**ACC Source data  
Version 0.0  
14th February 2018  
Oisin Creaner**

This describes the formats for output from LOFAR station’s Array Covariance Cube (ACC) calibration files in its current state.

**Outline**

ACC files contain a matrix of complex numbers describing the Array Covariances (also known as “crosslets” or “visibilities”) between each of the Receiver Units (RCUs.) This matrix is stored as a series of binary floating point numbers, alternating real and imaginary components of the covariance. Therefore, given *n* RCUs, these matrices consist of 2*n*2 floating point elements. One such matrix of Array Covariances is stored for each subband in order. [1] Therefore, given *N* subbands, the total file consists of 2*n*2*N* floats. The files in this case consist wholly of the binary floats, with no header or other metadata stored.

For a LOFAR international station, the Low Band Antenna array (LBA) consists of 96 antennae. Two RCUs are connected to each, one for for the X- and one for the Y-polarisation, giving a total of 192. These are numbered alternating between X- and Y-polarisation, with the even numbers (0-190) used for X-polarisation, and odd-numbers (1-191) for Y-polarisation.

The signal from these RCUs is processed into 512 subbands, each of width 200MHz/1024.

Query – how are these signals processed into covariances – not sure what that is the covariance of, nor of how it comes to have real and imaginary components.

The ACC file records the covariance of each RCU with each other RCU for each subband

**Date\_Timestamp\_xst.dat**

**For each subband**

**For each RCU (i)**

**For each RCU (j)**

**Float:  
Covariance (i,j) Real**

**Float:  
Covariance (i,j) Imaginary**

Figure : Structure of an ACC file

Each file is structured thus

* For each of the 512 subbands
  + 1 covariance matrix.
  + Each covariance matrix is structured as
  + For each of the 192 RCUs (Alternating X and Y polarisation)
    - A row consisting of the covariance for each RCU against each other
    - For each of those 192 covariances, the components are stored as
      * Float: Real component of covariance
      * Float: Imaginary component of covariance

# References

|  |  |
| --- | --- |
| [1] | I. I. Virtanen, *Station Data Cookbook,* ASTRON, 2012. |