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Title: High Speed  $\mu$ -Focus Computed Tomography on its way to industrial maturity

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Abstract:

Today  $\mu$ -focus computed tomography ( $\mu$ CT) plays only a minor roll as a method for high volume production testing in an industrial environment. Its main area of application is in research, prototyping and failure analysis.  $\mu$ CT has not yet reached high volume manufacturing/production test for several reasons. Two of key reasons are the timely effort of CT inspections and the costly automation of testing procedures.

The requirements for  $\mu$ CT are manifold. Inspection of samples from current production scenarios typically has to be achieved in less than 2 minutes. Quality of results must allow measurements with adequate accuracy. Furthermore results have to be repeatable and automatic testing procedures should be accomplished with small effort.

For several years Comet's Business Unit FEINFOCUS has concentrated its R&D resources on optimization of high resolution CT-systems concerning quality and inspection time. Comprehensive studies for different materials and products have been conducted and analyzed regarding dependency of results on different factors, such as the number of projections used. Detailed results will be presented for representative examples from automotive-and electronics-industry.

One of the key results of our research is that the dependency between image quality and duration of CT-scans is not proportional. Longer intervals for image integration - used to increase the signal-to-noise ratio of a single projection- as well as high numbers of projections do not necessarily lead to significantly better CT-results. For a wide portfolio of production test scenarios, sufficiently accurate CT results can be obtained at significantly lower test times. We will introduce a standard  $\mu$ CT system which enables  $\mu$ CT-scans in a minute cycle. This can be achieved through optimized synchronization between sampling frequency of the X-ray detector and the image acquisition software. Furthermore we speed up reconstruction of volume data by using special hardware. This new method enables the quality manager to extend the portfolio of testing procedures by  $\mu$ -focus CT and allows for the 3-dimensional analysis of significant number of samples at the production line.