Figure 3b shows the spatial distribution of the full width at half maximum (FWHM) of the rocking curve. As seen, FWHM is largest in the central part of the layer. Note that the Bragg angle position changes continuously across the ELO stripe. This is even better visible in Figure 4 that shows a cross-section at the position y = 539 of the map in Figure 3a. Such distribution of Bragg peak position clearly indicates tilting of ELO wings towards the mask – a phenomenon commonly observed in many ELO systems [2]. As can be seen, the maximum wing tilt angle, denoted as $\Delta\alpha$ in Figure 1, equals ~0.3°. Figure 4 shows that the fastest changes of the Bragg angle take place in the central part of the layer. Thus, the crystal lattice there must be strongly strained, which explains enhanced values of FWHM in that part of the layer (compare Figure 3b). Note also that RCI maps show that homoepitaxial GaAs/GaAs ELO layers are uniform along the ELO stripe. This is not necessarily the case in heteroepitaxial ELO layers where lattice and thermal expansion mismatches lead to strongly stressed epilayers.

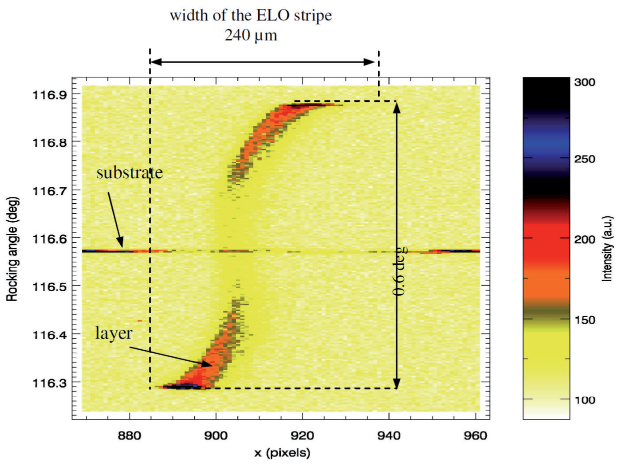

Figure 4. x-omega-map of the GaAs/GaAs single ELO stripe.

As an example Figure 5 shows a map of local diffraction intensity in a GaSb ELO stripe grown on a GaAs substrate coated by a planar GaSb buffer and SiO_2 mask. Local mosaicity in the wing area is clearly visible. Due to high spatial resolution of the RCI technique individual grains (microblocks) are visualized, so their sizes and relative misorientation can be readily determined.

Finally, results of RCI analysis of GaAs/GaAs and GaSb/GaAs ELO structures are compared with those obtained for the same samples by laboratory technique of spatially resolved X-ray diffraction (SRXRD) [3]. Due to more intense synchrotron X-ray beam and application of modern detectors, the spatial resolution of RCI is much higher, which makes this technique preferable for the detection of strongly localized strain fields in textured heteroepitaxial structures. On the other hand, analyzer crystals can be easily used in laboratory SRXRD technique allowing precise separation of overlapping signals in homoepitaxial ELO layers [4, 5].

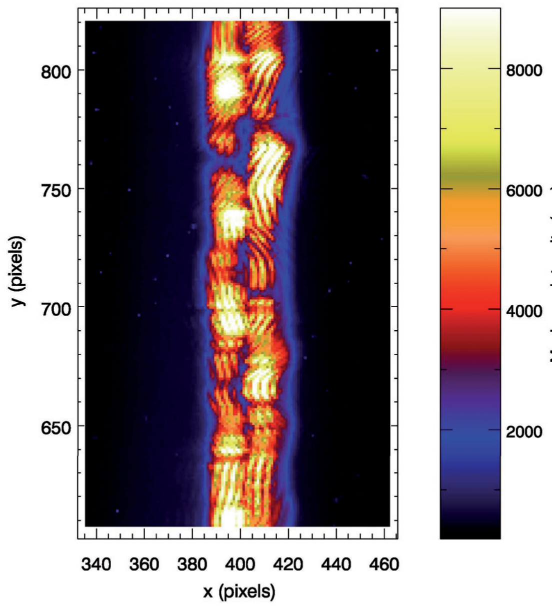

Figure 5. Spatial distribution of local diffraction intensity for GaSb/GaAs ELO layer. Pixel size is 1.4 µm. Microblock structure of the layer is visible.

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