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Mechanical Alignment Procedure for the ZetaPlus

Precautions:

a) Before you begin to align the ZetaPlus, the detector, either a photomultiplier tube (PMT), or an avalanche photodiode detector (APD) should be disconnected and the light pipe should be blocked.
b) Turn off the laser before mounting each optical component to avoid damaging the laser caused by back reflections. After the part to be aligned is mounted you can turn the laser back on.
c) Verify that all optical components are free of dust and finger prints before mounting. Use Ethanol and lens tissue to clean if necessary.
d) Use the Windows ZetaPlus program and go to: Setup/Diagnostics/Instrument Hardware Test to verify that each optical component is working properly. These items are:
   - Laser (laser should turn on and off)
   - 15 Degree Shutter (15 degree flag should open and close)
   - Reference Beam Shutter (reference beam flag should open and close)
   - Phase Modulator (Piezo should turn off and on)
   - Temperature Control Oven (front panel temperature L.E.Ds should turn off and on)
   - Neutral Density Filter (NDF wheel should turn continuously)
e) Tightening screws may cause the part you are aligning to move. Therefore each component alignment must be checked again after you have tightened the mounting bolts.
f) Use a laser power meter to verify that the laser is producing the correct output power.

Note: To insure that the laser is aligned properly, each fixed optical component which will influence the laser beam must be installed before the alignment process has been started. These items are:
   - SPLITTER (Beam Splitter)
   - NDF WHEEL (Neutral Density Filter)
   - POLARIZATION FILTER
   - COMBINER (Beam Combiner)

1. Aligning the Laser:

Refer to the ZetaPlus Optic Plate Configuration drawing for alignment pinhole locations. Remove the 45 degree mirror assembly (MIRROR), and mount an alignment pinhole in locations (1) and (2). Adjust the two plates on the laser tilt stage such that they are parallel before tightening the locking screw. Begin centering the beam through the two pinholes by turning the vertical and horizontal adjusting screws located on the laser tilt stage. Adjust the screws until the beam is at maximum intensity through pinholes (1) and (2). Tighten the two laser tilt stage mounting bolts.

polarization filter such that the reference count rate is between 1400 Kcps and 1600 Kcps. Tighten polarization clamp and mount bolts.

7. Aligning the 45 Degree Mirror:

Reinstall the mirror assembly (MIRROR). Reinstall pinhole in location (1). Remove pinhole from location (6). Install pinholes in location (7), and (8). Adjust the mirror holder and mount to bring the beam through the center of pinholes (7) and (8). Verify that there is no laser light splashing on any surfaces inside the cell holder. If so, you must readjust the mirror to remove the splash. Tighten the mirror clamp and mounting bolts.

8. Maximizing the 15 Degree Signal Using a BI-ZR3 Sample:

Remove pinholes from locations (1), (7) and (8). Maximize the NDF wheel (clearest section of neutral density filter). Insert electrodes into a cuvette filled a BI-ZR3 dilute sample sample. Loosen the detector mounting bolts, and begin to maximize the 15 degree count rate by adjusting the horizontal position of the detector assembly. Retighten the detector mounting bolts when the maximum count rate has been achieved. Loosen the four detector upright. Adjust the vertical position of the detector by sliding it up and down while keeping it pressed firmly against the upright mount. Retighten the four upright bolts when the maximum count rate has been achieved.

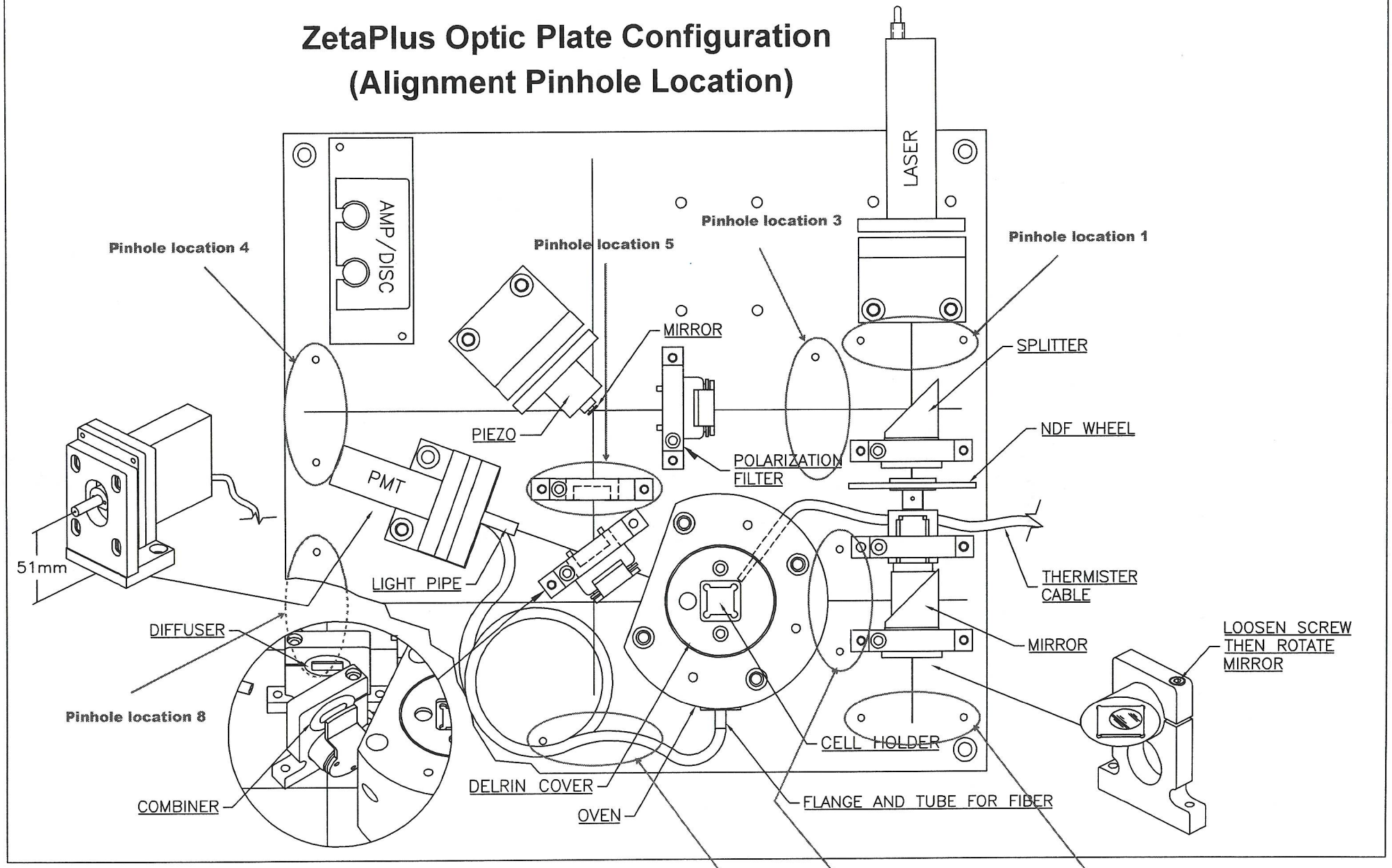
9. Making Minor Adjustments to the Alignment:

Note: At this point in the alignment procedure any adjustments to the detector assembly may influence the reference beam count rate, thus causing it to increase or decrease. Small changes are acceptable provided that the count rate remains between 1400 Kcps and 1600 Kcps. If the counts increase or decrease beyond the specified count rate readjust the polarization filter again to bring the counts within specification.

Set the instrument in alignment mode in the Windows ZetaPlus software (Setup/Alignment/On). Start a measurement and observe the spectrum. (*Note:* it is more helpful to zoom the frequency window while making minor adjustments to the alignment). Small spikes on either side of the 250 Hz frequency may be evident due to a slight misalignment of the reference beam. Make minor adjustments to the vertical and horizontal position of the Piezo tilt stage to remove excessive frequency spikes. Once the beating appears to be "noise free" (One single peak at 250 Hz), remove the electrodes from the oven assembly to verify that the dominant peak is displayed randomly throughout the frequency spectrum. See note below.

Note: "self peaking" is a term used to describe false 250 Hz beating caused by stray laser light. Stray laser light which bounces off objects other than the sample may reflect directly into the detector light pipe simultaneously with light reflected off the Piezo mirror causing "self peaking" to occur.

ZetaPlus Optic Plate Configuration
(Alignment Pinhole Location)



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