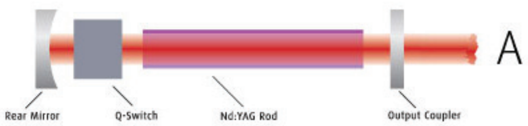
Different Resonator Options from Litron

Litron offers five distinct resonator configurations. This is more than any other manufacturer and this article sets out to help customers identify which one is best for their needs.

A. Conventional Stable

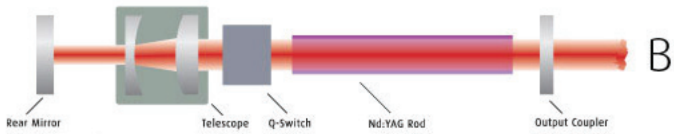
This multimode resonator has been around the longest time and is the simplest in terms of design. Typical characteristics are excellent energy extraction (measured as the amount of stored energy in the rod emerging in the pulse) and beam uniformity but somewhat high divergence and M^2 values. Conventional stable resonators allow the user to vary parameters such as input energy (flashlamp voltage) and repetition rate with very little variation in beam quality.



B. Telescopic Stable

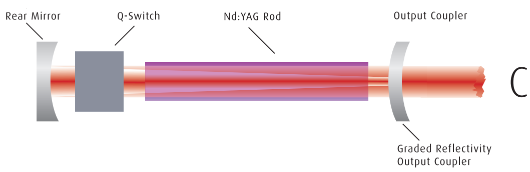
This variation on the multimode stable design places an intracavity telescope in the rear of the resonator. This has the two effects of compensating the thermal lensing in the laser rods and making the resonator appear considerably longer, without making it significantly more so, so reasonably short pulses are still obtained. The outcome is a laser beam with still very good spatial uniformity and efficient energy extraction but with much better divergence and M^2 characteristics than a conventional stable resonator.

The resonator is still flexible in terms of input energy and repetition rate and can be made even more so by means of adjustments to the telescope.



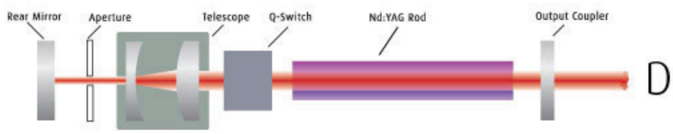
C. Gaussian-Coupled Unstable

This resonator comprises a P-branch confocal unstable resonator with a graded reflectivity mirror (GRM) for the output coupler. The rear mirror curvature is chosen so as to compensate the thermal lens in the rod and provide a more or less collimated output. The GRM unstable resonator provides lower values still for divergence and M^2, with reasonable extraction efficiency but the downside is less uniform near field uniformity and much less flexibility in varying the input energy and repetition frequency.



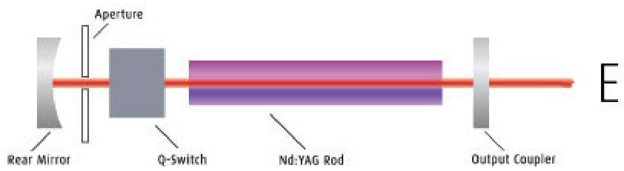
D. Telescopic Stable TEM_{00}

This is a variation on the telescopic stable resonator that additionally employs an intracavity aperture to suppress higher order transverse modes to allow the laser to give a beam with near diffraction limited, single mode TEM_{00} quality, with a uniform Gaussian profile. Input energy and repetition rate flexibility are similar for the telescopic stable resonator but extraction efficiency is relatively low, being between a third and a quarter of the multimode telescopic stable resonator. As an option, Litron offers a suite of apertures to allow a user to obtain a range of beam quality and energy trade offs from TEM_{00} to multimode.



E. Conventional Stable TEM_{00}

Compared to a telescopic stable TEM_{00} laser, a smaller footprint, shorter pulse duration and greater input energy flexibility are the main benefits. However, lacking the telescope, the extraction efficiency is lower still.



Comparison Table of Resonator Types

	Beam Quality (Uniformity)	Focusability (M^2)	Extraction Efficiency	Flexibility in Input Energy and Repetition Frequency
Conventional Stable	Excellent	Poor (>10)	Excellent (>90%)	Excellent
Telescopic Stable	Very Good	Very Good (3-4)	Very Good (80%)	Very Good
GRM Unstable	Poor	Excellent (~2)	Very Good (80%)	Poor
Telescopic Stable TEM_{00}	Excellent	Excellent (~1.2)	Poor (30%)	Very Good
Conventional Stable TEM_{00}	Excellent	Excellent (~1.2)	Very Poor (10%)	Excellent

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