The claims defining the invention are as follows

1. An active optical fibre, including:

a core comprised of at least a first material with at least a first refractive index;

an inner cladding comprised of at least a second material with at least a second refractive index substantially surrounding the core, whereby the core and the inner cladding form an area configured to propagate pump radiation from a pump laser coupled to the optical fibre when in use;

an outer cladding comprised of at least a third material with at least a third refractive index substantially surrounding the inner cladding, the third refractive index being smaller than the second refractive index, whereby the outer cladding confines pump radiation from the pump laser to the core and the inner cladding; and

a coating comprised of a thermally conductive metal, graphite or other thermally conductive material substantially surrounding the outer cladding,

wherein the inner cladding has a symmetry breaking shape configured to reduce impact of spatial hole-burning on absorption of the pump radiation as the pump radiation propagates through a length of the active optical fibre as compared to a circular cladding, and

wherein the thermally conductive metal, graphite or other thermally conductive material of the coating enables a reduced temperature increase between the area and an outer surface of the coating via the coating and the outer cladding as compared to conventional polymer coatings and enables an increased operating temperature of the area configured to propagate pump radiation and wherein thickness of the coating is determined by desired function of the active optical fibre.

2. The active optical fibre of claim 1, wherein the thermally conductive metal material includes: Aluminium, Copper, Gold, Tin, or an alloy thereof, and the thermally conductive graphite material includes: graphite or a composite material comprised of graphite.

3. The active optical fibre of claim 1 or 2, wherein the symmetry breaking shape is further configured to increase overlap of the pump radiation within the core along the length of the active optical fibre as compared to a circular cladding.

4. The active optical fibre of claim 3, wherein the symmetry breaking shape includes any one of: a D-shape, convex polygon, petal arrangement, and an ellipse.

5. The active optical fibre of any one of claims 1 to 4, wherein the thermally conductive metal, graphite or thermally conductive other material of the coating further enables an increased operating temperature and/or increased operating temperature range of the optical fibre.

6. The active optical fibre of claim 5, wherein the operating temperature is greater than 80°C.

7. The active optical fibre of claim 6, wherein the operating temperature is around 200°C.

8. The active optical fibre of any one of claims 5 to 7, wherein the operating temperature is below the melting point of the coating.

9. The active optical fibre of any one of claims 5 to 8, wherein the thermally conductive metal, graphite or thermally conductive other material of the coating further enables an increased thermal load from the laser.

10. The active optical fibre of any one of claims 1 to 9, wherein the thermally conductive metal, graphite or other thermally conductive material of the coating has a thermal conductivity greater than 0.18W/m/K.

11. The active optical fibre of claim 10, wherein the thermally conductive metal or graphite material of the coating has a thermal conductivity of 109 W/m/K.

12. The active optical fibre of any one of claims 1 to 11, wherein the thermally conducting other material of the coating includes polymers impregnated with metals, nitrides, oxides, carbides or other materials to increase a thermal conductivity of the coating.

13. The active optical fibre of claim 12, wherein the thermally conductive other material has a thermal conductivity greater than 0.5W/m/K.

14. The active optical fibre of claim 1, wherein the thickness of the coating is 1-10µm, 10-30µm, or 0.1-1µm.

15. The active optical fibre of claim 1, wherein the thickness of the coating is modulated radially or lengthwise.

16. A laser system, including:

a pump laser or pump laser array;

an active optical fibre coupled to the pump laser or pump laser array, the active optical fibre including:

a core comprised of at least a first material with at least a first refractive index;

an inner cladding comprised of at least a second material with at least a second refractive index substantially surrounding the core, whereby the core and the inner cladding form an area configured to propagate pump radiation from the pump laser or pump laser array when in use;

an outer cladding comprised of at least a third material with a at least third refractive index substantially surrounding the inner cladding, the third refractive index being smaller than the second refractive index, whereby the outer cladding confines pump radiation from the pump laser or pump laser array to the core and the inner cladding; and

a coating comprised of a thermally conductive metal, graphite or other thermally conductive material substantially surrounding the outer cladding,

wherein the inner cladding has a symmetry breaking shape configured to reduce impact of spatial hole-burning on absorption of the pump radiation as the pump radiation propagates through a length of the active optical fibre as compared to a circular cladding;

wherein the thermally conductive metal, graphite or thermally conductive other material of the coating enables a reduced temperature increase between the area and an outer surface of the outer cladding via the coating and the outer cladding and enables an increased operating temperature of the area

configured to propagate pump radiation, wherein thickness of the coating is determined by desired function of the active optical fibre, and wherein the coating supports a minimised size, weight, and cooling of the active optical fibre so as to minimise size and weight of the laser system.

17. The laser system of claim 16, wherein the active optical fibre and the pump laser or pump laser array are remotely coupled via a passive optical fibre, and the active optical fibre includes a laser output aperture at a distal end of the active optical fibre.

18. The laser system of claim 17, wherein the thermally conductive metal, graphite or thermally conductive other material of the coating supports a minimised distance between a proximal end of the active optical fibre coupled to the passive optical fibre and the laser output aperture.

19. The laser system of claim 17 or 18, wherein the thermally conductive metal, graphite or other thermally conductive material of the coating enables a maximised distance between the active optical fibre and the pump laser or pump laser array via the passive optical fibre.

20. The laser system of claim 19, wherein the distance between the pump laser or pump laser array and the active optical fibre is between 1 - 10 metres, 10 – 100 metres, or 100 – 10,000 metres.

21. The laser system of any one of claims 16 to 20, further including a cascade of pump modules including the pump laser or pump laser array, whereby one or more of the pump modules include the active optical fibre.