

Beam Naming Conventions for Astrid and the Configuration Tool

This document outlines the naming convention within Astrid and the Configuration Tool that observers will use for the upcoming new GBT arrays starting with the K-band Focal Plane Array which will become available in 2010. The current convention does not allow for more than 9 beams in a receiver. This needs to be updated to allow for any number of beams (or pixels) in a receiver.

Requirements:

- We want to expand the beam numbers available for configurations and astrid scan types to have any number of beams.
- The new naming convention will not require any changes to current observing scripts. I.e., we will not break any current observing script.

The old naming convention:

In the configurations the potential values are:

1. beam = "B1" setup IF system for beam 1 only
2. beam = "B2" setup IF system for beam 2 only
3. beam = "B3" setup IF system for beam 3 only
4. beam = "B4" setup IF system for beam 4 only
5. beam = "B12" setup IF system for both beams 1 and 2
6. "beam = B34" setup IF system for both beams 3 and 4

For scan types in Astrid:

1. beamName="1" use beam 1 for position on sky
2. beamName="2" use beam 2 for position on sky
3. beamName="3" use beam 3 for position on sky
4. beamName="4" use beam 4 for position on sky
5. beamName="C" use the center of the feed box for position on sky
6. beamName="MR12" use the mid-point between beams 1 and 2 for position on sky
7. beamName="MR34" use the mid-point between beams 3 and 4 for position on sky

For subBeamNod "MR12" means sub-reflector nod between beams 1 and 2 and "MR34" means sub-reflector nod between beams 3 and 4.

The new naming convention:

The simplest way to meet the requirements is to come up with new nomenclature. That way the configuration tool and scan types know what "version" they are dealing with and know how to handle them.

For the configuration scripts the new syntax will be

beam= "1"

beam= "2"

beam= "3"

and so on through all the allowable beam number for a given receiver/array. There will also be an "All" value which is used to setup the IF signal for all beams available for the array. Additionally the

beam parameter syntax will follow the current sdfits scans syntax to allow for many different beams to be routed through the IF system:

1. beam="1,2,10" would setup IF signals for beam 1, beam 2 and beam 10
2. beam="1:17" would setup IF signals for beams 1 through 17
3. beam="1:3,8" would setup IF signals for beams 1, 2, 3 and 8
4. beam="100,3:5" would setup IF signals for beams 3, 4, 5, and 100
5. beam="All" would setup IF signals for all beams in the array

The tracking beam will be the first beam in the list. For example:

1. for Beam="2,3,1,10" the tracking beam would be beam 2
2. for Beam="1:10" the tracking beam would be beam 1
3. for Beam="All" the tracking beam would be the lowest number beam available

The leading number (new version) or B (old version) tells the configuration tool which syntax is in play and allows all the old scripts to remain valid.

For all scan types we would have BeamName values of "C", "1", "2", "3", ..., "10", "11", ..., "100", "101", ... where "C" denotes the position of the "box center" of the feed. The center of the array and the center of the feed box can be different (e.g. the current Q-band receiver). So there will be an additional "arraycenter" value to specify the center of the array. For the mid-point values we would have a comma separated list:

1. "MR7,11" for beams 7 and 11
2. "MR12,67" for beams 12 and 67
3. "MR100,1" for beams 100 and 1

When the scan type sees a beamName with MR and a "," (comma) it knows it is the new syntax and when the "," (comma) is not present it is the old syntax.

For large arrays it will be cumbersome to include all the possible MR values. These can be easily calculated as follows. Let beam j have offset values of x_j and y_j . Likewise beam k will have offset values of x_k and y_k . The MRj_k offset values are then just $x = 0.5 * (x_j + x_k)$ and $y = 0.5 * (y_j + y_k)$.

Some scan types currently assume a default value for a reference beam based on the beamName value. With array receivers the reference beam will have to be explicitly specified for these scan type. A new parameter called "refBeam" will be used to specify the reference beam. It will take the same inputs as beamName. The default value of refBeam should be None. The default value of beamName should be "1". When a scan type encounters refBeam=None it should perform the operations that it currently performs.

The following scan types should have refBeam added to them:

Peak, Focus, AutoPeakFocus, AutoFocus, AutoPeak, AutoOOF

SubBeamNod will have two new arguments added. These will be beam1 and beam2 that function in the same manner as the Nod procedure. Default values for SubBeamNod will be beamName=None, beam1=None and beam2=None. If beamName is specified then the SubBeamNod will perform operations as it currently does. If beam1 and beam2 are specified then the subreflector motion should be between the two specified beams. If all three arguments are defined then beam1 and beam2 will take precedence.

