To accommodate the ever increasing wireless traffic in the access networks, considerable efforts have been recently invested in developing photonics-assisted wireless communication systems with very high data rates. Superior to photonic millimeter-wave systems, terahertz (THz) band (300 GHz-10 THz) provides a much larger bandwidth and thus promises an extremely high capacity. However, the capacity potential of THz wireless systems has by no means been achieved yet. Here, we successfully demonstrate 160 Gbit/s wireless transmission by using a single THz emitter and modulating 25 GHz spaced 8 channels (20 Gbps per channel) in the 300-500 GHz band, which is the highest bitrate in the frequency band above 300 GHz, to the best of our knowledge.