NAT meeting

19.7.2018

Agenda

~25'+5': N. Carlevaro: Details of the beam plasma system and reproduction of ITER relevant EP simulations

~25'+5':A. Biancalani: Update on: Energetic particle modes and turbulence; turbulence and zonal structures; EP and Alfven modes

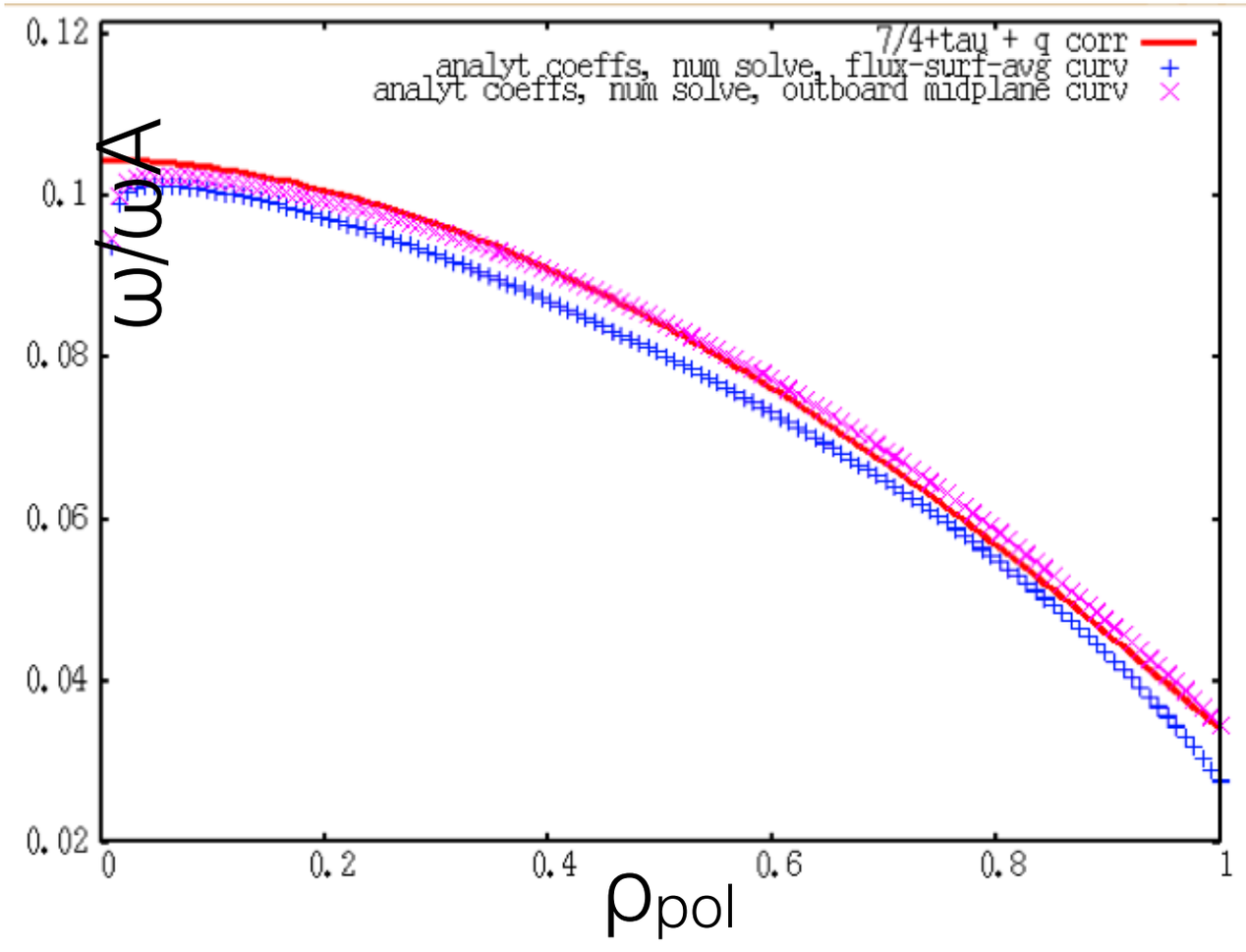
~10'+5':A. Mishchenko: EUTERPE simulations of the GAMs in stellarator geometry

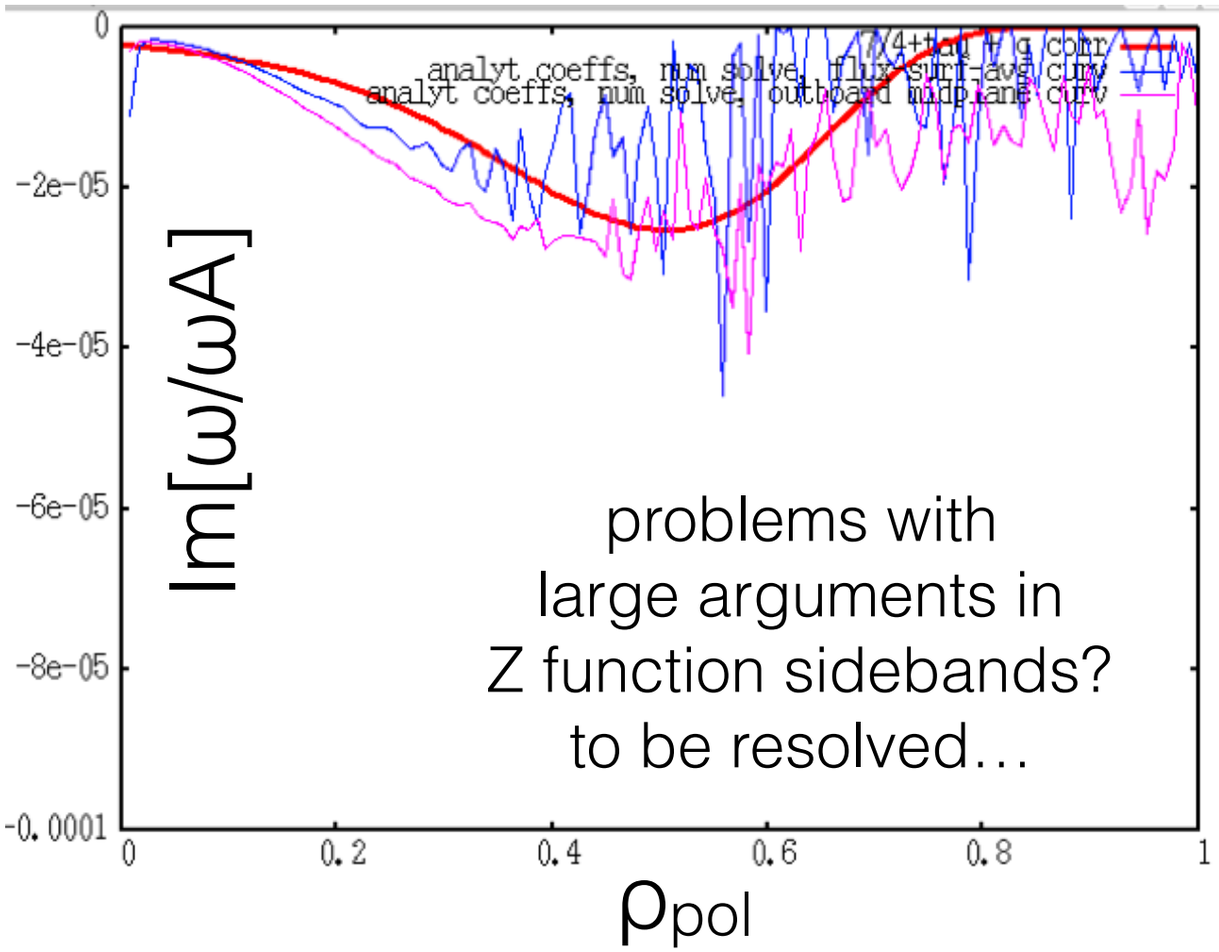
~10+5': Ph Lauber: Short update on LIGKA-FOW/KGAM-AUG studies (10 min)

~30': Discussion: Informal updates of working groups; conference rehearsals; mobility

Update on development and application of LIGKA

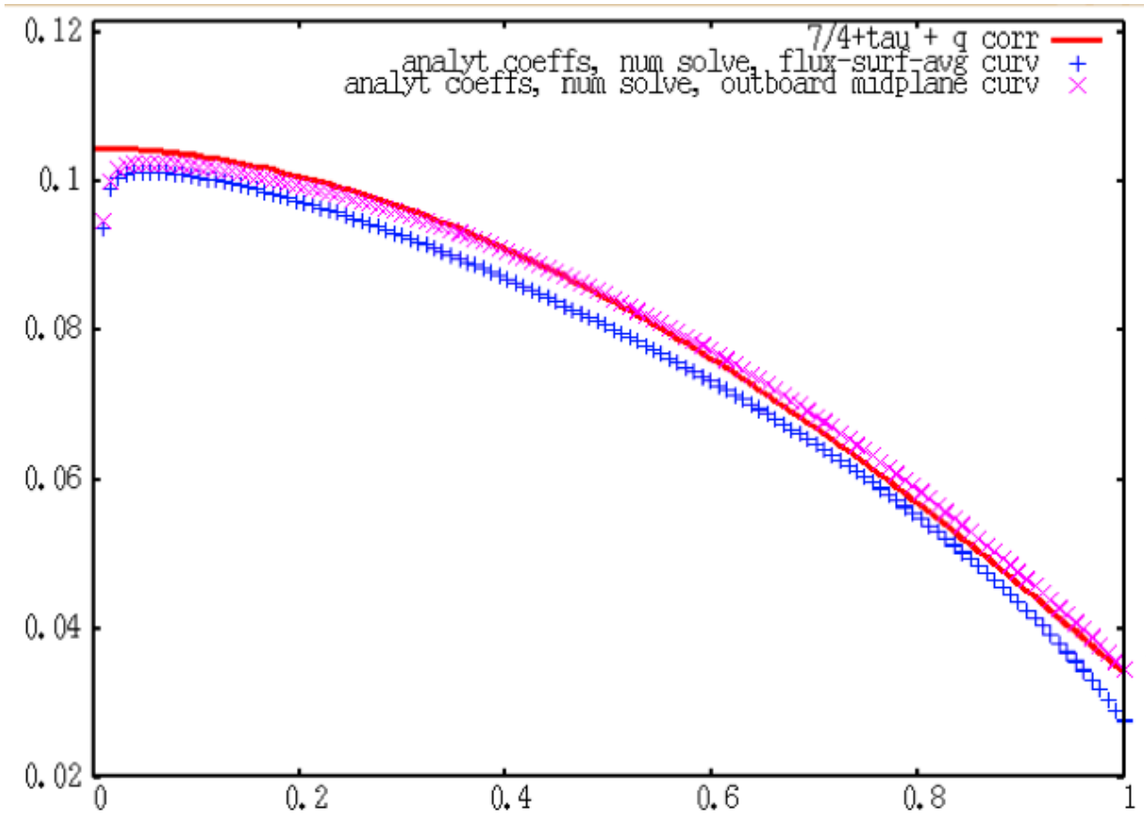
open ends of report in NAT review meeting (2/2018):
analytical coefficients, numerical solve

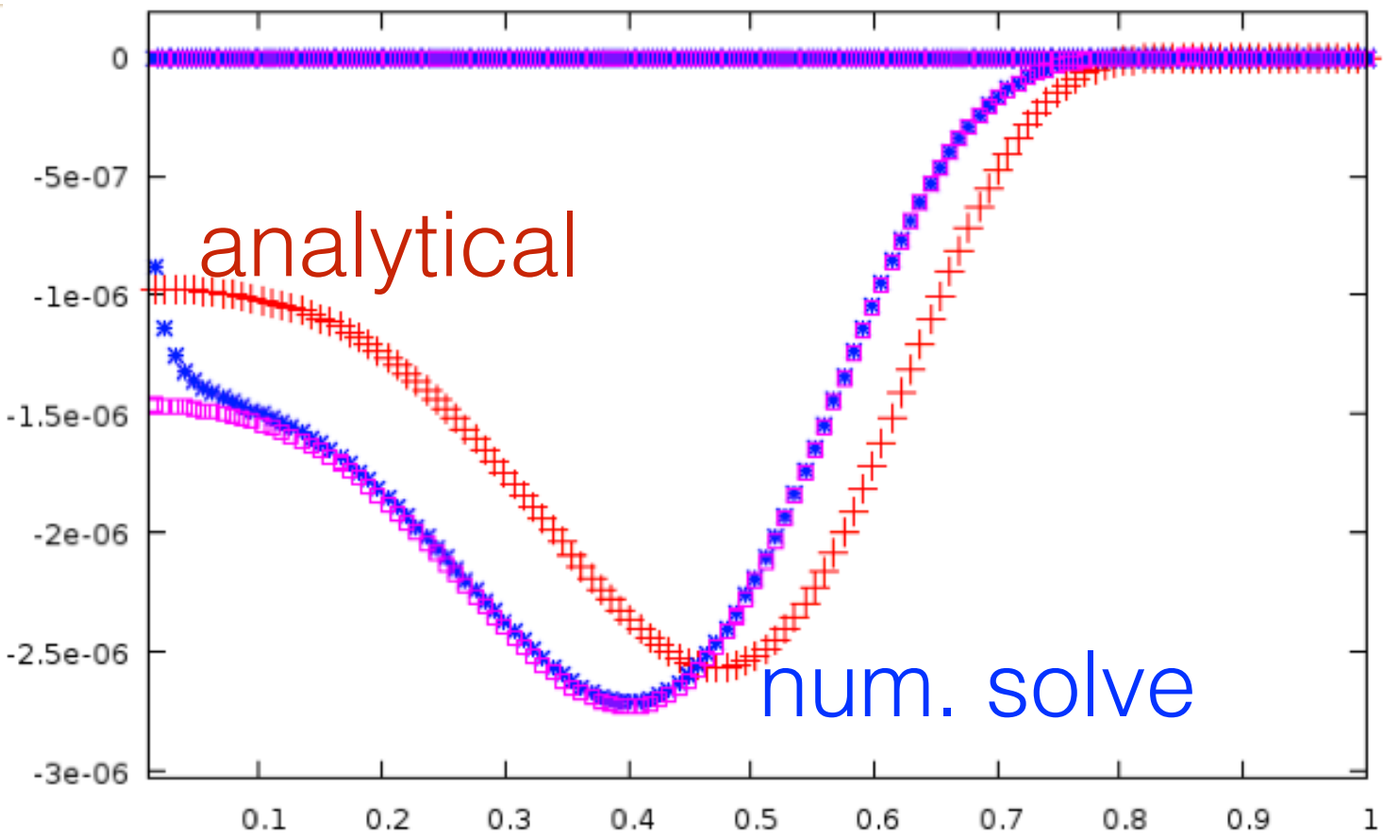




problems with
large arguments in
Z function sidebands?
to be resolved…

open ends of report in NAT review meeting (2/2018): analytical coefficients, numerical solve

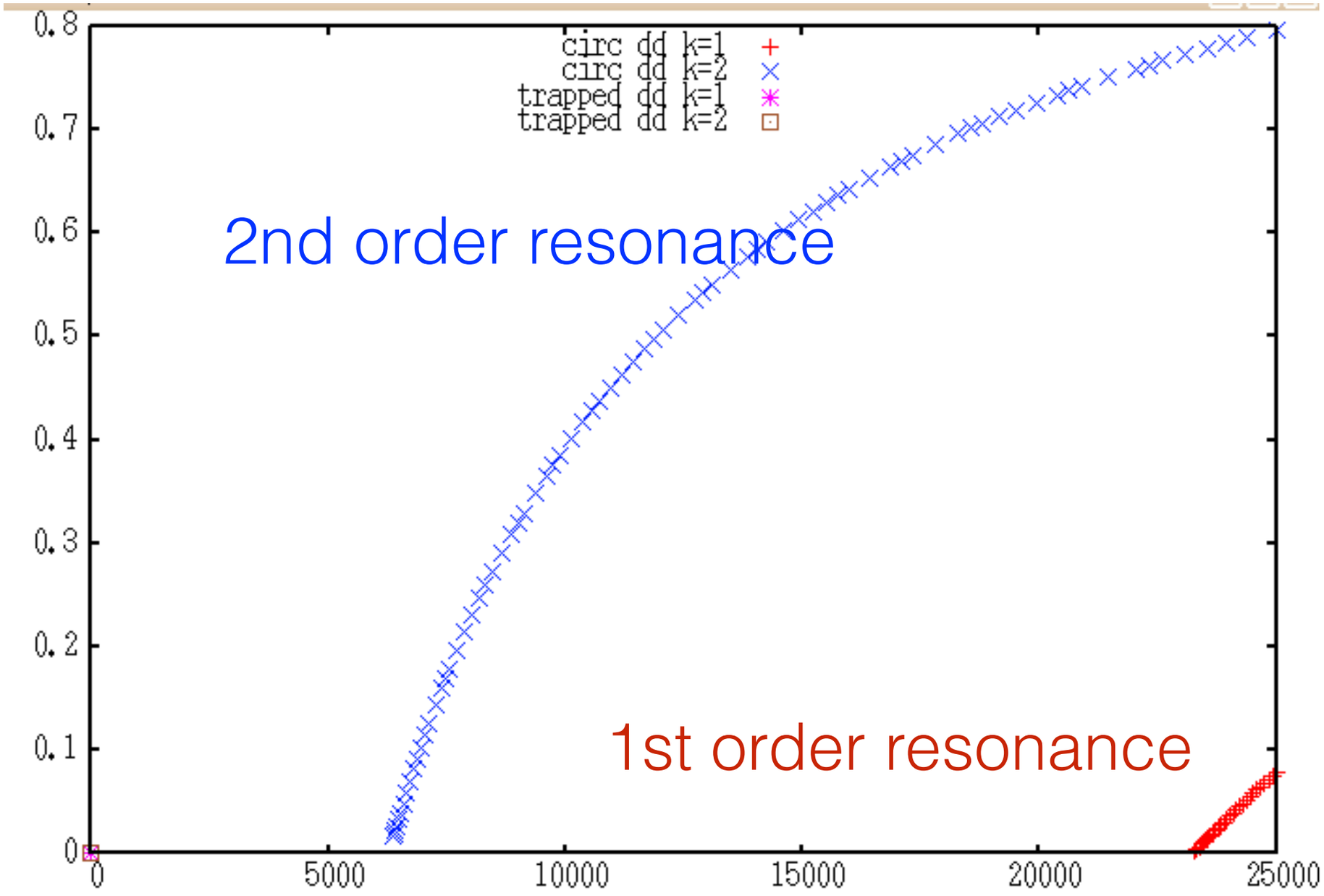




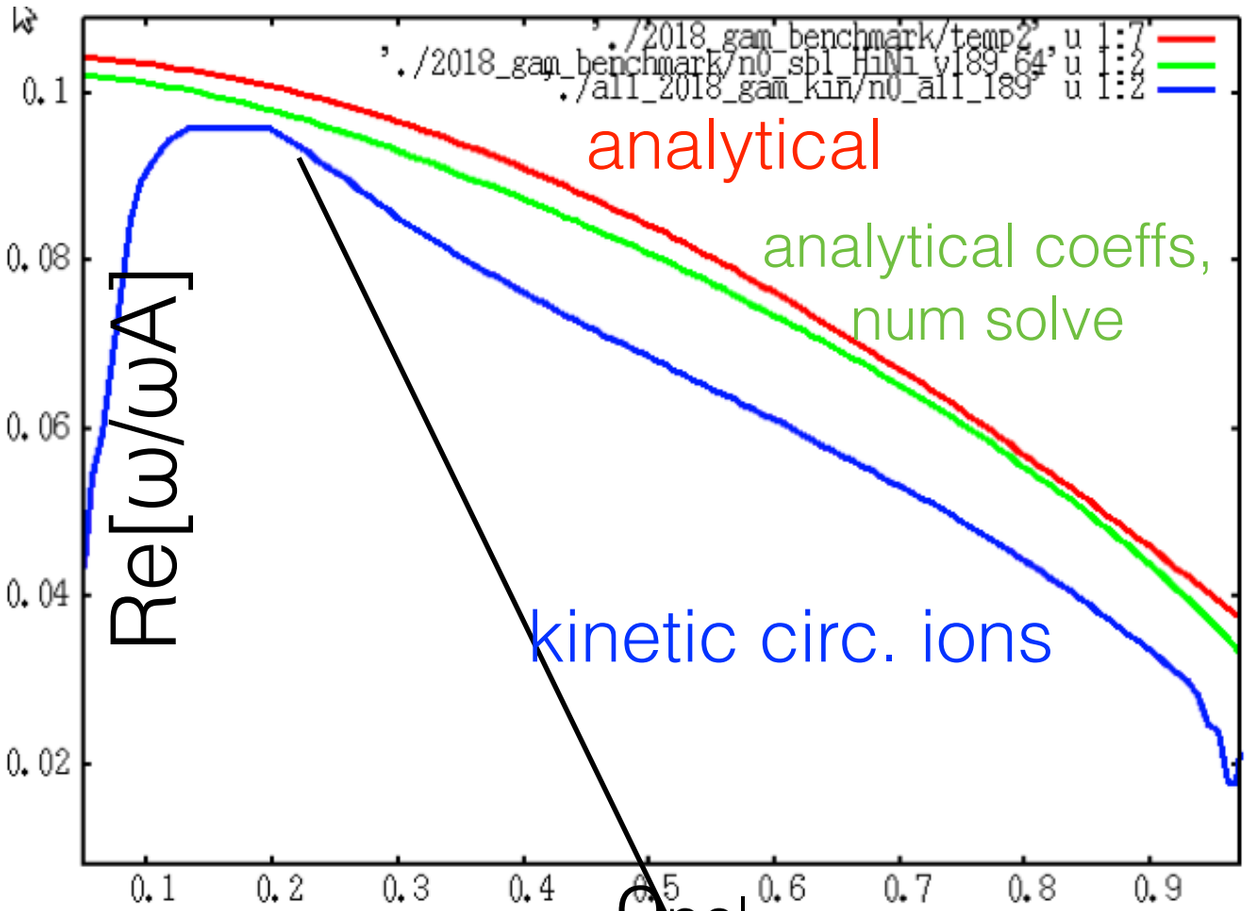
problem solved: ill conditioned local matrix developed numerical noise for small values of ω,γ;
matrix setup methodology changed

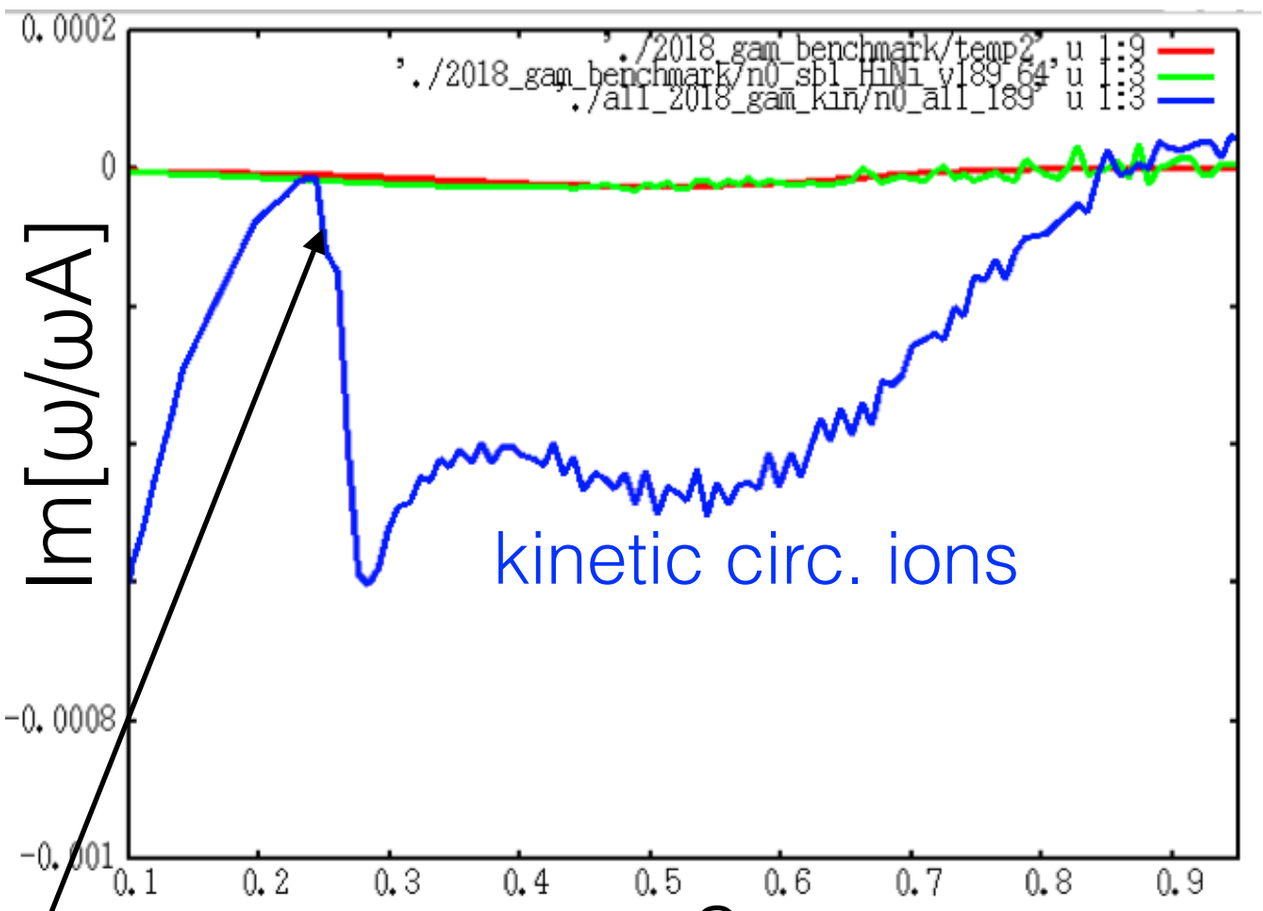
problem: too small energy grid for Maxwell tail:
cut off at 10Ti is not sufficient for accurate damping rates

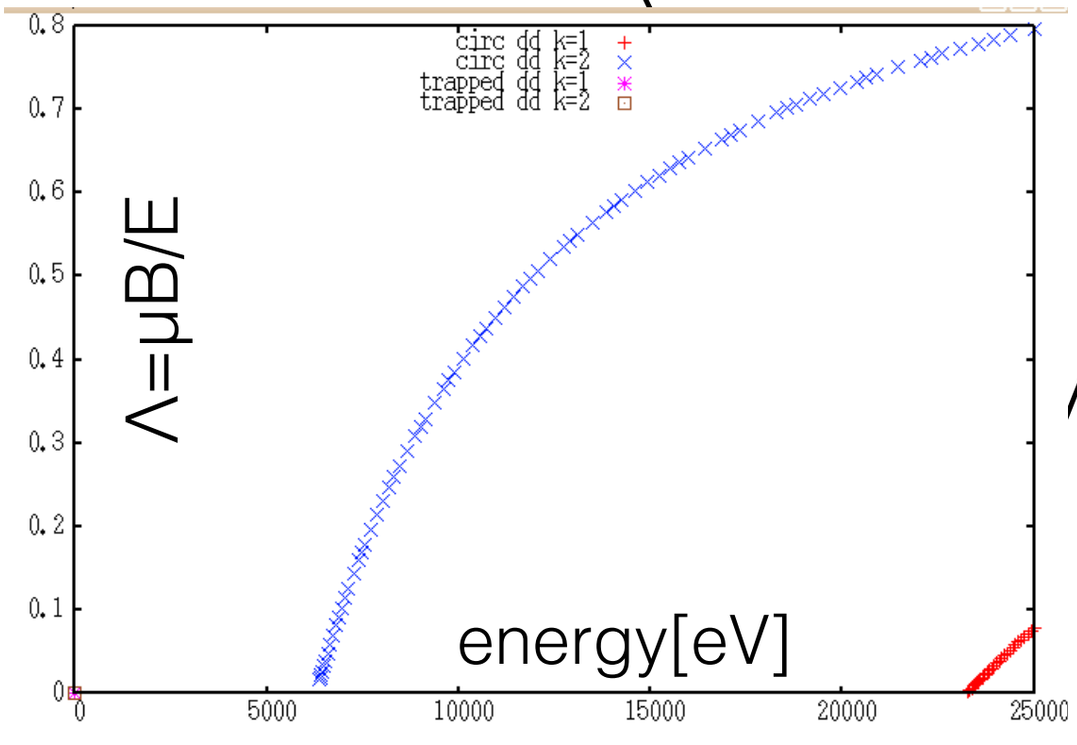
resonances: deuterium ions, r=0.25, ω=0.089 ωA



kinetic ions: only circulating ions, one sideband

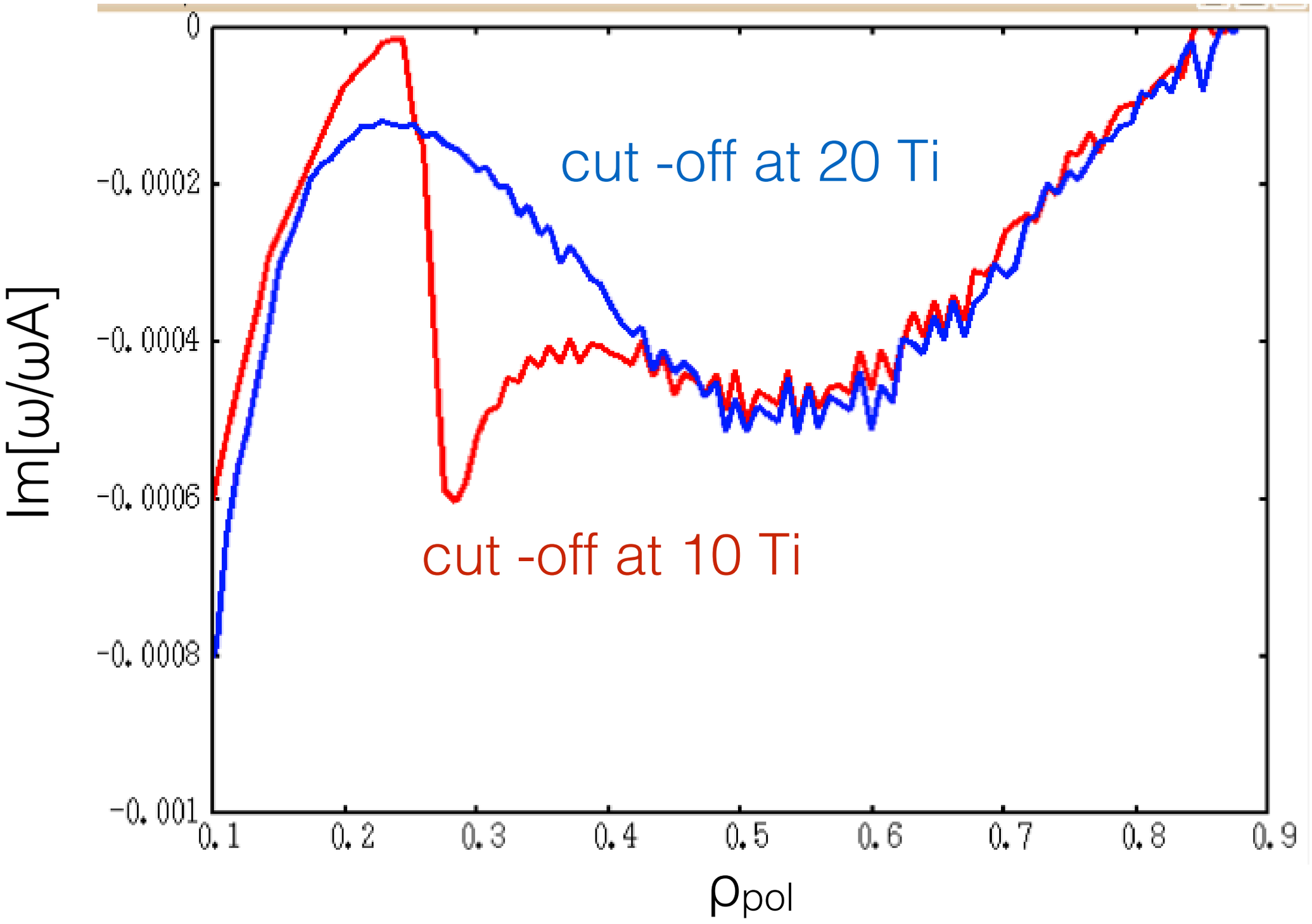






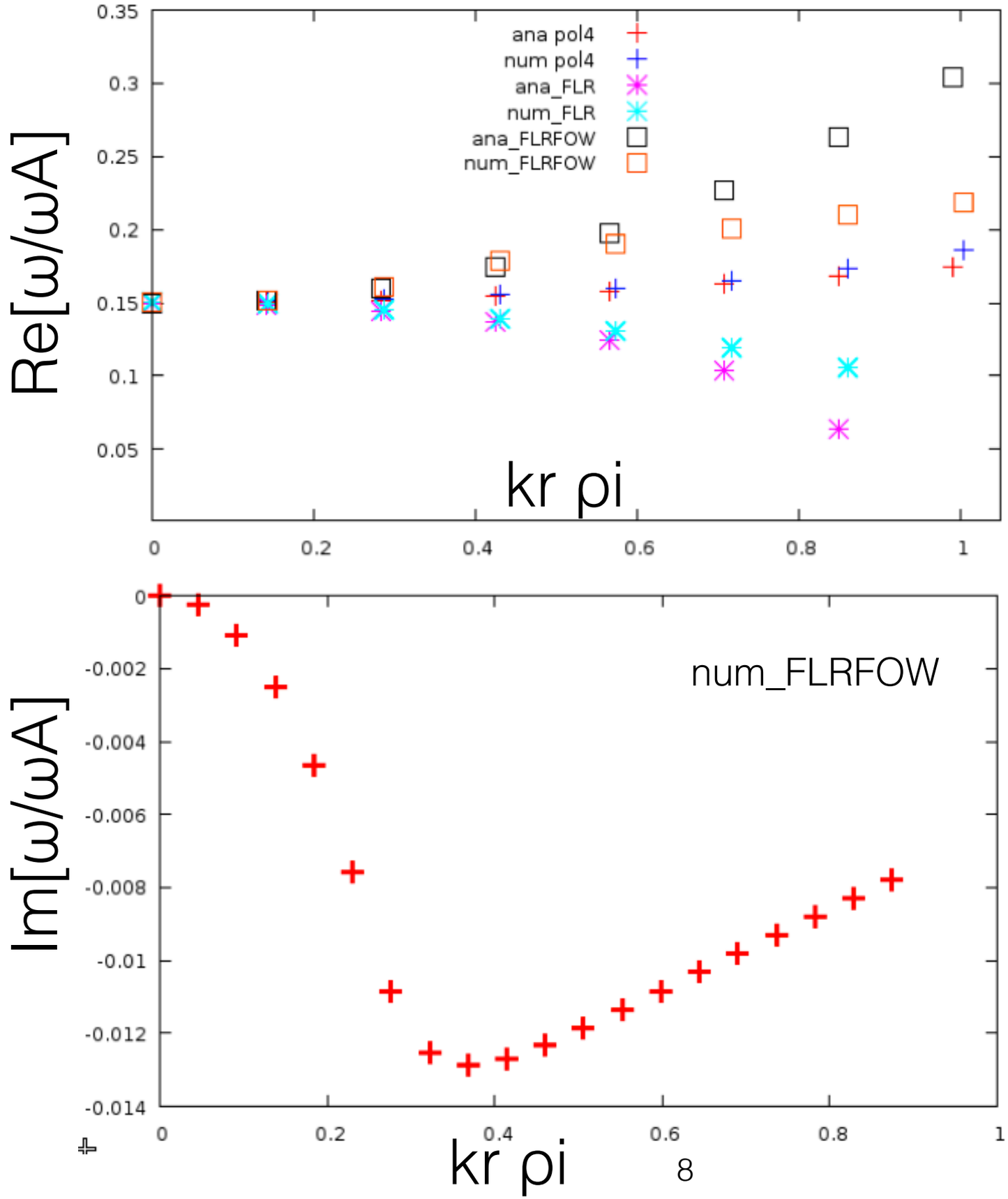
kinetic ions: higher damping rate due to lower ωGAM!

transition will become smoother for wider E-grid



now: expected behaviour… maximum in GAM damping at qmin

Finite orbit width version finished and benchmarked:

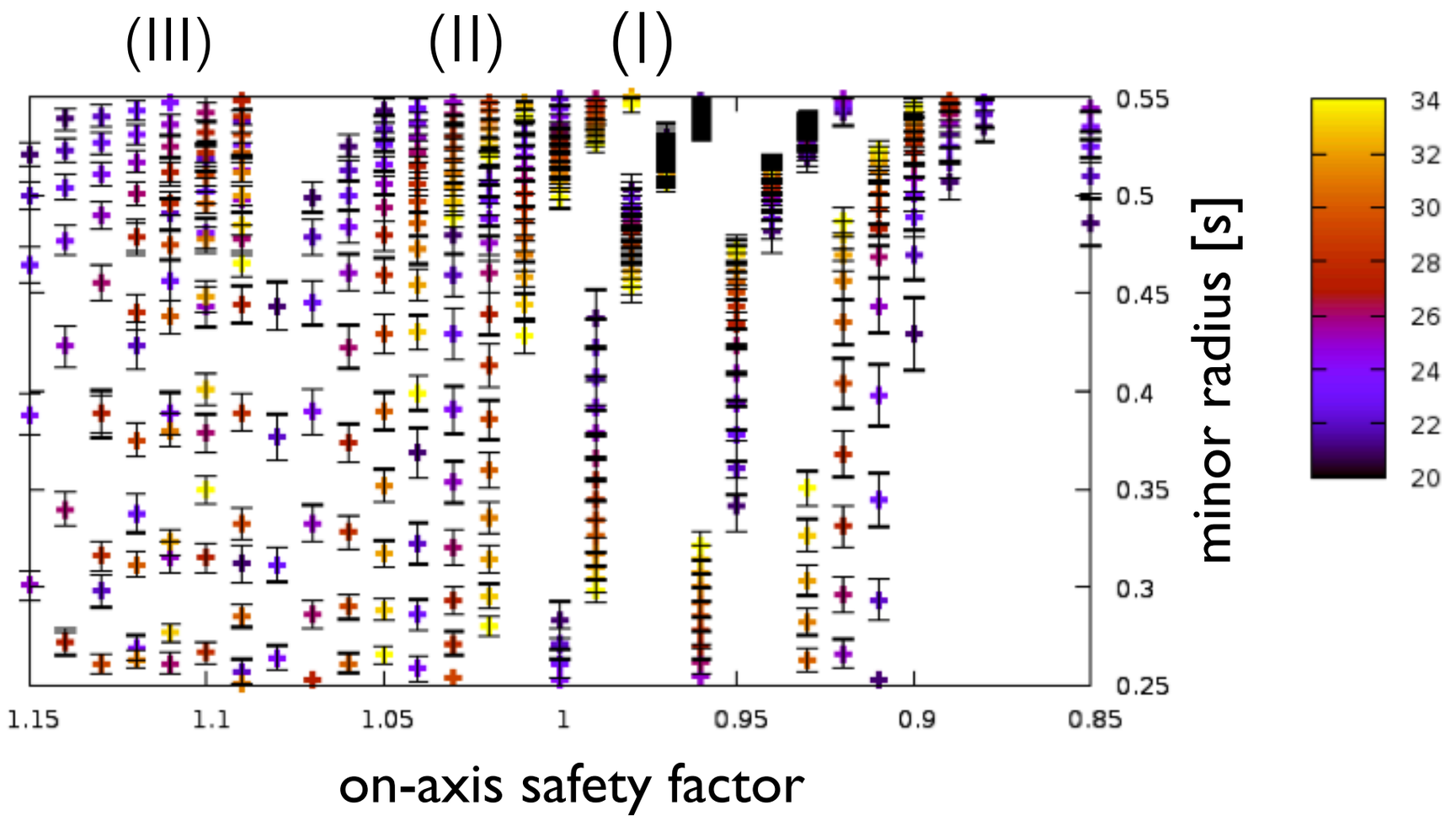


applications: LIGKA hierarchy to ITER/JT60-SA

- degree of (non-linear) Alfven eigenmode (AE) resonance overlap will determine the nature of EP transport in ITER and DEMO

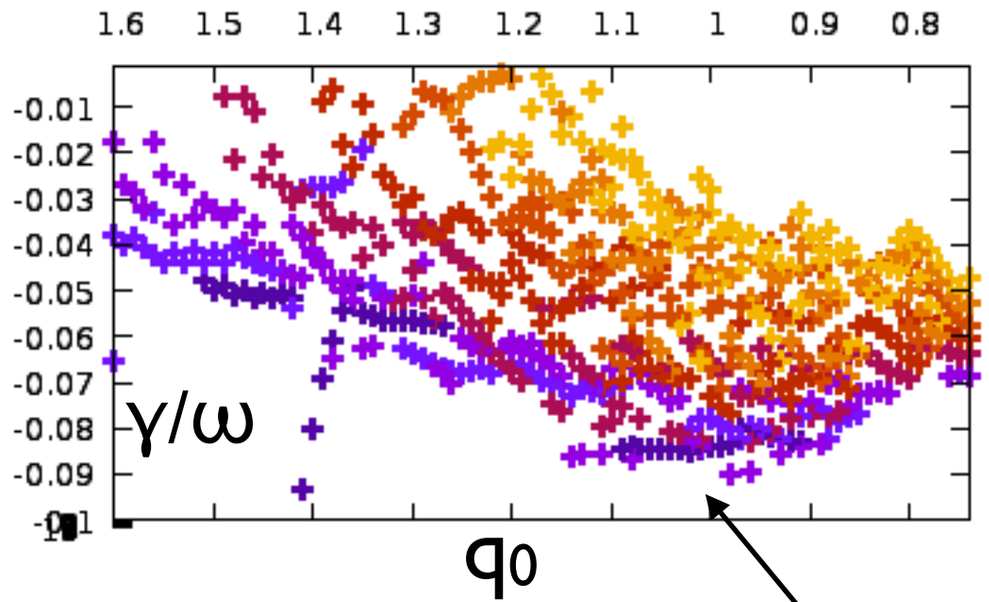
example: 15MA ITER scenario: linear TAE-α resonances depend strongly on q0:
strongly overlapping (I), intermediate (II) and scarce (III) TAEs spectra can exist here: only linearly unstable modes are shown

(N.B: for small particle orbits, Pφ and s are similar, thus the radial mode overlap is a proxy for resonance overlap)

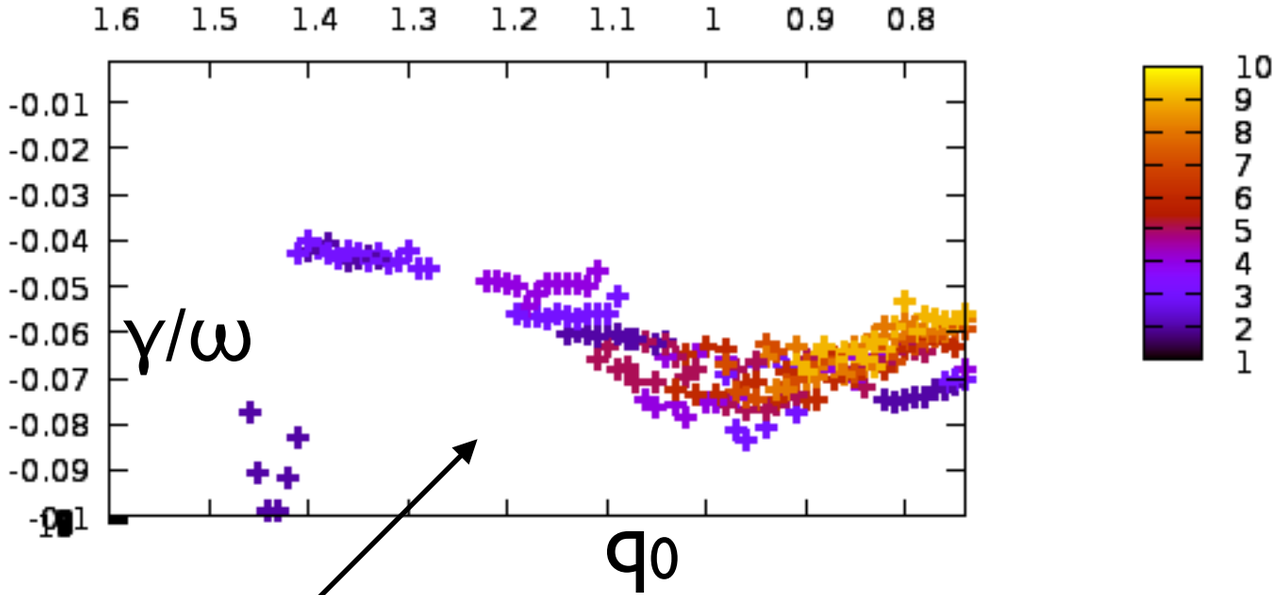


JT-60SA: local damping rates as function of q_0:

all TAEs between r=[0.2;0.4]

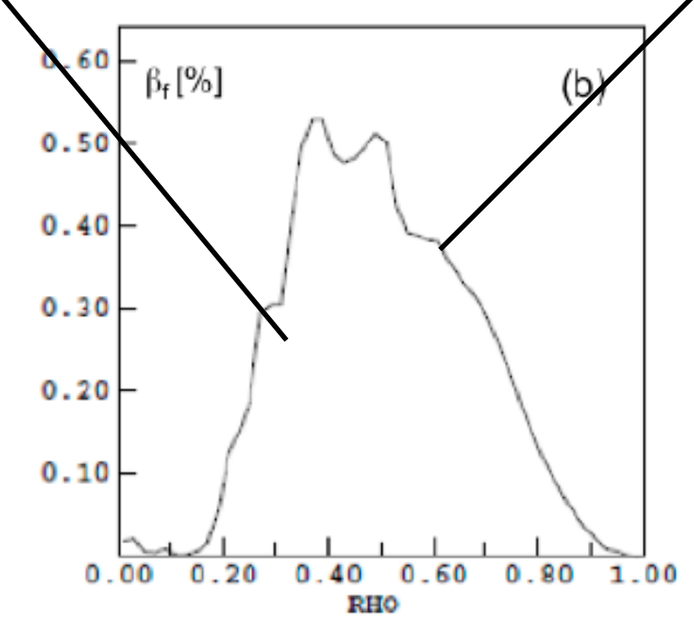


all TAEs between r=[0.5;0.6]



core localised TAEs
mid-n range are least damped modes
for $q_0>1$

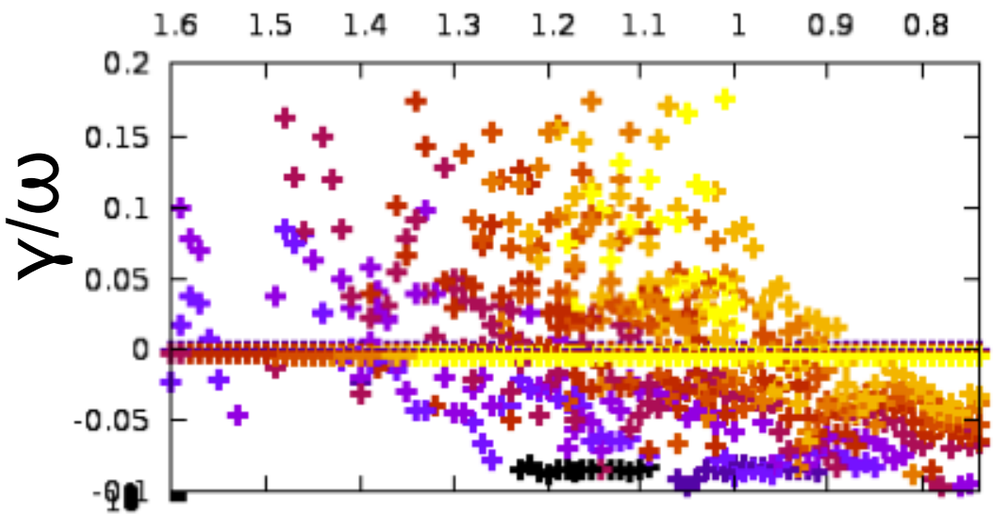
off-axis beam



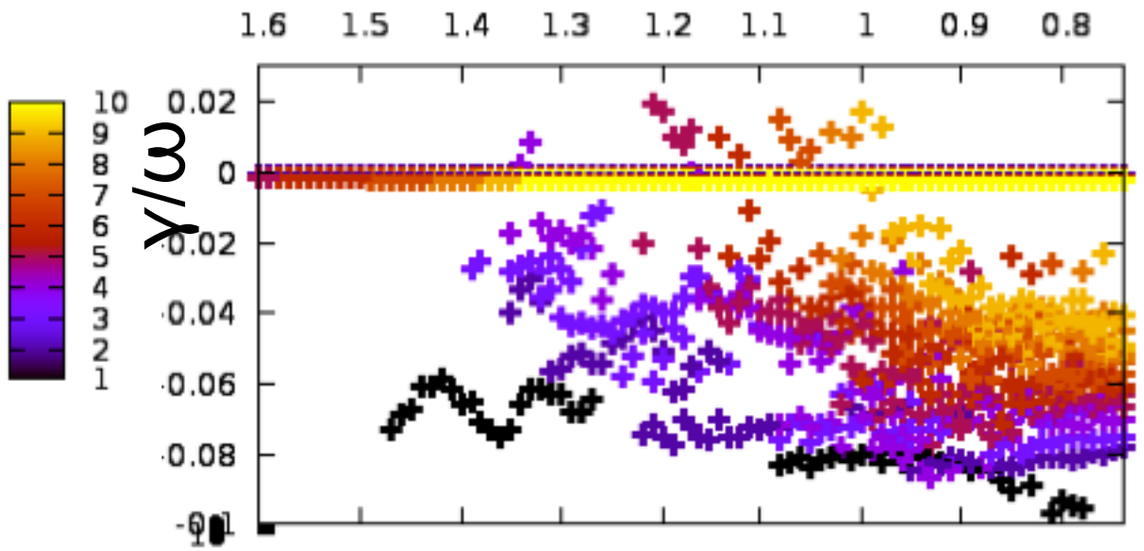
mid radius TAEs n=2,3
least damped for $q_0>1$

all TAE gaps, T_{EP}=50keV (Maxwellian), now FOW

ρ=[0.2,0.4]



ρ=[0.4,0.7]



- gives clear guidance which q-profiles to investigate with global runs:
- n>5 modes mode core localised, for q>1.3 also n=2,3,4 unstable

outlook:

- LIGKA analytical FOW model ready: paper Varenna 2018

- ongoing analysis of NLED reference case and AUG ‘EP-supershot’ 34924 (IAEA 2018)

- analytical expressions for anisotropic distribution functions (bump on tail; slowing down) derived and implemented (verification ongoing)

- HAGIS wave-wave model to be continued in fall 2018

General discussion

- other WP updates
- planned travel for 2018
- conferences: Varenna rehearsals (August)/IAEA (October)/APS(October)
- any other business?