

# IEEE SW Test Workshop

Semiconductor Wafer Test Workshop

Dominique Langlois  
Julien Harrault

**ALTIS**



**A SMART PROBE-CARD DATA BASE**

**A KEY TO SUCCESS**



**June 12-15, 2011**  
**San Diego, CA USA**

# Summary

- Altis company profile
- Probe card management deals with...
- “La DB Probe Cards”
  - Probe identification
  - Probe life in operation
  - Analysis
- Acknowledgements



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# Altis Company Profile



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# Altis International – Company Overview

- Location: Paris area, France (HQ, facilities)
- Wafer foundry BU: Capacity 35k wafers/month (8 inches)  
250nm → 130nm, 75% w/ Cu process
- Test & Packaging BU: Largest independent test capacity in Europe  
Turn Key (wafer fab + wafer test) model  
Test House (test only) model



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# Altis Test & Packaging – BU Overview

- Altis Test & Packaging BU is offering:
  - Flexible and adaptive support, whatever your project is
  - World class cost competitive solutions
- Versatile toolset & capabilities
  - M/S, digital, analog test (Teradyne J750/E & Catalyst, Verigy 93000...)
  - Automatic inspect°, temperature cycling, laser fusing, inking...
  - Long track of record on wafer test (advanced probing, high //, temp testing)
  - Proven experience of test dev, final test, packaging subcontracting
  - Automotive (ISO TS 16949) and security/crypto certifications



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# Probe Card management deals with...



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# My life of probe card engineer in figures

- 3000+ probe-cards and probe-heads
- x1 to x500 paralellism
- 8 different test platforms (PCM test, wafer test...)
- 15+ PC suppliers
- 2 types of PCs (removable heads or fixed ring)
- 6 PC technologies (cantilever, membrane, micro springs...)
- 3 different off line cleaning protocols
- 6 different on line cleaning materials
- Many customers (with their own requirements each)
- 100% serviceability commit given by my boss

... makes millions of reasons for me to get mad about it !



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## Solution for this nightmare situation

- Let's manage PCs using a dedicated IT tool and call it **DB Probe Cards**
- This **DB Probe Cards** is a fact, as it is today existing at Altis
- Main features are
  - It is a reliable system (24/7 availability)
  - It offers exhaustive event logging and analysis
  - It enable traceability management
  - It is secured through several levels of access (operator to engineer)
  - It is flexible for further evolutions
- Its development was done in close loop with all probe cards engineers and technicians



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# “La DB Probe Cards...”




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# DB Probe Cards entry panel











Utilisateur connecté : langlois

DB2

## Db Probe Cards



Copyright Altis Semiconductor [www.altissemiconductor.com](http://www.altissemiconductor.com)

	Recording PCB		PC failure
	Recording PH		Needle dresser
	Shipping		TIP refurbish
	Return		PRVX3 repair
	Statistics / graphs		Dash board

DB PROBING V2.01d



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# Those questions are now answered in a click !

Which information are related to and needed for this PC?

## Identification

Where is this PC located?

How to know which PCs need maintenance?

How to log maintenance was done for this PC?

How to prevent from using this PC?

How to inform this PC needs maintenance?

Life in operation

Analysis

Do I have the right amount of PCs in production?

Am I sure all my PCs are equally reliable?

How many TDs for this PC?

What is the history of my PC/PH?

What is the status of my PC fleet?

Am I sure there's no over maintenance on my PCs?



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# Identification

- Each PC/PH is identified upon first delivery to Altis
- Exhaustive list of information is linked to each hardware, ranging from product name or tester type to reception date or supplier reference
- A unique id / barcode is then placed on the probe card box, PCB and probe head

ENREGISTREMENT PROBE-CARD

Nouvel Enregistrement

Dupliquer enregistrement

Désignation carte

Code barre

Infos Probe card

Infos Probe head

Tip Length

Message Lotus Notes

Stop Order Probe card

Impression Etiquettes

Type d'élément

Reception

04/04/2001

Nom du Technicien

DESANLIS

Compteur Touchdown

Désignation

ARBAYO M3021

Particularités

SRAM

Dut

QUAD

Testeur

3995

Alt seq PRVX

Part Number

04P7097

Secteur Test

TEOL

Stop Order

code barre	date	désignation des cartes	designation dut	Testeur	N° carte	part number	code barre PH
890	10/01/2001	PR510	SRAM	QUAD	3995	1	04P7097
879	18/01/2001	ARBAYO M3021	SRAM	QUAD	3995	2	04P7097
893	08/02/2001	ARBAYO M3021	SRAM	QUAD	3995	3	04P7097
898	26/02/2001	ARBAYO M3021	SRAM	QUAD	3995	4	04P7097
919	13/03/2001	ARBAYO M3021	SRAM	QUAD	3995	5	04P7097

Err : 14

N° Fabricant

CERPROCE EUROPE

Ref Fabricant

CP80 PR410

N° Carte

6

Ref Origine

PCB WITH FIXED HEAD

Dedicace produit

Fq POAA

techno probe

CANTILEVER

Nb Aiguilles

376

Pitch/Cust.

PK

Nom Du Produit

ARBAYO

Technologie

C10N

N° de BL

Livraison prévue

Archivage

Produit testé

ARBAYO M3021

Diamètre aiguille fabricant (en mils)

Affichage Msg Prod

Consignes particulières

NA

Origine carte

DA 3392 DA 3503

Localisation

Extérieur

Documentation

Seq PRVX

Etat

En production

Statut Produit

Objets

Statut Carte

Restitué avec Tamis

Remarques



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# Life in Operation: Where is the PC, is it useable?

- DB Probe Cards provides the operator with real time information about location of probe card:
  - in production floor
  - in probe maintenance area
  - at technician desk
  - shipped @ external repair...
- but also about the status of the probe card
  - available for production
  - waiting for test engineer validation
  - loaned to subcontractor
  - Returned to owner...
- This enable to significantly reduce time spent on search for probe cards

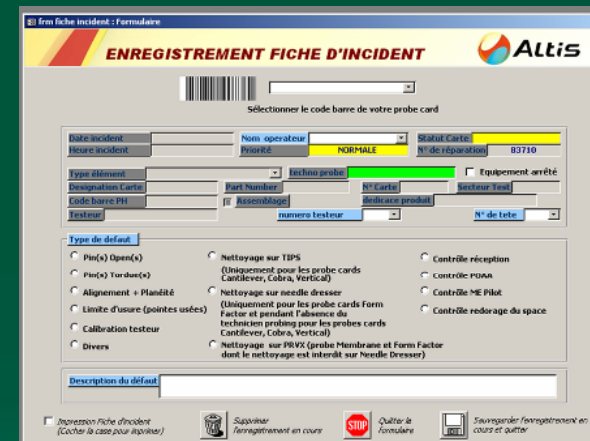


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# Life in operation: failure form recording

- Fail / Issue tracking is done by operator
- Each failing hardware is tracked using its barcode
- Simple GUI w/ predefined choices allows fast and simple form fill in
- Comment is allowed to add more info if needed
- In case a tester is stopped, higher priority is given by system



The screenshot shows a software interface for recording incident forms. The title bar reads 'si fra fiche incident : formulaire' and the main header is 'ENREGISTREMENT FICHE D'INCIDENT' with the 'Altis' logo. A barcode is visible at the top. Below it, there are several input fields and dropdown menus for recording incident details, including 'Date incident', 'Heure incident', 'Nom operateur', 'Statut Carte', 'Priorite', 'N° de réparation', 'Type écart', 'Designation Carte', 'Part Number', 'Assemblage', 'N° Carte', 'Matrice produit', 'Système test', 'testeur', 'numero testeur', and 'N° de teste'. A section titled 'Type de défaut' contains a list of predefined failure types with radio buttons, such as 'Pin(s) Open(s)', 'Pin(s) Tordus(s)', 'Alignement + Planité', 'Limite d'usure (pointes usées)', 'Calibration testeur', 'Divers', 'Nettoyage sur TIPS', 'Nettoyage sur needle dresser', 'Nettoyage sur PRVX', 'Contrôle réception', 'Contrôle PDA', 'Contrôle ME Pilot', and 'Contrôle redorage du space'. At the bottom, there is a 'Description du défaut' field and a row of buttons: 'Imprimer fiche incident (Cacher la case pour imprimer)', 'Supprimer l'enregistrement en cours', 'STOP', 'Quitter le formulaire', and 'Sauvegarder l'enregistrement en cours et quitter'.




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# Life in operation: which PCs need maintenance?

Dashboard tool gives at a glance the status of all PCs pending analysis, by tester type and analysis type

frm Tableau de bord : Formulaire

**TABLEAU DE BORD PRVX** 



	REPAIR PRVX	CTRL RECEPTION	CTRL POAA	ANALYSE EXPERT	NETTOYAGE SUR TIPS	NEEDLE DRESSER	REPAIR PIB	SPACE A REDORER
TESTEUR J750	5							
TESTEUR J971								
TESTEUR J995								
TESTEUR CATALYST							7	
TESTEUR ADV667X								
TESTEUR A93000								
TESTEUR S400								
TESTEUR S600	1							
MAJ AUTO	6			55			7	
TOTAL								



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# Life in operation – Repair form recording

- After doing any maintenance on probe, the technician is measuring probe-tip length/extension or bump height
  - allows for preventive maintenance
  - improves test quality
  - helps to anticipate probe repair
- Once the repair is over, technician is updating repair form
  - type of repair
  - reset of cleaning counter
  - update of measured data

Screenshot of the 'SAISIE REPAIR PRVX' software interface. The window title is 'E:\Fm repair prvx'. The interface includes a header with the Altis logo and navigation buttons like 'PCMA', 'Historique', 'Info Probe card', 'Info Probe read', and 'Analyse Expert Probing'. A main section contains a barcode and a '31' in a red box. Below this are several data entry fields: 'Type (Maintenance)', 'Date de création' (11/09/2011), 'N° de réparation' (83724), 'N° de pièce' (7142), 'Description du défaut', and 'Description du défaut' (PC SOUS CONTRÔLE PAR PILOT \*\*\*\*\*). There are several buttons for repair types: 'NORMAL REPAIR', 'NETTOYAGE PROBE', 'CTRL RECEPTEUR', 'RECHANGEMENT', 'RECHARGE SPARES', 'RETOURNEUR', 'A S'ATULER', 'A RECOMMENCER', 'CTRL PUMA', and 'CTRL NE PILOT'. At the bottom, there are fields for 'Date création' (17/01/2011), 'Tip Length Int' (200), 'Tip Length Act' (200), and 'Categorie Usure' (C1). A table at the bottom shows columns for 'AL', 'PL', 'CR', 'CD', 'LEAF', 'MOY DIA', 'NB Cycles', and 'Mal Cycles'.

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# Life in operation – How to prevent from using this PC?

- In case a PC has a problem, it must not be used in production
- A specific flag set by the engineer indicates this status
- This flag is propagated to the test logistic
- Operator will not have the possibility to use this probe card for productive test

The screenshot shows a software window titled "RECHERCHE PROBE CARD/PROBE HEAD" with the Altis logo. It contains several sections for data entry and search. A yellow arrow points from the second bullet point in the text to a red circle around a "Stop Order" button in the "Infos Complémentaires" section. Below this, a table displays search results.

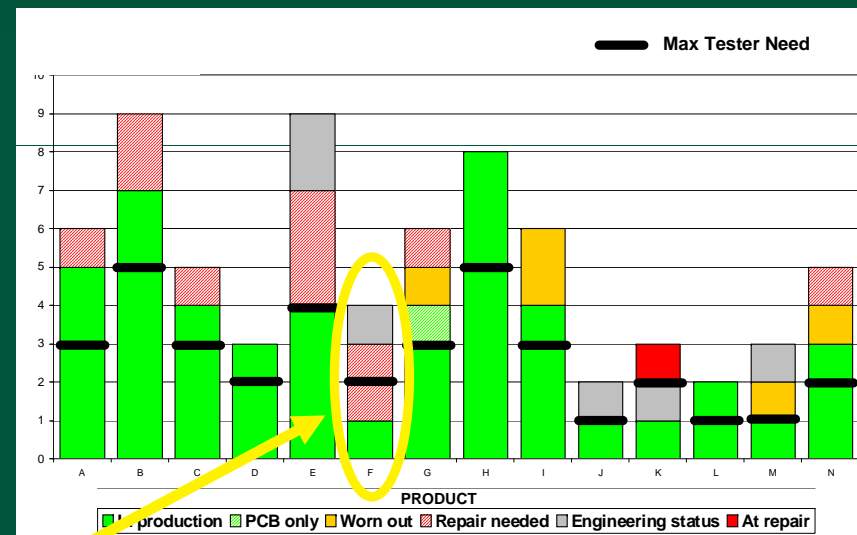
Affichage des résultats de la recherche						
Code base	Statut carte	Type élément	Matr. (révision)	Code assemblage	Designation carte	Particularités carte
2222	Production	Probe Head	05/22/2007	M289		



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# Analysis: Do I have the right number of PCs in production?

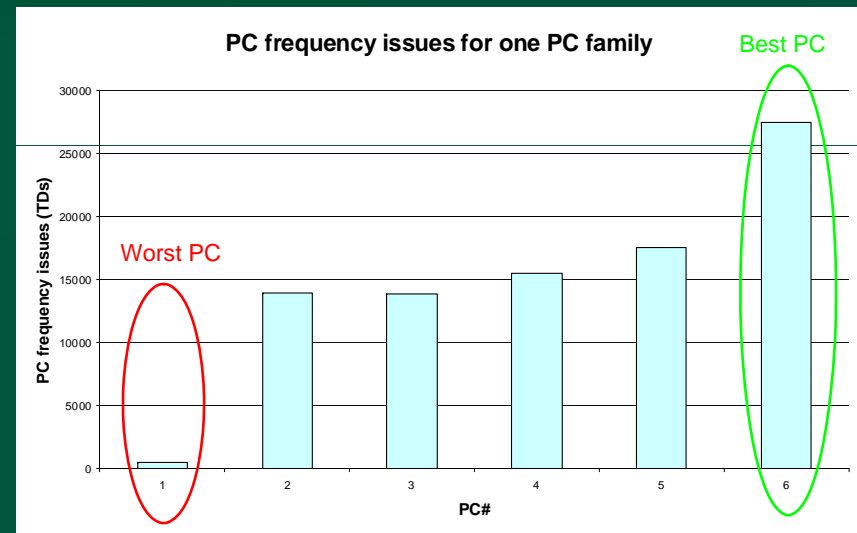
- Using volume forecast from capacity planning, it is possible to check for available PC
- Little extra analysis required for this checking
- Checking is performed against the real status of PCs (in production, ar repair...) coming from DB Probe Cards
- It enables to highlight priorities and to reduce risk of serviceability exposure due to lack of PCs



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# Analysis: Am I sure my Pcs are equally reliable?

- Assuming same manufacturing, all PCs should show equivalent
- Maintenance information logged in the DB Probe Cards allow to easily assess performance of each PC
- These results enable to focus maintenance on PCs w/ high failure rate
- And these results also enable to challenge PC manufacturer...



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# Analysis: How many TDs for this PC?

- Amount of touchdowns is a key indicator for a PC
  - Monitor of PC real life time
  - Threshold to trigger specific events (off line cleaning, reorder anticipation...)
- It is however not always easy to compute
  - All test insertions must be taken into account
  - Retest should not be forgotten
  - Also selective retest (that is partial retest of the wafer) must be accounted for
- DB Probe Cards is doing all this
  - Registration of TDs
  - Use of a threshold for each product/probe card to set the right offline cleaning frequency
  - Helps to reduce retest rate
  - Enables to anticipate end of life of PCs with respect to theoretical life time

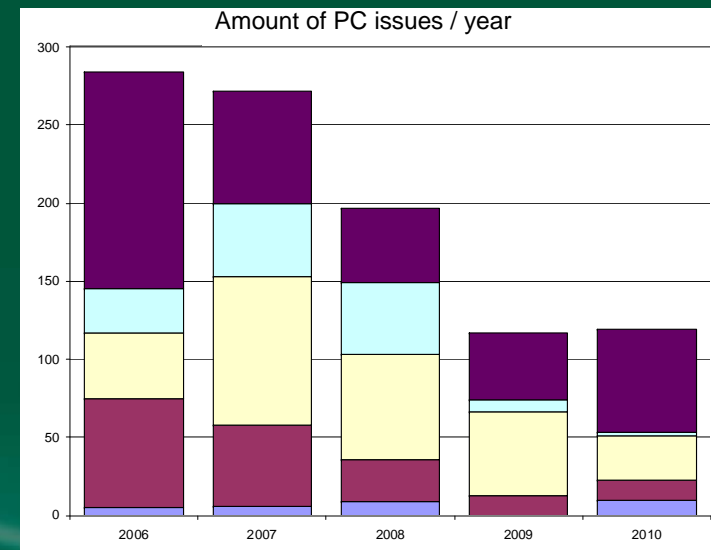
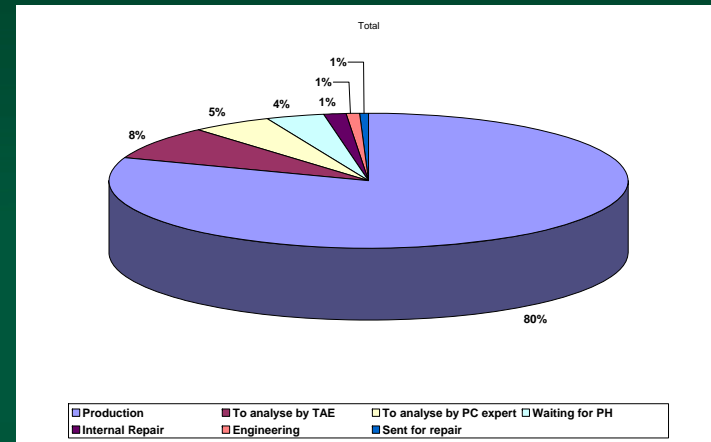


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# Analysis: What is the status of my PC fleet, how can I improve the availability of PCs?

- It is possible, at any time, to get a clear view of PC fleet and status
- This view can be tailored upon specific need (by customer, by product, by tester...)
- Using information from DB Probe Cards about PC events (nature, frequency), it is possible to build a pareto of detractors of PC issues
- This pareto is then used to define improvement actions on main detractors



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# Analysis: What is the history of my PC/PH?

- There is a need to get traceability on probe card / probe head matching
- DB Probe Cards allows to maintain exhaustive history on probe head / probe card history
- Also, DB Probe Cards maintain full history of PC during its use in production (which tester, which repairs...)

**HISTORIQUE ASSEMBLAGE PC/PH**

Date assemblage	Heure	Code Barre PC	Code Barre PH	N° Carte	RefHead	Type Shape	Remarques	Description du défaut
<b>M2899 SINGLE J750 N°8</b>								
06/03/2007	09:48:34	2192	2515	8	82854 H8	P88	Le 06/03/2007 Assemblage de la probe card CB 2192 avec la probe head CB 2515	
07/03/2007	09:41:04	2192	2515	8	82854 H8		Le 07/03/2007 Désassemblage de la probe head CB 2515 installée sur la probe card CB 2192	Mise à jour DB
30/07/2007	10:25:00	2192	2639	8	H08_83854H8_8818V401H011		Le 30/07/2007 Assemblage de la probe card CB 2192 avec la probe head CB 2639	
11/10/2007	15:49:19	2192	2639	0	H08_83854H8_8818V401H011		Le 11/10/2007 Désassemblage de la probe head CB 2639 installée sur la probe card CB 2192	Changement de PCB
11/10/2007	15:51:29	2192	2515	0	H13_0818H13_8818V401H011	P88	Le 11/10/2007 Assemblage de la probe card CB 2192 avec la probe head CB 2515	
18/10/2007	16:05:16	2192	2515	0	H13_0818H13_8818V401H011		Le 18/10/2007 Désassemblage de la probe head CB 2515 installée sur la probe card CB 2192	Tête HC en alignement et tp. dis. trop élevé
18/10/2007	16:05:38	2192	2222	8	H17_01531H17_8818V401H011	P88	Le 18/10/2007 Assemblage de la probe card CB 2192 avec la probe head CB 2222	

**HISTORIQUE CARTES SUR PRVX**

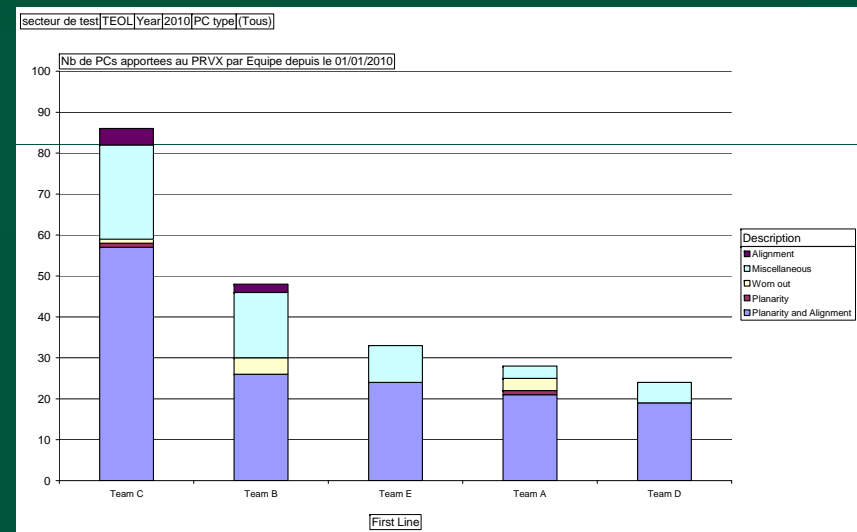
Date Interv	N° Interv	Code Barre	N° Carte	Type de Testeur	N° de Testeur Défaut	Description du défaut	Travaux effectués	Moy Tip Dia	Résultats PRVX
30/01/2008	61197	1555	4	3750	14	NE	Nettoyage gel pack-wafer + carbide		
05/02/2008	61220	1555	4	3750	17	NE	Nettoyage gel pack-wafer + carbide		
25/02/2008	61763	1555	4	3750	13	NE	Nettoyage cleaning sheet JDMHT20G + carbide wafer		
01/03/2008	61902	1555	4	3750	37	NE	Nettoyage pinceau et alcool + contrôle visuel		
05/03/2008	61910	1555	4	3750	0	NE	Nettoyage gel pack-wafer		
25/03/2008	62381	1555	4	3750	0	NE	Nettoyage gel pack-wafer		
01/04/2008	62561	1555	4	3750	31	NE	Nettoyage gel pack-wafer		
10/04/2008	62757	1555	4	3750	5	NE	Nettoyage gel pack-wafer		
02/05/2008	63258	1555	4	3750	37	NE	nettoyage + vérification Dur 0 (channel 50) inf de K.Benhessou		
05/05/2008	63259	1555	4	3750	0	NE	Nettoyage cleaning sheet JDMHT20G + carbide wafer		
26/05/2008	63722	1555	4	3750	13	NE	Nettoyage gel pack-wafer		
04/06/2008	64064	1555	4	3750	0	NE	Nettoyage gel pack-wafer		
02/07/2008	64618	1555	4	3750	14	NE	problème DUT 3, mauvais rendement	Nettoyage sur carbide tungstène en mode IFT 2 + contrôle visuel	
03/07/2008	64620	1555	4	3750	0	NE	Nettoyage gel pack-wafer		
05/07/2008	64688	1555	4	3750	17	NE	Nettoyage gel pack-wafer		
24/07/2008	65151	1555	4	3750	30	NE	PB dur 2 (sets 7 et 30)	Nettoyage sur carbide tungstène en mode IFT 2 + contrôle visuel + contrôle visuel	opt_0034 ok 1
25/07/2008	65186	1555	4	3750	0	PAL	Rij test PRVX	Alignement réplaine+CRS+LK+Tip Dia+Carbide Tungstène	0.88 opt_0035 ok 1
06/08/2008	65483	1555	4	3750	14	PAL	probe n°61 prod. us. à vérifier puis à donner à Karim pour essai	Alignement réplaine+CRS+LK+Tip Dia+Carbide Tungstène	0.71 opt_0039 ok 1
13/08/2008	65578	1555	4	3750	32	NE	accél	Nettoyage gel pack-wafer	
16/08/2008	65628	1555	4	3750	32	NE	Nettoyage preventif avant test	Nettoyage sur carbide tungstène en mode IFT 2 + contrôle visuel + gel pack sur mede dresser	
26/08/2008	65762	1555	4	3750	32	NE	Nettoyage de 1 pc pour pb perte de rendement	Nettoyage gel pack-wafer	
02/09/2008	65919	1555	4	3750	24	NE		Nettoyage gel pack-wafer	
05/09/2008	66043	1555	4	3750	32	NE		Nettoyage gel pack-wafer	
11/09/2008	66085	1555	4	3750	32	NE	perte de rendement sur dur 0 et 2	NETOYAGE ALIQUOT DE LA PC/DERRIERE DE L'ANODES	
11/09/2008	66151	1555	4	3750	0	NE	VOIR NOTE DE L'ANODES	Nettoyage sur carbide tungstène en mode IFT 2 + gel pack + mesure crs + contrôle visuel	opt_0044 ok 1
12/09/2008	66177	1555	4	3750	7	NE	accél	Nettoyage gel pack-wafer	



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# Analysis: Am I sure there is no over maintenance on my PCs?

- Assuming normal activities, one should expect no difference in PCs wear out between production shifts
- Again, DB Probe Cards enables to output statistics such as return rate by shift or by operator
- It is then possible to check and analyse specific behaviour
- Eventually, corrective actions are done to level jam rate by shift/operator



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# Summary

- The DB Probe Cards is an all-in-one system
  - It fits operator needs (GUI for all activities, used to let him know which probe card to use...)
  - It fits technician needs (friendly user interface to know which PCs to work on, possibility to input all maintenance info for each single PC...)
  - It fits engineer needs (improvement and fine tuning of PC efficiency is easily manageable, better cost of ownership is then made possible for the end customer)

**DB Probe Cards is the Swiss knife of the probing team !**



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## Many Thanks to...

- Julien. Harrault (PC coordinator) Altis
- Patrick Buffel (DB administrator/ PC technician) Altis
- Jean-Marc Desanlis (PC administrator) Altis
- Frederic Fontaine/P. Drugeon (PC technician) Altis

## And do not hesitate to contact us:

### Probe Card group contacts:

Julien Harrault

[julien.harrault@altissemicnductor.com](mailto:julien.harrault@altissemicnductor.com)

Dominique Langlois

[dominique.langlois@altissemicnductor.com](mailto:dominique.langlois@altissemicnductor.com)

### Test & Packaging BU contacts

BU general manager: Olivier Richard

[olivier.richard@altissemicnductor.com](mailto:olivier.richard@altissemicnductor.com)

Test project manager: Stephane Brandon

[stephane.brandon@altissemicnductor.com](mailto:stephane.brandon@altissemicnductor.com)

Test engineering manager: Marie-Catherine Lejard

[marie-catherine.lejard@altissemicnductor.com](mailto:marie-catherine.lejard@altissemicnductor.com)

Sales

[sales@altissemicnductor.com](mailto:sales@altissemicnductor.com)



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End of the presentation

Thanks for your attention



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