IcnirpCalc v 1.5

Introduction

The assessment of ham radio stations in Germany started in 1997 and got serious in 2002 when legislation introduced a new law called BEMFV. This law requires all German ham radio operators to file some papers to the administration BNetzA. Those papers have to prove that RF exposure is limited to certain values that consist of those given by the ICNIRP (European standard) plus limits for pacemakers (Germany only). In those times DARC has provided two software programs for its members to use, when doing those assessments. They are called WATT32 and QuickWatt.

In the IARU EMC WG meeting in 2007 the author of QuickWatt was asked to circulate it - if possible - in English language. Since nowhere else in the world limits for pacemakers exists, QuickWatt was modified for ICNIRP limits only and translated into English. This international Version is now called IcnirpCalc.

Usage

After starting the program, you will find an input area in the upper left corner. You can choose a ham band or a fixed frequency for calculation. The latter is accessed by double click on the edit box labelled “Freq.”. To choose an antenna click on the *Antenna* box and choose the antenna manufacturer first, then the antenna type and then the band on which the antenna is to be used (on multiband antennas). When done, do not forget to hit the button *Take Antenna* and the antenna data will be copied to the input box.

Go on further downwards and enter your output power. The main philosophy of IcnirpCalc is that white boxes have to be entered manually, the grey ones only output information, the entering has to be done somewhere else. The next edit box is *mode* with the default value SSB. If you click on it the right hand side of the program will change its appearance and the mode can be set in the upper part. You will find an area named *Intermittent operation* in this window as well. Since it does make a difference whether transmitting all the time or only part of the time, you can choose if in a time interval of 6 minutes you transmit all the time (choose TX6 RX0) or transmit 3 minutes and receive 3 minutes (choose TX3 RX3). The 6 minutes interval has something to do with the thermal relaxation time of human tissue and is a preset of ICNIRP values.

Even further down you can choose the *modulation factor*. Since it does make a difference in average power, whether you use CW or FM for example and only average power counts, modulation factors which transform maximum power to average power make sense using. However two different “sets” of those factors are available. The FCC factors are published in the OET Bulletin 63A for US ham radio assessments and the BNetzA values are given by German law. The third option gives you the factor one in any case.

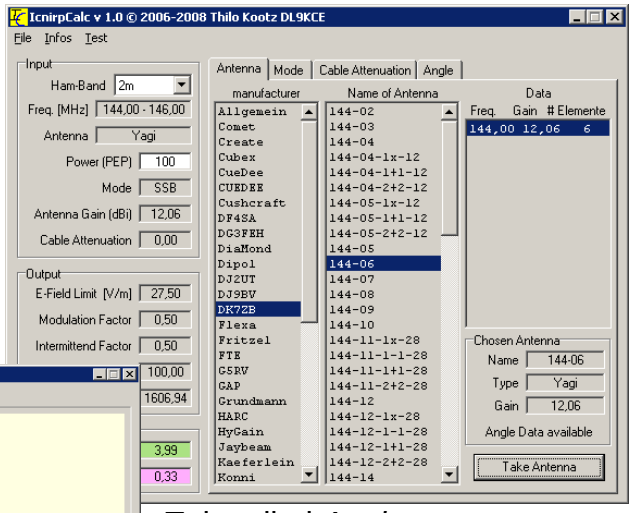
As we go down further in the input section, the *antenna gain* comes up. But the value has already been put in, when you chose the antenna. The next box is for the feeding cable. A click will bring up a new right hand side again. You can choose a cable and its length here and enter attenuations along the way of the transmitting signal (i.e. coaxial plugs or low pass filters etc.).

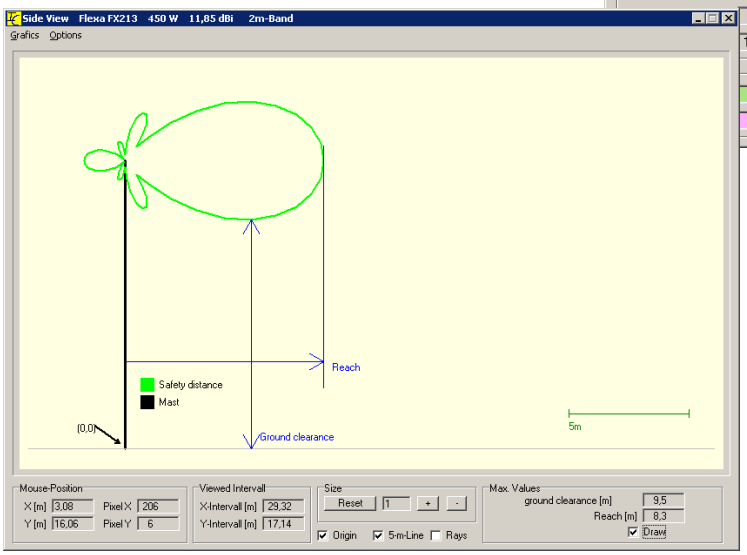
Now you finished all the inputs an you can look at the box in the lower left corner, where you will find the required safety distance in the green field. Since the

calculations are all done assuming far field conditions, in the pink field the distance to which the near field reaches is given. According to German law measuring or near field calculations have to be used beside the here calculated far field solution, if the near field conditions apply outside the ham operators property.
In the output filed some intermediary results are given for your information. For example you will find the E-Field limit according to ICNIRP for the given frequency, the antenna input power (power minus coax loss) and then EIRP. The latter is the power taking the max. antenna gain into account and can become quite large.

Antenna diagrams

Sometimes it can be very helpful to calculate the safety distance with respect to direction diagram of the antenna. For some antennas this diagram is given. Whether angle data is provided or not can be seen when choosing the antenna. In the lower right corner just above the button *Take Antenna* the wording *Angle Data available* appears. In such cases a new





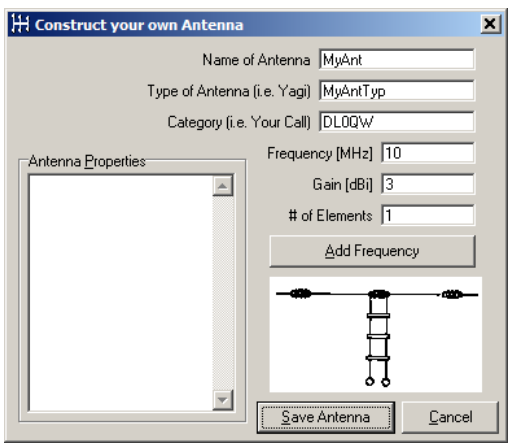
Tab called *Angle* appears as well. Clicking on it will provide you with EIRPs and safety distances under different angles. By clicking on *Antenna Side view* a new window appears and gives you safety distances drawn graphically on the screen.

Future

The German version of this software (QuickWatt) exists now since 2002. It is more sophisticated, because of the mentioned limits for pacemakers. Since the regulations of station assessment are varying a lot in the countries, this distribution is just an example of how things could be done and what values of station parameters can occur. This project could be continued if wanted and if feedback is provided to the author.

How to create own antennas

There are two way how to create own antennas. The easier method is using the menu item *construct own antenna* in the *file* menu. A new window opens up allowing you to insert antenna data. Choose a name and tell the program what type it is. Also provide a



category. If you are creating a commercial antenna, insert the manufacturers name here, else it is recommended to insert you call sign. Doing so, you can very easily find all the antennas you have created, your call sign being the *manufacturer*. All you need to do know is insert frequency, gain and the number of elements and press *add frequency*. If you have a mono band antenna you are done and you may save it. If however the antenna is usable on different bands override frequency, gain and the number of elements and press *add frequency* again. Repeat this until all band are covered, before you save the antenna. You will NOT be able to see this antenna right away. You have to close the program and restart it. The new antenna is now visible.

The following describes a more difficult approach, which however is very helpful, because it allows you to change errors. When you look in the working directory, you will find two files named “Antennas.txt” and “AntUser.txt”. The first file contains antennas provided with the program. The second File my contain you own data. It looks something like this.

[DL9KCE]
BigWheel,BigWheel,50,3,1,#
Collinear D-Star, Collinear ,432,7.15,1,#
CoolAnt,AllmostDummy,7.1,-4,1,10.1,1.1,1,#
T_FD4,Draht,3.5,3.01,1,7.0,4.01,1,14.1,5.13,1,18.1,6.33,1,28.5,7.79,1,#
[DL0XY]
SuperWire,likeDipole,10.1,4,1,14,1,6,1,#

The rectangular brackets contain the manufacturer, in case of individual antennas the call sign. The following lines each contain the description of one aerial. Look at the section DL0XY. The line starts with the first item *SuperWire*, which would by the name ofe the antenna, second item is it type, in this case *likeDipole*. The following numbers are triplets of Frequency, gain[dBi] and number of elements. If the antenna is good for more bands, more triplets are added until the line ends with comma and an # sign. A general representation has thus the format:

<Name of antenna>,<Type of antenna>, <Freq1>,<Gain1>, <#ele1>,……,
<FreqN>,<GainN>, <#eleN>,#

So the user may edit this text file manually to his needs.