## §21. Standardization of Atomic and Molecular Data

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Atomic and molecular (AM) data are important for plasma diagnostics and modeling for both core plasma and peripheral plasma. We develop and provide AM databases for plasma research and there are several available AM databases by other institutions. IAEA Atomic and Molecular Data Unit provides a search engine of atomic data via internet from the databases opened by several institutions but data are shown with their own format of each database. Standardization of data format is one of problems for data exchange for long time. In 1960s ALADDIN was proposed as a data exchange format and the fortran program was developed for searching and showing data from ALADDIN format data. But this format was not so widely used.

Recently there is a movement of new database network with using Atomic and Molecular Data Markup Language. This is now developing with XML technologies by several AM data centers internationally and the development is approved by IAEA. XML schema is being developed with examining complete description of atomic, molecular, and particle-surface (solid) interactions and properties. Other tools for data exchange are also being developed.

There is another international movement in astronomy community for developing virtual observatories which allow to access observation data taken by different observatories. AM data are also considered to be included to virtual observatories. Standard XML schema for data of spectral line wavelengths is already examined and included to virtual observatories.

Thus we examined the possibilities of participation of our AM databases to these movements. The participation will be benefit for us and many more researchers who need AM data. Figure 1 shows the schematic diagram for the new database network. IAEA with international committee will provide a search engine. Each database like our AM database only needs to have a gate to connect with the search engine. Each database does not need to change their database systems. We will discuss and examine about such a gate for our system.

We also discussed the XML schema of AM data. Atomic energy structure has own complexity on describing energy levels, e.g. LS coupling and jj coupling expressions, which are not independent. Some datasets for the same ion are often described with different coupling expressions by different authors. We need to examine such problems when developing the XML schema.
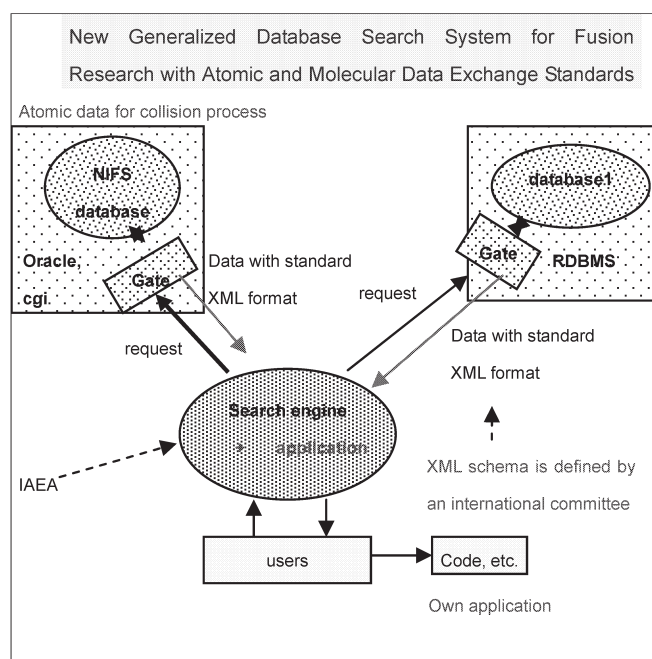


Fig.1 Schematic diagram of new database network. Users access to a search engine which send requests to a gate of each database via internet and receive AM data with standard format defined by XML schema. Users can use AM data easily to their own application.