



Standard Data Processing

The CXC performs standard data processing (SDP) on all Chandra science data; this procedure is commonly referred to as "the pipeline." The processing runs in several stages or "levels", each of which is built on the results of the preceding level. A well-defined set of data products are made at the end of each level. [Standard Data Processing Release Notes](#) are maintained for current and all previous SDP release versions.

Level 0 (L0):

takes raw Chandra spacecraft telemetry and splits it into convenient [FITS](#) files. The telemetry is then divided along the observation boundaries. These products should not be used for user-level analysis; if you feel there is a reason to revert to the L0 products, please email the [Helpdesk](#) for guidance.

Level 1 (L1):

takes L0 output and applies instrument-dependent corrections, such as the [aspect solution](#). The L1 outputs have not had anything irreversible done to the data (e.g. no photon event rejection). These products are sent to the observer, but they are generally only needed when reprocessing the data manually.

Level 1.5 (L1.5; only applies to grating data):

determines the zero-order centroids for sources in the field. Those positions, along with the spectral region definitions, are then used to calculate diffraction coordinates for the dispersed photons (which can only be identified at this level.) The resulting products are a source list, an augmented event list, and a spatial extraction region; see the [Analysis Guide for Chandra High Resolution Spectroscopy](#) for specifics on grating processing.

Level 2 (L2):

takes L1 outputs (or L1.5 for grating data) and applies standard, but irreversible, corrections. (By "irreversible" we mean that information has been lost that cannot be regained from the L2 products alone.) This includes filtering the event file on the good time intervals ([GTIs](#)), cosmic ray rejection, and position transformation to celestial coordinates (RA, Dec). A candidate [source list](#) and "finished" event file are produced, as well as a [dispersed spectrum](#) for grating data.

Level 3 (L3):

derives higher level information from the L2 outputs. This includes more precise source detection and characterization (fluxes, morphology), plus cross-correlation with other catalogs. This is being implemented now for Chandra; experience with earlier missions showed that these products are generally of poor quality when there is not a lot of data with which we can experiment. L3 is a major focus of our current development efforts.

Once an observation has made it successfully through the pipeline, it is passed to the **Verification and Validation (V&V)** team. The products are checked by CXC scientists to ensure data quality and to investigate the cause of any exposure losses. Only after the data passes V&V is it released to the observer; the V&V report is included in the data distribution so that the user is aware of any potential data issues.

There are a number of papers on [Standard Data Processing](#) available from the [Chandra Publications](#) page.

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