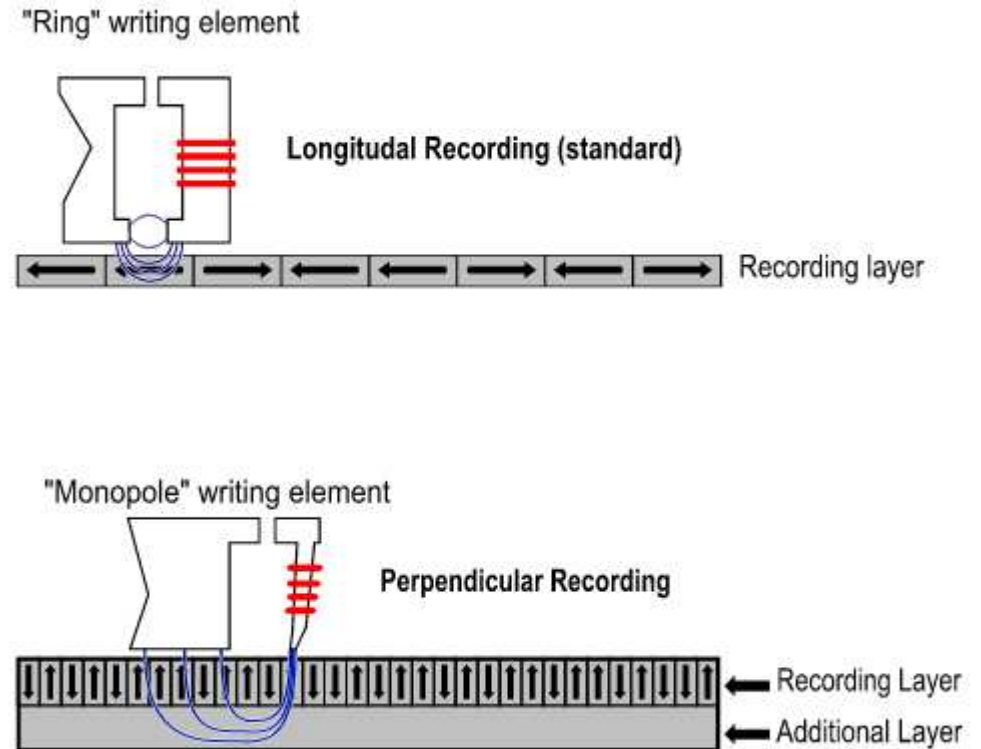


# Perpendicular recording

- It was first proven advantageous in 1976 by Shun-ichi Iwasaki, then professor of the Tohoku University in Japan, and first commercially implemented in 2005.

# 垂直写入技术

- 由于现今硬盘的资料记录区块大小已经发展到宽度只有30纳米左右,而磁性记录颗粒的尺寸不断下降,导致出现电磁学上的超顺磁效应（超顺磁性）,大大降低了硬盘的容量提升潜力。



500 Gbits/inch<sup>2</sup>

# 热辅助磁性录写 (HAMR)

– Heat-assisted magnetic recording

– 是一种使用镭射热先加热高度稳定媒体，以辅助磁性录写资料的技术。HAMR技术需要像铂铁合金这样高度稳定的磁性复合材料。这些材料可以在相当小的面积内储存单一字节而不再受限于超顺磁性；目前使用在硬盘储存的许多技术仍受限于超顺磁性。唯一的缺点是，他们必须被加热以适应磁场方向的改变。

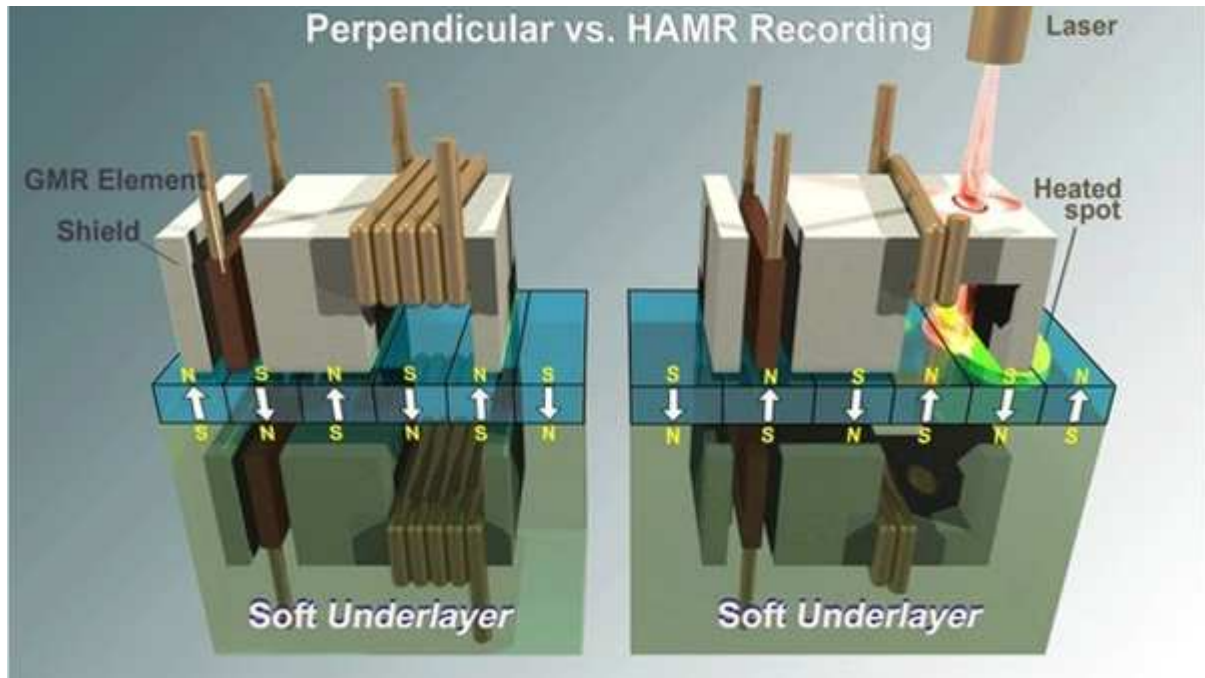
50 Tbits/inch<sup>2</sup>

# Seagate achieves HDD storage density of 1TB per square inch

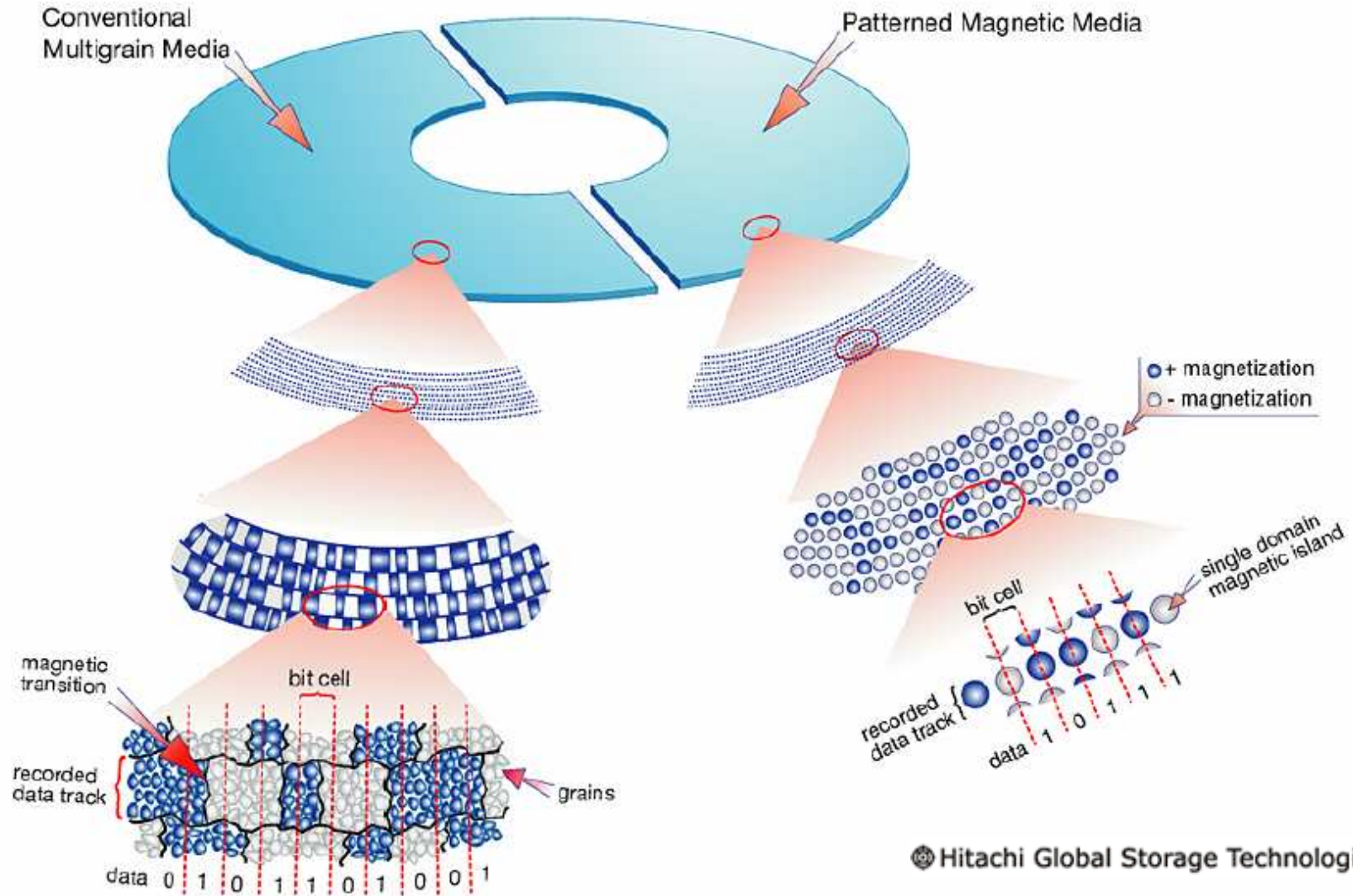
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Silicon Valley hard disc drive innovator Seagate Technology has succeeded in achieving enormous storage capacity for the future of HDDs. These days, HDDs seldom come to news due to the rise of other advanced storage options like SSDs. But, Seagate has stunned the analysts with an amazing storage density of 1TB, or one trillion bits per square inch. It is theoretically about 55 percent improvement over the current 620GB per square inch.

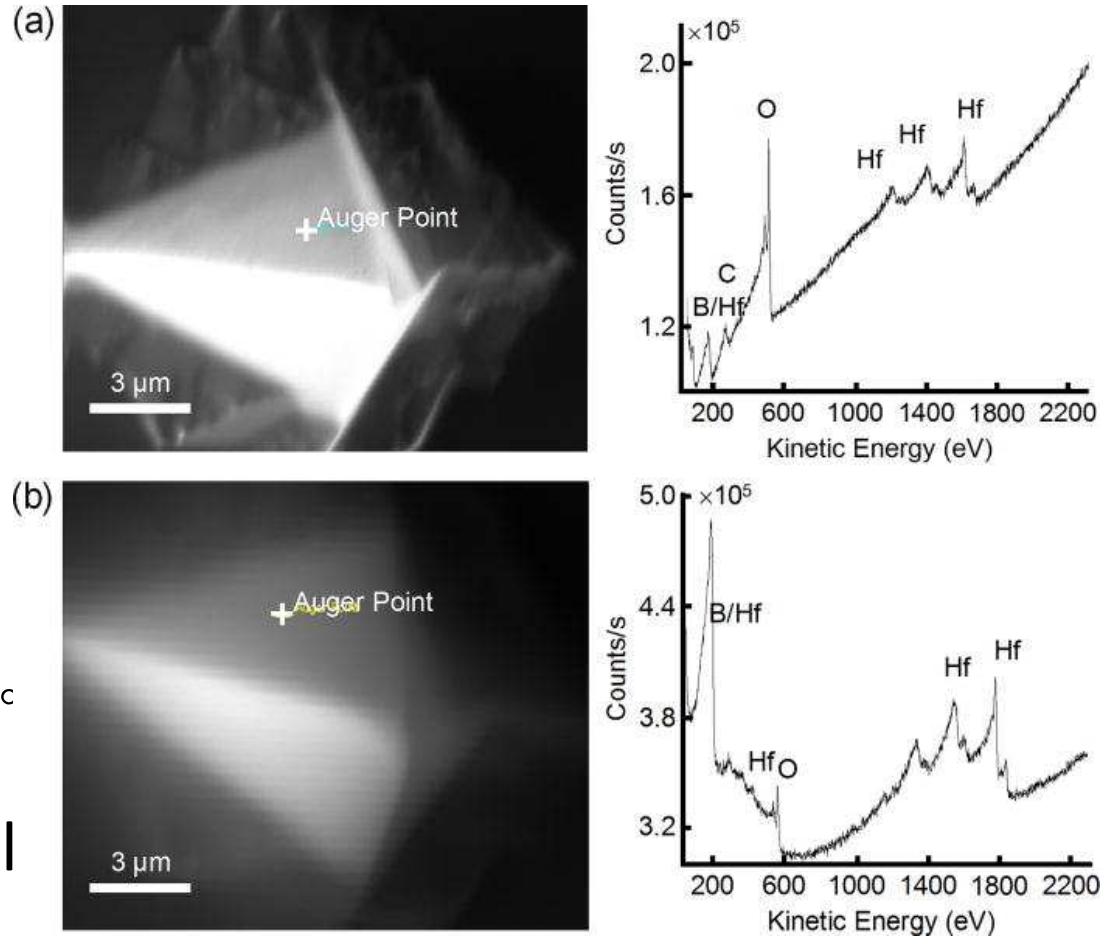


# Patterned Magnetic Media



# probe-based storage

- 据Intel研发团队介绍称：该硬盘的探针通过发送瞬间电脉冲，将数据比特信息发送到只有几纳米面积的铁电薄膜（ferroelectric film）上，铁电体材料在周围电场的作用下被永久的极化，从而实现数据存储。
- 每平方英寸能够保存超过1TB的数据，不过Intel并未公布总存储量为多少。



- 2010年底，硬盘工业界预测下一个技术变革将在西元2014-2015年之间。

- [zh/en.wikipedia.org](http://zh/en.wikipedia.org)
- “Recording heads with trackwidths suitable for 100 Gbit/in<sup>2</sup> density, “IEEE Trans. Magn., 35 (5), 2544-6 (1999)
- Proceedings of the IEEE | Vol. 96, No. 11, November 2008, Heat Assisted Magnetic Recording
- <https://www1.hgst.com/hdd/research/storage/pm/index.html>, Patterned Magnetic Media
- Applied Physics Letters , Volume 101 , Issue 9 , Hard HfB<sub>2</sub> tip-coatings for ultrahigh density probe-based storage