REMOTE LABS: Different approaches
Responsible: Prof**. G. Torzo** , ICIS-CNR and University of Padova, Italy

Introduction and Scenario
Laboratory classes play a crucial role both in schools and universities. On the other hand, laboratory management can be resource-intensive, requires a qualified staff and imposes significant logistics constraints to both managers (schools) and users (teachers and students). As a consequence school laboratories are rarely available to students out of the teaching hours.
Internet based Remote Labs (RL) may partially overcome these problems.
Suitable for RL are all the equipments locally controlled by a computer. But different strategies may be adopted, depending both on the type of the controlled hardware (totally or partially automatized), on the type of user (highschool or university students), on the level of freedom in use (predefined path through several choices, or free use with interaction with local operator)
The workshop, coordinated by G. Torzo, after an introduction by A. Longo, will propose three examples, which differs in flexibility, cost, complexity and efficiency, whith the goal of stimulating a broad discussion on the various aspect of RL.
The final discussion will be moderated by H. Jodl.

Contributions Summary
Prof**. M. Bocchicchio** and Ing**. A. Longo** from University of Salento , Italy
will present *WeColLab, a general, scalable and reusable framework*, to put online a laboratory equipment in a collaborative virtual environment. Our goal is “not to reinvent the wheel” each time a device goes online, but trying to *define some guidelines for a standard approach in the design of remote lab*, with the aim of permitting the definition of a satisfactory and effective user experience. This is important when we need to put on line different lab equipments (like in remote labs for schools) or to interact with a number of remote equipments at a time (e.g. to observe the same celestial body with two or more telescope at the same time, etc.). They also will present the results of WeColLab’s usability tests they have performed in secondary school students during nocturnal astronomy lessons.
Proff. **H. Jodl** and **S.Gröber**, University of Technology Kaiserslautern, Germany
will illustrate *Remote Controlled Labs (RCLs) :* real experiments which can be executed through the internet. Controlling the experiment is enabled by accessing an interface and a web server. Web cams allow the user to observe the on-going experiment.During the WS a particular example of RCL (*diffraction and interference of light*) will be used to demonstrate the general features of this approach.
Proff**. G. Torzo** and **P. Peranzoni**, ICIS-CNR and University of Padova, Italy
will present an example of remotely controlled *Scanning Probe Microscopy* (SPM) .
This is an essential topic in nanotechnology teaching courses, but the high cost of SPM apparatuses makes hard the introduction of this topic in many situations.
A <live> example illustrates the use of *very simple web-based remote control tools*: Windows-PC equipped with Tight-VNC server and a webcam. A Skype audio-video connection allows a fast communication between remote and local operators
During the RemoteLab session, the students, use a common web browser and ADSL connection, to take control of the PC driving the SPM hardware, and use the webcam audio/video to interact with the technical staff in the laboratory hosting the device.
The students choose the sample to be analyzed and then perform by themselves the measurements and the analysis in remote mode.

Goals of the RCL project are: 1) to setup experiments, which encourage play, to excite curiosity, and to stimulate motivation. This kind of RCL is devoted to pupils and undergraduate students as well as to interested lay people. In particular, this kind of RCL is a well suited prototype model to build-up own RCL in school projects: 2) to setup important physics experiments , which can be immediately used in teaching and learning (school or university), e.g. electron diffractio, light diffraction and interference, photoelectrical effect.
Essential features of such RCLs are: intuitive and easy operation,interactivity, observation of experiment via web cams, transfer of data to the user, provision background information.
During the WS an example of RCL on diffraction and interference will be illustrated