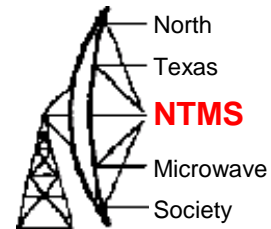


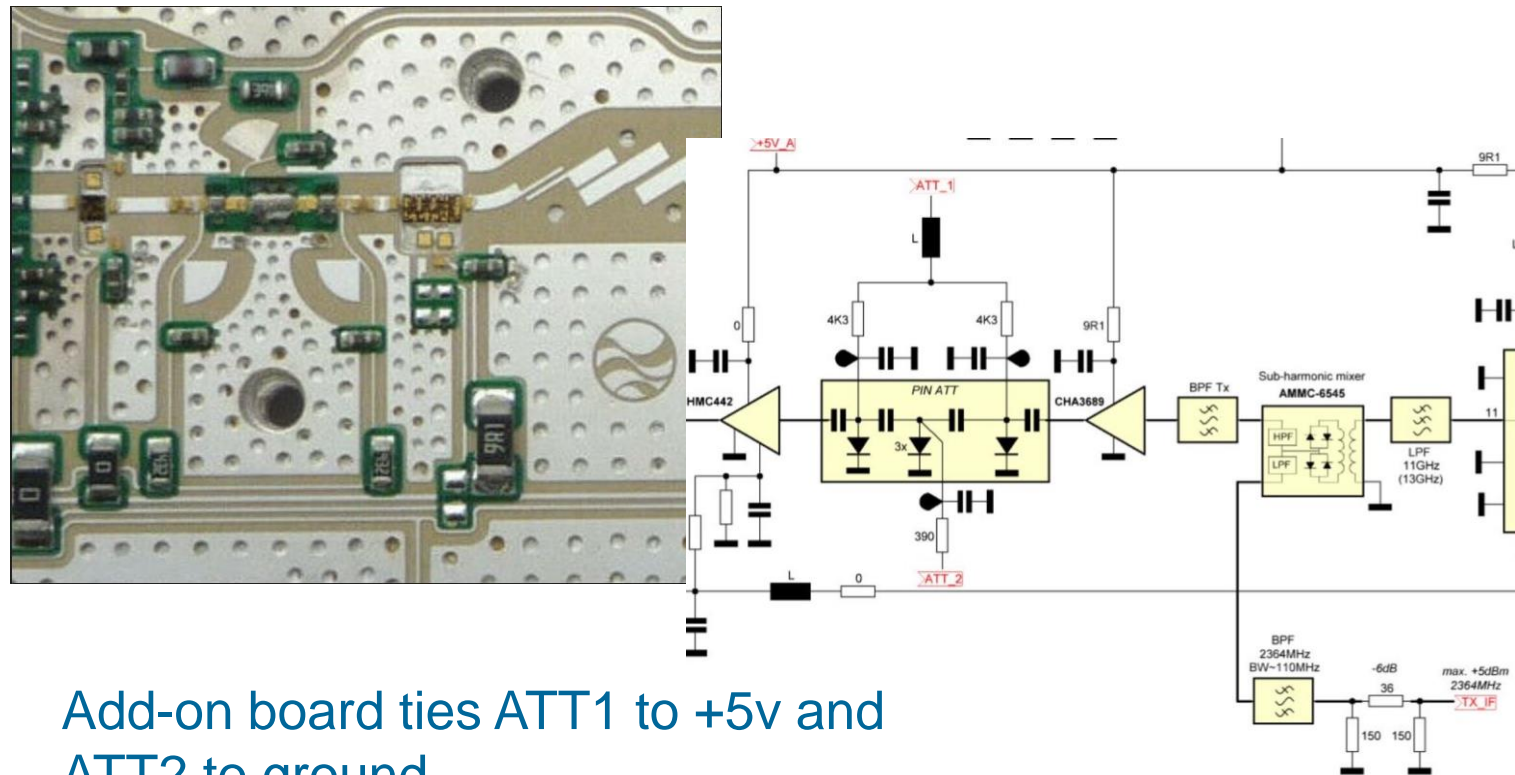
# Wavelab 24 GHz Optimization – Part 1

May 6, 2023

# Improving RF output

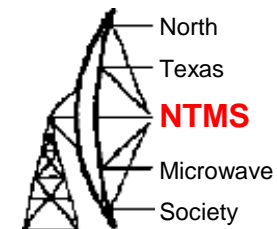


- Recall previous discussions around module-based PIN attenuator



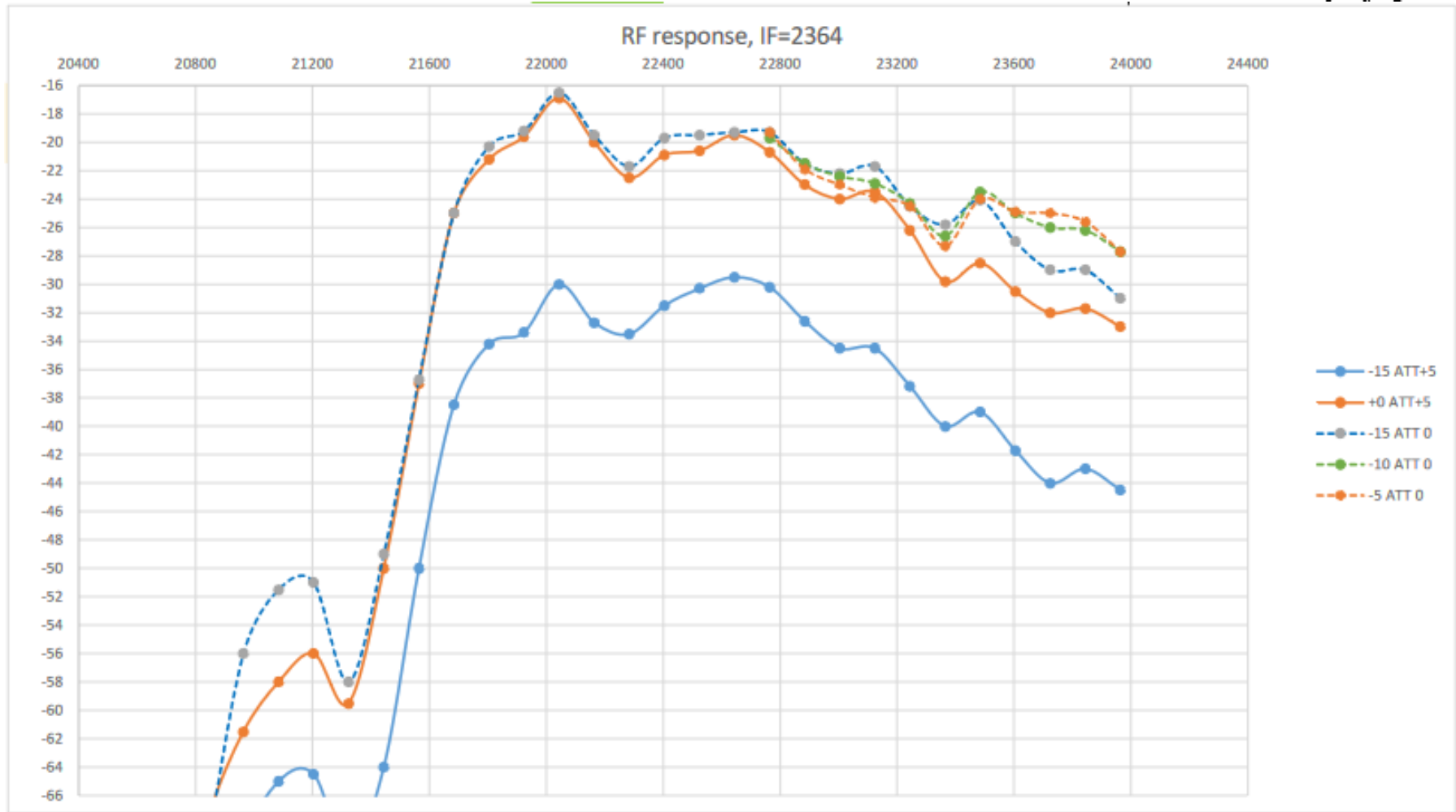
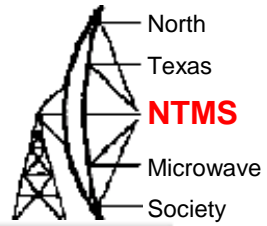
Add-on board ties ATT1 to +5v and ATT2 to ground

# Improving RF output

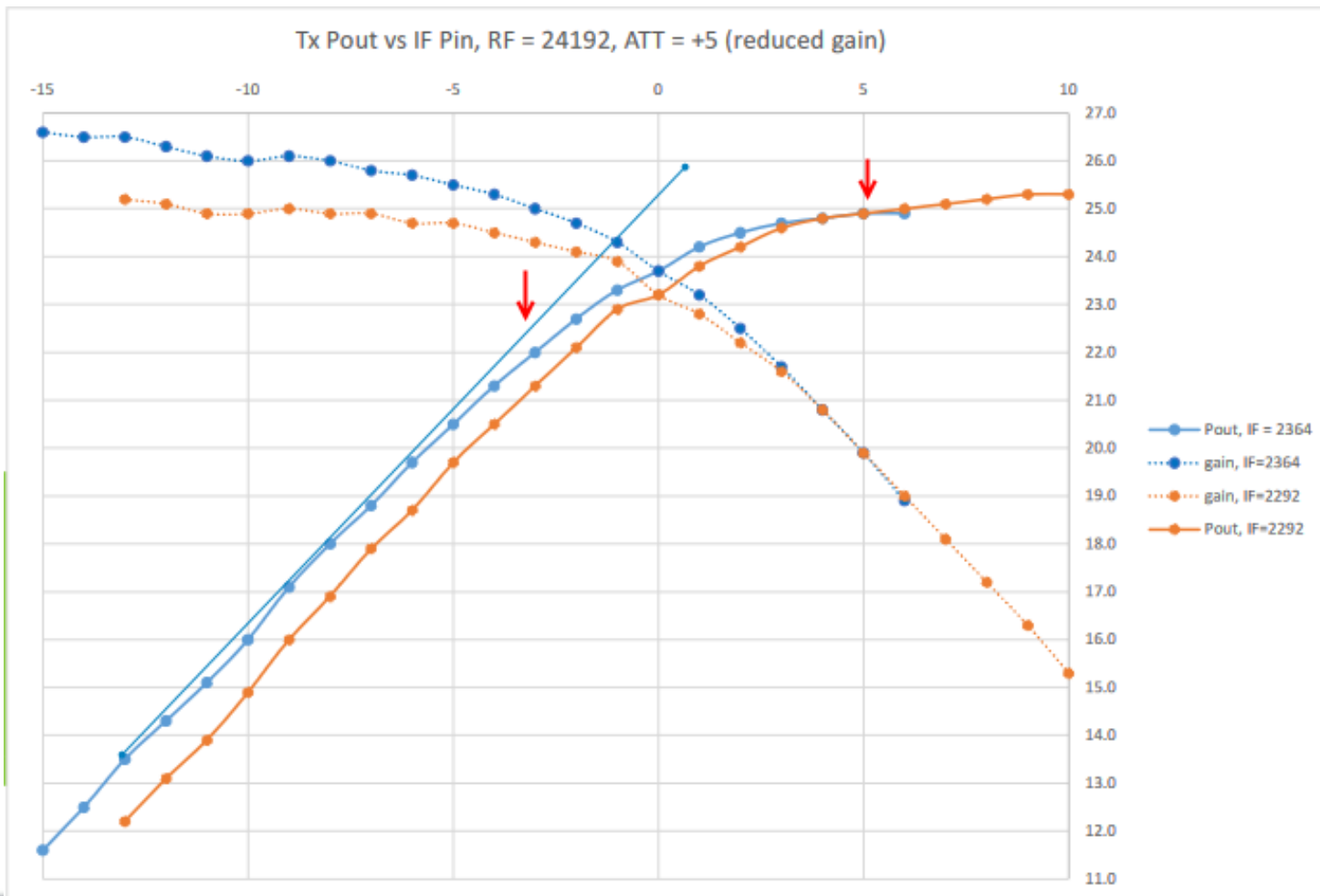
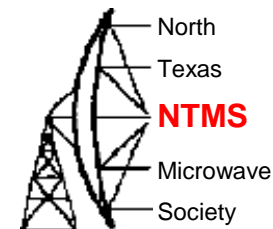


- We surmised that modifying the add-on board to allow ATT1 to float would reduce the attenuation in the transmit pipeline within the module.
- Mike Lavelle K6ML ran tests on the PA0MHE add-on board and Wavelab 23 GHz ODU module
  - He swept the LO1 frequency to determine the frequency response of the Wavelab's TX IF and RF band pass filters as well as the TX mixer and PA saturation points.
  - He then measured power in (after the PCB mixer) versus power out from the module to find the saturation point for the Wavelab module upconverter AMMC-6545 mixer for both conditions of ATT1 tied to +5v (stock PCB board design) and for ATT1 allowed to float.
  - The measurements demonstrate that eliminating most or all of the internal pin attenuation allows more drive in the transmit pipeline which provides full saturation of the final PA with less drive from the PCB. In theory this would enable more linear operation.
  - The modification will be described here and the measurement procedure if you would like to experiment with your Wavelab system on your own.

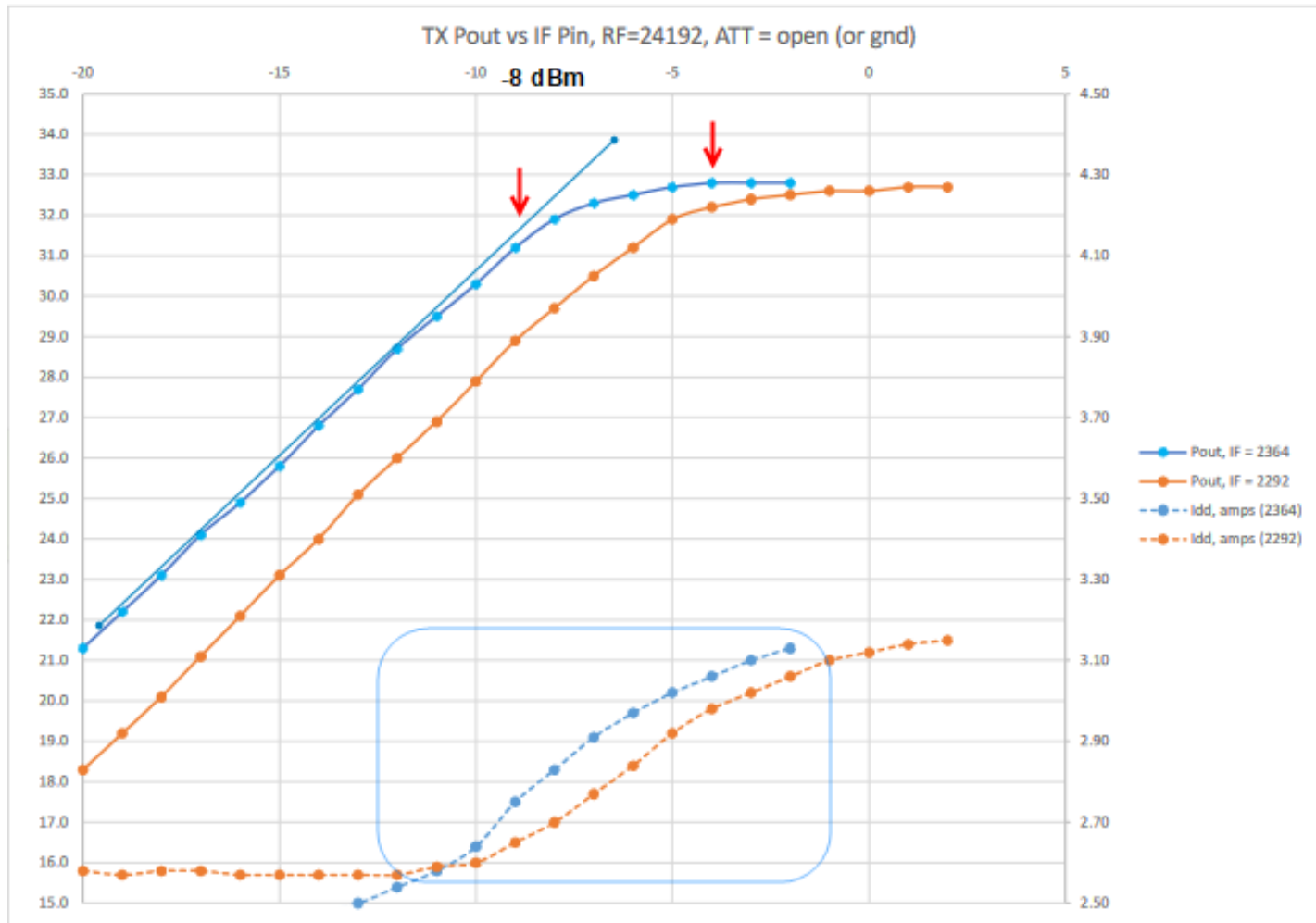
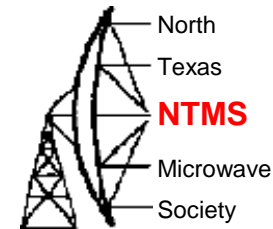
# K6ML swept LO1



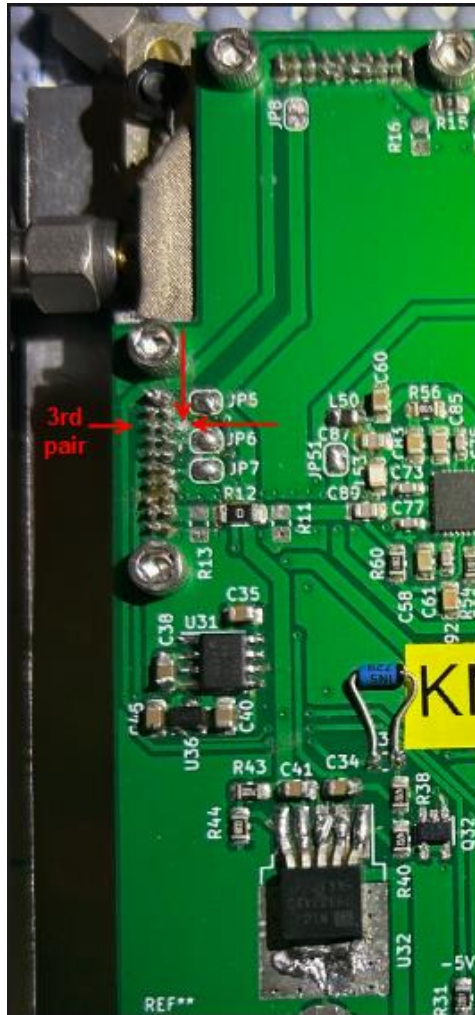
# K6ML upconverter saturation test – ATT1=+5v



# K6ML Pout/Pin ATT1 open

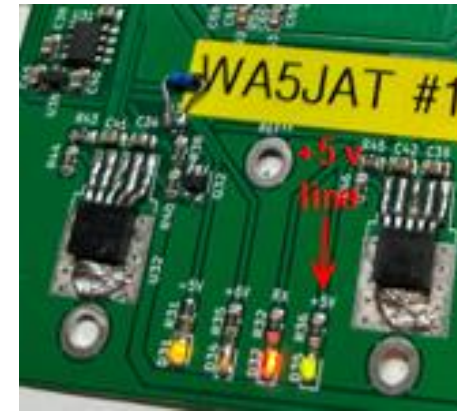


# The modification



Turn the power off.

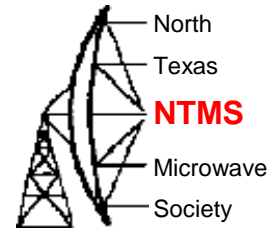
Make a vertical cut to the horizontal trace tied to the 3<sup>rd</sup> pair of pins on left side of board.



Check continuity from a +5v point like the +5v LED.

The 3<sup>rd</sup> pair of pins should now be open (not tied to +5v or grounded-although grounded will give the same results)

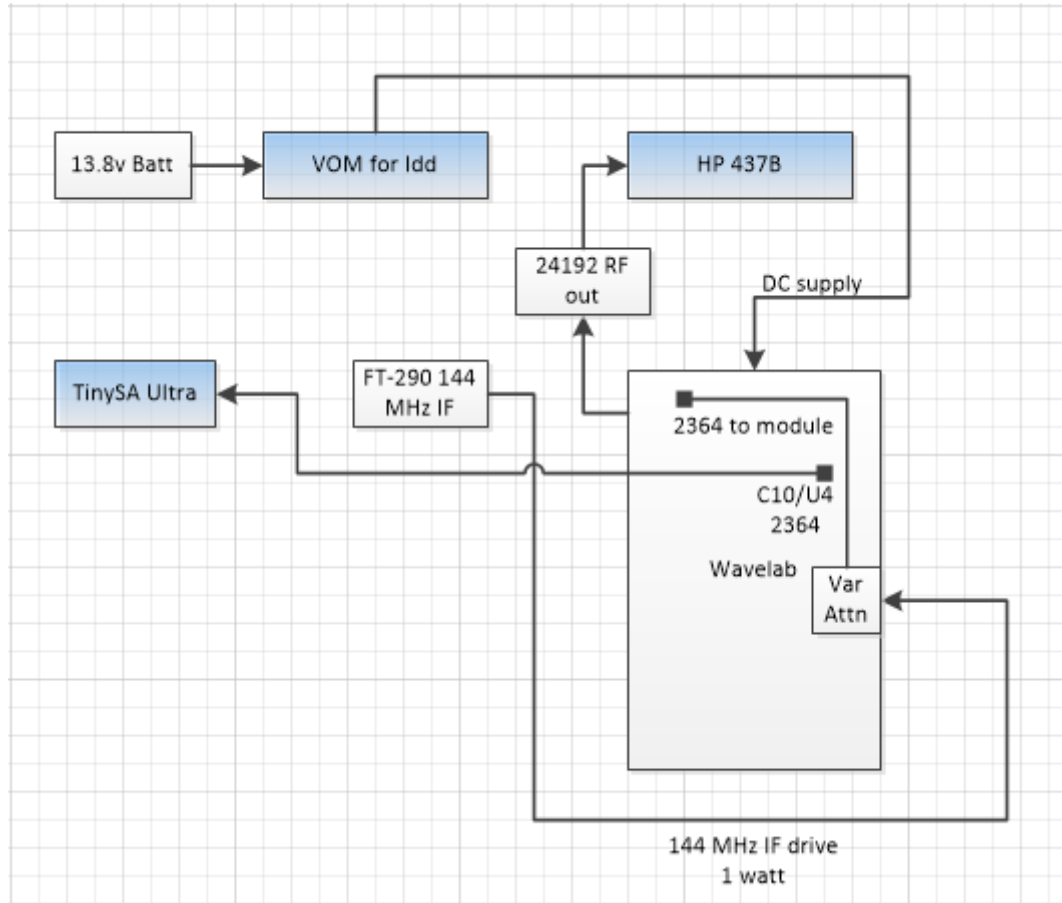
# Testing



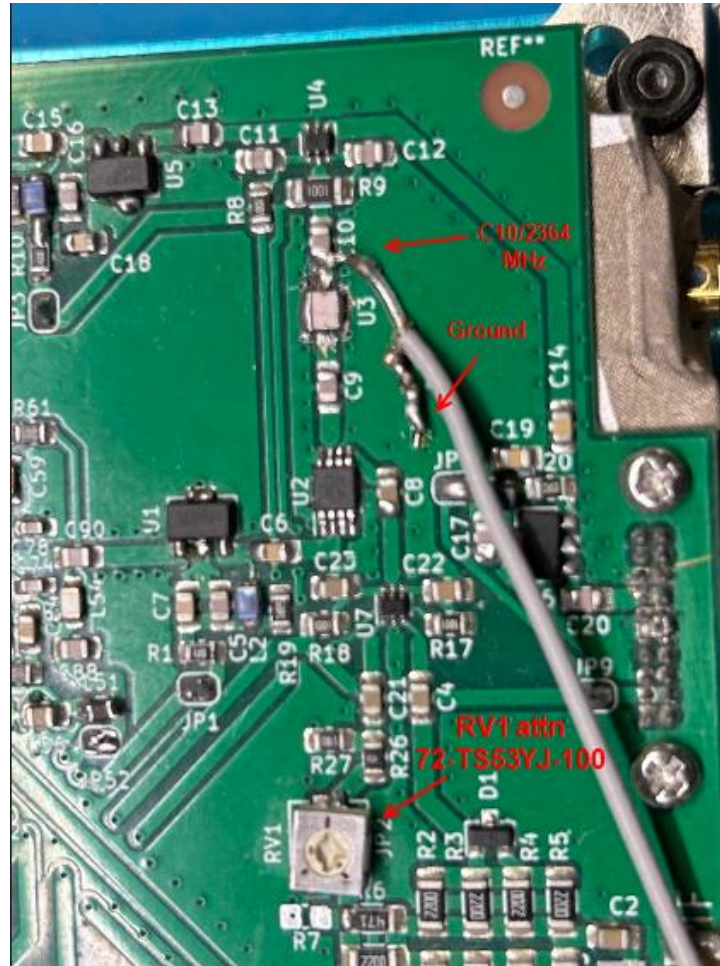
- Calibrate power meter to known source
  - DB6NT 24 GHz transverter = 2.5 watts = 34 dBm
  - 60dB attenuation to pad down to safe power head readings
- Calibrate or feel good about S.A.s for IF drive power readings
  - I tested a DigiLO (+2 dBm) an ADF 4351 development board (various outputs) using both the HP8566A and a TinySA Ultra.
- Attach a pigtail to C10 to read power levels of 2364 MHz drive
- Use RV1 pot to vary the drive level at approx. 1 dBm steps
- Record current, IF drive level, RF (24192 MHz) output level.



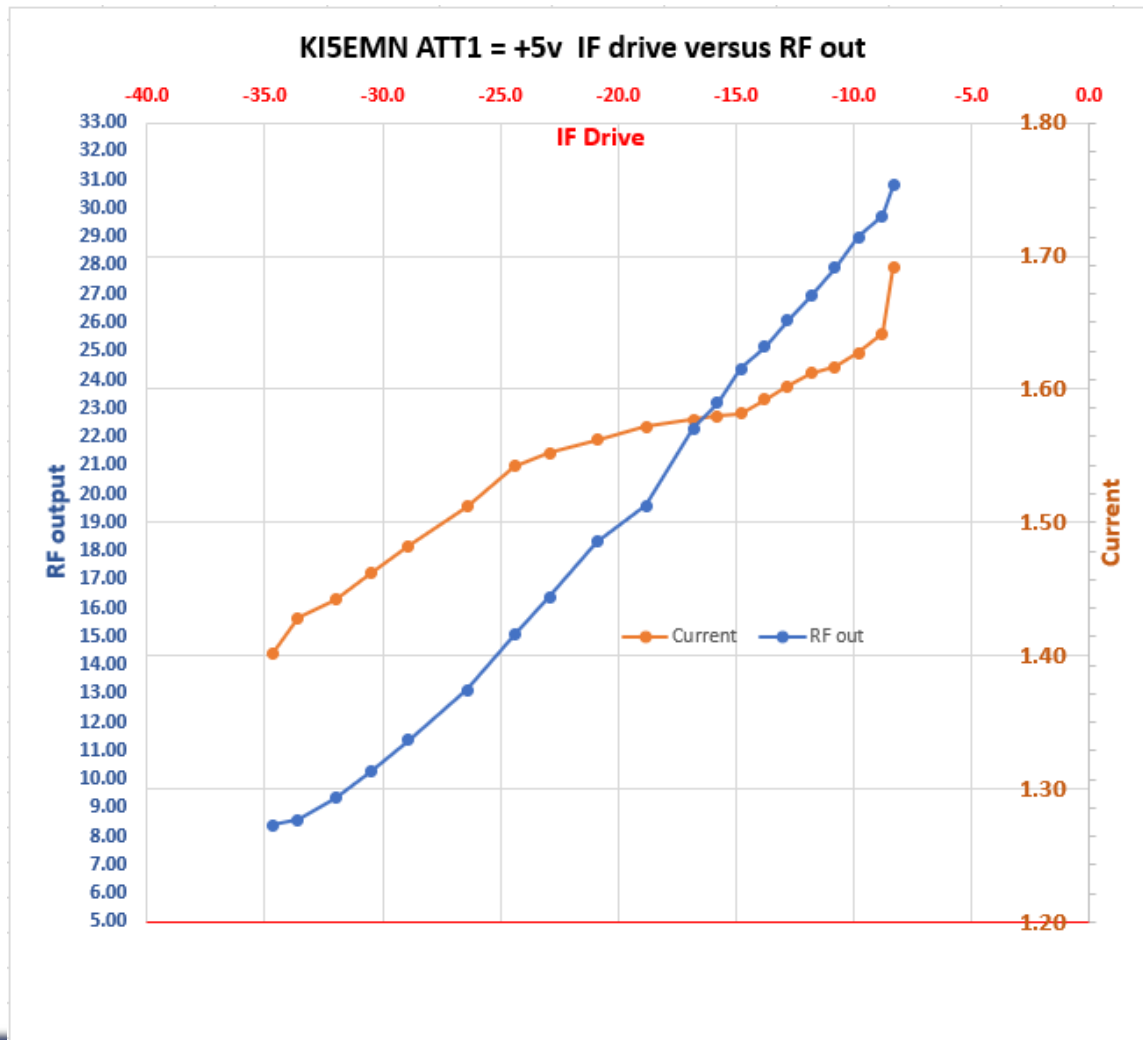
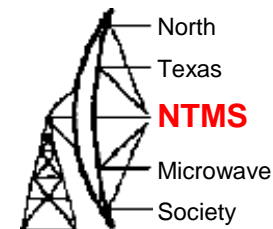
# Testing



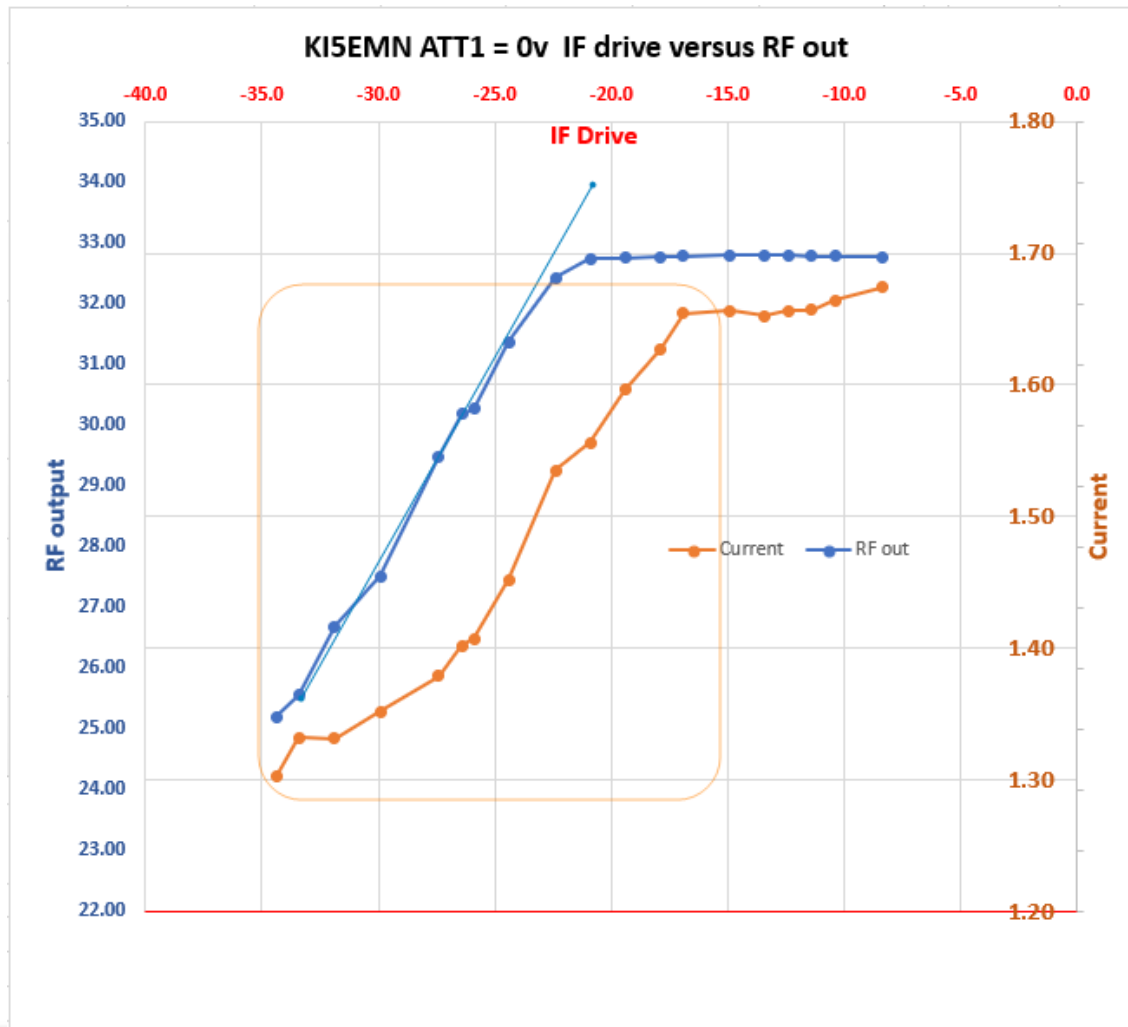
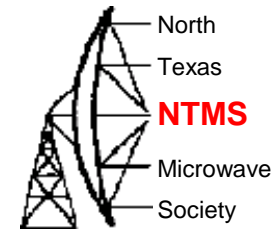
# Testing



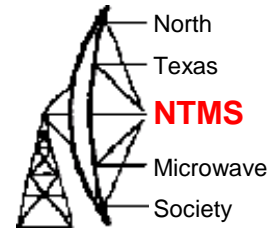
# IF drive vs RF out ATT1=+5v



# IF drive vs RF out ATT1=05v

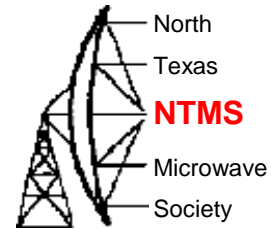


# Next steps



- Test effect of cooling regulators
  - Do “life test” to determine failure points when application is a beacon
- Work on receiver
  - Test several configurations (Shift IF, adjust filters)

# Resources



[Wavelab24GHz@groups.io | Home](https://groups.io/g/Wavelab24GHz)

[GitHub - PA0MHE/Wavelab-24G-Addon-module](https://github.com/PA0MHE/Wavelab-24G-Addon-module)

https://groups.io/g/Wavelab24GHz

Groups Your Groups Find or Create a Group

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New Topic



## Wavelab24GHz@groups.io

This group like to link all Ham radio amateurs who are building the Wavelab 24G Addon module from PA0MHE. Here we can pose questions, publish results, share improvements or modifications.

The design files are on the GitHub page: <https://github.com/PA0MHE/Wavelab-24G-Addon-module>

### Group Information

<https://github.com/PA0MHE/Wavelab-24G-Addon-module>

69 Members

33 Topics · Last Post: Jan 8

Started on 06/02/22

Feed

### Group Email Addresses

Post: [Wavelab24GHz@groups.io](mailto:Wavelab24GHz@groups.io)

Subscribe: [Wavelab24GHz+subscribe@groups.io](mailto:Wavelab24GHz+subscribe@groups.io)

Unsubscribe: [Wavelab24GHz+unsubscribe@groups.io](mailto:Wavelab24GHz+unsubscribe@groups.io)

Group Owner: [Wavelab24GHz+owner@groups.io](mailto:Wavelab24GHz+owner@groups.io)

Help: [Wavelab24GHz+help@groups.io](mailto:Wavelab24GHz+help@groups.io)

### Group Settings

All members can post to the group.

Posts to this group do not require approval

Posts from new users require approval

Messages are set to reply to group.

Subscriptions to this group do not require approval

Archive is visible to anyone.

Wiki is visible to members only.

Members cannot edit their messages.

Members can set their subscriptions to no.

https://github.com/PA0MHE/Wavelab-24G-Addon-module

Product Solutions Open Source Pricing

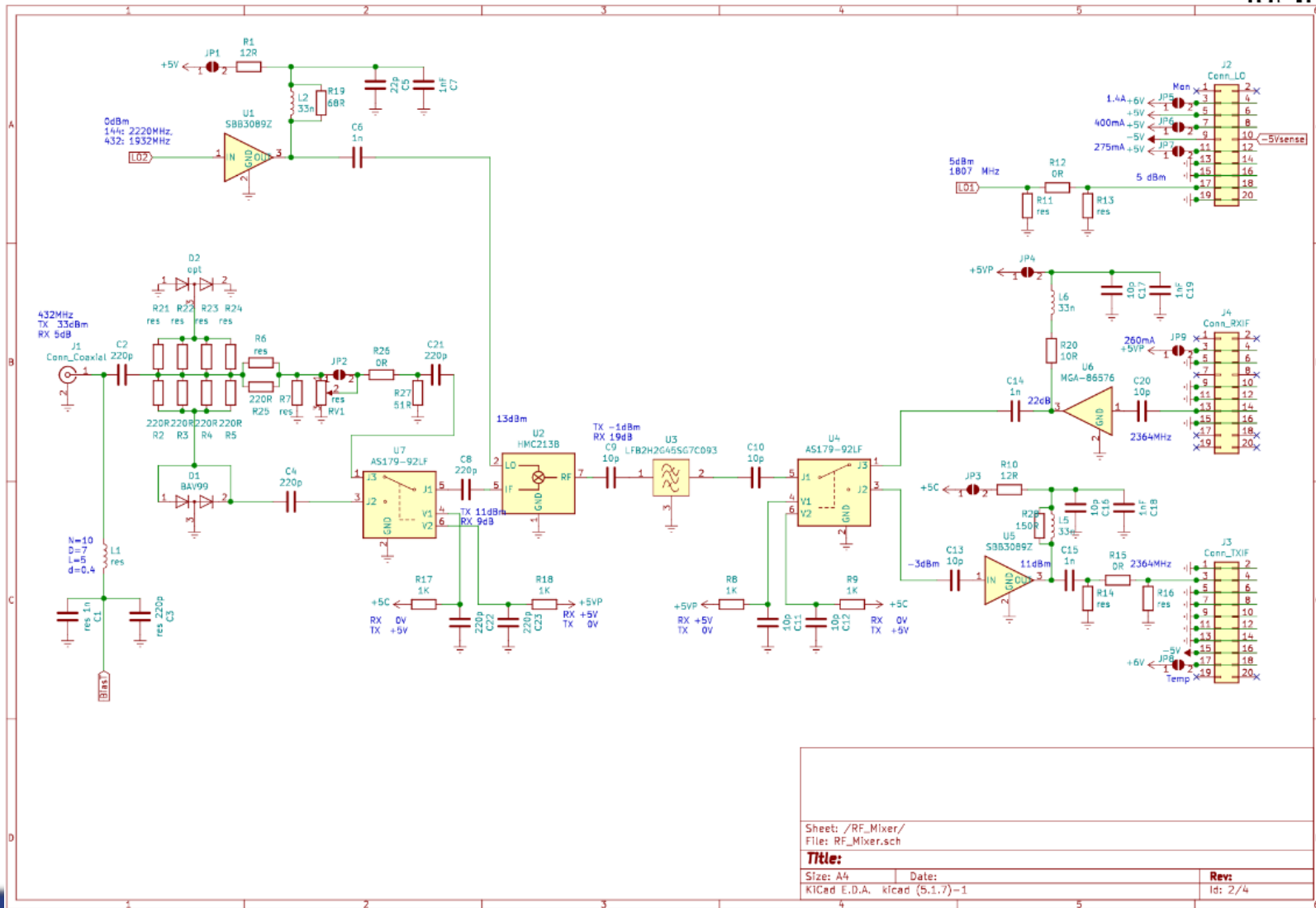
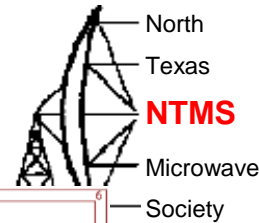
PA0MHE / Wavelab-24G-Addon-module Public

Code Issues Pull requests Actions Projects Security Insights

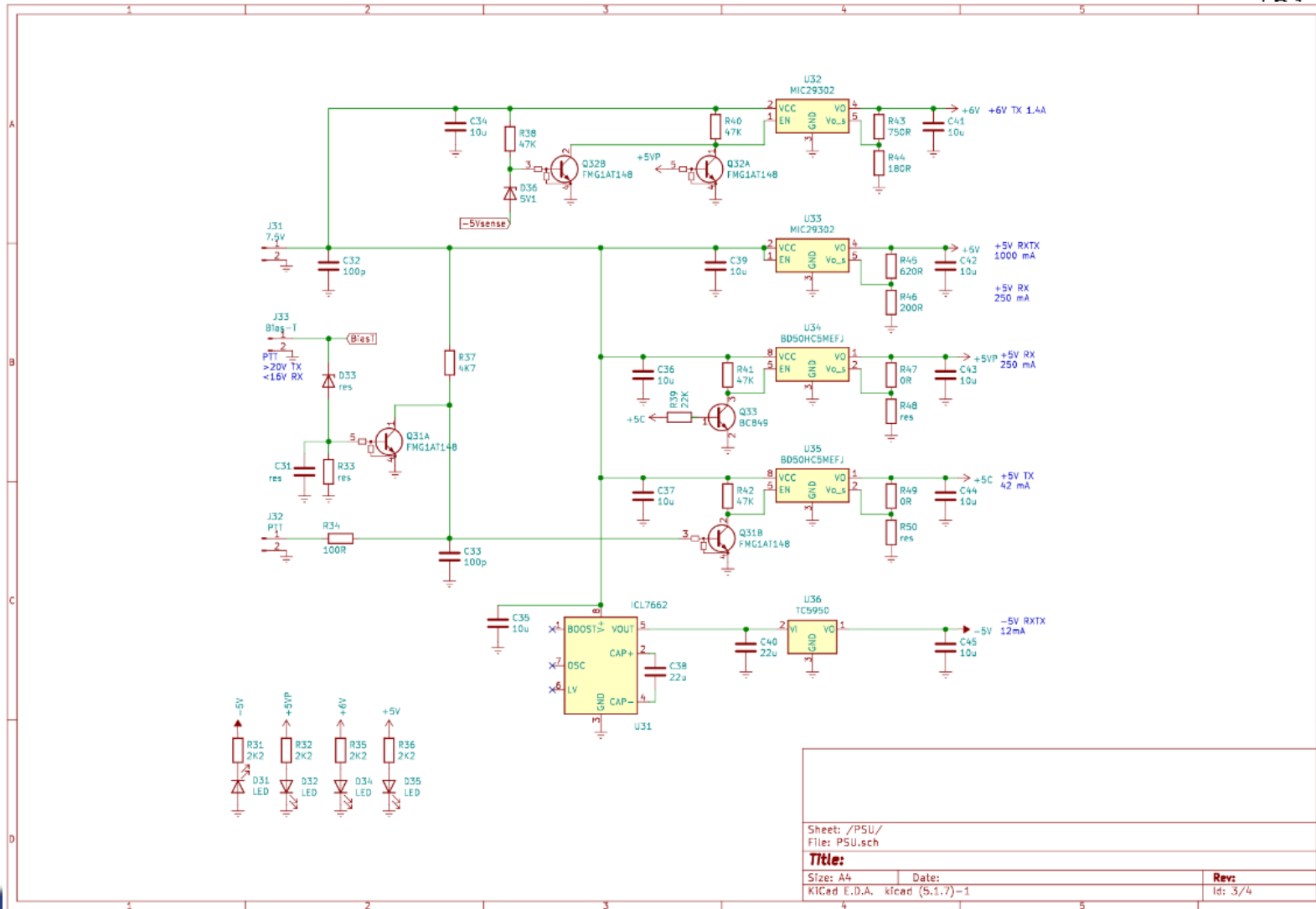
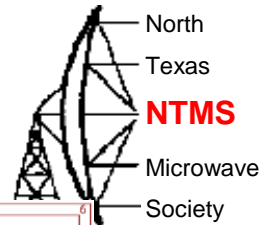
main 1 branch 0 tags Go to file

PA0MHE Deleted old V5 project file	ac64517 2 weeks ago
ADF4351_fixed_tiny_24GHz	Update ADF4351_fixed_tiny_24GHz.ino
HEX files	Added the HEX files
Kicad	Deleted old V5 project file
V5_documentation	V5 information
.gitattributes	Initial commit
BOM_v04_2.xlsx	Update BOM_v04_2.xlsx
ChangeList_V4.txt	Updated schematic

# Add on board schematic pages

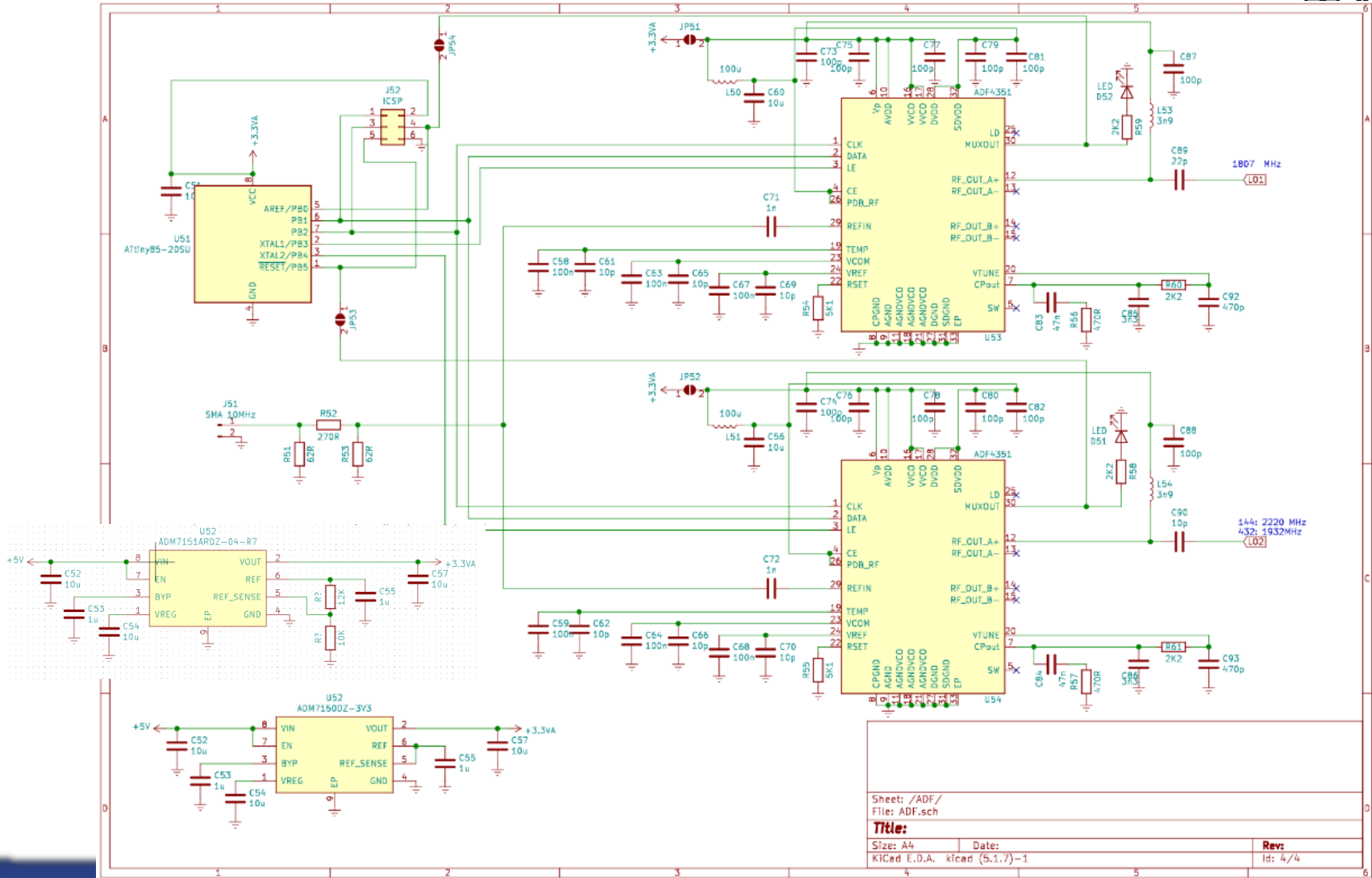
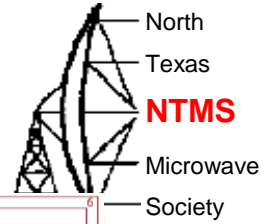


# Add on board schematic pages





# Add on board schematic pages



# Questions?

