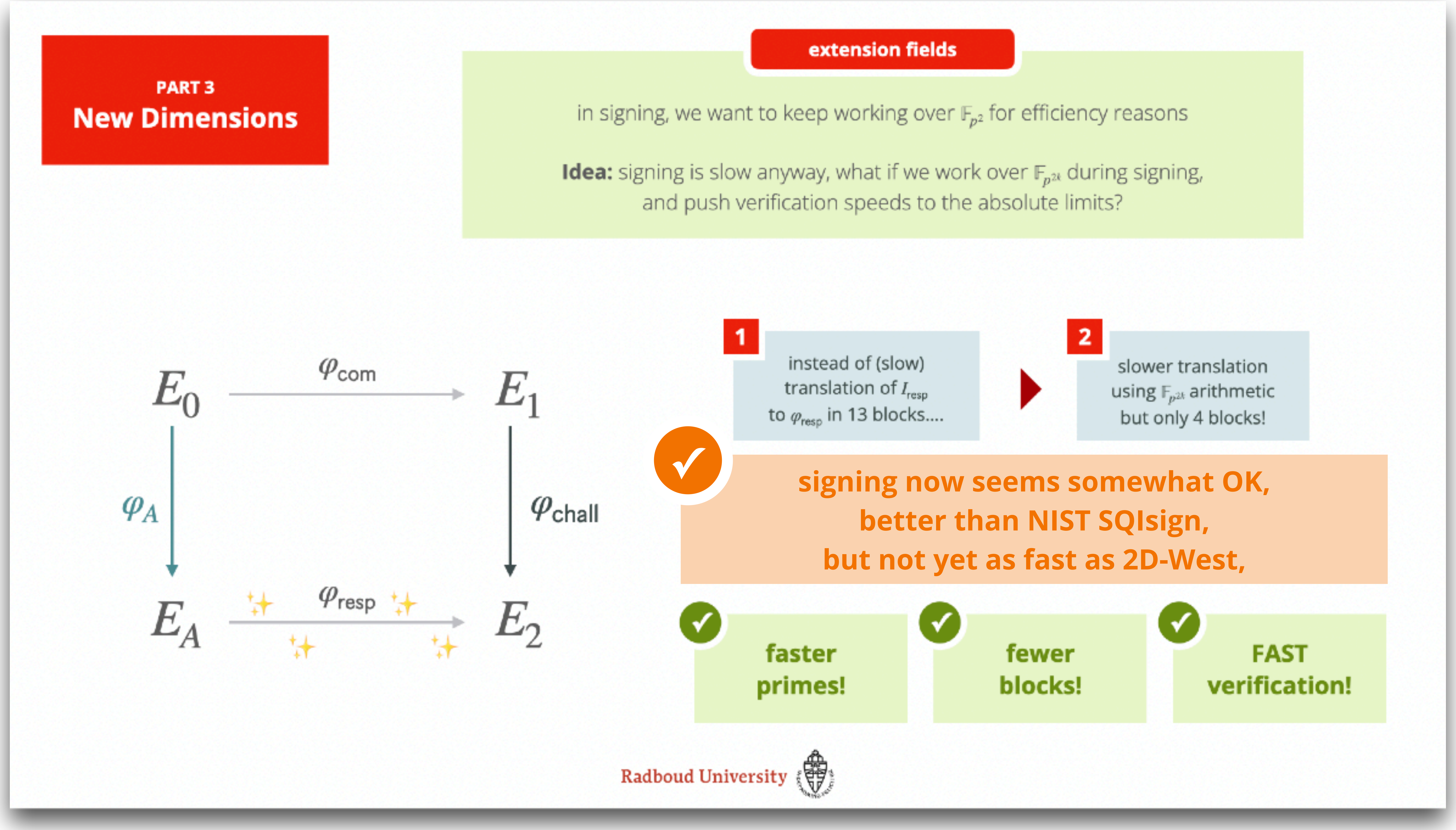
PART 5

# A 1D Miracle?

## Remember this slide?



PART 3

**New Dimensions**

**extension fields**

in signing, we want to keep working over $\mathbb{F}_{p^2}$ for efficiency reasons

**Idea:** signing is slow anyway, what if we work over $\mathbb{F}_{p^{2k}}$ during signing, and push verification speeds to the absolute limits?

$$\begin{tikzcd}
E_0 \arrow[r, "\varphi_{\text{com}}"] \arrow[d, "\varphi_A"'] & E_1 \arrow[d, "\varphi_{\text{chall}}"] \\
E_A \arrow[r, "\varphi_{\text{resp}}"'] & E_2
\end{tikzcd}$$

1 instead of (slow) translation of $I_{\text{resp}}$ to $\varphi_{\text{resp}}$ in 13 blocks....

2 slower translation using $\mathbb{F}_{p^{2k}}$ arithmetic but only 4 blocks!

✓ **signing now seems somewhat OK, better than NIST SQIsign, but not yet as fast as 2D-West,**

✓ **faster primes!**

✓ **fewer blocks!**

✓ **FAST verification!**

Radboud University

1 2024/778 shows much more practical signing procedure for 1D using 2D-isogenies 🤯

Radboud University

[2024/778]: Hiroshi Onuki, Kohei Nakagawa *"Ideal-to-isogeny algorithm using 2-dimensional isogenies and its application to SQIsign"*

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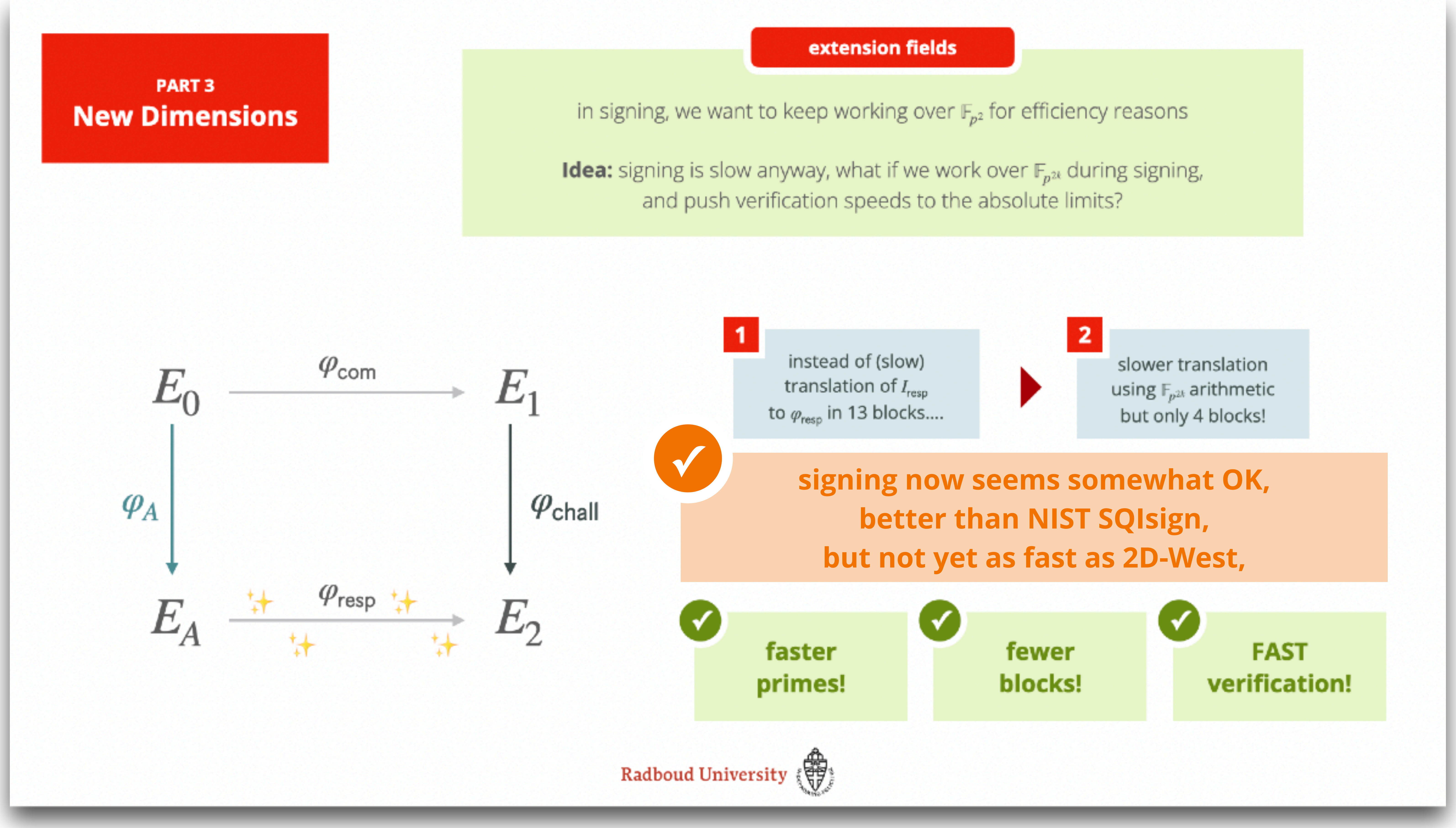

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2 Ongoing work shows highly-optimised verification for 1D verification "very likely" outperforms 2D verification

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