

Overall assessment

I find this article a very good description of an amateur radio telescope, explaining both the design and the choices made. The observation results achieved are well presented. Even though this is not the first time a telescope of this size has been built and described by amateurs, it is the best and most comprehensive description I have seen so far. Of course the greatest benefit will be for those who plan to build such an instrument themselves. Nevertheless a reader with a more casual interest in radio astronomy will benefit from it.

The comments made below are of a minor nature and are intended to give suggestions only. Even if the author decides not to follow the suggestions, it will be a worthwhile paper.

General remarks

It would be beneficial to have an explanation for each abbreviation used. This could be either at the first occurrence of an abbreviation or by the inclusion of a list of abbreviation. Furthermore it would be beneficial to have a numbering of the equations used.

Section 1

Typo:

Space-based telescopes may be required at wavelengths where the Earth's atmosphere is opaque to electromagnetic waves.

Suggestion for clarification:

The sentences

At the turn of the century, television broadcasting shifted from analog to digital. Several analog microwave point-to-point link and analog satellite-television antennas were decommissioned since no longer required by the new, more efficient digital modulations. The computing power of personal computers and corresponding interfaces increased to allow the comprehensive signal processing required for digital-television reception. Both allowed very successful radio-astronomical observations with amateur means [3], [4].

remain a bit unclear. It would be beneficial to explain how the technical developments enabled amateur radio astronomy.

Suggestion for correction:

The statement

Today global navigation satellite systems (GPS, GLONASS and similar) offer precise worldwide synchronization. The fiber-optic network offers high-capacity worldwide internet connectivity. Since both inexpensive synchronization and inexpensive data transfer is available to amateurs, the major achievements of amateur radio astronomy are yet to come. is too optimistic in my view. The accuracy of GPS/GLONASS unfortunately is not sufficient to allow VLBI synchronization (at least one order of magnitude too inaccurate). I would suggest to drop this part. Consequently the statement about interferometry in the subsequent paragraph should be deleted as well.

Section 2

Suggestion for clarification:

I find the statement

Most of them are hydrogen atoms that emit a single photon at the precise frequency of $f_0=1420405751.7667\text{Hz}$ corresponding to a spin-reversal energy transition every 11 million years.

a bit misleading. I suggest to rephrase as follows:

Most of this interstellar matter is atomic hydrogen. This hydrogen has two energy levels in its electronic ground state with an energy difference corresponding to a frequency of $f_0=1420405751.7667\text{Hz}$. The upper level can be excited by the collision of two atoms. This excited level then decays after an average lifetime of 11 million years by emitting a photon at the frequency mentioned.

Section 2.4

The statement

Antennas larger than $d > 100\lambda$ are typically built as dual-reflector Cassegrain telescopes.

is probably overestimating the actual situation where many large telescopes are using prime focus configurations (Effelsberg, GBT, Arecibo). I therefore suggest dropping that statement.

Section 4.1

Suggestion for clarification:

A simple Python script "zvezdar.py" transforms the requested right ascension and declination into azimuth and elevation including corrections for mechanical imperfections of the antenna rotor. EPR-203.

My understanding is that the journal MIDEA is not addressing an audience where it can be expected that astronomical expressions are known.

I suggest to add a few words about what right ascension and declination is.

Section 4.2

Suggestion for clarification:

It would be helpful for a reader not familiar with astronomy to relate the spectra shown to the direction of observation. Using the same picture as in fig. 20 could be helpful to get a basic understanding.

Section 4.3

Suggestion for clarification:

I would suggest to give an explanation of how the calibration was performed, i.e. how the transition from the spectrum in fig. 17 with signal level in dB to brightness temperature in fig. 18 was done.

Section 5.1

Suggestion for clarification

The statement

For example, interferometry works with just one-bit signal sampling and quantization.

may be a bit misleading in the sense that there is something special about interferometry and quantization resolution. This is not the case.

I would just leave out this sentence as the main point about the need for amplitude resolution has been made in the previous sentence.

Section 5.2

Suggestions for correction/clarifications

Hydrogenline radiation from other directions is much weaker since its sources are much farther away.

I believe this statement is not correct. The reason of the lower hydrogen line intensity is the much lower column density in directions other than the galactic plane.

*The whole galactic plane is **currently** not visible from our latitude 46° north*

It can hardly be envisioned that there will be a point in time when the whole galactic plane becomes visible from a northern latitude. The axis of rotation of the earth would have to change dramatically. Just leave "currently" out.

Galactic longitude zero $GLON=0$ is defined by radio observations as the powerful radio source Sagittarius A, supposed to be a very massive black hole in the center of our galaxy. It should be noted that the radio source at the galactic centre is Sagittarius A*, as there are many more radio sources collectively called Sagittarius A.

Also I would suggest not to call this source a "strong" source. At 3 Jansky it is weak compared to the other Sagittarius A sources.

A proposed wording is:

Galactic longitude zero $GLON=0$ is defined by radio observations as the radio source Sagittarius A*, supposed to be a supermassive black hole in the center of our galaxy.

Remarks on the fig. 21:

It would be helpful to annotate the figure to clarify that the scale on the right side is "galactic longitude".

Also I would suggest to reconsider the two annotations for Cygnus X and Cassiopeia A. I cannot see any broadband emission from Cassiopeia A in the graph. There seems to be a slight increase at the longitude of Cygnus X. However, the annotation seems to point at the patch around 1.1499 GHz which may be misleading.

I would suggest to remove the reference to Cassiopeia A and to relocate the Cygnus X annotation.

The same considerations apply to fig. 22.