

ATF2 review

B. Barish, A. Chao, O. Napoly, K. Oide,
M. Ross, N. Walker (chair), A. Seryi,
R. Tomas and A. Yamamoto



ATF2 review web and final document (19 pages!):

<https://ilcagenda.linearcollider.org/internalPage.py?pageId=1&confId=5973>

ATF2 review Final document:

The ATF2 review

A. Seryi

O. Napoly

R. Tomas

A. Yamamoto

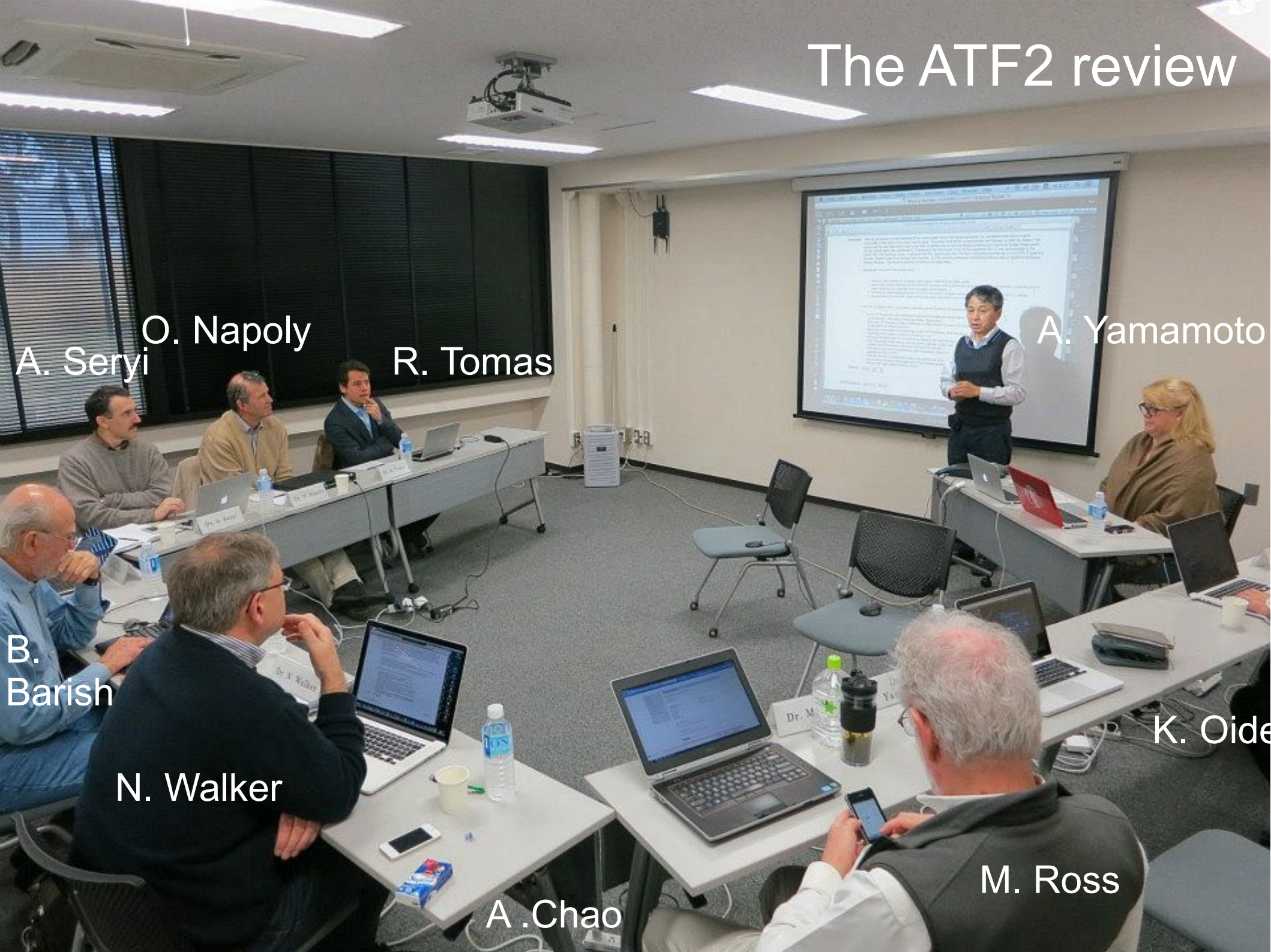
B. Barish

N. Walker

A. Chao

M. Ross

K. Oide



17 speakers from 9 labs

N. Terunuma, T. Naito, S. Kuroda, S. Araki,
M. Woodley, A. Lyapin, K. Kubo, G. White,
E. Marin, T. Okugi, T. Tauchi, P. Bambade,
S. Jang, P. Burrows, S. Boogert,
A. Faus-Golfe and J. Yan

Many pictures at:

<http://on.fb.me/Z2OTGw>

<http://on.fb.me/14QJ6I8>

ATF2 review: all participants



Evolution of ATF2 Goals

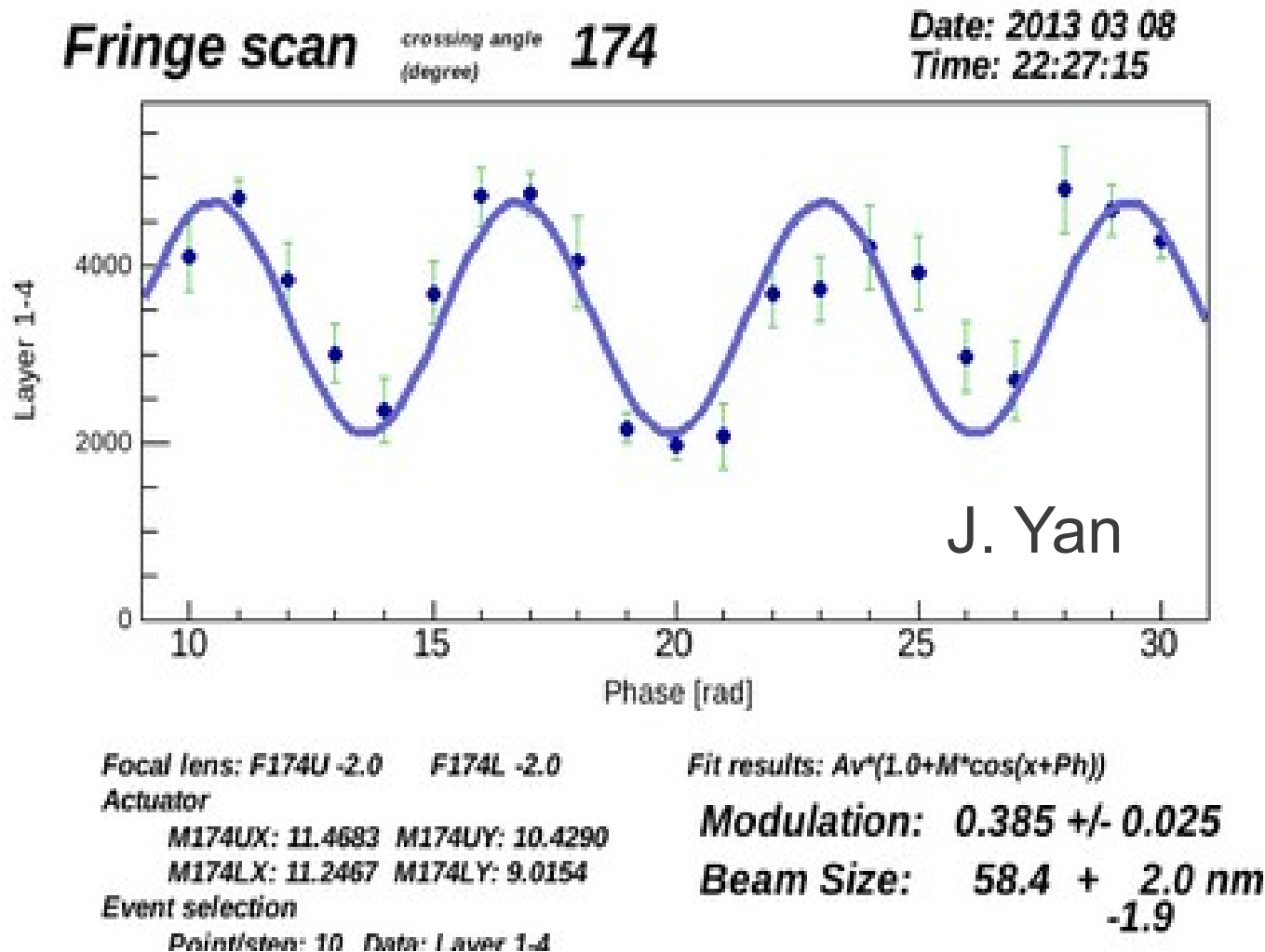
- Original goals from ILC TDR phase:
 - 1. Achieving 37 nm
 - 2. Stabilization to nm level
- Re-interpreted by the ATF2 collaboration
 - 1a. Demonstrate local chromaticity correction
 - 1b. Maintaining 37 nm over extended periods of time
 - 2a. Beam trajectory stabilization to nm level
 - 2b. Techniques for controlling beam jitter at nm level with an ILC beam

ATF2 review: General statements

“...The extensive upgrades and improvements to the machine itself, including critical sub-systems such as the **IPBSM**, together with the **organized approach to shifts and personnel training**, have resulted in significant gains in terms of understanding and characterizing the accelerator, resulting in a best-recorded beam size of **64 nm.**”

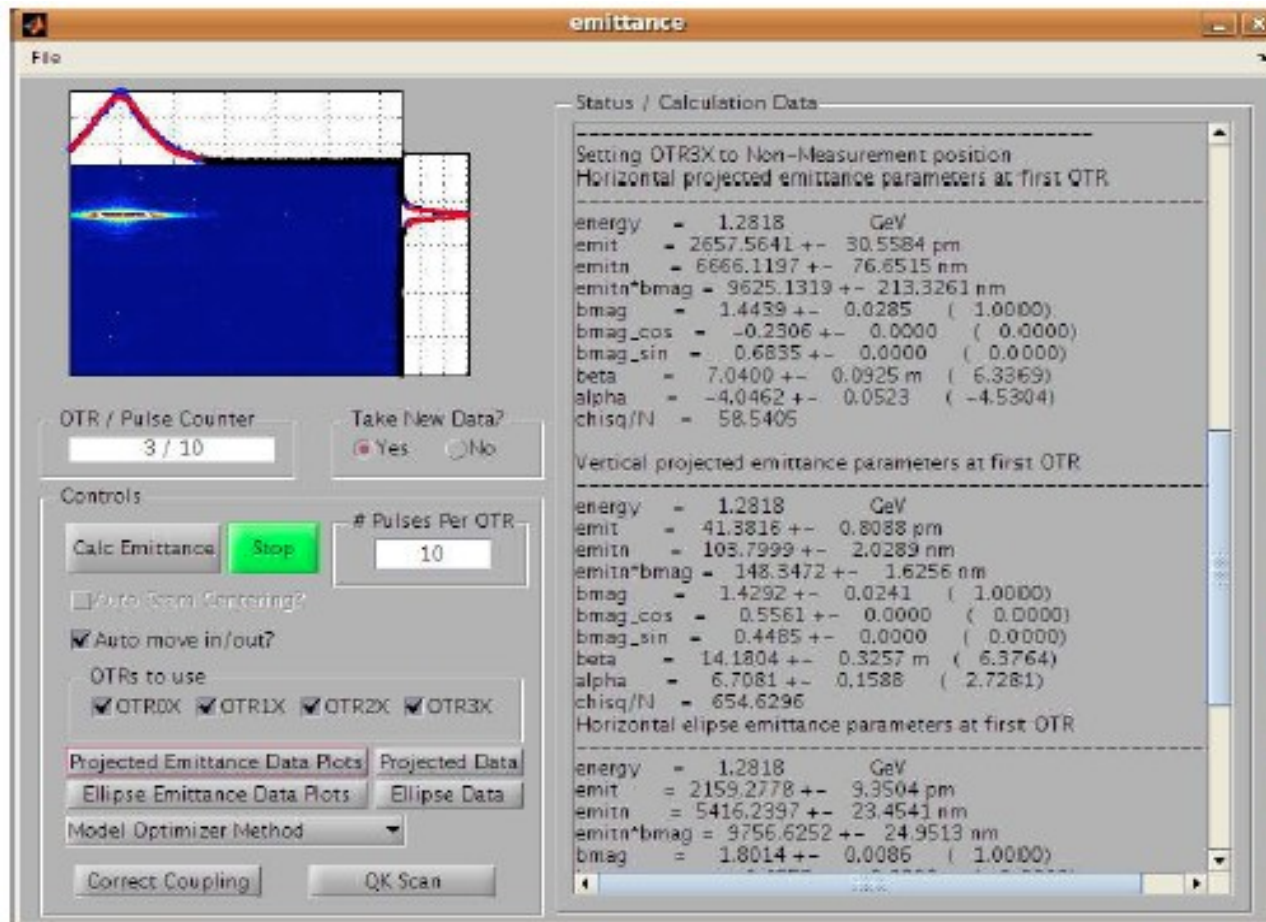
IPBSM

- **Major reform** in summer 2012 to suppress systematic errors and increase laser path stability



OTR

“The proposed coupling correction method with beam tilt on the OTR appears a very effective and **time saving** approach... OTR is a **key** diagnostic which has been an **R&D program** in itself”

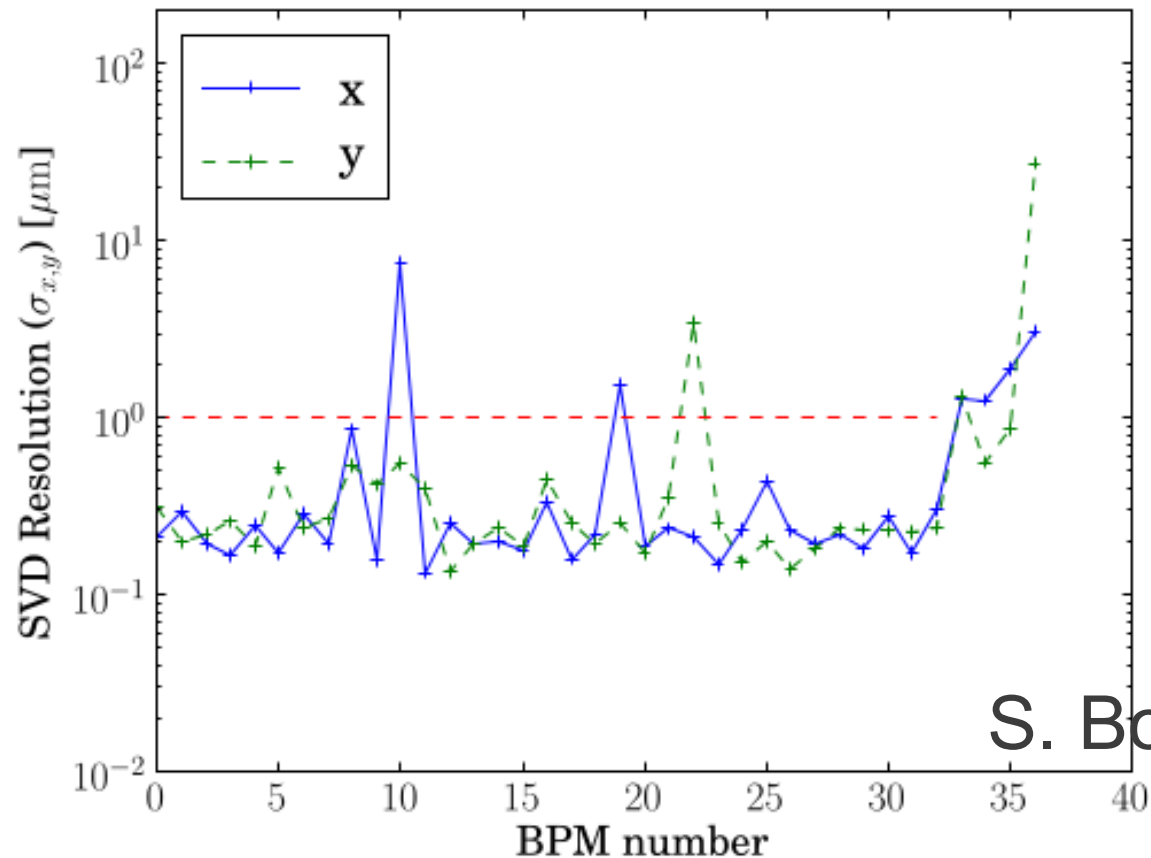


The **response matrix method** coupling correction method was **installed** and **tested** in **ATF2 control system** in December 2011

A. Faus-Golfe

BPMs

“The current cavity BPM systems (C- and S-Band) now appear to be **mature**, having demonstrated typically 200nm intrinsic resolution (30nm without attenuators)”



S. Boogert

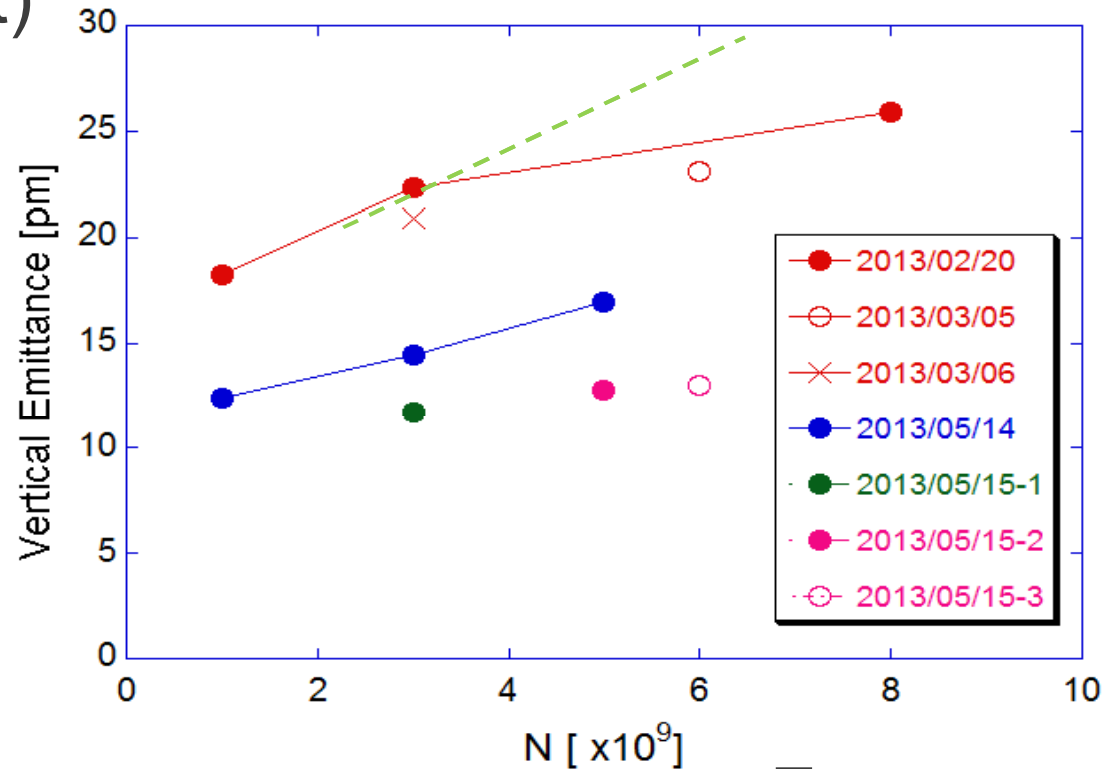
Some issues already solved!

“...discrepancy between the SR-based monitors (in emit) and the laser wires... need to be understood”

“Extracted emittance is consistently higher than in the ring... However for ATF2 (and ILC) it is the pulsed extracted emittance that counts.”

Ring had indeed 10 pm!

***OTR emittance measurement
by QS difference knob coupling correction***



Red ; 2013 March

Blue ; 2013 May

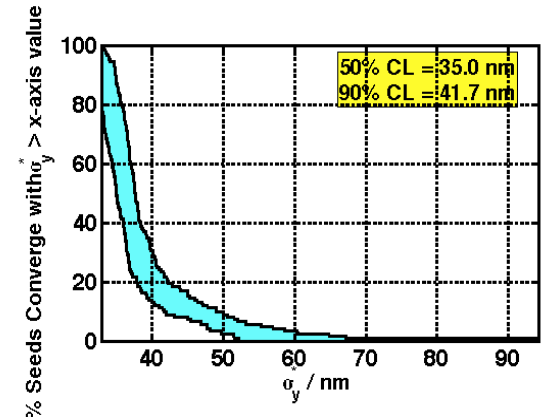
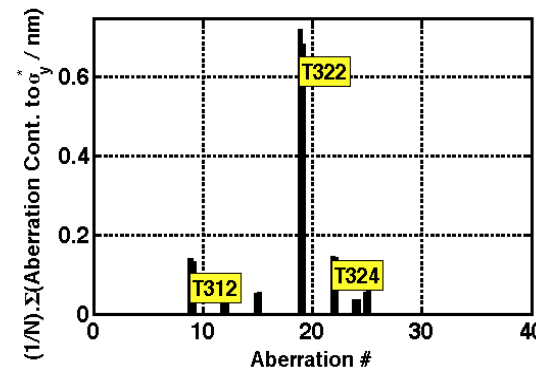
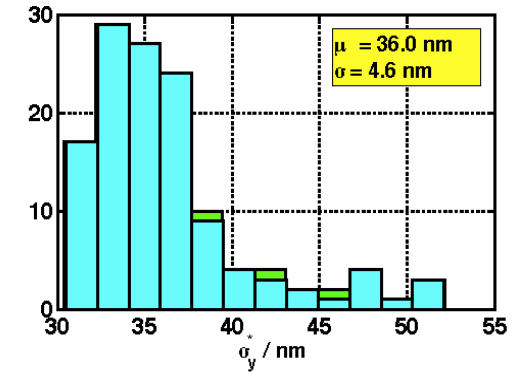
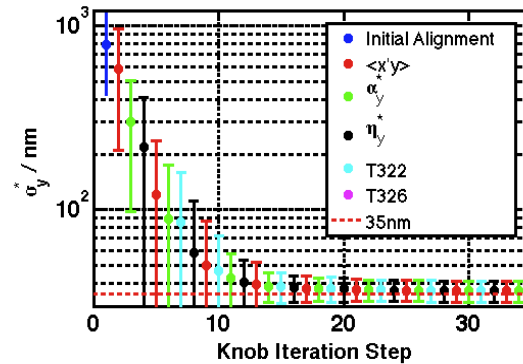
Green ; 2013 May with QK correction

Pink ; 2013 May with QK correction
with CCD tilt correction

Terunuma
Okugi

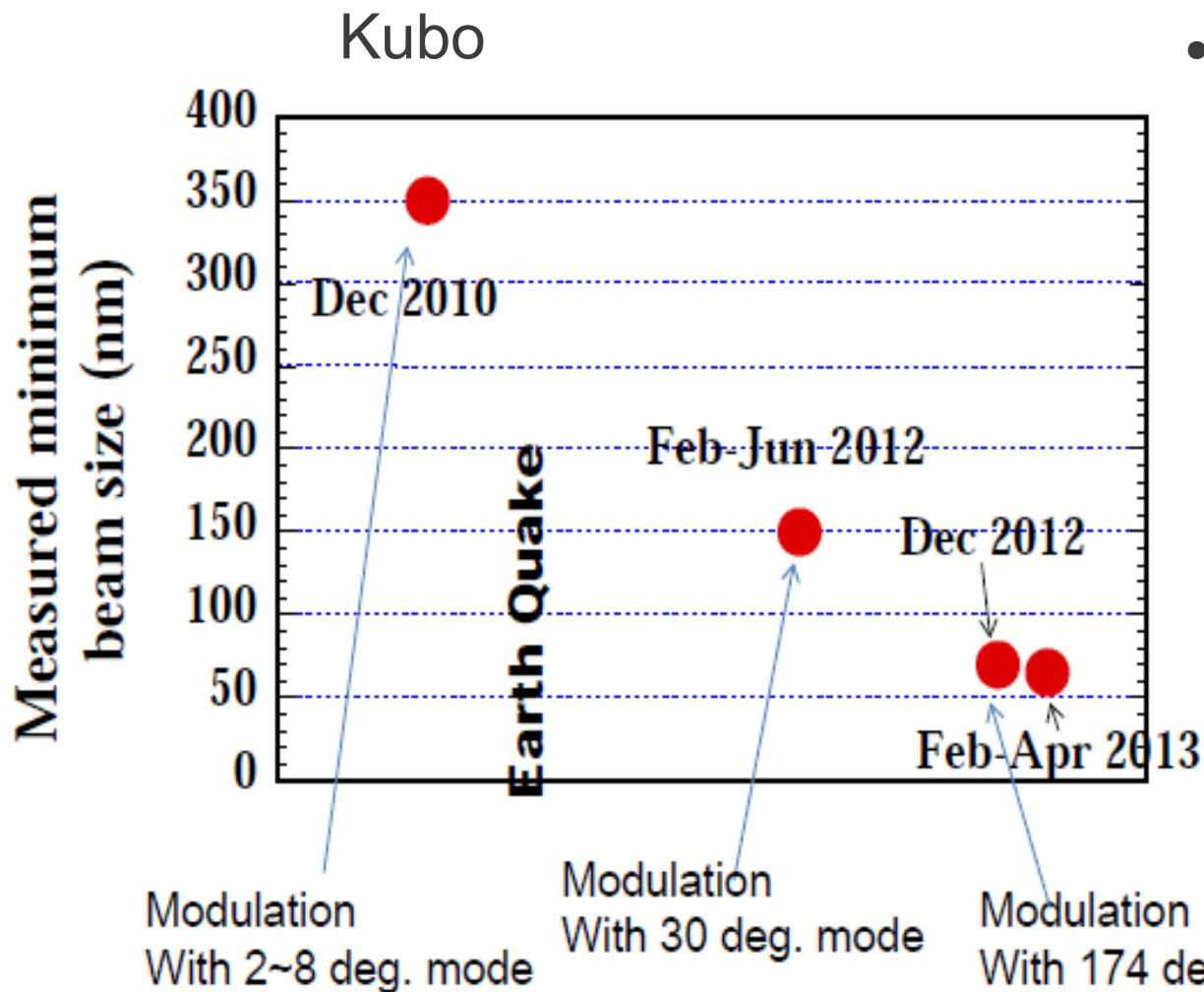
Optics & tuning

“Multipole components **beyond tolerance...**
QF1 replacement... larger β_x^* ... eventually return
to the **original demagnification...** detailed and
realistic **Monte Carlo** simulations... several
simulation codes”



Goal 1: 37 nm

- Reached 64 nm
- Tuning from ~ 3000 nm
- Suppression of aberrations confirmed to about $\sim 90\%$
- Bunch charge $\sim 10^9$ e-!!



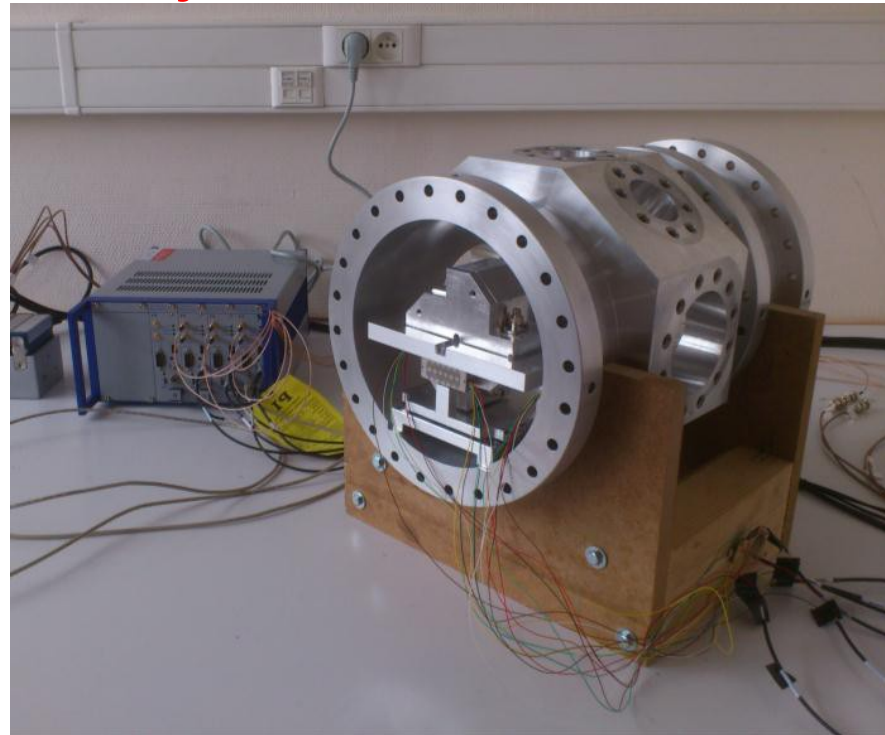
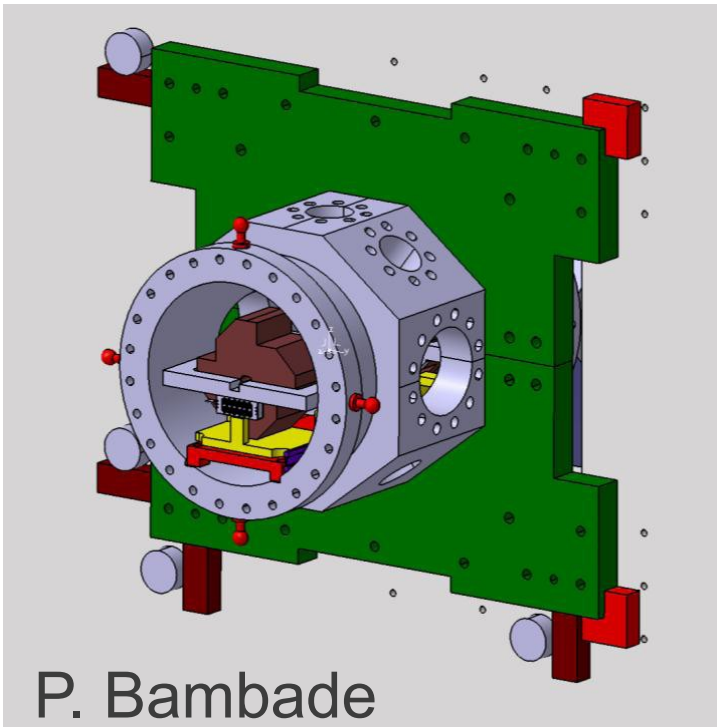
- “...**successful demonstration of the compact final focus optics and both the linear optics tuning and high-order aberration compensation schemes involved**”

Goal 2

- Goal 2 needs nominal bunch charge $\sim 10^{10}$ e-
- But this is seriously under threat by the “wakefield” problem → This needs special attention (**Goal 3?**)
- “There is a danger that the program becomes a demonstration of nm BPM technology... more details are needed... what exactly will be measured and quantified.”
- “...kicker and feedback systems (**FONT**) have already been successfully demonstrated.”
- “Catalog of the ILC-related feedback issues that are different... and a clear indication of how each one can be demonstrated at the ATF2 experiment should be made”

New IP chamber

“The committee notes that the new IP chamber due for installation in the summer is a **major addition...**”



“Initial calibration maintained... long calibration process... significant risk... stable temperature... should **not jeopardize** progress towards Goal 1.”

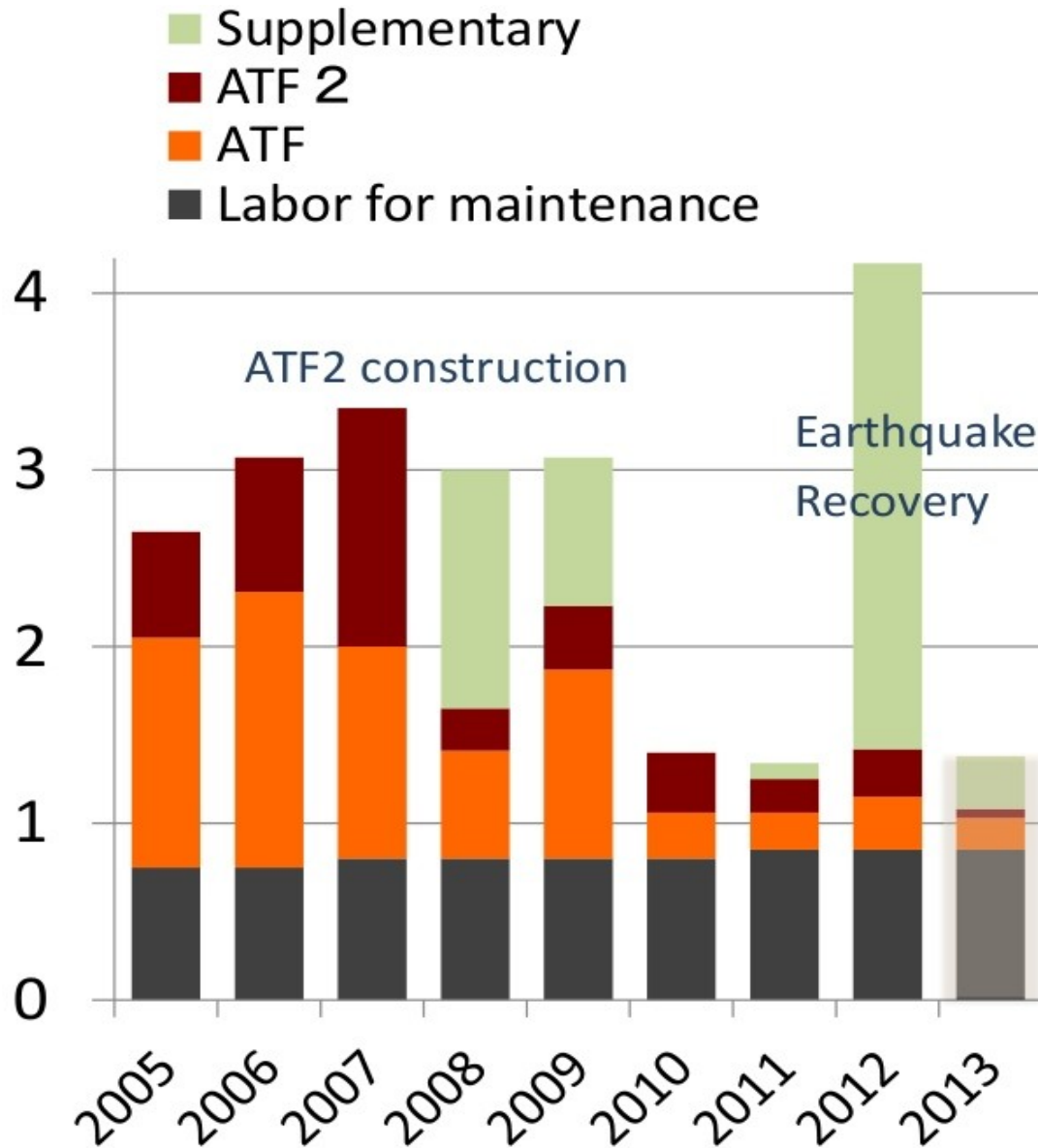
IP Jitter

- Lowest measured beam size was $\sigma = 64$ nm when ideal $\sigma = 48$ nm
- This gives an upper bound for the jitter of

$$IP_{jitter} < \sqrt{64^2 - 48^2} = 44 \text{ nm}$$

“Moving high resolution BPMs to a location upstream (exit of the EXT line) would aid in separating injection from FFS **jitter sources**. Installation of **vibration sensors** would further help characterization of jitter sources by separating mechanical (i.e. vibration) from wakefield driven sources.”

Severe budget cut



“The committee would like to urge the KEK management (and the collaboration in general) to further support this important and valuable program, and to try where possible to find additional funding.”

Recommendations for the ATF2 future

Beyond the existing (GDE) ILC goals... The plans for the **ultra-low beta* optics** should be pursued. Although the committee recognises this is being driven by a **CLIC** demonstration, these parameters are clearly also useful for any linear collider, including ILC. The more demanding vibration suppression and **ground motion measurement** will equally provide additional margin for ILC.

A further ILC-specific programme would be to reconsider the tests of the **superconducting final doublet**. This is a critical component for ILC, and the ATF2 offers the only true possibility to measure the magnetic field vibration at the required level.

Congratulations & Thanks

“Overall the committee was impressed with the progress made towards achieving the goals and would like to congratulate the ATF2 collaboration for their achievements.”

“The committee would like to thank our KEK hosts and all the ATF2 collaborators for a well-organized and enjoyable review.”