

LED light injection system for CMS ECAL Endcap

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INTRODUCTION

The CMS ECAL endcap already has a laser light injection system for the purposes of calibration.

However, it is proposed to add an additional light injection system, driven by LEDs. This will tap into the existing light injection system, as shown on the diagrams.

It has been discovered that if VPTs are not “flashed” for a certain time, the response drops. This is thought to be because of charge buildup within the VPT.

It is therefore desirable to flash the VPTs when they are not receiving scintillation light from scattered particles, in order to maintain their stability.

The existing laser calibration system cannot operate at sufficient frequency to do this, as it must also calibrate the barrel system.

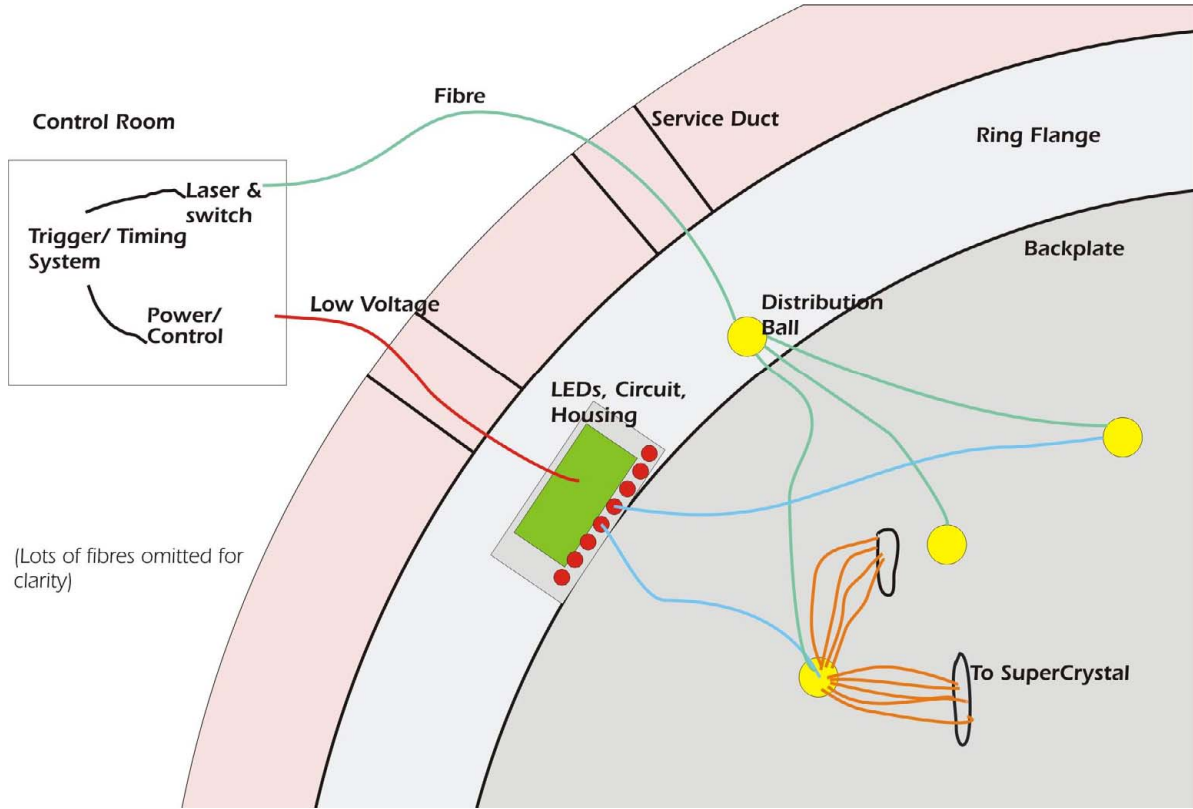
The LEDs will be mounted in a housing mounted on the Ring Flange. They will be able to flash during the $3\mu\text{s}$ “Abort Gap” during the bunch cycle, and may also be used to assist calibration.

Presumably, the LEDs will not be flashed when the calibration laser is flashed.

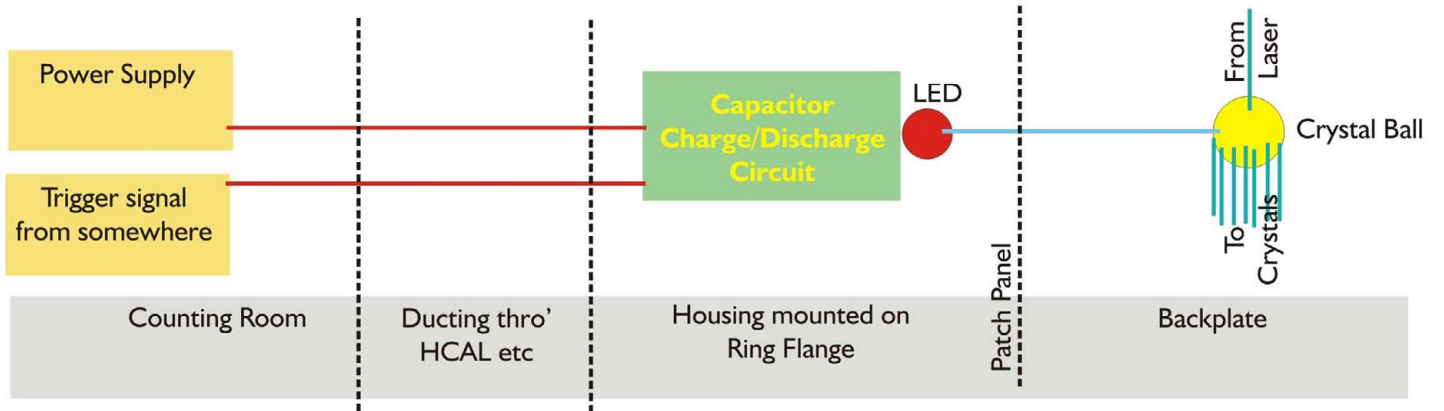
To power the LEDs, an extra power lead will need to be inserted into the service ducts. The location of the LED housing will depend on which duct the cable can be accommodated.

It may be the case that directly powering the LEDs via this cable will not be satisfactory from a noise point of view. In this case, the power cable would have to be accompanied by a triggering cable, and some capacitor charging/discharging circuit be installed in the housing on the ring flange.

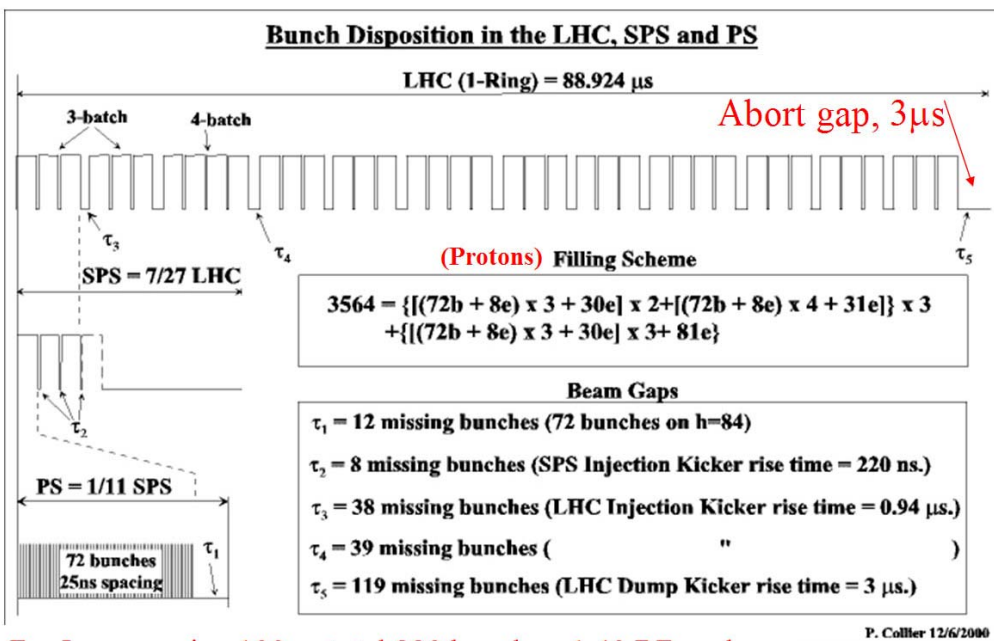
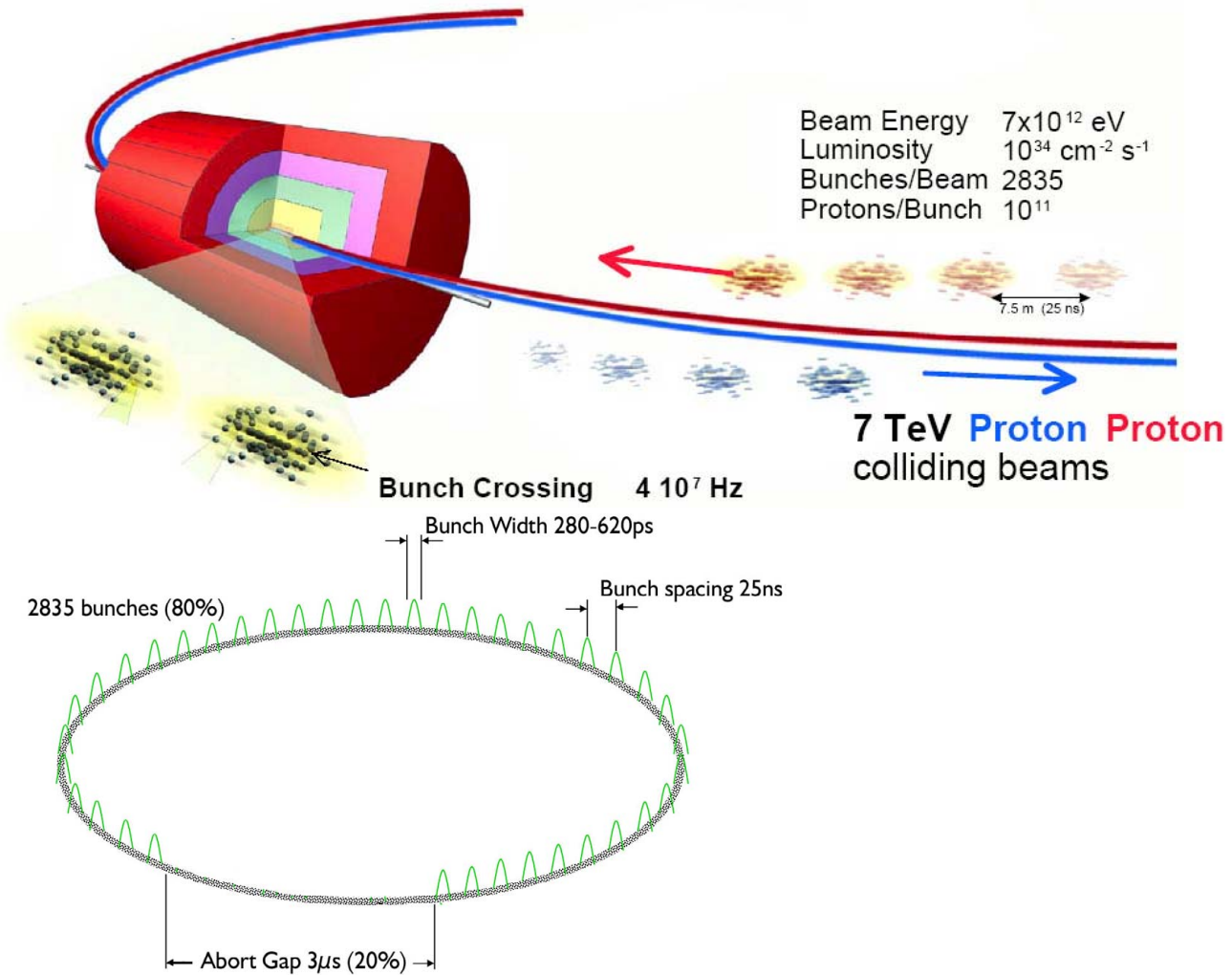
PHYSICAL LAYOUT



SCHEMATIC



OPERATION & TIMING



For Ions: spacing 100ns total 890 bunches 1.40 RF cycles

THINGS TO THINK ABOUT

Need 2 systems!

Flash Frequency $1/88.924\mu\text{s} = 11.2\text{kHz}$

Number of fibres needed (how many balls are there? 50 per end?)

Fibre length (do they need to be all the same?)

Power supply

Power consumption

Heating effects

Fibre Routing

Type of fibre

Min bend radius of fibre

Circuit board design

Housing

Radiation hardness

Prohibited substances (eg halogens?)

Cost

Location wrt service channels

Controlling - tie into triggering system etc

Fibre to LED interface

Fibre to Crystal Ball interface

Noise/crosstalk to other services