Future Simulation Scope

- The deliverables after 3 years will *include*
  1. Published analysis of electron test beam
  2. Published analysis of hadron test beam
  3. Code for generic energy flow algorithm
  4. Significant contributions to detector CDR and TDR
  5. Positions of responsibility in global LC software activity
  6. Report on simulations for other WPs (MAPs, DAQ, Mech.)
  7. Framework for physics analysis benchmarking of detector designs

Tasks

1. DESY test beam
2. Hadron test beam
3. Energy flow algorithms
4. Global detector design *(using energy flow)*
5. Integration with world LC software activities
6. Suppport of other WPs
7. Physics studies (*supporting energy flow and global detector design tasks)*

Task 1: DESY Test Beam

1. Establish analysis framework
2. Include (existing) digitisation code to mokka
3. First MC samples, electrons, ideal conditions (+cosmics?)
4. Understand beam environment
5. Understand wire chamber behaviour
6. Simple simulation of wire chamber in Mokka
7. MC samples, electrons, realistic conditions, incl. hodoscope
8. Comparison of MC/data, electrons and cosmics.

DESY Test Beam

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
1.1 Establish analysis framework	=											
1.2 Digitisation code in mokka	=											
1.3 1st ideal MC beam, cosmics	=											
1.4 Understand beam environment	=											
1.5 Understand wire chamber	=											
1.6 Implement wire chamber simulation	=											
1.7 Realistic MC samples	=											
1.8 Data/MC comparisons, e,cosmics	=	=	=									

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Task 2: Hadron Test Beam

1. Maintain available hadronic shower codes
2. Report requirements to host lab. (beam energy, type, run schedule)
3. First MC samples, ideal beam conditions, 1-2 hadronic models
4. Understand beam environment (profile, energy spread, particle content)
5. Simulation of beam line environment
6. Second MC samples, realistic beam conditions, 1-2 hadronic models
7. Understand Cerenkov counters
8. Separation into specific samples (efficiency, purity), various impact positions
9. Large MC production, full set of models, as above
10. Compare models/data, decide best model(s), estimate uncertainties
11. Publish test beam results, impact on detector design

Hadron Test Beam

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
2.1 Maintain hadron shower codes	=	=	=	=	=	=	=	=	=	=	=	=
2.2 Report test beam requirements	=											
2.3 Small ideal MC samples		=	=									
2.4 Understand beamline		=	=									
2.5 Simulate beamline			=	=								
2.6 Realistic MC samples			=	=	=							
2.7 Understand Cerenkov counters				=	=							
2.8 Species specific samples				=	=	=						
2.9 Production MC, all models					=	=	=					
2.10 Compare data/all MC models					=	=	=	=	=			
2.11 Publish results, impact design								=	=			

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Task 3: Energy Flow Algorithms

1. Review of existing work/code (SNARK, REPLIC, etc.)
2. Identify resolution limiting factors, simple physics benchmark processes (linking all detectors, but in limited regions, e.g. t decay, Z0 → jets, …)
3. Algorithm brainstorming: at least 2 contrasting approaches to energy flow
4. Define tools required by algorithm (e.g. calo. clustering)
5. Controlled comparison, existing codes: single process/detector geometry
6. First implementation of single new algorithm
7. Understand interplay between hadronic modelling uncertainties / energy flow
8. Physics benchmark comparison, feedback on tools
9. Further algorithm development and evaluation/refinement

Energy Flow Algorithms

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
3.1 Review existing packages	=	=										
3.2 Resol^{n} drivers; physics bench			=									
3.3 Brainstorming, >2 algorithms	=	=	=	=								
3.4 Define essential tools		=	=									
3.5 Existing algorithms study: 1 detector/process			=	=								
3.6 Implement 1 new algorithm				=	=							
3.7 Hadronic modelling interplay					=	=						
3.8 Compare physics benchmarks						=	=					
3.9 Further development/evaluation							=	=	=	=	=	=

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Task 4: Global Detector Design

1. Identify complete physics benchmark processes
   include background rejection
2. Scope definition: input from concept proponents
   what is appropriate to vary (+ what is not)
3. Use first benchmark physics analysis
   first detector concept/parameter set
4. Analysis used for alternative detector concepts
   (through LCWS/ECFA-DESY, etc., not nec. by UK)
5. Extend study with additional physics benchmark analyses
6. Vary detector parameters, each conceptual design
   radius, sampling frequency, segmentation
7. Compare of results leading to optimal design for each concept

Global Detector Design

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
4.1 Identify complete physics benchmarks	=	=										
4.2 Scope definition, all concepts		=	=									
4.3 1st benchmark study, 1 concept			=	=	=							
4.4 Analysis of alt. det. concepts				=	=							
4.5 Additional physics benchmarks					=	=	=	=				
4.6 Vary detector parameters, all concepts							=	=	=	=		
4.7 Comparison of results, optimisation				=	=	=	=	=	=	=	=	=

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Task 5: World Activity Integration

1. Participation in, and coordination of, software workshops as/when announced

   Will need significant travel funds!

2. Dissemination of UK simulation results/tools

Task 5: World Activity Integration

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
5.1 Workshop participation		=		=		=		=		=		=
5.2 Tools/Results dissemination			=		=		=		=		=	

Task 6: Support of other WPs

1. Add MAPS geometry to mokka

   Few wafer tests and whole detector

2. Study impact of DAQ design on local clustering, & etc.

3. Simulations of mechanical imperfections

4. Simulation studies supporting studies of alternative detector technologies (e.g. MAPS)

Task 6: Support of other WPs

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
6.1 Mokka implementation of MAPS concept	=	=	=									
6.2 Study of DAQ on local clustering				=	=	=						
6.3 Studies of mechanical imperfections			=				=		=			
6.4 Simulation studies supporting MAPS			=	=	=	=	=					

Task 7: Physics Studies

1. Define aspects of detector to be tested
   Intrinsic resolutions, particle separation
   Define set of complete physics benchmark processes
2. Implement simple, robust version of single analysis using generic tools
   Does not have to be "state-of-the-art"
3. Develop additional physics benchmark analyses
4. Understand interplay between hadronic modelling uncertainties and energy flow

Task 7: Physics Studies

Simulation Work Package	FY'05				FY'06				FY'07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
7.1 Define complete physics benchmarks	=	=										
7.2 Implement robust analysis with generic tools		=	=	=								
7.3 Additional physics benchmark analyses				=	=	=	=	=	=			
7.4 Investigate role of hadronic modelling					=	=	=	=	=	=	=	

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