NERVE CONDUCTION STUDIES

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Nerve Conduction Studies

- Different tests
  - Technique & Parameters of importance
- Interpretations of Parameters
- Hardware & Software components

Nerve Conduction Studies

- Motor Nerve Conduction Studies
- Sensory Nerve Conduction Studies
- Autonomic Nervous System Testing
- Late Responses
  - F waves
  - H Reflex
  - Axonal Reflex
- Blink reflex

Normal Physiology

- Nerve impulse generation
- Conduction along nerve fiber
  - In a myelinated fiber
  - In a non-myelinated fiber
- Conduction across Neuro Muscular Junction
- Muscle fiber excitation

Nerve Impulse Generation by external stimulus

- Use of Cathode

- Nerve Impulse Conduction
  - Orthodromic conduction
  - Antidromic conduction

Motor Nerve Conduction Studies

- Type of Electrodes
- Electrode Placements
- Technique
- Parameters
- Importance of two site stimulation
  (residual latency)
- Interpretation

Type of Electrodes & Placements

- Stimulating Electrodes
- Recording Electrodes
- Ground Electrodes

Recording Electrodes

- Active
  - Cathode
  - Over Muscle belly
- Indifferent
  - Anode
  - Over Belly Tendon montage

Stimulating Electrodes

- Cathode
- Anode

- Cathode of stimulating electrode close to Cathode of Recording electrode

Ground Electrode

- Reduce noise
- Between Active & Indifferent

Technique

- Position of Patient
- Skin Resistance Lowering
- Intensity used
  - Supra Maximal stimulation

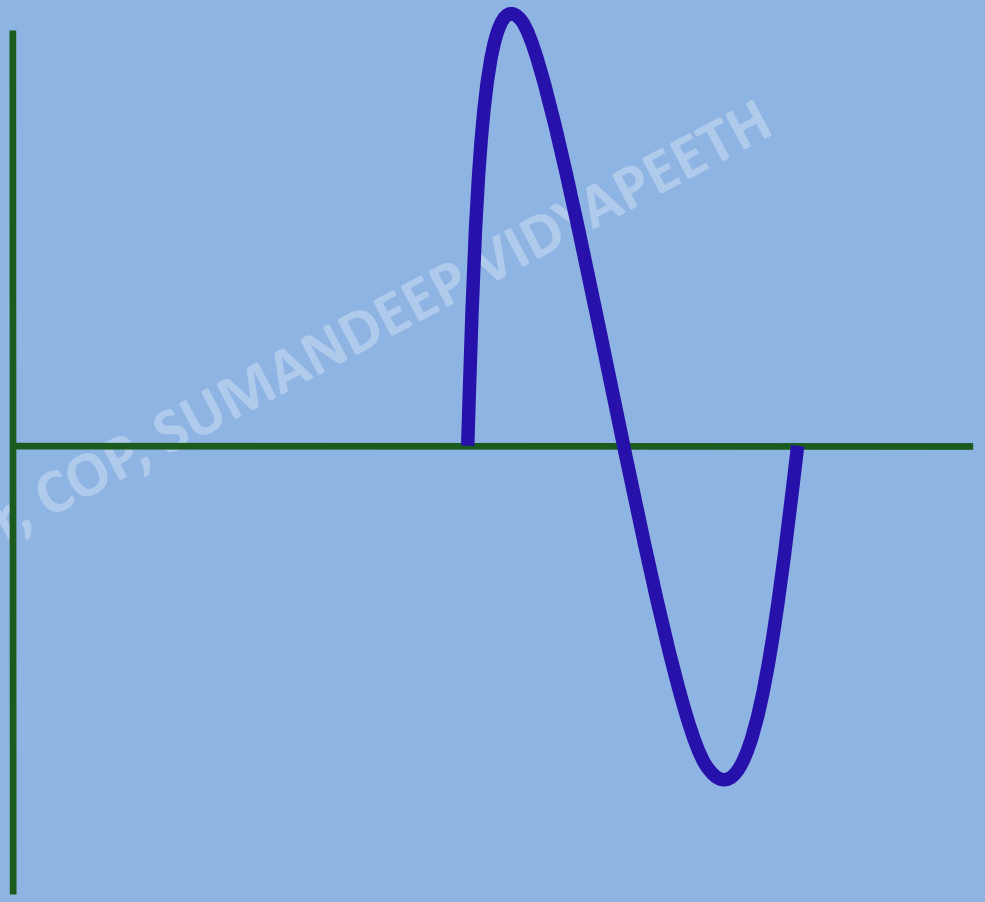
Graphical Output

- CMAP

(Compound Motor Action Potential)

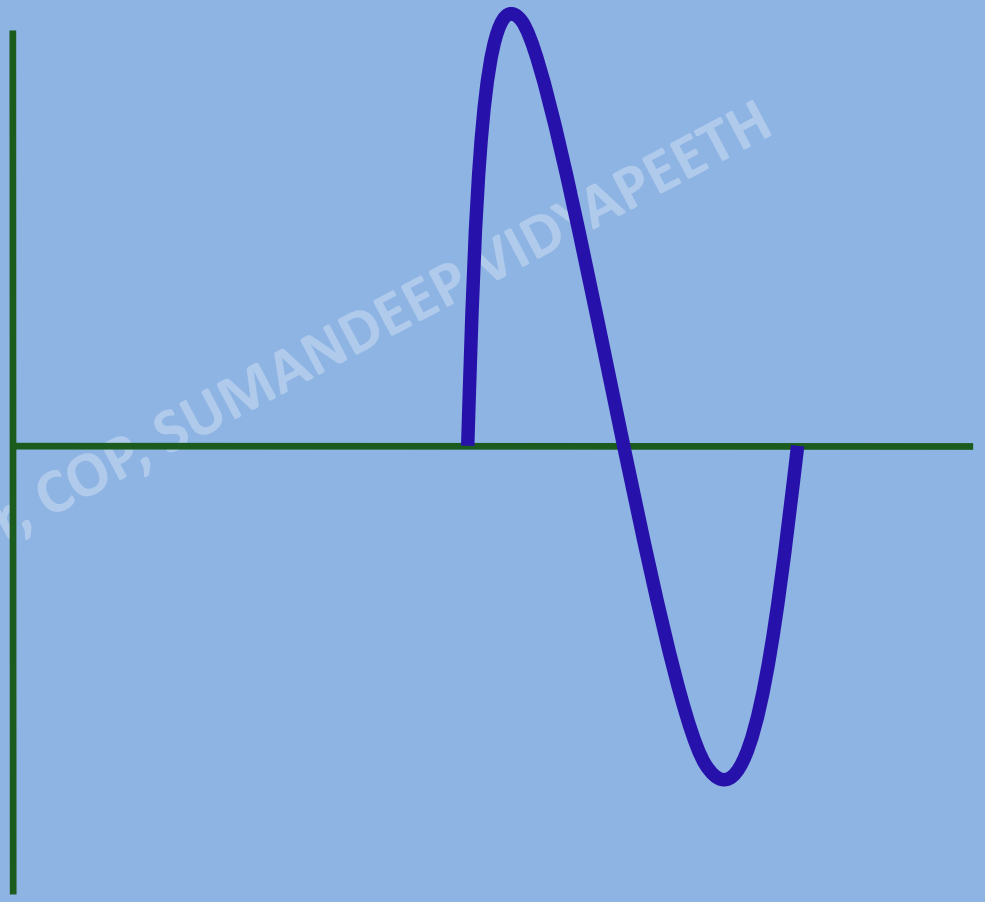
- Nature of Graph

- Negative Upside, Positive down



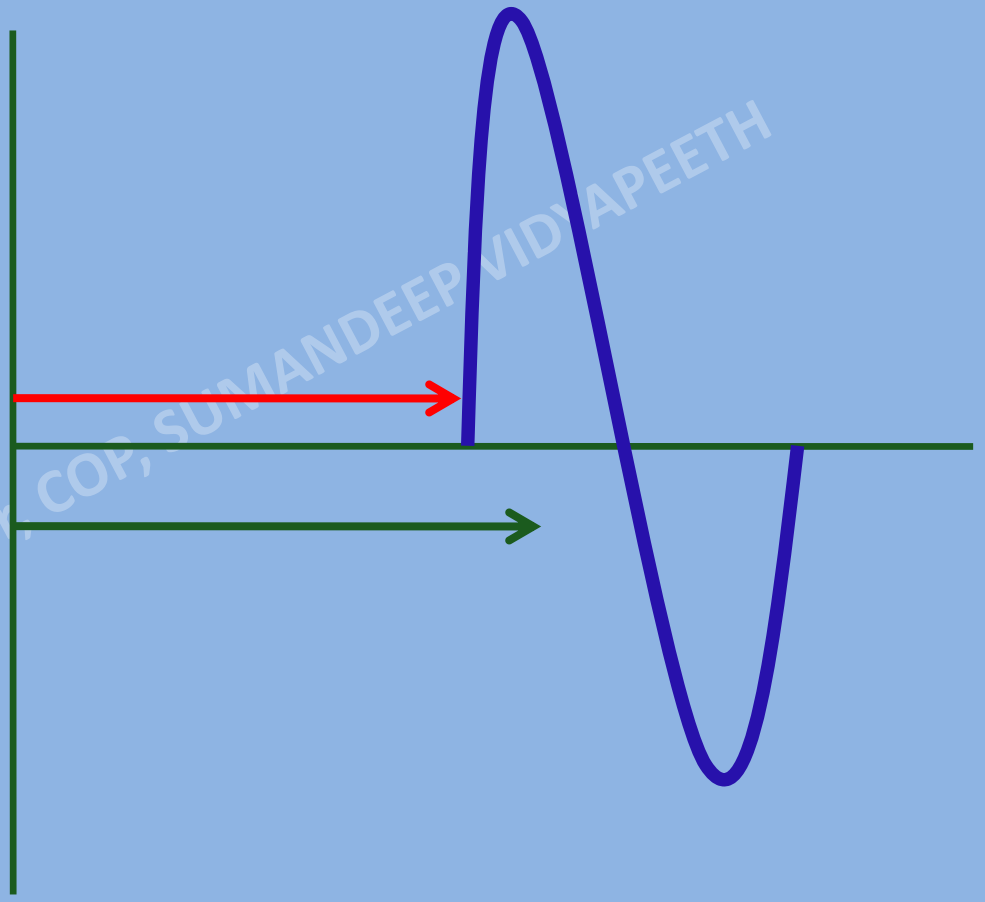
Parameters

- Latency
- Amplitude
- Duration



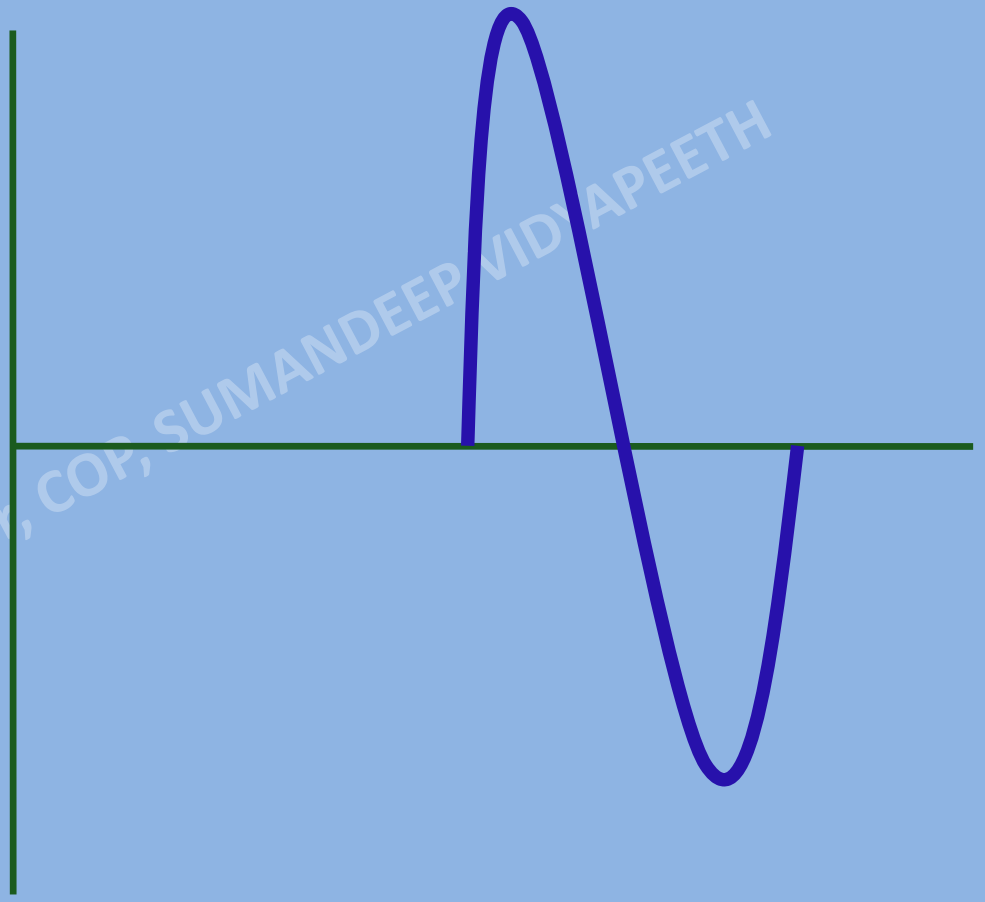
Parameters

- Latency
- Time taken to travel from Stim. site to Rec. Site



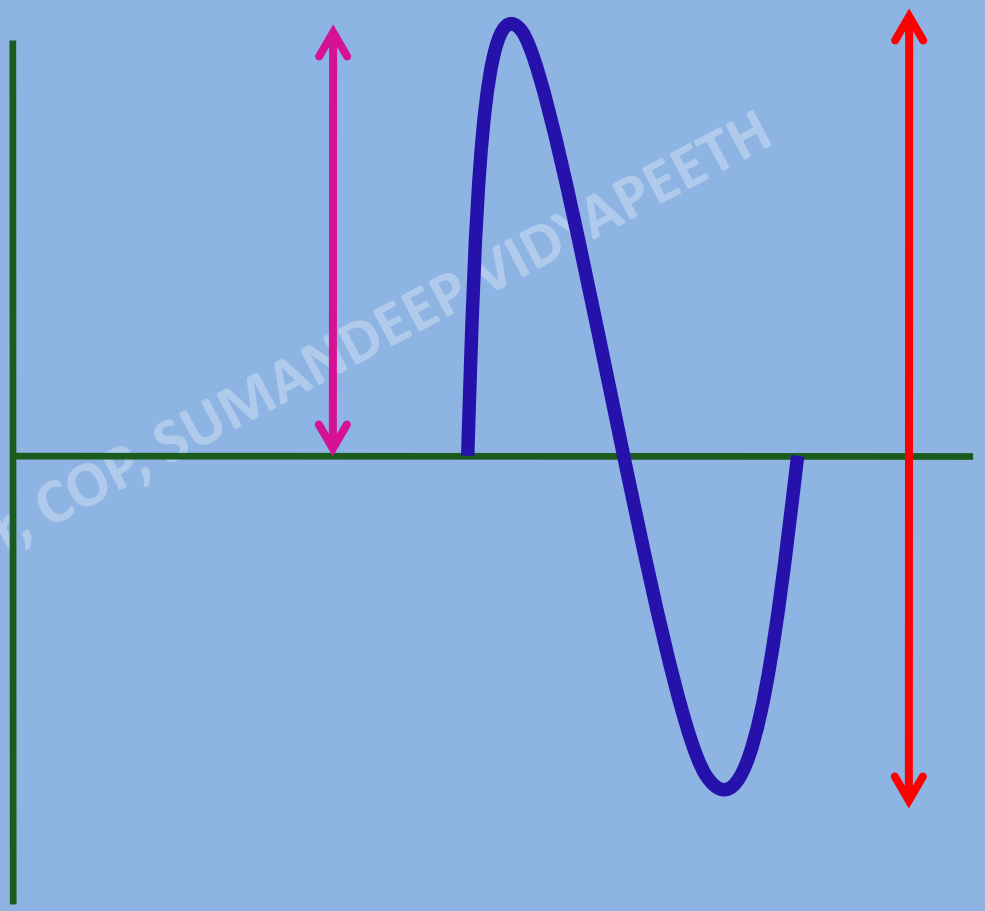
Parameters

- Amplitude
- No. of Motor Units



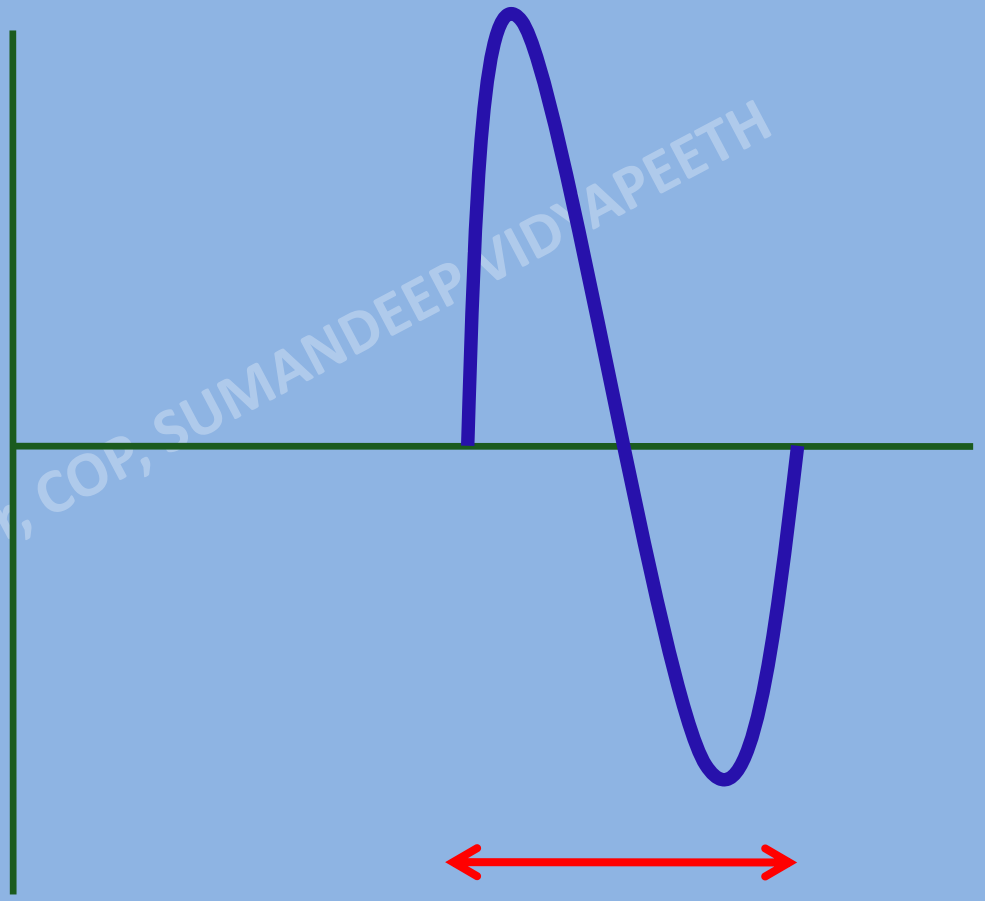
Parameters

- Amplitude Measurement
- Peak to Peak
- Negative Peak



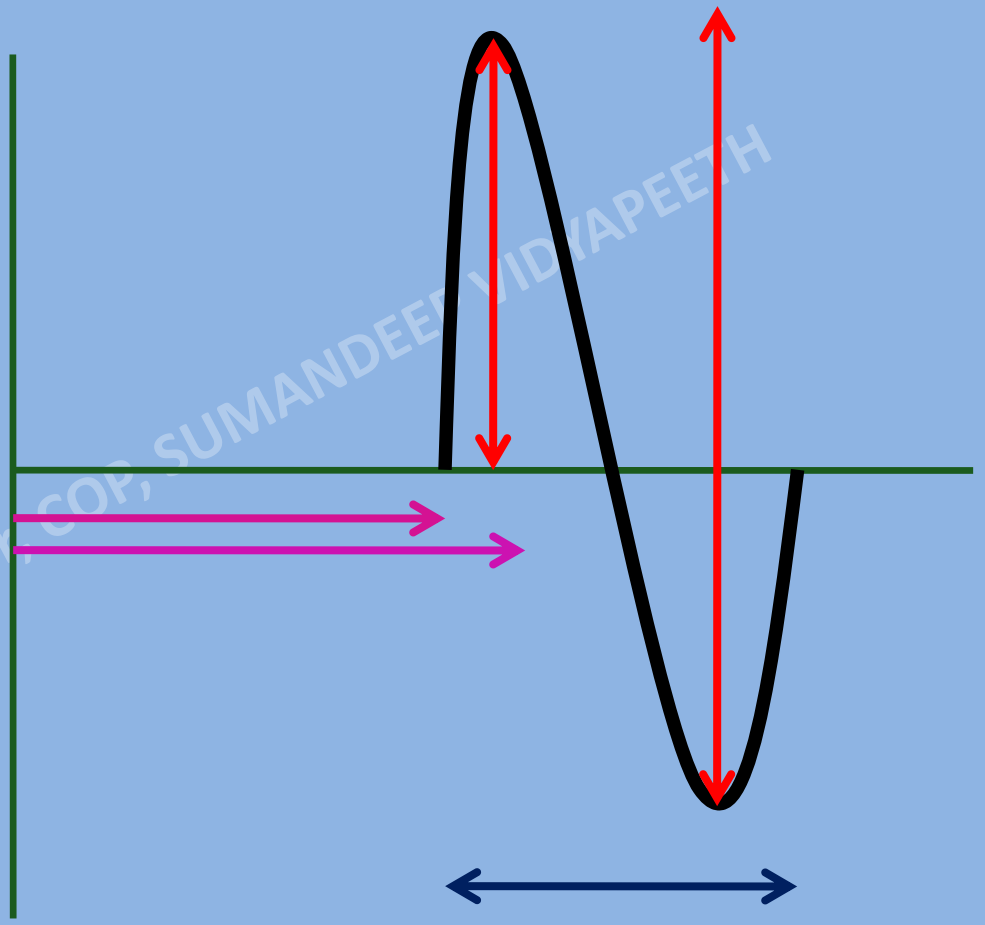
Parameters

- Duration
- Time taken by all motor units to complete response



Parameters

- Latency
- Amplitude
- Duration



- Latency
- Amplitude
- Duration

- Conduction Velocity ?

- Velocity
  - Distance / Time

- Distance – Length between Stimulation site & Recording site

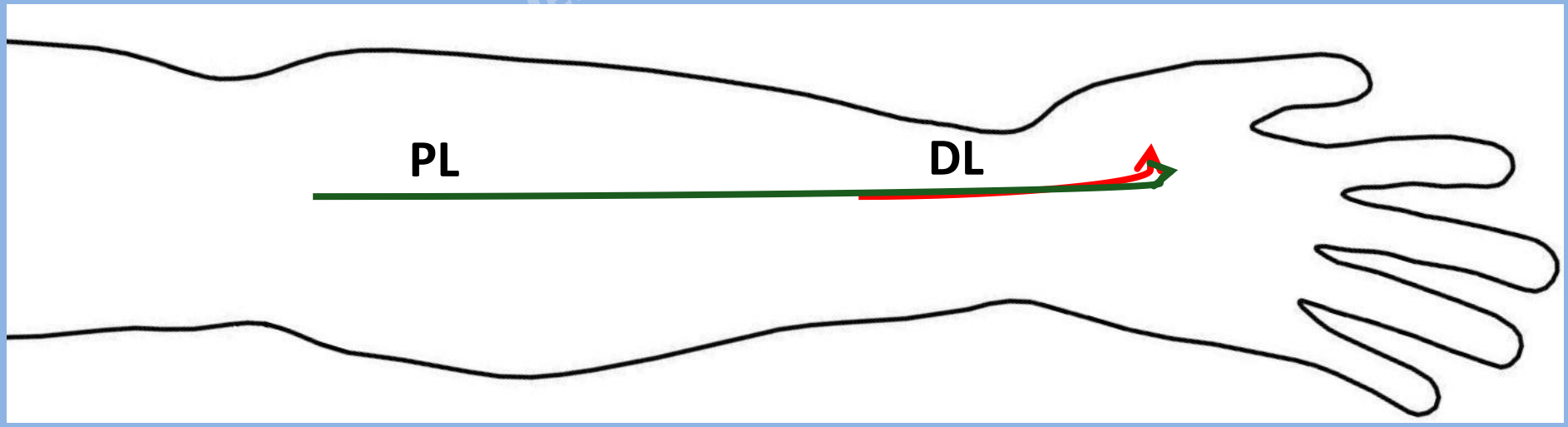
- Time – Latency

- Any delay in Time (increase in Latency) will affect Velocity (decrease in velocity)

- In MNCS, the associated issue,
  - Stimulation site – Nerve
  - Recording site – Muscle
  - Impulse crosses – Neuro Muscular Junction
  - What if problem lies at NMJ and not in Nerve?

- Residual latency

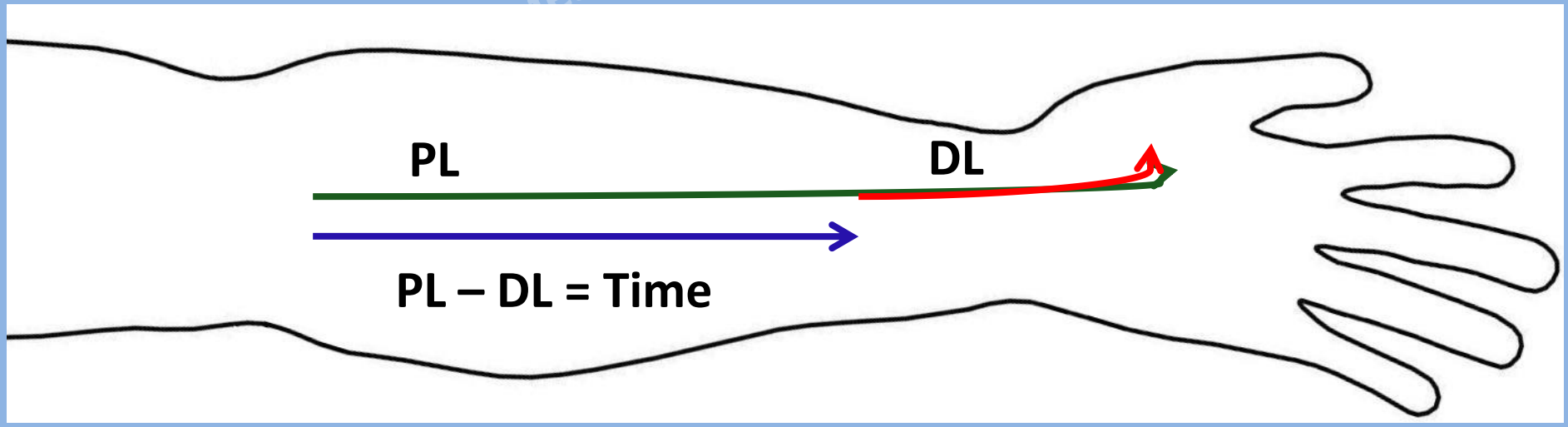
- How to Overcome Residual Latency issue?
- Stimulate at Two sites
- One at Distal point
  (Latency – Distal Latency)
- Another at Proximal point
  (Latency – Proximal Latency)



- Conduction Velocity
  - Distance / Time(PL – DL)

- Subtract the Distal Latency from Proximal Latency

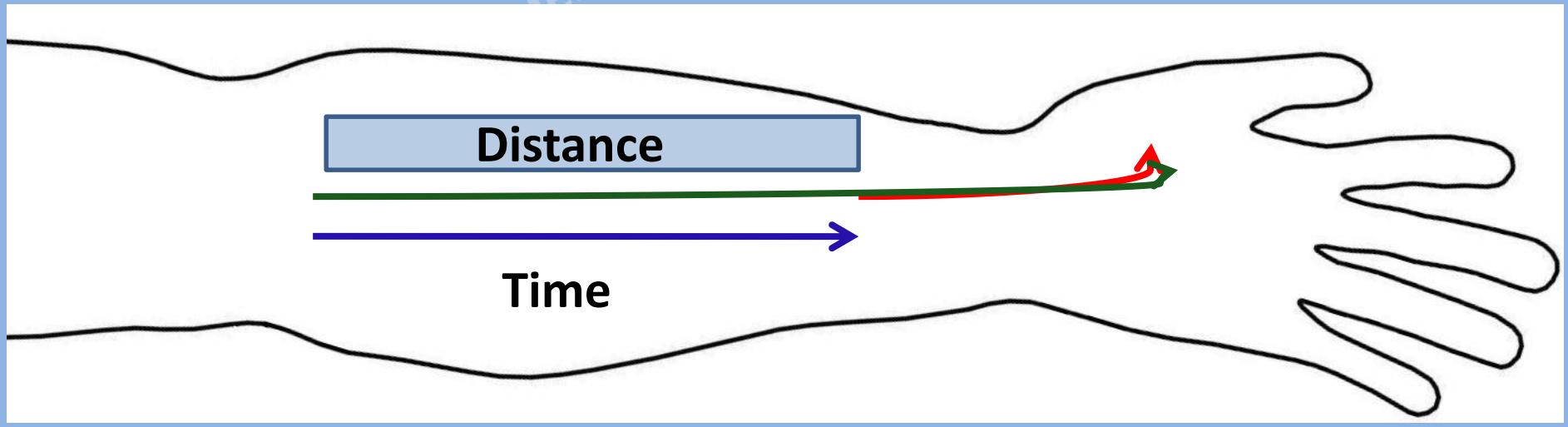
- Proximal Latency – Distal Latency =
  Time taken by impulse to travel between Proximal and Distal Stimulation Points



- Conduction Velocity
  - Distance / Time(PL – DL)

- Distance =

  Measure the Distance between
  Proximal stimulation Point and
  Distal Stimulation Point



- Proximal site stimulation can be any one or all

- Upper limb: Elbow, Spiral groove (Radial nerve), Axilla or Brachial plexus (Erb's point)
- Lower limb: Neck of fibula (Peroneal), Popliteal fossa (Tibial)

Upper Limb MNCS

Lower Limb MNCS

Interpretations

- Latency
- Amplitude
- Duration
- Conduction velocity

Normal Values

- Latency
- Amplitude
- Duration
- Conduction velocity
  - Upper limb – 55 ± 5 m/s
  - Lower limb – 50 ± 5 m/s

Interpretations

- Latency
- Amplitude
- Duration
- Conduction velocity

Sensory Nerve Conduction Studies

- Different types of SNCS
- Technique
- Parameters
- One site stimulation
- Interpretation

Methods of SNCS

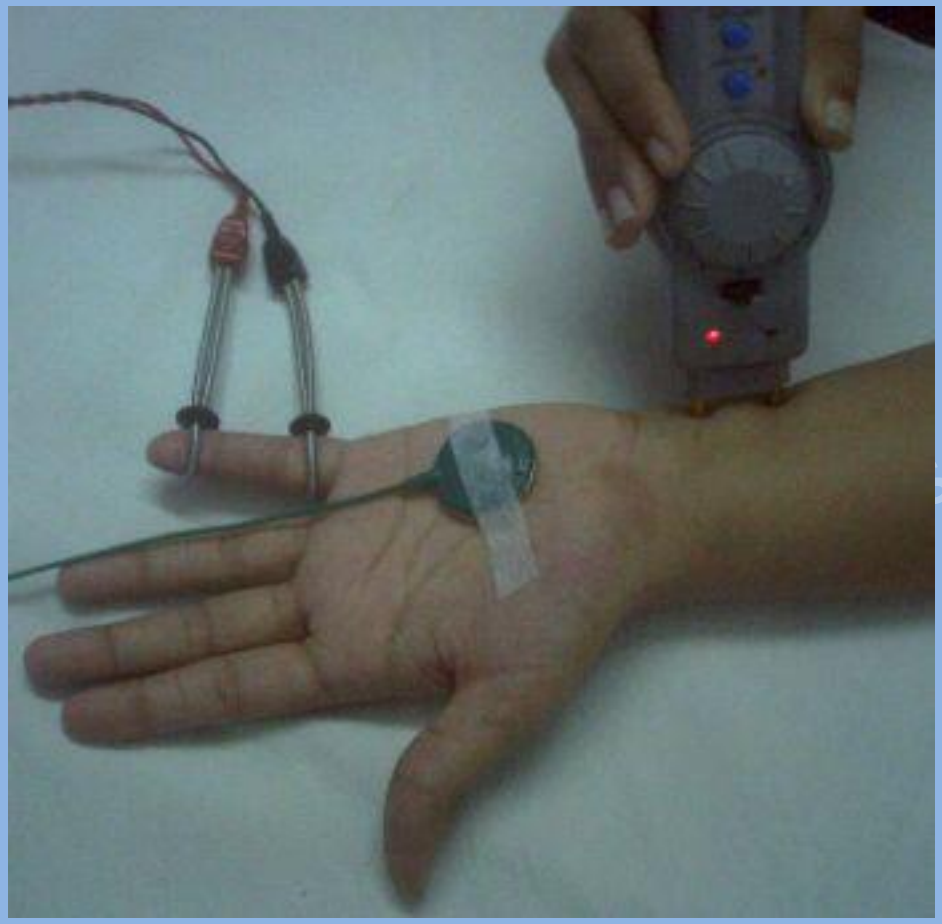
- 2 methods
- Orthodromic
- Antidromic
- Mostly Antidromic is used

Electrodes

- Recording electrodes
- Ring electrodes if recording from fingers / toes
- Surface electrodes as in MNCS, in other parts

- Other stimulating and ground electrodes remain same

SNCS for Upper limbs



SNCS for Upper & Lower limbs

- Upper limb Sensory (Orthodromic)

Sural nerve

Parameters

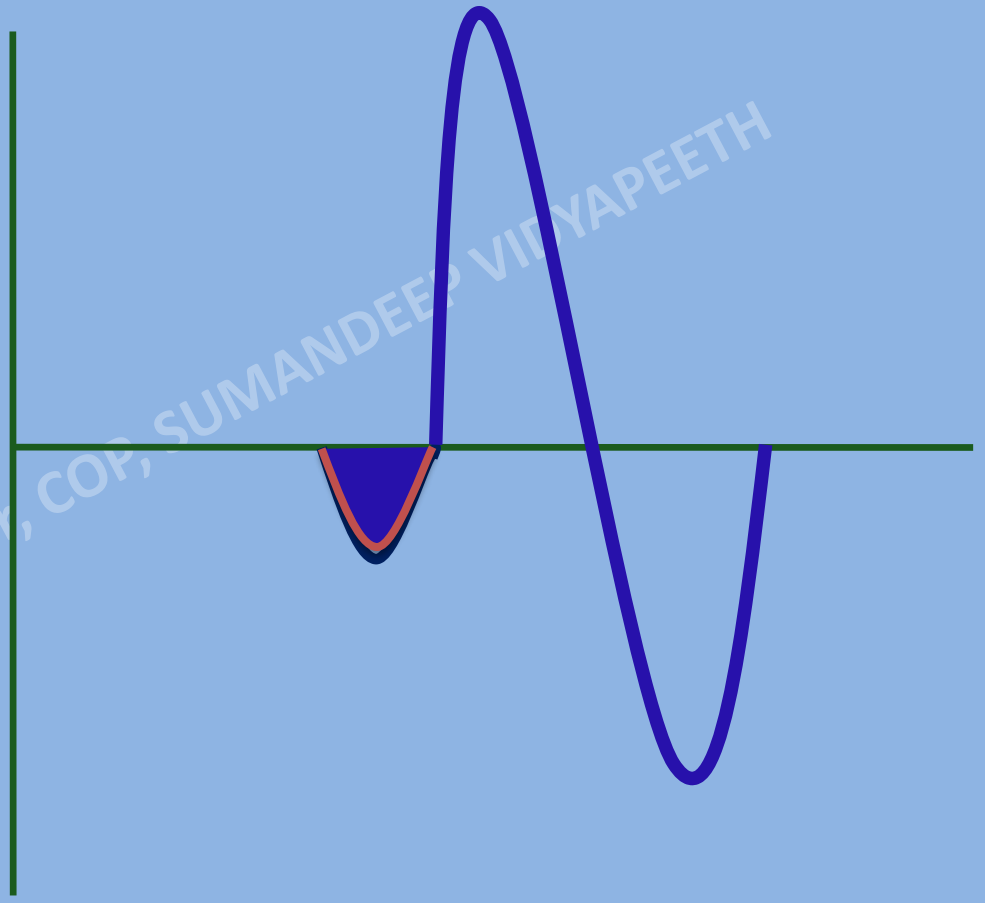
- Unlike MNCS

- Requires few mv to stimulate (sensory level threshold/intensity)

- Records in Microvolts (MNCS in millivolts)
- Chances of noise are high
- Filters need to be adjusted
- Requires Industrial standard earthing

Graphical Output

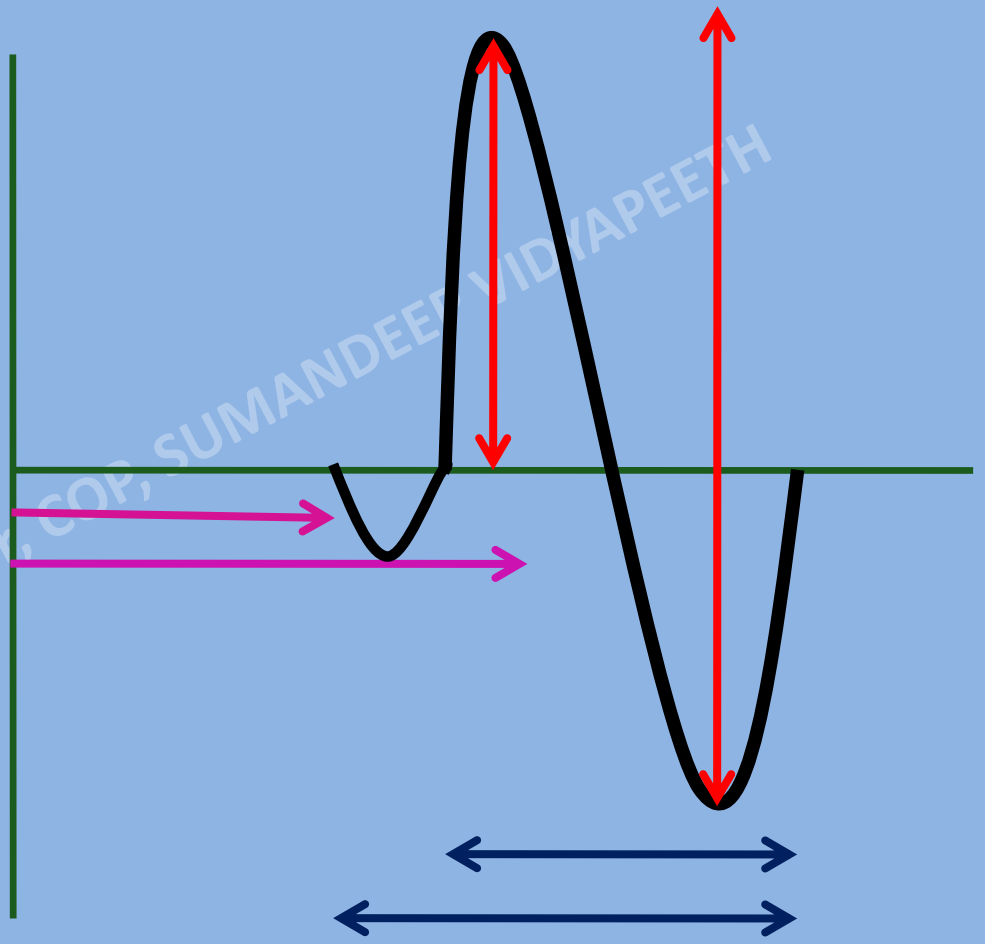
- SNAP
- (Sensory Nerve Action Potential)



- Bi / Triphasic in nature

Parameters

- Latency
- Amplitude
- Duration



SNCV

- Sensory Nerve Conduction Velocity

- Unlike MNCS, SNCS – both stimulation and recording takes place over nerve only
- No residual latency
- So, NO NEED to stimulate two sites to calculate Velocity

- Simple Distance/Time will give Velocity

Pitfalls of NCS

- With Both MNCS & SNCS only Distal part of Extremities are tested

- Proximal part?

Late Responses

- F Waves
- H Reflex

THANK YOU