DDS3 Wakefield and Dipole Signal Measurements in ASSET


- Power Spectra
- Phase and Amplitude Measurements
- Structure Straightness
- Wakefield Measurements
- Beam Centering Tests
Dipole Signal Centroid -vs- Frequency

Time (ns)

Frequency (GHz)
Sample Power Spectrum ($P_f$) as Step Beam Vertically ($Y_b$) Across Structure and Parameterize Results by

$$P_f(Y_b) = A_f^2 (Y_b - Y_f)^2 + B_f^2$$
rf_dat_25: X Beam Scan

Min Power (equiv offset in microns)

Frequency (GHz)
Before Adjustment

$Y = A + B \times \exp\left(-\frac{(X-D)^2}{2 \times C (D-E)^2}\right)$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td>125.4</td>
<td>+/- 2.762</td>
</tr>
<tr>
<td>$B$</td>
<td>264.0</td>
<td>+/- 22.09</td>
</tr>
<tr>
<td>$C$</td>
<td>541.2</td>
<td>+/- 37.08</td>
</tr>
<tr>
<td>$D$</td>
<td>1.0201E+04</td>
<td>+/- 96.84</td>
</tr>
<tr>
<td>$E$</td>
<td>0.5127</td>
<td>+/- 0.1104</td>
</tr>
</tbody>
</table>

RMS Err = 40.04

$\chi^2$/dof = 29/30

SIGMA WITH 40 MICRON WIRE SIZE SUBTRACTED = 541.1

After Adjustment

$Y = A + B \times \exp\left(-\frac{(X-D)^2}{2 \times C (D-E)^2}\right)$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td>391.8</td>
<td>+/- 35.08</td>
</tr>
<tr>
<td>$B$</td>
<td>316.8</td>
<td>+/- 23.07</td>
</tr>
<tr>
<td>$C$</td>
<td>929.0</td>
<td>+/- 71.74</td>
</tr>
<tr>
<td>$D$</td>
<td>-3.1845E-02</td>
<td>+/- 0.1456</td>
</tr>
</tbody>
</table>

RMS Err = 40.04

$\chi^2$/dof = 45/72

SIGMA WITH 40 MICRON WIRE SIZE SUBTRACTED = 316.6

STEP VARIABLE = ZERO

Time Data Was Taken: 9-DEC-1998 18:59:09

9-DEC-98 19:04:02
rf_dat_18: freq = 14.3 (GHz), Min Power = 84.9 (microns)

If \( \langle X \rangle = \alpha \frac{Z}{\sigma_z} \)

Then \( \text{min power} \sim \alpha / 5 \)

\( X - Z \) Correlation
rf_dat_57: freq = 15 (GHz), Min Power = 12.89 (microns)
2ND STRAIGHTEN WITH SHIM - 11 NOV 98 NOON

X Deviations
Y Deviations

MET
Inspection Department
- 060 -

Established 1962
Coupled & Uncoupled Synchronous Frequency vs Cell Number
w y _ 0 _ 3 :  W Y _ a n g a m p = 54 . 23 ± 0 . 1 8 V / p C / m / m m  a m p / e r r = 3 0 0 . 7
DDS3 (y-wake = o) (x-wake = x)

- Wake (V/pC/m/mm)
- Time (ns)

Graph showing the wake voltage over time for DDS3 with y-wake set to 0 and x-wake set to x.
wy_45_1: WY-ang amp = 4.04 +/- 0.19 V/pC/m/mm amp/err = 20.9
Beam Centering in DDS3

res_13: y offset from dyp

\( f = 15.1 \text{ GHz} \)

\[ y \text{ offset (mm)} \]

<table>
<thead>
<tr>
<th>sdr phase (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-100</td>
</tr>
<tr>
<td>-80</td>
</tr>
<tr>
<td>-60</td>
</tr>
<tr>
<td>-40</td>
</tr>
<tr>
<td>-20</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>60</td>
</tr>
</tbody>
</table>

Fits:
- \[ A \cdot \sin(2\pi f \tau) \]
- \[ A \cdot \sin(2\pi f \tau) + B \cdot \cos(2\pi f \tau) \]
res_16: y offset from dyp

$f = 15.1 \text{ GHz}$

offset (mm)

sdr phase (degrees)
res_16: y offset from dyp

\[ f = 22.7 \text{ GHz} \]
res_21: y offset from dyp

\[ f = 22.7 \, GHz \]
res_17: y offset from dyp

$f = 15.1 \text{ GHz}$
C-BAND

cb_res_8: y offset from dyp

f = 7.8 GHz

sdr phase (degrees)
ORBIT DIFFERENCE IN LIO2 DUE TO '30 ps' WAKE

ΔX or ΔY (μm)

ΔY

ΔX

Z (M)

100 105 110 115 120 125 130 135 140

150 140 135 130 125 120 115 110 105 100 50 0

-100 -110 -120 -130 -140 -150

140 141 142 143 144 145 146
Offset Wake

res_15: y offset from dy

$f = 15.1$ GHz

\[ \text{y offset (mm)} \]

\[ \text{sdr phase (degrees)} \]
res_15: x offset from dxp

\( f = 15.1 \text{ Hz} \)

Sine amp = 20 mm

Cosine amp = -57 mm
res_20: x offset from dxp

\[ f = 15.1 \text{ GHz} \]  
\[ \sin \text{ Amp} = -29 \mu \text{m} \]  
\[ \cos \text{ Amp} = -32 \mu \text{m} \]