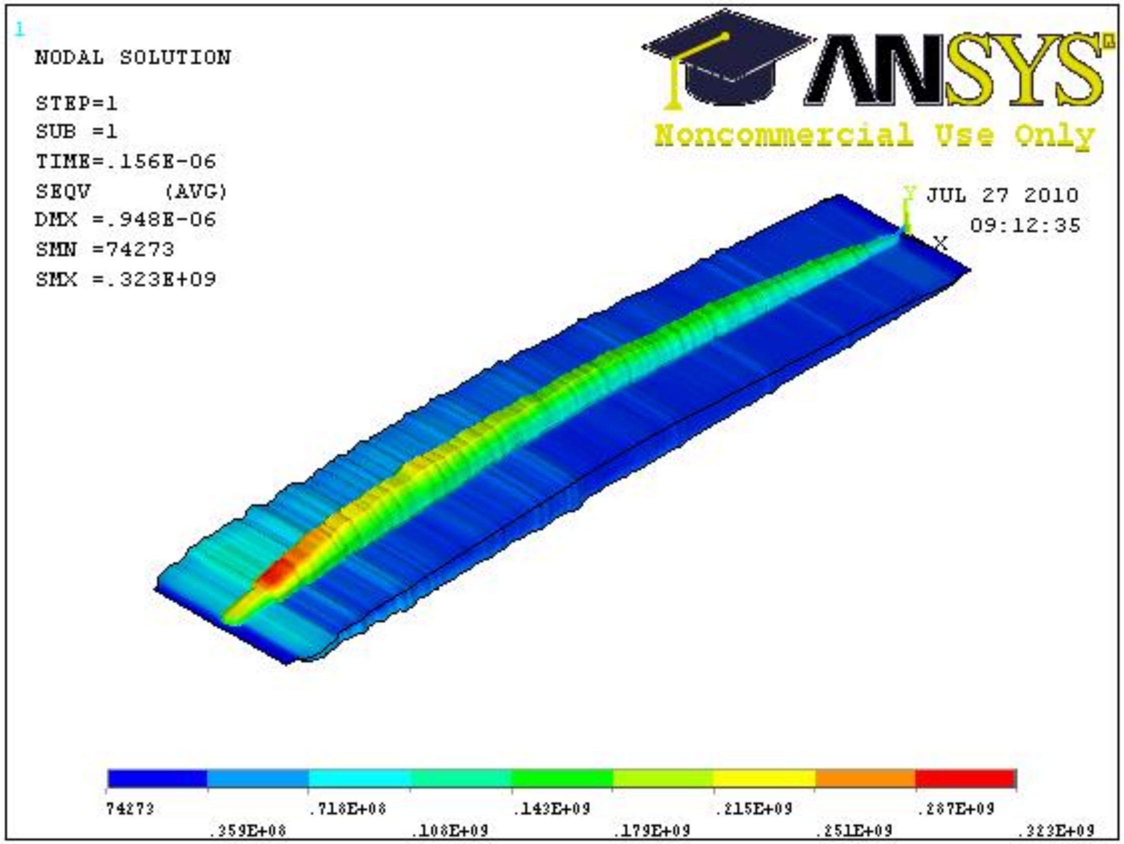
Follow up and current status of the FLUKA+ANSYS studies to a CLIC energy spoiler made out of beryllium

J.L. Fdez-Hernando – ASTeC/Cockcroft Institute (Daresbury Lab.)

13/08/2010



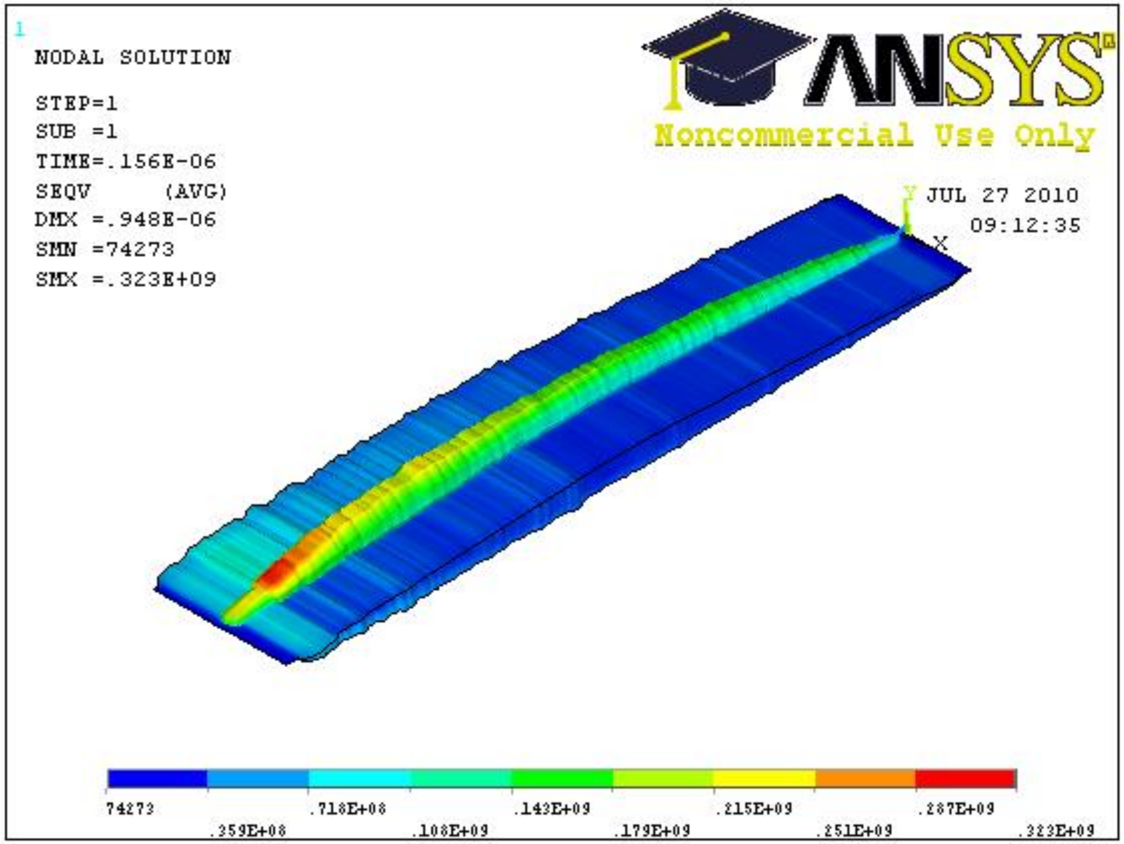
Flat part of 0.05Xo of Beryllium

Max equivalent stress achieved of ~325MPa is compressive and above the Yield Compressive Strength, therefore, it will suffer permanent deformation.

The maximum strain would be of 0.1%

T_{melt} [K]	1560
Y [10^5 MPa]	2.87
α_T [10^{-6} K^{-1}]	11.3
σ_{UTS} [MPa]	370
ΔT_{fr} [K]	228
Yield Tensile Strength [MPa]	240
Yield Compressive Strength [MPa]	270
Specific Heat Capacity [J/g°C]	1.925
Density [g/cm^3]	1.844

We showed at IPAC that for a flat part of 0.01Xo we are just under Yield Compressive Strength



Conclusions:

Both with a flat top of 0.01Xo and a flat top of 0.05Xo the top stress reached was not sufficient to fracture the material, but

For a flat top of 0.05Xo there will be permanent deformation of ~0.1% (in the red area).

How the spoiler is supported is critical. Any rigid points would not absorb the shockwave and the stress could reach fracture levels. Therefore, some sort of support/suspension should be designed, to safely absorb the shockwave in case of accident.

Outlook:

I'm performing more calculations which follow up the shockwave after the 156ns when the beam energy is deposited, to assess whether or not there would be a stress build up from the rebounding shockwaves and how the stresses and temperatures would evolve.