In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
x1 = pd.read_excel("xlsx (1).xlsx")
x2 = pd.read_excel("xlsx (2).xlsx")
x3 = pd.read_excel("xlsx (5).xlsx")
x4 = pd.read_excel("xlsx (6).xlsx")
x5 = pd.read_excel("xlsx (7).xlsx")
x6 = pd.read_excel("xlsx (8).xlsx")
```

In [3]:
```
merge_data = pd.concat([x1,x2,x3,x4,x5,x6])
merge_data
```

Out[3]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
0	2023-05-25 - 00:16:12	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
1	2023-05-25 - 00:46:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
2	2023-05-25 - 01:16:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
3	2023-05-25 - 01:46:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
4	2023-05-25 - 02:16:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
...	...	...	...	...	...	...	...
1574	2023-02-05 - 21:35:06	Normal	9	28.39185	70.29641	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
1575	2023-02-05 - 21:35:09	Normal	26	28.39184	70.29641	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
1576	2023-02-05 - 21:35:10	Normal	13	28.39183	70.29642	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
1577	2023-02-05 - 21:35:53	Ignition Off	0	28.39181	70.29559	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
1578	2023-02-05 - 21:36:53	Normal	0	28.39182	70.29562	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678

32093 rows × 7 columns

In [4]:
```
merge_data.reset_index(drop=True , inplace=True)
```

In [5]:
```
merge_data.dtypes
```

Out[5]:
```
Date Time       object
Status          object
Speed(Km/h)      int64
Latitude       float64
Longitude      float64
Reference       object
Mileage          int64
dtype: object
```

In [6]:
```
merge_data["Date Time"] = pd.to_datetime(merge_data["Date Time"])
```

In [7]:
```
merge_data[merge_data.duplicated()]
```

Out[7]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
693	2023-05-25 19:23:21	Normal	36	24.88278	67.02135	0.00 Km From Police Hospital, Garden - Karachi	24
1235	2023-05-26 09:25:24	Normal	77	24.91037	67.06838	0.00 Km From S.T High School, Gulshan 13-D 2 -...	52
2711	2023-05-27 14:52:27	Ignition Off	0	24.85648	67.00745	0.00 Km From CPLC Parking, Court St, Ali Dina ...	104
2712	2023-05-27 14:52:27	Ignition Off	0	24.85648	67.00745	0.00 Km From CPLC Parking, Court St, Ali Dina ...	104
9376	2023-03-14 08:50:41	Normal	12	24.90764	67.07853	0.00 Km From Najma Square, University Road, Gu...	7
...	...	...	...	...	...	...	...
30983	2023-02-05 12:27:20	Normal	94	25.84358	68.26366	7.00 Km From Railway Station, Village Manjhand...	194
31365	2023-02-05 16:14:26	Normal	90	27.08165	68.30872	0.00 Km From Halani, Noushahro Feroze District...	368
31828	2023-02-05 19:27:22	Normal	88	28.31676	69.76142	3.00 Km From Chakkar Khan Chang (Murid Shah) K...	581
31900	2023-02-05 20:05:46	Normal	105	28.39329	69.90354	3.00 Km From Bhong Masjid, Bhong, Near Sadiqab...	603
32000	2023-02-05 20:36:58	Normal	70	28.58941	70.25054	4.00 Km From Bosan Protein Farm, National High...	653

148 rows × 7 columns

In [8]:
```
merge_data.iloc[692:694]
```

Out[8]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
692	2023-05-25 19:23:21	Normal	36	24.88278	67.02135	0.00 Km From Police Hospital, Garden - Karachi	24
693	2023-05-25 19:23:21	Normal	36	24.88278	67.02135	0.00 Km From Police Hospital, Garden - Karachi	24

In [9]:
```
merge_data.drop_duplicates("Date Time",inplace=True)
```

In [10]:
```
merge_data.reset_index(drop=True , inplace=True)
```

In [11]:
```
merge_data
```

Out[11]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
0	2023-05-25 00:16:12	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
1	2023-05-25 00:46:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
2	2023-05-25 01:16:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
3	2023-05-25 01:46:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
4	2023-05-25 02:16:13	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
...	...	...	...	...	...	...	...
31894	2023-02-05 21:35:06	Normal	9	28.39185	70.29641	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31895	2023-02-05 21:35:09	Normal	26	28.39184	70.29641	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31896	2023-02-05 21:35:10	Normal	13	28.39183	70.29642	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31897	2023-02-05 21:35:53	Ignition Off	0	28.39181	70.29559	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31898	2023-02-05 21:36:53	Normal	0	28.39182	70.29562	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678

31899 rows × 7 columns

In [12]:
```
ignition = merge_data[(merge_data["Status"] == "Ignition On") | (merge_data
ignition
```

Out[12]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
18	2023-05-25 09:05:19	Ignition On	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
408	2023-05-25 09:36:15	Ignition Off	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20
428	2023-05-25 19:02:38	Ignition On	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20
993	2023-05-25 19:46:47	Ignition Off	0	24.95629	67.11987	0.00 Km From Memon Resturant, Sachal Goth - Ka...	42
1021	2023-05-26 09:08:26	Ignition On	0	24.95629	67.11987	0.00 Km From Memon Resturant, Sachal Goth - Ka...	42
...	...	...	...	...	...	...	...
31887	2023-02-05 21:29:24	Ignition Off	0	28.39186	70.29645	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31888	2023-02-05 21:29:32	Ignition On	0	28.39186	70.29645	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31889	2023-02-05 21:29:37	Ignition Off	0	28.39186	70.29645	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31891	2023-02-05 21:34:42	Ignition On	0	28.39186	70.29645	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678
31897	2023-02-05 21:35:53	Ignition Off	0	28.39181	70.29559	0.00 Km From Masjid e Aqsa, Itaq Colony, Rahim...	678

286 rows × 7 columns

In [13]:
```
index = pd.Series(merge_data[(merge_data["Status"] == "Ignition On") | (mer
index
```

Out[13]:
```
0         18
1        408
2        428
3        993
4       1021
       ...
281    31887
282    31888
283    31889
284    31891
285    31897
Length: 286, dtype: int64
```

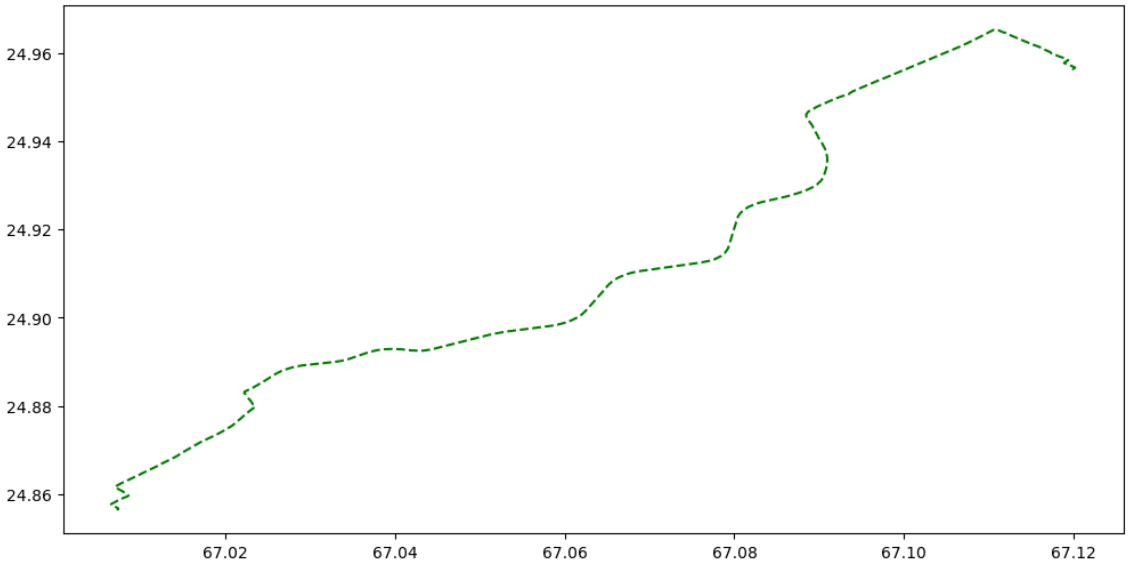
In [14]:
```
trip1 = merge_data.iloc[18:409]
trip1
```

Out[14]:

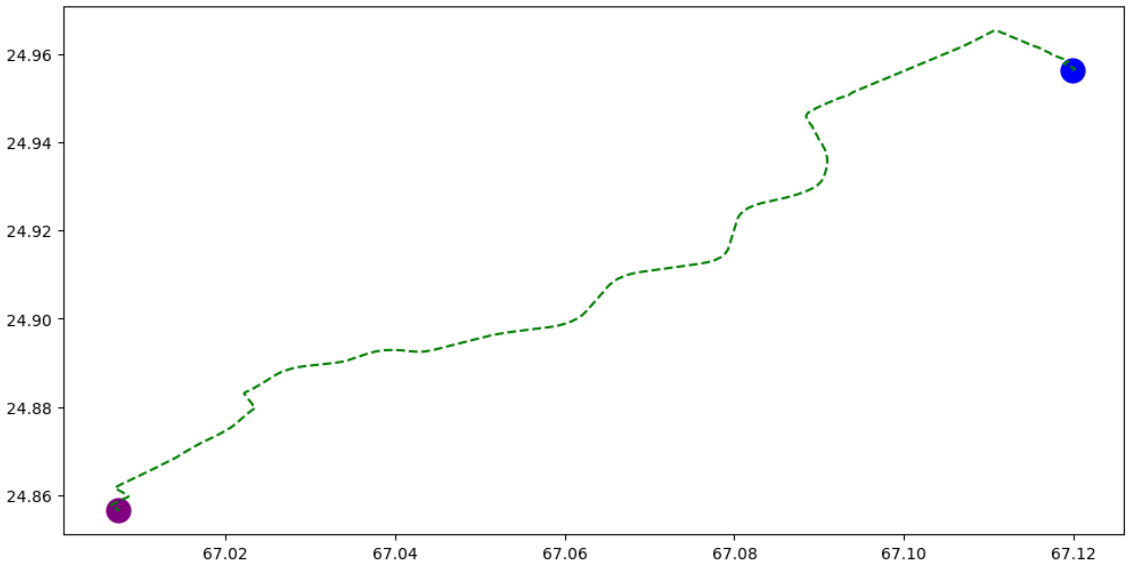
	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
18	2023-05-25 09:05:19	Ignition On	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
19	2023-05-25 09:05:25	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
20	2023-05-25 09:05:30	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
21	2023-05-25 09:05:35	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
22	2023-05-25 09:05:40	Normal	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
...	...	...	...	...	...	...	...
404	2023-05-25 09:35:58	Normal	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20
405	2023-05-25 09:36:02	Driver SeatBelt Close	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20
406	2023-05-25 09:36:07	Normal	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20
407	2023-05-25 09:36:12	Normal	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20
408	2023-05-25 09:36:15	Ignition Off	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20

391 rows × 7 columns

In [15]:
```
plt.figure(figsize=(12,6))
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.show()
```



In [16]:
```
plt.figure(figsize=(12,6))
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.scatter(trip1["Longitude"][18],trip1["Latitude"][18],linewidth=10 , col
plt.scatter(trip1["Longitude"][408],trip1["Latitude"][408],linewidth=10 , c
plt.show()
```

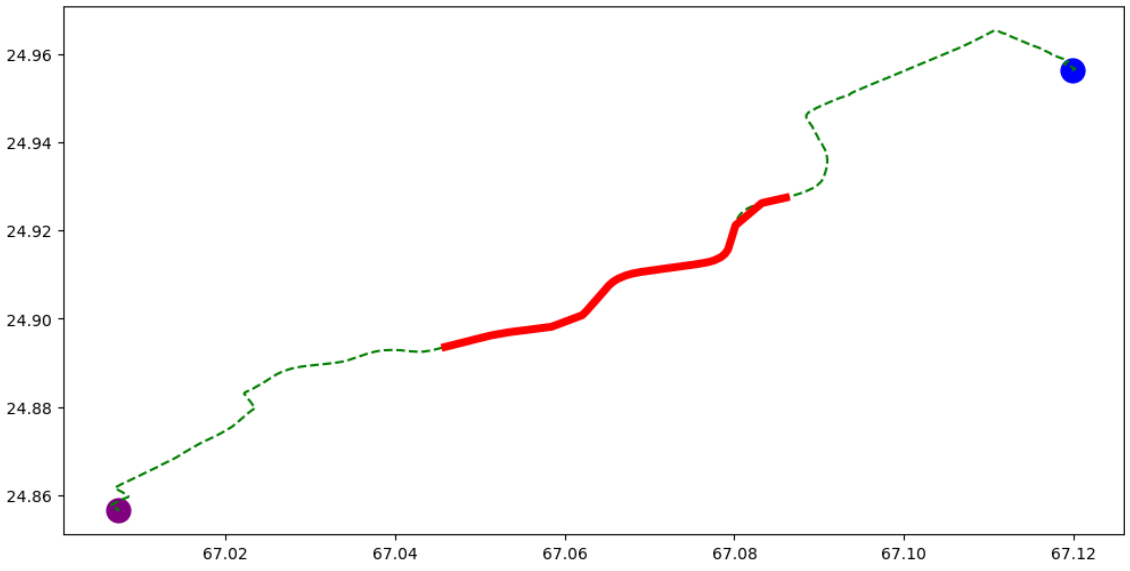


In [17]:
```
trip1_overspeed = trip1[trip1["Speed(Km/h)"] >= 80]
trip1_overspeed
```

Out[17]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
182	2023-05-25 09:18:20	Normal	82	24.92743	67.08607	0.00 Km From PSO Crystal Filling Station, Rash...	7
183	2023-05-25 09:18:25	Normal	80	24.92699	67.08506	0.00 Km From Centrum Lawn, Opposite UBL Sports...	7
184	2023-05-25 09:18:30	Normal	80	24.92665	67.08426	0.00 Km From Al-Farooq Hotel,Rashid Minhas Roa...	7
185	2023-05-25 09:18:34	Normal	81	24.92621	67.08325	0.00 Km From Harmain Plaza, Shahid Royal City,...	7
192	2023-05-25 09:19:06	Normal	82	24.92118	67.08015	0.00 Km From Harmain Plaza, Shahid Royal City,...	8

In [18]:
```
plt.figure(figsize=(12,6))
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.plot(trip1_overspeed["Longitude"],trip1_overspeed["Latitude"] , linewid
plt.scatter(trip1["Longitude"][18],trip1["Latitude"][18],linewidth=10 , col
plt.scatter(trip1["Longitude"][408],trip1["Latitude"][408],linewidth=10 , c
plt.show()
```

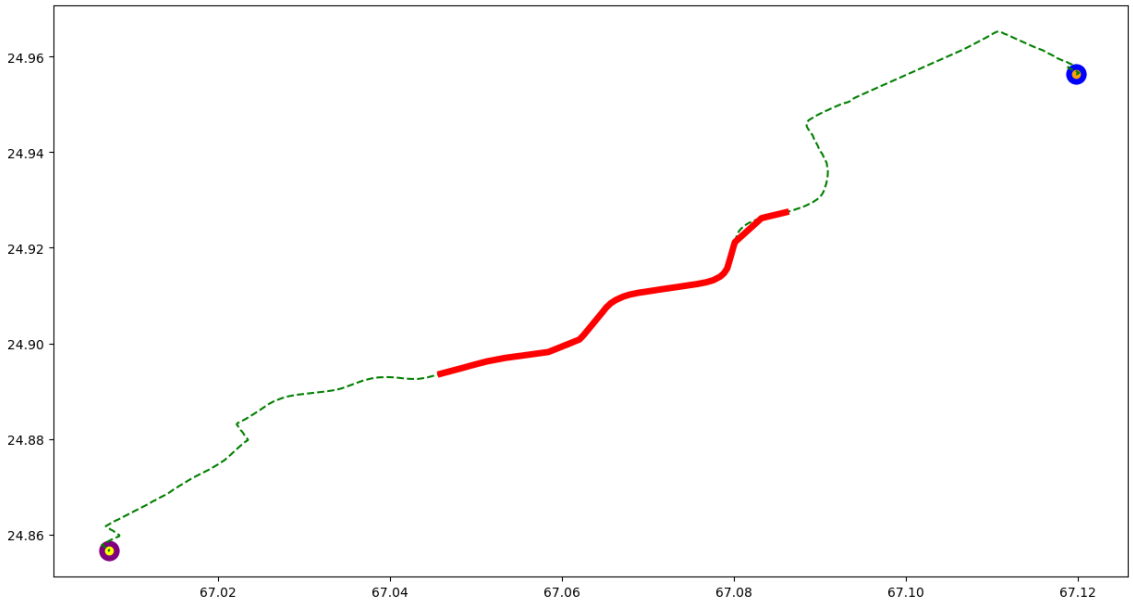


In [19]:
```
trip1[ (trip1["Status"] == "Driver SeatBelt Close") | (trip1["Status"] == "
```

Out[19]:

	Date Time	Status	Speed(Km/h)	Latitude	Longitude	Reference	Mileage
34	2023-05-25 09:06:39	Driver SeatBelt Open	0	24.95635	67.11983	0.00 Km From Memon Resturant, Sachal Goth - Ka...	0
405	2023-05-25 09:36:02	Driver SeatBelt Close	0	24.85659	67.00736	0.00 Km From CPLC Parking, Court St, Ali Dina ...	20

In [20]:
```
plt.figure(figsize=(15,8))
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.plot(trip1_overspeed["Longitude"],trip1_overspeed["Latitude"] , linewid
plt.scatter(trip1["Longitude"][18],trip1["Latitude"][18],linewidth=10 , col
plt.scatter(trip1["Longitude"][408],trip1["Latitude"][408],linewidth=10 , c
plt.scatter(trip1["Longitude"][34],trip1["Latitude"][34] , color = "orange"
plt.scatter(trip1["Longitude"][405],trip1["Latitude"][405] , color = "yello
plt.show()
```

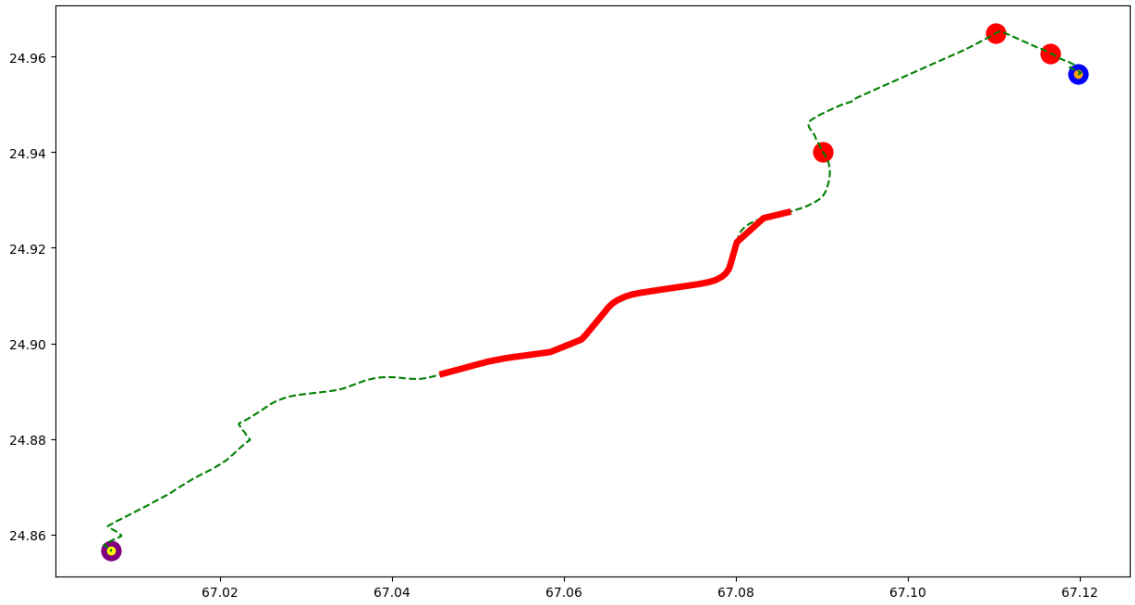


In [21]:
```
harsh_speed = []
speed = 0
for ind,i in trip1.iterrows():
    if i["Speed(Km/h)"] >= speed+20 :
        harsh_speed.append(ind)
    if speed <= i["Speed(Km/h)"]:
        speed = i["Speed(Km/h)"]
    if speed > i["Speed(Km/h)"] :
        speed = i["Speed(Km/h)"]
```

In [22]:
```
harsh_speed
```

Out[22]: [78, 96, 164]

In [23]:
```
plt.figure(figsize=(15,8))
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.plot(trip1_overspeed["Longitude"],trip1_overspeed["Latitude"] , linewid
plt.scatter(trip1["Longitude"][18],trip1["Latitude"][18],linewidth=10 , col
plt.scatter(trip1["Longitude"][408],trip1["Latitude"][408],linewidth=10 , c
plt.scatter(trip1["Longitude"][34],trip1["Latitude"][34] , color = "orange"
plt.scatter(trip1["Longitude"][405],trip1["Latitude"][405] , color = "yello
for i in harsh_speed:
    plt.scatter(trip1["Longitude"][i],trip1["Latitude"][i] ,linewidth=10 ,c
plt.show()
```



In [24]:
```
harsh_brake = []
brake = 0
for ind,i in trip1.iterrows():
    if i["Speed(Km/h)"] <= brake-20 :
        harsh_brake.append(ind)
    if brake <= i["Speed(Km/h)"]:
        brake = i["Speed(Km/h)"]
    if brake > i["Speed(Km/h)"] :
        brake = i["Speed(Km/h)"]
```

In [25]:
```
harsh_brake
```

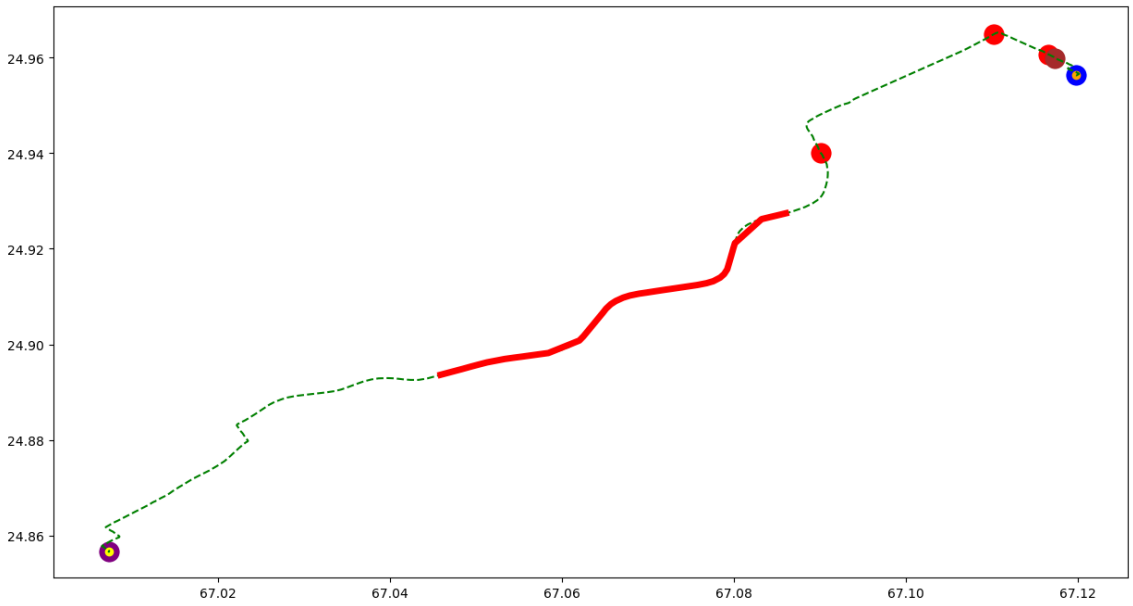
Out[25]: [75]

In [26]:
```
Duration = trip1["Date Time"][408] - trip1["Date Time"][18]
```

In [27]:

```
plt.figure(figsize=(15,8))
print(f"The Duration of Trip 1 is : {Duration} , No. of Harsh Speed is : \
{len(harsh_speed)} , No. of Harsh Break is : {len(harsh_brake)}")
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.plot(trip1_overspeed["Longitude"],trip1_overspeed["Latitude"] , linewid
plt.scatter(trip1["Longitude"][18],trip1["Latitude"][18],linewidth=10 , col
plt.scatter(trip1["Longitude"][408],trip1["Latitude"][408],linewidth=10 , c
plt.scatter(trip1["Longitude"][34],trip1["Latitude"][34] , color = "orange"
plt.scatter(trip1["Longitude"][405],trip1["Latitude"][405] , color = "yello
for i in harsh_speed:
    plt.scatter(trip1["Longitude"][i],trip1["Latitude"][i] ,linewidth=10 ,c
plt.scatter(trip1["Longitude"][75],trip1["Latitude"][75] ,linewidth=10 ,col
plt.show()
```

```
The Duration of Trip 1 is : 0 days 00:30:56 , No. of Harsh Speed is : 3 ,
No. of Harsh Break is : 1
```



In [28]:
```
on_list = []
off_list = []
for ind,i in ignition.iterrows():
    if i["Status"] == "Ignition On":
        on_list.append(ind)
    if i["Status"] == "Ignition Off":
        off_list.append(ind+1)

index_list = []
for i in range(143):
    index_list.append([on_list[i],off_list[i]])
index_list
```

Out[28]:
```
[[18, 409],
 [428, 994],
 [1021, 1431],
 [1450, 2110],
 [2111, 2168],
 [2200, 2634],
 [2635, 2645],
 [2645, 2653],
 [2657, 2679],
 [2681, 2709],
 [2715, 3177],
 [3179, 3405],
 [3406, 3451],
 [3458, 4439],
 [4281, 4550],
 [4445, 4842],
 [4551, 4973],
 [4848, 5235],
 [4974, 5243],
```

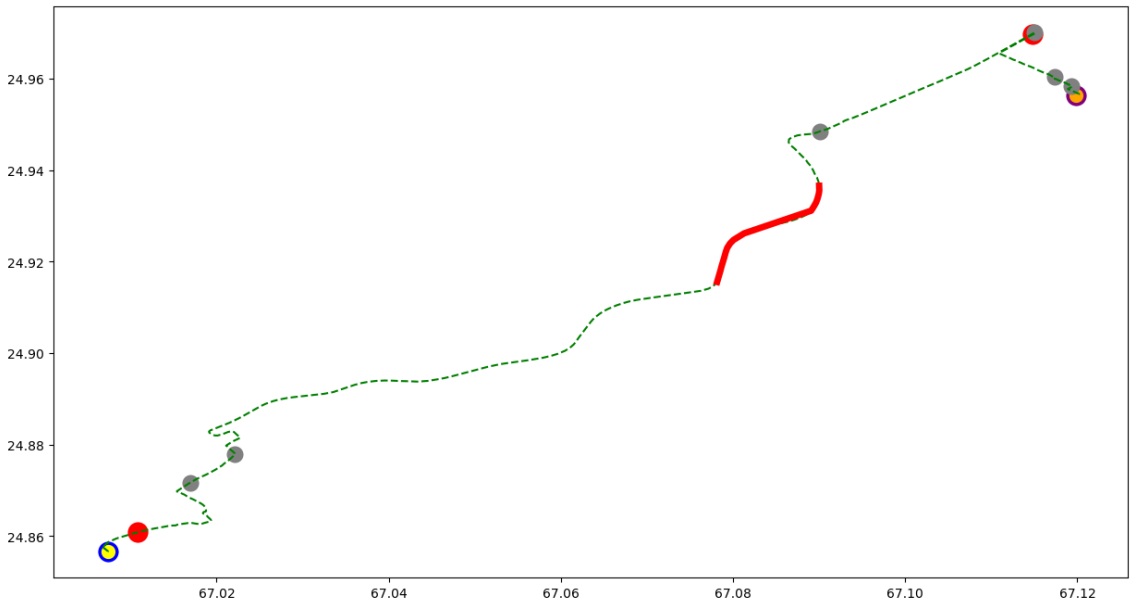
In [29]:
```
trip = {}
j = 1
for i in index_list:
    name = f"trip{j}"
    value = merge_data.iloc[i[0]:i[1]]
    trip[name] = value
    j += 1
```

In [30]:

```
def data(col):

    col.reset_index(drop=True , inplace=True)

    harsh_speed = []
    speed = 0

    for ind,i in col.iterrows():
        if i["Speed(Km/h)"] >= speed+20 :
            harsh_speed.append(ind)
        if speed <= i["Speed(Km/h)"]:
            speed = i["Speed(Km/h)"]
        if speed > i["Speed(Km/h)"] :
            speed = i["Speed(Km/h)"]

    harsh_brake = []
    brake = 0

    for ind,i in col.iterrows():
        if i["Speed(Km/h)"] <= brake-20 :
            harsh_brake.append(ind)
        if brake <= i["Speed(Km/h)"]:
            brake = i["Speed(Km/h)"]
        if brake > i["Speed(Km/h)"] :
            brake = i["Speed(Km/h)"]

    over_speed = col[col["Speed(Km/h)"] >= 80]

    closed = col[col["Status"] == "Driver SeatBelt Close"]
    opened = col[col["Status"] == "Driver SeatBelt Open"]

    plt.figure(figsize=(15,8))

    Duration = col["Date Time"].iloc[-1] - col["Date Time"].iloc[0]
    print(f"The Duration of this Trip is : {Duration} , No. of Harsh Speed
, No. of Harsh Break is : {len(harsh_brake)}")

    plt.plot(col["Longitude"],col["Latitude"] , ls = "--" , color = "green"
    plt.scatter(col["Longitude"][0:1],col["Latitude"][0:1],linewidth=10 , c
    plt.scatter(col["Longitude"][-1:],col["Latitude"][-1:],linewidth=10 , c

    plt.plot(over_speed["Longitude"],over_speed["Latitude"] , linewidth = 5

    plt.scatter(closed["Longitude"],closed["Latitude"] ,  linewidth = 5, co
    plt.scatter(opened["Longitude"],opened["Latitude"] ,linewidth = 5 , col

    for i in harsh_speed:
        plt.scatter(col["Longitude"][i],col["Latitude"][i] ,linewidth=10 ,c

    for i in harsh_brake:
        plt.scatter(col["Longitude"][i],col["Latitude"][i] ,linewidth=7 ,co

    plt.show()
```

In [31]:
```
data(trip["trip2"])
```

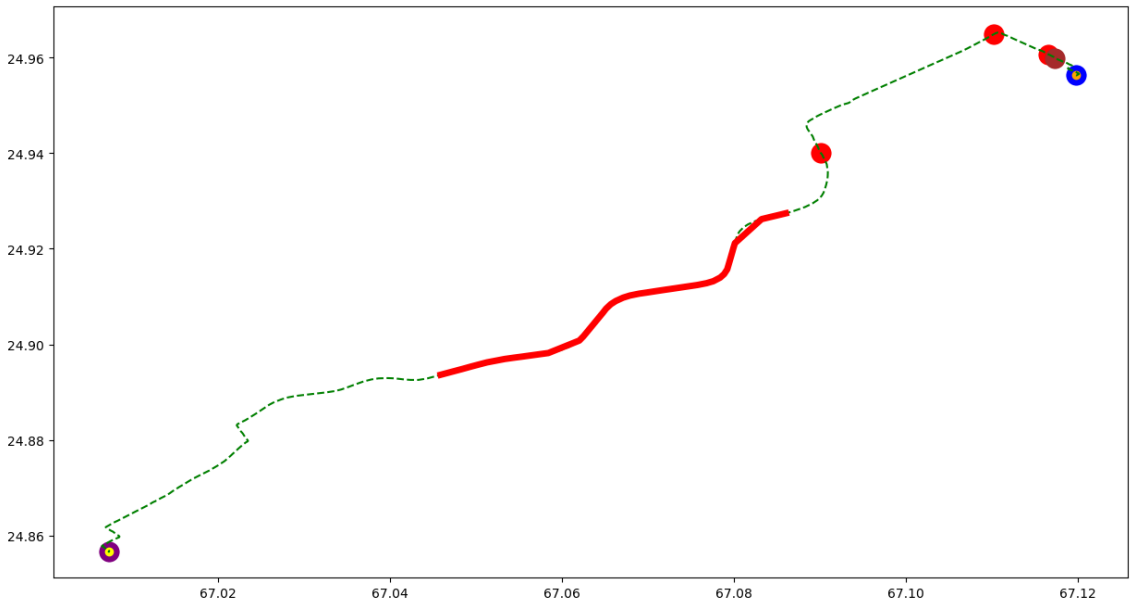
```
The Duration of this Trip is : 0 days 00:44:09 , No. of Harsh Speed is : 2
, No. of Harsh Break is : 6
```



In [32]:

```
plt.figure(figsize=(15,8))
print(f"The Duration of Trip 1 is : {Duration} , No. of Harsh Speed is : \
{len(harsh_speed)} , No. of Harsh Break is : {len(harsh_brake)}")
plt.plot(trip1["Longitude"],trip1["Latitude"] , ls = "--" , color = "green"
plt.plot(trip1_overspeed["Longitude"],trip1_overspeed["Latitude"] , linewid
plt.scatter(trip1["Longitude"][18],trip1["Latitude"][18],linewidth=10 , col
plt.scatter(trip1["Longitude"][408],trip1["Latitude"][408],linewidth=10 , c
plt.scatter(trip1["Longitude"][34],trip1["Latitude"][34] , color = "orange"
plt.scatter(trip1["Longitude"][405],trip1["Latitude"][405] , color = "yello
for i in harsh_speed:
    plt.scatter(trip1["Longitude"][i],trip1["Latitude"][i] ,linewidth=10 ,c
plt.scatter(trip1["Longitude"][75],trip1["Latitude"][75] ,linewidth=10 ,col
plt.show()
```

```
The Duration of Trip 1 is : 0 days 00:30:56 , No. of Harsh Speed is : 3 ,
No. of Harsh Break is : 1
```



In [ ]:

In [ ]: