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Gravitational waves from the QCD chiral phase transition before the electroweak symmetry breaking

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If the electroweak sector of the standard model is described by classically conformal dynamics, we show that the electroweak phase transition can be triggered by the chiral condensation of six massless quarks in the standard model in the supercooled universe.

The phase transition is first-order and occurs below the QCD scale temperature.

One of the phenomenological consequences of this scenario is sizable gravitational waves from the bubble collisions.

We derive the necessary conditions for the scenario to occur, using the specific example of the classically conformal B-L model.

We also briefly mention other cosmological implications, such as possibilities for electroweak baryogenesis and altered dark matter productions.

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