Claims

~~1. Antenna array module for a communication system on a cargo ship, comprising at least a first (11), a second (12) and a third (16) antenna element, each containing an antenna feed, whereby said first (11) and said second (12) antenna element are arranged to radiate mainly towards a first path and said third (16) antenna element is arranged to radiate mainly towards a second path opposite to said first path and whereby said first antenna element is tilted with respect to said second antenna element.~~

~~2. Antenna array module as in claim 1, whereby at least one of said antenna elements is a patch antenna.~~

~~3. Antenna array module as in claim 1 or 2, whereby said first and said second antenna element are tilted with respect to one another over an angle in the range of 5° to 70°.~~

~~4. Antenna array module as in any of the previous claims, wherein at least one of said antenna elements is arranged for radiating with circular polarization.~~

~~5. Antenna array module as in claim 4, wherein said at least one antenna element is provided with perturbations to excite two orthogonal radiation modes.~~

~~6. Antenna array module as in any of the previous claims, wherein said antenna elements are arranged on a substrate of dielectric material.~~

~~7. Antenna array module as in any of the previous claims, comprising a power divider/combiner arranged to split a signal to be transmitted over said at least three antenna elements and to combine signals received from the at least three antenna elements.~~

~~8. Antenna array module as in any of the previous claims, wherein said first antenna element, when installed, is tilted with respect to a vertical plane wherein said second antenna element is positioned to improve directivity in vertical direction.~~

~~9. Antenna array module as in any of the previous claims, wherein said at least three antenna elements form a substantially vertical stack.~~

~~10. Antenna array module as in any of the previous claims, wherein said antenna elements are made in a printed technology.~~

~~11. Antenna array module as in any of the previous claims, comprising a housing for said antenna elements.~~

~~12. Antenna array module as in any of the previous claims, wherein said third antenna element is not tilted with respect to said second antenna element.~~

1 ~~13~~. Method for installing an antenna array module on a cargo ship, the method comprising :

- taking an antenna array module ~~as in any of the previous claims,~~ for a communication system on said cargo ship, said antenna array module comprising at least a first (11), a second (12) and a third (16) antenna element, each containing an antenna feed,

- mounting said antenna array module on the bridge of said cargo ship, said bridge being so positioned to divide said cargo ship along its length axis in a longer part and a shorter part, whereby said first (11) antenna element is tilted with respect to said second (12) antenna element and said first and said second antenna element are so positioned that the main lobe of their directive pattern points towards a first path corresponding to said longer part, and said third (16) antenna element is positioned to radiate mainly towards a second path opposite to said first path.

2. Method for installing as in claim 1, wherein at least one of said antenna elements is a patch antenna.

3. Method for installing as in claim 1 or 2, wherein said first and said second antenna element are tilted with respect to one another over an angle in the range of 5° to 70°.

4. Method for installing as in any of the previous claims, wherein at least one of said antenna elements is arranged for radiating with circular polarization.

5. Method for installing as in claim 4, wherein said at least one antenna element is provided with perturbations to excite two orthogonal radiation modes.

6. Method for installing as in any of the previous claims, wherein said antenna elements are arranged on a substrate of dielectric material.

7. Method for installing as in any of the previous claims, wherein said antenna array module comprises a power divider/combiner arranged to split a signal to be transmitted over said at least three antenna elements and to combine signals received from the at least three antenna elements.

8. Method for installing as in any of the previous claims, wherein said first antenna element, when installed, is tilted with respect to a vertical plane wherein said second antenna element is positioned to improve directivity in vertical direction.

9. Method for installing as in any of the previous claims, wherein said at least three antenna elements form a substantially vertical stack.

10. Method for installing as in any of the previous claims, wherein said antenna elements are made in a printed technology.

11. Method for installing as in any of the previous claims, wherein said antenna array module comprises a housing for said antenna elements.

12. Method for installing as in any of the previous claims, wherein said third antenna element is not tilted with respect to said second antenna element.

13 ~~14~~. Method for installing as in any of the previous claims ~~13~~, whereby a plurality of said antenna array modules are mounted on said bridge.

14 ~~15~~. Method for installing as in any of the previous claims ~~13 or 14~~, whereby said antenna array module is mounted on a side of said bridge where a direct line of sight towards said longer part is available.

Claims

1. Method for installing an antenna array module on a cargo ship, the method comprising :
- taking an antenna array module for a communication system on said cargo ship, said antenna array module comprising at least a first (11), a second (12) and a third (16) antenna element, each containing an antenna feed,
- mounting said antenna array module on the bridge of said cargo ship, said bridge being so positioned to divide said cargo ship along its length axis in a longer part and a shorter part, whereby said first (11) antenna element is tilted with respect to said second (12) antenna element and said first and said second antenna element are so positioned that the main lobe of their directive pattern points towards a first path corresponding to said longer part, and said third (16) antenna element is positioned to radiate mainly towards a second path opposite to said first path.

2. Method for installing as in claim 1, wherein at least one of said antenna elements is a patch antenna.

3. Method for installing as in claim 1 or 2, wherein said first and said second antenna element are tilted with respect to one another over an angle in the range of 5° to 70°.

4. Method for installing as in any of the previous claims, wherein at least one of said antenna elements is arranged for radiating with circular polarization.

5. Method for installing as in claim 4, wherein said at least one antenna element is provided with perturbations to excite two orthogonal radiation modes.

6. Method for installing as in any of the previous claims, wherein said antenna elements are arranged on a substrate of dielectric material.

7. Method for installing as in any of the previous claims, wherein said antenna array module comprises a power divider/combiner arranged to split a signal to be transmitted over said at least three antenna elements and to combine signals received from the at least three antenna elements.

8. Method for installing as in any of the previous claims, wherein said first antenna element, when installed, is tilted with respect to a vertical plane wherein said second antenna element is positioned to improve directivity in vertical direction.

9. Method for installing as in any of the previous claims, wherein said at least three antenna elements form a substantially vertical stack.

10. Method for installing as in any of the previous claims, wherein said antenna elements are made in a printed technology.

11. Method for installing as in any of the previous claims, wherein said antenna array module comprises a housing for said antenna elements.

12. Method for installing as in any of the previous claims, wherein said third antenna element is not tilted with respect to said second antenna element.

13. Method for installing as in any of the previous claims, whereby a plurality of said antenna array modules are mounted on said bridge.

14. Method for installing as in any of the previous claims, whereby said antenna array module is mounted on a side of said bridge where a direct line of sight towards said longer part is available.