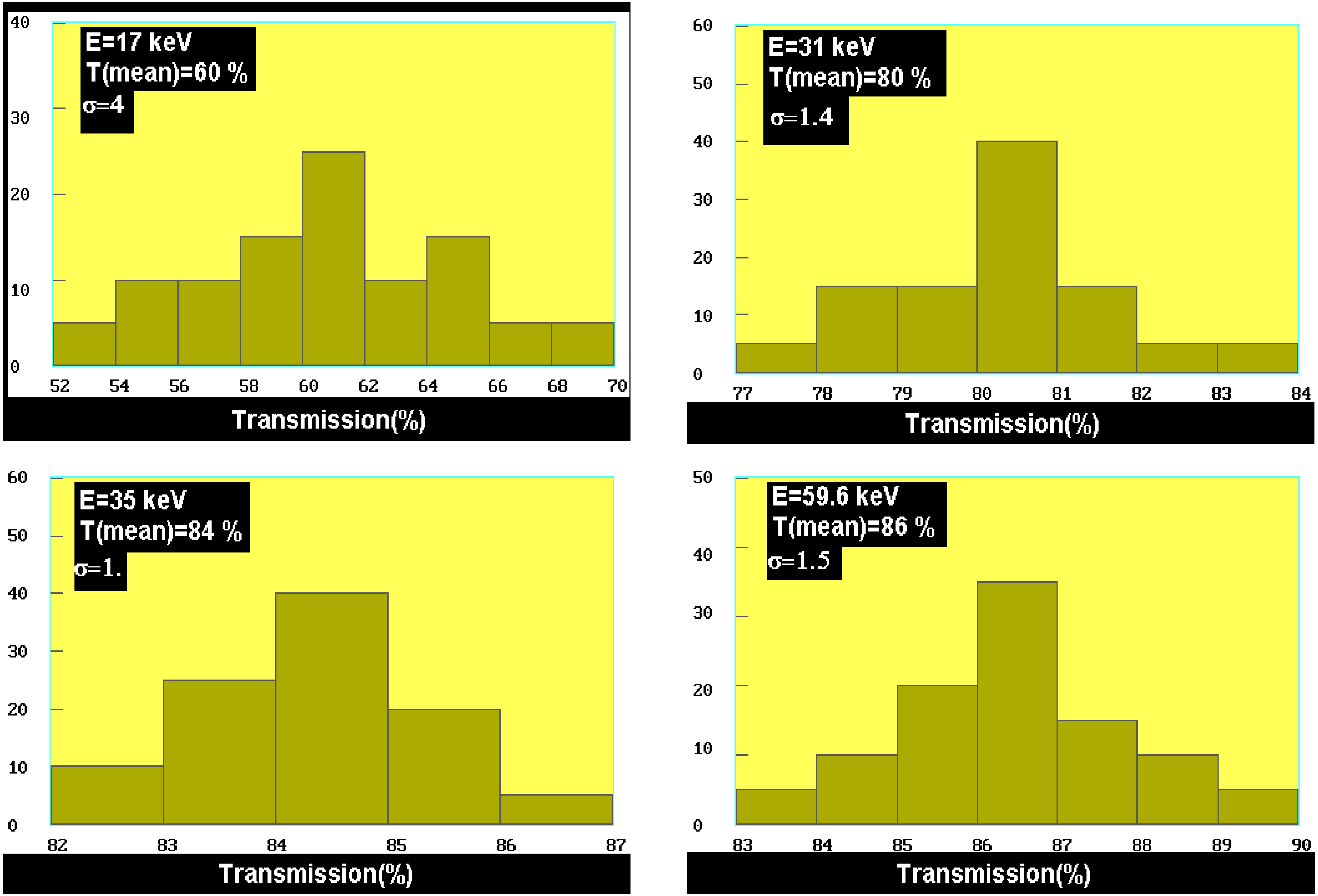
-The experimental procedure and the method/software used to determine STM PSAC transmission is the same used previously for the SPI FM Mask.

(see SPI Mask FM Transparency Test Report, Ref: SPI/CE/3/6712/ UVA and Minutes of SPI Co-Is meeting December 3-4, 2001, Garching).

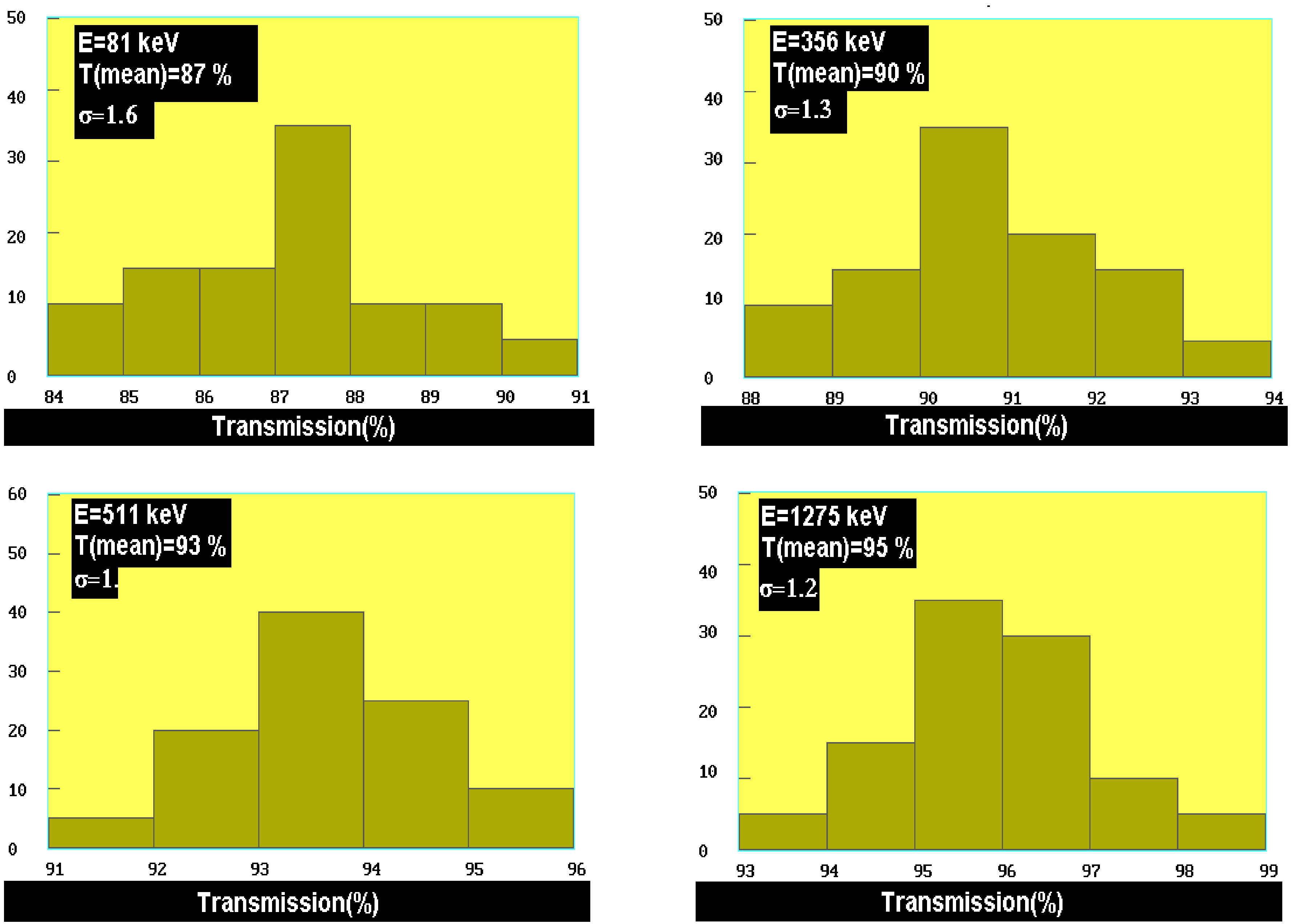
-We have measured transmission at 20 points randomly distributed over the STM PSAC surface at 4 different pitch angles (0, 2, 4 and 10º).

-Central pixel has been considered as a special "case".

-Incident energy varies between 17 and 1275 keV.


E=17 keV
T(mean)=60 %
σ=4
Transmission(%)
E=31 keV
T(mean)=80 %
σ=1.4
Transmission(%)
E=35 keV
T(mean)=84 %
σ=1.
Transmission(%)
E=59.6 keV
T(mean)=86 %
σ=1.5
Transmission(%)

ON-AXIS



E=81 keV
T(mean)=87 %
σ=1.6
Transmission(%)
E=356 keV
T(mean)=90 %
σ=1.3
Transmission(%)
E=511 keV
T(mean)=93 %
σ=1.
Transmission(%)
E=1275 keV
T(mean)=95 %
σ=1.2
Transmission(%)

STM PSAC Transmission at 0º in %

(mean value over 20 points)

	Energy(keV)							
	17	31	35	60	81	356	511	1275
	60 (60)	80 (81)	84 (84)	86 (86)	87 (88)	90 (91)	93 (93)	95 (---)
σ	4 (5)	1.4 (0.9)	1. (0.5)	1.5 (0.8)	1.6 (1.4)	1.3 (0.8)	1. (0.3)	1.2 (---)

***values between parenthesis correspond to PRELIMINARY results (see minutes SPI Scientific Team Meeting Toulouse March 21-22 2002).**

These results confirm those reported before.

MAIN CONCLUSIONS:

1)Standard deviations (σ) shows a high degree of uniformity over PSAC surface

2)Differences on transmission for the "off-axis" situation (2, 4 and 10º) are negligible.

CENTRAL PIXEL

-Central pixel transmission has been studied in detail.

1) In order to complete/confirm preliminary values reported during last SPI Scientific Team meeting. (see minutes SPI Scientific Team Meeting Toulouse March 21-22 2002) for the “on-axis” case.

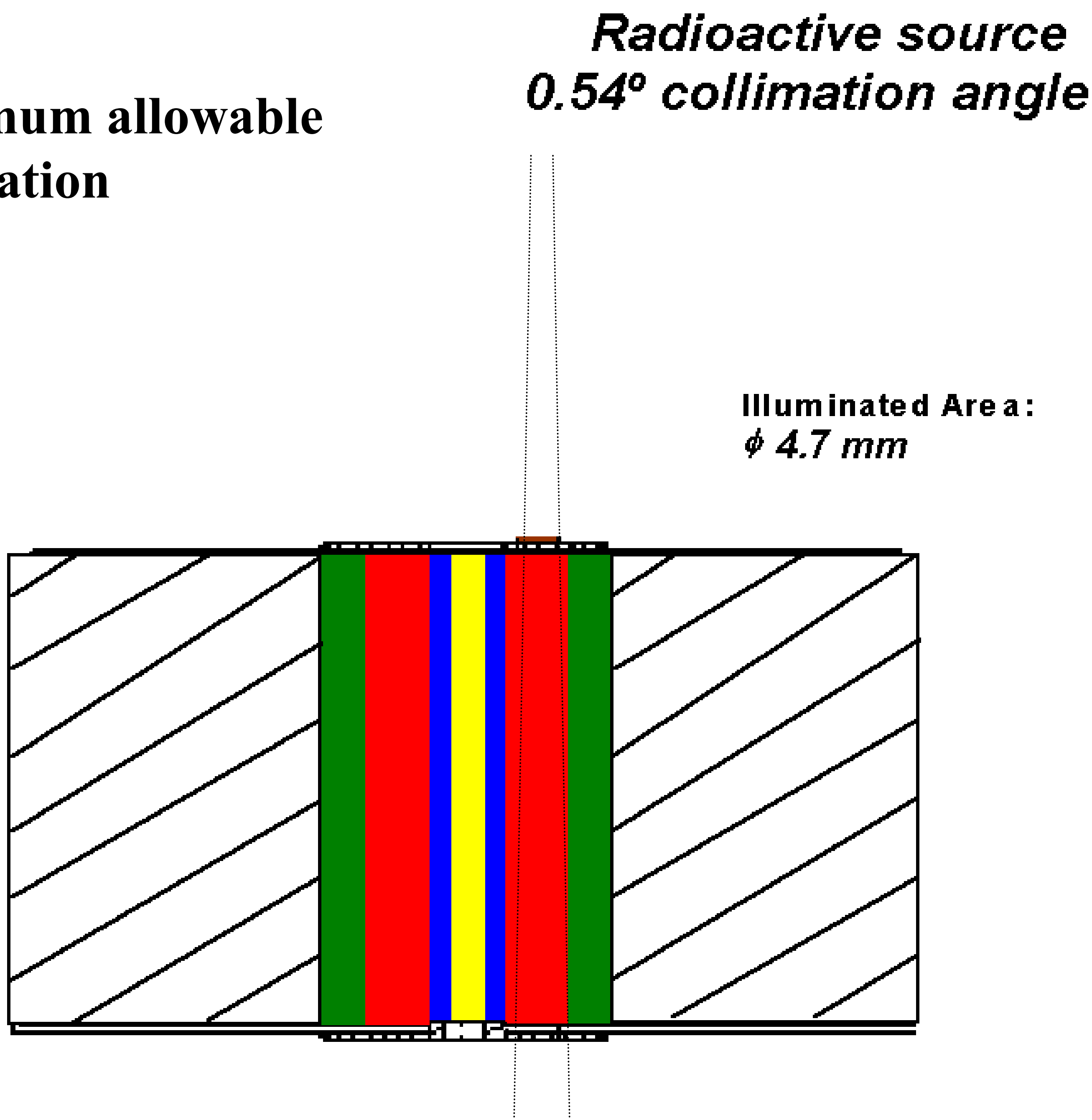
2) “off-axis” measurements at 2, 4 and 6º.

-Two different approximations have been considered:

1) Maximum source collimation (0.54º) to obtain “high quality spatial variation” of transmission (4 different zones considered). This has been done only for the “on-axis” case.

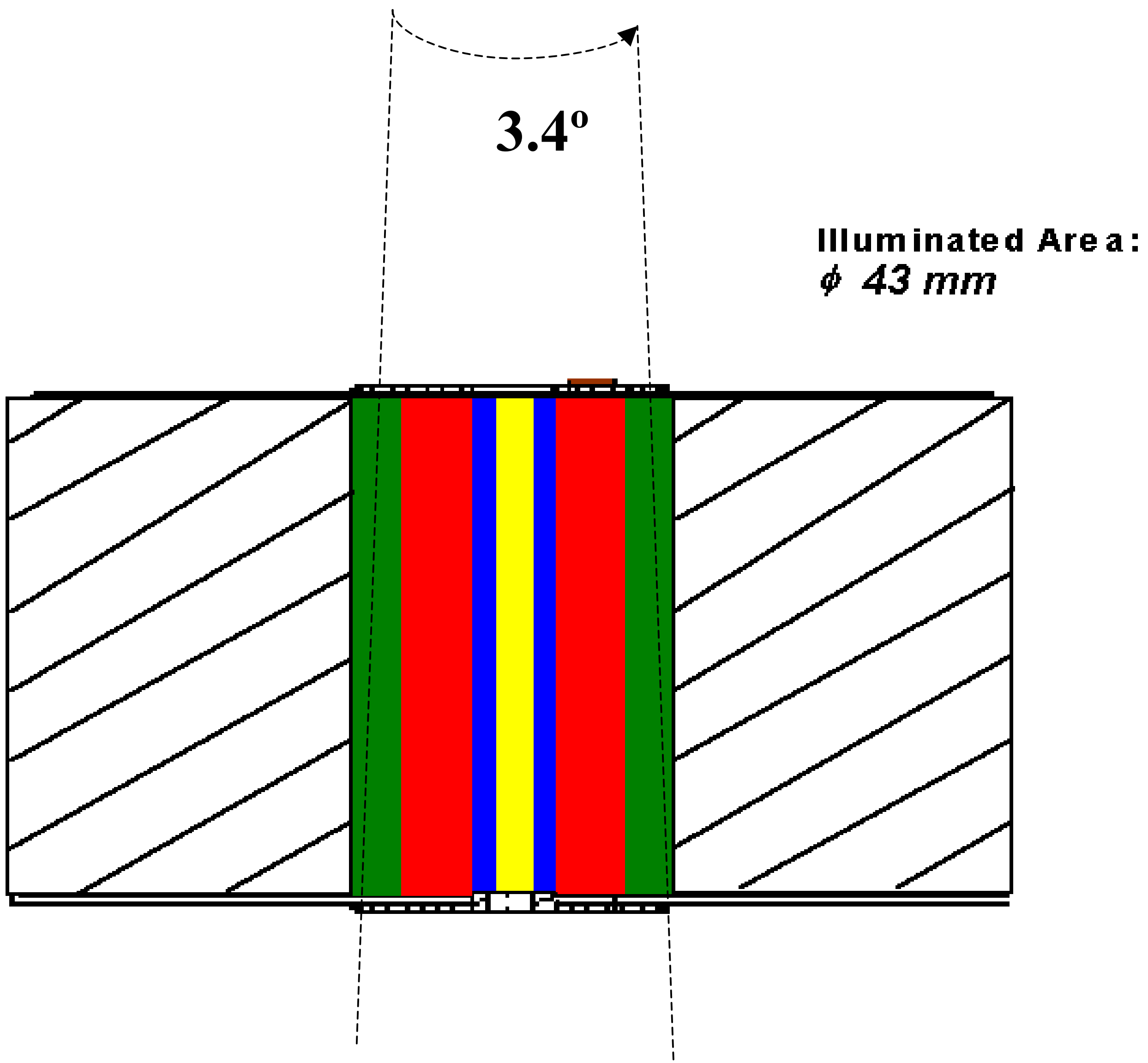
2)No source collimation at all, in order to “see” the overall transmission of the affected central pixel zone.

Maximum allowable collimation



Not collimated source

Nearly all the affected zone is “seen”.



PSAC Central pixel showing the different “absorption zones “

STM PSAC Transmission at 0° in %

Central Pixel

ZONE	Energy(keV)								
	17	21	31	35	60	81	356	511	1275
1	7±1	13±2	16±1	20±1	29±1	32±1	54±1	55±1	68±1
2	15±2	22±3	37±1	40±1	47±1	51±1	66±2	68±2	73±1
3	16±1	23±2	32±1	37±1	40±1	48±1	58±1	61±1	67±1
4	50±2	72±4	79±1	81±1	80±1	86±1	89±1	89±1	93±1

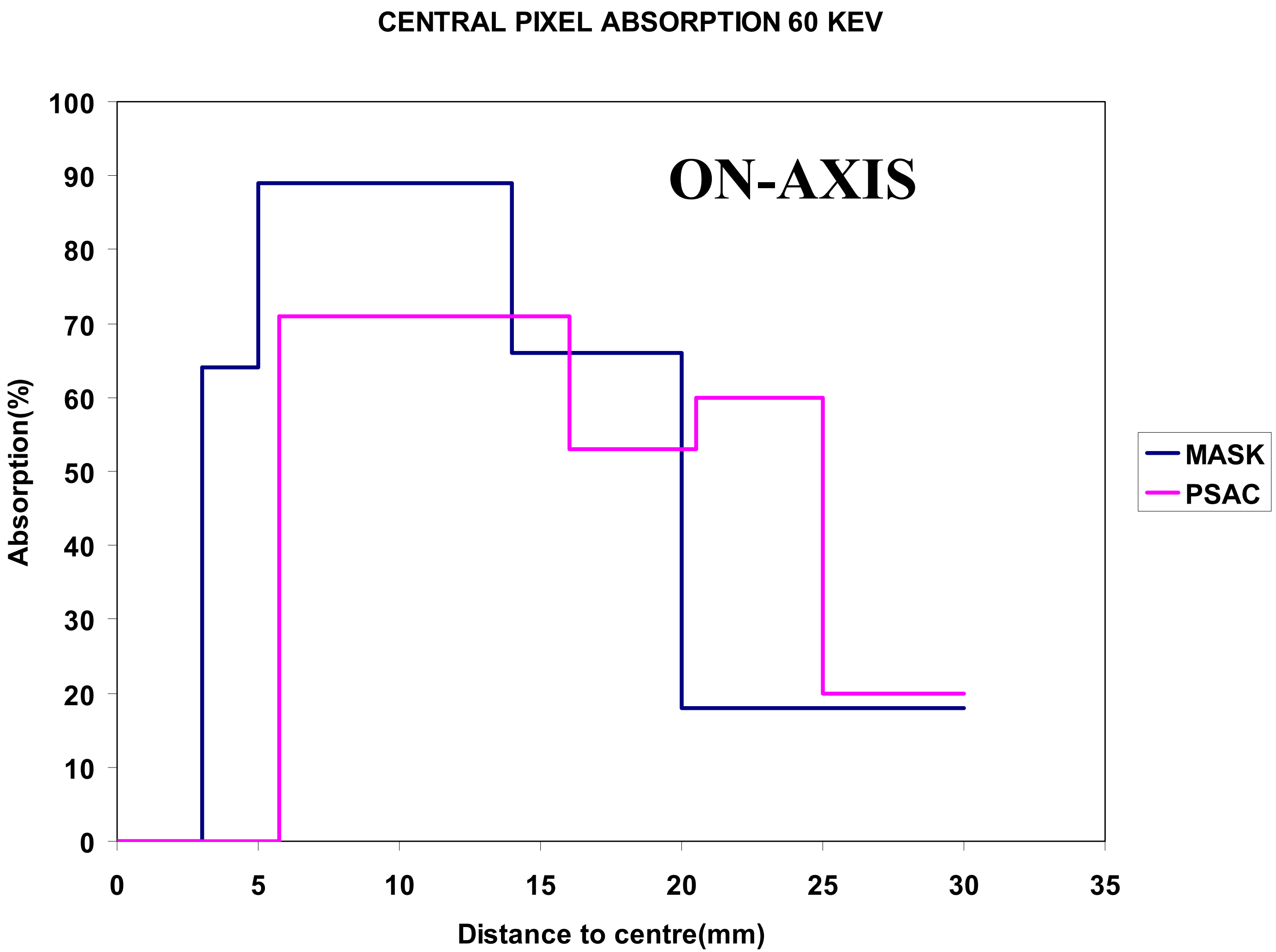
ZONE	Inner Dimension(mm)	Outer Dimension(mm)	Area/Total pixel area
1	∅ 11.5	∅ 32.	22.5 %
2	∅ 32.	∅ 41.	16.5 %
3	∅ 41.	∅ 50.	20.6 %
4	∅ 50.	∅ 67. (> pixel dimension)	37. %

CENTRAL PIXEL “ON-AXIS” MEASUREMENTS

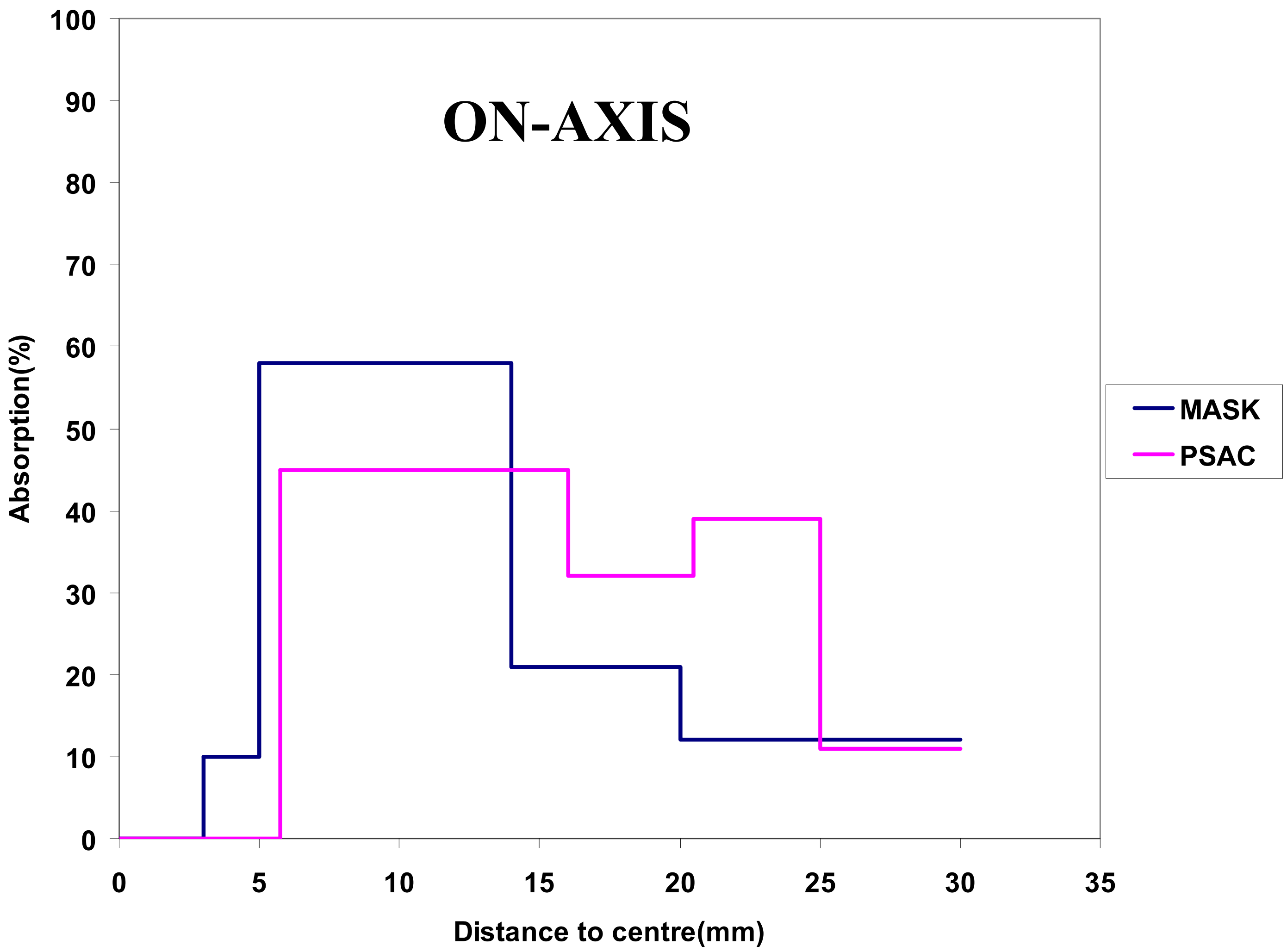
COLLIMATED SOURCE

1) Good agreement with preliminary central pixel transmission measurements (see minutes SPI Scientific Team Meeting Toulouse March 21-22 2002) except zone 2, that had an abnormally high value for the transmission.

2) Zone 4, that could be considered as an “affected zone” (visually) should be considered as a “quasi-normal” zone, from the transmission point of view.

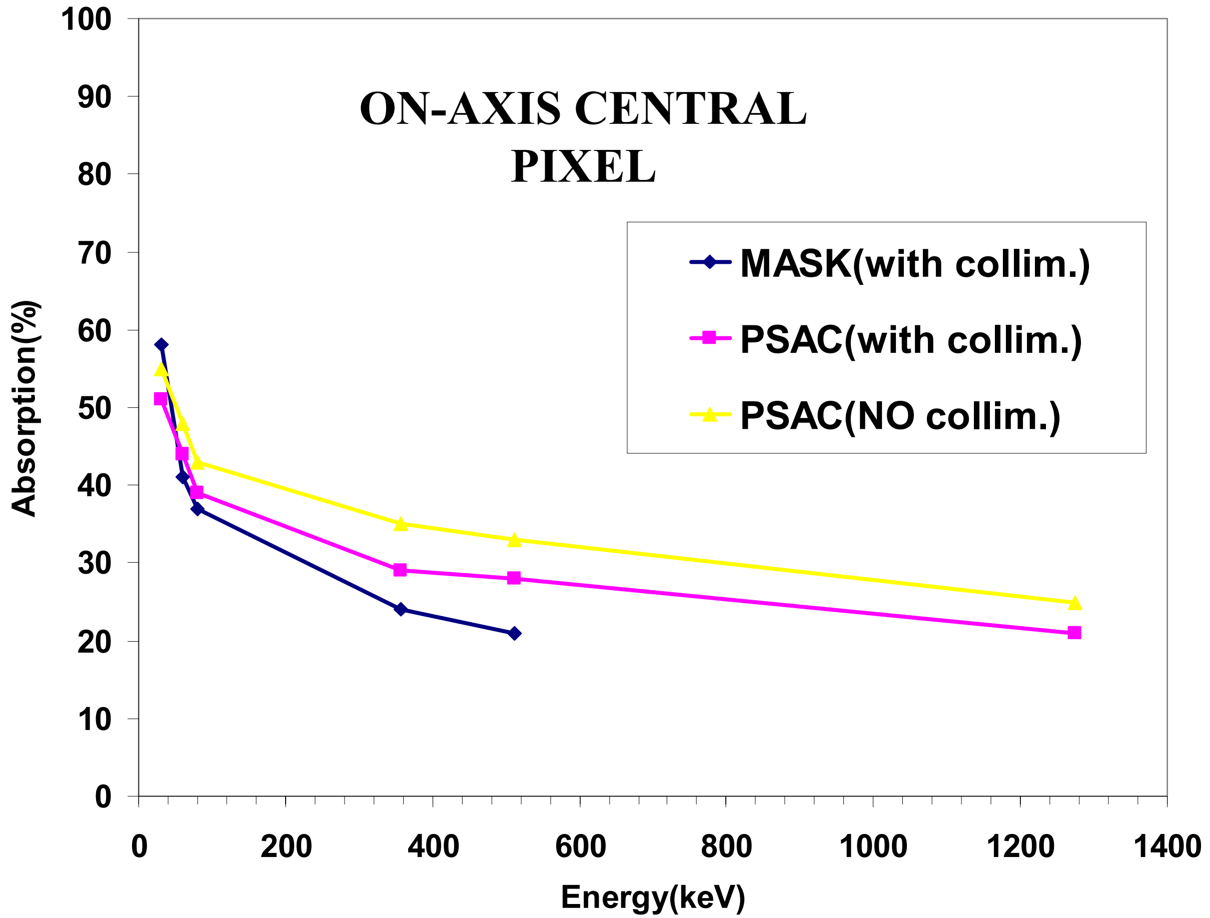

CENTRAL PIXEL ABSORPTION 60 KEV
ON-AXIS
Absorption(%)
Distance to centre(mm)
MASK
PSAC
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35

CENTRAL PIXEL ABSORPTION 511 KEV



NOT COLLIMATED SOURCE "ON-AXIS"

Measurements "on-axis" have been done with no collimated source in order to obtain the overall transmission of the affected area.



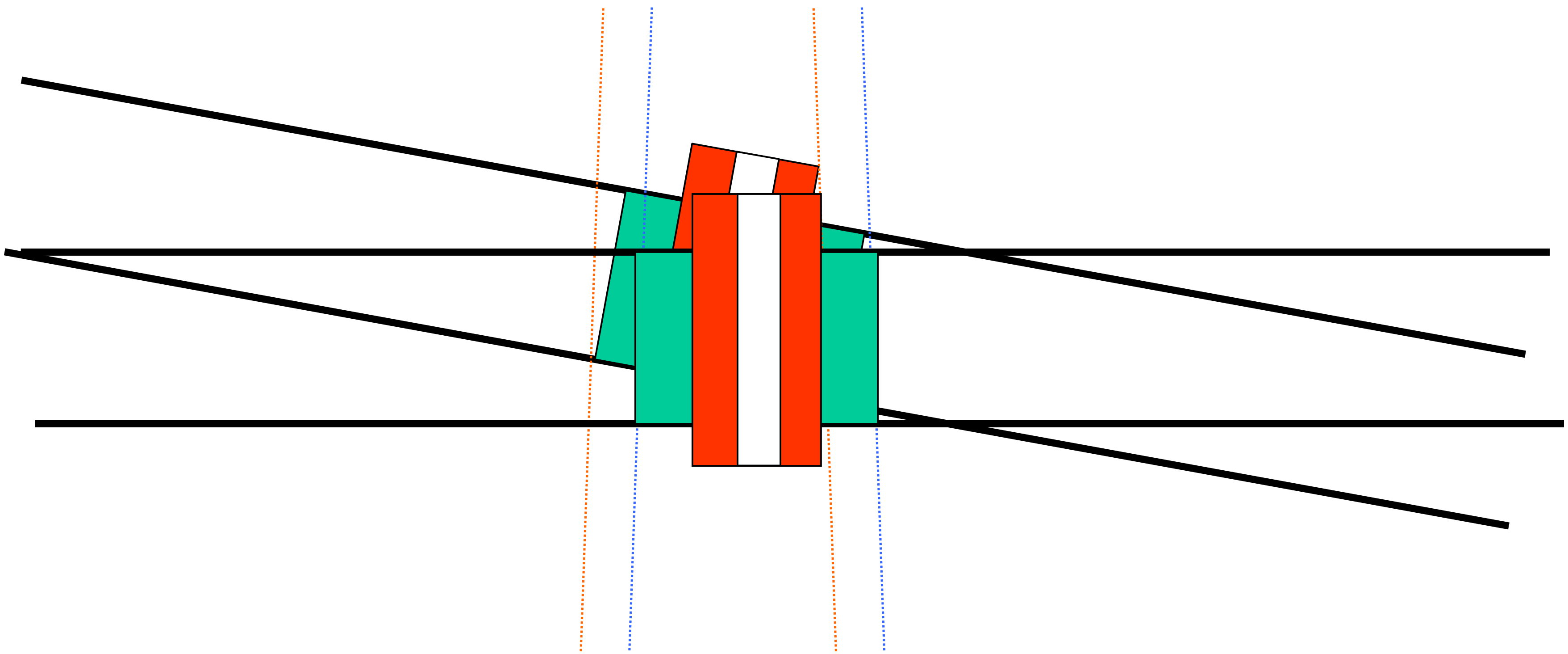
There is a systematic deviation for collimated w.r.t. NO collimated data (5% differences in absorption values).

NOT COLLIMATED SOURCE "OFF-AXIS" MEASUREMENTS

Off-axis measurements have been carried out in order to determine the effect of central pixel shadow on SPI detector plane.

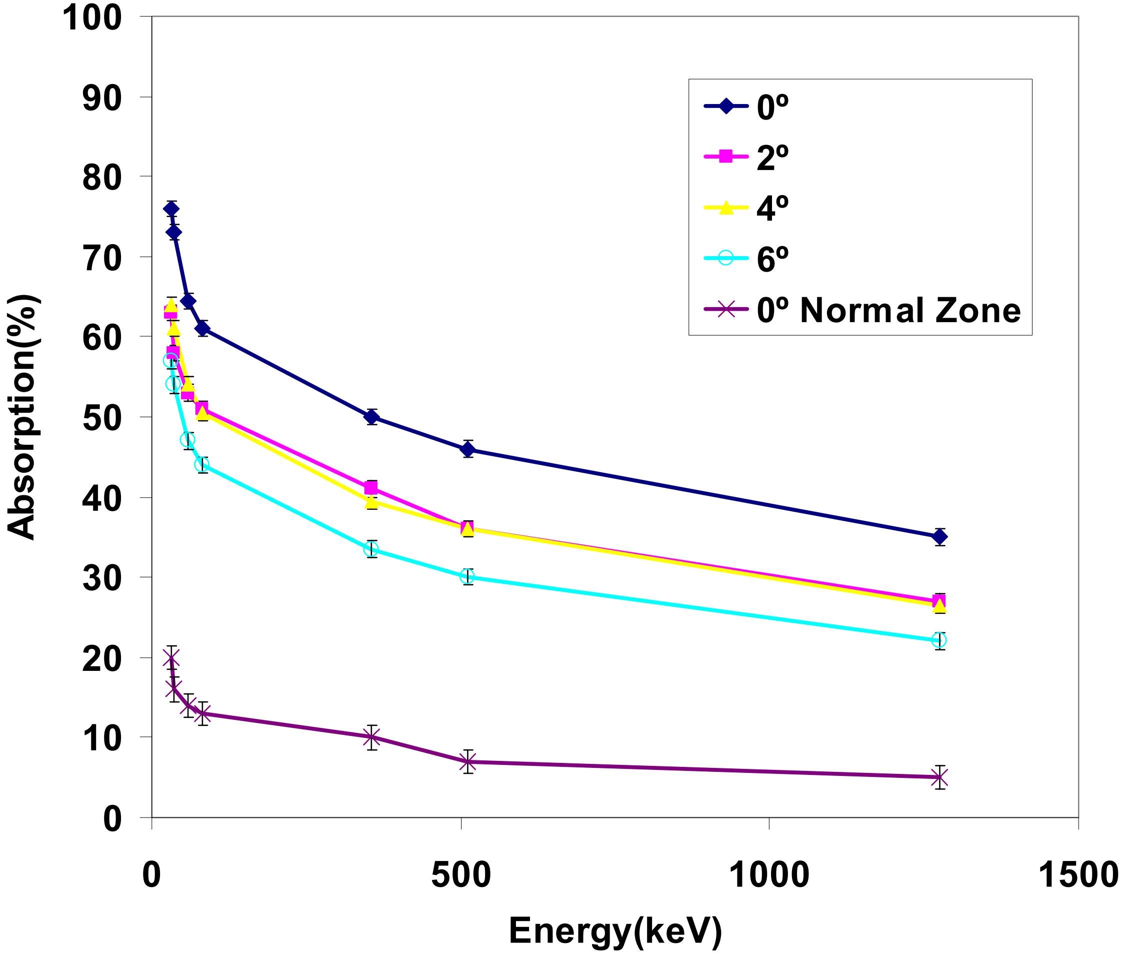
To "cover" all the affected area, two slightly displaced impinging points have been considered. Transmission is obtained as the mean value.

Overall transmission for the affected area at three pitch angles (2, 4 and 6°) has been measured

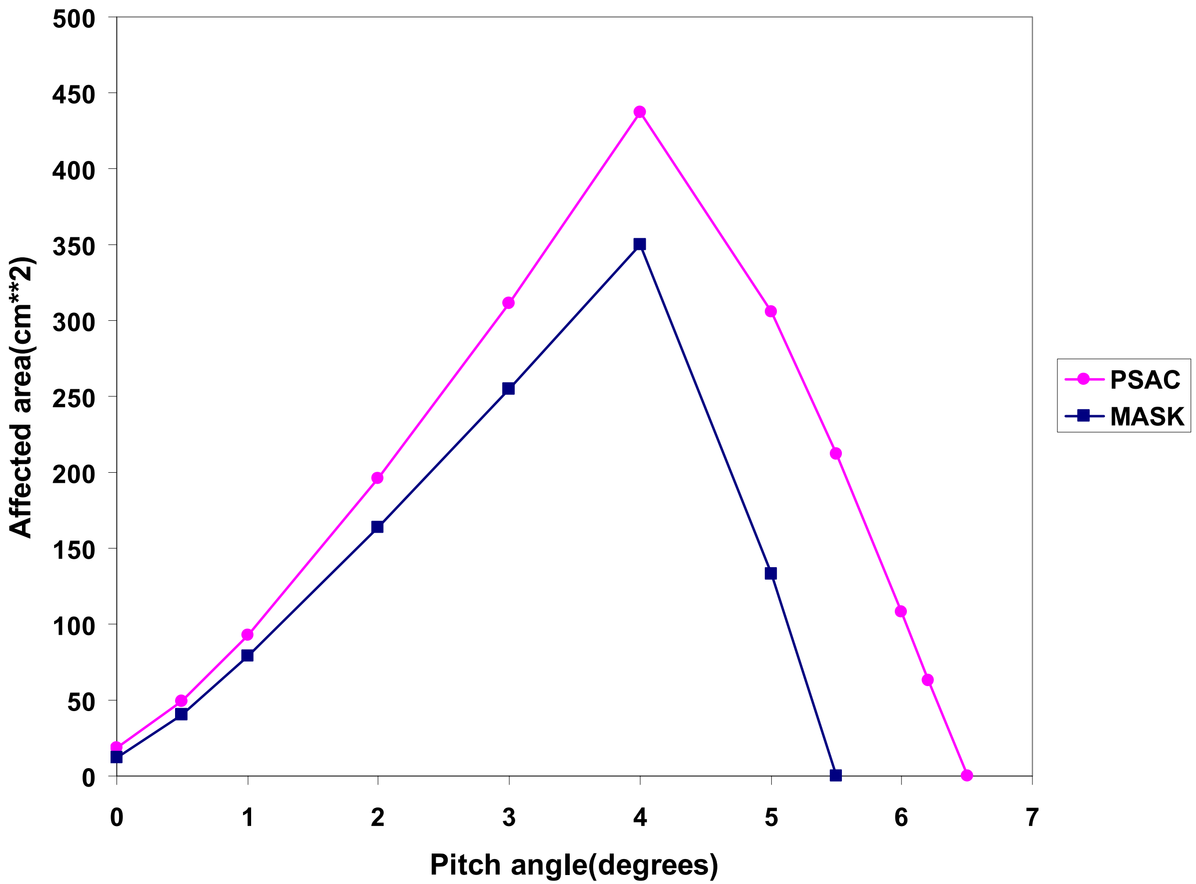


NOT COLLIMATED SOURCE "OFF-AXIS" MEASUREMENTS

Mean absorption of the "affected zone" (50 mm diameter).



Affected area by PSAC and MASK central “alignment hole”



Maximum “shadow” area at 4º

CONCLUSIONS

-A complete set on PSAC STM-O Model Transmission Measurements have been done (from 17 to 1275 keV) at different pitch angles (0, 2, 4 and 10º), showing a high degree of uniformity over its surface.

Central pixel transmission has been studied in detail using two different approximations (collimated vs not collimated source) for the "on-axis" case. It seems that PSAC central pixel absorption is slightly higher than that for the MASK (i.e. 28% vs 21% at 511 keV).

"Off-axis" transmission measurements have been also done for the central zone . Absorption slightly diminishes w.r.t. "on-axis" situation but this does not compensate for the increase of the affected area.

Maximum effect should be expected at 4º (maximum shadow area for both MASK and PSAC).

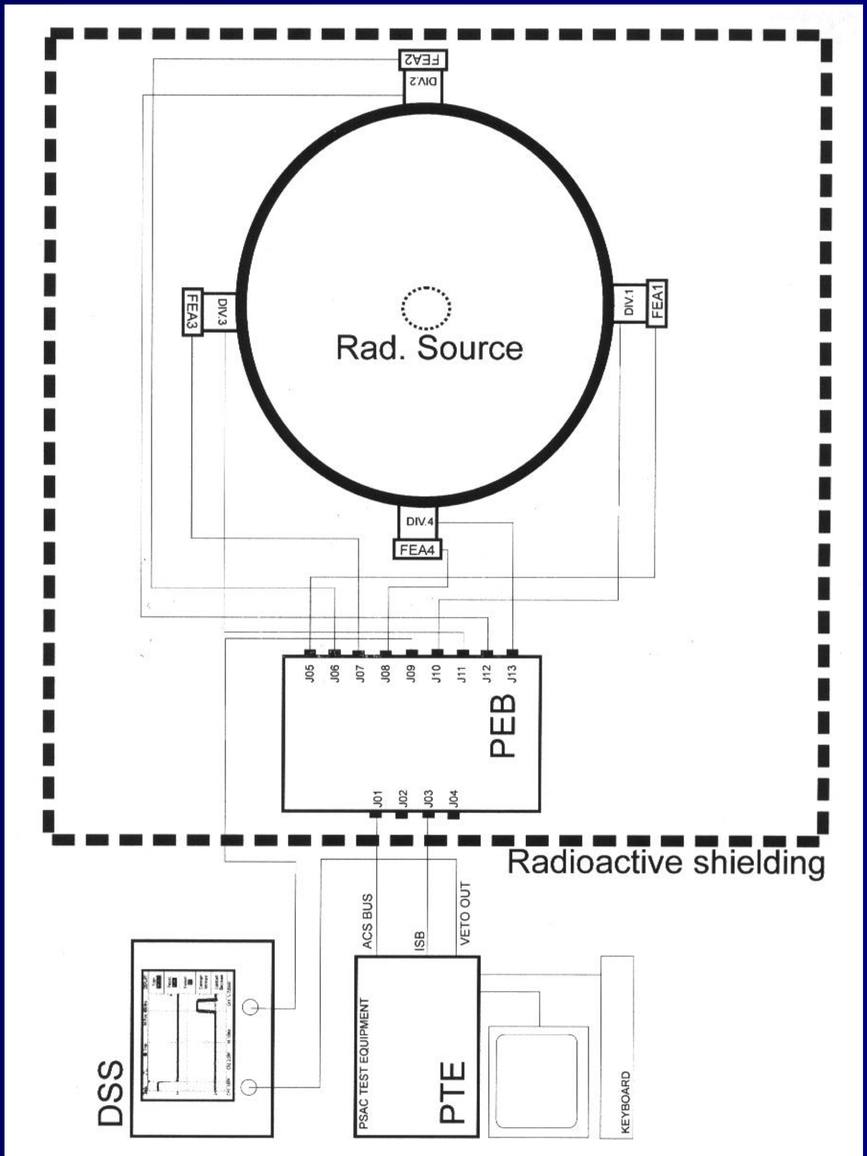
The PSAC Energy Threshold

Giselher Lichti

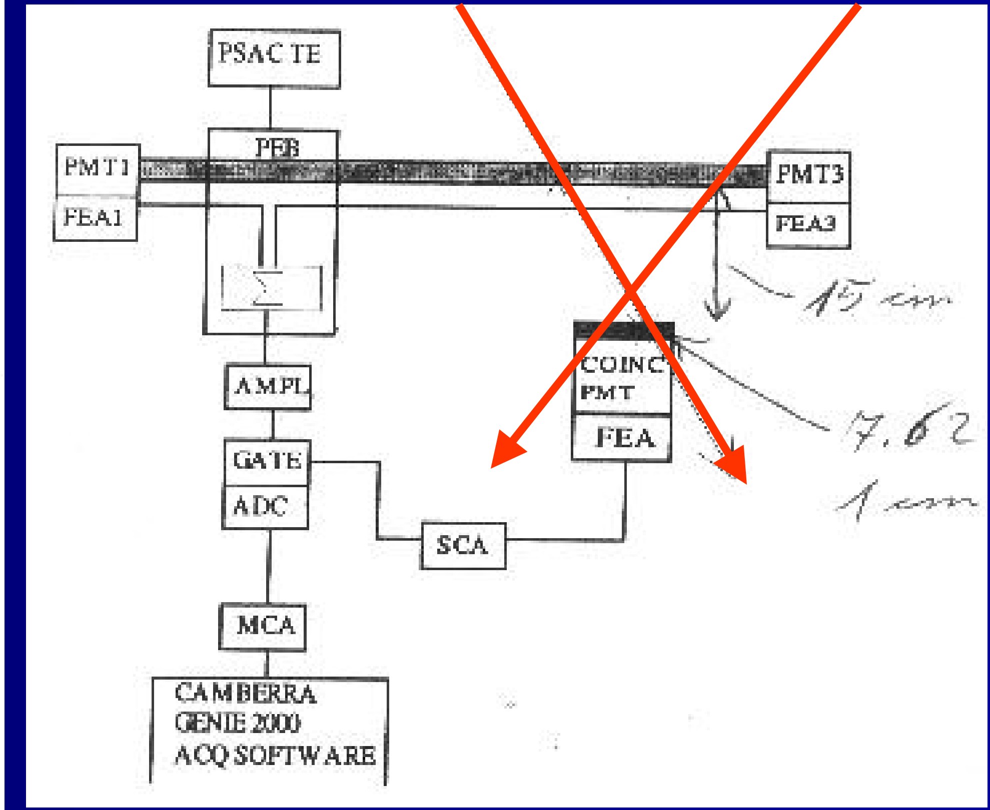
It was G. Weidenspointner who stimulated this work insistently asking each month for the value of the PSAC threshold

- knowledge of PSAC energy threshold important for
  - background simulation
- at Laben energy-calibration measurements were performed
- the results presented here are based on these measurements

Test setup used at Laben



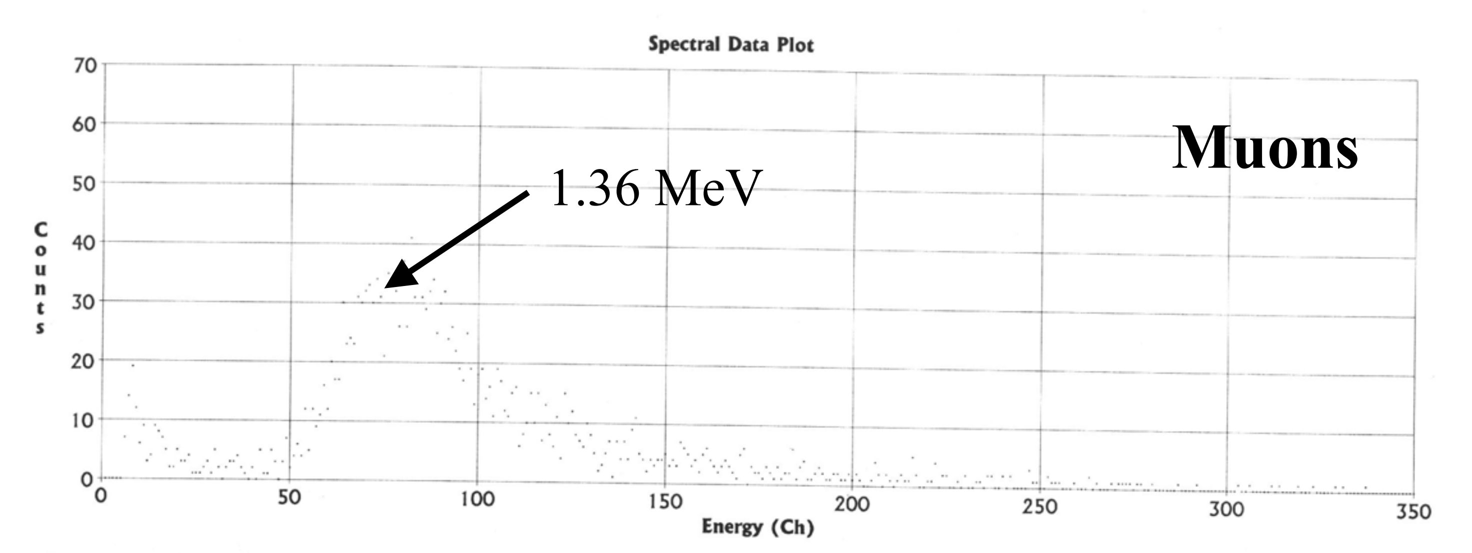
setup used for Muons

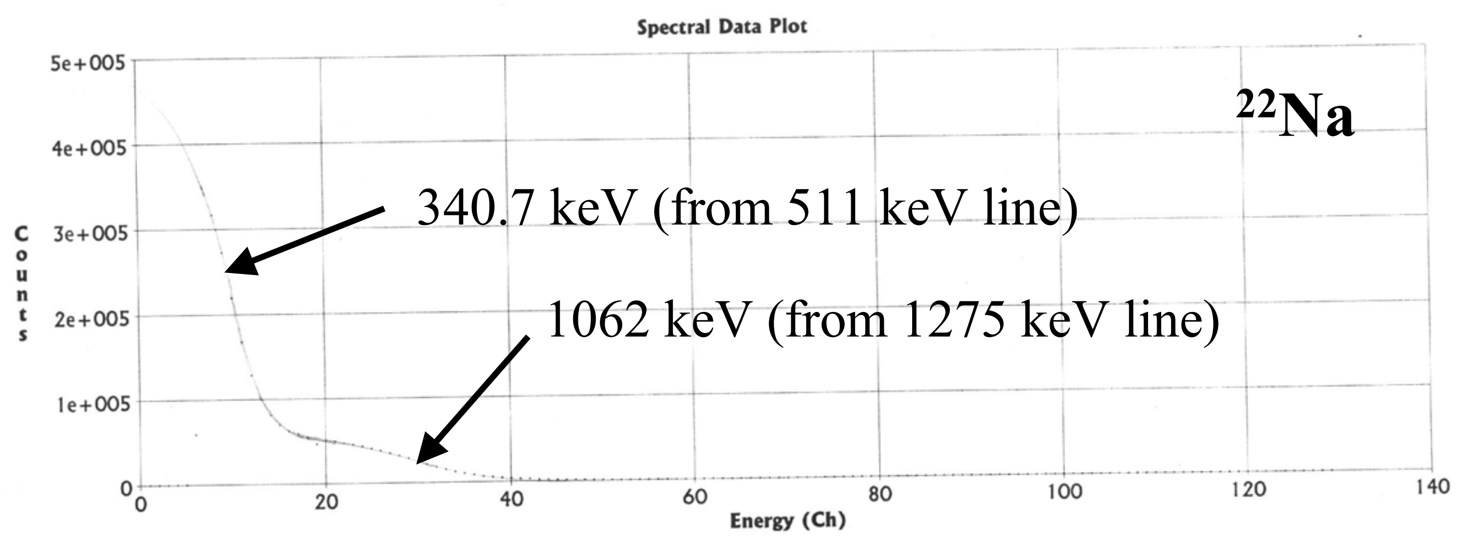


Energy deposit of Muons in 0.5 cm of plasticscintillator

- Muons deposit ~2 MeV/g cm^{-2}
- Muons do not penetrate the scintillator perpendicular ➡
- integration over
  - incidence angle and
  - Muon distribution necessary
- Muons deposit about 1.36 MeV in the PSAC

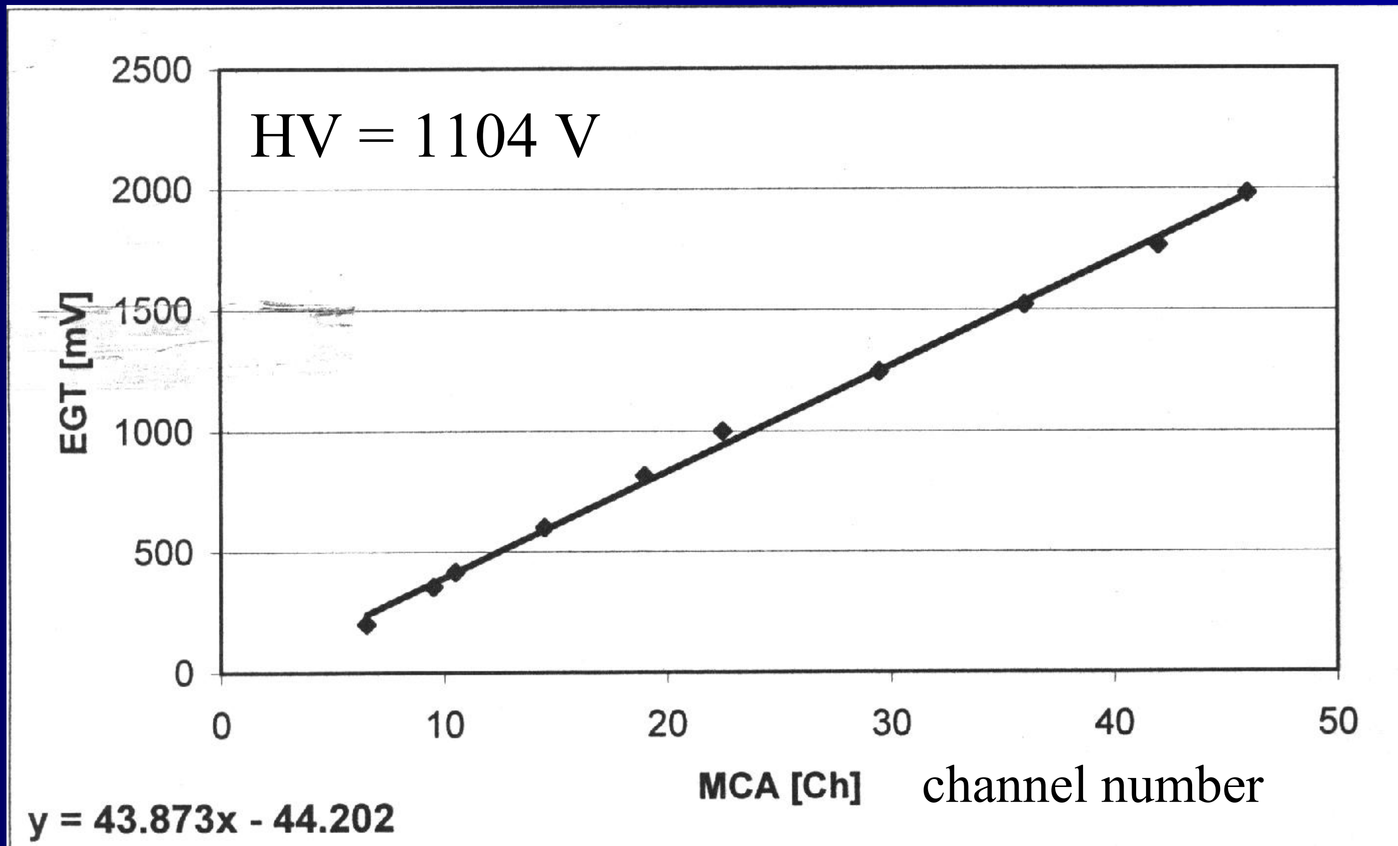
Measured energy-deposit spectra





Voltage-channel relation or electronic threshold-setting calibration(from Laben)

threshold setting

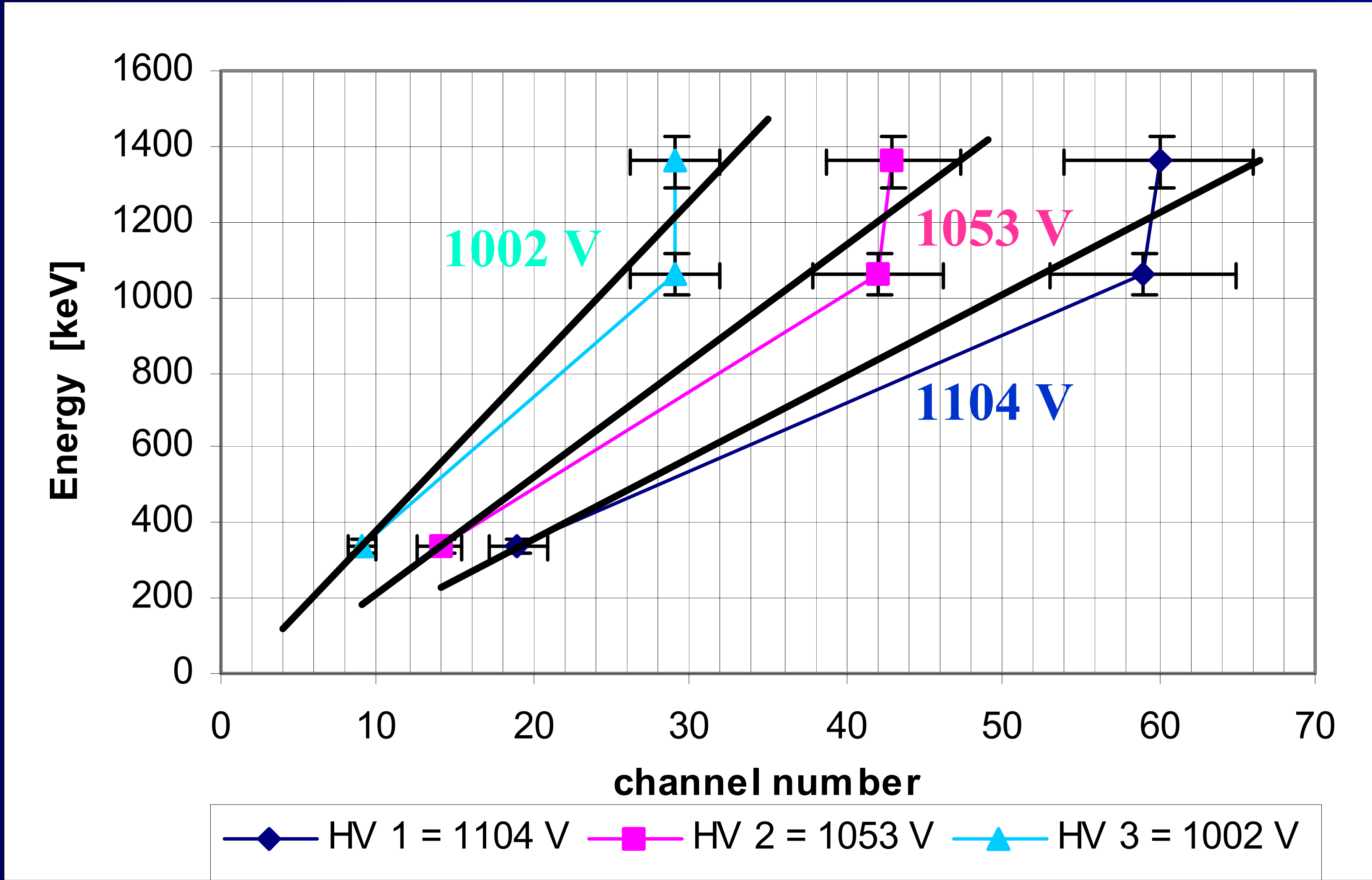


Task was to establish the channel-energy relation

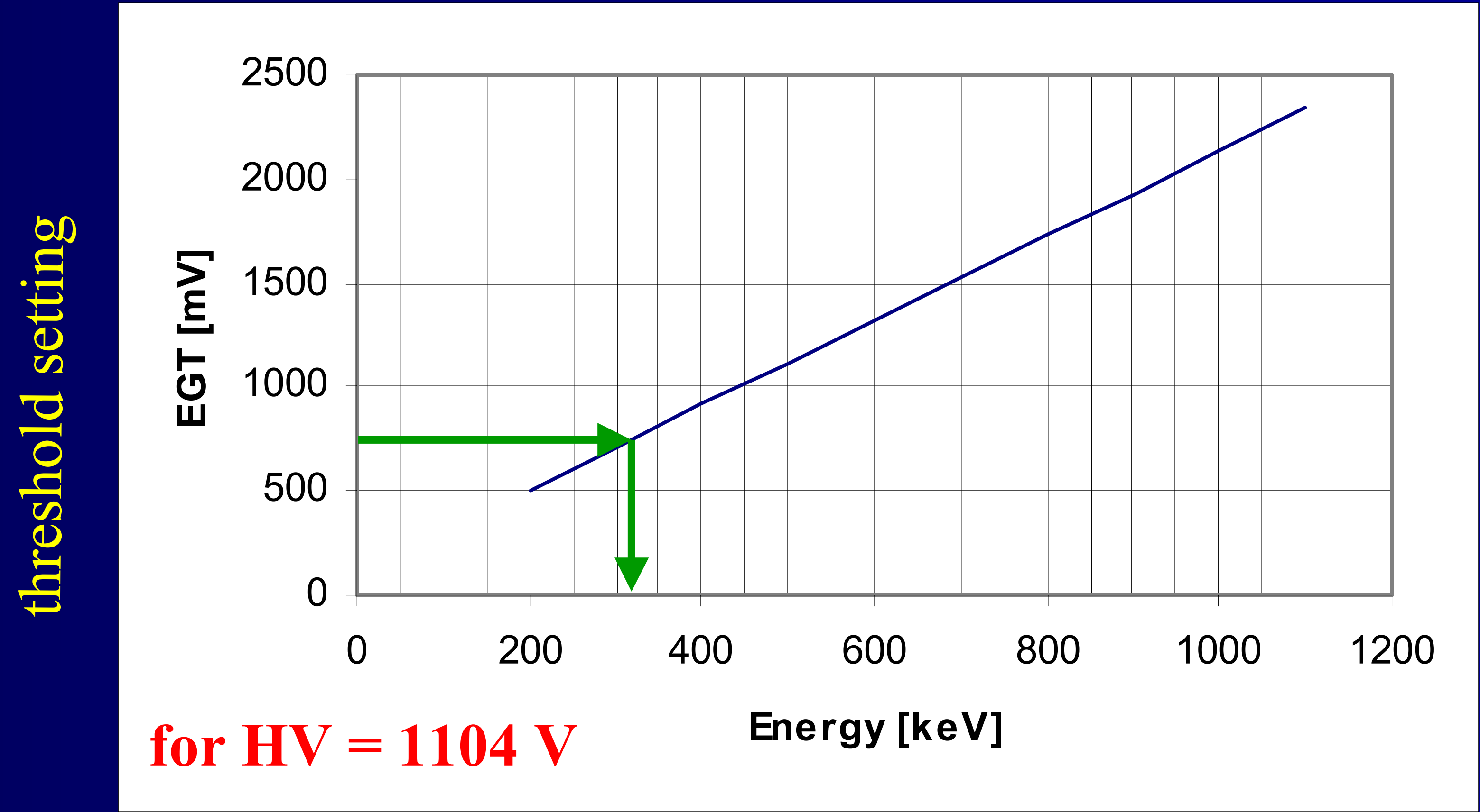
Channel-energy relation (and therefore energy threshold) dependent on

- HV setting
- calibration was performed for three HV settings
  - 1002 V
  - 1053 V
  - **1104 V**
- for each HV spectra were measured by Laben

The Energy-Channel Relation



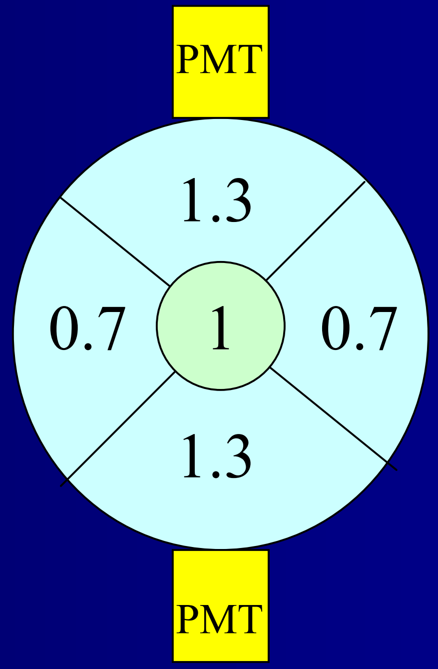
The Threshold Calibration Curve



PSAC energy threshold: (318 ± ?) keV

Inhomogeniety of the PSAC Thresholds

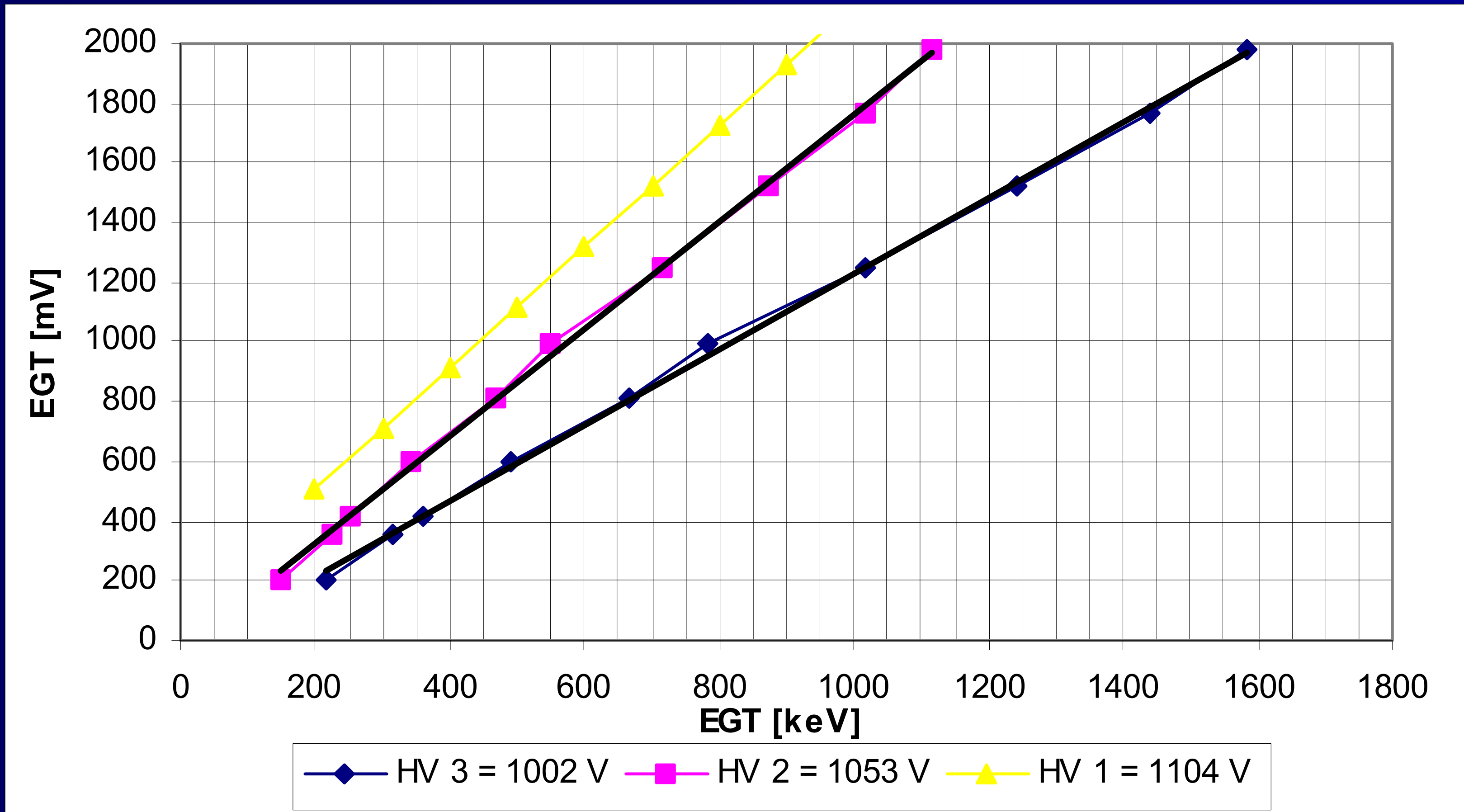
The radius of the central circle is not known!



The threshold depends on the location ➩ a rescaling is necessary!

Calibration for HV = 1002 V & 1053 V

threshold setting



Because of missing electronic calibration these calibration curves are highly uncertain!

Problems

- the threshold-setting-channel relation only known for one HV (1104 V)
- discrepancy of the energy calibration between
  - Muons
  - ^{22}Na
- unknown widths of the energy distribution ➡ threshold function not known!
- influence of event-trigger threshold on energy threshold not known

Determination of the PSAC Energy Threshold

Giselher Lichti und Stefanie Walch

Document No.: SPI-MPE-RP-1-38	
Issue No.: 1	Issue Date: April 30, 2002
Revision No.: -	Revision Date: -
Stored under:	PSAC-Thresholds1.doc

Distribution List

Name	Organization	Dist.	Name	Organization	Dist
V. Schönfelder	MPE		P. Jean	CESR	
G. Lichti	MPE	x	Y. Andrè	CNES	
A. von Kienlin	MPE				
			Ph. Durouchoux	CEA	
H. Schenkl	Albedo		B. Cordier	CEA	
E. Bachem	DLR		P. Leleux	University of Louvain	
			F. Sanchez	University of Valencia	
H.-J. Jung	Astrium		G. Skinner	Univ. of Birmingham	
D. Wolter	DJO		B. Teegarden	GSFC	
J.-P. Roques	CESR		G.Weidenspointner	GSFC	x
P. Mandrou	CESR		P. Caraveo	IFCTR	
P. von Ballmoos	CESR		J. Matteson	UCSD	

HARDWARE CONFIGURATION AT MOC

- Two workstations for data acquisition data distribution and data analysis.
- One CCOE for CNES.
- One X terminal.
- This will be installed 4-5 July.
- Still waiting for inputs.

TELEMETRY ACQUISITION AND DISTRIBUTION

- The 2 workstations will both receive telemetry: hot redundancy.
- Telemetry will be transmitted to CCOE (cnes workstation) in real time.
- Telemetry will be transmitted to CESR in (near) real time and then available through web interface.

TESTS

- Hardware and software configuration should be tested during the simulation test : 16 July.
- Configuration have to be definitive for the AFT in Baikonour.