M-set hyperbolic component(s) constraining matter production?

(F.J. Culetto and W. Culetto, Private Research-Associates, Int. Report, dated: Dec. 2022)

As had already been reported in several contributions (see our www.culetto.at website), Mandelbrot set's universality/structural stability is pretty likely to play some role in case of a tentative description of all things / structures and the dynamics there are by using Julia set fractals and their control spaces / connectedness loci (for the second order polynomials being iterated the main and midget Mandelbrot M sets). According to A. Douady: Julia Sets and the Mandelbrot Set (in H.-O. Peitgen and P.H. Richter: The Beauty of Fractals, 161-173 (1986)), all of M's combinatorial features are preserved if the holomorphic function f(z) being iterated (properly rescaled, 0 trapped in a bounded region) just differs from ($z^2 + \mathbb{C}$) by < 1 for all values of z, and the complex parameter $\mathbb{C}$ does not exceed 4 in modulus.

M's control space properties – if active in nature – could maybe force basic constraints. Because the period-k = 2^0 oscillations belong to $\mathbb{C}$-values from the Mandelbrot set's big cardioid, and integer (el.)charge quantization most likely is linked to the cardioid cusp's external angles (0;1), the conventional integer charged and neutral *matter's approximate pie chart piece* contribution to our universe's total energy content within the ΛCDM model could thus possibly emerge from an area-ratio involving the k = 1 hyperbolic component's area A_{2^0} which is 3π/8 (from cardioid area ($3\pi a^2/2$, 2|a| = 1, the cusp located at $\mathbb{C}$ = 1/4 + 0i)). Indeed, the area ratio of the doubly covered said cardioid – by doubly covering accounting for fermion spin – and the difference area between the maximally permissible $\mathbb{C}$-disk ($A_{\mathbb{C}\text{-disk}}$ = 16π) and twice the cardioid, i.e. $2A_{2^0}/(A_{\mathbb{C}\text{-disk}} - 2A_{2^0})$, would be 0.049 <u>1</u>80… compared with matter's 4.9% pie chart share (for details see the Planck Collaboration's releases). Given much of potential for unification attempts – everything would depend on $\mathbb{C}$ (which itself could end up as a complicated, fluctuating tensorial object in reality, in limit cases eventually making contact to the existing tensor theories) – and the M set quite probably being active in shaping asymptotic properties, special system dynamics/paths could already have been preselected, thus getting the right Ω_m right now need not be due to the ΛCDM model's (unreasonable) effectiveness (the there used Ω_m including ordinary as well as dark matter, i.e. being $\Omega_m + \Omega_{dm}$).

Regarding A. Einstein's on-shell relation $E^2 = p^2c^2 + m_0^2c^4$, which is of $z^2 + \mathbb{C}$ shape when been complexified, in case of vanishing rest mass the complex parameter $\mathbb{C}$ would be 0 or at least stay in an ε-disk around the origin for mild off-shell situations. Thus, for real-photon-induced matter production, the initial $\mathbb{C}$ = 0 condition might constrain such processes to $\mathbb{C}$-values from the centric symmetrical part of the big Mandelbrot cardioid, i.e. to its areas located in the 1st and 4th quadrant of the complex plane and their mirror-areas in Q3, Q4, to the left of the imaginary axis. The permitted $\mathbb{C}$-choices thus would come in pairs (Re$\mathbb{C}$, Im$\mathbb{C}$; – Re$\mathbb{C}$, – Im$\mathbb{C}$) and (– Re$\mathbb{C}$, Im$\mathbb{C}$; Re$\mathbb{C}$, – Im$\mathbb{C}$) too. The sum of the said areas would approx. be 64.6% of the cardioid area, and following the formula given above (the A_2^o in the numerator replaced by the sum area), would contribute 0.031 776… to the mass-energy share of ordinary matter. The residual 0.017 403… would have to come from processes with three out-states, maybe leading to some imbalance from sheer complexity in order to exhaust the cardioid's residual area to the left. Still before our universe's transition from its radiation- to matter-dominated phase, the latter source of imbalance could maybe have been part of the conceivable reasons for the matter-antimatter asymmetry observed and still awaiting definite answers.

As to the period-2 hyperbolic component's end to the right, i.e. the bifurcation root $\mathbb{C}_2$, this would be the last parameter accessible by having three out-states in real photon's matter production, the $\mathbb{C}$-values being (– 3/4, 0i) and the two rightmost $\mathbb{C}$s of M's cardioid. Exhaustion of the A_2^1 area is needing 4 out-states or 5, respectively. The disk of radius 1/4, centered at (– 1, 0i), is belonging to the area connected with dark matter, named ($A_2^o{}_{infl}$ – A_2^o) in our previous hypothetical work. The out-states' spin would be tied to above or below the complex plane, been accounted for by doubly covering the cardioid's as well as the circle's areas. And real photonic out-states do not change the $\sum \mathbb{C} = 0$ sum.

As to the leftmost period-3 hyperbolic component's (cardioid) cusp at (– 1.75, 0i), this would be accessible by having 7 out-states in real photon's matter production, secondary Mandelbrot set's area being part of the area connected with dark matter as is the period-2 component. In our previous hypothetical work we had proposed fractionally charged heavy leptons – a misnomer in the light of their mass range, but making sense compared with expected coexisting super-heavy partons maybe bonded by sort of generalized gluons – of (– 3/7, 4/7) electric charge quantum numbers, their absolute values being the external angles of the rightmost bi-accessible point of the secondary M set's real $\mathbb{C}$-axis. And the (4,3)-composite, if such stable state at all (we'd name it a *douadyon cluster*, honoring Adrien Douady's achievements in the M-set context), would then be neutral. By just taking the sum mass (i.e. without accounting for their binding energy by a probably new force) one would get some 16TeV/c^2, but could also end up with 35TeV/c^2 according to our crude estimation. Unfortunately far off the colliders' energy delivered these days.

Concluding, the potential constraints on the real photon's matter production could get altered if one had to include areas outside the connectedness locus, i.e. from ($A_2^o{}_{infl}$ – A_M).