Medical Biophysics II.

Pulse generators lab

Department of Biophysics and Radiation Biology

Pacemaker

<table>
<tr><th>I.</th><th>II.</th><th>III.</th><th>IV.</th><th>V.</th></tr>
<tr><td>Chamber(s) Paced</td><td>Chamber(s) Sensed</td><td>Response to Sensing</td><td>Rate Modulation</td><td>Multisite Pacing</td></tr>
<tr><td>0 = None</td><td>0 = None</td><td>0 = None</td><td>0 = None</td><td>0 = None</td></tr>
<tr><td>A = Atrium</td><td>A = Atrium</td><td>I = Inhibited</td><td rowspan="3">R = Rate Modulation</td><td>A = Atrium</td></tr>
<tr><td>V = Ventricle</td><td>V = Ventricle</td><td>T = Triggered</td><td>V = Ventricle</td></tr>
<tr><td>D = Dual (A+V)</td><td>D = Dual (A+V)</td><td>D = Dual (I+T)</td><td>D =Dual (A+V)</td></tr>
</table>

In our example: VVIR/AAIR

Pacemaker presentation

- Video: 14_Pulse generators – Pacemaker_2

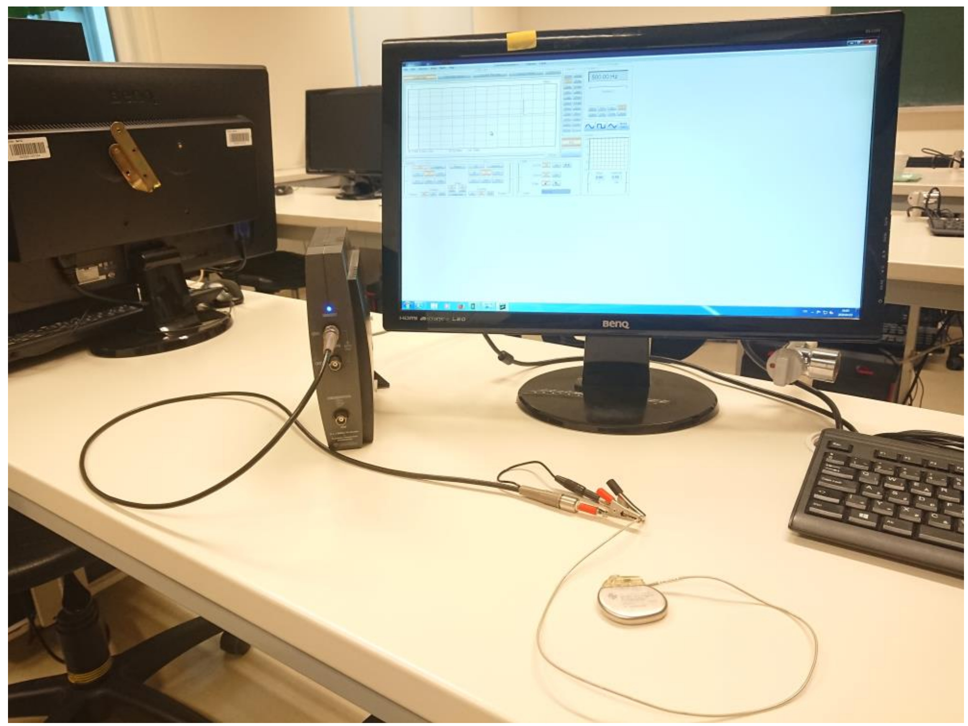
Measurement of Pacemaker Pulses 1.

Task 1.): Interpretation of the given pacemaker's code and measuring its pulse characteristics with a digital oscilloscope.

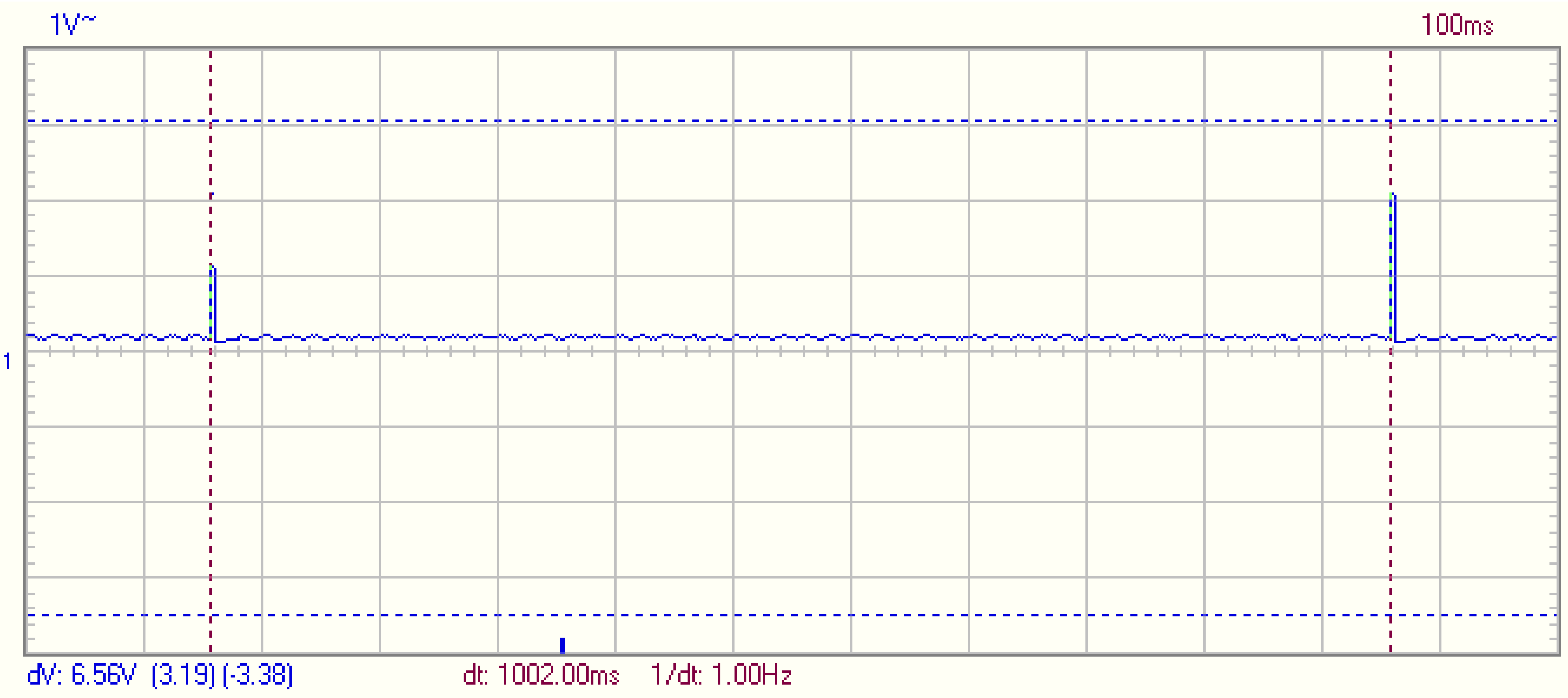
❖Video: 15_Pulse generators – Measurement of Pacemaker Pulses

$$T_{AMV} = \tau_1 + \tau_2$$

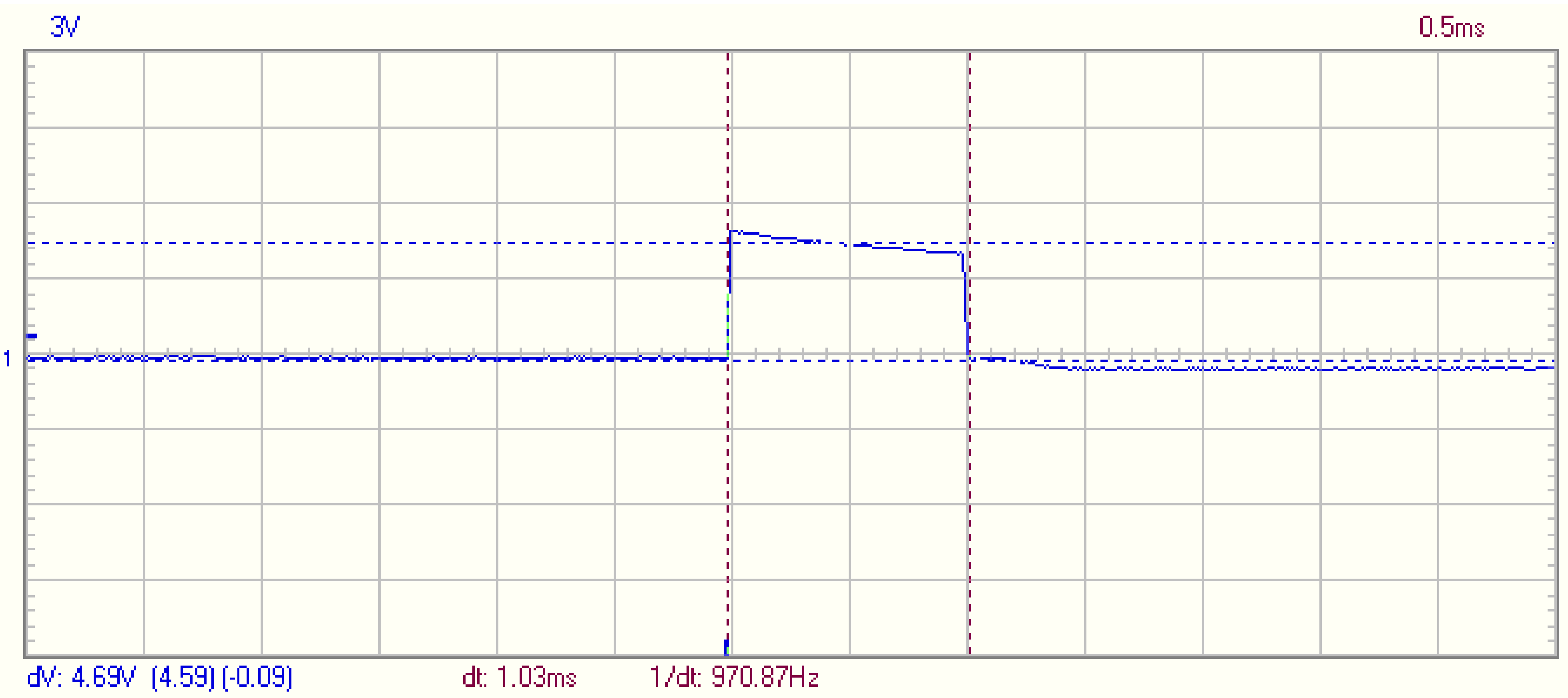
$$\text{Duty cycle} = \frac{\tau_1}{\tau_1 + \tau_2}$$



Measurement of Pacemaker Pulses 2.

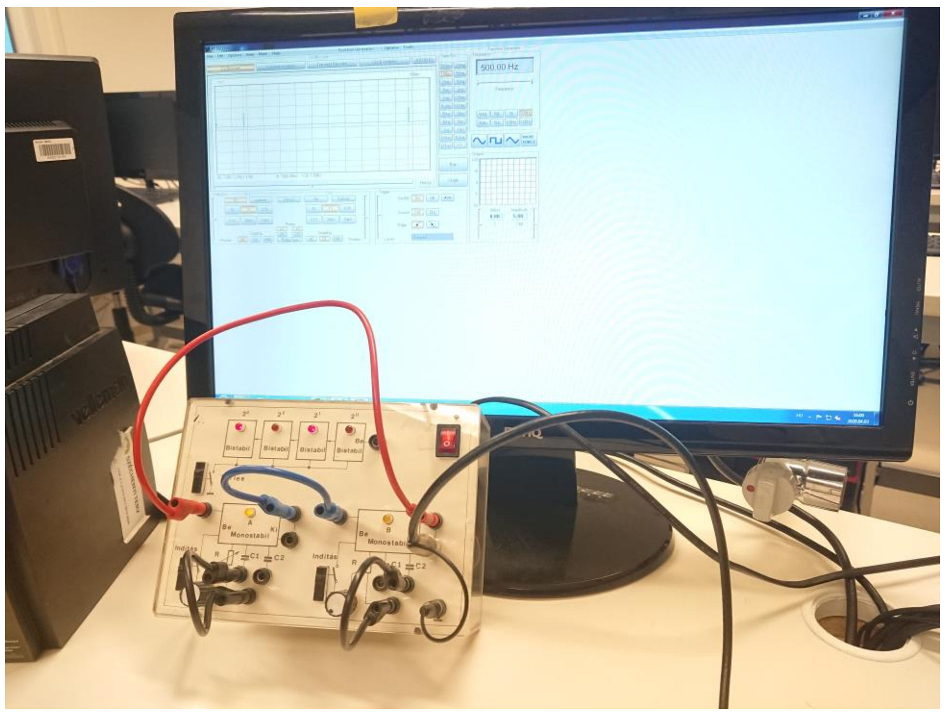


Measurement of Pacemaker Pulses 3.



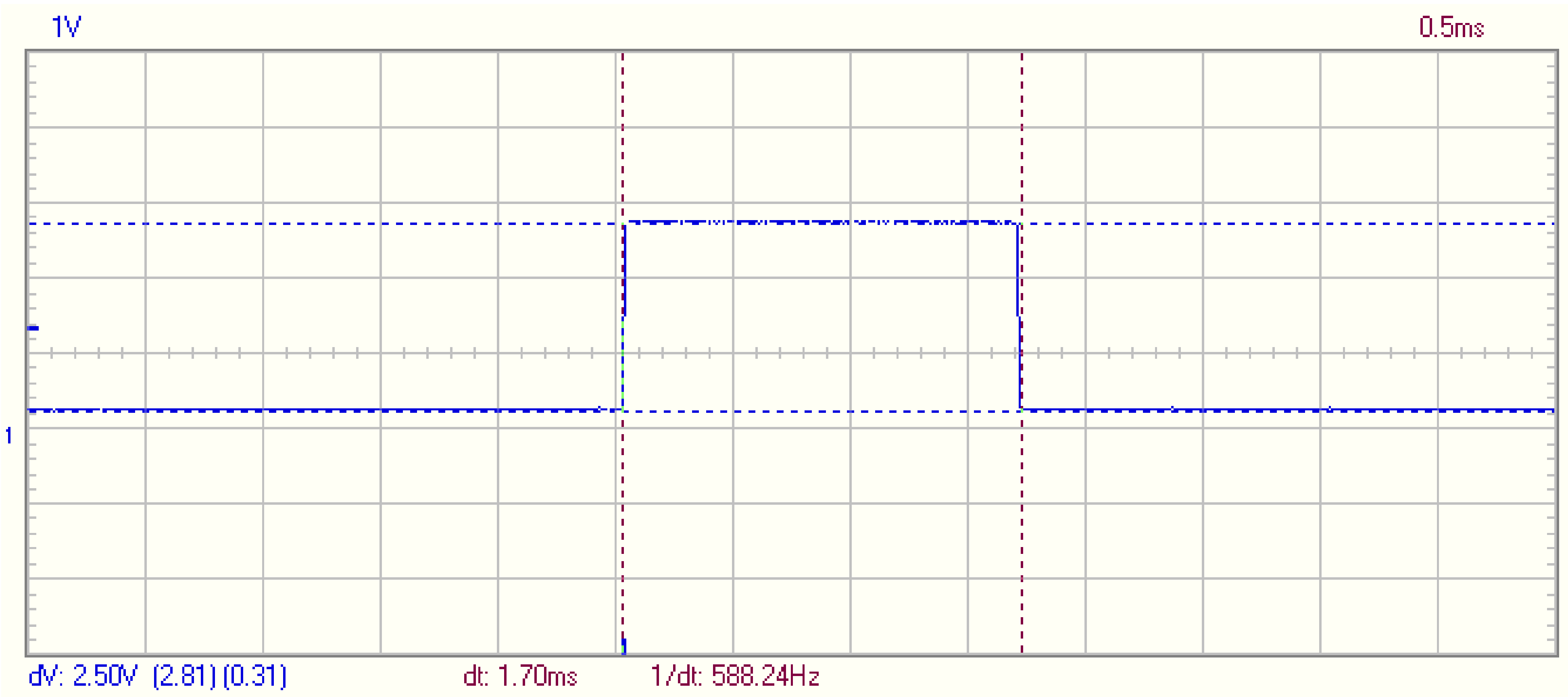
Modelling of Pacemaker Pulses 1.

Task 2.): Create a connection of the components of the model box in order to reproduce the pacemaker pulses as accurate as possible. Measure the pulse characteristics with the digital oscilloscope.



Modelling of Pacemaker Pulses 2.

Modelling of Pacemaker Pulses 3.



Calculation with Pacemaker Pulses

Task 3.): Calculate the pulse energy and the number of charge flowed through during one pulse in case of a given tissue resistance.

$$E = \frac{U^2}{R}\tau_{active} \qquad Q = \frac{U}{R}\tau_{active}$$