Getting started with the SAS II: the Current Calibration File and cifbuild

Giuseppe Vacanti (XMM-Newton SOC, gvacanti@xmm.vilspa.esa.es)

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Abstract

What is the Current Calibration File (CCF) and how to determine the correct subset of CCF constituents required to analyze a given observation. And, if you want to see what calibration curve has been applied to your data, consider the task *calview*.

1 Introduction

The XMM-Newton calibration database is comprised of a collection of algorithms (described in the Calibration Handbook [1]), and the Current Calibration File (CCF) constituents [2]. The latter contain the numerical values driving the calibration algorithms.

Every SAS task accesses the calibration database through the Calibration Access Layer (CAL, *cal*). The CAL is pointed to the correct set of CCF constituents through a CCF Index File (CIF).

cifbuild is used to generate the CIF appropriate to a given observation start date, and the date of analysis.

Details on how to use a CIF in conjunction with the SAS, and what environment variables must be used, can be found in the CAL documentation (see documentation of cal).

1.1 Where to find the CCF constituents

Information about the CCF constituents and where to download them can be found on the CCF web pages: http://xmm.vilspa.esa.es/ccf/.

If you visit the CCF web site, don't forget to subscribe to the `ccf` mailing list (http://xmm.vilspa.esa.es/mailman/listinfo/ so that you are kept abreast of CCF updates.

1.2 Environment variables

- `SAS_CCF`: points to the active CIF.
- `SAS_CCFPATH`: points to the directory (or directories) where the CCF constituents listed in the CIF can be found.

2 Generation of the Calibration Index File

The details of the algorithm that *cifbuild* uses to decide which version of the CCF constituents to use in the CIF are described in detail in the documentation of *cifbuild*, and they will not be repeated here. In order to use the SAS it is not important to know how the CIF is generated.

It is rather more important to know how to go about generating a CIF.

You can follow tow approaches:

- Download the entire database of CCF constituents (today about 500 of them), and run *cifbuild* locally. If you go for this option you should make sure that you follow the instructions given on http://xmm.vilspa.esa.es/ccf/ on how to make sure that your local version of the database is up to date.
- Use *cifbuild* directly from the CCF web pages, and download only the constituents you need. Note that on the CCF web pages you can also compare a CIF you have with the most up-to-date CIF, and then download only the CCF constituents that have changed.

3 Important changes ahead

With the next version of the SAS ($\approx$ February – March, 2002), and important change to the algorithm used to create the CIF will take place.

As a consequence of this change, the CCF constituents will have also an optional end of validity date. *cifbuild* will have to be updated to take this into account. However, it is important to understand that versions of *cifbuild* contained in all the public SAS versions up to 5.2.0 (*cifbuild* version < 4.0) will not be able to correctly work with the new type of CCF constituents.

This will be clearly explained via the XMM-Newton newsletter and on the relevant web pages. One more reason to pay a visit to the CCF web pages to download the CIF.

4 Another manner to look at the CIF

Any dataset with an extention called `CALINDEX` with the appropriate format can be used as a CIF.

The calibrated event lists created by the procs (see *gvacanti_3*), as well as those distributed with the pipeline products, contain a table extension describing the CCF constituents that were active during the processing of the data. This means that it is possible to set the environment variable `CCF_CIF` to point to an event list.

How can this be useful? Say that you are using an event list from the pipeline products. You want to extract a spectrum and create a response and effective area files, and you want to use the same set of CCF constituents that were used to create the event list. Define `SAS_CCFPATH`, then set `SAS_CCF` to point to the event list. Now you can continue the analysis, and the SAS will try to make use of the very same set of CCF constituents active during the pipeline run. Should any of these constituents not be available, the SAS will stop with an error message.

5 What is the calibration doing?

As alluded to above, the calibration corrections applied to the data by the SAS are given by the interaction of the *cal* and the appropriate set of CCF constituents. The latter by themselves cannot be used to derive any quantitative estimation of the magnitude of the corrections applied.

It is indeed the philosophy of the XMM calibration database that the only manner to access the calibration data, either in raw form (the contents of the datasets themselves) or in the interpreted form (the output of the algorithms) is through the functional interface provided by the calibration access layer (*cal*).

While this approach has numerous advantages from the point of view of the task development process, it also means that the effect of a given calibration quantity can only be visualized by writing a small program to set the CAL state, and then call one of the calibration functions with the appropriate input parameters.

The purpose of *calview* is to reduce the user's programming effort in this sense to nil. Most, and eventually all, of the calibration corrections applied in the SAS can in fact be examined individually with the help of *calview*, the SAS calibration viewer.

Given a CIF, that can also be one event list as explained above (Section 4), it is possible to interact with the SAS calibration access layer by setting the instrument configuration and a few physical parameters, and then view the calibration curves corresponding to the various stages of data reduction.

An example of a *calview* session is shown in Figure 1.

References

[1] Christian Erd, Phillipe Gondoin, David Lumb, Rudi Much, Uwe Lammers, and Giuseppe Vacanti. Calibration Access and Data Handbook. Technical Report XMM-PS-GM-20, ESA/SSD, Jan 14 2000. Found at the URL: `http://xmm.vilspa.esa.es/calibration/docs/general/calhb.ps.gz`.

[2] ESA. Interface Control Document for the XMM Current Calibration File. Technical Report XMM-SOC-ICD-0005-SSD, ESA/SSD, Dec 1999. Issue 3.4, Found at the URL: `ftp://astro.estec.esa.nl/pub/XMM/documents/ccf_icd.ps.gz`.

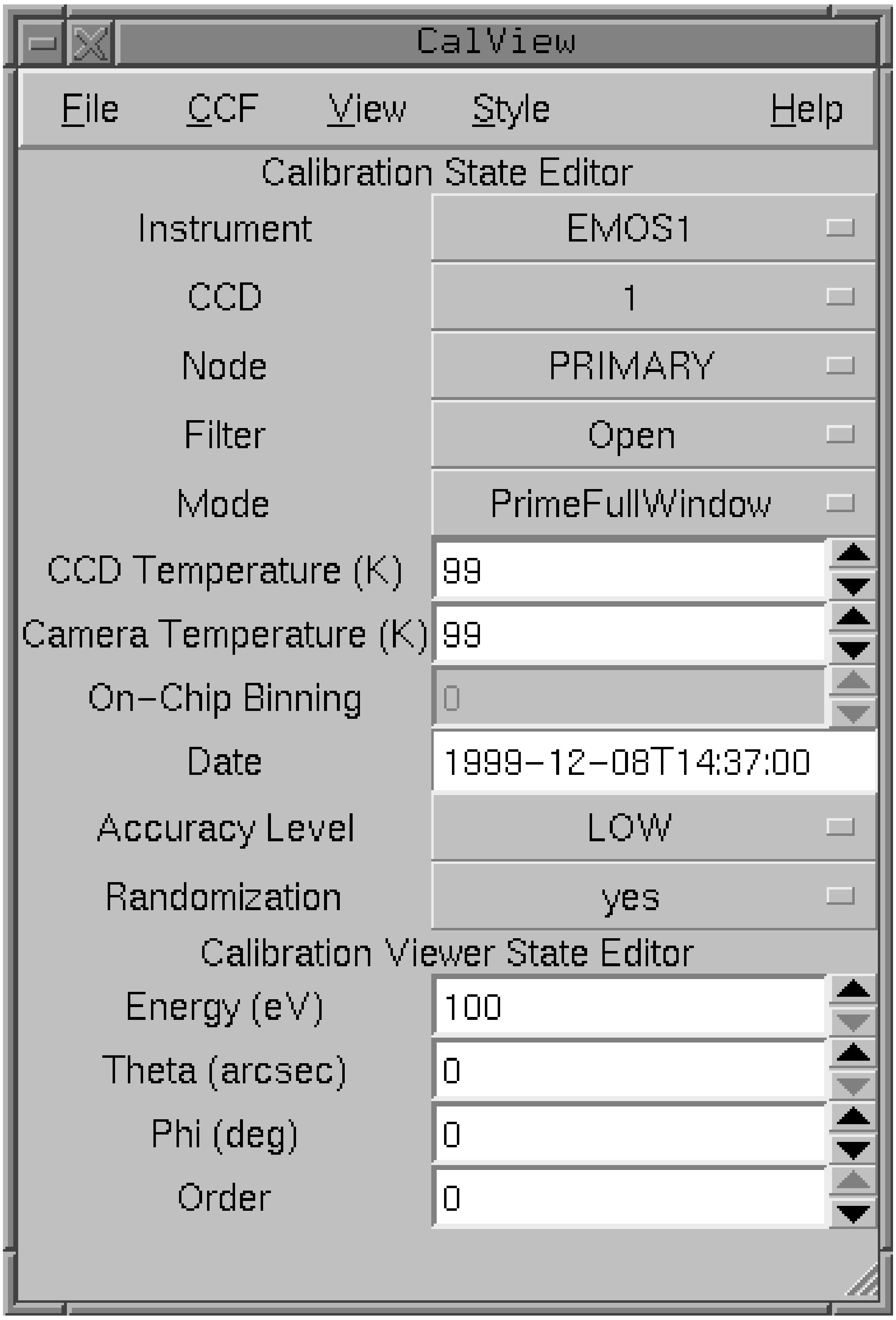

Figure 1: Working with the SAS calibration viewer.