

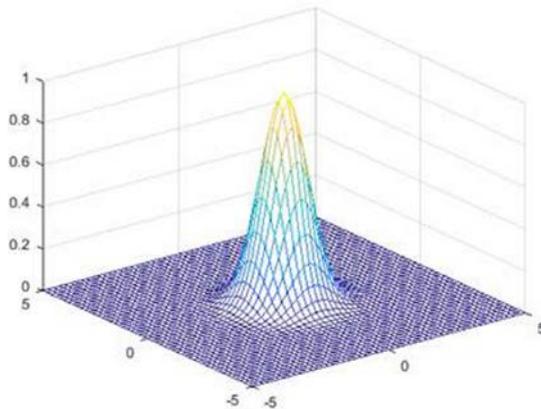
Calculation of Optical Power

Using the F-712.PM1 Power Meter with F-712 High-Precision Fiber Alignment Systems

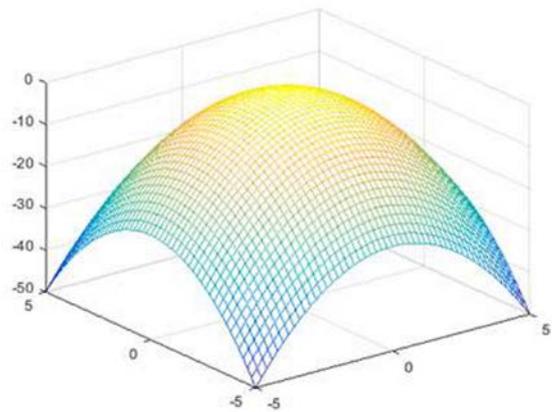
Today's fast pace of innovation means every alignment application is different. So, there is no universal 'best' approach to aligning an arbitrary device. There is, however, a best practice: exploratory experimentation. F-712 systems are very versatile and integrate a wealth of alignment functionality. You will find that some sequence of function calls will be optimal for your situation. Our applications engineers and service professionals are happy to assist if you have questions.

For example, we recommend power metrology with a logarithmic response, such as the output signal of our F-712.PM1 power meter. This provides the largest dynamic range, which is important for capture when far from optimum. It has another advantage: the logarithmic response flattens the steep sides of the typically Gaussian-like coupling profile, allowing a smoother approach to maximum with less risk of overshoot. But our F-712 alignment systems also allow (via the SIC command – see below) an automatic conversion to power for such a logarithmic signal, when desired. You can easily switch the exponential scaling on and off by issuing the SIC command accordingly. This allows you to take advantage of the smoothing of the logarithmic scaling yet query optical power accurately.

For many applications, this is a fine approach. Whether it is best for your devices can easily be determined as you initially work with the system and explore.



Gaussian-like coupling profile



Logarithmic scaling of the coupling profile

How does the SIC command work:

The measured power is fed into the controller as an analog input signal. The calculation settings defined with SIC are applied to the analog input signal before it is used in the fast alignment routines. The input values before and after the conversion with SIC can be queried with the TAV? and TCI? commands.

If you want to use the logarithmic output of the F-712.PM1 power meter as input for the alignment routines in an F-712 system (recommended because routines usually work better with it), make sure you have (re)set the SIC calculation to type "0" (= no calculation) before starting an alignment routine.

If you want to convert the logarithmic output of the F-712.PM1 power meter to (linear) power in an F-712 system, set the SIC command as follows:

```
SIC <FA input channel ID> 1 a b c d
```

Where

<FA input channel ID> is the identifier of an analog input channel of the controller.

“1” is the type of calculation to be applied—exponential scaling as follows:

$$\text{Power in W} = a + b * c^{(d * \text{analog input in V})}$$

“a”, “b”, “c” and “d” are the terms of the exponential equation for power calculation which have to be set as follows:

- a = 0
- b = **E** / 10^(c/m)
- c = 10
- d = 1/m

The values displayed in bold are taken from the calibration certificate of the F-712.PM1 power meter:

c	Intercept / V, see calibration certificate (value for logarithmic output signal, page 5)
m	Slope / V/A, see calibration certificate (value for logarithmic output signal, page 5)
E	Spectral responsivity / W/(A*nm) If the optical input of the power meter is used: See calibration certificate (pages 6 and 7). If the current input of the power meter is used with a photodiode, refer to the spectral responsivity in the documentation of this photodiode.

Note that the designation “c” is used for two different values, namely a term in the exponential equation of the SIC command (set in regular font), and also for the intercept/V in the calibration certificate of the power meter (set in bold).

Example:

Select power calculation for fast alignment input channel 1, with a = 1.234, b = 3.124, c = 2.234 and d = 0.9. Query the power value of the channel, and afterwards set SIC back to “no calculation” to use the logarithmic signal for the fast alignment routines. Send:

```
SIC 1 1 1.234 3.124 2.234 0.9
```

```
TCI? 1
```

```
SIC 1 0
```

If you want to use the SIC calculation as a convenient conversion tool, without at the same time changing the alignment routine input, you have to physically connect the power meter output to two separate channels of the controller and use one channel for the SIC conversion and the other for logarithmic alignment input, i.e. with SIC set to 0. Query the converted value with the TCI? command.