

Testing New Updates for CHART

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Introduction:

Recently CHART has undertaken some new hardware and software changes. The Software Defined Radio has been updated as well as the Operating System and SDR driver. These changes were made to stay up to date on the current hardware and software. Our goal is to test out the new hardware and software and make sure the changes don't affect collecting data in a negative way, and hopefully even improve it.

Materials used:

- CHART Horn
- Nooelec amp + filter
- RTL-SDR Version 3 (silver)
- RTL-SDR version 4 (black)



- SMA cable
- Raspberry pi 400 + mouse
- Monitor + HDMI cable
- Battery
- USB C cable
- "Ref" SD card
- "OS" SD card
- "Driver" SD card

Procedure:

To set up CHART we used the CHART procedure Document found on the CHART website (https://astrochart.github.io/memos/CHART_procedure.pdf). We ran through the procedure 5 different trials, ensuring to change the radio or SD card depending on the trial.

Trial 1: We used the “ref” SD card for this one and used the version 3 radio. The “ref”(short for reference) SD card is as the name suggests, our reference which is our raspberry pi OS and RTL-SDR drivers from 2023. This setup was also used in memo 7(https://astrochart.github.io/memos/2023.06.19_DayQuad2and3.pdf) and 8 (https://astrochart.github.io/memos/2023.06.26_BabyCHARTTests.pdf) on the CHART website. This will be used to ensure that the data we collect in the other trials looks correct and is comparable.

Trial 2: Keeping the version 3 radio, we switched out the “ref” SD card with the “OS” SD card. This one has the new operating system installed but still has the old SDR driver.

Trial 3: Still using the version 3 radio, we now are using the “driver” SD card. This one has both an updated operating system and SDR driver. (Note: it is important to shut down the pi in between trials, except for this one since we are using the same SD card for trial 4.)

Trial 4: Now we switch the version 3 radio with the version 4 one, keeping the SD card the same.

Trial 5: Lastly, we use the same set up that we did in trial 1 to make sure that nothing strange happened within the trails. This was the original plan, I did end up forgetting to switch out the radio though, so the black one was in use during this trial. We will omit this trial going forward.

Date : 06/26/2024

Location:

This was done outside near Pasteur Hall on the WSU campus, the following is our different Azimuths and Altitudes used in order to try and point at the same spot in the galaxy (galactic longitude of roughly 90 degrees).

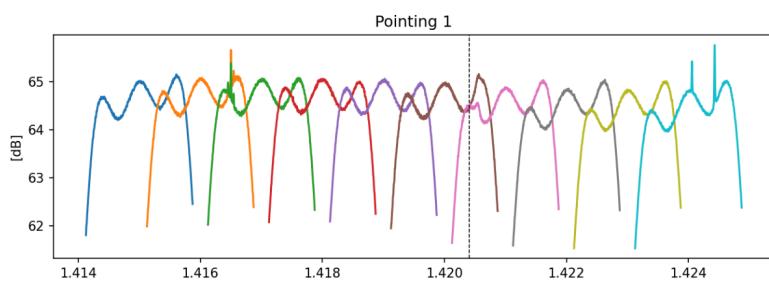
Trial	Time	Azimuth	Altitude
1	10:00 am	303 (W-NW)	33
2	10:15	305	31
3	10:30	306	29
4	10:45	308	26

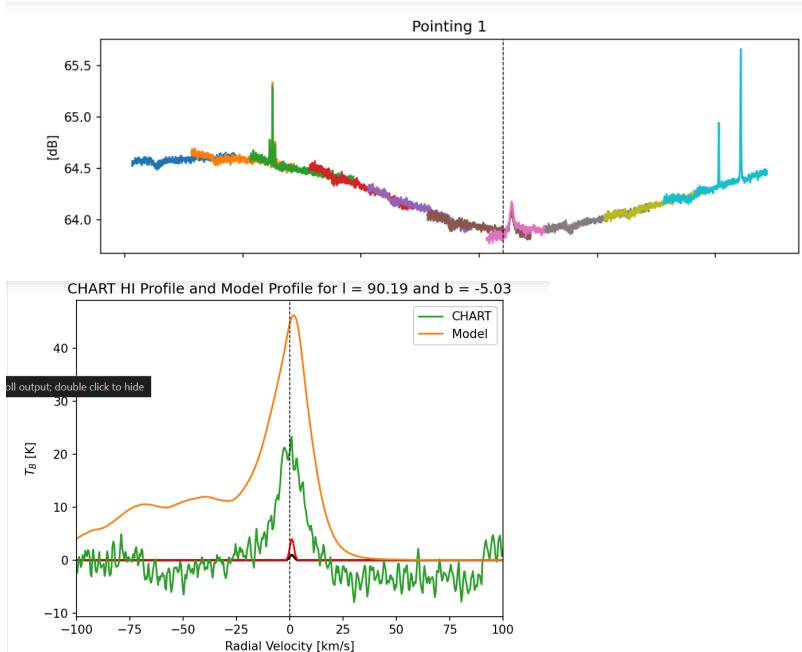
Due to an error in typing in the data, our times were different from what we intended. It didn't change the galactic longitude enough though to make a big difference so everything else was kept the same.

Trial	Time
1	10:00 am
2	10:24
3	10:40
4	11:00

Data:

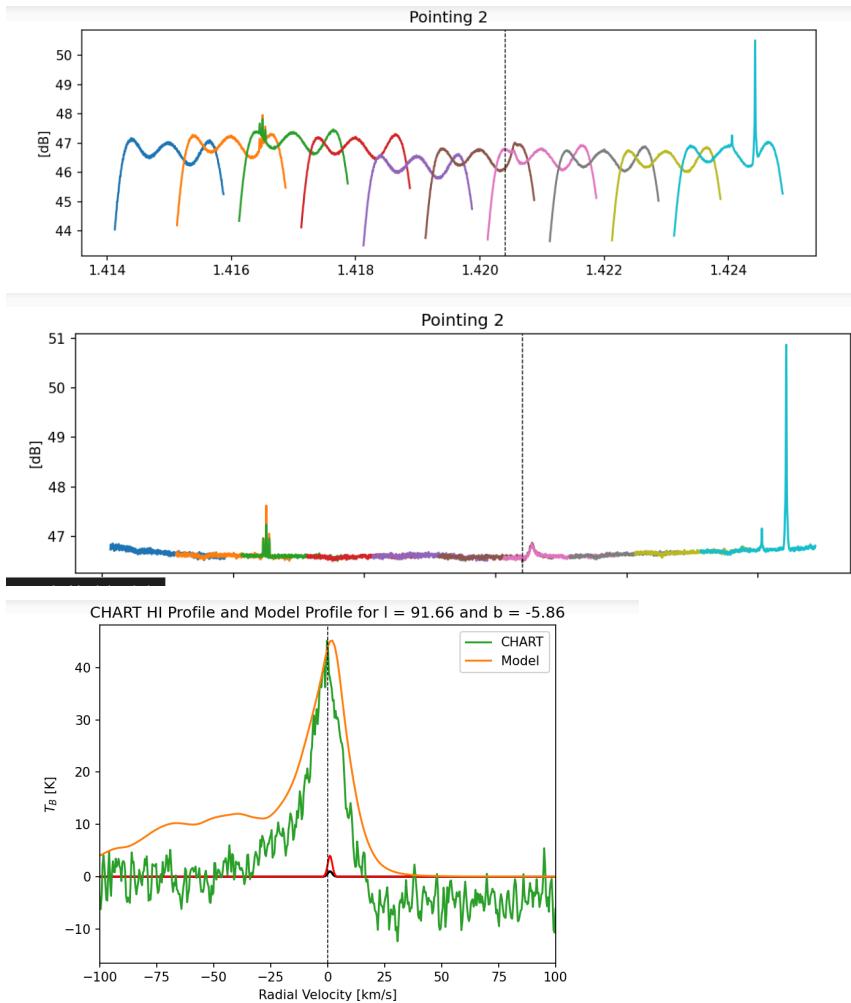
Trial 1: Silver Radio + "ref" SD card





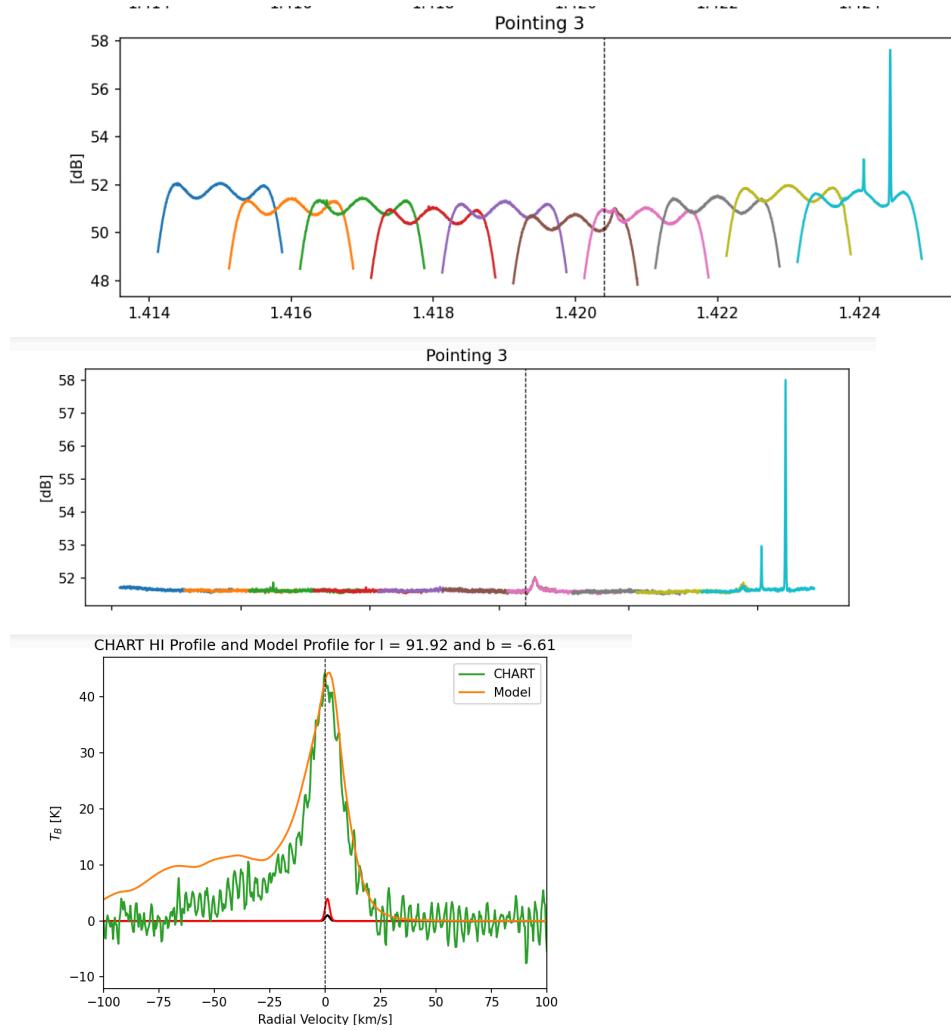
We have this weird dip going on in the next step, most likely from the weird slants we see up above.

Trial 2: Silver Radio + “OS” SD card



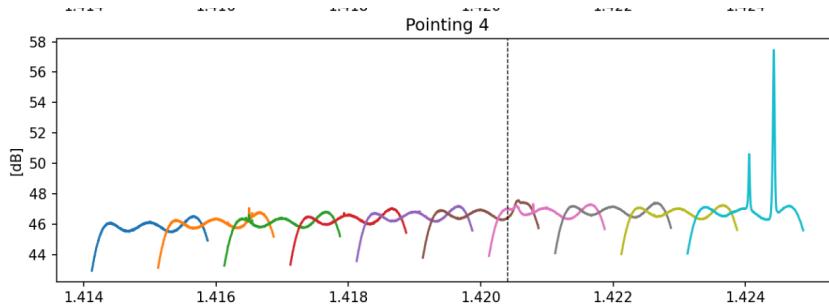
There is a noticeable slant in the data that straightens out in trial 2, this could suggest that the updated operating system is the reason that it gets fixed. It could also be some kind of constant interference that was picked up. Looking at past tests and doing further trials could be helpful to figure this out. However, because the newer setup seems to be an improvement, we are content leaving it for now.

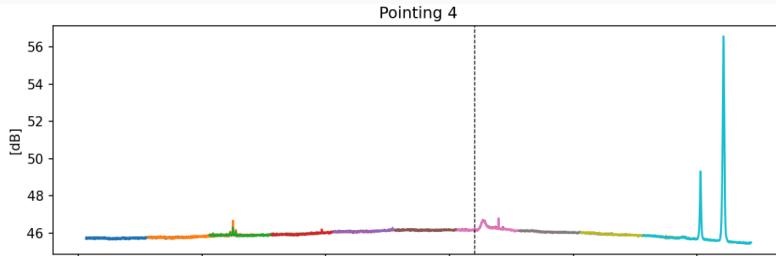
Trial 3: Silver Radio + “driver” SD card



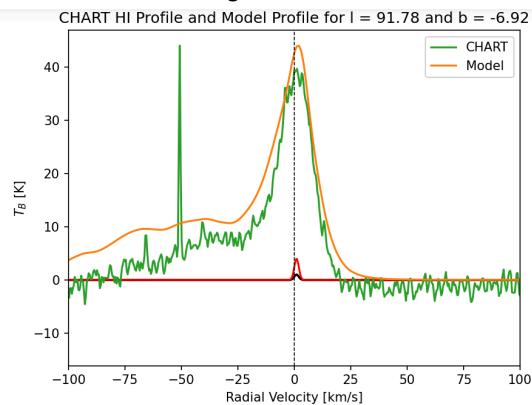
Trial 4: Black Radio + “driver” SD card

The noise in this one is significantly smaller compared to the others. This suggests that the new updates are better at filtering noise.





In our final trial, we can see a slight rise. Could possibly be from the version 4 radio, since this is when it gets used, but more data should be taken to be sure.



Conclusion:

Overall, it appears that the new hardware and software doesn't affect our data collecting negatively and improves it instead. While the slight rise we see in the data should be noted, it seems to pose no issue and resolves itself. The noise level in particular looks a lot smaller with the version 4 radio, updated operating system and SDR driver. More tests and digging could be done to help solidify this.