Afternoon – Working Groups: 2:00 pm – 6:00 pm, coffee break 3:45 pm – 4:15 pm

***WG I: Circular* Accelertors** — **Curia II (WH2SW)**

Conveners: Lee Teng (ANL), Roberto Cappi (CERN)
Secretary: Alexey Burov (Fermilab)

1. 3-GeV ring at the JHF — Fumiaki Noda (JAERI)
2. AGS high power upgrade plan — W.T. Weng (BNL)
3. AHF project — A. Thiessen (LANL)
4. High density and high intensity beams at CERN-PS: present studies, achievements and future goals — R. Cappi (CERN)
5. Results from impedance reduction in the SPS — E. Shaposhnikova (CERN)
6. Emittance dilution in HERA-p: lessons and overview — R. Wanzenberg (DESY)
7. ~~Multiparticle dynamics in the E-phi tracking code ESME: resources and results — J. MacLachlan (Fermilab)~~
8. Application of the UAL to high-intensity beam dynamics studies in the SNS ring — N. Malitsky et al. (BNL)
9. Longitudinal dynamics and rf hardware — M. Yoshii (KEK)
10. Diagnostic investigation of tune and tune shift in the IPNS RCS — J. Dooling et al. (ANL)
11. Hardware of beam injection and extraction — Y. Shirakabe (KEK)
12. ~~Magnet and power supply — M. Muto (KEK)~~
13. Beam profile monitor of high intensity proton — Y. Hashimoto (KEK)
14. Magnets for high beam power synchrotrons — F. Ostiguy (Fermilab)
15. Dual-harmonic resonant power supply — C. Jach (Fermilab)
16. Proton Driver vacuum system — T. Anderson (Fermilab)

WG II: Linear Accelerators — **1 North**

Conveners: Jean-Michel Lagniel (CEA), Roland Garoby (CERN)
Secretary: Xiaolong Zhang (Fermilab)

1. Aspects of beam behavior in different sections of the SNS linac — S. Nath (LANL)
2. High-intensity proton linac for the KEK/JAERI joint project — M. Ikegami et al. (KEK)
3. ESS linac design overview — R. Ferdinand et al. (CEA)
4. Status and plans of the SPL study at CERN — R. Garoby (CERN)
5. The TRASCO project — C. Pagani (INFN)
6. IFMIF a challenging high intensity accelerator — R. Ferdinand et al. (CEA)
7. An RFQ designed to accept beam from a weak focusing LEBT — L. Young (LANL)
8. Measurement of beam halo generation in an intense proton beam — P. Colestock et al. (LANL)
9. Wide dynamic-range beam-profile instrumentation for a beam-halo measurement: description and operation — J.D. Gilpatrick et al. (LANL)
10. MRTI codes and linac designs — B. Bondarev (MRI-Moscow)
11. Numerical code in use in CEA-Saclay — N. Pichoff et al. (CEA)
12. Modeling of mismatch induced emittance growth in linacs — I. Hofmann, G. Franchetti (GSI)
13. Halo and beam dynamics issues in high power linacs — N. Pichoff et al. (CEA)

REPORT OF WG-I CIRCULAR ACCELERATORS

(Papers sorted by subjects)

(A) Projects

	JHF	Noda
	AGS – Upgrades	Weng
	AHF	Thiessen

(B) Studies

BEAM	CERN-PS	HD & HI beams	Cappi
	SPS	Impedance reduction	Shaposhnikova
	HERA-p	Emittance dilution	Wanzenberg
	IPNS-RCS	Tune shifts & Inst.	Dooling
COMP.	ESME		Machlan
	UAL		Malitsky

(C) Hardware

JHF	RF	Yoshii
	Injection & Extraction	Sakai
	Profile Monitor	Toyama
PD	Magnets	Ostiguy
	Dual Harmonic PS	Jach
	Vacuum System	Anderson

JHF

Noda

3 GeV 25 Hz $\frac{1}{3}$ mA 1 MW beam power
50 GeV 0.3 Hz 2 μA 100 kW

Nuclear Transmutation (600 MeV)
Neutrons (3 GeV)
Neutrinos (3 GeV, 50 GeV)
Meson Factory (50 GeV)

Ongoing project Completion 2007

AGS Upgrade

Weng

AGS now 1 Hz 140 kW beam power

Phase 1

Linac 200 MeV → 416 MeV
Booster 1.9 GeV → 2.5 GeV
Accumulator at 2.5 GeV
AGS 1 Hz → 2.5 Hz at 2×10^{13} ppp = 0.47 MW
(65 M$)

Phase 2

Linac 1.2 GeV Superconducting
AGS 2.5 Hz at 1×10^{14} ppp → 2 MW
5 Hz → 4 MW
(+54 M$)

AHF Advanced Hydro Facility (proton radiography machine) Thiessen

Linac 157 MeV (or old 800 MeV)
Booster 4 GeV inject 25 pulses into
MR 50 GeV 6×10^{13} ppp $\xrightarrow{\text{w. loss}}$ 3.6×10^{13} ppp
(25% beam loss due to space charge)
Beams 12 beams 3×10^{12} ppp/beam
= 1×10^{11} p/frame × 30 frames
Construction: Time 8 years
Cost 2.4 B$

Kicker: 25 ns rise & fall time
50 ns flat

Camera: Initial 3 view
Final 12 view

Cappi

CERN – PS Hi Density & Hi Intensity Beams

High Density for LHC
High Intensity for CNGS

- $\epsilon_{x,y}$ no blow up, from booster to 25 GeV
- Transition passing w/o loss
  (ϵ_{ℓ} increase 1.2 eVs $\longrightarrow$ 2 eVs)

SPS Impedance Reduction — Shaposhnikova

To remove instability threshold

- { Change γ_t / More rf } longitudinal
- { Increase injection energy / Reduce impedance } Trans.

- First compare the Instability Mode Spectrum with the measured or computed $Z(\omega)$
- Find the culprits
- Remove or shield them
  - All were relatively easily taken care of.
  - Except a peak at 400 MHz — finally traced to kicker & septum (no good calculation of Z) — removed by shielding
  - All vacuum pump ports were shielded
  - Beam size is reduced by 7

HERA-p Emittance Dilution

Wangenberg

p-ring 40 – 920 GeV superconducting
100 mA 7.3×10^{10} p/bunch

Transverse dilution

$\frac{\Delta\epsilon_t}{\epsilon_t} \sim 12\%$ due to injection errors
(~8% due to aiming error)

Longitudinal dilution
(2 rf systems, 52 MHz
208 MHz for compressing bunch)
ϵ_L 50 eVs ⟶ 300 eVs (factor 6)
due to coupled bunch instability
(2 modes $n=1$, $n=163$)

Intrabeam scattering ⟶ decay of Luminosity
more or less agree with theory
Piwinsky 1.8%/hr
Bjorken, Mtingwa 3%/hr.

IPNS – RCS

Dooling

(50 MeV Linac, 450 MeV RCS 30 Hz)
(2 rf cavities $h=1$, $V_0 = 21$ kV)

- Longitudinal instability pre-spill beam
  (theoretical threshold is 0.33 eVs)
  Controled by phase shaker (scrambler)
- Transverse tunes rise due to over-neutralization (poor vacuum 1 μTorr)
  (~0.3)

ESME – Longitudinal Dynamics

MacLachlan

Single particle dynamics – standard except "slip" is calculated exactly $\tau(p)$

For Beam

- Environmental impedance Z_m (m = harmonic no. of rev. freq.)
- Space charge impedance – standard

Two movies

1. Pulling full buckets out of a stack
2. Displace empty buckets across stack (displacement acceleration)

UAL Unified Accelerator Library Malitzky

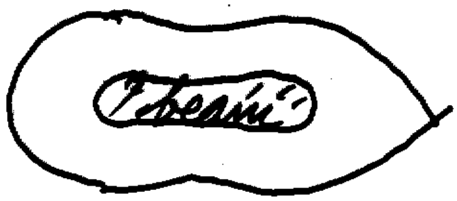
Bench-mark runs performed

Used for SNS ring

Still in development

JHF Long. Dynamics & RF Hardware — Yoshii

Dual harmonics RF (1st & 2nd harm.)



- Long. emittance must be enlarged to get stability
  - 3 GeV ring: ϵ_l = 3 eVs → 5 eVs before ext.
  - 50 GeV ring: ϵ_l = 5 eVs → 10 eVs (using phase/amplitude shaker)
- Split ferrite cores are used in rf cavities to control Q

JHF - Injection & Extraction

Sakai

50 GeV

$f_{rf} = 1.67$ MHz $h = 9$

$\tau_{rf} = 598$ ns

8 full bucket + 1 empty bucket

Extraction gap = 1100 ns

Abort gap = 300 ns (bipolar)

C shaped fast kicker pulsed by PFL (reversible)

JHF Profile Monitor

Toyama

- Wire scanner 7μm C filament Lo I.
- Gas sheet monitor, both Hi & Lo I.

PD Magnets

Ostiguy

1.5T, 15 Hz, separated function
(Tracking OK)

- Thin (50–100 μm) Si steel lamination
- Small conductor – water cooled ceramic packed cable

PD Vacuum system

Anderson

No vacuum chamber

- Z/n reduced by liner or cage
- Outgassing, 150 C bake

PD Dual Harmonic P.S.

Jack