IBIS Quality Activities in JEITA EDA WG

IBIS Summit Tokyo, Japan
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JEITA EDA-WG
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JEITA ; Japan Electronics and Information Technology Industries Association

Interest in IBIS Quality

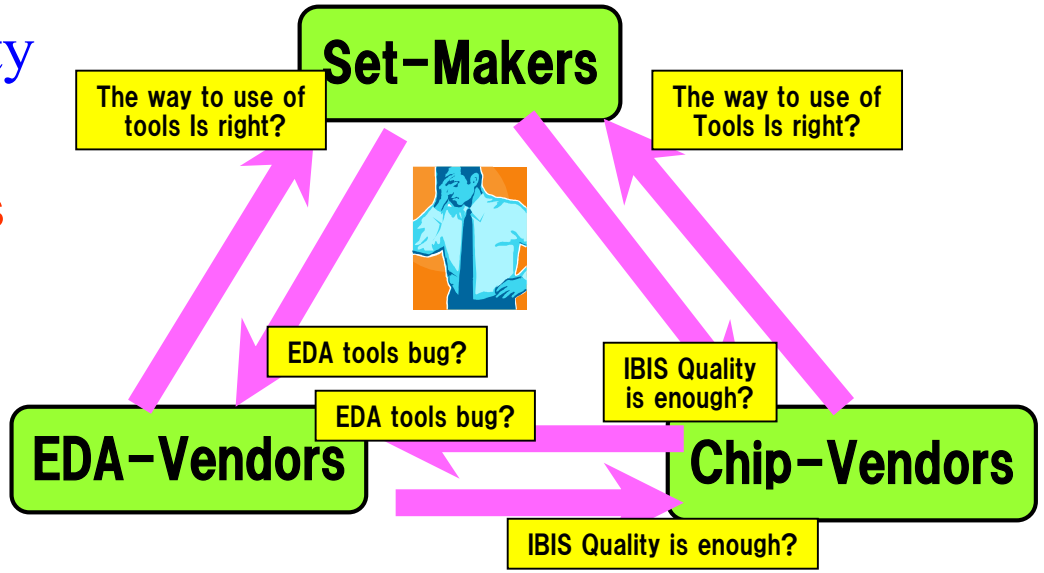
Past presentations concerned with IBIS Quality (2005 - 2008)

Date	Title	Author
January 31, 2005	IBIS Quality Committee Report	Kim Helliwell, Silicon Bandwidth, Inc.
July 25, 2006	IBIS Quality Designations	Mike LaBonte, Cisco Systems
February 1, 2007	IBIS Quality Committee Report	Kim Helliwell, LSI Logic
June 5, 2007	IBIS Quality Report	Mike LaBonte, Cisco Systems
September 11, 2007	Validation for IBIS Models	Wang, Lance*, Zhang, XinJun**, and Yan, Benny** (IO Methodology, *USA, **China)
September 14, 2007	IBIS Quality Activities Overview in JEITA EDA WG	Kondo, Yasumasa (Toshiba, Japan)
September 14, 2007	Validation for IBIS Models	Wang, Lance*, Zhang, XinJun**, and Yan, Benny** (IO Methodology, *USA, **China)
March 14, 2008	IDQ – IBIS Quality Checker	Manfred Maurer* and Christian Sporrer**, *Siemens AG, and **Infineon AG, Germany
November 11, 2008	Micron's IBIS Model Quality Process	Wolff, Randy (Micron Technology, USA)

- IBIS Quality is getting important in recent years.
- Many companies presented about IBIS Quality.

Back-Grounds of IBIS Quality

Why does JEITA focus on this Problem?



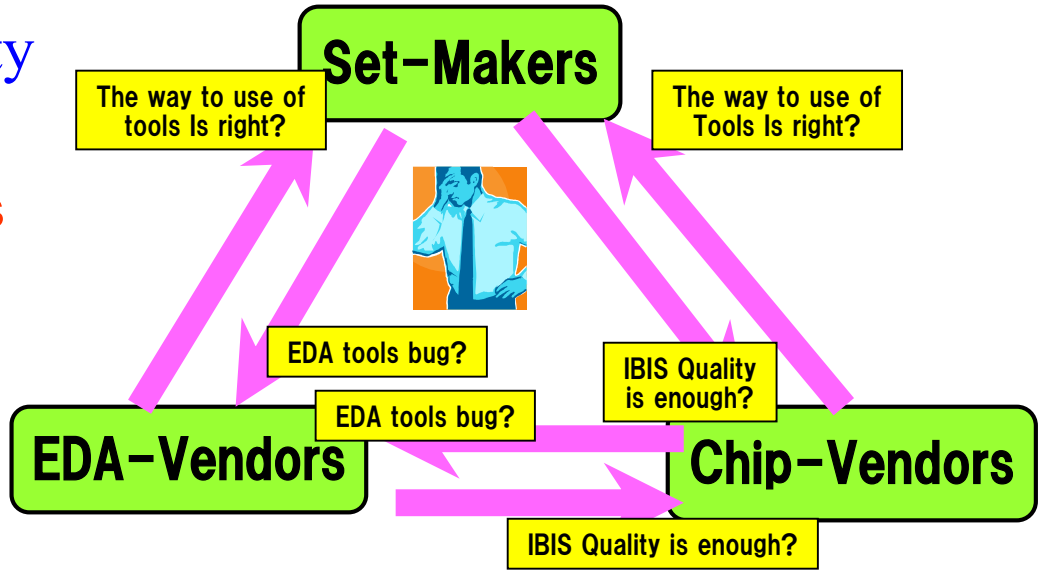
IBIS is the most important data for the transmission line signal simulation.
Set-makers require Chip-vendors of accurate IBIS model.

(1)Recently, Chip-vendors has prepared IBIS data for their customers, but they do NOT mention the accuracy of IBIS (probably they don't afford to do!).
(2)On the other hand, Set-makers don't know how to use that IBIS model with their own simulators. So their way to use the simulator may be wrong.
(3)There are various simulators of high speed design. IBIS defines the basic rule of IBIS keyword and concept, but EDA vendors can interpret with their own way. Their implementation may be wrong or include the program bugs.

On that situation,
What problems occur when IBIS data are distributed from chip-vendors?

Back-Grounds of IBIS Quality

Why does JEITA focus on this Problem?



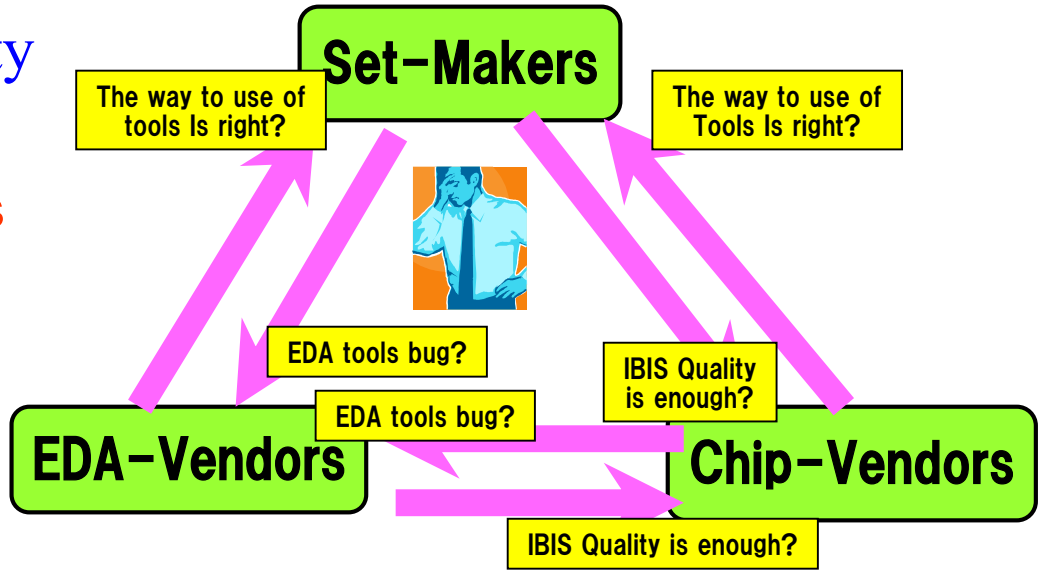
When Set-makers get incomprehensible simulation results with IBIS data, they may require chip-vendors of the correction of that wrong IBIS.
But…. It is very difficult for Chip vendors to deal with their request. Recently, most chip vendors check the IBIS data with their simulators prior to submit the data to their customers. So most problems are not easy-understanding.

Chip vendors must confirm customer's request in detail and their simulation tools. Even if they get all information, they cannot find the solution. Because…
(1)Customer may use the simulator in wrong way.
(2)The simulation parameters may be set wrongly by their customers without knowing
(3)That problems are caused by simulator's bugs

Finally, Chip-vendors cannot find solutions for the problems, they cannot help ignoring user's request……

Back-Grounds of IBIS Quality

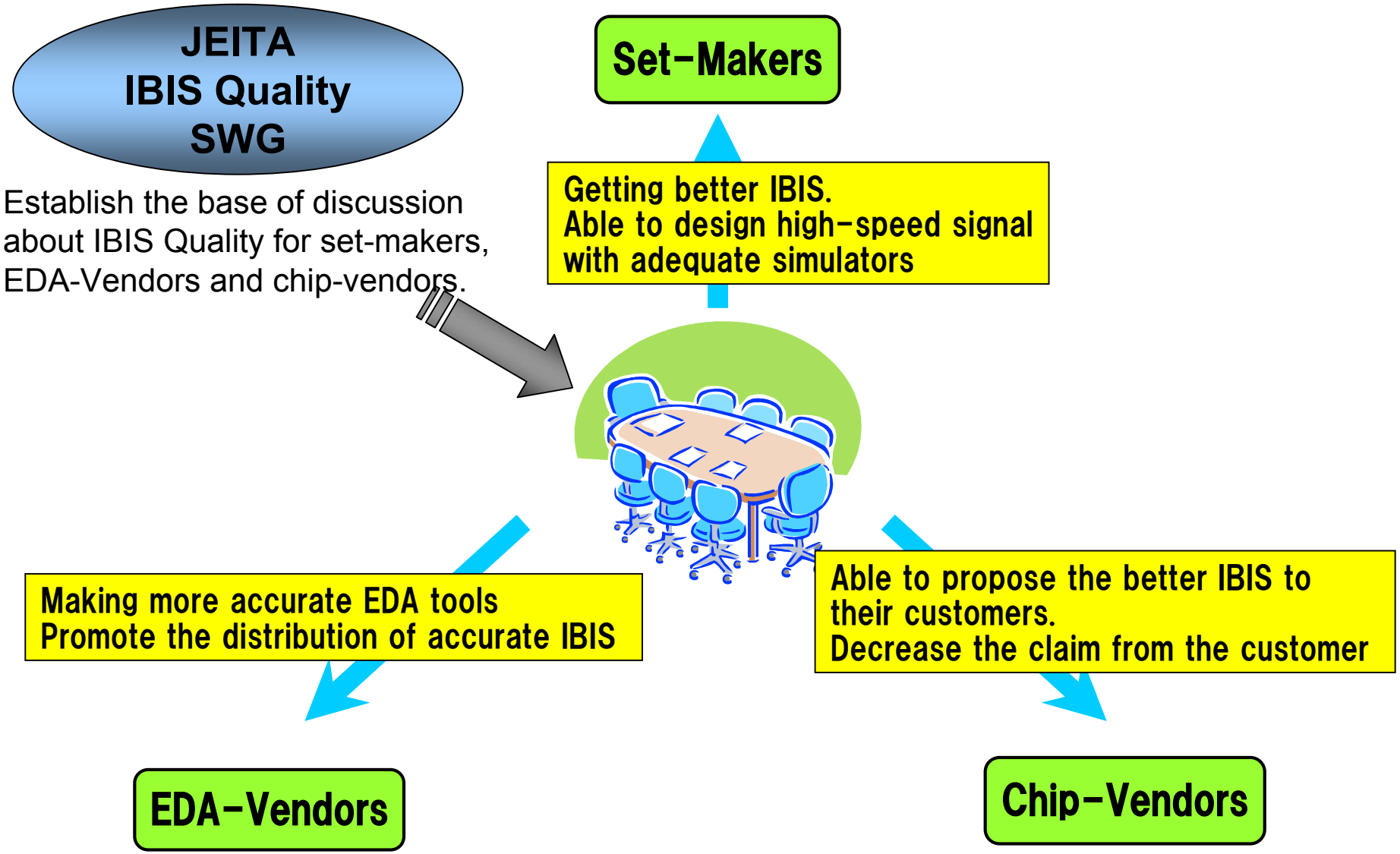
Why does JEITA focus on this Problem?



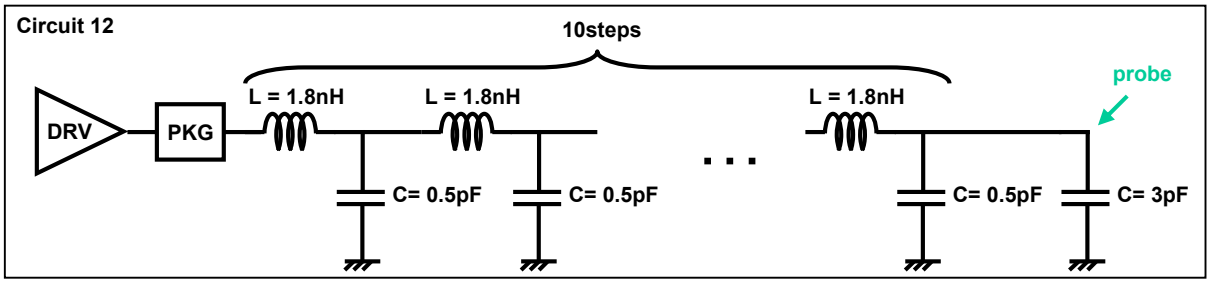
That situation is worst case , but occurs frequently.
JEITA would like to achieve a breakthrough this situation, for there are lots of set-makers (digital consumer products) and chip-vendors are belong to JEITA.

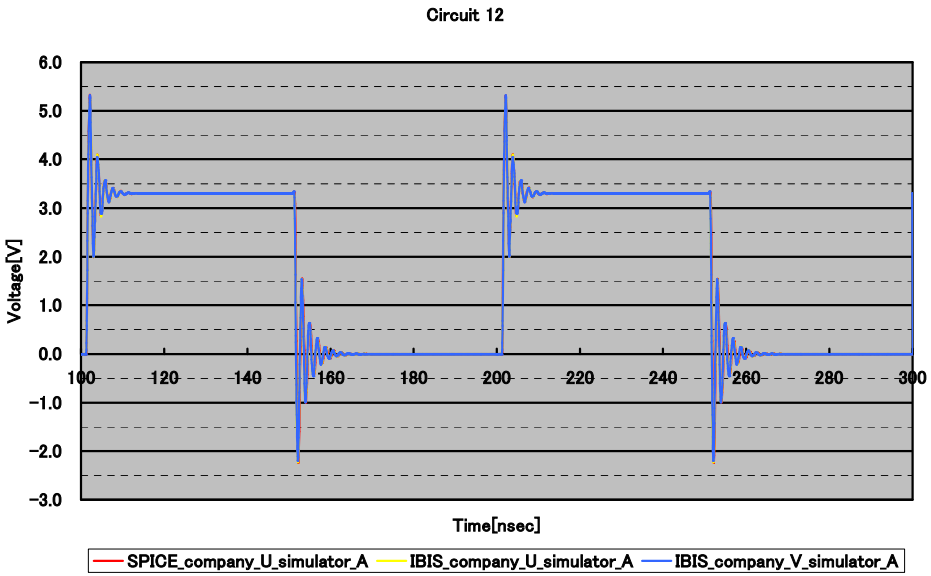
IBIS quality problem must be solved in two sides.
One is IBIS interpretation. EIA activities focus on this.
One more solution is the establishment of IBIS distribution system.
JEITA focus on this distribution system.

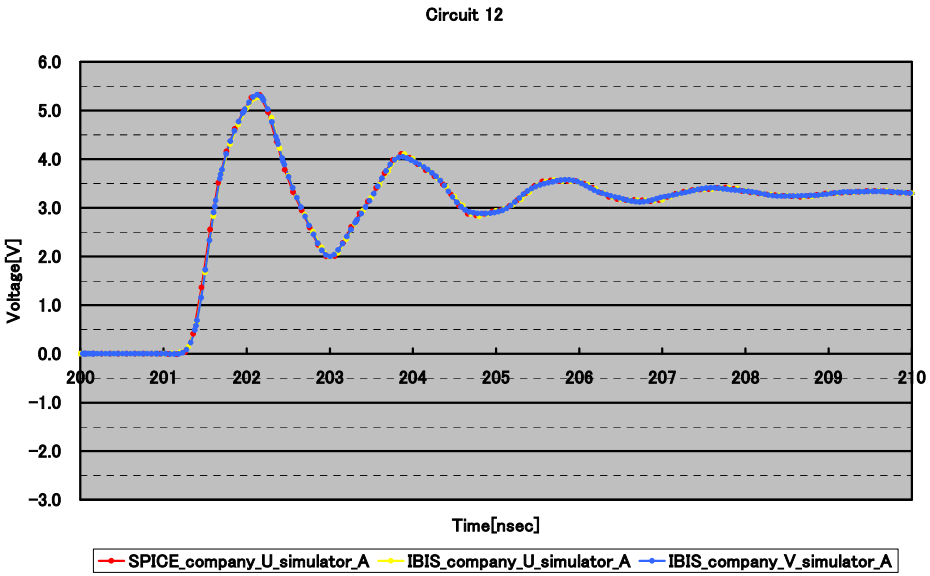
Expectations of this task



Golden IBIS Model



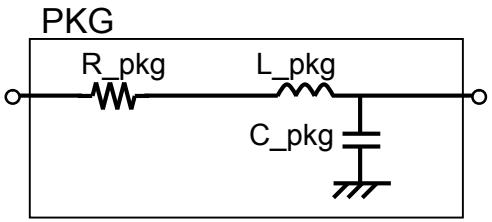




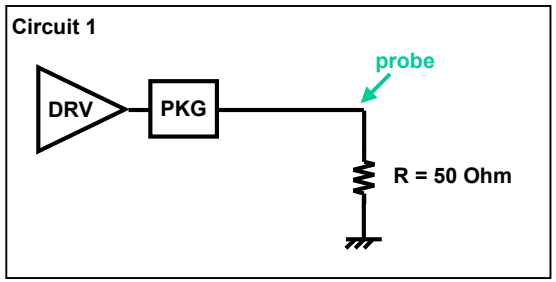
- Compare between SPICE and IBIS results simulated by company U with simulator A
- Completely matching ➔ Good Golden IBIS Model

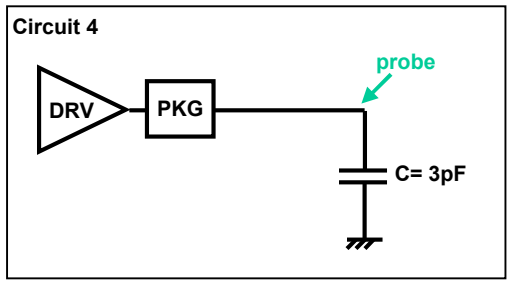
Test circuits group(1/2)

Name	Termination	Transmission line
Circuit 1	50ohm	0cm
Circuit 2	50ohm	5cm
Circuit 3	50ohm	30cm
Circuit 4	3pF	0cm
Circuit 5	3pF	5cm
Circuit 6	3pF	30cm
Circuit 7	3pF	30cm + 5cm

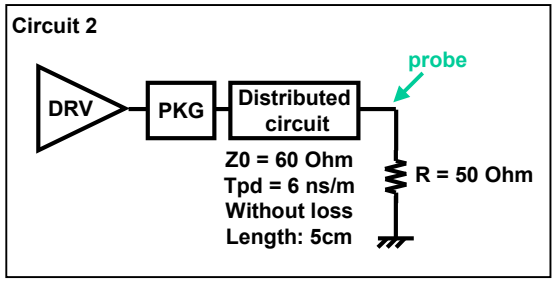


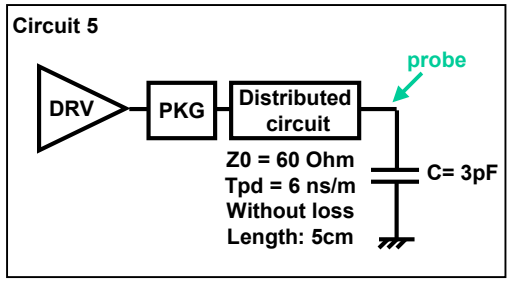
Input : PULSE
Frequency = 10MHz

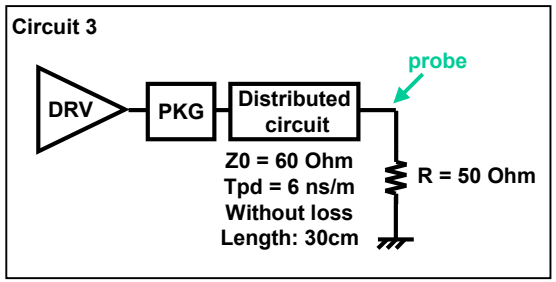


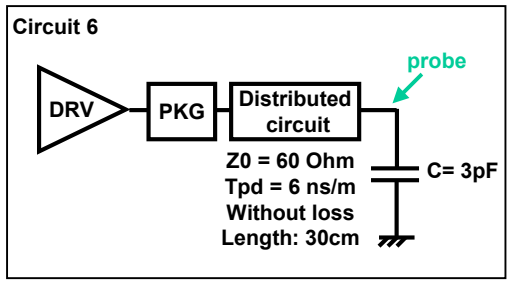


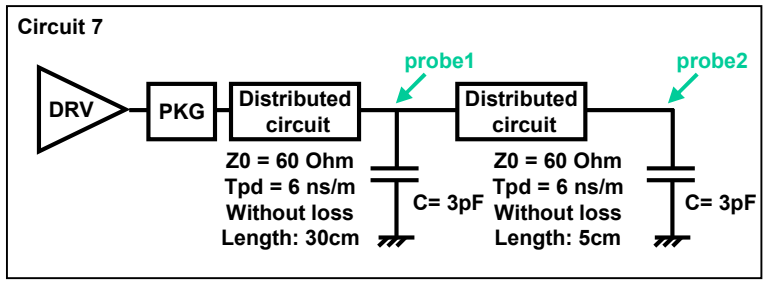
Our task group prepare the Golden test circuits.
(See left circuits for single and relatively low speed devices)





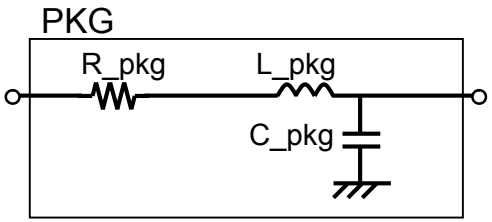




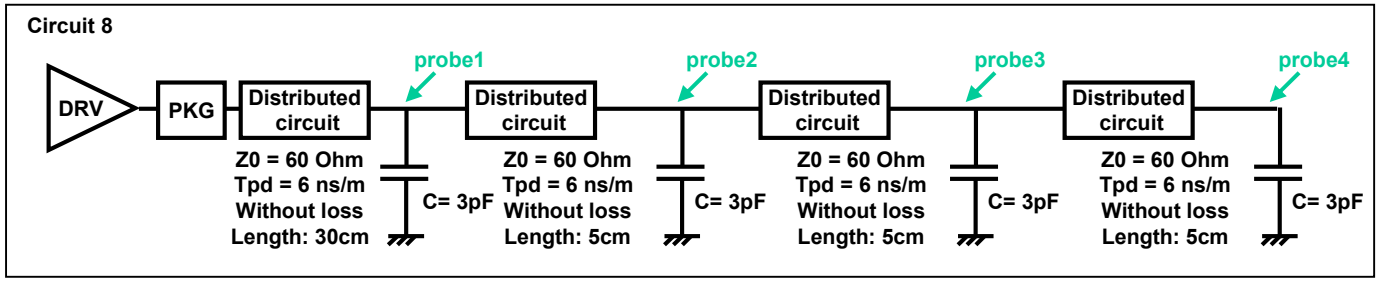


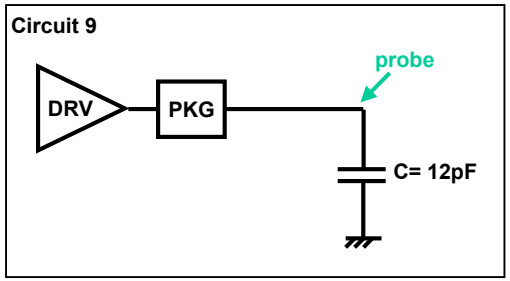
Test circuits group(2/2)

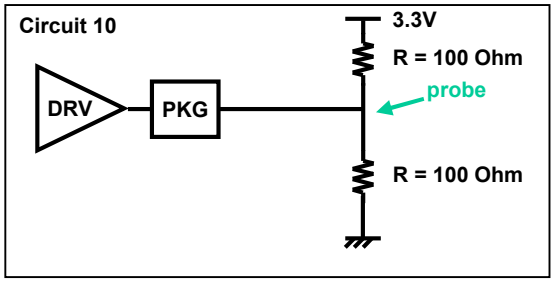
Name	Termination	Transmission line
Circuit 8	3pF	30cm + 5cm + 5cm + 5cm
Circuit 9	12pF	0cm
Circuit 10	100ohm + 100ohm	0cm
Circuit 11	10nH + 3pF	0cm
Circuit 12	3pF	5cm (Lumped circuit)

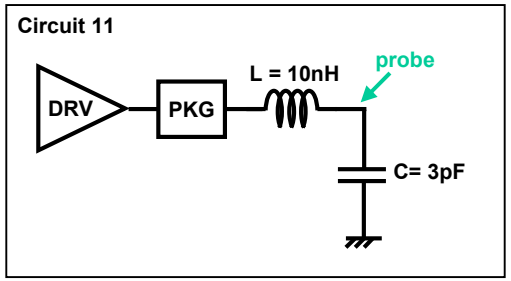


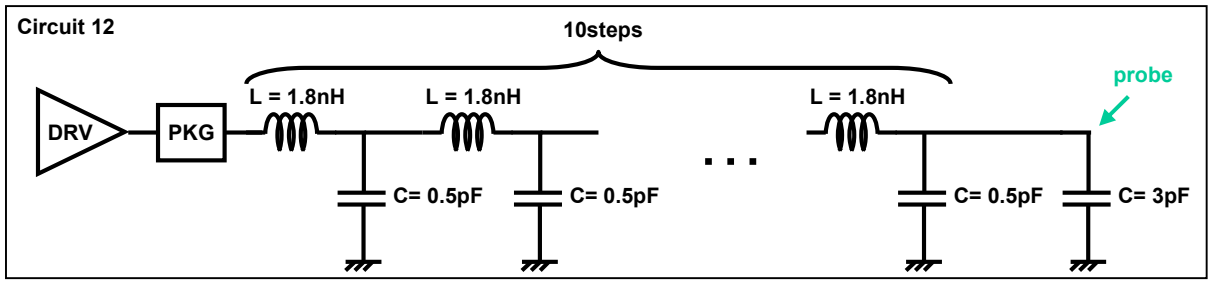
Input : PULSE
Frequency = 10MHz











The participants and the simulators

Simulators

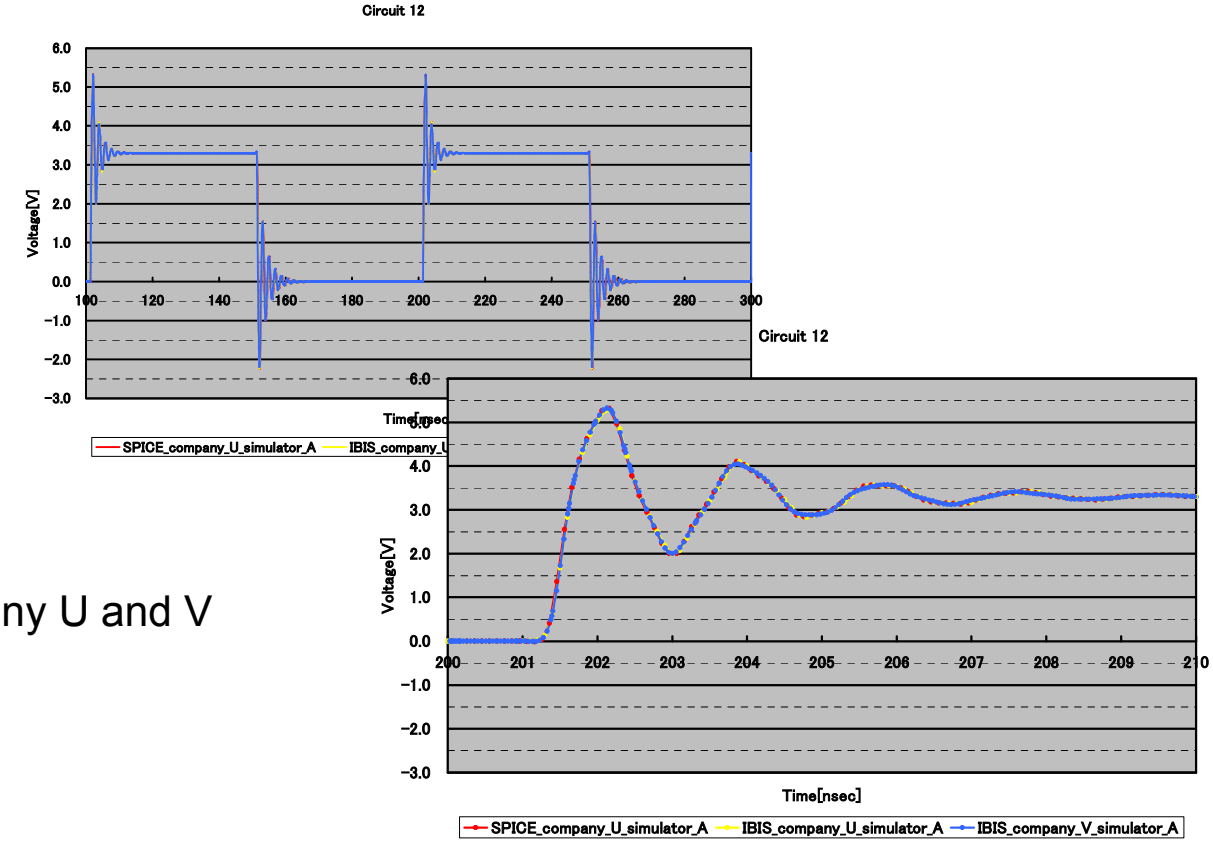
Companies

	A	B	C	D	E	F	G
U	○						
V	○						
W		○					
X			○	○			○
Y					○	○	
Z							○

6 companies in JEITA WG take part in this activities with 7 simulators.

The accuracy Check of simulator A using Circuit 12

	A	B	C	D	E	F	G
U	○						
V	○						
W		○					
X			○	○			○
Y					○	○	
Z							○



Compare the results by company U and V with simulator A.

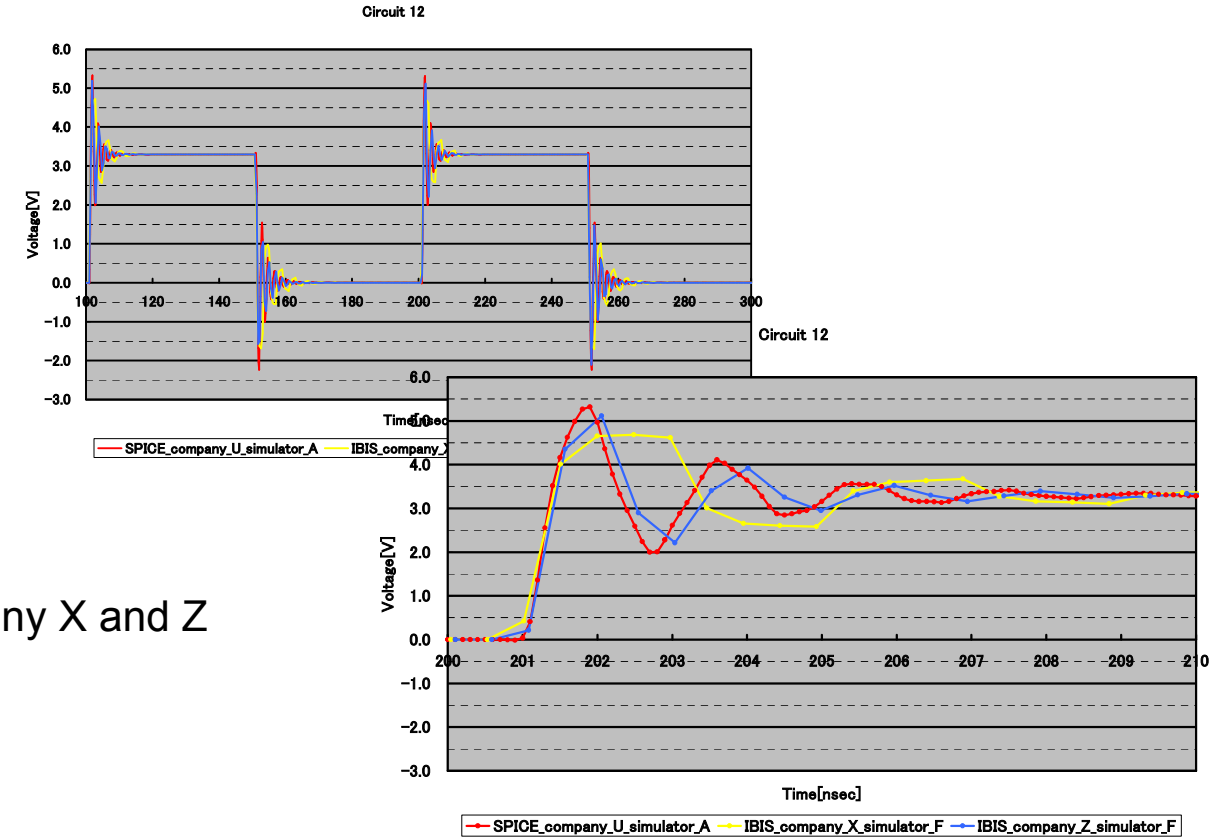
➔ Completely matching

The operators in both company U and V are competent.

Both simulation environments (parameter setting , default parameters,….) may be same.

The accuracy Check of simulator G using Circuit 12

	A	B	C	D	E	F	G
U	○						
V	○						
W		○					
X			○	○			○
Y					○	○	
Z							○



Compare the results by company X and Z with simulator G.

➔ Not consistent

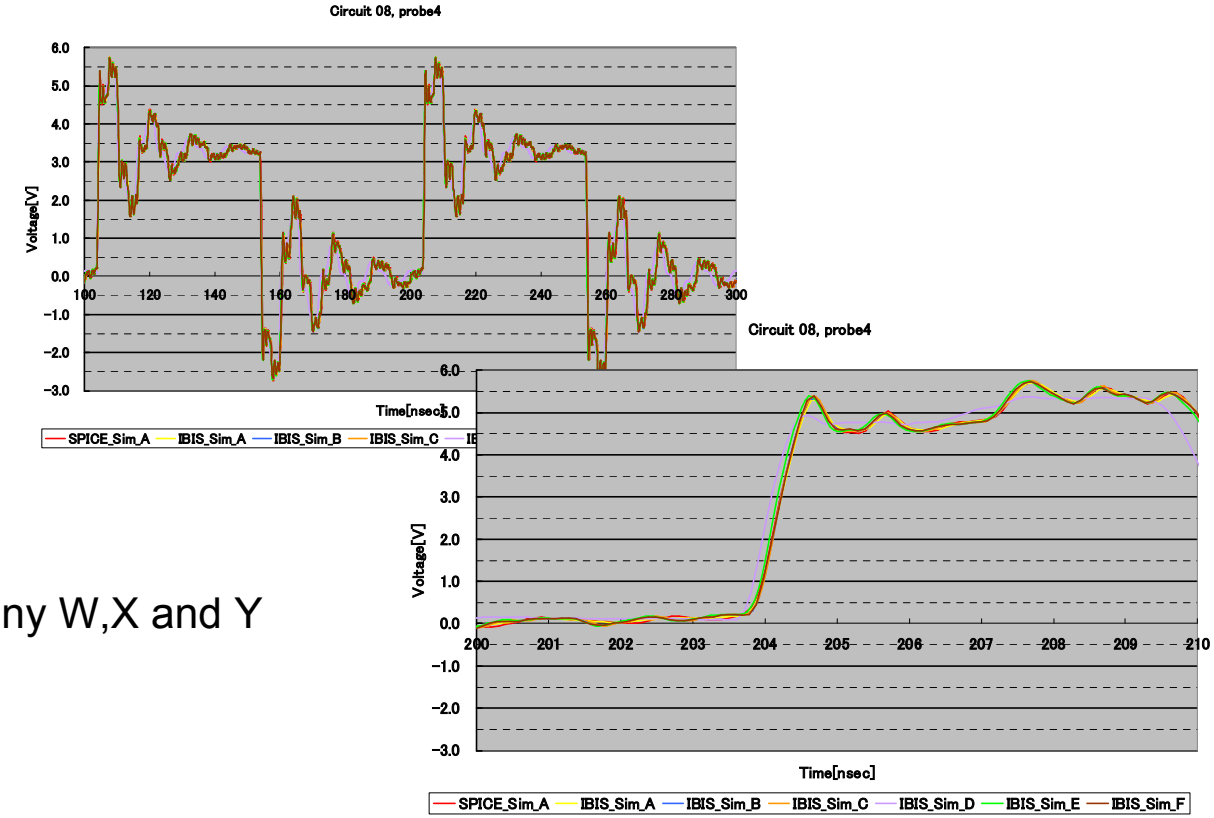
Company X and Z exchange their simulation input data each other.

➔They make sense that reasons of difference. So both results get along.

Comparison with golden input data with both golden IBIS and golden simulation result makes user's ability better.

The accuracy Check of simulator B,C,D,E,F using Circuit 8

	A	B	C	D	E	F	G
U	○						
V	○						
W		○					
X			○	○			○
Y					○	○	
Z							○



Compare the results by company W,X and Y with simulator B,C,D,E,F.

➔ Not consistent

We cannot distinguish the cause of inaccuracy due to whether user's skill or simulator.

The difference between the simulators (Results)

Accurate simulators

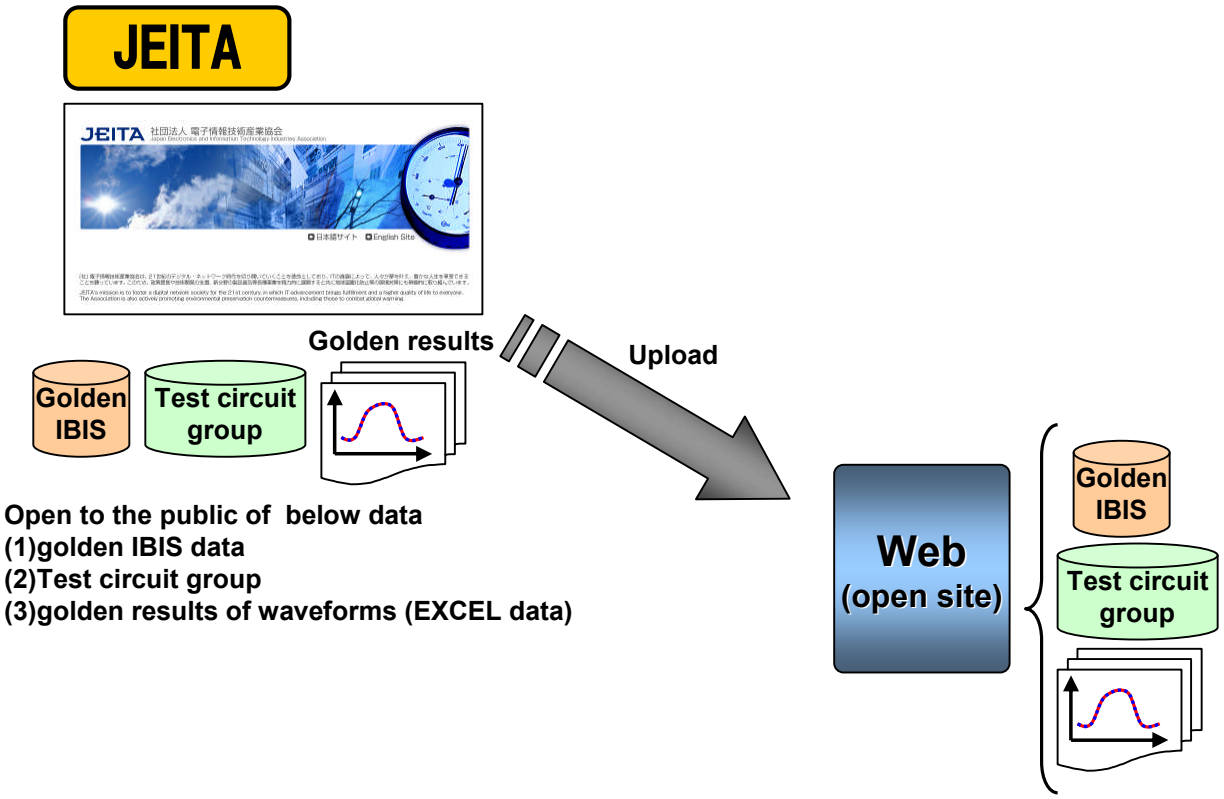
Simulator	Circuit No.											
	1	2	3	4	5	6	7	8	9	10	11	12
A	○	○	○	○	○	○	○	○	○	○	○	○
B	○	○	○	○	○	○	○	○	○	○	○	○
C	○	○	○	○	○	○	○	○	○	○	○	○
D	○	○	○	△	×	△	×	×	○	○	×	×
E	○	○	○	○	○	○	○	○	○	×	○	○
F	○	○	○	○	○	○	○	○	○	○	○	○

○ : Excellent
△ : Enough
× : Inadequate

According to the above results, Simulator A, B, C, E, F are good enough.
Simulator D may be improper for using transmission line simulator.

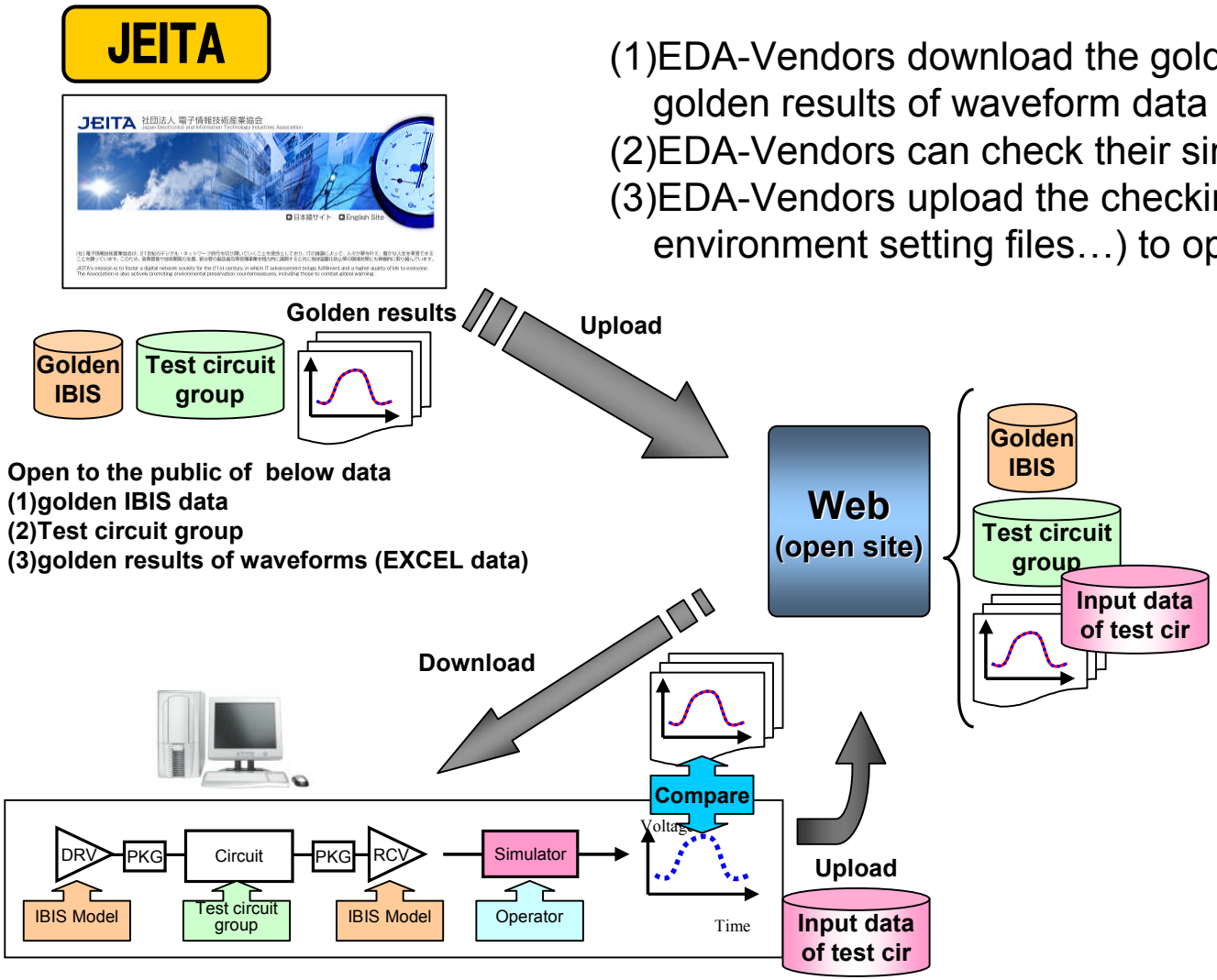
If EDA vendors check the accuracy with own simulators by themselves,
Simulation users and chip vendors can get the great benefit.

The basic concept for distribution of good IBIS models(1/4)



Open to the public of below data
(1)golden IBIS data
(2)Test circuit group
(3)golden results of waveforms (EXCEL data)

The basic concept for distribution of good IBIS models(2/4)

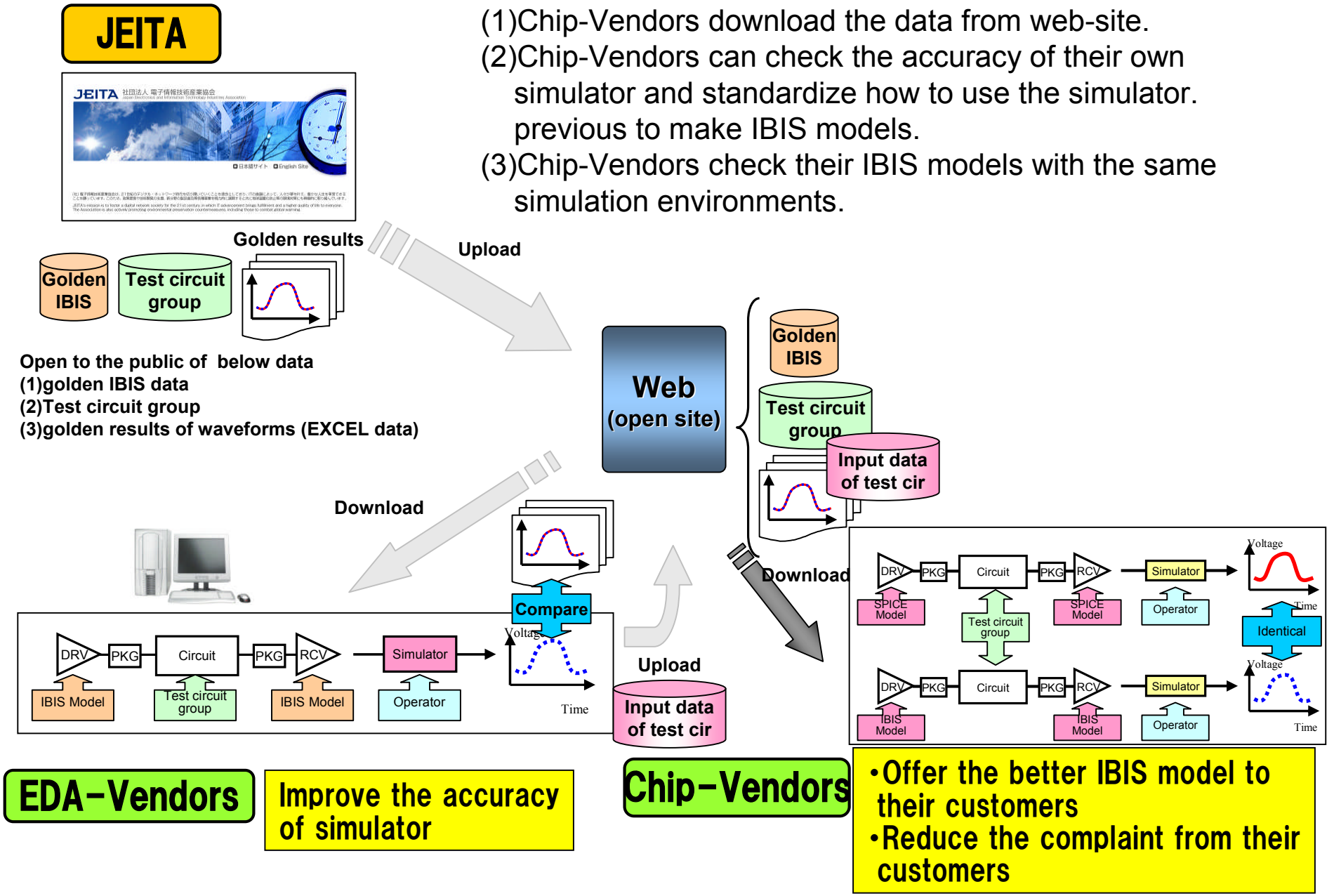


(1)EDA-Vendors download the golden IBIS , test circuits, golden results of waveform data from web site.
(2)EDA-Vendors can check their simulators with (1) data
(3)EDA-Vendors upload the checking data(input data, environment setting files…) to open website.

EDA-Vendors Improve the accuracy of simulator

The basic concept for distribution of good IBIS models(3/4)

(1)Chip-Vendors download the data from web-site.
(2)Chip-Vendors can check the accuracy of their own simulator and standardize how to use the simulator. previous to make IBIS models.
(3)Chip-Vendors check their IBIS models with the same simulation environments.



The basic concept for distribution of good IBIS models(4/4)

JEITA

Golden results

Golden IBIS

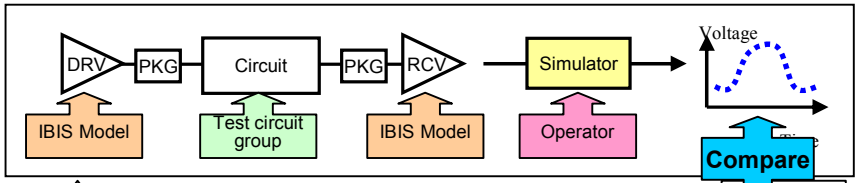
Test circuit group

Upload

Open to the public of below data
(1)golden IBIS data
(2)Test circuit group
(3)golden results of waveforms (EXCEL data)

Set-Makers

- Getting better IBIS from chip-vendors
- User skill up of simulation



Download

Web (open site)

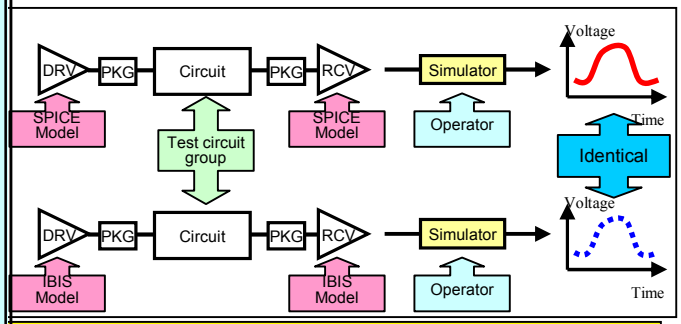
Golden IBIS

Test circuit group

Input data test cir

better IBIS

(1)Set-makers download the data from web-site.
(2)Set-makers can check the accuracy of their own simulator and standardize how to use the simulator. previous to make IBIS models.
(3)Set-makers check their getting IBIS models from chip-vendors with the same simulation environments.
(4)If chip-vendors make use of this concept, they can understand what is wrong easily.



EDA-Vendors

Improve the accuracy of simulator

Chip-Vendors

- Offer the better IBIS model to their customers
- Reduce the complaint from their customers

Merit

(1)EDA vendors offer the good simulation tools to chip-vendors and set makers.

(2)Chip vendors can offer the good IBIS models to set makers.

(3)Set makers can check accuracy of IBIS model from chip-vendors easily. On the other hand, chip vendors expect to reduce the trivial question from their customers.

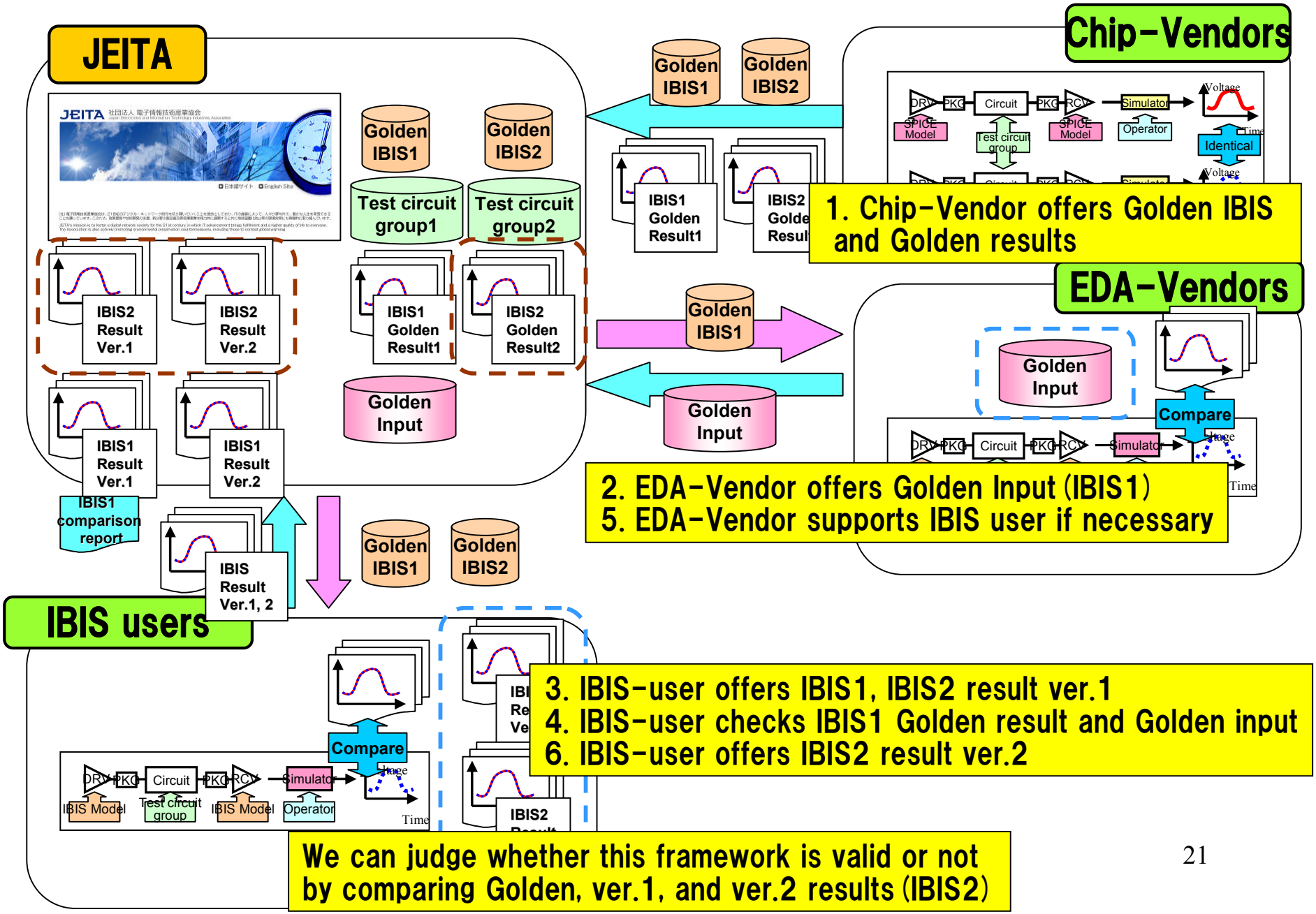
(4)All members can talk about IBIS accuracy each others using this concept and system.

What's in progress in this project?

- We are checking the validity of this framework.

- Member
  - Chip-Vendors
    - HITACHI, NEC, TOSHIBA
  - IBIS Users
    - Canon, FUJITSU, IBITECH, Panasonic, RENESAS, SHARP, SONY, TOSHIBA
  - EDA-Vendors
    - ATE, Cadence, CYBERNET, DIPRO, ZUKEN

How to check the validity of this framework



In the future…

- JEITA hopes that many simulator vendors take part in our activity.
- We must expand and improve the standard test circuits.
- Finally, this test circuits will be public inside JEITA members. IBIS users (companies) will make use of test circuits for checking their simulation environments and proceeding operator's ability.
- Verification and Validation are going to be very important for ISO9001 in the near future.

Thank you for all the help EIA/IBIS Committee!