Cooled Ablation

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MatLab simulation
Application of this ablation : medical ablation
Conclusion
Thanks

What is laser ablation ?
Principles of cooled laser ablation

The "Toy model"

One pulse instantaneous temperature rise: $\Delta T \propto E_p$

Material cools at: $\dfrac{1}{\sqrt{1+t/\tau_0}}$

Temperature of the surface encountered by the $(n+1)^{\text{th}}$ pulse:

$$T_n + 1 = T_n + \delta T \text{ with } \delta T = \frac{\Delta T}{\sqrt{1+\tau_R/\tau_0}}$$

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Ablation after m pulses : Proof

$$T_c < T_{material} = T_0 + \Delta T + \frac{\Delta T}{\sqrt{1 + \frac{\tau_R}{\tau_0}}} + \frac{\Delta T}{\sqrt{1 + \frac{\tau_R}{\tau_0}}} + ...$$

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$$\Leftrightarrow T_C = T_0 + \Delta T + (m - 1)\frac{\Delta T}{\sqrt{1 + \frac{\tau_R}{\tau_0}}}$$

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$$\Leftrightarrow T_c = T_0 + \Delta T + (m-1)\delta T$$

$$\Leftrightarrow m - 1 = \frac{T_c - T_0 - \Delta T}{\delta T}$$

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$$\Leftrightarrow m - 1 = \frac{T_c - T_0 - \Delta T}{\delta T}$$

$$\Leftrightarrow \boxed{m = \frac{T_c - T_0 - \Delta T + \delta T}{\delta T}} \tag{1}$$

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Choices of programmation
Results

Why we choose MatLab ?

Positive aspects

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- We use it in others courses at Télécom.

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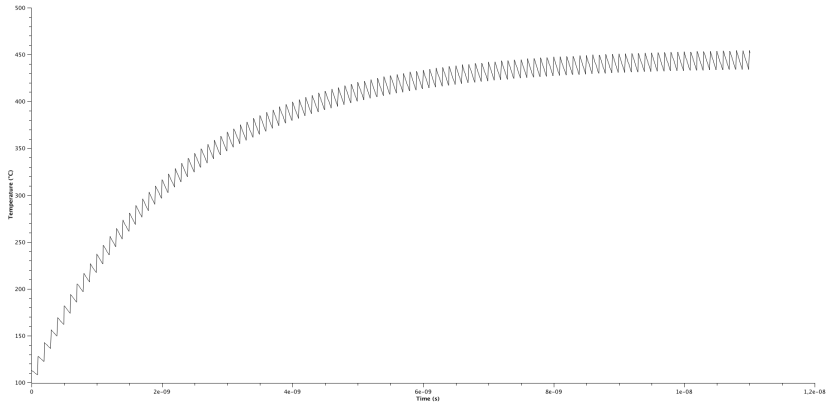**Choices of programmation**
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- It is not a free software.

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Temperature evolution of the impact point

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Thank you for your attention

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