

TP Review
Chapter V.
PROCUREMENT AND PURIFICATION OF
THE DARKSIDE-20K ARGON TARGET

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A. Overview and Goals

- Achieved ^{39}Ar BG free exposure by DS50, 5.5 t yr
- DS20k goal, 100 t yr \rightarrow need 10(w/ assuming higher LY?) -100 depletion factor
- Goal of Urania 100 kg/day
- Goal of Aria 150 kg/day w/ 10 -100 depletion factor

B. The Urania Project

- Urania project will extract 50 t (DS20k needs >30 t)
- No funds requested for construction
- History of relationship between DS and Kinder Morgan
- UAr accomplishments in DS50 (extraction and purification) and depletion factor achieved
- Details of the feed gas contents
- Details of the plant
- Optimization of the absorbent and other operational parameters (**Are those planned? or just mention our capability?**)
- Future plan and a possible alternate gas stream
- Schedule

C. The Aria Project

- Description of Aria project
- No funds requested for construction
- Theoretical BG for isotope separation->needs thousands of equilibrium stages
- Design w/ detailed calculations
- Detailed description of columns
- Plan for Seruci-I construction and test including Seruci-0
- Plan for the shaft
- Schedule for Aria project

D. DART: QC/QA for UAr and DAr

- DART (Depleted Argon Test) goal -> Measurements of a depletion factor of 10^5 w/ ~5-10 kg go LAr.
- History of Princeton measurement and DS50 measurement.
- Several planned small detectors
- need for a detector in the Seruci mine next to the Aria columns (**Do we need more detailed plan? Fund requested in this proposal?**)

E. DAr Delivery Plan

- Summary of requirements (85 % argon recovery factor each path in Aria -> total amount needed for DS20k is ~ 50 t)
- Shipping methods of 50 t UAr and DAr

F. DAr Storage and Management

- The final quantity of DAr -> 32 - 35 t (~ 10% more than the need for DS20k)
- **Most parts are redundant of the previous section**
- Stored underground at Seruci mine

G. Risks and Their Mitigation

- Risk of delays in Serici-II
- Possibility to start measurement w/ UAr
- W/ higher LY, and larger fiducial cut (**doesn't mentioned in the TP**), exposure of more than 5.5 t yr might be possible.

Small suggestions

line 1286 & 1287 Remove separation between paragraphs (... as liquid. The second ...)

line 1344 built in -> built-in

Fig. 6 If it is possible, please put "condenser" label to the condenser.

line 1412 boiler and thanks to -> boiler, and thanks to

line 1418 to bottle -> to both (???)

line 1506 Table number is missing

line 1525 - 1528 "Two measurements in the liquid phase were performed by DarkSide-50 collaborators in the past to qualify the natural ^{39}Ar depletion in gas extracted from the Cortez mine in Colorado:" ->

"To qualify the natural ^{39}Ar depletion in gas extracted from the Cortez mine in Colorado, two measurements in the liquid phase have performed in the past by DarkSide-50 collaborators:"

line 1529 LAr -> UAr

line 1538 and following -> and the following

line 1568 rthe -> the

line 1600 colorado -> Colorado

line 1658 Section number is missing