ASTROPEILER STOCKERT e.V.
Historische Radiosternwarte

European Conference on Amateur Radio Astronomy EUCARA 2023

Bad Münstereifel-Eschweiler, Germany, September 16th - 17th

Abstracts

(in the sequence as the talks will be presented)

Fast Radio Bursts: an increasing complex astronomical mystery
Laura Spitler, Max-Planck Institute for Radio Astronomy

Fifteen years ago, radio astronomers discovered a luminous, short-duration radio flash likely originating in a distant galaxy. We now know that thousands of these so-called fast radio bursts are occurring over the entire sky every day, but their astrophysical origin is still a mystery. Although remarkable progress has been made, in particular in the last five years, many questions remain. In this talk I will discuss the current status of the field and highlight what we know and don't know about FRBs.

Fast Radio Burst and Magnetar Observations with the Stockert Telescope
Wolfgang Herrmann, Astropeiler Stockert e.V.

Various theories exist about the nature of the Fast Radio Bursts (FRB). One of these theories is that FRBs might be magnetars. This idea received support by the observation of an exceptionally strong pulse emitted by a galactic magnetar in April 2020. At the Stockert telescope, we have been monitoring both a magnetar and two repeating FRBs spending several thousand hours of observation time on these targets. The findings from these observation campaign will be discussed. In particular, the question what commonality and what differences between these types of targets can be found in the observation data will be addressed.

The UK Radio Meteor Beacon
Andrew Thomas, UK Radio Astronomy Association

The UK Meteor Beacon is a collaborative project between the UK amateur radio and radio astronomy communities to facilitate the study of meteors above the UK. This presentation will describe:

- An overview of the project,
- The science objectives,
- Progress to date, beacon and receiver design and build,
- Development of receiving stations,
- Next steps.

An important part of the project is to establish a network of receiving stations to provide data for analysis of meteor paths. The requirements for a receiving station will be discussed and potential hosts are welcome to contact the speaker.

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Status of the BRAMS and MOMSTER projects
Hervé Lamy, Royal Belgian Institute for Space Aeronomy

BRAMS (Belgian RAdio Meteor Stations) is a Belgian radio forward scatter network aimed at detecting and characterizing meteoroids falling in the upper atmosphere. The network has a dedicated beacon located in the South of Belgium and currently nearly 50 receiving stations located in Belgium and neighbouring countries. The beacon transmits a CW wave with a power of around 130 Watts at a frequency of 49.97 MHz. Technical details about the network will be presented. In particular, the receiving box will be shown during or right after the talk. Recently, the project received an additional funding which will allow us to increase the transmitted power to 400 Watts and possibly to install a second transmitter.
In that sense we are looking for interested/ing locations in Germany as well. In parallel to the BRAMS project, we have developed a dedicated project for the secundary schools called MOMSTER (MObile Meteor STation for Education and outReach). This project uses the same receiving box as the BRAMS stations but a smaller dedicated dipole antenna, easier to transport and assemble. We are looking for people who may be interested in the project to bring it to schools in Germany.

Technical details of the Effelsberg radio telescope
Gerhard Stramm, Astropeiler Stockert e.V.

As a preparation for the Effelsberg visit, the details of the 100-m telescope will be explained.

Cosmic Radiation detection by muon counting
Paul Hearn, British Astronomical Association, Radio Astronomy Group

A simple scintillation detector is described configured for Cosmic Radiation (CR) detection by muon counting. The muon production process from CR interaction with upper atmosphere is described. Some initial results will be presented.

Mini maser telescope: observing astrophysical masers with a small backyard dish.
Eduard Mol

Astrophysical masers are a class of radio sources which emit at characteristic frequencies of molecules or atoms in the decimetre to millimetre wavelength range. Masers are commonly found in star forming regions and in the gas envelopes of red giant stars. Professional astronomers use masers to probe these environments where observations at shorter wavelengths are often hindered by gas and dust. Some masers are among the brightest sources in the sky at microwave frequencies, and many are variable over timescales of weeks to years. The high flux density and variability of some masers makes them interesting targets for amateur radio astronomers. However, up until a few years ago masers have received relatively little attention from the amateur community compared to, for example, the 1420 MHz hydrogen line. This is at least partially because of the challenges involved with radio astronomy at short wavelengths (e.g. high accuracy needed for telescope pointing and dish surface), and a lack of suitable equipment such as amplifiers and downconverters.

In this paper, I describe the construction, testing and observation results of the 1 metre “mini maser telescope”, a small telescope using off- the-shelve equipment for performing observations of methanol masers at 12.2 GHz and water masers at 22.2 GHz. For 12.2 GHz, low- cost and widely available satellite TV LNBFs could be used as a front-end. LNBFs for the 22.2GHz range are still considerably more costly and less available than for the Ku band (10-12 GHz), although some options have become available in recent years. Up until July 2023 only two methanol maser sources were observed, because there are only a handful 12.2 GHz methanol masers which are bright enough to be detectable using small dishes and RFI from satellites was sometimes problematic. Water masers at 22.2 GHz generally have higher flux densities, with some of the brightest water masers exceeding 10^4 Jy. There are also fewer sources of interference at 22.2 GHz, although the effects of atmospheric attenuation and noise are more pronounced at 22.2 GHz compared to 12.2 GHz. Eight water masers have been observed with the mini maser telescope, some of which with a much higher signal-to-noise ratio than the methanol masers despite higher atmospheric attenuation and noise level. Two of the brightest water maser sources, the star-forming regions W49 and W51, were observed once every 3- 6 weeks for a full year in order to detect variability in their spectra.

This project demonstrates that, with the right approach, observing masers can be a very rewarding project for radio astronomy enthusiasts.

On the way to the fifth Bonn survey: The Effelsberg-Bonn HI Survey (EBHIS)
Jürgen Kerp, Argelander-Institute for Astronomy, University of Bonn

Neutral atomic hydrogen is THE indicator of the distribution of interstellar matter in the Milky Way Galaxy. Since the primordial nucleosynthesis of the elements about 3 minutes after the Big Bang, the ratio between hydrogen and helium in the cosmos has not changed fundamentally. All heavier elements can be considered safely as impurities in this gas. The neutral form of the hydrogen atom can be easily measured using the HI 21-cm line radiation.
Neutral atomic hydrogen is by far the dominant fraction of hydrogen in the Milky Way, and its distribution allows conclusions to be drawn about the mass distribution and dynamics of the whole Milky Way Galaxy system at linear scales ranging from 0.1 pc to tens of kpc.
It is a dream to become true to perform a complete sky survey with one of the world's largest fully steerable radio telescopes on Earth, the Effelsberg 100-m dish. The fact that we finally succeeded was not foreseeable and also blocked with partly extreme technological challenges. I would like to present these to you in this talk.

Recent observing techniques at the Dwingeloo telescope
Tammo Jan Dijkema and Thomas Telkamp, CAMRAS

A new software stack in Dwingeloo allows us to efficiently use a software defined radio (SDR) to perform radio astronomical observations. With this software, we have already observed many continuum sources, performed neutral hydrogen measurements, and observed pulsars. All of this is presented in real-time, so that visitors (and operators!) of the telescope can enjoy the observation while observing.

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Historische Radiosternwarte

PiRaTe - The Pi Radio Telescope: A modular, hard- and software open-source amateur radio telescope platform
Hans-Georg Zaunick

The 3m radio telescope at the Radebeul public observatory was instrumented at its last major overhaul with a new positioning and observation control system. This platform is based on an inexpensive Raspberry Pi minicomputer and is assembled entirely from off-the shelf components. The integrative hardware as well as the control, monitoring and scheduler software (including web interfaces for platform independent control) are documented under open-source licenses for ease of adaptation in own DIY projects. The device driver software implements the ubiqituos INDI protocol which is an open-source quasi-standard for remotely operated observatory systems. It allows the remote scope control even in concurrent multi-user mode.
We report about the experience gained at the first two years of successful operation and present first measurements in Ku band as well as the envisaged front-end for 21cm line observations.

Overview of the Stockert Radio Telescopes
Wolfgang Herrmann, Astropeiler Stockert

This talk is an introduction to the various radio telescopes of the Stockert radio astronomy site and is intended as a preparation for the demonstrations for Sunday afternoon. The general setup of the various telescopes will be explained, including frontend, backend and software solutions.