

# ACC Data

Array correlation/crosslet statistics statistics (ACCs) describe the autocorrelation between different antenna for a number of subbands across a period of time (visibilities, covariances). A single ACC file typically contains one or more scans across the entire subband range of an observing mode, which differs from a XST file which only observed a single subband. They can be used to generate all-sky maps, a representation of the sky brightness distribution of the station at a given frequency, though typically ACCs are used for station debugging and calibration

## Generating ACCs (Validation Required)

ACCs are generated using the `rspectl` command while the station is in `swivel`, a known mode is set by `rspectl --mode=N` or `rspectl --band=N M` and the station is expected to be in bitmode 16 as no other observations can be performed simultaneously. It will generate an output integrated over the last  $N_{sec}$  to a file in a given *local\_folder*. The overall syntax to generate an output is

```
user1@icu$ rspectl --xstatistics --duration=n_observation_seconds --integration=n_sec --directory=local_folder
```

This differs from XSTs as no subband is specified. It is recommended to keep the observing mode in the *local\_folder* name due to the lack of metadata associated with the observation.

You are also recommended to check in with your observer or station configuration to see the subbands the scan will be performed over. While by default, this covers every subband in a given mode before looking, your configuration may have changed and only use a limited subset of frequency channels.

## A note on HBA all-sky observations

Due to the rigid tile structure of the HBAs aligning the side lobes, performing all-sky observations with the entire HBA array is a hopeless endeavour.

However, at the GLOW stations, James Anderson worked around this by activating a single antenna in each HBA tile in a pseudo-random fashion to minimise sidelobe collision. Further work on the methodology by Menno Norden and Michiel Brentjens optimized this method and resulted in the [script found here](#), slightly modified for use on the Irish station, which will automate the process for you. It should be run before any attempts to perform all-sky observations with the HBA tiles.

## ACC Data Format (Validation Required)

ACCs are antenna-major files that are written to disk every integration period for each subband. They do not come with any metadata outside of the starting time, which is present in the file name.

Each sample is  $4 \times N_{\text{subbands}} \times N_{\text{antenna}} \times N_{\text{antenna}}$  long (by default, an international station has 96 antenna). Each antenna generates a real and imaginary sample for it's correlation with every other antenna (Complex128 type, 2 Float64s, for each polarization). As a result, at the (n,n) indices we generate the autocorrelation of the antenna with no lag. The overall format can be thought of as a 3D cube, with (n,n) squares stacked for  $m$  time samples.

(N0,N0)	(N0,N1)	...	(N0,Nn)
(N1,N0)	(N1,N1)		
...		...	
(Nn,N0)			(Nn,Nn)

Each sample above is the index of 2 Complex128 values, for each polarizations of an antenna pair, giving an overall dimension of (192, 192) Complex128 elements for a standard international station.

See the "XST Data" page for an explanation on using these data products for all-sky maps.

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