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Compact spectroscopy imaging detectors for astrophysical applications

Monday, July 22, 2019 12:40 PM (15 minutes)

In this talk, I will present how we combine spectroscopy and imaging capabilities inside one compact device for submillimeter observations. This system is an interferometric system that has been designed to fulfill the spectroscopic requirements of a space mission. The idea is to bring a Fabry-Pérot spectrometer very close to the detector (silicon bolometers) such that they form a coupled, resonant system with enhanced detection efficiency. For this purpose, we introduce a new type of Fabry Pérot for submillimeter spectroscopy: instead of having metal mesh mirrors, we use an assembly of thin silicon sheets. Theoretical simulations have shown that the use of dielectrics instead of metals suppresses the ohmic losses thus leading to increasing the absolute efficiency of the spectrometer. In order to reach a high finesse similar to what we have in the case of interferometers made with metallic grids, we choose to assemble several silicon sheets to form one mirror as defined by the Bragg mirror theory. Moreover, we have found that the coupling of the spectrometer with the detector is close to perfect: the absorption of the whole assembly has almost 100% efficiency for wavelengths corresponding to the size of the resonant cavity of the Fabry Pérot. This system may lead to a real improvement and can reduce the observations time by a factor of 2, which is not negligible at all. In the second part of the talk, I will describe how we have built the mirrors and what optical tests we have performed to conclude that the silicon sheets are perfectly compatible with the finesse of our spectrometer. Finally, I will present the last measurements that we did with the silicon spectrometer at cold temperature (4K).

Less than 5 years of experience since completion of Ph.D

Y

Student (Ph.D., M.Sc. or B.Sc.)

Y

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