Eight years of Schools in Radiocommunications and Networking at ICTP

S. M. Radicella
Aeronomy and Radiopropagation Laboratory
The Abdus Salam International Centre for Theoretical Physics

IN MEMORIAM

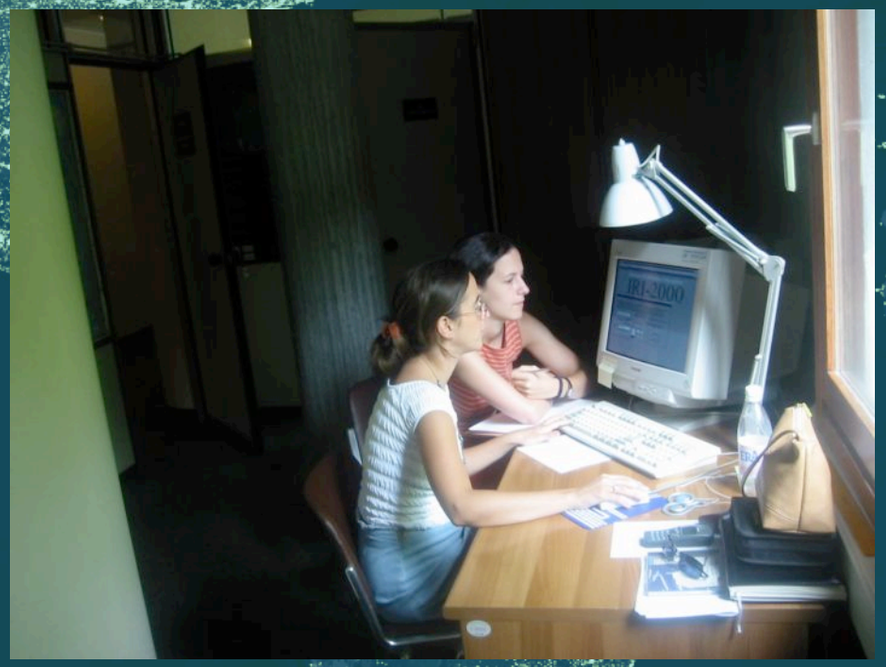
Our dear colleague and School Lecturer

Prof. G. O. Ajayi (1941-2004)

ICTP Associate 1992-2004,

died on 12 December 2004, in Abuja, Nigeria.

The Aeronomy and Radiopropagation Laboratory



Aeronomy Section:
Research activities:
- Ionospheric data analysis,
- Ionospheric modeling,
- Data ingestion in models
- Ionospheric effects in satellite positioning

***Wireless Networking Unit*: technical support and training in the use of radio solutions for local area computer networking for academic and research institutions.**

A Premise for Action at ICTP

The growth of the ICT poses the challenge of providing developing countries with means to be linked with the rest of the world to avoid of being cut-out from the main stream of information flow.

The academic community is the obvious starting point for these efforts that will permeate to the rest of society.

The underlying problem is the lack of sufficient well qualified human resources able to handle the new systems and technologies.

The action at the Centre

To contribute to the expansion of ICT in developing countries the Centre:

- **Established a Programme on Networking and Radiocommunications with the collaboration of the United Nations University.**
- **Carried out Intensive Training Activities for scientists from developing countries**

Both radio technology and computer networking was used to facilitate the access of ICT to academic institutions in developing countries.

Why radio technology?

Radio represents a powerful tool to leap-frog the communication technology gap between developed and developing world.

It allows:

- **Temporary installation**
- **Access difficult locations**
- **Fast deployment and easy reuse of systems**
- **Mobility**

The former Programme

Objective of the Programme of Training and System Development on Networking and Radiocommunications :

To provide technical assistance and training to academic and scientific institutions in developing countries requesting to help to establish small area computer networks and their connection to the Internet

Main Projects (1)

Pilot project: computer network for education and research at the Obafemi Awolowo University of Ile-Ife, Nigeria with the use of spread spectrum radio technology. Successfully completed by June 1996,

Intensive Training, in Trieste and in Nigeria, of staff from 40 Nigerian universities in the use of radio technologies for computer networking, with support from the World Bank (1996-1997).

Training on the use of Radio for Computer Networking at the University of Cape Coast, Ghana, supported also by the United Nations University (UNU). A basic Radiocommunications Training Laboratory has been implemented at the University of Cape Coast for this purpose (1998).

Extended Training Activity on Networking and Radiocommunications in Trieste, supported also by the United Nations University. Participants were from Nigeria, Morocco, Angola, Senegal, Cote d'Ivoire, Romania (1998).

Main Projects (2)

Since 2000 the ARPL has been involved in Training Activities and Technical Assistance in the use of radio for computer networking in Benin, Sudan and again Nigeria.

A Pilot project for the establishment of a full Internet Connectivity between the National Institute for Material Physics located at the Magurele Physics Platform and the node of the Polytechnic University of Bucharest, Romania, was successfully carried out during July 1997.

A series of Seminars on Networking and Radiocommunication were carried out in Bucharest, Romania, in 1999, 2000 and 2001 co-organized with the University of Bucharest (CREDIS) and financed by the World Bank.

A new project for ICT development is being planned at the University of Douala, Cameroon.

A new Activity in ICT

The Centre is organizing an

ICT Technology Observatory and Training Unit for Developing Countries

in close collaboration with the

International Telecommunication Union, Bureau of Development in Telecommunications

in the framework of an agreement signed in February 2004.

Objective and operation scheme

Its objective is to identify the most modern and cost- effective technology to be deployed mostly in academic and research institutions in developing countries and to train trainers in their use.

***ICTP will provide computer equipment, courses, expertise and seed money.**
***ITU/BDT will contribute with seed money and industry contacts.**
***Other partners should provide instruments and laboratory equipment.**

Training activities

From 1989 a series of Colleges, Schools and Workshops where carried out in the field of radiopropagation and radiocommunications.

From 1998 yearly Schools on the use of radio for digital communications and computer networking have been carried out with intensive use of hands on experimental practice, including open source solutions and the construction of low cost microwaves directive antennas.

A number of more than 1500 participants from all continents were trained in 35 training activities.

The Schools on Radio

1998 Use of radio for digital communications in developing countries, including spectrum management

1999 Use of radio for digital communications in developing countries, including spectrum management

2000 School on data and multimedia communications using terrestrial and satellite radio links

2001 School on data and multimedia communications using terrestrial and satellite radio links

2002 School on Radio Use for Digital and Multimedia Communications

2003 School on Radio Use for Information and Communication Technology

2004 School on Digital Radio Communications for Research and Training in Developing Countries

The 1998 School

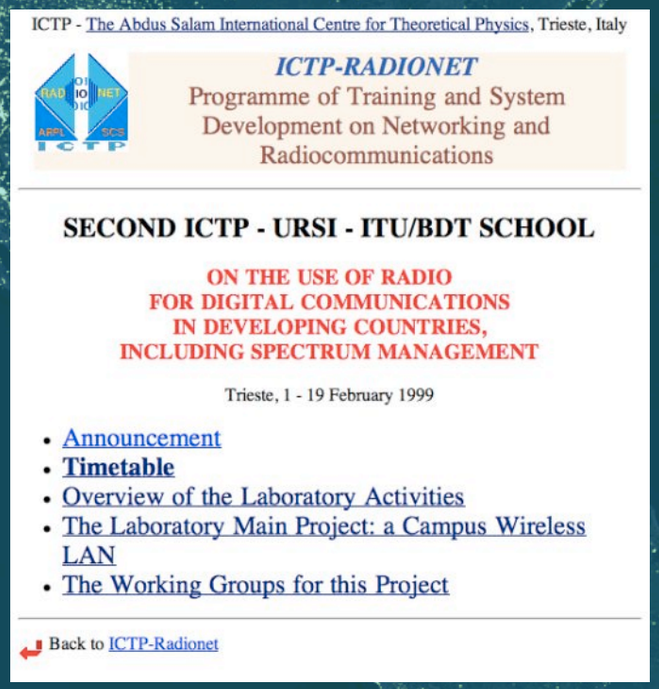
Use of radio for digital communications in developing countries, including spectrum management

Two weeks of theoretical lectures, followed by one of lab:

- ***Interactive introduction to LINUX***
- ***Radiofrequency exercises (power and frequency measurements)***
- ***Networking Basics and Exercises***
- ***Installation of Spread Spectrum Networks: Frequency Hopping and Direct Sequence***
- ***Field Experiment : Allignement of Parabolic Antennas***
- ***GPS (Demo)***
- ***Digital Microwave Link at 10 GHz***
- ***Packet Radio: AX25 and TCP/IP over AX25***

Lab lectures and (some) exercises published on the web

The 1999 School


ICTP - The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

ICTP-RADIONET
Programme of Training and System Development on Networking and Radiocommunications

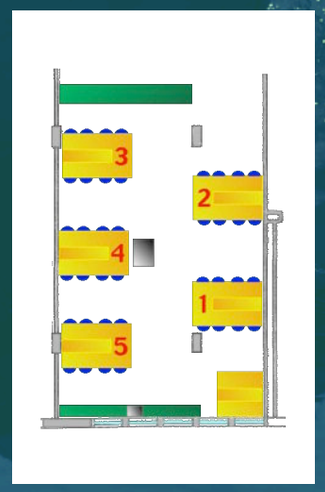
SECOND ICTP - URSI - ITU/BDT SCHOOL

ON THE USE OF RADIO FOR DIGITAL COMMUNICATIONS IN DEVELOPING COUNTRIES, INCLUDING SPECTRUM MANAGEMENT

Trieste, 1 - 19 February 1999

- Announcement
- Timetable
- Overview of the Laboratory Activities
- The Laboratory Main Project: a Campus Wireless LAN
- The Working Groups for this Project

Back to ICTP-Radionet



Use of radio for digital communications in developing countries, including spectrum management

- One week of theoretical lectures, followed by two of lab

Many new lab experiences added: video conference over wireless, APRS, remote data acquisition, etc.

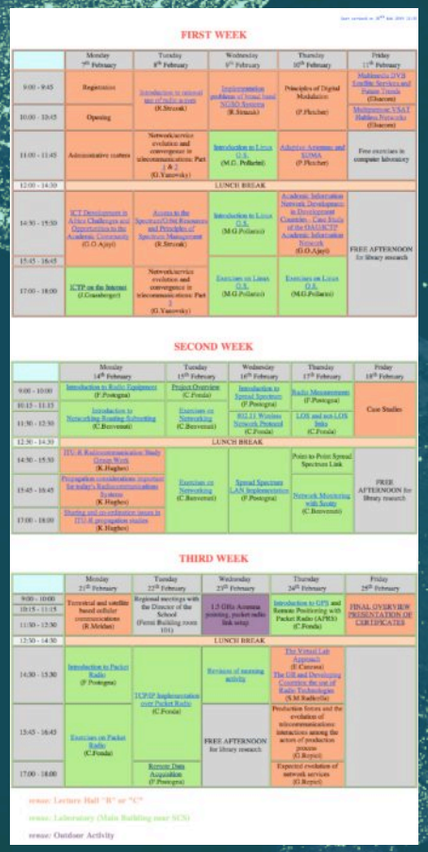
- Most lab lectures and exercises are published on the web site of the school "on the fly"

- Case studies, groups, CDROMs

- Lab as a "simulation of real life"

- Financial aspects are considered

The 2000 School



School on data and multimedia communications using terrestrial and satellite radio links

- Most of the theoretical lectures are published on web, together with all the lab lectures and exercises

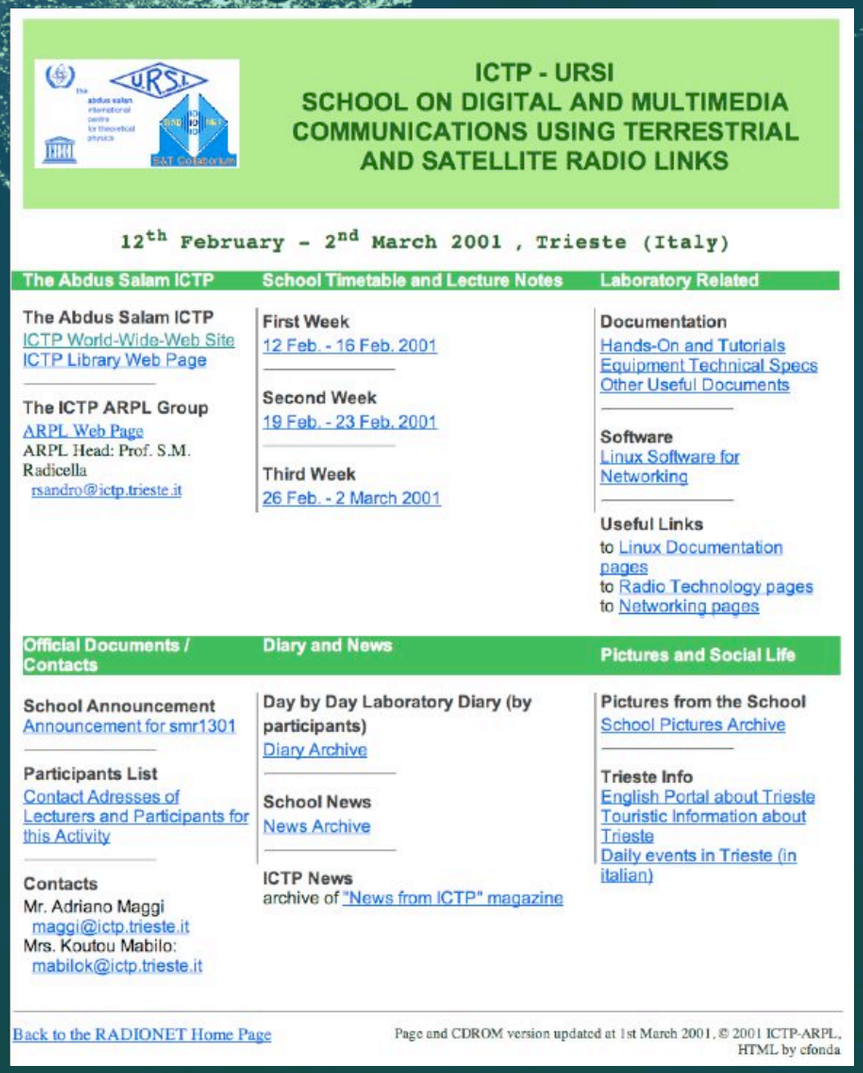
- Lab activities are distributed among all 3 weeks

- Satellites technology, 7 Km link at 1.5 and 2.4 GHz,

- more on 802.11b WLANs

- Web-based, CDROMs

The 2001 School



ICTP - URSI
SCHOOL ON DIGITAL AND MULTIMEDIA COMMUNICATIONS USING TERRESTRIAL AND SATELLITE RADIO LINKS

12th February - 2nd March 2001 , Trieste (Italy)

The Abdus Salam ICTP | School Timetable and Lecture Notes | Laboratory Related

The Abdus Salam ICTP
ICTP World-Wide-Web Site
ICTP Library Web Page

The ICTP ARPL Group
ARPL Web Page
ARPL Head: Prof. S.M. Radicella
rsandro@ictp.trieste.it

First Week
12 Feb. - 16 Feb. 2001

Second Week
19 Feb. - 23 Feb. 2001

Third Week
26 Feb. - 2 March 2001

Documentation
Hands-On and Tutorials
Equipment Technical Specs
Other Useful Documents

Software
Linux Software for Networking

Useful Links
to Linux Documentation pages
to Radio Technology pages
to Networking pages

Official Documents / Contacts | Diary and News | Pictures and Social Life

School Announcement
Announcement for smr1301

Participants List
Contact Adresses of Lecturers and Participants for this Activity

Contacts
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Mrs. Koutou Mabilo:
mabilok@ictp.trieste.it

Day by Day Laboratory Diary (by participants)
Diary Archive

School News
News Archive

ICTP News
archive of "News from ICTP" magazine

Pictures from the School
School Pictures Archive

Trieste Info
English Portal about Trieste
Touristic Information about Trieste
Daily events in Trieste (in italian)

Back to the RADIONET Home Page

Page and CDROM version updated at 1st March 2001, © 2001 ICTP-ARPL, HTML by cfonda

School on data and multimedia communications using terrestrial and satellite radio links

- Web portal with all lectures, info, documentation, daily diary, links, etc.

- One week of theory, followed by two weeks of lab

- Visit to TELIT laboratories (demos, e.m. anechoic chamber, etc.)

- Exercises with software for Radio Spectrum Management

The 2002 School

School on Radio Use for Digital and Multimedia Communications

- Theory in the mornings, lab in the afternoons

- New lecture topics: frontiers of digital radio communications, theory of financial planning, ...

- Software for radio interference analysis, software for radiolinks design

- Long distance WiFi 802.11b link experience

- Practical experiences on WiFi installation, by experts from Venezuela (ESLARED)

The 2003 School

School on Radio Use for Information and Communication Technology

- *New lab logistic, more space for equipments and for people, direct access to the terrace*
- *More time for lab, new experiments, 2 long distance radiolinks (25 Km and 7 Km)*
- *Measurements on antennas (in lab, on the field)*
- *Focus on 802.11 spread spectrum for WLANs*
- *Presentation of examples of "successful experiences" done in Africa and Venezuela*

The 2004 School

School on Digital Radio Communications for Research and Training in Developing Countries

- Started with a two days Round Table to discuss the role of ICT for Science and Research in Developing Countries, with the participation of the ITU/BDT and the ICTP Directors.

- Focused on innovative solutions in design and implementation of 2.4 GHz low-cost wireless local area networks.

- Much of the time was devoted to hands-on sessions of antenna building, installation, testing and measurements.

- A Radio Laboratory Handbook was prepared and distributed to the participants, together with other material.

Follow-ups

A “multiplying effect” (training to trainers, they train others, and so on...)

Equipment has been donated after the school, to develop small projects

Consultantship during and after the Schools

Examples of follow-ups: Sudan, Cuba, Nigeria, Guatemala, Romania, ...

To end this presentation

I wish you a fruitful participation to this year School,

With a warm WELCOME