

## **Unexplained Changes by Michael McKubre to His 1994 "M4" Experiment**

*Based on a Forensic Investigation Performed by Steven B. Krivit  
and Originally Reported on Jan. 29, 2010*

This is a more-concise summary of the original investigation report.  
The full report and set of audit materials can be found here:

<http://newenergytimes.com/v2/sr/McKubreM4/McKubre-Experiment-M4.shtml>

Around the year 2008, Steven Krivit began asking LENR scientists "What's the best experimental evidence in the field that supports the theory of 'cold fusion'?" The response was overwhelming and emphatic, indicated by theorist Scott Chubb's response:

**The proof is the 24 MeV!  
McKubre nailed it.**

- Scott Chubb, 2007

According to "cold fusion" theory, two deuterium nuclei fuse and produce one helium-4 atom, releasing 24 MeV of heat per helium-4 atom.

This is the equation:  $D+D \rightarrow 4He + 24 MeV / 4He$

In 1994, LENR experiments took place at SRI International, in Menlo Park, California. This experiment series was called “M4.”

The research was sponsored by the Electric Power Research Institute and published in June 1998 in report #EPRI TR-107843-V1



In the 1994 experiments, researchers measured only four helium samples.

**Table 3-7**  
**Summary of Helium Analysis**

	<b>Sample Duration</b>	<b>Date</b>	<b>Time</b>	<b>ppm</b>
1	669.4h	8/16/94	15:07	1.556
2	810.2h	8/22/94	11:55	1.661
3	1172.7h	9/06/94	14:30	0.340

Image from EPRI TR-107843-V1 *pg. 3-221, pdf pg. 349*

4	1407.7h	9/16/94	09:30	2.077
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Image from EPRI TR-107843-V1 *pg. 3-222, pdf pg. 350*

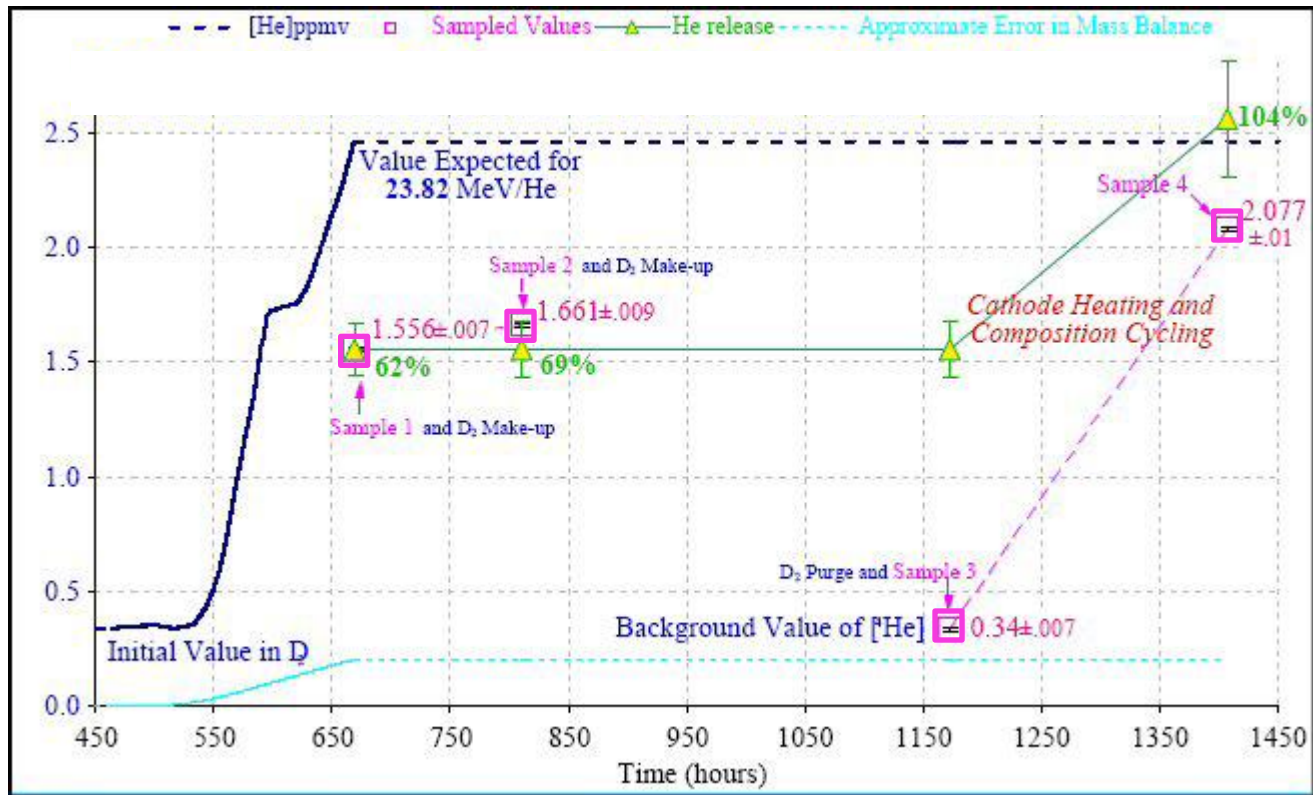
According to the "cold fusion" theory,  $D+D \rightarrow 4He + 24 MeV / 4He$ , the only significant energetic nuclear product in LENRs is  $4He$ . This assumption is false.

To bolster their theory, the "cold-fusion"-believing scientists in the mid-2000s cast doubt on the other nuclear products that had been reported in the LENR experiments.

Sometimes, they cast doubt on the experimental results reported by other researchers. Sometimes, they cast doubt on their own experimental data that conflicted with the "cold fusion" theory.

These activities are not covered in this report. Only experiment M4 is examined here.

McKubre displayed the graph below, possibly for the first time, at the ICCF-10 conference in 2003. The 1998 EPRI report, where this data was first published, had no such graph.



<http://newenergytimes.com/v2/library/2003/2003McKubreM-ReviewOfExperimentalMeasurements.pdf>

The graph is almost identical to the graph that McKubre and Peter Hagelstein presented during the 2004 Department of Energy Review of LENRs.

The key data were the four sampled values of measured helium-4.

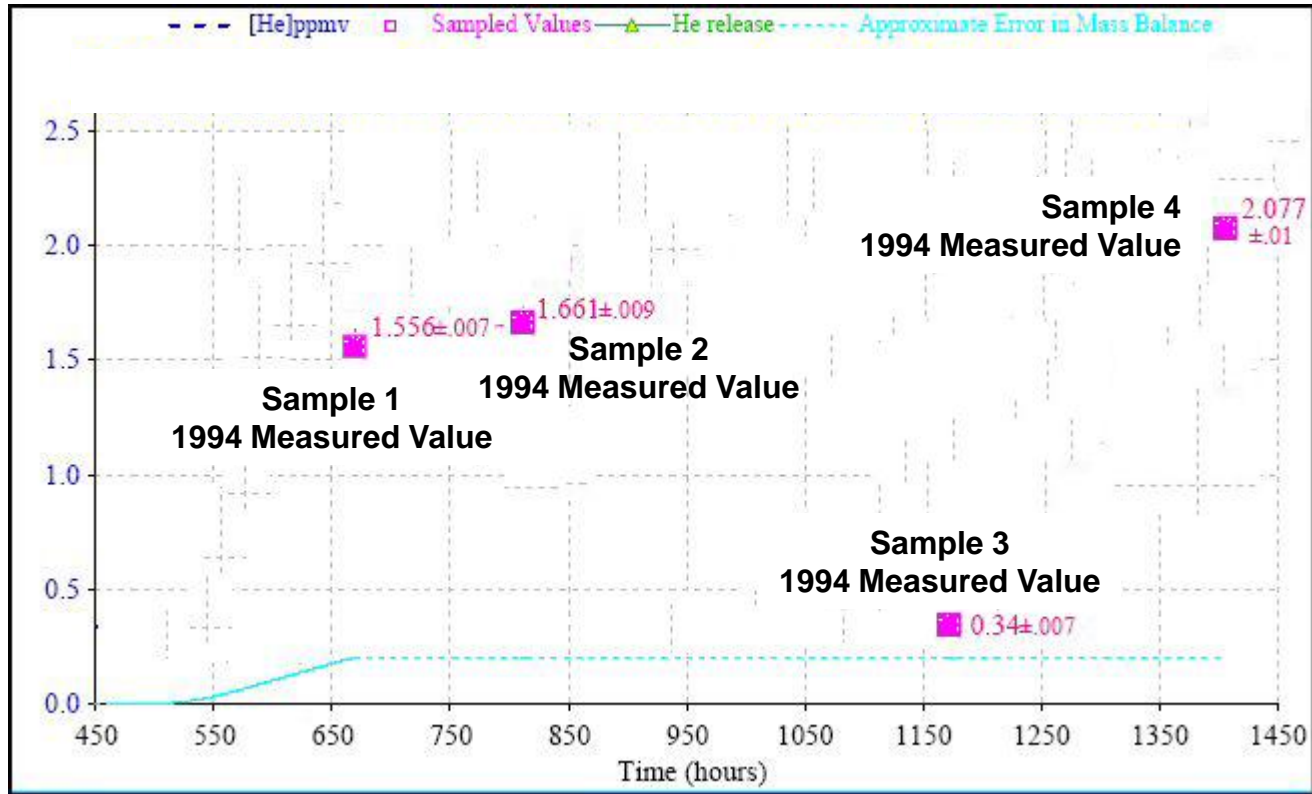


Image from McKubre, ICCF-10, 2003. Bold black text added by SBK.

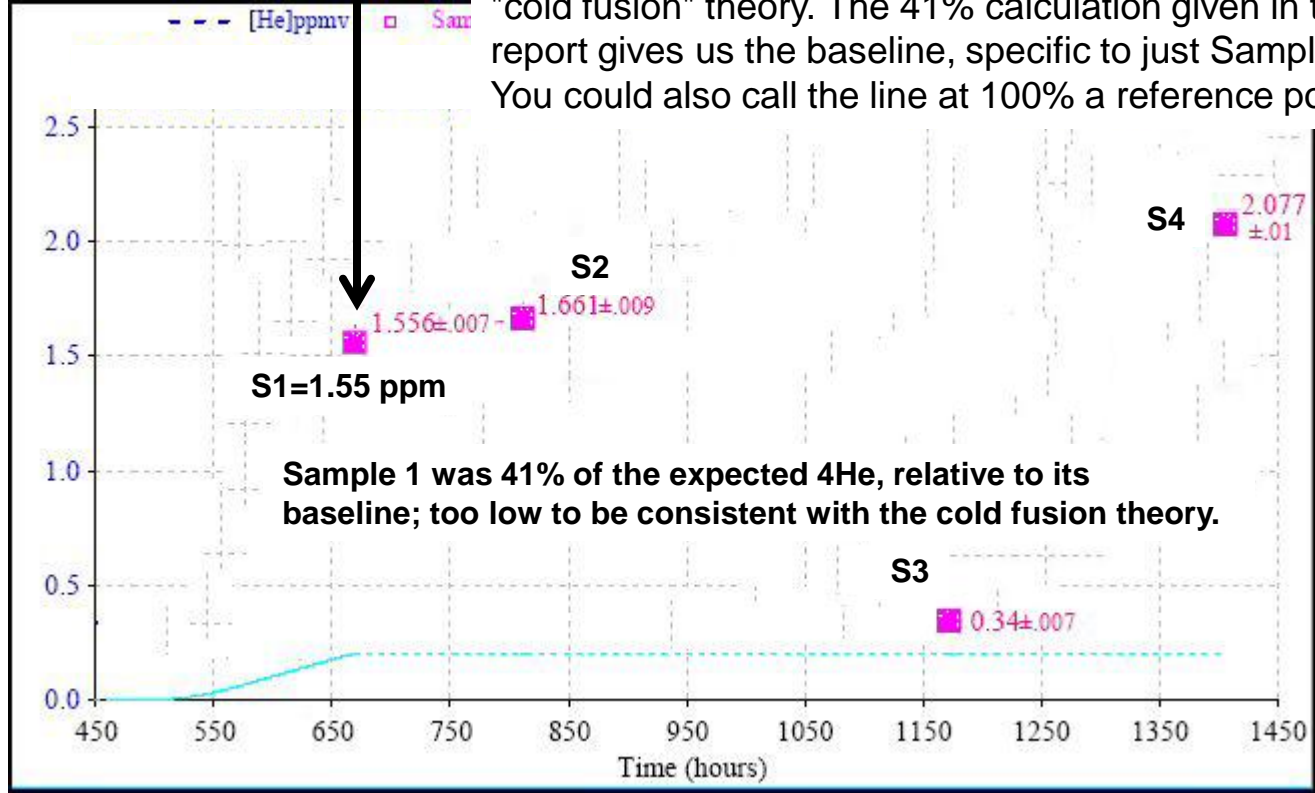
Relative Baseline of 100% for Sample 1 at 3.76 ppm

100%

41%

0%

Helium Concentration in ppm



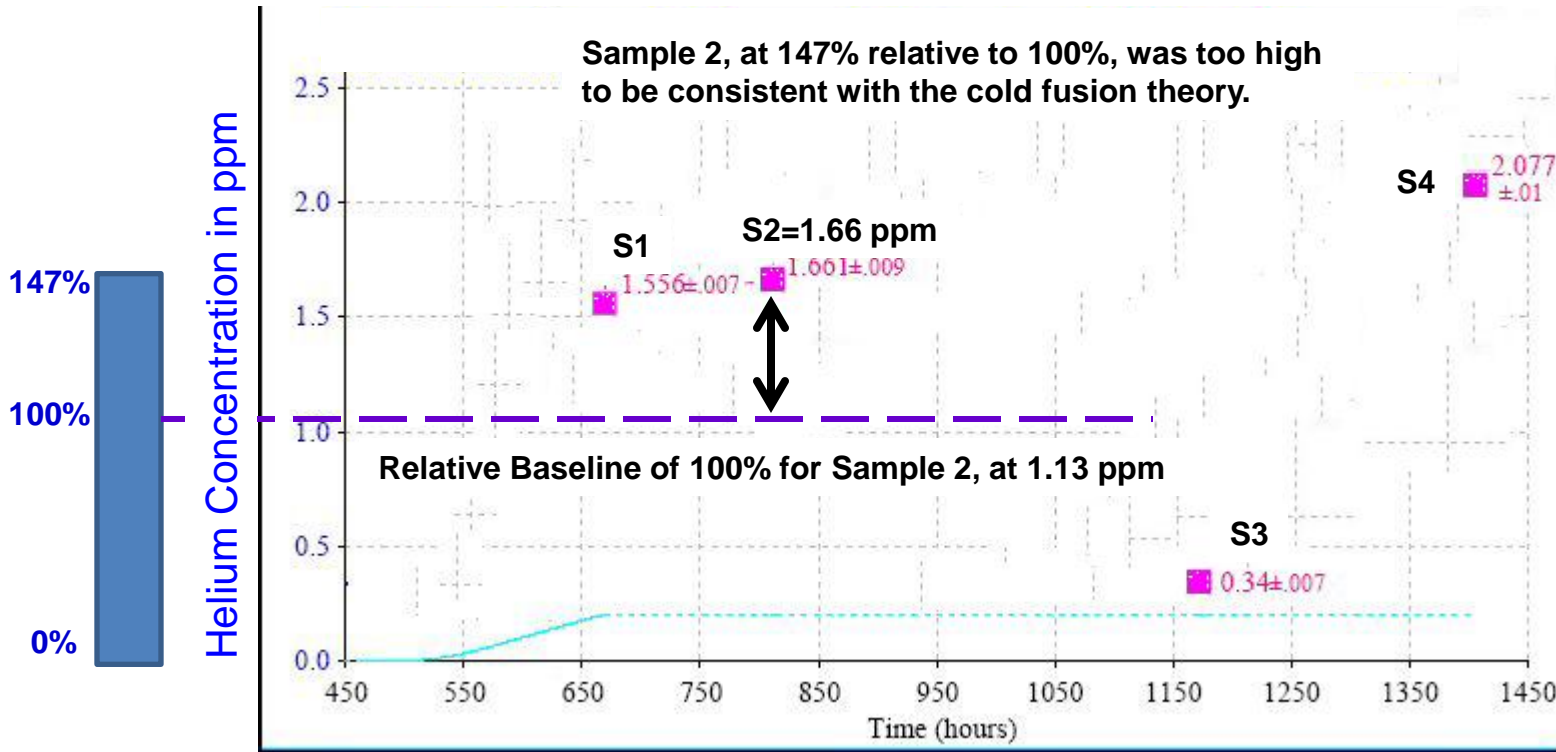
The 1998 report said that the measured value of helium in Sample 1 (1.556 ppm) was only 41% of its relative predicted value (3.76 ppm) for that sample, based on the "cold fusion" theory. The 41% calculation given in the report gives us the baseline, specific to just Sample 1. You could also call the line at 100% a reference point.

S1=1.55 ppm

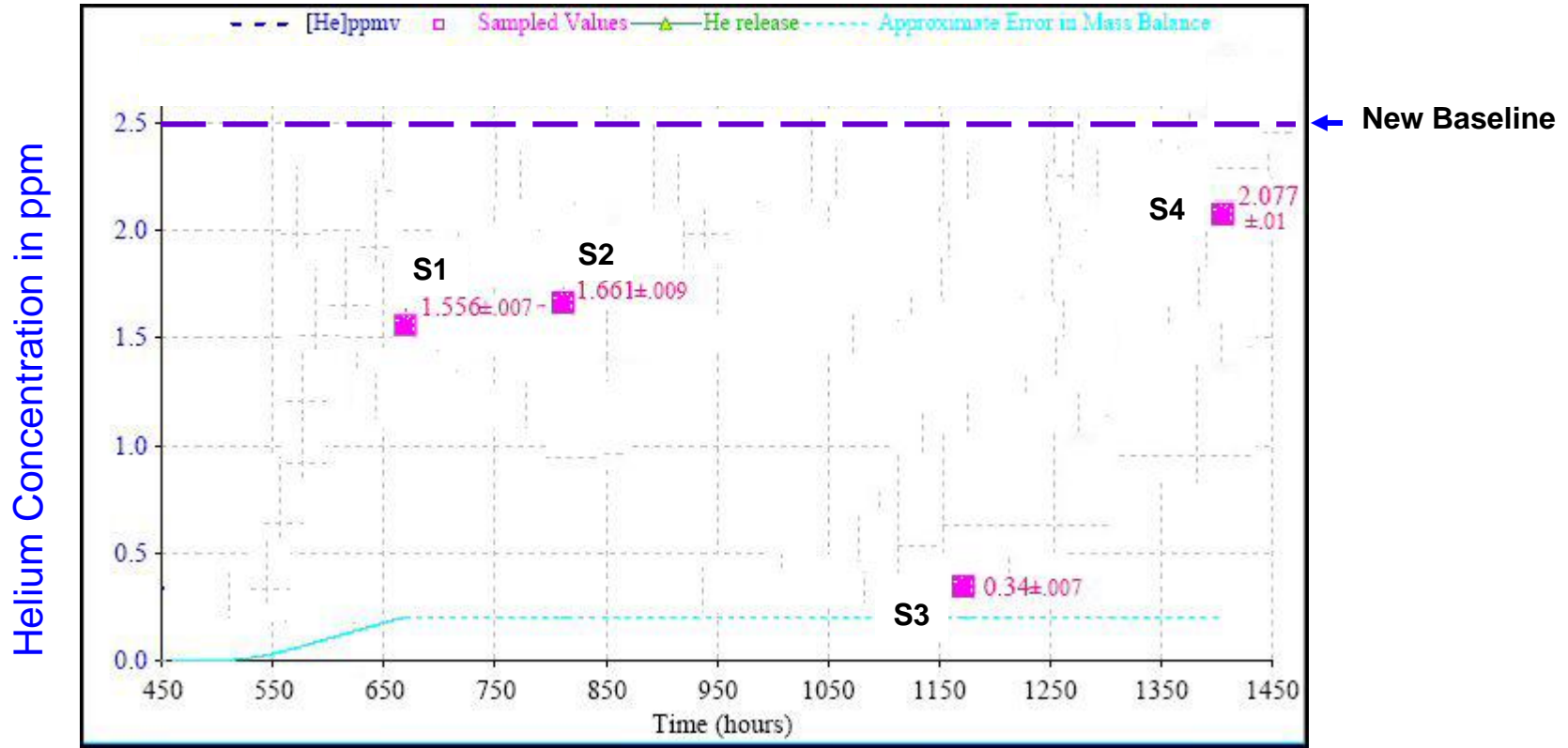
Sample 1 was 41% of the expected 4He, relative to its baseline; too low to be consistent with the cold fusion theory.



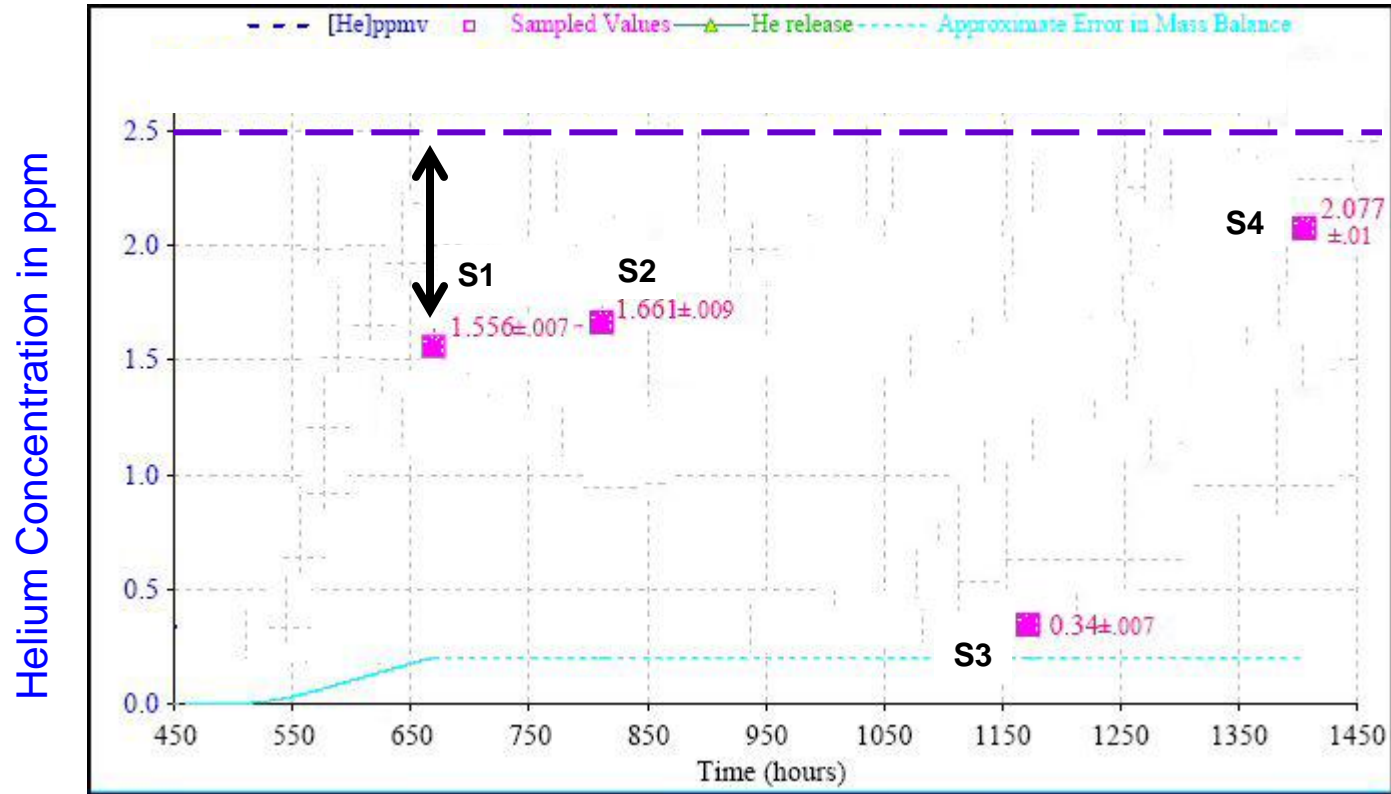
The 1998 report said that the measured value of Sample 2 (1.661 ppm) was 147% of its relative predicted value (1.13 ppm) for that sample. The 147% calculation gives us the specific baseline for Sample 2. (The volume is different now because of the amount of gas they removed in the first sample.)



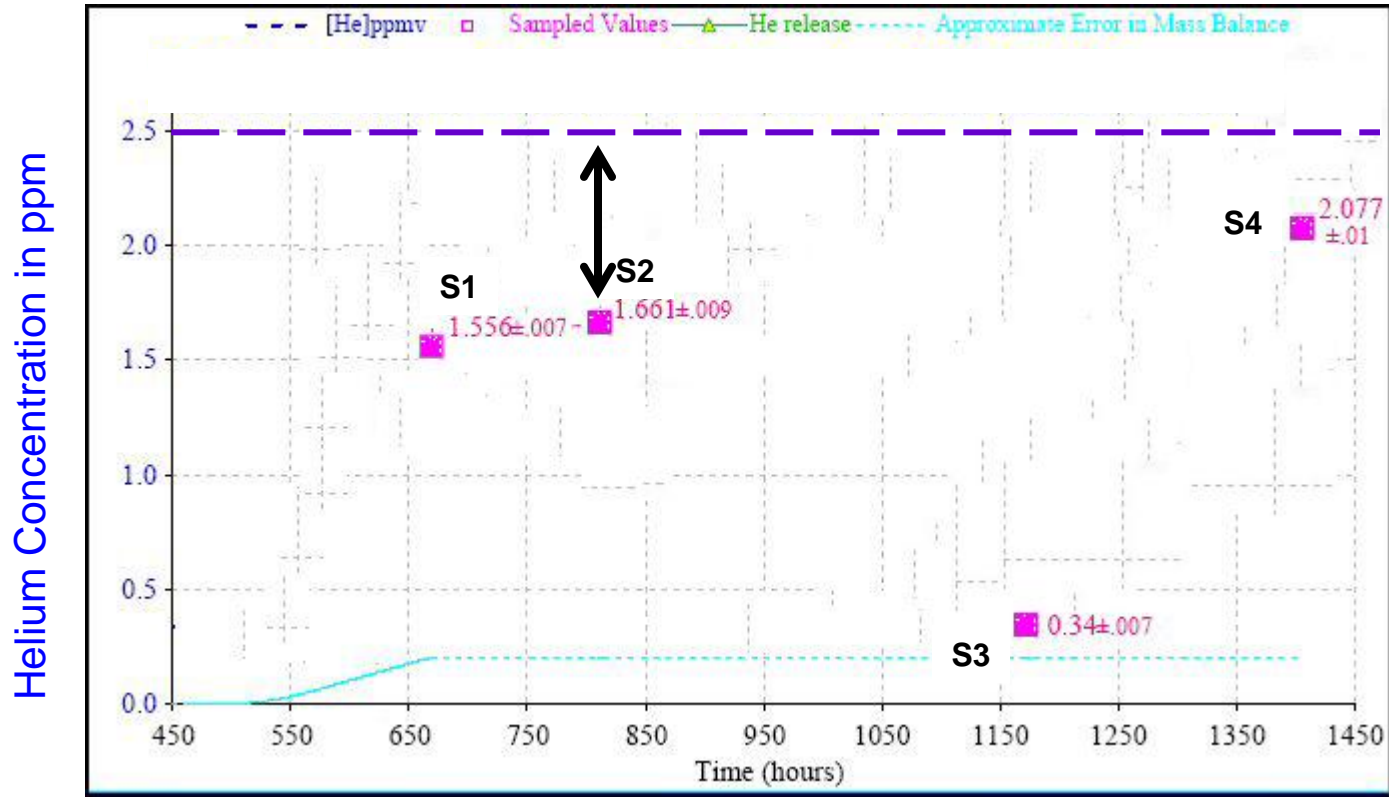
In 2003, McKubre created a new, single baseline for predicted  $4\text{He}$  values. But creating a single baseline for all values is not legitimate; they each require individual and unique baselines for each sample, as McKubre explained in his 1998 report.



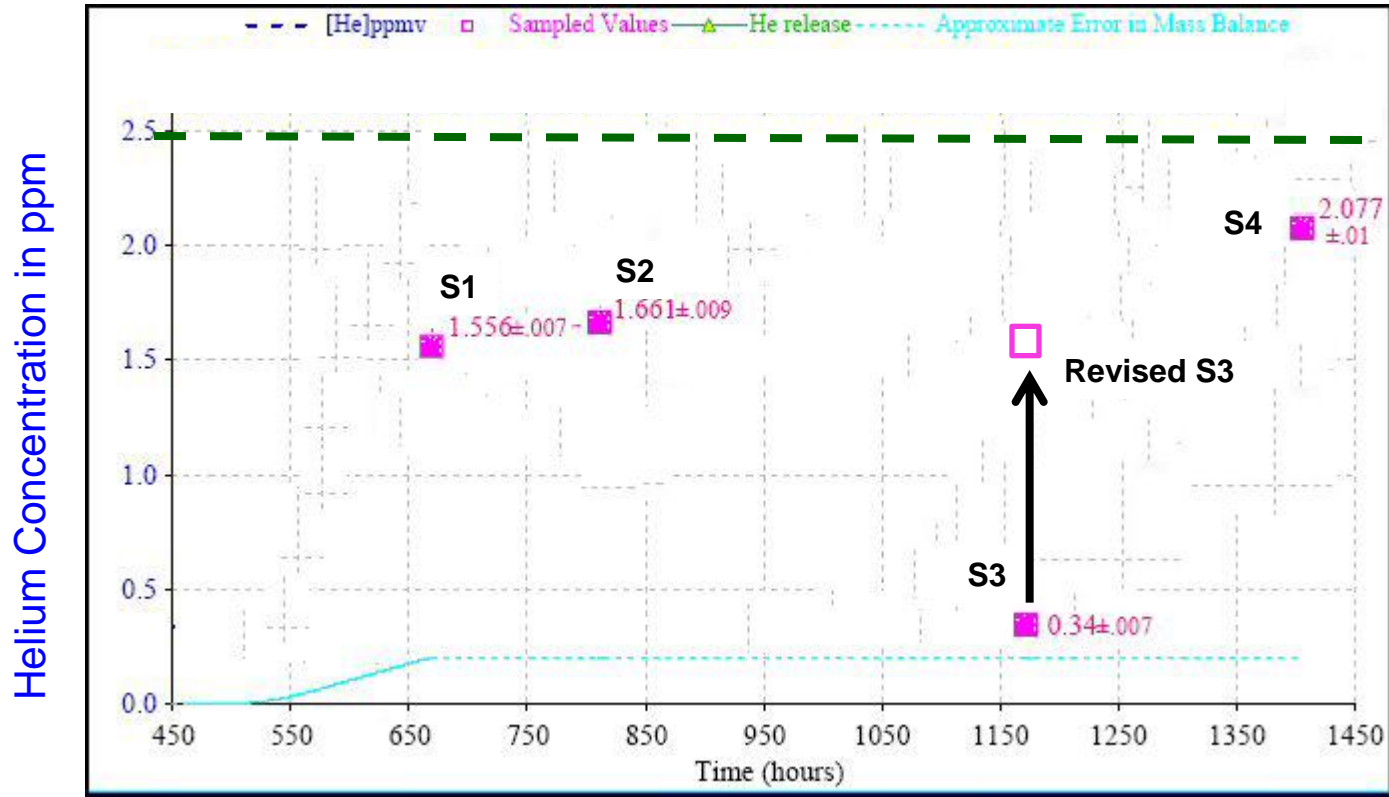
Now, with the new single baseline, S1 takes on new meaning. Whereas before, S1 had indicated 41% of the predicted amount of helium, it now indicates 62% of the predicted value.



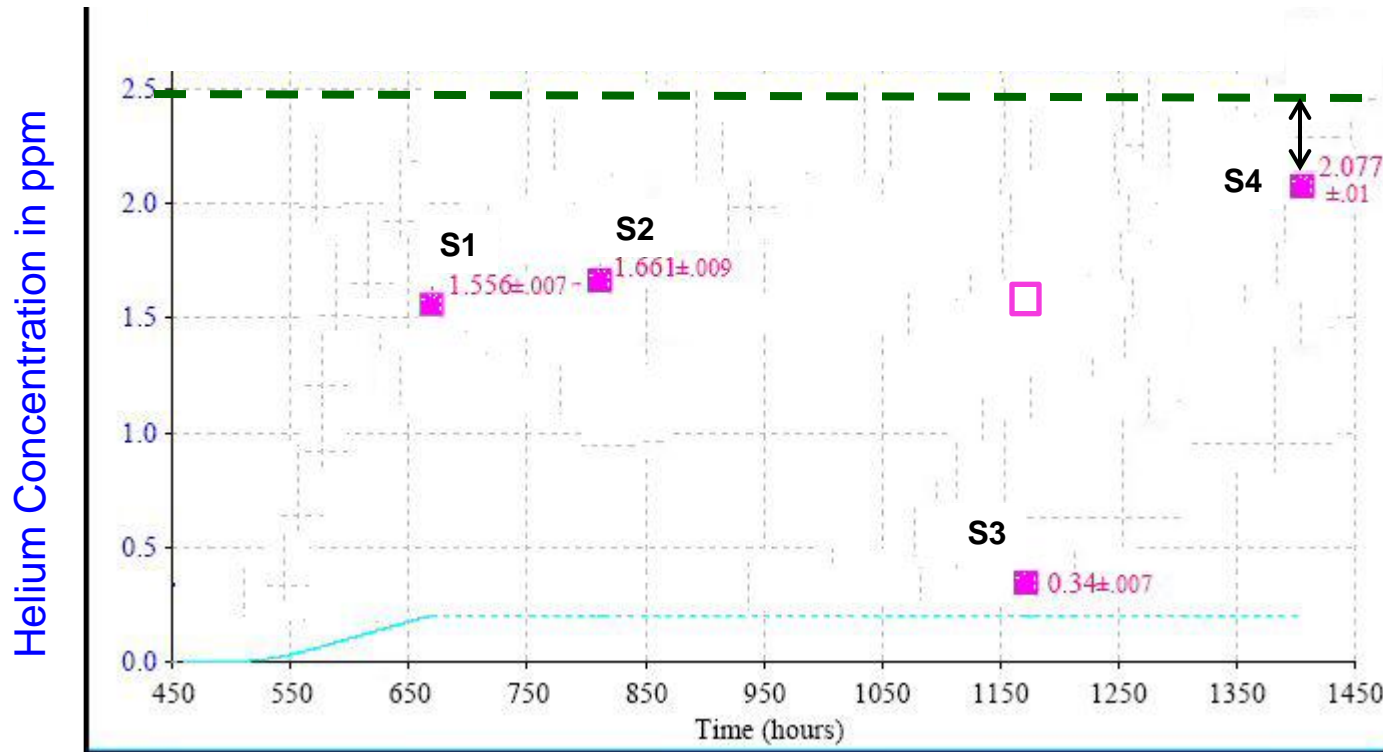
With the new, single baseline, S2 also takes on new meaning. Whereas before, S2 had indicated 147% of the predicted amount of helium, it now indicates 69% of the predicted value.



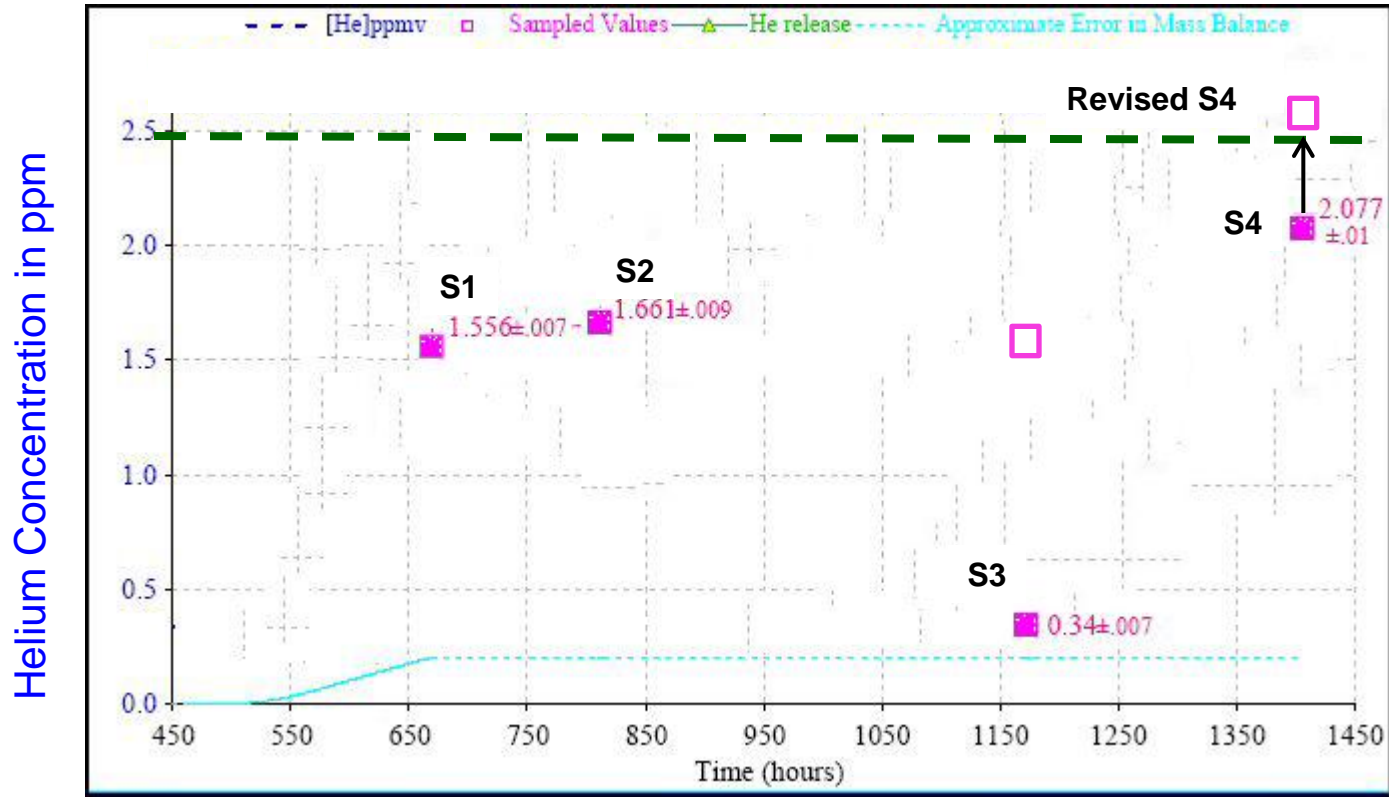
Then McKubre moved the value for Sample 3 upward. He said that S3, originally measured and reported at 0.34, was wrong. In 2003, he said that *unaccounted-for* helium had been “hiding” in the palladium and therefore the measurement should have been exactly 1.556, just like Sample 1.



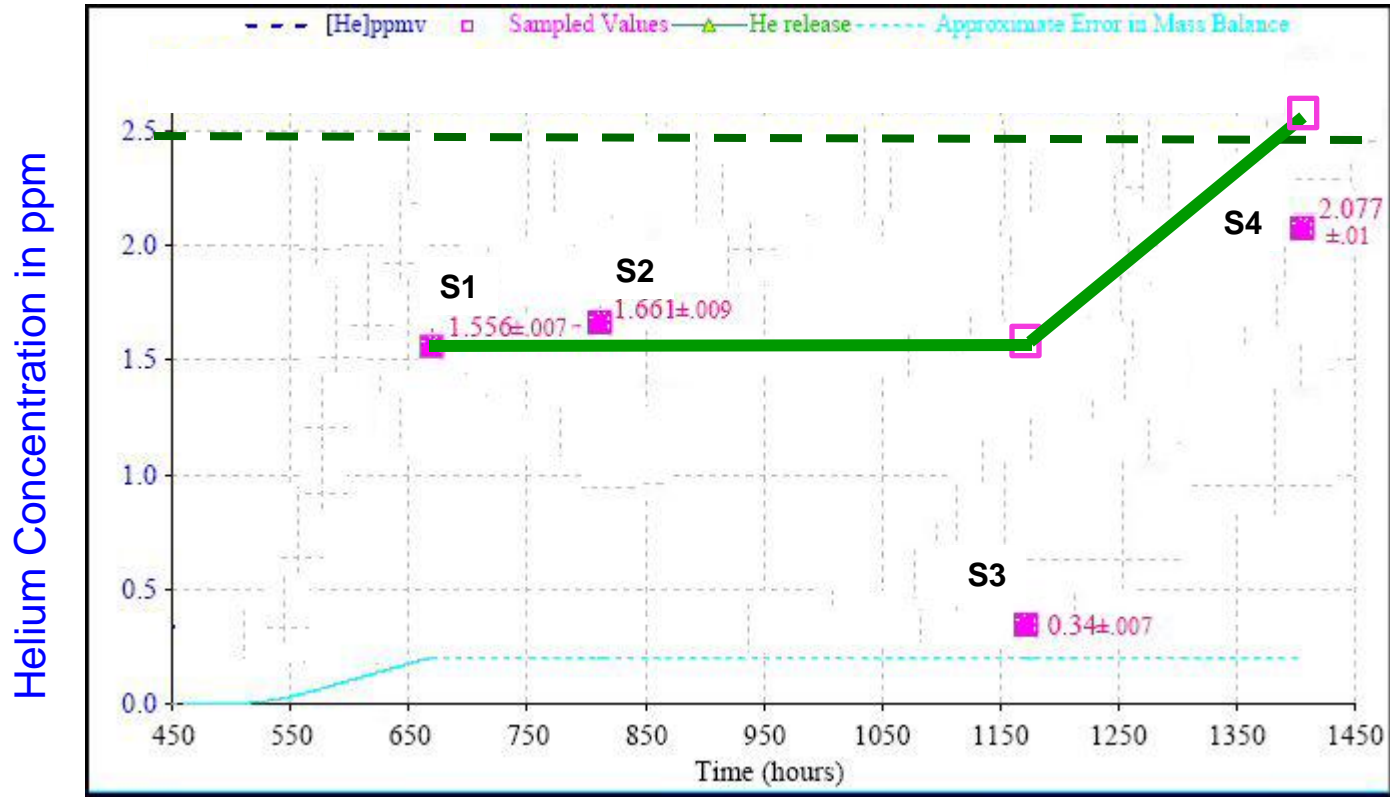
According to the new baseline, S4 would then have been 85% of the value that would be consistent with the "cold fusion" theory. But in the 1998 report, no predicted value is shown for S4: not 85%, not 104%, none. That's because a variety of factors affected the experiment when S4 was sampled, and, as they explained in the 1998 report, they lacked the data to calculate the proportionality of sample S4 to the "cold fusion" theory.



In 2003, without the necessary data to calculate the proportionality of sample S4 to the "cold fusion" theory, McKubre said that S4 came out to 104% of the baseline.

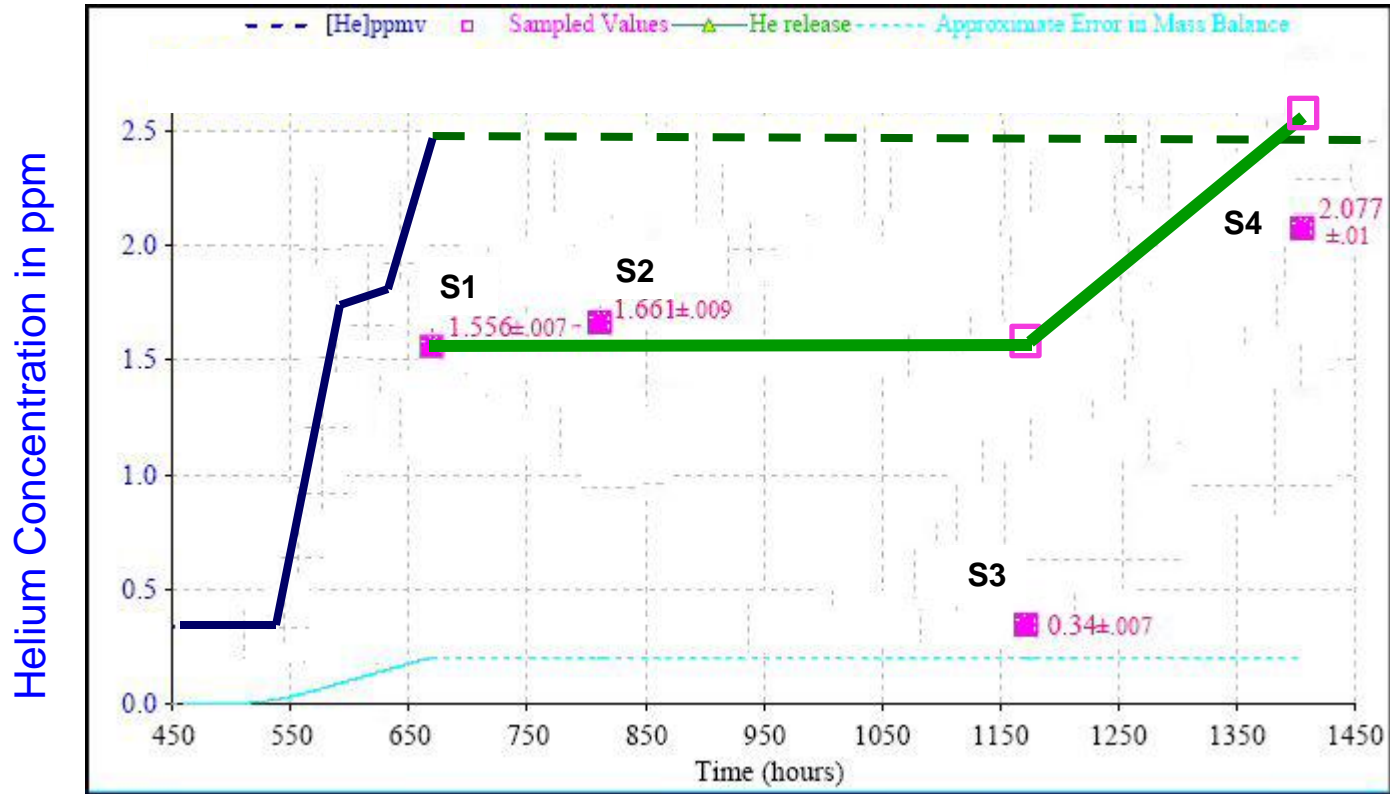


Then he linked S1, S2, the revised S3, and the revised S4 in a contiguous curve.

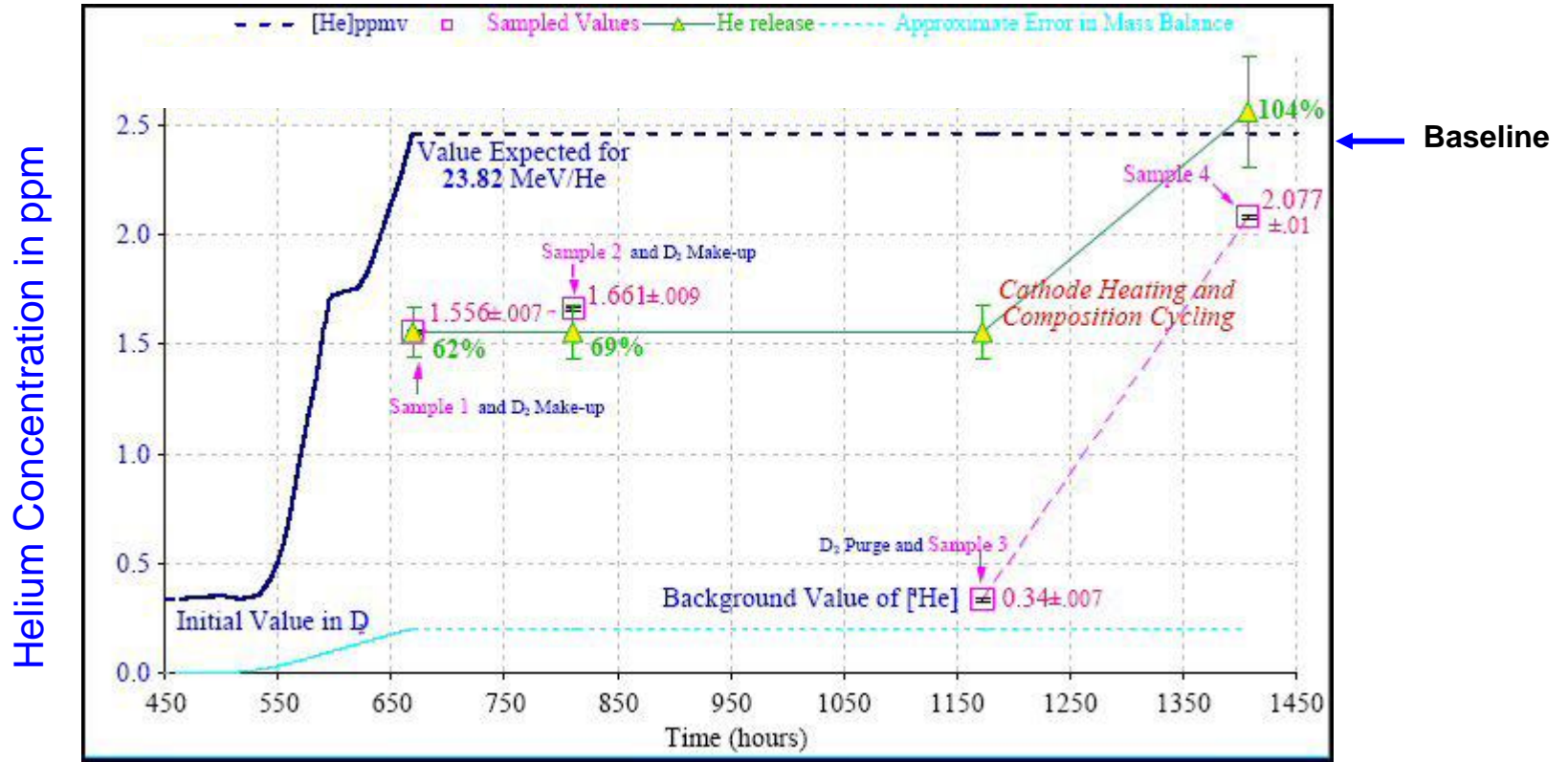




Next, McKubre added a solid line which reflects the predicted proportion of helium formation to heat burst #2 (220h to 306h) and burst #3 (464h to 669h). The dotted line is supposed to represent the predicted value of helium, given a 24 MeV/4He reaction. (See last slide for heat burst events and full timeline.)



Reconstruction of the graph McKubre presented at ICCF-10 in 2003 and to the Department of Energy in 2004 is now complete.

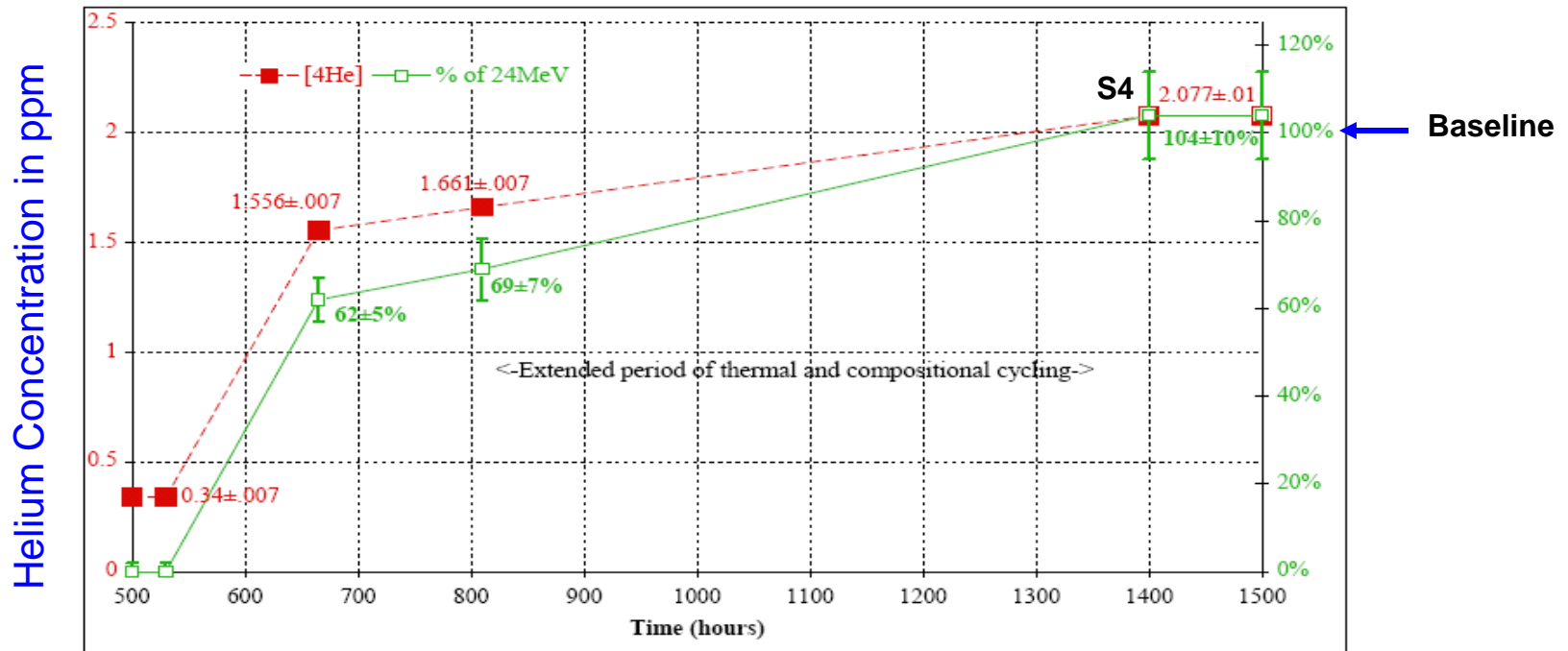


Three years later, by the 2007 APS conference, McKubre had made lots of changes to the graph.

Now, "100%" is right at 2 ppm, exactly where the 2.077 value is. Go back one slide to see that in 2003, "100%" was closer to 2.5 ppm, and the 2.077 value was down at 85%. The baseline has shifted again.

### M4: Correlation of Heat with Helium

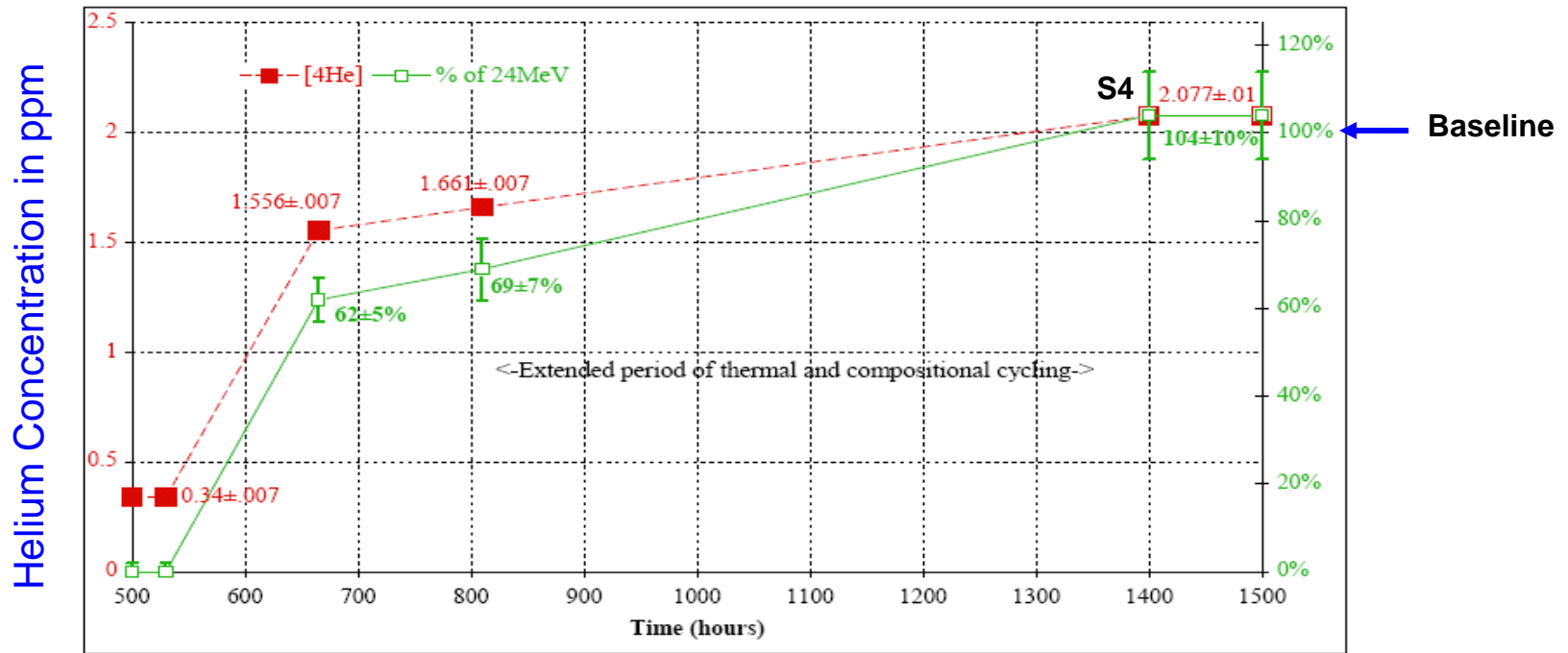
104±10%



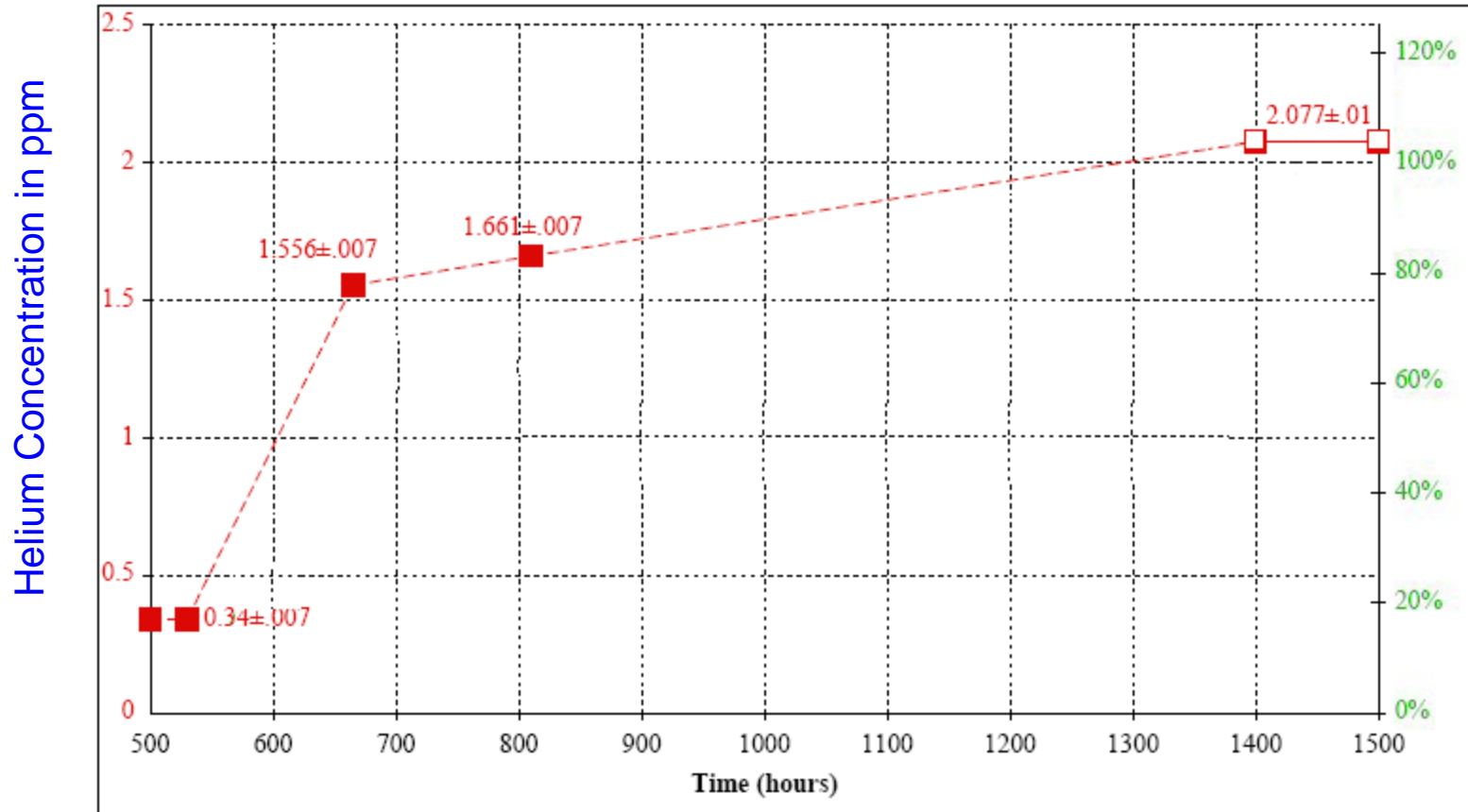
The objects in green are supposed to represent proximity of measured helium to the "cold fusion" theory. Let's take that out and look only at the objects in red, which are supposed to represent experimental measurements.

### M4: Correlation of Heat with Helium

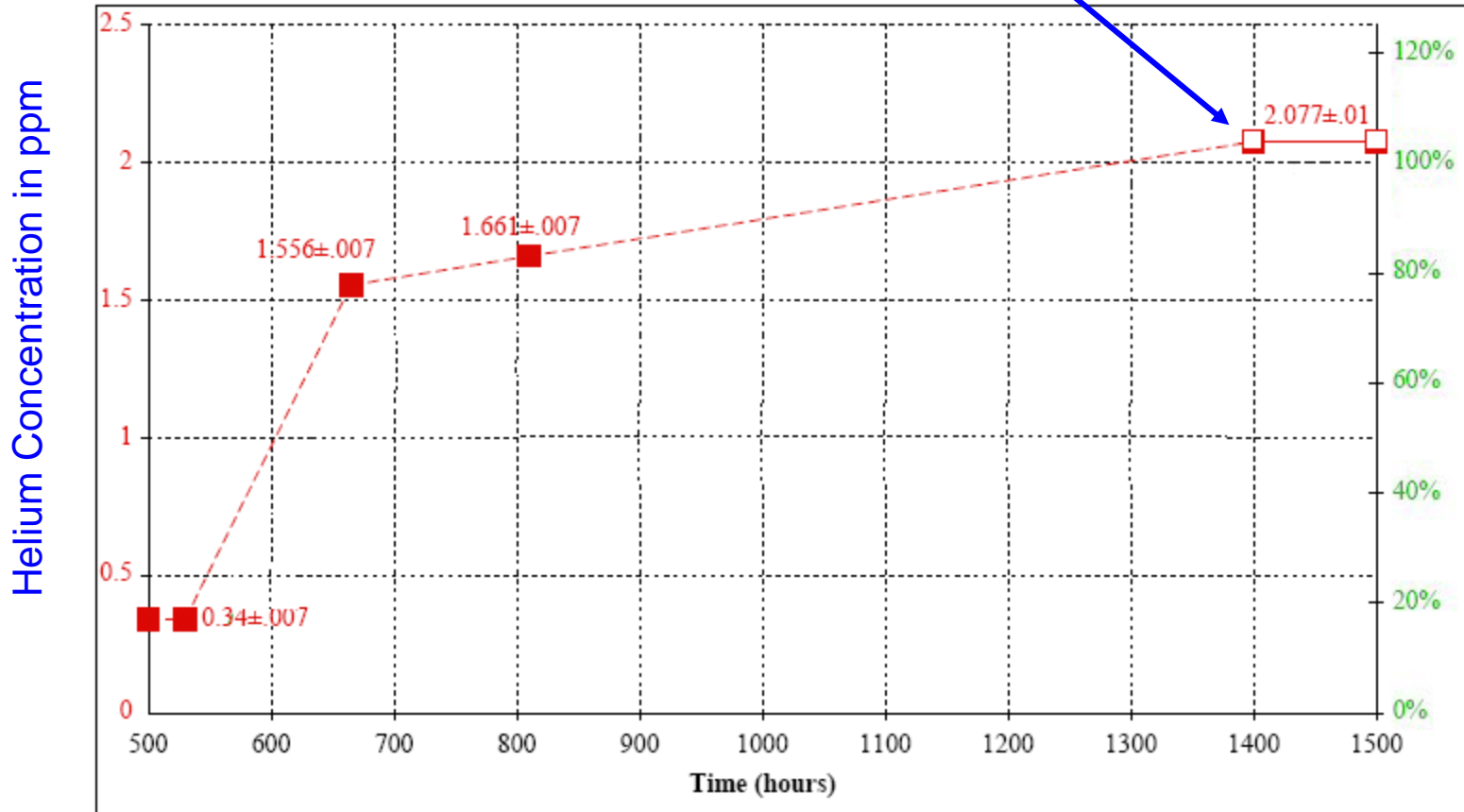
104±10%



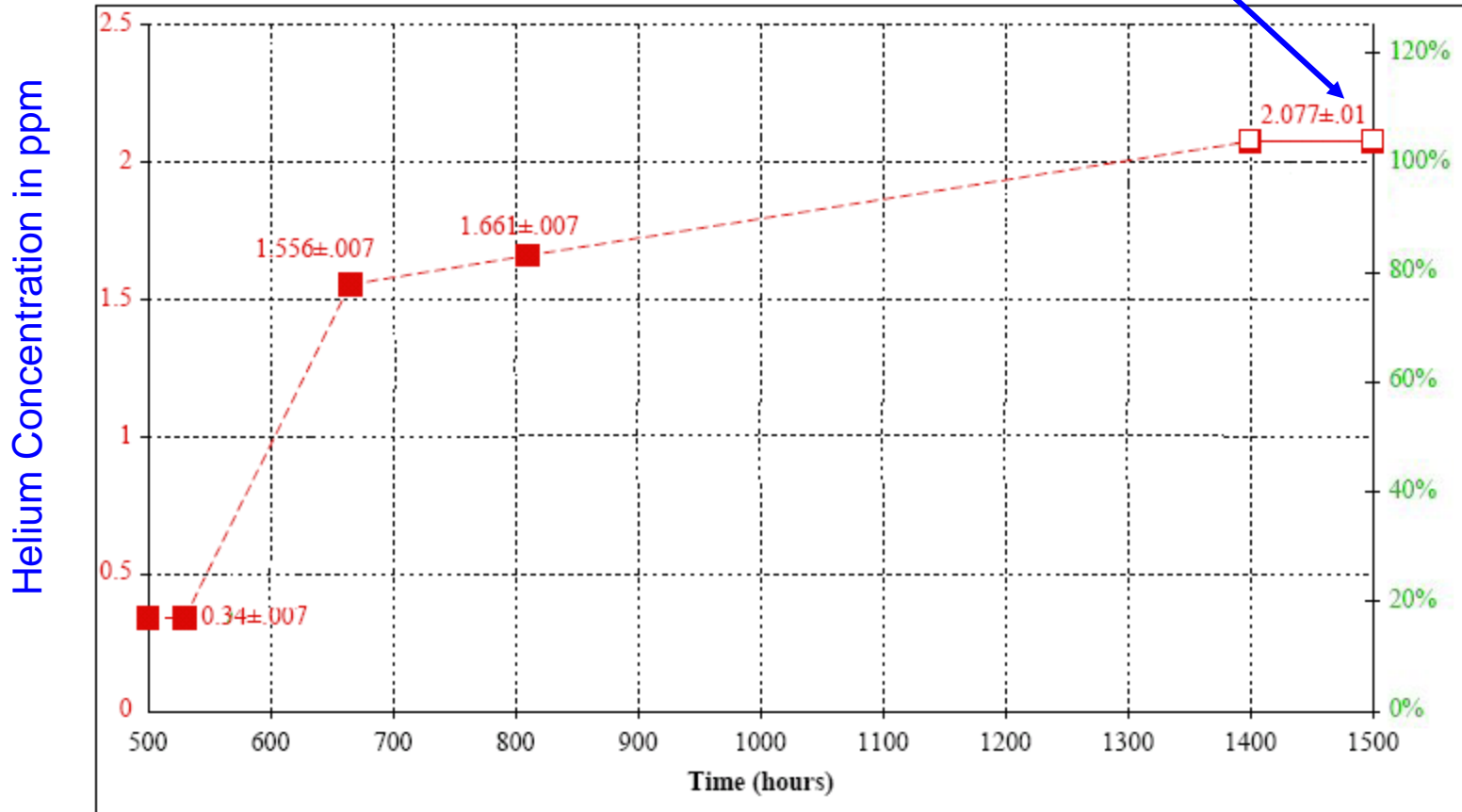
The objects in red is supposed to represent actual, experimental measurements.



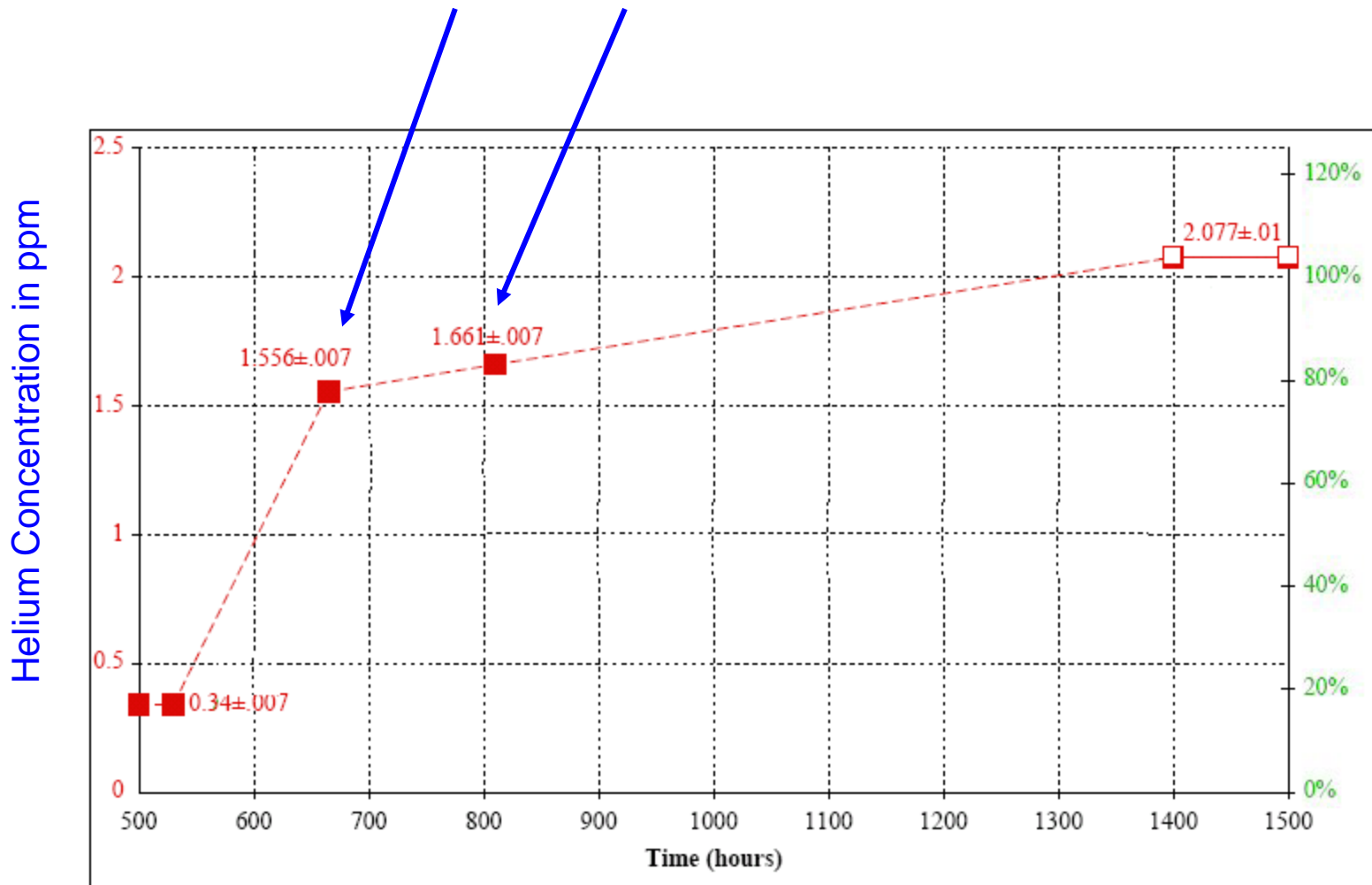
Let's look at Sample 4 (S4) first. This is easy to spot from its concentration (2.077ppm) and its time (1407h).



The objects in green is supposed to represent proximity of measured helium to the "cold fusion" theory. Let's take that out and look only at the objects in red, which is supposed to represent experimental measurements.



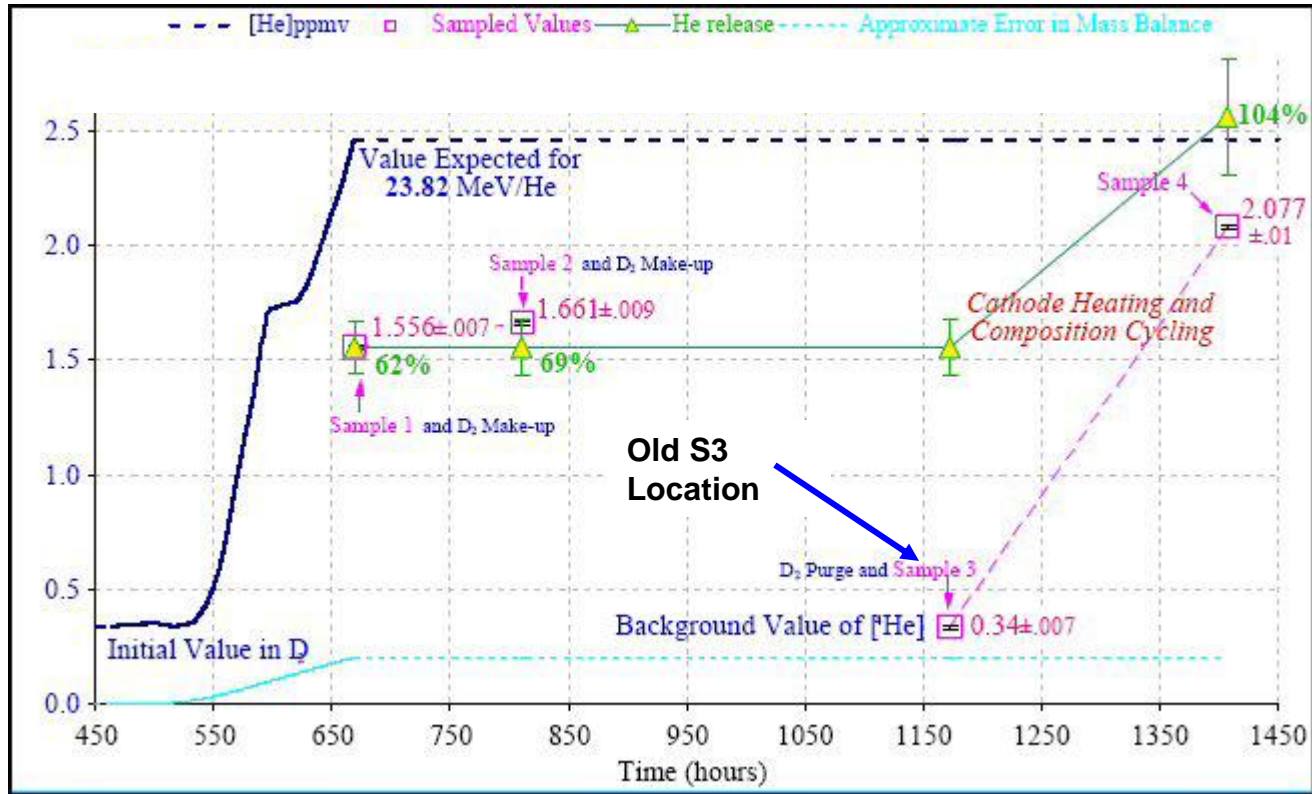
The good news is that measured values for helium samples 1 and 2 haven't changed.



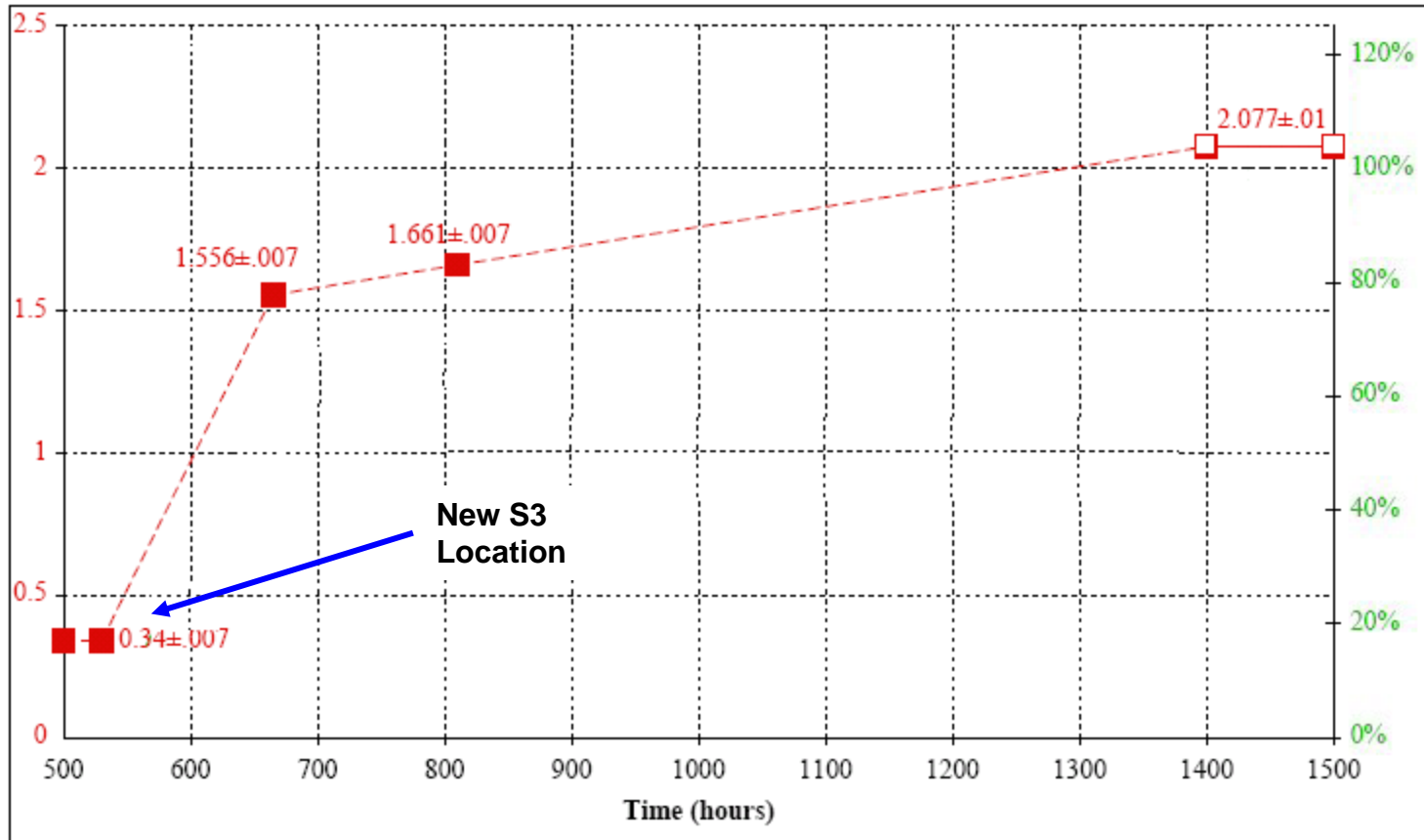


Unfortunately, Sample 3 from 1172h has moved.

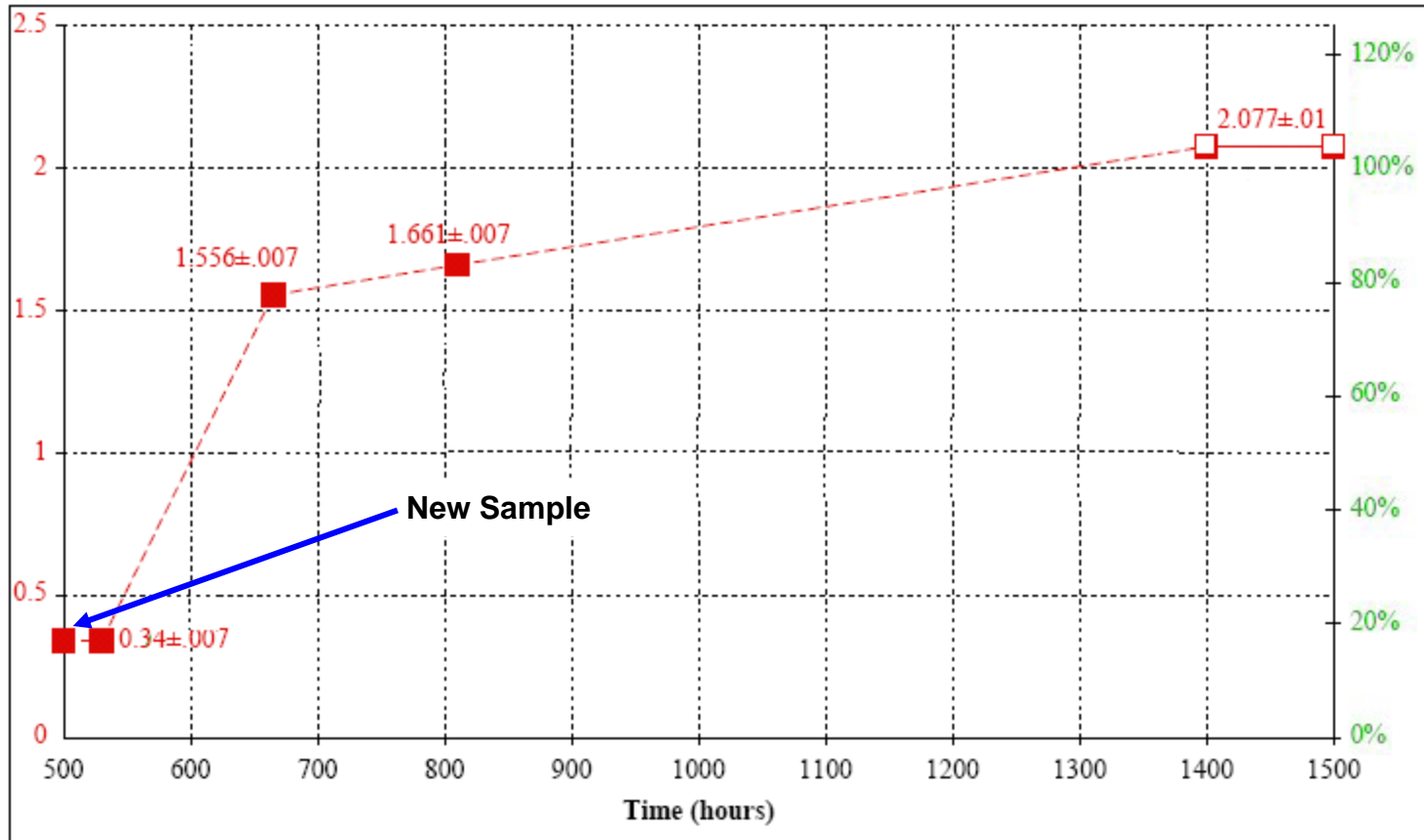
Helium Concentration in ppm



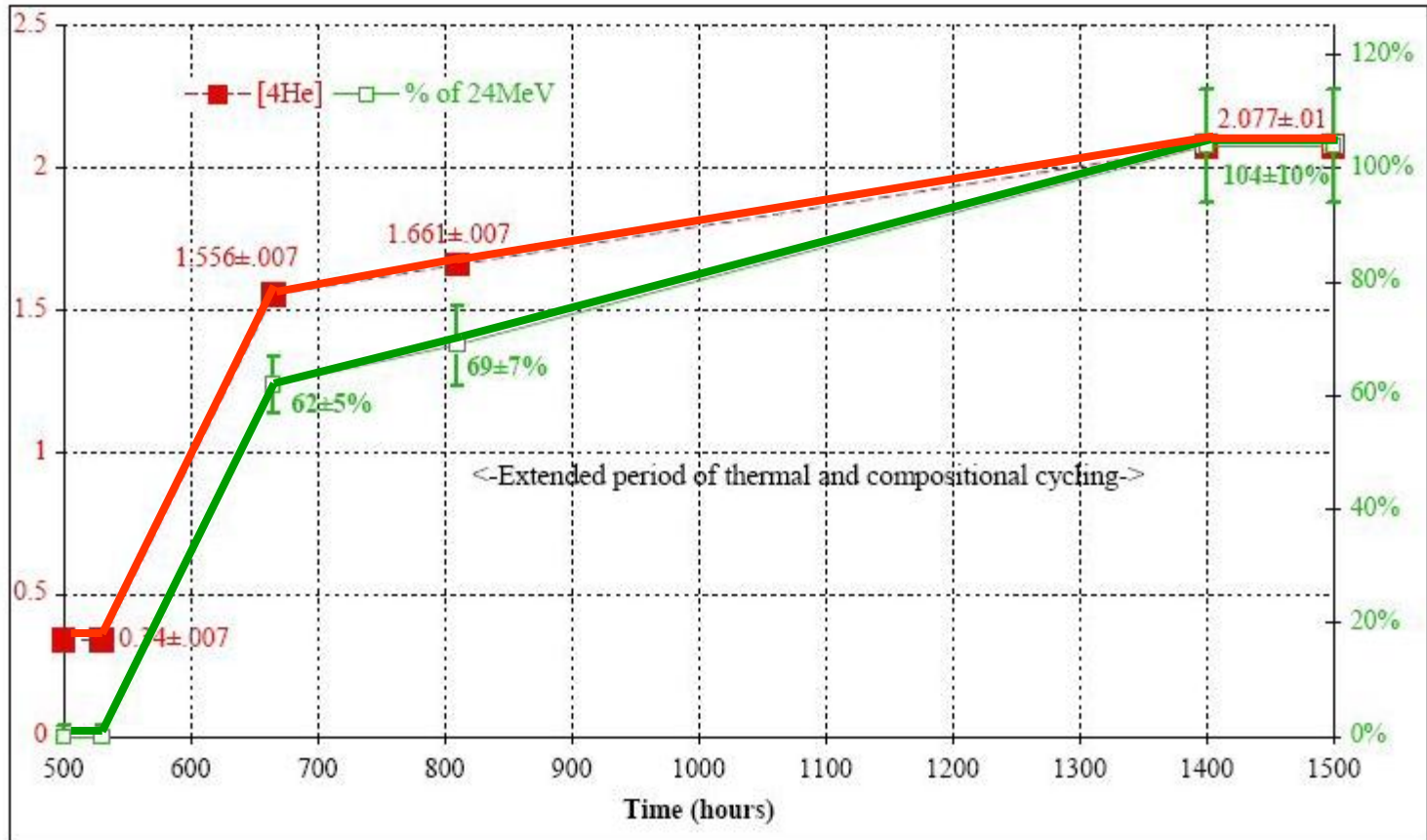
S3 is now over at 530h.



We also have a new helium sample to the left of S3, which has appeared 13 years after the experiment was performed.



After that, McKubre drew a green line representing proximity of measurements to theoretical agreement with the "cold fusion" theory. Visually, the samples and the theory seem to track well. McKubre has also removed his previous baseline indicator at 100%.



On March 21, 2010, at the American Chemical Society meeting in San Francisco, during a press conference, Steven Krivit asked McKubre about the changed values (plural) in experiment M4. Here is his response:

In the preliminary report we issued to the Electric Power Research Institute, which was a report private to [EPRI] that now is public, [it] contained, I think, a value of the mass-balance for helium-4 and heat which was, I think it was, from memory, and this is sixteen years ago, maybe, now, 85 +/- 10 percent.

When we recalibrated the volumes that were involved in determining that mass balance, the value became a more correct value, it was 105 +/- 10 percent. Now those two values are experimentally the same. I would prefer the lower value since you can't get more product than your reaction produces.

But the correction was observed, reported to the Electric Power Research Institute, which were the sponsors of that work. I also made a comment about it in the conference at Lerici in the year 2000 at ICCF-8 during my presentation. So the published value, the first published value is in the conference proceedings and the first published value contains the correct value of that mass balance, 105 +/- 10 percent.

The next day, McKubre gave his scheduled talk at ACS.

For the first time since 2000, McKubre did not discuss or show any slide about experiment M4, let alone claim that it showed evidence for D+D “cold fusion.”

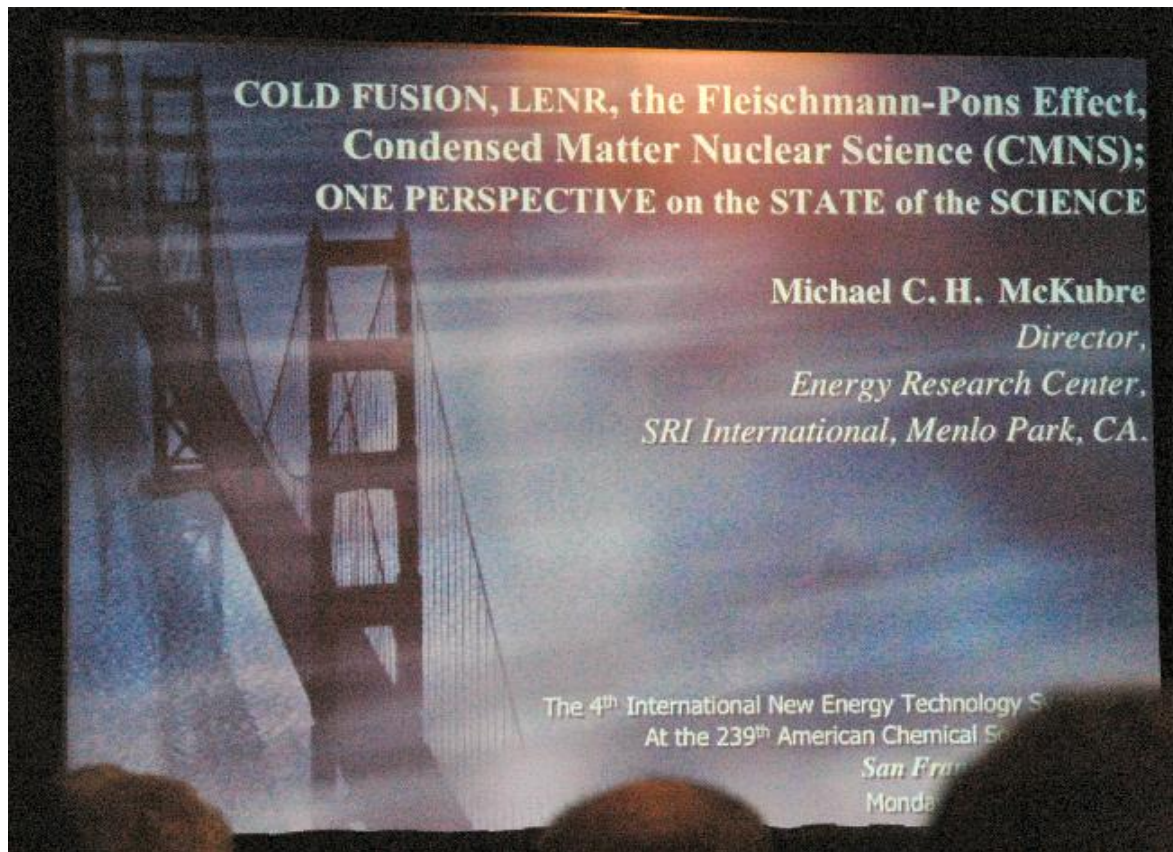


Image from McKubre ACS Presentation, San Francisco, March 22, 2010

Later that week, Krivit checked on the correction McKubre claimed that he reported to EPRI. Brian Schimmoller of EPRI answered the inquiry:

“After checking, there is no record in our system of any corrections or errata published for those reports, and the retired project manager tells us that he's not aware of any corrections or errata either.” (Schimmoller to Krivit, March 30, 2010)

That project manager was Thomas Passell, who also was at the March 2010 ACS meeting. Schimmoller also contacted Albert Machiels, the other manager on that project. Machiels, too, was not aware of any corrections or errata.



McKubre repeated the "correction" story in an e-mail to his colleagues on Dec. 10, 2011.

Subj:Re: CMNS: New Energy Times special report dated Dec 8 re Krivit's interview with  
MITRE Corp on behalf of

IARPA

Date:12/10/2011

From:michael.mckubre@sri.com

To:cmns@googlegroups.com

I doubt that any on this list needs to be told this but neither I nor anyone else at SRI "fabricated" data associated with M4 (or anything else that I am aware of). We had occasion to reanalyze those data, found an error in the EPRI report (a private document at that point), and communicated that promptly to the only person who was aware or cared (in the mid-to-late '90's) - the EPRI Program Manager. Later published reports in the open literature are (I believe) correct, and I have had no reason to doubt or refine them in the past dozen years.

-Mike



## References

Thomas Passell (Project Manager), Michael McKubre, Steven Crouch-Baker, A. Hauser, N. Jevtic, S.I. Smedley, Francis Tanzella, M. Williams, S. Wing (Principal Investigators), B. Bush, F. McMohon, M. Srinivasan, A. Wark, D. Warren (Non-SRI Contributors,) "Development of Energy Production Systems from Heat Produced in Deuterated Metals - Energy Production Processes in Deuterated Metals, Volume 1, TR-107843-V1," June 1998

Michael McKubre, Francis Tanzella, Paolo Tripodi and Peter Hagelstein, "The Emergence of a Coherent Explanation for Anomalies Observed in D/Pd and H/Pd Systems; Evidence for  $4\text{He}$  and  $3\text{He}$  Production." 8th International Conference on Cold Fusion. 2000. Lerici (La Spezia), Italy: Italian Physical Society, Bologna, Italy.

"New Physical Effects In Metal Deuterides," Peter Hagelstein, Michael McKubre, David Nagel, Talbot Chubb, Randy Hekman. This is the paper submitted to the U.S. Department of Energy, intended to be a summary paper of LENR for the 2004 U.S. Department of Energy LENR Review. The paper has been widely distributed and may have been available on the DoE Web site at one time.

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# EPRI/SRI M4 – Full Experiment Timeline – Merged Layers of All Data

