

Getting RFI Mitigation into the Workplace

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Connection to the Science

- Science Requirements
 - Bandwidth
 - Astrophysically interesting frequencies
 - Sensitivity, accuracy and reliability
- Implementation Costs
 - Signal processing
 - Competition for resources
 - Time and effort to science
 - Non-expert use

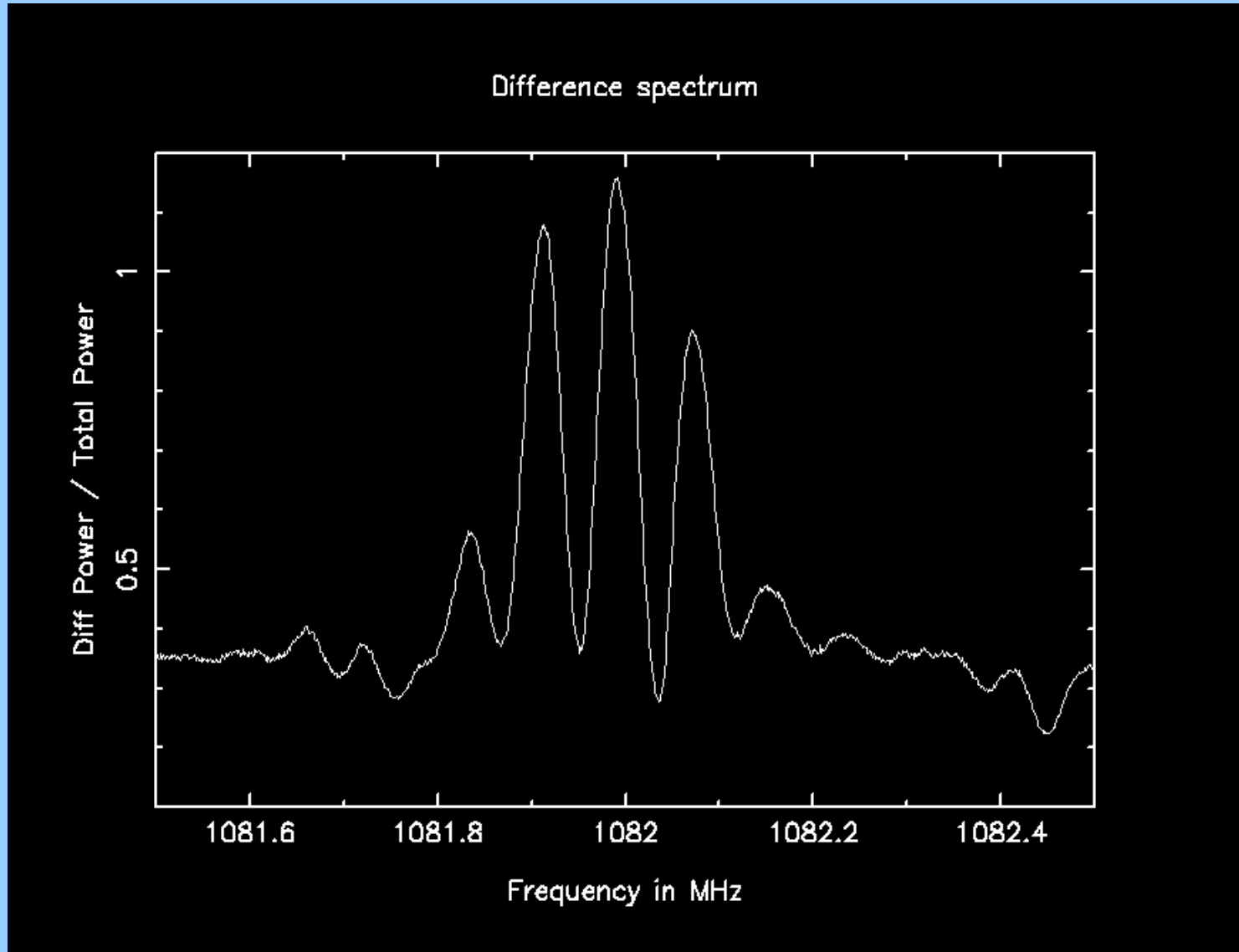
Bandwidth

- > 100 MHz below 1.7 GHz
 - Sensitivity
 - Redshift searches
 - Survey efficiency
- Variety of signals within passband
 - Multiple algorithms
 - RFI layers

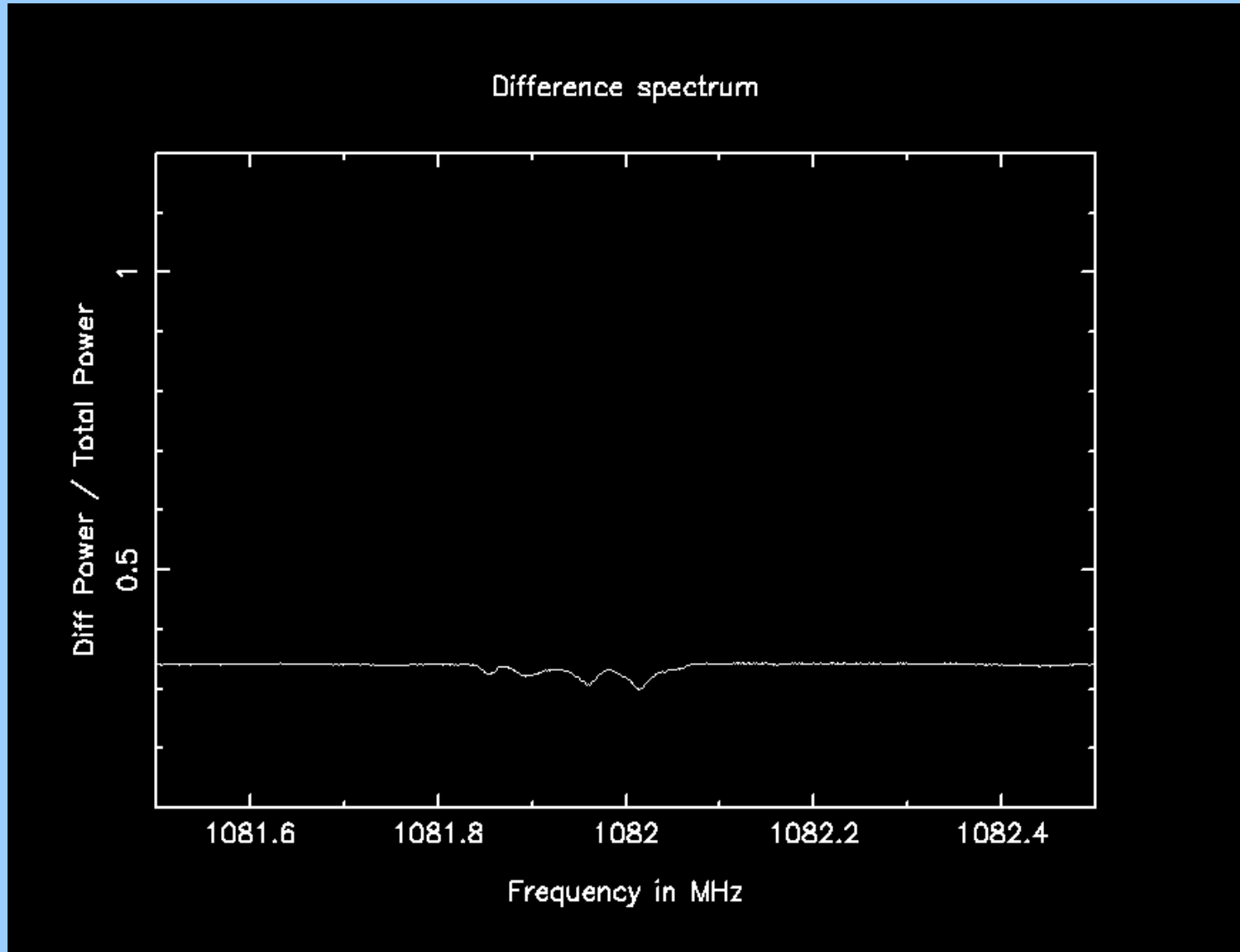
Astrophysically Interesting Frequencies

- 1025 - 1150 MHz (HI, $z = 0.235 - 0.386$)
 - 2 known lines + 2 Lyman-alpha candidates
 - Lyman-alpha wavelengths in UV (satellites)
 - Need efficient survey of $z > 0.3$ radio quasars
 - two channels of BW > 100 MHz
 - Gen'l purpose processor ~ 0.3 MHz real-time
 - FPGA technology
- Greatest HI interest 400 - 900 MHz
 - Multiple TV and cell phone signals

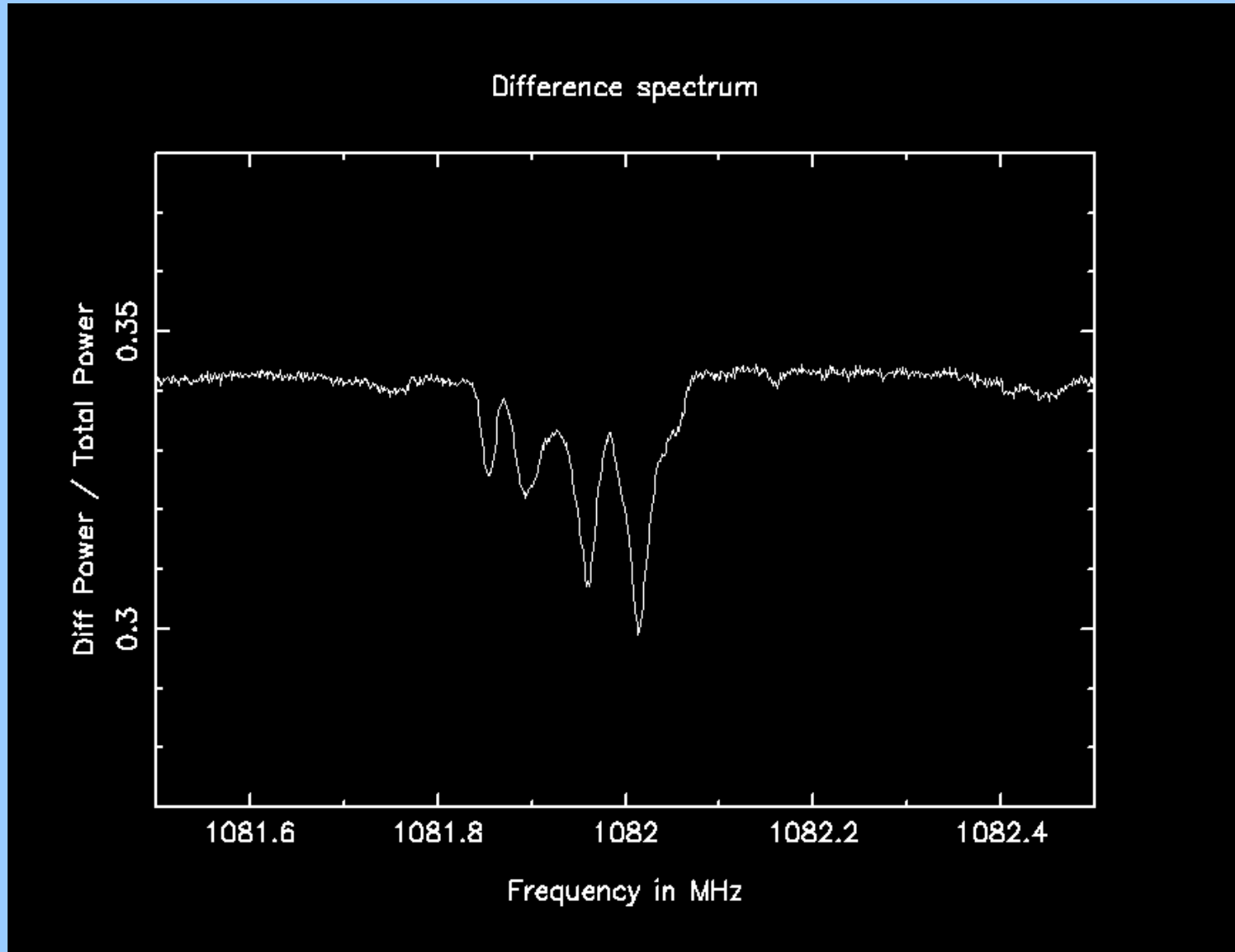
Sensitivity, Accuracy and Reliability



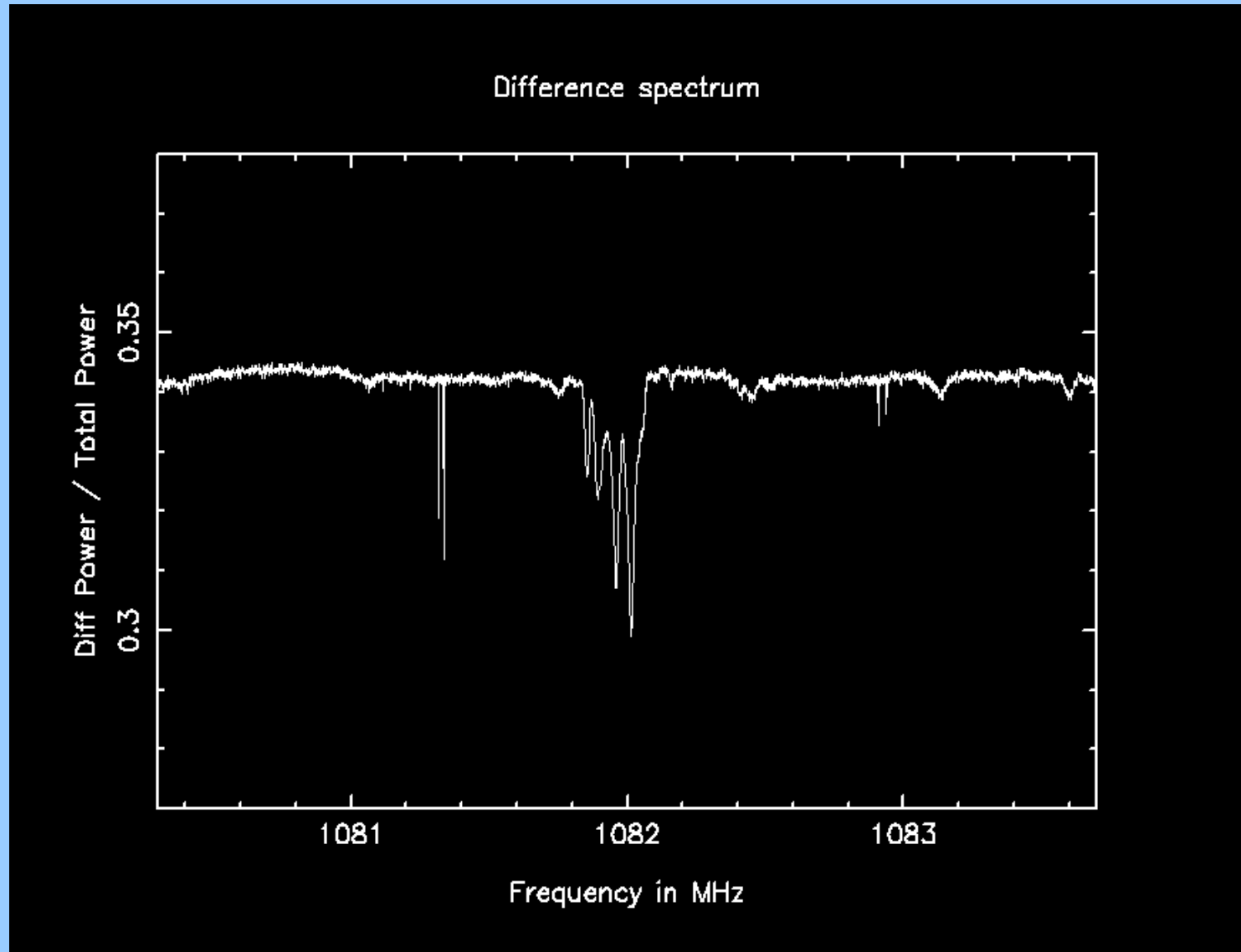
Sensitivity, Accuracy and Reliability



Sensitivity, Accuracy and Reliability



Sensitivity, Accuracy and Reliability



Signal Processing Costs

- Operations per unit bandwidth
 - 1.3 to 10 times RFI-free spectroscopy
 - RFI signal-dependent algorithms
- Available technologies
 - PC clusters, real-time BW ~ 10 MHz
 - software
 - Programmable gate arrays ~ 100 MHz
 - firmware expertise
 - Application-specific integrated circuits ~ 1 GHz
 - firmware + foundry charges

Non-Expert Use

- Strong function of cost and difficulty
 - Still lots of RFI-free science
 - Finite bandwidth resources
- Algorithm robustness
 - Tend to forget hand-tuning of demonstrations
 - User feedback
- New instrument commissioning costs
 - Software
 - User documentation

SKA Design

- Integrate RFI mitigation into design
 - Retrofitting very difficult
- Algorithms need plenty of field experience
 - Otherwise risk unproductive expense
 - Experience will take considerable time
 - Temptation to include exciting but unproven ideas
 - Complexity enormous at all levels