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. A working prototype of the dashboard is currently operational, demonstrating real-time spot visualization of WSPR, FT4 and FT8 spots. 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

- Enable amateur radio operators to optimize their transmissions based on real-time ionospheric conditions to improve contesting efficiency and DXing success
- Provide local propagation insights to individual PSWS stations by visualizing WSPR, FT8, and FT4 spots on an interactive map with band-specific color coding and propagation path overlays
- Make PSWS data accessible and actionable for everyday ham radio operators, not just scientific researchers.

PSWS System

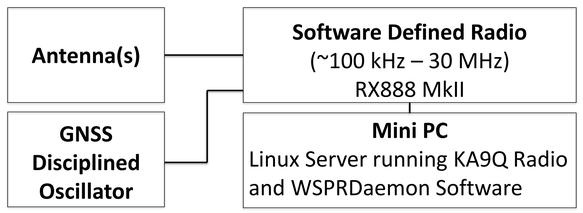

Figure 1: This diagram shows the basic layout of a PSWS System.

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.

Design Requirements

- Display Real-Time visualization of HF Propagation Conditions
- Develop interactive map and regional band-opening table views
- Testing Dashboard with real contests at W3USR
- Integrate with external data to enhance real-time HF Conditions
- Decode WSPR, FT8, and FT4 spots and integrate with external space weather observations.
- Develop session-persistent filter settings so operators can return to their preferred configuration

Current Dashboard

The dashboard has been developed as a real-time web application built using Flask, MongoDB, and Leaflet.js. The dashboard visualizes WSPR, FT4, and FT8 spots decoded by the PSWS receiver, and features two different views for the operator: an interactive world map displaying decoded spots with band-specific color mapping, and a regional band-opening table showing activity across 14 geographic regions for the 6 primary contesting bands. Operators can filter spots by band, mode, country, continent, CQ Zone, and ITU Zone. There is a prototype currently up and running, published at uacnj.kd3ald.com. This prototype was used in the ARRL SSB DX Contest this past March to aid operators contesting.

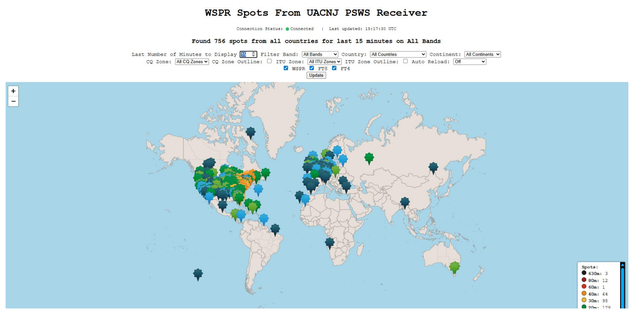

Figure 3: This picture shows the current progress of the map portion of the dashboard

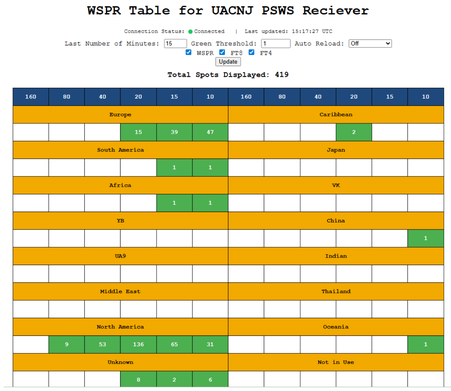

Figure 4: This picture shows the region-based table with the six main contesting bands.

Project Timeline

- Summer 2025
  - Finalized initial design requirements
  - Began work on dashboard with advisement of FRC members
  - Installed system with working prototype at K3LR
- Fall 2025
  - Continued development of dashboard
  - Review system operation and design
  - Introduced dashboard to W3USR Contesting
- Spring 2026
  - Install and test at a volunteer contesting station
  - Use dashboard to aid in W3USR Contesting
  - Collect feedback on dashboard
  - Present results at 2026 HamSCI Workshop
- Summer / Fall 2026
  - Continue development and feature implementation of the dashboard

Future Work / Next Steps

- Install, test and use dashboard at volunteer contest station, and collect operator feedback
- Develop alerting function to notify operators of specific band openings
- Integrate with external propagation sources like ITU-R-HF Models
- Explore integration with N1MM+ logger for easier in-contest use
- Expand to support multiple simultaneous PSWS receivers to enable broader propagation comparisons.
- Explore machine learning with historical propagation models to provide enhanced propagation predictions.

Installation at K3LR / KD3ALD

References

https://github.com/hamsci/frc_contesting

https://wsprdaemon.org

Acknowledgements

Frankford Radio Club, W3USR Amateur Radio Club, HamSCI Community

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