Displays such as LCD panels are illuminated using frequency-doubled vertical extended cavity surface emitting lasers (VECSELs) as efficient light sources. Visible light from the VECSELs are directed to an illuminating panel using optical fibers and/or optical gratings to provide substantially uniform illumination of the illuminating panel. Visible light from the illuminating panel, which can be provided at a particular number of primary wavelengths by the VECSELs, is then used to illuminate the display.