



Week Summary Report

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Overall Summary

Week type: User Experiment – AWAKE Cherenkov BPMs
Date/WeekNumber: 12/04/2021 to 16/04/2021 (Week 3)
EDMS number: 2508859 & 2493388

Beam time: 25.5 hours
Fatal Failure time: 2 hours
Installation time: 15 hours
Number access: 8

#	Experiment Name	Responsible	Institute	Installation time	Beam time
2508859	AWAKE Cherenkov BPMs	Eugenio Senes	CERN	15 hours	23.5 hours
2493388	Cherenkov BLMS	Belén M. Salvachúa Ferrando	CERN	2 hours	2 hours

Weekly activity

Most of the beamtime this week was spent continuing the work done of the AWAKE Cherenkov BPM. After a couple of days spent setting up the beam and experiment we were able to achieve good beam transport of 85 % with stability mostly better than 10 %. Regular accesses were held in order for the AWAKE staff to alter their set up. The RP department were fully cooperative with our requirements. After some optimisation of their setup the AWAKE team were able to gather some data which will be analysed soon.

In addition to the AWAKE tests the Cherenkov Beam Loss monitor experiment was installed on the in air test stand spectrometer. There was an initial test of the signal produced when exposed to the beam

There were a few enforced stoppages mostly due to failures in the Klystrons. There were some stability issues with the laser also and the gun coolant had to be replenished. None of these failures were long term and operation began soon afterwards.

Day by day report

Monday



The week began with an access from 10:30 until 14:15. The access was to modify the BPM set up and check the feasibility of installing the Cherenkov BLM on the in-air spectrometer line. Both looked successful and beam mode began when the laser was turned on.

Beam was returned at ~80 % transport was achieved using the machine settings of the previous week. There was a problem with the SF6 gas pressure in MKS11 which was resolved. There were some signals received from the BPM set up.

To improve the BPM set up there was an access at 16:20. Following the access the beam was restored at 18:00. However, there was a control issue with all of the quadrupoles, the solenoids, and some of the correctors giving an error message. The error meant that the Matlab scripts crashed and the beam was impossible to control using the gui. The errors were fixed by manually resetting each element. Operation ended at 18:55.

Tuesday

The day again began in access to make adjustments to the BPM set up. The beam restarted at 10:00 and a transport of ~ 85 % was achieved. The signals coming from the BPM set up appeared okay but not great

A second access was done at 11:45 where adjustments were made to the BPM set up and the waveguides were sent up to the Klystron Gallery. During this access the installation of the Cherenkov BLMs was continued. During this access the internal door handle fell off and the people inside the tunnel had to use the fire escape to exit the building. The access finished at 17:00 and a patrol was done. The door handle was repaired during this time.

After the access the beam was restored to the BPM setup. The signal again seemed okay although the bunch charge jitter was quite large and should be reduced if possible. In the evening the beam was also directed to the BLM optical fibre. No signal was seen and an adequate trigger needed to be connected to the oscilloscope in the barrack.

Wednesday

Wednesday started with a problem with Klystron MKS 15 which took a long time to pulse (~ 30 minutes). The signals seen by the AWAKE team were significantly poorer than previously. It was thought that this could be from the beam stability, so work was done to improve this with the help of Edu. The laser spot size was reduced and the pulse picker settings were manually adjusted to produce a single bunch with no leakage. The stability was around 10% or lower. Despite this increase the signal was still poor.

An access was booked to see if the setup could be improved for 16:00. The pipe of the BPM was moved closer to the exit window of the beam. During this access the BLM setup was checked and realigned. The plasma lens pump again began to make a rattling noise.

The beam was restarted at 18:30. A further 2 hours of beam time was given to the BPM experiment although the results failed to improve. Klystron MKS15 dropped out at 20:30 and the day's operation ended.

Thursday

The beam was restarted at the stability improved. Klystron MKS11 dropped out for a few minutes but soon restarted. For a beam of 50 pC 85 % transport was achieved and 11 % stability at the in-air test stand was seen. A quick check of the BLM experiment was done with the beam. The signal seen on the scope was similar to the expected signal and it appears that the experiment is ready for the following week. Charge scans were performed for the BPM between 50 pC and 350 pC as well as bunch number scans for bunches of 100 pC.

There was a short access from 16:15 to 17:00 to make some further adjustments to the BPM. There was some difficulty in starting klystrons MKS11 and MKS15 following this. The cause of this was the charger not working. After it was restarted the klystrons began pulsing. To aid the



BPM team a (very) quick measurement of the bunch length was done with a bunch length of around 3 ps looking likely. Beam operation ended at 20:00.

Friday

The day started with an access until 11:00 to change the setup of the BPM. Following this a good beam transport and stability was achieved. There was an issue with the new BPM set up so an access was called to restore the previous setting.

The access lasted 1 hour ending at 14:00. Again the klystrons took a long time to begin pulsing. The cause of this was investigated and the coolant for the gun had run low. It was topped up with de-ionised water and restarted easily. Some final measurements were taken for the BPM setup before operation ended at 17:30.

Other business

A new mirror arm was fabricated by Wilfrid to allow laser alignment on the in-air spectrometer stand.

Additional resources

Main issues

Magnet control issue (solved by Antonio and Luke)

Klystron MKS 15 coolant running low (solved by Wilfrid, Stefan Curt and Gerry)

Klystron MKS11 experiencing an SF6 leak (solved by Wilfrid...)

Actions needed to be followed up

Devise a way of doing laser alignment on the in-air test stand.

Check the status of the SF6 error in klystron MKS11.

Further look to solve the noise in the plasma lens pump.

Understand where the end of the trigger cables in the klystron gallery.

Look at moving one of the unused CTF3 front ends to the barrack to aid data collection.