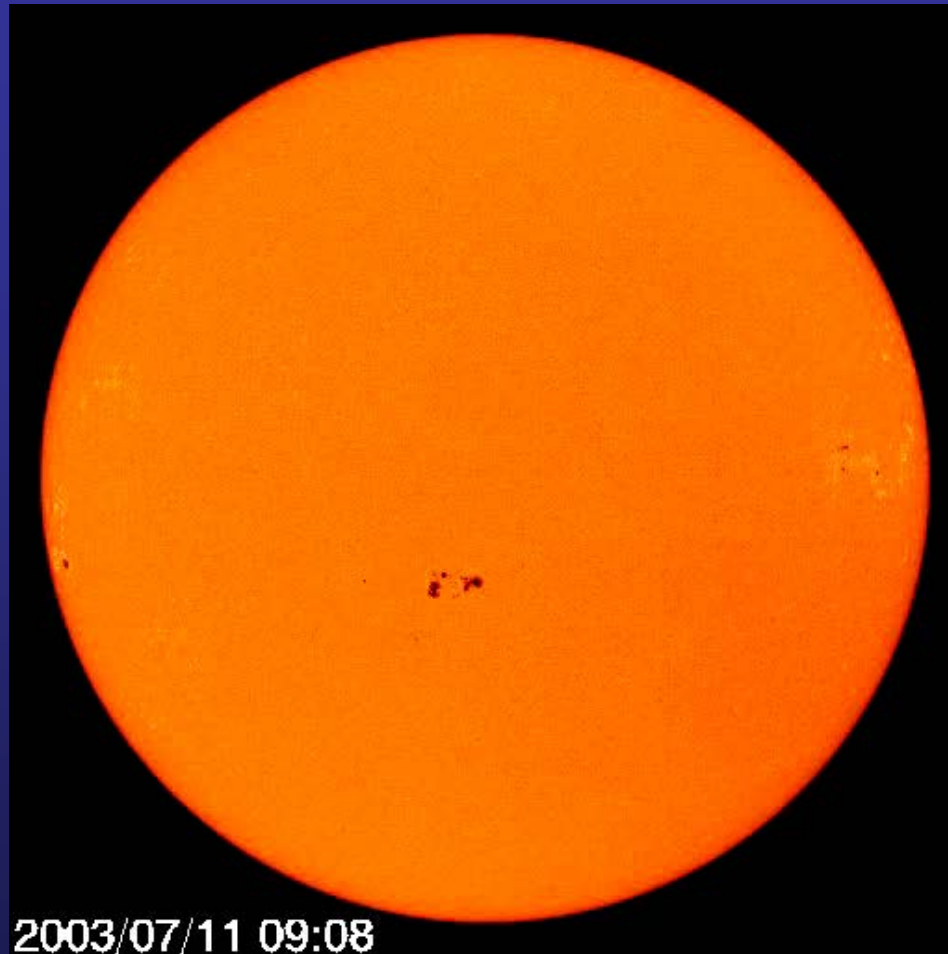


*Interferometry on the Sun Utilizing a
Yagi-Uda Array and an SRT*

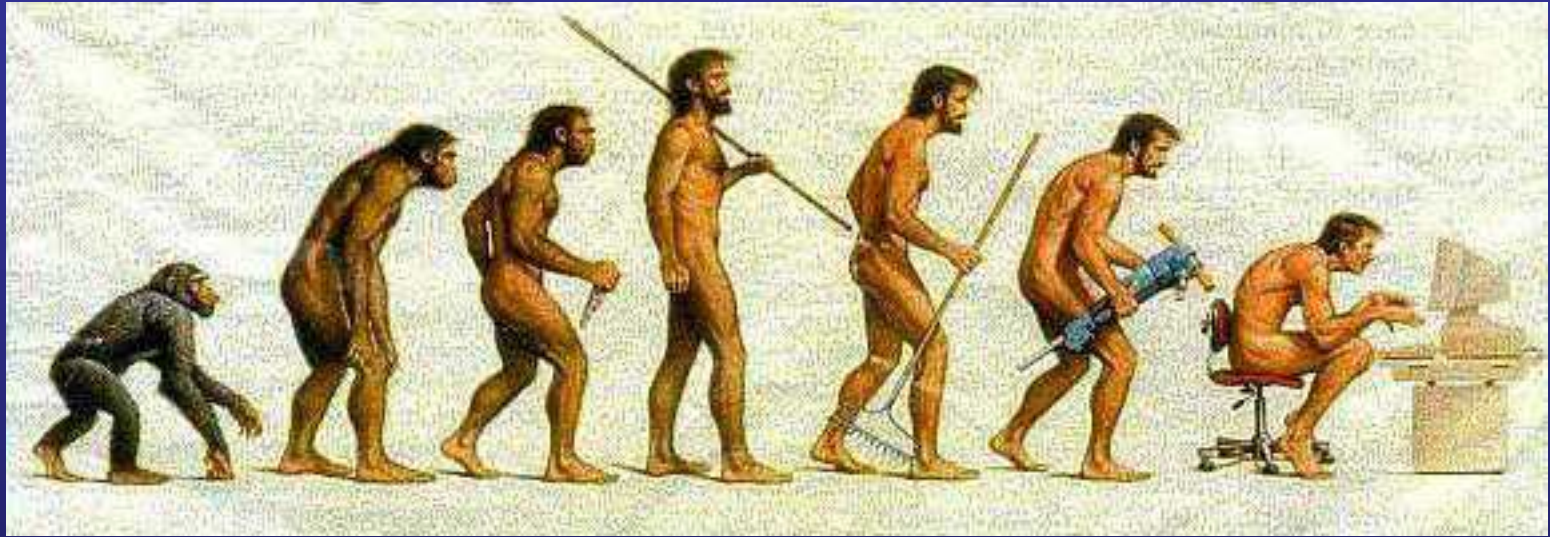
"Real Life: I'm an REU Student"

In the Beginning, there was light...



And it was good...

But then somewhere, something went terribly wrong...



Some strange DNA made its way into the species, and some men and women began to enjoy... math... physics... and computers...

Sometime in the 20th Century, a small sect of these people joined together, and formed an island nation in the distant land of Westford. They called their new home "Haystack". They then built a shrine to which scholars from around the world would flock and spread the fame of Haystack.



These strange creatures, after spending countless years behind computers coupled with their constant craving for their supernatural drink, called Coffee, became intolerant of the visible light of the stars. For this reason, they delved into the black arts and began to see the world in the forbidden frequency of RADIO.

Years later, the master tribe, the NSF, bound the science clans together and told them to spread their knowledge. Henceforth, each year the people of Haystack scoured the lands far and near to find young men and women willing to sacrifice 10 weeks of their lives to the pursuits of science... with the occasional RET.

This is the tale of one of these brave young scientists. They called him Doug.

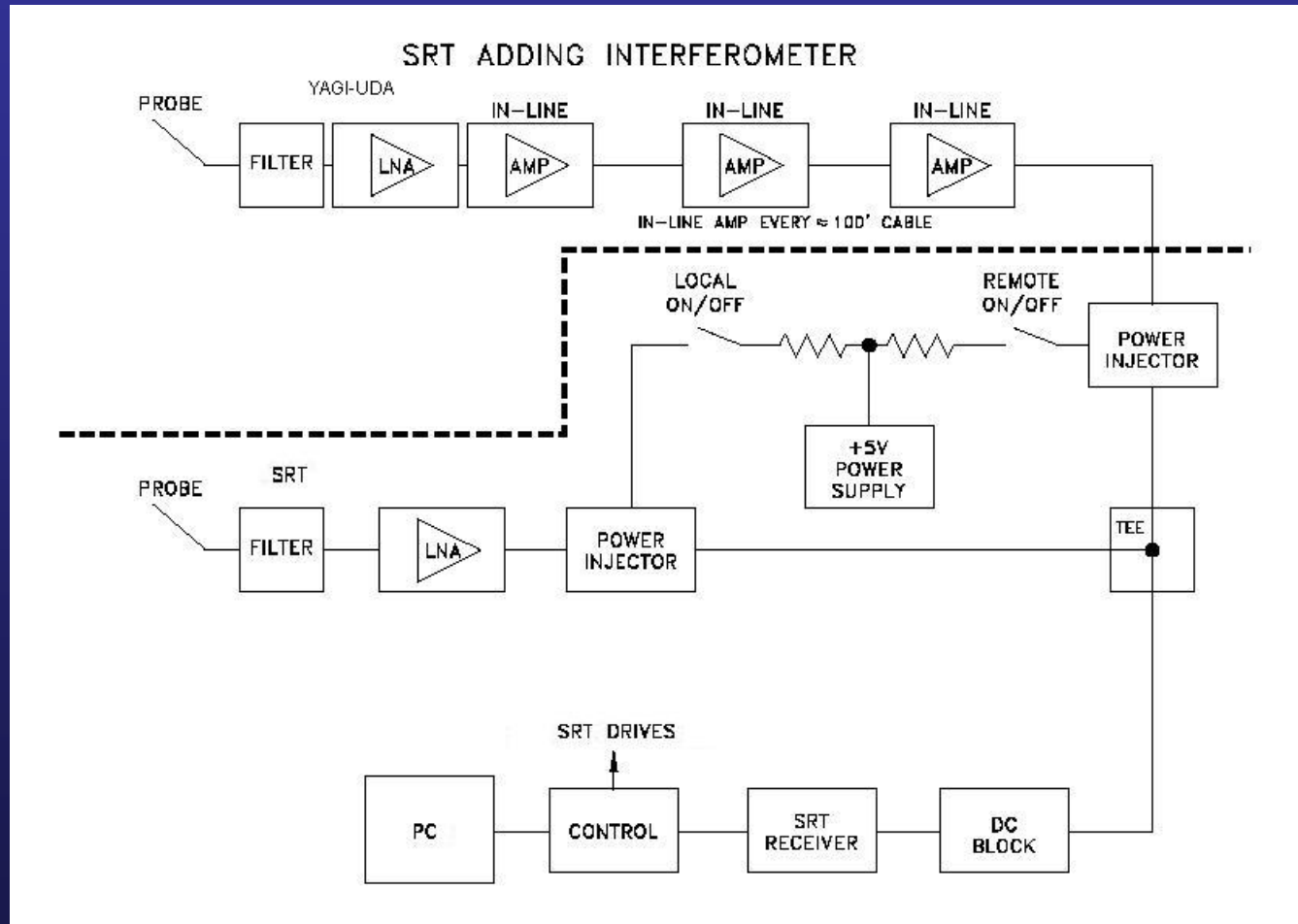
The elders appointed him two "mentors": Alan Rogers and Preethi Pratap, though this number soon grew as the entire clan chipped in to teach the young scholar the ways of Haystack. These elders appointed onto Doug the following tasks:

- Create an interferometry experiment at a low cost
- One which other clans can afford using only a Yagi and an SRT
- Design the layout for hardware necessary for the task
- Gather data from the sun
- Reduce the data and find fringes
- Compare these fringes to theoretical data
- Package the experiment for other clans across the globe

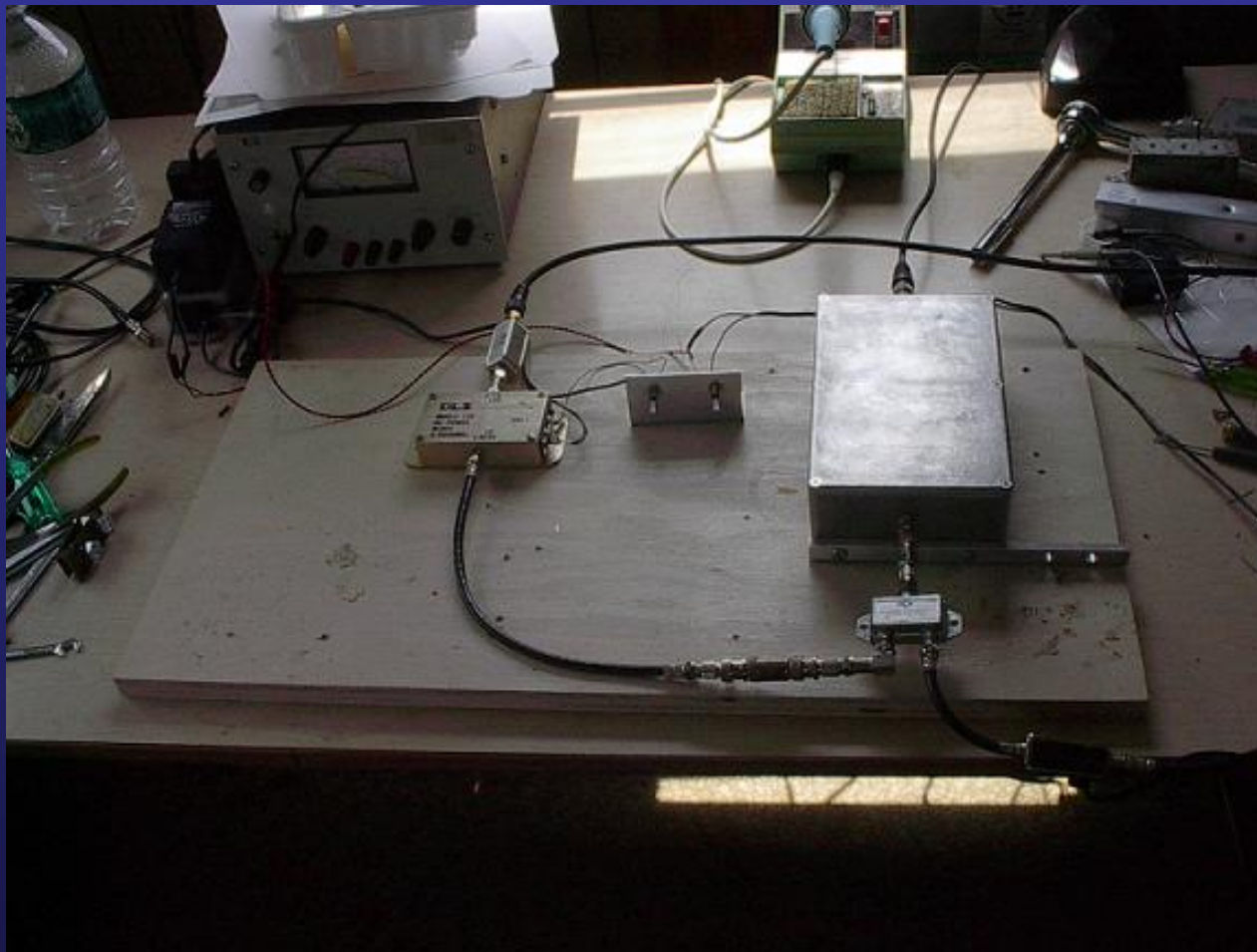
Thus, the young Doug set out, armed only with his wits, sunglasses, a pocket full of widgets, and a couple hundred feet of coaxial cable.



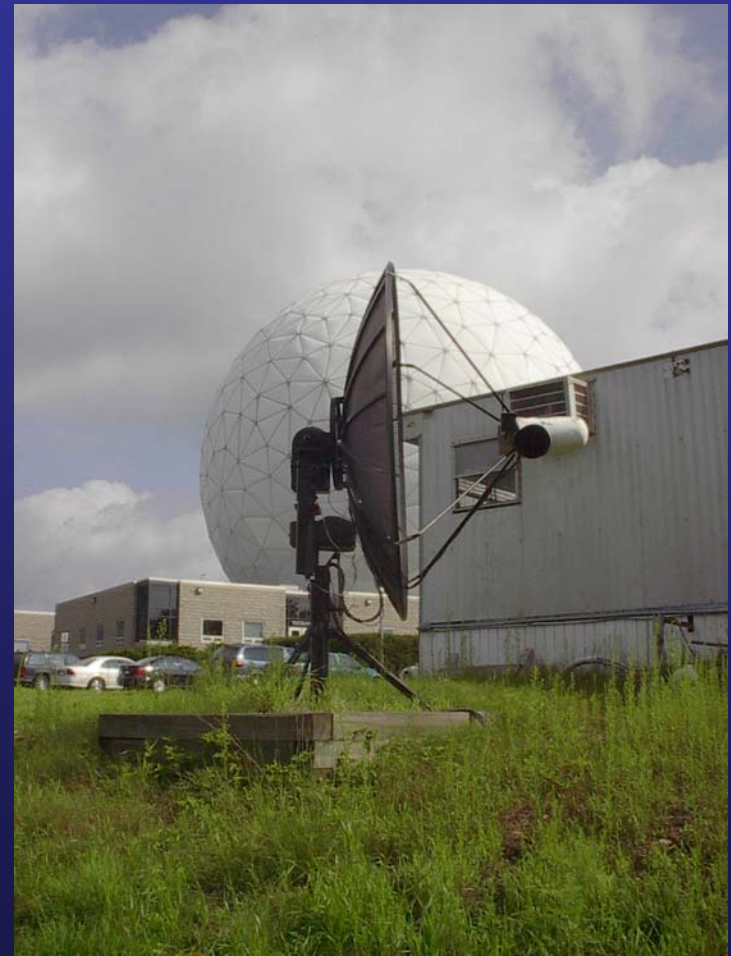
Soon there was a hardware schematic:



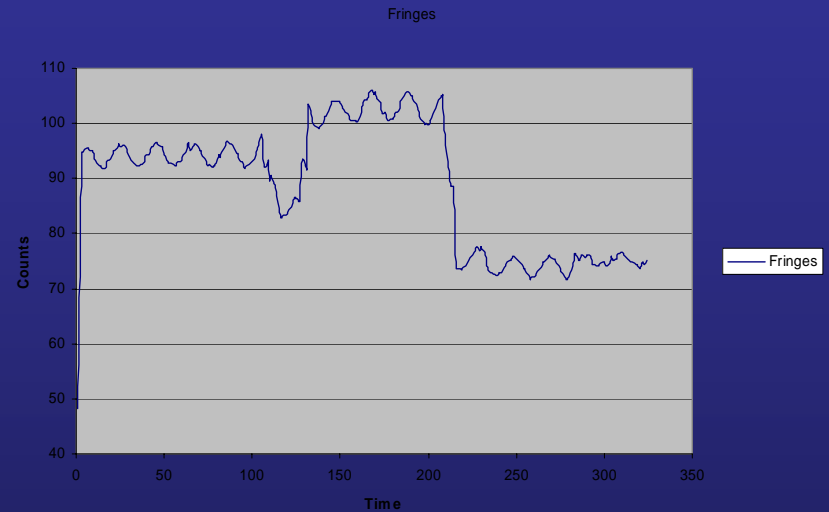
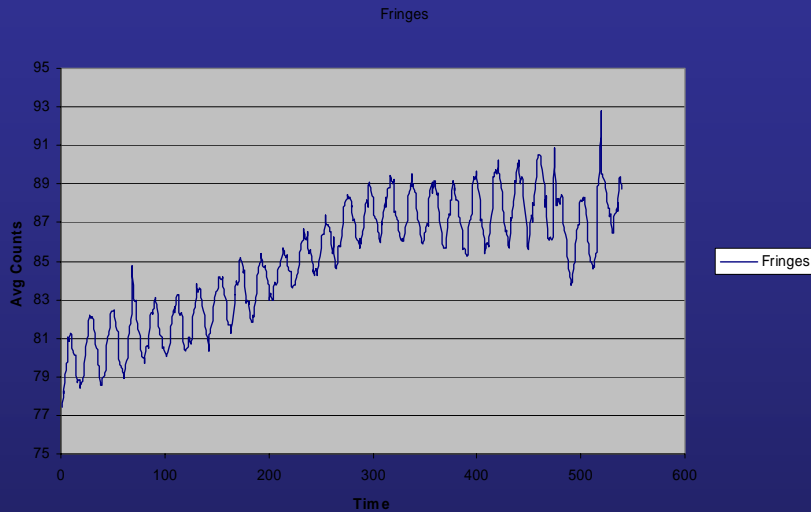
And it was thus built:



The SRT was commanded to point at the Sun, and the Yagi was pointed towards the heavens (by hand)

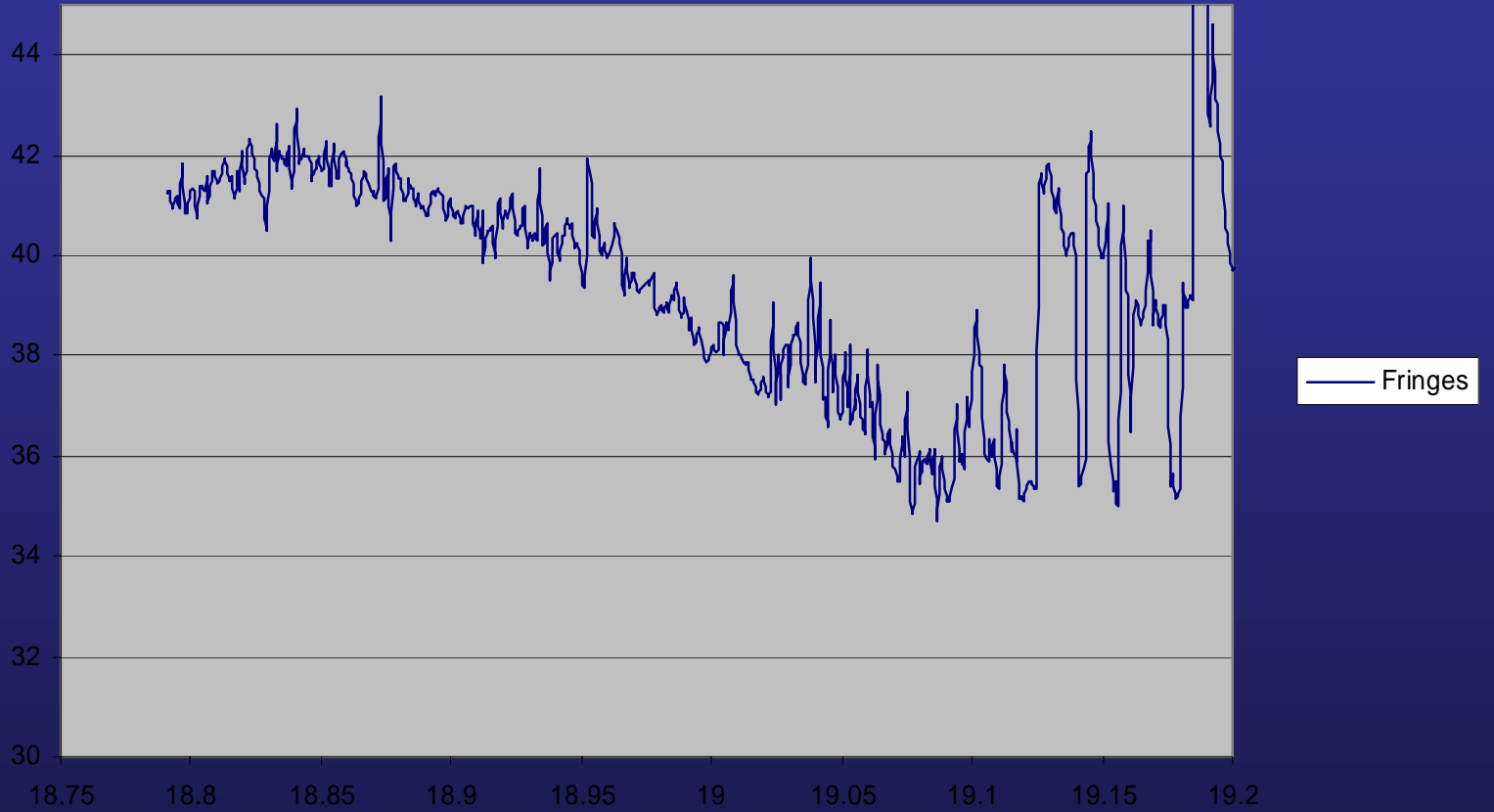


The devices, when close, worked well. They were then separated by 180 feet and data collected in the hopes of finding fringes. The results were soon in hand:

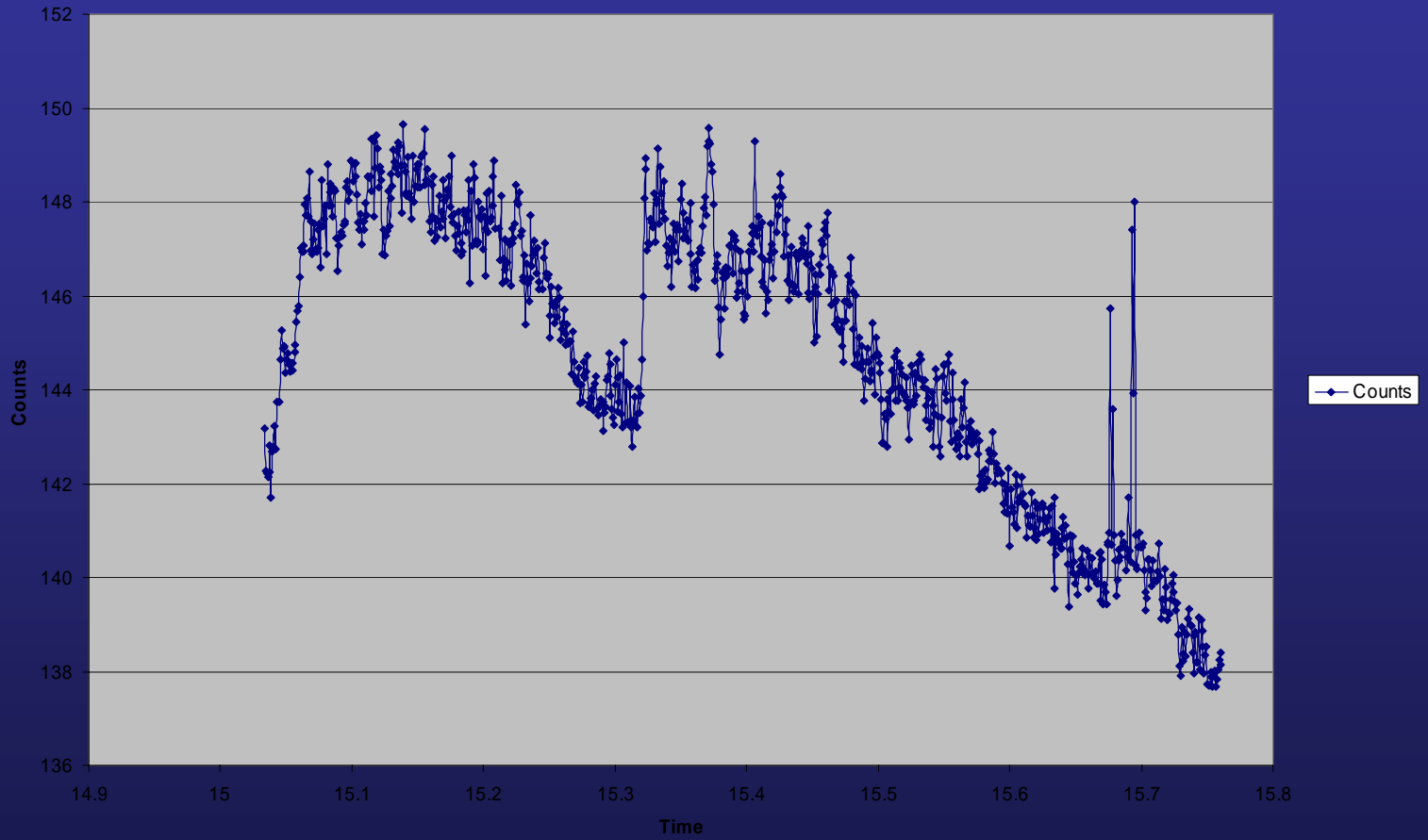


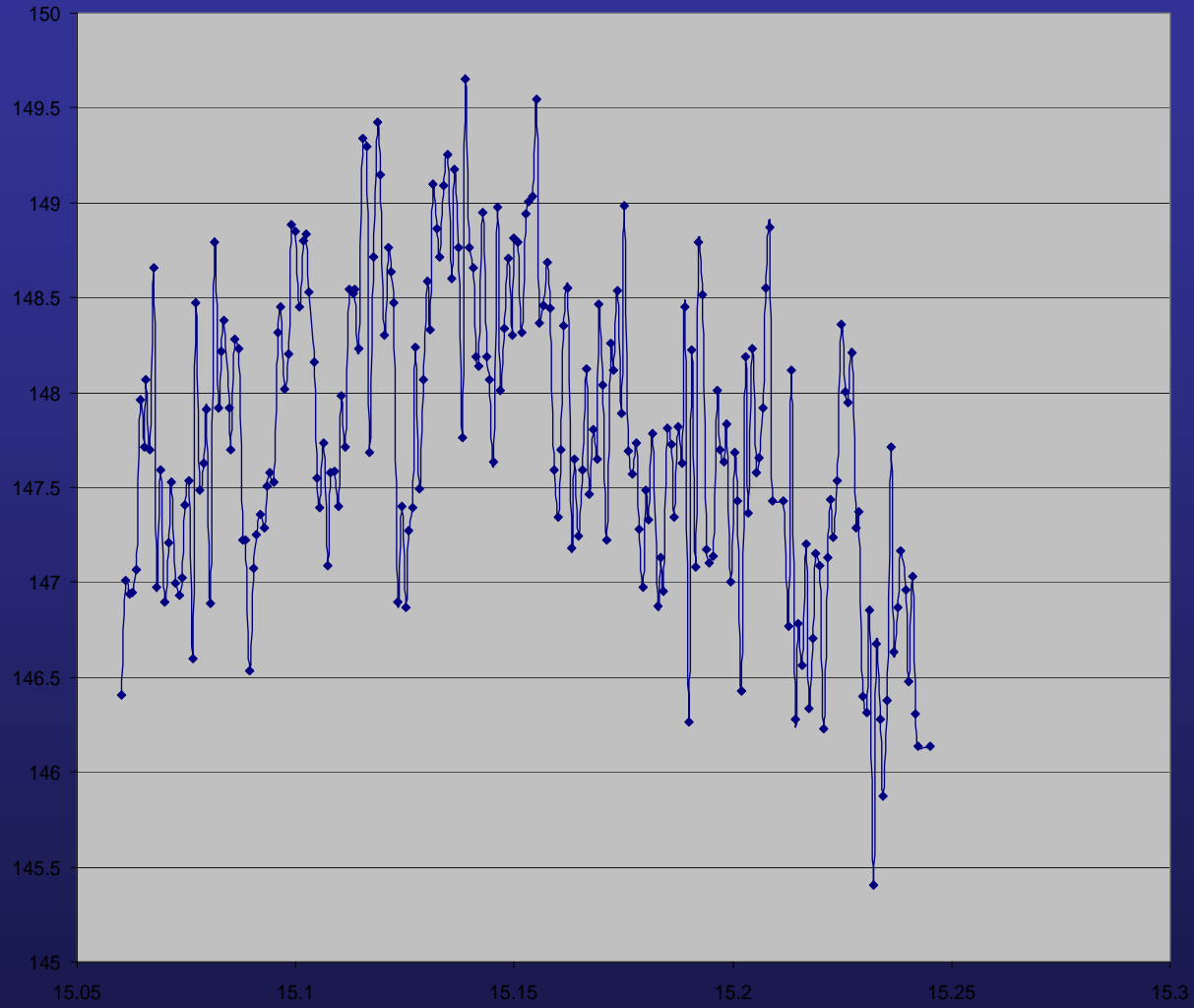
They appeared to be fringes... but they were acting strangely... As such more data was gathered. The following are the findings...

Fringes



Fringes?





Series1



Frustrated from not finding the fringes, Doug retreated to his sacred cubicle in order to pray to his God... (in ASCII, of course)



Unsure of how to continue, Doug consulted the 5 wise men:

Phil robbed other SRT shrines and gave pieces and solace. He also warned not to forget code of the Samurai.



John analyzed the problem and suggested multiple methods of tweaking the hardware, then drove off on his motorcycle.



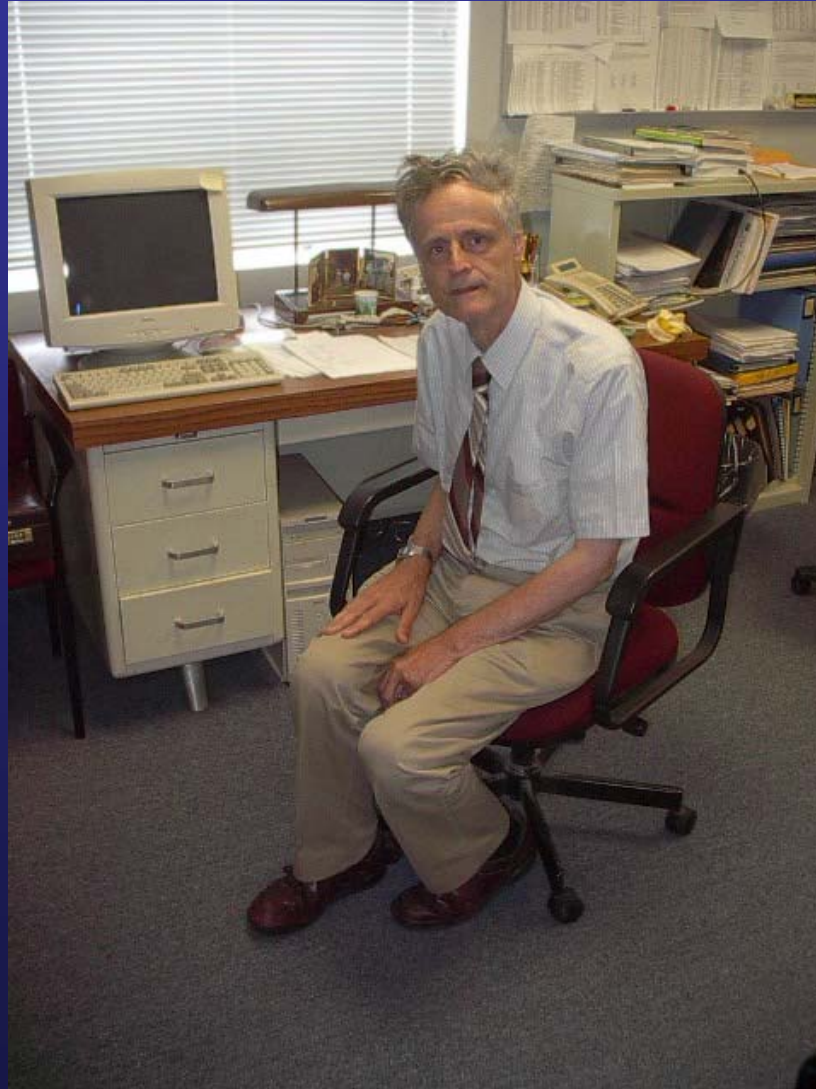
Rich donated miles of coax, dozens of connectors, and discovered that the adjustable attenuator from the Shack of Radios did not indeed work.



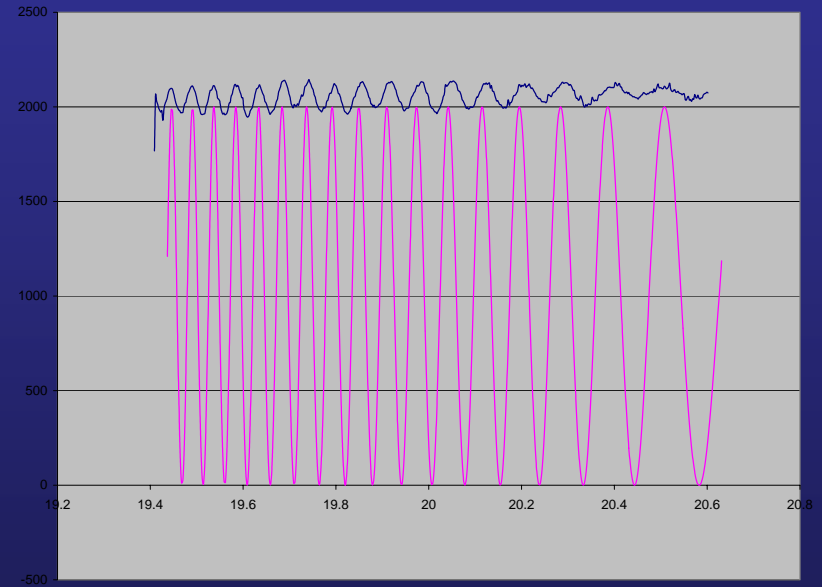
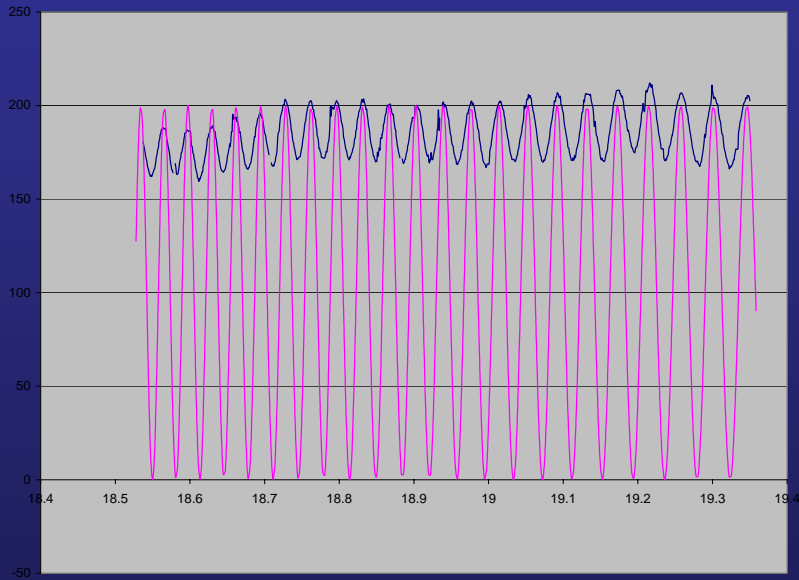
Joe braved rain, brought in the signal analyzer, and, after several hours of work, discovered that the relics Phil had stolen no longer functioned, and that the source of the RFI was from a neighboring SRT.



Finally, when all else failed, the most wise of the wise men came forth. He known as Alan. After several minutes, Alan's mere presence, and the minor adjustment of improper polarization, miraculously fixed the interferometer!



After returning from a brief trip to another science sect, "The CFA", young Doug set forth to observe fringes... and behold, he did!



Not only did fringes appear, but they also fit theoretical predictions! The experiment was finally fruitful.

Results:

- Proof that interferometry between a Yagi and an SRT is possible
- Evidence of everything that can go wrong in the setup of Yagi/SRT interferometry.
- Evidence that the Yagi can pick up any radio source within 100 feet of its location, including cell phones.
- A detailed experimental setup for others to follow to one day obtain fringes in such an experiment.

However, just when our young astronomer thought that he was out of the woods, Preethi told him to create a series of powerful commands to track GPS satellites with the SRT.

Doug set forth and landed in the doorway of the mighty running sage Art. But before Art would part with his knowledge, he put Doug to the test. Art took him into the woods, where Art ran like the wind, trying constantly to give Doug a heart attack. However, failing to dissuade him, and Art called other sages in the distant lands of Canada and Sweden.

Art indeed found many commands, but ultimately Alan intervened and instructed Doug to write commands of his own from a simple algorithm. However, the algorithm proved to be full of pitfalls and poor documentation!



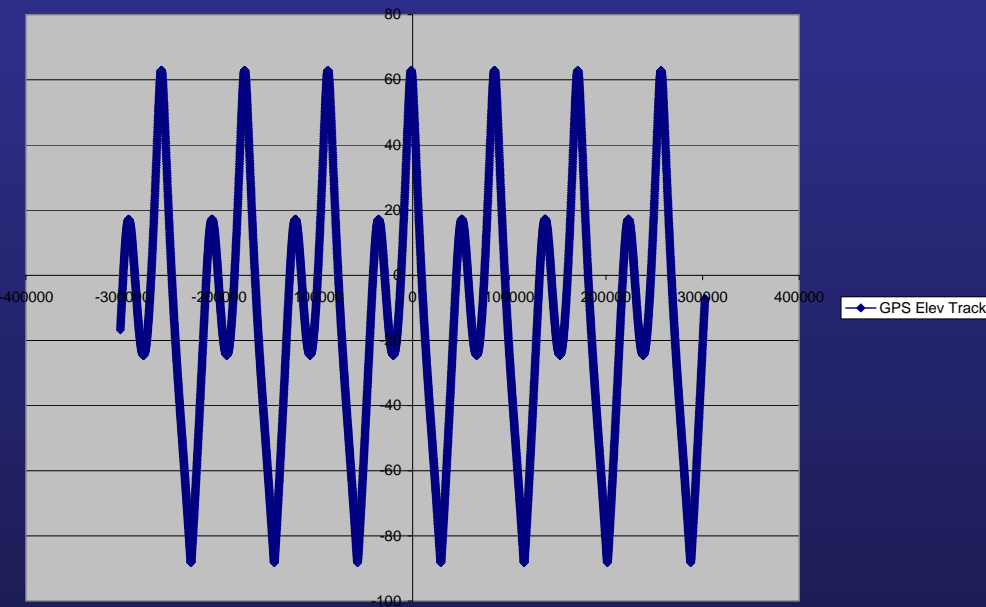
Finally, after days by Art's side and continued prayer once more in the sacred cubicle...



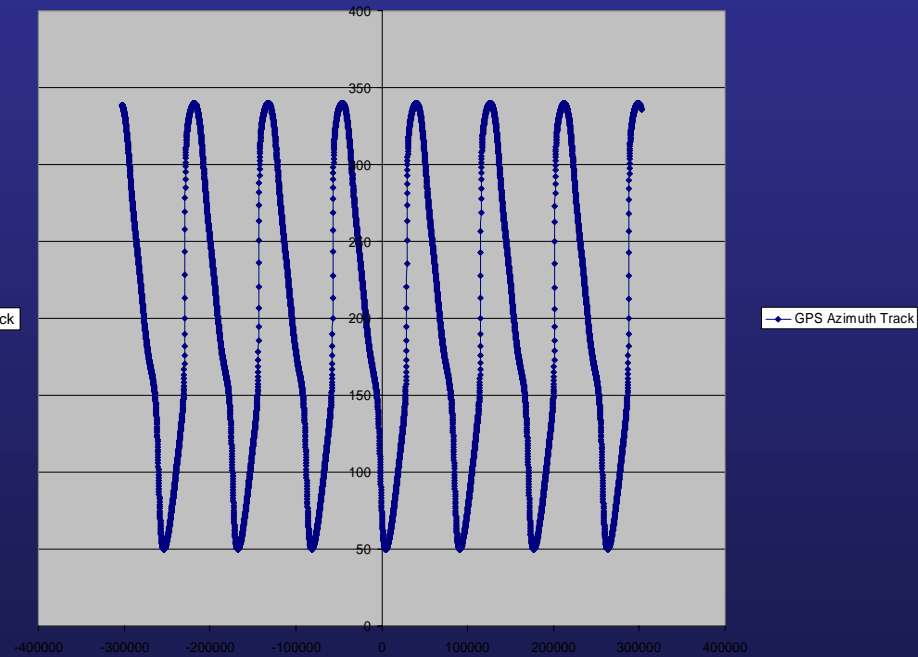
Doug realized that he was indeed not in the Arctic Circle and that having the longitude and latitude inputted correctly would make a significant difference in his code...

Today the code is able to accurately track the orbits of GPS satellites for at least the course of a month:

GPS Elev Track



GPS Azimuth Track



Where We are Today:

- GPS code is capable of tracking satellites for over a month.
- Code accurately predicts positions of satellites to within ~1.5 degrees
- Code is well commented and ready to be integrated into SRT software

Future Plans:

- Placing code into Java's Swing Set™
- Removing human hardwiring of code from equations
- Read/write ability given to software to produce parameter files
- Internet paging capabilities to gather ephemeris data without user

Credits and Acknowledgements

- RB Phillips: For constant support, laughter, and of course, for making it hot
- Joe Salah: For the opportunity of a lifetime to work at Haystack
- Preethi Pratap: For taking me in and showing me the ropes of the SRT
- Alan Rogers: For pulling me out of the abyss when I thought I would never make it out
- Judy Signorello: For eternal smiles in the morning and for helping with everything
- Rich Jackson: For pointing out some of my not so fine wiring skills
- Art Neill: For running with me and for the last week of living at my desk
- Brian Corey: For constant GPS support, whether you think it helped or not
- Guy Grand: For crisp \$5000 bills to get me through my days
- Joe Crowley: For your absolute genius with the signal analyzer
- John Ball: For always knowing exactly what and how hard to tweak it
- Samurai Jack: For never giving up, ever
- Phil Shute: Because you are indeed the mighty one
- Shep Doeleman: For making me laugh all summer one cubicle down
- The REUs: For making this summer truly remarkable
- Susan, Heidi, and the rest: For knowing the answers to all my office questions
- The Book of I Ching: For showing me not to have rocks on the green
- Madeleine Needles: For always knowing exactly which book will help
- The RETs: For funky meteor noises and a good source of stress relief
- Alan Whitney: For your GPS tracker
- Roger Cappallo: For pushing my on the road and entertaining me with music
- Mike Titus: For always having a smile and a hello at the ready
- Don Sousa: For Squires and DHL
- Rich Crowley: For keeping my computer out of the morass... all summer
- To Everyone Else: My deepest thanks for something I will cherish forever

