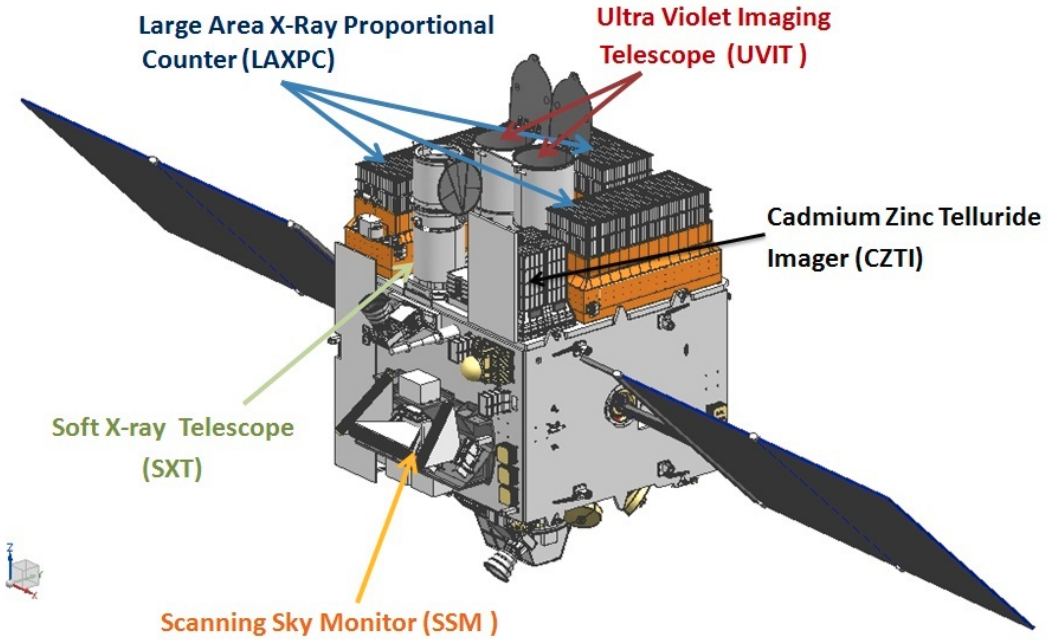
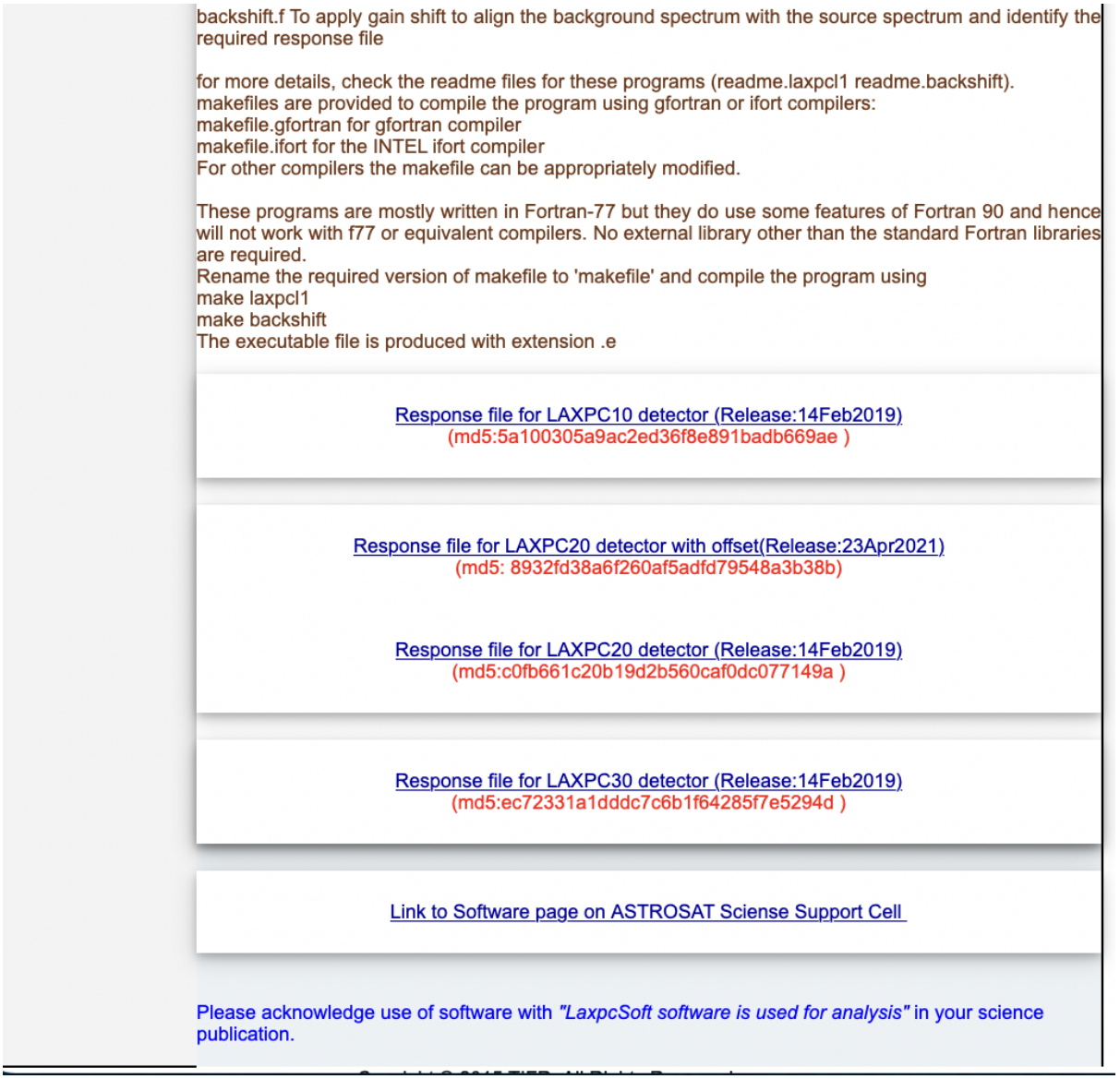
AstroSAT Data Analysis



1. Download the laxpcl1 and backshift package from https://www.tifr.res.in/~astrosat_laxpc/LaxpcSoft.html

2. Also download the response file for LAXPC10 and LAXPC20 from same webpage



3. To install the software

   mkdir laxpcsoft

   cd laxpcsoft

   tar -xvf filename.tar.gz

   cp makefile.gfortran makefile

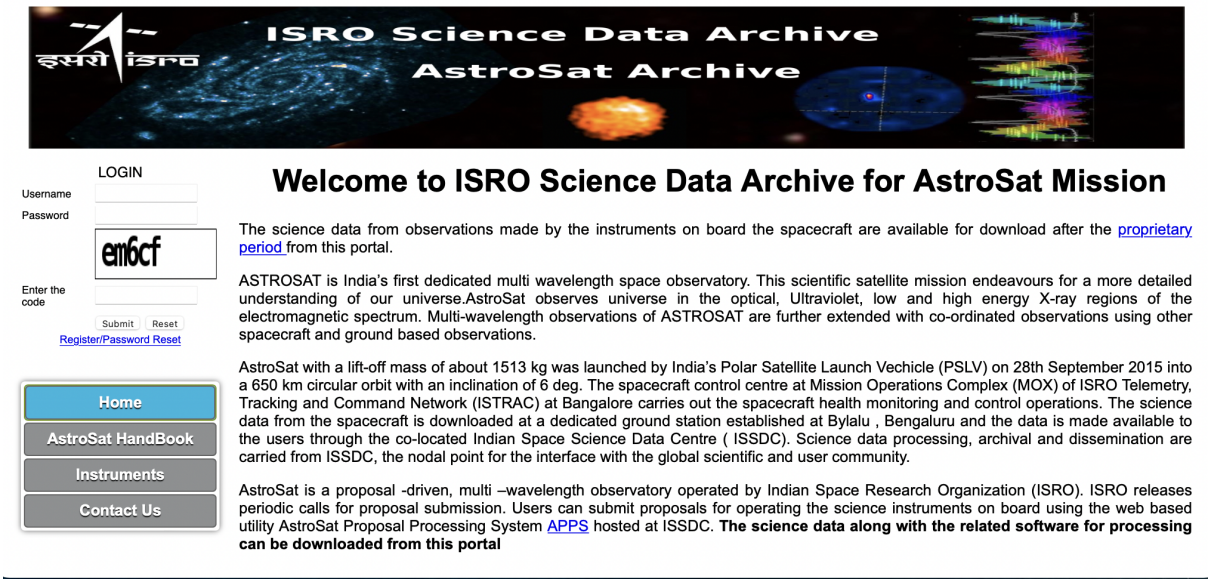
   make laxpcl1

   make backshiftv3

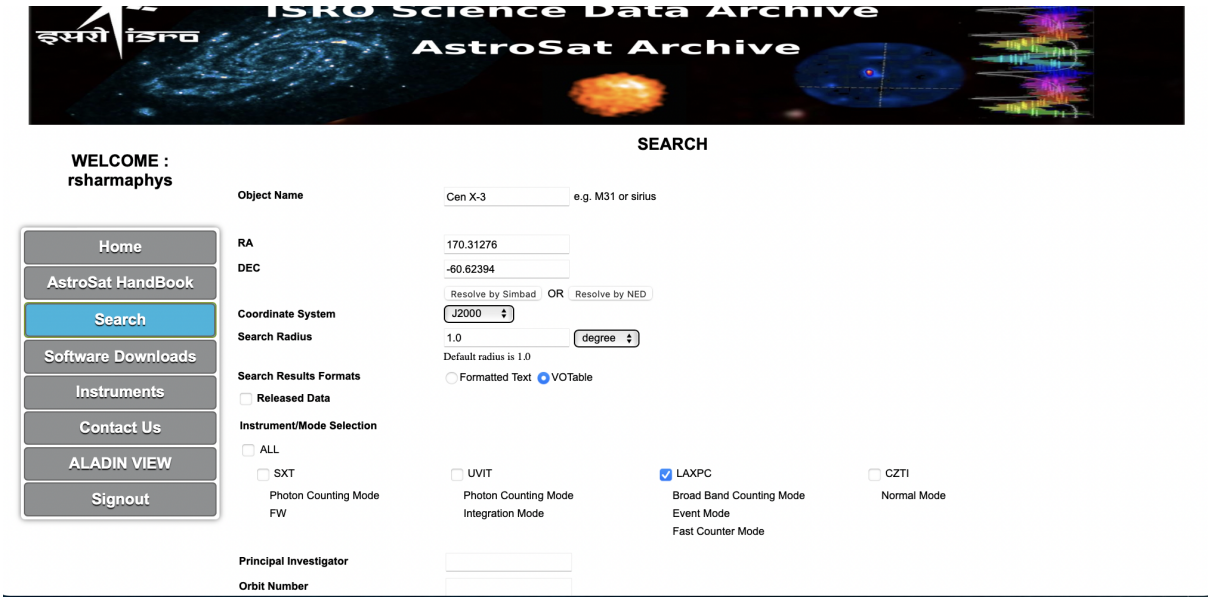
4. Download the data from

   https://astrobrowse.issdc.gov.in/astro_archive/archive/Home.jsp

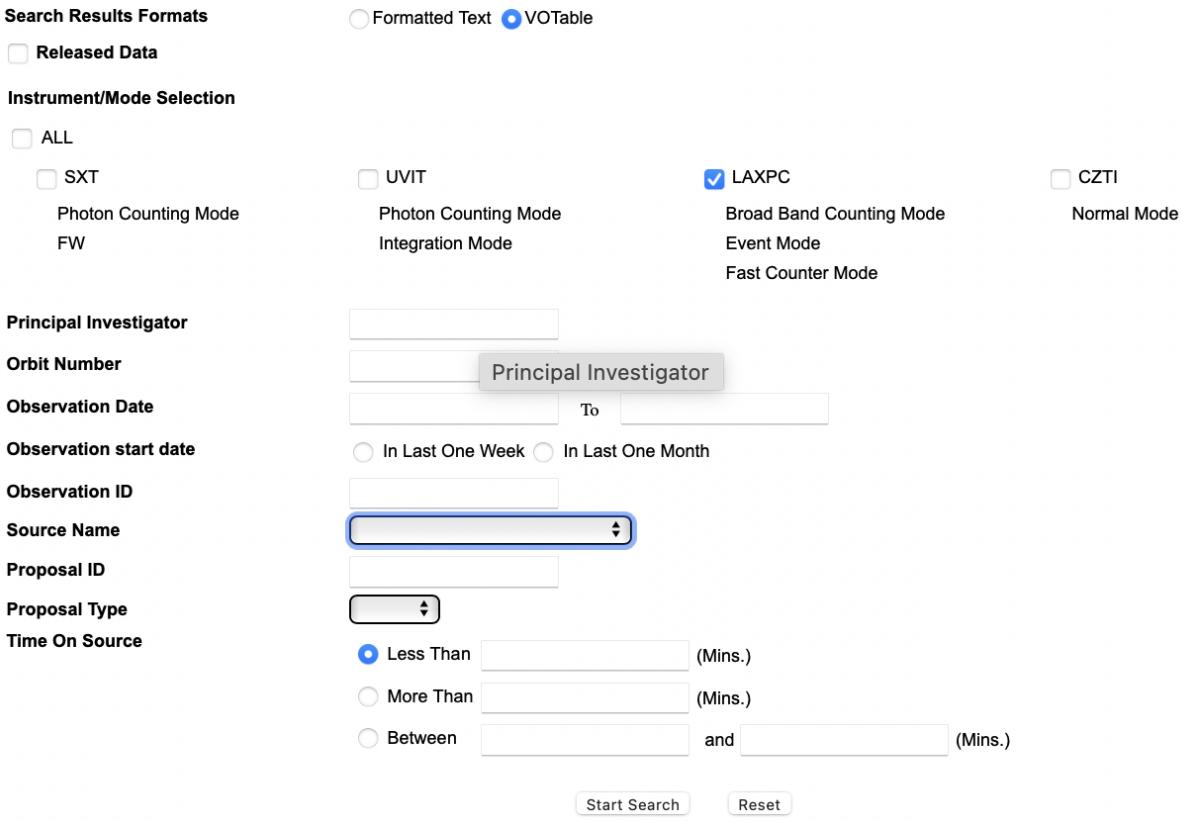
5. Login id is required to download the data. If you have an account then login otherwise make an account.



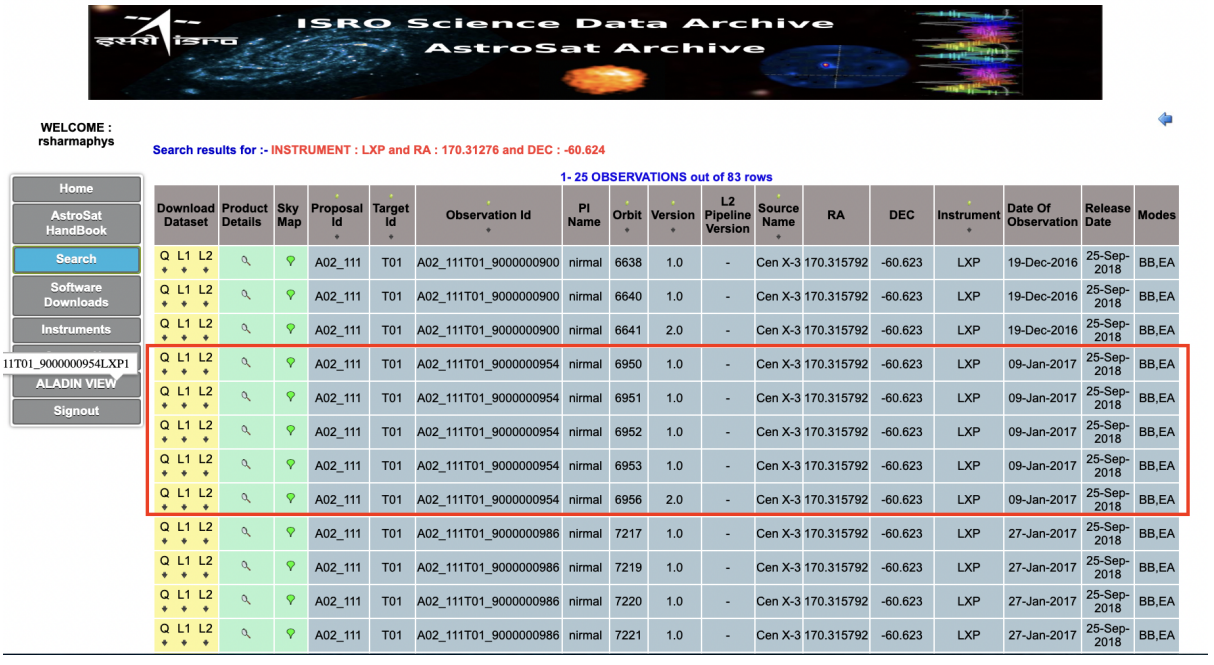
6. Enter the source details in Search form enter source name



If Simbad and NED are unable to resolve the source, one can look for the source in the source list and select.



7. Download the Level 1 (L1) data for obs-ID=A02_111T01_900000095**4** and orbit cycle= 6956



Sometimes marged data is stored in the last orbit. Then download only last orbit data.

8. Unzip the download directory:

   *for f in *.zip; do unzip $f; done;*

9. Check the path of your level 1 directory which will be the input directory.

   $ pwd

10. Now everything will be run in the laxpcsoft directory and all output will be in the same directory.

11. Edit the input path to level 1 data in *findfile* in the laxpcsoft* directory.

```
# find /mnt/Data/Data/level-2/ -name "*00000$1*.???" | grep -v lxp2 | grep -v lxp3 | grep -v issdc | grep -
v "gti$" | grep -v "frt$" | grep -v "pha$" | grep -v "orb$" | grep -v "att$" | grep -v "lbt$" | grep -v
frame | sort > ls2
# find /mnt/Data/Data/level-1/ -name "*00000$1lxp1EA_level1.fits" | sort > ls1
#find /mnt/Data/Data/level-1/ -name "*00000$1*.*" | grep -v lxp2 | grep -v lxp3 | grep -v issdc | grep -v
"gti$" | grep -v "frt$" | grep -v "xml$" | grep -v "hk$" | grep -v "orb$" | grep -v "txt$" | grep -v
"bti$" | grep -v "aux1" | grep -v "aux2" | grep -v frame | grep -v ".tar" | sort > ls1
find home/rsharma/X-ray_workshop/day5_astrosat/*000$1* -name "*00000$1*.*" | grep -v lxp2 | grep -v lxp3 |
grep -v issdc | grep -v "gti$" | grep -v "frt$" | grep -v "xml$" | grep -v "hk$" | grep -v "orb$" | grep -
v "txt$" | grep -v "bti$" | grep -v "aux1" | grep -v "aux2" | grep -v frame | grep -v ".tar" | sort > ls1
#find /mnt/Data/Data/level-1/forD/*000$1* -name "*00000$1*.*" | grep -v lxp2 | grep -v lxp3 | grep -v
issdc | grep -v "gti$" | grep -v "frt$" | grep -v "xml$" | grep -v "hk$" | grep -v "orb$" | grep -v "txt$"
| grep -v "bti$" | grep -v "aux1" | grep -v "aux2" | grep -v frame | grep -v ".tar" | sort > ls1
```

12. Then run

    sh findfile 954

13. This will create ls1 file which will show the input level 1 files with full path

14. Replace ls1 with laxpcl1.inp

    mv ls1 laxpcl1.inp

15. Create a gti.inp with zero time.

    echo "0" > gti.inp

16. Now run ./laxpcl1 with default parameters.

```
rsharma:../laxpcsoft$ ./laxpcl1.e
 Type lxp,tbin,anode [1 1.0 0]
/
 Type channel range for light curve [0 1023]
/
 Type No. of channels in spectrum: 1024/512/256 [         512 ]
/
 Type uld bin,Earth occultation, event flag [-1 1 2]
/
```

17. It will create the lxp1level2.gti. Now replace lxp1level2.gti to gti.inp

    mv lxp1level2.gti gti.inp

18. Set the correct background according to date of observation in **back4.inp** file

    backfit.lxp10**jan17**

    backlxp10mar16ul1.pha

    backlxp10mar16ul2.pha

    backlxp10mar16ul3.pha

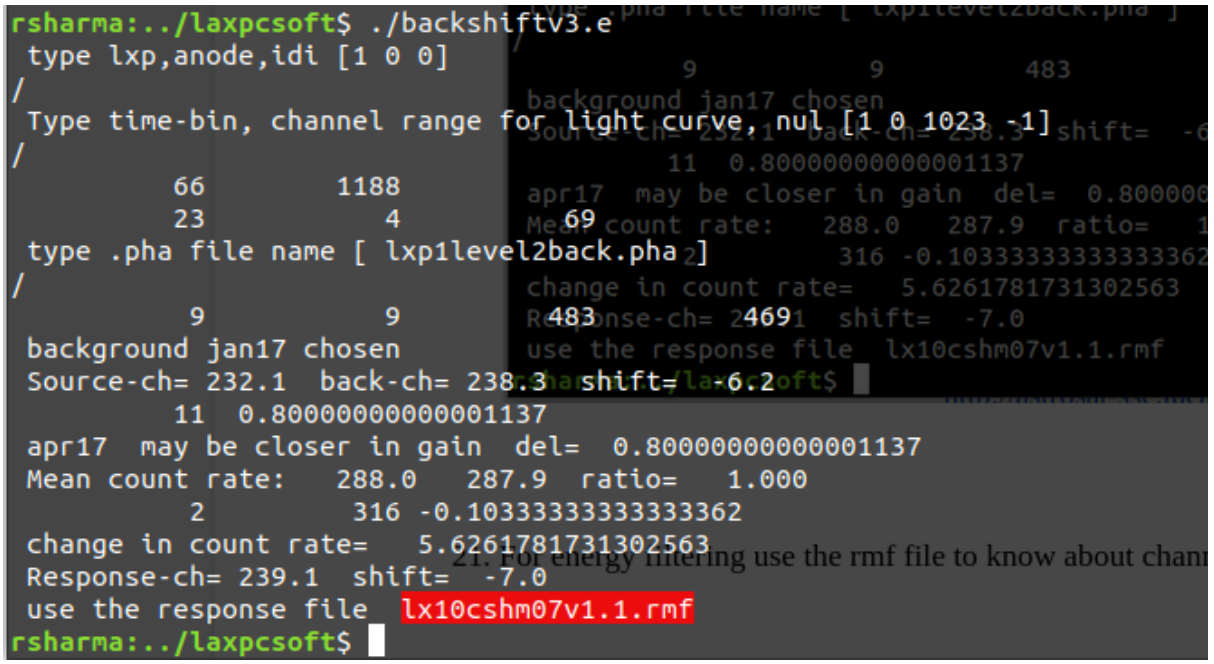
    backlxp10mar16ul4.pha

    backlxp10**jan17**.pha

    backfit3.lxp10mar16

19. Now rerun the ./laxpcl1

20. Run ./backshiftv3



21. For energy filtering use the rmf file to know about channel-energy relation

22. You can also use software provided by IUCAA and barycentre code (**AS1bary**) can be downloaded from http://astrosat-ssc.iucaa.in/data_and_analysis

23. Run as1bary for barycentric corrections

axBary - Usage:

/home/rsharma/as1bary/as1bary -i orbitFile -f inputDataFile [-o outFile]

[-ra RA] [-dec DEC] [-ref refFrame]

Useful inputs from the terminal: For **laxpcl1**

lxp,tbin,ian

lxp: S. No. of LAXPC detector (1-3)

tbin: Time bin for light curve in seconds

ian: Anodes to be used for light curve/ spectrum (0-10)

ian=0: all main anodes (A1-7) are used

ian=1: Top layer (A1+A2)

ian=3: Second layer (A3+A4)

ian=2,4-10: The respective anode

icl,icu : The range of Channel no. to be used in light curve (0-1023)

default is icl=0, icu=1023, type "/" to use default

nca : No. of channels to be used in spectrum (256/512/1024)

Always use the default value. To use default type '/'

nul,je,iev : To use default type '/'

Useful inputs from the terminal: For **backshiftv3**

lxp, ian, idi

lxp: S. No. of LAXPC detector (1-3)

ian: Anodes to be used for light curve/ spectrum (0-10), same as laxpcl1

idi: To control the removal of diurnal oscillation

idi=0 apply the correction (only if duration is long enough)

any other value will suppress the correction

tbin lcl lcu nul

tbin: Time bin used for generating the light curve

lcl,lcu: Channel range used for light curve (between 0 1023)

nul: flag to fit low energy background. Use nul=-2 for using fit to layer 1 background for channels 0-200 (< about 20 keV)

filename: To use default type '/'