|  |
| --- |
| For certain M and L, among all the proposed binary sequences, 4 sequences will be selected by following below:* Step 1: sequences are ranked in terms of sync accuracy, and sync accuracy margin is set to provide tolerance on median operation over cross-checking results.

Note: For the sequences fall within the margin, they are considered as similar sync accuracy.* For each sequence, median value among all the cross-checked values is picked up for comparison
* Margin value: # of samples (0.13 us)
	+ For M=1, M=2: 2 samples
	+ For M=4: 1 sample

Note: if the number of sequences within the margin is smaller than 4, the margin can be extended to count in a set of 4 sequences from the same company.* Step 2: for the sequences falling within the margin, further check the cross-correlation:
* **Alt 1**: within the margin, **4 sequences from the same company** are selected, if more than 1 sets are picked up, the cross-correlation results are compared for such sets. The median value of cross-checked cross-correlation results is used for comparison. Sync accuracy may also be considered for comparing different sets.
	+ Cross-correlation value, for a set :
		- For one cross-checking result, use the **maximum** cross- correlation value of the 4 sequences to represent the set
		- Median value for the cross-correlation of all the cross-checking results for the set is used
* Step 3 : Select one set with the smallest cross-correlation value ; another set with the best sync accuray (the worst sync wihin the set is used to represent the set)
 |

In the following, set 1 and set 2 accroding to above 3 steps are provided for each M & L combinations. Set 1 is the one set with smallest cross-correlation value in the step 3. Set 2 is the one set with the best sync accuray in the step 3.

* M=1, L=4，Set 1 & set2

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 4 | 3.000  | 2 vivo86 CATT207 docomo304 OPPO335 Ericsson383 Apple |
| 5 | 3.960  | 1 vivo75 Panasonic88 CATT206 docomo333 Ericsson381 Apple |
| 2 | 4.840  | 3 vivo74 Panasonic87 CATT302 OPPO334 Ericsson382 Apple |
| 3 | 9.268  | 4 vivo85 CATT303 OPPO336 Ericsson384 Apple |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| vivo,CATT,Ericsson,Apple {2,3,4,5} | 0.75 | 9.26 us |
| Set1 : selected sequence: vivo,CATT,Ericsson,Apple {2,3,4,5},maximum cross correlation value of the 4 sequences =0.75Set2 : selected sequence: vivo,CATT,Ericsson,Apple {2,3,4,5},the maximum timing error (worst sync) within the set = 9.26usNote :margin=49 sample |
|  |

**Proposal 1:** For M=1, L=4 (if supported), the set of LP-SS binary sequences is:

[0 1 0 1]

[0 1 1 0]

[1 0 0 1]

[1 0 1 0]

* M=1, L=6，Set 1 & set2

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 6 | 2.580  | 306 OPPO8 vivo117 ZTE Corporation, Sanechips123 ZTE Corporation, Sanechips387 Apple |
| 4 | 2.840  | 7 vivo118 ZTE Corporation, Sanechips124 ZTE Corporation, Sanechips305 OPPO388 Apple |
| 1 | 3.583  | 386 Apple6 vivo119 ZTE Corporation, Sanechips122 ZTE Corporation, Sanechips340 Ericsson |
| 7 | 3.663  | 5 vivo120 ZTE Corporation, Sanechips121 ZTE Corporation, Sanechips337 Ericsson385 Apple |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| vivo,ZTE,Apple {7,1,4,6} | 1 | 3.663us |
| Set1 : selected sequence:{7,1,4,6},maximum cross correlation value of the 4 sequences = 1Set2 : selected sequence:{7,1,4,6},the maximum timing error (worst sync) within the set = 3.663usNote :margin=9 sample |
|  |

**Proposal 2:** For M=1, L=6 (if supported), the set of LP-SS sequence is:

[1 0 1 0 1 0]

[0 1 0 1 0 1]

[1 0 0 1 0 1]

[1 0 1 0 0 1]

* M=1, L=8，Set 1 & set2

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 10 | 2.953  | 10 vivo92 CATT126 ZTE Corporation, Sanechips130 ZTE Corporation, Sanechips263 Qualcomm295 Samsung310 OPPO389 Apple |
| 12 | 3.048  | 11 vivo264 Qualcomm296 Samsung127 ZTE Corporation, Sanechips131 ZTE Corporation, Sanechips311 OPPO390 Apple344 Ericsson |
| 8 | 3.516  | 12 vivo128 ZTE Corporation, Sanechips132 ZTE Corporation, Sanechips262 Qualcomm294 Samsung309 OPPO |
| 1 | 3.711  | 125 ZTE Corporation, Sanechips129 ZTE Corporation, Sanechips261 Qualcomm293 Samsung |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| ZTE,QC,Samsung {1,10,12,8} | 0.75 | 3.711us |
| Set1 : selected sequence:{ 1,10,12,8},maximum cross correlation value of the 4 sequences = 0.75Set2 : selected sequence:{ 1,10,12,8},the maximum timing error (worst sync) within the set = 3.711usNote :margin=8 sample |
|  |

**Proposal 3:** For M=1, L=8 (if supported), the set of LP-SS sequence is:

[1 0 1 0 0 1 0 1]

[1 0 1 0 1 0 0 1]

[1 0 0 1 0 1 0 1]

[0 1 0 1 0 1 0 1]

* M=2, L=8，Set 1 & set2

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 5 | 1.302  | 16 vivo135 ZTE Corporation, Sanechips266 Qualcomm395 Apple |
| 3 | 1.310  | 265 Qualcomm15 vivo |
| 7 | 1.430  | 93 CATT133 ZTE Corporation, Sanechips139 ZTE Corporation, Sanechips141 ZTE Corporation, Sanechips145 ZTE Corporation, Sanechips237 LGE267 Qualcomm13 vivo |
| 11 | 1.430  | 35 Nokia79 Panasonic95 CATT240 LGE268 Qualcomm |
| 12 | 1.465  | 347 Ericsson14 vivo134 ZTE Corporation, Sanechips143 ZTE Corporation, Sanechips147 ZTE Corporation, Sanechips80 Panasonic |
| 4 | 1.497  | 34 Nokia94 CATT239 LGE |
| 6 | 1.500  | 348 Ericsson |
| 14 | 1.560  | 36 Nokia96 CATT136 ZTE Corporation, Sanechips238 LGE299 Samsung393 Apple |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| Vivo {7,12,3,5} | 0.75 | 1.465us |
| ZTE {7,12,5,14} | 0.75 | 1.560us |
| CATT,LGE {7,4,11,14} | 0.75 | 1.560us |
| QC {3,5,7,11} | 0.75 | 1.430 us |
| Set1 : selected sequence: vivo{ 7,12,3,5 }，ZTE{7,12,5,14}，CATT,LGE{7,4,11,14}, QC {3,5,7,11}maximum cross correlation value of the 4 sequences = 0.75Set2 : selected sequence: QC {3,5,7,11},the maximum timing error (worst sync) within the set = 1.430usNote :margin=2 sample |

**Proposal 4:** For M=2, L=8 (if supported), the set of LP-SS sequence is down-selected among:

vivo:

[0 1 1 0 1 0 0 1]

[1 0 0 1 1 0 0 1]

[0 1 0 1 1 0 0 1]

[0 1 1 0 0 1 0 1]

ZTE:

[0 1 1 0 1 0 0 1]

[1 0 0 1 1 0 0 1]

[0 1 1 0 0 1 0 1]

[1 0 1 0 0 1 0 1]

CATT, LG:

[0 1 1 0 1 0 0 1]

[ 1 0 1 0 0 1 0 1]

[0 1 0 1 1 0 1 0]

[1 0 0 1 0 1 1 0]

QC:

[0 1 0 1 1 0 0 1]

[0 1 1 0 0 1 0 1]

[0 1 1 0 1 0 0 1]

[1 0 0 1 0 1 1 0]

* M=2, L=12，Set 1 & set2

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 14 | 0.906  | 149 ZTE Corporation, Sanechips160 ZTE Corporation, Sanechips164 ZTE Corporation, Sanechips |
| 5 | 0.998  | 20 vivo151 ZTE Corporation, Sanechips156 ZTE Corporation, Sanechips157 ZTE Corporation, Sanechips161 ZTE Corporation, Sanechips |
| 7 | 1.004  | 18 vivo150 ZTE Corporation, Sanechips158 ZTE Corporation, Sanechips162 ZTE Corporation, Sanechips |
| 17 | 1.074  | 39 Nokia |
| 4 | 1.100  | 152 ZTE Corporation, Sanechips351 Ericsson |
| 15 | 1.100  | 350 Ericsson |
| 12 | 1.151  | 17 vivo |
| 18 | 1.300  | 153 ZTE Corporation, Sanechips159 ZTE Corporation, Sanechips163 ZTE Corporation, Sanechips |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| ZTE { 14,7,5,4} | 0.833 | 1.100us |
| Set1 : selected sequence: ZTE {14,7,5,4}, maximum cross correlation value of the 4 sequences = 0.833Set2 : selected sequence: ZTE {14,7,5,4},the maximum timing error (worst sync) within the set = 1.100usNote :margin=2 sample |

**Proposal 5:** For M=2, L=12 (if supported), the set of LP-SS sequence is:

[1 0 0 1 1 0 0 1 1 0 0 1]

[0 1 1 0 1 0 0 1 1 0 0 1]

[0 1 1 0 0 1 1 0 1 0 0 1]

[0 1 1 0 0 1 0 1 1 0 0 1]

* M=2, L=16，Set 1 & set2

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 28 | 0.782  | 256 Huawei271 Qualcomm |
| 34 | 0.782  | 272 Qualcomm |
| 22 | 0.789  | 21 vivo |
| 7 | 0.792  | 253 Huawei |
| 4 | 0.792  | 165 ZTE Corporation, Sanechips354 Ericsson |
| 38 | 0.797  | 23 vivo |
| 20 | 0.819  | 269 Qualcomm |
| 25 | 0.822  | 22 vivo |
| 24 | 0.831  | 24 vivo270 Qualcomm |
| 26 | 0.840  | 168 ZTE Corporation, Sanechips175 ZTE Corporation, Sanechips179 ZTE Corporation, Sanechips355 Ericsson |
| 36 | 0.879  | 99 CATT170 ZTE Corporation, Sanechips |
| 39 | 0.894  | 100 CATT292 MTK |
| 12 | 0.910  | 291 MTK |
| 5 | 0.910  | 166 ZTE Corporation, Sanechips |
| 9 | 0.910  | 167 ZTE Corporation, Sanechips |
| 13 | 0.911  | 98 CATT |
| 33 | 0.911  | 289 MTK |
| 11 | 0.913  | 97 CATT |
| 2 | 0.913  | 255 Huawei |
| 6 | 0.913  | 290 MTK |
| 8 | 0.913  | 254 Huawei |
| 10 | 0.976  | 171 ZTE Corporation, Sanechips |
| 30 | 0.976  | 403 Apple |
| 40 | 0.976  | 404 Apple |
| 23 | 0.986  | 242 LGE |
| 32 | 1.011  | 401 Apple |
| 41 | 1.041  | 172 ZTE Corporation, Sanechips |
| 35 | 1.042  | 174 ZTE Corporation, Sanechips178 ZTE Corporation, Sanechips |
| 27 | 1.042  | 173 ZTE Corporation, Sanechips177 ZTE Corporation, Sanechips |
| 29 | 1.042  | 176 ZTE Corporation, Sanechips180 ZTE Corporation, Sanechips |
| 3 | 1.042  | 244 LGE |
| 21 | 1.042  | 243 LGE |
| 37 | 1.042  | 241 LGE |
| 19 | 1.042  | 402 Apple |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| vivo{22,25,38,24} | 0.750 | 0.831us |
| ZTE{4,5,9,26} | 0.875 | 0.910us |
| ZTE{ 27,35,26,29} | 0.750 | 1.042us |
| Huawei{7,8,2,28} | 0.625 | 0.913us |
| QC{20,24,28,34} | 0.625 | 0.831us |
| MTK{33,6,12,39} | 0.625 | 0.913us |
| Apple{32,19,30,40} | 0.625 | 1.042us |
| CATT{11,13,36,39} | 0.875 | 0.913us |
| LGE{ 37,23,21,3} | 0.750 | 1.042us |
| Set1 : selected sequence: Huawei{7,8,2,28}, QC{20,24,28,34}, MTK{33,6,12,39},Apple{32,19,30,40}, maximum cross correlation value of the 4 sequences = 0.625Set2 : selected sequence: vivo{22,25,38,24}, QC{20,24,28,34},the maximum timing error (worst sync) within the set = 0.913usNote :margin=2 sample |

**Proposal 6:** For M=2, L=16 (if supported), the set of LP-SS sequence is down-selected among:

Huawei:

[0 1 1 0 0 1 1 0 1 0 1 0 1 0 0 1]

[0 1 1 0 1 0 0 1 0 1 0 1 1 0 0 1]

[0 1 0 1 1 0 1 0 0 1 1 0 0 1 0 1]

[1 0 0 1 1 0 1 0 0 1 0 1 1 0 0 1]

QC:

[1 0 0 1 0 1 0 1 1 0 0 1 1 0 0 1]

[1 0 0 1 1 0 0 1 0 1 1 0 0 1 0 1]

[1 0 0 1 1 0 1 0 0 1 0 1 1 0 0 1]

[1 0 1 0 0 1 1 0 0 1 1 0 0 1 0 1]

MTK:

[1 0 1 0 0 1 1 0 0 1 0 1 0 1 1 0]

[0 1 1 0 0 1 1 0 1 0 0 1 0 1 0 1]

[0 1 1 0 1 0 1 0 0 1 1 0 0 1 1 0]

[1 0 1 0 1 0 0 1 1 0 1 0 0 1 1 0]

Apple:

[1 0 1 0 0 1 0 1 1 0 0 1 0 1 0 1]

[1 0 0 1 0 1 0 1 0 1 0 1 1 0 0 1]

[1 0 0 1 1 0 1 0 1 0 1 0 0 1 0 1]

[1 0 1 0 1 0 0 1 1 0 1 0 1 0 0 1]

vivo:

[1 0 0 1 0 1 1 0 0 1 1 0 1 0 0 1]

[1 0 0 1 1 0 0 1 1 0 0 1 0 1 0 1]

[1 0 1 0 1 0 0 1 1 0 0 1 1 0 0 1]

[1 0 0 1 1 0 0 1 0 1 1 0 0 1 0 1]

* M=4, L=16，Set 1 & set2
	+ balanced ‘0’ and ‘1’ within each OFDM symbol:

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 37 | 0.815  | 25 vivo |
| 28 | 0.848  | 184 ZTE Corporation, Sanechips190 ZTE Corporation, Sanechips194 ZTE Corporation, Sanechips407 Apple |
| 34 | 0.850  | 82 Panasonic |
| 33 | 0.880  | 183 ZTE Corporation, Sanechips189 ZTE Corporation, Sanechips193 ZTE Corporation, Sanechips |
| 48 | 0.911  | 192 ZTE Corporation, Sanechips196 ZTE Corporation, Sanechips |
| 39 | 0.911  | 408 Apple |
| 41 | 0.933  | 27 vivo |
| 12 | 0.944  | 181 ZTE Corporation, Sanechips |
| 15 | 0.945  | 105 CATT |
| 35 | 0.976  | 187 ZTE Corporation, Sanechips |
| 16 | 0.978  | 106 CATT |
| 36 | 0.978  | 107 CATT |
| 38 | 0.978  | 108 CATT |
| 47 | 0.978  | 182 ZTE Corporation, Sanechips |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| CATT{15,16,36,38 } | 0.826 | 0.978us |
| ZTE{ 12,47,33,28} | 0.875 | 0.978us |
| Set1 : selected sequence: CATT{15,16,36,38 }, maximum cross correlation value of the 4 sequences = 0.826Set2 : selected sequence: CATT{15,16,36,38 }, ZTE{ 12,47,33,28}, the maximum timing error (worst sync) within the set = 0.978usNote : extend 1 sample to 0.163us to include a set of 4 sequences |

* M=4, L=16，Set 1 & set2
	+ unbalanced ‘0’ and ‘1’ within each OFDM symbol:

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 22 | 0.600  | 61 Futurewei |
| 1 | 0.633  | 287 MTK |
| 18 | 0.650  | 64 Futurewei |
| 20 | 0.730  | 63 Futurewei |
| 21 | 0.790  | 62 Futurewei |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| Futurewei {22,21,20,18 } | 0.5 | 0.790us |
| Set1 : selected sequence: Futurewei {22,21,20,18 }, maximum cross correlation value of the 4 sequences = 0.5Set2 : selected sequence: Futurewei {22,21,20,18 }, the maximum timing error (worst sync) within the set = 0.790usNote : margin=1 sample |

**Proposal 7:** For M=4, L=16 (if supported), the set of LP-SS sequence is down-selected among:

CATT (balanced):

[0110100110101010]

[0110101010011010]

[1010011010101001]

[1010100110100110]

ZTE (balanced):

[0 1 1 0 0 1 0 1 1 0 1 0 0 1 0 1]

[1 1 0 0 0 1 0 1 1 0 1 0 0 0 1 1]

[1 0 1 0 0 1 0 1 1 0 1 0 0 0 1 1]

[1 0 0 1 1 0 1 0 1 0 1 0 0 1 0 1]

Futurewei (unbalanced):

[1 0 0 0 1 0 0 0 0 0 0 1 0 0 1 0]

[1 0 0 0 0 1 0 0 1 0 0 0 0 0 1 0]

[1 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0]

[1 0 0 0 0 1 0 0 0 0 0 1 0 0 0 1]

* M=4, L=32，Set 1 & set2
	+ balanced ‘0’ and ‘1’ within each OFDM symbol:

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 17 | 0.524  | 109 CATT |
| 39 | 0.560  | 112 CATT |
| 42 | 0.570  | 29 vivo |
| 38 | 0.570  | 111 CATT |
| 33 | 0.585  | 32 vivo |
| 13 | 0.612  | 258 Huawei |
| 36 | 0.613  | 197 ZTE Corporation, Sanechips |
| 34 | 0.630  | 110 CATT |
| 45 | 0.649  | 201 ZTE Corporation, Sanechips |
| 37 | 0.650  | 200 ZTE Corporation, Sanechips |
| 41 | 0.650  | 30 vivo |
| 5 | 0.650  | 198 ZTE Corporation, Sanechips |
| 35 | 0.650  | 199 ZTE Corporation, Sanechips |
| 52 | 0.650  | 203 ZTE Corporation, Sanechips |
| 10 | 0.650  | 260 Huawei |
| 43 | 0.650  | 204 ZTE Corporation, Sanechips |
| 44 | 0.650  | 202 ZTE Corporation, Sanechips |
| 40 | 0.650  | 245 LGE |
| 11 | 0.650  | 257 Huawei |
| 8 | 0.650  | 259 Huawei |
| 28 | 0.650  | 31 vivo |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| CATT{17,34,38,39} | 0.797 | 0.630us |
| ZTE{ 36,5,35,37} | 0.883 | 0.650us |
| ZTE{45,44,52,43} | 0.938 | 0.650us |
| HW{11,13,8,10} | **0.493** | 0.650us |
| vivo{42,41,28,33} | 0.653 | 0.650us |
| Set1 : selected sequence: HW{11,13,8,10}, maximum cross correlation value of the 4 sequences = 0.493Set2 : selected sequence: CATT{17,34,38,39}, the maximum timing error (worst sync) within the set = 0.630usNote : margin=1 sample |

* + unbalanced ‘0’ and ‘1’ within each OFDM symbol:

|  |  |  |
| --- | --- | --- |
| logic sequence index | Median sync accuracy (Excluding ZTE unipolar results) (us) for each sequence | sequence index + company |
| 2 | 0.563  | 281 MTK |
| 1 | 0.651  | 282 MTK |
| 3 | 0.651  | 283 MTK |
| 4 | 0.651  | 284 MTK |
| Company + logic sequence index group  | maximum cross correlation value | maximum timing error |
| MTK{1,2,3,4} | 0.375 | 0.651us |
| Set1 : selected sequence: MTK{1,2,3,4}, maximum cross correlation value of the 4 sequences = 0.375Set2 : selected sequence: MTK{1,2,3,4}, the maximum timing error (worst sync) within the set = 0.651usNote : margin=1 sample |

**Proposal 8:** For M=4, L=32(if supported), the set of LP-SS sequence is down-selected among:

HW (balanced):

[0 1 0 1 1 0 1 0 1 0 1 0 1 0 0 1 1 0 1 0 0 1 1 0 0 1 1 0 0 1 0 1]

[0 1 1 0 0 1 0 1 0 1 1 0 0 1 0 1 1 0 0 1 1 0 1 0 1 0 1 0 0 1 0 1]

[0 1 0 1 0 1 0 1 1 0 1 0 1 0 0 1 1 0 1 0 1 0 0 1 1 0 1 0 0 1 1 0]

[0 1 0 1 0 1 1 0 0 1 0 1 1 0 1 0 0 1 1 0 0 1 1 0 1 0 1 0 0 1 0 1]

CATT (balanced):

[0 1 1 0 1 0 0 1 1 0 1 0 1 0 1 0 0 1 0 1 1 0 1 0 1 0 0 1 0 1 1 0]

[1 0 1 0 0 1 0 1 1 0 0 1 1 0 1 0 0 1 1 0 1 0 1 0 1 0 0 1 0 1 1 0]

[1 0 1 0 0 1 0 1 1 0 1 0 1 0 0 1 0 1 1 0 0 1 1 0 1 0 0 1 1 0 1 0]

[1 0 1 0 0 1 1 0 1 0 1 0 1 0 0 1 0 1 1 0 1 0 1 0 0 1 0 1 1 0 0 1]

Mediatek (unbalanced):

[0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 1 0 1 0 0]

[0 0 0 1 0 1 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 1 0 0]

[0 0 1 0 0 0 1 0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0]

[0 0 1 0 0 1 0 0 0 0 0 1 1 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0 0 1 0]