DIY Astronomy

DIY Radio Telescope: 21cm Hydrogen Measurements of the Milky Way

Doug Holland

21cm Radio Telescope
(21cm => 1.42GHz)
Hydrogen Emission

WiFi Dish Antenna: $82.99
eBay
- 24dBi gain
- 2.4GHz but works at 1.42GHz
- 14ºx10º beam width

Low Noise Amplifier: $44.95
Amazon
- 40dB, Tuned for 21cm

Software Defined Radio: $24.95
https://www.rtl-sdr.com/
- USB interface

SDR# software - free

Software Defined Radio (SDR) interfaces via USB

SDR# software controls SDR

IF Average Plugin used to average multiple samples to decrease noise and increase signal

Low Noise Amplifier (LNA)

Software Defined Radio (SDR)

Dish Antenna

Shovel Handle

Counter Weight

Tripod

Measuring a galaxy's rotation
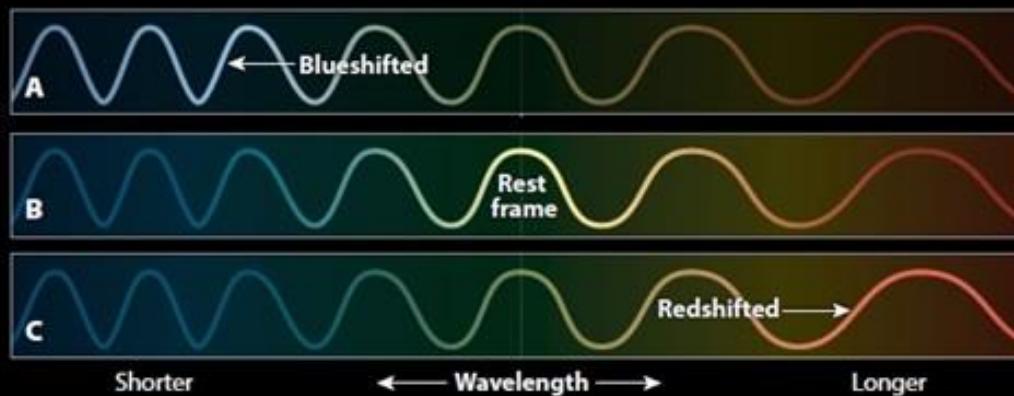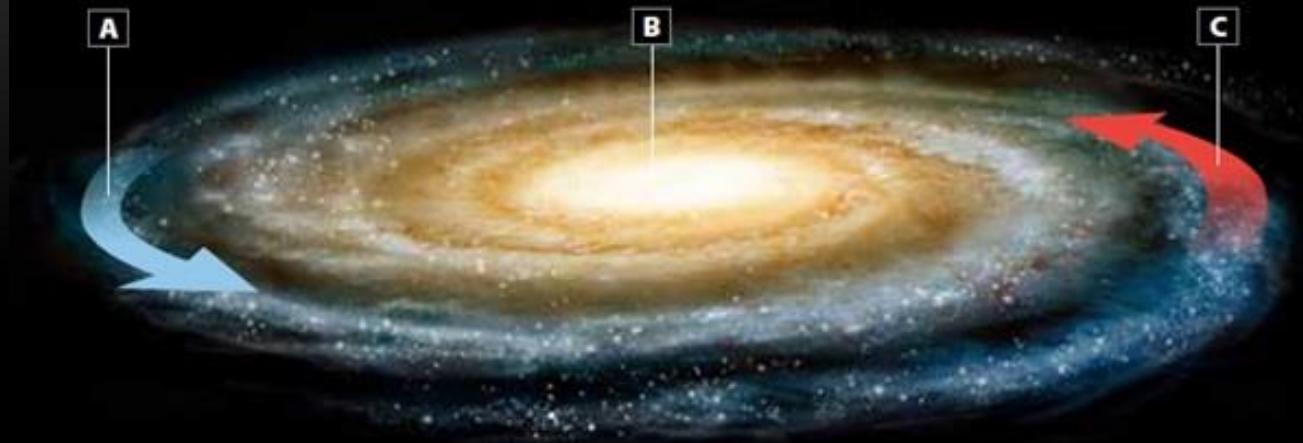
As a galaxy rotates, the material moving away from us shows a redshift in the wavelength of any emitted light (red arrow). Material moving toward us shows a blueshift (blue arrow). By measuring these shifts across a galaxy, astronomers can determine its rotation. ASTRONOMY: ROEN KELLY

https://astronomy.com/magazine/ask-astro/2018/05/rotational-speed-of-a-galaxy

1418.2167939 MHz   Cumulations: 520000 of: 902000   Recording time: 167s

Corrected background!

-64

-66

-69

1418.80   1419.40   1420.00   1420.60   1421.20

SDR# v1.0.0.1715 - RTL-SDR (USB)

001.420.000.000

Ba

▶ Frequency Manager *

▶ Signal Diagnostics *

▼ IF Average *

☑ Window   *KamSoft*

                      v. 2.6

FFT resolution 1024

Intermediate average 1000

0
-5
-10
-15
-20
-25
-30
-35
-40

2020-10-06 17:57:160.77

Stellarium 0.20.3

N

NE   NW

nedids

Draconids

Deneb

Vega   Arcturus

E

Altair   Sun

Spica

Mercury

Saturn

Antares

SE   SW

S
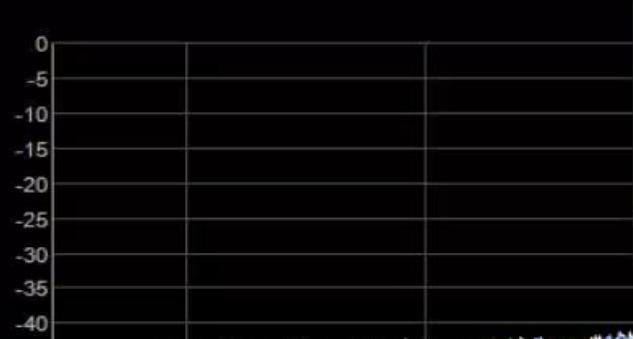
Earth, Holland Observatory, 8 m   FOV 203°   17.9 FPS   2020-10-06 17:57:16 UTC-0
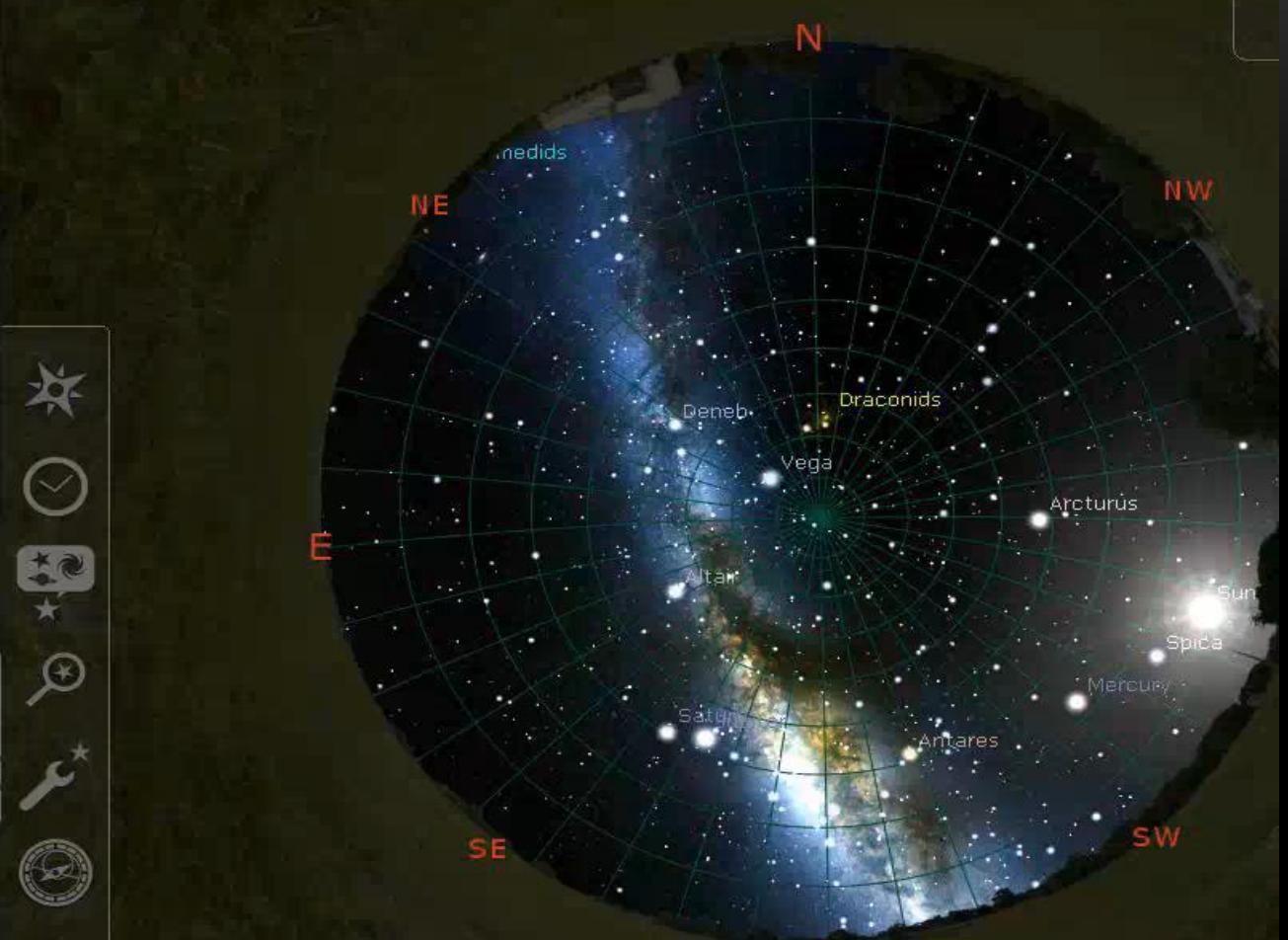
Contrast

Link to Source of Design

https://www.rtl-sdr.com/cheap-and-easy-hydrogen-line-radio-astronomy-with-a-rtl-sdr-wifi-parabolic-grid-dish-lna-and-sdrsharp/

Presentation posted on webpage: www.holland-observatory.net

The End