Meeting: 1003, Atlanta, Georgia, MAA CP T1, MAA Session on Mathematics Experiences in Business, Industry, and Government

1003-T1-347 **Gregory E. Coxson*** (gcoxson@ieee.org), 607 Windsor Place, Moorestown, NJ 08057, **James K Beard** (jkbeard@comcast.net), mail stop 137-233, Lockheed Martin MS2, 199 Borton Landing Road, Moorestown, NJ 08057, **Jon C Russo** (jrusso@atl.lmco.com), 20 Christian Street, Cherry Hill, NJ 08054, and **Keith Ericson**, **Michael Monteleone** and **Michael Wright**. *Recent Results on Costas Arrays.*

Costas Arrays are permutation matrices with the special Costas property: Translating the matrix by an integral number of rows and columns and overlaying it on the original never results in more than one 1 falling on top of another 1. This makes them ideal as frequency shift schemes for radar, sonar, and communication waveforms - the property that first led to their investigation by Costas - and they have also been used as symbols in digital watermarks. Although Costas arrays can be found by exhaustive searches over sets of permutation matrices, number-theoretic generation algorithms have been found by Welch, Golomb, Lempel, and extensions of these have been found by Taylor. Special generators that exploit symmetries to simplify the search have been used by Brown, Cenkl, Games, Rushanan, and Moreno. Silverman, Vickers and Mooney have found a relationship that accurately predicts the number of Costas Arrays as the order varies, but it predicts they will die out above order 28. However, number-theoretic methods generate large numbers of Costas Arrays for orders above 25. The authors have performed the first complete searches over orders 24 and 25 and speculate that the set of known Costas Arrays of order 26 is the complete set. (Received September 10, 2004)