やっぱり

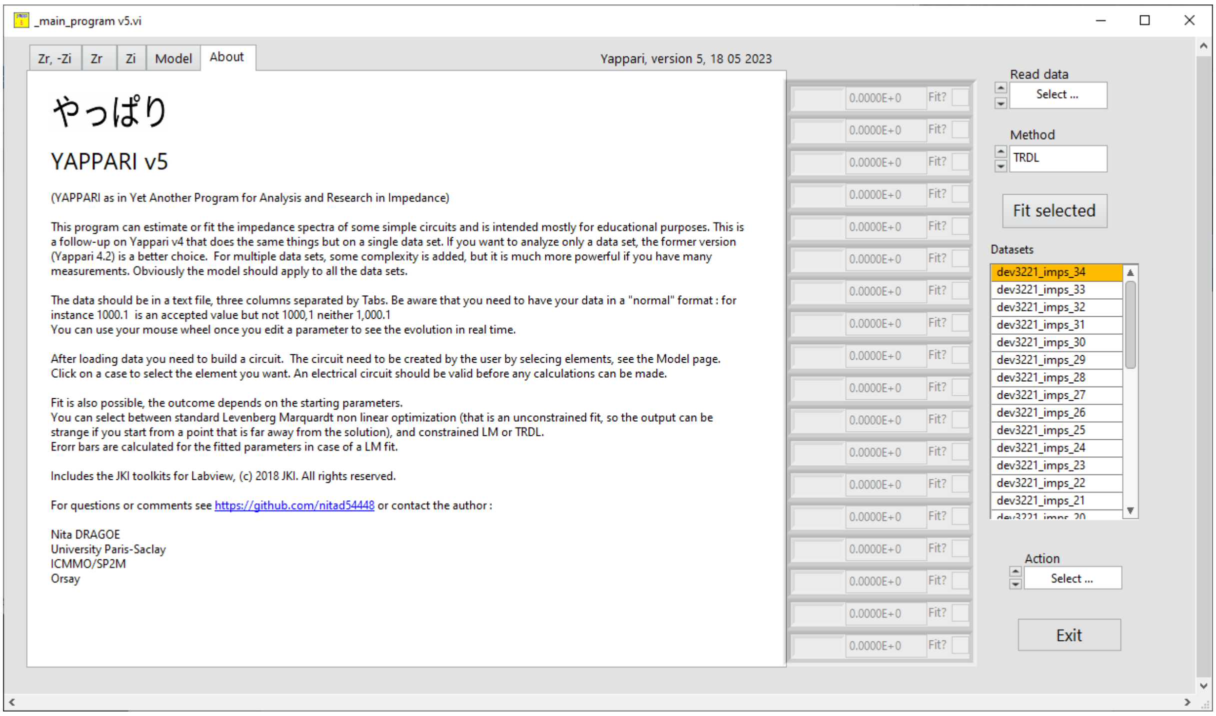
Version 18 08 2023

YAPPARI TUTORIAL

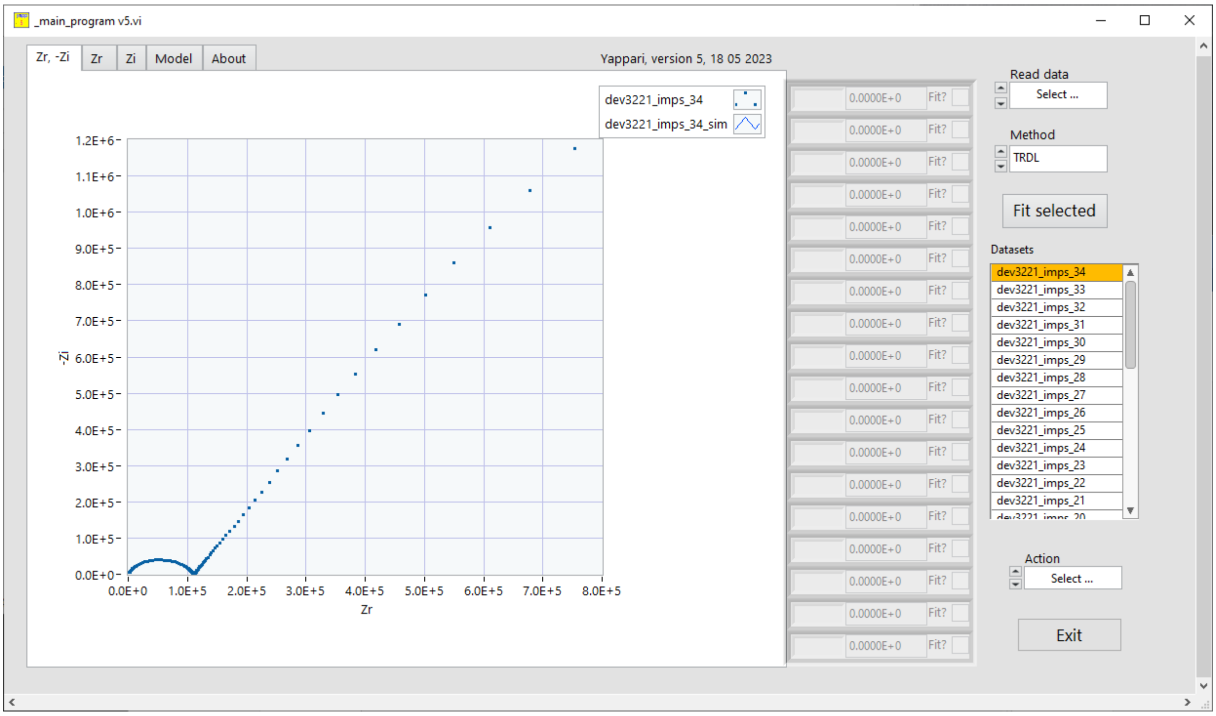
Multiple datasets fits

YAPPARI stands for Yet Another Program for Analysis and Research in Impedance.
This program can be referenced as http://dx.doi.org/10.13140/RG.2.2.15160.83200
YAPPARI-5 is designed to multiple datasets fitting of the impedance spectra of a user-made circuit.
You are encouraged to contribute to the help file, you can send it to me and I'll add it to Github for the benefit of the other users.

Let's make a fitting of some data to understand basic functions.
The first thing to do is select the separator (tab, ;, , or space) which is used in the data file (this applies to MFLI CSV and 3 columns files). This parameter can be selected on the "Parameters page".
Then, we need to add some data.
In the data folder supplied with the installer there is a file dev3221_imps_0_sample_00000.csv, which is a ceramic measured over a weekend with a Zurich Instruments impedance analyzer. In this device there is an option Auto Save, who just adds all the data to a single file.
We can open this file with Read data, by selecting CSV format and select which data set to see (one or more datasets an be selected)

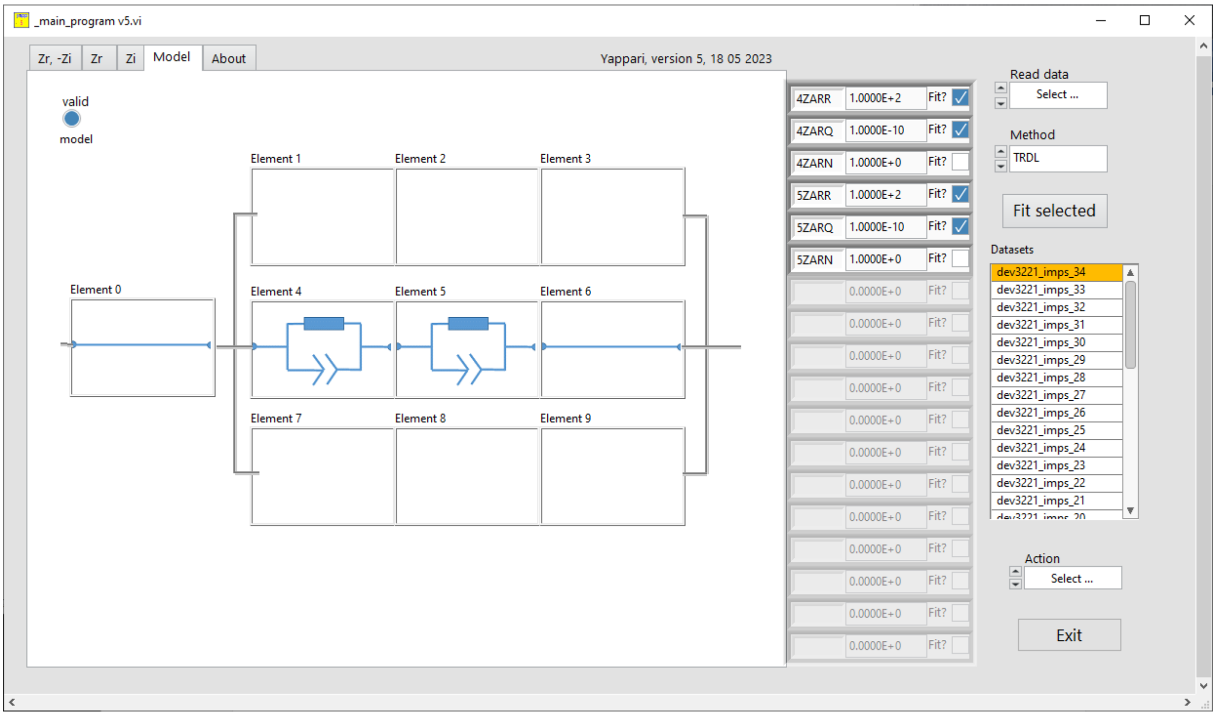


There are 35 measurements in this file, from 0 to 34 (the last measurement in the file appears as the first one in the datasets list). if we look at the Nyquist plot, the experimental data and simulated ones for all selected datasets are plotted:

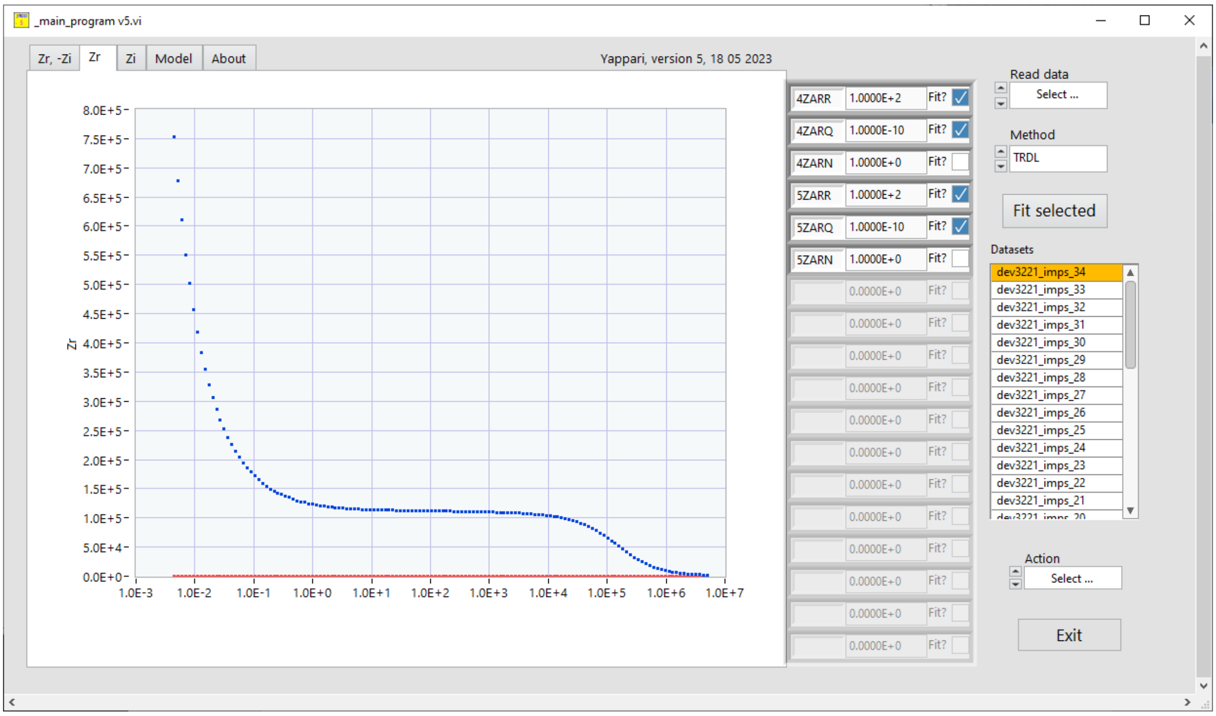


Here there is no simulation hence only one graph will appear. For calculations we'll need a model. Let's make one, I'll just make two Zarcs, to show how to fit (this is not an advice on what model to fit for this spectrum!)

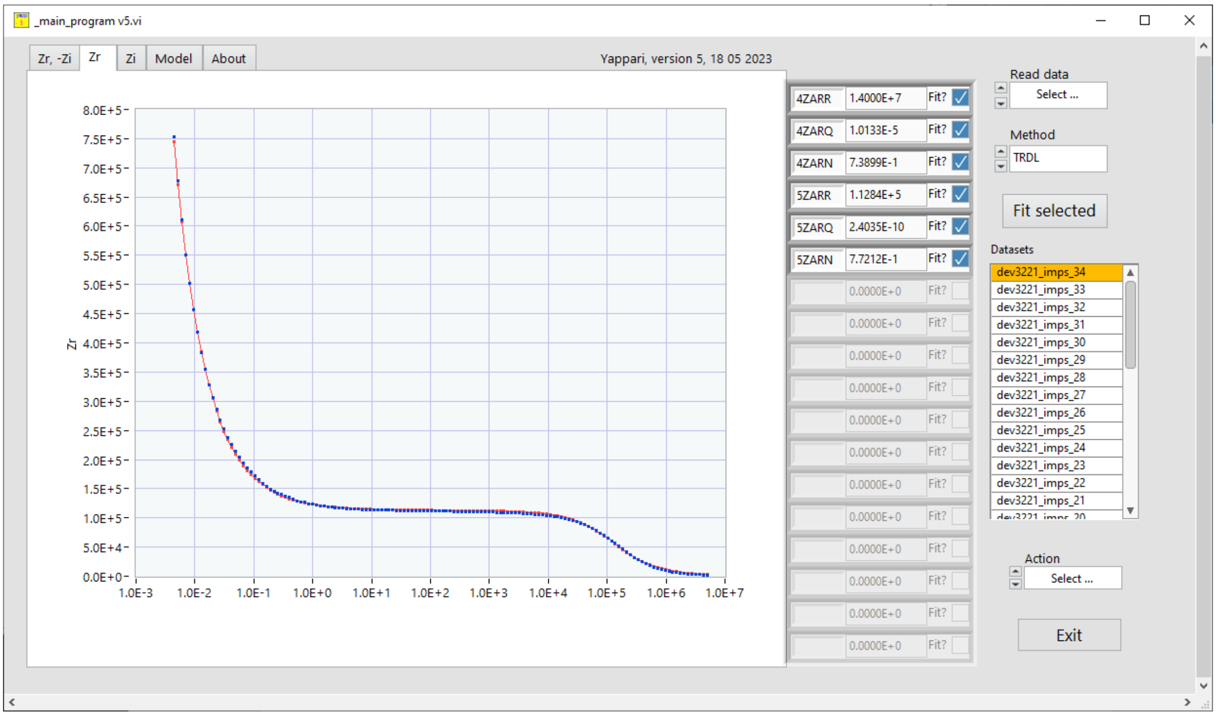
If I make a model like this



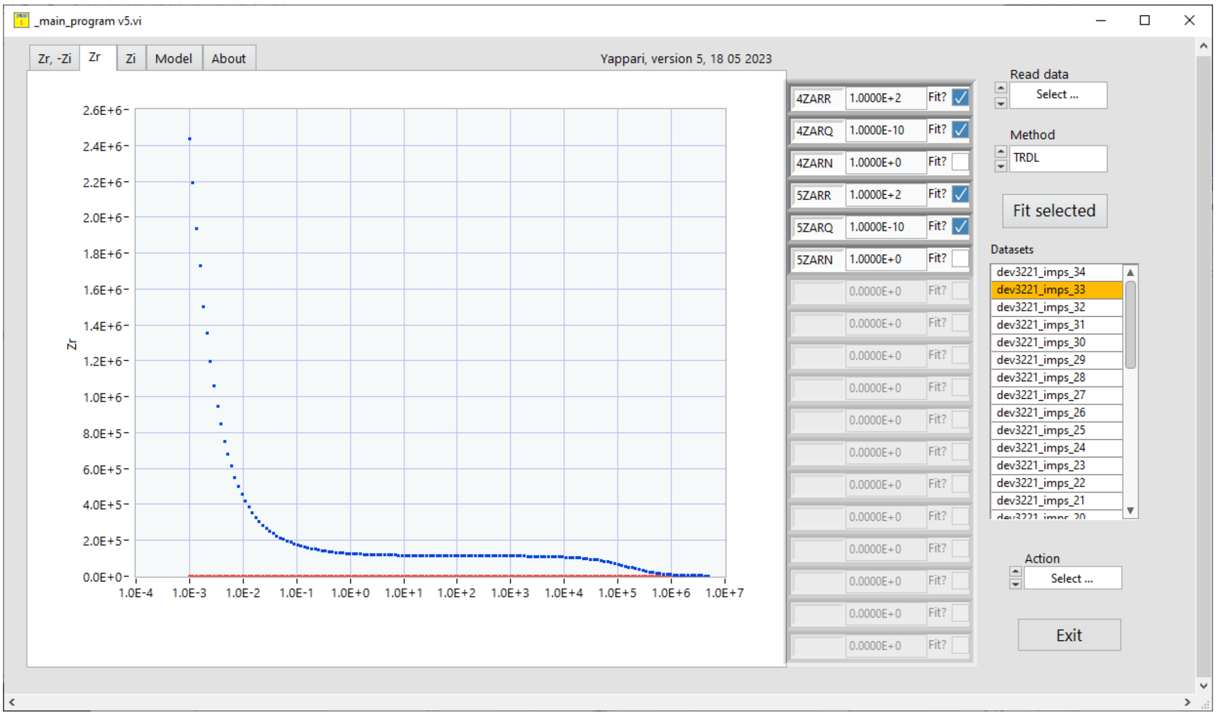
Six parameters, describing the two Zarcs, will appear with some dummy values. The calculated and experimental data are now plotted (the initial values are very far from the what they should be, the initial parameters are some defaults).



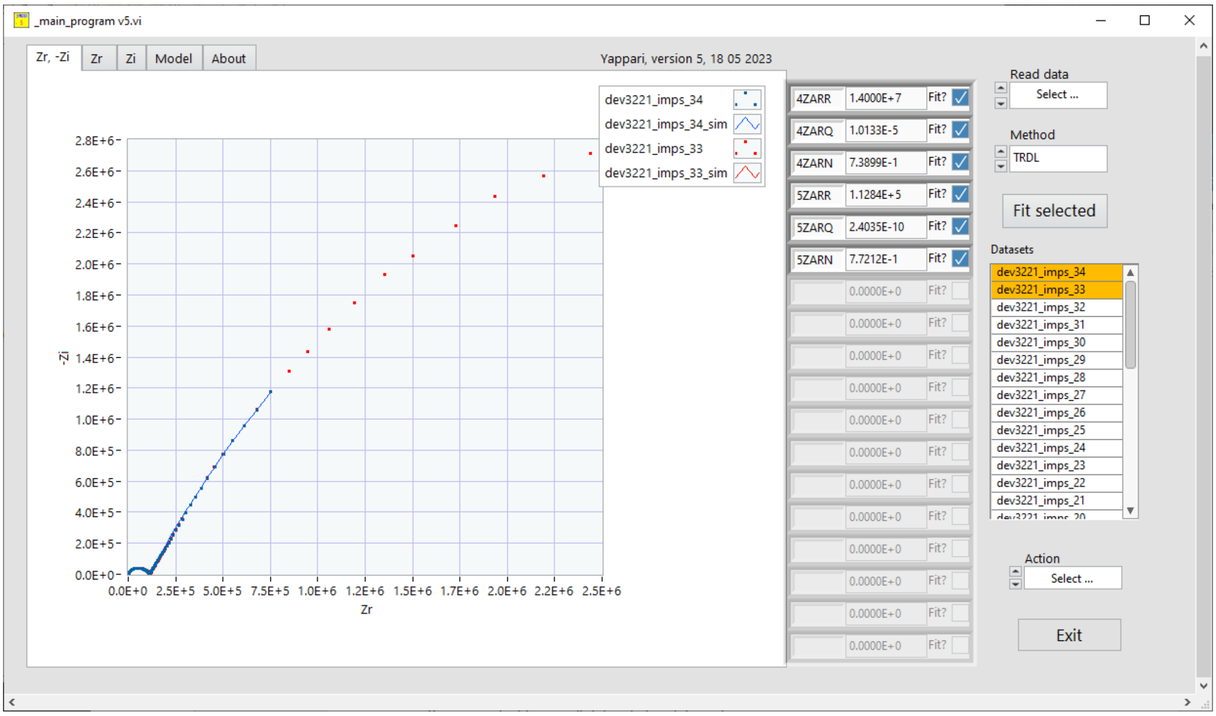
After adjusting manually and doing a couple of TRDL fits, we can get this which looks pretty good



We fitted only the first dataset, so if you select the second data you'll see the same initial parameters since we did not fit them.



You can select one or more (or ALL) datasets for plots and comparison, let's look at Nyquist plot for the first 2 data sets:

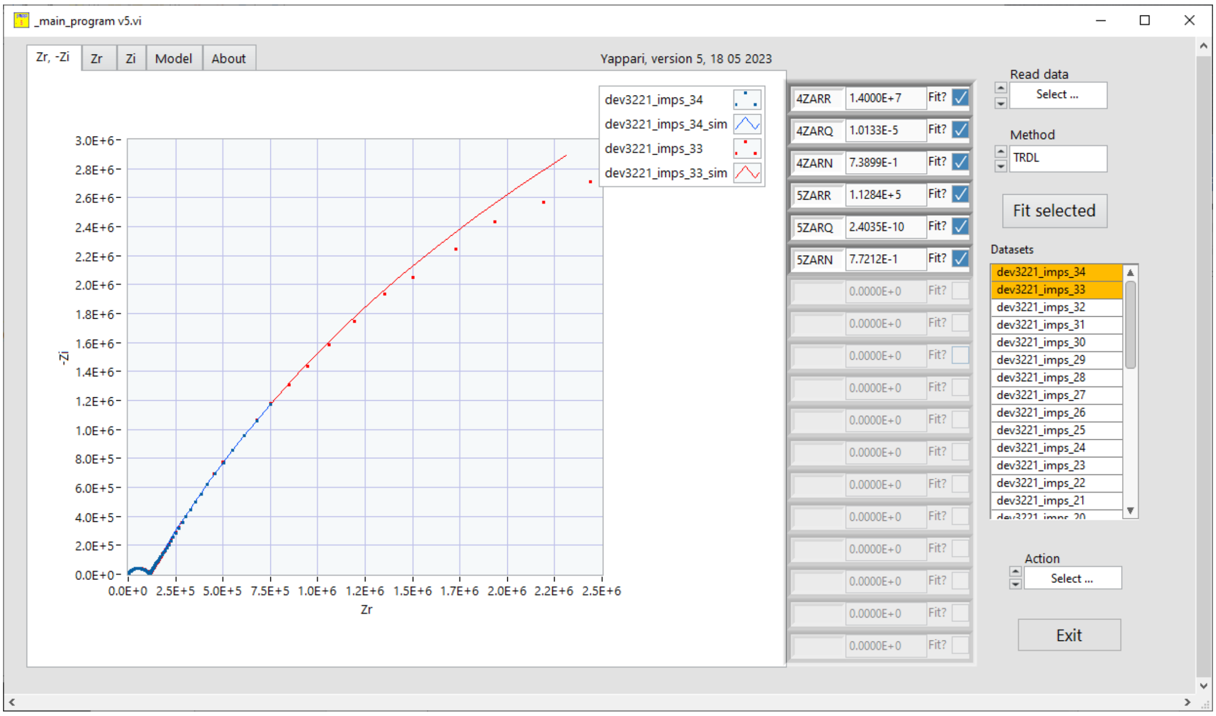


The two datasets have different frequency ranges, we can see the first set is fitted well, not the second (the legend on the right side of the graphs allows to change points, colors, and so on).

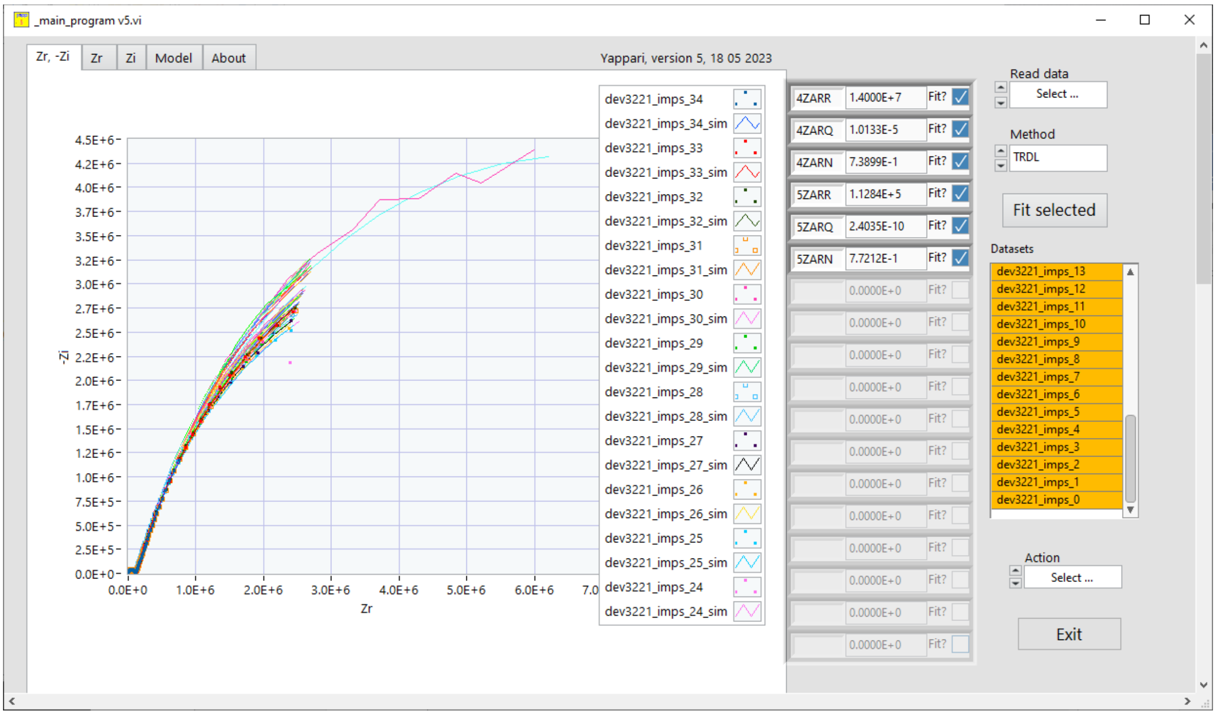
Next step is to copy the parameters from the first dataset to the 34 others by using

Action : Clone these parameters to all

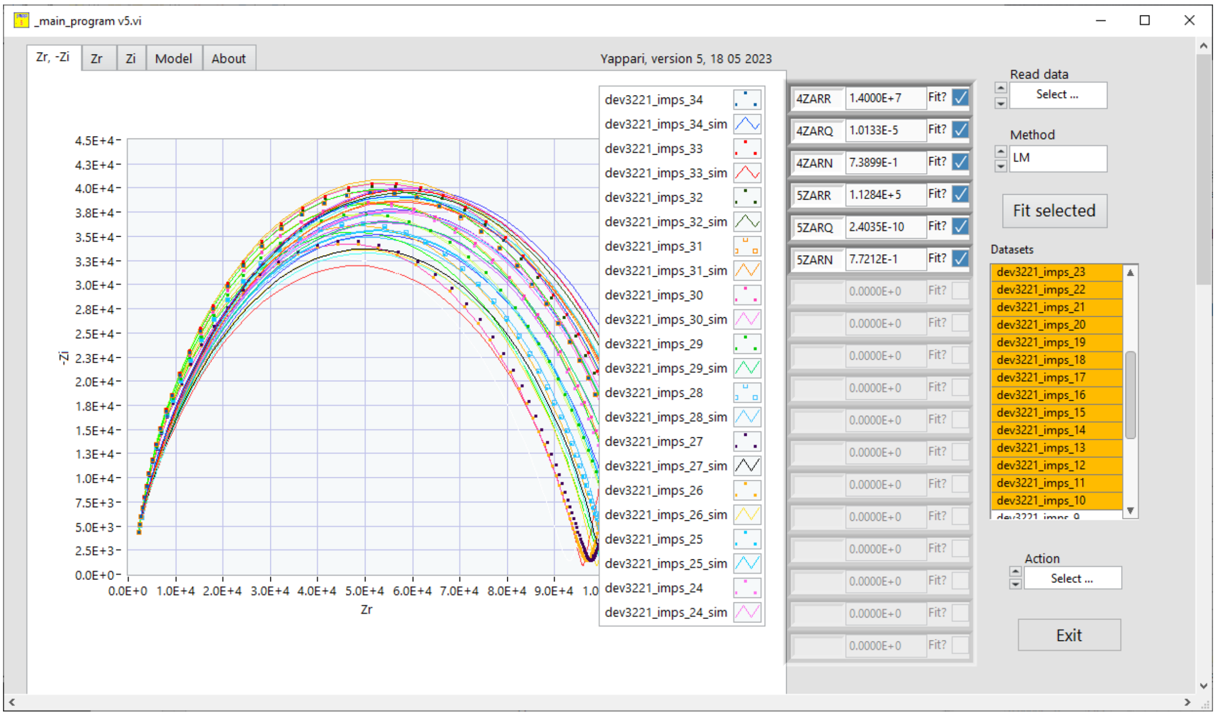
The parameters for the first set were copied to the other datasets and the calculations show that they are not that far



Let's fit them all, by selecting all datasets and use Fit selected. It will take a minute on a regular computer and you'll get something like



You can adjust the range for viewing the graph,

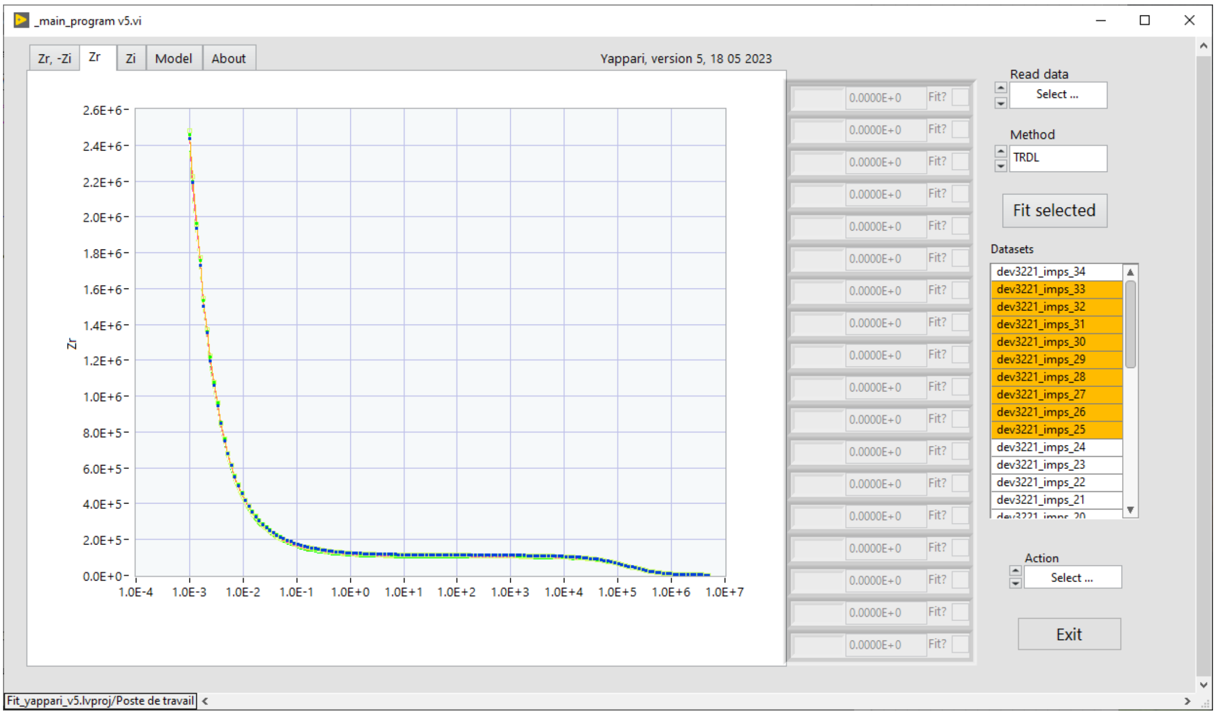


You can save all data to ASCII files for making your own graphs.
Also you can save all the parameters to a file, they are separated by Tabs. This file contains R2 and chi2 together with esd for the fits. The esd are calculated only for unconstrained fit.

Yappari v5 - parameters saved : 18/05/2023 13:22:49

Dataset	R2	chi2	4ZARR	esd	4ZARQ	esd	4ZARN	esd	5ZARR	esd	5ZARQ	esd	5ZARN	esd
dev3221_imps_34	9.998103E-1	8.181934E+1	1.399964E+7	7.536805E+3	1.013275E-5	1.091587E+4	7.389936E-1	1.470069E+4	1.128353E+5	3.494140E+3	2.403539E-10	2.052499E+4	7.721182E-1	2.043698E+4
dev3221_imps_33	9.998613E-1	1.622669E+2	1.055534E+7	1.479720E+4	1.057738E-5	3.342599E+4	7.580726E-1	3.927529E+4	1.165388E+5	7.403273E+3	2.721206E-10	4.373066E+4	7.630881E-1	4.355314E+4
dev3221_imps_32	9.998856E-1	1.453812E+2	1.063659E+7	1.356263E+4	1.041905E-5	3.057688E+4	7.568210E-1	3.595415E+4	1.157916E+5	6.784430E+3	2.731784E-10	4.007398E+4	7.629034E-1	3.991107E+4
dev3221_imps_31	9.998839E-1	1.668674E+2	1.028405E+7	1.354980E+4	1.049484E-5	3.059828E+4	7.588725E-1	3.592125E+4	1.146898E+5	6.817636E+3	3.021129E-10	4.010963E+4	7.561332E-1	3.993908E+4
dev3221_imps_30	9.998849E-1	1.611541E+2	1.013578E+7	1.340489E+4	1.053283E-5	3.026210E+4	7.591503E-1	3.551858E+4	1.117707E+5	6.753842E+3	3.067345E-10	3.980872E+4	7.554907E-1	3.963927E+4
dev3221_imps_29	9.998852E-1	1.619192E+2	1.009246E+7	1.325226E+4	1.065630E-5	2.993482E+4	7.593231E-1	3.513282E+4	1.086678E+5	6.674182E+3	3.220609E-10	3.935585E+4	7.525943E-1	3.918562E+4
dev3221_imps_28	9.999379E-1	1.286392E+2	1.006806E+7	9.629417E+3	1.080187E-5	2.175068E+4	7.593830E-1	2.553488E+4	1.047259E+5	4.833760E+3	2.868025E-10	2.879782E+4	7.610694E-1	2.868093E+4

Another useful function (use with care, the measurement frequencies should be the same) is averaging a set of measurements. Select the datasets you want to average:



Then use *Action: Average selected dataset* command

An additional set appears with the name average (you can change it)