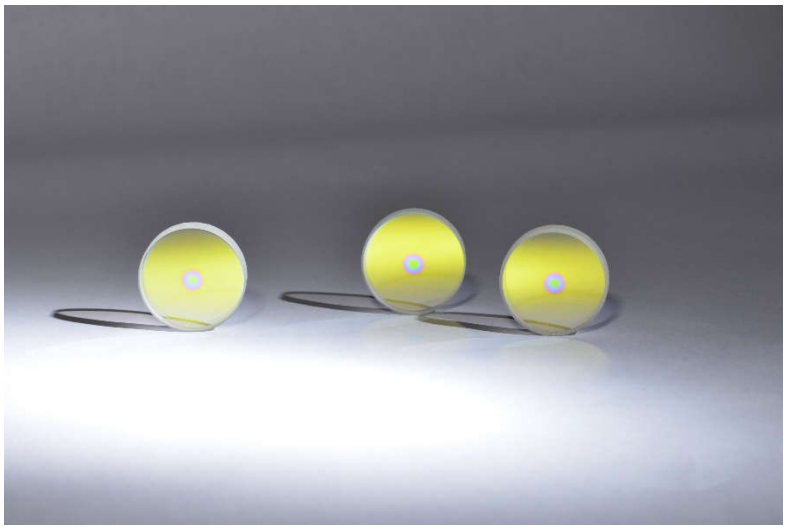
Variable Reflectivity Mirrors

15% - 40%

266-2500 nm



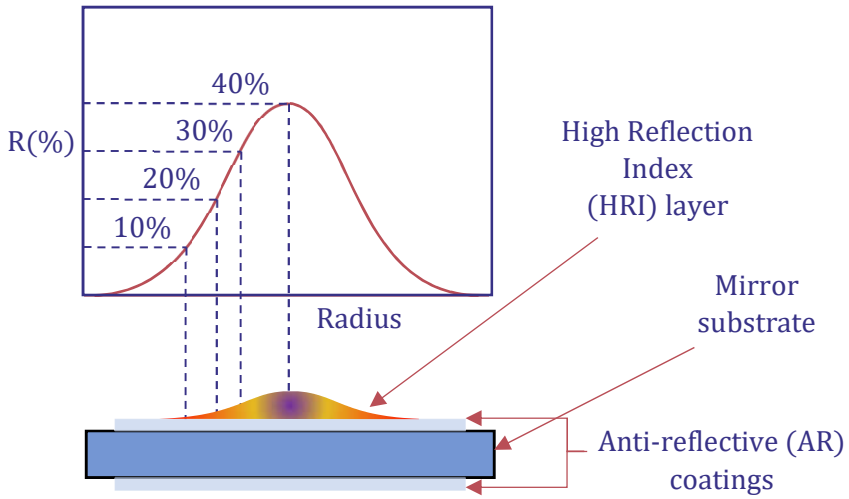
Variable reflectivity mirrors (VRM) also known as Radial Gradient Reflection Mirrors (RGRM), Graded Reflectivity Mirrors (GRM) or (Super) Gaussian Mirrors are unique optical mirrors designed for specific wavelength with reflection value variation as a function of radius (position form the center of mirror on the mirror ‘s surface). Usually – the highest reflectivity in the center. These mirrors can be produced only by few optical thin film coating companies worldwide.

Simplest method to produce Variable Reflectivity Mirror is to deposit single high reflection index layer through specifically designed mask. VRM (GRM) usually are produced either by Fixed Mask method (employing shadowing effect) or by Rotating Mask method.

$$R(r) = R_0 exp\left[-\left(\frac{r}{w}\right)^k\right] \text{ or } R(r) = R_0 exp\left[-2\left(\frac{r}{w}\right)^k\right]$$

R – reflection at specific spot (%); **R_0** – reflection at the center (%);

r – radius; **w** – coating radius; **k** – order



Applications:

- To improve beam profile (shape) and produce high quality laser beam in non-stable (unstable) resonators with high pulse energies and low divergence.
- 3photon Variable Reflectivity Mirrors are mostly used in Nd:YAG ($Nd:Y_3Al_5O_{12}$) laser systems as cavity optics (gaussian output coupler)
- In order to achieve higher pumping efficiency Variable Reflectivity Mirrors (VRM) are used in frequency doubling systems.

Advantages and disadvantages using VRM in resonators

- Very good extraction efficiency;
- Near-perfect values of M^2;
- Lower divergence;
- Less field uniformity in comparison to other resonator types;
- Repetition frequency and input energy can be adjusted in very narrow ranges.

Features

- Variable Reflectivity Profile is only working for single specific wavelength;
- Extremely stable for high power applications;
- Reduces risk of optical damage in high energy laser systems.