

OH 5 GHz Maser Emissions from an OH/IR Star and a Proto-Planetary Nebula

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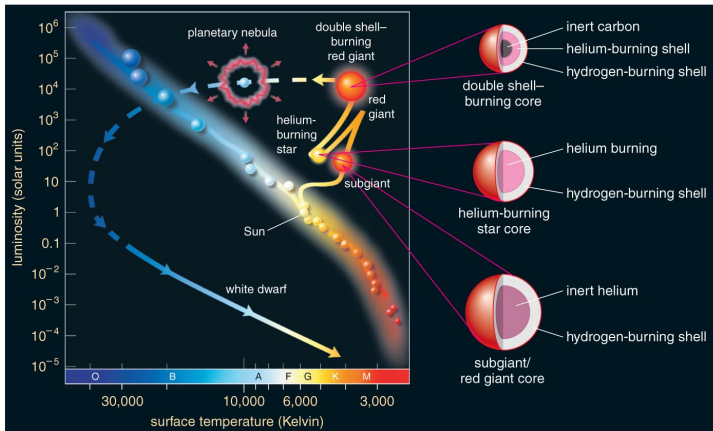
National Astronomy and Ionosphere Center

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OH/IR Stars

- An OH/IR star is an evolved late type star showing OH maser emission which is bright at near infrared wavelengths.
- Miras with short pulsation periods (about one year) and low mass loss rates produce weak masers in the 1667 MHz line
- Miras with a high mass loss rate and long pulsation periods (up to six years), the 1612 MHz hydroxyl masers becomes much stronger than the 1667 masers
- Known as OH/IR stars for their strong hydroxyl (OH) masers and strong infrared (IR) emission from the shell of warm gas.
- The intensity of the maser follows the changing brightness of the star as it pulsates.

OH/IR Star: Asymptotic giant branch star with dust-rich wind and 18 cm OH maser emission.



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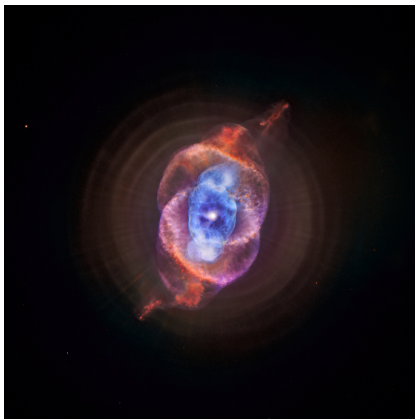


Proto-Planetary Nebula

- A protoplanetary nebula (PPN) a star with rapid stellar evolution
- Falls between the late asymptotic giant branch phase and the subsequent planetary nebula (PN) phase
- A PPN emits strongly in infrared radiation
- It is the second-from-the-last high-luminosity evolution phase in the life cycle of intermediate-mass stars (1-8 Solar masses)

Cat's Eye Nebula

Example of young planetary nebula with bipolar structure (optical/X-ray image)



Observations with Arecibo

- OH/IR star (IRAS 16260+3454) in 18 cm (on, L-band) and 5 GHz (on, C-band)
- Descriptive Statistics
- Calibration source (B1622+23) for 5 GHz (position switching)
- PPN (IRAS 18095+2704) in 18 cm (on) and 5 GHz (position switching, three 5 minute integrations)

Radio Telescope, Arecibo, PR



Reduction Process

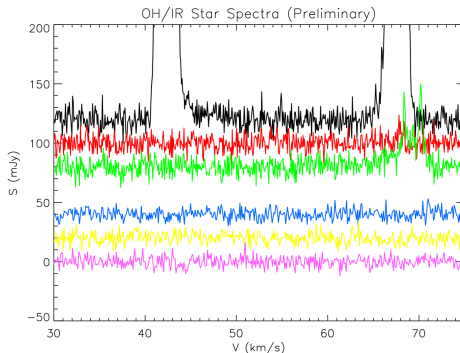
- Calibrating the 5 GHz scale to mJy for each of the three lines and each of their polarizations
- Position switching
 - Difference the on and off spectra
 - Apply noise diode calibration
 - Average the two linear polarizations
- Formed weighted average of the three integrations for each line
- Removed polynomial baseline of order 2
- Plotted intensity vs. velocity

Results: OH/IR Star

■ Lines Plotted

- 1612.2 MHz
- 1665.4 MHz
- 1667.4 MHz
- 4660.2 MHz
- 4750.7 MHz
- 4765.6 MHz

- (Note: Scans displaced vertically by 20 mJy for display)



Results: Proto-Planetary Nebula

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