



# ILC-HiGrade Scientific and Annual Meeting

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## WP8 – Tuner Status

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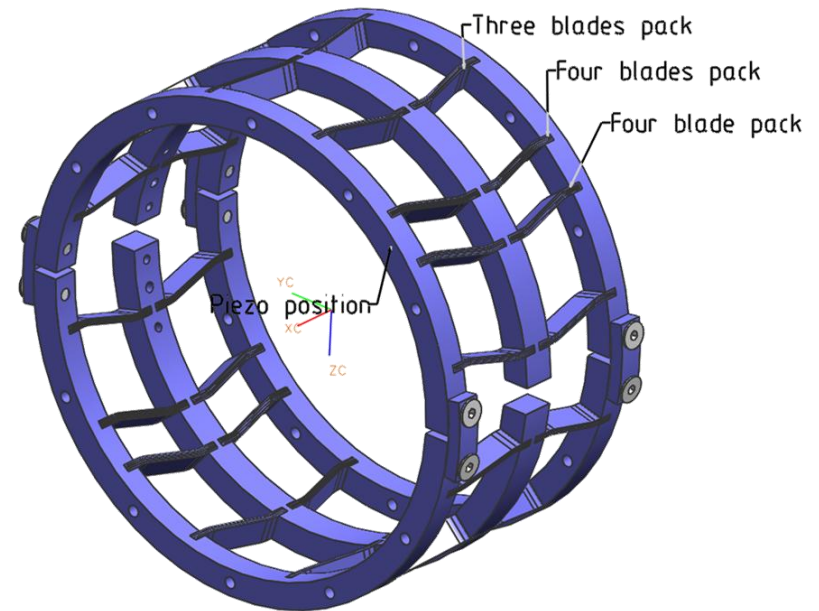
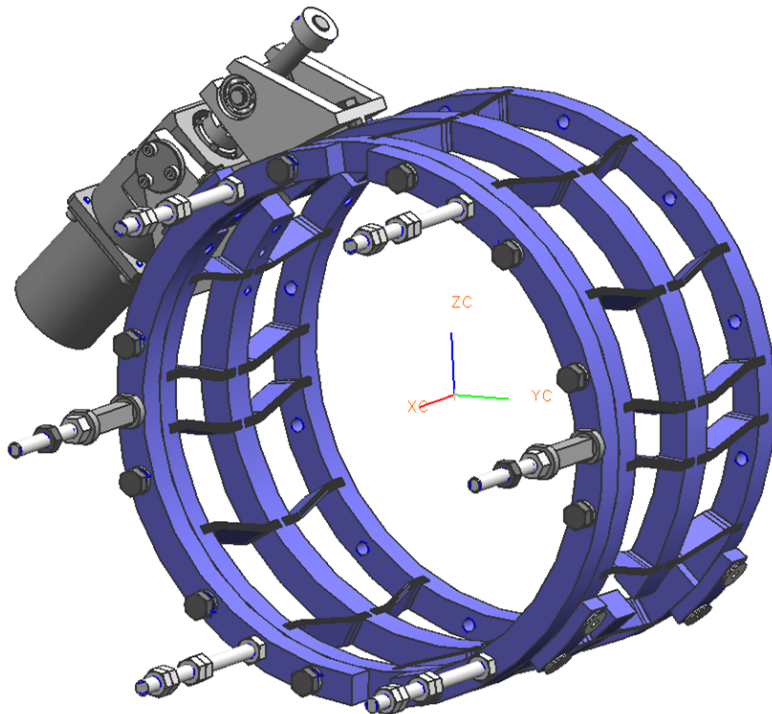
- Intro/Overview
  - The ILC Blade Tuner
  - R&D and Production so far
- Current status
  - Update from ongoing Blade Tuner tuner activity worldwide
  - Final HiGrade production
- EU
  - Budget profile, reporting etc.



# From prototypes to the ILC Blade Tuner

By 2008, the prototyping phase of the tuner development could be considered as positively concluded.

The experience gained converged in the final revision of Blade Tuner design.



The tuner is designed to address and fulfill all the XFEL and ILC specifications:

- LFD compensation with significant performance margin, for affordable high gradient operations.
- Increased tuner strength to satisfy ASME safety codes, both in compression and in traction.

Overview of R&D and Production results in the ILC-HiGrade framework:

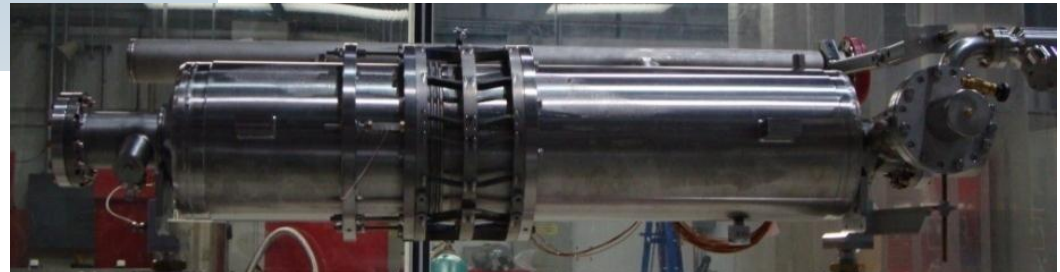
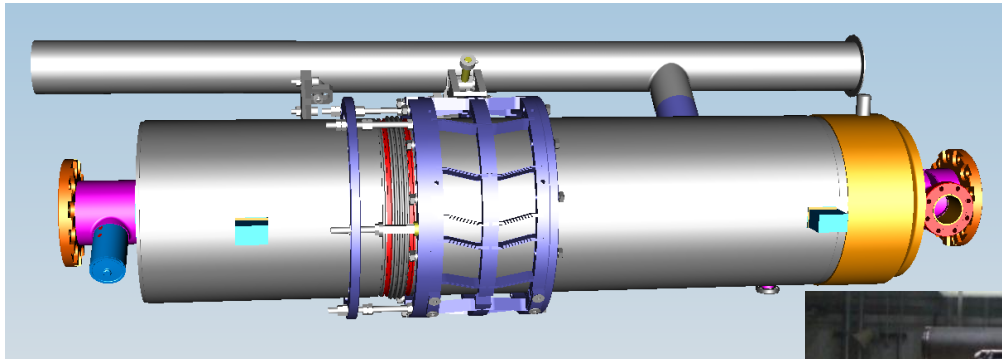
- **2008:** - first light tuner prototype cold tested at DESY and BESSY  
- Blade Tuner design finalized, through test and FEM simulations
- **2009:** - 8 units produced at Zanon, RT acceptance test done at LASA  
- 6 units shipped to FNAL for CM2, 2 to KEK for S1-Global  
- first single-cavity cold tests at FNAL-NML  
- mid-term D8.2 deliverable issued.
- **2010:** - ILC Blade Tuner successfully cold tested at BESSY  
- tuner manufacturing procedure deeply reviewed jointly with Zanon  
- 8 units produced, 2 shipped to FNAL for CM2  
- more single-cavity cold tests at FNAL-NML  
- first cryomodule/cavity-string test at KEK



# Blade Tuner worldwide / 1: Fermilab

The second cryo-module for the ILC-TA facility at Fermilab is fully equipped with Blade Tuners:

- A joint effort of INFN and FNAL teams: these cavity units with Blade Tuner include an adapted helium tank design, new magnetic shielding and MLI wrapping design.
- All the tuners have been procured and the cavity units have been prepared at FNAL. Several cold tests in horizontal cryostat (HTS) have been experienced so far.
- CM2 cavity string is currently under preparation, cryomodule cold test soon to come.
- FNAL will continue Blade Tuner production for the further incoming cryomodules.

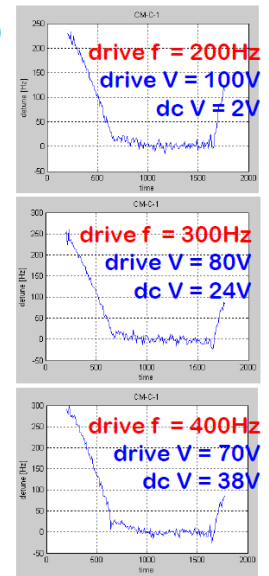
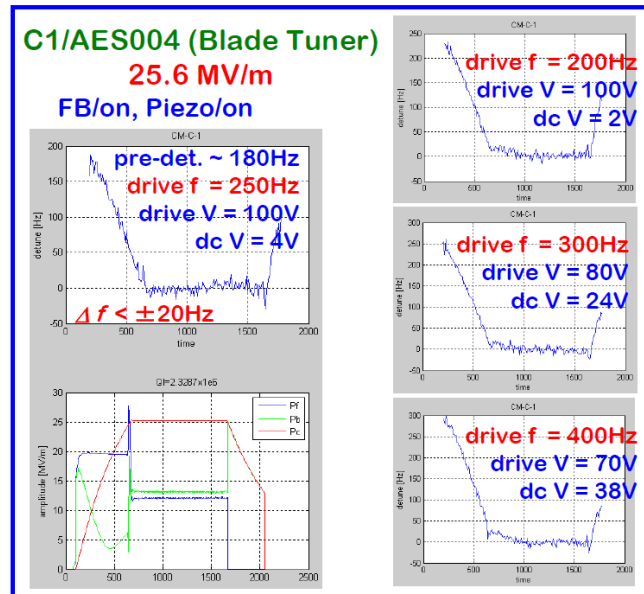
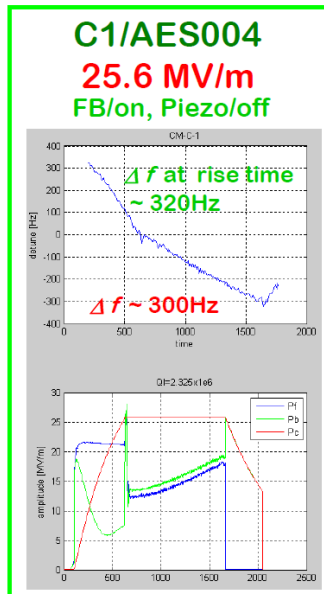




# Blade Tuner worldwide / 2: KEK

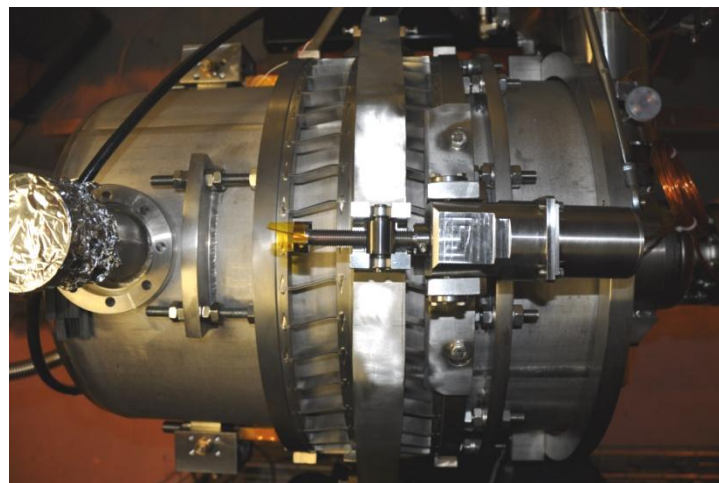
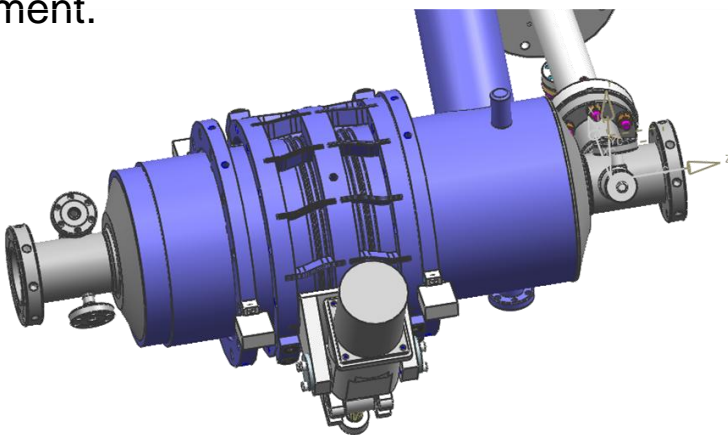
The ILC S1-Global project in KEK (Japan):

- Demonstration of effective cryo-module operations at the ILC goal gradient. Realization of an actual comparison of different cavity and cold tuning solutions, a step toward the concept of plug-compatibility.
- Two cryomodules simultaneously cold tested (A and C), both with special 4-cavities string. Cryomodule C hosts two cavity units from FNAL equipped with Blade Tuner.
- Large data set collected through several CW and pulsed test sessions in 2010. Blade Tuner proved to fulfill both static and dynamic detuning compensation requirements, detailed report under writing and soon to be released.



Currently the activity related to Blade Tuners is spreading on different topics. Here's an update:

- A collaboration has been proposed, in the framework of EuCARD2, with HZB, IPNO and CEA devoted to the development of the Blade Tuner design for the heavy-HOM-dumped cavity in high-current CW linacs.
- Successful cold test has been conducted on March 2011 on a 5-cell proton beta=0.47 cavity at CEA Saclay. The cavity, also realized by INFN Milano, was equipped with a special version of coaxial Blade Tuner with piezoelectric actuators.
- INFN Milano is also in charge of the realization of the third-harmonic injector section for the X-FEL. In this frame a special rescaled coaxial Blade Tuner for 3.9 GHz cavities is under development.



# Toward HiGrade end

- As of today, the long call-for-tender procedure for the HiGrade 24 units set is over.
- Production at Zanon is on the way, delivery expected by January 2012.
  - For the last produced set Zanon procured and install a set of special tooling machines devoted to Blade Tuner manufacturing and required by the revised machining procedure developed. These parts are now already available with a positive impact on costs and delivery time.
- “Demonstrate suitability of tuner design”, one of the objectives for HiGrade WP8, has been thoroughly achieved:
  - Intense activity on specimens tests, prototyping and analyses before design finalization
  - Several cold test performed in different scenario and various laboratories worldwide
- The “cost-effective design” claimed by HiGrade as one the key ILC directives has been also achieved:
  - Deep revision of production procedure jointly developed with EZ.
  - 16 units manufactured so far.







# EU

- Including the payment of the final HiGrade tuner set, we expect to boost the spending profile (though not flat) and sum up enough eligible costs in order to apply for the total EC contribution.
- Deliverable D8.3 due at the end of the project fulfilled with tuner fabrication. Final reports writing on going.
- Audit certificate not provided so far (not required). It should be provided for this final budget reporting.

		year 1	year 2	year 3	year 4*	Total	TARGET
Personnel	RTD (A)	47046.38	62615.20	25935.08	80000.00	215596.66	175000
	COORD (B)			53214.01	20000.00	73214.01	70000
	SUPP (C)	7807.18	20949.88	37957.98	10000.00	76715.04	70000
	total - direct	54853.56	83565.08	117107.07	110000.00	365525.71	315000
	<b>total (OH)</b>	<b>87765.70</b>	<b>133704.13</b>	<b>187371.31</b>	<b>176000.00</b>	<b>584841.14</b>	<b>504000</b>
Other costs	RTD (A)	32756.08	24934.13	11770.03	130000.00	199460.24	480000
	total - direct	32756.08	24934.13	11770.03	130000.00	199460.24	480000
	<b>total (OH)</b>	<b>52409.73</b>	<b>39894.61</b>	<b>18832.05</b>	<b>208000.00</b>	<b>319136.38</b>	<b>768000</b>
<b>Audit</b>	<b>Audit</b>				<b>2000.00</b>	<b>2000.00</b>	<b>2000</b>
<b>TOTAL</b>		<b>140175.42</b>	<b>173598.73</b>	<b>206203.36</b>	<b>384000.00</b>	<b>903977.52</b>	<b>1274000</b>
<b>To EC</b>	<b>Max. Contr.</b>	<b>104116.64</b>	<b>127475.57</b>	<b>142800.16</b>	<b>284100.00</b>	<b>658492.36</b>	<b>652900</b>

\* Year 4 figures are zero-order projections from expected costs