Range and Duty Cycle (T0900503-v1)

Displays inspiral range and duty cycle of S5. All time plots start on 8:00AM PST. Weekly plots typically start on a Tuesday morning, 8:00AM PST.

Setup

Parameters

IFO: H1 - Hanford 4K, H2 - Hanford 2K and L1 - Livingston 4K
rchnIFO: channel name of inspiral range for IFO (minute trend)
schnIFO: channel name of lock state for IFO (minute trend);
    0 - nothing locked, 1 - mode cleaner lockec, 2 - ifo locked, 3 - ifo in power up, 4 - ifo in science mode
S5startLHO: used S5 start time for Hanford (for convenience we start on a Tuesday, 8:00am PST)
S5startLHOGPS: GPS time at start of S5 at Hanford
S5startLLO: used S5 start time for Livingston
now: current date (rounded down to closest 8:00am PST)
untilnowLHO: seconds since start of S5 at Hanford
untilnowLLO: seconds since start of S5 at Livingston
S5startShift: shift in seconds between Livingston and Hanford start times
S5IFOCalV1: start time of official version 1 calibration for IFO
S5IFOCalV1diff: time in seconds of official version 1 calibration from start of S5 run
S5IFOCalV1shift: calibration correction for inspiral range prior to version 1 calibration

```
In[12]:= rchnH1 = "H1:DMT-SNSM_EFFECTIVE_RANGE_MPC";
         rchnH2 = "H2:DMT-SNSM_EFFECTIVE_RANGE_MPC";
         rchnL1 = "L1:DMT-SNSM_EFFECTIVE_RANGE_MPC";

In[15]:= schnH1 = "H1:DMT-LCKL_STATE_VECTOR";
         schnH2 = "H2:DMT-LCKL_STATE_VECTOR";
         schnL1 = "L1:DMT-LCKL_STATE_VECTOR";
```

```
In[18]:= S5startLHO = {2005, 11, 4, 16, 0, 0};
         (* start on Tue instead *)
         S5startLHO = {2005, 11, 8, 16, 0, 0};
         S5startLHOGPS = 815500813 - 13;
         S5startLLO = {2005, 11, 14, 18, 0, 0};
         (* round down to full day *)
         now =
          ToDate[24 * 3600 * IntegerPart[(FromDate[Date[0]] - FromDate[S5startLHO]) / (24. * 3600)] +
            FromDate[S5startLHO]]
         (*now={2007,8,7,16,0,0.}*)
         untilnowLHO = FromDate[now] - FromDate[S5startLHO];
         untilnowLLO = FromDate[now] - FromDate[S5startLLO];
         S5startShift = FromDate[S5startLLO] - FromDate[S5startLHO];

Out[22]= {2007, 10, 2, 16, 0, 0.}

In[26]:= S5H1CalV1 = {2005, 11, 22, 18, 0, 0};
         S5H1CalV1diff = FromDate[S5H1CalV1] - FromDate[S5startLHO];
         S5H1CalV1shift = 0.95;
         S5H2CalV1 = {2005, 12, 6, 17, 0, 0};
         S5H2CalV1diff = FromDate[S5H2CalV1] - FromDate[S5startLHO];
         S5H2CalV1shift = 1.12;
         S5L1CalV1 = {2005, 12, 6, 17, 0, 0};
         S5L1CalV1diff = FromDate[S5L1CalV1] - FromDate[S5startLLO];
         S5L1CalV1shift = 1.025;
```

Functions

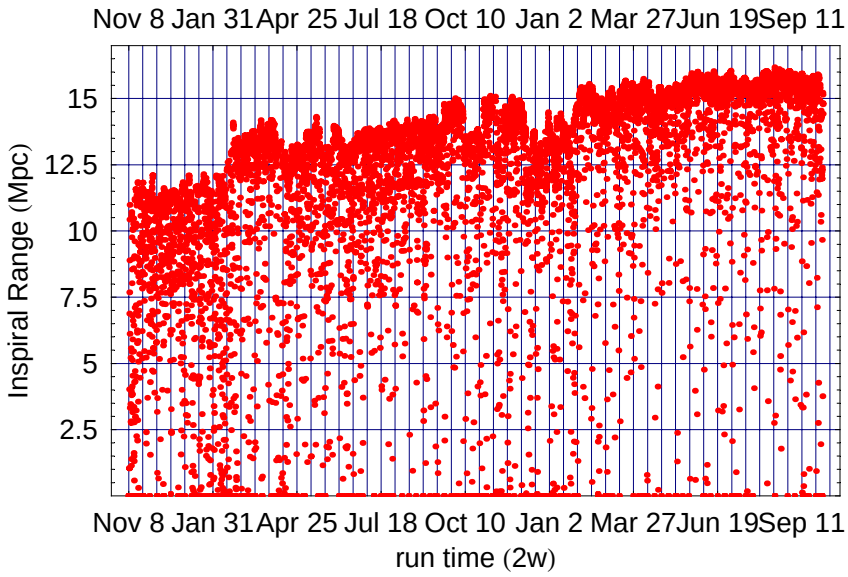
Get Data

H1

Range Trend

In[141]:=

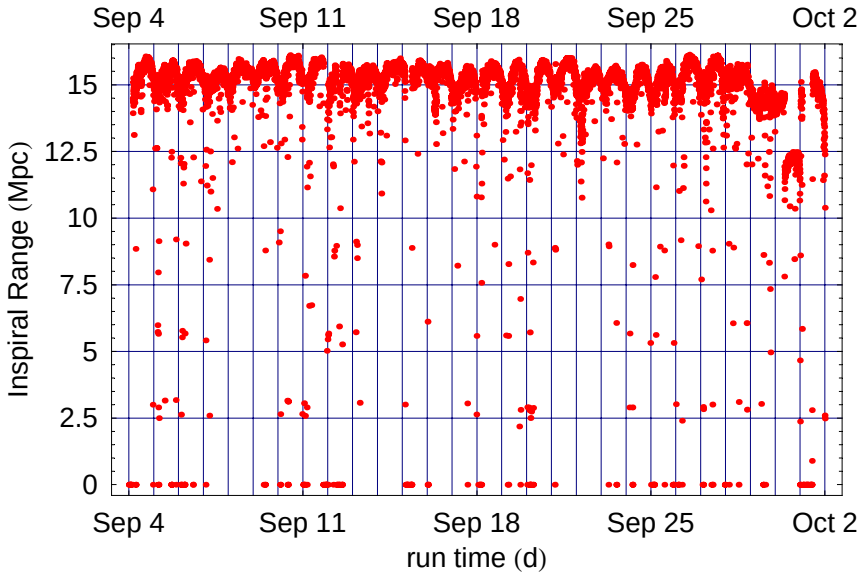
```
pltH1 = ListPlot[bin[{#[[1]]/(24 3600.), #[[2]]} & /@ rH1cal, 120], FrameLabel →
    {"run time (2w)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → {0, 17},
  GridLines → {Table[14 i, {i, 0, 1 + Last[rH1cal][[1]]/(14 24 3600.)}], Automatic}, FrameTicks →
   {Table[{2 42 i, dayname[2 42 24 3600 i]}, {i, 0, 1 + Last[rH1cal][[1]]/(2 42 24 3600.)}], Automatic},
  PlotJoined → False, PlotStyle → {Thickness[0.001], RGBColor[1, 0, 0]}];
```



Range Trend over past 3-4 Weeks

In[142]:=

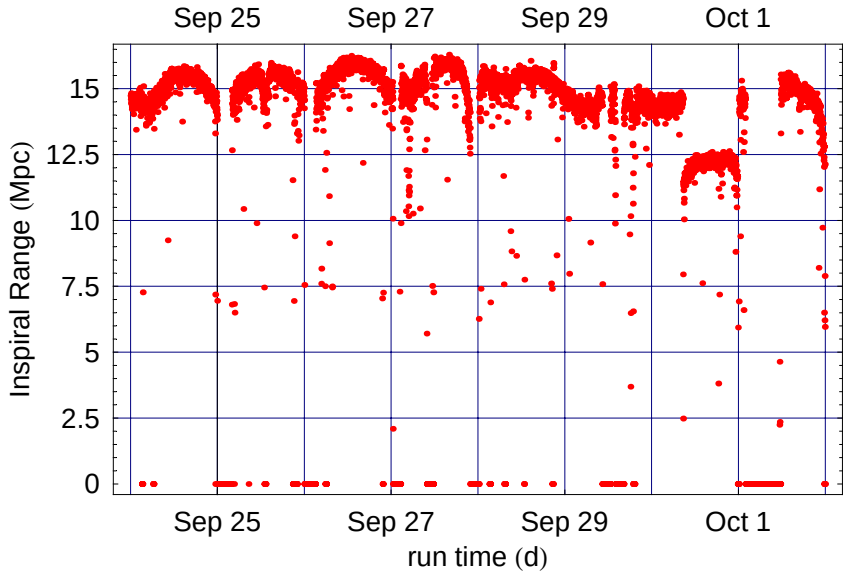
```
dropdaysfront = 7 (IntegerPart[Last[rH1cal][[1]] / (7 24 3600.)] - 3);
pltH1short = ListPlot [bin[{#[[1]] / (24 3600.), #[[2]]} & /@
    SelectByTime[24 3600. dropdaysfront, Last[rH1cal][[1]], rH1cal], 5],
  FrameLabel → {"run time (d)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → All,
  GridLines → {Table[i, {i, 0, 1 + Last[rH1cal][[1]] / (24 3600.)}], Automatic}, FrameTicks →
   {Table[{7 i, dayname[7 24 3600 i]}, {i, 0, 1 + Last[rH1cal][[1]] / (7 24 3600.)}], Automatic},
  PlotJoined → False, PlotStyle → {Thickness [0.007], RGBColor [1, 0, 0]}];
```



Range Trend over past 7 Days

In[144]:=

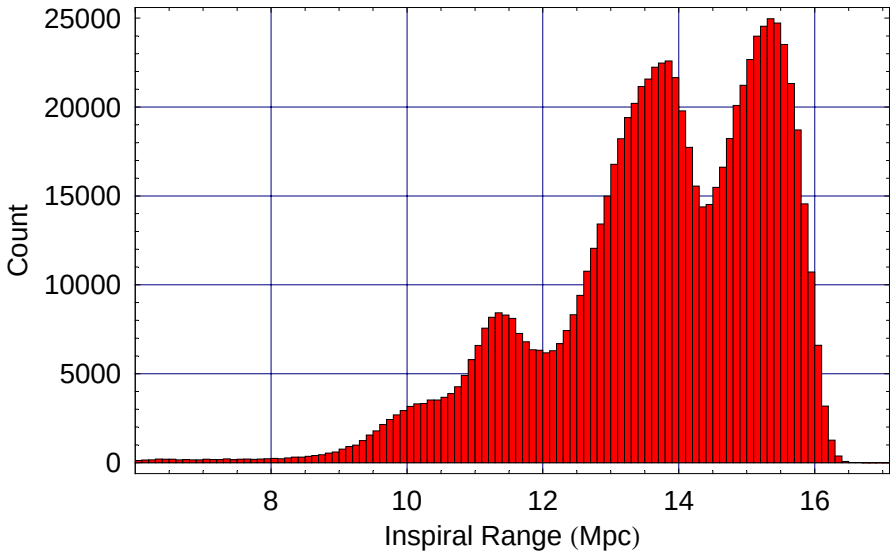
```
dropdaysfront = IntegerPart[Last[rH1cal][[1]] / (24 3600.)] - 7;
pltH1recent = ListPlot [bin[{#[[1]] / (24 3600.), #[[2]]} & /@
    SelectByTime[24 3600. dropdaysfront, Last[rH1cal][[1]], rH1cal], 2],
  FrameLabel → {"run time (d)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → All,
  GridLines → {Table[i, {i, 0, 1 + Last[rH1cal][[1]] / (24 3600.)}], Automatic}, FrameTicks →
   {Table[{2 i, dayname[2 24 3600 i]}, {i, 0, 1 + Last[rH1cal][[1]] / (2 24 3600.)}], Automatic},
  PlotJoined → False, PlotStyle → {Thickness [0.007], RGBColor [1, 0, 0]}];
```



Accumulated Histogram

In[146]:=

```
histH1 = Histogram[#[[2]] & /@ rH1cal, HistogramRange → {6, 17},
   HistogramCategories → Range[2, 18, 0.1], FrameLabel → {"Inspiral Range (Mpc)", "Count"}
   Frame → True, GridLines → Automatic, BarStyle → {RGBColor[1, 0, 0]}];
```



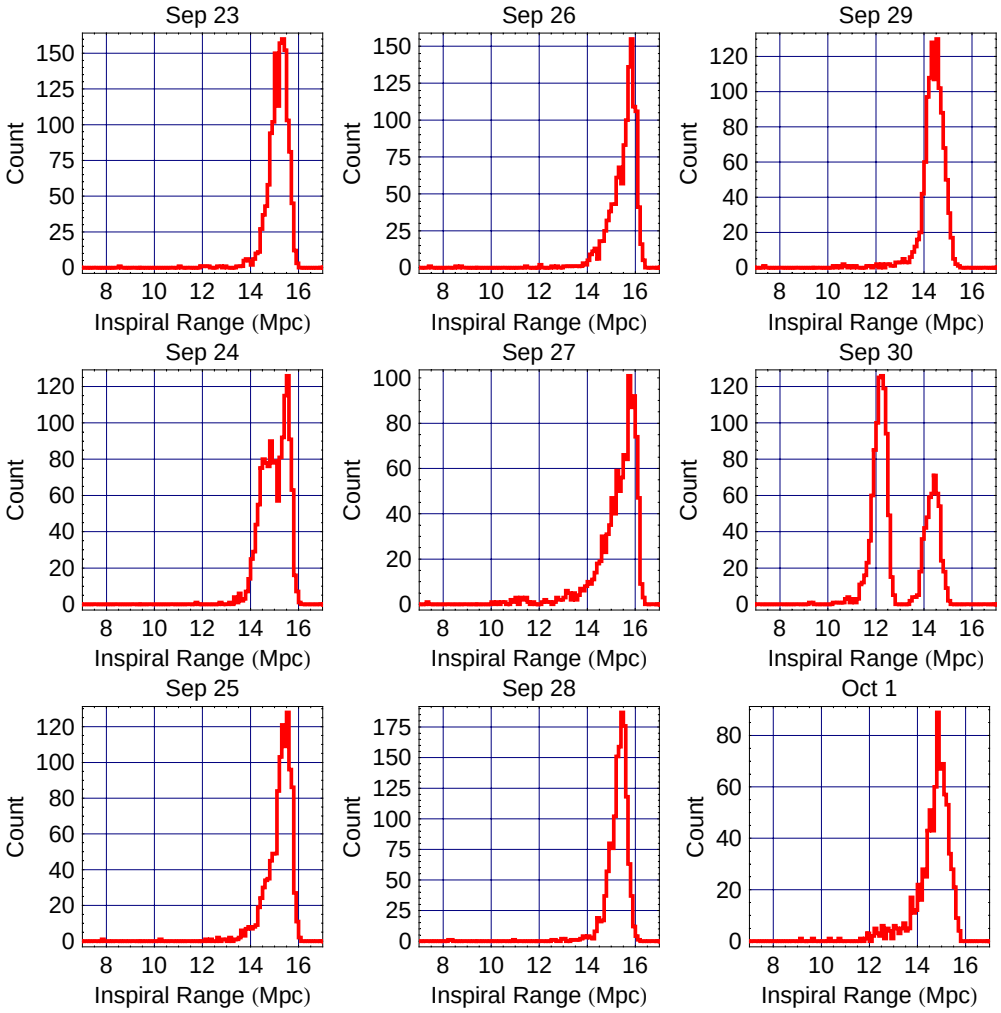
In[147]:=

```
histH1alt =
  ListPlot[StepHistogram[#[[2]] & /@ rH1cal, HistogramCategories → Range[2, 18, 0.1]],
   PlotJoined → True, PlotRange → {{6, 17}, All},
   PlotStyle → {Thickness[0.007], RGBColor[1, 0, 0]},
   FrameLabel → {"Inspiral Range (Mpc)", "Count"},
   Frame → True, GridLines → Automatic, DisplayFunction → Identity];
```

Daily Histograms over past 9 Days

In[148]:=

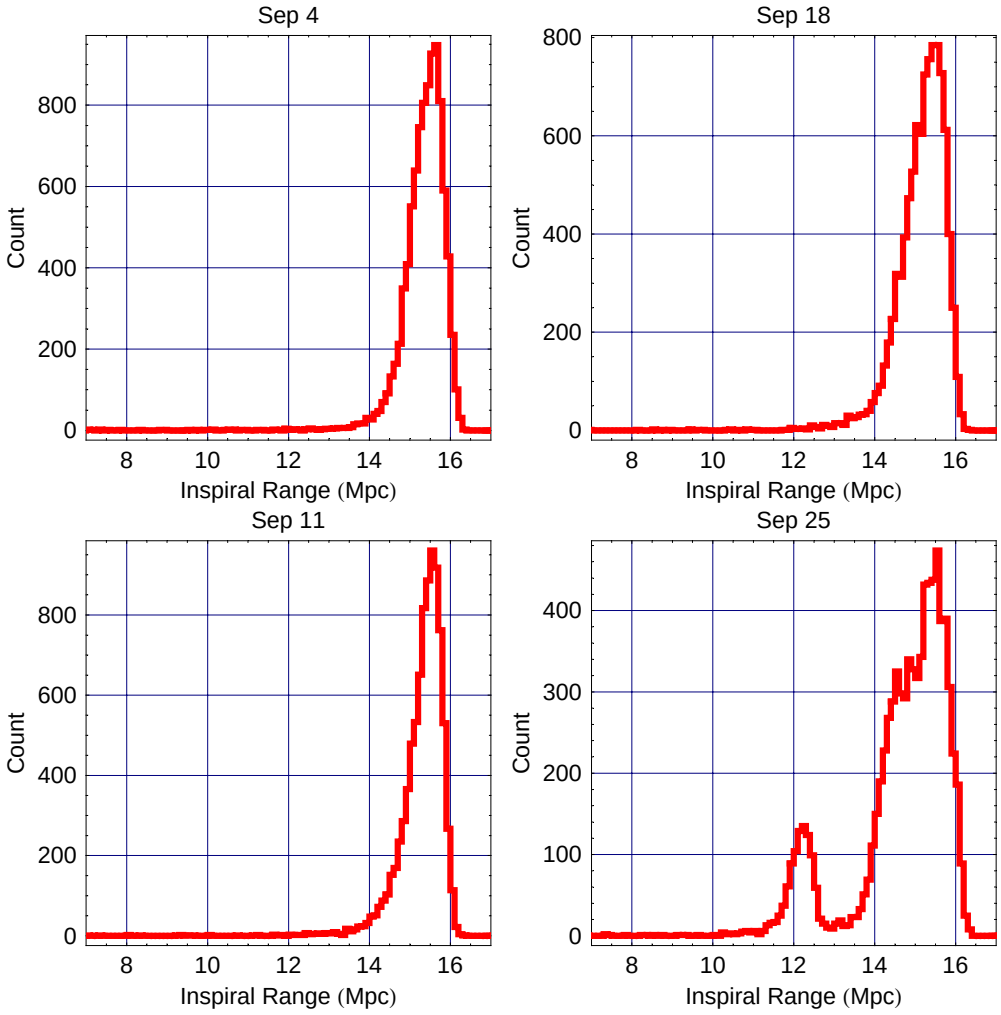
```
dropdaysfront = Length[rDaysH1] - 9;
stepDailyH1 =
  StepHistogram[Transpose[#][[2]], HistogramCategories → Range[2, 18, 0.1]] & /@
   Drop[rDaysH1, dropdaysfront];

histDailyH1 = Show[
   GraphicsArray[

    Partition[
      Table[
       ListPlot[stepDailyH1[[i]], PlotJoined → True,
        PlotRange → {{7, 17}, All}, PlotStyle → {Thickness [0.016], RGBColor [1, 0, 0]},
        FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[24 3600 (dropdaysfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 9}],
      3] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 23
Sep 26
Sep 29
Sep 24
Sep 27
Sep 30
Sep 25
Sep 28
Oct 1
Count
Inspiral Range (Mpc)

Weekly Histograms over past 4 Weeks

In[151]:=

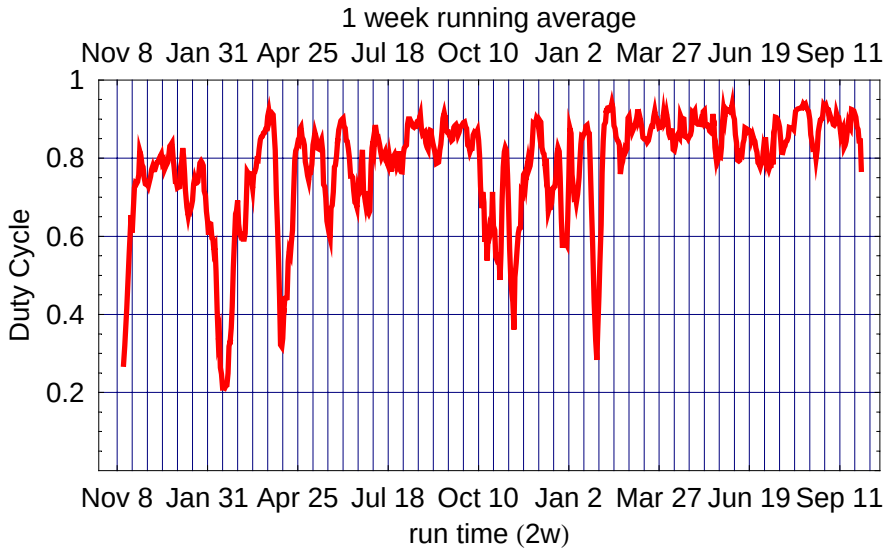
```
dropweeksfront = Length[rWeeksH1] - 4;
stepWeeklyH1 =
  StepHistogram[Transpose[#][[2]], HistogramCategories → Range[2, 17, 0.1]] & /@
   Drop[rWeeksH1, dropweeksfront];

histWeeklyH1 = Show[
   GraphicsArray[

    Partition[
      Table[
       ListPlot[stepWeeklyH1[[i]], PlotJoined → True,
        PlotRange → {{7, 17}, All}, PlotStyle → {Thickness [0.016], RGBColor [1, 0, 0]},
        FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[7 24 3600 (dropweeksfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 4}],
      2] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 4
Count
Inspiral Range (Mpc)
Sep 18
Count
Inspiral Range (Mpc)
Sep 11
Count
Inspiral Range (Mpc)
Sep 25
Count
Inspiral Range (Mpc)

Duty Cycle Trend

In[154]:=

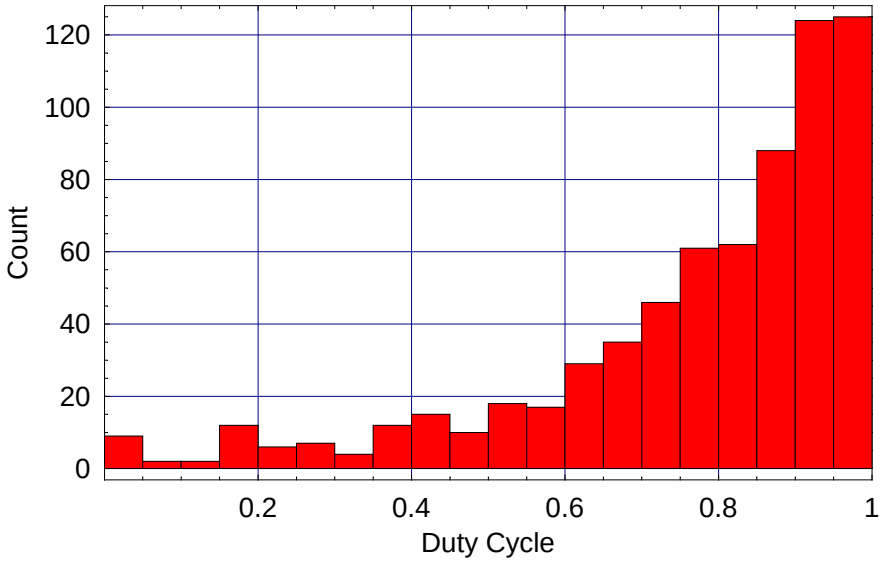
```
dutyH1avrg = Transpose[{Drop[Transpose[dutyH1][[1]], 6],
    Plus @@ # / 7 & /@ Partition[Transpose[dutyH1][[2]], 7, 1]}];
pltH1avrg = ListPlot[dutyH1avrg,
   FrameLabel → {"run time (2w)", "Duty Cycle", "1 week running average", ""},
   AspectRatio → 0.5, Frame → True, PlotRange → {0, 1}, PlotJoined → True,
   GridLines → {Table[14 i, {i, 0, 1 + Last[rH1cal][[1]] / (14 24 3600.)}], Automatic}, FrameTicks →
    {Table[{84 i, dayname[84 24 3600 i]}, {i, 0, 1 + Last[rH1cal][[1]] / (84 24 3600.)}], Automatic},
   PlotStyle → {Thickness [0.007], RGBColor [1, 0, 0]}];
```



Accumulated Daily Duty Cycle Histogram

In[156]:=

```
hsH1 = Histogram[Last /@ dutyH1, HistogramRange → {0, 1},
   HistogramCategories → Range[0, 1, 0.05], FrameLabel → {"Duty Cycle", "Count"},
   Frame → True, GridLines → Automatic, BarStyle → {RGBColor [1, 0, 0]}];
```

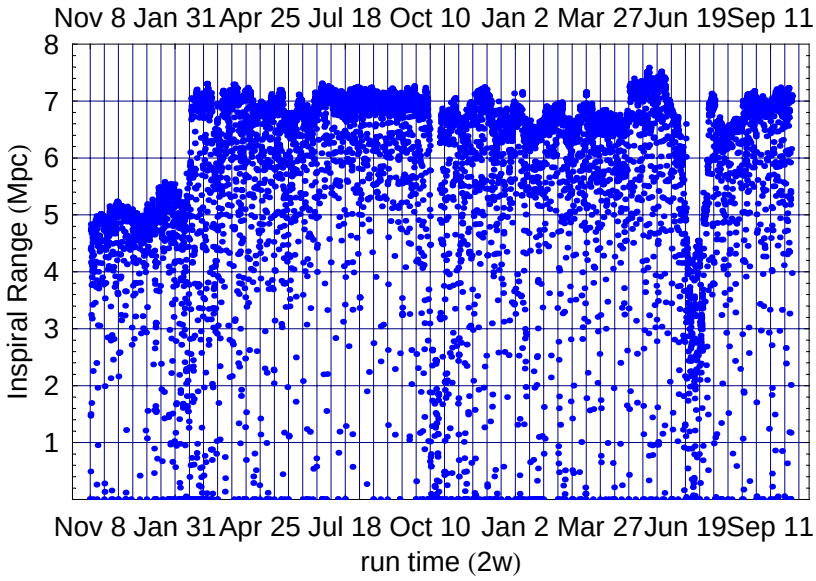


H2

Range Trend

In[157]:=

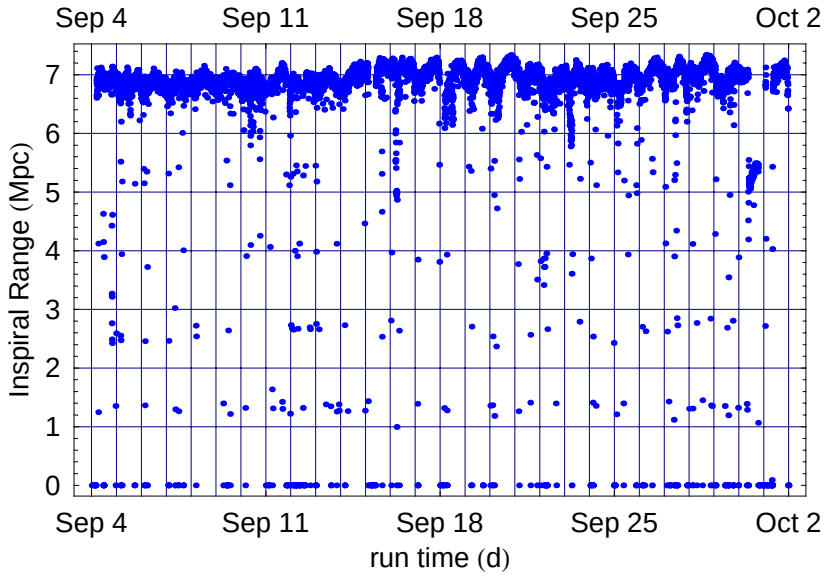
```
pltH2 = ListPlot [bin[{#[[1]]/(24 3600.), #[[2]]} & /@ rH2cal, 120], FrameLabel →
    {"run time (2w)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → {0, 8},
   GridLines → {Table[14 i, {i, 0, 1 + Last[rH2cal][[1]]/(14 24 3600.)}], Automatic}, FrameTicks →
    {Table[{2 42 i, dayname[2 42 24 3600 i]}, {i, 0, 1 + Last[rH2cal][[1]]/(2 42 24 3600.)}], Automatic},
   PlotJoined → False, PlotRange → {0, 6},
   PlotStyle → {Thickness [0.001], RGBColor [0, 0, 1]}];
```



Range Trend over past 3-4 Weeks

In[158]:=

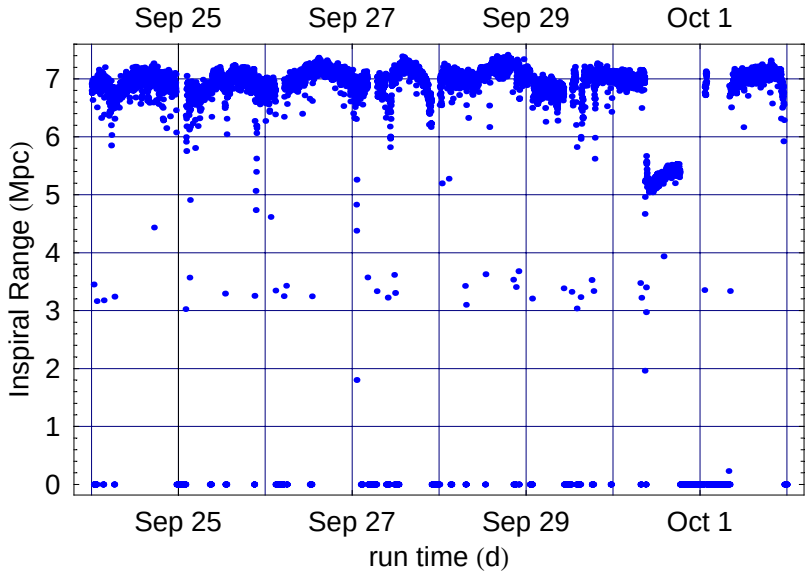
```
dropdaysfront = 7 (IntegerPart[Last[rH2cal][[1]] / (7 24 3600.)] - 3);

pltH2short = ListPlot [bin[{#[[1]] / (24 3600.), #[[2]]} & /@
     SelectByTime[24 3600. dropdaysfront, Last[rH2cal][[1]], rH2cal], 5],
   FrameLabel → {"run time (d)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → All,
   GridLines → {Table[i, {i, 0, 1 + Last[rH2cal][[1]] / (24 3600.)}], Automatic}, FrameTicks →
    {Table[{7 i, dayname[7 24 3600 i]}, {i, 0, 1 + Last[rH2cal][[1]] / (7 24 3600.)}], Automatic},
   PlotJoined → False, PlotStyle → {Thickness [0.007], RGBColor [0, 0, 1]}];
```



Range Trend over past 7 Days

In[160]:=

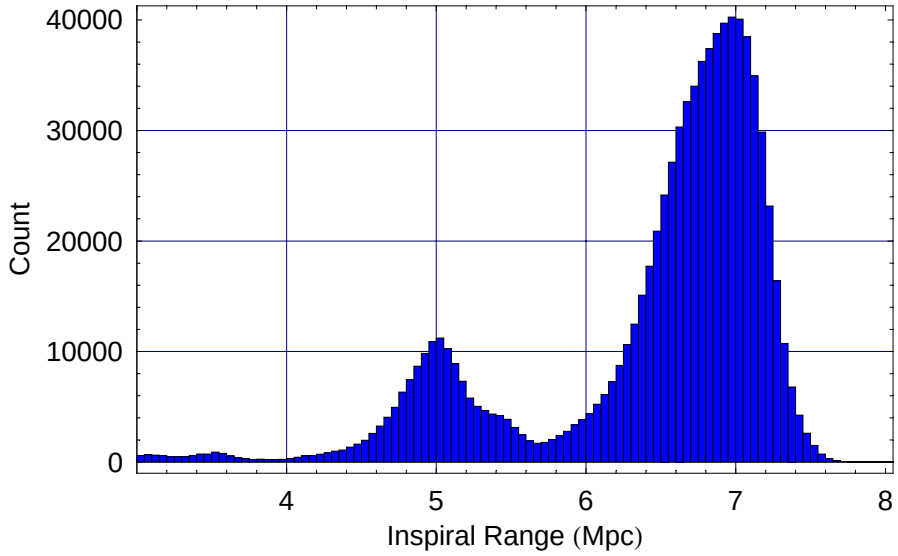
```
dropdaysfront = IntegerPart[Last[rH2cal][[1]] / (24 3600.)] - 7;
pltH2recent = ListPlot [bin[{#[[1]] / (24 3600.), #[[2]]} & /@
    SelectByTime[24 3600. dropdaysfront, Last[rH2cal][[1]], rH2cal], 2],
  FrameLabel → {"run time (d)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → All,
  GridLines → {Table[i, {i, 0, 1 + Last[rH2cal][[1]] / (24 3600.)}], Automatic}, FrameTicks →
   {Table[{2 i, dayname[2 24 3600 i]}, {i, 0, 1 + Last[rH2cal][[1]] / (2 24 3600.)}], Automatic},
  PlotJoined → False, PlotStyle → {Thickness [0.007], RGBColor [0, 0, 1]}];
```



Accumulated Histogram

In[162]:=

```
histH2 = Histogram[#[[2]] & /@ rH2cal, HistogramRange → {3, 8},
   HistogramCategories → Range[2, 15, 0.05],
   FrameLabel → {"Inspiral Range (Mpc)", "Count"}, Frame → True,
   GridLines → Automatic, BarStyle → {RGBColor[0, 0, 1]}];
```



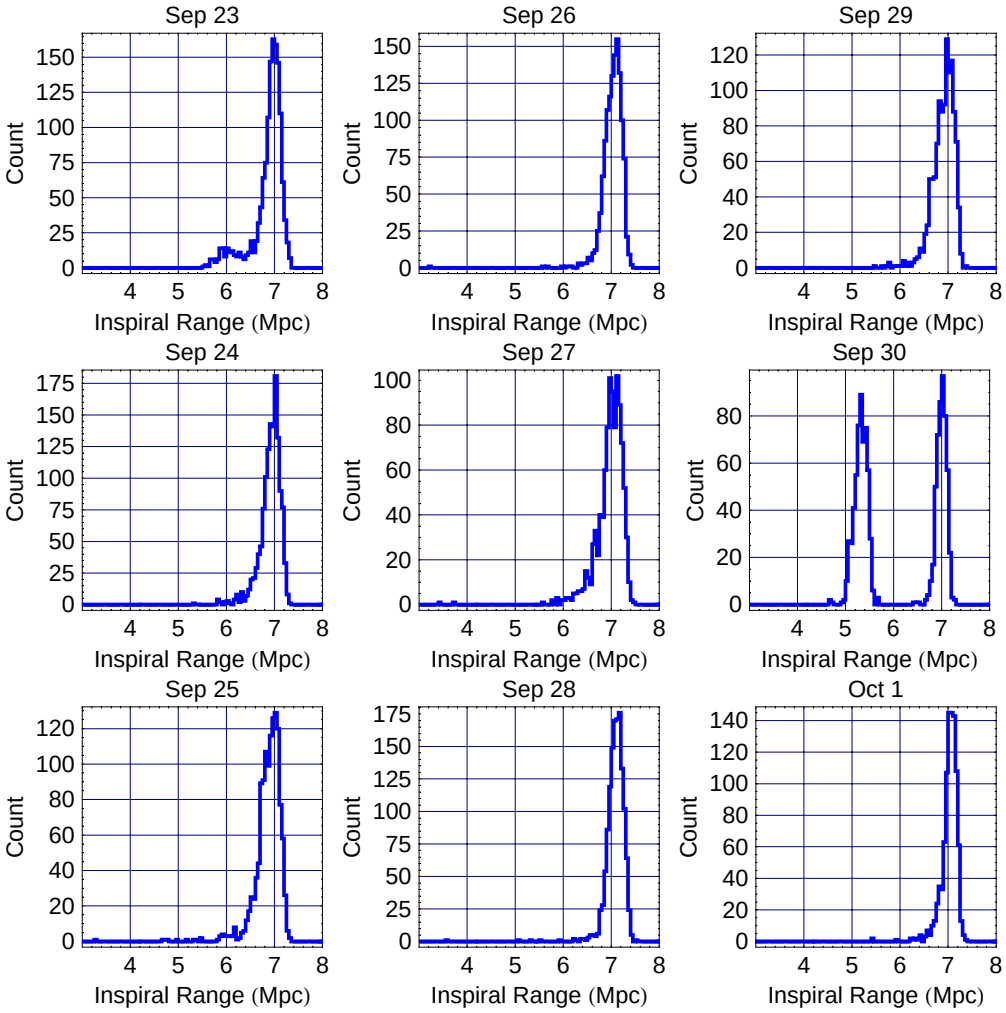
In[163]:=

```
histH2alt =
  ListPlot[StepHistogram[#[[2]] & /@ rH2cal, HistogramCategories → Range[2, 16, 0.05]],
   PlotJoined → True, PlotRange → {{3, 8}, All},
   PlotStyle → {Thickness[0.007], RGBColor[0, 0, 1]},
   FrameLabel → {"Inspiral Range (Mpc)", "Count"},
   Frame → True, GridLines → Automatic, DisplayFunction → Identity];
```

Daily Histograms over past 9 Days

In[164]:=

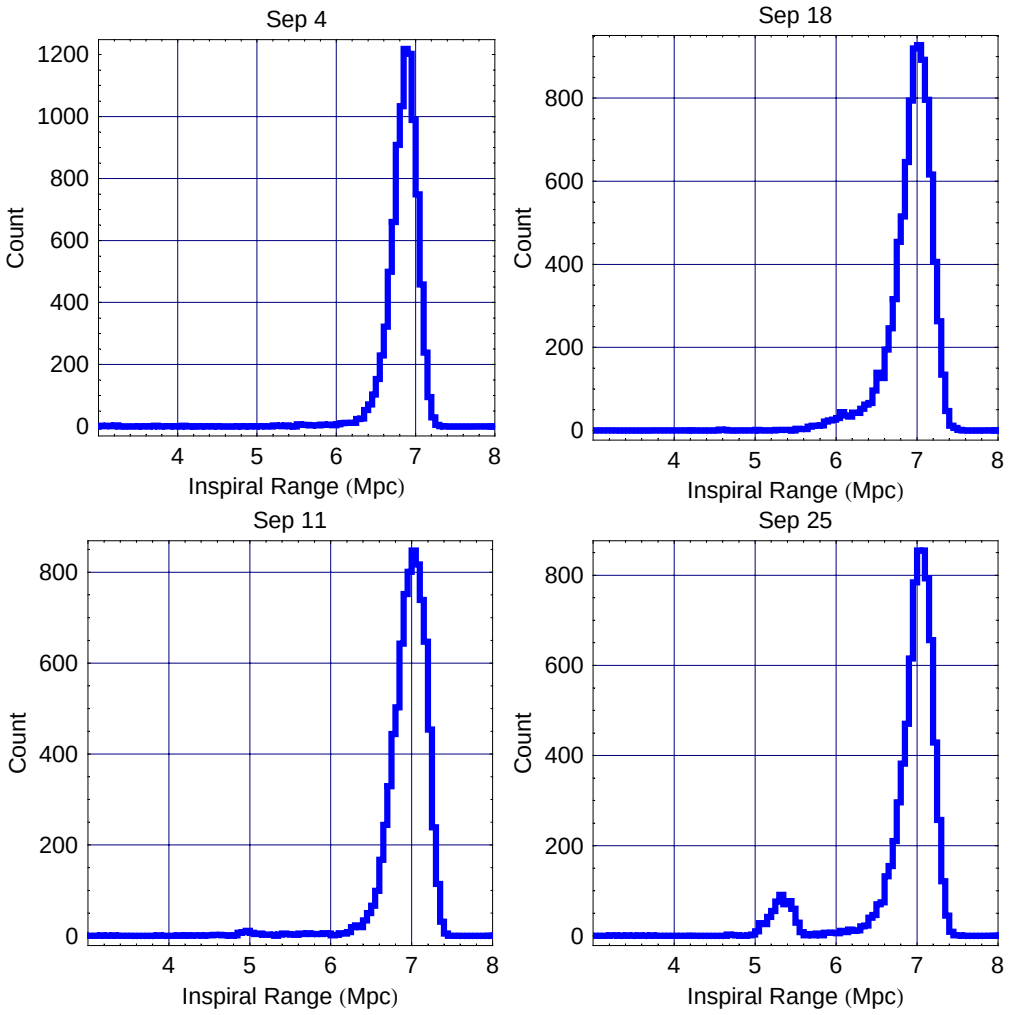
```
dropdaysfront = Length[rDaysH2] - 9;
stepDailyH2 =
  StepHistogram[Transpose[#][[2]], HistogramCategories → Range[2, 15, 0.05]] & /@
   Drop[rDaysH2, dropdaysfront];

histDailyH2 = Show[
   GraphicsArray[

    Partition[
      Table[
       ListPlot[stepDailyH2[[i]], PlotJoined → True,
        PlotRange → {{3, 8}, All}, PlotStyle → {Thickness [0.016], RGBColor [0, 0, 1]},
        FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[24 3600 (dropdaysfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 9}],
      3] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 23
Count
Inspiral Range (Mpc)
Sep 26
Count
Inspiral Range (Mpc)
Sep 29
Count
Inspiral Range (Mpc)
Sep 24
Count
Inspiral Range (Mpc)
Sep 27
Count
Inspiral Range (Mpc)
Sep 30
Count
Inspiral Range (Mpc)
Sep 25
Count
Inspiral Range (Mpc)
Sep 28
Count
Inspiral Range (Mpc)
Oct 1
Count
Inspiral Range (Mpc)

Weekly Histograms over past 4 Weeks

In[167]:=

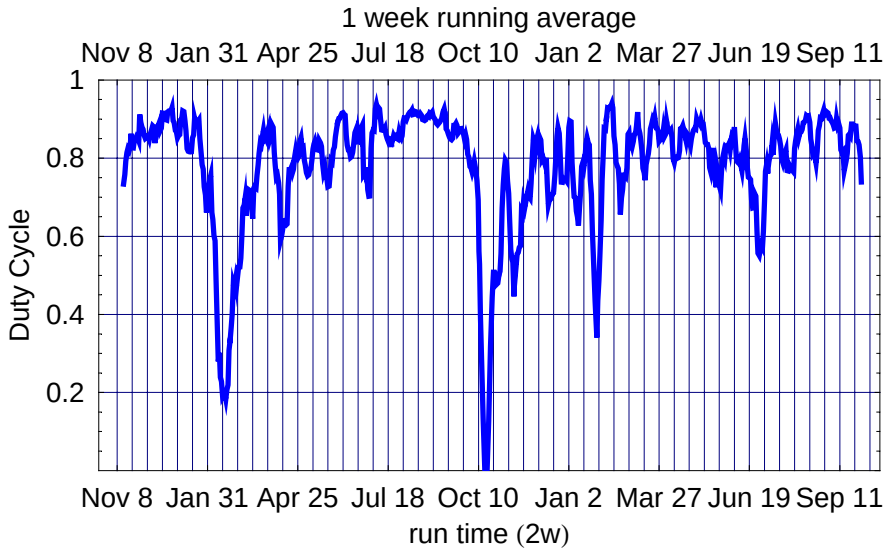
```
dropweeksfront = Length[rWeeksH2] - 4;
stepWeeklyH2 =
  StepHistogram[Transpose[#][[2]], HistogramCategories → Range[2, 15, 0.05]] & /@
   Drop[rWeeksH2, dropweeksfront];

histWeeklyH2 = Show[
   GraphicsArray[

    Partition[
      Table[
       ListPlot[stepWeeklyH2[[i]], PlotJoined → True,
        PlotRange → {{3, 8}, All}, PlotStyle → {Thickness [0.016], RGBColor [0, 0, 1]},
        FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[7 24 3600 (dropweeksfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 4}],
      2] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 4
Count
Inspiral Range (Mpc)
Sep 18
Count
Inspiral Range (Mpc)
Sep 11
Count
Inspiral Range (Mpc)
Sep 25
Count
Inspiral Range (Mpc)

Duty Cycle Trend

In[170]:=

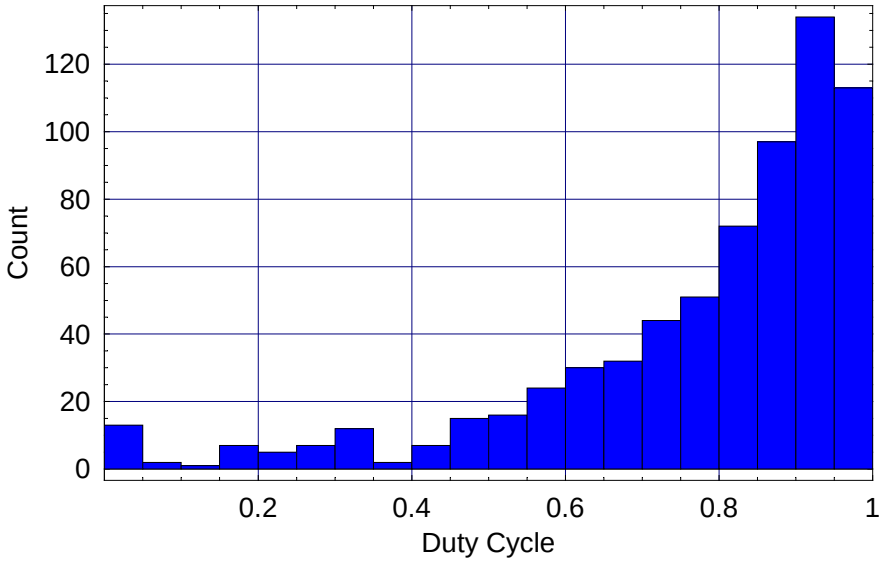
```
dutyH2avrg = Transpose[{Drop[Transpose[dutyH2][[1]], 6],
    Plus @@ # / 7 & /@ Partition[Transpose[dutyH2][[2]], 7, 1]}];
pltH2avrg = ListPlot[dutyH2avrg,
   FrameLabel → {"run time (2w)", "Duty Cycle", "1 week running average", ""},
   AspectRatio → 0.5, Frame → True, PlotRange → {0, 1}, PlotJoined → True,
   GridLines → {Table[14 i, {i, 0, 1 + Last[rH1cal][[1]] / (14 24 3600.)}], Automatic}, FrameTicks →
    {Table[{84 i, dayname[84 24 3600 i]}, {i, 0, 1 + Last[rH1cal][[1]] / (84 24 3600.)}], Automatic},
   PlotStyle → {Thickness[0.007], RGBColor[0, 0, 1]}];
```



Accumulated Daily Duty Cycle Histogram

In[172]:=

```
hsH2 = Histogram[Last /@ dutyH2, HistogramRange → {0, 1},
   HistogramCategories → Range[0, 1, 0.05], FrameLabel → {"Duty Cycle", "Count"},
   Frame → True, GridLines → Automatic, BarStyle → {RGBColor [0, 0, 1]}];
```

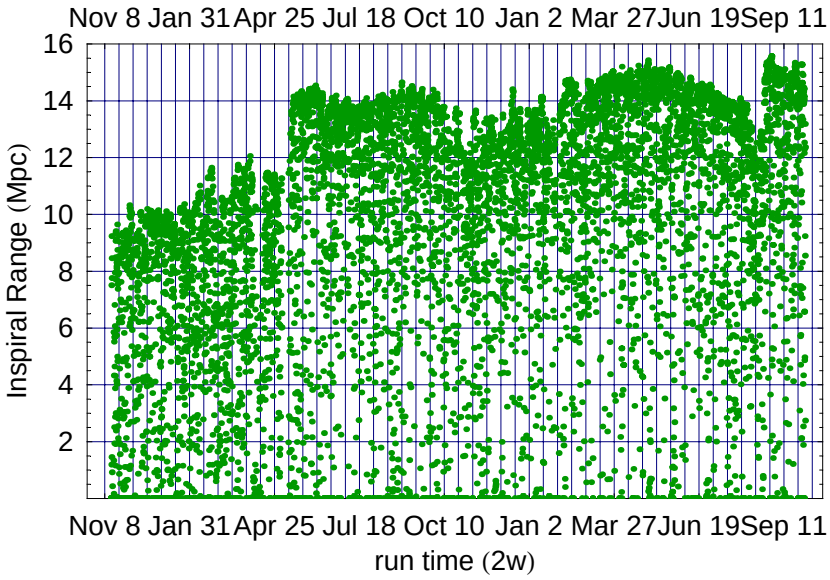


L1

Range Trend

In[173]:=

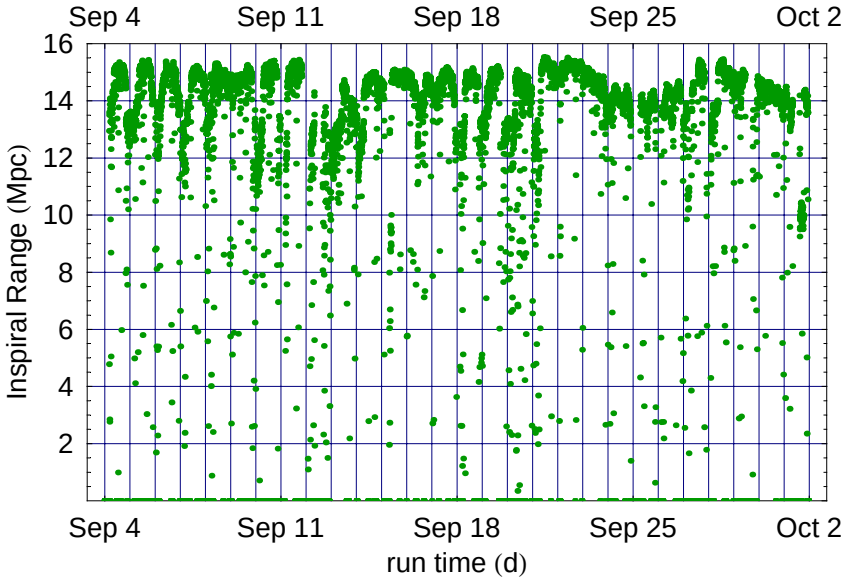
```
pltL1 = ListPlot[bin[{(#[[1]] + S5startShift)/(24 3600.), #[[2]]} & /@ rL1cal, 120], PlotRange → {0, 16},
  FrameLabel → {"run time (2w)", "Inspiral Range (Mpc)"}, Frame → True,
  GridLines → {Table[14 i, {i, 0, 1 + (Last[rL1cal][[1]] + S5startShift)/(14 24 3600.)}], Automatic},
  FrameTicks → {Table[{2 42 i, dayname[2 42 24 3600 i]},
    {i, 0, 1 + (Last[rH1cal][[1]] + S5startShift)/(2 42 24 3600.)}], Automatic},
  PlotJoined → False, PlotStyle → {Thickness[0.001], RGBColor[0, 0.6, 0]}];
```



Range Trend over past 3-4 Weeks

In[174]:=

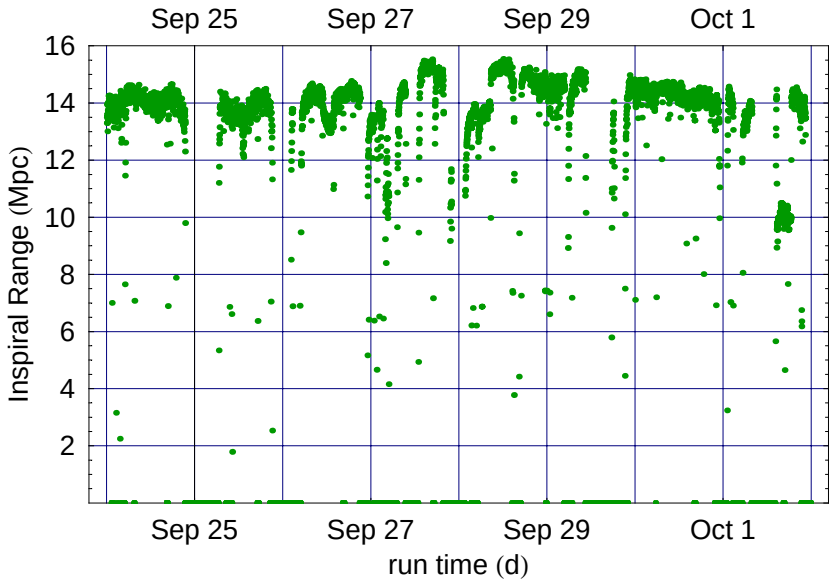
```
dropdaysfront = 7 (IntegerPart[(Last[rL1cal][[1]] + S5startShift)/(7 24 3600.)] - 3);
pltL1short = ListPlot [bin[{#[[1]]/(24 3600.), #[[2]]} & /@ SelectByTime[24 3600. dropdaysfront,
      Last[rL1cal][[1]] + S5startShift, rL1cal, S5startShift], 5], PlotRange → {0, 16},
   FrameLabel → {"run time (d)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → All,
   GridLines → {Table[i, {i, 0, 1 + (Last[rL1cal][[1]] + S5startShift)/(24 3600.)}], Automatic},
   FrameTicks → {Table[{7 i, dayname[7 24 3600 i]},
      {i, 0, 1 + (Last[rL1cal][[1]] + S5startShift)/(7 24 3600.)}], Automatic},
   PlotJoined → False, PlotStyle → {Thickness[0.007], RGBColor[0, 0.6, 0]}];
```



Range Trend over past 7 Days

In[176]:=

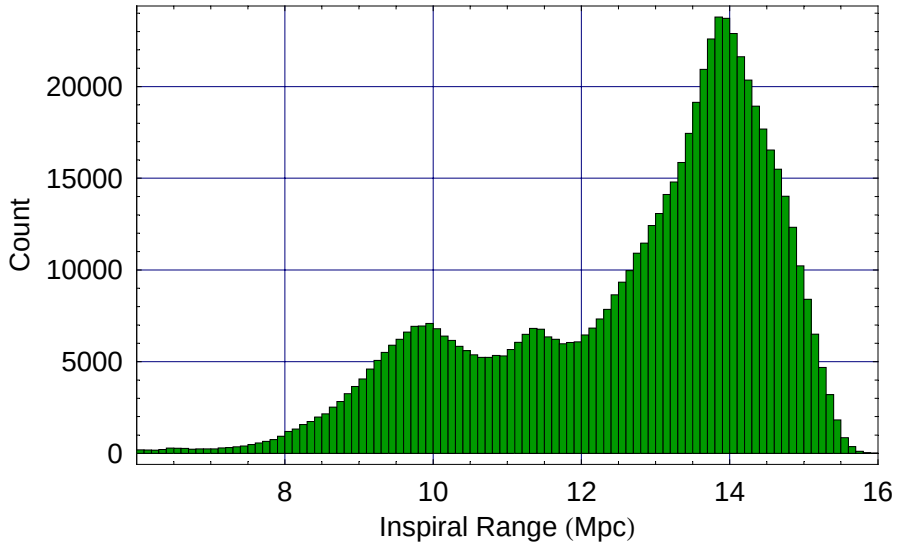
```
dropdaysfront = IntegerPart[(Last[rL1cal][[1]] + S5startShift)/(24 3600.)] - 7;
pltL1recent = ListPlot [bin[{#[[1]]/(24 3600.), #[[2]]} & /@ SelectByTime[24 3600. dropdaysfront,
    Last[rL1cal][[1]] + S5startShift, rL1cal, S5startShift], 2], PlotRange → {0, 16},
  FrameLabel → {"run time (d)", "Inspiral Range (Mpc)"}, Frame → True, PlotRange → All,
  GridLines → {Table[i, {i, 0, 1 + (Last[rL1cal][[1]] + S5startShift)/(24 3600.)}], Automatic},
  FrameTicks → {Table[{2 i, dayname[2 24 3600 i]},
    {i, 0, 1 + (Last[rL1cal][[1]] + S5startShift)/(2 24 3600.)}], Automatic},
  PlotJoined → False, PlotStyle → {Thickness [0.007], RGBColor [0, 0.6, 0]}];
```



Accumulated Histogram

In[178]:=

```
histL1 = Histogram[#[[2]] & /@ rL1cal, HistogramRange → {6, 16},
   HistogramCategories → Range[2, 16, 0.1], FrameLabel → {"Inspiral Range (Mpc)", "Count"}
   Frame → True, GridLines → Automatic, BarStyle → {RGBColor[0, 0.6, 0]}];
```



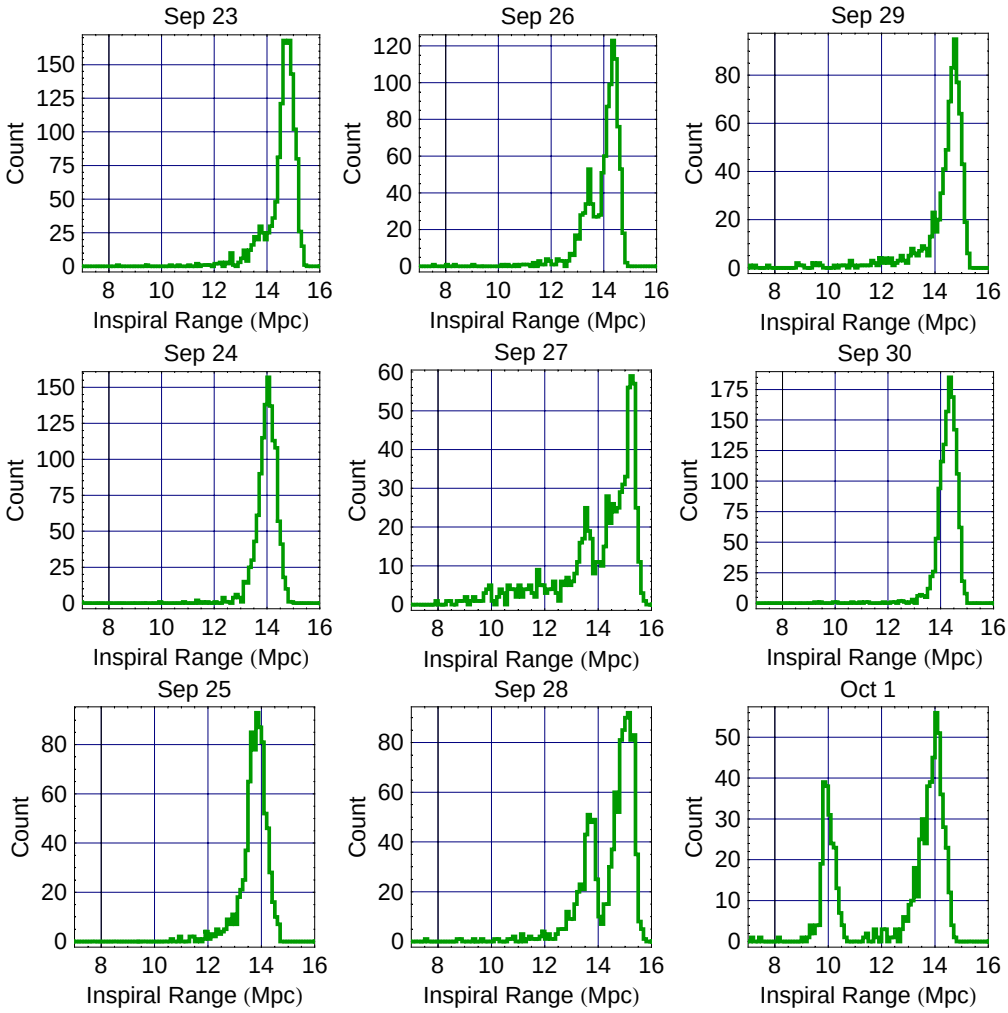
In[179]:=

```
histL1alt =
  ListPlot[StepHistogram[#[[2]] & /@ rL1cal, HistogramCategories → Range[2, 16, 0.1]],
   PlotJoined → True, PlotRange → {{7, 16}, All},
   PlotStyle → {Thickness[0.007], RGBColor[0, 0.6, 0]},
   FrameLabel → {"Inspiral Range (Mpc)", "Count"},
   Frame → True, GridLines → Automatic, DisplayFunction → Identity];
```

Daily Histograms over past 9 Days

In[180]:=

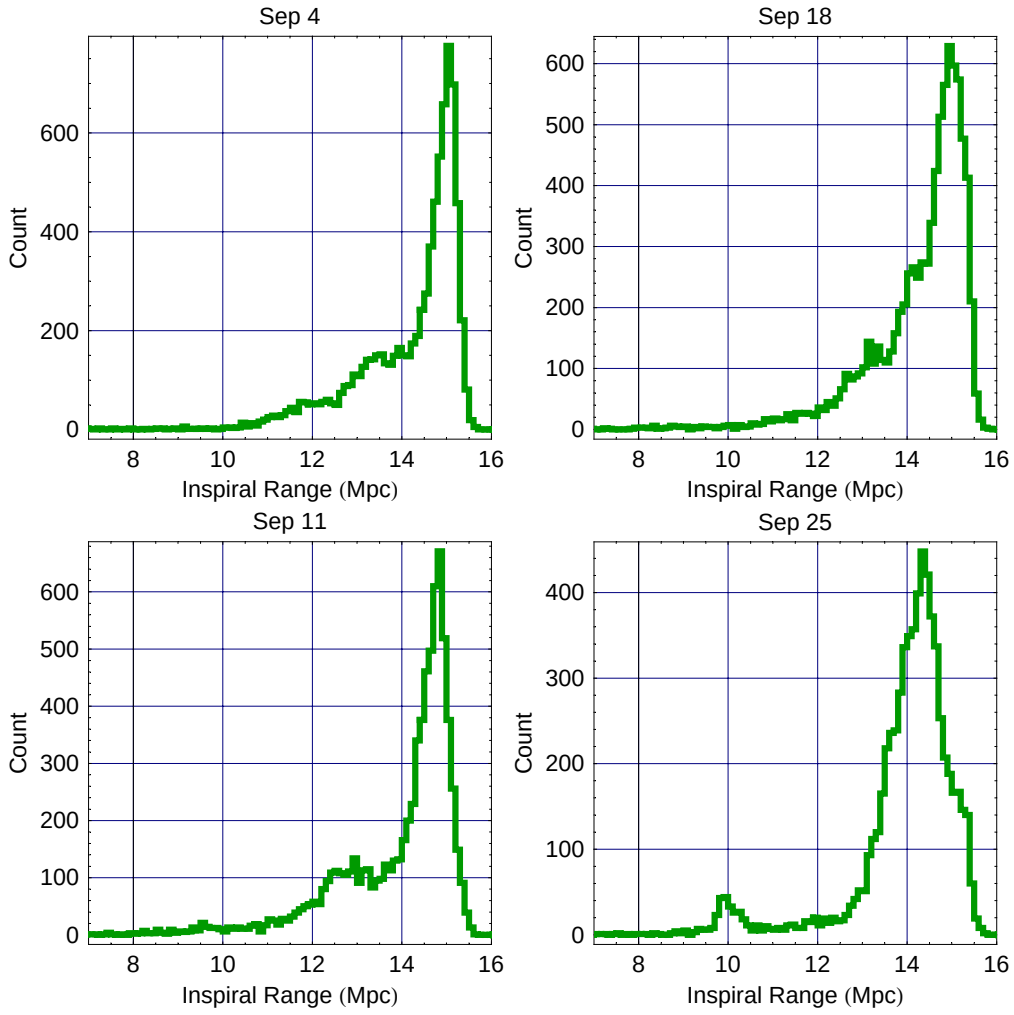
```
dropdaysfront = Length[rDaysL1] - 9;
stepDailyL1 =
  StepHistogram[Transpose[#][[2]], HistogramCategories → Range[2, 18, 0.1]] & /@
   Drop[rDaysL1, dropdaysfront];

histDailyL1 = Show[
   GraphicsArray[

    Partition[
      Table[
       ListPlot[stepDailyL1[[i]], PlotJoined → True, PlotRange → {{7, 16}, All},
        PlotStyle → {Thickness [0.016], RGBColor [0, 0.6, 0]},
        FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[24 3600 (dropdaysfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 9}],
      3] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 23
Count
Inspiral Range (Mpc)
Sep 26
Count
Inspiral Range (Mpc)
Sep 29
Count
Inspiral Range (Mpc)
Sep 24
Count
Inspiral Range (Mpc)
Sep 27
Count
Inspiral Range (Mpc)
Sep 30
Count
Inspiral Range (Mpc)
Sep 25
Count
Inspiral Range (Mpc)
Sep 28
Count
Inspiral Range (Mpc)
Oct 1
Count
Inspiral Range (Mpc)

Weekly Histograms over past 4 Weeks

In[183]:=

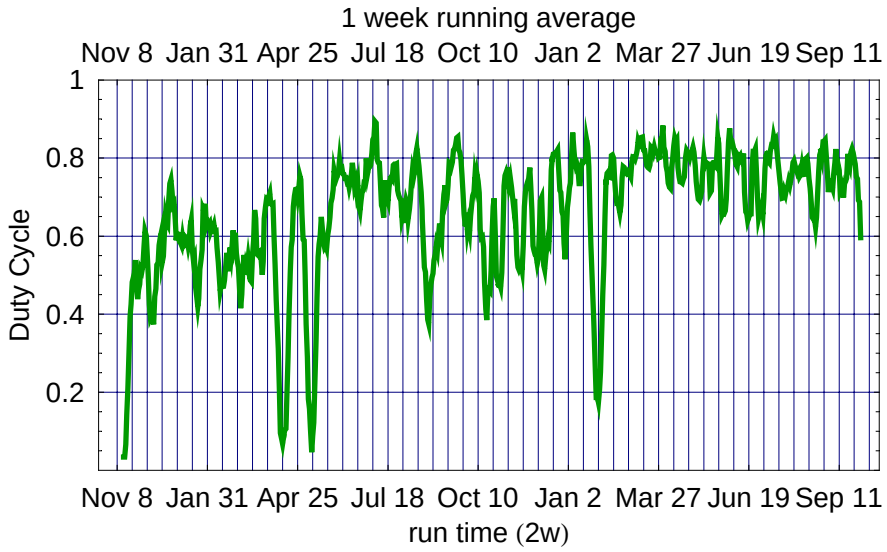
```
dropweeksfront = Length[rWeeksL1] - 4;
stepWeeklyL1 =
  StepHistogram[Transpose[#][[2]], HistogramCategories → Range[2, 18, 0.1]] & /@
   Drop[rWeeksL1, dropweeksfront];

histWeeklyL1 = Show[
   GraphicsArray[

    Partition[
      Table[
       ListPlot[stepWeeklyL1[[i]], PlotJoined → True, PlotRange → {{7, 16}, All},
        PlotStyle → {Thickness [0.016], RGBColor [0, 0.6, 0]},
        FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[7 24 3600 (dropweeksfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 4}],
      2] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 4
Count
Inspiral Range (Mpc)
Sep 18
Count
Inspiral Range (Mpc)
Sep 11
Count
Inspiral Range (Mpc)
Sep 25
Count
Inspiral Range (Mpc)

Duty Cycle Trend

In[186]:=

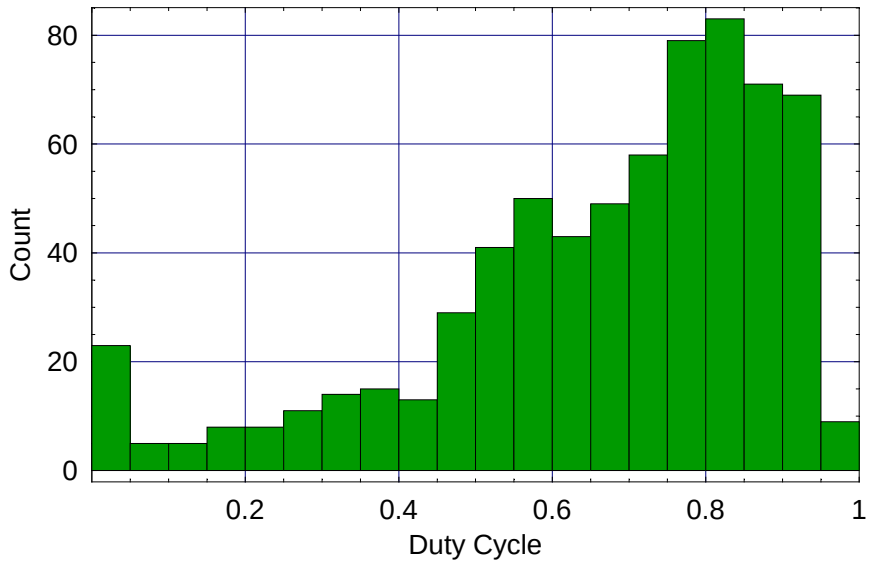
```
dutyL1avrg = Transpose[{Drop[Transpose[dutyL1][[1]], 6],
    Plus @@ # / 7 & /@ Partition[Transpose[dutyL1][[2]], 7, 1]}];
pltL1avrg = ListPlot[dutyL1avrg,
   FrameLabel → {"run time (2w)", "Duty Cycle", "1 week running average", ""},
   AspectRatio → 0.5, Frame → True, PlotRange → {0, 1}, PlotJoined → True,
   GridLines → {Table[14 i, {i, 0, 1 + Last[rH1cal][[1]] / (14 24 3600.)}], Automatic}, FrameTicks →
    {Table[{84 i, dayname[84 24 3600 i]}, {i, 0, 1 + Last[rH1cal][[1]] / (84 24 3600.)}], Automatic},
   PlotStyle → {Thickness[0.007], RGBColor[0, 0.6, 0]}];
```



Accumulated Daily Duty Cycle Histogram

In[188]:=

```
hsL1 = Histogram[Drop[Last /@ dutyL1, 10], HistogramRange → {0, 1},
   HistogramCategories → Range[0, 1, 0.05], FrameLabel → {"Duty Cycle", "Count"},
   Frame → True, GridLines → Automatic, BarStyle → {RGBColor [0, 0.6, 0]}];
```

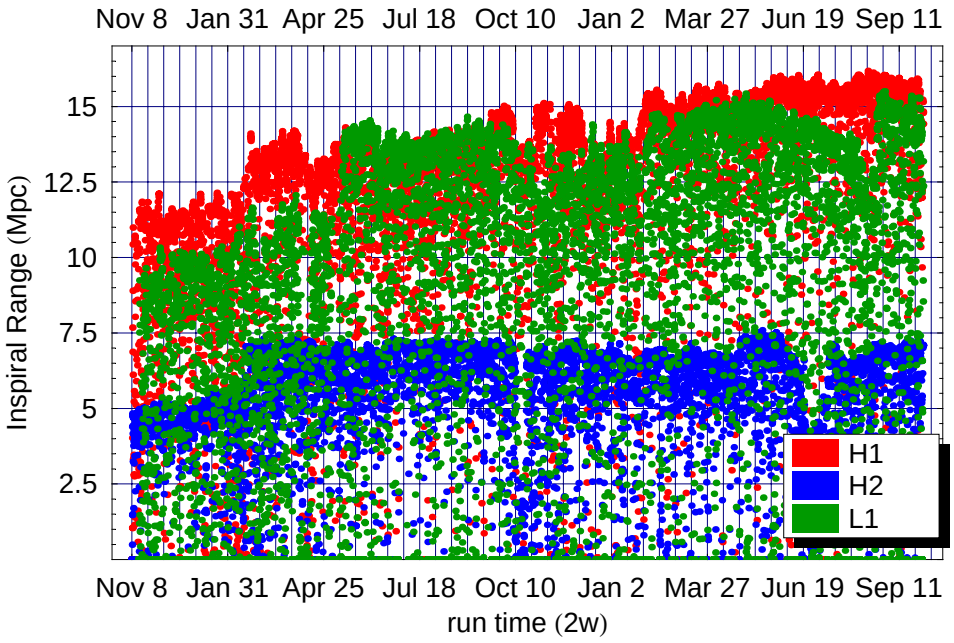


Combined

Range Trend

In[189]:=

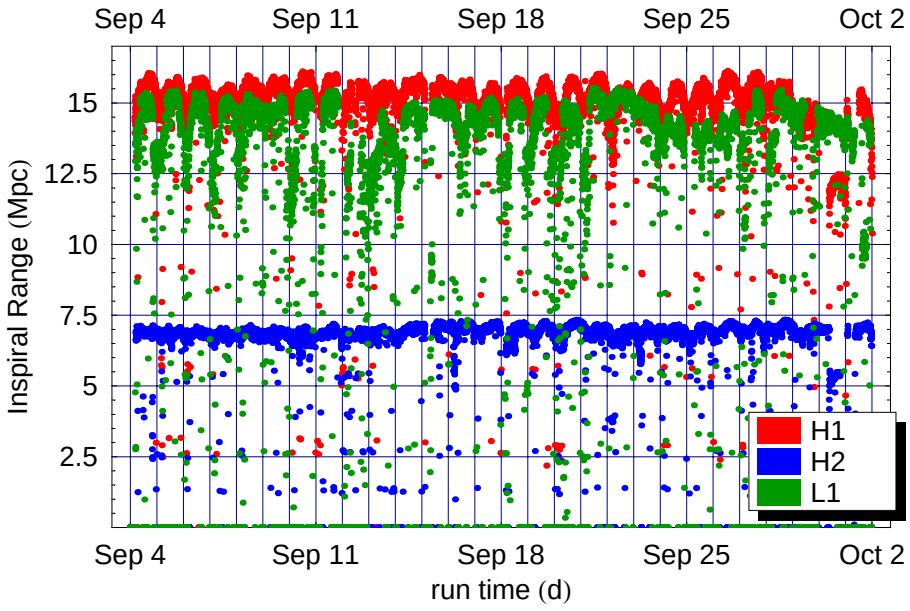
```
pltHHL = ShowLegend[
   Show[{pltH1, pltH2, pltL1}, PlotRange → {All, {0, 17}}, DisplayFunction → Identity],
   {{{RGBColor[1, 0, 0], "H1"}, {RGBColor[0, 0, 1], "H2"}, {RGBColor[0, 0.6, 0], "L1"}},
    LegendPosition → {.6, -.42}, LegendSize → {0.3, 0.2}, LegendShadow → {0.02, -0.02}}];
```



Range Trend over past 3-4 Weeks

In[190]:=

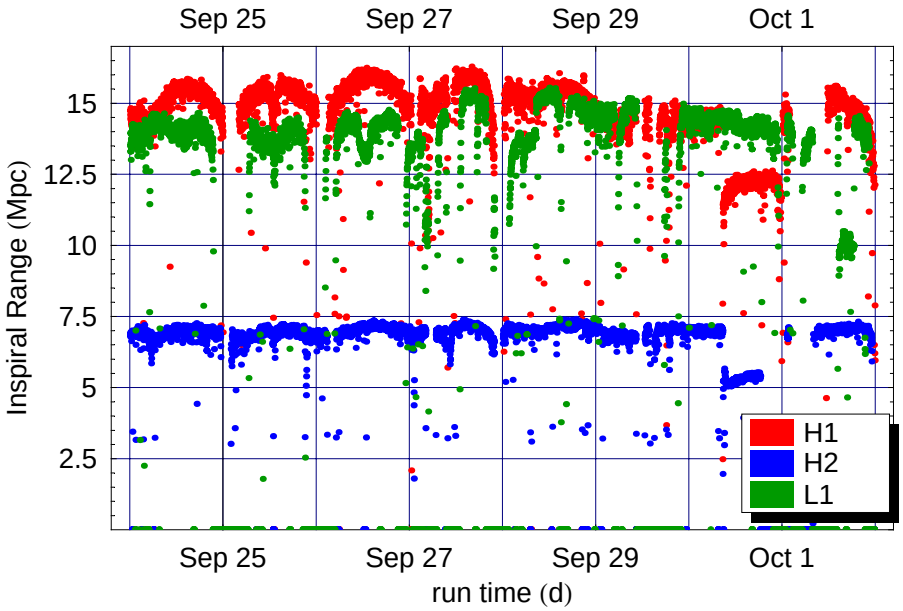
```
pltHHLshort = ShowLegend[Show[{pltH1short, pltH2short, pltL1short},
    PlotRange → {All, {0, 17}}, DisplayFunction → Identity],
   {{{RGBColor[1, 0, 0], "H1"}, {RGBColor[0, 0, 1], "H2"}, {RGBColor[0, 0.6, 0], "L1"}},
    LegendPosition → {.6, -.42}, LegendSize → {0.3, 0.2}, LegendShadow → {0.02, -0.02}}];
```



Range Trend over past 7 Days

In[191]:=

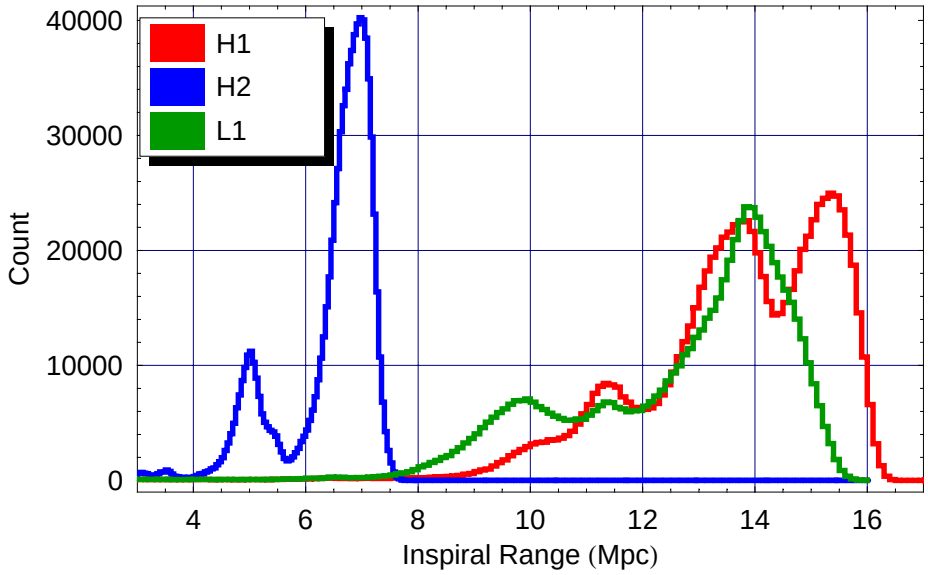
```
pltHHLrecent = ShowLegend[Show[{pltH1recent, pltH2recent, pltL1recent},
    PlotRange → {All, {0, 17}}, DisplayFunction → Identity],
   {{{RGBColor[1, 0, 0], "H1"}, {RGBColor[0, 0, 1], "H2"}, {RGBColor[0, 0.6, 0], "L1"}},
    LegendPosition → {.6, -.42}, LegendSize → {0.3, 0.2}, LegendShadow → {0.02, -0.02}}];
```



Accumulated Histogram

In[192]:=

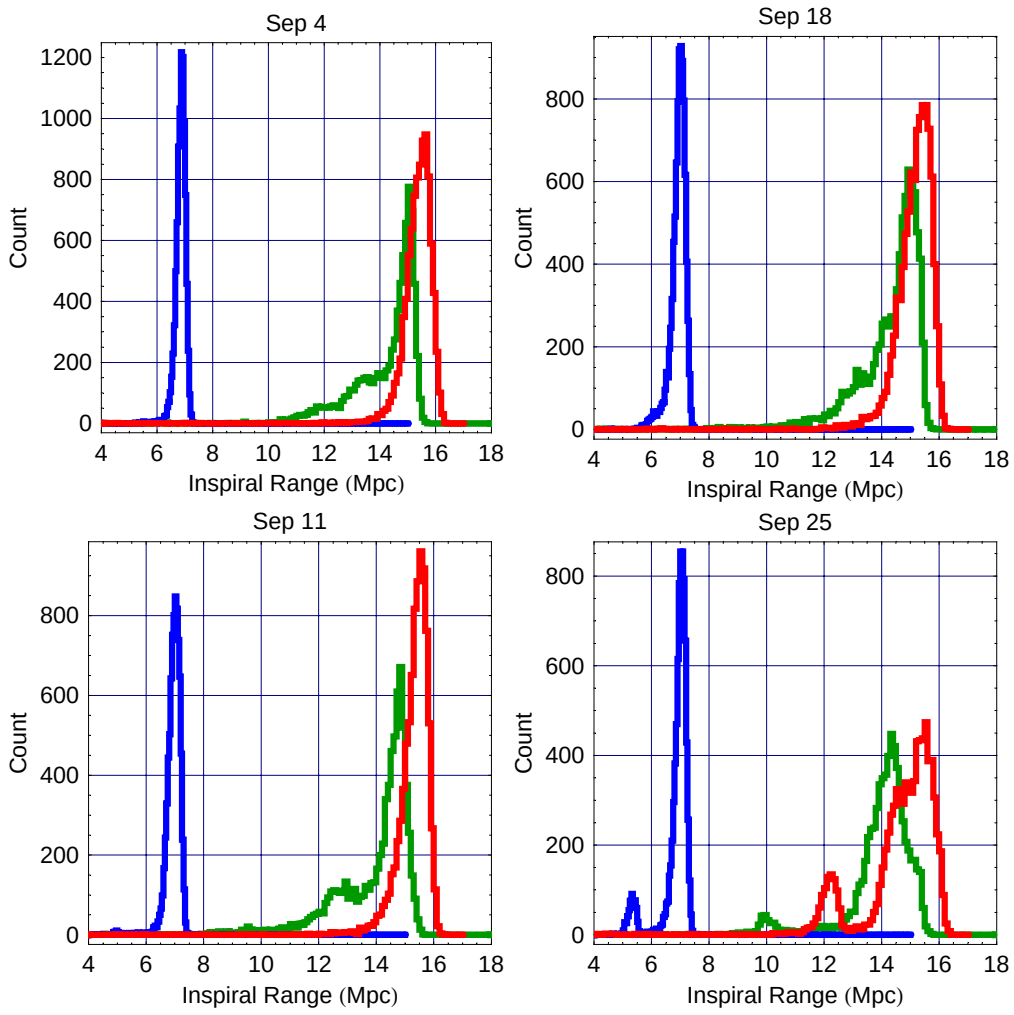
```
histHHL = ShowLegend[Show[{histH1alt, histH2alt, histL1alt},
    PlotRange → {{3, 17}, All}, DisplayFunction → Identity],
   {{{RGBColor[1, 0, 0], "H1"}, {RGBColor[0, 0, 1], "H2"}, {RGBColor[0, 0.6, 0], "L1"}},
    LegendPosition → {-.7, .285}, LegendSize → {0.4, 0.3}, LegendShadow → {0.02, -0.02}}];
```



Weekly Histograms over past 4 Weeks

In[193]:=

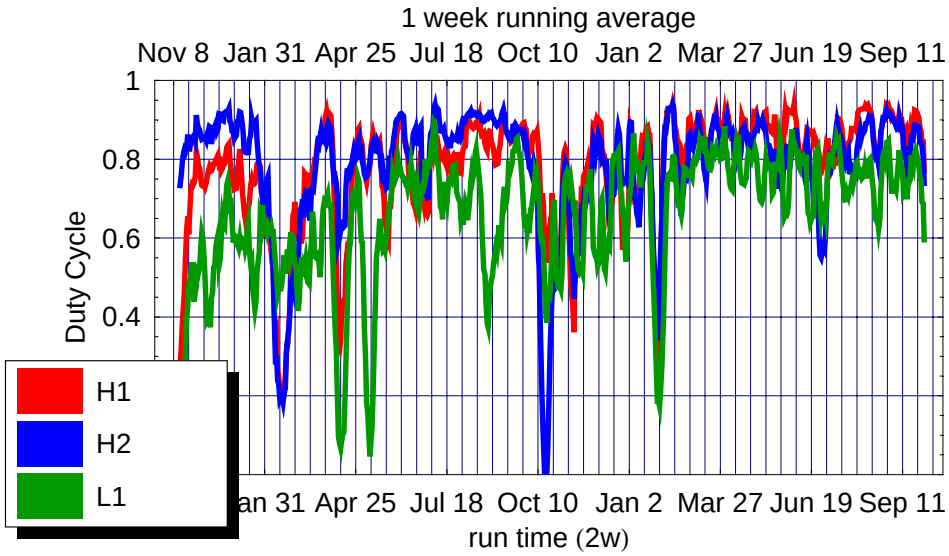
```
histWeekly = Show[
   GraphicsArray[

    Partition[
      Table[
       MultipleListPlot[stepWeeklyL1[[i]], stepWeeklyH2[[i]],
        stepWeeklyH1[[i]], PlotJoined → True, PlotRange → {{3.999, 18}, All},
        SymbolShape → None, PlotStyle → {{Thickness [0.016], RGBColor [0, 0.6, 0]},
          {Thickness [0.016], RGBColor [0, 0, 1]}, {Thickness [0.016],
           RGBColor [1, 0, 0]}}, FrameLabel → {"Inspiral Range (Mpc)", "Count"},
        PlotLabel → dayname[7 24 3600 (dropweeksfront + i - 1)],
        Frame → True, GridLines → Automatic,
        AspectRatio → 1, textoptsmall, DisplayFunction → Identity],
       {i, 1, 4}],
      2] // Transpose,

    GraphicsSpacing → 0
   ]
  ];
```


Sep 4
Count
Inspiral Range (Mpc)
Sep 18
Count
Inspiral Range (Mpc)
Sep 11
Count
Inspiral Range (Mpc)
Sep 25
Count
Inspiral Range (Mpc)

Duty Cycle Trend

In[194]:=

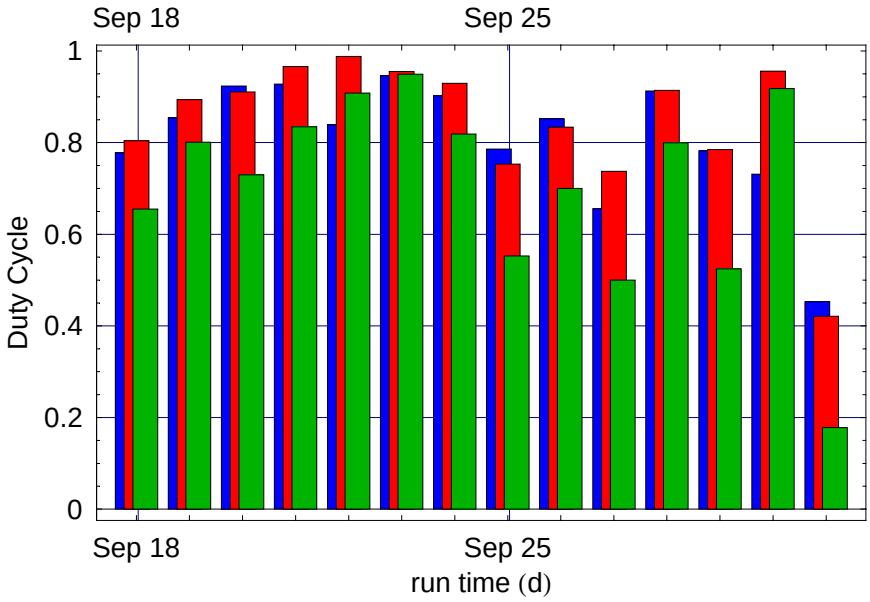
```
histHHL = ShowLegend[Show[{pltH1avrg, pltH2avrg, pltL1avrg}, DisplayFunction → Identity],
    {{{RGBColor[1, 0, 0], "H1"}, {RGBColor[0, 0, 1], "H2"}, {RGBColor[0, 0.6, 0], "L1"}},
     LegendPosition → {-.9, -.45}, LegendSize → {0.4, 0.3}, LegendShadow → {0.02, -0.02}}];
```



Daily Duty Cycle over Past 2-3 Weeks

In[195]:=

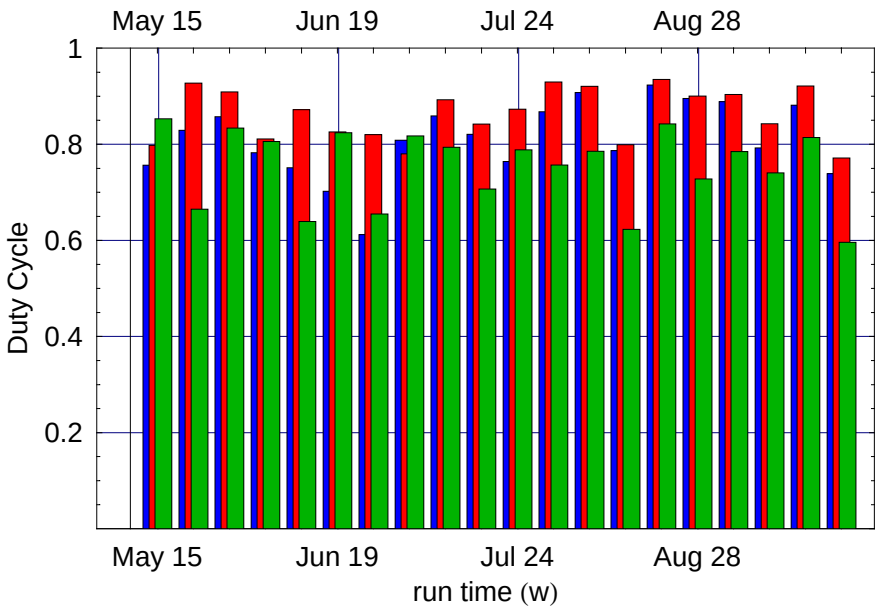
```
dropdaysfront = 7 (IntegerPart[Length[dutyH1] / 7.] - 2);
dutyHHLshort =
  BarChart[Drop[Last /@ dutyH2, dropdaysfront], Drop[Last /@ dutyH1, dropdaysfront],
   Drop[Last /@ dutyL1, dropdaysfront], FrameLabel → {"run time (d)", "Duty Cycle"},
   Frame → True, GridLines → {Table[i + 1.2, {i, 0, Length[dutyH1] - 1, 7}], Automatic},
   BarStyle → {RGBColor[0, 0, 1], RGBColor[1, 0, 0], RGBColor[0, 0.7, 0]},
   BarSpacing → -0.3, BarGroupSpacing → 0.5, BarLabels → Table[If[Mod[i, 7] === 0,
      dayname[(i + dropdaysfront) * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]];
```



Weekly Duty Cycle over Past 4 Months

In[197]:=

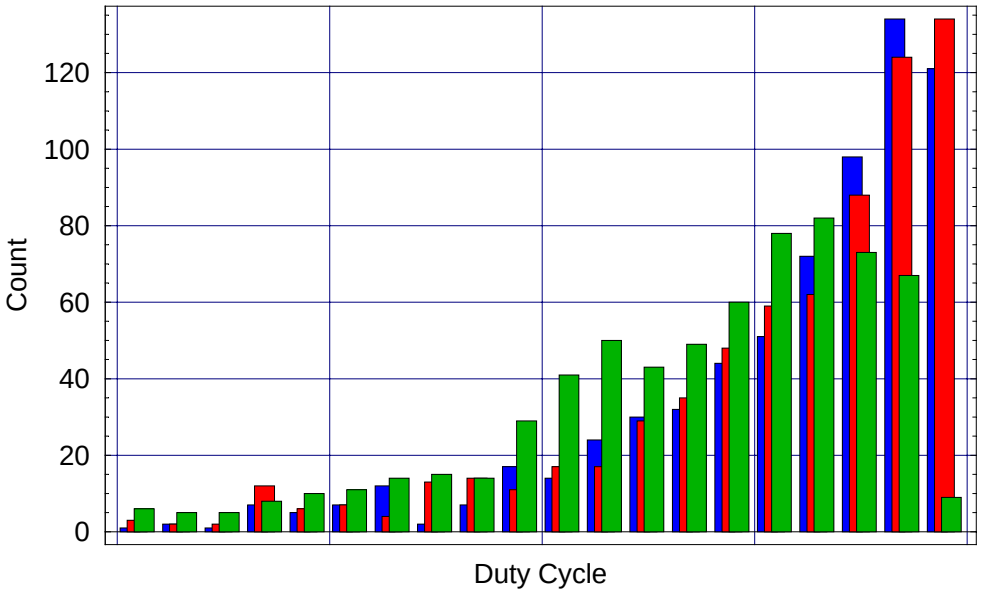
```
dropweekfront = Max[IntegerPart[Length[dutyH1] / 7.] - 20, 0];
dutyHHLweekly = BarChart[Drop[bin[Last /@ dutyH2, 7], dropweekfront],
   Drop[bin[Last /@ dutyH1, 7], dropweekfront], Drop[bin[Last /@ dutyL1, 7], dropweekfront]
   FrameLabel → {"run time (w)", "Duty Cycle"}, PlotRange → {0, 1}, Frame → True,
   GridLines → {Table[i + 1.2, {i, 0, Length[dutyH1] - 1, 5}], Automatic},
   BarStyle → {RGBColor[0, 0, 1], RGBColor[1, 0, 0], RGBColor[0, 0.7, 0]},
   BarSpacing → -0.3, BarGroupSpacing → 0.5, BarLabels → Table[If[Mod[i, 5] === 0,
      dayname[(i + dropweekfront) * 7 * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]];
```



Accumulated Daily Duty Cycle Histogram

In[199]:=

```
dutyHistHHL =
  BarChart[BinCounts[Last /@ dutyH2, {0, 1, 0.05}], BinCounts[Last /@ dutyH1, {0, 1, 0.05}],
   BinCounts[Last /@ dutyL1, {0, 1, 0.05}], FrameLabel → {"Duty Cycle", "Count"},
   Frame → True, GridLines → {Table[i + 0.7, {i, 0, Length[dutyH1] - 1, 5}], Automatic},
   BarStyle → {RGBColor[0, 0, 1], RGBColor[1, 0, 0], RGBColor[0, 0.7, 0]},
   BarSpacing → -0.3, BarGroupSpacing → 0.5, BarLabels → None];
```



In[200]:=

```
bin[#[[4]] & /@ coinc, 2]
```

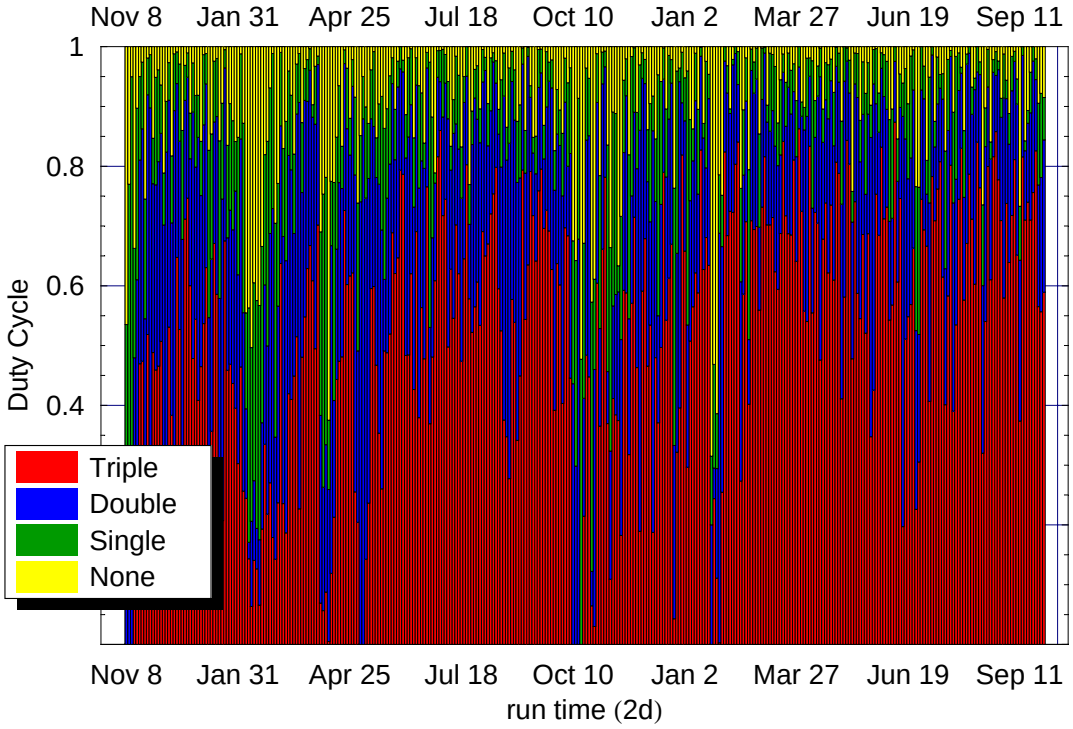
Out[200]=

```
{0, 0, 0, 0.0802083, 0.227083, 0.469444, 0.473958, 0.19375, 0.518403, 0.271528, 0.488542,
 0.459375, 0.465625, 0.506944, 0.179167, 0.267014, 0.530903, 0.383333, 0.325347,
 0.647569, 0.526736, 0.287153, 0.711458, 0.746528, 0.600347, 0.478472, 0.544097,
 0.408333, 0.464931, 0.536806, 0.630556, 0.254861, 0.356597, 0.670833, 0.585764,
 0.197569, 0.206944, 0.675, 0.458681, 0.46875, 0.436806, 0.395139, 0.302778, 0.464236,
 0.256597, 0.244444, 0.143403, 0.0635417, 0.140625, 0.126389, 0.065625, 0.193056,
 0.335069, 0.218056, 0.270486, 0.178819, 0.142361, 0.237153, 0.6375, 0.235764,
 0.186806, 0.419444, 0.410069, 0.448958, 0.514931, 0.226736, 0.480556, 0.547917,
 0.628819, 0.667361, 0.608681, 0.494792, 0.701736, 0.0690972, 0.0565972, 0.0878472,
 0.00486111, 0.11875, 0.212847, 0.443403, 0.473958, 0.48125, 0.726042, 0.602083,
 0.616667, 0.621528, 0.255208, 0.204167, 0, 0, 0.142361, 0.236458, 0.595486, 0.598958,
 0.467361, 0.353472, 0.260417, 0.490972, 0.488194, 0.519444, 0.688542, 0.620486,
 0.646528, 0.793403, 0.786458, 0.483333, 0.484375, 0.620139, 0.426389, 0.690625,
 0.379514, 0.563542, 0.477778, 0.765625, 0.369097, 0.480903, 0.608681, 0.815972,
 0.859722, 0.717361, 0.744792, 0.497569, 0.627778, 0.545833, 0.702083, 0.620139,
 0.473958, 0.645139, 0.802431, 0.578125, 0.522222, 0.564931, 0.60625, 0.533681,
 0.690625, 0.65, 0.670139, 0.720486, 0.753819, 0.798264, 0.595139, 0.524653,
 0.375347, 0.347569, 0.277431, 0.577083, 0.538889, 0.341319, 0.449306, 0.79375,
 0.54375, 0.635069, 0.791319, 0.717361, 0.641319, 0.759028, 0.795139, 0.695833,
 0.726389, 0.691667, 0.627083, 0.391667, 0.637153, 0.601736, 0.403472, 0.696875,
 0.683681, 0.445486, 0, 0, 0, 0, 0.214583, 0.484028, 0.447569, 0.0645833, 0.0302083,
 0.604514, 0.365278, 0.661111, 0.781597, 0.369444, 0.109028, 0.411458, 0.384028,
 0.374653, 0.182639, 0.592361, 0.588194, 0.317708, 0.570833, 0.714931, 0.463194,
 0.189583, 0.590972, 0.678819, 0.465625, 0.534375, 0.1875, 0.479861, 0.370833,
 0.496875, 0.789931, 0.542361, 0.612847, 0.669444, 0.0430556, 0.321528, 0.395833,
 0.81875, 0.657986, 0.296528, 0.507639, 0.564931, 0.621528, 0.588194, 0.827083,
 0.627083, 0.680903, 0.634028, 0, 0.244097, 0.111111, 0.00277778, 0.254514, 0.823958,
 0.684028, 0.724653, 0.722917, 0.803125, 0.840625, 0.273611, 0.586111, 0.707292,
 0.402083, 0.709028, 0.694097, 0.699306, 0.559375, 0.731597, 0.815972, 0.702083,
 0.702083, 0.714236, 0.623611, 0.594097, 0.6875, 0.841667, 0.717014, 0.687153,
 0.685069, 0.810417, 0.640972, 0.862847, 0.724653, 0.557639, 0.540278, 0.833681,
 0.554514, 0.722917, 0.704861, 0.475694, 0.678125, 0.738542, 0.621528, 0.735069,
 0.609722, 0.806944, 0.787847, 0.410764, 0.58125, 0.843403, 0.803472, 0.477778,
 0.740625, 0.5875, 0.545139, 0.685764, 0.520833, 0.687153, 0.347569, 0.425347,
 0.753125, 0.684375, 0.831944, 0.712153, 0.731597, 0.542708, 0.567708, 0.873611,
 0.60625, 0.745833, 0.196875, 0.510764, 0.548264, 0.568403, 0.663194, 0.226042,
 0.305208, 0.744792, 0.69375, 0.666319, 0.406597, 0.782639, 0.709028, 0.761806,
 0.807639, 0.614583, 0.401042, 0.582986, 0.801736, 0.390278, 0.534722, 0.744792,
 0.830208, 0.576042, 0.670833, 0.786806, 0.711458, 0.602778, 0.840278, 0.763889,
 0.319792, 0.540278, 0.799653, 0.610069, 0.815972, 0.857986, 0.777431, 0.709375,
 0.579514, 0.737847, 0.638889, 0.717708, 0.811111, 0.651389, 0.373958, 0.815625,
 0.709722, 0.739931, 0.709722, 0.755903, 0.825694, 0.565278, 0.556597, 0.589236}
```

Daily Coincidence Chart

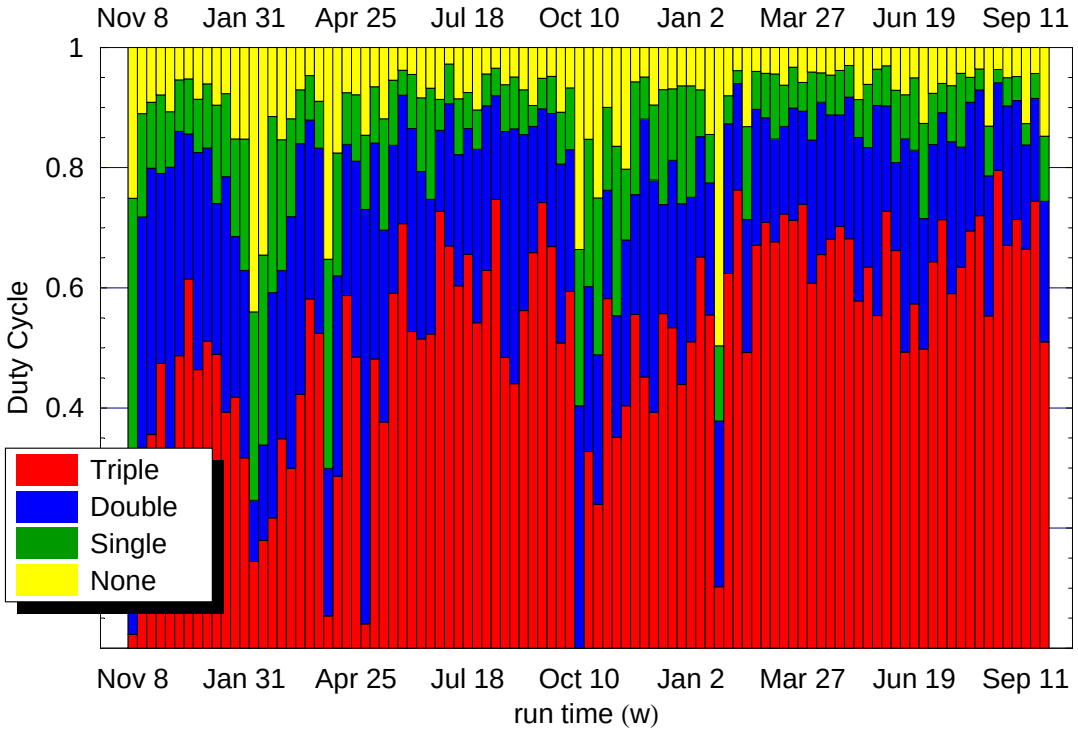
In[201]:=

```
binC = 2;
coincHHL = ShowLegend[

   StackedBarChart[bin[#[[4]] & /@ coinc, binC],
    bin[#[[3]] & /@ coinc, binC], bin[#[[2]] & /@ coinc, binC], bin[#[[1]] & /@ coinc, binC],
    PlotRange → {0, 1},
    FrameLabel → {"run time (2d)", "Duty Cycle"}, Frame → True,
    GridLines → {Table[i + 1.2, {i, 0, Length[dutyH1] - 1, 7}], Automatic}, BarStyle →
     {RGBColor[1, 0, 0], RGBColor[0, 0, 1], RGBColor[0, 0.7, 0], RGBColor[1, 1, 0]},
    BarSpacing → 0, BarGroupSpacing → 1.0, BarLabels → Table[If[Mod[i, 84 / binC] === 0,
       dayname[binC * i * 24 * 3600], ""], {i, 0, Length[dutyH1] / binC - 1}],
    DisplayFunction → Identity],

   {{{RGBColor[1, 0, 0], "Triple"}, {RGBColor[0, 0, 1], "Double"},
     {RGBColor[0, 0.6, 0], "Single"}, {RGBColor[1, 1, 0], "None"}}, LegendPosition →
     {-0.9, -.4}, LegendSize → {0.35, 0.26}, LegendShadow → {0.02, -0.02}}];
```



In[203]:=

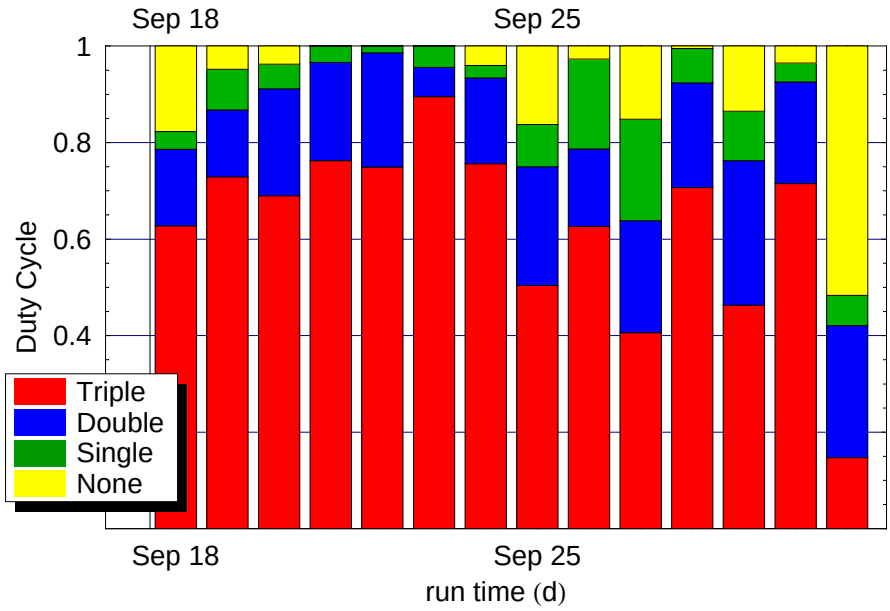
```
binC = 7;
coincHHL = ShowLegend[

   StackedBarChart[bin[#[[4]] & /@ coinc, binC],
    bin[#[[3]] & /@ coinc, binC], bin[#[[2]] & /@ coinc, binC], bin[#[[1]] & /@ coinc, binC],
    PlotRange → {0, 1},
    FrameLabel → {"run time (w)", "Duty Cycle"}, Frame → True,
    GridLines → {Table[i + 1.2, {i, 0, Length[dutyH1] - 1, 7}], Automatic}, BarStyle →
     {RGBColor[1, 0, 0], RGBColor[0, 0, 1], RGBColor[0, 0.7, 0], RGBColor[1, 1, 0]},
    BarSpacing → 0, BarGroupSpacing → 1.0, BarLabels → Table[If[Mod[i, 84 / binC] === 0,
       dayname[binC * i * 24 * 3600], ""], {i, 0, Length[dutyH1] / binC - 1}],
    DisplayFunction → Identity],

   {{{RGBColor[1, 0, 0], "Triple"}, {RGBColor[0, 0, 1], "Double"},
     {RGBColor[0, 0.6, 0], "Single"}, {RGBColor[1, 1, 0], "None"}}, LegendPosition →
     {-0.9, -.4}, LegendSize → {0.35, 0.26}, LegendShadow → {0.02, -0.02}}];
```



Daily Coincidence Chart over Past 2-3 Weeks

In[205]:=

```
dropdaysfront = 7 (IntegerPart[Length[dutyH1] / 7.] - 2);
coincHHLshort = ShowLegend[

   StackedBarChart[
    Drop[#[[4]] & /@ coinc, dropdaysfront], Drop[#[[3]] & /@ coinc, dropdaysfront],
    Drop[#[[2]] & /@ coinc, dropdaysfront], Drop[#[[1]] & /@ coinc, dropdaysfront],
    PlotRange → {0, 1},
    FrameLabel → {"run time (d)", "Duty Cycle"}, Frame → True,
    GridLines → {Table[i + 1, {i, 0, Length[dutyH1] - 1, 7}], Automatic}, BarStyle →
     {RGBColor[1, 0, 0], RGBColor[0, 0, 1], RGBColor[0, 0.7, 0], RGBColor[1, 1, 0]},
    BarLabels → Table[If[Mod[i, 7] === 0, dayname[(i + dropdaysfront) * 24 * 3600], ""],
      {i, 0, Length[dutyH1] - 1}],
    DisplayFunction → Identity],

   {{{RGBColor[1, 0, 0], "Triple"}, {RGBColor[0, 0, 1], "Double"},
     {RGBColor[0, 0.6, 0], "Single"}, {RGBColor[1, 1, 0], "None"}}, LegendPosition →
     {-0.9, -.4}, LegendSize → {0.35, 0.26}, LegendShadow → {0.02, -0.02}}];
```

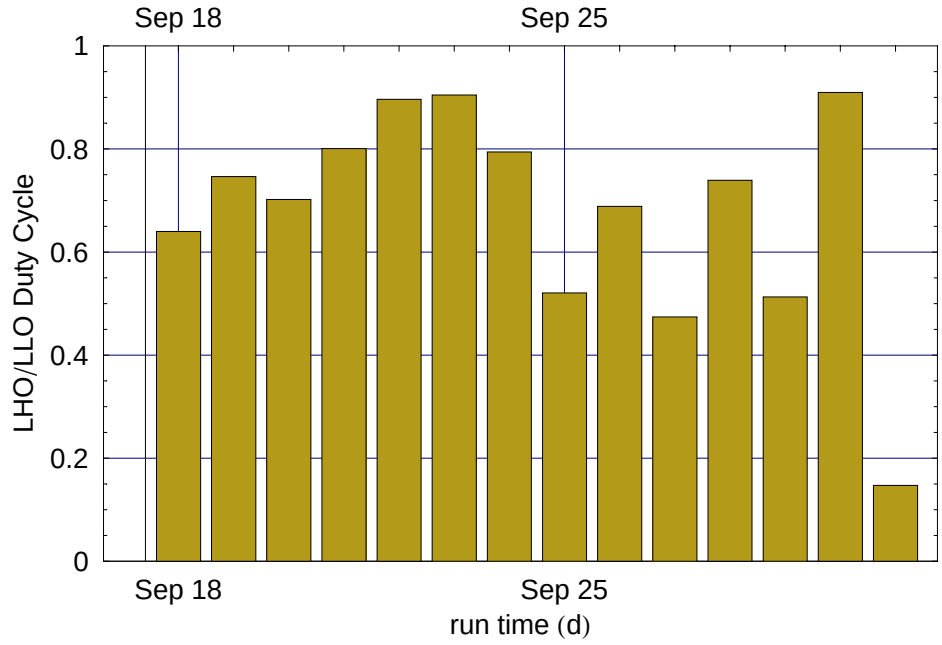


Daily LHO/LLO Coincidence Chart over Past 2-3 Weeks

This coincidence requires the Livingston detector and at least one of the Hanford detectors in science mode

In[207]:=

```
dropdaysfront = 7 (IntegerPart[Length[dutyH1] / 7.] - 2);
coincHLshort = BarChart[Drop[coincHL, dropdaysfront],
   PlotRange → {-1*^-5, 1},
   FrameLabel → {"run time (d)", "LHO/LLO Duty Cycle"}, Frame → True,
   GridLines → {Table[i + 1, {i, 0, Length[dutyH1] - 1, 7}], Automatic},
   BarStyle → {RGBColor [0.7, 0.6, 0.1]}, BarLabels → Table[If[Mod[i, 7] === 0,
      dayname[(i + dropdaysfront) * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]];
```



Weekly Triple Coincidence Chart over Past 4 Months

In[209]:=

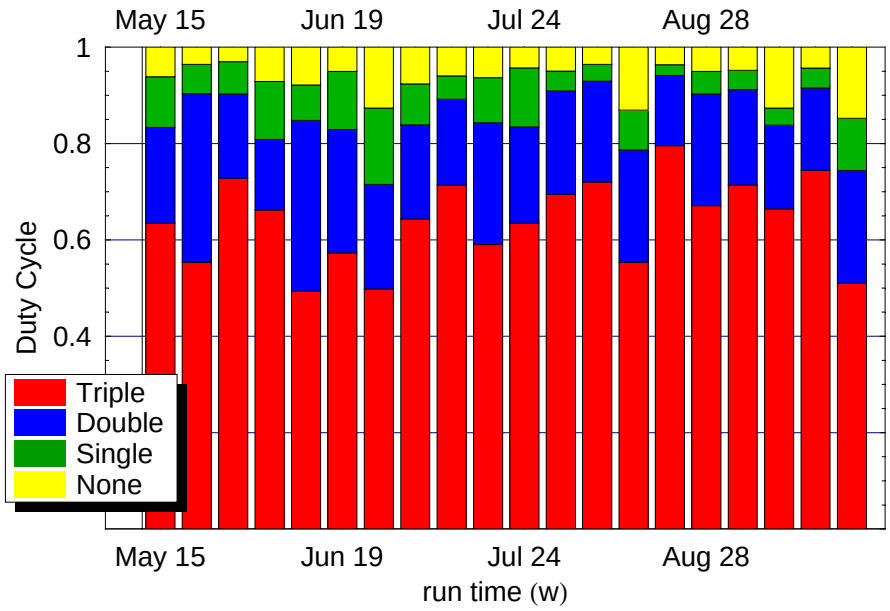
```
dropweekfront = Max[IntegerPart[Length[dutyH1] / 7.] - 20, 0];
Drop[bin[#[[4]] & /@ coinc, 7], dropweekfront]
```

Out[209]=

```
{0.634524, 0.55377, 0.727976, 0.662103, 0.493254, 0.573115,
 0.498214, 0.643353, 0.713393, 0.590278, 0.634226, 0.694643, 0.720238,
 0.553274, 0.795635, 0.670833, 0.71369, 0.664385, 0.744345, 0.509921}
```

In[210]:=

```
coincHHLweekly = ShowLegend[

   StackedBarChart[Drop[bin[#[[4]] & /@ coinc, 7], dropweekfront],
    Drop[bin[#[[3]] & /@ coinc, 7], dropweekfront], Drop[bin[#[[2]] & /@ coinc, 7],
     dropweekfront], Drop[bin[#[[1]] & /@ coinc, 7], dropweekfront],
    PlotRange → {0, 1},
    FrameLabel → {"run time (w)", "Duty Cycle"}, Frame → True,
    GridLines → {Table[i + 1, {i, 0, Length[dutyH1] - 1, 5}], Automatic}, BarStyle →
     {RGBColor[1, 0, 0], RGBColor[0, 0, 1], RGBColor[0, 0.7, 0], RGBColor[1, 1, 0]},
    BarLabels → Table[If[Mod[i, 5] === 0, dayname[(i + dropweekfront) * 7 * 24 * 3600], ""],
      {i, 0, Length[dutyH1] - 1}],
    DisplayFunction → Identity],

   {{{RGBColor[1, 0, 0], "Triple"}, {RGBColor[0, 0, 1], "Double"},
     {RGBColor[0, 0.6, 0], "Single"}, {RGBColor[1, 1, 0], "None"}}, LegendPosition →
     {-0.9, -.4}, LegendSize → {0.35, 0.26}, LegendShadow → {0.02, -0.02}}];
```



Weekly LHO/LLO Coincidence Chart over Past 4 Months

This coincidence requires the Livingston detector and at least one of the Hanford detectors in science mode
This numbers include a 2.4% correction factor due to the 4h maintenance periods each week.

In[211]:=

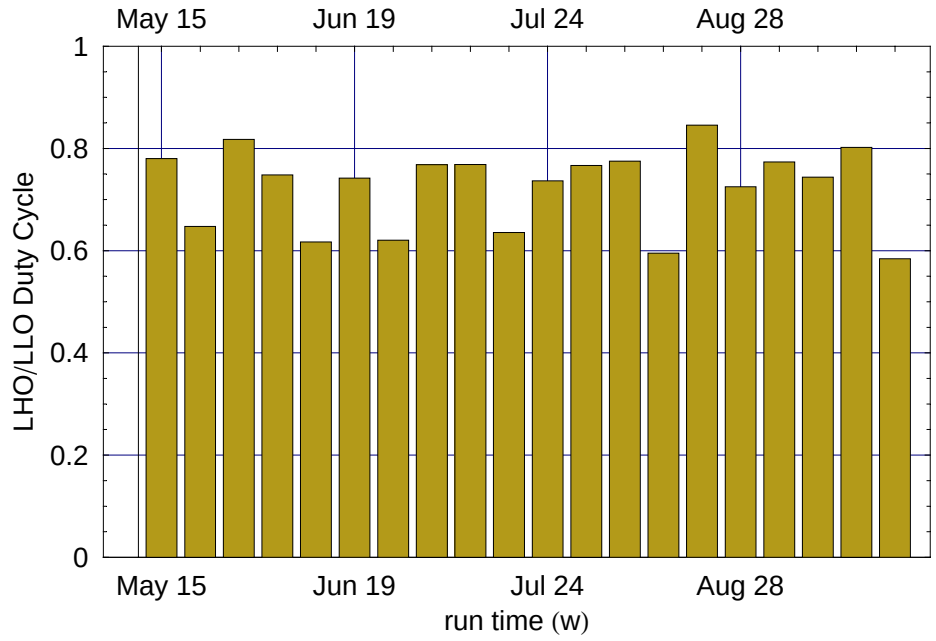
```
maintenanceCorr = 1 + 4./(24*7); dropweekfront = Max[IntegerPart[Length[dutyH1] / 7.] - 20, 0];
concHLweekly = maintenanceCorr Drop[bin[coincHL, 7], dropweekfront]
```

Out[212]=

```
{0.780147, 0.647397, 0.817727, 0.748254, 0.617231, 0.741957,
 0.620481, 0.768263, 0.768568, 0.635717, 0.736473, 0.766638, 0.77517,
 0.594988, 0.845557, 0.725198, 0.773545, 0.74409, 0.802289, 0.58412}
```

In[213]:=

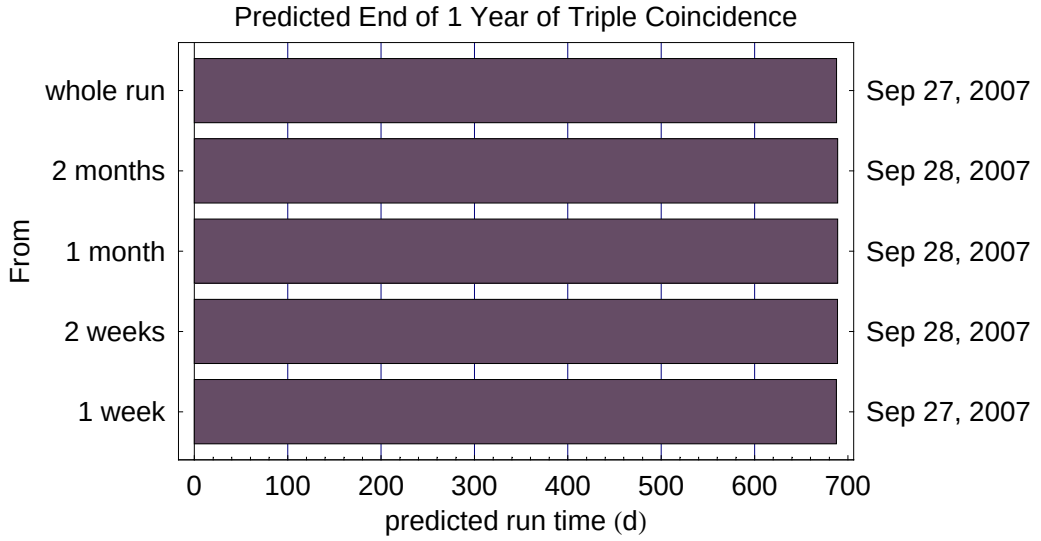
```
coincHLweekly = BarChart[concHLweekly,
   PlotRange → {-1*^-5, 1},
   FrameLabel → {"run time (w)", "LHO/LLO Duty Cycle"}, Frame → True,
   GridLines → {Table[i + 1, {i, 0, Length[dutyH1] - 1, 5}], Automatic},
   BarStyle → {RGBColor [0.7, 0.6, 0.1]}, BarLabels → Table[If[Mod[i, 5] === 0,
      dayname[(i + dropweekfront) * 7 * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]];
```



Predicted End of 1 Year of Triple Coincidence

In[214]:=

```
BarChart[predictEndOfRun, BarOrientation → Horizontal,
  BarStyle → {RGBColor [0.4, 0.3, 0.4]}, Frame → True, GridLines → {Automatic, None},
  PlotLabel → "Predicted End of 1 Year of Triple Coincidence",
  FrameLabel → {"predicted run time (d)", "From"},
  FrameTicks → {Automatic, Transpose[{{1, 2, 3, 4, 5}, predictEndOfRunLegend}],
    None, Transpose[{{1, 2, 3, 4, 5}, predictEndOfRunDate}]}];
```



Overall Progress towards 1 Year of Triple Coincidence

In[215]:=

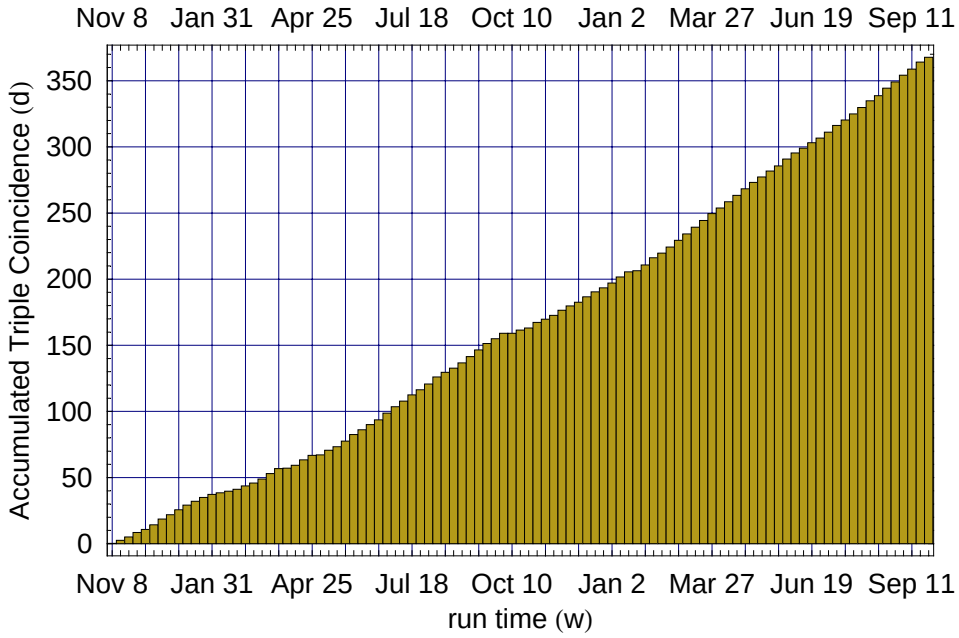
```
cummTriple = Last /@ Partition[tripleCoincAcc, 7]
```

Out[215]=

```
{0.173177, 2.57115, 5.10512, 8.4722, 10.8304, 14.3199, 18.6767, 21.9944, 25.647,
 29.172, 31.9915, 35.0659, 37.3626, 38.3984, 39.682, 41.2542, 43.7477, 45.8949,
 48.9081, 53.0554, 56.8081, 57.2005, 59.2436, 63.4248, 66.8984, 67.1936, 70.6338,
 73.3151, 77.5033, 82.5213, 86.254, 89.9227, 93.6463, 98.7908, 103.536, 107.82,
 112.488, 116.335, 120.791, 126.085, 129.527, 132.667, 136.66, 141.329, 146.572,
 151.319, 154.929, 159.137, 159.137, 161.462, 163.173, 167.293, 169.801, 172.661,
 176.601, 179.815, 182.609, 186.573, 190.343, 193.441, 197.057, 201.673, 205.606,
 206.331, 210.738, 216.13, 219.613, 224.376, 229.391, 234.194, 239.293, 244.335,
 249.557, 253.864, 258.513, 263.355, 268.328, 273.151, 277.257, 281.757, 285.686,
 290.832, 295.51, 299.007, 303.069, 306.587, 311.12, 316.159, 320.329, 324.809,
 329.717, 334.821, 338.739, 344.353, 349.103, 354.157, 358.853, 364.114, 367.72}
```

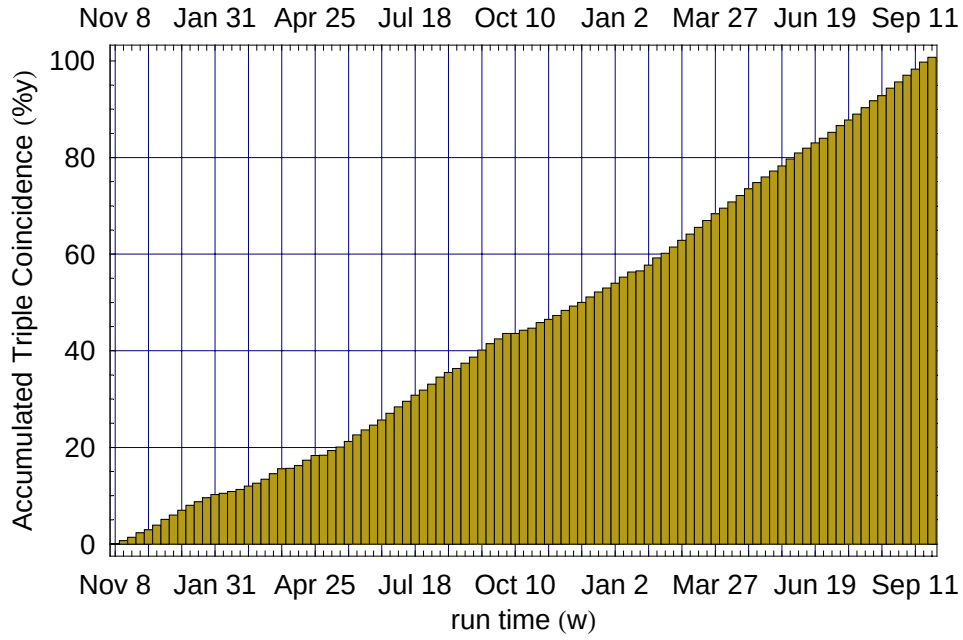
In[216]:=

```
BarChart[cummTriple, BarStyle → {RGBColor [0.7, 0.6, 0.1]},
  GridLines → {Table[i, {i, 1, Length[cummTriple], 4}], Automatic},
  FrameLabel → {"run time (w)", "Accumulated Triple Coincidence (d)"},
  Frame → True, GridLines → Automatic, BarSpacing → -0.2, BarLabels →
   Table[If[Mod[i, 12] === 0, dayname[i * 7 * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]
 ];
```



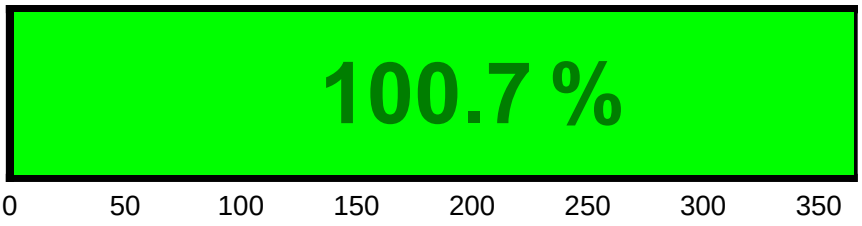
In[217]:=

```
BarChart[100 * cummTriple / 365., BarStyle → {RGBColor [0.7, 0.6, 0.1]},
  GridLines → {Table[i, {i, 1, Length[cummTriple], 4}], Automatic},
  FrameLabel → {"run time (w)", "Accumulated Triple Coincidence (%y)"},
  Frame → True, GridLines → Automatic, BarSpacing → -0.2, BarLabels →
   Table[If[Mod[i, 12] === 0, dayname[i * 7 * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]
 ];
```



In[218]:=

```
Show[

  Plot[1, {x, -1*^-3, 365}, Frame → True, GridLines → {Automatic, None},
   PlotRange → {{-1*^-3, 365}, {0, 1}}, AspectRatio → 0.2, FrameTicks → {Automatic, None},
   FrameStyle → {Thickness[0.01]}, DisplayFunction → Identity],

  Graphics[{RGBColor[0, 1, 0], Rectangle[{2, 0.018}, {tripleCoincTotal, 1 - 0.022}]}],

  Graphics[{RGBColor[0, 0.5, 0], Text[Round[1000 tripleCoincTotal / 365.] / 10. "%", {200, 0.5},
     TextStyle → {FontFamily → "Helvetica", FontSize → 40, FontWeight → Bold}]}],

  DisplayFunction → $DisplayFunction
 ];
```



Predicted End of 1 Year of LHO/LLO Coincidence

This coincidence requires the Livingston detector and at least one of the Hanford detectors in science mode

In[219]:=

```
BarChart[HLpredictEndOfRun, BarOrientation → Horizontal,
  BarStyle → {RGBColor [0.4, 0.3, 0.4]}, Frame → True, GridLines → {Automatic, None},
  PlotLabel → "Predicted End of 1 Year of LHO/LLO Coincidence",
  FrameLabel → {"predicted run time (d)", "From"},
  FrameTicks → {Automatic, Transpose[{{1, 2, 3, 4, 5}, HLpredictEndOfRunLegend}],
    None, Transpose[{{1, 2, 3, 4, 5}, HLpredictEndOfRunDate}]}];
```

Overall Progress towards 1 Year of LHO/LLO Coincidence

This coincidence requires the Livingston detector and at least one of the Hanford detectors in science mode

In[220]:=

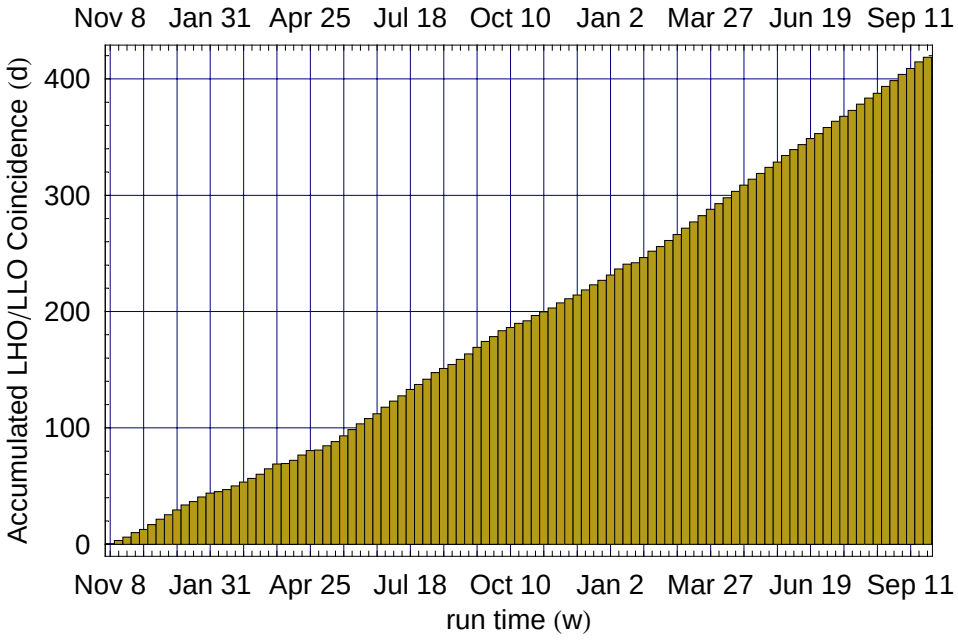
```
cummHL = Last /@ Partition[HLCoincAcc, 7]
```

Out[220]=

```
{0.248177, 3.22283, 6.06976, 10.0202, 12.6135, 16.782, 21.4971, 25.4227, 29.389,
 33.6259, 36.6415, 40.5898, 43.9418, 45.187, 47.02, 50.0888, 53.4547, 56.5019,
 60.188, 64.8748, 68.9283, 69.481, 72.0755, 76.6741, 80.5449, 80.8602, 84.6192,
 88.1408, 93.2088, 98.5345, 103.39, 108.03, 112.119, 117.656, 122.96, 127.639,
 132.952, 137.281, 141.878, 147.471, 151.028, 154.463, 158.821, 163.641, 169.216,
 174.34, 178.509, 183.503, 186.372, 189.925, 192.009, 196.649, 199.762, 203.067,
 207.429, 211.049, 214.19, 218.621, 223.002, 226.939, 231.335, 236.598, 240.826,
 241.879, 246.371, 251.937, 255.932, 261.065, 266.29, 271.716, 277.075, 282.419,
 287.9, 292.846, 297.869, 303.335, 308.669, 313.815, 318.61, 324., 328.478,
 334.117, 339.278, 343.54, 348.661, 352.935, 358.216, 363.513, 367.892, 372.966,
 378.246, 383.602, 387.714, 393.532, 398.544, 403.885, 409.007, 414.537, 418.566}
```

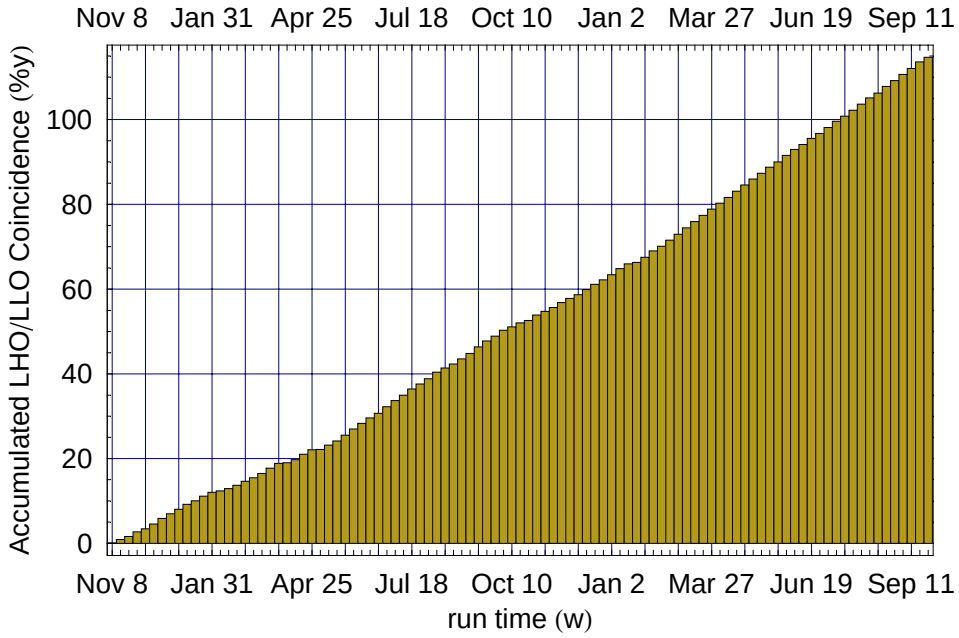
In[221]:=

```
BarChart[cummHL, BarStyle → {RGBColor [0.7, 0.6, 0.1]},
  GridLines → {Table[i, {i, 1, Length[cummHL], 4}], Automatic},
  FrameLabel → {"run time (w)", "Accumulated LHO/LLO Coincidence (d)"},
  Frame → True, GridLines → Automatic, BarSpacing → -0.2, BarLabels →
   Table[If[Mod[i, 12] === 0, dayname[i * 7 * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]
 ];
```



In[222]:=

```
BarChart[100 * cummHL / 365., BarStyle → {RGBColor [0.7, 0.6, 0.1]},
  GridLines → {Table[i, {i, 1, Length[cummHL], 4}], Automatic},
  FrameLabel → {"run time (w)", "Accumulated LHO/LLO Coincidence (%y)"},
  Frame → True, GridLines → Automatic, BarSpacing → -0.2, BarLabels →
   Table[If[Mod[i, 12] === 0, dayname[i * 7 * 24 * 3600], ""], {i, 0, Length[dutyH1] - 1}]
 ];
```



In[223]:=

```
Show[

  Plot[1, {x, -1*^-3, 365}, Frame → True, GridLines → {Automatic, None},
   PlotRange → {{-1*^-3, 365}, {0, 1}}, AspectRatio → 0.2, FrameTicks → {Automatic, None},
   FrameStyle → {Thickness[0.01]}, DisplayFunction → Identity],

  Graphics[{RGBColor[0, 1, 0], Rectangle[{2, 0.018}, {HLCoincTotal, 1 - 0.022}]}],

  Graphics[{RGBColor[0, 0.5, 0], Text[Round[1000 HLCoincTotal / 365.] / 10. "%", {200, 0.5},
     TextStyle → {FontFamily → "Helvetica", FontSize → 40, FontWeight → Bold}]}],

  DisplayFunction → $DisplayFunction
 ];
```