Single-source chip-based frequency comb enabling extreme parallel data transmission -
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The internet today transmits hundreds of terabits per second, consumes 9% of all electricity worldwide and grows by 20-
30% per year(1,2). To support capacity demand, massively parallel communication links are installed, not scaling
favourably concerning energy consumption. A single frequency comb source may substitute many parallel lasers and
improve system energy-efficiency(3,4). We present a frequency comb realized by a non-resonant aluminium-gallium-
arsenide-on-insulator (AlGaAsOI) nanowaveguide with 66% pump-to-comb conversion efficiency, which is significantly
higher than state-of-the-art resonant comb sources. This enables unprecedented high data-rate transmission for chip-
based sources, demonstrated using a single-mode 30-core fibre. We show that our frequency comb can carry 661 Tbit s(-
1) of data, equivalent to more than the total internet traffic today. The comb is obtained by seeding the AlGaAsOI chip with
10-GHz picosecond pulses at a low pump power (85 mW), and this scheme is robust to temperature changes, is energy
efficient and facilitates future integration with on-chip lasers or amplifiers(5,6).

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