Abstract
PARTNeR\(^1\) stands for Proyecto Academico con el Radiotelescopio de NASA en Robledo (the Academic Project with NASA's radio telescope at Robledo), and allows students to perform radio astronomy observations. High school and university students can access the PARTNeR radio telescope via the internet. The students can operate the antenna from their own school or university and perform radio astronomy observations.

What is PARTNeR?
The acronym PARTNeR stands for Proyecto Academico con el Radiotelescopio de NASA en Robledo (the Academic Project with NASA's radio telescope at Robledo). NASA has three satellite tracking stations across the world:

- CDSCC (Canberra Deep Space Communications Complex), Australia.
- GDSCC (Goldstone Deep Space Communications Complex), USA.
- MDSCC\(^2\) (Madrid Deep Space Communications Complex), Spain.

One of the 34-m antennas located at MDSCC\(^2\) (see Figure 1) is no longer used for satellite tracking and, thanks to an agreement between the Spanish space agency (INTA, Instituto Nacional de Tecnica Aeroespacial) and the American space agency (NASA), students can use it to perform radio astronomy observations. Comunidad Autonoma de Madrid and Fundacion Española para la Ciencia y la Tecnología (FECYT) are also PARTNeR sponsors.

Activities offered by PARTNeR: radio astronomy observations
High school and university students can access the PARTNeR radio telescope via the internet. The students can operate the antenna from their own school or university and perform radio astronomy observations. There are two scientific projects they can join:

- X-ray binary monitoring. An X-ray binary consists of a compact object (black hole or neutron star) and a “normal” star, swallowed by the compact object. Some of these systems show radio bursts and their study can give us information about the black hole/neutron star, accretion rate, etc. In Figure 2, components of a low mass X-ray binary are shown.

\(^{1}\) http://www.laeff.inta.es/partner
\(^{2}\) http://www.mdscc.org
\(^{3}\) http://www.centrodevisitantes.com
• Galactic Plane maps. Most of the material in our Galaxy is located in the galactic plane and our students can map many of these sources (supernova remnants, i.e. the structure resulting from the gigantic explosion of a massive star; HII regions, i.e. a cloud of gas and plasma in which star formation is taking place; etc.). In Figure 3, you can see a Rosette Nebula map obtained with PARTNeR radio telescope (S band = 12cm).

Other projects may be done after an evaluation by the scientific committee.

Activities offered by PARTNeR: Hands-on activities

For primary and secondary school students, astronomy hands-on activities are available at the training and visitor centre, attached to MDSCC. They last for 2.5 hours and the maximum number of students for a hands-on activity is thirty. They can be accessed according to the age of the students and topic selected by the teachers:

• The Sun. Students build Sun watches and learn how to use them. They also perform observations with a telescope to study sunspots.
• Rockets. Depending on the age of the visitors, our students build water rockets and study launch speed, height reached by the rocket, etc.
• Planets and planetary systems. Students learn how to use radar techniques to explore the surface of a planet and different methods to detect exoplanets.
Activities offered by PARTNeR: Final projects for university students

In the Spanish educational system, it is compulsory for an engineering student to develop a Final Project carried out at university or within a company. PARTNeR also offers that opportunity. Currently, under an agreement between Universidad Miguel Hernandez (Alicante) and INTA, a telecommunication engineering student is designing and developing new software to control the PARTNeR antenna.

High school teacher training

Radio astronomy is not a common subject and high school teachers have to be trained and helped to spread the knowledge to students. We have developed teaching material adapted to the Spanish high school education system. At the moment there are three didactic units:

- Electromagnetic spectrum.
- Radio astronomy.
- Radio telescopes.

High school teachers interested in joining PARTNeR must attend a training course, usually at the beginning of the academic year, to learn more about:

- Radio astronomy.
- How to perform a radio astronomy observation.
- Techniques to implement PARTNeR as a different tool to fulfil the curriculum in their classrooms.

Conclusion

In the last three years, since PARTNeR was made available to high school and universities, about 50 teaching institutions have enrolled our project. This means 250 students have accessed the PARTNeR radio telescope.

More than 6000 people visited the training and visitor centre attached to MDSCC during 2006. We estimate that when hands-on activities are offered for the first time this year they will be accessed by at least 2500 students.