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TREE-RING ANALYSIS OF TIMBERS  
FROM THE HARWICH CRANE AND  
WHEELHOUSE, HARWICH, ESSEX

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Summary

The date of construction of the crane at Harwich has been a subject of speculation for many years, some believing that it was made in the seventeenth century. More recent studies of the structure suggested that it was contemporaneous with the wheelhouse, an interesting structure in its own right, displaying unusual carpentry features not from the traditions of domestic architecture. This dendrochronological study revealed that both crane and wheelhouse used very fast-grown oaks with few annual rings. The wheelhouse contained some re-used elements such as ships' knees and also some softwood timbers. Only two samples, one from the crane jib and one from the wheelhouse, were dated. The wheelhouse utilised timbers felled in the mid-eighteenth century, most likely in the period AD 1739-69. The present jib yielded a sequence which dated to AD 1734-83, which gives a most likely felling period of AD 1792 - AD 1824. There is therefore no evidence to support either the contemporaneity of the wheelhouse and crane, nor their possible seventeenth-century origin.

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# TREE-RING ANALYSIS OF TIMBERS FROM THE HARWICH CRANE AND WHEELHOUSE, HARWICH, ESSEX

## Introduction

The wheelhouse and crane have been on their present site next to the seafront at Harwich (NGR TM 262325) since AD 1932. Andrews *et al* (1999) have made a report on the crane and wheelhouse on which much of the following has been based. There are early references to cranes in the Navy Yard in AD 1662 and AD 1680, and it is known that improvements were made at the yard following a royal visit in AD 1666/7. There is a record of a crane being ordered very shortly after this visit which has often been associated with the surviving artefact, though interestingly a view of Harwich of *c* AD 1713 fails to illustrate such a crane.

The crane and wheelhouse are illustrated in Figures 1-3, based on drawings kindly supplied by Essex County Council. This shows the wheelhouse containing two large treadwheels. From a windlass, a chain runs longitudinally through a hollow beam projecting from the wheelhouse, to a near horizontal jib. The jib is thought to be mostly original, except for an obvious repair to the upper surface. It connects to a mast which has a large oak insert and a renewed softwood base. The crane and wheelhouse were renovated in AD 1933 shortly after being placed at the present site. The soffit of the southern top plate of the wheelhouse is inscribed 'LA WR 1799', whilst some spokes on the treadwheels have inscriptions, one of which is, presumably, a date of '1862'. Many of the knees used in the wheelhouse are clearly re-used, they are of various sizes, and probably come originally from ships.

Significant timber decay meant that the crane was recently dismantled, and certain of the timbers were to be replaced. This gave an opportunity for dendrochronological study of its timbers, which was requested by Deborah Priddy (English Heritage) in order to inform Scheduled Monument Consent and the programme of repair and timber replacement. The wheelhouse was studied at the same time, giving the opportunity to test the dating associated with these two elements on historical grounds by dendrochronology.

The structure of the wheelhouse was probably made by skilled naval carpenters, it has none of the features of contemporaneous domestic architecture, and includes many unusual joints. The posts are joined to the top plates with double tenons. The tie beams are halved to receive the top plates with the post being joined in reverse assembly. The inscribed date of AD 1799 is thought to be appropriate to the building, rather than the earlier dates associated with the crane itself. Andrews *et al* suggest that it is likely that the crane dates from the same time as the wheelhouse.

## Methodology

The site was visited in May and in June AD 1999, when the timbers were assessed for their potential use in dendrochronological study. The locations sampled are illustrated in Figures 1-3. Sample HWC03 was a slice removed from the end of the older section of the mast, the other samples were cores.

Core samples were obtained using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis. The cores and slice were prepared for measuring by sanding using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Only samples with more than 45-50 rings were measured and used in subsequent analyses as sequences with fewer than this number of rings rarely give reliable crossmatching. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01 mm using a specially constructed system utilizing a binocular microscope with the

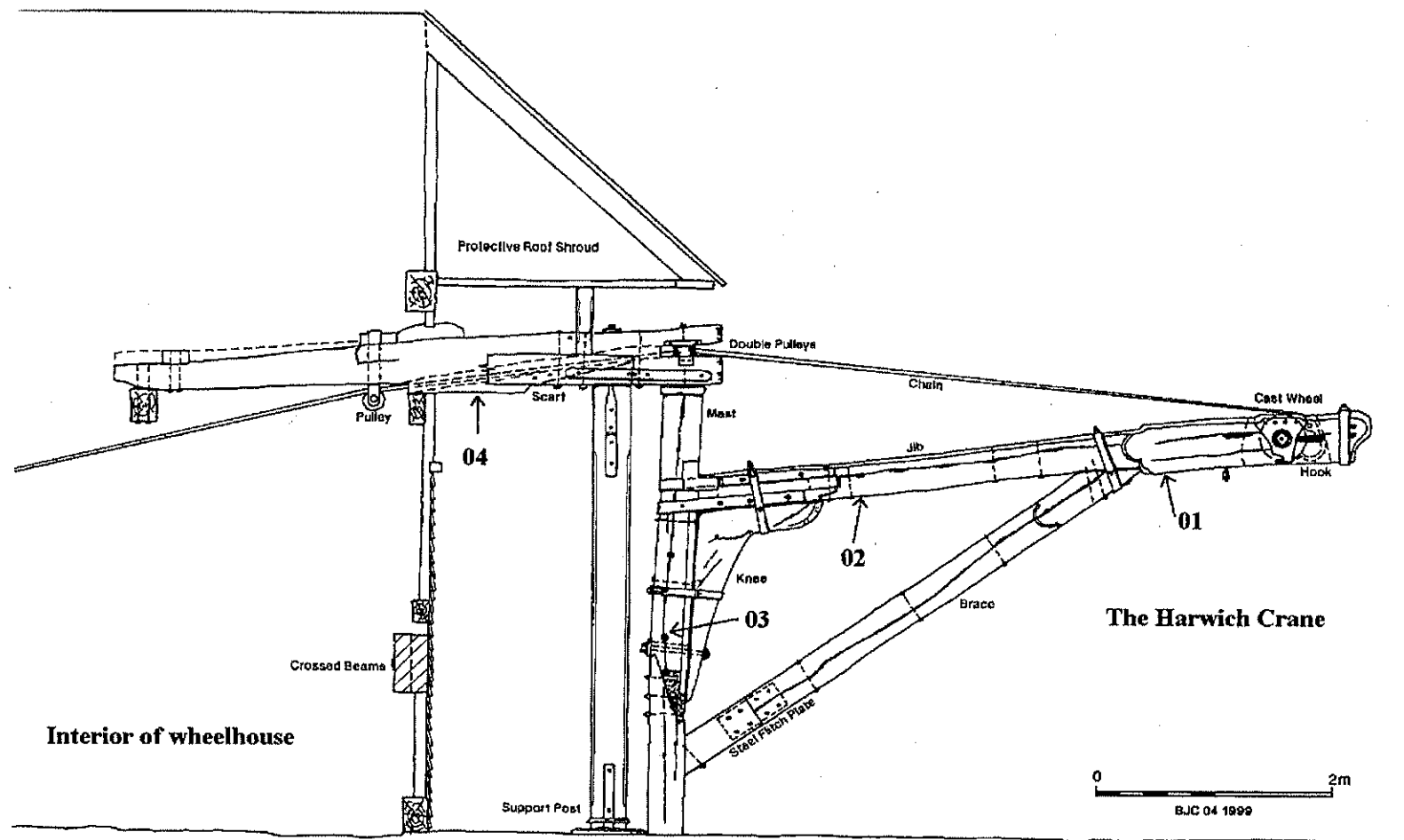


Figure 1: Detailed drawing of the Harwich Crane, showing locations of samples taken for dendrochronology

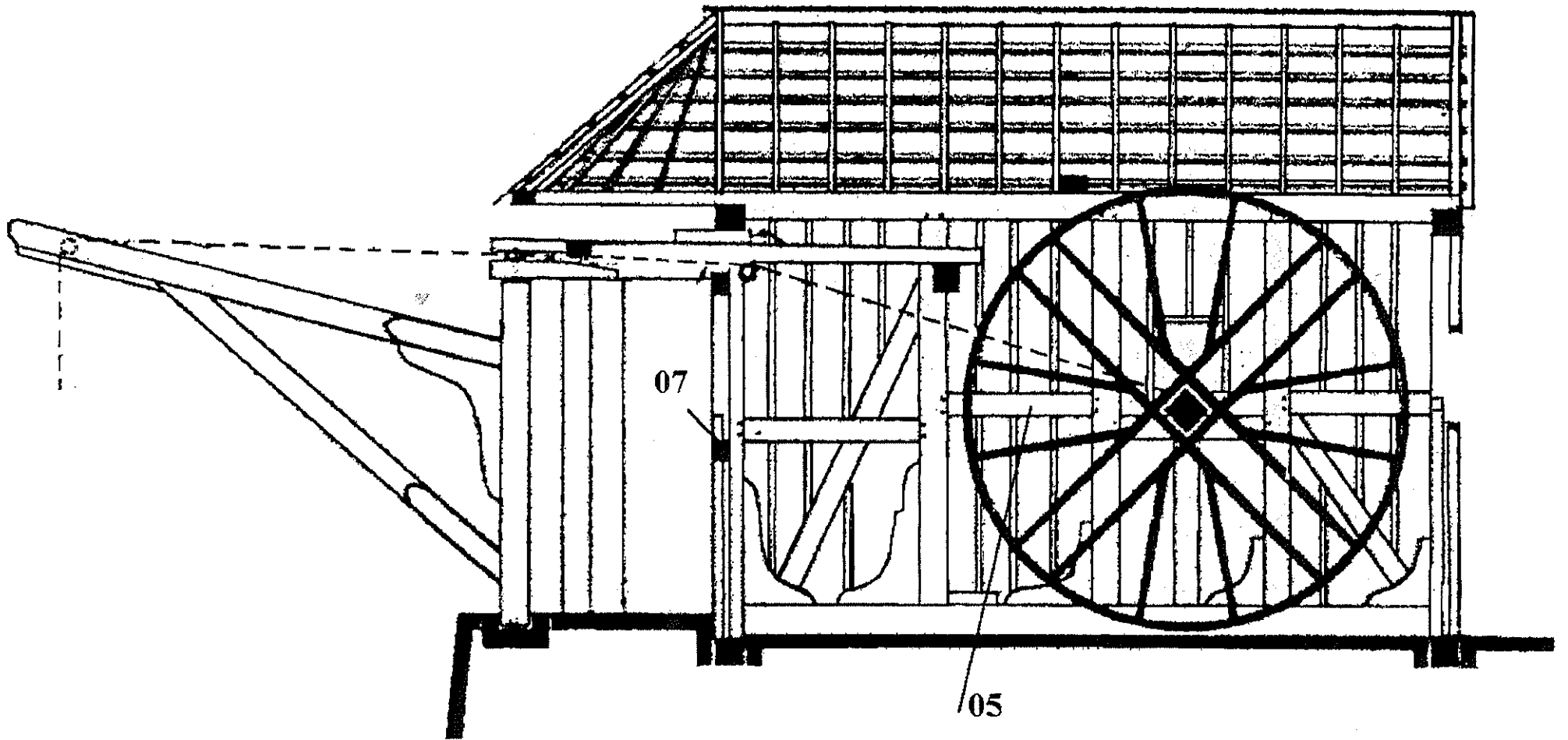
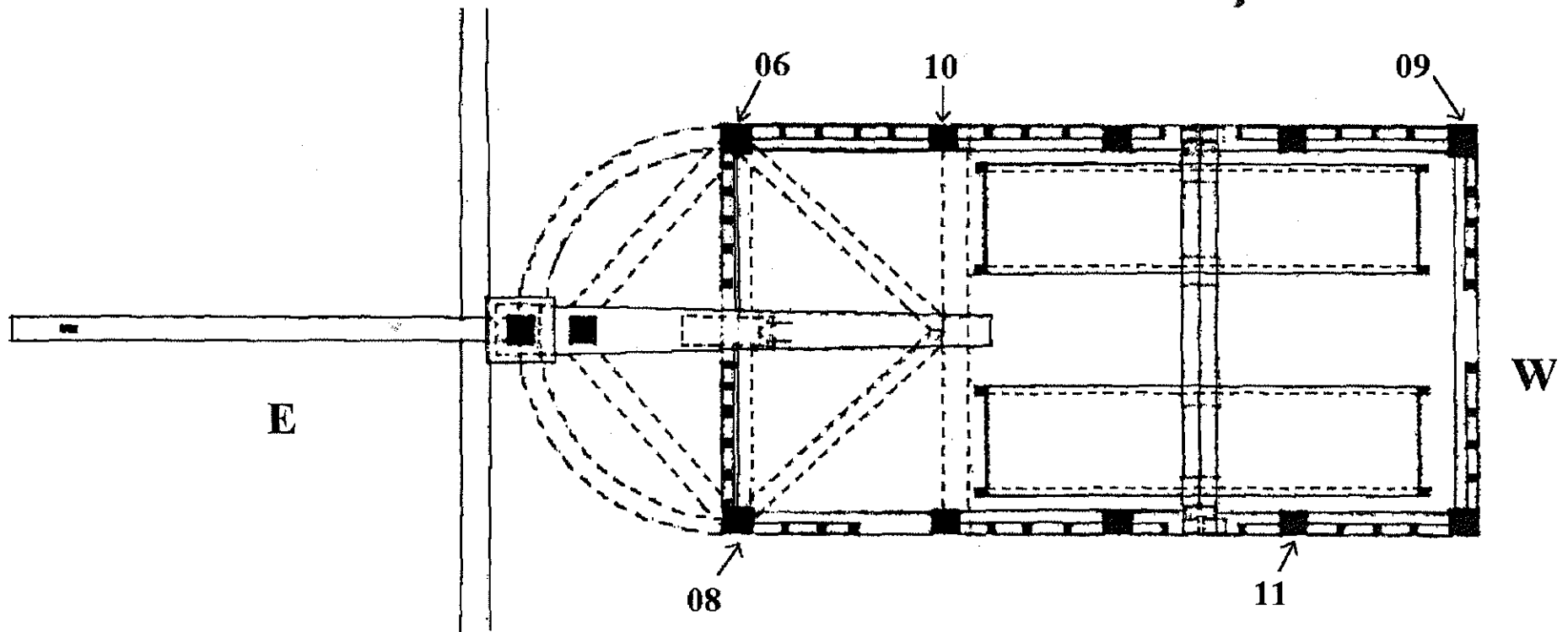


Figure 2: Drawing of the Wheelhouse and Crane, Harwich, showing locations of samples taken for dendrochronology



**Figure 3:** Plan of the Wheelhouse and Crane, Harwich, showing locations of samples taken for dendrochronology

sample mounted on a travelling stage with a linear transducer linked to a PC. The software used in measuring and subsequent analysis was written by Ian Tyers (1999).

Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This activity also acts as a measure of quality control in identifying any errors in the measurements when the samples crossmatch. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973). Those *t*-values in excess of 3.5 are taken to be indicative of acceptable matching positions provided that they are supported by satisfactory visual matches, and give consistent matching positions.

When crossmatching between samples is found, their ring-width sequences are meaned to form an internal site mean sequence which is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the rings available on each sample. Interpretation of these dates then has to be undertaken to relate these findings to the construction date of the phase under investigation. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. In this instance, the sapwood estimates are based on those proposed for this area by Miles (1997), in which 95% of samples are likely to have from 9 to 41 sapwood rings. Where bark is present on the sample the exact date of felling of the tree used may be determined.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).

## **Results**

One of the knees set against the south wall, and the top plates, including the one carved with the date '1799' were found to be made from softwood species.

All the timbers sampled were of oak (*Quercus* spp.). Details of the samples are given in Table 1, and their approximate locations are shown in Figures 1-3. Most of the larger timbers, ie the main elements of the crane and the posts and braces of the wheelhouse, were found to contain less than 50 rings. Only four samples contained 50 or more rings (see Table 1).

Two of these (HWC01 and HWC10) were subsequently dated by comparisons with other chronologies (Tables 2 and 3; Figure 4), the ring width data for each being presented in Table 4. Samples HWC03 and HWC04 did not match either of these timbers or each other. They were each compared with a range of site and regional chronologies, but neither gave satisfactory consistent matches.

**Table 1:** Oak (*Quercus* spp.) timbers sampled from the Harwich Crane and Wheelhouse, Essex

h/s = heartwood-sapwood boundary

| <b>Sample No</b> | <b>Origin of core/slice</b>     | <b>Total No of years</b> | <b>Average growth rate (mm yr<sup>-1</sup>)</b> | <b>Sapwood details</b> | <b>Date of sequence AD</b> | <b>Felling date of timber AD</b> |
|------------------|---------------------------------|--------------------------|---|------------------------|----------------------------|----------------------------------|
| HWC01            | Crane jib                       | 50                       | 3.2   | ?h/s                   | 1734 - 1783                | 1792 - 1824                      |
| HWC02            | Crane jib                       | <50                      | not measured                                    | -                      | unknown                    | unknown                          |
| HWC03            | Crane mast                      | 53                       | 3.2   | -                      | unknown                    | unknown                          |
| HWC04            | Hollow beam, carrying chain     | 50                       | 5.2   | 15                     | unknown                    | unknown                          |
| HWC05            | Mid-rail, bay 2 south           | <50                      | not measured                                    | -                      | unknown                    | unknown                          |
| HWC06            | South east corner post          | <50                      | not measured                                    | -                      | unknown                    | unknown                          |
| HWC07            | Outer diagonal brace, east wall | <50                      | not measured                                    | -                      | unknown                    | unknown                          |
| HWC08            | North east corner post          | <50                      | not measured                                    | -                      | unknown                    | unknown                          |
| HWC09            | South west corner post          | <50                      | not measured                                    | -                      | unknown                    | unknown                          |
| HWC10            | Post 2, south                   | 56                       | 3.8   | 11                     | 1684 - 1739                | 1739 - 1769                      |
| HWC11            | Post 4, north                   | <50                      | not measured                                    | -                      | unknown                    | unknown                          |



**Table 4:** Ring-width data for the two dated timbers, HWC01 and HWC10

| Year         | ring widths (0.01mm) |     |     |     |     |     |     |     |     |     |
|--------------|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>HWC01</b> |                      |     |     |     |     |     |     |     |     |     |
| AD1734       |                      |     |     | 242 | 160 | 156 | 175 | 328 | 313 | 324 |
|              | 177                  | 82  | 144 | 277 | 458 | 439 | 372 | 301 | 173 | 144 |
| AD1751       | 325                  | 444 | 342 | 425 | 490 | 458 | 272 | 441 | 585 | 285 |
|              | 199                  | 182 | 362 | 391 | 210 | 234 | 276 | 536 | 546 | 358 |
|              | 349                  | 290 | 338 | 374 | 421 | 456 | 343 | 324 | 339 | 330 |
|              | 258                  | 275 | 340 |     |     |     |     |     |     |     |
| <b>HWC10</b> |                      |     |     |     |     |     |     |     |     |     |
| AD1684       |                      |     |     | 437 | 475 | 438 | 435 | 438 | 409 | 447 |
|              | 489                  | 420 | 453 | 364 | 256 | 317 | 403 | 509 | 393 | 436 |
| AD1701       | 427                  | 343 | 428 | 605 | 372 | 480 | 487 | 369 | 301 | 185 |
|              | 311                  | 387 | 504 | 243 | 391 | 395 | 481 | 205 | 185 | 203 |
|              | 333                  | 344 | 276 | 449 | 354 | 468 | 450 | 328 | 367 | 408 |
|              | 297                  | 355 | 314 | 326 | 427 | 376 | 405 | 421 | 228 |     |