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## On the Joint Security of Encryption and Signature in EMV

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**Abstract:** We provide an analysis of current and future algorithms for signature and encryption in the EMV standards in the case where a single key-pair is used for both signature and encryption. We give a theoretical attack for EMV's current RSA-based algorithms, showing how access to a partial decryption oracle can be used to forge a signature on a freely chosen message. We show how the attack might be integrated into EMV's CDA protocol flow, enabling an attacker with a wedge device to complete an offline transaction without knowing the cardholder's PIN. Finally, the elliptic curve signature and encryption algorithms that are likely to be adopted in a forthcoming version of the EMV standards are analyzed in the single key-pair setting, and shown to be secure.

**Category / Keywords:** applications / EMV, signature, encryption, attack

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**Note:** Correction of "1968" to "1984" in Table 1 and text.

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