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(21) International Application Number: PCT/US96/18287 (22) International Filing Date: 7 November 1996 (07.11.96) (30) Priority Data: 60/006,260 ✓ 7 November 1995 (07.11.95) ✓ US (71) Applicant (for all designated States except US): CALIFORNIA INSTITUTE OF TECHNOLOGY [US/US]; 1200 East California Boulevard, Pasadena, CA 91125 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): YADID-PECHT, Orly [IL/US]; Pasadena, CA (US). FOSSUM, Eric, C. [US/US]; Pasadena, CA (US). (74) Agent: HARRIS, Scott, C.; Fish & Richardson P.C., Suite 1400, 4225 Executive Square, La Jolla, CA 92037 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: AN IMAGE SENSOR WITH HIGH DYNAMIC RANGE LINEAR OUTPUT**(57) Abstract**

Designs and operational methods to increase the dynamic range of image sensors (200) and APS devices (300) in particular by achieving more than one integration times for each pixel (302) thereof. An APS system (200) with more than one column-parallel signal chains (204, 206) for readout are described for maintaining a high frame rate in readout. Each active pixel (302) is sampled for multiple times during a single frame readout, thus resulting in multiple integration times. The operation methods can also be used to obtain multiple integration times for each pixel (302) with an APS design having a single column-parallel signal chain (104) for readout. Furthermore, analog-to-digital conversion of high speed and high resolution can be implemented.

