

ReadMe

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1. Top-level directory structure

File or folder	Content
./ReadMe.pdf	This document
./data_spex/	X-ray spectra data and response files in SPEX format
./img/	Chandra image file
./region/	Ds9 region files for spectral extraction (in wcs coordinates)
./spex/	SPEX fitting commands and results
./pynb/	Python Jupyter notebook and data files to reproduce figures

2. X-ray Spectral Data and Response Files

Data files are located in `./data_spex/`, organized by extraction method and observatory:

Subdirectory	Content
<code>./data_spex/epic+rgs/</code>	XMM-Newton RGS and EPIC spectra for the cluster center analysis
<code>./data_spex/radial/chandra/</code>	Chandra ACIS annulus spectra (annu*) to generate radial profile
<code>./data_spex/radial/xmm/</code>	XMM-Newton EPIC annulus spectra (annu*) and the central region to generate radial profile
<code>./data_spex/vtbin/xmm/</code>	XMM-Newton EPIC Voronoi binned spectra (poly*) except the central regions

Subdirectory	Content
<code>./data_spex/vtbin/chandra/</code>	Chandra ACIS Voronoi binned spectra (poly*) for central regions

Each data file consists of:

- *.`spo` : spectral data
- *.`res` : response files

3. SPEX Fitting Results

SPEX command files are located in `./spex/` and are used to reproduce the spectral fitting results presented in the paper.

Subdirectory	Content
<code>./spex/obs/</code>	Data loading scripts for different observations and extraction regions
<code>./spex/model/</code>	Model definition scripts
<code>./spex/fittings/</code>	Best-fit parameter files

Usage Instructions

The main script is `./spex/run_main.com`. Use the `log exe` command within this file to reference different scripts for switching data and models:

1. Data Loading (in `./spex/obs/`):

- `load_rgs_epic.com` : Load RGS + EPIC combined data
- `load_xmm_center.com` : Load XMM central region data (radial profile center)
- `load_xmm_annu*.com` : Load XMM radial annulus data
- `load_chandra_annu*.com` : Load Chandra radial annulus data
- `load_xmm_poly*.com` and `load_chandra_poly*.com` : Load Voronoi binned data

2. Model Loading (in `./spex/model/`):

- `model_rgs+epic.com` : For RGS + EPIC joint fitting (use only after `load_rgs_epic.com`)
- `model_epic_agm.com` : For XMM central region fitting (use only after `load_xmm_center.com`)

- `model_ccd.com` : For all other CCD spectra (Chandra and XMM radial annuli, Voronoi bins)

3. Fitting Results (in `./spex/fittings/`):

After loading the data and model, use `log exe` to reference the corresponding `.com` file to load the best-fit parameters from the paper.

Images and ds9 Region Files

Directory	Content
<code>./img/</code>	Base images used in the paper (e.g., <code>broad_thresh.img</code>)
<code>./region/</code>	ds9 region files (<code>.reg</code> format) for spectral extraction regions

Region file descriptions:

- `radial/annu-*.reg` : Radial annulus region definitions
- `vtbin/sn70.reg` : Voronoi bin region definitions
- `xmm-bkg.reg` , `chandra-bkg.reg` : Background region definitions
- `xmm-circ.reg` : EPIC central region definition for joint fitting with RGS
- `chandr-agn.reg` : AGN region definition(excluded) in Chandra spectral extraction

Python Jupyter Notebooks to Reproduce Figures

Notebook:

`./pynb/run_plot.ipynb` : Jupyter notebook to generate Figures 1-3 in the paper

Dependencies:

`./pynb/read_qdp.py` : Helper function to read QDP-format spectral files

Input Data: located in `./pynb/data/`