Graduate Studies Thesis\Dissertation Information
Ferdowsi University of Mashhad

Title of Thesis\Dissertation: Design of a Reflectarray Antenna With Co-Secant Radiation Pattern using Evolutionary Strategies

Author: Arash Sarshar
Supervisor(s): Dr. A.R. Attari **Advisor Teacher(s): ……..**

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Abstract: Reflectarray antennas are a hybrid form of antennas bringing the advantageous features of array antennas and reflector antennas together. In reflectarray antennas a flat printed array of elements is illuminated by a source feed, which is usually a small horn antenna. Each element receives the incident electromagnetic wave and re-radiates it with a certain phase shift. The overall reflectarray radiation pattern depends on the array factor, element radiation pattern and also the feed pattern. Various elements have been designed and employed for reflectarray antennas, ranging from stub-loaded patch elements, aperture coupled patches, loops, dipoles and ring elements.

In this thesis two novel elements are proposed: A stacked stub-loaded patch element for X-band linear polarization antenna with True Time Delay structure, and an aperture coupled patch element with T-shaped slots for dual linear or circular polarization X-band reflectarray antenna. The performance of the elements is evaluated with the aid of full wave electromagnetic simulation software and the results are reported.

Also a new phase synthesis algorithm is developed for the radiation pattern synthesis of reflectarray antennas. Heuristic search methods are used for the synthesis of a shaped beam reflectarray and the efficiency of the methods are compared.

Signature of Supervisor: **Amir Reza Attari** **Date: 10/29/2012**	**Key-Words:** 1. *Reflectarray Antennas* 2. *Floquet Analysis* 3. *Heuristic Optimization* 4. *Radiation Pattern Shaping*