

12CO and 13CO in Wolf-Rayet Barred Galaxy NGC 5430

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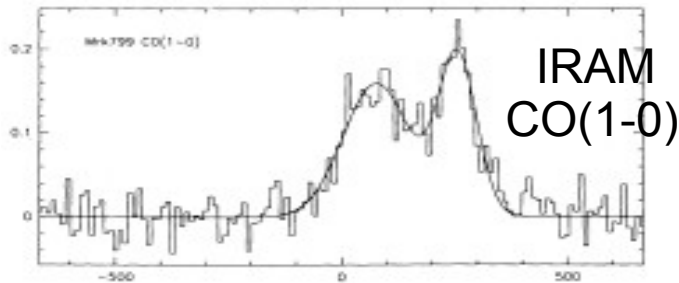
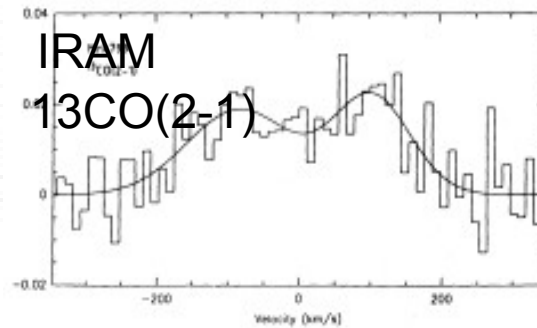
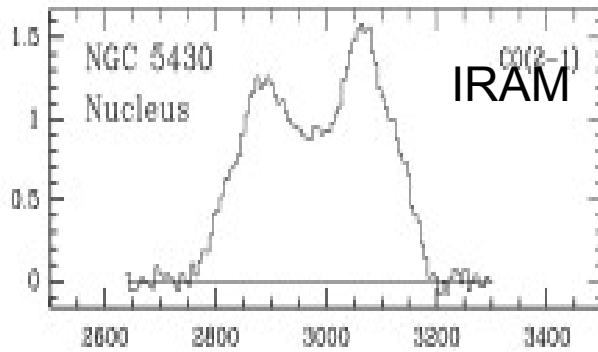
Michiko Umei
(Hokkaido University, Japan)

Target: Wolf-Rayet Barred Galaxy

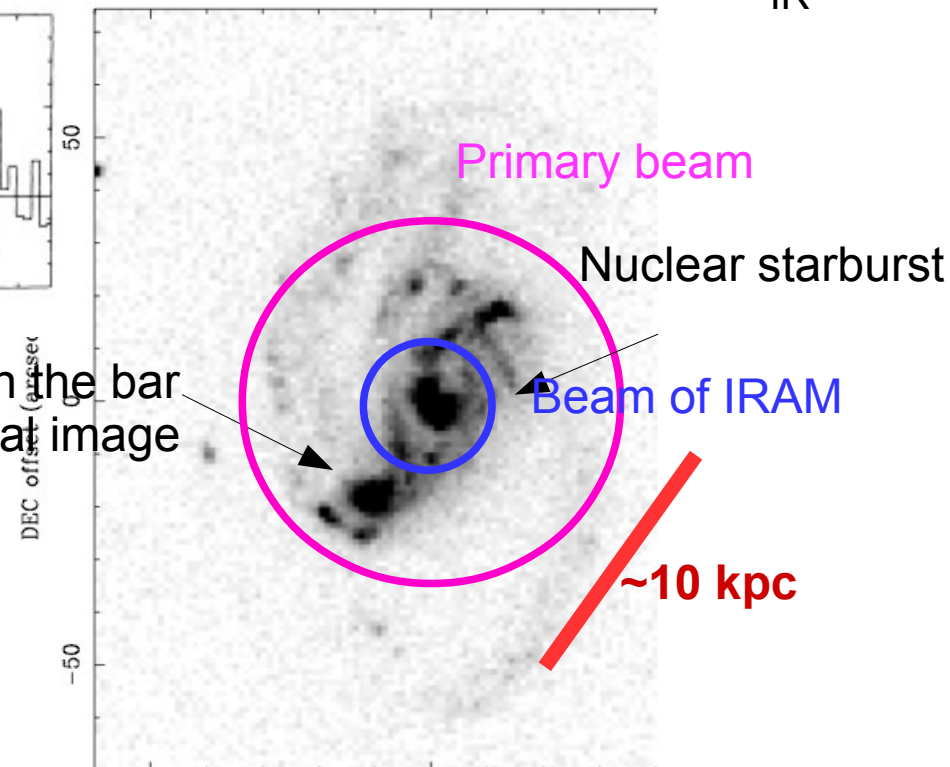
Nearby or far spiral galaxy?

- Contain 10^2 - 10^3 massive stars ($> 30 M_{\text{sun}}$), recent starburst

- NGC 5430
- $D = 43 \text{ Mpc}$ ($1'' = 207 \text{ pc}$)
- SBb
- SFR: $\sim 8 M_{\text{sun/yr}}$ (from L_{IR})



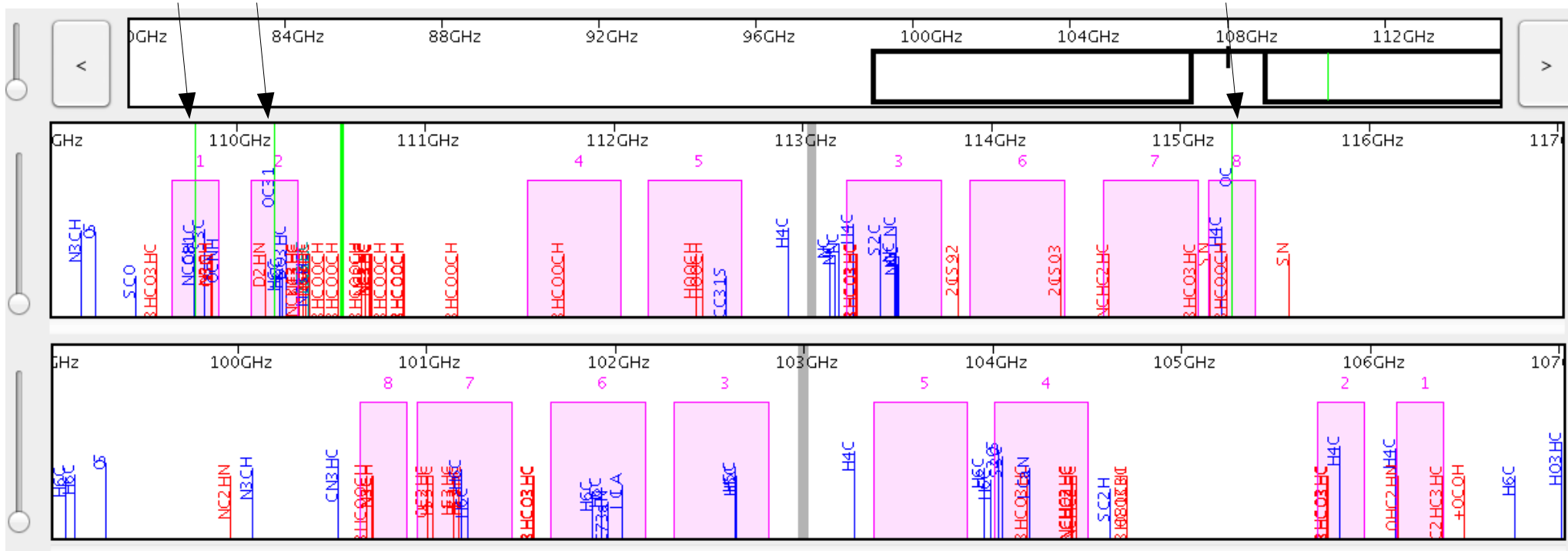
W-R region in the bar
Peak in optical image



Three CO Lines

C18O 13CO(1-0) 250 MHz (~8 km/s)

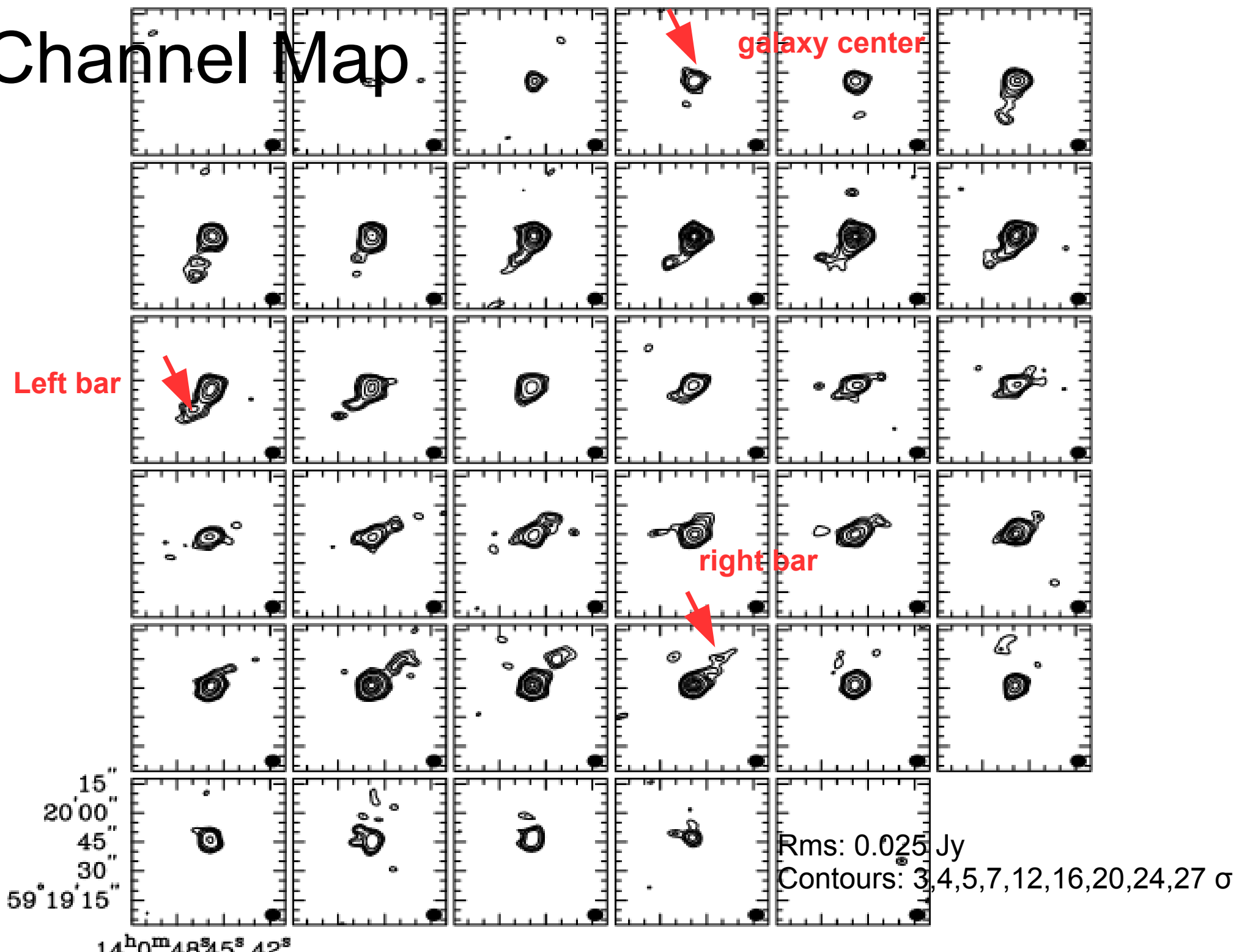
12CO(1-0)



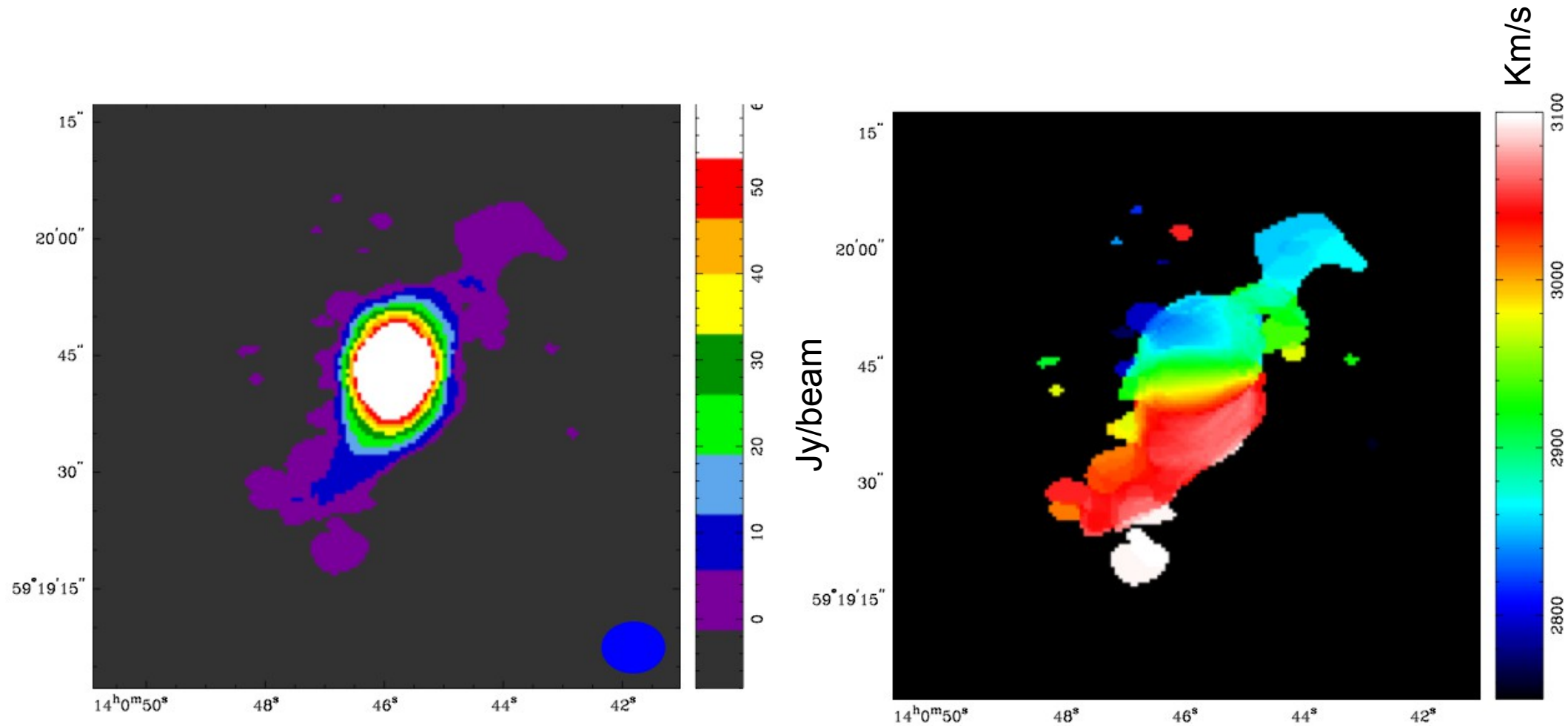
Total Obs. Time: 4.8 hours

Total on source time: 2.8 hours

Channel Map



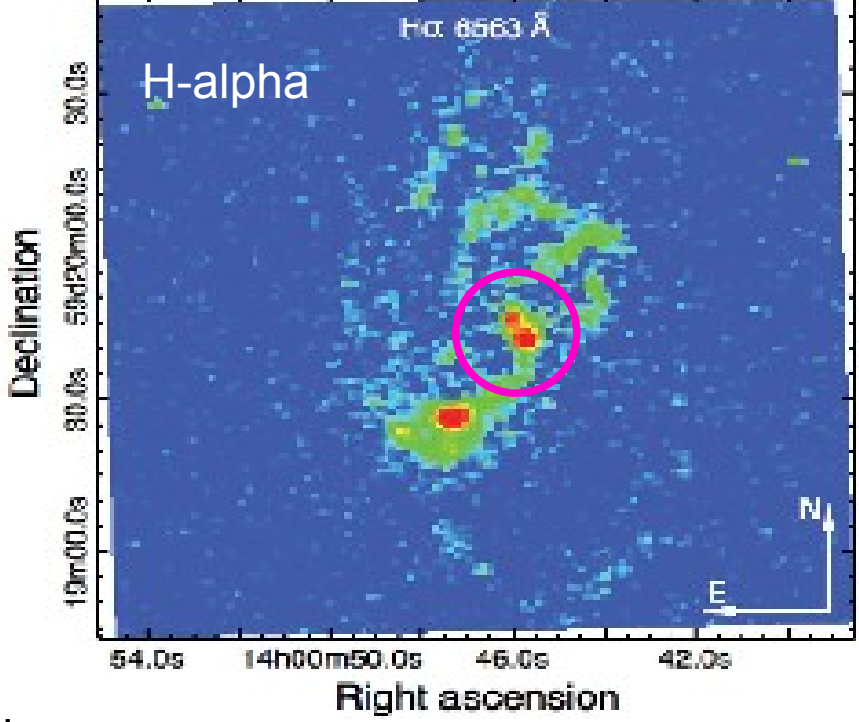
Moment Maps



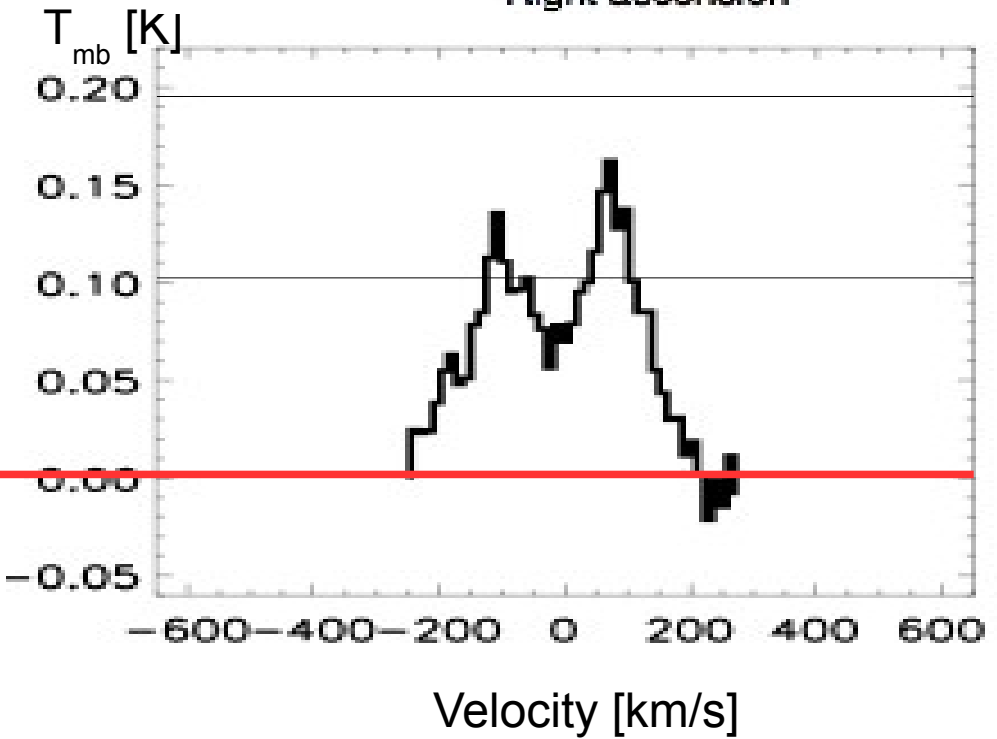
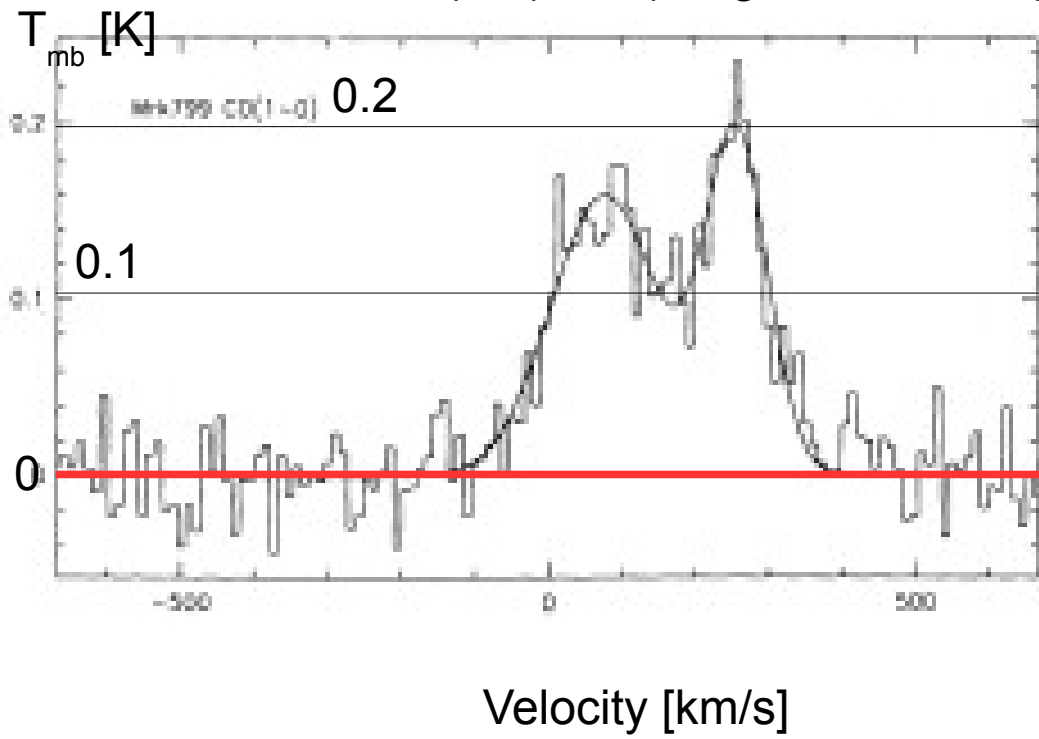
Check Flux

Compare with Single Dish

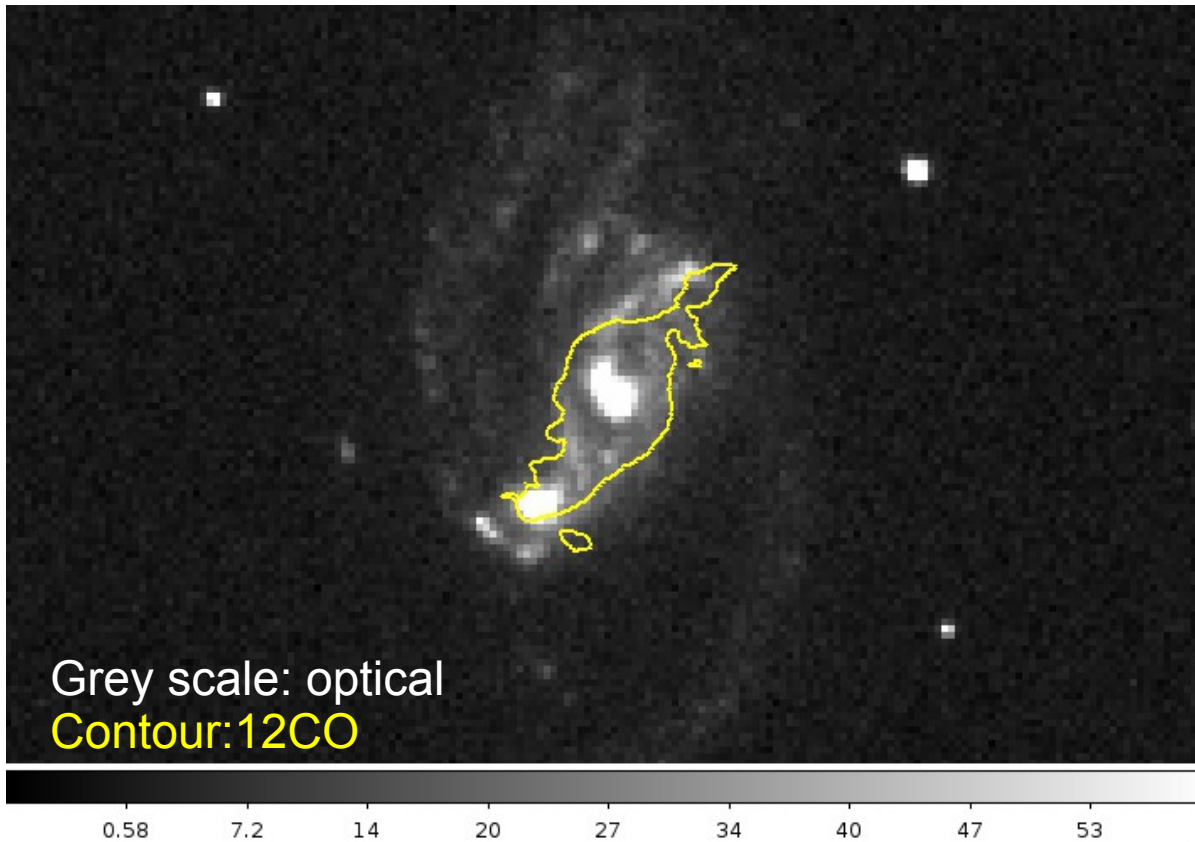
Check the flux with the region where the miss flux is small: central 22" (beam size of IRAM 115GHz)



IRAM 30-m CO(1-0) 22" (Krugel et al. 1990)



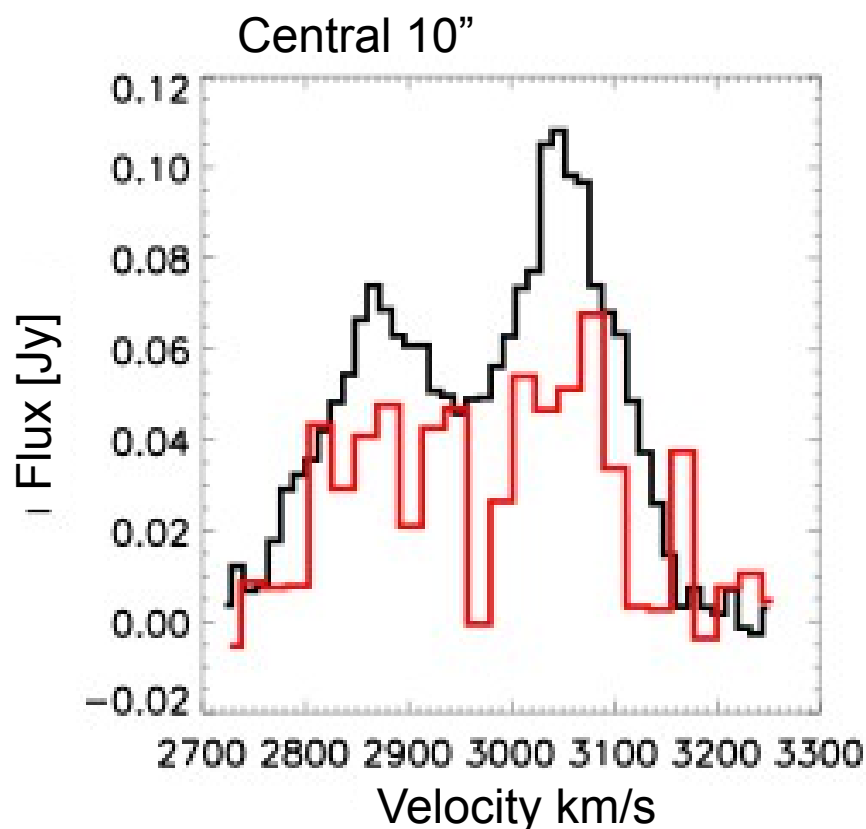
Check Flux



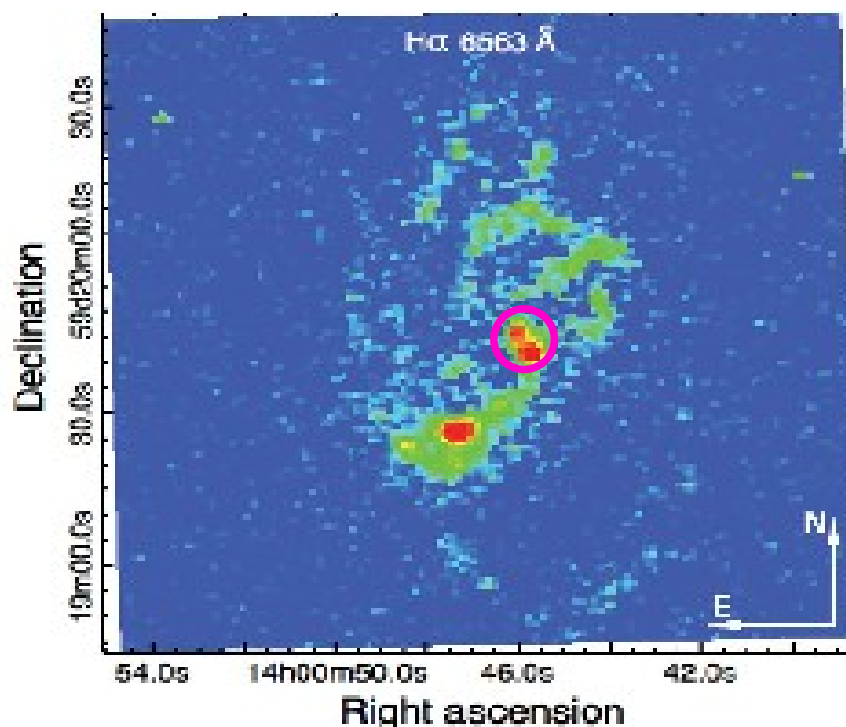
Weak CO emission but strong optical emission →

- Star Formation efficiency (SFR/gas mass) is extremely high
- Missing flux is large in the bar region

Gas Mass of Galactic Center



H-alpha (Briere et al. 2012)



Spectrum of $^{12}\text{CO}/8$ (black) and ^{13}CO (red)

Galactic GMCs: ~ 6

Starburst nucleus/regions: 10-15

Merger: > 20

- Mass from ^{12}CO : $\sim 2 \times 10^9 \text{ Msun}$ ((2 - 5) $\times 10^9 \text{ Msun}$ in IRAM's study)
- $^{12}\text{CO}/^{13}\text{CO}$ ratio in Kelvin = $\sim 14 \rightarrow$ typical value for nuclear starburst

Future Work

- Single dish observation, fix the short spacing problem
 - line ratio: Physical state of gas
- Higher angular resolution with CARMA, $< 3''$
- → sub-kpc resolution