Quantum Antenna hypothesis

1. So called massless extremals (MEs) serve as motivation for the model.

   (a) MEs or topological light rays serve as space-time correlates for radiation above elementary particle scales. They are extremely ge neral class of extremals of Kähler action expressible as graphs of maps $M^4 \to CP_2$ and have Minkowskian signature of induced metric.

   (b) Simplest MEs are characterized by local light-like direction vector k (light-like momentum) defining plane M^2 and polarization vector epsilon is in plane orthogonal to M^2. CP_2 coordinates are arbitrary, possibly manyvalued, functions of these two coordinates.

   (c) I have proposed that also more general solutions for which k is replaced with varying local light-like direction and polarization vector with local light-like direction orthogonal to the local sub-space $M^2(\mathrm{x})$ are solutions. The two coordinates are obtained from these by integrating. This requires that Frobenius integrability conditions are satisfied. A very large class of preferred extremals representable as graphs $M^4 \to CP_2$ might decompose to this kind of regions. Magnetic flux tubes would not have this decomposition.

   (d) I have proposed that these coordinates define what I have cal led Hamilton-Jacobi structure in M^4 generalizing the notion of complex structure to Minkowskian signature.

2. MEs have nice physical properties:

   (a) They describe propagating of classical field modes characterized by polartization vector orthogonal to the direction of light-like vector with light-velocity. In the general case the direction of velocity can vary as also the direction of polarization vector. One expects that this kind of solutions are appropriate in many-sheeted situation when sheets are connected by wormhole contacts and interact. The natural interpretation is as massless modes or as space.time correlates of massless particles.

   (b) There is superposition in the direction of light-like vector and but with same polarization direction only. Only waves with definite chirality/photons are superposed so that pulse shape is pre served and no dispersion occurs. This is very much like state after state function reduction measuring momentum and polarization for a state of radiation field. Classical TGD thus mimics some aspects of quantum theory.

   (c) MEs are ideal for precisely targeted communication of informati on without change in the pulse shape and loss of intensity of signal with distance. Laser beam serves as analogy for MEs. In Maxwellian electrodynamics only non-targeted radiation with intensity decreasing like $1/r^2$ is possible.

3. The hierarchy of Planck constants $h_{eff} = n \times h$ has interpretation in terms of non-determinism of Kähler action and would give rise to dark MEs and dark photons crucial in living matter.

   (a) 3-surfaces at two boundaries of CD are connected by n space-time surfaces co-inciding at their ends at boundaries of CDs. This means in case of MEs MEs which have n sheets.

   (b) Actually the weak form of electric-magnetic duality as boundary conditions does not allow real boundaries so that one havelocally 2- fold coverings of M^4 for 3-surfaces. For MEs they are possible. The analogy is sphere as compared to disc.

   (c) Wormhole contacts with Kähler magnetic monopole flux flowing through them connected these two MEs. Of course, the other space-time sheet can be also magnetic flux tube and the pair in question would be many-sheeted microscopic counterpart of Alfwen wave in Maxwell's theory.

4. Dark MEs provide an ideal realization for EEG as communication from biological body (BB) to magnetic body (MB) and as control of BB by MB.

   (a) Frequency modulation by varying slowly the length of quantum antenna emitting MEs provides a possible coding of in formation. Also Josephson radiation ftrom cell membrane codes information by frequency modulation: "whale's song".

(b) Resonant interaction makes cyclotron frequencies to act like passwords. Collection of cyclotron frequencies specifies the sender and receiver in the first approximation. If MEs and flux tubes form pairs then reconnection is necessary pre-requisite for communication and occurs only if local magnetic fields and thus cyclotron frequencies for same h_{eff} are identical. One can think that magnetic bodies are scanning all the time for possible presence of other objects by varying the flux tube thickness and when reconnection occurs, an elementary variant of directed attention takes place.

(c) Zero energy ontology allows to consider several basic mechanisms based on resonance mechanism of communication and control.

(d) Communication would take place via positive energy signals to future.

(e) Memory recall would involve negative energy signals to geometric past and response as positive energy signals and would be "seeing" in time direction.

(f) Motor actions would be involve negative energy signals to the geometric past initiating the motor action in geometric past. Libet's findings support this view.

(g) Remote metabolism by sending negative energy signals to system analogous to population inverted laser would make instantaneous reaction to sensory input possible.

(h) Josephson radiation from generalized Josephson junctions at cell membrane would communicate local sensory data (nerve pulses transform data from external world to local data) represented by variations of membrane potential, also those induced by nerve pulse. Variation of membrane potential defines frequency modulation which is small (below 10 per cent) as compared to the main part of generalized Josephson energy involving also the difference of cyclotron energies.

(i) Dark cyclotron radiation from magnetic body transformed to bio-photons would perform bio-control. Its energy range is in visible and UV characteristic for molecular transitions so that the control of biochemistry is possible.

(j) Microtubules (MTs) are excellent candidates for quantum antennas. They are constantly varying their length and the frequency variation of the radiation send associated with (say) ME in parallel with the microtubule could define coding of information to "whale's song". The natural question is whether the frequency variations of membrane potential manifested in EEG correlate strongly with the frequency variations due to variation of MT length.