

THIC Inc.

The Premier Advanced Recording Technology Forum

Large Format Optical Storage: Protecting Critical Government Data

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Storing More of Your Digital World

Large Format Optical Storage

Protecting Critical Government Data

John Drollinger

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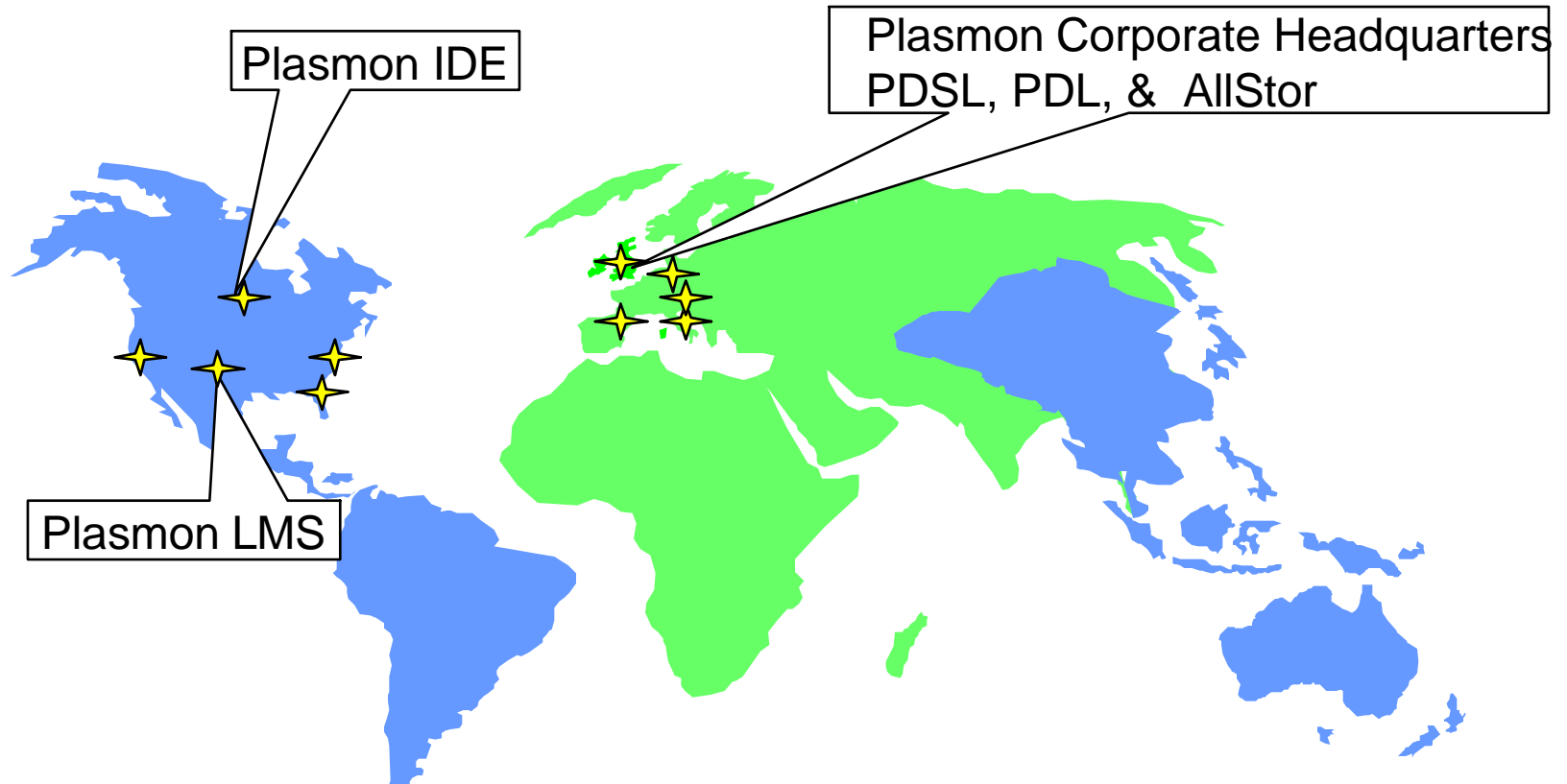
THIC, Denver

June 28, 2000

Corporate Background

- **Target '99/00 revenue -- \$120MM**
- **Internal growth and acquisitions**
- **450 employees - major operations in UK, Minneapolis, and Colorado Springs**
- **21 years of optical storage experience**
- **www.plasmon.com**
stock ticker - PLM.L (London)

Plasmon Offices



★ Sales offices: California, Minnesota, DC, Florida, Colorado, Texas, France, Italy, Germany, Belgium, England

Corporate Milestones

- **1985 Company Incorporated by Comtech Plc**
- **1988 First optical media product - Motheye WORM**
- **1989 Commenced sales of optical drives and libraries**
- **1994 Acquired IDE - library manufacturer in Minneapolis, MN**
- **1996 M-Series library introduction**
- **1996 IPO on London Stock Exchange**

Corporate Milestones

- **1997 CD Library introduction**
- **1997 Commenced tape library production**
- **1999 Acquired Philips LMS - 12” Optical drive business in Colorado Springs, CO**
- **1999 Acquired 12” library product line from Cygnet**

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Colorado Springs, CO

- Drive Center of Excellence
- Focused on developing and manufacturing optical and tape drives
- ISO 9001 facility with 120,000 square feet and 155 people



12" Optical Family History

- **1979 Philips demonstrated 12" recording technology at Briar Cliff Lab in New York**
- **1984 Philips/CDC Joint Venture.
Established headquarters in Colorado Springs**
- **1985 Ship first 12" optical drive, capacity 2GB, single head**

12" Optical Family History

- **1990 Philips LMS becomes independent standalone division**
- **1991 Philips LMS ships first dual head 12" optical drive, capacity 5.6GB**
- **1992 Philips LMS reaches milestone of 10,000 drives shipped**
- **1995 Philips LMS ships second generation dual head 12" optical drive, capacity 12GB**

12" Optical Family History

- **1998 Philips LMS reaches milestone of 20,000 drives and media shipments of 500,000 12" optical platters**
- **1999 In January, Plasmon acquires Philips LMS**

12" Optical Family History

- **Plasmon's core business is optical data storage**
- **LMS is a key piece of this business (~35% of total revenues)**
- **LMS was not part of Philips' core businesses (consumer electronics, lighting, and components) and represented only 1% of Philips' total revenue**

12" Optical Family History

- **1999 In July, Plasmon acquires Cygnet 12-inch library business**
 - Plasmon now controls all key technologies (drives, libraries, and media) in 12" optical format
- **1999 Fourth quarter, Plasmon ships third generation dual head 12 inch optical drive, capacity 30GB**

12 Inch TrueWORM Technology

WORM Recording

True WORM

- **Ablative**
- **Bubble forming**
- **Phase Change**

Software protection

- **CCW**
- **WORM tape**

WORM Recording

- **Both phase change and ablative methods write data by changing the local reflectance of a recording layer**
- **Both processes are irreversible**

Ablative overview

- **Laser heats Tellurium alloy above melting point**
- **Molten material rolls back from central point, leaving a pit**
- **Pit is about 4 times darker than the surrounding rim and surface**
- **This contrast is easily detected on the read pass**

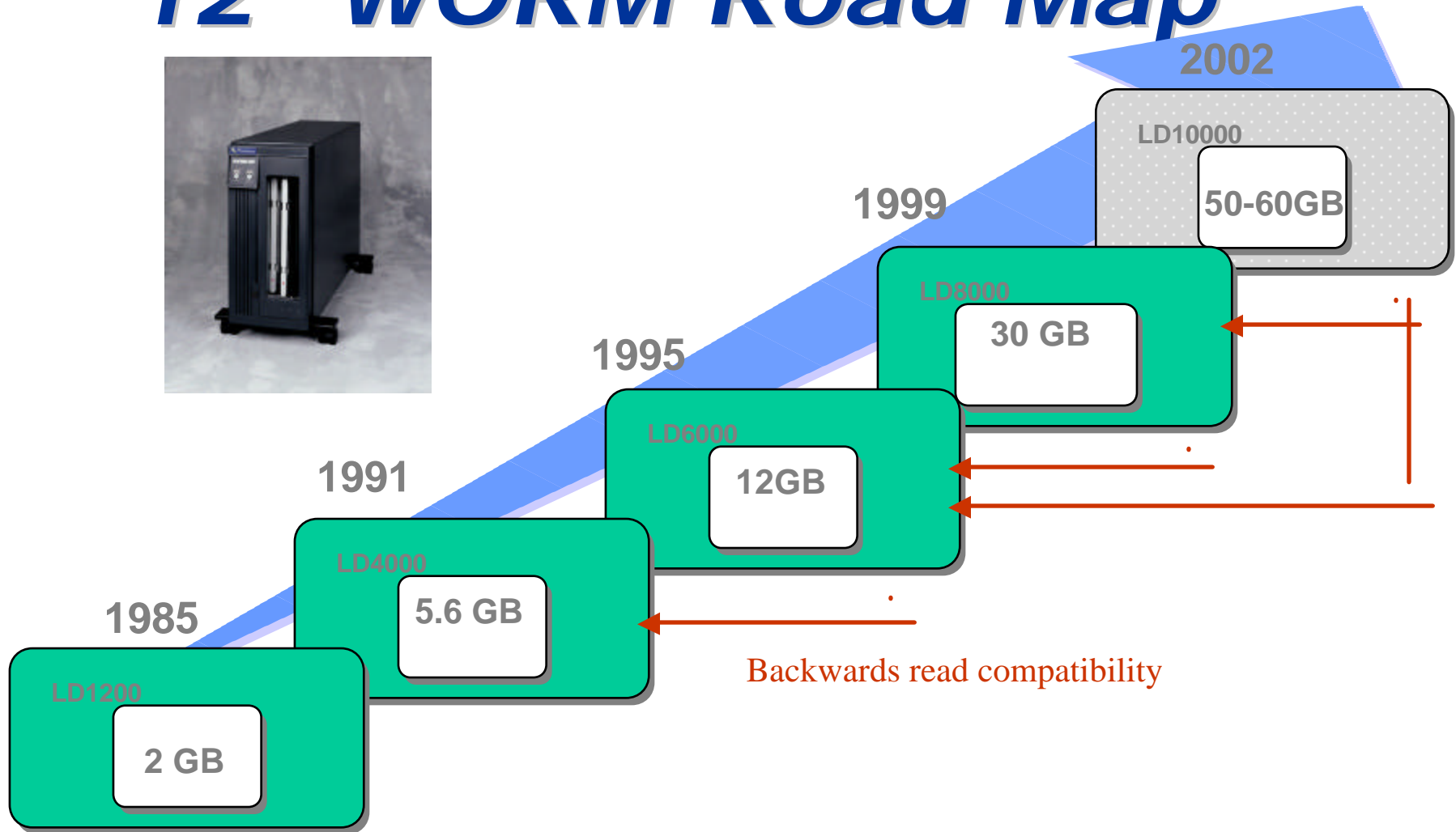
Phase Change overview

- **Unrecorded layer is amorphous**
- **Laser heat changes spot to crystalline state**
- **Crystalline state is much brighter than surrounding amorphous surface**
- **Again, this contrast is easily detected on the read pass**

12 Inch TrueWORM Technology?

- **First 3 generations were ablative WORM ending with 12GB media**
- **Ablative capacity limit ~ 25GB per disk**
- **Move to phase change**
 - **higher densities starting at current 30GB**
 - **multiple generations possible**
 - **multilayer recording possible**
 - **leverage phase change DVD research**

12" WORM Road Map



Backwards read compatibility



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Next Generation

- **Evolution based on currently available technology**
- **Same red laser**
- **Dual layer recording - proven in DVD**
- **Backward read compatible**

Future Generations

- **Blue laser technology (420nm GaN) will give an increase of 2.5 times**
- **Super resolution could realistically yield an improvement of 4 times and still maintain a workable signal to noise ratio (SNR)**
- **High NA (~0.85) combined with thin cover layers can give an increase in density of 2 times**
- **Grey scale encoding should yield an improvement of around 2 times but requires complex signal processing**

Large Format Technology Benefits and Advantages



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12" TrueWORM Media



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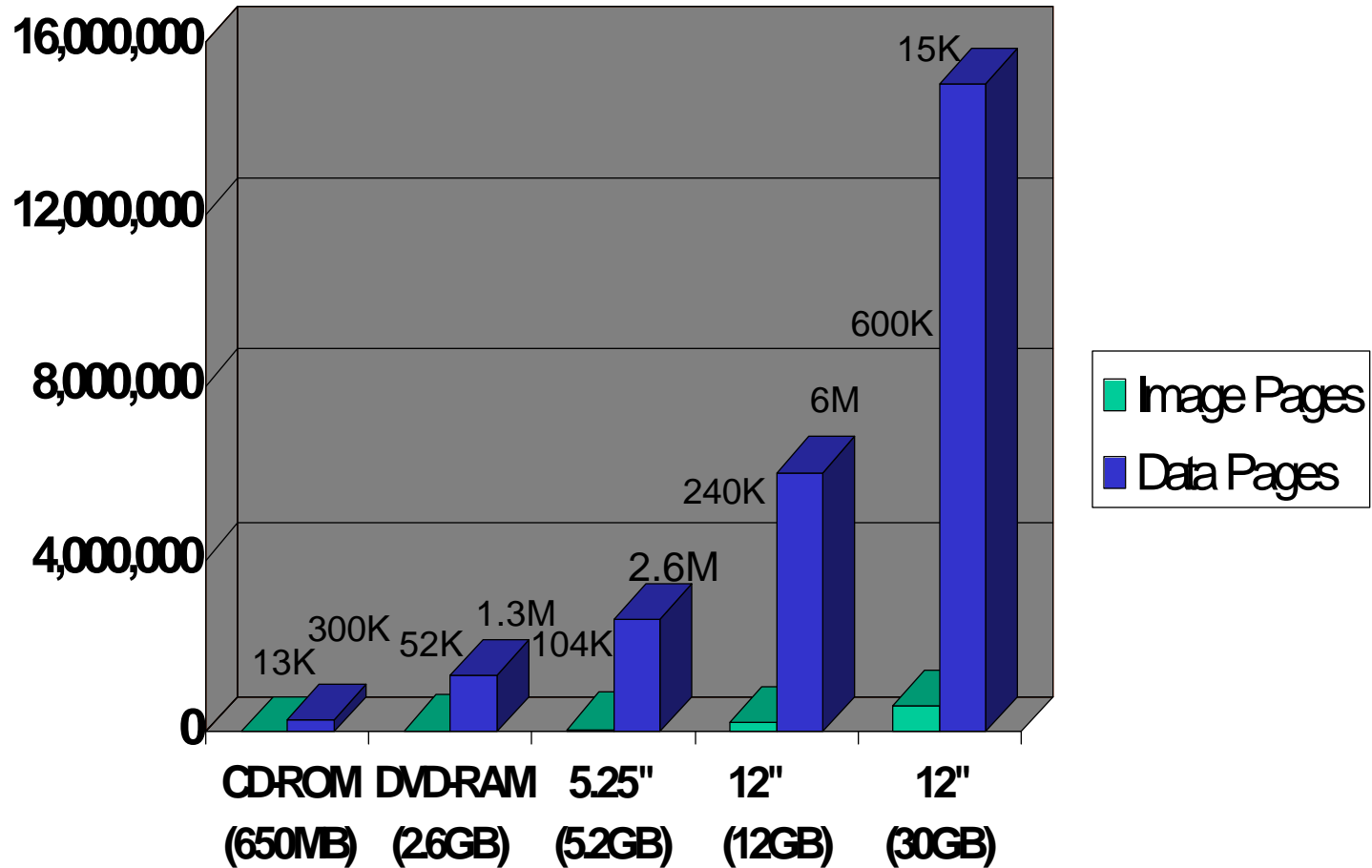
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12" TrueWORM Media

- **Thermally stable glass substrate**
- **Phase change WORM recording layer -- permanent and unalterable**
- **Guaranteed 100 year data life from date of recording**

Capacity Advantage

Document Storage Capacity per Optical Disk



Reliability Advantages

High Reliability

- **Minimal disk swapping = reduced thrashing = reduced mechanical wear**
- **Over 50% of all drives from 1986 still in use**
- **Stable glass media**
- **30,000 MTBF: a 50% increase**

Archival Advantages

12-inch TrueWORM Technology™

- **Permanent**
- **Unalterable**
- **Virus proof**



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12 Inch Government Archive Applications

- **Fannie Mae**
- **US Air Force**
- **NY State Workers Comp Bureau**
- **Oklahoma State Insurance Fund**
- **Spanish Social Security Administration**
- **Dutch Tax Office**
- **IRS SCRIPS**
- **U.S. Army (PERMS)**

IRS SCRIPS

- **Service Center Recognition Image Processing System**
- **Scan-Optics scanners capture images**
- **NCR N4000 servers with 400GB of RAID process images**
- **12 inch optical provides archive at 5 of 10 service centers**

IRS SCRIPS

- **Capture and storage of these forms:**
 - **1040EZ**
 - **1098 - mortgage/student loan interest**
 - **1099 - nonwage income**
 - **Most important forms - federal tax deposits from corporations**

IRS SCRIPS

- **SCRIPS processes 100-120 million forms per year**
- **Peak week = 4 million forms**
- **Activity is beginning to decrease as more taxpayers use TeleFile system**
- **SCRIPS is truly mission-critical for processing the government's money**



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US Army (PERMS)

- **Army personnel records**
- **Data retention period = life of the soldier**
- **In 1973, fire destroyed 200 million pages of paper records from 1959 and earlier**

US Army (PERMS)

- **Ongoing migration of personnel records to large format optical began in 1993 with some activity last year**
- **All personnel/benefit records for approx. 1300 soldiers fit on one 12GB disk**



12 Inch TrueWORM Products



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Phase Change WORM Recording

- **Mature technology**
- **In use since the mid-80's by Kodak and Panasonic**
- **Widely accepted by US and foreign governments for archival applications**