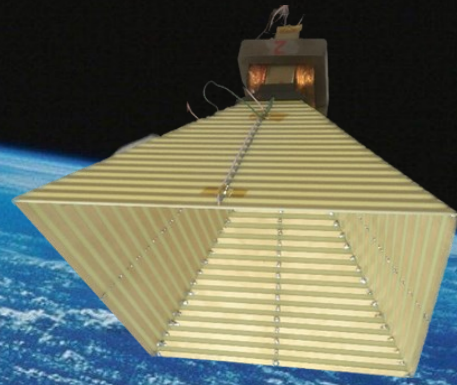


# Torre Space Power Systems

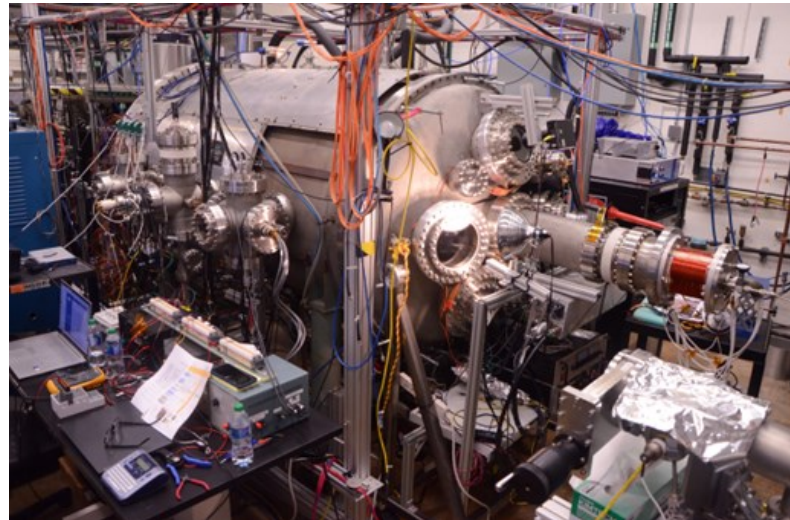
## September 2023 R&D Status Summary

Patent: US 2022 0161945 A1 published 5-26-22



TSPS is developing a new form of electrical power generation that enables the naturally occurring high velocity ionized plasma that is emitted by the sun to flow through a magnetic field; a technology based on the science of magnetohydrodynamics. Founded in 2020, our team works to research and test a new technology to provide solutions for space applications of all sizes while reducing the problems of sustainability, environmental waste reduction and foreign-sourcing of rare-earth materials.

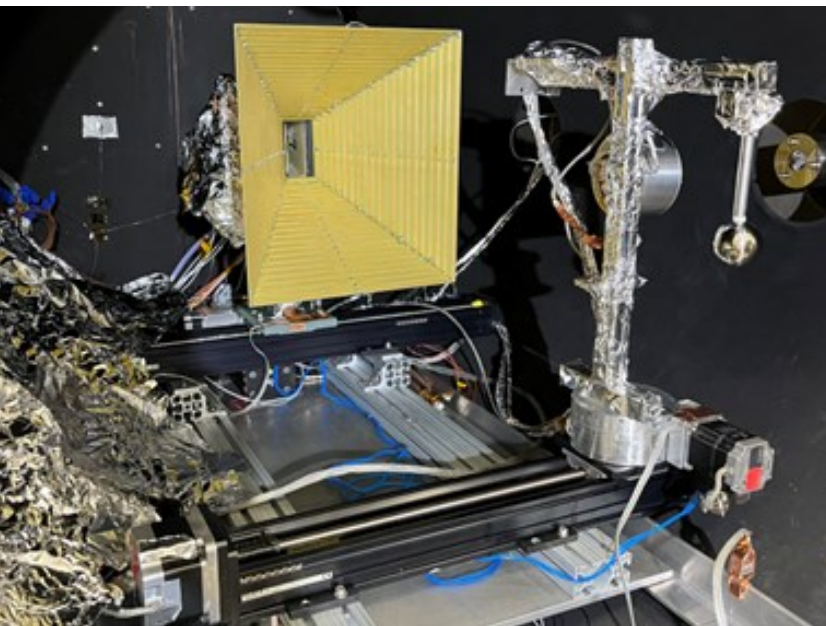
***Phase I Proof-of-Concept Tests  
have been completed at NASA MSFC  
Environmental Effects Facility.***



**Positive Volts and  
Power Produced!**

***Exposed to LEO & GEO/SW  
Plasma Environments***

***Proof of Basic  
Functional Capability***



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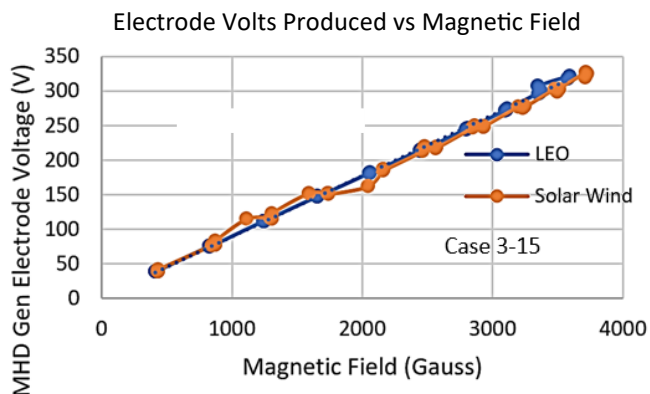
William Torre, P.E.  
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wtorre@sbcglobal.net

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<https://www.tspss.space>

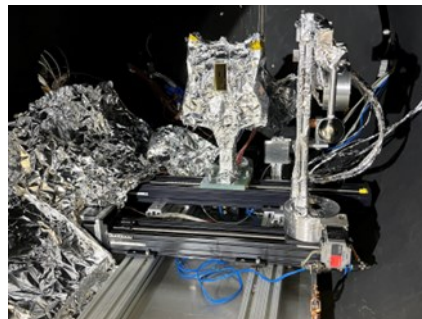
Chris Torre, P.E.  
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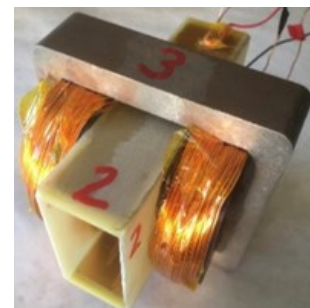
# Torre Space Power Systems



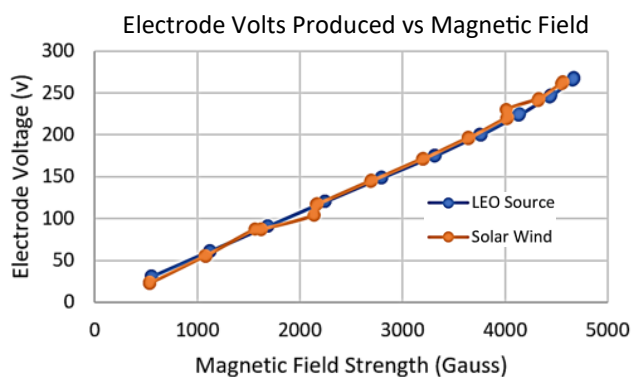
Mounted Inside the Plasma Vacuum Chamber



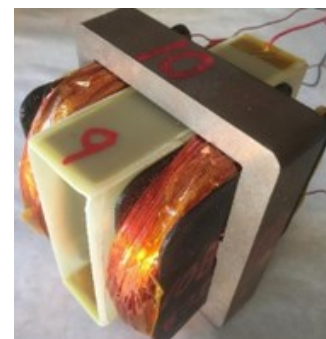
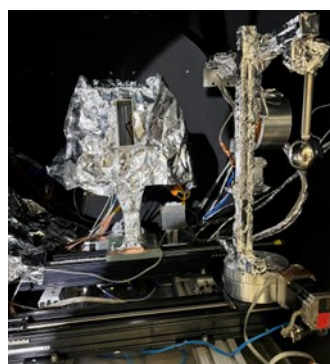
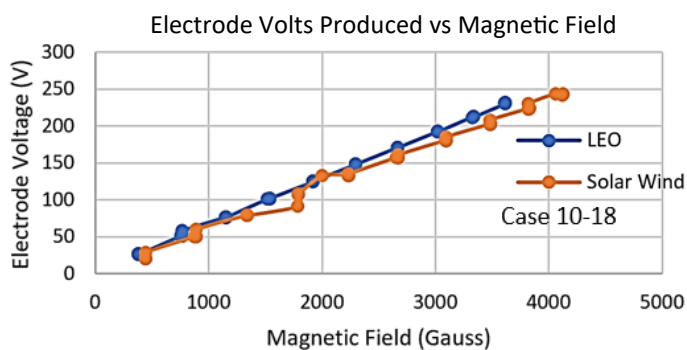
MHD Channel Test Articles



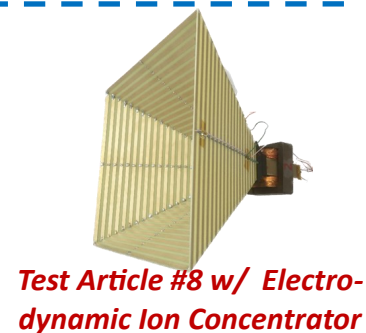
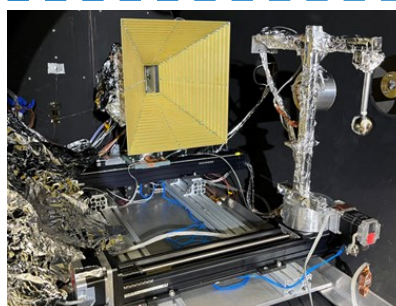
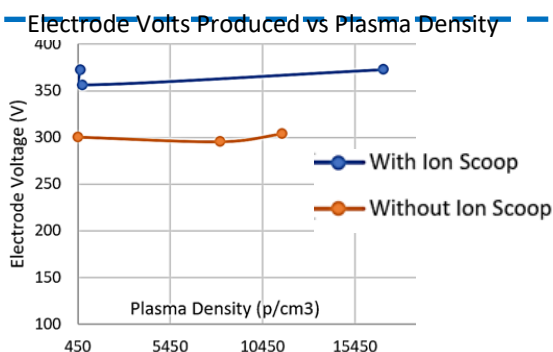
Test Article #3



Test Article #8



Test Article #10



Test Article #8 w/ Electrodynamic Ion Concentrator

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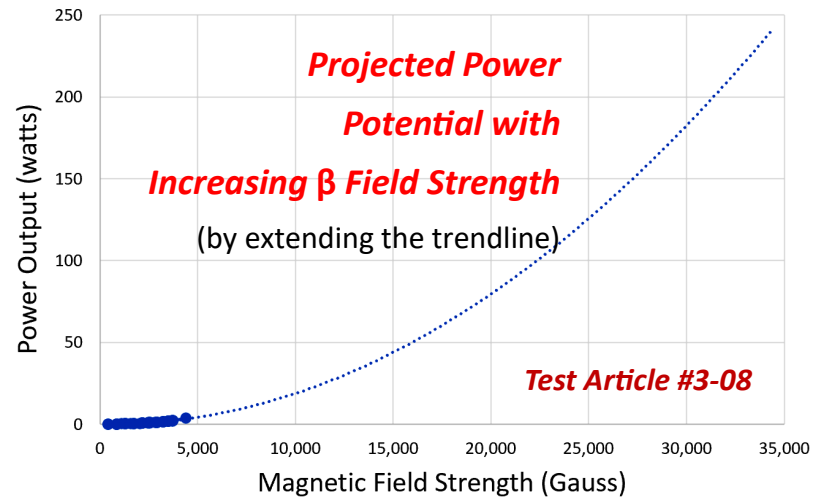
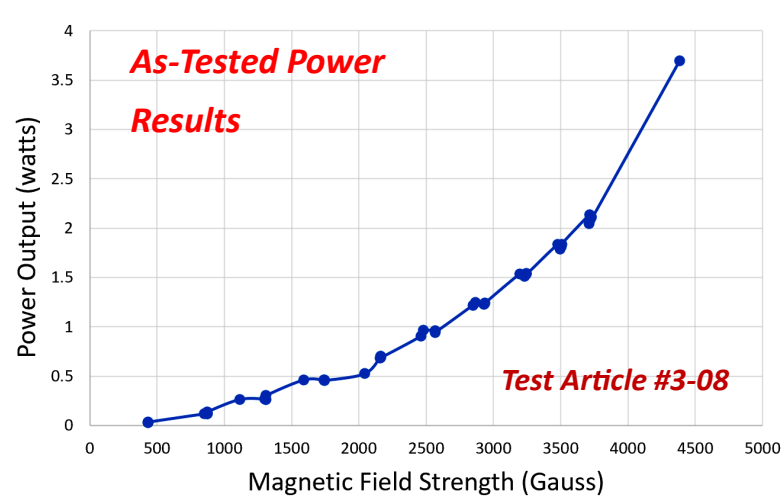
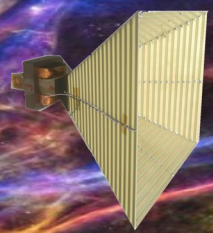
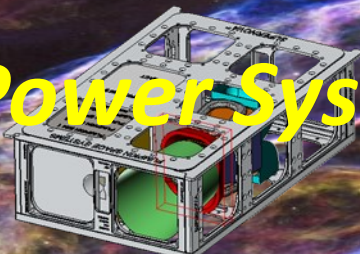
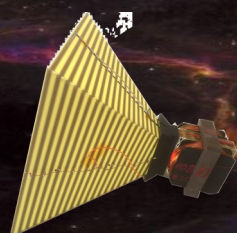
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# Torre Space Power Systems



The as-tested power (Watts) output of Test Article #3 in solar wind/GEO plasma is shown on the left with a range of applied magnetic field strengths; 4,500 Gauss was about the highest used in this test case. The graph on the right depicts an extended trendline up to about 35,000 Gauss; in which case the power would rise to around 250 Watts. Phase II will evaluate using superconducting electro-magnets to achieve up to 3—3.5 Tesla (see next page).

An MHD generator has no moving parts and essentially consists of a channel through which ionized particles are passed through an applied magnetic field. Electrodes collect a voltage potential perpendicular to the magnetic field and the flow of ions. The power output is proportional to the product of the plasma conductivity, the square of the ionized plasma velocity, and the square of the strength of the magnetic field through which the plasma passes. For space applications a convergent, electrodynamic inlet nozzle would guide the ions and increase the density and conductivity of plasma as it enters the MHD channel.

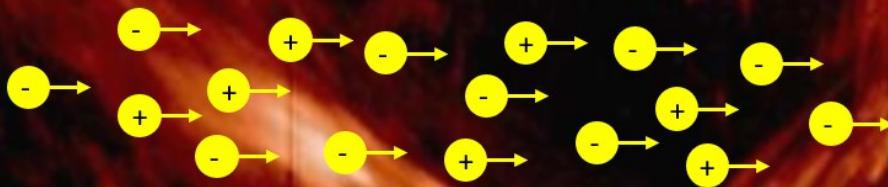
***The universe is filled with plasma!***

***Plasma, plasma everywhere! Our star is a plasma generating machine of tremendous power. The Solar System is filled with it's ionized plasma.***

Ref: <https://www.plasma-universe.com>

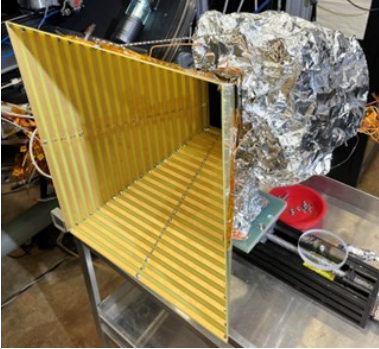
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Nuclear Fusion  $\rightarrow$  coronal plasma  $\rightarrow$   $H + He^+_{(ion)} + H^+_{(ion)} + e^-_{(free)} + p^+_{(free)} \dots$  [3]





# Torre Space Power Systems



## Phase 1— Proof-of-Concept Feasibility

- Magnetic field  $\beta$  performance tested .....
- MHD system test plan defined .....
- Test articles & electrodynamic scoops built .....
- Scaling factors for lab to flight similarity .....
- Test results from MSFC EEF plasma chamber .....
- Power production validated .....



TRL1

TRL2

TRL3

TRL4

TRL5

TRL6

TRL7

TRL8

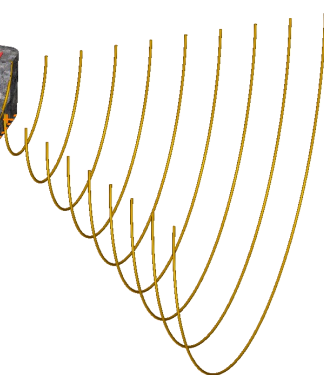
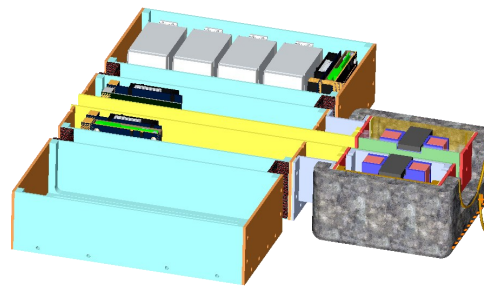
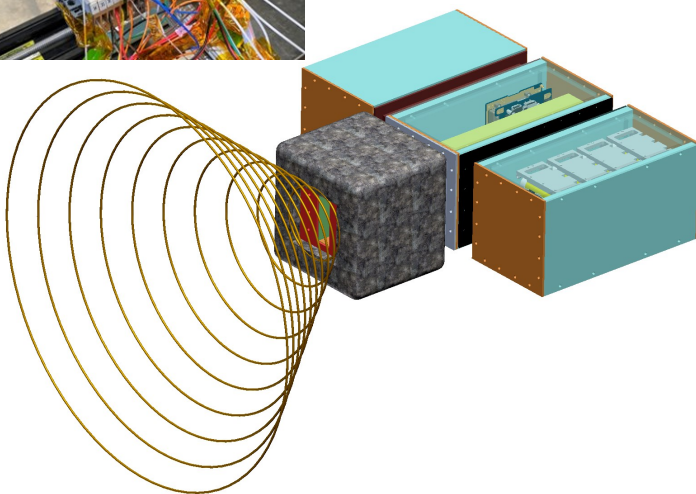
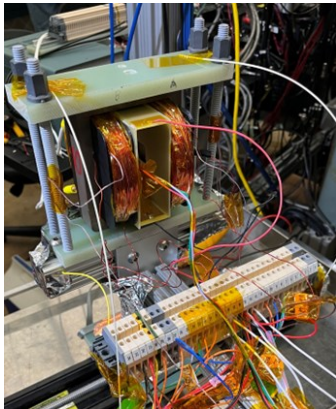
## Phase 2—Breadboard Demonstrator

- Superconducting-Magnet system demonstrated.....
- Electrodynamic scoop function demonstrated .....
- Solid-state electronics packaging designed.....
- Power Watts & Volts regulation validated .....
- MHD TA's tested in flight-equivalent plasma environ.



## Phase 3—Prototype to Flight Fidelity

- Power regulation system optimized
- Packaging for launch designed
- Specification of interfaces & system requirements
- On-orbit deployment of functional system demonstrated
- Successful operational functionality



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