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Mapping Quark-Hadron Deconfinement for Hot, Dense and Rotating Matter under Magnetic Field

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The quark-hadron transition that happens in ultra-relativistic heavy-ion collisions is expected to be influenced by the effects of rotation and magnetic field, both present due to the geometry of a generic non-head-on impact. We augment the conventional T-μ_B planar phase diagram for QCD matter by extending it to a multi-dimensional domain spanned by temperature T, baryon chemical potential μ_B, external magnetic field B and angular velocity ω. Using two independent approaches, one from a rapid rise in entropy density and another dealing with a dip in the speed of sound, we identify deconfinement in the framework of a modified statistical hadronization model. We find that the deconfinement temperature $T_C(\mu_B,\ \omega,\ eB)$ decreases nearly monotonically with increasing μ_B, ω and eB with the most prominent drop (by nearly 40 to 50 MeV) in T_C occurring when all the three quasi-control (collision energy and impact parameter dependent) parameters are tuned simultaneously to finite values that are achievable in present and upcoming heavy-ion colliders. We discuss the possibility of having phenomenological probes acting as magnetometer and anemometer in heavy-ion collisions.

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