

Brief Summary of three (3) Blade Tuner Cold Tests in HTS

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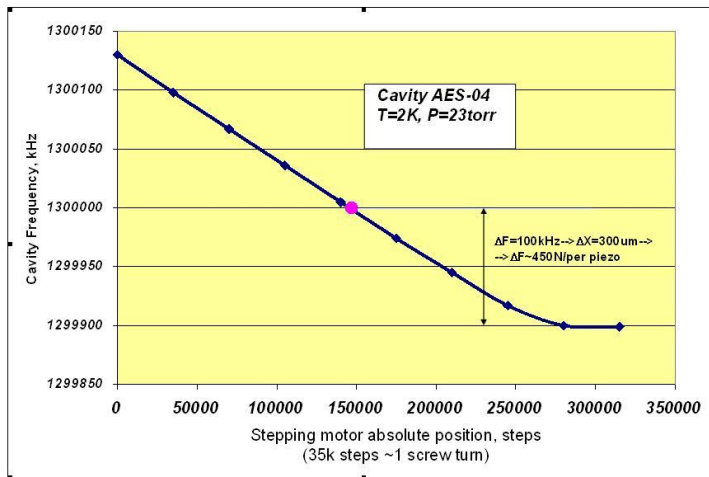
Timergali Khabibouline

Test #1

S1Global cavity (AES-004)

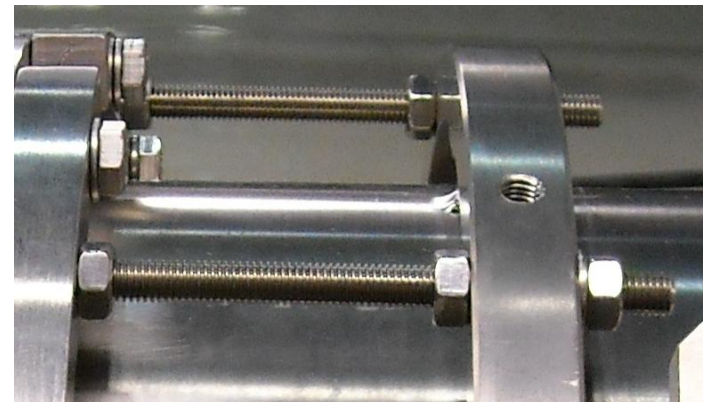
– S1Global cavity (AES-004) test :

- Blade Tuner – from Milan
- Slow Tuner –OK



- Fast/piezo tuner test failed
- Why?

*(We assumed, during installation at HTS wrong setting of clearance between nuts & flange on the safety rod \rightarrow piezo worked against 4 SS safety rods instead of cavity.
We have no chance for second thermo-cycle...)*



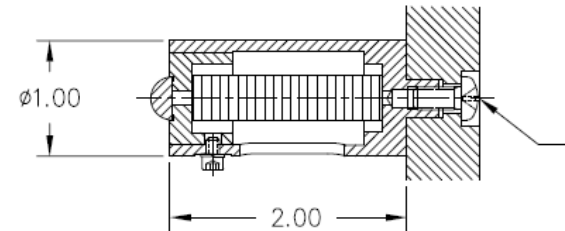
Test #2

AES013 test

TBAES013 has been equipped with Milan Blade Tuner.
At the same time piezo holder has been changed.



Milan style- "open piezo holder"



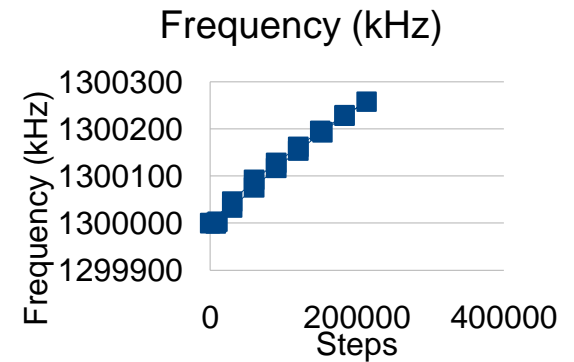
FNAL style – "encapsulated piezo holder"

MAIN OBJECTIVE: TO AVOID SHEARING FORCES ON PIEZO

Test #2

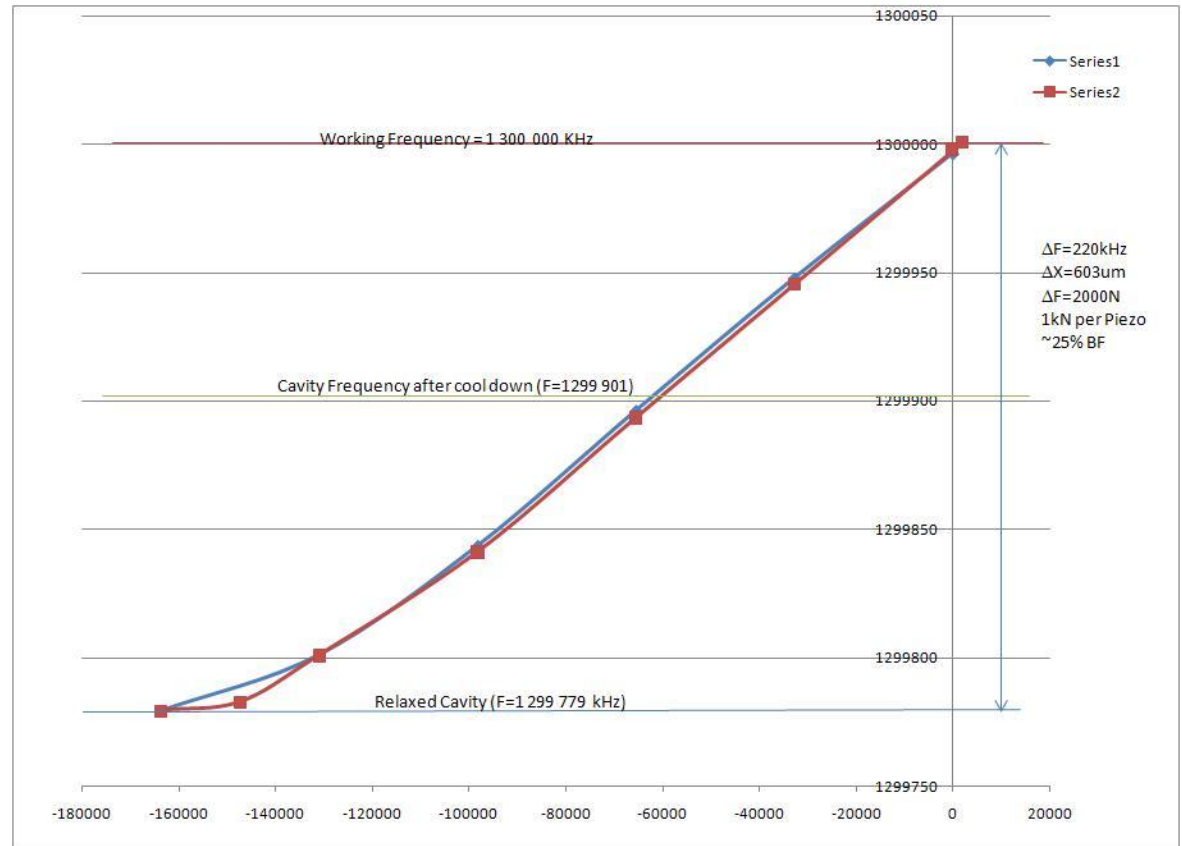
AES013 test

Slow Tuner Performance



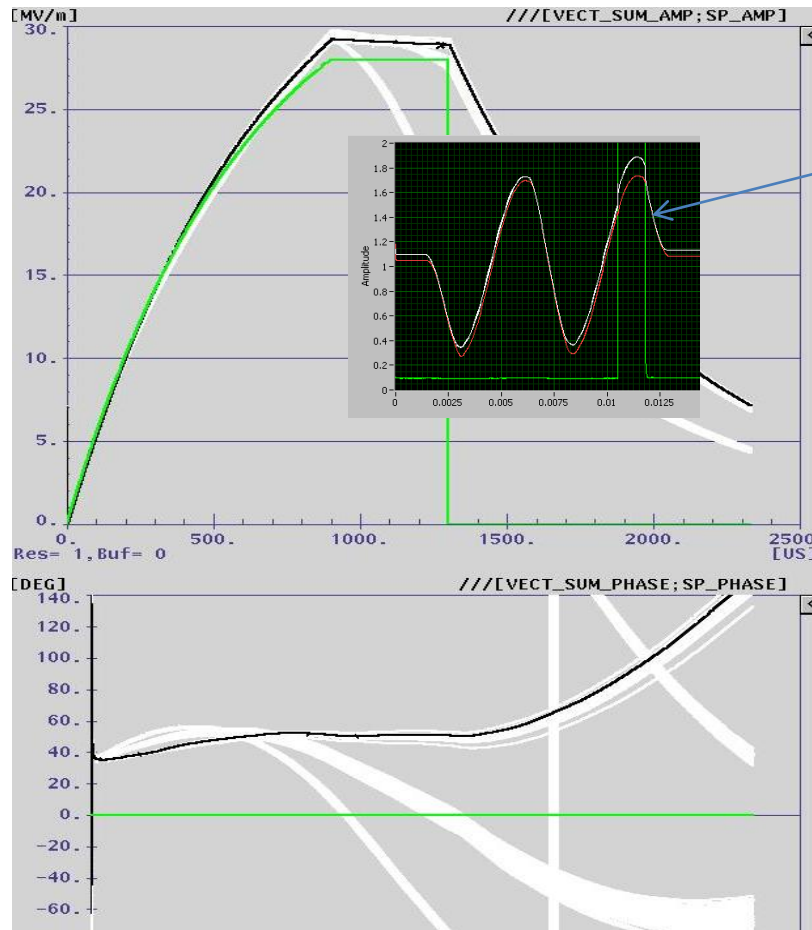
Warm cavity tuned approximately 0.2 MHz higher than INFN recommendation

Tuner range (~500kHz) and cold piezo preload (~25% of Blocking Forces) still acceptable



Test #2
AES013 test
FAST TUNER PERFORMANCE

LFD Compensation at $E_{acc}=33\text{MV/m}$
Manual adjustment of pulse parameters
to keep cavity phase flat during “Flat-Top”



V_{piezo} p-to-p ~150V

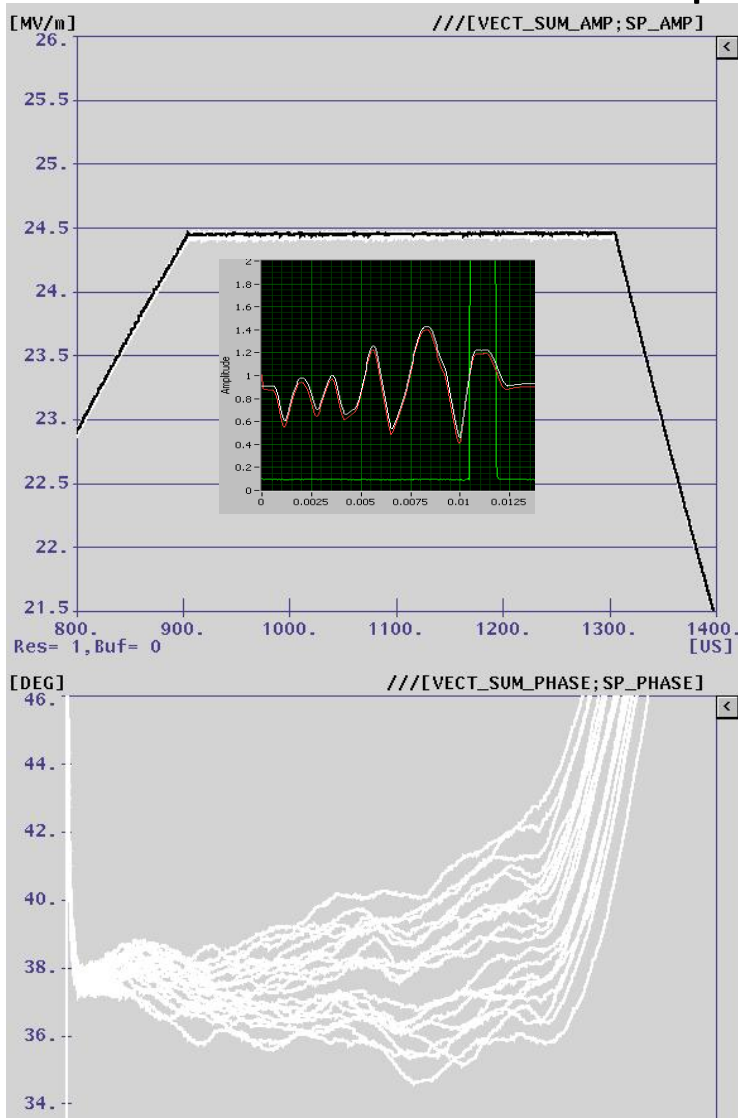
Appears that high gradients
might require piezo with
longer stroke

Test #2

AES013 test

FAST TUNER PERFORMANCE

LFD Adaptive LS Compensation



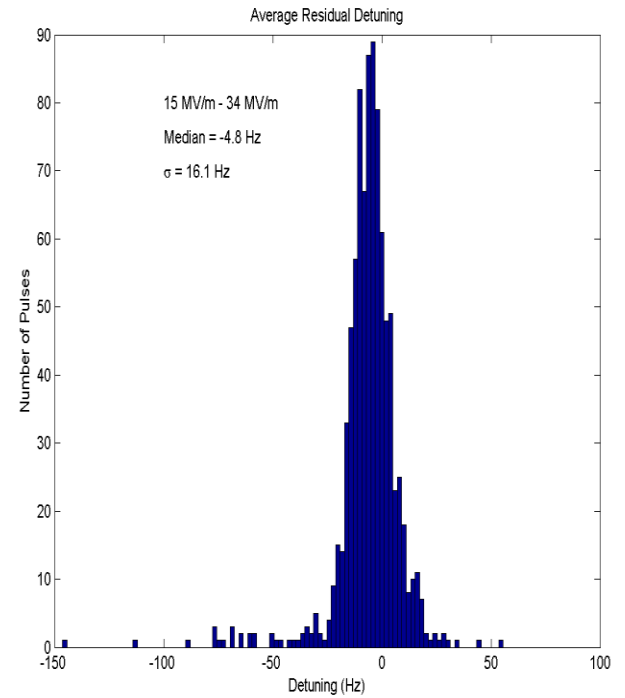
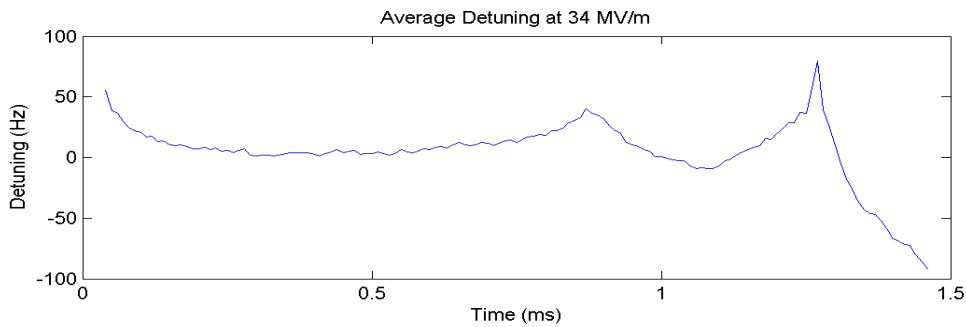
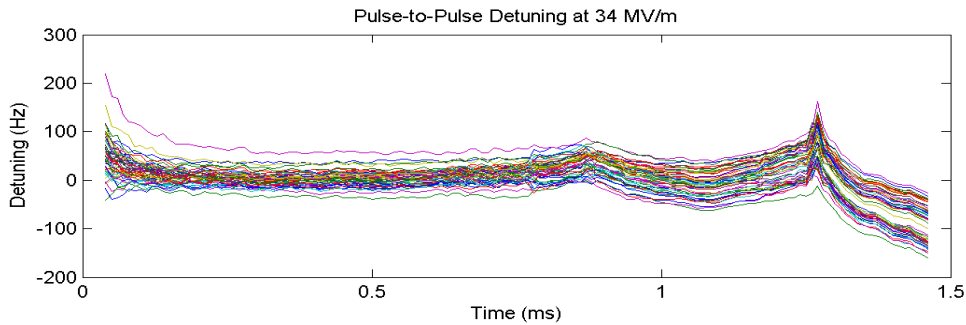
- Implemented an adaptive version of the LS procedure that worked successfully in CCII
- Able to maintain flat phase during both fill and flattop
- Able to track the resonance as cavity was ramped down from 15 MV/m to 35 MV/m and back up again (movie)

Test #2

AES013 test

FAST TUNER PERFORMANCE

Cavity sensitivity to Piezo Voltage: 11Hz/V



Test #3

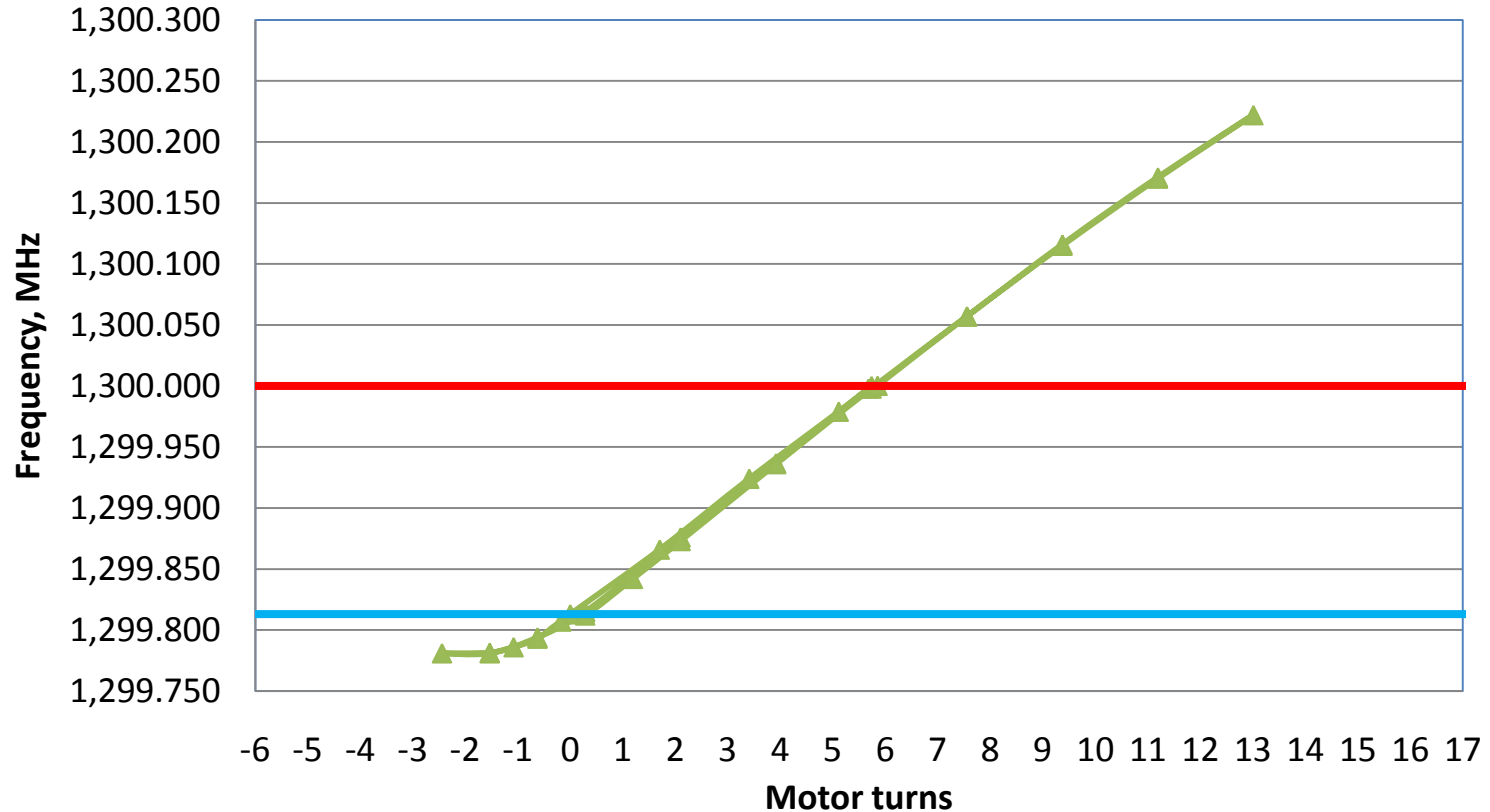
AES009 test

Slow Tuner Performance

TBAES09 has been equipped with Blade Tuner build at the USA.
Piezo holder was FNAL style.

AES09 motor range

▲ motor range measurement — goal frequency — cool down frequency



Test #3
AES009 test
FAST Tuner Performance

PROBLEM: Cavity sensitivity to Piezo Voltage: 3,5Hz/V
3 TIMES LESS THAN EXPECTED

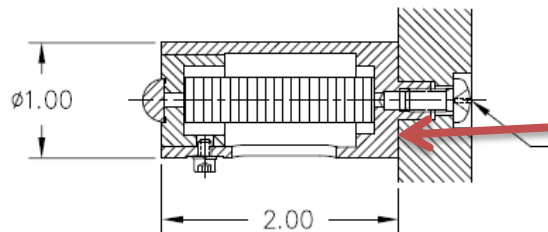
As a result at maximum voltage on Piezo (200V) we was not able to compensate LFD for gradient more than 25MV/m...



Why?

What is different from AES013 test ?

Is this effect of “lock tight adhesive”
which has been applied to screw?



We have observed very thing layer of
Adhesive on the surface of holder.

Summary (1)

- Tuner test system successfully commissioned and operational
- Preliminary assessment of blade tuner performance is very positive
 - Able to limit detuning at 35 MV/m to less than about 50 Hz during both fill and flat-top (we are sure that we could do it better)
- We are still “on the learning curve” ...
- Development on QA procedure during tuner assembly and testing is under development...

Summary (2)

- Fast Tuner may require piezo with longer stroke=longer length
 - Need to collect more experimental data
 - DESY experience – cavities LFD sensitivity coefficient distribution quite broad ... (2 times)
 - For AES013 at 35MV/m to compensate LFD
Apiezo~150V
 - Would have no impact on tuner design (for piezo up to 60mm long)