

# poster project

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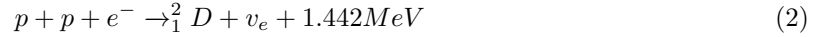
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## 1 Proton-Proton Chain Reaction

Initially two protons will undergo fusion to form deuterium. One of the protons will experience beta plus decay.[1]

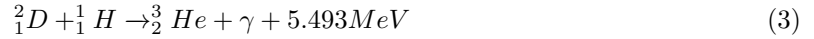


the resultant positron will annihilate with an electron into two gamma rays and the complete equation can be seen.



This reaction is quite slow due to the fact it is started by weak nuclear forces. On average a proton stays in the core of the sun for  $1 \times 10^9$  years. Due to the time taken it has so far experimentally impossible to calculate the cross section[3].

A fast reaction is now initiated by the strong nuclear force



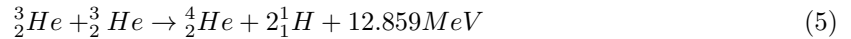
In our sun deuterium only exists for approximately one second before fusing with a proton[1]. The overall reaction is



This releases 26.73 MeV of energy, not accounting for what is lost to neutrinos[3].

### 1.1 P-P I Chain

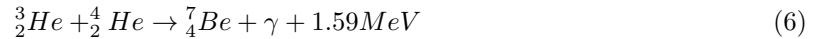
The first branch of the p-p chain produces 83.3 percent of  ${}^4_2He$ . the equation for the p-pI branch is as follows:



This branch is dominant between temperatures of 10-18MK[2].

### 1.2 P-P II Chain

This branch is dominant with temperatures between 14-23MK[1]. This section includes the following three reactions:



## References

- [1] Eric G Adelberger et al. "Solar fusion cross sections. II. The p p chain and CNO cycles". In: *Reviews of Modern Physics* 83.1 (2011), p. 195.
- [2] Christian Iliadis. *Nuclear physics of stars*. John Wiley & Sons, 2015.
- [3] Anthony C Phillips. *The physics of stars*. John Wiley & Sons, 2013.