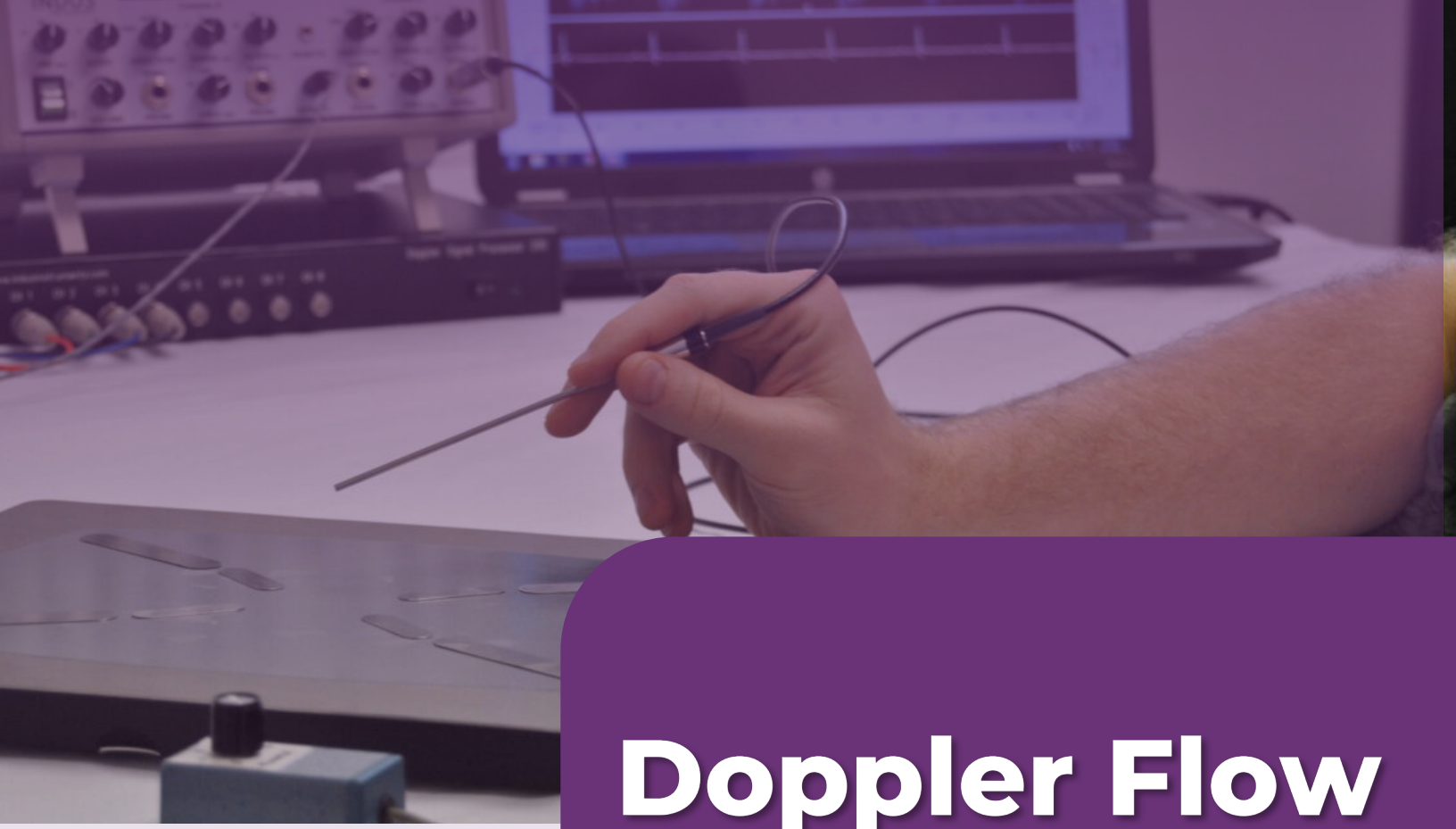
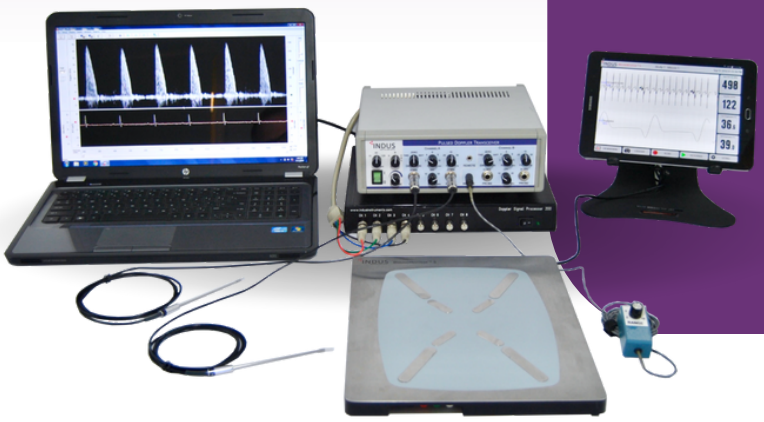


Doppler Flow Velocity System

Non-Invasive Measure of Cardiovascular Physiology



- Noninvasive solution to serialy quanitify changes in hemodynamics and cardiovascular function in small animals

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Non-Invasive Cardiac Assessment in Rodents, Fish and other species

The Indus Doppler Flow Velocity System (DFVS) is a proven and cost-effective alternative to conventional imaging systems. Small handheld probes easily and reliably measure blood velocity in the heart and the arteries of rodents, fish and other animal models making serial studies of cardiac and arterial function available to more labs than ever before. With a proven track record of more than 100 publications, the Indus DFVS is an important instrument for any cardiovascular lab. It can be used as an alternative to complex, invasive surgical models and offers blood flow velocity measurements and functional calculations not possible with traditional imaging systems and their larger probes. As the life span of our population grows increasingly longer, it has never been more important to translate basic research into clinically relevant applications and appropriate therapies. Noninvasive techniques have advanced to measure robust parameters, such as blood flow velocity, in rodents. These advancements permit comprehensive assessment of cardiovascular function while avoiding complicated surgical procedures required with other instrumentation.

Research Area	Model	Flow Parameter
Cardiac Function: Systolic and Diastolic	• Myocardial Infarction • Heart Failure • Hypertrophy • Cardiomyopathy	• Aortic Outflow Velocity • Mitral Inflow Velocity
Coronary Flow Reserve	• Myocardial Ischemia • Pressure Overload-Hypertrophy • Atherosclerosis	• Hyperemic/Baseline Coronary flow velocity ratio
Arterial Stiffness (Pulse Wave Velocity)	• Hypertension • Atherosclerosis	• Aortic Arch Velocity • Abdominal Aortic Velocity
Pressure-Overload (Stenosis)	• TAC Banding Model	• Carotid (R/L) peak velocity ratio • Stenotic Jet velocity-estimation of pressure gradient across stenosis
Peripheral Artery Disease and Perfusion	• Renal, Carotid, Iliac, Femoral and Saphenous Vein Flow Velocities	• Flow velocities in peripheral vessels before & after surgical intervention or during therapeutic response

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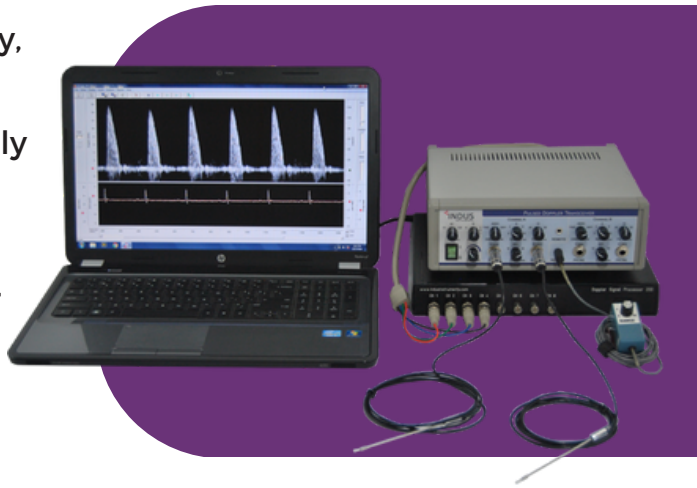
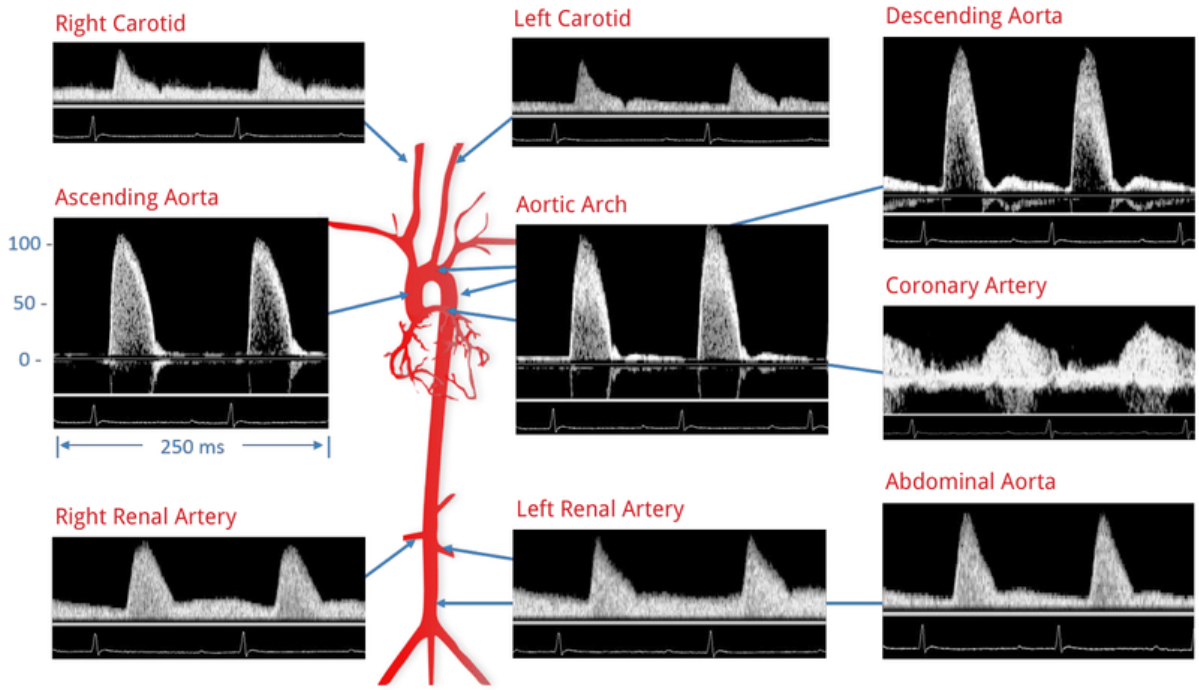
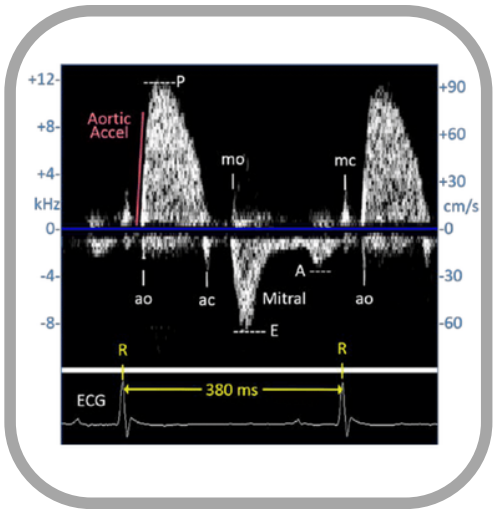
The Doppler Flow Velocity System is a high-frequency, real-time pulsed Doppler measurement device with integrated data analysis software designed specifically for measuring cardiovascular function in small animals. The high sampling rates grant excellent temporal resolution, making this the ideal system for studying fast heart rates and rapid blood accelerations present in mice and other small animals. No imaging required.







Cardiac Doppler Signals In a Mouse: Aortic Outflow and Mitral Inflow Waveforms

Measure valuable indicies of function to investigate cardiomyopathies.

Aortic Outflow: Pre-ejection time, ejection time, Peak & Mean Velocity, Peak & Mean Accelration, Stroke Distance, and more.

Mitral Inflow: Isovolumic Contraction and Relaxation Time, E-Peak Velocity, A-Peak Velocity, E-A Peak Velocity Ratio, and more.

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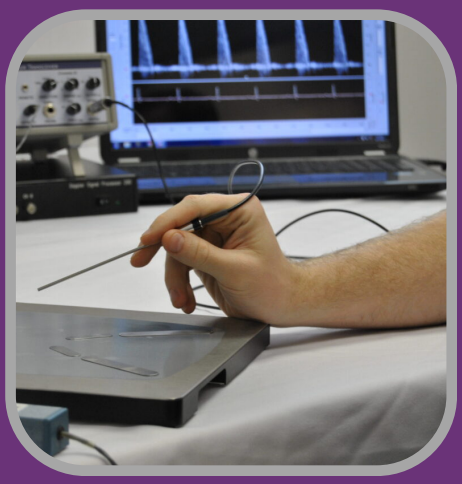

Make More Measurements Than Conventional Imaging Systems:

Using miniature handheld probes, The Indus DFVS operates quickly without the need for imaging to reach vessels with pinpoint accuracy. Flow velocities and differentials in various arteries, including the aorta, are reliably measured by placing the tip of the probe at a shallow angle relative to the direction of flow to be measured.

Invasive Surgeries Not Necessary:

Unlike conventional flow measurement systems, surgical placement of cuffs around blood vessels is not required. Instead, measurements are made from the skin surface while the probe operator receives real-time feedback to confirm optimal probe position based on the measured flow waveform.

Measurements Highly Transferable From Bench To Bedside:

Large bodies of literature exist that prove the translational relevance of rodent flow velocity data to clinical findings. Some of the parameters assessed include:

- cardiac function (systolic - aortic FV; diastolic - mitral FV)
- myocardial perfusion (coronary flow reserve - coronary FV)
- pressure overload by stenosis (left & right carotid FVs and stenotic jet FV at aortic arch)
- arterial stiffness (aortic arch & abdominal FVs for pulse wave velocity)
- peripheral perfusion (renal, carotid, iliac, femoral, saphenous vein FVs)

Small System Footprint Takes Up Minimal Lab Space:

This powerful system is both compact and easily transportable, allowing it to be shared between cooperating labs with ease. The noninvasive approach to flow measurement often reduces the time associated with laboratory protocols, compliance and time required to generate meaningful data.

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Valuable Measurements Done With Ease...

- Serial measurements or measures responsive to interventions can be made
- Cardiac systolic and diastolic function can be assessed under various conditions
- Superior Pulse Wave Velocity with simultaneous abdominal and aortic velocity measurements to assess Arterial Stiffness
- Severity of transverse aortic constriction (TAC) can be assessed by comparing left and right carotid velocities
- Pressure gradient across TAC can be estimated using stenotic jet velocity
- Induced responses in microvascular beds can be measured through pulsatility and resistivity indices
- Hyperemic velocity responses can be evaluated by assessing coronary flow reserve, a function of cardiac work affected by disease, age, and pressure/volume overload conditions
- Banding effectiveness and coronary reserve measured with Hyperemic/Baseline velocity relations
- Coronary flow distributions can be assessed through changes in the systolic/diastolic flow ratio

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Doppler Flow Velocity System Measurements

Vital Signs:
- Heart Rate
- R-R Interval

Systolic Indices:
- Aortic Outflow Velocity
- Peak velocity
- Mean velocity
- Peak acceleration
- Mean acceleration
- Pre-ejection time
- Ejection time
- Rise time
- Stroke distance

Diastolic Indices:
- Mitral Inflow Velocity
- E-peak velocity
- E-stroke velocity
- E-time duration
- E-acceleration time
- E-deceleration time
- E-peak to 1/2 E-peak time
- E-linear deceleration time
- E-linear deceleration rate
- A-peak
- A-stroke distance
- A-time duration
- E-A peak velocity ratio
- Isovoluminic contraction time
- Isovoluminic relaxation time

Peripheral Artery Indices:
Carotid, Renal, Femoral, Tail
- Peak Velocity
- Mean flow velocity
- Minimum flow velocity
- Pulsatility Index
- Resistivity Index

Coronary, Transverse
- & Abdominal Aorta Indices:
- Peak Diastolic Velocity (PDV; Coronary)
- Peak Systolic Velocity (PSV; Coronary)
- Diastolic Area (DA; Coronary)
- Systolic Area (SA; Coronary)
- Ratios PSV/PDV & SA/DA
- Pulse Wave Velocity
- (pulse transit time from
- Arch to Abdominal Aorta)

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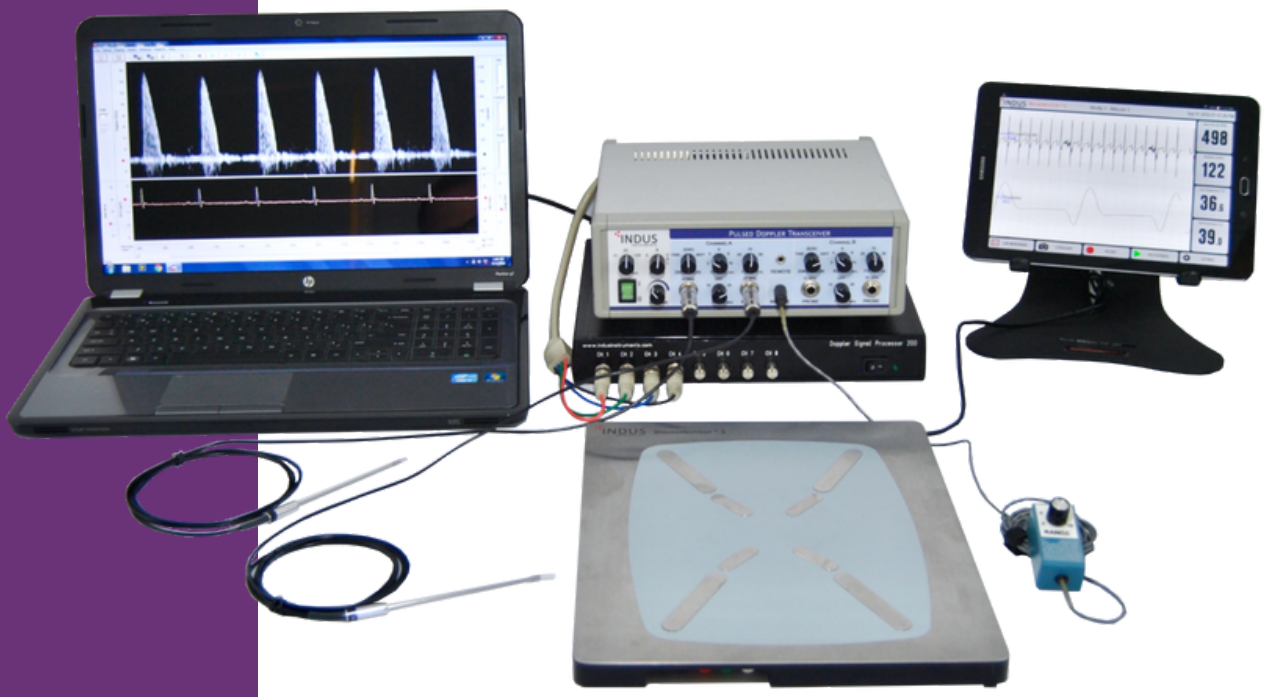

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