Principal Researcher	Koichiro Asahi	Number of Reserchers	3
Research Institution Department Title	Professor, Graduate School of Science and Engineering, Tokyo Institute of Technology	Location of Institution	Meguro, Tokyo
Title of Project	Ultrahigh-Sensitivity Search for an Electric Dipole Moment of a ^{129}Xe atom by Means of Nuclear Spin Maser with Artificial Feedback		
Abstract of Research Project	Non-zero value of a permanent electric dipole moment (EDM) can occur only if the time-reversal invariance is violated, and thus provides an important probe for theories which describe the world of elementary particles and fields. The project is aimed at a search for a permanent electric dipole moment (EDM) of ^{129}Xe atom in a range down to two orders of magnitude lower than the present experimental limit $|d\,(^{129}\text{Xe})| < 4\times 10^{-27}$ e·cm, the region of $|d|$ where the presently most promising theories predict. An EDM is measured through a frequency change which would occur in the precession of a ^{129}Xe nuclear spin when the direction of an electric field is reversed. The keys to a high sensitivity detection of an EDM therefore are: i) a long lasting time of the spin precession, and ii) a high precision of the magnetic field monitoring. We will meet these requirements by incorporating a nuclear spin maser of new type, which we have recently succeeded in putting into operation by introducing an artificial feedback mechanism. The maser of this type enables a self-sustained precession of ^{129}Xe spins at fields as low as ~10 mG, and thus allows a high-precision field monitoring by means of the non-linear magneto-optic effect. By this experiment, we thus expect that the presence of physics beyond the standard model may be established if a finite $|d|$ value is found, or some limit would be set upon theories proposed to extend the standard model, if an upper limit to $|d|$ is obtained.		
References	1) "Nuclear Spin Maser with an Artificial Feedback Mechanism", H. Yoshimi, K. Asahi, K. Sakai, M. Tsuda, K. Yogo, H. Ogawa, T. Suzuki, and M. Nagakura, *Phys. Lett.* A 304, 13-20 (2002). 2) "Measurement of parity-nonconserving rotation of neutron spin in the 0.734-eV p-wave resonance of ^{139}La", T. Haseyama, K. Asahi, J.D. Bowman *et al*, *Phys. Lett.* B 534 (2002) 39-44.		

Term of Project	Fiscal years 2003-2007 . (5years)					

Budget	FY2003	FY2004	FY2005	FY2006	FY2007	TOTAL
Allocation (in thousand of yen)	21,500	17,200	13,700	14,400	9,200	76,000

Homepage Address		None