OPEN SOURCE

AMATEUR RADIO

WHY ARE WE HERE?

THE BASIS AND PURPOSE OF THE AMATEUR RADIO AND AMATEUR RADIO SATELLITE SERVICE ARE DEFINED IN PART 97. AN OPEN SOURCE APPROACH SUPPORTS EVERY PURPOSE OF THE AMATEUR RADIO SERVICE.

OPEN SOURCE IS CRUCIAL FOR THE SURVIVAL OF THE AMATEUR SATELLITE SERVICE IN THE UNITED STATES.

WHAT IS OPEN SOURCE?

- *denoting software for which the original source code is made freely available and may be redistributed and modified.* (Oxford)
- Over time, the definition has grown to apply to hardware and firmware too.
- Freely distributed with no discrimination against persons, groups, or fields of endeavor.
- Licensed! Open Source is not automatically a "free for all".
- For a business, using Open Source allows the business to focus on things that differentiate the business, instead of reinventing a wheel badly or getting bogged down in "silos" of proprietary repeated work. Examples include Google, Amazon, Facebook, and many other very large and profitable ventures.

“ §97.1 Basis and purpose.

(a) Recognition and enhancement of the value of the amateur service to the public as a **voluntary noncommercial communication service, particularly with respect to providing emergency communications.** ”

While amateur radio is not a dedicated emergency communications service, our public service role is extremely clear.

This doesn't mean we can't have a healthy ecosystem of companies offering amateur radio products of all types. We can earn money producing neat things for amateur radio. Open Source does not threaten that. On the contrary, Open Source greatly strengthens economic activity in several ways.

“§97.1 Basis and purpose.

(b) Continuation and extension of the amateur's proven ability to contribute to the **advancement of the radio art.**”

Proven ability!

We are expected to advance the radio arts!

“§97.1 Basis and purpose.

(c) Encouragement and improvement of the amateur service through rules which provide for **advancing skills in both the communication and technical phases of the art.**”

This may seem like a repeat of (b), but there's important differences.

1) We must participate in the rules-making process in order to allow for us to advance our skills.

2) Amateur Radio is not just about operating skill.

“ §97.1 Basis and purpose.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts. ”

Being an electronics nerd is just as important in amateur radio as being a champion contester.

Having an educated population is the only way we can continue to practice self-rule and self-regulation. Education and training are very closely related.

“

§97.1 Basis and purpose.

(e) Continuation and extension of the amateur's unique ability to enhance **international goodwill.**

”

International collaboration has been prevented in the Amateur Radio Satellite Service by ITAR/EAR.

Using the public domain carve-outs in existing regulatory law allows the Amateur Radio Satellite Service to hold up its end of the "International Goodwill" bargain in Part 97. These rules are a perfect fit for amateur satellite, but there has been sustained opposition for decades to adopting Open Source. This is changing and will make a huge positive difference in amateur satellite work.

REGULATORY LANDSCAPE FOR AMATEUR SATELLITE

ITAR

- The International Traffic in Arms Regulations (ITAR) is the United States regulation that controls the manufacture, sale, and distribution of defense and space-related articles and services as defined in the United States Munitions List (USML).
- Things like rocket launchers, torpedoes, and other military hardware are on this list. It restricts the plans, diagrams, photos, and other documentation used to build ITAR-controlled military gear. This is called “technical data”.

EAR

- The Export Administration Regulations (EAR) is regulated by the Commerce Control List (CCL) and applies to all goods and technical data intended for commercial use and has military applications.
- The relevant category is "Propulsion Systems, Space Vehicles, and Related Equipment"

WHAT ARE THE IMPLICATIONS OF A "COMMERCIAL" APPROACH IN AMATEUR RADIO SATELLITE WORK?

IMPLICATIONS

- Stagnation, technical lag
- Isolation
- Lower participation across the board in operations, technicians, and experts
- Potential loss of spectrum
- Potential loss of the Amateur Radio Satellite Service

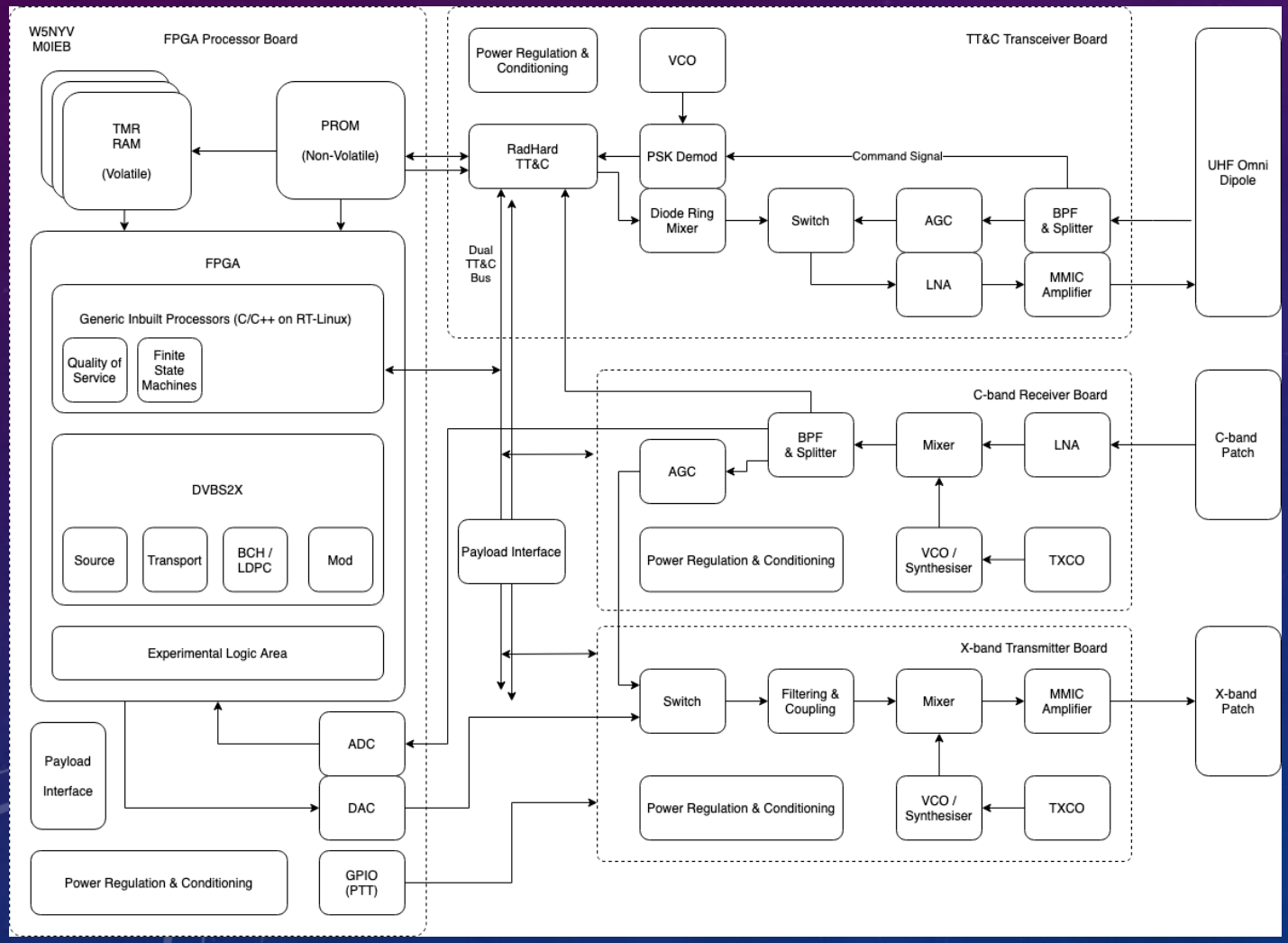
FINAL DETERMINATION LETTER

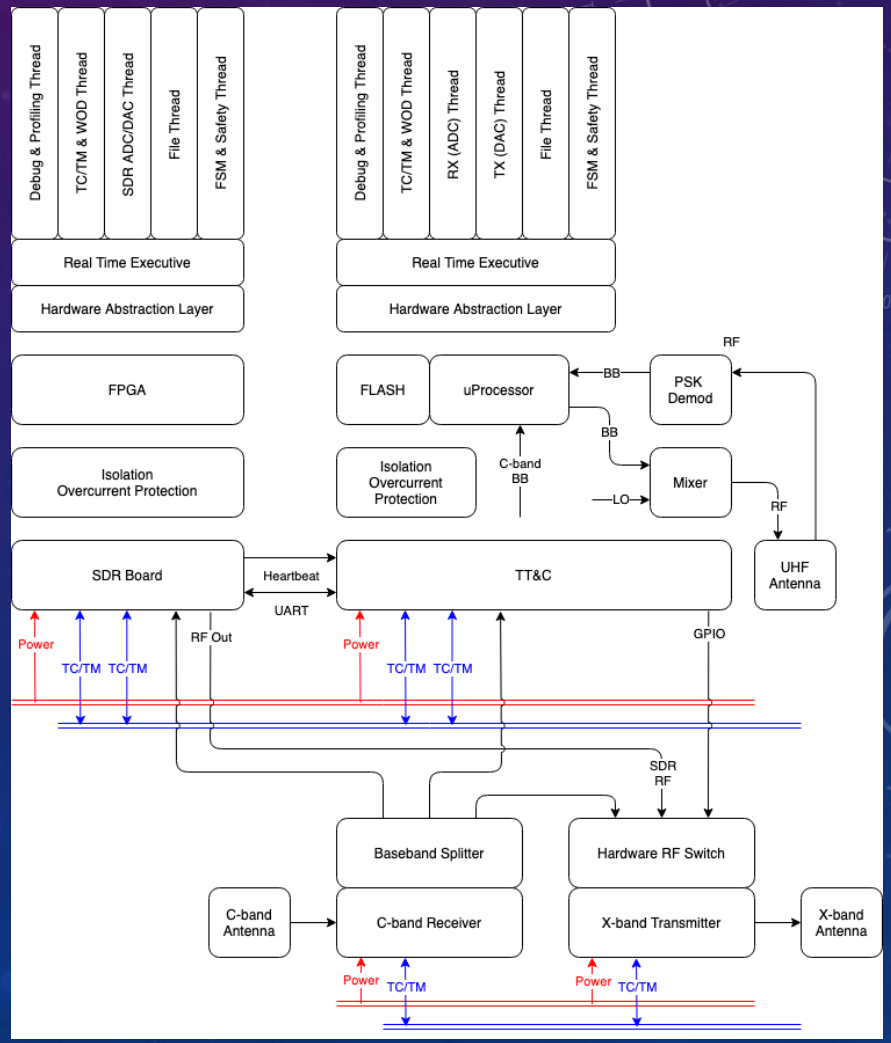
- A Commodity Jurisdiction Request was filed by Open Research Institute, with the US State Department, in February 2020.
- In August 2020, the US State Department released a Final Determination that open source satellite work was free of ITAR.
- Efforts to secure the same written result for EAR are underway now.
- After that, an Advisory Opinion will be requested to tie the two results together.
- https://github.com/phase4ground/documents/tree/master/Regulatory

DEBRIS MITIGATION

- Space Debris is considered a huge threat
- The FCC regulates spacecraft in the United States
- Large constellations have staked out "orbital shells" as turf.
- To reduce Debris, a spacecraft must be able to point and move
- Attitude control and propulsion are now requirements for space

OPEN SOURCE - A PATH THROUGH THE DEBRIS



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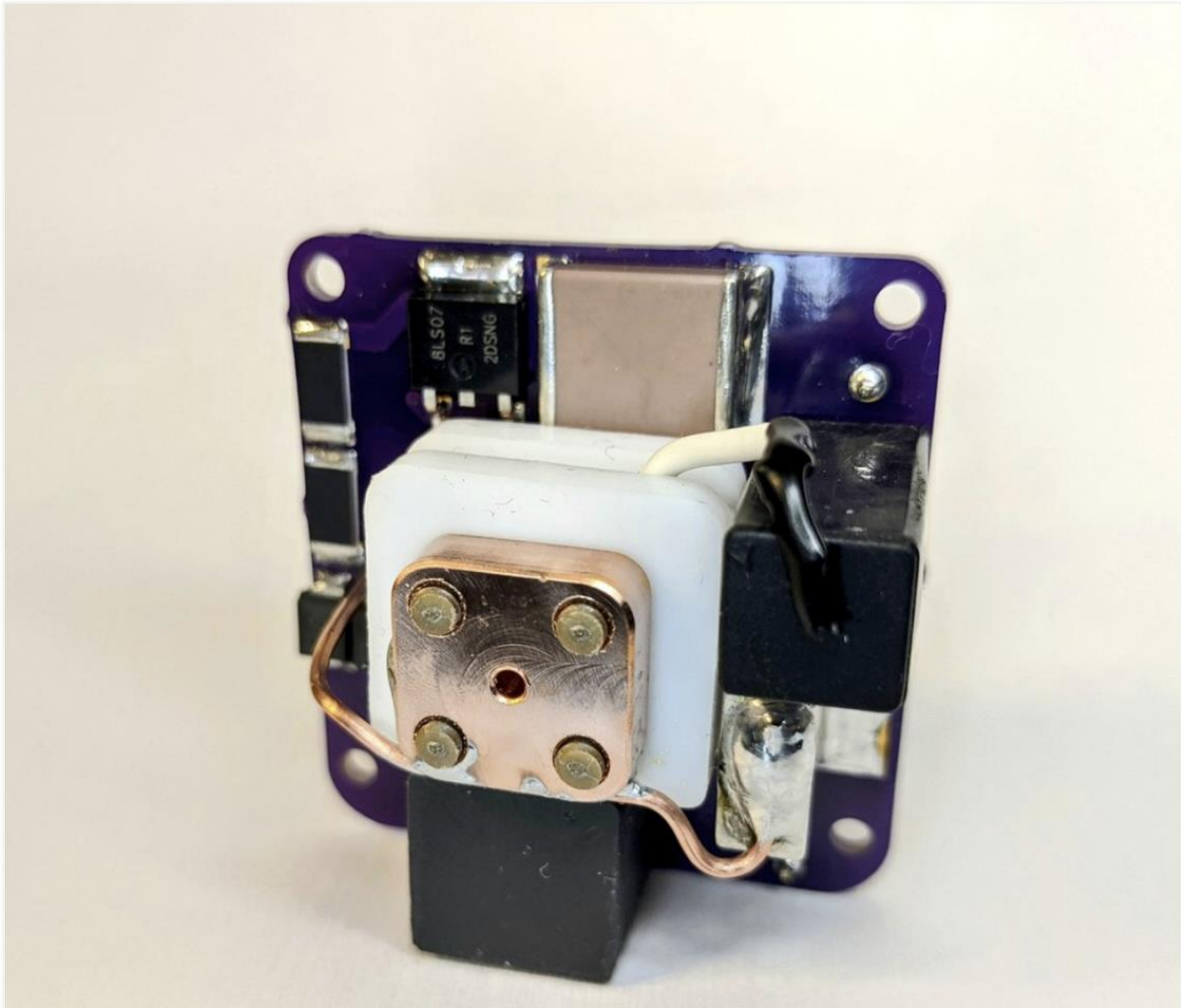
ANALOG DEVICES

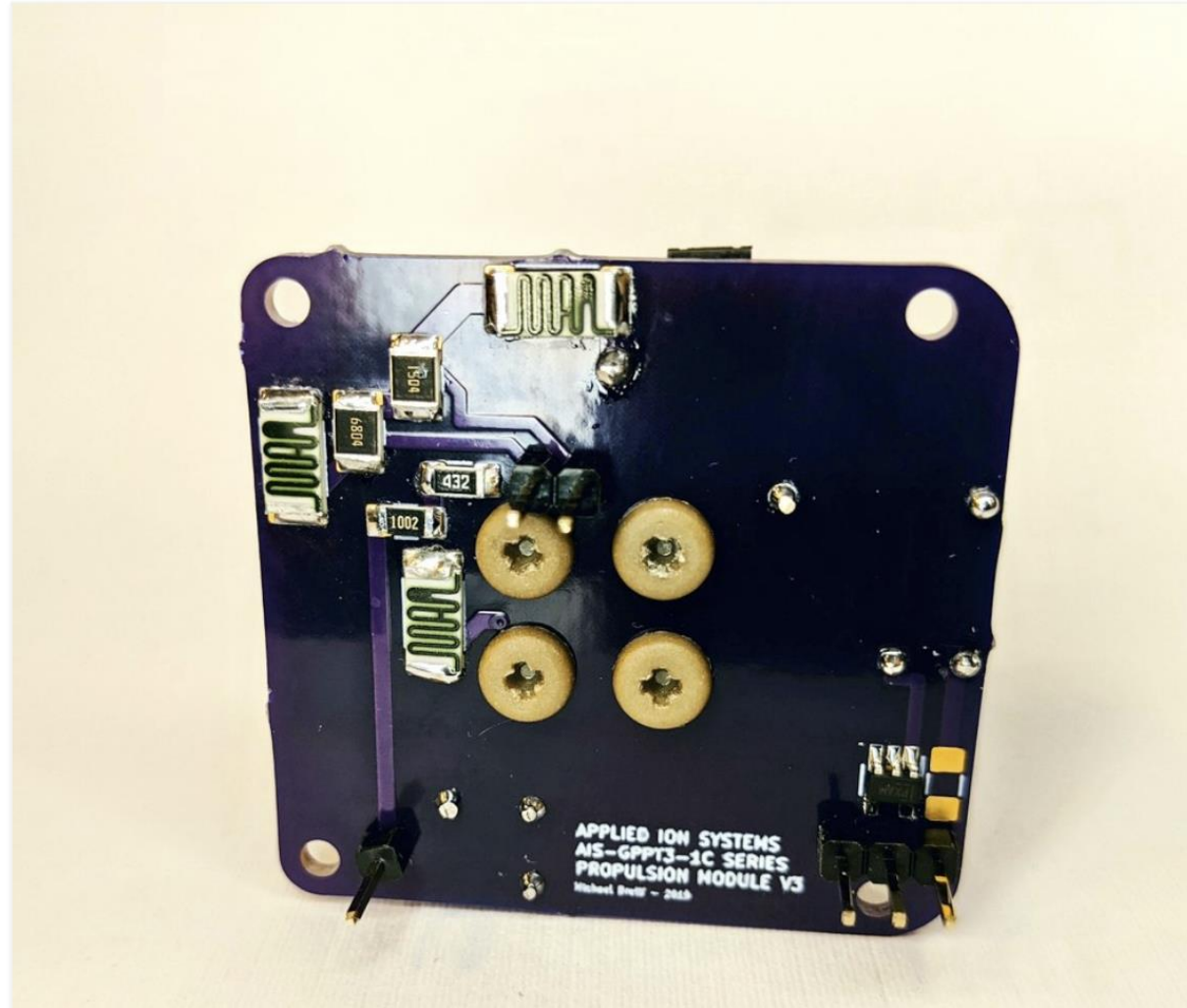
Testing and Qualification of a New AIS-gPPT3-1C Micro Pulsed Plasma Thruster Build

13
DEC 2020

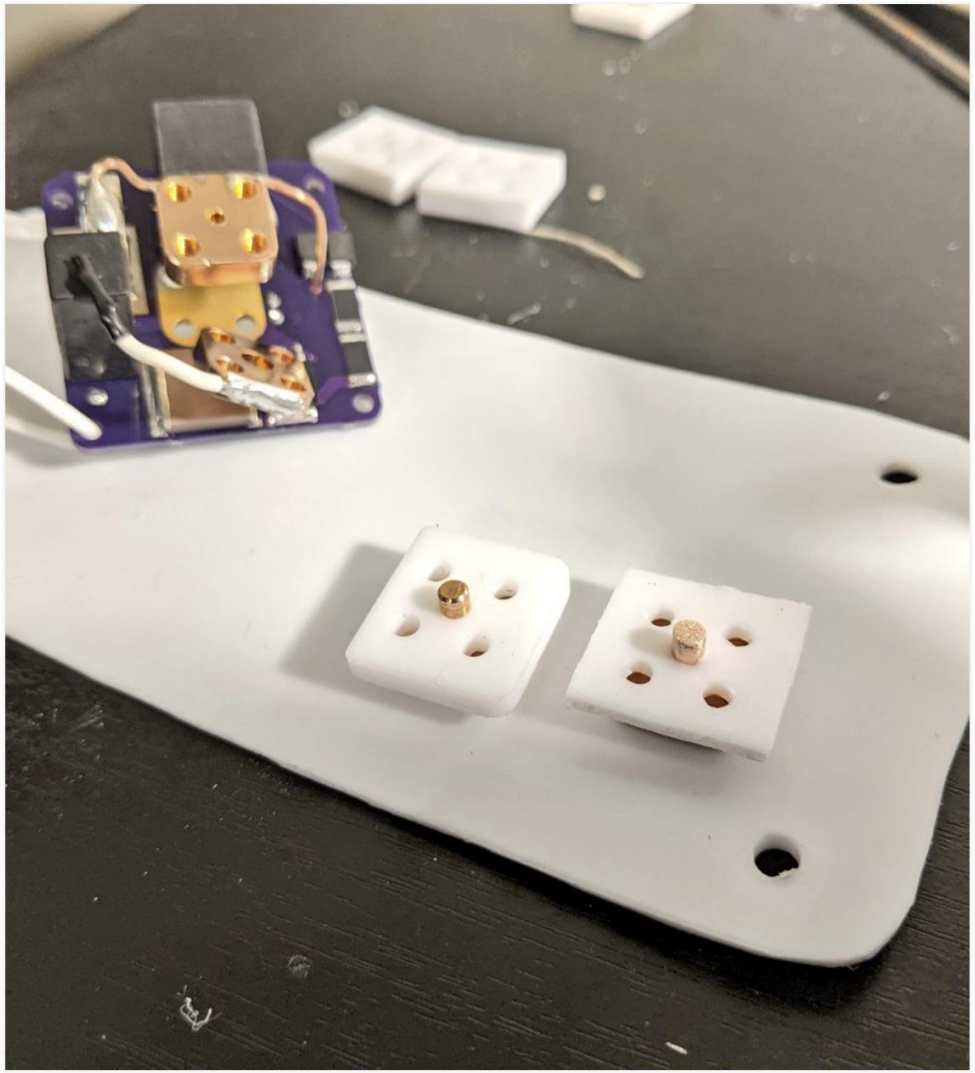
by AppliedIonSystems | posted in: Uncategorized | 0

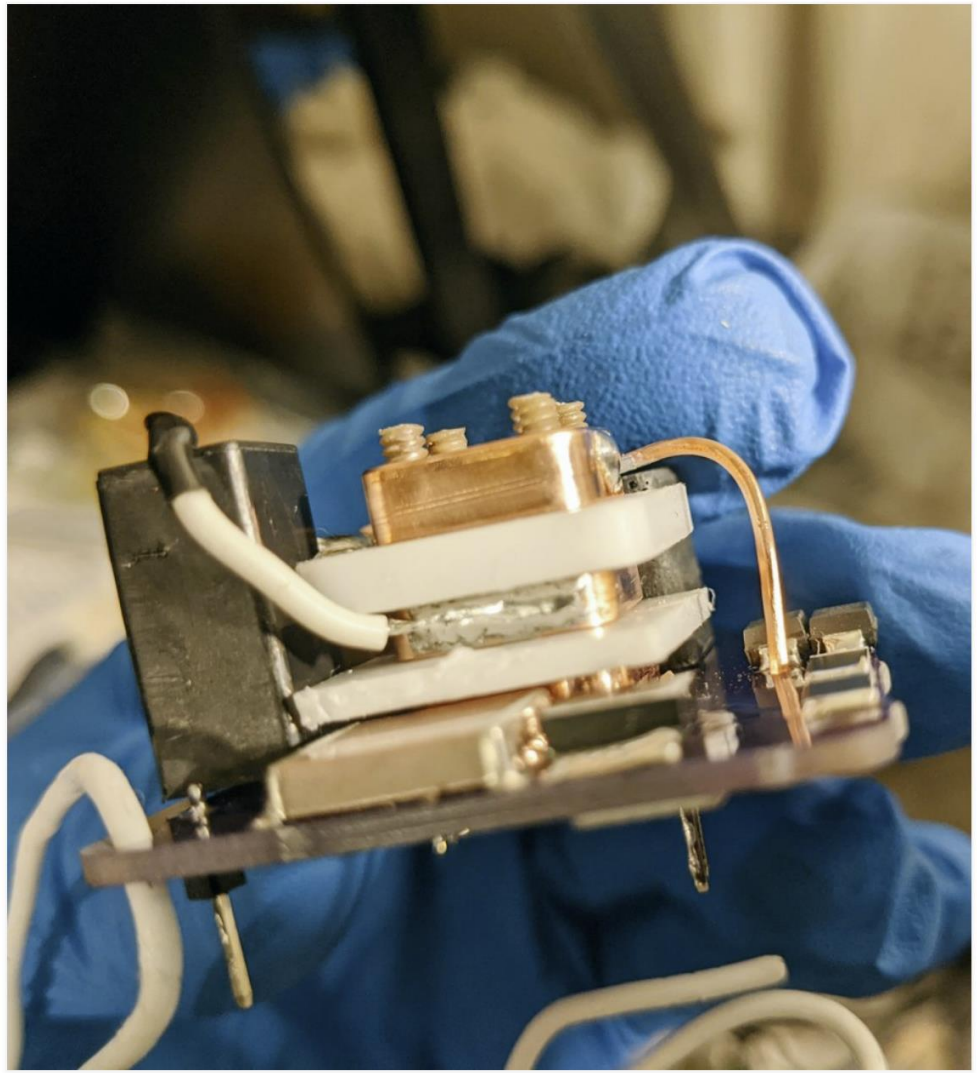
After the recent lifetime test of the rebuilt AIS-gPPT3-1C Micro Pulsed Plasma Thruster, I was commissioned to deliver a brand new gPPT3 system for testing and possible integration aboard another nanosat.



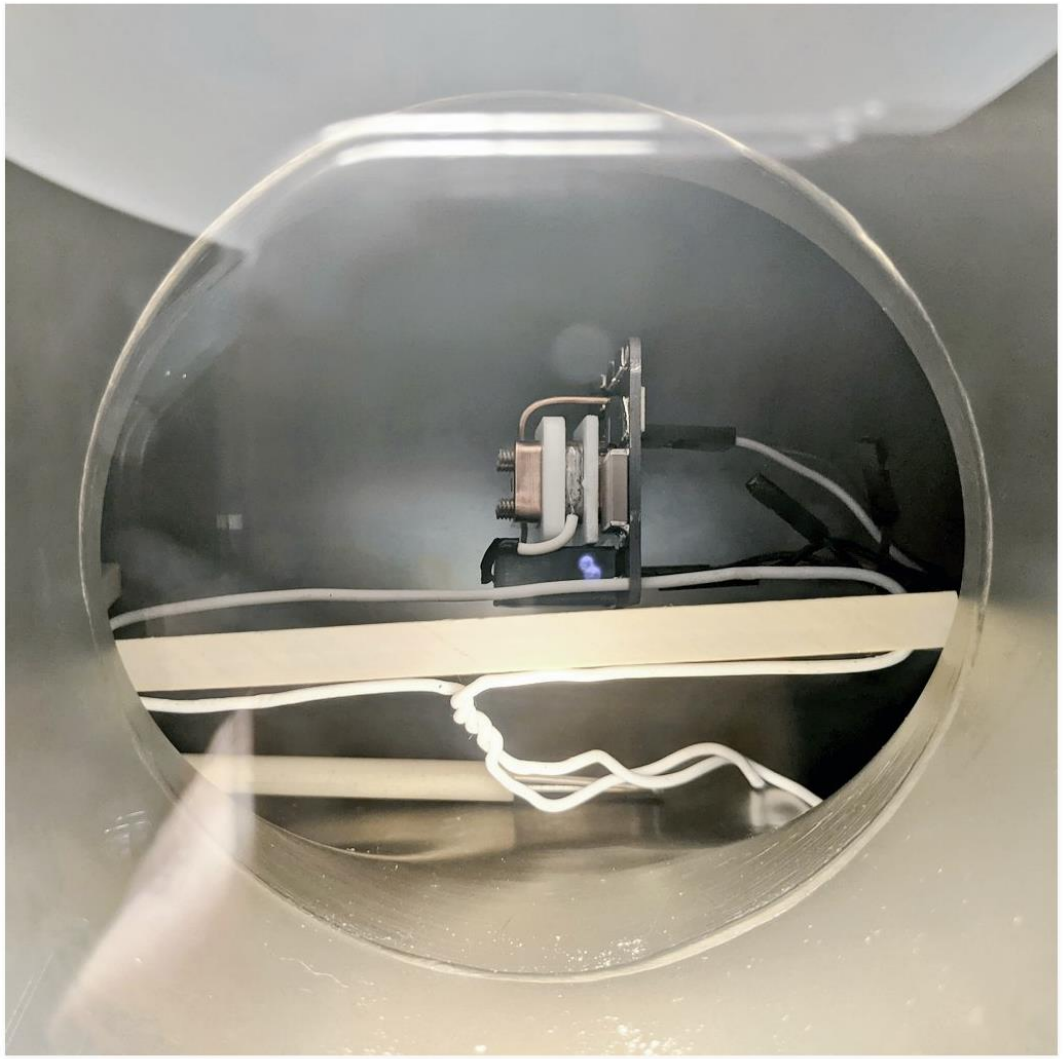


Reviewing the machined parts for the thruster, it was decided to bring the cathode pin closer to the surface of the Teflon fuel bore by replacing the original 1/8” Teflon insulator plate with a 1/16” thick plate. The surface of the cathode pin was also roughed up with 60 grit sandpaper to increase the probability of breakdown with a much rougher surface.





The thruster was loaded into the chamber again for a second test. All system I/O were nominal, however no output pulse was observed. The thruster was disassembled, discovering the cathode pin was too close to the Teflon fuel bore, pressing up into it and blocking the bore, preventing ignition from occurring. The cathode pin height was adjusted, and both the pin and igniter surfaces were roughed with sandpaper. The thruster was loaded up again for a third run.



After adjusting the input voltage up from 3.3V to 3.8V, the thruster started firing reliably, and I was finally able to finish qualification of the new thruster build with the recorded 10 shots in a row. The qualification test was livestreamed (like the other two prior), which can be viewed on the AIS Twitter feed or below. The 10 shot sequence can be seen starting at 3:53 in the video. At 3.8V at a rep rate of 0.25Hz 10 ignitions in a row were achieved without misfire at a main discharge of 1500V and 0.15J per shot.

Learn more at https://appliedionsystems.com/

FACING THE CHALLENGES

- Open Source is the best relief for ITAR/EAR. Being free of heavy regulatory burdens is an enormous cost and risk reducer.
- Aside from purchasing commercial attitude control and propulsion options, Open Source is the best way to tackle Debris Mitigation rules.
- The Open Source amateur technical community is vibrant, diverse, and productive.
- A huge array of Open Source work comes from NASA. It's high quality and reliable.