

# Summary of Configuration Parameters

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An overview of parameters that drive the design of configurations is presented.

## Area designations

Core – central condensation per technology type, 500 m radius

Inner – continuation of central condensation per technology type, up to 2.5 km radius

Skirt region – annulus around inner region, 2.5 km to 13 km radius (the skirt is the inner part of the mid region)

Mid region – annulus around inner region, 2.5 km to 180 km radius

Remote region – annulus around the mid region, 180 to 3000+ km in radius

## Overall layout description

Three **core/inner regions**, each about 5 km in diameter, that are dedicated to the three types of receptor technologies (dishes, dense and sparse aperture arrays). The edges of the inner regions are separated by nominally 1000 metres; 6 km separation of centres of core/inner regions. Practical terrain constraints may drive inner region placement and hence cost of signal transport to the central signal processing facility located near the three inner regions.

Around the inner regions **individual dishes** will be placed in a **skirt** region to provide a gradual transition to the log-**spiral** arrangement of **clumps** of antennas up to the outer limit of the mid region. The individual dishes trace the spiral arms going from the inner regions outward into the mid region. The placement of clumps of dishes to be combined with the **AA stations** along the spiral arms as close to the inner regions as is possible for the actual locations of the three inner regions.

Beyond the mid region the **remote stations** will be planned.

## Distribution of collecting area

The table below summarises a number of properties of the configuration in terms of distribution of dishes and AA stations. The table does not list PAF's as these will be placed on (a subset of) the dishes.

Collecting area													
region	radius km	dishes				dense AA (high)				sparse AA (low)			
		%		# dishes		%		# stations		%		# stations	
		cum.	zone	cum.	zone	cum.	zone	cum.	zone	cum.	zone	cum.	zone
core	0.5	20	20	600	600	30	30	75	75				
inner	2.5	50	30	1500	900	66	36	165	90	66	66	165	165
mid	skirt 13	61.7	11.7	1850	350								
	180	80	30	2400	900	100	34	250	85	100	34	250	85
remote	3000+	100	20	3000	600								
	Total		100		3000		100		250		100		250

Table 1: distribution of collecting area. Numbers in the columns labelled 'cum' and 'zone' indicate the cumulative number up to that zone, resp. the number in that zone.

## Spiral arms

The winding parameters of the spirals are chosen such that good uv coverage is obtained. In the skirt region a gradual transition takes place from one set of traditional spiral parameters appropriate close in, to a set more suited for the rest of the mid area. The shape of the spiral is defined by the following equation, see [1]:

$$r = a \times \exp\left(\frac{b \times \theta^3}{(\theta + \phi)^2}\right)$$

where  $a$ ,  $b$  and  $\phi$  are constants,  $r$  is the radius from the centre and  $\theta$  is the polar angle. The values of the constants are  $a=2.5\text{km}$ ,  $b=1.5$  and  $\phi=4.0$ . The number of spiral arms is 5.

### Stations

For 5 spiral arms, in the mid region the number of AA stations is  $85/5=17$  per arm (ref. Table 1). The clumps of dishes in this area, but outside the skirt (see below), are to be co-located with the AA stations as much as possible. For the 900/5 dishes in the mid region per arm that implies clumps with 11 dishes.

For the purpose of the current study of configurations it has been agreed to limit the number of stations in the remote region to 25. There will be 600 dishes in total in this area, which implies remote stations with 24 dishes each.

### The Skirt

A skirt region is proposed where dishes are placed **individually** along the spiral arms from 2.5 to 13 km in radius. The log distribution of collecting area requires that there are a total of 350 dishes in this skirt region (ref. Table 1). That results in 70 individual dishes per spiral arm up to 13 km radius along that arm for a 5 arm configuration.

This also implies that the number of **clumps** in the mid region outside the skirt is  $(900-350)/11=50$ , so 10 clumps per arm.

Within this skirt region the **AA stations** will be placed on the dish spiral arms where possible, but a limited amount of extra trenching may be required to avoid having very unbalanced AA layouts as a result of the offsets between the AA and dish core/inner regions.

### Reference

[1] Configurations: Intermediate dish distribution, R.C. Bolton, R.P. Millenaar, CTF, 23-2-2010