Density fluctuations in the solar corona;

effects on

radio emission

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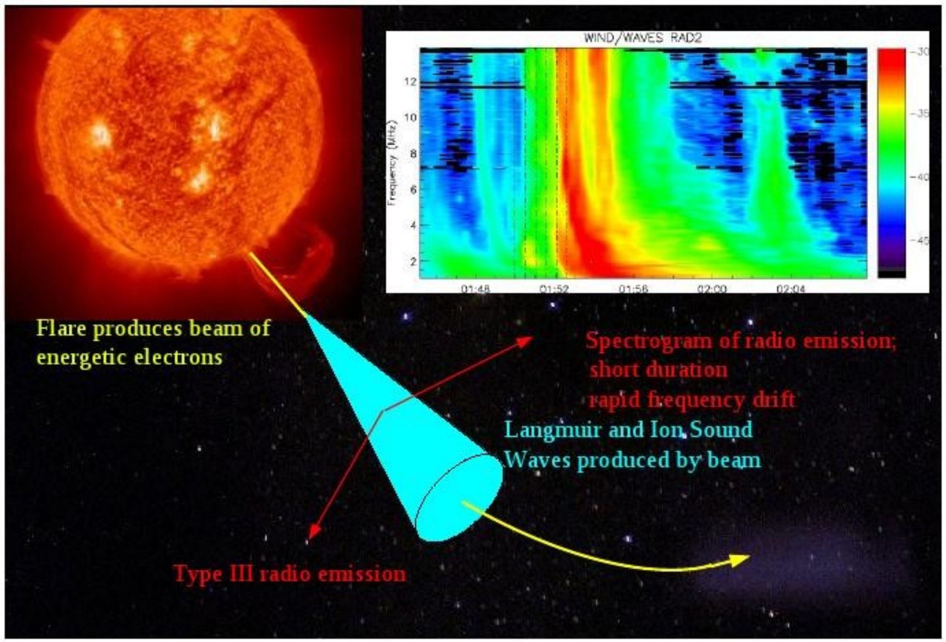
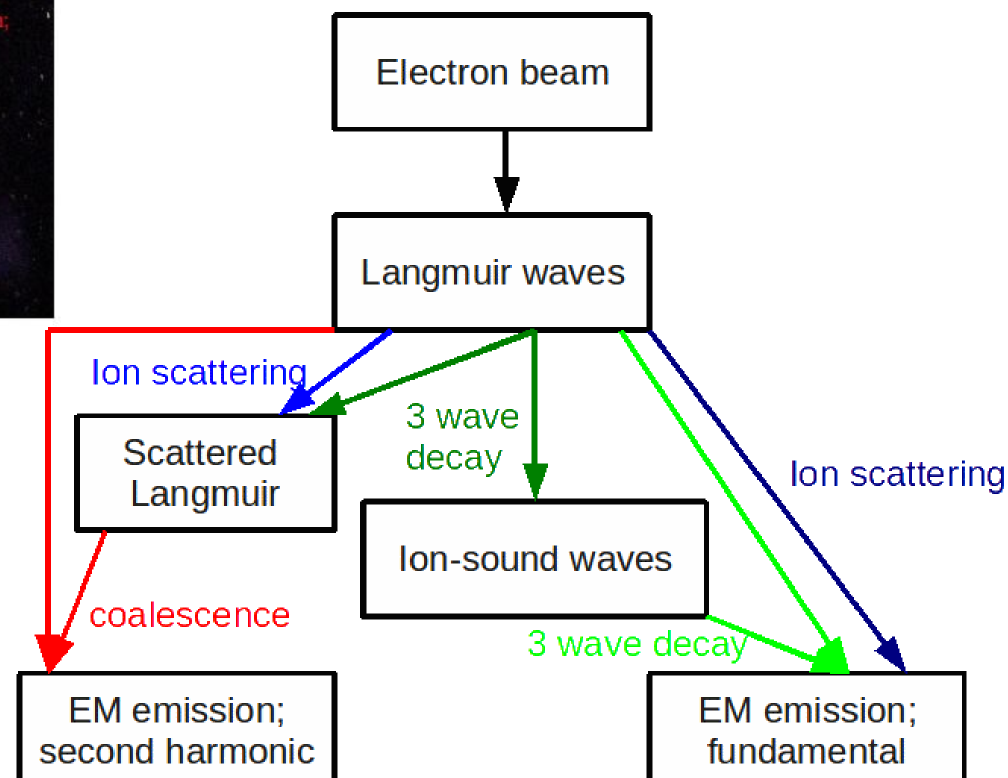
Radio Emission Mechanism



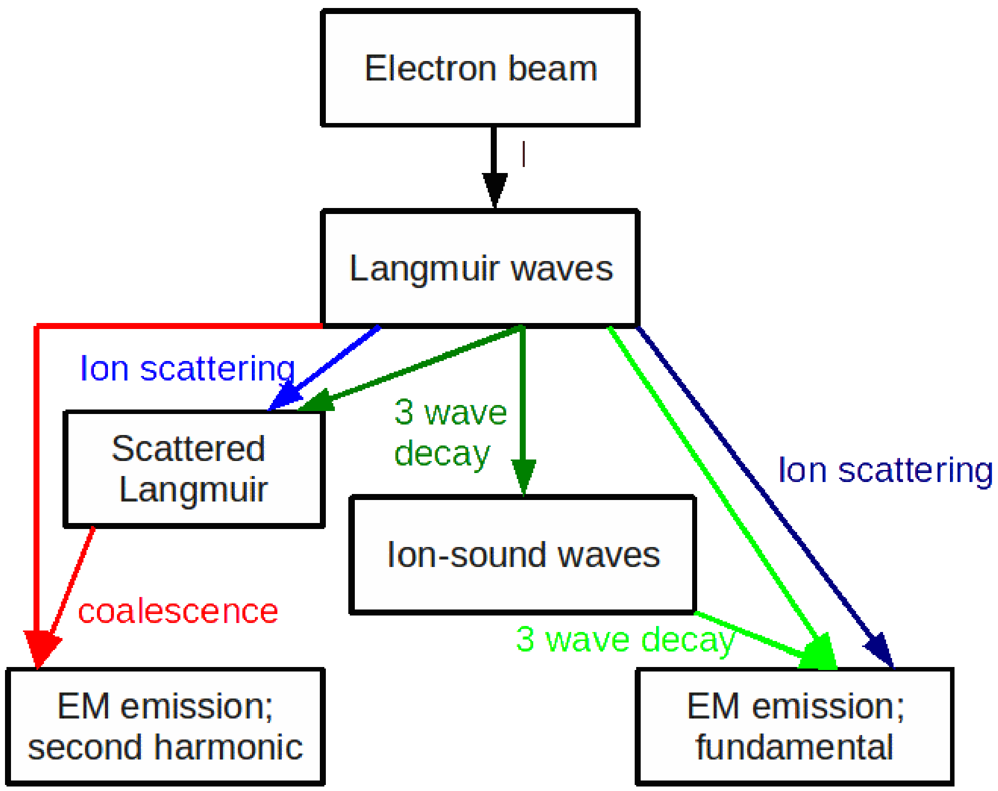


Harmonic Emission

Emission at 2nd harmonic comes from Langmuir wave coalescence, so we need backwards propagating Langmuir waves.

Ion scattering, 3 wave decays and diffusion may all contribute to backwards Langmuir spectrum.

Emission is absorbed and scattered as it propagates, but not as strongly as fundamental emission.



Density Pertubations

- Density gradients in plasma act on the Langmuir waves

- A constant, positive gradient, shifts waves to lower wavenumbers

- Constant, negative gradient, shifts waves to higher wavenumbers

- Fluctuating density shifts waves alternately up and down in wavenumber

- Random fluctuations can also be described as diffusion

1D approximation

Langmuir and ion-sound waves tend to be strongly confined to the beam direction (or counter to it); 1D approximation in code

EM emission is not; in fact it is strongest perpendicular

For fundamental emission, the EM wave has little momentum; Langmuir and sound wave coalesce almost head-on

For harmonic emission, the EM wave has significant momentum; use a variation of head-on approximation, attempting to account for this

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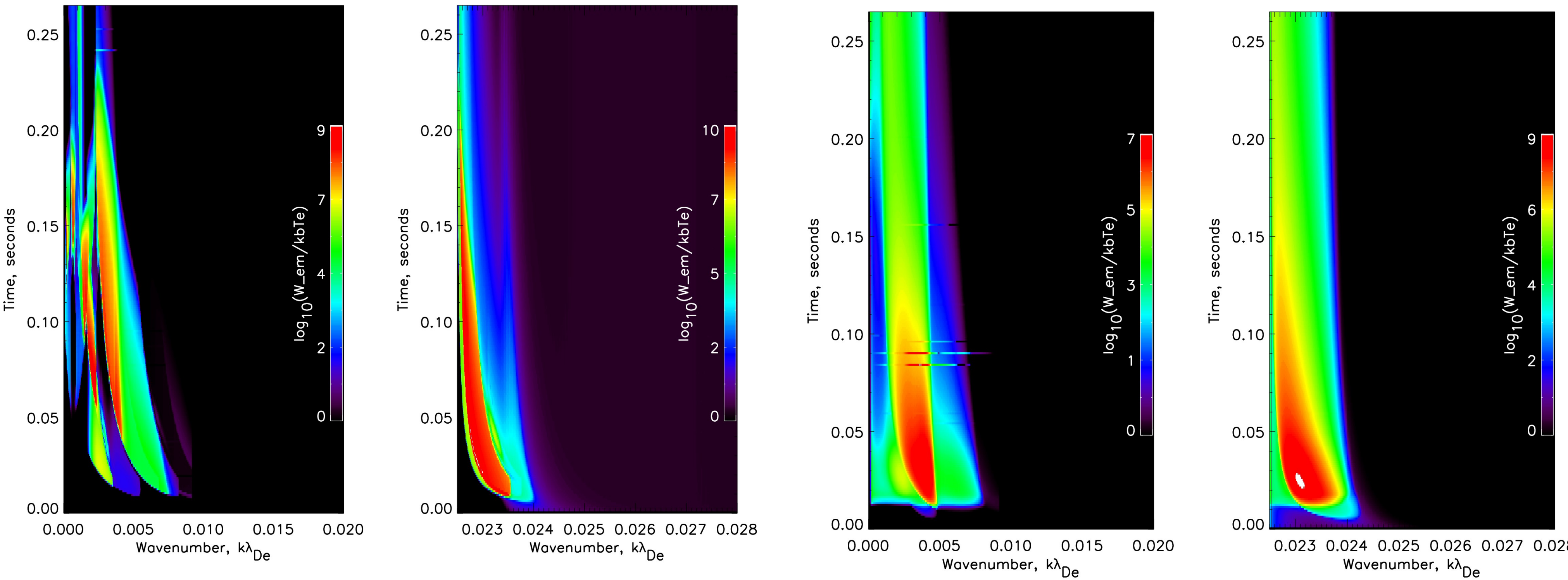
Ion-sound wave scattering

Fundamental and harmonic EM radiation as a function of wavenumber
Left; constant density. Right; including density fluctuations.



Spreading of Langmuir waves by fluctuations gives lower maximum intensity but broader longer duration emission.

End

Thanks for your attention!

Fundamental Emission

Ion scattering is quite inefficient, so we need ion-sound waves to get fundamental emission.

Ion-sound waves are rapidly damped, so we need rapid production.

Fundamental emission is strongly absorbed by the plasma, so little is observed.