

AstroSat Proposal Preparation

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UVIT exposure time calculator

Home Science Instrument Calibration Observing Publications Software Downloads Intranet

Exposure Time Calculator v 2.0.0

Source

Star Spectral Type A 1 V

Black Body

Galaxy

AGN

Power Law

Flat Spectrum

User Defined

Magnitude 15.0 Band

Flux Density 3.5e-15 Ergs/s/cm²/A

At wavelength 3300.0 A

Eq. Coordinates 11 00 00.0, -16 00 00.0

Galactic Extinction

E(B-V) R_v 3.1

N_H

Distance E(B - V) 0.0

A_v

Background

Dark counts 25

Output

Signal-to-Noise Ratio FOR Exposure Time required Signal-to-Noise Ratio 5.0

Submit Reset

Software

Obs Planning: VIS

Obs Planning: UV

Exposure Calculator

ETC Help

Bright Source Warning Tool

Timestamp Conversion

Observing

Preparations

Proposal Submission

Planning Tools

Data Status

Data Archive

Astrosat

Astrosat Website (ISRO)

Astrosat Website (IUCAA)

Science Support

Astrosat at ISSDC

Outreach

Astrosat at ASI-POEC

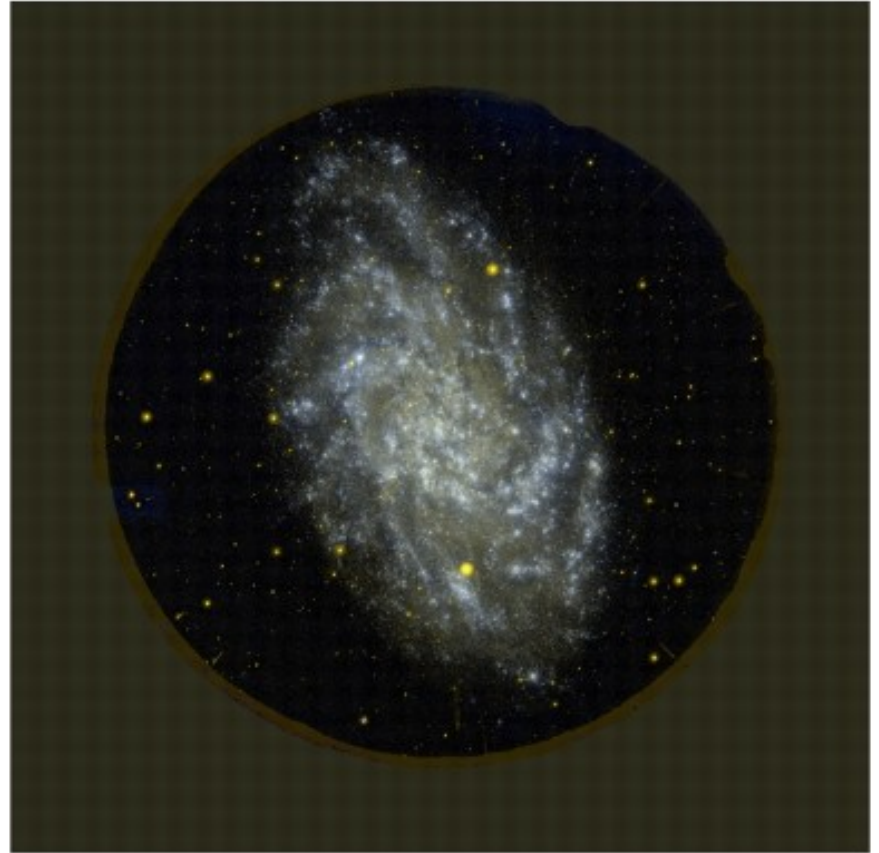
Picture of the Month

Astrosat on Facebook

- 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 $SNR = (\text{total source counts} / \text{total background counts})$

Example

- Source : Galaxy, M 33
- Type Sc
- Redshift = 0.000597
- V magnitude = 5.28
- $R_v = 3.1$
- $A_v = 0.114$



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 x 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 x 10 ⁺⁰⁴ Too Bright!	0.23

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

[Download Output \[TXT\]](#)

[Return to User Inputs](#)



WebPIMMS for ASTROSAT

A Mission Count Rate Simulator

Based on PIMMS 4.7d

From: Input Energy Range: Units keV Angstroms

To: Output Energy Range: Units keV Angstroms

Source:
Flux /
Count Rate (ergs/cm²/s OR counts/s) Redshift:

Galactic nH (cm⁻²): Intrinsic nH (cm⁻²):

Model	Parameters
<input checked="" type="radio"/> Power Law	Photon Index: <input type="text"/>
<input type="radio"/> Black Body	Temperature kT: <input type="text"/> keV
<input type="radio"/> Therm. Bremss.	Temperature kT: <input type="text"/> keV
<input type="radio"/> APEC	Solar Abundance Ratio: <input type="text" value="0.2"/>
	LogT keV: <input type="text" value="5.60 0.0343"/>

ESTIMATE

- 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

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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)

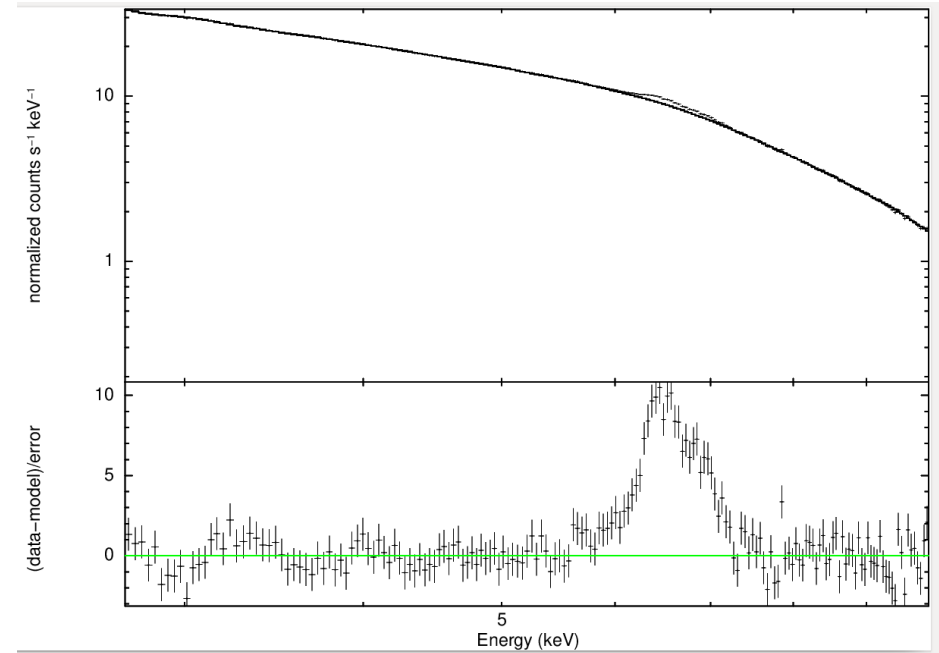
- astrosat_sxt_simulate_spec
- astrosat_laxpc1_simulate_spec
- astrosat_laxpc2_simulate_spec
- astrosat_laxpc3_simulate_spec
- astrosat_czti_simulate_spec
- astrosat_xray_simulate_spec
- astrosat_get_count_rate
- astrosat_multi_rebin_spec
- astrosat_sim
- astrosat_uvit_fuv_baf2_sim
astrosat_uvit_fuv_caf21_sim
- 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

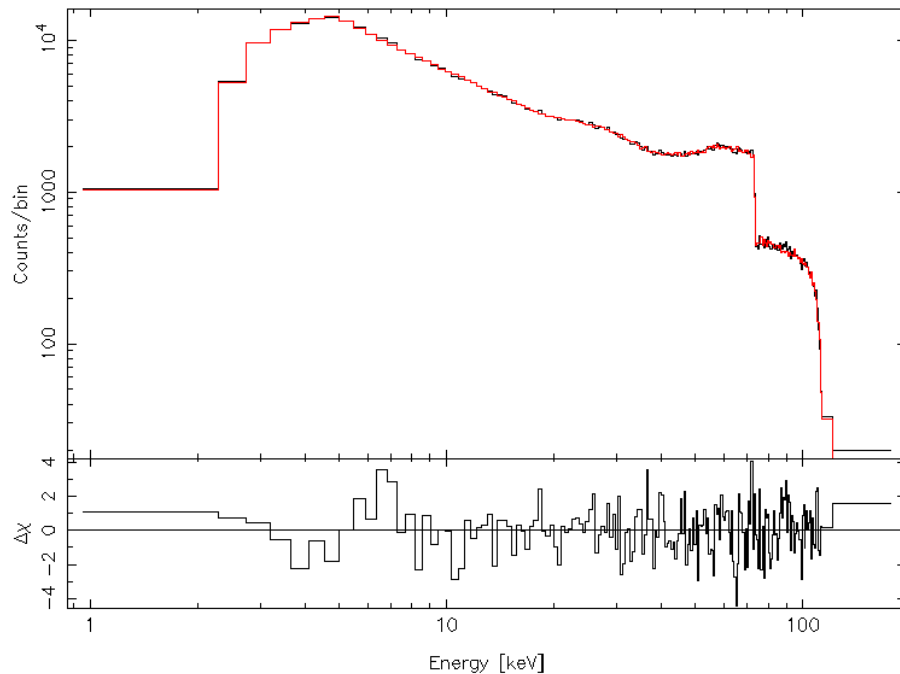
Model	Parameter	unit	value
	S		
TBABS	nH	10^{22}	0.5(fixed)
DISKBB	T_{in}	keV	$0.45^{+0.10}_{-0.09}$
	norm		$205^{+852.35}_{-148.92}$
Gaussian	LineE	keV	$6.56^{+0.023}_{-0.023}$
	sigma	keV	$0.33^{+0.028}_{-0.026}$
	norm	10^{-4}	$7.73^{+0.062}_{-0.58}$
powerlaw	PhoIndex		$1.50^{+0.007}_{-0.008}$
	norm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



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

For lower exposure time (1000 sec)

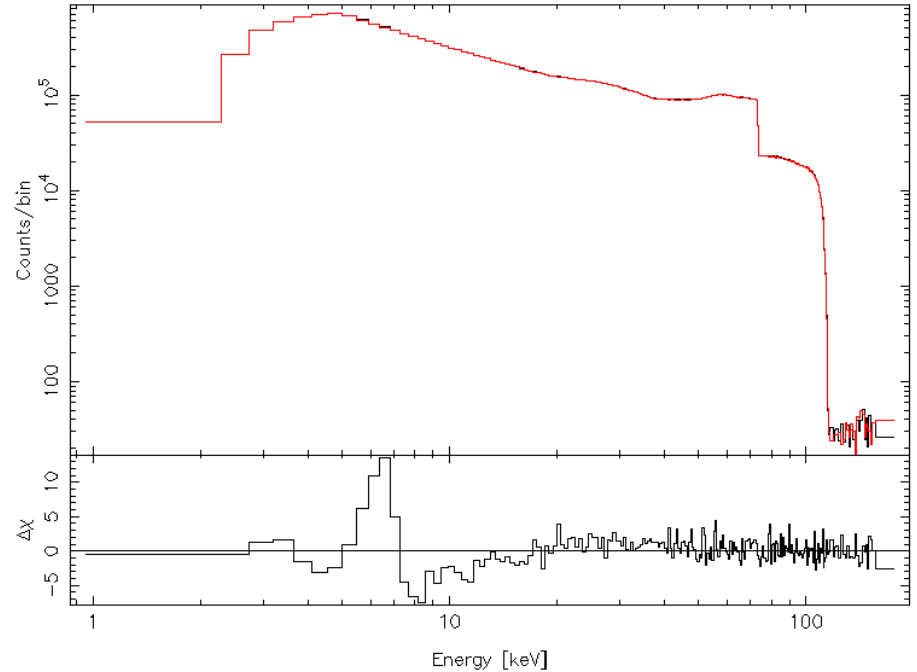
• idx	param	value	min	max
• 1	tbabs.nH (10^{22})	0.27	0	0.62
• 2	diskbb.norm	$1.3e-04$	$1.03e-06$	554.453
• 3	diskbb.Tin (keV)	22.26	5.90	34.90
• 4	powerlaw.norm	0.21	0.19	0.23
• 5	powerlaw.Index	1.56	1.49	1.66
• 6	Gauss.norm	$7.60e-04$	$4.56e-04$	$10.65e-04$
• 7	Gauss.LineE (keV)	7.10	6.20	8.00
• 8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



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

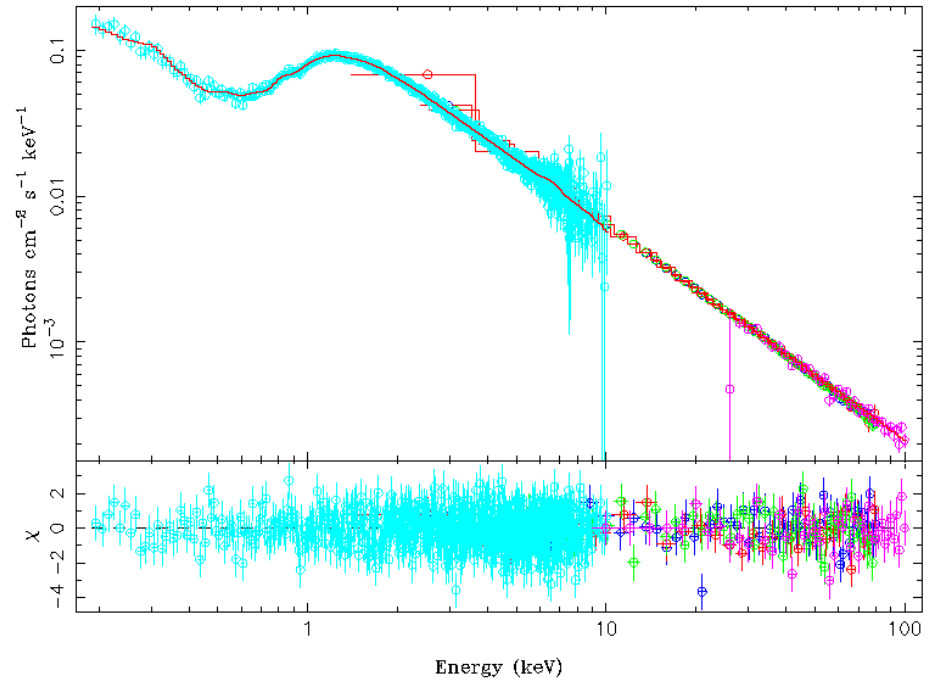
Larger exposure time (50000 sec)

• 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_uvfit_fuv_caf21_sim (2000.0);`
- `astrosat_get_count_rate (1);`
- Output:
- Count rate 1.59
- Count rate error 0.028

END