

A Thermodynamic Perspective on the Interaction of Radio Frequency Radiation with Living Tissue

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Introduction

This is a presentation of a published paper :

Michael Peleg: A Thermodynamic Perspective on the Interaction of Radio Frequency Radiation with Living Tissue, International Journal of Biophysics, April 2012, DOI: 10.5923/j.biophysics.20120201.01

The presentation, like the paper, is rigorous. Only the radiation temperature value is cited from the paper without a full proof here.

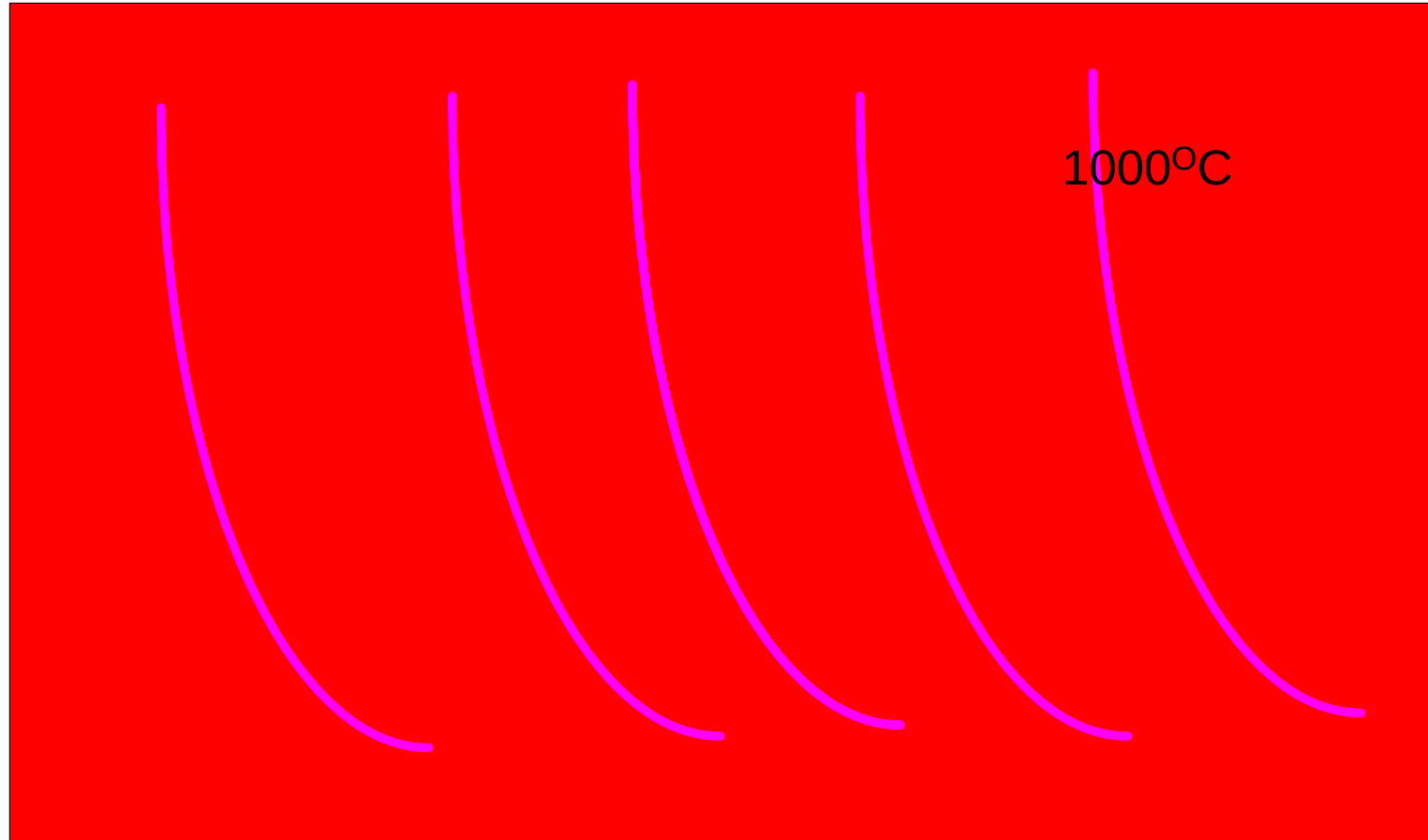
The presentation uses no equations, please do not let its somewhat light nature break your chain of understanding.

It shows a one potential mode of biological interaction, there are others. It may be important and it may be not, anyway it is an interesting physical viewpoint.

Known classical physics

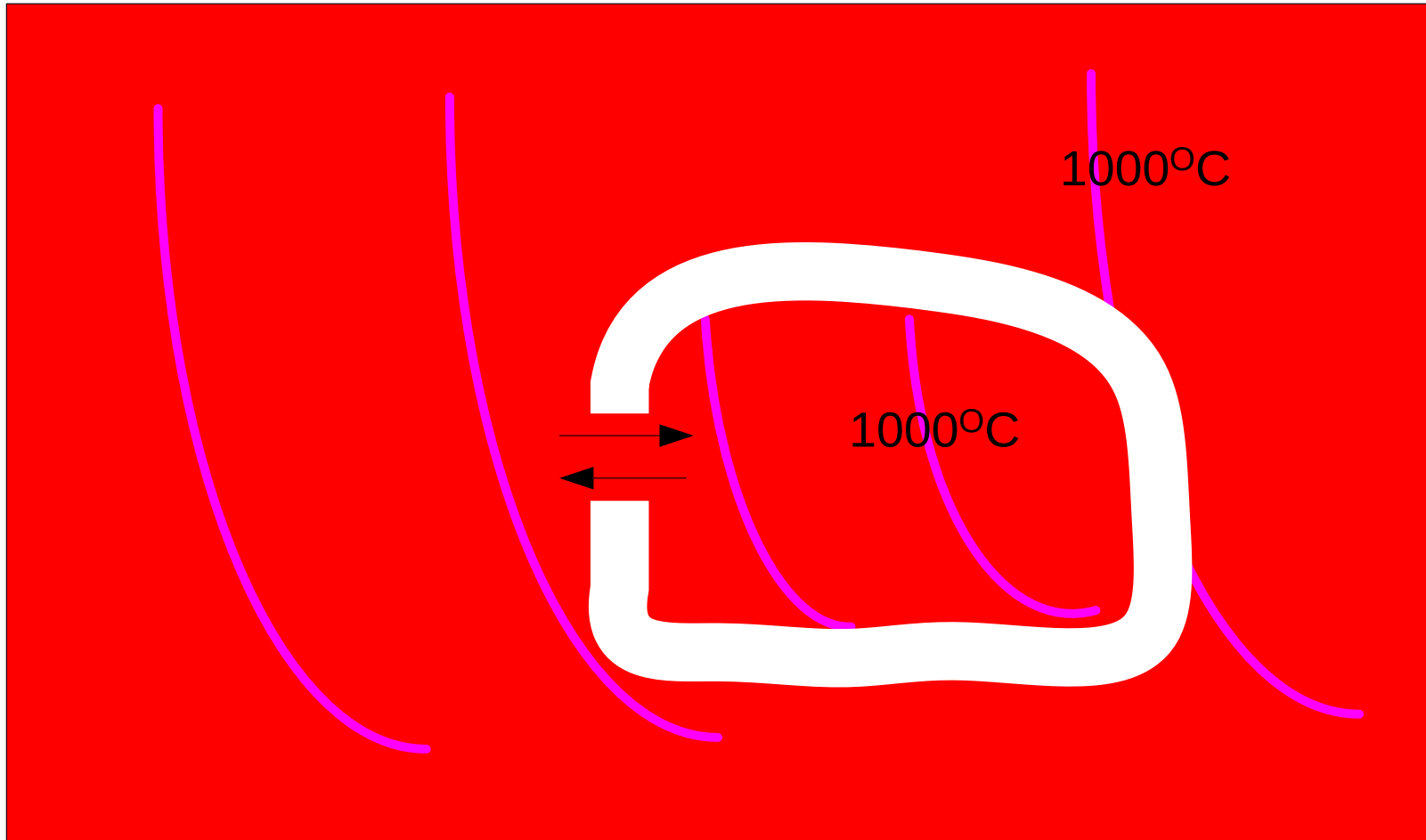
- Heat and energy flow from high temperature regions to low temperature ones.
- In thermal equilibrium the temperature is uniform.
- In equilibrium the energy is distributed evenly among all possible energy carrying modes such as velocities of particles, heights of particles, molecular vibrations and electromagnetic fields. This is very basic and called "equipartition".
- The consequence of the above is the black body radiation – natural radio-frequency radiation present everywhere on the Earth with energy density proportional to temperature. Its energy share is tiny.

The hell



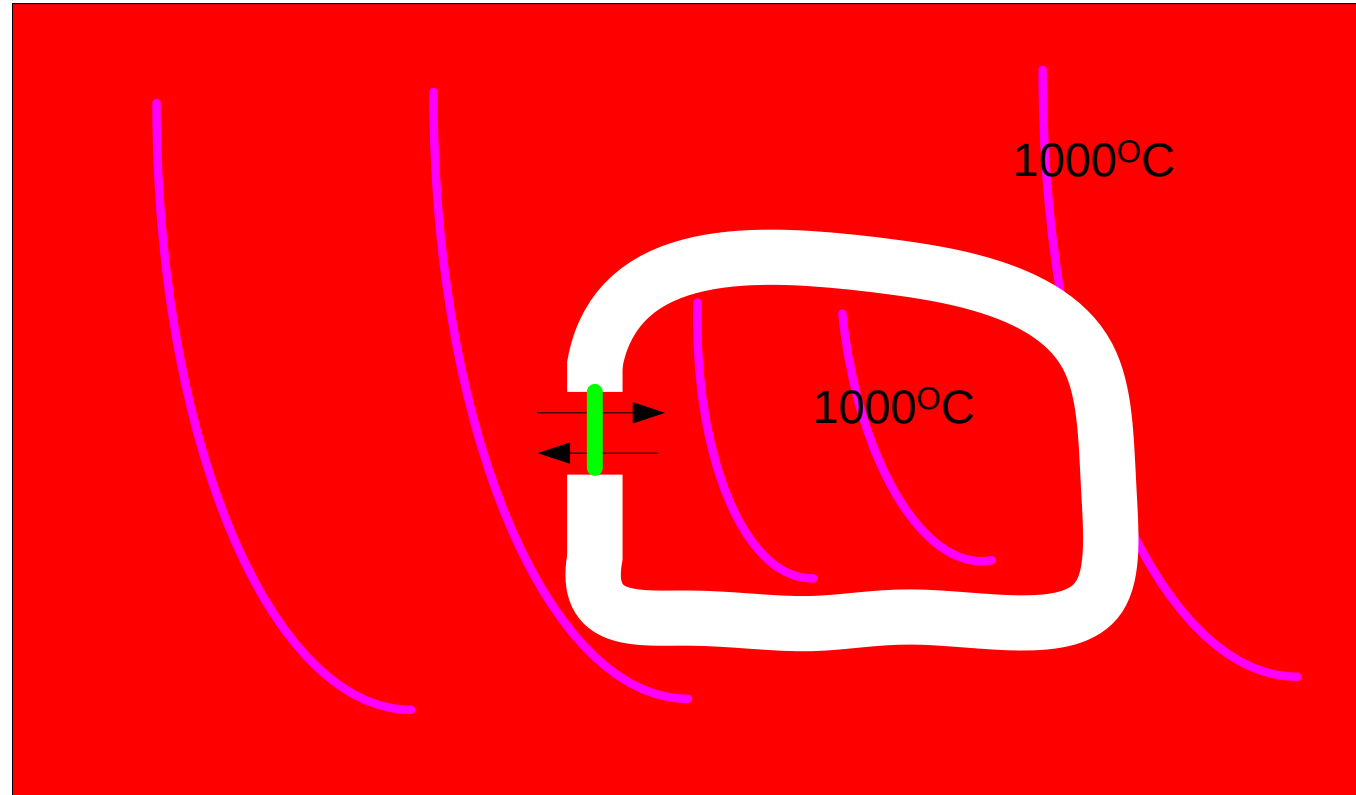
- Very hot, say 1000°C , and in thermal equilibrium.
- A tiny part of the energy there is in the form of RF black body radiation, this is the least problem of the inmates.

Igloo in hell



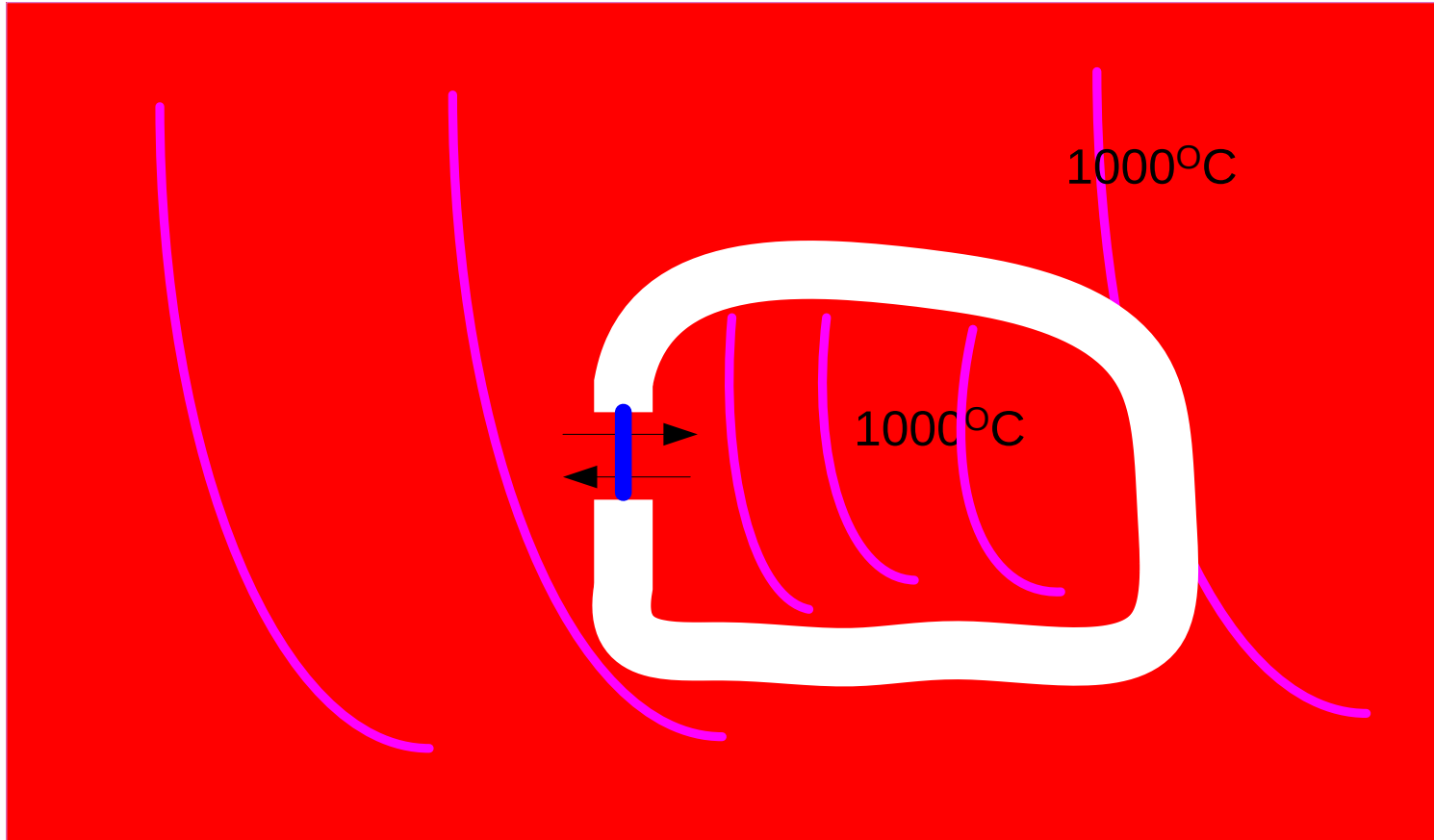
- Made of a science fiction material which is perfectly thermally insulating and reflects all radiation. The igloo has an opening.
- After sufficient time the igloo interior will reach 1000°C and the energy flow entering its opening will be the same as the energy flow exiting it.

The same igloo but with a barrier made of conventional material closing the igloo opening



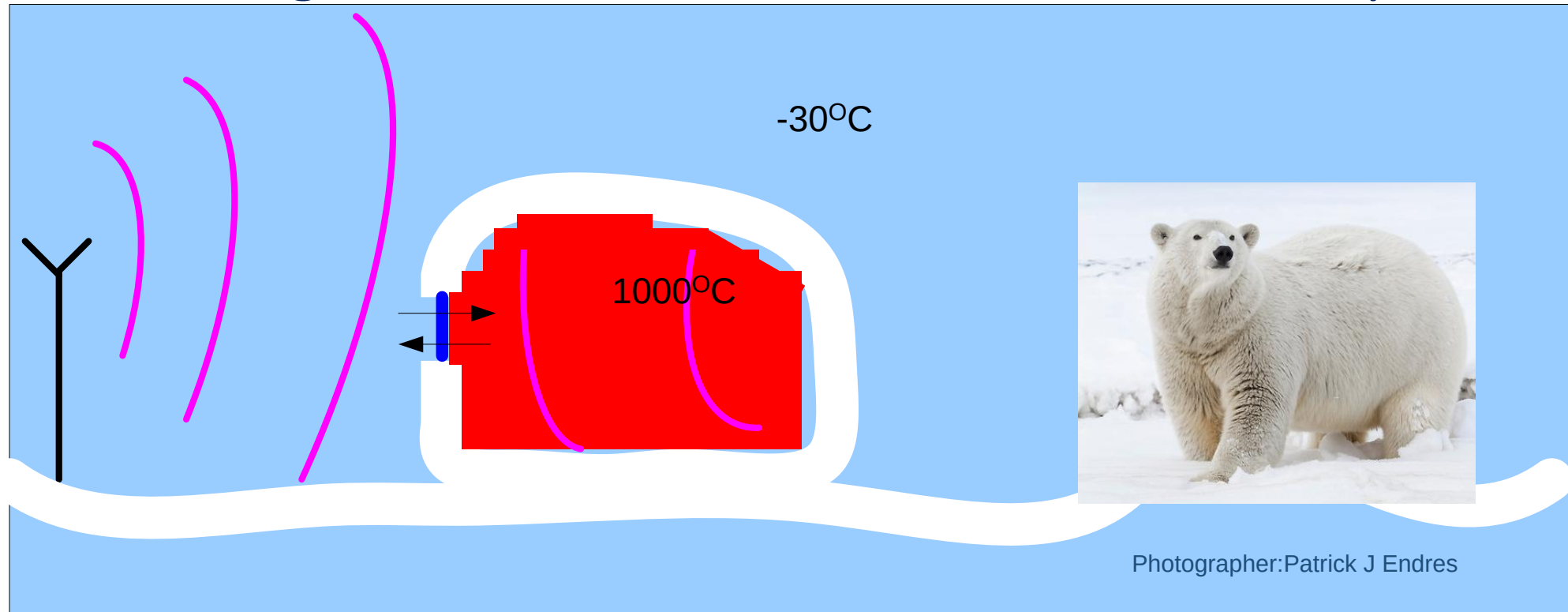
- Exactly the same result, 1000°C inside, only the energy flow across the barrier will be slower and its nature will be influenced by the barrier material. The temperature inside at equilibrium is not influenced by the barrier material which is the only interface between the igloo and hell.

The same igloo but with a theoretical barrier perfectly insulating everything except RF



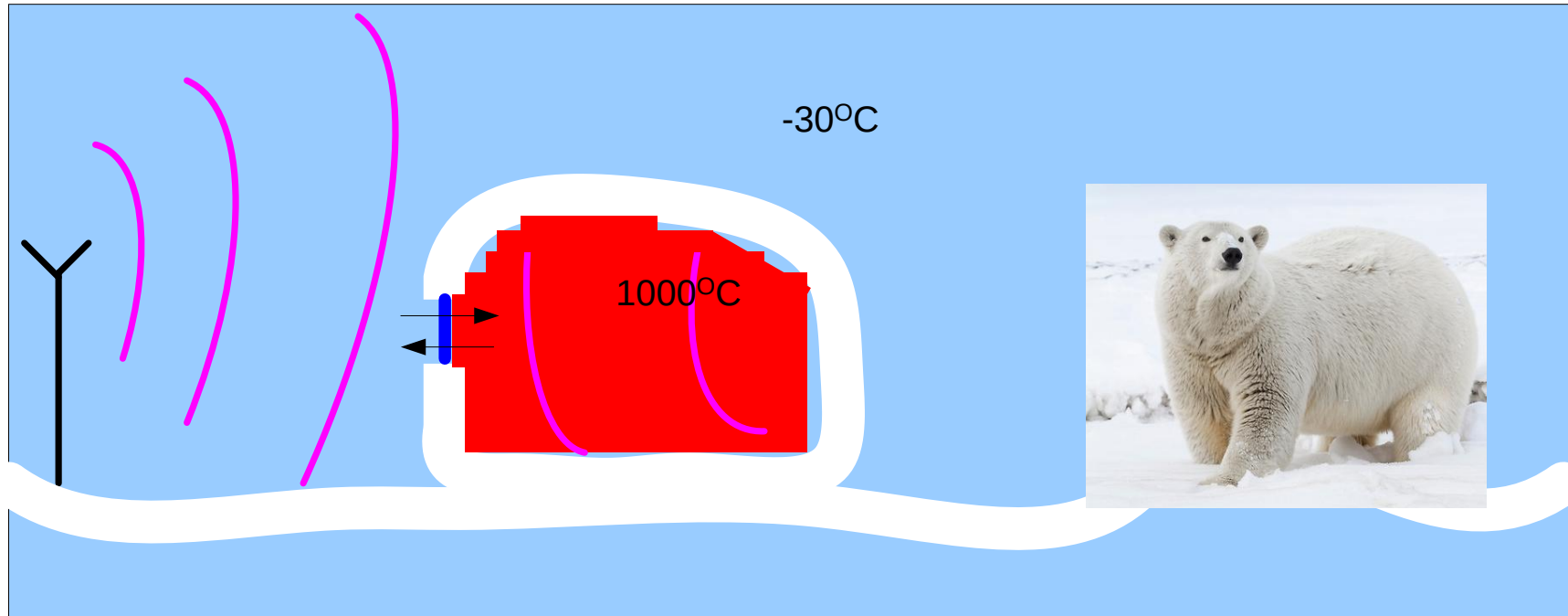
- Exactly the same result, 1000°C inside, only the energy flow across the barrier will be RF radiation only in both directions. The only interface of the igloo with hell is now the black body RF radiation and it suffices to raise the temperature inside to 1000°C! It takes more time than with no barrier.

The igloo with the above RF-only passing barrier in Alaska where it belongs. A base-station a hundred meters away.



- The igloo will experience on its opening the same RF radiation density as it did in hell and since this is its only interface with the world, the inside temperature will be the same 1000°C . Base station is hell in this case. The air outside the igloo is -30°C and a polar bear walks around. And, according to the full paper, 1000°C is an understatement.
- How this can be? Two vastly different temperatures? What happened to the thermal equilibrium? --- There is no thermal equilibrium, the radiation temperature is 1000°C , the air temperature is -30°C . All other temperatures are somewhere in between. This is similar to a freezing and sunny day in winter with interior of a greenhouse being nicely warm.

Igloo in Alaska



Now what is the temperature of each DNA molecule of the polar bear?

I think that nobody really knows, it depends how each specific molecule couples into the RF field and how it couples to its surrounding. And 50°C , not 1000°C , is the end of a DNA useful life. The temperatures may differ from molecule to molecule and between regions in one molecule causing damage (I do not know what really happens there)

Conclusion: Known physics does not tag RF radiation as being weak. From the viewpoint above it is tremendously strong. The issue is closely related to the man-made radiation being vastly higher than the natural black body radiation background.