User Alignment of an X8 PROTEUM on a FR591, MICROSTAR or MICROSTAR-H generator

Required tools:
1. Fluorescent pipe
2. Beam stop override
3. Beam attenuator
4. Open beam pipe
5. Half beam pipe
6. Half beam absorber

Warning
Some procedures require an activated open beam key switch. This enables the safety shutter to open with an open radiation enclosure. This is a potentially dangerous situation and may only be performed by properly trained personnel.

General
The following descriptions assume that the system has been installed by a qualified Bruker AXS service engineer, who set the goniometer height and level and bolted down the hover unit bar to the table top according to the procedures described in the Service pages.
Figure 3. Alignment table, with adjustments indicated.
Start the Bruker Instrument Service (BIS) on the Server PC.
Start ProteumServer on the Server PC.
Make a connection to the Instrument (Instrument > Connection...)

1. Rough alignment
This procedure assumes that the alignment base was loosened from the bar, and that the complete goniometer was hovered away from the mirrors. This procedure also assumes that the mirrors were aligned according to the procedures as described in the MONTEL200 manual.

1. Place the fluorescent pipe in the collimator stand.
2. Place the beam stop override in the beam catcher position.
3. Hover the goniometer to the safety switch, such that the entrance unit activates the switch at about half its stroke. Position the entrance unit roughly in the center of the switch. Then disable the hovers.
4. Turn on the X-rays at 35 kV-10 mA
5. Switch on the open beam key (open beam lamp flashes) and open the shutters, using the Toggle Shutter function in ProteumServer (Instrument > Toggle Shutter).

6. Hover the goniometer until a sharp spot appears on the screen of the fluorescent pipe. Position the goniometer such that the spot is positioned roughly in the middle of the screen, the entrance unit is roughly in the middle of the safety switch and the switch is activated at about half its stroke. Then disable the hovers.
7. Close the shutters, by using the ProteumServer software (Instrument > Toggle Shutter) and turn the open beam key in the safe position (open beam lamp is off).
8. Set both micrometers such that the hover unit slots overlap the screw holes in the bar. Set the micrometers at about equal values.
9. Fixate the hover unit to the bar.
10. Switch on the open beam key (open beam lamp flashes).
11. Open the shutters, by using the ProteumServer software (Instrument > Toggle Shutter).
12. Activate the hovers and turn the inner-micrometer (D) clock wise until the spot disappears from the fluorescent screen. Note the micrometer value. Turn counter clock wise (the spot re-
appears) until the spot disappears again and note again the micrometer value. Set the inner-
micrometer at the average value.

13. Repeat the previous step for the outer-micrometer (E).
14. Disable the hovers, close the shutters (press Toggle Shutter again) and set the open beam key in the safe position.

4. Optimization of mirror alignment
Start BCP and choose Tools > Half-beam

1. Place the open beam pipe in the collimator stand and mount the beam attenuator.
2. Place the beam stop override in the beam catcher position.
3. Set the generator at operating power, for instance full power (MICROSTAR: 45 kV-60 mA) and let the system stabilize for ~60-90 min.
4. Switch on the open beam key (open beam lamp flashes). Warning: this enables open beams. Be sure not to hold your hands in-between the collimator stand and detector.
5. Measure the beam intensity continuously:
   a. Seconds per exposure 1.0
   b. Test: Enable Continuous
   c. Tool: Enable Goniometer head tool
   d. Press START button
6. The intensity is shown by the program, in the window marked with a red arrow above. The visualization window (on the left) shows the beam and integration window on the detector. Be sure that the beam is within the integration window. Enlarge the integration window to 100X100 pixels if necessary. If the beam is still not in the window, but clearly on one of the edges, repeat the ‘Rough alignment’ part. If this does not help, the goniometer pitch might be wrong and you should contact a Bruker AXS service engineer for assistance to set the goniometer pitch and level. This will also require a complete realignment of the mirrors.

7. Slightly change both the vertical and horizontal mirror adjustments such that the intensity is maximized.

8. Make a note of the intensity and abort the intensity measurement, by pressing STOP.

9. Set the ‘open beam’ key in the safe position (open beam lamp does not flash).

5. Fine alignment
This procedure is performed with the open beam key in the safe position (lamp does not flash). For each measurement the enclosure must thus be closed. The procedure requires an iterative alignment, starting with alignment at the crystal position; being followed by alignment at the collimator entrance and finally ending with alignment at the crystal position.

Alignment at crystal position:
1. Place the open beam pipe in the collimator stand and mount the beam attenuator.
2. Place the beam stop override.
3. Set the generator at operating power, for instance full power (Microstar: 45 kV-60 mA) and let the system stabilize for 60-90 min.
4. Place the half beam absorber on the crystal position.
5. Use the video microscope and the crystal alignment routines (ProteumServer: Center Crystal plug-in) to align the half beam absorber such that it obscures half of the beam.
6. In BCP > Half-Beam procedure, Choose:
a. Seconds per exposure: 1.0
b. Test: Vertical
c. Tool: Goniometer head tool.
7. Press START to measure the beam intensity above and below the half beam absorber with the automated beam alignment routine.

8. Slightly adjust the height of the goniometer at the crystal position (outer height adjustment C) to reduce the Vertical % Variation.
9. Repeat steps 6 - 8 until the intensity above and below the half beam absorber differ less than 10 %.
10. In BCP > Half-beam procedure choose:
    a. Seconds per exposure: 1.0
    b. Test: Horizontal
    c. Tool: Goniometer head tool.
11. Measure the beam intensity left and right of the half beam absorber by using the automated beam alignment routine by pressing START.
12. Activate the hovers and slightly adjust the inner-micrometer (D) of the goniometer to reduce the Horizontal % Variation. Then disable the hovers.
13. Repeat steps 10 – 12 until the intensity left and right of the half beam absorber differ less than 10%.
14. Remove the half beam absorber.

Alignment at collimator entrance
1. In BCP > Half-beam procedure choose:
   a. Seconds per exposure: 1.0
   b. Test: Vertical
   c. Tool: Collimator tool.
   d. Press START.
2. Place the half beam pipe in the collimator stand with the dots pointing in the direction according to the software instructions and mount the attenuator.
3. Slightly adjust the height of the goniometer at the collimator entrance (A and B), to reduce the Vertical % Variation. Be sure to adjust the two height adjustments equally such that the roll of the goniometer does not change.
4. Repeat steps 1 to 3 until the intensity above and below the obstruction differ less than 5%.
5. In BCP > Half-beam procedure choose:
   a. Seconds per exposure: 1.0
   b. Test: Horizontal
   c. Tool: Collimator tool.
   d. Press START.
6. Place the half beam pipe in the collimator stand with the dots pointing in the direction according to the software instructions and mount the attenuator.
7. Activate the hovers and slightly adjust the outer-micrometer (E) of the goniometer to reduce the Vertical % Variation. Then disable the hovers.
8. Repeat steps 5 to 7 until the intensity left and right of the obstruction differ less than 5%.

Repeat the alignment at the crystal position, reducing the % Variation to less than 5%.

If the alignment was changed significantly it is advisable to repeat the procedure. Always end the alignment at the crystal position.