



Implementing Scan Test with SSN On-Chip Compare and Diagnostic Data Collection on Advantest 93000

September 23, 2022

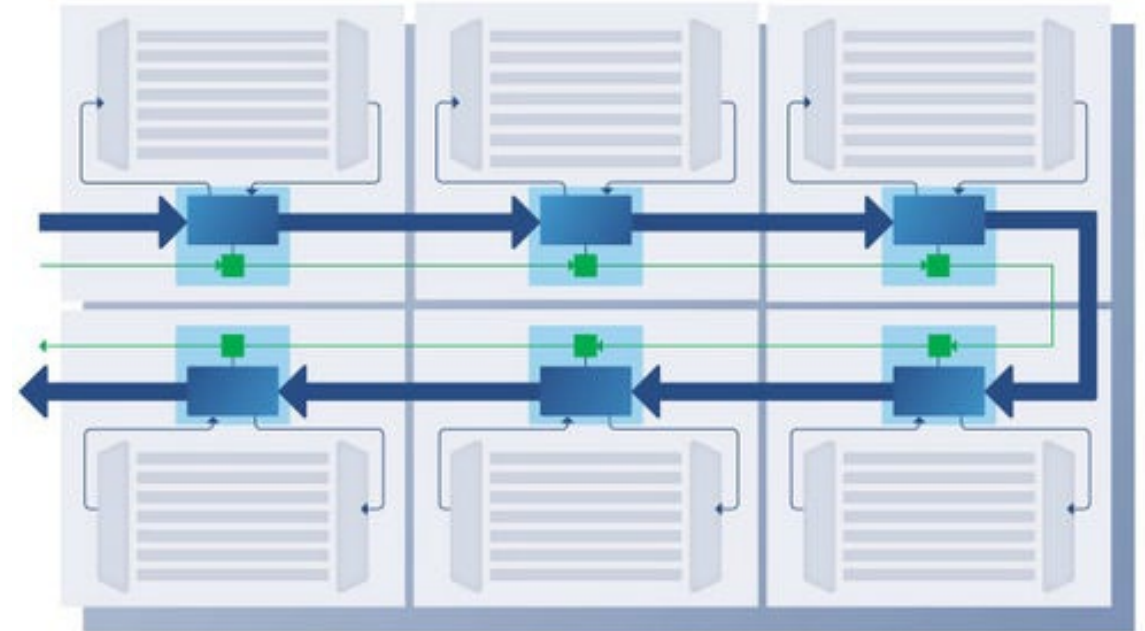
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What is SSN (Scan Streaming Network)?

Provides packetized delivery of scan test data

Optional on-chip compare

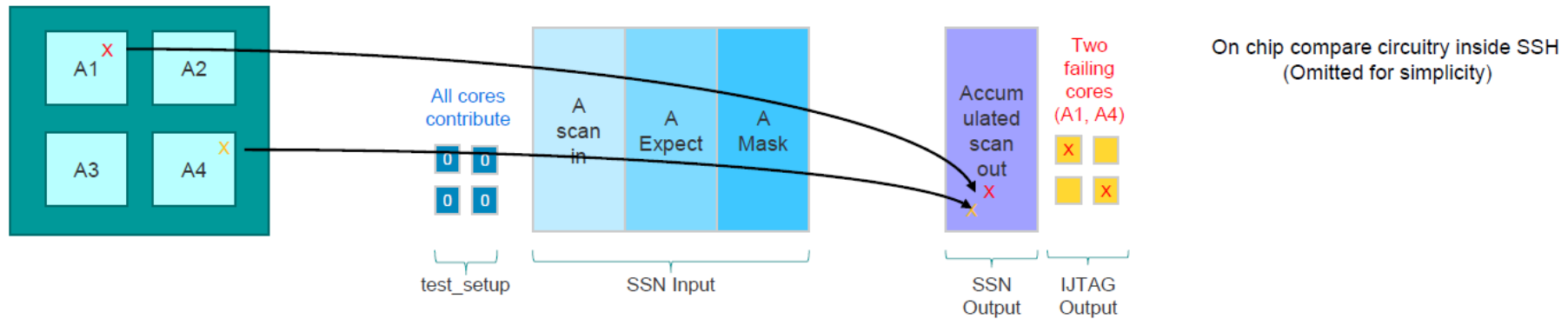
- Allows concurrent testing of multiple identical cores with the same packets.
- Reduces the test data volume required to test identical cores.
- May require additional testing to collect failure data.



Siemens SSN On-Chip Compare Diagnostic Flow (1)

Advanced Topics

On-chip compare: Diagnosis example 2 step 1



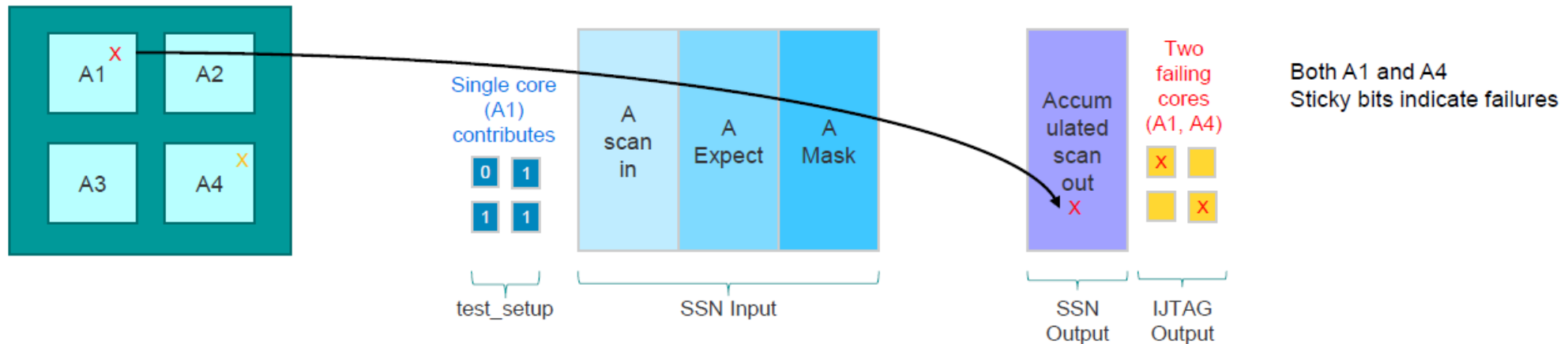
- Example: 2 cores fail

- All cores contribute to accumulated status (default)
 - test_setup procedure setting
- Accumulated scan output represents failures from both failing cores A1, A4
- Diagnosis cannot be performed from failure file

Siemens SSN On-Chip Compare Diagnostic Flow (2)

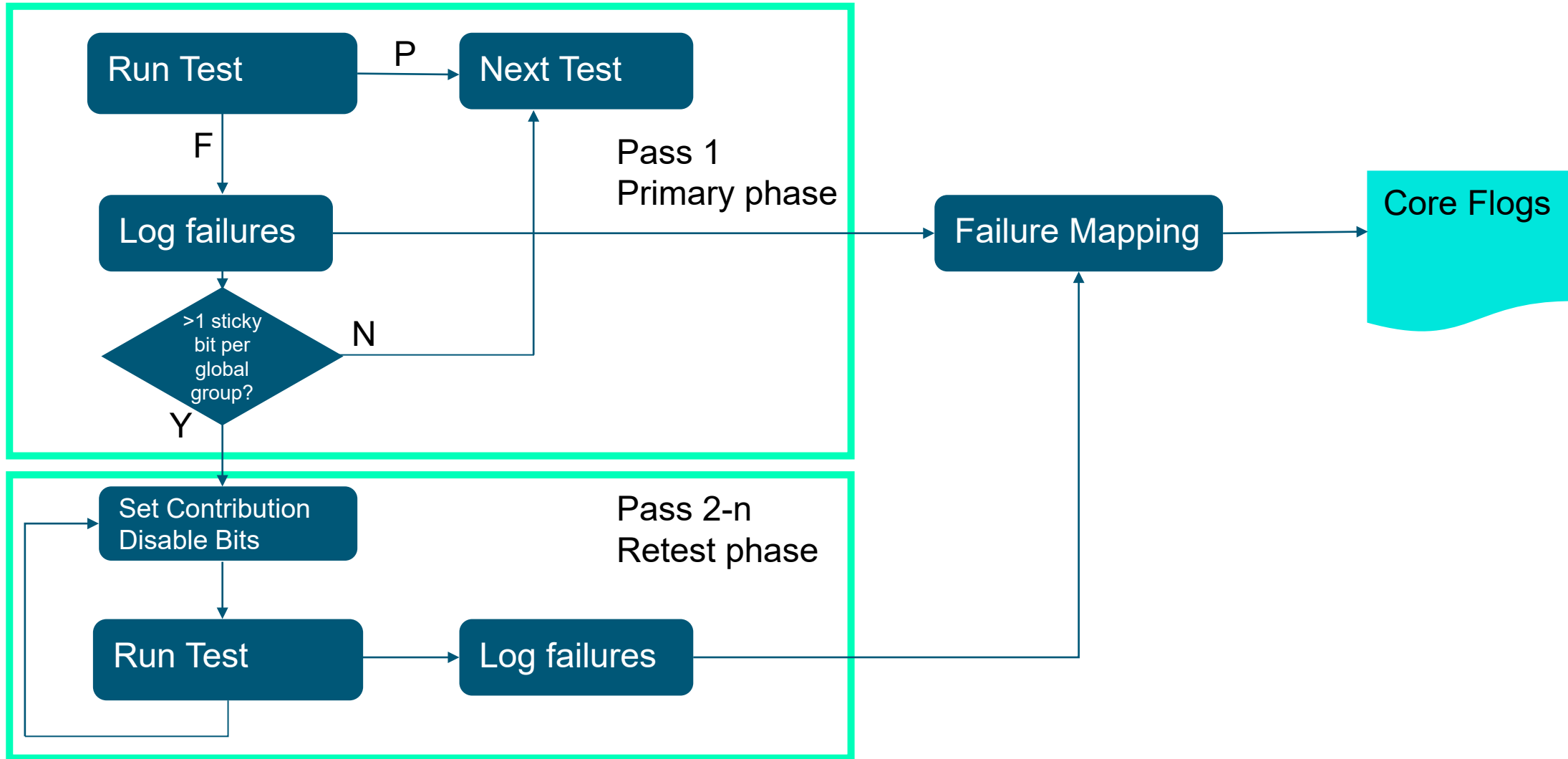
Advanced Topics

On-chip compare: Diagnosis example 2 step 2

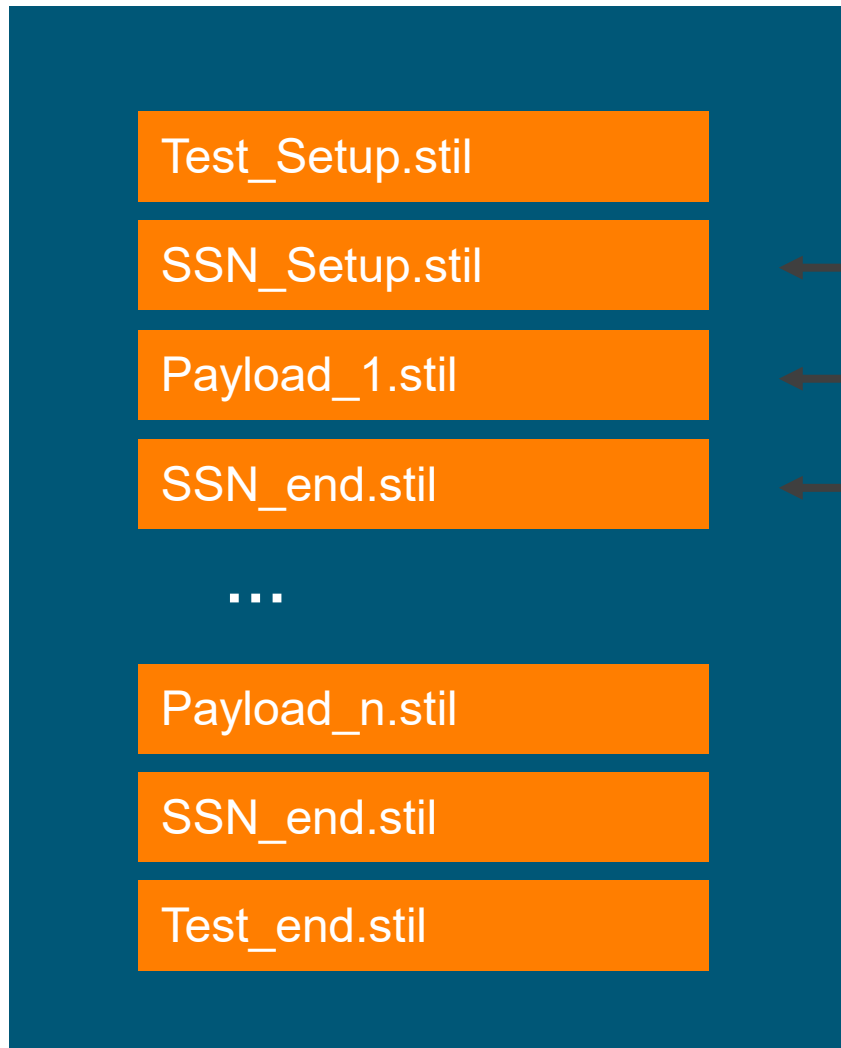


- Example: 2 cores fail
 - Accumulated scan output represents failures from both failing cores
 - Diagnosis cannot be performed from failure file
- Patch test_setup to disable A2, A3, A4 contribution to accumulated status - apply same pattern

Siemens SSN On-Chip Compare Diagnostic Flow (3)



SSN On-Chip Compare Required Pattern Burst Sequence



Contribution disable bits

SSN Structure Annotations

Sticky status bits

Challenges to Solve in 93K Test Implementation:

- Reading sticky bits from multiple labels in a pattern burst
- Modifying ssn_setup pattern at runtime with disable contribution bit settings
- Knowing which 93K pattern vectors correspond with sticky and disable contribution bits

SSN On-Chip Compare Required Pattern Burst Sequence

Test_Setup.stil

SSN_Setup.stil

Payload_1.stil

SSN_end.stil

...

Payload_n.stil

SSN_end.stil

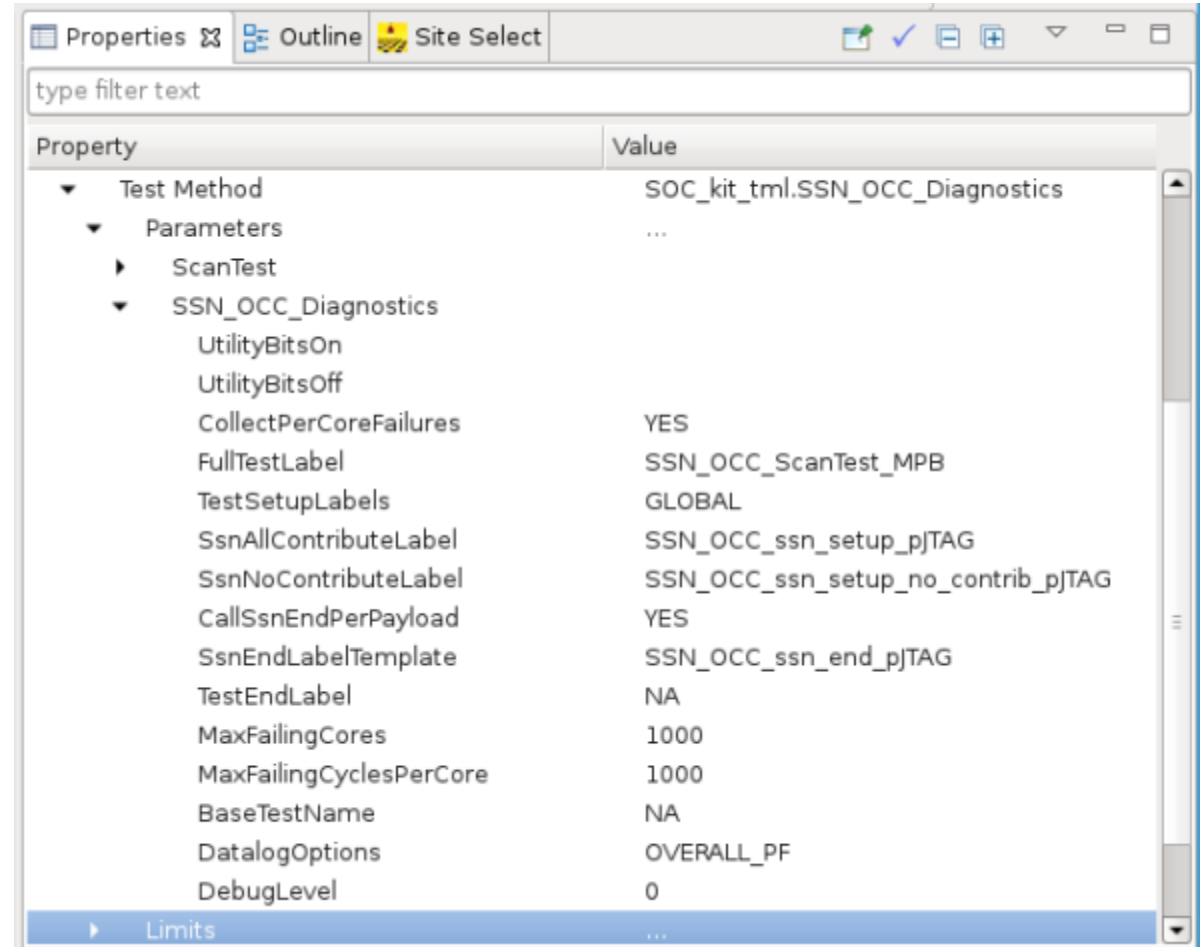
Test_end.stil

Signal	pDATA (Instructions)	pJTAG (Instructions)
Call# Grp	DEFAULT	DEFAULT
0	CALL SSN_OCC_test_setup_pDATA	CALL SSN_OCC_test_setup_pJTAG
1	CALL SSN_OCC_ssn_setup_pDATA	CALL SSN_OCC_ssn_setup_pJTAG
2	CALL SSN_OCC_payload_1_pDATA	CALL SSN_OCC_payload_1_pJTAG
3	CALL SSN_OCC_ssn_end_pDATA	CALL SSN_OCC_ssn_end_pJTAG
4	CALL SSN_OCC_payload_2_pDATA	CALL SSN_OCC_payload_2_pJTAG
5	CALL SSN_OCC_ssn_end_pDATA	CALL SSN_OCC_ssn_end_pJTAG
6	CALL SSN_OCC_test_end_pDATA	CALL SSN_OCC_test_end_pJTAG
7	BEND	BEND

Advantest 93K Example Diagnostics Setups

Very configurable through parameters

- Two categories of TestMethod parameters:
 - **ScanTest**: Based on standard SmarTest TestMethod
 - **SSN_OCC_Diagnostics**-specific
- User can provide a complete burst pattern to run, or have TestMethod generate a burst at run-time
 - For run-time generation, user specifies individual labels as parameters



The screenshot shows the 'Properties' window for the 'SOC_kit_tml.SSN_OCC_Diagnostics' test method. The window is divided into 'Test Method' and 'Parameters' sections. The 'Parameters' section is expanded to show the 'SSN_OCC_Diagnostics' sub-section, which contains a list of parameters and their values.

Property	Value
Test Method	SOC_kit_tml.SSN_OCC_Diagnostics
Parameters	...
ScanTest	
SSN_OCC_Diagnostics	
UtilityBitsOn	
UtilityBitsOff	
CollectPerCoreFailures	YES
FullTestLabel	SSN_OCC_ScanTest_MPB
TestSetupLabels	GLOBAL
SsnAllContributeLabel	SSN_OCC_ssn_setup_pJTAG
SsnNoContributeLabel	SSN_OCC_ssn_setup_no_contrib_pJTAG
CallSsnEndPerPayload	YES
SsnEndLabelTemplate	SSN_OCC_ssn_end_pJTAG
TestEndLabel	NA
MaxFailingCores	1000
MaxFailingCyclesPerCore	1000
BaseTestName	NA
DatalogOptions	OVERALL_PF
DebugLevel	0
Limits	...

Getting Sticky_status and Disable_on_chip_compare_contribution Vector Locations

Annotations for sticky and contribution disable

Sticky status (from ssn_end):

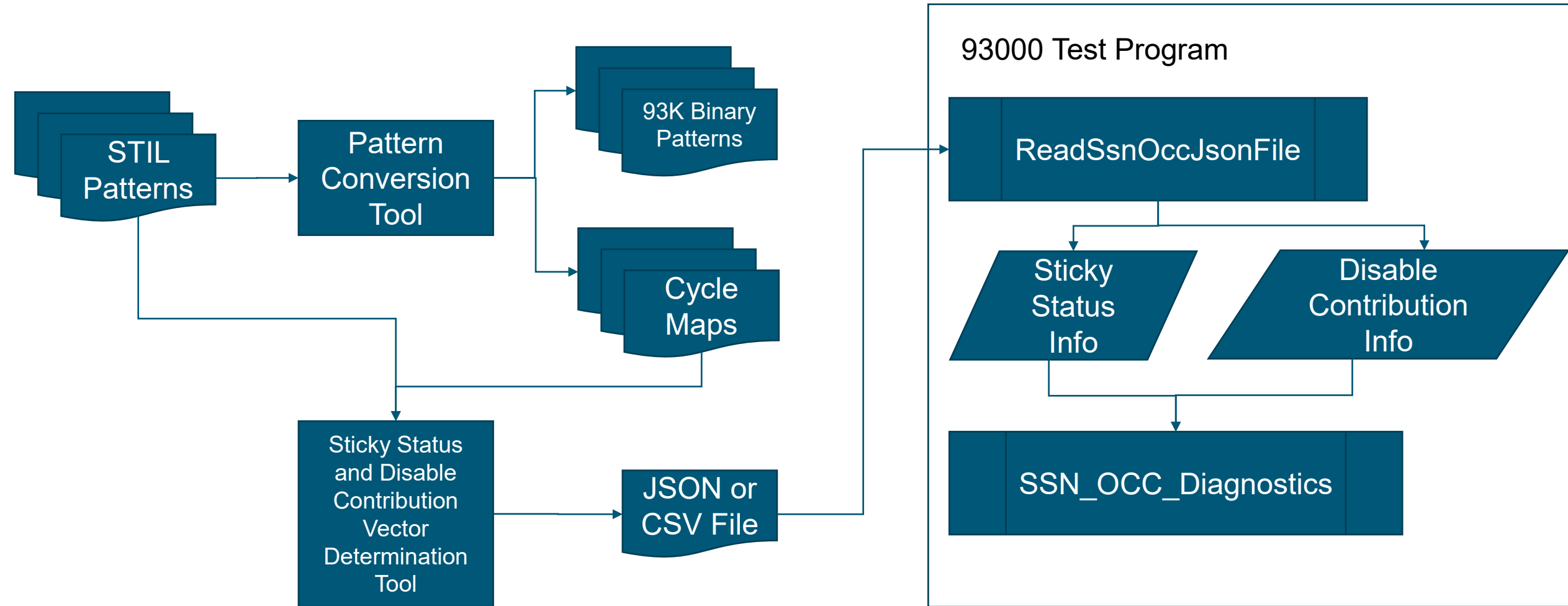
```
Ann {* TESSSENT_PRAGMA variable GPS_1.gps_baseband_rtl1_tessent_ssn_scan_host_1_inst.sticky_status  
-type read -var_bits {0} -pin TDO -relative_cycles {12} *}
```

Contribution disable (from ssn_setup):

```
Ann {* TESSSENT_PRAGMA variable  
GPS_1.gps_baseband_rtl1_tessent_ssn_scan_host_1_inst.disable_on_chip_compare_contribution -type write  
-var_bits {0} -pin TDI -relative_cycles {64} *}
```

1. Identify cycle with annotation
2. Begin edit at annotation cycle + relative_cycles X tck_ratio

Getting Sticky_status and Disable_on_chip_compare_contribution Vector Locations



Conclusions

- Advantest has a working 93000 SmarTest TestMethod for SSN On-Chip Compare Diagnostics in use by a customer for a High- Performance Computing Device with many cores
- Collaboration between Advantest, Siemens, and end-user was critical
- Working on SmartScale and EXA Scale systems (latest 93000 tester architecture)