Very Cold Fusion Project Update, 21 October 2022.

(Also posted to Facebook)

Beware of Russians bearing gifts!

For our Very Cold Fusion project, I will be using the very device -- the reentrant cylindrical microwave cavity -- that was at the heart of "The Thing" -- a passive listening device or bug that was invented by Leon Theremin during his captivity in Stalin's Gulag. (Theremin also invented the electronic musical instrument that bears his name).

"The Thing" had no batteries or external connections, but was powered by a strong beam of microwaves that was pointed at it from a van parked across the street. Several weeks before the end of World War II, it was hidden in a carved wooden plaque of the Great Seal of the United States and presented by a delegation of the Young Pioneer organization of the Soviet Union to the U.S. Ambassador as a "gesture of friendship" to Stalin's WWII ally. It hung in the ambassador's residence in Moscow and spied on the private conversations of our ambassadors for seven years, until a radio operator at the British embassy in Moscow overheard the conversations on an open Soviet Air Force channel.

The Thing (listening device) (accessed 2022-10-21)

Theremin exploited the high sensitivity of the resonant frequency of the cavity to tiny displacements in the gap between the capacitor plates constituting the end of the re-entrant post and the end of the cavity. The end of his cavity with a thin metal membrane that served as the microphone pickup.

I will use a similar cavity but tune the resonant frequency with finely-controlled displacements in search of a "sweet spot." The intent is to produce a high-frequency overtone that resonates with the correlated oscillations of the deuterium dipoles of the Bose condensate. This is thought to be what facilitates D-D fusion in highly-loaded palladium.

I will use two posts that meet along the centerline of the cavity. On the end of one post, I will deposit a thin layer of palladium while simultaneously incorporating deuterium, a system known as "codeposition." It was discovered by Stanislaw Szpak at the U.S. Naval Laboratory in San Diego, California less than a year after the initial discovery of Fleischmann and Pons. It has since proven to be the most reliable and reproducible cold fusion system and produces excess heat and nuclear products almost immediately. Indeed, the F-P experiment, which requires many days or weeks to produce excess heat, and which was very difficult to reproduce, and then only occasionally, may have unknowingly produced Pd-D codeposition.

As soon as excess heat is observed from our codeposition layer, it will be blasted dry with nitrogen gas and quenched with a blast of liquid nitrogen. This will freeze in the nuclear-active sites, which are very transient at room temperature. The high background bulk concentration of

PdD, which facilitates the super-abundant vacancy state of the diffuse nuclear-active sites, becomes increasingly thermodynamically stable at low temperatures, and escape of D from the lattice is simultaneously inhibited.

The nuclear-active post will then be transferred, still at a temperature near 77K, to the cavity, which is already immersed in liquid nitrogen. The cavity will then be sealed, drained, evacuated, back-filled with a low pressure of deuterium, and energized with microwaves to produce a cold RF plasma discharge between the posts. Hopefully the plasma will sustain and intensify the D-D fusion. The plasma will be observed and analyzed with an optical fiber probe sealed in the wall of the cavity.

The frequency will then be swept in search of the sweet spot. There is some indication that it will be 327.3843525222 MHz. This is the hyperfine spin-spin transition in Deuterium and is one of the most precisely-known physical constants. It was measured in 1971 by Wineland and Ramsey with their deuterium maser. D-line maser activity has also recently been observed in the cold fusion experiments of Mitchell R. Swartz.

The astute observer will sense a lot of speculative arm-waving in this concept. Fair enough! But it does build upon the failures and successes of many dedicated researchers. I hope myself to fail enough times to eventually succeed.

Here is a link to a spreadsheet where I calculate the parameters of the re-entrant cavity, which is still a work in progress:

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