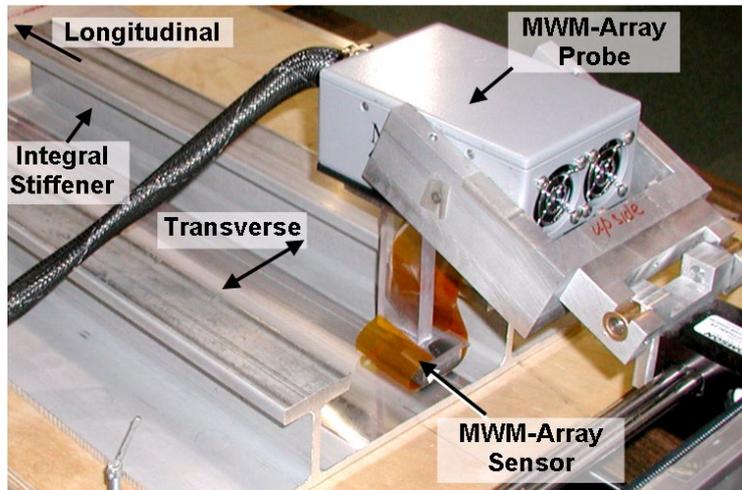
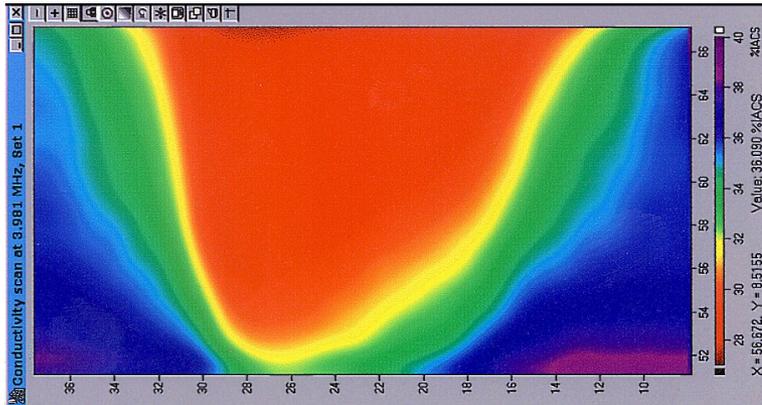


ASM 7th International Conference on Trends in Welding Research  
Callaway Gardens Resort, Pine Mountain GA; May 16-20, 2005  
**POSTER SESSION**



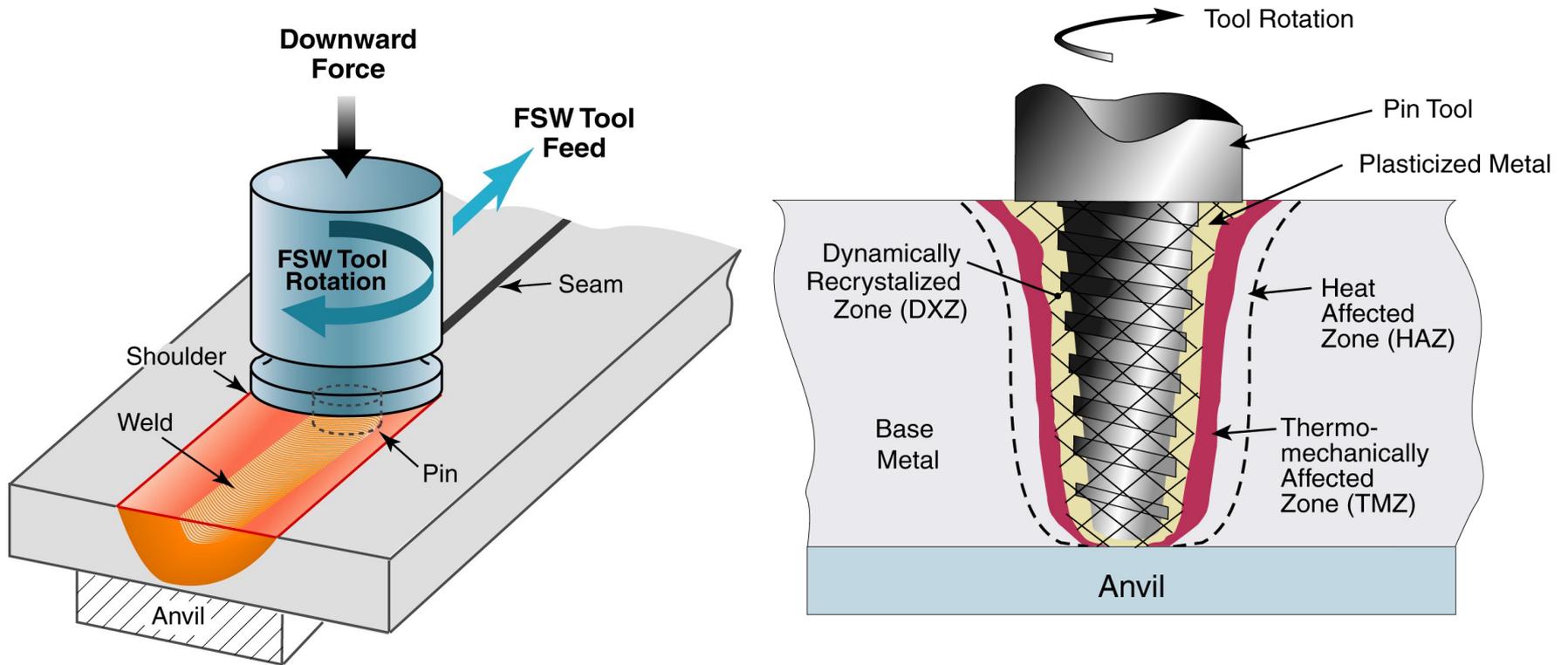
# MWM<sup>®</sup>-Array Inspection for Quality Control of Friction Stir Welded Extrusion

David Grundy, Vladimir Zilberstein,  
and Neil Goldfine

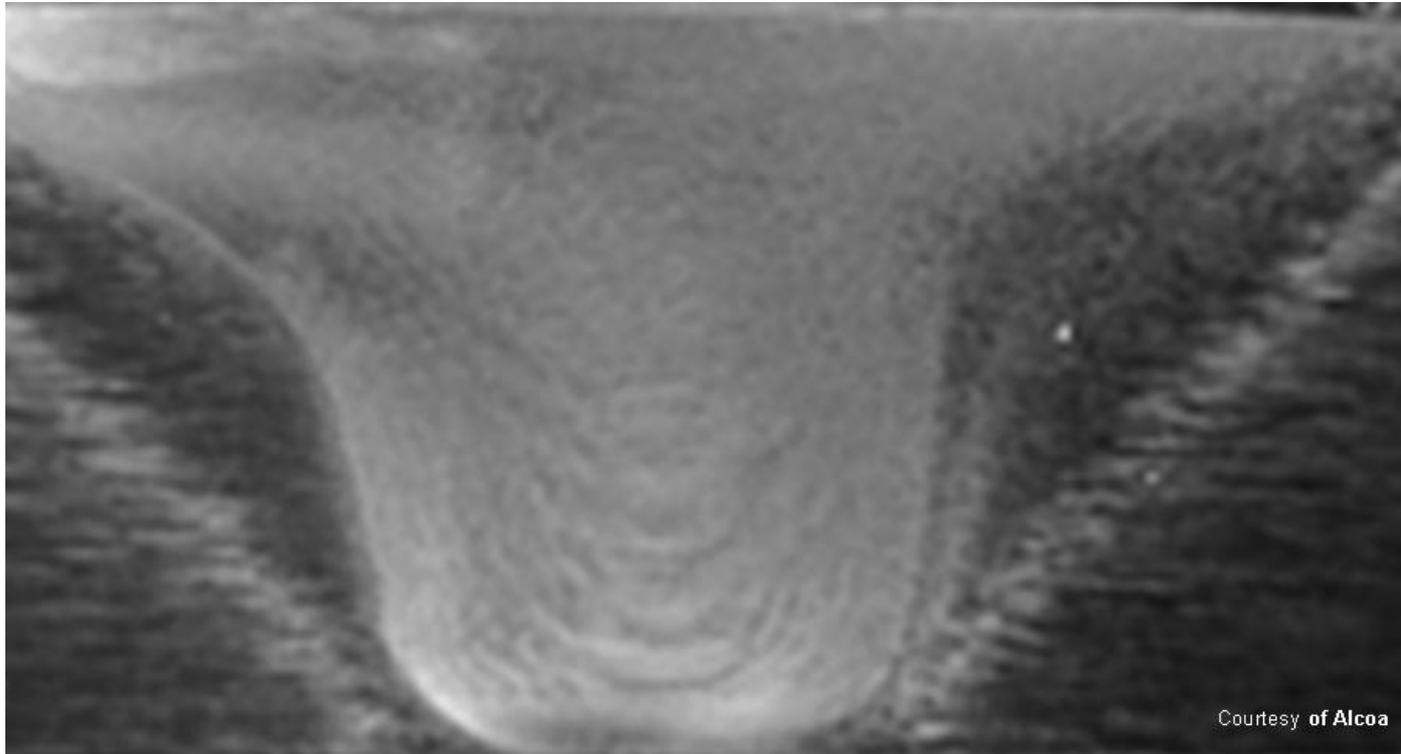
JENTEK Sensors, Inc., Waltham, MA, USA  
Phone: (781) 642-9666

Jerrold Green and Israel Stol  
Alcoa Technical Center, Pittsburgh, PA, USA

# Schematics of FSW Process

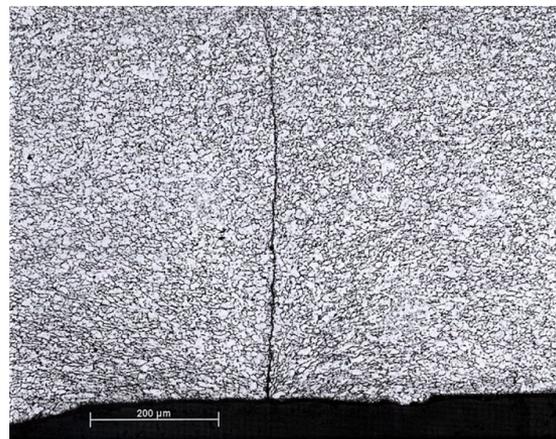
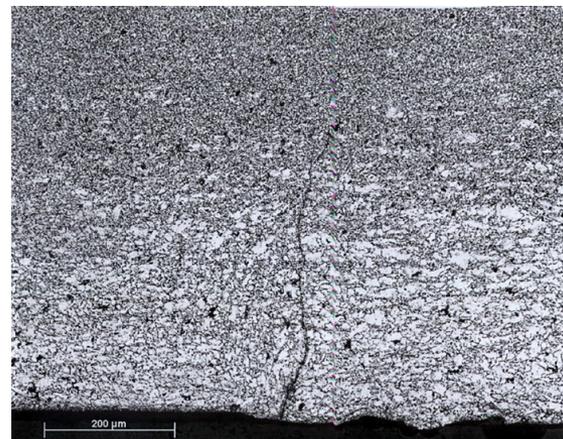
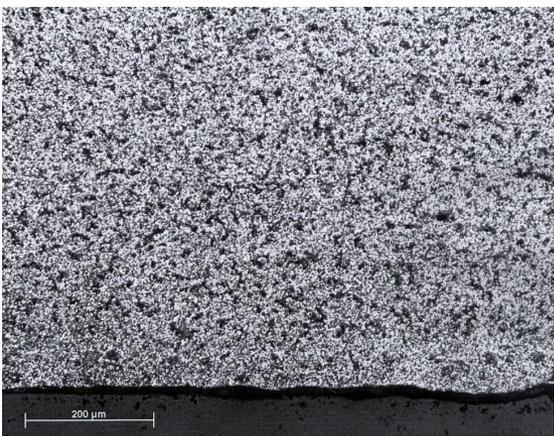
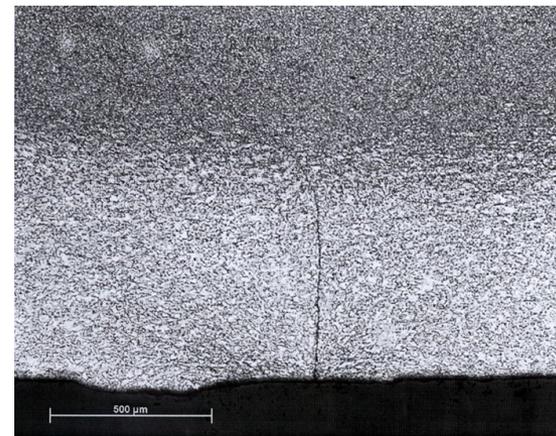
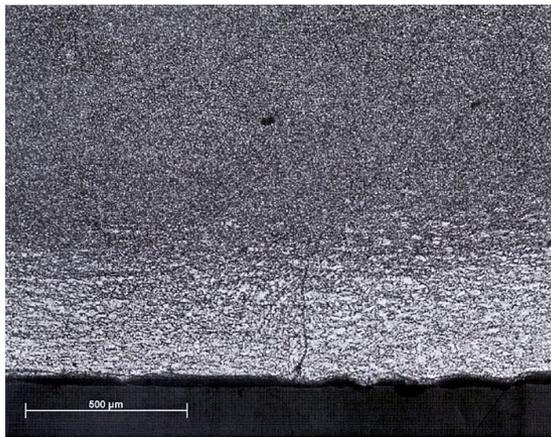
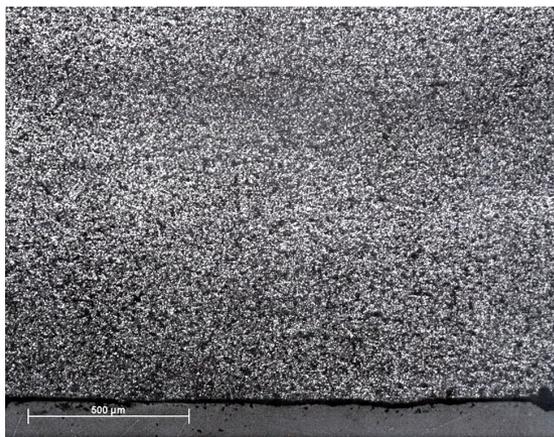


# Cross Sectional Macrograph of a Full-Penetration FSW



Courtesy of Alcoa

# Photomicrographs of etched cross-sections of butt FSWs near the backside

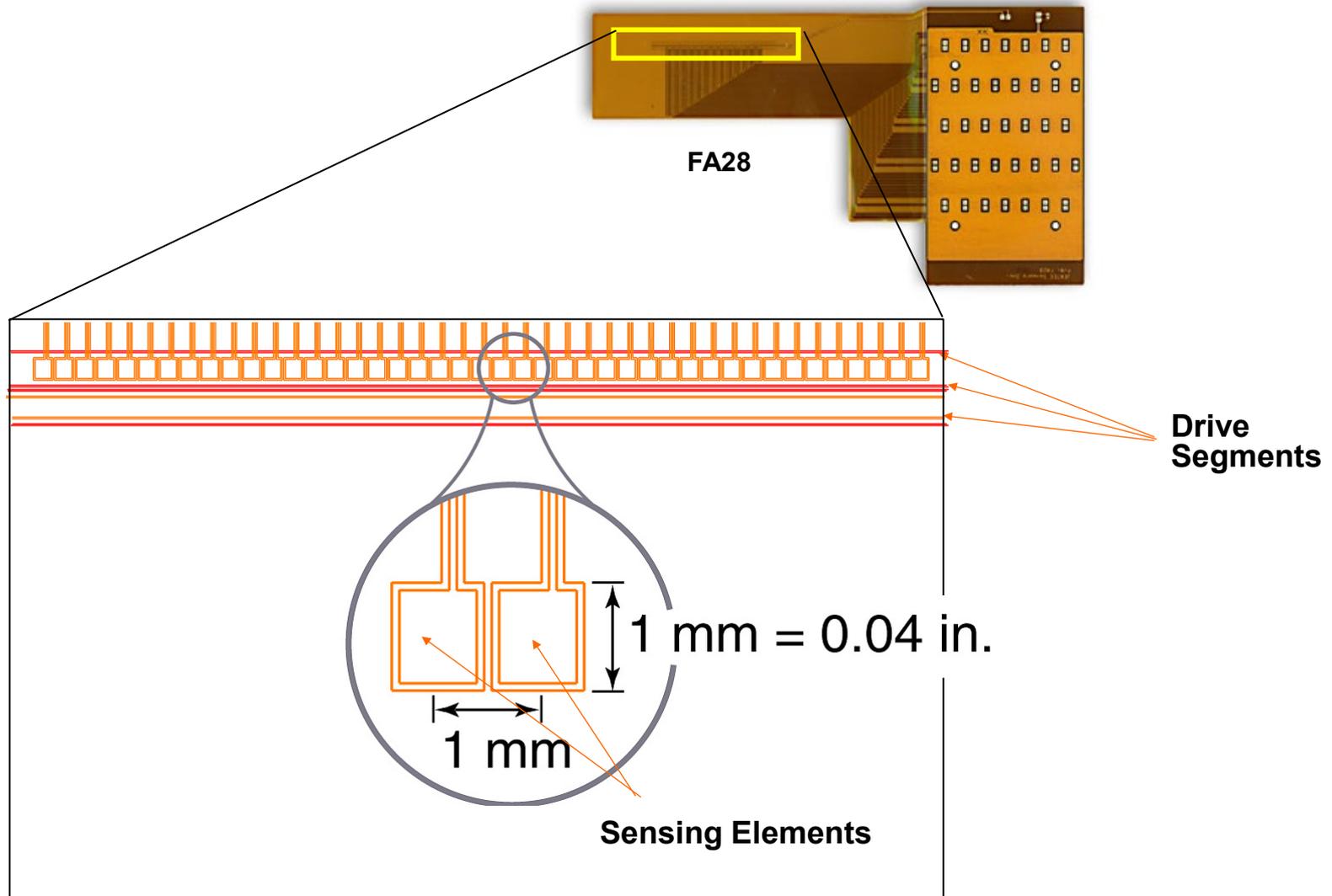


**Without discrepant conditions**

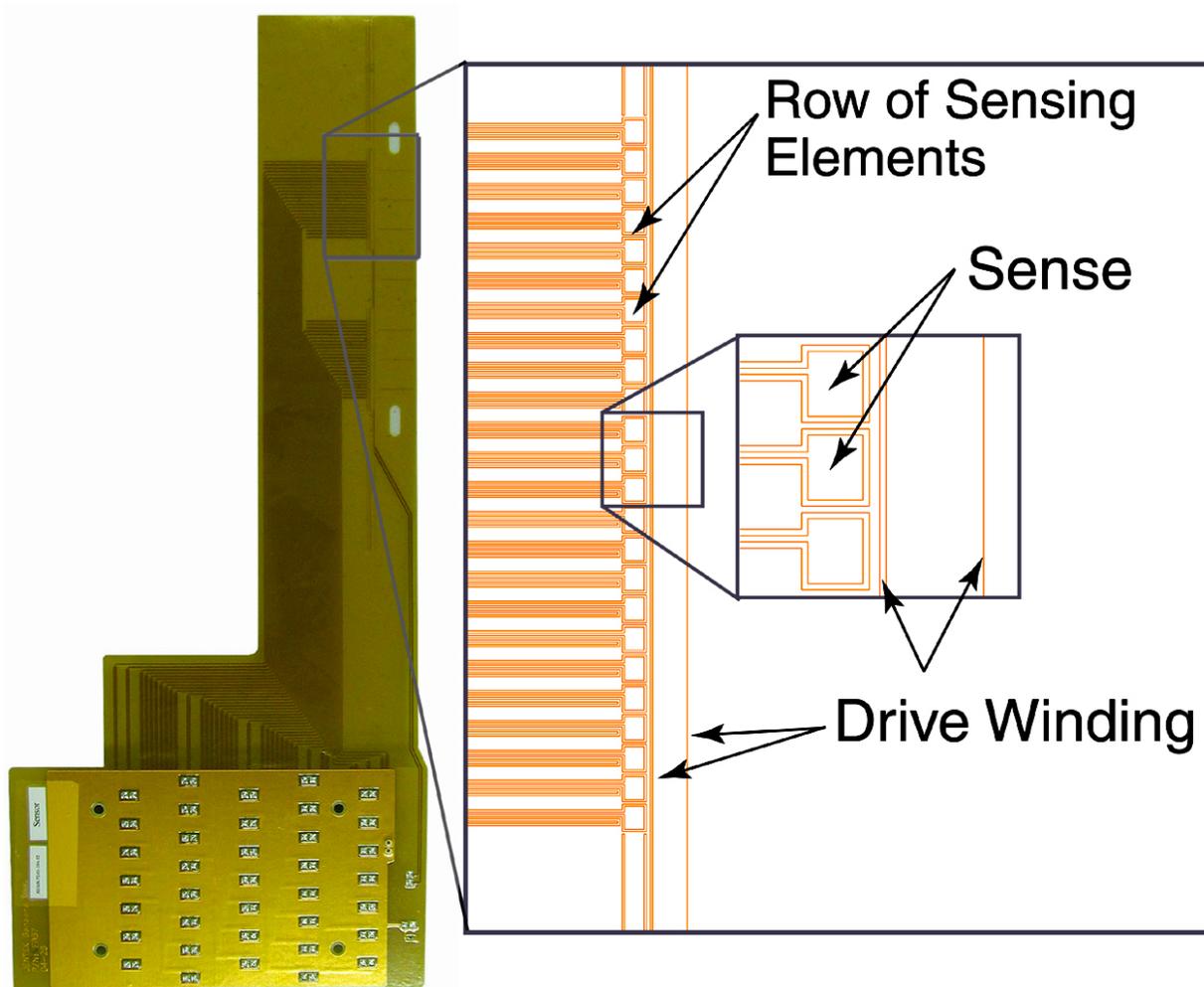
**Kissing Bond**

**LOP**

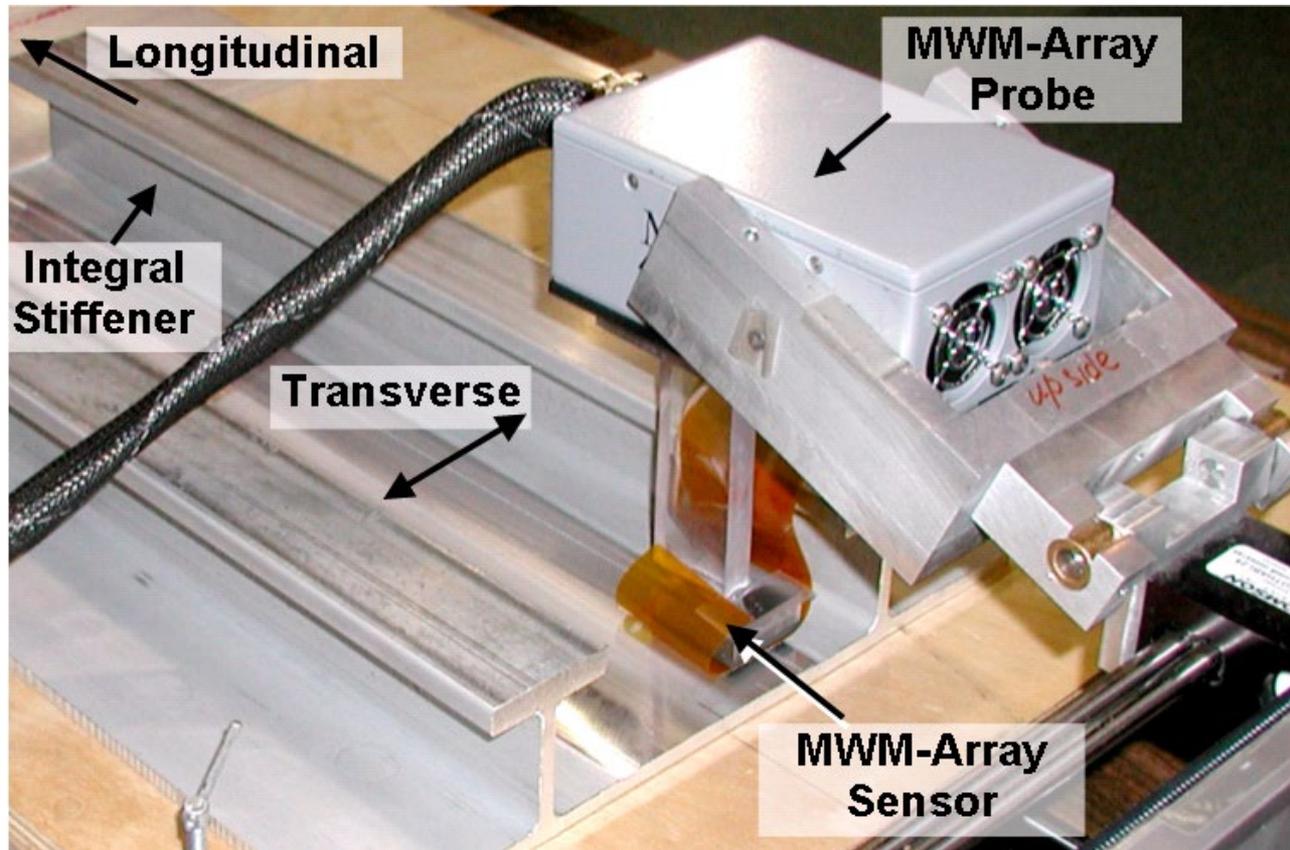
# MWM-Array for Shallow Cracks – FA28



# MWM-Array Sensor FA57

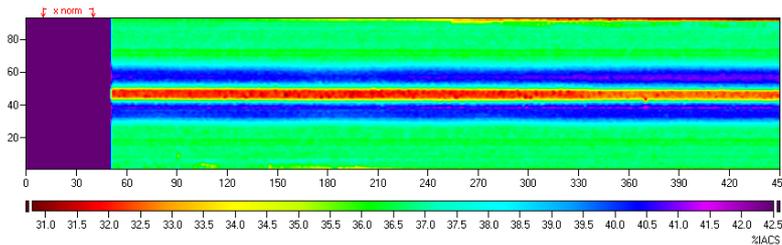


# Scanning Set-up for FSW Study

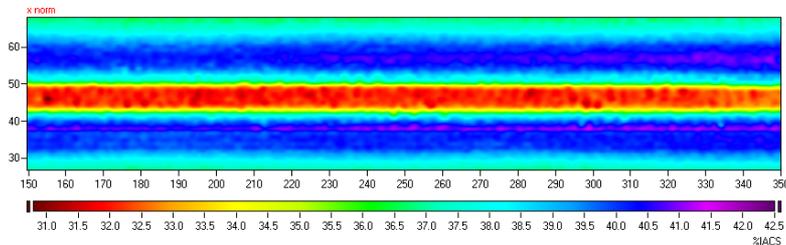


# Friction Stir Welding (FSW)

## Good, Full Penetration

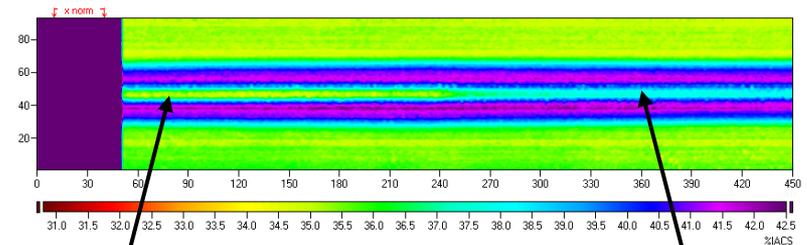


Full Scan



Close-up View

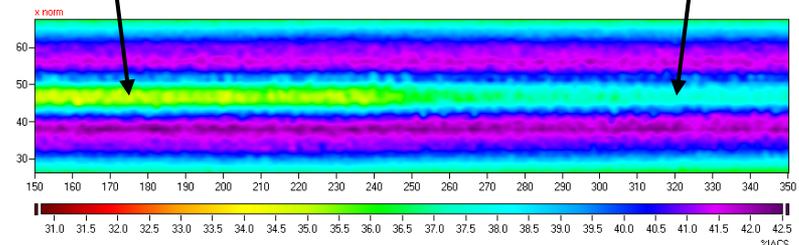
## Kissing Bond and Lack of Penetration



Full Scan

Kissing bond

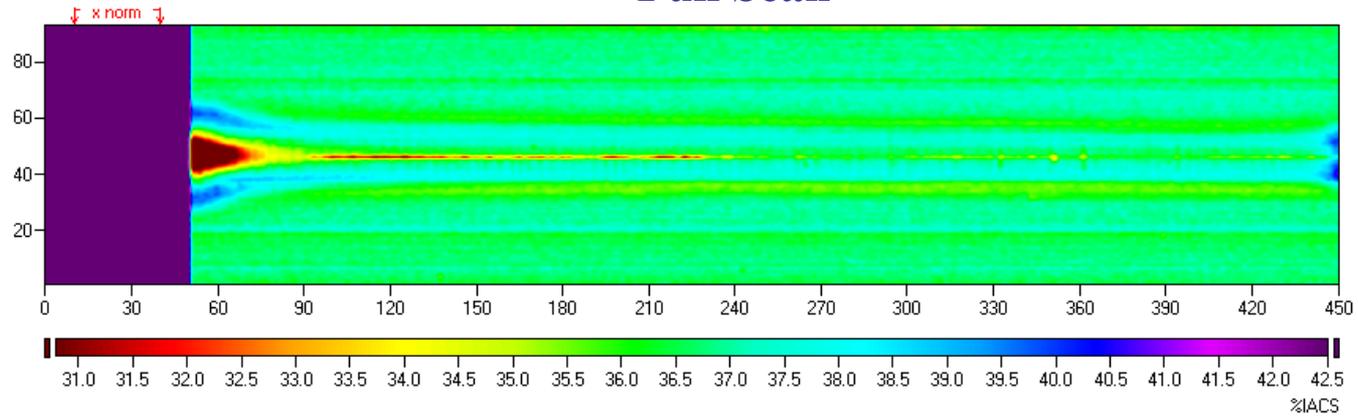
Lack of penetration



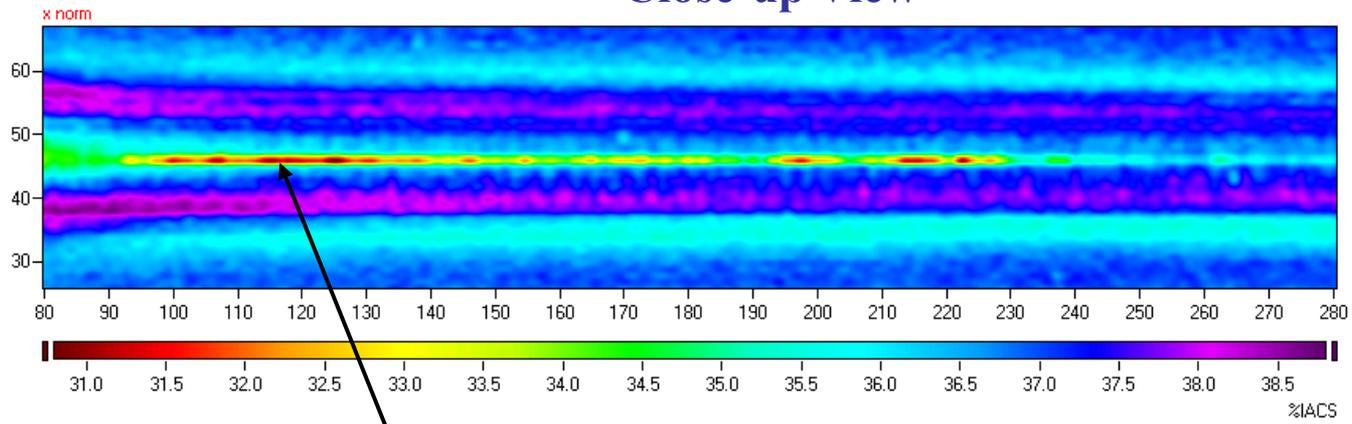
Close-up View

# MWM-Array Longitudinal Scan

## Full Scan

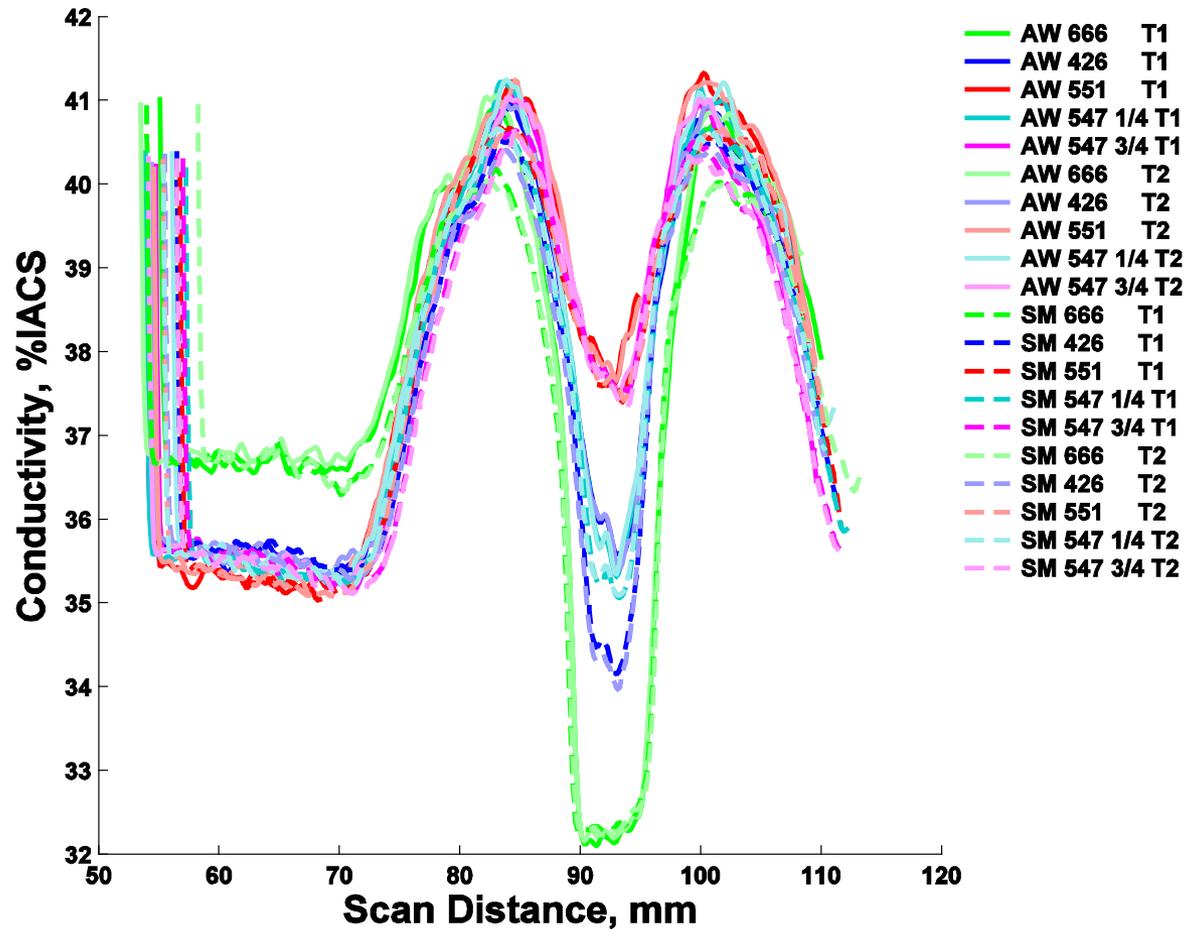


## Close-up View

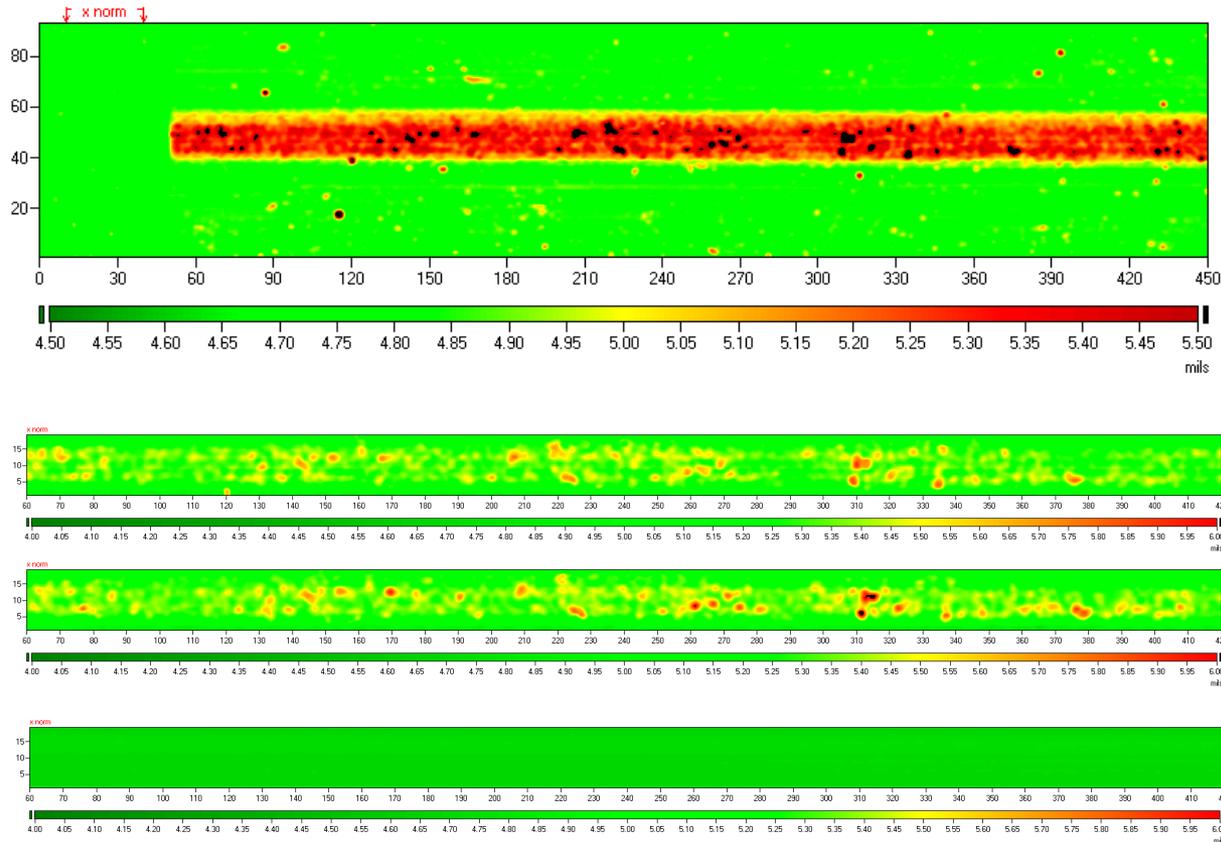


**Intermittent Planar  
Discontinuities**

# Plots of conductivity acquired during transverse scans of panels in the as-welded (solid lines) and skim-machined (dashed lines) surface conditions



# MWM-Array measured lift-off acquired during longitudinal scanning of two different FSW panels



# Image of electrical conductivity revealing the nugget, TMZ, HAZ and base metal

