arms 531-534 which form a radiating structure of a square shape (seen from a top view). Feeding terminals 5310-5340 are placed at corners facing another oscillator arm. In another variant of the known radiator, the connective portion has four parts of a shape of folded dipoles connected with two adjacent sides of two adjacent oscillator arms, respectively. Folded dipoles formed by a connective portion and connected to oscillator arms act as a dipole square, as described in WO 2007/114620A1.

The mentioned above dipole squares and crossed dipoles developed for base station antennas provide good F/B ratio and 65 degree beamwidth but its beamwidth and position of a phase center have very low dependence versus frequency.

Thus some of known feeds for dish and lens antennas are too big and complicated for manufacturing. Other known radiators having simple structures haven't suitable beamwidth dependence versus frequency to be used as feeds of lens antennas providing constant beamwidth.

BRIEF DESCRIPTION OF PREFERRED EMBODIMENTS

~~It is a purpose~~Embodiments of the invention seek to overcome the above described problems of prior techniques by providing a relatively small dual polarized radiator creating beamwidth about 65 degree at a low frequency of operating frequency band and varying inversely with frequency or at least having a minimal deviation from this dependence over a wide frequency band.

~~It is another purpose~~Embodiments of the invention also seek to provide a relatively small dual polarized radiator for lens antennas creating beams which can remain almost constant in a beamwidth over a wide frequency band.

~~It is another purpose~~Embodiments of the invention also seek to provide a relatively small dual polarized radiator providing high isolation between feeds of a multi beam lens antenna.

Embodiments of the present invention further seek to create a dual polarized feed for lens antennas which ~~is~~ may be easy to be manufactured.

According to an embodiment of the invention, there is provided a dual polarized ~~antenna~~ radiator comprising: a radiating arrangement; and a feeding element containing two feeding lines and forming two perpendicular baluns supporting the radiating arrangement above a reflective conductive

plate having ~~a shape of a circle or an octagon and~~ side walls, a dielectric body and four directing conductive strips. The radiating arrangement comprises two crossed dipoles connected by four outer conductors. The four outer conductors form an outer contour of the radiating arrangement having a shape of a circle or a polygon. Each crossed dipole contains two dipole arms comprising two equal branches connected together at a point of connection between the dipole arm and one of the two feeding lines. ~~The~~ A first gap between the two equal branches of each dipole arm and ~~the~~ a second gap between adjacent branches of different dipole arms increase towards the outer contour of the radiating arrangement. Each outer conductor has a middle portion and two end portions. The middle portion connects adjacent branches of the different dipole arms with the two end portions, wherein one end portion is placed between the branches of one dipole arm and the other end portion is placed between the branches of an adjacent dipole arm. One end portion of one outer conductor and the other end portion of an adjacent outer conductor are placed between the two branches of one of the dipole arms and are separated from each other by a third gap creating a capacitive coupling between the two outer conductors. The dielectric body is placed above the radiating arrangement.

The ~~F~~four directing conductive strips are placed above ~~a~~ the reflective conductive plate and below ~~a~~ the radiating arrangement. Each directing conductive strip is placed in parallel ~~of~~ to the middle portion of one of outer conductors between the said middle portion and a side wall of ~~a~~ the reflective conductive plate.

The radiating arrangement may be formed from a single sheet of conductive material.

The radiating arrangement and the feeding element may be made as one part by die-casting.

The feeding element ~~is~~ may be connected to the dipole arms in the middle of the radiating arrangement and may comprise~~s~~ four tubes containing two coaxial cables inside and connected by a flat conductor nearby the reflective conductive plate.

The inner conductors of the coaxial cables are connected to the radiating arrangement by conductive bridges.

The dual polarized radiator may further comprise a thin dielectric film placed between the feeding element and a conductive plate.

A distance between ~~a~~ the radiating arrangement and ~~a~~ the conductive plate may be smaller than 0.25 wave length corresponding to a middle operating frequency.

CLAIMS

1. A dual polarized radiator comprising:

a radiating arrangement, a feeding element containing two feeding lines and forming two perpendicular baluns supporting the radiating arrangement above a reflective conductive plate containing side walls, a dielectric body and four directing conductive strips;

wherein the radiating arrangement comprises two crossed dipoles connected by four outer conductors forming an outer contour of the radiating arrangement in a shape of a circle or an octagon;

wherein each crossed dipole comprises two dipole arms, each dipole arm contains two equal branches connected together at a point of connection between the dipole arm and one of the two feeding lines;

wherein ~~the~~a first gap between two equal branches of each dipole arm and ~~the~~a second gap between adjacent branches of different dipole arms increase toward the outer contour of the radiating arrangement;

wherein each outer conductor contains a middle portion and two end portions;

wherein the middle portion connects the adjacent branches of the different dipole arms with the two end portions;

wherein ~~the~~a first end portion is placed between the branches of one dipole arm and ~~the~~a second end portion is placed between the branches of an adjacent dipole arm;

wherein one end portion of one outer conductor and the other end portion of an adjacent outer conductor are placed between the branches of one of the dipole arm, and are separated from each other by a third gap creating a capacitive coupling between the two adjacent outer conductors;

wherein ~~a~~the dielectric body is placed above ~~a~~the radiating arrangement; and

wherein the four directing conductive strips are placed above ~~a~~the reflective conductive plate and below ~~a~~the radiating arrangement and each directing conductive strip is placed in parallel ~~of~~ to the middle portion of one of the outer conductors between the said middle portion and a side wall of ~~a~~the reflective conductive plate.

2. A dual polarized radiator according to claim 1, wherein ~~a~~the reflective conductive plate is made in a shape of a circle or an octagon.

3. A dual polarized radiator according to claim 1, wherein ~~a~~the dielectric body is made in a shape of a cut cone.

4. A dual polarized radiator according to any preceding claim, wherein athe dielectric body is made of a material having dielectric constant less than 2.5 and more than 1.2.

5. A dual polarized radiator according to any preceding claim, wherein athe dielectric body is made of a light artificial material.

6. A dual polarized radiator according to any preceding claim, wherein the radiating arrangement is formed from a single sheet of conductive material.

7. A dual polarized radiator according to any preceding claim, further comprising a thin dielectric film placed between the feeding element and athe reflecting conductive plate.

8. A dual polarized radiator according to any preceding claim, wherein the reflective conductive plate is made in a shape of a circle or an octagon.

9. A dual polarized radiator according to any preceding claim, wherein a distance between the radiating arrangement and the reflective conductive plate is smaller than 0.25 wave length corresponding to a middle operating frequency.

10. A dual polarized radiator according to any preceding claim, wherein said radiator forms a beam having beamwidth varying inversely with frequency or at least having a minimal deviation from this dependence.

11. A dual polarized radiator according to any preceding claim, wherein said radiator is placed nearly a surface of a dielectric lens to create an antenna forming a beam having a minimal beamwidth deviation as a function of frequency.

12. A dual polarized radiator according to any preceding claim, wherein plurality of said radiators are placed nearly a surface of a spherical Luneberg lens to create a multi beam base station antenna forming a set of beams having a minimal deviation of thea power level at crossover points between adjacent beams.