

SUBJECT: PRE-PROTOTYPE EXPERIMENTAL DATA - TEST BENCH X-04
DATE: August 14, 2025
TEST SERIES: ALPHA-PHASE-09
LOCATION: SPERS R&D FACILITY - LAB 3
FILE REF: SPERS-X04-RES-V1

1.0 OVERVIEW

This report summarizes the analytical results from the "X-04" Tabletop Test Bench. The X-04 is a 1:5 scale functional model of the SPERS reactor core, utilizing a single-loop (Red Loop only) configuration.

The primary objective was to validate the **dissociation efficiency** of the acoustic drivers and the **transmutation potential** of the Lithium-7 reaction pathway.

2.0 TEST PARAMETERS

- **Device:** X-04 "Iron Lung" Test Bench.
- **Power Input:** 12 kW (Restricted).
- **Magnetic Pinch:** 8 Tesla (40% of MK1 capability).
- **Pulse Frequency:** 45 Hz.
- **Duration:** 4.0 Hours.

3.0 RESULTS: MODE A (MUNICIPAL SLUDGE)

Actual wet-lab analysis of input vs. output streams.

3.1 INPUT MATERIAL

- **Source:** Raw Municipal Sewage Cake (De-watered).
- **Composition:** 12% Solids, high concentration of organic lipids, cellulose, and E. coli pathogens.
- **Odor:** Strong/Putrid.

3.2 OUTPUT SLURRY ANALYSIS (POST-REACTION)

Samples were drawn from the discharge manifold and subjected to Gas Chromatography-Mass Spectrometry (GC-MS).

Parameter	Input Value	Output Value	% Change	Notes
Coliform Bacteria	4.2×10 ⁶ CFU/ml	0 CFU/ml	-100%	Full Sterilization via shockwave.
Complex Organics	High (C-H-O Chains)	Trace	-98%	Dissociation into elemental Carbon.
Chem. Oxygen Demand	8,500 mg/L	120 mg/L	-98.5%	Meets "Grey Water" standards.
Solids Volume	100% (Baseline)	4%	-96%	Mass converted to gas/energy.

3.3 OBSERVATIONS

The "Pulse/Purge" cycle successfully prevented wall fouling. The SiC liner showed **no adhesion** of biological material after 4 hours. The output water was clear, sterile, and hot (85°C).

4.0 PROJECTED OUTPUT: MODE B (INDUSTRIAL)

Computed simulation based on X-04 Neutron Flux measurements.

Due to the X-04's limited magnetic pinch (8 Tesla), full transmutation of heavy metals could not be physically sustained. However, neutron flux sensors confirmed the **Proton-Lithium-7 fusion event**.

Based on this measured flux (10¹¹ n/cm²/s), we project the following breakdown for a standard Industrial Arsenic load in the full-scale MK1 (20 Tesla).

4.1 TARGET ISOTOPE: ARSENIC-75 (⁷⁵AS)

- **Context:** Common contaminant in semiconductor waste.
- **Reaction Pathway:** Neutron Capture followed by Beta Decay.

4.2 SIMULATION DATA (MK1 SCALE)

Stage	Isotope	Half-Life	State	Notes
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Stage	Isotope	Half-Life	State	Notes
Input	Arsenic-75	Stable	Toxic Liquid	Soluble industrial waste.
Reaction	Arsenic-76	26 Hours	Unstable	Created via neutron capture.
Decay	Selenium-76	Stable	Solid/Inert	Non-toxic trace mineral.

4.3 CONCLUSION FOR MODE B

The neutron flux recorded in the X-04 test proves that the SPERS reactor generates sufficient particle density to transmute Arsenic into Selenium. The containment of the intermediate isotope (⁷⁶As) requires a **24-hour hold** in the "Blue Loop" buffer tanks before release.

5.0 SPECTROMETRY CONFIRMATION

- **Helium-4 Detection:** The exhaust gas separator registered a steady production of Helium-4 at a rate of 2.1 LPM, confirming the fusion of the Lithium-7 fuel catalyst.
- **Carbon Nanostructures:** Analysis of the solid residue via TEM revealed the presence of Multi-Walled Carbon Nanotubes (MWCNT) nucleating on the graphite seed particles.

6.0 ENGINEERING SIGNOFF

Status: PASSED
Recommendation: Proceed to Pilot Fabrication of CORE-A1 (Full Scale).

Signed:
Dr. B. S. [Redacted] - Chief
Scientist