Latest Progress on LUARLW generator

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I. THE INPUT HADRONIC CROSS SECTION

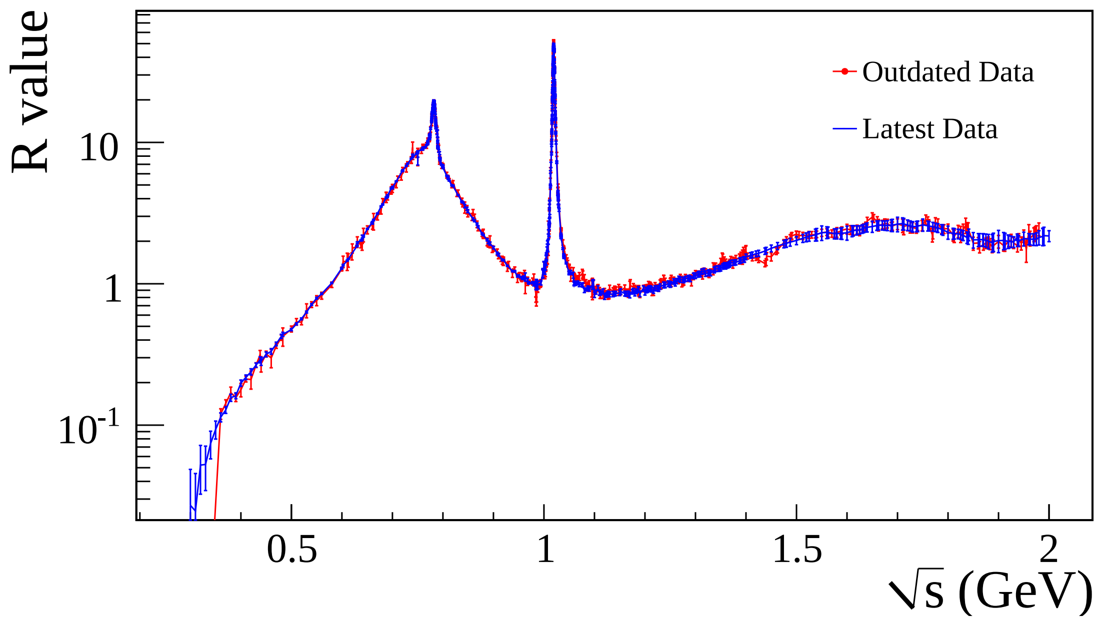

FIG. 1. The update of R values at low energies.

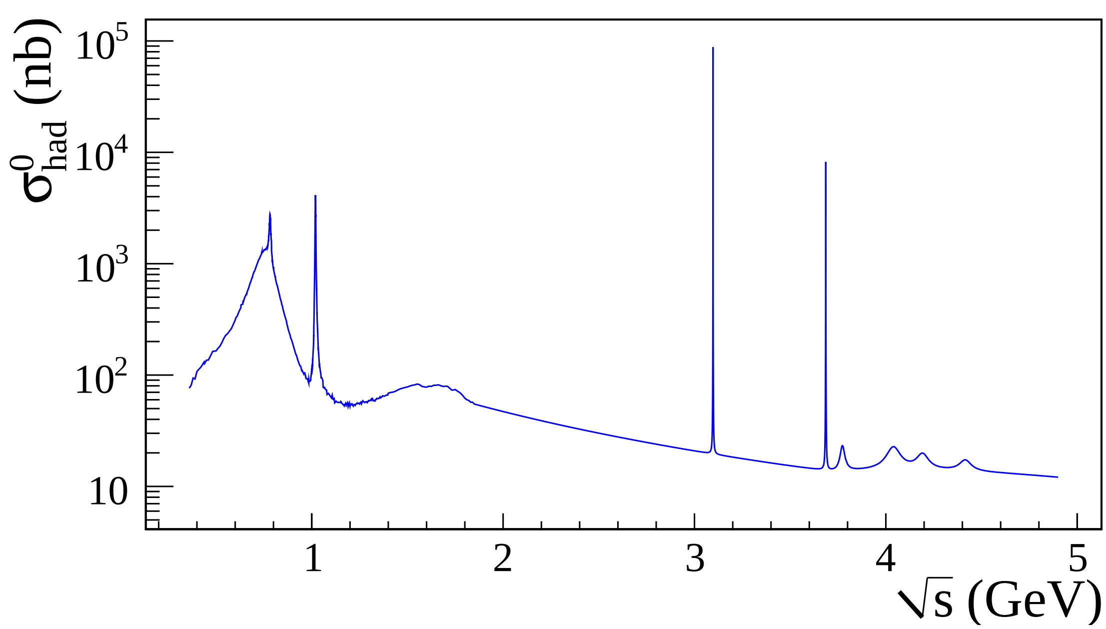

FIG. 2. The input hadronic cross sections.

II. COMPARING OF RESULTED ISR FACTORS

The radiator function of Kureav-Fadin scheme:

$$F_{\rm SF}^{\rm KF}(x,s) = \beta x^{\beta-1}\Big[1+\frac{\alpha}{\pi}\Big(\frac{\pi^2}{3}-\frac{1}{2}\Big)+\frac{3}{4}\beta-\frac{\beta^2}{24}\Big(\frac{1}{3}L+2\pi^2-\frac{37}{4}\Big)\Big]$$
$$-\beta(1-\frac{1}{2}x)-\frac{1}{8}\beta^2\Big[4(2-x)\ln x+\frac{1+3(1-x)^2}{x}\ln(1-x)+6-x\Big]. \quad (1)$$

The J. M. Wu's scheme:

$$F_{\rm SF}^{\rm WU}(x,s) = \beta x^{\beta-1}\Big[1+\frac{3}{4}\beta-\frac{\beta^2}{24}\Big(\frac{1}{3}L+2\pi^2-\frac{37}{4}\Big)\Big]\cdot\Big[1+\frac{\alpha}{\pi}\Big(\frac{\pi^2}{3}-\frac{1}{2}\Big)\Big]$$
$$-x^{\beta}(\beta+\frac{\beta^2}{4})+x^{\beta+1}(\frac{\beta}{2}-\frac{3}{8}\beta^2)+O(x^{\beta+2}\beta^2). \quad (2)$$

The Nicrosini-Luca scheme:

$$F_{\rm SF}^{\rm NL}(x,s) = \beta\Delta x^{\beta-1}-\beta(1-\frac{1}{2}x)-\frac{1}{8}\beta^2\Big[4(2-x)\ln x+\frac{1+3(1-x)^2}{x}\ln(1-x)+6-x\Big],$$
$$\Delta = 1+\frac{\alpha}{\pi}\Big(\frac{3}{2}L+\frac{\pi^2}{3}-2\Big)+\Big(\frac{\alpha}{\pi}\Big)^2\Big\{[\frac{9}{8}-2\zeta(2)]L^2+[-\frac{45}{16}+\frac{11}{2}\zeta(2)+3\zeta(3)]L$$
$$-\frac{6}{5}[\zeta(2)]^2-\frac{9}{2}\zeta(3)-6\zeta(2)\ln 2+\frac{3}{8}\zeta(2)+\frac{57}{12}\Big\}. \quad (3)$$

Where the $L = \ln(s/m_e^2)$.

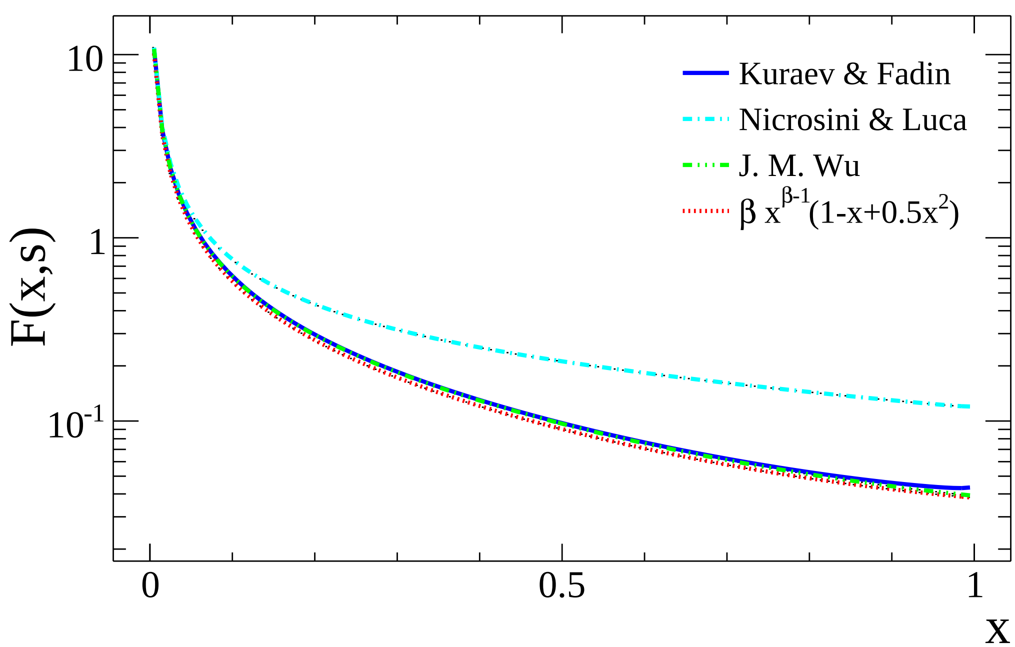

FIG. 3. The radiator function of different schemes.

To obtain the total cross section:

$$\sigma_{\rm had}^{\rm tot}(s) = \int_0^{x_m} {\rm d}x F_{\rm SF}(x,s) \frac{\sigma_{\rm had}^0(s')}{|1-\Pi(s')|^2}. \tag{4}$$

This leads to

$$1+\delta(s) = \frac{\sigma_{\rm had}^{\rm tot}(s)}{\sigma_{\rm had}^0(s)}. \tag{5}$$

TABLE I. The calculated ISR correction factors with different schemes.

	Nominal	KF scheme		WU scheme	
$\sqrt{s}$ (GeV)	$1+\delta$	$1+\delta$	$\Delta_{\rm rel}$ (%)	$1+\delta$	$\Delta_{\rm rel}$ (%)
2.2324	1.2217	1.2196	0.17	1.2228	-0.09
2.4000	1.2282	1.2259	0.18	1.2298	-0.13
2.8000	1.2392	1.2367	0.20	1.2420	-0.23
3.0500	1.2106	1.2072	0.28	1.2141	-0.30
3.0600	1.2004	1.1968	0.29	1.2040	-0.30
3.0800	1.1427	1.1385	0.37	1.1464	-0.32
3.4000	1.4435	1.4300	0.94	1.4481	-0.32
3.5000	1.4022	1.3909	0.80	1.4069	-0.34
3.5424	1.3887	1.3781	0.76	1.3936	-0.35
3.5538	1.3847	1.3742	0.75	1.3896	-0.35
3.5611	1.3826	1.3722	0.75	1.3875	-0.36
3.6002	1.3709	1.3610	0.72	1.3759	-0.36
3.6500	1.3442	1.3349	0.69	1.3492	-0.38
3.6710	1.2880	1.2798	0.63	1.2928	-0.37