In response to the increasing deployment of bus dedicated lanes in practice, this study presents a bandwidth maximization model that designs both phase sequences and offsets over a series of intersections along an arterial with bus dedicated lanes to provide concurrent progression for bus and general traffic flows. The proposed model takes into account the following factors that may affect the progression performance:

- Bus dwelling time at bus stops
- Location of bus dedicated lanes
- Traffic queues; and
- Conflicts between through movements and left-turning traffic.

The results from numerical analysis with two planned BRT sites have confirmed the effectiveness of the proposed model and the evaluation with extensive simulation experiments has verified the benefits from concurrent progression.

**Model Formulation**

- **Objective Function**
  \[
  \max_{\{g_i\}} \sum_{j=1}^{m} h_j g_j \left( \sum_{i=1}^{n} (N_0 \delta_i + (N - 1) \delta_i) b_i \right)
  \]

- **Constraints for Progression Bands for Passenger Cars**
  \[
  0 \leq \delta_i \leq e, \quad b_i \leq n, \quad c_i \leq M(1 - e) - (1 - e), \quad \delta_i \neq \delta_i + 1
  \]

- **Traffic Queue on Bus Dedicated Lanes**
  \[
  \delta_i + b_i + c_i + n_i = M(1 - e) - (1 - e) - \frac{1}{2} \left( \delta_i + b_i + c_i + n_i + M(1 - e) \right)
  \]

- **Average Person Delay**
  \[
  \text{Average Person Delay} = \frac{\text{Total Travel Time} - \text{Total Travel Distance}}{\text{Number of Person Flows}}
  \]

**Conclusion**

This study has developed a signal optimization model to provide concurrent progression to passenger cars and buses along an arterial with dedicated bus lanes. The proposed model computes the optimal phase sequences and offsets that maximize the total benefit of all arterial users under various geometric conditions and left-turn phase patterns. The model takes into account the difference in travel times between passenger cars and buses, conflicts between buses on dedicated bus lanes and turning vehicles, and relations between bus stop locations and traffic queues.

The comparison results from the extensive simulation experiments show that the proposed model can outperform other arterial signal design models in terms of control delays for buses, the number of stops for buses, and average person delay, compared to MAXBAND and TRANSYT. With such a signal system, responsible traffic agencies can minimize the resistance from passenger car users when promoting and facilitating the use of transit system.

Further research: incorporating an active TSP in the design, developing a rigorous yet robust model for the selection of its deployment location and accounting for potential variance in the available input data.