

Industrial Partners in the Americas and Cavity Plans for FY09

Mark Champion

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Americas Region Cavity Vendor Overview

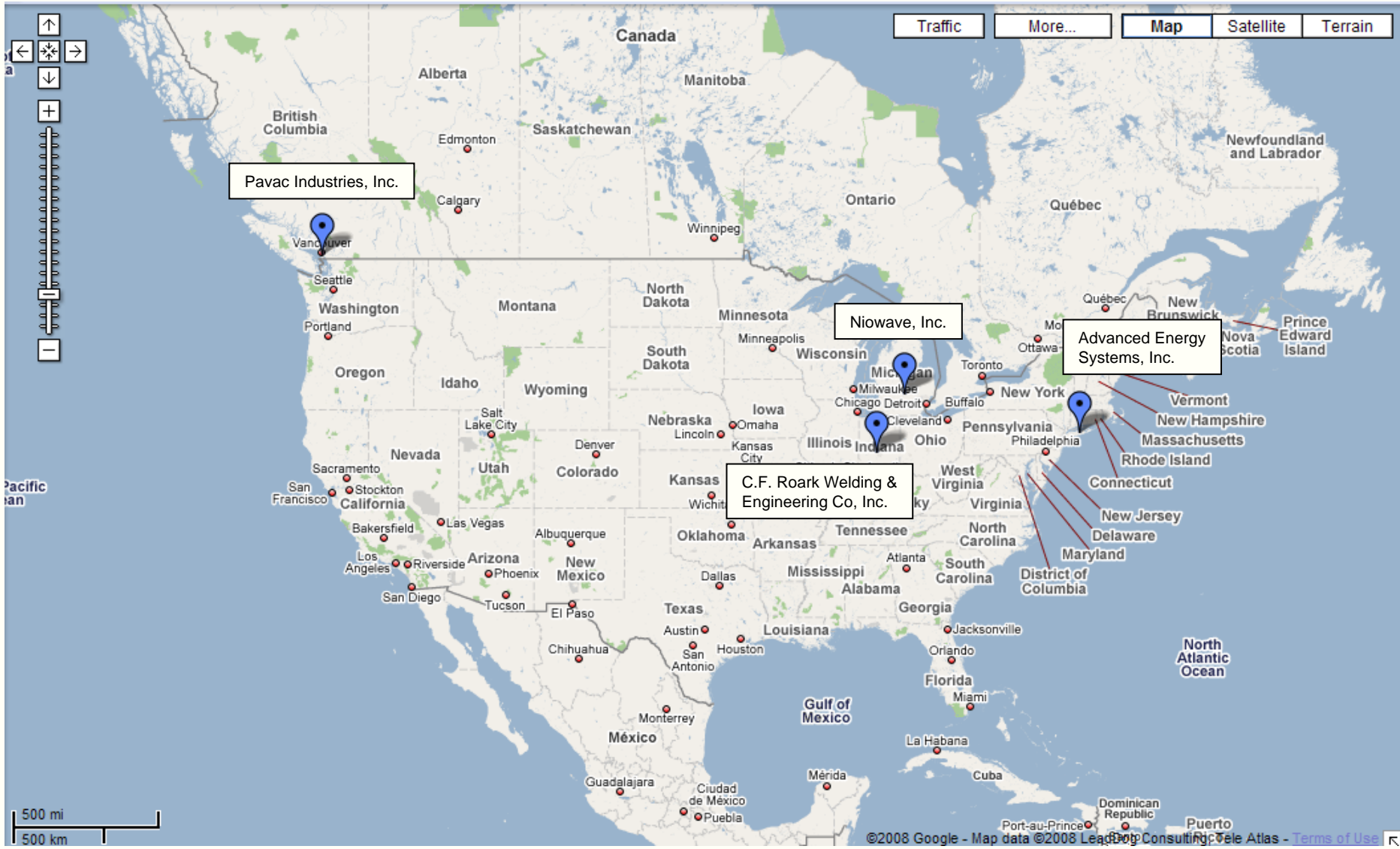


- **Advanced Energy Systems (AES), Inc.**
Medford, New York
<http://www.aesys.net/>
- **Niowave, Inc.**
Lansing, Michigan
<http://www.niowaveinc.com/>
- **C.F. Roark Welding & Engineering Co, Inc.**
Brownsburg, Indiana
<http://www.roarkwelding.com/>
- **Pavac Industries, Inc.**
Richmond, British Columbia
<http://www.pavac.com>

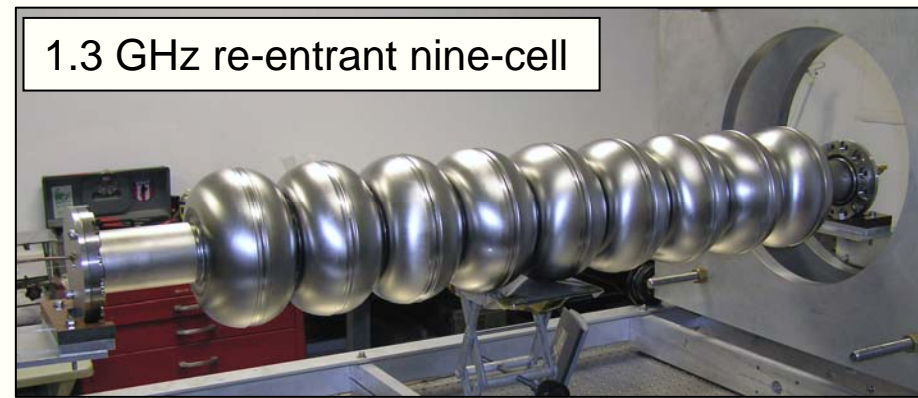
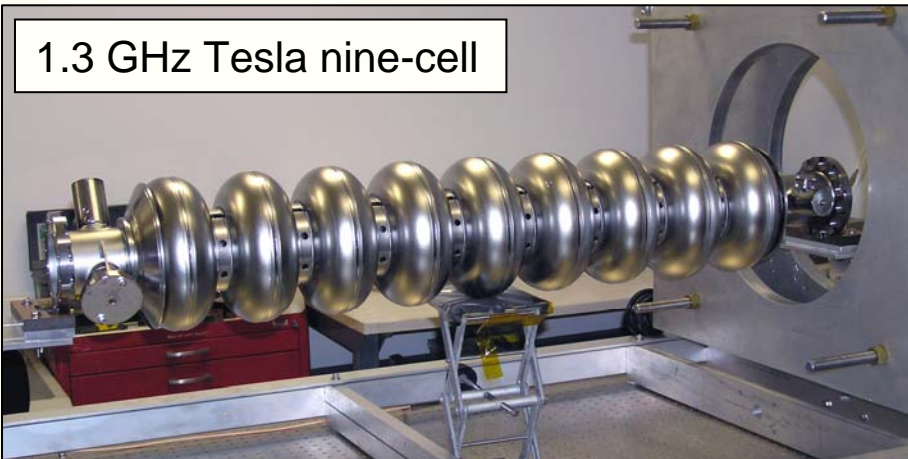
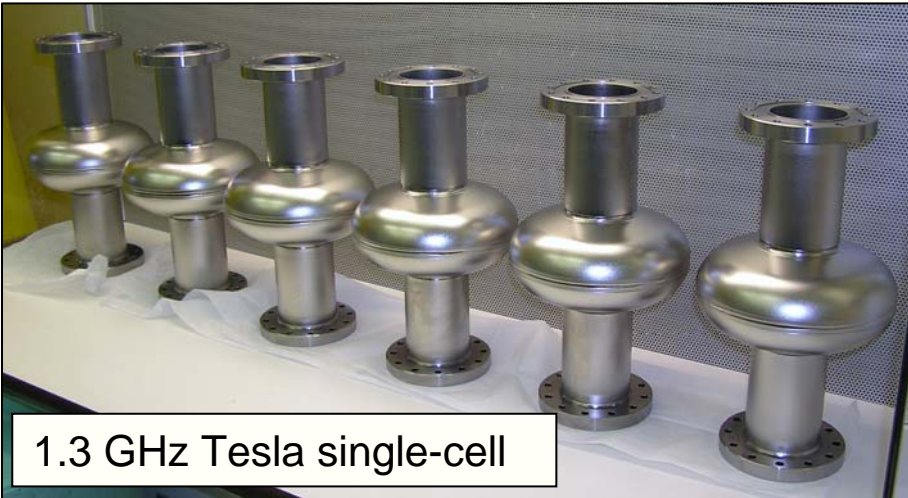
Americas Region Cavity Vendor Locations



Fermilab



AES has complete production capability on-site



Niowave & Roark collaborate on 1.3 GHz cavities

Roark is working independently on low-beta structures



Niowave-Roark Tesla
single-cell cavities

Delivered June 2008

Roark 325 MHz $\beta=0.22$
single-spoke cavity

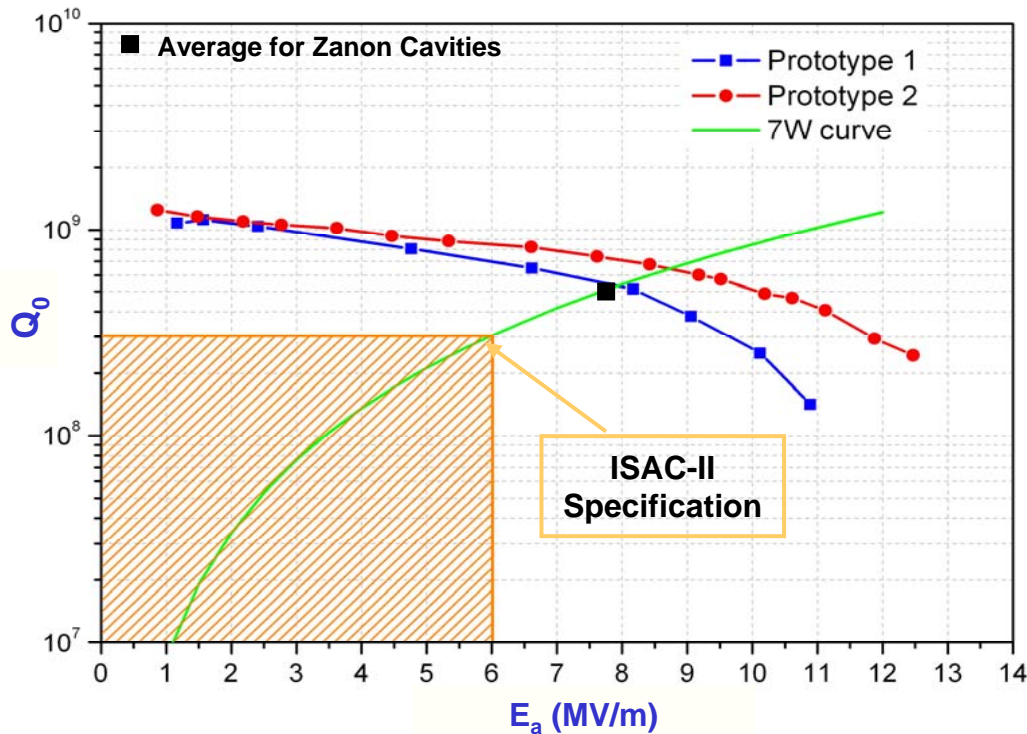
Delivered Summer 2008



Pavac is producing 20 coaxial resonators in collaboration with Triumf for the ISAC-II Phase-II extension

- Two prototypes manufactured and tested
- Both prototypes perform significantly above ISAC-II specifications; average values of $E_a=8.2\text{MV/m}$, $E_p=40\text{MV/m}$ cw (specification 6MV/m)
- Pavac is preparing to produce Tesla 1.3 GHz cavities in collaboration with Triumf and Fermilab

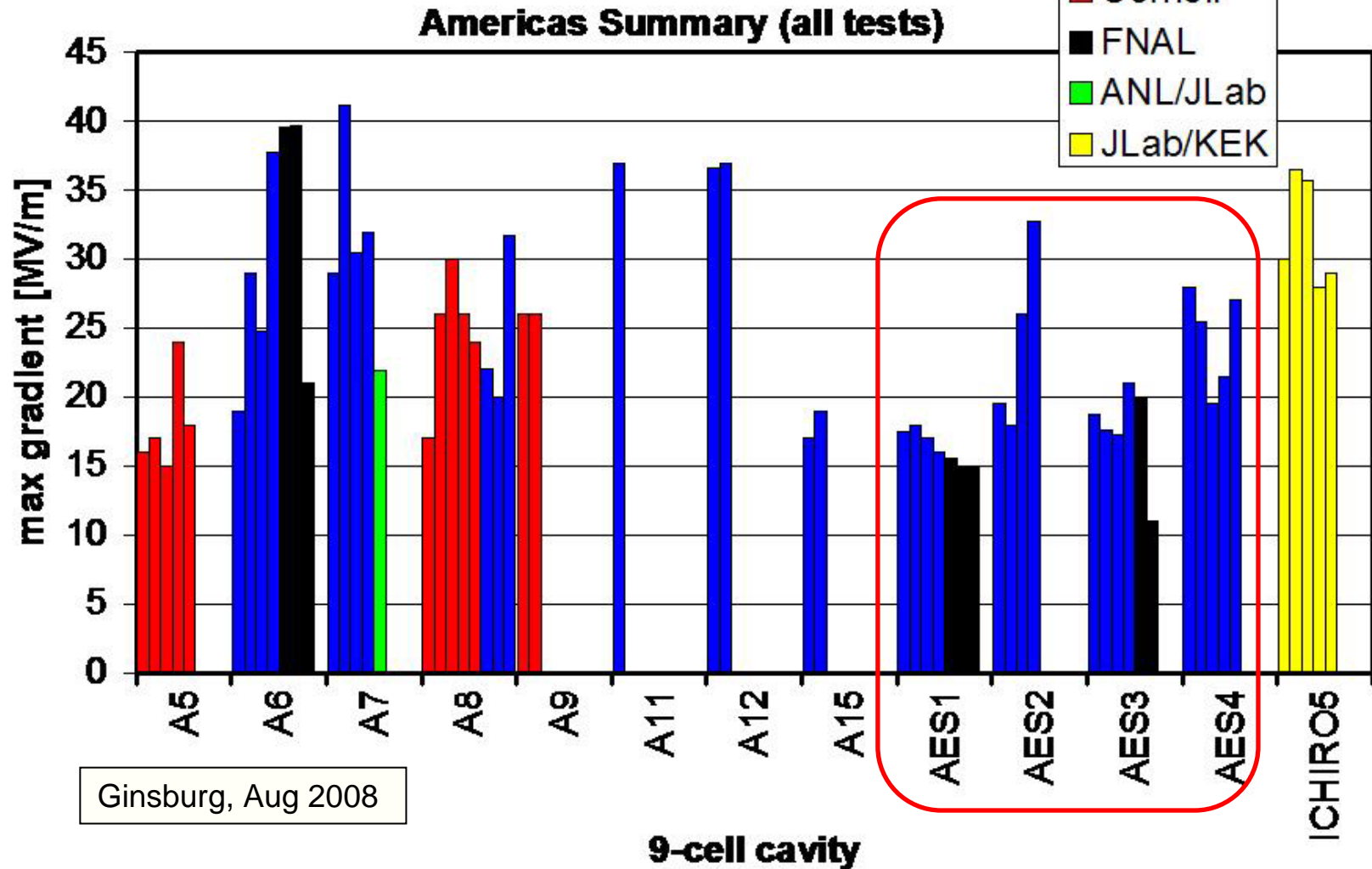
141 MHz prototype's Q curves



- **AES**
 - 4 nine-cell Tesla cavities (FNAL)
 - 6 single-cell Tesla cavities (FNAL)
 - 1 nine-cell low-loss cavity (Cornell)
 - and others
- **Niowave-Roark**
 - 6 single-cell Tesla cavities (FNAL)
 - 5 single-cell 3.9 GHz cavities (FNAL)
- **Roark**
 - 1 single-spoke resonator at 325 MHz (FNAL)
- **Pavac**
 - 2 coaxial resonators at 141 MHz (Triumf)

AES Tesla nine-cell cavity performance to date

Single-cell cavity test results
presented by Padamsee & Ginsburg



Ginsburg, Aug 2008

Cavities Presently on Order from Fermilab

- **Expected by end of 2008**
 - 6 nine-cell Tesla cavities from AES
 - 12 nine-cell Tesla cavities from Accel
 - 6 single-cell Tesla cavities from Accel
- **Expected by ~ Sep 2009 (recent orders)**
 - 6 nine-cell Tesla cavities from AES
 - 6 nine-cell Tesla cavities from Niowave-Roark

Inventory of Tesla-shape cavities procured through Fermilab

Tesla-shape nine-cell cavities		
Description	No. Cavities	Status
AES 1-4	4	tested
AES 5-10	6	due Nov 2008
AES 11-16	6	due Sep 2009
Accel 5-9	5	tested
Accel 10-17	8	received Mar 2008; testing in progress
Accel 18-29	12	due Dec 2008
Jlab fine-grain prototype	1	tested
Jlab large-grain 1-2	2	tested
Jlab fine-grain 1-2	2	fabrication complete; testing in progress
Niowave-Roark 1-6	6	due Sep 2009
Total	52	
Already Received	22	
Tesla-shape single-cell cavities		
Description	No. Cavities	Status
AES 1-6	6	tested at Cornell
Accel 1-6	6	due Nov 2008
Niowave-Roark 1-6	6	received Jun 2008; testing in progress
Total	18	
Already Received	12	

Note that 5 nine-cell cavities were produced by Jefferson Lab.

- **Accel is clearly the leading manufacturer of high-performance superconducting cavities at this time**
- **In the Americas region, industrial experience ranks as follows:**
 - **AES – most experienced**
 - **Niowave-Roark – less experienced**
 - **Pavac – least experienced**
- **The first AES nine-cell production yielded a mix of performance results, but the experience was valuable in preparing for the 2nd production**
 - **Electron beam welder on-site at AES**
 - **Clean room assembly area in front of welder**
 - **Improved tooling for welding**
- **Limited experience at Niowave-Roark and Pavac, but initial results are promising**
- **We must work with the vendors to develop the needed capabilities**
 - **Need to better understand performance limitations and feed back this information into the manufacturing process**

How do we “work with the vendors?”

- Improve our understanding of performance limitations
- Process and test cavities without too much delay
 - Feed back information to the vendors
- Visit the vendors, discuss fabrication details, review fabrication plans and results, and observe fabrication techniques
- If we want to reduce fabrication time, consider stockpiling needed materials
 - Could reduce fabrication time by ~ factor of 2 (12 mo → 6 mo)
- Or, work with niobium vendors to ensure needed material is available with shorter delivery time (possible?)

- **Industrialization of superconducting cavity production in the Americas region is proceeding with four vendors**
 - AES, Niowave, Roark and Pavac
- **Significant numbers of cavities are being produced**
 - **52 total Tesla nine-cell cavities**
 - 22 completed already
 - 18 due by end of 2008
 - another 12 due by Sep 2009
- **We must:**
 - Improve our understanding of performance limitations
 - Process and test cavities and give feedback to vendors