

First Report on

The 2007 ESO Instrument Calibration Workshop

held at ESO Headquarters, Garching, Germany, 23–26 January 2007

Andreas Kaufer, Florian Kerber, Reinhard Hanuschik, Ferdinando Patat, Michele Peron, Martino Romaniello, Michael Sterzik, Lowell E. Tacconi-Garman (ESO)

The first ESO Instrument Calibration Workshop took place from 23–26 January 2007 at the ESO Headquarters in Garching, Germany. It attracted more than 120 participants (Figure 1) with a good representation of the diverse ESO user community and ESO operations groups.

The La Silla Paranal Observatory is currently operating 19 optical, NIR, and MIR instruments (9 VLT, 2 VLTI, 8 La Silla). Successful scientific operation of such an instrument suite is a complex task. To monitor and calibrate both the performance of each of these instruments and the quality of the data they deliver, ESO executes dedicated calibration plans. The calibration plans describe – for each instrument – systematic measurements that are routinely performed in order to aid in the calibration of data from science programmes, at least to specified levels of accuracy.

This scheme of orchestrating our instruments using a detailed plan based on a combination of scientific and operational requirements is invoked in the poster of the workshop (cf. Figure 2). In the case



Figure 2: The La Silla Paranal orchestra.



Figure 1: The participants of the 2007 ESO Instrument Calibration Workshop just behind the Headquarters building in wintry Garching.

of a concert or other musical performance on stage, the contact between the audience and the artist is very direct and the feedback is given in an immediate, audible and usually unmistakable manner. This is not always true in the case of an observatory and its user community, even more so when many programmes are performed in service mode and observers do not meet observatory staff in person.

The first ESO/ST-ECF workshop “Calibrating and understanding HST and ESO instruments” was held in 1995 to review the calibration strategies of HST and ESO La Silla instruments and to prepare for the start of operation of the VLT.

We felt that after more than seven years of science operation with the innovative, complex, and still growing instrumentation suite at the VLT, it was timely to review the achievements and limitations of the established instrument calibration plans together with the ESO user community.

Hence the goals of the workshop can be summarised as:

- to foster the sharing of information, experience and techniques between observers, instrument developers, and instrument operation teams,
- to review the actual precisions and limitations of the applied instrument calibration plans,
- to collect the current and future requirements from the ESO users.

We tried to cover a large variety of aspects through a series of overview talks

given by observatory staff, invited talks, contributed talks and posters. A total of 11 sessions highlighted the various instruments: Optical Spectro-Imagers; Optical Multiobject Spectrographs; NIR and MIR Spectro-Imagers; High-Resolution Spectrographs; Integral Field Spectrographs; Adaptive Optics Instruments; Polarimetric Instruments; Wide-field Imagers; Interferometric Instruments; as well as other crucial aspects such as data flow, quality control, data reduction software and atmospheric effects. In all sessions an overview talk given by a member of the Instrument Operation Team (IOT) described the status quo including the calibration plan, followed by invited talks by expert users. Almost all talks are available in pdf format by clicking on the corresponding links on the workshop programme page at <http://www.eso.org/cal07/agenda.html>

Immediately after the workshop a group of about 15 ESO Instrument Scientists and experts met for a retreat, starting the process of analysing the feedback and discussing the next steps. Based on the valuable feedback from the community provided during the workshop and, in order to carry over the momentum created by it, we compiled a first list of topics that deserve further attention:

- Calibration Proposals at ESO
- Role of Instrument Operations Teams and Instrument Scientists
- Closing the loop between Science Requirements and Calibration Plans
- Interaction with user community
- Pipelines (modular, robust, error handling, science ready products, feedback to engineering calibration, flat fielding, sky subtraction)
- How to achieve high precision in photometry and spectrophotometry

Photo: L. Calçada, ESO

- How to achieve the highest S/N ratios
- Quality Control (interaction with science pipeline, trending analysis)
- Archive (access to calibration data)
- Refined exposure time calculators
- Instrument modelling (bottom-up and top-down approaches combined)
- Calibration Reference Data (traceable to laboratory standards)
- Facilitate the use of VLTI and address its specific calibration needs
- Support for polarimetry
- Availability and use of standard stars
- Characterisation and calibration of the atmosphere
- Radiometric calibration of AO data
- Detector fringing
- Instruments (pre-construction simulation, performance monitoring, active compensation).

As mentioned, we very much consider this a process and further input is highly welcome. One easy way to send your suggestions will be to fill in the feedback form at: <http://www.eso.org/cal07/feedback.html>

Our next steps are to consolidate the input and topics in a concise document that will contain recommendations for improving calibration procedures at ESO. We will attempt to assess the effort re-

quired for each recommendation and will assign priorities based on scientific merit, but also practical considerations. We will then make a detailed plan and schedule to implement the improved calibration procedures in a timely manner.

While the above is clearly work in progress, Dietrich Baade already offered his personal summary of the workshop in an excellent and stimulating summary talk from which we extracted some quotes for future reference (see text box).

As Gianni Marconi put it during the workshop: “Calibration is a life-long learning process”. One obvious lesson from the workshop is to ensure good communication between the observatory and the end user. In this spirit we hope to make progress on the above points together and we plan to soon report back to the community.

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Selected Quotes

- Calibration cannot make up for poorly prepared observations. (Piercarlo Bonifacio)
- Artifacts are removed most effectively by multiple re-sampling. (Eric Emsellem)
- Prenatal modelling is better than post-mortem calibration. (Michael Rosa)
- False matches can confirm expectations most beautifully. (Carlo Izzo)
- NIR polarimetry is a last-minute add-on for enthusiasts. (Nancy Ageorges, Hans Martin Schmid)
- ESO should accept and support calibration proposals. (Eric Emsellem and the Calibrated Majority)
- The best quality check is a logarithmically scaled three-colour image. (Mike Irwin)
- Thou shalt not have parallel pipelines. (Several)
- No calibration – no astronomy. (Dietrich Baade)
- The sky is the limit. (Many, referring to the Earth’s atmosphere)

Report on the

Fourth Advanced Chilean School of Astrophysics: Interferometry in the Epoch of ALMA and VLTI

Felipe Barrientos¹
Neil Nagar²
Felix Mirabel³

¹ Departamento de Astronomía y Astrofísica, Pontificia Universidad Católica de Chile

² Grupo de Astronomía, Universidad de Concepción, Chile

³ ESO

The interferometry school in the epoch of ALMA and VLTI (www.astro.puc.cl/school) was held at the campus of the Universidad Católica de Chile, in Santiago, during 4–8 December 2006. This FONDAF Center for Astrophysics school was organised jointly by Pontificia Universidad Católica de Chile, Universidad de Concepción, ESO, ALMA, the National Radio Astronomy Observatory (NRAO), the U.S. Naval Research Labo-

ratory (NRL) and the U.S. Office of Naval Research Global (ONRG).

The school was organised to provide young Chilean and Latin American researchers and students with the fundamentals of interferometry in the radio and in the optical, and to introduce current and future instrumentation, techniques and results. The experts also discussed the impact of interferometry