

Nano-Spin Motor



Innovative "Nano size Motor" realize GHz rotational speed

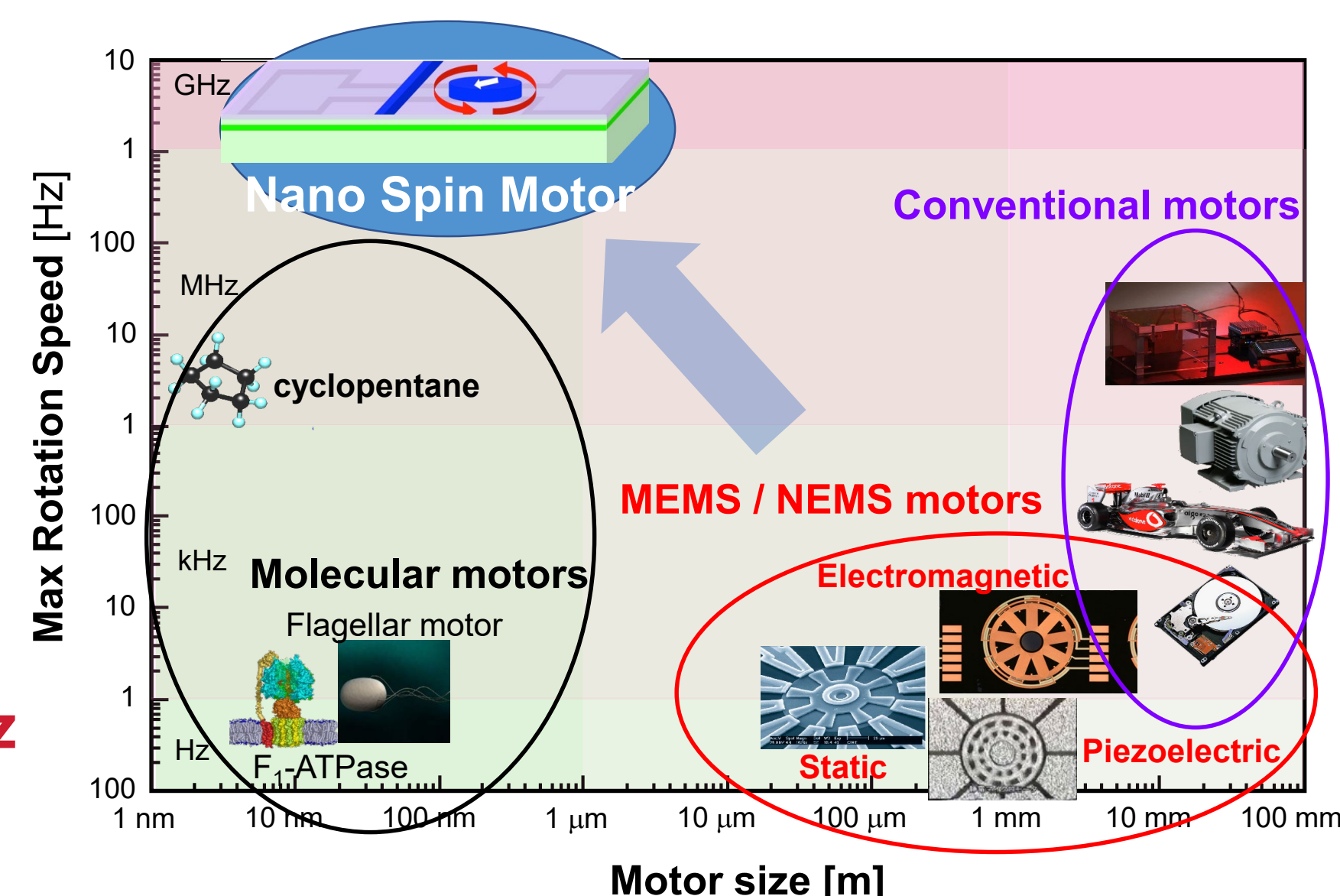
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1. Motor Innovation Trend

"Smaller", "High Rotational Speed" and "Durable" motors have been required.

Several MEMS/NEMS motors have been introduced but they can not realize.

- Size: less than 100 nm
- Rotational Speed: faster than GHz
- Unlimited usage time

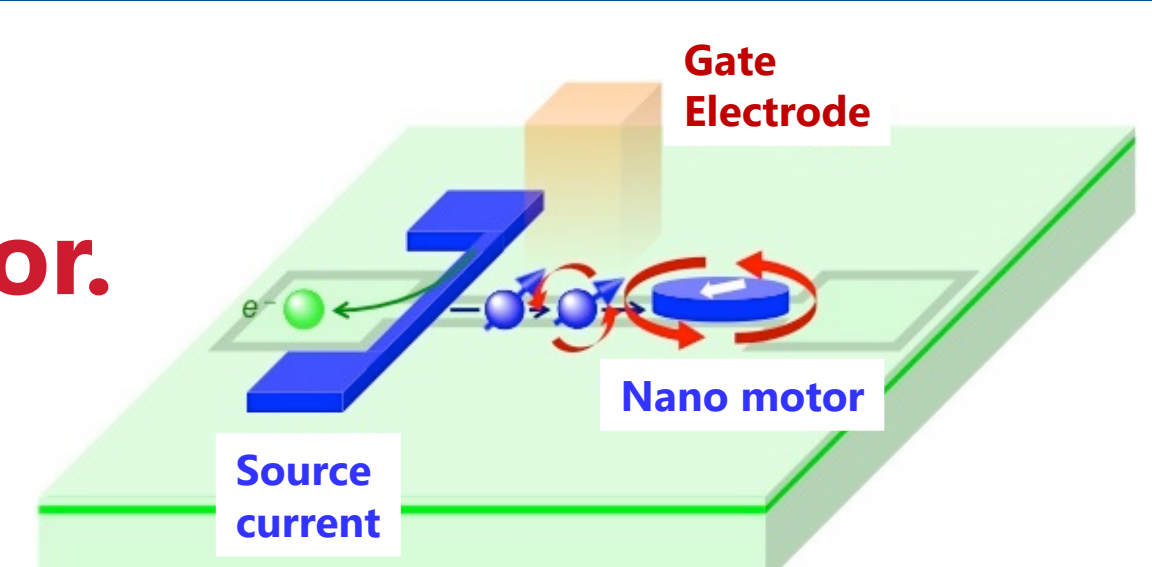


2. Novel "Nano Spin Motor"

Nano-spin motor can be the fastest motor.

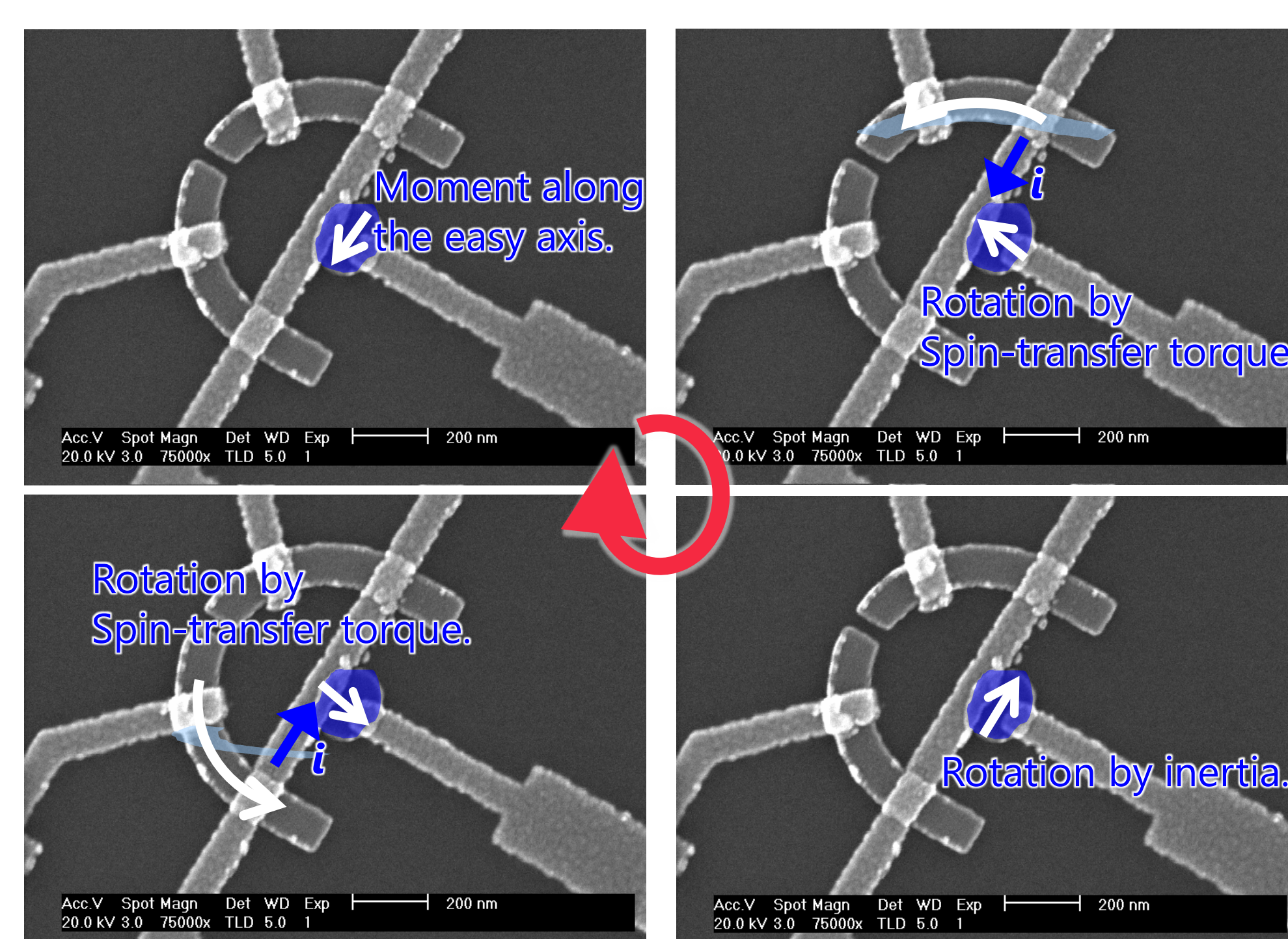
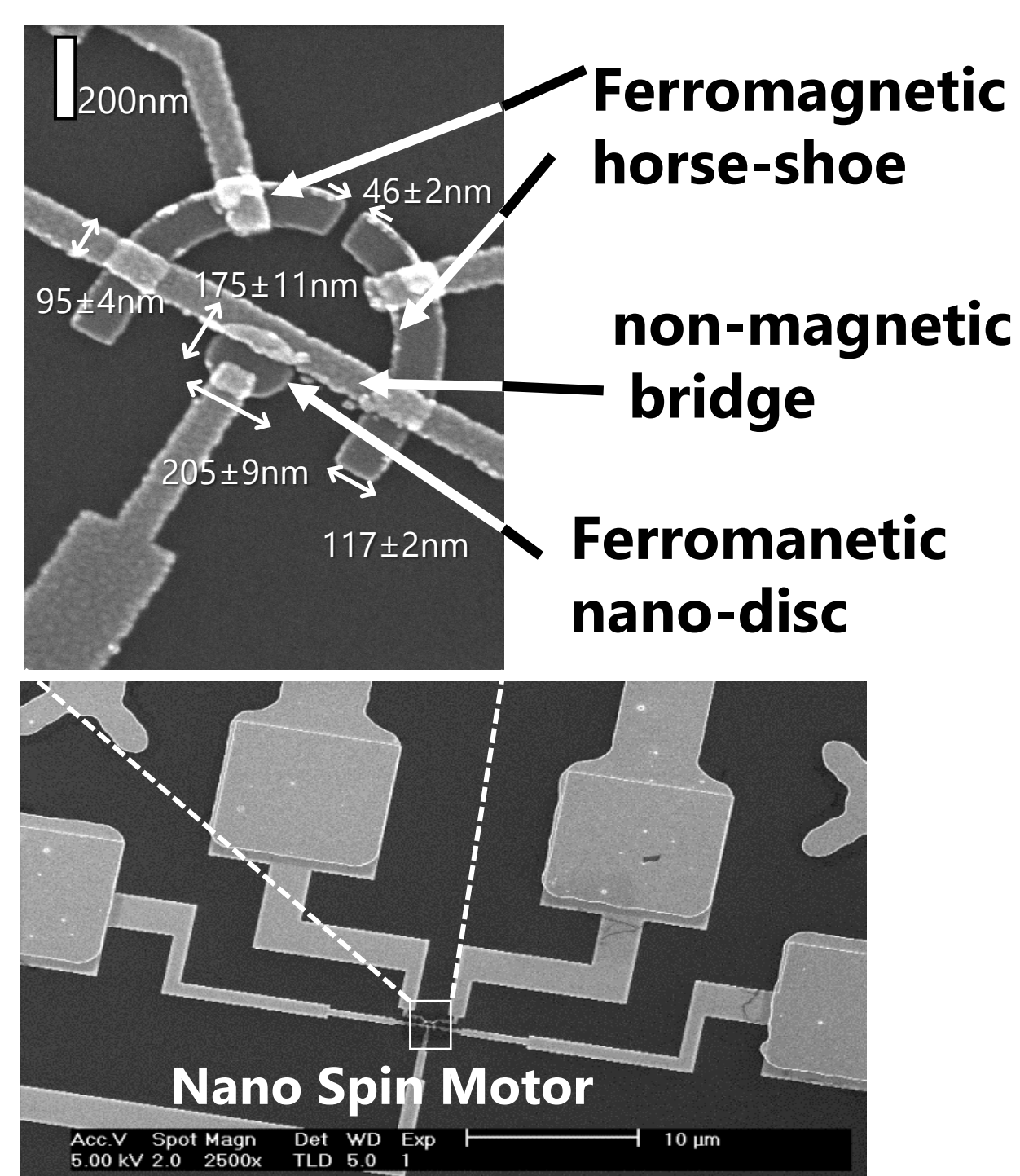
Mechanism

A spin-polarized current can rotate a magnetic moment in a ferromagnetic disc, which has continuous tunability between 0 and a few GHz reproducibly.



	Conventional	This invention
Rotation Frequency	Hz ~ kHz	Hz ~ GHz
Device size	100 μm ~ 1 mm	100 nm ~ 1 μm

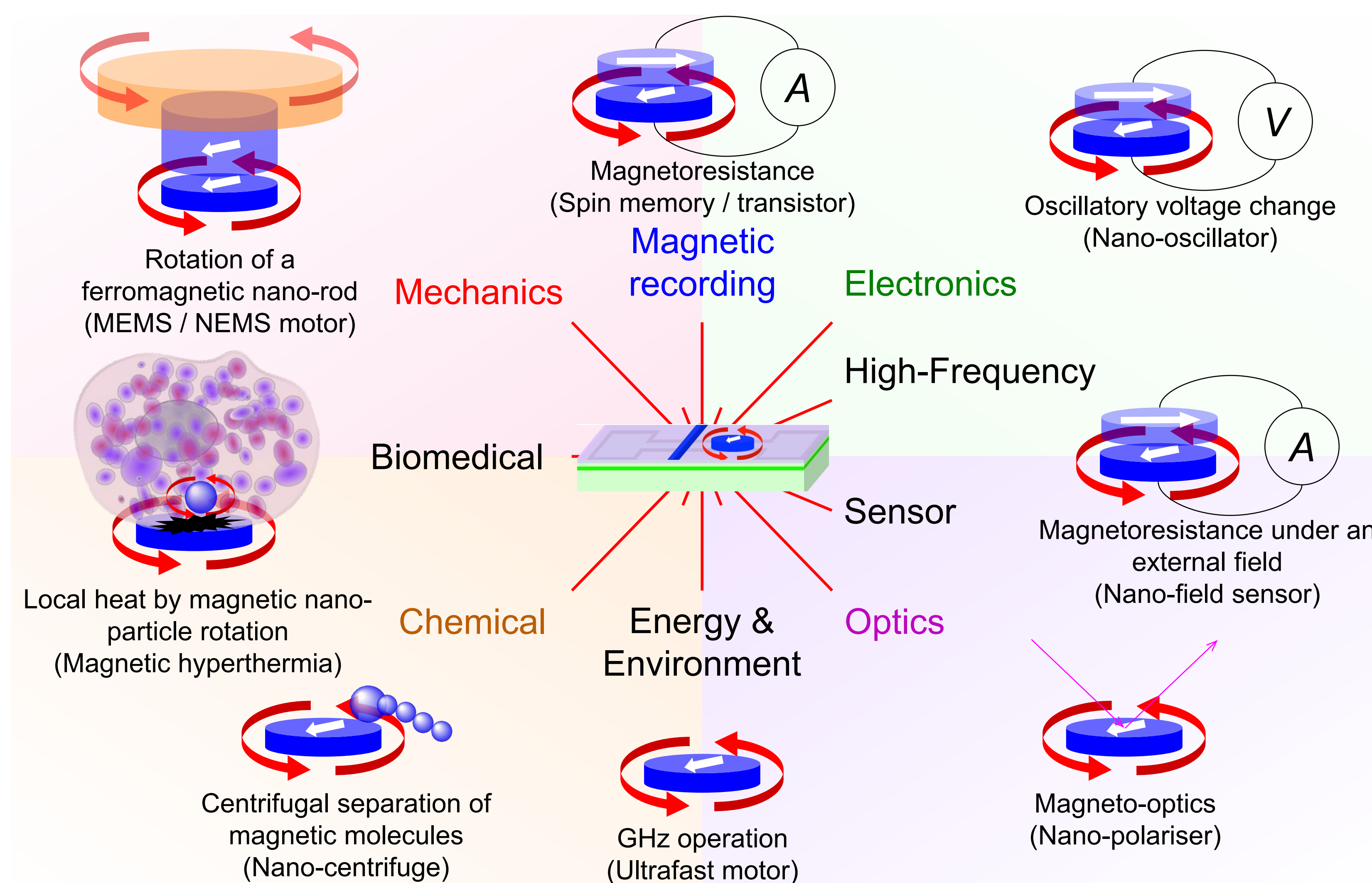
Electrical operation to rotate magnetic moment



An all-metallic nano-spin motor is fabricated with a split ferromagnetic horse-shoe and a nano-disc as well as a non-magnetic bridge and electrodes.

By alternatively introducing a current from each split horse-shoe, spin-polarised electrons exert a torque onto the nano-disc, achieving the rotation of the magnetic moment in the nano-disc.

3. Potential Applications



- A nano-spin motor, nano-flow controller for a MEMS and NEMS up to GHz rotation.
- Molecules and cells stirrer, using those tagged with magnetic nanoparticles
- Local nanoscale heater via the rotation of a magnetic nanoparticle in a cell for perforation.

4. Patent Licensing Available

Patent No.: WO2014/024697 (JP, US, EP, CN, TW & KR)

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