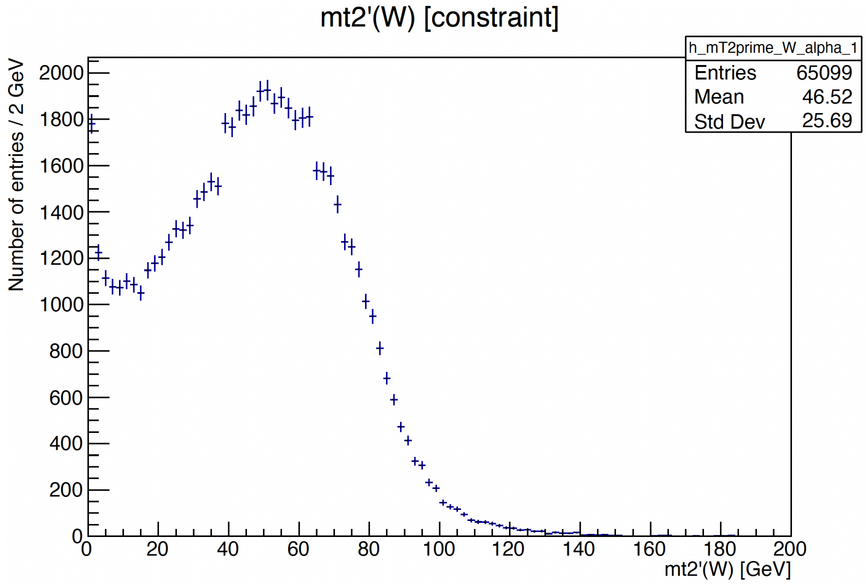
Documenting The Meaning of The Parameters



1. Simple Fit: $f_4(x) = a \arctan(k(x-h)) + C$

   1. h:

      - h governs the horizontal translation of the graph.
      - Here, wishing the drop of arctan to be *anti-symmetric* at 80 GeV, $h \sim 80$ GeV.

   2. C:

      - When $x \sim 80$, $f_4(80) \sim C$. Accordingly, C determines the vertical translation of the graph and, in particular, the value which f_4 assumes at 80 GeV.
      - Here, $C \sim 800$.

   3. a:

      - a governs the vertical stretch or compression of the graph as well as its reflection across the x-axis. Its value is dependent upon k and the number of entries of the histogram.
      - Here, the basic shape is not arctan, but rather $-\arctan$, rendering $a < 0$.

   4. k:

      - k governs the horizontal stretch or compression of the graph. Its value is dependent upon a and the number of entries in the histogram.
      - Here, as arctan is stretched, so that its great drop extends from 60 to 120 GeV, one should expect $k < 1$. In particular, as f_4 diminishes from ~ 1700 to ~ 50 in the interval $[60, 120]$, then one good initial guess might be $(a, k) \simeq (-800, 0.1)$.
      - We can further quantify the interdependency of a, k by observing that, for x close to h, $f_4(x) \sim a * k(x-80) + 800$. This forms a straight line, whose slope is equal to $a * k$. In approximating the slope of this line as $\frac{1700-50}{120-60} \sim -30$, which the pair $(-800, 0.1)$ satisfies to the order of magnitude.

2. More Complex Fit: $f_0(x) = (P_3 + P_4 x) \arctan((x - P_1)/P_2) + C$

   1. P_1:

      - P_1 governs the horizontal translation of the graph.

- Here, wishing the drop of arctan to be *anti-symmetric* at 80 GeV, $P_1 \sim 80$ GeV.

2. P_2:

   - $P_2 \sim 1/k$ governs the horizontal stretch or compression of the graph.
   - Here, $P_2 \sim 1/0.1 = 10$.

3. P_4:

   - For large $|x|$, arctan $\rightarrow \pm\pi/2$, so $f_1(x) \rightsquigarrow \{(P_3 + C) + P_4 x\}$. Accordingly, P_4 governs the slope of the line which f_4 approaches for large x.
   - Here, wishing for the slopes to be flat upon either end, $P_4 \sim 0$.

4. P_3:

   - If $P_4 \sim 0$, then the equation reduces to f_4, where $P_3 \sim a$ governs the vertical stretch of the graph.
   - Here, $P_3 \sim -800$.

5. C:

   - When $x \sim 80$, $f_4(80) \sim C$, as discussed above.
   - Here, $C \sim 800$.

3. Even More Complex Fit: $f_0(x) = (P_3 + P_4 x) \arctan((x - P_1)/P_2) + P_5 x + 1$

   1. P_5:

      - For large x, $f_0 \rightsquigarrow (P_3 + 1) + (P_4 + P_5)x$.
      - Ideally, for flat tails, $P_5 \sim 0$. But, if that is so, then f_0 should not attain its desired value when $x = 80$. Instead, $P_5(80) + 1 \sim 800 \rightarrow P_5 \sim 10$.
      - Accordingly, this might imply that $P_4 \sim -10$, in order that the slopes might 'cancel out' for large x.

   2. All other relevant parameters may retain their values, given in 2.

4. Alternative Simpler Fit #1: $f_2(x) = (P_3 + P_4 x)\frac{x-P_1}{\sqrt{P_2+(x-P_1)^2}} + C$.

   1. P_1:

      - P_1 governs the horizontal translation of the graph.
      - Here, $P_1 \sim 80$.

   2. C:

      - Again, $C \sim 800$, as discussed above.

   3. P_4:

      - For large x, $f_1(x) \rightsquigarrow \{(P_3 + C) + P_4 x\}$.
      - Wishing for flat tails, $P_4 \sim 0$.

   4. P_3:

      - P_3 governs the vertical stretch of the graph.
      - Here, $P_3 < 0$. Further, when $|x|$ becomes 'far away' from 80, say, $x = 80$ (where the graph begins to level off), we know $f_1(80) \sim 50$. If $f_1(80) \sim \{(P_3 + C) + 0(80)\})$ and $C = 800$, then $P_3 \sim -800$.

   5. P_2:

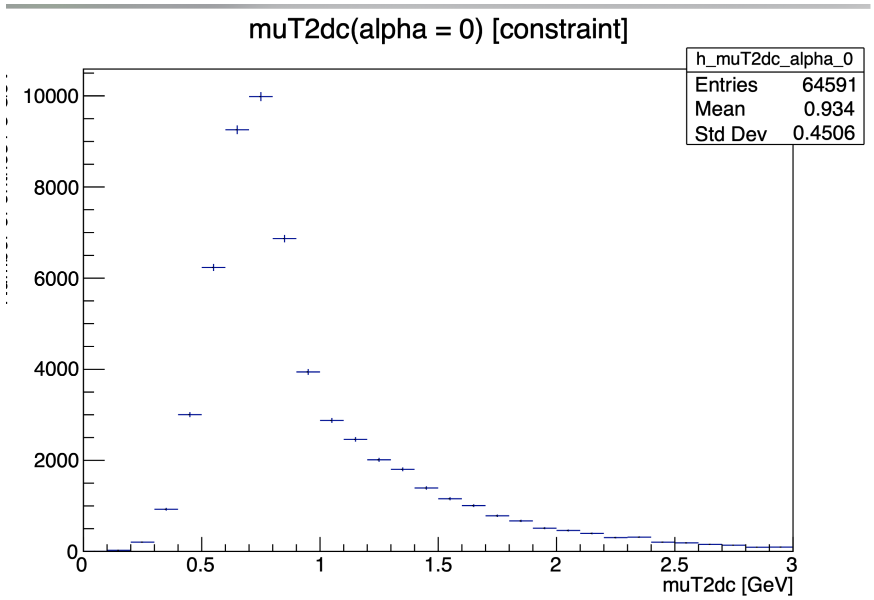
- For no discontinuity at $x = 80$, $P_2 > 0$.
- For $x \sim 80$, $P_3 \frac{x-P_1}{\sqrt{P_2+(x-P_1)^2}} \sim \frac{P_3}{\sqrt{P_2}}(x-P_1)$. This forms a straight line approximation to the graph, whose slope is $P_3/\sqrt{P_2}$. In approximating the slope of this line as ~ -45, then $-800/\sqrt{P_2} \sim -45$, whence $P_2 \sim 300$.

5. ALTERNATIVE FIT #1: $f_3(x) = (P_3 + P_4 x)\frac{x-P_1}{\sqrt{P_2+(x-P_1)^2}} + P_5 x + 1$.

   1. P_5:

      - For large x, $f_3 \rightsquigarrow (P_3 + 1) + (P_4 + P_5)x$.
      - Ideally, for flat tails, $P_5 \sim 0$. But, if that is so, then f_3 should not attain its desired value when $x = 80$. Instead, $P_5(80) + 1 \sim 800 \to P_5 \sim 10$.
      - Accordingly, this might imply that $P_4 \sim -10$, in order that the slopes might 'cancel out' for large x.

   2. All other relevant parameters may retain their values, given in 4.



1. SIMPLE FIT: $f_4 : f(x) = a\arctan(k(x-h)) + C$

   1. h:

      - h governs the horizontal translation of the graph
      - Here, wishing the drop of arctan to be *anti-symmetric* at 1, let $h \sim 1$.

   2. C:

      - When $x \sim 1$, $f(1) \sim C$. Accordingly, C determines the vertical translation of the graph, according to the number of entries in every bin. In particular, it will determine the value which f assumes at 1.
      - Here, $C \sim 3500$.

   3. a:

      - a governs the vertical stretch or compression of the graph as well as its reflection across the x-axis. Its value is dependent upon k and the number of entries in the histogram.
      - Here, the basic shape is $-\arctan$, rendering $a < 0$.

   4. k:

      - k governs the horizontal stretch or compression of the graph.
      - Here, as arctan is compressed, so that its drop extends from ~ 0.75 to 1.75, one should expect $k > 1$. In particular, as f diminishes from $\sim 10,000$ to ~ 1000 in the interval $[0.75, 1.75]$, then one good initial guess might be $(a, k) \simeq (-3000, 10)$.

2. MORE COMPLEX FIT: $f_0 : f(x) = (P_3 + P_4 x)\arctan((x - P_1)/P_2) + C$

   1. P_1:

      - P_1 governs the horizontal translation of the graph.
      - Here, wishing the drop of arctan to be *anti-symmetric* at 1, $P_1 \sim 1$.

2. P_2:

- $P_2 \sim 1/k$ governs the horizontal stretch or compression of the graph.
- Here, $P_2 \sim 1/10 = 0.1$.

3. P_4:

- For large $|x|$, arctan $\to \pm\pi/2$, so $f_0 \rightsquigarrow \{(P_3 + C) + P_4 x\}$. Accordingly, P_4 governs the slope of the line which f_0 approaches for large x.
- Here, wishing for the slopes to be flat upon either end, $P_4 \sim 0$.

4. P_3:

- If $P_4 \sim 0$, then the equation reduces to f_4, where $P_3 \sim a$ governs the vertical stretch of the graph.
- Here, $P_3 \sim -3000$.

5. C:

- Here, $C \sim 3500$.

3. Even More Complex Fit (??): $f_1(x) = (P_3 + P_4 x)\arctan((x - P_1)/P_2) + P_5 x + 1$

1. P_5:

- For large x, $f_0 \rightsquigarrow (P_3 + 1) + (P_4 + P_5)x$.
- Ideally, for flat tails, $P_5 \sim 0$. But, if that is so, then f_1 should not attain its desired value when $x = 1$. Instead, $P_5(1) + 1 \sim 3500 \to P_5 \sim 3500$.
- (Also, this might imply that $P_4 \sim -3500$, in order that the slopes might 'cancel out' for large x)?

2. All other relevant parameters may retain their values, given in 2.

4. Alternative Simpler Fit 1: $f_2(x) = (P_3 + P_4 x)\frac{x - P_1}{\sqrt{P_2 + (x - P_1)^2}} + C$.

1. P_1:

- P_1 governs the horizontal translation of the graph.
- Here, $P_1 \sim 1$.

2. C:

- Again, $C \sim 3500$, as discussed above.

3. P_4:

- For large x, $f_1(x) \rightsquigarrow \{(P_3 + C) + P_4 x\}$.
- Wishing for flat tails, $P_4 \sim 0$.

4. P_3:

- P_3 governs the vertical stretch of the graph.
- Here, $P_3 < 0$. Further, when $|x|$ becomes 'far away' from 1, say, $x = 1.75$ (where the graph begins to level off), we know $f_1(1.75) \sim 1000$. If $f_1(1.75) \sim \{(P_3 + C) + 0(1.75)\})$ and $C = 3500$, then $P_3 \sim -2500$.

5. P_2:

- For no discontinuity at $x = 1$, $P_2 > 0$.

- For $x \sim 1$, $P_3 \frac{x-P_1}{\sqrt{P_2+(x-P_1)^2}} \sim \frac{P_3}{\sqrt{P_2}}(x-P_1)$. This forms a straight line approximation to the graph, whose slope is $P_3/\sqrt{P_2}$. In approximating the slope of this line as ~ -9000, then $-2500/\sqrt{P_2} \sim -9000$, whence $P_2 \sim 0.02$.

5. ALTERNATIVE FIT #1: $f_3(x) = (P_3 + P_4 x)\frac{x-P_1}{\sqrt{P_2+(x-P_1)^2}} + P_5 x + 1$.

   1. P_5:

      - For large x, $f_3 \rightsquigarrow (P_3 + 1) + (P_4 + P_5)x$.
      - Ideally, for flat tails, $P_5 \sim 0$. But, if that is so, then f_3 should not attain its desired value when $x = 1$. Instead, $P_5(1) + 1 \sim 3500 \rightarrow P_5 \sim 3500$.
      - Accordingly, this might imply that $P_4 \sim -3500$, in order that the slopes might 'cancel out' for large x.

   2. All other relevant parameters may retain their values, given in 4.