Visibility data for verification of Gridding algorithms

# Introduction

This document very briefly summaries the inputs used to generate visibilities for verification of gridding algorithms.

# Telescope model

These simulations made use of a nominal SKA1 mid-combined telescope layout taken the configuration listed in the SKA ECP register (https://skaoffice.atlassian.net/wiki/display/EP/ECP+Register). This telescope has 254 antennas with a maximum baseline of approximately 200km.

Macintosh HD:Users:bmort:peter_bramm_scripts:verification:SKA1_mid_combined.eps

# Sky model

As these simulations are targeted at verification of gridding algorithms a simple sky model of 7 sources arranged in an ‘L’ configuration was chosen. This configuration consisted of:

* 1 source at the phase centre
* 4 sources of the same Right Ascension as the phase centre, but with Declinations of +0.3, +0.6, +0.9, +1.9, and +2.9 degrees from the phase centre.
* 2 sources at the same Declination as the phase centre but with Right Ascensions of +0.2, and +0.4 from the phase centre.

# Observation settings

## Pointings

Two pointing directions were chosen for fictitious observation targets, which satisfy the condition of allowing a symmetric 6-hour observation of the target while staying at reasonably high elevation throughout.

|  |  |  |
| --- | --- | --- |
| Pointing ID | RA [deg] | Dec [deg] |
| 0 | -90.355 | -8.571 |
| 1 | -38.246 | -45.639 |

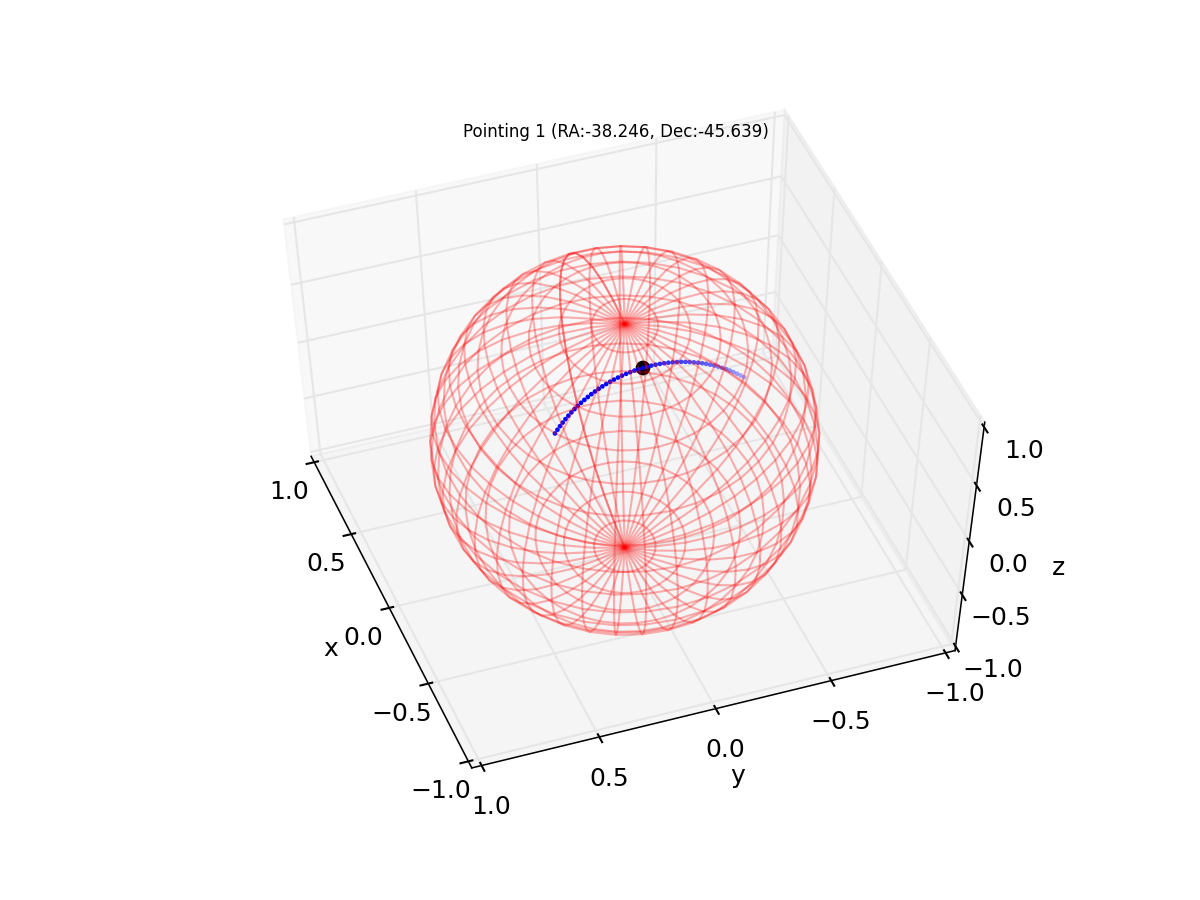
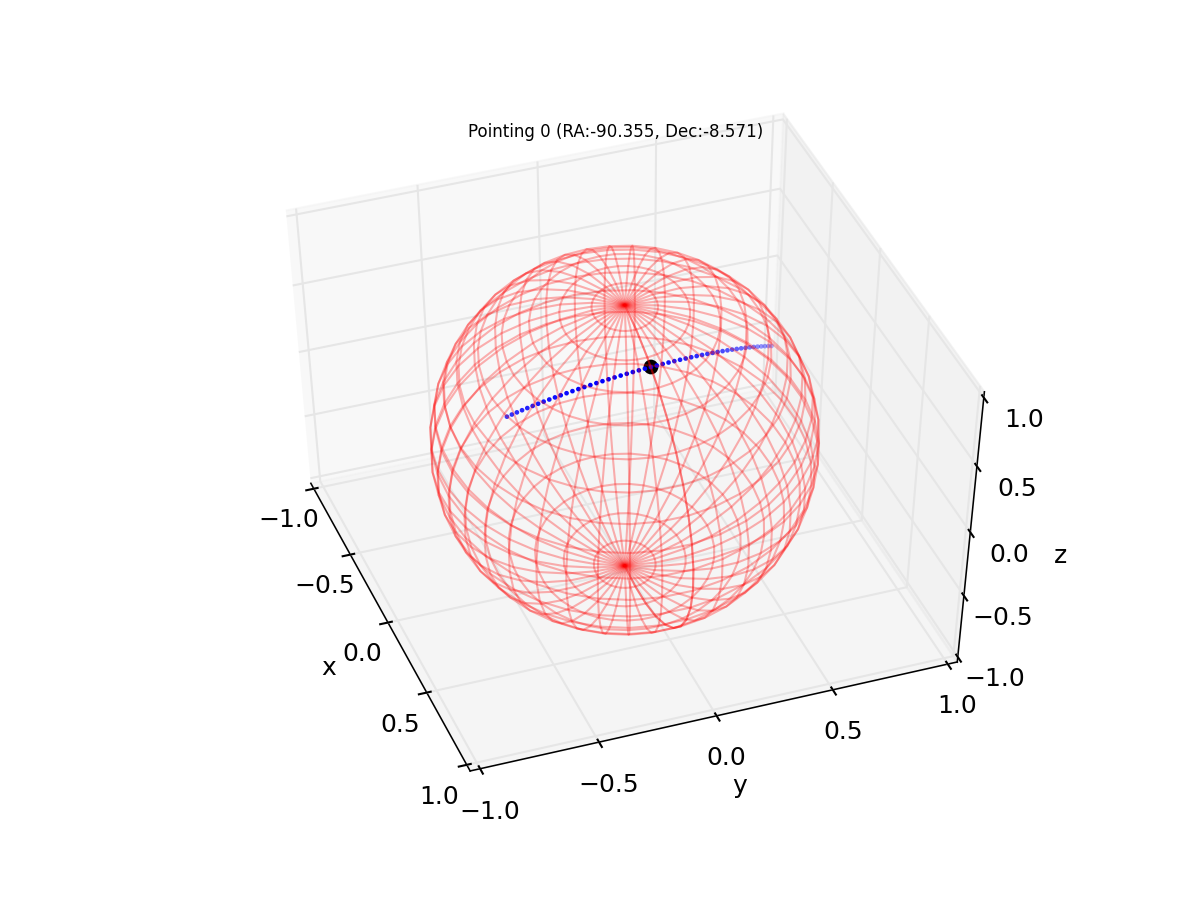


Figure 1: Locus of points representing a 6-h observation for the two pointings (right: pointing ID 0, left: pointing ID 1) described in the table above. Plots are in the Azimuth, Elevation co-ordinates. The black point represents the centre time for the observation.

In order to generate a representative range of uvw-coordinates, three 16-s ‘snapshot’ observations, each consisting of 200 correlator dumps of length 0.08-s have been generated. These three snapshots represent short sections of 6-hour observations at the start, 1.5-hours into, and 3-hours into the observation in order to sample the range of possible uvw-coordinates within snapshots for the observation. Tables detailing the start time and azimuth and elevation of the three snapshots are given below:

### ‘Snapshot’ 1

@ start of 6 hour observation

|  |  |  |  |
| --- | --- | --- | --- |
| Pointing ID | Time [MJD UTC] | Az. [deg] | El. [deg] |
| 0 | 57086.113194 | 72.1 | 42.6 |
| 1 | 57086.257639 | 126.2 | 52.0 |

### ‘Snapshot’ 2

@ 1.5 hours from the start

|  |  |  |  |
| --- | --- | --- | --- |
| Pointing ID | Time[MJD UTC] | Az. [deg] | El. [deg] |
| 0 | 57086.175694 | 48.5 | 59.5 |
| 1 | 57086.320139 | 136.8 | 66.9 |

### ‘Snapshot’ 3

@ 3 hours from start

|  |  |  |  |
| --- | --- | --- | --- |
| Pointing ID | Time[MJD UTC] | Az. [deg] | El. [deg] |
| 0 | 57086.238194 | 0.0 | 68.0 |
| 1 | 57086.382639 | 180.0 | 75.0 |

## Frequencies.

Two observation frequencies have been chosen. One near the start, and one near the end of band 1 of the SKA combined mid.

These frequencies were:

1. 0.6 GHz
2. 1.0 GHz

# Visibility data files

Visibility data files are named using the following pattern:

test\_p<pointing ID>\_s<snapshot ID>\_f<freq ID>

and have the extension \*.ms for Measurment Set format and \*.vis for OSKAR visibility binary format (not this is the oskar-2.6.0 visibility block binary format, so is not yet possible to read with the current OSKAR release, version 2.5.1).

* **Pointing ID** (either 00 or 01) and corresponds to the pointings in table in section 3.1.
* **Snapshot ID** (either 00, 01, or 02) corresponds to the observation snapshots described in sections 3.1.1, 3.1.2, and 3.1.3.
* **Frequency ID** is either 00 for the channel at 0.6 GHz, or 01 for the channel at 1.0 GHz

# CASA images