

STAR Forward Tracking Update

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- Akio's page → <https://www.star.bnl.gov/protected/spin/akio/fcs/index.html#2026>
- Magnetic Field Settings. → <https://www.star.bnl.gov/protected/spin/akio/fcs/magneticField/index.html>
- FTT time offset calibration → https://www.star.bnl.gov/protected/spin/akio/fcs/ftt_sim_hit_maker/timecut/index.html#20260914
- FST outer sensor 1 degree gap → No PR but at /star/u/akio/fcstrk12/star-sw-fwd & "FstOuterGapFix" branch
 - We need be careful because reading old and new MuDst can cause wrong correction
 - Proposal : Ignore XYZ hits in MuDST & always recalculate XYZ from strip info, instead of correcting MuDST's XYZ
→ Making XYZ plots directly from existing MuDST will be always wrong
- FST Wedge Flip → Jason & Flemming & Akio will meet Wednesday 10AM
- Small Test (20 files each) afterburner PicoDst production started
 - Fwd stream test production : /gpfs01/star/pwg_tasks/FwdCalib/akio/pico_fwdtest_20260915/
 - Zero Field 2022 production : /gpfs01/star/pwg_tasks/FwdCalib/akio/pico_zf2022_20260915/
- GitHub to Gitea transition & our current and future PRs???

Magnetic Field Settings in MC & Tracking

<https://www.star.bnl.gov/protected/spin/akio/fcs/magneticField/>

1. MC scripts were missing “field=-5.0” option → Running with forward field (+5), opposite from usual reverse field, but consistent
2. FST region : StarFieldAdaptor hardcodes $B_z = +4.99$ → Only correct for MC with missing “field=-5.0” (or forward field data)
3. FTT region : Afterburner macros are missing StarMagField instance → Always 0 (ok with BFC)
4. Seed Charge : Seed curvature to seed charge is based on $B_z > 0$ → Wrong sign for reverse field data and MC

- Tracking speed with fixed vs mapped magnetic field
 - x2 slower with mapped field
 - Small scale test shows no difference in tracking
- (3b) Field=0 for $z > 450\text{cm}$ but still it is -0.4 kG at $z = 450\text{cm}$
 - Costs about ~10% more CPU with mapped field over fixed 0 field
 - I think we did this to reduce track extrapolation failure to FCS
 - But I see no difference in failure rate now
→ Remove this cut-off?
- Many (~40%) converged tracks failing to GenFit projections even at $> 2\text{GeV}$
→ Under investigation

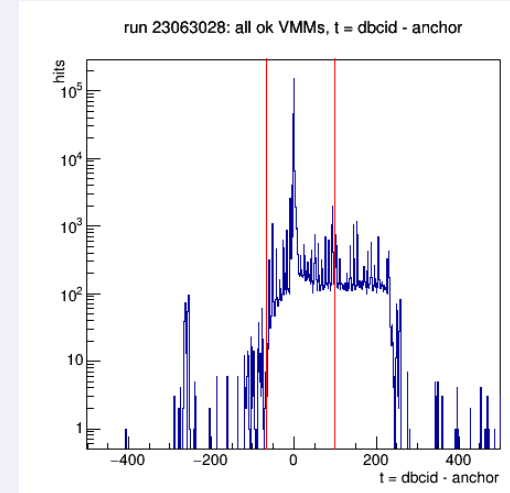
→ PR#26 on Daniel's DEV <https://github.com/jdbrice/star-sw-1/pull/26>

	Setup	True field			Fitter field		
		FST	FTT	FCS	FST	FTT	FCS
Before fix	MC FON generator → sim.C	+4.98	map(+1)	map(+1)	+4.98 const	map(+1)	0
	MC FOFF generator FieldOff → sim.C	0	0	0	+4.98 const	map(+1)	0
	BFC FON 2022	map(-1)	map(-1)	map(-1)	+4.98 const	map(-1)	0
	BFC FOFF (ZF)	≈0	≈0	≈0	+4.98 const	≈0	0
	Afterburner FON	map(-1)	map(-1)	map(-1)	0	0	0
	Afterburner FOFF	≈0	≈0	≈0	0	0	0
After fix	MC FON — (1)+ (2)	map(-1)	map(-1)	map(-1)	map(-1)	map(-1)	0 (3b: map)
	MC FOFF — (1)+ (2)	0	0	0	0	0	0
	BFC FON — (2)	map(-1)	map(-1)	map(-1)	map(-1)	map(-1)	0 (3b: map)
	BFC FOFF — (2)	≈0	≈0	≈0	≈0	≈0	0
	Afterburner FON — (2)+(3) magField=1	map(-1)	map(-1)	map(-1)	map(-1.0014)	map(-1.0014)	0 (3b: map)
	Afterburner FOFF — (3) magField=0	≈0	≈0	≈0	0	0	0

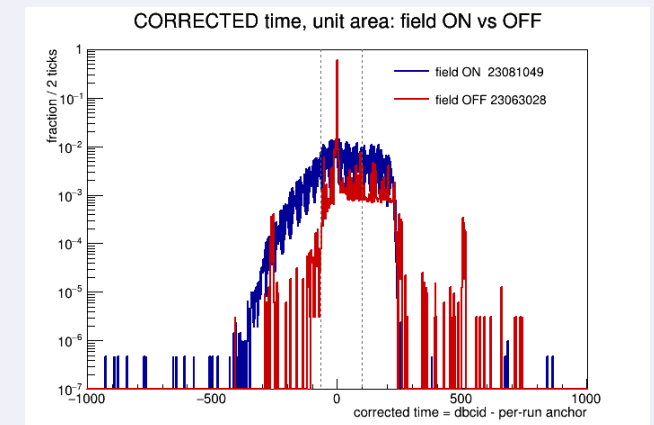
Magnetic Field Settings

https://www.star.bnl.gov/protected/spin/akio/fcs/ftt_sim_hit_maker/timecut/index.html#20260914

ZF Low Lumi Data



- ZF data has no Y clusters → FTT time offset cold start `HitCalibHelper::ready()` counts single time bin peak, not all good hits
→ Low lumi & low occupancy → Needs ~1000 events cold start, instead of ~100 events
- [fttDataWindow.C](#) : Macro to read MuDst & get time offsets (txt & plots)
→ https://www.star.bnl.gov/protected/spin/akio/fcs/ftt_sim_hit_maker/timecut/fttDataWindow/
- [fttDataWindow_db.C](#) : Macro to push time offset calibration (a txt file per run) to DB
 - \$STAR/StDb/idl/fttDataWindowsB.idl
 - <https://www.star.bnl.gov/Browser/STAR/browse-Calibrations-ftt-fttDataWindowsB.html>
- StFttDbMaker update
 - Read local text file (./fttDataWiddow) if exist, or read from DB (no DB push so far)
 - DB begin time = Run start time
 - DB end time = Dimitry says do **NOT** use... STAR DB is only using “begin time”
 - St_db_Maker query time = 1st event timestamp (30sec ~ 3min later than Run start time)
 - **Dangerous when missing DB entry for a run = DB entry for last pushed run used = totally wrong if applying TimeWindowCut**
 - Add Run# in “fttDataWindowsB” table in DB to check run# matches with current run
 - Otherwise.... Should it crash? Or run with no time window cut (accept all)?
 - This did not affect in past with “accept all” in afterburner by not cutting on timing at all
 - Still to do :
 - Decide on Time Window Cut
 - Code and macro PR
 - Run on ALL production runs
 - Push to DB
 - Turn off cold start mode and read DB
→ Much less pileup hits



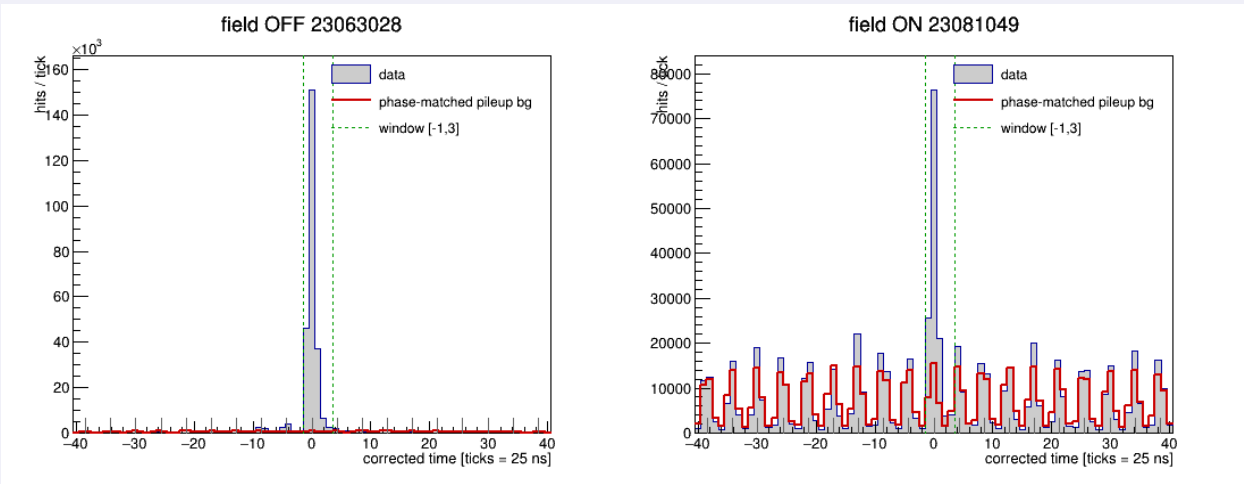
ZF & Production data

FTT Time Window Cut

https://www.star.bnl.gov/protected/spin/akio/fcs/ftt_sim_hit_maker/timecut/index.html#20260914

Looking at ZF low luminosity & low occupancy data helps to see where are real and pileup hits

- DB (1st example entry) : -65 to 100 (It seems like BFC uses this)
- Current Afterburner : -40 to 100



window	field OFF 23063028			field ON 23081049		
	inside	signal fraction	signal kept	inside	signal fraction	signal kept
[-1, 1]	0.725	0.991	0.957	0.059	0.757	0.816
[-1, 2]	0.745	0.990	0.982	0.061	0.753	0.836
[-1, 3]	0.752	0.989	0.991	0.063	0.723	0.828
[-3, 3]	0.757	0.986	0.995	0.065	0.689	0.814
[-10, 20]	0.821	0.940	1.028	0.156	0.310	0.884
[-30, 60]	0.864	0.867	0.998	0.363	0.144	0.957
[-40, 100] (afterburner)	0.900	0.829	0.994	0.504	0.100	0.921
[-65, 100] (DB)	0.913	0.822	1	0.577	0.095	1
[-100, 150]	0.946	0.787	0.992	0.771	0.066	0.928

Proposal : -1 to 3

- This will reduce pileup hits to ~1/100
- While keeping ~99% of in time hits