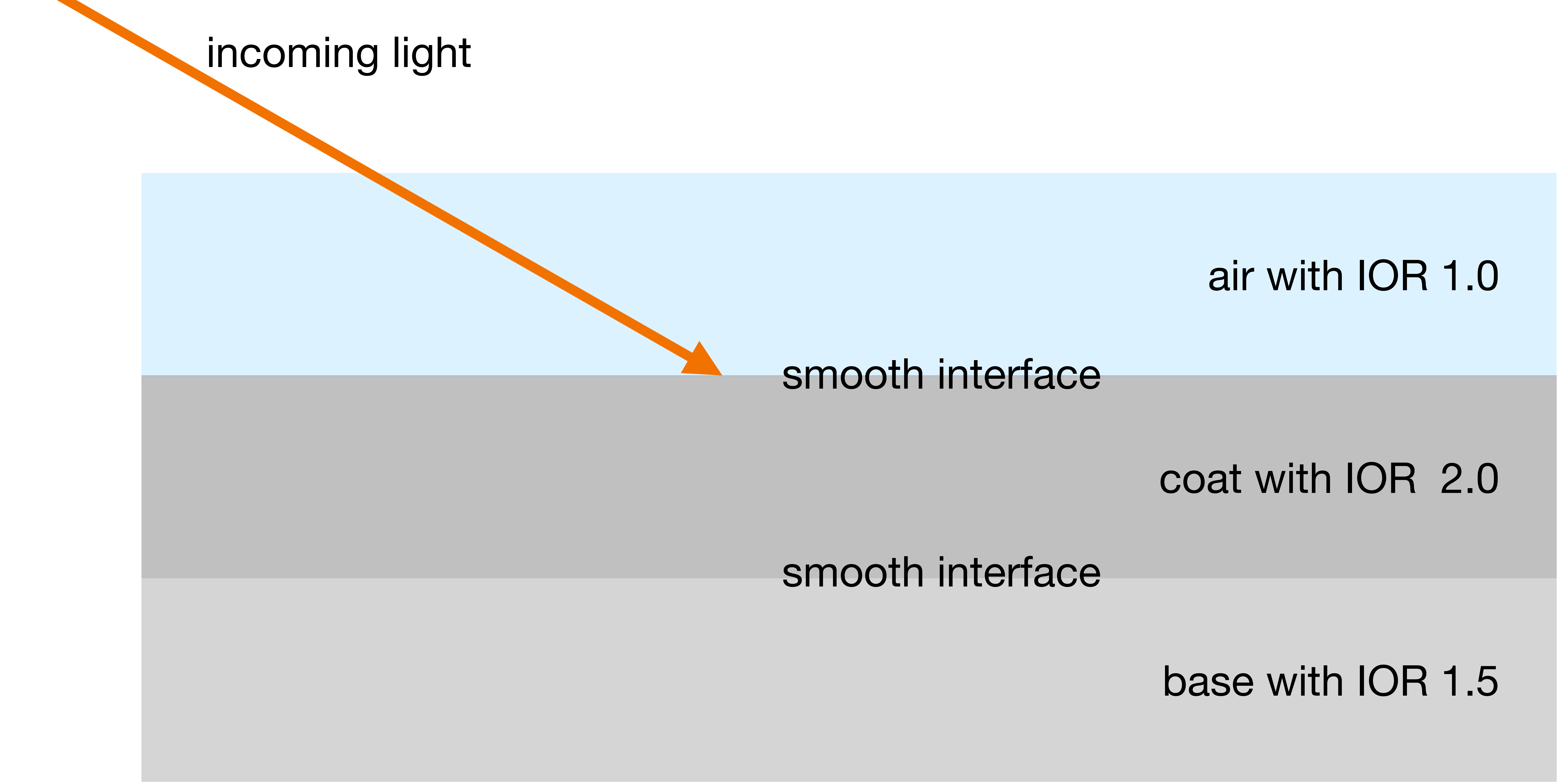
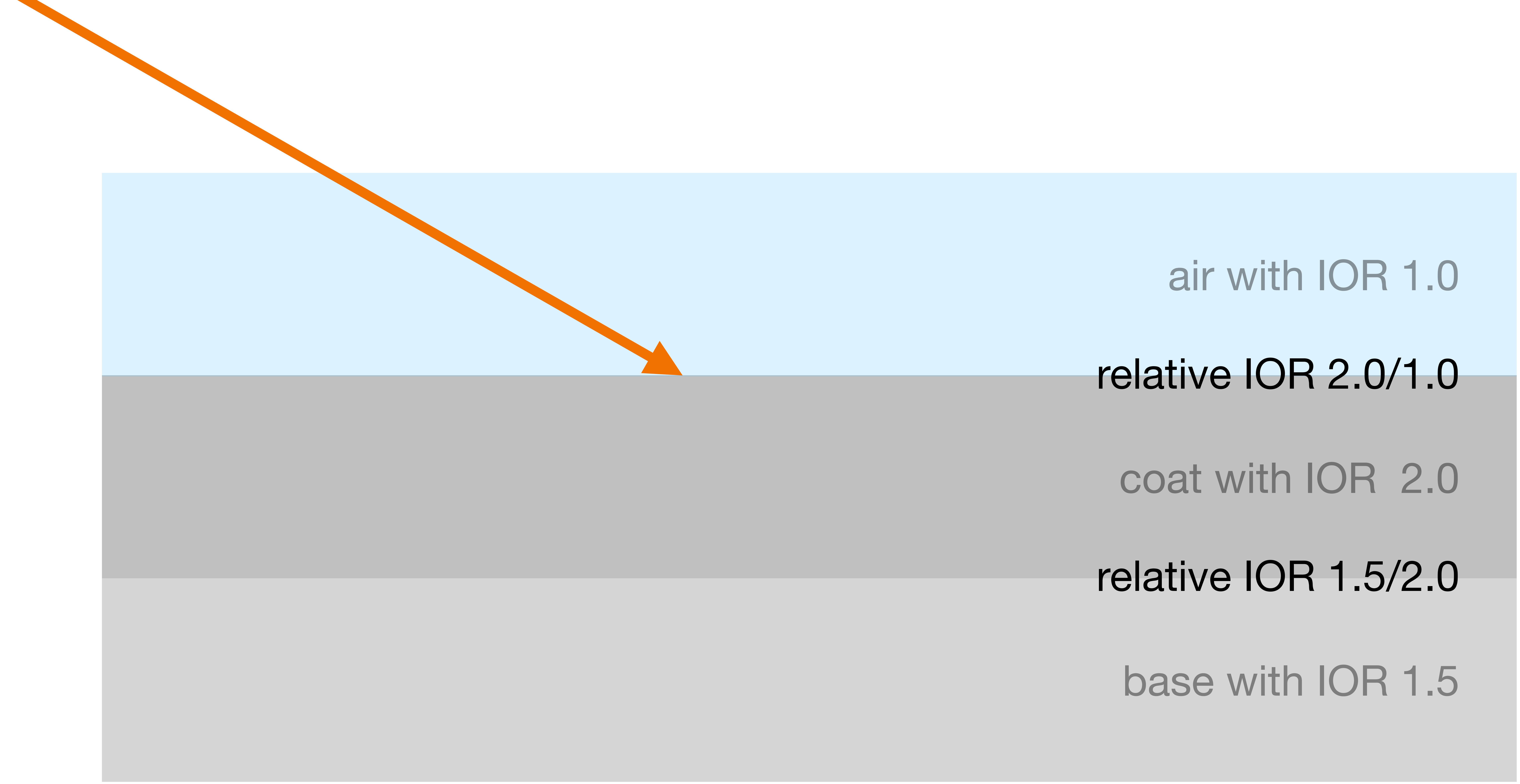
Visual Explanation of Proposed Fix for Spurious TIR

Illustrated using a representative example

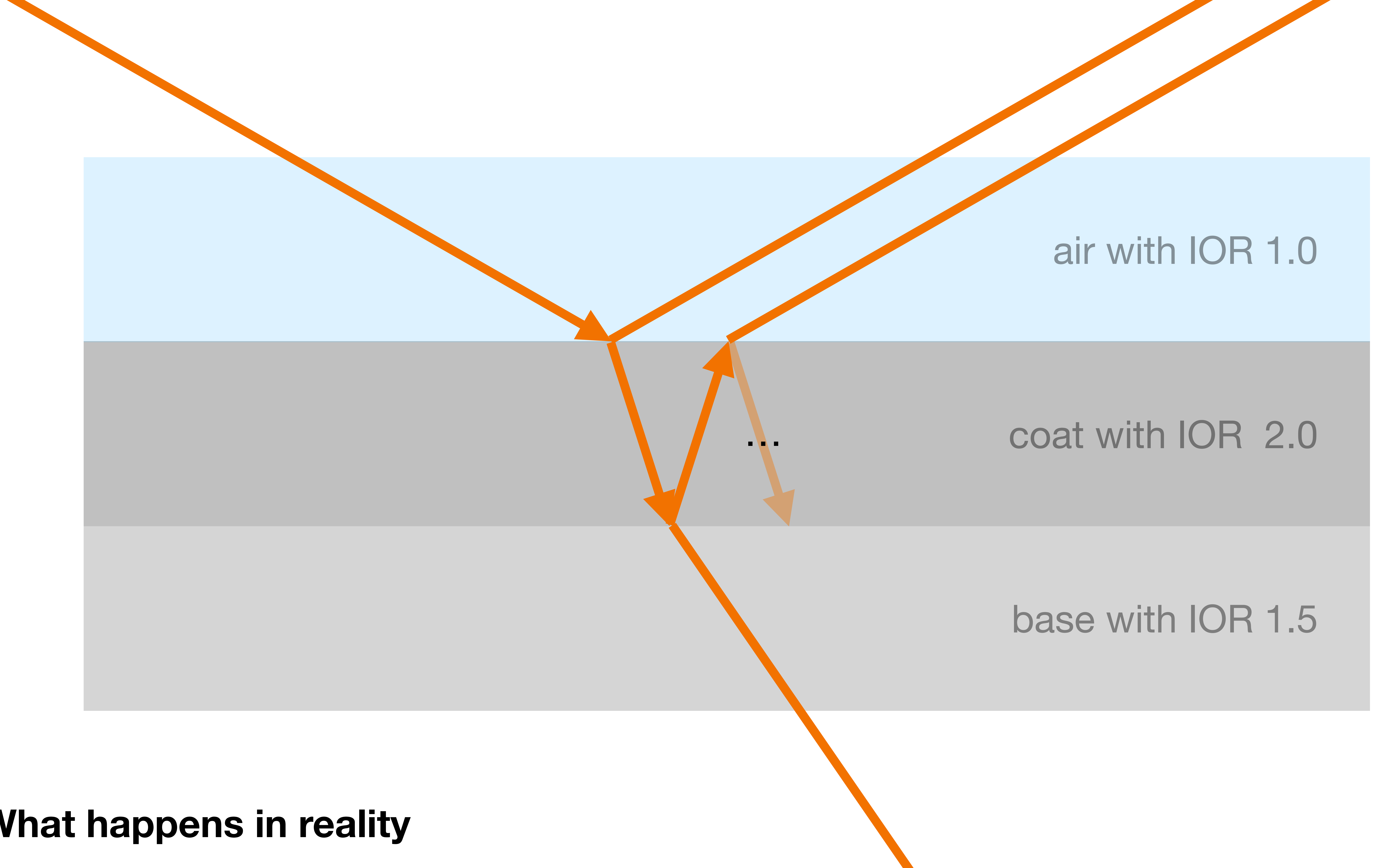
Peter Kutz | April 24, 2024


incoming light
air with IOR 1.0
smooth interface
coat with IOR 2.0
smooth interface
base with IOR 1.5

The setup


air with IOR 1.0
relative IOR 2.0/1.0
coat with IOR 2.0
relative IOR 1.5/2.0
base with IOR 1.5

The setup



What happens in reality

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What happens if coat refraction is ignored

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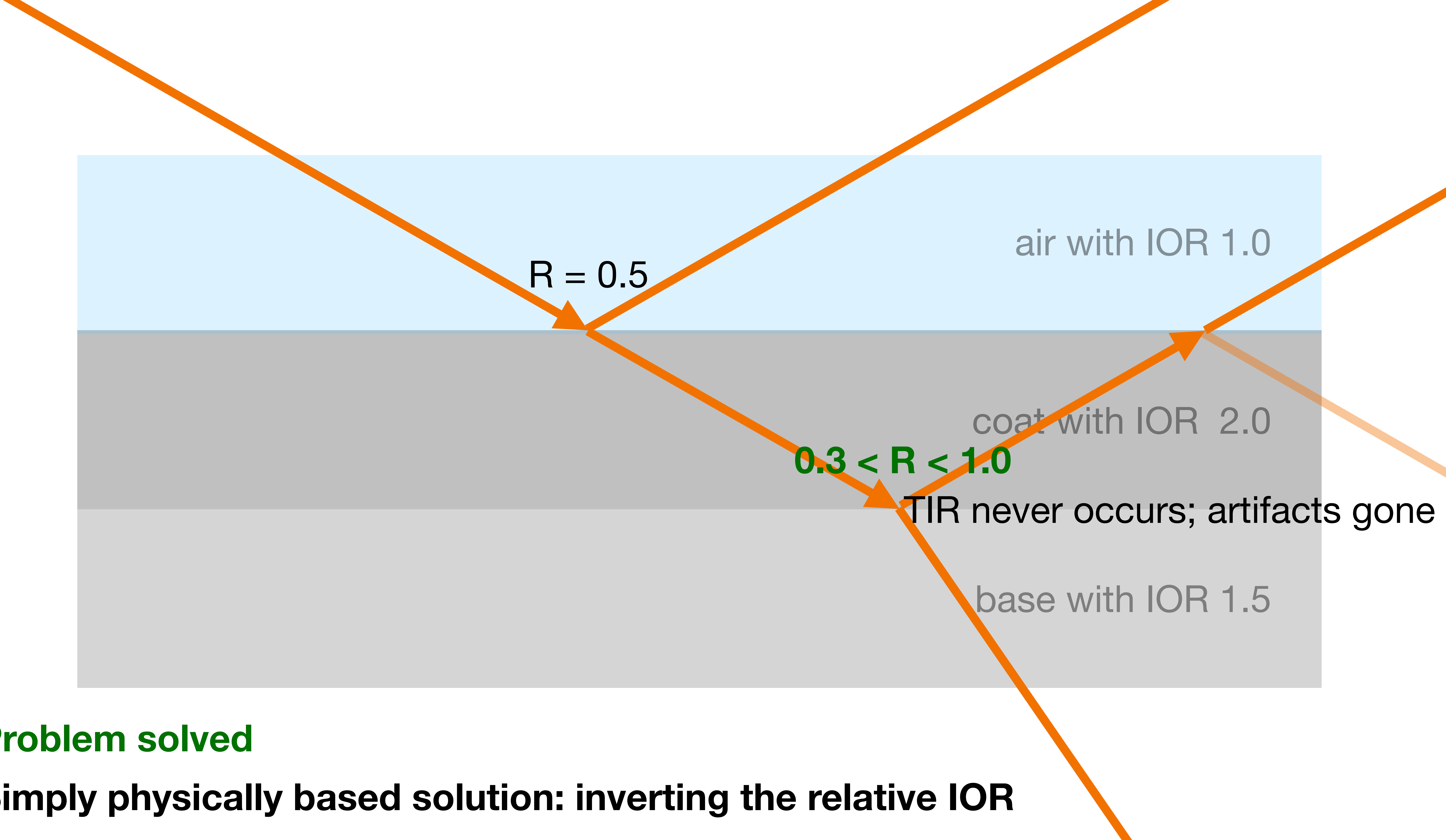
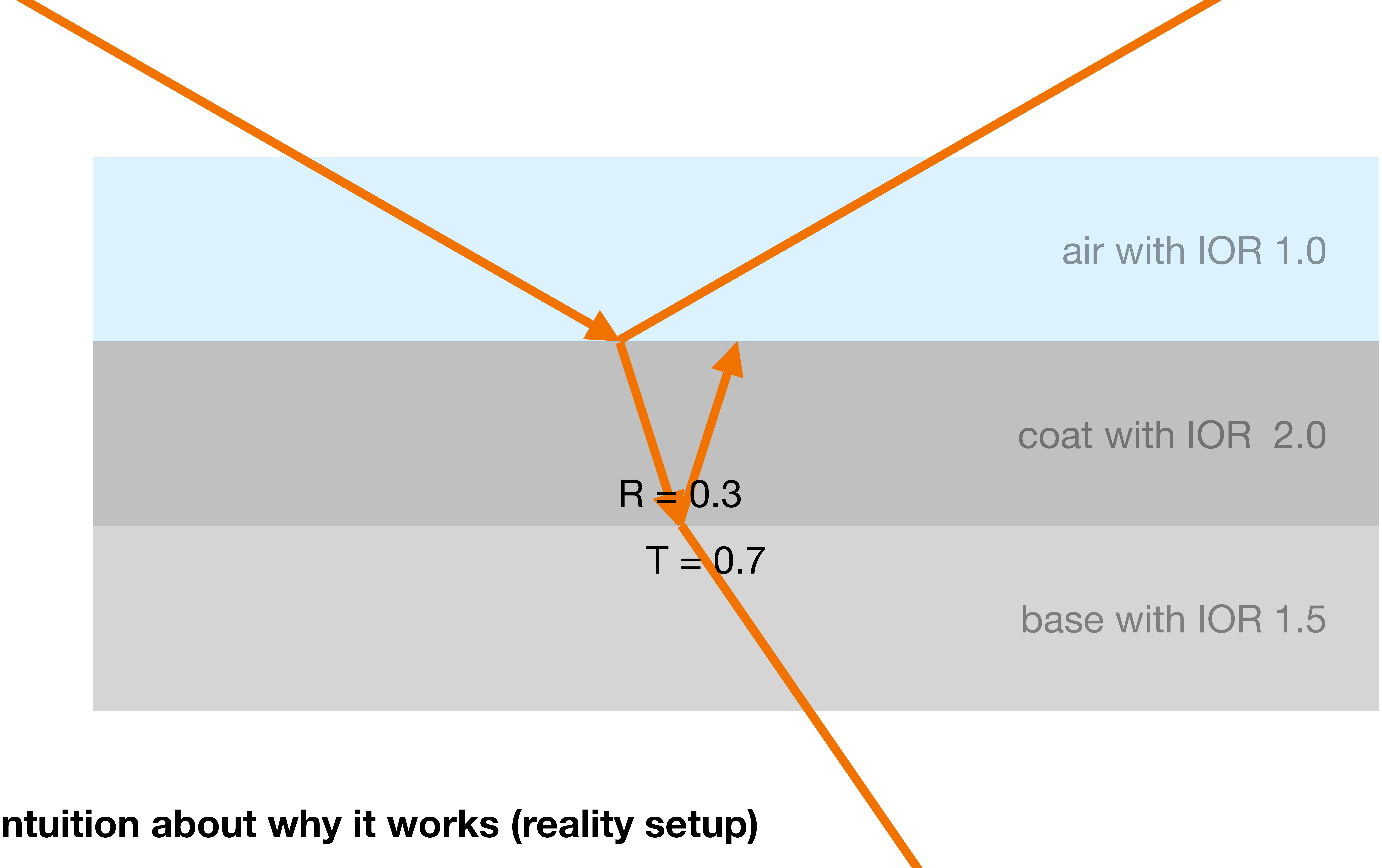
Simply physically based solution: inverting the relative IOR

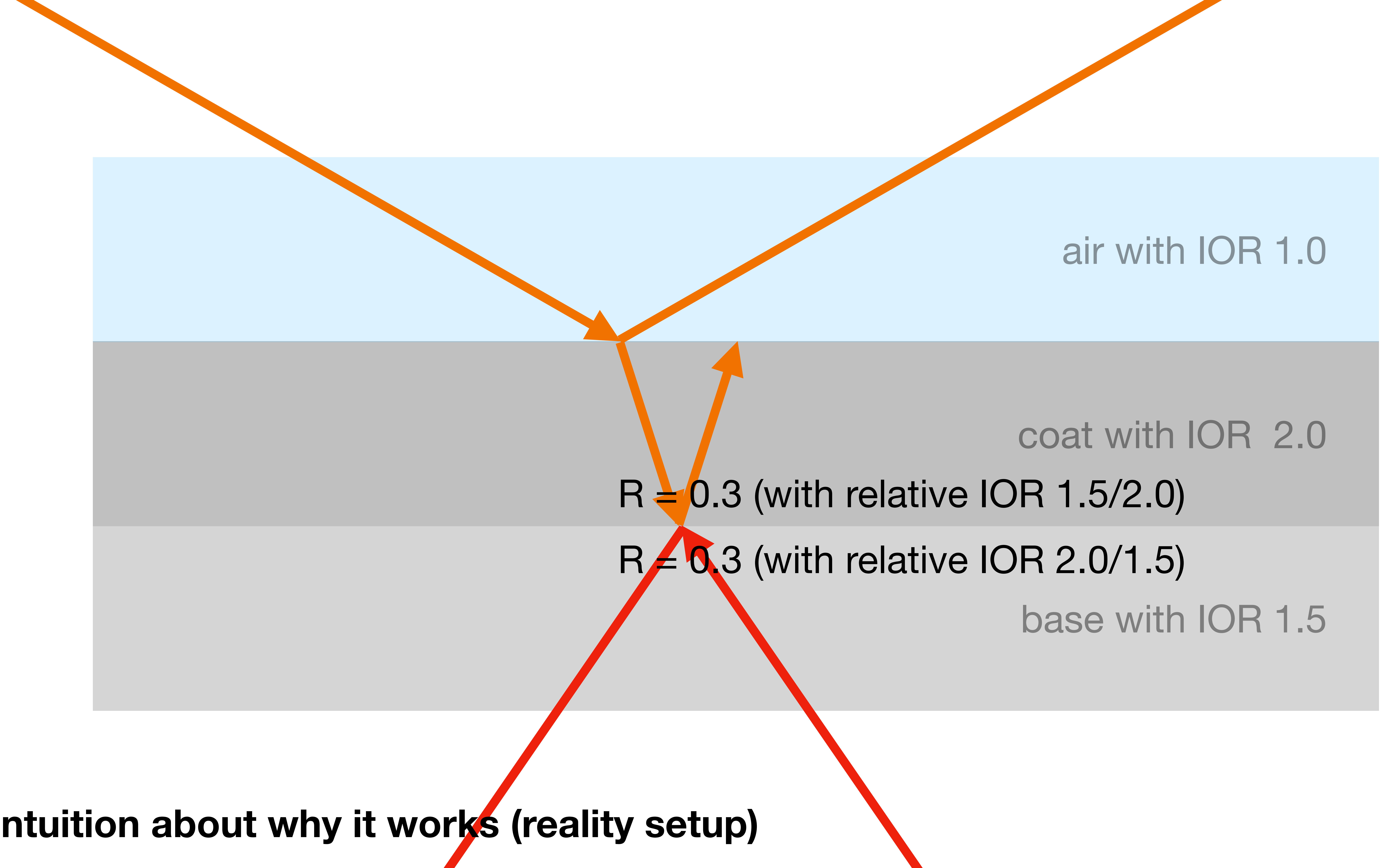


Problem solved

Simply physically based solution: inverting the relative IOR



Intuition about why it works (reality setup)



Intuition about why it works (reality setup)

Intuition about why it works (ignoring coat refraction)

TODO:

This solution produces a base reflection that is slightly higher than reality.

For a more accurate solution, the relative IOR would need to be modified differently (instead of simply being inverted).

At a high level, the relative IOR would need to be reduced (toward 1.0) to eliminate the extra reflectivity.