Introduction to Incoherent Scatter Radar: Part 4 - Plasma Lines

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And my advisor: William E. Gordon

Incoherent Scatter Radar

- Radar
- Scatter
- Incoherent –
  Plasma Line

Collective behavior

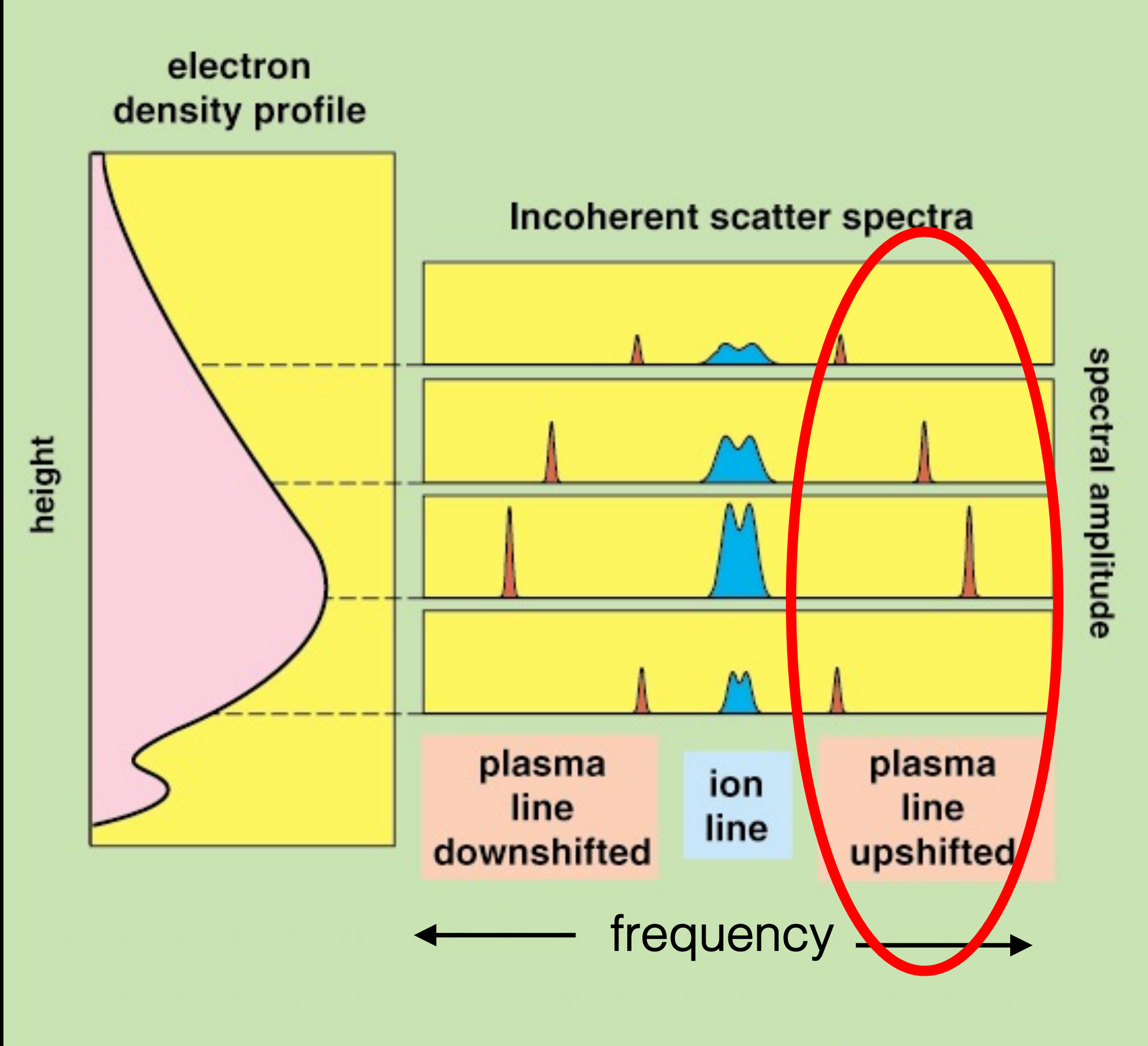
- There are a number of wave modes existing inherently in the ionospheric plasma

Ion acoustic waves

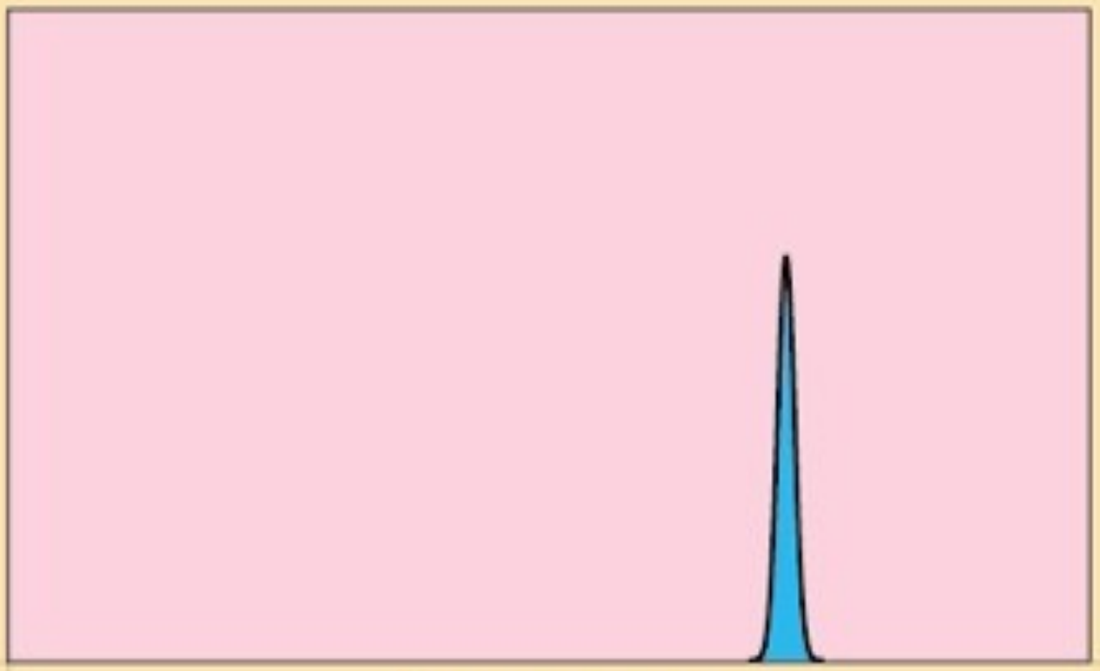
→ *Langmuir waves (plasma frequency)*

Debye Spheres (Debye length)

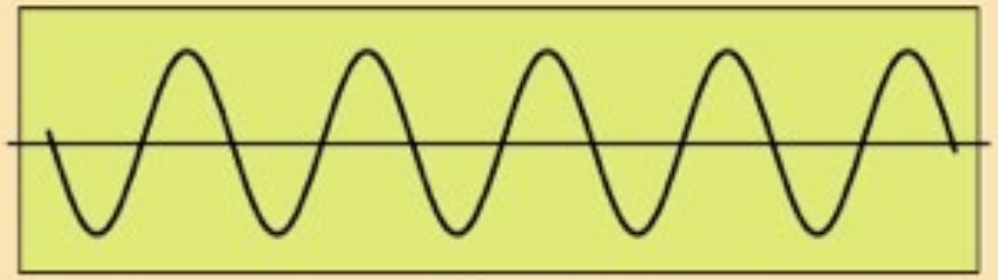
Landau Damping ……


electron
density profile
Incoherent scatter spectra
height
spectral amplitude
plasma
line
downshifted
ion
line
plasma
line
upshifted
frequency

time



frequency



time

frequency

Incoherent scattering: the short story

Plasma Frequency ~

$$\omega_p^2 = \frac{n_0 e^2}{m\epsilon_0}$$

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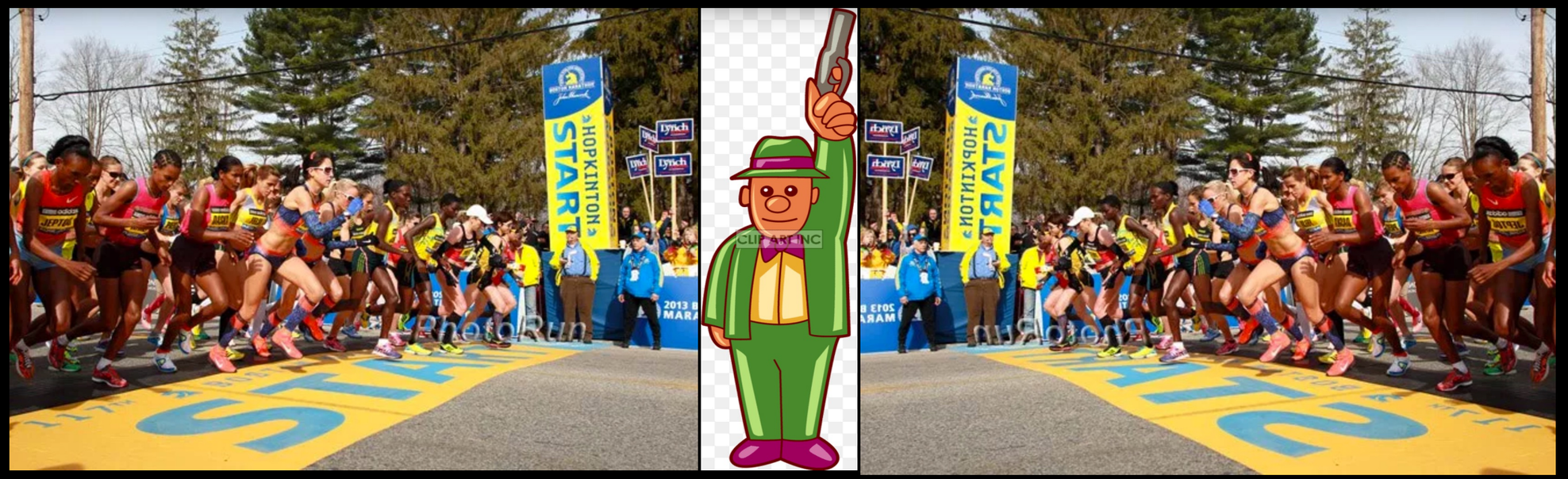
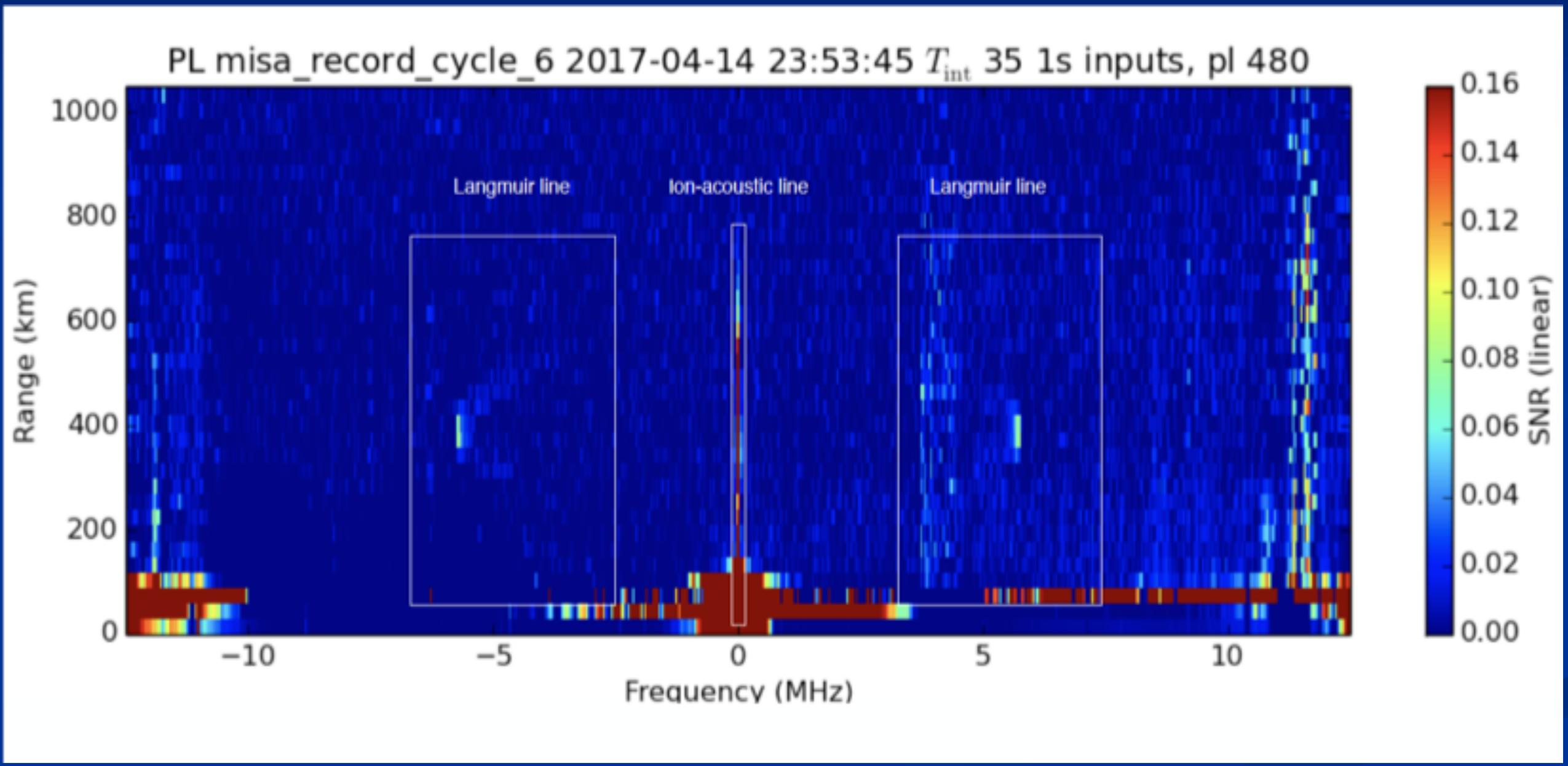
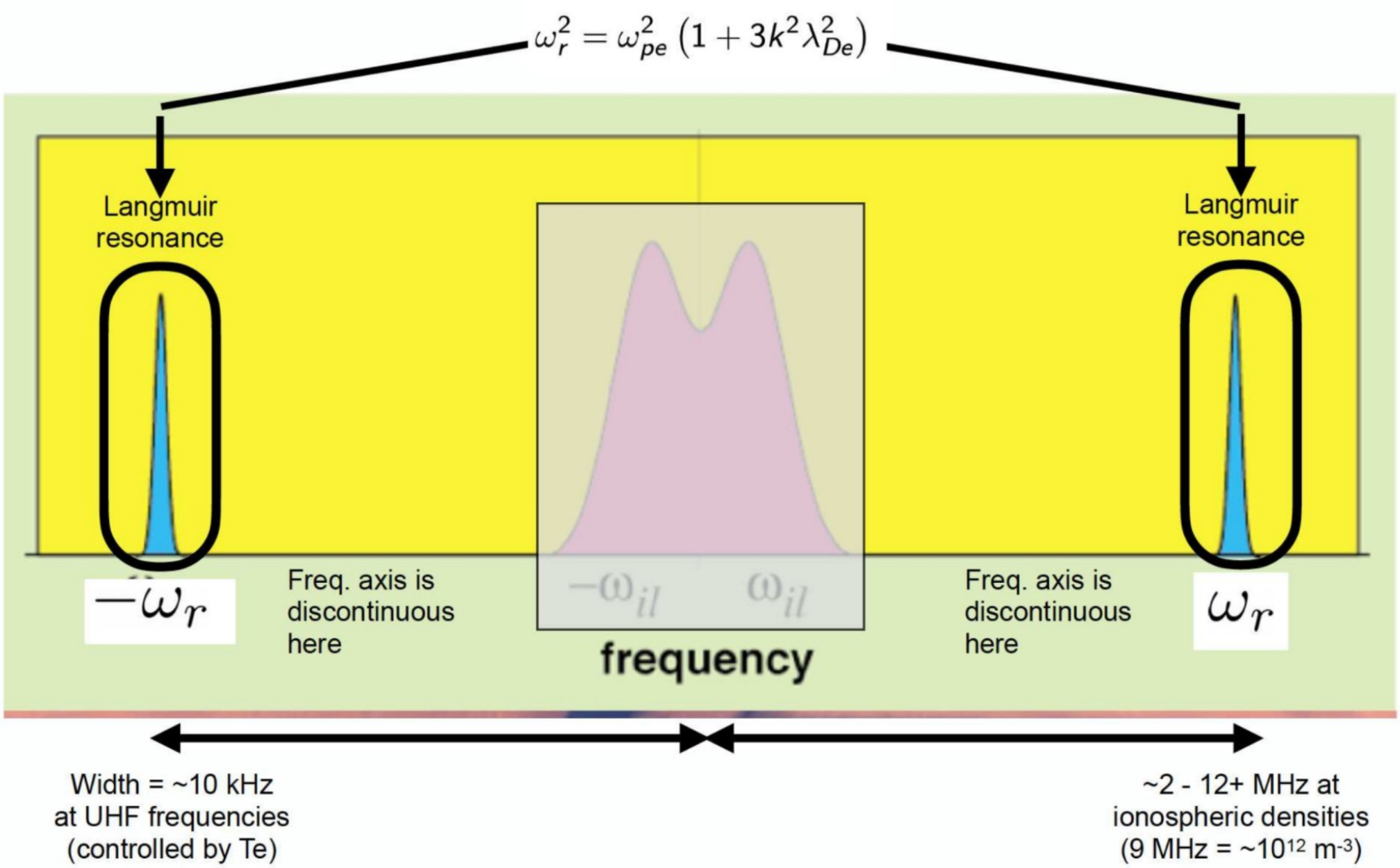


The electron gas oscillates at a natural plasma oscillation frequency

Langmuir (or plasma) waves



IS Spectrum: Plasma Line