



## **Instructions for practical lesson**

# **Coverage planning of indoor wireless systems with *I-Prop* software tool**

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**Subject:** Telecommunication Networks

## **Quick general instructions for coverage planning with I-Prop**

### Target practice:

- to optimally adjust the transmission parameters of WiFi access points associated with software simulation inside buildings and practically understand their meaning
- to understand the problem of propagation of radio signals inside buildings
- to learn how to work with the program I- Prop

### Before the practise, study form the lectures and recommended literature:

- the issue of transmitting radio signals in WiFi band (frequency bands , the relationship between wavelength and frequency, relationship between attenuation and gain, term Fresnel zone)
- a comparison of 802.11 standards (radio channels , transmit power , converting W to dBm, technology of spectrum - DSSS, FHSS, OFDM, bit rates )

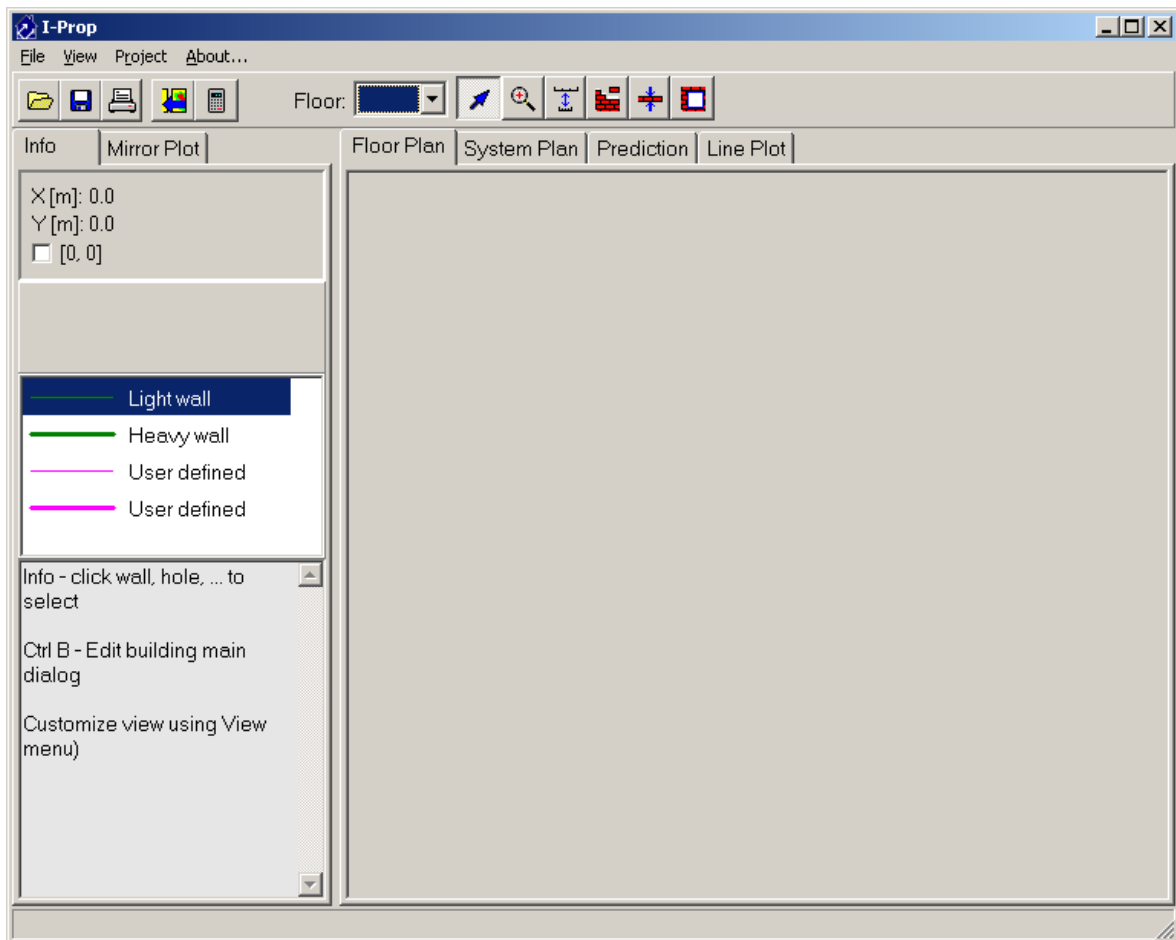
### Assignment:

Using the I- Prop, perform according to the instructions of the teacher:

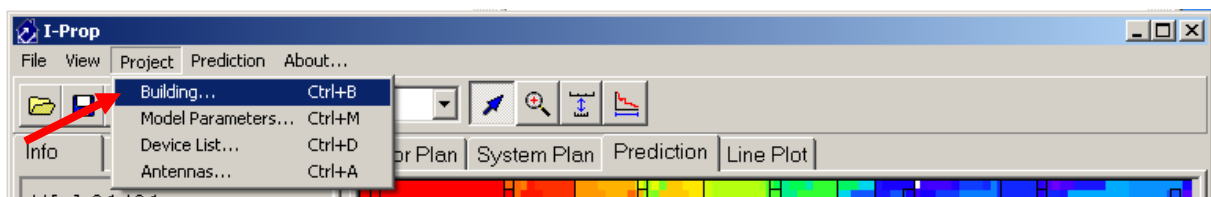
1. Set the transmission parameters of the access point / WiFi access points.
2. Calculate and represent the coverage of selected area by WiFi signal.
3. Display changes in the level of the received signal with the distance of the direction of propagation .

Comment the individual settings and answer the questions to the teacher.

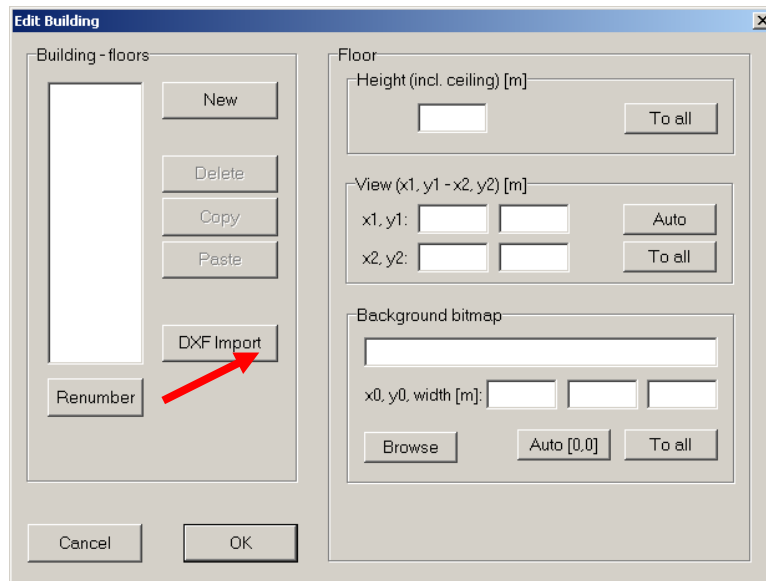
1. Run I-Prop (icon on the desktop).



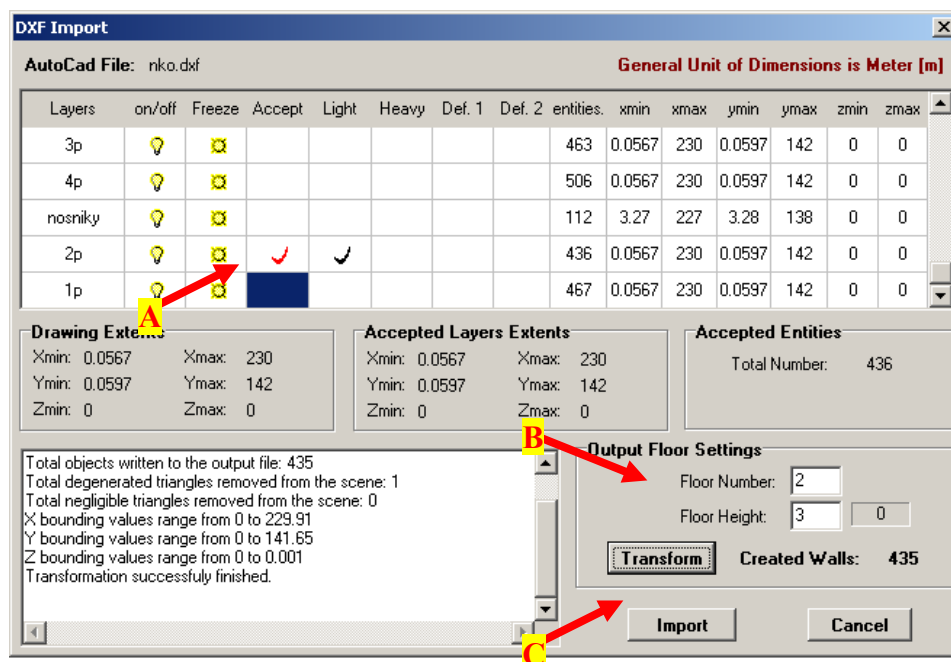
2. Start by setting a plan of a building



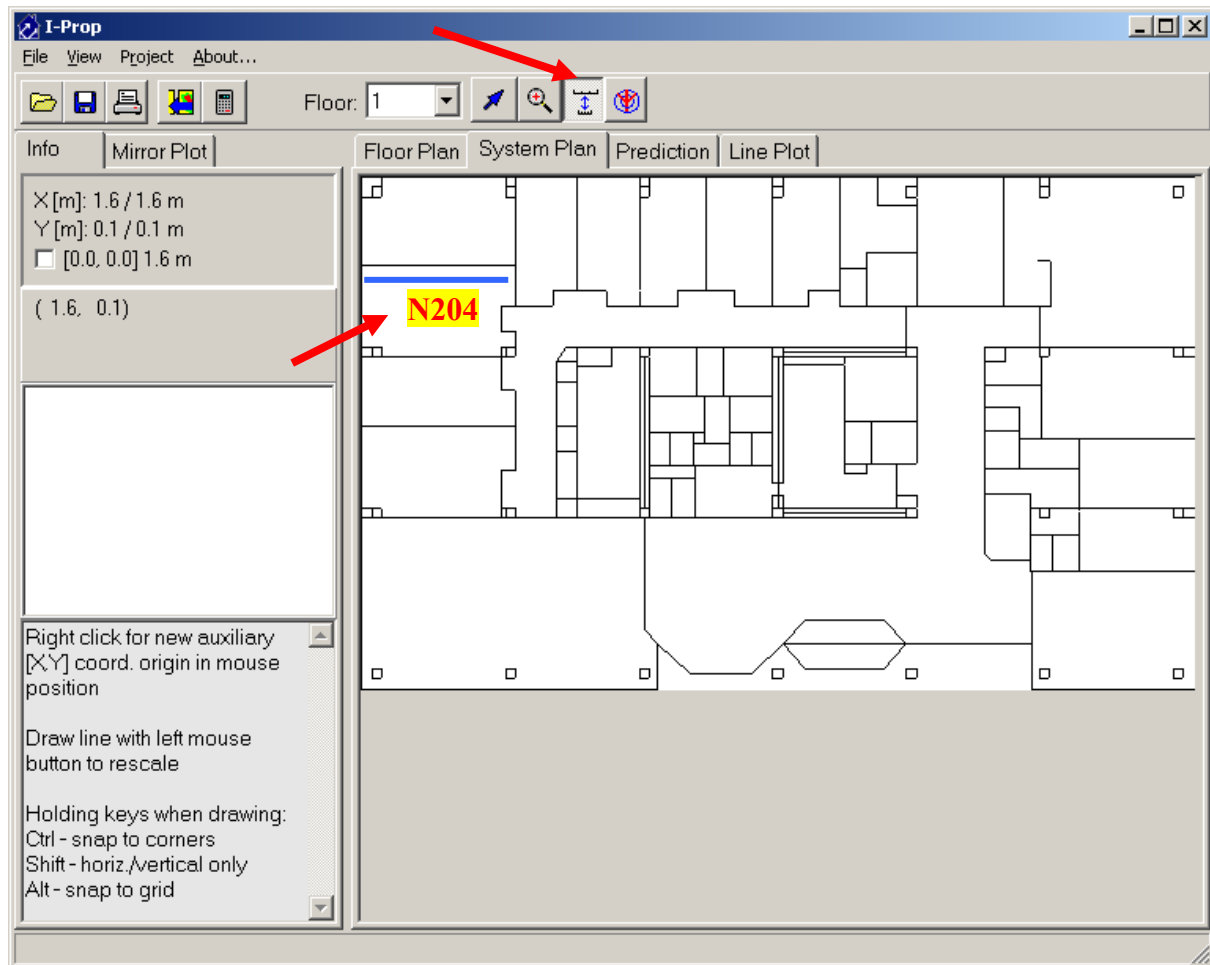
3. Click on **DXF Import** button



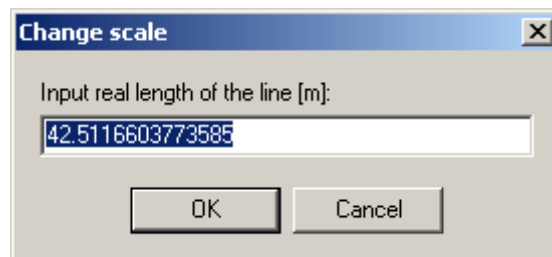
4. Choose on disk *D:\student\iprop\* file **nko.dxf**.
  - A) Check the box *Accept* at 2nd layer.
  - B) Set the *Floor Number* to the value **2** and *Floor Height* to the value **3 m**
  - C) Press *Transform*, then *Import*



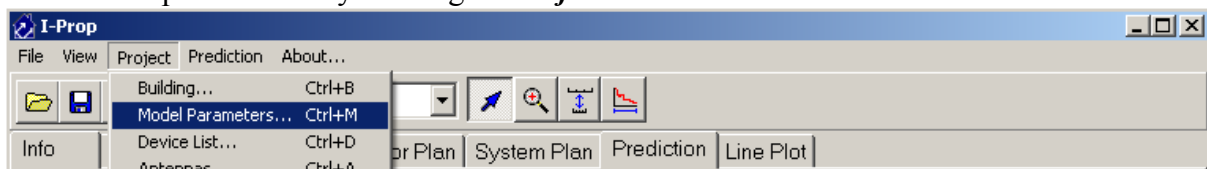
5. Now it is necessary to calibrate the loaded floor plan. Choose the tab *System Plan*. Select *Rescale* button and draw the calibration line on the length of the room N204.



6. Enter the real length of the room N204: **6 meters**.

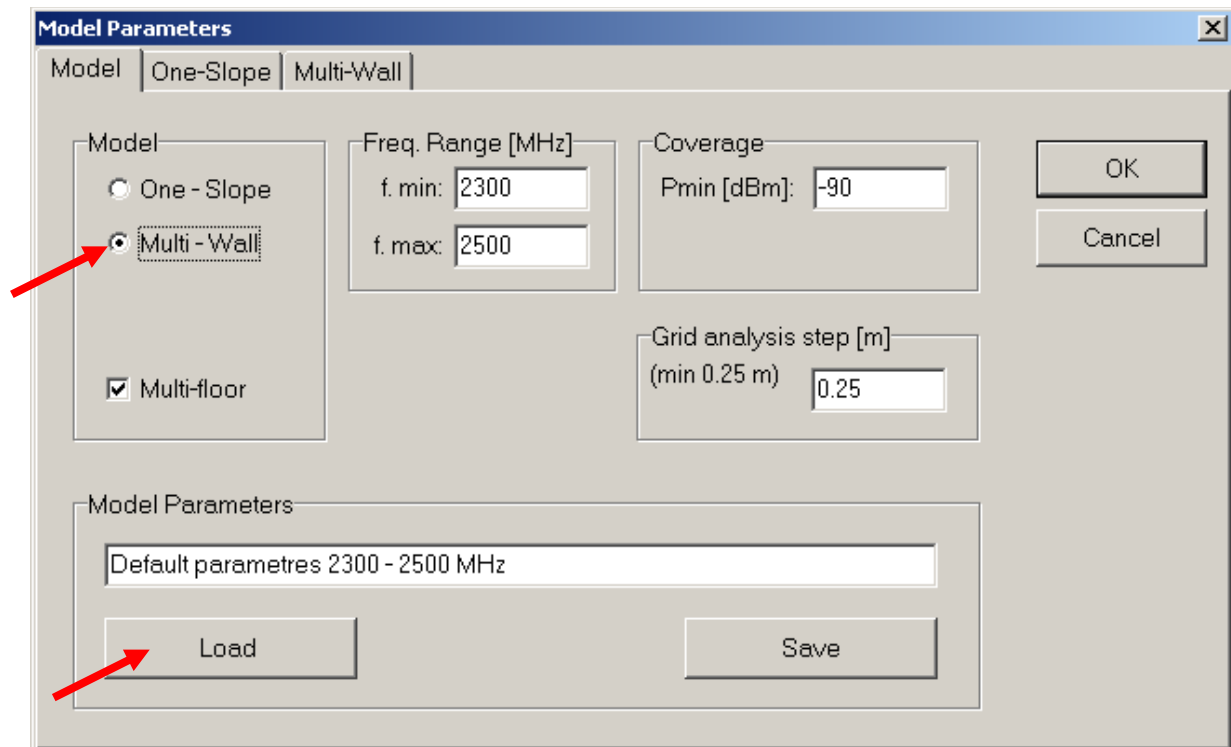


7. Set up the model by clicking on **Project - Model Parameters**



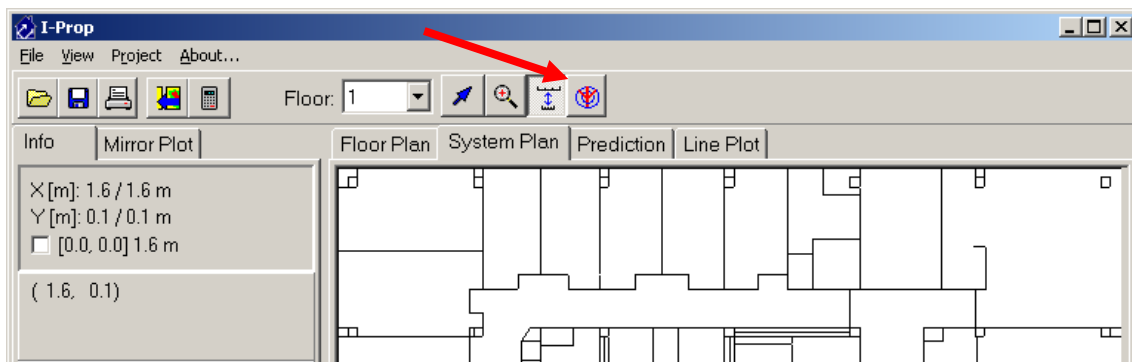
8. Fold **Model**, choose **Multi-Wall**;

9. Load the file **Default 2450 MHz.mp** saved on **D:\student\iprop**



10. Location of access points:

- A) Select the button which is marked by arrow
- B) Click to place on the floor plan of the building and place an access point



11. Set parameters of the AP:

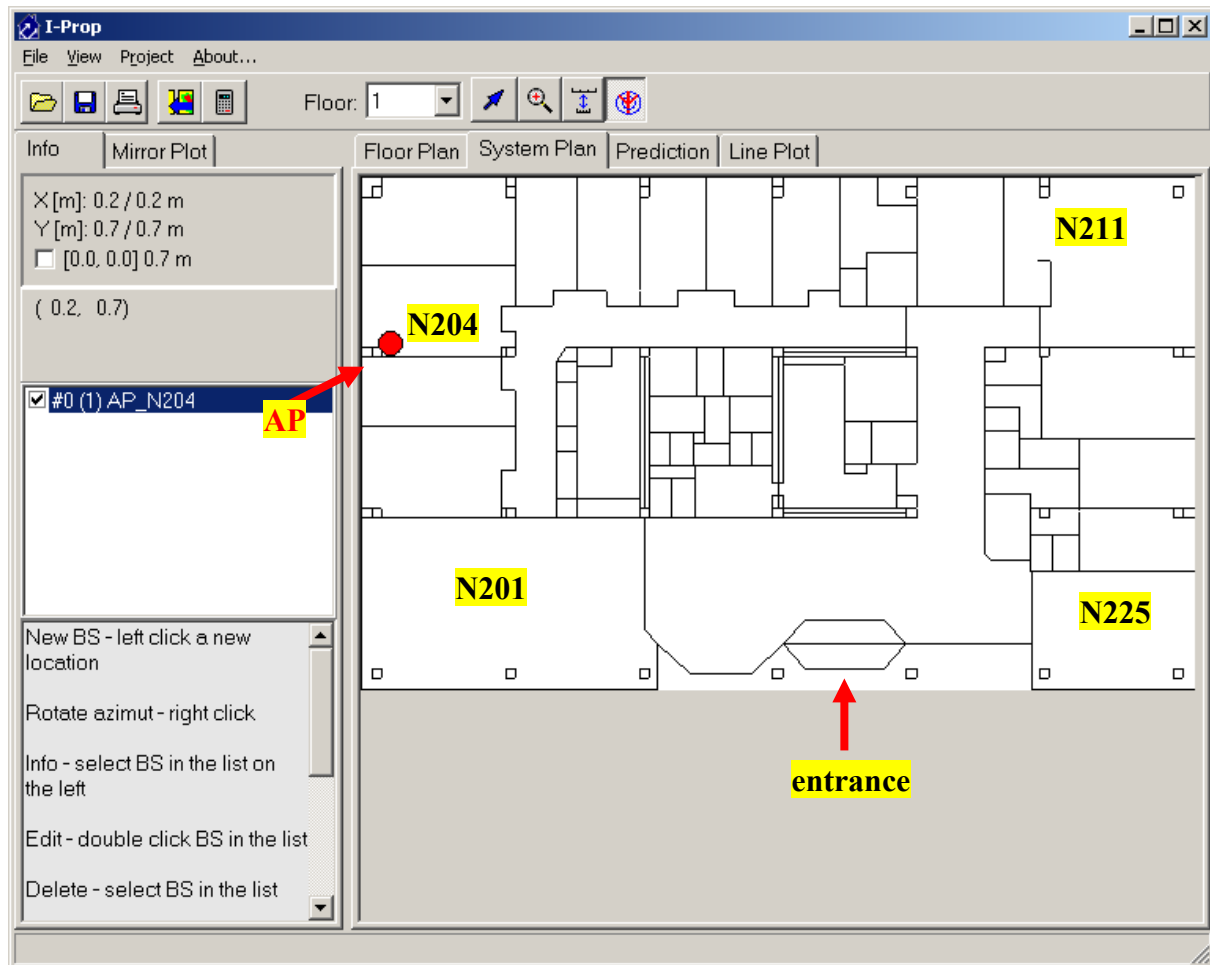
- A) Choose Floor: **2**
- B) The height of the AP: **2m**
- C) Choose the type of antenna:

- isotropic - ideal omni-directional
  - hemispheric - directional
- D)** Enter the power level [dBm] - 20 dBm max!
- E)** Select the channel which is specified by the frequency by IEEE 802.11b, g  
Description parameter is optional.

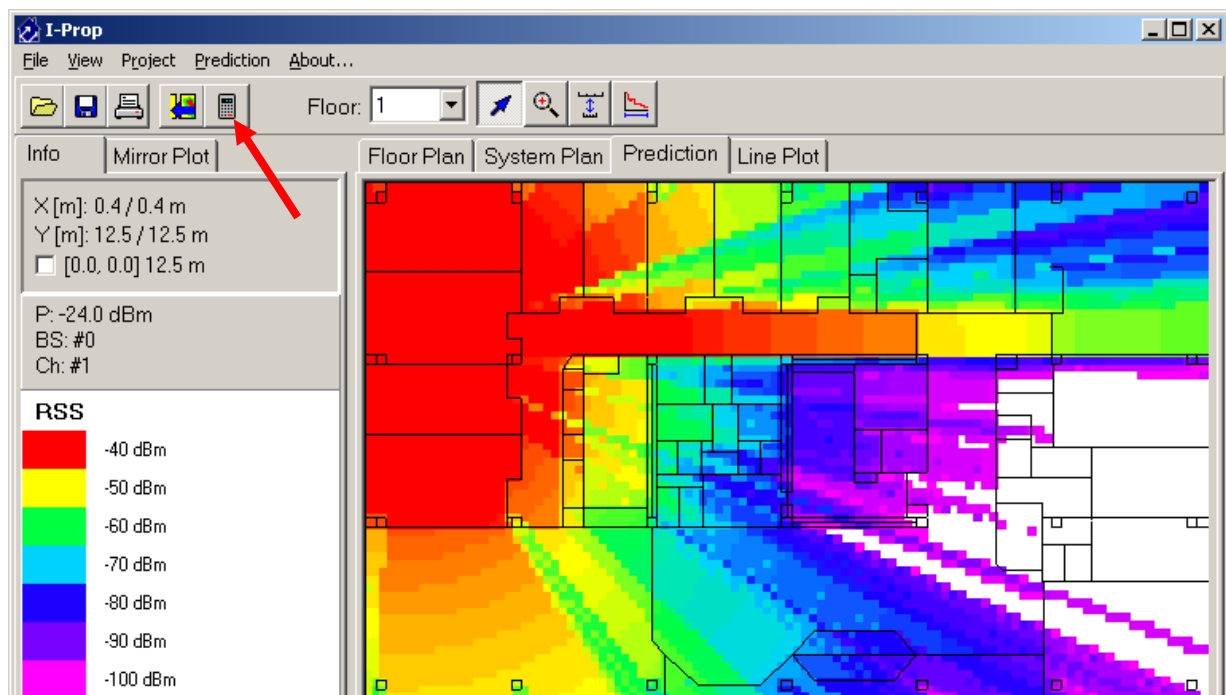
The image shows a 'Base Station Parameters' dialog box with the following fields and annotations:

- Description:** A text field containing 'AP\_N204'.
- Location:** A group box containing four text fields: 'floor:' (1), 'x [m]:' (1.02), 'y [m]:' (11.22), and 'height [m]:' (0). A red arrow labeled **A** points to the 'x [m]:' field.
- Antenna:** A group box containing a dropdown menu set to 'Isotropic', and two text fields: 'azimuth [°]:' (0) and 'elevation [°]:' (0). A red arrow labeled **C** points to the 'Isotropic' dropdown.
- Power:** A group box containing a text field 'P [dBm]:' (20) and a checked checkbox labeled 'ON'. A red arrow labeled **B** points to the 'P [dBm]:' field, and a red arrow labeled **D** points to the 'ON' checkbox.
- Frequency channel:** A group box containing two text fields: 'f [MHz]:' (2412) and 'channel:' (1). A red arrow labeled **D** points to the 'channel:' field.

At the bottom right are 'Cancel' and 'OK' buttons.

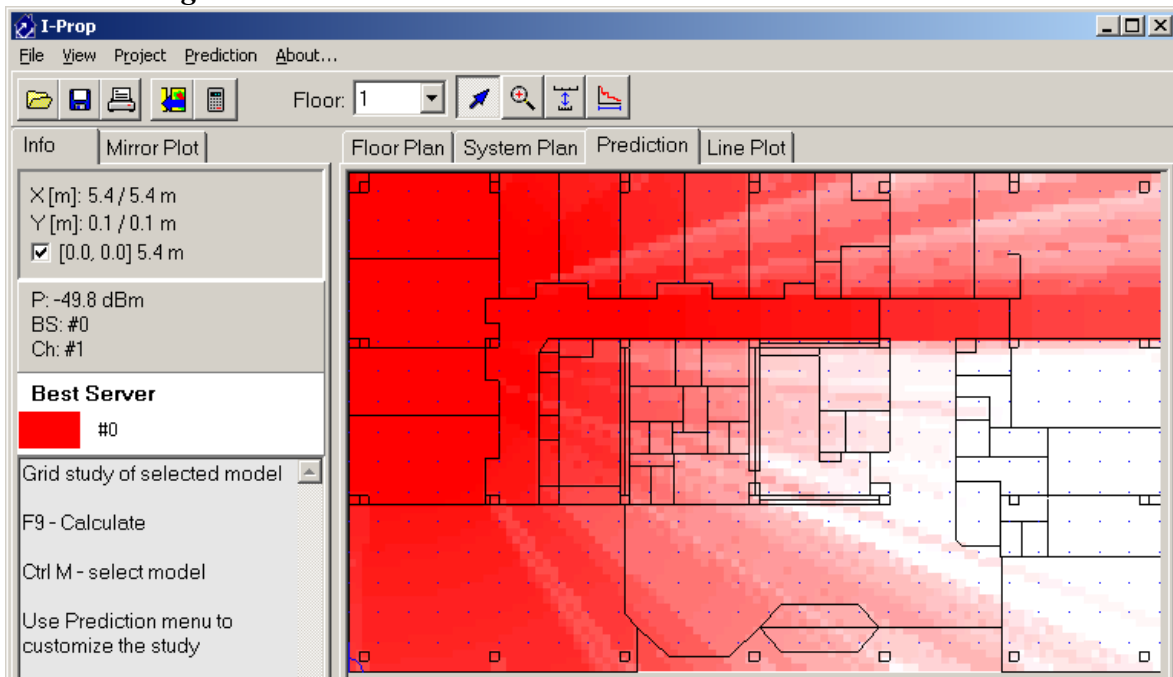


12. Click on *Calculate*.

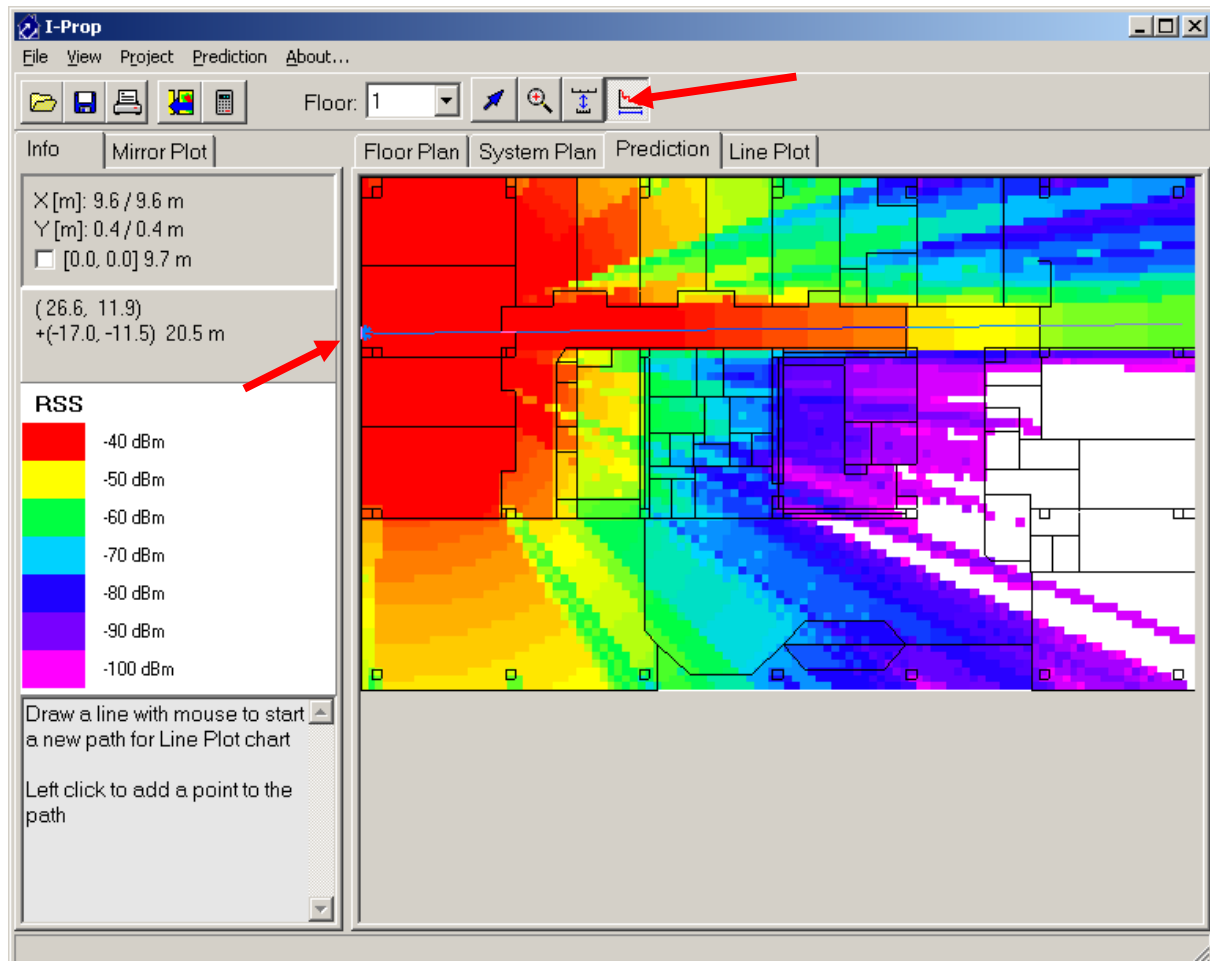




13. In menu **Prediction** you can choose **RSS level**, **Best Server**, **Freq. Channel**, **Coverage**.



14. Continue with the proposal by adding next Access points. The aim is to cover all the 2nd floor of N building.
15. Measurement of RSS level: Click on 3rd icon **Measurement**, drag a line in the corresponded direction of signal propagation.



16. The output is a graph describing the power level depending on the distance (chosen route of the line).

