

The statistics of industrial XFEL cavities fabrication at E.ZANON

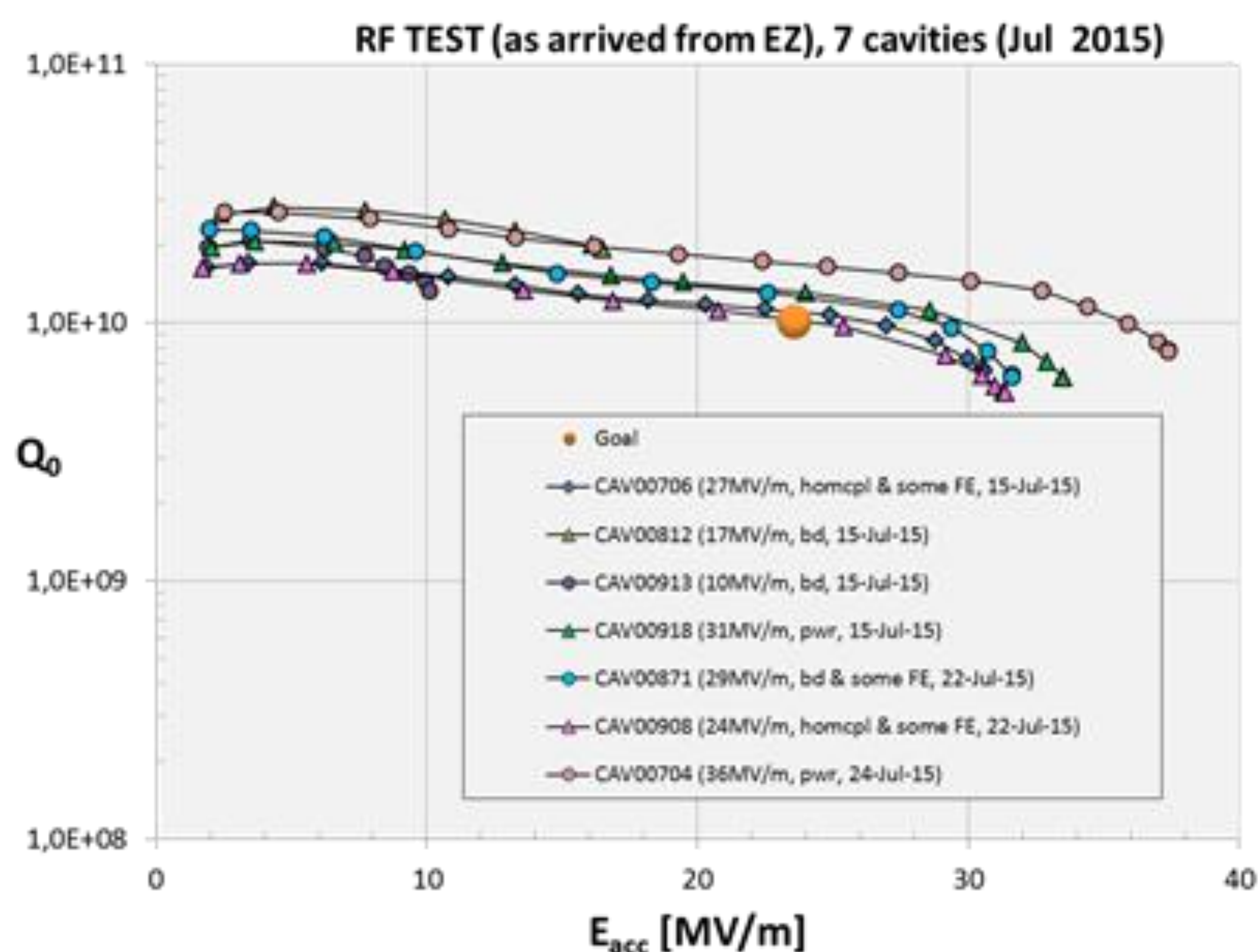
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Abstract

Serial production of the superconducting cavities for European-XFEL will be completed at E.ZANON by the end of 2015. For that reason we can summarize the results and present the statistics of industrial cavity fabrication. Many parameters have been traced during different steps of cavity production. The most interesting of them, as cavity length, frequency, field flatness and eccentricity, are presented and discussed.



RF Characteristics: Frequencies / Field flatness

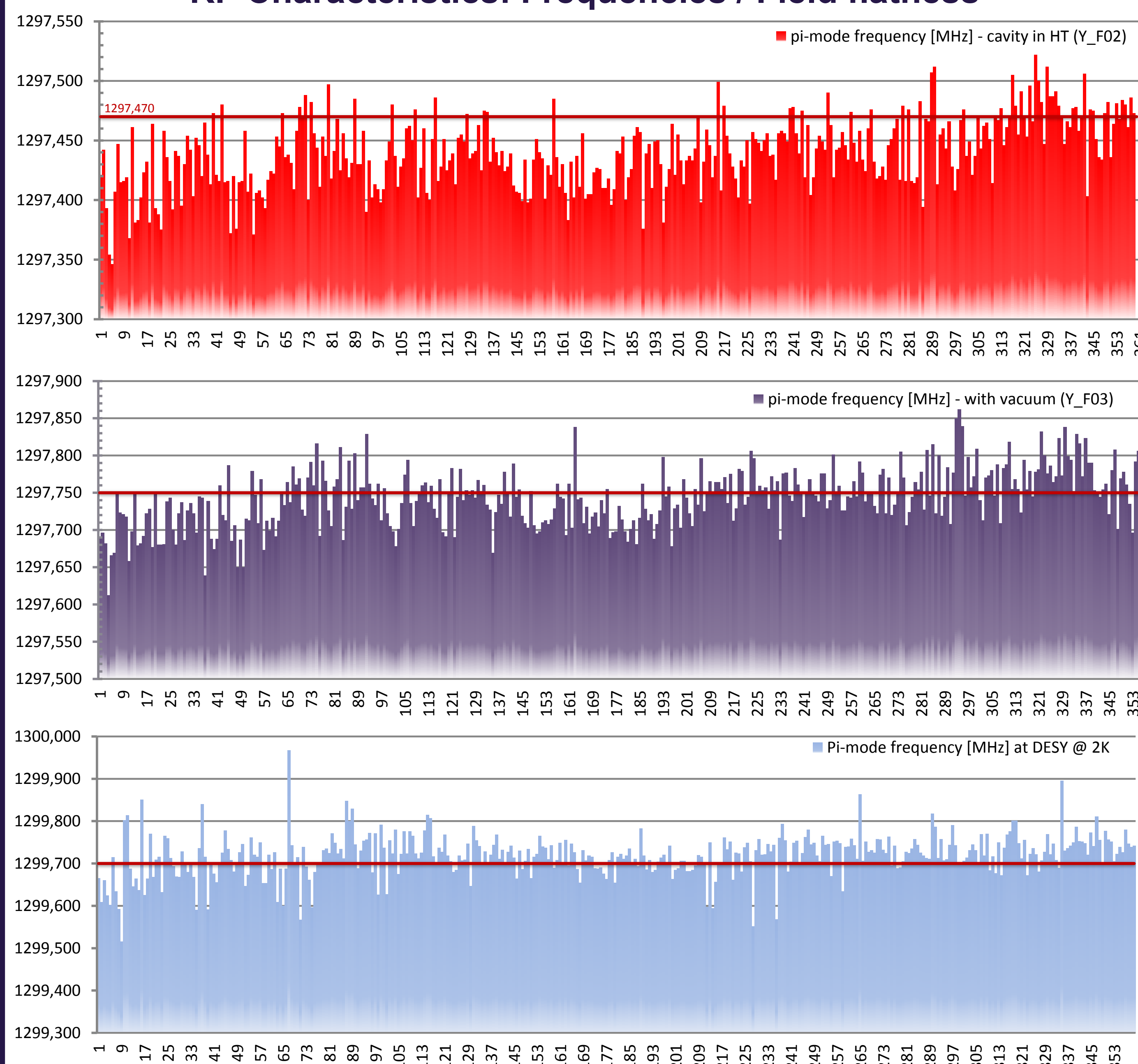


Figure 5: Pi-mode frequencies at different conditions

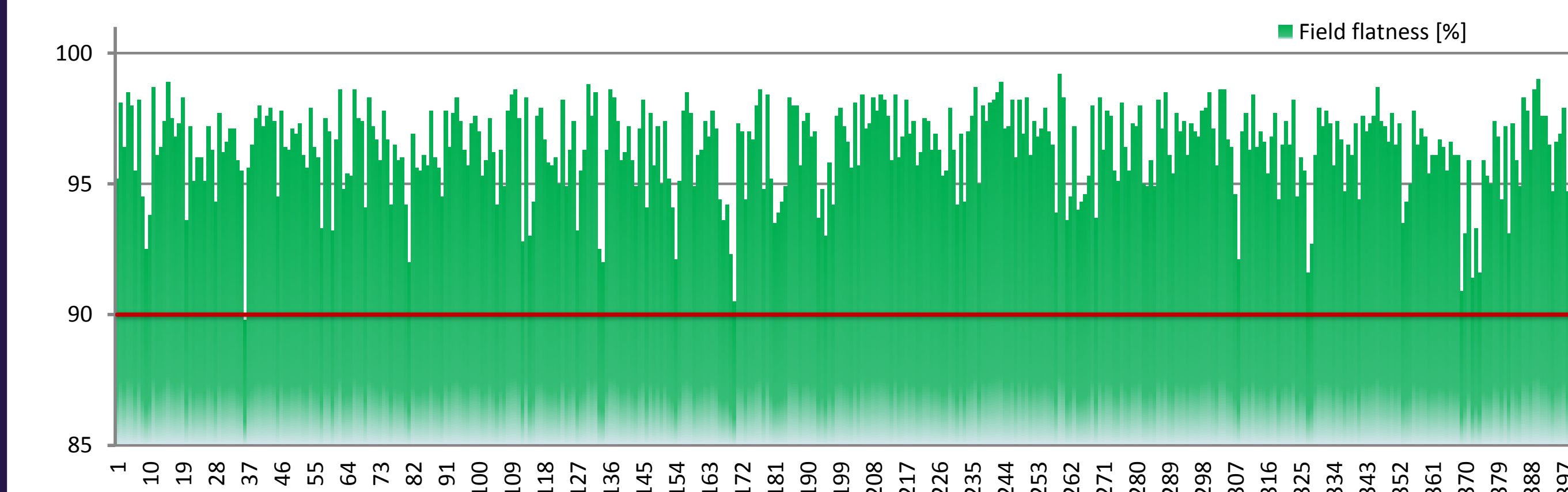


Figure 6: Cavity field flatness at TM010 pi-mode before BCP

Mechanical Characteristics: Shrinkage / Length / Eccentricity

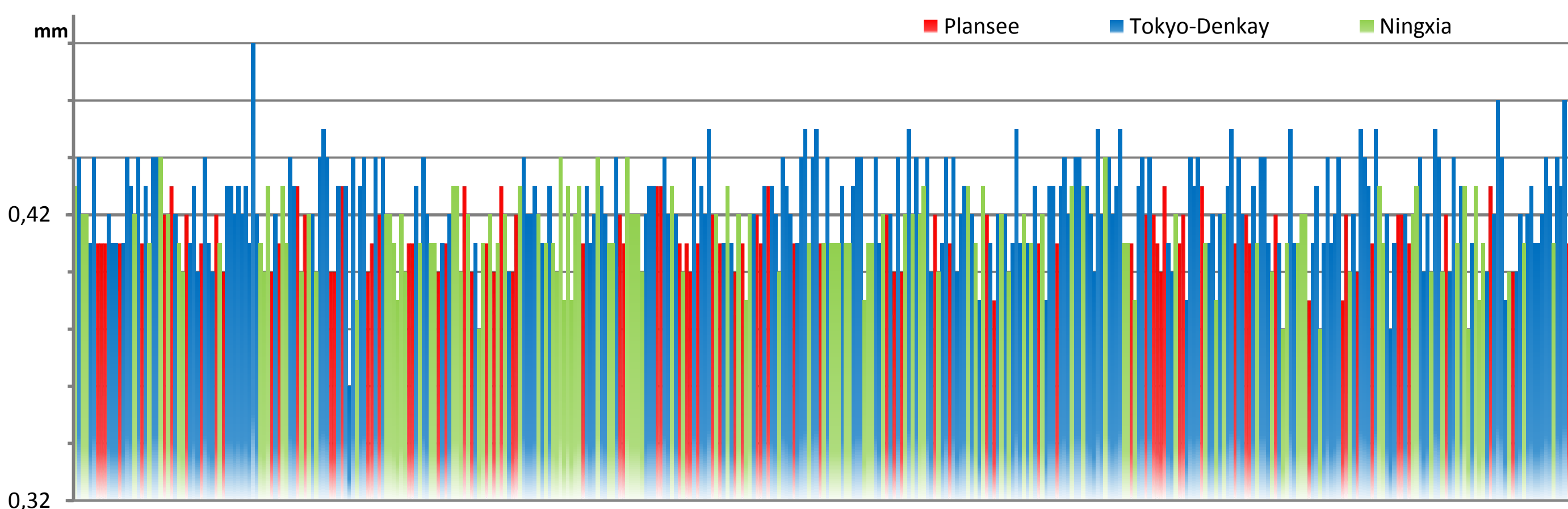


Figure 2: Shrinkage of equator welding seems for different materials

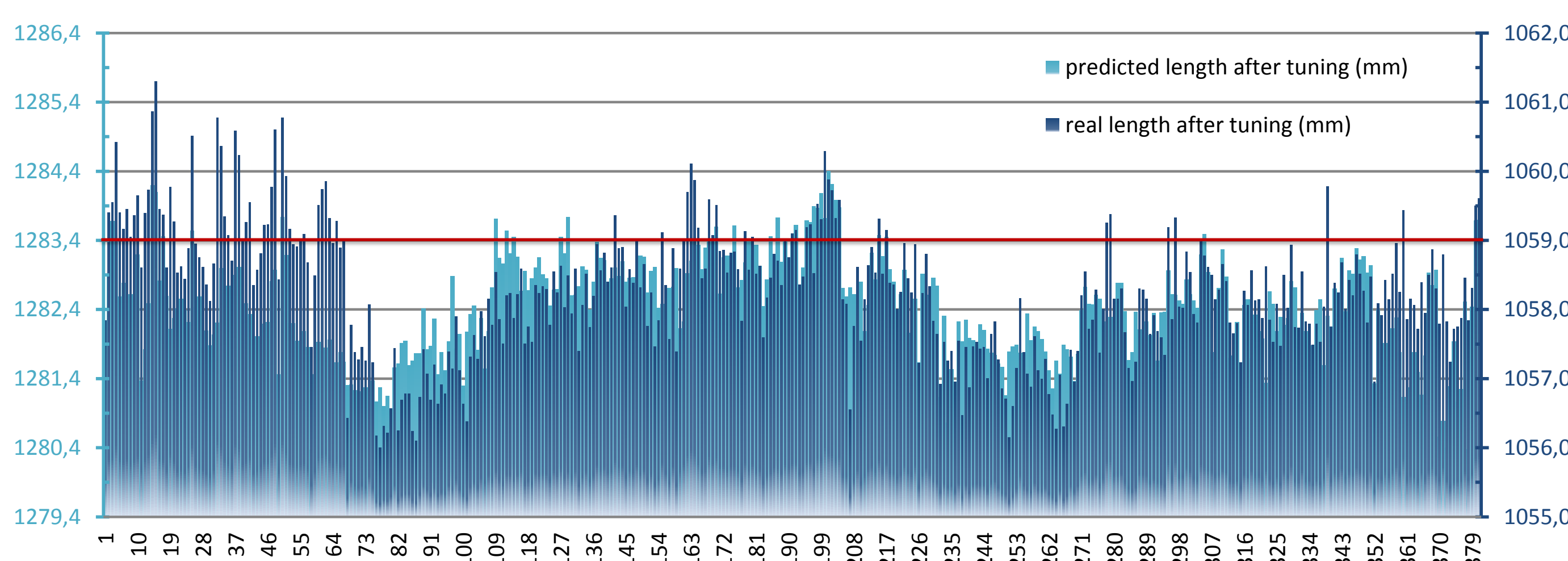


Figure 3: Predicted (light blue) and real (blue) cavity lengths

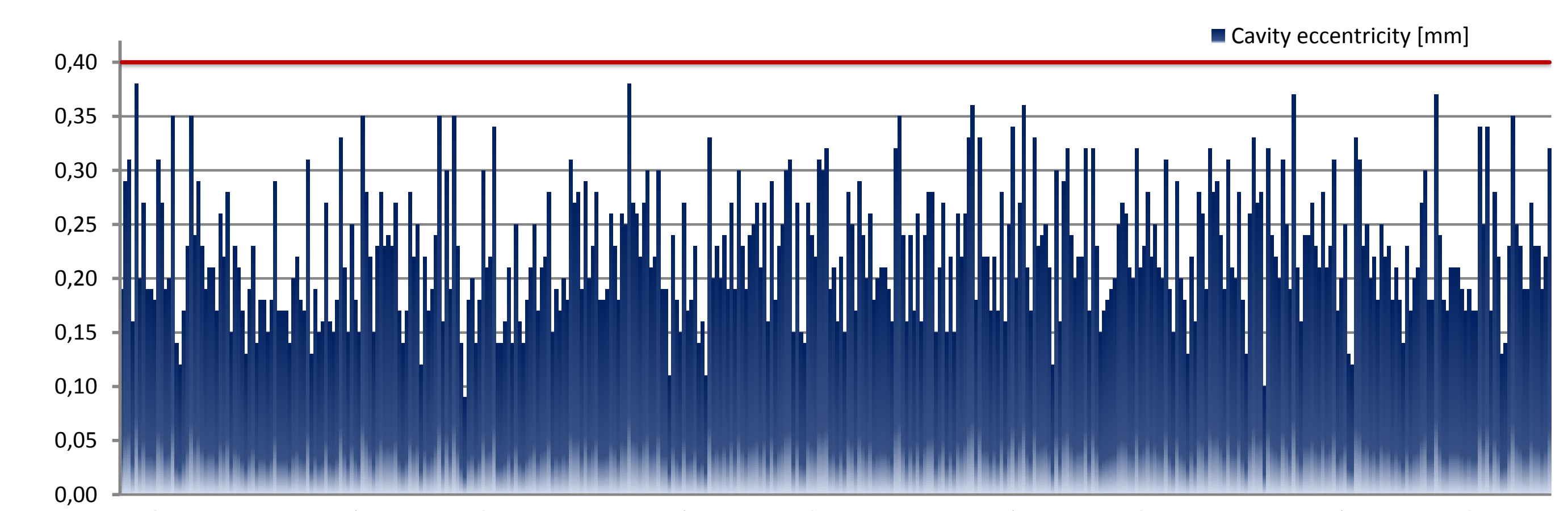


Figure 4: Maximal value of cavity eccentricity before welding in helium tank

Summary

By the end of 2015, E. Zanon will finish the cavity production for XFEL Project. The main results of the statistics analyzes are:

- average shrinkage of cavities is (0.419 ± 0.015) mm. For Tokyo Denkay material (0.43 mm) it is 0.02 mm higher than for Plansee and Ningxia;
- average length between reference rings of produced cavities is 1058.24 mm, as required by DESY;
- real cavity lengths are very close to predicted values;
- average maximal eccentricity value for cavities is 0.2 mm. So the cavities are twice straighter than it's limited by XFEL specification;
- after the cold measurements results for pre-series cavities the pi-mode frequency was increased, correcting the target values during the tuning;
- average field flatness of produced cavities before final BCP is 96 % (over required 90 %).

References:

- [1] A. Sulimov et al., "Description and First Experience with the RF Measurement Procedure for the European XFEL SC Cavity Production", 2nd IPAC'11, San Sebastian, Spain, 2011, pp. 277-279.
- [2] A. Sulimov et al., "First RF Measurement Results for the European XFEL SC Cavity Production" Proceedings of LINAC2012, Tel-Aviv, Israel, 2012, pp. 195-197.
- [3] http://xfel.desy.de/cavity_database/