1059-78-222 **Ildar R Gabitov*** (gabitov@math.arizona.edu), Deparetment of Mathematics, University of Arizona, 617 N. Santa Rita, Tucson, AZ 85721, **Bridget Kennedy** (bkennedy@math.arizona.edu), Department of Mathematics, University of Arizona, Tucson, AZ 85721, and **Andrei Maimistov** (aimaimistov@gmail.com), National Research Nuclear University, 31 Kashirskoe Shosse, Moscow, Russia. *Gain- added metallic nanostructures as optical meta-atoms.*

Split ring resonators with added Josephson junctions (rf-SQUIDS) are known to be acting as meta-atoms in the radio frequency regime. We consider a mathematical model of a nanoscale metallic resonator with two level resonant atoms which could operate in optical regime. Josepson junctions are well described by a sin-Gordon type of equation. The Maxwell-Bloch system is known to be a good model for two-level atoms and represents the generalization of a sin-Gordon equation. We derive a system of equations describing the electrodynamics of a metallic nano-resonator with active atoms and analyze the response of such an object to an external electromagnetic field. The main feature of this meta-atom is a large magnetic dipole moment, which is much larger than electric dipole moment in natural atoms. (Received February 23, 2010)