Section 1: Photo-gun to gun valve VBV2I02

- 1. HV condition (w/o Kr) the present tee-electrode
- 2. Prepare second small shed electrode (we can re-use insulator/flange or make spare too)
- 3. If we vent gun modify NEG tube layout
 - a. Eliminate gun flange bellows so corrector may be closer upstream
 - b. Replace MFH2I01 w/ new solenoid (needs fixture on stand)
 - c. New solenoid still needs new tube, NEG coated
 - d. Orient gun valve vertical, like others? Is VBV2I02 "good" (replace w/ VBV3I02?)
- 4. Replace tee-chamber with new load lock chamber

Section 2: Gun valve VBV2I02 to VBV1I07

- 1. Install new larger bore Y-chamber (replaces old Y + dipole can)
 - a. Vacuum fire chamber (done)
 - b. NEG coat surfaces the beam will see
 - c. New NEG 10" flange bottom of chamber
 - d. Two ion pumps.
 - e. RGA there, or someplace else.
 - f. New 15 deg dipole designed, bids arriving, PR soon; receive and map
 - g. Two chromox screens, one with hole. Check retraction. Top hats?
 - h. Can we install laser window w/ less birefringence
- 2. Outrigger laser box (+ laser curtain)
 - a. Gets removed for bakeout
 - b. Can we eliminate (or simplify)? Need to find a pic!
 - c. Replace MFB1I02 w/ new solenoid (needs fixture)
- 3. Wien filters (general assembly)
 - a. Remove and disassemble each Wien filter, keeps track of parts
 - b. Vacuum chamber ears removed
 - c. Wien magnet steel and nickel clamps re-used, but with new coils
 - d. Magnet+chamber mapped (before or after electrodes)
 - e. New 40kV feedthroughs w/ new non-mag springs used
 - f. TBD, use existing short ceramic+hanger, or new long ceramic+hanger
 - g. HV test before installing bake
- 4. Wien filter controls (general)
 - a. New 20A PS + cable drops
 - b. New 30kV HVPS + switches + cable drops
 - c. Wien filter spin dances needed @ 130keV and 200keV (eventually)
- 5. Vertical Wien filter
 - a. Same crosses, pumps, viewers?
 - b. We can re-use existing "peanut quads", but better quad (air or iron) desired
- 6. Spin Solenoids
 - a. No change, oh yeah!
 - b. Maybe we locate a little further apart with a steering coil or bpm in beween?

- 7. Short DP can
 - a. Re-use, but replace w/ new NEG's which type, and need new tabs?
 - b. Same IP?
 - c. Where is the BEST location to improve QE lifetime
- 8. Prebuncher
 - a. Store, relocate
- 9. Harp
 - a. Only need one harp to match? Here or later?
- 10. PCup/Viewer
 - a. Keep, as-is.
 - b. Same anti-collision circuit
- 11. Valve
 - a. All-metal isolation, w/ shut override
 - b. Let't keep but maybe we can locate to minimize future bakeouts?

Section 3: VBV1I07 to VBV0I02

- 1. MFQ0I01 is replaced with new solenoid (fixture)
- 2. Horizontal Wien filter
 - a. No longer sandwiched between A1/A2
 - b. May need : 2 crosses + 2 viewers + 2 small pumps
 - c. Will need two small Wien quads on crosses (or new quads TBD)
 - d. Brock cavity gets removed
- 3. A1/A2
 - a. Re-use A1/A2, like a pump at each aperture
 - b. Need to define spacing (filter), location (steering), and insertion (kicker)
 - c. Re-use PSS kicker (works @ 130keV, seems fine at 200keV)
 - d. Choose whether we kick to A1 or A2
 - e. Don't see why we need A1 cross anymore, normal steering coil?
- 4. Harp
 - a. One need one harp to match? Here or earlier?
 - b. Valve
 - c. Viton valve OK, mates to unbaked region
- 5. Viewers
 - a. Replace cracked YAG screen, maybe one near harp, or put chromox

Section 4: VBV0I02 to VBV0I06

- 1. Chopper 1,2 w/ MFA0I03, MFA0I05
 - a. We'll leave as-is
 - b. Challenging to remove, maybe too risky, can do later if needed?
 - c. Mitigates long field reach of new solenoids
- 2. Chopping chamber bellows to bellows
 - a. Pull out and store as-is, in case need to re-install

- b. New chamber that accommodates new chopper solenoids
- c. Improve chopping aperture linear manipulators, reproducibility
- d. Same apertures or new apertures?
- e. Need CP or is MS alone fine?
- f. Big YAG screen?
- 3. Earth correcting coil
 - a. For now remains, would like to improve, maybe
- 4. Downstream
 - a. Not sure we do anything downstream of chopper 2 at this time

Rebuild Gun to Chopper : 11 – 14 weeks

Gun work (11 days = 2-3 weeks)

- 1. (6 shift) Tee @ 200 kV
- 2. (7 day) New electrode bake
- 3. (6 shift) Small shed @ 200 kV
- 4. (7 day) Replace NEG tube + anode flange

Rebuild beam line (7-8 weeks)

- 1. (2 days) Make everything safe
- 2. (3 days) Disconnects of cables and controls and dumping of penetrations
- 3. (2 days) Girder vacuum disconnects and removal to labs and tunnel storing
- 4. (2-3 weeks) Wien breakdown + shop work + re-assembly + HV testing + mapping)
- 5. (2-3 weeks) Populating new girder layouts with existing hardware + alignments
- 6. (3 days) Pedestal modifications
- 7. (1 week) Installation, 1A, vacuum hookups, 2A
- 8. (2 weeks) Bakeouts
- 9. (1 week) Cable reconnects and HCO

Beam Commissioning Jobs (35 shift = 2-3 weeks)

- 1. (9 shift) HCO w/ beam first time
- 2. (2 shift) Injector steering script for new location of correctors and bpm's
- 3. (4 shift) Wien filter spin calibration w/ Mott (at 130 keV)
- 4. (4 shift) Wien optics measurements and quadrupole correction
- 5. (2 shift) Dipole optics measurement to finalize shims
- 6. (2 shift) Develping a matching criteria
- 7. (1 shift) PSS kicker @ 130 keV and 200 keV
- 8. (9 shift) Gun lifetime checkout

