AstroSat Proposal Preparation

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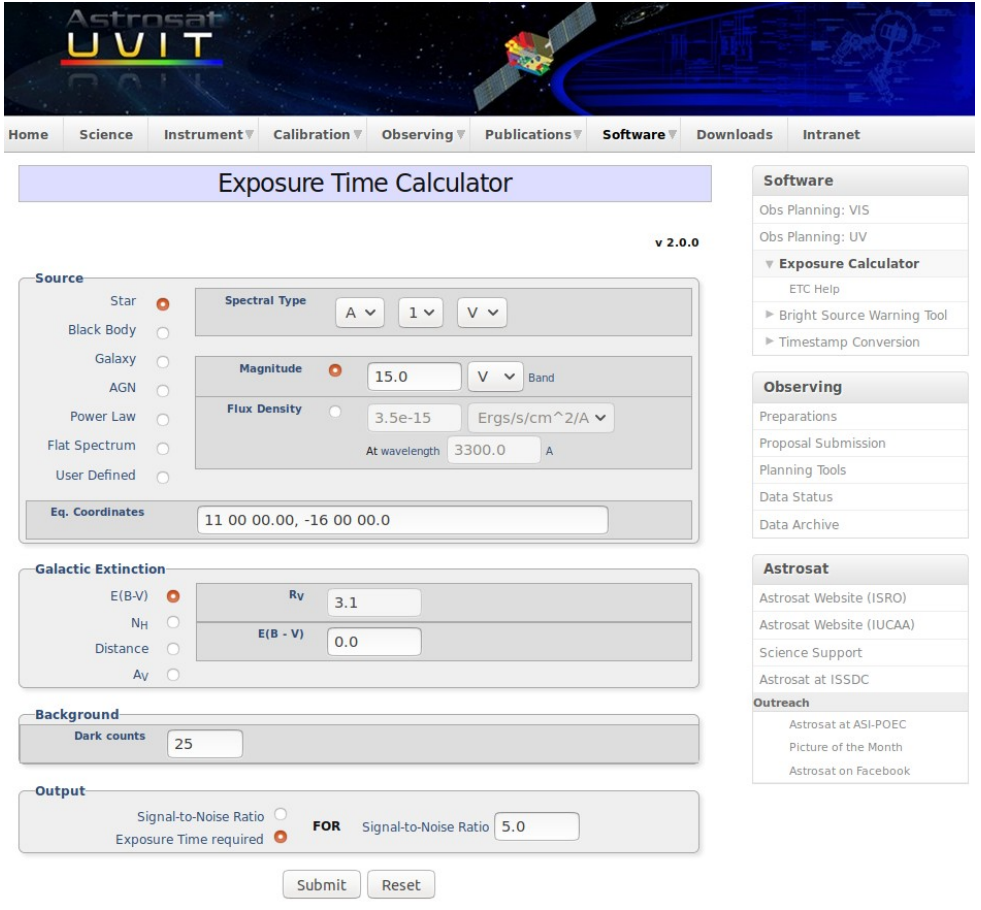
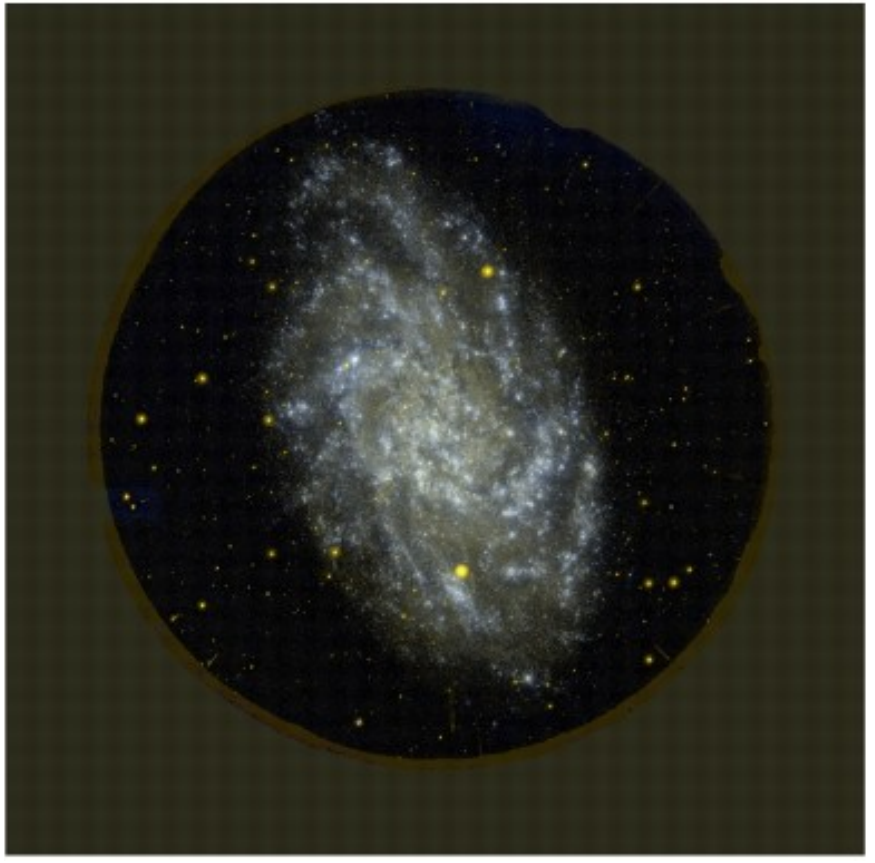
UVIT exposure time calculator



- Type of source: generate spectrum and normalize using uvit response
- Source magnitude (apparent magnitude): scale the spectrum
- Source co-ordinate: warning in case source is too close to galactic plane
- Galactic extinction: $R_v=A_v/(E(B-V))$
- Background: default 25 counts/sec which detector noise, provide larger if user thinks that he needs to consider other external contribution.
- Output: exposure time and SNR=(total source counts/total background counts)

Example

- Source : Galaxy, M 33
- Type Sc
- Redshift = 0.000597
- V magnitude = 5.28
- Rv = 3.1
- Av = 0.114



Data and image taken from http://ned.ipac.caltech.edu/cgi-bin/nph-objsearch?objname=M33&img_stamp=YES&list_limit=9&extend=no

Output

Galactic Latitude:	-30 deg. (Lower limit is 30 deg.)	
Filter	Source count rate (s^{-1})	Exposure Time (s)
FUV CaF2-1	357.1	28.00
FUV BaF2	303.6	33.00
FUV Sapphire	239.8	42.00
FUV Silica	97.86	102.0
FUV CaF2-2	315.3	32.00
NUV Silica	3722.4	2.69
NUV B15	78.70	127.0
NUV B13	1167.6	8.56
NUV B4	1471.1	6.80
NUV N2	334.0	30.00
VIS 3	$2.70 \times 10^{+04}$ Too Bright!	0.37
VIS 2	8161.4	1.23
VIS 1	6972.6	1.43
VIS ND1	623.9	16.00
VIS BK-7	$4.32 \times 10^{+04}$ Too Bright!	0.23

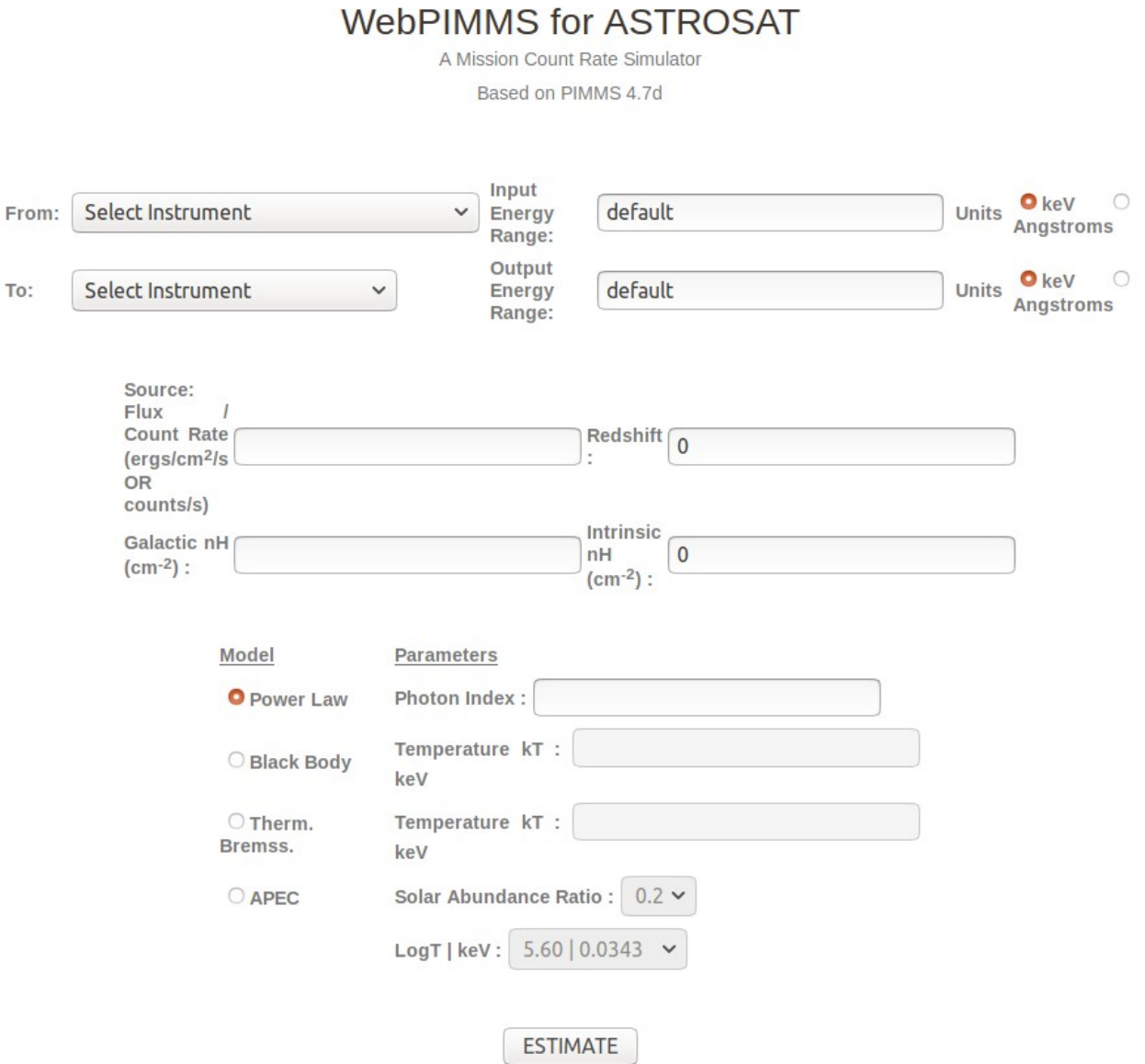
Note: Source Count Rate is over the instrument PSF, 1.8"

Download Output [TXT]

Return to User Inputs

W

- This tool is useful to get an approximate value of count rate with AstroSat instruments SXT, LAXPC, CZTI and SSM.
- One should have prior knowledge of some parameters with other instruments like XMM-Newton, RXTE, etc.



Web PIMMS output

WebPIMMS for ASTROSAT

Home Help About Contact

Web PIMMS for ASTROSAT - Result

INPUTS:

From	: xmm pn thin	
Instrument	: astrosat laxpc	
Input Energy	: 4.0-10.0	keV
Output Energy	: 3.0-80.0	keV
Source : Count Rate	: 50.0 counts/s	
Galactic nH	: 0.47e22 cm-2	
Redshift	: 0	
Intrinsic nH	: 0 cm-2	
Model	: Power Law	
Photon Index	: 1.48	

OUTPUTS:

* For power law model with photon index = 1.4800; NH = 4.700E+21
and 5.000E+01 cps in XMM PN THIN (4.000- 10.000keV)
%!% Pile-up corrected PATTERN=0-4 rate in 5 arcmin region assumed
(Internal model normalization = 1.830E-01)
* PIMMS predicts 3.129E+02 cps with ASTROSAT LAXPC (3.000- 80.000keV)
PIMMS >

Download the above output as a PDF file

Back

Simulation of energy spectrum for SXT, LAXPC, and CZTI

- To find the optimum exposure time
- Large exposure corresponds to less uncertainty in model parameters.
- Response files and background files are available on the website: http://astrosat-ssc.iucaa.in/?q=proposal_preparation
- Energy spectrum can be simulated using XSPEC using fakeit.
- ISIS code astrosat.sl can also be used. It also uses fakeit task.
- This code is available on ASSC proposal preparation web page.

ISIS (astrosat.sl)

- astrosat_sxt_simulate_spec
- astrosat_laxpc1_simulate_spec
- astrosat_laxpc2_simulate_spec
- astrosat_laxpc3_simulate_spec
- astrosat_czti_simulate_spec
- astrosat_xray_simulate_spec
- astrosat_get_count_rate
- astrosat_multi_rebin_spec
- astrosat_sim

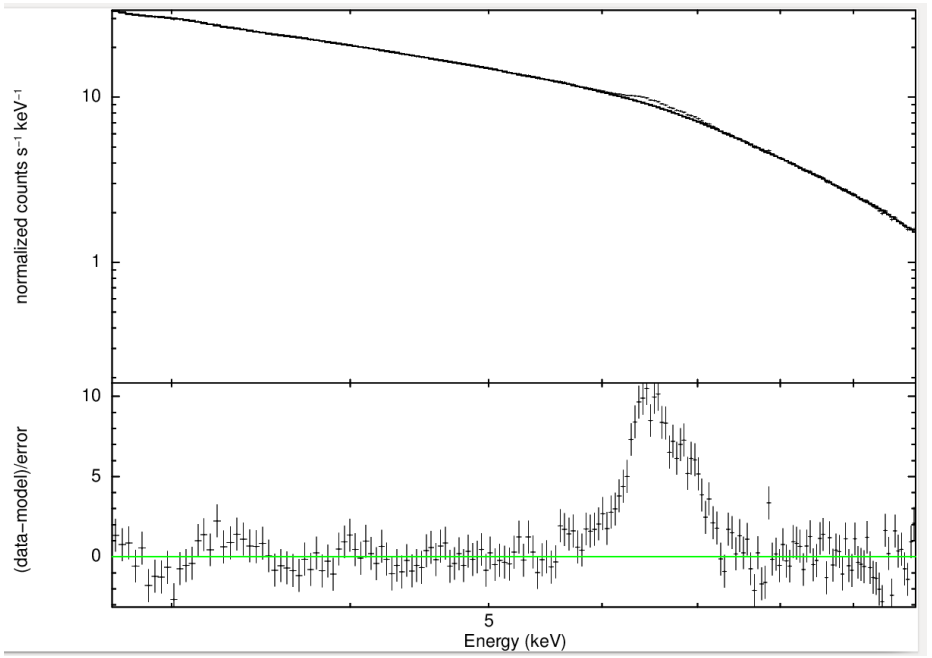
- astrosat_uvit_fuv_baf2_sim astrosat_uvit_fuv_caf21_sim
- astrosat_uvit_fuv_caf22_sim astrosat_uvit_fuv_saph_sim
- astrosat_uvit_fuv_sil_sim astrosat_uvit_fuv_sim
- astrosat_uvit_nuv_b13_sim astrosat_uvit_nuv_b15_sim
- astrosat_uvit_nuv_b4_sim astrosat_uvit_nuv_n2_sim
- astrosat_uvit_nuv_sil_sim astrosat_uvit_nuv_sim
- astrosat_uvit_sim astrosat_uvit_vis_bk7_sim
- astrosat_uvit_vis_nd1_sim astrosat_uvit_vis_sim
- astrosat_uvit_vis_vis1_sim astrosat_uvit_vis_vis2_sim
- astrosat_uvit_vis_vis3_sim

ISIS (astrosat.sl)

- Give the path of response and background files in the code astrosat.sl
- Invoke “isis” and load “astrosat.sl”
- Define the model one wants to fit.
- Use function like **astrosat_laxpc2_simulate_spec(exposure);**
- It will simulate the energy spectrum for LAXPC2 and fit the energy spectrum using the above-defined model
- Here exposure can be varied
- We can easily find the optimum value of exposure.
- One can also follow the example given in my talk: http://astrosat-ssc.iucaa.in/images/isisi_session_shahalam.pdf

Example: Black hole binary system: GX 339-4

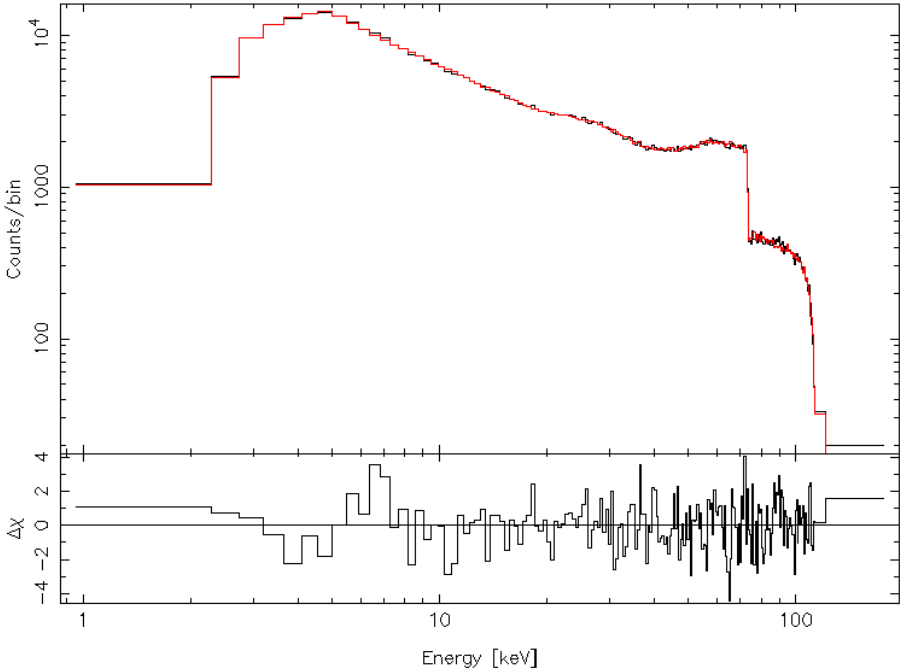
Model	Parameters	unit	value
TBABS	nH	10^{22}	0.5(fixed)
DISKBB	T_{in}	keV	$0.45^{+0.10}_{-0.09}$
	norm		$205^{+852.35}_{-148.92}$
Gaussian	LineE	keV	$6.56^{+0.023}_{-0.023}$
	sigma	keV	$0.33^{+0.028}_{-0.026}$
	norm	10^{-4}	$7.73^{+0.062}_{-0.58}$
powerlaw	PhoIndex		$1.50^{+0.007}_{-0.008}$
	norm		$0.20^{+0.003}_{-0.003}$



Values obtained with XMM-Newton observation, between energy band 2.5-10 keV.

For lower exposure time (1000 sec)

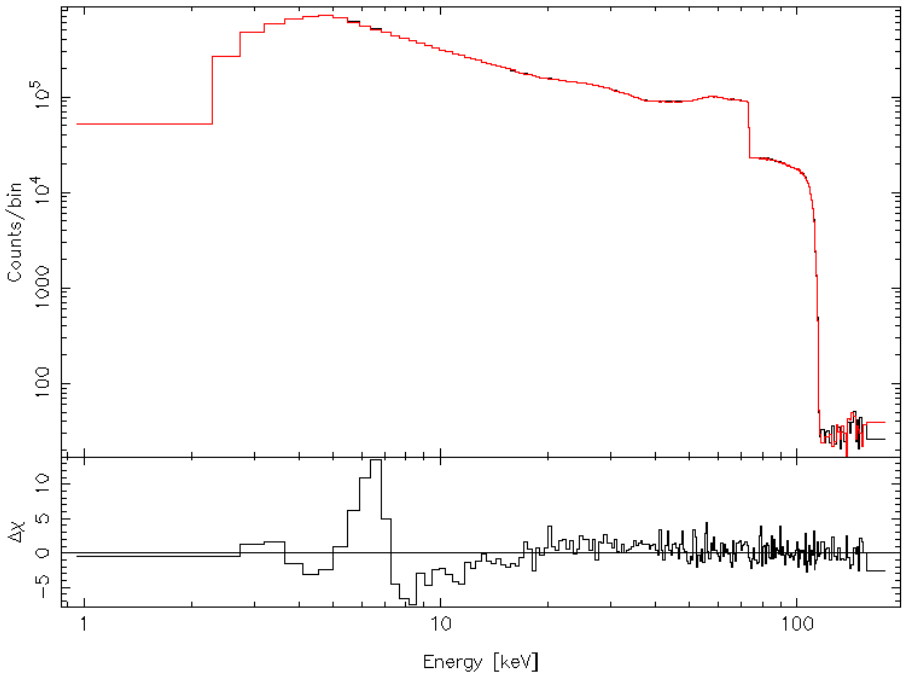
- idx param value min max
- 1 tbabs.nH (10^22) 0.27 0 0.62
- 2 diskbb.norm 1.3e-04 1.03e-06 554.453
- 3 diskbb.Tin (keV) 22.26 5.90 34.90
- 4 powerlaw.norm 0.21 0.19 0.23
- 5 powerlaw.Index 1.56 1.49 1.66
- 6 Gauss.norm 7.60e-04 4.56e-04 10.65e-04
- 7 Gauss.LineE (keV) 7.10 6.20 8.00
- 8 Gauss.Sigma (keV) 0 0 2.08



Iron line residual is not well constrained. To show the iron line residual, norm of Gaussian =0

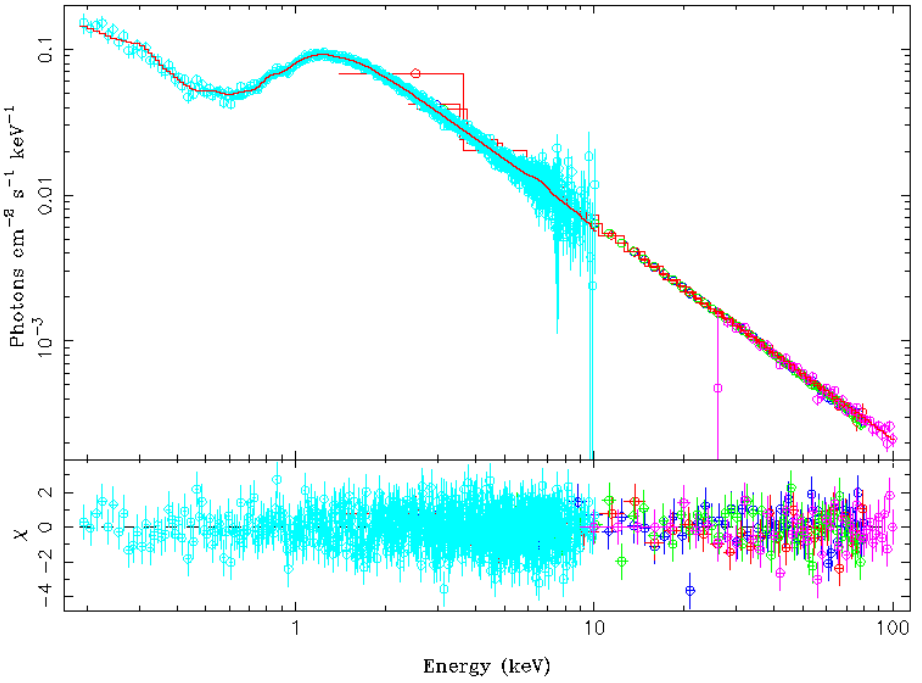
Larger exposure time (50000 sec)

- idx param value min max
- 1.tbabs.nH (10^22) 1.38 0.93 2.06
- 2.diskbb.norm 73.33 29.85 2322.58
- 3. diskbb.Tin (keV) 0.67 0.64 0.70
- 4 powerlaw.norm 0.20 0.20 0.21
- 5 powerlaw.Index 1.51 1.50 1.52
- 6 gaussian.norm 0.00078 0.00068 37.25
- 7 Gauss.LineE (keV) 7.55 6.20 7.80
- 8 Gauss.Sigma (keV) 0.045 0 2.77



Simultaneous plot of energy spectra of SXT, LAXPC, and CZTI

- CZTI rate = 11.17 +/- 0.13 counts/s
- SXT rate = 7.94 +/- 0.01 counts/s
- LAXPC3 rate = 293.60 +/- 0.12 counts/s
- LAXPC2 rate = 282.92 +/- 0.12 counts/s
- LAXPC1 rate = 308.34 +/- 0.13 counts/s



UVIT count rate

- astrosat_uvit_fuv_caf21_sim (2000.0);
- astrosat_get_count_rate (1);
- Output:
- Count rate 1.59
- Count rate error 0.028

END