CLAIMS

1. Antenna assembly, comprising:

- a single substrate (1) having a lower surface (11) and an upper surface (12);
- an isotropic source of spherical electromagnetic waves configured for emitting surface waves on the upper surface (12) of the substrate;
- a ground plane formed on the lower surface (11) of the substrate constituted by a metallic deposit on the entire lower surface (11);
- an antenna element (2), formed on the upper surface (12) of the substrate (1), said antenna element (2) being constituted by a periodic patterns metasurface formed on the substrate by a texture of subwavelength patches, the antenna element having a radiation pattern, said antenna element being constituted of
    - a first-scale metasurface defined by a two-dimensional alternation (2) of metal or metamaterial patches (21, 22, 23) having closely spaced vertices in each contiguous element thus forming small gaps;
    - a plurality of switches (211, 212) disposed in the gap (200) between the vertexes of the patches, each switch (211, 212) permitting to connect two patches through the vertexes, the connected patches defining a second-scale metasurface having a pattern thus forming the antenna element; wherein each patch has dimensions which do not depend to the frequency of the waves to be radiated by the second-scale metasurface, the antenna element being configured for transforming the emitting surface waves into leaky waves.

2. Antenna assembly according to Claim 1, wherein the patches have dimensions smaller than $\lambda/40$ where λ is the wavelength corresponding to the frequency of the waves to be radiated and are preferably comprised between $\lambda/70$ to $\lambda/40$.

3. Antenna assembly according to one of the preceding claims, wherein each switch comprises a phase change material.

4. Antenna assembly according to claim 1 or 2, wherein each switch comprises electronic element such as diodes or micro-electro-mechanical systems.

5. Antenna assembly according to one of the preceding claims, wherein the second-scale metasurface is formed by one of the following patterns: discs, squares, rectangles.