# New experimental approach to determine the electron screening potential of various atomic configurations for fusion reaction

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Ambiguities of screening potential for cross section enhancement prevent to deduce a precise astrophysical S-factor in charged particle nuclear fusion reaction. There are several experimental efforts to overcome these difficulties:
1) by using invert reaction between target and projectile, such as $^{3}$He(d,p)$^{4}$He and d($^{3}$He,p)$^{4}$He,

2) by changing the target pressure which establish the values for the energy loss used in data reduction, d($^{3}$He,p)$^{4}$He,
3) by different combination for incident channels such as
$^{6}$Li(p,a)$^{3}$He, $^{6}$Li(d,a)$^{4}$He, $^{7}$Li(p,a)$^{4}$He,
4) by using molecular beam such as D($^{3}$He,p)$^{4}$He and $^{3}$He(d,p)$^{4}$He.

Recently there have been important techniques to investigate the S-factor without the electron screening effect; they are Trojan Horse method and the particular apparatus for bare target-beam interaction.
Here we propose new experimental approach to determine the screening potential for fusion reaction. Since bare target atoms have never been available until now, we could propose a possible approach to investigate the atomic effect for screening potential of fusion reaction. Based on the present experiments of $^{3}$He($^{3}$He,2p)$^{4}$He reaction at low center of mass energy around 28-keV, it is noticed that incident beam remains partially charged and interacts with neutral target atoms. Thus, there happen various kinds of interaction between target and beam in charge states, such as 3He(0) + 3He(0), 3He(0) + 3He(1+), 3He(0) + 3He(2+), 3He(1+) + 3He(1+), 3He(1+) + 3He(2+), 3He(2+) + 3He(2+). These are possible combination of atomic states for target and beam though the target excitation might be hardly happened. In order to discriminate each contribution from these states to the screening potential, we are trying to introduce the electric or magnetic filter similar to the velocity filter (Wien Filter) before the target and detector assembly.

Present status of our experimental results and perspective design will be detailed in the conference.