**Network Parameter Tuning Framework Design**

**Title:** *Adaptive Parameter Tuning Framework for 5G RAN and Core Network*

**A. Adjustable Parameters**

| **Parameter** | **Description** | **Range** | **Default Value** | **Tuning Frequency** |
| --- | --- | --- | --- | --- |
| Transmission Power (dBm) | Power level of base station radios | 10 – 50 dBm | 43 dBm | Real-time / hourly |
| Handover Margin (dB) | Threshold for triggering handovers | 0 – 10 dB | 3 dB | Daily / event-driven |
| Beamforming Weights | Directional antenna pattern coefficients | Continuous vector parameters | Initialized from training | Weekly / monthly |
| Scheduler Weights | Priority weights for traffic classes (e.g., URLLC) | 0 – 1 per class | 0.5 for default | Per deployment |
| Slice Bandwidth Allocation | Amount of bandwidth assigned per network slice | 5 – 100 MHz | According to SLA | Real-time / SLA changes |
| Load Balancing Thresholds | Trigger points for traffic offloading | 60% – 90% utilization | 75% utilization | Real-time monitoring |

**B. Thresholds and Policies**

* **Handover Policy:**
  + Trigger handover if RSRP difference > 3 dB for more than 200 ms
  + Prioritize target cell with lowest load < 70% utilization
* **Power Control Policy:**
  + Reduce power by 1 dBm in low-load periods >30 mins to save energy
  + Increase power if packet loss > 2% persistently for 10 mins
* **Scheduling Policy:**
  + URLLC traffic prioritized with max delay ≤1 ms
  + eMBB traffic throughput maximized during off-peak hours
* **Slice Management Policy:**
  + Reallocate bandwidth dynamically based on slice SLA breach alerts
  + Minimum guaranteed bandwidth per slice maintained at 80% SLA

**C. Framework Architecture**

1. **Monitoring Module:** Continuously collects KPIs and feeds into analytics engine.
2. **Decision Engine:** ML models predict optimal parameter settings based on current network state.
3. **Parameter Adjustment API:** Interface to RAN and Core controllers for dynamic updates.
4. **Feedback Loop:** Performance metrics post-adjustment fed back for continuous learning.

**Manual Override:** Network ops can override auto-t