Visibility matrix eigenvectors

R. Ansari - April 2019

Sky source

$$I_s(\nu) = |E_s(\nu)|^2 = E_s^*(\nu)E_s(\nu)$$

Feed gain

$$G_i(\nu) = g_i(\nu)\exp(i\varphi_i(\nu))$$

Visibilities

$$
\begin{aligned}
\mathcal{V}_{ij} &= D_i^*(\vec{\omega}_s)\,D_j(\vec{\omega}_s)\exp\left(i\mathbf{k}_s(\vec{r_j}-\vec{r_i})\right)G_i^*G_j\,I_s + \langle n_i^*n_j\rangle \\
\mathcal{V}_{ij} &= \left(D_i(\vec{\omega}_s)e^{i\mathbf{k}\vec{r_i}}\,E_s\right)^*\left(D_j(\vec{\omega}_s)e^{i\mathbf{k}\vec{r_j}}\,E\right)G_i^*G_j + \langle n_i^*n_j\rangle
\end{aligned}
$$

Multiple sky sources

$$D_i(\vec{\omega}_s)e^{i\mathbf{k}\vec{r_i}}\,E_s \;\rightarrow\; \sum_s D_i(\vec{\omega}_s)e^{i\mathbf{k}_s\vec{r_i}}\,E_s$$

Visibility matrix

$$
\begin{aligned}
[\mathbf{D^s G}] &= \left[\left(\sum_s D_i(\vec{\omega}_s)e^{i\mathbf{k}_s\vec{r_i}}\,E_s\right)G_i\right] \\
[[\mathcal{V}]] &= [\mathbf{D^s G}]^\dagger\,[\mathbf{D^s G}] + \langle [\mathbf{n}]^\dagger\,[\mathbf{n}]\rangle \qquad \text{Eq.C}
\end{aligned}
$$