Fractal statistical analysis under the critical point (CP) hypothesis is applied to electromagnetic (EM) signals emitted before failure. A new approach to the analysis of a possible EM fractal pattern evolution toward CP is suggested. The analysis reveals characteristic signs of approaching the CP: the emergence of memory effects; the increase of the spatial correlation; the decrease of the anti-persistence behavior; the appearance of persistence properties in the tail of the precursors, a loss of multi-fractality and, finally, the divergence of the energy release rate. These critical features are compatible with the percolation theory of fracture process.