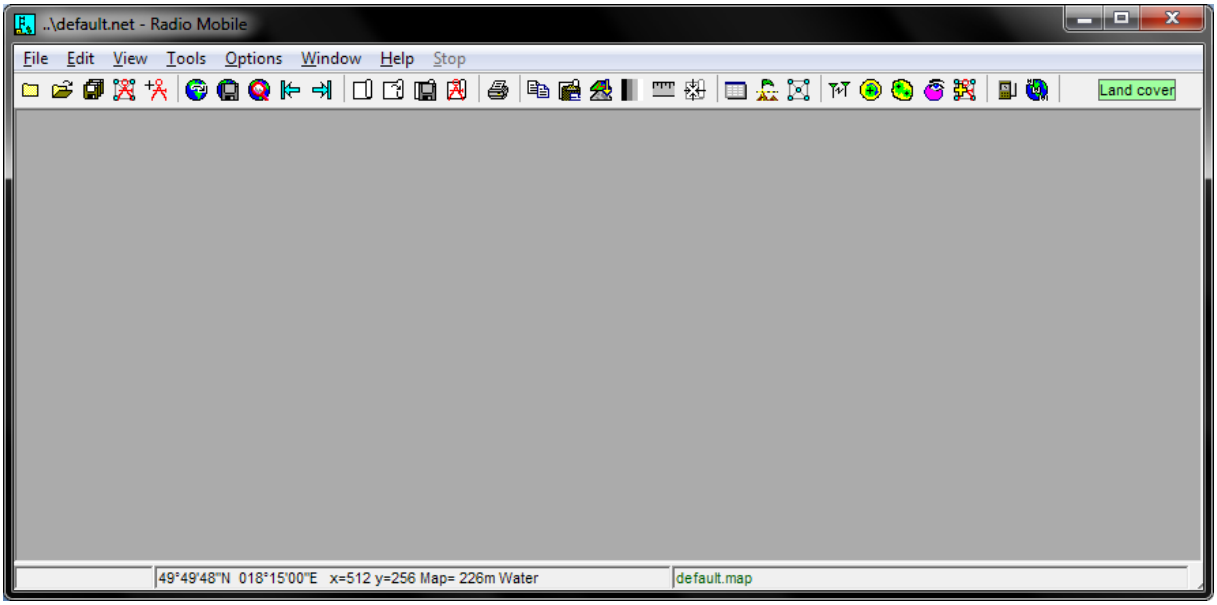
VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE | DEPARTMENT OF TELECOMMUNICATIONS

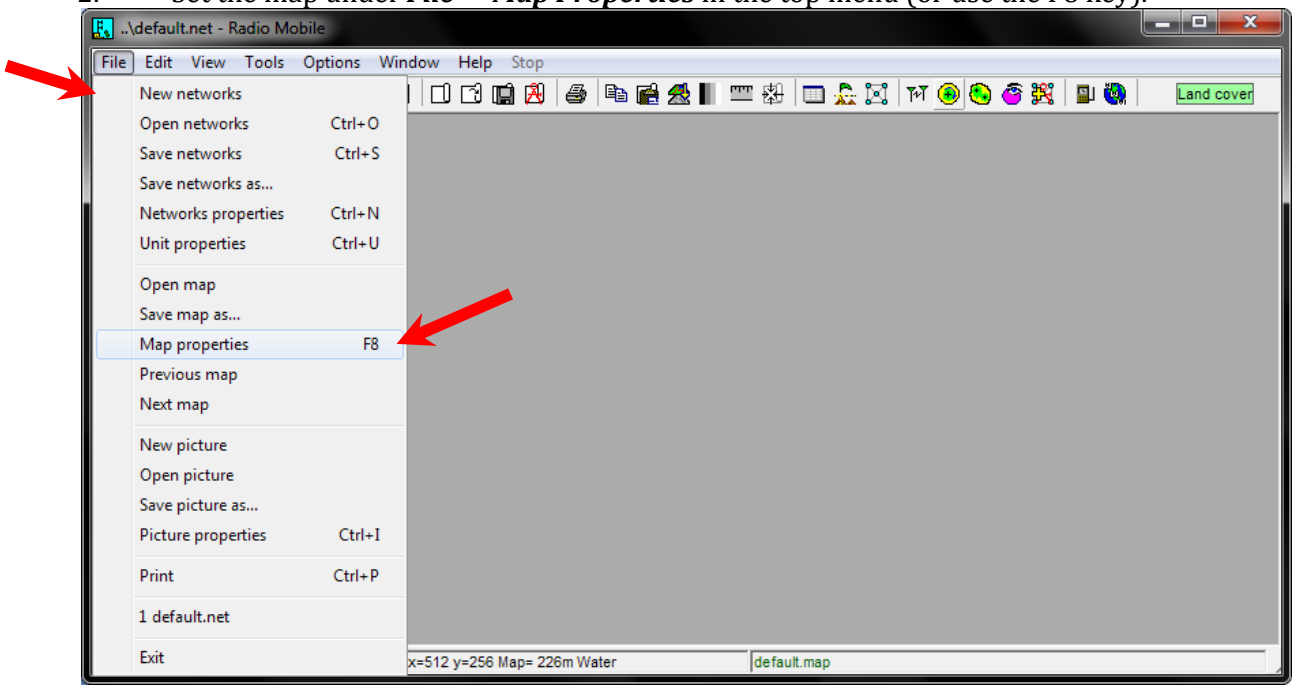
Simulation/Modelling of Coverage with Radiomobile Tool

Date: 15 April 2020
Author: Ing. Libor Michalek, Ph.D.
Contact: libor.michalek@vsb.cz
Subject: Telecommunication Networks

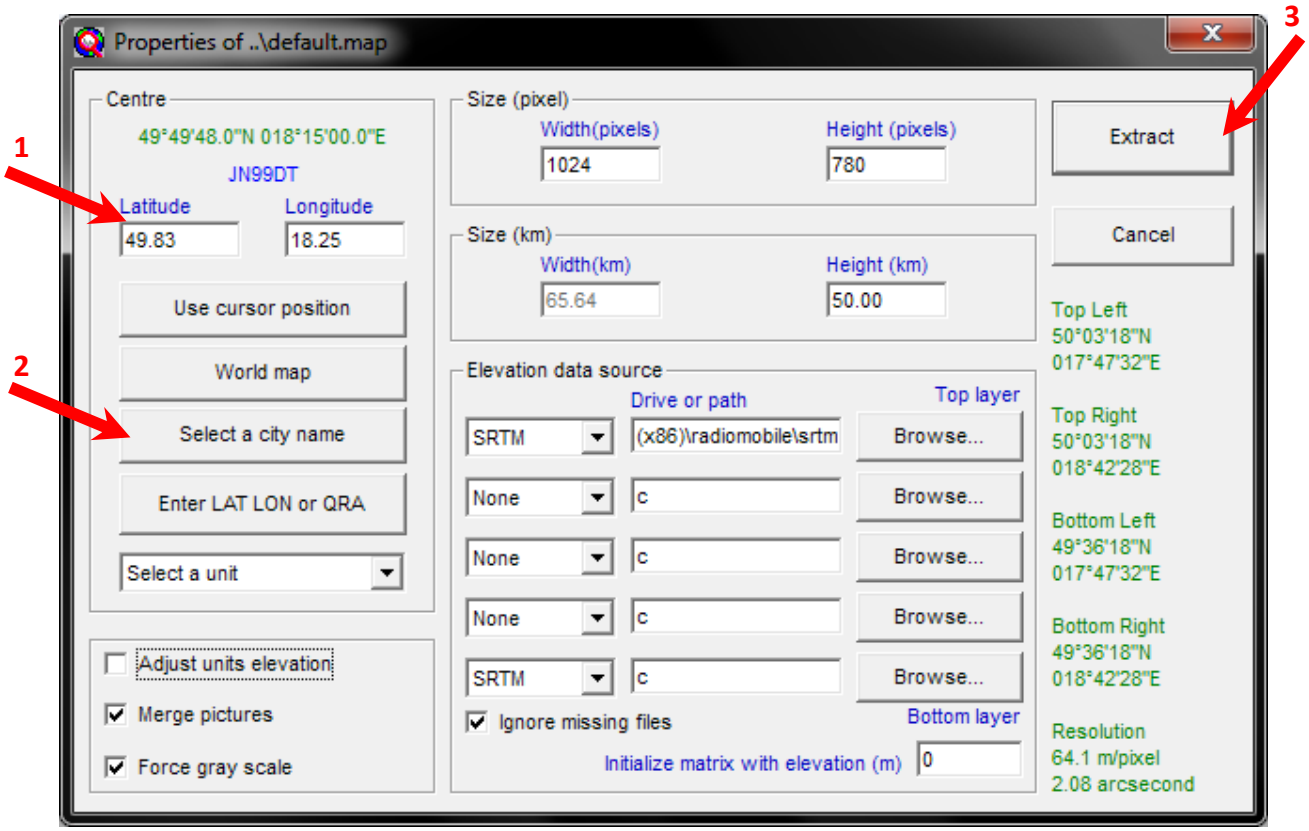
1. Start the Radiomobile tool by desktop icon 

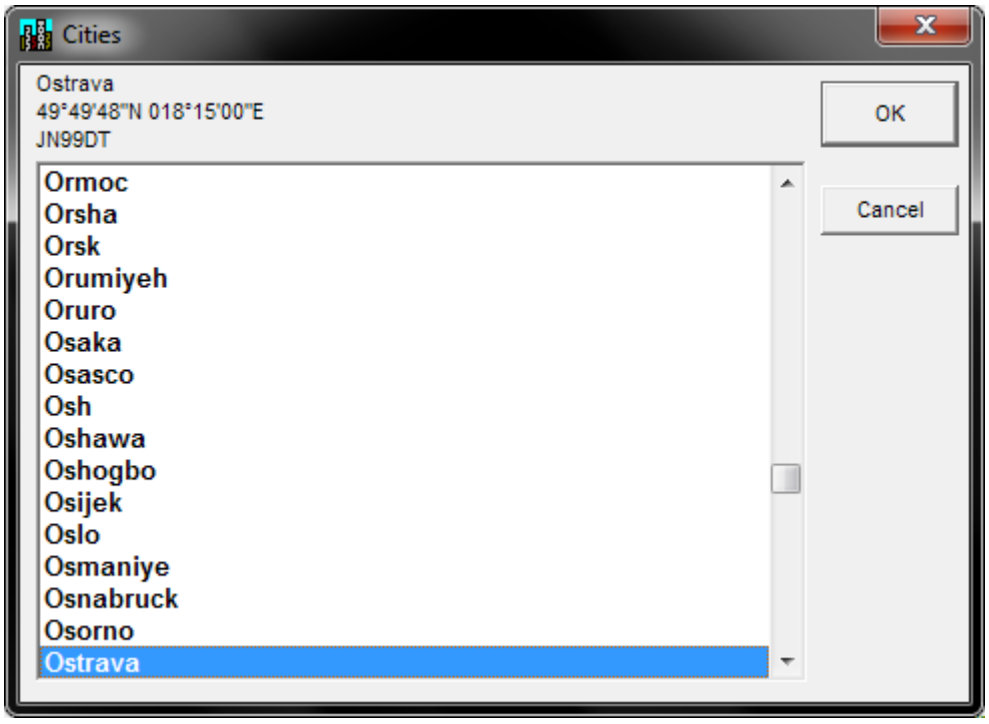


2. Set the map under ***File → Map Properties*** in the top menu (or use the F8 key).

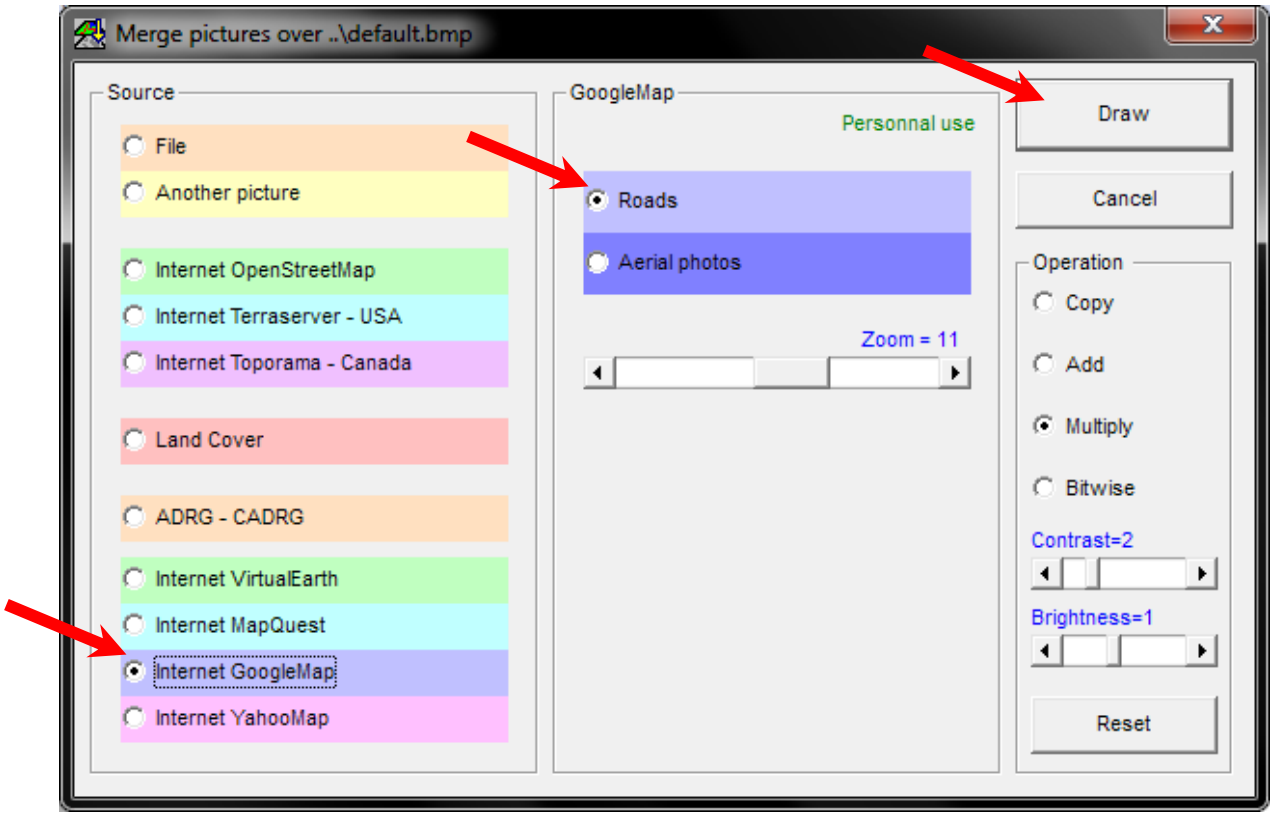


3. The map settings you can determine the center of the display area by entering the coordinates of GPS (1) or by searching in the list of cities (2). For our example, let's search for a city Ostrava. Then confirm Extract (3).



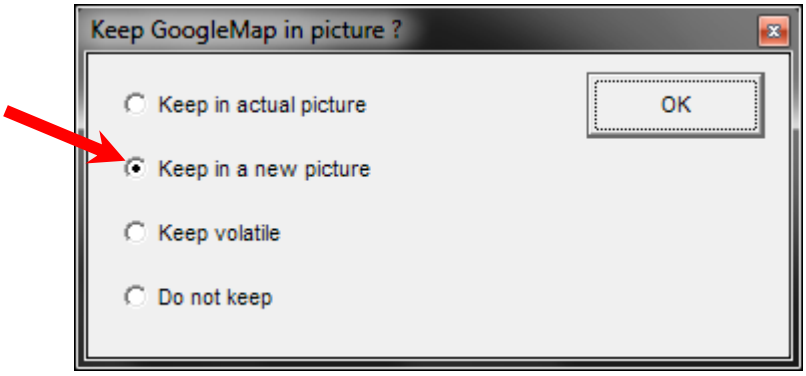


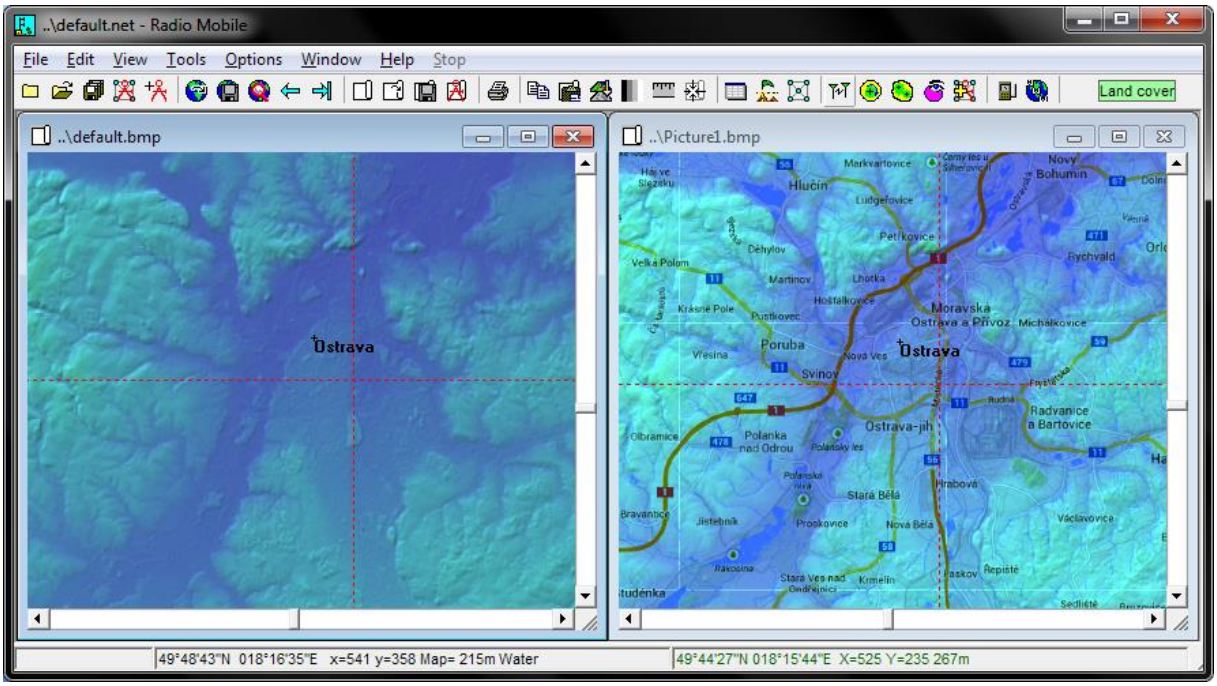
4. Choose a format map as: **Internet GoogleMap - Roads** and confirm by **Draw**. Choose operation as **Multiply.**



5. You will be prompted to choose a method of preserving rendered the situation. You can choose from the following options:
   - **Keep in actual picture** (Maintain plotted in the current map view)
   - **Keep in new picture** (Create a new map of the rendered view)
   - **Keep volatile** (Maintain temporarily)
   - **Do not keep** (Cancel the display)

   We recommend always choose b) and create a new view to render a new image / map. Program Radio Mobile does not have "undo" function, so anything redraw once, you cannot take it back. For this reason, it is good to keep available all continuous maps in case you will need a step back.

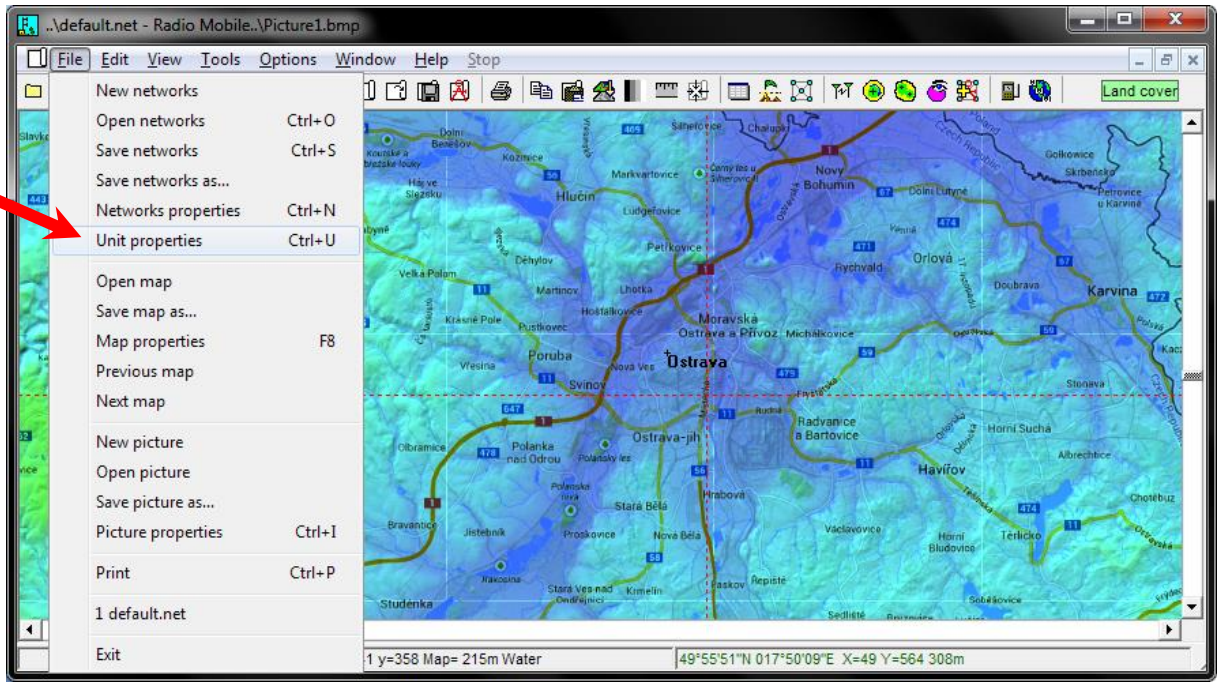




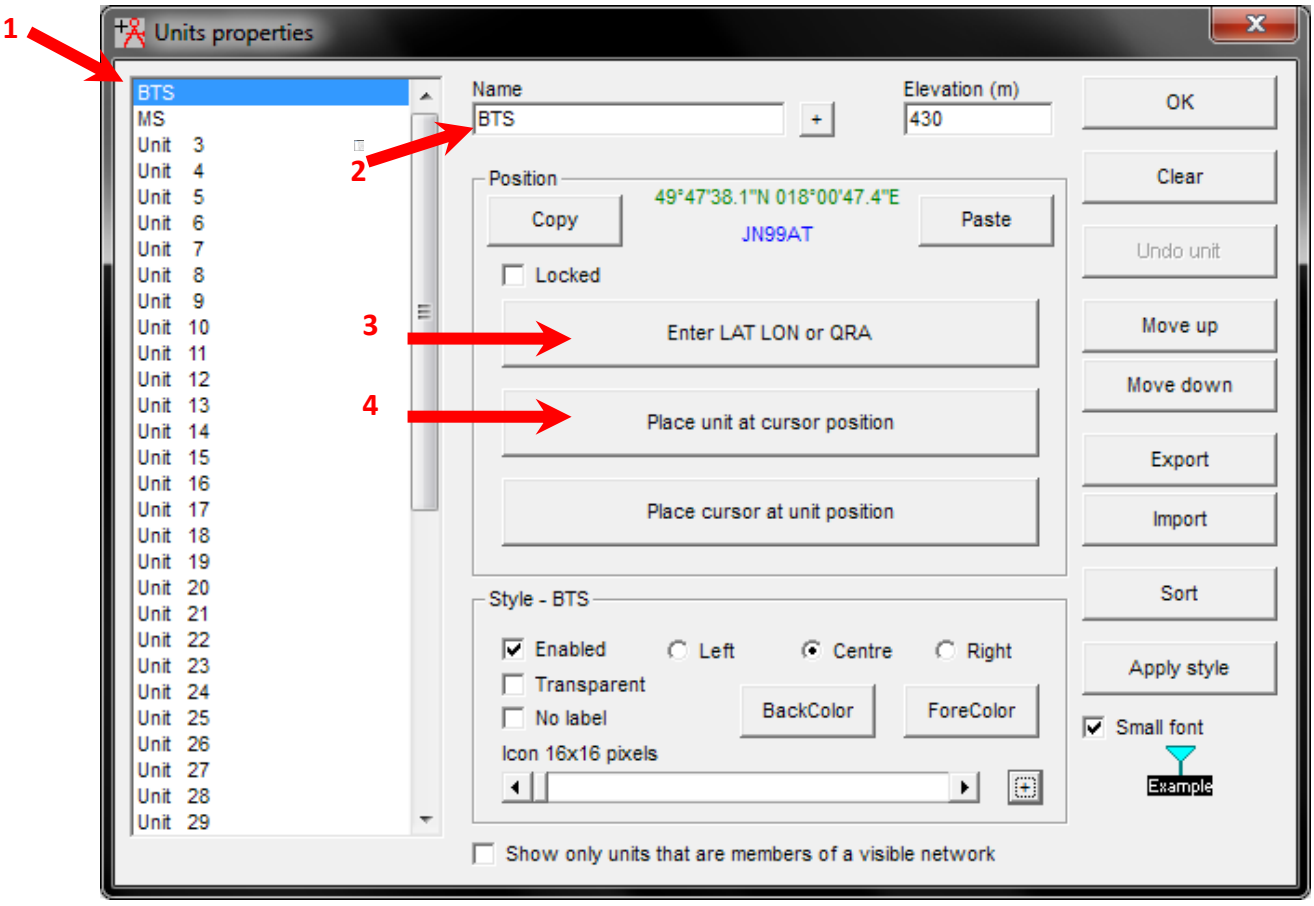
6. If you want to re-draw the map, you can elegantly do it from existing maps terrain morphology by clicking on the **Merge Pictures.**

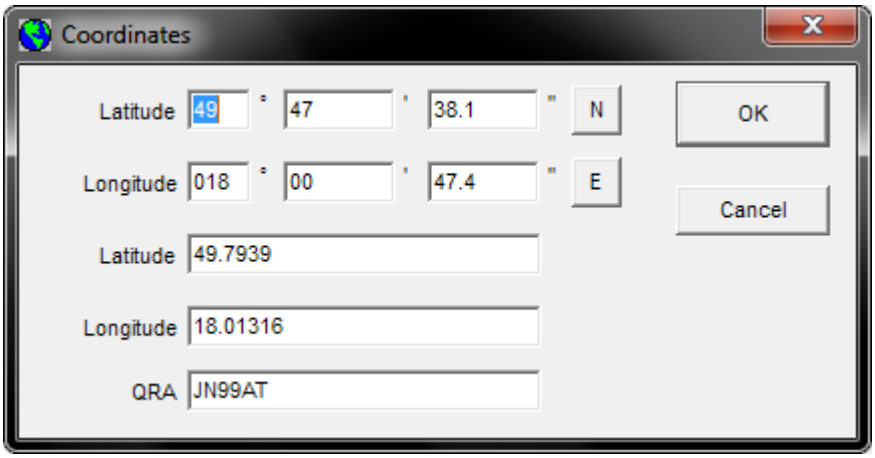
Merge Picture

7. At this time we have prepared a map for locating transmitters - base stations. In Radio Mobile are all transmitting / receiving devices called as **Units**. Set up and edit individual units via **File → Unit Properties (or CTRL + U)**.

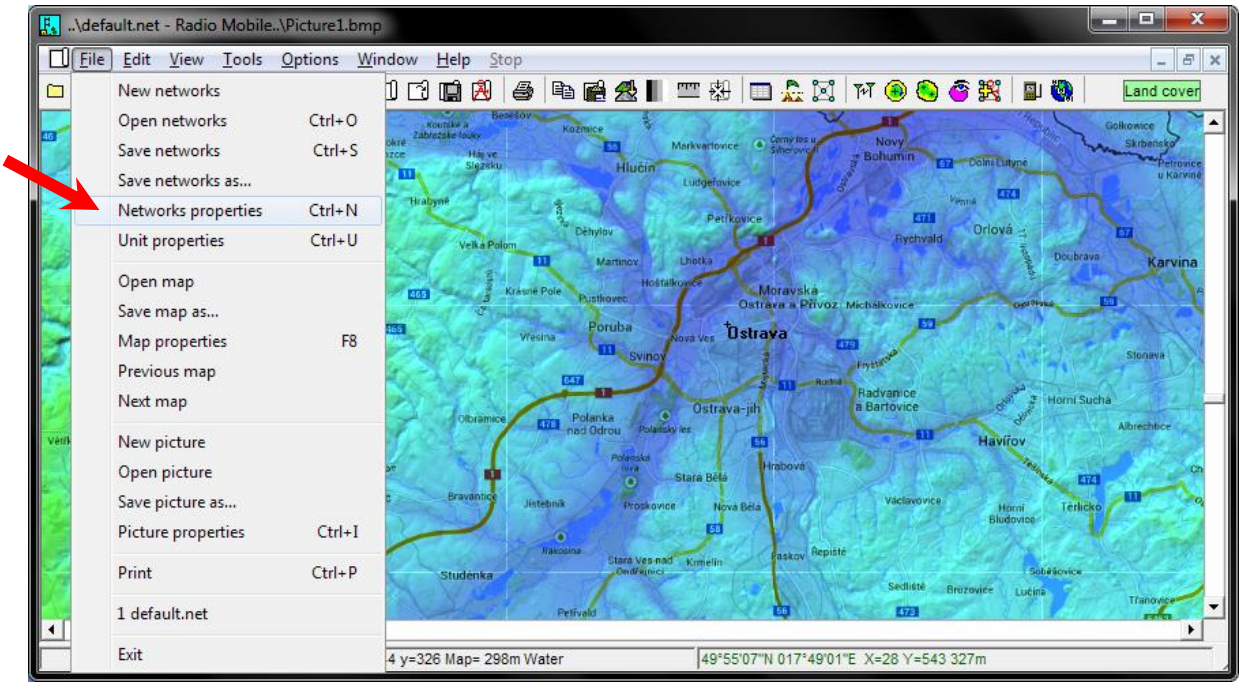


8. Click on Unit 1 (1), name it as a base station BTS (2), enter its GPS position (3) – if you know it. Otherwise place the base station at the cursor position (4) – first click OK, then place cursor, open Unit properties (Ctrl+U), choose the Unit and click on „Place unit at cursor position“.
   Repeat the steps for Unit 2 - The mobile station MS.

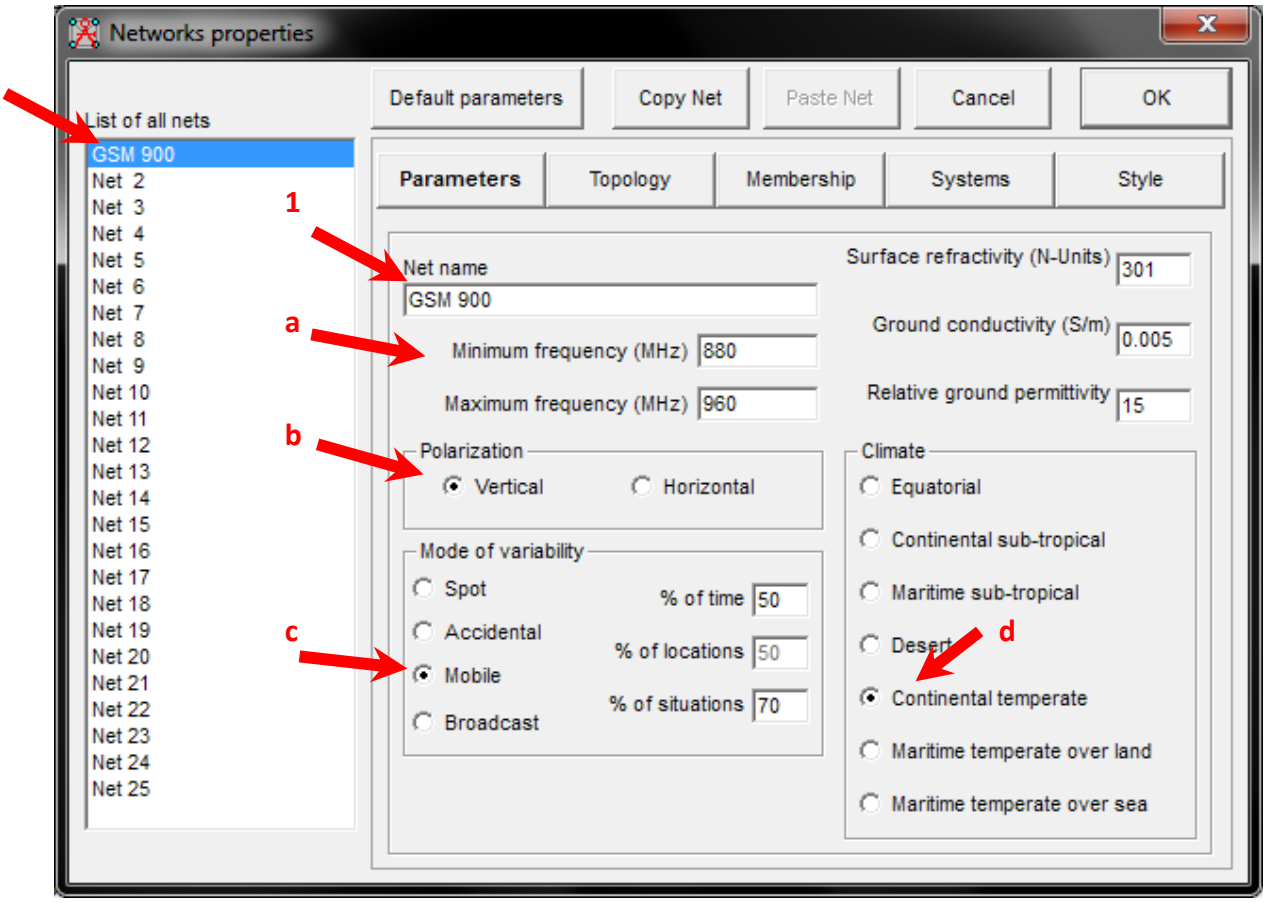




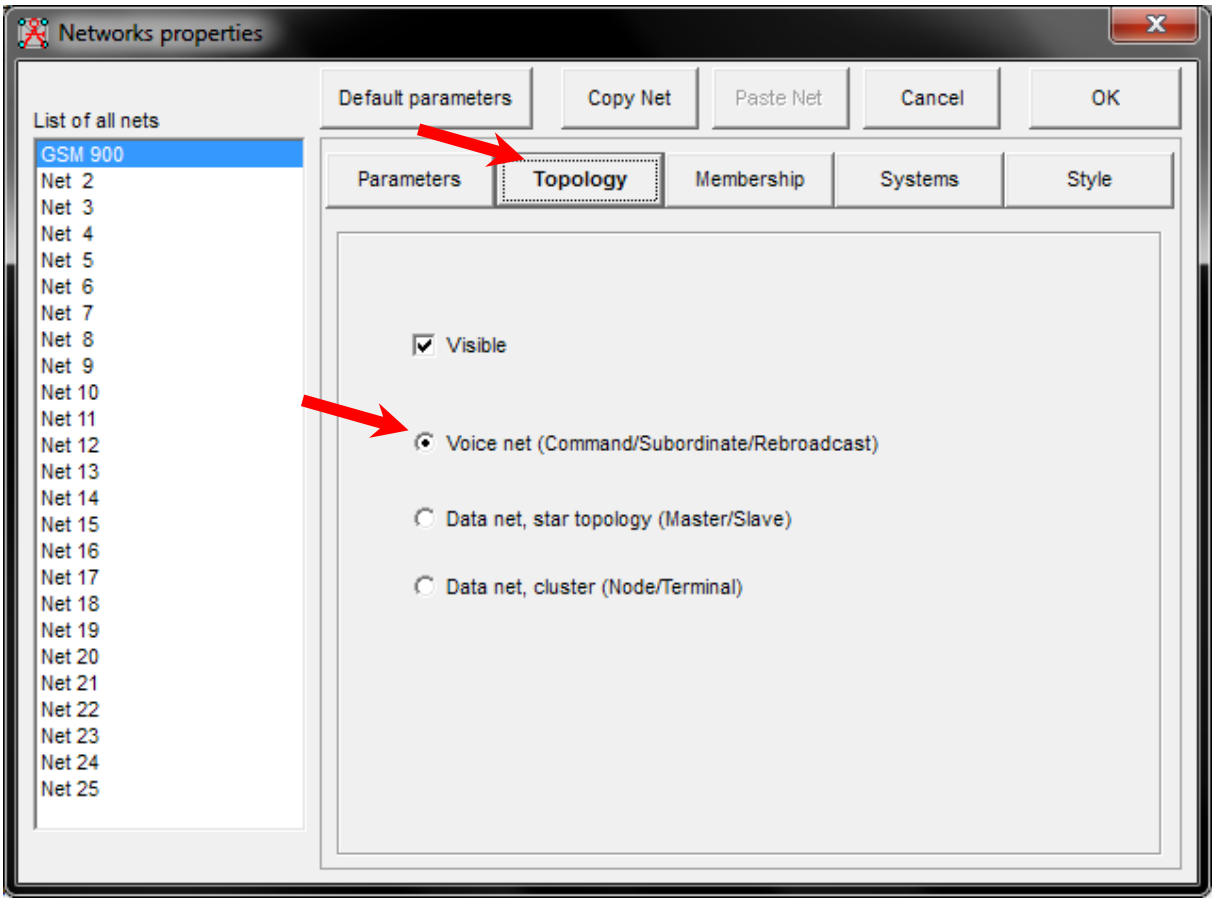
9. The position of base stations and the receiver (MS) is done. Now, define Network properties - assign the transmitter and receiver electrical parameters via **File → Network properties (or CTRL + N)**.



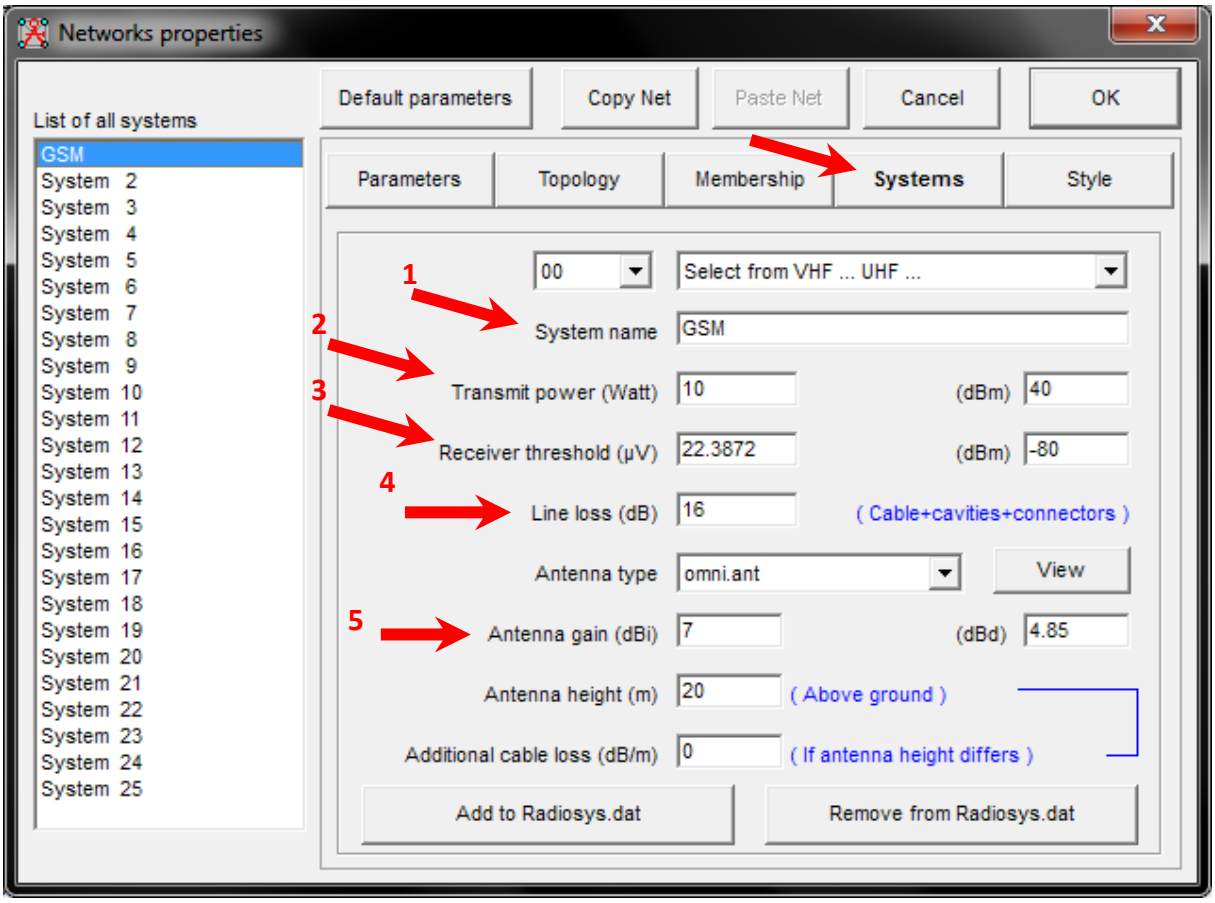
10. Set the name (1), then:
    a) Minimum and maximum frequency used in the appropriate network
    b) polarization (vertical)
    c) mode of variability (Mobile)
    d) climatic conditions of propagation (Continental temperate)



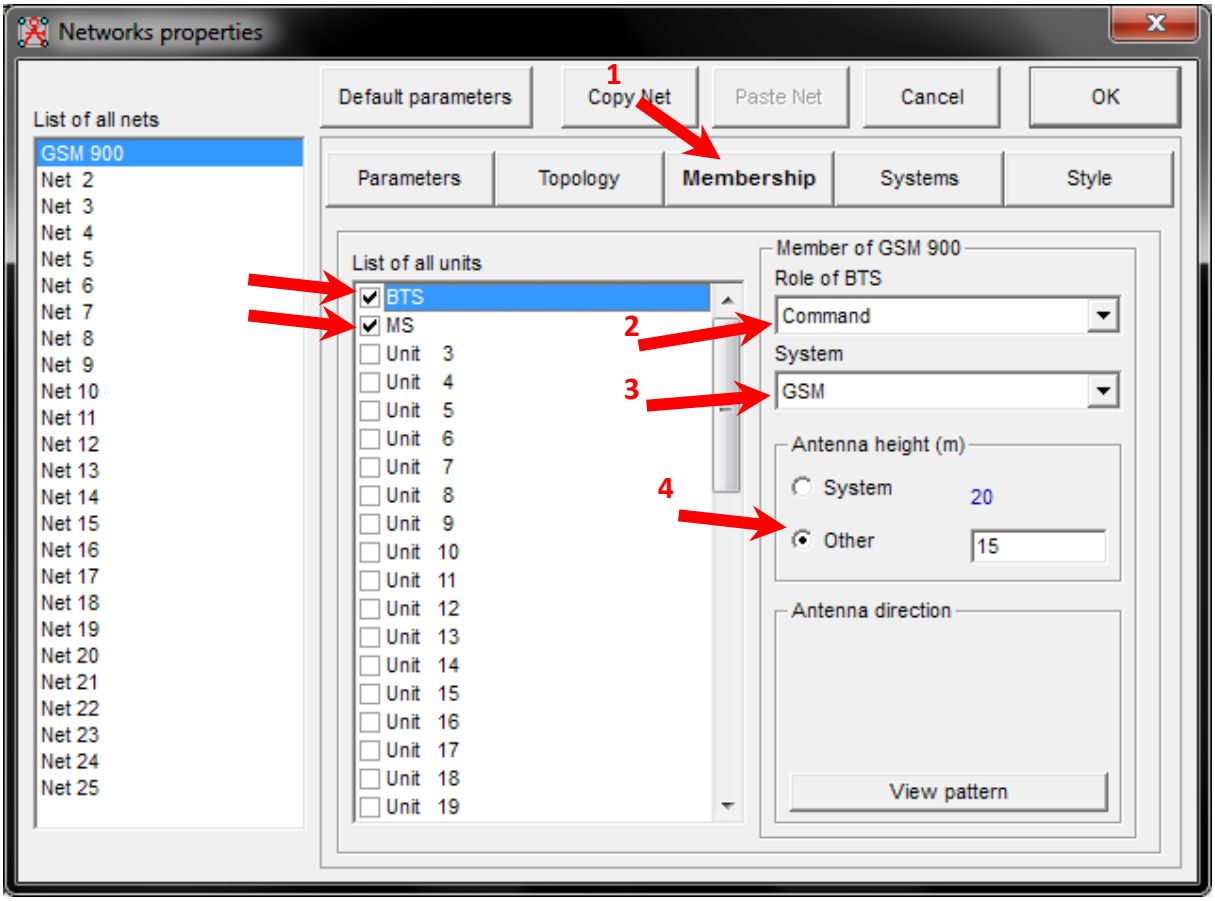
11. In **Topology** set up the type of network to **Voice net**



12. Now we define the electrical parameters of the network. You can perform in the **Systems** tab. Choose the "GSM" from list of all systems (1), set the transmit power in W or dBm (2), the minimum receiver threshold (3), line loss on connectors and cable (4), antenna gain (5). You can also set the radiation pattern of the antenna - default is omni-directional.



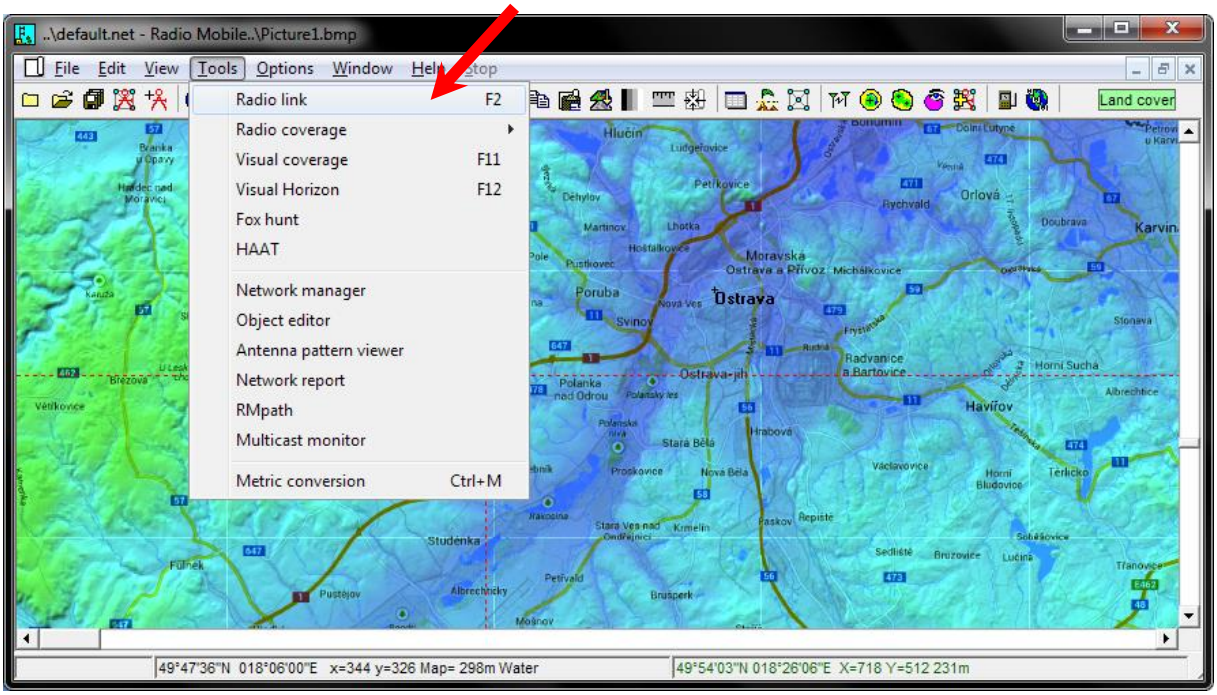
13. The final step in the network settings is the membership assign of the transmitter and receiver in our network. In the tab Membership (1) set in the field Role (2) for BTS, select Command and Subordinate MS. Both units are set to GSM system (3). You can also change the Antenna height (4).



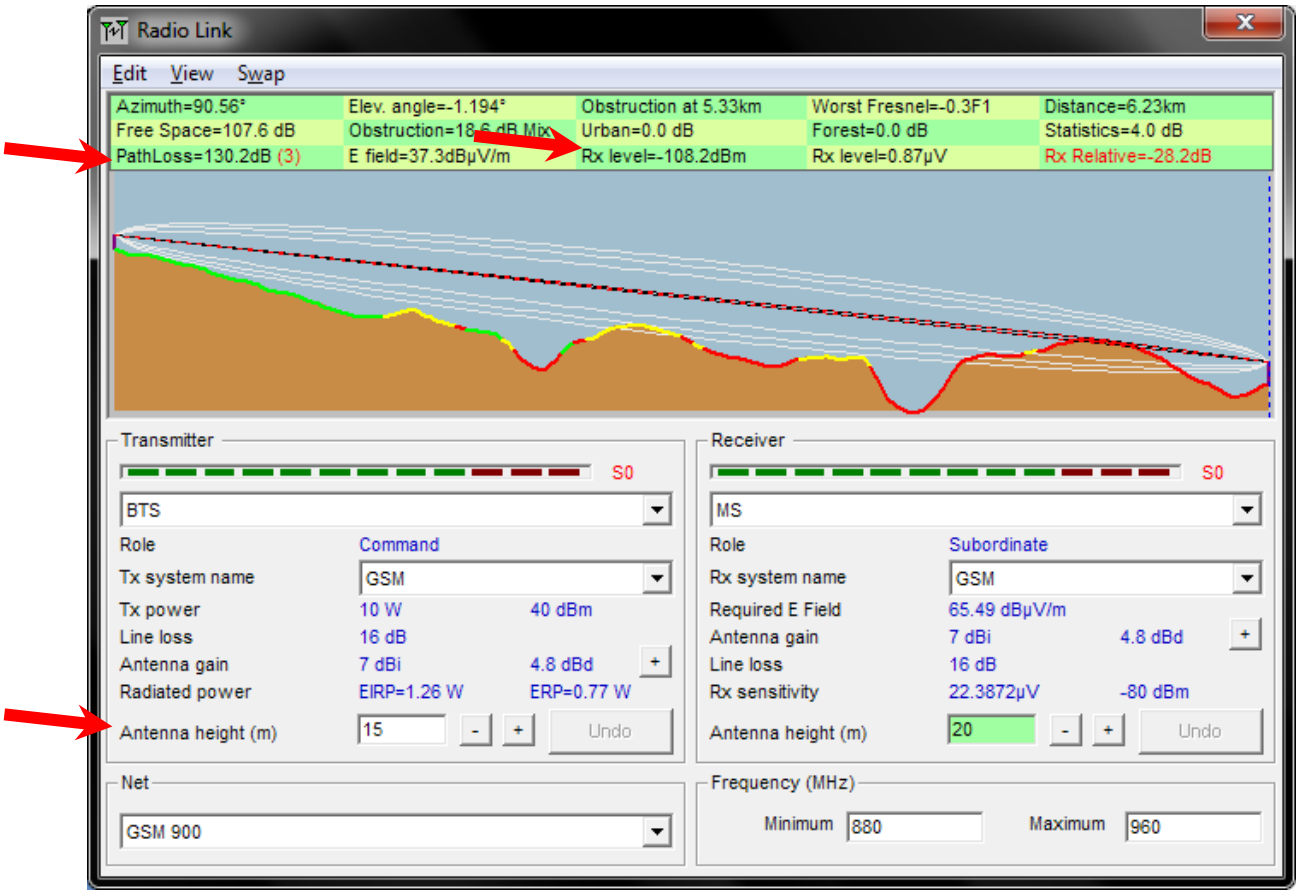
This completes the setting of the broadcasting network. We can proceed to the actual simulation.

Simulation run in Radio Mobile

14. We begin by displaying the radio link **Tools> Radio link** or key F2.

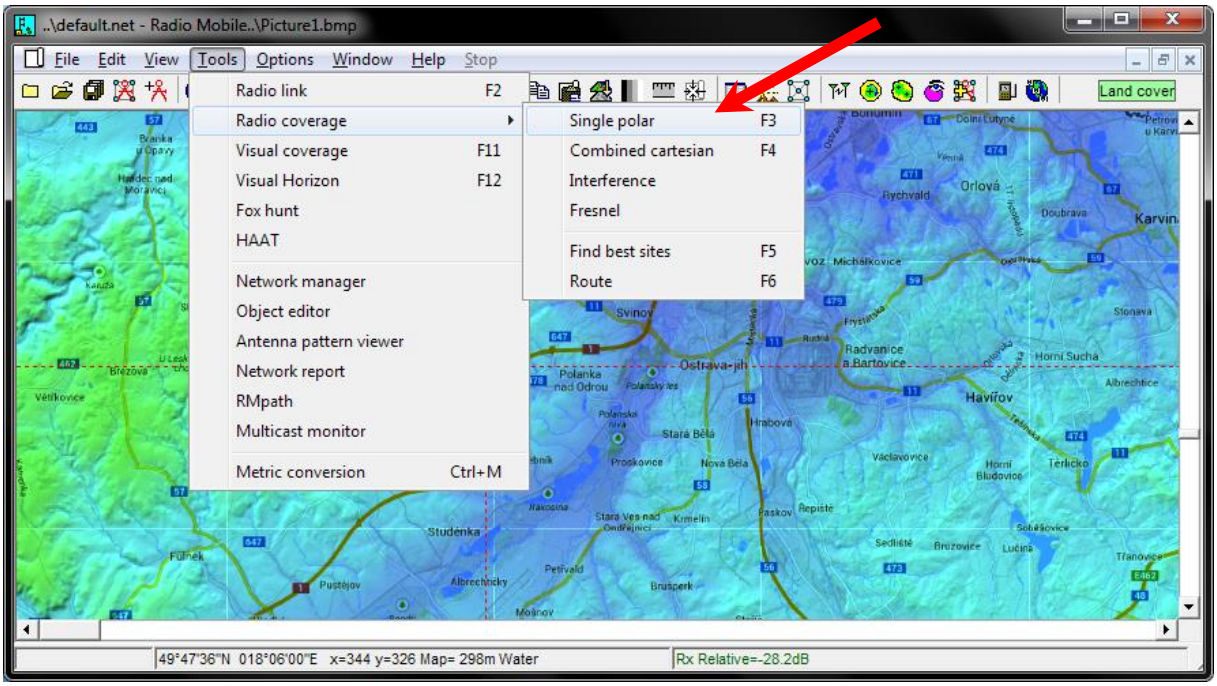


15. You can see Fresnel zone and its possible disruption. At the top of the window, you can deduct the value of the loss of signal space (pathloss), receive level (Rx level). In the lower part, you can define parameters for the transmitter and receiver. You have the possibility to additionally change the antenna height.

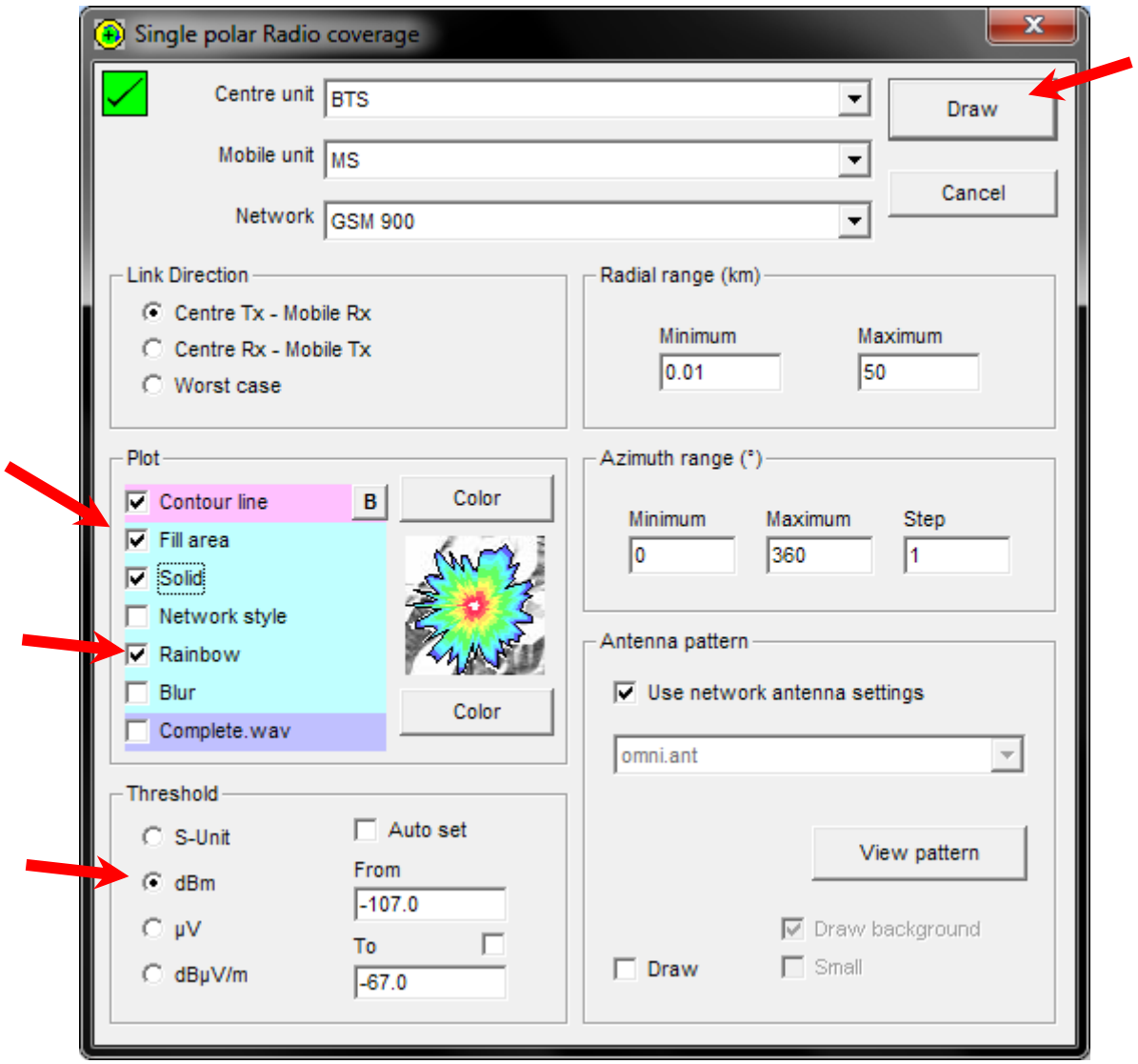


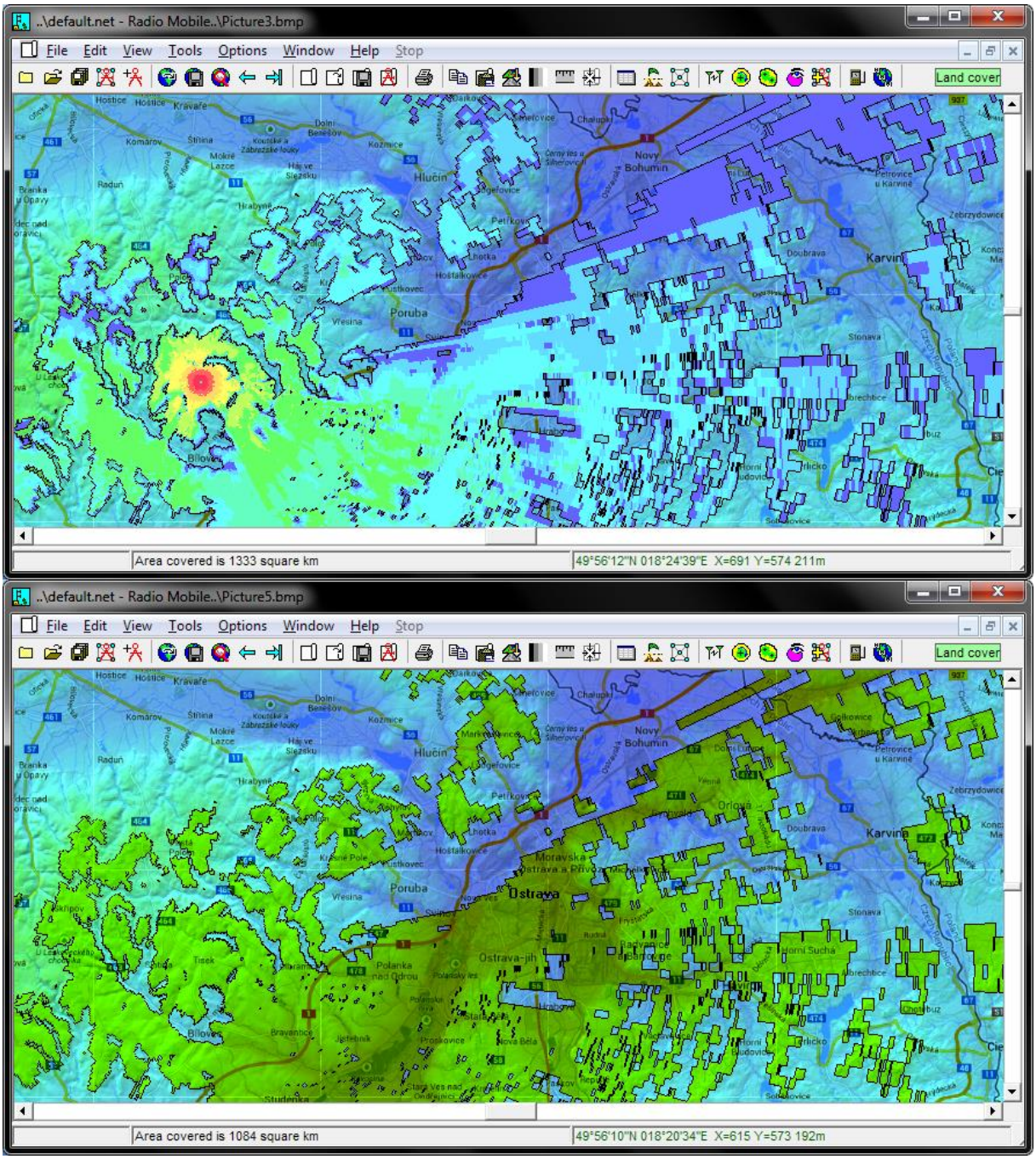
(A more detailed listing of the parameters of the radio link in the menu, click **View → Details**.)

16. Perform radio coverage via **Tools → Radio coverage → Single polar (or press F3)**.



17. In this step, you just select how to display a coverage (**Fill area; Solid** and possibly **Rainbow**). The display can be either in units of dBm or dBμV/m. Draw the simulation by **Drawn** button.




..\default.net - Radio Mobile..\Picture3.bmp
File Edit View Tools Options Window Help Stop
Land cover
Area covered is 1333 square km
49°56'12"N 018°24'39"E X=691 Y=574 211m
..\default.net - Radio Mobile..\Picture5.bmp
File Edit View Tools Options Window Help Stop
Land cover
Area covered is 1084 square km
49°56'10"N 018°20'34"E X=615 Y=573 192m