Title: Amateur Radio Astronomy
Author: J. Fielding
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Reviewed by: Whitham D. Reeve, Anchorage, Alaska USA (biography on last page)
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First published in 2006 and reprinted in 2006, 2007 and 2008, *Amateur Radio Astronomy* is a paperback that has 13 chapters covering a number of interesting topics from meteor radar systems to low noise amplifiers. Book length is 311 pages plus a three page index. The book is published by the Radio Society of Great Britain (RSGB) and available through ARRL in the United States for US $32.95 plus shipping (that varies from US $10.50 to over US $40 depending on method).

The table of contents indicates this book covers a wide range of topics including low frequency radio astronomy and a hydrogen line receiving system operating at 1420 MHz. However, I found the book really is a series of what seem to be unrelated essays. The author, John Fielding, an engineer and licensed radio amateur (ZS5JF), says he wrote the book because there are no books "dealing with radio astronomy from the radio amateur's perspective". He appears to be well-qualified to write about the technical aspects of radio, but I do not believe he wrote a book of use to amateur radio astronomers. His writing style is easy to read.

The first 34 pages are devoted to a brief history of radio astronomy. Radio astronomy is a young science, dating back perhaps to the early 1930s when books started to appear that discussed the influence of solar activity and geomagnetic disturbances on radio transmission (for example, see H.T. Stetson, Earth, Radio and the Stars, McGraw-Hill, 1934). It was at this time that Karl Jansky wrote about "Electrical Disturbances Apparently of Extraterrestrial Origin" in the Proceedings of the IRE in 1933. To me, the history of radio science and radio astronomy is fascinating, and I was somewhat disappointed in the short list of references at the end of this chapter. However, readers will get an adequate overview and will be exposed to the heavy influence that radio and radar equipment developed during World War II had on the paths followed since then.

Chapter 2 covers radar astronomy. The author provides a good overview of radar, how it works, the radar equation for a point target and meteor trail, and a brief description of J.S. Hey's radar astronomy work. There is nothing of direct use to an amateur radio astronomer in this chapter. I would have preferred some discussion of how an amateur radio astronomer can implement a radar system and the type of observing that can be done on an amateur's budget. There is no mention of the considerable body of work by radio amateurs in Earth-Moon-Earth (EME) experiments. These experiments essentially take the form of bistatic radars and I believe are worth mentioning in this chapter.

A later chapter, Chapter 7, discusses a 50 MHz meteor radar system. Unfortunately, it fails to provide needed information. There is no overview or system block diagram to provide the reader with a blueprint for a working radar system. The low power transmitter described in Chapter 7 is based on vacuum tubes. While buildable by someone with interest in pursuing vacuum tube technology, the transmitter, modulator and control schematics appeared incomplete. Someone with experience in radio construction may be able to figure it out. Nevertheless, I feel a more

complete discussion and emphasis on solid-state electronics would have been more appropriate for this radar system.

The author provides a good technical overview in Chapters 3 (Receiver Parameters) and Chapter 4 (Antenna Parameters) but there is little of direct use to the amateur radio astronomer. These two chapters may have been written to prepare the reader for later chapters but that was not apparent to me. In the receiver chapter there are a few schematics and some limited information on construction but the chapter lacks a coherent discussion of how to build receivers or use commercial receivers for different frequencies and bandwidths and how to apply the concept of noise temperature to receiver design and use. The antenna chapter has a similar tilt. It is unlikely that an amateur radio astronomer unfamiliar with antenna design and construction could build a usable antenna or even decide what type of antenna to buy from this chapter. The first four chapters take up about one-half the book.

Chapter 5 on Early Low Noise Amplifiers is of historical interest only, unless the reader wishes to build amplifiers based on vacuum tubes ("valves" to the author). When I started working my way through college as an aircraft radio technician in 1965, almost all of our equipment was based on vacuum tubes. The author's discussions in this chapter were more of a walk down memory lane for me. Even if the reader has some old tube equipment lying around and wishes to use it, this chapter is short and could have been eliminated.

The next chapter, Assembling a Station, has useful tidbits but is somewhat dated. The author briefly discusses the very important subject of permanent recording techniques. He mentions a cassette player and chart recorder and also using a computer soundcard to record WAVE files. When I became interested in radio astronomy about a 1-1/2 years ago, I found that written logs are important but are much more useful when supplemented by audio recordings. The author should have discussed more contemporary techniques for recording signals such as dataloggers and solid-state audio recording devices. I cannot imagine using an electromechanical chart recorder now, although they probably still are a used by a few amateur radio astronomers. I do not know if the benchmark logging and charting software, Radio-SkyPipe was available in 2006 but it certainly was in 2008. It is too bad the author did not include updates in the later printings of this book.

It is interesting that EME is mentioned in Chapter 6, and a BASIC computer program listing is provided for calculating the loss budget associated with EME. The author has a section on "Choice of Frequency Band" but it is very general: "If the intention were to receive signals from deep-space (eg, Sagittarius in the Milky Way) a higher frequency would be an advantage." The discussion in this section focuses on the amateur radio bands and it is not clear how those bands are related to amateur radio astronomy. Chapter 6 includes a section on antenna positioning coordinates but it is a narrative and lacks numerical examples. I doubt a newcomer could read this section and then figure out how to point an antenna toward Jupiter or other extraterrestrial radio sources.

Practical Low Noise Amplifiers are discussed in Chapter 8. This chapter focuses on 432 and 1296 MHz receiver systems, but there is some useful information applicable to other frequencies and LNAs in general. It has been my experience that semiconductor curves and datasheets provide a place to start but the development of LNAs is a trial-and-error process. Come to think of it, practically everything I have ever designed and built ended up with trial-and-error to solve feedback problems, temperature drift problems and so on.

The trial-and-error process is not made clear in Chapter 8, but Chapter 9, Assessing Receiver Noise Performance, briefly walks through receiver testing, which is where the reader will find that process takes place. The discussion in this chapter of professional noise measurement systems is of little use to the amateur radio astronomer except to dream about having some of that gear. The author does describe a home-built system that may be of some use.

Chapter 10 is called Station Accessories. This should have been integrated with Chapter 6, or the other way around. This is a short chapter but it includes the schematics of several easy-to-build accessories, including an audio filter, meteor ping detector and meteor product detector. I wondered why the meteor detection accessories were not in Chapter 7.

Chapter 11, Low Frequency Radio Astronomy, is mis-titled. I think the author used the phrase "low frequency" to indicate frequencies lower than VHF, which most of the book so far has discussed. The author dedicates a few pages to Jupiter emissions in the 20 MHz range (HF band) and then shifts on the last page to "lower frequency experiments" at around 2 MHz (the low end of the HF band). There is no mention of true low frequency and very low frequency radio astronomy below around 300 kHz. Like some other chapters, this chapter is of no practical use to the amateur radio astronomer.

The Science of Meteor Scatter, Chapter 12, is one of the longer chapters at 23 pages. I found some interesting discussions in this chapter, and readers might be inspired to look more deeply into meteor scatter experiments. The author provides a couple of line drawings and a photograph of a roof-mounted corner antenna system for meteor scatter work at 50 MHz – just enough to make me think about how such an antenna would work for me and how I could build and use it. However, I was then told that "details of corner and trough reflectors can . . . be found in RSGB and ARRL publications. I think a systems approach would have been more useful here, with details on the building blocks and where to get information on how to build them.

The final chapter, A Hydrogen Line Receiving System, actually has some useful construction information, particularly on an LNA for 1420 MHz operation. Other circuits required to make up a complete receiving system also are presented. Still, I was left wondering how everything tied together and what I could expect once I got the circuits working. In fact, those are the kinds of questions I had throughout this book – what do the signals sound like and how do they look on a chart recorder or datalogger chart. The only charts provided by the author in the whole book are those made by paid investigators in a research environment. I kept asking, what would the amateur radio astronomer see and hear? How would the amateur radio astronomer analyze and correlate the data?

In conclusion, there is little in this book to warrant spending at least US $43.45. I disagree with the author that there are no other books for the amateur radio astronomer, although I would agree there are few good ones and nothing current. The book Radio Astronomy by John Kraus, while not written specifically for amateur radio astronomers, is the benchmark book that anyone serious about radio astronomy, amateur or otherwise, should have on their bookshelf. It is unfortunate that Kraus's book is the only one I can recommend. The problem, of course, is that a good book for amateur radio astronomers has yet to be written.

Biography – Whitham D. Reeve

Whitham Reeve was born in Anchorage, Alaska and has lived there his entire life. He became interested in electronics in 1958 and worked in the airline industry in the 1960s and 1970s as an avionics technician, engineer and manager responsible for the design, installation and maintenance of electronic equipment and systems in large airplanes. For the next 36 years he worked as an engineer in the telecommunications and electric utility industries with the last 31 years as owner and operator of Reeve Engineers, an Anchorage-based consulting engineering firm. Mr. Reeve is a registered professional electrical engineer with BSEE and MEE degrees. He has written a number of books for practicing engineers and enjoys writing about technical subjects. Recently he has been building a radio science observatory for studying electromagnetic phenomena associated with the Sun, Earth and other planets.

Amateur Radio Astronomy â€¢ Amateurs in Radio Astronomy can do quite a bit of useful work â€¢ Even with very modest equipment â€¢ Simple short-wave receiving systems are all that is required, for example, to capture Solar Flares, and detect radiation from Jupiter, and the Center of our own Galaxy. SIMPLE RADIO TELESCOPE BLOCK DIAGRAM â€¢ This diagram depicts a simple Total Power Radiometer that can be used to capture Solar flares, Jupiter noise and detect the Galactic Continuum Radiation: Dipole antenna â€¦â€¦â€¦.

Amateur Radio Astronomy. Article Â· September 2000 with 28 Reads. How we measure 'reads'.Â Radio astronomy observation may be made in the bands 13.36-13.41MHz (solar), (25.55-25.67) MHz (Jupiter) and (37.50-38.25) MHz (Continuum) observations. Those are the potential observation that can be monitored in radio region. Amateur astronomy is a hobby where participants enjoy observing or imaging celestial objects in the sky using the unaided eye, binoculars, or telescopes. Even though scientific research may not be their primary goal, some amateur astronomers make contributions in doing citizen science, such as by monitoring variable stars, double stars sunspots, or occultations of stars by the Moon or asteroids, or by discovering transient astronomical events, such as comets, galactic novae or supernovae in other Amateur Radio Astronomy. How to start. Jean Marie Polard [F5VLB - 2016]. The book you need to understand and operate an amateur radio astronomy station, It is free, may be freely distributed, but nothing can be changed and the source must be cited. Thank you to Miguel A. Vallejo EA4EOZ for the technical reading an to Peter & Heather for the English corrections. Ver 0.1b f5vlb@kermaz.com. F5VLB-EA4EOZâ€“ 2016 Amateur Radio Astronomyâ€¦ How to start. Index.