Zero-crossing Pattern and Scaling of Background Brain Dynamics and Alpha Rhythm ASIF SHARIF, DERCHYAN LIN, Ryerson University, HON KWAN, University of Toronto — The scaling property of the broad-band fluctuation and the α rhythm of the brain dynamics is studied based on the zero-crossing of the local electroencephalographic (EEG) recording taken from six healthy young adults in eyes closed and eyes open. A two-component scenario, consisting of a broad- band fractal and narrow-band rhythm components, is assumed to model the EEG zero-crossing. Scaling is found in the power law distribution $p(\tau) \sim \tau^{-\nu}$ of the crossing time interval τ of the broad-band fluctuation. An inverse relationship between broad-brand fluctuation and the α rhythm is observed. The Hurst exponent was found to be higher in eyes closed compared to eyes open. In α dominant brain state, the α rhythm interval L also exhibits scaling in the form of power law distribution: $p(L) \sim L^{\phi}$. Our main result is the relationship $\nu + \phi \sim 3$ that characterizes the "organization" of these two prominent features of the brain dynamics. The possible role of self- organized criticality of punctuated equilibrium in this organization is argued.

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