

VLBA Wideband Receiver Checkout Test

1/12/2021

From the VLBA coord wiki

- Wideband receiver checkout test setups: need new test files that make use of RDBE
 - Combine with testing of fast data links for near-realtime tests

RX Frequency Spans

Per the VLBA OSS, we have the following RX and frequency ranges (in GHz)

<https://science.nrao.edu/facilities/vlba/docs/manuals/oss/bands-perf>

90cm:	0.312	-	0.342
50cm:	0.596	-	0.626
21cm:	1.35	-	1.75
13cm:	2.2	-	2.4
6 cm:	3.9	-	7.9
4 cm:	8.0	-	8.8
2 cm:	12.0	-	15.4
1 cm:	21.7	-	24.1
7 mm:	41.0	-	45.0
3 mm:	80.0	-	90.0

RX Frequency Spans/Ranges

90cm:	0.312	-	0.342	→	30 MHz
50cm:	0.596	-	0.626	→	30 MHz
21cm:	1.35	-	1.75	→	400 MHz (but see next slide)
13cm:	2.2	-	2.4	→	200 MHz
6 cm:	3.9	-	7.9	→	4 GHz
4 cm:	8.0	-	8.8	→	800 MHz
2 cm:	12.0	-	15.4	→	3.4 GHz
1 cm:	21.7	-	24.1	→	2.4 GHz
7 mm:	41.0	-	45.0	→	4 GHz
3 mm:	80.0	-	90.0	→	10 GHz

The settings

- Assuming 4 Gbps and dual (or single) polarization recording:
 - Instantaneous bandwidth is 512 MHz (or 1024 MHz)

Receiver	BW	Settings (dual, single pol)
90cm	30 MHz	One, one
50cm	30 MHz	One, one
21cm: Note: extended range 1.2-1.9 GHz. Other receivers may also have extended ranges.	700 MHz if using the extended range	Two, one. Note: LO restrictions could force having more settings. LO restrictions may impact other bands.
13cm	200 MHz (This range will expand if the RFI filters are removed)	One, one
6cm	4 GHz	Eight, four
4cm	800 MHz	Two, one
2cm	3.4 GHz	Seven, four
1cm	2.4 GHz	Five, three
7mm	4 GHz	Eight, four
3mm	10 GHz	Twenty, ten

Some notes/questions – 1/2

- Dual/single pol?
 - Do dual pol recording, so at least 55 settings (but LO restrictions will push this up)
 - Have one key file for everything but 3mm, one for only 3mm
- Old tests used pointing style data, now we can use correlation
 - Do collimation when a new RX is installed, then
 - Do the wideband checkout using regular scans
- Up to one hour of observing? How much time per scan?
 - 1 min per scan/setting for all bands except for 3mm. For 3mm, use 3 minute long scans.
 - For the file with everything except 3mm: expect about 25-30 settings (~30 minutes total)
 - For the file with 3mm only: expect ~20 settings (~60 minutes in total)
- A strong continuum source only?
 - Yes (3C454.3 may be the only source suitable for all the bands)
- Data processing? As any other correlation, or more effort post correlation?
 - May use the pipeline in addition to making sniffer plots. See next page.

Some notes/questions – 2/2

- Data products? Would sniffer plots suffice?
 - We will start with sniffer plots
 - Push it through the pipeline as well; also serves as a sanity for calibration (e.g., Tcals)
- What are we deriving?
 - Plots of BPs (e.g., sniffer plots)
- What are we delivering? Plots? Sensitivity/performance? Web posts?
 - Let's see if the sniffer plots would suffice. A parameter can be tweaked to make the solint longer for sniffer plots since scans will be longer than the default 30s.
- Cadence?
 - After a new RX is put in place, or when problems show up (~once every 2 months)
- For internal use, or to be provided to the VLBA community?
 - Primarily for internal use.
- Use pulse cal or not?
 - Yes
 - Correlate with enough spectral resolution: Start with 0.1 MHz/channel and 0.2s for Tint.
 - For RFI, we can design a separate dedicated test if/when needed.

Near Real time Correlation (Jay/Walter)

- Transfer speed is 20 times slower than recoding at each antenna (add 10% uncertainty).
- Do short time correlation and a long time correlation separately.
 - For 'Short': use online data transfer for the RX of interest only,
 - For 'Long': better to ship the disks if it will take more than 6 hours to transfer the data online

Conclusion: Download in near real time the scans of the band of interest

Who will make the set ups?

- Mark will start putting the setups together, working with Jessica (and Jim for a template key file). Jay could help too.
- Jay will look into the data/correlation (data transfer, correlation, pipeline...)

Timeline?

- The sooner the better
- Goal: have setups and key files made latest by mid March 2021