Towards
the THERA Contribution to the TESLA TDR

THERA meeting, 19.10.2000, DESY. M.Klein

organization
[February 00]

+ 8/9.2.2000 initial meeting

  physics, subdivision in groups, how to reach our goal to ensure a future for ep physics

  s. sided copies by tomorrow

+ spring / prior to DIS 2000 *) 14/15.4.

  informal, open workshop at ... date ...

  THERA - ep scattering at $\sqrt{s} \sim 1$ TeV. proc. MK

  TESLA workshop, Padua, U.Katz, May

  *) cf.
  A De Roeck DIS98
  Y. Sirois DIS99.

+ October 2000

  "ep Physics with THERA" workshop

→

+ December 2000 or January 2001

  "ep Physics with THERA" written report of enough pages and contribution to Technical Design Report for TESLA.

Organizational structure

	Working Groups	Convenors
●	Low x	P Newman (U Birmingham) E Levin (Tel Aviv) A Levy (Tel Aviv)
●	Heavy Flavours	K Daum (Wuppertal) L Gladilin (U Hamburg,Moscow)
●	Photon structure	J Butterworth (UC London) S Söldner-Rembold (CERN/U Freiburg) M Krawczyk (Warsawa)
●	High Q^2	E Perez (Saclay) K Long (IC London) M Kuze (KEK)
●	QCD and MC simulation	L Lönnblad (U Lund) H Spiesberger (U Mainz) H Jung(U Lund)
●	Detector and Infrastructure	L Bauerdick (DESY HH) J Crittenden (U Bonn) U Katz (U Bonn) M Klein (DESY Z) D Pitzl (DESY HH)
●	Machine	S Schlenstedt(DESY Z) U Schneekloth(DESY)
●	Polarization	E Rondio (Warsawa) A Deshpande (Yale U)
●	Nuclei	M Strikman (Penn State)
●	Gamma	S Sultansoy (Ankara)

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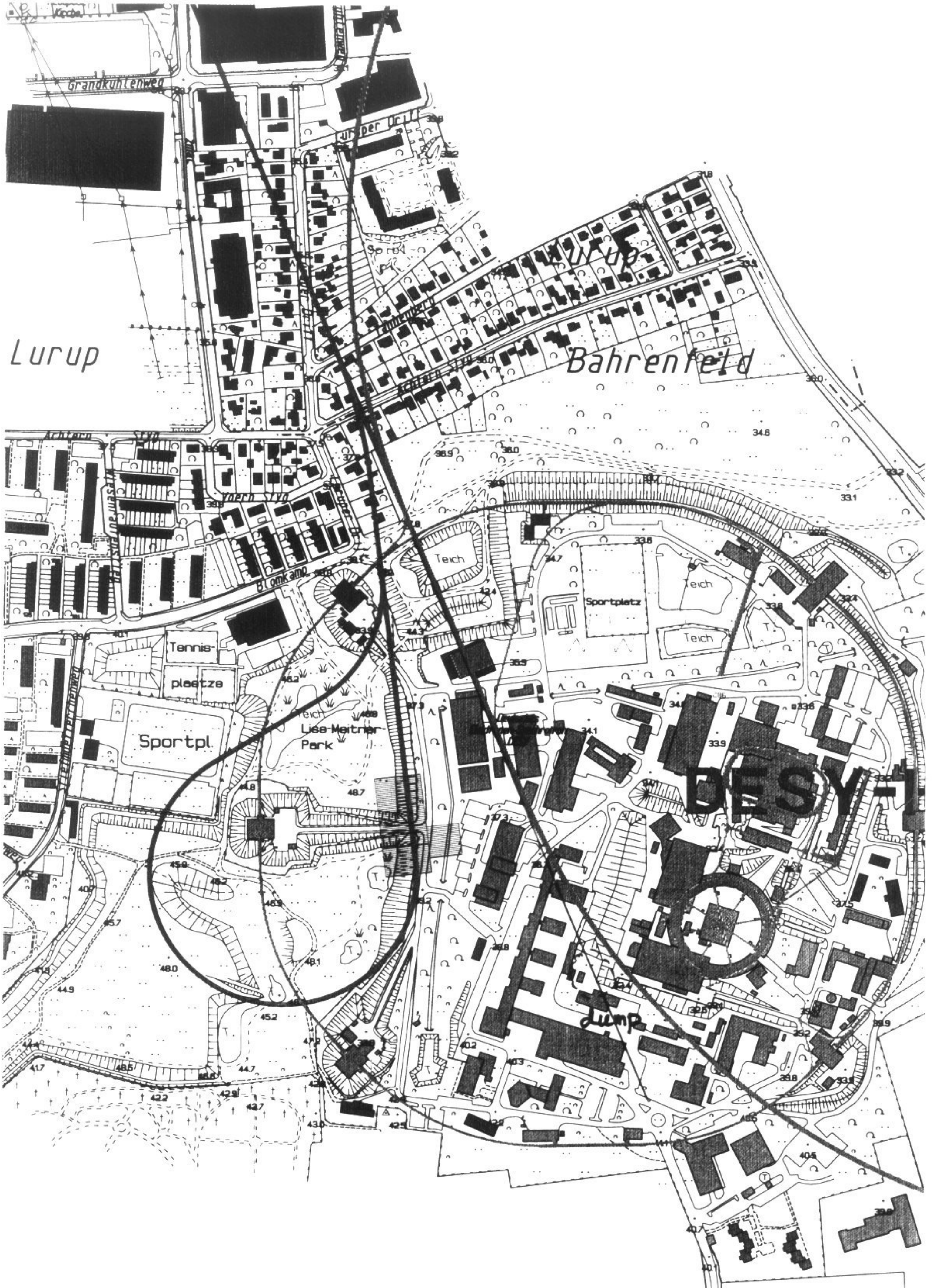
Last modified: Tue Sep 12 14:46:02 MEST 2000
Doris Eckstein

THERA   V1.

Electron-Proton Interactions at $\sqrt{s} \simeq 1$ TeV

with TESLA(e) and HERA(p)

[all of us, edited].



Lurup
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Bahrenfeld
Grandkuhlenweg
Achtern Styg
Blomkamp
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Sportplatz
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plaetze
Sportpl.
Teich
Lise-Meitner-
Park
DESY
Jump

ep Physics with THERA at $\sqrt{s} \approx 1$ TeV

V2

1. Introduction
2. Kinematics
3. Physics of High Parton Densities at Low x
   [F_2, F_L, $\mathcal{F}$, diffraction, nuclei ..]
4. Testing Quantum Chromodynamics
   [α_s, forward jets, jets, gluon and parton distributions.]
5. Heavy Flavour Structure of the Proton
   [F_2^c, F_2^b, vector mesons ..]
6. Quark-Gluon Structure of the Photon
7. Searches at very High $Q^2 > M_Z^2$
   [LQ, SUSY, e^*, ν^*, r.h. currents ..]
8. Further Options / Spin Structure of the Proton at Low x, Large Q^2
   [$\vec{e}\vec{p}$, real γp interactions ..

9. Summary

A1. Accelerator and Infrastructure Aspects

A2. Feasibility Study of a THERA-D detector.

ep interactions with THERA at $\sqrt{s} = 2 \cdot \sqrt{E_e \cdot E_p} \approx 1$ TeV

1 page

5.9.2000
M. Klein.

advance energy frontier
3..4 · HERA

- E_e (TESLA) $\approx$ 250 .. 500 GeV, E_p (HERA) $\approx$ 300 .. 900 GeV
  $e^{\pm}$, high polarization.
  max E_e determined by separation of e/p beams after interaction

new low x field theory
LHC × 10^{-7}
ν astrophys.

- $\mathcal{L} \simeq 10^{30}\,cm^{-2}s^{-1} \leftrightarrow \sim 10\,pb^{-1}$/year for low Q^2/x physics:
  saturation: unitarity limit of rise of F_2 / xg, large phase space for forward jets (DGLAP → "BFKL"), diffraction (2g ↔ resolved IP), heavy flavour (beauty). theory in NNLO. $\delta\alpha_s$ = 1/2 % accuracy

new apparatus in West area

- detector: new backward apparatus design for $\vartheta_e \leq 179.5°$
  and high elm. & hadronic backward energy $E \lesssim E_e$ (20 × HERA!)
  central and forward: resemble H1/ZEUS. energies limited by E_p
  e, p, γ taggers possible to be placed, needed for physics

operation parallel to TESLA

- use e^+ after e^+e^- collision or every second bunch.
  [dedicated mode: use both arms of TESLA / standing wave type cavities: advantage of sc Linac. get e^- of $2 \cdot E_e$]
  adjust bunch spacing of TESLA to 96 ns · 11/n = 352 ns

accelerator aspects

- reverse p direction in HERA, passive transfer line TESLA → HERA,
  e beam dump on DESY site, focus: sc magnets ~ 10 m from i.a. point
  ..

options

- eA (high density parton i.a.'s), $\vec{e}\vec{p}$ (at low x, large Q^2), γp with $E_\gamma \sim 800$ GeV

$\mathcal{L}$ upgrade accesses very hi Q^2

- $\mathcal{L}$ increase by: proton beam cooling, dynamic focussing,
  flat beams, TESLA power, p RF .. : p accelerator R&D.
  very high $Q^2 \leq 1\,TeV^2$: proton substructure to $2 \cdot 10^{-19}$ m
  new phenomena? LQ spectroscopy / polarized $e^{\pm}$) . r.h. currents

" the one reason "

Veksler.

5 lines

research of lepton and hadron interactions at TeV energy scale requires the ll and hh machines to be complemented with a lh collider. this is an opportunity at DESY to remain at the frontier of strong i.a. physics.

Organization.

◎ Contribution to the TDR

- this meeting
- decide on outline : ~1/working group
  for a discussion meeting
  or/and <u>tomorrow evening</u>

- presentation of highlights
  Wednesday 29.11. ?

- draft contributions 8.12.00

- editorial work and release in December.

◎ Physics at THERA

full documentation of the work
to be ready in February 2001
to accompany the TDR appendix.
not the conf. proceedings way!

organization of this meeting

- this session

- you are invited for a dinner by DESY,
  bistro on site, $20^{\underline{00}}$, tonight

- tomorrow: parallel sessions of
  low x - seminarroom 1, 10-13
  heavy flavour, γ and simulation
  - seminarroom 5, 10-13

  detector group meets at 11 in Sem 3a
  - P. Wesolowski: p cooling at 12 in 3a !

- plenary reports tomorrow
  14 ... 20^{00} (?) below cantiene

- [leave copies of your transparencies.
  → web : Doris Eckstein.]

DESY conf. page linked to
http://www.ifh.de/thera

tentative
Agenda for
plenary session
19.10.00

1. Low x

2. Simulation

3. Photon Structure

any time

4. Heavy Flavour

5. High Q^2

6. polarization

7. Detector

discussion of
TDR contents.

[$14 - 19^{00}$

↳ 40 min for each group including discussion.

room below canteene.