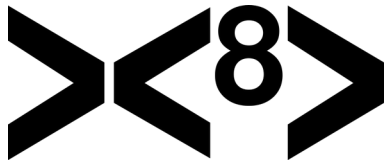
An Appliance for FM Satellites

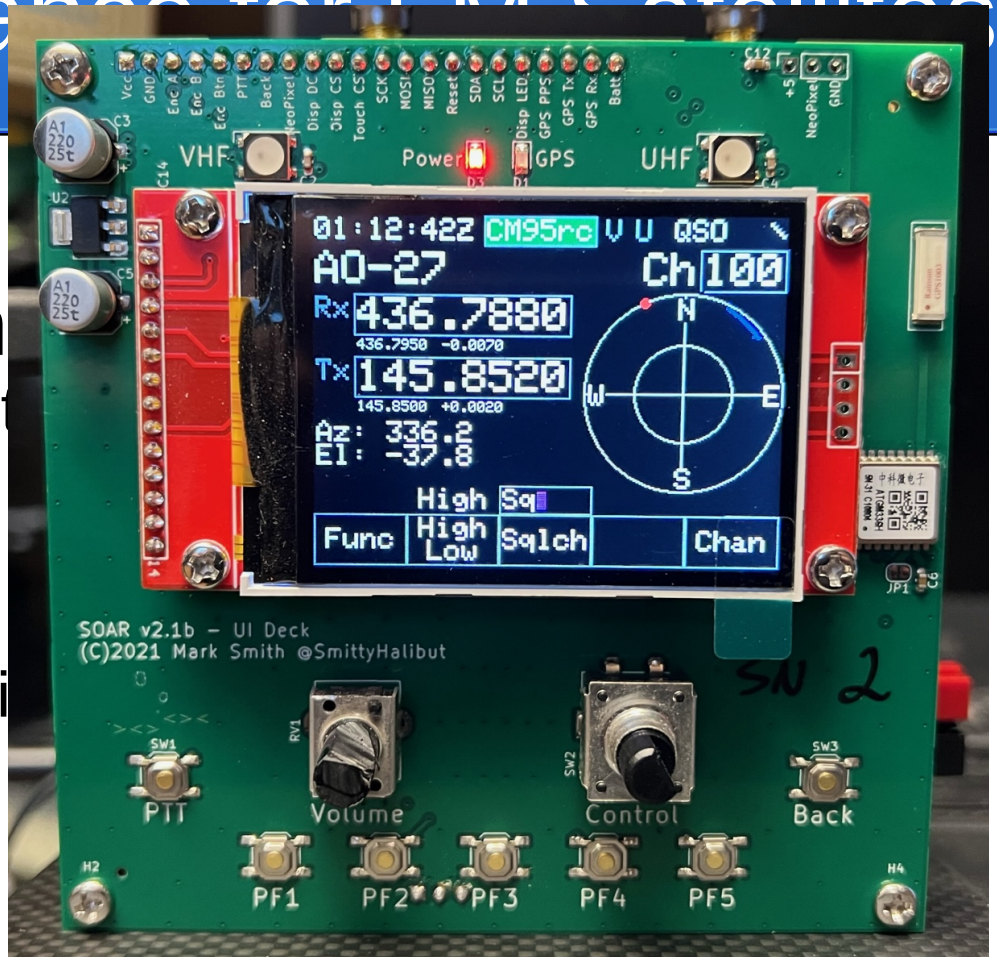


Mark Smith, N6MTS
@SmittyHalibut

Head Cheese, Halibut Electronics, Inc.
@HalibutElec
https://electronics.halibut.com/

Video

An Appliance for FM Satellites



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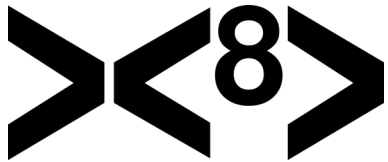
Video

Why FM Sats are a Challenge



Video

Why FM Sats are a Challenge

- Full Duplex

Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math

Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math
  - Pass Prediction

Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math
  - Pass Prediction
  - Doppler Shift

Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math
  - Pass Prediction
  - Doppler Shift
  - Azimuth and Elevation

Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math
  - Pass Prediction
  - Doppler Shift
  - Azimuth and Elevation
- Audio

Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math
  - Pass Prediction
  - Doppler Shift
  - Azimuth and Elevation
- Audio
  - Routing to Headset and Radios

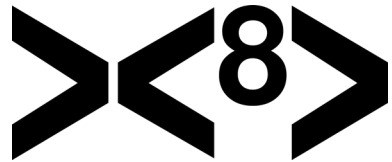
Video

Why FM Sats are a Challenge

- Full Duplex
- Satellite Math
  - Pass Prediction
  - Doppler Shift
  - Azimuth and Elevation
- Audio
  - Routing to Headset and Radios
  - Record the Pass

Video

Ideal Appliance for FM Sats



Video

Ideal Appliance for FM Sats

Does all those things.

Video

Ideal Appliance for FM Sats

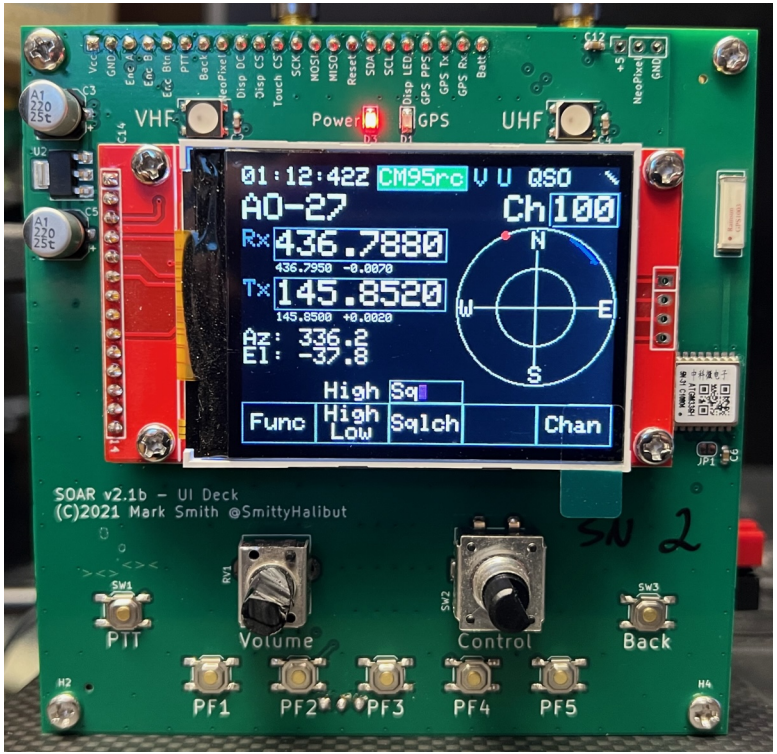
Does all those things.

(...an easy slide...)

Video

SOAR

SOAR: Satellite Optimized Amateur Radio



Video

SOAR: Full Duplex VHF/UHF

Video

SOAR: Full Duplex VHF/UHF

- Separate VHF and UHF radio modules.

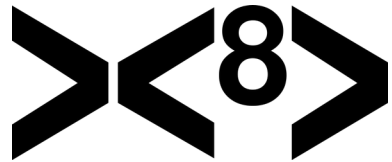
Video

SOAR: Full Duplex VHF/UHF

- Separate VHF and UHF radio modules.
- Band Pass Filters on each, little to no desense.

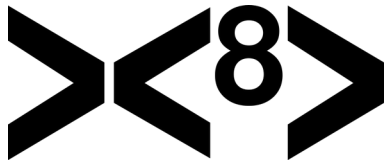
Video

SOAR: Satellite Math



Video

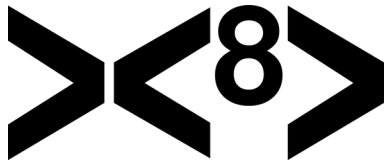
SOAR: Satellite Math



- Built-in GPS: Knows where and when it is.

Video

SOAR: Satellite Math



- Built-in GPS: Knows where and when it is.
- Satellite TLE on internal storage: Knows where the satellites are.

Video

SOAR: Satellite Math

- Built-in GPS: Knows where and when it is.
- Satellite TLE on internal storage: Knows where the satellites are.
- Automatically calculates:

Video

SOAR: Satellite Math

- Built-in GPS: Knows where and when it is.
- Satellite TLE on internal storage: Knows where the satellites are.
- Automatically calculates:
  - Pass AOS/LOS times, predictions.

Video

SOAR: Satellite Math

- Built-in GPS: Knows where and when it is.
- Satellite TLE on internal storage: Knows where the satellites are.
- Automatically calculates:
  - Pass AOS/LOS times, predictions.
  - Relative velocity, doppler shift.

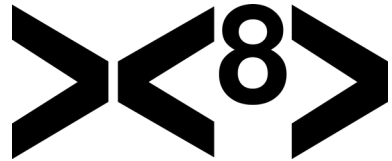
Video

SOAR: Satellite Math

- Built-in GPS: Knows where and when it is.
- Satellite TLE on internal storage: Knows where the satellites are.
- Automatically calculates:
  - Pass AOS/LOS times, predictions.
  - Relative velocity, doppler shift.
  - Azimuth and elevation, display.

Video

SOAR: Audio



Video

SOAR: Audio

- Optimized for headset use.

Video

SOAR: Audio

- Optimized for headset use.
- Pass audio recorded to internal storage:

Video

SOAR: Audio

- Optimized for headset use.
- Pass audio recorded to internal storage:
  - Can be played back on SOAR.

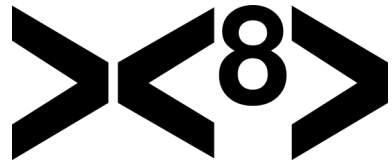
Video

SOAR: Audio

- Optimized for headset use.
- Pass audio recorded to internal storage:
  - Can be played back on SOAR.
  - Available as .WAV over USB

Video

SOAR: Boom Controls



Video

SOAR: Boom Controls

- External PTT available:

Video

SOAR: Boom Controls

- External PTT available:
  - Mount a button on the antenna boom?

Video

SOAR: Boom Controls

- External PTT available:
  - Mount a button on the antenna boom?
  - Foot switch?

Video

SOAR: Boom Controls

- External PTT available:
  - Mount a button on the antenna boom?
  - Foot switch?
- Azimuth/Elevation data available:

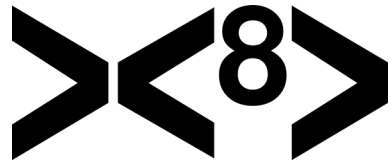
Video

SOAR: Boom Controls

- External PTT available:
  - Mount a button on the antenna boom?
  - Foot switch?
- Azimuth/Elevation data available:
  - Targeting display on boom?

Video

SOAR: User Interface



Video

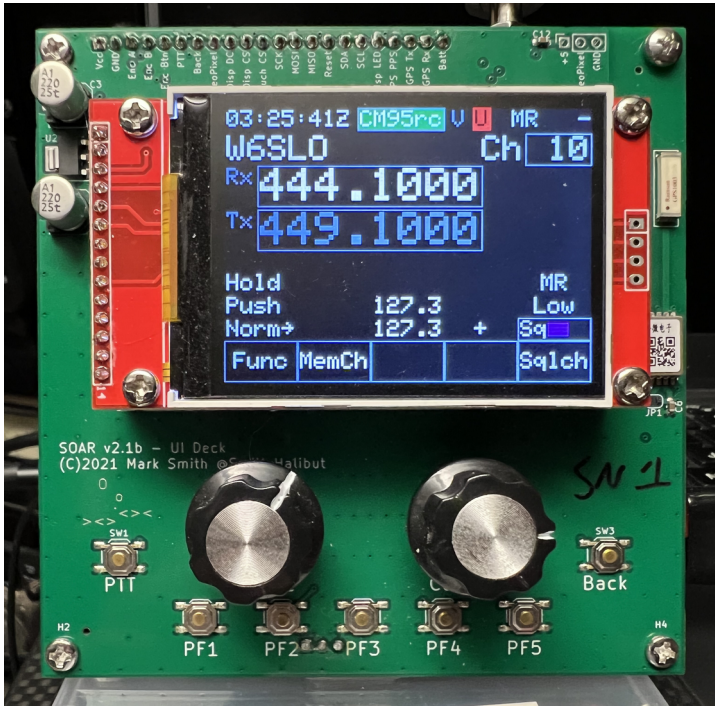
SOAR: User Interface

- Four Operating Modes (Views):

Video

SOAR: User Interface

- Four Operating Modes (Views):
  1)Standard HT



Video

SOAR: User Interface

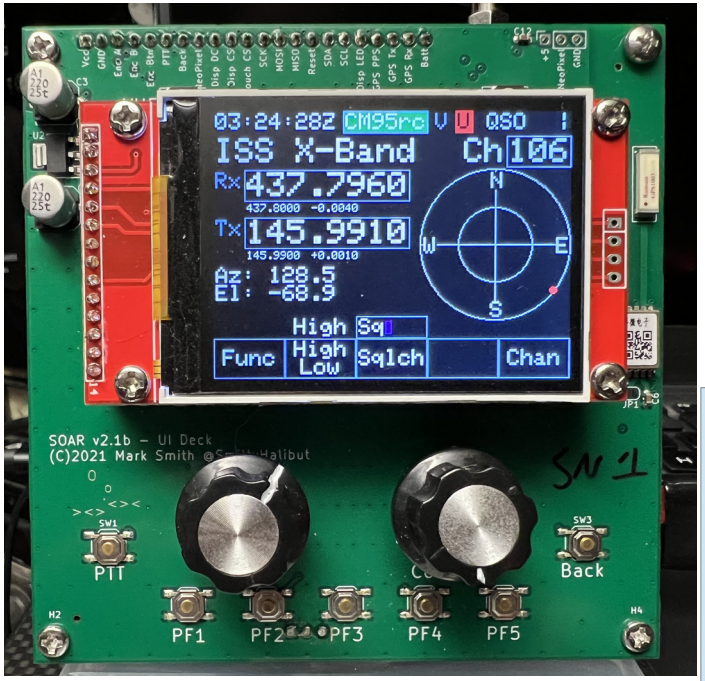
- Four Operating Modes (Views):
  1) Standard HT
  2) Pass Prediction

To be designed...

Video

SOAR: User Interface

- Four Operating Modes (Views):
  1) Standard HT
  2) Pass Prediction
  3) Pass Operation



Video

SOAR: User Interface

- Four Operating Modes (Views):
  1) Standard HT
  2) Pass Prediction
  3) Pass Operation
  4) Pass Playback

Video

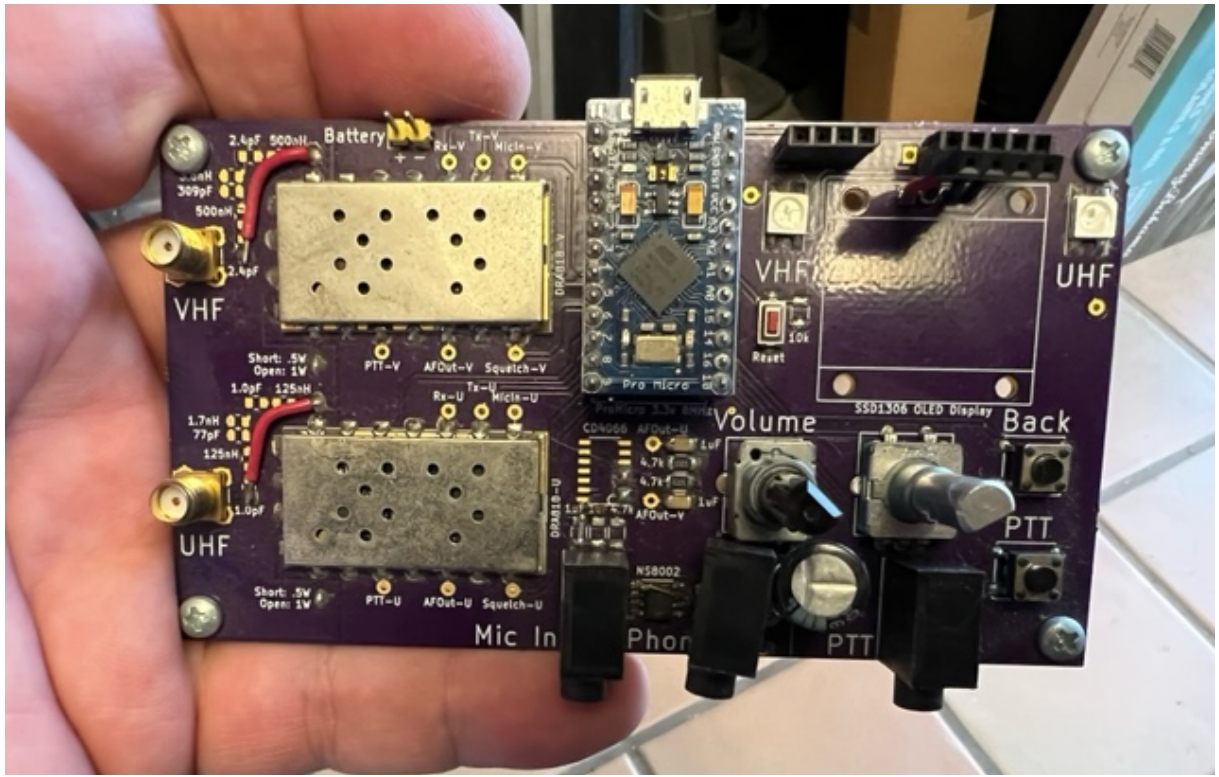
SOAR Hardware: v1

- Bring-a-Hack to Maker Faire 2017

Video

SOAR Hardware: v1

- Bring-a-Hack to Maker Faire 2017



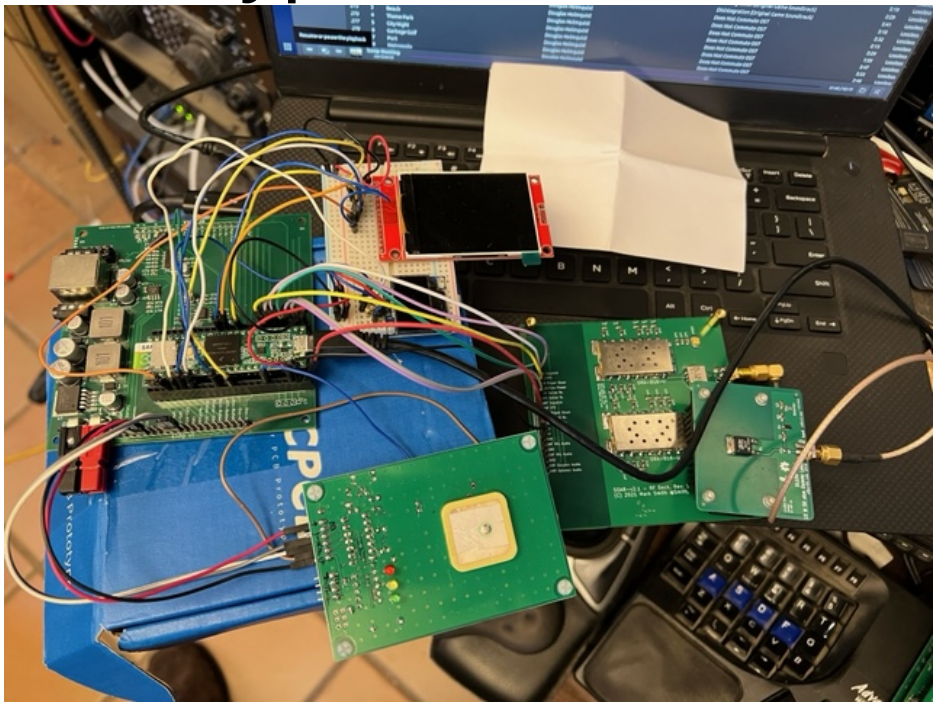
SOAR Hardware: v2

- Prototype hardware, for development and testing

Video

SOAR Hardware: v2

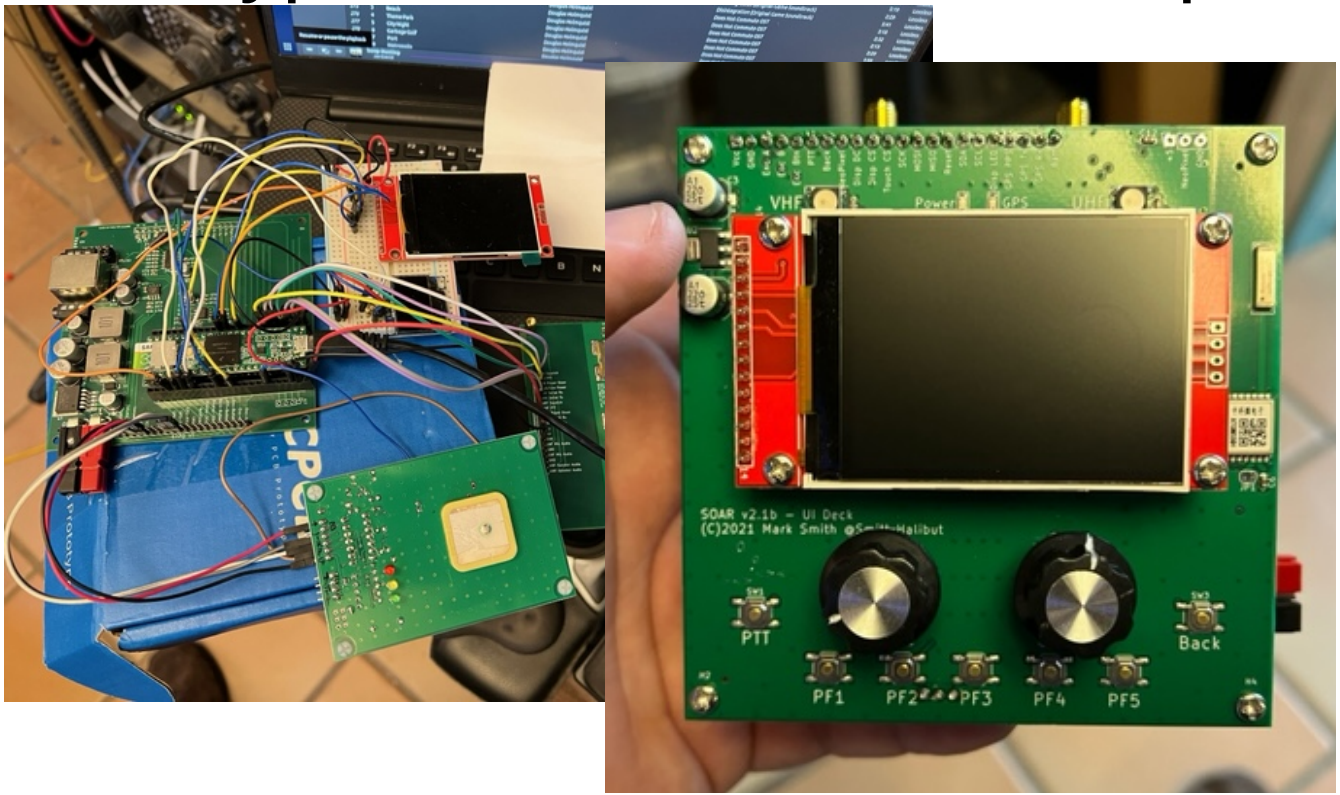
- Prototype hardware, for development and testing



Video

SOAR Hardware: v2

- Prototype hardware, for development and testing



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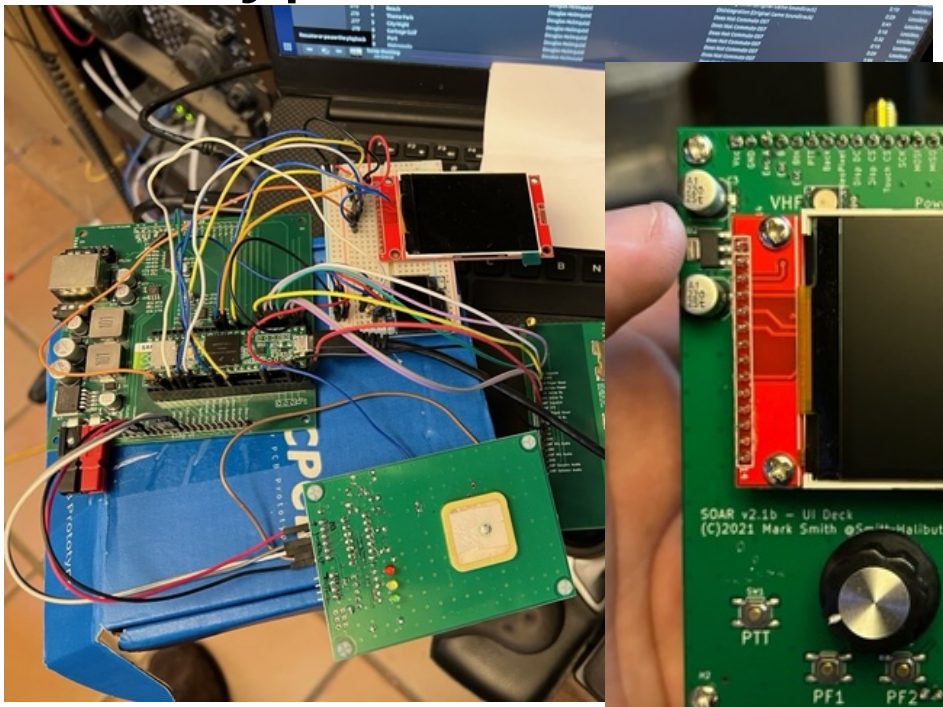
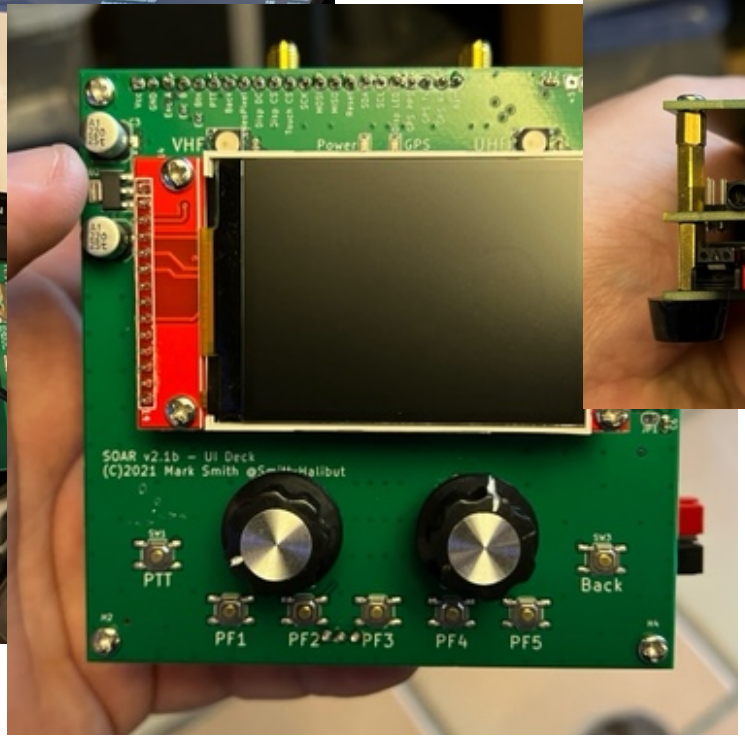
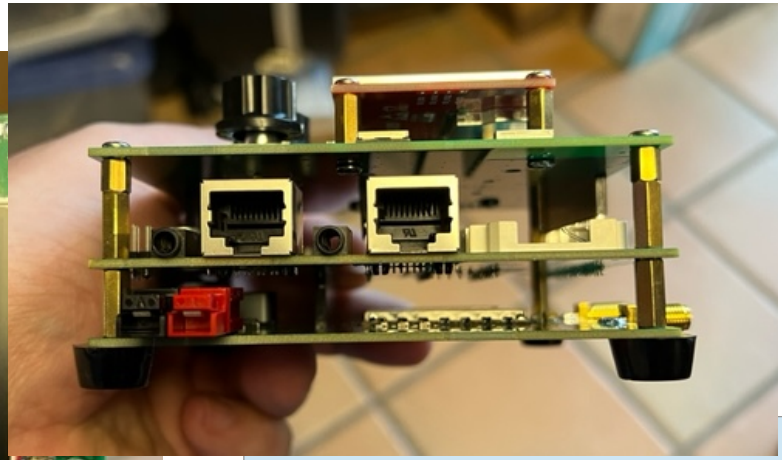
SOAR Hardware: v2

- Prototype hardware, for development and testing







Video

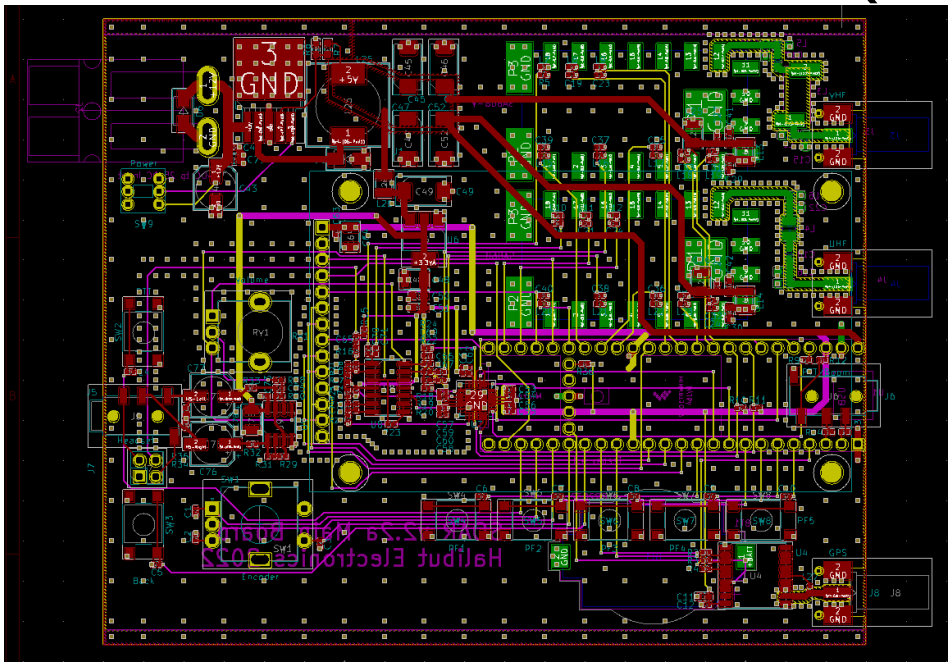
SOAR Hardware: v2.2

- Production Hardware (in fab as of 2022-02-05)

Video

SOAR Hardware: v2.2

- Production Hardware (in fab as of 2022-02-05)



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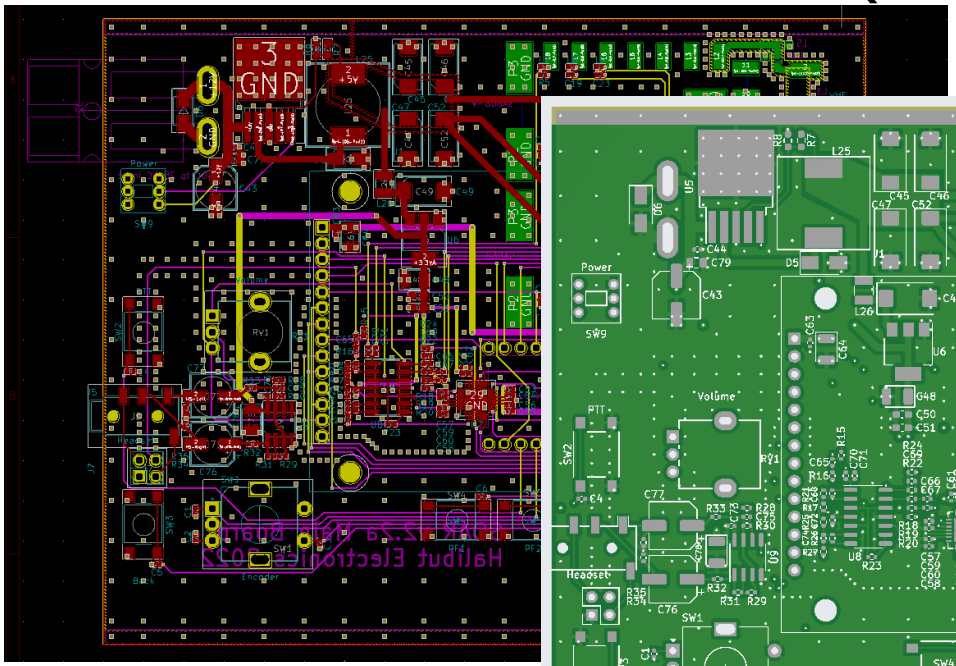

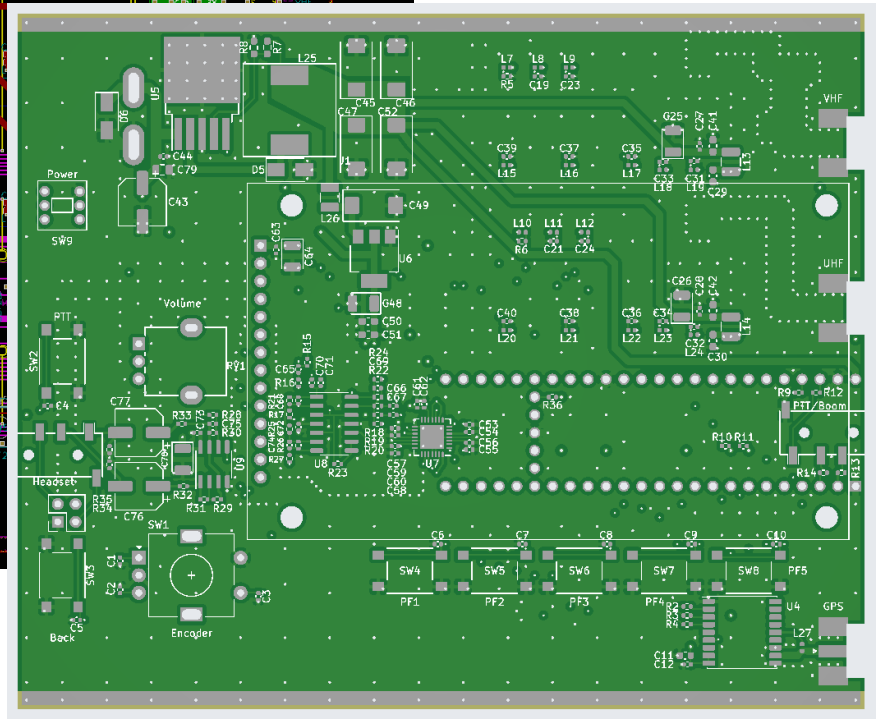

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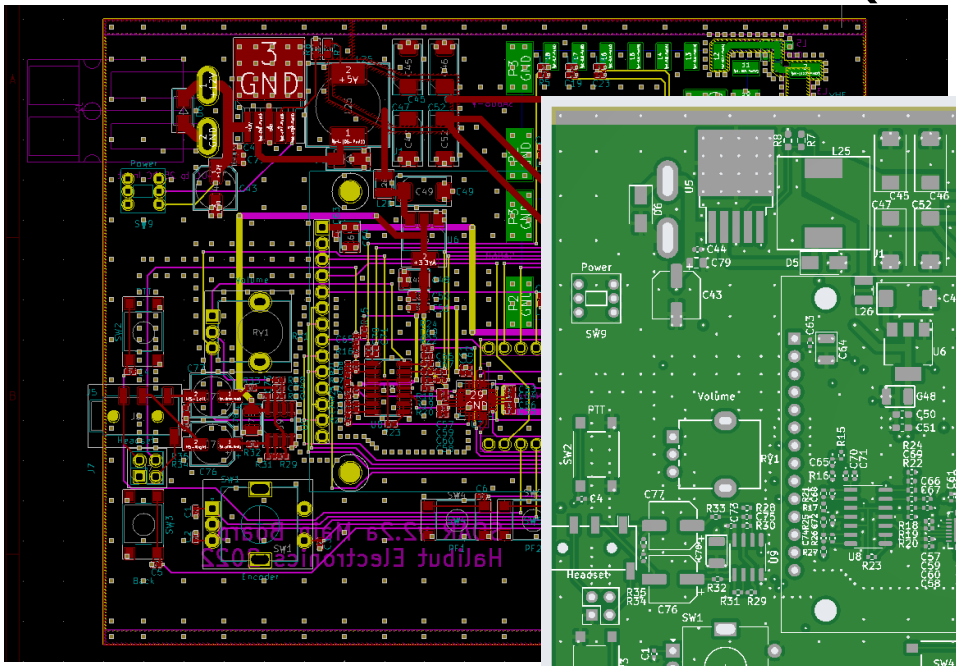

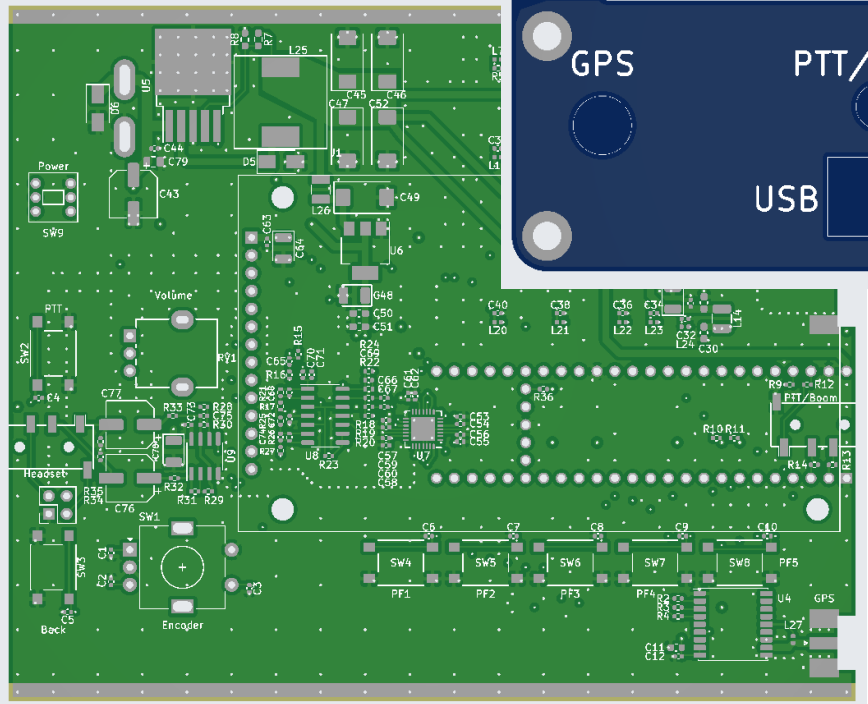

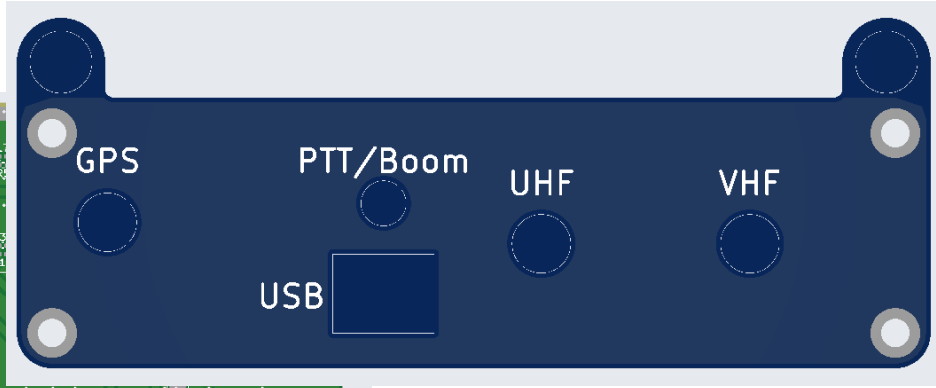

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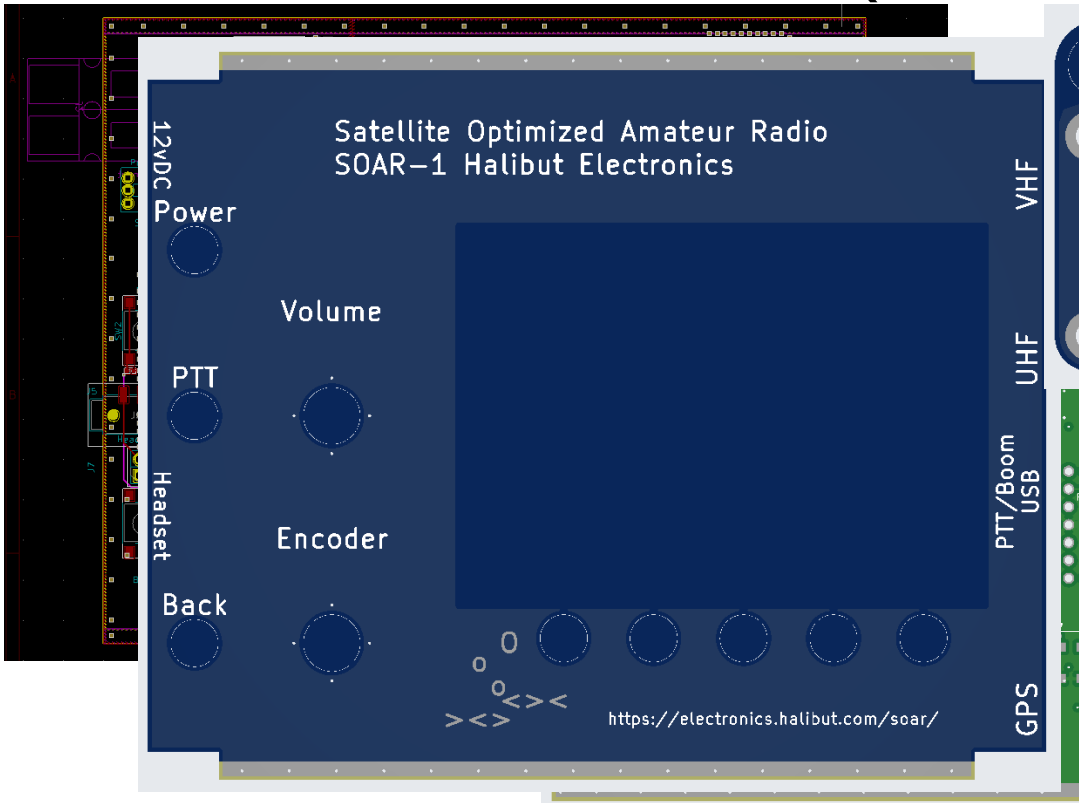
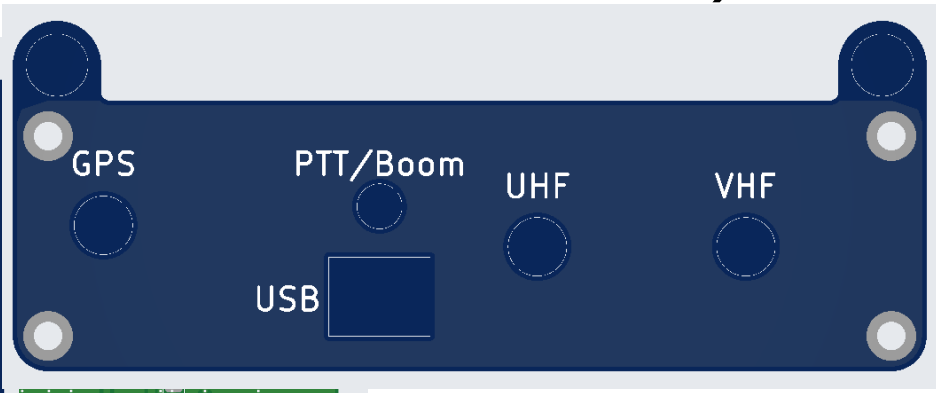
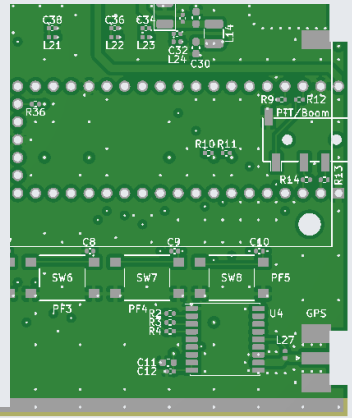
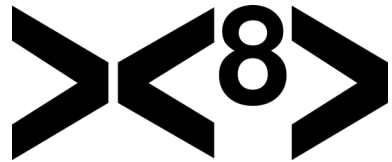






Video

Possible Future Features



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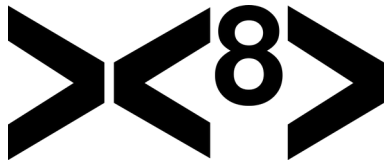


THIS IS NOT A COMMITMENT TO THESE NEW FEATURES!

This is just what I’m thinking about...

Video

Possible Future Features

- On-radio packet/APRS mode

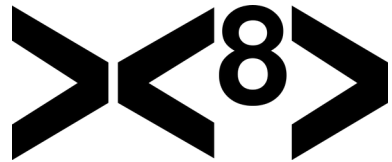
Video

Possible Future Features

- On-radio packet/APRS mode
- USB Audio/CAT: remote station

Video

Possible Future Hardware



Video

Possible Future Hardware

- Antenna boom mounted targeting display

Video

Possible Future Hardware

- Antenna boom mounted targeting display
- Lightweight az/el rotator

Video

Possible Future Hardware

- Antenna boom mounted targeting display
- Lightweight az/el rotator
- More power: Amp and/or Preamp

Video

Possible Future Hardware

- Antenna boom mounted targeting display
- Lightweight az/el rotator
- More power: Amp and/or Preamp
- Replace FM modules with narrowband SDR: SSB, CW, FT*, etc.

Video

Thank You!

SOAR: Satellite Optimized Amateur Radio

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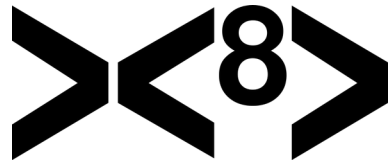

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