

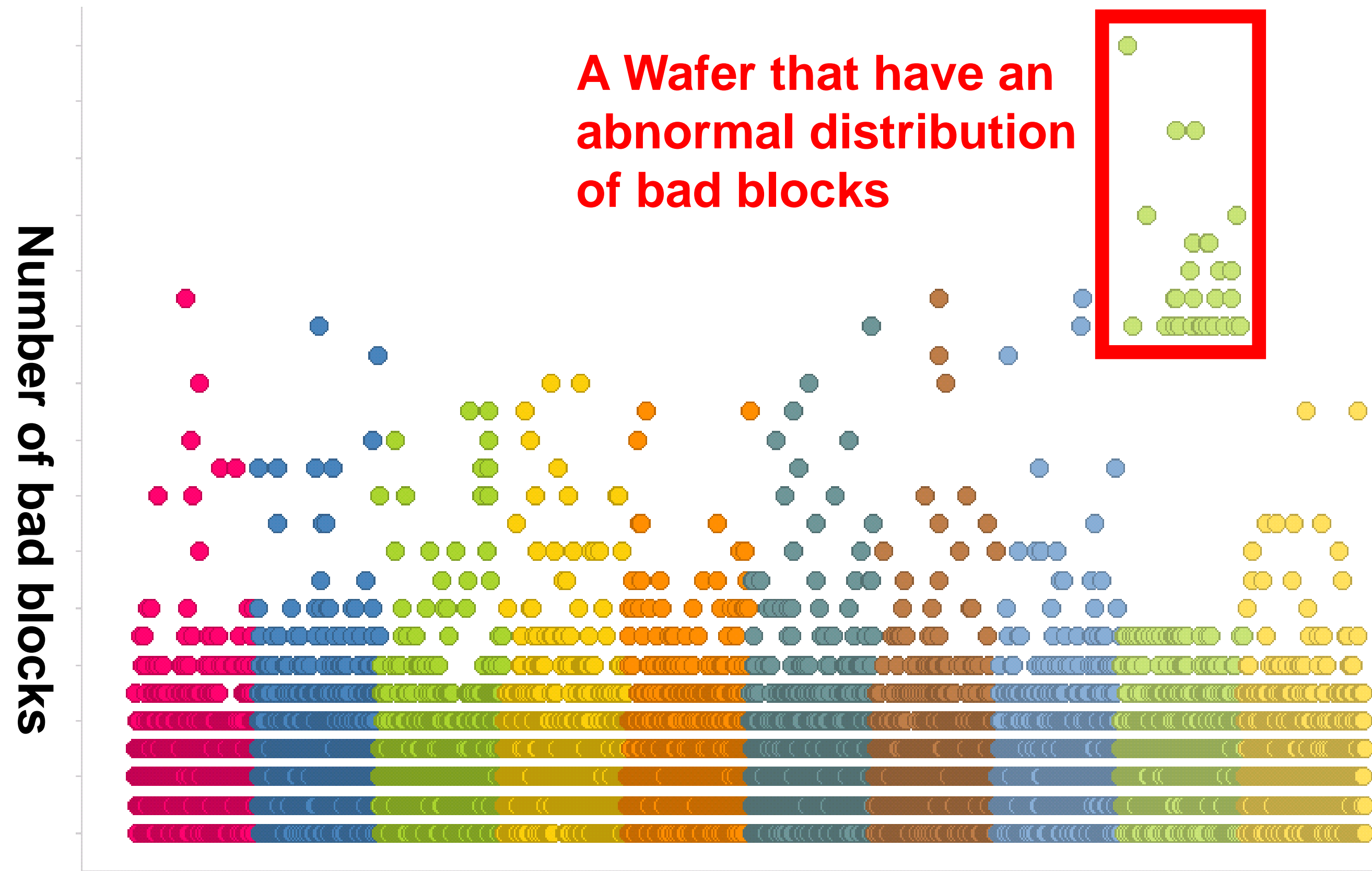
# An Automated Bad Blocks Analysis System Development for NAND Flash

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## Introduction



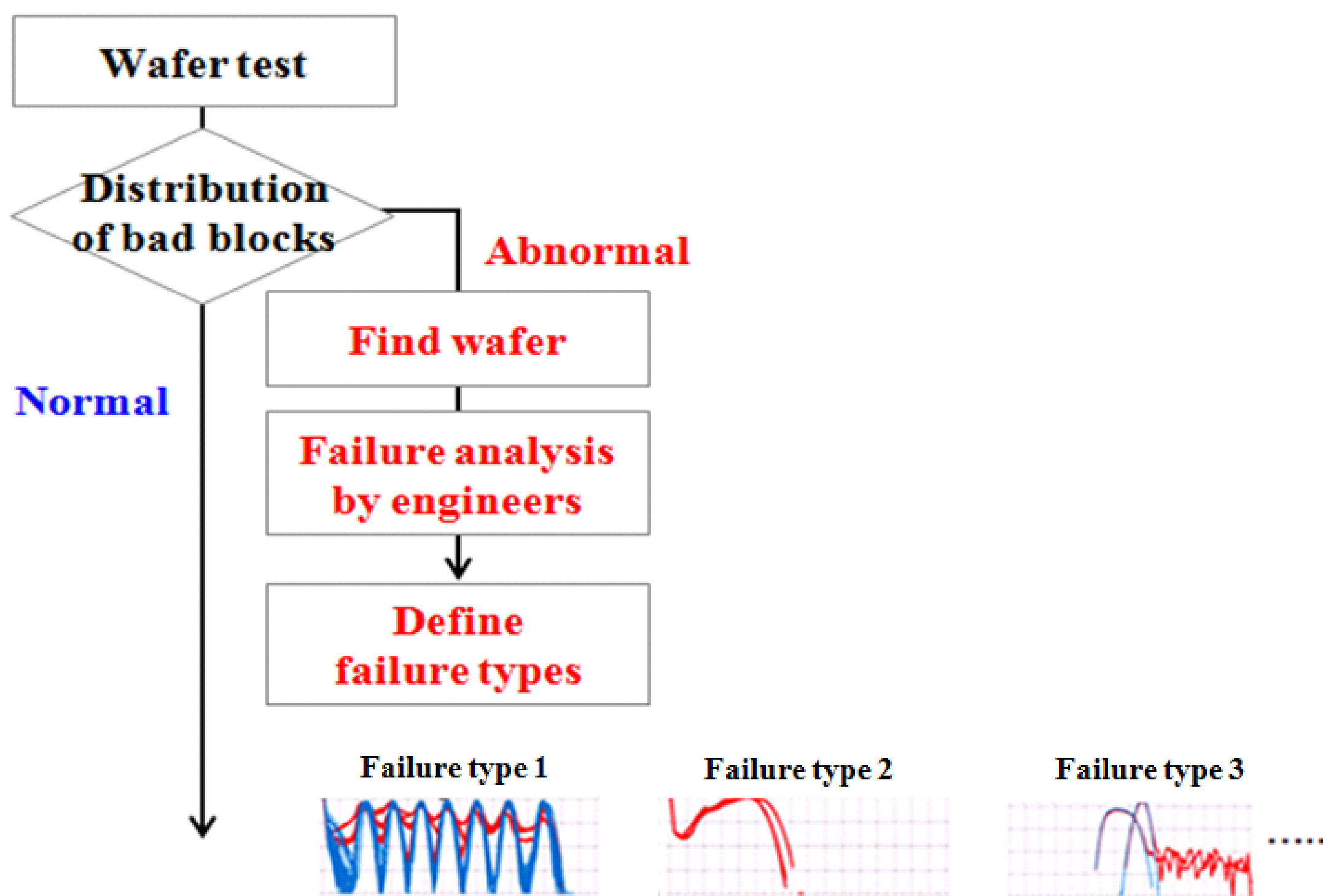
Wafers



- NAND Flash : Some bad blocks.
- Bad Block
  - One or More invalid bits : Reliability is not guaranteed
  - One of the most important factors : Great influence to the quality
- Wafer Probe Test
  - Electrically checks : All individual chips on wafer
  - Bad blocks per each chip

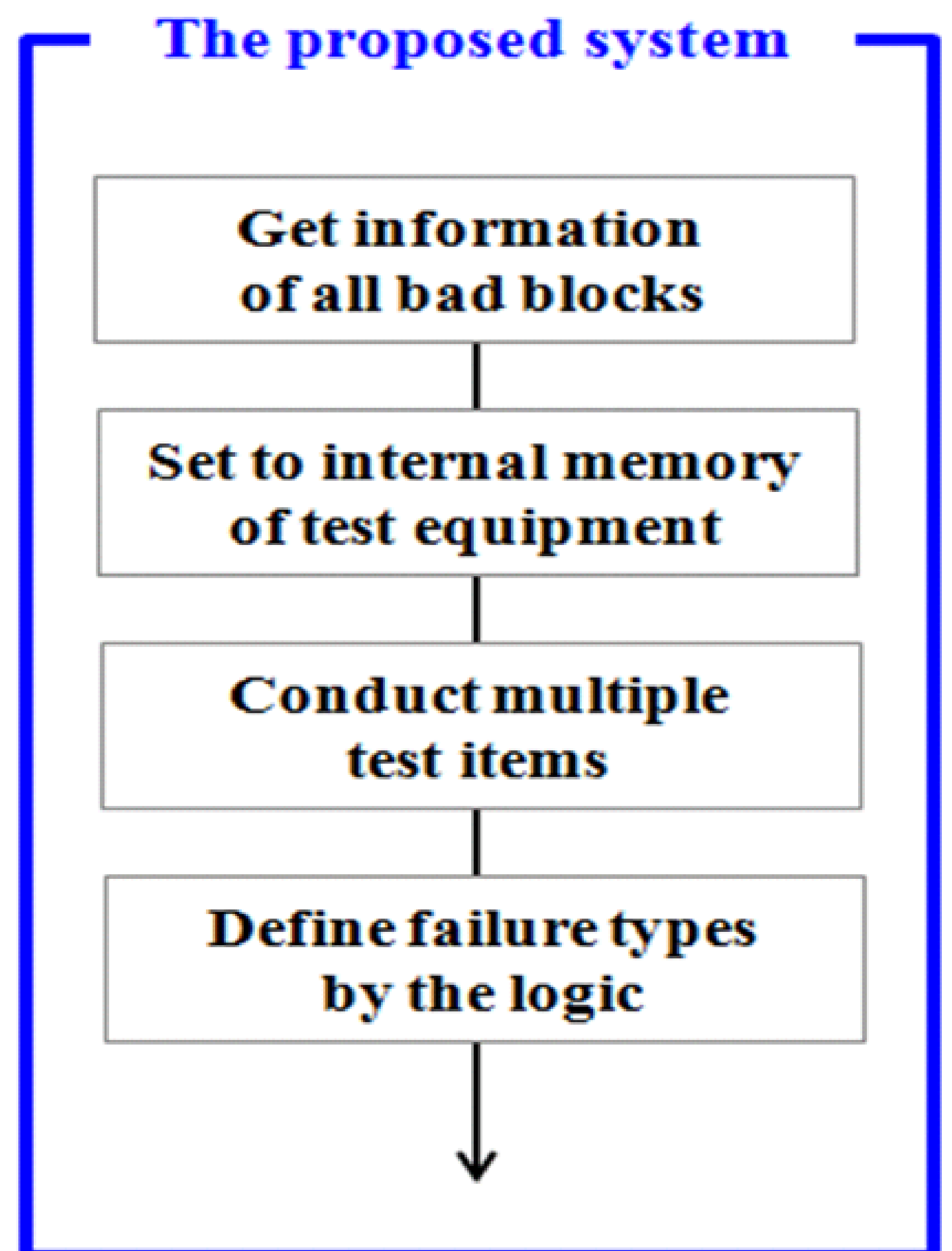
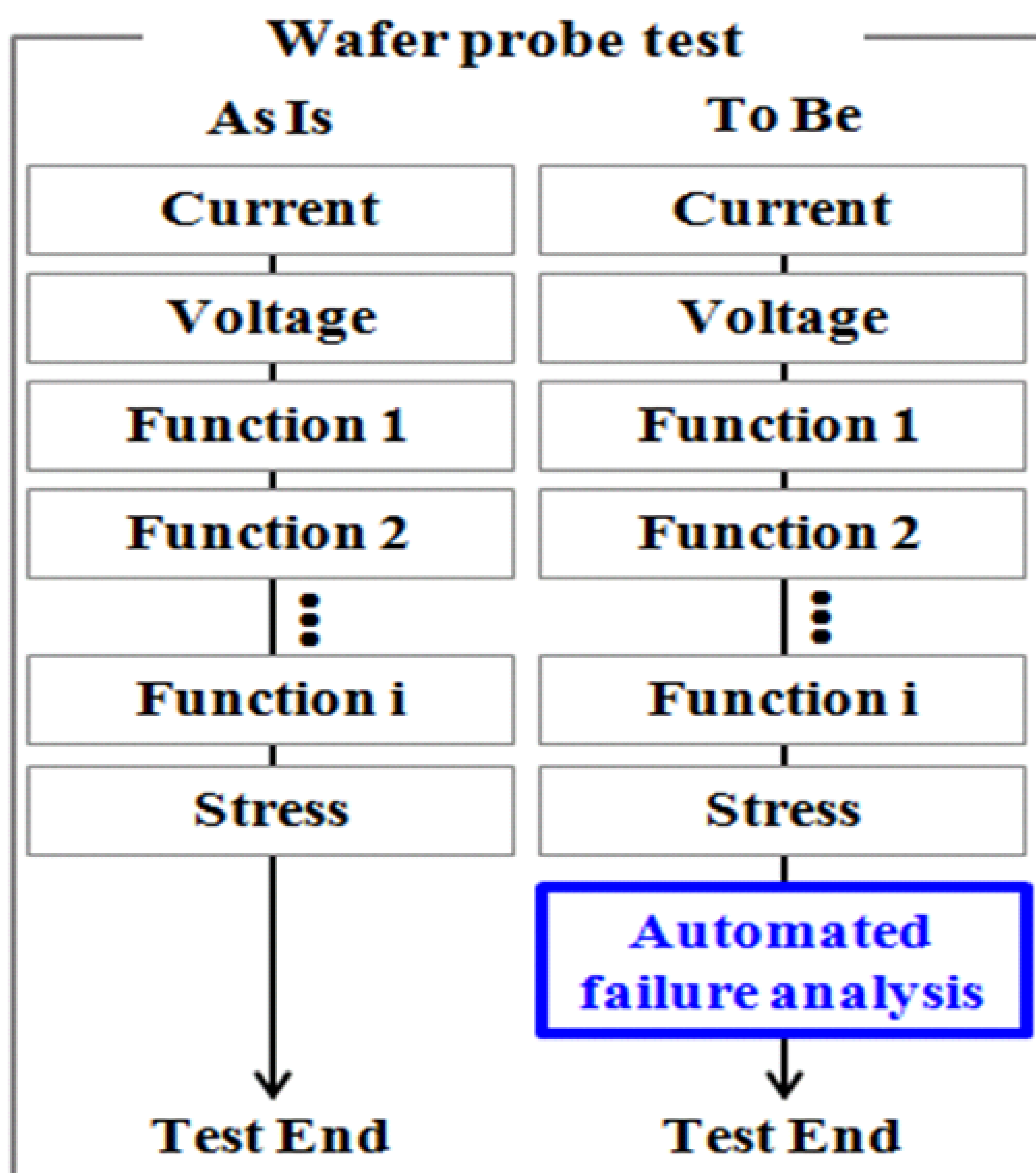
**✓ If we don't do the additional failure analysis, we don't know the failure type of bad blocks**

# Proposed Method



- Process of failure analysis
  - Monitor the distribution of bad blocks
  - Directly conduct failure analysis
  - Define specific failure types of bad blocks

- ✓ Too much time and effort
- ✓ Only a small number of bad blocks



- Develop an automated bad blocks analysis system
  - First, get information of all bad blocks per each chip
  - Second, set to internal memory of test equipment
  - Third, conduct multiple test items
  - Finally, define failure types of bad blocks by the logic

- ✓ Can know specific failure type of bad blocks without additional failure analysis
- ✓ Can efficiently monitor changes of failure types without extra time and effort

# Results

## As Is

Procedure of failure analysis	Chip	Bad blocks
1	Chip1	A
2	Chip1	B
3	Chip1	C
4	Chip2	D
5	Chip2	E
6	Chip3	F
7	Chip3	G
...		
49	Chip10	AW
50	Chip10	AX

**Serial failure analysis**  
(Time : **9.8 hour**)

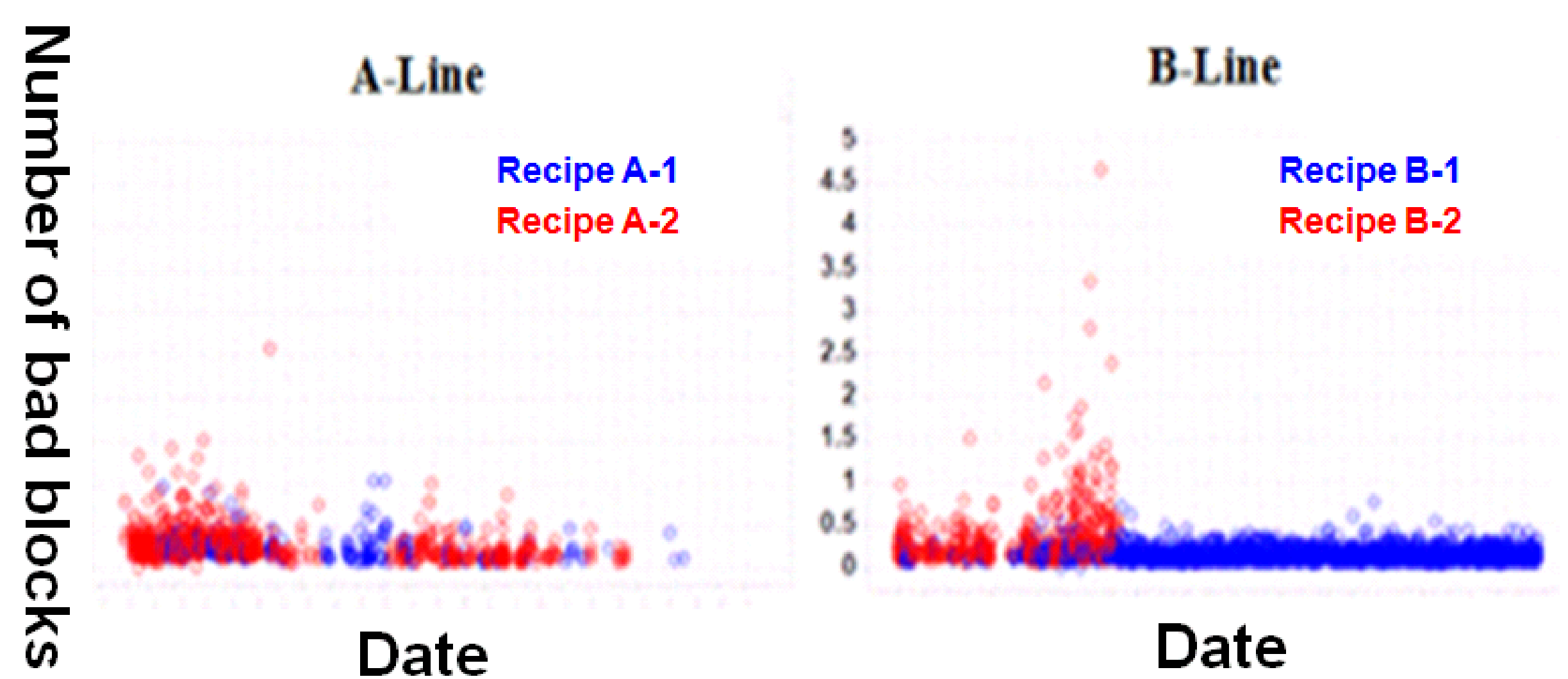
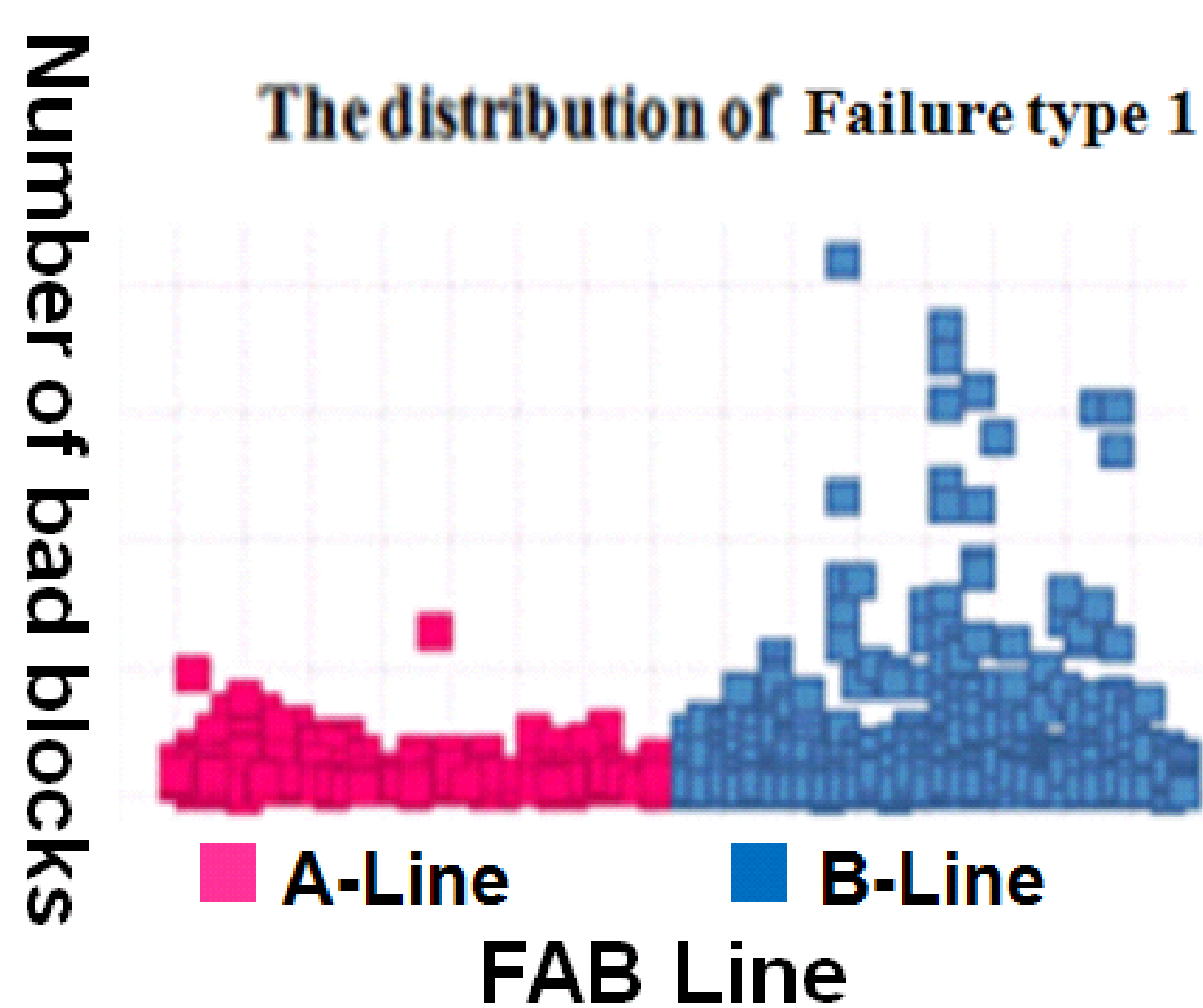
## To Be

Procedure of failure analysis	Chip	Bad blocks
1	All	A,D,F, ...,AW
2	All	B,E,G, ...,AX
3	All	C

**Parallel failure analysis**  
(Time : **0.6 hour**)

**95% reduced**  
(9.8 hour → 0.6 hour)

✓ **Significantly reduce time of failure analysis : 95%(9.8Hr → 0.6Hr)**



✓ **Compare distribution of failure type 1 :  
B-Line is higher than A-Line(some recipes)**

## Conclusion

- Requirements for quality about nand flash are recently growing
- Many companies study various methods to improve the quality
- So, we develop an automatic bad blocks analysis system
- System automatically analyze failure types of bad blocks in real time
- Can know specific failure type of bad blocks without additional failure analysis
- Can efficiently monitor changes of failure types without extra time and effort