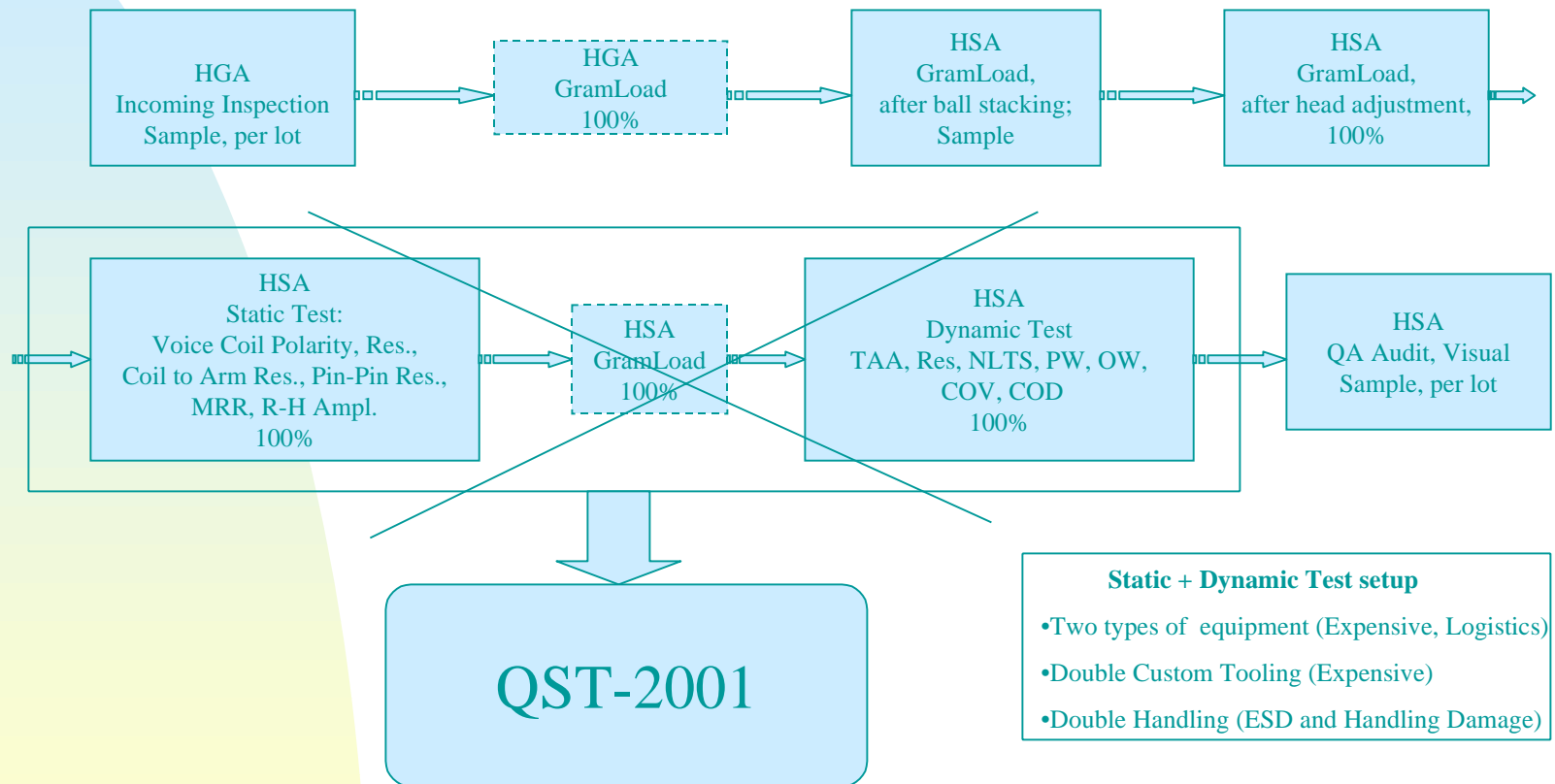




QST-2001

*A Cost Effective Solution for
Production Testing of HSA*

Simplified HSA Process FlowChart



Topics

- ◆ Test Capabilities
- ◆ Tests unavailable with DET
- ◆ Additional Functions
- ◆ Cost Considerations
- ◆ Correlation to the Dynamic Electrical Tests (DET)
- ◆ Testing HSA: Advantages over DET
- ◆ Installed Base

Test Capabilities (1)

- ◆ Industry accepted production DET tests for HSA:
 - ◆ Parametric tests: (amplitude, asymmetry, PW, OW, NLTS, SNR)
 - ◆ Stability tests (amplitude COV)
 - ◆ Special Tests: (BLPN, Popcorn)
- ◆ **Are they available from QST -2001?**
 - ◆ Parametric tests: Yes (amplitude, asymmetry)
 - ◆ Stability tests: Yes (amplitude COV + more)
 - ◆ Special Tests: Yes (BLPN, Popcorn)

Test Capabilities (2)

- ◆ What is not available?
 - ✦ Some Parametric tests: (PW,OW, NLTS, SNR)
- ◆ Is that significant for production test of HSA? *Questionable*
 - ✦ *The major failure mode of HGA in the Stack is the ESD related (providing that prior to stack build 100% of HGA passed a full-scale DET evaluation and Visual Inspection)*
 - ✦ *A study performed by D. Guarisco (Maxtor Corp., published by IDEMA, April 21, 99) demonstrates that the Amplitude is most sensitive to ESD damage of GMR head. Results are confirmed for three different head vendors.*

Conclusion (1)

- *QST 2001 is a **Candidate** to replace DET in HSA Production Test.*

Other tests available with QST-2001 that can add Value to HSA production test

- ◆ **Hysteresis.**
 - ✦ Base line shift, Amplitude instability
- ◆ **Sensitively Test**
 - ✦ Pin layer reversal
- ◆ **Barkhausen jump**
 - ✦ Amplitude instability
- ◆ **Bias angle/Bias point**
 - ✦ Magnetic state of the pinned layer
- ◆ **$\Delta R/R$**
 - ✦ Head Efficiency, ESD damage

- Are these tests optional? No
They are the part of the basic machine and come for free.
- Does DET provides the same options?
No

Conclusion (2)

- *QST 2001 is a **Strong Candidate** to replace DET in HSA Production Test.*

Additional Functions (not provided by DET testers)

- **Static test capability:**
 - ◆ *Reader (Head Select, Short/Open, Polarity)*
 - ◆ *Writer (Short/Open)*
 - ◆ *Preamp Chip (Modes Functionality, Fault Line, Power Margins, Power Consumption)*
 - ◆ *Voice Coil (Open/Short, Coil Resistance, Winding Polarity, Inductance)*
 - ◆ *Pin-to-Pin, Pin-to-Ground Flex connections*
 - ◆ *Flex passive component measurements (resistors and capacitors)*

What does better fit your budget?

(Cost Effective Solution)

DET?

- RWA 1632 does not meet new high frequency requirements. A new generation of expensive (\$100K+)DET testers is required.
- High Density expensive media is required.
- Stand alone Static Testers to check Reader, Writer, Preamp Chip, Voice Coil, e.t.c. prior to DET is required.
- Two different sets of expensive custom tooling for each new program are required (1 for DET and 1 for Static Tester). It doubles the tooling expenses which normally accounts for up to 10% of the tester cost.

What does better fit your budget? (2)

(Cost Effective Solution)

QST- 2001!

- Independent of the Frequency. DC type operations for typical production tests.
- Two independent channels double the test speed.
- Static Tester functions are included.
- No media is required.
- No additional custom tooling is required
- Additional available tests may be accountable for higher yield
- No comb or head protector removal
- Low price

Conclusion (3)

- *QST 2001 is a **Very Strong Candidate** to replace **DET and Static Testers** in HSA Production Test.*

Does the correlation to DET exist between parameters measured on both testers?

- *The correlation has been demonstrated at HGA and HSA levels for the amplitude based tests*
- *An **Amplitude** correlation between QST- 2001 and Guzik tester is achieved with $R^2 = 0.81$ during the HGA level evaluation (12 heads).*
- *Even better **Amplitude** correlation ($R^2 = 0.93$) is demonstrated in the different study on HSA level*

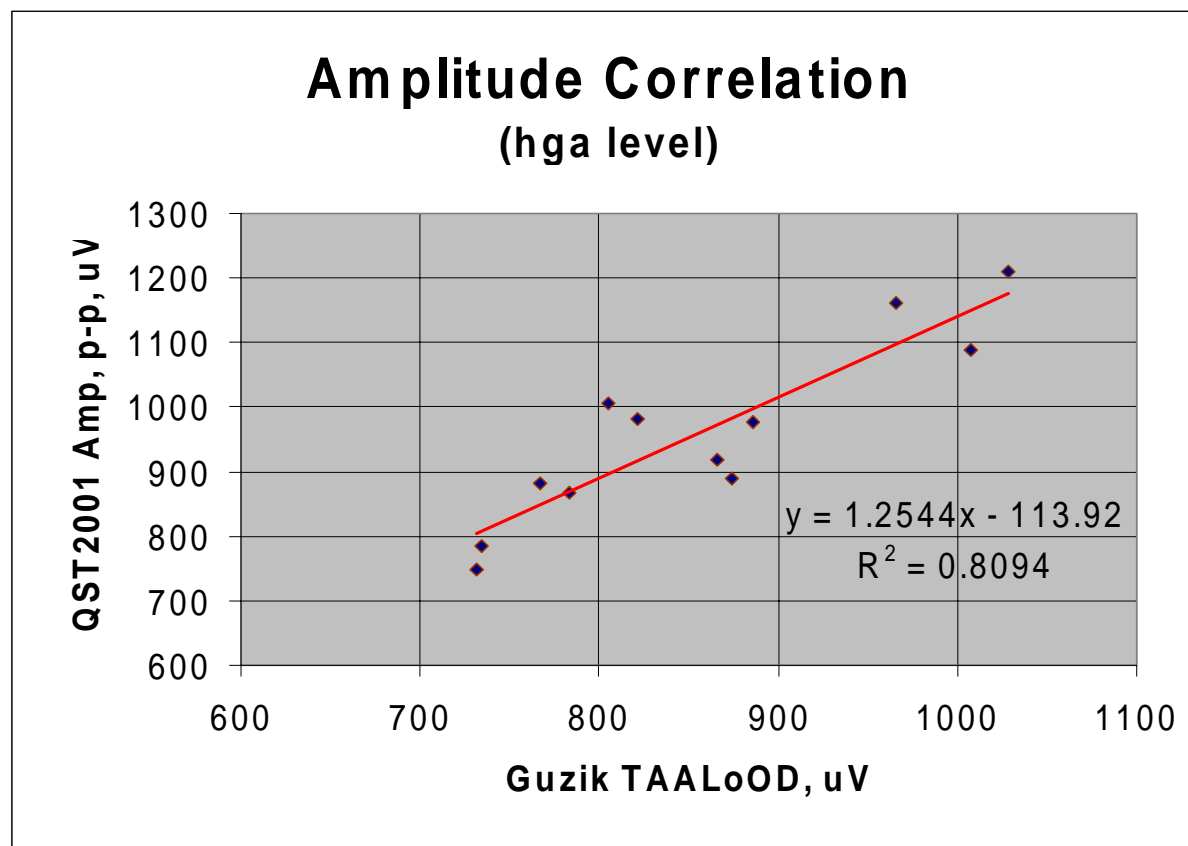
Test conditions

■ QST-2001

- ◆ Sweep: ± 100 Oe
- ◆ Bias current: 10 mA
- ◆ Amplitude is measured at ± 100 Oe
- ◆ Average : 2 times
- ◆ No of points: 1200
- ◆ No of Cycles: 10

■ Guzik 1632 + 1701

- ◆ Bias Current: 10 mA
- ◆ -----
- ◆ -----



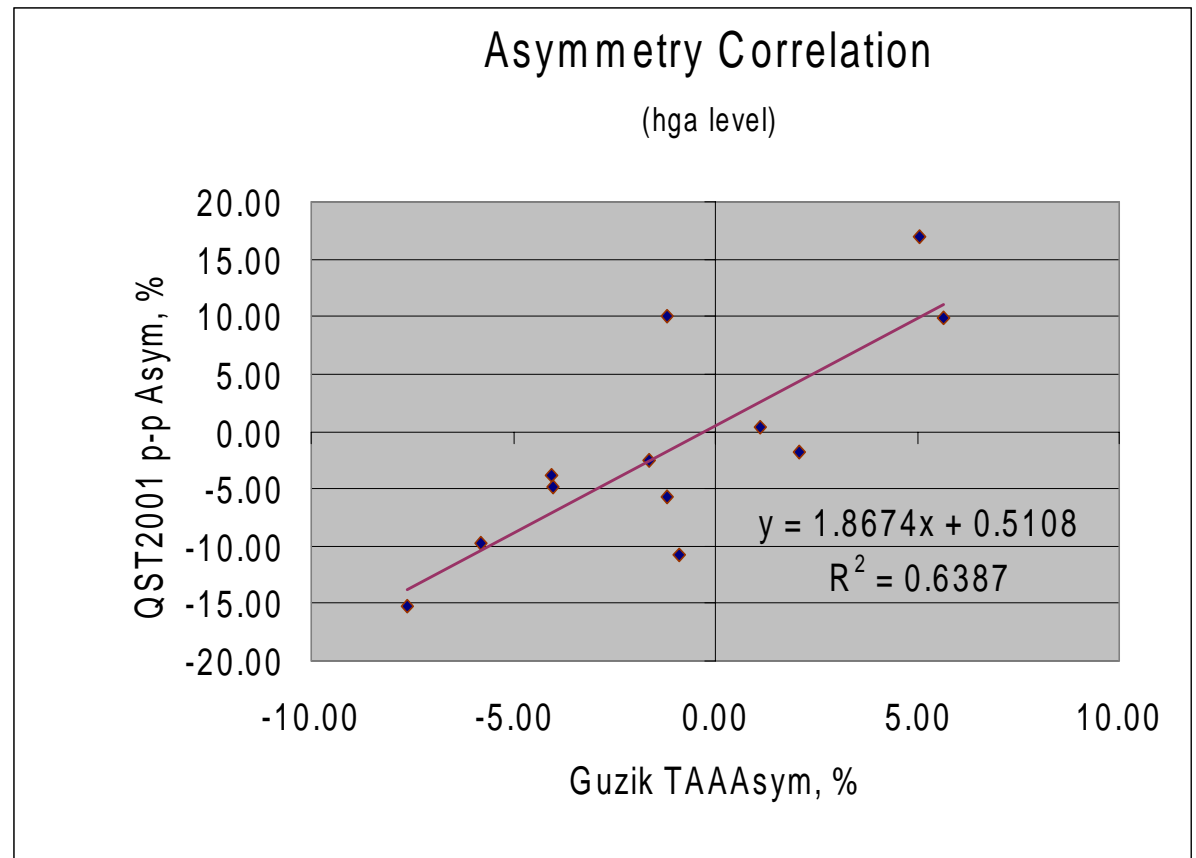
Test conditions

■ QST-2001

- ◆ Sweep: ± 100 Oe
- ◆ Measured at ± 100 Oe
- ◆ Bias current: 10 mA
- ◆ Average : 2 times
- ◆ No of points: 1200
- ◆ No of Cycles: 10

■ Guzik 1632 + 1701

- ◆ Bias Current: 10 mA
- ◆ -----
- ◆ -----



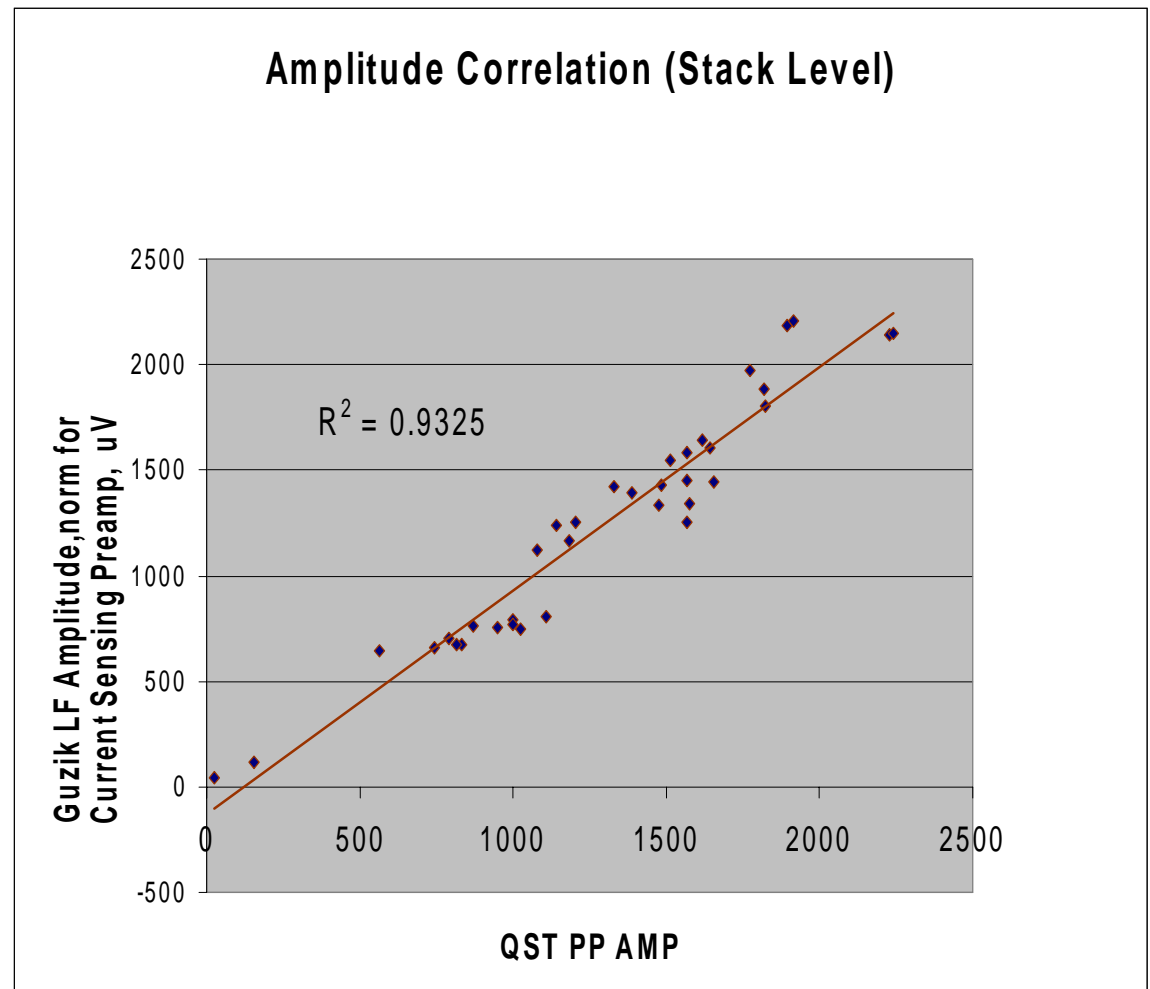
Test conditions

■ QST-2001

- ◆ Sweep: ± 275 Oe
- ◆ Measured at ± 250 Oe
- ◆ Bias Current: 5 mA
- ◆ Average :
- ◆ No of points:
- ◆ No of Cycles:

■ Guzik 1001 + 1701

- ◆ Frequency: 5 MHz
- ◆ Filter: 60 MHz
- ◆ Bias Current: 5 mA
- ◆ RPM: 5400



QST Testing of HSA: Advantages over DET

- ◆ High Sensitivity to ESD damage of GMR head
- ◆ Reduced possibility of handling damages
- ◆ Test results are not media dependent
- ◆ Static Test included
- ◆ No additional custom tooling required
- ◆ Short test time
- ◆ High throughput (up to 240 UPH)
- ◆ Low Cost



Integral Solutions Int'l

Installed Base.



50 ISI Quasi - Static testers are used in the USA and 8 other countries worldwide. Among our customers:
Quantum Corporation, IBM, Western Digital Corporation, Samsung,
Yamaha, Sony, Maxtor, Read-Rite, SAE, Alps, Tandon, Hitachi.

Conclusion

QST 2001 is a Cost effective Solution for Testing HSA In Production.