TANGERINE SDR
PSWS CONTROL SOFTWARE
DEMO

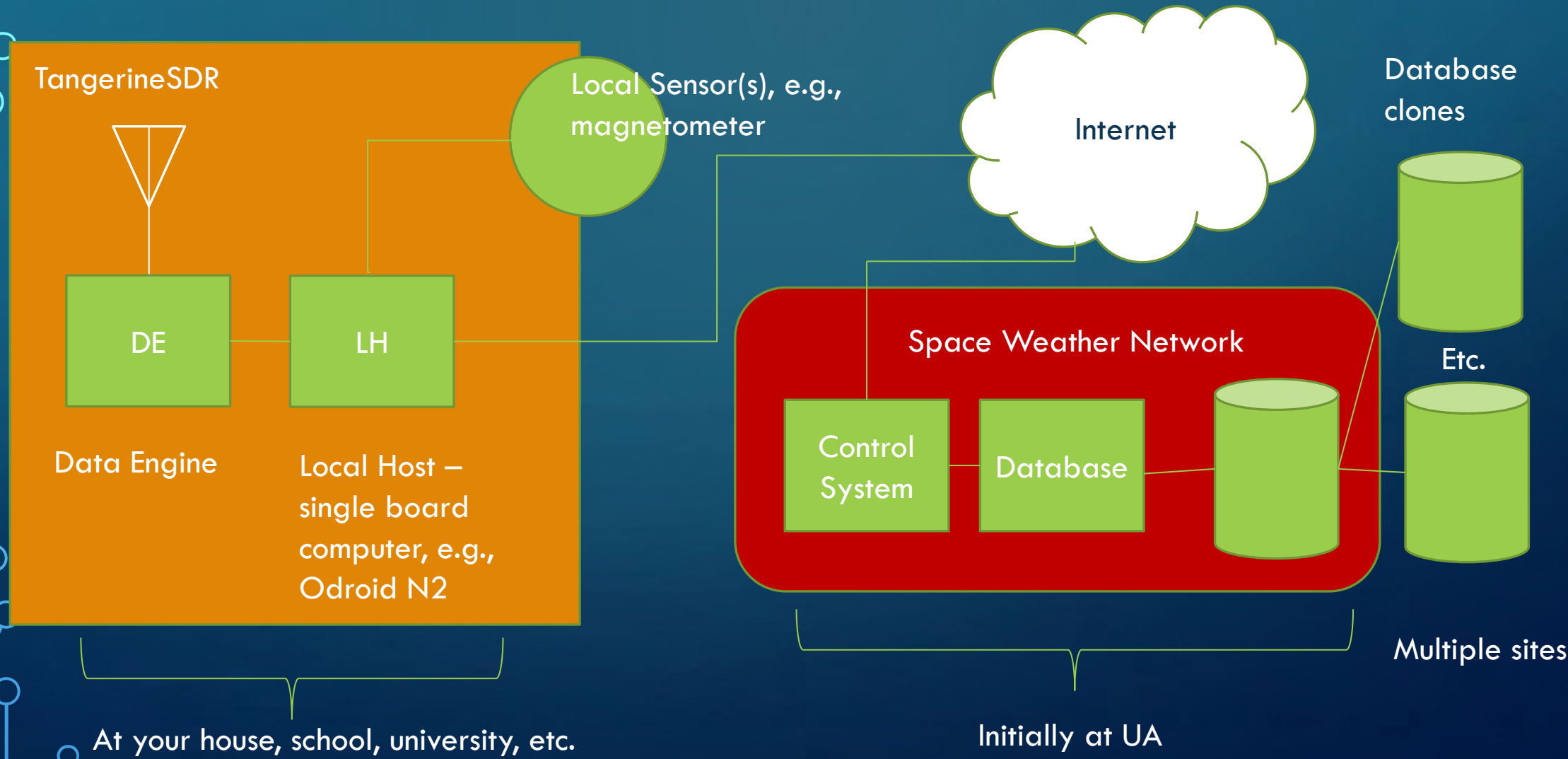
OBSERVING THE IONOSPHERE FROM YOUR HOME QTH

BILL ENGELKE, AB4EJ - HAMSCI WORKSHOP, MARCH 2021

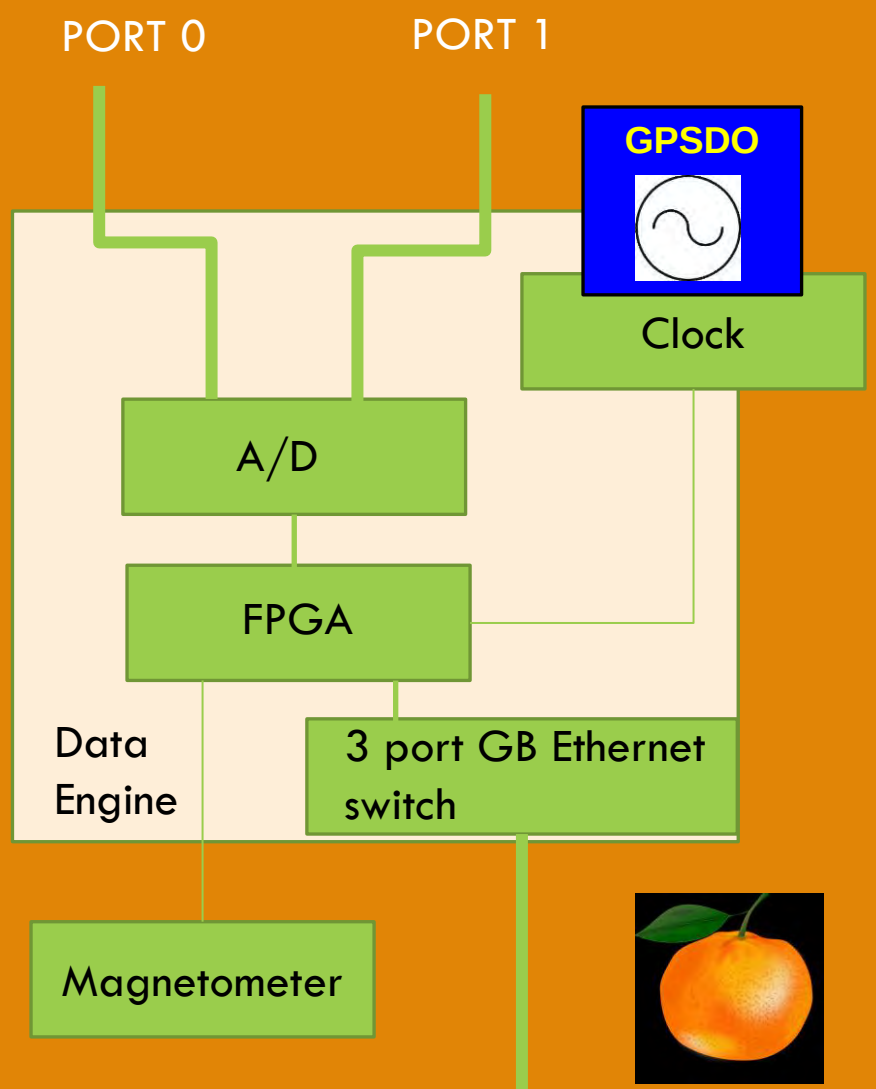
OVERVIEW

- System Architecture
- Local Host Design
- Simulator Design
- Example spectrograms
- Demo

PSWS NETWORK – LOGICAL ARCHITECTURE

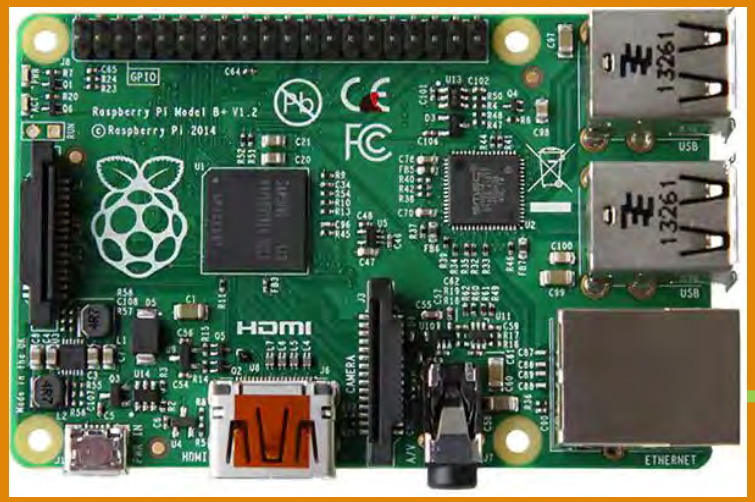


WHAT IS IN THE TANGERINE SDR?



A TangerineSDR consists of:

- Data Engine – A/D converter and FPGA
- Single Board Computer (Odroid N2 4GB RAM)
- Connected together by a gigabit switch
- (optional) – highly accurate clock; magnetometer



Local Host:
Raspberry Pi 4 b+ or Odroid N2

TANGERINE-SDR SOFTWARE

Internet

To Central Control System

OPTIONAL LOCAL LARGE SERVER

ULTRA-HIGH SPEED "LOCAL FIREHOSE" DATA

Local Host

Data Engine (FPGA)

UDP PORTS

CONTROL COMMANDS

App.py – written in Python3

- Handles commands from local web server; upload bulk data to Central

Spawn subprocesses

Monitor

Processes written in C

- Handle high speed data feed from DE
- Save data in Digital RF format
- Decode FT8 & WSPR signals
- Interface to GNURadio
- Handle "Remote Firehose" data

Local Browser-based UI "Web Controller" (running flask, flask-WTForms)

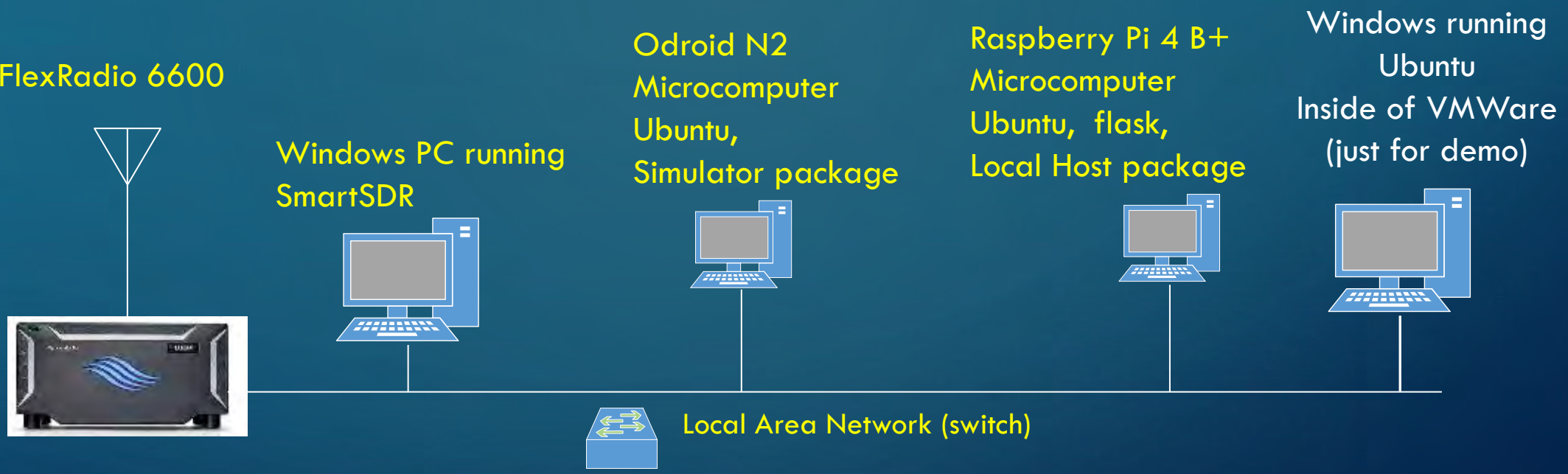
HIGH SPEED DATA

TangerineSDR

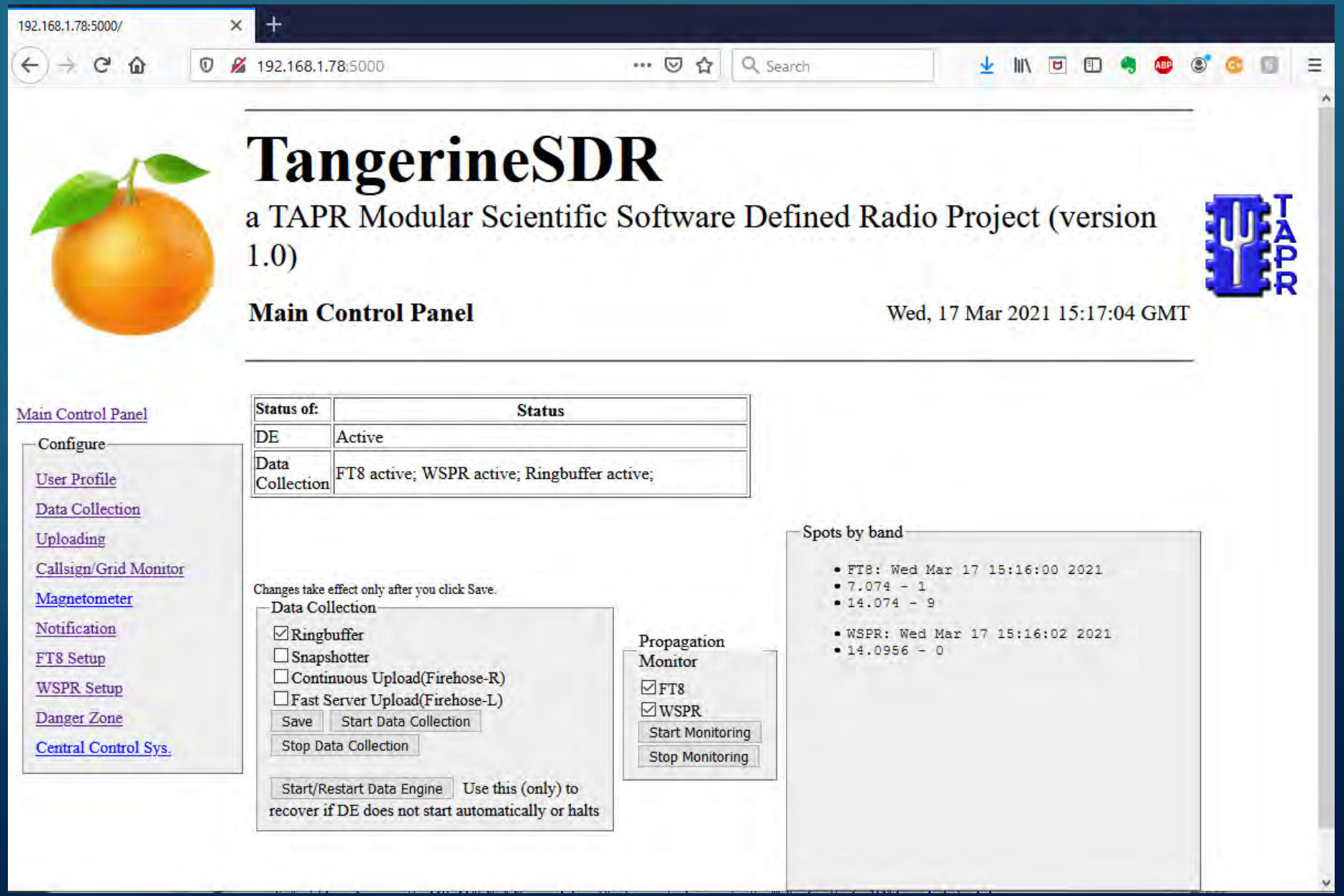
Local USB HD

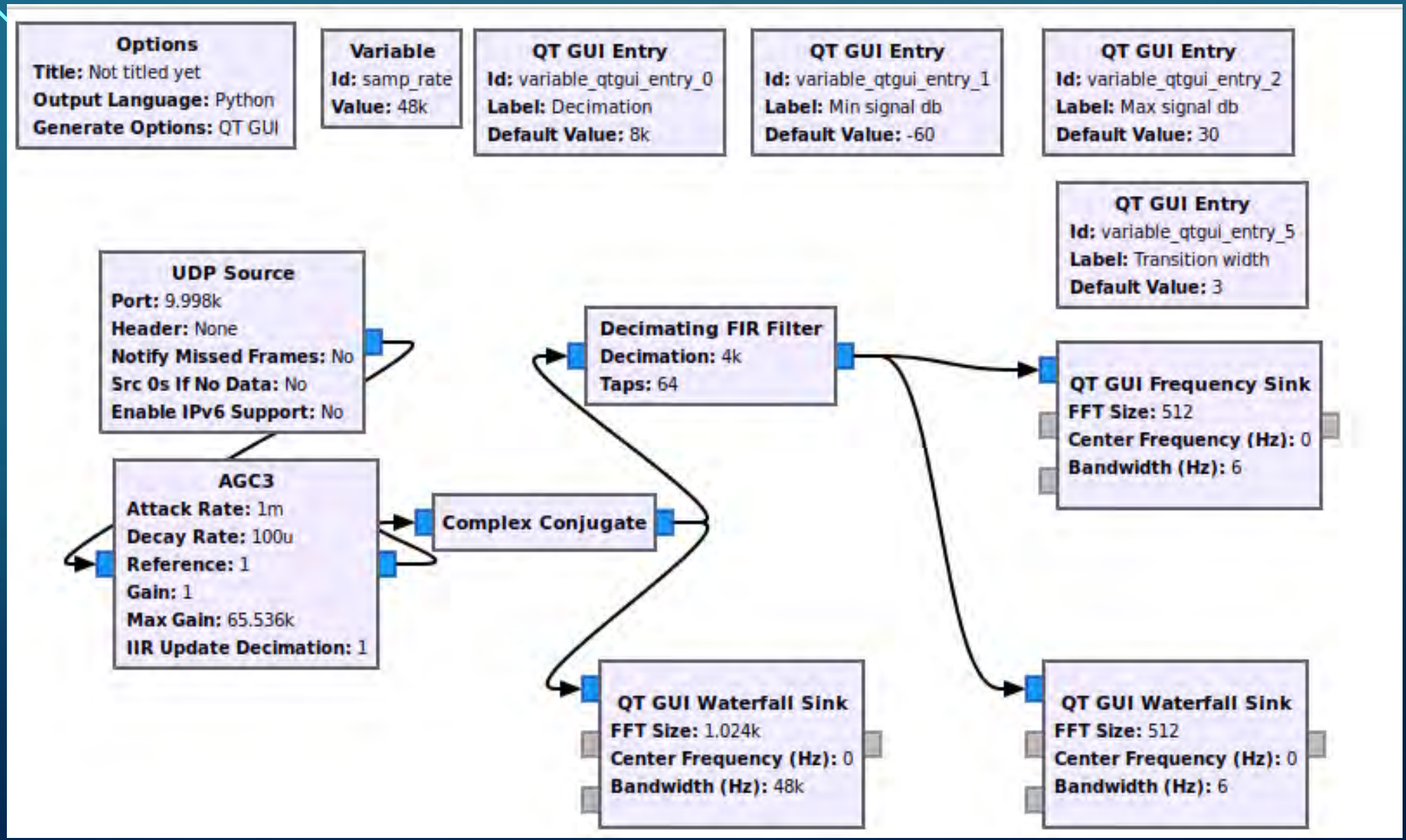
RAMdisk

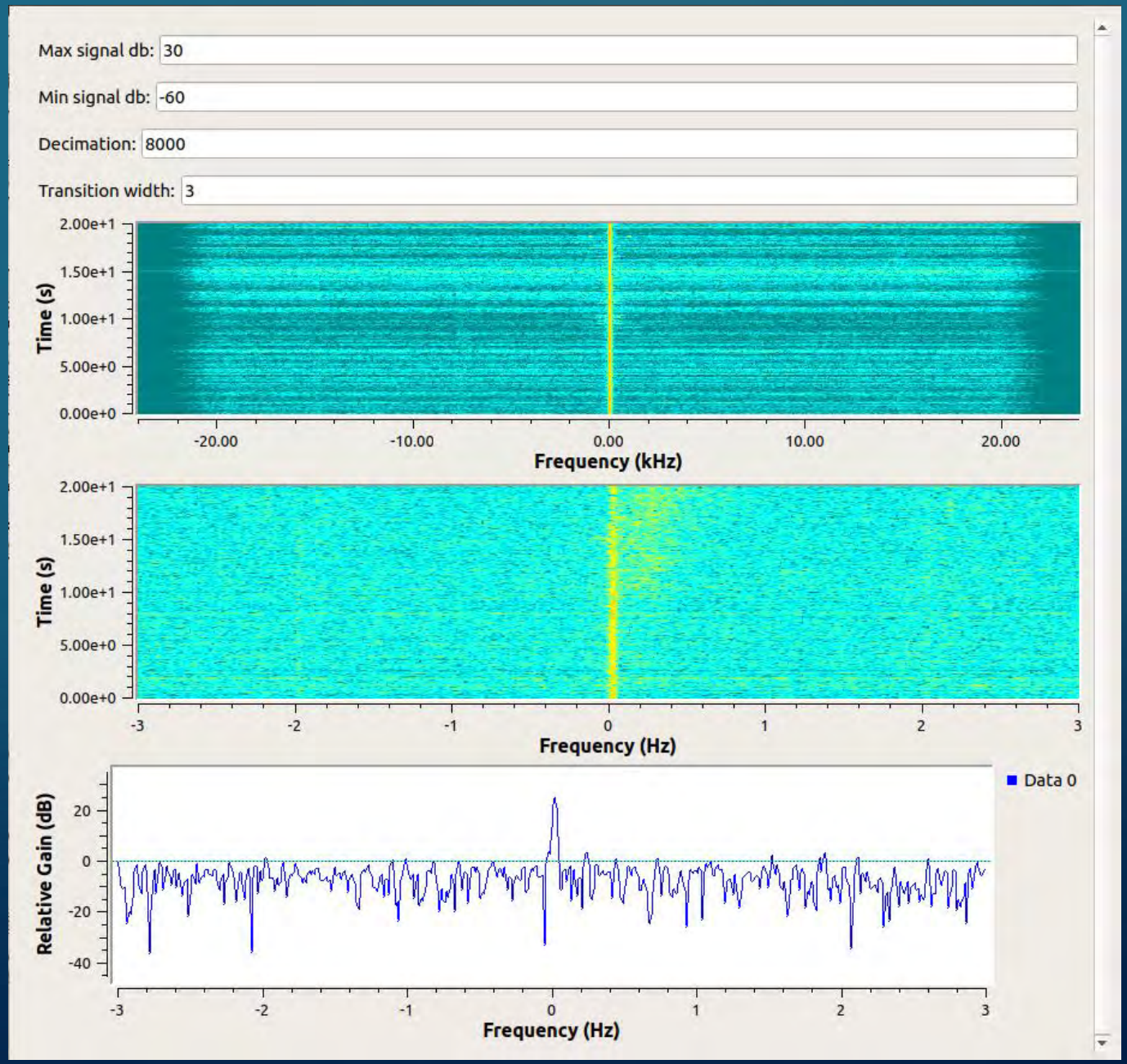
SIMULATING THE TANGERINE



NOTE: this is just for the simulation. You don't need all this to run the TangerineSDR!

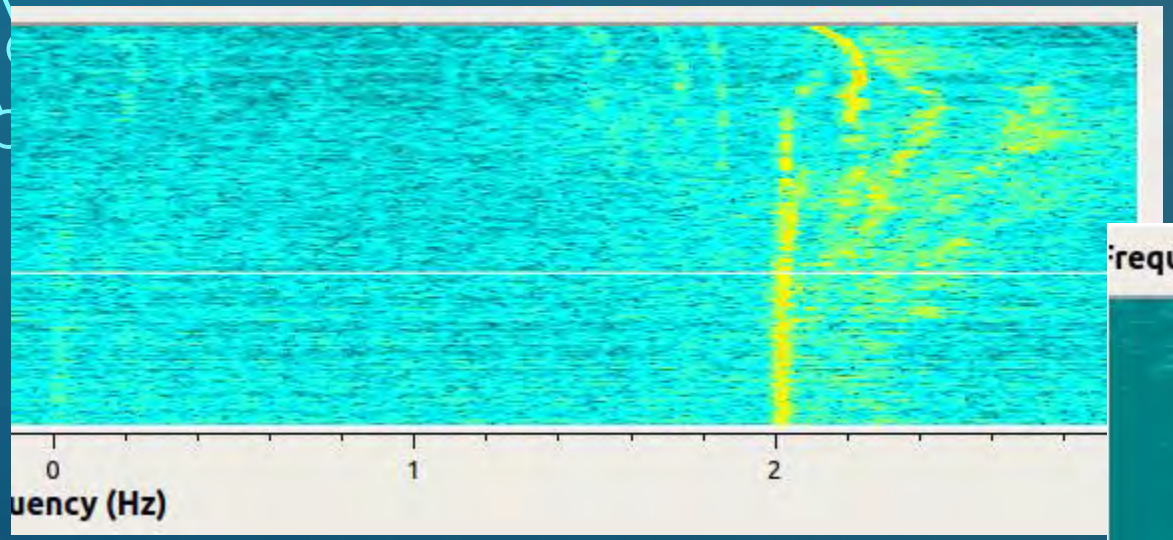

192.168.1.78:5000/
192.168.1.78:5000
Search
TangerineSDR
a TAPR Modular Scientific Software Defined Radio Project (version 1.0)
Main Control Panel
Wed, 17 Mar 2021 15:17:04 GMT
Main Control Panel
Configure
User Profile
Data Collection
Uploading
Callsign/Grid Monitor
Magnetometer
Notification
FT8 Setup
WSPR Setup
Danger Zone
Central Control Sys.
Status of:
Status
DE
Active
Data Collection
FT8 active; WSPR active; Ringbuffer active;
Changes take effect only after you click Save.
Data Collection
Ringbuffer
Snapshotter
Continuous Upload(Firehose-R)
Fast Server Upload(Firehose-L)
Save
Start Data Collection
Stop Data Collection
Start/Restart Data Engine
Use this (only) to recover if DE does not start automatically or halts
Propagation Monitor
FT8
WSPR
Start Monitoring
Stop Monitoring
Spots by band
FT8: Wed Mar 17 15:16:00 2021
7.074 - 1
14.074 - 9
WSPR: Wed Mar 17 15:16:02 2021
14.0956 - 0


Options
Title: Not titled yet
Output Language: Python
Generate Options: QT GUI
Variable
Id: samp_rate
Value: 48k
QT GUI Entry
Id: variable_qtgui_entry_0
Label: Decimation
Default Value: 8k
QT GUI Entry
Id: variable_qtgui_entry_1
Label: Min signal db
Default Value: -60
QT GUI Entry
Id: variable_qtgui_entry_2
Label: Max signal db
Default Value: 30
QT GUI Entry
Id: variable_qtgui_entry_5
Label: Transition width
Default Value: 3
UDP Source
Port: 9.998k
Header: None
Notify Missed Frames: No
Src 0s If No Data: No
Enable IPv6 Support: No
AGC3
Attack Rate: 1m
Decay Rate: 100u
Reference: 1
Gain: 1
Max Gain: 65.536k
IIR Update Decimation: 1
Complex Conjugate
Decimating FIR Filter
Decimation: 4k
Taps: 64
QT GUI Frequency Sink
FFT Size: 512
Center Frequency (Hz): 0
Bandwidth (Hz): 6
QT GUI Waterfall Sink
FFT Size: 1.024k
Center Frequency (Hz): 0
Bandwidth (Hz): 48k
QT GUI Waterfall Sink
FFT Size: 512
Center Frequency (Hz): 0
Bandwidth (Hz): 6

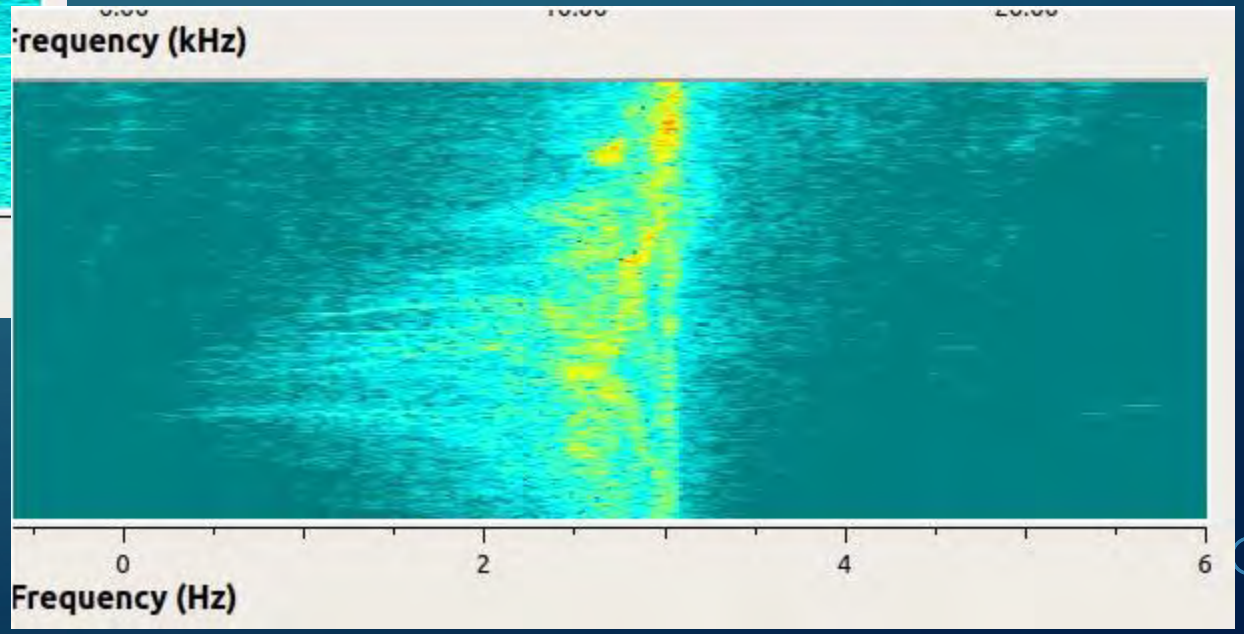

Max signal db: 30
Min signal db: -60
Decimation: 8000
Transition width: 3
Time (s)
2.00e+1
1.50e+1
1.00e+1
5.00e+0
0.00e+0
-20.00
-10.00
0.00
10.00
20.00
Frequency (kHz)
Time (s)
2.00e+1
1.50e+1
1.00e+1
5.00e+0
0.00e+0
-3
-2
-1
0
1
2
3
Frequency (Hz)
Relative Gain (dB)
20
0
-20
-40
Data 0
-3
-2
-1
0
1
2
3
Frequency (Hz)

Tangerine examples

Sunrise....

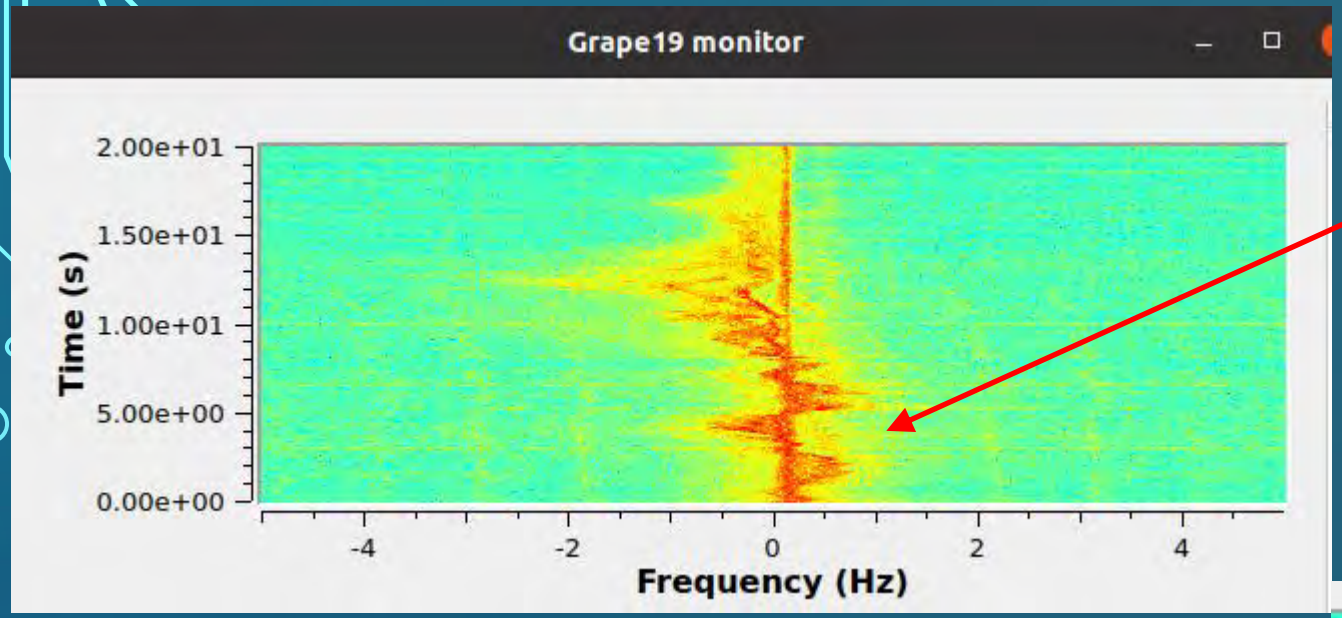


Sunset...



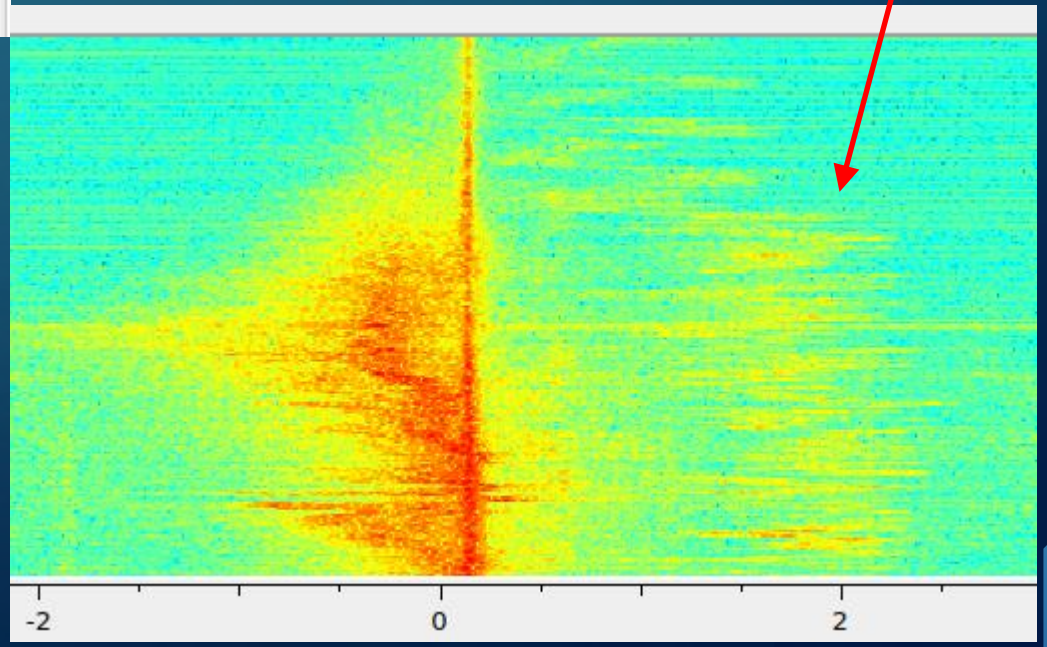
Colors are based on gnuradio settings; these will be improved

...Swiftly fly the days...



Possible TID and/or solar flare (sine wave shape)

???



Grape examples

Good color settings in gnuradio here

PLANS

- Hardware available soon – see talk by Scotty WA2DFI
- Central Control System / Database available by mid-2022

Q & A

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