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Title:Improved external base resistance extraction for submicrometer InP/InGaAs DHBT models
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Abstract: An improved direct parameter extraction method is proposed for III-V heterojunction bipolar transistor (HBT) external base resistance Rbx extraction from forward active S-parameters. The method is formulated taking into account the current dependence of the intrinsic base-collector capacitance found in III-V HBTs with a fully depleted collector. It is shown that the real part of Z11 - Z12 reduces to the external base resistance at the collector current Ic = Ip/(1 - X0), where Ip is a characteristic current and X0 is the zero-current distribution factor given as the ratio of the emitter to the collector area. The determination of the parameters Ip and X0 from experimental S-parameters is described. The method is applied to high-speed submicrometer InP/InGaAs DHBT devices and leads to small-signal equivalent circuit models, which accurately predicts the measured S-parameters as well as the maximum stable power gain/maximum available power gain in the frequency range from 40 MHz to 110 GHz.