**Suslov Summary**

3D: Get sense that we can either straightup propose non-uniform angular average and get one version of his equation. Or we can impose κ boundaries, which will enforce the angular terms into another configuration, and get another version of the same equation. In each case, only valid for small T’s. But this is no serious handicap, as this will cover localized and delocalized (in limit of large # of channels) phases. DMPK is recovered by imposing RPA angular averages.

1D: Can do straightup non-uniform angular average and get one version. Or can impose κ boundary, which will force the angular averages into a particular form and get another version, of the same form. He says even if angular averages are initially RPA thing, the κ’s will contort into non-RPA and we’ll get the γ term still. But then unclear how DMPK would be recovered. [Also, WN doesn’t support]

Shapiro scheme seems shaky, especially because of CLT.

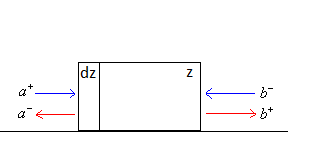
B field: Q1D → 1D but how justify parameters γ, A.

where does ρ → ρ + ρ0 come in? and how does this differ from doing the Mphys recursion relation?

How does κ deal go away, i.e., how do you get universal equations from it?

How do you straightforwardly compare Markos models, presumably based on g = T with his model with the skin resistance?

All attempts so far have not unequivocally captured the Anderson transition. And Suslov argues that this is because the equations written so far have been making assumptions incompatible with a true description of the transition, namely the random phase approximation. He seeks to generalize this. So he considers a small slice added to a conductor:



He considers the β = 1,2 case, and so M will be in general given by:



where the u’s and υ’sare unitary matrices (note my notation differs from his). He proposes a simple statistical model, based off of the polar form of M itself:



where ε is a diagonal matrix satisfying:



The statistics of the w matrices are left unspecified except to assert that both *uw* and *υw* may effectively be taken to reduce to *u* and *υ* themselves, to O(dz). We’re using the generic u, υ, and w, to refer to any of u1,2, υ1,2, and w1,2,3,4 respectively. Thereupon, the matrix Mʹʹ = MMʹ is constructed, an expression for the new eigenvalues λʹʹ(λ,υ,ε) (λʹʹ will not depend on u) is formed. Then, making reference to Appendix E, the probability distribution of the eigenvalues will evolve according to:



The integral over du can formally be done as there is no u dependence anywhere. He performs the integral over λ using a Jacobian, J. Once P and J are expanded in powers of ε, the Pdz integral may be performed using the statistical model for ε given above. Finally, the υ integrals are done within a mean field approximation. He obtains,



where,



and the A, B, C, and D terms all represent certain υ correlations defined below,



The next question to address is, what is reasonable to assume regarding the index dependence of these terms? The author considers B = C as likely, and certainly true if TRS is present. Then two arguments are made for A and D being diagonal. The first involves expressing A and D in terms of the υmn’s modulus and phase. It is argued that even without presuming random phases for the υ12 matrix elements, these terms will be diagonal. The latter argument approaches the situation from a different perspective. In a separate series of papers, he argues that the correct handling of the scattering matrix to conductance formulas requires the introduction of two weakly transparent matrices on either side of the conductor, which can be thought of as the conductors ‘skin’ resistance. This is because, in this limit whereby Tn would be small, the physically appropriate conductance formula g = g0ΣTn/(1-Tn) would reduce to the one, g = g0ΣTn that has been succesfully used to predict the various well known properties of the conductance distribution, especially in the metallic regime, such as UCF, and its Gaussian profile, etc. He argues that these Mκ will force the aforementioned angular averages into a diagonal form. To see how, we demand that this form satisfies the usual form of M, which it must since it possesses the same symmetry.



Demanding the polar form of M that we’ve been using to develop the GDMPK, fit this structure requires:



where = M11 – M12 + M21 – M22. In the large λ limit, these imply,



But making this simplification to Aij, for instance, would eliminate that term, which predictably reduces us to the extreme limit of non-interacting channels. So if we back up from that limit, we may write:



where h is a Hermitian matrix, and considered small in some sense. If this definition is inserted into A and D, and expanded for small h, then assuming hmn is only correlated with itself, he arrives at the diagonality conclusion. Under this latter approximation, we find, defining Kij = (1/2)(Bij + Cij + Dij):



where,



Under the RPA, this definition of Kmn will reduce to the Muttalib version. And one will also note that a random phase approximation will reduce γn → 0, returning us to an equation similar to the Muttalib version of the DMPK. The former diagonal approximation will also reduce to an equation of this form, though with different definitions of the parameters. An equation for the Lyapunov exponents is also written down, within this model. As one would expect, the γ term plays a substantial role. When present, it will invalidate the sum rule alleged prior by Muttalib et all. Additionally, the author argues that it pushes the exponents far enough apart to be effectively non-interacting, supporting his contention that the exponents are normally distributed about their mean, with effectively non-overlapping tails. This would imply, even in 3D, an effectively Gaussian distribution for P(lng). This would contradict the implications of the previous work, which predicts a Gaussian distribution becomes less appropriate for small g because it finds the distribution possesses a skewness which asymptotically increases to 1 or so. It is of note to mention that using the aforementioned microscopic models for the transfer matrix building block **M**ʹ does not produce the same terms the author has found with his model, and that in fact a diagonal approximation with these models is equivalent to the RPA. Once again, this highlights the open question of what features a statistical model needs to have.

In a previous paper, Suslov demonstrates why this extra γ term is useful, and a brief digression is informative. The author shows that using this equation as a guide, he can construct a scaling equation which reproduces the conductance cumulants from the NLσM in d = 2+ε dimensions, provide a good qualitative match to the 3D critical distribution. The general approach is not to solve the GDMPK equation itself, but to take a simpler, hopefully equivalent tack, that uses its 1D version within Shapiro’s scaling scheme. We start with a 2+ε dimensional conductor:



and model it as a concatenation of 1D wires surrounded by dielectric:



Then we may write:



where gi is the conductance of the ith wire. The probability distribution P(g) of the individual wires is assumed identical, but to follow from the 1D analogue of GDMPK equation, which is provided a justification along a similar vein earlier provided for the GDMPK:



where A0 = <sin2(θ – φ)> is an angular average over the unitary ‘matrices’, and



It is argued that due to ambiguities in the definitions of resistance, we should allow for a general redefinition of λ → λ + λ0. Next a PDE for the characteristic function F1(τ,z) = ∫dg·e-τgP1(g) is constructed. And last the development of the N-channel characteristic function FN(τ,z) is worked out. We presume it develops longitudinally just as the 1D characteristic function did, but that transversely it develops in product fashion [reference B-field paper which relaxes this assumption somewhat], consistent with the fact that the g’s are independent variables. We have:



He argues this brings us to:



where



And to the probability distribution P(G,L), by the inverse Laplace transform:



where C is a contour parallel to the imaginary axis, past all poles. The critical distribution corresponds to the length-independent solution to this equation, obtained via saddle point approximation:



where gc = p/τ0 ~ 1/ε and a(g) is a logarithmically varying function ~ 1 close to gc. Under a certain iterative scheme, the conductance cumulants in 2+ε dimensions are also reproduced. He says eventually that p ~ ξ/L, γ ~ Lz/L. Analysis of the distribution in 3D (p >> 1, arbitrary γ) also reproduces the expected Gaussian distribution in the metallic regime, ln-normal distribution in the insulating regime (p << 1), and provides a decent fit to numerical results in the critical regime (p ~ 1). In another paper [reference B field], the author applies the GDMPK to a metal in a magnetic field, and largely comes to the same conclusions regarding its features at the critical point and conducting/insulating regimes.