Mem. S.A.It. Suppl. Vol. 19, 406

Memorie della
Supplementi

The Solar Tower at Monte Mario: a New Didactic Laboratory for Astronomy

F. D'Alessio[1] , M. Faccini[1] , R. Leoni[1] , G. Giobbi[1]

Istituto Nazionale di Astrofisica – Osservatorio Astronomico di Roma, Via Frascati 33, I-00040 Monte Porzio Catone (Roma), Italy
e-mail: francesco.dalessio@oa-roma.inaf.it

Abstract. The year 2009 witnessed the restoration of the Solar Tower of Astronomical Observatory of Rome, in the INAF main office of Villa Mellini, Monte Mario. This structure underwent a patient restructuring of optics, mechanics and control equipment. Moreover, some areas have been converted into welcome centre for the visitors, so as to transform a scientific instrument which was active up to a few years ago into a didactic structure, mainly suitable for school groups.
The Solar Tower of Monte Mario, which has been open to the public since January 2010, allows visitors to directly observe the Sun, as well as the spectrum of its light. The Tower therefore becomes an effective didactic instrument in order to teach and talk about a wide range of scientific topics from Solar Physics to Sun-Earth interactions, to Stellar Evolution. Here we describe the work done by the DivA group of INAF-OAR for putting back into service the Solar Tower, from the technical and didactic viewpoints. We shall also take stock of the activities organized in the first few months of activity.

Key words. Outreach - Teaching - Solar Physics

1. Introduction

In the framework of activities for the International Year of Astronomy (IYA2009) the DivA group Astronomy Outreach of INAF-OAR realized an initiative within the topic Astronomy and world heritage, aimed at improving and exploiting places and structures connected to the history of Astronomy. The goal of this initiative has been the requalification of a structure of a certain historical value in the INAF main office at Monte Mario, so as to return to the people of Rome a symbol of the OAR, as well as of the Astronomy of the city : the Solar Tower. More than six months of patient work on the part of OAR researchers and technicians, as well as an extraordinary INAF funding for IYA2009, have allowed us to give a new lease of life to a unique teaching tool. On April 20, 2009 the Solar Tower started working anew, in the framework of an opening ceremony, followed by a whole week, full of visits and other events for schools and amateur astronomers. Starting from January 2010, the Solar Tower of Monte Mario has been open to the public without interruptions, with one day of visits a week.

Send offprint requests to: F. D'Alessio

Fig. 1. The Solar Tower: external view.

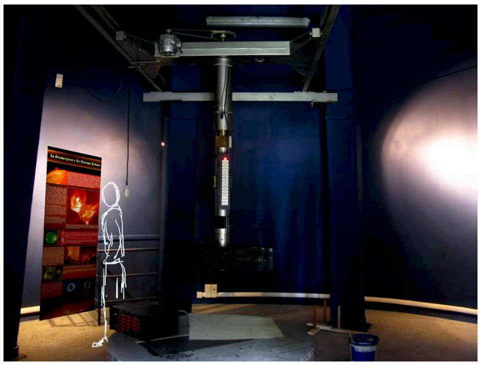

Fig. 2. Project for the new observing room.

2. Structure

The Solar Tower is constituted by two independent coaxial structures: an external protection (tower and dome) and an internal latticework, which supports all optical systems. Lens, coelostat, spectroscope and dome are driven by electric engines. The clockwise movement of the primary mirror guarantees that it constantly follows the Sun. The structure includes a deep shaft, once used for high-resolution Spectroscopy. At the moment, spectroscopic observations are made thanks to an optical bench, especially realized in the structures ground level, with a lower resolution, so as to allow the projection of the whole spectrum upon a 120 cm screen.

3. Renovation

The renovation of the Tower has been a team work of various offices and people within the OAR, coordinated by DivA staff. We have aimed both at restoring the structure, thus keeping all the original equipment and solutions, and at realizing a teaching ambience similar to contemporary science centers. Accordingly, the observation room on the ground floor has been fitted out as a welcome centre, and restored, so as to allow a maximum of 30 visitors to observe both the disk and the spectrum of the Sun in the best possible way. Thanks to the help of the OAR Solar team, we have realized and installed - all around the room - a series of posters illustrating all the topics connected with Solar Physics. The coelostat mirrors have been dismantled and re-aluminized with the aluminizer of the Observing Station Campo Imperatore. Moreover, some researchers of the Technology team have revised the mechanics (gears, tracks, guides, pulleys, belts), as well as the electric installation of the coelostat and of the Towers control panel, which fully commands the instrument both inside the dome and - 34 me-

Table 1. Solar Tower Info

Tower height	34 *m*
Shaft depth	18 *m*
Lens Diameter	45 *cm*
Focal lenght of the lens	28 *m*
Diameter of the coelostat mirrors	80 *cm*
Diameter of the Sun disk	30 *cm*

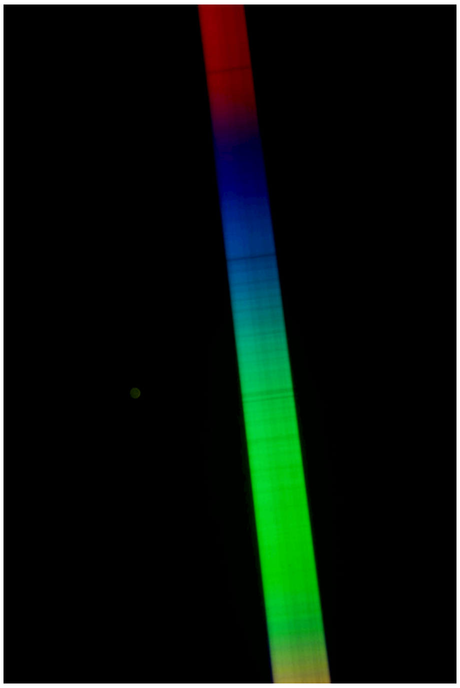

Fig. 3. The Sun Spectrum obtained at the Solar Tower focal plane.

tres below - in the observing room. The spectroscopy has been modified and optimized, and special screens have been realized for an optimum observation of the solar disk. A holoscreen has been employed for projecting the solar spectrum, in transmission, thus allowing both an easier observation and a higher luminosity of the spectrum.

4. Astronomy Outreach and Education

The visit to the Solar Tower represents a unique chance in this country for Astronomy outreach, teaching and observing. The peculiarity of this instrument (it is the only Solar tower open to the public in the whole Italy), as well as of the observations it allows, make it an incredible tool for teaching Astronomy in general, and Solar Astronomy in particular. Therefore, the visits are mainly designed for school groups, which have represented more than two thirds of the visitors in the first four months of opening. The groups of pupils and teachers come almost exclusively from the schools of Rome and its province. During the opening week, the Solar Tower has been visited by almost a thousand people, from 9:00 am to 7:00 pm. In the first four months of opening, we have registered more than 900 visitors, an exceptional number, if we take into consideration the fact that, because of the logistics, the Tower is only open one day a week, with three shifts. The visit is guided by OAR researchers within the DivA group who, while taking their cue for explanations from topics of Solar Physics, also enlarge their talks to other areas of Astronomy: from the planets to Stellar Evolution.

5. Future Developments

The interventions made sofar have aimed at making the Solar Tower work again and converting the room on the ground floor from a technical area (instruments room) to a welcome centre, according to standard safety rules. Our work is far from finished. Just like

Fig. 4. Visitors during the Sun disk observation.

any other structure open to the public, though having the privilege and charm of offering the experience of an astronomical/solar observation, the Solar Tower will undergo continuous upgrades. We have already planned a series of improvements as far as teaching tools are concerned. We have bought a number of professional video cameras, which will be installed on the top of the tower, inside and outside its dome. They will allow people to see - live - how the coelostat works during the observations: an impossible task, since visitors cannot be admitted to that area. Before the end of this year, we plan to install a personal computer and a widescreen 50 monitor on the ground floor, not only in order to watch live pictures of the inside of the dome, but also to provide the guides with dynamic multimedia tools, which will enrich the visit to the Solar Tower. Finally, we already have a project for an improvement of the optics. Indeed, we plan to realize an optical bench suitable for teaching, to be placed side by side to the solar one. This will allow us to handle complex topics, such as interference and diffraction. Moreover, we are studying a second version of the solar spectroscope, in order to obtain a better performance and a greater potential.

Acknowledgements. We are grateful to Roberto Speziali, Mauro Centrone, Ivan Ferraro, Andrea Di Paola and the staf of Observing site of Campo Imperatore for their technical support; Ilaria Ermolli and the OAR Solar Team for their scientific support. A special thank to Giorgio Buonvino for his relevant collaboration. Finally, we would like to thank the Director of the Astronomical Observatory of Rome for inspiring this project.