



	<b>Experiment title: High temperature phase transitions in BiFeO<sub>3</sub> (Part 2, BM-1A)</b>	<b>Experiment number:</b> HS- 3642
<b>Beamline:</b> ID-31	<b>Date of experiment:</b> from: 11.03. 2009 to: 13.03.2009	<b>Date of report:</b> 26.08.2010
<b>Shifts:</b> 6	<b>Local contact(s):</b> Y. Filinchuk	<i>Received at ESRF:</i>
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## Report:

The crystal structure of BiFeO<sub>3</sub> was studied at the beamline BM-1A. The measurements at high temperatures above 700C were not performed because of the unstable work of the hot-air blower which had fluctuations of temperature with an amplitude of about  $\pm 3^{\circ}\text{C}$  over times much shorter than the time of an SR powder diffraction scan with a reasonable statistical accuracy. This temperature fluctuation prevents high resolution SR diffraction studies that were planned. Instead of the measurements at high temperature we performed measurements at low temperature. The main motivation of our studies comes from recent literature reports which show anomalies in the Raman spectra of BiFeO<sub>3</sub> [5,6]. These anomalies observed near 140K and 210K were attributed to possible magnetic reorientations which might effect the crystal structure of BiFeO<sub>3</sub> or the internal strains in BiFeO<sub>3</sub>.

The strong texture effects which were described in our earlier studies performed with ID-31 [4] and also described in the Exp.Report HS-3659 were no longer observed. Due to the geometry of the position sensitive detector we were able to observe a large part of the Debye Scherrer rings and the angular averaging over the measured intensities was sufficient to overcome the problem of texture found in high resolution powder diffraction studies at ID-31. The angularly averaged SR powder diffraction patterns of BiFeO<sub>3</sub> were measured at

several temperatures between 80 K and 500C. The SR powder BiFeO<sub>3</sub> pattern measured at RT (soild symbols) is compared with the results of the Rietveld refienement of the crystal structure of BiFeO<sub>3</sub> shown in Fig.1 The refinement gives a reasonably low Bragg factor of about 2.5. The observed SR powder diffraction pattern agree well with the standard BiFeO<sub>3</sub> crystal structure model [1,2]. We did not observe any structural changes in the temperaure range around 140K and 210 Kwhere several anomalies were reported from BiFeO<sub>3</sub> Raman studies[5,6].

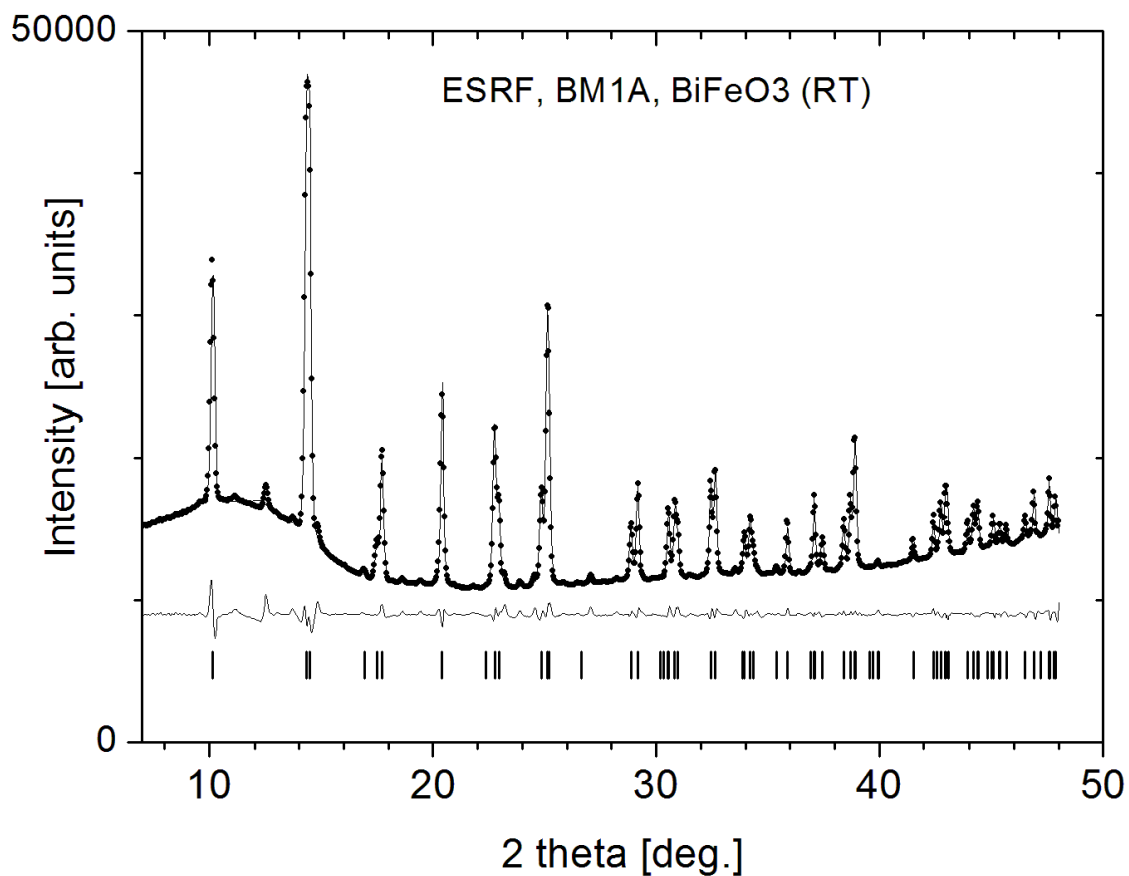


Fig. 2. Results of the Rietveld refinement of the SR powder diffraction pattern of BiFeO<sub>3</sub> measured at RT with beamline BM-1A. The measured data and the calculated diffraction pattern are represented by solid circles and solid line, respectively. Below the graph there is shown a difference curve. The ticks indicate positions of the Bragg peaks owing to the crystal structure of BiFeO<sub>3</sub>.

## References

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