Proposals

1. The Standard Model is not a complete theory of particle physics. There are fundamental physical phenomena in nature that the Standard Model can not explain and a complete theory must involve physics explanations beyond it. The $B_s^0 \to \mu^+\mu^-$ and $B^0 \to \mu^+\mu^-$ decays can be used to study the possible Standard Model extensions.

2. $B_s^0 \to \mu^+\mu^-$ and $B^0 \to \mu^+\mu^-$ decays are suppressed in the Standard Model. The decays are theoretically clean and have precise branching fractions predictions in the Standard Model.

3. The LHCb detector at the Large Hadron Collider in CERN is well suited for detecting $B_{(s)}^0 \to \mu^+\mu^-$ decays.

4. The measured $B_{(s)}^0 \to \mu^+\mu^-$ branching fractions were normalised to the $B^+ \to J/\psi K^+$ and $B^0 \to K^+\pi^-$ channels. Normalising significantly improves the precision of the measured branching fractions.

5. In LHCb, the trigger efficiency can be estimated from the data with the TISTOS method. The bias of the method can be reduced by dividing the candidates into sub-samples according to the momentum of the B meson, applying the method in each sub-sample, and combining the results.

6. $B_s^0 \to \mu^+\mu^-$ decays are experimentally confirmed. Albeit subject to large uncertainties, the measured $B_s^0 \to \mu^+\mu^-$ branching fraction in the combined CMS and LHCb analysis is in agreement with the Standard Model prediction.

7. The combined CMS and LHCb data show evidence of $B^0 \to \mu^+\mu^-$ decays. The detected number of $B^0 \to \mu^+\mu^-$ candidates is higher than expected in the Standard Model. The uncertainties of the measurement are large and the measured $B^0 \to \mu^+\mu^-$ branching fraction is compatible with the Standard Model prediction.

8. Those New Physics scenarios where the branching fraction predictions for $B_s^0 \to \mu^+\mu^-$ and $B^0 \to \mu^+\mu^-$ decays are larger than predicted in the Standard Model are disfavoured by the data. More precise measurements are necessary to study the viability of New Physics scenarios with the branching fraction predictions close to the Standard Model.

9. Studying what the universe is made of is as expensive as playing football. We should do both.