Claims

1. An active antenna arrangement (20; 30; 50) for transmitting precoded signals in a communication system (100) supporting multi-stream beam-forming, the active antenna arrangement (20; 30; 50) comprising:

- three or more active antenna devices (21, 22, 23; 31, 32, 33, 34, 35; 51, 52, 53, 54, 55, 56) each comprising an antenna element (24) and a power amplifier (25),

- a first splitter (26; 41; 63), operatively connected to a first active antenna device (21; 31; 51) and a second splitter (27; 42; 64), operatively connected to a third active antenna device (23; 33; 53), each splitter arranged to split a respective precoded signal S_1, S_2 into two or more split precoded signals, and

- a first combiner (28; 45; 58) operatively connected to a second active antenna device (22; 32; 52), the first combiner (28; 45; 58) arranged to:

- receive one of the two or more split precoded signals from the first splitter (26; 41; 63), and one of the two or more split precoded signals from the second splitter (27; 42; 64), and

- combine the received split precoded signals for transmission by the second active antenna device (22; 32; 52), and wherein

- the three or more active antenna devices (21, 22, 23; 31, 32, 33, 34, 35; 51, 52, 53, 54, 55, 56) are connected in pairs, the first active antenna element (2) transmitting part of the precoded signal S_1, the second active antenna element (22) transmitting part of the precoded signal S_1 and part of the precoded signal S_2 as combined by the first combiner (28; 45; 58), and the third active antenna element (23) transmitting part of the precoded signal S_3.

2. The active antenna arrangement (20; 30; 50) as claimed in claim 1, wherein the first and second splitters (26, 41, 63; 27, 42, 64) each comprises a microstrip line comprising a first end to which one of the precoded signals is applied and an opposite end being divided

into two or more parts, each part taking a predetermined amount of power of the applied precoded signal.

3. The active antenna arrangement (20; 30; 50) as claimed in claim 2, wherein the opposite end of the microstrip line is divided into two parts, and designed so that the predetermined amount of power for a first of the two parts lies within the range of 40 to 60 % of the power of the applied precoded signal.

4. The active antenna arrangement (20; 30; 50) as claimed in claim 12, ~~further~~ comprising a third splitter (65) and wherein each of the first, second and third splitters (63, 64, 65) comprises a three-way splitter~~operatively connected to a fifth active antenna device (55), a fourth splitter (66) operatively connected to a sixth active antenna device (56), the first splitter (63), operatively connected to the first active antenna device (51) and the second splitter (64), operatively connected to the third active antenna device (53), each splitter (63, 64, 65, 66) comprising a microstrip line comprising a first end to which one of the precoded signals is applied and an opposite end being divided into three parts, each part taking a predetermined amount of power of the applied precoded signal, each splitter (63, 64, 65, 66) arranged to split the respective precoded signal into three split precoded signals, and wherein the first combiner (58) is operatively connected to the second active antenna device (52), the active antenna arrangement (50) further comprising a second combiner (59) operatively connected to the first splitter (63), the second splitter (64) and the third splitter (65), and a third combiner (60) operatively connected to the second splitter (64), the third splitter (65) and the fourth splitter (66), and a fourth combiner (61) operatively connected to the third splitter (65) and the fourth splitter (66), the second combiner (59) arranged to:~~

~~- receive one of the three split precoded signals from the first splitter (63), one of the three split precoded signals from the second splitter (64), and one of the three split precoded signals from the third splitter (65)~~

~~- combine the received split precoded signals for transmission by the third active antenna device (53),~~

~~the third combiner (60) arranged to:~~

~~- receive one of the three split precoded signals from the second splitter (64), one of the three split precoded signals from the third splitter (65), and one of the three split precoded signals from the fourth splitter (66), and~~

~~- combine the received split precoded signals for transmission by the fourth active antenna device (54),~~

~~the fourth combiner (61) arranged to:~~

~~- receive one of the three split precoded signals from the third splitter (65), and one of the three split precoded signals from the fourth splitter (66), and~~

~~- combine the received split precoded signals for transmission by the fifth active antenna device (55)~~.

5. The active antenna arrangement (20; 30; 50) as claimed in claim 4, wherein the combiner (59) is operatively coupled to the first, the second and the third splitter (63, 64, 65) so as to receive one of the three split precoded signals from the first splitter (63), one of the three split precoded signals from the second splitter (64) and one of the three split precoded signal from the third splitter (65).

~~6~~5. The active antenna arrangement (20; 30; 50) as claimed in any of the preceding claims, wherein consecutive antenna elements (24) are arranged with a spacing in the range from 0.4 wavelengths to 0.6 wavelengths.

~~7~~6. A base station (110) for transmitting precoded signals in a communication system (100) supporting multi-stream beam-forming, the base station (110) comprising an active antenna arrangement (20; 30; 50) as claimed in any of the preceding claims.

87. A method (150) in a base station (110) for transmitting precoded signals in a communication system (100) supporting multi-stream beam-forming, the base station (110) comprising an active antenna arrangement as claimed in claim 1, the method comprising:

- applying (151) a respective precoded signal to the first splitter (26; 41; 63) and the second splitter (27; 42; 64),

- splitting (152), by each of the first and second splitter, a respective one of the applied precoded signals into two or more split precoded signals,

- receiving (153), in the first combiner (28; 45; 58), one of the two or more split precoded signals from the first splitter, and one of the two or more split precoded signals from the second splitter, and

- connecting the three or more active antenna devices (21, 22, 23; 31, 32, 33, 34, 35; 51, 52, 53, 54, 55, 56) in pairs,

- transmitting, by the first active antenna element (21), part of the precoded signal S_1,

- transmitting ~~(154)~~, by the second active antenna element (22), part of the precoded signal S_1 and part of the precoded signal S_2 as combined by the first combiner (28; 45; 58), and ~~device (22; 32; 52) the received split precoded signals~~

transmitting, by the third active antenna element (23), part of the precoded signal S_3.

98. A computer program (113) for a base station (110) for transmitting precoded signals in a communication system (100) supporting multi-stream beam-forming, the base station (110) comprising an active antenna arrangement as claimed in claim 1, the computer program (113) comprising computer program code which, when run on a processor (111) of the base station (110), causes the base station (110) to:

- apply a respective precoded signal to the first splitter (26; 41; 63) and the second splitter (27; 42; 64),

- split, by each of the first and second splitter (26; 41; 63; 27; 42; 64), a respective one of the applied precoded signals into two or more split precoded signals,

- receive, in the first combiner (28; 45; 58), one of the two or more split precoded signals from the first splitter, and one of the two or more split precoded signals from the second splitter, and

~~- transmit (154), by the second active antenna device (22; 32; 52) the received split precoded signals~~transmit, by the first active antenna element (21), part of the precoded signal S_1,

- transmit, by the second active antenna element (22), part of the precoded signal S_1 and part of the precoded signal S_2 as combined by the first combiner (28; 45; 58), and

- transmit, by the third active antenna element (23), part of the precoded signal S_3.

10~~9~~. A computer program product (112) comprising a computer program (113) according to claim 9~~8~~, and a computer readable means (114) on which the computer program (113) is stored.