patterns are drawn *based on local knowledge*, i.e., the driving path of a given node is determined by the oscillation data of this node and few nodes in direct interactions. Lack of information around certain node does not affect the applications of the DPAD method to nodes far away. In these cases it is possible to draw incomplete TFL patterns from incomplete knowledge, and these unperfect TFL patterns may still provide useful and instructive guidance in analyzing the oscillations. Here we only consider a relatively simple situation of information lacks – incomplete interaction structure.

We again consider the state of Fig. 2(c), and apply the DPAD method with incomplete interaction knowledge. Specifically, we draw the TFL pattern under the condition that 50 L-RCs randomly chosen unknown. One of these TFL patterns is shown in Fig. 5(a). Comparing Fig. 5(a) with Fig. 3(b) we find while Fig. 3(b) has a single connected network, Fig. 5(a) has at most 51 clusters disconnected from each other (only 4 clusters are shown in Fig. 5(a)). In the incomplete TFL pattern we observe some tree-like networks each having a source node controlling the downstream nodes. We also find a cluster having a TFL loop which is exactly the same as the source loop of Fig. 3(b). It is obvious that Fig. 5(a) keeps the essential structure of the complete TFL shown in Fig. 3(b). In particular, from Fig. 5(a) we see clearly the oscillation source and we can locate the two key L-RCs in the source loop which control the whole oscillatory state. In Fig. 5(b) we present another TFL pattern for a different set of unknown 50 long-range interactions, where a L-RC on the source loop of Fig. 3(b) is, unfortunately, chosen to be unknown. Now we observe no loop but at most 50 tree clusters (4 clusters shown in Fig. 5(b)), each is driven by a source node. And the source nodes themselves are not driven by any other node in the incomplete TFL. It becomes difficult to locate the source loop without some additional information. Nevertheless, the incomplete TFL pattern of Fig. 5(b) can still show rich driving paths of the state Fig. 2(c) and it may serve as an excellent guidance for analyzing the oscillation organization. The following understanding is of great help in estimating the unknown L-RCs of the source nodes. (i) Each source node must be driven by a L-RC phase-advanced. (ii) In TFL pattern the phase differences between all pairs of target centers and their corresponding upstream driving nodes are approximately the same (they are about 1.91 *rad* in our system as shown in Fig. 5(c)). This phase difference can be used for seeking the upstream driving nodes of the unknown L-RCs. (iii) The ″source″ node controlling the largest tree cluster of Fig. 5(b) has large probability to be a key node in the source loop (this conclusion is confirmed by all 10 test, using different sets of unknown L-RCs). These conclusions, which may be popular for self-sustained target waves in small-world excitable networks, can considerably reduce the difficulty in recovering the complete TFL. If we have some additional (still not complete) information which may be model dependent, the above conclusions may be used for predicting the missing long-range driving links of the source nodes and recovering the complete TFL structure. For instance, in our system