# EHM UCHUN DASTUR

**Xususiy yarimo'tkazgichli asboblarda elektronlar va kovaklar statistikasini haroratning ta'siri orqali tahlil qilish dasturi**

**Программа для анализа статистики электронов и дырок в специальных полупроводниковых приборах по влиянию температуры**


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**12 sahifada**


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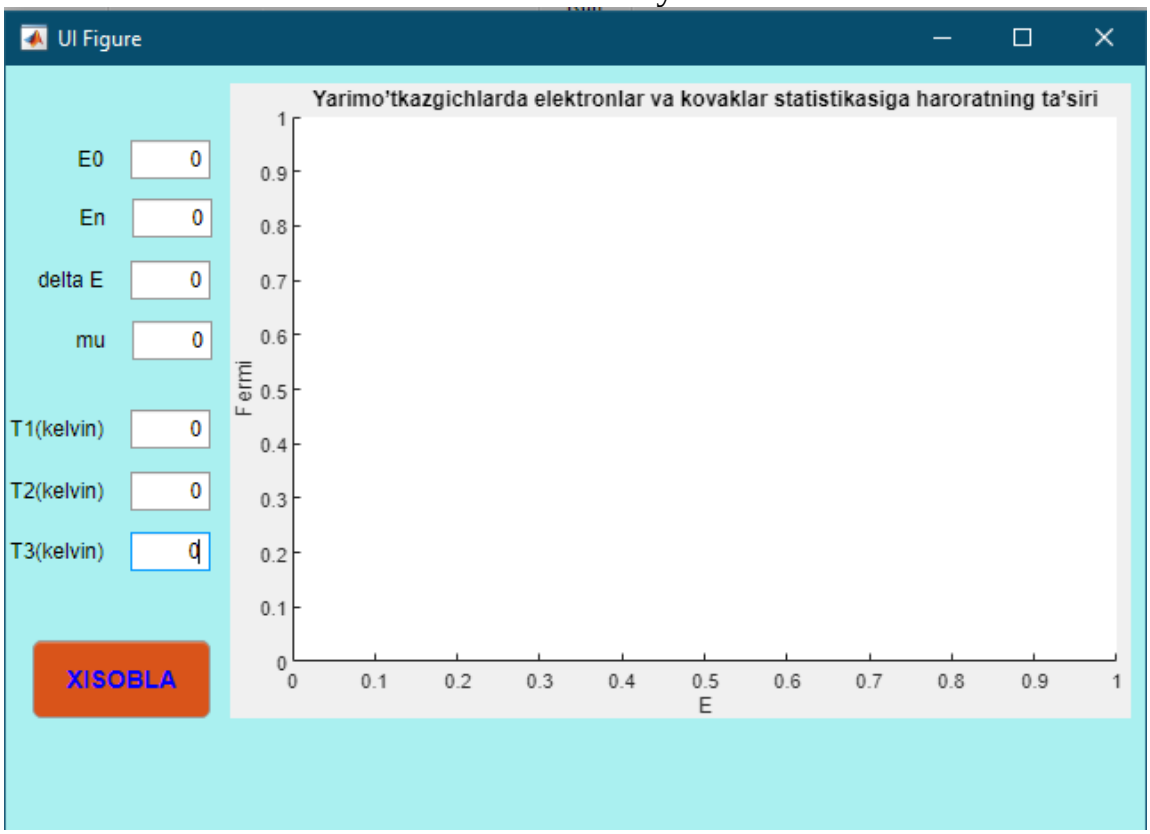
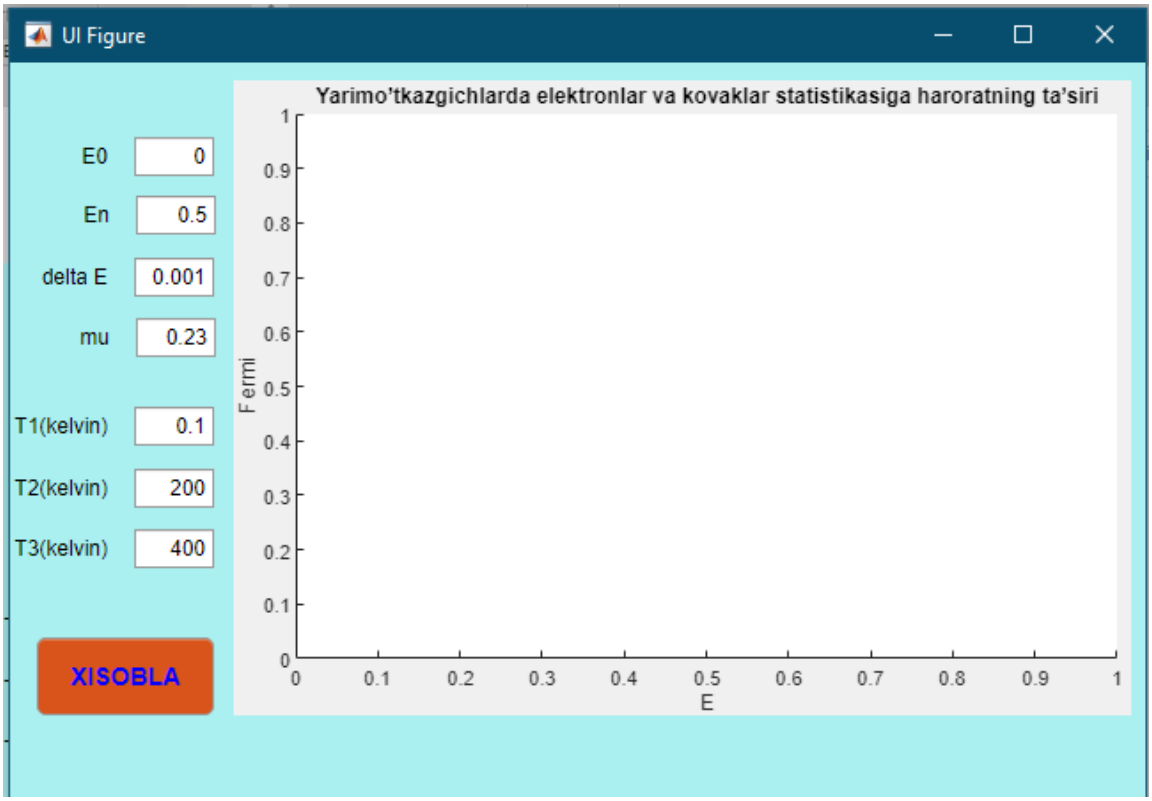
## Dastur oyna ko’rinishlaridan na`munalar

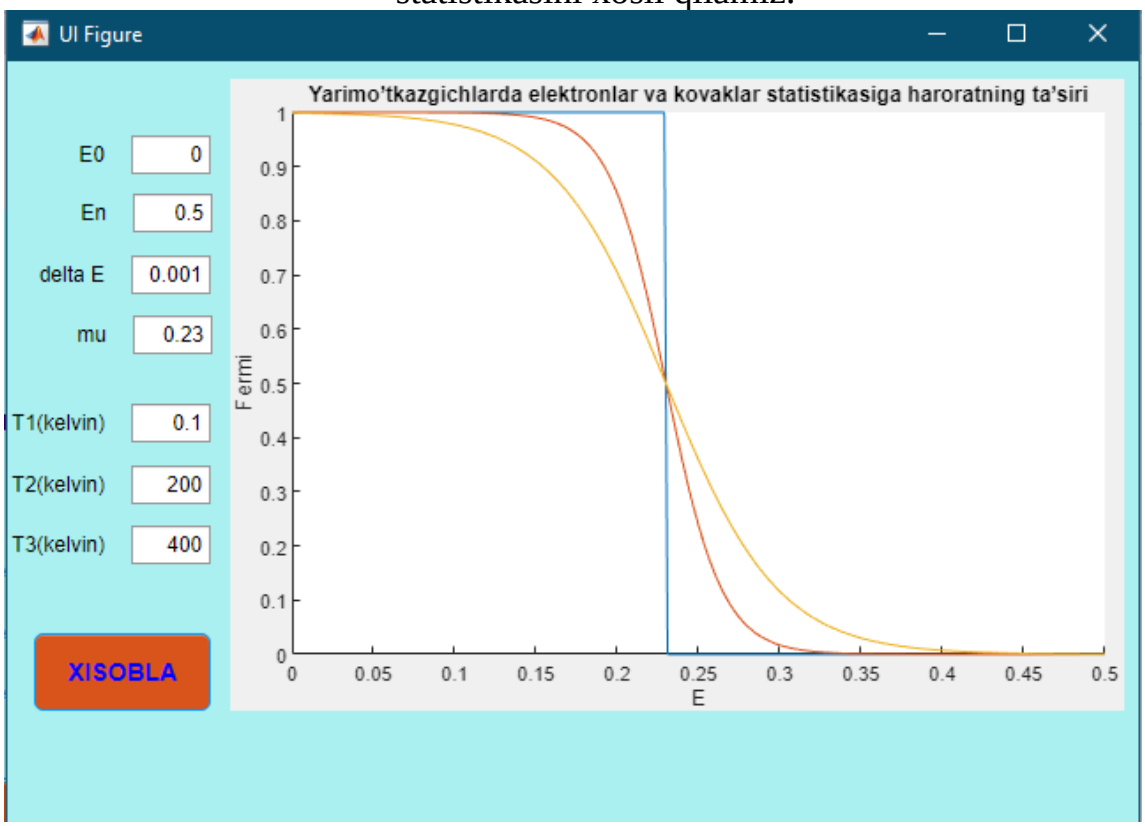
1. Xususiy yarimo’tkazgichli asboblarda elektronlar va kovaklar statistikasi (Fermi-Dirak taqsimot funksiyasi)ni haroratning ta’siri orqali tahlil qilish dasturi bosh oynasi.



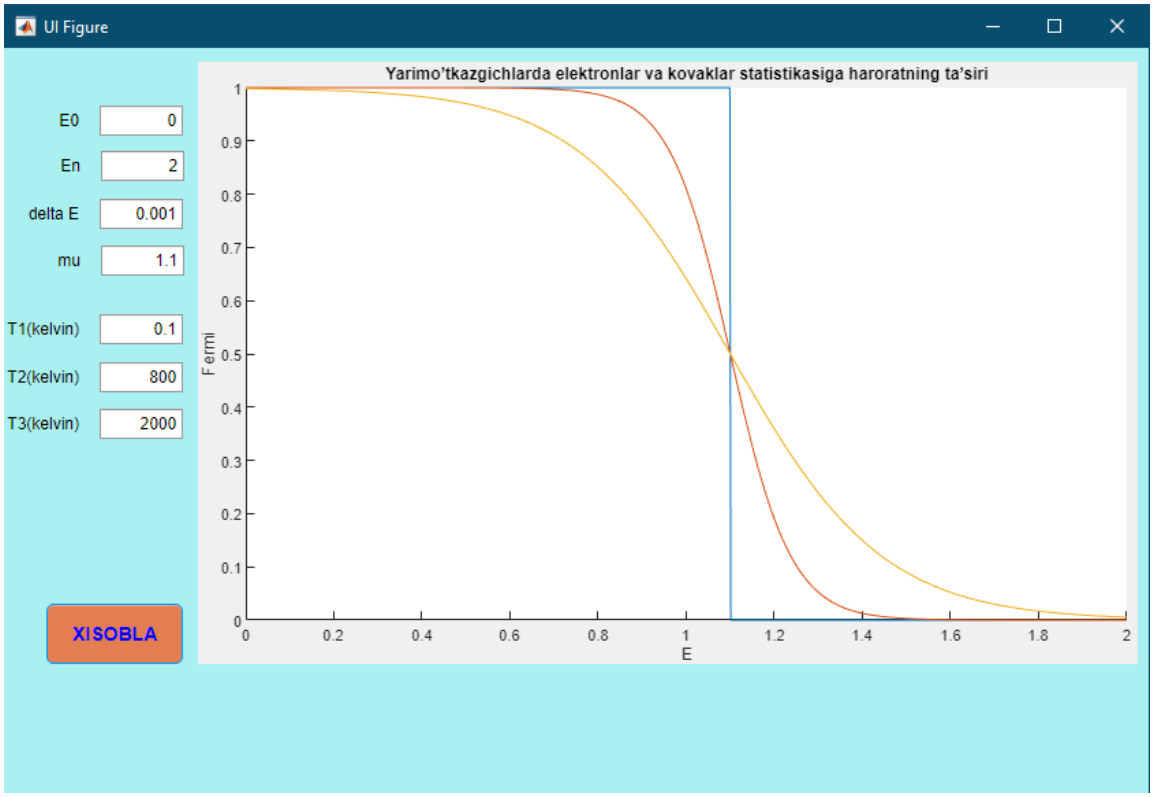

2. Run tugmasini bosish orqali Fermi energiyasi (μ), Erkin elektronning boshlang’ich energiyasi ($E_0$), Erkin elektronning n- sathdagi energiyasi ($E_n$), va kerakli harorat (T1, T2, T3) lar mos ravishda kiritiladi.




3. Xisobla tugmasi yordamida berilgan haroratlardagi elektronlar va kovaklar statistikasini xosil qilamiz.




4. Xisobla tugmasi yordamida berilgan haroratlardagi elektronlar va kovaklar statistikasini xosil qilamiz.




## DASTUR MATNI

```
classdef app4 < matlab.apps.AppBase

    % Properties that correspond to app components

    properties (Access = public)

        UIFigure              matlab.ui.Figure

        UIAxes                matlab.ui.control.UIAxes

        E0EditFieldLabel      matlab.ui.control.Label

        E0EditField           matlab.ui.control.NumericEditField

        EnEditFieldLabel      matlab.ui.control.Label

        EnEditField           matlab.ui.control.NumericEditField

        deltaEEditFieldLabel  matlab.ui.control.Label

        deltaEEditField       matlab.ui.control.NumericEditField

        muEditFieldLabel      matlab.ui.control.Label
```

```
    muEditField             matlab.ui.control.NumericEditField
    T1kelvinEditFieldLabel  matlab.ui.control.Label
    T1kelvinEditField       matlab.ui.control.NumericEditField
    T2kelvinEditFieldLabel  matlab.ui.control.Label
    T2kelvinEditField       matlab.ui.control.NumericEditField
    T3kelvinEditFieldLabel  matlab.ui.control.Label
    T3kelvinEditField       matlab.ui.control.NumericEditField
    XISOBLAButton           matlab.ui.control.Button
    Label                   matlab.ui.control.Label
end


properties (Access = private)
    k=1.38e-23;
    el=1.6e-19;


 end


methods (Access = private)
    % Button pushed function: XISOBLAButton
    function XISOBLAButtonPushed(app, event)


        e0=app.E0EditField.Value;
        en=app.EnEditField.Value;
        e1=app.deltaEEditField.Value;
```

```
        mu=app.muEditField.Value;
        t1=app.T1kelvinEditField.Value;
        t2=app.T2kelvinEditField.Value;
        t3=app.T3kelvinEditField.Value;

        i=e0:e1:en
        y1=(1+exp((i-mu).*app.el./(app.k.*t1))).^(-1);
        y2=(1+exp((i-mu).*app.el./(app.k.*t2))).^(-1);
        y3=(1+exp((i-mu).*app.el./(app.k.*t3))).^(-1);
        plot(app.UIAxes,i, y1, i, y2, i, y3);
    end
end
% App initialization and construction
methods (Access = private)
    % Create UIFigure and components
    function createComponents(app)
        % Create UIFigure
        app.UIFigure = uifigure;
        app.UIFigure.Color = [0.6667 0.9412 0.9412];
        app.UIFigure.Position = [100 100 640 480];
        app.UIFigure.Name = 'UI Figure';
        % Create UIAxes
        app.UIAxes = uiaxes(app.UIFigure);
```

```
        title(app.UIAxes, 'Yarimo'tkazgichlarda elektronlar va kovaklar statistikasiga haroratning ta'siri')
        xlabel(app.UIAxes, 'E')
        ylabel(app.UIAxes, 'Fermi')
        app.UIAxes.FontSize = 11;
        app.UIAxes.Position = [127 113 506 358];
        % Create E0EditFieldLabel
        app.E0EditFieldLabel = uilabel(app.UIFigure);
        app.E0EditFieldLabel.HorizontalAlignment = 'right';
        app.E0EditFieldLabel.Position = [31 417 25 22];
        app.E0EditFieldLabel.Text = 'E0';
        % Create E0EditField
        app.E0EditField = uieditfield(app.UIFigure, 'numeric');
        app.E0EditField.Position = [71 417 45 22];
        % Create EnEditFieldLabel
        app.EnEditFieldLabel = uilabel(app.UIFigure);
        app.EnEditFieldLabel.HorizontalAlignment = 'right';
        app.EnEditFieldLabel.Position = [32 384 25 22];
        app.EnEditFieldLabel.Text = 'En';
        % Create EnEditField
        app.EnEditField = uieditfield(app.UIFigure, 'numeric');
        app.EnEditField.Position = [72 384 45 22];
        app.EnEditField.Value = 0.5;
        % Create deltaEEditFieldLabel
```

```
app.deltaEEditFieldLabel = uilabel(app.UIFigure);
app.deltaEEditFieldLabel.HorizontalAlignment = 'right';
app.deltaEEditFieldLabel.Position = [13 349 43 22];
app.deltaEEditFieldLabel.Text = 'delta E';
% Create deltaEEditField
app.deltaEEditField = uieditfield(app.UIFigure, 'numeric');
app.deltaEEditField.Position = [71 349 45 22];
app.deltaEEditField.Value = 0.001;
% Create muEditFieldLabel
app.muEditFieldLabel = uilabel(app.UIFigure);
app.muEditFieldLabel.HorizontalAlignment = 'right';
app.muEditFieldLabel.Position = [32 315 25 22];
app.muEditFieldLabel.Text = 'mu';
% Create muEditField
app.muEditField = uieditfield(app.UIFigure, 'numeric');
app.muEditField.Position = [72 315 45 22];
app.muEditField.Value = 0.23;
% Create T1kelvinEditFieldLabel
app.T1kelvinEditFieldLabel = uilabel(app.UIFigure);
app.T1kelvinEditFieldLabel.HorizontalAlignment = 'right';
app.T1kelvinEditFieldLabel.Position = [-2 265 58 22];
app.T1kelvinEditFieldLabel.Text = 'T1(kelvin)';
% Create T1kelvinEditField
app.T1kelvinEditField = uieditfield(app.UIFigure, 'numeric');
```

```
        app.T1kelvinEditField.Position = [71 265 45 22];
        app.T1kelvinEditField.Value = 0.1;
        % Create T2kelvinEditFieldLabel
        app.T2kelvinEditFieldLabel = uilabel(app.UIFigure);
        app.T2kelvinEditFieldLabel.HorizontalAlignment = 'right';
        app.T2kelvinEditFieldLabel.Position = [-2 230 58 22];
        app.T2kelvinEditFieldLabel.Text = 'T2(kelvin)';
        % Create T2kelvinEditField
        app.T2kelvinEditField = uieditfield(app.UIFigure, 'numeric');
        app.T2kelvinEditField.Position = [71 230 45 22];
        app.T2kelvinEditField.Value = 200;
        % Create T3kelvinEditFieldLabel
        app.T3kelvinEditFieldLabel = uilabel(app.UIFigure);
        app.T3kelvinEditFieldLabel.HorizontalAlignment = 'right';
        app.T3kelvinEditFieldLabel.Position = [-2 196 58 22];
        app.T3kelvinEditFieldLabel.Text = 'T3(kelvin)';
        % Create T3kelvinEditField
        app.T3kelvinEditField = uieditfield(app.UIFigure, 'numeric');
        app.T3kelvinEditField.Position = [71 196 45 22];
        app.T3kelvinEditField.Value = 400;
        % Create XISOBLAButton
        app.XISOBLAButton = uibutton(app.UIFigure, 'push');
        app.XISOBLAButton.ButtonPushedFcn = createCallbackFcn(app,
@XISOBLAButtonPushed, true);
```

```
            app.XISOBLAButton.BackgroundColor = [0.851 0.3294 0.102];
            app.XISOBLAButton.FontSize = 14;
            app.XISOBLAButton.FontWeight = 'bold';
            app.XISOBLAButton.FontColor = [0 0 1];
            app.XISOBLAButton.Position = [16 113 100 44];
            app.XISOBLAButton.Text = 'XISOBLA';
            % Create Label
            app.Label = uilabel(app.UIFigure);
            app.Label.BackgroundColor = [0.9216 0.8353 0.6431];
            app.Label.FontSize = 14;
            app.Label.FontAngle = 'italic';
            app.Label.FontColor = [1 0 0];
            app.Label.Position = [123 57 510 39];
            app.Label.Text = {'Dasturdan o’qituvchilar, yarimo’tkazgichlar fizikasi
yo’nalishidagi ilmiy xodimlar, '; 'mustaqil izlanuvchilar va boshqa xohlovchilar
foydalanishlari mumkin. '; ''};
        end
    end
    methods (Access = public)
        % Construct app
        function app = app4
            % Create and configure components
            createComponents(app)
            % Register the app with App Designer
```

```
            registerApp(app, app.UIFigure)
            if nargout == 0
                clear app
            end
        end
        % Code that executes before app deletion
        function delete(app)
            % Delete UIFigure when app is deleted
            delete(app.UIFigure)
    % Create UIFigure
            app.UIFigure = uifigure;
            app.UIFigure.Position = [100 100 754 480];
            app.UIFigure.Name = 'UI Figure';
            % Create A0EditFieldLabel
            app.A0EditFieldLabel = uilabel(app.UIFigure);
            app.A0EditFieldLabel.HorizontalAlignment = 'right';
            app.A0EditFieldLabel.Position = [56 427 25 22];
            app.A0EditFieldLabel.Text = 'A0';
            % Create A0EditField
            app.A0EditField = uieditfield(app.UIFigure, 'numeric');
            app.A0EditField.Position = [96 427 100 22];
            app.A0EditField.Value = 1.4;
            % Create deltaAEditFieldLabel
            app.deltaAEditFieldLabel = uilabel(app.UIFigure);
```

```
app.deltaAEditFieldLabel.HorizontalAlignment = 'right';
app.deltaAEditFieldLabel.Position = [38 382 43 22];
app.deltaAEditFieldLabel.Text = 'delta A';
% Create deltaAEditField
app.deltaAEditField = uieditfield(app.UIFigure, 'numeric');
app.deltaAEditField.Position = [96 382 100 22];
app.deltaAEditField.Value = 0.1;
% Create AnEditFieldLabel
app.AnEditFieldLabel = uilabel(app.UIFigure);
app.AnEditFieldLabel.HorizontalAlignment = 'right';
app.AnEditFieldLabel.Position = [56 337 25 22];
app.AnEditFieldLabel.Text = 'An';
% Create AnEditField
app.AnEditField = uieditfield(app.UIFigure, 'numeric');
app.AnEditField.Position = [96 337 100 22];
app.AnEditField.Value = 1.4;
% Create TkelvinEditFieldLabel
app.TkelvinEditFieldLabel = uilabel(app.UIFigure);
app.TkelvinEditFieldLabel.HorizontalAlignment = 'right';
app.TkelvinEditFieldLabel.Position = [29 293 52 22];
app.TkelvinEditFieldLabel.Text = 'T(kelvin)';
% Create TkelvinEditField
app.TkelvinEditField = uieditfield(app.UIFigure, 'numeric');
app.TkelvinEditField.Position = [96 293 100 22];
```

```
            app.TkelvinEditField.Value = 1;
            % Create UIAxes
            app.UIAxes = uiaxes(app.UIFigure);
            title(app.UIAxes, 'Graph')
            xlabel(app.UIAxes, 'A')
            ylabel(app.UIAxes, 'Fermi')
            app.UIAxes.Position = [228 18 512 431];
            % Create XisoblashButton
            app.XisoblashButton = uibutton(app.UIFigure, 'push');
            app.XisoblashButton.ButtonPushedFcn = createCallbackFcn(app,
@XisoblashButtonPushed, true);
            app.XisoblashButton.Position = [56 177 140 75];
            app.XisoblashButton.Text = 'Xisoblash';
        end
    end
    methods (Access = public)
        % Construct app
        function app = app1
            % Create and configure components
            createComponents(app)
            % Register the app with App Designer
            registerApp(app, app.UIFigure)
            if nargout == 0
                clear app
```

```
        end
    end
    % Code that executes before app deletion
    function delete(app)
        % Delete UIFigure when app is deleted
        delete(app.UIFigure)
    end
  end
end
```