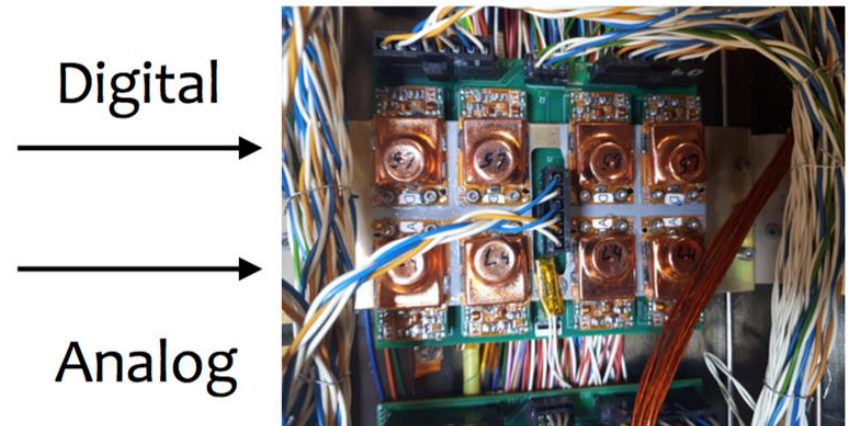
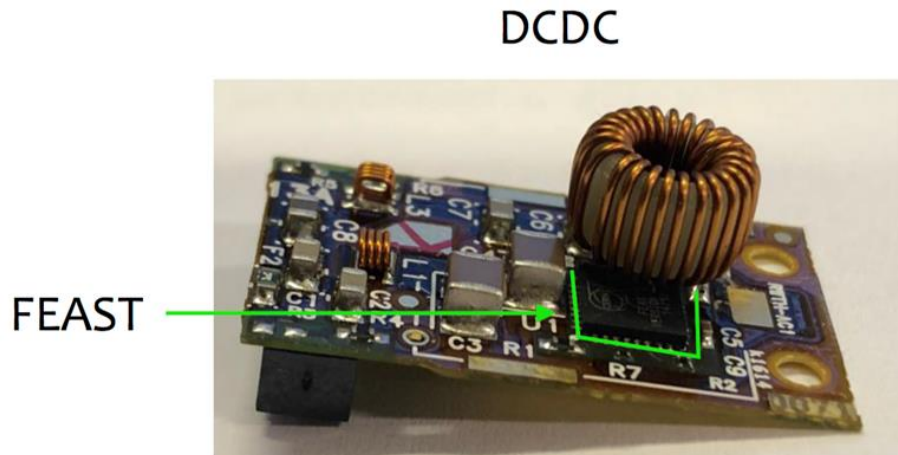


Request from CMS

Context

- Issue with DCDC converters failing when enabling them
- Major issue for CMS and all experiments upgrade
 - reason why they reopened CMS during the YETS and started the YETS 1 week early

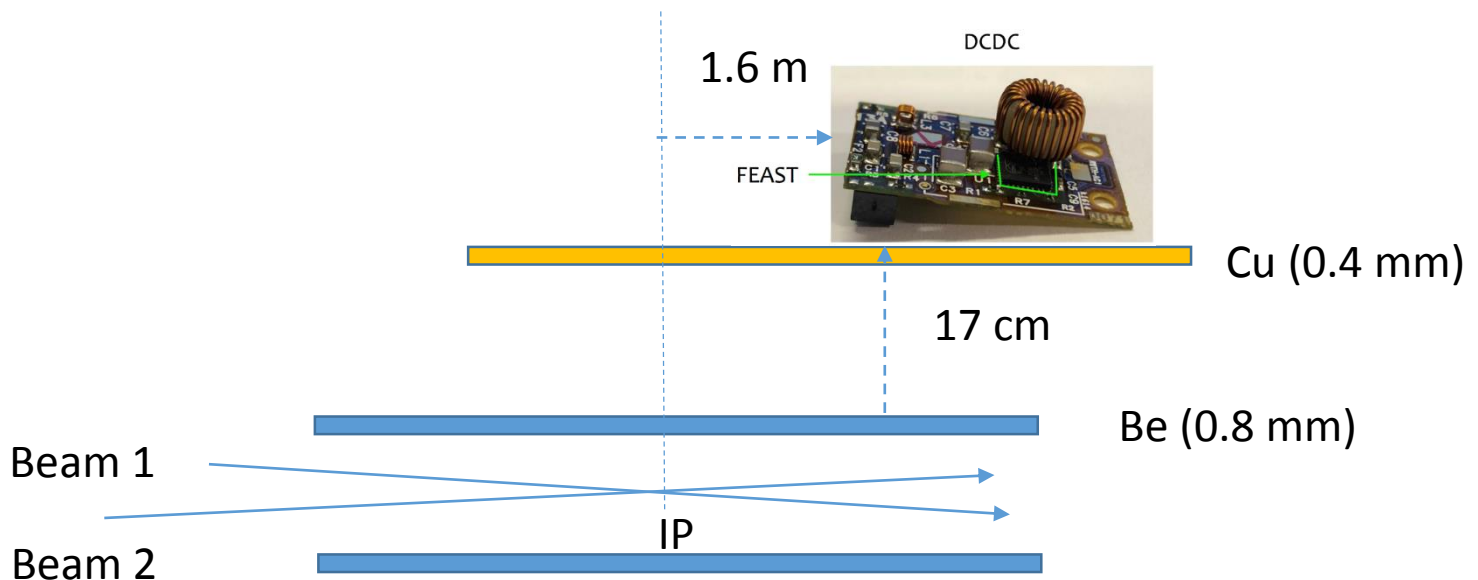


Request

- EP observed that “problems in the system started to be more frequent after the filling scheme was adjusted to 8b4e” and asked if electromagnetic pickup from the beam could be involved.
- We asked what the location is and checked the power spectrum from the beam
- CMS said that at frequencies of 10-100 KHz the shielding is less effective.
- The DC-DC converters are located 17 cm from the beam, shielded by 0.8 mm of Be and 0.4 mm of copper.

Shielding of Be and Cu

- The skin depth in Be (with resistivity $3.3e-8$ Ohm.m) is comparable to the Be thickness (0.8 mm) for 15 kHz, so indeed not many multiple of revolution frequencies ($f_{rev}=11$ kHz) are supposed to reach the converters with large beam power.
- At 100 kHz, the skin depth in Be is 300 micron (200 micron in Cu).

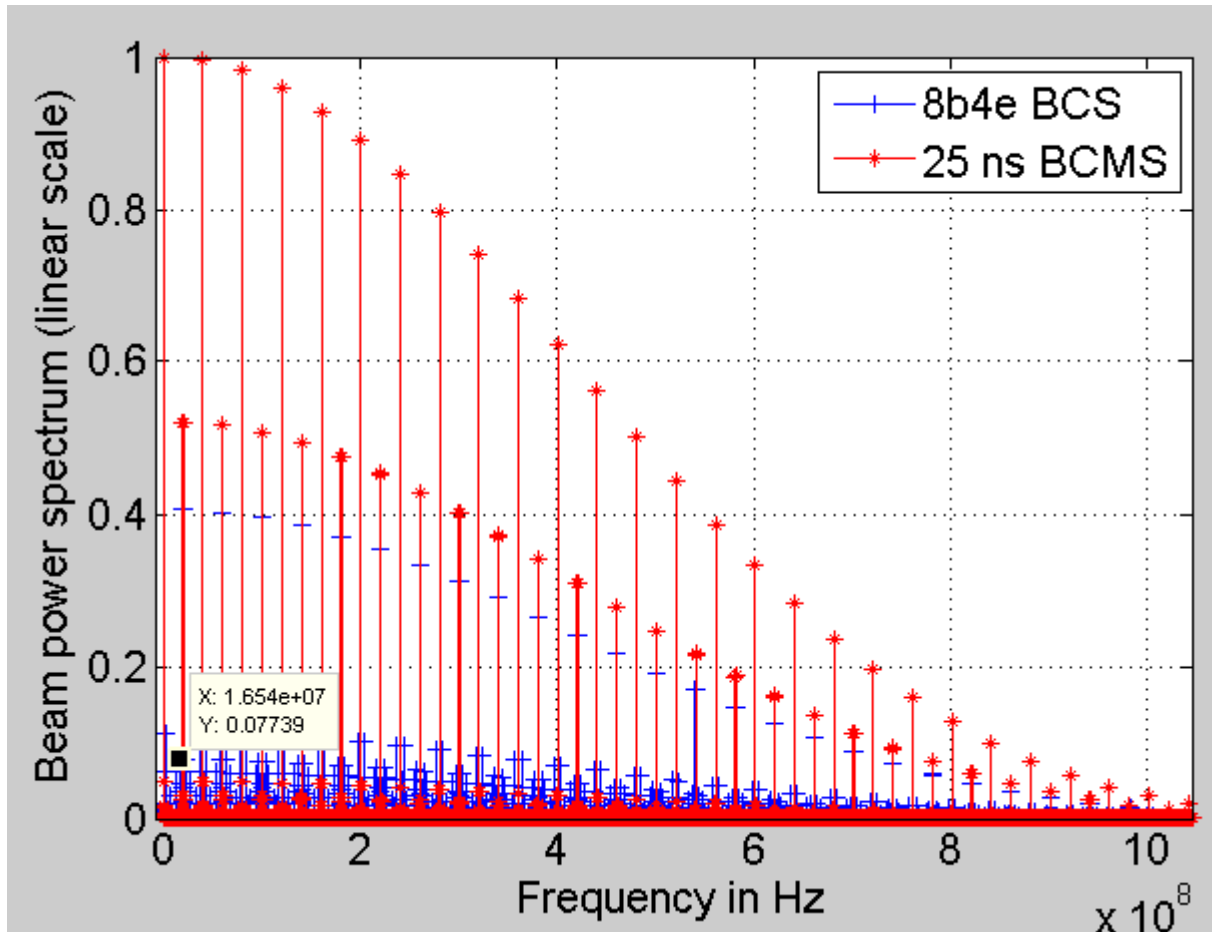


Difference between beam spectrum for 8b4e and 25 ns

1 fill with 8b4e: 6442

1 fill with BCMS: 5965

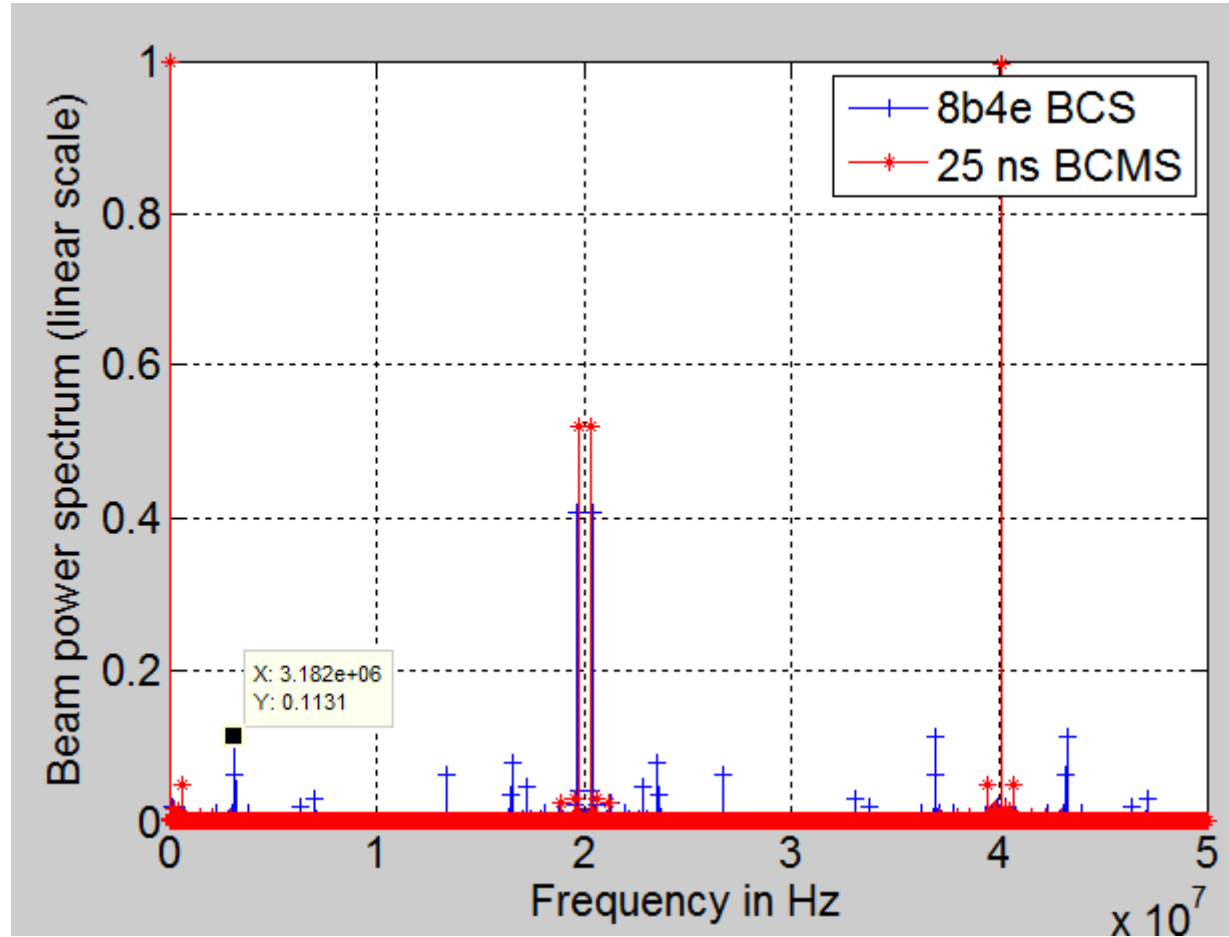
Frequency from 0 to 1 GHz



→ Similar beam spectra at that level: major 40 MHz components with 20 MHz sidebands

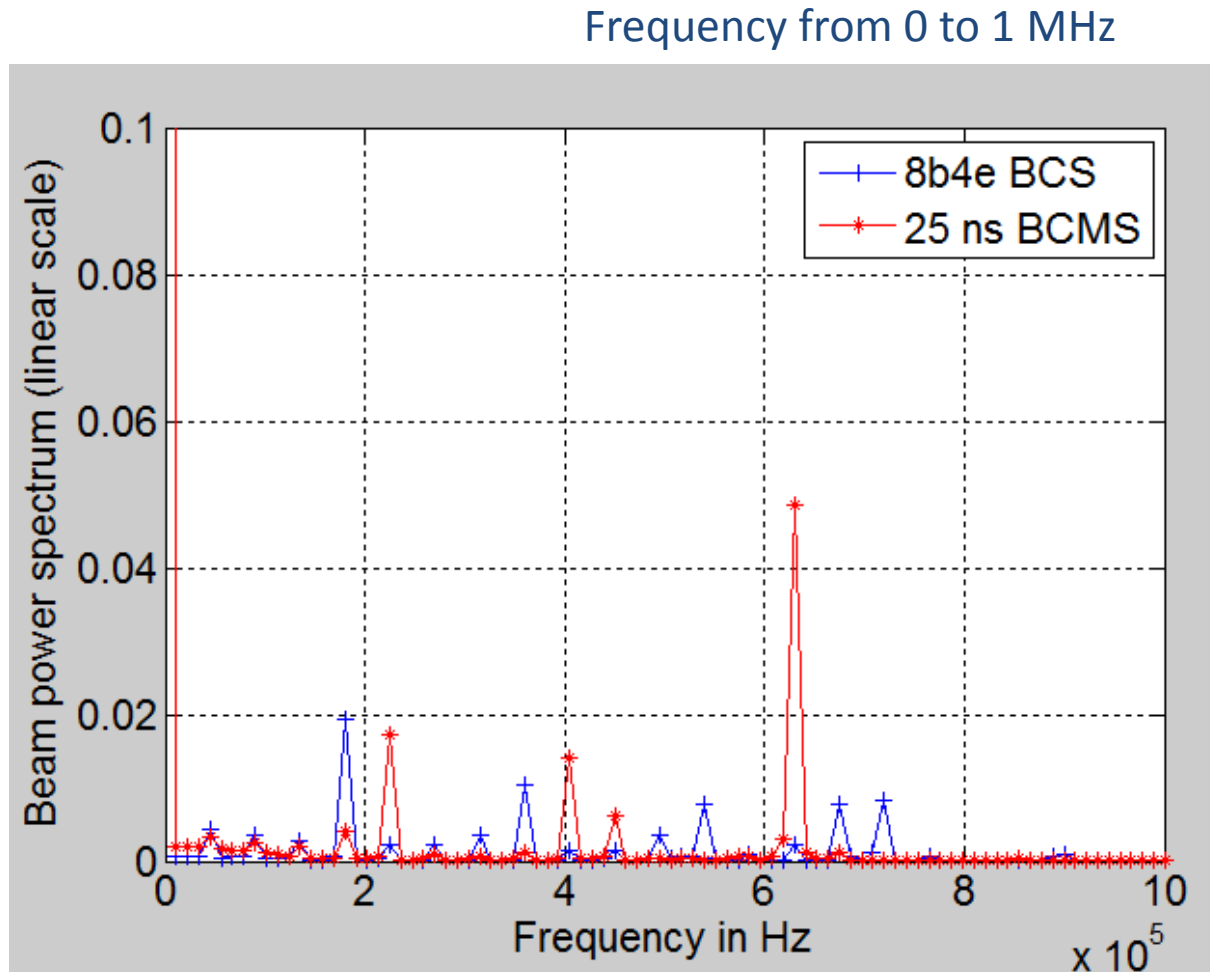
Difference between beam spectrum for 8b4e and 25 ns

Frequency from 0 to 50 MHz



→ 8b4e has an added 12×25 ns periodicity: 3 MHz harmonics around main lines

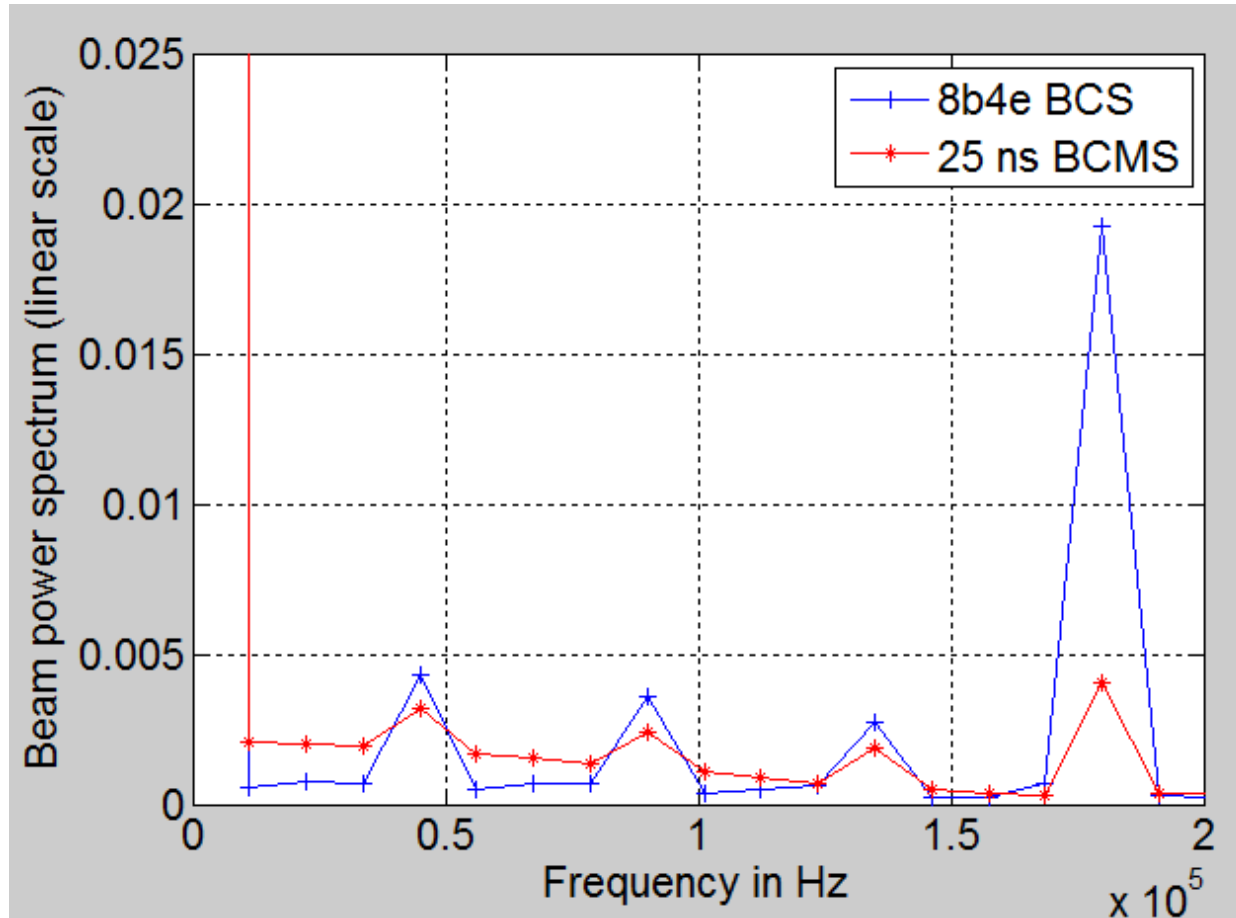
Difference between beam spectrum for 8b4e and 25 ns



- Above 1 MHz, skin depth is below 100 micron in Be. Not much reaches the boards
- Some peaks are different for BCMS and 8b4e

Difference between beam spectrum for 8b4e and 25 ns

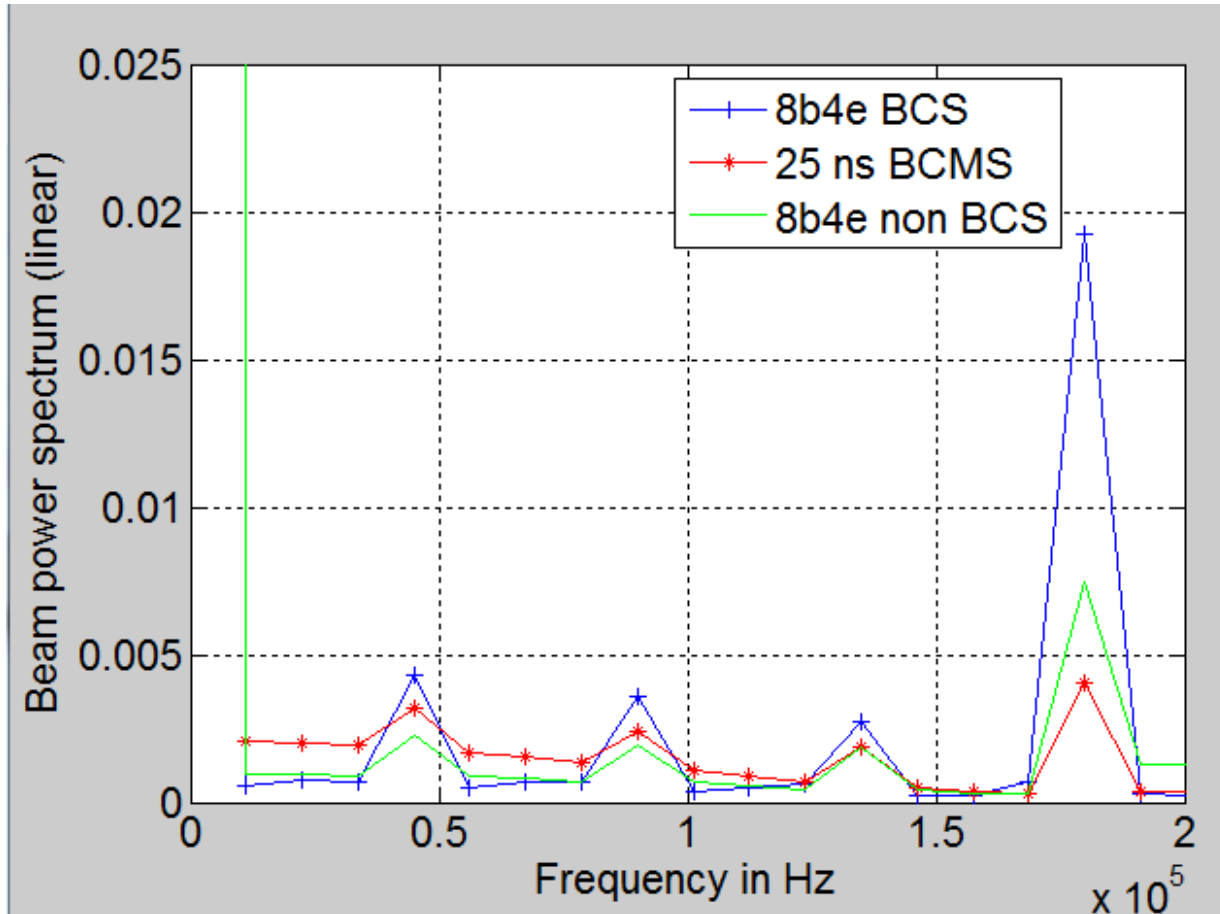
Frequency from 0 to 200 kHz: frequency range of interest



- Below 100 kHz, similar power expected for both filling schemes (within a factor of 2)
- Larger peak at 180 kHz

Difference between beam spectrum for 8b4e and 25 ns

Frequency from 0 to 200 kHz: frequency range of interest



→ Larger peak at 180 kHz is not as large for the non BCS 8b4e filling scheme

Where we are

- We see no obvious reason why 8b4e would be much worse than BCMS in the 10 to 100 kHz range.
- We provided that information to CMS.
- During the weekend, the designers found more information and will get back to us soon.
- Similarly to the beam screen heat load, it would be good to have a procedure to evaluate how much power can escape the beam pipe at a given frequency. IW2D does not provide this readily. We will work on this with Francesco, based on the work of Nicolas and Carlo in particular (now at JUAS).