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# Planning for Jan 2009 9mA studies

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# January 9mA studies

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- Main goals
    - What can we learn about the beam losses in the dump line?
    - LLRF studies: feed-forward, feedback gain studies
    - RF studies: cavity field stability for long pulses
    - Gradient studies: increase ACC456 to quench (or other limits)
  - Operating conditions
    - *Maximum charge per pulse: 30nC (nominal)*
    - Try to get 3nC operation with 10 bunches, else 1nC with 30 bunches. Low rep rate (40kHz)
    - Long RF flat top (800us)
    - 700MeV in 1<sup>st</sup> shift, increase ACC456 during 2<sup>nd</sup> shift
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# Shift #1 (Jan 11/12, 15:00-07:00)

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## Proposed outline

	Primary study	Lead studiers
15:00	In parallel: <ul style="list-style-type: none"><li>• Set up ACC1, ACC23, ACC456 (800us flat-tops)</li><li>• Try to reproduce 3nC setup from Sept run, else set up 1nC operation</li></ul>	<ul style="list-style-type: none"><li>• Ayvazyan</li><li>• Sigggi?</li></ul>
	Transport beam through bypass to dump (either 10x 3nC or 30x 1nC, 40kHz rep rate)	FLASH expert?
~21:00	Preliminary tests of new FF algorithm at ACC456	Ayvazyan
~23:00	Characterize dump line beam losses, see if we can affect losses by changing correctors, quads,... Measure energy and physical aperture. Test response of new cerenkov blms,...	Carwardine, Walker
07:00	<i>End of Shift</i>	

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# Shift #2 (Jan 14/15, 15:00-07:00)

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## Proposed outline

	Primary study	Lead studiers
15:00	Try to increase feedback gain. Characterize energy stability vs feedback gain vs pulse length with beam. Correct 250kHz ripple,...	Ayvazyan, Canelo, Michizono
~21:00	Push the gradients in ACC456 with beam. Find gradient limits, measure quench signatures, test quench detection, check coupler powers,...	Ayvazyan, Canelo, Michizono
~03:00	No-beam open-loop measurements. Measure stability of ACC456 cavity fields, with long pulses for different gradients, different pre-detunings,...	(Pei), Walker, (Adolphsen),..
07:00	<i>End of Shift</i>	

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# Other possible studies / tasks

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- Test MPS interface to LLRF systems to terminate LLRF control on beam trip.
  - Test Simcon DSP based control at ACC456
  - Investigate fast transients in vector sum that appear in DAQ data (parallel study)
  - Understand RF waveforms, calibrations, compare DOOCS and DAQ waveforms, etc (partial parallel study)
  - ~~Commission 3MHz gun operation~~
  - Test 3MHz trigger to laser
  - ...other?
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# RF studies: cavity field stability

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- Continuation of previous study... (Pei, Adolphsen)
  - Validate our analyses of previous datasets, eg
    - Can we verify that LFD is the cause of the end-of-pulse instabilities?
    - Can we find an ‘optimum’ pre-detuning?
    - RF power overhead measurements
  - Should use DAQ data for data analysis this time.
  - (We need detailed list of studies and measurements)
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# Beam loss studies / Dump line characterization

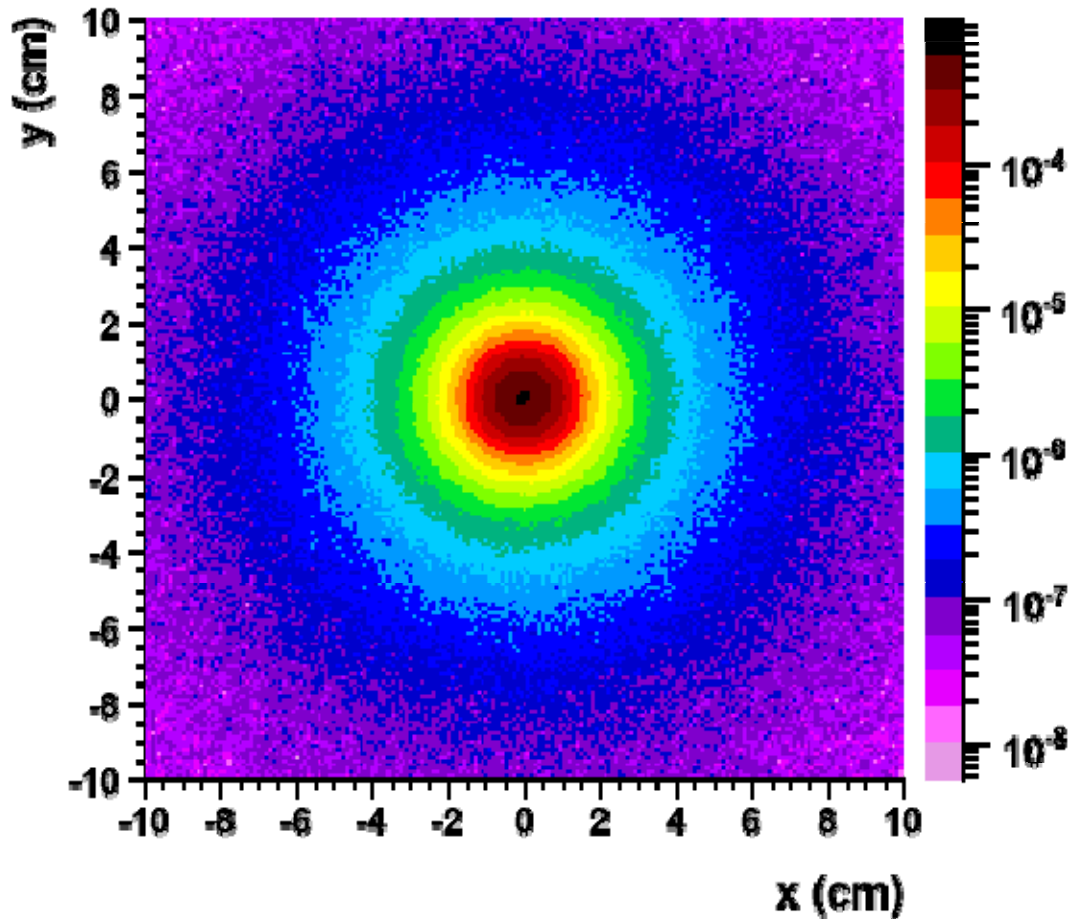
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- Measure energy / physical aperture of dump line, compare with expected values from model
  - Grab a corrector and see if we can change the beam loss signatures
  - Can we tell when we're in the center of the beam pipe?
  - What's the effect on losses and dump temperature / temperature profile of changing the defocusing quads and rotator magnets?
  - Can we tell how big the beam is at the dump?
  - What do we learn from the new cerenkov loss monitor?
  - Dark current issues
  
  - Presence of copper window may make these studies difficult.
  
  - *Studies should result in quantitative measurements.*
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# “Quick” simulation of dose from shower of 1nC @ 700MeV through 2mm copper window

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**Dose (GeV/g/primary electron)**



- Multiply by 1000 to get the dose distribution in Gy 1m downstream of the window.
- Even in the lowest bins of the plot show  $1e-5$  Gy per bunch or 4 Gy/day

Lars Fröhlich

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# Personnel

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- FLASH experts: Ayvazyan, Grecki, Schreiber, Walker, (who?),...
  - Visitors: Carwardine, Cancelo, Davidsaver, Michizono, Matsumoto
  - Remote: Pei, Adolphsen, Chase, Dong
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# Notes

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- We keep good notes in the elog, especially to time-stamp interesting times for analysis and to record appropriate information
  - Studiers: please provide specific information on studies and measurements to be taken:
    - Beam loss studies
    - RF measurements
  - Brief follow-up meeting on Friday (time to be announced)
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