Solar System Section Database Template
Version 1.0 (February 2016)

Disclaimer: This template is intended as a guide for amateur radio astronomers and not for professional observational use. Please direct communication on errors found and enhancement suggestions for this guide to the SARA Coordinator of the appropriate SARA Section.

Purpose: The following data template is intended for consideration of what data can be collected, assuming one wants to start a database for a specific instrument. Such a template can be made available for all SARA members to upload their data. Observers would be able to see if they are getting a proper signal by comparing to what others gathered for a similar instrument. Once SARA gets enough data, it can decide if a database is valuable for the data it holds.

Observing Specifications
Object observed
Date and UT
Latitude/ Longitude (of observer or object?)
Frequency/ Frequency Range
Check all that Apply:
☐ Thermal
☐ Continuum Spectrum
☐ Absorption Spectrum
☐ Emission Spectrum
☐ Non-Thermal Synchrotron

Type of Radio Object Specifics
RA and Declination:
☐ Sun
☐ Solar flare observations at VLF and decametric frequencies
☐ Moon
☐ Planet
☐ Jupiter observations at decametric frequencies
☐ Asteroid
☐ Meteor
☐ Comet

Telescope Specifications
System specifications
Antenna tracking & Phase tracking programs
Antenna Specifications and Type
☐ Monopole
☐ Dipole
☐ Dish
☐ Helix

☐ Yagi
☐ IBT
☐ SDR
LNA Specifications
System Temperature
Online System (e.g. Skynet)
Software Specifications and Output
☐ fft?
☐ Waterfall plot?
☐ Doppler shift?
Type of Receiver list
☐ Ettus
☐ Spectracyber
☐ Rtl-SDR
☐ RASDR2
☐ Radio Jove
☐ SuperSid

Experience Level Specifications

- Price of System Setup (if purchased new)
- Ease of System Setup
- Ease of Software Configuration
- SARA Subject Matter Expert(s)

Methodology
☐ Simple observation
☐ Molecular Spectroscopy
☐ Occultation
☐ Interferometry
☐ Imaging
☐ Radiometry and Magnetometry
☐ Polarimetry

Considerations

- Type of Analysis Completed
- Calibration Source and Minimum Resolution (at specified wavelength)

Recorded Output
Source structure:
☐ Complex
☐ Double
☐ Single

Considerations

- Raw Data Table
- Flux and Flux Density
- Angular Size

- Gain
- Interference Sources

Notes

Disclaimer Suggestions Subsection: This subsection includes comments, suggestions, and peer reviews for improving this protocol. The reason for this is to allow a protocol to become a living document and be posted, rather than stagnate in obscurity until a volunteer is found to enhance the protocol. SARA members will always have ideas for improvement. To make improvements or offer comments, contact the Section Coordinator.

1. Suggestions By Ed Harfmann

FITS is a good format. CDF - http://cdf.gsfc.nasa.gov/ is a newer format that supports huge (>2G) files. (It also has meta data – header support like FITS.) Either of these (or yet other formats) are fine as long as the format is publicly documented so that anyone can read or translate the data without having to go through licensing issues.
1) What is your time standard and how often is your system supposed to check? GPS, NTP, … 5 minutes? 1/hour? 1/day?
2) Calibration should be available in some form and should not be so onerous that data cannot be collected. There should be multiple levels depending upon the user and their abilities.
a. Basic instrument specifications – dish size... While not precise, the data is useful to correlate event timing if the profiles match if nothing else.
b. A simple procedure should be available for people starting out. Their data quality is obviously lower, but it is still worth something.
c. At the complex end, a procedure that has a precise measurement of the system characteristics is better and the data is of higher quality.
Each of these should have a date of calibration. Professionals use references and calibrations that trace back to NIST or some other organization easily. Few – if any at all – will have this ability. Therefore what should our standards be? How will we define them so that they cab be implemented? Just because someone has an HP noise figure analyzer does not mean that it has been calibrated to a known standard nor that anyone else has access to it.
3) Calibration of the system changes over time. Saying the system was calibrated 10 years ago to NIST 3 level is worthless. When was the calibration done? (I will obviously ignore system changes due to maintenance and upgrades since those invalidate any calibration.)
4) Calibration is not an all-or-nothing. You may have a time reference that is as accurate as GPS, but amplitude calibration that is +/- several db (e.g., Radio Jove – volume controls vary. Hasn't stopped their data from being immensely valuable.) Time, frequency and amplitude need to be part of the data if possible and each may be a different quality. (Are there other calibration dimensions that should be considered? Positional?)

5) Each observing section needs to define their goals for the various levels and how to determine them. What is right for SuperSID is not right for Extra-Galactic.

6) Quality/calibration as being a kind of slider (for each element) – Very poor to high quality. Data submission should not be excluded because the system cannot be described to professional standards. As long as the error bars can be estimated, we have useful data.

2. Suggestions By Charles Osborne

A lot of data goes to waste, created by systems which lack a few key pieces of information to be comparable from one observer to another. For instance: listing dish size, LNA temperature, and receiver type doesn't put it all together into performance. What's needed is a measure like "dB/Kelvin" which then collects focusing issues, detuning of the LNA from mismatch, cable loss effects on overall noise performance, back end noise figure and gains etc. It's how everything works together that matters. Not claimed specifications on pieces.

Then there's the "where was I pointing" and "when". A big problem is time errors. We get all interested in just the act of collecting gigabytes, without being able to go back into it later and look for unexpected events like pulses, Flares, and Gamma Ray Bursts, or just where we were pointing when on drift scans. Without good time referencing that can be next to impossible.

For example I can hover over a system tray icon on this PC that tells me one minute ago my laptop was resync'd with UTC and found to be -0.004sec in error. It's a program called Dimension4 that checks an Internet time server of your choice every five minutes or whatever you set. On the other hand ten years ago I was taking data at an observatory and routinely found things logging away to the wrong hour ±ten minutes due to time servers being down, or connectivity lost on site, and PC clocks quickly accumulating ten minute a day errors, or Daylight Savings Time change errors. Most PCs today are totally engrossed in checking for updates every few minutes while punching holes in data sets and ruining time continuity.

Bandwidth information: Who knows how many MHz of signal is going into that continuum measurement? There's ways to measure that and determine the correct noise bandwidth.

In a digital back end, what the FFT block size is and sampling rate, and efficiency. It is a similar result to the noise bandwidth question. Because if the system is only able to look at the level once every few seconds, the result is much different than a system that can spend a higher percentage of its time integrating noise data instead of missing it.

All this plays into FITS data format. It allows a lot of different observers to compare data by having all the right pieces collected into a header. The header describes the order of things in the file and how they were collected. It does have lat/lon, frequency, and the type of antenna, but described more in sensitivity terms and where it was pointing in ra/dec, just in a more universal way of describing it.

With very few members tracking, time and pointing accuracy becomes even more important for a drift scan.

These efforts likely will turn into a few basics of time and ra/dec verification articles that would be beneficial. If one doesn't know how to measure something it all becomes just best effort data. Hopefully some of our programmer types can help do some conversion scripts to make data sets more comparable.