The Development of SpaceWire Communication Tester (SpaceWire Test Module)

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Outline

- What is a SpaceWire Communication Tester (SpaceWire Test Module) ?
- Why do we need SpaceWire Test Module?
- SpaceWire Test Module
  - Function Block Diagram
  - Hardware and Set-up
  - Software
  - Performance Test
  - Trigger
  - Verification
- Summary

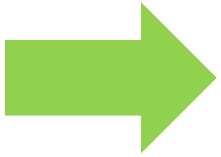
What is a SpaceWire Communication Tester (SpaceWire Test Module) ?

- A low-cost and customizable Debug and Analysis tool for SpaceWire
  - Source codes of FPGA logic and Software will be opened
- Four main functions
  - Signaling Rate Counters
  - Statistics Counters
  - Trigger
  - Self-checking

Why do we need SpaceWire Test Module?

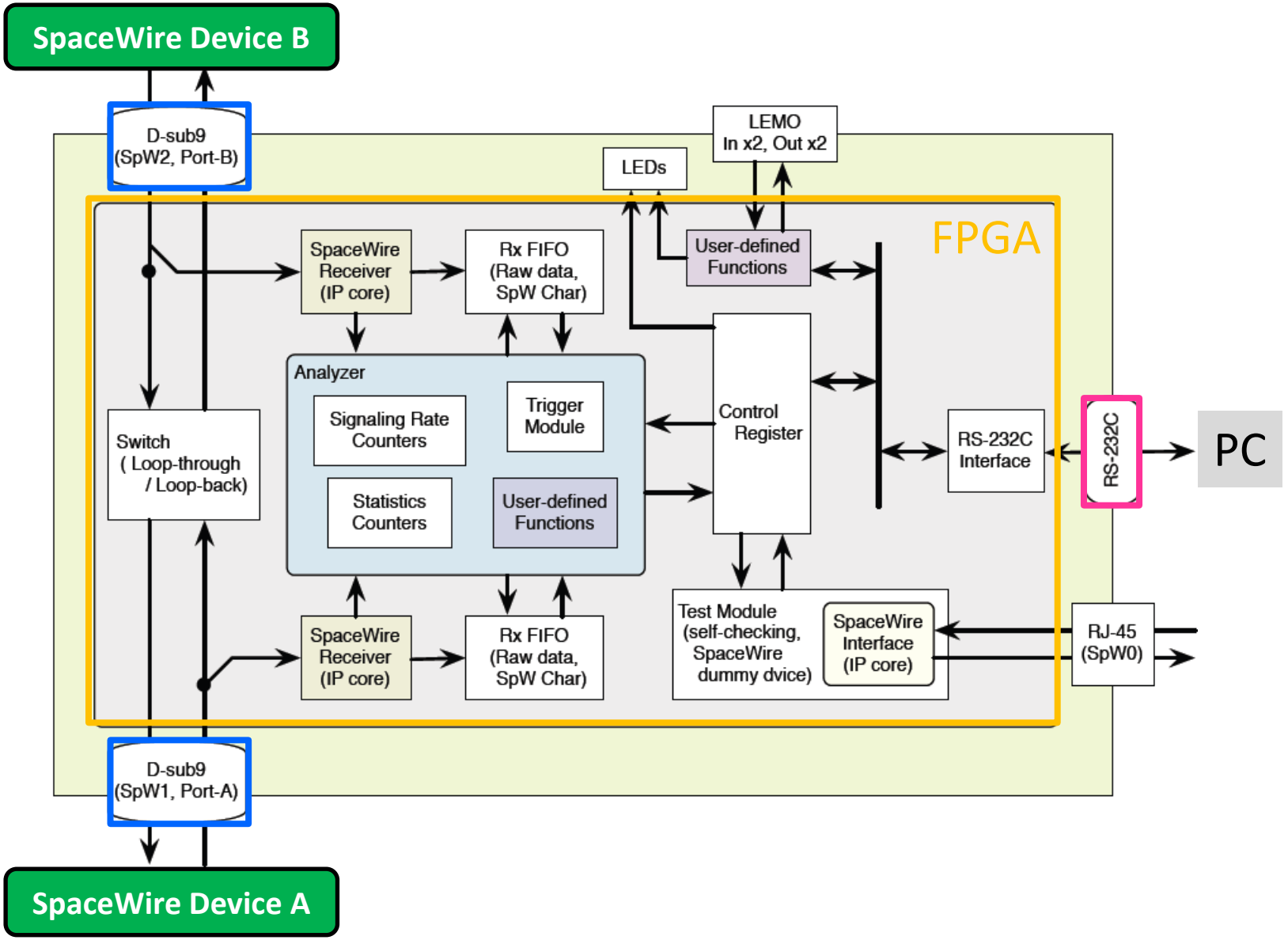
- A laboratory (ex. college, institute, or etc.) that develops and/or uses SpaceWire devices needs to debug those by monitoring SpaceWire links
- If a laboratory operates some SpaceWire systems, It is desirable to have a couple of debug tools for SpaceWire
- But, budget is limited

The low-cost debug tool that can be freely used also in a bench scale test is needed

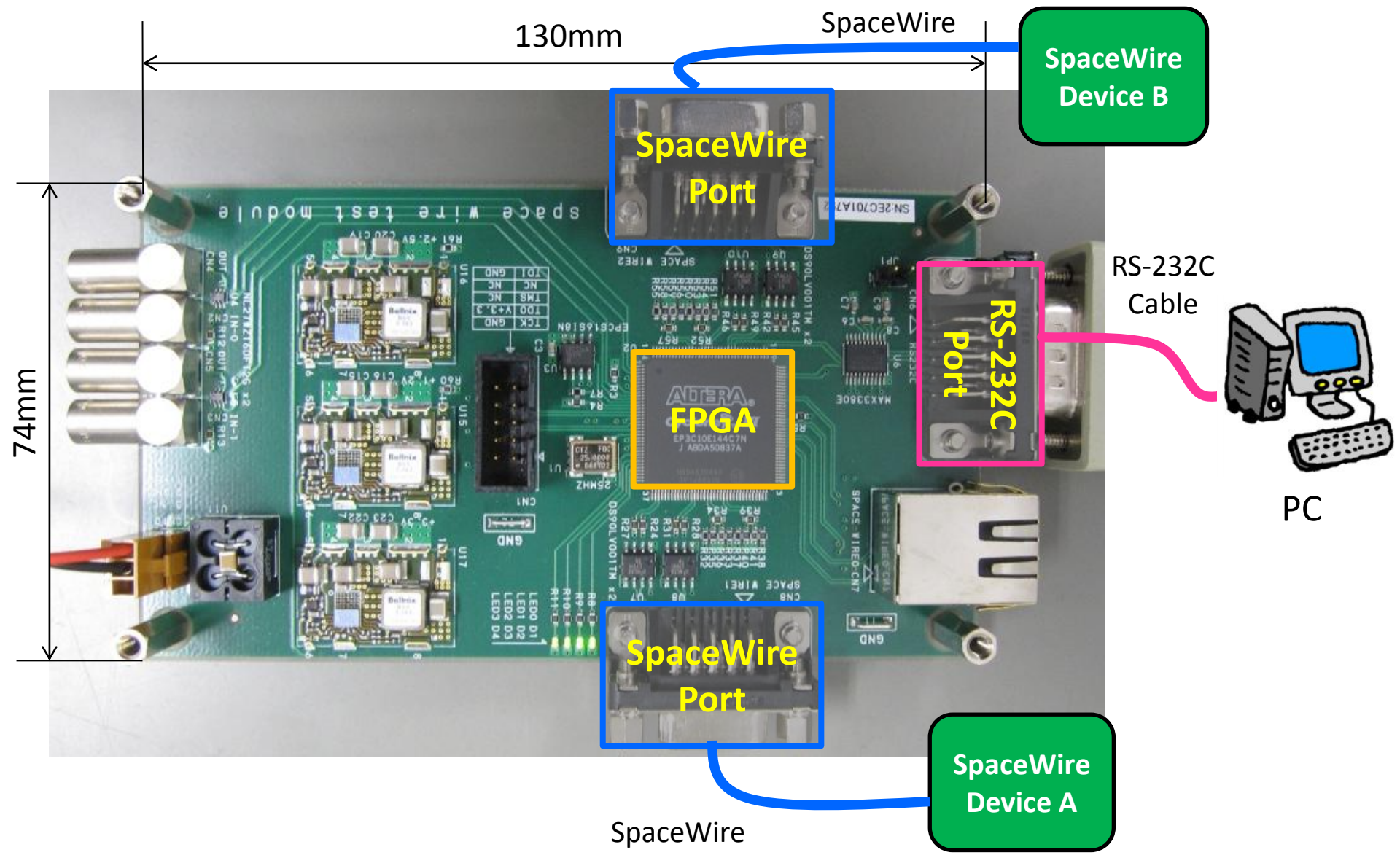


SpaceWire Test Module

Function Block Diagram

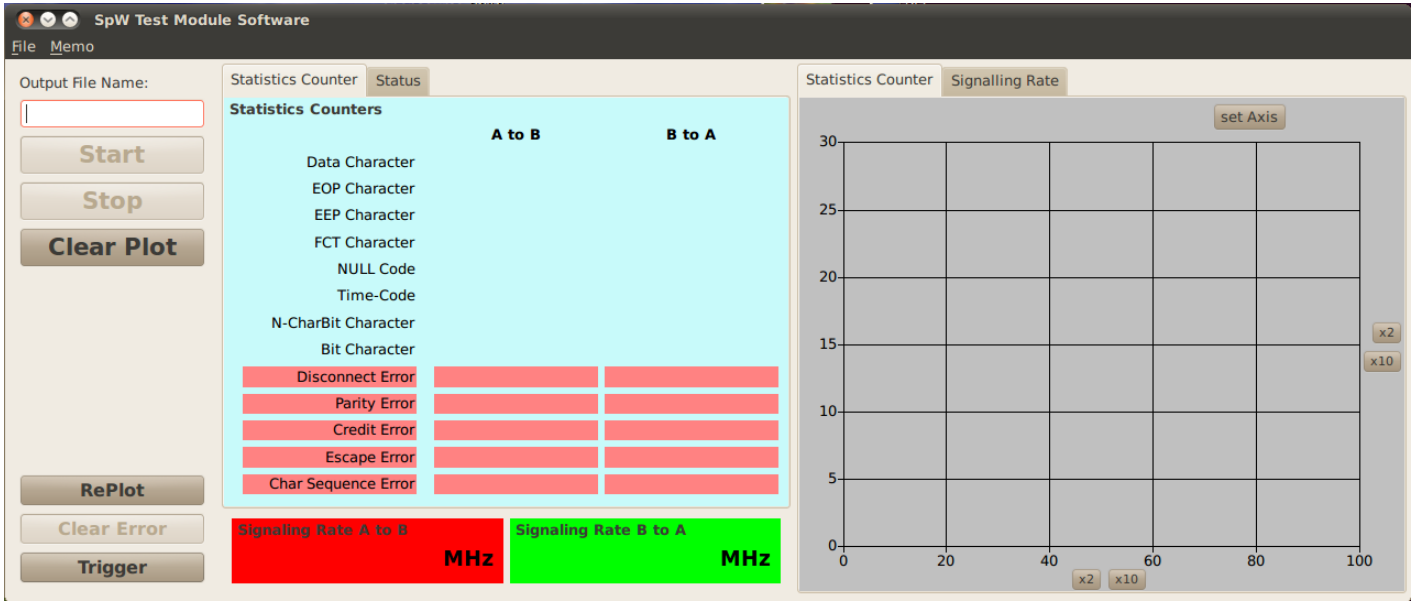


Hardware and Set-up



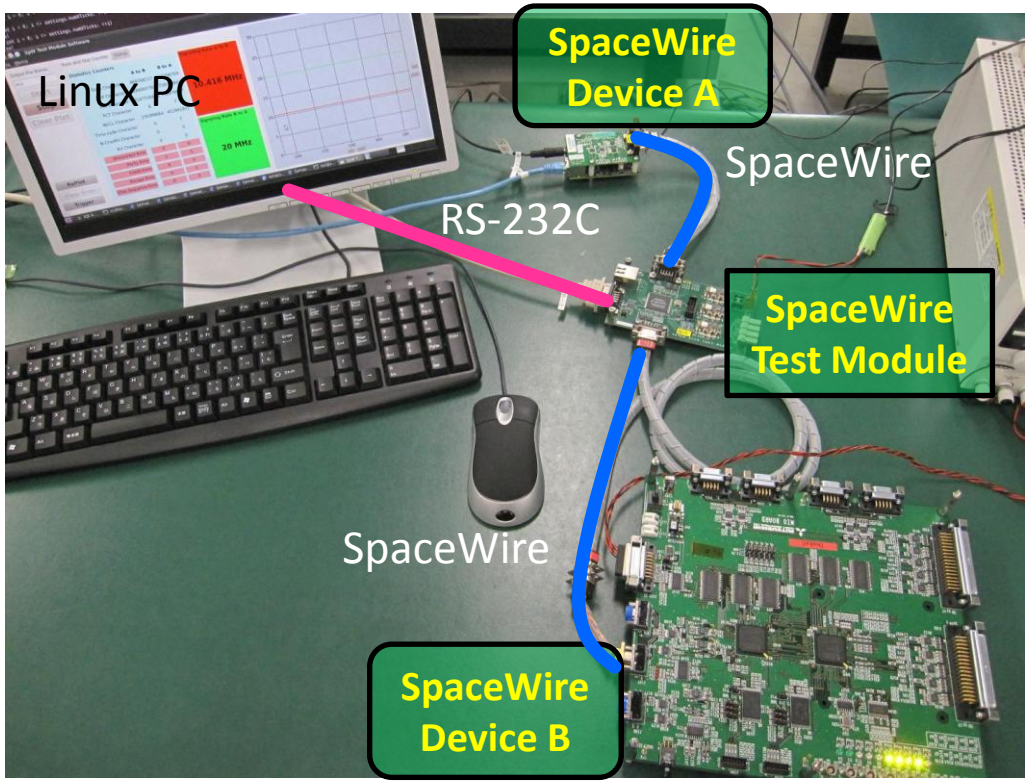
Software

- Languages we used are C++ and Qt
- Statistics of SpaceWire Characters, Codes, and Errors are displayed in accumulated value and rate per a second on the plot
- The log files of all data are generated
- Interface of PC is Serial or USB

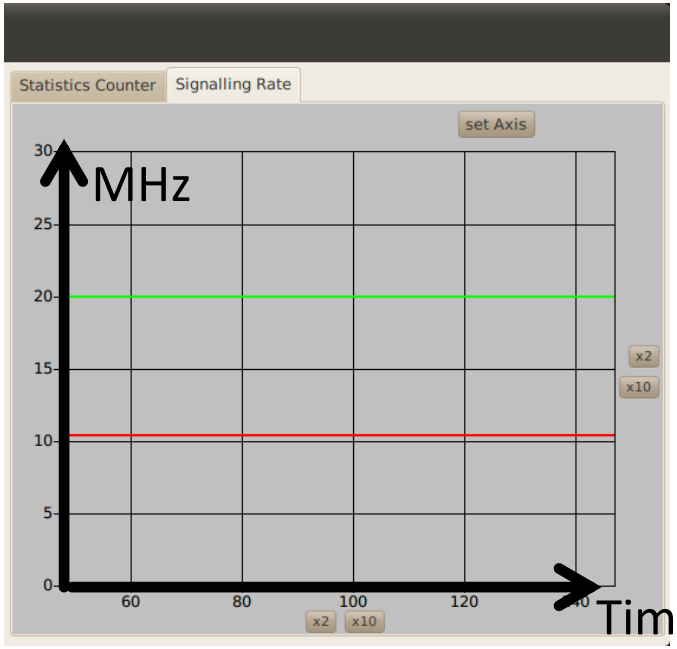


V-axis: Statistic or Signaling Rate H-axis: Time

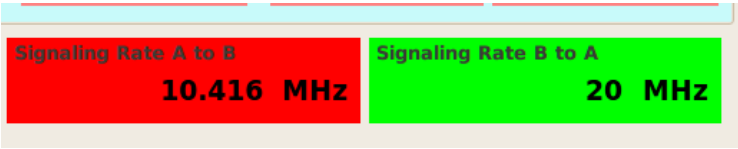
Performance Test



SpaceWire Device A : 10.416MHz
SpaceWire Device B : 20MHz



Performance test for Signaling Rate function and Statistics Counters function about Time-code were successful.



FCT Character	0	0
NULL Code	1302015	2499923
Time-Code	64	64

Trigger

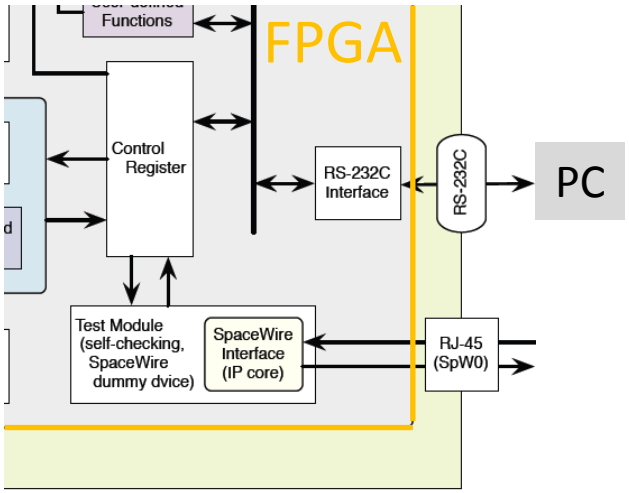

Trigger Window
File
A
B
EOP Character
EEP Character
FCT Character
NULL-Code
Time-Code
N-CharBit Character
Bit Character
Disconnect Error
Parity Error
Credit Error
Escape Error
Trigger
Debug Mode
set Axis
0
10
20
30
40
50
60
70
80
90
100
/10
/2
x2
x10
RePlot
Clear Error
Trigger
Trigger Window (kingfisher)
File
A
B
EOP Character
EEP Character
FCT Character
NULL-Code
Time-Code
N-CharBit Character
Bit Character
Disconnect Error
Parity Error
Credit Error
Escape Error
Trigger
Debug Mode
set Axis
Prev.
0
20
40
60
80
100
120
140
160
/10
/2
x2
x10

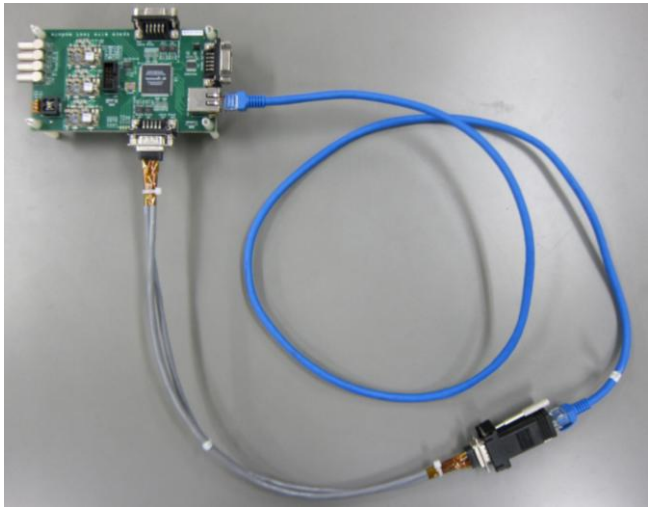
Verification

- How do we verify SpaceWire Test Module about the other SpaceWire Characters and Errors? and how does user verify the codes after the user modified the source codes?

Self-checking function

  - This function works as a dummy SpaceWire device
  - We can send arbitrary number of SpaceWire Characters, codes, and errors using this function





Summary

- We are developing a low-cost and customizable debug and analysis tool for SpaceWire (SpaceWire Test Module)
- Performance test of Signaling Rate Counters function, Statistics Counters function about Time-Code, and software were successful
  - Status of Development

	Signaling Rate	Statistics	Trigger	Self-checking
FPGA logic	○	○	△	△
Software	○	○	△	×
Verification	○	△	△	×

- The source codes of FPGA logic and software are going to be opened and can be modified as the users like

Thank you for your attention