

Launching DORIS II and ARGUS

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Early days of DORIS

- The DESY laboratory was founded in 1959
- synchrotron DESY began to work in 1964
practically copy of Cambridge (US) machine
since we had to learn (thanks to US colleagues!)

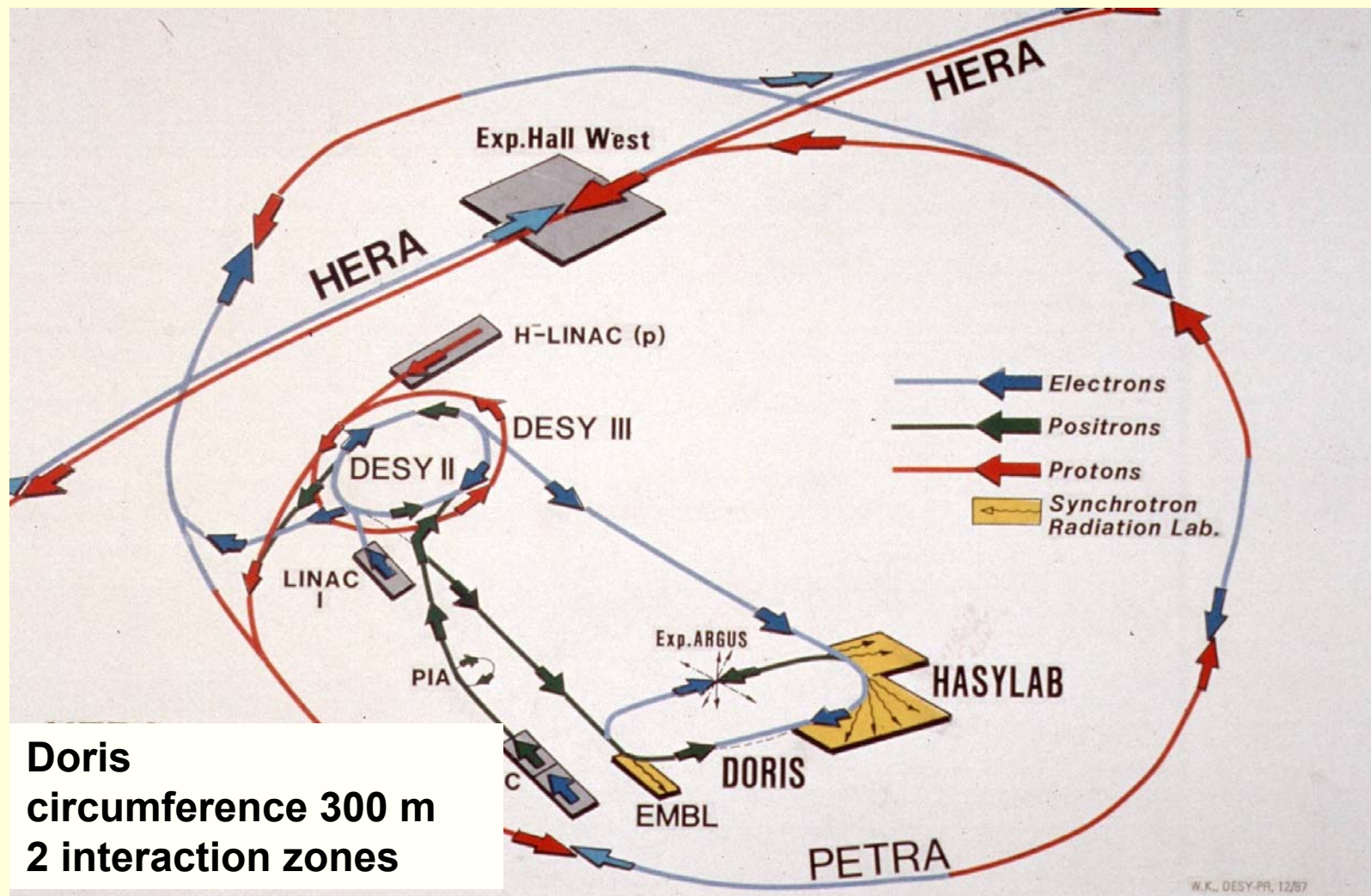
Increasing ambition after DESY worked

- Soon discussions about building something unique → e⁺e⁻ collider
- Theorists: total energy not above 2 GeV
crosssection 1/s, formfactors < 1
- Jentschke: 3.5 GeV/beam, limited by rf
but magnets up to 5 GeV/beam

DORIS

- **Doppel-Ring-Speicher**
"double-ring storage"
built from 1969 and started operation in 1974
- **Objective:** study collisions between
electrons-positrons
electrons-electrons (2 rings !)
electrons-protons?! Also envisaged

DESY Layout



DORIS

**Later phases of DORIS in
competition with bigger projects**

Parallel to PETRA 1977 – 1981

Parallel to HERA construction 1981 – 1992

Synchrotron radiation labs

→ Restricted funds and manpower

Nevertheless very successful

DORIS achievements before upgrading

- **Elementary particle physics
with PLUTO and DASP**
e.g. Charmonium spectroscopy
Discovery of open charm (F meson)
- **SYNCHROTRON Radiation Labs
successful**
from parasitic to dedicated operation
HASYLAB
EMBL (first and main SR lab for EMBL)

The way to DORIS I

- In 1977 discussions start to increase energy
- PLUTO proposes $2 \times 4.3 \text{ GeV} = 8.6 \text{ GeV}$
- **Objective:** measure σ_{tot} for e^+e^-
 study excited charm states
 investigate tau lepton
 Search for 3. quark generation not mentioned
- **Forschungskollegium gives support**
on 30 June 1977
- **same day**
observation of Y resonance announced
in public seminar at FNAL
becomes immediately known everywhere

- **Only 1 week later (6 July 1977) Pluto started discussion with machine people exploring upgrade to 5 GeV/beam**

(Degele, Bürger, Criegee, Flügge)

5 GeV seemed possible in one ring mode with PETRA cavities and power supplies

- **Directorate meetings 7 and 14 July 1977**
Degele is asked to work out detailed proposal

To 2 x 5 GeV (DORIS I)

- In **October 1977** the possible physics program at a 10 GeV machine was discussed at a workshop.
- **J Bürger and H Schröder presented the physics program of PLUTO and DASP II collaborations**
(DASP II successor of DASP I, group moved to PETRA)

Upgrading approved on 16.12.1977 by Directorate
Start-up already on 20.2.1978

Difficult decision

since PETRA was supposed to start in 1978,
it had highest priority since in competition with PEP
Bet with Panofsky who starts first!

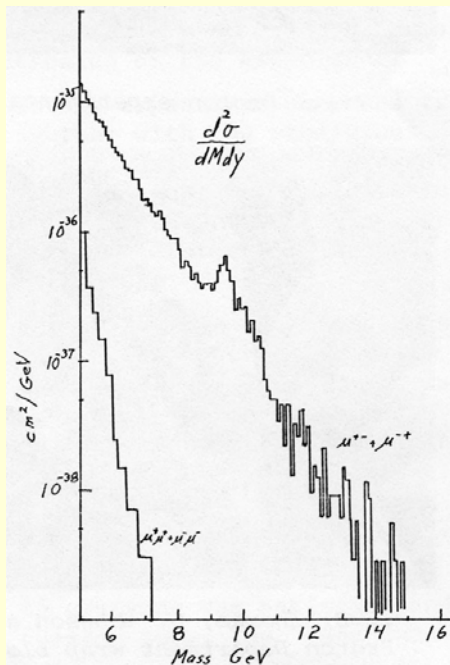
The Upsilon

Scan in the $Y(1S)$ region started at DESY on 15 April 1978

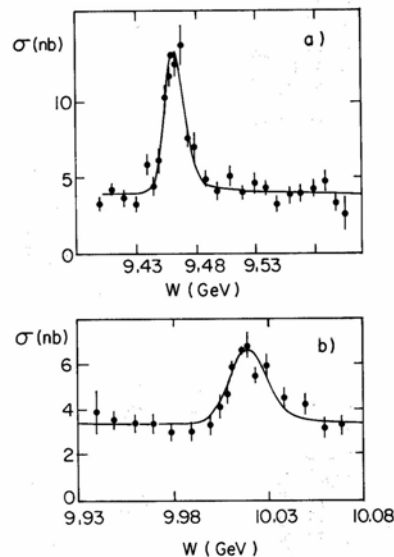
Surprising! First results expected from CLEO in 1979 (de Rujula)

Fluctuation seen, champagne bottle opened, peak disappears

on April 30 1978 a narrow resonance signal at $Y(9.46)$ seen by DASP II and Pluto;
in August 1978 $Y(9.9)$ seen by DASP II



FNAL First evidence of Upsilon



DASP II Upsilon resonances resolved

Only these results established FNAL bump as signal of 3. generation of quarks!

Not sufficiently acknowledged

DORIS I in 1979/80

In 1979

not much running

intermediate positron accumulator PIA installed
to improve e^+ injection for PETRA and
to free DORIS for its own research programme

In 1980 DASP II and LENA take data on Y and Y'

**In March 1980 DORIS I stops temporarily
running for high energy physics**

Much time for SR for EMBL and Fraunhofer Society

**Competition between high energy physics
versus SR becomes serious**

ARGUS

**"A Russian-German-United States-Swedish
Collaboration"**

spouse of senior member:

**Alle Richtigen Genies Unter Sich
(all real geniuses among themselves)**

The birth of ARGUS

In summer 1977 I encouraged Schmidt-Parzefall to take over DASP (which becomes DASP II) and **consider the possibility for a new detector for DORIS**

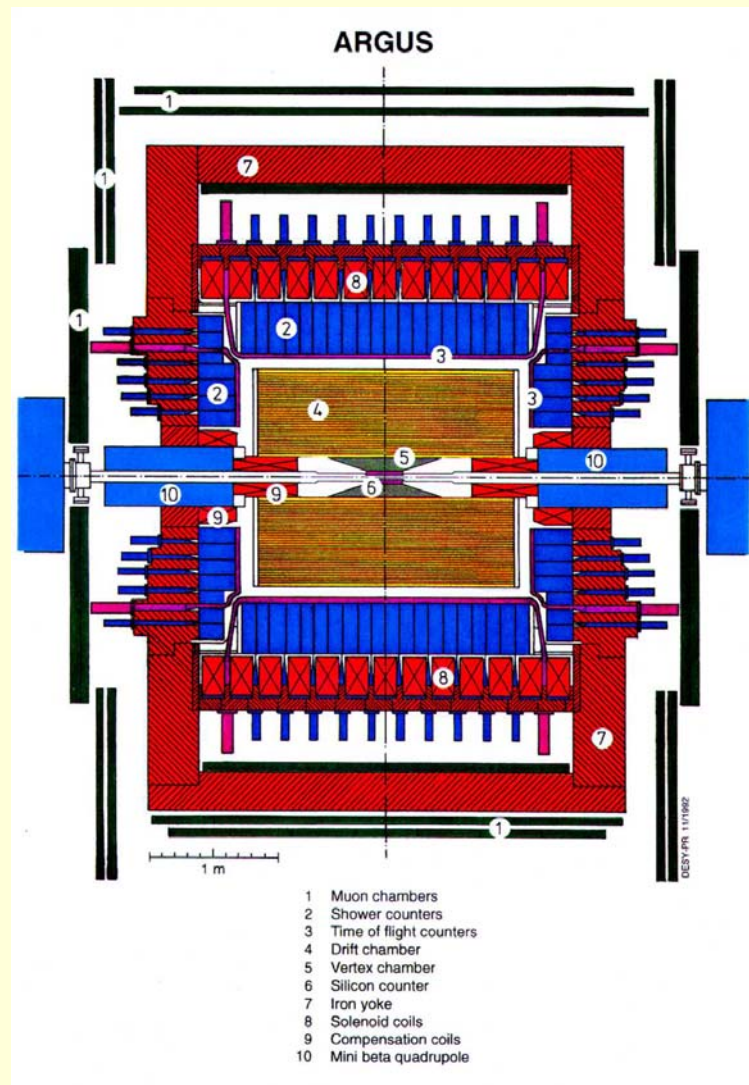
(I was afraid of little physics at DESY during PETRA construction)

Without consulting committees!

(only other case in my life: Heavy Ions at CERN)

Initially proposal for new detector not welcome since all efforts should go to PETRA

- **Schmidt-Parzefall accepts challenge**
- **contacts colleagues**
- **September 1977 “Wegener dinner” at Dortmund**
- **in November 1977 Schmidt-Parzefall presents
“ARGUS – a new detector for DESY”,
Proposal Nr.146 to Forschungskollegium
Containing already the most important elements
of final design:
large solid angle (hermeticity),
particle identification,
shower counter inside coil for low energy photons,
muon chambers,**



14 October 1978

DESY – Proposal Nr. 148
 eingegangen am 18.10.1978

A R G U S

A New Detector for DORIS

by

A Russian-German-United States-Swedish Collaboration

H. Hasemann, A. Krolzig, W. Schmidt-Parzefall, H. Schröder,
 H.D. Schulz, F. Selonke, E. Steinmann, R. Wurth

Deutsches Elektronen-Synchrotron DESY, Hamburg

W. Hofmann, A. Markees, M. Panter, K. Rauschnabel,
 J. Spengler, D. Wegener

Institut für Physik, Universität Dortmund

H. Albrecht, K.R. Schubert, J. Stiewe,
 Institut für Hochenergiephysik, Universität Heidelberg

P. Böckmann, L. Jönsson
 Institute of Physics, University of Lund

A. Babaev, M. Danilov, Yu. Galaktionov, Yu. Gorodkov, Yu. Kamyshev,
 V. Lubimov, I. Tichomirov, V. Shevchenko, E. Shumilov

Institute of Experimental and Theoretical Physics,
 ITEP, Moscow

R.L. Childers, C.W. Darden
 Department of Physics and Astronomy
 University of South Carolina



The ARGUS group

**One year later: Scientific Council 4
December 1978**

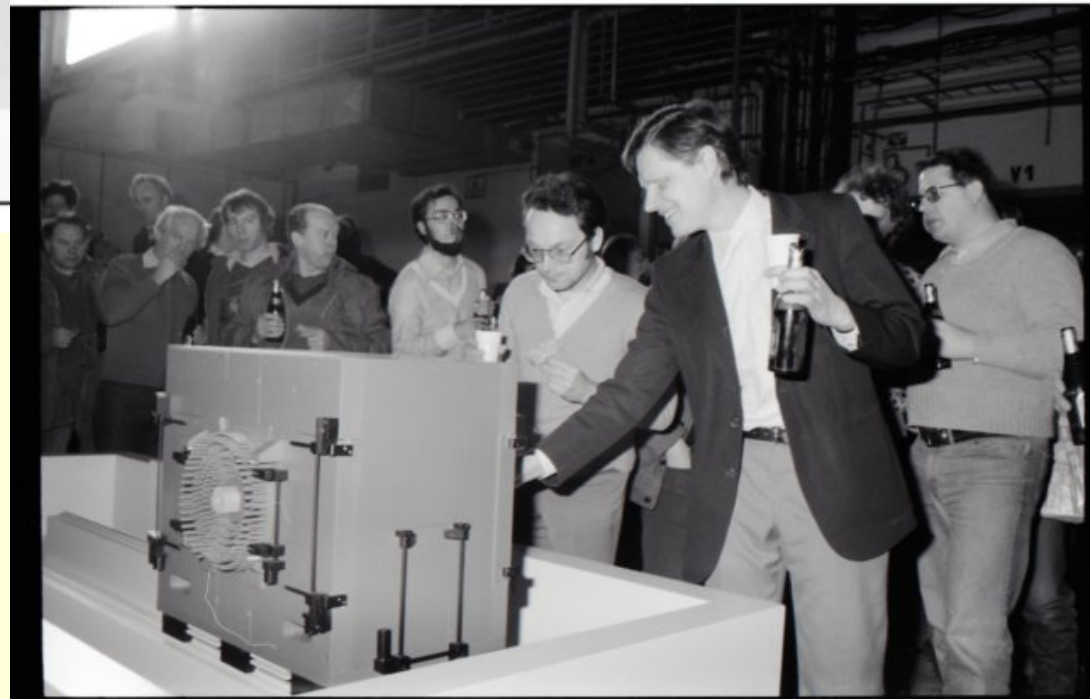
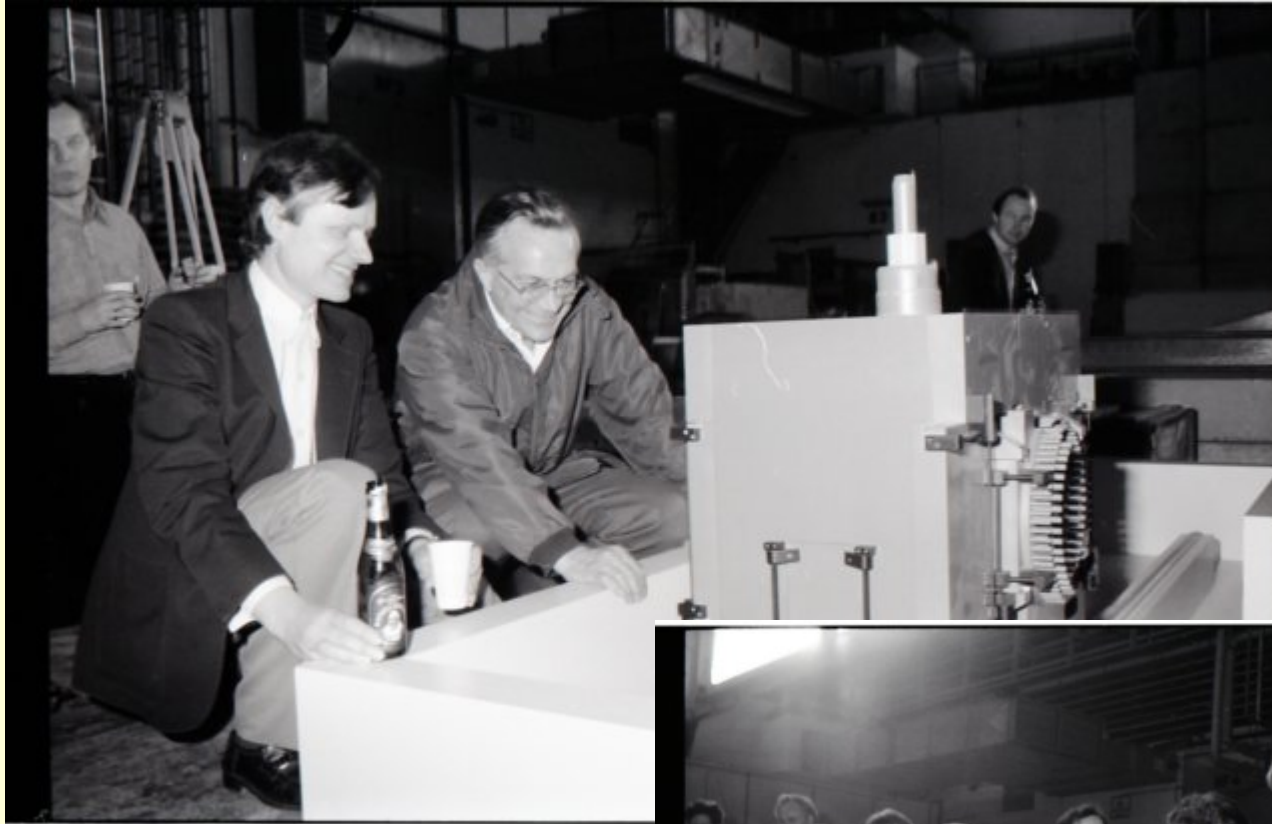
Minutes:

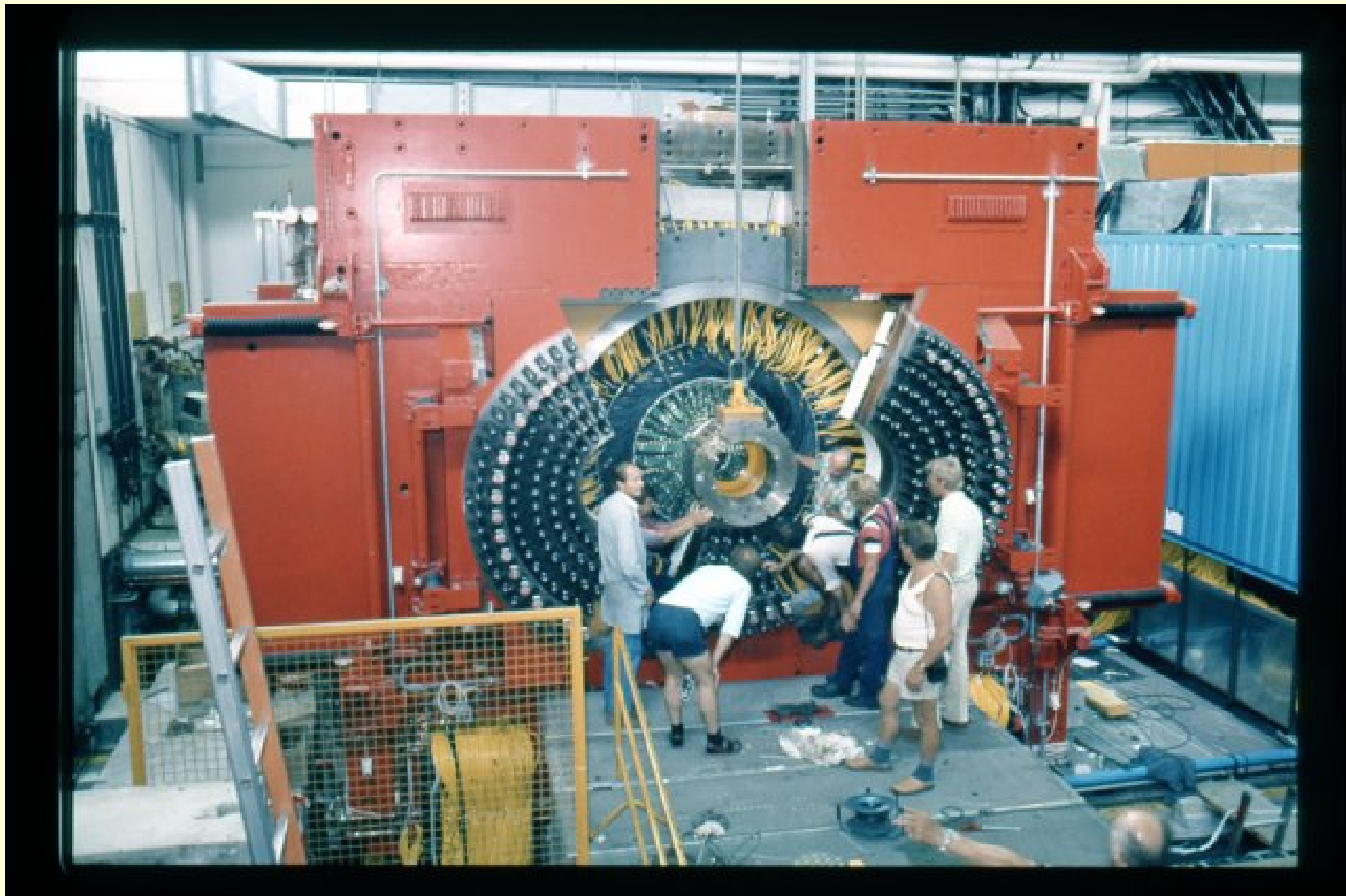
**“Schopper reports further that the
Forschungskollegium has positively evaluated the
proposal of a new detector ARGUS. !!**

**The cost will be DM 8 million with the use of several
components of DASP. “**

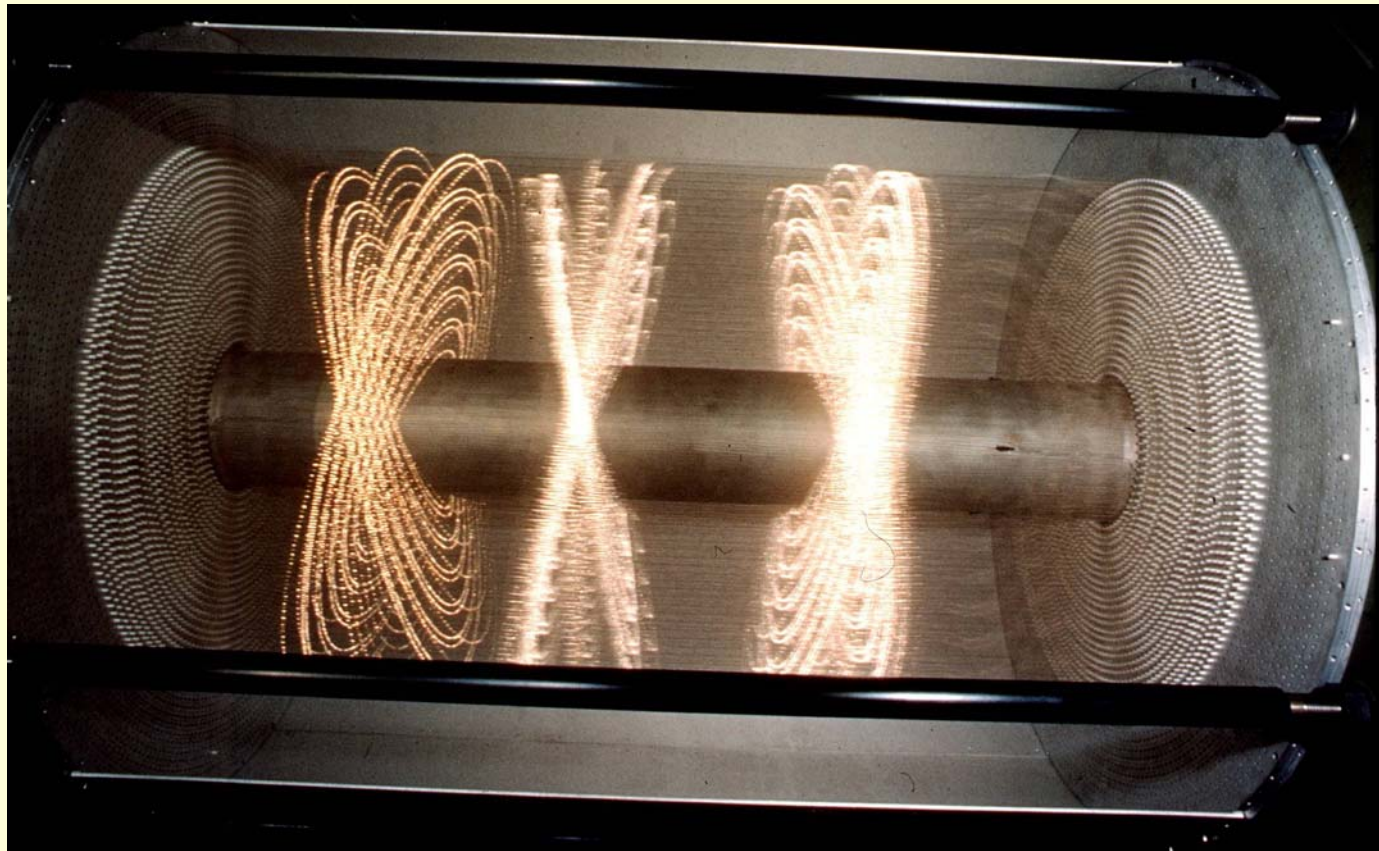
**After clarifying the resources Directorate
approves ARGUS in July 1979**

With target to be operational in 1981





Wire Chamber of ARGUS



30.000 wires.

Electronic chamber replaces bubble chamber!



1 January 1981: Schopper goes, Soergel comes

DORIS II

Boost Total Energy to 11.2 GeV

1982 - 1993

Upgrading of DORIS I

During 1981 proposal by G.-A.Voss discussed in SC to change magnetic lattice of DORIS to **achieve higher energies with substantial power savings**

K. Wille presents concrete scheme allowing 2 x 5.6 GeV with reduced power consumption:

reduce gap width of magnets; more coil windings;
separator plates for injection and faster kicker;
strong quads near interactions

cost DM 2 million, 6 months shut down

**Shut-down starts 2 November 1981,
start of DORIS II already in May 1982**

Detectors at DORIS II

- During a DORIS workshop in February 1981 the idea arose to transfer the Crystal Ball CB detector from SLAC to DESY. The proposal was accepted in summer 1981 to replace LENA
- The CB detector was transported to DESY in spring 1982 and started data taking August 1982
- ARGUS rolled in two months later
- Crystal Ball and ARGUS were approved for running for 3 years
- **Crystal Ball receives priority for one year**

Data Taking in 1983-1987

In 1983-85 DORIS II was running mainly for Crystal ball at Y(1S)

For second part of 1986 ARGUS was main user,
but Schmidt-Parzefall complains to WR – 04 March 1986
and asks for beam time (100 pb^{-1}) at Y(4S)
in 1976
and sufficient luminosity in 1987

The competition between the two experiments delayed the B-physics program of ARGUS for nearly 3 years because the CB collaboration preferred to run at the Y(1S) resonance, since it was optimized for spectroscopic studies

Finally the great success

On 25 September 1986, with 50 events of B_0 - B_0 bar mixing
H. Schroeder presented the first results in ARGUS group meeting.
A mixing ratio of $rd = 0.20 \pm 0.12$ was obtained

82. WR – 16 March 1987, First 'public' presentation?

Vor Beginn der Sitzung trägt H. Schröder von der ARGUS-Kollaboration über neueste Ergebnisse zur $B\bar{B}$ -Mischung vor (s. Anlage 1).
Herr Drees beglückwünscht die ARGUS-Kollaboration zu dem schönen Ergebnis der $B\bar{B}$ -Mischung.

H. Schröder

Anlage 1
zum 82. WR-Protokoll

OBSERVATION OF
 $B_d^0 - \bar{B}_d^0$ OSCILLATIONS
WITH
ARGUS

SUMMARY:

ALL 3 METHODS GIVE A POSITIVE
SIGNAL FOR $B_d^0 - \bar{B}_d^0$ - OSCILLATIONS.

ALL RESULTS ARE CONSISTENT WITH A

MIXING OF $y \approx 20\%$.

B - B^{bar} mixing by ARGUS

Reported at EPS Conference at Uppsala 25 June 1987

Was highlight at International Lepton-Photon Symposium
at Hamburg, 27/31 July 1987

**“The session on the weak decays of quarks
included the now famous result from the ARGUS
experiment at DESY on particle mixing
in the neutral B meson system.”**

(CERN Courier, 27, September, pg.4, 1987)



Schmidt-
Parzefall
reporting

At that meeting also report on
first observation of b decay
without producing charm
M.Shifman (ITEP) admitted to be
surprised by result.

Short TOP excursion



H.Schopper baptised Tiger TOP
in zoo at Leipzig Conference



Top today?

My top story started when for PETRA
(1977) a theoretical prediction was made

$m_{\text{top}} \approx 44 \text{ GeV}$.

RF power was increased for 22 GeV/beam!

No top !!

At Leipzig conference 16/25 July 1984

UA1 claimed a signal at $m_{\text{top}} = 40 \text{ GeV}$

(CERN Courier 24,263,1984; Phys. Lett. B147 (1987) 493).

\Rightarrow small mixing parameter
for B oscillations $rd = 0.01$

ARGUS mixing ratio $rd = 0.20 \pm 0.12$

required $m_{\text{top}} > 50 \text{ GeV}$,

**20 years ago a surprising result
in view of the UA1 claim**

Top quark indirectly observed at LEP, discovered at FNAL

The rest of the ARGUS History

- **1989** another good year for ARGUS
190 days of running with 201 pb⁻¹
Only 66 days for SR
- **1990** first quarter new vertex detector and central drift chamber installed in ARGUS
Running until June, but low luminosity 17 pb⁻¹
July long shut-down for by-pass for DORIS SR
Argus silicon detector installed,
- **1991** good year, 300 pb⁻¹

Odd years good, Even years bad !??

- **1992 bad year**

Integrated luminosity only 17 pb⁻¹

Mishaps, e.g. Silicon vertex detector damaged by beam

October 1992 ARGUS stops data taking

- **V.Soergel asks at ESC 26 November 1992:**

Can same luminosity be obtained again as before upgrading ?

→ Decision on DORIS programme for particle physics to continue to be taken in spring 1993.

1993 After continuing problems with luminosity for collider mode even without HERA operating **B.Wiik** informs ESC on 17 Juni 1993 that in agreement with the ARGUS group the Directorate had decided to **stop DORIS for particle physics**

Achievements of ARGUS acknowledged in colloquium on 22 November 1993 by D.Cassels and B.Stech

ARGUS successful detector

- **B oscillations comparable to other great achievements at DESY, e.g. gluon discovery at PETRA.**
- **B oscillations opened new field which continued at B factories and will continue at LHC (LHCb)**
- **Very successful detector in spite of difficult conditions**
 - **Thanks to competence and devotion of accelerator staff and physicists from DESY and outside**
fast decisions, rapid realization

All this is now Golden past

- **DESY will remain outstanding lab for particle physics even without dedicated accelerator**
- **Accelerator and detector development will remain important task**
- **Participation in experiments in other labs, DESY as interface for German groups**
- **Learn from astrophysicists, they have no access to facilities (La Silla, Hubble telescope etc.)**
- **A.Wagner's proposal of operating accelerators at long distance**

**My best wishes for the
future of DESY**