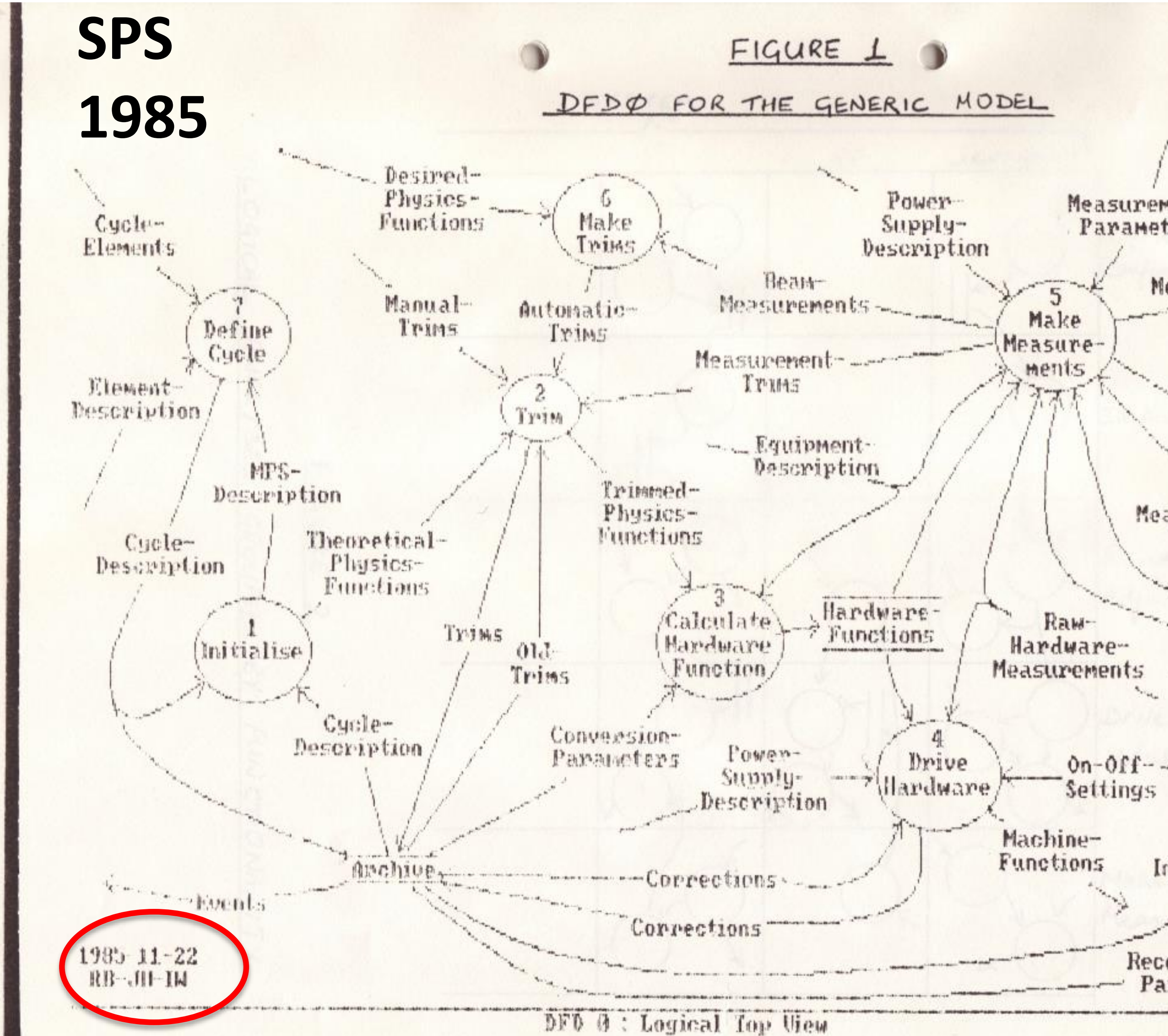
Thinking outside the box

Mike Lamont

- It was a nightmare to compile this talk –without knowing exactly why ☹

SPS
1985



Distribution

V.Hatton
L.Evans

R.Giachino
M.Gyr
R.Lauckner
J.Miles
L.Normann
S.Peraire
A.Spinks
J.Ulander
I.Wilkie

LEP 1990 – Ramp

4 Prepare for a Ramp

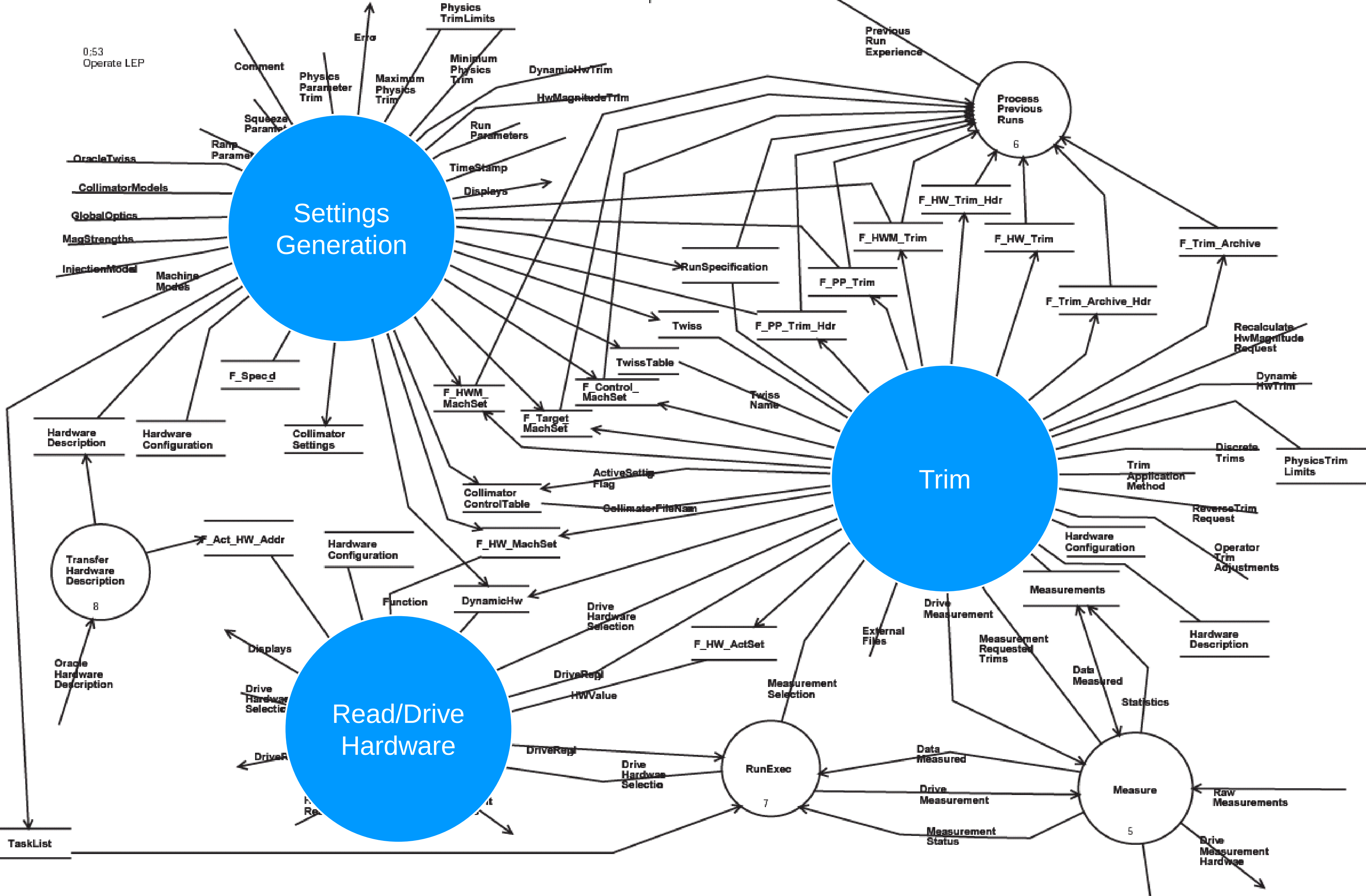
- **opera** — Change mode to Acceleration
- **man_rt -u** — Update and Check LEP Run Table
- **pc_set -i set.names delay** — download delays.
- **pc_set -i ramp.names -x 8 TIMEX** — set TIMEX, if necessary.
- **pc_set -i ramp.names LINEAR** — set LINEAR or EXP.
  The corresponding values must be set in the LRT (LINEAR = 0, EXP = 1).
- Check that the RF is ready
- **load_vect -r ramp_nom_c.d a** — load the basic ramp vectors
- **check_vector_timex -i ramp.names** — **N.B. Required for the next step**
- You can now go to the ramping stage.

CORREC QD +0,040 QF -0.342, FOR TIMEX 4, 8

5 Ramp

- **enable_pc -i ramp.names** — enable the PC's for acceleration
- Put kickers on standby. In 'opera':
  <LEP controle utilities><LEP kicker instalation>
- start ramp — send timing
  From 'opera' :
  <LEP controle system><LEP master timing controle><acceleration>
  The ramp will then start automatically.
- watch *vecnum* for e.g. RM2QD with pctest during ramp
- switch longitudinal feedback off
- After ramp increase RF voltage
- **check_vector_timex -i ramp.names** — **N.B. Required for the next step**
- **man_rt -u** — Update run table after ramp
- check tunes. In 'opera' : **<LEP controle utilities><LEP tune measurement>**
- Measure closed orbit, and record file name — needed to monitor changes
- Correct closed orbit (if > 1.4mm), and record correction. — needed to monitor changes
  (get the right twiss file by doing ¡quick_twiss¿ in the RTC)

Operate LEP



1991 OPERATE LEP

MEMORANDUM

To: Robin Lauckner

From: Mike Lamont

cc: R.Bailey, V. Hatton, K.H. Kissler, J.Poole, M. Tyrrell.

Subject: ORACLE Performance

Date: 7th January 1991

1. Introduction

The question of whether or not an ORACLE database would provide a fast enough service to meet the requirements of a LEP control system was raised at a recent meeting of the AWG. Also raised were the access requirements of the "New LEP Analysis" and the desirability of a "local" database service.

As you know, in attempt to address these issues I have recently brought up the ORACLE database server on BASEL. This is version 6 (the most recent) and was installed January 90 by Fredrick Hemmer of CN. I have transferred "live" data from the LEP (VAX) databases to the database on Basel. I have also created tables which attempt to reflect a possible implementation of the new analysis. Using these tables and the transferred data I have attempted to measure the timings of typical accesses e.g. the retrieval of a "physics function" or the retrieval of hardware settings for a given hardware grouping. Hopefully these reflect the time critical accesses of the system. Given below is a summary of the results so far. This memo is in no way meant to be a full–scale evaluation rather first indications and to raise the matter for discussion.

1992

28.6 pb-1

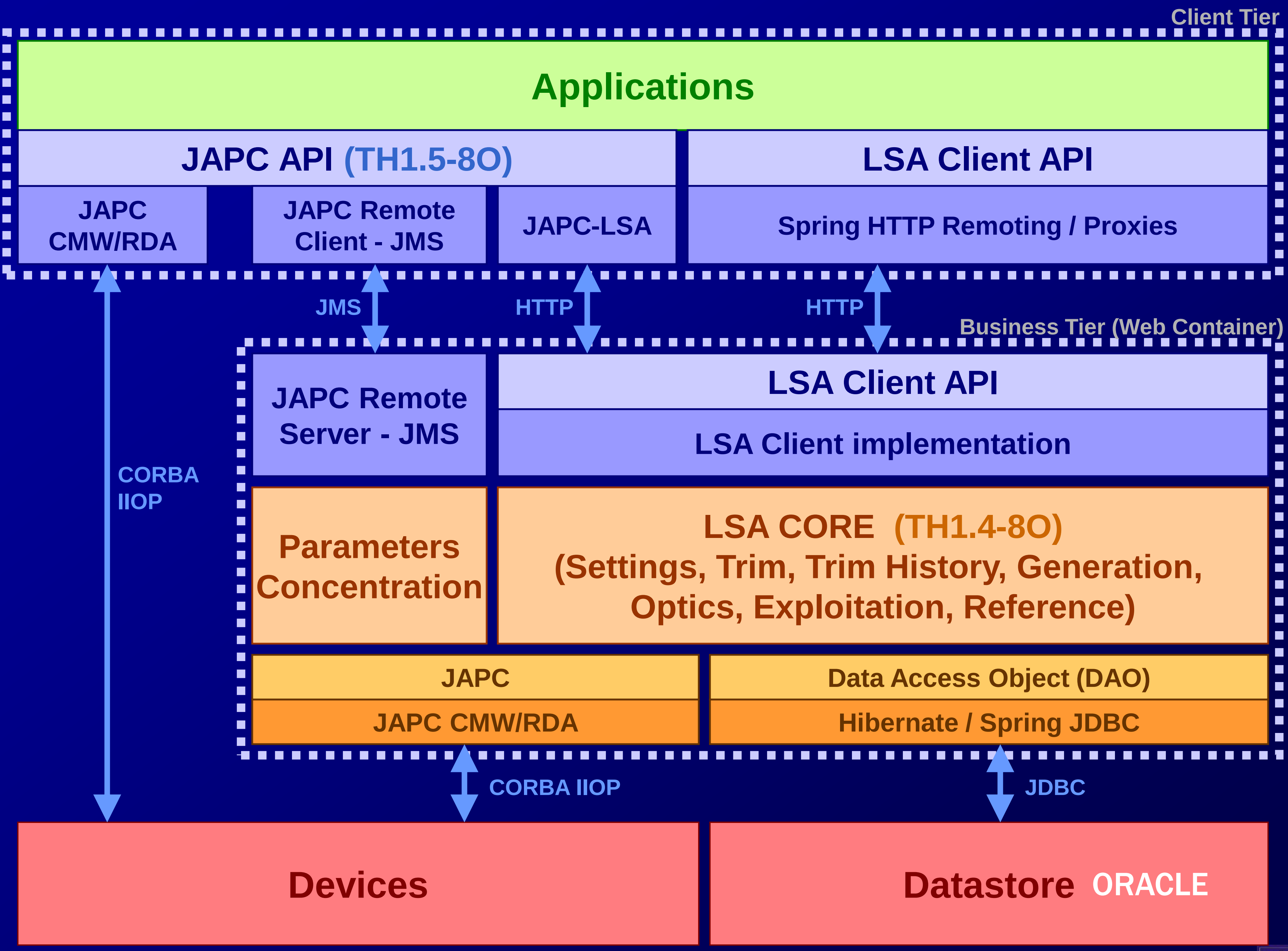
The sloppy start-up from hell. The super optics (94/100)
Combined ramp & squeeze

→ I can't believe they let us do this

"After another night trying to optimize the ramp & squeeze we came to the conclusion, supported by computer simulations that the 94/100 optics was intrinsically stable."

Pretzel commissioned

LSA 2004


Client Tier
Applications
JAPC API (TH1.5-8O)
LSA Client API
JAPC CMW/RDA
JAPC Remote Client - JMS
JAPC-LSA
Spring HTTP Remoting / Proxies
JMS
HTTP
HTTP
Business Tier (Web Container)
CORBA IIOP
JAPC Remote Server - JMS
LSA Client API
LSA Client implementation
Parameters Concentration
LSA CORE (TH1.4-8O)
(Settings, Trim, Trim History, Generation, Optics, Exploitation, Reference)
JAPC
JAPC CMW/RDA
Data Access Object (DAO)
Hibernate / Spring JDBC
CORBA IIOP
JDBC
Devices
Datastore ORACLE

However

- Our understanding has changed
- The requirements have changed
- The technology has changed and some of us are actually using it

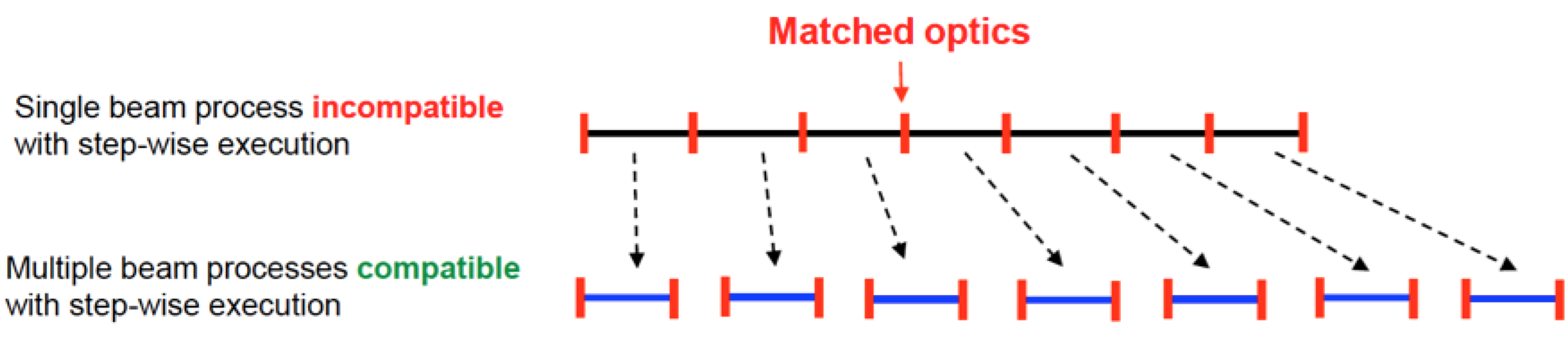
Levelling as an example

Controls aspects (beam dynamics issues not considered) :

- Separation levelling:
  - ✓ Small local orbit bump,
  - ✓ No collimator movement required (for usual ranges),
  - ✓ Operational.
- Crossing (X) angle levelling:
  - ✓ Larger local orbit bump,
  - ❖ Orbit FB gymnastics (reference),
  - ❖ ***May*** require collimator movements,
  - ✓ Roadmap(s) to operational state available.
- β^* levelling:
  - ❖ All the glory and complexity of a squeeze step,
  - ❖ May be non-local (beta-beating),
  - ❖ In principle collimator movements are required (~ squeeze).
  - ❖ Maturity & complexity – MDs required?

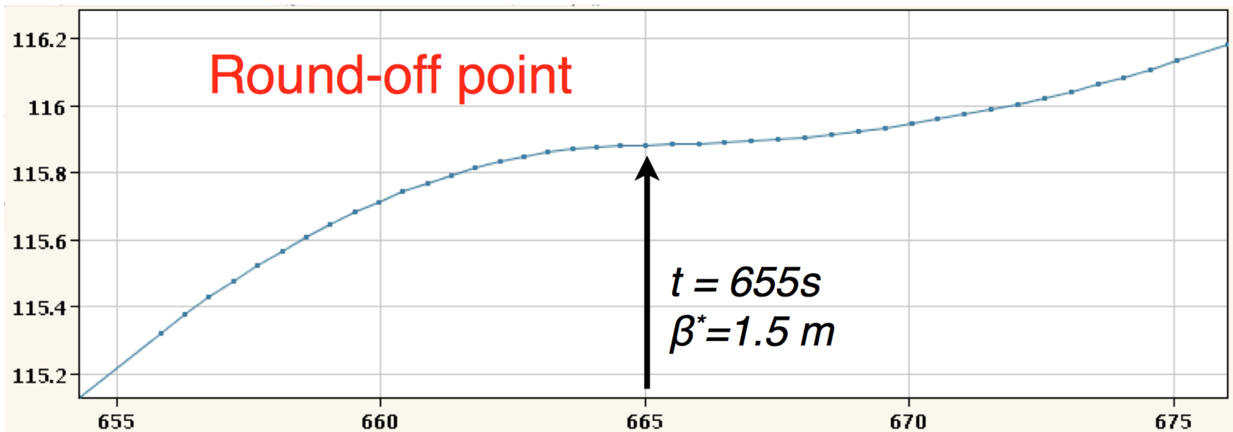
Beta* levelling

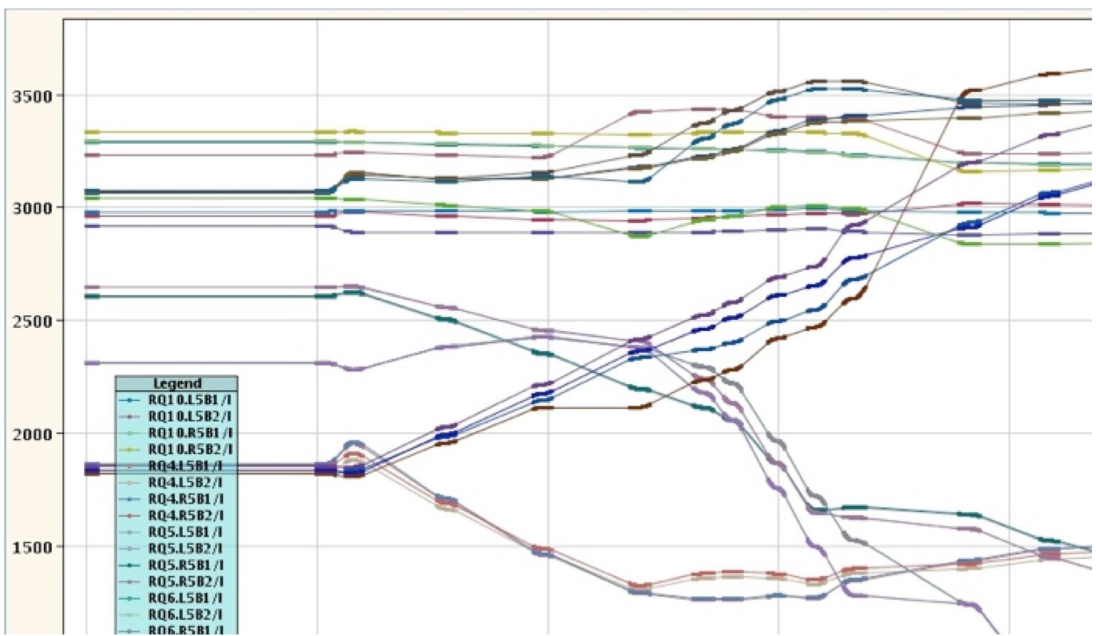
- We want to change optics, bumps, collimators in Stable Beams with 500 MJ circulating
- Clunky with the present architecture
  - beam process paradigm
  - signed collimator limits associated with beam process
  - fixed matched points
  - Loss maps at every possible beta* value?



Fixed matched points in the squeeze

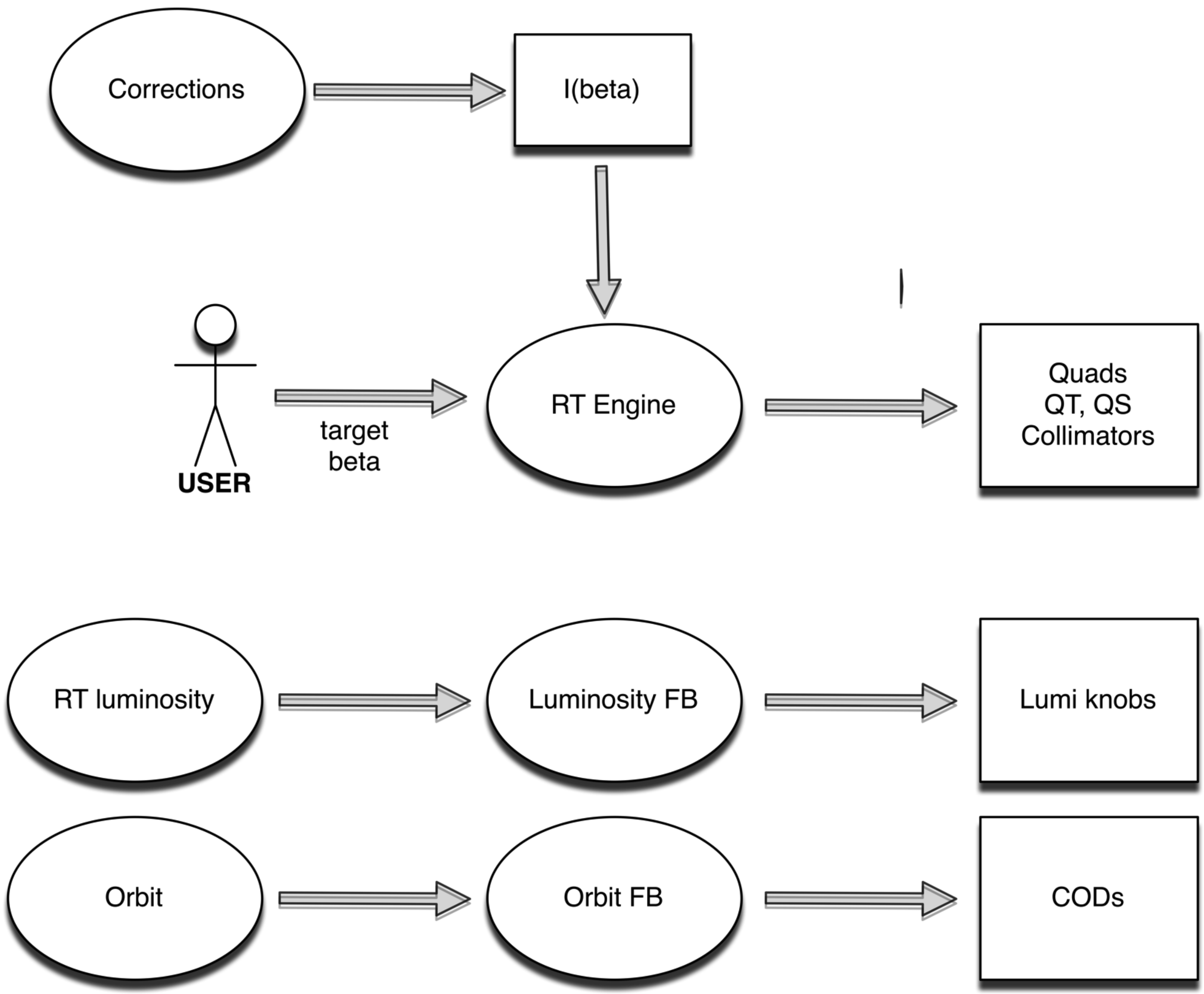
– What are they doing there anyway?





What about?

- Match in appropriate increments through the squeeze (one IP)
  - construct settings for closely matched points – could even match dynamically
  - **K(beta), I(beta)** for a limited set of magnets/converters (IPQs etc)
  - don't worry about functions(t) at this point
- RT engine executes a synchronous step through (with a pause facility!) between chosen beta_initial and beta_final with appropriate rounding
- Targeting small steps – not the full squeeze
- RT luminosity optimization in parallel – if needed


Corrections
I(beta)
USER
target
beta
RT Engine
Quads
QT, QS
Collimators
RT luminosity
Luminosity FB
Lumi knobs
Orbit
Orbit FB
CODs

Advantages

- Imagine configurable step size - which could be quite gentle. This might give us a nice level of control
- Incorporate any Q, Q’,C- variations
- RT orbit feedback could work in parallel
- RT lumi FB could work in parallel or if the luminosity drifts off we could pause, optimize and continue…
- Detailed checks after each step

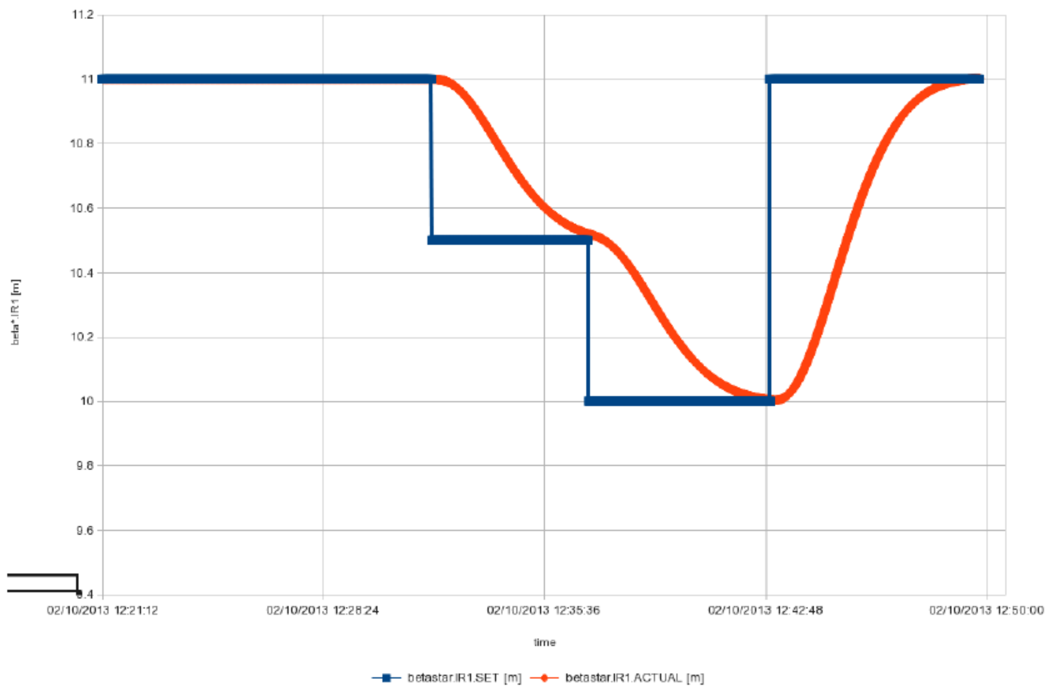
Dynamic validation

- Validate our beta* space and recognize our phenomenal reproducibility
- Provoke losses with programmed ADT excitation throughout squeeze…

Beta* levelling test

2013

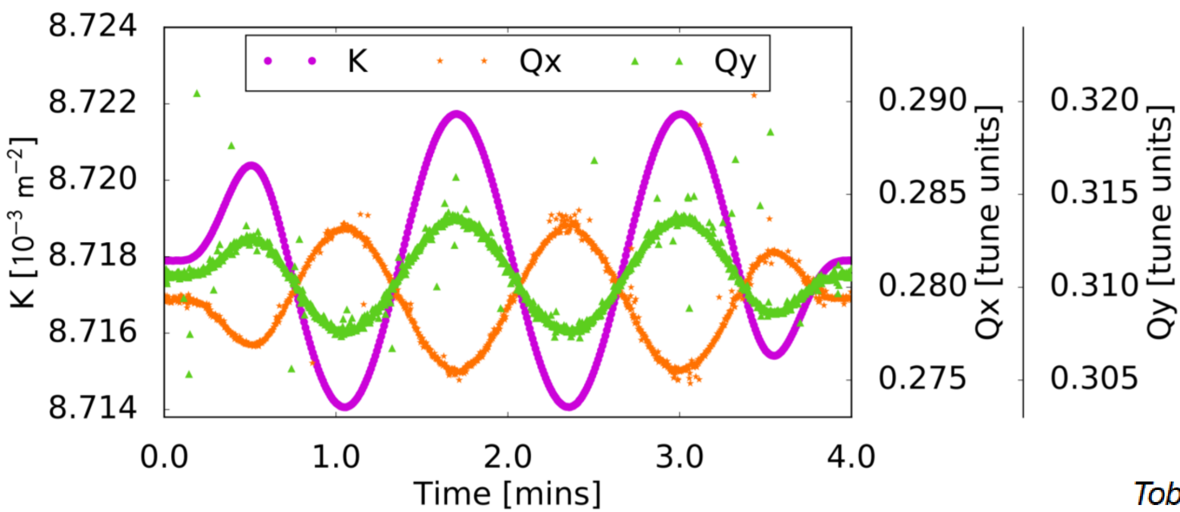
- Quick test of real-time squeeze starting from 11.0 m to 10.5 m to 10.0 m and back to 11.0 m (ML and RS)
  - Aim was to probe the feasibility of real time beta* leveling post-LS1. It was a naked squeeze in IR1 only with no prior orbit, tune, or chromaticity corrections included. 2nd order feedback effects on tune and orbit clearly observed. Beam lifetime OK throughout test.



Some are thinking out of the box already

OMC, collimation etc : use available, imperfect functionality, deal with LSA mechanics as it is

- K-modulation, Collimator/BLM FB…
- ADT "on the fly" during dynamic phases



Tobias Persson
on behalf of the OMC-team

Other ideas

- Sequencer/State machine
  - Formality, parallelism, catch mistakes
- Java VM in the front-ends
- Light front-ends and fibre

We've been in the present box quite a while.
Time to re-think?