

TARE LOADS DESCRIPTION – ETW

Process

Comments

Typical ETW Moment Balance:
 Convention X,Y,Z, l, m, n
 Units: N, Nm [SI System]
 M11 AF1
 M12 AF2
 M2 YM Yaw Sting Side
 M3 PM Pitch Sting Side
 M4 RM
 M5 PM Pitch Model Side
 M6 YM Yaw Model Side

1	Calibration in ETW Balance Calibration Machine (BCM) at discrete temperatures Typically 300 K ($\Delta 15$ K) 115 K	Derive Balance Matrix and Virtual Zeros at each calibration temperature
2	Record bare Balance Zeros M11, M12, M2, M3, M4, M5, M6	
3	Add Model Components	
4	Perform Dead Weight Traverse $\Theta = -10^\circ, 0^\circ, +10^\circ$ at $\Phi = 0^\circ$ $\Theta = -10^\circ, 0^\circ, +10^\circ$ at $\Phi = 180^\circ$	Derive weight and CG for Balance and model assembly Independent of Balance Zeros Independent of temperature
5	Record Actual Balance zeros for Balance and model assembly	Incidence known, zeroed at $\Theta = 0^\circ$ Roll known, zeroed at $\Phi = 0^\circ$ Derive Expected balance signals from weight and CG at known Balance incidence
6	Derive Balance Signal Offsets	= Expected - Actual
7	Perform Tare Loadings over expected incidence ranges (ETW Definition: No-Wind Traverses) Record Balance signals	
8	Calculate Gross loads on model assembly from Balance signals, Balance matrix and balance signal offsets	
9	Subtract model weight = $F_n(\text{incidence})$	
10	Derive net forces in aerodynamic axes system	<u>Should</u> be Zero! BUT: Tares affected by instrumentation crossing metric gap, quality of balance / model joint, balance stability,

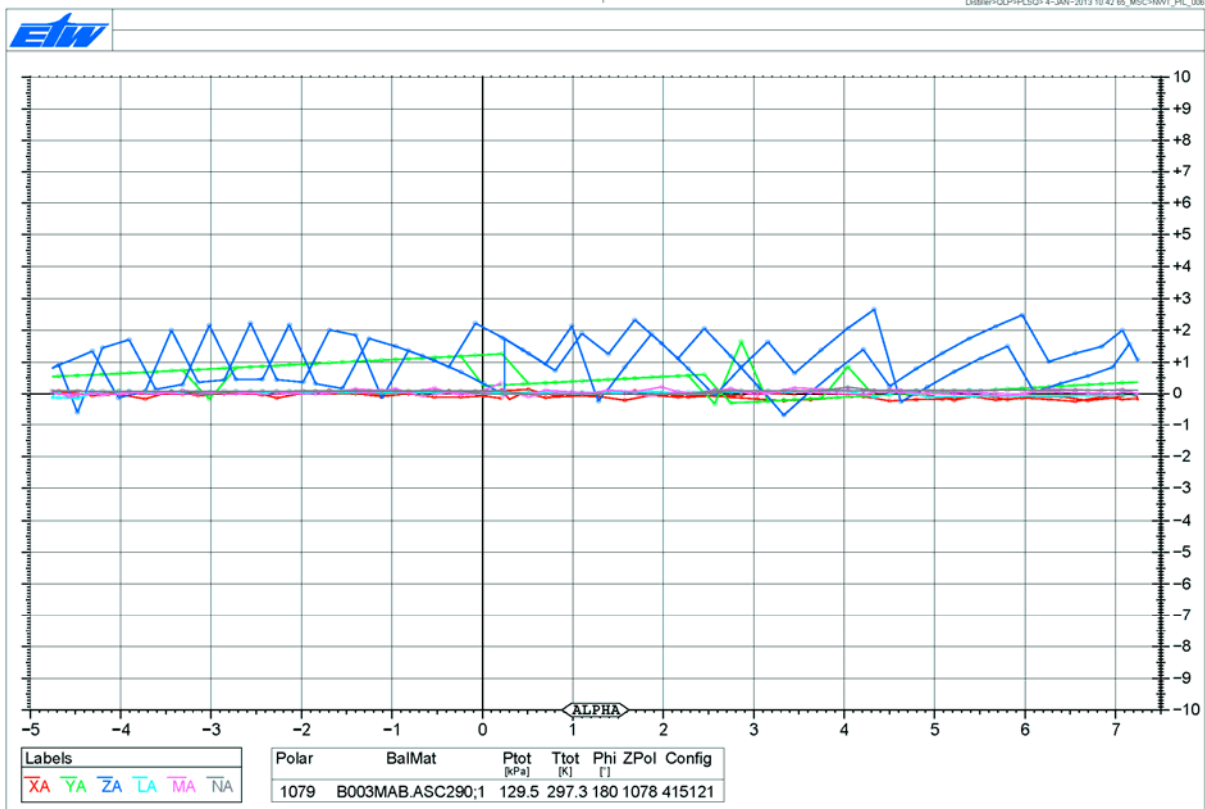


Figure 1 Residual Forces from No-Wind Traverse

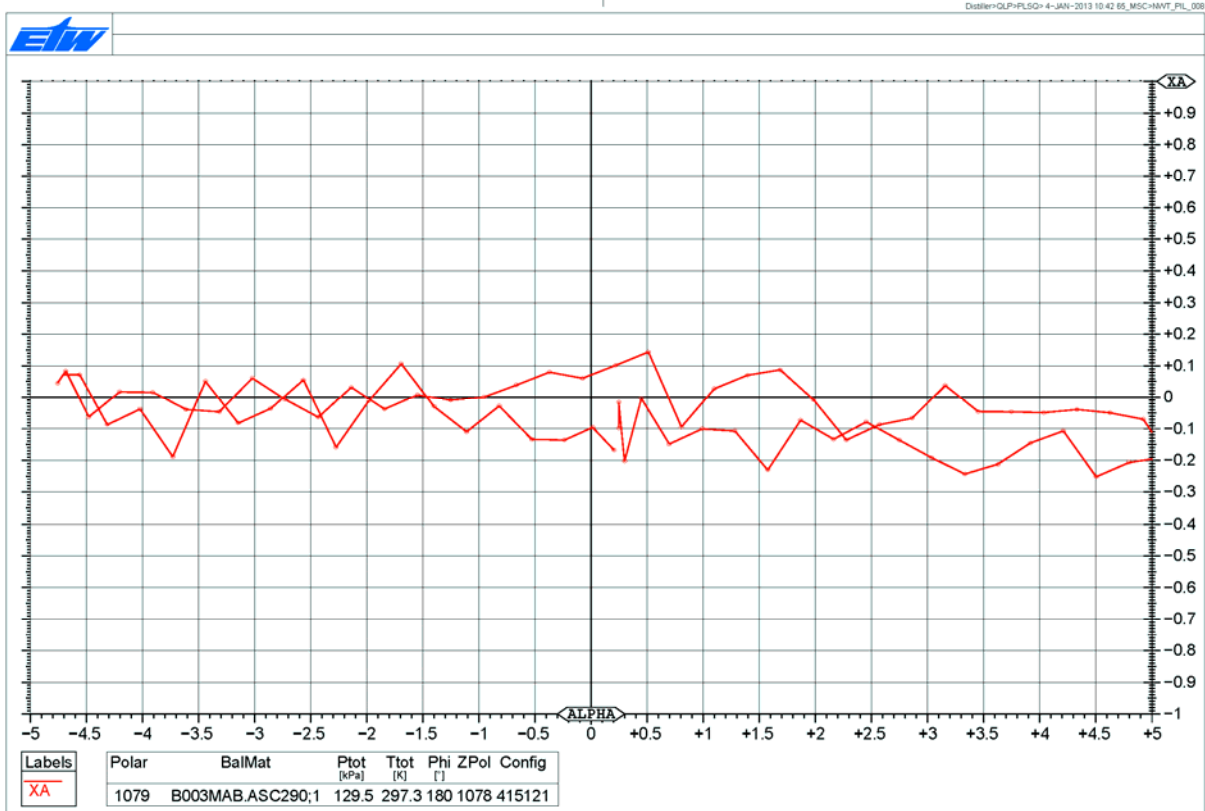
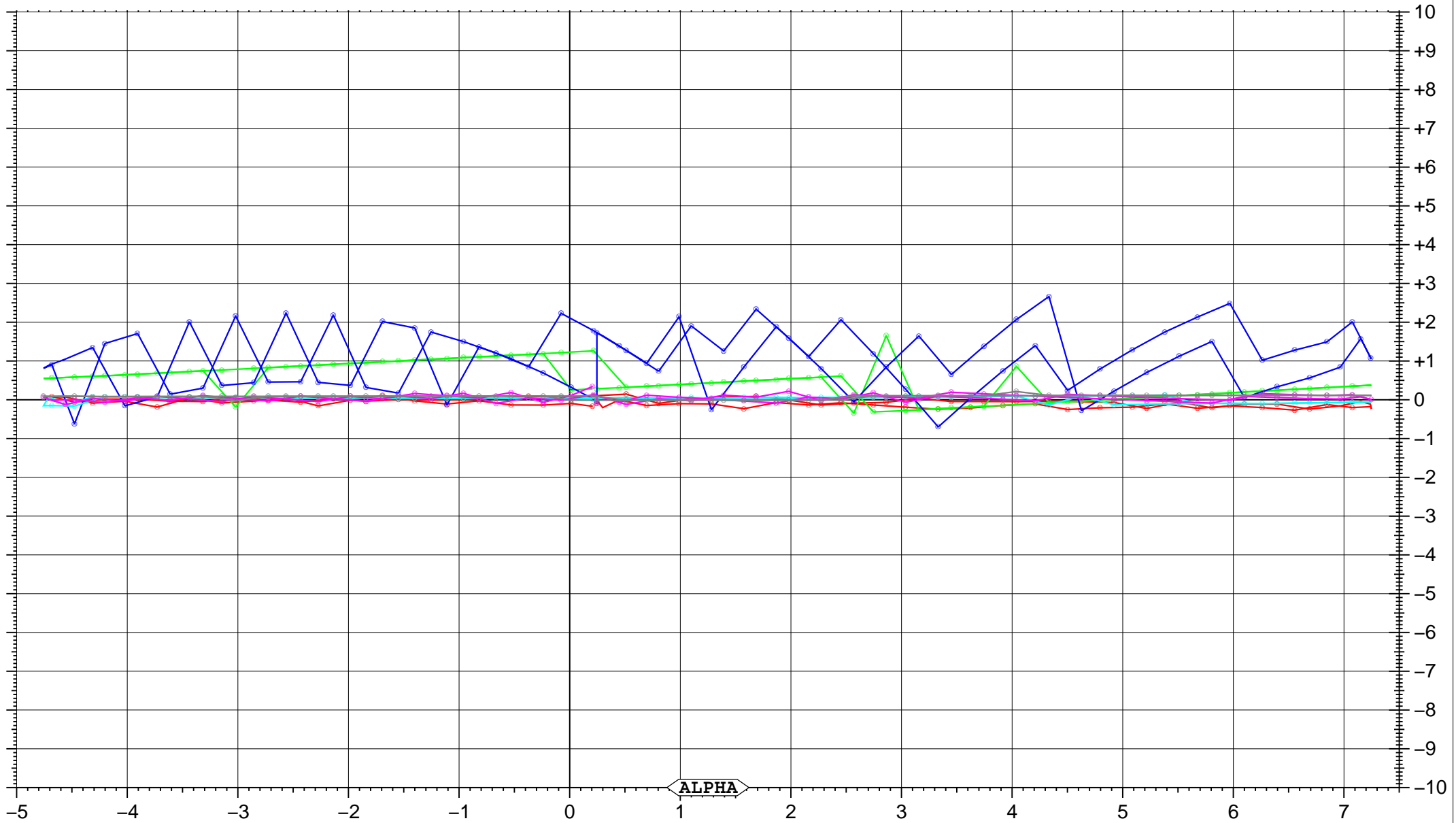
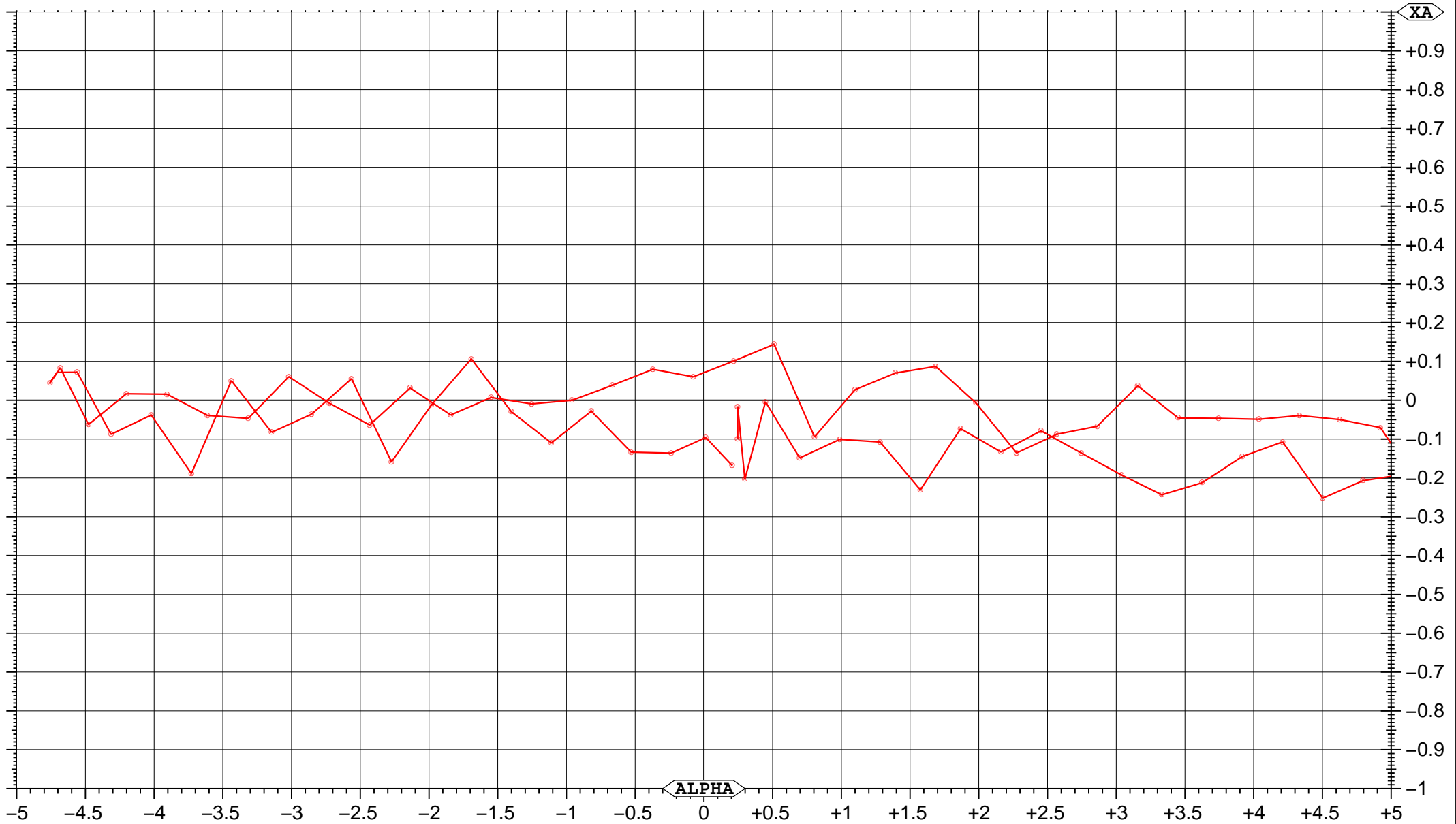


Figure 2 Residual XA Force - Expanded Scale



Labels					
$\bar{X}A$	$\bar{Y}A$	$\bar{Z}A$	$\bar{L}A$	$\bar{M}A$	$\bar{N}A$

Polar	BalMat	Ptot [kPa]	Ttot [K]	Phi [°]	ZPol	Config
1079	B003MAB.ASC290;1	129.5	297.3	180	1078	415121



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XA

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