



# AMS Works at CSIST

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**Technology Taiwan, ROC**  
**Mar. 9, 2005**



# History of Chung Shan Institute of Science and Technology

- **1. CSIST was established in 1969 as a small military technological think-tank and laboratory.**
- **2. Over 3 decades, CSIST has been scattered over 5800 acres throughout Taiwan with employees over 10 thousand. Meantime, CSIST has progressively accumulated a broad spectrum in the areas of aeronautics, mechanics, electronics, radar, information, communication, chemistry, material, and quality assurance**
- **3. During these period, CSIST has completed the development of advanced weapon systems and defense equipments, including fighting aircraft, missiles, multiple launch rocket systems, and C4ISR systems, successfully delivering to the armed forces for defense preparedness.**
- **4. Since 1989, CSIST has created Science Research Park to share the technical capacity with the civilian industry and research organizations. AMS is one of the most successfully projects under this plan.**



**Headquarter of CSIST at Longtan,  
Taoyuan, Taiwan, Republic of China**



# Organization of CSIST

10,000<sup>+</sup> employees

CHUNG-SHAN INSTITUTE OF SCIENCE AND TECHNOLOGY (CSIST)  
PRESIDENT'S OFFICE

PLANNING DIVISION    HUMAN RES. DIVISION    ADMINIST. DIVISION    PROCUREMENT. DIVISION    COMPTROL. DIVISION    INDUS. SAFETY DIVISION

SYS. DEVL. CENTER    ILS CENTER    AERON. SYS. RESCH. DIV.    CHEM. SYS. RESCH. DIV.    LUNGYUAN RESCH. PARK    CHINGSHAN RESCH. PARK

SYS. MANF. CENTER    INFO. MANG. CENTER    MECHN. SYS. RESCH. DIV.    MATERIALS R&D. DIV.    TAICHUNG RESCH. PARK

INFO. COMM. RESCH. DIV.    ELECT. SYS. RESCH. DIV.



# Electronic System Research Division (ESRD)

1,200<sup>+</sup> employees

ELECTRONIC SYSTEM RESEARCH DIVISION  
DIRECTOR'S OFFICE

PLANNING SECTION	ADMINIST. SECTION	PROCUREM. SECTION	COMPTROL. SECTION	INDUS.SAFETY SECTION
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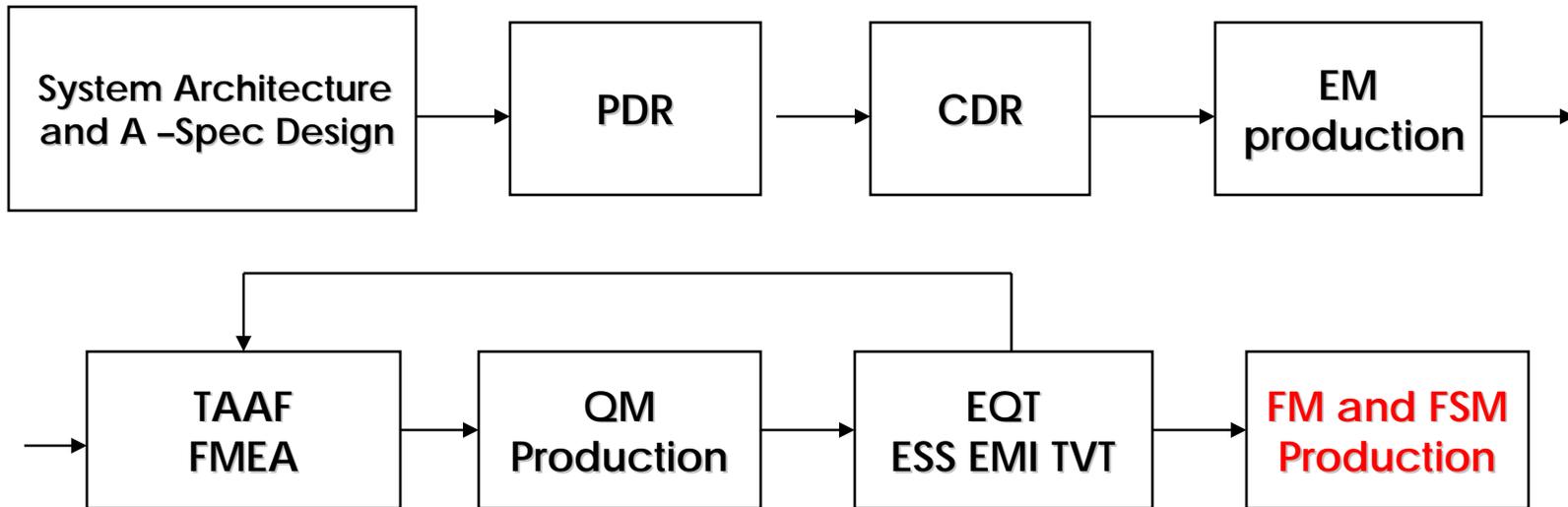
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PROD.MANUF. SECTION	RADAR SYS. SECTION	ANTENNA SECTION	ENGR.TESTING SECTION	QA&ILS SECTION
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MICROWAVE DEV.SECTION	AVIONICS SECTION	POWER ELEC. SECTION	TGT.TRACKING SECTION	SINGAL PROC. SECTION
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## High Quality AMS Electronics System Design and Production Flow at CSIST



PDR: Preliminary Design Review

CDR: Critical Design Review

EM: Engineering Model, QM: Qualification Model

TAAF: Test, Analysis and Fix

FMEA: Failure Mode Effect Analysis

EQT: Environmental Qualification Test

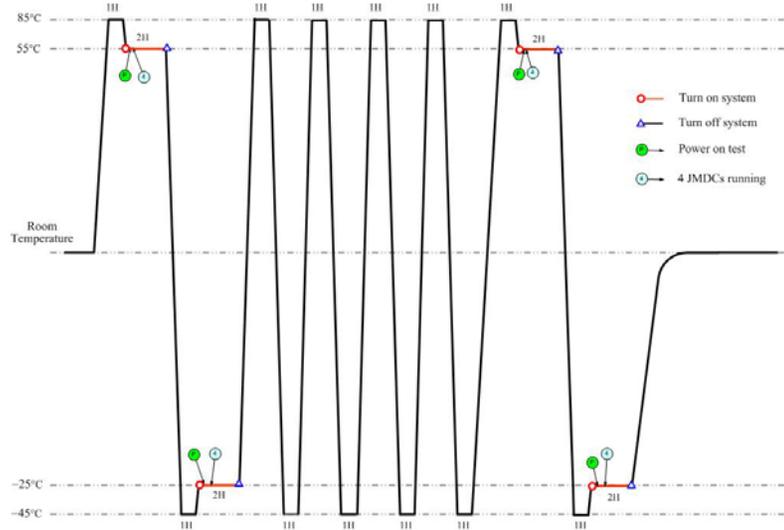
ESS: Environmental Stress Screen, EMI: Electromagnetic

Interference. TVT: Thermal Vacuum Test

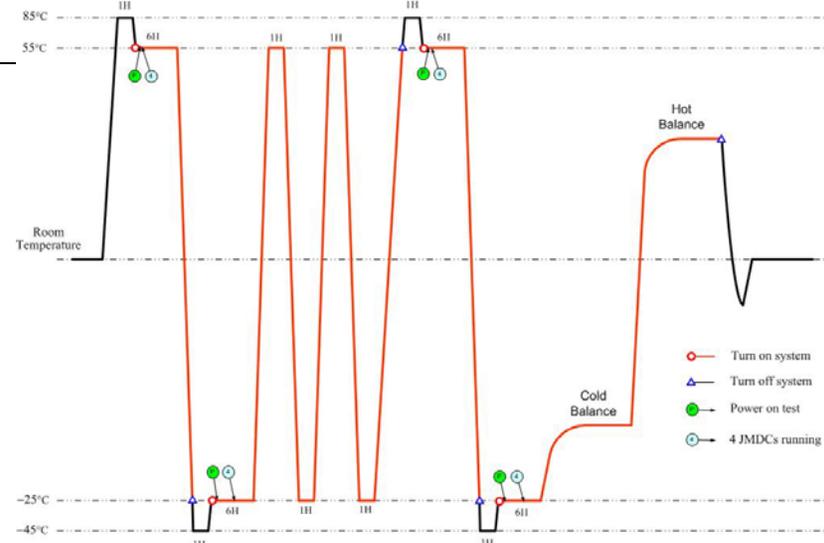


# Environmental testing profiles for AMS02

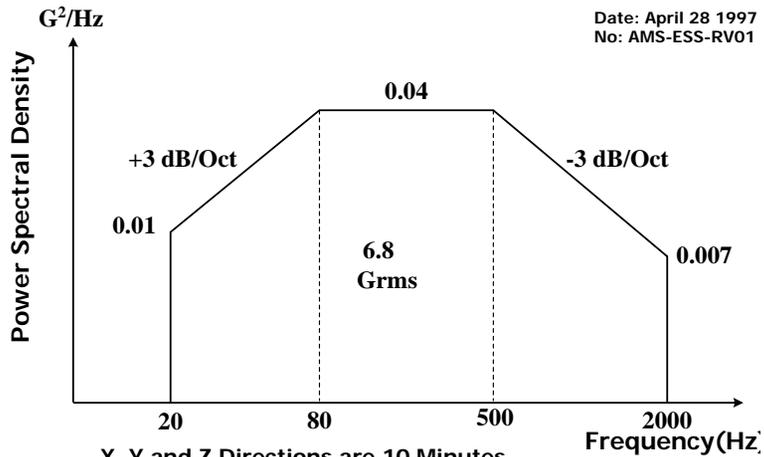
AMS-02 J-Crate (QM) Thermal Cycles Test Profile



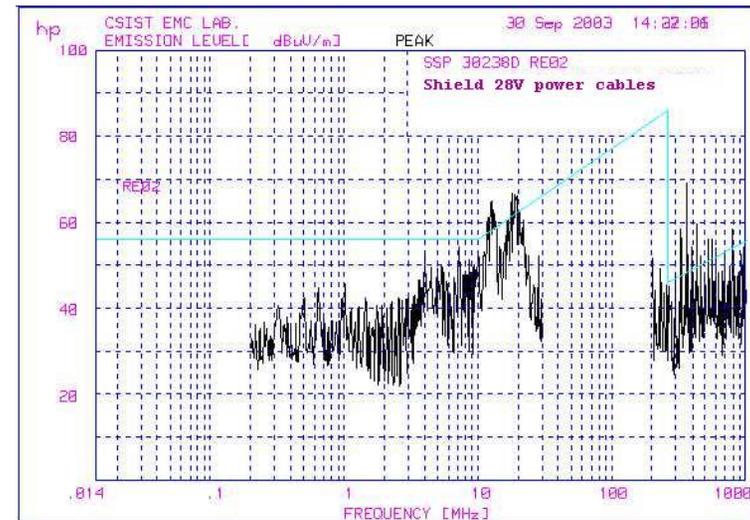
AMS-02 J-Crate (QM) Thermal-Vacuum Test Profile



EMI Test Spec.



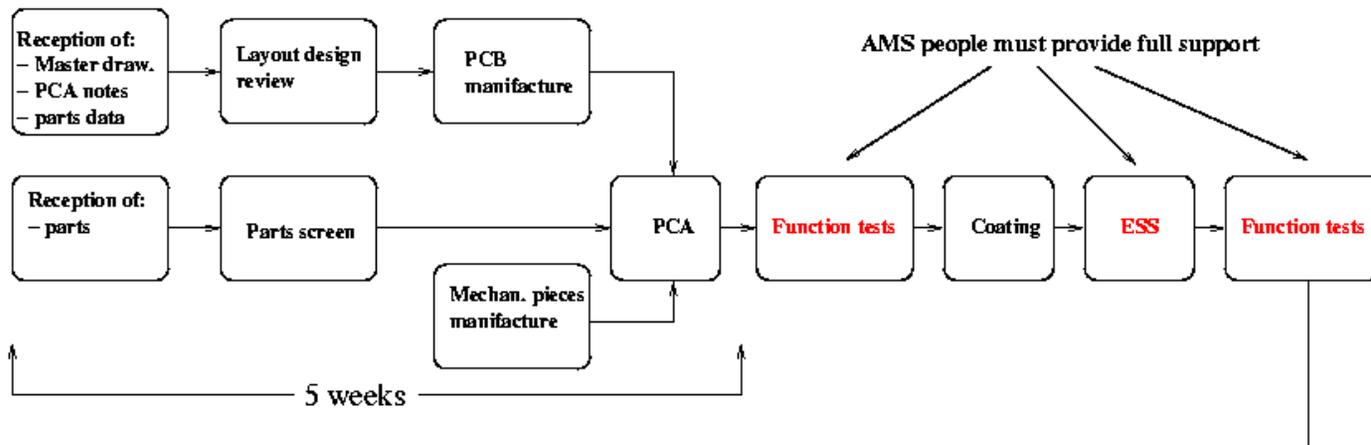
The ESS Random Vibration Spectrum for AMS



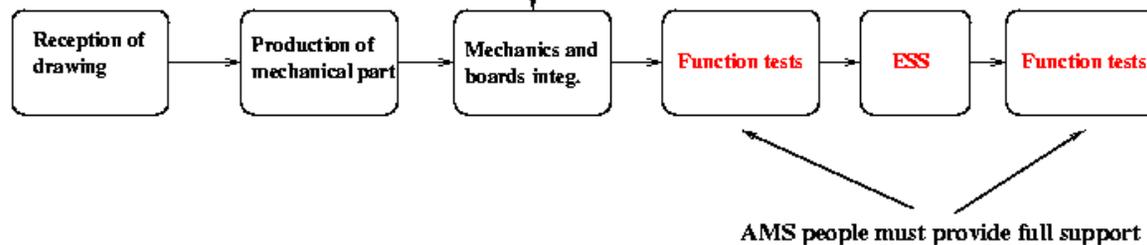


# Production flow at CSIST

Single board production (input in the chain of one type per week)



Crate production





## **Program control for AMS electronic project at CSIST**

- 1. Create a program office to monitor all AMS electronics activities, including design, production, testing , and QA**
- 2. Conduct weekly Program review by CSIST, National Central University, and Academic Sinica**
- 3. Set up biweekly video conference with MIT group at CERN**
- 4. Organize a Technical Interchange Meeting (TIM) of electronics for all AMS collaborations every three months held at CSIST, Taiwan or CERN, Geneva**
- 5. Follow MIL STD, NASA Spec, and CSIST SOP for all design, production , and quality control procedures**



## **AMS 02 works at CSIST**

- 1. Global Data Acquisition Computer (DAQ) Design, Implementation and Environmental Testing**
  - System architecture design
  - Electronic and mechanic hardware design and production
  - Quality assurance and Environmental testing
- 2. Sub-detector Electronics modules Production**
  - PCB/PCA manufacture and cable assembly
  - Crate and other mechanical parts manufacture
  - Quality control and environmental testing
- 3. TTCS boards manufacture and ESS testing**
- 4. PDS boards and crate manufacture and ESS testing**
- 5. ACCOP computer design, manufacture and ESS testing**
- 6. UPS battery casing design, fabrication, and ESS testing**



# Environmental Stress Screening a and TVT testing Examples



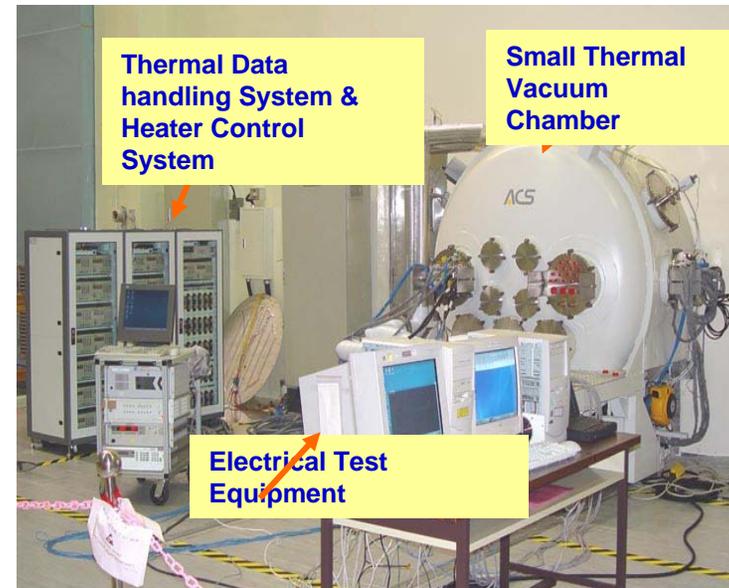
Vibration Testing



Temperature Cycling



EMI Testing



*Thermal Vacuum Test*

**Electronic Systems Research Division in CSIST**



# AMS02 Production Summary

## Mar. 9, 2005



## J/JT/JPD produced at CSIST

Type	Name	J-Crate	JT-Crate	JPD-Crate
	Qty	EM/QM2/ FM/FS	QM2/ FM/FS	QM2/ FM/FS
PCB		72	28	18
PCA		72	28	18
Coating		72	28	18
Mechanics Crate		3	3	3



## T/TPD U/UPD DC/DC Converter QM2/FM/FS produced at CSIST

Qty Type	T-Crate	TPD- Crate	U-Crate	UPD- Crate	DC/DCCo nverter
PCB	198	11	83	6	174
PCA	198	11	83	6	174
Coating	198	11	83	6	174
Mechanics Crate	10	4	4	4	None



## Other boards produced at CSIST

Name Type Qty	UGPDV2 FM/FS	JINFV1/QM2+ V2 QM2/FM/FS	28V Filter QM2/FM/FS
PCB	2	29	34
PCA	2	29	34
Coating	2	29	34



## **Total production for AMS-02 at CSIST**

- Total Boards Production of J, T, and U crates:  
655 pieces
- USCM Processing boards: 40 pieces
- Mechanics: 38 Crates
  - Including all the front panel, heat sink, stiffener, spacer for all the board produced at CSIST
- Power cable sets: 20 sets
- Other sub-electronics boards, PDS, TTCS and ACOP production will be conducted in the future.

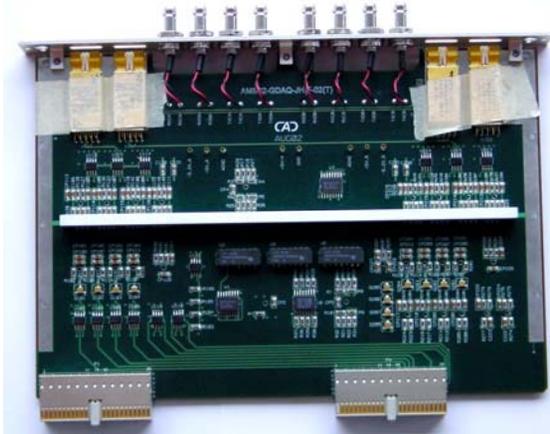


## J/JT/JPD Crate QM2 status

- All the QM2 PCB production, PCA production, board level function test before/after thermal cycling, and coating process had been finished
- Crate level function test before/during/after thermal cycling, crate level function test before/after Vibration, EMI, and TVT at NSPO have been finished
- J/JT/JPD Crate FM/FS production are in processing



# AMS02 GDAQ QM boards have been tested successfully through ESS and TVT



**JHIF**



**JSBC**



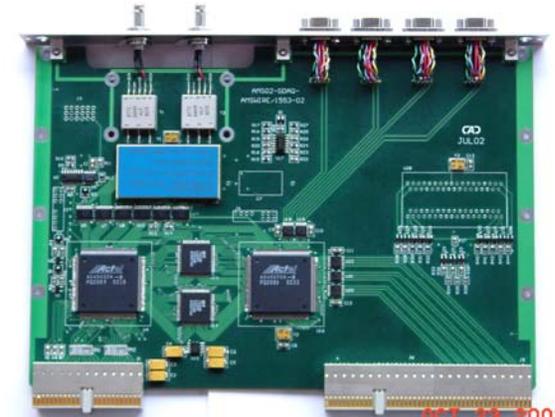
**JIM-CAN**



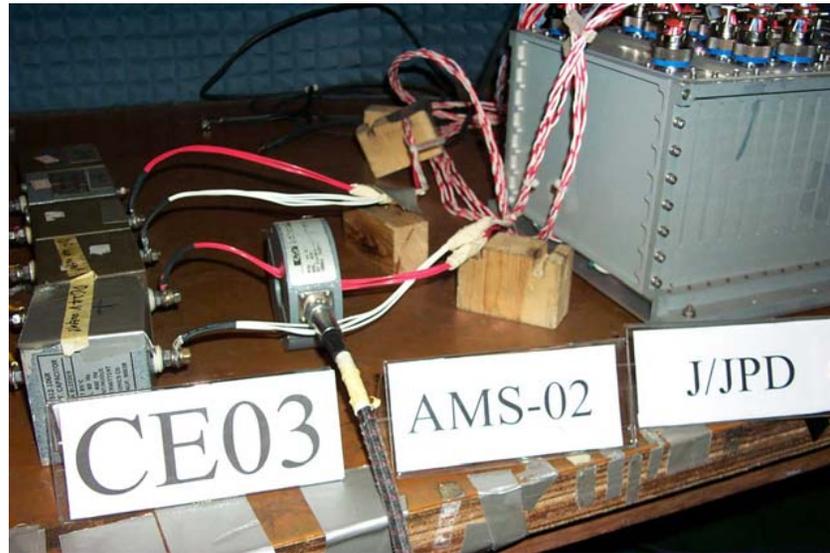
**JIM-HRDL/422**



**JBU**



**JIM-AMSW&1553**



J/JPD Crate Integrated Test



JPD Crate function test during thermal cycling

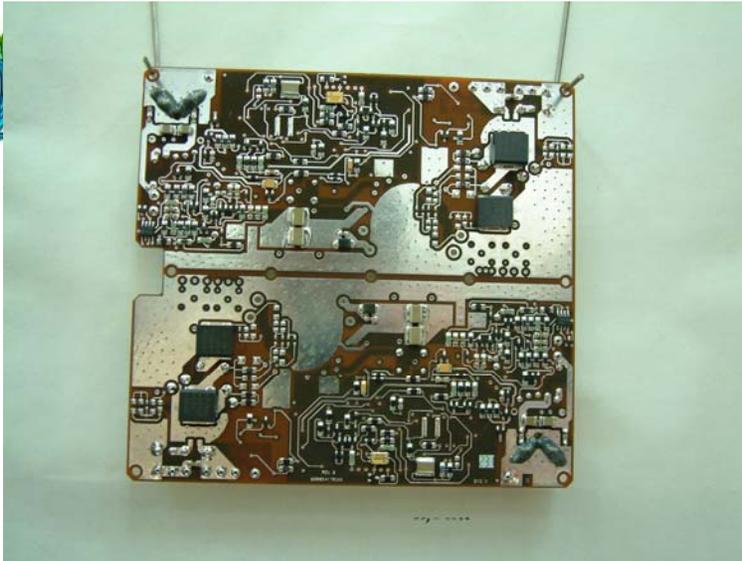


J Crate Function Test Set-Up  
Electronic Systems Research Division in CSIST



## DC/DC converters

- All the DC/DC converters QM2 PCB production, PCA production, board level function test before/during/after thermal cycling, and coating process had been finished
- Including 5 S9048, 4 S9051, 4 S9053, 1 S9053U, 7 S9054, 2 S9055, 4 S9056, 3 S9057, 3 S9057E; Total 33 pieces.



DC/DC converter S9048 OM2  
COMPONENT side



S9048,S9051,S9053 QM2 Thermal Cycling

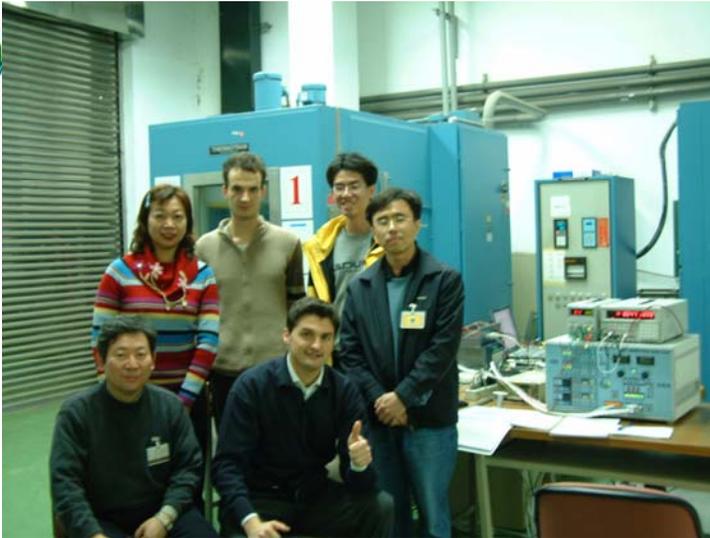


Board Level Function Test for QM2  
S9048,S9051,S9053 during thermal cycling



Board Level Function Test for  
S9048,S9051,S9053

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Board Level Function Test for S9054,S9055D,S9056



Board level function test for QM2 S9057 and S9057E



DC/DC converter QM2 S9057 and S9057E Thermal Cycling

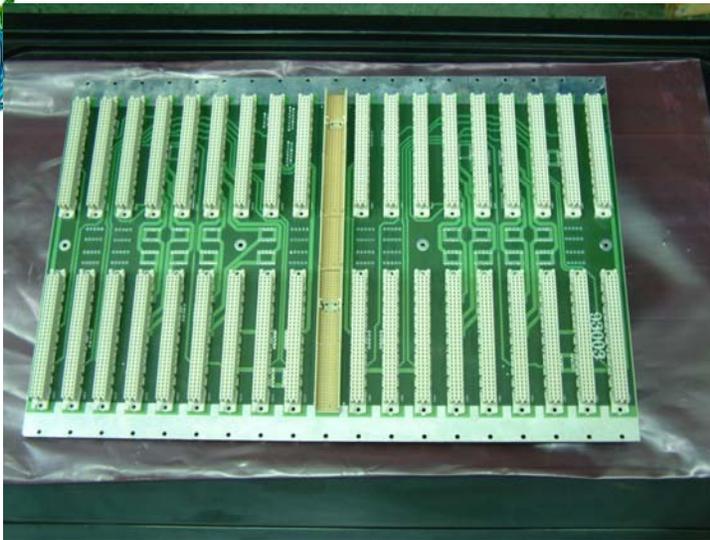


Board level function test for QM2 S9057 and S9057E

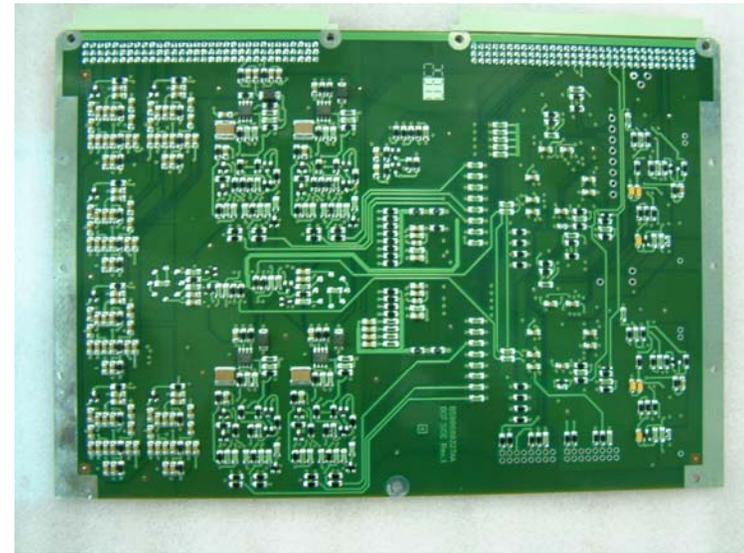


## T/TPD Crate QM2 status

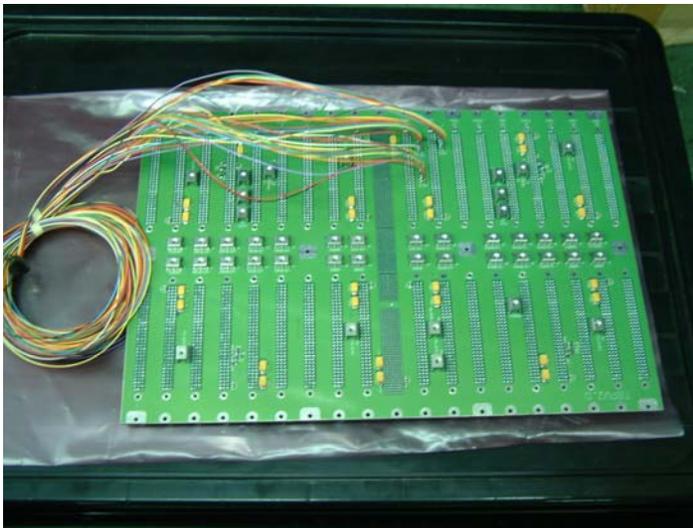
- TDR2, TBP board level function testing, coating, thermal cycling had been finished at CSIST
- TPSFEV2, TBSV2, TPDV2 first piece function test is finished at U. of Perugia, Future boards production are in processing



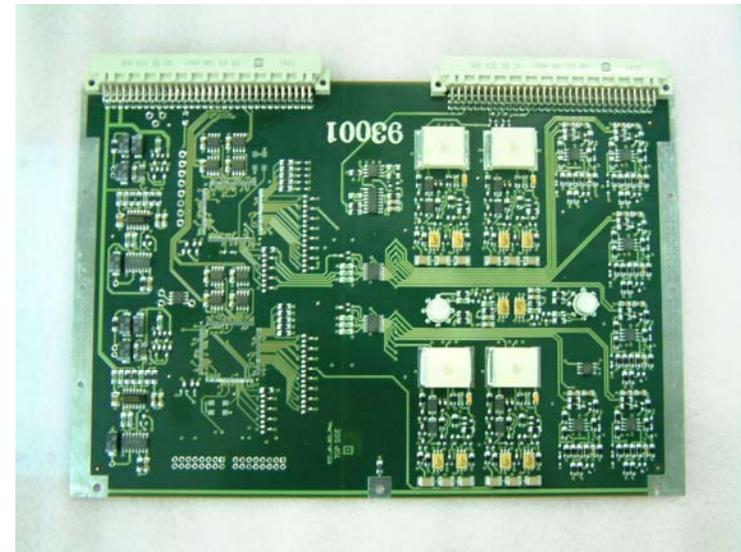
T-Crate /TBPV2 QM2  
COMPONENT SIDE



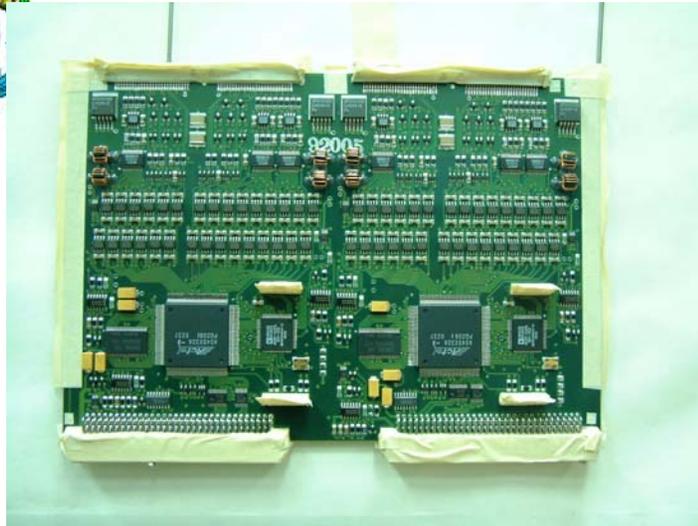
T-Crate/TBSV2(S9068)QM2  
COMPONENT SIDE



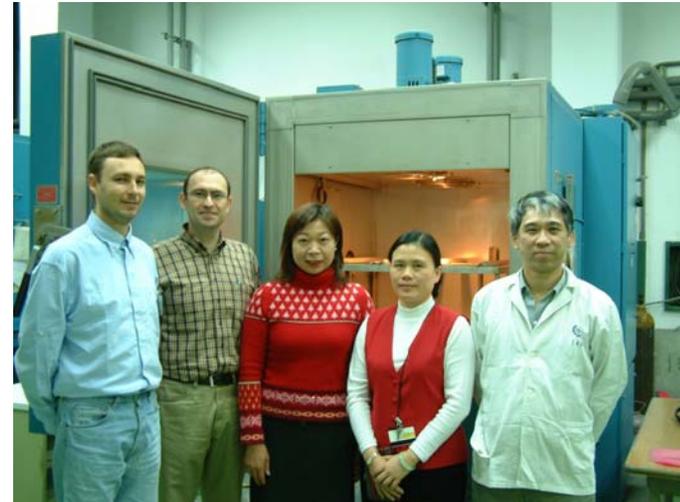
T-Crate /TBPV2 QM2  
SOLDER SIDE



T-Crate/TBSV2(S9068)  
QM2 SOLDER SIDE



T-Crate/TDR2(9018) QM2



Board Level Function Test for  
TDR2(S9018) QM2



TDR2(S9018) QM2 Thermal Cycling



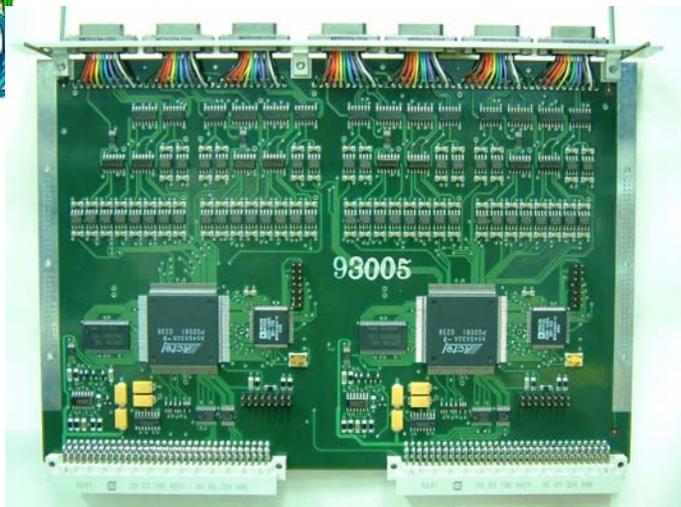
Board Level Function Test for  
QM2V2 JPD and QM2  
TBP/UBP/UHVG/IINFV2

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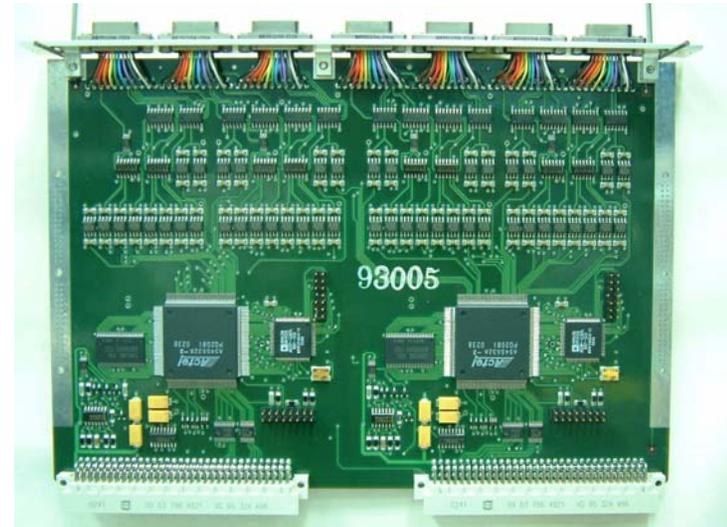


## U/UPD Crate QM2 status

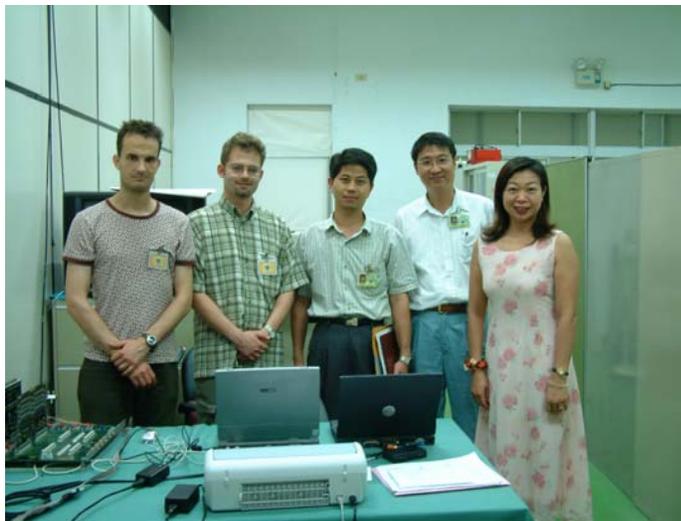
- All the U-Crate boards  
UPSF2EV2, UHVG, UDR2, UBPV2 and  
UPD boards QM2 PCB production, PCA  
production, board level function testing  
before/during/after thermal cycling, and  
coating process had been finished



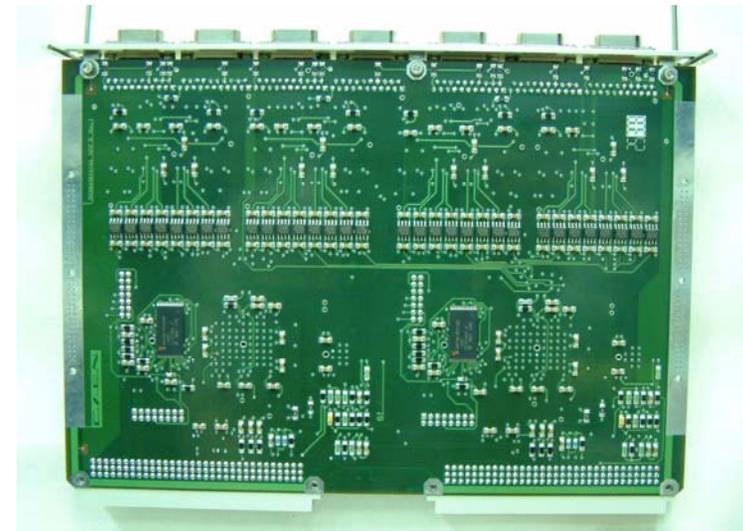
U-Crate/UDR2(S9043) QM2



U-Crate/UPSFEV2(S9070) Side A QM2



Board Level Function Test for  
TDR2(S9018) QM2

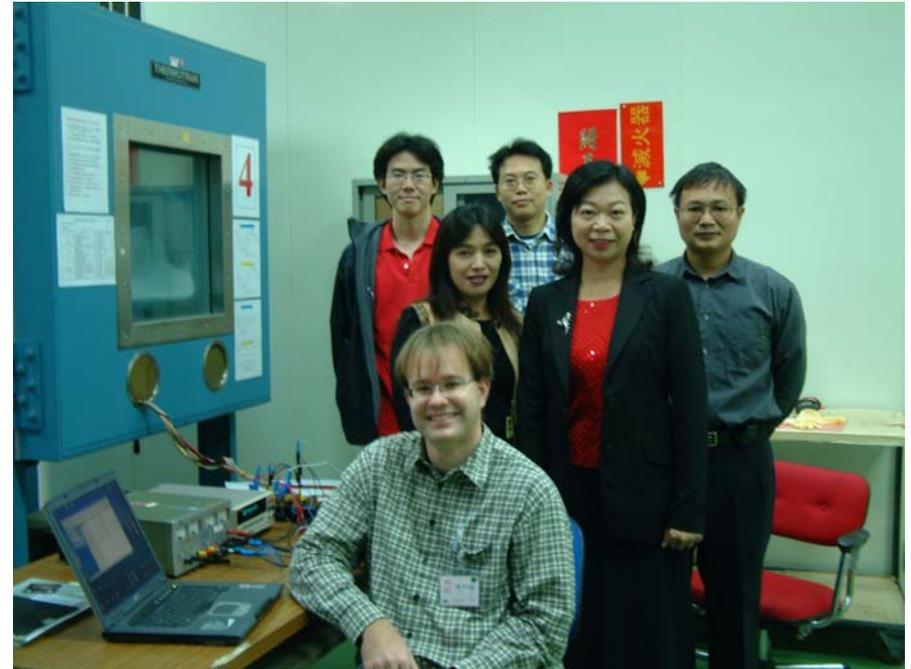


U-Crate/UPSFEV2(S9070) Side B QM2

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Board Level Function Test for  
TPSFE(S9070),S9048,S9053U,S9011AU  
QM2 before thermal cycling



Board Level Function Test for  
TPSFE(S9070),S9048,S9053U,S9011AU  
QM2 after thermal cycling



## Conclusions

- CSIST will fully support to complete the PCB , PCA, and mechanical crates production with highest quality according to the AMS requirements and schedule.
- CSIST has been cooperated very well with the people from CAEN, I.N.F.N Sez.di.Perugia, Uni. Of Karlsruhe, Uni.of Geneva, KYUNGPOOK National Uni., NCU, Sinica and MIT during the production and qualification testing period. This is one of the key factors to guarantee the performance and quality of AMS hardware produced at CSIST.