

Radio Astronomy & Signal Interpretation

You are part of a team that detected an unusual periodic radio signal from space. The signal has these characteristics:

- Frequency: 1420.4 MHz (hydrogen line)
- Period: Exactly 24 hours
- Intensity varies in a complex pattern
- Source appears to be 50 light-years away

To do:

1. Analyze what this signal could realistically be (provide 3-4 plausible explanations)
2. Design a systematic approach to determine which explanation is correct
3. Explain why the 1420.4 MHz frequency is significant and what it tells us
4. Discuss what additional observations you would need and which telescopes/instruments would be most suitable