The bid opening date and time for this bid has been changed to Monday, May 11th, at 1 PM.

Below are the vendor questions that were submitted prior to the deadline listed in the RFP. University responses follow each of the vendor questions. All vendors responding to the RFP must incorporate these items into their response. Failure to do so may disqualify the vendor.

Q1. List of Items, Schedule of Requirements, Scope of Work, Terms of Reference, Bill of Materials required.

A1. All information regarding this bid is contained in the bid document on the Procurement Department Web Site http://www.umass.edu/procurement/bidsopen.htm.

Q2. Soft Copy of the Tender Document through email.

A2. All information regarding this RFB is available on our web site (see answer to question 1 above). We do not send out this information through email.

Q3. Names of countries that will be eligible to participate in this tender.

A3. Any counties that are not prevented by law.

Q4. Information about the Tendering Procedure and Guidelines.

A4. All information regarding this RFB is available on our web site (see answer to question 1 above).

Q5. Estimated Budget for this Purchase

A5. Not Applicable

Q6. Any Extension of Bidding Deadline?

A6. Not at this time.

Q7. Any Addendum or Pre Bid meeting Minutes?
A7. We did not hold a Pre Bid Meeting. All Addendum are on our web site (see answer to question 1).

Q8. Can anyone bid on this project?
A8. Anyone can submit a response to this bid that are not prohibited by law.

Q9. Questions concerning item 18 D in the RFB.

Please clarify the final sentence.
“The final payment will be released when the equipment is received and accepted by the University”

Does this mean the final payment will be released when the equipment is received and the delivery accepted?

A9. This means when the equipment is received and approved for payment by the person that orders the equipment.

Q10. Could you please forward the Terms and Conditions that will apply to this specific bid?
A10. The terms are listed in the bid document.

Q11. Attachment A. Item 4. Deep RIE:

Bullet Point #2: Liquid Helium for Stage Cooling

- The use of low temperature “liquid” Helium to cool the substrate stage is not typical for DRIE systems. Can the committee clarify this requirement? Is it possible the committee meant liquid “Nitrogen” or is referring to the helium “gas” backside cooling instead?

A11. We intend to use liquid nitrogen for the substrate stage cooling. The helium is for the backside cooling for wafer temperature control.

Q12. These systems are referenced in Appendix A, Section 27, Item (3), a Reactive Ion Etcher and Item (4) a Deep RIE system. I have listed our questions under the appropriate UM specification called out in the RFB as follows:

(3) Reactive Ion Etcher
- HBr and/or Cl-based, O2, CHF3, CF4, H2 etc. etching capability
- Although 5 or 6+ gases are mentioned, how many gases should this system accommodate?

We would like to accommodate as many as the users will need. For the moment, we expect to have at least 8 lines.
Because the price of the RIE system reflects how many corrosive and non-corrosive gas lines are configured, can a list of the process gases required be provided?

Typical gases include HBr and/or Cl-based, O2, CHF3, CF4, H2, N2, Ar, SF6, etc.

- What materials are planned to be etched in this system?

This is a multipurpose etcher, and we expect the materials to be etched in this system include semiconductors, oxides, and polymers.

- LN2 for substrate temperature control
- What is the minimum and/or maximum substrate temperature required?
- 150 to +400 °C

- RIE Plasma Source
  - Please confirm the power of this source (watts)
  - Please confirm if an ICP (Inductively Coupled Plasma) source is required.
  - If so, what is the power (watts) required from the RF bias source?
  - RF power ≥600 W. ICP source of ≥3kW is required.

- Toxic gas line with mass flow controller
- Non-toxic gas line with mass flow controller
- These two requirements indicate only 2 gas lines are required. Please confirm if this is the intent of this specification. If not, please indicate, including spares, how many Toxic and Non-toxic mass flow controllers are required.

  Among HBr, Cl2, O2, CHF3, CF4, H2, N2, Ar, SF6, we consider gases other than O2, N2, H2, Ar are toxic.

(4) Deep RIE

- Liquid helium for stage cooling
- Is this a typo? Is the requirement for the stage to be equipped with helium (gas) backside cooling?
- Yes. We intend to use liquid nitrogen for the substrate stage cooling. The helium is for the backside cooling for wafer temperature control.

- Plasma Source
  - Please confirm if this is an ICP source and the wattage.
  - Please confirm the wattage of the RF bias source.
  - RF power ≥300 W. ICP source of ≥3kW is required.

- Toxic gas line with mass flow controller
- Non-toxic gas line with mass flow controller
- These two requirements indicate only 2 gas lines are required. Please confirm if this is the intent of this specification. If not, please indicate, including spares, how many Toxic and Non-toxic mass flow controllers are required.
What gas(es) do you consider toxic?
We will need regular gases such as H2, O2, N2, Ar, etch in addition to SF6, C4F8, etc. the formers ones are non-toxic and the latter ones are toxic.

General Questions
- Are there any safety requirements or standards that the above two system need to meet?
- After the systems are installed are there any performance specifications other than repeating the SAMCO qualification tests performed prior to shipping the system from our factory?

The above equipment need to meet the safety requirements as imposed by UMass Amherst EHS according to national and local laws. Standard tests would be fine although specific recipe tests from users are preferred if possible.

A12. RIE

Q13. Appendix A Items # (3) Reactive Ion Etcher and # (4) Deep RIE. We have the following questions to ask for each:

# (3) Reactive Ion Etcher:

1. LN2: Is there a strong reason for the requirement of LN2 substrate temperature control? Would a heat exchanger design with a range from -40 to +180°C be acceptable?

2. Quartz Clamp: What’s the reason for the requirement of quartz clamp? Over the years, our customers favor ceramic clamps, as quartz clamps crack easier and will be etched away over time.

#(4) Deep RIE:

1. Liquid helium: What’s the reason behind the requirement of liquid helium cooling? Our design utilize a heat exchanger to control the temperature on substrate electrode, which is much less expensive in terms of operational cost.

2. Quartz Clamp: What’s the reason for the requirement of quartz clamp? Quartz clamps will be etched away over time, and therefore, we typically recommend a ceramic clamp.

A13. RIE

1) The substrate temperature control using LN2 is for better sidewall profile for some materials. If research has shown that the heat exchanger design can achieve the same quality of profile then it is acceptable, although we prefer a wider temperature control range.
2) Quartz does not introduce unexpected contaminations into the circuits we are building. If a ceramic clamp can serve the same purpose, it is acceptable.

**DRIE**

1) We meant liquid nitrogen for stage control. Helium is for backside cooling (not liquid helium).

2) Quartz does not introduce unexpected contaminations into the circuits we are building. If a ceramic clamp can serve the same purpose, it is acceptable.

**Q14. Electron Beam Evaporation System**

1. What materials would you like to deposit? Even a list of some key materials would be helpful.
2. What film thickness range would you like to achieve?
3. How many 4in and how many 6in wafers need to be loaded per batch?
4. What temperature range do the substrates need to be controlled within? Heating and cooling is noted as a specification and I would like to understand the temperature range.
5. What pressure would you like to start the deposition process at?
6. Would a vacuum base pressure of $9 \times 10^{-8}$ Torr be suitable?

**Sputter Deposition System**

1. What materials would you like to deposit? If magnetic materials are to be deposited we would like to change the magnetics in the sources which use these materials.
2. Are 8 sputter sources required or the ability to have positions for 8 sputter sources? Are you considering purchasing a system with less sputter sources and having the ability to add source later?
3. Which sources will be connected to DC power supplies and which sources will be connected to RF power supplies?
4. Can you please describe what you are looking for when you say source isolation options?
5. Would a vacuum base pressure of $9 \times 10^{-8}$ Torr be suitable?

**A14. Electron Beam Evaporation System**

3) The materials may include common metals (for example, gold, nickel, chromium, cobalt, aluminum, palladium, silver, platinum, niobium, and titanium, semiconductors (such as germanium, silicon) and insulators (for example, silicon oxide). Usually the film thickness ranges from a few nanometers to hundreds of nanometers. In rare cases, we may need to go beyond micrometer.

4) The number of 4 in or 6 in wafers are not critical for most of our research projects. However, it may be important for our future industry users. To this end, a system with larger capacity would be helpful.

5) We would like to connect a liquid nitrogen substrate cooling system to the substrate holder so a feedthrough for the liquid nitrogen is necessary. In some case, we would like to heat up our substrate to a few hundreds of degree Celsius using resistive heating or lamp heating.

6) Usually better than $5 \times 10^{-6}$ Torr.

7) Yes.
Sputter Deposition System

1) Materials would include a broad range of transition metal oxides, ceramics, metals, etc. Magnetic materials may be included.

2) We are considering purchasing a system with more sources so that we can do co-sputtering and multiple layer sputtering without breaking the vacuum (to change the source). 8 sputtering guns are strongly preferred although 6 is acceptable.

3) Usually we connect metallic sources to DC and insulating sources to RF. Occasionally we swap the targets (DC to RF or vice versa) to achieve different process goals.

4) We prefer a shutter for each individual source.

5) Higher base vacuum is strongly preferred.