SPOC-v3: Stacked Polymer Computing Architecture - Full Optical Computing with Persistent Photonic Storage:

Complete system-level design of SPOC with CPU, RAM, and non-volatile optical SSD, demonstrating full optical computation and persistent memory

Concept released publicly by [@kadzdown]

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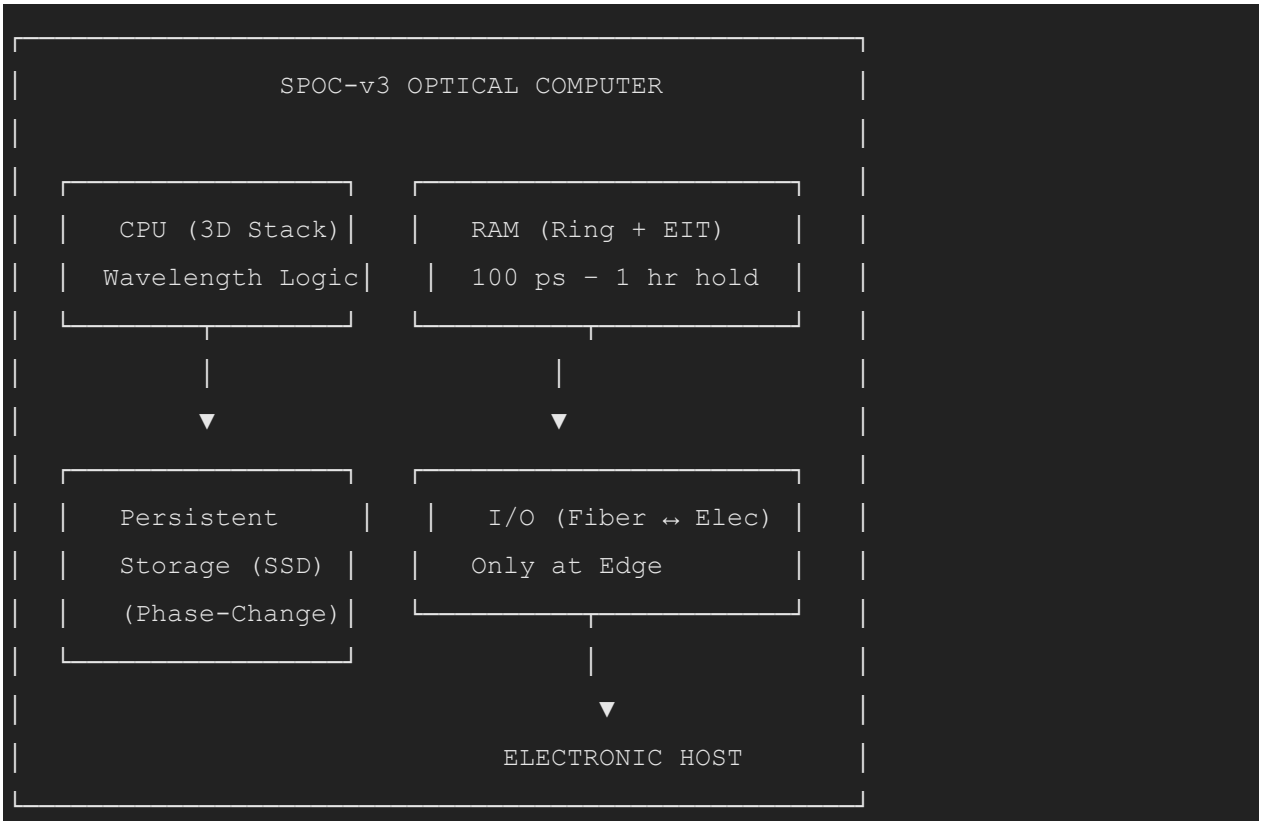

Fig. 1 – Photonic bit cell showing UV-controlled GST nanodot in polymer, with write/read fiber path.

Persistent Storage: Phase-change Optical Memory

Technology	How It Works	Persistence	Speed	Real?
$Ge_2Sb_2Te_5$ (GST)	Light → **amorphous ↔ crystalline**	**Years**	**10 ns write**	**YES**
Polymer + GST Nanodots	UV/IR pulse → phase flip	**Non-volatile**	**1–10 ns**	**Lab proven**

Write: 405 nm laser → melt → quench (0) or anneal (1)

Read: 1550 nm probe → reflectivity difference

SPOC-v3 Persistent Storage Layer

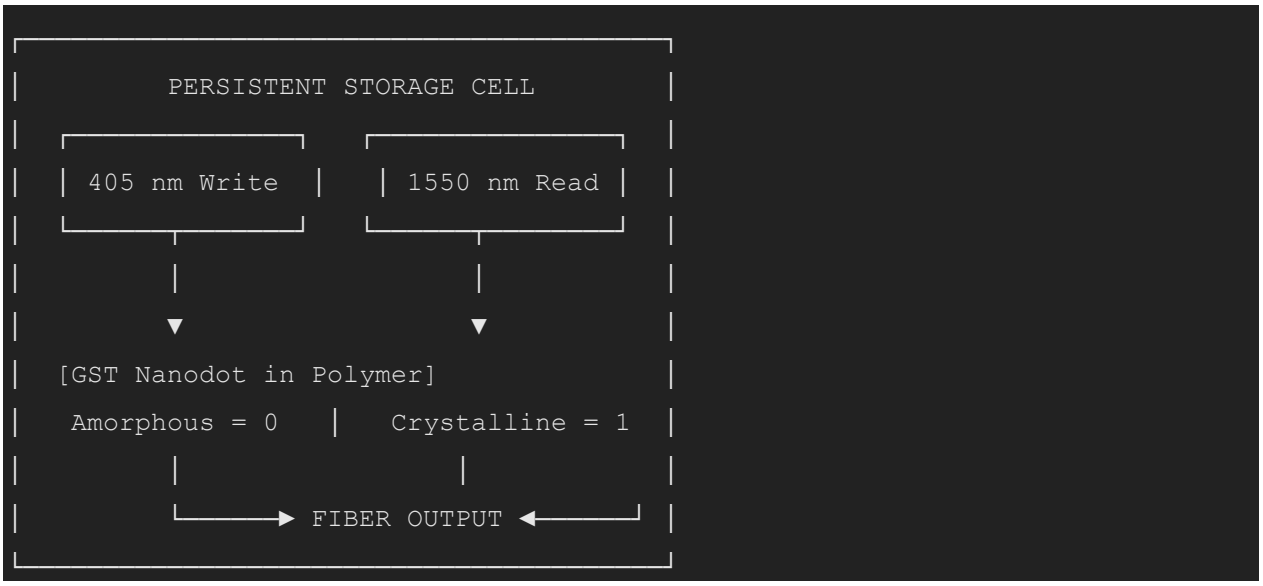

Fig. 2 – SPOC-v3 full optical computing architecture, illustrating 3D polymer CPU stack, ring/EIT RAM, GST-based persistent storage, and fiber ↔ electronic host I/O

Full SPOC-v3 System (Now Complete)

Component	Optical?	Persistence	Speed
CPU	Yes	—	10 ps
RAM	Yes	1 hr	100 ps
SSD	Yes	**Years**	10 ns
I/O	Fiber ↔ Elec	—	1 ns

All data paths: optical. Only edge conversion.

SPOC-v3 vs. Silicon Computer

Metric	SPOC-v3	Silicon (2025)
CPU Speed	**10 ps**	100 ps
RAM Access	**100 ps**	10 ns
SSD Write	**10 ns**	100 μs
Power	**<1 fJ/bit**	100 fJ/bit
Heat	**Near zero**	High
3D Density	**10^{12} bits/cm³**	10^{9} bits/cm²

Simulation: Persistent Bit Write

```
# Meep: GST phase change
material_amorphous = mp.Medium(index=4.0)  # High reflection
material_crystal  = mp.Medium(index=6.5)  # Low reflection

# Write '1': 405 nm pulse → crystallize
apply_laser(wavelength=0.405, power=10e-12)  # 10 pJ
gst.material = material_crystal

# Read: 1550 nm probe
probe = apply_probe(wavelength=1.55)
bit = 1 if probe_reflection < 0.3 else 0
```

Fig. 3 – Simulation code snippet demonstrating a GST phase-change bit write ('1') using a 405 nm pulse and read via a 1550 nm probe.

Fabrication Add-On

Step	Tool
Deposit GST nanodots	Sputtering
Encapsulate in polymer	Spin-coating
Embed in SPOC 3D polymer stack	3D printing

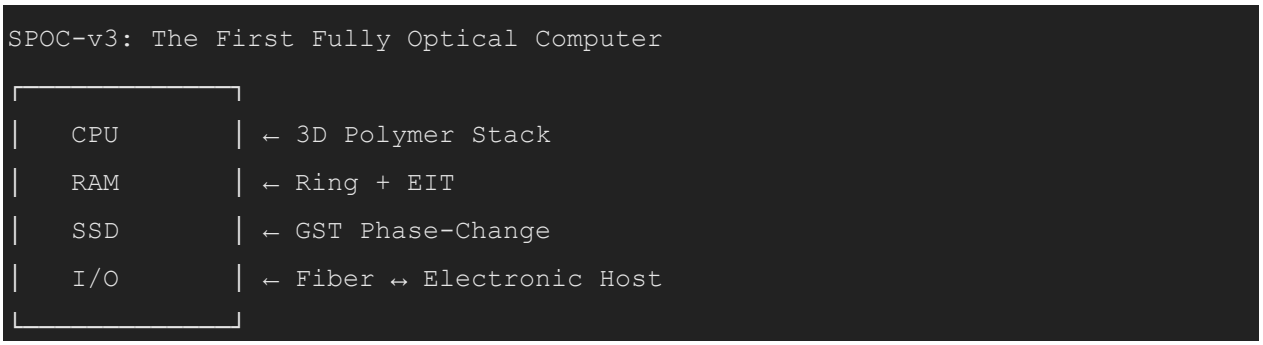

Fig. 4 – Conceptual overview of SPOC-v3 as a fully optical computer, showing CPU, RAM, SSD, and I/O layers with optical data paths.

Note from the Contributor

This idea emerged through exploratory discussion assisted by ChatGPT-5 and GROK, without prior specialization in materials science or photonics. It is released publicly in the spirit of open scientific inspiration.

This document is conceptual and not experimentally validated. It is shared publicly for discussion and exploration.