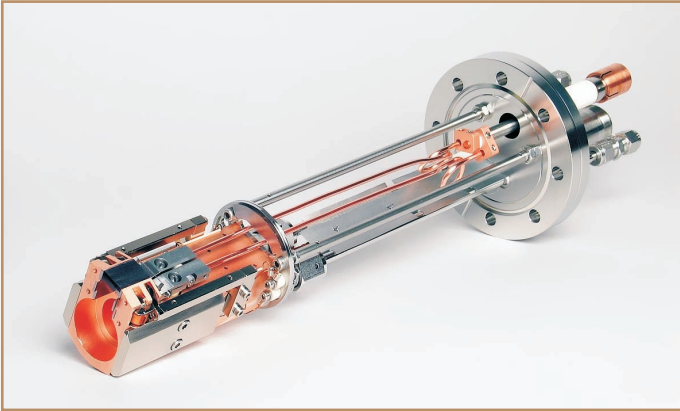


Boron Doping Source EBVV-B 63-5



EBVV-B 63-5, vertical electron beam evaporator with 5 cm³ 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 cm³.

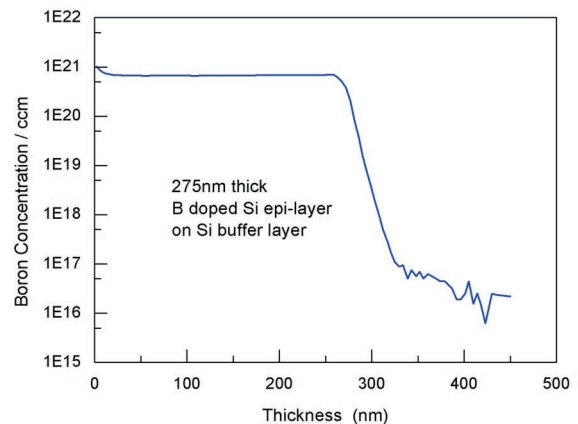
The 270° beam deflection design of the electron emitter eliminates nearly all ion bombardment on the filament due to a sharply bent electron beam path near the beam exit aperture. Thus, the filament is well shielded from evaporant or charged particles ejected from the crucible.

Application

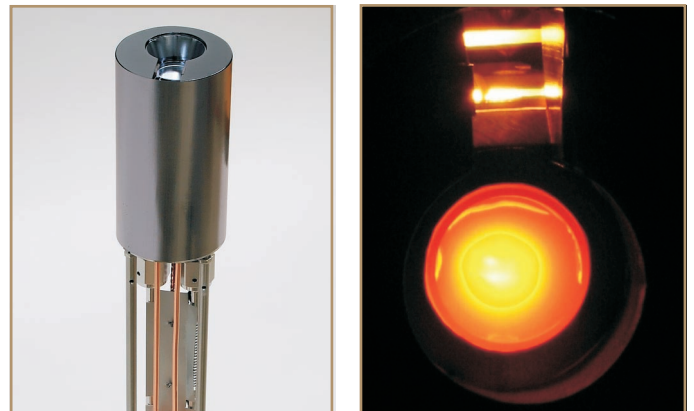
The EBVV-B 63-5 allows high purity evaporation of elemental boron or Si-B alloy with high deposition rates up to one $\mu\text{m}/\text{h}$. Consequently, it allows Si and SiGe MBE growth of highest Boron doped epi-layers with Boron concentrations up to $10^{21}/\text{ccm}$.

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 cm³
- 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

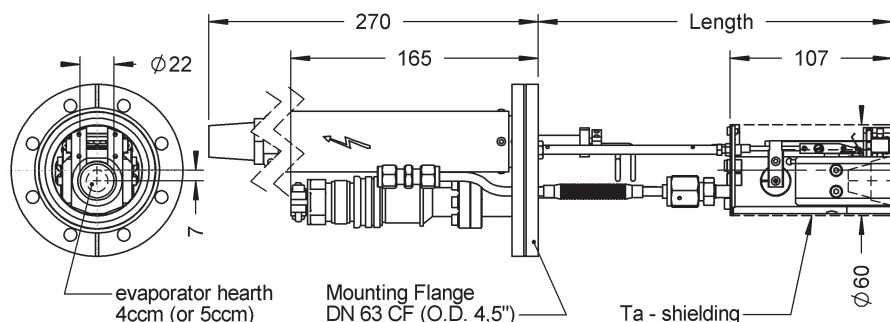
The EBVV 63-5-B is equipped with a specially adapted set of shielding parts manufactured from high-purity single crystalline Si. A Si plate and a ring cover all parts of the metallic body that are potentially subject to electron or ion bombardment and that face the substrate. Only this Si-shielding allows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

Mounting Flange	DN63 CF (O.D. 4,5") or DN100 CF (O.D. 6")
Dimensions in vacuum	Length: 234 – 450 mm (user specific); ØD: 60 mm
Crucible capacities	5 cm ³
Hearth dimensions (Ø ∞ depth)	Ø23mm (12° taper) ∞ 15mm
Filament type	short-legged coil of W wire, electron emitting filament
Bakeout temperature	250°C (all air side connectors removed)
Operating pressure	1 × 10 ⁻¹¹ mbar ... 1 × 10 ⁻⁵ 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; 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 Ø8 mm (air side)
Options	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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