ATLAS-J Silicon subgroup 報告

Y. Unno

KEK

representing ATLAS-J Silicon collaboration

- **Milestones 2000**
- **Module FDR/PRR**
- **Production schedule**

Milestones 2000

- **Hybrid Decision in May**

  Cu/Polyimide design proposed by KEK

- **Hybrid Design Review in June**

  60 k4 hybrids for "Module-0" programme

- **Detector PRR in August**

  - after preseries production

  Hamamatsu GO

  Sintef, CiS pending

- **Detector PRR follow-up in October**

  Sintef -> Hamamatsu

  CiS GO

Milestones 2000 - cont'd

- **ASIC pre-production (ABCD3T)**

  Lot1 - July -> proto-"Module-0"

  Lot2 - Nov. (corner run)

  Lot3 - Jan./Feb.

Radiation damage to ABCD3T found in Oct. and other irradiation

- **Higher Vdd (digital power supply)**

  PMOS-NMOS imbalance during annealing

  - under accelerated annealing

- **TrimRange setting**

  Threshold uniformity - 4 ranges

  After irradiation, range stuck at "0"

  - traced back to the (dummy) "latch" circuitry copied from other DAC circuitry (which was OK under clocking)

  - under modification to skip the "latch" by shortening the metal traces, in the Jan./Feb. lot

Cu/Polyimide hybrids

- **Technologies**

“Wrap-around” one-piece construction

Four layers, surface layers “meshed”

“Build-up” and “Through-hole” technologies

Build-up: 150 um “via”

- finer pitch traces, design flexibility

(Through-hole: 300 um “hole”)

High-thermal conductivity Carbon substrate

- Carbon-carbon: 700W/m/K (fibre direction)

ATLAS Module 99/ABCD flex

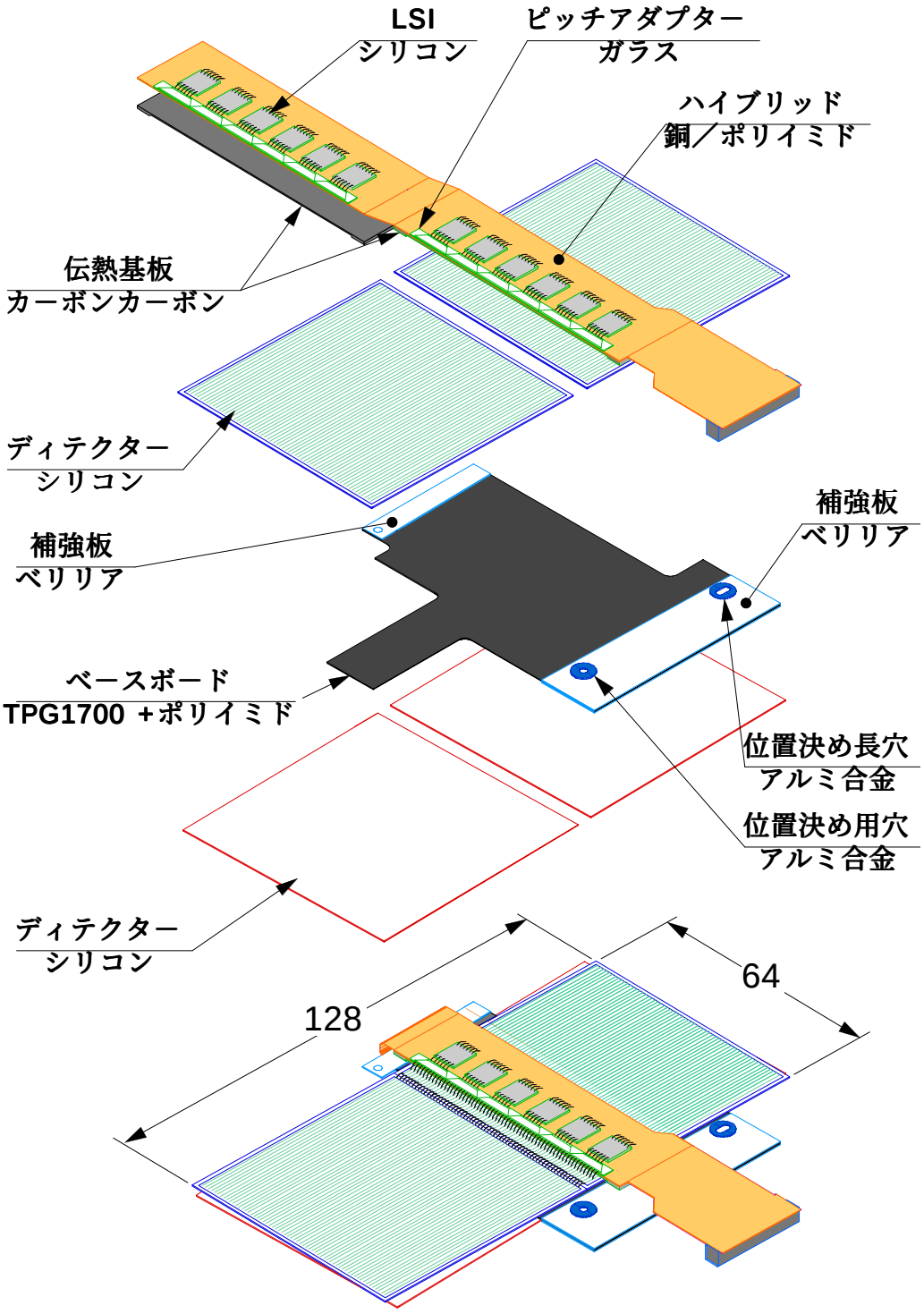
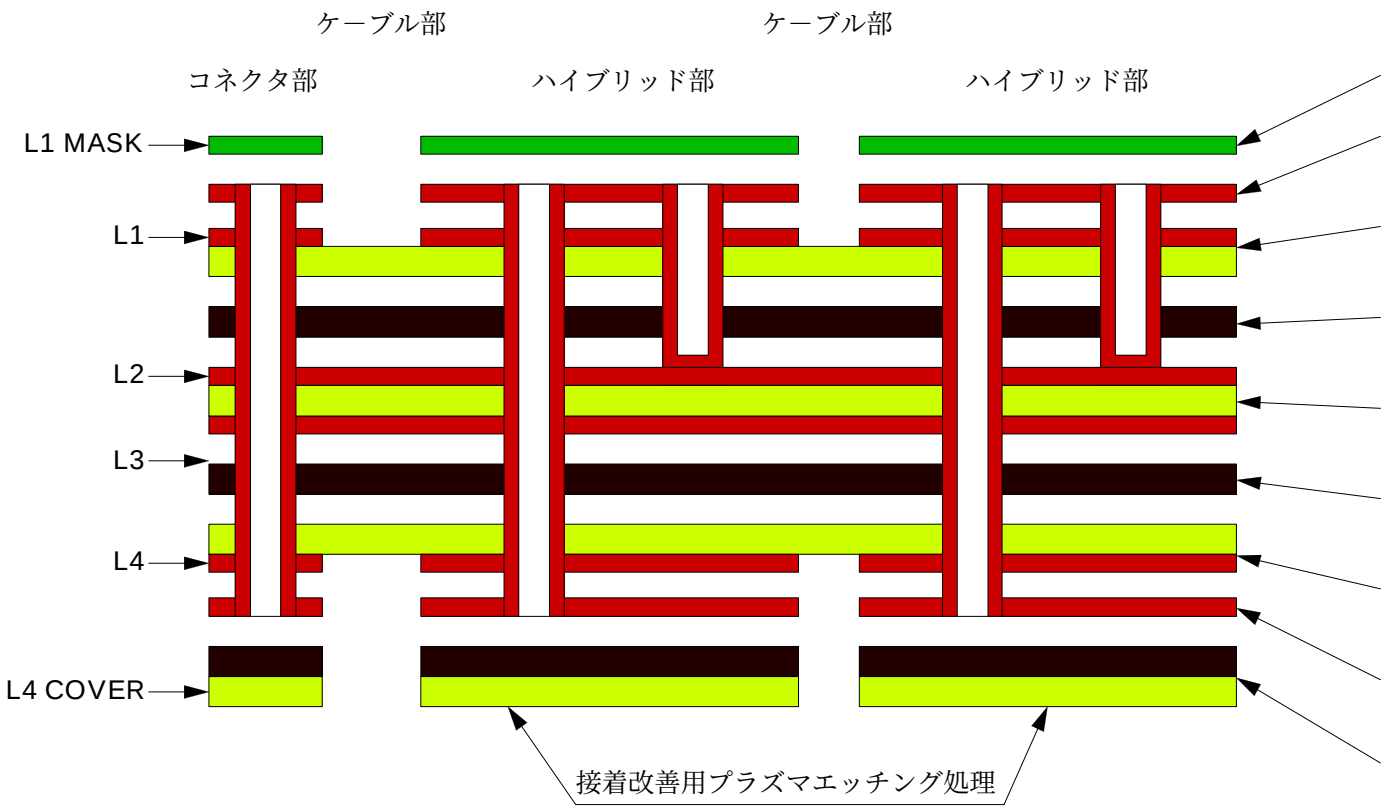


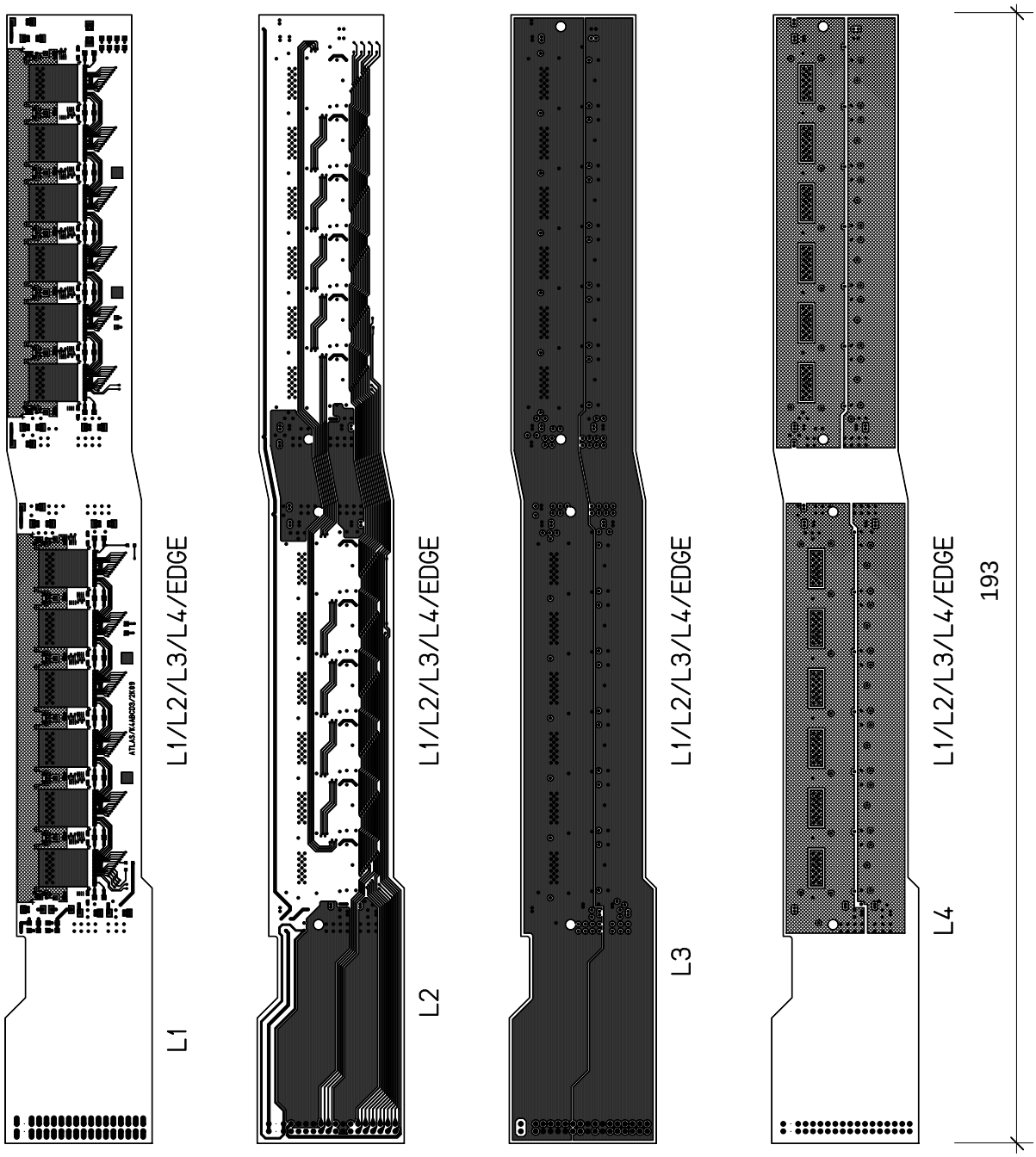
図１　モジュール概観図



材料名	厚み（ミクロン）
フォトソルダーレジスト	20
スルーホールメッキ	20(15?)
ポリイミド片面銅張板 1/3oz 1 mil. 無接着タイプ	37
接着剤	25
ポリイミド両面銅張板 1/3oz 1 mil. 1/3oz 無接着タイプ	49
接着剤	25
ポリイミド片面銅張板 1/3oz 1 mil. 無接着タイプ	37
スルーホールメッキ	20(15?)
ポリイミドカバーフィルム 1/2 mil.　接着剤33ミクロン	46
合計　回路部 ケーブル部	279 149
表面処理 アルミワイヤーボンディング用無電解金メッキ ・金メッキ　0.2～0.3ミクロン ・下地Niメッキ　3ミクロン以下	

図3　ATLAS/K4ABCD3/2K09　フレキシブル多層基板層構成図

20000714



Layer Layouts of the Cu/Polyimide Flex Circuit Version 4

図４　レイアウト

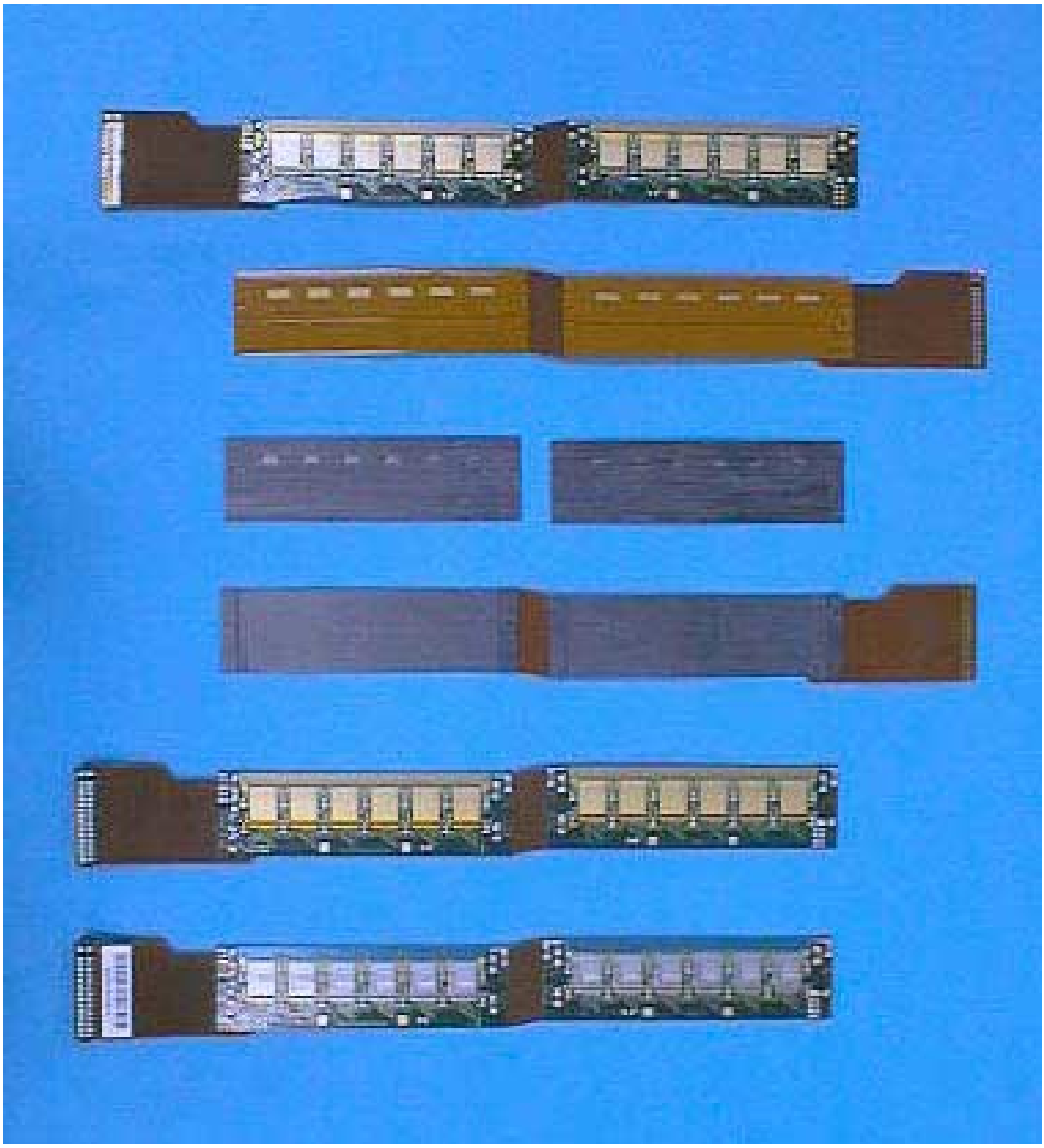
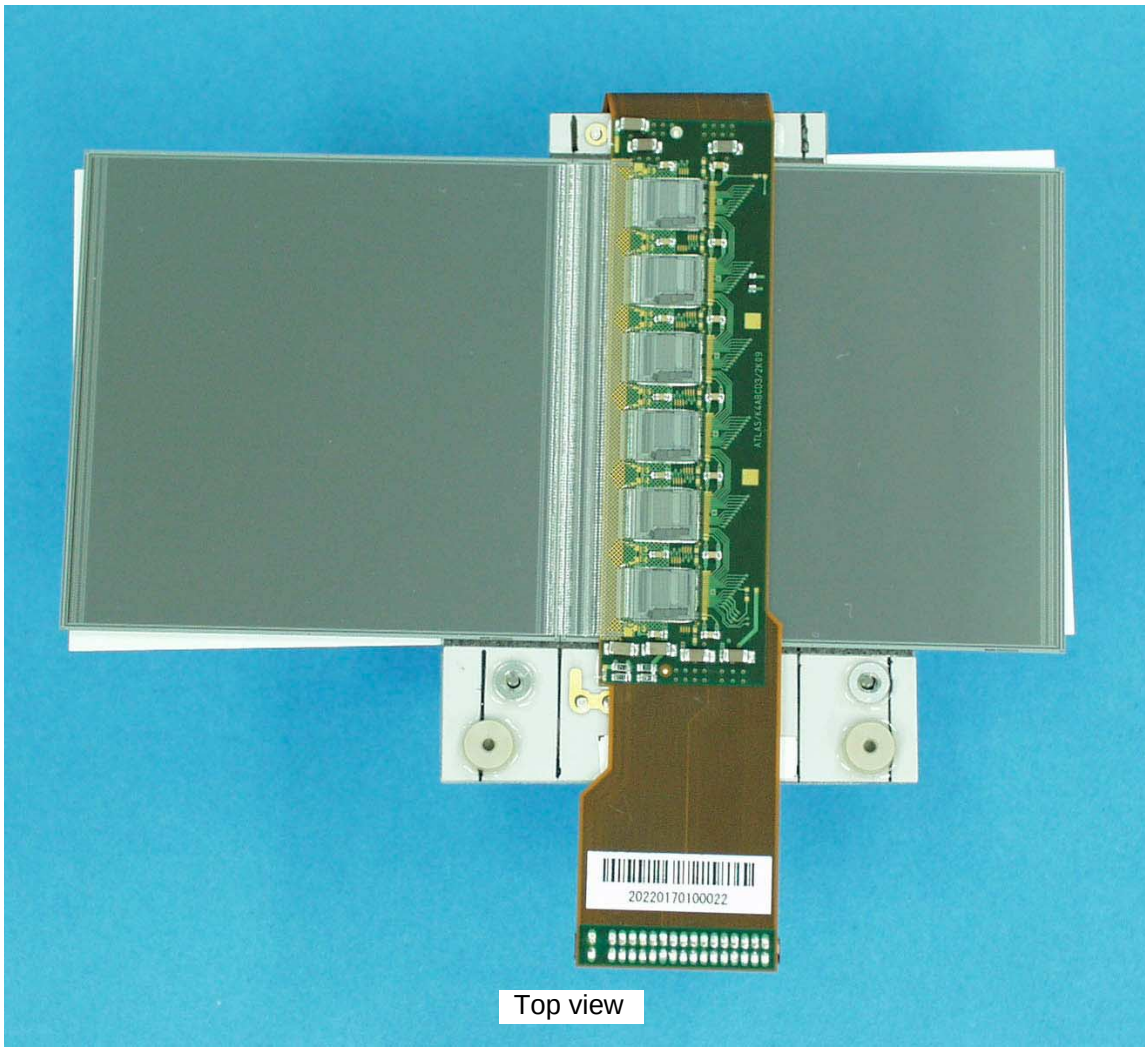
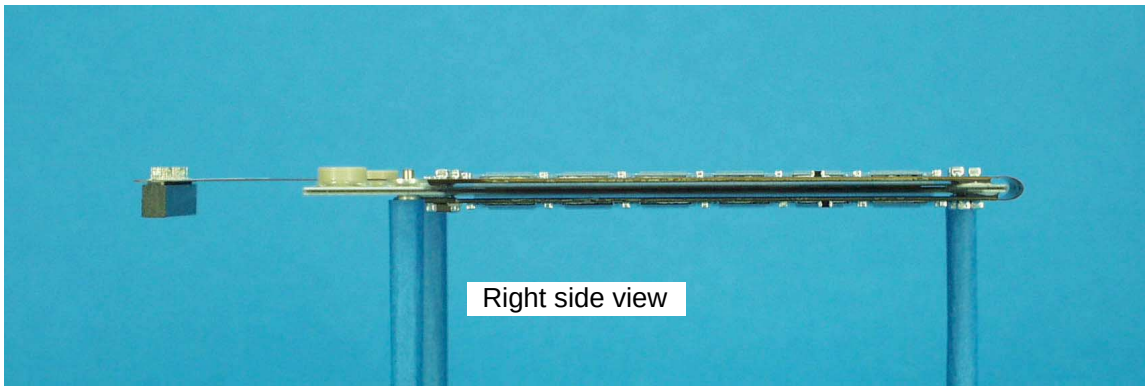


図７　銅ポリイミド・フレキシブル基板

・表から見た銅ポリイミド・フレキシブル基板
・裏から見た銅ポリイミド・フレキシブル基板
・カーボン・カーボン放熱用基板
・裏から見た銅ポリイミド・ハイブリッド回路基板
・IC以外を実装した銅ポリイミド・ハイブリッド回路基板
・ICも実装して、ボンディング済みの銅ポリイミド・ハイブリッド回路基板





0 10 20 30 40 50

Unit : mm

図８　モジュール

Module FDR/PRR

- **Hybrids, Baseboard, ASIC deliveries started in Oct.**

- **Dec. SCT week**

  A few proto-”Module-0”s were built and reported

  Two modules were irradiated in Oct.

- **Beamtest in Dec. at KEK**

  Two non-irradiated, one irradiated (Barrel)

  Two non-irradiated, one irradiated (Forward)

- **System test at CERN**

  Jan. - Feb.: 6 modules, 12 modules test

  Mar: 18 modules final test

- **FDR in End of March, followed by PRR soon**

  Data and documents preparation in Jan.-Feb.

Barrel Modules FDR Organisation and Responsibilities

Technical Specification of Module: (A. CARTER & Y. UNNO)

Electrical: overall performance, and also detectors +ASICs + hybrid +power supplies separately.

Mechanical: overall assembly and also baseboard + hybrid separately.

Thermal requirements: temperatures and cooling.

Interfaces: barrel assemblies + optical readout + power supplies:

Richard N, Tony W and Alex G

Technical Specification of Components:

Detectors	**Janet C**
Glues	**Nobu U**
ASICs	**Wladek D**
Hybrids	**Nobu U**
Baseboards	**Tony C**

Monitoring and Control (R. BRENNER)

Environment	**Richard N and Richard B**
Cooling	**Mike T**
Power supplies and Safety	**Alex G**
Alignment	**Richard N**

Assembly Procedures: (Y. UNNO)

Detailed documentation of procedures	**Martin G**
Jigs and their use	**Ole D**
Accountability: databases	**Nobu U**
Facilities at each site	**Richard A**
Qualifying assembly sites	**Tony C**

Assembly of modules on to barrels **Richard N**

Quality Assurance: (R. APSIMON)

Components: as for Technical Specs

Module testing: Electrical: Lars E/Mechanical: **Nobu U**

Packaging and dispatch:

Project Schedule: (A.CARTER)

Component supplies

Cluster resources

Timetable

Prototype Module Results: (Electrical / J.CARTER, Mechanical / Y. UNNO)

Pre-irradiation: at the *individual module* level:

Metrology

Electrical: noise occupancy, stability, S/N, operation robustness

Mechanical: thermal cycling results and cooling options

Pre-irradiation: at the *combined module* level:

Systems tests of multi-modules

Post-Irradiation:

Mechanical integrity

Electrical performance

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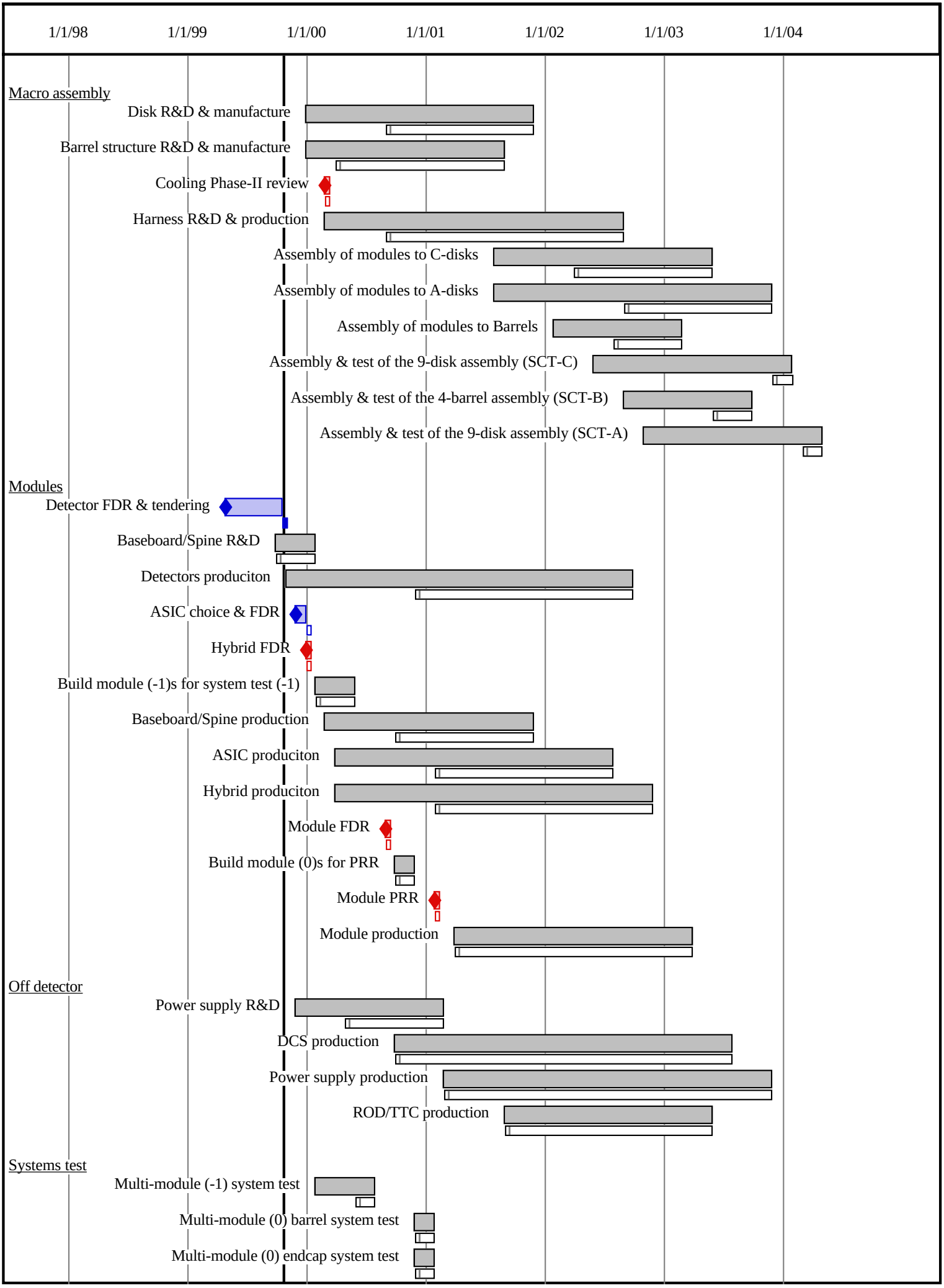
Production schedule

- **Module production**

  Autumn 2001 - End 2002 (1 year + a few months)

- **Cylinder (B5) assembly**

  Autumn 2002 - Early 2003 (6 months?)


1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
1/1/03
1/1/04
Macro assembly
Disk R&D & manufacture
Barrel structure R&D & manufacture
Cooling Phase-II review
Harness R&D & production
Assembly of modules to C-disks
Assembly of modules to A-disks
Assembly of modules to Barrels
Assembly & test of the 9-disk assembly (SCT-C)
Assembly & test of the 4-barrel assembly (SCT-B)
Assembly & test of the 9-disk assembly (SCT-A)
Modules
Detector FDR & tendering
Baseboard/Spine R&D
Detectors produciton
ASIC choice & FDR
Hybrid FDR
Build module (-1)s for system test (-1)
Baseboard/Spine production
ASIC produciton
Hybrid produciton
Module FDR
Build module (0)s for PRR
Module PRR
Module production
Off detector
Power supply R&D
DCS production
Power supply production
ROD/TTC production
Systems test
Multi-module (-1) system test
Multi-module (0) barrel system test
Multi-module (0) endcap system test