Halogen-free laminates for PCBs

Status

1. Remind - Legal requirements
2. Available laminates
3. Suppliers of PCBs
4. Mechanical properties
5. Fire behaviour
6. Experience in industry
7. Experience at CERN
8. Conclusion
9. Going further ??

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1- Remind - Legal requirements :

- at CERN Safety Instruction No 41
  http://edms.cern.ch/file/335806/LAST_RELEASED/IS41_E.pdf

  Halogenated materials, hence **FR-4** are (should be) **banned !**

- in Europe still no law,
  but a proposed directive
  + “pollueur-payeur” principle

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2- Available laminates : FR-4 type :

- **HITACHI** MCL-RO-67G
- **ISOLA** Duraver E-CU 156
- **PARK-NELCO** N4000-2 EF
- **+ POLYCLAD** PCL-HF-541, -571
- **+ MATSUSHITA** R1566
- **TOSHIBA** TLD-152

+ polyimides + Isoval (FR5) + Permaglass (CEM3) …

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3- Circuit-makers claiming to use 0-hal :

- Adv. Mat. Co, ITEQ Corp. (USA)
- **AC+, CEM, SOS électr., TECHCI R-A (F)**
- **AIK Laminate (De), AT&S (A)**
- **Elektrotryck AG (S)**
- **MAS (It + Be)** (= Matsushita Avionic Systems ?)
- **Park-Nelco-Dielectra, Scotland El (UK)**
- **SPS (Bulgaria)**
- Taconic Int., Leaf Techno (Ireland)
- Sony, Toshiba, Hitachi (Jp)

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4- Suppliers announce good electrical and mechanical properties (similar to FR-4).

- Only Cu adhesion might be weaker.

5- Results of fire tests are satisfactory

- Laminates are also rated V-0
- Lower production of smoke
- Smoke is less corrosive and less toxic

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6- Experience in industry :

- Portable Computers by Toshiba, Sony, HP…
- Portable phones by Nokia (Hitachi), Erickson and Motorola

As one can see, this is limited to ‘high turn-over’ applications, i.e. ‘short-duration’ devices.

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7- Experience with FR-4 at CERN :

The TS-DEM (former EST-DEM) Group has produced about a dozen prototypes for CERN clients.

They use mainly the Park-NELCO and the ISOLA, (as well as onece the HITACHI) materials

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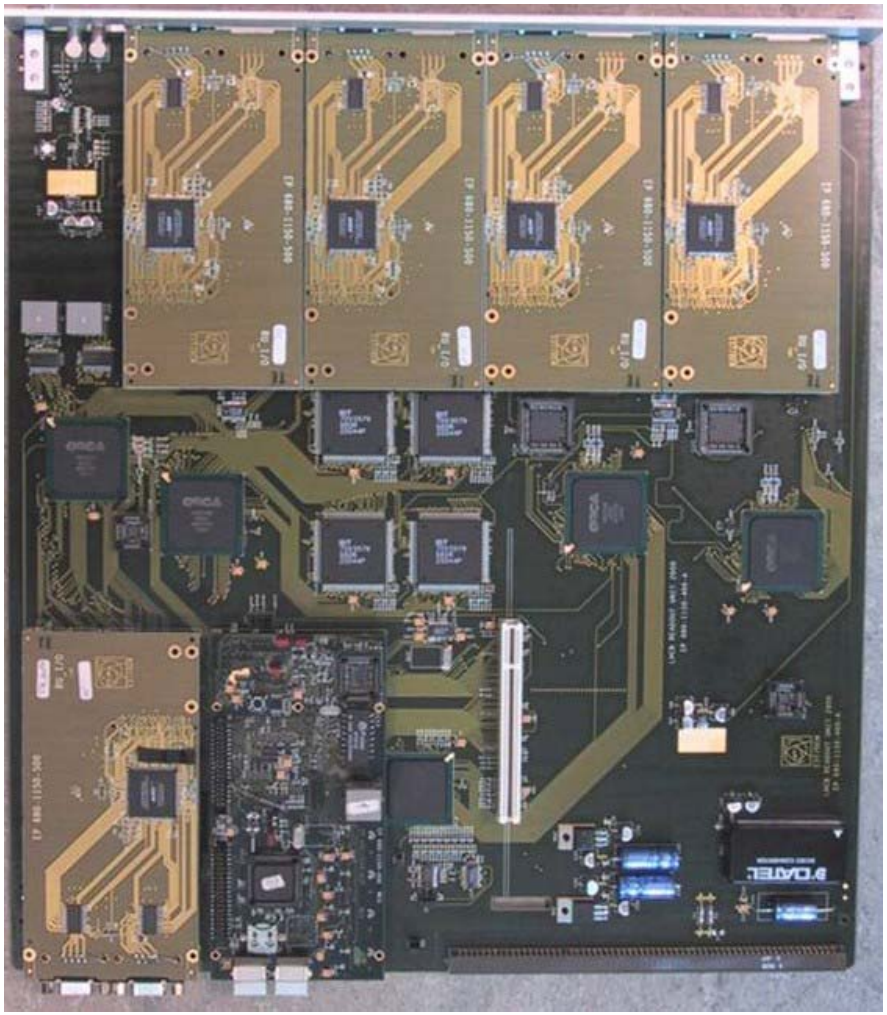
Example:

9U module (8-layer, 37x40cm)
made by Electrotryck (Sw)
with the R-1566 halogen-free
laminate from Matsushita (NAIS)
for LHCb
HV, HF, discreet, logic…



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8- Conclusions :

- Benefit for the environment
- Lower disposal price (taxes)
- Better fire behaviour
- Good electrical (incl. HF) behaviour
- Prototypes are OK, but ageing (?)
- Still problems of availability ?
- Slight higher price (from + 3% to x 2)

Questionnaire / use of 0-hal. PCBs

9- Questionnaire sent to experiment and machine representatives :

- Have you envisage to use halogen-free laminates ?
- Did you have problems to identify the available materials ?
- Have you try to order halogen-free material(s), from whom ?
- Did you have problems to get samples ? … industrial quantities ?
- Did you face problems of time delay, price, other... ?
- Have you made prototypes, of what type(s) ?
- Have you tested the prototypes - what tests ?
- Did you find problems/faults - of what type ?
- Do you envisage to go further with the new material(s) ?
- Any other comment ?