

Minutes 23rd AWAKE Run 2 Meeting, July 30th, 2020

<https://indico.cern.ch/event/942513/>

Zoom (23): Jan Pucek, Giovanni Zevi Della Porta, Stefano Mazzoni, Athanasios Topaloudis, Philip Burrows, Collette Pakuza, Eduardo Granados, Eugenio Senes, Francesco Velotti, Luca Garolfi, Harsha Panuganti, John Farmer, Joseph Wolfenden, Josh Moody, Kook-Jin Moon, Livio Verra, Mariana Moreira, Mathew Wing, Patric Muggli, Rebecca Ramjiawan, Stephen Jackson, Valentin Fedosseev

Matters arising (Giovanni Zevi):

Edda is still away this week. Giovanni is moderating today's meeting again. There were two presentations scheduled – BI presentation concerning YAG screen replacements, eBPMs and digital cameras update. Second, a presentation from John including new simulation result for witness electron beam matching and loading.

BI Status (Stefano Mazzoni, Eugenio Senes, Athanasios Topaloudis):

The overview was presented by Stefano. The stepper motor class upgrade has been completed, connecting additional stepper motors is in progress. Beam screens made from Chromox will be replaced by YAG. A slightly different approach will be used for the holder. The screen will not be marked directly but the holder will be coated in black copper and the signs will be coated in gold. The holder should be ready by the end of August (currently at the coating lab), YAGs will be laser cut. The team responsible for installation will be available from October. The time estimate for the exchange is two weeks including safety margin, but it will require support of the vacuum team (might be done when opening for Josh, last week of October). Decision on the exact date is still to be made.

The update of the digital cameras was presented by Athanasios. The digital cameras DAQ will run on a server, the software is ready but not yet released. Several features required by AWAKE were implemented like the extraction image, which has not been tested yet. There are several other features possible which are not linked to requests from AWAKE but will be included since same FESA class will be used for AWAKE and SPS. A test of the system could start to be tested on low importance screens.

Eugenio presented the electron BPMs progress. First location was picked to add a test Cherenkov diffraction BPM. Once the technology is proven to work another eBPM might replace an already existing BPM. There are two parts of the system – the radiator and the detection system. The prototyping will be done in two stages – in air prototype to be verified at CLEAR and afterwards a vacuum system. It is possible to insert electromagnetic buttons alongside the dielectric ones to directly compare the output. The upcoming tests at CLEAR are important to estimate the radiated power, which is difficult to simulate. Also, a collaboration with TRIUMF will help develop an optimized detection system.

Questions:

Josh asks about improving the resolution versus field of view. What is the limit of resolution for YAG screen? – The resolution depends on the thickness of the screen, but the one we want to install should have a resolution of approximately 30 microns.

Gio: We have been testing the electron spectrometer, the power supply can provide very low currents so the 20 MeV beam could be measured. Would it be possible to put a test camera to the spectrometer? What is the status of the spectrometer screen? – The screen is at CLEAR and can be easily taped to the exit of the vacuum chamber.

Parameter space for high-emittance witness (John Farmer):

The planned injection geometry of the electron witness bunch will lead to significant emittance increase (shown by Livio), which in turn will increase the matched spot size. The difficulty arises from the fact that the bubble formation depends on beam density, but the beam loading depends on the beam current - simply increasing the witness charge can overload the wakefield. To do a parameter scan John characterized the blowout by looking at two quantities: the fraction of the charge inside the bubble and the field on axis. Three different cases were simulated – low density plasma with a thin foil, high density with plasma with a thick foil, and high density plasma with a thin foil. The results of these initial simulations suggest high-quality acceleration may be possible using a longer bunch with higher charge. Proper discussion is needed to decide on the parameters we will be aiming for during RUN 2.

Next time: The agenda and the date of the next meeting will be decided once Edda comes back from vacation.

Jan Pucek, Aug 5th, 2020