



CRAFT

Northwestern

C I E R A

CENTER FOR INTERDISCIPLINARY EXPLORATION
AND RESEARCH IN ASTROPHYSICS

UNVEILING A HYPERACTIVE FRB IN A DUST- OBSCURED ENVIRONMENT WITH STAR FORMATION

Vic (Yuxin) Dong, Northwestern University

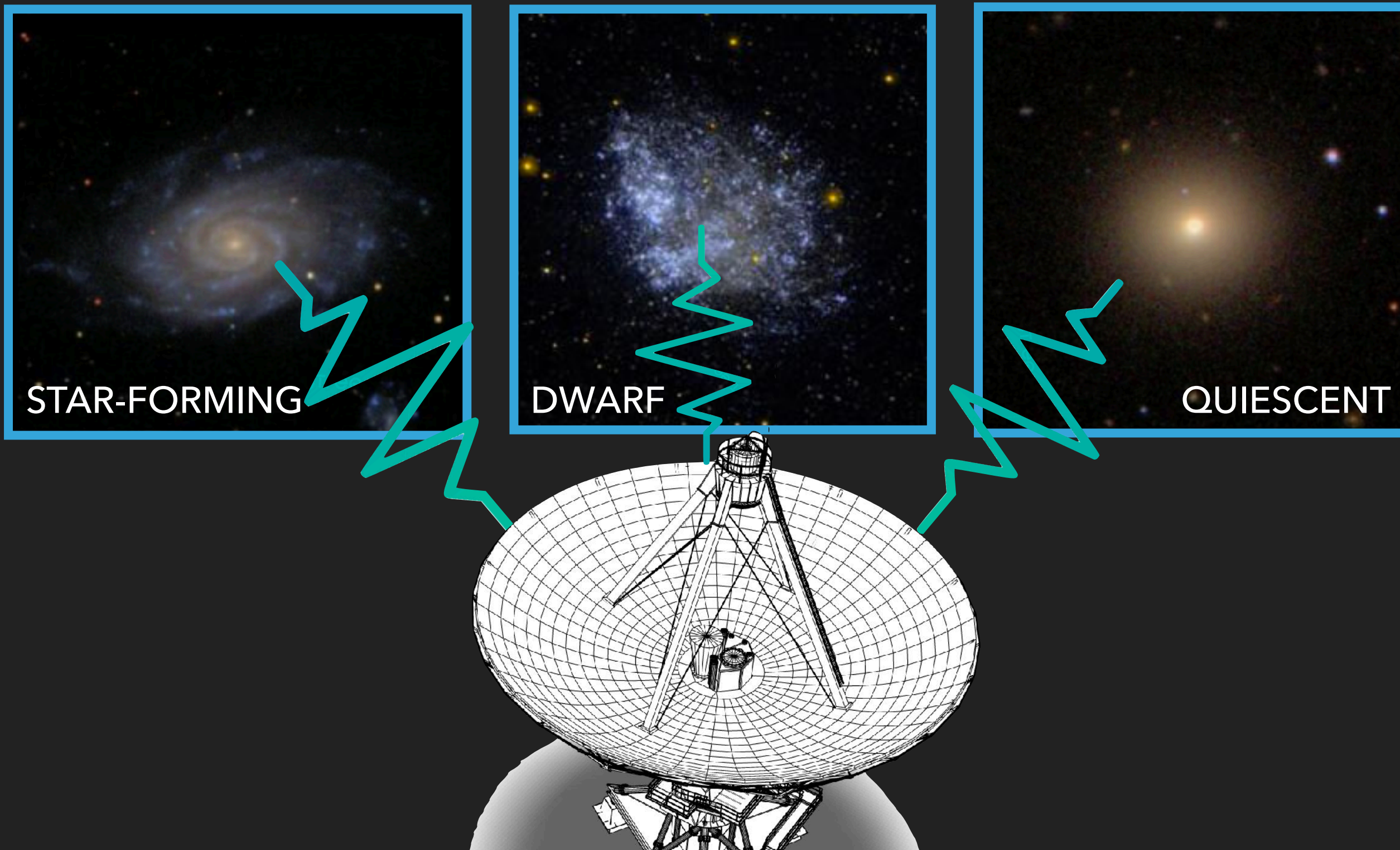
Wen-fai Fong, Tarraneh Eftekhari, Adam Deller

The Transient and Variable Universe 2023



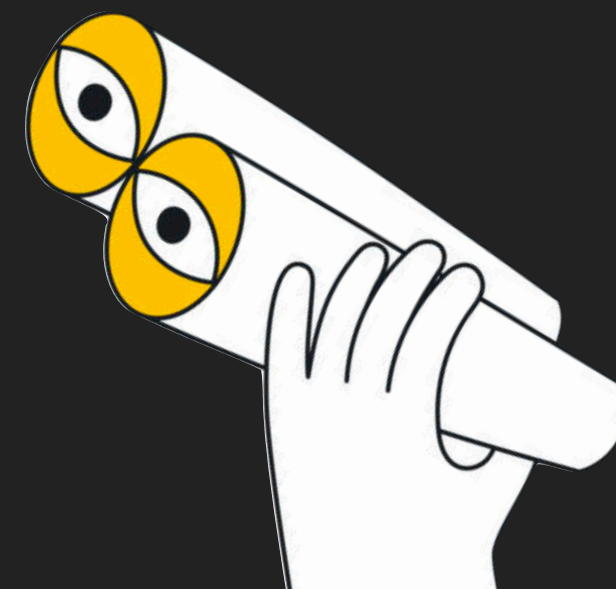
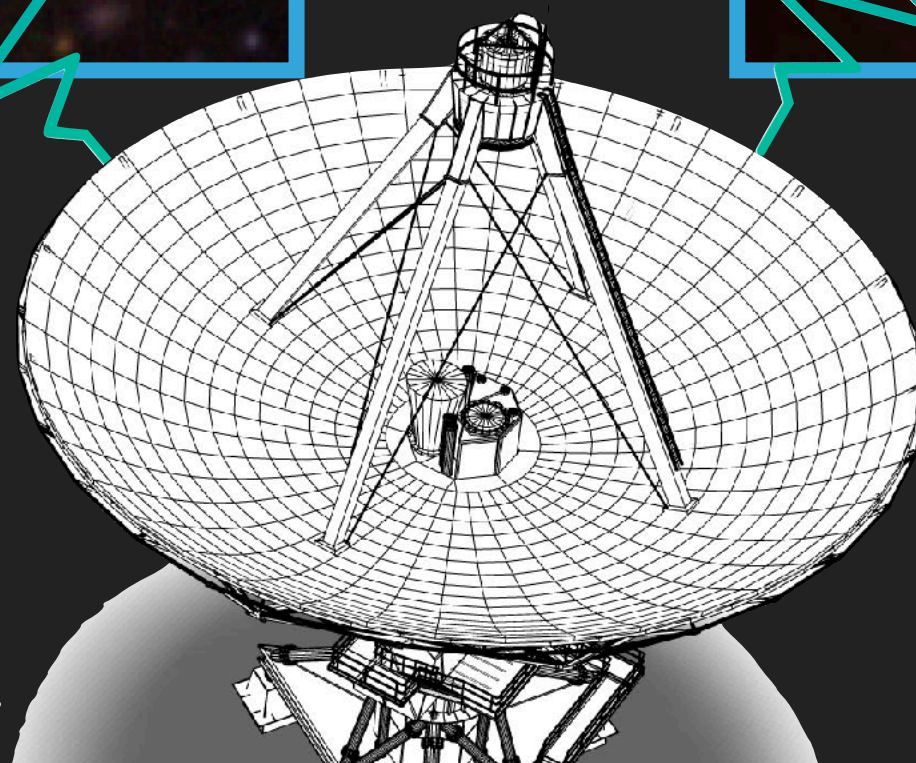
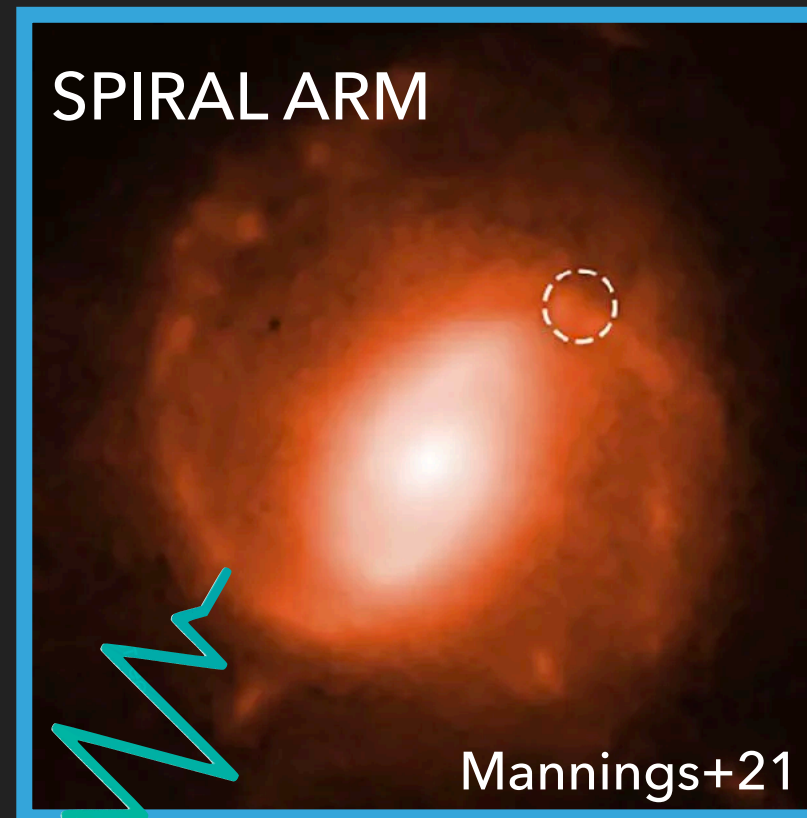
CATCHING FRBS IN DIVERSE ENVIRONMENTS!

Fast Radio Burst (FRB): millisecond, bright flashes of radio pulses usually at cosmological distances.



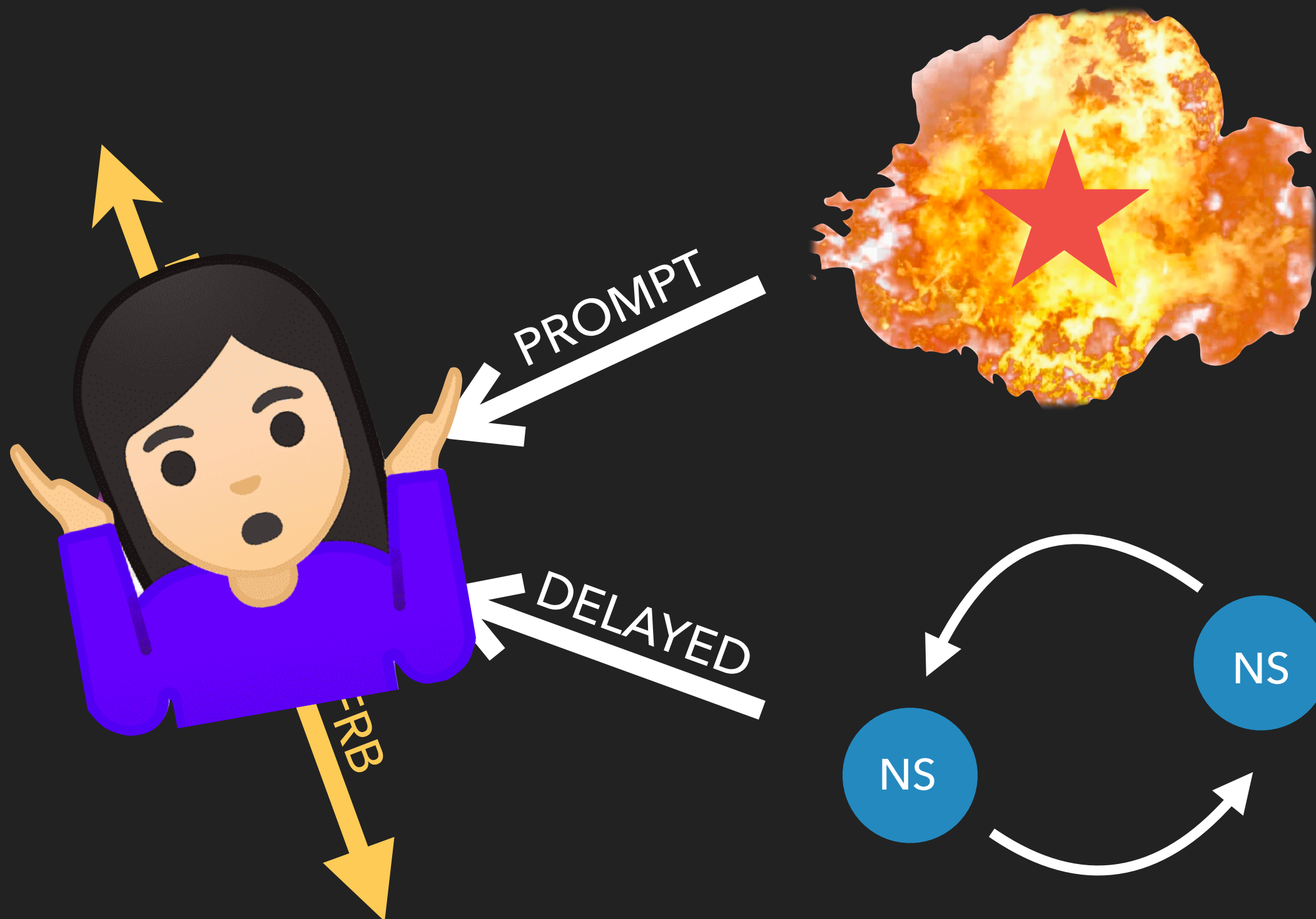
CATCHING FRBS IN DIVERSE ENVIRONMENTS, EVEN LOCALLY!

Fast Radio Burst (FRB): millisecond, bright flashes of radio pulses usually at cosmological distances.

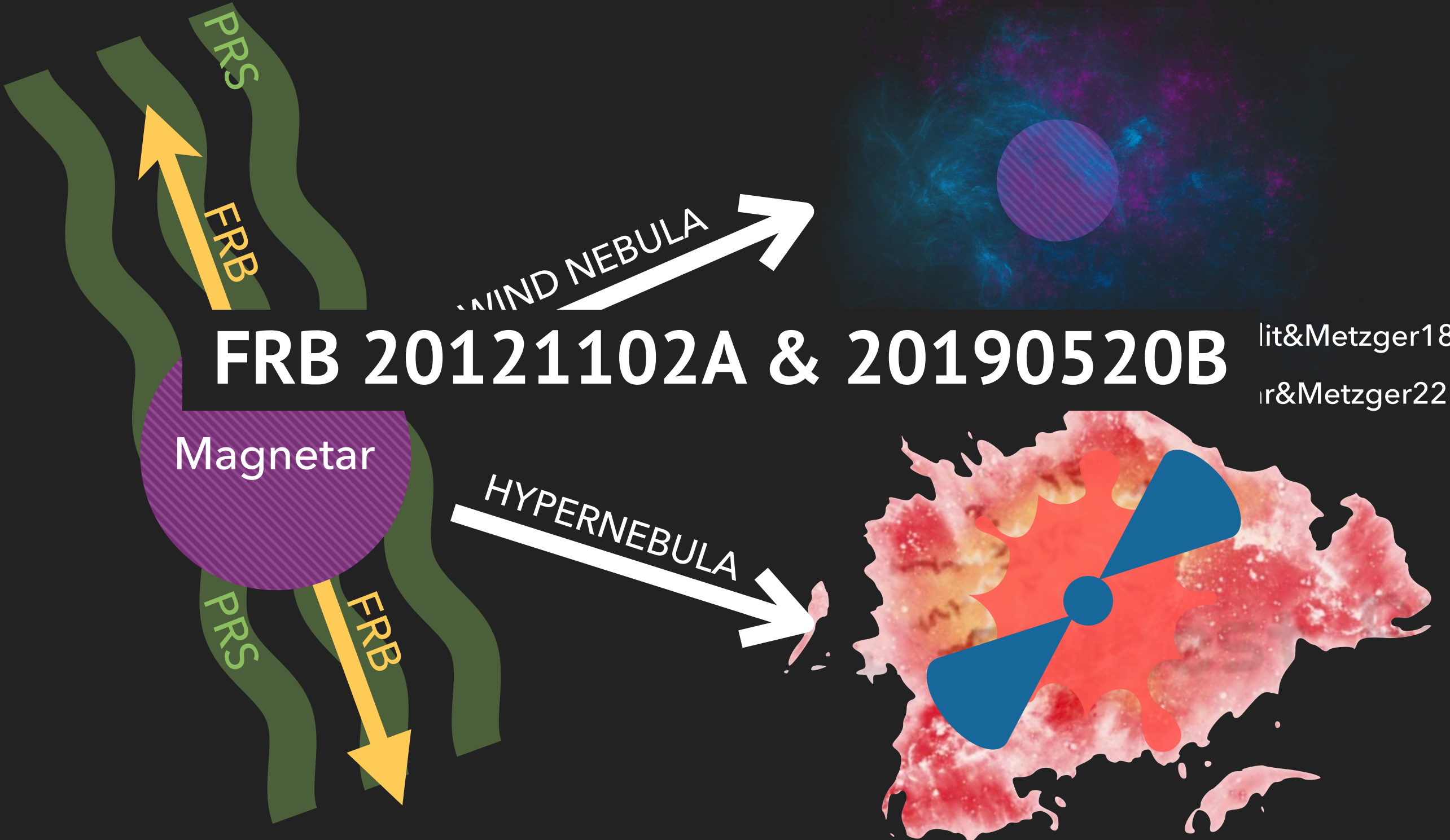


See Alexa Gordon's talk for more!

THE ORIGIN OF FRBS MAY BE A MAGNETAR?



THE ORIGIN OF FRBS ALSO PRODUCES PRS IN SOME CASES



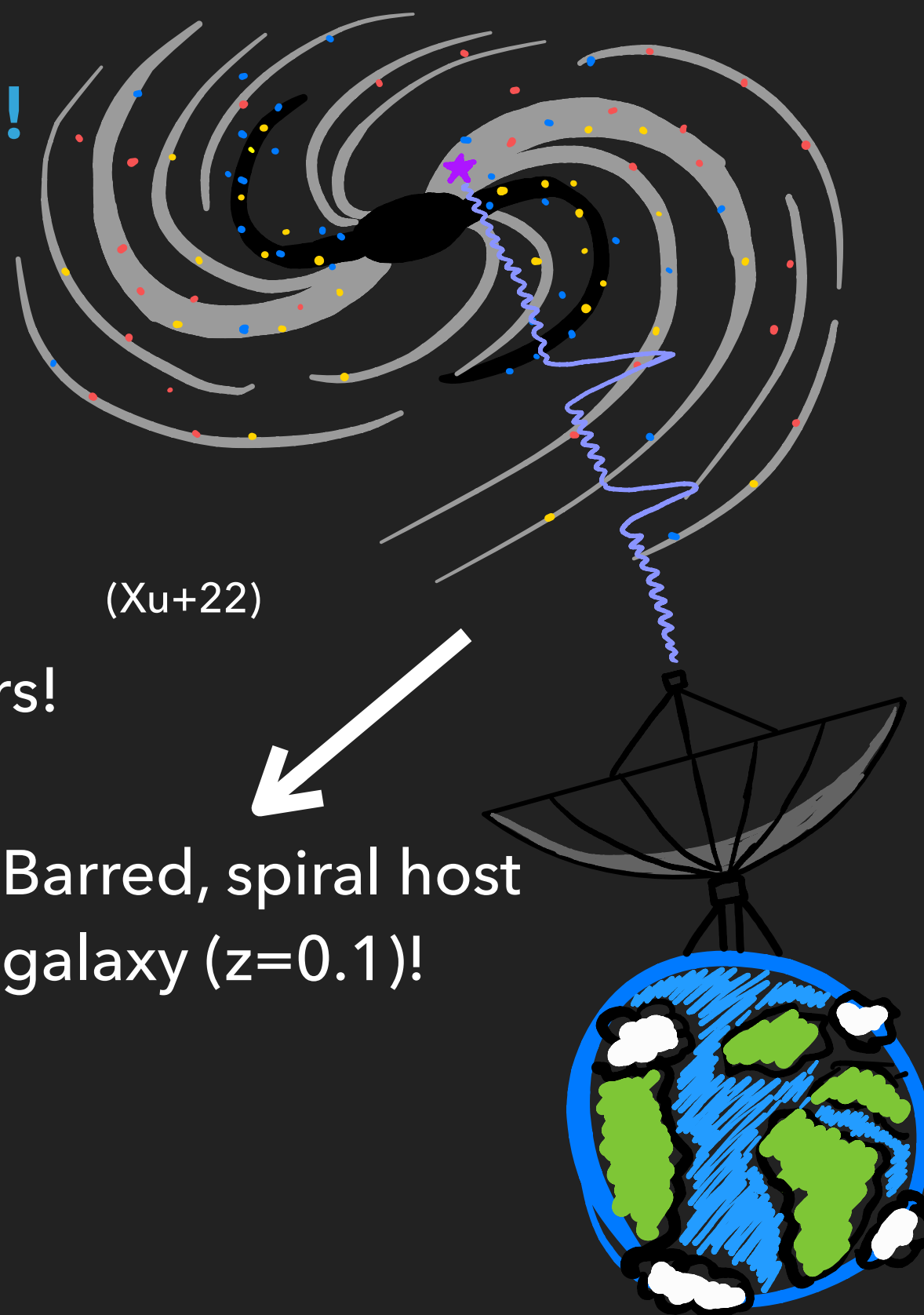
FRB 20201124A IS ONE OF THE MOST ACTIVE FRBS OF ALL TIME!

~1800 bursts
detects in 82 hours!

(Xu+22)

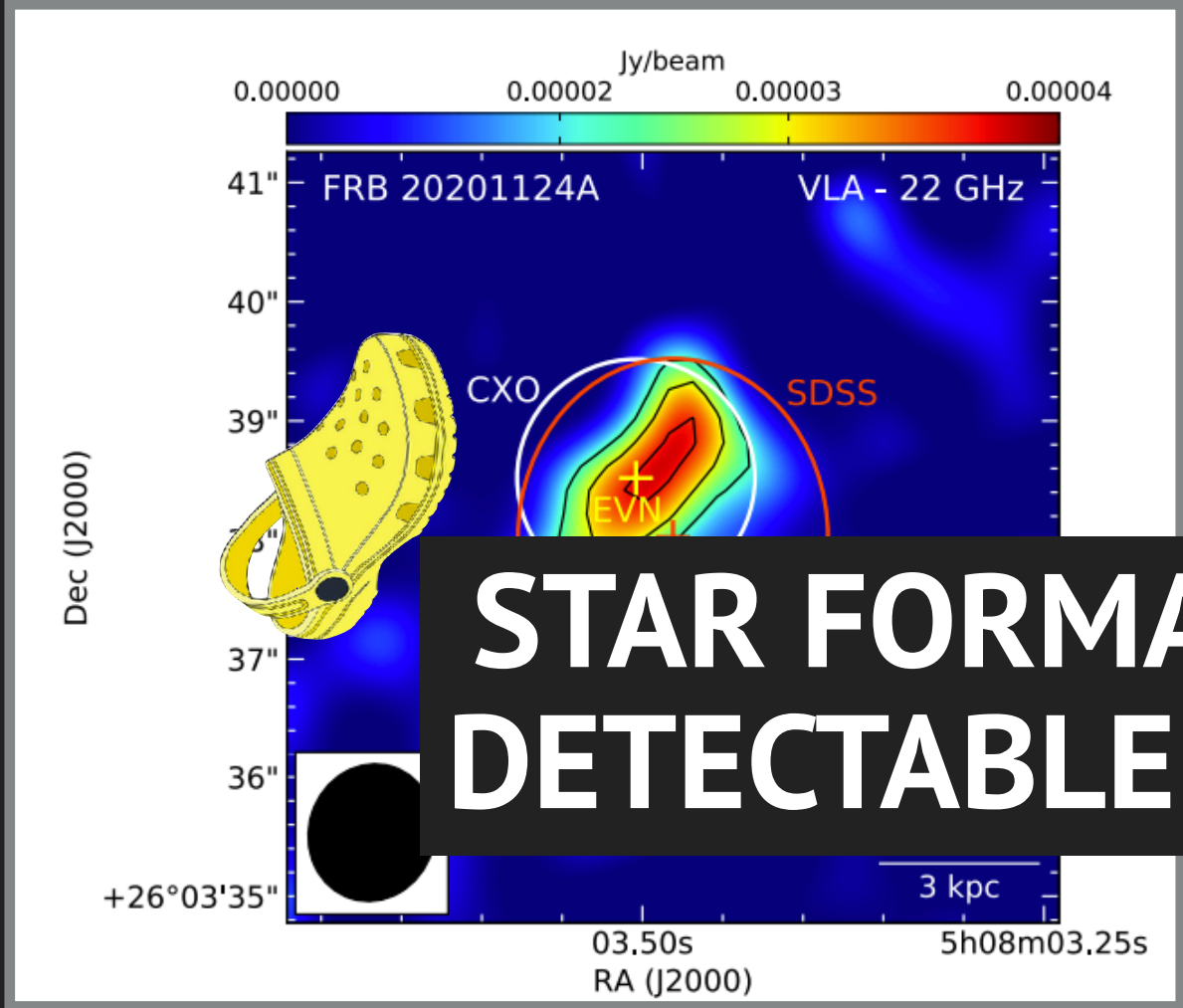
Barred, spiral host
galaxy (z=0.1)!

First detected by CHIME, then
localized to **milliarcsecond**
precision with EVN

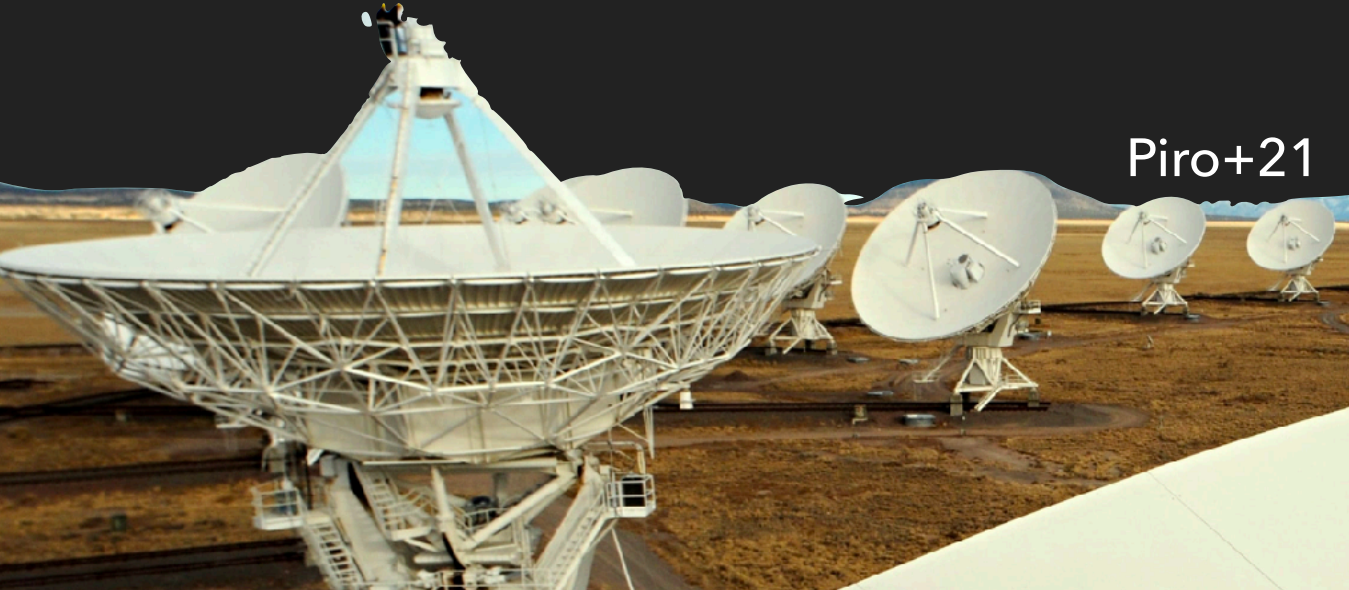
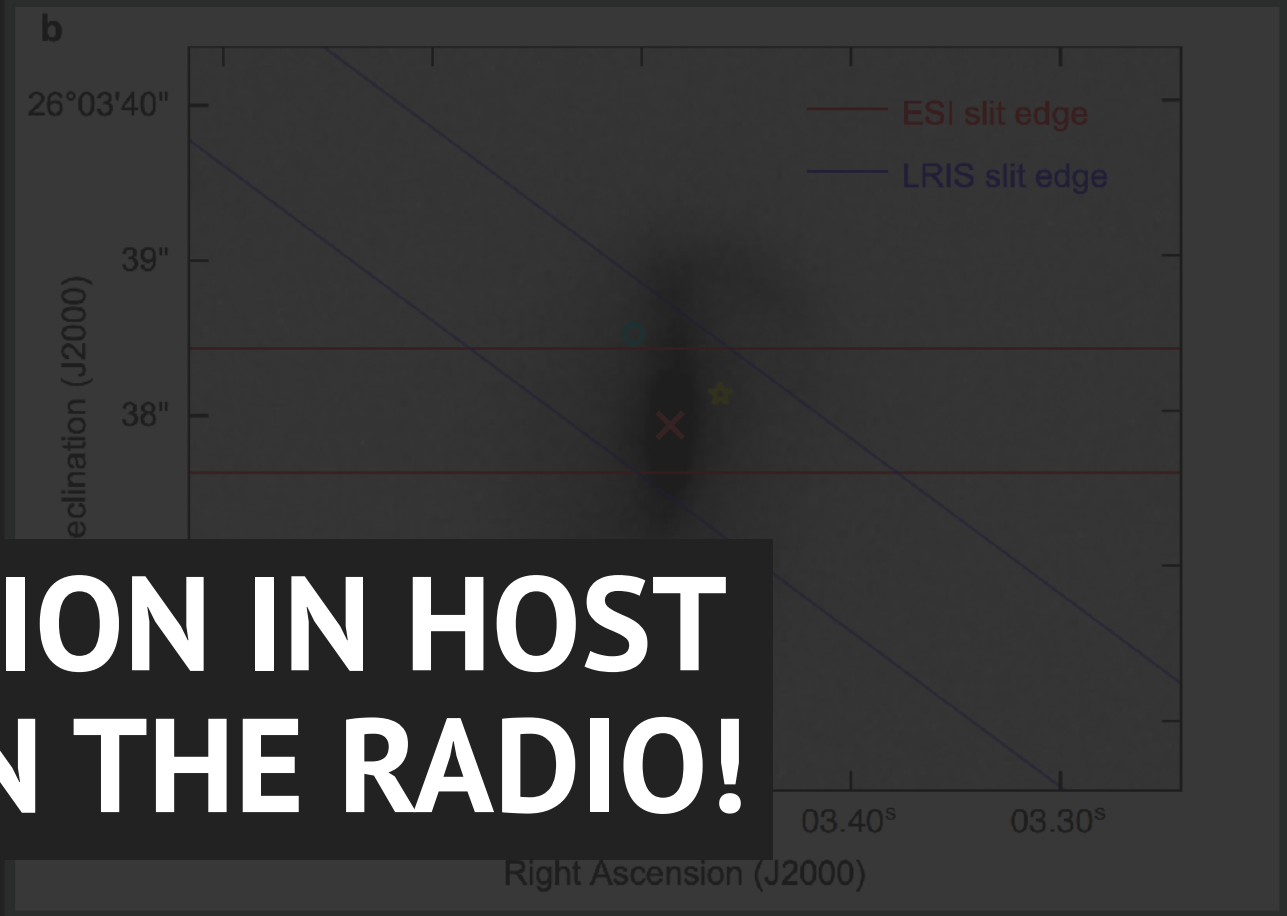


VLA/RADIO

KECK/OPTICAL



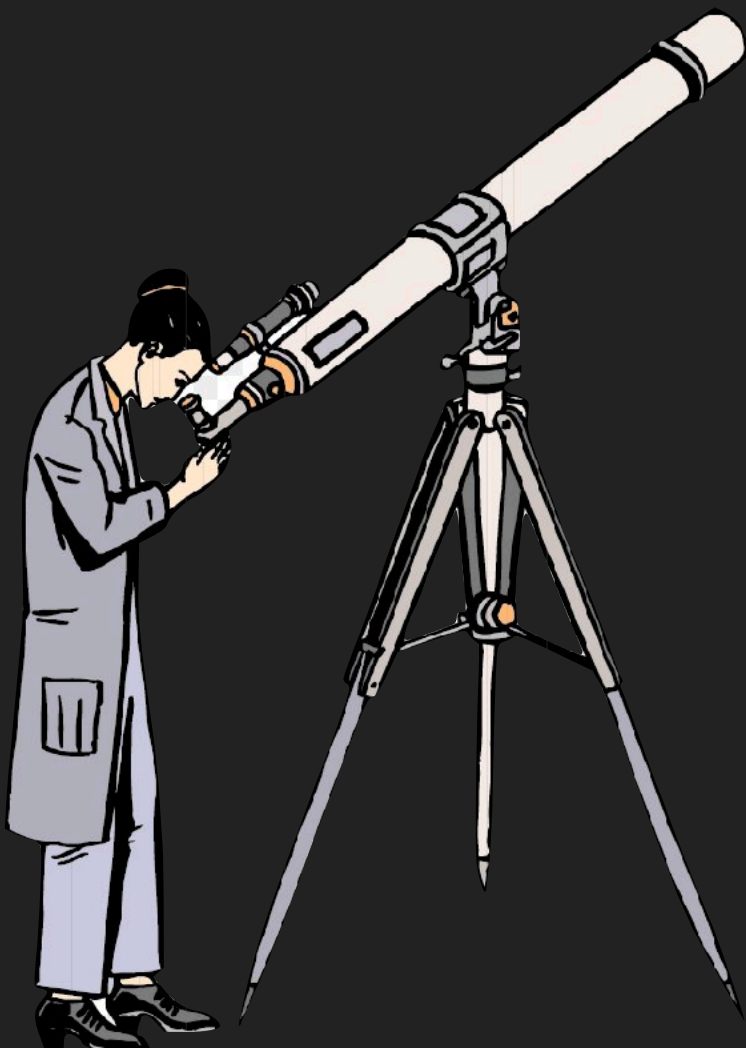
STAR FORMATION IN HOST DETECTABLE IN THE RADIO!



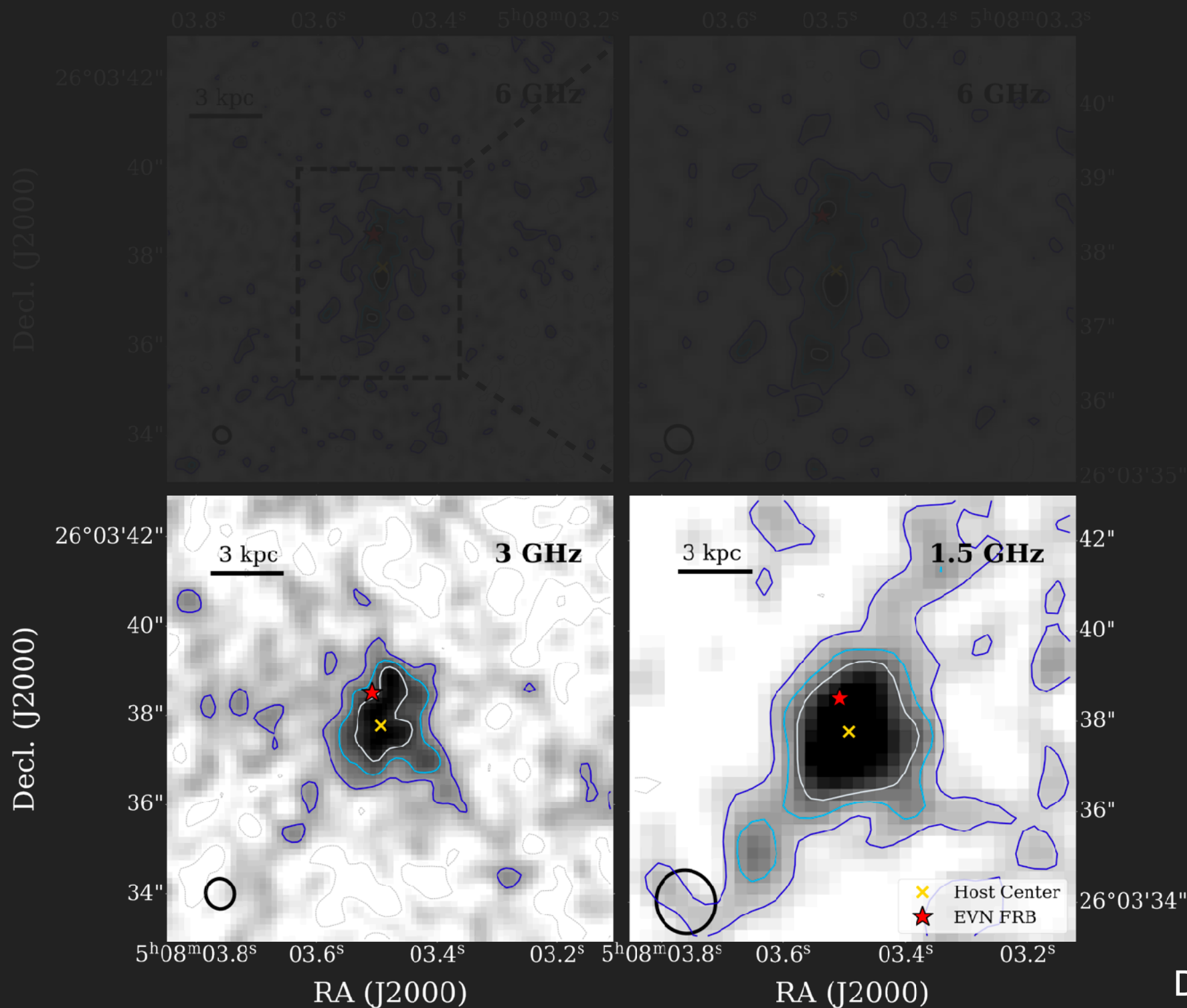
OUR NEW VLA AND *HST* OBSERVATIONS ALLOW US TO...

Probe **STAR FORMATION**
within the host galaxy
and at the FRB location

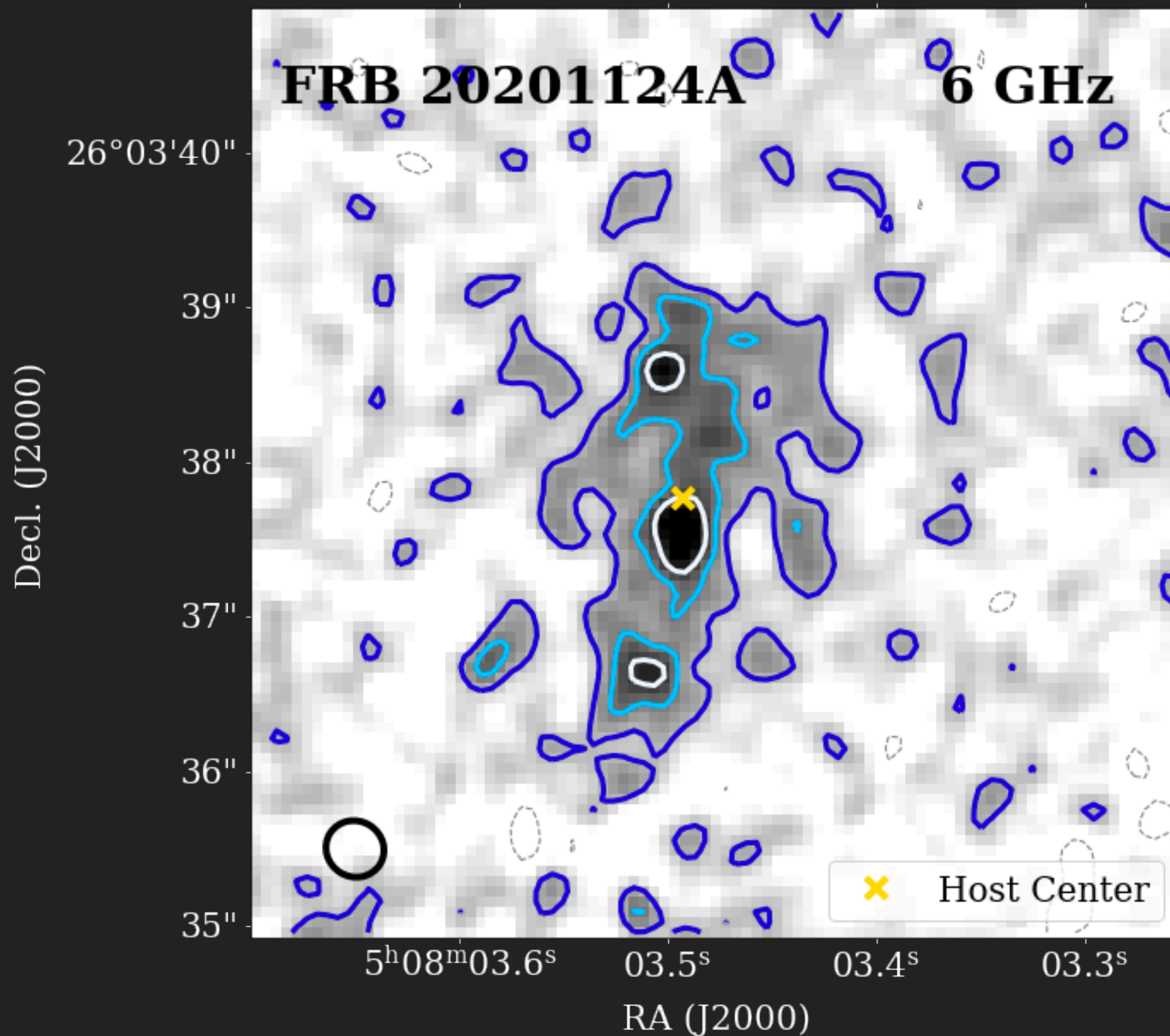
Search for the faintest **PRS**
associated with a FRB to date



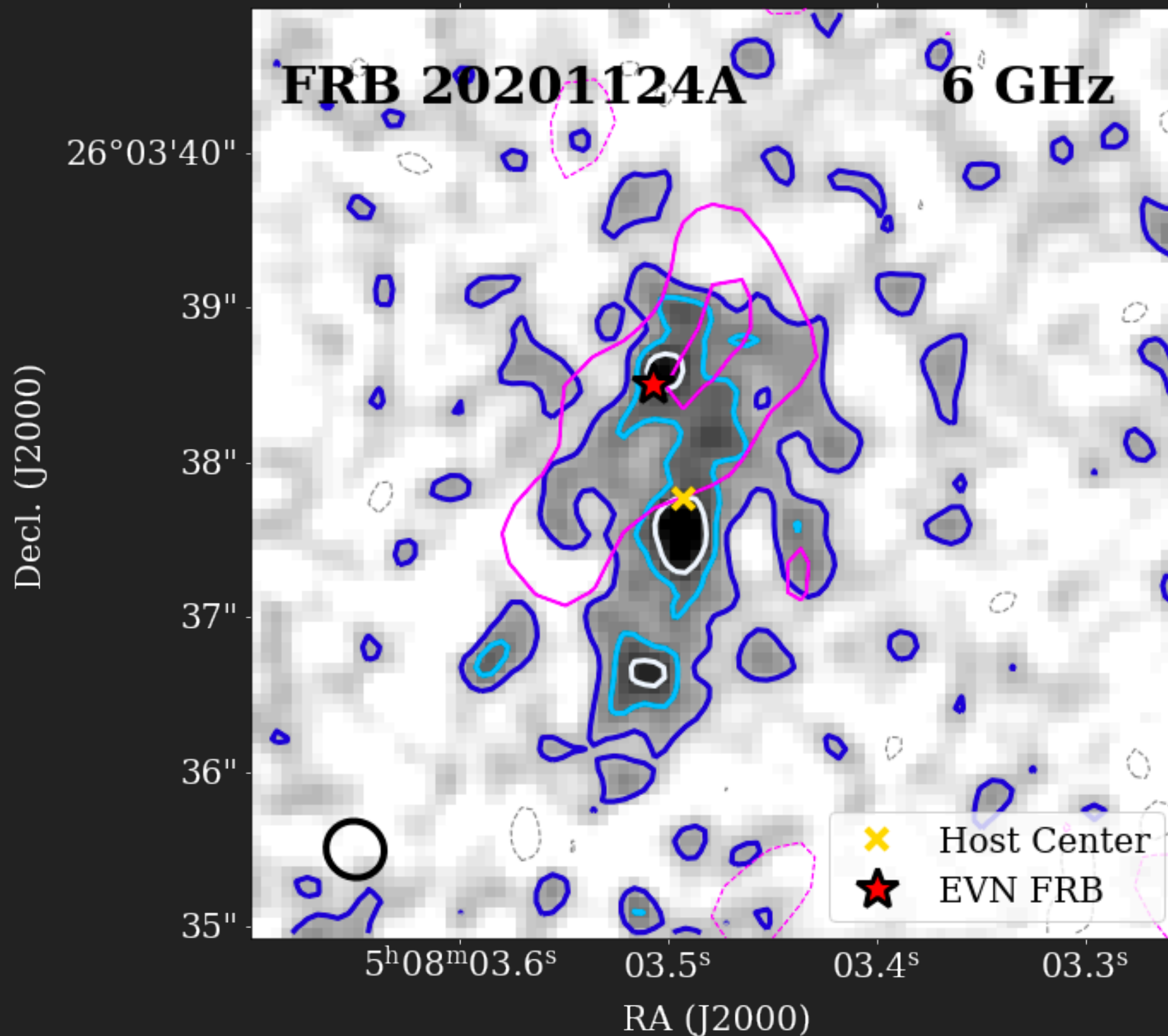
THE MORPHOLOGY IN THE RADIO IS CENTERED ON THE HOST AND RESOLVED ACROSS ALL FREQUENCY BANDS



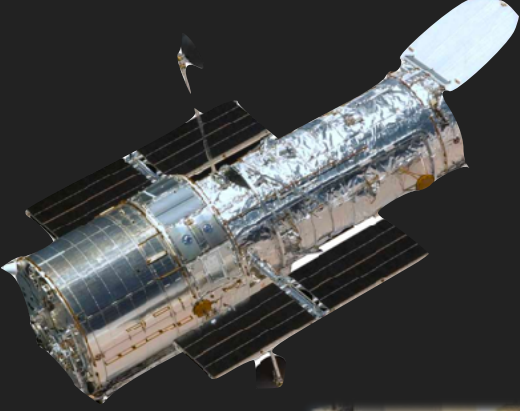
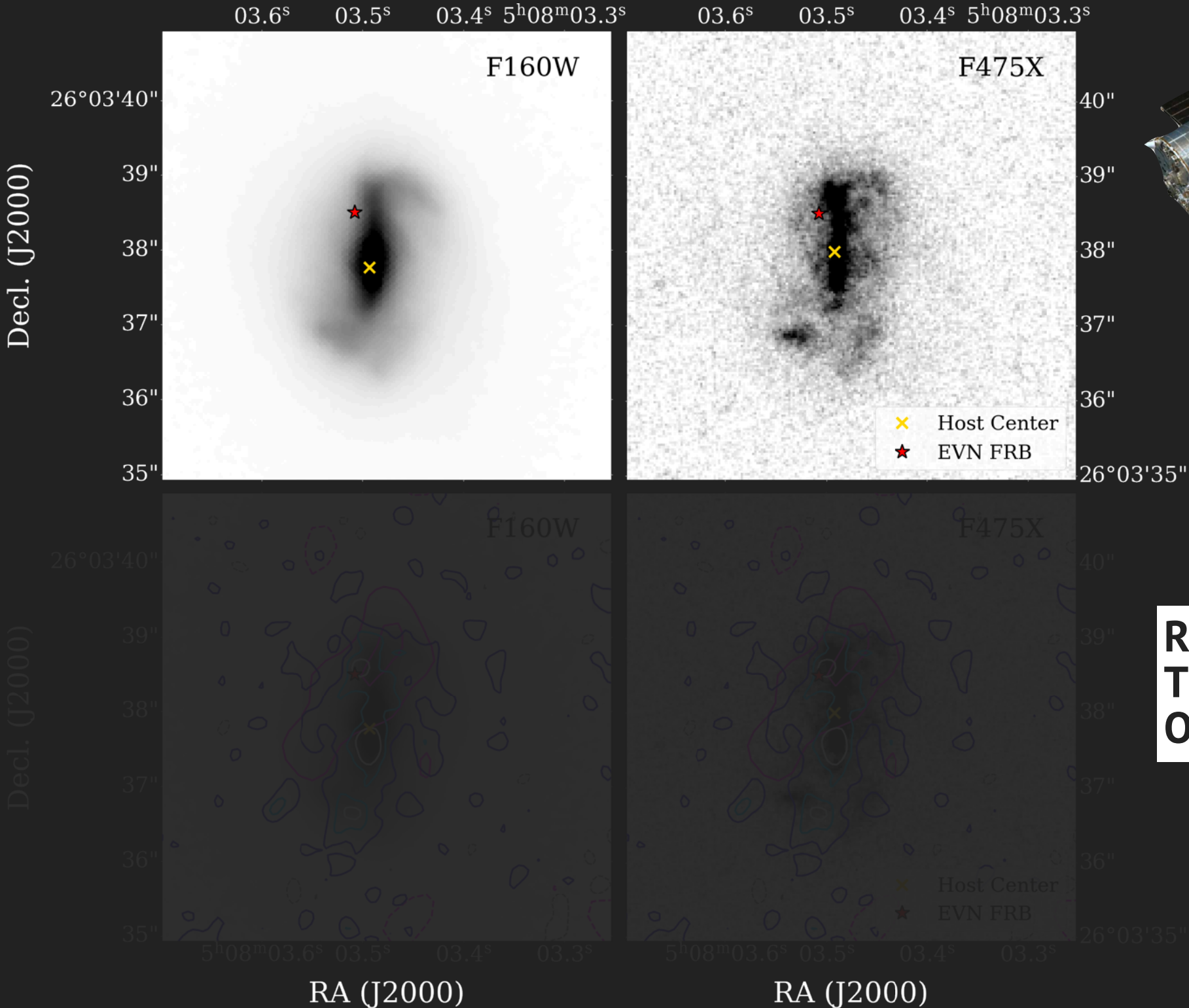
THE RADIO MORPHOLOGY IS HEAVILY RESOLVED AND HIGHLY COMPLEX AT 6 GHZ



THE RADIO MORPHOLOGY IS HEAVILY RESOLVED AND HIGHLY COMPLEX AT 6 GHZ



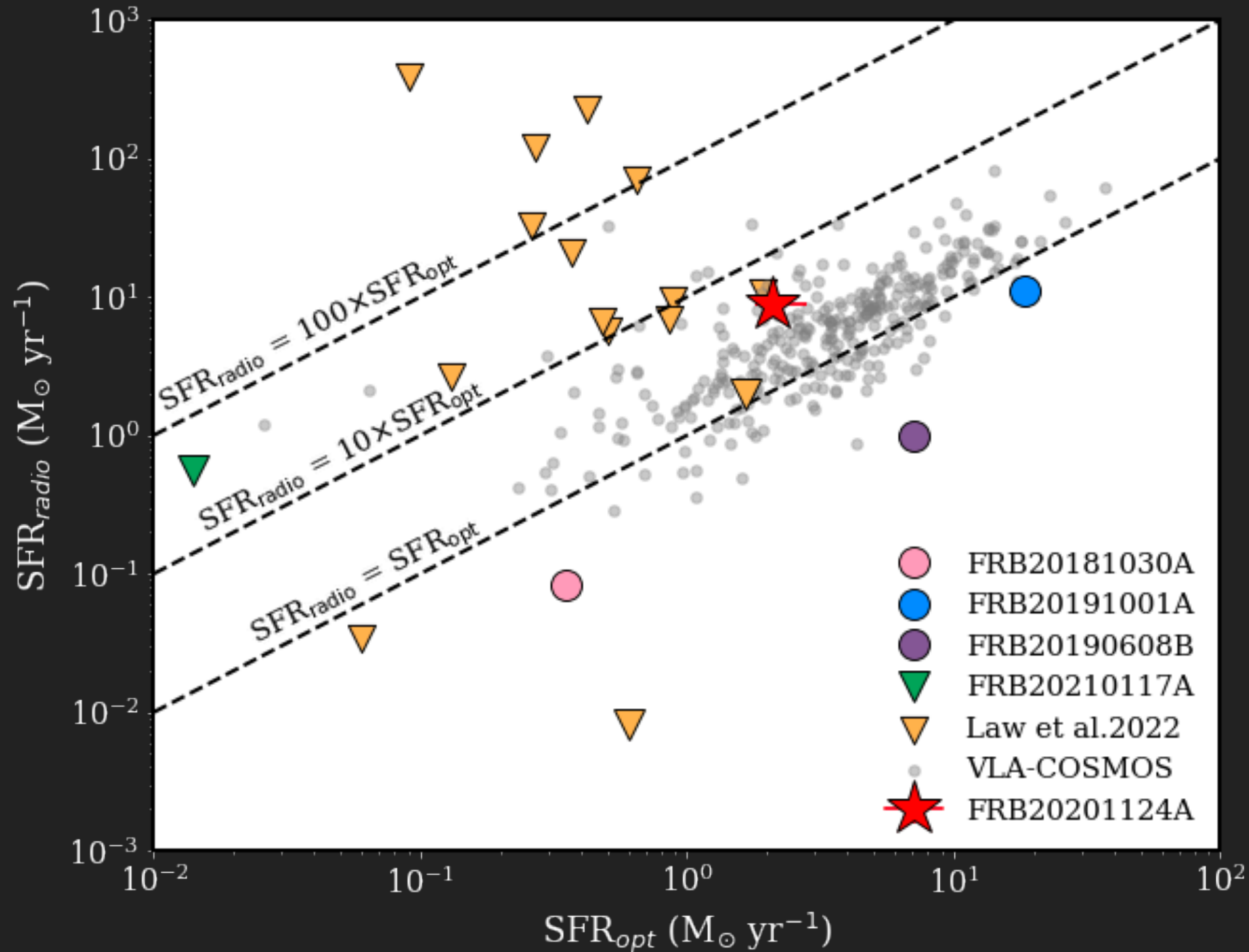
NEW HST OBSERVATIONS REVEAL BAR AND SPIRAL ARM FEATURES OF THE HOST GALAXY.



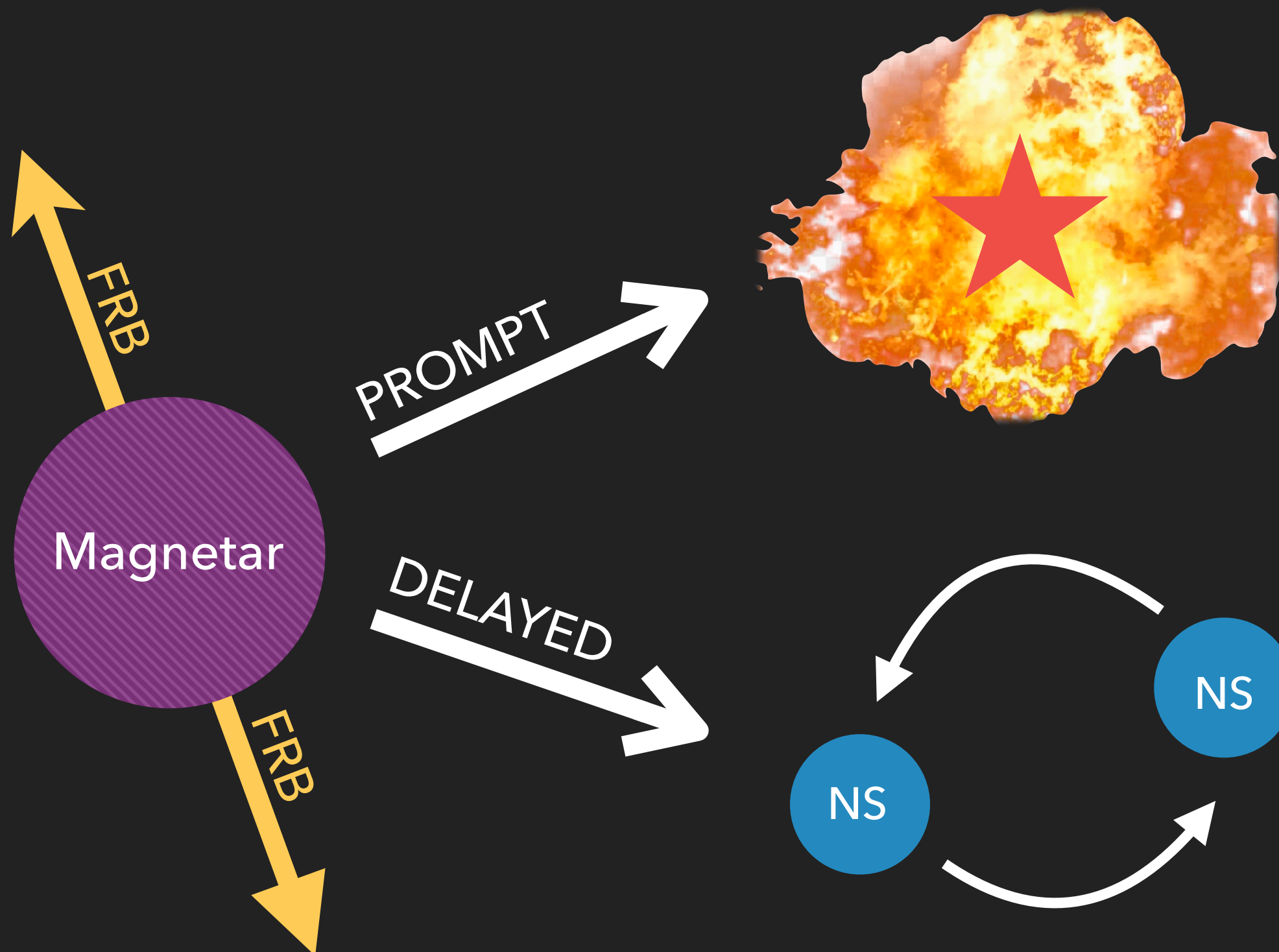
PI: A. Mannings (UCSC)

RADIO EMISSION TIGHTLY TRACES THE MORPHOLOGY OF THE HOST GALAXY

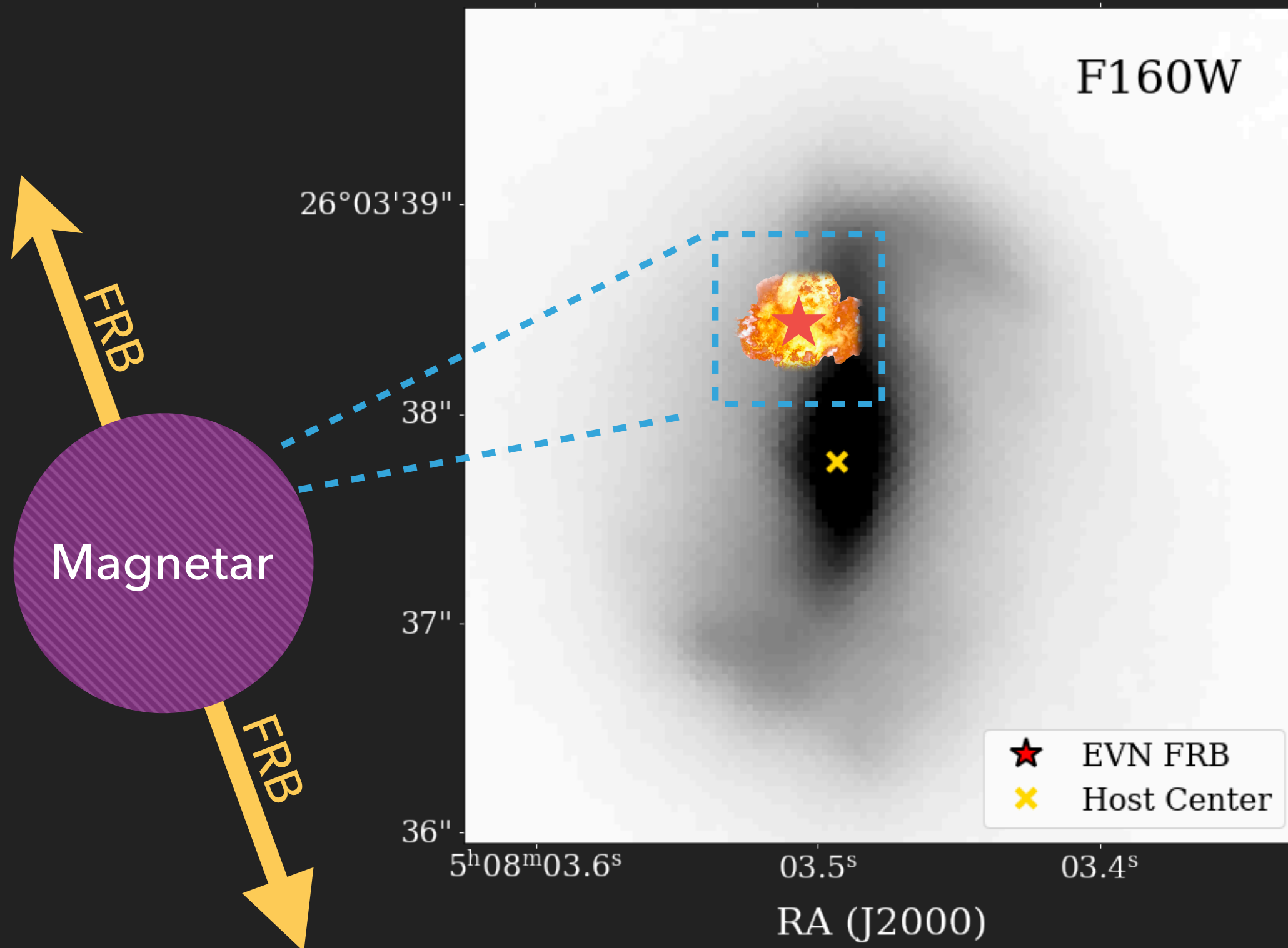
OBSCURED STAR FORMATION THROUGHOUT THE HOST GALAXY



THE ORIGIN OF FRBS MAY BE A MAGNETAR?



PROGENITOR OF FRB 20201124A: MAGNETAR BORN *IN-SITU* FROM THE EXPLOSION OF A MASSIVE STAR



CONCLUSIONS



Look out for the paper on ArXiv next week!

Radio emission is resolved in all bands and traces the morphology of the host galaxy.

Star formation extends to burst site and there are signs of obscured star formation within the host galaxy

FRB 20201124A

Multi-wavelength observations are crucial for understanding FRB progenitor channels.

The progenitor could be a magnetar born *in-situ* from the explosion of a massive star.

BACK UP SLIDES

SPECTRAL INDEX FROM SED FITTING INDICATES STAR FORMATION

