Calibration of OMA on RITA II

C.R.H. Bahl, K. Lefmann and B.R. Hansen

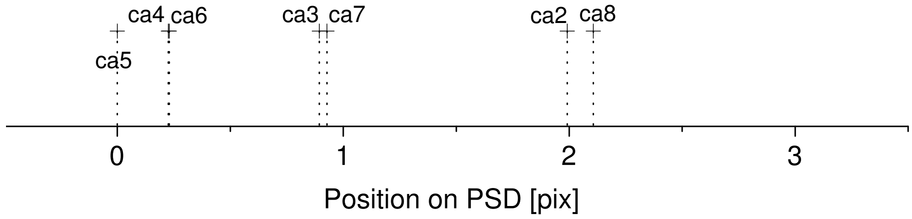
May 12, 2004

1 Introduction

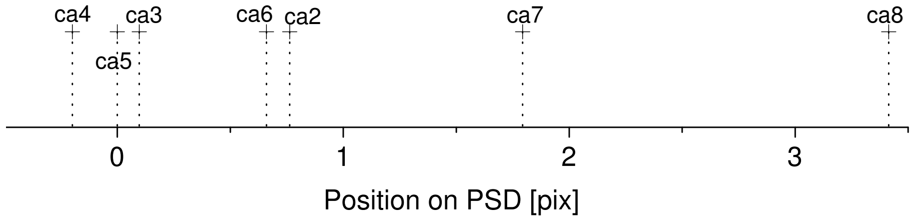
It has for some time been a problem that the angle between the analyzer rack and the beam (the TASCOM motor OMA) cannot be properly calibrated. This is due to the flexibility of the analyzer in the capability of turning the analyzer blades. As the blades turn around the same axes as OMA (certainly blade 5), only one of these angles can be calibrated. The analyzer consists of 7 blades numbered 2 to 8 controlled by the TASCOM motors $ca2$ to $ca8$.

The point-to-point focusing mode ($focus\_conste$) was designed to monochromatically focus the beams reflected from the different blades of the analyzer to the same point on the detector. Because of the asymmetry of the analyzer rack relative to the incoming neutron beam and the asymmetry of the detector to the analyzer, the beams from the different blades will actually intersect the detector at slightly different positions. This is seen in figure 1(a) calculated theoretically, assuming 5 meV neutrons and perfect alignment of all angles. The beam from the central blade ($ca5$) is defined to intersect the detector at 0. This corresponds to pixel 64 on the PSD. The exact position of the intersection can be controlled with the TASCOM motor $2TA$. Actually this can be used to calibrate $2TA$. In the following it is only the relative position of the intersections, that is important. It is seen in figure 1(a), that the rest of the blades intersect the detector nearly pairwise, in distances increasing with the blade distance from the central blade. Plotting these distances from the central blade as a function of blade number gives a parabola, see figures at the end.

If the angle OMA is above or below the perfectly aligned value, the center of the parabola will be shifted, and the intersection of the beams will not be pairwise, see figure 1(b) and the figures at the end.



(a) Perfect alignment of OMA



(b) OMA 2° below perfect alignment

Figure 1: The calculated intersection points on the PSD in the point-to-point focusing mode.

2 Example of calibration of OMA

This section will describe alignment of OMA and the analyzer blades using the point-to-point focusing mode. The energy is set to EF=5 meV, corresponding to $2TA = 74.17°$. First invoke this mode by $focus\_conste$, making sure that all the blades are free to move. Place a vanadium or plastic sample on the sample table.

Run the TASCOM macro *cascan*. This will scan each blade one at a time, leaving the others parked at 0. After each scan a *pixscanx* of the PSD i taken at the most intense position of the blade. This gives the position of the blades reflection on the PSD. The macro gives a table showing the old position, the maximum intensity position and the position on the PSD of each blade.

Plot the positions of the blades versus blade number, and connect the points with a parabola. The position of the center of the parabola gives the error in OMA. The figures at the end can be consulted to determine the magnitude of the error.

Now move OMA by subtracting ΔOMA and *remo* to the value it had before. (i.e. if OMA is 60.78° and ΔOMA is found as -5°, set $OMA = 65.78$ and *remo* to 60.78.)

Move the *ca* motors according to the movement in OMA. BUT note that the values of the *ca* motors rise clockwise opposite to all other motors, where the values rise anticlockwise. This means that the *ca*'s must be compensated in the same (numerical) direction as OMA. If the change in OMA angle is considerable (more than $\sim 1 - 2^{\circ}$) the blades should be recalibrated with the *cascan* macro, as the asymmetry means that the blades can not be compensated by exactly the same amount as OMA is moved.

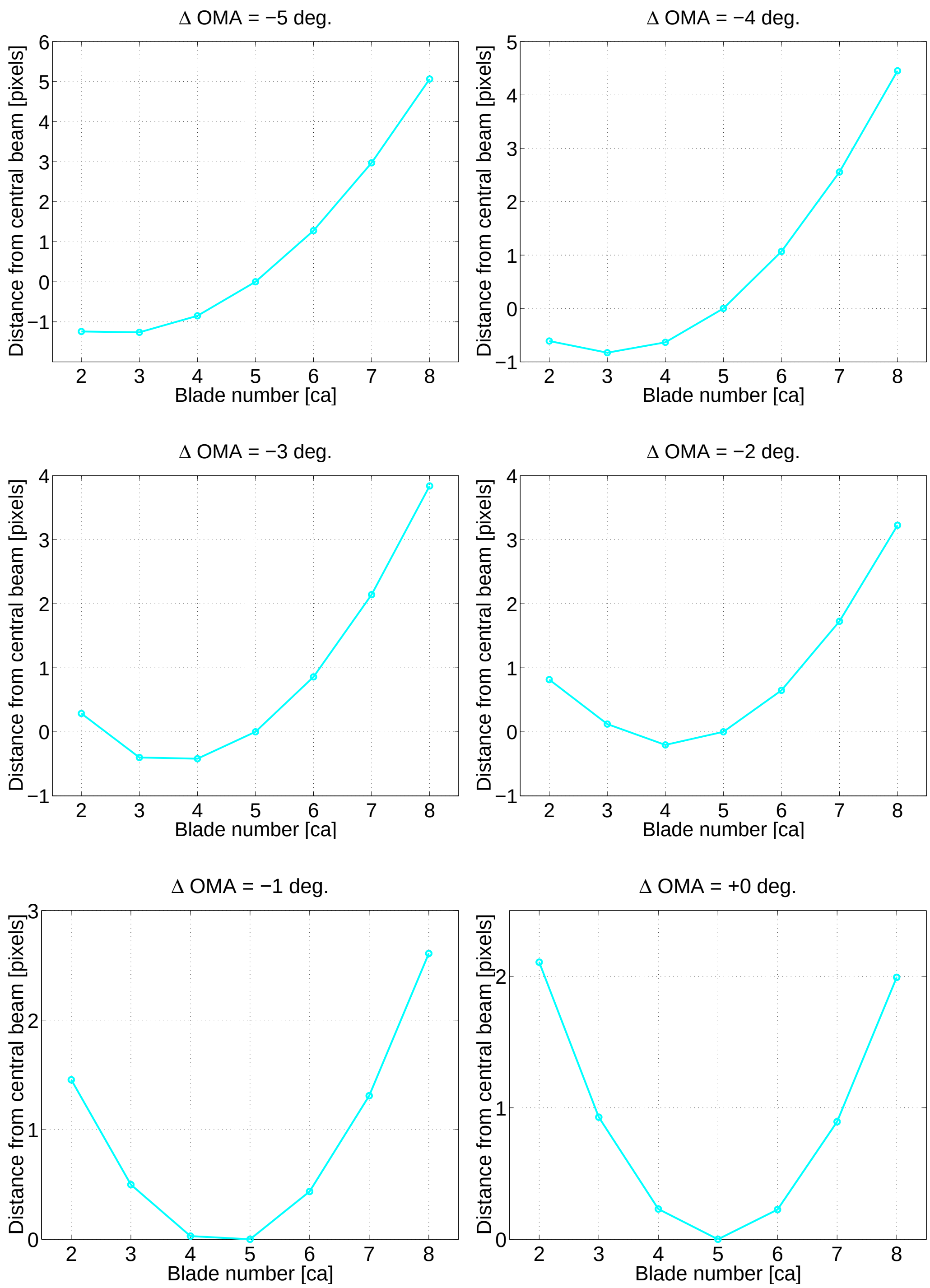


Figure 2: Position on the PSD of the blades, with a negative ΔOMA, in the EF=5 meV case.

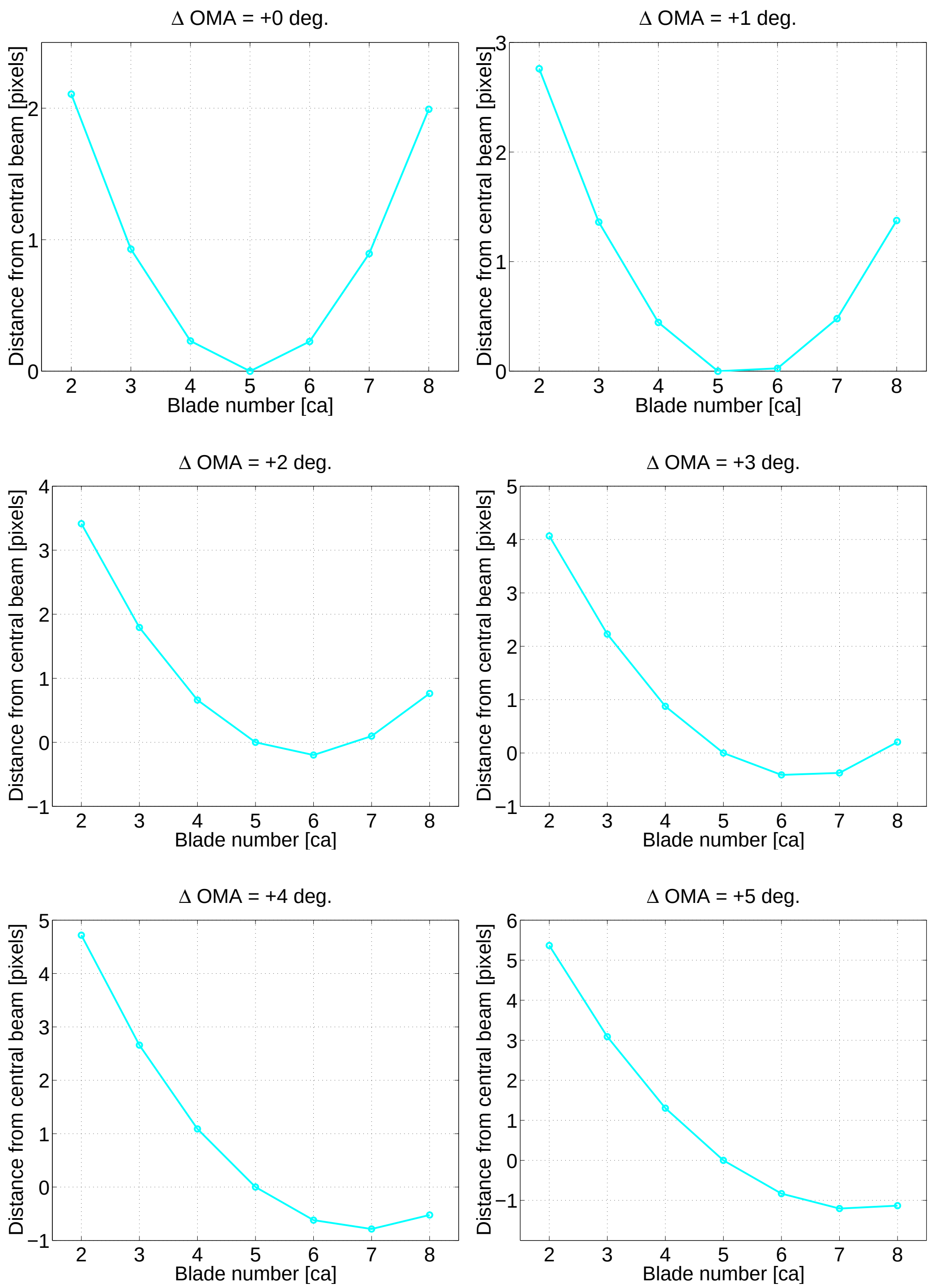


Figure 3: Position on the PSD of the blades, with a positive ΔOMA, in the EF=5 meV case.