LOIS - High-Performance Computing for a Distributed Space Probing Sensor Network

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Science

- IRF (Swedish Institute of Space Physics)
- LOIS Space Centre
- Växjö University
- Uppsala DataBase Labaratory

Companies

- Videum Science Park, Växjö
- AerotechTelub AB, Växjö
- IBM

Outline

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Specialisation

Specialised people
for special tasks

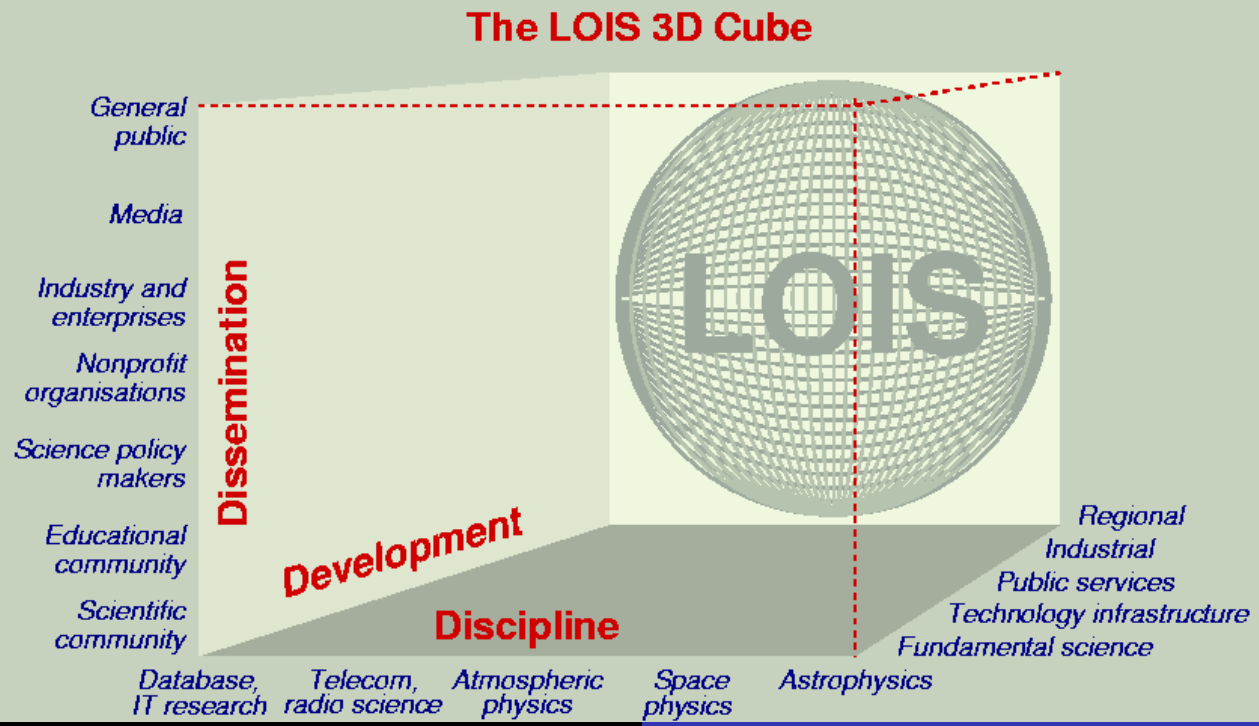
Dynamic

Continuous
development

Outline

3D LOIS Cube

Broad range of research Disciplines, extended Development sectors, and wide Dissemination of results



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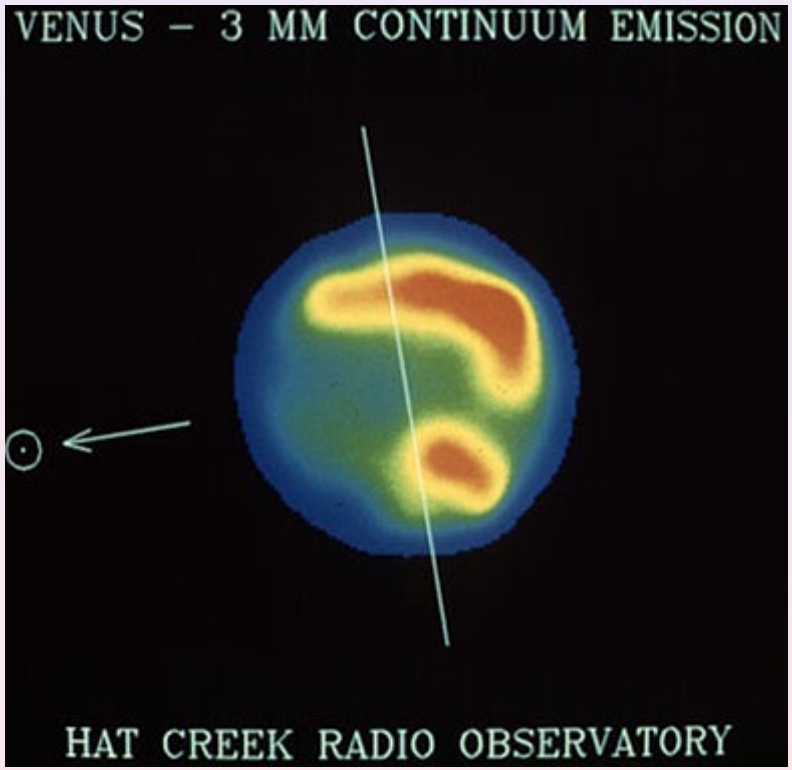
Space physics

- Passive mapping
- Active mapping
- Dynamical system
  Active and passive



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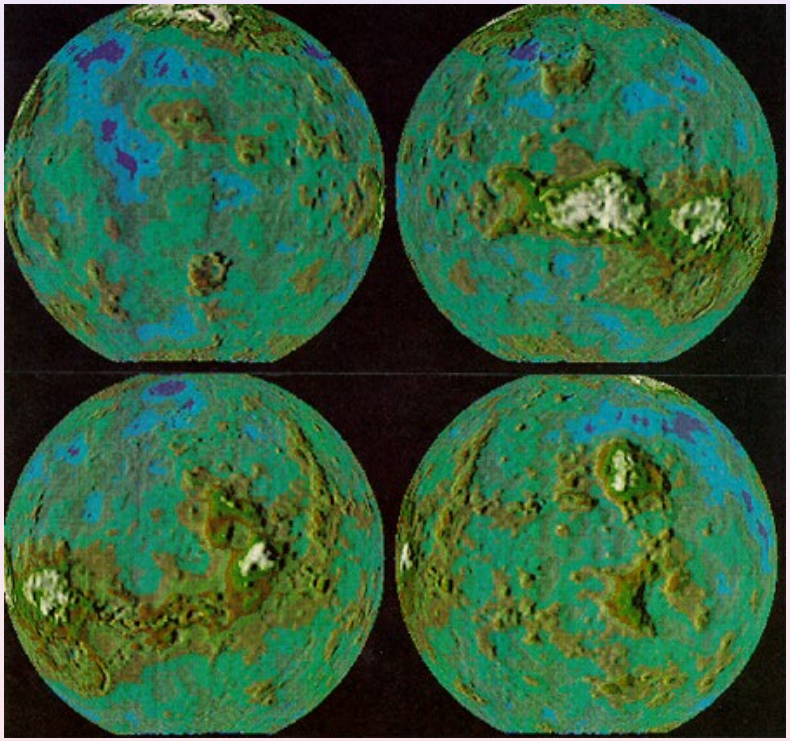

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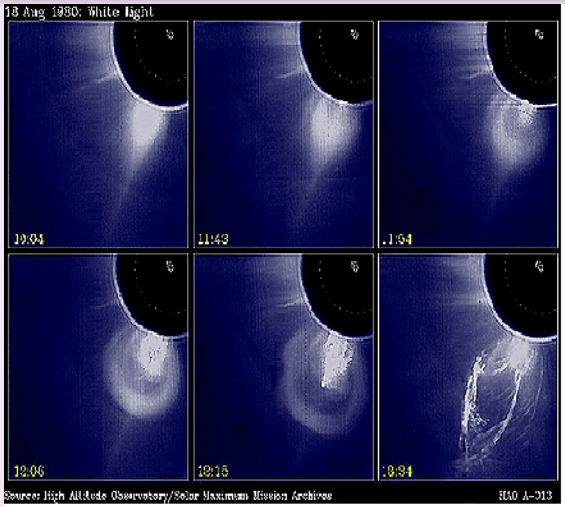
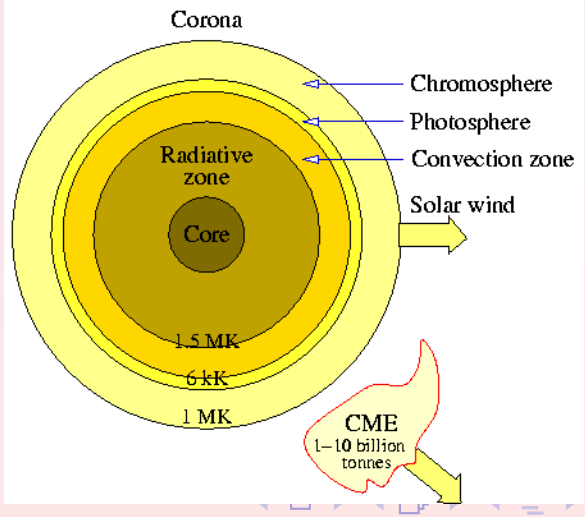
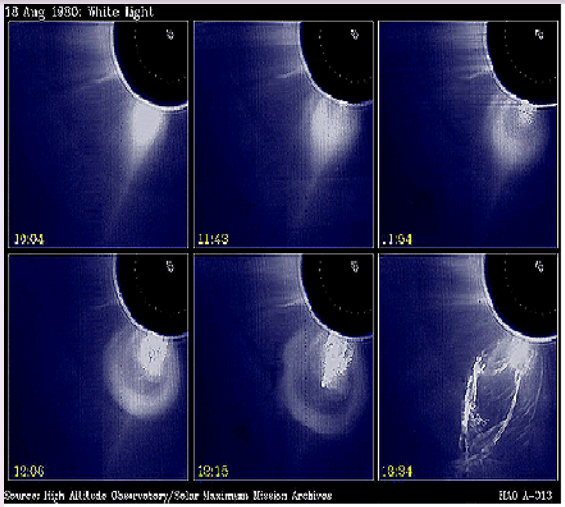
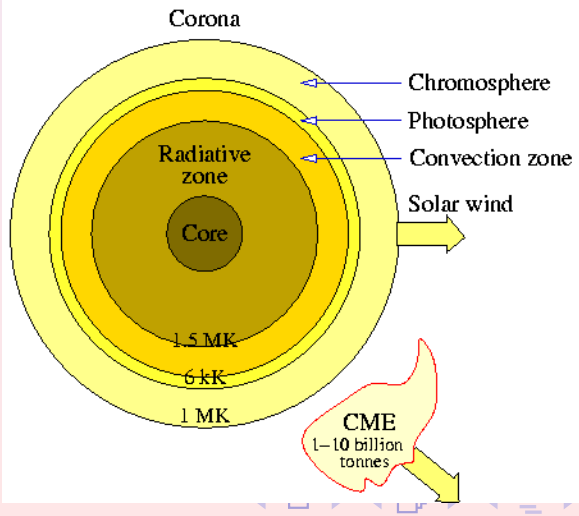




Astronomy

- Interstellar
- Intergalactic





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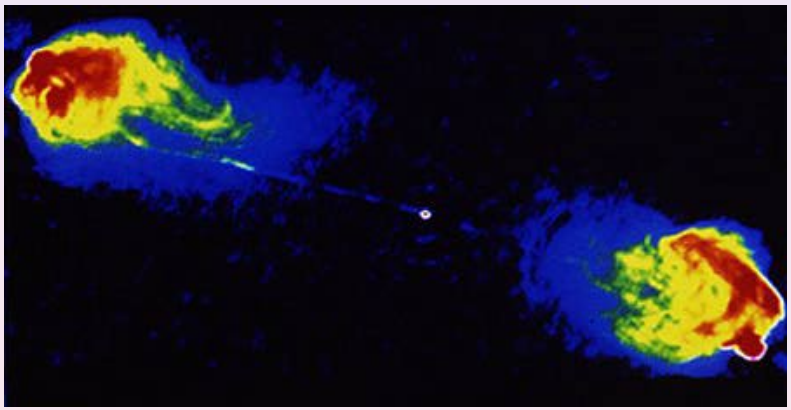

Outline

The Past

- Specialised equipment
- Storage and transport
- Static/mechanical solutions

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Tomorrow

- Using off the shelf equipment
- Smarter sensors
- Software instead of hardware upgrades

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Challenges

- Receiving Signals
- Transmitting signals
- Comparing signals

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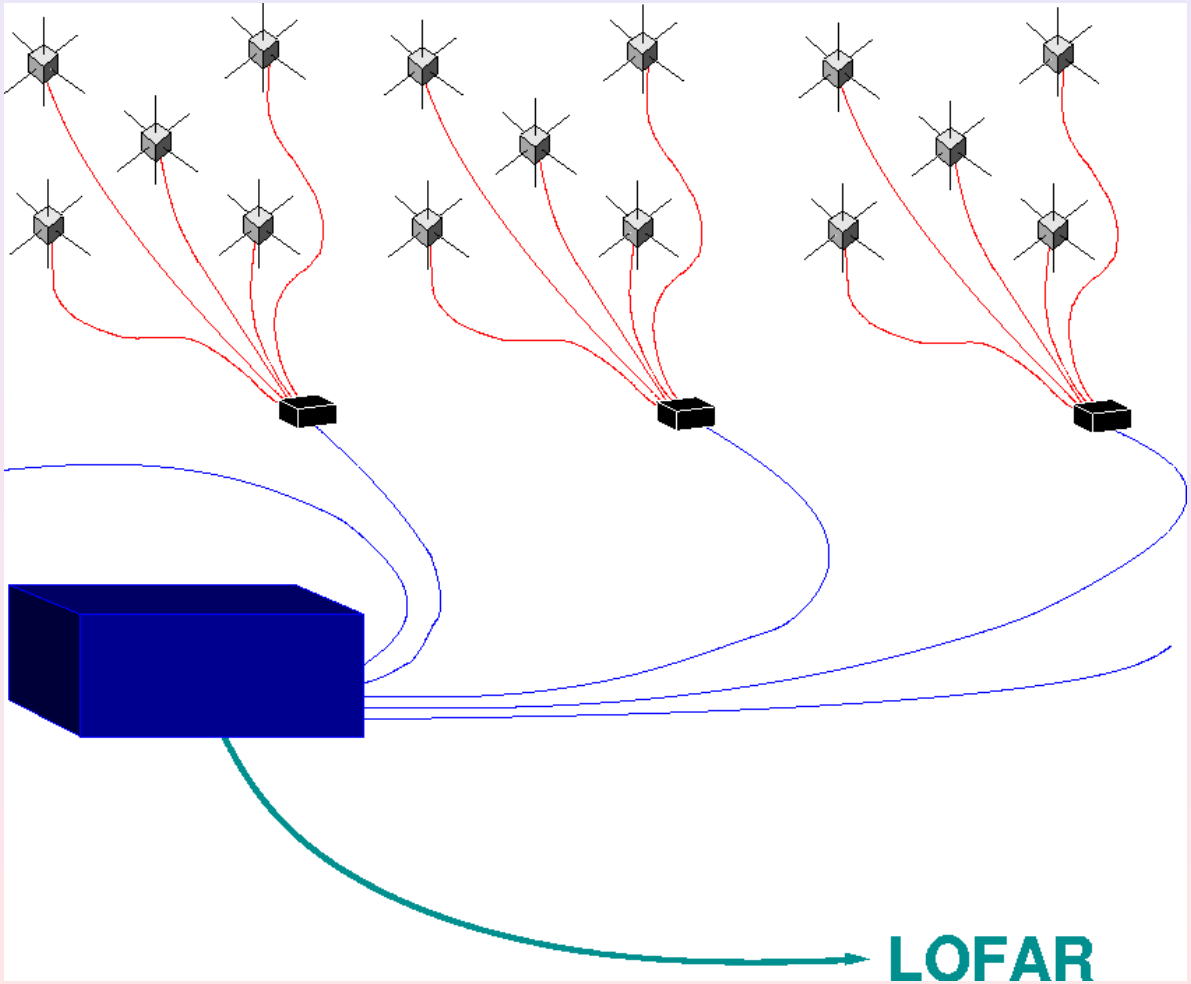
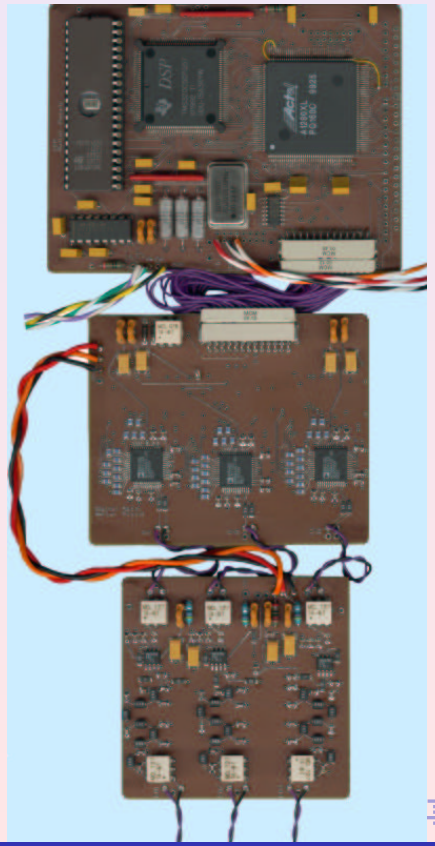

LOFAR

Data

- Each antenna node gives 1Gb/s (6Gb/s)
- Ca. 10 000 nodes grouped in sub grids
- Sub grid distributed over the whole of southern Sweden



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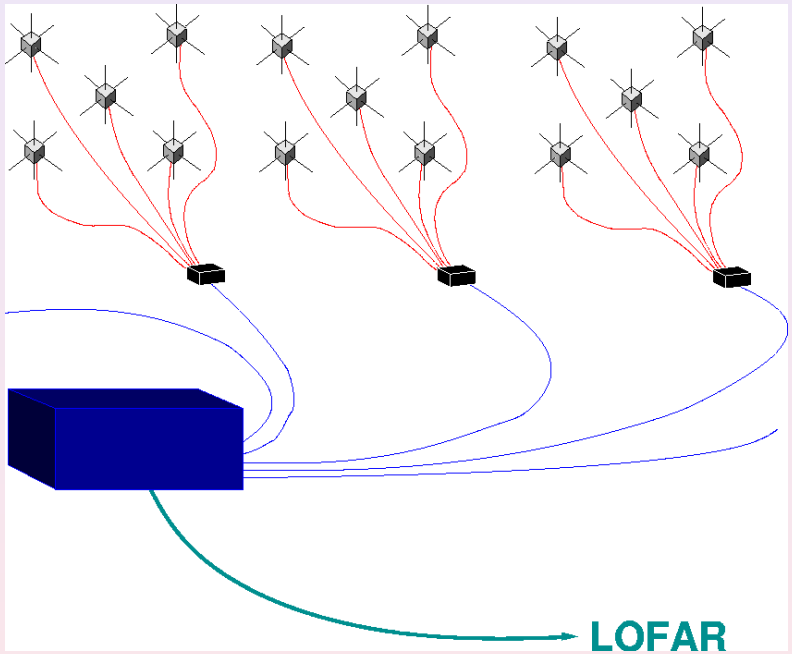
- Realtime and post processing of data
- Recalibration and compensation of changing environment
- Multiple simultaneous experiments



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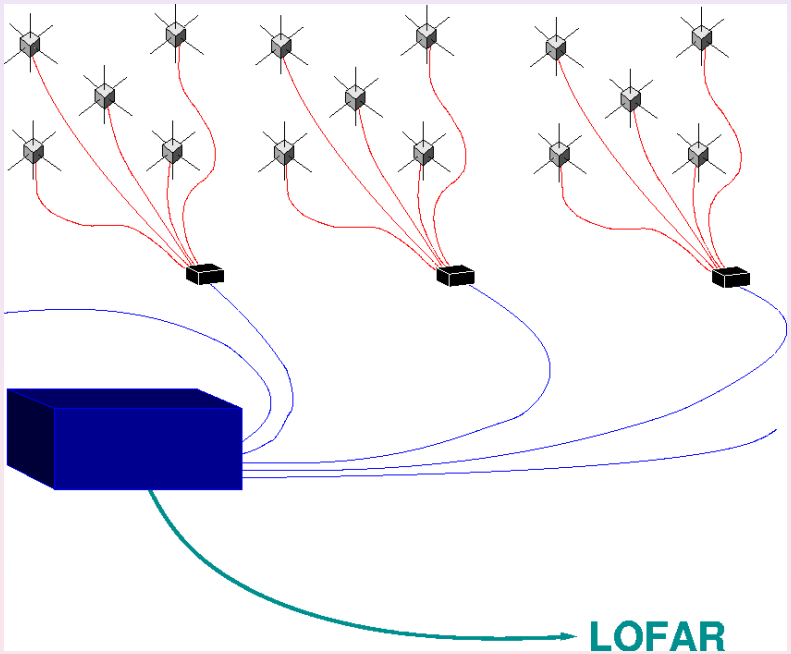

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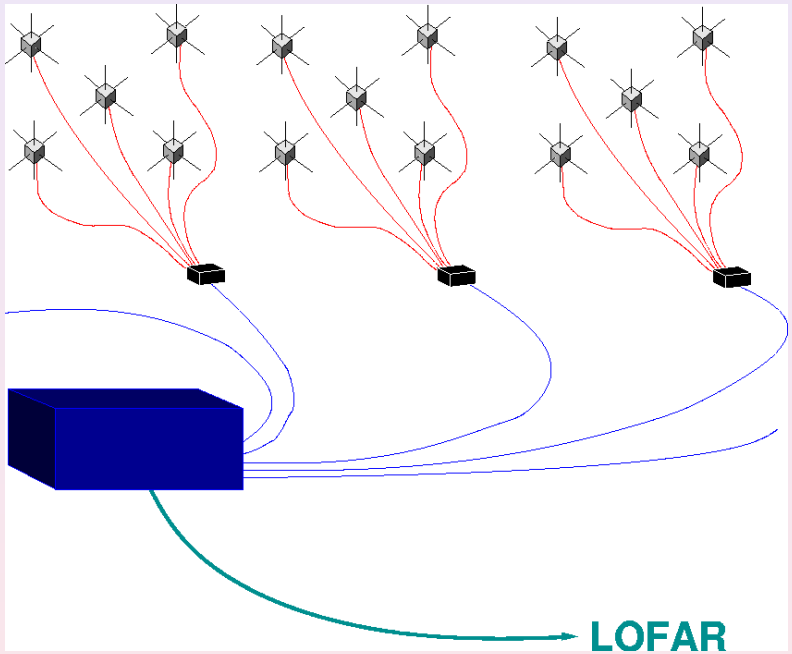

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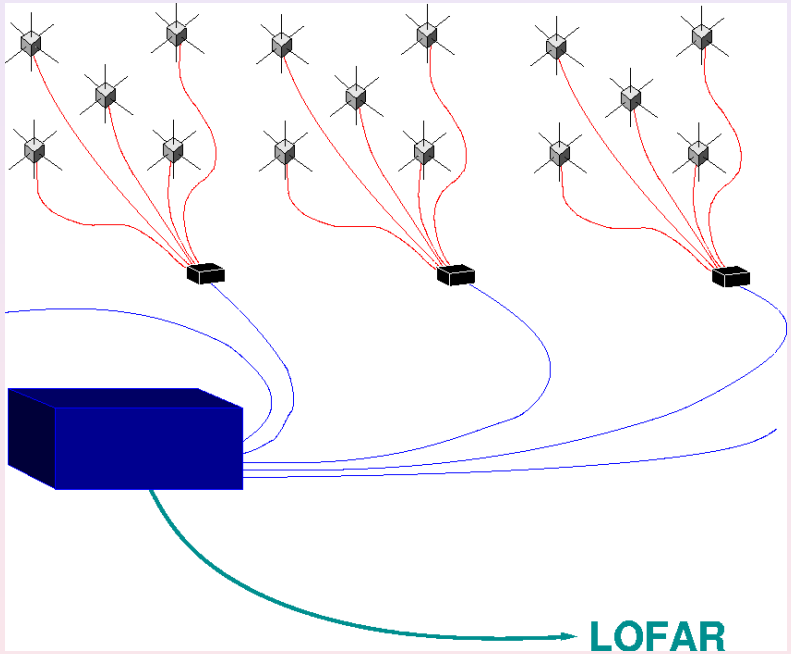
Transmitting

- High number of possible transmitting modes and combinations
- By using receiving and transmitting sub arrays we can correct the transmitting signal in real time.



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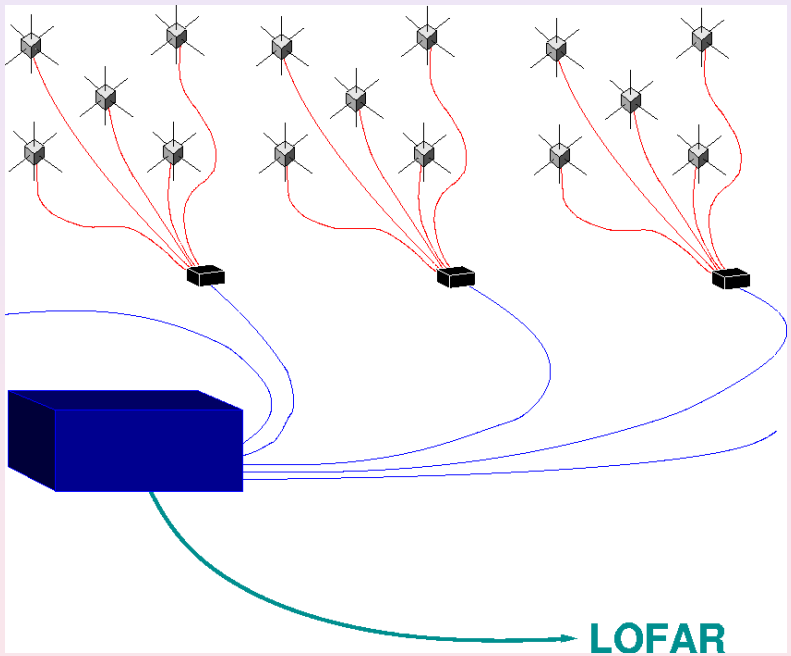

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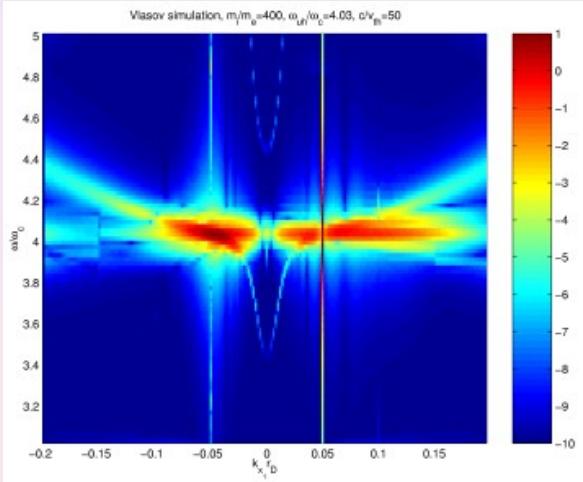
Comparing

- Analytical results
- Simulations



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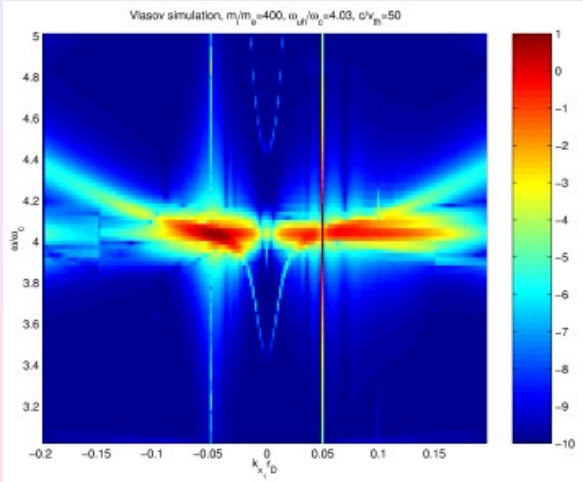
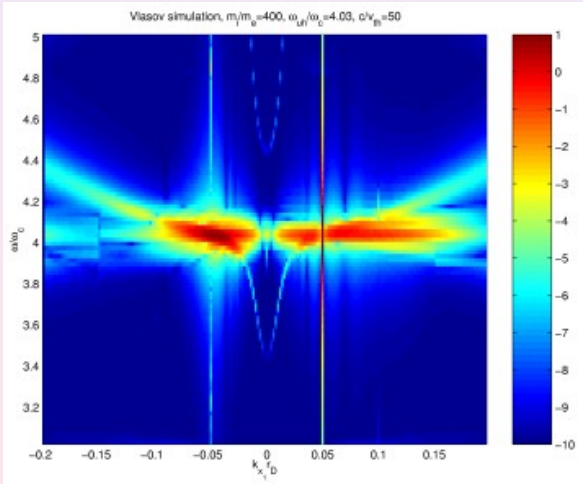


Kinetic simulations

$$\frac{\partial f_\alpha}{\partial t} + v \cdot \nabla f_\alpha + \frac{q_\alpha}{m_\alpha}(E + v \times B) \cdot \nabla_v f_\alpha = 0$$

$$\begin{aligned} \nabla \cdot E &= \frac{\rho}{\epsilon_0} \\ \nabla \cdot B &= 0 \\ \nabla \times E &= -\frac{\partial B}{\partial t} \\ \nabla \times B &= \mu_0 j + \frac{1}{c^2}\frac{\partial E}{\partial t} \end{aligned}$$



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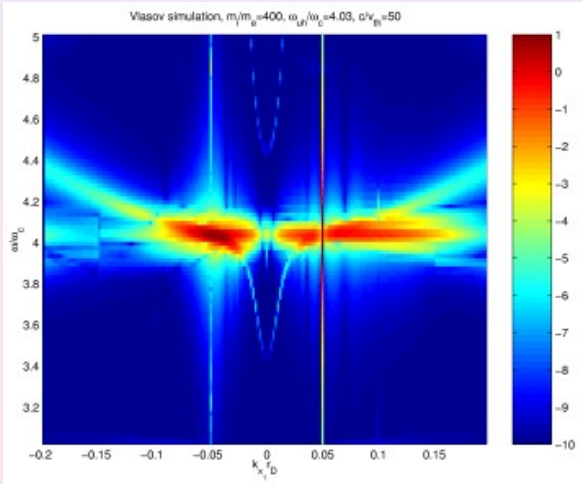

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