Talk at Splinter Meeting

Splinter C

Radioastronomy for the Classroom

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Inquiry-based approaches to teaching astronomy in schools are in most cases limited to the optical range of the electromagnetic spectrum. Regarding celestial observations, the optical telescope is still the tool of choice for teachers and students. But scientific breakthroughs are to be expected (also) in different wavelengths. The first results of ALMA show new and fascinating discoveries. With the installation of other ground based instruments like LOFAR and SKA, we are at the dawn of a new era in radio astronomy. In order to let the pupils participate in the coming research results, it is necessary to develop new educational concepts to boil down the principles of radio telescopes, discuss the technical challenges and analyze the astronomical data in the classroom. In this talk I will present a successful approach to radio astronomy using low-cost everyday items connected with an USB-Stick for Software Defined Radio. The incoming signal is then visualized by freeware computer programs. By changing the setup of the antenna from a simple wire-loop to a parabolic dish and varying the filters/amplifiers, different wavelength ranges could be covered. Whereas low frequency signals only reveal temporal variations of the signal strength without giving too much information about the direction, signals in the GHz-Range could easily be spatially resolved. Scanning the sky in the GHz-Band leads therefore to an intensity-coded celestial map at the chosen wavelength - for example in the light of the 21cm line of hydrogen. The resolution in frequency is accurate enough to distinguish different velocities of the hydrogen gas due to the Doppler-effect. Regarding the electronic parts of the radio telescope as a black box, this concept could easily be used at school starting at grade nine. A more sophisticated description of the electronics is reserved for students of grade eleven.