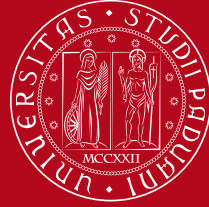


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Generalized Quantum Measurements as Enhancement Tool for Space Quantum Technologies

Matteo Padovan - 37th Cycle

1st Year Presentation - 27th October 2021

- **My background**

- High school degree in *Electronics and Electrotechnics* (2010 - 2015)
- Bachelor degree in *Information Engineering @ DEI UniPD* (2015 - 2018)
- Master degree in *I.C.T. for Internet and Multimedia – Photonics @ DEI UniPD* (2018 - 2020)

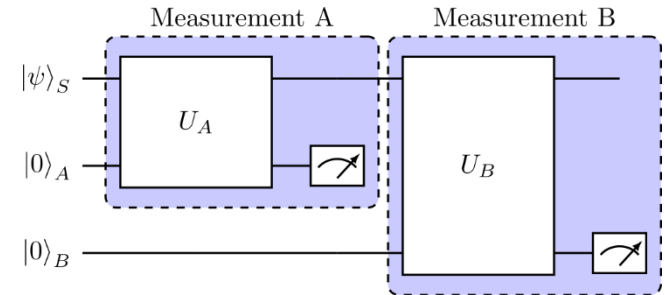
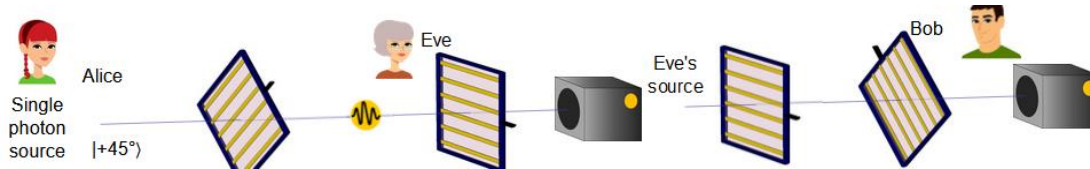


Main goal: Enhancement and development of photonics-based quantum technologies, focused on space applications.

Enhancement tool: Generalized (non-projective) measurements

Mainly based on

- Optical table experiments
- Feasibility tests
- Real implementations



1. Generalized measurements for certified randomness extraction

- Sequential measurements \Rightarrow Higher generation rates
- *Example:* Bowles *et al.*, Quantum 4, 344 (2020). To be tested experimentally.
- Paper publication expected

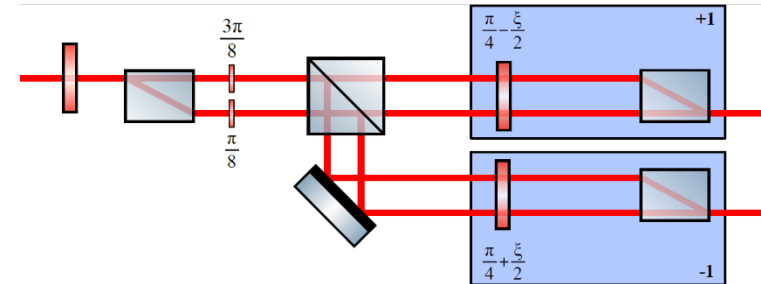
2. Generalized measurements for QKD

- Improvements of the security analysis \Rightarrow Higher key rates
- *Example:* Phys. Rev. A 84, 010302(R). To be tested experimentally.
- Paper publication expected

3. Implementations

- Fiber-based QKD systems
- Free-space-based QKD systems
- Field-tests, robustness analysis, simulations

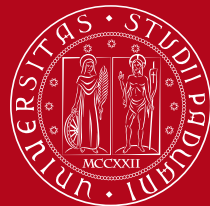
4. Thesis



WBS NUMBER	TASK TITLE	% OF TASK COMPLETE	FIRST YEAR												SECOND YEAR												THIRD YEAR											
			T1				T2				T3				T4				T1				T2				T3				T4							
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Generalized quantum measurements for certified randomness extraction																																					
1.1	Preliminary studies	0%	█	█	█	█																																
1.2	Laboratory experiments and data analysis	0%		█	█	█	█	█																														
1.3	Paper publication	0%							█	█	█	█																										
2	Generalized quantum measurements for quantum key distribution																																					
2.1	Preliminary studies	0%																																				
2.2	Laboratory experiments and data analysis	0%																																				
2.3	Paper publication	0%																																				
3	Implementations																																					
3.1	Implementation of standard fiber-based QKD protocols	0%	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█														
3.2	Implementation of standard free-space-based QKD protocols	0%	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█														
3.3	Field tests of QKD protocols	0%																																				
3.4	Simulations of performances with integrated optics	0%																																				
3.5	Paper publication	0%																																				
4	Thesis																																					
4.1	Thesis writing	0%																																				

Thanks for the attention

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