

# Millimetre and Submillimetre Astronomy

**R. D. Woistencroft  
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# Millimetre And Submillimetre Astronomy

**Robert R. Redfield**



## **Millimetre And Submillimetre Astronomy:**

**Submillimetre Astronomy** Graeme D. Watt, Adrian S. Webster, 2013-03-14 G M Bernstein M L Fischer and P L Richards Department of Physics University of California Berkeley California 94720 U S A J B Peterson Department of Physics Princeton University Princeton New Jersey 08540 U S A T Timusk Department of Physics McMaster University Hamilton Ontario L8S 4M1 Canada ABSTRACT Recent measurements of the diffuse background at millimeter wavelengths indicate no departure from a Planck spectrum near the peak of the blackbody curve Anisotropy measurements indicate no structure at the 2% level in the recently detected submillimeter excess We report here the results of an April 1987 balloon flight of an instrument designed to measure the spectrum of the cosmic background radiation from 1 mm to 3 mm A description of the instrument can be found in Peterson Richards and Timusk 1985 Modifications were made to the apparatus and experimental procedure in order to identify and reduce systematic errors Results from the latest flight indicate that two effects hamper the interpretation of the data These systematic effects will be described in detail in a forthcoming publications they are probably responsible for the non Planckian spectrum measured by Woody and Richards 1981 Attempts to remove the systematic effects from our data yield the upper limits to the CBR brightness temperature in 4 bands from 1 mm to 3 mm There is no evidence for an excess of radiation near the 2.8 K blackbody peak Development of Coherent Detector Technologies for Sub-Millimetre Wave Astronomy Observations Boon Kok Tan, 2015-09-15 The thesis describes the development of receiver technologies for sub millimetre astronomy instruments focusing on high performance coherent cryogenic detectors operating close to the superconductor gap frequency The mixer chip which comprises the SIS devices fed by a unilateral finline and matching planar circuits was fabricated on 15 micron silicon substrate using the recently developed Silicon On Insulator SOI technology This offered broadband IF and RF performance with fully integrated on chip planar circuits resulting in an easily reproducible mixer chip and a simple mixer block An important consequence of this design is that it can be extended to the supra THz region and making the fabrication of multi pixel heterodyne arrays feasible The extension of the operation of major telescopes such as ALMA APEX and the GLT from single pixel to large format arrays is the subject of extensive research at present time since it will allow fast mapping combined with high resolution of the submillimetre sky The technology described in this thesis makes a major contribution to this effort *Millimetre and Submillimetre Astronomy* R.D. Wolstencroft, W.B. Burton, 2012-12-06 The millimetre and submillimetre spectral region 300 to 3000 Ilm or 1000 to 100 GHz was until recently one of the few spectral regimes not fully opened up for astronomical studies Thanks both to improvements in detectors and receivers and to the construction of large telescopes at high altitude sites this situation is improving very rapidly Three major telescopes have been built recently and are coming into operation during 1987 and 1988 namely the 15m James Clerk Maxwell Telescope JCMT and the IOAM Caltech Submillimetre Observatory CSO telescope both located on Mauna Kea Hawaii and the 15 m Swedish ESO telescope SEST in Chile Because a very wide range of astronomical

problems can be tackled with these major new facilities there is a great deal of interest from the many potential new users anxious to become familiar with this rapidly developing field During 1986 it became clear to British and Dutch astronomers involved in planning the commissioning and operation of the JCMT that a summer school in this field would greatly benefit the potential and actual JCMT user community With financial support from the SERC and supplemented by a grant from the ZWO the Summer School on Millimetre and Submillimetre Astronomy was held at Stirling University from June 21 to 27 1987

**The Spatialities of Radio Astronomy** Guy Trangoš, 2023-04-28 The Spatialities of Radio Astronomy examines the multidisciplinary overlap between the spatial disciplines and the studies of science and technology through a comparative study of four of the world's most important radio telescopes Employing detailed analysis historical research interviews personal observations and various conceptual manoeuvres Guy Trango reveals the depth of spatial process active at these scientific sites and the territories they traverse Through the conceptual frameworks of territory hyper concentration and contingency Trango interprets the telescope as exploded across space and time present in multiple connected sites simultaneously and active in the production of space He develops a historiographic and contemporary analysis of the Atacama Large Millimeter submillimeter Array ALMA Chile the Five hundred meter Aperture Spherical radio Telescope FAST China the Arecibo Observatory Puerto Rico and the MeerKAT SKA South Africa These case studies are global exemplars of the different spatial transformations that occur through science Their relationships to surrounding communities and landscapes reveal deeper constitutional processes embodied in each institutional and spatial form This book spans the modern history of architecture and science the studies of science technology and society and urban theory It is of specific interest to architects and designers expanding their analysis of spatial production scholars in the study of geography landscape science technology and astronomy and people fascinated with how these radio telescopes were conceptualised built and operate today Millimetre and Submillimetre Waves Frank Atkinson Benson, 1969 CO: Twenty-Five Years of Millimeter-Wave Spectroscopy William B. Latter, Simon J.E. Radford, Philip R. Jewell, Jeffrey G. Mangum, John Bally, 2013-12-01 Interstellar carbon monoxide CO was first detected in 1970 with the 36 foot diameter telescope of the National Radio Astronomy Observatory on Kitt Peak in Southern Arizona R W Wilson K B Jefferts and A A Penzias of Bell Labs reported We have found intense 2.6 mm line radiation from nine Galactic sources which we attribute to carbon monoxide Soon afterward several other basic molecules were also observed in space IAU Symposium 170 CO Twenty Five Years of Millimeter Wave Spectroscopy was organized to commemorate those discoveries The Symposium reviewed the accomplishments of a quarter century of research on interstellar molecular gas surveyed the current state of millimeter wave spectroscopy and gave a glimpse of what the next 25 years might hold Studies of interstellar CO have revolutionized our understanding of the phases and dynamics of the interstellar medium the initial and final stages of stellar evolution the chemistry of dense and diffuse interstellar matter and of the solar system the structure of the Milky Way galaxy and the

content and structure of other galaxies some very distant Spectroscopic studies of CO and other molecules are primary tools for investigating all these topics which are among the most fundamental and active research areas in astrophysics New developments in instrumentation including several powerful new telescopes continue to keep millimeter and submillimeter wavelength radio astronomy at the forefront of research

*Europe to the Stars* Govert Schilling, Lars Lindberg Christensen, 2013-02-01 The creation of the European Southern Observatory ESO in 1962 was the culmination of the dream of leading astronomers from five European countries Over the years as more member states joined ESO constructed the La Silla and Paranal observatories as well as the Atacama Large Millimeter submillimeter Array ALMA together with partners ESO is now starting to build the world's biggest eye on the sky the European Extremely Large Telescope At the dawn of 2012 its 50th anniversary year ESO is ready to enter a new era One that not even its founding members could have anticipated in their boldest dreams Constantly at the technological forefront ESO is ready to tackle new and as yet unimaginable territories of high precision technology and scientific discovery Produced especially for ESO's 50th anniversary this sumptuously illustrated book takes the reader behind the scenes of the most productive ground based observatory in the world It contains the best 300 of ESO's images hand picked from a large collection of more than 100 000 images Beautifully produced *Europe to the Stars* tells the story of how dreams of giant telescopes became a reality and covers many of the exciting discoveries made at La Silla and Paranal BBC Sky at Night 1 February 2013 Leave the book on your coffee table certainly but read it first and come back to it regularly It's an intelligent inspiring celebration of a great European scientific adventure Astronomy Now 1 March 2013

**Nuclear Science Abstracts**, 1969 CAP2007 Conference Proceedings, High Energy Astrophysics: Volume 1, Particles, Photons and Their Detection M. S. Longair, Malcolm S. Longair, 1992-02-27 Volume 1 Allen's Astrophysical Quantities Clabon Walter Allen, Arthur N. Cox, 2000 This new fourth edition of Allen's classic *Astrophysical Quantities* belongs on every astronomer's bookshelf It has been thoroughly revised and brought up to date by a team of more than ninety internationally renowned astronomers and astrophysicists While it follows the basic format of the original this indispensable reference has grown to more than twice the size of the earlier editions to accommodate the great strides made in astronomy and astrophysics It includes detailed tables of the most recent data on General constants and units Atoms molecules and spectra Observational astronomy at all wavelengths from radio to gamma rays and neutrinos Planetary astronomy Earth planets and satellites and solar system small bodies The Sun normal stars and stars with special characteristics Stellar populations Cataclysmic and symbiotic variables supernovae Theoretical stellar evolution Circumstellar and interstellar material Star clusters galaxies quasars and active galactic nuclei Clusters and groups of galaxies Cosmology As well as much explanatory material and extensive and up to date bibliographies Allen's Astrophysical Quantities Arthur N. Cox, 2015-03-19 This new fourth edition of Allen's classic *Astrophysical Quantities* belongs on every astronomer's bookshelf It has been thoroughly revised and brought up to date by a team of more than ninety

internationally renowned astronomers and astrophysicists While it follows the basic format of the original this indispensable reference has grown to more than twice the size of the earlier editions to accommodate the great strides made in astronomy and astrophysics It includes detailed tables of the most recent data on General constants and units Atoms molecules and spectra Observational astronomy at all wavelengths from radio to gamma rays and neutrinos Planetary astronomy Earth planets and satellites and solar system small bodies The Sun normal stars and stars with special characteristics Stellar populations Cataclysmic and symbiotic variables supernovae Theoretical stellar evolution Circumstellar and interstellar material Star clusters galaxies quasars and active galactic nuclei Clusters and groups of galaxies Cosmology As well as much explanatory material and extensive and up to date bibliographies *Light Pollution: The Global View* H.E

Schwarz,2013-03-09 The effects of light pollution on flora fauna including humans and their widely varying night time activities are often subtle and need extensive field studies to be quantified in a sensible manner Some of the highlights were The presentation of the 1st world atlas of artificial night sky brightness Cinzano et al the article by the International Darksky Association on their world wide efforts to curb light pollution Alvarez del Castillo et al the laws controlling light pollution implemented in Spain Diaz et al and Chile Sanhueza et al an overview of the work on radio frequency protection of sites Cohen et al and the excellent introduction to the topic from the Chilean point of view Daud Related topics in the book are light pollution education aircraft contrails space advertising with an added document provided by the relevant UN commission and an experiment on involving the population of an entire country in measuring sky brightness by using the internet and the media The text is aimed at professionals from a wide range of disciplines related to lighting and its effects on the night time environment in the broadest sense of the word Lay persons interested in this emerging multi disciplinary field can also find much of interest in this book *Maxwell's Enduring Legacy* Malcolm Longair,2016-07-07 An authoritative scientific history of a world leading physics laboratory from its origins in the late nineteenth century to the present day

**The Road to Galaxy Formation** William C. Keel,2002-09-20 Written by one of the leading authorities in the field this is one of the first book s to describe one of today s most important problems in cosmology the formation of galaxies The book tackles this great puzzle by discusses the beginnings of the process from cosmological observations and calculations considers the broad features of galaxies that we need to explain and what we know of their later history The author compares the competing theories for galaxy formation and considers the progress expected from new generations of powerful telescopes both on earth and in space An intriguing text on one of today s greatest and most profound puzzles

*Astrophysics, Astronomy and Space Sciences in the History of the Max Planck Society* Luisa Bonolis,Juan-Andres Leon,2022-12-05 This book provides the first comprehensive historical account of the evolution of scientific traditions in astronomy astrophysics and the space sciences within the Max Planck Society Structured with in depth archival research interviews with protagonists unpublished photographs and an extensive bibliography it follows a unique history from the post

war relaunch of physical sciences in West Germany to the spectacular developments and successes of cosmic sciences in the second half of the 20th century up to the emergence of multi messenger astronomy It reveals how the Society acquired national and international acclaim in becoming one of the world s most productive research organizations in these fields

**Literature 1988, Part 2** Astronomisches Rechen-Institut,2013-06-29 From the reviews Astronomy and Astrophysics Abstracts has appeared in semi annual volumes since 1969 and it has already become one of the fundamental publications in the fields of astronomy astrophysics and neighbouring sciences It is the most important English language abstracting journal in the mentioned branches The abstracts are classified under more than a hundred subject categories thus permitting a quick survey of the whole extended material The AAA is a valuable and important publication for all students and scientists working in the fields of astronomy and related sciences As such it represents a necessary ingredient of any astronomical library all over the world Space Science Reviews 1 Dividing the whole field plus related subjects into 108 categories each work is numbered and most are accompanied by brief abstracts Fairly comprehensive cross referencing links relevant papers to more than one category and exhaustive author and subject indices are to be found at the back making the catalogues easy to use The series appears to be so complete in its coverage and always less than a year out of date that I shall certainly have to make a little more space on those shelves for future volumes The Observatory Magazine 2 *Thirty Years of Astronomical Discovery with UKIRT* Andy Adamson,John Davies,Ian Robson,E. Ian Robson,2013-11-26 These are the proceedings of an international meeting hosted by the Royal Observatory Edinburgh to commemorate the 30th anniversary of the dedication of the UKIRT the United Kingdom InfraRed Telescope The volume comprises 31 professional level papers The first part of the book has 10 thorough reviews of the conception design and build of the telescope as well as accounts of some its key instruments such as IRCAM the common user infrared camera CGS4 the fourth Cooled Grating Spectrometer and the Wide Field Camera The second part of the book comprises 14 reviews of scientific achievements during its twenty years of visitor mode operations The final part of the book is a series of 7 reviews of the results from the multiple surveys being done as part of UKIDSS UKIRT Infrared Deep Sky Survey The authors are all experts in their respective fields for example instrument scientists operations staff and leading astronomers Springer Handbook of Atomic, Molecular, and Optical Physics Gordon W. F. Drake,2023-02-09 Comprises a comprehensive reference source that unifies the entire fields of atomic molecular and optical AMO physics assembling the principal ideas techniques and results of the field 92 chapters written by about 120 authors present the principal ideas techniques and results of the field together with a guide to the primary research literature carefully edited to ensure a uniform coverage and style with extensive cross references Along with a summary of key ideas techniques and results many chapters offer diagrams of apparatus graphs and tables of data From atomic spectroscopy to applications in comets one finds contributions from over 100 authors all leaders in their respective disciplines Substantially updated and expanded since the original 1996 edition it now contains several entirely new chapters

covering current areas of great research interest that barely existed in 1996 such as Bose Einstein condensation quantum information and cosmological variations of the fundamental constants A fully searchable CD ROM version of the contents accompanies the handbook

**The New Physics** Paul Davies, P. C. W. Davies, 1989 The New Physics is a sweeping survey of developments in physics up to the present day All of the major topics at the frontiers of the subject have been covered in this collection of reviews Whether the reader wants to know about the ultimate building blocks of matter the structure origin and evolution of the Universe quantum gravity low temperature physics optics and lasers chaos or quantum mechanics this widely acclaimed book contains a clear explanation by one of the top scientists working in the field Aimed at scientists and laymen alike the articles are profusely illustrated throughout with colour photographs and clear explanatory diagrams and have been meticulously edited to ensure they will appeal to a wide range of readers In this single volume Paul Davies renowned for his ability to communicate advanced topics to the non specialist has gathered an exciting collection of reviews by many of the world's top physicists



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