Software-Defined Radio Direction of Arrival Analysis

**Project:** A portable system that finds and displays direction of arrival (DOA) data.

**The Source Location Problem:** Can we locate an electromagnetic (EM) source using an array of antennas?

Where $R$ is a covariance matrix of our samples, and $w$ is a steering vector:

$$\max w^H R w$$

$$\text{s.t. } w^H w = 1$$

This results in the following steps for finding the DoA:
1. Calculate covariance matrix
2. Find maximum eigenvalue
3. Return the argument of the eigenvector

**Calibration Method**
- Coherent receivers were used to eliminate frequency offsets.
- Cross correlation is used to correct for initialization time delays.
- Broadside calibration is used to resolve initial phase offsets.

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