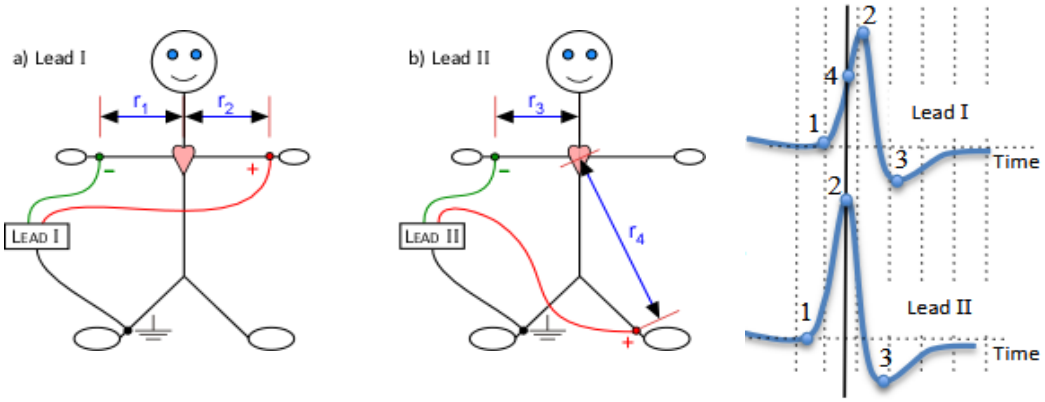
Phys104 - EKG lab using sample data collected in 2015



· **Use Logger Pro to find the voltage and time duration of one QRS peak:**

		Lead I		Lead II	
Point	**QRS**	**Time (s)**	**Potential (*mV*)**	**Time (s)**	**Potential (*mV*)**
1	Q	0.848	0.867	0.844	0.842
2	R	0.874	1.648	0.872	2.750
3	S	0.894	0.891	0.908	0.697
4		0.872	1.612		

· **Time duration of each peak (using points 1 and 3):**

Lead I: $\Delta t_I = t_{3\,I} - t_{1\,I} =$ 0.046 *seconds* = 46 *milliseconds*

Lead II: $\Delta t_{II} = t_{3\,II} - t_{1\,II} =$ 0.064 *seconds* = 64 *milliseconds*

· **Maximum potential difference of each peak (using points 2 and 3):**

Lead I: $\Delta V_I = V_{2\,I} - V_{3\,I} =$ 0.757 *mV*

Lead II: $\Delta V_{II} = V_{2\,II} - V_{3\,II} =$ 2.053 *mV*

· **Calculating maximum dipole moment:**

· *Use the time when Lead II gives a max. voltage*

Use Lead I, point 4: $\Delta V_{4\,I} =$ 1.612 *mV*

Use Lead II, point 2: $\Delta V_{2\,II} =$ 2.750 *mV*

<r> (m)	ε_o ($C^2/(N \cdot m^2)$)	κ_{water}
0.75	8.85E-12	80

· ***p_x, the x-component of dipole moment:***

$$p_x = (\Delta V_I)\,2\pi\varepsilon_o\kappa_{water}r^2$$
$$= (1.612\times10^{-3}V)\,2\pi\,(8.85\times10^{-12})(80)(0.75)^2$$

p_x = 4.03E-12 C·m

Dipole Moment Units (where $N = \frac{CV}{m}$):

$$V\left(\frac{C^2}{N\cdot m^2}\right)m^2$$
$$= \frac{VC^2}{N} = \frac{VC^2}{\left(\frac{CV}{m}\right)}$$
$$= C\cdot m$$

· ***p_y, the y-component of dipole moment:***

$$p_y = (\Delta V_{II} - \tfrac{1}{2}\Delta V_I)\,2\pi\varepsilon_o\kappa_{water}r^2$$
$$= (2.750\times10^{-3}V - (\tfrac{1}{2})1.612\times10^{-3}V)\,2\pi\,(8.85\times10^{-12})(80)(0.75)^2$$

p_y = 4.86E-12 C·m

· ***Therefore, the dipole moment p is:***

$$p = \sqrt{p_x^2 + p_y^2} \;\; and \;\; \theta = \tan^{-1}\left(\frac{p_y}{p_x}\right)$$

p = 6.32E-12 C·m
θ = 50.3 °