

סמינריון

הנדך מוזמנות להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ג' 23.02.2021

(י"א באדר, תשפ"א), בשעה 13:45 באמצעות הזום :

<https://technion.zoom.us/j/2076561843>

מרצה : אבישי קדרון

מנחה : פרופ' אמר' גרשון גרוסמן

על הנושא :

optimization of cooling power of a miniature Pulse Tube cryocooler by using simulations and new design of all the system's parts.

The seminar will be given in Hebrew

תקציר ההרצאה :

A cryocooler is a device for producing cooling at cryogenic temperatures (typically below 120K). The main uses of cryocoolers include liquefaction of natural gas (LNG) for transportation (*Transportation*), applications of high-temperature superconductors (*Superconductors*), storage of biological cells and specimens (*Biology*). For some military applications, such as cooling of infrared sensors for missile guidance and night vision, it is highly important to miniaturize the cryocooler as much as possible.

The Pulse Tube (PT) cryocooler is a regenerative cryocooler based on the Stirling cycle, where the displacer has been replaced by a pressure wave, thus simplifying the design and operation. The PT is probably the most suitable candidate for miniature cryocoolers. Several such devices have been constructed and tested at the Rechler Cryogenic Cooling Laboratory, the most successful of which has been the MTSa – Miniature Technion Stainless ver. a. With the regenerator measuring only 12_{mm} and a total length of 31_{mm}, this in-line cryocooler has achieved a no-load temperature of 98_K and 108_K at 300_{mW} load, while operating at 103_{Hz} with a helium fill pressure of 40_{bar} and a pressure ratio of 1.3. This cryocooler is one of the smallest of its kind ever constructed worldwide. While the performance of the MTSa was quite impressive, its design has not been fully optimized. As it was proven by simulations, with some design modifications the device can reach lower temperatures, both at no-load and with some typical (IR detector) loads, thus providing more cooling power. In this research a new design of the miniature PT cryocooler is being considered. By using a simulation software, SAGE - perhaps the most popular cryocooler design software, which was also used in the design of the MTSa, the cryocooler was optimized and was fully redesigned. The new design shall produce, at the same temperature, about 400% more cooling power.

בברכה,

פ"מ"ח אתי סאס

מרכז הסמינרים