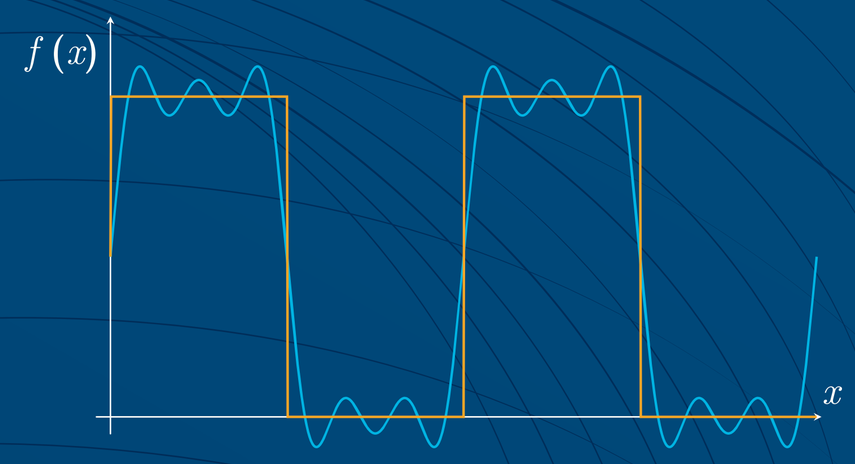
Exciting Antennas

Motivation

- Response of any linear system can be decomposed into a set of natural states.
- These states allow for analyzing different excitations.



In the case of signal analysis, we can express arbitrary periodic signals with Fourier series.

$$f(x) \simeq a_0 + \sum_{n=1}^{N} a_n \cos(nkx) + \sum_{n=1}^{N} b_n \sin(nkx)$$

EIGENDECOMPOSITION

- If the system is described by a matrix, its eigenstates are obtained from eigenvalue decomposition.

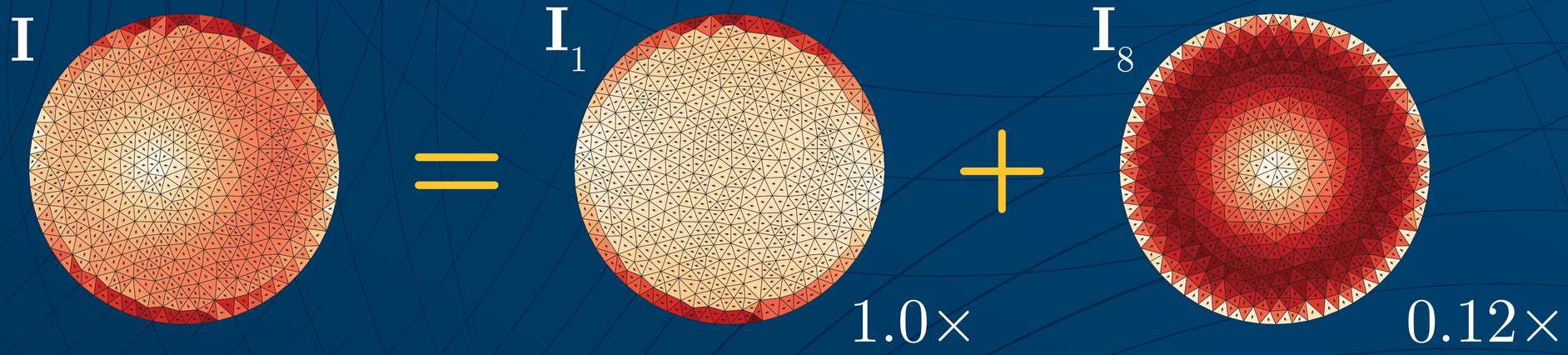
$$\mathbf{A}\,\mathbf{x}_n = \lambda_n \mathbf{x}_n$$

Characteristic modes ...

- ... diagonalize the system matrix and provide orthogonal far fields.
- ... are useful for designing small and MIMO antennas.

$$\mathbf{I} \simeq \sum_{n=1}^{N} \alpha_n \mathbf{I}_n$$

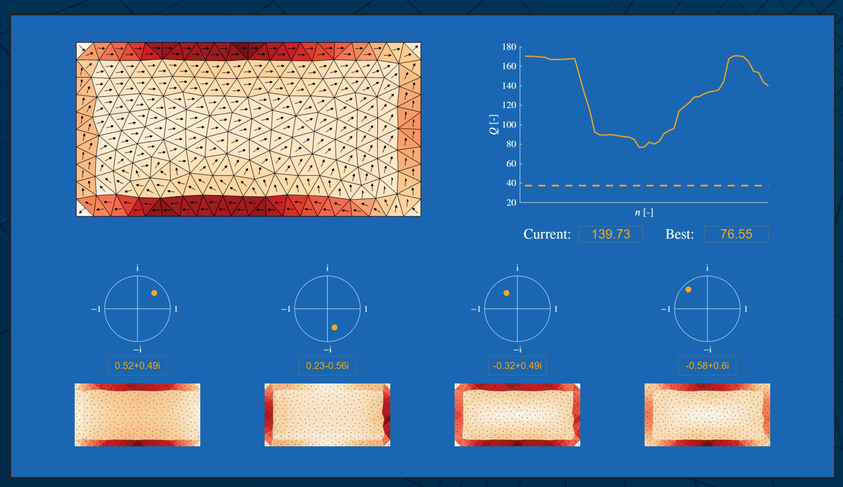
$$\mathbf{X}\mathbf{I}_n = \lambda_n \mathbf{R}\mathbf{I}_n$$



Would you like to know more?

Challenge

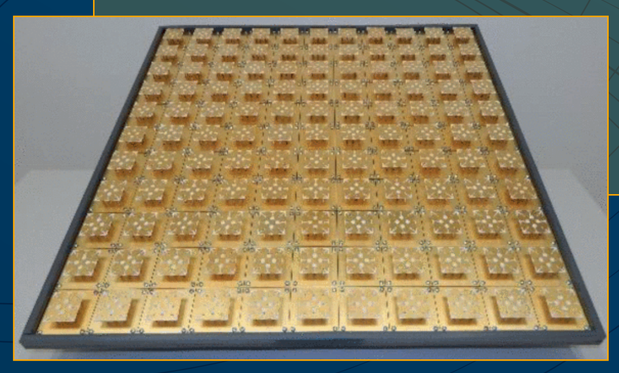
- Find excitations to get the lowest Q factor.



Interactive MATLAB antenna designer powered by AToM.

Did you know?

Characteristic modes were used to manufacture MIMO antenna with 484 ports.



More...

- CEM Group | cem.elmag.org
- Other topics: EM theory, fundamental bounds, synthesis

EMiT Electromagnetic Tuesday

ELMAG.ORG

CTU CZECH TECHNICAL UNIVERSITY IN PRAGUE