The big impact of a big dish: Science with the Effelsberg 100-m Telescope

Report of Contributions

Contribution ID : **3** Type : **talk**

A Global Millimeter VLBI Array Survey of Compact Extra Galactic Radio Sources at 86 GHz

Tuesday, 20 February 2018 16:30 (0:15)

Summary

Very Long Baseline Interferometry (VLBI) Observations at 86 GHz reach a resolution of about 50 μas and sample the scales as small as 10^3–10^4 Schwarzschild radii of the central black hole in Active Galactic Nuclei (AGN), and uncover the jet regions where acceleration and collimation of the relativistic flow takes place. We present the results from a large global VLBI survey of 162 ultra compact radio sources at 86 GHz conducted in 2010-2011. This survey has contributed an increase of ~ 2 on the total number of AGN imaged with VLBI at 86 GHz. The survey data attained a baseline sensitivity of 0.1 Jy and a typical image sensitivity of 5 mJy/beam.

We have used Gaussian model fitting to represent the structure of the observed sources and to estimate the flux densities and sizes of the core and jet components. The model fitting yields estimates of the brightness temperature (T_b) of the VLBI bright core (base) of the jet and inner jet components of AGN, taking into account the resolution limits of the data at 3mm. We have applied a basic population model with a single value of intrinsic brightness temperature, T_0, in order to reproduce the observed distribution of T_b. In this talk, the analysis and the results of the basic population model will be presented. We also present the brightness temperature limits made directly from the visibility data.

Primary author(s) : GOPALAKRISHNAN NAIR, Dhanya

Co-author(s) : LOBANOV, Andrei (MPI für Radioastronomie); KRICHBAUM, Thomas P. (MPI für Radioastronomie); ROS, Eduardo (MPI für Radioastronomie); ZENSUS, J. Anton (MPI für Radioastronomie)

Presenter(s) : GOPALAKRISHNAN NAIR, Dhanya

Session Classification : Effelsberg in VLBI networks

Contribution ID : **0** Type : **talk**

Ammonia surveys of the Galactic cold interstellar medium

Tuesday, 20 February 2018 11:40 (0:15)

Summary

The cold interstellar medium (CISM) hosts and fuels the star formation. It's structure and physical parameters largely effect the rate of star formation and the initial mass function of the resulted stellar population. The ammonia rotation-inversion lines have been among the most liked tracers of the cold interstellar medium since the late 1970-s. Both very cold cores (T_kin = 10K) and so called hot cores (T_kin > 100K) were discovered in a large number, and were identified as locations of low mass and high mass star formation in the last 4 decades. The Effelsberg-100m radio telescope was definitely one of the best facilities worldwide in the search for CISM, and participated in a large number of cm-wave ammonia spectral line measurement projects. A brief review of 40 years of ammonia observations with the Effelsberg-100m will be given, from the first observations of Heiles Cloud 2, till recent results by projects related to the Herschel Space Observatory. We will show how those measurements altered our view on the physics of interstellar medium, and star formation. First results of our ammonia survey of 50 Planck cold clouds will be also reported.

Primary author(s) : TÓTH, L. Viktor (Eötvös University Budapest)

Co-author(s) : KRAUS, Alex (MPIfR); FEHÉR, Orsolya (Konkoly Observatory, Budapest)

Presenter(s) : TÓTH, L. Viktor (Eötvös University Budapest)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **18** Type : **talk**

Broadband calibration for single-dish telecopes

Wednesday, 21 February 2018 09:30 (0:15)

Summary

In recent years radioastronomical receiving systems have seen huge improvements in terms of bandwidth and back-end processing capabilities. As an example, the K-band receiver at the Effelsberg 100-m radio telescope provides 8-GHz of instantaneous bandwidth and, using stacked FPGA-based FFT spectrometers, up to 2 million spectral channels. While such new devices offer great potential to the modern observatory facilities, they also demand for completely new data reduction software. On the one hand, the sheer amount of produced data needs sophisticated programming techniques to make use of parallel/distributed computing. One the other hand it must be taken into account that quantities like system temperature, Tsys, the intensity, Tcal, of calibration normals (noise diodes), and receiver and antenna gains are not constant over the large recorded bandwidths.

We developed methods to incorporate frequency dependence into the flux-density calibration scheme for the widely used position- and frequency-switching techniques. By combining this with spectroscopic cross-scanning and focus measurements on bright continuum sources and with numerical models, it is even possible to infer antenna taper parameters and optimal focus positions as a function of frequency, as well as to account for weather effects.

Primary author(s) : WINKEL, Benjamin

Co-author(s) : KRAUS, Alex (MPIfR)

Presenter(s) : WINKEL, Benjamin

Session Classification : Technical activities, future developments

Contribution ID : **16** Type : **talk**

Colliding Worlds Science with the Effelsberg

Wednesday, 21 February 2018 14:30 (0:15)

Summary

Galaxy collisions are among the most magnificent *accidents* in the Universe. Rapid star formation, morphological distortions, gaseous outflows, galactic merging - these phenomena are among the large number of possible results of a close passage of two (sometimes, even more) galaxies. The distortions of magnetic fields, traced by the continuum radio emission, are also present. My talk is aimed at summarising the efforts I undertook to study the radio-emitting content of galaxy pairs and groups. In particular, I will present the magnetised tails of a close pair Arp 269, which host a large-scale, ordered magnetic field that does not follow the general direction of the gas escape from the system; the compact and powerful emitter HCG 60, a galaxy group that is a part of a cluster, but it itself serves as a parent structure to a head-tail radio galaxy; the best-known group, the Stephan's Quintet, with its large magnetised halo and a large shock front caused by an infalling galaxy. A brief summary of somewhat less picturesque, yet still interesting systems will also be included, in order to present the final conclusion: that wherever detected, magnetic fields seem to play an important part in the physics of low-quantity galaxy systems.

Primary author(s) : NIKIEL-WROCZYŃSKI, Błażej (Astronomical Institute and Observatory, Jagiellonian University)

Presenter(s) : NIKIEL-WROCZYŃSKI, Błażej (Astronomical Institute and Observatory, Jagiellonian University)

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **40** Type : **not specified**

Concluding remarks

Wednesday, 21 February 2018 17:00 (0:15)

Summary

Presenter(s) : KRAMER, Michael; KADLER, Matthias (Universitaet Wuerzburg)

Session Classification : Discussion, conclusions

Contribution ID : **20** Type : **talk**

Detection of radio quasi-periodic oscillations in the γ-ray-loud X-ray binary LS I +61°303

Wednesday, 21 February 2018 16:00 (0:15)

Summary

The radio-loud X-ray binary LS I +61°303, which is a source of emission up to the TeV γ-ray regime, features predictable radio outbursts occurring with a period of about one month. Previous observations have revealed microflares superimposed on these large outbursts with periods ranging from a few minutes to hours. This makes LS I +61°303, along with Cyg X-1, the only TeV emitting X-ray binary exhibiting radio microflares. To further investigate this microflaring activity in LS I +61°303 we observed the source for almost 100 hours continuously with the 100-m Effelsberg radio telescope at three frequencies with unprecedented time resolution for a multiwavelength radio observation of this source. Timing analysis of the obtained light curves led to the detection of quasi-periodic oscillations (QPO) with timescales of 15 h at all three frequencies. We discuss multiple shocks in a relativistic jet as a possible physical process behind these radio QPO.

Primary author(s) : JARON, Frederic (IGG Uni Bonn)

Co-author(s) : SHARMA, Richa (Max Planck Institute for Radio Astronomy); MASSI, Maria (MPIfR); FUHRMANN, Lars (MPIfR); ANGELAKIS, Emmanouil (MPIfR); MYSERLIS, Ioannis (MPIfR); LI, Guang-Xing (USM Munich); SHI, Xun (Max-Planck-Institut für Astrophysik)

Presenter(s) : JARON, Frederic (IGG Uni Bonn)

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **21** Type : **poster**

Discovery of Water Maser Superburst with Effelsberg and Torun Radio Telescopes

Summary

On September 7, 2017, a new water maser super burst in W49N, occurred at V_LSR -82 km/s with flux density of up to 40,000 Jy, was detected with Effelsberg during the regular monitoring, and immediately confirmed by Torun on September 8, 2017. This discovery have triggered the global network of single dish monitoring programme which has just recently established during the IAU Symposium 336 (Astrophysical Masers: Unlocking the Mysteries of the Universe), Cagliari (Sardinia), Italy, September 4-8, 2017. Moreover, the following-up VLBI observations of the 22-GHz water masers have also successfully carried out with KaVA, EVN, VLBA. In this poster, we present data from the monitoring of this super burst by the Torun radio telescope in both 22 GHz water masers and 6.7 GHz methanol masers. We also discuss future collaboration between Effelsberg & Torun.

Primary author(s) : WOLAK, Paweł (Centre for Astronomy, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University)

Co-author(s) : KRAMER, Busaba (Max Planck Institute for Radio Astronomy); OLECH, Mateusz (Nicolaus Copernicus University); KRAUS, Alex (MPIfR); MENTEN, Karl (MPIfR)

Presenter(s) : WOLAK, Paweł (Centre for Astronomy, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University); KRAMER, Busaba (Max Planck Institute for Radio Astronomy); OLECH, Mateusz (Nicolaus Copernicus University)

Session Classification : Poster session, discussion

Contribution ID : **44** Type : **not specified**

Discussions, workshop synopsis

Wednesday, 21 February 2018 16:30 (0:30)

Summary

Session Classification : Discussion, conclusions

Contribution ID : **28** Type : **talk**

Extragalactic Radio Continuum Observations with the Effelsberg 100-m Telescope: Total Intensity and Linear Polarization

Wednesday, 21 February 2018 13:30 (0:30)

Summary

Radio continuum observations are one of the four main observing modes of the Effelsberg 100-m radio telescope. They need high receiver sensitivity (low receiver noise) and stability over a large bandwidth and a phase reference for the polarization angle measurement, and are highly weather dependent especially at cm wavelength and below. Special technical and software tools were developed at the MPIfR to fulfil these requirements and to correct for weather influences. The radio continuum traces the thermal and nonthermal radiation of point-like or extended sources and the observations give full information about the Stokes parameters I, Q, and U. In my talk I will concentrate on extragalactic sources and present results of nearby spiral galaxies seen face-on and edge-on and what we learned about the magnetic fields there. The talk will also include results of large, more distant objects like relics and radio galaxies, as well as surveys of distant galaxies (only partly resolved) in the radio continuum and linear polarization. Further, radio continuum single-dish observations are essential as complementary measurements to interferometer observations to provide the missing large-scale flux density information.

Primary author(s) : KRAUSE, Marita

Presenter(s) : KRAUSE, Marita

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **8** Type : **talk**

Extragalactic maser science with large radio telescopes

Tuesday, 20 February 2018 11:10 (0:30)

Summary

In this talk, after a brief outline of the relevance of extragalactic masers as fundamental tools to tackle and provide answers to many important and puzzling mysteries of modern astronomy, I will report on a number of projects, related to extragalactic masers, led by our group in past and recent times with Effelsberg and some of the other largest radio telescopes in the world, and provide possible hints for future maser-related observing projects that would benefit from the availability of a state-of-the-art big dish.

Primary author(s) : TARCHI, Andrea (INAF-Osservatorio Astronomico di Cagliari)

Presenter(s) : TARCHI, Andrea (INAF-Osservatorio Astronomico di Cagliari)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **4** Type : **talk**

F-GAMMA: multi-frequency radio monitoring of Fermi blazars

Wednesday, 21 February 2018 15:30 (0:15)

Summary

Will review a compilation of findings from the F-GAMMA program.

Primary author(s) : ANGELAKIS, Emmanouil

Presenter(s) : ANGELAKIS, Emmanouil

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **33** Type : **talk**

Fast Radio Burst Science with Effelsberg

Wednesday, 21 February 2018 11:30 (0:30)

Summary

A new class of millisecond-duration radio transients was discovered a decade ago. We know now that the sources of these "fast radio bursts" (FRBs) are extragalactic but their exact astrophysical origin is still unknown. In particular, we have made large strides in our understanding of these sources from the sole repeating FRB. Effelsberg has played a key role in follow up observations of this source. We are also working on turning Effelsberg into an FRB finder with a special emphasis on multi-observatory observations. In this talk I will review past work and discuss our future plans.

Primary author(s) : SPITLER, Laura

Presenter(s) : SPITLER, Laura

Session Classification : Pulsar observations at Effelsberg

Contribution ID : **24** Type : **talk**

Fourty years of M31 observations with the Effelsberg Telescope

Wednesday, 21 February 2018 16:15 (0:15)

Summary

The first total power scans of the Andromeda galaxy M31 in 1972 already demonstrated the unique performance of the Effelsberg telescope to detect weak, extended radio continuum emission. From 1972 to 2012 we conducted 8 surveys of M31 at three wavelengths, with improving sensitivity of the receiving systems and capability to detect linear polarization, involving four PhD students. The magnetic field of M31 is very regular, preserving its direction along a ring-like structure in the disk. This is regarded as the first and best evidence so far for the action of the large-scale dynamo in galaxies. Parker-type field loops were found for the first time in any spiral galaxy. The regular field leads to fast diffusion of cosmic rays and prevents the formation of a radio halo of detectable surface brightness. The magnetic field in the central region is inclined to the disk and of opposite direction, indication of a major merger event in the past. M31 became the cornerstone to investigate the nonthermal properties of spiral galaxies.

Primary author(s) : BERKHUIJSEN, Elly M. (MPIfR)

Co-author(s) : BECK, Rainer (MPIfR)

Presenter(s) : BERKHUIJSEN, Elly M. (MPIfR); BECK, Rainer (MPIfR)

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **6** Type : **talk**

From single-dish to space-VLBI: the pivotal role of Effelsberg in AGN studies

Tuesday, 20 February 2018 16:45 (0:30)

Summary

From radio-SED fitting of AGN, to the record angular resolution reached with space-VLBI facilities like RadioAstron, Effelsberg has given a fundamental contribution to the study of AGN and their characterization. I will give an overview of the projects I worked on during the past years: the study of the radio phase in broad absorption line quasars, its connection with fast nuclear winds, and the more recent results from the three RadioAstron key science projects on AGN imaging. The latter, making use of the 10m space-VLBI antenna orbiting Earth since 2011, aim at studying the jet launching and collimation mechanism - including magnetic fields configuration - at the highest angular resolution reached to date (tens of micro-arcsec). Thanks to the Effelsberg single-dish sensitivity, it has been possible to recover the signal on space-baselines up to several Earth diameters, dramatically improving the outcomes of the RadioAstron mission. I will cover both technical and scientific improvements introduced by Effelsberg contribution.

Primary author(s) : BRUNI, Gabriele (INAF - Institute for space astrophysics and planetology)

Presenter(s) : BRUNI, Gabriele (INAF - Institute for space astrophysics and planetology)

Session Classification : Effelsberg in VLBI networks

Contribution ID : **23** Type : **poster**

Fueling the Milky Way Galaxy: on the formation of high altitude molecular gas

Summary

Since billions of years the Milky Way Galaxy forms stars. An efficient re-fueling process is necessary to maintain this persistent star formation. Several gas accretion modes are under investigation. Here, we cross-correlated multi-frequency data of EBHIS, Planck and DRAO to investigate the formation of molecular gas high above the Galactic disk, in the disk-halo interface. Using EBHIS and Planck full-sky data allows to identify, by their HI line along with far-infrared intensity, the location of molecular high altitude clouds. Matching these regions of interest with the Planck Catalogue of Galactic Cold Clumps (PGCC) discloses the presence of cold molecular gas. We focus on two high altitude molecular clouds with firm distance limits to calculate their physical properties. Disclosing eventually the efficiency of cold gas accretion.

Primary author(s) : VYAS, Charitarth (Argelander Institute for Astronomy); KERP, Juergen (Argelander-Institut fuer Astronomie)

Presenter(s) : VYAS, Charitarth (Argelander Institute for Astronomy)

Session Classification : Poster session, discussion

Contribution ID : **47** Type : **not specified**

Guided tour 100-m Telescope

Thursday, 22 February 2018 11:15 (1:15)

Summary

Session Classification : Effelsberg tour

Contribution ID : **31** Type : **talk**

High precision polarimetry and sources with stable linear and circular polarization in the GHz regime

Wednesday, 21 February 2018 09:45 (0:15)

Summary

We present a novel data analysis methodology to recover the linear and circular polarization parameters of radio sources. The detailed treatment of instrumental effects allows the detection of linear and circular polarization degrees as low as 0.3 %. The instrumental linear polarization is corrected across the whole telescope beam and significant Stokes Q and U can be recovered even when the recorded signals are severely corrupted. The instrumental circular polarization is corrected with two independent techniques which yield consistent Stokes V results. The accuracy we reach is of the order of 0.1-0.2 % for the polarization degree and 1^{o} for the angle. The methodology was used to recover the polarization parameters of around 150 active galactic nuclei that were monitored monthly between 2010.6 and 2016.3 with the Effelsberg 100-m telescope. We identified sources with stable polarization parameters that can be used as polarization standards. Five sources have stable linear polarization; three are linearly unpolarized; eight have stable polarization angle; and 11 sources have stable circular polarization, four of which with non-zero Stokes V.

Primary author(s) : MYSERLIS, Ioannis

Co-author(s) : ANGELAKIS, Emmanouil; ZENSUS, Anton

Presenter(s) : MYSERLIS, Ioannis

Session Classification : Technical activities, future developments

Contribution ID : **32** Type : **talk**

Investigation of molecular outflow chemistry with carbon chain molecules

Tuesday, 20 February 2018 12:25 (0:15)

Summary

Linear carbon chain molecules (LCCMs) are power weapons to trace early cold dark cores (ECCCs). In more evolved sources, the enhancement of molecules such as C4H and HCO2+ is the character of warm carbon chain chemistry (WCCC). However, the chemical features of three sources with decreasing of Nitrogen-containing molecules but enhancement of C3S can not be explained by ECCCs or WCCCs. So we propose a new chemistry called shocked carbon-chain chemistry (SCCC) which focuses on the chemical processes driven by S+ evaporated from grain surface under the effect of shock.

Primary author(s) : LIU, Xunchuan (Peking University, China)

Presenter(s) : LIU, Xunchuan (Peking University, China)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **49** Type : **poster**

Multi-band studies on High-redshift BAL quasars

Summary

Presenter(s) : TUCCILLO, Diego

Session Classification : Poster session, discussion

Contribution ID : **30** Type : **poster**

Multifrequency monitoring of periodic maser sources.

Summary

Recent discovery of periodic and alternating flares of 6.7 GHz methanol and 22 GHz water maser in source G107.298+5.639 gave us a new insight into possible mechanism causing periodicity in stellar masers. Following this finding we designed multifrequency monitoring program to other known sources showing intermittent flares. In this poster we summarise results of those observations and propose future collaboration between Effelsberg & Torun in expanding studies to other transitions.

Primary author(s) : OLECH, Mateusz (Nicolaus Copernicus University)

Co-author(s) : WOLAK, Paweł (Centre for Astronomy, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University); SZYMCZAK, Marian (Toruń Centre for Astronomy Nicolaus Copernicus University); BARTKIEWICZ, Anna (Toruń Centre for Astronomy Nicolaus Copernicus University)

Presenter(s) : OLECH, Mateusz (Nicolaus Copernicus University); WOLAK, Paweł (Centre for Astronomy, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University)

Session Classification : Poster session, discussion

Contribution ID : **37** Type : **talk**

New receivers, phased-array feed, spectropolarimeter

Wednesday, 21 February 2018 09:00 (0:30)

Summary

Primary author(s) : WIECHING, Gundolf

Presenter(s) : WIECHING, Gundolf

Session Classification : Technical activities, future developments

Contribution ID : **27** Type : **talk**

Out-of-focus holography at the Effelsberg telescope

Wednesday, 21 February 2018 10:00 (0:15)

Summary

The out-of-focus (OOF) holography technique allows users to obtain low resolution maps of the wavefront (aberration) distribution in an antenna surface using astronomical observations. It requires —in contrast to traditional holography measurements— only one in-focus and two out-of-focus images of a compact source at a good signal-to-noise ratio. The 100-m Effelsberg antenna has an active sub-reflector surface with 96 actuators which are set in order to correct the gravitationally-caused surface deformations of the primary dish. The active surface is controlled via a static look-up table, which was calculated from a Finite Element Method (FEM) model of the antenna and is not based on real measurements. It is confirmed that the FEM model does indeed improve the sensitivity and gain-elevation curve for high frequency observations from the secondary focus, but further improvements from real measurements are likely possible. Within the scope of this (Uni-Bonn master thesis) project a general OOF holography software (pyoof package) was developed that takes care of the particular geometry and blockage of the Effelsberg antenna. It solves the under-determined problem of the observed power pattern and aperture distribution relation, that is required for the phase-retrieval computation of the OOF holography. Several OOF holography observation campaigns were performed, including consistency checks, e.g. through the introduction of known misalignments in the active surface and the comparison of measurements with the FEM model on and off. The measurements show that the basic principle works and that surface adjustments are possible. Finally, subsequent to the end of the master thesis project, a new look-up table is proposed (within a new set of observations) for fixed elevations with guidelines on how to model gravitationally-caused surface deformations for future science observing campaigns and therewith improve the gain-elevation curve.

Primary author(s) : WINKEL, Benjamin (MPIfR); KRAUS, Alex (MPIfR); CASSANELLI, Tomas (University of Toronto); BACH, Uwe (MPIfR)

Presenter(s) : CASSANELLI, Tomas (University of Toronto)

Session Classification : Technical activities, future developments

Contribution ID : **22** Type : **talk**

Polarized emission of cluster merger shock fronts

Wednesday, 21 February 2018 14:00 (0:15)

Summary

Mergers of galaxy clusters clusters generate gigantic shock fronts in the intra-cluster medium. At these shock fronts electrons are accelerated to relativistic energies and causes synchrotron emission –called radio relic— in downstream of the shock. We studied several of those relics with Effelsberg and found an enigmatic high degree of polarisation. Moreover, our studies shed light on the magnetic fields in the intracluster and intergalactic medium.

Primary author(s) : KIERDORF, Maja

Presenter(s) : KIERDORF, Maja

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **42** Type : **not specified**

Poster session

Tuesday, 20 February 2018 19:00 (1:00)

Summary

Session Classification : Poster session, discussion

Contribution ID : **34** Type : **talk**

Pulsar Projects at the Effelsberg Telescope

Wednesday, 21 February 2018 10:45 (0:30)

Summary

In this talk I will overview some of the major pulsar projects using the Effelsberg telescope. These include several ongoing searches, from the full-sky High Time Resolution Universe Survey to searches of the Galactic centre. These surveys employ novel RFI rejection techniques and binary search algorithms. To extract the most interesting science from these new pulsars high precision timing campaigns are needed. These observations are used to constrain the equation-of-state, test theories of gravity and investigate pulsar evolution, among many other projects. Finally the most stable pulsars are used to search for gravitational waves from binary supermassive black hole mergers.

Primary author(s) : CHAMPION, David

Presenter(s) : CHAMPION, David

Session Classification : Pulsar observations at Effelsberg

Contribution ID : **13** Type : **talk**

Pulsar Science with the Large European Array for Pulsars

Wednesday, 21 February 2018 11:15 (0:15)

Summary

The ultimate goal of the European Pulsar Timing Array (EPTA) is the direct detection of nano-Hertz gravitational waves, via their influence on pulse times of arrival. For this to be achieved, extreme precision is required in observations of highly-rotationally-stable pulsars. The Large European Array for Pulsars (LEAP) is an ERC-funded experiment (P.I. Michael Kramer), led by scientists at the Max Planck Institute for Radio Astronomy, which uses the combined collecting area of the EPTA telescopes to form a single tied-array with an equivalent dish size of 195 metres. As the most sensitive of the EPTA telescopes, Effelsberg is used as the reference in the calculation of the interferometric delays between the telescopes in our array. Since 2012, monthly observations of a set of millisecond pulsars have been made using LEAP, with precisions greatly exceeding those possible with the individual telescopes. In this talk, I will give an overview of the LEAP experiment, and present recent results of the ongoing scientific projects based on our data set.

Primary author(s) : MCKEE, James (MPIfR)

Presenter(s) : MCKEE, James (MPIfR)

Session Classification : Pulsar observations at Effelsberg

Contribution ID : **38** Type : **talk**

Pulsar observations with German LOFAR stations

Wednesday, 21 February 2018 12:00 (0:30)

Summary

Primary author(s) : TIBURZI, Caterina

Presenter(s) : TIBURZI, Caterina

Session Classification : Pulsar observations at Effelsberg

Contribution ID : **43** Type : **not specified**

Pulses and Waves (movie presentation)

Tuesday, 20 February 2018 20:00 (0:30)

Summary

Presenter(s) : TOTH, L. Viktor (Eotvos Lorand University, Budapest)

Session Classification : Poster session, discussion

Contribution ID : **12** Type : **talk**

Radio Continuum Studies of Supernova Remnants and Pulsar Wind Nebulae with the 100-m Effelsberg telescope

Wednesday, 21 February 2018 14:15 (0:15)

Summary

As the most significant source of chemical enrichment, energy input, and cosmic ray production in the interstellar medium, supernovae and their remnants play an important role in the evolution of our Galaxy. Most SNRs in our Galaxy have been discovered through their radio emission and for the majority this remains the only means of studying them. The 100-m radio telescope in Effelsberg has been essential for radio continuum and linear polarization studies of supernova remnants and pulsar wind nebulae, because it provides high resolution imaging with some of the most sensitive receiver systems currently available. In this review I will discuss the impact of radio continuum and polarization studies with the 100-m radio telescope in Effelsberg on studies of SNRs, PWNe and the importance of such studies to the investigation of pulsars.

Primary author(s) : KOTHES, Roland (National Research Council Canada, Dominion Radio Astrophysical Observatory)

Presenter(s) : KOTHES, Roland (National Research Council Canada, Dominion Radio Astrophysical Observatory)

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **14** Type : **talk**

Radio recombination lines: the synergy between a big dish and dipoles

Tuesday, 20 February 2018 14:00 (0:15)

Summary

The interstellar medium (ISM) is central to the evolution of galaxies. New stars are formed from interstellar gas, and these in turn enrich the gas with the products of nucleosynthesis. This gives rise to a recycling of matter in the ISM. One interesting aspect of this cycle is the relation between the cold neutral medium, which comprises most of the ISM mass, and other phases of the ISM, such as molecular clouds. Our understanding of the ISM has increased over the last decades, in part thanks to the opening of the radio and submillimeter windows. In these windows systematic surveys of atomic and molecular gas through surveys of the 21 cm HI line and from CO line transitions are possible. These have revealed a complex and dynamic ISM in which the different phases are related, but many questions remain open. Radio recombination lines (RRLs) offer a complementary way of studying the ISM. In particular RRLs of carbon. Carbon having a lower ionization potential than hydrogen, is ionized throughout the ISM, which makes carbon RRL (CRRL) emission ubiquitous in our Galaxy. Given the physics of low frequency (< 1 GHz) CRRL emission, the lines are good tracers of cold diffuse gas. Using the power of the low frequency array (LOFAR), and single dish radio telescopes like Effelsberg, our group is conducting a survey of CRRLs in the Milky Way. By studying the evolution of the CRRL properties with principal quantum number and comparing with updated models of RRL emission, we can determine the thermodynamic properties of the gas (such as temperature and density). In this talk I will give an overview of RRL observations, highlighting what can be learned from combined observations with the 100-m Effelsberg telescope and LOFAR.

Primary author(s) : SALAS, Pedro (Leiden Observatory)

Co-author(s) : OONK, J. B. Raymond (Leiden observatory)

Presenter(s) : SALAS, Pedro (Leiden Observatory)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **1** Type : **talk**

Radio synchrotron spectra of star-forming galaxies

Wednesday, 21 February 2018 15:45 (0:15)

Summary

We have analyzed the radio continuum spectra of 14 star-forming galaxies by fitting nonthermal (synchrotron) and thermal (free-free) radiation laws. The underlying radio continuum measurements cover a frequency range of 325 MHz to 24.5 GHz. It turns out that most of these synchrotron spectra are not simple power-laws, but are best represented by a low-frequency spectrum with a mean slope of 0.59, and by a break or an exponential decline in the frequency range of 1 – 12 GHz. The break or cutoff energies are in the range of 1.5 - 7 GeV. We briefly discuss the possible origin of such a cutoff or break. If the low-frequency spectra obtained here reflect the injection spectrum of cosmic-ray electrons, they comply with the mean spectral index of Galactic supernova remnants. Our work demonstrates that single-dish K-band measurements are indispensable for this kind of analysis (Effelsberg, GBT, or SRT).

Primary author(s) : KLEIN, Uli (AIfA, Univ. Bonn)

Co-author(s) : LISENFELD, Ute (Departamento de Fısica Teorica y del Cosmos, Universidad de Granada, Spain); VERLEY, Simon (Departamento de Fısica Teorica y del Cosmos, Universidad de Granada, Spain)

Presenter(s) : KLEIN, Uli (AIfA, Univ. Bonn)

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **29** Type : **talk**

Single dish observations for the study of the AGN duty cycle

Wednesday, 21 February 2018 14:45 (0:15)

Summary

One of the best tools to investigate the duty cycle of jets in radio AGN is modelling of radio galaxy's radio spectra. Particularly interesting to this aim are remnant radio galaxies, which represent the phase after the jets switch off, and restarted radio galaxies, which show active radio jets associated with remnant plasma from a previous activity.
These classes of sources have remained elusive so far. However the recent availability of low frequency surveys has opened the way to new searches of such sources, as remnant radio plasma is brighter at MHz frequencies. To date, we have selected a sample of 23 remnant candidates in the Lockman Hole field with LOFAR at 150 MHz and we are expanding the search for both remnant and restarted radio galaxies in the LOFAR Two-metre Sky Survey. While data at low frequencies are ideal to select such sources, complementary frequencies higher than 1.4 GHz are crucial to understand the physical condition and evolutionary stage of the radio plasma. In particular, some of our recent studies on single objects have proved the importance of 5-GHz observations to disentangle between old ageing lobes and lobes that are still fuelled by the nuclear activity.
Single dish deep observations, which are sensitive to large scale and low surface brightness emission, are especially suited to study AGN remnants. Sardinia Radio Telescope observations at 7 GHz have already shown us that single dishes can provide powerful constraints to the source radio spectra, especially if beam subtraction algorithms are available. Observations with the Effelsberg telescope are therefore promising for the characterization of sources in our upcoming samples.

Primary author(s) : BRIENZA, Marisa (ASTRON)

Presenter(s) : BRIENZA, Marisa (ASTRON)

Session Classification : Continuum observations with the 100-m Telescope

Contribution ID : **46** Type : **not specified**

Talk about Effelsberg Telescope

Thursday, 22 February 2018 10:00 (1:00)

Summary

Presenter(s) : JUNKES, Norbert (MPIfR)

Session Classification : Effelsberg tour

Contribution ID : **9** Type : **talk**

The ATLASGAL catalogue of class I methanol masers

Tuesday, 20 February 2018 11:55 (0:15)

Summary

Class I methanol masers (CIMMs) are extremely important tools to investigate early stages of massive star formation: they are shock tracers and they are not affected by extinction. Therefore they are likely the only way to probe protostellar activity in young deeply embedded objects and allow a reliable classification (proto- or prestellar phase) of these fundamental phases of massive star-formation. CIMMs are also extremely sensitive to the physics of the emitting gas and multi-line observations of these lines constrain the temperature and the density structure of maser spots.

In this talk, I will present a catalogue of all known Class I methanol masers from 1 cm up to 3 mm in a sample of 200 ATLASGAL sources in different evolutionary phases, from very young objects, still dark at 70 mu, to evolved sources already hosting ultracompact HII regions. The catalogue includes observations at 44 GHz and 36 GHz with the Effelbserg telescope, at 84.5 GHz and 95.1 GHz with the IRAM-30m, and at 25 GHz with the SRT telescope.

Primary author(s) : LEURINI, Silvia (INAF-OA Cagliari)

Presenter(s) : LEURINI, Silvia (INAF-OA Cagliari)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **15** Type : **talk**

The Inner Jet Structure of 3C 84 from GMVA Mapping

Tuesday, 20 February 2018 16:15 (0:15)

Summary

We present sub-parsec scale observations of 3C 84 using the Global mm-VLBI Array (GMVA). Given the proximity of 3C84 (z=0.018), this source is one of the best test-beds to probe AGN jet launching mechanism: whether the jet is disk-launched (Blandford-Payne mechanism) or black-hole launched (Blandord-Znajek mechanism). GMVA achieves an angular resolution of about 50 micro-arcsec, which corresponds to about 500 Schwarzschild radii for 3C 84. In eight epochs from 2008 to 2015, we discovered a "double" nuclear structure in the core region. There is a significant correlation between position angle and brightness temperature of these components. Based on their high brightness temperature (10e10 K) and large separation (70 micro-arcsec), we concluded that the double structure does not correspond the jet base but rather is an effect of helical jet motion. We estimate the probable black hole location using both conical and parabolic jet profiles.

Primary author(s) : TRIPPE, Sascha (Seoul National University)

Presenter(s) : TRIPPE, Sascha (Seoul National University)

Session Classification : Effelsberg in VLBI networks

Contribution ID : **26** Type : **poster**

Variability of 22 GHz water and 6.7 GHz methanol masers in G111.256-0.770

Summary

6.7 GHz methanol and 22 GHz water vapour masers are considered to probe different regions of protostar environment, due to different exciting schemes. Discovery of periodic and alternating variability of both lines in G107.25 + 5.64 shows, they may origin from the same location. In attempt to find another correlated variability, we monitored other source known of having methanol and water masers with similar radial velocities: G111.256 - 0.770, for about 200 days. Although no correlation between CH_3OH and H_2O masers was found, we detected strong variability on time-scales of months to years.

Primary author(s) : DURJASZ, Michał (Nicolaus Copernicus University, Toruń, Poland)

Presenter(s) : DURJASZ, Michał (Nicolaus Copernicus University, Toruń, Poland)

Session Classification : Poster session, discussion

Contribution ID : **11** Type : **talk**

Variability of Water Masers in W49N: Results from Effelsberg Long-term Monitoring Programme (2014-2017)

Tuesday, 20 February 2018 12:10 (0:15)

Summary

We present results from the long-term monitoring of the 22-GHz water maser in W49N with the 100-m Effelsberg radio telescope during 2014-2017. Following the strong outburst in W49N in late 2013, we have started repeated observations at Effelsberg in February 2014, making use of the telescope's unique spectral line observation capability which provides a broad velocity range coverage from -500 to +500 km/s with a spectral resolution better than 0.1 km/s. The major outburst feature (up to 80,000 Jy) at high velocity (˜ 98 km/s) has faded away in 2014. However, we found that the source is still active with several high velocity blue-shifted outbursts. Some features appear at extremely high velocities (up to +/- 300 km/s) and show rapid flux variations within a 1-2 month period. These sub-year scale variability implies that the water masers could be excited by episodic shock propagation caused by a high-velocity protostellar jet.

Primary author(s) : KRAMER, Busaba (Max Planck Institute for Radio Astronomy)

Co-author(s) : MENTEN, Karl (MPIfR); KRAUS, Alex (MPIfR)

Presenter(s) : KRAMER, Busaba (Max Planck Institute for Radio Astronomy)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **2** Type : **talk**

Very-Long-Baseline Interferometry with Effelsberg

Tuesday, 20 February 2018 15:45 (0:30)

Summary

The 100-m radio telescope is a member of the European VLBI Network, the Global mm-VLBI Array, the High Sensitivity Array, and participates regularly at geodetic observations and ad-hoc observations. The observatory is one of the most sensitive dishes in the world and is equipped with receivers at all the bands available in established open-sky networks, from 3.5 mm to 92 cm. I will summarize VLBI efforts and science performed with Effelsberg, report on recent highlights and give an outlook to future enhancements.

Primary author(s) : ROS, Eduardo (MPI für Radioastronomie)

Presenter(s) : ROS, Eduardo (MPI für Radioastronomie)

Session Classification : Effelsberg in VLBI networks

Contribution ID : **35** Type : **not specified**

Welcome

Tuesday, 20 February 2018 11:00 (0:10)

Summary

Presenter(s) : KRAMER, Michael; KADLER, Matthias (Universitaet Wuerzburg)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **41** Type : **talk**

X-rays and the Effelsberg telescope

Tuesday, 20 February 2018 14:45 (0:30)

Summary

The Effelsberg radio telescope is perhaps the instrument that has had the most influence on the development of X-ray astronomy in the past decades. The reason for this perhaps surprising fact is that by providing information about the distribution of atomic hydrogen in the Galaxy, the Effelsberg 21cm surveys are a key ingredient in virtually all analyses of X-ray spectra. In this talk I will show how X-ray spectra are influenced by absorption in the interstellar medium, how X-ray astronomers use Effelsberg hydrogen columns in their analyses, and how X-ray data can provide us with information about the distribution of metals and ionized gas in the Galaxy that is complementary to that observed with Effelsberg.

Primary author(s) : WILMS, Joern (Remeis-Sternwarte, FAU Erlangen-Nuernberg)

Presenter(s) : WILMS, Joern (Remeis-Sternwarte, FAU Erlangen-Nuernberg)

Session Classification : Spectroscopy with the 100-m Telescope

Contribution ID : **25** Type : **talk**

"How to maintain the star formation of the Milky Way Galaxy?" On the value of single dish HI full-sky surveys

Tuesday, 20 February 2018 14:15 (0:30)

Summary

Single dish HI surveys open widely the portal to a hidden kingdom in astrophysics, the phase transition from atomic to molecular gas in the interstellar medium. Beyond the narrowly confined band of the Milky Way's disk 21-cm photons reach the observer nearly unattenuated even from deep space. The Doppler velocity allows to disentangle emission of unrelated sources, accidentally superposed on a single line of sight. The filled aperture is the key to identify the locations and the dynamics involved in phase transitions from the warm to the cold and eventually the molecular gas phase.

In this talk I am going to highlight selected results deduced from the Effelsberg-Bonn HI Survey, the Parkes Galactic-All-Sky Survey and the derived data product HI4PI. I focus on the structure of the Milky Way interstellar medium on linear scales from sub-pc to tens of kpc, disclosing the strong interrelation between HI, the Galactic magnetic field and the associated phase transitions. Eventually answering the open question how to maintain the persistent star formation rate of the Milky Way Galaxy over cosmic time.

Primary author(s) : KERP, Jürgen

Presenter(s) : KERP, Jürgen

Session Classification : Spectroscopy with the 100-m Telescope