An optical system to study temperature influenced chemical and mechanical changes to the PCD structure

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SAIP 2010: Applied and Industrial Physics
1 October 2010

It is acknowledged that temperature induces damage in the diamond bits due to friction during the drilling process

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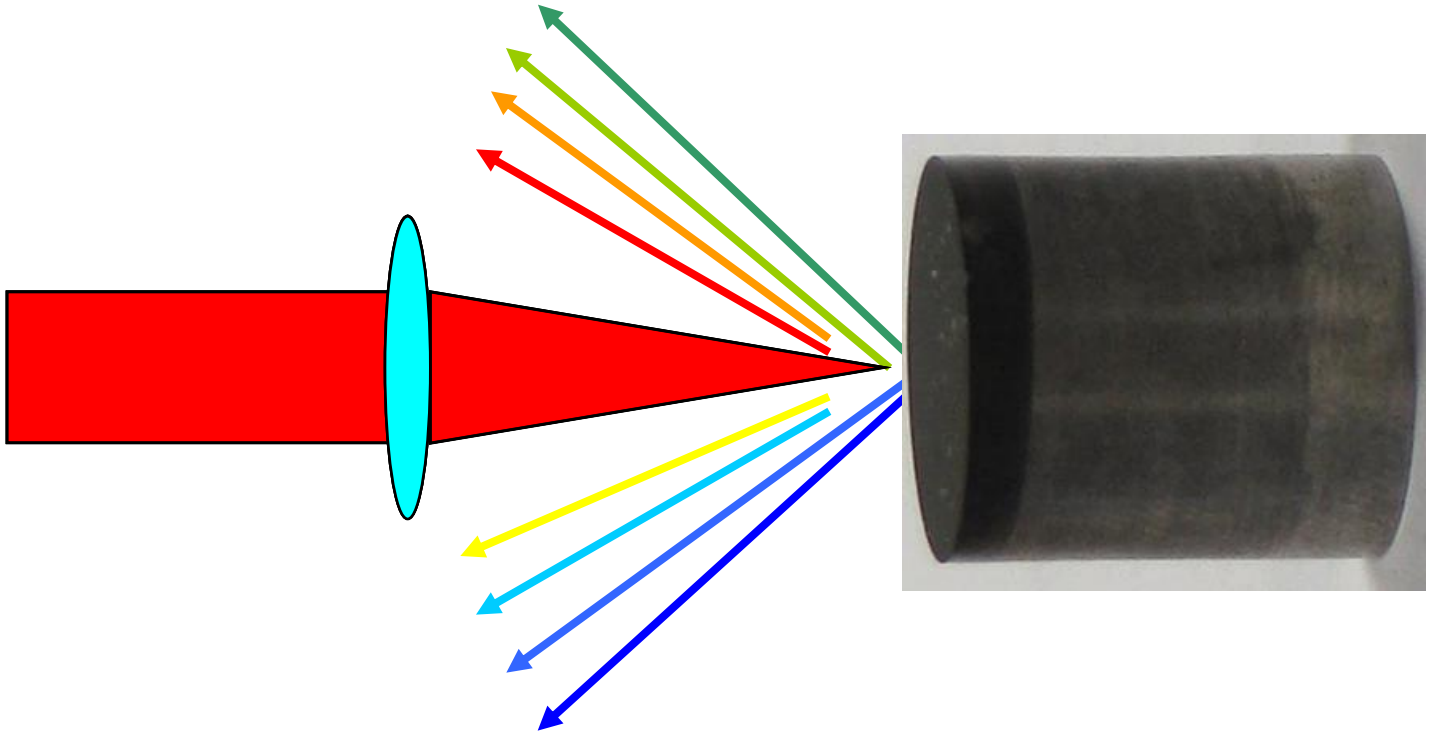
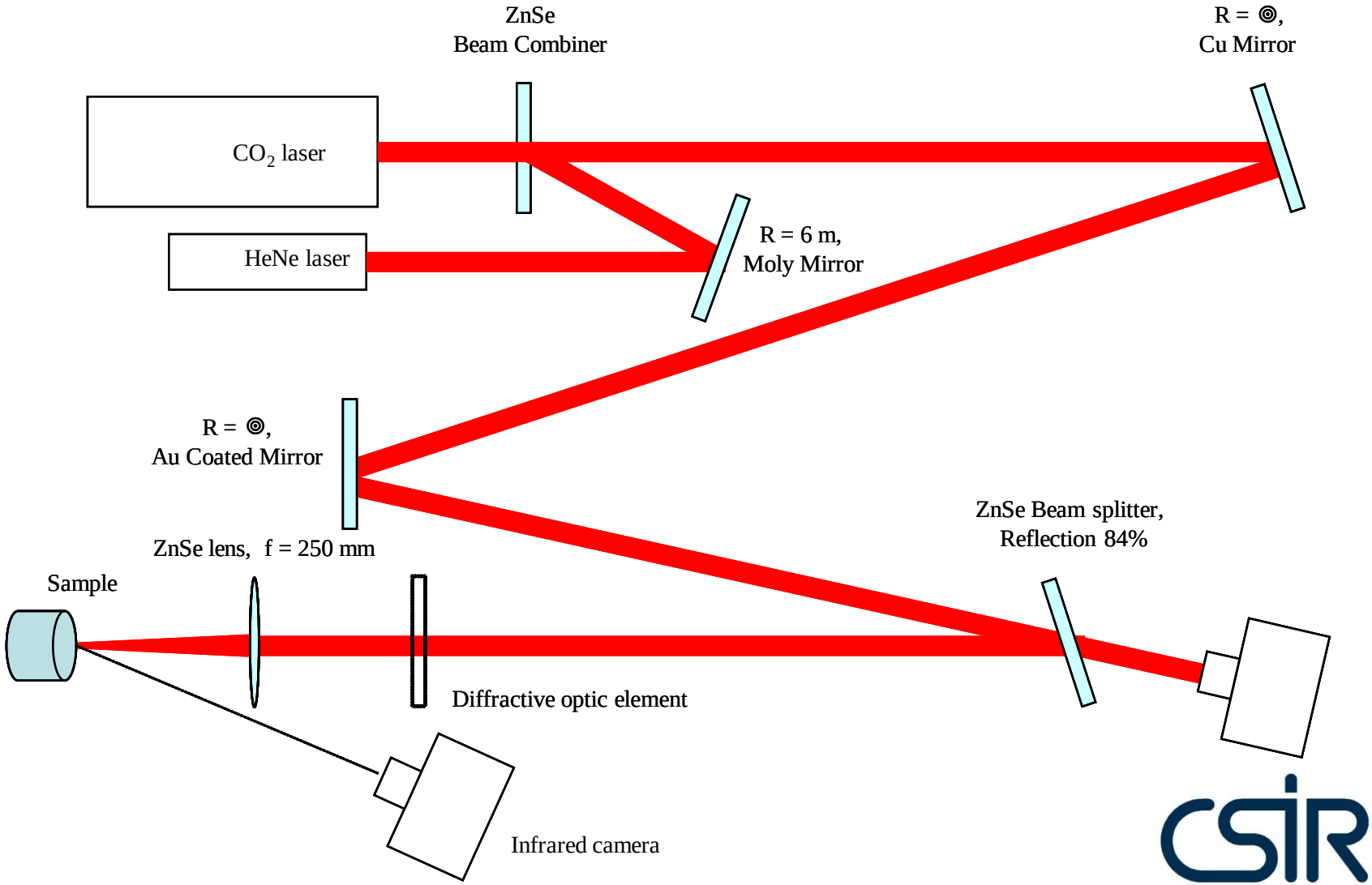
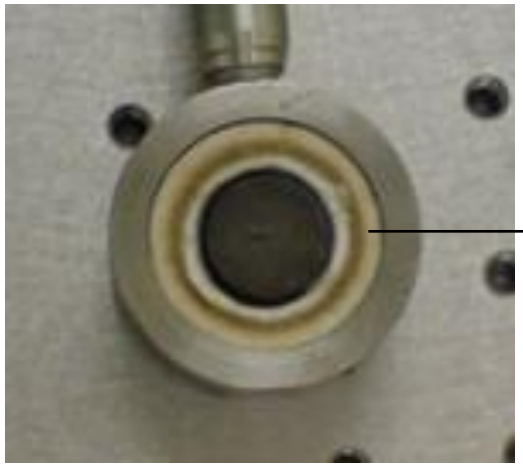
We can raise the temperature of the diamond sample by laser heating it



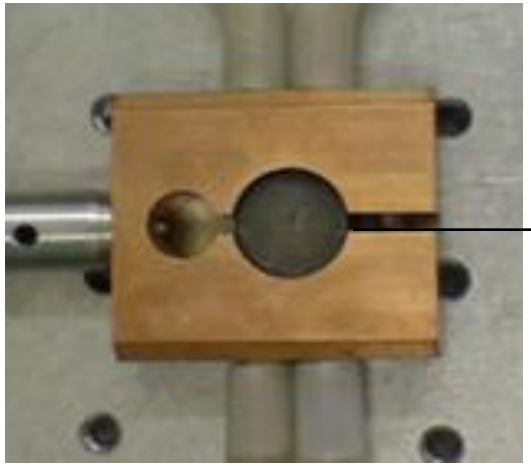
Laser heating of diamond by optical absorption



We can engineer two boundary conditions in our experiment

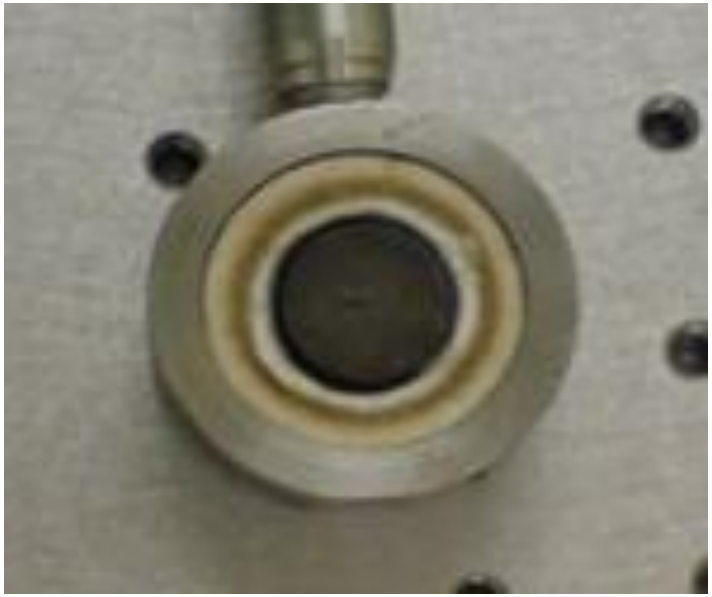


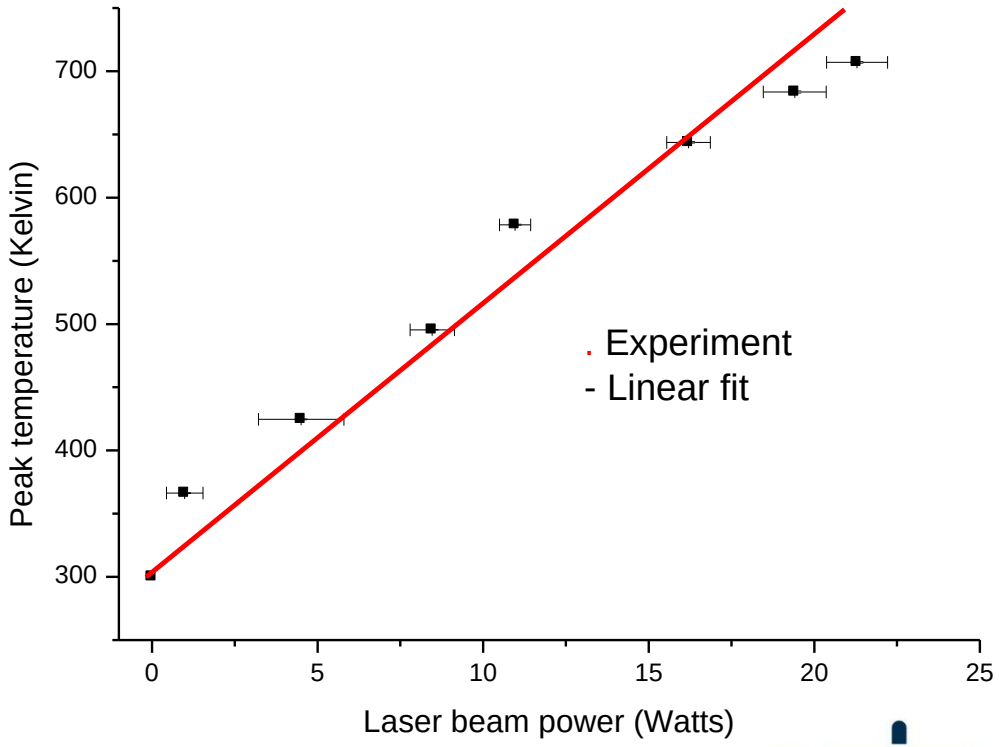
Insulator



Water-cooled

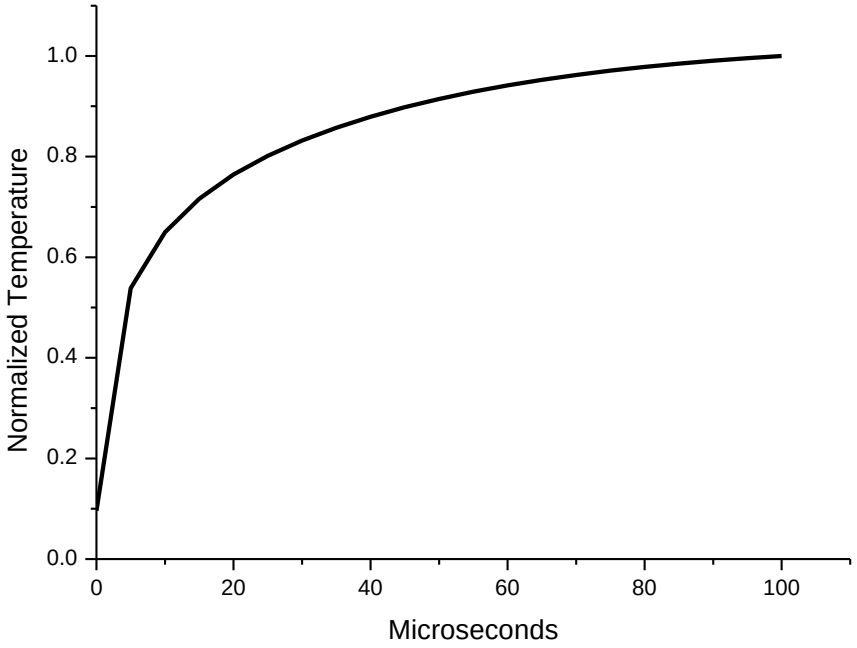
In insulator case, we expect the peak temperature on the sample to increase as the laser power increases





We expect a rapid rise in temperature until steady state

Model prediction



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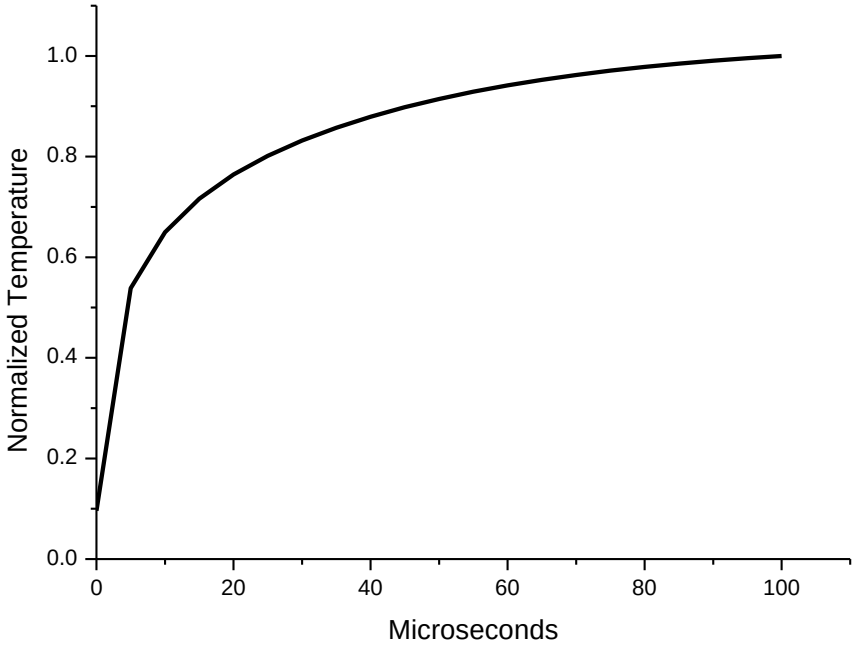
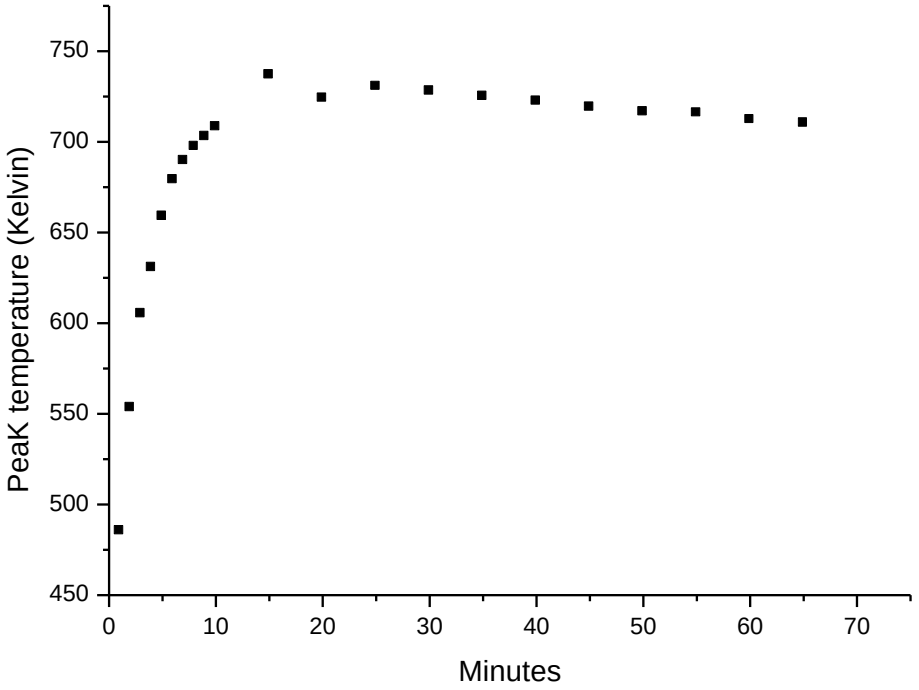
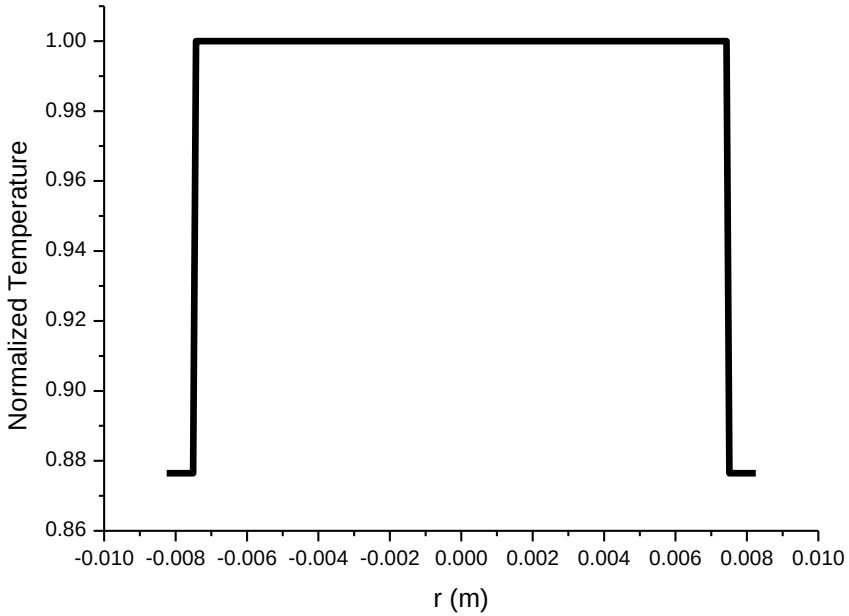


Experimental data



At steady state we predict a uniform temperature profile across the sample

Model prediction



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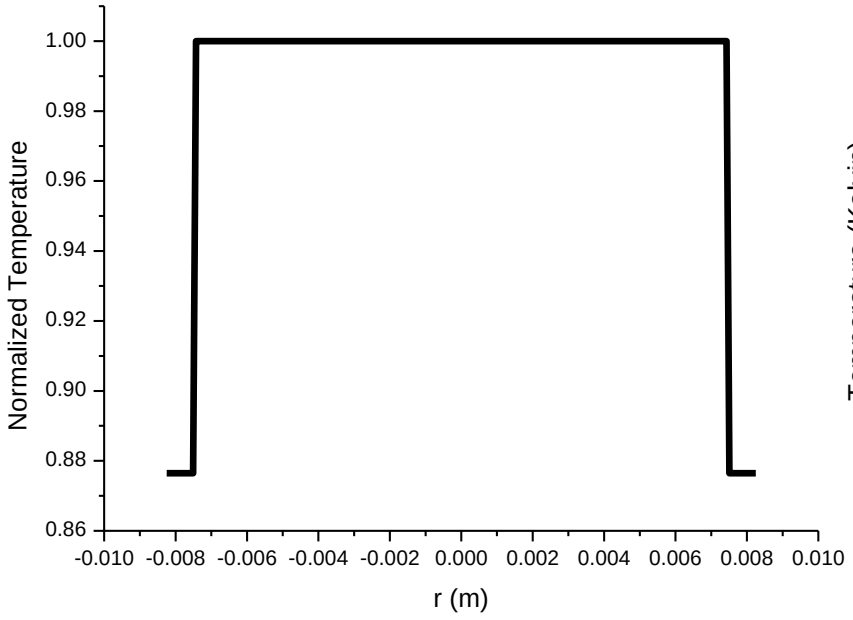
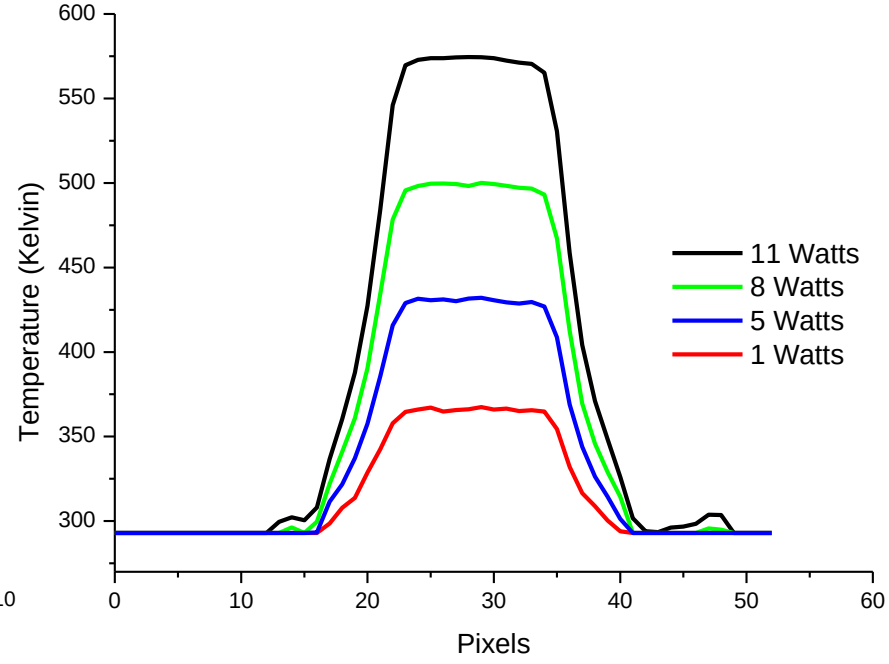


Experimental data



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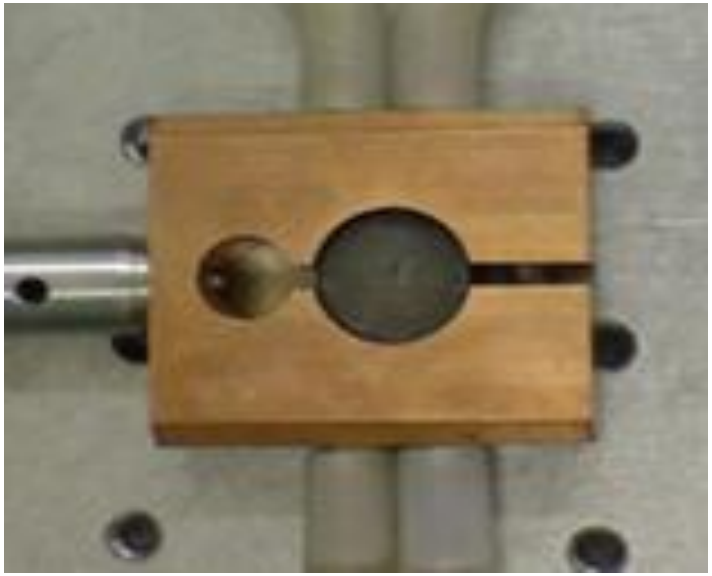

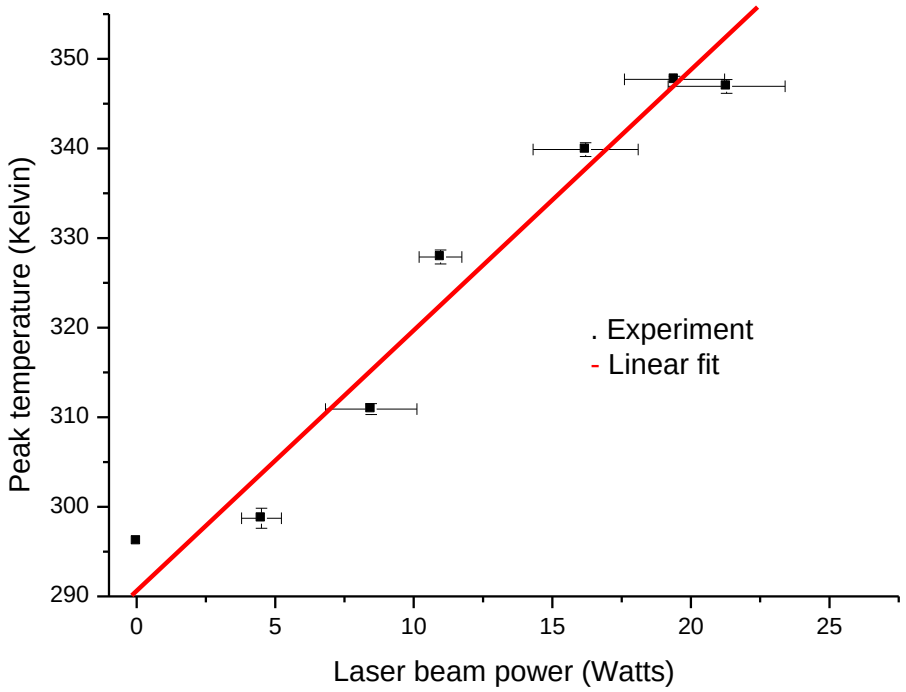

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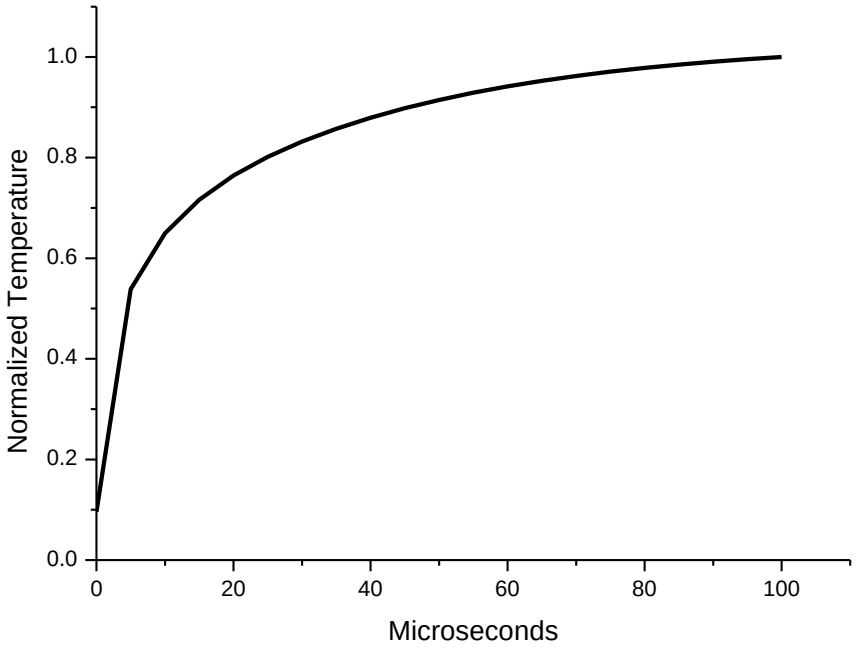

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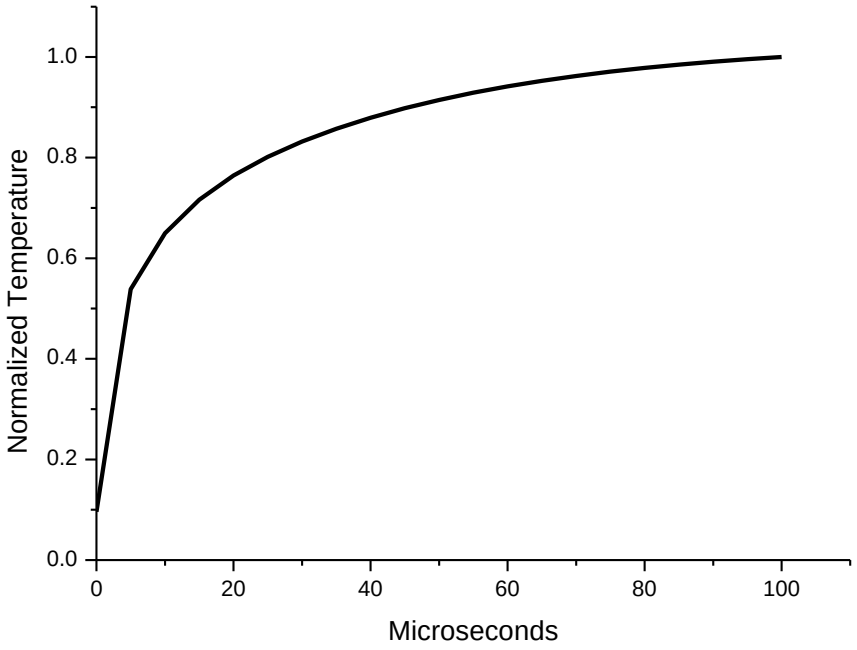
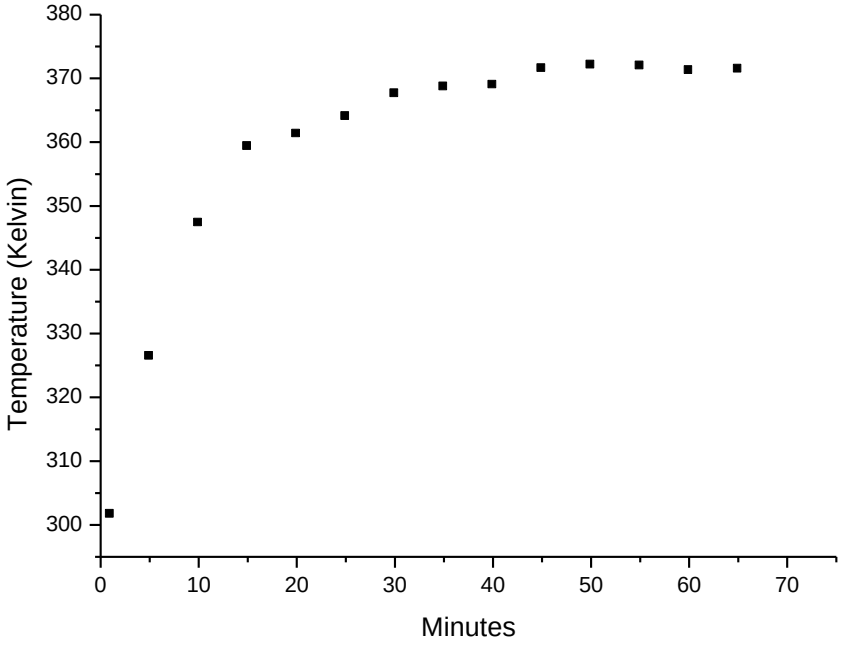
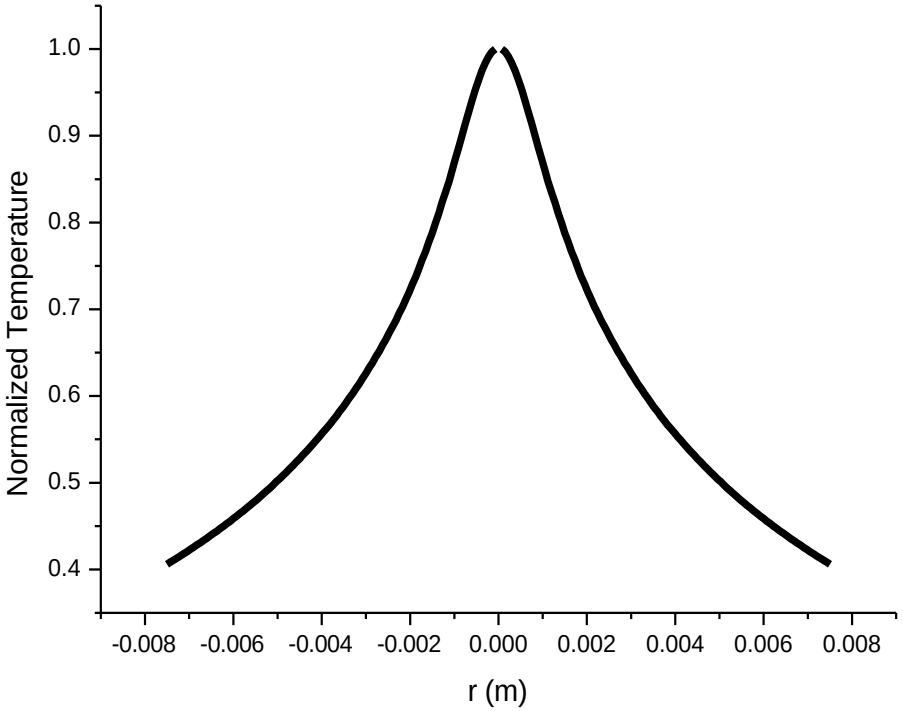


Experimental data



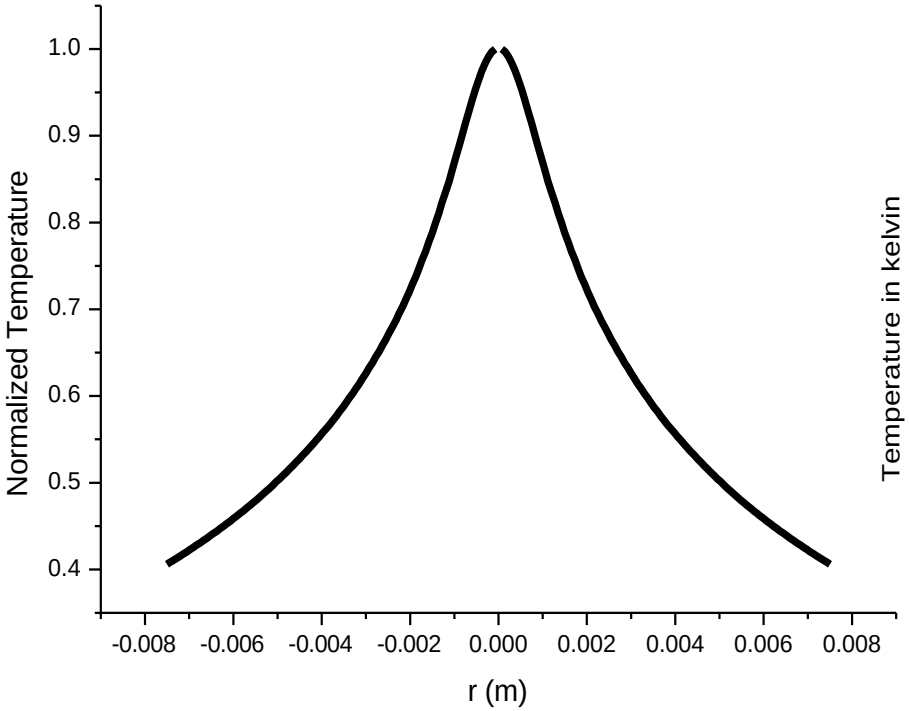
At steady state we predict a gradient temperature profile across the sample

Model prediction

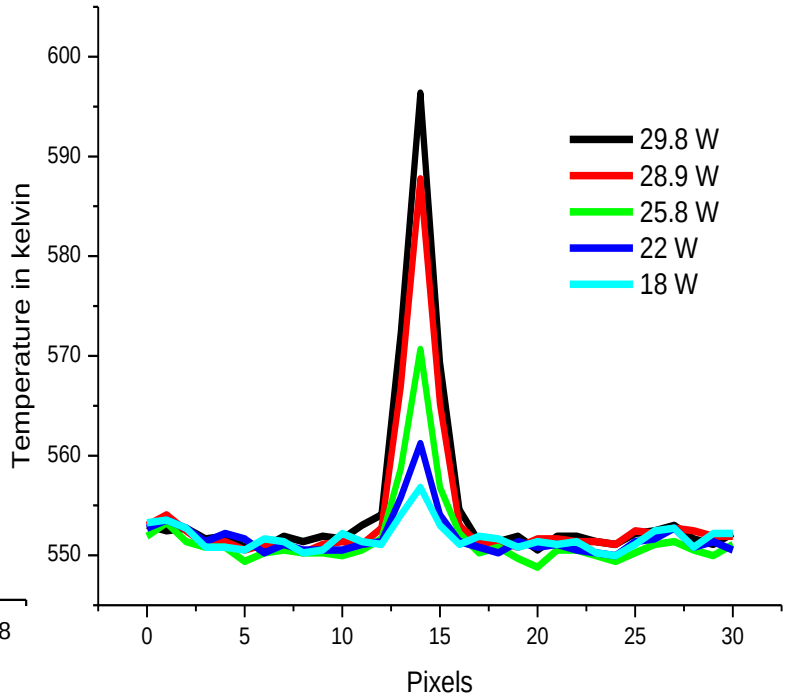


At steady state we predict a gradient temperature profile across the sample

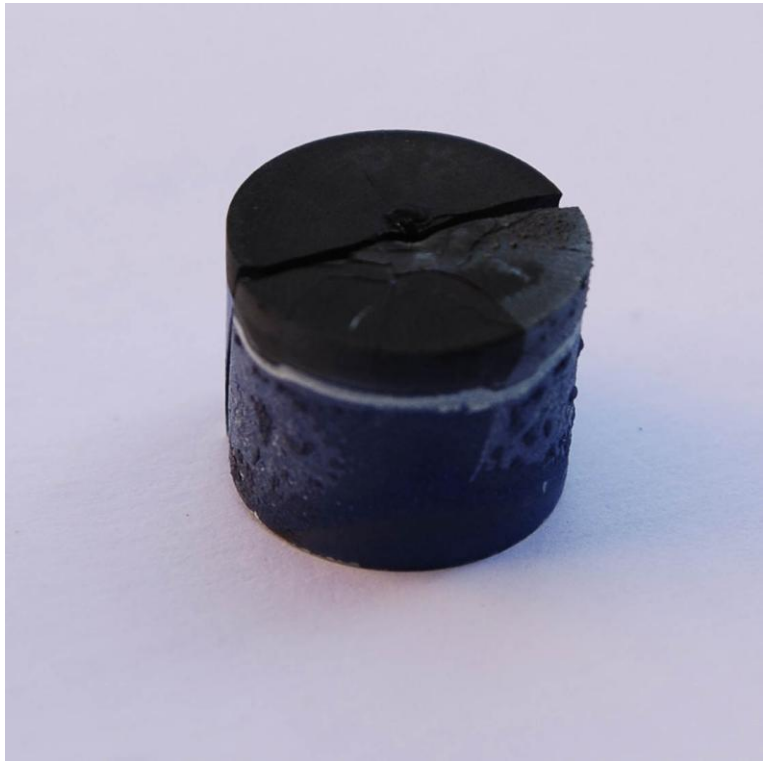
Model prediction



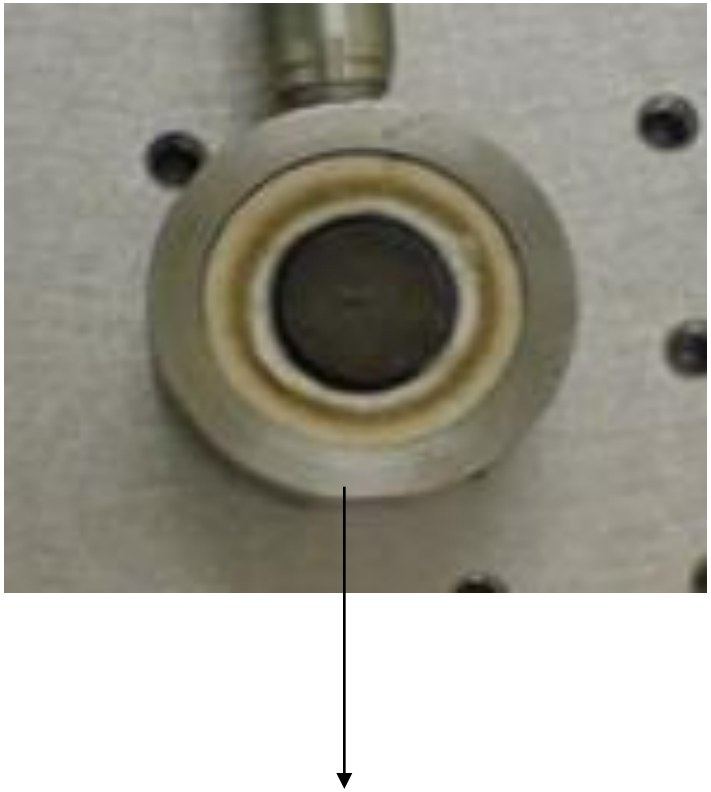
Experimental data

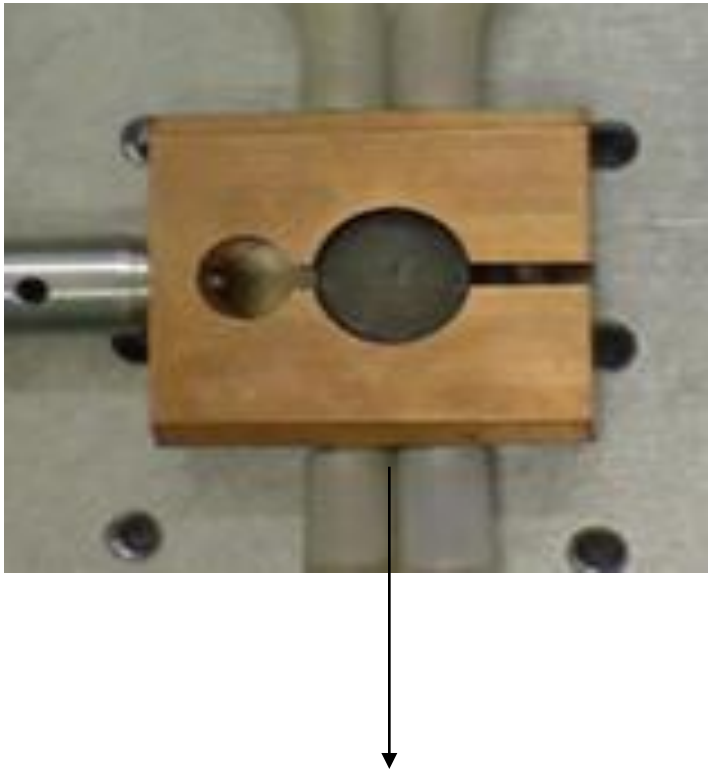


Conclude remarks on the industrial diamond samples



Conclude remarks on the temperature measurements





Uniform temperature profile Gradient temperature profile

Thank You

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