SPECTICATIONS FOR THE

III-V Molecular Beam Epitaxy Valved Cracker Package for Varian Gen II MBE machine

For a successful award the contractor must demonstrate that their crackers meet all of the following MINIMUM requirements:

1. Valved Arsenic Cracker for 1988 Varian Gen II system
    a. The arsenic cracker capacity must be at least 500cc
    b. The arsenic cracker may be water cooled, but the cooling must be external to the vacuum, such that a water leak would not affect the system vacuum
    c. The arsenic cracker must be capable of producing both As_2 and As_4 atomic species
    d. The arsenic cracker must have independent heating of the reservoir and cracking zones
    e. The cracker zone must be capable of heating to at least 1200C
    f. A valve must exist between the base and cracking zone, the operation of which must be compatible with existing NRL Applied Epi automated valve positioner (see below)
    g. The arsenic cracker shall have a linear or nearly linear flux versus valve position profile
    h. The valve must be a right angle type of valve
    i. The arsenic cracker must have flux uniformity over 3” (within 2%)
    j. Flux reproducibility must be within 1 %
    k. The source must provide at least three orders of magnitude flux shut off
    l. The valve must go from fully closed to fully open in less than 3 seconds
    m. The package must come equipped with at least one DC power supply, one PID temperature controller for Type C thermocouple, and 1 set of cables to be used to control the reservoir temperature (SCR power control for heating cell filaments is not acceptable)
2. Antimony Valved Cracker for 1988 Varian Gen II system
    a. The antimony cracker must have a capacity of at least 200cc
    b. The crucible and needle must be all PBN
    c. The antimony cracker must be capable of producing Sb_2 atomic species
    d. The crucible must be one piece of at least 200cc
    e. The antimony cracker may be water cooled, but the cooling must be external to the vacuum, such that a water leak would not affect the system vacuum
    f. Independent heating of the base and cracking zone is required
    g. The cracker zone must be capable of heating to at least 1200C
    h. Demonstrated flux uniformity over 3” (within 2%)
    i. Flux reproducibility must be within 1 %
    j. A linear or nearly linear flux versus valve position response
    k. The operation of the valve must be compatible with existing NRL Applied Epi automated valve positioner (see below).

l. The antimony cracker must provide at least two orders of magnitude flux control
m. The antimony cracker must have greater than three orders of magnitude flux shut off
n. The valve must go from fully closed to fully open in less than 3 seconds
o. The package must come equipped with at least one DC power supply, one PID temperature controller for Type C thermocouple, and 1 set of cables to be used to control the reservoir temperature (SCR power control for heating cell filaments is not acceptable)

Additional cracker package requirements:

A. Both crackers must be compatible with existing Applied Epi automated valve positioner for As and Sb crackers
B. Both crackers must be compatible with existing Applied Epi DC Power Modules with integrated PID temperature controllers to be used to control the cracking zones
C. Both crackers must be compatible with existing Varian GEN II (vintage 1988) MBE system