.1 BQTOLLLL

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Usage:
`BrFr L1+ L2- L3+ L4- BQTOLLLL mu Nf res_swch ias A lambda barrho bareta;`

Explanation:
This model describes decays $B_{d,\,s} \to \ell^+\ell^-\ell^+\ell^-$ in the framework of the Standard Model (SM), using only electromagnetic contribution to the matrix element and only for identical leptons in the final state. Main proceses is based on the decay chains $B_{d,\,s} \to \ell^+\ell^-\,(\gamma^* \to \ell^+\ell^-)$. Matrix elements for the decays $B_{d,\,s} \to \ell^+\ell^-\gamma$ correspond to the paper D.Melikhov, N.Nikitin, Phys.Rev.D**70**, 114028 (2004).

Set of Wilson coefficients $C_i(\mu)$ in the SM contains the lowest order of the electroweak contributions and perturbative QCD corrections in the NLO approach (see A.J.Buras and M.Munz, PRD**52**, 186 (1995)). Resonant contribution to the coefficient C_{9V}^{eff} is described according to the paper D.Melikhov, N.Nikitin, S.Simula, PLB**430**, 332 (1998). Value of the strong coupling constant is fixed at the scale of M_Z. Scale parameter μ separates the perturbative and nonperturbative contribution of the strong interaction. The nonperturbative contribution is contained in the matrix elements of basis operators $O_i(\mu)$ between the initial and final hadronic and vacuum states. In this model we use the hadronic form factors from the dispersion relation of the quark model approach (D.Melikhov, B.Stech, PRD**62**, 014006 (2000)). For calculation of the CKM-matrix elements the Wolfenstein parametrization with accuracy $O(\lambda^4)$ is used.

Input parameters of the model:

- mu = the scale parameter (in GeV) is approximately equal to the mass of b-quark (mu = 5 GeV by default). This parameter separates the perturbative and nonperturbative contributions of the strong interaction in the decay matrix elements.

- Nf = number of the "effective" quark flavours for calculation of the strong coupling constant $\alpha_s(\mu)$. Nf = 5 by default at B-decays scale.

- res_swch = resonance (J/ψ and ψ') switching parameter.
  If res_swch = 0 (default) then the resonant contribution is switched OFF,
  If res_swch = 1 then the resonant contribution is switched ON.

  Resonant contribution is taken into account only in the $C_{9V}^{eff}(\mu,\, s)$ coefficient.

- ias = choice of the $\alpha_s(M_Z)$:
  ias = 0 corresponds to the current lowest experimental value of $\alpha_s(M_Z)$;
  ias = 1 (default) corresponds to the current average experimental value of $\alpha_s(M_Z)$;
  ias = 2 corresponds to the current maximal experimental value of $\alpha_s(M_Z)$.

- A = parameter A in Wolfenstein parametrization of CKM-matrix (0.88 by default).

- lambda = parameter λ in Wolfenstein parametrization of CKM-matrix (0.227 by default).

- barrho = parameter $\bar{\rho} = \rho\sqrt{1-\lambda^2}$ in Wolfenstein parametrization of CKM-matrix (0.22 by default).
- bareta = parameter $\bar{\eta} = \eta\sqrt{1-\lambda^2}$ in Wolfenstein parametrization of CKM-matrix (0.34 by default).

Example:

```
Define mu 5.0
Define Nf 5
Define res_swch 0
Define ias 1
Define A 0.88
Define lambda 0.227
Define barrho 0.22
Define bareta 0.34
#
Decay B_s0
   1.000   mu+  mu-  mu+  mu-   BQTOLLLL mu Nf res_swch ias A lambda barrho bareta;
Enddecay
CDecay anti-B_s0
#
End
```

Notes:

Resonant contribution of ρ^0- and ω^0-mesons (for B_d decays) and resonant contribution of φ-meson (for B_s decays) are switched ON for all values of the parameter res_swch.