# CMS Timing Requirements for LHC-type Test Beams with 25 ns Bunch Structure

## Introduction

- To be used by the LHC experiments to verify their electronics and detector designs under realistic LHC operating conditions

    - Perform global system tests, combining several detector systems
        - system response to real particles and noise correlation to real LHC-type structure
        - check synchronisation and timing requirements

    - Validate FE chips and read-out protocols in conditions simulating those of the LHC

➔ These studies can be performed with an LHC-type beam from the SPS with a 25 ns time structure

## Example: CMS Tracker Tests

- Common LHCC milestone for the Silicon and MSGC tracking system tests

## Schedule

- Short periods of dedicated beam time is requested by ATLAS and CMS in future years of SPS operation

- First of such tests planned for early 2000

- LHC-type beams available in the experimental zones of both the West and North Areas.

# Experimental Requirements on Timing Signals

- Requested timing signals from SPS Faraday Cage in BA3

    1) 40.079 MHz (RF producing 25 ns structure)
        - including tolerances, the lowest frequency the CMS TTC system can lock to is 40.078 MHz

    2) 43 kHz (SPS revolution frequency)

- Request optical fibre connection to CMS experimental counting rooms
    1) West Hall EHW2 (Bat. 190)
    2) North Hall EHN1 (Bat. 887)

    - single-mode connection to minimize jitter

- Request square wave signals from the optical receivers

    - 50/50 mark/space ratio with AC-coupled ECL swing coaxial outputs for 50Ω termination to ground

- CMS requests availability of such signals already for September 1999 in order to perform setting-up tests before the availability of beam next year
    - test with SL/HRF group is being prepared for September 1999

## Questions:

- What is the main cause of the 300 ps jitter on the optical fibre ?
    - does the jitter follow a Gaussian distribution ?
    - is it random noise or sub-harmonic feed-through ?

- What wavelength laser transmitter will be used ?

- What phase drift relative to the beam bunches should the experiments expect over a period of 24 hours ?

- Could the fibre delivering the 43 kHz SPS revolution frequency be switched over to the 11.246 kHz LHC orbit signal at some date in the future ?

- Could the two timing signals be provided also to the labs at CERN (Bat. 4 R-002) in order to check the TTC systems ?

    - by the end of 1999 ?

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