Ring Oscillator PUF on FPGA: Design and Characterisation by Using Second-Order Compensated Measurement

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**Stochastic variations inherent to manufacturing process**

**PUF**

**IDENTIFIABILITY**

**PHYSICALLY UNCLONABLE**

**RO-PUF**

**a)** FPGA-implimented RO array

**b)** 51 RO reproduced in 20 different positions

**c)** RO = 3 inverters + 1 AND gate

**IMPLEMENTATION**

**RESULTS**

**Intra-distance and inter-distance**

**Receiver Operation Characteristic (ROC)**

**More secure**

**Better Identification**

**More robust**

**Extract oscillation frequency**

**Compare the frequencies of pairs of oscillators**

32-bit array: sign bit (1 bit) + subtraction of frequencies in binary format (31 bits)

Create a 50-bit word corresponding to the bit we select in each case and study the reliability with the Hamming distance

**FPGA: Zynq 7000 SoC**

**Sign bit** $f_i > f_j \rightarrow 1$ or $f_i < f_j \rightarrow 0$

**Remaining bits** $Binary(|f_i - f_j|)$