

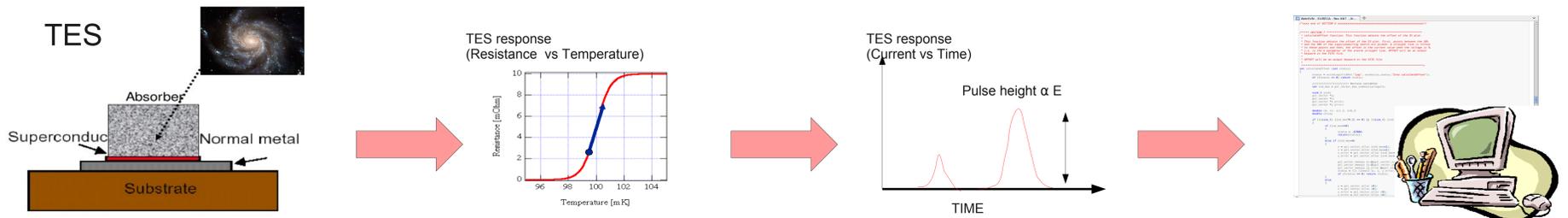
Processing chains for Characterization and Data Analysis of TES X-ray detectors



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Under the **EURECA** (EUropean-Japanese Calorimeter Array) project to develop a prototype of an X-ray Imaging detector based on **TES** (Transition Edge Sensor) technology, the software group is responsible for the elaboration of a full set of processing chains to characterize the instrument and to process the real data it can collect (SRON and IFCA (CSIC-UC) institutes) and to create the tools to graphically display the results (ISDC institute).

We present here a description of the **processing chains** (purpose, component tasks, output information) as well as the **test harness** and the additional **pipeline** created to fully process the input data according to their type and some fixed user's specifications in an automatic, un-managed way. They are being developed by the IFCA-SRON collaboration.

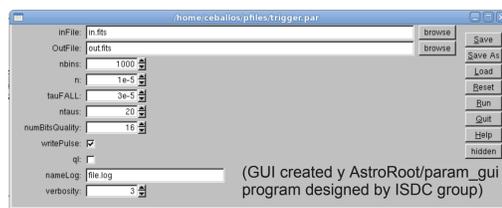


PROCESSING CHAINS

Set of interactive tasks written in C++ (through ISDC Data Access Layer Library) that can be run in the command line or using a GUI, version controlled through a SVN repository (+WebSVN)

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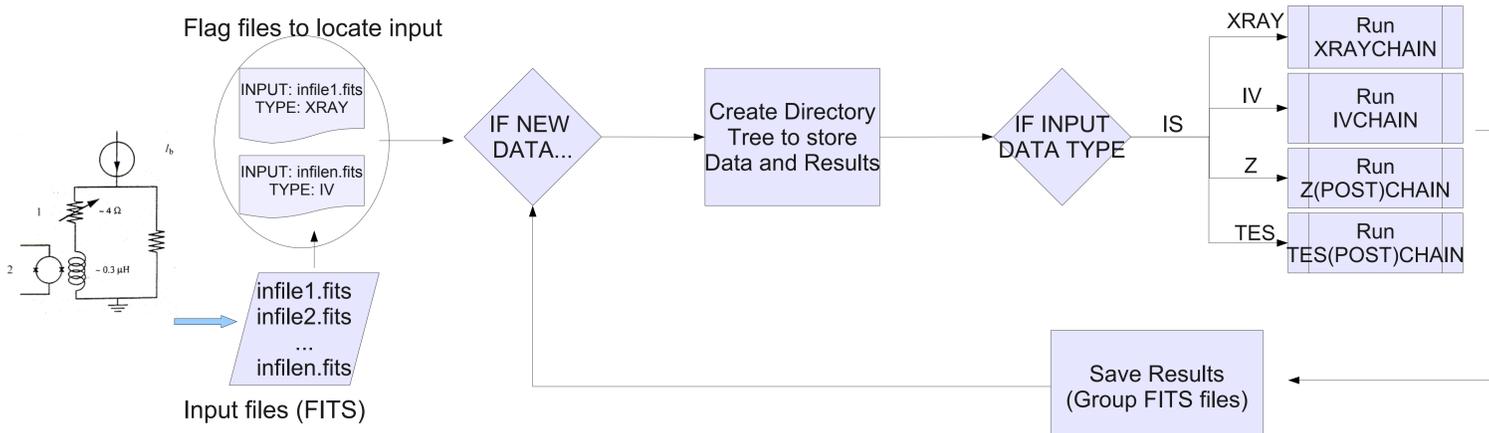
EURECA PROCESSING CHAINS
[ceballos@rhea ~]$ trigger inFile=in.fits outFile=out.fits
numBins=1000 n=1.E-5 tauFALL=3.E-5 ntaus=20
numBitsQuality=16 writePulse=y ql=n nameLog=file.log
verbosity=3
    
```



XRAYCHAIN	IVCHAIN	Z(POST)CHAIN	TES(POST)CHAIN
<p>Gets TES energy resolution through pulse analysis</p> <p>IN: Current I vs. Time t OUT: energy resolution</p> <p>trigger → pulseshape → filter Pulse finding → Pulse quality → Pulse template</p> <p>energyresol → holzgauss Convol. w/ template → Energy resolution</p>	<p>Gets the IV curve characteristics analyzing current I vs. voltage V (which ascends & descends in ramps)</p> <p>IN: input $V(t)$ and measured $I(t)$ OUT: critical I, dissipated power, TES resistance in normal/superconduct. state</p> <p>ivrepr → ivproc IV definition → IV curve fitting</p>	<p>Z: calculates TES Complex Impedance ZPOST: gets TES prop. from the CI (bias power, heat capacity, thermal ct.)</p> <p>IN: input noise $V(t)$ and measured $I(t)$ OUT: CI and then TES properties</p> <p>zcplx → polezero → (POST) zpars Calc. CI(freq) → Finds gain & poles/zeros → Gets physical parameters</p>	<p>TES: finds instrument noise characteristics for a given bias voltage TESPOST: fits noise components to get relevant physical parameters</p> <p>IN: input $I(t)$ OUT: fits to noise components</p> <p>tesps → polezero → (POST) calnoise Current noise spect. density → gain, poles, zeros → Johnson/phonon noise</p>

(PERL) TEST HARNESS: suite of test perl scripts designed for each task in the chains that checks the output results against input (known) simulated values (using `eur_simulate`)

AUTOMATIC PIPELINE: perl script(s) that automatically process a continuous flow of input data (FITS format) according to their data type (IV, complex impedance, TES noise...)



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- References:**
- Eureca - A European-Japanese Micro-calorimeter Array Under Development For Ixo De Korte et al. 2009AAS...21345714D
 - ISDC Data Access Layer (DAL) Jennings et al. 1998, ADASS VII, ASP Conference Series, Vol. 145
 - C++: GCC, the GNU compiler collection gcc.gnu.org
 - The Perl programming language www.perl.org
 - Subversion (SVN) subversion.apache.org
 - WebSVN - Online SVN repository browser websvn.tigris.org
 - Test::Harness http://search.cpan.org