one-fifteenth the shortest effective wavelength, less than one-eighth the shortest effective wavelength, etc.).

[0092] As shown in FIG. **9**, the antenna radiating element **64** of antenna **30** may be mounted within a corresponding volume **125** (sometimes referred to herein as cavity **125**). The edges of volume **125** for antenna **30** may be defined by conductive vias **130** and the underlying ground traces. In this way, conductive vias such as conductive vias **130** and the underlying ground traces may form a conductive cavity for each antenna in the phased antenna array (e.g., each antenna in the phased antenna array may be a cavity-backed antenna having a conductive cavity formed from conductive vias and ground traces). The conductive cavity may serve to enhance the gain of antenna **30** and/or may serve to isolate the antennas in the phased antenna array from each other (e.g., to minimize electromagnetic cross-coupling between the antennas).

[0093] The example of FIG. **9** is merely illustrative. The fences of conductive vias **130** may follow any desired lateral outline (e.g., the fences of conductive vias **130** may follow any desired straight and/or curved paths). Patch element **60-3** and parasitic elements **124** may have other shapes (e.g., any desired shapes having any desired number of curved and/or straight edges). If desired, multiple antennas **30** may be mounted within cavity **125** (e.g., antennas for covering different frequency bands).

[0094] FIG. **10** is a cross-sectional side view showing how phased antenna array **36** may include multiple antennas having different numbers of stacked patch elements. As shown in FIG. **10**, phased antenna array **36** may include at least antennas **30-1** and **30-2** embedded within substrate **70** of antenna module **68**. While transmission line layers **78** of substrate **70** may include any desired number of ground trace layers, only ground traces **102** are shown in FIG. **10** for the sake of clarity.

[0095] Antenna **30-1** may be coupled to at least a first radio-frequency transmission line path **32-1** in the additional routing layers **96** of transmission line layers **78**. Antenna **30-1** may include an antenna radiating element **64-1** coupled to the signal trace in radio-frequency transmission line path **32-1** by conductive via **134**. In scenarios where antenna **30-1** is differentially fed, antenna radiating element **64-1** may be coupled to a differential radio-frequency transmission line path in additional routing layers **96** (e.g., a differential radio-frequency transmission line path such as differential radio-frequency transmission line paths **32**D of FIG. **6**) using multiple conductive vias. Antenna **30-1** may be located within a cavity **125-1** between fences of conductive vias **130** and ground traces **102**.

[0096] Antenna **30-2** may be coupled to at least a second radio-frequency transmission line path **32-2** in transmission line layers **78** (e.g., dielectric layers of substrate **70** that are located closer to ground traces **102** than additional routing layers **96**). Antenna **30-2** may include an antenna radiating element **64-2** coupled to the signal trace in radio-frequency transmission line path **32-2** by conductive via **136**. In scenarios where antenna **30-2** is differentially fed, antenna radiating element **64-2** may be coupled to a differential radio-frequency transmission line path in transmission line layers **78** (e.g., a differential radio-frequency transmission line path such as differential radio-frequency transmission line paths **32**D of FIG. **6**) using multiple conductive vias. Antenna **30-2** may be located within a cavity **125-2** between fences of conductive vias **130** and ground traces **102**. Conductive vias **130** may extend from ground traces **102** (or other ground traces in transmission line layers **78**) to conductive landing (contact) pads **132**. Conductive landing pads **132** may be coplanar with any desired portion of antenna radiating elements **64-1** and/or **64-2** or may be non-coplanar with antenna radiating elements **64-1** and **64-2**.

[0097] As shown in FIG. **10**, antenna radiating element **64-1** is separated from radio-frequency transmission line path **32-1** by a relatively short distance such as distance **88**. Because the signal trace for radio-frequency transmission line path **32-2** is lower than the signal trace for radio-frequency transmission line path **32-1**, antenna radiating element **64-2** is separated from radio-frequency transmission line path **32-2** by a relatively long distance such as distance **84**. Conductive via **136** may thereby introduce more inductance to radio-frequency transmission line path **32-2** than conductive via **134** introduces to radio-frequency transmission line path **32-1**.

[0098] Antenna radiating element **64-1** may, for example, include a single patch element coupled to conductive via **134**. At the same time, antenna radiating element **64-2** may include multiple stacked patch elements such as patch elements **60-1**, **60-2**, and **60-3** (e.g., antenna **30-2** may be formed using the structures of antenna **30** of FIG. **8**). This may introduce capacitances to antenna radiating element **64-2** (e.g., capacitances C**1**, C**2**, and C**3** of FIG. **8**) that help to compensate for the relatively high inductance associated with conductive via **136** and that thereby serve to match the impedance of antenna **30-2** to the impedance of radio-frequency transmission line path **32-2**. In this way, the impedance of antennas **30** in phased antenna array **36** may be sufficiently matched across the array (e.g., without using SMT capacitors) despite feeding the antennas using radio-frequency transmission line paths at different distances from the antenna radiating elements (e.g., as required to feed a relatively large number of antennas in antenna module **68** within a small volume while still exhibiting satisfactory electromagnetic isolation between the radio-frequency transmission line paths).

[0099] The example of FIG. **10** is merely illustrative. Conductive vias **130** and conductive landing pads **132** may be omitted. Phased antenna array **36** may include any desired number of antennas having a single patch element (e.g., antennas such as antenna **30-1** of FIG. **10** and antenna **30** of FIG. **6**) and any desired number of antennas having multiple stacked patch elements (e.g., antennas such as antenna **30-2** of FIG. **10** and antenna **30** of FIG. **8**). Phased antenna array **36** may additionally or alternatively include other antennas having two stacked patch elements or more than three stacked patch elements.

[0100] The foregoing is merely illustrative and various modifications can be made by those skilled in the art without departing from the scope and spirit of the described embodiments. The foregoing embodiments may be implemented individually or in any combination.

1. An electronic device comprising:

a dielectric substrate;

ground traces on the dielectric substrate;

a radio-frequency transmission line path having a signal trace on the dielectric substrate, the ground traces forming part of a ground conductor for the radio-frequency transmission line path;

an antenna radiating element on the substrate and overlapping the ground traces, wherein the antenna radiat-