

INDUSTRIAL RESPONSE TO RF POWER REQUIREMENTS

David M Wilcox

High Power RF Engineering Faraday Partnership UK
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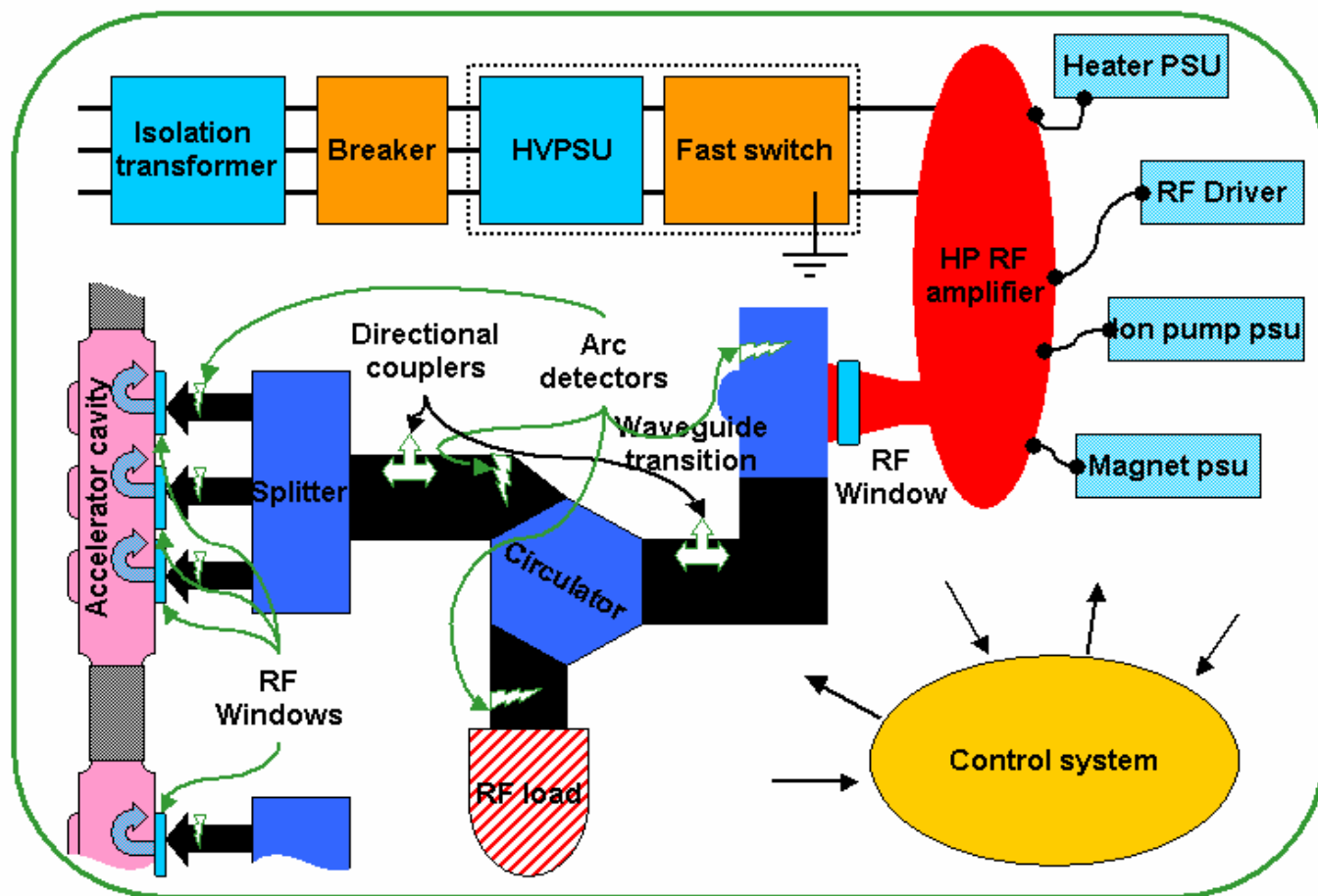
Overview

- RF hardware
- Industry's contribution so far
- Technology from other sources
- Future industrial response and challenges
- Preparing industry for the challenges
- Conclusions and recommendations

RF hardware

- RF System comprises
 - Power supply (power conditioning)
 - RF source and amplifier
 - Monitoring and protection
 - Passive components
 - Control system
 - Accelerator cavity with coupler and window

RF System Schematic



Industry's contribution so far -1

- Products purchased in open competition
- Specifications devised by machine designers
- Products based on technology developed for other purposes.
- Special bespoke devices in small numbers
- Increasing use of devices manufactured for terrestrial broadcast TV

Industry's contribution so far -2

- Little time to consider before tendering
- Learning curve steep
- Frequent problems
- High risk of cost and time over-run
- Little if any long term business
- Expensive after-sales technical support

Companies are wary of accepting low volume, high risk contracts

Technology from other sources

Examples of technology being developed by industry for other applications

- Silicon carbide active devices
- Matrix converter technology derived from motor drive R&D
- IOT technology from TV broadcast extended to 1.3 GHz
- Gyro-Travelling Wave Amplifier

Future response -1

Basic assumptions

- The business must be profitable
- The business must be as beneficial to the company as other opportunities
- The business must be positive in its contribution to the company's business strategy

Future response -2

- Risk
 - Technical
 - Financial
 - Commercial
 - Other
- Disruption to routine business
 - Drain on engineering and manufacturing resources
 - Long term support commitment
- Beneficial legacy
 - Spin-off benefits

Challenges

Major challenges for large machines

- The scale is far greater than anything before
- The frequency, voltage and power density demand higher standards of manufacture
- The cost targets are much more challenging
- The timescales will be difficult to achieve
- Close technical support will be needed during machine lifetime

Preparing industry -1

Prerequisites

- Involvement by industry vital in the pre-construction phase of the machine
- Any nation that expects to receive contracts in return for supporting the project must possess suitable industrial capability
- Only components that meet the minimum acceptable standard can be considered
- A commercially “level playing field” must be assured

Preparing industry -2

Industry needs people, time and money to develop

- Its knowledge
 - Learning
 - Teaching
 - Training
- Its manufacturing capability
 - Processes
 - Capital equipment
 - Manpower

Preparing industry -3

- Early participation
 - Time to learn and understand
 - Contribute to manufacturing design detail
 - Eliminate risks and reduce cost
- Access to funds for
 - Developing capability
 - Technical risk reduction projects
 - Prototyping
- Workable business environment
 - Juste retour
 - The “Level Playing Field”
 - Price comparison

Conclusions/recommendations -1

- Increased manufacturing capacity will be needed
- This must be paid for by the projects
- Industrial process development, prototyping and life testing must be funded
- Industry cannot be expected to take on cutting edge, risky business without support

Conclusions/recommendations -2

- Industry should have an input to cost estimates as well as design detail
- The budget for each tendered task should be stated in the tender documents
- For “fair play” between bidding nations, “ex-works” prices should be the basis for comparison

Conclusions/recommendations -3

- Establish industrial construction team well before construction phase
- If multiple suppliers are needed, provide each one with the same opportunities and support
- Collaboration between manufacturers may be more beneficial than competition?

Conclusions/recommendations -4

Major projects must succeed first time

There may not be a second chance

Finally

Industry will play its part if it is able to participate as a full and equal partner within the project team

END

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