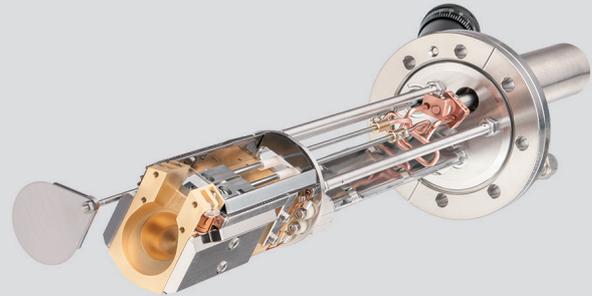
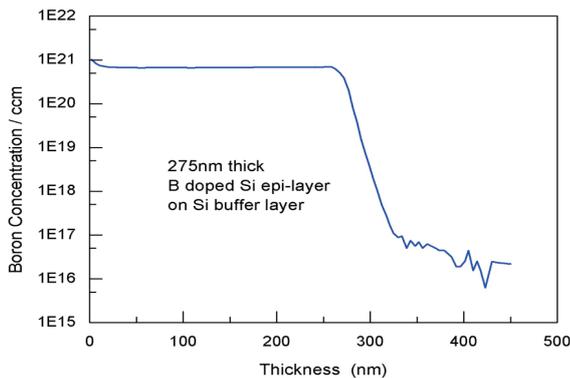


## E-BEAM BORON DOPING SOURCE EBVV-B

- Up to  $10^{21}$ /ccm Boron doping in Si-MBE
- Evaporation of elemental Boron or Si-B alloy in vertical e-beam evaporator
- Small dimensions; can be used in DN63CF (O.D. 4.5") effusion cell ports; hearth volume  $5 \text{ cm}^3$
- Optimized for SiGe MBE with Si shielding parts



EBVV-B 63-5, vertical electron beam evaporator with  $5 \text{ cm}^3$  hearth volume, mounted on DN63CF (O.D. 4,5") flange



SIMS profile of a B-doped Si MBE layer on Si-substrate

The Vertical Electron Beam Evaporator EBVV-B 63-5 allows to introduce real e-beam evaporation into your MBE system that has originally been designed for effusion cells only.

The unique and extremely compact design permits to install the EBVV-B 63 instead of an ordinary effusion cell on any MBE system having CF63 ports with an I.D.  $\geq 60 \text{ mm}$ . Even tilted ports can be used. Despite its small footprint, the new EBVV-B 63 includes a complete electromagnetic x- and y-dynamic beam deflection system and can deliver beam powers up to 3 kW.

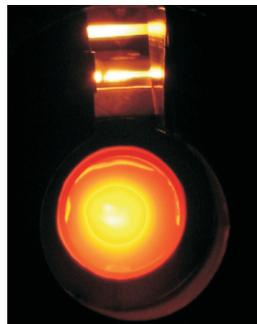
The evaporator hearth volume is  $5 \text{ cm}^3$ .

The  $270^\circ$  beam deflection design of the electron emitter eliminates nearly all ion bombardment on the filament due to a sharply bent electron beam path near the beam exit aperture. Thus, the filament is well shielded from evaporant or charged particles ejected from the crucible.

### Applications

The EBVV-B 63-5 allows high purity evaporation of elemental boron or Si-B alloy. Consequently, it allows Si and SiGe MBE growth of highest Boron doped epi-layers with Boron concentrations up to  $10^{21}$ /ccm.

This concept is applied in Si/SiGe HBTs or Si based Esaki-Diodes with record peak-to valley ratio and current density. The SIMS profile below shows a 275 nm Si layer with high Boron doping.



EBVV-B 63-5 filled with high purity Si-B charge in operation

The EBVV-B is equipped with a specially adapted set of shielding parts manufactured from high-purity single crystalline Si. A Si plate and a ring cover all parts of the metallic body that are potentially subject to electron or ion bombardment and that face the substrate. Only this Si-shielding allows the growth of highest purity Boron doped Si and SiGe films. We also supply high purity Si-B source material in superior quality. It is machined and pre-conditioned from wafer-grade Si-single crystals and high purity Boron, fitting the evaporator hearth.

### Technical Data

|                         |   |
|-------------------------|---|
| Mounting flange         | DN63CF (O.D. 4.5") or DN100CF (O.D. 6")   |
| Dimensions in vacuum    | Length: 234 – 450 mm (user specific); ØD: 60 mm   |
| Crucible capacities     | 5 cm <sup>3</sup>   |
| Hearth dimensions       | Ø 23 mm (12° taper) x 15 mm   |
| Filament type           | short-legged coil of W wire, electron emitting filament   |
| Bakeout temperature     | 200°C (all air side connectors removed)   |
| Operating pressure      | 1 × 10 <sup>-11</sup> mbar ... 1 × 10 <sup>-5</sup> mbar  |
| Acceleration voltage    | 4 - 6 kV  |
| Beam power              | max. 3 kW   |
| Filament current        | max. 25 A at 10V (AC)   |
| Spot size               | 5 mm diameter, approx.  |
| Primary beam deflection | 270° by permanent magnet system   |
| Dynamic beam deflection | coils wound from KAPTON™ isolated wire; defl. frequency: max. 150 Hz;<br>x-deflection current: ± 1,5 A max.; y-deflection current: ± 2 A max. |
| Water cooling           | water flow rate 5 l/min at 4 bar; connectors Swagelok Ø 8 mm (air side)   |
| Options                 | integrated rotary shutter (S) (for DN100CF or larger only)  |

