Principal Researcher	Kenshi Sagara	**Number of Reserchers**	5
Research Institution • Department • Title	Professor, Department of Physics, Kyushu University	**Location of Institution**	Fukuoka City

Title of Project	Direct Measurement of Cross Sections of Nuclear Fusion Reactions in Stars
Abstract of Research Project	In heavy stars after finishing hydrogen burning, helium begins to burn. First ^{12}C is made from three ^{4}He ' s, then $^{4}He+^{12}C->^{16}O+\gamma$ reaction takes place. This reaction plays a very important role because it determines C/O ratio which, for example, influences production of albumen and determines whether the star becomes a supernovae or a red dwarf. Measurement of the reaction rate has been attempted for about 35 years in the world, however, no precise data have been obtained yet. Purpose of the present study is to precisely and directly measure the $^{4}He+^{12}C->^{16}O+\gamma$ reaction cross section at stellar energy. Since the cross section is extremely small, we increase ^{12}C beam intensity by a new acceleration method (ref.2), use a blow-in type ^{4}He target of sufficient thickness (ref. 1), and detect ^{16}O recoils with high efficiency using a recoil mass separator. Background level in the detection is now 10^{-14}. To obtain the goal, the BG level should be decreased to 10^{-19} and measurement for a few months is necessary. We will develop new methods in the separator, in the detector and in the accelerator, and will obtain the precise data in five years. The new methods to be developed will be widely used to detect infinitesimal amount of particles, such as super heavy new elements.
References	1）K. Sagara, A. Motoshima, T. Fujita, H. Akiyoshi and N. Nishimori, A Blow-in Type Windowless Gas Target, *Nuclear Instrument and Methods* A278 (1996) p.392-p.398 2）K. Sagara, T. Nakashima, et al., Strong-focusing in tandem accelerator with alternating voltage gradient, *Nuclear Instrument and Methods* A484 (2002) p.88-p.94
Term of Project	Fiscal years 2003-2007 . （5years）

Budget Allocation (in thousand of yen)	FY2003	FY2004	FY2005	FY2006	FY2007	TOTAL
	28,900	23,700	24,000	5,800	5,900	88,300

Homepage Address	http://www.kutl.kyushu-u.ac.jp/index-j.shtml