Referring now to Fig. 1B, a plurality of, here four, bowtie radiators 10a - 10d, are disposed form an array antenna 30. In the illustration of Fig. 1 A, the four bowtie radiators 10a -10d are disposed to form a 2 x 2 array. Those of ordinary skill in the art will appreciate, of course, that any size array or shape array may be formed via the radiators. Array antenna 30 may be used as a building block with which to build relative large array antennas (e.g., array antennas comprising tens, hundreds or thousands of antenna elements depending upon the needs of a particular application). Thus, the radiator design described above in conjunction with Fig. 1 can be integrated into full antenna arrays that can be printed and prototyped in short amount of time.

Referring now to Fig. 2, a simulation of an AMT radiator of the type described above in conjunction with Fig. 1 illustrates that printed reactive tuning elements (or tuning posts) 18, 20 produce a desired field configuration within an antenna unit cell. Thus, tuning elements 18, 20 function as so-called Faraday walls so as to control and shape field configurations within an antenna unit cell.

It should be appreciated that the design relies on AMT features. For example, a conductor having a relatively high conductivity (e.g., a conductivity substantially in the range of that of copper) is used in current carrying areas (e.g., transmission lines as compared to Faraday walls).

A feed circuit 32 comprises a printed vertical-launch signal path 33 and a pad 34. Signals are coupled to/from radiator 12 via feed circuit 32.

Referring now to Fig. 3, in which like elements of Figs. 1 and 2 are provided having like reference designations, a bowtie radiator includes aperture 12, tuning structures 18, 20 and feed circuit 32 comprised of vertical launch structure 33, feed point (or pad) 34 and transmission line feed 36 which crosses bowtie aperture 12. It should be appreciated that transmission line feed 36 is disposed on a surface of substrate 14. Thus, the voltage on the transmission line feed creates a voltage gradient which excites the aperture from beneath.

In an embodiment, an AMT aperture radiator may be formed as follows. An antenna substrate 14 is provided having a conductor on both sides thereof (i.e., the substrate is provided as a double clad substrate). A milling operation is performed on

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1. An antenna element comprising:

a first substrate having first and second opposing surface with a milled bowtie slot aperture provided in the first surface thereof; and

at least one milled opening and a Faraday wall, formed by filing the at least one milled opening with conductive liquid, disposed proximate the bowtie slot aperture.

2. The antenna element of claim 1 wherein the at least one Faraday wall includes a first one and a second one of a plurality of Faraday walls.

3. The antenna element of claim 2, wherein said plurality of Faraday walls are symmetrically disposed about the aperture with the first one of said plurality of Faraday walls forming a first set of tuning elements symmetrically disposed on either side of said bowtie slot aperture and the second one of said plurality of Faraday walls forming a second set of tuning elements symmetrically disposed on either side of said bowtie slot aperture .

4. The antenna element of claim 3, further comprising:

a second substrate bonded to the second surface of the first substrate having a first and second opposing surface; and

a feed circuit comprising a vertical launch extending from the first to second surface of the second substrate and a connected feed line on the second opposing surface of the first substrate disposed across a slot portion of said milled aperture.

5. The antenna element of claim 4, wherein the feed circuit is disposed between the first set of tuning elements and the second set of tuning elements.

6. An antenna assembly comprising:

a first substrate having first and second opposing surface with a milled bowtie slot aperture provided in the first surface thereof;

at least one milled opening and a Faraday wall, formed by filing the at least one milled opening with conductive liquid, disposed proximate the bowtie slot aperture;

a first set of tuning elements symmetrically disposed on either side of said milled aperture;

a second set of tuning elements symmetrically disposed on either side of said of said milled aperture;

a second substrate bonded to the second surface of the first substrate having a first and second opposing surface; and

a feed circuit comprising a vertical launch extending from the first to second surface of the second substrate and a connected feed line on the second opposing surface of the first substrate disposed across a slot portion of said milled aperture.

7. An array antenna comprising a plurality of antenna assemblies, each antenna assembly embodying the antenna assembly set forth in claim 6.

8. The array antenna of claim 7, comprising four antenna assemblies arranged such that a first set of tuning elements of a first antenna assembly and a first set of tuning elements of a

second antenna assembly are respectively adjacent to a second set of tuning elements of a third antenna assembly and a second set of tuning elements of a fourth antenna assembly.

9. An AMT process for fabricating a bowtie slot antenna, the method comprising:

(a) milling copper from a first surface of a double clad dielectric substrate to form an aperture;

(b) milling copper from a second, opposite surface of the double clad dielectric substrate to form a feed line for the aperture;

(c) bonding the double clad dielectric substrate to a first surface of a second substrate having a ground plane conductor disposed over a second surface thereof to form a bonded assembly;

(d) milling the bonded assembly to form at least one opening for a Faraday wall proximate the aperture; and

(e) filling the at least one opening with a conductive liquid to form the Faraday wall.

10. The method of claim 9, further comprising milling the bonded assembly to form at least one opening for a vertical signal path and filling the at least one opening for the vertical signal path.

11. The method of claim 10, wherein the conductive liquid is a conductive ink.