

# Backward Compatible MIMO Techniques in a Massive MIMO Test-bed for Long Term Evolution (LTE) Mobile Systems

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**Abstract**— This paper proposes a virtual antenna mapping method for backward compatible massive or large-scale antenna multiple input multiple output (MIMO) base stations that provide communication services for legacy user equipment (UE) that can recognize only two or four base station antennas. The proposed method adopts and improves the omnidirectional beamforming that has been pioneered in previous works. The computer simulation results provide four important findings; the most important is that the actual number of virtually mapped physical antennas is inversely proportional to the transmit power per antenna.

**Keywords** — massive MIMO, virtual antenna techniques, omnidirectional beamforming, large array antennas, precoding techniques



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