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Basically, reinterpret the prematching algorithm which is used for separating the system models into two different groups: 1. non-EH D2D link group which can not perform SWIPT(which think interference as noise) 2. SWIPT-enabled link group which thinks of the interference as useful information.

## Algorithm

- Prematching Algorithm

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### Algorithm 1 Prematching Algorithm

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**Input:**  $\hat{D}, \hat{C}, P_k^C, P_{th}^1, P_{max}, T_{min}^D$ .

**Output:**  $S_i^D, Inf^D, Eha^D$ .

**Initialize:**  $S_i^D = \hat{C}, Inf^D = \emptyset, Eha^D = \emptyset$ .

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1: for  $i \in \hat{D}$  do
2:   for  $k \in \hat{C}$  do
3:     obtain  $\lambda_{i,min}^e$  using (9), obtain  $T_{i,max}^D$  using (10).
4:     if  $\lambda_{i,min}^e > 1$  or  $T_{i,max}^D \leq T_{min}^D$  then
5:        $S_i^D \setminus k$ .
6:     end if
7:   end for
8:   if  $S_i^D = \emptyset$  then
9:      $Inf^D \cap i$ .
10:  else
11:     $S_i^D \neq \emptyset, Eha^D \cap i$ .
12:  end if
13: end for
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This prematching algorithm is basically used for separating the SWIPT-enabled D2D links and non-EH D2D links. As clearly shown in the pseudocode of the algorithm, the function first take set of Cellular links set(which is marked as  $\hat{C}$ ), the D2D link set(which is marked as  $\hat{D}$ ), the transmission power of CUE K(which is marked as  $P_k^C$ ), thresholds on the received power for EH at D2D receiver when sharing the RB with CUE(which is marked as  $P_{th}^1$ ), the maximum transmission power(which is marked as  $P_{max}$ ) and the minimum throughput of D2D link 1 when satisfying the EH circuit (which is marked as  $T_{min}^D$ ) as the input argument. And the output will be **partner selection set**( $S_i^D$ ), the non-EH D2D links(which can not perform SWIPT)( $Inf^D$ ), the SWIPT-enabled D2D links( $Eha^D$ ).

This algorithm can be divided into following steps:

- First, initialize the partner selection set with Cellular link set and assign an empty set to SWIPT-enabled D2D links and non-EH D2D links respectively.
- Scan each link in the D2D links set and each link in the Cellular link sets. For each iteration, assign value to the power splitting ratio and The maximum throughput through following equations:

$$\lambda_{min}^{e,i} = \frac{P_{th}^1}{P_{max}h_i^D + P_k^C h_{k,i} + N_0}$$

$$T_{i,max}^D = \log_2\left(1 + \frac{P_{max}h_i^D}{P_k^C h_{k,i} + N_0 + \frac{N_1}{1-\lambda_{i,min}^e}}\right)$$

For each iteration, if the power splitting ratio is greater than 1 or the maximum throughput for SWIPT-enabled D2D link 1 is smaller than the input threshold throughput, then partner selection set will remove k link from CUE.

- After the nested for loop, the algorithm will check if the final partner selection is empty. If so, the D2D link will be grouped into the non-EH D2D link set otherwise it will be grouped in to SWIPT-enabled D2D link set.