How can I align a Cyclone Gas Cell?

For mirror alignment of any version of CycloneTM gas cell, but most especially for the variable pathlength cell options, Specac thoroughly recommend use of the laser alignment accessory P/N GS24500. This provides a coherent, visible source of light to assist in the initial cell alignment before the cell is placed into a spectrometer sample compartment for fine tuning against the spectrometers source and detection system. It is usually only necessary to adjust the input and output mirrors on the transfer optical unit rather than any adjustment of the mirrors inside the gas cell to achieve the correct alignment.

Taking a C10 CycloneTM cell as an example, this is factory aligned and set to a pathlength of 10.56 meters (40 passes of the beam through the cell). For a fixed pathlength cell the T shaped field mirror (FM) will show a line of 10 spots of light on the longest part of the T shaped FM, with 19 spots of light in total arranged as two parallel lines from side to side across the FM. If for any reason the objective mirrors (OM1 (input) and OM2 (output)) at the top of the cell become detached from their spring setting, then the pattern of light spots on the FM will not be observed. Consequently, no amount of adjustment on the input and output mirrors of the optical unit will allow for correct alignment. The objective mirrors must be remounted correctly in their spring setting. This is not a tricky job, but it does involve removal of the outer glass or metal cylinder of the gas cell to gain access to the mirrors for resetting. It is therefore crucial to establish a pattern of light spots on the FM to verify that the internal mirrors OM1 and OM2 are set correctly.

For variable pathlength cells, if the OM2 has been adjusted via the micrometer screw for a different pathlength from the standard factory setting, it is necessary to establish some pattern of light spots on the FM to calculate for a set pathlength. Any slight misalignment either side of the next sequence of spots (next corresponding sequence of 4 passes through the cell) means there will be no passage of light through the cell and consequently no light will reach the output mirror of the optical unit.`

Therefore, for alignment of a FIXED pathlength CycloneTM gas cell using the laser alignment accessory, mount the CycloneTM gas cell on the alignment accessory such that the laser source will enter the optical transfer unit from the same beam direction as the spectrometer system. Rotate and/or tilt the input mirror to direct a beam of light up to the input objective mirror (OM1) at the top of the gas cell. If both objective mirrors (OM1 (input) and OM2 (output)) are in alignment then a pattern of spots corresponding to a particular pathlength setting are seen on the bottom T shaped FM. The final beam pass through the cell will be directed past the FM to the output mirror in the optical unit. This mirror can then be rotated and/or tilted to direct the beam of light to the target cross on the laser alignment accessory. The CycloneTM gas cell can then be placed into the spectrometer for fine tuning and maximising the beam signal throughput.

For alignment of a VARIABLE pathlength cell on the laser alignment accessory, mount the CycloneTM gas cell on the alignment accessory such that the laser source will enter the optical transfer unit from the same beam direction as the spectrometer system.

If NO light spots are seen on the FM when the beam of input light from the laser alignment accessory is directed to the OM1, then adjust OM2 by movement of the micrometer screw until a pattern of light spots is obtained. (It is assumed that OM1 and OM2 are correctly set in their mirror mountings.) When a particular beam pass sequence has been established, the final beam pass through the cell will be directed past the FM to the output mirror in the optical unit. This mirror can then be rotated and/or tilted to direct the beam of light to the target cross on the laser alignment accessory. The CycloneTM gas cell can then be placed into the spectrometer and the input and output mirrors ONLY of the optical unit may need to be adjusted to peak up the signal for the pathlength selected. Only when this is done should the micrometer be adjusted to change the position of the OM2 and hence the pathlength of the cell. Changing of the OM2 should not alter the alignment of the cell from this point.

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