CANON ANELVA CORPORATION, hereafter “CANON ANELVA”, (President: Junro Sakai HQ: 2-5-1, Asao-ku Kurigi, Kawasaki-shi, Kanagawa, JAPAN) developed a sputter equipment “NC7900”, which enables new generation STT-MRAM\(^1\) mass-production. Recently we announced 200% of MR ratio\(^2\) for Perpendicular\(^3\) MTJ\(^4\) using this equipment.

NC7900 enables high quality deposition of multilayer stack with perpendicular magnetic anisotropy for next generation STT-MRAM.

- **Achieved 200% of MR ratio for Perpendicular MTJ**
  We have achieved 200% of MR ratio for Perpendicular MTJ, which is required for mass-production of high-capacity MRAM.

- **Successor of “C-7100EX”**
  NC7900 enables mass-production of φ300mm MRAM. The design concept of NC7900 is based on “C-7100EX”, which has about 90% share of worldwide MRAM development equipment\(^5\). NC7900 provides low particle count and high throughput. This tool is designed for mass-production line and is expected to release to market by second Quarter of 2014.

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1 STT-MRAM: New generation MRAM, utilizes Spin-Transfer-Torque effect to reverse magnetization.
2 MR ratio: Magnetoresistance ratio. High MR ratio is necessary to reach high-capacity MRAM.
3 Refers to the direction of magnetic anisotropy as out of film plane.
4 Magnetic Tunnel Junction, a thin film stack comprising magnetic & nonmagnetic films in certain order. The resistance of this stack depends on relative orientation of magnetization of the magnetic films.
5 As per our own research.
1. History

CANON ANELVA, an experienced leader in high technology PVD tools, has a dominant market share for MTJ Production/Development equipment. In 2001, we released “C-7100” equipment, the first 200mm wafer MTJ deposition equipment in the world. We have shipped over fifty (50) units of C-7100 for HDD head manufacturing and have 100% of worldwide share. We have also shipped this equipment to several customers for MRAM development. In 2004, we released 300mm wafer “C-7100EX” dedicated to MTJ development. The “C-7100EX” has 90% of worldwide share in MRAM market.

Megabit size MRAM chips are now available in market. R&D teams worldwide are currently working on gigabits mass-capacity MRAM to replace the DRAM. To increase the MRAM capacity, the perpendicular MTJ STT-MRAM is most suitable candidate. For this type of MTJs, the film stack structure and related processes are more complicated than those for in-plane MTJs. With our “NC7900”, we open pathways for mass-production of perpendicular MTJ STT-MRAM.

We have been evaluating reliability of “NC7900” located in our fab. Although a mass-production base equipment, we confirmed top-class 200% MR ratio for perpendicular MTJ.

2. Features

- Inherit the concept of world’s top-class C-7100EX (Ultra High Vacuum and Oblique sputter).
- Available for Perpendicular Magnetic MTJ as well as longitudinal MTJ processes.
- 20 wph throughput for Perpendicular MTJ.
- Ultra High Vacuum (base pressure on the order of $10^{-8}$ Pa).
- Energy conservation design (10% improvement in energy consumption compared to C-7100EX).
- Productivity: MTBF over 400h, MTTR less than or equal to 4.5h, uptime over 95%

* Throughput, MTBF, MTTR, uptime is now under evaluation.

3. In future

We are targeting to release NC7900 by second Quarter of 2014, keep progress of mass-production evaluation and continue to improve overall performance.

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6 Depending on condition of MTJ multilayer, throughput may change.
7 MTBF: Mean Time Between Failure
8 MTTR: Mean Time To Repair
9 Uptime is available equipment time for operation. It represents equipment reliability and stability.
CANON ANELVA, a wholly owned company by CANON Inc., has great knowledge of Vacuum technology and provides vacuum deposition equipments, vacuum gauges, vacuum pumps and its parts. In vacuum deposition equipment field, we have a number of product line-up for sputtering equipment and worldwide top share on HDD head and Media field. We have received honorable awards such as “Prime Minister’s Award”, “Inoue Harushige Prize Committee”, and “Ichimura Industrial Award”. Our latest business has provided a number of equipment for Smart device field. Annual sales revenue for 2012 was 37.1 billion yen.