What is claimed is:

1. A laser processing apparatus comprising:

a chuck table that holds a workpiece;

laser beam applying means that applies a pulsed laser beam to the workpiece held on the chuck table; and

processing feeding means that moves the chuck table and the laser beam applying means relative to each other in a processing feed direction,

wherein the laser beam applying means includes laser beam oscillating means that oscillates a laser beam of such a wavelength as to be transmitted through the workpiece, and a focusing unit that focuses the laser beam oscillated from the laser beam oscillating means to apply the laser beam to the workpiece held on the chuck table,

the focusing unit includes a focusing lens that focuses the laser beam oscillated from the laser beam oscillating means, and a spherical aberration extending lens that selectively extends spherical aberration of the focusing lens, and

the pulsed laser beam is applied from the focusing unit to the workpiece held on the chuck table to form shield tunnels each composed of a fine hole and an amorphous region shielding the fine hole, the shield tunnels extending from an upper surface toward a lower surface of the workpiece,

wherein the spherical aberration extending lens extends the spherical aberration of the focusing lens in a range of from 100 to 500 μm.

2. The laser processing apparatus according to claim 1, wherein the pulsed laser beam has a peak energy density set to within a range of from 1 to 100 TW/cm^2.