1. Purpose of Experiments
   Include immediate goal of the experiments, scientific importance and/or programatic relevance.
   Refer to any relevant program milestones or ITER R&D commitments.

   Demonstrate the functionality of the laser ablation impurity injection system and begin the investigation of core impurity particle confinement.

2. Background
   Discuss Physics basis of the proposed research, Prior results at Alcator or elsewhere, and any related work being carried out separately.

   Experiments in Alcator C developed a scaling relation for the impurity particle confinement time in ohmic discharges involving parameters such as q, a, R, Zeff, and the mass of the background gas. We will attempt to duplicate these experiments for the purpose of either verifying the old scaling relation or developing a new one.

3. Approach
   Describe the methodology to be employed; explain the rationale for the choice of parameters, etc. Describe the analysis techniques to be employed in interpreting the data, if applicable. If the approach is standard or otherwise self-evident, this section may be absorbed into the Experimental Plan.

   The injection system is capable of introducing a number of different impurity species into the machine. For this run period, the injector will be loaded with Si, Al, Ti, V, Cr, and Mo. We will begin by injecting those deemed 'easiest' to ablate and to have penetrate into the core plasma (eg. lower Z materials such as Si or Al). We will monitor the signals detected in the core plasma by the x-ray tomography arrays, the bolometers, the OMA, and HIREX (when applicable). One goal will be to maximize the number of ablated atoms which penetrate through the separatrix by varying the laser energy and/or the ablation spot size. The decay of the core signals with time is indicative of the impurity particle confinement, and will be measured for a range of plasma parameters as outlined. These injections should be able to piggy-back on other proposed experiments on any run day.
4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

**Toroidal Field:** 5 T

**Plasma Current:** variable, to 500 kA

**Working gas species:** H at first (for shake-down tests), then D and He

**Density:** standard

**Equilibrium configuration** (if possible, refer to database equilibria): near circular at first (for scaling comparisons), then elongated

**Pulse length, typical current & density waveforms, etc.** Refer to database or sketch desired waveforms: minimum flat-top of order 100 ms required

4.2 Auxiliary Systems

**RF Power, pulse length, phasing:** none

**Pellet Injection (species):** none

**Impurity blow-off injection:** as prescribed

**Special gas puffing:** eventually pre-fill in other than H

**Other:** none

4.3 Diagnostics

List required diagnostics, and any special setup or configuration, e.g. non-standard digitization rate.

Impurities observed with x-ray tomography, bolometers (tangential array), HIREX, and the U. Maryland OMA. The lack of the VUV spectrograph is somewhat limiting, but these other diagnostics should be sufficient for the work proposed here.

5. Experimental Plan

5.1 Run sequence plan

Specify total number of runs required, and any special requirements, such as consecutive days, no Monday runs, extended run period (10 hours maximum), etc.

One run day for shake-down tests of hardware, and of order one run day for each background gas investigated. These injections should be sufficiently non-perturbing to not disturb other coincident experiments. This however, must first be verified during the shake-down period.
6. Anticipated Results

Discuss possible experimental outcomes and implications. Indicate if the program may be expected
to lead to publications, milestone completions, improved operating techniques, etc. Indicate if
the experiments are intended to contribute to a joint research effort, or an external database.

Development of an ohmic impurity particle confinement time scaling relation to compare with that derived in Alcator C. This sets the foundation for future work extending the relation to higher elongation, diverted plasmas and discharges with large amounts of RF heating.