CLAIMS

The invention claimed is:

1. An integrated ~~polarisation~~ polarization splitter comprising a multimode interference coupler ~~(110)~~ which in turn comprises:

– an input waveguide ~~(120)~~ intended to feed a transverse electric (TE) mode and a transverse magnetic (TM) mode of an optical signal to the multimode interference coupler ~~(110)~~,

– a first output waveguide ~~(130)~~ intended to transmit the transverse electric (TE) mode of the optical signal,

– a second output waveguide ~~(140)~~ intended to transmit the transverse magnetic (TM) mode of the optical signal,

~~the splitter being **characterised in that**~~ wherein the multimode interference coupler ~~(110)~~ additionally comprises an anisotropic multimode waveguide region formed by a plurality of sections of a core material ~~(210)~~ and a plurality of sections of a cladding material ~~(230)~~, respectively alternately arranged in a periodic way with a period (Λ) smaller than the wavelength of ~~a light~~ the optical signal propagated through said anisotropic multimode waveguide region; and being wherein ~~said anisotropic region generating a Talbot self-image of the transverse electric (TE) mode at a first distance (L_{TE}), and a Talbot self-image of the transverse magnetic (TM) mode at a second distance (L_{TM}), said second distance (L_{TM}) being a whole number times greater than the first distance (L_{TE}); and forming interfaces between~~ the plurality of sections of core material ~~(210)~~ and the plurality of sections of cladding material ~~(230)~~ of the anisotropic multimode waveguide region form an angle (α) greater than zero with a plane perpendicular to the input waveguide ~~(120)~~, the first output waveguide ~~(130)~~ and the second output waveguide, ~~(140).~~ being the splitter characterised in that the angle (α) is greater than zero, and wherein the polarization splitter comprises:

a first taper connected to the input waveguide;

a second taper connected to the first output waveguide; and

a third taper connected to the second output waveguide;

wherein each one of: the first taper, the second taper and the third taper, respectively, comprise:

a waveguide with variable width, and

sections of core material and sections of cladding material arranged in an alternating and periodic way.

~~2. The polarisation splitter according to claim 1, characterised in that the second distance (L_{TM}) is approximately two times greater than the first distance (L_{TE}).~~

~~3. The polarisation splitter according to claim 2, characterised in that the anisotropic region of the multimode interference coupler (110) has a length that is approximately three times greater than the second distance (L_{TM}).~~

~~4.~~2. The ~~polarisation~~ polarization splitter according to ~~any of the preceding~~ claim~~s~~ 1, characterised in that the angle (α) is comprised between 5° and 25°.

~~5.~~3. The ~~polarisation~~ polarization splitter according to claim 2~~4~~, characterised in that the angle (α) is comprised between 10° and 20°.

~~6.~~4. The ~~polarisation~~ polarization splitter according to ~~any one of the preceding~~ claim~~s~~ 1, characterised in that the plurality of sections of core material ~~(210)~~ comprise a central gap ~~completed~~ filled by cladding material ~~(230)~~.

~~7. The polarisation splitter according to any one of the preceding claims, characterised in that it comprises:~~

- ~~a first taper (121) connected to the input waveguide (120);~~
- ~~a second taper (131) connected to the first output waveguide (130); and~~
- ~~a third taper (141) connected to the second output waveguide (140);~~

~~wherein each one of: the first taper (121), the second taper (131) and the third taper (141), respectively, comprise:~~

- ~~a waveguide with variable width, and~~
- ~~sections of core material (210) and sections of cladding material (230) arranged in an alternating and periodic way.~~

~~8.~~5. The ~~polarisation~~ polarization splitter according to claim 1~~7~~, characterised in that the first taper ~~(121)~~, the second taper ~~(131)~~, the third taper ~~(141)~~,

respectively, comprise a central bridge made of core material ~~(210)~~ that joins the sections of core material ~~(210)~~, the width of each central bridge being inversely proportional to the width of the respective taper ~~(121, 131, 141)~~.

~~9. The polarisation splitter according to any one of the claims 7 or 8, characterised in that the sections of core material (210) of the first taper (121), the second taper (131) and the third taper (141) are adapted to rotate from a plane perpendicular to the input waveguide (120), the first output waveguide (130) and the second output waveguide (140), to an angle (α), said angle (α) being greater than zero.~~

~~10.~~6. The ~~polarisation~~ polarization splitter according to ~~any one of the preceding~~ claim~~s~~ 1, characterised in that the anisotropic region of the multimode interference coupler ~~(110)~~ has constant geometric properties throughout the length thereof.

~~11.~~7. The ~~polarisation~~ polarization splitter according to ~~any one of~~ claim~~s~~ 1 ~~to 10~~, characterised in that the anisotropic region of the multimode interference coupler ~~(110)~~ comprises a variable geometry throughout the length thereof.

~~12.~~8. The ~~polarisation~~ polarization splitter according to ~~any one of the preceding~~ claim~~s~~ 1, characterised in that at least one waveguide selected among: the input waveguide ~~(120)~~, the first output waveguide ~~(130)~~ and the second output waveguide ~~(140)~~ is arranged with an angle different than 90° in an interface with the multimode interference coupler ~~(110)~~.

~~13.~~9. The ~~polarisation~~ polarization splitter according to ~~any one of the preceding~~ claim~~s~~ 1, characterised in that the core material ~~(210)~~ is silicon.

~~14.~~10. The ~~polarisation~~ polarization splitter according to claim 9~~13~~, characterised in that the core material ~~(210)~~ is arranged on an insulator layer.