# Identification of acoustic parameters of wood

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**The aim of this study is to find a method for measuring individual mode shape in three axes for a complex vibro-acoustic analysis of wood.**

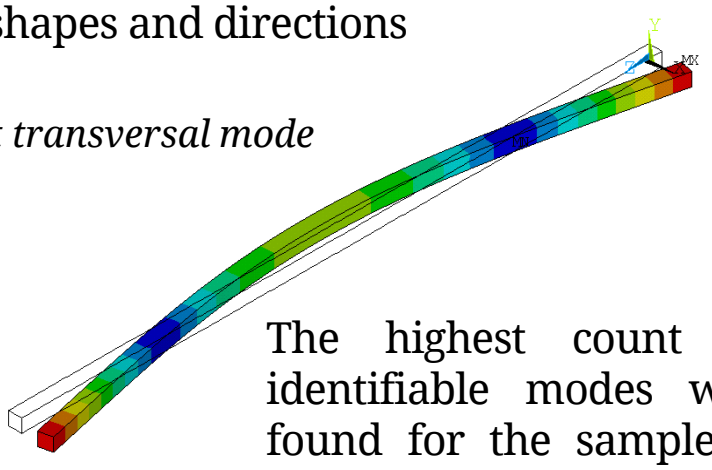
For simultaneous multisensoring measurement were used:

- Microphone Audix TM-1
- Laser vibrometer PDV-100
- Accelerometers KS94B.10

Modal analysis

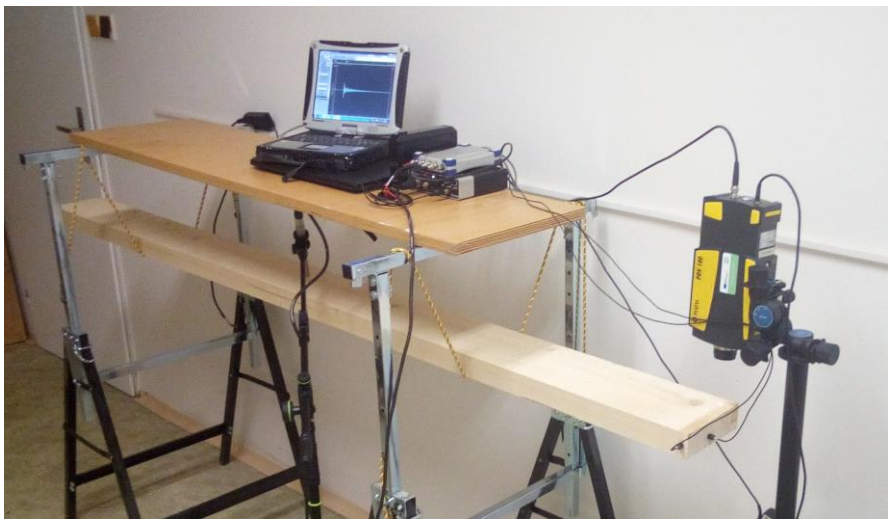
- Due to the one-axis sensors, frequencies were assigned to individual modal shapes and directions

*First transversal mode*

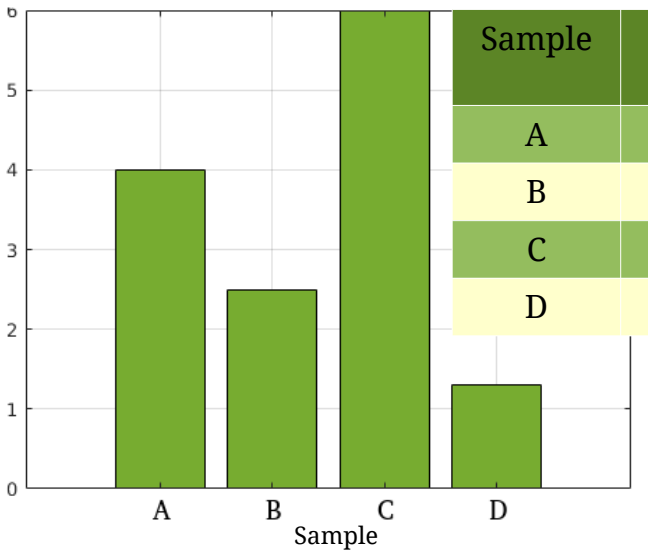


The highest count of identifiable modes was found for the sample C (long and thin)

Set up for measurement of frequencies and mode shapes of wooden beam



**Influence of dimensional ratio to the count of transversal mode**




| Sample | Dimension [mm] |
|---|---|
| A | 50x160x2400 |
| B | 20x64x960 |
| C | 50x50x2400 |
| D | 50x50x750 |

Natural frequencies compared between species. With rising frequencies and mode order are differences bigger. The main differences are in the longitudinal modes

| Species | Multiplicator of the first frequency | | | | | |
|---|---|---|---|---|---|---|
| **Spruce** | 2.73 | 5.20 | 8.32 | 23.42 | 46.90 | 70.60 |
| **Beech** | 2.73 | 5.31 | 8.63 | 24.11 | 48.28 | 72.23 |
| **Ash** | 2.71 | 5.20 | 8.40 | 23.21 | 46.52 | 68.84 |
| **Alder** | 2.71 | 5.18 | 8.32 | 22.55 | 45.17 | 65.67 |
| **Lime** | 2.71 | 5.18 | 8.40 | 24.71 | 51.21 | 73.90 |
| | 2. T mode | 3. T mode | 4. T mode | 1. L mode | 2. L mode | 3. L mode |

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