

# Challenges in 1 Teradot/in.<sup>2</sup> dot nanoimprint lithography for bit-patterned media

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An ever-increasing demand for higher capacity information storage devices is forcing the magnetic storage industry to develop alternative technologies to the currently adopted perpendicular magnetic recording (which is already driving longitudinal recording out of the market). A leading technological candidate for extending perpendicular magnetic recording beyond 1 Terabit/in<sup>2</sup> is bit-patterned media (BPM), in which magnetic nano-arrays are fabricated and where each “island” in the array forms a separate recording magnetic bit.

This talk will focus on the key challenges in nano-imprint lithography for BPM applications. While significant progress has recently been made in demonstrating both the high-resolution dot patterning using a X-Y stage e-beam tool <sup>[1]</sup>, and the imprinted results <sup>[2]</sup>, many serious issues still remain in many of the technical prospects. The major challenges include: 1) the commercial availability of a high-resolution rotating stage e-beam tool, which is urgently required to generate a concentric circular track pattern for master template fabrication; 2) the processing difficulties in the fabrication and replication of a 1× template with 1 Teradot/in<sup>2</sup> densities and above. The defectivity, lifetime and damage of the template are still questionable; 3) the tight requirements of size uniformity and positioning sigma. For reasonable SNR, the bit size and positioning variation must not exceed 6% (1σ) <sup>[3]</sup>; 4) the needs of advanced metrology associated with these very small dots characterization; and 5) the feasibility of a double-side imprint solution, defect density control, and throughput for manufacturing. In this talk, we will address the above challenges and present our initial experimental results of 25 nm pitch (1 Teradot/in<sup>2</sup>) dot patterning in resist, template fabrication, and imprinted results as example for discussion.

<sup>1</sup> XiaoMin Yang et al, JVST B 25(6), 2202, 2007

<sup>2</sup> Douglas Resnick et al, Mater. Res. Soc. Symp. Proc. Vol. 961, 2007

<sup>3</sup> Richter et al, APL **88**, 222512, 2006