

Electrocardiography I

Exercise I:

- a) Monitor and record an ECG from 12 leads of your schoolmate.
- b) For the instantaneous values of potential in R peaks check the validity of following relations: $U_{II} = U_I + U_{III}$ ($U_I = U_L - U_R$, $U_{II} = U_F - U_R$, $U_{III} = U_F - U_L$).
- c) Construct and evaluate the mean electrical axis of the QRS complex.

Instrumentation: Electrocardiograph SEIVA PRAKTIK, ECG gel.

Procedure Ia:

1. ECG unit is connected to PC. By double-clicking the icon SEIVA Database open the database window.
2. Press the button [Ins]. The *New patient* window appears. Fill the patient's data and confirm them by [Ctrl+Enter] or press button [OK].

Place electrodes to the limbs and chest according to the next figure and the table. Moisture the places of connection with ECG-gel before the electrodes are attached. After the measurement always clean, disinfect and dry electrodes. The person whose EKG is being measured should remain calm and relaxed. Encourage the person to breathe normally.

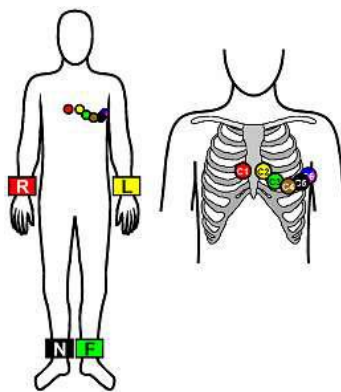



Fig. 1

Electrode	Colour coding	Placement
R	red	right arm
L	yellow	left arm
F	green	left leg
N	black	right leg
C1	red - white	4th interrib., right side from sternum
C2	yellow - white	4th interrib., left side from sternum
C3	green - white	between C2 and C4
C4	brown - white	5th interrib. in medioklav. line
C5	black - white	in the same level as C4 in the front ax. line
C6	Blue (purple) - white	in the same level as C4 in the medial ax. line

3. By clicking the application icon ECG in the upper right corner of the database window run the application.
4. Start the monitoring by pressing [F5].
5. Check parameters of monitoring by pressing [F7] or by right-clicking the corresponding button, set AC filter for the elimination of 50/60 Hz noise and baseline (0.3 Hz).
6. Press [F8] or right-click the corresponding button; set the speed of monitoring to 25 mm/s.
7. Press [F9] or right-click the corresponding button; set the sensitivity of monitoring to 10 mm/mV.
8. Press [F10] or right-click the corresponding button; set 2x6 leads+1rhythm to be displayed on the monitor.
9. Stop monitoring, if necessary, by [Esc] or by pressing the button STOP. Save the last 10 seconds of ECG record into the database [F2].
10. Print out the record by pressing [F6].

11. Open the analysis mode window [F11]. Select appropriate myofilter [F9]. Observe the record in the Averaged and Zoom mode. Make some manual changes of intervals with the aid of the measurement markers. (The intervals and the interpretation previously saved are not changed after changing the position of the markers.)
12. Print out the table [F6] in the *Averaged* mode, if necessary.
13. Exit application [Alt+F4].
14. Exit Database .

Data derived from the ECG record use for the drawing of the mean electrical axis of the QRS complex.

Procedure Ib:

1. Use the records of the classical unipolar limb leads I, II, III for drawing the mean electrical axis of the QRS complex. This construction represents the projection of the heart vector to the frontal plane.
2. Design Einthoven's equilateral triangle. Label apexes as L, R, F. Mark the conventional polarity of the standard lead I, II, III (Fig. 5).
3. Draw normal in the midpoint of each side of the triangle. The normal can be considered as the intersection of isoelectric planes of records of leads I, II, III with the frontal plane. Normals intersect in the isoelectrical point of the heart - a starting point of an electrical vector of the heart, a special case of which is an electrical axis of the heart.
4. Read the amplitudes of Q, R, S oscillations - the distance from the isoelectrical line to the peak - for I, II, and III lead from ECG or the table of the analysis mode window.

5. Sum up the values of Q, R, S oscillations for I, II, and III lead, take care of the correct polarity of oscillations. Draw them in corresponding polarity to the respective sides of Einthoven's triangle.
6. Draw normals from the ends of abscissae corresponding to the sum of Q, R, S peaks. Normals intersect in the ending point of the mean electrical axis of the QRS complex. By connecting this point with the centre of Einthoven's triangle (the starting point of the electrical axis), obtain the electric axis of the QRS complex.
7. To establish the direction of the heart electrical axis, regard the starting point as a centre of the circle, the perimeter of which corresponds to the angular scale. The positive direction of x-axis fits to 0° . The upper semicircle is divided from 0° to -180° , the lower from 0° to 180° (Fig. 58 in the textbook, page 122).
8. Compare the calculated value of the QRS complex with that of a healthy conducting cardiac system.