



# AN 403

## Si<sub>1-x</sub>Ge<sub>x</sub> Characterization by RBS

May 7, 2007 (Version 3.0)

### Discussion

Rutherford Backscattering Spectrometry (RBS) quantitatively measures the Ge content in Si<sub>1-x</sub>Ge<sub>x</sub>, without the need for reference materials, and RBS Channeling can be used to measure the epitaxial layer quality. The measurement is non-destructive.

RBS can measure Ge content from 0.1% to 100% concentrations with depth resolution of 5-10 nm. An RBS spectrum of a 1.1 $\mu$ m Si<sub>1-x</sub>Ge<sub>x</sub>/1.2 $\mu$ m Si<sub>1-y</sub>Ge<sub>y</sub> (grading y from 18% to 5%)/Si and the calculated depth profile are shown in Figures 1 and 2 respectively. The measurement uncertainty for Ge is about 0.1% to 0.3% in most cases.

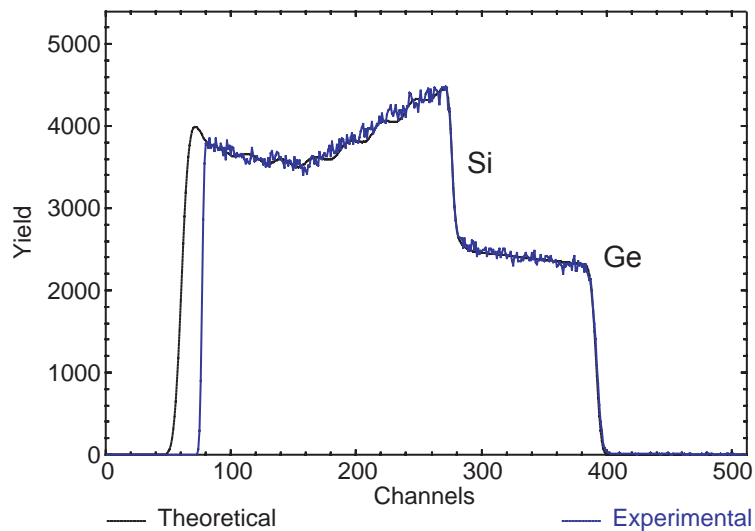


Figure 1

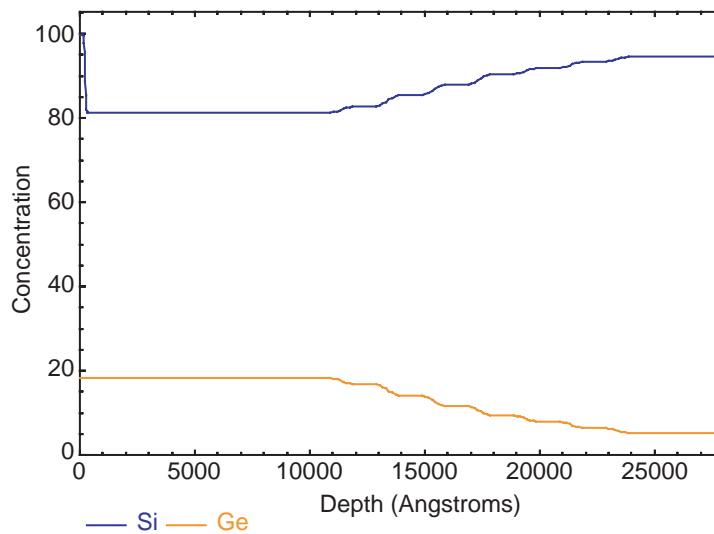


Figure 2

RBS Channeling can measure the SiGe epitaxial layer quality. RBS spectra of good and bad epilayers of 300nm Si<sub>1-x</sub>Ge<sub>x</sub>/Si(grading x from 16% to 29%)/Si are shown in Figures 3 and 4 respectively. Higher SiGe epitaxial quality has lower channeling yield.

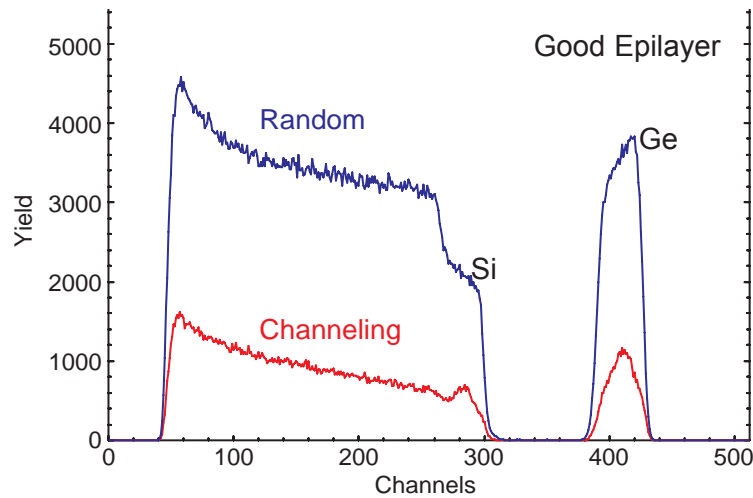


Figure 4

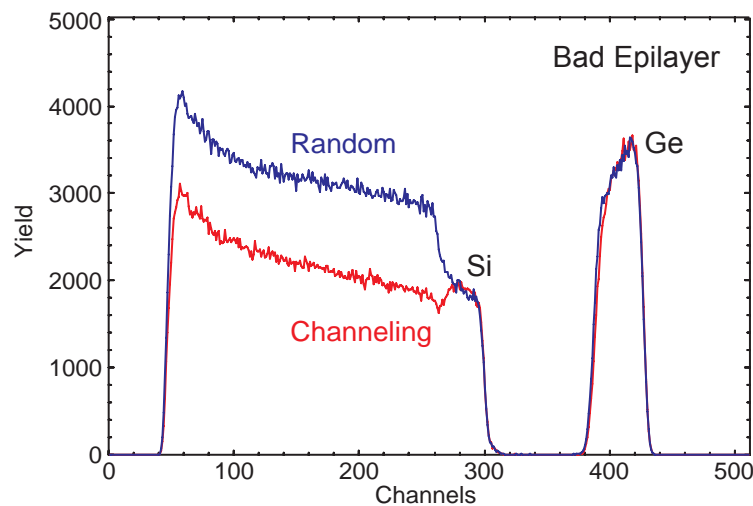


Figure 3

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