AFEB and Delay Chips Testing, Test Stand Calibration

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Outline

- **AFEB Data Analysis**
- **AFEB Test Stand Monitoring**
- **Delay Chips Data Offline Analysis**
- **Delay Chips Online Selection**

AFEB Data Analysis

- **Current AFEB Data Offline Analysis**
  - ❑ **Main Selecting Criteria** :
    - ✓ **Threshold**
    - ✓ **Noise**
    - ✓ **Resolution and Slewing Time**

AFEB Main Selecting Criteria

❑ - **Threshold Selection Criteria** (V_{ctrl} = 150 mV)

- ✓ Average **Threshold** — < **40.0 fC**
- ✓ Max. Threshold **Deviation** from Average — < **5.0 fC**
- ✓ Average **Noise** — < **2.2 fC**
- ✓ **Max. Noise** — < **2.4 fC**

❑ - **Time Selection Criteria** (Q_{in} = 100 fC)

- ✓ Max. Time **Deviation** from Average — < **2.0 nS**
- ✓ Average Time **Resolution** — < **0.8 nS**
- ✓ Average **Slewing** Time (Q_{in} = 50 – 550 fC) — < **3.0 nS**
- ✓ **Max. Slewing** Time (Q_{in} = 50 – 550 fC) — < **3.5 nS**

AFEB Test Stand Monitoring

- ## AFEB Test Stand Stability Measurements

  - ❑ **Maximal Deviation Analysis for Monitoring Boards**

    - ✓ Threshold   < 1.0 fC
    - ✓ Noise   < 0.1 fC
    - ✓ Propagation Time   < 1.0 nS
    - ✓ Resolution Time   < 0.1 nS
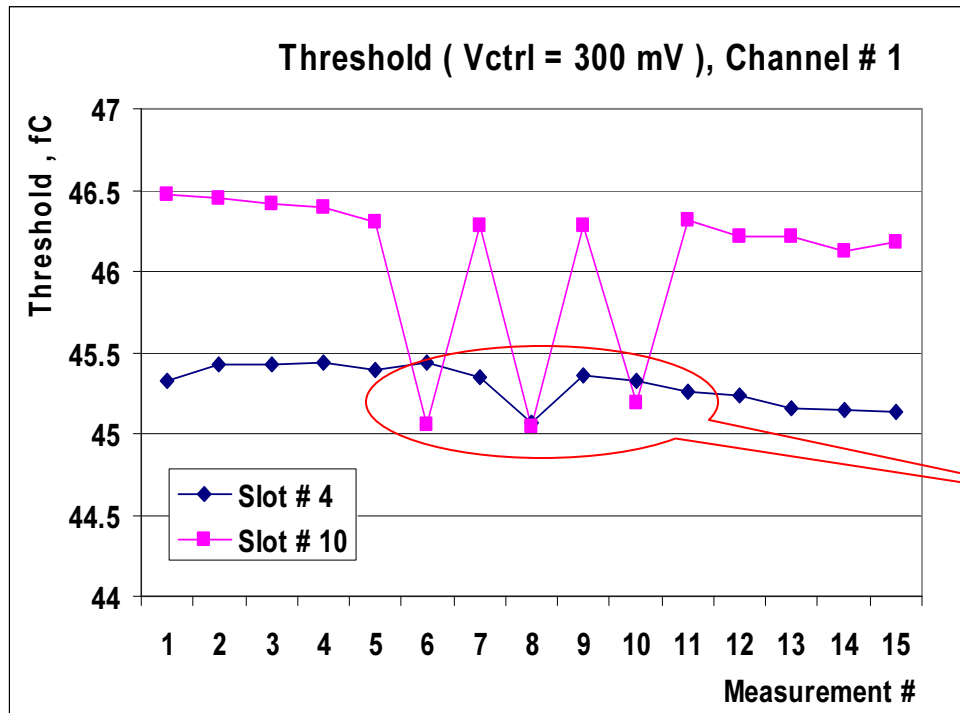   - ✓ Slewing Time   < 0.5 nS

  - ❑ **Test Stand Improvement**

    - − Threshold Measurements
    - − Fixed Minor Ground Problem

Stand Ground Problem

– **Threshold Measurements with Different Ground Conditions**

Threshold (Vctrl = 300 mV), Channel # 1

Y-axis: **Threshold , fC** (44, 44.5, 45, 45.5, 46, 46.5, 47)

X-axis: **Measurement #** (1 through 15)

Legend:
- Slot # 4
- Slot # 10

Objectionable
Ground Connection

Delay Chips Data Analysis

- **Delay Chips Data Offline Analysis**
  - ❑ Main **Selecting Criteria** and Delay Groups
    - ✓ **Delay** (code = 15) and **Slope**
    - ✓ "**Max–Min**" **Delay** and **Delay Deviation**
    - ✓ **Delay Control** for Different Groups

- **Delay Chips Online Selection**
  - ❑ **Selecting Criteria**
    - – As for Offline Analysis
  - ❑ **Online Analysis**
    - – Program Working But not Debug

Delay Chip Selecting

❑ - Delay Chip Selection Criteria

- ✓ **Max. Different** Between Chip Channel Delays   **< 3.0 nS**
- ✓ Max. **Delay Deviation** from Interpolation   **< 2.0 nS**
- ✓ Max. **Delay Deviation** from Average (code = 15)   **< 1.5 nS**
- ✓ Max. **Slope Deviation** from Average   **< 0.15 nS/code**

❑ - Delay Chip Groups (for Average Delay, code = 15)
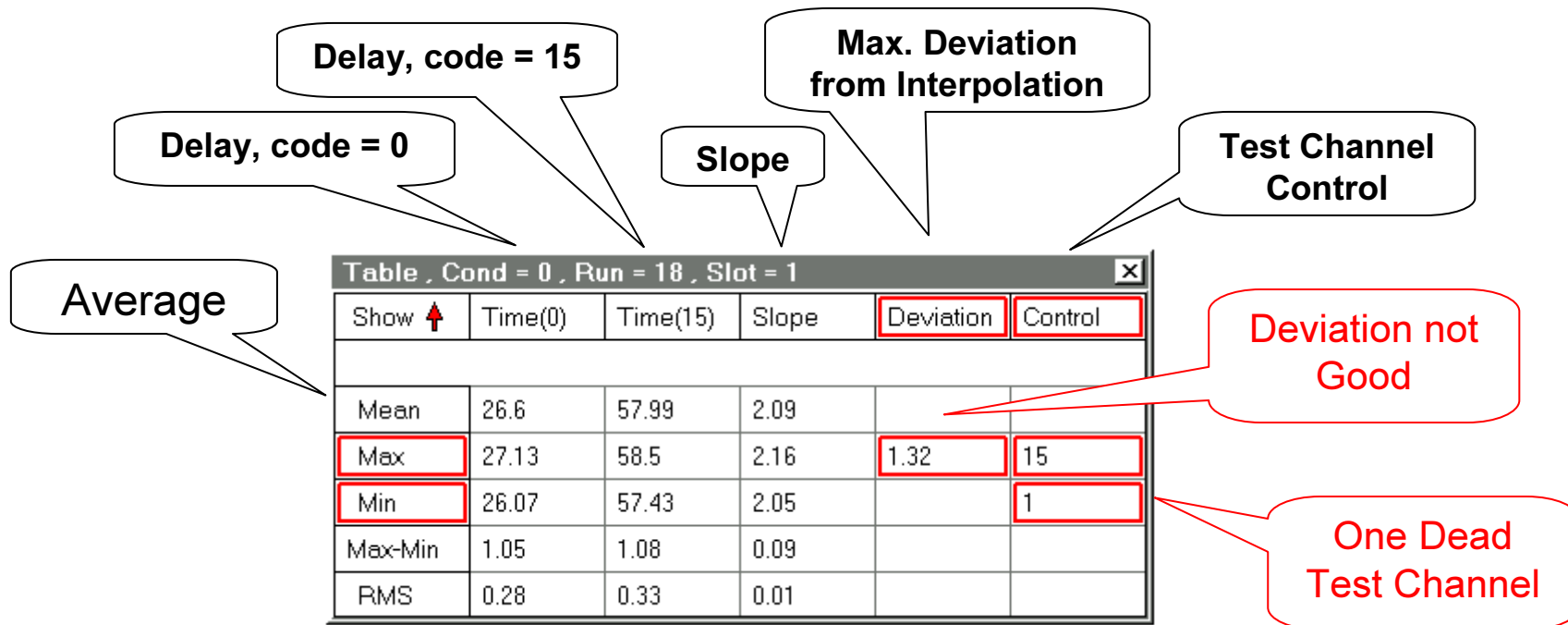
Group 1 :   0.0 – 44.0 nS*   Group 4 : 48.0 – 50.0 nS   Group 7 : 54.0 – 56.0 nS

Group 2 : 44.0 – 46.0 nS*   Group 5 : 50.0 – 52.0 nS   Group 8 : 56.0 – 58.0 nS

Group 3 : 46.0 – 48.0 nS   Group 6 : 52.0 – 54.0 nS   Group 9 : 58.0 – 100 nS*

*) Don't Used

Delay Chips Online Testing

❑Delay Chip Measurement Example

Delay, code = 15

Max. Deviation from Interpolation

Delay, code = 0

Slope

Test Channel Control

Average

Table , Cond = 0 , Run = 18 , Slot = 1					
Show ↑	Time(0)	Time(15)	Slope	Deviation	Control
Mean	26.6	57.99	2.09		
Max	27.13	58.5	2.16	1.32	15
Min	26.07	57.43	2.05		1
Max-Min	1.05	1.08	0.09		
RMS	0.28	0.33	0.01		

Deviation not Good

One Dead Test Channel

*) All Measured Characteristics are in nS