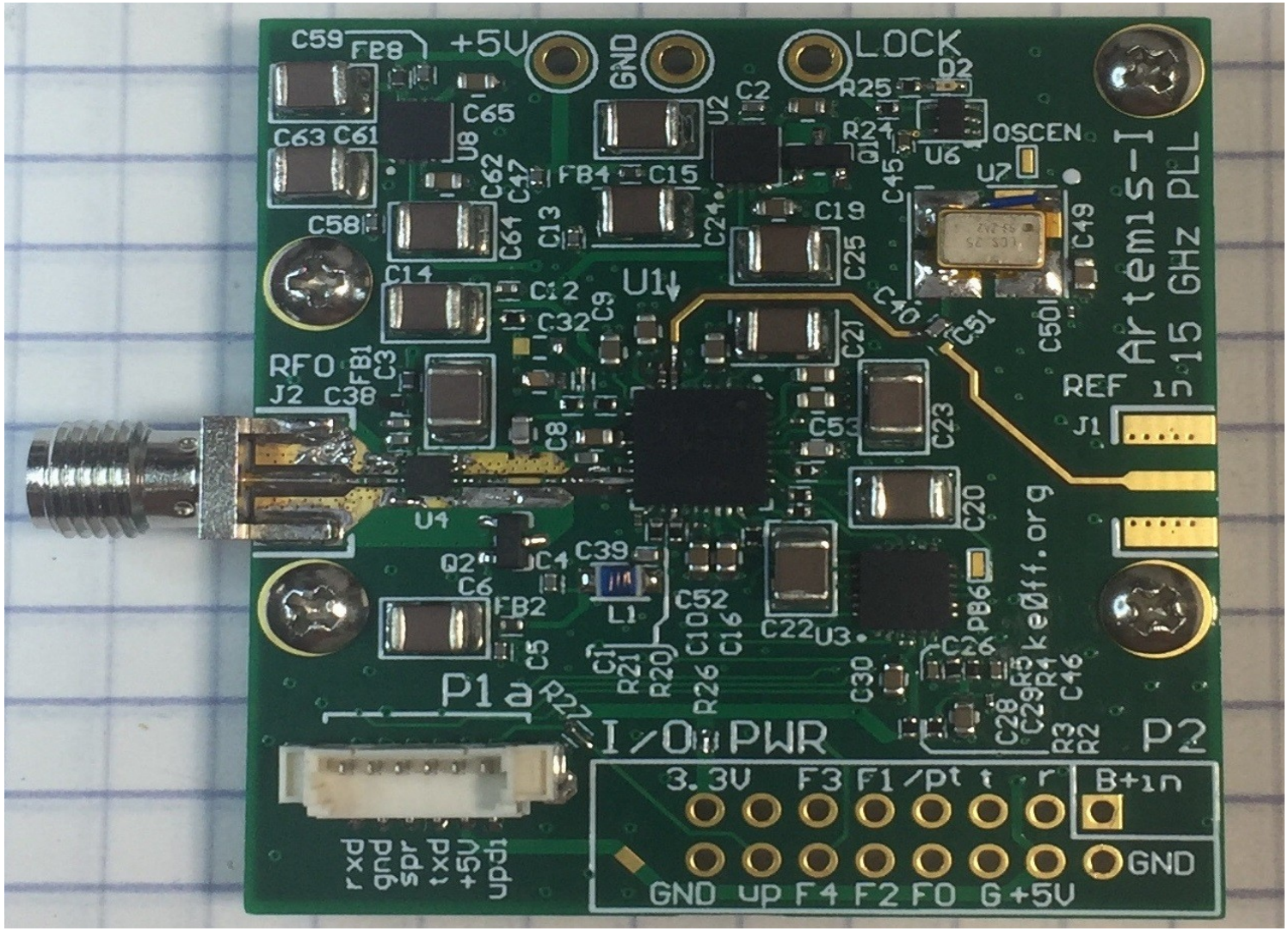
Artemis-I

A 4 GHz to 15 GHz PLL Synthesizer with integrated configuration MCU

Artemis-I

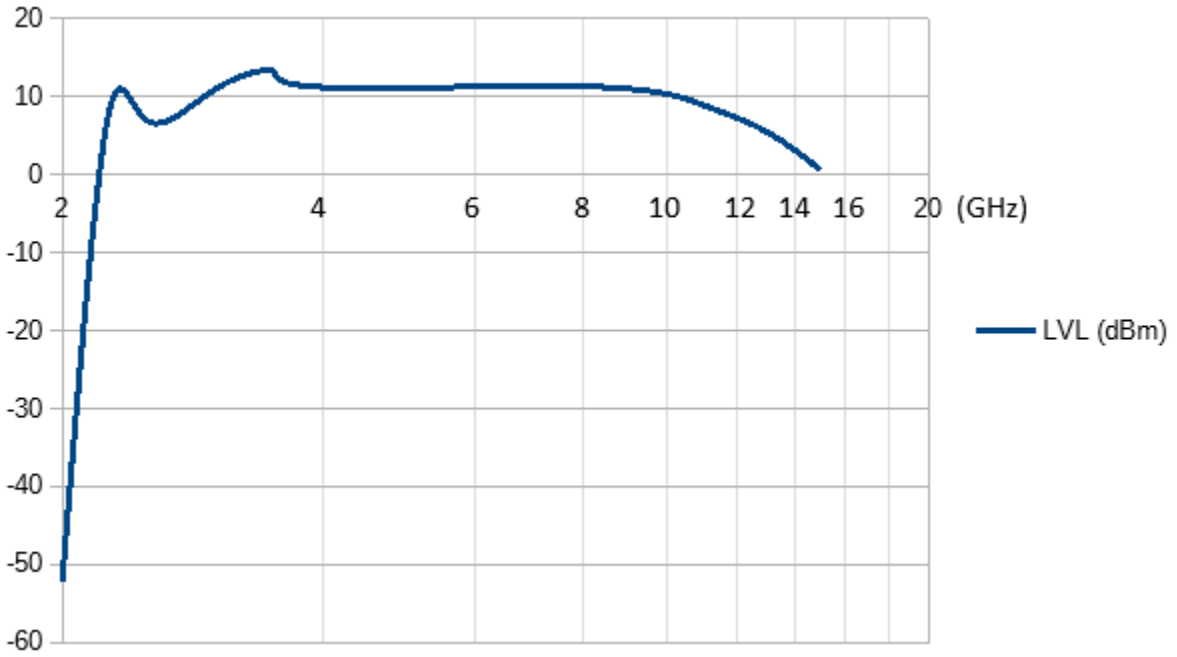

+5V
GND
LOCK
OSCEN
RFO
J2
REF
J1
P1a
I/O PWR
P2
3.3V
GND
Artemis-I
15 GHz PLL
ke0ff.org

Stats

- About 2” square
- Frequency range: 4000 MHz to 15000 MHz (operation as low as 2250 Mhz with reduced output)
- Output level: +12 ±2 dBm at 8000 MHz
- Typical Phase Noise <TBD>
- Reference: 25.0000 MHz on-board, External reference selected by de-soldering and moving a chip capacitor and may range from 5 MHz to 1400 Mhz, 0.2 to 2 Vpp (-1 dBm to +19 dBm), Zin = 50Ω
- Power supply: +5Vdc, 400 mA (heatsink required)
- Communications: TTL UART com, 9600 baud, N81
- /MUTE input: GND true, 3.3V compatible, on-board pull-up, GND to mute output
- Frequency select inputs: 5 bit, binary, GND true, 3.3V logic
- Primary connection: 16 pin ribbon header, 0.05” wire-spacing. More or less compatible with the Orion-I connector.
- MCU PGM connection: Atmel UPDI programming via primary 16 pin connector or optional 6-pin programming connector
- Requires a heatsink (provided)

Performance

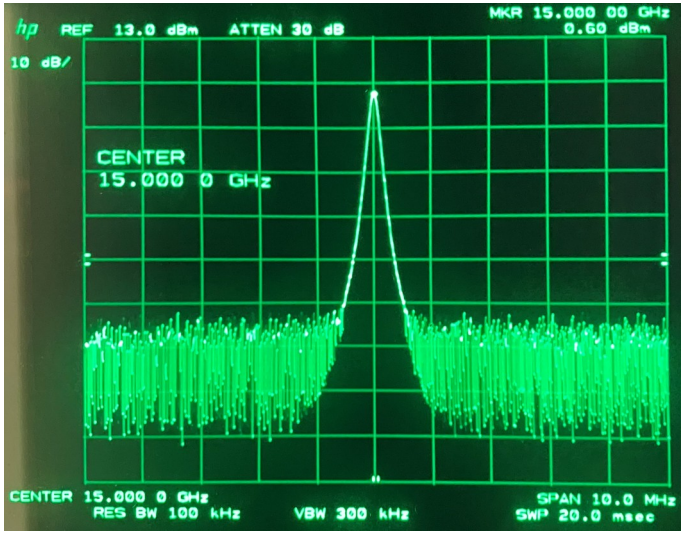
- **Frequency response:**



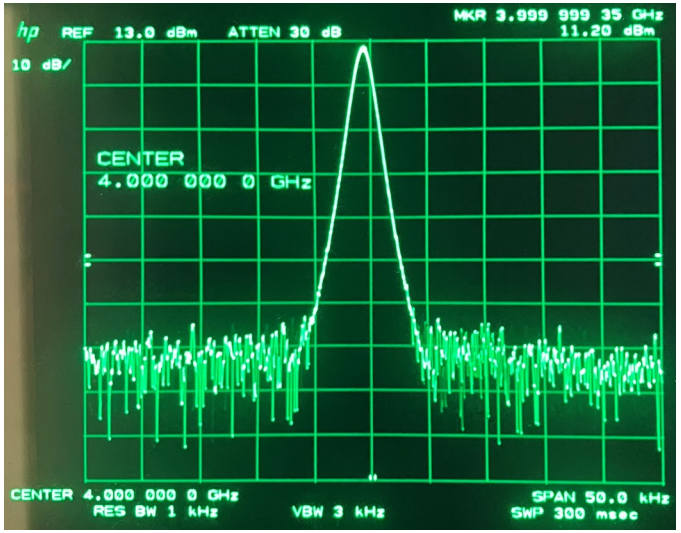
- **Low-end roll-off due to PMA2-183LN+ amplifier response**
- **High-end rolloff due mostly to PLL output response**
- **4-channels currently supported, selected by logic inputs – up to 32 possible**
- **Optional mute input to allow PLL output to be “keyed”**

Performance

- **Frequency plot at 15 GHz:**

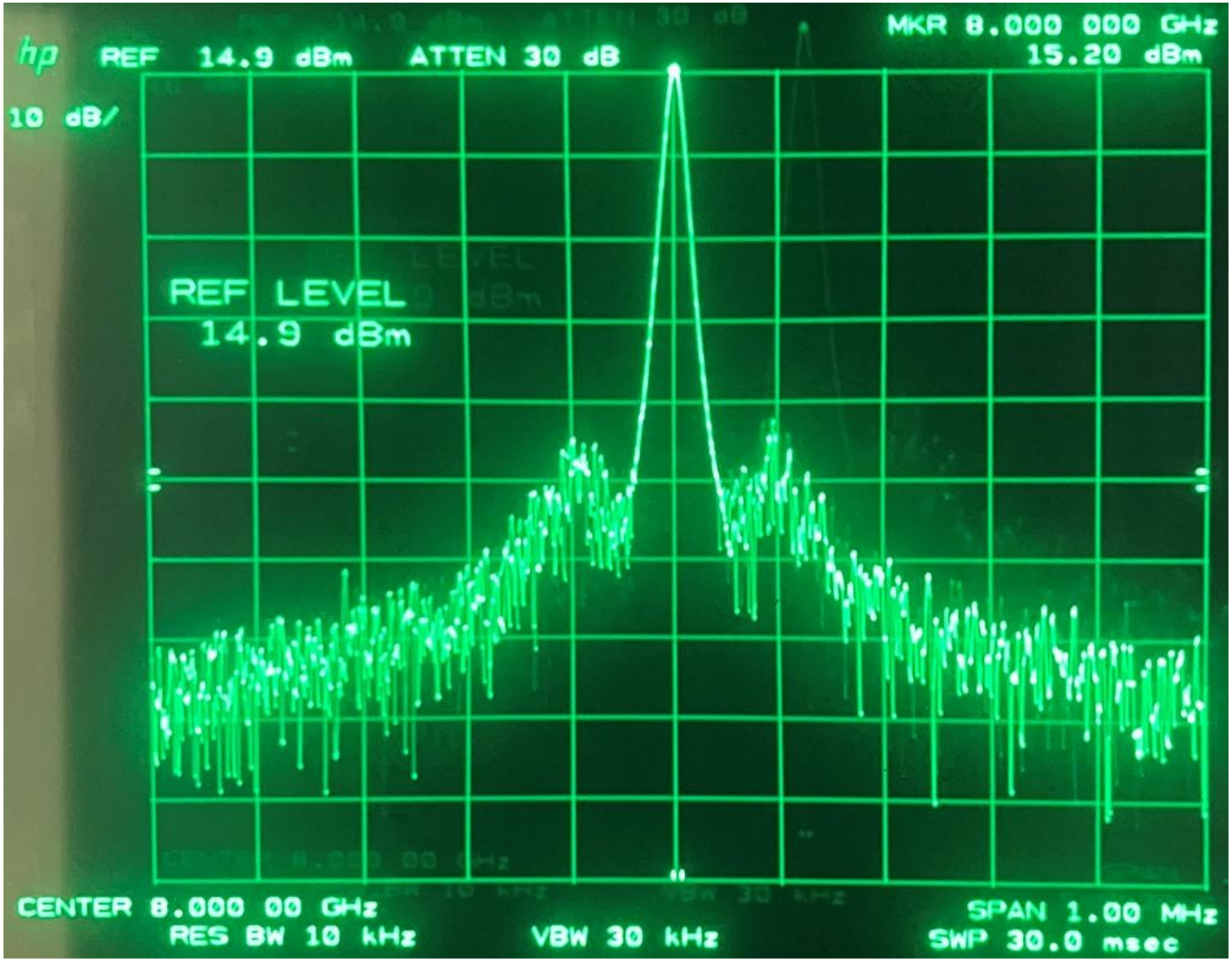


- **Frequency plot at 4 GHz:**



Performance

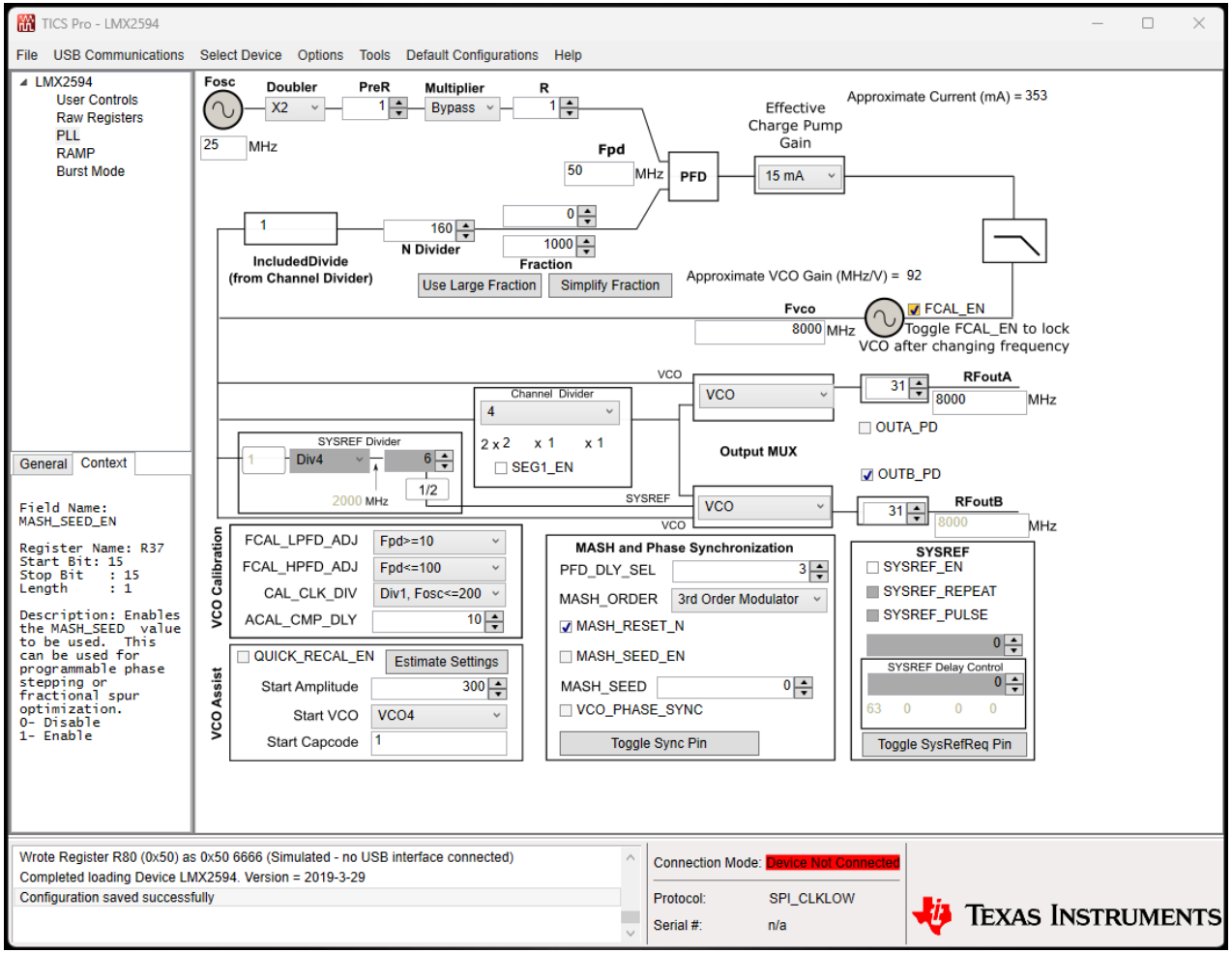
- **Close-in spectra at 8 GHz:**



Support

TICS Pro software:

- **User configures channel parameters**
- **Export register data to text file**
- **Format files for inclusion in C-source using an Excel spreadsheet**
- **Compile and load onto controller**
- **Future software support is expected to allow direct upload as is done on the Orion-I**



Cost and other factors…

- **Last cost estimate has Artemis cost at about $280 (cost can vary depending on market conditions for the “expensive” devices) – This estimate is over a year old at this point**

- **Programming adapter (currently required to configure the channel data) is about $40 (with some assembly required). A kit is possible with enough interest.**

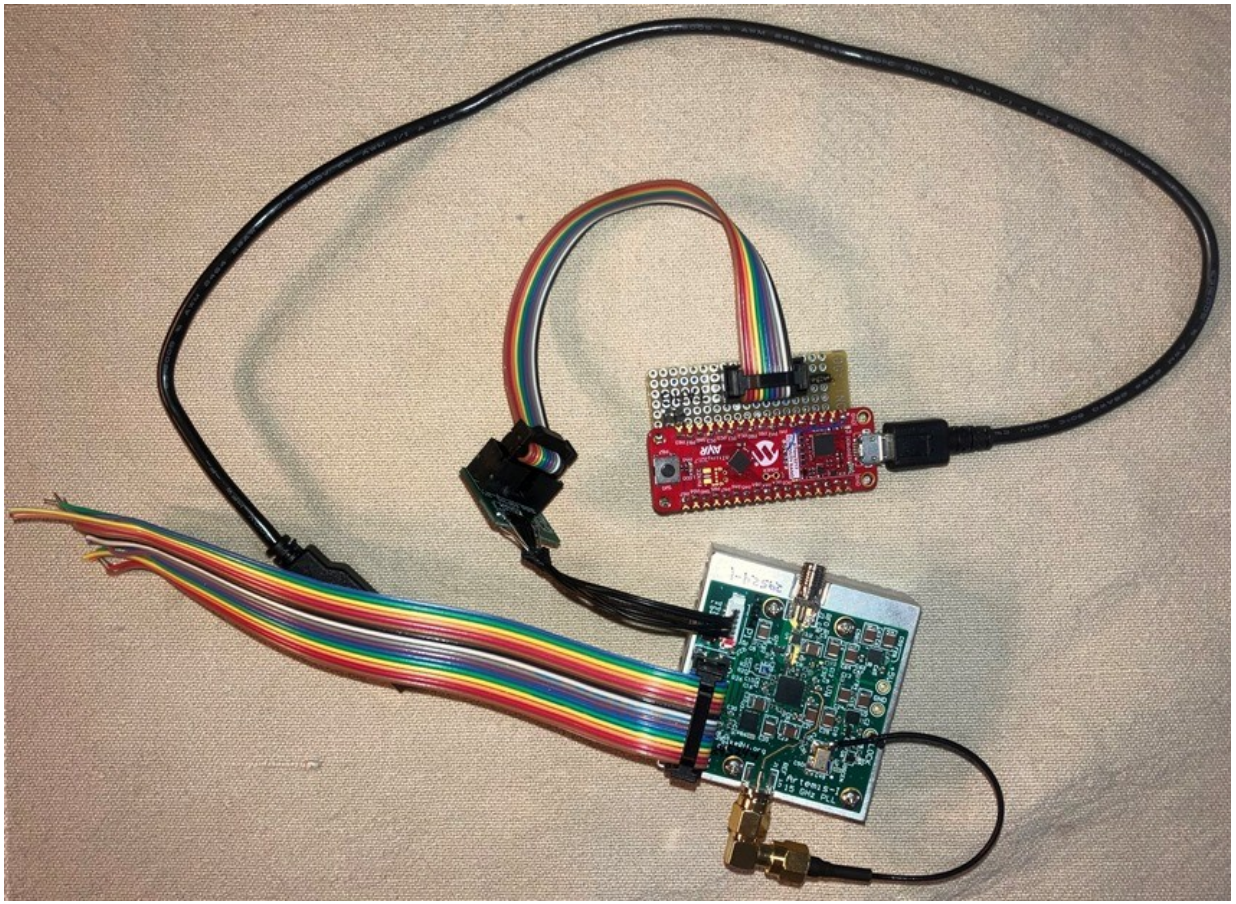
The Artemis System

- Simple serial interface:

```
============
Artemis 2-15GHz PLL, V0.2, 4-chan
'?<ent>' for help, 09/23/24, de KE0FF
Artemis Start...
ETI: 1
<pll start>
Tone ON  ETI: 1
CH set: 3
T0:323.4 K; T1:321.6 K; ETI: 3

Artemis Help:
0-3: set PLL CH
n: tone on
f: tone off
<ENTER>: display ETI(sec)/temp(K) stats
    T0=regulator, T1=PLL
V: SW Version
```

- Microchip or Atmel Studio compiler available from Microchip.



Bottom line:

- One unit built with parts to build at least one more.
- Waiting on third party individual(s) to characterize the unit. Initial results promising, but no good info pn PN with the equipment available on-site.
- Hand assembly makes production slow and tedious. Would need demand for at least 10 units to justify commercial assembly.
- Kits are not realistic due to the high component cost and delicate soldering operations.

Links

- TICS Software: https://dr-download.ti.com/secure/software-development/support-software/MD-xsZ2KP7U5k/1.7.7.5/TICSPro_1.7.7.5_23-Jul-2024.exe

- LMX2594 datasheet: https://www.ti.com/product/LMX2594?keyMatch=LMX2594&tisearch=universal_search&usecase=GPN-ALT

- Artemis github repo: https://github.com/ke0ff/artemis_pll

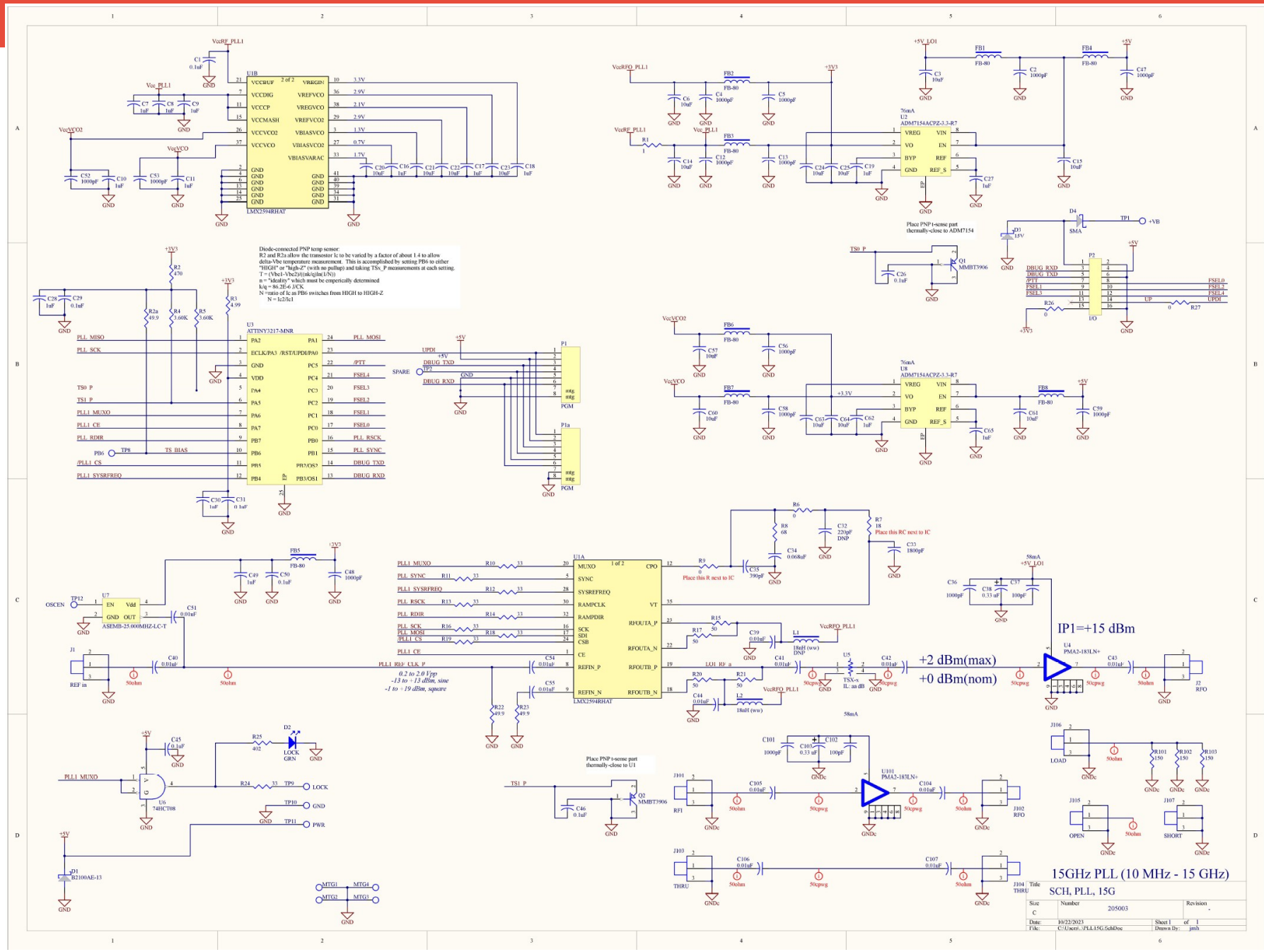
- Mini Circuits product page for the PMA2-183LN+: https://www.minicircuits.com/WebStore/dashboard.html?model=PMA2-183LN%2B

- SiLabs/Tiva/ATtiny Programming Guide: https://ke0ff.github.io/Orion/silabspgm.pdf

- email: joeh@ke0ff.org

- Microchip Studio: https://www.microchip.com/en-us/tools-resources/develop/microchip-studio#Downloads

Schematic


LMX2594RHAT
ATTINY3217-MNR
ASEMB-25.000MHZ-LC-T
74HCT08
ADM7154ACPZ-3.3-R7
PMA2-183LN+
TSX-x
MMBT3906
B2100AE-13
15GHz PLL (10 MHz - 15 GHz)
SCH, PLL, 15G
205003
10/22/2023
IP1=+15 dBm
+2 dBm(max)
+0 dBm(nom)