Thirdly, the voltage recovery is plotted in Figure 6. Simulations discussion is detailed down below for the voltage sag main characteristics;

1) Voltage sag magnitude.

Voltage sag magnitude as expected follows a negative exponential curve which slope depends on *b*. This means that, depending on the active-power feeder loads at the time the fault occurs, this parameter will vary. Particularly, in this case, *b* proved to be -1.42 and the CB reclosing time 500 ms.

2) Voltage sag duration.

From observing Figure 4, the duration can be seen for four different reclosing times. Therefore, the larger is the reclosing time; the lower is the retained voltage during the simulation. For this simulation, the feeder loads value has been set to 64 kW and IM running empty at the time the fault occurs.

3) Voltage sag recovery

It is worth noting that, as expected, the recovery takes place for all phases at the same instant, t = 1.63 when the CB recloses the circuit, however, the voltage amplitude is not absolutely recovered until 80 ms after it. Therefore, it has been demonstrated the fact that to fully define the recovery process of this voltage sag approach, it has to be done with two steps, the first when the CB recloses de circuit and the second when the voltage reaches the pre-fault value.

6. Conclusion

This paper has presented a new voltage sag typology, both simulations and real recorded events have demonstrated the proposed analytical expression. The results have proven the dependability of the model adopted as well as the appropriateness of this new voltage sag approach. Overall, this study has enhanced the present research towards PQ disturbances. Furthermore, this study reliably demonstrates the fact that further immunity tests are required in order to observe its effects on loads.

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