

Steps of CZTI data analysis using level2 pipeline software

Installation and use of CZTI data reduction software:

<http://astrosat-ssc.iucaa.in/?q=cztiData>

Sample data: Crab (Observation ID : 9000000778, Observation Date : 8th November 2019)

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

One can use a single task cztpipeline to generate all the level2 products like image, lightcurves, spectra and response files. Individual tasks can also be used to create the same level2 products. See the user guide http://astrosat-ssc.iucaa.in/uploads/czti/CZTI_level2_software_userguide_V2.1.pdf.

unzip the level1 data using the command

```
>unzip LEVEL1AS1CZT20161108A02_090T01_9000000778.zip
```

```
>heainit
```

```
>cztpipeline
```

```
*****
```

```
Running AstroSat CZTI Pipeline
```

```
Task: cztpipeline Version:2.1 Release Date:2018-03-08
```

```
*****
```

```
Enter L1 Directory Path[]
```

```
/home/user_name/walkthrough/czti/20161108_A02_090T01_9000000778_level1
```

```
Enter path to create L2 pipeline products[./]
```

```
Enter Start Step[1]
```

```
Enter End Step[3]
```

```
Overwrite existing file?(YES/NO):[YES]
```

```
Enter RA of source in decimal degrees[83.63224]
```

```
Enter DEC of source in decimal degrees[22.01047]
```

```
After this, following level2 products are generated in the directory.
```

```
20161108_A02_090T01_9000000778_level2/czti/modeM0
```

Output files:

```
AS1A02_090T01_9000000778cztM0_level2.aspect_Q0
```

```
AS1A02_090T01_9000000778cztM0_level2.aspect_Q1
```

```
AS1A02_090T01_9000000778cztM0_level2.aspect_Q2
```

```
AS1A02_090T01_9000000778cztM0_level2.aspect_Q3
```

```
AS1A02_090T01_9000000778cztM0_level2_bc.evt
```

```
AS1A02_090T01_9000000778cztM0_level2_bc.fits
```

```
AS1A02_090T01_9000000778cztM0_level2_bc_livetime.fits
```

```
AS1A02_090T01_9000000778cztM0_level2_bunch.fits
```

```
AS1A02_090T01_9000000778cztM0_level2.fits
```

```
AS1A02_090T01_9000000778cztM0_level2.gti
```

```
AS1A02_090T01_9000000778cztM0_level2.hdr
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_badpix.fits
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_bc_ds.evt
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_bc_ds_pc.evt
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_clean.dph
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_clean.dpi
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_clean.evt
```

```
AS1A02_090T01_9000000778cztM0_level2_quad_clean.img_Q0
```

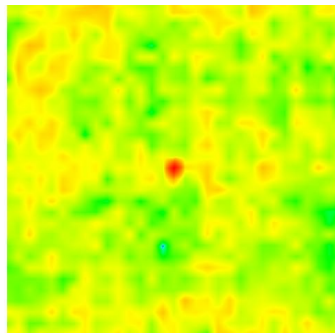
```

AS1A02_090T01_9000000778cztM0_level2_quad_clean.img_Q1
AS1A02_090T01_9000000778cztM0_level2_quad_clean.img_Q2
AS1A02_090T01_9000000778cztM0_level2_quad_clean.img_Q3
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q0.lc
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q0.pha
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q0.rsp
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q1.lc
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q1.pha
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q1.rsp
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q2.lc
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q2.pha
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q2.rsp
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q3.lc
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q3.pha
AS1A02_090T01_9000000778cztM0_level2_quad_clean_Q3.rsp
AS1A02_090T01_9000000778cztM0_level2_quad_clean_weight.evt
AS1A02_090T01_9000000778cztM0_level2_quad_livetime.fits

```

Plot the image using ds9 (source is in the centre of the image)

```
>ds9 AS1A02_090T01_9000000778cztM0_level2_quad_clean.img_Q0
```



Plot the lightcurves:

Default binning is 1000 sec.

To generate lightcurves of different time binsize, run cztbindata task.

```
/walkthrough/czti/20161108_A02_090T01_9000000778_level2/czti/modeM0$ cztbindata
```

```
[ main.cpp:34] In Main reading par file
```

```
Enter input event file [] : AS1A02_090T01_9000000778cztM0_level2_quad_clean.evt
```

```
Enter MKF file [] :
```

```
/home/user_name/walkthrough/czti/analysis_czti/20161108_A02_090T01_9000000778_level2/czti/
AS1A02_090T01_9000000778czt_level2.mkf
```

```
Enter badpixel file [] : AS1A02_090T01_9000000778cztM0_level2_quad_badpix.fits
```

```
Enter livetime file [] : AS1A02_090T01_9000000778cztM0_level2_quad_livetime.fits
```

```
Enter output file [] : lcv_binsize_1s
```

```
Enter output event file with mask weights [] : evt_with_mskwt.evt
```

```
Apply maskweights (yes/no) [] :y
```

```
Enter RA of source in decimal degrees <0 - 360> [] : 83.63308
```

```
Enter DEC of source in decimal degrees <-90 - 90> [] : 22.0145
```

```
Enter badpixel threshold to be applied [] : 0
```

```
Enter output type <lc, spec, both> [] : lc
```

```
Enter time bin size for lc [] : 1.0
```

```
Enter energy range (in keV) [] : - (To generate lightcurves in a specific energy range, you can specify the required energy ranges in
the above task)
```

Overwrite Existing files(yes/no) [] : y