

Subreflector Nodding with the GBT

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SR Nodding Introduction

- SR nodding is designed to mimic a traditional Nod observation by tilting the subreflector instead of moving the whole telescope. As such, it has much lower overhead (3 seconds) and faster switching is possible. This faster switching results in better baselines for faint, wide spectral lines. For narrow lines, the reduced overhead helps observing efficiency.
- It can be used with any backend, but there appears to be a small (~ 30 mK) power offset between the two positions, so it is not recommended for CCB observations.

SR Nodding Commands

There are two ways to command subreflector motions:

1. *SubBeamNod* command
2. the *submotion* class

All observers should be able to get by with the *SubBeamNod* command.

SubBeamNod

SubBeamNod(location, scanDuration, beamName, nodLength,
nodUnit)

example:

```
SubBeamNod("3C48", 60.0, "MR12", nodlength=3,  
nodUnit="integrations")
```

- beamName must be "MR12" or "MR34" (depending on receiver).
- nodLength is the half-cycle time. That is the time spent in one position plus move time to the second position.
- nodUnit can also be "seconds". It can only be "integrations" for the Spectrometer or DCR, all other backends must use "seconds".
- There is no need for scanDuration (specified in seconds) to be a multiple of nodLength

submotion

submotion class is an option for any scan type (i.e. Track, Nod, OnOff, etc.). Currently available building blocks are *SubFocus*, *SubHome*, *SubNod*, and *SubNull*. The *SubNod* building block would be used for nodding.

example:

```
Track("3C48", None, 60.0, beamName="MR12",  
submotion=SubNod(nodlength=3, nodUnit="integrations"))
```

Options are the same as for *SubBeamNod*.

The *SubFocus* command allows a manual focus. *SubHome* zeros the subreflector position. *SubNull* preserves the current configuration of the subreflector.

SR Nodding Policies

- Currently nodding is only released for Ka-band observations, but it should work for all dual-beam receivers (Ku, K, Ka, Q).
- Observers must do a focus observation every 45 minutes to lubricate actuators.
- The minimum half-cycle time is 4.4 seconds (or 3 1.5 second Spectrometer integrations), but it can be as long as you want. Half-cycle times greater than 30 seconds should be discouraged.
- Reduction scripts are still in a rough state, so observers may need some help reducing their data.