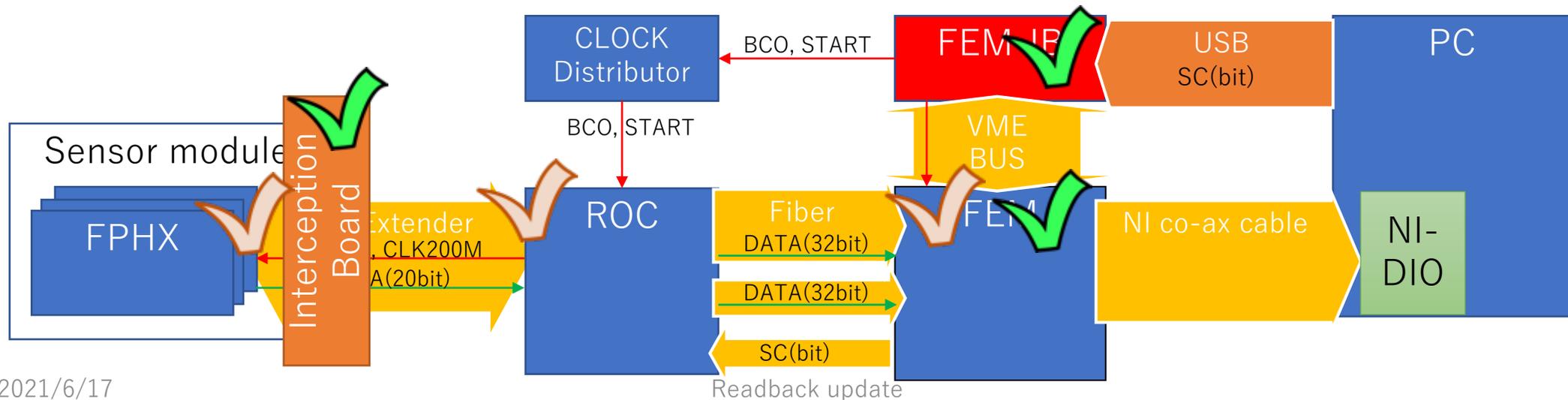# Updates on Readbacker R&D
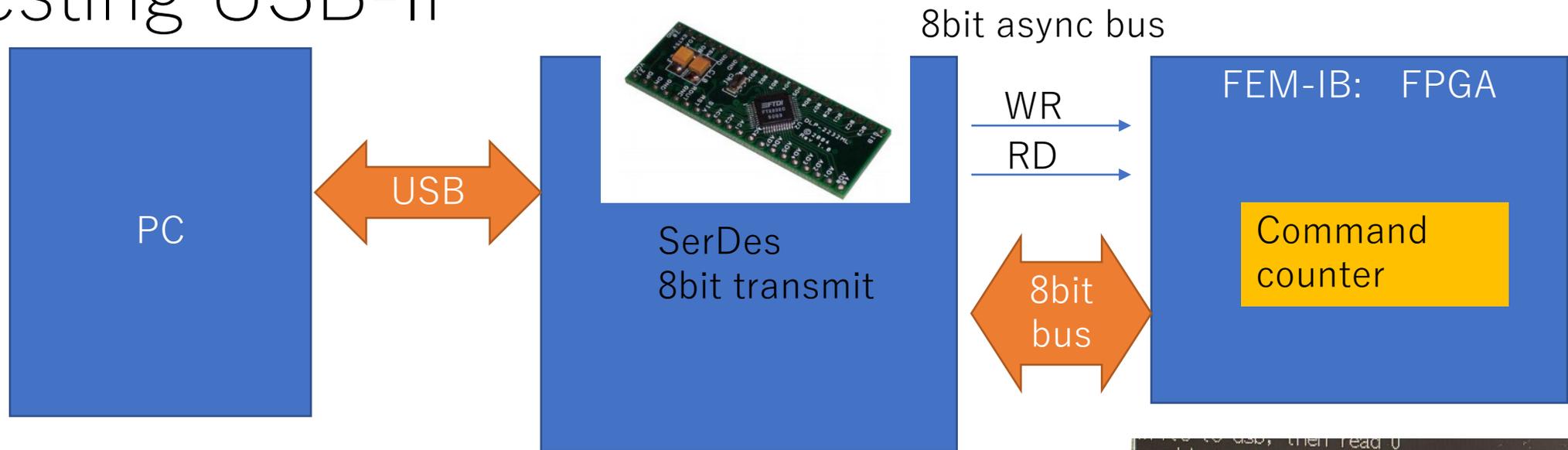
T. Hachiya and R. Takahama

Nara Women's University & RIKEN

Status

- At last meeting,
  - the readback signal is confirmed at FEM-IB.
  - We will develop USB-I/F to get the value from FEM-IB to PC

- This time:
  - We developed USB-I/F

Testing USB-IF

8bit async bus

PC ←→ USB ←→ SerDes 8bit transmit ←→ 8bit bus ←→ FEM-IB: FPGA

WR
RD

Command counter

- Testing the readout function through USB-IF
  - Command counter on FEM-IB FPGA
  - Readback the counter value
- Readback test successful
  - Readback value as expected

- Ready to read back the register value

```
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  8   9
retval :  8    0x8
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  9   10
retval :  9    0x9
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  10   11
retval :  10    0xa
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  11   12
retval :  11    0xb
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  12   13
retval :  12    0xc
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  13   14
retval :  13    0xd
write to usb, then read 0
read_bytes_to_usb: read back bitmode :  14   15
retval :  14    0xe
write to usb, then read 0
```
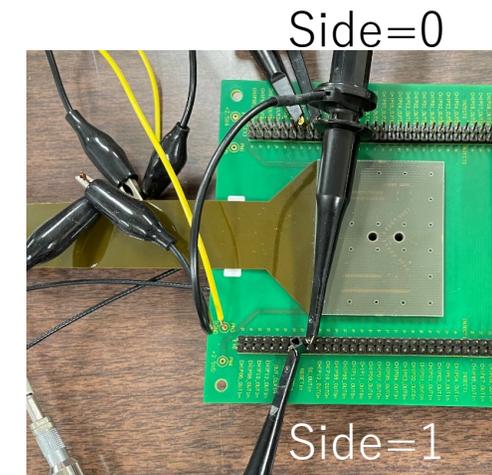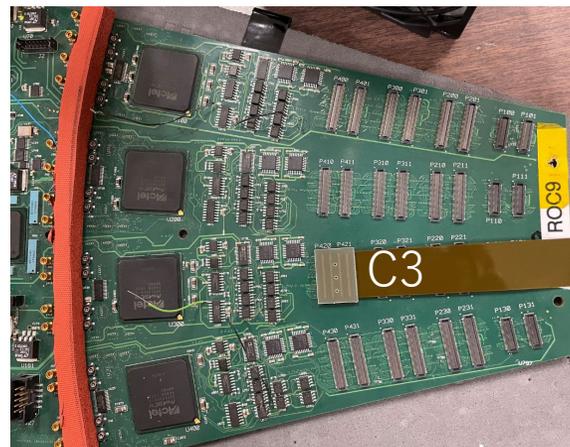
Readback from the register

- Readback function is implemented at GUI
  - Push "Read" button to readback the value

- GUI shows the readback values for the registers right after the FFR is issued.
  - Readback values are different with the values in "To Chip"
  - All RB values are consistent with the default values described in the spec. sheet.

Reg	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Readback	1	1	8	16	32	48	80	112	144	176	70	4	64	33	5	16
Default	1	1	8	16	32	48	80	112	144	176	4|6 70	0|4 4	4|0 64	4|2 34	0|5 5	16

Additional test to send the SC to the chip

- Send the SC command to the chip of interest.
  - SC commands and Readback values are monitored on the IC board

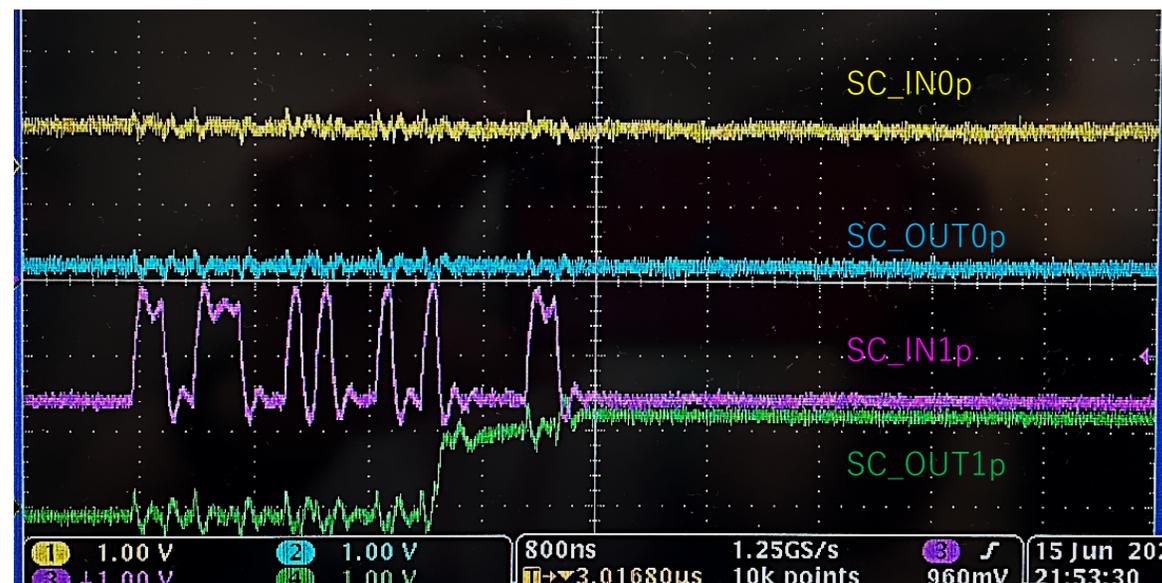- The test is successful

Side=0

C3

Side=1

Chip=2, Side= 0

SC_IN0p

SC_OUT0p

SC_IN1p

SC_OUT1p

1 1.00 V   2 1.00 V   800ns   1.25GS/s   1 ∫   15 Jun 2021
                          3.01680µs 10k points 920mV   21:54:09

Chip=2, Side=1

SC_IN0p

SC_OUT0p

SC_IN1p

SC_OUT1p

1 1.00 V   2 1.00 V   800ns   1.25GS/s   3 ∫   15 Jun 202
   1.00 V   3.01680µs 10k points 960mV   21:53:30
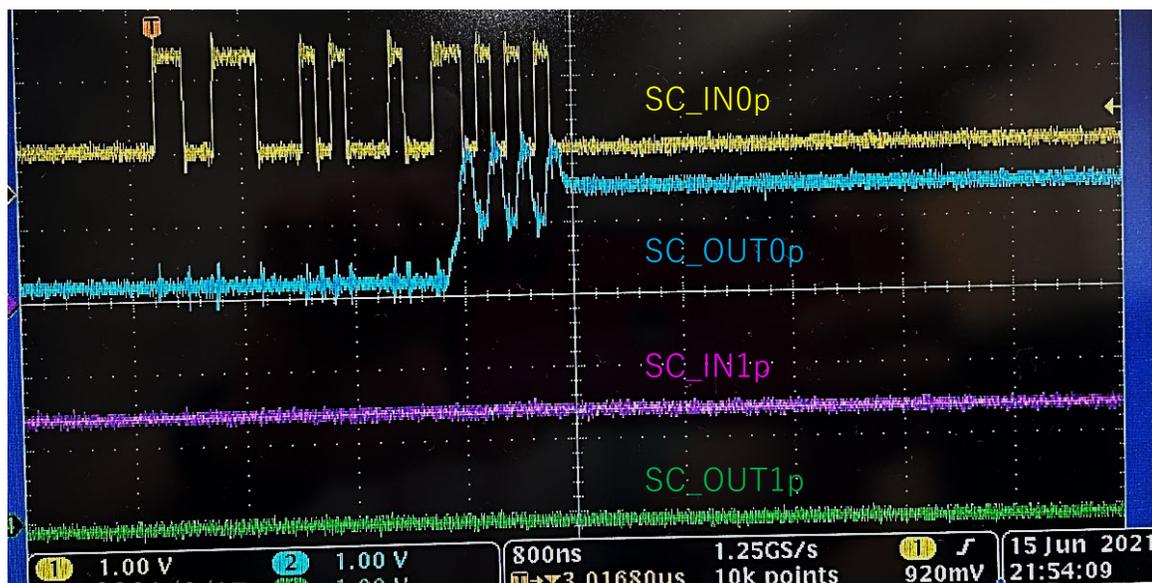
Summary

- USB-IF is developed and tested
  - It works nicely

- Readback function is implemented and tested
  - All the register values are readout for a chip

- Send the SC to the chip of interest successfully

- To do next
  - Test the readback function
  - Update GUI to use the readback function more easily
  - Document