

1047-05-283

Ye Dong* (dye@math.wvu.edu), Department of Mathematics, West Virginia University, Morgantown, WV 26506. *Pfaffian Orientations in Cubic Polyhex Graphs on the Torus and the Klein Bottle.*

Let G be a graph admitting a perfect matching. A circuit of even size C is *central* if $G - C$ has a perfect matching. Given an orientation to G , an even circuit C is *oddly oriented* if along either direction of traversal around C , the number of edges of C with the direction as the same as the traversal direction is odd. An orientation of G is *Pfaffian* if every central circuit of G is oddly oriented. A graph G is *Pfaffian* if it has a Pfaffian orientation. A brace is a 2-extendable bipartite graph. A complete characterization Pfaffian braces was obtained by Robertson, Seymour and Thomas, and independently by McCuaig.

A polyhex graph is a cubic graph embedded on a surface with only hexagonal facial circuits. By the Euler's formula, the surface can be only the torus or the Klein bottle. C. Thomassen gave a classification for polyhex graphs. Every polyhex graph on the torus is bipartite. But a polyhex graph on the Klein bottle is not necessary bipartite. We show that a cubic polyhex graph on the torus is pfaffian if and only if it is planar, or isomorphic to the Heawood graph. For a polyhex graph on the Klein bottle, we show that it is Pfaffian if and only if it is planar or non-bipartite. (Received January 30, 2009)