OPTOMAN

YOUR SIDEKICK FOR LASER OPTICS DEVELOPMENT

Dispersive mirrors

OPTOMAN, your sidekick for laser optics development will guide you through the features and requirements of dispersive mirrors for your ultra-fast laser system.

First, let's get familiar with our dispersive mirror features:

Predefined and flat GDD
Negative GDD down to –5000 fs²

Rs>99.99% & Rp>99.99%

LIDT >0.3 J/cm² @ 1030nm, 50 fs, 150 kHz

Ø 5 -120 mm

From 250 nm up to 5000 nm

Existing fundamental limitations and technological advice:

GDD vs Wavelength for different chirped mirror designs. More negative GDD value results in a narrower operational bandwidth.

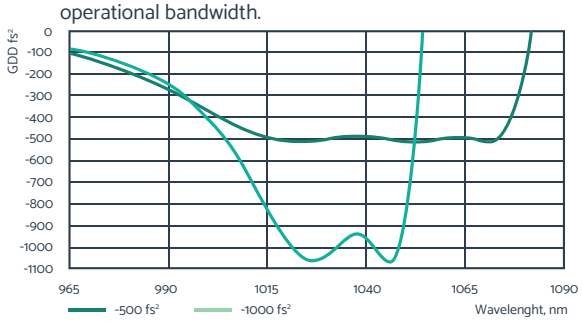


Fig. 1 calculated GDD values at AOI 10°

Below graph indicates GDD dependence on operational bandwidth at a fixed coating thickness of 10 µm. Stars on the graph indicate experimentally produced designs.

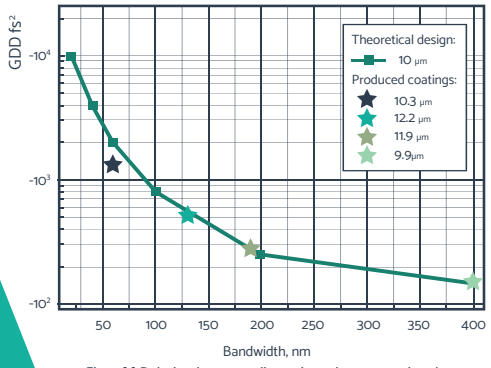


Fig. 2 [1] Relation between dispersive mirror operational bandwidth and average achievable GDD.

Source:[1] PERVAK, V., et al. Empirical study of the group delay dispersion achievable with multilayer mirrors. Optics express, 2013, 21.15: 18311-18316.

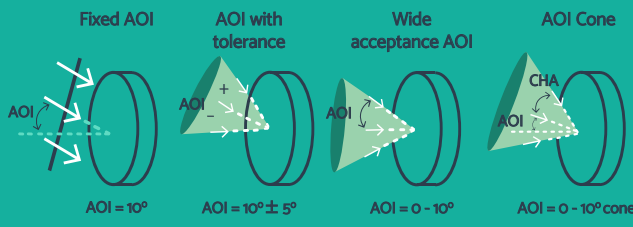
Tell OPTOMAN a bit about your laser system:

Center wavelength _____ nm
Operational bandwidth _____ nm
Pulse duration _____ fs
Pulse energy _____ mJ
Repetition rate _____ Hz
Beam diameter _____ mm (1/e²)
Beam shape _____

(**Tip#1:** spectral bandwidth can be calculated by knowing the pulse duration. You can use **this calculator**)

Requirements for dispersive mirror:

Reflectivity R> ___ % (**Tip#2** if value is unknown then the typical choices are: >99%; >99.5% or >99.9%)
Group delay dispersion (GDD) _____ fs² & tolerance +/- _____ fs²
Angle of incidence (AOI):



(**Tip#3:** at higher GDD values it is beneficial to design the laser so that the AOI can be fine-tuned for best performance.)

Defining priorities makes things easier.

It is important to know which specifications are most critical:
Priority #1 ____ #2_____ #3_____ ....
A typical example:

#1 – LIDT. Maximum energy fluence on coated surface > 0.3 J/cm².
#2 – GDD oscillations are as low as possible.
#3 – GDD is as low as possible. The preference is -300 fs².
#4 – The bandwidth optimization target – 100nm.

Pulse compression analysis:
OPTOMAN can do a pulse compression analysis and present you with a data analysis after a specific number of bounces.

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