For discussion of GWP04 IR integration

A. Seryi, suggestions for GWP04
with possible additions from
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External milestones

- Detector LOI group workshops
  - **ILD workshop, January 14-16, DESY Zeuthen**
  - **SiD workshop, January, 28-??, SLAC**
- Sendai GDE and Detector meeting
  - **March 3-6, Sendai, Japan**
- BDS driven review of Crab Cavity
  - **End of March, Daresbury**
- BDS driven review of Final Doublet
  - **Tentative, April 2-4 at BNL**
- BDS driven workshop & review of polarization and E-measurements
  - **April 9-11, DESY Zeuthen**
- PM driven review of Final Doublet, long MDI instrumentation and Crab cavity
  - **May 5-6, Daresbury**

Next steps

- Develop & implement the short term (to Sendai) plan
  - **Organize the groups for EDR structure and launch their work**
    - Starting from the posted BDS WP table, suggest optimized structure of tasks
    - Suggest leaders of the work, taking into account submitted EOIs and the reporting structure
    - Suggest time for the regular meetings
    - Suggest bigger design review meetings

- Next page show a tentative structure which need to be improved to represent task-name table that could be used for planning the work and tracking the progress

Tentative table, to be improved

4	IR & IR integration	Sub-WP managing	Sub-WP manager	BNL	Parker
			Sub-WP manager deputy	SLAC	Markiewicz
		IR physics design	IR & FD accel. phys. design	BNL	Parker
					Parker+
				Oxford	Burrows
			FD Vibration design study	BNL	Jain
				LAPP	Jeremie
		IR eng. design	Detector moving system design	JINR	Syresin
				SLAC	Amann
			FD magnet design	BNL	Anerella+
			Optimization of CFS requirements	SLAC	EngName
			IR cryogenics design	FNAL	Peterson
				NSF	Weisend
			FD mover system design	SLAC	Amann
				Wiscons	Feyzi
			IR shielding design	JINR	Syresin
			Suppression of vibration propagation on pipes	Wiscons	Feyzi
			Complementary design study for baseline FD	FNAL	Zlobin
		IR magnet prototype	IR magnet stability study	BNL	Jain
			magnet testing	BNL	Anerella+
			production	BNL	Anerella+
			tooling assembly	BNL	Anerella+
		IR hardware options	Study Rutherford cable for 14mr	FNAL	Zlobin
			Study permanent magnet for 14mr	Kyoto U	Iwashita
		Detector groups interaction	Interact with GLD/LDC (ILD)	KEK	none
				DESY	none
				LLR/IN2P	none
			Interact with SiD	SLAC	none
			Interact with 4th	Iowa Univ	none
			Interact with existing CERN det	CERN	none

Urgent next steps for GWP04

- Set up connections to Detector side
  - **BDS GWP04 => Detector LOI groups**
    - ILD MDI-D: Tauchi, Buesser
    - SiD MDI-D: ?
    - 4th MDI-D
  - **TAGL & GWP04 => all detectors: RD until further notice**
- Setup connection to CFS
  - **Fred Asiri and John Osborne**
- Define the core group who should attend GWP04 meetings and schedule them
  - **should include the above mentioned connecting people and at least one institutional representative from labs that are involved or expressed interest**

Urgent next steps for GWP04

- After setting up detector & CFS connections
  - **document existing IR assumptions in the interface document**
  - **discuss and suggest the plan of studies that can be done by machine and detector group before LOI submission**

Questions for study for the platform / no platform design

- Understand responsibilities and cost division, e.g.
  - **No platform: detector group fully responsible for moving detectors fast while preserving their alignment, and be consistent with on-surface assembly or other agreed upon or imposed conditions and for associated cost**
  - **With platform: BDS takes part of the cost and responsibility for solving the detector exchange problem**
- Study technical questions of platform solution (mostly machine group)
  - **vibration modes & optimization of location and number of support posts;**
  - **static deflection including deformation with off-centered loads;**
  - **how to achieve precision and provide guidance of movers;**
  - **how to manufacture the platform & steel platform versus concrete design;**
- Study technical questions of no platform solution (mostly detector group)
  - **Are there any alignment issues unique or difficult without a platform?**
  - **Are there any stability issues unique or difficult without a platform?**
- Study and compare questions that may be common for both solutions
  - **next page**

with Marty's input

Questions for study for the platform / no platform design

with Marty's input

- Study and compare questions that may be common for both solutions
  - **How much concrete is needed for a stable base for the detector loads?**
  - **How thick must the concrete be to suitably contain the "optical references" for QD0?**
  - **How much steel plate is needed for the Hillman rollers? Are there guide features on the steel? What do the pushers or other motion mechanisms react against?**
  - **How QD0 is anchored longitudinally? Is it more of an issue without a platform?**
  - **How are the Pacmen moved? They need to go with the detector, and again this appears somewhat easier with a platform, but this may not be true. Note that motion in Z is needed to avoid the fixed beamline.**
  - **What is the beam elevation? It might be possible to shift the cost of understructure of the smaller detector to the machine in the platform case by requiring a thicker platform!**
  - **It seems plausible that many detector utilities can be above, or more likely beside, the detector. How do utilities and other connections that go off the detector complex get made in a way that does not take push-pull time?**
  - **Cost estimation & comparison**

200, 350 GeV CM parameters

- It is suggested to have studies (mostly in GWP03) of the 200 & 350 GeV CM parameter set
  - **A plan of study document will be sent to PMs and the Integration group**
- Next page show VERY tentative table, which based on several assumptions that either need to be justified or may not be entirely correct
  - **dependence on L* may appear in the lower energy range**

Primary parameters and analytic calculations

TENTATIVE. NOT TO BE USED AS INPUT FOR PHYSICS CALCULATIONS

500 GeV CM (and tentative 200 & 350 CM)

	Nom.200	Nom.200	Nom.350	Nom.350	Nominal
Ecms [GeV]	200	200	350	350	500
gamma	1.96E+05	1.96E+05	3.42E+05	3.42E+05	4.89E+05
N	2.00E+10	2.00E+10	2.00E+10	2.00E+10	2.00E+10
nb	2625	2625	2625	2625	2625
Tsep [ns]	369.2	369.2	369.2	369.2	369.2
Iave in train [A]	0.0087	0.0087	0.0087	0.0087	0.0087
f	5	5	5	5	5
Pb [W]	4.21E+06	4.21E+06	7.36E+06	7.36E+06	1.05E+07
IP Parameters					
gamepsX	1.00E-05	1.00E-05	1.00E-05	1.00E-05	1.00E-05
gamepsY	4.00E-08	4.00E-08	4.00E-08	4.00E-08	4.00E-08
bx	2.60E-02	3.30E-02	2.00E-02	2.00E-02	2.00E-02
by	4.00E-04	4.00E-04	4.00E-04	4.00E-04	4.00E-04
sigx	1.15E-06	1.30E-06	7.64E-07	7.64E-07	6.39E-07
sigy	9.0E-09	9.0E-09	6.8E-09	6.8E-09	5.7E-09
sigxp	4.43E-05	3.94E-05	3.82E-05	3.82E-05	3.20E-05
sigyp	2.26E-05	2.26E-05	1.71E-05	1.71E-05	1.43E-05
L* [m]	3.50	**4.50**	3.50	**4.50**	3.50
Max divergence X	4.00E-04	3.53E-04	4.00E-04	3.53E-04	4.00E-04
Max divergence Y	1.00E-03	8.82E-04	1.00E-03	8.82E-04	1.00E-03
Collim safety factor	1.5	1.5	1.5	1.5	1.5
Coll depth X	6.0	6.0	7.0	6.2	8.3
Coll depth Y	29.5	26.0	39.0	34.4	46.6
Estim Y emit growth	0.704	0.905	0.230	0.295	0.113
Lum reduct factor	0.766	0.725	0.902	0.879	0.948
sigz	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04
Dx	1.31E-01	1.03E-01	1.70E-01	1.70E-01	1.70E-01
Dy	1.66E+01	1.48E+01	1.90E+01	1.90E+01	1.90E+01
Uave	0.010	0.009	0.027	0.027	0.047
delta_B	0.003	0.003	0.012	0.012	0.023
P_Beamstrahlung [W]	1.44E+04	1.15E+04	9.03E+04	9.03E+04	2.41E+05
ngamma	0.742	0.660	1.095	1.095	1.286
Hdx	1.012	1.006	1.026	1.026	1.026
Hdy	4.543	4.346	4.770	4.770	4.770
Hd	1.67E+00	1.64E+00	1.70E+00	1.70E+00	1.70E+00
Geo Lum	4.01E+37	3.56E+37	8.00E+37	8.00E+37	1.14E+38
Lum. (m-2 s-1)	**5.12E+37**	**4.22E+37**	**1.23E+38**	**1.20E+38**	**1.85E+38**

k~1/r/ga

TENTATIVE. JUST EXAMPLE

All numbers in red are input

All numbers in black or blue are calculated

All numbers are analytic calculations but Guinea Pig usually agrees within +/- few

Constants:

alpha	7.2974E-03
re	2.8510E-15
me	5.1100E+05
c	2.9980E+08
e	1.6020E-19

Magenta -- input which needs to be justified

assume 6 is limit

Dark green -- calculated, and need to be justified

Appendix

- A slide from ALCPG07 talk

GWP.4 Interaction Region and IR integration

- Includes the IR system engineering and integration, IR magnet design and its prototypes, design of IR cryogenics, design of IR shielding, design of the system to move the detectors, stability study of IR magnets, design of IR magnet movers and supports, evaluation of alternative magnet solutions for IR, etc.
- Very tightly connected to detector hardware design. GWP4 leaders will work closely with representatives of two emerging detector proto-collaborations to create a technically-optimal and cost-optimal IR design
- Deliverables: documented descriptions of interfaces between machine and detector systems,
  - **including relevant parameters of such interfaces (location, geometries, stability, etc); documented descriptions of requirements to CFS systems, to safety and other systems, and also documented divisions of responsibilities.**
- Documenting such interfaces must allow non-simultaneous publication of the machine EDR and of the Detector EDR
- Also include design report for the IR magnets with assessment of prototype magnetic and mechanical stability performance, with design of the cryogenic system, power supply and quench protection system, supports, movers, shielding and interfaces to forward instrumentation and IR vacuum chamber, and the updated cost.