

Time and Frequency:
A Bibliography of NBS Literature

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TIME AND FREQUENCY STANDARDS

January - December 1971

- [A-78]²
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- [A-80]²
(F) BAY, Z., "The use of microwave modulation of lasers for length measurements," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, pp. 59-62 (August 1971).
- [A-81]²
(F) BAY, Z., and LUTHER, G. G., "The measurement of optical frequencies and a redetermination of the velocity of light," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.) SPEC. PUBL. 343, pp. 63-66 (August 1971).
- [A-82]²
(F) EVENSON, K. M., WELLS, J. S., and MATARRESE, L. M., "Defining the speed of light: A combination time, frequency and length standard," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, pp. 67-69 (August 1971).
- [A-84]²
(F) HALL, J. L., and BARGER, R. L., "The implication of saturated molecular absorption for the laser wavelength standard problem," (Abstract), Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, p. 49 (August 1971).
- [A-86a]²
(D) HELLWIG, H., and HALFORD, D., "Accurate frequency measurements: Survey, significance, and forecast," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, pp. 17-25 (August 1971).
- [A-87]²
(F) MIELENZ, K., "Interferometry for wavelength comparisons," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, pp. 53-57 (August 1971).
- [A-88]² FOWLER, H. A., WITT, T. J., TOOTS, J., OLSEN, P. T., and EICKE, W., "Referencing of the U.S. national volt against a Josephson frequency-to-voltage source," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, pp. 223-225 (August 1971).

² Nos. refer to designation in SP-350.³ Letters in parentheses indicate applicability to additional sections.

- [A-89] BEEHLER, R. E., "Cesium atomic beam frequency standards: A survey of laboratory standards development from 1949-1971," PROC. 25th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, April 26-28, 1971) pp. 297-308 (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1971).
- [A-90] BRANDENBERGER, H., HADORN, F., HALFORD, D., and SHOAF, J. H., "High quality quartz crystal oscillators: Frequency domain and time domain stability," PROC. 25th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, April 26-28, 1971) pp. 226-230 (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1971).
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- [A-91] HELLWIG, H., BARNES, J. A., and GLAZE, D. J., "Frequency biases in a beam tube caused by Ramsey excitation phase differences," PROC. 25th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, April 26-28, 1971) pp. 309-312 (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1971).
- [A-92] RISLEY, A. S., "The physical basis of atomic frequency standards," NAT. BUR. STAND. (U.S.), TECH. NOTE 399, 54 pages (USGPO, C13.46:399, \$0.60, April 1971).

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- [A-93] BARNES, J. A., and WINKLER, G.M.R., "Time and frequency standards in the U.S.A.," PROC. 26th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, June 6-8, 1972) pp. 269-277 (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1972).
(B)
- [A-94] BEEHLER, R. E., "Recent progress on atomic frequency standards," (Summary) CPEM DIGEST (1972 Conf. on Precision Electromagnetic Meas., Boulder, CO 80302, June 26-29, 1972), pp. 166-167 (IEEE, Inc., New York, NY 10017, \$15.00/\$10.00 member, June 1972).
- [A-95] EVENSON, K. M., DAY, G. W., WELLS, J. S., and MULLEN, L. O., "Extension of absolute frequency measurements to the cw He-Ne laser at 88 THz (3.39 μ)," APPL. PHYS. LETT., 20, No. 3, pp. 133-134 (February 1, 1972).
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- [A-96] HALFORD, D., "Technological workhorses: Metrology's atomic standards," Atomic & Molecular Physics, Chap. 12 (Edited by the Committee on Atomic & Molecular Physics, National Research Council) (Printing & Publishing Office, National Academy of Sciences, Washington, DC 20418), pp. 130-136 (1971).
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- [A-97] HELLWIG, H., Ed., Proceedings of the Frequency Standards and Metrology Seminar (Quebec, Canada, Aug. 30-Sept. 1, 1971), 500 pages (Quantum Electronics Lab., Dept. of Elect. Eng., Laval University, Quebec, Canada, \$10.00, 1972).
- [A-98a] HELLWIG, H., BELL, H. E., KARTASCHOFF, P., and BERGQUIST, J. C., "Frequency stability of methane-stabilized He-Ne lasers," Proceedings of the Frequency Standards and Metrology Seminar (Quebec, Canada, Aug. 30-Sept. 1, 1971), pp. 267-275 (Quantum Electronics Lab., Dept. of Elect. Eng., Laval University, Quebec, Canada, \$10.00, 1972);
- [A-98b] J. APPL. PHYS., 43, No. 2, pp. 450-452 (February 1972).

- [A-99] HELLWIG, H., BARNES, J. A., GLAZE, D. J., and KARTASCHOFF, P.,
"Frequency shifts due to Ramsey type interrogation in atomic beam tubes,"
NAT. BUR. STAND. (U.S.), TECH. NOTE 612, 25 pages (USGPO, C13.46:612,
\$0.35, February 1972).
- [A-100] HELLWIG, H., "Frequency standards and clocks: A tutorial introduction," NAT.
BUR. STAND. (U.S.), TECH. NOTE 616, 69 pages (USGPO, C13.46:616,
\$0.70, April 1972).
- [A-101a] HELLWIG, H., and BELL, H. E., "Experimental results with atomic hydrogen
storage beam systems," METROLOGIA, 8, No. 3, pp. (July 1972);
- [A-101b] PROC. 26th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics
Command, Ft. Monmouth, NJ 07703, June 6-8, 1972) pp. (Electron.
Ind. Assoc., Washington, DC 20006, \$6.50, 1972).
- [A-102] KARTASCHOFF, P., and BARNES, J. A., "Standard time and frequency generation,"
PROC. IEEE, 60, No. 5, pp. 493-501 (May 1972).

SECTION B
TIME SCALES, TIME

January - December 1971

- [B-30]^a BARNES, J. A., "A non-mathematical discussion of some basic concepts of precise time measurement," ON FREQUENCY (TRACOR, INC.), 2, No. 2, 17 pages (May 1971).
- [B-31] ALLAN, D. W., and GRAY, J. E., "Comments on the October 1970 Metrologia paper 'The U. S. Naval Observatory clock time reference and the performance of a sample of atomic clocks'," METROLOGIA, 7, No. 2, pp. 79-82 (April 1971).

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- [B-32a] ALLAN, D. W., GRAY, J. E., and MACHLAN, H. E., "The National Bureau of Standards atomic time scale: Generation, dissemination, precision, and accuracy," (Summary) CPEM DIGEST (1972 Conf. on Precision Electromagnetic Meas., Boulder, CO 80302, June 26-29, 1972), p. 165 (IEEE, Inc., New York, NY 10017, \$15.00/\$10.00 member, June 1972);
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- [B-32b] IEEE TRANS. INSTRUM. AND MEAS., IM-21, No. 4, pp.
(A) (November 1972).
- [B-33] ALLAN, D. W., "Statistical modeling and filtering for optimum atomic time scale generation," Proceedings of the Frequency Standards and Metrology Seminar (Quebec, Canada, Aug. 30-Sept. 1, 1971), pp. 388-410 (Quantum Electronics Lab., Dept. of Elect. Eng., Laval University, Quebec, Canada, \$10.00, 1972).
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^a Nos. refer to designation in SP-350.

SECTION C

DISTRIBUTION/RECEPTION OF TIME AND FREQUENCY SIGNALS

January - December 1971

- [C-70]^a BLAIR, B. E., and MORGAN, A. H., Eds., Precision Measurement and Calibration, Frequency and Time, NAT. BUR. STAND. (U.S.), SPEC. PUBL. 300. 5, 565 pages (USGPO, C13.10:300/v.5, \$6.00, June 1972).
(A, B, D, E)
- [C-72a] ALLAN, D. W., BLAIR, B. E., DAVIS, D. D., and MACHLAN, H. E., "Precision and accuracy of remote synchronization via network television broadcasts, Loran-C, and portable clocks," METROLOGIA, 8, No. 2, pp. 64-72 (April 1972);
- [C-72b] PROC. 25th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, April 26-28, 1971) pp. 195-208 (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1971).
- [C-73] BEEHLER, R. E., "Spaceborne clock system: Some alternatives for a proposed NASA experiment," (Unpublished report).
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- [C-74] DAVIS, D. D., "Frequency standard hides in every color TV set," ELECTRONICS, pp. 96-98 (May 1971).
- [C-75] DAVIS, D. D., BLAIR, B. E., and BARNABA, J., "Long-term continental U.S. timing system via television networks," IEEE SPECTRUM, 8, No. 8, pp. 41-52 (August 1971).
- [C-76] FEY, R. L., "Time dissemination capabilities using the Omega system," PROC. 25th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, April 26-28, 1971) pp. 167-170 (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1971).
- [C-77] FEY, L., "New signals from an old timer--WWV," BROADCAST ENGINEERING, 13, No. 7, pp. 44-46, July 1971.
- [C-78] HAMILTON, W. F., and JESPERSEN, J. L., "Application of VLF theory to time dissemination," NAT. BUR. STAND. (U.S.), TECH. NOTE 610, 170 pages (USGPO C13.46:610, \$1.50, November 1971).
- [C-79] HANSON, D. W., and HAMILTON, W. F., "One-way time synchronization via geostationary satellites at UHF," IEEE TRANS. INSTRUM. AND MEAS., IM-20, No. 3, pp. 147-153 (August 1971).
- [C-80] HANSON, D. W., and HAMILTON, W. F., "Clock synchronization from satellite tracking," IEEE TRANS. AEROSP. AND ELECTRON. SYST., AES-7, No. 5, pp. 895-899 (September 1971).
- [C-81] HANSON, D. W., HAMILTON, W. F., and GATTERER, L. E., "The NBS frequency and time satellite experiment using ATS-3," Proceedings Precise Time and Time Interval (PTTI) Strategic Planning Meeting (November 16-18, 1971), pp. 155-165 (U. S. Naval Observatory, Washington, DC 20390).
- [C-82] JESPERSEN, J. L., GATTERER, L. E., HANSON, D. W., and HAMILTON, W. F., "Artificial satellites as a means of time dissemination," L'Espace et la Communication (Conf. on Space and Communications, Proc.), 1, pp. 426-433 (40, rue de Seine, Paris 6^e: Editions Chiron, March 29-April 2, 1971).

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- [C-83] KAMAS, G., and HANSON, D. W., "Recent VHF/UHF satellite timing experiments at the National Bureau of Standards," Proceedings Precise Time and Time Interval (PTTI) Strategic Planning Meeting (December 10-11, 1970), pp. 79-82 (U. S. Naval Observatory, Washington, DC 20390).
- [C-84] NBS, "NBS frequency and time broadcast services," NAT. BUR. STAND. (U.S.), SPEC. PUBL. 236, 1971 Edition, 15 pages (USGPO, C13.11:236, \$0.25, July 1971).
- [C-85] VIEZBICKE, P. P., "NBS frequency-time broadcast station WWV, Fort Collins, Colorado," NAT. BUR. STAND. (U.S.), TECH. NOTE 611, 29 pages (USGPO, C13.46:611, \$0.35, October 1971).

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- [C-86] ALLAN, D. W., "Time transfer using near-synchronous reception of optical pulsar signals," PROC. IEEE (LETT.), 60, No. 5, pp. 625-627 (May 1972).
- [C-87] ALLAN, D. W., and MACHLAN, H. E., "Time transfer using nearly simultaneous reception times of a common transmission," PROC. 26th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, June 6-8, 1972), pp. (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1972).
(B)
- [C-88] FEY, L., "A time code for the Omega worldwide navigation system," PROC. IEEE (LETT.), 60, No. 5, p. 630 (May 1972).
- [C-89] HOWE, D. A., "Results of active line-1 TV timing," PROC. IEEE (LETT.), 60, No. 5, pp. 634-637 (May 1972).
- [C-90a] HOWE, D. A., "Nationwide precise time and frequency distribution utilizing an active code within network television broadcasts," IEEE TRANS. INSTRUM. AND MEAS., IM-2, No. 3, pp. 263-276 (August 1972).
- [C-90b] PROC. 26th ANN. SYMP. ON FREQUENCY CONTROL (U.S. Army Electronics Command, Ft. Monmouth, NJ 07703, June 6-8, 1972), pp. (Electron. Ind. Assoc., Washington, DC 20006, \$6.50, 1972).
- [C-91] JESPERSEN, J. L., BLAIR, B. E., and GATTERER, L. E., "Characterization and concepts of time-frequency dissemination," PROC. IEEE, 60, No. 5, pp. 502-521 (May 1972).
- [C-92] JESPERSEN, J. L., and FEY, L., "'Time-telling' techniques," IEEE SPECTRUM, 9, No. 5, pp. 51-58 (May 1972).
- [C-93] NBS, "NBS frequency and time broadcast services," NAT. BUR. STAND. (U.S.), SPEC. PUBL. 236, 1972 Edition, 14 pages (USGPO C13.11:236, \$0.25, March 1972).

SECTION D

STATISTICS OF TIME AND FREQUENCY ANALYSES,
FREQUENCY STABILITY, LABORATORY MEASUREMENTS

January - December 1971

- [D-18b]² BARNES, J. A., ET AL., "Characterization of frequency stability," IEEE TRANS. INSTRUM. AND MEAS., IM-20, No. 2, pp. 105-120 (May 1971).
- [D-19] BARNES, J. A., and MARVIS, S., "Efficient numerical and analog modeling of flicker noise process," NAT. BUR. STAND. (U.S.), TECH. NOTE 604, 22 pages (USGPO, C13.46:604, \$0.35, June 1971).
- [D-20] SHOAF, J. H., "Specification and measurement of frequency stability," (Unpublished report).

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- [D21] STANLEY, J. T., and MILTON, J. B., "Basic laboratory methods for measurement or comparison of frequencies and time intervals," (Unpublished report).

² Nos. refer to designation in SP-350.

SECTION E
GENERAL, SUMMARY, AND STATUS REPORTS

January - December 1971

- [E-25]^a BRANSCOMB, L., "Measurement standards, language of discovery," Proceedings International Conference on Precision Measurement and Fundamental Constants (NBS-Gaithersburg, MD 20760, August 3-7, 1970), D. N. Langenberg and B. N. Taylor, Eds., NAT. BUR. STAND. (U.S.), SPEC. PUBL. 343, pp. 3-8 (August 1971).
- [E-26] BLAIR, B. E., "Time and frequency: A bibliography of NBS literature published July 1955 - December 1970," NAT. BUR. STAND. (U.S.), SPEC. PUBL. 350 (USGPO, C13.10:350, \$0.55, June 1971).

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- [E-27] BARNES, J. A., "The basic concepts and management within the U.S.A. of precise time and frequency," (Unpublished report).
- [E-28] JESPERSEN, J. L., BLAIR, B. E., and GATTERER, L. E., Guest Eds., Special Issue on Time and Frequency, PROC. IEEE, 60, No. 5, 172 pages (May 1972).
- [E-29] JESPERSEN, J. L., BLAIR, B. E., and GATTERER, L. E., "Scanning the issue," PROC. IEEE, 60, No. 5, pp. 476-477 (May 1972).
- [E-30] PAGE, C. H., and VIGOUREUX, P., Eds., "The international system of units (SI)," NAT. BUR. STAND. (U.S.), SPEC. PUBL. 330, 1972 Edition (USGPO, C13.10:330/2, \$0.30, January 1972).

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SECTION F

FUTURE TRENDS IN TIME-FREQUENCY METROLOGY

January - December 1971

- [F-1] FINNEGAN, T. F., DENENSTEIN, A., and LANGENBERG, D. N., "ac-Josephson-effect determination of e/h : A standard of electrochemical potential based on macroscopic quantum phase coherence in superconductors," PHYS. REV., B4, No. 5, pp. 1487-1522 (September 1971).
- [F-2] KAMPER, R. A., and ZIMMERMAN, J. E., "Noise thermometry with the Josephson effect," J. APPL. PHYS., 42, No. 1, p. 132 (January 1971).
- [F-3] McDONALD, D. G., RISLEY, A. S., CUPP, J. D., and EVENSON, K. M., "Harmonic mixing of microwave and far-infrared laser radiations using a Josephson junction," APPL. PHYS. LETT., 18, No. 4, pp. 164-164 (February 15, 1971).

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- [F-4] (A) BAY, Z., LUTHER, G. G., and WHITE, J. A., "Measurement of an optical frequency and the speed of light," PHYS. REV. LETT., 29, No. 3, pp. 189-192 (July 17, 1972).
- [F-5] (A) HALFORD, D., "Infrared-microwave frequency synthesis design: Some relevant conceptual noise aspects," Proceedings of the Frequency Standards and Metrology Seminar (Quebec, Canada, Aug. 30-Sept. 1, 1971), pp. 431-466 (Quantum Electronics Lab., Dept. of Elect. Eng., Laval University, Quebec, Canada, \$10.00, 1972).
- [F-6] (A) HALFORD, D., HELLWIG, H., and WELLS, J. S., "Progress and feasibility for a unified standard for frequency, time, and length," PROC. IEEE (LETT.), 60, No. 5, pp. 623-625 (May 1972).
- [F-7] McDONALD, D. G., RISLEY, A. S., CUPP, J. D., and EVENSON, K. M., "Four-hundredth-order harmonic mixing of microwave and infrared laser radiation using a Josephson junction and a maser," APPL. PHYS. LETT., 20, No. 8, pp. 296-299 (April 15, 1972).
- [F-8] RISLEY, A. S., "The Josephson junction as applied to the measurement of the frequencies of several laser lines," Proceedings of the Frequency Standards and Metrology Seminar (Quebec, Canada, Aug. 30-Sept. 1, 1971), pp. 325-328 (Quantum Electronics Lab., Dept. of Elect. Eng., Laval University, Quebec, Canada, \$10.00, 1972).
- [F-9] WELLS, J. S., EVENSON, K. M., DAY, G. W., and HALFORD, D., "Role of infrared frequency synthesis in metrology," PROC. IEEE (LETT.), 60, No. 5, pp. 621-623 (May 1972).

SECTION G
SELECTED NON-NBS TIME AND FREQUENCY PAPERS
PUBLISHED 1971-1972

The following selected bibliography is provided within the framework of the NBS publication outline for calendar years 1971 and 1972. The selection represents contributions to the time and frequency field on the basis of their value in terms of survey, tutorial nature, originality, and availability; as such they document the scope and depth of work in the field. The selection cannot be exhaustive; however, we welcome recommendations for inclusion in future listings.

The material is organized as follows:

- G.1 Time and Frequency Standards
- G.2 Time Scales, Time
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