SPhotonix

Sustainable Data Storage

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FMS the Future of Memory and Storage

AI fueling data growth. Can storage keep up?

133% increase in data generation (2020-2024) fueled by adoption of AI and IOT

Over 90% of all data in existence was created in just the last two years

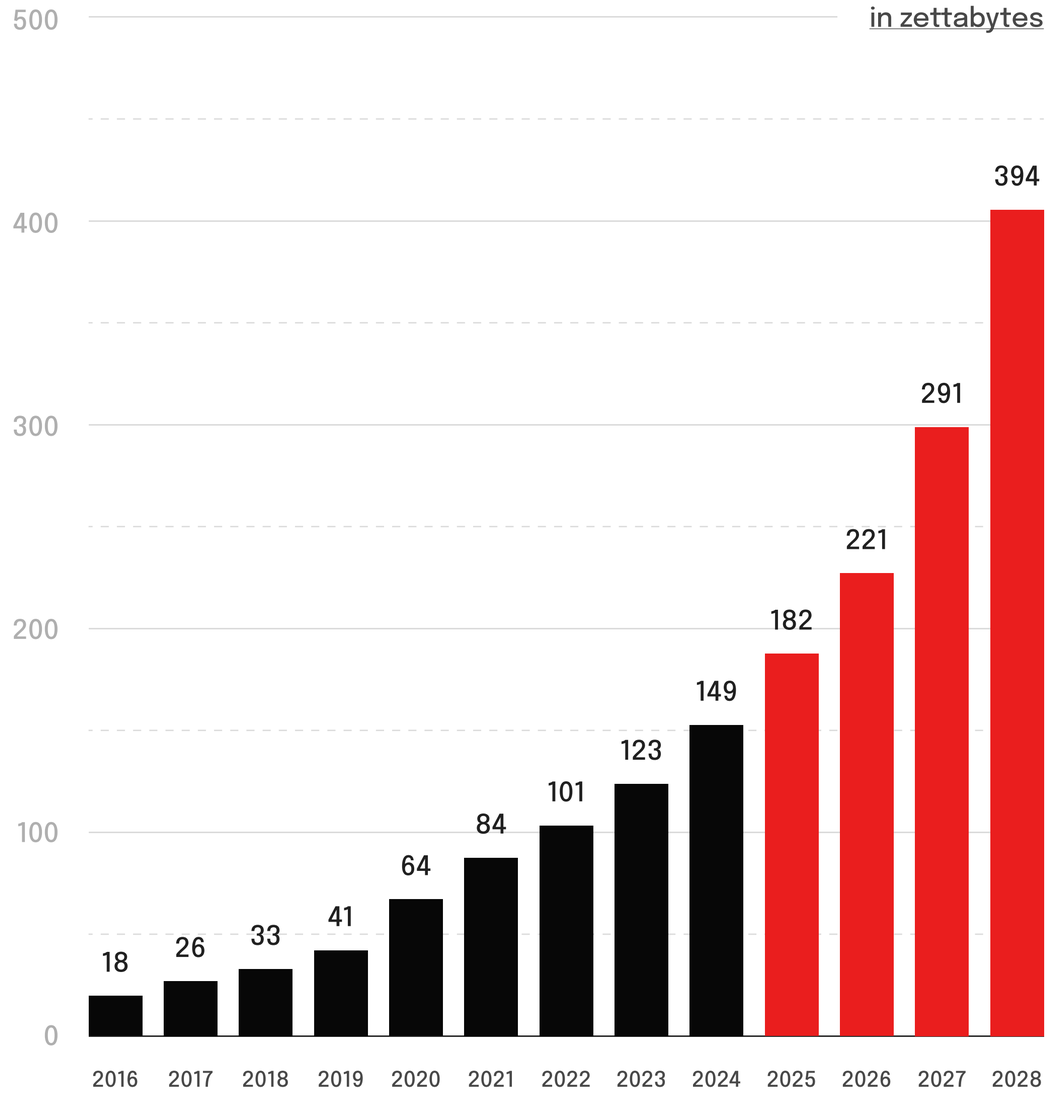
60-80% of data stored ‘archival-class’

Net data growth demands innovation

AI isn’t just generating more data – it’s generating new types

https://www.statista.com/statistics/871513/worldwide-data-created/

Global growth in annual data generated



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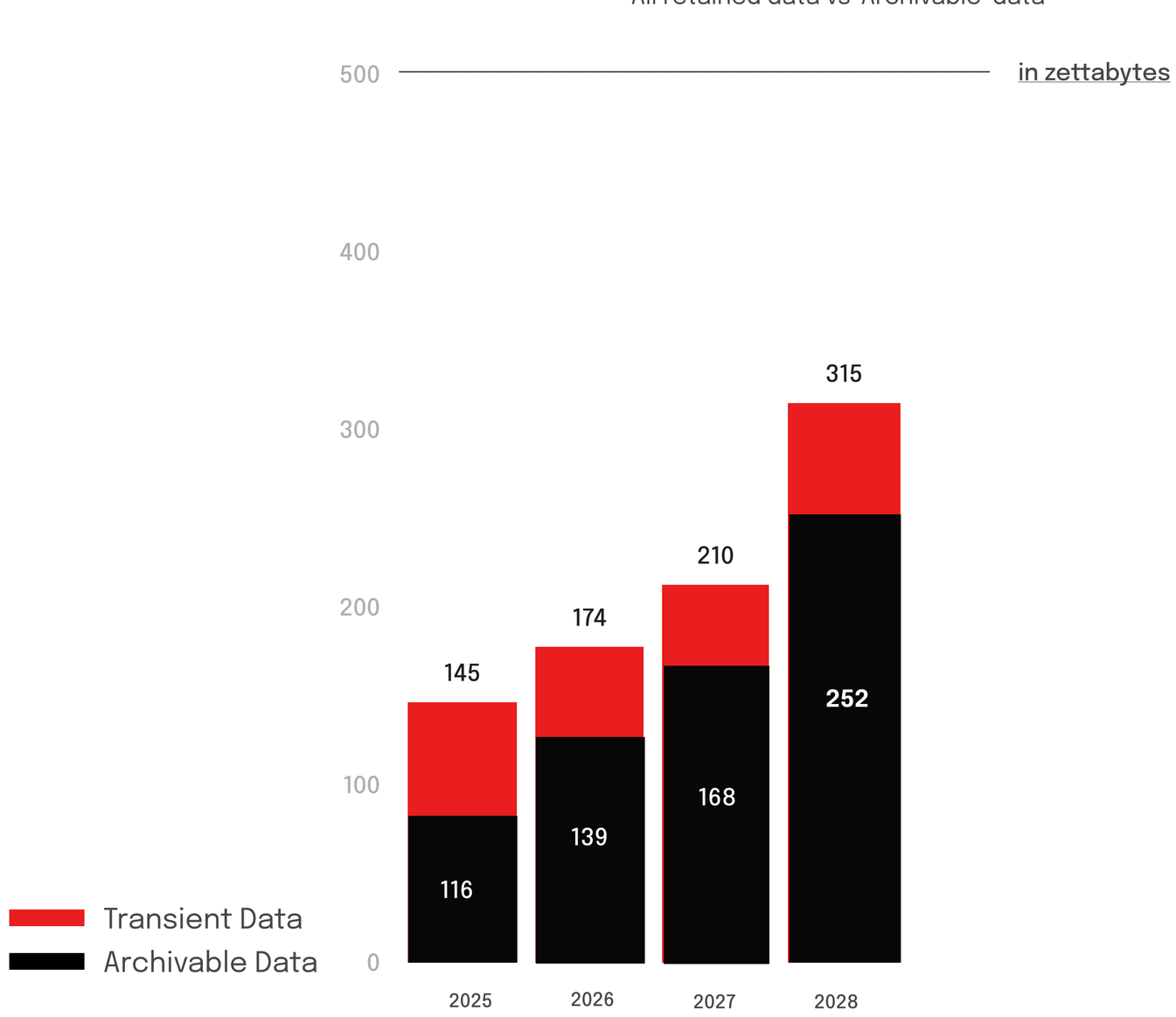
Estimates on net data growth

10-20% data retention - stored long term, rest is deleted or overwritten

6-12% archived - out of all data retained over 60% is archived for the long term

20-30% deletion rate - old retained data deleted annually.

Much valuable data infrequently accessed



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Archivable data: Growing contributors

Compliance Data

HIPAA (Healthcare), FDA 21 (Pharma), GDPR/CPA (Privacy), OECD (Geoscience), IRS(Finance), Solvency II (Insurance), E&P Regulations (Energy), GxP/GLP/GMP(Biotech), Nuclear Reg (Energy)

AI Training Data

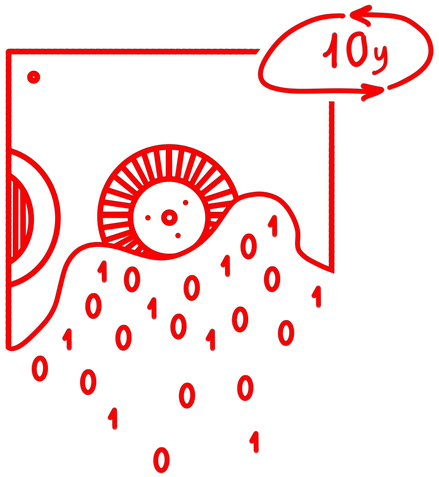
Foundation/model training, NLP, CV, RL. ML Versioning, Model Snapshots, LLM Seeds, Immutable LLM snapshots, tamper proof archive

AI Generated Data

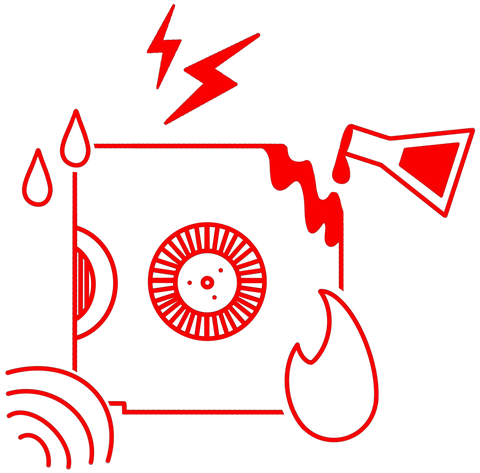
Logs, Simulation Content, Synthetic data, reinforcement learning environments, GenAI content

Aerospace / Research

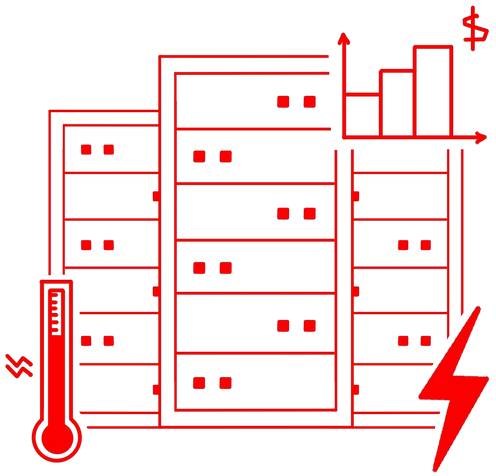
Flight telemetry, spacecraft logs, high resolution imaging, design logs, AI training data, raw simulation data



- Current data storage **longevity** around **10-15 years** per disk
- **Replacing media** costs tens of **billions of dollars** each year
- Significant **environmental impact** due to energy and waste

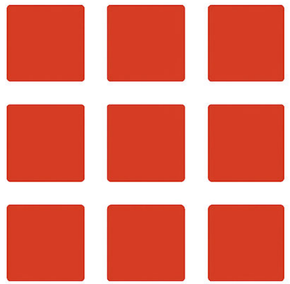


- Existing Data storage devices susceptible to **heat**, chemical reaction, **liquids**, humidity and **Electromagnetic Pulse damage**, increasing TCO significantly



- Existing technology requires to be **stored at 16-24°C**
- Significant saving of **plastic and electrical waste**
- **Unsustainable** energy cost and CO2 emissions

What Next-Gen Storage Needs



Density

Durability

Speed

Cost

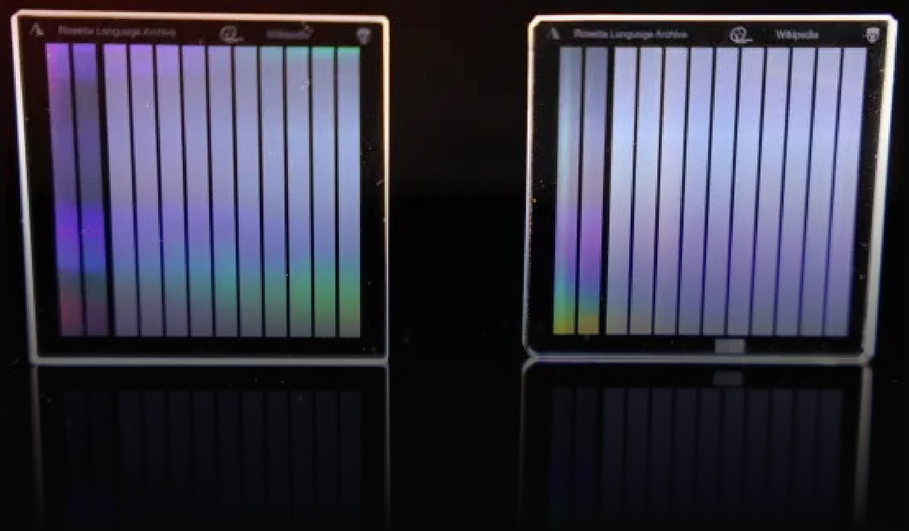
STORING – 252 ZETABYTE OF DATA IN 2028

	Incumbent technology	5D Optical Memory
Media Capacity	30 TB	250 TB
# of media required	8.4B	1 B
Energy to manufacture	294 PJ	2.35 PJ
Amount of E-Waste	~1.6M tons	Fully Recyclable
Energy to write data	10 years	1000+ years
Space required	1,940,400 m^3	65,016 m^3
Weight per TB	~1.6M tons	~100,000 metric tons

SOLUTION – MEDIA COST – 1 EXABYTE OF DATA

	5D Optical Memory
Amount of data	1,015,200 TB
Media Capacity	250 TB
# of media required	4,061
Cost per media	$35
Total media cost	$142,135
Longevity	1000+ years
Media cost over 30 years	**$142,135**

5D Memory Crystal



Durable & Secure Data Storeage

Data written inside Quartz glass – the most durable material for data storage, data persists for thousands of years
Immutable WORM storage technology, with rewrite potential.

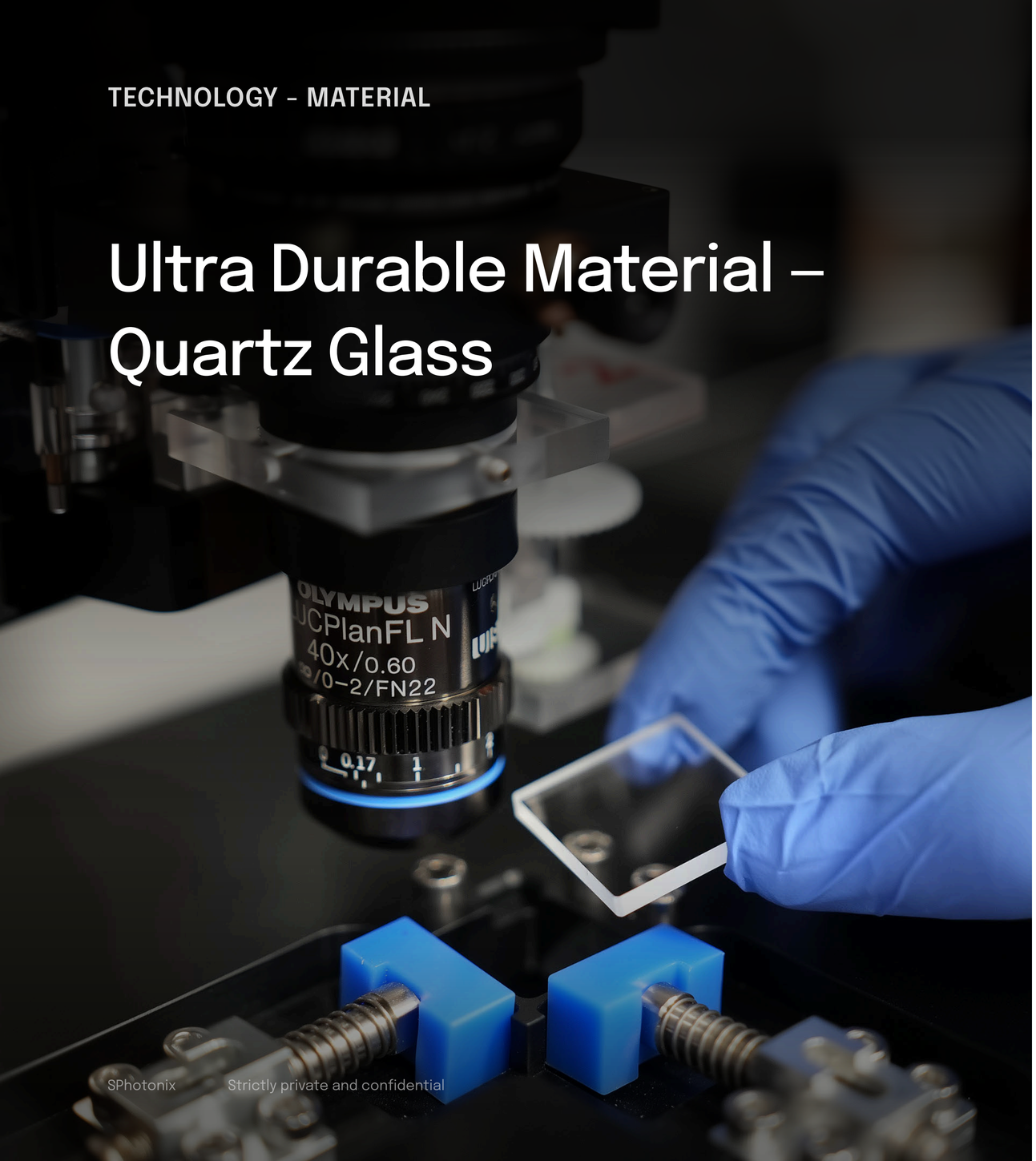
Eliminate Waste and CO2 emissions

Once written, **no energy or maintenance required** to persist, ever. **No need to copy data** from old discs as 5D Quartz Glass does not degrade. **Fully recyclable**, no E-Waste.

Highest Data Density, 50x material cost saving

Fused silica Quartz is effectively sand, although energy required to produce, **material cost significantly lower**
Leading volumetric storage density, up to 10 GB/mm³

Ultra Durable Material – Quartz Glass



- Remains stable at temperatures up to 1000C for extended periods
- Tolerates rapid temperature changes
- Chemically inert, zero water absorption rate
- Tensile strength 50MPa
- Compressive strength 1100MPa
- Mechanical wear resistant
- Resistant to UV and ionizing radiation (Space/Nuclear)
- Inert to Electromagnetic radiation (EMP)
- Scratch and abrasion resistant
- Can store data securely even in extreme conditions, such as high heat, deep ocean environments, or outer space.

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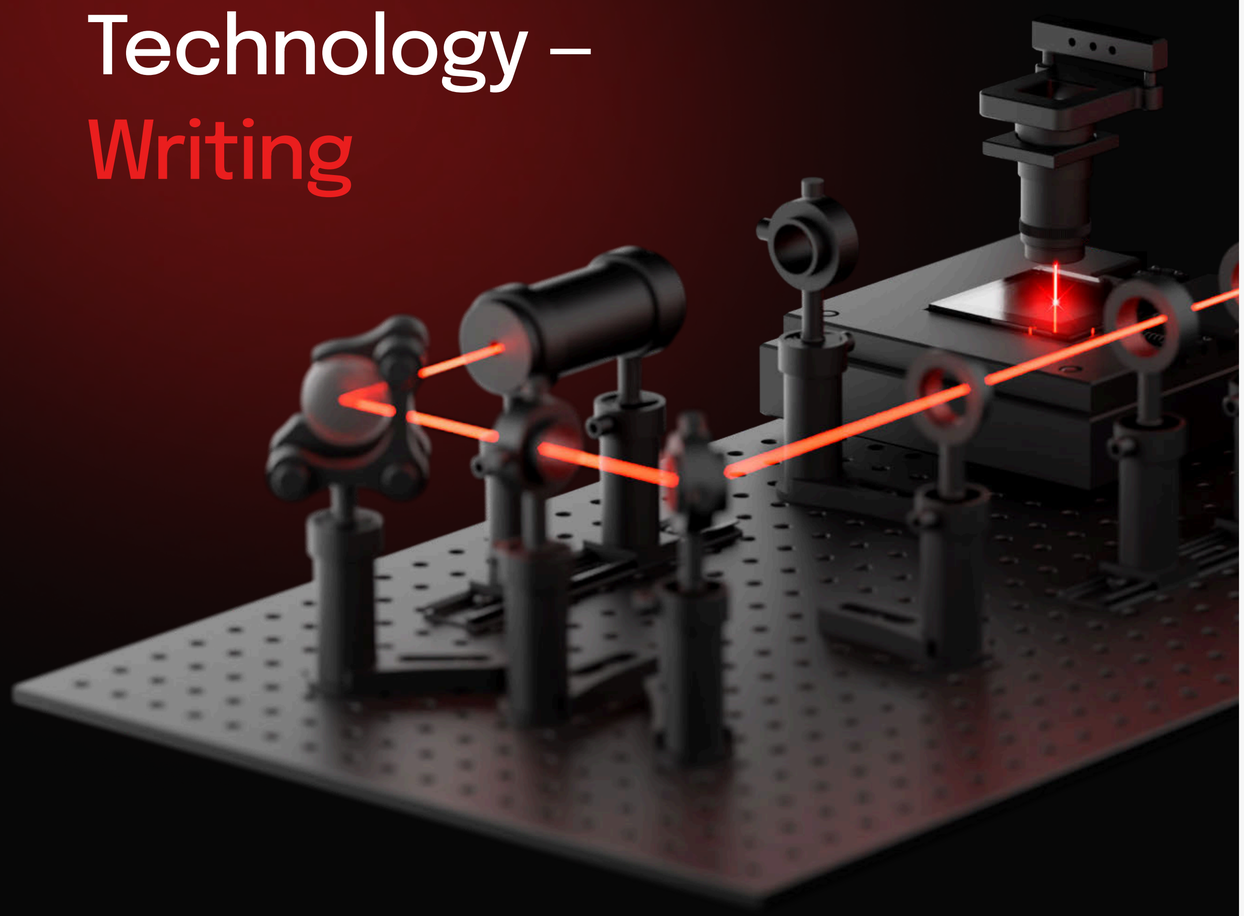
Data Storage Technology – Writing



Femtosecond laser-based optical system

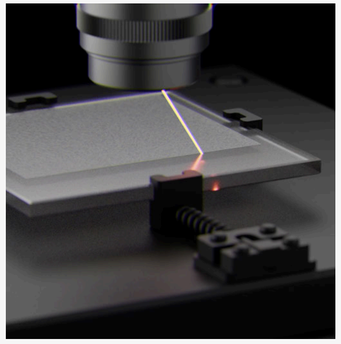
Delivers precision energy bursts into quartz glass, creating billions of nanostructures with unmatched accuracy

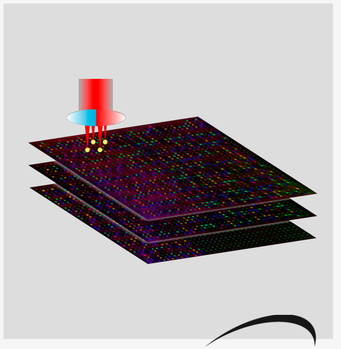
Software-driven optics

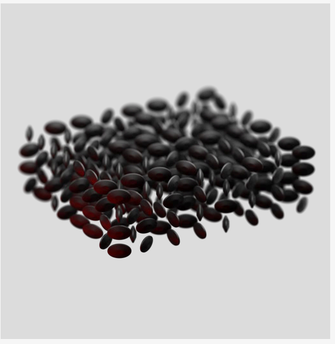
Precisely control nanostructure properties, including polarization and birefringence, enabling storage of 8 binary bits per nanostructure

Five dimensions

Enabling ultra-dense data storage medium include width, height, depth, polarization, and birefringence







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Thank You!

To make data storage durable, scalable and sustainable for the next generations growing data storage needs

https://sphotonix.com

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