# Lorentz Invariance for $\pi^+$ 4-Current

Recall the vertex factor for an $s^+$ transition

$$\langle s^+(p')|j^\mu_{s^+}|s^+(p)\rangle = e(p^\mu + p'^\mu)$$

This is the point-like vertex that we want to generalize for a composite $\pi^+$ particle. In this scenario, there are two independent 4-vectors, $p_\mu$ and $p'_\mu$. They also have the condition $p'_\mu - p_\mu = q_\mu$. To construct the most general possible form of a Lorentz invariant $\langle \pi^+(p')|j^\mu_{\pi^+}|\pi^+(p)\rangle$, we use the only two independent linear combinations

$$p'_\mu + p_\mu$$

and

$$p'_\mu + (-p_\mu)$$

These terms may also be multiplied by unknown scalar-function coefficients.

$$\langle \pi^+(p')|j^\mu_{\pi^+}|\pi^+(p)\rangle = e\left[F(q^2)(p'^\mu + p) + G(q^2)(p'^\mu - p^\mu)\right]$$

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