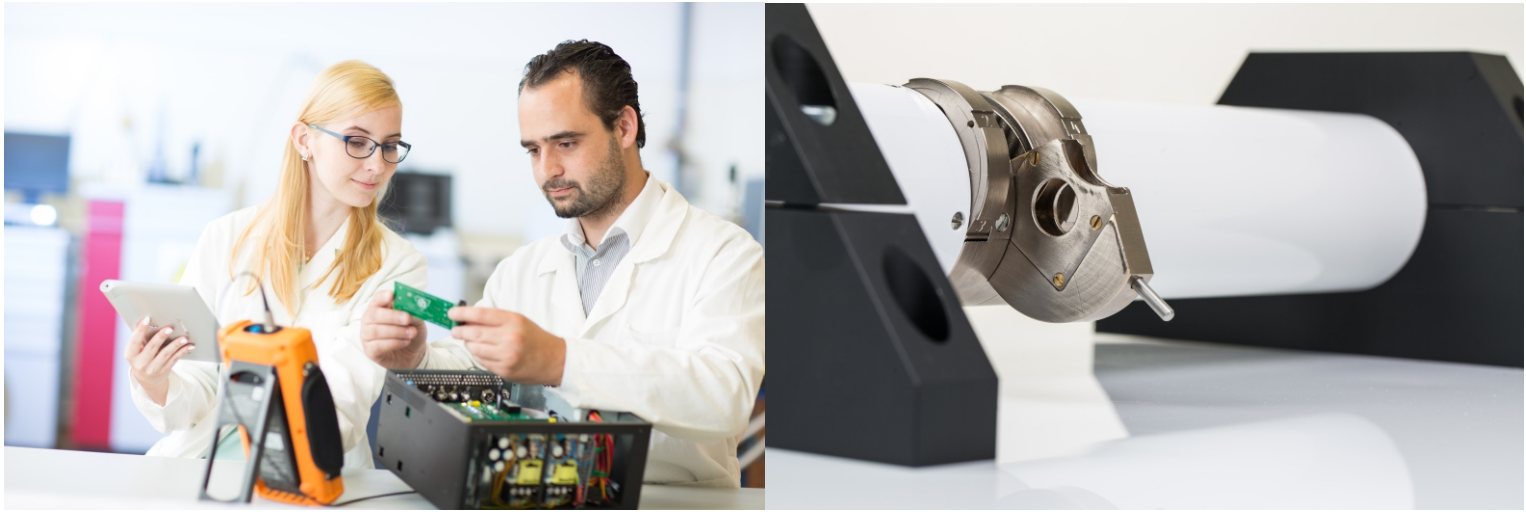


TRANSMISSION **MÖSSBAUER** SPECTROMETER



- > Typical experimental setup for transmission mössbauer spectra measurement consist of:
 - Experimental Bench.
 - Intelligent Nuclear Detector.
 - Neodymium Velocity Transducer.
 - Spectrometer main unit.
 - **Gamma radiation source and spectra interpretation software has to be purchased separately.**

EXPERIMENTAL **BENCH**

- > Experimental Bench is cylindrical, with two mounting feet.
- > The cylinder has approx. 70 mm in diameter and it is 460 mm long.
- > As can be seen on figure, cylinder is separated in three parts:
 - Detector housing (protective shielding of detector, which also works as the radiation shield).
 - Sample holder (with two collimators to adjust amount of gamma photons which are impacting the sample and going through to detector).
 - Velocity transducer housing (protective shielding of velocity transducer, including lead gamma radiation shield).



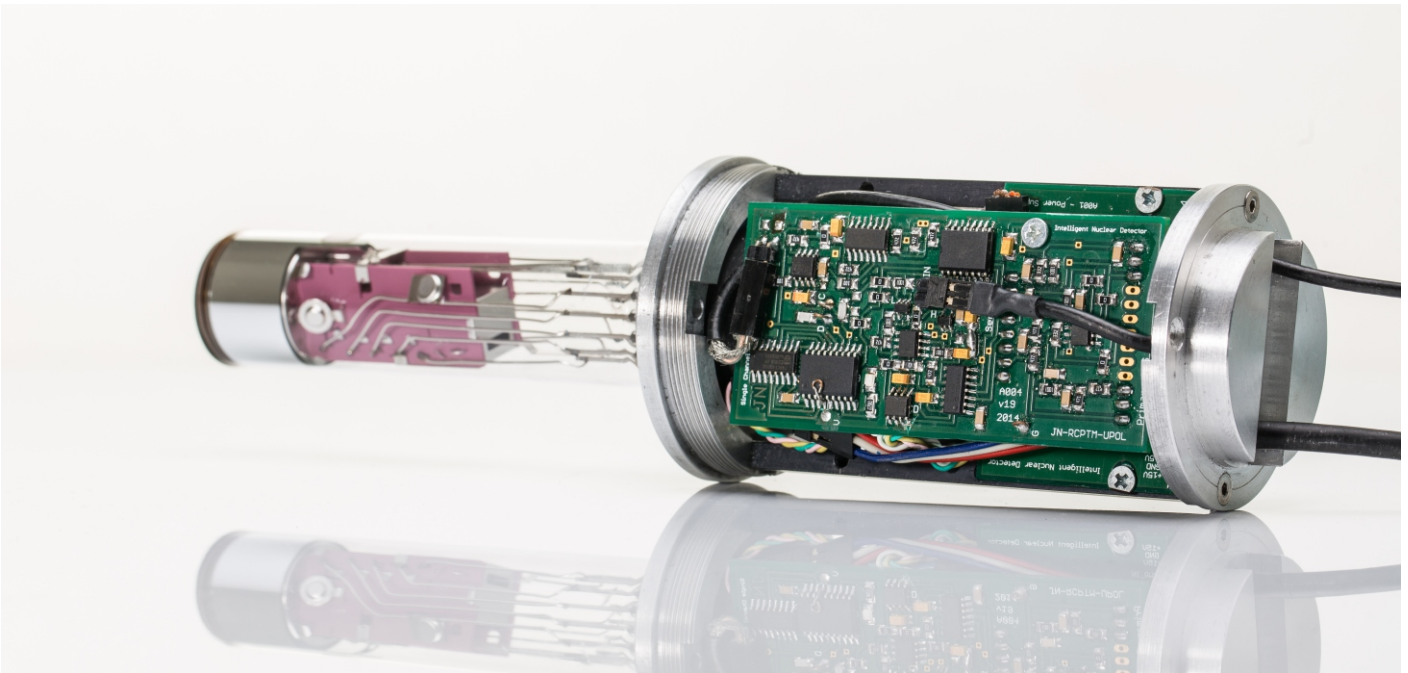
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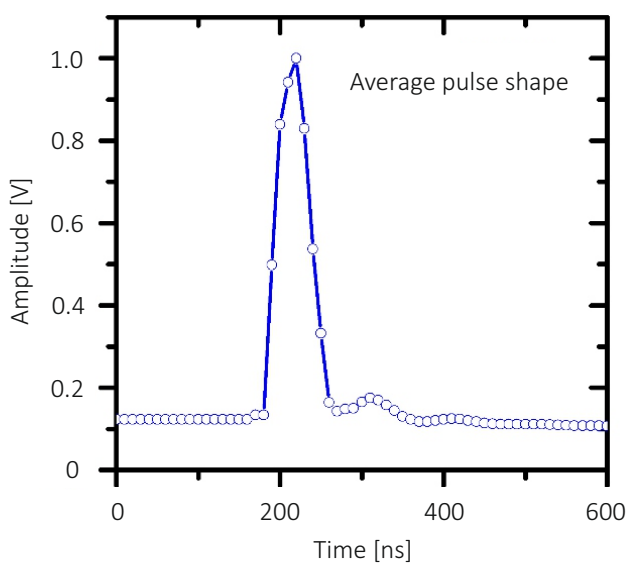
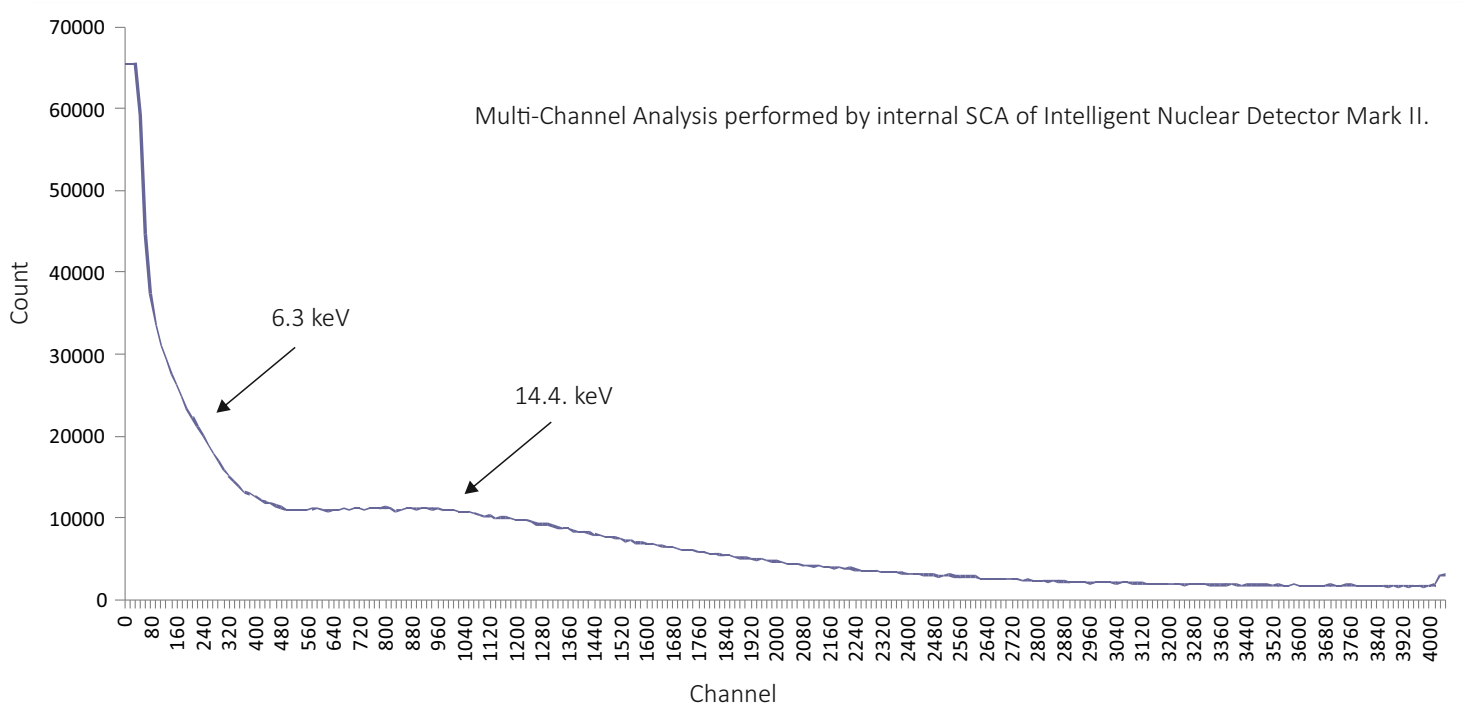
INTELLIGENT NUCLEAR DETECTOR



- > Complete detection and signal processing unit in single compact housing.
- > Designed primarily for 14.4 keV gamma photons detection, but it is capable of different energies detection (it can be simply customized).
- > Mark I. version includes:
 - YAP:Ce Scintillating crystal – 1" diameter, 0.3 mm thickness, 30 nm alluminum mirror.
 - Photomultiplier – HAMAMATSU R6095, 1" diameter.
 - High voltage supply – HAMAMATSU C9028-01, from 0 to -1200V.
 - Three stage fast amplifier.
 - Control and power supply electronics.
 - Control application for PC with Windows OS.
- > Mark II. Version includes:
 - YAP:Ce Scintillating crystal – 1" diameter, 0.3 mm thickness, 30 nm alluminum mirror.
 - Photomultiplier – HAMAMATSU R6095, 1" diameter.
 - High voltage supply – HAMAMATSU C9028-01, from 0 to -1200V.
 - Three stage fast amplifier.
 - Single-channel analyzer – in combination with control application is capable to perform complete multi-channel analysis.
 - Control and power supply electronics.
 - Control application for PC with Windows OS.



- > The amplification of detector is controlled electronically, using standard USB (I2C) interface.
- > High voltage level of photomultiplier is controlled electronically, using standard USB (I2C) interface.
- > Analog output signal (from amplifier) is a mixture of various amplitudes from 0 V to 5 V, pulse-length is about 120 ns (both amplitude and pulse-length depends on detected energy).
- > Logic output signal (from single channel analyzer) is a series of TTL positive logic pulses, which represents only valid detections (gama photons with selected energies).
- > Detector can be controlled with custom program, instruction set is included.



Average pulse shape was acquired as an average of 100 000 analog pulses (directly from amplifier) with amplitudes $1\text{ V} \pm 0.05\text{ V}$. For this purposes, the NI USB-5133 digitizer was used.



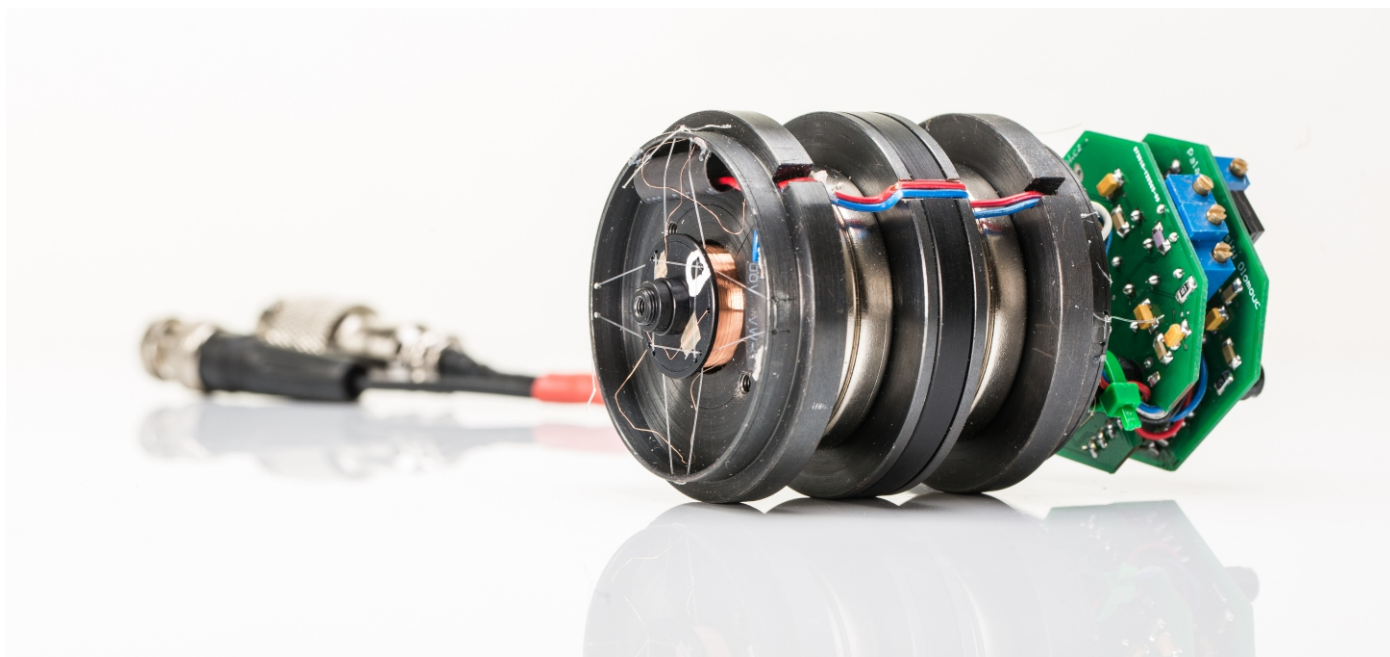
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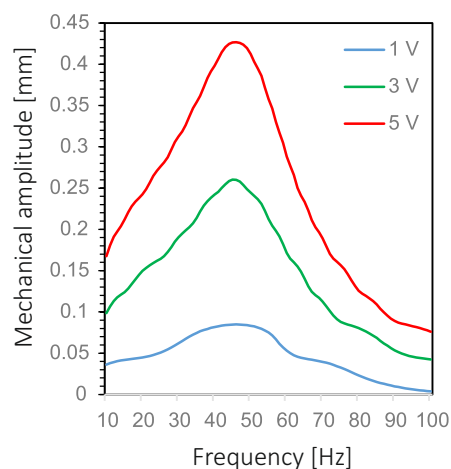
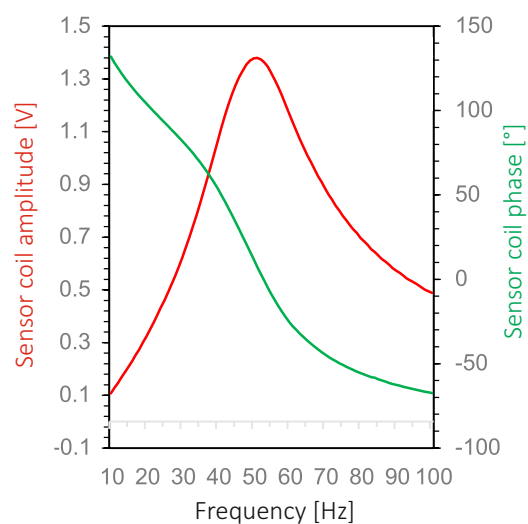


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NEODYMIUM VELOCITY TRANSDUCER



- > Complete velocity drive solution for Mössbauer spectroscopy.
- > Analogue PID feedback for precise movement regulation is integrated directly in transducer body.
- > Important parameters:
 - Nylon strings.
 - Four neodymium magnets.
 - Maximum velocity ± 30 mm/s (designed primarily for ^{57}Fe Mössbauer spectroscopy).
 - Non-linearity less than 0.1 %.
 - Line width about 0.276 mm/s.
 - Conversion ratio approx. $1.6 \text{ V} = 10 \text{ mm/s}$.
 - Resonant frequency 30 - 50 Hz.
 - Velocity signal from sensor coil output.
 - Velocity error signal output.



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SPECTROMETER MAIN UNIT



- > Contains all spectrometer electronics, including Velocity Signal Generator, Spectrum Registration Unit, personal computer with Windows OS installed, Spectrometric PC application, power supply and status display.
- > Velocity Signal Generator:
 - Triangular velocity signal (Constant acceleration symmetric).
 - Velocities up to ± 30 mm/s.
 - One period of velocity signal consists of 32 768 values.
 - One period of velocity signal is divided into 1024 channels.
- > Spectrum Registration Unit:
 - Unfolded registered spectrum consists of 1024 data points.
 - Maximum possible value for one point is 2^{32} counts.
- > Personal computer:
 - With Windows OS and spectrometric application installed.
 - Used for communication with spectrometer and data storage.
 - Can be easily connected to the internet network and thus accessed remotely.
- > Power supply:
 - Pc and spectrometer power supply.
 - Power failure battery backup system.
- > Status display
 - displays information about sample and spectrometer status.

