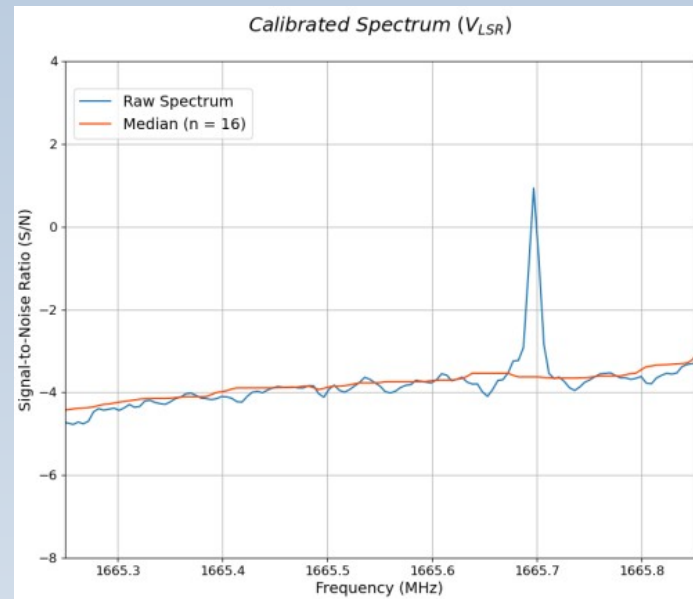


# DSES 1<sup>st</sup> Maser Detection!

September 16, 2024 182320 UTC

- W3 star forming region 6200 light-years away
- In the Perseus Arm (seen near Cassiopeia)
- RA/DEC = 02:27:03 / 61:52:24
- Rest frequency = 1665.4 MHz



- SDRPlay at 5 MHz bandwidth,  $T_{\text{samp}} = 0.5$  s, 10 minute collection
- 1420 MHz feed with 2<sup>nd</sup> antenna probe and LNA for 1612-1720 MHz
- Observers: Ray Uberecken, Rick Hambly, Dan Layne
- Thanks to Ray (feedhorn) and Glenn Davis, Lewis Putnum, Phil Gage (System1)

# Circumstellar Hydroxyl (OH) Maser

- Shell of gas around late M star (red giant) contains molecular OH produced by UV radiation on H<sub>2</sub>O
- Strong infrared radiation excites OH to maser transitions at 1612, 1665, 1667, and 1720 MHz
- Often show double peak. VLSR-corrected Doppler shift blue (towards observer) or red (away)
- Often bright (> 100 Jy), but highly variable emission
- OH masers are large: 1,000 – 10,000 AU

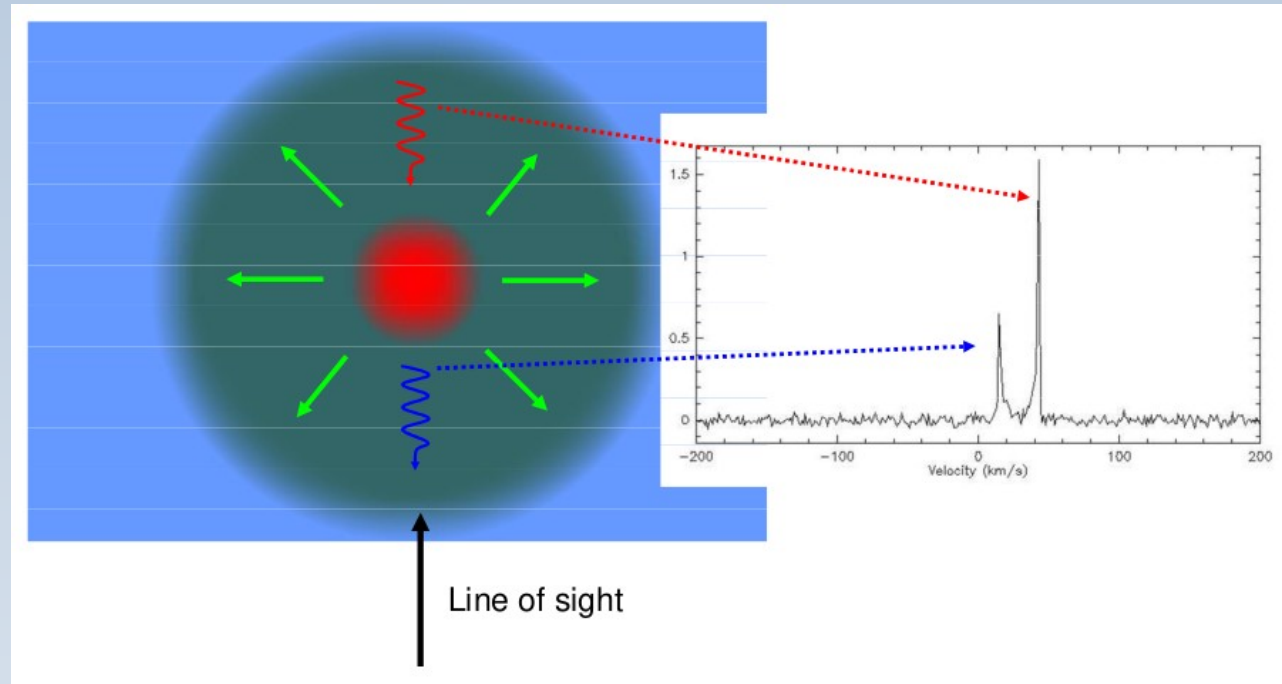
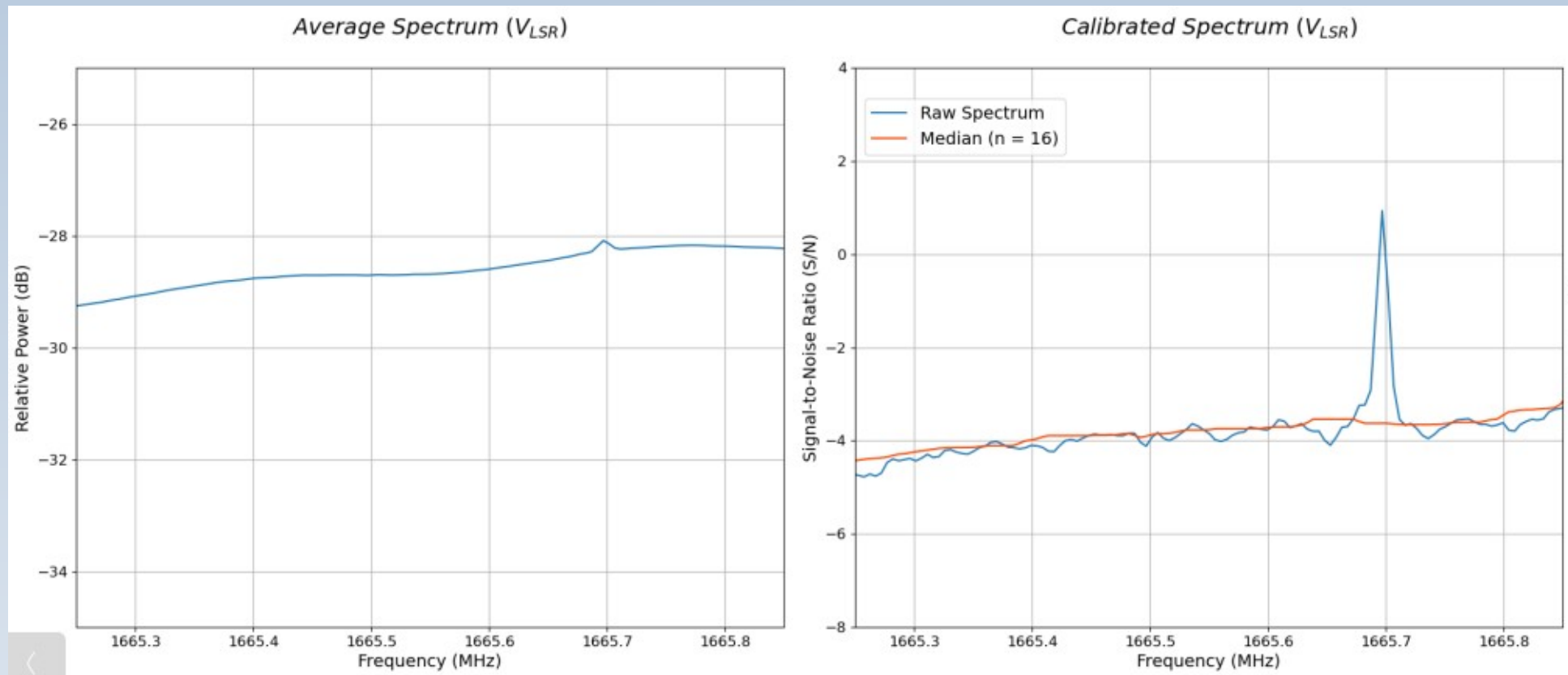


Diagram credit: Wolfgang Herrmann, SARA

*Strong infrared radiation is also present in HII star forming regions, such as W3, where OH masers may be found.*

# W3 (OH) Maser Observation 9/16/24



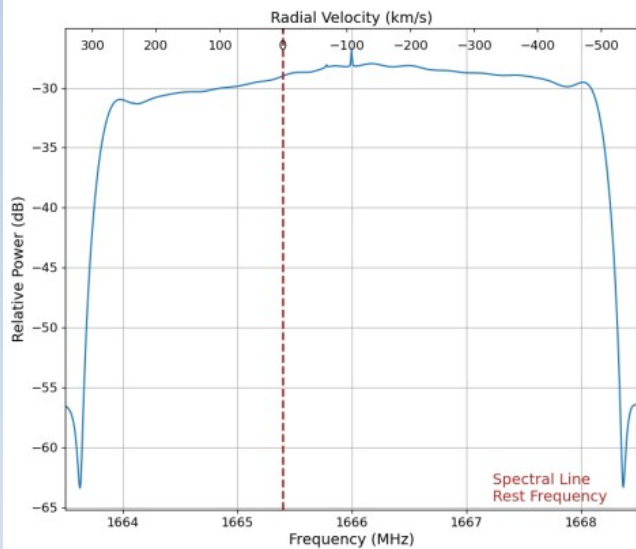
“Calibrated” means cold sky subtracted from source

cold\_1665\_W3\_20240916\_114643; hot\_1665\_W3\_20240916\_122320

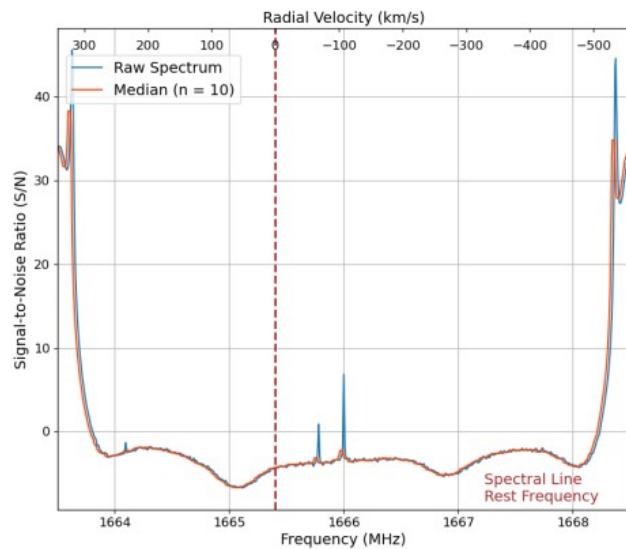
# Raw Results

DC offset at 1666.0 plus W3(OH) at 1665.7  
hot\_1665\_W3\_20240916\_122320

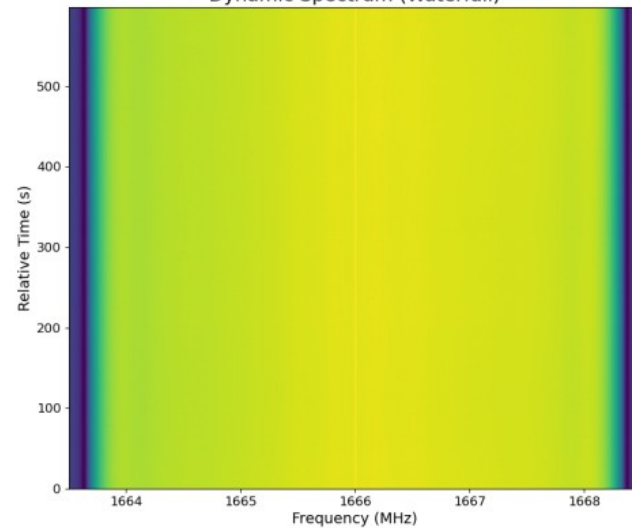
Average Spectrum



Calibrated Spectrum

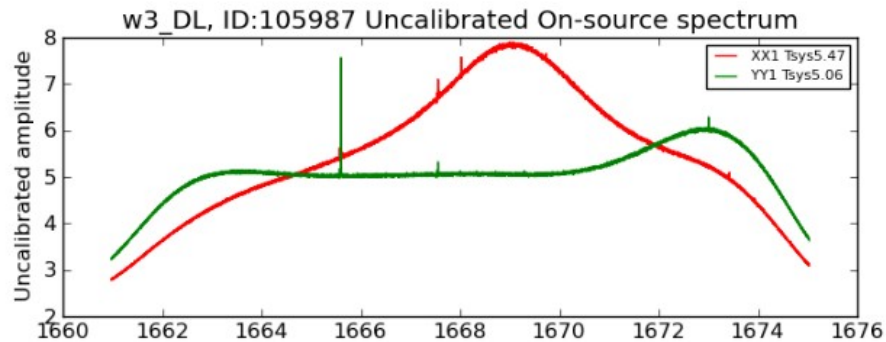


Dynamic Spectrum (Waterfall)

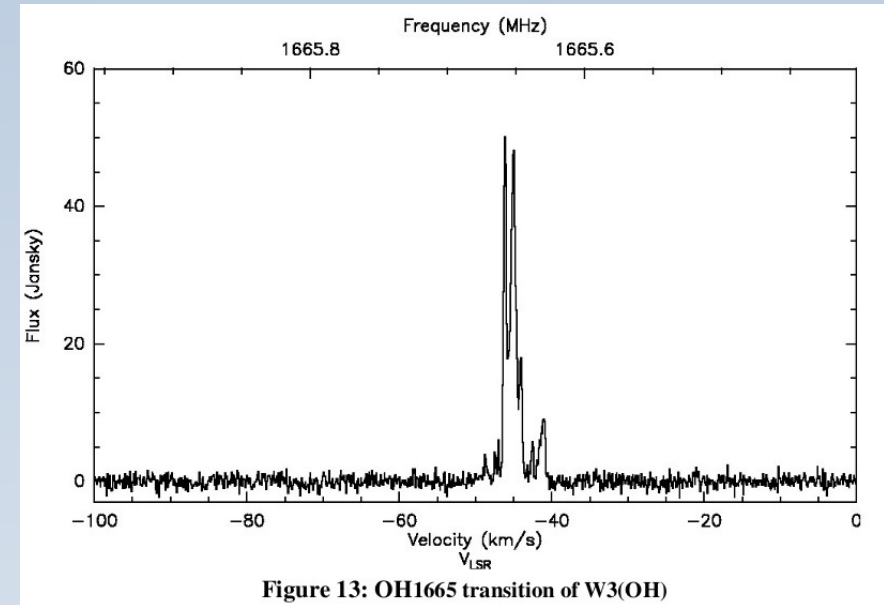


# Verification

GBO 20 m W3 peaks at 1665, 1667



Astropailer 25 m W3 1665



**HawkRAO VLSR Calculator:** <http://f4klo.ampr.org/vlsrKLO.php>  
Calculates the topocentric radial velocity of an observer in a given direction based on observer's latitude, longitude, and UTC time. Determines observational frequencies for cosmic spectral lines (HI, masers).

# OH Maser Future Plans

Maser	RA / DEC	Constellation	Dec. Viewing	Frequency
W3	2.45 / 61.87	Cassiopeia	Circumpolar	1612, 1665/67
W49	19.17 / 9.10	Aquila	9am - 4pm	1665, 1665/67, 1720
Vy Cma	7.38 / -25.77	Canis Major	10pm - 5am	1612, 1665/67
V669 Cass	1.56 / 62.45	Cassiopeia	Circumpolar	1612, 1667
Nml Cyg	20.77 / 40.12	Cygnus	8am - 10pm	1612
OH 026.5 + 0.6 IRAS 18348-0526	18.35 / -5.26	Scutum	8am - 5pm	1612