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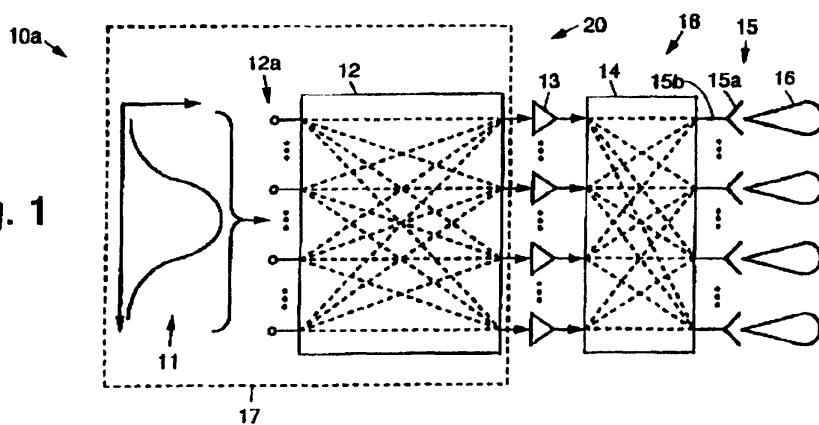
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(54) Intermodulation scattering communications apparatus

(57) Multiple beam, multi-frequency communication apparatus (10) that provides for significant intermodulation scattering improvements for multiple beam, multi-frequency communications systems implemented using directly radiating active phased array (15), or multi-feed reflector systems fed from composite, multiple shared transmit amplifiers (13). The multiple beam, multi-frequency communications apparatus (10) comprises a defocused antenna array (15) having a plurality of antenna elements (15a) and a plurality of feeds (15b). A hybrid amplifier structure (18) is coupled to the feeds (15b) of the defocused antenna array (15) and shares the plurality of transmit amplifiers (13) among the feeds (15b) of the antenna array (15). Assignment apparatus

(20) is coupled to the hybrid amplifier structure (18) for assigning particular transmit amplifier (13) to be contributors to particular beams (16) radiated by the antenna array (15) in response to a desired beam profile (11). Improvements result from judicially combining the effects of the shared transmit amplifiers (13) (that carry all the signals in the frequency reuse system), with phasing effects inherent in the multiple beam radiating structure in order to realize the desired zonal frequency reuse pattern 21. An optimal assignment algorithm implemented in the assignment apparatus (20) results in a uniform distribution of power over the transmit amplifiers (13), resulting in corresponding improvements in system performance in the far field.

Fig. 1





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EUROPEAN SEARCH REPORT

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 88 01456 A (HUGHES AIRCRAFT CO) 25 February 1988 * page 12, line 27 - page 13, line 4 * * page 15, line 13 - page 16, line 27; figures 1-3,6 * ---	1,2,4-6, 8	H01025/00 H01021/22 H0103/26
X	GB 2 281 009 A (NORTHERN TELECOM LTD) 15 February 1995 * page 6, line 34 - page 9, line 12; figure 6 *	1,2,5,6	
A	US 5 132 694 A (SREENIVAS AJAY) 21 July 1992 * column 5, line 50 - column 7, line 25; figures 3,4 *	1,5	
A	EGAMI S AND KAWAI M: "An Adaptive Multiple Beam System Concept" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, vol. SAC-5, no. 4, May 1987, pages 630-636, XP002099075 New York, USA * section III: characteristics of the 'hybrid transponder' *	1,5	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	ROEDERER A G: "SEMI-ACTIVE REFLECTOR ANTENNAS" PROCEEDINGS OF THE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM (APSI), ANN ARBOR, JUNE 28 - JULY 2, 1993, vol. 3, 28 June 1993, pages 1338-1341, XP000452529 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS * the whole document *	1,5	H01Q H03F
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	7 April 1999	Van Dooren, G	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 97 30 0507

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07-04-1999

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
WO 8801456 A	25-02-1988	US	4819227 A		04-04-1989
		CA	1278114 A		18-12-1990
		CN	1007396 B		28-03-1990
		DE	3781397 A		01-10-1992
		EP	0277205 A		10-08-1988
		JP	1500478 T		16-02-1989
		JP	2650700 B		03-09-1997
		US	4879711 A		07-11-1989
<hr/>					
GB 2281009 A	15-02-1995	EP	0647978 A		12-04-1995
		EP	0647979 A		12-04-1995
		EP	0647980 A		12-04-1995
		EP	0647981 A		12-04-1995
		EP	0647982 A		12-04-1995
		EP	0647983 A		12-04-1995
		EP	0639035 A		15-02-1995
		JP	7079476 A		20-03-1995
		US	5596329 A		21-01-1997
		US	5570098 A		29-10-1996
<hr/>					
US 5132694 A	21-07-1992	US	5093668 A		03-03-1992
		EP	0405372 A		02-01-1991
		JP	3038901 A		20-02-1991
<hr/>					