



A proposal to solve some puzzles in semileptonic B decays

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Some long-standing problems in the experimental data for semileptonic $b \rightarrow c l \nu$ decay rates have resisted attempts to resolve them, despite substantial efforts. We show that the presence of a relatively large decay rate into radially-excited D-mesons may alleviate several of these tensions simultaneously. In particular, their presence could help explaining the discrepancy between model calculations and experimental results for the first orbitally-excited doublets, known as the “ $1/2$ vs. $3/2$ puzzle”. In order to substantiate our hypothesis, we estimate the decay rate into the first two radially excited charmed states using a quark-model and light-cone sum-rules, finding that it is not unreasonable to expect $O(1\%)$ branching fraction for these decays.

Authors: Mr BERNLOCHNER, Florian (University of Victoria (CA)); Dr TURCZYK, Sascha (LBNL); LIGETI, Zoltan (Lawrence Berkeley National Laboratory)

Presenter: Mr BERNLOCHNER, Florian (University of Victoria (CA))

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