

Claims:

1. An LED backlight for use with a display panel, the backlight comprising:
 - a monolithic LED array having a surface and comprising a plurality of LEDs for emitting light from the surface of the array;
 - a monolithic collimator array comprising a plurality of collimating channels, and being aligned so that each of the collimating channels is aligned with one or more of the plurality of LEDs, wherein the collimating channels are configured to collimate emitted light emitted from the LEDs to angles in the range of about $\pm 50^\circ$ from a line substantially normal to the surface of the LED array;
 - a microlens array for focusing the collimated light to infinity, the microlens array comprising a plurality of lenslets, each lenslet aligned with a collimating channel of the monolithic collimator array; and
 - a relay lens for focusing the light from the microlens array on a display panel.
2. The LED backlight according to claim 1, wherein each collimator channel is aligned with a single LED, preferably a red, green, blue or white LED.
3. The LED backlight according to claim 1 or 2, wherein each lenslet of the microlens array is aligned with:
 - a) a single collimator channel, wherein a central axis of the collimator channel and a central axis of the lenslet are aligned; or
 - b) one or more collimator channels, wherein a central axis of each of the one or more collimator channels are offset from a central axis of the lenslet; or
 - c) a combination of (a) and (b).
4. The LED backlight according to claim 1 or claim 2, wherein each lenslet of the microlens array is aligned with one or more collimator channels, wherein a central axis of each of the one or more collimator channels are offset from a central axis of the lenslet.

5. The LED backlight according to claim 3 and claim 4, wherein the monolithic collimator array comprises at least first and second sub-arrays of collimator channels, wherein each collimator channel in the first sub-array of collimator channels is identically offset from the central axis of the corresponding lenslet and each collimator channel in the second sub-array of collimator channels is identically offset from the central axis of the corresponding lenslet, whereby selective actuation of the LEDs aligned with the first or second sub-array of collimator channels would provide illumination on non-identical portions of a display panel.
6. The LED backlight according to any of the preceding claims, wherein the monolithic LED array and the monolithic collimator array are integrally formed.
7. The LED backlight according to any of the preceding claims, wherein the LED array is a microLED array.
8. The LED backlight according to any of the preceding claims, wherein the collimating channels are configured to collimate emitted light emitted from the LEDs to angles in the range of about $\pm 40^\circ$, preferably $\pm 30^\circ$, preferably $\pm 20^\circ$.
9. The LED backlight according to any of the preceding claims, wherein the monolithic collimator has a depth of from 100 to 2000 microns
10. The LED backlight according to any of the preceding claims, wherein each channel of the monolithic collimator has an internal surface, the internal surface having a surface roughness (S_q) of less than 20 nm and/or wherein the internal surface has a reflective coating thereon.
11. The LED backlight according to claim 10, wherein the internal surface has a reflective coating which is a metallic coating, such as PVD deposited silver.
12. The LED backlight according to any of the preceding claims, wherein the monolithic collimator is injection moulded.

13. The LED backlight according to any of the preceding claims, wherein the monolithic collimator is made using nanolithography.
14. An LED backlight according to any of claims 1 to 13, further comprising a polariser.
15. A digital light projector comprising the LED backlight of any of claims 1 to 14 and a display panel.
16. The digital light projector according to claim 16, wherein the display panel is arranged at a separation from the relay lens such that substantially all light from the LED backlight is incident on the display panel.
17. An LED illumination device for forming the LED backlight according to any of claims 1 to 14, the device comprising:
- a monolithic LED array having a surface and comprising a plurality of LEDs for emitting light from the surface of the array;
 - a monolithic collimator array comprising a plurality of collimating channels, and being aligned so that each of the collimating channels is aligned with one or more of the plurality of LEDs, wherein the collimating channels are configured to collimate emitted light emitted from the LEDs to angles in the range of about $\pm 50^\circ$ from a line substantially normal to the surface of the LED array; and
 - a microlens array for focusing the collimated light to infinity, the microlens array comprising a plurality of lenslets, each lenslet aligned with a collimating channel of the monolithic collimator array.
18. An LED illumination device according to claim 17, further comprising a polariser.
19. A digital light projector comprising the LED illumination device of claim 17 or 18 and a display panel.

20. Use of a monolithic collimator array for collimating light from a monolithic LED array in an LED backlight.