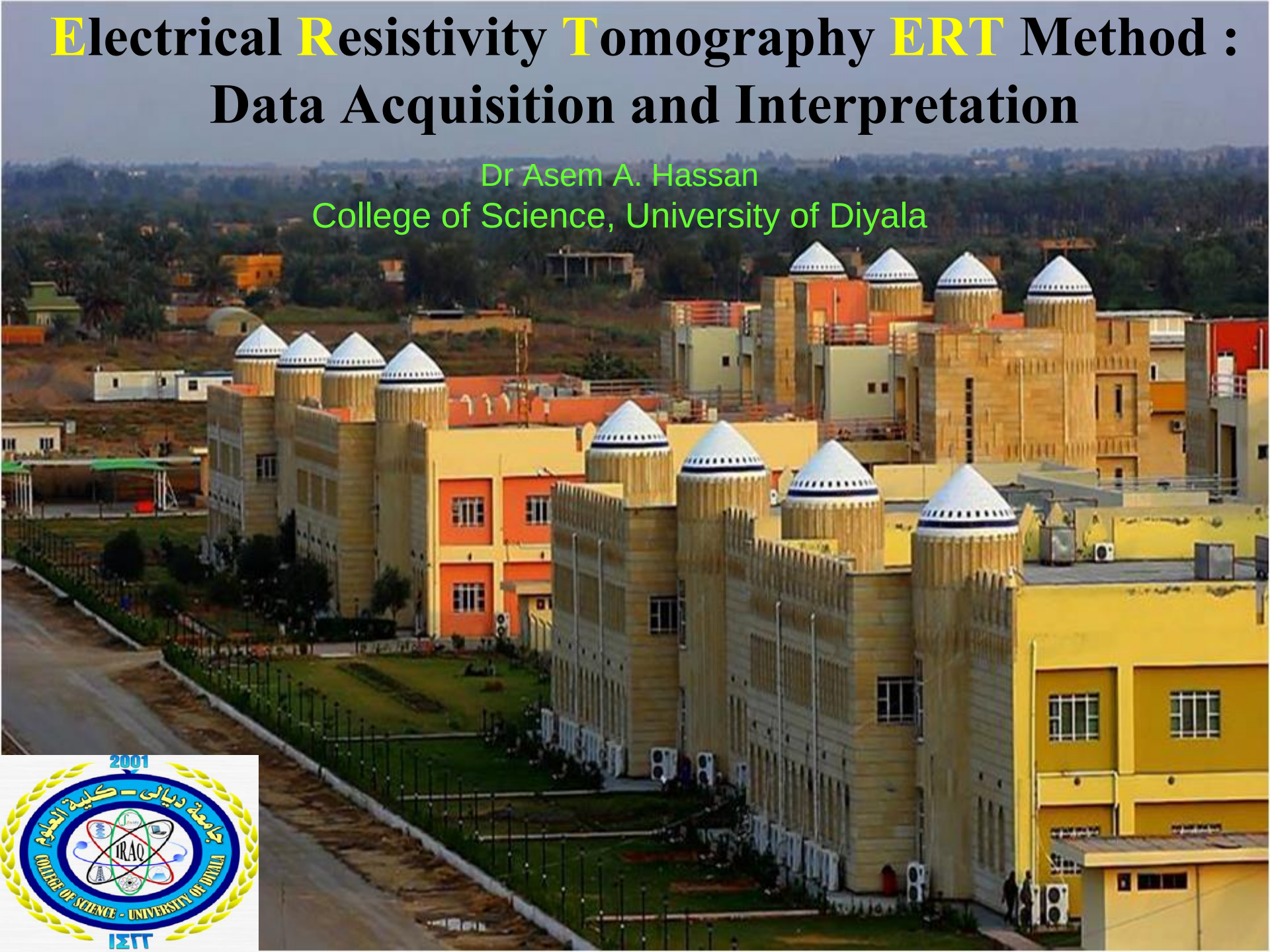
# Electrical Resistivity Tomography ERT Method : Data Acquisition and Interpretation

Dr Asem A. Hassan
College of Science, University of Diyala



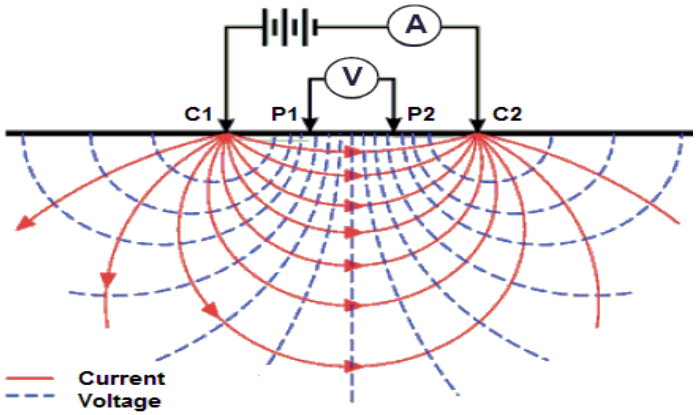
# Background

**Electrical resistivity** is a physical property of a material that describes its ability to resist the flow of electricity.

A DC or low frequency current is injected through a pair of electrodes and the resulted voltage difference is measured using another pair from which soil resistivity is calculated.

$$\rho = K\frac{\Delta V}{I}$$

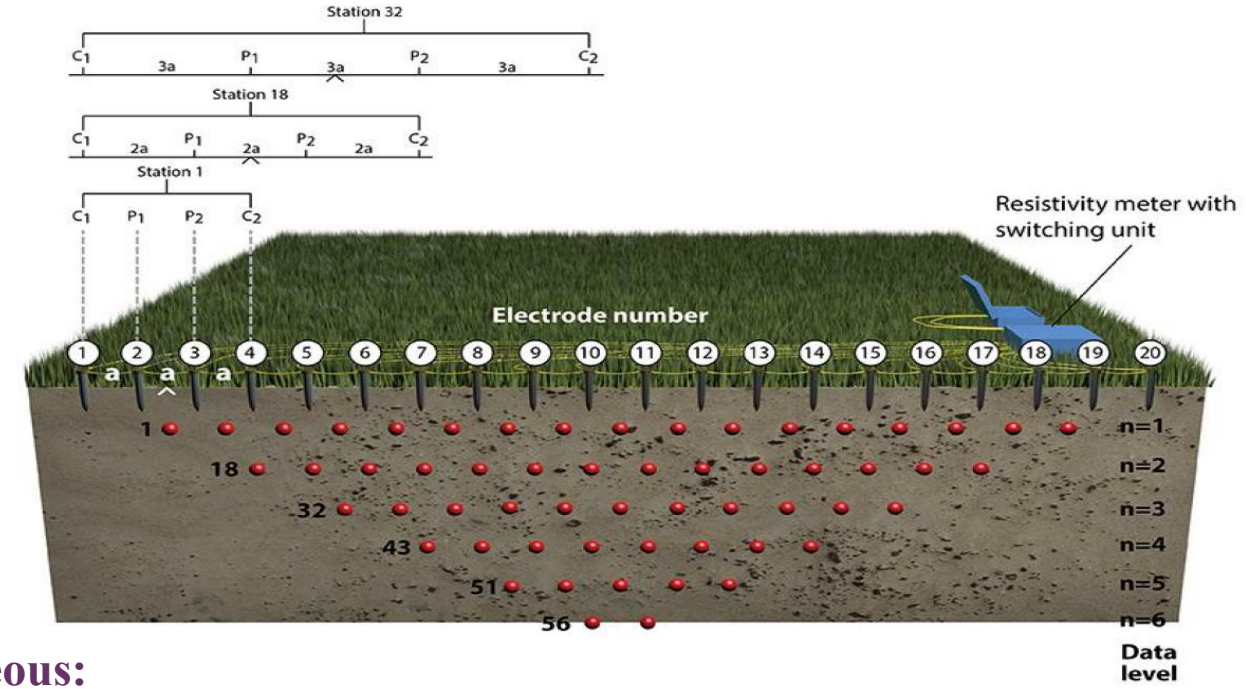
$\rho$ : *Resistivity (Ohm.m)*
$\Delta V$ : *Voltage difference (Volts)*
$I$ : *Current (Amps)*
$K$: *Geometric Factor (m)*




**Four-electrode resistivity Method**

C1, C2 Current Electrodes
P1, P2 Voltage Electrodes

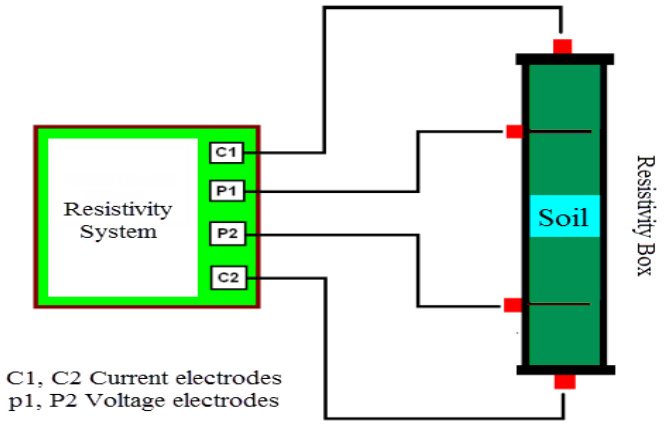
# Electrical Resistivity Tomography ERT

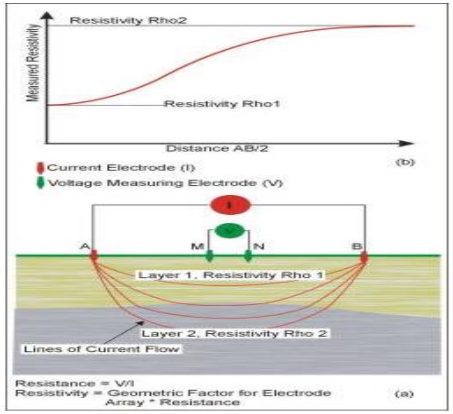



## Advantageous:

(1) Speed up data acquisition
(2) Provide large data sets to construct 2D and 3D resistivity images
(3) Offer the flexibility to choose a suitable electrode arrangement for a particular problem, which in turn reduces the effort and laborious electrode switching using manual systems

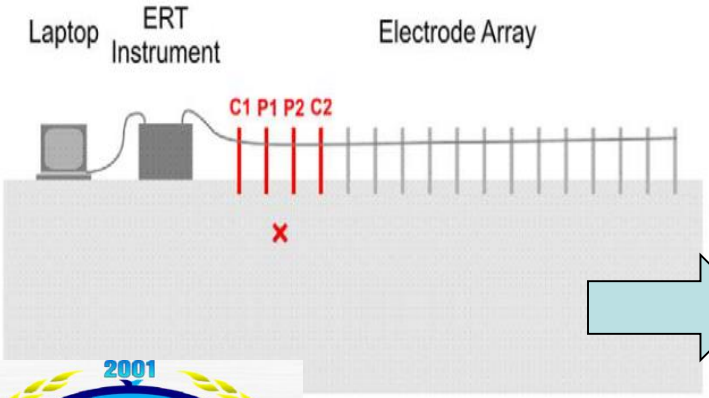
# Four-electrode resistivity Method

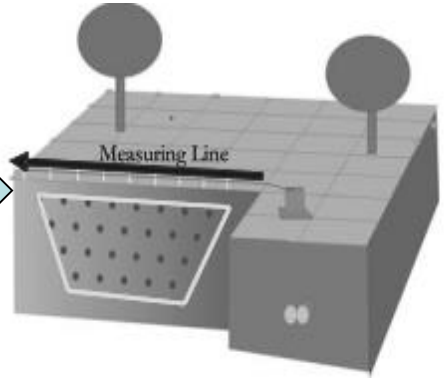


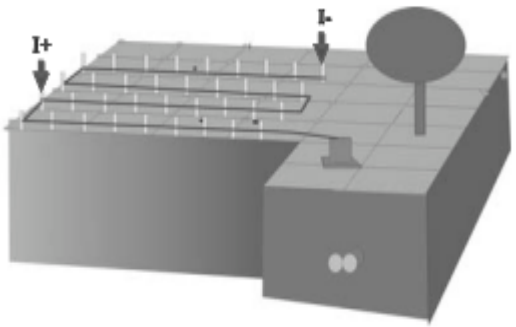




1D

# Electrical Resistivity Tomography ERT Method



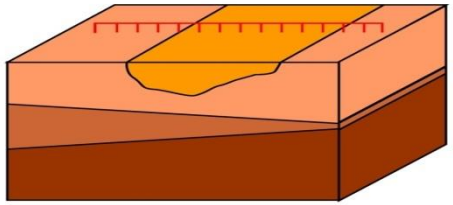

2D

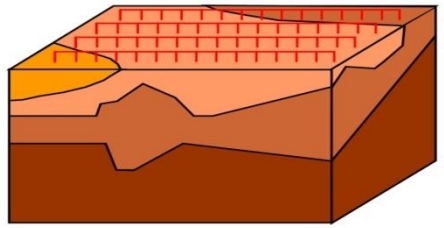
3D

# ERT Method

ERT is a technique of construction an image of the subsurface electrical properties by passing an electrical current along many paths and measuring the associated voltages. Resistivity distribution can be related to physical conditions of interest such as lithology, porosity, and water content..

Data Collection

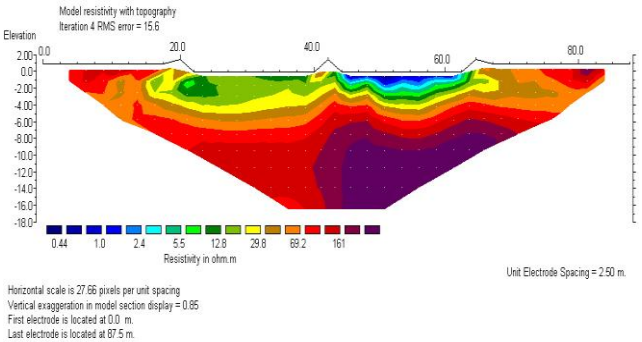


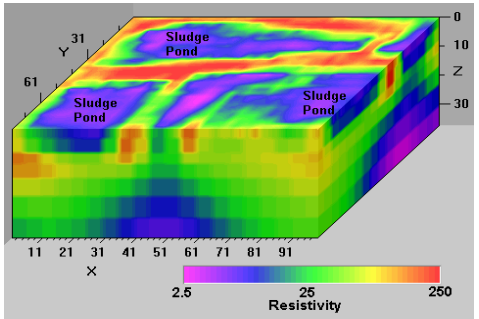


Data Inversion

Calculating the resistivity distribution that is consistent with observed data

Electrical Image

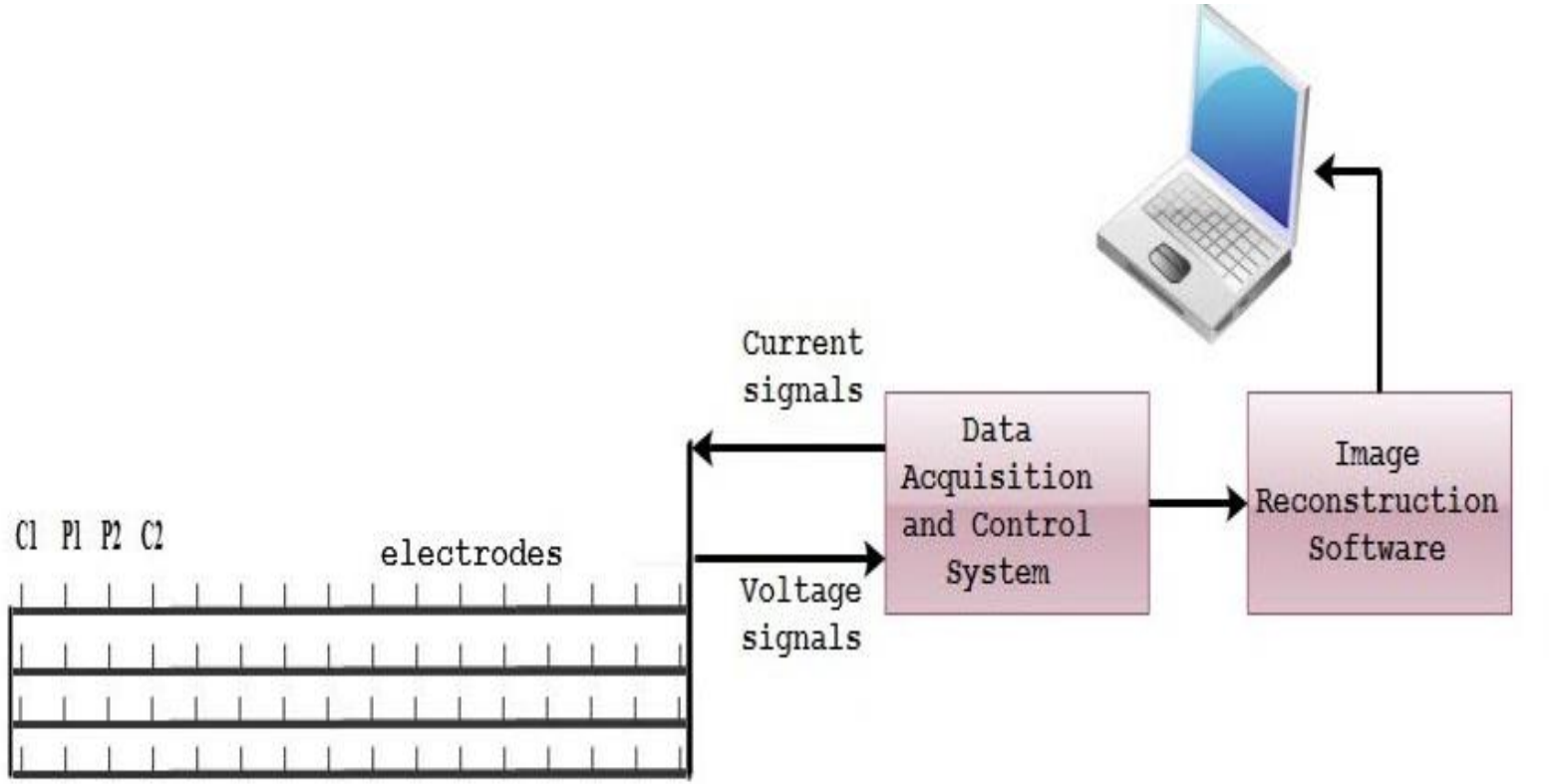



2D Model

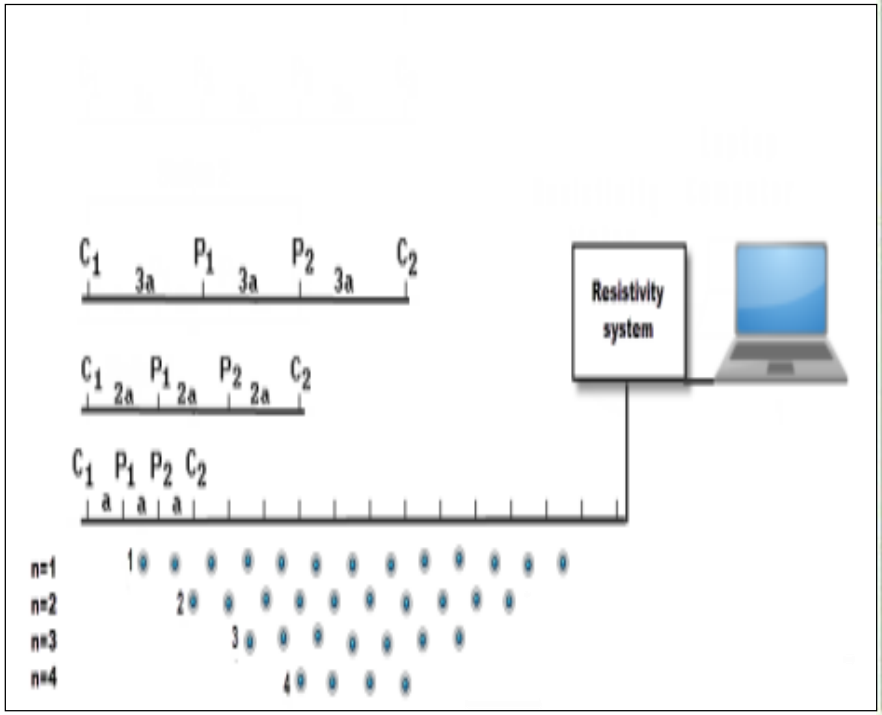
3D Model

# ERT Method: Data Acquisition and Interpretation

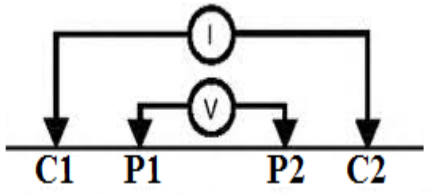


# ERT Method: Data Acquisition

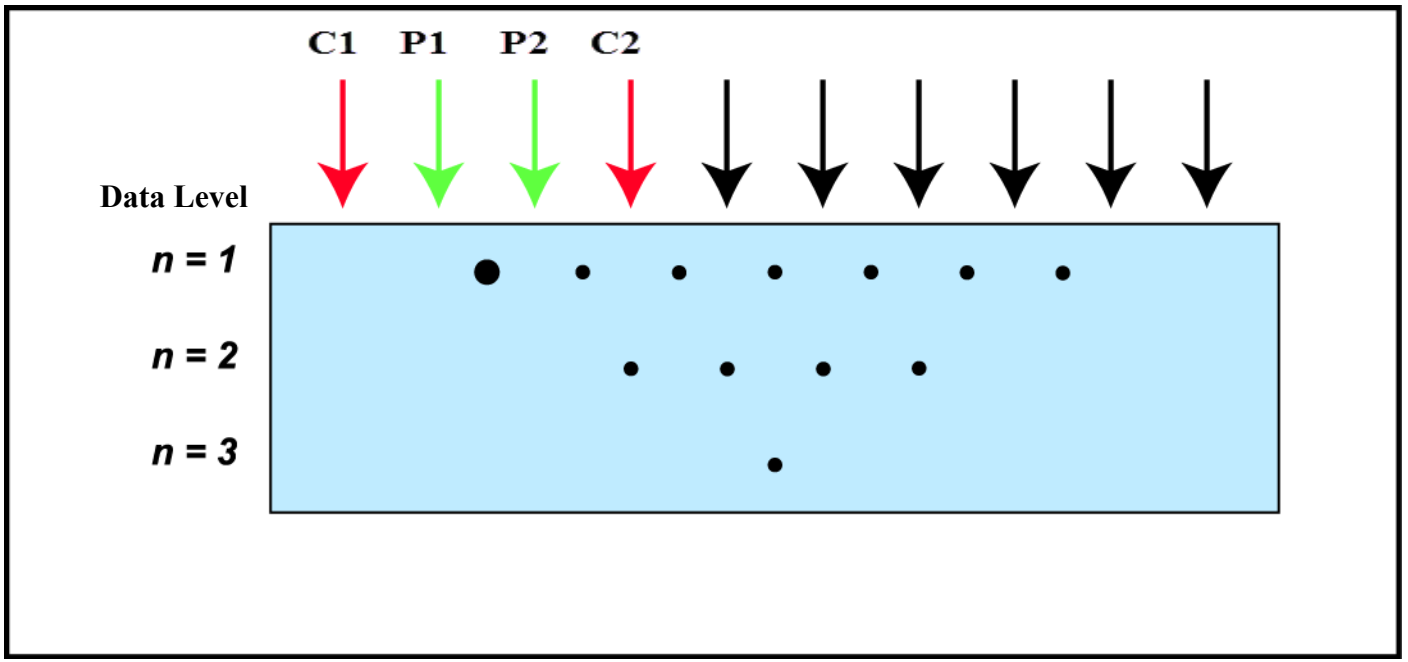
**ERT Method is based on the traditional four-electrode method combined with automatic multiplexing of a larger number of electrodes**

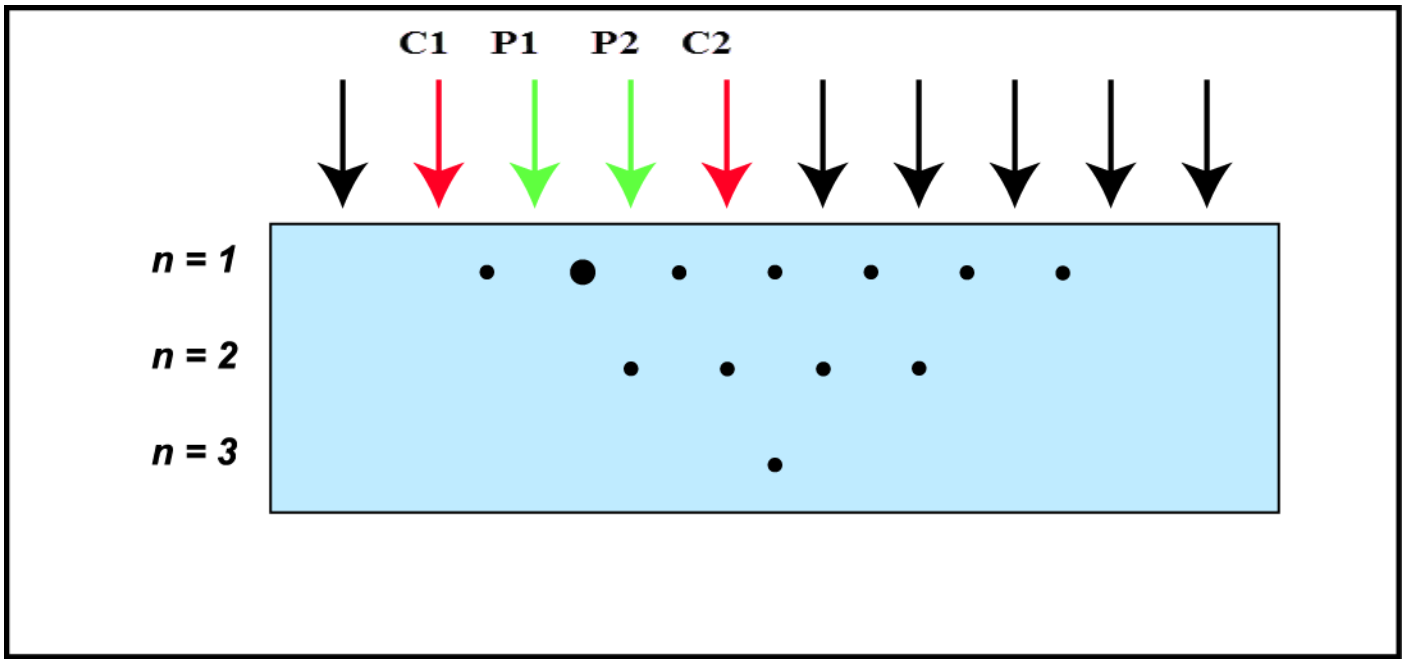


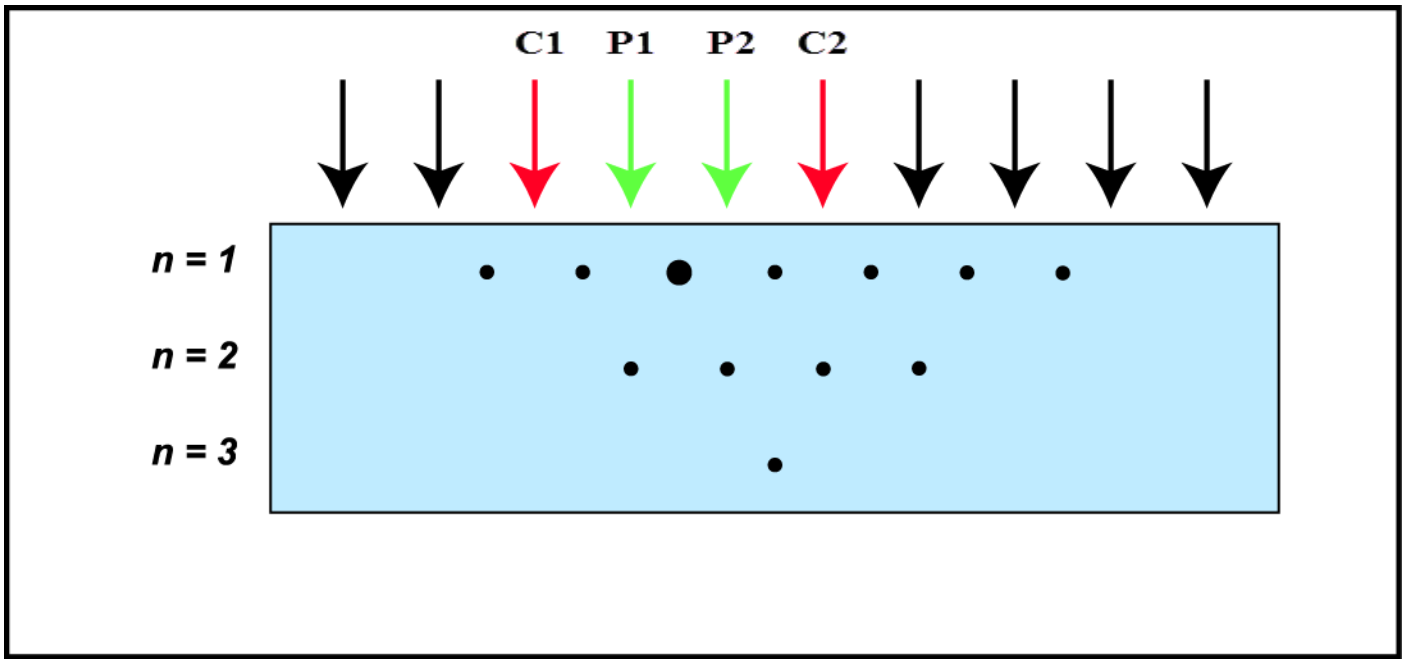

# 2D Data Acquisition

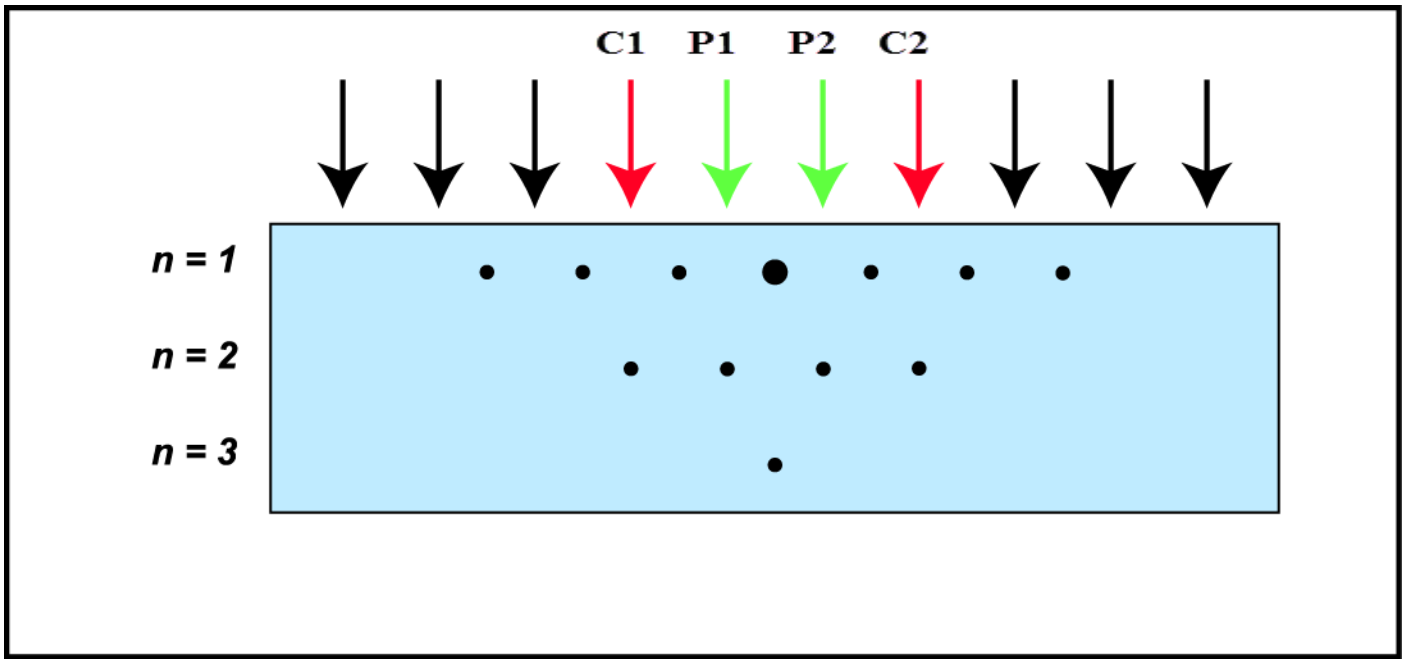


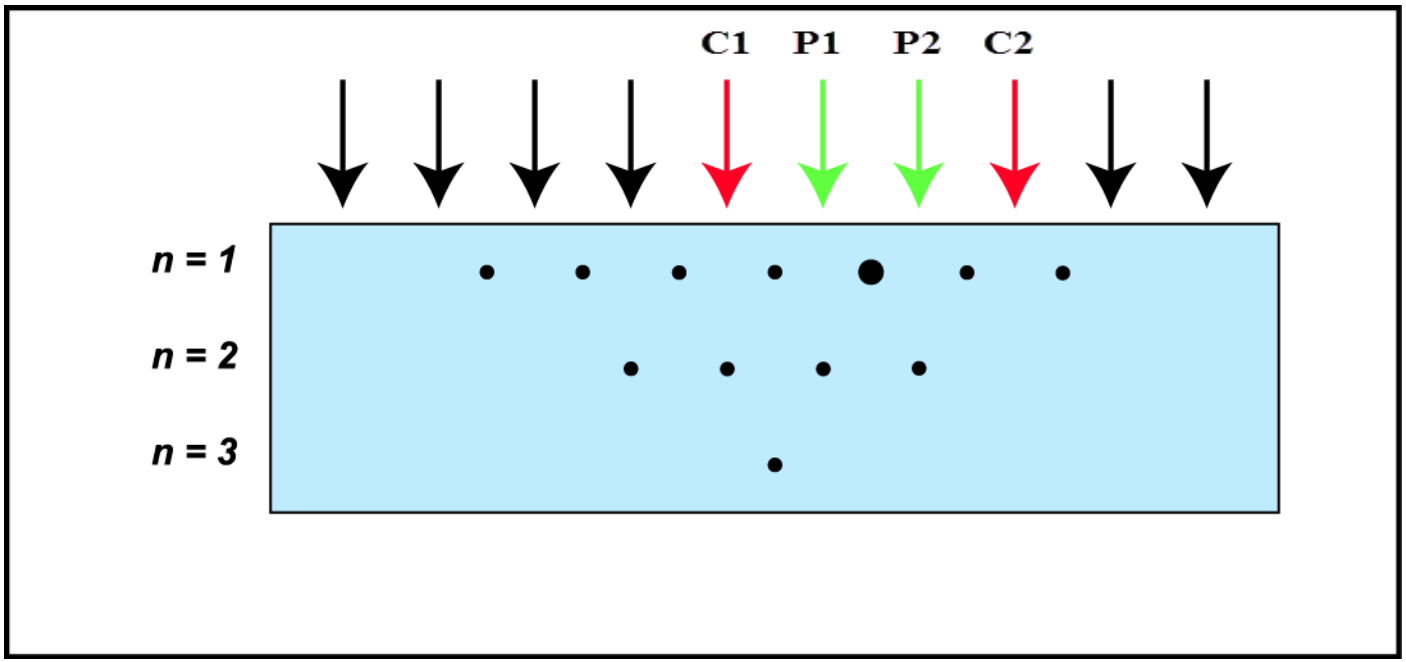

**C1, C2 Current Electrodes**
**P1, P2 Voltage Electrodes**

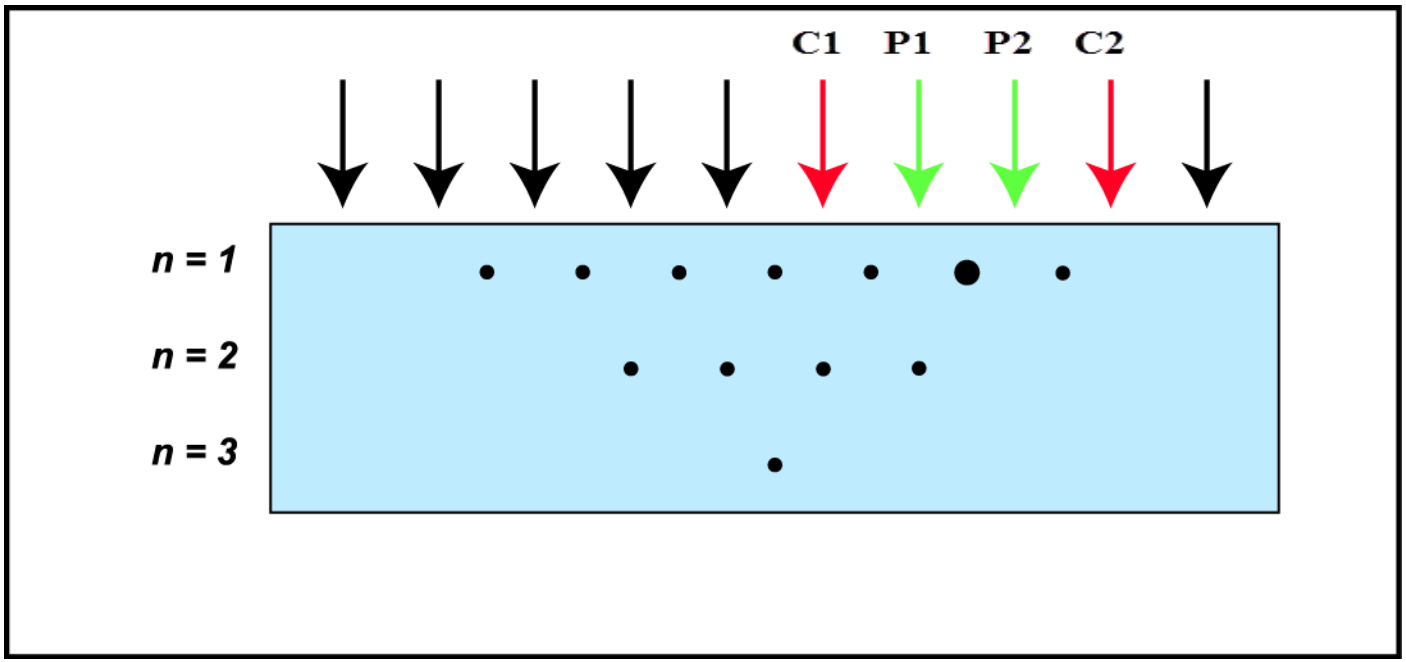


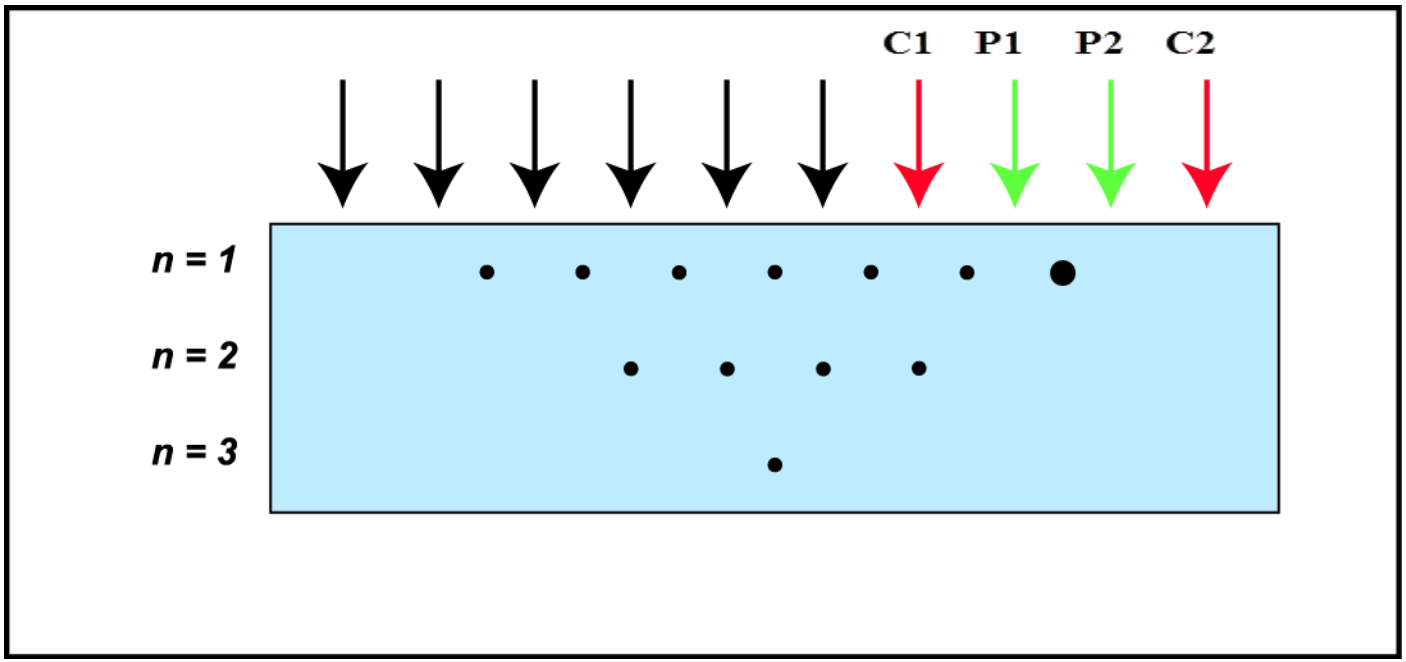

C1
P1
P2
C2
n = 1
n = 2
n = 3

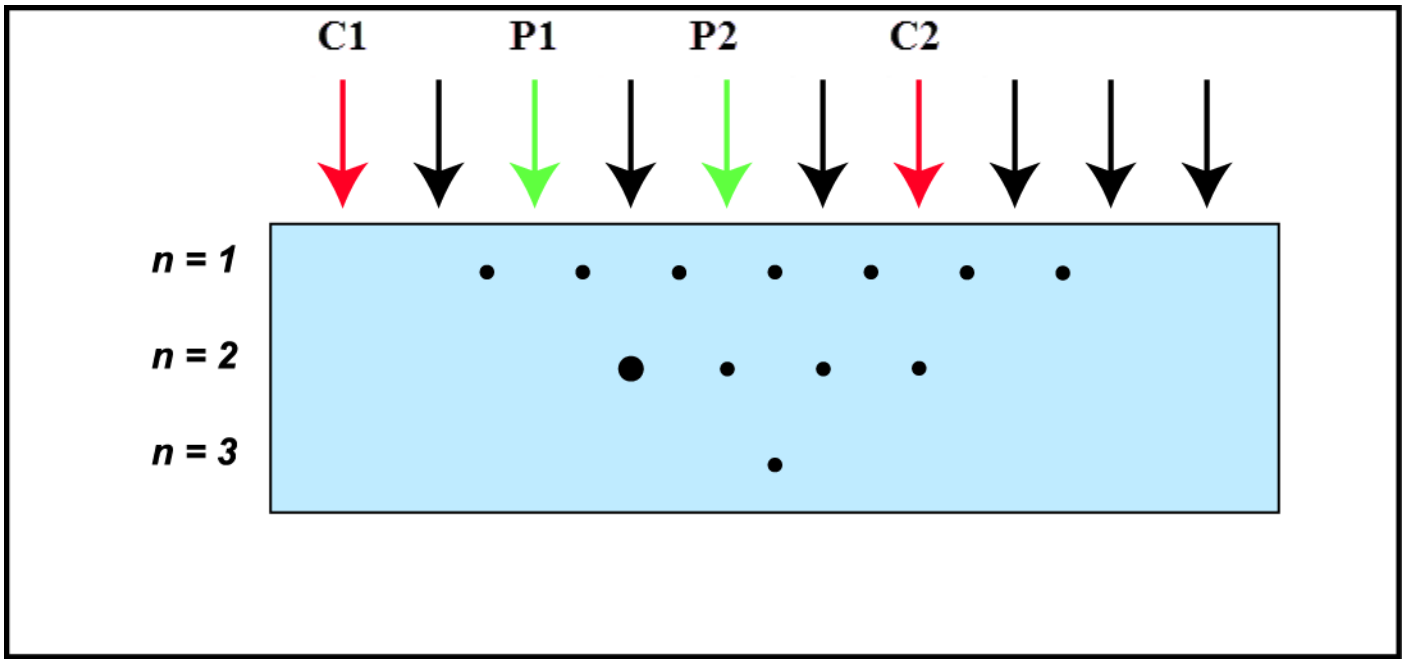

C1
P1
P2
C2
n = 1
n = 2
n = 3

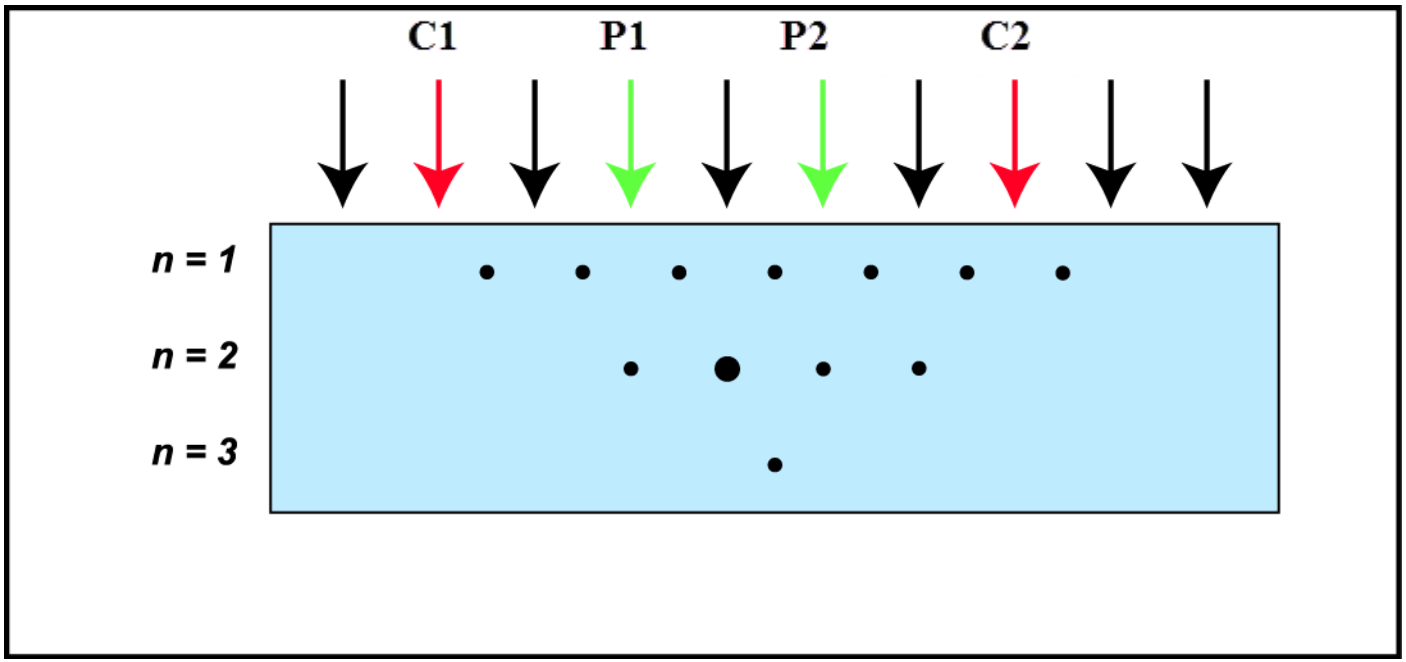

C1
P1
P2
C2
n = 1
n = 2
n = 3

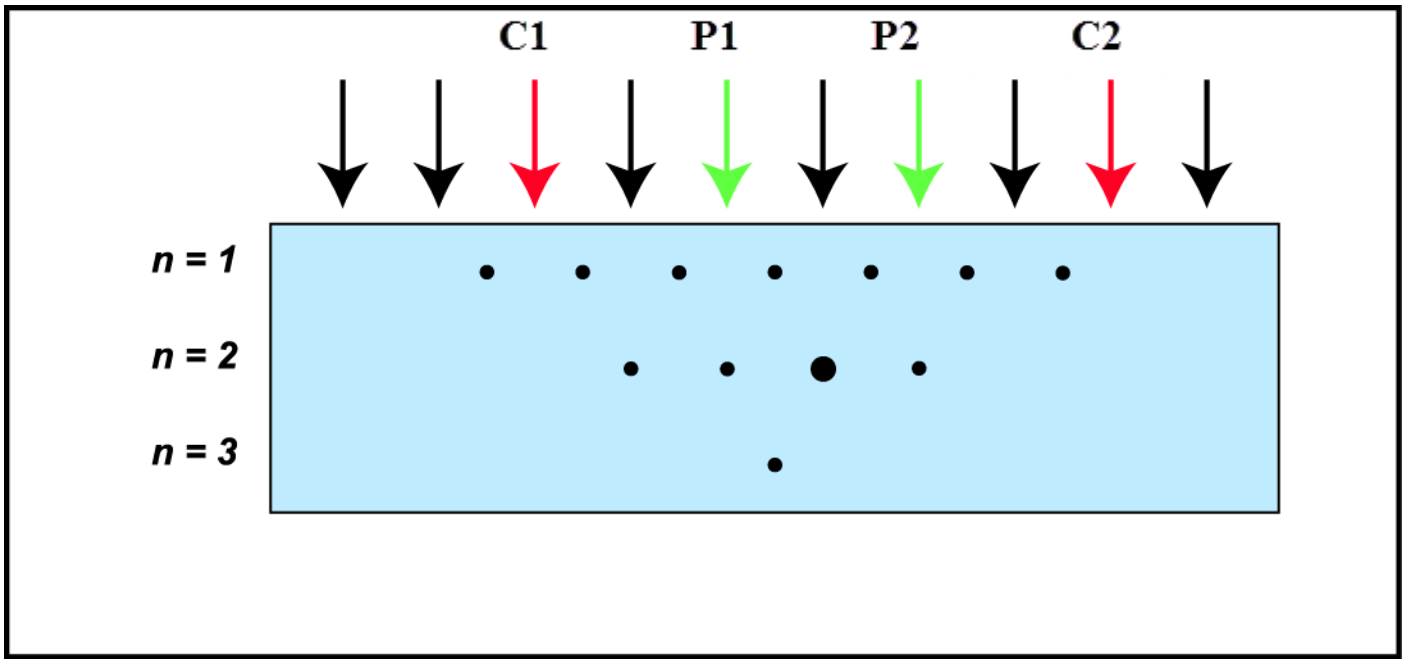

C1
P1
P2
C2
n = 1
n = 2
n = 3

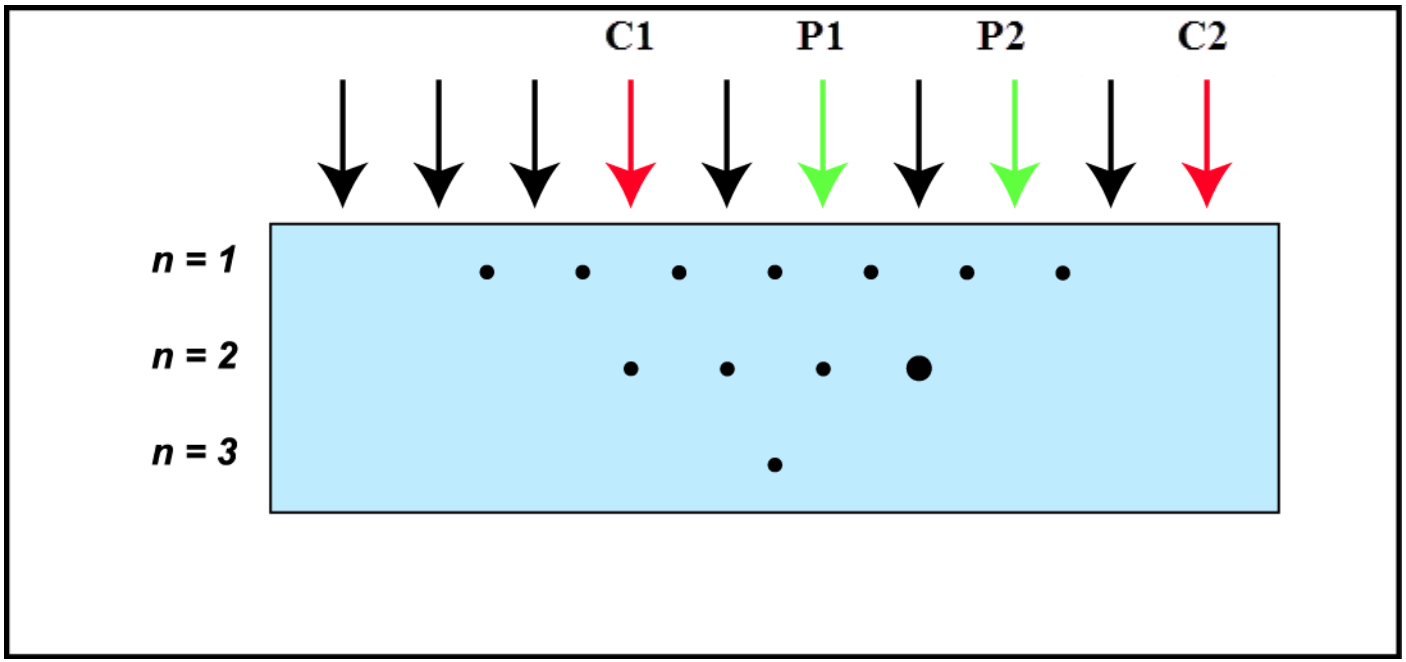

C1
P1
P2
C2
n = 1
n = 2
n = 3

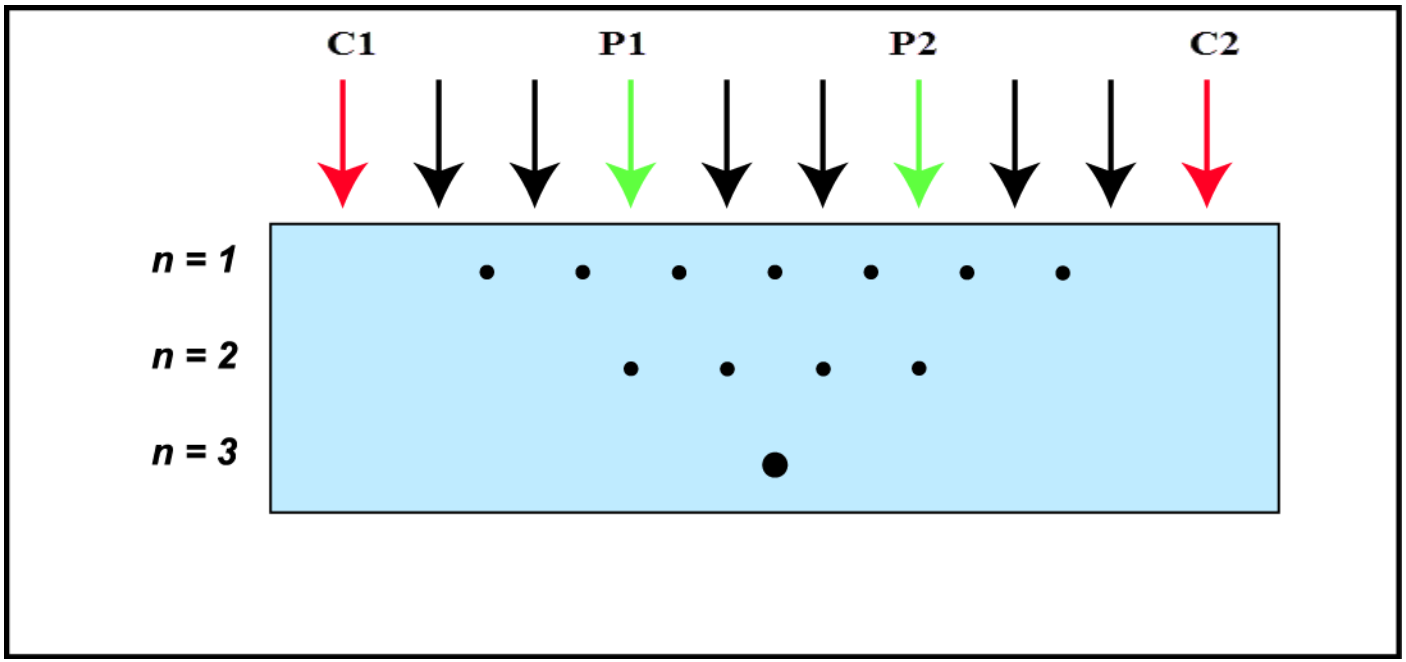

C1
P1
P2
C2
n = 1
n = 2
n = 3


C1
P1
P2
C2
n = 1
n = 2
n = 3

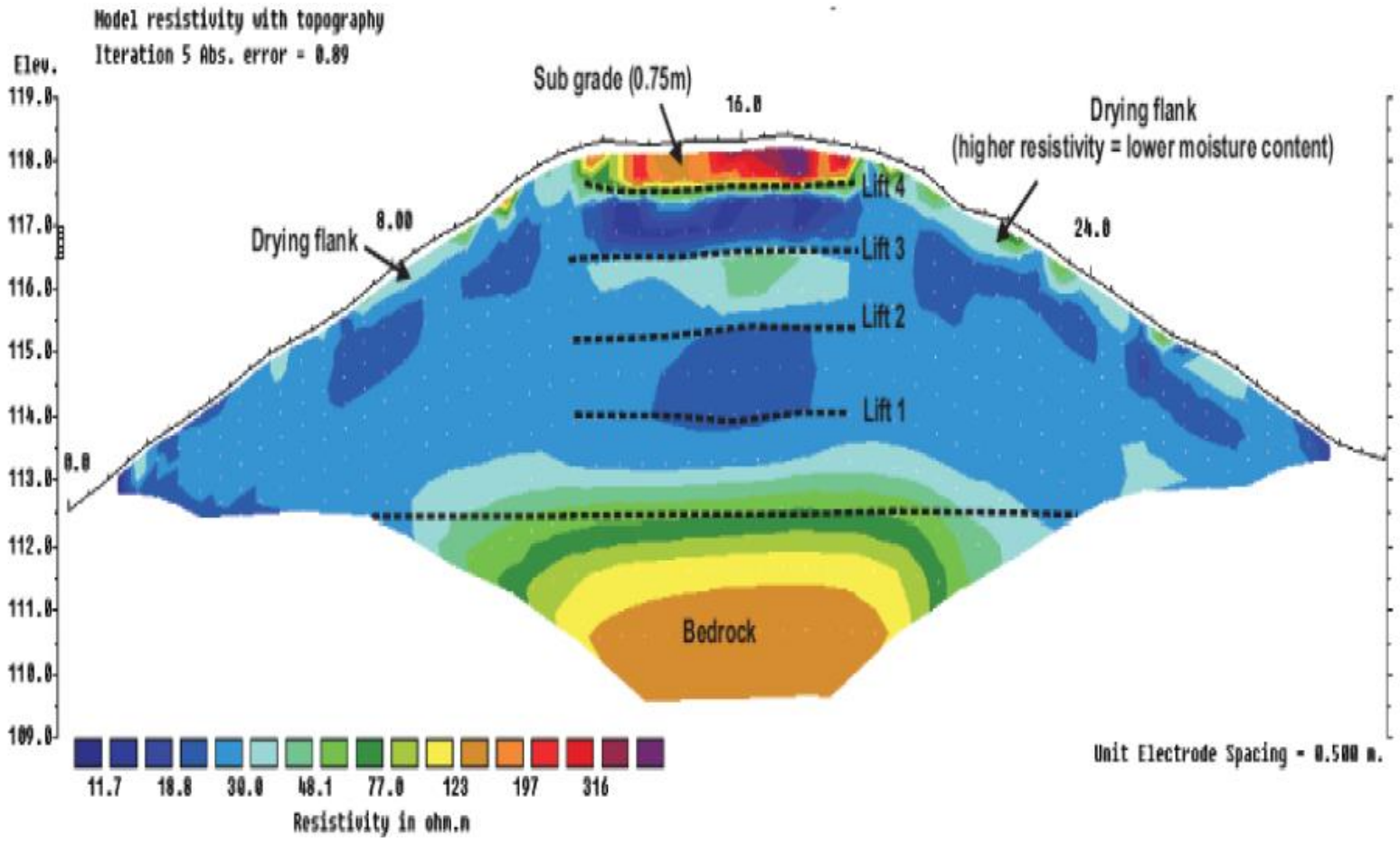

C1
P1
P2
C2
n = 1
n = 2
n = 3


C1
P1
P2
C2
n = 1
n = 2
n = 3


C1
P1
P2
C2
n = 1
n = 2
n = 3

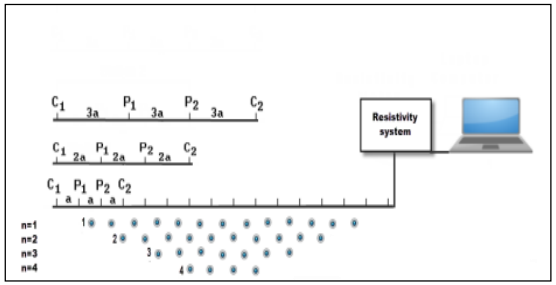

C1
P1
P2
C2
n = 1
n = 2
n = 3

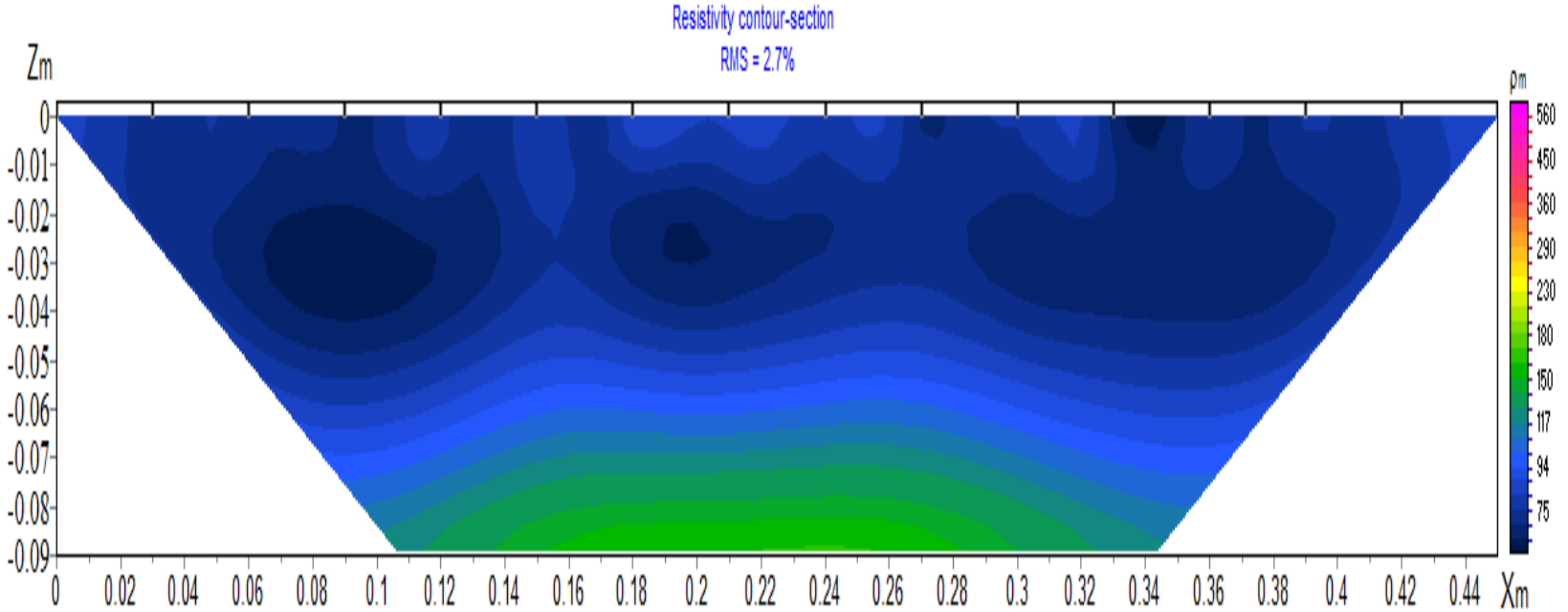
# 2D Resistivity section




2D resistivity Section of the BIONICS embankment, UK

# 2D resistivity experiment




2D Resistivity sections of a water-filled container


Thank You