inverse cyclotrons, the simplicity of the method makes it the clear favourite.

G. Gabrielse discussed recent progress in trapping keV antiprotons emerging from deceleration foils and their 'cooling' to meV energies. Electron cooling in such traps works extremely well, and has permitted his PS 196 experiment at CERN to accumulate more than 10^5 antiprotons at 4.2 K (0.3 meV) in their attempt to reach a one part in 10^9 comparison of the charge/mass ratios of protons and antiprotons.

The same group recently demonstrated the feasibility of transporting trapped particles by moving a trap filled with electrons across the United States. 'You can regard this as serious work or as a cheap stunt!', said Gabrielse. If a stunt, it is still necessary since ultra high precision measurements must be done far from the electromagnetically noisy environments near particle accelerators.

Several routes to the production of cold low energy positrons were discussed by M. Charlton (London), including the use of beta emitters produced at CERN's ISOLDE on-line isotope separator and positrons from electromagnetic showers produced either in a special purpose electron accelerator or in the LIL LEP injector linac.

After production, antihydrogen must itself be confined or trapped to prevent it from annihilating on the walls of its container. This can be done using the 'restoring' force produced by a magnetic quadrupole field on the positron's magnetic moment. J.T.M. Walraven described how this technique has been perfected with atomic hydrogen at MIT and Amsterdam and reviewed the prospects for further cooling within such traps from K to mK temperatures using Lyman alpha lasers which are now close to reality.

Summarizing, D. Kleppner of MIT, himself a pioneer in the trapping of spin polarized atomic hydrogen, said that comparison of normal and antihydrogen will be of tremendous interest. The probability of violating sacred physics laws like CPT and the equivalence principle may be low, but these laws have to be tested to the limit.

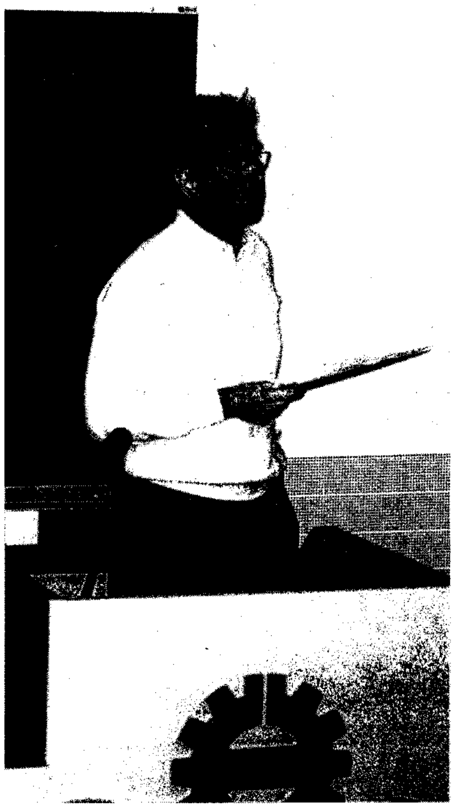
Comparing the present situation with that of the 1987 Karlsruhe symposium on atomic antimatter, Kleppner added that progress in hydrogen spectroscopy 'exceeds our wildest dreams of five years ago', while trapping and cooling of charged particles to temperatures of a few K and of neutral atoms to millikelvin levels (both of which looked 'wild' in 1987), are now demonstrated facts.

In hydrogen spectroscopy, the attainable resolution is now kHz instead of MHz in 1987 and will soon be reduced to Hz. The challenge in antihydrogen formation is to combine these techniques. Even if deep underlying symmetries withstand the attack, we will learn a lot about both fundamental symmetries and new technology.

From John Eades

Signal Processing

New technology for physics. Y. Neuvo reviewing median based filters during the recent Signal Processing for LHC workshop in Tampere (Finland).



Signal processing techniques, extensively used nowadays to maximize the performance of audio and video equipment, have been a key part in the design of hardware and software for high energy physics detectors since pioneering applications in the UA1 experiment at CERN in 1979.

In addition to the problem of disentangling the signal produced by the particles in the detectors from noise, advanced image processing algorithms will be needed in future experiments to pattern recognize events of interest. Thus a topical Signal Processing Workshop was jointly organized by CERN, the Finnish Research Institute of High Energy Physics (SEFT) and the Tampere University of Technology (TUT), from 2 to 4 July in Finland.

Specifically in the context of applications for the LHC proton-proton collider to be built in CERN's LEP tunnel, the workshop aimed at triggering cross-fertilization between the HEP community and experts eager to contribute. It gathered more than 50 participants and was hosted by TUT's Signal Processing Laboratory.

(This Laboratory, inaugurated in 1988, concentrates on the areas of digital video, digital audio, biomedical signal processing and VLSI system design. Applications of non-linear filters (median based algorithms) are a speciality. It also collaborates extensively with TUT's Electronics laboratory, founded in 1967.)

During the first part of the workshop, engineers and physicists gave an overview of detectors, front-end electronics, trigger and data acquisition systems for LHC and a number of other areas. This was followed by surveys of more than ten ongoing TUT activities, such as Linear Median Hybrid filtering and multi dimensional median signal processing (together with their implementation in VLSI), module generators, floating point formats, neural net hardware (analogue and digital), image processing algorithms, etc.

Three working groups (short floating point format, median and neural net applications, Application Specific Integrated Circuits and processors) were formed to identify areas of common interest to prepare for future collaboration.