CLAIMS:

1. A beam splitting apparatus for use within a lithographic system, comprising:
a plurality of static mirrors each arranged to receive a different part of a first radiation beam from a radiation source and to reflect a respective portion of radiation along one of a plurality of directions to form a plurality of branch radiation beams for provision to a plurality of tools; and
at least one diverging optical element arranged to increase the divergence of a radiation beam.

2. The beam splitting apparatus of claim 1 , wherein each of the plurality of directions provides a respective branch optical path, each branch optical path being associated with a respective one of the plurality of tools.

3. The beam splitting apparatus of claim 2, wherein at least one branch optical path is associated with the plurality of the static mirrors such that at least one branch radiation beam comprises a plurality of said reflected portions.

4. The beam splitting apparatus of claim 2 or 3, wherein each of the branch optical paths is associated with a respective plurality of the static mirrors such that each branch radiation beam comprises a plurality of said reflected portions.

5. The beam splitting apparatus of any of claims 1 to 4, wherein each static mirror is arranged to extend partially across the first radiation beam

6. The beam splitting apparatus of any of claims 1 to 5, wherein at least some of the plurality of static mirrors are configured to reflect a solid area of the first radiation beam.

7. The beam splitting apparatus of any preceding claim, wherein at least some of the plurality of static mirrors are provided by a reflective grating, each of a plurality of faces of the grating providing a respective one of the plurality of static mirrors.

8. The beam splitting apparatus of claim 7, wherein each reflective face of the grating that is associated with a same one of the plurality of directions extends substantially parallel to a single silicon crystal plane.

9. The beam splitting apparatus of claim 7 or 8, wherein the grating is a macro-scale grating.

10. The beam splitting apparatus of claim 9 as dependent on claim 2, wherein the reflective faces are arranged such that expansion of each reflected portion causes partial overlap of at least two reflected portions associated with one branch optical path at the one of the plurality of tools associated with the one branch optical path.

11. The beam splitting apparatus of claim 10, wherein the reflective faces are arranged such that the overlapping reflected portions provide a branch radiation beam having an intensity profile substantially the same as an intensity profile of the first radiation beam.

12. The beam splitting apparatus of any of claims 7 to 11 as dependent on claim 2,

wherein the grating comprises a first plurality of faces associated with a first branch optical path to provide a first branch radiation beam;

wherein each one of the first plurality of faces is arranged to reflect a respective part of the first radiation beam to form a respective sub-beam of the first branch radiation beam ; and

wherein the first plurality of faces is arranged such that if a position of the first radiation beam changes in a plane perpendicular to a propagation direction of the first radiation beam, a power received by at least one of the first plurality of faces increases and a power received by at least one of the first plurality of faces decreases.

13. The beam splitting apparatus of claim 7 or 8, wherein the grating is a micro-scale grating.

14. The beam splitting apparatus of claim 13, wherein the reflective faces of the grating are arranged such that portions of radiation reflected from the grating diffract to provide said plurality of branch radiation beams.

15. The beam splitting apparatus of claim 14, wherein the reflective faces of the grating are arranged such that each branch radiation beam has an intensity profile substantially similar to an intensity profile of the first radiation beam.

16. The beam splitting apparatus of any of claims 7 to 15, wherein the faces of the grating have translational symmetry in at least one direction perpendicular to a direction of propagation of the first radiation beam.

17. The beam splitting apparatus of any of claims 7 to 16, wherein the beam splitting apparatus comprises expansion and/or flat-top forming optics and wherein the reflective grating is disposed upstream of said expansion and/or flat-top forming optics.

18. The beam splitting apparatus of any of claims 7to 17, wherein the reflective grating is arranged to receive the radiation beam from a flat mirror disposed between the radiation source and the reflective grating.

19. The beam splitting apparatus of any of claims 7to 18, wherein the grating is formed from etched silicon.

20. The beam splitting apparatus of claim 19, wherein the grating comprises a reflective coating, the reflective coating comprising a material or composition selected for grazing incidence reflectivity of a desired wavelength.

21. The beam splitting apparatus of any of claims 7 to 20, further comprising a further reflective grating arranged to further split at least one of the branch radiation beams provided by the grating.

22. The beam splitting apparatus of any preceding claim, wherein at least one of the static mirrors is provided with one or more apertures arranged to permit a portion of the first radiation beam not reflected by the at least one static mirror through the aperture towards a further one of the plurality of static mirrors.

23. The beam splitting apparatus of any preceding claim, wherein at least one of said static mirrors comprises a ring-shaped reflective surface arranged to reflect a portion of radiation along an associated branch optical path and to permit a portion of the first radiation beam through an aperture defined by the ring toward a further one of the plurality of static mirrors.

24. The beam splitting apparatus of claim 23, wherein said ring-shaped reflective surface is arranged such that if a position of the first radiation beam changes in a plane perpendicular to a propagation direction of the first radiation beam, a power received by at least one part of the ring-shaped reflective surface increases and a power received by at least a further part of the ring-shaped reflective surface decreases.

25. The beam splitting apparatus of any preceding claim, wherein at least one of the static mirrors comprises a first reflective surface and a second reflective surface joined along an edge, wherein the edge is arranged for placement within a radiation beam.

26. The beam splitting apparatus of any preceding claim, wherein at least one of the static mirrors is provided with active cooling.

27. The beam splitting apparatus of any preceding claim, comprising a plurality of diverging optical elements, each arranged to increase the divergence of a respective one of the branch radiation beams.

28. The beam splitting apparatus of any preceding claim, wherein the radiation source comprises one or more free electron lasers.

29. A system comprising:

a radiation source operable to produce a first radiation beam;

a plurality of tools arranged to receive respective branch radiation beams; and

a beam splitting apparatus according to any preceding claim arranged to split the first radiation beam into a plurality of branch radiation beams and to provide respective branch radiation beams to each of the plurality of tools.

30. The system of claim 29, further comprising a respective diverging optical element for each of the plurality of tools.

31. The system of claim 30 wherein the beam splitting apparatus is arranged according to any of claims 7 to 20 and wherein each respective diverging optical element is downstream of the grating.

32. The system of claim 29, 30 or 31, wherein the diverging optical element comprises a convex, concave and/or saddle shaped grazing incidence mirror.

33. The system of any of claims 29 to 32, further comprising optics configured to modify the cross-sectional shape of a branch radiation beam.

34. The system of claim 33, wherein the optics comprises an array of mirrors arranged to split the branch radiation beam into a plurality of sub-beams and to combine the sub-beams together.

35. The system of any of claims 29 to 34 wherein the first radiation beam comprises EUV radiation.

36. The system of any of claims 29 to 35, wherein the plurality of tools comprises a lithographic apparatus and a mask inspection apparatus each arranged to receive a different one of the branch radiation beams.

37. The system of any of claims 29 to 36, wherein the radiation source comprises one or more free electron lasers.

38. A method comprising:

producing a first radiation beam in a radiation source; and

directing the first radiation beam to a beam splitting apparatus according to any of claims 1 to 28 to produce a plurality of branch radiation beams.

39. The method of claim 38, further comprising directing each branch radiation beam to a respective tool.