Contribution ID: **32** Type: **not specified**

Development of direct measurement techniques for the in-situ internal alignment of accelerating structures

Wednesday 22 March 2017 10:15 (25 minutes)

In the framework of the PACMAN project we have developed a test set-up to measure the electromagnetic center of high gradient accelerating structures for alignment purposes. We have hypothesized with previous simulation studies that a resolution of 1 mm is possible using a stretched conductor wire along the structure and a network analyzer to detect the minimum perturbation when the wire is in the center of a dipole mode at 17 GHz. The calibration of the set-up, the equipment instrumentation and data acquisition software allows the measurement of the electromagnetic center, with a final precision and accuracy on the micron level. The absolute position of the structure with respect to the wire is measured in the environment of a coordinate measuring machine which has an uncertainty of 0.3 mm in order to gain accuracy in the alignment process of accelerating structures in the tunnel.

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Session Classification: Microwave Technology