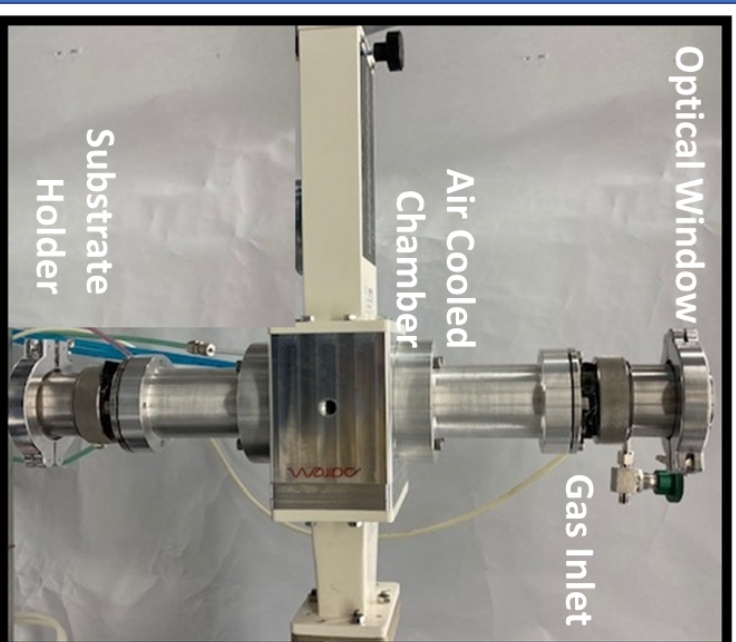
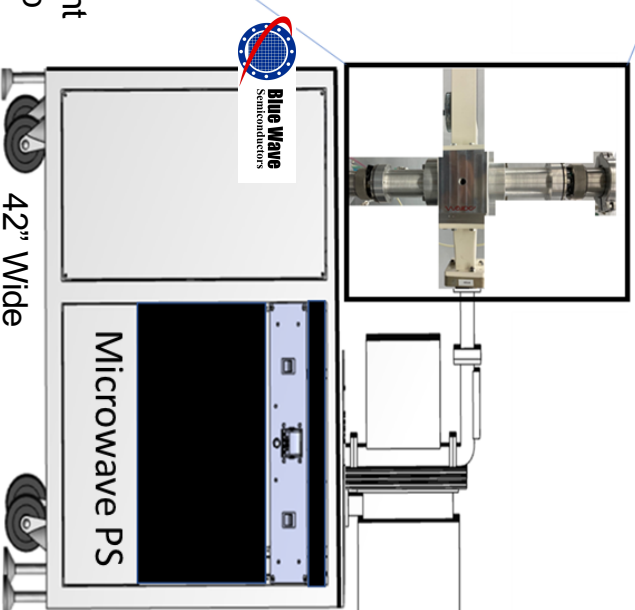


- Basic Microwave Component from Sairem.
- CVD-Diamond Process and Components from Blue Wave Semiconductors
- Easy sample Loading and Unloading
- Easy replacement of quartz tube reactor



48" height  
30" Deep



Note: Layout and dimension may change in the final configuration

# NIRIM Microwave CVD Diamond System

*Blue Wave Semiconductors offers a versatile NIRIM style microwave plasma chemical vapor deposition system (MPCVD) for synthesis of CVD diamond for research and development. The tool can be used for CVD diamond layer fabrication with variety of diamond film qualities including epitaxially grown single crystals, polycrystalline, microcrystalline and nanocrystalline coating layers (doped and undoped) for various applications including quantum applications, thermal management, nano electronics, detectors, MEMS and sensors. Typical growth rate of CVD diamond can be 0.1 micron/hr to max 1 micron/hr. Blue Wave MPCVD system provides easily replaceable quartz tube chamber to avoid cross-contamination.*

## System Description

**1.1. Deposition Chamber:** Deposition chamber (quartz tube) capable of producing high quality crystal growth of CVD diamond. Substrate stage capable of holding up to 1x1cm<sup>2</sup> inch diameter substrate.

**1.2. Vacuum Pump:** MWCVD system comes with mechanical dry pump with base pressure better than  $5 \times 10^{-2}$  Torr for evacuating main CVD chamber. Includes all applicable hardware, vacuum plumbing and valves for pumping and venting operations. **1.3. Pressure Gauge:** Deposition chamber has capacitance and Pirani combination gauge. Blue Wave deposition tool has external built in electronics and utilizes pressure set-point interlock for over pressure safety protection.

**1.4. Process Gas Flow Meters:** Gas handling is entirely designed for electronic gas purity Mass flow controllers (MFCs) for CH<sub>4</sub> and H<sub>2</sub> gases. They are designed to control gas flows in a wide variety of flow ranges adequate for deposition of high-quality thin films. All MFCs are calibrated for specific gases. All MFCs are constructed with gas shut-off valves for over pressure safety shut-off feature.

**1.5. Deposition Process Pressure Automation:** Blue Wave integrates pressure controller, which is a self-contained compact, closed-loop electronic control system used for upstream or downstream pressure control. It contains a Baratron® capacitance manometer, normally closed proportioning control valve, and closed-loop control electronics. The module controls precisely automatic deposition process pressure from 50 Torr to 200 Torr.

**1.6. Substrate Holder:** Blue Wave integrates water cooled Moly sample stage. Sample stage can be adjusted for its height in reference to plasma ball to control the temperature of the see substrate from 800°C to 1100°C.

**1.7. Two-Color IR Pyrometer for Sample Temperature Measurement:**

Two-color IR pyrometer for temperature monitoring through optical fiber with bright LED digital display, and ideally suited for measuring MWCVD sample temperature very precisely. It is extremely fast and accurate with a response time of 10 msec and accuracy of 0.2% of full scale.

**1.8. Computer control panel with compute and display (specify).**

Blue Wave offers computer control monitor and software the following: 1. Gas flow control, 2. Pressure monitoring, 3. Microwave injected power, 4. Vacuum and Pressure measurement: Pressure display, Computer with hardware and software will be provided. Also includes safety protection features. Recipes for polycrystalline and nanocrystalline CV Diamond depositions will be provided.

**1.9. Microwave Components for MPCVD:** Microwave CVD system will have 1kW, 2.45GHz MW Generator (G4), Continuous Wave, Digital Front Panel, Control, 3ph 208V input, WR340 manual 3-stub tuner, Arc detection flange WR340 with optical fiber eChilly 5 Water Recirculatory.

**1.10. Equipment Frame:** Metal rack with front panels loaded on 19" DIN rack rails within the frame and enclosure. The frame houses vacuum valves, pressure displays, MFCs, stainless steel plumbing lines for vacuum, water and gases, power supply, switches, relays, power strips, water flow interlock and wiring.

# Basic Facility Requirements per System

## Electrical Power

- One (1) 208 Vac Single or three Phase 20 Arms (or)
- Three (3) 110V-10 Amps.

for microwave power supply, one mechanical pump and system electronics. Additional requirements may be required based on system configuration.

## Water Cooling

Flow rate required at least 1 gpm (15-20°C or 25°C max). Water line connections are male ¼" Swagelok compression fittings with separate connections for inlet and outlet.

## Equipment Floor Space

The conventional system footprint is approximately 36" x 24" x 65". An additional 3'ft clearance is recommended around the reactor for easy access and floor space behind the system for the pump. Vacuum pump will be situated outside the frame which needs additional floor space of 36"x36".

## Gases Required

Gases connections are ¼" Swagelok compression fittings. High purity H<sub>2</sub> and CH<sub>4</sub> and other gases depending on process with regulator outlet to set pressure 30-40 psi are required. N<sub>2</sub> and O<sub>2</sub> gas cylinder with regulator 30-40 psi pressure is required for venting the deposition chamber.

## Process Gas exhaust

System needs pump exhaust connection that complies with local safety regulations for proper venting. It is recommended that the exhaust vent connection should not be more than 15ft from the pump outlet.

Note: Above is the list of basic facility requirement. Depending upon system and options, final requirements may be different or additional requirements may be needed.



780 Montague Expy. St 506 San Jose, CA 95131  
(408) 520-4550

<https://sekiamond.com/information-request/>