

Development of a Contesting and DXing Dashboard for the HamSCI Personal Space Weather Station

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Introduction

This project aims to develop a dashboard display specifically for amateur radio HF contesting, DXing, and general operations using data from the HamSCI Personal Space Weather Station as well as potentially adding other local and remote real time data. While most PSWS development efforts thus far have focused on strictly scientific objectives, this project will aim to make the data available and useful in real time for Ham Radio Operators. The dashboard has a goal of enhancing real-time HF propagation assessments for amateur radio operators. This project will involve the HamSCI Community, the Frankford Radio Club, and W3USR. This project aims to advance amateur radio capabilities and strengthen science contributions to space weather research.

DX Dashboard Goals

1. Enable amateur radio operators to optimize their transmissions based on real-time ionospheric conditions to improve contesting efficiency and DXing success.
2. Provide local propagation insights to individual stations.
3. Contribute to a larger understanding of both localized and global HF conditions.

PSWS System

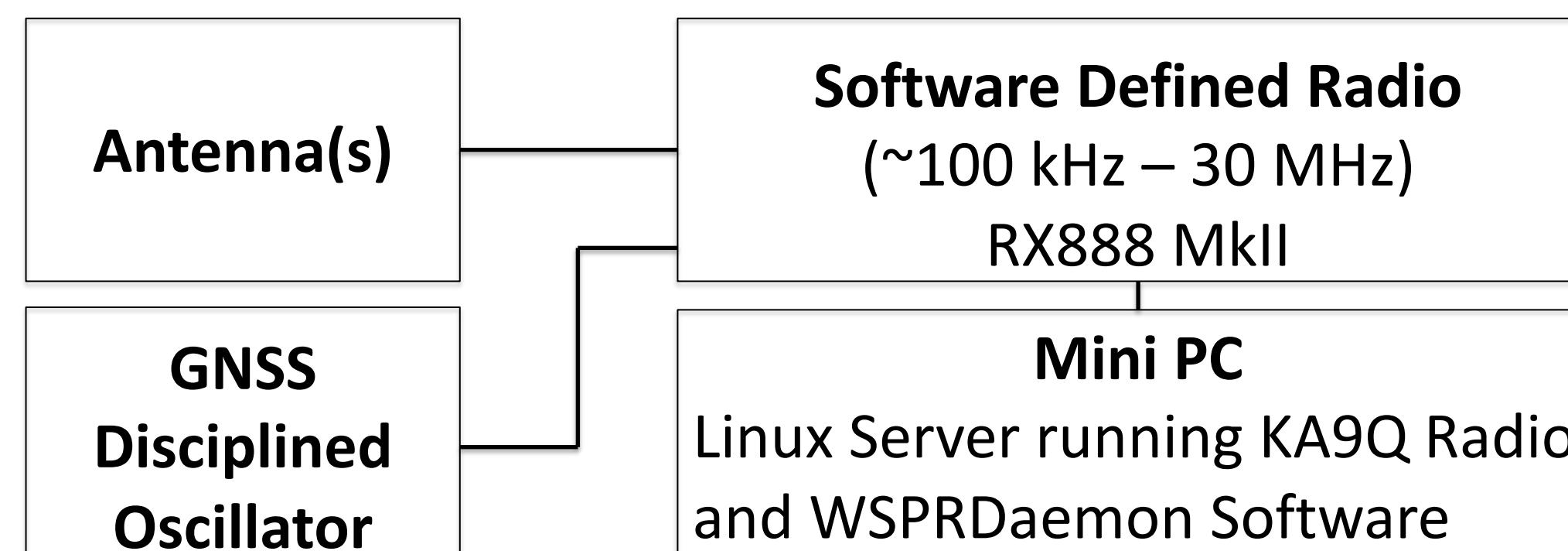


Figure 1: This diagram shows the basic layout of a PSWS System.

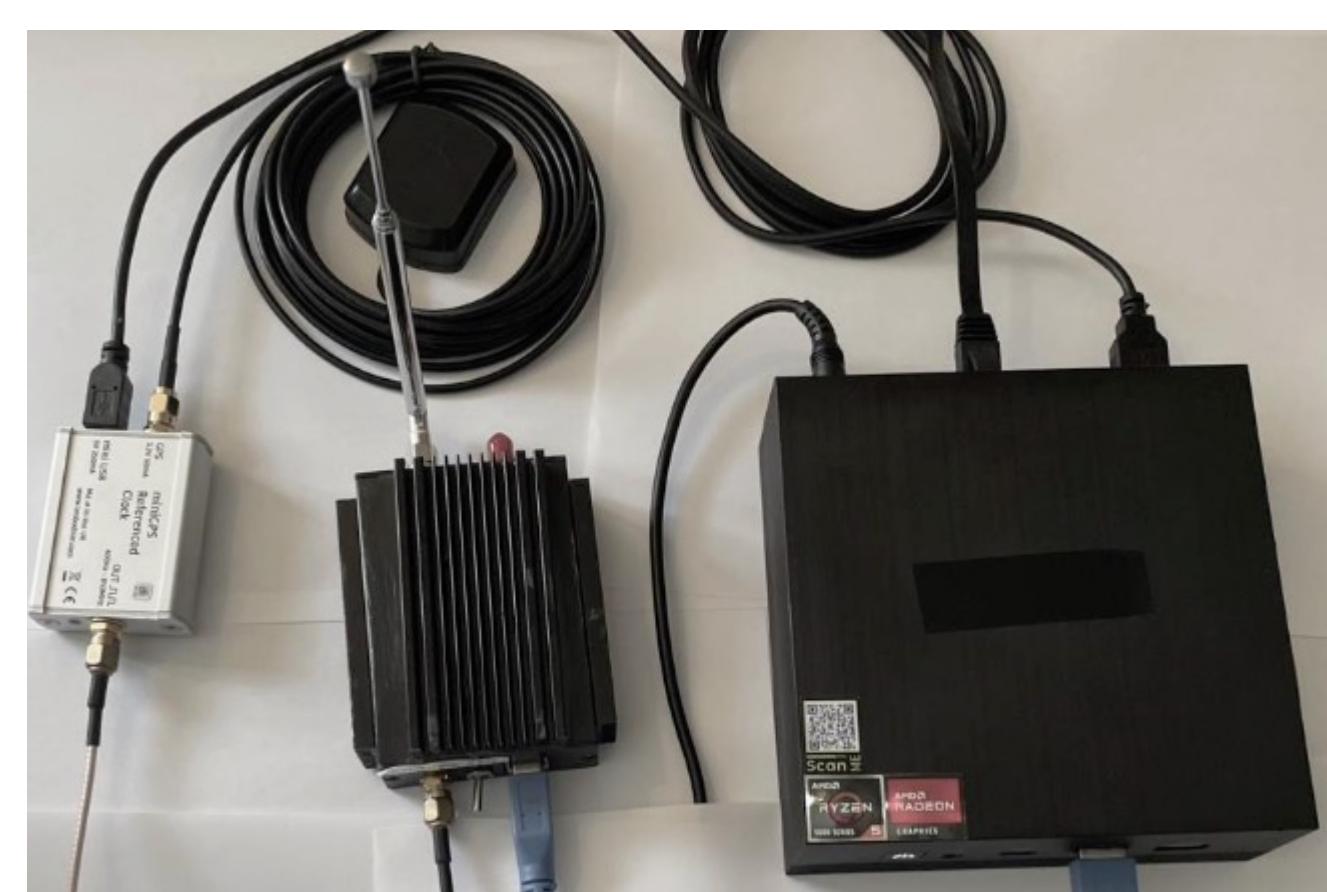


Figure 2: This picture shows the connections and basic layout of the PSWS System

The HamSCI Personal Space Weather Station is a multi-instrument system designed to measure space weather for both scientific research and amateur radio operations. The core of the PSWS is the RX-888/KA9Q-radio WSPRDaemon-Grape High Frequency (HF) software-defined radio (SDR), capable of capturing and analyzing signals across the 0.3-30 MHz range.

What Questions Should the Dashboard Answer?

- What bands are open and where are they open to?
 - When did they open?
 - When did they close?
 - E.g. Is 80 m open to Europe?
- What is the current maximum usable frequency (MUF)?
- Which band is open and has the most activity?
- What direction are the signals coming from?
 - Short path, Long path or Skew Path?
- Make use of internet-available space weather data, data from other PSWS's, etc.
- What is the angle of arrival information for a specific station?
- Could multiple data sources improve operator awareness and maximize contest efficiency?

How do we answer these questions?

- Develop and improve a dashboard that allows for easy viewing of data
 - Real-time data collected from PSWS (WSPR, FT8, WWV, HFDL, etc.)
 - Add connections to external data
 - Alerting when certain bands may be opening
- Integration with other real-time, non-real-time, historic, and contesting data
 - Reverse Beacon Network
 - NASA Space Weather Data
 - Multiple PSWS
 - PSK Reporter
 - Integration with DX Cluster
- Investigate use of various antenna types to find azimuth and elevation for best reception path
 - Utilize Multiple Antennas, or Directional Antennas
- Analyze historical propagation reports to identify trends
 - Use machine learning to create new reports based off older data

First Steps

- Utilize web mapping programs like WSPR.rocks to display WSPR Spots discovered by the PSWS

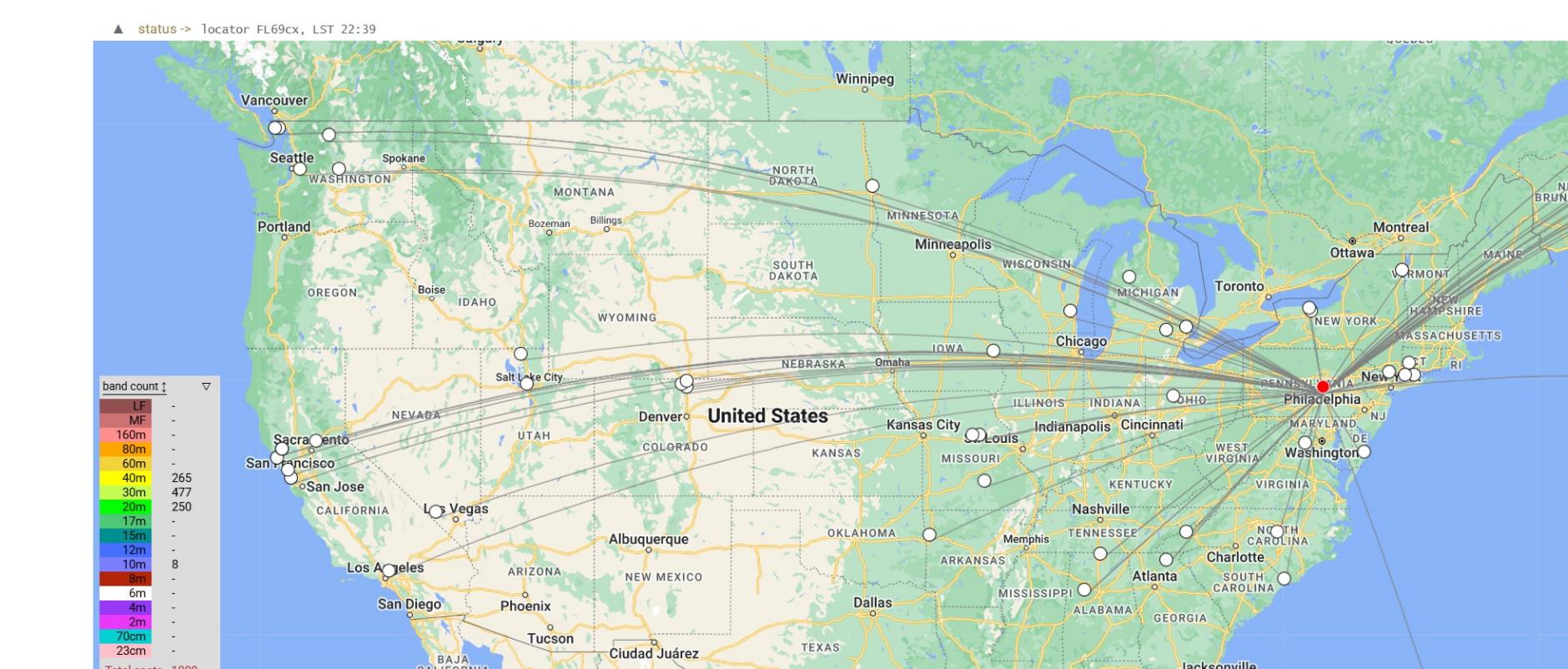


Figure 3: This picture shows WSPR Spots transmitted by AC3V all over the world.

First Steps Continued

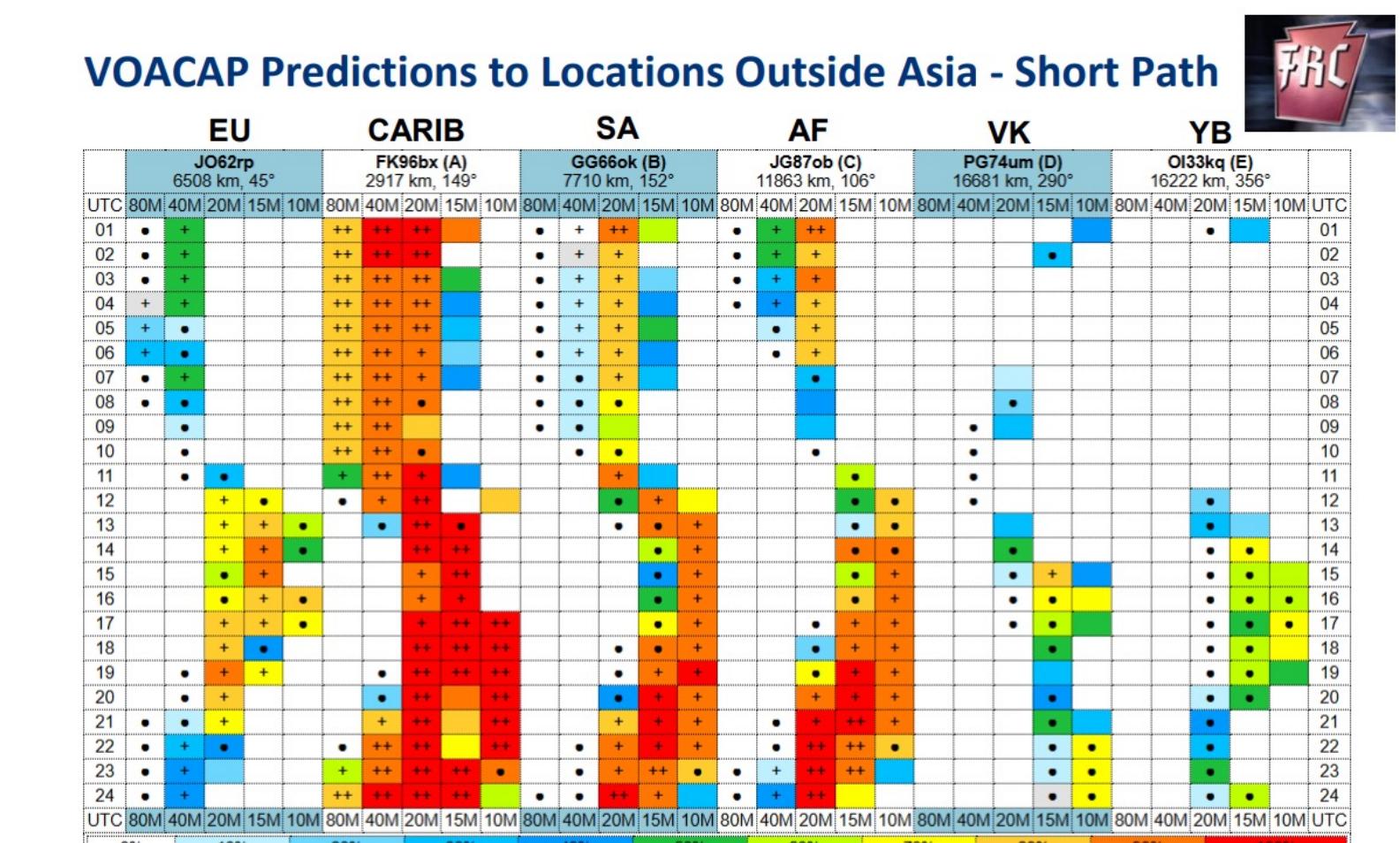


Figure 4: This photo shows Voice of America Coverage Analysis Program [predictions](#) of band openings. A goal of the Dashboard is to provide this information using real time data from the PSWS and other sources.

Design Requirements

- Display Real-Time visualization of HF Propagation Conditions
- Develop N1MM+ Logger Extension / External Dashboard Program
- Testing Dashboard with real contests
- Integrate with external data to enhance real-time HF Conditions
- Decode WSPR spots and integrate with external space weather observations.

Project Timeline

- Summer 2025
 - Finalize initial design requirements
 - Begin work on dashboard with advisement of FRC members
- Fall 2025
 - Use Contesting dashboard at W3USR for the contest season
 - Continue development of dashboard
 - Review system operation and design
- Spring 2026
 - Install and test at a volunteer contesting station
 - Collect feedback on dashboard
 - Present results at 2026 HamSCI Workshop

References

WSPR.rocks! – WSPR Mapping website
Voice of America Coverage Analysis Program (VOACAP) for Ham Radio

Acknowledgements

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