Pre-Matching Algorithm

This algorithm will be used to help find those D2D links that can perform SWIPT in the D2D communication system.

The pseudocode of this algorithm will look like this:

Algorithm 1 Pre-Matching Algorithm		
Input	:	$D, C, P_k^c, P_{thresold}^1, P_{max}, T_{min}^D$
output	:	$PS, InfD, EnaD$
Initialize	:	$EnaD = \emptyset, InfD = \emptyset$
Step 1	:	**for** $i \in D$ **do**
Step 2	:	$PS_i^D = C$
Step 3	:	**for** $k \in C$ **do**
Step 4	:	obtain $\theta_{i,min}$ using (6), obtain $T_{i,max}^D$ using (8)
Step 5	:	**if** $\theta_{i,min} \geq 1$ or $T_{i,max}^D \leq T_{min}^D$ **then**
Step 6	:	Remove current k from PS_i^D
Step 7	:	**end if**
Step 8	:	**end for**
Step 9	:	**if** $PS_i^D = \emptyset$ **then**
Step 10	:	add i to $InfD$
Step 11	:	**elseif** $PS_i^D \neq \emptyset$ **then**
Step 12	:	add i to $EnaD$
Step 13	:	**end if**
Step 14	:	add PS_i^D to PS
Step 15	:	**end for**

As shown the pseudocode, the generated D2D links set D, CUE set C, transmission power of CUE P_k^c, the minimum power segment $P_{thresold}^1$, maximum transmission P_{max}, the minimum Throughput of a D2D link T_{min}^D will be taken as input, and it should generate a partner selection PS, a SWIPT-supported D2D link group $EnaD$ and a Non-EH group $InfD$.

To start with, two empty sets for $EhaD$ and $InfD$ will be firstly initialized respectively. Each D2D link i will be paired with a CUE k from a sub-partner selection PS_i^D which will be initialized as the CUE set C for each loop of D2D i can be obtained using equations:

$$\theta_{i,min} = \frac{P_{thresold}^1}{P_{max}h_i^D + P_k^c h_{k,i} + N_0}(1)$$

$$T_{i,max}^D = \frac{P_i^D h_i^D}{P_k^C h_{k,i} + N_0 + \frac{N_1}{1-\theta_{i,min}}}$$

Then, as mentioned before, for each D2D link i paired with the current CUE k, if the minimum power splitting ratio $\theta i,min$ of the current D2D i is greater than 1 and the maximum throughput $T_{i,max}^D$ is smaller than the minimum throughput T_{min}^D, that means it is impossible for the current CUE k to help the D2D link i perform SWIPT, then the current CUE k will be removed from the sub-partner selection set. Finally, at the end of loop of the CUE set, the current sub-partner selection will be checked if it is empty, if so, it means that the current D2D link i cannot find any CUE k to help it perform SWIPT hence cannot activate EH, then it will be added to $InfD$. Otherwise, it means that there is at least one CUE k which can help it perform SWIPT and it will be

added to the group $EhaD$. The sub-partner selection will be added to the partner selection set PS. So, at the end of this pre-matching algorithm, each D2D link i will have a partner selection set where the CUEs can help it perform SWIPT.