SAFIRE

PHASE THREE

EXPERIMENTS & DISCOVERIES

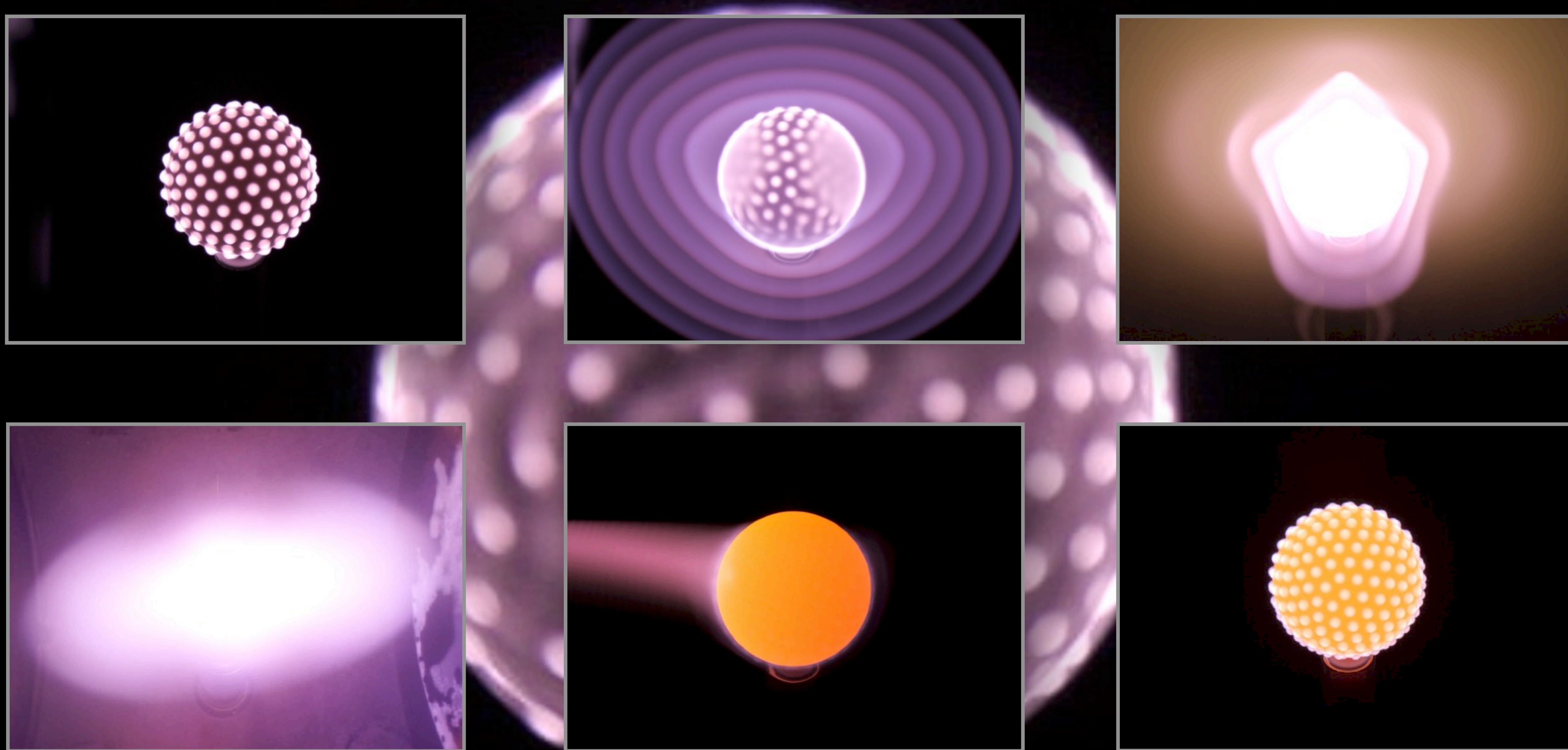
SAFIRE

Note: all photographs of experiments are exactly as seen by the eye, no Photoshopping has been done.

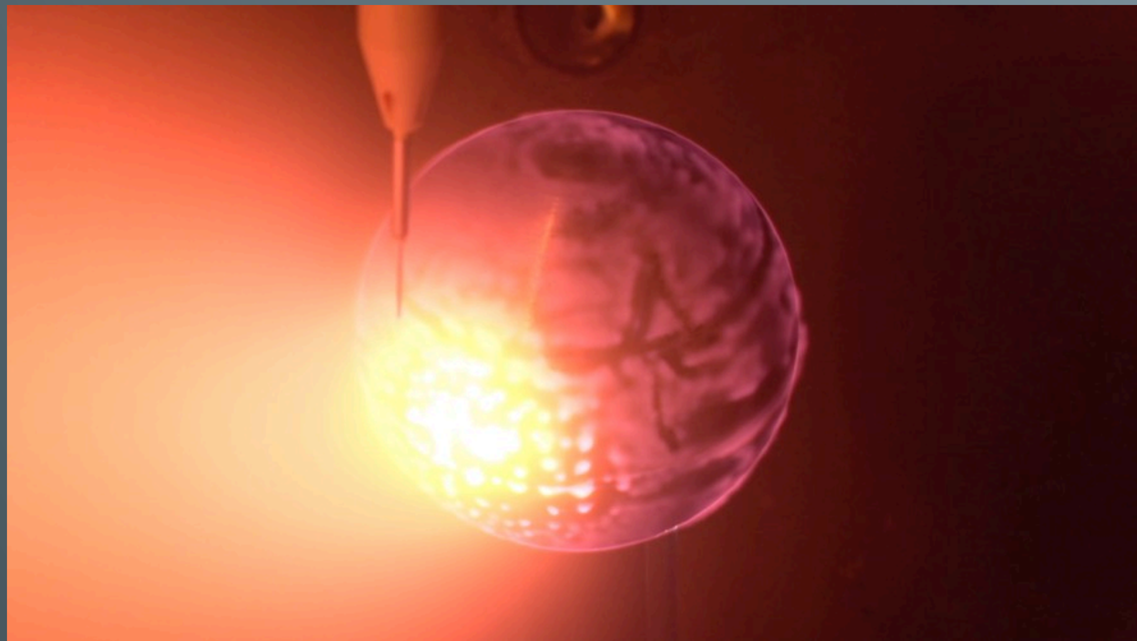
DISCOVERIES

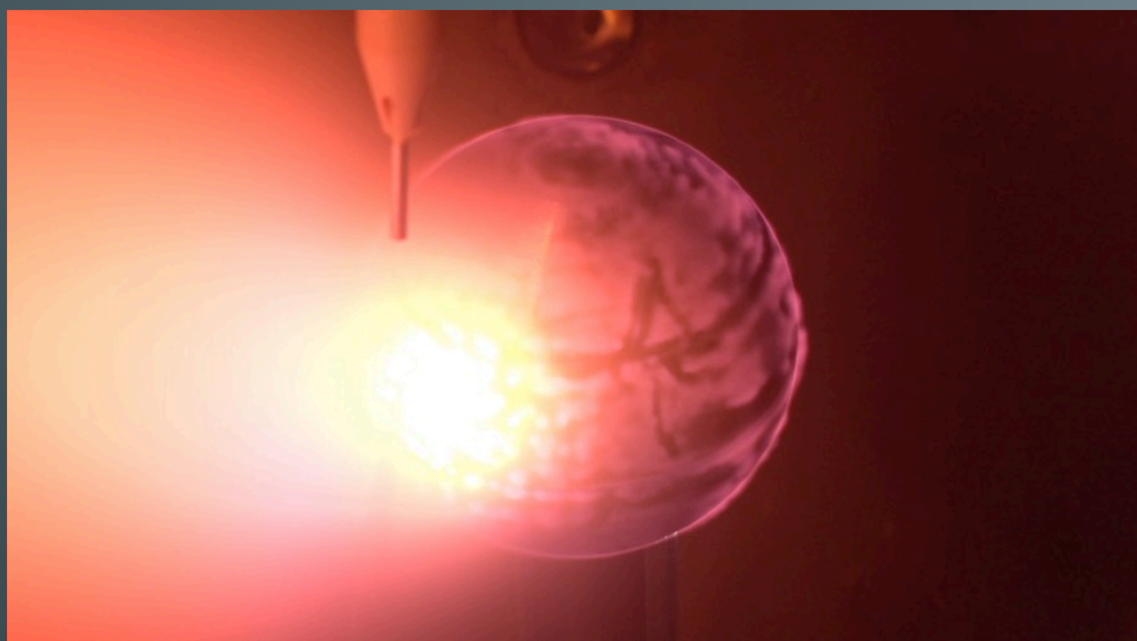
Experimental Results

The primary notable achievement of this apparatus is its ability to produce a stable, sustainable plasma which consists of multiple spherical double layers surrounding the anode.



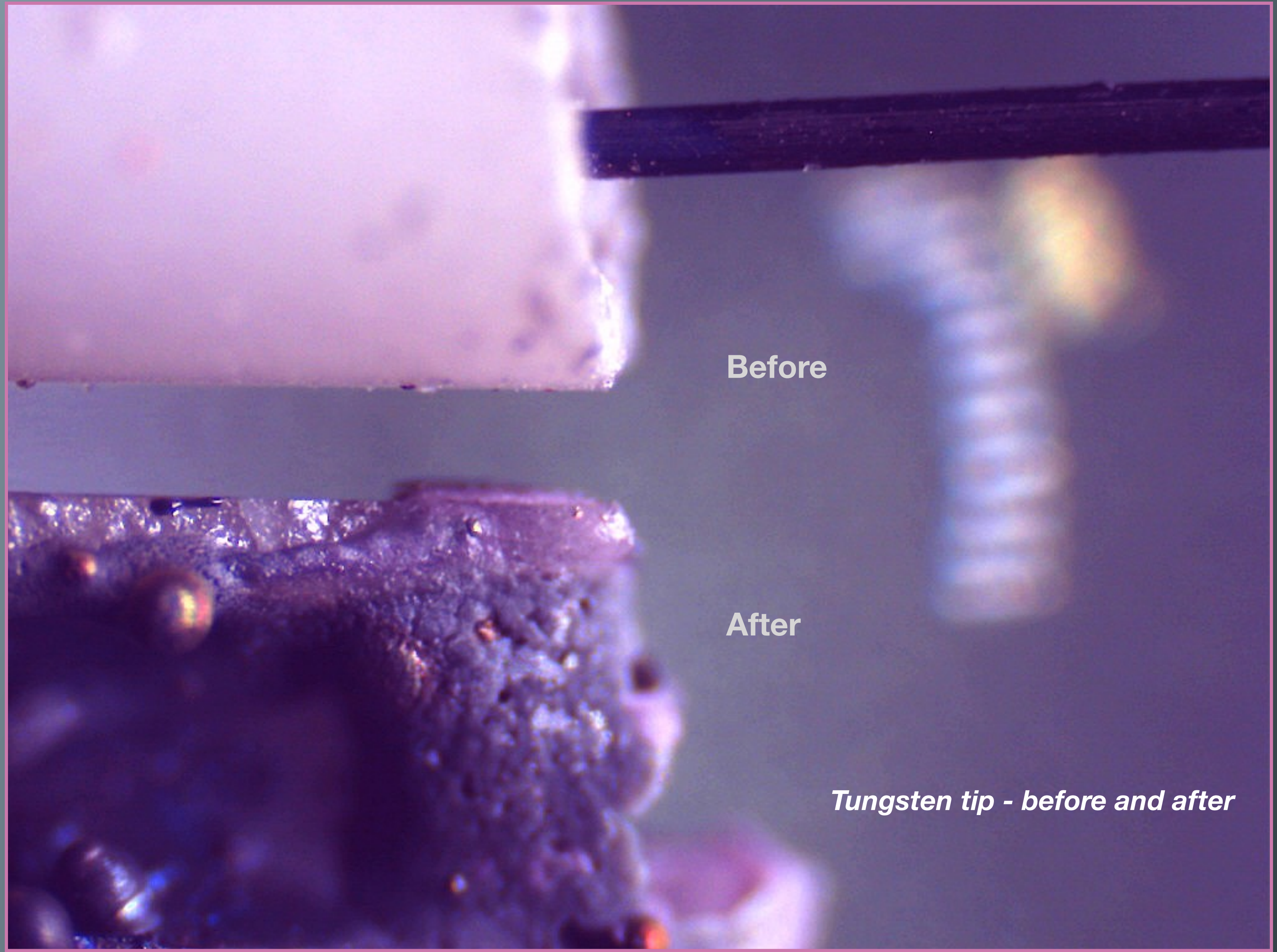
examples of different plasma regimes



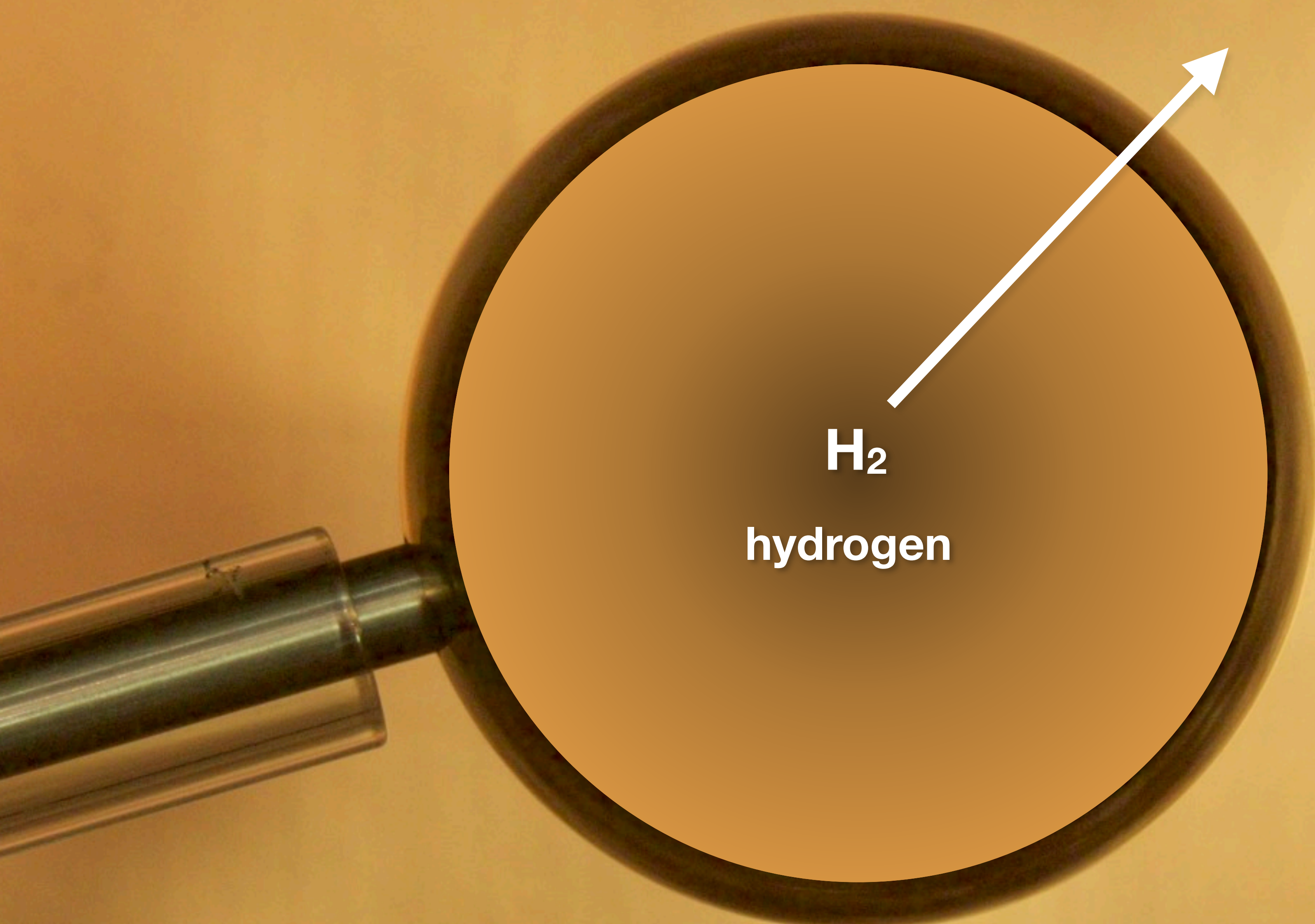


Any project that attempts to build a working model of the Sun will be dealing with high temperatures because plasmas are known to be extremely hot. In an early test to calibrate the telemetry of the gimbal mounted Langmuir probe, a tungsten wire was attached to the tip. Watching a video of the chamber, an operator maneuvered the probe toward the outermost layer of visible plasma. The plasma was being sustained by an input power of 182 watts to the anode. Before it even reached what appeared to be the edge of the plasma, the end of the tungsten tip vaporized and the remaining alumina insulator appeared to melt.

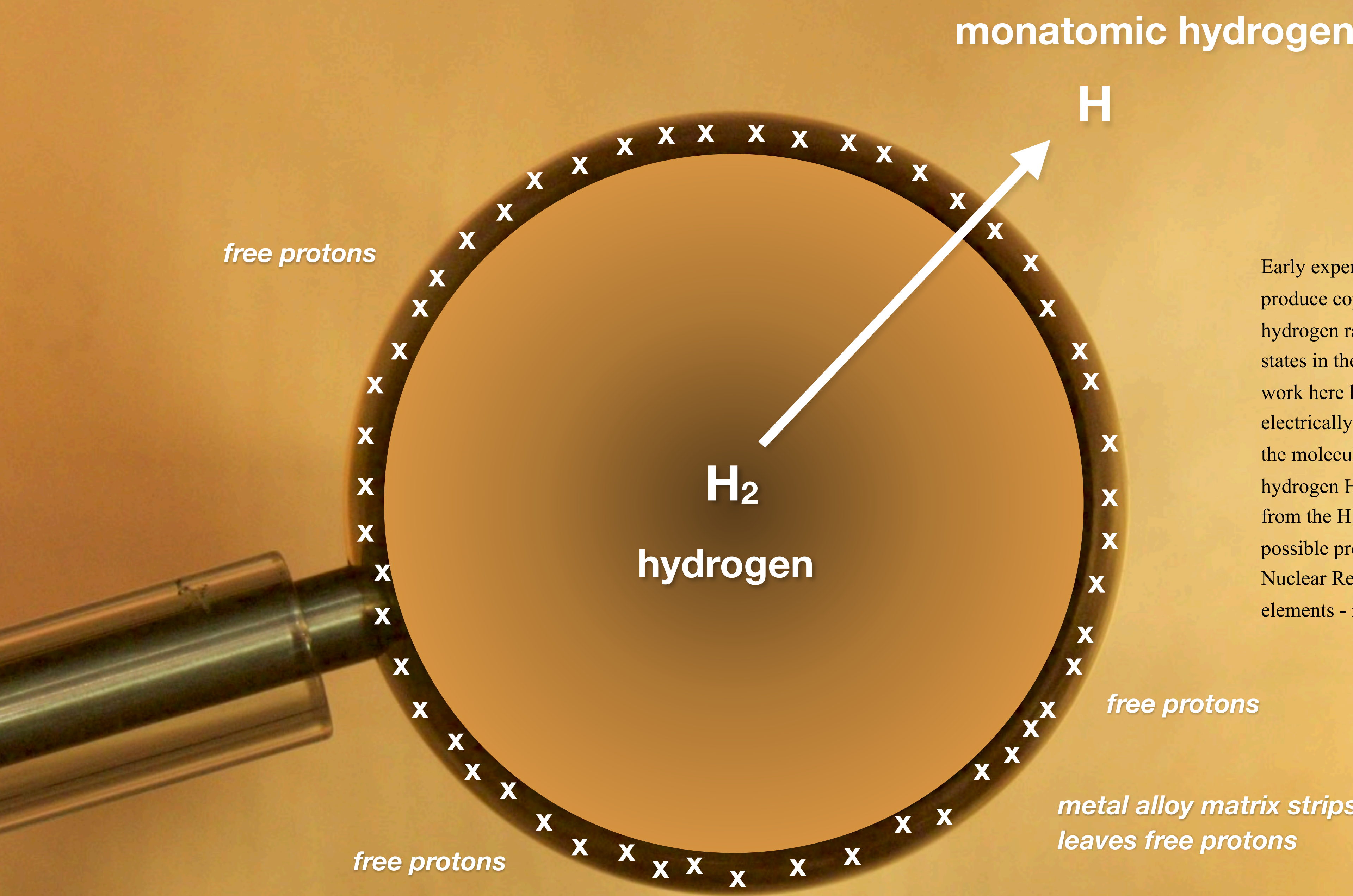
Thermodynamics analyses made during the design phase indicated that the plasma would have a maximum temperature of around two thousand degrees Celsius. Fifty-five hundred degrees Celsius is necessary to vaporize tungsten. How hot was the plasma? This strange anomaly was a cause of much excitement among the team. The unexpected vaporization of the tungsten tip required a redesign and rebuild of the Langmuir probe. *The new tungsten tips are twenty times the size of the first.*



Tungsten tip - before and after



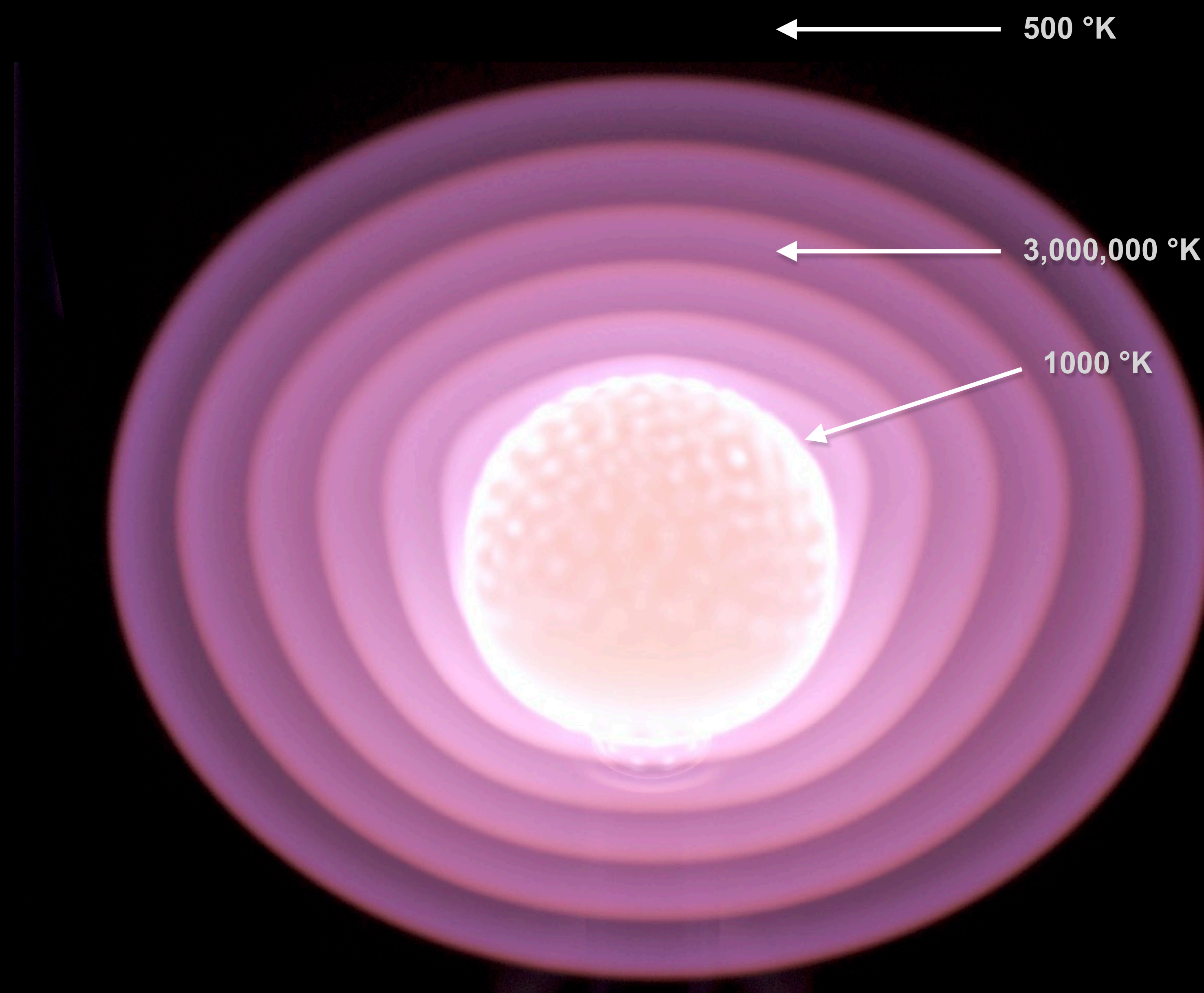
The anodes used in the experiment can be replaced easily and quickly. The standard anode is solid metal alloy, but it can be substituted with a hollow one. This hollow anode is mounted in a way that permits its core to be pressurized with hydrogen and other gases. The differential between the pressure in the anode and that in the larger chamber allows the gas to escape the anode through the crystalline lattice. The resulting plasma may more accurately model the Sun’s atmosphere in the vacuum of space than one created in a gas infused atmosphere.



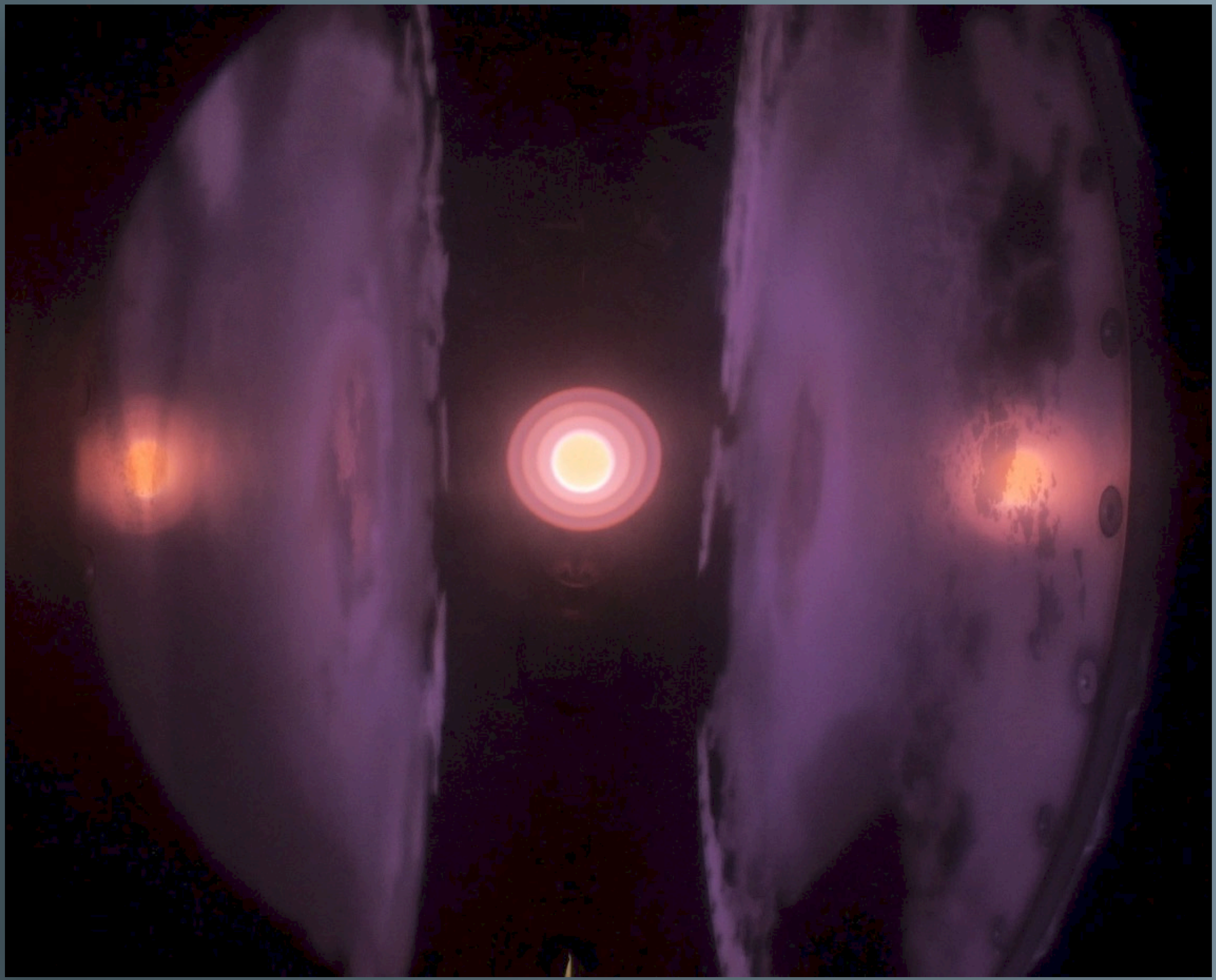
Early experimental runs with this setup produce copious amounts of monatomic hydrogen raised to unexpectedly high-energy states in the chamber. Although the process at work here has not been studied in detail, the electrically charged metal alloy matrix splits the molecular hydrogen H2 into monatomic hydrogen H. Concurrently it strips electrons from the H, leaving free protons. This is a possible process by which Low Energy Nuclear Reactions (LENR) - transmutation of elements - might occur.

A major discovery is that of an electro chemical catalytic process between hydrogen and other trace elements. It has been found to be the primary reason for the formation of the stable spherical plasma double layer shells.

The formation of these shells causes the plasma to behave as a transforming capacitor. These extremely powerful electromagnetic shells are responsible for the trapping of high energy electrons, ions and photons.



High temperature energy is *contained* within the plasma double layers

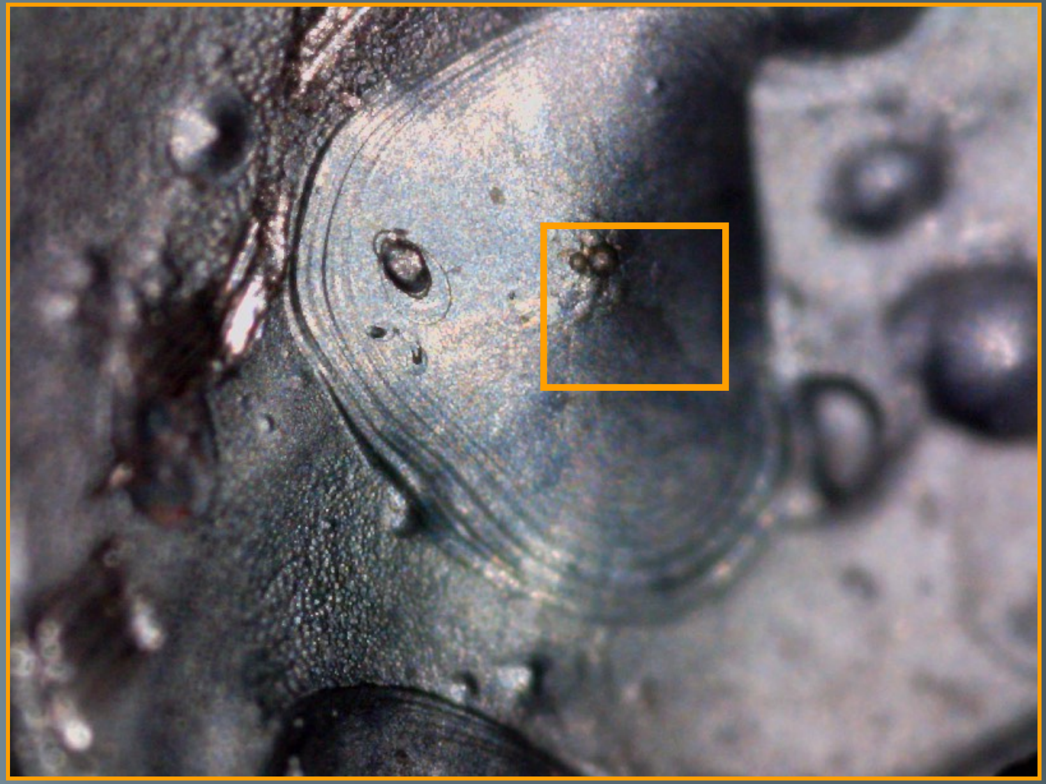


The trapping prevents the ions from flying out and smashing up against the cathodes and the steel walls of the chamber. It keeps the high energies contained within the plasma, energies that would otherwise destroy the apparatus.

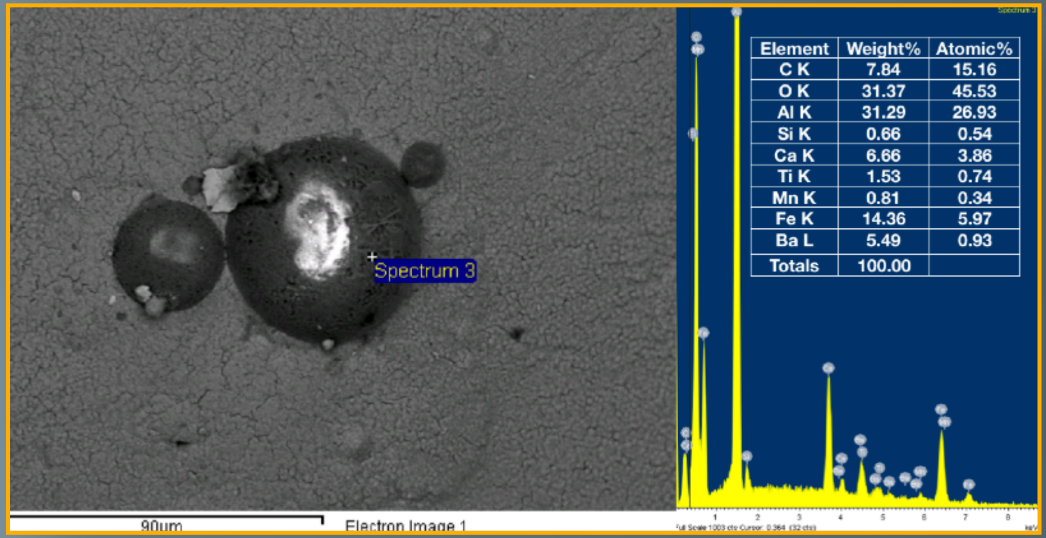
The spherical plasma double layer shells show no sign of being affected by gravity – they are spherical and would require little or no inertial damping. This is enormously significant.

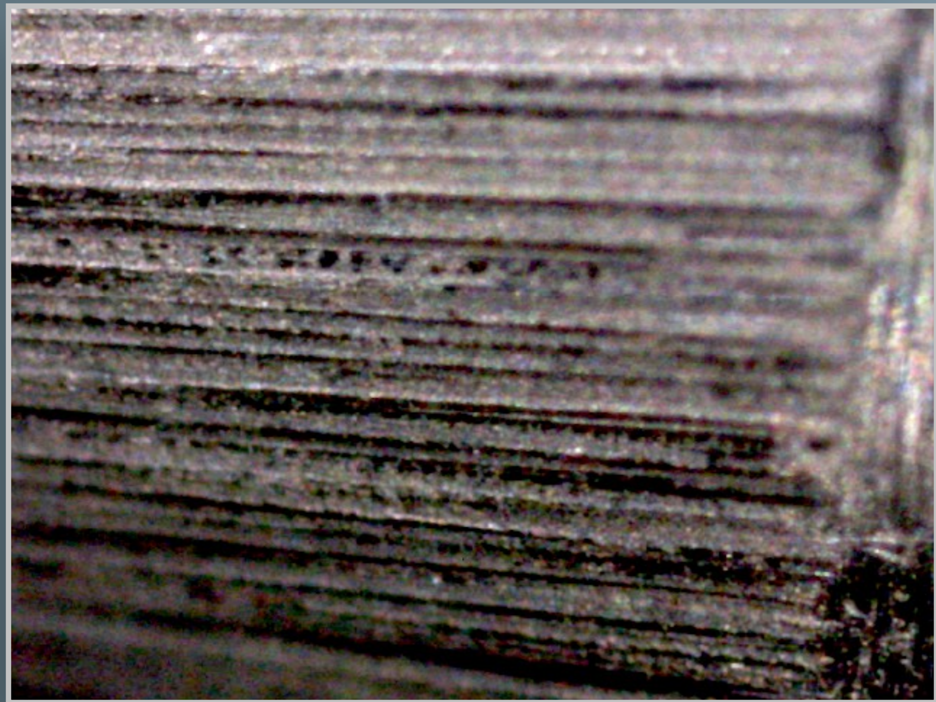
After these test runs the metal alloy anode exhibited visual changes on its surface. Scanning electron microscopy (SEM) showed new concentrated elements in small pits or atop ridges formed during testing – elements which were not present in the original metal alloy. Among them were titanium, barium, and calcium. It is uncertain at this time why these elements came to be there.

Optical microscopy



SEM analysis of nodule (Barium, Titanium, Calcium and others)





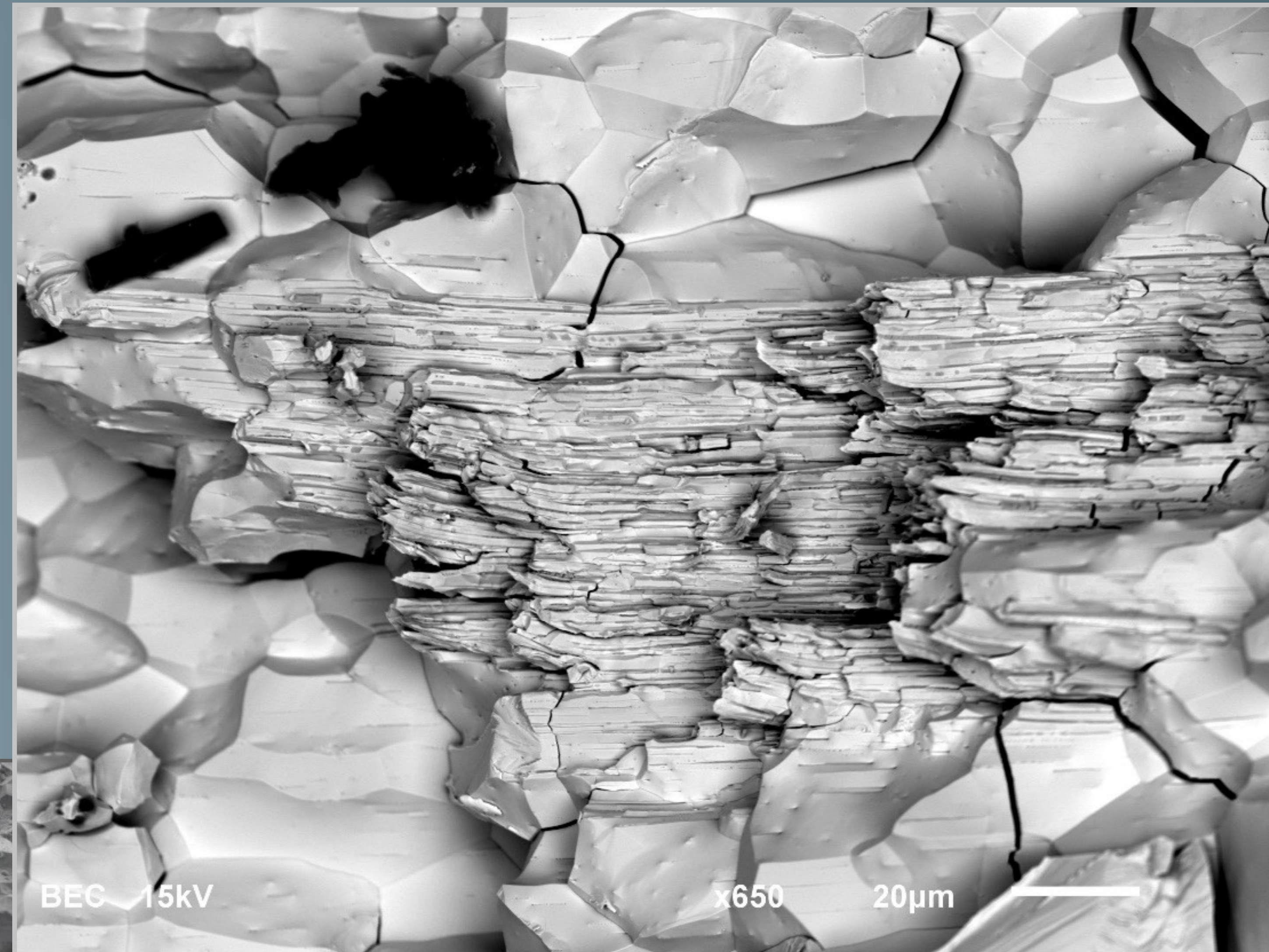
Optical microscopy of virgin tungsten

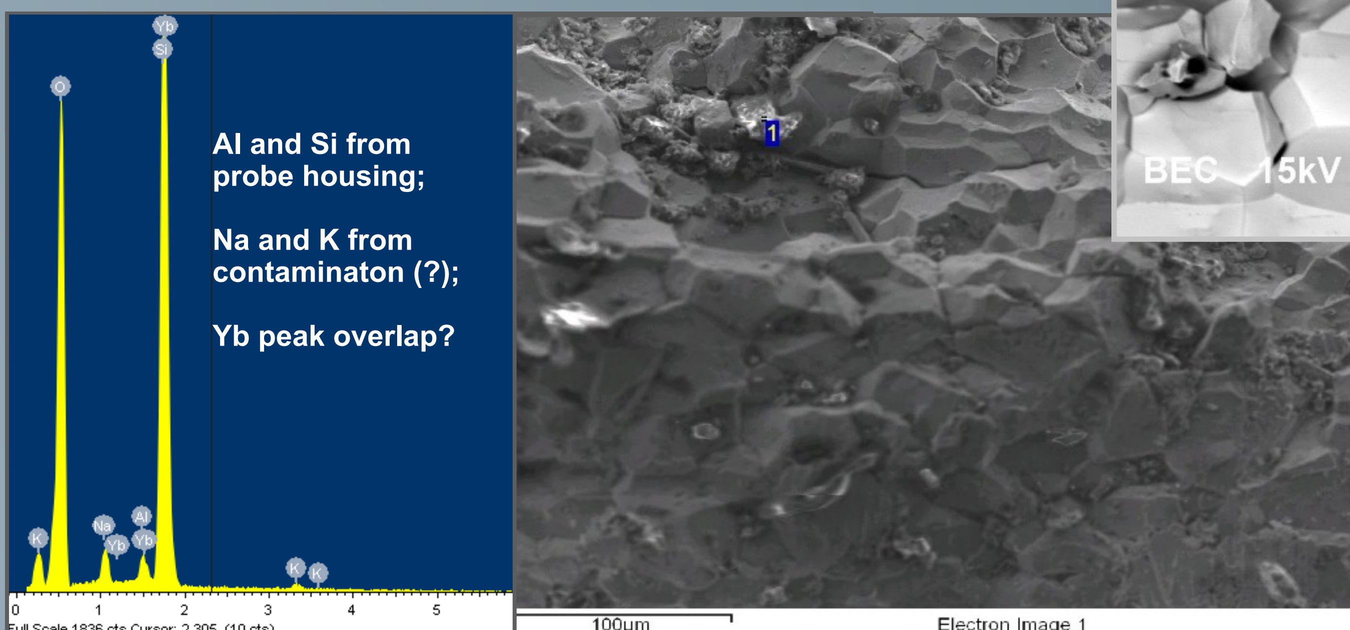
Crystalline changes after plasma exposure

The tungsten probe tip used during these metal-hydrogen tests also displayed odd changes. The tungsten did not show melting or boiling on the surface, but the material was very brittle. It was possible to break the metal apart and examine it in longitudinal sections.

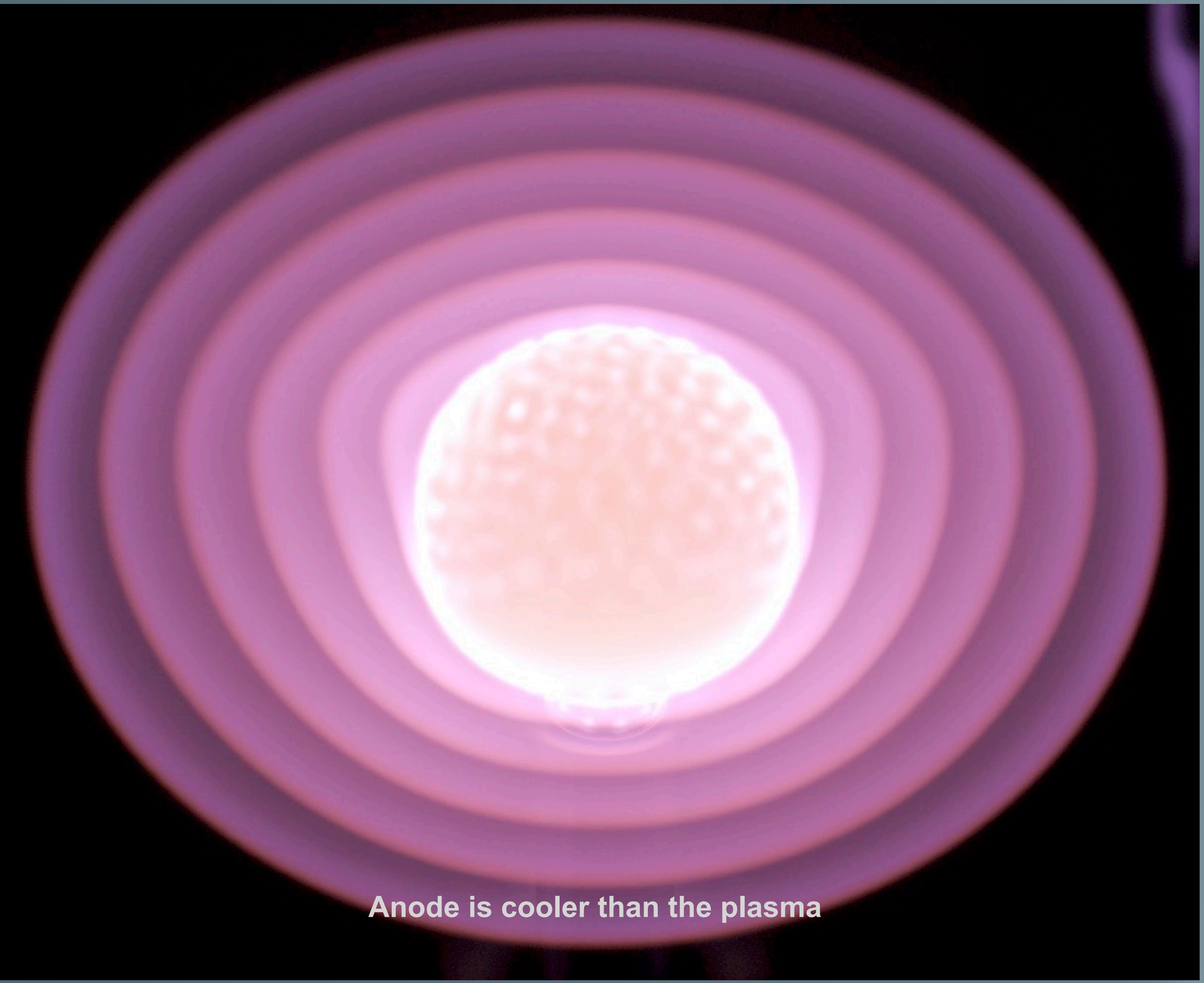
Optical microscopy revealed the tungsten had melted in the interior while leaving the surface in its original crystalline condition. The exterior only showed discoloration, which is expected from exposure to a hot plasma. The interior of the tungsten also showed new chemistry, with concentrations of elements not seen in the tip before exposure to the chamber discharge, a true mystery.

SEM showing changes of the crystalline structure on the inside of the tungsten



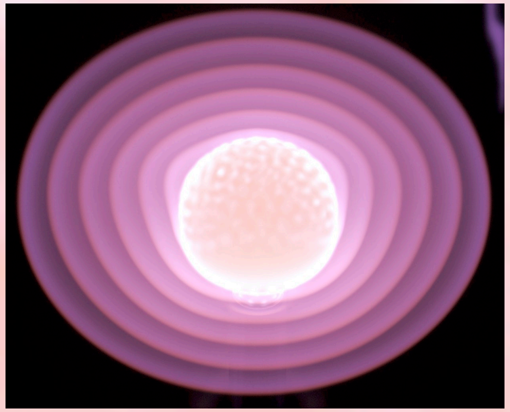


Various other new elements



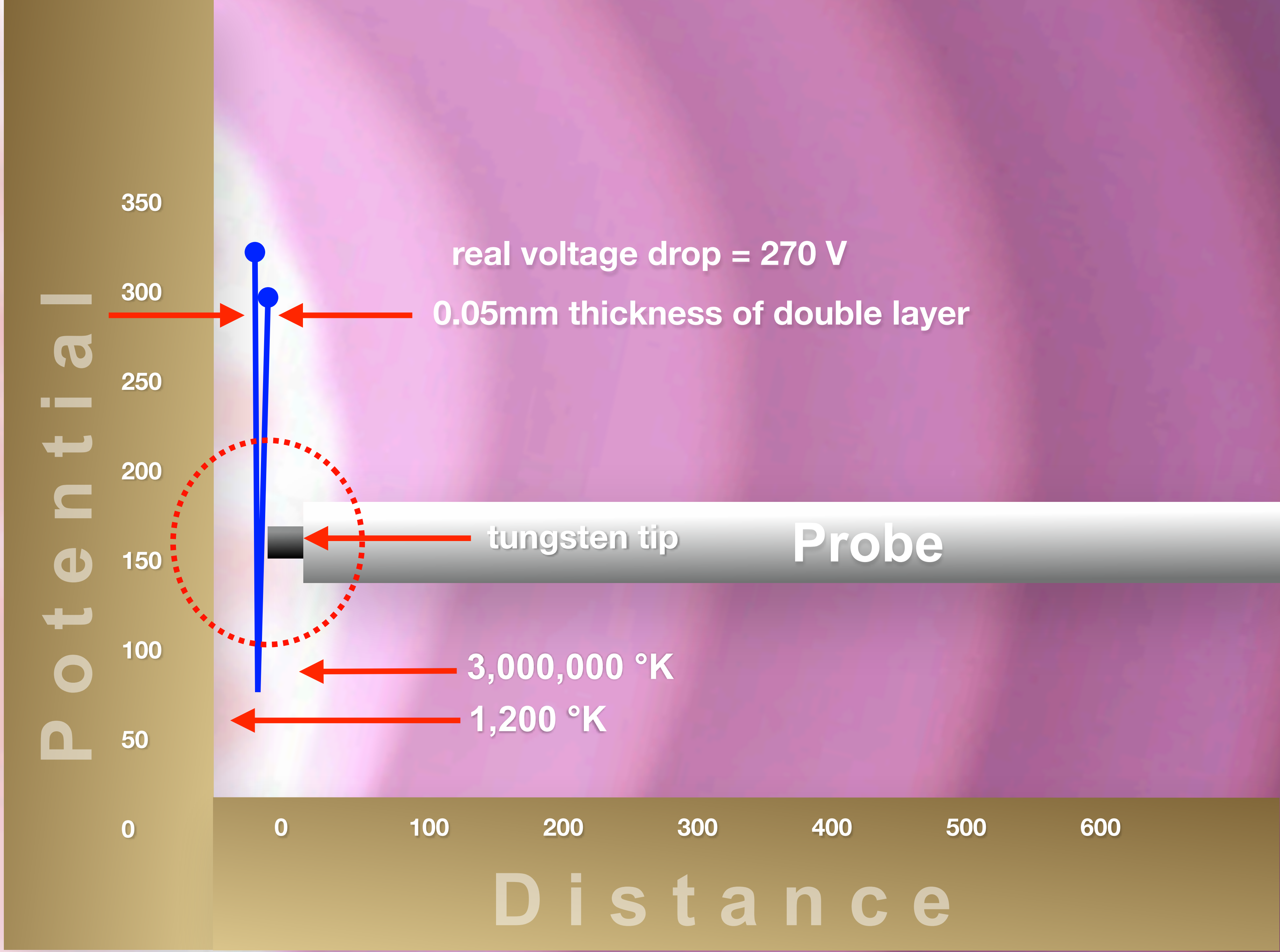
Another surprise: both solid and hollow anodes are cooler than the plasma – defying the laws of thermodynamics. Although there was H being diffused through the hollow anode the temperatures of both the solid and hollow anodes were similar.

These responses may be due to the extremely thin but powerful plasma double layer forming just off the surface of the anode. This limits electrons from impinging on the anode surface that would otherwise heat the anode to higher temperatures.

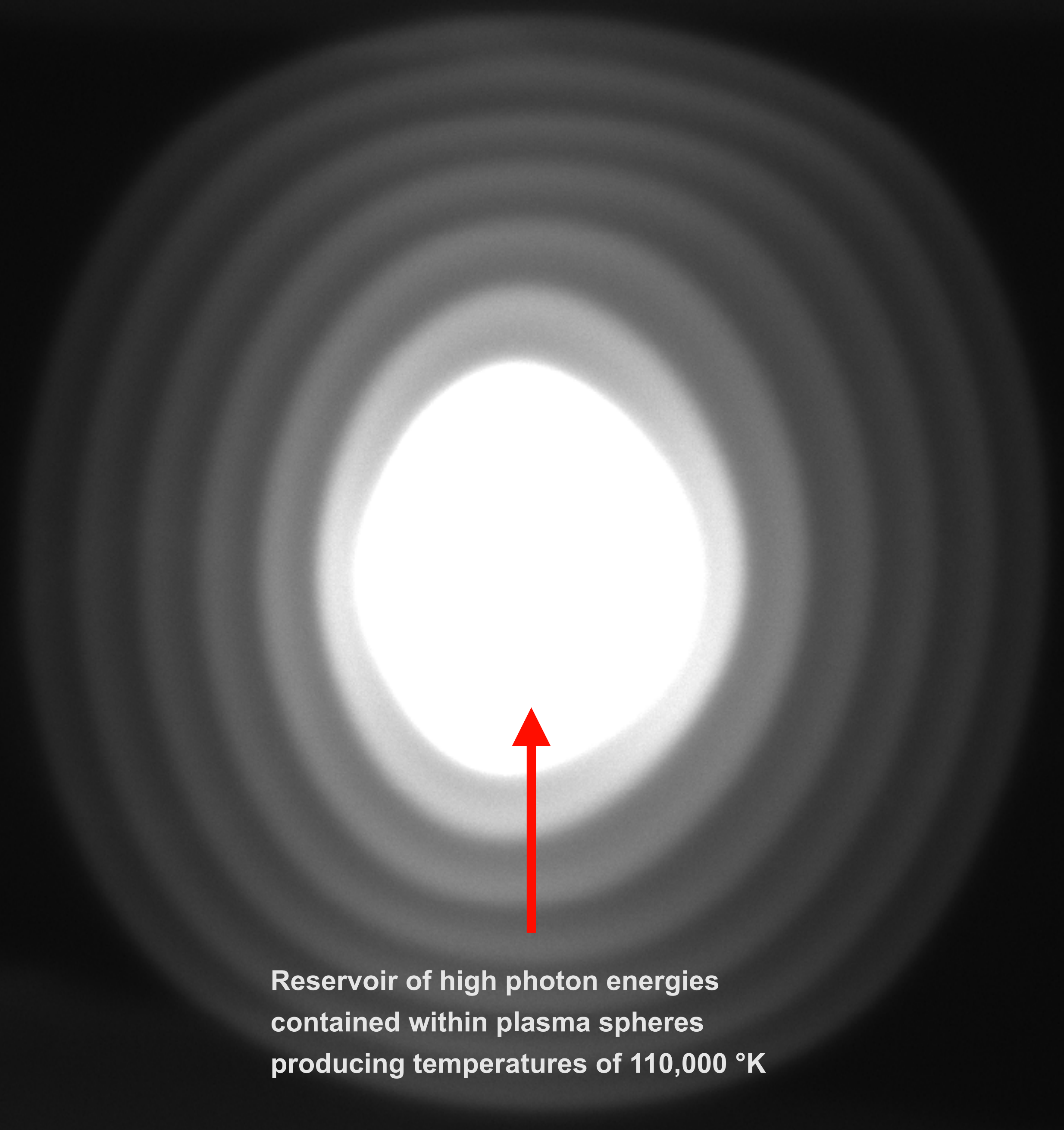


The voltage drop of 270 volts very close to the chamber anode, if converted entirely into temperature, would equate to 3,000,000 K, which, remarkably, is the same temperature increase seen when moving from the Sun's chromosphere to its lower corona.

The high temperature and high density of the plasma inside the double layers shows the spherical double layer shells are creating a force field of some kind, responsible for there being a higher pressure inside than outside the double layers.



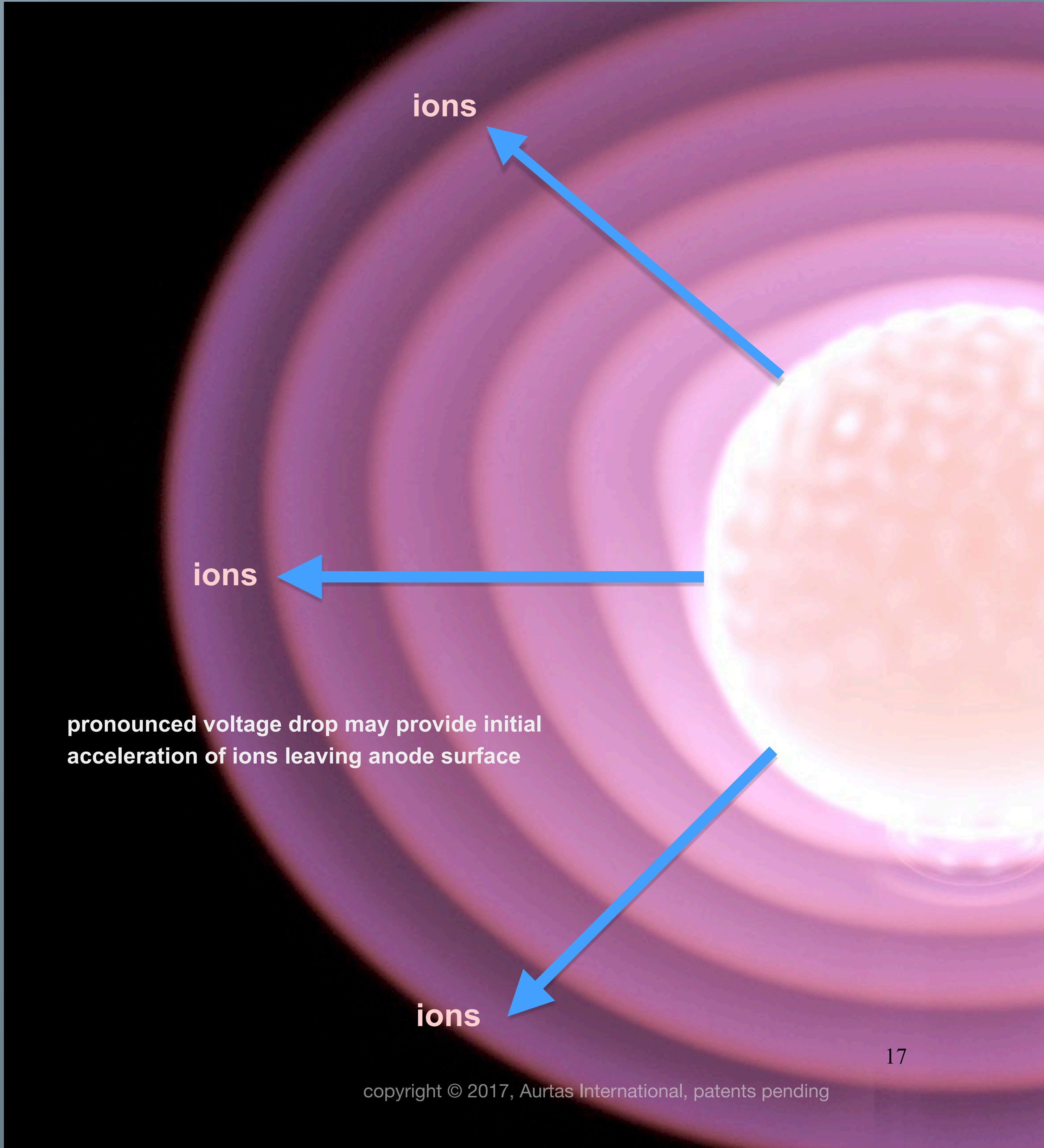
Plasma produces highly energized ultraviolet photons



It is not known at this time if the experimental plasma produces x-rays or gamma rays. However it does produce highly energized ultraviolet photons. From the visible Balmer lines obtained through optical spectroscopy it is deduced that the hydrogen is creating copious amounts of 10.2 eV Lyman Alpha photons, indicating that there is a reservoir of high photon energies contained within the plasma spheres. This is producing a temperature of 110,000 Kelvin when the tungsten is exposed to it, and may account for the deformation and chemical changes of the tungsten probes, which happens in seconds, or possibly even picoseconds.

Ultraviolet light camera

Much is to be learned as to how the experiment brings particles to such high velocities and energy states. One significant discovery is that the pronounced voltage drop may provide the initial acceleration of ions leaving the anode surface and the boost needed to drive the ions across subsequent layers, acquiring even more energy as they traverse electric fields contained within the surrounding plasma.



The energy densities being produced by these experiments are far greater than predicted. Energies of this magnitude are found in two other places – the Sun’s photosphere …

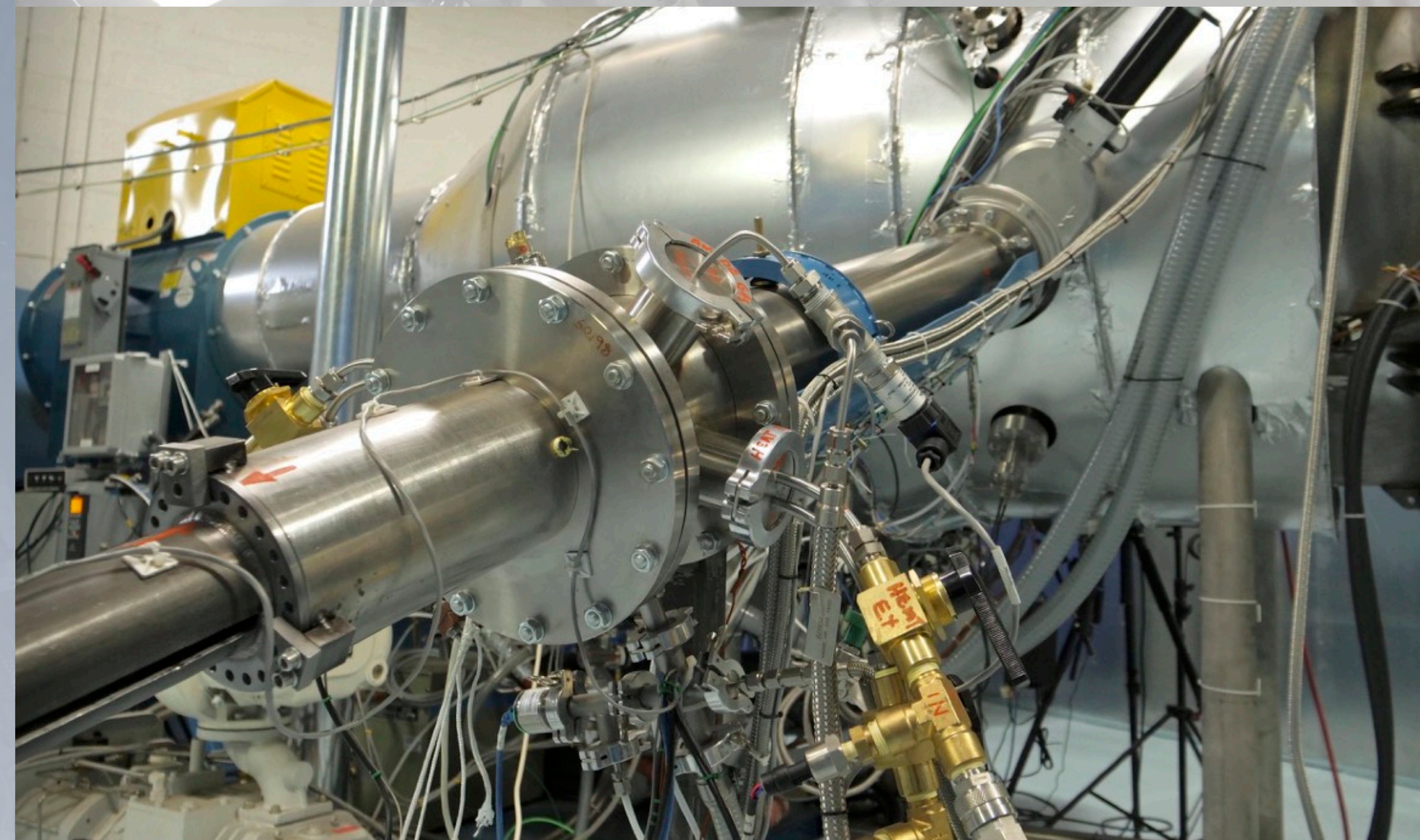
… and nuclear bombs.

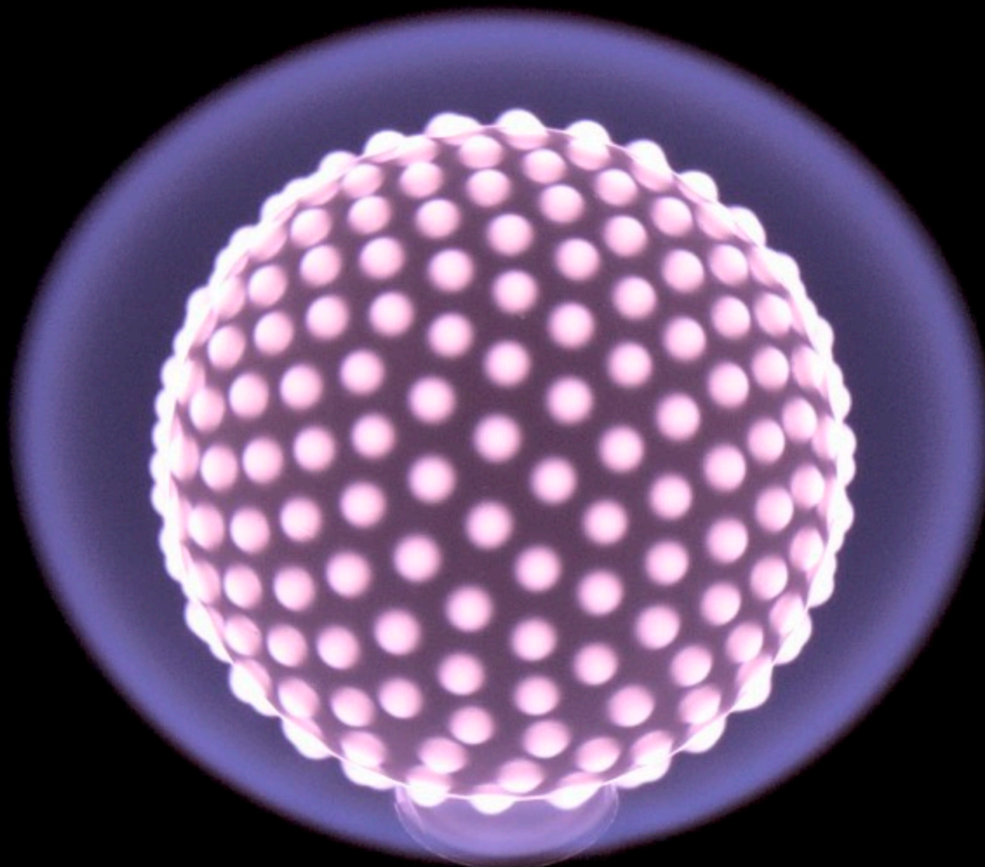
SUMMARY

In summary the SAFIRE experiment is capable of:

- DOX – Design of Experiments Methodology.
- Creation of exothermic plasma reactions – the key to unlocking the reactions that cause powerful electromagnetic spherical plasma double layer shells to form.
- Creating a variety of spherical plasma discharges.
- Containing, controlling and stabilizing high-energy dense plasmas.
- Producing copious amounts of atomic hydrogen.
- Producing free protons within the anode metal alloy matrix.
- Producing 10.2eV vacuum ultra violet light.
- Electrical confinement of high-energy photons (photon trapping).
- Producing variations in electron density comparable to the photosphere, heliosphere, and nuclear bombs.
- Potential of Low-Energy Nuclear Reactions (LENR).
- Accelerating ions through the spherical plasma double layers to ballistic velocities.

- A condition where the anode is cooler than its surrounding atmosphere.
- Systems control and data acquisition.
- Moving many measuring instruments freely through the plasma atmosphere.
- Obtaining many and varied instrumentation data sets.
- Compiling and transformation of data for post experimental analysis.
- The ability to gather data at extremely high rates – Pico Seconds.
- Correlating and generating graphical overlays of all the data.
- Synchronizing all data streams in real time.
- Obtaining high-resolution video and still images.
- Materials testing.
- Material deposition and erosion tests.
- Langmuir Probe Analysis.
- Optical Spectroscopy.
- Near Ultra Violet light measurements.
- Infrared measurements.
- Polarimetry.





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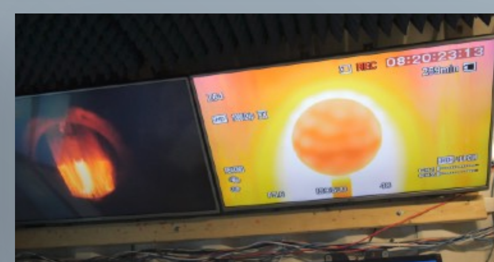

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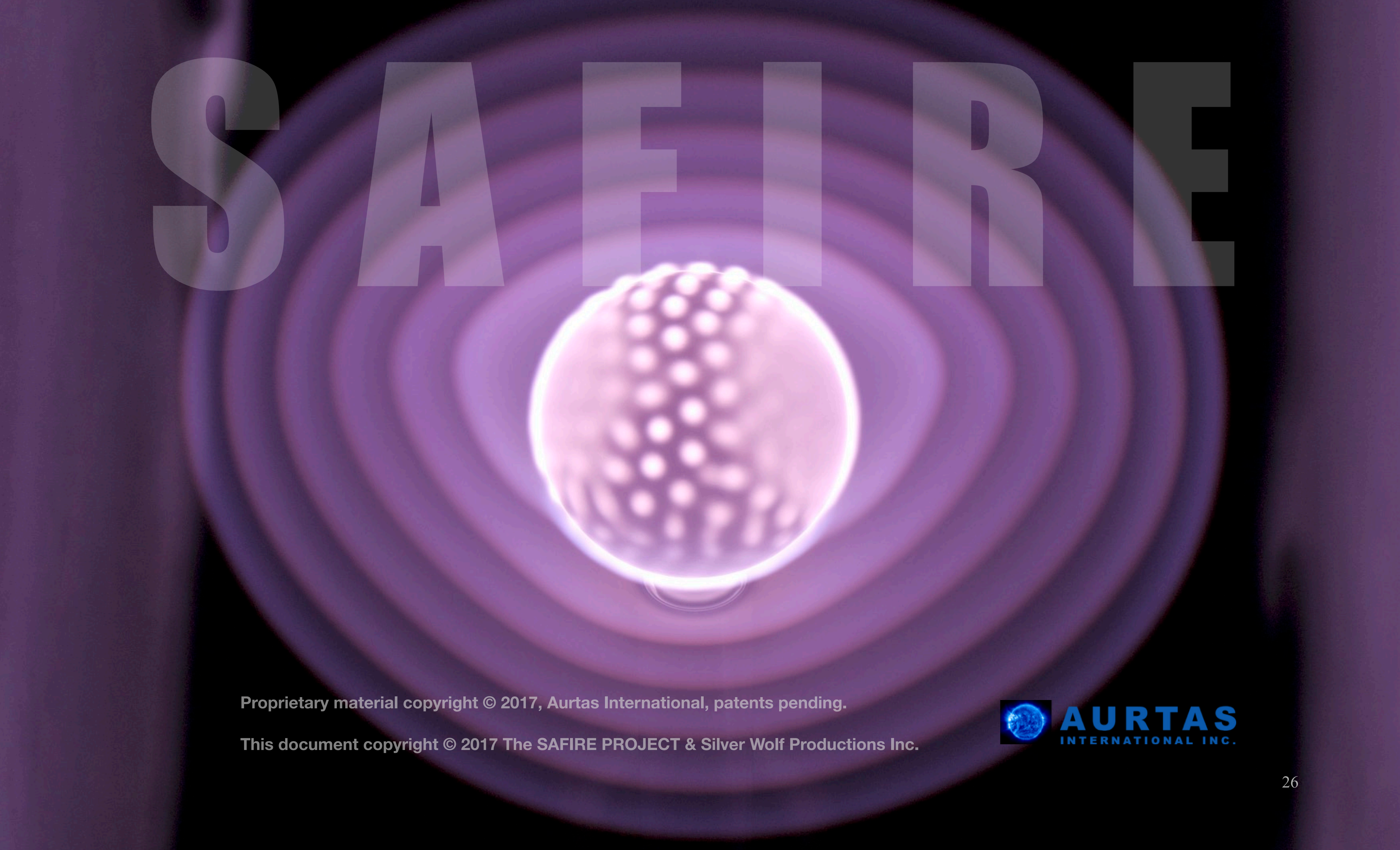

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