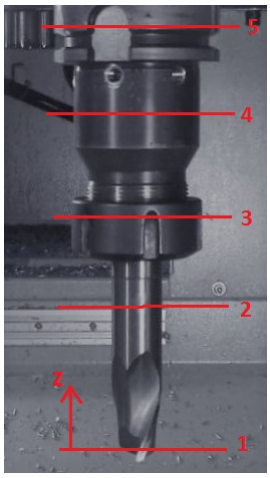
UBC MECH 592 - Machine tool Structures and Vibrations - Prof. Y. Altintas
Project III: Experimental Modal Analysis of an Endmill
Due date: Monday, 5 November 2018

The attached files (with $.frf$ extension) contain displacement Frequency Response Functions (FRF) of all 5 impact measurements that are done during the laboratory session. Below figure shows the approximate impact locations on the endmill that is tested. Measured from the tool tip in axial (z) direction, the approximate impact locations of the 5 points are 0, 55, 90, 130 and 165 mm. The vibration is measured at the tool tip (Point 1) by an accelerometer. The first column of each file is the frequency [Hz], second column is the real part of the computed FRF [m/N], and the third column is the imaginary part of the computed FRF [m/N].



Use hand calculation to calculate the following:

- From the previous Project 2, we know that there are 3 dominant natural frequencies (with large amplitude peaks) close to 1070 Hz, 1900 Hz and 2560 Hz. Do a simple curve fitting to find the natural frequencies, damping ratios and mode shapes of these 3 most flexible vibration modes. Discuss your results considering the limitations and advantages of the simple method.

Use CUTPRO V13 MODAL ANALYSIS software to calculate the following:

- Input each measurement to the software and setup the '1D Bar' type project.
- Select the useful peaks (natural frequencies). Discuss why you did such selection.
- Do a curve fitting (using the software) to the FRF graphs.
- Obtain the modal coefficients for each of the vibration mode that you identified using the software. Compare your hand calculation values to the values that you obtained from the software. Discuss the results.
- Obtain the mode shape for each of the vibration mode that you have identified. Compare your hand calculation values to the values that you obtained from the software. Discuss the results.