

More on activating nonlocality through broadcasting of quantum states (work in progress)

Emanuel-Cristian Boghiu¹, Joseph Bowles¹, Flavien Hirsch³,
Pei-Sheng Lin², Marco Túlio Quintino³ (alphabetical order)

¹ICFO-The Institute of Photonic Sciences, The Barcelona Institute of Science and Technology, Castelldefels (Barcelona), Spain

²Department of Physics and Center for Quantum Frontiers of Research & Technology (QFort), National Cheng Kung University, Tainan, Taiwan

³Institute for Quantum Optics and Quantum Information (IQOQI), Austrian Academy of Sciences, Vienna, Austria

INTRODUCTION

There is a new scenario which achieves activation of nonlocality through the broadcasting of quantum states [1]. This broadcast scenario is very promising as it uses less resources than alternatives. We are looking at better understanding this scenario, with the hope of activating nonlocality for all the entangled region of the 2-qubit isotropic state.

BACKGROUND

HIDDEN NONLOCALITY

The relationship between entanglement and nonlocality is understood for pure states: every pure entangled state violates a Bell inequality and vice-versa. For general states the situation is more complicated. There are mixed entangled states which have a local hidden variable model [2]. Surprisingly, it has been shown that by going beyond standard Bell to more exotic scenarios, one can get nonlocality in the same regime where there is a local model in the standard scenario. Examples include single-copy sequential scenarios [3] and multiple-copy scenarios [4]. Recently a new scenario appeared ("broadcast scenario") [1] that activates nonlocality with a smaller amount of resources.

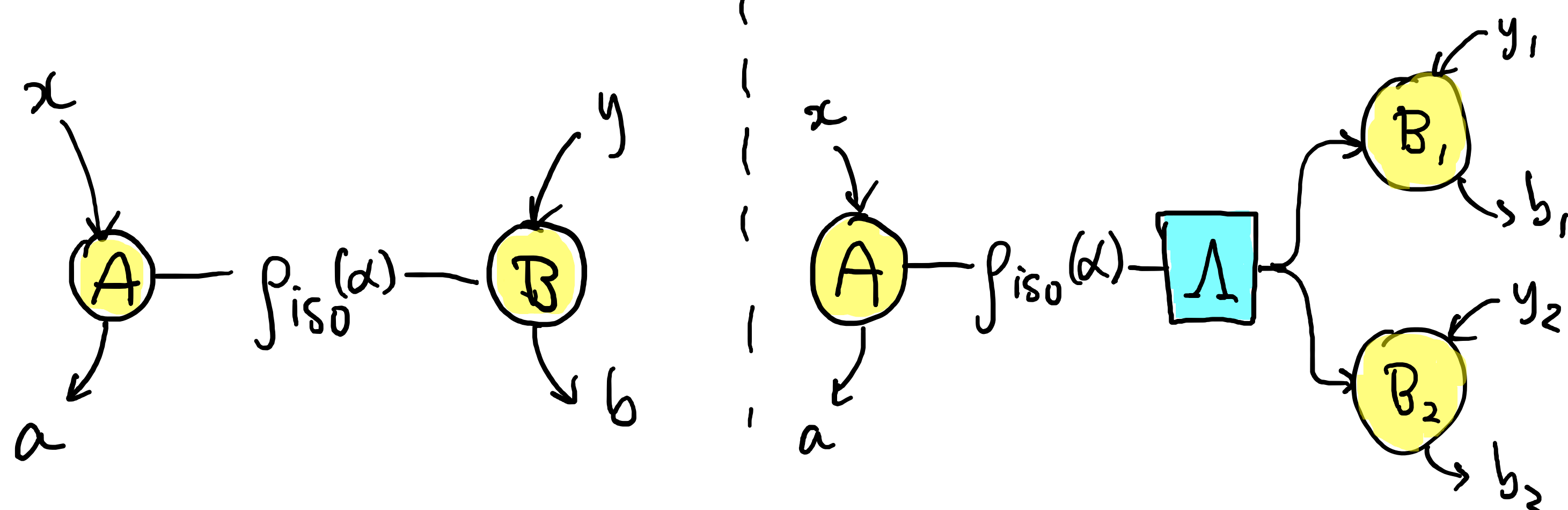
BROADCAST SCENARIO

In standard Bell, imagine that Bob processes his quantum state with an arbitrary quantum channel Λ and sends it to his friends Bob₁ and Bob₂. You can show that while $p(ab|xy)$ is local in standard Bell, the distribution $p(ab_1b_2|xy_1y_2)$ is nonlocal between Alice and the group of Bobs.

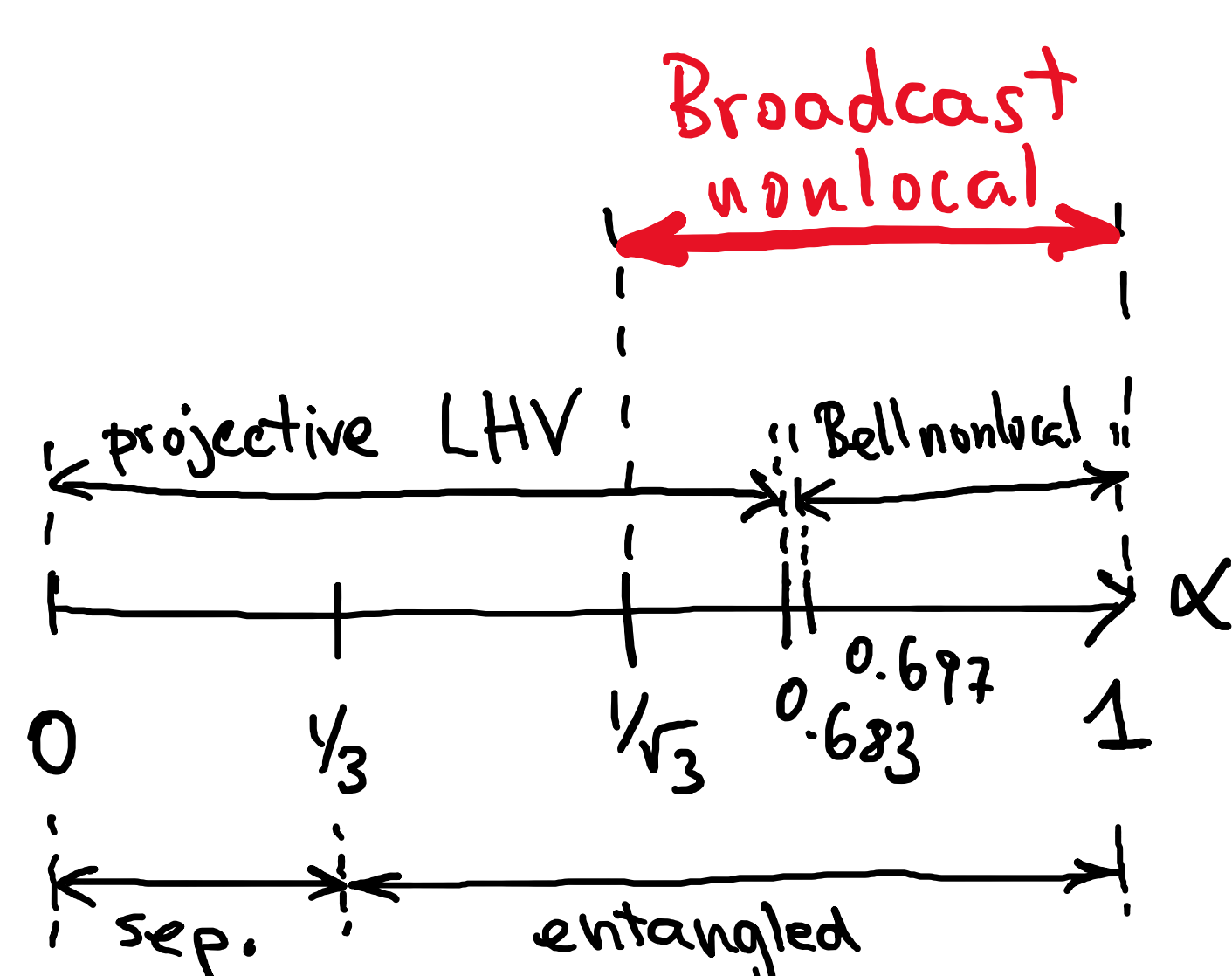
QUESTIONS

- Can we push the critical visibility down to 1/3? [YES, numerically.](#)
- Do we get a similar improvement if we look at detection efficiencies as opposed to visibilities? [YES, 73.5%.](#)
- What is the intuition behind the quantum channel Λ ? Can we get it from first principles? [Unclear.](#)
- Why do we need at least 3 inputs for Alice in [1]? Why doesn't it work for 2? [Unclear.](#)
- What happens in a steering scenario? [Visibility below 1/2.](#)
- Can we generate genuine network nonlocality from an LHV state? [YES.](#)
- What happens if we mix this scenario with the sequential scenario? [Nothing interesting so far.](#)
- Can we find a family of inequalities for this new scenarios with good visibilities? [YES.](#)
- ...

STANDARD BELL | BROADCAST SCENARIO



$$\rho_{iso}(\alpha) = \alpha |\phi^+\rangle\langle\phi^+| + (1-\alpha) \frac{\mathbb{I}}{4}$$



Results from [1].
Can we improve this and push the bound down to $\alpha = 1/3$?

REFERENCES

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