CLAIMS:

1. A packaging system for shipping a temperature sensitive payload, the packaging system comprising:

a housing comprising a bottom wall, a top wall located above and in spaced vertical alignment with the bottom wall, and side walls extending vertically between the bottom wall and the top wall, the housing defining a payload compartment for holding the payload;

a cooling system comprising one or more arrays of cold heat pipes, one or more arrays of warm heat pipes, a top layer of cold phase change material (PCM) and a bottom layer of warm PCM material;

each array of cold heat pipes located within the housing and comprising one or more cold heat pipes, each cold heat pipe shaped like an inverted “U” and comprising a horizontal section connecting two downwardly extending vertical sections;

each array of warm heat pipes located within the housing and comprising one or more warm heat pipes, each warm heat pipe shaped like a “U” and comprising a horizontal section connecting two upwardly extending vertical sections;

a first phase change material (PCM) located within each cold heat pipe, the first phase change material conditioned to a first temperature at which the first PCM changes phase between liquid and gas;

a second phase change material (PCM) located within each warm heat pipe, the second phase change material conditioned to a second temperature that is warmer than the first temperature at which the second PCM changes phase between liquid and gas;

the top layer of cold phase change material is disposed above the payload compartment and in thermal contact with the horizontal section of each cold heat pipe, and the first PCM evaporates in the vertical sections due to heat transferred from the payload, rises into the horizontal section and transfers heat to the top layer of cold phase change material; and

the bottom layer of warm phase change material is disposed below the payload compartment and in thermal contact with the horizontal section of each warm heat pipe, and the second PCM evaporates in the horizontal section due to heat transferred from the bottom layer of warm phase change material, rises into the vertical sections and transfers heat to the payload.

2. The packaging system of claim 1 further comprising:

a first thermally conductive plate in thermal contact with the top layer of cold phase change material.

3. The packaging system of claim 2 wherein:

the cold heat pipes are welded to the first thermally conductive plate.

4. The packaging system of claim 2 wherein:

the cold heat pipes are embedded in the first thermally conductive plate.

5. The packaging system of claim 1 further comprising:

a second thermally conductive plate in thermal contact with the bottom layer of warm phase change material.

6. The packaging system of claim 5 wherein:

the warm heat pipes are welded to the second thermally conductive plate.

7. The packaging system of claim 5 wherein:

the warm heat pipes are embedded in the second thermally conductive plate.

8. The packaging system of claim 1 wherein:

the vertical sections of each heat pipe has an inner surface that defines grooves to facilitate capillary flow of the phase change material in a condensed state.

9. The packaging system of claim 1 wherein the first PCM condenses in the horizontal section due to heat transferred to the top layer of cold phase change material, trickles down to the sections and absorbs heat from the payload.

10. The packaging system of claim 1 wherein the second PCM condenses in the vertical sections due to heat transferred to the payload, trickles down to the horizontal section and absorbs heat from the bottom layer of warm phase change material.