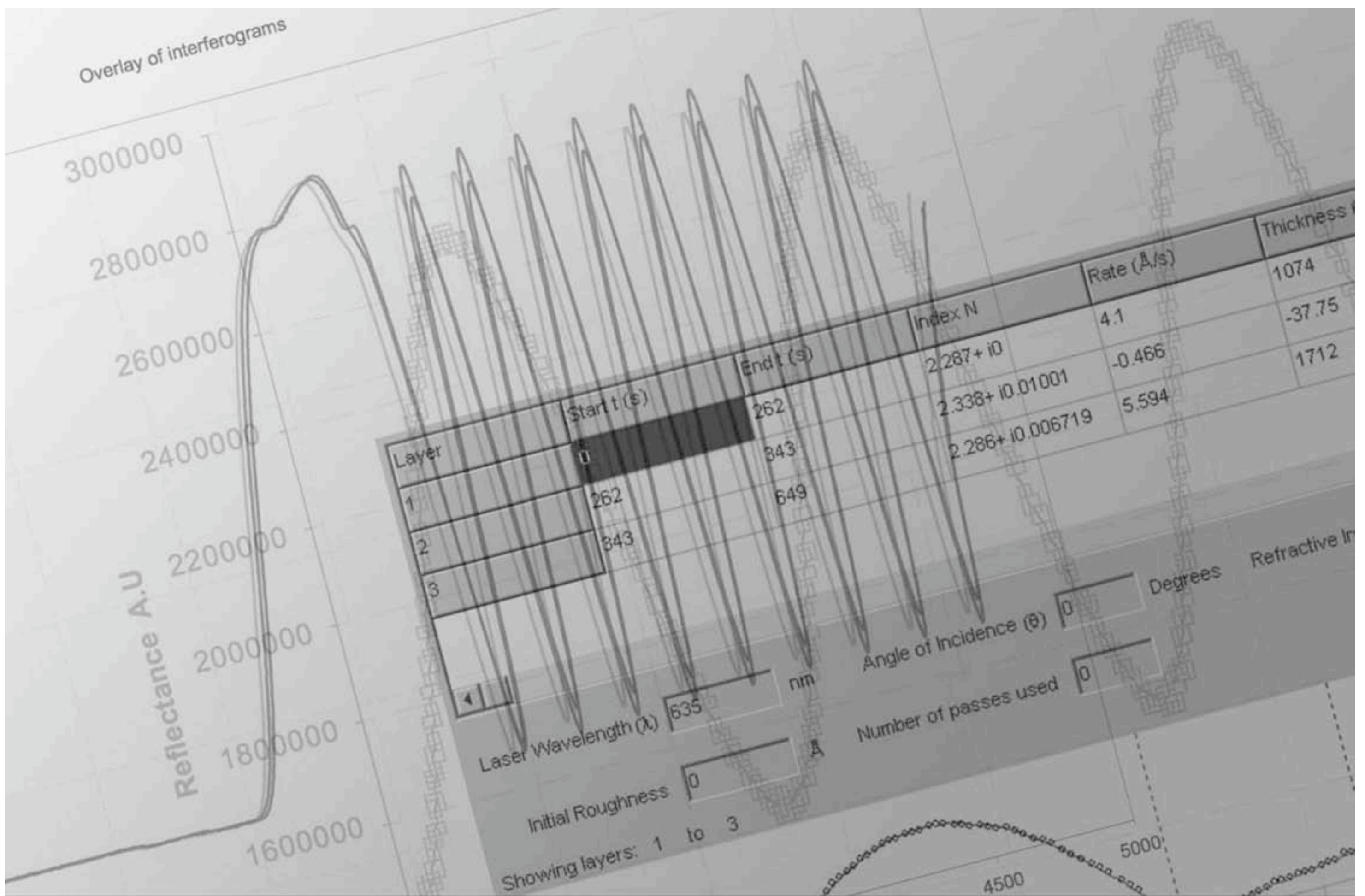

ORS APPLICATION NOTES

In Situ Monitoring for VCSEL

Advantages of live, *in situ* monitoring for manufacturing of VCSEL

- Direct comparison possible between *in situ* growth-rate measurement and *ex situ* centre stop band (CSB) measurement;
- Automatic, real-time analysis of the growth rate allows for control of the VCSEL process;
- Guaranteed VCSEL yield improvement ensured by targeting
  - +/- 5nm CSB
  - +/- 3nm CSB

Live, *in situ* growth-rate monitoring now provides a guaranteed method of increased product yield for VCSEL, with direct correlation possible to *ex situ* characterisation methods.

By controlling the growth rate of the initial layers of the n-type DBR, it is possible to ensure that the centre stop band specification is hit and maintained, increasing process yield. The figures below show *ex situ* reflectance wafer map data and *in situ* reflectance data for an in-spec wafer.

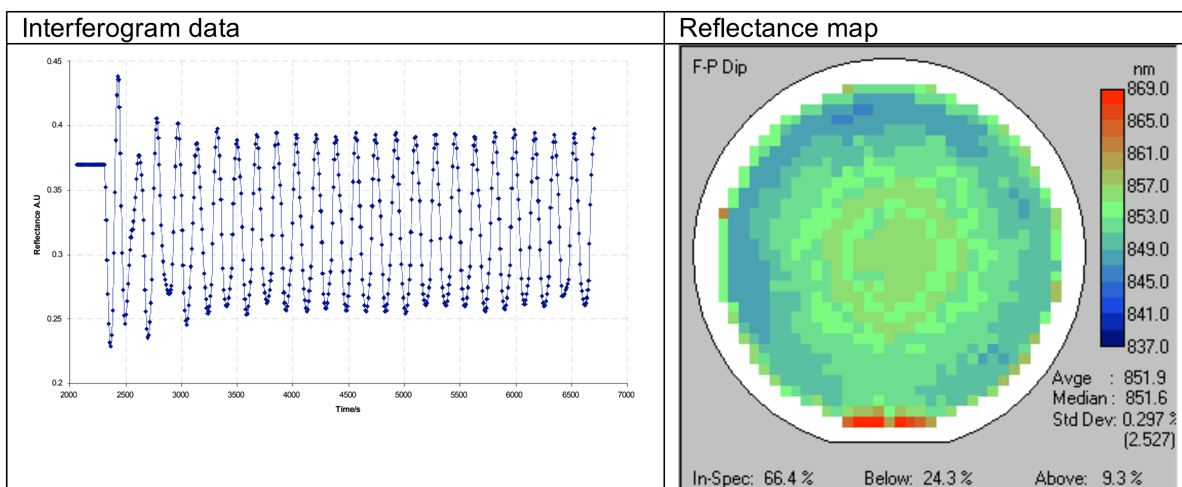

Figure 1: In situ growth rate measurement and ex situ PL measurment

The data for the CSB measurment from the PL is then compared to the *in situ* growth-rate measurement with a high degree of reliability.

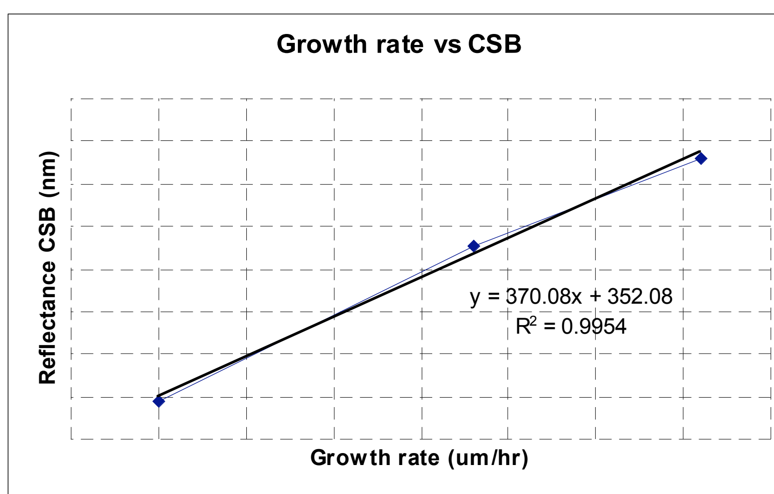

Figure 2: Comparison of ex situ CSB measurment to in situ growth-rate measurement