V. ANARCHY IN THE GRAVITY SECTOR

Thus far, we have considered flavor-changing processes within supersymmetric models with hybrid gauge-gravity mediation, in which the structure of the gravity contributions is dictated by the FN mechanism. However, the gravity sector need not obey such selection rules and may, for example, be of anarchical character. By anarchy we mean structure-less gravity contributions, such that all terms of the (hermitian) matrices in Eq. (3.1) obey

$$(X_{q_A})_{ij} \sim \mathcal{O}(1), \tag{5.1}$$

and carry, in general, order one CP-violating phases. In particular we do not consider accidental suppressions in the magnitude of individual matrix elements. We now study which measurements can reveal the existence of such anarchical models.

Assuming anarchical structure for the squark masses-squared, one can still consider various structures for the trilinear scalar couplings. The effect of non-vanishing A-terms is two-fold: First, the RG evolution of the soft terms is modified, and second, chirality-mixing processes may get direct contributions from these terms. We explore three different scenarios for the A-terms:

1. Section V A: vanishing A-terms;

2. Section V B: anarchical A-terms;

3. Section V C: Yukawa-like textured A-terms.

Before we start a detailed discussion, a comment regarding the MFV terms is in order. In the current context of an anarchical texture in the X_{q_A} matrices Eq. (5.1), non-MFV effects are non-negligible in the δ^q_{LL} parameters provided $r \gtrsim y_t^2\lambda^5 \sim 3\cdot 10^{-4}$, where $\lambda \sim |V_{12}| \sim 0.2$, as can be seen from Eq. (3.3). This is a weaker condition than in the analogous FN case, where interesting, gravity-dominated effects require $r \gtrsim y_t^2\lambda^4 \sim 2\cdot 10^{-3}$. This in turns implies that for the gravity-mediated contributions to have observable consequences, the messenger scale can in principle be lower in the anarchical setup than in the framework with a FN flavor structure.