Generating and detecting single microwave photons and phonons

Prof. Göran Johansson
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In this talk, I'll discuss the physics of microwave photons moving in a coplanar waveguide (1D transmission line) interacting with one or more artificial atoms. Compared to the optical regime, the microwave regime allows for strong and stable coupling of the photons to (artificial) atoms. In particular, I'll discuss the possibility of using the giant cross-Kerr effect for QND detection of propagating microwave photons [1,4]. I'll also discuss robust designs for broadband single photons sources [2].
If there is time, I'll also discuss what happens when the microwave photons are replaced by surface acoustic wave (SAW) phonons. The phonon velocity is five orders of magnitude slower, implying also that the atom is now substantially larger than the wavelength for its spontaneous emission. This results in a strongly frequency dependent coupling between the atom and the waveguide and a unique non-exponential decay dynamics of the atom [3].
References

[1] S. R. Sathyamoorthy, T. M. Stace, G. Johansson, Comptes Rendus Physique 17, 756-765 (2016).
[2] S. R. Sathyamoorthy, A. Bengtsson, S. Bens, M. Simoen, P. Delsing, G. Johansson, Phys. Rev. A 93, 063823 (2016)
[3] L. Guo, A. Grimsmo, A. F. Kockum, M. Pletyukhov, G. Johansson, Phys. Rev. A 93, 053821 (2017)
[4] S. R. Sathyamoorthy, L. Tornberg, A. F. Kockum, B. Q. Baragiola, J. Combes, C. M. Wilson, T. M. Stace, G. Johansson, Phys. Rev. Lett. 112, 093601 (2014)