Title:	Graphene josephson junctions and high kinetic inductance aluminum films
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Abstract:	Parametric resonance is the phenomenon that occurs due to the presence of non-linear circuit elements. We studied gate tunable graphene-based Josephson junctions (gJJ) and propose a way to observe parametric effects in such devices. We fabricated a gate tun- able gJJ by depositing superconducting material on graphene, which was encapsulated by hexagonal boron nitride (hBN). We performed microwave measurements at cryogenic temperature, as our circuit consisted of gJJ embedded on a superconducting cavity formed by the coplanar waveguide (CPW) transmission line. The experiments show that due to the unique electron transport properties of graphene, we can tune the resonator's resonance by applying voltage bias to graphene through DC-line in the cavity. We have studied the tem- perature and power dependence of quality factor for such resonators. We have discussed the equivalent circuit for the cavity and the junction, and calculated the inductance of the junction. The non-linear circuit element in our case is the gJJ that behaves as a non-linear inductor and when coupled with a cavity can be used to study parametric effects. For the second part of the thesis, we fabricated aluminum thin films to study the grain size of aluminum. Aluminum films were grown in vacuum and under partial pressure of oxygen. The chips were attached to different quartz crystals that were oscillating at differ- ent frequencies. The grain size is studied using scanning electron microscopy. It is shown in literature that granular aluminum films have higher kinetic inductance, and the long term goal is to fabricate high kinetic inductance microwave resonators.
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