Excerpts from Round Table 2. 25/01-2007 at 16:25

Panel members: Robert Ecoffet, Giovanni Santin & Michel Melotte

Notes by: Ali Mohammadzadeh

Points raised by the panel:

1) Environment Model

May the environment models be modified to account for the fact that ions heavier than Fe have not been detected in space?

2) Four important issues with respect to SEE rate calculation need to be addressed:

- Danger area1: How shall the issue regarding long collection length area is addressed? The agreed upon adopted method shall be implemented in our standards.

- Danger2: SEEs with large contribution from charge generated by other mechanisms than prompt charge. Smaller feature sizes is a problem.

- Danger 3: How many sensitive volumes to take into account for SEL and SET?

- Danger 4: SEUs in complex devices. Transient SEUs (Robert believes that this may be a test issue)

We often make predictions that are never modified, this is an open loop situation. The models were good for 20 years ago but the situation today has changed.

New models need to be simple to use for engineers, a tool with complexity level between Geant4 and CREME is required.

Ana: It is important to understand the physics prior to improving the model. That is the method currently followed in my work, understanding the physics to attempt to develop an improved, simple to use, engineering tool.

Ray: The problem of obtaining more accurate rate calculations is to figure out how we keep from pricing our selves out of existence.

Robert: There are not too many MOS types, it is worth performing more detailed investigation of device parameters. This does not have to be expensive and costly.

Michel: G4 may become very expensive as one may have to use device physics models, Spice , etc.

Andrew, SV may be explored by laser. G4 may be over the top to look at MBUs, the laser may resolve SVs down to microns. But does not give too much information below this. Some times lasers may be useful.

Thierry: It is difficult to define SV for destructive phenomena. For destructive phenomena there is always alternative methods. It is rare that we need to define error rate on such events. Appropriate methods for defining SV for LU is difficult to find today. We employ worst case SV, which is to say only one cell.

Ray: RPP is employed because the cord length distribution is required. Otherwise Monte Carlo methods are required to obtain this information. **Question**: To what extent do we need accurate rate calculations and when is this accuracy not required?

Ana: Each cell has a different configuration. A prediction tool will always give an approximation.

Robert: We set unnecessary LET requirements, and then we overestimate the rates. **Question**: Is the community happy with this? May we improve on this? Would testing at a maximum LET of 60 be OK? Is it acceptable to remove heavier ions from the particle spectra? Shall we do something simple and cheap?

Andrew: The current LET values are too lax for some cases and too harsh for other cases. That is why the current LET specifications is a poor method.

Ray: There is never going to be one size fits all. Something that works for a research satellite is going to be different from the requirement for a manned spaced programme. We need a degree of flexibility in the methodology but also in terms of the customers.

Giovanni: Proposes different requirement classifications.

Ray: If we harden to 60 could we get a better performance by hardening to 37?

Renaud: **Question**: If we do not consider the LET as important parameter then what is the output?

Robert: My personal feeling is that it is not necessary to impose and LET higher than 60 (because this is 30 tilted by 60 degrees). Subsequently, we may significantly improve rate predictions by employing clever methods to define the SV.

Thierry: I agree with Robert what is the limit for HI testing? The range of the ion is very important to define. What shall be the requirement for the minimum HI range.

Ray: We are confronting the same issues. We also see the same problems in the reliability field. The Radiation community is more proactive in confronting these problems. Ken LaBel is performing a qualification activity next week. If a part does not meet the LET requirement, shall it de discarded or may one emply mitigation techniques? Do we look at the performance of the part alone or as part of an entire system?

Ralf: This is an issue about who the customer is. If a customer has experts, they may be willing to accept mitigation at system level. Then we may have the other type of customer that may not accept this approach. It is already clear that we probably can not get around this problem in a simple manner but take a differentiated approach. Simply saying, just reduce the LET requirement may be a too simplified manner. I would be worried that to limit the test coverage may cause problems later on. This is also not a satisfactory answer which may lead to harmful affects. We need to work on improving our knowledge. If we already have the knowledge we should make use of it otherwise we should acquire the knowledge. We require a new approach.

Ray: In the past, people tended to be dissatisfied with yes and no answers. If one specify a LET requirement such as 70 or 100 one may also specify the cots associated with each of the requirements. An uneducated customer will understand this.

Giovanni: Do we know how much this will cost?

Renaud: There are several cost items associated to the above. Complying to the current specification means: go to Ganil then go to another accelerator to cover low LETs. In case of deviation with requirements, there are costs associated with recalculation and request for deviation etc.

Renaud: **Question**: What is the additional risk of changing the LET from 100 to 60? I am ready to move on this. Not every body agrees, but if I was not convinced I would not move from 100 to 60.

Thierry: **Question**: Is some one else ready to move the LET value to 60?

Ray: Let us ask the customers.

Renaud: **Question**: What do NASA, ESA, CNES think about this.

Ray: There is almost always an adversarial conflict between customer and contractor even within NASA.

Renaud: If the community believes that the LET shall be reduced then this is first step and then we have to convince the customer.

Andrew: I agree that there is a small risk in reducing to 60, however, I also agree with Ralf that we need to be careful. One could find a scenario in the future where some parts would need to be tested for higher LETs however, it would be difficult to change the requirements from low to high LETs (if the A/Z would be 100).

Renaud: When I started at Astrium the requirement was 140, we have subsequently reduced this.

Reno: The problem is we can not have one requirement for all component types. We need to treat different components in different ways. Thus, applying different requirements to different components. Secondly: There are other issues to be considered: there is pressure, there is not enough test time, the results may be accepted or in fact the closer one gets to the launch date every thing will be accepted. Testing is a convenience - nothing else. Concerning the testing, modern devices take two years to test. By the time testing is complete the component is obsolete. We need to find a simpler and faster test method. We need to classify components in groups. **Suggestion**: To ensure positive results from these discussions a small working group needs to be created.

Giovanni: **Question**: Who will use the tool that is being developed at Vanderbilt University?

Ray: The research plan is: Vanderbilt has worked with G4 and interfaces. Making a tool that is faithful to the physics. This is not going to be the standard used in the community as one usually not have enough information to perform calculations and it also takes a long time to do the calculations. The plan is to use this to improve the models with better physics fidelity employed to upgrade CREME96 models. It is not going to be called CREME as this is trademarked.

Giovanni: ESA is also planning to implement such a tool is Spenvis. However, it will not be as complex as the Vanderbilt version.

Ray: Let me know if you find an idiot proof model.

Ana: In some months I will have a tool that may be working and provide some more insight.

END.

Conclusion by Reno:

Overall it is a very complex issue. The basic approach has been validated and has been used successful. The overall approach is not wrong. However, may we slightly relax the requirements? There is currently no straight forward approach to achieving this. How can we go ahead with a new approach? How can we find a way forward? We need to follow a technology classification type method, and then how do we address the LET issue? Based on these discussions and inputs – I can suggest we form a working group who should try to identify a way forward?

Ralf: This should be addressed by the RWG. This, shall also be addressed in the RHA document.

Reno is willing to take the task to contact the volunteers and get the working group officially going.