TTCupgrade production design review
08-02-07
Sophie BARON, PH/ESS

Presents:

- ALICE: Anton JUSKO, Pedja JOVANOVIC
- ATLAS: Philippe FARTHOUAT, Thilo PAULY
- CMS: Jan TROSKA, Andre G. HOLZNER
- LHCb: Jorgen CHRISTIANSEN, Richard JACOBSSON, F. ALESSIO
- PH/ESS: Chris PARKMAN, Markus JOOS, Stephane DETRAZ, Sophie BARON

MINUTES

An overview of the full system was presented. For each part (Optical transmission, RF2TTC, Fanout), the performances were evaluated and presented, as well as the technical implementation or modifications, the price and the schedules. Finally, the performances of the full system were presented, together with total quantities, price estimation, schedules (see slides). A first estimation of the quantities is presented in these minutes according to the discussions we had during the meeting. The values will be corrected after the feedback of the experiments. The remarks made on each subject are presented below.

*RF_Tx/Rx_Digital

+ NUMBERS OF TX INSTALLED: Now that the RF signal is re-generated at the CCR, the two Tx sets installed in the SR4 could be shared. This will allow all the experiments to have only one common pair of TX modules (easier to maintain for the AB/RF, and reduce the quantity of modules to buy). To be discussed with the AB/RF group.

+ SIGNAL VARIATIONS WITH TEMPERATURE: Jorgen said that the signal phase shift must be measured versus temperature, to know what we could expect if there are temperature variation inside one crate. The complete phase shift scheme (from SR4 to experiments) should be estimated to get an idea of the diurnal and seasonal variations.

+ DOCUMENTATION: Jan required that information about datasheet and suppliers must be integrated on module pages on EDMS, to ease the manufacturing of a second batch years after the first one.

+ QUANTITIES: These quantities assume that the AB/RF do not count any spare for us. They may be managed by them (at least the batch of ‘extra spares’). The purchase of additional lasers must be foreseen, as this is the component that is most likely to fail over time. These are mounted in sockets and therefore easy to exchange. Some lifetime estimates for the lasers would be worth to get from the manufacturers. They normally have such estimates based on accelerated ageing qualifications.

Tx:

	Used	Hot Spares	Cold Spares	Extra Spares	TOTAL
Tx (SR4)	2	1	1	1	5
Tx (CCR)	2	1	1	1	5
TOTAL	4	2	2	2	10

Rx:

	Used	Hot Spares	Cold Spares	Extra Spares	TOTAL
Rx (ALICE)	2	1	1	1	5
Rx (ATLAS)	2	1	1	1	5
Rx (CMS)	2	1	1	1	5
Rx (LHCb)	2	1	1	1	5
Rx (CCR-ESS)	2	1	1	1	5
TOTAL	10	5	5	5	25

*RF2TTC board

+ DESIGN REVIEW FOLLOW-UP:
- the adjustable internal clock is not required anymore. The source of the internal clock used by the RF2TTC-final version will still be the same 160.32MHz oscillator.
- Pedja said that, according to the low level of the magnetic field in ALICE trigger zone, and according to the fact that many other DC-DC converters are used in crates close to the TTC crate, it is possible to use a DC-DC converter also on the RF2TTC board to generate the -5V.
- Redundancy of the configuration registers to protect the FPGA against SEU is not mandatory anymore according to the low level of radiations in the trigger area of ALICE
- A way to reconfigure the FPGA (by accessing a register) will be provided. However, the FPGA reconfiguration via SYSRESET is declared not to be convenient, and will be removed.

+ ORBIT LENGTH: 3BC long minimum pulse width seems to be short enough for ALICE, ATLAS and LHCb (they are anyway reacting on the rising edge of the clock, and the length of the orbit is not a problem). CMS needs to check.

+ MANUAL & AUTOMATIC MODE: Jorgen insisted on the fact that the manual mode must always be available if required, to allow the detector control software to decide which signal has to be selected and when, rather than having the board working in a standalone mode. This possibility is confirmed. The board can work in manual mode full time

if required.

+ INCREASED JITTER OF BCref ON PROTO1:
  - Jorgen suggested that it may come, either from a bad resistor in a termination during assembly, or from the delay 25 chips. It seems that one of the channels of this chip generates more jitter than the other. To be checked with the chip designers.
  - The delay25 chip will be exchanged to check if the jitter is still there.

+ ORBIT ALIGNMENT & SYNCHRONISATION:

It has been made clear that during ramping, the orbit and the BCref will not be synchronized. The phase between the two signals will be shifted by 200ps for a proton run, and by 1.2ns for an ion run. As this phase will be known only once the flat top is reached, the orbit alignment calibration will need to be checked at least once for each type of run. For similar runs, the AB/RF will ensure a stability of the phase of the orbit compared to the BCref. However, this phase shifting may not be fully implemented for the pilot runs in December. The experiments insisted on the fact that this feature will be particularly required for the pilot runs, because the 'physics' periods may be very short and repetitive. Such working conditions with a changing phase from fill to fill *will not be acceptable*. LHCb and ALICE experiments insisted on the fact that they must from fill to fill have same clock and orbit phase relative to the real collisions. A presentation will be made by AB/RF during the LEADE in April, during which the experiments will express their point of view. However, as the alignment window of the orbit will be 10ns wide minimum, a well centered phase alignment during injection should even be sufficient to be used as well during the flat top without any other modification.

+ SCHEMATICS MODIFICATIONS:
  - THRESHOLD ADJUSTMENT: it has been agreed that the remote control of the threshold for the clock inputs will be removed (including the DAC). It will stay for the orbit as a precaution.
  - MANUAL RESET: Everybody agreed that the manual reset should be removed (the push button is currently inside the board because there is no place on the front panel).
  - BOARD INITIALISATION: A little circuitry will be added to the board, so as an initialization procedure of the TTCrx, Delay25 and DAC is launched after the FPGA configuration (at power up).
  - -5V GENERATION: a compromise will be looked at, to optimize the heat dissipation on the resistor and the drop in the regulator.
  - POWER CONSUMPTION: Chris insisted on the fact that the module should not consume more than 30W, according to the VME 64x specifications. The RF2TTC board consumes about 26W according to the crate monitor (0.3A on +5V, 1.4A on -12V and 2.5A on 3.3V).
  - NECL TERMINATION of the orbit output signals. It has been agreed that the signals will be AC coupled by default, but that the capacitor may be replaced by a 0 Ohm resistor if a DC coupling is required.

+ QUANTITIES:

	Used	Hot Spares	Cold Spares	Extra Spares	TOTAL
Rx (ALICE)	1	1	1	1	4
Rx (ATLAS)	1	1	1	1	4
Rx (CMS)	1	1	1	1	4
Rx (LHCb)	1	1	1	1	4
Rx (CCR-ESS)	1	1	1	1	4
TOTAL	5	5	5	5	20

*Clock FANOUT

+ JITTER FOR NEGATIVE PULSES: the jitter performances are better for positive orbit than for negative ones. Although this is not critical, this needs to be understood.

+ QUANTITIES:

	Used	Hot Spares	Cold Spares	Extra Spares	TOTAL
Rx (ALICE)	2	2	Common spares: 2?	0	4
Rx (ATLAS)	1	1		0	2
Rx (CMS)	4	2		0	6
Rx (LHCb)	1	1		0	2
Rx (CCR-ESS)	1	1		0	2
TOTAL	9	7	2	0	6 + 2