

NASA Laboratory astrophysics workshop report @Gatlinburg, Tennessee, USA: 2010/10/25-28

概要

NASA LAWは4年に1回開催されるlab astroに関するworkshop
CX-TESの研究概要について、ポスターで報告を行った:概ね好評
CXのみで5(6)つのポスター(全体で61ポスター):実験3(4), 理論1, 観測1
実験:TMU,JPL,ORNL,LLNL, 理論:ORNL, 観測:ORNL

ORNL(Oak Ridge National Laboratory):12月にADRを運搬、導入、
低衝突エネルギー(100-2000 eV/amu)での全断面積を測定済み

その他:

AtomDBがver2.0に更新(CfA)

Recombination, Ionization measurement(TSR)

Density dependence line ratio(LLNL)

Astro-Hはかなり期待されているようである(高分光性能という点で)

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NASA Laboratory Astrophysics Workshop 2010



4年に1度アメリカで開催

Lab astro(observer,modeler,experimentist)

関係者のworkshop

今回は、Tennessee州Gatlinburg

今回の参加者:98 人

(Randoll,Dan,Kaastra等が出席していた)

Workshopの目的

前回のworkshopでrecommendした研究の評価

最新のlab astroの実験結果の評価

NASAの将来計画に対し、必要な実験データの洗い出し

Astro2010を受けて業界としてどのように動いていくか

workshopの結果をwhite paperにまとめ、提出

どのようにして若手を育てていくべきか

CXに関する研究発表(ポスターのみ記載)

- 1.Theoretical investigation of charge transfer between N^{6+} and atomic hydrogen (ORNL)
- 2.Total Charge exchange cross section measurement of highly charged ion on atomic H (ORNL)
- 3.Laboratory experiments of SWCX with TMU-ECIS and TES microcalorimeter (TMU) <- 我々
- 4.The ion-induced charge exchange X-ray emission of the Jovian auroras: Magnetospheric or solar wind origin? (ORNL)
- 5.Measurement and Calculation of absolute Charge-exchange and electro-impact excitation cross section for highly-charged Ions (JPL)

Oak Ridge National Laboratoryの状況

2.Total Charge exchange cross section measurement of highly charged ion on atomic H (ORNL)

C. Havener, I. N. Draganic, D. McCammonの3人が中心人物

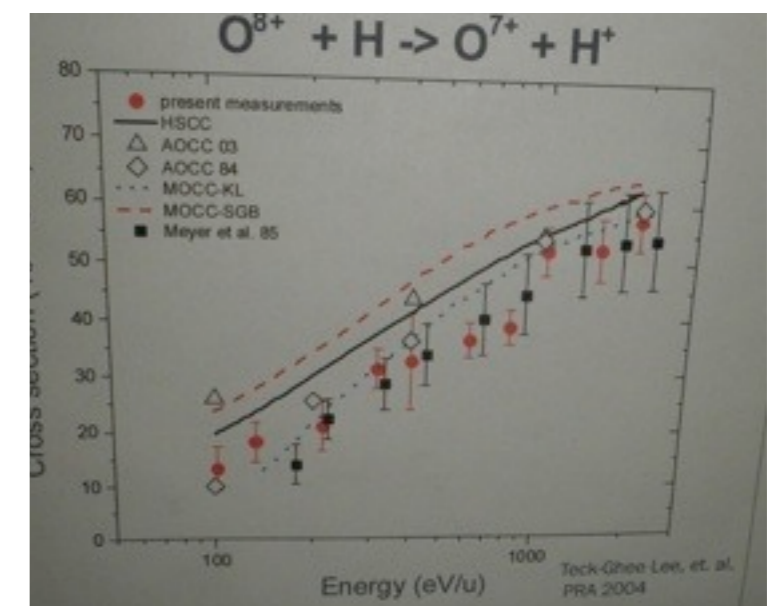
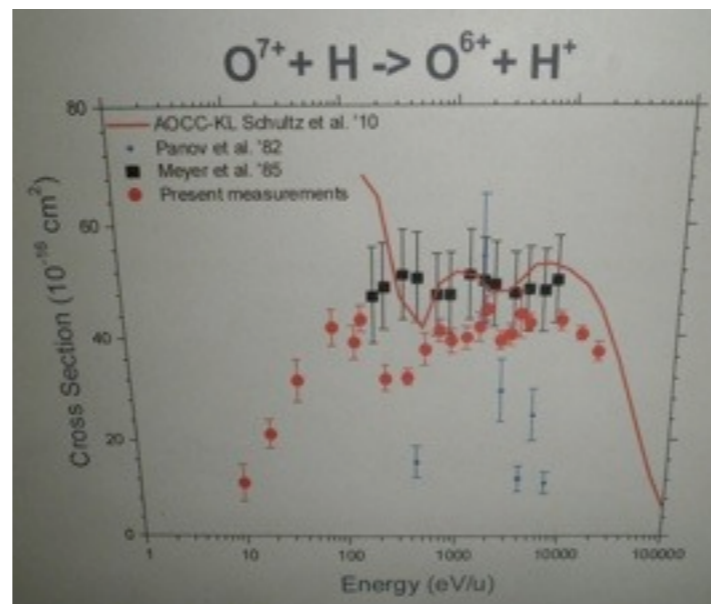
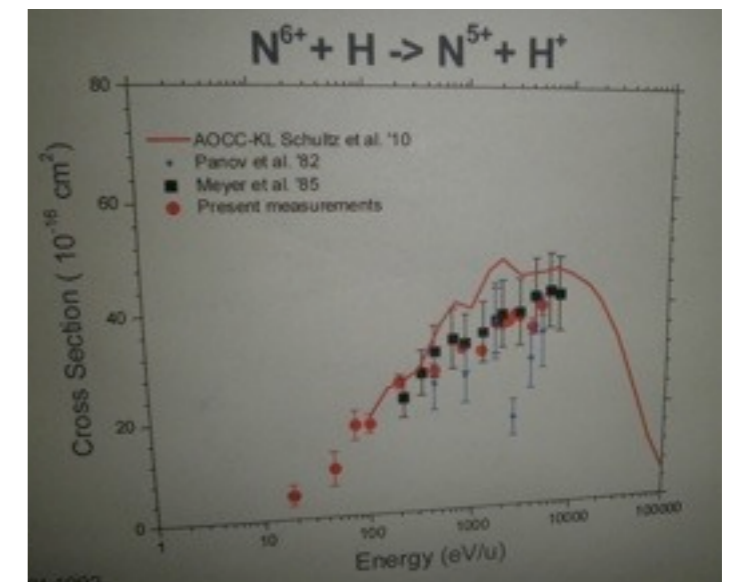
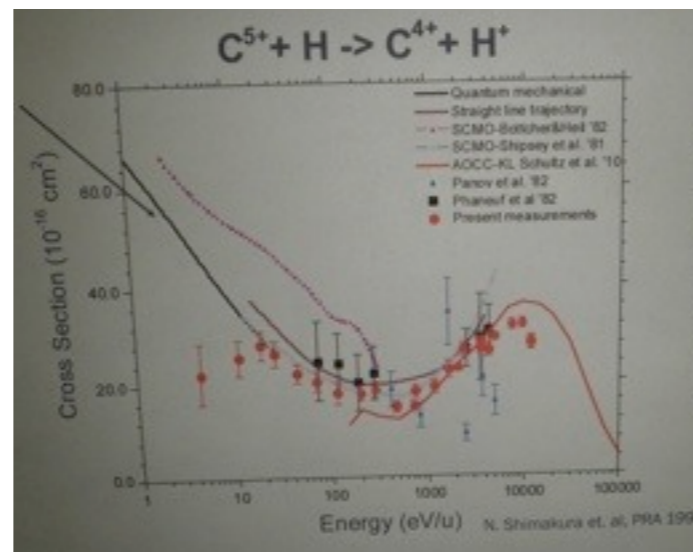
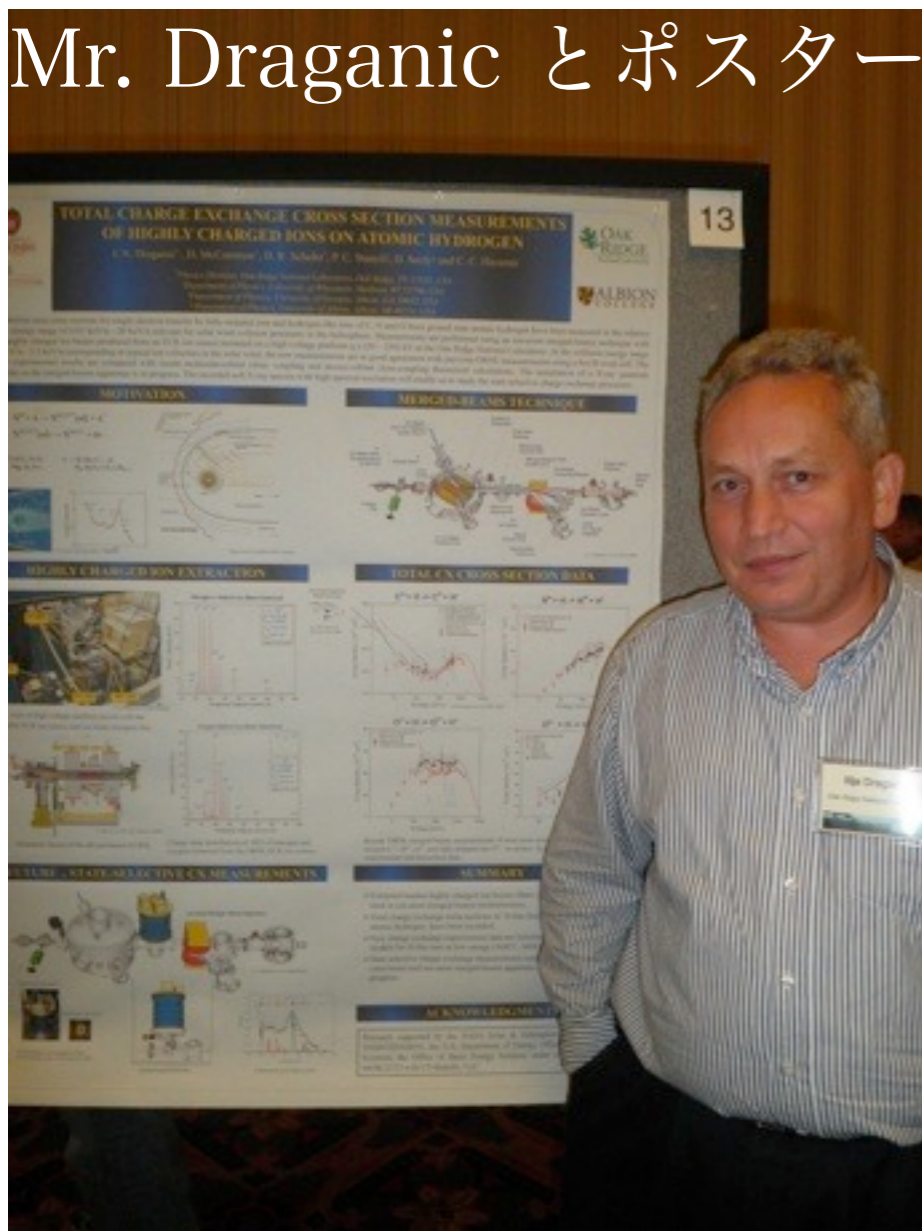
0.3 - 3.3 keV/u で完全電離したC,N,OとH原子のCX全断面積を測定

12月wisconsin-ADRをORNLに運搬。現状スペクトル無し(取れない)

懸念事項: バックグラウンド(O^{+q} が照射される)、振動、真空度

Couple of year で測定システムは完成するだろうとの事

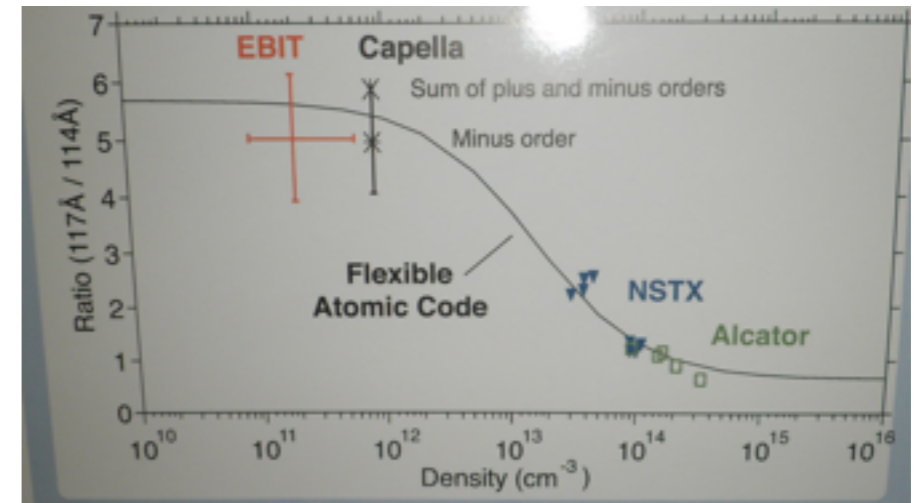
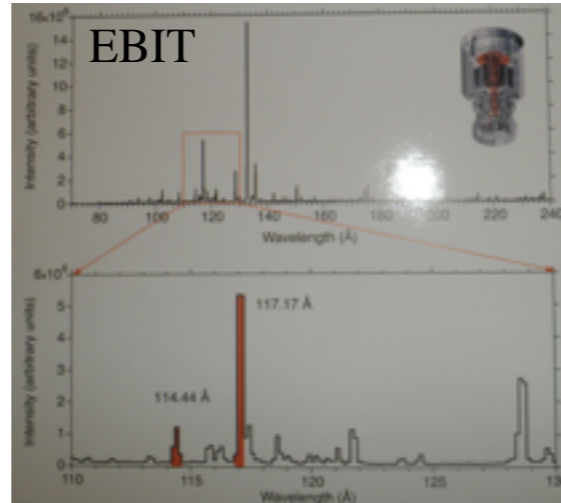
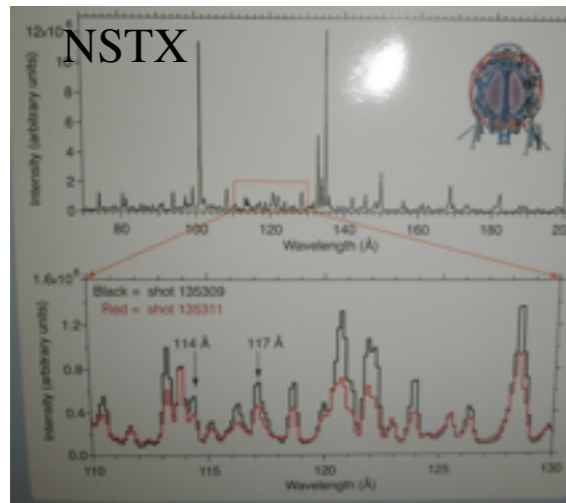
Mr. Draganic とポスター



その他:興味を引かれたポスター 1

Laboratory calibration of density-dependent lines in the EUV and soft X-ray regions for astrophysics (Lepson et al. SSL, Berkeley)

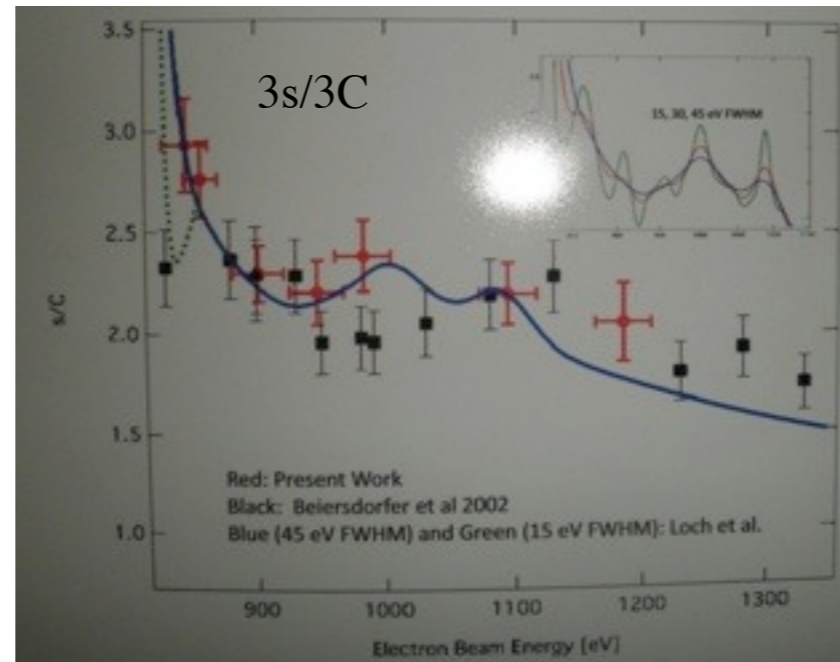
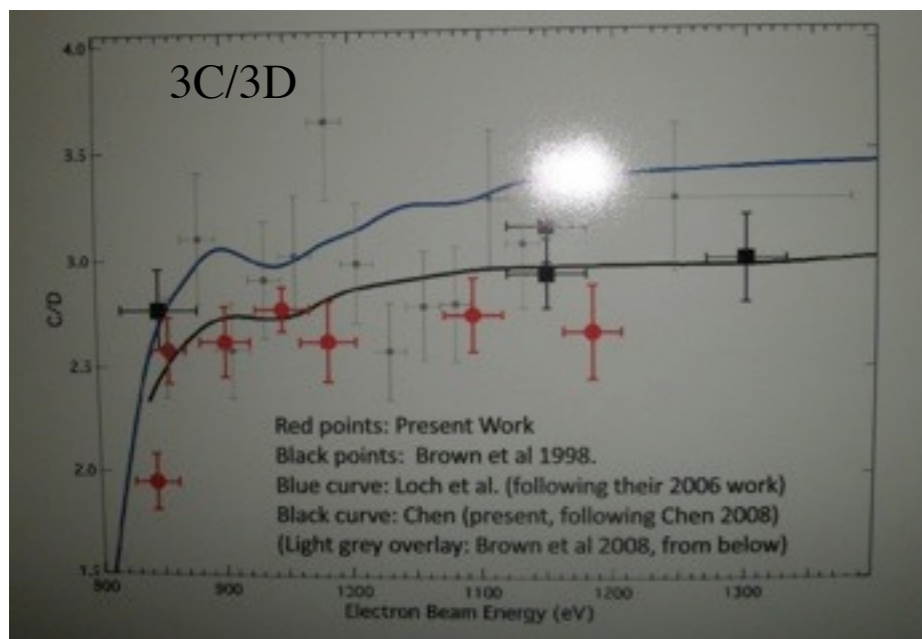
Fe XXII のline ratio(114.44Å,117.17Å)を $5 \times 10^{10} \text{cm}^{-3}$ から $5 \times 10^{14} \text{cm}^{-3}$ の範囲で測定
EBIT(LLNL),Tokamak(MIT),NSTX?を用いて、広範囲の密度領域で測定を行った。



New result on Fe XVII 3C/3D and 3s/3C line Ratios (Gillaspy et al. NIST)

NIST EBIT+calorimeterによる結果。Fe XVIIの比の新しいデータ。

3C,3Dの断面積は、理論値により近づいた(理論値から10%以内)。LLNLの測定とも良く一致



Electron impact excitation cross section at 964 eV	Experiment [10 ⁻²⁰ cm ²]		Theory [10 ⁻²⁰ cm ²]
	Brown et al 2006 RR 3d from: Scofield 1976	Renewed RR 3d from: Chen 2008	(Chen 2007)
3C	8.92(170) → 11.1(23)		10.7(5)
3D	2.98(33) → 3.75(80)		3.91(20)

その他:興味を引かれたポスター 2

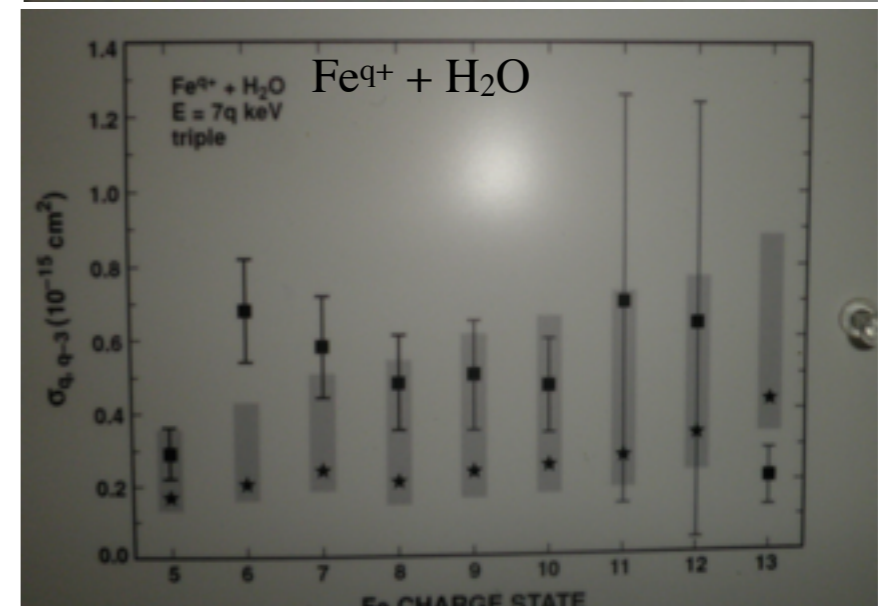
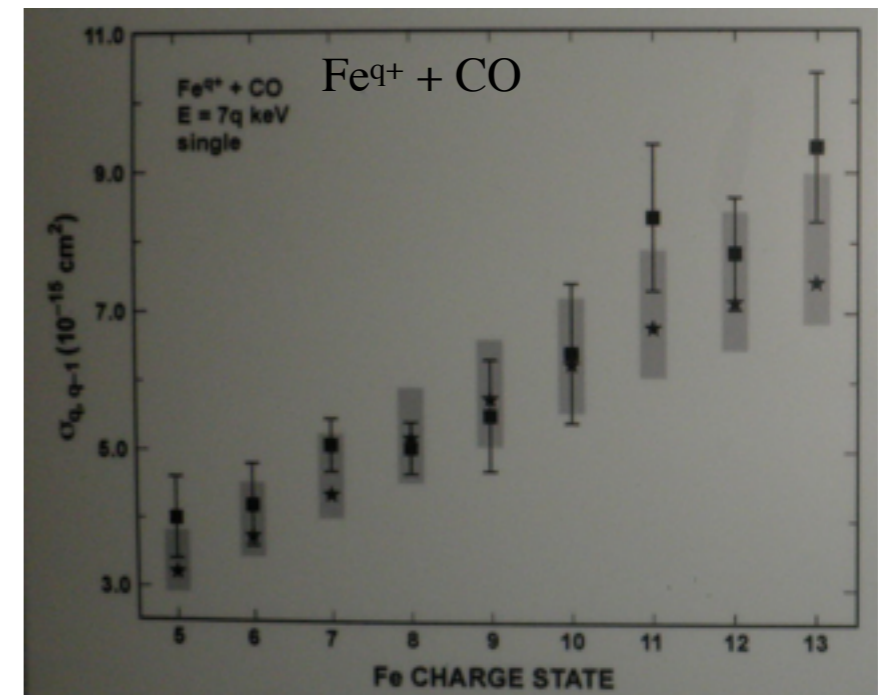
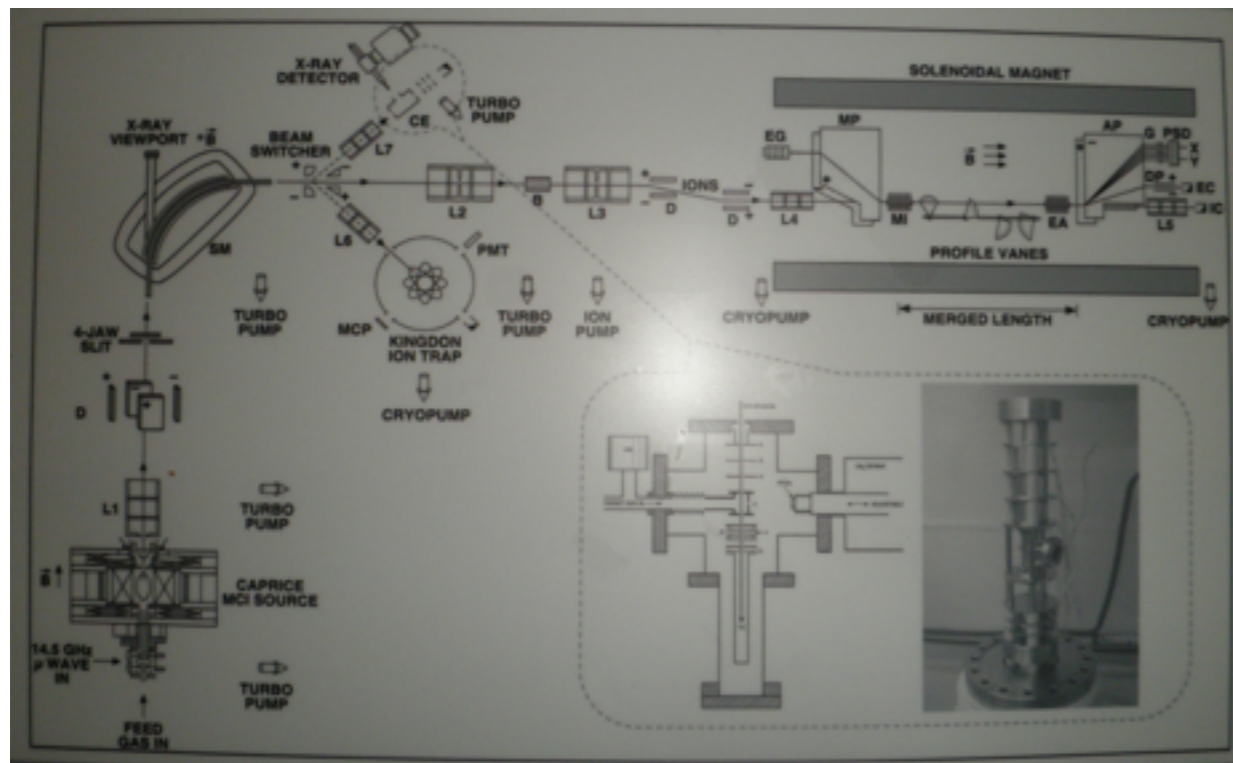
Non-equilibrium Ionization based on AtomDB (Ji et al. HSC)

太陽(HINODE)のデータで非平衡plasmaをAtomDB v2.0でチェック

AtomDB v2.0:RR,DRを考慮。NEIの評価に影響有り

Measurement and calculation of absolute charge-exchange and electron-impact excitation cross sections for highly-charged Ions (Chutjian et al. JPL)

Fe^{q+} ($q=5-13$), CO , CO_2 , H_2O のCX断面積を測定



Breakout session: Mission success inspired by lab astro

前回のLAWから、Lab astroに関連して明らかになったサイエンス

- Excitation cross section for Fe13+ coronal green line, Resolving Fe conundrum in stellar atmospheres (Chutjian)
- Charge exchange cross sections for solar wind ions on gases produced by comet (Chutjian)
- X-ray observations of molecular cooling flows in galaxy cluster. This may be CX (Stancil)
- AtomDB used to model Type Ia SNRs and measure progenitor abundance (Smith/Badebes)
- Measuring outflows of AGNs with accurate wavelengths (Kaastra/Beiersdorfer)
- Ability to distinguish between dust and atoms in the ISM due to more accurate X-ray wavelengths and photo-absorption structure calculation (Kaastra)
- Stellar cluster winds in X-rays showing cascades from DR and RR used to derive Mass loss rate, energy input in NEI plasmas, Done for first time for cluster winds(Li)
- HST observations yielding Heavy element abundance in metal poor star using new transition probabilities in rare earth elements to understand r-process (den Hartog/Lawler)
- Abundance in cool stars X-ray band in 10-200 Å used NIST database compilations(Wiese/Smith)
- SNR observation of Tycho discovery of Mn and Cr from inner shell fluorescence lines and get mass of progenitor (Smith)
- AGN UTSs interpretation required new DR data from theory and experiment (Kallman/Savin)

Breakout session: Critical data need to current and future missions

将来missionに関連して、必要とされるデータ

- Fine structure lines longward of 1 micron
- Collisional excitation cross section
- Charge exchange cross section for interstellar H and He
- Dielectronic recombination and photoionization
- Electron impact ionization wavelength for Fe-L, Ni-M,-L,
- ionization balance calculations
- density dependent line ratio
- lab measurement to benchmark theory
- Basic atomic data for Fe group elements for first three spectra: wavelength, oscillator strengths, line ISs from UV to IR