

## Boron Doping Source EBVV-B 63-5



EBVV-B 63-5, vertical electron beam evaporator with 5 cm<sup>3</sup> hearth volume, mounted on DN63 CF (O.D. 4.5") flange

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.  $\geq$  60mm. 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 3kW.

The evaporator hearth volume is 5 cm<sup>3</sup>.

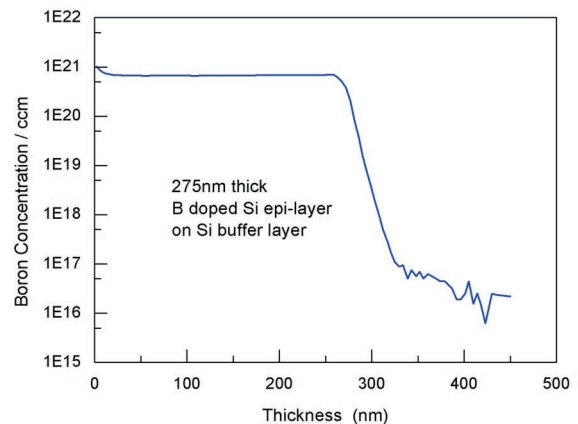
The 270° beam deflection design of the electron emitter eliminates nearly all ion bombardment on the filament due to a sharply bent electron beam path near the beam exit aperture. Thus, the filament is well shielded from evaporant or charged particles ejected from the crucible.

### Application

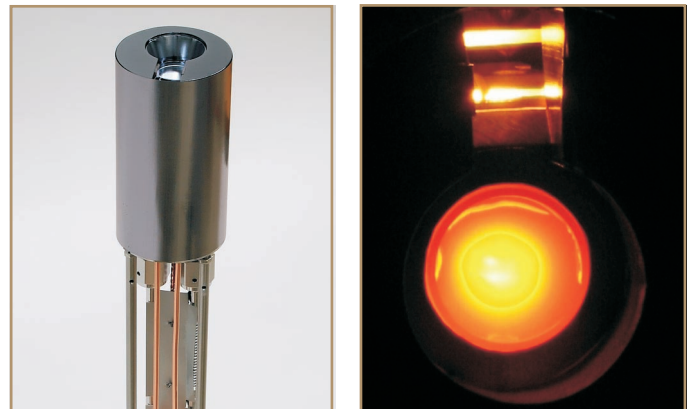
The EBVV-B 63-5 allows high purity evaporation of elemental boron or Si-B alloy with high deposition rates up to one  $\mu\text{m}/\text{h}$ . Consequently, it allows Si and SiGe MBE growth of highest Boron doped epi-layers with Boron concentrations up to  $10^{21}/\text{ccm}$ .

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 275nm Si layer with high Boron doping.

- Up to  $10^{21}/\text{ccm}$  Boron doping in Si-MBE
- Evaporation of elemental Boron or Si-B alloy in vertical e-beam evaporator
- Small dimensions; can be used in DN63 CF (O.D. 4.5") effusion cell ports; hearth volume 5 cm<sup>3</sup>
- Optimized for SiGe MBE with Si shielding parts



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



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

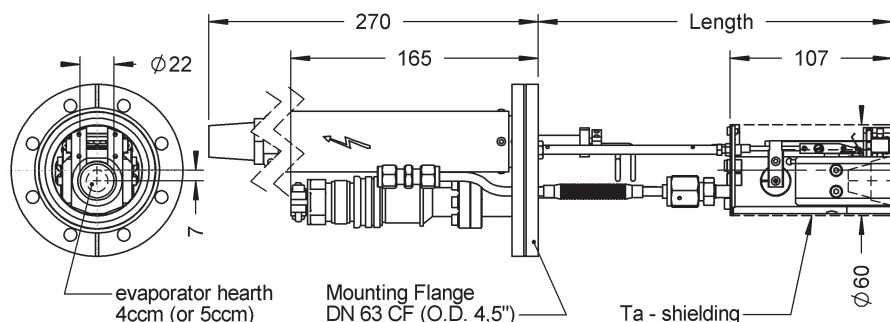
The EBVV 63-5-B is equipped with a specially adapted set of shielding parts manufactured from high-purity single crystalline Si. A Si plate and a ring cover all parts of the metallic body that are potentially subject to electron or ion bombardment and that face the substrate. Only this Si-shielding allows 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

<b>Mounting Flange</b>	DN63 CF (O.D. 4,5") or DN100 CF (O.D. 6")
<b>Dimensions in vacuum</b>	Length: 234 – 450 mm (user specific); ØD: 60 mm
<b>Crucible capacities</b>	5 cm <sup>3</sup>
<b>Hearth dimensions (Ø ∞ depth)</b>	Ø23mm (12° taper) x 15mm
<b>Filament type</b>	short-legged coil of W wire, electron emitting filament
<b>Bakeout temperature</b>	250°C (all air side connectors removed)
<b>Operating pressure</b>	1 × 10 <sup>-11</sup> mbar .... 1 × 10 <sup>-5</sup> mbar
<b>Acceleration voltage</b>	4 – 6 kV
<b>Beam power</b>	max. 3 kW
<b>Filament current</b>	max. 25 A at 10V (AC)
<b>Spot size</b>	5 mm diameter, approx.
<b>Primary beam deflection</b>	270° by permanent magnet system
<b>Dynamic beam deflection</b>	coils wound from KAPTON™- isolated wire; defl. frequency: max. 150 Hz; x-deflection current: ± 1,5 A max.; y-deflection current: ± 2 A max.
<b>Water cooling</b>	water flow rate 5 l/min at 4 bar; connectors Swagelok Ø8 mm (air side)
<b>Options</b>	integrated rotary shutter (S) (for DN100 CF or larger only)

Schematic drawing of the EBVV-B 63-5

The DN100 CF version only differs in the base flange dimension.



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