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RTL-SDR (RTL2832U) and software defined radio news and projects. Also featuring Airspy, HackRF, FCD, SDRplay and more.

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October 6, 2020

Using an RTL-SDR to Measure the Basis for the Dark Matter Hypothesis

From calculations depending on the distribution of visible star mass in our galaxy, a certain galactic rotational velocity vs distance from center curve is expected. However, when scientists actually measure the galactic rotation, another curve is found - a curve which should result in the galaxy flying apart. This mismatch in expected vs measured data has given rise to the theory of "dark matter". The theory essentially states that in order to get the measured curve, the galaxy must have more mass, and that this mass must come from non-luminous matter scattered amongst the galaxy which is difficult or impossible to observe.

In the past we have posted about Job Geheniau's radio astronomy projects a few times on this blog. So far he has used an RTL-SDR and radio telescope dish to generate a full radio image of the galaxy at the Hydrogen Line frequency of 1.42 GHz. This project worked by pointing the telescope at one section of the galaxy, measuring the total Hydrogen line power with the RTL-SDR over a number of minutes, then moving the telescope to the next section.
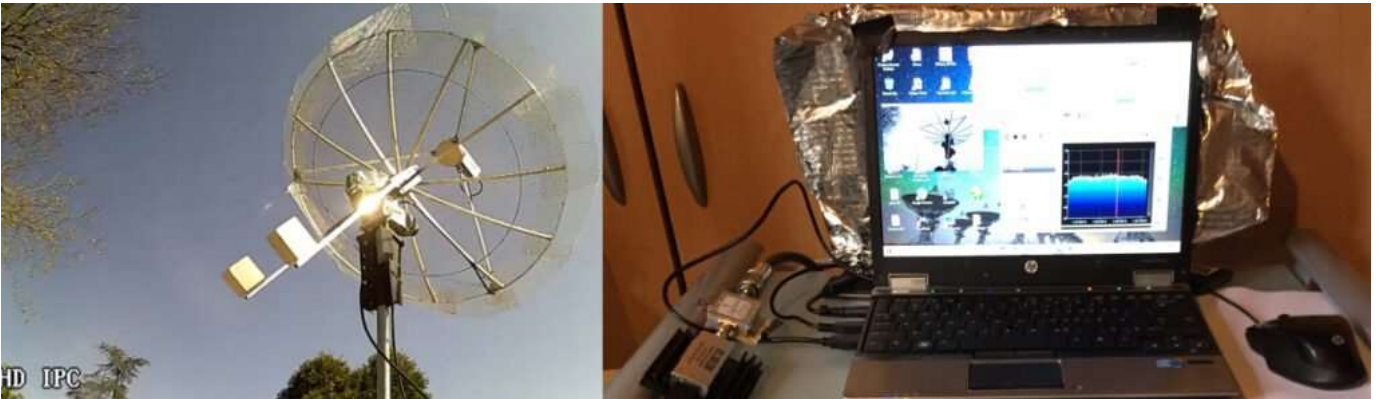
Job's Radio Telescope + Laptop and RTL-SDR Setup

Using the same hardware and techniques to observe the Hydrogen Line frequency, he was now able to measure the rotational curve of our galaxy. When the telescope points to different arms of the galaxy, the Hydrogen line measurement will be doppler shifted differently. The measured doppler shift can be used to figure out the rotational velocity of that particular arm of the galaxy. By measuring the rotational velocity from the center of the galaxy to the outer edges, a curve is created. Job's measured curve matches that seen by professional radio astronomers, confirming the mismatch in expected vs measured data.

Job's document explaining his setup and measurement procedure can be found here (pdf file).
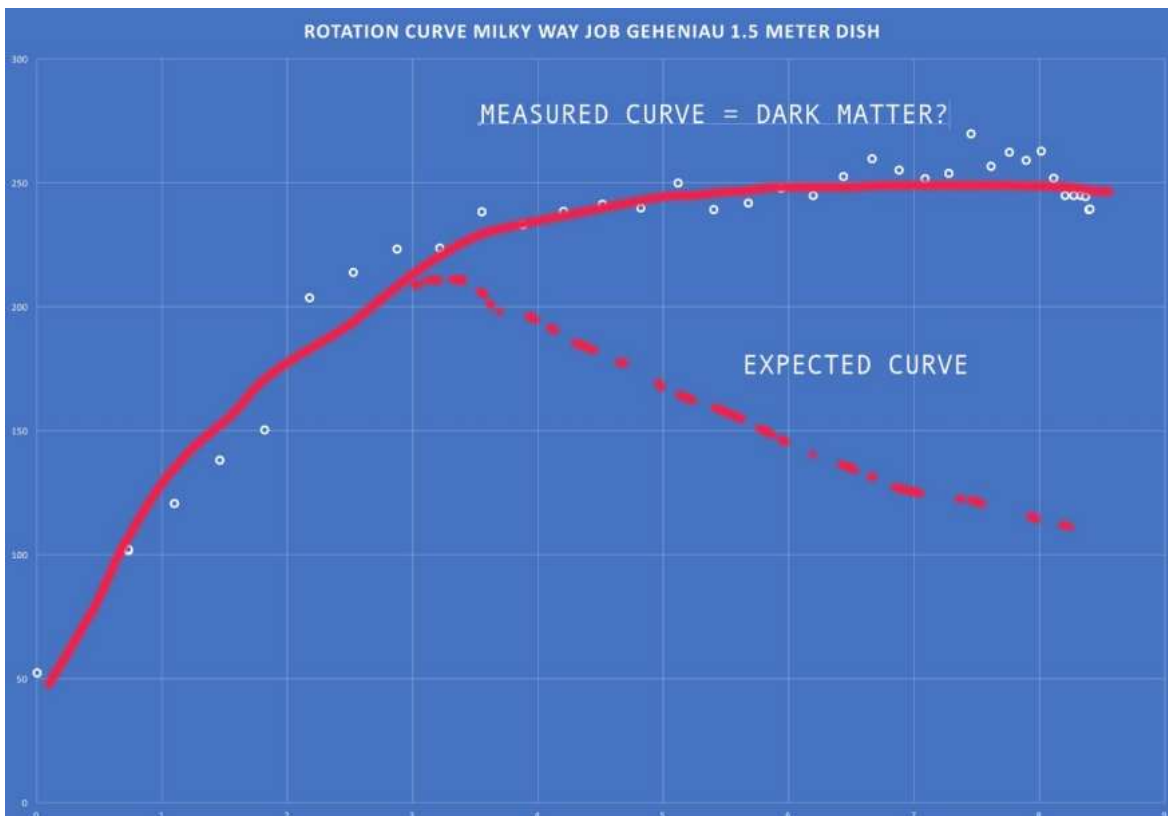
Job's Measured vs Expected Curve

If you'd like to get started with Hydrogen line radio astronomy with an RTL-SDR, we have a tutorial over here.

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Written by admin Posted in Applications, Radio Astronomy, RTL-SDR Tagged with dark matter, radio astronomy, rtl-sdr, rtl2832, rtl2832u

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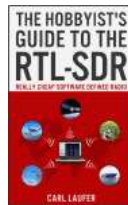
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What is RTL-SDR

The RTL-SDR is an ultra cheap software defined radio based on DVB-T TV tuners with RTL2832U chips. The RTL-SDR can be used as a wide band radio scanner. It may interest ham radio enthusiasts, hardware hackers, tinkerers and anyone interested in RF.

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