

# Exercise: Galileo magnetic field

data set from Galileo magnetometer  
(synthesized)

file: gll\_data.sav, contains:

- total magnetic field
- radial distance
- time in seconds

## your tasks:

- Which ions are present?
- Is the time resolution of the magnetometer sufficient to detect electrons or protons?

Tips:

- restore, 'gll\_data.sav'
- use IDL-FFT
- remember basic plasma physics formula for the ion cyclotron wave:

$$\omega_{gyro} = \frac{qB}{m}, \quad f_{gyro} = \frac{\omega_{gyro}}{2\pi}$$

Background:

If the density of ions is high enough they will excite ion cyclotron waves during gyration around the magnetic field lines. This gyration frequency only depends on mass per charge and on the magnitude of the magnetic field.

In a low-beta plasma the magnetic field dominates over plasma effects. The magnetic field shows only very little influence from the plasma and can be considered as a magnetic dipole.

<http://www.sciencemag.org/cgi/content/full/274/5286/396>