

# Timing Mode low-energy background (OCR-1762)

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## Motivation (status June 2006):

- for analysis of serendipitous science (not only!) or faint spectral features there should be detailed knowledge on camera background (e.g., in onon-optimum instrument mode set-up)
- camera background obtained with Closed filter
- minimum accumulated time per mode: length of maximum exposure (i.e. 1 revolution)
- LW mode: 136 ks, SW mode: 174 ks, TI mode: 57 ks so far
- use one calibration observation with a subject not useful otherwise for EPIC-pn for a TI mode Closed filter observation
- next “possible” case: NRCO-63: MOS-1 filter check, Omega Cen: has already been observed *after* (0307\_0112220101\_PNS003) the EPIC-pn micrometeorite event (0156\_0095810401\_PNS003), no obvious (!) indication of damage of the Medium filter

# OCR-1762: idea of setup

- Main idea: calibration measurement without loss of scientific observing time  
i.e. no additional load on calibration budget
- Take a serendipitous (non EPIC-pn) calibration observation: NRCO-63:  
1227\_0412780101 (2006-08-21), 20 ks
- TI mode Closed filter exposure: normal set-up  
(lower threshold 40 adu  $\sim$  200 eV): 10 ks
- TI mode Closed filter exposure: changed set-up  
(lower threshold 36 adu  $\sim$  180 eV): 10 ks
- within SAS both exposures can be treated the same:  
parameter lowerthreshold=40 in task epframes
- information from non-standard set-up “for free” (i.e., low-energy background)
- no additional offset map calculation in between
- Lower threshold: 40 [adu] (A1\_CMLOTH0: F1615=552)  
→ 36 [adu] (A1\_CMLOTH0: F1615=548): OCR needed

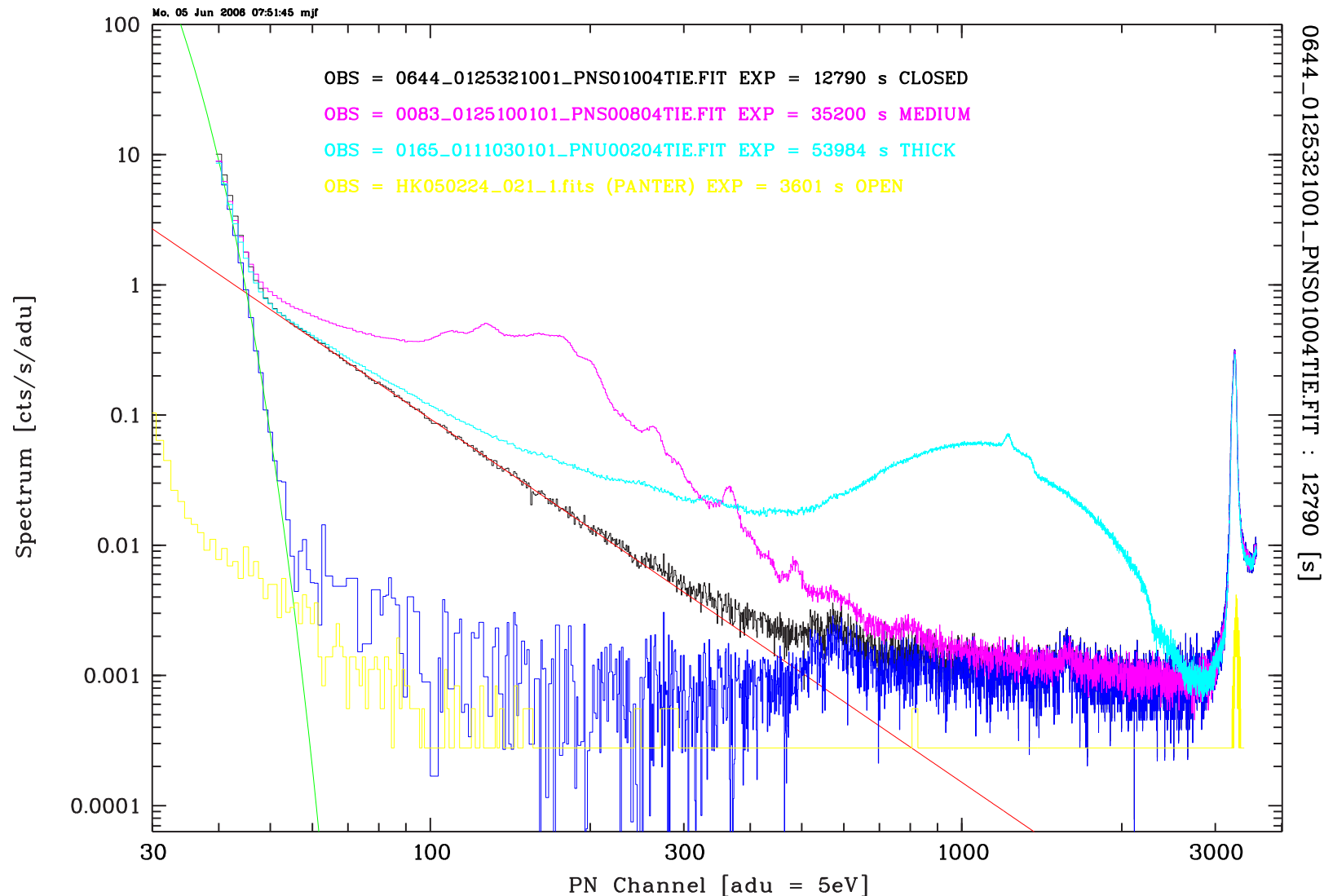
# OCR-1762: feasibility

- 0644\_0125321001\_PNS010: TI Closed, 12.8 ks, 40 adu
- total rate (incl. MIPs, important for telemetry): 77.5 cts/s
- parameterization of low-energy spectrum by:  
power-law (index  $\alpha = -2.79$  (fit to channel range 70 – 200 adu), and  
Gaussian (40 – 51 adu).
- Extrapolating from 40 adu to 36 adu: expected total rate: 194 cts/s
- maximum rate without counting mode:  $> 400$  cts/s
  
- →: 1227\_0412780101\_PNU002: 187 cts/s

# TI mode: overview of Closed filter exposures

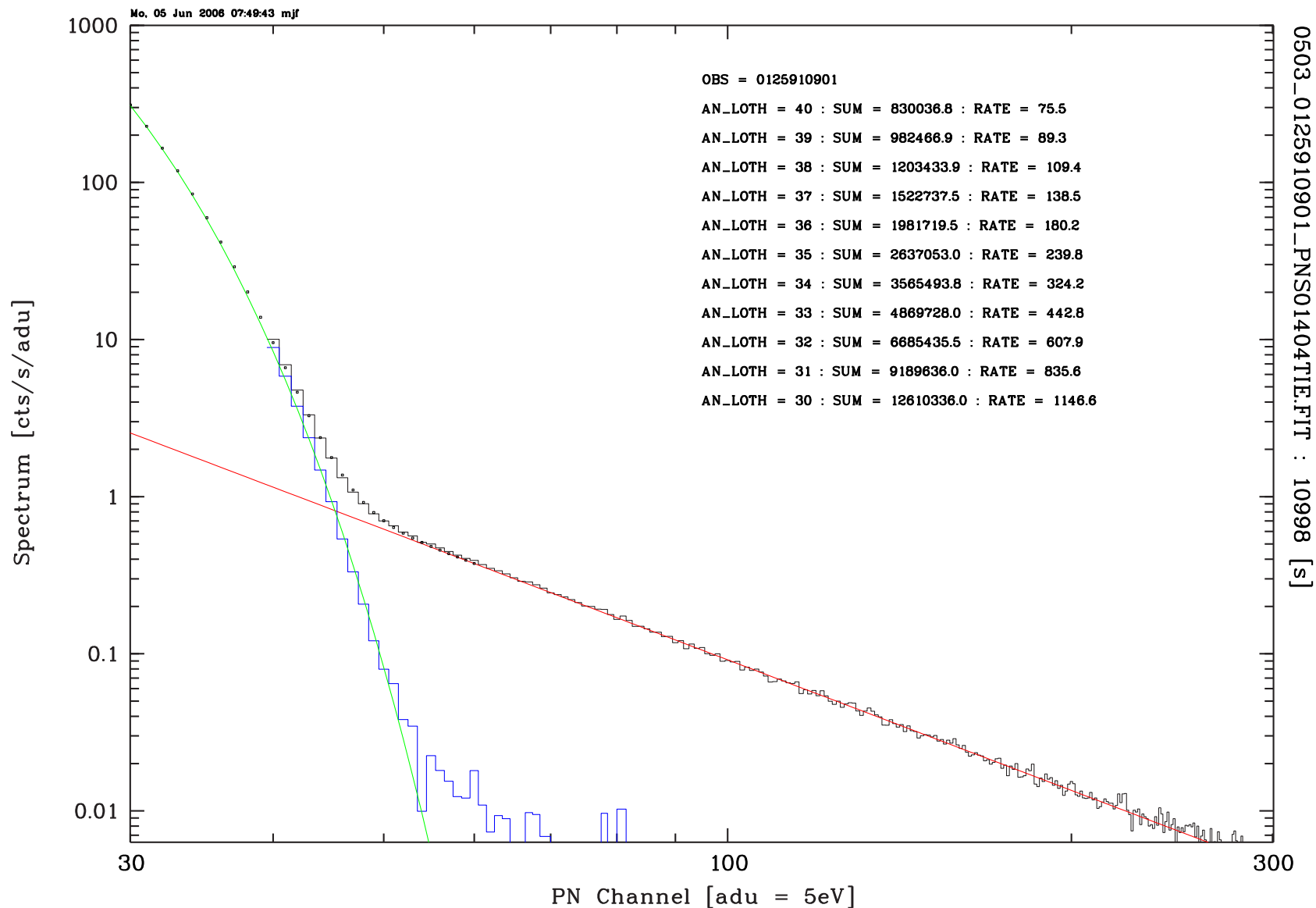
Observation-ID	Time [s]	Obs-Start	Rate_40 [cts/s]	Rate_36 [cts/s]
0503_0125910901_PNS014	10998	2002-09-07T20:11:32	75.5	180.2
0598_0105262401_PNS003	8603	2003-03-15T14:51:07	79.2	192.4
0644_0125321001_PNS010	12790	2003-06-15T08:44:58	77.5	194.1
0683_0154150401_PNS003	5184	2003-09-01T05:28:19	83.8	228.8
0817_0165160201_PNS003	9686	2004-05-26T21:40:02	86.5	175.2
0820_0165160301_PNS003	9684	2004-05-31T11:51:37	89.2	211.1
<b>Total</b>	<b>56945</b>		~ 82	~ 200

# EPIC-pn: Timing mode raw spectra (no pattern recognition)



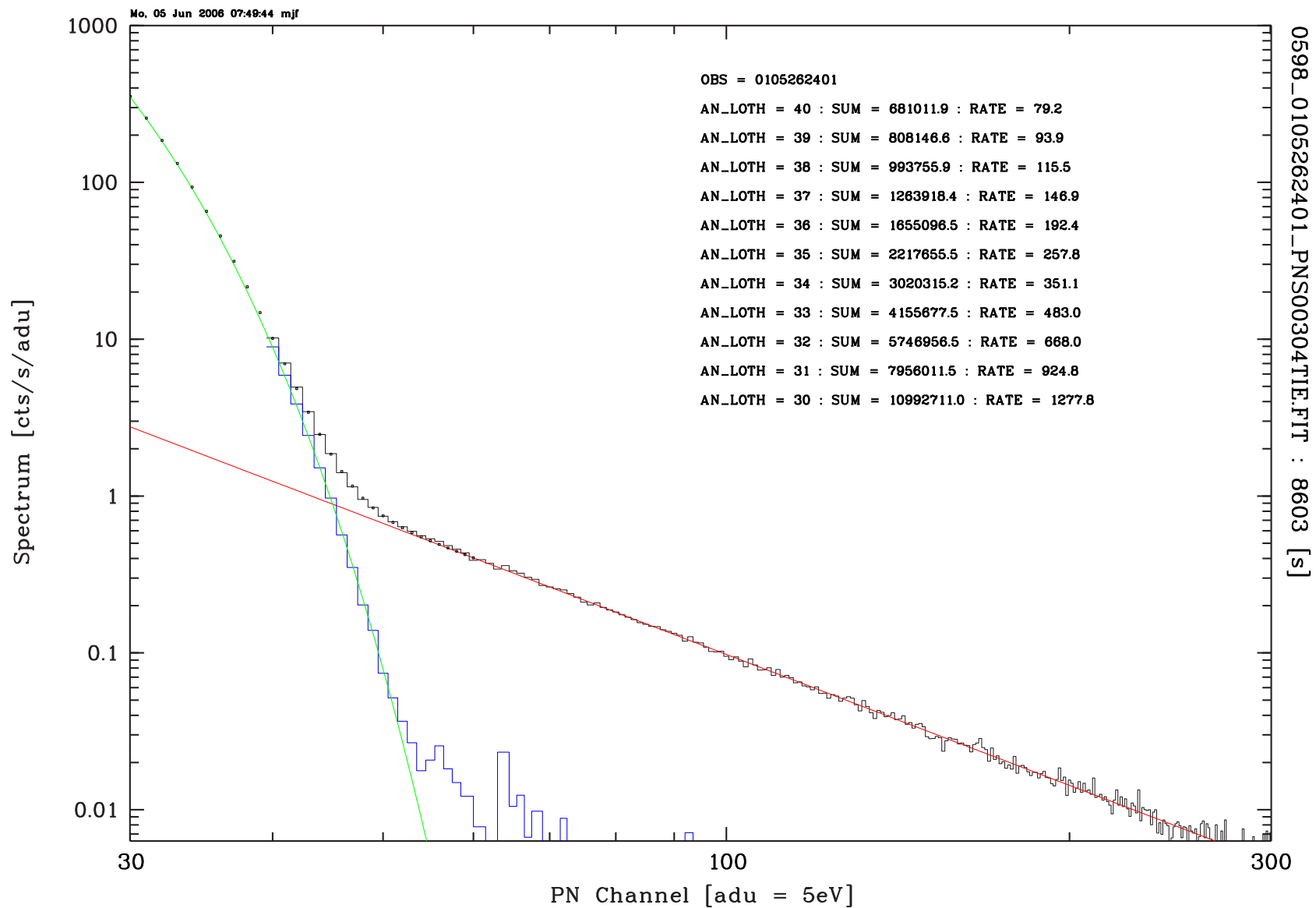
0644\_0125321001\_PNS010 Closed: raw (black ), fit to power-law component (red), residual (blue), Gauss low-energy component (green). N132D (dashed magenta), Vela X-1 (dashed cyan), yellow: EPIC-pn FM1 (PANTER, 1 adu  $\sim$  5.3 eV).

# TI mode: 0503\_0125910901\_PNS014

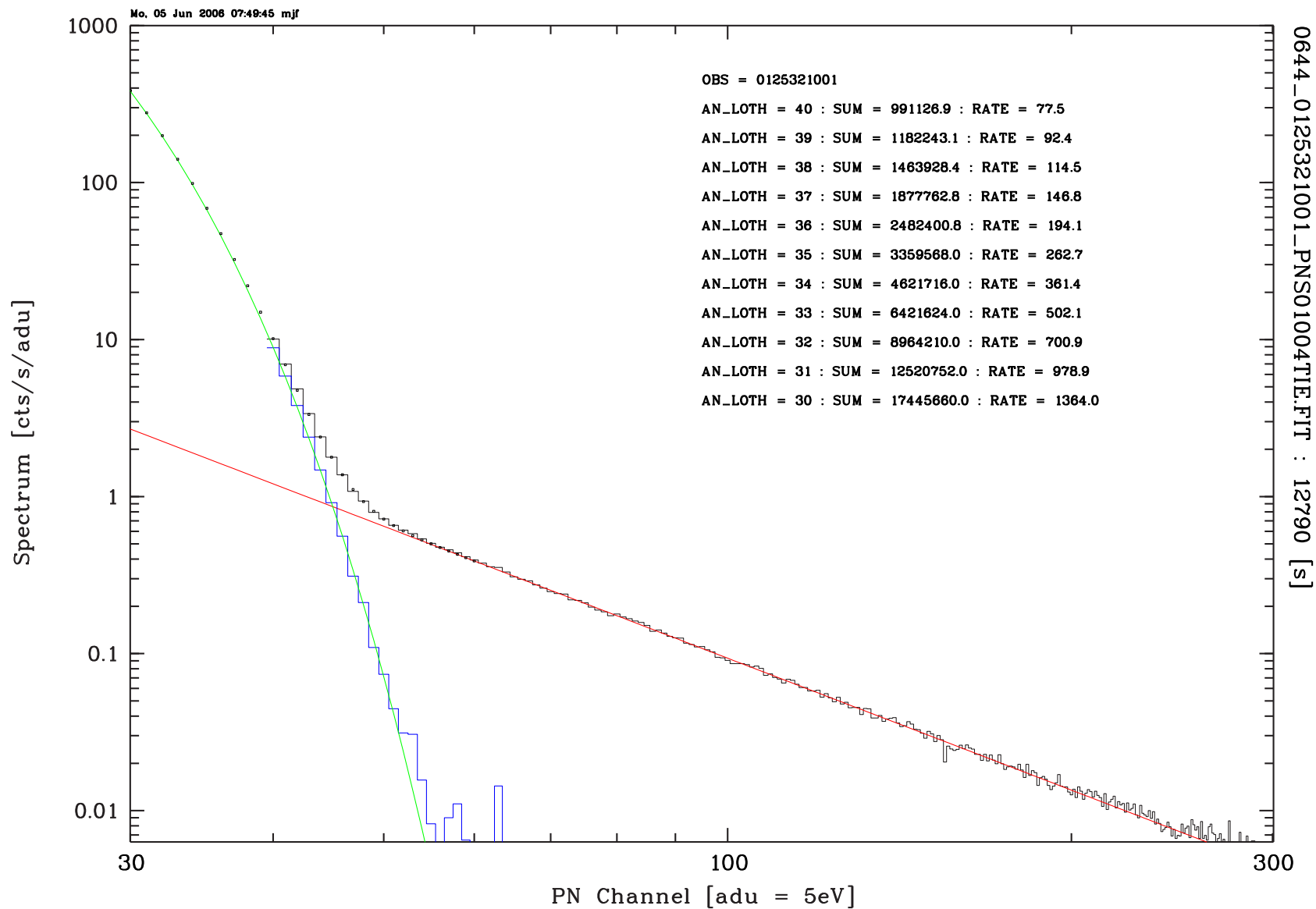


Spectrum and two-component low-energy fit for 0503\_0125910901\_PNS014.  
Measured total rate (40 adu), extrapolations for lowered thresholds 39 ... 30 adu.

# TI mode: 0598\_0105262401\_PNS003

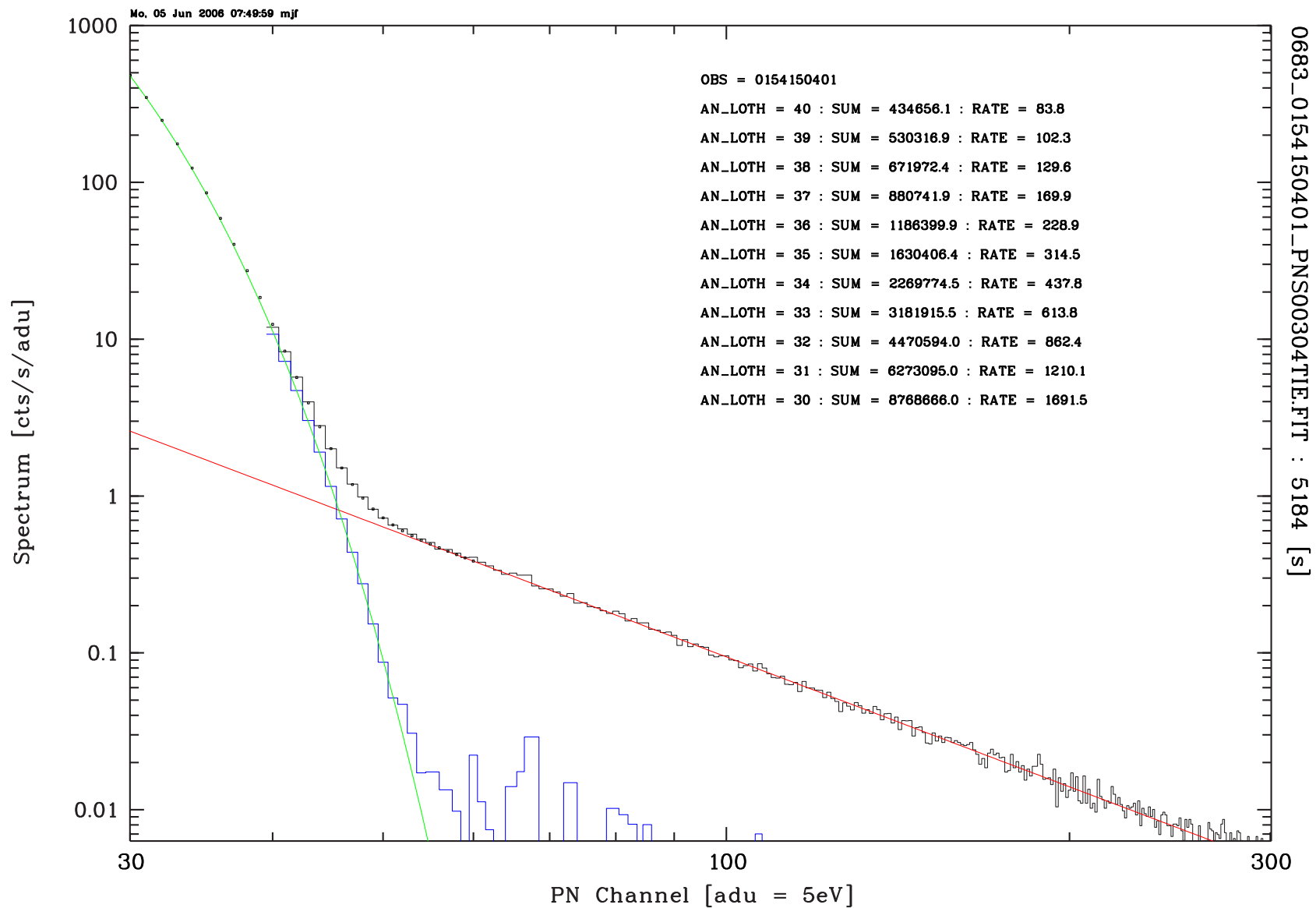


# TI mode: 0644\_0125321001\_PNS010

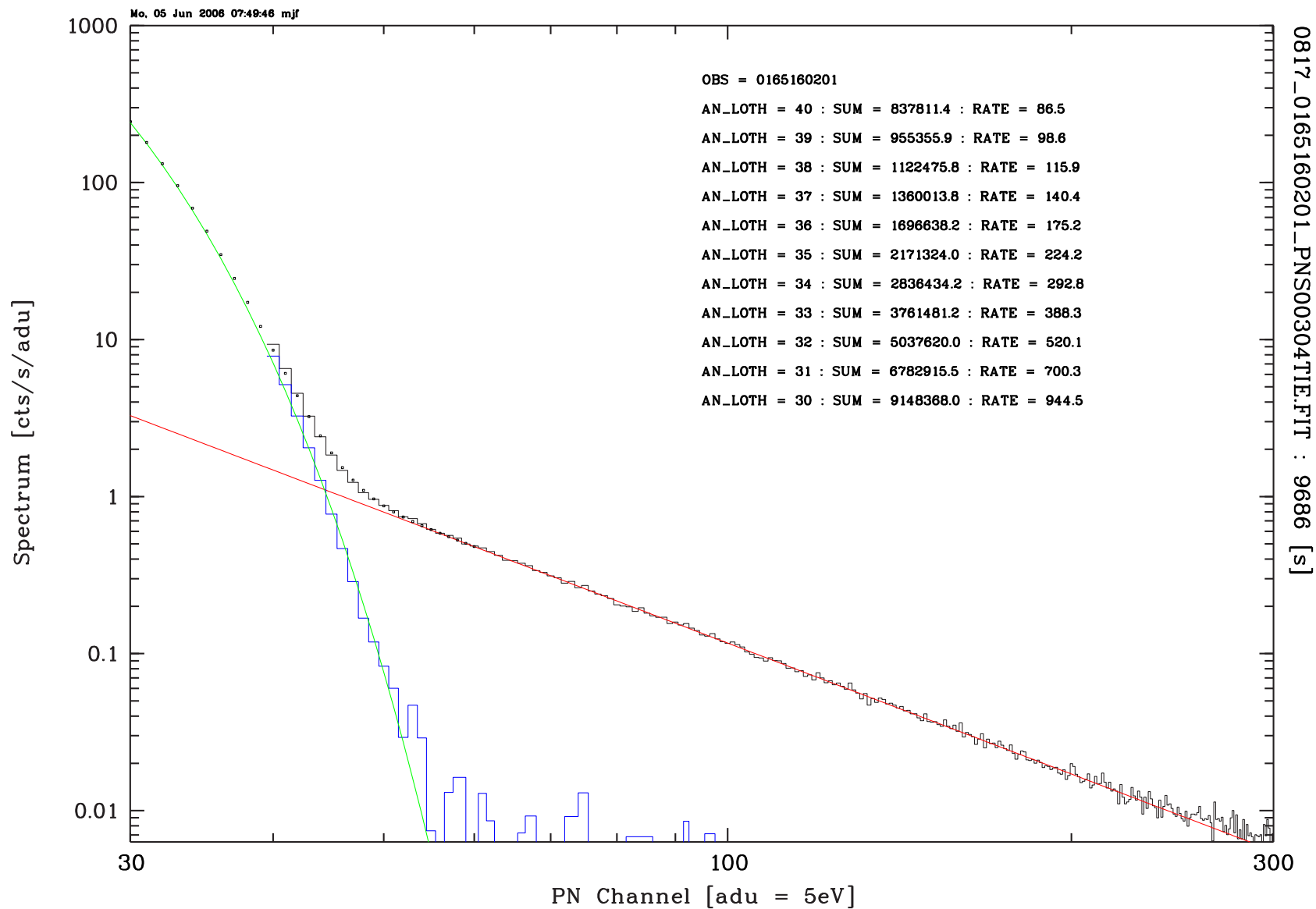




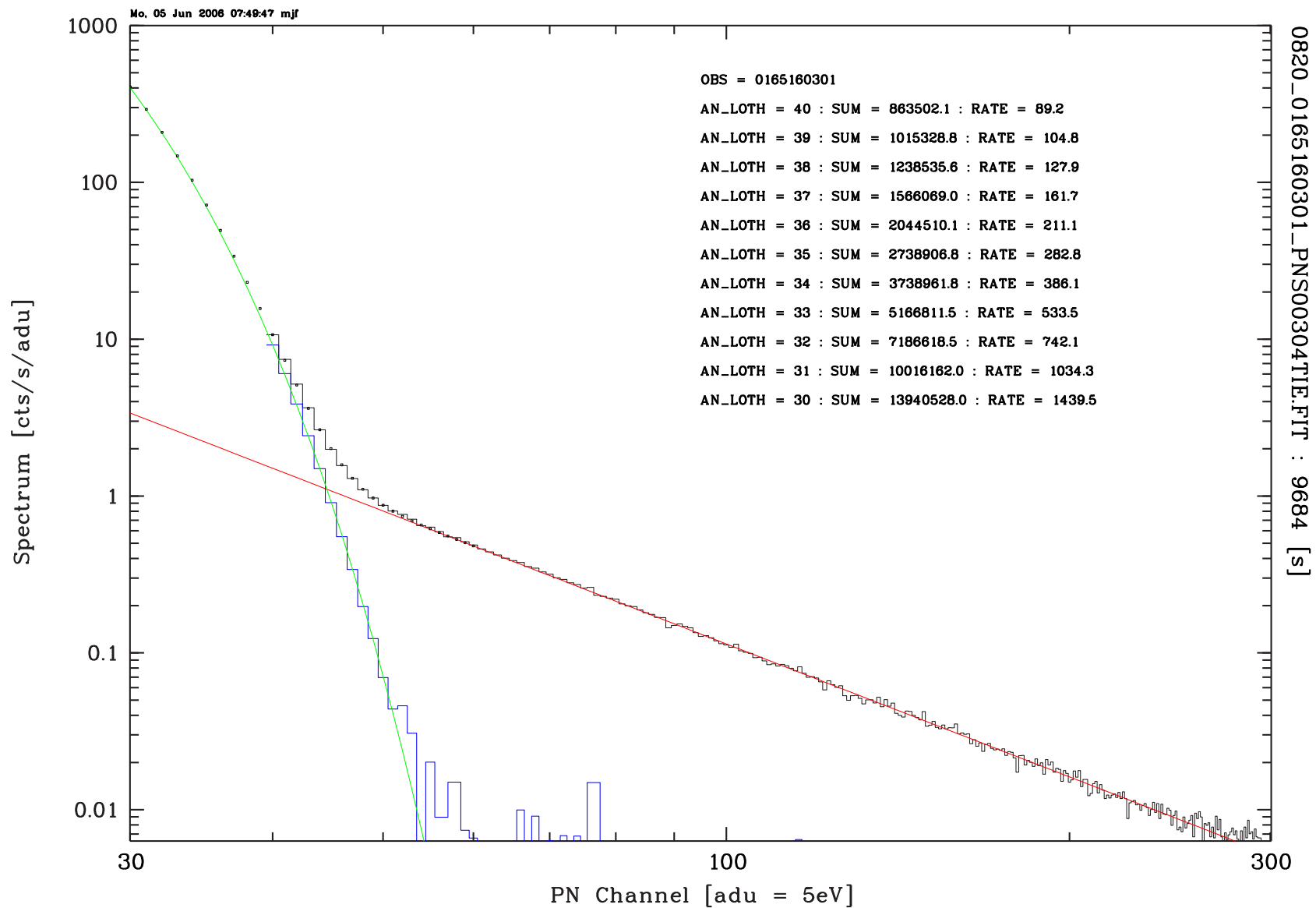
# TI mode: 0683\_0154150401\_PNS003



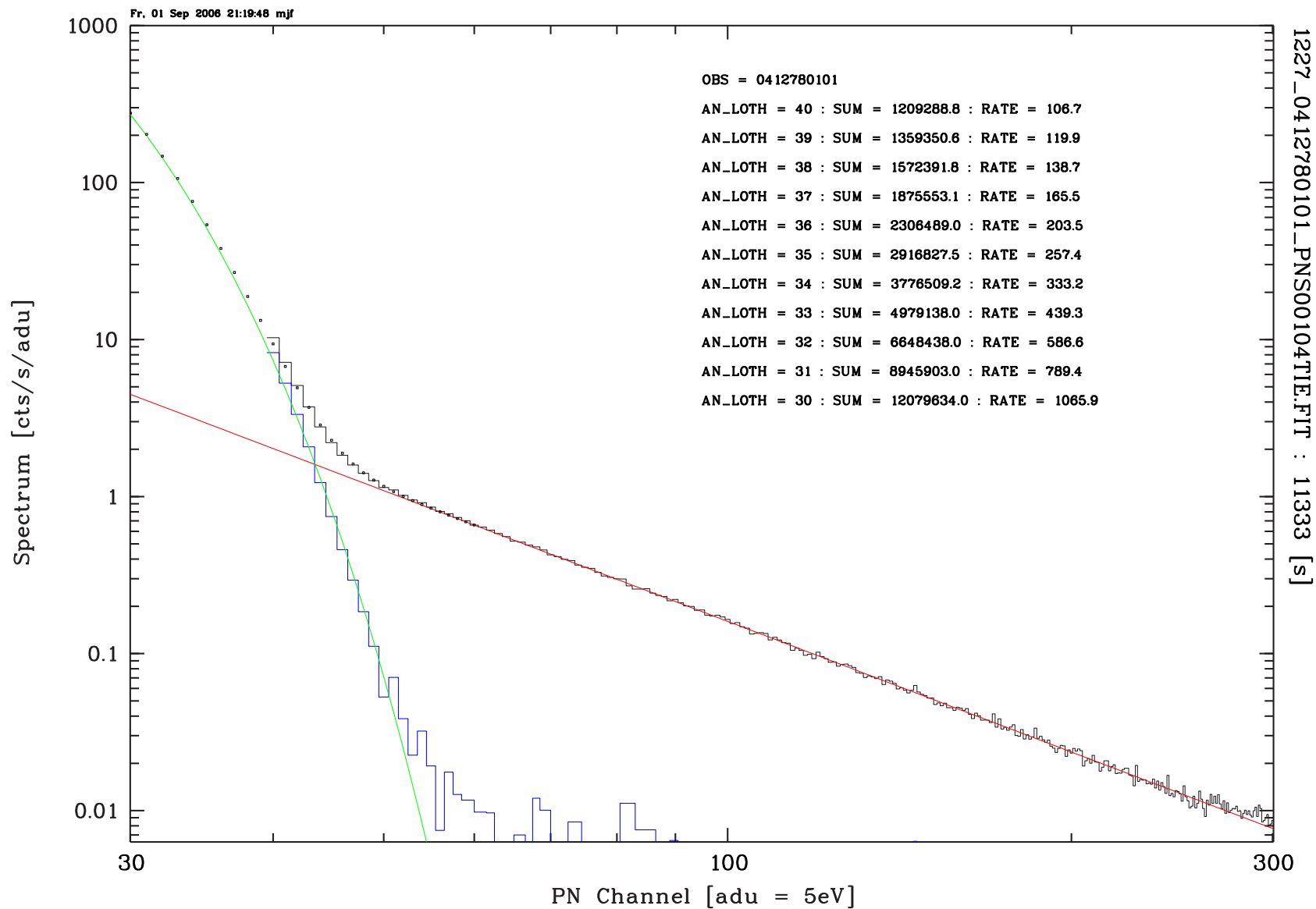
# TI mode: 0817\_0165160201\_PNS003



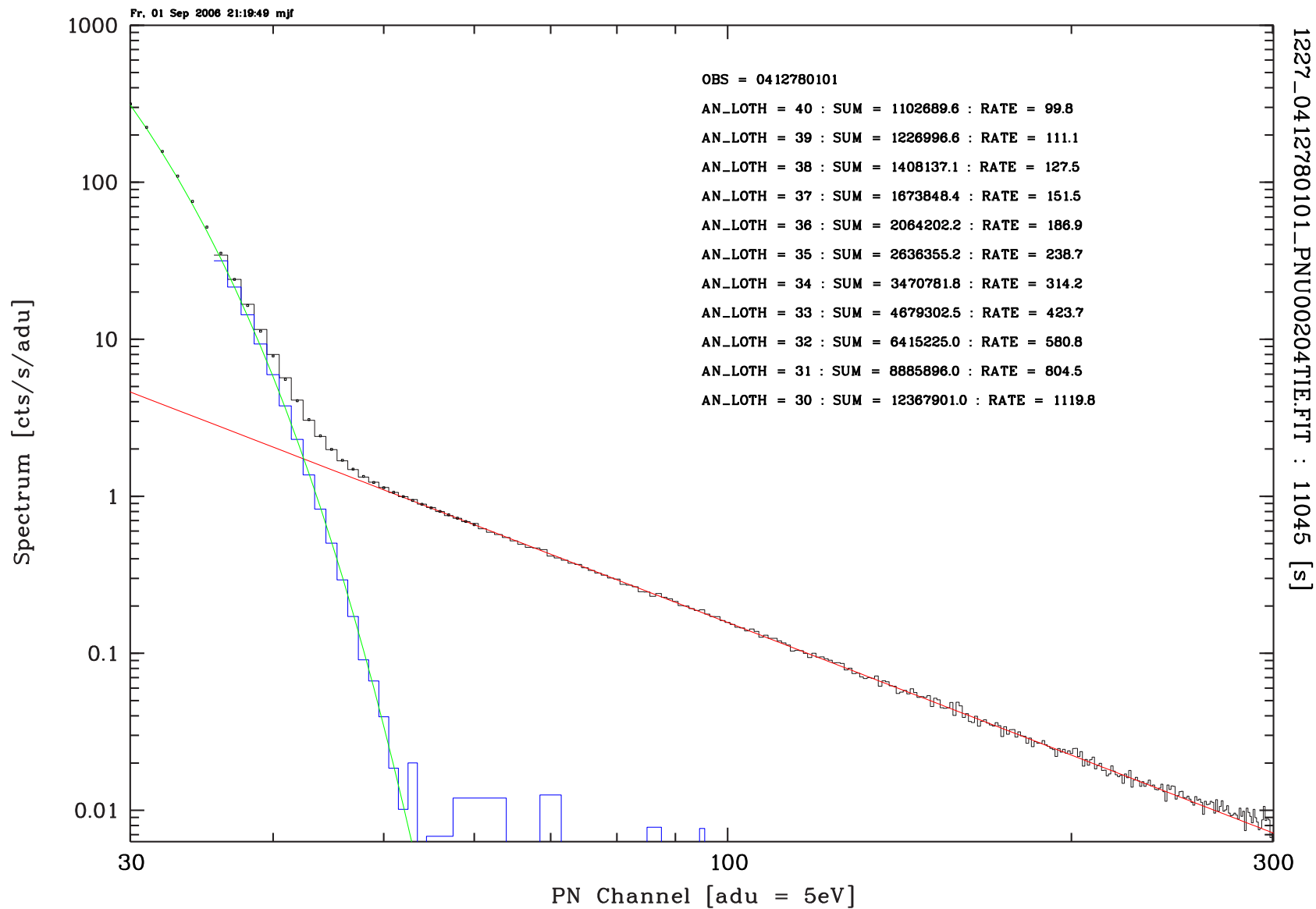
# TI mode: 0820\_0165160301\_PNS003



# TI mode: 1227\_0412780101\_PNS001



# TI mode: 1227\_0412780101\_PNU002



→: movie

## OCR-1762: summary + conclusions

- OCR-1762 1227\_0412780101\_PNU002 successful!
- count rates (dominated by low-energy spectral part) as expected [187 vs. 194 cts/s]
- no unexpected increase of background below default threshold
- maybe general trend, that background increases with time: increasing power-law normalization (solar minimum ?)