Fabrication of X-Band Structure

Workshop on RF Breakdown in Copper Structures

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Clean Room Specification

Federal Standard 209D

Six Designated levels of Cleanroom Cleanliness:

- Class 100,000
- Class 10,000
- Class 1,000
- Class 100
- Class 10
- Class 1

The class number refers to the maximum number of particles bigger than 0.5 \(\mu\text{m}/\text{cubic foot}\)

Horizontal Laminar Air Flow or Vertical Laminar Air Flow

Using High Efficiency Particulate Air (HEPA) Filter
Fabrication Procedure

- Rough Machining
- Single Diamond Turning
- Ozonized Water Rinsing
- Cell Stacking
- Pre-Bonding at 150°C
- Diffusion Bonding at 850°C
- Chemical Cleaning for Input/Output/HOM Parts
- Final Brazing
- Leak Check and N2 Purge, Filling
- Alignment Measurement and Straightening
- Microwave Characterization
- ASSET Experiment
- Vacuum Baking
- High Power Processing
## Particle Count for the Location Related with Our Structure Fabrication

<table>
<thead>
<tr>
<th>Location</th>
<th>Room 150 Inside Tent</th>
<th>Kly. Clean Room</th>
<th>Room 150 High Ceiling</th>
<th>Room 150 Main Room</th>
<th>Kly. QC Room</th>
<th>Bake Station</th>
<th>Furnace Station</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0.3μm</strong></td>
<td>0 to 100,000</td>
<td>30,000</td>
<td>350,000</td>
<td>500,000</td>
<td>600,000</td>
<td>850,000</td>
<td>900,000</td>
</tr>
<tr>
<td><strong>0.5μm</strong></td>
<td>0 to 100,000</td>
<td>10,000</td>
<td>60,000</td>
<td>100,000</td>
<td>110,000</td>
<td>170,000</td>
<td>200,000</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>M.W. QC</td>
<td>Mech. QC</td>
<td>Assembly &amp; Storage</td>
<td>Bead Pulling</td>
<td>M.W. QC</td>
<td>Assembly &amp; Storage</td>
<td>Baking</td>
</tr>
<tr>
<td>Duration (Days)</td>
<td>10</td>
<td>14*</td>
<td>20*</td>
<td>5*</td>
<td>7*</td>
<td>5*</td>
<td>4+7</td>
</tr>
</tbody>
</table>
## Vacuum Baking for Our Structure

<table>
<thead>
<tr>
<th>Structure</th>
<th>Date</th>
<th>Bake ID</th>
<th>Temp. C</th>
<th>Days</th>
<th>Hot</th>
<th>Cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>75cm</td>
<td>6/4/93</td>
<td>TS293</td>
<td>400</td>
<td>6</td>
<td>3E-8</td>
<td>3E-10</td>
</tr>
<tr>
<td>DS1</td>
<td>2/7/94</td>
<td>Manual</td>
<td>400</td>
<td>2.5</td>
<td>5E-8</td>
<td>4E-9</td>
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<tr>
<td>0.9m-1</td>
<td>5/30/96</td>
<td>TS419</td>
<td>450</td>
<td>4</td>
<td>5E-9</td>
<td>5E-10</td>
</tr>
<tr>
<td>0.9m-2</td>
<td>5/16/96</td>
<td>TS416</td>
<td>450</td>
<td>4</td>
<td>5E-9</td>
<td>5E-10</td>
</tr>
<tr>
<td>DS1</td>
<td>3/7/97</td>
<td>TS450</td>
<td>550</td>
<td>6</td>
<td>3E-8</td>
<td>1E-9</td>
</tr>
<tr>
<td>DS2</td>
<td>1/27/97</td>
<td>TS445</td>
<td>550</td>
<td>5</td>
<td>3E-8</td>
<td>1E-9</td>
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<tr>
<td>CERN</td>
<td>9/43</td>
<td>Heat Tape</td>
<td>150</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDS1</td>
<td>10/2/96</td>
<td>TS438</td>
<td>450</td>
<td>5</td>
<td>2E-8</td>
<td>9E-10</td>
</tr>
<tr>
<td>DDS2</td>
<td>4/23/97</td>
<td>TS453</td>
<td>550</td>
<td>3.5</td>
<td>6E-9</td>
<td>1E-9</td>
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</tbody>
</table>
For Disks and Parts with Diamond Turning Finish

- Vapor degreasing in perchloroethylene for 5 minutes (solvent degreasing)
- Alkaline soak clean using Enbond Q527 for 5 minutes (detergent to clean dirt)
- Water rinsing
- 50% hydrochloric acid for 1 minute (oxide removing)
- Water rinsing
- Mixed Acid (Phosphoric, Nitric, Acetic, Hydrochloric) for 5 seconds
- Water rinsing
- Cold and hot Deionized water rinsing
- Isopropyl alcohol rinsing
- Blow dry
For Disks and Parts with Regular Machining Finish

- Vapor degreasing in perchloroethylene for 5 minutes (solvent degreasing)
- Alkaline soak clean using Enbond Q527 for 5 minutes (detergent to clean dirt)
- Water rinsing
- 50% hydrochloric acid for 1 minute (oxide removing)
- Water rinsing
- Mixed Acid (Phosphoric, Nitric, Acetic, Hydrochloric) for 1 minute
- Water rinsing
- Mixed Acid (Sulfuric, Nitric, Hydrochloric) for 5 seconds (75% etching here)
- Water rinsing
- Solution of Oxyban 60 (1% by volume) for 2-5 minutes (anti-tarnish, CH,CO...)
- Water rinsing
- Cold and hot Deionized water rinsing
- Isopropyl alcohol rinsing
- Blow dry