File description for PAF antenna radiation patterns

Files are produced on flush2 directories, eg

/flush2/hay175/MATLABV2/data/SKA/B2/Tests/D19/Struts2/1.201GHz/R

and will be copied to corresponding datastore directories, eg

/datastore/hay175/MATLABV2/data/SKA/B2/Tests/D19/Struts2/1.201GHz/R

These folders contains a number of files.

SpherePatches_1.0217deg.mat

The number in the name of this file is a legacy of an earlier directory structure where files for multiple frequencies existed in one directory. It is calculated from dthetadeg=kappa * lambda./(2*D) where lambda is the wavelength, D=12m is the diameter of the antenna and kappa=1.

This file contains the details of a division of the radiation sphere into regions and the Cartesian coordinates of points in each regions where the radiation patterns are calculated. The number of regions is np=54. The points in region 1 are x1, y1 and z1 and domega1 is the area element in region 1, etc.

For each region of the sphere there is a file containing the radiation patterns, eg

SpherePatches_1.0217deg_Loaded1.mat

which contains the Cartesian coordinates Ex1, Ey1 and Ez1 of the far-zone magnetic field. These arrays have dimension npts x nports, where npts is the number of points in the far-zone region and nports is the number of LNA-output ports on the array.

ACMs.mat

This file contains noise covariance matrices lambda and lambda_A and the zenith angles thy_zenith. lambda is the total noise covariance and has dimensions nports x nports x nzen where nzen is the number of zenith angles. lambda_A is the array noise covariance matrix or that corresponding to an isotropic external field and loss in the array elements. The radiation patterns and ACMs have been normalized so that

$$A_e = \frac{|w^t v|^2}{\bar{w}^t \,\text{lambda\_A}\; w}$$

$$T_{sys} = \frac{\bar{w}^t\; \text{lambda}\; w}{\bar{w}^t \,\text{lambda\_A}\; w}$$

$$v = p_x E_x + p_y E_y + p_z E_z$$

where px, py and pz are the coordinates of any unit vector tangent to the radiation sphere and w is the beamforming weight vector.

Not all ACMs have yet been generated for the frequencies at which radiation patterns have been produced and they require some testing. When this is done the files will be copied to datastore.

SGH 12 December 2016.