

EXHIBIT 1



- [54] **INTEGRATED FREQUENCY TRANSLATION AND SELECTIVITY**
- [75] Inventors: **Robert W. Cook**, Switzerland; **Michael J. Bultman**, Jacksonville; **Richard C. Looke**, Jacksonville; **Charley D. Moses, Jr.**, Jacksonville; **David F. Sorrells**, Jacksonville, all of Fla.
- [73] Assignee: **ParkerVision, Inc.**, Jacksonville, Fla.
- [21] Appl. No.: **09/175,966**
- [22] Filed: **Oct. 21, 1998**
- [51] **Int. Cl.⁷** **H04B 1/26**
- [52] **U.S. Cl.** **455/313**; 455/296; 307/497
- [58] **Field of Search** 455/131, 150.1, 455/179.1, 180.1, 182.3, 192.3, 230, 266, 296, 306, 307; 307/203, 204, 215, 277, 295, 480, 487, 497

0 632 288 A3	7/1996	European Pat. Off.	G01S 13/75
0 486 095 B1	2/1997	European Pat. Off.	H03D 3/00
0 782 275 A2	7/1997	European Pat. Off.	H04B 7/02
0 785 635 A1	7/1997	European Pat. Off.	H04B 1/713
0 795 978 A2	9/1997	European Pat. Off.	H04L 5/06
0 837 565 A1	4/1998	European Pat. Off.	H04B 1/69
0 862 274 A1	9/1998	European Pat. Off.	H03M 1/06
0 874 499 A2	10/1998	European Pat. Off.	H04L 25/64
0 512 748 B1	11/1998	European Pat. Off.	H04N 9/64
2 743 231 A1	7/1997	France	H04B 7/12
2-39632	2/1990	Japan	H04B 7/12
2-131629	5/1990	Japan	H04B 7/12
2-276351	11/1990	Japan	H04L 27/22
2 161 344	1/1986	United Kingdom	H04B 1/69
2 215 945	9/1989	United Kingdom	H04L 27/00
WO 80/01633	8/1980	WIPO	H04J 1/08
WO 94/05087	3/1994	WIPO	H03M 1/00
WO 96/02977	2/1996	WIPO	H04B 1/26
WO 96/39750	12/1996	WIPO	H04B 1/26
WO 98/00953	1/1998	WIPO	H04L 27/26
WO 98/24201	6/1998	WIPO	H04H 1/00

[56] **References Cited**

U.S. PATENT DOCUMENTS

Re. 35,494	4/1997	Nicollini	327/554
Re. 35,829	6/1998	Sanderford, Jr.	375/200
2,057,613	10/1936	Gardner	250/8
2,241,078	5/1941	Vreeland	179/15

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

0 035 166 A1	2/1981	European Pat. Off.	H04B 1/26
0 193 899 B1	9/1986	European Pat. Off.	G01S 7/52
0 380 351 A2	8/1990	European Pat. Off.	H03H 17/04
0 380 351 A3	2/1991	European Pat. Off.	H03H 17/04
0 411 840 A2	2/1991	European Pat. Off.	G01R 33/36
0 411 840 A3	2/1991	European Pat. Off.	G01R 33/36
0 423 718 A2	4/1991	European Pat. Off.	H04N 7/01
0 423 718 A3	4/1991	European Pat. Off.	H04N 7/01
0 486 095 A1	5/1992	European Pat. Off.	H03D 3/00
0 512 748 A2	11/1992	European Pat. Off.	H04N 9/64
0 512 748 A3	11/1992	European Pat. Off.	H04N 9/64
0 548 542 A1	6/1993	European Pat. Off.	H03B 19/14
0 632 288 A2	1/1995	European Pat. Off.	G01S 13/75
0 411 840 B1	10/1995	European Pat. Off.	G01R 33/36
0 696 854 A1	2/1996	European Pat. Off.	H04B 1/26

OTHER PUBLICATIONS

Aghvami, H. et al., "Land Mobile Satellites Using the Highly Elliptic Orbits— The UK T-SAT Mobile Payload," *4th International Conf. On Satellite Systems for Mobile Communications and Navigation*, Oct. 17–19, 1988, pp. 147–153.

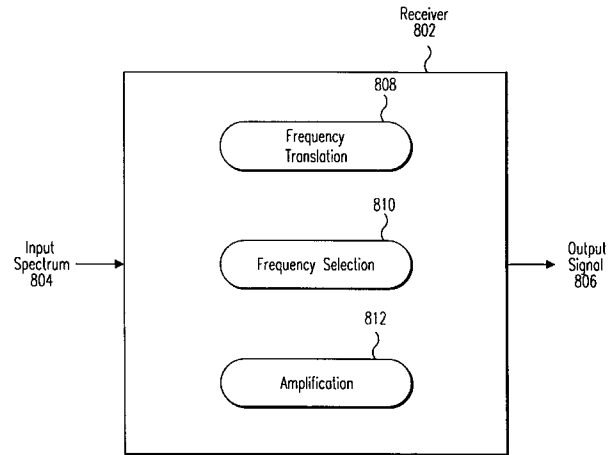
(List continued on next page.)

Primary Examiner—Reinhard J. Eisenzopf
Assistant Examiner—Sam Bhattacharya
Attorney, Agent, or Firm—Sterne, Kessler, Goldstein & Fox P.L.L.C.

[57] **ABSTRACT**

Methods and apparatuses for frequency selectivity and frequency translation, and applications for such methods and apparatuses, are described herein. The method includes steps of filtering an input signal, and down-converting the filtered input signal. The filtering and the down-conversion operations are performed in an integrated, unified manner. The apparatus described herein can be implemented as an integrated circuit (IC).

194 Claims, 55 Drawing Sheets



U.S. PATENT DOCUMENTS

2,270,385	1/1942	Skillman	179/15	4,392,255	7/1983	Del Giudice	455/328
2,283,575	5/1942	Roberts	250/6	4,430,629	2/1984	Betzl et al.	333/165
2,358,152	9/1944	Earp	179/171.5	4,446,438	5/1984	Chang et al.	328/127
2,410,350	10/1946	Labin et al.	179/15	4,456,990	6/1984	Fisher et al.	370/119
2,451,430	10/1948	Barone	250/8	4,472,785	9/1984	Kasuga	364/718
2,462,069	2/1949	Chatterjea et al.	250/17	4,479,226	10/1984	Prabhu et al.	375/1
2,462,181	2/1949	Grosselfinger	250/17	4,481,490	11/1984	Huntley	332/41
2,472,798	6/1949	Fredendall	178/44	4,481,642	11/1984	Hanson	375/9
2,497,859	2/1950	Boughtwood et al.	250/8	4,485,488	11/1984	Houdart	455/327
2,499,279	2/1950	Peterson	332/41	4,504,803	3/1985	Lee et al.	332/31 R
2,802,208	8/1957	Hobbs	343/176	4,517,519	5/1985	Mukaiyama	329/126
2,985,875	5/1961	Grisdale et al.	343/100	4,517,520	5/1985	Ogawa	329/145
3,023,309	2/1962	Foulkes	250/17	4,518,935	5/1985	van Roermund	333/173
3,069,679	12/1962	Sweeney et al.	343/200	4,521,892	6/1985	Vance et al.	375/88
3,104,393	9/1963	Vogelman	343/200	4,563,773	1/1986	Dixon, Jr. et al.	455/327
3,114,106	12/1963	McManus	325/56	4,577,157	3/1986	Reed	329/50
3,118,117	1/1964	King et al.	332/22	4,583,239	4/1986	Vance	375/94
3,226,643	12/1965	McNair	325/40	4,591,736	5/1986	Hirao et al.	307/267
3,258,694	6/1966	Shepherd	325/145	4,602,220	7/1986	Kurihara	331/19
3,383,598	5/1968	Sanders	325/163	4,603,300	7/1986	Welles, II et al.	329/50
3,384,822	5/1968	Miyagi	325/30	4,612,464	9/1986	Ishikawa et al.	307/496
3,454,718	7/1969	Perreault	178/66	4,612,518	9/1986	Gans et al.	332/21
3,523,291	8/1970	Pierret	340/347	4,616,191	10/1986	Galani et al.	331/4
3,548,342	12/1970	Maxey	332/9	4,621,217	11/1986	Saxe et al.	315/1
3,555,428	1/1971	Perreault	325/320	4,628,517	12/1986	Schwarz et al.	375/40
3,617,892	11/1971	Hawley et al.	325/145	4,634,998	1/1987	Crawford	331/1 A
3,621,402	11/1971	Gardner	328/37	4,648,021	3/1987	Alberkrack	363/157
3,623,160	11/1971	Giles et al.	340/347 DA	4,651,034	3/1987	Sato	307/556
3,626,417	12/1971	Gilbert	343/203	4,675,882	6/1987	Lillie et al.	375/80
3,629,696	12/1971	Bartelink	324/57 R	4,688,253	8/1987	Gumm	381/7
3,662,268	5/1972	Gans et al.	325/56	4,716,376	12/1987	Daudelin	329/107
3,689,841	9/1972	Bello et al.	325/39	4,716,388	12/1987	Jacobs	333/173
3,714,577	1/1973	Hayes	325/145	4,718,113	1/1988	Rother et al.	455/209
3,717,844	2/1973	Barret et al.	340/5 R	4,726,041	2/1988	Prohaska et al.	375/91
3,735,048	5/1973	Tomsa et al.	179/15 BM	4,733,403	3/1988	Simone	375/103
3,806,811	4/1974	Thompson	325/146	4,734,591	3/1988	Ichitsubo	307/219.1
3,868,601	2/1975	MacAfee	332/45	4,737,969	4/1988	Steel et al.	375/67
3,949,300	4/1976	Sadler	325/31	4,743,858	5/1988	Everard	330/10
3,967,202	6/1976	Batz	325/31	4,745,463	5/1988	Lu	358/23
3,980,945	9/1976	Bickford	325/30	4,751,468	6/1988	Agoston	328/133
3,987,280	10/1976	Bauer	235/150.53	4,757,538	7/1988	Zink	381/7
3,991,277	11/1976	Hirata	333/70	4,768,187	8/1988	Marshall	370/69.1
4,003,002	1/1977	Snijders et al.	332/10	4,769,612	9/1988	Tamakoshi et al.	328/167
4,013,966	3/1977	Campbell	325/363	4,785,463	11/1988	Janc et al.	375/1
4,019,140	4/1977	Swerdlow	322/65	4,791,584	12/1988	Greivenkamp, Jr. et al.	364/525
4,035,732	7/1977	Lohrmann	325/446	4,801,823	1/1989	Yokoyama	307/353
4,047,121	9/1977	Campbell	331/76	4,806,790	2/1989	Sone	307/353
4,066,841	1/1978	Young	178/66 R	4,810,904	3/1989	Crawford	307/353
4,066,919	1/1978	Huntington	307/353	4,810,976	3/1989	Cowley et al.	331/117 R
4,081,748	3/1978	Batz	325/56	4,811,362	3/1989	Yester, Jr. et al.	375/75
4,130,765	12/1978	Arakelian et al.	307/220 R	4,819,252	4/1989	Christopher	375/122
4,130,806	12/1978	Van Gerwen et al.	325/487	4,833,445	5/1989	Buchele	341/118
4,142,155	2/1979	Adachi	325/47	4,862,121	8/1989	Hochschild et al.	333/173
4,170,764	10/1979	Salz et al.	332/17	4,868,654	9/1989	Juri et al.	358/133
4,204,171	5/1980	Sutphin, Jr.	328/167	4,870,659	9/1989	Oishi et al.	375/82
4,210,872	7/1980	Gregorian	330/9	4,871,987	10/1989	Kawase	332/100
4,245,355	1/1981	Pascoe et al.	455/326	4,885,587	12/1989	Wiegand et al.	42/14
4,253,066	2/1981	Fisher et al.	329/50	4,885,756	12/1989	Fontanes et al.	375/82
4,253,069	2/1981	Nossek	330/107	4,888,557	12/1989	Puckette, IV et al.	329/341
4,308,614	12/1981	Fisher et al.	370/119	4,890,302	12/1989	Muilwijk	375/80
4,320,361	3/1982	Kikkert	332/16 R	4,893,316	1/1990	Janc et al.	375/44
4,320,536	3/1982	Dietrich	455/325	4,893,341	1/1990	Gehring	381/7
4,346,477	8/1982	Gordy	455/257	4,894,766	1/1990	De Agro	363/159
4,355,401	10/1982	Ikoma et al.	375/5	4,896,152	1/1990	Tiemann	340/853
4,356,558	10/1982	Owen et al.	364/724	4,902,979	2/1990	Puckette, IV	329/343
4,360,867	11/1982	Gonda	363/158	4,908,579	3/1990	Tawfik et al.	328/167
4,363,132	12/1982	Collin	455/52	4,910,752	3/1990	Yester, Jr. et al.	375/75
4,365,217	12/1982	Berger et al.	333/165	4,914,405	4/1990	Wells	331/25
4,370,572	1/1983	Cosand et al.	307/353	4,920,510	4/1990	Senderowicz et al.	364/825
4,389,579	6/1983	Stein	307/353	4,922,452	5/1990	Larsen et al.	365/45
				4,931,921	6/1990	Anderson	363/163
				4,944,025	7/1990	Gehring et al.	455/207

4,955,079	9/1990	Connerney et al.	455/325	5,412,352	5/1995	Graham	332/103
4,965,467	10/1990	Bilteerijst	307/352	5,416,803	5/1995	Janer	375/324
4,967,160	10/1990	Quievy et al.	328/16	5,422,913	6/1995	Wilkinson	375/347
4,970,703	11/1990	Hariharan et al.	367/138	5,423,082	6/1995	Cygan et al.	455/126
4,982,353	1/1991	Jacob et al.	364/724.1	5,428,638	6/1995	Cioffi et al.	375/224
4,984,077	1/1991	Uchida	358/140	5,428,640	6/1995	Townley	375/257
4,995,055	2/1991	Weinberger et al.	375/5	5,434,546	7/1995	Palmer	332/151
5,005,169	4/1991	Bronder et al.	370/76	5,438,692	8/1995	Mohindra	455/324
5,006,810	4/1991	Popescu	328/167	5,444,415	8/1995	Dent et al.	329/302
5,010,585	4/1991	Garcia	455/118	5,444,416	8/1995	Ishikawa et al.	329/341
5,014,304	5/1991	Nicollini et al.	379/399	5,444,865	8/1995	Heck et al.	455/86
5,015,963	5/1991	Sutton	329/361	5,446,421	8/1995	Kechkaylo	332/100
5,017,924	5/1991	Guiberteau et al.	342/195	5,446,422	8/1995	Mattila et al.	332/103
5,020,149	5/1991	Hemmi	455/325	5,448,602	9/1995	Ohmori et al.	375/347
5,020,154	5/1991	Zierhut	455/608	5,451,899	9/1995	Lawton	329/302
5,052,050	9/1991	Collier et al.	455/296	5,454,007	9/1995	Dutta	375/322
5,065,409	11/1991	Hughes et al.	375/91	5,454,009	9/1995	Fruit et al.	372/202
5,091,921	2/1992	Minami	375/88	5,463,356	10/1995	Palmer	332/117
5,095,533	3/1992	Loper et al.	455/245	5,463,357	10/1995	Hobden	332/151
5,095,536	3/1992	Loper	455/324	5,465,071	11/1995	Kobayashi et al.	329/315
5,111,152	5/1992	Makino	329/300	5,465,410	11/1995	Hiben et al.	455/266
5,113,094	5/1992	Grace et al.	307/529	5,465,415	11/1995	Bien	455/326
5,113,129	5/1992	Hughes	323/316	5,471,162	11/1995	McEwan	327/92
5,122,765	6/1992	Pataut	332/105	5,479,120	12/1995	McEwan	327/91
5,124,592	6/1992	Hagino	307/520	5,479,447	12/1995	Chow et al.	375/260
5,136,267	8/1992	Cabot	333/174	5,483,193	1/1996	Kennedy et al.	329/300
5,140,705	8/1992	Kosuga	455/318	5,483,549	1/1996	Weinberg et al.	375/200
5,150,124	9/1992	Moore et al.	342/68	5,483,691	1/1996	Heck et al.	455/234.2
5,151,661	9/1992	Caldwell et al.	328/14	5,490,173	2/1996	Whitehart et al.	375/316
5,159,710	10/1992	Cusdin	455/304	5,493,581	2/1996	Young et al.	375/350
5,170,414	12/1992	Silvian	375/59	5,495,200	2/1996	Kwan et al.	327/554
5,172,070	12/1992	Hiraiwa et al.	329/304	5,495,202	2/1996	Hsu	327/113
5,191,459	3/1993	Thompson et al.	359/133	5,495,500	2/1996	Jovanovich et al.	375/206
5,204,642	4/1993	Ashgar et al.	331/135	5,499,267	3/1996	Ohe et al.	375/206
5,212,827	5/1993	Meszko et al.	455/219	5,500,758	3/1996	Thompson et al.	359/189
5,214,787	5/1993	Karkota, Jr.	455/3.2	5,517,688	5/1996	Fajen et al.	455/333
5,220,583	6/1993	Solomon	375/82	5,519,890	5/1996	Pinckley	455/307
5,220,680	6/1993	Lee	455/102	5,523,719	6/1996	Longo et al.	327/557
5,222,144	6/1993	Whitehart	381/15	5,523,726	6/1996	Kroeger et al.	332/103
5,230,097	7/1993	Currie et al.	455/226.1	5,523,760	6/1996	McEwan	342/89
5,239,686	8/1993	Downey	455/78	5,539,770	7/1996	Ishigaki	375/206
5,241,561	8/1993	Barnard	375/1	5,555,453	9/1996	Kajimoto et al.	455/266
5,249,203	9/1993	Loper	375/97	5,557,642	9/1996	Williams	375/316
5,251,218	10/1993	Stone et al.	370/120	5,579,341	11/1996	Smith et al.	375/267
5,251,232	10/1993	Nonami	375/5	5,579,347	11/1996	Lindquist et al.	375/346
5,260,970	11/1993	Henry et al.	375/10	5,584,068	12/1996	Mohindra	455/324
5,263,194	11/1993	Ragan	455/316	5,592,131	1/1997	Labreche et al.	332/103
5,263,196	11/1993	Jasper	455/324	5,602,847	2/1997	Pagano et al.	370/484
5,267,023	11/1993	Kawasaki	358/23	5,602,868	2/1997	Wilson	375/219
5,278,826	1/1994	Murphy et al.	370/76	5,604,732	2/1997	Kim et al.	370/342
5,282,023	1/1994	Scarpa	358/36	5,608,531	3/1997	Honda et al.	386/1
5,287,516	2/1994	Schaub	375/88	5,610,946	3/1997	Tanaka et al.	375/269
5,293,398	3/1994	Hamao et al.	375/1	5,617,451	4/1997	Mimura et al.	375/340
5,303,417	4/1994	Laws	455/314	5,619,538	4/1997	Sempel et al.	375/328
5,307,517	4/1994	Rich	455/306	5,621,455	4/1997	Rogers et al.	348/6
5,315,583	5/1994	Murphy et al.	370/18	5,630,227	5/1997	Bella et al.	455/324
5,321,852	6/1994	Seong	455/182.1	5,640,415	6/1997	Pandula	375/202
5,325,204	6/1994	Scarpa	348/607	5,640,424	6/1997	Banavong et al.	375/316
5,337,014	8/1994	Najle et al.	324/613	5,640,428	6/1997	Abe et al.	375/334
5,339,054	8/1994	Taguchi	332/100	5,640,698	6/1997	Shen et al.	455/323
5,339,459	8/1994	Schiltz et al.	455/333	5,648,985	7/1997	Bjerede et al.	375/219
5,355,114	10/1994	Sutterlin et al.	340/310 A	5,650,785	7/1997	Rodal	342/357
5,361,408	11/1994	Watanabe et al.	455/324	5,663,878	9/1997	Walker	363/159
5,369,800	11/1994	Takagi et al.	455/59	5,663,986	9/1997	Striffler	375/260
5,375,146	12/1994	Chalmers	375/103	5,668,836	9/1997	Smith et al.	375/316
5,379,040	1/1995	Mizomoto et al.	341/143	5,680,078	10/1997	Arii	332/178
5,379,141	1/1995	Thompson et al.	359/125	5,680,418	10/1997	Croft et al.	375/346
5,388,063	2/1995	Takatori et al.	364/724.17	5,689,413	11/1997	Jaramillo et al.	363/146
5,390,364	2/1995	Webster et al.	455/52.3	5,699,006	12/1997	Zelev et al.	327/341
5,400,084	3/1995	Scarpa	348/624	5,705,955	1/1998	Freeburg et al.	331/14
5,404,127	4/1995	Lee et al.	340/310.02	5,710,998	1/1998	Opas	455/324
5,410,541	4/1995	Hotto	370/76	5,714,910	2/1998	Skoczen et al.	331/3

5,715,281	2/1998	Bly et al.	375/344
5,721,514	2/1998	Crockett et al.	331/3
5,724,002	3/1998	Hulick	329/361
5,724,653	3/1998	Baker et al.	455/296
5,729,577	3/1998	Chen	375/334
5,729,829	3/1998	Talwar et al.	455/63
5,732,333	3/1998	Cox et al.	455/126
5,736,895	4/1998	Yu et al.	327/554
5,737,035	4/1998	Rotzoll	348/725
5,742,189	4/1998	Yoshida et al.	327/113
5,748,683	5/1998	Smith et al.	375/347
5,760,645	6/1998	Comte et al.	329/304
5,764,087	6/1998	Clark	327/105
5,767,726	6/1998	Wang	327/356
5,768,118	6/1998	Faulk et al.	363/72
5,771,442	6/1998	Wang et al.	455/93
5,777,692	7/1998	Ghosh	348/725
5,777,771	7/1998	Smith	359/180
5,786,844	7/1998	Rogers et al.	348/6
5,793,801	8/1998	Fertner	375/219
5,802,463	9/1998	Zuckerman	455/208
5,809,060	9/1998	Cafarella et al.	375/206
5,818,582	10/1998	Fernandez et al.	356/318
5,825,254	10/1998	Lee	331/25
5,834,985	11/1998	Sundegård	332/100
5,864,754	1/1999	Hotto	455/280
5,881,375	3/1999	Bonds	455/118
5,892,380	4/1999	Quist	327/172
5,894,239	4/1999	Bonaccio et al.	327/176
5,896,562	4/1999	Heinonen	455/76
5,900,747	5/1999	Brauns	327/9
5,901,054	5/1999	Leu et al.	363/41
5,901,187	5/1999	Iinuma	375/347
5,901,344	5/1999	Opas	455/76
5,901,347	5/1999	Chambers et al.	455/234.1
5,901,348	5/1999	Bang et al.	455/254
5,901,349	5/1999	Guegnaud et al.	455/302
5,903,178	5/1999	Miyatsuji et al.	327/308
5,903,187	5/1999	Claverie et al.	329/342
5,903,196	5/1999	Salvi et al.	331/16
5,903,421	5/1999	Furutani et al.	361/58
5,903,553	5/1999	Sakamoto et al.	370/338
5,903,595	5/1999	Suzuki	375/207
5,903,609	5/1999	Kool et al.	375/261
5,903,827	5/1999	Kenan et al.	455/326
5,903,854	5/1999	Abe et al.	455/575
5,905,449	5/1999	Tsubouchi et al.	340/825.69
5,907,149	5/1999	Marckini	235/487
5,907,197	5/1999	Faulk	307/119
5,911,116	6/1999	Nosswitz	455/83
5,911,123	6/1999	Shaffer et al.	455/554
5,914,622	6/1999	Inoue	327/172
5,920,199	7/1999	Sauer	324/678
5,943,370	8/1999	Smith	375/334

OTHER PUBLICATIONS

Al-Ahmad, H.A.M. et al., "Doppler Frequency Correction for a Non-Geostationary Communications Satellite. Techniques for CERS and T-SAT," *Electronics Division Colloquium on Low Noise Oscillators and Synthesizer*, Jan. 23, 1986, pp. 4/1-4/5.

Ali, I. et al., "Doppler Characterization for LEO Satellites," *IEEE Transactions On Communications*, vol. 46, No. 3, Mar. 1998, pp. 309-313.

Allan, D.W., "Statistics of Atomic Frequency Standards," *Proc. Of the IEEE Special Issue on Frequency Stability*, Feb. 1966, pp. 221-230.

Allstot, D.J. et al., "MOS Switched Capacitor Ladder Filters," *IEEE Journal of Solid-State Circuits*, vol. SC-13, No. 6, Dec. 1978, pp. 806-814.

Allstot, D.J. and Black, W.C. Jr., "Technological Design Considerations for Monolithic MOS Switched-Capacitor Filtering Systems," *Proceedings of the IEEE*, vol. 71, No. 8, Aug. 1983, pp. 967-986.

Alouini, M. et al., "Channel Characterization and Modeling for Ka-Band Very Small Aperture Terminals," *Proc. Of the IEEE*, vol. 85, No. 6, Jun. 1997, pp. 981-997.

Andreyev, G.A. and Ogarev, S.A., "Phase Distortions of Keyed Millimeter-Wave Signals in the Case of Propagation in a Turbulent Atmosphere," *Telecommunications and Radio Engineering*, vol. 43, No. 12, Dec. 1988, pp. 87-90.

Antonetti, A. et al., "Optoelectronic Sampling in the Pico-second Range," *Optics Communications*, vol. 21, No. 2, May 1977, pp. 211-214.

Austin, J. et al., "Doppler Correction of the Telecommunication Payload Oscillators in the UK T-SAT," *18th European Microwave Conference*, Sep. 12-15, 1988, pp. 851-857.

Auston, D.H., "Picosecond optoelectronic switching and gating in silicon," *Applied Physics Letters*, vol. 26, No. 3, Feb. 1, 1975, pp. 101-103.

Baher, H., "Transfer Functions for Switched-Capacitor and Wave Digital Filters," *IEEE Transactions on Circuits and Systems*, vol. CAS-33, No. 11, Nov. 1986, pp. 1138-1142.

Baines, R., "The DSP Bottleneck," *IEEE Communications Magazine*, May 1995, pp. 46-54.

Banjo, O.P. and Vilar, E. , "Binary Error Probabilities on Earth-Space Links Subject to Scintillation Fading," *Electronics Letters*, vol. 21, No. 7, Mar. 28, 1985, pp. 296-297.

Banjo, O.P. and Vilar, E. , "The Dependence of Slant Path Amplitude Scintillations on Various Meteorological Parameters," *Antennas and Propagation (ICAP 87) Part 2: Propagation*, Mar. 30-Apr. 2, 1987, pp. 277-280.

Banjo, O.P. and Vilar, E. , "Measurement and Modeling of Amplitude Scintillations on Low-Elevation Earth-Space Paths and Impact on Communication Systems," *IEEE Transactions On Communications*, vol. COM-34, No. 8, Aug. 1986, pp. 774-780.

Banjo, O.P. et al., "Tropospheric Amplitude Spectra Due to Absorption and Scattering in Earth-Space Paths," *Antennas and Propagation (ICAP 85)*, Apr. 16-19, 1985, pp. 77-82.

Basili, P. et al., "Case Study of Intense Scintillation Events on the OTS Path," *IEEE Transactions On Antennas and Propagation*, vol. 38, No. 1, Jan. 1990, pp. 107-113.

Basili, P. et al., "Observation of High C² and Turbulent Path Length on OTS Space-Earth Link," *Electronics Letters*, vol. 24, No. 17, Aug. 18, 1988, pp. 1114-1116.

Blakey, J.R. et al., "Measurement of Atmospheric Millimetre-Wave Phase Scintillations in an Absorption Region," *Electronics Letters*, vol. 21, No. 11, May 23, 1985, pp. 486-487.

Burgueño, A. et al., "Influence of rain gauge integration time on the rain rate statistics used in microwave communications," *Annales des Telecommunications*, Sep./Oct. 1988, pp. 522-527.

Burgueño, A. et al., "Long-Term Joint Statistical Analysis of Duration and Intensity of Rainfall Rate with Application to Microwave Communications," *Antennas and Propagation (ICAP 87) Part 2: Propagation*, Mar. 30-Apr. 2, 1987, pp. 198-201.

Burgueño, A. et al., "Long Term Statistics of Precipitation Rate Return Periods in the Context of Microwave Communications," *Antennas and Propagation (ICAP 89) Part 2: Propagation*, Apr. 4-7, 1989, pp. 297-301.

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.