

Integration of the TRACK Beam Dynamics Model to Decrease LINAC Tuning Times C.E. Peters, C. Dickerson, F. Garcia, M.A. Power

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Full Integration of Beam Dynamics Code into the ATLAS Control System

Problem

ATLAS delivers a wide range of ion species to 100+ experiments per year. experiment requires individual Each tuning of hundreds of devices in a varying configuration of beam paths. Operators don't have a 'birds eye' view of the beam quality during the tuning process.

APPROX. SCALF

Initial Selected Conditions Beam Path

Individual Device Settings

Solution

An in-house **beam simulation model** to display beam size and quality to operators in real time, using initial emittance data, individual device field models, and interactive graphs which execute quick enough to iterate after each device's adjustment.



New Pre-Processing Code to Define Beampath and Format Input Files

ATLAS	
ATOM TRAP FACILITY FACILITY GENERAL PURPOSE	
ECR-II PII SOURCE PII ATLAS LINAC PHYSICS	
ECR-I SOURCE INJECTOR LINAC BOOSTER LINAC CANADIAN PENNING TRAP	
ACCELERATOR 0 50	

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l		0.00 20.00	7 V 0.00 30.00	
I	QDP201:CONTROL_Y 3.59 KV	QDP202:CONTROL_Y 2.71 KV	QDP203:CONTROL_Y 3.00 KV	STP204 STP204:CONTROL_Y -0.61 AMPS
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68	mhb4	24.000	1.000	140.000	1	
1	drift	42.700	3.000	3.000		
71	eq3d	-4.963	17.500	3.000	60	
72	eq3d	5.322	17.500	3.000	60	
1	drift	89.100	3.000	3.000		
71	eq3d	-4.590	17.500	3.000	60	
72	eq3d	3.531	17.500	3.000	60	
1	drift	116.900	3.000	3.000		
71	eq3d	4.107	17.500	3.000	60	
72	eq3d	-4.682	17.500	3.000	60	
1	drift	132.400	3.000	3.000		
77	eq3d	8.073	17.145	3.000	60	
78	eq3d	-8.574	27.305	3.000	100	1
81	eq3d	8.162	17.145	3.000	60	





ATLAS (

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QDP2

QDP2

QDP2

QDP2

QDP2

QDP:

QTP:

QTP:

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DP201Y

DP201X

DP202Y

DP202X

DP203X

DP203Y

TP204X1

TP204Y1

TP204X2

112



Source and PII



The program retrieves current settings A SQL query is executed on a database Device and order information is Finally, a fully formatted and of devices to extract only the devices for each device, and applies a scale scaled TRACK input file is created, automatically extracted from the included in that beamline. Source, factor to convert control voltages to with 'save points' that enable rapid control system based on the beamline currently in use. injector, and target are included. physical field values. re-calculation.

New Post-Processing of TRACK Simulation with Graph Views

a middle linear



The below two graphs represent the same beamline before and after optimizing the focus. This demonstrates a possible example of comparing a bad tune to a good tune which (due to overfocusing) hits the beam pipe (starting at 4.00m) less often. Changing the focus through the quadrupoles via the normal control system interface resulted in a 5% increase in total beam transmission when



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