

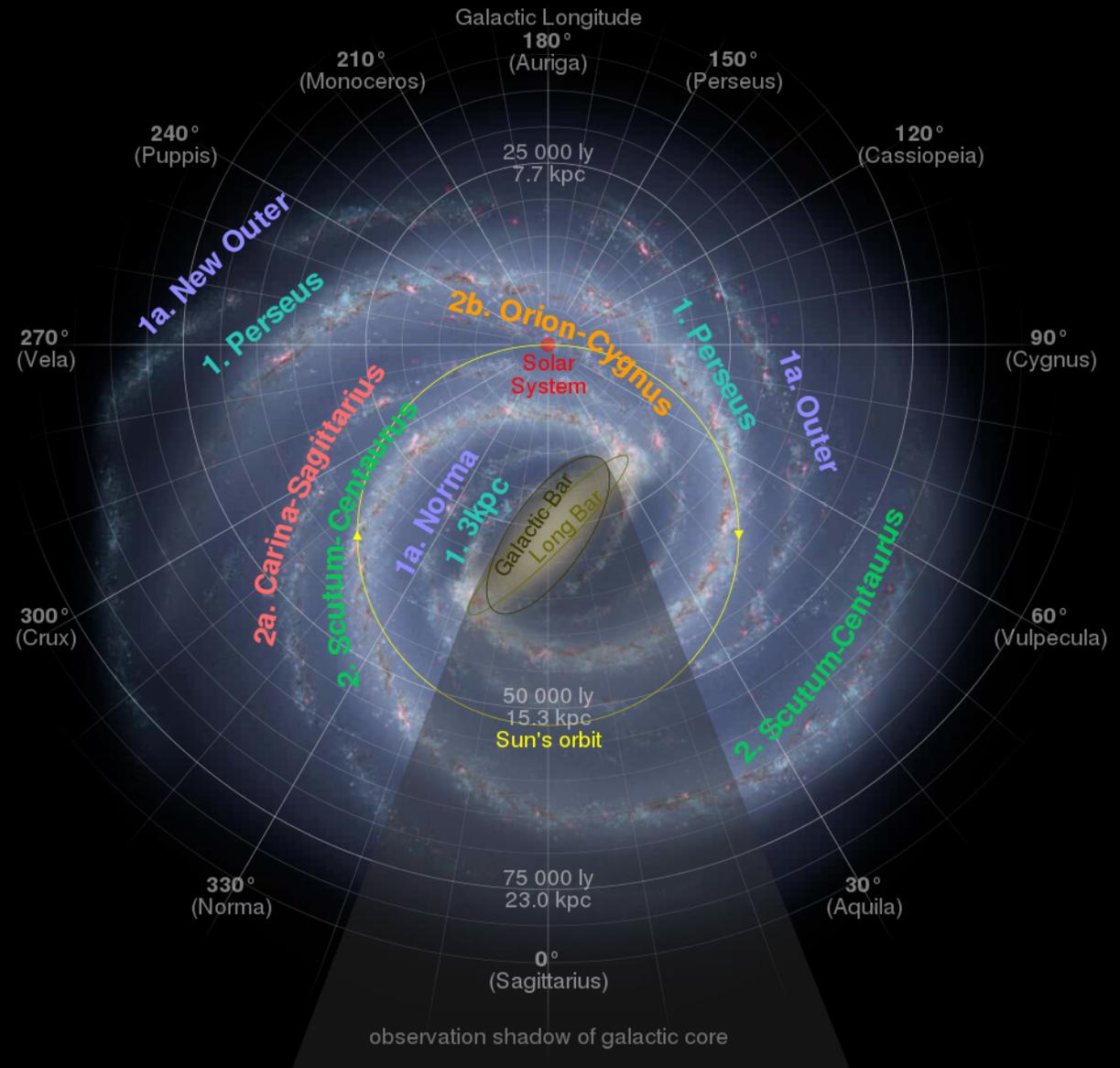
MAPEO DE LA GALAXIA CON EL S.R.T.

Termodinámica y Electromagnetismo
Facultad de CC Matemáticas
Seminario/Prácticas

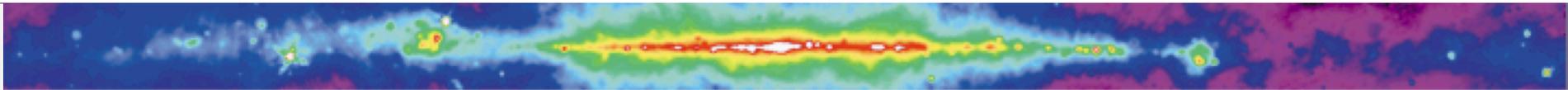
GUIÓN

- LA ESTRUCTURA DE LA GALAXIA
- LA VELOCIDAD DE ROTACIÓN DE LA GALAXIA
- LA EMISION HI
- RADIO ASTRONOMIA
- COORDENADAS GALACTICAS
- EL SMALL RADIO TELESCOPE (SRT)

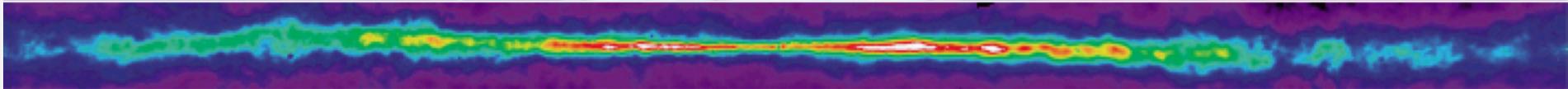
LOS BRAZOS DE LA GALAXIA



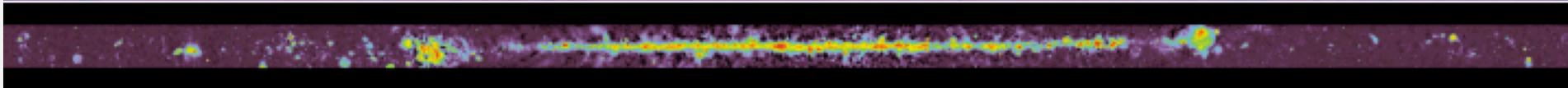
RadioContinuo (408 MHz)



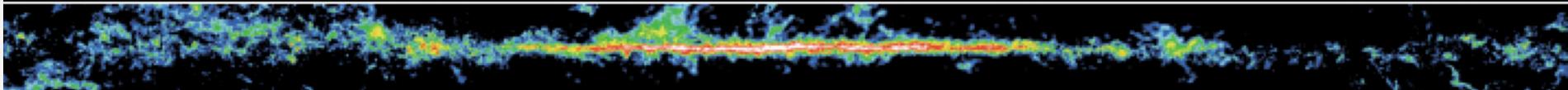
Hidrogeno Atómico



RadioContinuo (2.4 - 2.7 GHz)



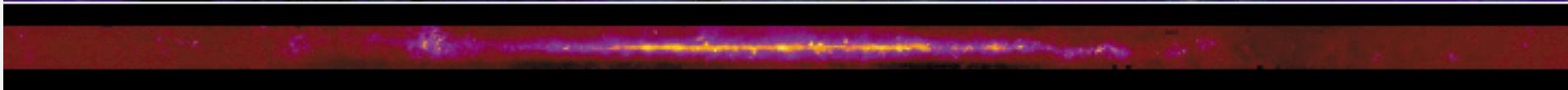
Hydrógeno Molecular



Infrarrojo Medio



Infrarrojo Medio



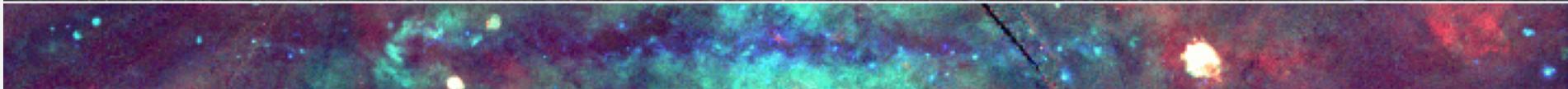
Infrarrojo Cercano



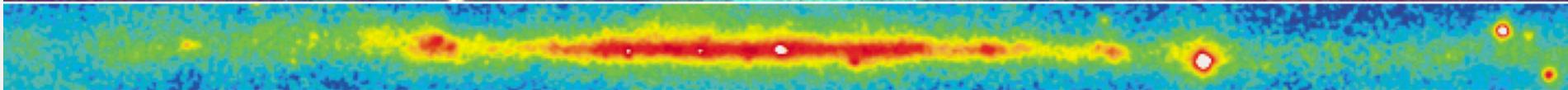
Optico



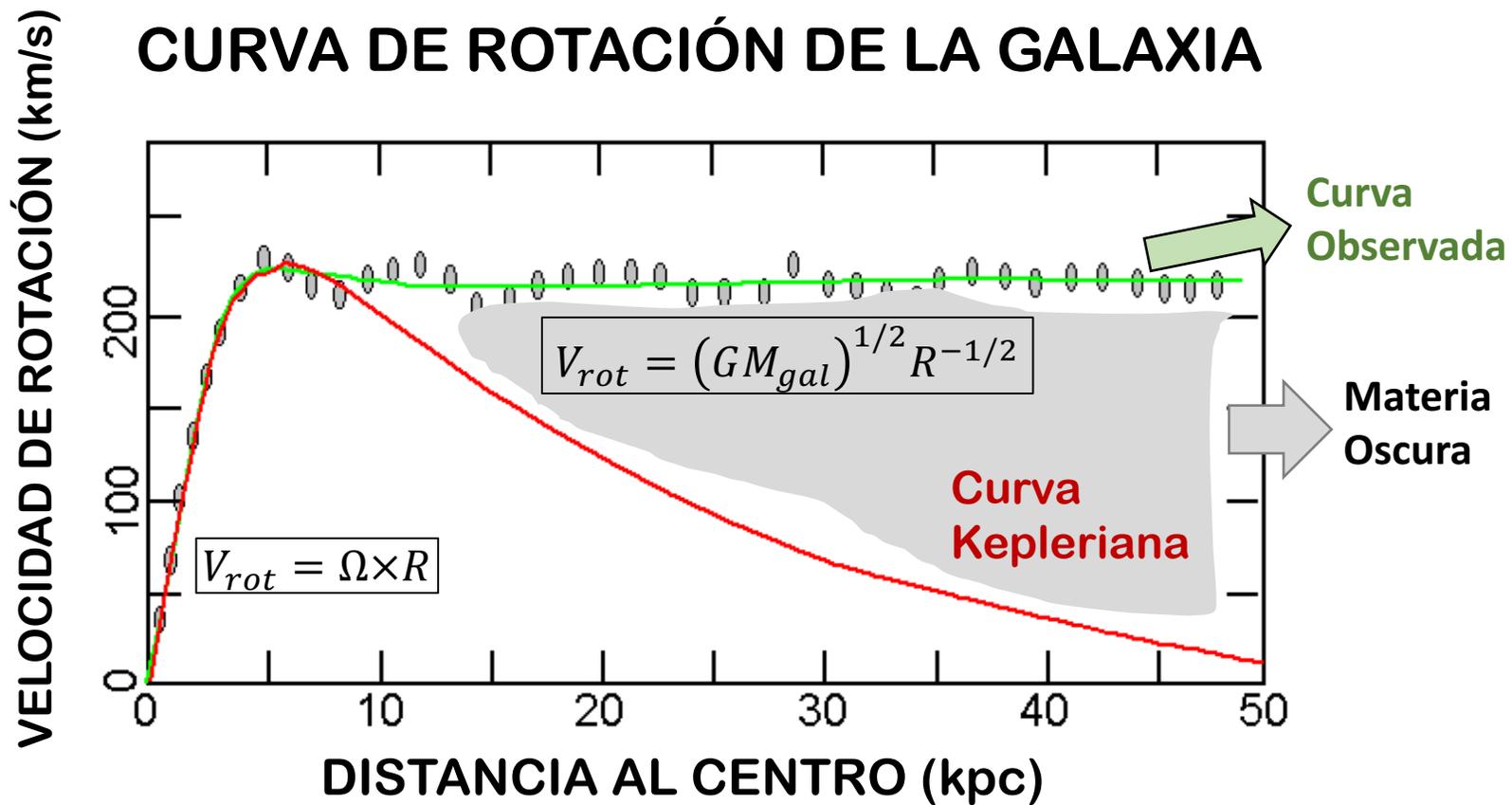
Rayos X



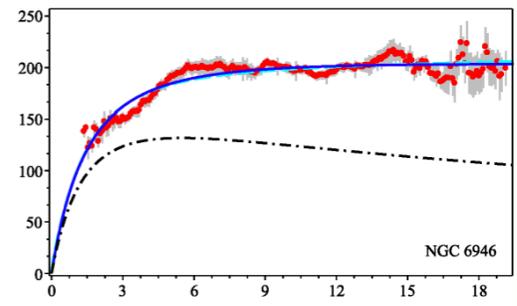
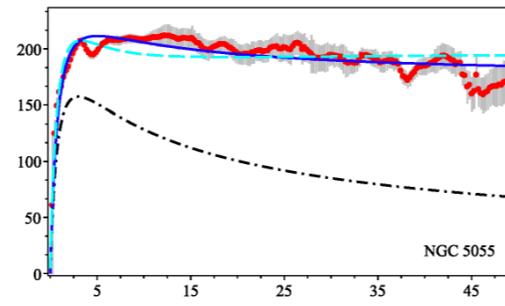
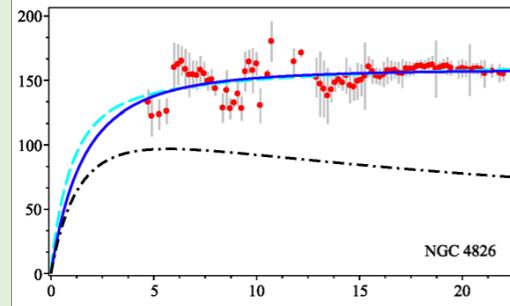
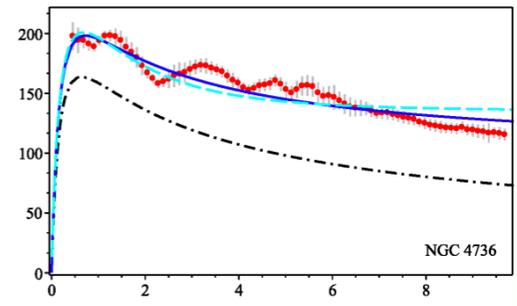
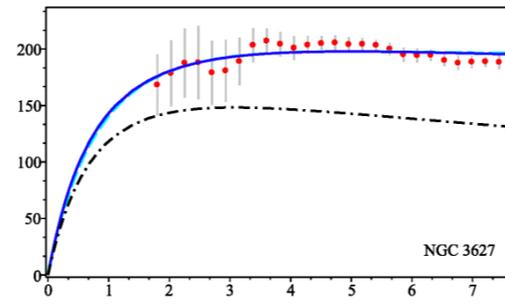
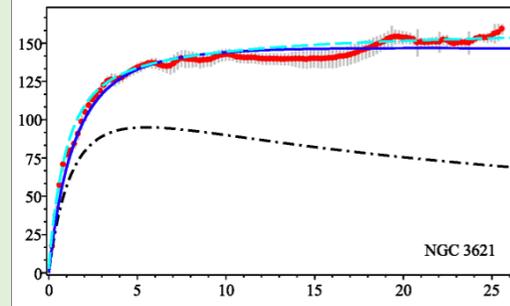
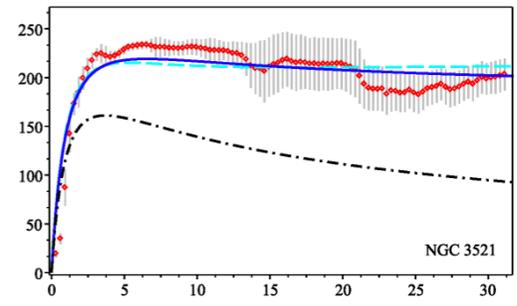
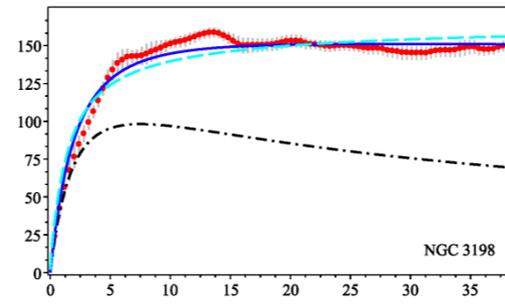
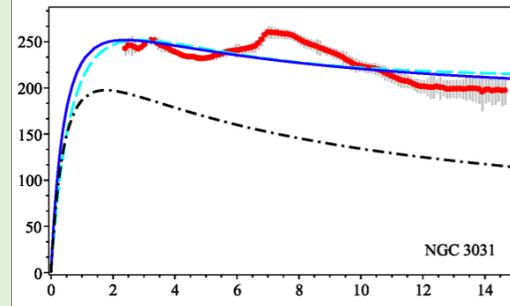
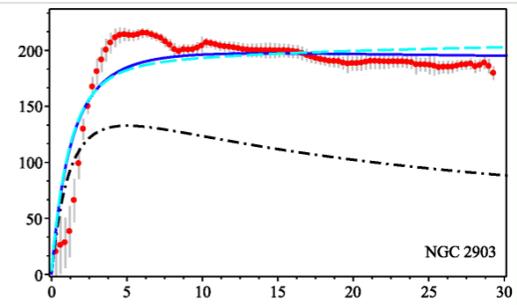
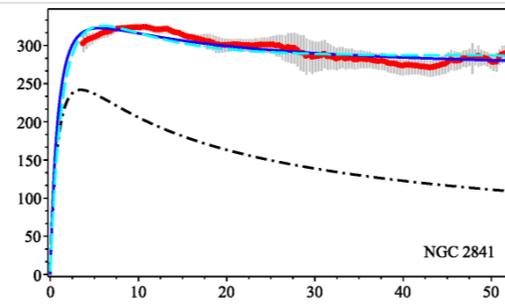
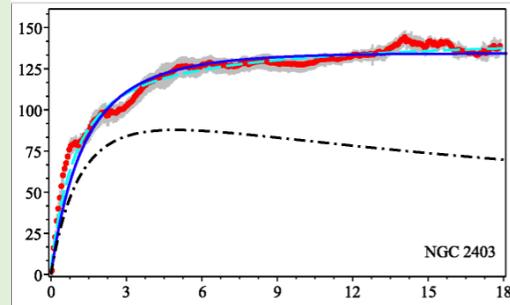
Radiación Gamma



CURVA DE ROTACIÓN DE LA GALAXIA



CURVAS DE ROTACIÓN DE GALAXIAS ESPIRALES



¿CÓMO PERCIBIMOS LA ROTACIÓN DE LA GALAXIA?

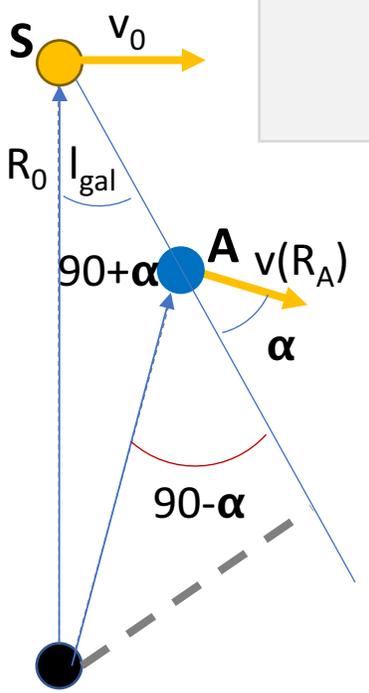
La velocidad del HI en B viene dada por:

$$v_B = v(R_B) - v_0 \sin l_{gal}$$

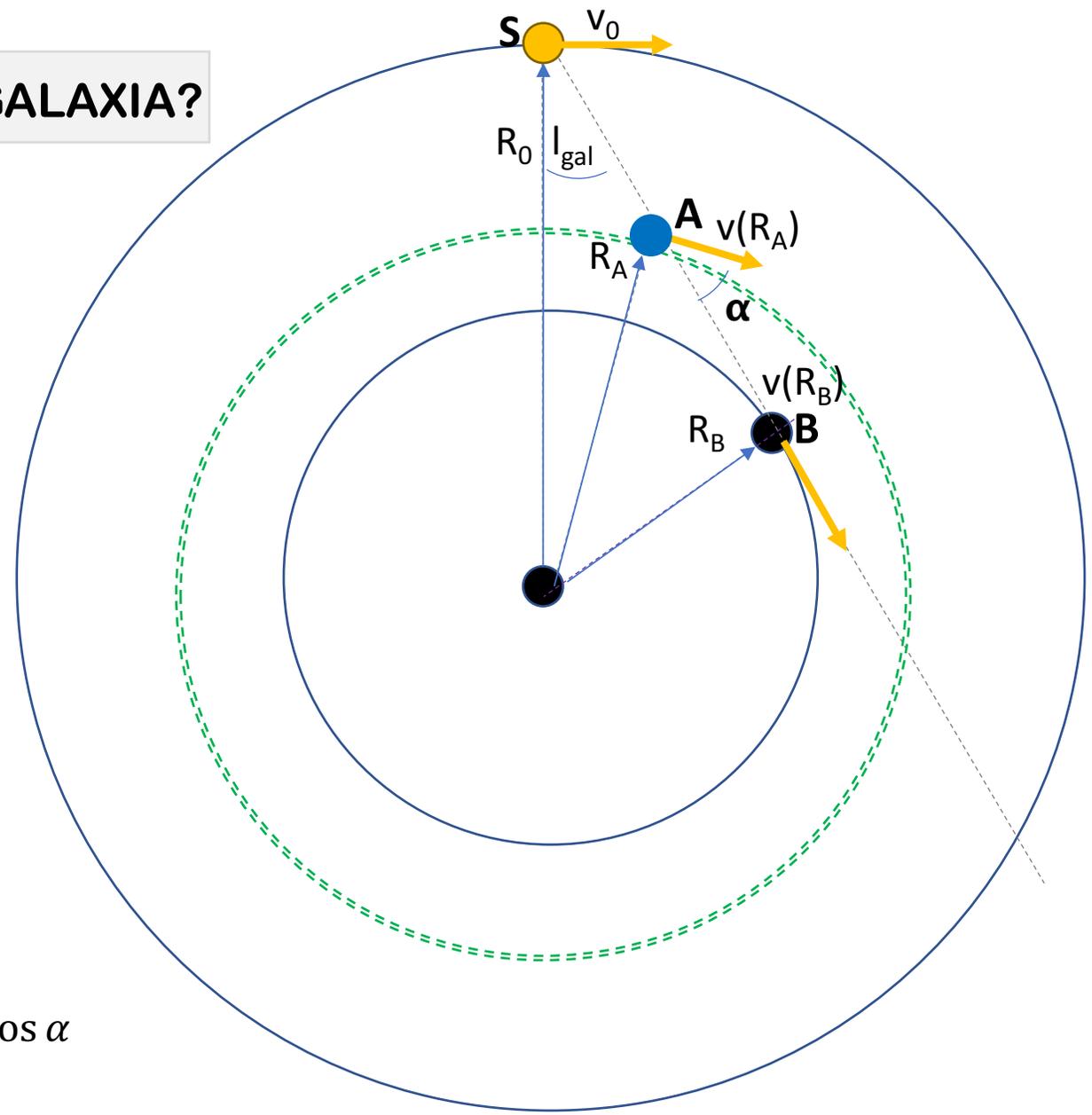
La velocidad del HI en A viene dada por:

$$v_A = v(R_A) \cos \alpha - v_0 \sin l_{gal}$$

$$v_A = v(R_A) \frac{R_0 \sin l_{gal}}{R_A} - v_0 \sin l_{gal}$$

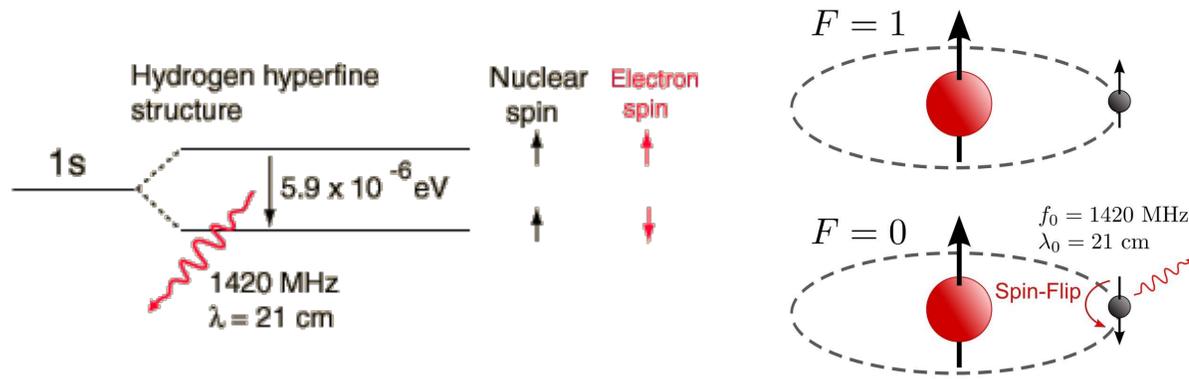


$$R_0 \sin l_{gal} = R_A \sin(90 - \alpha) = R_A \cos \alpha$$

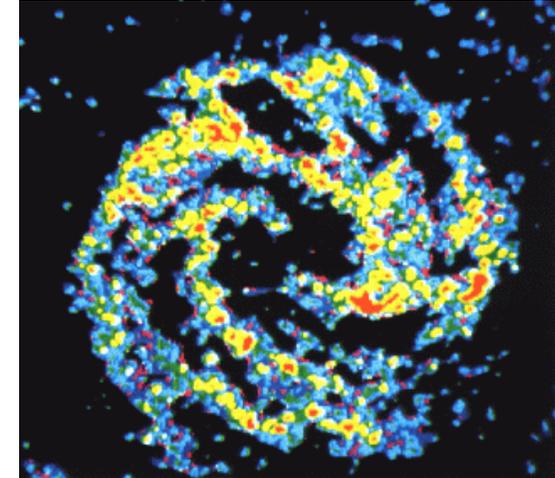


¿CÓMO SE MIDE LA ROTACIÓN DE LA GALAXIA?

- ❖ Utilización de la línea de 21 cm de H I



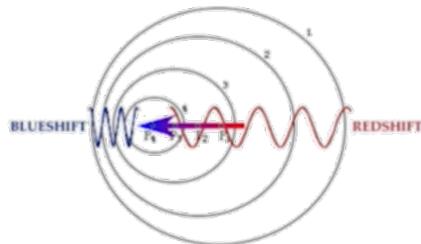
M83 en 21 cm



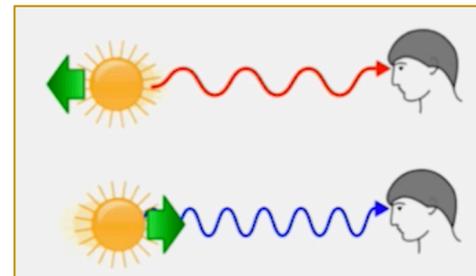
- ❖ y el desplazamiento Doppler

$$\frac{\nu - \nu_0}{\nu_0} = \frac{v}{c}$$

Alta frecuencia



Baja frecuencia



EL PEQUEÑO RADIOTELESCOPIO DE LA UNIVERSIDAD COMPLUTENSE DE MADRID



Diámetro de la Antena: 2 m

Resolución angular: 7°

Rango de frecuencias: 1370 MHz - 1800 MHz

(Banda L/línea de 21 cm)

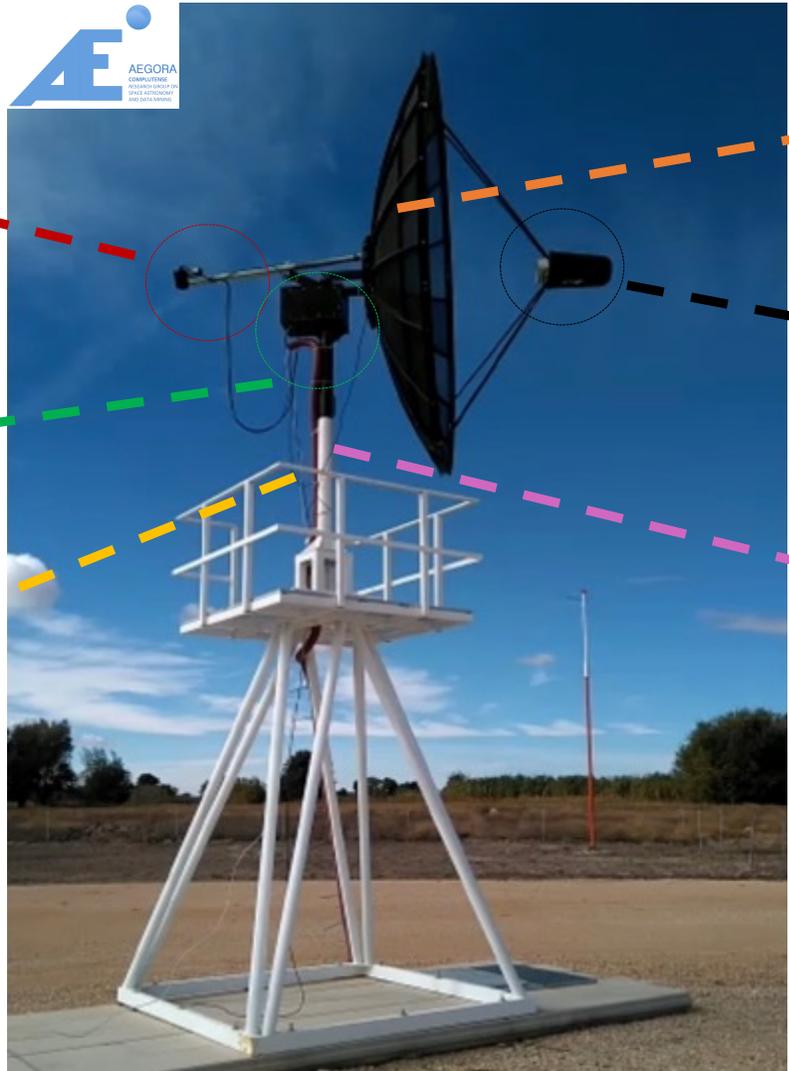
Resolución espectral: 7.8 kHz (sobre 156 o 64 canales)

Anchura de banda: 0.5 MHz o 1.2 MHz

Situada en el Complejo Astronómico de la Hita (Toledo)

[Coords. 39° 34'07" N 3° 11'10" O](#)

$$\theta \approx 1.22 \frac{\lambda}{D} = 1.22 \frac{21}{200} \times \frac{180}{\pi} = 7^{\circ}34'$$



Motor Elevación

Motor Azimut

Cable Señal

Reflector

Receptor

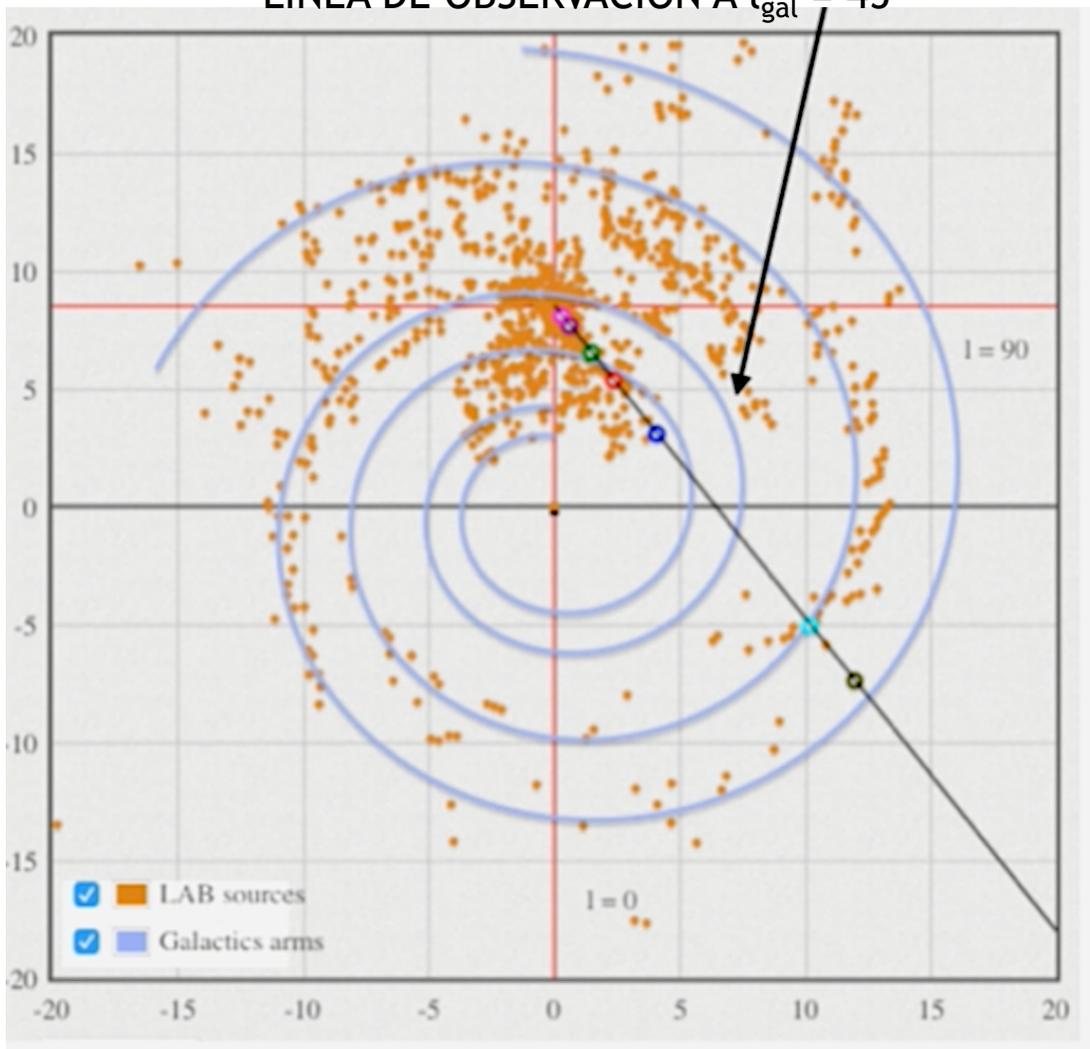
Mástil

Amplificador + Ordenador (graba la señal)

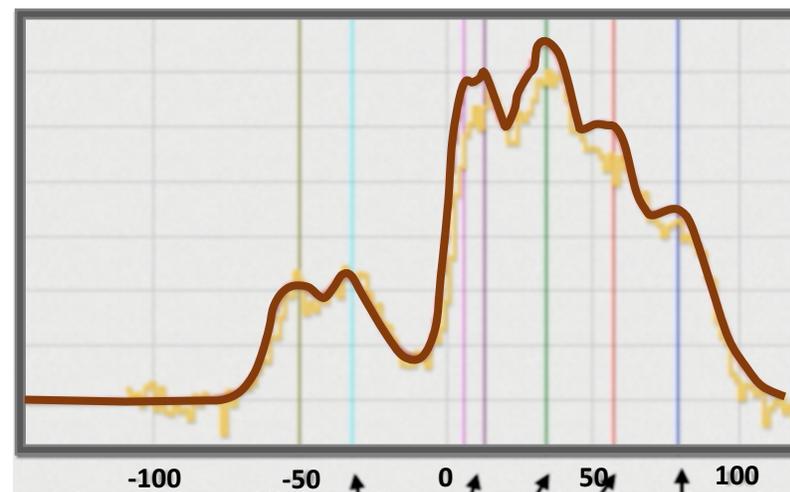
SRT-AEGORA-UCM

OBSERVACIÓN DE LA LINEA DE 21 cm CON EL SRT-UCM

LINEA DE OBSERVACIÓN A $l_{gal} = 45^\circ$



PERFIL DE LA LÍNEA DE 21 cm OBSERVADO



Picos desplazados en velocidad producidos por las nubes en la línea de observación

MEDIDA DE 21 cm CON EL SRT-UCM

1. Apuntar a unas coordenadas (l,b)
2. Indicar un tiempo de exposición de 10 minutos
3. Obtener y leer los espectros (fichero .csv)
4. Representar el perfil
5. Medir la velocidad máxima del perfil
6. Determinar la distancia radial del punto tangente

$$\begin{aligned} R &= R_0 \sin(l) = (8.5 \text{ kpc}) \sin(30^\circ) = 4.25 \text{ kpc} \\ V &= v_r + V_0 \sin(l) \\ &= 101 \text{ km/s} + (220 \text{ km/s}) \sin(30^\circ) \\ &= 210 \text{ km/s} \end{aligned}$$

