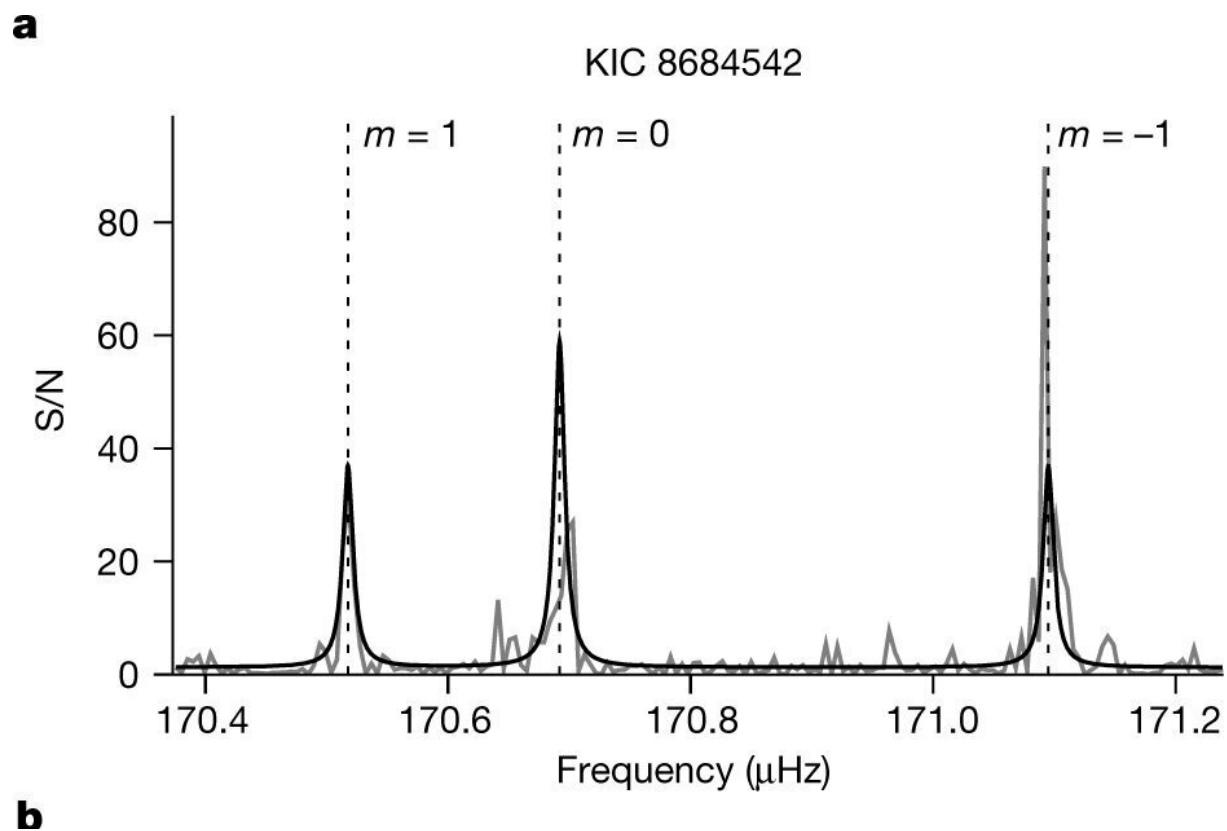


# Measuring oscillations of light from red giant stars reveals strengths of their interior magnetic fields

October 11 2022, by Bob Yirka



Asymmetric splittings of two mixed modes in KIC 8684542. a, Gravity-dominated mixed mode. b, Pressure-dominated mixed mode. The grey lines show the observed power spectrum in terms of signal-to-noise ratio (S/N) and the black lines show the best-fitting model spectrum. The vertical dotted lines mark the locations of the frequencies. It is noted that the x axis is re-scaled to align the  $m = \pm 1$  modes. Credit: *Nature* (2022). DOI:

10.1038/s41586-022-05176-0

A quartet of researchers at IRAP, Université de Toulouse, has found a way to measure the interior magnetic field of red giant stars. In their paper published in the journal *Nature*, Gang Li, Sébastien Deheuvels, Jérôme Ballot and François Lignières describe how they used data from the Kepler satellite to calculate the interior magnetic field strength for red giants. Lisa Bugnet, with the Flatiron Institute, in New York has published a News & Views piece in the same journal issue outlining the difficulties in measuring magnetism in stars and the work done by the team in France.

Red giants are stars that have exhausted their inner hydrogen core leaving behind a helium center with a burning outer hydrogen shell. Such stars are studied by noting the makeup of the light they emit along with periodic dimming and brightening. In this new effort, the researchers wondered if it might be possible to use such a small amount of data to calculate the inner magnetic field of such stars.

The researchers began their work by noting that prior researchers have shown that most red giants vibrate and that such vibrations are likely due to a strong magnetic field inside of them, which is reflected in oscillations in the light that is emitted. Study of such oscillations is known as asteroseismology, and it involves trying to make sense of the frequencies, lifetimes, amplitudes and modes of the oscillations.

Analysis of the oscillations is based on the assumption that most, if not all, of the dynamic processes that go on inside of a star are reflected in their properties. Prior research has also shown that the modes of [oscillation](#) are dominated by gravity in the middle parts of the star and that pressure dominates oscillations in the outer parts. Thus, shifts in

modal frequencies can offer clues about the degree of magnetism inside of the star.

In their work, the researchers used data from Kepler to measure modal frequencies in the oscillations of different [red giants](#) to indirectly measure the strength of their internal magnetism—they found amplitudes of 30 to 100 kG. Measurements, the researchers note, that were consistent with what had been theorized.

**More information:** Gang Li et al, Magnetic fields of 30 to 100 kG in the cores of red giant stars, *Nature* (2022). [DOI: 10.1038/s41586-022-05176-0](#)

Lisa Bugnet, Vibrations probe magnetic fields inside evolved stars, *Nature* (2022). [DOI: 10.1038/d41586-022-02979-z](#)

© 2022 Science X Network

Citation: Measuring oscillations of light from red giant stars reveals strengths of their interior magnetic fields (2022, October 11) retrieved 20 June 2024 from <https://phys.org/news/2022-10-oscillations-red-giant-stars-reveals.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.