PS/AR/Note 90-08

18 May 1990

# COPIES OF TRANSPARENCIES PRESENTED AT THE CONTROLS' USERS FORUM

**Chamonix, 25-28 April 1990**

V. Chohan

(Coordinator : Sessions on Accelerator Operations at CERN)

A) GENERAL

B) AAC

C) CONCLUSIONS

Seminaire C U F - Novotel Chamonix
25 - 28 avril 1990

# Programme

## Mercredi 25 avril

| | | |
|---|---|---|
| 18 h 00 | Arrivée au Novotel | |
| 19 h 00 | Réunion de Bienvenue | |
| 20 h 00 | Diner | |

## Jeudi 26 avril

| | | | |
|---|---|---|---|
| dès 07 h 30 | Petit Déjeuner | | |
| 08 h 30 | Introduction | | |
| 08 h 40 | Système de contrôle du CPS | | W. Heinze |
| 09 h 10 | Système de contrôle SPS/LEP | | P. Charrue |
| 09 h 40 | Data base in Control Systems | | J. Poole |
| 10 h 00 | Pause Café | | |
| 10 h 30 | Opération des accélérateurs | | V. Chohan |
| | - Général | | |
| | - Linac | | E. Tanke |
| | - PSB + CPS + LPI | | B. Frammery |
| | - SPS | | A. Faugier |
| | - LEP | | R. Bailey |
| | - LEAR | | D. Manglunki |
| | - AA | | V. Chohan |
| | - Common grounds in PS controls and Current work at human interface level | | M. Bouthéon<br>A. Pace |
| | - Special points and discussions | | |
| 12 h 30 | Déjeuner | | |
| 14 h 00 | Alimentations et Aimants | | J. Pett |
| | Alimentations LEP | | J. Pett |
| | Alimentations SPS | | O. Berrig |
| | Alimentations CPS | | G. Coudert |
| 15 h 30 | Pause café | | |
| 16 h 00 | Radiofréquence | | E. Ciapala |
| | - RF du CPS | | J. Boucheron |
| | - RF du SPS | | T. Linnecar |
| | - RF du LEP | | E. Ciapala |
| | - Cavités du SPS/LEP | | G. Cavallari |
| 17 h 00 | Timing et Synchronisation | | G. Beetham |
| | - Timing du CPS | | G. Daems |
| | - PLS (Program Lines Sequencer) | | J. Lewis |
| | - Message Frame | | R. Lauckner |
| | - Timing SPS/LEP | | G. Beetham |
| | - BST (Beam Synchronous Timing) | | M. Rabany |
| 18 h 00 | Pause ... | | |
| 18 h 30 | Personal view of the evolution of Control Systems | | R. Parker |
| 19 h 30 | Diner | | |

## Vendredi 27 Avril

| | | | |
|---|---|---|---|
| dès 07 h 30 | Petit Déjeuner | | |
| 08 h 30 | Transfert de faisceaux et séparateurs | | V. Mertens |
| | Transfert PS | | J. Boucheron |
| | Transfert, extraction SPS/LEP | | V. Mertens |
| 09 h 10 | Zones expérimentales | | D. Manglunki |
| 09 h 40 | Radiations | | G. Rau |
| 10 h 00 | Pause café | | |
| 10 h 30 | Services généraux | | P. Ciriani |
| | - Contrôles du groupe LEP/CV | | C. Bertuzzi |
| | - Contrôles du réseau électrique LEP | | A. Swift |
| | - Principes, missions, programmes | | P. Ciriani |
| | - Gestion des alarmes (Apollo) | | R. Martini |
| | - Un utilisateur "industriel", problèmes de communication et opération | | A. Scaramelli |
| 12 h 30 | Déjeuner | | |
| 14 h 00 | Vide | | P. Strubin |
| 14 h 45 | Cryogénie | | A. Juillerat |
| 15 h 30 | Pause café | | |
| 16 h 00 | Instrumentation et physique machine | | R. Cappi |
| | Instrumentation CPS | | G. Gelato |
| | Instrumentation SPS/LEP | | A. Burns |
| | Physique machine | | R. Cappi |
| 17 h 30 | Pause ... | | |
| 19 h 30 | Soirée Savoyarde | | |

## Samedi 28 avril

| | | |
|---|---|---|
| dès 07 h 30 | Petit déjeuner | |
| 08 h 30 | Présentation du groupe de travail Architecture et DSC (DWG) | K.H. Kissler |
| 09 h 15 | Présentation du groupe de travail Applications (AWG) | F. Perriollat |
| 10 h 00 | Pause café | |
| 10 h 30 | Premiers pas vers une synthèse.... | Operations |
| 11 h 15 | Discussions et propositions | |
| 12 h 00 | Résumé et conclusions<br>Clôture du séminaire | |
| 12 h 30 | Déjeuner | |
| 14 h 30 | Retour vers Genève. | |

**SEMINAIRE C U F**

Novotel - Chamonix
25 au 28 Avril 1990

# OPERATION DES ACCELERATEURS

## General

V. Chohan

CHOHAN
a&c

USERS' FORUM ::::: POINT OF VIEW OF MACHINE OPERATIONS

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(1) LOT OF THE VIEWPOINTS WILL BE BIASED BY PERSONAL EXPERIENCE OF SPEAKERS WITH INDIVIDUAL MACHINES

(2) HOWEVER. THE AIM IS TO SEEK COMMON GROUNDS &/OR COMMON DENOMINATOR ACROSS CERN AS FAR AS ACCLR. OPERATIONS ARE CONCERNED.

FIRST THE DISCLAIMER: ANY CRITICISM SHOULD BE TAKEN IN THE SPIRIT OF DISCUSSION AND . IN THE SENSE OF CONSTRUCTIVE CRITICISM - PARTICULARLY BY ONES WHO FEEL CRITICIZED"

This meeting was organised at too short a notice !!
We shall attempt to present some "synthesised" viewpoints on Saturday after our own, (ie. OPERATIONS) Brainstorming meeting tomorrow.

ESSENTIALLY A FORUM FOR PRESENTING COMMON GROUNDS

( AND WISH LISTS !! ) AND HIGHLIGHTING INDIVIDUAL

OPERATING NEEDS OF DIFFERENT ACCELERATORS AT CERN

(1) GENERAL — V. CHOHAN

(2) OPERATIONAL NEEDS / EXPERIENCE / HIGHLIGHTS ETC..

| | |
|---|---|
| (A) LINAC | E. TANKE |
| (B) LPI ( + PS / PSB) | B. FRAMMERY |
| (D) SPS | A. FAUGIER |
| (E) LEP | R. BAILEY |
| (F) LEAR | D. MANGLUNKI |
| (G) AAC | V. CHOHAN |

~5 to 10 mins. each.

(3) PROPOSALS IN SEEKING COMMON GROUNDS IN PS CONTROLS

& CURRENT WORK AT HUMAN INTERFACE LEVEL - M. BOUTHEON & A. PACE

(4) SPECIAL POINTS

(5) DISCUSSION & CONCLUSIONS

# WHAT IS ACCELERATOR OPERATIONS ?

It concerns a wide spectrum of accelerator operating conditions & uses during & after commissioning and the normal (so-called) operations. It includes the following activities :→

(1) START-UP (or SHUT-DOWN)

(2) SETTING MACHINE OPERATING MODES eg. 3 → SPS, 8 → PS/PSB, 11 → AAC

(3) MACHINE "ADJUSTMENT" (SETTING-UP) FOR A GIVEN MODE

(4) Machine Experiment / Development

(5) Routine Operation / beam production

(6) Trouble-shooting / fault Repair.

# Some Definitions

* Accelerator operations implies MANIPULATION of Beams and Beam-related processes and situations.

MANIPULATE ≙ MEASURE, MODIFY, TREAT

ie. STACK, EXTRACT

ie. - Stach. Co.
- bunch Rot

SITUATIONS ≙ MODES,

* BEAM IS THE FINAL CRITERION FOR ALL ACTIONS (Not specific Equipment)

* Application Programs → Defined as higher level tasks which utilise ALL the base-level Supervisory & ON/OFF control software to finally manipulate beams & beam-related processes and situations.

Using the above Definitions leads to the "OPERATOR" wearing several hats including :—

(a) Plain & simple machine-minder

(b) Accelerator Physicist / Engineer

(c) Accelerator Experimenter

(d) Equipment Specialist called in for help or trouble-shooting

Reminder : We are talking of only the last 2 phases of an Accelerator Life-cycle
Namely – Commissioning & operations &
NOT – Design / Construction / Installation.

# BASIC COMMON GROUNDS

Although not directly in line with the definition of operations (≡ manipulate beams & conditions) - there is a general consensus on how some base-level equipment is controlled, e.g.,

- Power Supplies
- Vacuum Systems including Cryogenics
- Basic Beam Instrumentation like scintillation screens, beam current transformers (fast, d.c.), position P.U.'s
- Interlocks & Access

These are the vital pre-requisites of any Accelr. BEFORE any commissioning/running-in can take place and the OPERATIONS usually assumes their existence & functionality (like we breath air & drink water !!)

IT IS PROBABLY THE EASIEST LEVEL ON WHICH A COMMON DENOMINATOR CAN BE & SHOULD BE SOUGHT WITHOUT TOO MUCH DIFFICULTY.

At this base-level, a lot of discussions / studies and implementations were carried out in the PS in the seventies. These resulted in some uniform PS standards which are now <u>taken for granted</u> in the PS by any new Equipment builders/ or suppliers within the PS. (For example, LPI or ACOL projects etc)

However, it should be stated that having a "single supplier" (e.g. Power or Vacuum group) or single instrumentation expert (e.g., d.c. beam transformer) <u>DID HELP</u> !! (& Bernd Kuiper's hammer in fixing interface standards !!)

# LIST OF COMMON-DENOMINATORS

*** REMEMBER :: BEAM IS THE FINAL CRITERION FOR OPERATIONS AND, APPLICATION PROGRAMS ARE THE ONES THAT USE THE ENSEMBLE OF "LOW-LEVEL" EQUIPMENT/CONTROLS TO MANIPULATE BEAMS

(1) NEED FOR GLOBAL TOP-LEVEL MECHANISMS FOR :

(A) MACHINE START-UP ( AFTER SHUTDOWN OR POWER FAIL )

(B) MACHINE STOP ( SHUTDOWN OR ECONOMY MODES )

(C) GLOBAL MODE SETTINGS. I.E.
1 OUT OF 11 IN AAC . (SINGLE PUSH BUTTON)
1 OUT OF 8 IN PS.(REAL.EXCLUSIVE "USERS"?)
1 OUT OF 3 IN SPS (UPDATE TO MASTERFILE?)

(D) GENERAL ARCHIVE & RETRIEVAL OF ALL MACHINE PARAMETERS FOR ANY ONE SITUATION (MODE) OF MACHINE

(E) ALARMS & WARNINGS SYSTEM WITH REASONABLE TURN-ROUND TIME FOR CORRECTING FALSE ALARM SITUATIONS ( FLEXIBILITY ) AND TOLERANCE SETTINGS ( NOT A COMPUTER EXPERT TO CORRECT)

(F) LOGGING OF GOOD SETTINGS/OPERATIONS

(2) NEED FOR A "COMMAND" LANGUAGE FROM THE CONTROL ROOM INTERACTION MEDIUM: · THIS ENABLES A FAST SETTING-UP OF A BEAM MANIPULATION SITUATION OR PROCESS FOR TESTS. BEAM EXPT./STUDIES AND TROUBLE-SHOOTING : EXAMPLES:

ISAAC : IBM1800 / PDS1
ESAU : PS CONTINUOUS XFR PDP11
BASIC : LINAC
NODAL : PS /SPS /AAC

NODAL WAS NOT "INVENTED" AS A LANGUAGE FOR CONTROLLING ACCELERATORS BUT EVOLVED FROM "ISAAC" FOR EXACTLY THE PURPOSES MENTIONED !!

OBVIOUS IMPLICATIONS:: (A) EASILY READABLE HIGH LEVEL COMMANDS/PROGRAMS WITH EQUIP. DETAILS HIDDEN AWAY I.E.. "OBVIOUS" CONCEPT OF SUBROUTINE CALLS. EQUIP/DATA MODULES ETC.

(B) REDUCED INTERMEDIATE LEVELS IN HARDWARE. SOFTWARE AND "STRUCTURES" TO A MINIMUM

E.G.. NOT HEAVY "WORKING SETS" (PS) OR COMPLICATED (BUT FAST !) CALLS TO DATABASE RTNS. (FERMILAB)

(3) NEED FOR "OPERATORS" (= AS DEFINED EARLIER) TO WRITE APPLICATIONS ( = AS DEFINED EARLIER) PROGRAMS

Question : Where / how do calls in TCP/IP socket Lib. fit in say for:

Equip ⟷ Console
VME ⟷ N-120
or
PC

(4) NEED FOR TIMING SURVEILLANCE/ ACQUISITION "WATCH-DOG" - CERTAINLY FOR CIRCULAR MACHINES FEEDING EACH OTHER WITH SYNCHRONIZED R.F. TIMINGS !!

(5) EASY SELECTION OF ANALOGUE & VIDEO SIGNALS FOR FAULT-FINDING I.E.. COMPUTERIZED SETTINGS FOR 'SCOPES. TRIGGERS AND SIGNAL SELECTION - AT LEAST. IN REMOTE CONTROL ROOM AND/ OR DIGITIZED & SOFTWARE TREATED SIGNALS FOR SPECIAL CASES

(6) NEED FOR A MEDIUM TO KEEP UPTO DATE "PROCEDURES" FOR BEAM OR PROCESS MANIPULATION. FOR EXAMPLE. WITH 11 MODES IN THE AA AND DIFFERENT SETTING-UP "SITUATIONS". ALL RELEVANT PROCEDURES ARE ON CERNVM AND ARE READ/CORRECTED/UPDATED BY USERS

( NEEDS VM TERMINAL IN AA LOCAL CONTROL ROOM !! )
( PAPER FILES OF OPERATIONAL PROC. IN PS ?? . PHOTOGRAPHS ? .. )

(7) "FAST PLOT" ( STYLE FERMILAB) : PLOT ANYTHING(S) VS.ANYTHING
( NODAL ALLOWS THIS AT LINE TYPE OUTPUT LEVEL)

## "CONTROVERSIAL" COMMON DENOMINATORS

(1) MINIMUM NUMBER OF INTERMEDIATE LEVELS OF SOFTWARE . HARDWARE AND STRUCTURES BETWEEN A USER AND WHAT HE SETS OUT TO DO;

I.E.. KEEP SIMPLE THINGS SIMPLE - CORROLLARY : DO NOT IMPOSE COMPLEX HARDWARE/SOFTWARE OR MANIPULATION "STRUCTURES" ON SIMPLE PROCESSES

( FINALLY. IT SIMPLIFIES APPLIC. PROGRAMS & DIAGNOSE FAULTS)

E.G.. FERMILAB DOES ALL WE DO IN LI/PSB/PS/AAC/SPS + UPTO TEVATRON WITHOUT RESERVATION OR HEAVY TOP LEVEL STRUCTURES

THIS CONFLICTS WITH "UNIFICATION" SINCE WE ARE ALL USED TO OUR OWN OPERATIONS' "RELIGIONS". SET WAYS AND METHODS AND . ARE ALLEGEDLY "OPTIMIZED" ALREADY !!

*** AT THE TOP LEVEL .MAYBE THE SIMPLEST WOULD BE TO ALLOW STRUCTURES AS SEEN & USED TODAY & CONVERGE BY "CONSENSUS" !!

( NEED FOR FLEXIBILITY INSTEAD OF RIGIDITY DUE TO OVER-STRUCTURING)

( PROCESS MANIPULATION. DEFINITIONS. STRUCTURES. WORKING SETS. RESERVATION OVERHEADS ETC... DO WE HAVE A CONSENSUS CERNWIDE? )

(2) SOLVE THE PROBLEM OF A TRUE .MUTUALLY EXCLUSIVE." VIRTUAL" MACHINE WITH REAL ORTHOGONALITY BETWEEN "MODES" : HENCE RESOLVE COMMON ISSUES OF P.P.M. /MODES ETC.. IN PSB. PS AS WELL AS SPS & LHC IN ONE GO! ( CONTROVERSIAL BECAUSE OF HISTORY. COSTS ETC ) . IT WOULD BE EASIER TO BRING IN OTHER MACHINES ( E.G.. AAC. LEAR. LEP ...) IN THIS STRUCTURE IF DONE IN CLEAR-CUT VERTICAL HIERARCHY . < NO OVERLAPS AS IN PS EIGHT "USERS" OR VIRTUAL MACHINES >

SPS HOPES TO ACHIEVE THIS ANYWAY ?

CLEAR "TIMING" OR SEQUENCE-LINE BOUNDARIES

AND WOULD ENABLE A SEMBLANCE TO UNIFICATION AT THE TOP LEVEL FOR MACHINE OPERATIONS.

( MAY BE AAC & LEAR HAVE ALREADY ' DISAPPEARED ' BY THEN !! )

SOME GENERAL REMARKS

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WE MAY AGREE ON MANY COMMON GROUNDS BUT. MANY QUESTIONS REMAIN . ESSENTIALLY AT THE IMPLEMENTATION LEVEL.

<1> WHAT ARE WE AIMING AT AND. AT WHAT COSTS ??. I.E.. DO WE ONLY WANT TO HIDE THE DIFFERENCES AT THE TOP LEVEL WHILE BIG DIFFERENCES REMAIN AT THE BOTTOM ? WHERE ARE THE DEMARCATION LINES ?

<2> ONCE THE LIMITS ARE DEFINED. WHAT TIME SCALE ARE WE AIMING AT ?? ( 1 YR . 5 YRS. 10 YRS ?? !)

<3> AT THE LEVEL OF APPLICATIONS & PROCEDURES. ALL MACHINES ARE DIFFERENT AND THE SHIFT-OPERATOR HAS TO RESPECT THIS ANYWAY FOR HIS NEEDS - THEREFORE. ARE WE NOT UNDER-ESTIMATING THE REAL REQUIREMENTS AND OVER-ESTIMATING THE BENEFITS OF UNIFICATION ? !!

OR.

ARE WE REALLY UNDER-ESTIMATING A SHIFT TECHNICIAN'S ABILITY TO HANDLE DIFFERENT MACHINES ? THERE IS NO RUNNING AWAY FROM THE FACT THAT THE SHIFT TECHNICIAN HAS TO HAVE ENOUGH KNOW-HOW ABOUT PROCESSES/ MACHINES HE IS SUPPOSED TO MANAGE:

( HOW IS IT ACHIEVED AT FERMILAB ? )

THEREFORE . THE ONLY SAVINGS IN STAFF WOULD COME FROM SMALLER CONTROLS GROUPS DUE TO UNIFIED HARDWARE & SOFTWARE & NOT FEWER SHIFT TECHNICIANS!!!

CONTROVERSIAL !

COMMON GROUNDS AT A GLANCE

| | UNAC | PSB | PS | LPI | SPS | LEP | LEAR | AAC |
|---|---|---|---|---|---|---|---|---|
| (1) GLOBAL COMMANDS -STARTUP STOP | O | O | O | O | SEQNR | O | O | O |
| (2) GLOBAL "MODE SETTINGS | X | | | PPM | SEQNCR | O | O | X |
| (3) ARCHIVES + RETRIEVAL | X | | O (PLS) | O | O | O | X | |
| (4) "GOOD" ALARMS SYS. | N.A. | O | O | X | O | O | X | X |
| (5) "COMMAND" LANGUAGE FOR CONTROL ROOM NEEDS | X | YES, PAINFUL | BUT PAINFUL | X | O | | PASCAL + ROUTINES | X |
| (6) LOGGING OF PARAMETERS | X | O | O | X | O | O | X | X |
| (7) "EASE OF USE" FOR USERS TO WRITE APPLIC. PRGMS. | X | | O | X | O | | X | X |
| (8) COMPUTERISED PROCEDURES /DOCUMENTATION | O | | O on PSNET | No | HELP | O | O | O |
| (9) TIMING SURVEILLANCE FOR RF SYNCH (" WATCHDOG") | X | | | No | O | | | O |
| (10) CONTROLLED 'SCOPE/TRIG SETTINGS FOR ANALOG SIGNALS | N.A. | | | X | O | O | O | |
| (11) DIGITIZED ANALOG SIGS. | | | O Very Painful | Yes (specif) | O | O | O | O |

PARTIALLY AVAILABLE O

FULLY AVAILABLE : X

SEMINAIRE C U F

Novotel - Chamonix
25 au 28 Avril 1990

# OPERATION DES ACCELERATEURS

## AA

V. Chohan

# The AAC Complex = AC & AA Rings

(1) Simple Tree structure : divided into Equipment & studies/ops etc

(2) Machine studies / setting up Branch for each Ring

(3) No RESERVATION

(4) Machine "Modes" superimposed at the HIGHEST LEVEL & are transparent afterwards. {"True" orthogonality}
We do this by different timing files which finally use same Preset counters
{ie. d.c., "almost" single mode machines}

(5) Very many "Global" commands
- procedures
- Sophisticated Applic. programs.
  - Acceptances
  - Tunes
  - Auto. Adjustment
  - Coh. Osc.
  - F Transfer
  - Obstruction search
  - etc.

See CERN/PS/89-57 (AR)

11 Possible Modes

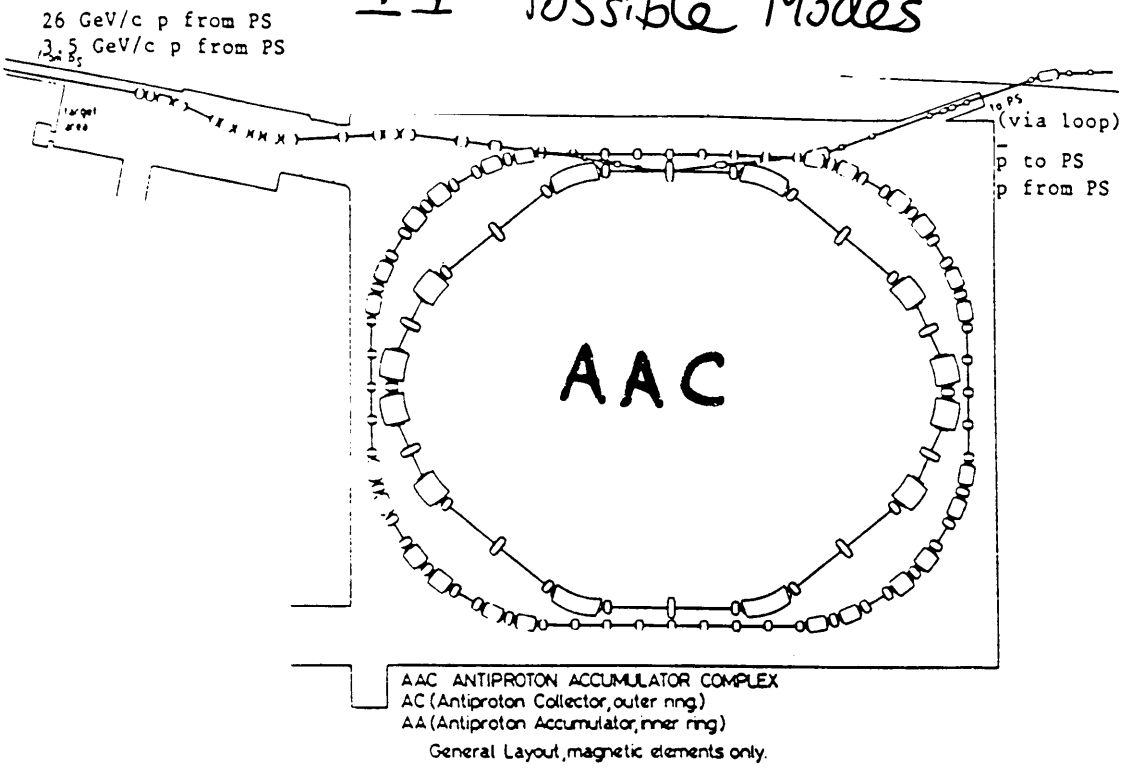



Fig. 1. Antiproton Accumulator Complex

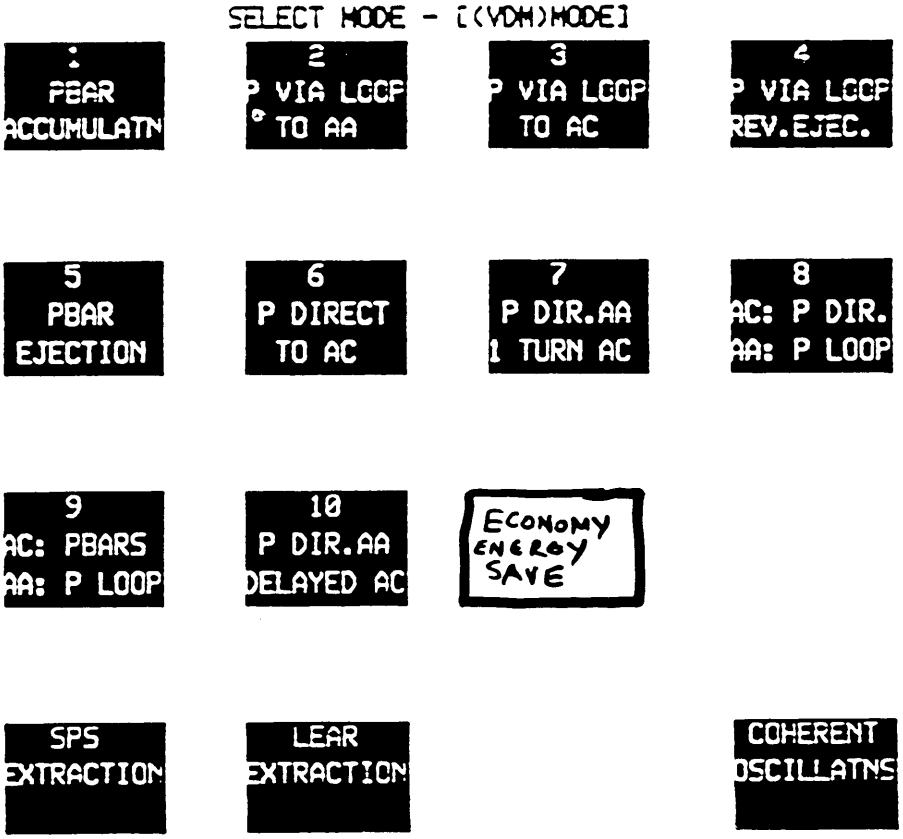
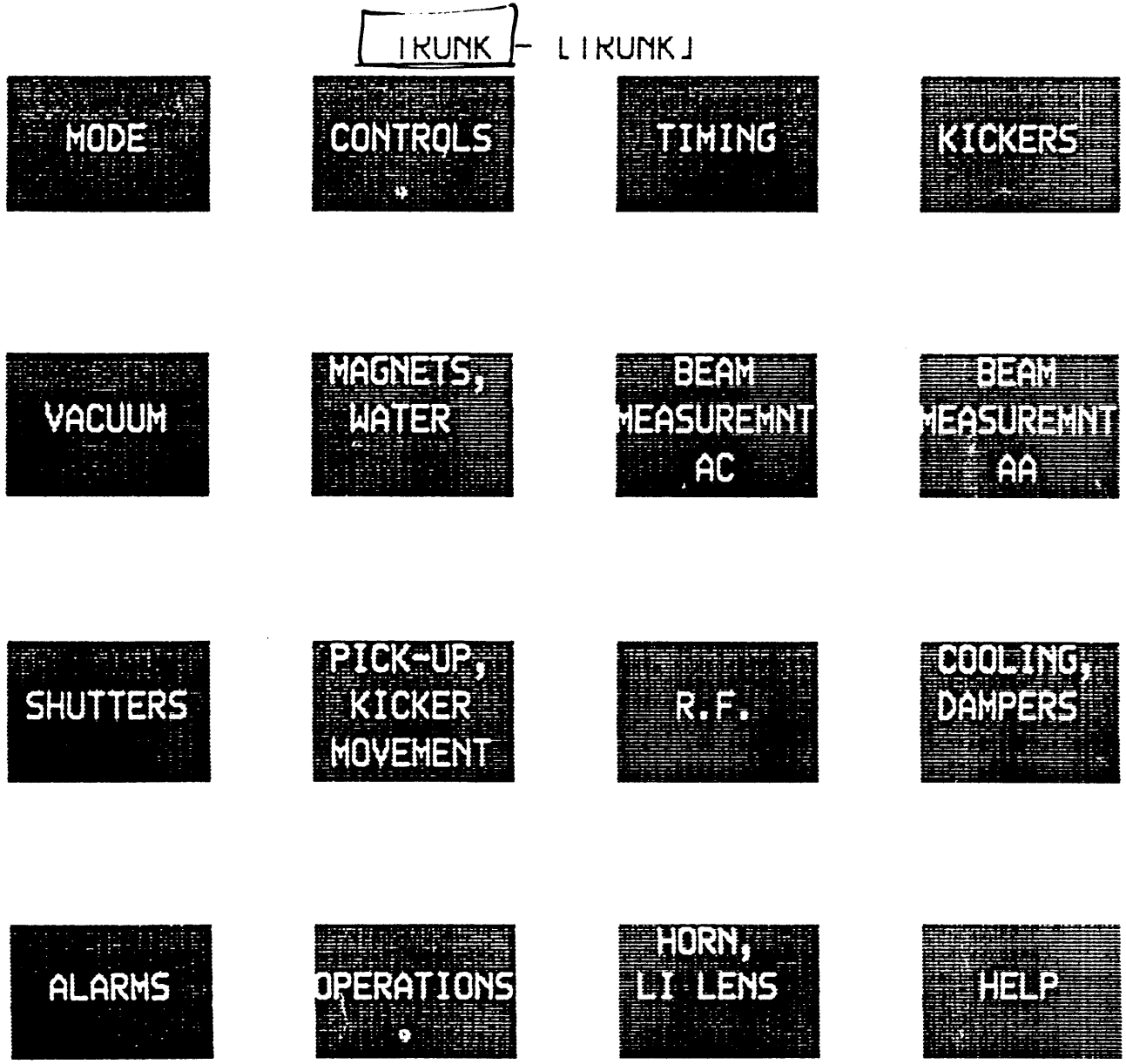



Fig. 2. Operational Modes in AAC


TRUNK
[ TRUNK ]
MODE
CONTROLS
TIMING
KICKERS
VACUUM
MAGNETS, WATER
BEAM MEASUREMNT AC
BEAM MEASUREMNT AA
SHUTTERS
PICK-UP, KICKER MOVEMENT
R.F.
COOLING, DAMPERS
ALARMS
OPERATIONS
HORN, LI LENS
HELP

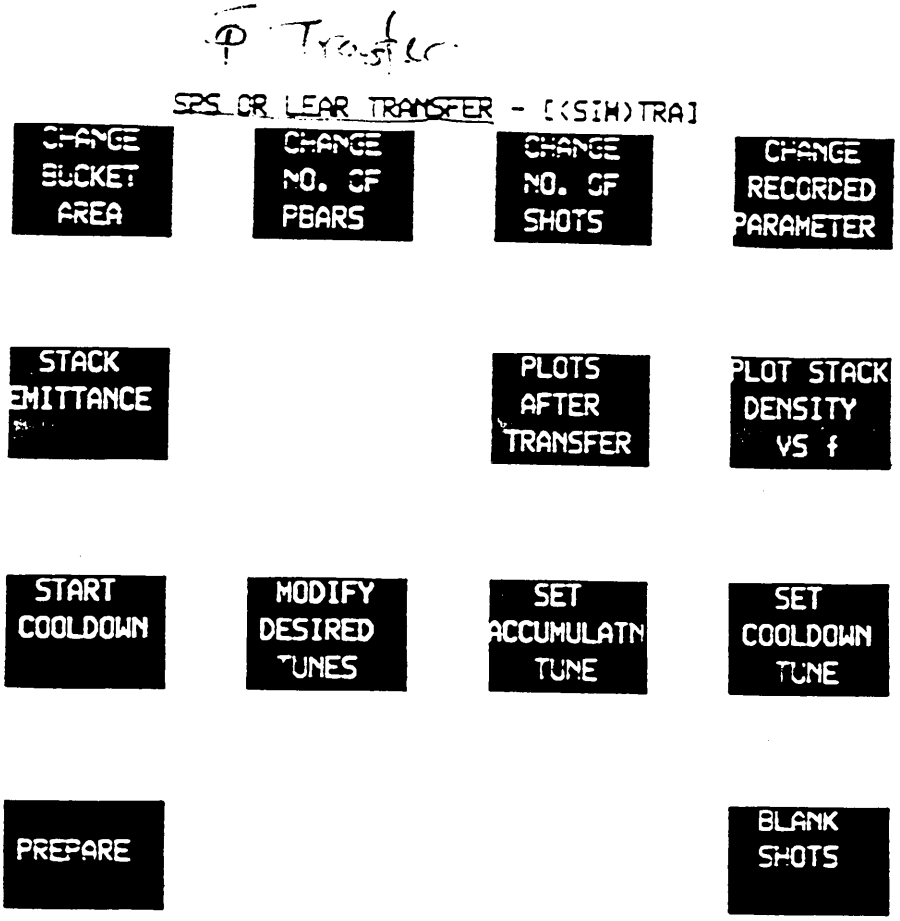



Fig. 3. Choices for Antiproton Transfers

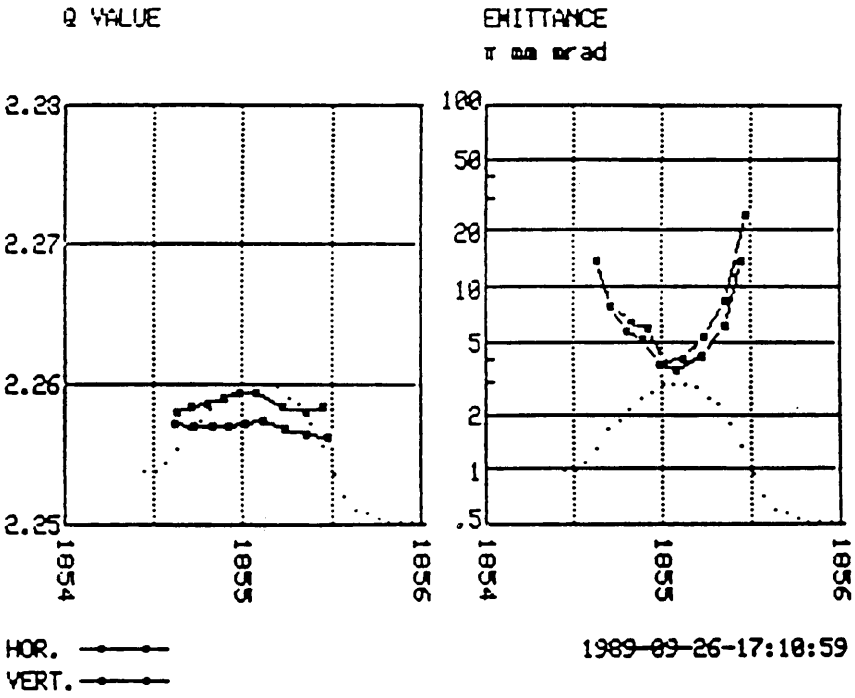



Fig. 4. Stack core Tunes and Emittances

AA ADJUSTMENT 1983-08-25-22:27

| | REQUIRED | MEASURED |
|---|---|---|
| COH. 1855.09 | 2.2555 | 2.2553 |
| QV kHz | 2.2598 | 2.2598 |
| TRIM | 0 | 0 mm |
| DP/P | 0 | 0 E-3 |
| COH.OSC. H | 0 | .4 mm |
| V | 0 | 0 mm |
| COS COMP.L | 0 | 0 deg |

Coherent oscillations are adjusted with cooldown tunes. Accumulation tunes restored now.

| RESULTING VALUES | | SAVED IN |
|---|---|---|
| BENDING | 1944.73 A | REFERENCE + FILE |
| TRIM | 8.73 A | |
| QD | 1058.59 A | |
| QF | 1464.62 A | |
| SEPTUM | 3878.39 A | REFERENCE + FILE |
| DVTS022 | -1.46 A | |
| BTIS002 | 410.53 A | |
| EJ.KICKER | 59.52 kV | |
| SYNC PH. | 66.2 deg | FILE |
| INJ. | 1845.83kHz | |
| INJ.EFFICIENCY | 85 % | |

The tunes have been adjusted to accumulation values on the stack orbit. These values are saved.

**Fig. 5. Results from the Automatic Setting-up Program for AA**

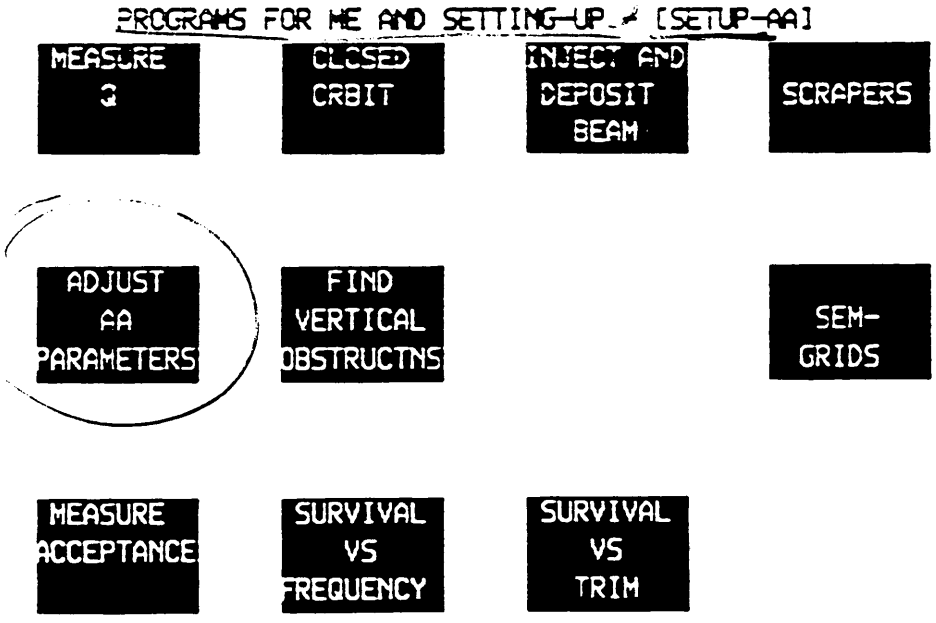



**Fig. 6. Choices for Machine Experiment and Setting-up Programs**

# EXAMPLE OF SINGLE BUTTON "SETTING UP"

AA ADJUSTMENT 1990-04-17-17:29

| | REQUIRED | MEASURED |
|---|---|---|
| QH } 1855.09 | 2.2545 | 2.2543 |
| QV } kHz | 2.26 | 2.2600 |
| TRIM | -.2 | -.1 mm |
| DP/P | 0 | 0 E-3 |
| COH.OSC. H | 0 | .2 mm |
| V | 0 | 0 mm |
| COS COMP.L | 0 | 0 deg |

| RESULTING VALUES | | SAVED IN |
|---|---|---|
| BENDING | 1944.15 A | |
| TRIM | 8.65 A | REFERENCE |
| QD | 1057.75 A | + FILE |
| QF | 1464.57 A | |
| SEPTUM | 3912.84 A | REFERENCE |
| DVT8022 | -1.79 A | + FILE |
| BTI8002 | 411.62 A | |
| EJ.KICKER | 55.62 kV | |
| SYNC PH. | 81.6 deg | FILE |
| f INJ. | 1845.92kHz | |
| INJ.EFFICIENCY | 90 % | |

AC ADJUSTMENT 1990-04-17-18:20

| | REQUIRED | MEASURED |
|---|---|---|
| QH } CENTRAL | 5.455 | 5.4544 |
| QV } ORBIT | 5.435 | 5.4355 |
| TRIM | -.3 | -.3 mm |
| DISP. LSS | 0 | .9 mm |
| COH.OSC. H | 0 | 0 mm |
| V | 0 | .1 mm |
| L | 0 | 1 deg |

| RESULTING VALUES | | SAVED IN |
|---|---|---|
| B-TRIM4 | 4.03 A | |
| BENDING | 2285.64 A | |
| Q-TRIM1 | -12.97 A | REFERENCE |
| Q-TRIM2 | 72.07 A | + FILE |
| Q-TRIM3 | -48.28 A | |
| Q-MAIN | 1871.33 A | |
| SM-EJ | 22838.1 A | REFERENCE |
| DVT7013 | -.43 A | + FILE |
| DVT7042 | .46 A | |
| EJ.KICKER | 4*64.2 kV | |
| SYNC PH. | -9deg | FILE |
| DP/P | -.56E-3 | FILE |
| INJ.EFFICIENCY | 92% | |

Coherent oscillations are adjusted with cooldown tunes. Accumulation tunes restored now.

The tunes have been adjusted to accumulation values on the stack orbit. These values are saved.

SEPARATE PROGRAMS FOR AC & AA & applicable for different Modes

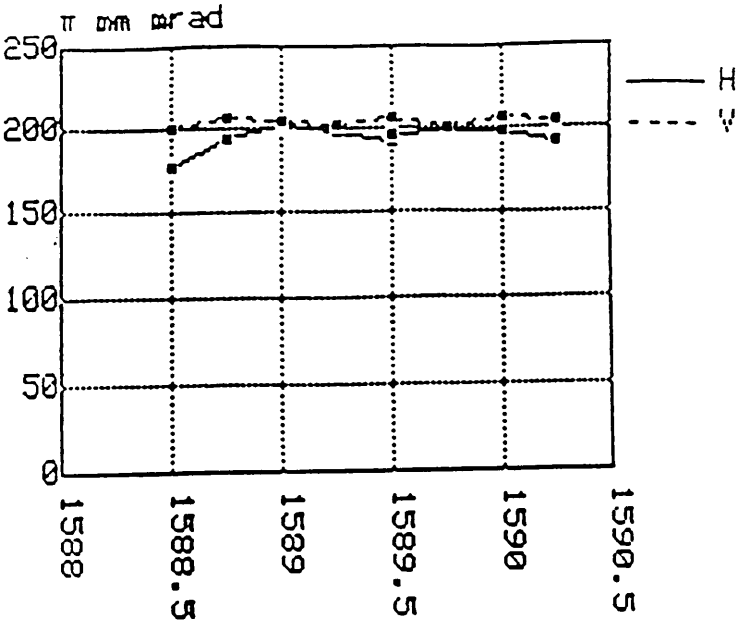
- Rf Synch.

Each program:

1. Requests beam
2. Measures & adjusts TUNES at CENTRE FREQ
3. Measures orbits
4. Adjusts Central field, Trim etc.
5. Corrects Inj. Coherent Oscillations in H, V & L using Digitizers
6. Verify Energy Matching (AA & PS)

AC ACCEPTANCE vs FREQUENCY 1989-08-25-23:43:

| $f_0$ kHz | $A_h/\pi$ mm mrad | $A_v/\pi$ mm mrad |
|---|---|---|
| 1588.5 | 177 | 199 |
| 1588.75 | 194 | 205 |
| 1589 | 201 | 203 |
| 1589.25 | 198 | 202 |
| 1589.5 | 191 | 205 |
| 1589.75 | 198 | 200 |
| 1590 | 197 | 206 |
| 1590.25 | 191 | 204 |
| 1589.5 | 195 | |



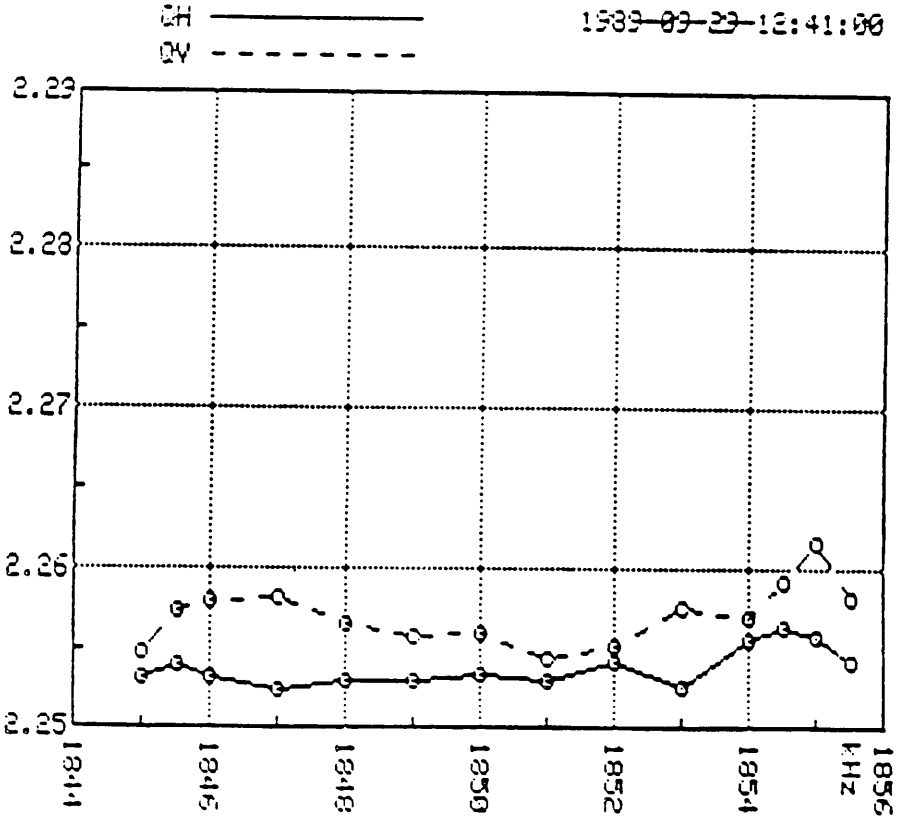
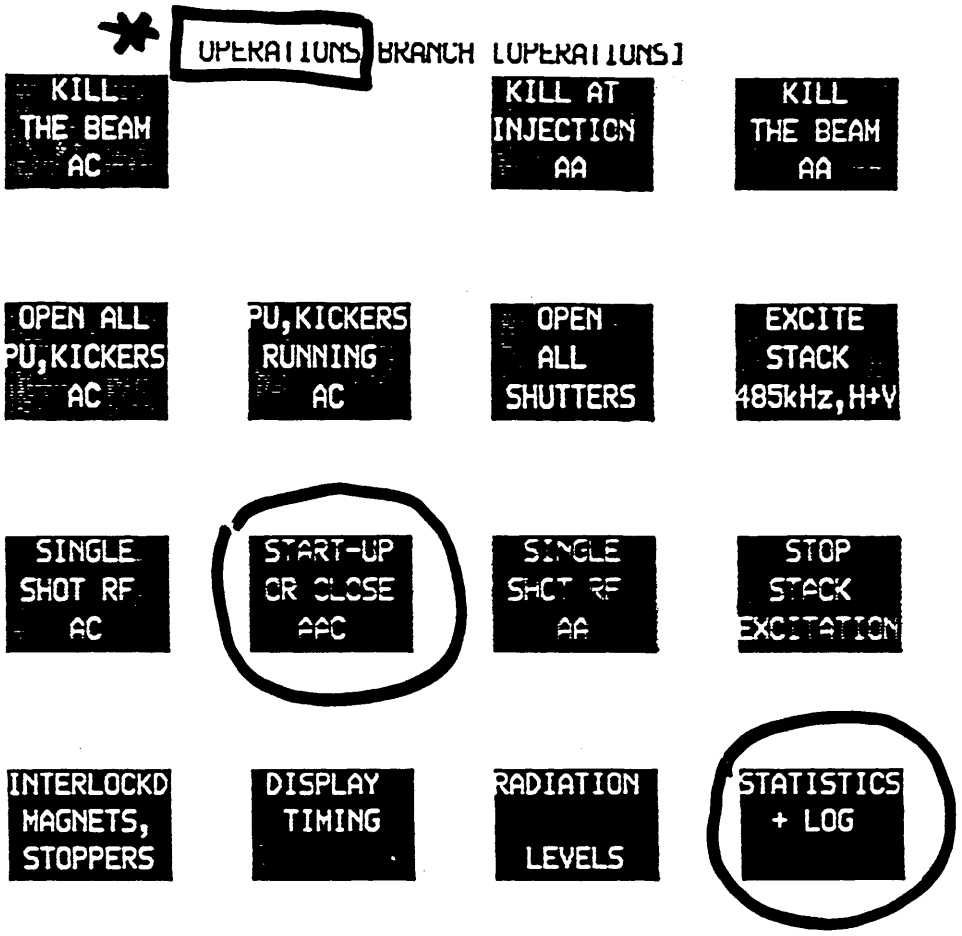




Fig. 8. Tunes Versus Momentum in AA Ring

EXAMPLE:

# GLOBAL COMMANDS




CLOSE OR OPEN AAC !!

CLOSE AAC

START AAC

↳ Affects: Power Supplies
RF
Stoch. Cooling Systems
(hundreds of Amplifiers etc.)
Switches

DISPLAY AAC

Example: Trouble-shooting Timing problems using Digitised & Created signals from the Control system. (NOT 'SCOPES)

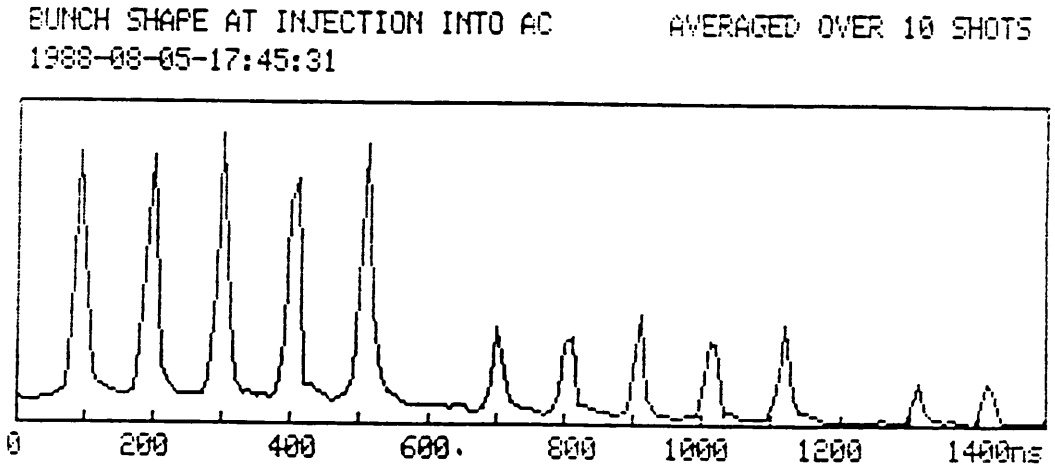



Fig. 6. Correct Injection Timing with 5 pion bunches.

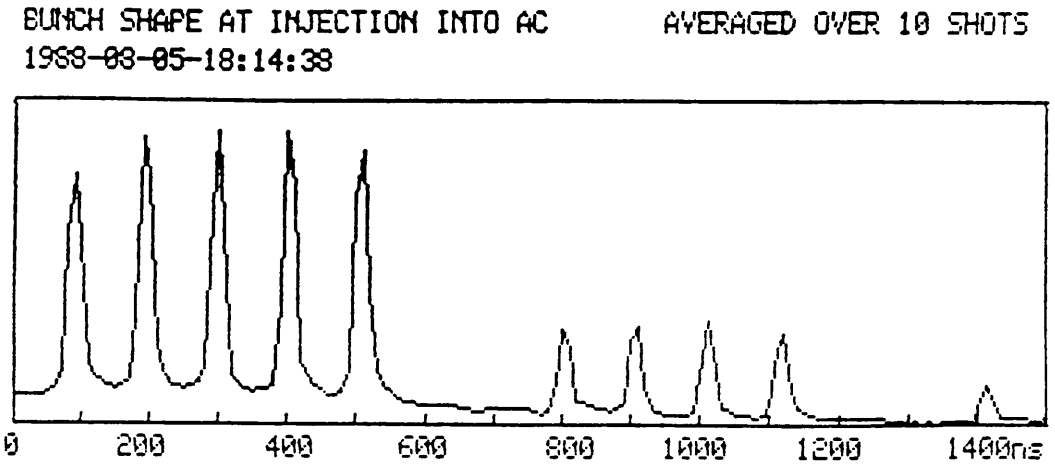



Fig. 7. Misaligned Injection - only 4 pion bunches on 2nd turn.

EXAMPLE : TIMING FAULT DETECTED USING DIGITIZED/STORED SIGNAL.

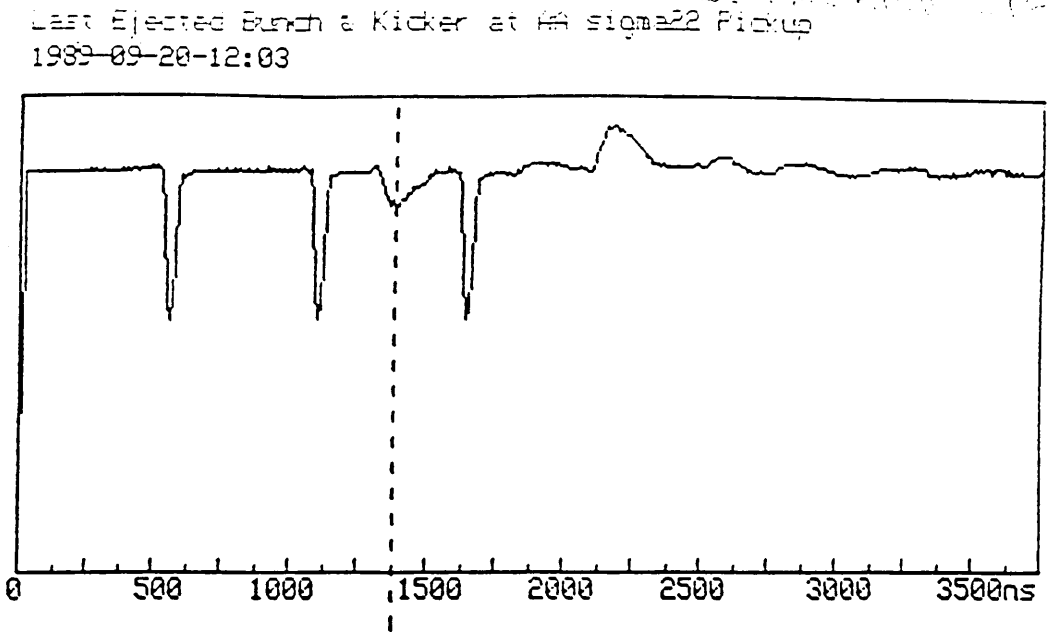



Fig. 4. With Correct Ejection Kicker Activation

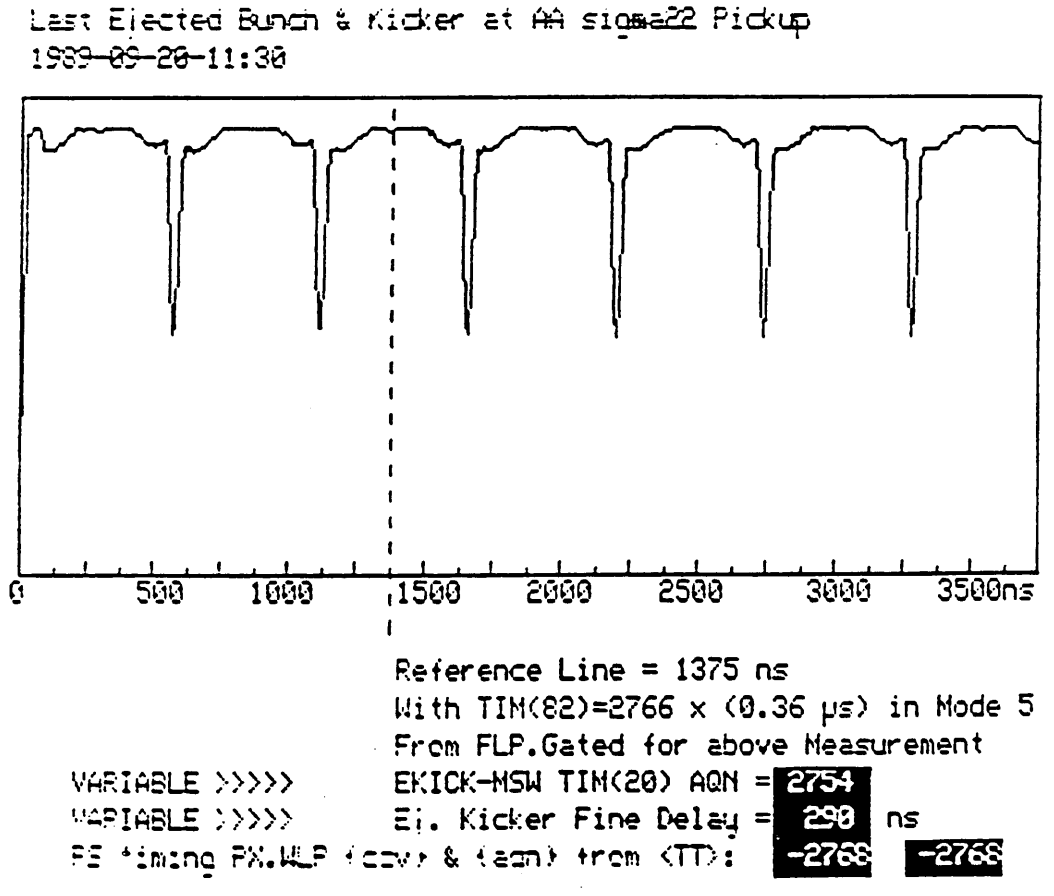



Fig. 5. Ejection kicker did not fire: bunch still circulating

CHOHAN
aac

## USUAL QUESTION:
## WHY DID AA & AC NOT FIT IN SO-CALLED "STANDARD" PS MCR Control System?

(1) At Equipment level it does completely in Hardware & Software.

(2) At "Structures" level at the top, it DOES NOT because it is much SIMPLER than PSB/PS for Timings/PLS/PPM etc & saw no obvious need or usage of heavy concepts of Work sets/reservations etc.

(3) At Applications level - all programs were/are written by machine users/experimenters

(4) There are NO COMPLEX HARDWARE STRUCTURES between Applic. software and equipment 'cause there is No P.P.M.! The only Complex Equipment Module is for GPIB/Camac Interface (S/W)

(5) The Controls group did NOT have TIME or WISH to cater for this Complex in 178/80 at the CONSOLES LEVEL — SO, S[illegible] Touch Terminals are also DIRECTLY connected to AA Front-end Nord.

**SEMINAIRE C U F**

Novotel - Chamonix
25 au 28 Avril 1990

# C O N C L U S I O N S

## Synthèse OP

**V. Chohan**

1. OPERATIONS SPECIFY AND ARE WILLING TO WRITE APPLICATION PROGRAMS USING HIGH-LEVEL TOOLS PROVIDED BY CONTROLS GROUP
2. PROCESS-ORIENTED TOOLS
3. ARCHIVING FACILITIES
4. DIGITISED SIGNALS WHEREVER APPLICABLE
5. BETTER RESPONSE TIMG
6. WE ARE ACCELERATOR OPERATIONS — KEEP THIS IN MIND AS OPPOSED TO GENERAL SERVICES.
7. KEEP IN MIND THAT THE "OPERATOR" IS THE ULTIMATE CLIENT.

# WHERE DO WE GO FROM CHAMONIX ?

S. G. = STUDY GROUP

① S. G. to study / propose how to achieve a mutually exclusive "virtual" machine to satisfy all requirements of PSB/PS/SPS (LHC?) in pulse-to-pulse Modulation. SPS claims to be achieving this anyway. Is it not time for PS to RETHINK the PLS concepts (& vicious overlaps of "users", line usage etc.)

✳ This obviously affects Sequencing Concepts, Timing System, timing hardware and timing demarcation lines.
Should this not be the starting point for Rob Parker ?

Once the vertical hierarchy of machines is RECOGNISED, (virtual or d.c.)
it may be easy to include all simpler machines in this structure.

A CERN-wide Study Group (MMI) to agree on Human Interaction level details of presentation/symptics. This includes layout of new consoles composed of work-stations (?) etc -- as well as "tiny" details of Red for "off" & Green for "ON" !!

etc....

etc...

BUT FIRST,

* THE BALL IS BACK IN THE COURT OF CONTROLS' GROUPS !

AT LEAST THEY SHOULD TELL US WHICH WAY WE ARE GOING & STANDARDISE THE INTERFACE TO OUR SOFTWARE.

APOLLOS ?
DEC STATIONS ? if so which "flavour" ? CLEAR RISC
PC's ?

A CERN-Wide Study Group to present a consensus on entry "structures" and usage from the top level to final application which differs in different machines. The mandate would be to IDENTIFY COMMON APPLICATIONS/USAGE IF POSSIBLE and a Uniform Way of presentation where possible. !!

The study Group might discover that there are very few common grounds like low-level Eqpmt (Power/vacuum --) and that FINAL application uses are drastically different.

**OR**

IT MAY PROPOSE MANY COMMON GROUNDS !

EXAMPLE →

# SEEMINGLY COMMON EXAMPLE OF TUNE MEASUREMENTS

(1) At first sight, we all do it !
PSB / PS / AC / AA / SPS / LEP / EPA / LEAR

(2) Different Methods :
(1) Kick beam & measure : ACTIVATE SPECIAL H/W
(2) Schottky : PASSIVE
(3) Beam Transfer function (BTF) : ACTIVATE DIFFERENT H/W from (1)

(3) Different Uses or Needs : Hardware Activation ; Passive ; Need for Test Beams or, done Every Cycle, or done once only ($p\bar{p}$ Inj)

(4) Final Applications :

| | PSB | PS | SPS | EPA | LEP | AC | AA | LEAR |
|---|---|---|---|---|---|---|---|---|
| (a) Chromaticity at single energy | | | | | | | | 1, 3 |
| (b) Tunes vs. Aperture ($\Delta p/p$) (needs Test beam) | | | | | | X | X | 1 |
| (c) Pure Tunes at single point | | | | | | X | X | 1, 3 |
| (d) Tune values in Stacked beams, i.e., in core regions | | | | | | | X | |
| e) Tunes during Acceleration cycle | X | X | | | | | / | 1 |
| :) Tunes for each bunch (of 12) for $p\bar{p}$ operations. | | | X | | | | | |

# SPECIAL ISSUES

## Related to Geography / or machines

For example:

1. PS/PSB : Availability of spare cycles always implies continuous requirement of Shared Instrumentation in Conflict or in Unison with Operations.

2. LEP/SPS : Geography forces a quick hardware diagnostics in the PCR before taking a multi-kilometer car ride with correct equipment

3. LEP : Current OPERATIONS spend more time on "Controls-related environment" issues rather than Accelerator issues!

If the AIM was to TELL each other what we do and how preferably over a Beer,

WE SUCCEEDED

If the aim was to show our different needs / methods

We succeeded

NOW LET'S SEE WHAT THE MANAGEMENT DECIDES !!