Microchip-Nantes:
A Manufacturer's Perspective

From Space Hermetic Products to the New Space Era

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A Journey in the Use of EEE COTS Components in Space
ACCEDE-ESCCON pre-activity, March 24th, 2025

Back to 2010-2015…what was the trend?

Microchip-Nantes, formerly known as Atmel and previously as MHS, has a strong flight heritage with “space certified components”… During this period 2010-2015, we observed a shift in the space market needs:

- The demand for ASICs, especially designed for one customer/application, is decreasing in favor of standard products

- Then, traditional hermetic QML-V/ESCC QPL standard products are sometimes considered too expensive and unnecessary for certain projects.

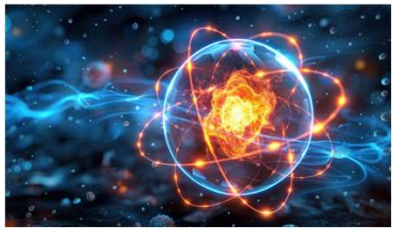
- It appears that our long-standing customers, like new space players, are seeking low-cost components within a larger and performing commercial portfolio… COTS!

Our main questions were…

When our customers choose COTS option,

- How can they ensure radiation tolerance?
- How can they access reliability data?
- How do they accept the lack of traceability?
- How do they manage an absence of screening, relying only on quality based on SPC?
- How do they handle the lack of obsolescence management and change traceability?
- How do they accept a multi-site manufacturing flow?....

…And, our answers



- *How can they ensure radiation tolerance?*

→ Testing for radiation tolerance is challenging and time-consuming.

- *How can they access reliability data?*

→ Accessing these data is also generally difficult, as it is typically limited to some high-volume Automotive PPAP customers.

- *How do they accept the lack of traceability?*

→ It seems they rely on the trace code as a reference. However, they may not be aware that a single trace code does not always correspond to one specific wafer lot.

… And, our answers

- *How do they manage an absence of screening, relying only on quality based on SPC?*

→ SPC are sensitive data, they do not have access to in-process control data

- *How do they handle the lack of obsolescence management and change traceability?*

→ They maintain stock of thousands of parts with the same trace code

- *How do they accept a multi-site manufacturing flow?*

→ They probably consider it to have no impact

Finally, we addressed the most critical question

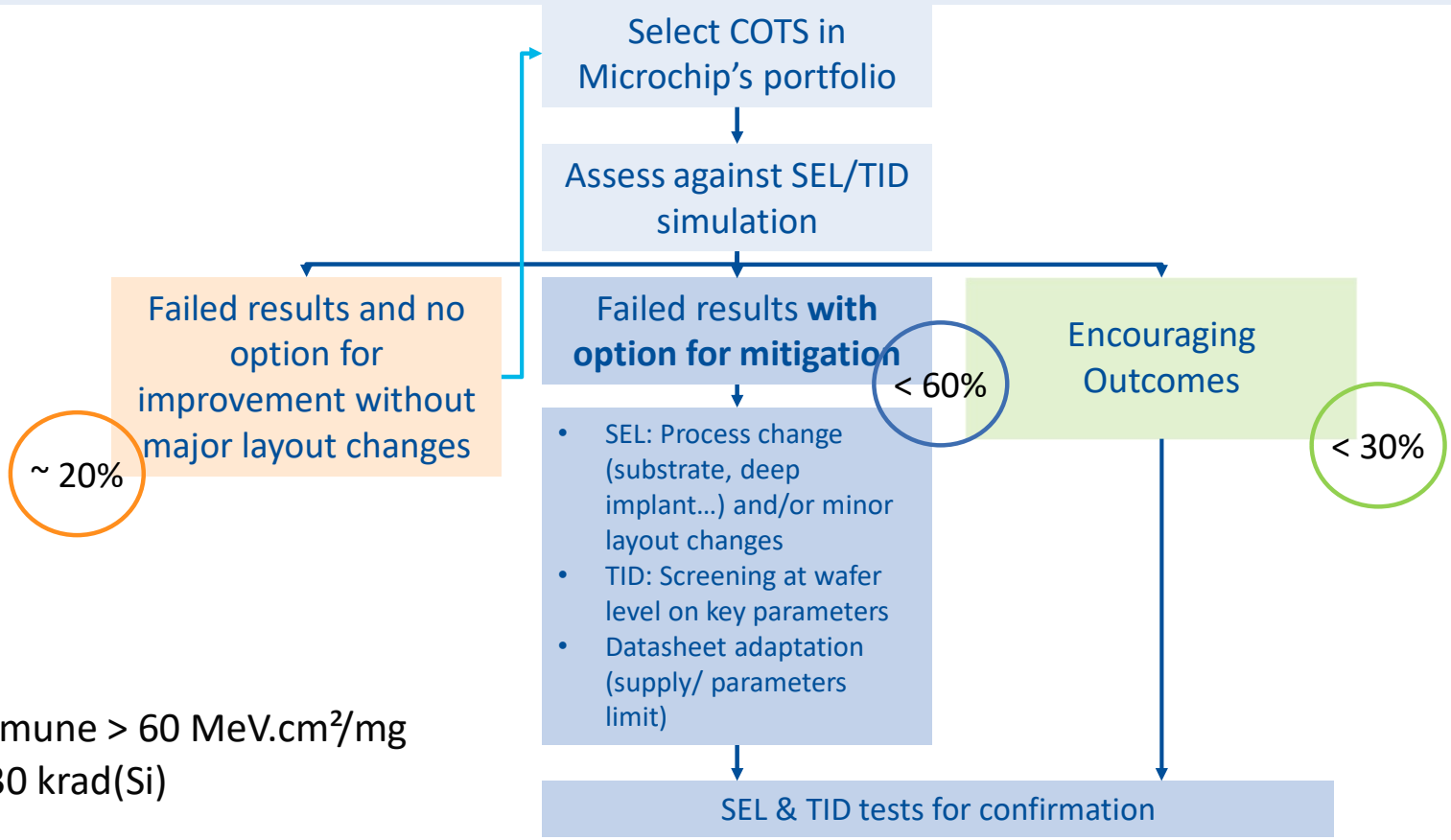
Is there a market between certified space components and COTS?

Our answer was “yes”, if we can:

- Select products from Microchip COTS portfolio and enhance their radiation tolerance to an acceptable level.
- Propose a new screening and qualification process extending the temperature range to [-55°C to 125°C], ensuring traceability, to address the COTS weaknesses
- Propose a price that aligns with our customers’ final price: considering not only the COTS price but also the cost of their ownership (stock/storage, radiation tests, reliability estimation…)

We will name it
HP, “Hirel Plastic”

Challenge #1 - COTS selection



Our target

1. SEL immune > 60 MeV.cm²/mg
2. TID > 30 krad(Si)

Challenge #2 – Creation of a “new HP quality level”

What standards can we rely on to build our enhanced proposal??

Challenge #2 – Creation of a “new HP quality level”

What are the COTS weaknesses that HP could address?
… In Controls and management

	Policy and Controls	Supply chain	Product availability	Change/ Obsolescence	Production control	Customer support	Minimum order quantity
COTS	--	Multiple wafer fab, assy lines…	unknown	Not mandatory	It depends…	< usual support for traditional space components	High
-HP “New” space projects	Managed by ADG TRB.	Single controlled manufacturing Baseline.	Extended product availability (15+ years)	TRB management - Extended PCN program	Extended process monitors - TRB management	Dedicated support from ADG-Nantes	< 100#

Challenge #2 – Creation of a “new HP quality level”

What are the COTS weaknesses that HP could address?

… Traceability and Documentation

	Traceability	Documentation available for each product
COTS	A trace code which does not guarantee a single wafer lot.	Data sheet - Difficult to access to PPAP/reliability data
-HP “New” space projects	Wafer lot/Trace code - With a single wafer lot per trace code	Procurement specification - Qualification report - Radiation report

Challenge #2 – Creation of a “new HP quality level”

What are the COTS weaknesses that HP could address?

… An extended qualification and characterization addressing space constraints

	Reliability and environmental Extended tests	Radiation	Molding characterization		Extended temperature range	Packaging controls
COTS	--	--	Difficult to obtain data	--	various	Depends on Assy lines In-process controls
-HP “New” space projects	Life test up to 4000 hrs/125°C HAST 130°C/85% RH, 2*96 hrs Thermal cycling 55/125°C, up to 1500 cyc	TID/SEL qual SEU characterization ELDRS evaluation, when needed	Molding Reference, Tg… documented in Qual report	Outgassing test results available in Qual report	Target is -55/125°C -- 100% electrical testing	DPA -- Each assy lot: bond pull/ball shear/solderability tests

Challenge #3 – HP price versus COTS

How can we optimize our costs, given the constraint of low space volumes?

- Use the same Bill Of Materials as COTS version

  There is no need to purchase large quantities of lead-frames/substrates, thereby avoiding the need to amortize these costs over low production volumes

- Use the same assembly line as COTS version

  There is no need to manage specific reliability monitor, as we can rely on the existing assembly lines monitor reports.

This implies that we consider using pure tin lead finish products, when implementing a post-plate annealing process for 1 hour at 150°C.

Our HP, an alternative to COTS?

The 1st "significant" project which comforts us in our new offer was, in the years 2015

And today …

After a decade of development/improvement, we are able to affirmatively answer our most critical question:

"Is there a market between certified space components and COTS???"

Thank You!

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