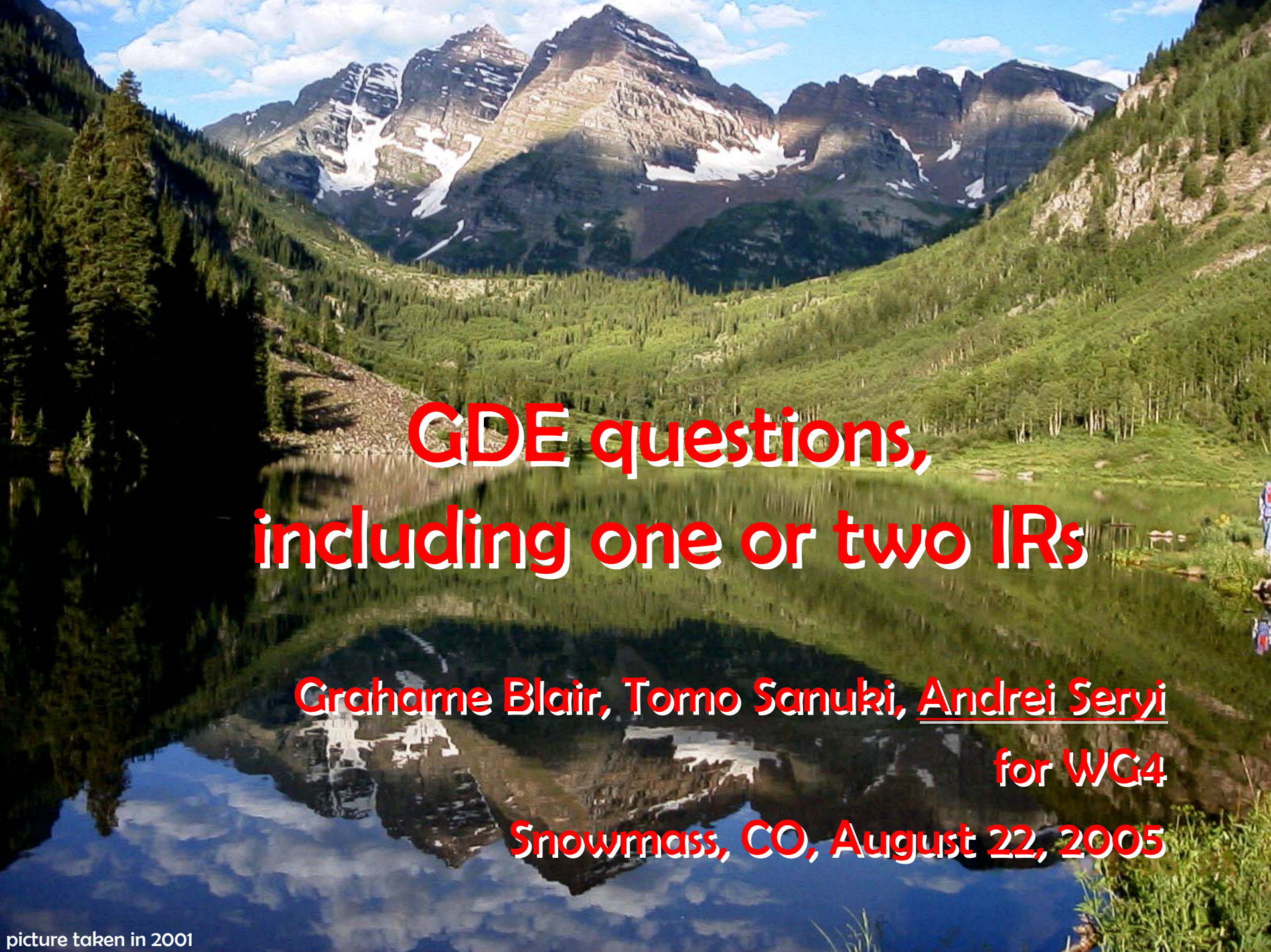

GDE questions, including one or two IRs

Grahame Blair, Tomo Sanuki, Andrei Seryi

for WG4

Snowmass, CO, August 22, 2005

picture taken in 2001

Snowmass 2005

GDE questions (Himel's list) related to WG4

http://alcpg2005.colorado.edu:8080/alcpg2005/program/accelerator/GG3/tom_himel20050820225601.xls

	Decisions	Rank	expense	impacts other decisions	decision contentiousness	product	Input needed from	Input needed from	Input needed from	Input needed from
2	beam and luminosity parameters. All groups involved	1	1	1	2	2	GG1-params	GG3-Ops	WG4-BDS	
3	main linac starting gradient, upgrade gradient, and upgrade path	2	1	3	1	3	GG5-cost	WG5-Cavities	GG1-params	WG2-Linac
4	straight or follow earth's curvature?	3	1	1	2	2	GG5-cost	GG4-civil	WG1-LET	WG4-BDS
5	1 or 2 IRs, if two, run interleaved?	4	1	3	1	3	GG5-cost	WG4-BDS	GG6-options	WWS
6	1, 1.5, or 2 tunnel	5	1	1	1	1	GG5-cost	GG3-Ops	WG2-Linac	GG4-civil
7	DR size and shape	6	1	2	1	2	GG5-cost	WG3b-DR	GG1-params	GG6-options
8	e+ source type conv/undulator/compton	7	2	1	2	4	GG5-cost	WG3a-sources	GG3-Ops	WG3b-DR
9	is there an e+ pre damping ring	8	1	2	3	6	GG5-cost	GG1-params	WG3b-DR	WG3a-source
10	DR location: 1st half tunnel, 2nd half, ceiling, under cryomodules, separate tunnel	9	1	2	1	2	GG5-cost	GG1-params	GG3-Ops	WG3b-DR
11	cavity shape/iris size	10	1	3	1	3	GG5-cost	WG5-Cavities	WG1-LET	WG2-Linac
15	crossing angle		1	2	1	2	WG4-BDS	GG4-civil	GG6-options	
21	gamma-gamma upgrade path		2	2	2	8	WG4-BDS	GG6-options	WG3b-DR	GG1-paran
34	optimize L*		3	2	2	12	WG4-BDS			
35	tail folding octupoles in BDS?		2	3	2	12	WG1-LET	WG4-BDS		
37	collimation stragegy - passive? Order of E and beta		3	3	2	18	WG1-LET	WG4-BDS		
40	FF optics: traditional/local correction		2	3	3	18	WG4-BDS			

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GDE questions (Himel's list) related to WG4

http://alcpg2005.colorado.edu:8080/alcpg2005/program/accelerator/GG3/tom_himel20050820225601.xls

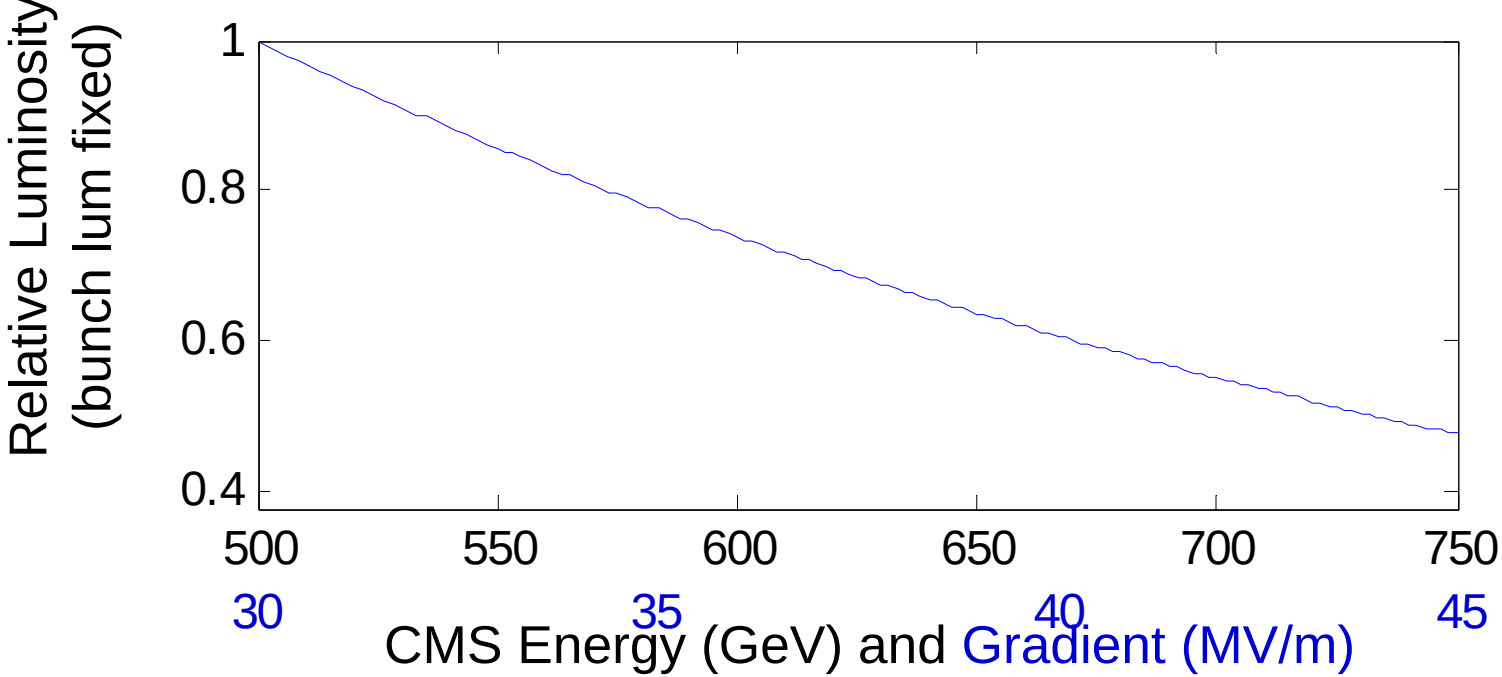
- beam and luminosity parameters
- straight or follow earth's curvature?
- 1 or 2 IRs, if two, run interleaved?
- crossing angle
- gamma-gamma upgrade path
- optimize L*
  - consider range 3.5-4.5m (depend on x-ing angle)
- tail folding octupoles in BDS?
  - yes, included in BDS; collimation must work without them
- collimation strategy - passive? Order of E and beta
  - passive spoiler (survive 2bunch at 500GeV CM, one at 1TeV CM); first beta, then E; detection of E-error by separate chicane in diagnostics section, one bunch (337ns) may go through
- FF optics: traditional/local correction
  - local correction

beam and luminosity parameters

- Nominal parameters are acceptable
- Parameter sets which have large beamstrahlung, may turn out to be not working from the point of view of extraction line energy acceptance and from background (pairs hitting vertex)
- High Lumi 1TeV set is not working. Alternative set suggested. Need feedback from DR & LET.
- Alternative set for 500GeV CM will be suggested
- Some other sets (e.g. Low P) may have the same problems (not evaluated in details)
- Low Q option is good for background (but Nbunches may be concern for DR?)

beam and luminosity parameters (cont'd)

- From WG2 summary by Chris Adolphsen: "If decrease current by reducing number of bunches, achieve the following energy reach assuming ~ 50% cooling overhead used and no Q variation with gradient (could lower rep rate if needed). (Assumed that in 10 years, which is probably the earliest the machine could be built, that 45 MV/m could be reached routinely)."
- For 1TeV linac, the energy reach is then 1.5TeV, with 70% of charge
- To what max energy/disruption should we spec the hardware: layout, design of BDS beamlines (including in particular the extraction lines and SC quad)?



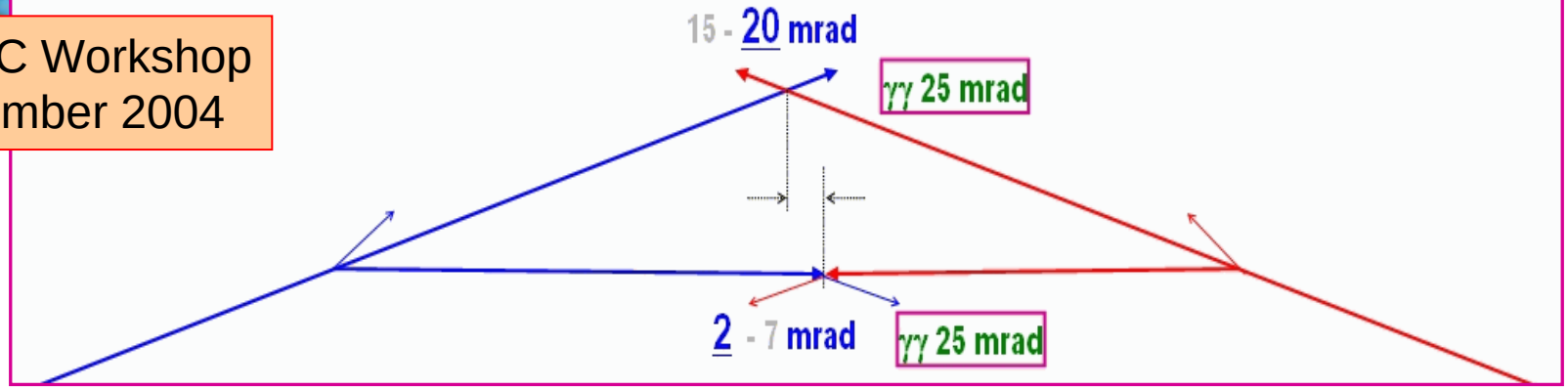
straight or follow earth's curvature?

- **Prefer not to have any vertical angle between linac and BDS**
  - **this may be useful if one need to upgrade BDS, add collimation section, or diagnostics section**
  - **if multi-TeV compatibility is considered, preferable not to have vertical angle within some region around IR (for example +-5km? – to be evaluated)**

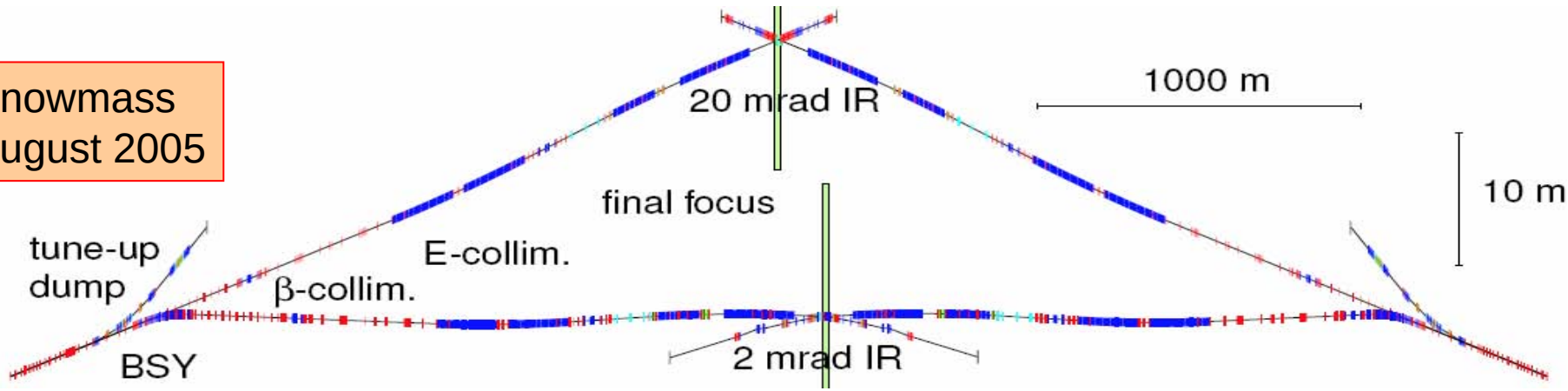
Recommendations from the WG4

Tentative, not frozen configuration, working hypotheses, "strawman"

1st ILC Workshop
November 2004



Snowmass
August 2005



Strawman tentative configuration turns into real design: Full optics for all beamlines; Mature 20mrad optics and magnets design; Several iteration of optics for 2mrad IR; Upstream and downstream diagnostics for both IRs

Baseline: two BDSs, 20/2mr, 2 detectors, 2 longitudinally separated IR halls

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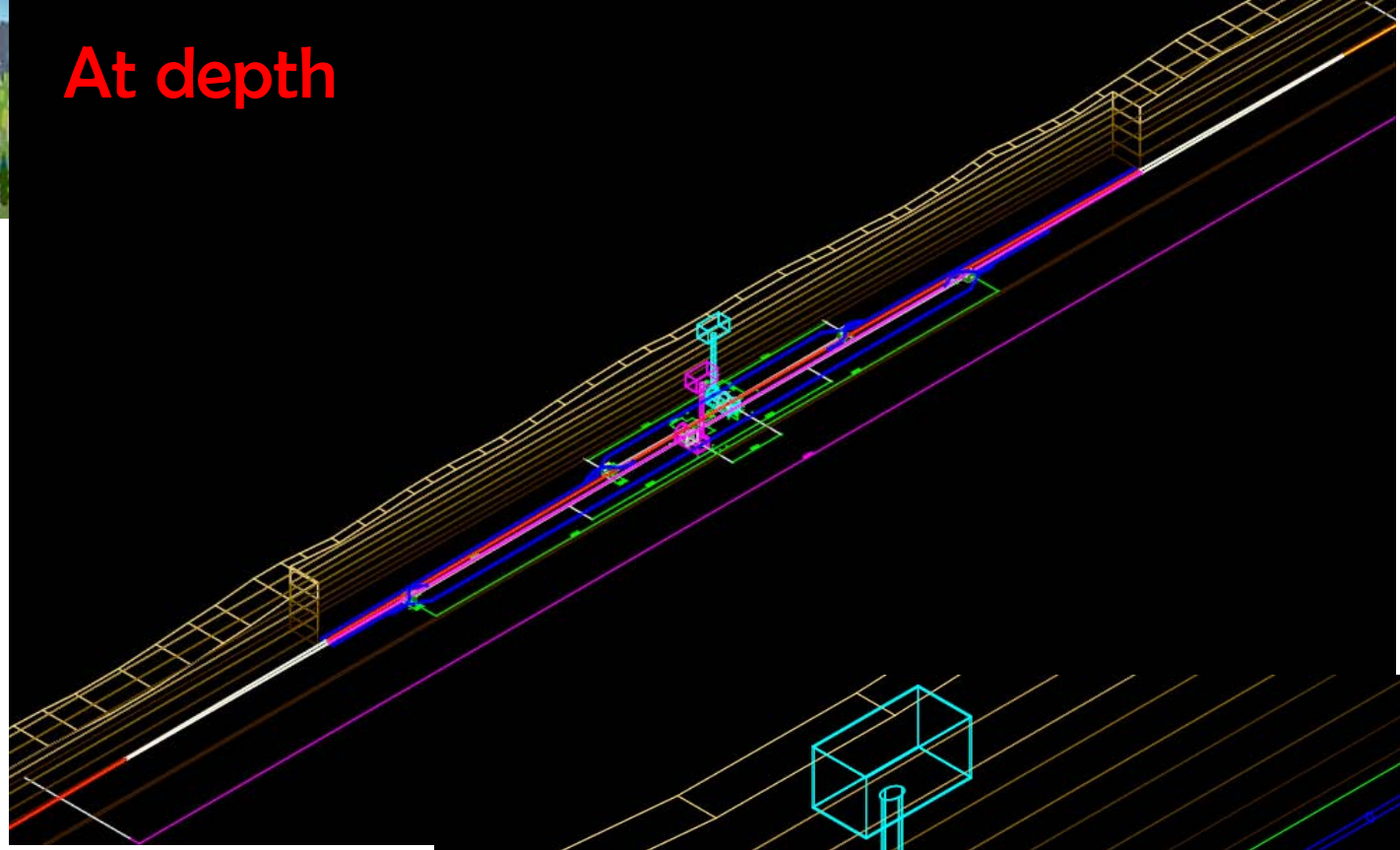
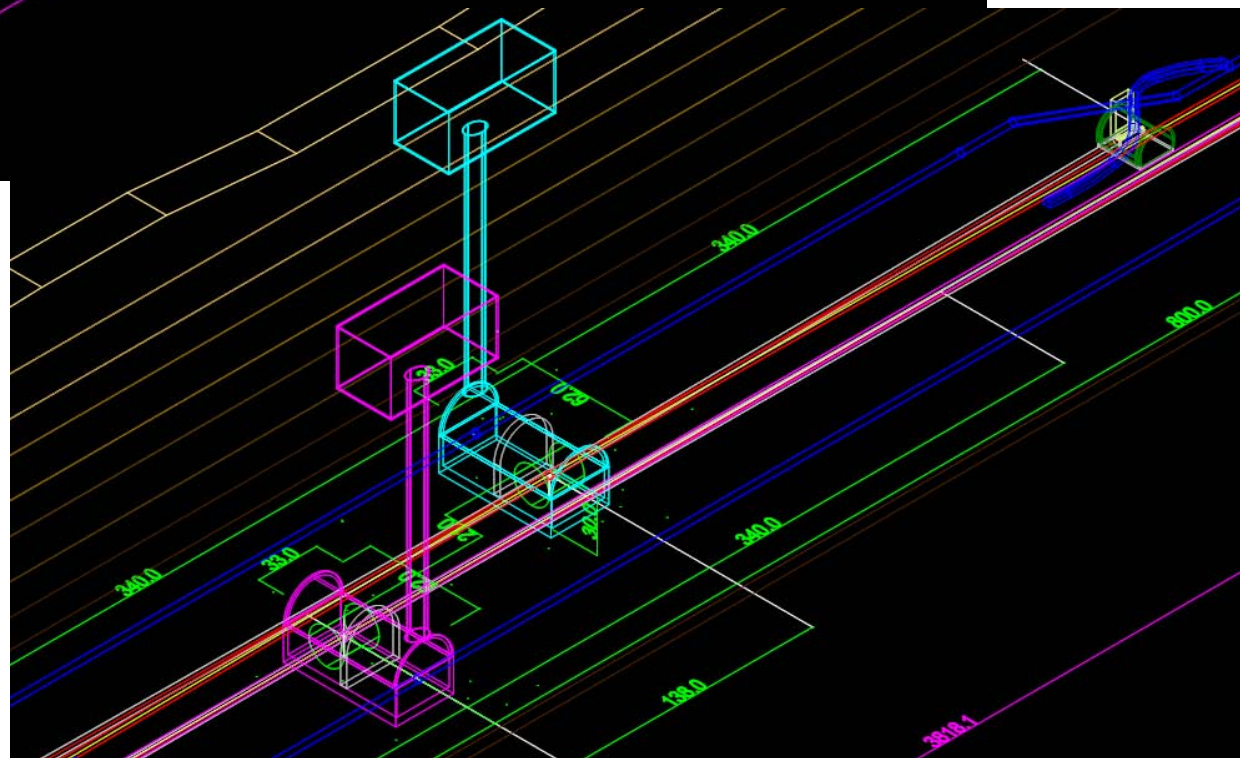
At depth





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One or two IRs, crossing angle Baseline & Alternatives

- **Baseline: two BDSs, 20/2mr, 2 detectors, 2 longitudinally separated IR halls**
  - **$\gamma\gamma$ assumed to work at 20mr**
- **Alternative 1: two BDSs, 20/2mr, 2 detectors in 1 IR hall @ Z=0**
  - **pro: civil engineering savings, no constraints on bunch separation**
  - **con: vibration issues/operational & installation constraints**
- **Alternative 2: single IR/BDS, wide enough for 2 push-pull detectors**
  - **pro: cost savings, no constraints on bunch separation**
  - **con:**
    - vibration issues/operational & installation constraints
    - GG6: $\gamma\gamma$ may not be feasible since need long & invasive modifications of IR implying very long switch over time
  - **note:**
    - transforms adiabatically into alternative 1, if required by physics
      - build additional tunnels for 2nd IR with desired configuration (small, intermediate or large angle, for e+e- or $\gamma\gamma$)
      - optimize 2nd IR using experience gained with 1st IR
    - question of one or two detectors is decoupled
      - study technical feasibility & implication of supporting two detectors (wide IR hall?; FD is part of detector for faster detector exchange?, etc…)
- **Intermediate x-ing angle (10-15mr) is a variant for any of the above**
  - **unlikely to be $\gamma\gamma$ compatible**

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Alternative 1

- two BDSs, 20/2mr, 2 detectors in 1 IR hall @ Z=0

- pro: civil engineering savings, no constraints on bunch separation
- con: vibration issues/operational & installation constraints

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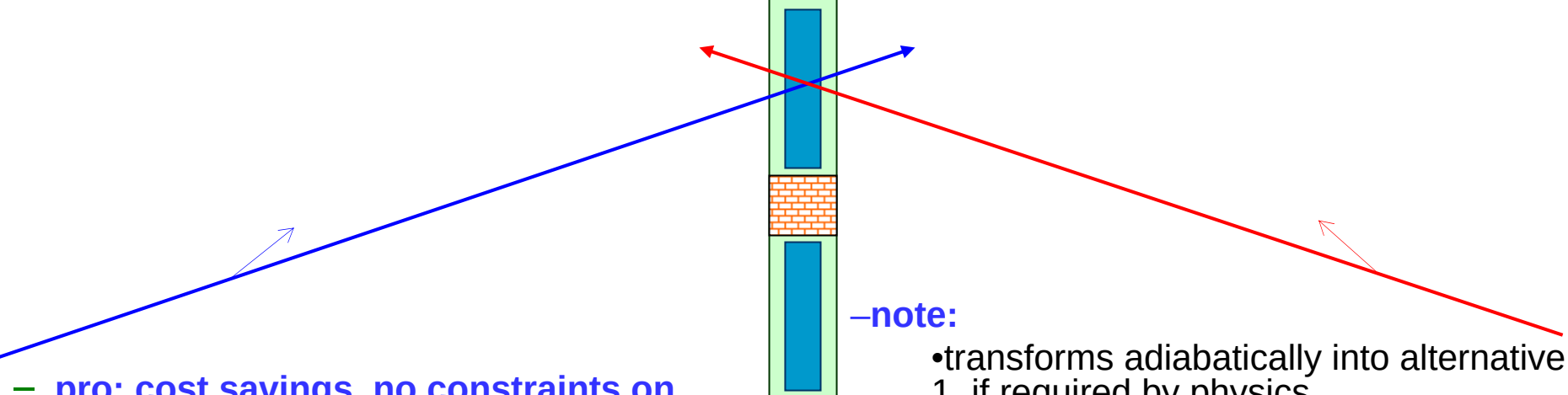
Alternative 2

• Alternative 2: single IR/BDS, wide enough for 2 push-pull detectors



– **pro: cost savings, no constraints on bunch separation**

–**con:**

- •vibration issues/operational & installation constraints
- •GG6: $\gamma\gamma$ may not be feasible since need long & invasive modifications of IR implying very long switch over time

–**note:**

- •transforms adiabatically into alternative 1, if required by physics
  - –build additional tunnels for 2nd IR with desired configuration (small, intermediate or large angle, for e+e- or $\gamma\gamma$)
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