



## Giant Particle Chess

Team Event, Open-To-All

Points: 20

### ***Before the game:***

There can be only one team of 16 members from each pool, with a captain leading the side. The captain is involved in:

1. Representing the team as a whole during probabilistic events like the toss.
2. Issuing instructions to team members and deciding the next move in the game.

The two sides are called "Matter" and "Antimatter". The Matter side plays first.

The 16 members of each team are randomly allotted particles (chess pieces) and initial positions to participate in the game through a selection of chits.

An impartial referee will be overseeing the match. Disputes, if any, will be addressed to him and his word will be the final.

### ***During the game:***

Most rules from chess apply as they are with the following changes in terminology:

1. The chess board itself is the all-pervading Higgs field. Everything you do in the match will be encompassed by this mysterious field.
2. The co-ordinates are replaced by ordered pairs of numbers. For example, a6 becomes (1,6) and g2 becomes (7,2). The captains are to specify each move aloud by saying "<Particle> to <co-ordinates>", for example, "Black King to e5" is replaced by "Antiproton to (5,5)". Remember that if you are in the Antimatter team, you must use the appropriate terminology for the antiparticle, except for one of them, where it



doesn't make a difference. (Which one?)

3. Capturing a piece will be termed "Annihilation" of matter and antimatter.

4. Castling will be termed "measurement of the entangled proton-  $K^+$  system." For example, "I would like to measure my entangled system of His Revered Majesty the Proton and the  $K^+$  meson at <position>". Scientific humour in announcing moves is appreciated.

5. Terminology for chessmen:

- a. The King is the Proton- stable, massive and sluggish, content to sit in His place.
- b. The Queen is now the Electron- Highly mobile and energetic, can interact whenever needed.
- c. The Rook is the  $K^+$  meson.
- d. The Bishop is the WIMP! No, we do not mean it is a cowardly piece, we just mean to say that it is one of the Weakly Interacting Massive Particles that could be a candidate for dark matter. Weakly interacting because it can go right through the other pieces.
- f. The Pawns are the neutrinos, the little ones. Can change flavour when in their mass eigenstates after reaching the other end of the Higgs field.

***Additional rules :***

During the course of the game, at the all odd prime turns the referee will roll a die. A turns consists of a move by both matter and anti matter. Whenever the prime is of the form  $4k+1$ , then the die will be rolled at the start of matters move, and if it is of the form  $4k-1$  then the die will be rolled at the start of anti-matters turn. Since 2 is the





“oddest” of the primes, the die will be rolled at the start of both matter and anti matters turn at the 2nd move.

If a “1” comes up on the die, then the referee will introduce a particle-antiparticle pair of neutrinos (pair production), to remain for 5 moves, after which they will again annihilate with their respective antiparticles. If, by then, one of the new neutrinos has already been annihilated, then the 5 move rule does not apply to the other neutrino, i.e. He stayed until killed.

Also, whenever a particle of one type kills any other particle of the same type, then they annihilate and both are removed from the board. This does not apply to neutrinos because of they are neutral.

Electrons can scatter off particles of the same nature, i.e electrons (anti-electrons) can be reflected off other matter(antimatter) particles. They cannot scatter off neutrinos. The laws of reflection will apply. The reflected electron can go on to annihilate another in the same move. Multiple reflections are allowed.

Entanglement: A team may choose to entangle any two of its particles for the cost of a move. Entangled particles move simultaneously, and follow the moves of either of the two particles. The captain will choose which of the two particles they will simultaneously move like, and this choice will remain final through the duration of the entanglement. The entanglement will last for a duration of 5 turns. Moves are only allowed if they are valid for both pieces.

***Time-limit:***

Each team given 15 min to complete their moves. Whoever finishes their time first lose. In case of any discrepancy, the decision of Co-ordinators will be final.

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