**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
	1. Eliminate gun flange bellows so corrector may be closer upstream
	2. Replace MFH2I01 w/ new solenoid (needs fixture on stand)
	3. New solenoid still needs new tube, NEG coated
	4. 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)
	1. Vacuum fire chamber (done)
	2. NEG coat surfaces the beam will see
	3. New NEG 10” flange bottom of chamber
	4. Two ion pumps.
	5. RGA there, or someplace else.
	6. New 15 deg dipole designed, bids arriving, PR soon; receive and map
	7. Two chromox screens, one with hole. Check retraction. Top hats?
	8. Can we install laser window w/ less birefringence
2. Outrigger laser box (+ laser curtain)
	1. Gets removed for bakeout
	2. Can we eliminate (or simplify)? Need to find a pic!
	3. Replace MFB1I02 w/ new solenoid (needs fixture)
3. Wien filters (general assembly)
	1. Remove and disassemble each Wien filter, keeps track of parts
	2. Vacuum chamber ears removed
	3. Wien magnet steel and nickel clamps re-used, but with new coils
	4. Magnet+chamber mapped (before or after electrodes)
	5. New 40kV feedthroughs w/ new non-mag springs used
	6. TBD, use existing short ceramic+hanger, or new long ceramic+hanger
	7. HV test before installing bake
4. Wien filter controls (general)
	1. New 20A PS + cable drops
	2. New 30kV HVPS + switches + cable drops
	3. Wien filter spin dances needed @ 130keV and 200keV (eventually)
5. Vertical Wien filter
	1. Same crosses, pumps, viewers?
	2. We can re-use existing “peanut quads” , but better quad (air or iron) desired
6. Spin Solenoids
	1. No change, oh yeah!
	2. Maybe we locate a little further apart with a steering coil or bpm in beween?
7. Short DP can
	1. Re-use, but replace w/ new NEG’s – which type, and need new tabs?
	2. Same IP?
	3. Where is the BEST location to improve QE lifetime
8. Prebuncher
	1. Store, relocate
9. Harp
	1. Only need one harp to match? Here or later?
10. PCup/Viewer
	1. Keep, as-is.
	2. Same anti-collision circuit
11. Valve
	1. All-metal isolation, w/ shut override
	2. 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
	1. No longer sandwiched between A1/A2
	2. May need : 2 crosses + 2 viewers + 2 small pumps
	3. Will need two small Wien quads on crosses (or new quads TBD)
	4. Brock cavity gets removed
3. A1/A2
	1. Re-use A1/A2, like a pump at each aperture
	2. Need to define spacing (filter), location (steering), and insertion (kicker)
	3. Re-use PSS kicker (works @ 130keV, seems fine at 200keV)
	4. Choose whether we kick to A1 or A2
	5. Don’t see why we need A1 cross anymore, normal steering coil?
4. Harp
	1. One need one harp to match? Here or earlier?
	2. Valve
	3. Viton valve OK, mates to unbaked region
5. Viewers
	1. Replace cracked YAG screen, maybe one near harp, or put chromox

**Section 4: VBV0I02 to VBV0I06**

1. Chopper 1,2 w/ MFA0I03, MFA0I05
	1. We’ll leave as-is
	2. Challenging to remove, maybe too risky, can do later if needed?
	3. Mitigates long field reach of new solenoids
2. Chopping chamber – bellows to bellows
	1. Pull out and store as-is, in case need to re-install
	2. New chamber that accommodates new chopper solenoids
	3. Improve chopping aperture linear manipulators, reproducibility
	4. Same apertures or new apertures?
	5. Need CP or is MS alone fine?
	6. Big YAG screen?
3. Earth correcting coil
	1. For now remains, would like to improve, maybe
4. Downstream
	1. 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

