IST status

Gerrit van Nieuwenhuizen
TC integration meeting
LBL, Sept. 11 2007

Silicon sensors quotation

HAMAMATSU QUOTATION

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Please send all payments, credit references and returns to:
Hamamatsu Corporation
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Phone: 718-352-2026
Fax: 718-352-0823
E-mail:
nschiller@hamamatsu.com
http://usa.hamamatsu.com

To:	Dr. Gerrit van Nieuwenhuizen MIT 77 Massachusetts Avenue Cambridge, MA 02139 US	Date: Number:	05/27/2005 NXS05-12665165
Phone: Fax:	857-928-7477	Type: Terms: Ship Via: F.O.B.: Delivery:	Price Quotation Net 30 UPS ground Middlesex, NJ TBD

Subject: Quote for Gerrit van Nieuwenhuizen at MIT

Line Item		QTY	Unit Price	Lead Time
1	Barrel Straight (320umt, 200V min) [Barrel Straight (320umt, 200V min)]	618	$450.00	-
2	Barrel Stereo (320umt, 200V min, SiO2 layer: 1um) [Barrel Stereo (320umt, 200V min, SiO2 layer: 1um)]	618	$1,159.00	-

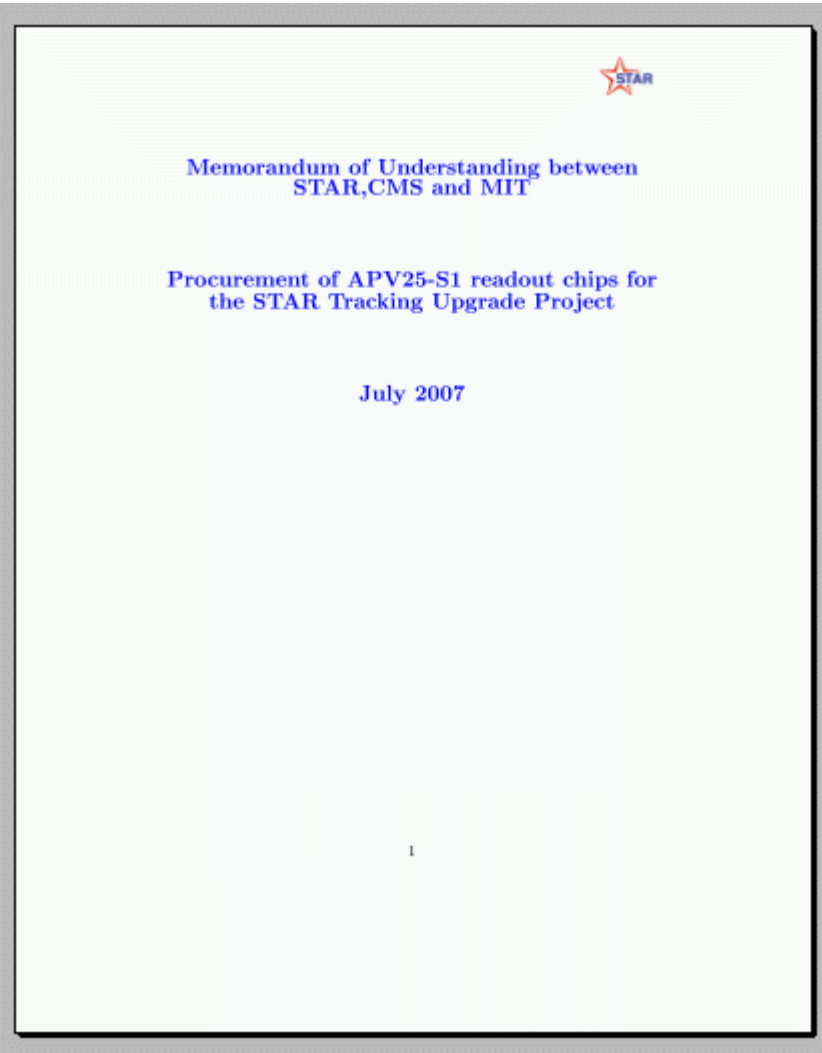
Need to be renewed

Need to be replaced with short strip quotation

Working on it, RFQ should go out before the end of this month

APV25-S1 chips

- Enough chips available to play with
- more chips will be procured through FY07 and FY08 R&D
- MOU between STAR/MIT and CMS needs to be put in place!

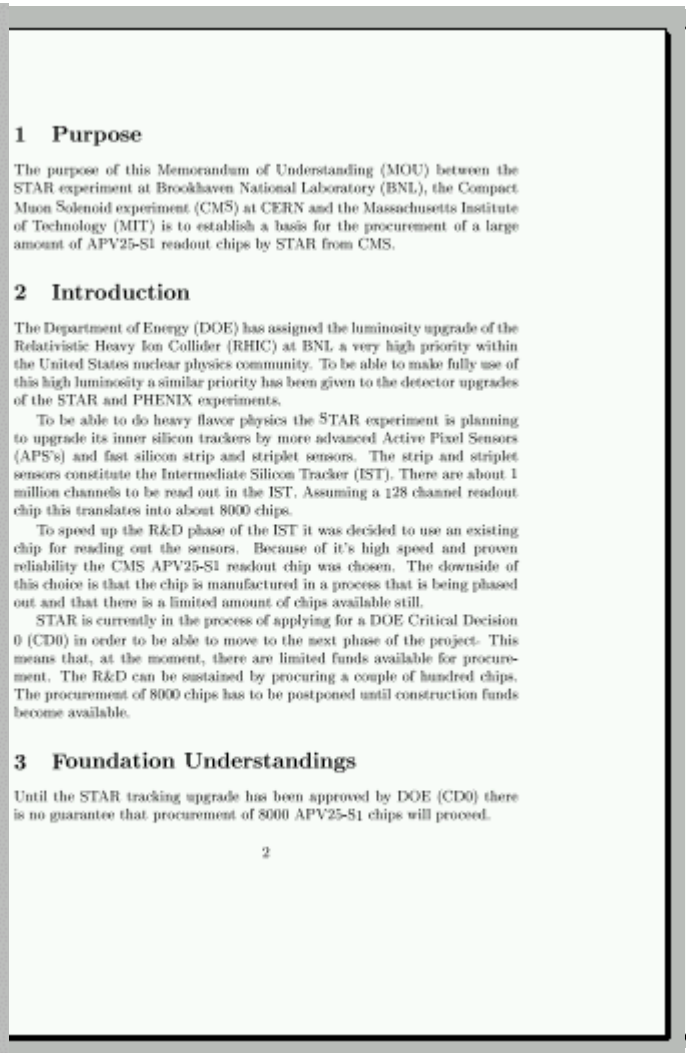


Memorandum of Understanding between STAR,CMS and MIT

Procurement of APV25-S1 readout chips for the STAR Tracking Upgrade Project

July 2007

1



1 Purpose

The purpose of this Memorandum of Understanding (MOU) between the STAR experiment at Brookhaven National Laboratory (BNL), the Compact Muon Solenoid experiment (CMS) at CERN and the Massachusetts Institute of Technology (MIT) is to establish a basis for the procurement of a large amount of APV25-S1 readout chips by STAR from CMS.

2 Introduction

The Department of Energy (DOE) has assigned the luminosity upgrade of the Relativistic Heavy Ion Collider (RHIC) at BNL a very high priority within the United States nuclear physics community. To be able to make fully use of this high luminosity a similar priority has been given to the detector upgrades of the STAR and PHENIX experiments.

To be able to do heavy flavor physics the STAR experiment is planning to upgrade its inner silicon trackers by more advanced Active Pixel Sensors (APS's) and fast silicon strip and striplet sensors. The strip and striplet sensors constitute the Intermediate Silicon Tracker (IST). There are about 1 million channels to be read out in the IST. Assuming a 128 channel readout chip this translates into about 8000 chips.

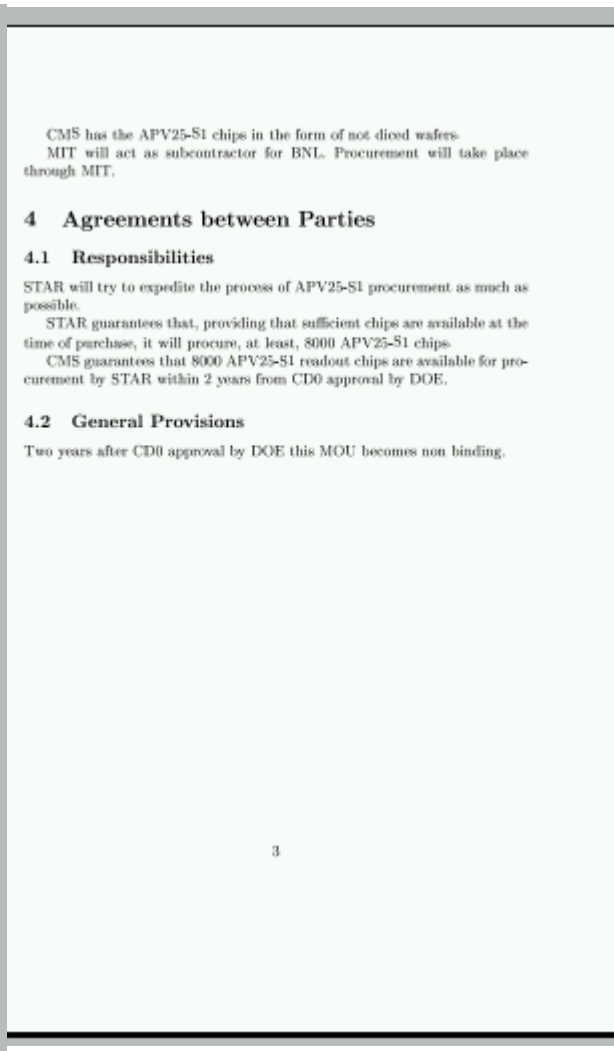
To speed up the R&D phase of the IST it was decided to use an existing chip for reading out the sensors. Because of it's high speed and proven reliability the CMS APV25-S1 readout chip was chosen. The downside of this choice is that the chip is manufactured in a process that is being phased out and that there is a limited amount of chips available still.

STAR is currently in the process of applying for a DOE Critical Decision 0 (CD0) in order to be able to move to the next phase of the project. This means that, at the moment, there are limited funds available for procurement. The R&D can be sustained by procuring a couple of hundred chips. The procurement of 8000 chips has to be postponed until construction funds become available.

3 Foundation Understandings

Until the STAR tracking upgrade has been approved by DOE (CD0) there is no guarantee that procurement of 8000 APV25-S1 chips will proceed.

2



CMS has the APV25-S1 chips in the form of not diced wafers.

MIT will act as subcontractor for BNL. Procurement will take place through MIT.

4 Agreements between Parties

4.1 Responsibilities

STAR will try to expedite the process of APV25-S1 procurement as much as possible.

STAR guaranteers that, providing that sufficient chips are available at the time of purchase, it will procure, at least, 8000 APV25-S1 chips.

CMS guarantees that 8000 APV25-S1 readout chips are available for procurement by STAR within 2 years from CD0 approval by DOE.

4.2 General Provisions

Two years after CD0 approval by DOE this MOU becomes non binding.

3

Hybrids and modules

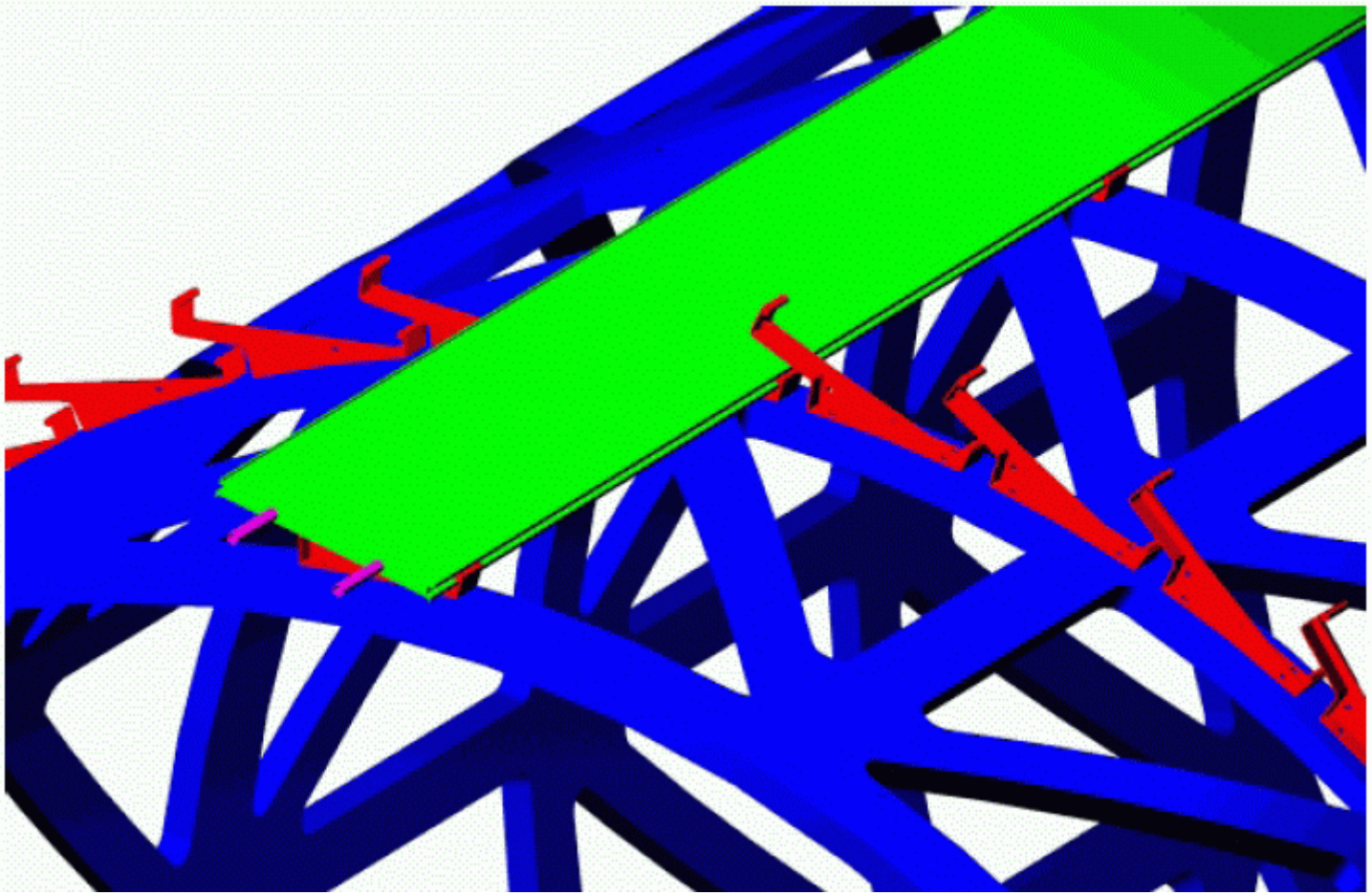
- hybrids for FGT have been battle tested in test beam already
- prototype flex hybrids produced in beginning 2007
- IST single chip hybrid working in spring 2007
- IST quad chip hybrid working in July 2007
- currently mounting quad chip hybrid on PHOBOS sensor
  (cranky bonding machine, needs refurbishing)
- lab readout systems ready or being procured

- next step is to fully populate hybrid with chips
- mount on a PHOBOS pad or pp2pp strip sensor
- make several readout systems operational
- set up cosmic ray station

Ladder considerations

- still concentrating on air cooling
    - > not sure if cooling through ladder is good idea
    - > cool chips directly, tcCF cooling tower?
- problems with feeding out the signals
    - > 4 cm width is not much for a 30 chip cable
    - > need to go to a separate hybrid and cable
    - > some smart configuration needed
- maybe carbon foam is not the best material
    - > not very stiff, needs thick skin
    - > brittle
    - > difficult to make 'hard' features
- investigating Aluminum honeycomb
    - > ATLAS connection (= Dave Lynn)
- have to solve mounting issues

ATLAS stave mount



Readout scheme

- about 700,000 channels
  - = 5,000 APV25-S1 chips
  - = 5,000 ADC's
  - = 5,000 FIFO's
  - ===> RDO's
- data streams in parallel in 10us into RDO's
- most likely zero suppression
  - > pedestal suppression
  - > common mode noise correction
  - > thresholding for hits
- or data compression
- still working on the details
  - > processing units
  - > FPGA's
- multiplexing onto the DDL-SIU fibers

Aims for CY2007

- Build and test several detector modules
- Design and produce prototype ladder
    - > mechanical tests
    - > thermal tests
- Do the ground work for STAR beam test setup