New data and plans for the next year at Auburn

Stuart Loch, Connor Ballance,
Mitch Pindzola, Teck Lee,
Shahin Abdel-Naby, Francis Robicheaux

Di Wu, Josh Vander Hyden,
Jonathan Pearce, Rebecca Rogers

James Goodloe

Auburn University
7th October 2011

Atomic data from the last year

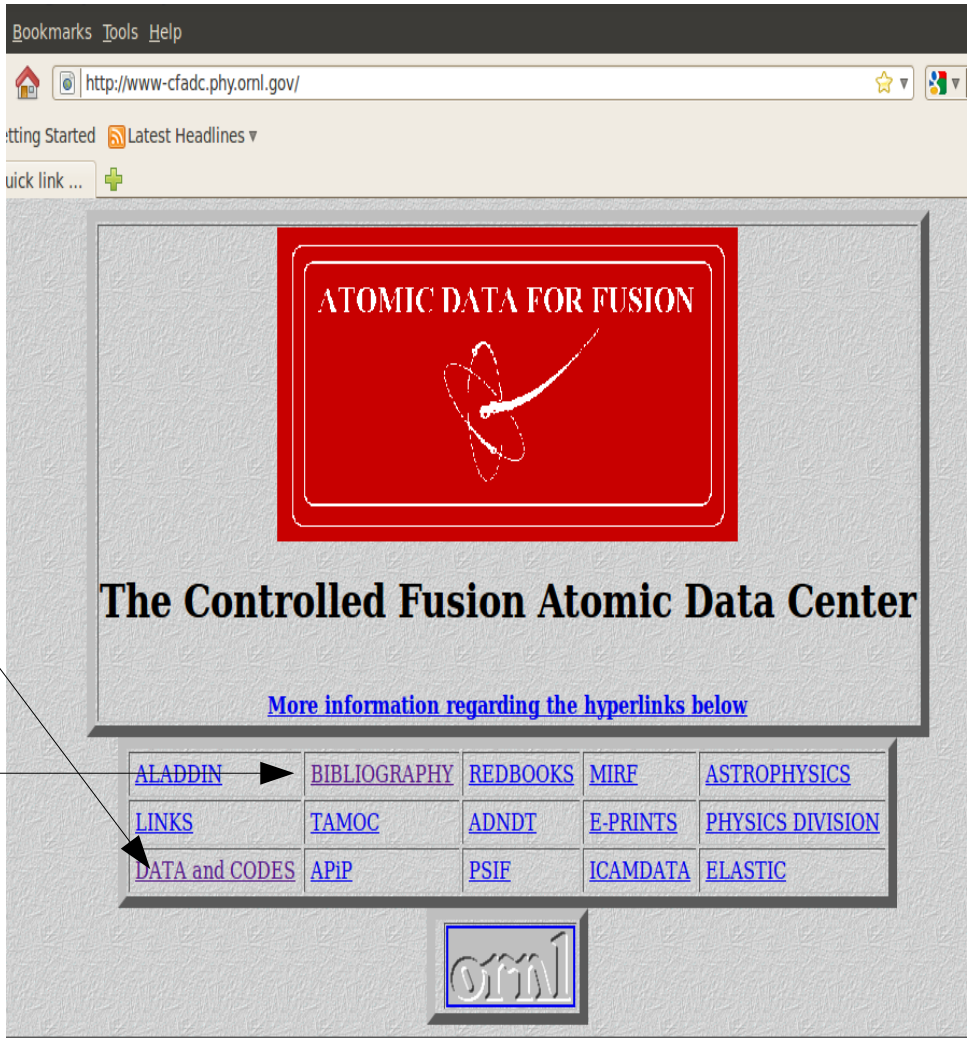
- Electron-impact excitation using R-matrix codes
  - Fe2+ {Dirac RM}
    - [Bautista et al., *ApJ Letts* **718** L189 (2010)]
  - Ne^{2+} {BP-RM}
    - [McLaughlin et al, *JPB* **17** 175206 (2011)]
  - Ne^{3+} and Ne^{6+} {ICFT-RM}
    - [Ludlow et al, *PRA* **84** 022701 (2011)]
  - $Ar^{3+, 4+, 7+, 8+, 10+, 11+, 12+, 13+, 14+,17+}$ {BP-RM}
    - [Ludlow et al. *JPB* **43** 074029 (2010)]
  - H-like Mn, Cr, Fe, Co and Ni {ICFT-RM}
    - [Malespin et al. *A&A* **526** A115 (2011)]
  - B^{4+} (n≤7) {LS-RM}

- Electron-impact ionization
  - Al^{2+} ground term {RMPS}
    - [Wu et al. PRA (in press)]
  - C^{3+} 5s {RMPS, DW}
    - [Pindzola *PRA* **83** 062705 (2011)]
  - B (n≤4), B^{+} (n≤4), B^{2+} (n≤5) {RMPS, TDCC}
    - [Lee et al. *PRA* **82** 042721 (2010)]
    - Showed how to scale direct ionization cross sections to higher n-shells.
  - Xe^{24+} ground configuration {CADW, RMPS}
    - [Pindzola et al. *JPB* **43** 025201 (2010)]
  - C_2
    - [Pindzola et al. *JPB* 43 065201 (2010)]
  - Double ionization of
    - B^{+} {TDCC, RMPS} [Pindzola et al. *JPB* **44** 105202 (2011)]
    - Be {TDCC, RMPS} [Pindzola et al. JPB 43 105204 (2010)]

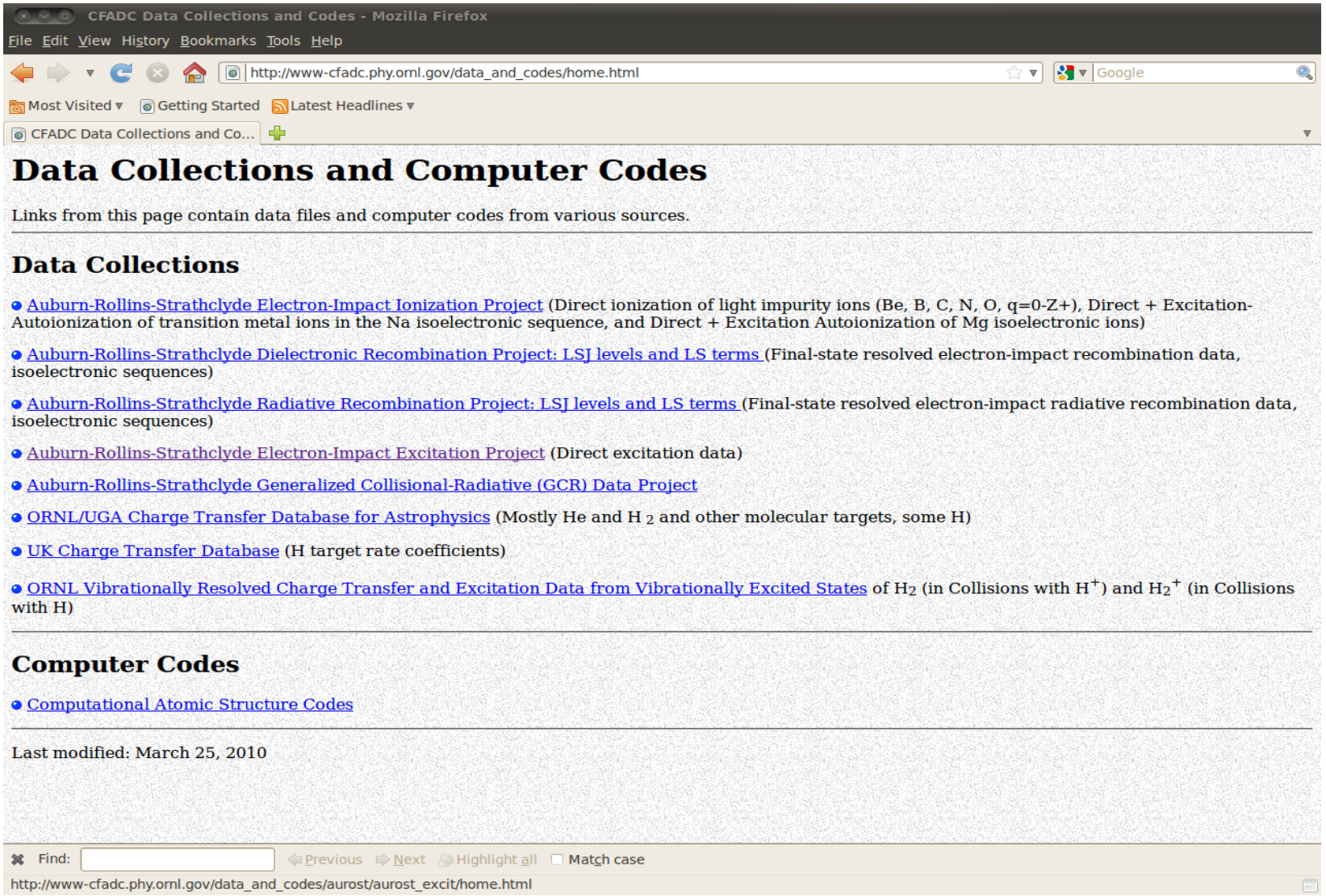
- Dielectronic recombination
  - New adf09 files
    - Ar-like iso-electonic sequence [Nikolic et al. A&A 516 A97 (2010)]
    - Al-like iso-electronic sequence [Abdel-Naby et al., submitted]
  - W^{35+} [Ballance et al. *JPB* **43** 205201 (2010)]
  - Studies on near threshold DR
    - $Mg^{8+} \rightarrow Mg^{7+}$ [Robicheaux et al., *PRL* **105** 233201 (201)]
    - $C^{3+} \rightarrow C^{2+}$ [Pindzola et al., *PRA* **83** 042705 (2011)]
  - Comparison with experiment
    - Be-like Si [Orban et al., *ApJ* **721** 1603 (2010)]
    - Be-like Ne [Orban et al., *Physica Scripta* **144** 014035 (2011)

The future of the CFADC web page

- With the atomic group at Oak Ridge National Laboratory due to close, there is some interest in relocating their CFADC web page.
  - We hope to be able to move the database (with adf files and archives of rate coefficients) to Auburn.
  - Dave Schultz is hoping to relocate the bibliographic search engine.

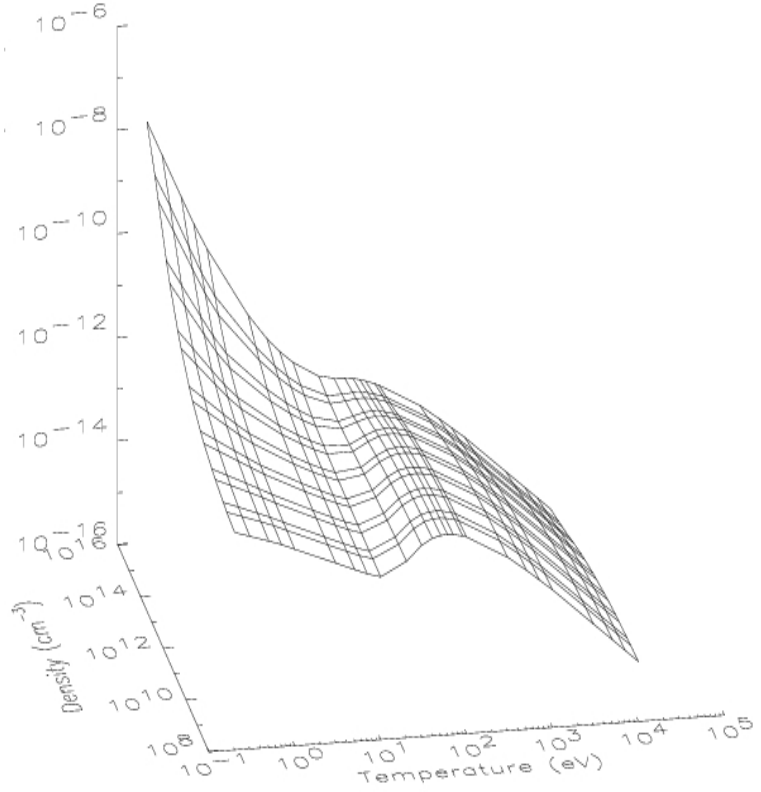


Reminder of the data at CFADC

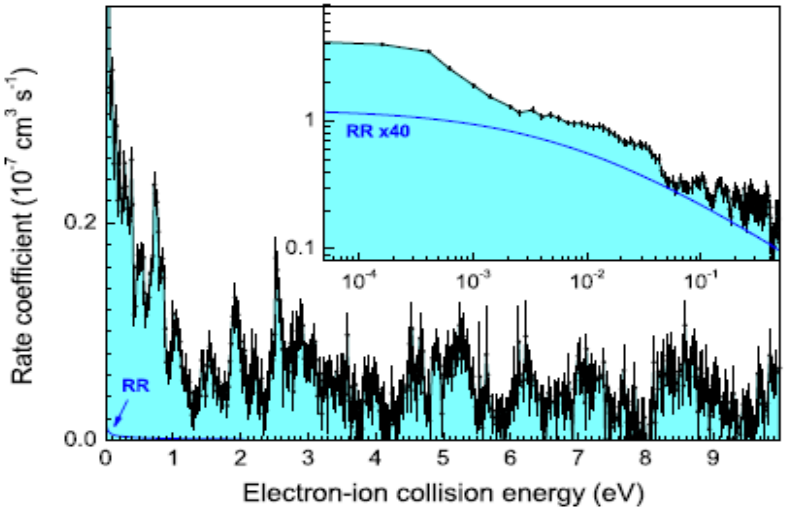


Future plans for Auburn

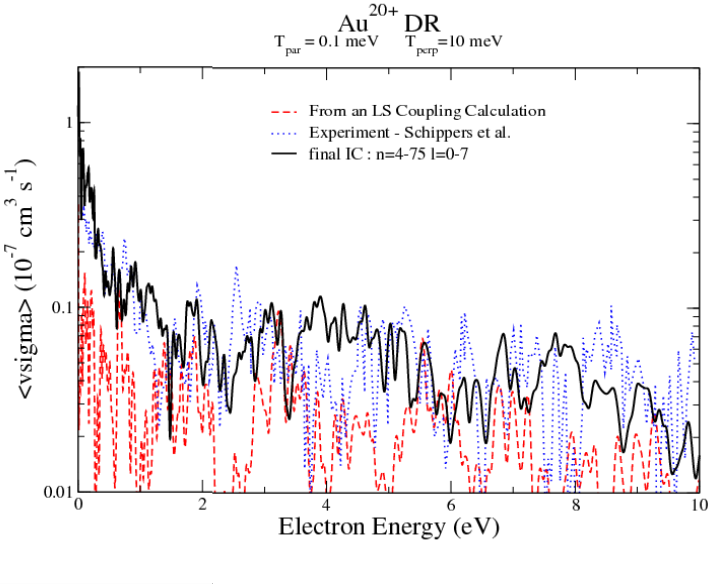
- Data for GCR coefficients
  - Put B GCR data into ADAS
  - To make C GCR we need
    - C, C^+ excitation,
    - excited state ionization for C, C^+, C^{2+}
  - Move on to N, O, F, and Ne.
  - Work on R-matrix script for further sequences.
  - Heavy species GCR
    - Ar as an initial study



- Ionization
  - Excited state ionization processes for near neutrals.
    - Excited states that have significant excitation-autoionization.
  - Complete missing data for Al iso-nuclear [neutral Al]
  - Iso-electronic sequence work using CADW script
    - Fe-peak elements [Mn, Cr, Fe, Co and Ni]
    - Automate the term and level-splitting in the script
    - Automate the generation of radiative branching ratios
- Dielectronic recombination for complex species.

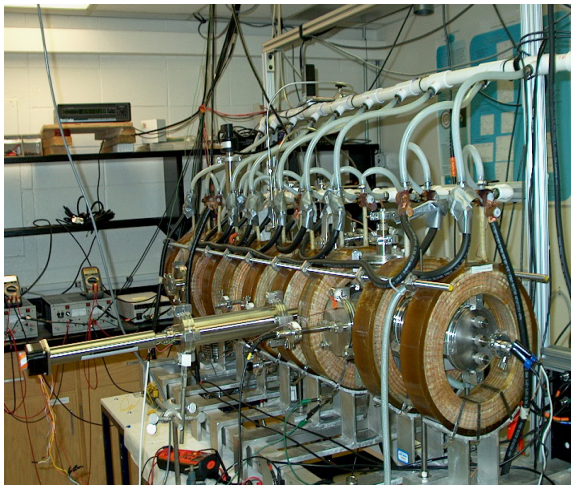


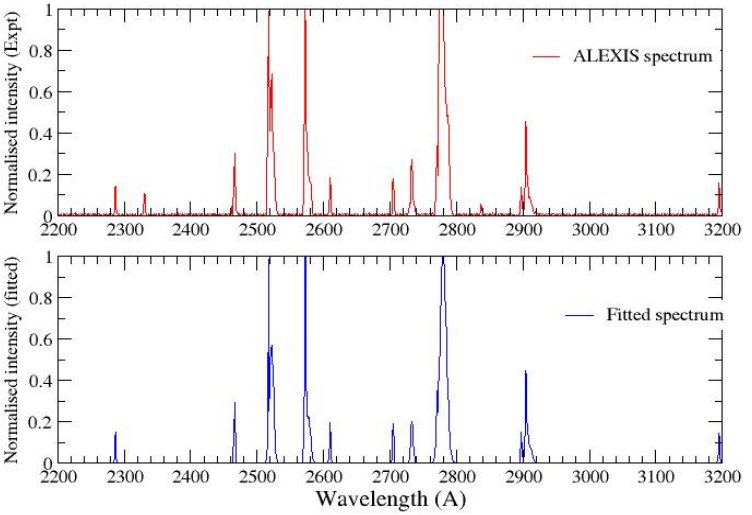
Storage ring measurements of Au20+ DR. From Schippers et al. Physica Scripta **T144** 014039 (2011)



Interaction with the plasma group at Auburn

- We have projects with
  - Ed Thomas looking at non-equilibrium Ar plasma experiment (ALEXIS)
    - GCR data for Ar
  - Steve Knowlton looking at spectral signatures of magnetic islands on CTH
    - C GCR





Requests for atomic data gratefully taken!

- Let us know if
  - there is any atomic data that you need.
  - you have used our data in any modeling. Feedback would be welcome.