Technical Article

Quick Flexibility Tips for Customizing SNR and Resolution on Your Spectrometer Design

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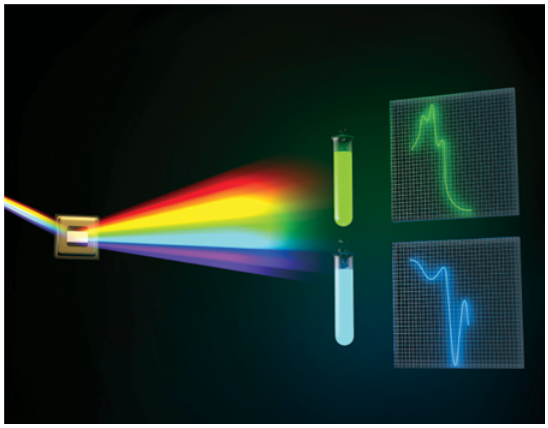


Engineers understand the essential importance of two key performance metrics for any spectrometer design: signal-to-noise ratio (SNR) and spectral resolution.

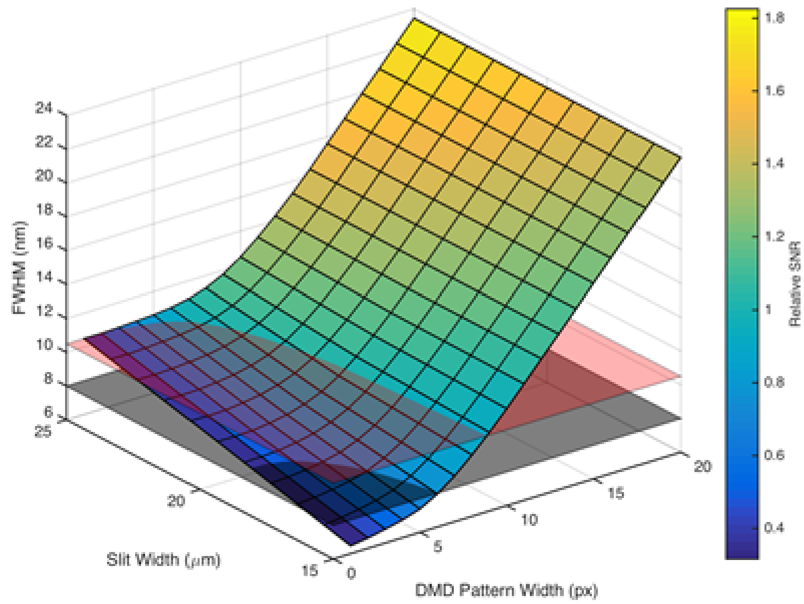
SNR is the ratio of signal power to noise power. This is important because it determines the consistency of the spectrums measured. Resolution is significant because it determines the minimum distance in nanometers adjacent spectral peaks can be to each other while the spectrometer still accurately resolves both peaks. Depending on the material being sampled, different SNR and resolutions may be required in order to get an accurate, usable measurement.

Thanks to the flexibility of our DLP® NIRscan™ and DLP NIRscan Nano evaluation modules (EVMs), developers using these solutions can now optimize their spectrometer products for specific use cases, whether it is for agriculture, pharmaceuticals, factory control, or other key industries.

When tuning a spectrometer design featuring DLP technology, there are three things that can be adjusted to tailor performance: resolution, SNR, and scan time. Adjusting any one of these factors has a proportional impact on the other performance settings.

For example, if you need a faster scan, you often must compromise on SNR and resolution. Fortunately for developers, DLP technology offers unparalleled flexibility because the digital micromirror device (DMD) is inherently programmable to control how the spectrum is measured. In other words, the patterns that are shown to the DMD can be easily modified, unlike other solutions that operate more like a traditional camera.

It's hard to understate the flexibility of being able to vary the pattern width, but this chart illustrates why it gives spectrometer designs a lot more room for optimization. In the below graphic, you can clearly see the interplay of slit width, pattern width, resolution in full width half max (FWHM) and relative SNR in a spectrometer.



I encourage you to read my recent Application Report that discusses the trade-offs in maximizing SNR and resolution. It includes a wealth of specific details to help developers designing spectrometers extract the full value of the DLP NIRscan EVMs.

If you're are at an earlier step and need to better understand how DLP technology can be integrated in your next spectrometer or chemical analyzer, see our comprehensive report on DLP technology design considerations for spectroscopy designs.

You can also read more about how TI's DLP technology is used in spectroscopy applications:

- Tapping the cloud for IoT sensing solutions
- From crops to store shelves, the future is looking bright for near-infrared spectroscopy
- TI DLP® NIRscan™ Nano Evaluation Module has answers to your handheld near-infrared sensing application problems
- Taking a look inside the DLP® NIRscan™ Nano Evaluation Module
- Getting the Most from the DLP® NIRscan™ Nano Evaluation Module: Part One
- Getting the Most from the DLP® NIRscan™ Nano Evaluation Module: Part Two

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