Optimising SKA1-Mid Scale-Dependent Sensitivity

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Abstract

In this report we study the scale dependent sensitivity of the SKA1-Mid and SKA1-SUR baseline designs. We propose changes to the baseline design that enhance the sensitivity of SKA1-Mid at smaller angular scales (e.g. 0.4-1 arcsec at 650MHz) without compromising the performance at larger scales. The changes we propose are guided by the SKA1-Mid level-zero science requirements [2], which suggest that very long baselines ($>$ 100km) are not necessary to achieve the SKA1-Mid science objectives. In particular, we show that a 254 dish layout with a maximum baseline of 120km, for the specific case of an imaging survey at angular resolution 0.4-1 arcsec and in the frequency range 650-1000 MHz, improves the SKA1-Mid survey speed by up to than 40% and is 4 times faster than SKA-SUR as defined in the baseline design (see Table 12) and about 40% faster than the 2nd generation SKA-SUR (R. Braun September 2013)[1]. The higher sensitivity on these small scales could be vital for experiments that require high sensitivity on angular small scales, such as weak lensing and some astrobiology experiments. Furthermore, this layout spans significantly less space which could reduce trenching and data transport costs. We also show that with a conservative addition of 12 dishes the SKA1-Mid survey speed can be improved by up 80% on the smaller angular scales.

1 Introduction

The SKA at mid frequencies (SKA-Mid) will be built in two phases, SKA-Mid phase one (SKA1-Mid) and phase two (SKA-Mid) in South Africa, and SKA survey (SKA-SUR) in phase one in Australia. The key science goals for SKA phase one include the study of the history and role of neutral hydrogen in the Universe from the dark ages to the present-day, the use of pulsars as probes of fundamental physics [1] and continuum and HI surveys to pin down the cosmological model. The large emphasis on key science projects is outlined in several SKA memos, as the baseline design has emerged. It should however be noted that changes which do not compromise the key science cases are possible and such changes could increase the science output of SKA1-Mid.

Radio interferometers have become so complex that it has become fundamentally challenging to relate scientific performance to design and engineering specifications, although some progress has been made (Braun 2012 [3], Winjholds & van der Veen 2008 [4]). On the other hand, simulation packages such as the `MeqTress` system (Noordam and Smirnov 2010 [5]) have become sufficiently sophisticated that 'brute force' simulations of complex instruments are technically feasible. This makes it possible to approach telescope design in an almost experimental way, using simulations to measure the impact of specific design decisions on scientific performance (Smirnov *et al.* 2012, in prep.)

In this document we use a MeqTress based simulations framework to study the scale dependent sensitivity of the latest SKA1-Mid antenna layout from the SKA project office (SPO), the so-called V8 layout. The performance of this antenna layout is then compared to alternative layouts and the SKA-SUR 1st and 2nd generation antenna layouts.

The rest of this document is laid out as follows: in subsection 1.2 we discuss the science requirements for SKA1-Mid, then in subsection 1.3 we describe the layouts that we consider. In section 2 we describe our simulation techniques and the metrics we generated from the experiment. Finally, the results and concluding remarks are in section 3 and section 4.

[1]We note that the 2nd generation configurations of R. Braun increase the maximum baseline of SKA1-SUR from $\sim$ 50 km to $>$ 70 km

1.1 SKA1 Mid-frequency Baseline Design

The latest SKA1-Mid layout from the SPO differs significantly from the baseline design, the biggest modifications being the moving of almost all SKA1 dishes beyond a radius of $\sim$ 500m to the spiral arms, and the shortening of the maximum baseline from 173km to 155km. These modifications lead to better uv-coverage on the longer baselines, and consequently a slightly better naturally weighted point spread function (PSF). However, due to the core-heavy overall design of SKA1-Mid, the PSF still retains very broad wings, which is a major issue for current deconvolution algorithms based on `CLEAN`, (Hogbom 1974), particularly at low SNR. The PSF shape can be improved by a combination of visibility weighting and tapering techniques, however this comes at a cost in sensitivity. This loss in sensitivity, coupled with the inability to deconvolve the PSF at low SNR, will limit the dynamic range capabilities of SKA1-Mid. Therefore, major breakthroughs in deconvolution algorithms are required to reach the dynamic ranges promised by SKA1's nominal sensitivity. A family of algorithms based on compressive sensing (CS) has recently emerged to tackle deconvolution issues in the context of the SKA and its pathfinder missions [6], in particular `MORESANE` (Dabbech et al., [7, 8]) and `PURIFY` (Carrillo et. al. 2013). Although obviously not yet as well tested as `CLEAN`, these algorithms have been shown to be superior to `CLEAN` in detecting diffuse and compact emission, especially at low SNR (Ferrari 2014, in prep [9]). Furthermore, unlike `CLEAN`, these algorithms do not require a 'nice' PSF. In addition to the CS-based algorithms, a Bayesian approach to radio interferometry imaging has lead to the `RESOLVE` algorithm (Junklewitz *et al* 2014 [11]), which has also been shown to produce better results than `CLEAN`. The emergence of these techniques is particularly relevant to SKA1-Mid since the core-heavy design is crucial for the pulsar science goals, and attaining a Gaussian PSF needed by CLEAN with these core-heavy layouts is a major challenge.

In light of all of this, we have decided to relax the 'nice' naturally weighted PSF requirement [2] and propose changes to the V8 layout that optimise the performance at smaller angular scales, while not significantly compromising the larger scales. We adopt naturally weighted sensitivity per scale as our performance metric, under the assumption that newer deconvolution algorithms will allow us to recover that naturally weighted sensitivity.

1.2 SKA1-Mid science requirements

In this subsection we outline the scientific rationale for a change in the baseline design, which we believe is as cost neutral as possible given the information we received from the SKA office and which gives a direction which is different for the configuration of SKA-MID. We have based the propositions in this document upon the assessment workshop for the Cosmology working group where extensive discussion have taken place with the pulsar and transient senior scientists, along with direct communication with the Continuum Science SWG, plus several informal discussions between the Cosmology members and the HI/continuum members.

1.2.1 Highlights of requirements of each science area

Pulsar science: The pulsar search science is mainly dependent on the core of SKA-MID. One of the key factors being the instantaneous sensitivity which depends on the number of antennas in the core. During the discussions in the SWG, it was our understanding that a 10%decrease in collecting are would be an acceptable perturbation in the overall pulsar search. It is advantageous to remove the dishes from the edges of the core as this would result in a wider synthesised beam. We also note that the Pulsar SWG requires the full sensitivity of SKA-MID for accurate timing of the pulsars discovered in the survey.

Cosmology: In what concerns the baseline distribution in this document we have four aspects which we would like to highlight: Cosmology with continuum and HI galaxy surveys, weak gravitational lensing and intensity mapping.

- **Cosmology with HI surveys**: The key requirement for HI surveys for cosmology is to have a large survey speed coupled with baselines which do not resolve out the flux of the galaxies being observed. Given the sizes of galaxies and the fact that we would like a significant amount of the flux not to be resolved out, the baselines of most interest are baselines below around 5km. Hence an outer core is the most important aspect of a telescope for such science. However losing a small amount of sensitivity compared to the baseline design in this region of uv space is not critical and was discussed at the Cosmology science assessment workshop, and in fact we find that we do not lose any sensitivity in this regime for out preferred configuration.
- **Cosmology with weak lensing**: Here the main aspect is a high sensitivity at scales which can measure the structure and shape of the galaxies in continuum. Given the size of galaxies, this requires significant sensitivity at scales which correspond to 0.5 to 1 arcsec. The current baseline design has a natural sensitivity

[2] Attaining a Gaussian PSF with SKA1-Mid will require radical changes to the baseline design which may have unforeseen financial and science output implications. The major motivation for a Gaussian PSF is the inability of `CLEAN` to deconvolve the PSF at low SNR

very close to the JVLA at the scales of interest, something that will only damage the scientific reputation of the SKA. For these reasons having a larger number of antennas in the spiral arms out to around 70-80 km is beneficial for this science and the lack of those baselines would simply make such a survey unfeasible. Such studies also have to be done with SKA-MID as SKA-SUR does not have enough antennas on the longer baselines (and does not have a long enough maximum baseline) to produce reliable maps for weak lensing. Furthermore, the number of UV tracks is much lower than SKA-MID providing a poorer sampling of the spatial frequencies of interest.

- **HI and continuum morphologies**: In the current baseline design there is a lack of sensitivity in the baselines which one would need to study morphologies of the detected continuum and HI galaxies. The baselines needed for morphological studies of galaxies are similar to the baselines needed for the weak lensing experiment, and therefore should be advantageous for galaxy evolution studies which are central to the goals of the HI and Continuum SWGs.
- **Cosmology with intensity mapping surveys**: Intensity mapping requires very short baselines and would benefit from having several clusters of antennas placed either in the core or in the outer core. This arrangement is not incompatible with the configuration proposed here and is briefly discussed below.

1.2.2 General rationale

Cost Neutral proposal: We propose here a baseline change outlined in this document. The scientific rationale is that baselines larger than $\sim 80-90$km are expensive given that the signal needs significant boosting to reach the main correlator, and the extra trenching and the key fact that none of the main science goals are directly affected by a modest reduction of the maximum baseline (the science case that we believe to have the most stringent requirement for high resolution is the 40mas at $\nu \sim 14$GHz for the Cradle of Life).

We also note here that we have assumed an approximate cost neutrality for the SKA-Mid in isolation. If we were to consider a solution where the whole of the mid-frequency SKA1 as cost neutral (i.e. not interfering with SKA-Low baseline costing) then a significant number of additional dishes could be distributed within our proposed configurations which would substantially increase the imaging capability, the survey speed and the sheer volume of science that could be carried out with the SKA at mid-frequencies, but which could not be carried out with a separate site solution for the mid-frequency SKA. We assume such studies will be incorporated into the new science case for the SKA, but do not consider them here.

A proposal that should be encompassing of all science cases: The rationale that the array has significant UV coverage all the way up to 70-80 km baselines to cover the above science cases. This arrangement is very beneficial for HI and continuum morphological studies, furthermore it produces a survey speed which allows weak lensing experiments to be possible with SKA-1. We believe that it does not strongly affect HI and pulsar science as a whole and allows for better imaging capabilities with SKA-MID. This would be greatly beneficial for the project compared to the baseline design. Furthermore we suggest that several clusters of around 6 antennas, depending on the exact masking of roads/environments, be placed in the core/outer core as to increase the sensitivity for intensity mapping. We do not investigate this here as we believe it will only cause a minor perturbation in the survey speed and sensitivities that we discuss.

1.2.3 Specific layout implementation:

The level-zero scientific requirements for SKA1[2] published by the SKA project office in March 2014 suggest that (at least for SKA1-Mid), an array with a maximum baseline of around 100km is required. Therefore, we seek a layout with the shortest possible maximum baseline that does at least as well as the V8 baseline design in the resolution range 0.4-1 arcsec over 650, 800 and 1000MHz while not significantly compromising the performance at the larger angular scales. Moreover, as stated previously, having a layout which performs just as well as (or better) than the baseline layout but which covers significantly less space translates to a reduction in trenching and data transport costs, which presents an opportunity to re-invest the funds somewhere else, therefore we consider the conservative addition of 12 dishes. However, we note that improvements on the scales of interest are still possible without these 12 additional dishes. Furthermore, having more a better uv-coverage further out decreases loss in sensitivity for non-natural weighting schemes. We note that shifting the dishes along the arms to get more sensitivity at small angular scales will affect the sensitivity at larger scales (see Tables 16-22 for scale dependent noise statics), we therefore encourage input from the SWG in search for an optimal solution. In the next section we present two alternative layouts, these layouts have maximum baselines of 120km. The scale dependent sensitivity of these layouts is compared to the SKA1-Mid and SKA-SUR baseline layouts in section 2.

1.3 Background on Layouts

The following SKA1-Mid layouts are under consideration here:

V8B155 This is the V8 layout (254 dishes) released by the SPO (May 2014). This layout has a maximum baseline of 155km.

W8-iCjBl This is the V8 layout with i dishes added to the spiral arms and j dishes moved the core to spiral arms. The spacing in the arms is then optimised to get more sensitivity on the longer ($>$ 50km) baselines (See baseline distribution histograms in Figure 2). This layout has maximum baseline length of l kilometres.

SUR The SKA survey layout (96 dishes) released by the SPO (March 2013). This layout has maximum baseline of 50km.

SUR75 This is an unofficial SKA survey layout (96 dishes) produced by Robert Braun (September 2013). This forms the basis of the SKA Imaging Performance Memo [2]. This layout has a maximum baseline of 75km.

The details of the layouts are tabulated in Table 1, and Figure 1 shows the layouts while Figure 2 shows the baseline distribution histograms. Figure 3 shows the uv-coverage for the different layouts at 1GHz for declinations -50,-30,-10 degrees and for 8hr tracks. At this point some optimisation has been done on the antenna distributions but we emphasise that further improvements can be and should be made.

Table 1: Breakdown of the SKA1-Mid layouts under consideration.

V8B155 [254 dishes]	SKA dishes	Legacy dishes	Both	%
Core	76	30	106	41.7
Outer-core	24	34	58	22.8
Spiral-arms	90	0	90	35.5
W8-0C0B120 [254 dishes]				
Core	76	30	106	41.7
Outer-core	24	34	58	22.8
Spiral-arms	90	0	90	35.5
W8-0C9B120 [254 dishes]				
Core	67	30	97	38.2
Outer-core	24	34	58	22.8
Spiral-arms	99	0	99	39.0
W8-12C9B120 [266 dishes]				
Core	76	30	106	40.0
Outer-core	24	34	58	21.8
Spiral-arms	102	0	102	38.2

Table 2: Breakdown of the SKA survey layouts under consideration.

SUR [96 dishes]	SKA dishes	Legacy dishes	Both	%
Core	18	36	54	56.25
Spiral-arms	42	0	42	43.75
SUR75 [96 dishes]				
Core	24	36	60	62.5
Spiral-arms	36	0	36	37.5

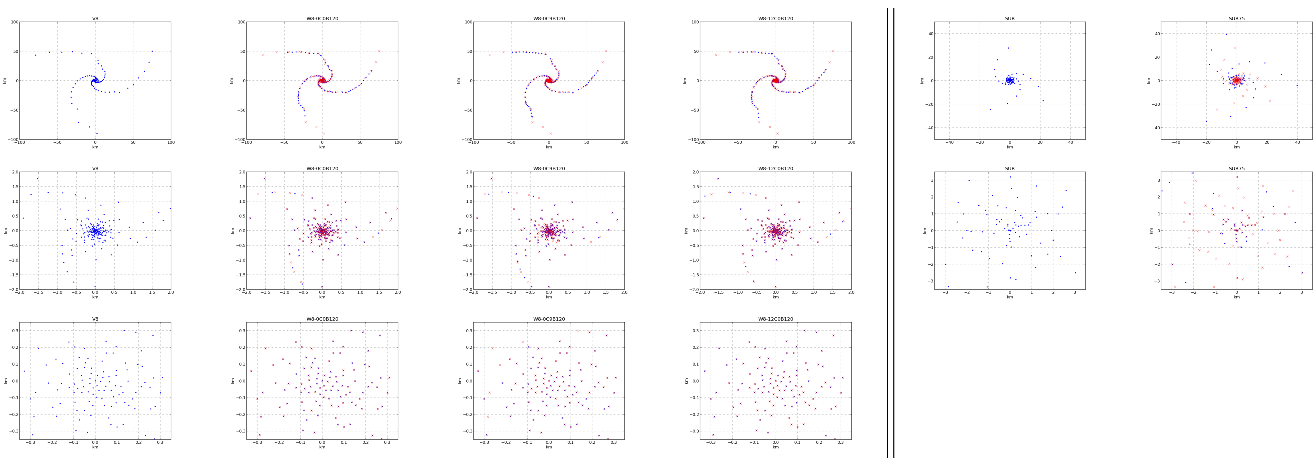

Figure 1: Antenna layouts, V8 plotted as a reference (red crosses) for SKA1-Mid layouts, and SKASUR plotted as reference for the SKASUR75 layout. The vertical lines separate SKA1-Mid and SKA survey layouts.

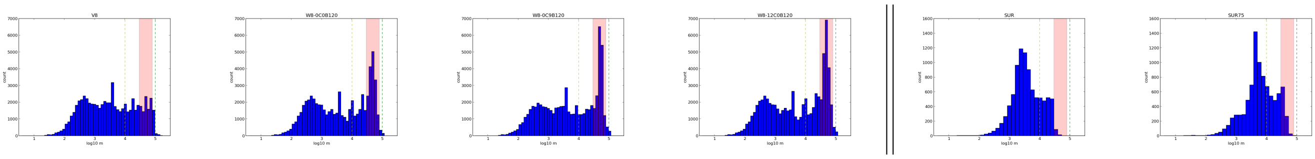

Figure 2: Baseline distribution with the uv-distance in log_{10} km . Yellow and green dashed lines mark 10 and 120 kilometres respectively, and the pink strip represents baselines from 30-80km.

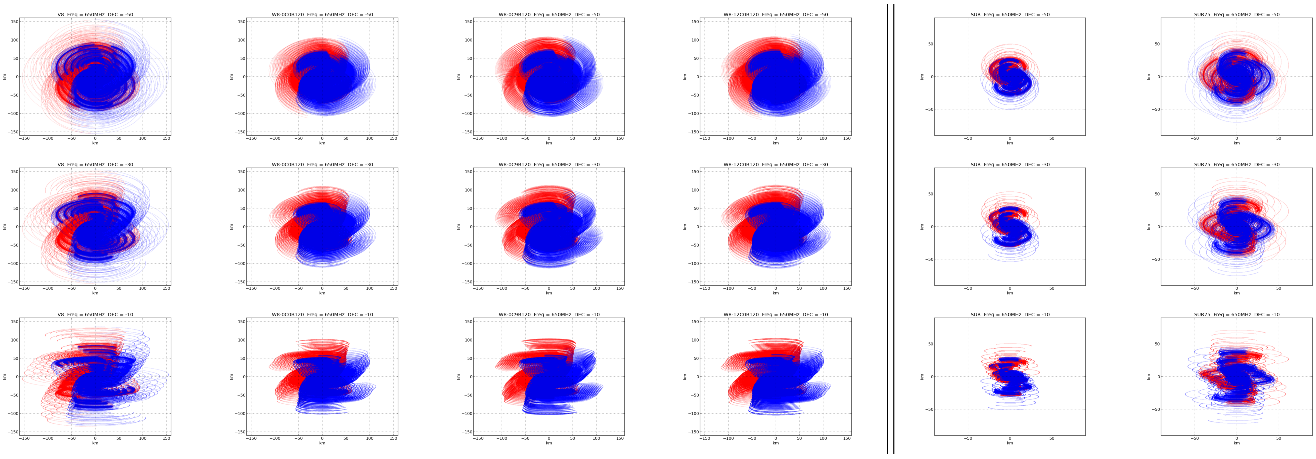

Figure 3: UV-Coverage for 8-hr tracks at 650MHz (50MHz bandwidth) at declinations -50,-30,-10 for the different layouts. Blue indicates uv-points, red indicates conjugate uv-points. The vertical lines separate SKA1-Mid and SKA survey layouts.

2 The Experiment

Our aim is to investigate the scale-dependent sensitivity of the layouts described in the previous section. We use the `makems` tool to make simulated measurement sets (MS) of 8hr tracks with a 60s integration time for declinations -50, -30 and -10 degrees, at frequencies of 650, 800 and 1000MHz, with a single 50MHz channel. The expected rms noise per real and imaginary part for each visibility is calculated as

$$\sigma_{\rm vis} = \frac{\rm SEFD}{\sqrt{2\Delta t \Delta \nu}}. \tag{1}$$

We use the baseline design's SEFD values for the SKA and legacy dishes. The noise for visibilities corresponding to baselines between SKA and legacy dishes is calculated using $\rm SEFD_{MIX} = \sqrt{SEFD_{SKA} \times SEFD_{LEGACY}}$. The MS is then filled with random Gaussian noise using the computed value of the noise for a given integration and bandwidth. We then use the (CASA-derived) `lwimager` tool to make dirty maps of the PSF as well as dirty maps of the noise using various weighting and tapering schemes. Note that for uniform and robust weighting, a crucial parameter is the size of the uv-bin over which weights are uniformized. By default this is determined from the full image size, but `lwimager` allows one to uniformize the weights over bins corresponding to a user-defined FoV instead. For these simulations uv-bins corresponding to a FoV of 10 arcmin were used.. The following metrics were generated:

- PSF full width at half maximum (FWHM) size (mean of the FWHM dimensions). This was measured by making high-resolution images of the PSF (0.05 arcsec resolution), and fitting a Gaussian to the PSF (Table 3). A catalog of PSF cross-sections (full uv-coverage) is provided in Appendix A.
- PSF symmetry (PSF size parameters are obtained as explained above). As a measure of PSF symmetry, we define $\mathrm{PSF}_{sym} = 1 - \mathrm{FWHM}_{min}/\mathrm{FWHM}_{maj}$, then $\mathrm{PSF}_{sym} = 0$ is perfect symmetry, and the symmetry degenerates as $\mathrm{PSF}_{sym} \rightarrow 1$ (Table 4).
- RMS pixel noise at different angular scales for 50kHz, 50MHz and 166MHz wide bands (Tables 5 - 7).
- RMS PSF far sidelobe level. These were measured by making images of the PSF 1 degree across, and measuring the rms levels beyond a radius of 30 arcmin.
- SNR for a 10μJy source at 1000MHz with a spectral index of -0.7 after 8hrs for a 166MHz band (Table 8).

- Average SNR over frequencies 650, 800 and 1000MHz (166MHz band) after 8 hours, for a 10μJy source at 1000MHz with a spectral index of -0.7. $\overline{\mathrm{SNR10}} = \sqrt{\frac{1}{3}(\mathrm{SNR10}_{650}^2 + \mathrm{SNR10}_{800}^2 + \mathrm{SNR10}_{1000}^2)}$ (Table 9).
- Hours required to reach a mean SNR of 10 (Table 10).
- Survey Speed. These values are calculated using the FOV values in the SRD (band 1 for SKA1-Mid and band 2 PAF FOV for SKASUR) and the values in Table 8. Note that unlike the SKASUR FOV, the SKA1-Mid FOV changes across the band ($\mathrm{FOV}_{\mathrm{Mid}} \sim \nu^{-2}$). $\mathrm{SS}_{\mathrm{Freq}} = \mathrm{FOV}_{\mathrm{Freq}} \times \mathrm{SNR}^2$.
- Average survey speed. $\overline{\mathrm{SS}} = \sqrt{\frac{1}{3}(\mathrm{SS}_{650}^2 + \mathrm{SS}_{800}^2 + \mathrm{SS}_{1000}^2)}$ (Table 12).

3 Simulation Results

3.1 PSF and Noise Statistics

Figure 4 shows the PSF sizes (FWHM) for the layouts under consideration as a function of frequency for natural and robust-2 weighting as well as robust-2 weighting with a 1$''$ Gaussian taper at a declination of -30 degrees. Note that for natural weighting the PSF is highly non-Gaussian (see appendix A) therefore the FWHM size is not representative of the PSF size. The PSF sizes for the SKA1-Mid layouts are similar for the other two weighting schemes, while unsurprisingly, the SUR75 has a significantly smaller PSF compared to SUR. In the case for SKA1-Mid, this shows that a 120km maximum baseline layout has very similar resolving performance compared to a 150km maximum baseline layout.

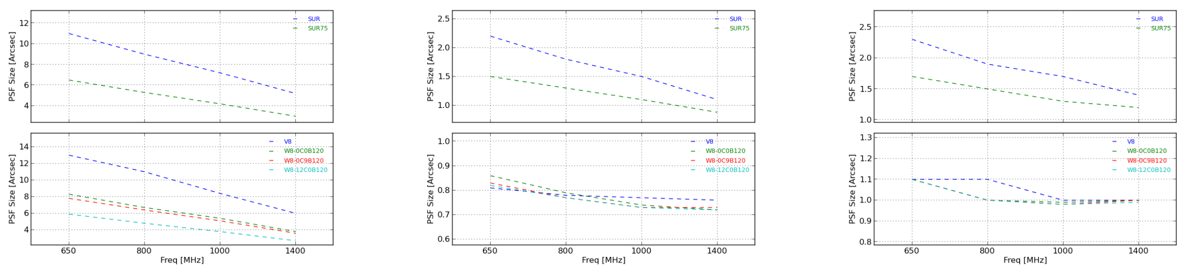

Figure 4: PSF size as a function of frequency for the SKA survey layouts (top) and MID layouts (bottom). This is done for natural (column 1) and robust-2 weighting (column 2) as well as robust-2 weighting with a 1$''$ Gaussian taper (column 3) at a declination of -30 degrees.

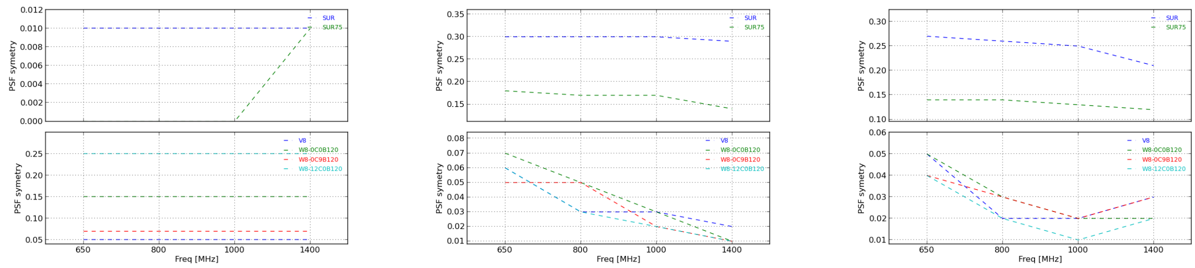

Figure 5: PSF symmetry as a function of frequency for the SKA survey layouts (top) and MID layouts (bottom). This is done for natural (column 1) and robust-2 weighting (column 2) as well as robust-2 weighting with a 1$''$ Gaussian taper (column 3) at a declination of -30 degrees.

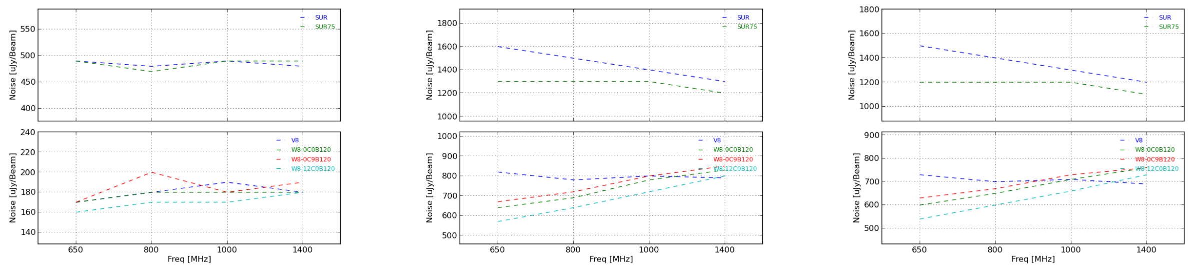

Figure 6: Noise for a 50MHz wide band as a function of frequency for the SKA survey layouts (top) and MID layouts (bottom). This is done for natural (column 1) and robust-2 weighting (column 2) as well as robust-2 weighting with a 1″ Gaussian taper (column 3) at a declination of -30 degrees.

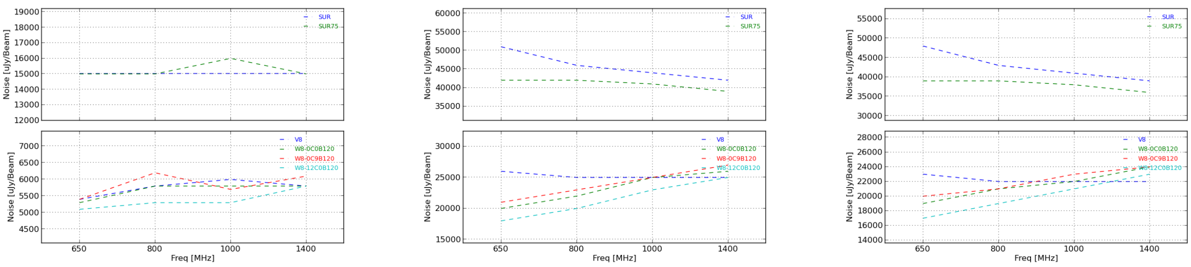

Figure 7: Noise for a 50kHz wide band as a function of frequency for the SKA survey layouts (top) and MID layouts (bottom). This is done for natural (column 1) and robust-2 weighting (column 2) as well as robust-2 weighting with a 1″ Gaussian taper (column 3) at a declination of -30 degrees.

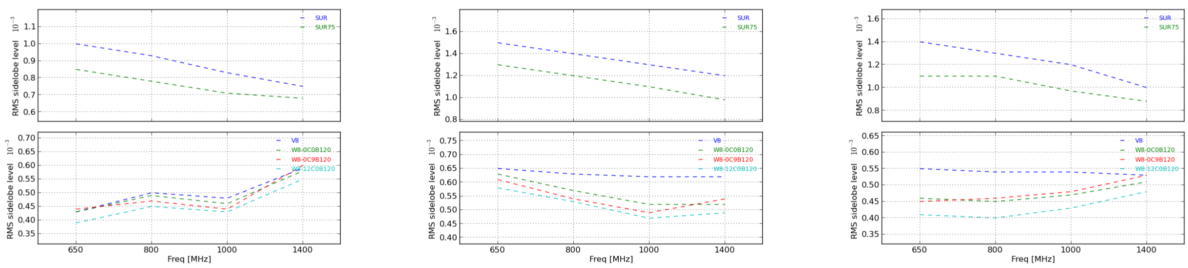

Figure 8: PSF far sidelobe level as a function of frequency for the SKA survey layouts (top) and MID layouts (bottom). This is done for natural (column 1) and robust-2 weighting (column 2) as well as robust-2 weighting with a 1″ Gaussian taper (column 3) at a declination of -30 degrees.

3.2 Scale dependent PSF and Noise Statistics

In this section we only present the scale dependent PSF and noise statics at declination -30 degrees, statics for declinations -10 and -50 can be found in Appendix B. These metrics are generated at different angular scales, this is done by applying an inner-taper[3] to taper out baselines that do not fall within a given resolution range, i.e., we only consider uv-points that correspond to a given resolution. A table showing which resolution ranges belong to the different resolution bins is included on each page to facilitate the reading of the tables in this section.

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 3: FWHM PSF sizes (in arcsec) for the different layouts at different angular scales. These values are generated at 650, 800 and 1000MHz for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

	650MHz									800MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.7	0.9	1.3	2.4	3.3	4.9	20.1	25.0	814.6	0.6	0.8	1.4	2.3	3.3	5.1	19.6	24.6	791.7
W8-0C0B120	0.8	1.0	1.2	2.3	3.3	4.9	20.9	27.5	814.6	0.7	0.9	1.3	2.3	3.4	4.9	20.7	27.5	791.7
W8-0C9B120	0.8	1.0	1.2	2.3	3.4	5.0	19.9	24.7	815.3	0.7	0.8	1.3	2.3	3.4	5.1	19.4	24.3	790.8
W8-12C0B120	0.8	1.0	1.2	2.3	3.3	4.9	20.9	27.1	814.6	0.7	0.9	1.3	2.3	3.5	4.9	20.5	26.8	791.7
SUR	1.3	2.0	1.9	2.5	3.4	5.3	18.9	19.8	1097	1.0	1.7	1.6	2.3	3.4	5.4	17.5	18.2	973.7
SUR75	1.0	1.5	1.5	2.4	3.3	5.6	15.5	16.4	1167	1.0	1.3	1.4	2.4	3.4	5.6	15.9	16.8	1019

	1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.6	0.8	1.3	2.3	3.4	5.3	20.8	26.1	776.2	0.6	0.8	1.3	2.3	3.3	5.2	21.6	26.1	716.2
W8-0C0B120	0.6	0.8	1.3	2.4	3.3	4.9	22.5	29.6	776.2	0.5	0.6	1.3	2.4	3.3	5.3	23.4	28.8	716.2
W8-0C9B120	0.6	0.7	1.3	2.3	3.4	5.2	20.7	25.8	776.2	0.5	0.6	1.3	2.4	3.3	5.2	21.7	26.3	714.5
W8-12C0B120	0.6	0.7	1.3	2.4	3.3	4.9	22.2	28.9	776.2	0.5	0.6	1.3	2.3	3.3	5.3	23.0	28.2	716.2
SUR	1.0	1.4	1.4	2.4	3.3	5.5	16.4	16.9	903.9	0.9	1.2	1.4	2.4	3.3	5.5	15.3	15.6	751.3
SUR75	0.8	1.2	1.3	2.4	3.4	5.3	16.6	17.4	933.8	0.7	0.9	1.3	2.4	3.4	4.8	17.1	17.8	758.7

Table 4: PSF symmetry (see section 2) for the different layouts at different angular scales. These values are generated at 650, 800 and 1000MHz for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

	650MHz									800MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.2	0.1	0.05	0.07	0.07	0.08	0.03	0.03	0.01	0.1	0.1	0.07	0.05	0.08	0.07	0.01	0.01	0.01
W8-0C0B120	0.1	0.1	0.06	0.07	0.01	0.07	0.05	0.04	0.01	0.1	0.1	0.02	0.00	0.09	0.08	0.03	0.02	0.01
W8-0C9B120	0.2	0.1	0.02	0.07	0.06	0.07	0.00	0.01	0.00	0.1	0.1	0.06	0.05	0.1	0.06	0.03	0.04	0.01
W8-12C0B120	0.1	0.1	0.06	0.06	0.01	0.07	0.05	0.04	0.01	0.1	0.1	0.03	0.01	0.1	0.08	0.02	0.01	0.01
SUR	0.6	0.5	0.5	0.2	0.1	0.09	0.2	0.2	0.4	0.5	0.4	0.4	0.06	0.2	0.06	0.1	0.1	0.3
SUR75	0.4	0.3	0.3	0.2	0.02	0.00	0.06	0.07	0.4	0.4	0.3	0.2	0.2	0.08	0.01	0.07	0.08	0.3

	1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.07	0.08	0.1	0.07	0.1	0.06	0.02	0.02	0.03	0.07	0.08	0.08	0.1	0.07	0.01	0.01	0.01	0.02
W8-0C0B120	0.1	0.1	0.08	0.05	0.1	0.07	0.02	0.02	0.03	0.09	0.1	0.07	0.1	0.01	0.03	0.00	0.01	0.02
W8-0C9B120	0.1	0.1	0.08	0.07	0.1	0.05	0.06	0.06	0.03	0.08	0.08	0.08	0.06	0.05	0.02	0.03	0.02	0.02
W8-12C0B120	0.1	0.1	0.07	0.05	0.1	0.06	0.01	0.02	0.03	0.1	0.1	0.06	0.1	0.03	0.01	0.00	0.01	0.02
SUR	0.5	0.4	0.4	0.1	0.1	0.03	0.1	0.1	0.2	0.5	0.3	0.09	0.1	0.00	0.1	0.05	0.05	0.01
SUR75	0.3	0.3	0.2	0.01	0.09	0.01	0.05	0.06	0.2	0.3	0.3	0.2	0.07	0.1	0.07	0.06	0.07	0.1

[3]The weights for the taper are generated using a Butterworth function.

Table 5: Noise (in μJy/Beam) for a 50kHz band after an 8hr synthesis with a 60s integration for the different layouts at different angular scales. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

	650MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	110	79.0	120	150	180	89.0	67.0	56.0	310
W8-0C0B120	99.0	66.0	84.0	140	210	98.0	75.0	61.0	300
W8-0C9B120	84.0	63.0	92.0	160	200	95.0	71.0	62.0	300
W8-12C0B120	87.0	60.0	78.0	140	210	94.0	73.0	61.0	300
SUR	5300	480	570	550	610	260	170	170	2800
SUR75	1300	320	370	440	560	210	200	190	2700

	800MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	100	73.0	110	150	180	86.0	66.0	56.0	370
W8-0C0B120	82.0	63.0	95.0	160	200	96.0	72.0	60.0	370
W8-0C9B120	76.0	62.0	110	170	200	92.0	72.0	63.0	370
W8-12C0B120	73.0	58.0	91.0	160	190	93.0	71.0	60.0	370
SUR	2700	400	470	500	590	240	180	170	3000
SUR75	640	290	350	460	560	200	230	220	2800

	1000MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	97.0	72.0	110	150	180	84.0	68.0	59.0	480
W8-0C0B120	74.0	61.0	110	170	180	96.0	71.0	60.0	480
W8-0C9B120	70.0	60.0	120	170	190	89.0	73.0	64.0	490
W8-12C0B120	66.0	56.0	110	170	170	92.0	72.0	61.0	480
SUR	650	240	260	340	370	160	150	150	3500
SUR75	300	180	230	310	310	140	220	210	3100

	1400MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	58.0	45.0	70.0	93.0	110	52.0	42.0	38.0	440
W8-0C0B120	44.0	37.0	72.0	90.0	140	62.0	43.0	38.0	440
W8-0C9B120	45.0	38.0	77.0	99.0	120	54.0	46.0	41.0	450
W8-12C0B120	40.0	35.0	70.0	89.0	140	60.0	43.0	38.0	440
SUR	350	200	260	320	350	140	180	170	3800
SUR75	240	160	240	270	290	150	260	260	3300

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 6: Noise (in μJy/Beam) for a 50MHz band after an 8hr synthesis with a 60s integration for the different layouts at different angular scales. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	3.5	2.5	3.6	4.6	5.7	2.8	2.1	1.8	9.7	3.2	2.3	3.5	4.8	5.7	2.7	2.1	1.8	12.0	3.1	2.3	3.6	4.8	5.7	2.7	2.2	1.9	15.0	1.8	1.4	2.2	2.9	3.6	1.6	1.3	1.2	14.0
W8-0C0B120	3.1	2.1	2.7	4.5	6.6	3.1	2.4	1.9	9.6	2.6	2.0	3.0	5.0	6.2	3.0	2.3	1.9	12.0	2.4	1.9	3.4	5.4	5.5	3.0	2.3	1.9	15.0	1.4	1.2	2.3	2.9	4.4	2.0	1.4	1.2	14.0
W8-0C9B120	2.7	2.0	2.9	5.1	6.2	3.0	2.3	1.9	9.6	2.4	2.0	3.4	5.4	6.2	2.9	2.3	2.0	12.0	2.2	1.9	3.7	5.3	5.9	2.8	2.3	2.0	15.0	1.4	1.2	2.4	3.1	3.8	1.7	1.4	1.3	14.0
W8-12C0B120	2.8	1.9	2.5	4.4	6.6	3.0	2.3	1.9	9.6	2.3	1.8	2.9	5.1	5.9	2.9	2.3	1.9	12.0	2.1	1.8	3.3	5.3	5.2	2.9	2.3	1.9	15.0	1.3	1.1	2.2	2.8	4.4	1.9	1.4	1.2	14.0
SUR	170	15.0	18.0	17.0	19.0	8.2	5.4	5.2	90.0	86.0	13.0	15.0	16.0	19.0	7.6	5.6	5.5	96.0	20.0	7.5	8.4	11.0	12.0	5.0	4.7	4.7	110	11.0	6.3	8.3	10.0	11.0	4.6	5.5	5.5	120
SUR75	42.0	10.0	12.0	14.0	18.0	6.8	6.4	6.1	85.0	20.0	9.2	11.0	15.0	18.0	6.4	7.1	6.9	89.0	9.5	5.6	7.3	9.9	9.8	4.4	6.9	6.7	97.0	7.4	5.2	7.5	8.4	9.3	4.7	8.3	8.2	100

Table 7: Noise (in μJy/Beam) for a 166MHz band after an 8hr synthesis with a 60s integration for the different layouts at different angular scales. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	1.9	1.4	2.0	2.5	3.1	1.5	1.2	1.0	5.3	1.7	1.3	1.9	2.6	3.1	1.5	1.2	1.0	6.5	1.7	1.3	2.0	2.7	3.1	1.5	1.2	1.0	8.3	1.0	0.8	1.2	1.6	2.0	0.9	0.7	0.7	7.6
W8-0C0B120	1.7	1.2	1.5	2.4	3.6	1.7	1.3	1.1	5.3	1.4	1.1	1.7	2.7	3.4	1.7	1.2	1.0	6.4	1.3	1.1	1.9	3.0	3.0	1.7	1.2	1.0	8.4	0.8	0.6	1.2	1.6	2.4	1.1	0.8	0.7	7.6
W8-0C9B120	1.5	1.1	1.6	2.8	3.4	1.6	1.2	1.1	5.3	1.3	1.1	1.9	3.0	3.4	1.6	1.3	1.1	6.5	1.2	1.0	2.0	2.9	3.3	1.5	1.3	1.1	8.4	0.8	0.7	1.3	1.7	2.1	0.9	0.8	0.7	7.8
W8-12C0B120	1.5	1.0	1.3	2.4	3.6	1.6	1.3	1.1	5.3	1.3	1.0	1.6	2.8	3.2	1.6	1.2	1.0	6.4	1.1	1.0	1.8	2.9	2.9	1.6	1.2	1.1	8.3	0.7	0.6	1.2	1.5	2.4	1.0	0.8	0.7	7.6
SUR	91.0	8.3	9.9	9.5	11.0	4.5	3.0	2.9	49.0	47.0	7.0	8.1	8.7	10.0	4.1	3.1	3.0	53.0	11.0	4.1	4.6	5.9	6.5	2.7	2.6	2.6	60.0	6.1	3.5	4.5	5.5	6.1	2.5	3.0	3.0	66.0
SUR75	23.0	5.6	6.4	7.7	9.8	3.7	3.5	3.3	47.0	11.0	5.0	6.1	8.0	9.8	3.5	3.9	3.8	49.0	5.2	3.1	4.0	5.4	5.4	2.4	3.8	3.7	53.0	4.1	2.8	4.1	4.6	5.1	2.6	4.6	4.5	58.0

Table 8: SNR after 8 hours relative to a 10μJy source at 1000Hz (166 MHz band) with a spectral index of -0.7 for the different layouts. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	7.0	9.9	6.8	5.3	4.3	8.8	11.7	13.8	2.5	6.7	9.2	6.0	4.4	3.7	7.8	10.2	11.9	1.8	5.9	8.0	5.1	3.8	3.2	6.8	8.4	9.8	1.2	7.8	10.2	6.5	4.9	4.0	8.8	10.8	12.1	1.0
W8-0C0B120	7.8	11.7	9.2	5.5	3.7	8.0	10.4	12.8	2.6	8.2	10.7	7.1	4.3	3.4	7.0	9.4	11.3	1.8	7.7	9.4	5.3	3.4	3.3	6.0	8.1	9.6	1.2	10.4	12.3	6.4	5.0	3.2	7.3	10.6	12.0	1.0
W8-0C9B120	9.3	12.4	8.5	4.8	4.0	8.2	10.9	12.6	2.6	8.9	10.9	6.2	4.0	3.4	7.3	9.3	10.7	1.8	8.2	9.7	4.9	3.4	3.1	6.5	7.9	9.1	1.2	10.1	12.0	5.9	4.6	3.8	8.4	10.0	11.2	1.0
W8-12C0B120	8.9	13.0	10.0	5.7	3.7	8.2	10.7	12.9	2.6	9.2	11.6	7.4	4.2	3.6	7.2	9.4	11.2	1.8	8.7	10.3	5.5	3.5	3.5	6.3	8.0	9.4	1.2	11.3	13.2	6.5	5.1	3.3	7.6	10.5	11.8	1.0
SUR	0.1	1.6	1.4	1.4	1.3	3.0	4.5	4.7	0.3	0.2	1.7	1.4	1.4	1.1	2.8	3.8	3.9	0.2	0.9	2.4	2.2	1.7	1.5	3.6	3.9	3.9	0.2	1.3	2.3	1.7	1.4	1.3	3.1	2.6	2.6	0.1
SUR75	0.6	2.4	2.1	1.8	1.4	3.6	3.9	4.0	0.3	1.0	2.3	1.9	1.5	1.2	3.3	3.0	3.1	0.2	1.9	3.2	2.5	1.9	1.9	4.1	2.7	2.7	0.2	1.9	2.8	1.9	1.7	1.6	3.1	1.7	1.8	0.1

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 9: SNR after 8 hours relative to a 10μJy source at 1000Hz (166 MHz band) with a spectral index of -0.7 averaged over 650,800 and 1000MHz, for the different layouts at different angular scales. These values are generated for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

resbin	1	2	3	4	5	6	7	8	9
V8	6.9	9.3	6.1	4.6	3.8	8.1	10.3	12.0	1.8
W8-0C0B120	8.6	11.1	7.1	4.6	3.4	7.1	9.7	11.5	1.8
W8-0C9B120	9.2	11.3	6.5	4.2	3.6	7.7	9.6	11.0	1.8
W8-12C0B120	9.6	12.1	7.5	4.7	3.5	7.4	9.7	11.4	1.8
SUR	0.8	2.0	1.7	1.5	1.3	3.2	3.8	3.9	0.2
SUR75	1.5	2.7	2.1	1.7	1.5	3.6	2.9	3.0	0.2

Table 10: The hours required to reach a mean SNR of 10 (average over 650,800 and 1000MHz), relative to a 10μJy source at 1000MHz with a spectral index of -0.7 for the different layouts at different angular scales. These values are generated for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

resbin	1	2	3	4	5	6	7	8	9
V8	16.8	9.2	21.3	37.1	54.8	12.2	7.5	5.6	261.2
W8-0C0B120	10.8	6.5	15.7	37.5	68.1	15.8	8.5	6.0	259.3
W8-0C9B120	9.5	6.3	18.8	44.6	62.1	13.7	8.7	6.7	262.4
W8-12C0B120	8.7	5.5	14.1	36.4	63.8	14.7	8.5	6.2	258.2
SUR	1260	194.3	273.4	365.4	456.5	79.8	56.5	53.9	1.926e+04
SUR75	362.3	108.8	177.3	276.8	347.9	63.3	94.6	88.2	1.637e+04

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 11: Relative (w.r.t SUR at 800MHz) survey speeds for the different layouts, calculated using the FOV (using PAF FOV for SKASUR) values given in the SRD [2] and the values in table 8. These values are generated at 650, 800 and 1000MHz for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively at declination -30 degrees. For each column the intensity of the colour increases with the value.

	650MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	72.7	3.2	2.0	1.4	1.2	0.9	0.8	1.1	11.4
W8-0C0B120	90.9	4.4	3.8	1.5	1.0	0.7	0.7	1.0	12.5
W8-0C9B120	127.3	5.0	3.2	1.2	1.0	0.8	0.7	1.0	12.5
W8-12C0B120	118.2	5.4	4.3	1.6	1.0	0.8	0.7	1.0	12.5
SUR	0.4	1.0	0.9	1.1	1.2	1.1	1.4	1.5	1.6
SUR75	5.6	2.2	2.2	1.7	1.4	1.7	1.0	1.1	1.7

	800MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	43.6	1.8	1.1	0.6	0.6	0.5	0.4	0.6	4.0
W8-0C0B120	65.5	2.4	1.5	0.6	0.5	0.4	0.4	0.5	4.0
W8-0C9B120	76.4	2.6	1.1	0.5	0.5	0.4	0.4	0.4	4.0
W8-12C0B120	82.7	3.0	1.6	0.6	0.6	0.4	0.4	0.5	4.0
SUR	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SUR75	18.2	1.9	1.8	1.2	1.1	1.4	0.6	0.6	1.1

	1000MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	21.8	0.9	0.5	0.3	0.3	0.2	0.2	0.2	1.1
W8-0C0B120	37.3	1.2	0.5	0.2	0.3	0.2	0.2	0.2	1.1
W8-0C9B120	41.8	1.3	0.4	0.2	0.3	0.2	0.2	0.2	1.1
W8-12C0B120	47.3	1.5	0.6	0.2	0.3	0.2	0.2	0.2	1.1
SUR	12.7	2.2	2.3	1.5	1.8	1.7	1.0	1.0	0.6
SUR75	60.0	3.8	3.0	1.8	2.6	2.1	0.5	0.5	0.7

	1400MHz								
resbin	1	2	3	4	5	6	7	8	9
V8	19.1	0.7	0.4	0.3	0.2	0.2	0.2	0.2	0.4
W8-0C0B120	34.5	1.1	0.4	0.3	0.2	0.1	0.1	0.2	0.4
W8-0C9B120	32.7	1.0	0.3	0.2	0.2	0.2	0.1	0.2	0.4
W8-12C0B120	40.9	1.2	0.4	0.3	0.2	0.1	0.1	0.2	0.4
SUR	27.3	1.9	1.5	1.1	1.2	1.3	0.5	0.4	0.3
SUR75	60.9	2.8	1.8	1.6	1.8	1.2	0.2	0.2	0.4

Table 12: Relative (w.r.t SUR) average survey speeds for the different layouts, calculated using the FOV (PAF FOV for SKASUR) values given in the SRD [2] and the values in table 8. These values are generated for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declination -30 degrees. For each column the intensity of the colour increases with the value.

resbin	1	2	3	4	5	6	7	8	9
V8	2.9	1.2	0.8	0.7	0.5	0.4	0.5	0.6	6.4
W8-0C0B120	4.0	1.7	1.3	0.7	0.4	0.3	0.4	0.5	6.5
W8-0C9B120	5.1	1.9	1.1	0.5	0.5	0.4	0.4	0.5	6.5
W8-12C0B120	5.1	2.1	1.6	0.7	0.4	0.4	0.4	0.6	6.6
SUR	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SUR75	2.8	1.8	1.5	1.3	1.3	1.3	0.6	0.6	1.1

4 Conclusions

The metrics we have used suggest that the science goals (at least those listed in the SRD in addition to cosmology with weak lensing and HI surveys) can be met by a layout which covers significantly less space compared to the baseline layout. The W8-0C0B120 layout performs better at smaller angular scales, $> 20\%$ improvement in terms of the noise properties and a 40% improvement in survey speed, without compromising the larger scales. Moreover, the SKA1-Mid performance can be further enhanced (by about 80%) by adding a handful of dishes in the spiral arms as can be seen with the W8-12C0B120 layout.

Bringing in the dishes from the longer baselines translates to a greater sensitivity on the relevant (to the science goals of SKA1-Mid) smaller scales, as can be seen in Tables 5-10. Even more encouraging is the fact that this doesn't compromise the size or the symmetry of the PSF as seen in Tables 3 and 4, as well as in Appendix A. In comparison to the SUR baseline design configurations we find that all SKA-Mid configurations significantly out perform SKA-SUR in terms of sensitivity and survey speed. Even with the 2nd generation SKA-SUR configuration with longer baselines, our proposed SKA1-Mid configuration still outperforms SKA-SUR in terms of survey speed by a factor of ~ 1.4. **We proffer the W8-0C0B120 configuration as a solution which allows for weak lensing, HI and continuum source morphology characterisation for galaxy evolution studies, as well as the other science cases detailed in the SRD. Although we note that such a configuration also needs to be analysed by other SWGs, in particular the HI SWG.**

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A PSF cross-sections

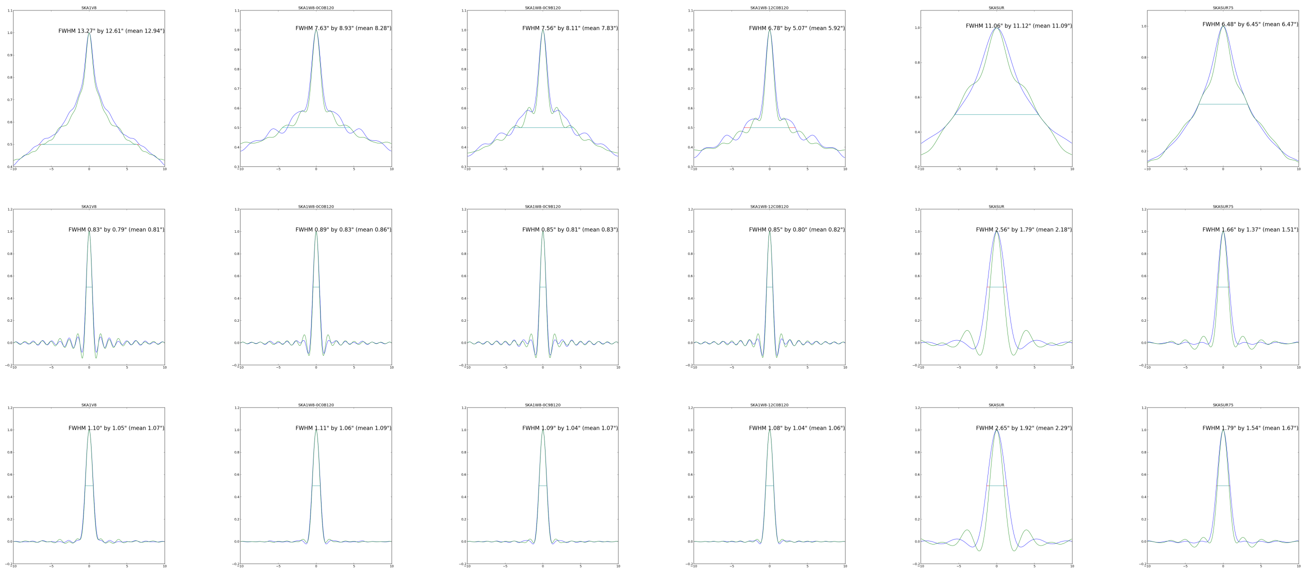

Figure 9: PSF cross-sections at Dec=-30 deg, Freq=650MHz for the different layouts. Row 1 and 2 are for natural and robust-2 weighting respectively, and row 3 is for robust-2 weighting with a 1 arcsec Gaussian taper. The blue and green curves are cross-sections along l and m respectively, and the horizontal line marks the FWHM. FWHM parameters are included in the plot.

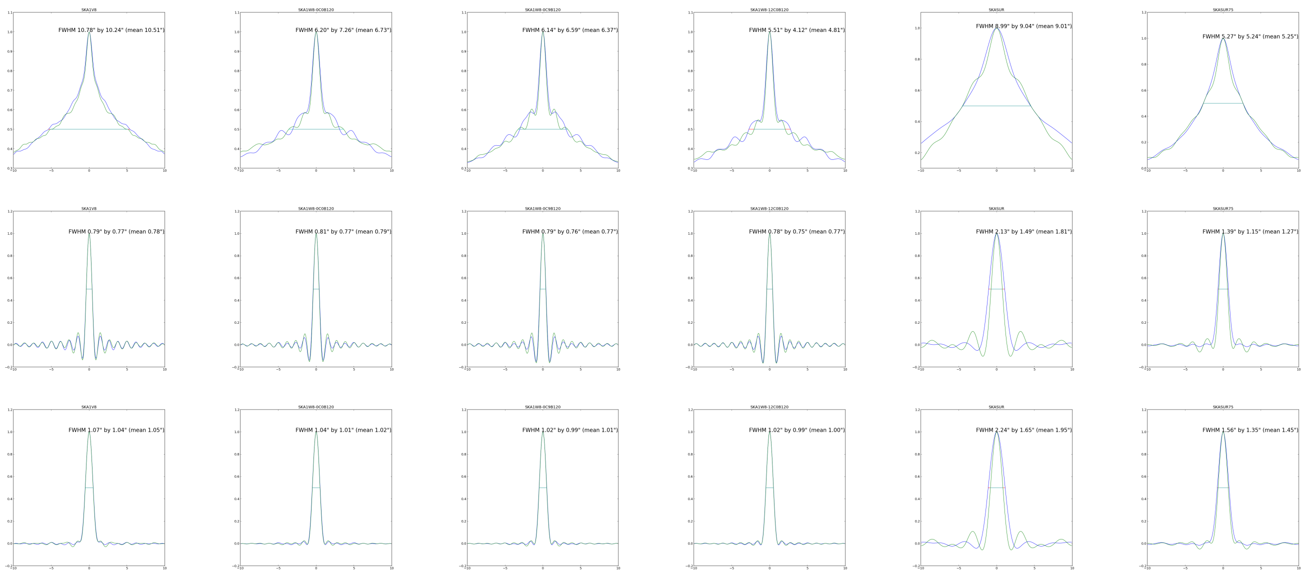

Figure 10: PSF cross-sections at Dec=-30 deg, Freq=800MHz. Row 1 and 2 are for natural and robust-2 weighting respectively, and row 3 is for robust-2 weighting with a 1 arcsec Gaussian taper. The blue and green curves are cross-sections along l and m respectively, and the horizontal line marks the FWHM. FWHM parameters are included in the plot.

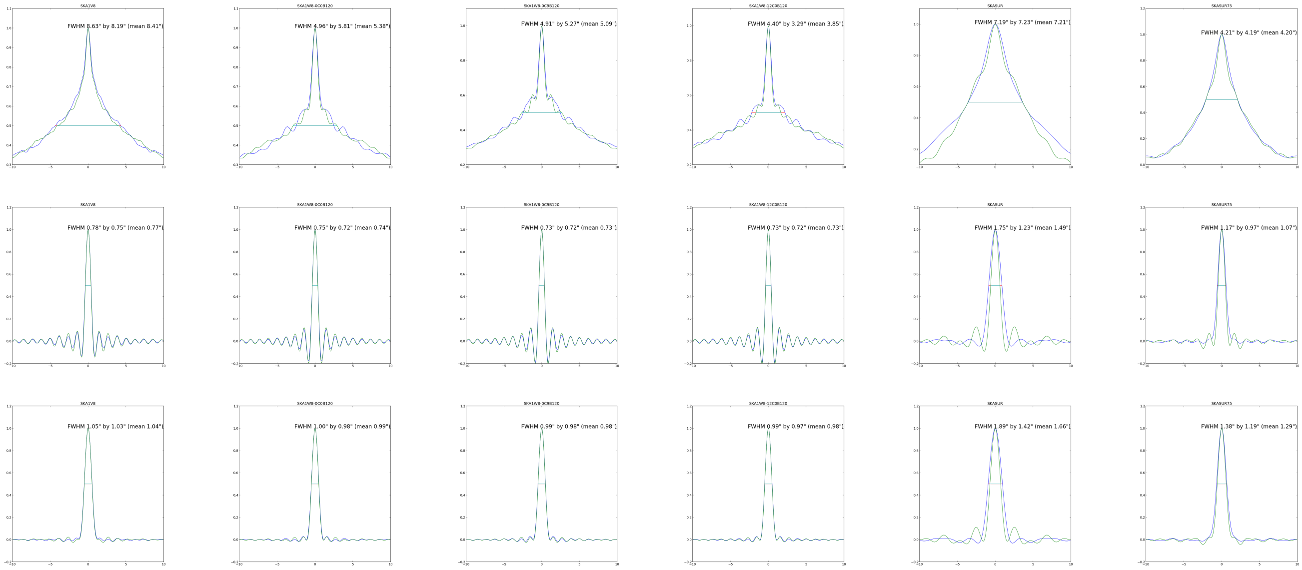

Figure 11: PSF cross-sections at Dec=-30 deg, Freq=1000MHz. Row 1 and 2 are for natural and robust-2 weighting respectively, and row 3 is for robust-2 weighting with a 1 arcsec Gaussian taper. The blue and green curves are cross-sections along l and m respectively, and the horizontal line marks the FWHM. FWHM parameters are included in the plot.

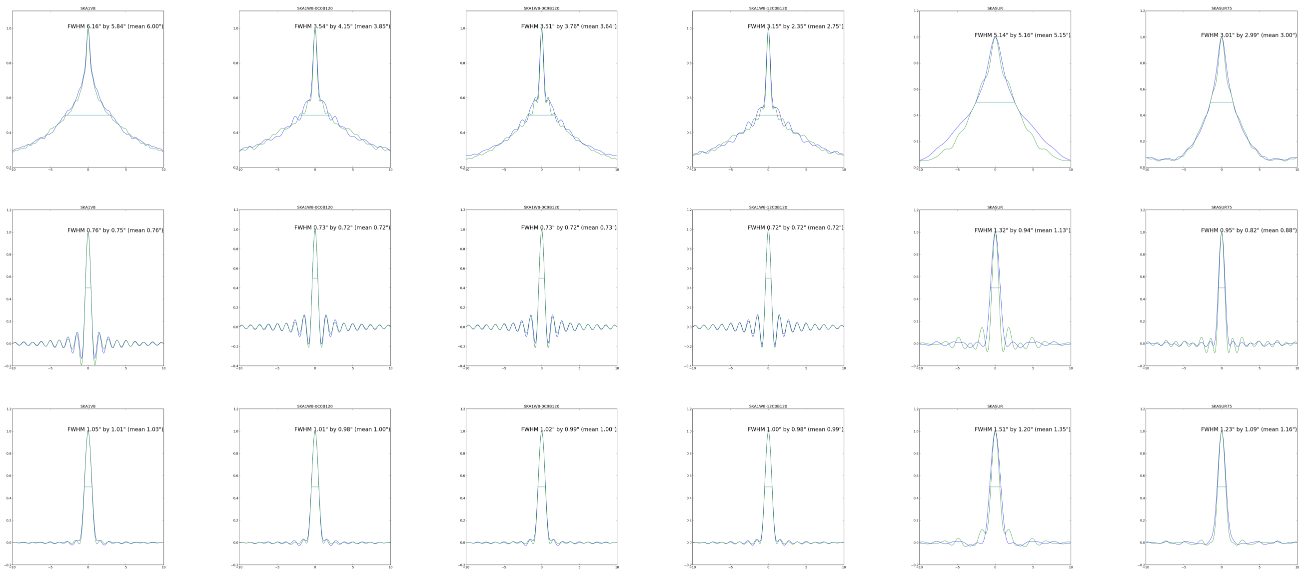

Figure 12: PSF cross-sections at Dec=-30 deg, Freq=1400MHz. Row 1 and 2 are for natural and robust-2 weighting respectively, and row 3 is for robust-2 weighting with a 1 arcsec Gaussian taper. The blue and green curves are cross-sections along l and m respectively, and the horizontal line marks the FWHM. FWHM parameters are included in the plot.

B Scale Dependent Sensitivity Statistics

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 13: FWHM PSF sizes (in arcsec) for the different layouts at different angular scales. These values are generated at 650, 800 and 1000MHz for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.7	0.9	1.3	2.4	3.4	5.0	20.2	25.0	818.8	0.6	0.8	1.4	2.3	3.3	5.0	19.7	24.6	798.4	0.6	0.8	1.3	2.3	3.4	5.2	20.6	25.9	781.5	0.6	0.8	1.3	2.3	3.4	5.3	21.4	26.0	727.6
W8-0C0B120	0.8	1.1	1.3	2.3	3.3	4.9	21.1	27.6	818.8	0.7	0.9	1.3	2.3	3.4	4.8	20.7	27.5	798.4	0.6	0.8	1.3	2.4	3.4	4.9	22.2	29.4	781.5	0.6	0.6	1.3	2.4	3.4	5.3	23.2	28.8	727.6
W8-0C9B120	0.8	1.0	1.2	2.4	3.4	5.0	20.0	24.6	820	0.7	0.8	1.3	2.3	3.3	5.1	19.5	24.2	797.8	0.6	0.7	1.3	2.3	3.4	5.2	20.4	25.6	781.4	0.5	0.6	1.3	2.4	3.3	5.3	21.5	26.2	726.5
W8-12C0B120	0.8	1.0	1.3	2.3	3.3	4.9	21.0	27.2	818.8	0.7	0.9	1.3	2.3	3.4	4.9	20.5	26.8	798.4	0.6	0.8	1.3	2.4	3.4	4.9	21.9	28.6	781.5	0.5	0.6	1.3	2.4	3.3	5.3	22.8	28.2	727.6
SUR	1.2	1.9	1.9	2.5	3.4	5.4	18.9	20.0	1029	1.0	1.7	1.6	2.3	3.4	5.5	17.6	18.3	943.3	1.0	1.4	1.4	2.4	3.4	5.6	16.5	17.0	914.7	0.9	1.1	1.3	2.4	3.4	5.5	15.4	15.8	776.1
SUR75	0.9	1.5	1.5	2.4	3.3	5.4	15.7	16.6	1072	0.9	1.3	1.4	2.4	3.4	5.6	16.0	16.8	984.2	0.8	1.2	1.3	2.3	3.4	5.3	16.6	17.5	948.6	0.7	0.9	1.3	2.4	3.4	4.9	17.1	17.8	793.4

(b) DEC=-30, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.7	0.9	1.3	2.4	3.3	4.9	20.1	25.0	814.6	0.6	0.8	1.4	2.3	3.3	5.1	19.6	24.6	791.7	0.6	0.8	1.3	2.3	3.4	5.3	20.8	26.1	776.2	0.6	0.8	1.3	2.3	3.3	5.2	21.6	26.1	716.2
W8-0C0B120	0.8	1.0	1.2	2.3	3.3	4.9	20.9	27.5	814.6	0.7	0.9	1.3	2.3	3.4	4.9	20.7	27.5	791.7	0.6	0.8	1.3	2.4	3.3	4.9	22.5	29.6	776.2	0.5	0.6	1.3	2.4	3.3	5.3	23.4	28.8	716.2
W8-0C9B120	0.8	1.0	1.2	2.3	3.4	5.0	19.9	24.7	815.3	0.7	0.8	1.3	2.3	3.4	5.1	19.4	24.3	790.8	0.6	0.7	1.3	2.3	3.4	5.2	20.7	25.8	776.2	0.5	0.6	1.3	2.4	3.3	5.2	21.7	26.3	714.5
W8-12C0B120	0.8	1.0	1.2	2.3	3.3	4.9	20.9	27.1	814.6	0.7	0.9	1.3	2.3	3.5	4.9	20.5	26.8	791.7	0.6	0.7	1.3	2.4	3.3	4.9	22.2	28.9	776.2	0.5	0.6	1.3	2.3	3.3	5.3	23.0	28.2	716.2
SUR	1.3	2.0	1.9	2.5	3.4	5.3	18.9	19.8	1097	1.0	1.7	1.6	2.3	3.4	5.4	17.5	18.2	973.7	1.0	1.4	1.4	2.4	3.3	5.5	16.4	16.9	903.9	0.9	1.2	1.4	2.4	3.3	5.5	15.3	15.6	751.3
SUR75	1.0	1.5	1.5	2.4	3.3	5.6	15.5	16.4	1167	1.0	1.3	1.4	2.4	3.4	5.6	15.9	16.8	1019	0.8	1.2	1.3	2.4	3.4	5.3	16.6	17.4	933.8	0.7	0.9	1.3	2.4	3.4	4.8	17.1	17.8	758.7

(c) DEC=-50, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.7	0.9	1.3	2.4	3.3	5.0	20.1	25.0	815.1	0.6	0.8	1.4	2.3	3.3	5.1	19.7	24.7	793.8	0.6	0.8	1.4	2.3	3.4	5.2	20.8	26.0	775	0.6	0.8	1.3	2.4	3.3	5.2	21.6	26.1	717.4
W8-0C0B120	0.8	1.0	1.2	2.3	3.3	4.9	20.9	27.5	815.1	0.7	0.9	1.3	2.3	3.4	5.0	20.8	27.6	793.8	0.6	0.8	1.4	2.4	3.3	4.9	22.5	29.7	775	0.5	0.6	1.3	2.4	3.3	5.2	23.3	28.8	717.4
W8-0C9B120	0.8	1.0	1.2	2.3	3.3	5.0	19.9	24.8	816	0.7	0.8	1.3	2.3	3.4	5.2	19.5	24.4	792.9	0.6	0.7	1.3	2.3	3.4	5.2	20.7	25.8	774.5	0.5	0.6	1.3	2.4	3.3	5.2	21.6	26.2	715.5
W8-12C0B120	0.8	1.0	1.2	2.3	3.3	4.9	20.9	27.1	815.1	0.7	0.9	1.3	2.3	3.4	5.0	20.5	26.9	793.8	0.6	0.7	1.3	2.4	3.4	4.9	22.2	28.9	775	0.5	0.6	1.3	2.4	3.3	5.2	22.9	28.1	717.4
SUR	1.4	2.0	1.9	2.4	3.4	5.2	19.1	20.1	1031	1.1	1.7	1.6	2.4	3.3	5.3	17.6	18.3	962.8	1.0	1.5	1.4	2.4	3.4	5.4	16.4	16.9	936.8	0.9	1.2	1.4	2.4	3.3	5.5	15.2	15.5	761.8
SUR75	0.9	1.5	1.5	2.4	3.4	5.5	15.6	16.4	1051	0.9	1.3	1.4	2.4	3.4	5.5	15.8	16.7	975.9	0.8	1.2	1.3	2.4	3.4	5.2	16.5	17.3	948.3	0.7	1.0	1.3	2.4	3.4	4.9	17.3	18.0	753.2

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 14: PSF symmetry (see section 2) for the different layouts at different angular scales. These values are generated at 650, 800 and 1000MHz for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.08	0.07	0.04	0.09	0.05	0.00	0.08	0.08	0.02	0.08	0.07	0.03	0.06	0.01	0.02	0.06	0.06	0.01	0.05	0.05	0.06	0.06	0.1	0.04	0.02	0.03	0.02	0.05	0.05	0.06	0.08	0.04	0.05	0.04	0.04	0.02
W8-0C0B120	0.04	0.04	0.05	0.1	0.06	0.00	0.1	0.1	0.02	0.06	0.04	0.05	0.06	0.00	0.03	0.08	0.08	0.01	0.04	0.05	0.1	0.1	0.2	0.05	0.03	0.06	0.02	0.07	0.07	0.06	0.1	0.01	0.09	0.05	0.06	0.02
W8-0C9B120	0.06	0.06	0.06	0.1	0.08	0.01	0.05	0.04	0.01	0.07	0.06	0.06	0.07	0.05	0.00	0.02	0.01	0.00	0.06	0.06	0.06	0.04	0.07	0.01	0.04	0.03	0.02	0.07	0.08	0.05	0.07	0.01	0.04	0.01	0.02	0.02
W8-12C0B120	0.03	0.04	0.06	0.1	0.07	0.00	0.1	0.1	0.02	0.06	0.04	0.03	0.05	0.03	0.03	0.07	0.06	0.01	0.04	0.05	0.07	0.1	0.1	0.05	0.02	0.05	0.02	0.07	0.07	0.05	0.1	0.01	0.08	0.05	0.06	0.02
SUR	0.6	0.4	0.4	0.3	0.06	0.1	0.1	0.1	0.3	0.5	0.4	0.4	0.1	0.2	0.1	0.1	0.1	0.2	0.4	0.3	0.4	0.1	0.2	0.04	0.1	0.1	0.2	0.4	0.3	0.1	0.2	0.05	0.09	0.06	0.07	0.03
SUR75	0.3	0.3	0.3	0.2	0.1	0.01	0.05	0.06	0.3	0.3	0.2	0.2	0.2	0.02	0.03	0.08	0.09	0.3	0.3	0.2	0.2	0.06	0.1	0.03	0.07	0.08	0.2	0.3	0.2	0.1	0.07	0.02	0.02	0.07	0.07	0.2

(b) DEC=-30, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.2	0.1	0.05	0.07	0.07	0.08	0.03	0.03	0.01	0.1	0.1	0.07	0.05	0.08	0.07	0.01	0.01	0.01	0.07	0.08	0.1	0.07	0.1	0.06	0.02	0.02	0.03	0.07	0.08	0.08	0.1	0.07	0.01	0.01	0.01	0.02
W8-0C0B120	0.1	0.1	0.06	0.07	0.01	0.07	0.05	0.04	0.01	0.1	0.1	0.02	0.00	0.09	0.08	0.03	0.02	0.01	0.1	0.1	0.08	0.05	0.1	0.07	0.02	0.02	0.03	0.09	0.1	0.07	0.1	0.01	0.03	0.00	0.01	0.02
W8-0C9B120	0.2	0.1	0.02	0.07	0.06	0.07	0.00	0.01	0.00	0.1	0.1	0.06	0.05	0.1	0.06	0.03	0.04	0.01	0.1	0.1	0.08	0.07	0.1	0.05	0.06	0.06	0.03	0.08	0.08	0.08	0.06	0.05	0.02	0.03	0.02	0.02
W8-12C0B120	0.1	0.1	0.06	0.06	0.01	0.07	0.05	0.04	0.01	0.1	0.1	0.03	0.01	0.1	0.08	0.02	0.01	0.01	0.1	0.1	0.07	0.05	0.1	0.06	0.01	0.02	0.03	0.1	0.1	0.06	0.1	0.03	0.01	0.00	0.01	0.02
SUR	0.6	0.5	0.5	0.2	0.1	0.09	0.2	0.2	0.4	0.5	0.4	0.4	0.06	0.2	0.06	0.1	0.1	0.3	0.5	0.4	0.4	0.1	0.1	0.03	0.1	0.1	0.2	0.5	0.3	0.09	0.1	0.00	0.1	0.05	0.05	0.01
SUR75	0.4	0.3	0.3	0.2	0.02	0.00	0.06	0.07	0.4	0.4	0.3	0.2	0.2	0.08	0.01	0.07	0.08	0.3	0.3	0.3	0.2	0.01	0.09	0.01	0.05	0.06	0.2	0.3	0.3	0.2	0.07	0.1	0.07	0.06	0.07	0.1

(c) DEC=-50, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	0.1	0.1	0.06	0.07	0.04	0.05	0.04	0.03	0.00	0.1	0.1	0.03	0.06	0.03	0.05	0.03	0.02	0.00	0.07	0.07	0.06	0.02	0.1	0.05	0.02	0.02	0.02	0.06	0.07	0.08	0.05	0.08	0.01	0.01	0.00	0.03
W8-0C0B120	0.1	0.09	0.07	0.08	0.1	0.08	0.04	0.05	0.00	0.1	0.09	0.01	0.04	0.09	0.07	0.04	0.03	0.00	0.09	0.09	0.03	0.04	0.1	0.07	0.02	0.02	0.02	0.08	0.08	0.07	0.1	0.06	0.01	0.01	0.00	0.03
W8-0C9B120	0.1	0.1	0.05	0.07	0.03	0.06	0.00	0.00	0.00	0.1	0.1	0.01	0.08	0.03	0.04	0.01	0.02	0.00	0.09	0.09	0.07	0.04	0.06	0.04	0.07	0.06	0.02	0.07	0.07	0.07	0.05	0.06	0.03	0.02	0.02	0.03
W8-12C0B120	0.1	0.09	0.07	0.06	0.08	0.08	0.05	0.05	0.00	0.1	0.09	0.01	0.04	0.08	0.07	0.04	0.02	0.00	0.09	0.09	0.02	0.03	0.1	0.07	0.02	0.02	0.02	0.08	0.08	0.06	0.1	0.04	0.01	0.01	0.00	0.03
SUR	0.7	0.4	0.4	0.1	0.06	0.07	0.1	0.1	0.2	0.5	0.3	0.3	0.09	0.05	0.04	0.1	0.1	0.2	0.4	0.3	0.3	0.06	0.2	0.01	0.1	0.1	0.2	0.4	0.2	0.05	0.2	0.02	0.1	0.04	0.04	0.02
SUR75	0.3	0.3	0.3	0.2	0.08	0.03	0.05	0.05	0.3	0.2	0.3	0.3	0.02	0.05	0.00	0.06	0.07	0.2	0.2	0.2	0.2	0.1	0.04	0.03	0.04	0.04	0.2	0.3	0.2	0.04	0.06	0.09	0.07	0.02	0.02	0.1

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 15: Noise (in μJy) for a 50kHz band after an 8hr synthesis with a 60s integration for the different layouts at different angular scales. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	110	79.0	110	150	190	88.0	66.0	56.0	290	100	73.0	110	150	180	86.0	67.0	57.0	350	96.0	70.0	110	150	180	84.0	67.0	59.0	450	58.0	43.0	68.0	91.0	110	52.0	41.0	37.0	400
W8-0C0B120	110	66.0	83.0	140	200	97.0	75.0	61.0	290	83.0	63.0	95.0	160	200	96.0	73.0	61.0	350	76.0	62.0	110	170	170	93.0	72.0	60.0	450	44.0	37.0	72.0	91.0	140	61.0	44.0	38.0	410
W8-0C9B120	95.0	67.0	87.0	160	200	94.0	72.0	62.0	290	78.0	61.0	110	160	200	93.0	71.0	61.0	360	72.0	60.0	110	170	190	90.0	73.0	64.0	460	45.0	38.0	76.0	97.0	120	55.0	46.0	40.0	420
W8-12C0B120	90.0	59.0	76.0	130	200	93.0	74.0	61.0	290	73.0	57.0	87.0	150	190	93.0	72.0	61.0	360	67.0	56.0	100	160	160	91.0	72.0	62.0	450	40.0	34.0	68.0	86.0	130	59.0	44.0	39.0	410
SUR	5200	460	560	510	620	270	170	160	2600	2800	390	460	500	630	250	180	170	2900	750	230	260	350	400	160	150	140	3300	360	210	270	340	360	150	170	170	3700
SUR75	1500	330	370	460	540	220	200	190	2500	650	300	350	440	540	210	220	210	2700	300	180	240	310	320	140	210	200	2900	230	160	240	270	310	150	250	250	3200

(b) DEC=-30, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	110	79.0	120	150	180	89.0	67.0	56.0	310	100	73.0	110	150	180	86.0	66.0	56.0	370	97.0	72.0	110	150	180	84.0	68.0	59.0	480	58.0	45.0	70.0	93.0	110	52.0	42.0	38.0	440
W8-0C0B120	99.0	66.0	84.0	140	210	98.0	75.0	61.0	300	82.0	63.0	95.0	160	200	96.0	72.0	60.0	370	74.0	61.0	110	170	180	96.0	71.0	60.0	480	44.0	37.0	72.0	90.0	140	62.0	43.0	38.0	440
W8-0C9B120	84.0	63.0	92.0	160	200	95.0	71.0	62.0	300	76.0	62.0	110	170	200	92.0	72.0	63.0	370	70.0	60.0	120	170	190	89.0	73.0	64.0	490	45.0	38.0	77.0	99.0	120	54.0	46.0	41.0	450
W8-12C0B120	87.0	60.0	78.0	140	210	94.0	73.0	61.0	300	73.0	58.0	91.0	160	190	93.0	71.0	60.0	370	66.0	56.0	110	170	170	92.0	72.0	61.0	480	40.0	35.0	70.0	89.0	140	60.0	43.0	38.0	440
SUR	5300	480	570	550	610	260	170	170	2800	2700	400	470	500	590	240	180	170	3000	650	240	260	340	370	160	150	150	3500	350	200	260	320	350	140	180	170	3800
SUR75	1300	320	370	440	560	210	200	190	2700	640	290	350	460	560	200	230	220	2800	300	180	230	310	310	140	220	210	3100	240	160	240	270	290	150	260	260	3300

(c) DEC=-50, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	110	78.0	110	150	180	88.0	66.0	56.0	300	99.0	74.0	110	150	190	86.0	66.0	56.0	370	96.0	72.0	110	150	180	83.0	67.0	58.0	480	58.0	43.0	69.0	92.0	110	51.0	42.0	37.0	430
W8-0C0B120	100	65.0	83.0	140	200	99.0	75.0	61.0	300	80.0	62.0	95.0	160	200	95.0	73.0	61.0	360	73.0	60.0	110	180	170	94.0	73.0	61.0	470	44.0	37.0	72.0	92.0	130	60.0	44.0	38.0	430
W8-0C9B120	86.0	63.0	90.0	160	200	94.0	72.0	61.0	310	76.0	63.0	110	170	200	92.0	72.0	62.0	370	71.0	61.0	120	170	190	89.0	72.0	63.0	480	45.0	38.0	76.0	97.0	120	54.0	46.0	40.0	440
W8-12C0B120	90.0	60.0	77.0	130	210	94.0	73.0	60.0	310	73.0	58.0	90.0	160	190	93.0	73.0	60.0	370	67.0	57.0	100	170	160	91.0	71.0	61.0	470	40.0	35.0	71.0	89.0	140	59.0	43.0	38.0	430
SUR	7100	480	620	540	580	260	170	160	2900	3200	400	500	480	550	240	180	170	3100	860	240	270	330	370	160	150	150	3600	380	200	260	310	350	150	180	170	4100
SUR75	1600	330	370	470	550	210	200	200	2700	710	300	350	470	510	200	230	220	2900	320	190	230	310	300	140	210	210	3300	240	160	240	260	300	150	260	260	3400

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 16: Noise (in μJy) for a 50MHz band after an 8hr synthesis with a 60s integration for the different layouts at different angular scales. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

650MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.6	2.5	3.6	4.6	5.9	2.8	2.1	1.8	9.1
W8-0C0B120	3.3	2.1	2.6	4.5	6.3	3.1	2.4	1.9	9.2
W8-0C9B120	3.0	2.1	2.8	4.9	6.5	3.0	2.3	2.0	9.2
W8-12C0B120	2.8	1.9	2.4	4.2	6.2	2.9	2.3	1.9	9.2
SUR	160	15.0	18.0	16.0	20.0	8.5	5.4	5.2	82.0
SUR75	49.0	10.0	12.0	14.0	17.0	7.0	6.3	6.1	81.0

800MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.2	2.3	3.6	4.7	5.6	2.7	2.1	1.8	11.0
W8-0C0B120	2.6	2.0	3.0	5.0	6.2	3.0	2.3	1.9	11.0
W8-0C9B120	2.5	1.9	3.3	5.2	6.4	2.9	2.2	1.9	11.0
W8-12C0B120	2.3	1.8	2.8	4.8	5.9	2.9	2.3	1.9	11.0
SUR	87.0	12.0	15.0	16.0	20.0	7.8	5.6	5.4	92.0
SUR75	21.0	9.5	11.0	14.0	17.0	6.5	7.0	6.7	87.0

1000MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.0	2.2	3.5	4.8	5.6	2.6	2.1	1.9	14.0
W8-0C0B120	2.4	2.0	3.4	5.5	5.4	2.9	2.3	1.9	14.0
W8-0C9B120	2.3	1.9	3.6	5.4	6.0	2.9	2.3	2.0	15.0
W8-12C0B120	2.1	1.8	3.1	5.2	5.1	2.9	2.3	2.0	14.0
SUR	24.0	7.4	8.2	11.0	13.0	5.0	4.6	4.6	100
SUR75	9.6	5.7	7.4	9.7	10.0	4.5	6.5	6.4	92.0

1400MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	1.8	1.4	2.2	2.9	3.6	1.6	1.3	1.2	13.0
W8-0C0B120	1.4	1.2	2.3	2.9	4.3	1.9	1.4	1.2	13.0
W8-0C9B120	1.4	1.2	2.4	3.1	3.8	1.7	1.4	1.2	13.0
W8-12C0B120	1.3	1.1	2.2	2.7	4.3	1.9	1.4	1.2	13.0
SUR	11.0	6.6	8.5	11.0	11.0	4.6	5.4	5.4	120
SUR75	7.3	5.1	7.5	8.6	9.7	4.6	8.0	7.8	100

(b) DEC=-30, natural weighting

650MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.5	2.5	3.6	4.6	5.7	2.8	2.1	1.8	9.7
W8-0C0B120	3.1	2.1	2.7	4.5	6.6	3.1	2.4	1.9	9.6
W8-0C9B120	2.7	2.0	2.9	5.1	6.2	3.0	2.3	1.9	9.6
W8-12C0B120	2.8	1.9	2.5	4.4	6.6	3.0	2.3	1.9	9.6
SUR	170	15.0	18.0	17.0	19.0	8.2	5.4	5.2	90.0
SUR75	42.0	10.0	12.0	14.0	18.0	6.8	6.4	6.1	85.0

800MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.2	2.3	3.5	4.8	5.7	2.7	2.1	1.8	12.0
W8-0C0B120	2.6	2.0	3.0	5.0	6.2	3.0	2.3	1.9	12.0
W8-0C9B120	2.4	2.0	3.4	5.4	6.2	2.9	2.3	2.0	12.0
W8-12C0B120	2.3	1.8	2.9	5.1	5.9	2.9	2.3	1.9	12.0
SUR	86.0	13.0	15.0	16.0	19.0	7.6	5.6	5.5	96.0
SUR75	20.0	9.2	11.0	15.0	18.0	6.4	7.1	6.9	89.0

1000MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.1	2.3	3.6	4.8	5.7	2.7	2.2	1.9	15.0
W8-0C0B120	2.4	1.9	3.4	5.4	5.5	3.0	2.3	1.9	15.0
W8-0C9B120	2.2	1.9	3.7	5.3	5.9	2.8	2.3	2.0	15.0
W8-12C0B120	2.1	1.8	3.3	5.3	5.2	2.9	2.3	1.9	15.0
SUR	20.0	7.5	8.4	11.0	12.0	5.0	4.7	4.7	110
SUR75	9.5	5.6	7.3	9.9	9.8	4.4	6.9	6.7	97.0

1400MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	1.8	1.4	2.2	2.9	3.6	1.6	1.3	1.2	14.0
W8-0C0B120	1.4	1.2	2.3	2.9	4.4	2.0	1.4	1.2	14.0
W8-0C9B120	1.4	1.2	2.4	3.1	3.8	1.7	1.4	1.3	14.0
W8-12C0B120	1.3	1.1	2.2	2.8	4.4	1.9	1.4	1.2	14.0
SUR	11.0	6.3	8.3	10.0	11.0	4.6	5.5	5.5	120
SUR75	7.4	5.2	7.5	8.4	9.3	4.7	8.3	8.2	100

(c) DEC=-50, natural weighting

650MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.5	2.5	3.6	4.7	5.8	2.8	2.1	1.8	9.6
W8-0C0B120	3.2	2.0	2.6	4.3	6.4	3.1	2.4	1.9	9.5
W8-0C9B120	2.7	2.0	2.9	5.0	6.4	3.0	2.3	1.9	9.7
W8-12C0B120	2.8	1.9	2.4	4.3	6.5	3.0	2.3	1.9	9.6
SUR	220	15.0	20.0	17.0	18.0	8.1	5.4	5.2	91.0
SUR75	50.0	11.0	12.0	15.0	17.0	6.6	6.5	6.2	85.0

800MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.1	2.3	3.6	4.7	5.9	2.7	2.1	1.8	12.0
W8-0C0B120	2.5	2.0	3.0	5.1	6.3	3.0	2.3	1.9	12.0
W8-0C9B120	2.4	2.0	3.5	5.2	6.4	2.9	2.3	2.0	12.0
W8-12C0B120	2.3	1.8	2.8	5.0	6.0	2.9	2.3	1.9	12.0
SUR	100	13.0	16.0	15.0	17.0	7.6	5.7	5.5	100
SUR75	23.0	9.5	11.0	15.0	16.0	6.2	7.1	6.8	91.0

1000MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	3.0	2.3	3.6	4.9	5.7	2.6	2.1	1.8	15.0
W8-0C0B120	2.3	1.9	3.4	5.6	5.5	3.0	2.3	1.9	15.0
W8-0C9B120	2.3	1.9	3.7	5.4	5.9	2.8	2.3	2.0	15.0
W8-12C0B120	2.1	1.8	3.2	5.4	5.2	2.9	2.3	1.9	15.0
SUR	27.0	7.4	8.6	10.0	12.0	4.9	4.7	4.6	120
SUR75	10.0	5.9	7.3	9.7	9.4	4.4	6.8	6.6	100

1400MHz									
resbin	1	2	3	4	5	6	7	8	9
V8	1.8	1.4	2.2	2.9	3.6	1.6	1.3	1.2	14.0
W8-0C0B120	1.4	1.2	2.3	2.9	4.2	1.9	1.4	1.2	14.0
W8-0C9B120	1.4	1.2	2.4	3.1	3.8	1.7	1.4	1.3	14.0
W8-12C0B120	1.3	1.1	2.2	2.8	4.4	1.9	1.4	1.2	14.0
SUR	12.0	6.3	8.2	9.9	11.0	4.7	5.6	5.5	130
SUR75	7.5	5.1	7.4	8.2	9.5	4.7	8.2	8.1	110

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 17: Noise (in μJy) for a 166MHz band after an 8hr synthesis with a 60s integration for the different layouts at different angular scales. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	2.0	1.4	2.0	2.5	3.2	1.5	1.2	1.0	5.0	1.8	1.3	2.0	2.6	3.1	1.5	1.2	1.0	6.1	1.7	1.2	1.9	2.6	3.0	1.5	1.2	1.0	7.8	1.0	0.8	1.2	1.6	2.0	0.9	0.7	0.6	7.0
W8-0C0B120	1.8	1.1	1.4	2.5	3.5	1.7	1.3	1.1	5.0	1.4	1.1	1.7	2.7	3.4	1.7	1.3	1.1	6.1	1.3	1.1	1.9	3.0	3.0	1.6	1.3	1.0	7.8	0.8	0.6	1.3	1.6	2.3	1.1	0.8	0.7	7.1
W8-0C9B120	1.6	1.2	1.5	2.7	3.6	1.6	1.2	1.1	5.1	1.3	1.1	1.8	2.8	3.5	1.6	1.2	1.1	6.2	1.2	1.0	2.0	3.0	3.3	1.6	1.3	1.1	8.0	0.8	0.7	1.3	1.7	2.1	0.9	0.8	0.7	7.2
W8-12C0B120	1.6	1.0	1.3	2.3	3.4	1.6	1.3	1.1	5.0	1.3	1.0	1.5	2.6	3.3	1.6	1.2	1.1	6.2	1.2	1.0	1.7	2.9	2.8	1.6	1.2	1.1	7.9	0.7	0.6	1.2	1.5	2.3	1.0	0.8	0.7	7.1
SUR	90.0	8.0	9.8	8.9	11.0	4.7	3.0	2.8	45.0	48.0	6.8	8.0	8.7	11.0	4.3	3.1	3.0	51.0	13.0	4.1	4.5	6.1	7.0	2.8	2.5	2.5	57.0	6.2	3.6	4.7	5.8	6.2	2.5	3.0	2.9	64.0
SUR75	27.0	5.7	6.5	7.9	9.4	3.8	3.5	3.3	44.0	11.0	5.2	6.1	7.6	9.5	3.6	3.8	3.7	48.0	5.3	3.1	4.1	5.3	5.6	2.5	3.6	3.5	51.0	4.0	2.8	4.1	4.7	5.3	2.5	4.4	4.3	56.0

(b) DEC=-30, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	1.9	1.4	2.0	2.5	3.1	1.5	1.2	1.0	5.3	1.7	1.3	1.9	2.6	3.1	1.5	1.2	1.0	6.5	1.7	1.3	2.0	2.7	3.1	1.5	1.2	1.0	8.3	1.0	0.8	1.2	1.6	2.0	0.9	0.7	0.7	7.6
W8-0C0B120	1.7	1.2	1.5	2.4	3.6	1.7	1.3	1.1	5.3	1.4	1.1	1.7	2.7	3.4	1.7	1.2	1.0	6.4	1.3	1.1	1.9	3.0	3.0	1.7	1.2	1.0	8.4	0.8	0.6	1.2	1.6	2.4	1.1	0.8	0.7	7.6
W8-0C9B120	1.5	1.1	1.6	2.8	3.4	1.6	1.2	1.1	5.3	1.3	1.1	1.9	3.0	3.4	1.6	1.3	1.1	6.5	1.2	1.0	2.0	2.9	3.3	1.5	1.3	1.1	8.4	0.8	0.7	1.3	1.7	2.1	0.9	0.8	0.7	7.8
W8-12C0B120	1.5	1.0	1.3	2.4	3.6	1.6	1.3	1.1	5.3	1.3	1.0	1.6	2.8	3.2	1.6	1.2	1.0	6.4	1.1	1.0	1.8	2.9	2.9	1.6	1.2	1.1	8.3	0.7	0.6	1.2	1.5	2.4	1.0	0.8	0.7	7.6
SUR	91.0	8.3	9.9	9.5	11.0	4.5	3.0	2.9	49.0	47.0	7.0	8.1	8.7	10.0	4.1	3.1	3.0	53.0	11.0	4.1	4.6	5.9	6.5	2.7	2.6	2.6	60.0	6.1	3.5	4.5	5.5	6.1	2.5	3.0	3.0	66.0
SUR75	23.0	5.6	6.4	7.7	9.8	3.7	3.5	3.3	47.0	11.0	5.0	6.1	8.0	9.8	3.5	3.9	3.8	49.0	5.2	3.1	4.0	5.4	5.4	2.4	3.8	3.7	53.0	4.1	2.8	4.1	4.6	5.1	2.6	4.6	4.5	58.0

(c) DEC=-50, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	1.9	1.4	2.0	2.6	3.2	1.5	1.1	1.0	5.3	1.7	1.3	2.0	2.6	3.2	1.5	1.2	1.0	6.4	1.7	1.3	2.0	2.7	3.1	1.4	1.2	1.0	8.3	1.0	0.8	1.2	1.6	1.9	0.9	0.7	0.7	7.5
W8-0C0B120	1.8	1.1	1.4	2.4	3.5	1.7	1.3	1.1	5.2	1.4	1.1	1.6	2.8	3.4	1.7	1.3	1.1	6.3	1.3	1.0	1.9	3.1	3.0	1.6	1.3	1.1	8.2	0.8	0.6	1.3	1.6	2.3	1.0	0.8	0.7	7.5
W8-0C9B120	1.5	1.1	1.6	2.8	3.5	1.6	1.3	1.1	5.3	1.3	1.1	1.9	2.9	3.5	1.6	1.2	1.1	6.4	1.2	1.1	2.0	3.0	3.2	1.5	1.3	1.1	8.4	0.8	0.7	1.3	1.7	2.1	0.9	0.8	0.7	7.7
W8-12C0B120	1.6	1.0	1.3	2.3	3.6	1.6	1.3	1.0	5.3	1.3	1.0	1.6	2.7	3.3	1.6	1.3	1.0	6.4	1.2	1.0	1.8	3.0	2.8	1.6	1.2	1.1	8.2	0.7	0.6	1.2	1.5	2.4	1.0	0.8	0.7	7.5
SUR	120	8.3	11.0	9.4	10.0	4.5	3.0	2.9	50.0	55.0	7.0	8.6	8.3	9.5	4.2	3.1	3.0	55.0	15.0	4.1	4.7	5.6	6.4	2.7	2.6	2.5	63.0	6.6	3.5	4.5	5.5	6.1	2.6	3.1	3.0	71.0
SUR75	27.0	5.8	6.4	8.2	9.6	3.6	3.6	3.4	47.0	12.0	5.2	6.0	8.1	8.8	3.4	3.9	3.8	50.0	5.6	3.2	4.0	5.3	5.2	2.4	3.7	3.6	57.0	4.1	2.8	4.1	4.5	5.2	2.6	4.5	4.4	59.0

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 18: SNR after 8 hours relative to a 10μJy source at 1000Hz (166 MHz band) with a spectral index of -0.7 for the different layouts. These values are generated at 650, 800 and 1000 MHz, at angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	6.8	9.8	6.9	5.3	4.2	8.9	11.7	13.9	2.7	6.7	9.2	5.9	4.6	3.8	7.8	10.1	11.8	1.9	6.0	8.2	5.2	3.8	3.3	6.9	8.6	9.8	1.3	7.9	10.5	6.7	5.0	4.0	8.8	11.0	12.3	1.1
W8-0C0B120	7.4	11.8	9.4	5.5	3.9	8.0	10.4	12.8	2.7	8.2	10.7	7.1	4.3	3.4	7.0	9.2	11.1	1.9	7.6	9.3	5.4	3.3	3.4	6.2	8.0	9.5	1.3	10.4	12.3	6.3	5.0	3.4	7.5	10.4	12.0	1.1
W8-0C9B120	8.2	11.6	8.9	5.0	3.8	8.3	10.9	12.6	2.7	8.7	11.0	6.4	4.1	3.3	7.2	9.5	11.0	1.9	8.0	9.6	5.0	3.4	3.0	6.4	7.9	9.0	1.2	10.2	12.1	6.0	4.7	3.8	8.3	10.0	11.5	1.1
W8-12C0B120	8.7	13.1	10.2	5.9	4.0	8.4	10.6	12.7	2.7	9.2	11.8	7.7	4.4	3.6	7.3	9.4	11.0	1.9	8.6	10.3	5.8	3.5	3.6	6.4	8.0	9.2	1.3	11.2	13.3	6.7	5.3	3.4	7.7	10.3	11.6	1.1
SUR	0.1	1.7	1.4	1.5	1.3	2.9	4.6	4.8	0.3	0.2	1.7	1.5	1.3	1.1	2.7	3.8	3.9	0.2	0.8	2.5	2.2	1.6	1.4	3.6	3.9	4.0	0.2	1.3	2.2	1.7	1.4	1.3	3.1	2.6	2.7	0.1
SUR75	0.5	2.4	2.1	1.7	1.4	3.5	3.9	4.1	0.3	1.0	2.2	1.9	1.5	1.2	3.3	3.1	3.2	0.2	1.9	3.2	2.5	1.9	1.8	4.1	2.8	2.9	0.2	2.0	2.8	1.9	1.7	1.5	3.1	1.8	1.8	0.1

(b) DEC=-30, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	7.0	9.9	6.8	5.3	4.3	8.8	11.7	13.8	2.5	6.7	9.2	6.0	4.4	3.7	7.8	10.2	11.9	1.8	5.9	8.0	5.1	3.8	3.2	6.8	8.4	9.8	1.2	7.8	10.2	6.5	4.9	4.0	8.8	10.8	12.1	1.0
W8-0C0B120	7.8	11.7	9.2	5.5	3.7	8.0	10.4	12.8	2.6	8.2	10.7	7.1	4.3	3.4	7.0	9.4	11.3	1.8	7.7	9.4	5.3	3.4	3.3	6.0	8.1	9.6	1.2	10.4	12.3	6.4	5.0	3.2	7.3	10.6	12.0	1.0
W8-0C9B120	9.3	12.4	8.5	4.8	4.0	8.2	10.9	12.6	2.6	8.9	10.9	6.2	4.0	3.4	7.3	9.3	10.7	1.8	8.2	9.7	4.9	3.4	3.1	6.5	7.9	9.1	1.2	10.1	12.0	5.9	4.6	3.8	8.4	10.0	11.2	1.0
W8-12C0B120	8.9	13.0	10.0	5.7	3.7	8.2	10.7	12.9	2.6	9.2	11.6	7.4	4.2	3.6	7.2	9.4	11.2	1.8	8.7	10.3	5.5	3.5	3.5	6.3	8.0	9.4	1.2	11.3	13.2	6.5	5.1	3.3	7.6	10.5	11.8	1.0
SUR	0.1	1.6	1.4	1.4	1.3	3.0	4.5	4.7	0.3	0.2	1.7	1.4	1.4	1.1	2.8	3.8	3.9	0.2	0.9	2.4	2.2	1.7	1.5	3.6	3.9	3.9	0.2	1.3	2.3	1.7	1.4	1.3	3.1	2.6	2.6	0.1
SUR75	0.6	2.4	2.1	1.8	1.4	3.6	3.9	4.0	0.3	1.0	2.3	1.9	1.5	1.2	3.3	3.0	3.1	0.2	1.9	3.2	2.5	1.9	1.9	4.1	2.7	2.7	0.2	1.9	2.8	1.9	1.7	1.6	3.1	1.7	1.8	0.1

(c) DEC=-50, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	7.0	10.0	6.9	5.3	4.2	8.9	11.8	13.8	2.6	6.8	9.1	5.9	4.5	3.6	7.8	10.2	12.0	1.8	6.0	8.0	5.1	3.7	3.2	6.9	8.6	9.9	1.2	7.8	10.5	6.6	5.0	4.0	8.9	10.9	12.2	1.1
W8-0C0B120	7.7	12.1	9.4	5.7	3.8	7.9	10.4	12.7	2.6	8.4	10.9	7.1	4.2	3.4	7.1	9.2	11.0	1.9	7.8	9.5	5.3	3.3	3.3	6.1	7.9	9.4	1.2	10.4	12.4	6.3	5.0	3.4	7.6	10.3	11.8	1.1
W8-0C9B120	9.0	12.3	8.6	4.9	3.9	8.3	10.8	12.7	2.5	8.8	10.7	6.2	4.1	3.3	7.3	9.4	10.9	1.8	8.1	9.5	4.9	3.4	3.1	6.5	8.0	9.1	1.2	10.2	12.1	6.0	4.7	3.8	8.4	9.9	11.3	1.0
W8-12C0B120	8.7	13.1	10.1	5.8	3.8	8.2	10.6	13.0	2.5	9.3	11.7	7.5	4.3	3.6	7.3	9.3	11.3	1.8	8.6	10.2	5.6	3.4	3.5	6.3	8.1	9.5	1.2	11.3	13.1	6.5	5.1	3.3	7.7	10.5	12.0	1.1
SUR	0.1	1.6	1.3	1.4	1.3	3.0	4.5	4.7	0.3	0.2	1.7	1.4	1.4	1.2	2.8	3.8	3.9	0.2	0.7	2.5	2.1	1.8	1.6	3.7	3.9	3.9	0.2	1.2	2.3	1.8	1.4	1.3	3.1	2.6	2.6	0.1
SUR75	0.5	2.3	2.1	1.6	1.4	3.7	3.8	4.0	0.3	0.9	2.2	1.9	1.4	1.3	3.4	3.0	3.1	0.2	1.8	3.1	2.5	1.9	1.9	4.2	2.7	2.8	0.2	1.9	2.8	1.9	1.8	1.5	3.1	1.8	1.8	0.1

Table 19: SNR after 8 hours relative to a 10μJy source at 1000Hz (166 MHz band) with a spectral index of -0.7 averaged over 650,800 and 1000MHz, for the different layouts at different angular scales. These values are generated for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	6.9	9.5	6.2	4.7	3.8	8.1	10.4	12.0	1.9
W8-0C0B120	8.5	11.1	7.2	4.6	3.5	7.2	9.6	11.4	1.9
W8-0C9B120	8.8	11.1	6.8	4.3	3.5	7.6	9.6	11.1	1.8
W8-12C0B120	9.5	12.2	7.8	4.9	3.6	7.5	9.6	11.2	1.9
SUR	0.8	2.0	1.7	1.5	1.3	3.1	3.8	3.9	0.2
SUR75	1.5	2.7	2.1	1.7	1.5	3.5	3.0	3.1	0.2

(b) DEC=-30, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	6.9	9.3	6.1	4.6	3.8	8.1	10.3	12.0	1.8
W8-0C0B120	8.6	11.1	7.1	4.6	3.4	7.1	9.7	11.5	1.8
W8-0C9B120	9.2	11.3	6.5	4.2	3.6	7.7	9.6	11.0	1.8
W8-12C0B120	9.6	12.1	7.5	4.7	3.5	7.4	9.7	11.4	1.8
SUR	0.8	2.0	1.7	1.5	1.3	3.2	3.8	3.9	0.2
SUR75	1.5	2.7	2.1	1.7	1.5	3.6	2.9	3.0	0.2

(c) DEC=-50, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	7.0	9.4	6.2	4.7	3.8	8.2	10.4	12.1	1.8
W8-0C0B120	8.7	11.3	7.2	4.6	3.5	7.2	9.5	11.3	1.8
W8-0C9B120	9.1	11.2	6.6	4.3	3.5	7.7	9.6	11.1	1.8
W8-12C0B120	9.5	12.1	7.6	4.7	3.5	7.4	9.7	11.5	1.8
SUR	0.7	2.0	1.7	1.5	1.4	3.2	3.8	3.9	0.2
SUR75	1.4	2.7	2.1	1.7	1.6	3.6	2.9	3.0	0.2

Table 20: The hours required to reach a mean SNR of 10 (average over 650,800 and 1000MHz), relative to a 10μJy source at 1000MHz with a spectral index of -0.7 for the different layouts at different angular scales. These values are generated for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	16.9	8.9	20.8	36.1	54.4	12.1	7.4	5.5	230.7
W8-0C0B120	11.2	6.5	15.5	37.7	64.3	15.3	8.8	6.1	231.2
W8-0C9B120	10.3	6.5	17.6	42.6	64.9	13.8	8.6	6.5	237.8
W8-12C0B120	8.9	5.4	13.2	33.8	60.7	14.3	8.6	6.4	234.5
SUR	1399	192.3	270.1	373.1	497.5	82.6	55.0	52.3	1.692e+04
SUR75	362.4	110.2	181.1	274.6	354.1	65.0	89.8	83.8	1.502e+04

(b) DEC=-30, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	16.8	9.2	21.3	37.1	54.8	12.2	7.5	5.6	261.2
W8-0C0B120	10.8	6.5	15.7	37.5	68.1	15.8	8.5	6.0	259.3
W8-0C9B120	9.5	6.3	18.8	44.6	62.1	13.7	8.7	6.7	262.4
W8-12C0B120	8.7	5.5	14.1	36.4	63.8	14.7	8.5	6.2	258.2
SUR	1260	194.3	273.4	365.4	456.5	79.8	56.5	53.9	1.926e+04
SUR75	362.3	108.8	177.3	276.8	347.9	63.3	94.6	88.2	1.637e+04

(c) DEC=-50, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	16.6	9.0	21.2	36.8	55.3	12.0	7.3	5.5	257.1
W8-0C0B120	10.7	6.3	15.5	37.5	65.7	15.4	8.8	6.3	250.7
W8-0C9B120	9.8	6.4	18.6	43.3	64.4	13.6	8.7	6.5	261.6
W8-12C0B120	8.8	5.5	13.8	35.8	63.7	14.6	8.5	6.0	257.5
SUR	1641	191.8	290.7	344.7	431.8	79.7	56.4	53.8	2.038e+04
SUR75	398.1	113	176.9	281	326	61.1	94.9	88.6	1.703e+04

resbin	1	2	3	4	5	6	7	8	9
Resolution [arcsec]	0.4-1	0.4-2	1-2	2-3	3-4	3-10	10-60	10-100	600-3600

Table 21: Relative (w.r.t SUR at 800MHz) survey speeds for the different layouts, calculated using the FOV (using PAF FOV for SKASUR) values given in the SRD [2] and the values in table 18. These values are generated at 650, 800 and 1000MHz for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	68.2	3.0	2.0	1.4	1.4	1.0	0.8	1.1	12.5	43.6	1.7	0.9	0.7	0.7	0.5	0.4	0.5	4.2	22.7	0.9	0.5	0.3	0.4	0.2	0.2	0.2	1.1	20.0	0.7	0.4	0.3	0.3	0.2	0.2	0.2	0.5
W8-0C0B120	80.9	4.3	3.6	1.5	1.2	0.8	0.7	0.9	12.5	64.5	2.3	1.4	0.6	0.6	0.4	0.3	0.5	4.2	36.4	1.1	0.5	0.2	0.4	0.2	0.2	0.2	1.1	34.5	1.0	0.4	0.3	0.2	0.2	0.1	0.2	0.5
W8-0C9B120	100.0	4.2	3.3	1.2	1.1	0.8	0.7	0.9	12.5	73.6	2.5	1.1	0.6	0.6	0.4	0.4	0.5	4.0	40.0	1.2	0.4	0.2	0.3	0.2	0.2	0.2	1.1	33.6	1.0	0.3	0.2	0.2	0.2	0.1	0.2	0.4
W8-12C0B120	109.1	5.3	4.4	1.8	1.2	0.8	0.7	0.9	12.5	81.8	2.8	1.6	0.7	0.7	0.4	0.4	0.5	4.0	45.5	1.4	0.6	0.3	0.4	0.2	0.2	0.2	1.1	40.0	1.2	0.4	0.3	0.2	0.2	0.1	0.2	0.5
SUR	0.4	1.0	0.9	1.3	1.4	1.2	1.5	1.5	1.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	10.0	2.1	2.3	1.5	1.8	1.8	1.1	1.0	0.6	26.4	1.6	1.3	1.0	1.4	1.4	0.5	0.5	0.3
SUR75	4.2	1.9	2.0	1.7	1.8	1.7	1.0	1.1	1.8	17.3	1.7	1.7	1.3	1.3	1.5	0.7	0.6	1.1	59.1	3.6	2.8	2.0	2.8	2.3	0.5	0.5	0.7	63.6	2.8	1.7	1.6	1.9	1.3	0.2	0.2	0.4

(b) DEC=-30, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	72.7	3.2	2.0	1.4	1.2	0.9	0.8	1.1	11.4	43.6	1.8	1.1	0.6	0.6	0.5	0.4	0.6	4.0	21.8	0.9	0.5	0.3	0.3	0.2	0.2	0.2	1.1	19.1	0.7	0.4	0.3	0.2	0.2	0.2	0.2	0.4
W8-0C0B120	90.9	4.4	3.8	1.5	1.0	0.7	0.7	1.0	12.5	65.5	2.4	1.5	0.6	0.5	0.4	0.4	0.5	4.0	37.3	1.2	0.5	0.2	0.3	0.2	0.2	0.2	1.1	34.5	1.1	0.4	0.3	0.2	0.1	0.1	0.2	0.4
W8-0C9B120	127.3	5.0	3.2	1.2	1.0	0.8	0.7	1.0	12.5	76.4	2.6	1.1	0.5	0.5	0.4	0.4	0.4	4.0	41.8	1.3	0.4	0.2	0.3	0.2	0.2	0.2	1.1	32.7	1.0	0.3	0.2	0.2	0.2	0.1	0.2	0.4
W8-12C0B120	118.2	5.4	4.3	1.6	1.0	0.8	0.7	1.0	12.5	82.7	3.0	1.6	0.6	0.6	0.4	0.4	0.5	4.0	47.3	1.5	0.6	0.2	0.3	0.2	0.2	0.2	1.1	40.9	1.2	0.4	0.3	0.2	0.1	0.1	0.2	0.4
SUR	0.4	1.0	0.9	1.1	1.2	1.1	1.4	1.5	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12.7	2.2	2.3	1.5	1.8	1.7	1.0	1.0	0.6	27.3	1.9	1.5	1.1	1.2	1.3	0.5	0.4	0.3
SUR75	5.6	2.2	2.2	1.7	1.4	1.7	1.0	1.1	1.7	18.2	1.9	1.8	1.2	1.1	1.4	0.6	0.6	1.1	60.0	3.8	3.0	1.8	2.6	2.1	0.5	0.5	0.7	60.9	2.8	1.8	1.6	1.8	1.2	0.2	0.2	0.4

(c) DEC=-50, natural weighting

	650MHz									800MHz									1000MHz									1400MHz								
resbin	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
V8	97.6	3.1	2.3	1.3	1.1	0.9	0.9	1.1	13.4	61.0	1.7	1.1	0.6	0.5	0.5	0.4	0.6	4.4	30.5	0.9	0.5	0.3	0.3	0.2	0.2	0.2	1.2	25.6	0.7	0.5	0.2	0.2	0.2	0.2	0.2	0.5
W8-0C0B120	117.1	4.7	4.2	1.5	0.9	0.7	0.7	1.0	13.4	91.5	2.5	1.6	0.5	0.4	0.4	0.4	0.5	4.5	51.2	1.2	0.6	0.2	0.3	0.2	0.2	0.2	1.2	46.3	1.0	0.4	0.2	0.1	0.1	0.1	0.2	0.5
W8-0C9B120	158.5	4.9	3.6	1.1	0.9	0.8	0.8	1.0	12.2	101.2	2.4	1.2	0.5	0.4	0.4	0.4	0.5	4.3	54.9	1.2	0.5	0.2	0.2	0.2	0.2	0.2	1.2	43.9	1.0	0.4	0.2	0.2	0.2	0.1	0.2	0.5
W8-12C0B120	146.3	5.5	5.2	1.5	0.9	0.8	0.7	1.0	13.4	112.2	2.9	1.8	0.6	0.5	0.4	0.4	0.5	4.3	62.2	1.4	0.7	0.2	0.3	0.2	0.2	0.2	1.2	53.7	1.2	0.5	0.3	0.1	0.1	0.2	0.2	0.5
SUR	0.3	0.9	0.8	1.1	1.2	1.2	1.5	1.5	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	9.9	2.2	2.5	1.6	1.6	1.7	1.1	1.0	0.5	31.7	1.8	1.7	1.1	1.1	1.2	0.5	0.4	0.3
SUR75	5.4	1.9	2.4	1.4	1.3	1.8	1.0	1.0	1.8	19.5	1.8	2.1	1.1	1.1	1.5	0.6	0.6	1.2	70.7	3.3	3.3	1.8	2.5	2.2	0.5	0.5	0.7	81.7	2.9	2.0	1.6	1.6	1.2	0.2	0.2	0.4

Table 22: Relative (w.r.t SUR) average survey speeds for the different layouts, calculated using the FOV (PAF FOV for SKASUR) values given in the SRD [2] and the values in table 18. These values are generated for angular scales {0.4-1, 0.4-2, 1-2, 2-3, 3-4, 3-10, 10-60, 10-100, 600-3600} arcsec and are labelled *resbin* {1, 2, 3, 4, 5, 6, 7, 8, 9} respectively. This is done for natural weighting at declinations -10, -30 and -50 degrees. For each column the intensity of the colour increases with the value.

(a) DEC=-10, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	3.1	1.2	0.8	0.7	0.6	0.4	0.5	0.6	6.4
W8-0C0B120	4.2	1.8	1.4	0.7	0.5	0.3	0.4	0.5	6.3
W8-0C9B120	4.9	1.6	1.2	0.6	0.5	0.4	0.4	0.5	6.2
W8-12C0B120	5.5	2.2	1.6	0.8	0.5	0.4	0.4	0.5	6.3
SUR	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SUR75	3.3	1.8	1.4	1.4	1.4	1.3	0.6	0.7	1.1

(b) DEC=-30, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	2.9	1.2	0.8	0.7	0.5	0.4	0.5	0.6	6.4
W8-0C0B120	4.0	1.7	1.3	0.7	0.4	0.3	0.4	0.5	6.5
W8-0C9B120	5.1	1.9	1.1	0.5	0.5	0.4	0.4	0.5	6.5
W8-12C0B120	5.1	2.1	1.6	0.7	0.4	0.4	0.4	0.6	6.6
SUR	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SUR75	2.8	1.8	1.5	1.3	1.3	1.3	0.6	0.6	1.1

(c) DEC=-50, natural weighting

resbin	1	2	3	4	5	6	7	8	9
V8	3.6	1.2	0.8	0.6	0.5	0.4	0.5	0.6	6.8
W8-0C0B120	4.8	1.8	1.4	0.7	0.4	0.3	0.4	0.5	7.1
W8-0C9B120	5.9	1.8	1.2	0.5	0.4	0.4	0.4	0.5	6.8
W8-12C0B120	6.0	2.0	1.7	0.7	0.4	0.4	0.4	0.6	6.8
SUR	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SUR75	3.2	1.6	1.5	1.2	1.4	1.3	0.6	0.6	1.2