

The Premier Advanced Recording Technology Forum

THIC Inc.

Holographic technology and product development update

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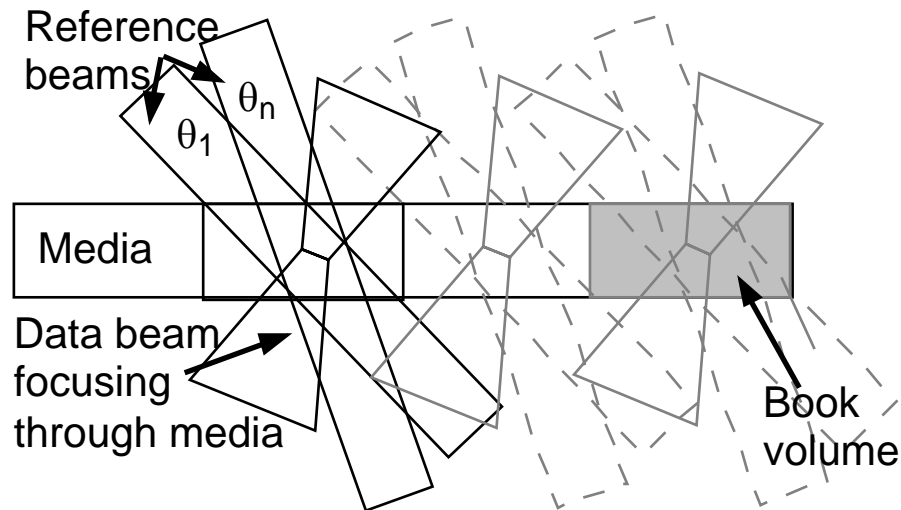
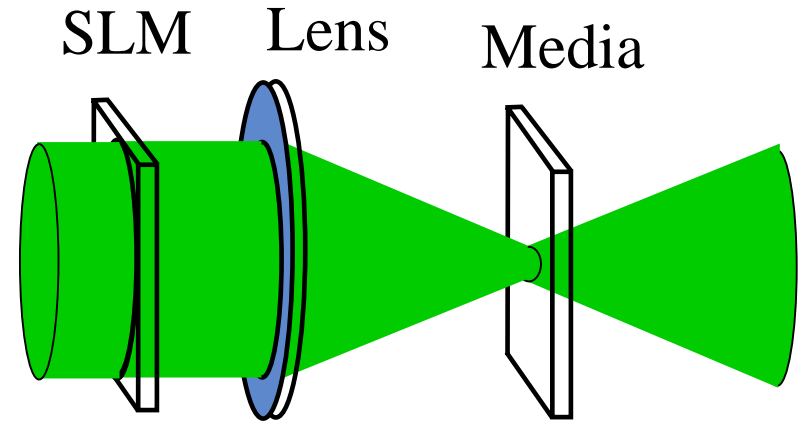
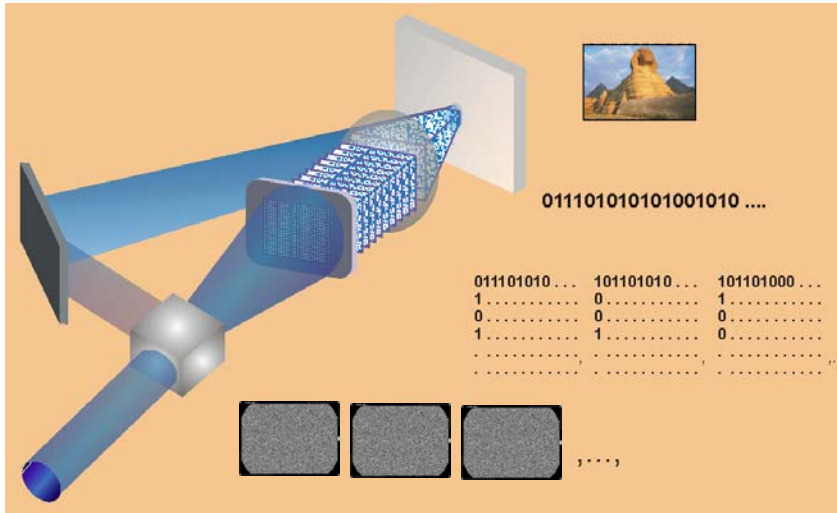
**Presented at the THIC Meeting at the National Center for
Atmospheric Research, 1850 Table Mesa Drive, Boulder CO
80305-5602**

June 29-30, 2004

Agenda

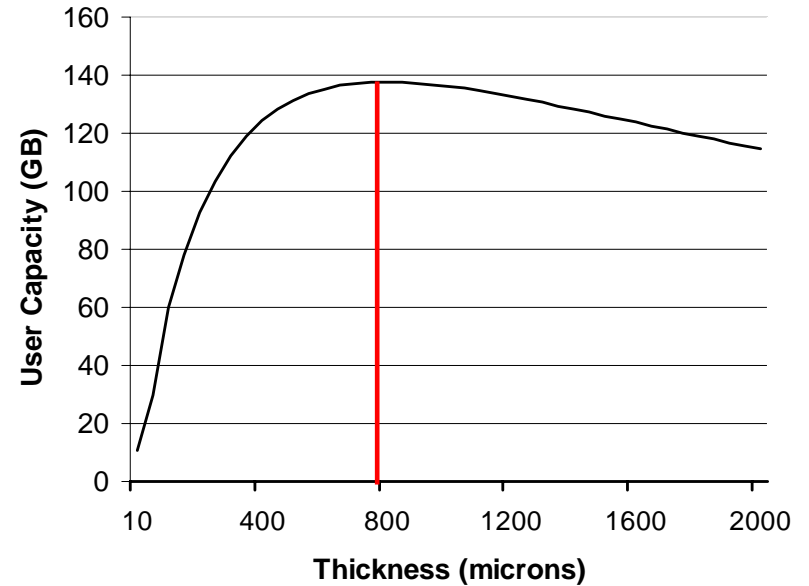
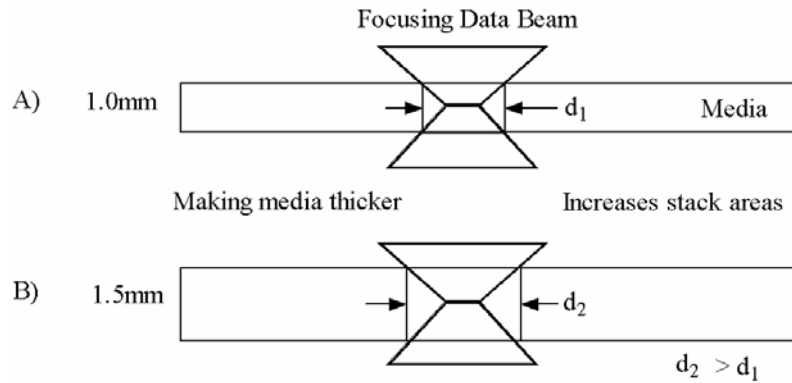
- Technology update
 - Polytopic filter
 - Phase Conjugation architecture
 - Technology roadmap
- Product development update
 - Drive development program status
 - Product road map
 - Product specifications and form factors
 - Partners and potential users

Technology update

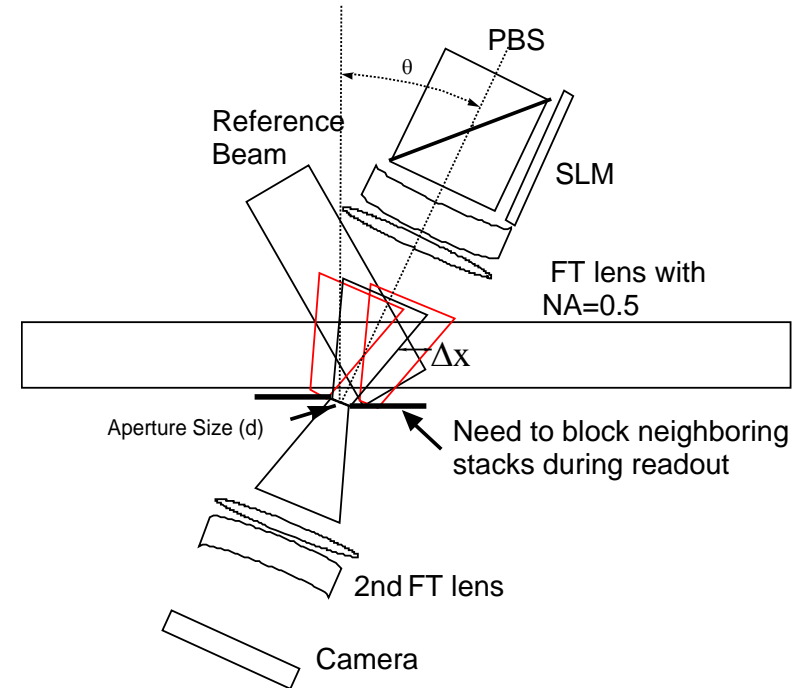
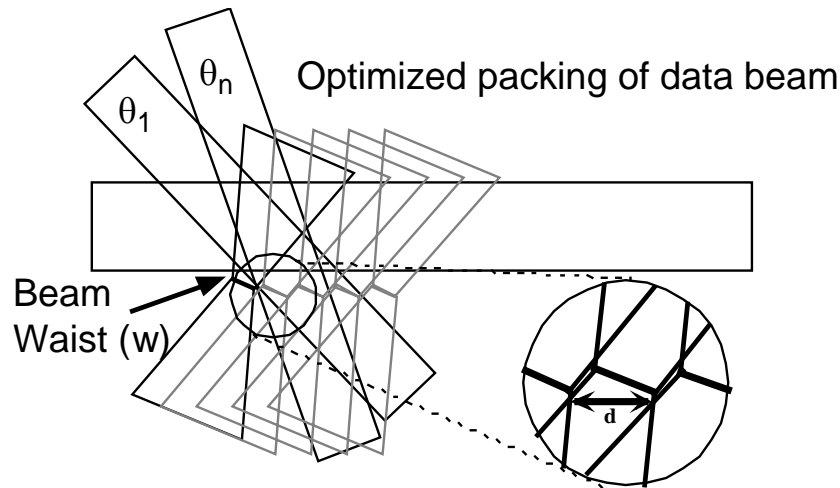




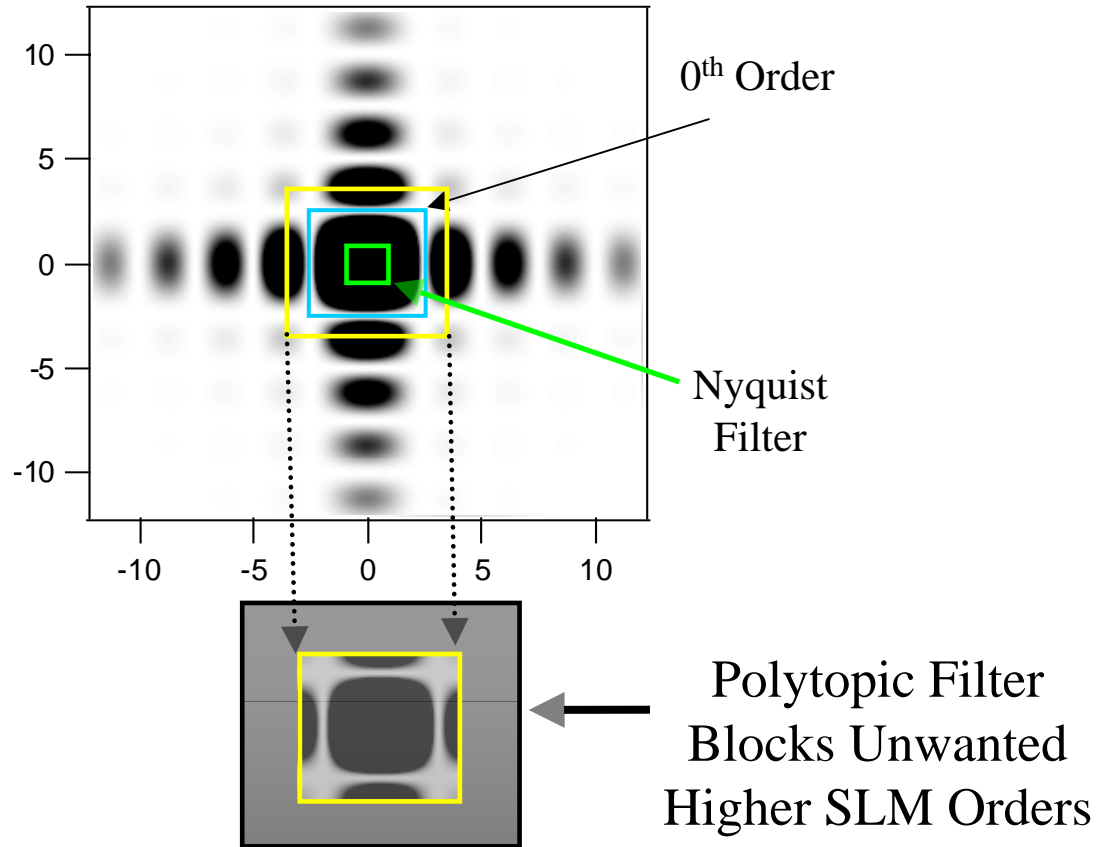
Geometrical storage limit



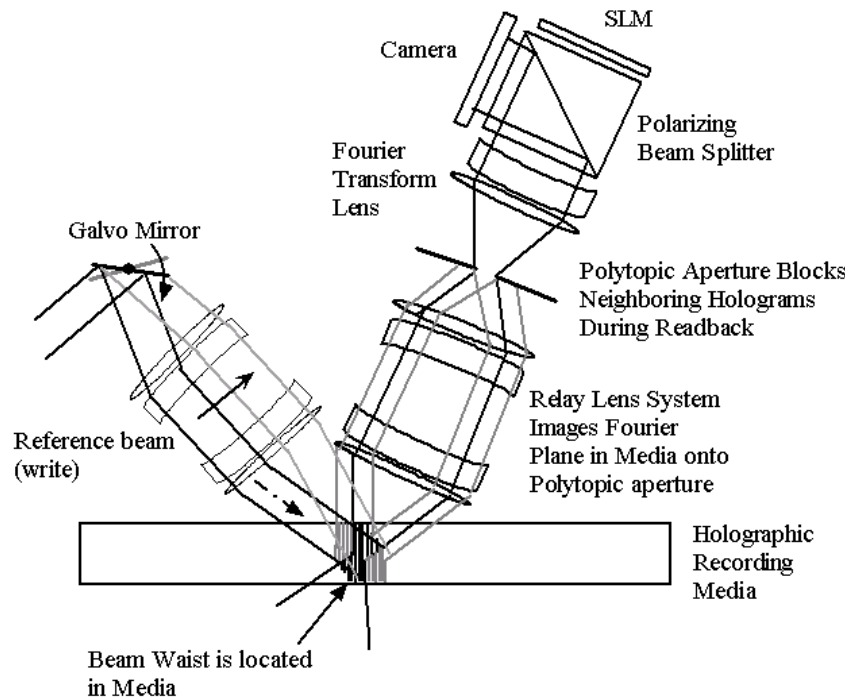
“Three-dimensional holographic disks” (H.-Y. S. Li and D. Psaltis) in Appl. Opt. vol 33, pp 3764-3774 (1994)



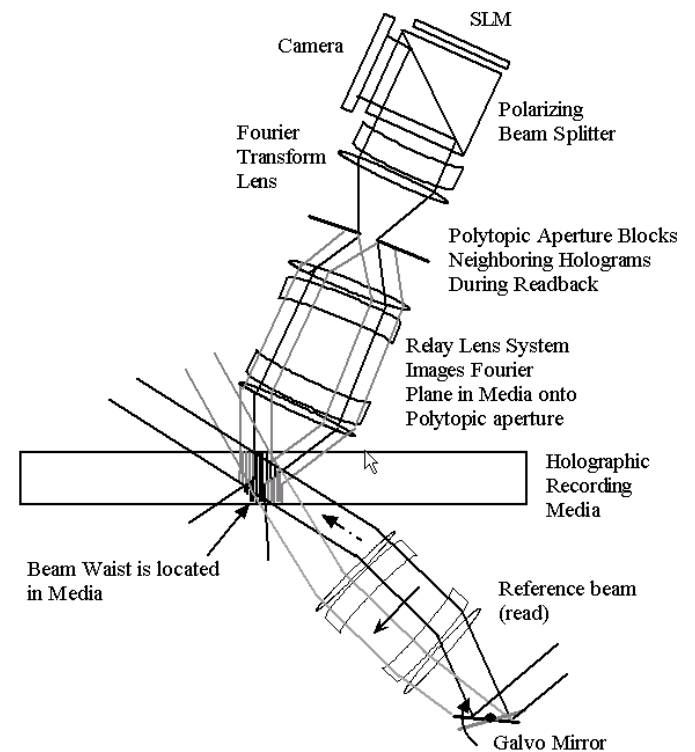
**At the Fourier/Focus
plane of SLM**



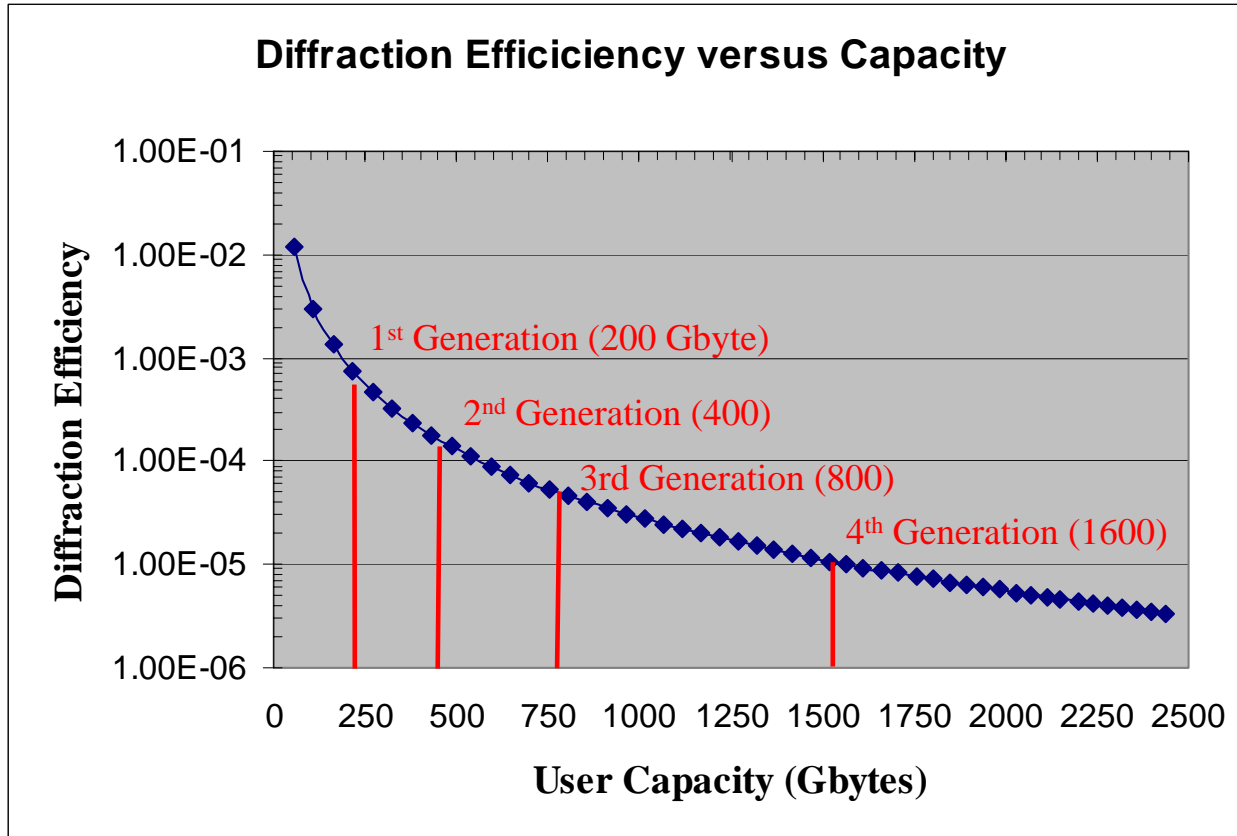
Write



Read



Balancing Capacity and Diffraction Efficiency: Polytopic



Areas of improvements
To go from
200GB to 1.6 TB

1. M#
2. Detector Sensitivity
3. Increase Laser Power

*Assumes Current Media M#
of 6 per 200um @ 1.5mm thick, FT plane in media

	Current	P1	P2	P3	P4
Specs	80GB (80Gb/in2)	200 GB 20 MB/s	400 GB 40 MB/s	800 GB 80 MB/s	1600 Gb/in2 120 MB/s
# of pages per book	100	96	162	325	662
Reference Beam Sweep (degrees)	16	7	12	24.5	25
Hologram pitch (θ, r) (mm)	1.0x0.9	0.82, 0.48	0.82, 0.48	0.82, 0.48	0.82, 0.48
Nyquist filter / Beam Waist area	1.2x	1.2x	1.2x	1.2x	1.2x
NA of object beam	0.45	0.6	0.6	0.6	0.6
Bragg Null	3-4 th	2nd	2nd	2nd	1st
SLM/Camera Pixels	1280x1024	1280x1024	1280x1280	1280x1280	1280x1280
Wavelength (nm)	532	407	407	407	407

Angle and Polytopic Multiplexing

Product development update

Drive development program status

- Currently we are about half way to developing a prototype holographic storage drive.
- The prototype will use a blue laser, polytopic and Phase Conjugation hardware architecture.
- All hardware/firmware development is currently on schedule.
- We plan to have the prototype fully functional by the end of October 2004.
- We see no “show-stoppers” for completing the prototype on time and no new inventions are required.
- Goal: to ship Customer Qualification Units (CQU's) by the end of 2005.

Recordable family →



Re-writable family →

Path from 200 GB to 1.6 TB



DRIVE

- 200 GB Capacity
- 20 MB/s Transfer Rate
- 250 ms avg. seek time
- 407 nm Laser
- 1.3 megabits/page
- BER $<10^{-15}$
- 100K power on hours MTBF

CARTRIDGE MEDIA

- 130 mm disc
- 3 year shelf life (prior to recording)
- >50 year archive life
- No special handling required
- 5.25" X 6" X .25"

RW-drive backward read compatible with R-media
R-drive backward read compatible for 4 generations

- ***TeraCart***

- **AM-1450 (Asaca Corp)**

With a storage density of 63.9TB per Square Foot of floor space, the AM1450 will be the highest density random access storage system available in the world.

- **290 TB of Random Access media in a single cabinet**
- **1450 cartridges per cabinet**
- **200GB Tapestry holographic media and multiple drives in the library cabinet**

Tapestry HDS-200R Drives & Media



- End Users
 - InPhase Video Advisory Board (15 companies)



- Media Manufacturers
 - Maxell
 - Imation

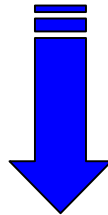


- Drive
 - OMA partner
 - Sony - Blue Lasers (ODS 2004)
 - Alps - Mechanics and Optics



- Media and Test Equipment Sales
 - 15 companies

- **Low cost, secure media**
- **Low cost, lens-less reader**
- **High density, rugged format**
- **High speed, no wear replication**
- **Fast turn-around master recording**



Consumer Market Opportunities

- **Games**
- **Video Distribution**