

Simulation and measurement of chatter in diamond turning

[Marsh, E.R.](#) (Pennsylvania State Univ); [Yantek, D.S.](#); [Davies, M.A.](#); [Gilsinn, D.E.](#)

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Abstract: This paper considers chatter in diamond turning of aluminum. A nonlinear chip area model is developed for use with the classic single degree of freedom cutting model. The chip area model is formulated as a function of the change in depth of cut between consecutive passes. This function is shown to be highly dependent on the quadratic term when turning the diameter of cylindrical workpieces with round-nosed diamond tools. The cutting model is further extended to include an impact disturbance to the cutting process. The recent research in ultra-precision machining is incorporated to properly account for the rise in specific cutting energy at extremely light depths of cut. Simulations of the resulting tool displacement show close agreement with experimental measurements. (18 refs.) (Author abstract)